SAN FRANCISCO GROUNDWATER SUPPLY PROJECT

Final Environmental Impact Report
Volume 2 of 2

Planning Department Case No. 2008.1122E
State Clearinghouse No. 2009122075

December 2013

City and County of San Francisco
San Francisco Planning Department

Important Dates:

DEIR Publication Date:	March 13, 2013
DEIR Public Comment Period:	March 13, 2013 to April 27, 2013
DEIR Public Hearing Date:	April 18, 2013
FEIR Certification Meeting Date:	December 19, 2013

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5.12 Utilities and Service Systems

This section assesses the Groundwater Supply Project's potential impacts on utilities and service systems, including natural gas, petroleum, electricity, telecommunications, stormwater drainage, water supply pipelines, wastewater collection, and solid waste disposal. The analysis provides mitigation measures to reduce potential impacts, as appropriate.

5.12.1 Setting

The project area would be located in the western side of San Francisco, and is generally situated between 19th Avenue (Highway 1) to the east, the Great Highway to the west, Fulton Street to the north, and Lake Merced to the south. The project area overlies the North Westside Groundwater Basin. The subsections below describe known utility systems and related infrastructure within the project vicinity as well as solid waste disposal facilities within the greater San Francisco Bay Area that could receive construction-related wastes.

Utilities

Underground Utilities in Project Area

Streets often function as underground utility corridors. The location of existing utilities are, therefore, taken into consideration when siting and installing new utilities. The preliminary engineering drawings for the proposed project (SFPUC, 2011) show the location of the project pipelines as well as existing structures and utilities along the alignment. These engineering drawings identify known utilities located in the project area including gas, sewer, and domestic cold water pipelines, telephone lines, cable lines, as well as electrical lines. **Table 5.12-1** indicates the location of known underground utilities within the project area.

However, because of the nature of underground construction, the exact location of underground utilities cannot be precisely determined based on construction documents; the exact location can only be determined by careful probing or hand digging, in compliance with Article 6 of the California Occupational Safety and Health Administration (Cal/OSHA) Construction Safety Orders. Therefore, prior to construction, Underground Service Alert – Northern California (USA North), a non-profit corporation which provides utility location services in Central and Northern California, is utilized to mark underground utilities.

For purposes of analysis, this EIR uses the California Department of Transportation (Caltrans) policies, as stated in the *Caltrans Project Development Procedures Manual* (Caltrans, 1999), to identify "high priority" utilities that would pose a greater risk to workers and the public should an accident occur during construction and that therefore warrant special consideration. Pursuant to the policy, high-priority utilities include pipelines carrying petroleum products, oxygen, chlorine, toxic or flammable gases; natural gas in pipelines greater than 6 inches nominal pipe diameter or with normal operating pressures greater than 60 pounds per square inch gauge; and underground electric supply lines, conductors, or cables that have a potential to ground more than 300 volts that do not have effectively grounded sheaths (Caltrans, 1999).

TABLE 5.12-1
EXISTING ABOVEGROUND AND UNDERGROUND UTILITIES LOCATED ALONG AND ACROSS SAN FRANCISCO GROUNDWATER SUPPLY PROJECT PIPELINE ALIGNMENTS[a]

Pipeline Segment	Utility	Diameter (inches)
1. West Sunset Well Facility to Sunset Reservoir	Gas	3 and 4
	Sewer	8, 12, 15 18, and 21
	Water	6 and 8
	Electrical lines	Unknown
	Telephone line (aboveground)	Unknown
2. Golden Gate Park Pipeline Junction to West Sunset Well Facility	Gas	3, 4, and deactivated 4 inch line
	Sewer	8, 10, and 15
	Water	6 and 8
	Telephone line	Unknown
	Cable line	Unknown
	Electrical lines	4
	Muni rail track, overhead electric Muni cable lines, and underground duct banks	NA
3. Central Pump Station Well Facility to Golden Gate Park Pipeline Junction	Unknown	Unknown
4. South Sunset Well Facility to West Sunset Well Facility	Muni rail track, overhead electric Muni cable lines, and underground duct banks	NA
	Sewer	8, 10, 15, 27
	Telephone line (aboveground)	Unknown
	Water	6, 8
	Gas	3, 4
	Electrical lines	Unknown
5. North Lake Well Facility to Golden Gate Park Pipeline Junction	Overhead electric lights	NA
6. South Windmill Replacement Well Facility to Golden Gate Park Pipeline Junction	TBD	TBD

[a] Due to the nature of underground construction, the exact location of underground utilities cannot be precisely determined based on construction documents; the exact location can only be determined by careful probing or hand digging, in compliance with Article 6 of the Cal/OSHA Construction Safety Orders.

NOTES:
NA = Not Available
TBD = To Be Determined

SOURCE: SFPUC, 2010 and 2011

Water Supply

As described in earlier sections of this EIR, water supply in the city of San Francisco is served through a local water pipeline distribution and delivery system operated and managed by the SFPUC.

Natural Gas and Electricity

Natural gas in the city of San Francisco is served through a network of regional gas pipelines owned by Pacific Gas and Electric Company (PG&E).

PG&E also provides electric power to meet San Francisco's industrial, commercial, and domestic requirements. SFPUC Power Enterprise provides electric power to meet the municipal requirements of the City and County of San Francisco (CCSF). Municipal uses include operating Muni light rail, streetcars and electric buses, street and traffic lights, municipal buildings, and other city facilities, including the San Francisco International Airport.

Telecommunications

San Francisco is served by multiple telecommunications companies, including AT&T, Xfinity/Comcast, and Verizon/MCI. As indicated in Table 5.12-1, above, existing telecommunication lines (including aboveground telephone lines and belowground cable lines) run along and across several portions of proposed pipeline segments.

Wastewater and Stormwater

The SFPUC maintains and operates the existing Combined Sewer System. This system combines stormwater runoff and wastewater flows in the same network of pipes and conveys flows to facilities for treatment prior to discharge through outfalls into San Francisco Bay or Pacific Ocean. Discharges are regulated under National Pollutant Discharge Elimination System (NPDES) permits, which are described in Section 5.16, Hydrology and Water Quality. The collection system comprises about 976 miles of underground pipes throughout city streets. Within the project area, wastewater and stormwater flow is conveyed to treatment facilities including the Oceanside Water Pollution Control Plant (located at 3500 Great Highway) before eventual discharge to the Pacific Ocean.

Solid Waste Disposal

Recology handles all residential and commercial waste, recycling, and composting for the city of San Francisco. However, individual project sponsors and their construction contractors are responsible for construction wastes. All construction wastes produced in San Francisco must be taken to a registered facility that is certified to receive these wastes by the San Francisco Department of the Environment (SFDE). In accordance with the San Francisco Construction and Demolition Recycling Ordinance (see Section 5.12.2, below), these registered facilities are required to recycle or reuse at least 65 percent of all construction waste received. Additionally, CCSF has had a goal to divert 75 percent of all waste from landfills by 2010. Two registered facilities within the city of San Francisco could receive project waste: OP Trucking CDI Operations and Recology San Francisco (SFDE, 2011).

Once construction wastes are delivered to these registered facilities, the wastes are sorted. Any waste that must be disposed of at a landfill would be taken to whichever landfill the registered facility chooses. The landfills that each registered facility uses are shown below:

- OP Trucking CDI Operations – Corinda Los Trancos Landfill (Padilla, 2013)
- Recology San Francisco – Altamont Landfill and Resource Recovery (Jenkins, 2011)

Table 5.12-2 shows the permitted and available capacities of these facilities as well as the types of waste the facilities can accept.

TABLE 5.12-2
ACTIVE LANDFILLS LIKELY TO RECEIVE PROJECT CONSTRUCTION WASTE

Facility (Jurisdiction)	Total Estimated Permitted Capacity[a] (cubic yards)	Total Estimated Capacity Used (cubic yards)	Estimated Remaining Capacity (cubic yards)	Percent Capacity Remaining	Closure Date[a]	Waste Types Accepted/Permitted
Solid Waste Disposal Facility						
Altamont Landfill and Resource Recovery (Alameda County)	62,000,000	16,280,000[b]	45,720,000 As of 08/22/05[a]	74%[b]	1/1/2029	Ash, construction/ demolition, contaminated soil, green materials, industrial, mixed municipal, other designated waste, tires, shreds
Corinda Los Trancos Landfill (San Mateo County)	37,900,000	11,000,000[d]	26,900,000 As of May 2011[c]	71%[d]	1/1/2018	Construction/demolition, mixed municipal, sludge (BioSolids), asbestos, other designated wastes, tires

[a] Capacity information from CalRecycle Waste Facility Profiles (CalRecycle, 2013a and 2013b).
[b] Calculated using CalRecycle data (CalRecycle, 2013a and 2013b).
[c] Capacity information provided by CalRecycle staff (Hohlwein, 2012).
[d] Calculated using data provided by CalRecycle staff (Hohlwein, 2012).

5.12.2 Regulatory Framework

Federal Regulations

No federal regulations related to utilities and service systems apply to the proposed project.

State Regulations

California Public Utilities Commission

The California Constitution vests the California Public Utilities Commission (CPUC) with the sole authority to regulate privately owned and investor-owned public utilities, such as PG&E. This exclusive power extends to all aspects of utility regulation, including facility location, design, construction, maintenance, and operation. CPUC requires regulated utilities to work closely with local governments and give due consideration to local government concerns. The CPUC does not regulate publicly owned utilities such as the SFPUC.

California Integrated Waste Management Act of 1989

The California Integrated Waste Management Act (CIWMA) of 1989 (Public Resources Code [PRC], Division 30), enacted through Assembly Bill (AB) 939 and modified by subsequent legislation, required all California cities and counties to implement programs to reduce, recycle, and compost at least 50 percent of wastes by the year 2000 (PRC Section 41780). A jurisdiction's diversion rate is the percentage of its total waste that it diverts from disposal through reduction, reuse, and recycling programs. The State determines compliance with the mandate to divert 50 percent of generated waste[1] through a complex formula. This formula requires cities and counties to conduct empirical studies to establish a "base year" waste generation rate against which future diversion is measured. The diversion rates in subsequent years are then determined by deduction rather than by direct measurement of material recycled and composted; i.e., cities and counties track the amount of material disposed of at landfills, then subtract that amount from the base-year amount, and the difference is assumed to be diverted (PRC Section 41780.2).

Using waste generation amounts from 2002 as a base year, as of 2006, the most recent year for which jurisdiction summary information is available, San Francisco diverted 70 percent of its waste, which complies with the 50 percent annual waste diversion goal mandated by AB 939 (CalRecycle, 2013c).

Utility Notification Requirements

Title 8, Section 1541 of the California Code of Regulations requires excavators to determine the approximate locations of subsurface installations such as sewer, telephone, fuel, electricity, and water lines (or any other subsurface installations that may reasonably be encountered during excavation work) prior to opening an excavation.

California law (Government Code Section 4216 et seq.) requires owners and operators of underground utilities to become members of and participate in a regional notification center, such as USA North. USA North receives reports of planned excavations from public and private excavators and transmits the information to all participating members that may have

1 "Generated waste" includes waste that is both disposed of and diverted.

underground facilities at the location of an excavation. USA members mark or stake their facilities, provide information, or give clearance to dig (USA North, 2011).

Local Regulations

San Francisco Construction and Demolition Ordinance

San Francisco Ordinance No. 27-06 mandates the recycling of construction and demolition (C&D) debris generated[1] in the city of San Francisco. This ordinance affects all construction projects such as new construction and partial demolitions. It requires the property owner to make sure that all C&D materials removed from the project are properly recycled. This ordinance prohibits any C&D materials from being placed in trash or sent directly to a landfill. C&D materials must be taken by a registered transporter to a registered facility that reuses or recycles those materials. At the registered facility, a minimum of 65 percent of the material must be diverted from the landfill (SFDE, 2011).

5.12.3 Impacts and Mitigation Measures

Significance Criteria

For the purposes of this EIR, the Groundwater Supply Project would have a significant effect on utilities and service systems if it were to:

- Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board;
- Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
- Require or result in the construction of new stormwater drainage facilities or the expansion of existing facilities, the construction of which could cause significant environmental effects;
- Have insufficient water supply available to serve the project from existing entitlements and resources, or require new or expanded water supply resources or entitlements;
- Result in a determination by the wastewater treatment provider that would serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments;
- Be served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs; or
- Be out of compliance with federal, state, and local statutes and regulations related to solid waste.

Because of the nature of the proposed project, this EIR applies the following criterion, in addition to those described above, and considers that the project would have a significant effect on utilities and service systems if it were to:

- Disrupt operation or require relocation of regional or local utilities.

Approach to Analysis

This section describes the impacts that have been screened out from further analysis and the reasons why; and describes the approach to impact analysis.

Because of the nature of the proposed project, this report does not analyze the following criterion for the reasons described below:

- ***Require or Result in the Construction or Expansion of Stormwater Drainage Facilities, the Construction of Which Could Cause Significant Environmental Effects.*** The SFPUC does not propose to construct or expand stormwater drainage facilities as part of the proposed project. As discussed under Impacts HY-3 and HY-4 in Section 5.16, Hydrology and Water Quality, project implementation would not substantially increase the rate or amount of stormwater runoff. Thus, project implementation would not cause an exceedance of existing stormwater drainage capacity that would necessitate the construction or expansion of infrastructure. Thus, the criterion related to the construction or expansion of stormwater drainage facilities is not applicable to the proposed project and is not discussed further in this report. For additional discussion of the proposed project's effects on stormwater drainage facilities, see Section 5.16, Hydrology and Water Quality.

The second criterion listed above, *Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects*, relates to the primary purpose of the proposed project, which is a water supply project that includes water treatment (disinfection) and would add groundwater as a source of municipal water supply in San Francisco (it also includes connections to the existing municipal water system for the operation of sinks and emergency eyewashes/showers at two of the well facilities). The primary purpose of this EIR is to evaluate the potential impacts of implementing the project. Its construction would cause significant effects as identified in this EIR; refer to Sections 5.1, Overview, through 5.11, Recreation, and 5.13, Public Services through 5.19, Agricultural and Forest Resources, for more information. The potential for implementation of the project to require the construction of new or the expansion of existing wastewater facilities is addressed below under Impact UT-5.

The analysis of project effects related to utilities and service systems addresses temporary construction-related impacts as well as impacts during project operations. However, as indicated below, potential impacts on utilities and utility services would occur primarily during project construction; project operations would not result in substantial long-term impacts on utilities and service systems, given that no belowground excavation work would be required during project operations. During construction, short-term temporary disruption of service could occur if existing utilities were accidentally damaged during project-related construction activities.

This analysis also identifies potential impacts related to landfill capacity resulting from the disposal of construction waste as well as the ability of local jurisdictions to comply with federal, State, and local landfill statutes. The largest potential source of solid waste would be excavated soil material. Although much of the soil would be reused onsite as backfill, an estimated 2,570 cubic yards of excess spoils would be generated during construction activities and would require offsite disposal. Because spoils could expand by up to approximately 20 percent, since soils are less compact after excavation, it is conservatively assumed that the total excess spoils would be approximately 3,040 cubic yards. Thus, this analysis evaluates the potential effects of landfill disposal with respect to the available capacity of local landfills and the CCSF's ability to comply with solid waste diversion rates.

Impact Summary

Table 5.12-3 lists the proposed project's utility and service system impacts and significance determinations.

TABLE 5.12-3
SUMMARY OF IMPACTS – UTILITIES AND SERVICE SYSTEMS

Impacts	Significance Determinations
Impact UT-1: Project construction would not result in a substantial adverse effect related to landfill capacity.	LS
Impact UT-2: Project construction would not result in a substantial adverse effect related to compliance with federal, State, and local statutes and regulations pertaining to solid waste.	LS
Impact UT-3: Project construction would potentially result in a substantial adverse effect related to disruption of utility operations or accidental damage to existing utilities.	LSM
Impact UT-4: Project construction would potentially result in a substantial adverse effect related to the relocation of local utilities.	LSM
Impact UT-5: Project operations would not result in the construction or expansion of wastewater treatment facilities, exceed wastewater treatment requirements, or result in a determination by the wastewater treatment provider that there is insufficient capacity to serve the project.	LS
Impact UT-6: Project operations would not require more water supply than would be available through existing entitlements and resources, nor would it require new or expanded water supply resources or entitlements.	LS
Impact C-UT: Project implementation would result in cumulatively considerable impacts related to disruption or relocation of utilities, landfill capacity, or compliance with solid waste statutes and regulations.	LSM

NOTES:
LS = Less-than-Significant impact, no mitigation required
LSM = Less-than-Significant impact with Mitigation

Impact Analysis

Construction Impacts

Impact UT-1: Project construction would not result in a substantial adverse effect related to landfill capacity. (Less than Significant)

As described in Chapter 3, Project Description, construction activities during Phase 1 and Phase 2 would result in an estimated 320 cubic yards of excess soils from well facility construction and

● 1,990 cubic yards of excess soils from pipeline construction activities. In addition, demolition of the two existing well facilities would also require disposal of approximately 240 cubic yards of materials and approximately 100 cubic yards would require disposal from excavation at Sunset Reservoir, resulting in a total excess spoils volume of 3,180 cubic yards with a 20 percent expansion factor accounted for. Excavated soil that is not reused would be stockpiled daily at appropriate staging areas for future reuse or would be taken to an appropriate facility for recycling, reuse, or disposal. As described in Chapter 3, Project Description, most of the spoils material is expected to be nonhazardous waste.[2] However, if contaminated soils are encountered, the waste would be trucked to the closest facility that accepts the type of contaminated soils encountered. Refer to Section 5.17, Hazards and Hazardous Materials, for information regarding disposal of hazardous materials.

In compliance with the San Francisco Construction and Demolition Ordinance (Ordinance No. 27-06), spoils would be taken to one of the registered facilities that reuse or recycle C&D materials.[3] Two registered facilities in San Francisco would accept project waste. Each of these facilities is required to divert a minimum of 65 percent of the C&D materials it receives. As a ● result, the receiving landfill would receive up to 1,115 cubic yards of C&D materials over the construction period. Therefore, the project's contribution to the receiving landfill would be equal to less than 0.01 percent of the remaining capacity of each of the landfills that may receive the waste (Altamont and/or Corinda Los Trancos). Because adequate capacity exists at the landfills to accept the project's construction waste, potential impacts related to exceeding permitted landfill capacity would be less than significant.

Impact UT-2: Project construction would not result in a substantial adverse effect related to compliance with federal, State, and local statutes and regulations pertaining to solid waste. (Less than Significant)

Project implementation would generate waste materials, including construction debris, demolition materials, and excavated spoils that could exceed the local waste diversion goals or daily tonnage limit of local landfills, which would be a potentially significant impact. However, the San Francisco Construction and Demolition Ordinance (Ordinance No. 27-06) prohibits C&D materials from being placed into the trash or sent directly to a landfill. Compliance with this ordinance would ensure that all project waste is taken to a registered facility, which would arrange for the proper recycling, reuse, and disposal of the C&D materials that the project produces. The registered facilities are required to divert a minimum of 65 percent of C&D materials from the landfill. Additionally, CCSF has a goal to divert 75 percent of all waste from

[2] Nonhazardous wastes are materials that are not contaminated and do not pose a threat to water quality once disposed. Class III waste disposal facilities are permitted to receive such wastes.

[3] Facilities are registered and approved by the San Francisco Department of the Environment.

landfills. Therefore, potential impacts related to compliance with federal, State, and local solid waste statutes and regulations would be less than significant.

Impact UT-3: Project construction would potentially result in a substantial adverse effect related to disruption of utility operations or accidental damage to existing utilities. (Less than Significant with Mitigation)

Construction activities for the proposed project could result in damage to or interference with existing water, sewer, storm drain, natural gas, electricity, and/or telecommunication lines (see Table 5.12-1). A majority of the project facilities are located along transportation rights-of-way, which frequently serve as utility corridors. Although the exact location of underground utilities is not known at this time, utility lines of varying sizes are located along and across several of the groundwater pipeline routes and at the proposed well facility sites.

Groundwater Well Facility Construction

Groundwater well facility construction activities, such as demolition of the existing South Windmill Replacement and North Lake well facilities, tree removal, and excavation could result in accidental damage to utilities. Approximate excavation depths for installation of the foundations for the well facilities are as follows:

Site	Depth of Excavation
Lake Merced Well Facility	5 to 8 feet for foundations, 24 feet for vibrocompaction/stone columns
South Sunset Well Facility	8.5 to 13 feet
West Sunset Well Facility	8.5 to 14 feet
Central Pump Station Well Facility	35 feet for drilled piers
South Windmill Replacement Well Facility	35 feet for drilled piers
North Lake Well Facility	35 feet for drilled piers

Tree removal as well as use of construction equipment such as telescopic cranes and pump-setting rigs to install the well components at each site could accidentally damage any overhead utilities lines present in the project area. In addition, overhead utility poles and underground utility lines along roadways could be damaged accidentally from the movement of large construction equipment and vehicles throughout the project area. Well facility construction would also require new connections to existing electrical, water, and sewer lines. Installing these connections could result in damage to the existing utilities or temporary disruptions in service.

Pipeline Construction

Pipeline installation would require excavation of six different roadway segments with lengths ranging from approximately 2,080 feet to 6,860 feet. The groundwater pipelines would generally require excavation of trenches not more than 6 feet deep and 10 feet wide. Trench widths would be greater (16 feet) at the Central Pump Station well facility site because new electrical, water supply and/or overboard utility lines would be located adjacent to the proposed pipelines. Trench depths would be greater (12 feet) at two locations where the MUNI light rail intersects Pipeline Segment 2 on Judah Street and Pipeline Segment 4 on Taraval Street. Auger boring trenchless excavation (micro tunneling) would be used at these locations to avoid damaging the light rail. Although auger boring would avoid impacts on the light rail, it could affect other utilities in that area. Additionally, trenching activities could result in accidental damage to utilities.

Although it can be reasonably assumed that project construction planning would include avoidance of overhead utility lines, the use of the telescopic crane to stage and lay pipeline segments could result in accidental damage to existing overhead utility lines. In addition, overhead utility poles and underground utility lines along the roadways could be damaged accidentally from the movement of large construction equipment and vehicles throughout the project area.

As discussed above, the project area could cross a number of underground utility lines, including natural gas pipelines, electrical powerlines, telecommunication lines, and other water supply pipelines. Accidental rupture of or damage to these utility lines during project construction could temporarily disrupt utility services and, in the case of high-priority utilities, could result in significant safety hazards for construction workers and the public. For the above reasons, potential impacts on existing utilities and utility services during project construction could be significant. However, these potential impacts would be reduced to a less-than-significant level with implementation of **Mitigation Measure M-UT-3a, Preconstruction Utility Identification and Coordination; Mitigation Measure M-UT-3b, Protection of Other Utilities during Construction**; **Mitigation Measure M-UT-3c, Safeguard Employees from Potential Accidents Related to Underground Utilities; Mitigation Measure M-UT-3d, Notify San Francisco Fire Department; Mitigation Measure M-UT-3e, Emergency Response Plan and Notification; Mitigation Measure M-UT-3f; Ensure Prompt Reconnection of Utilities;** and **Mitigation Measure M-UT-3g, Coordinate Final Construction Plans with Affected Utilities.** These mitigation measures, described below, serve to avoid or minimize the potential for disrupting utilities and utility services by identification and protection or temporary disconnection of utility lines, notification and coordination with emergency response providers, and reconnection of utilities.

Mitigation Measures

Mitigation Measure M-UT-3a: Preconstruction Utility Identification and Coordination. Prior to construction activities, the SFPUC or its contractor(s) shall determine the locations of overhead and underground utility lines, such as natural gas, electricity, sewer, telephone, cable, fuel, water, and MUNI lines, that may be encountered during construction work. Pursuant to State law, the SFPUC or its contractor(s) shall notify USA North so that utility companies may be advised of the work and may field-mark or otherwise protect and warn the contractor of their existing utility lines. Information regarding the location of existing utilities shall be reviewed before construction activities begin. Utilities may be located by customary techniques such as geophysical methods and hand excavation.

The SFPUC or its contractor(s) shall notify all affected utility service providers in advance of the project construction plans and schedule. The SFPUC or its contractor(s) shall make arrangements with these entities regarding the protection, relocation, or temporary disconnection of services prior to the start of construction, and prompt reconnection of services, as required.

Mitigation Measure M-UT-3b: Protection of Other Utilities during Construction. Specifications shall be prepared as part of the design plans. These specifications shall include procedures for the excavation, support, and fill of areas around subsurface utilities, cables, and pipes. If the project encounters overhead electric and/or telephone lines during pipeline construction, the SFPUC or its contractor(s) shall coordinate with SFMTA and appropriate telecommunication service providers to de-energize overhead electric lines as required by the federal and State Occupational Safety and Health Administration (OSHA) regulations.

Mitigation Measure M-UT-3c: Safeguard Employees from Potential Accidents Related to Underground Utilities. While any excavation is open, the SFPUC or its contractors shall protect, support, or remove underground utilities as necessary to safeguard employees. As part of contract specifications, the contractor(s) shall be required to provide updates on excavations planned for the upcoming week and to specify when construction will occur near a high-priority utility. At the beginning of each week when this work will take place, per California OSHA, the contractor is required to hold safety tailgate meetings and to document contents of meeting. The SFPUC is not required to attend these contractor tailgate meetings, but may attend.

Mitigation Measure M-UT-3d: Notify San Francisco Fire Department. If construction activities result in damage to high-priority utility lines, the SFPUC or its contractor(s) shall immediately notify the San Francisco Fire Department to protect worker and public safety.

Mitigation Measure M-UT-3e: Emergency Response Plan and Notification. The SFPUC or its contractor(s) shall develop an emergency response plan prior to commencing construction activities. The emergency response plan shall identify measures to be taken in response to a leak or explosion resulting from a utility rupture. In addition, the SFPUC or its contractor(s) shall notify the appropriate emergency response department whenever damage to any utility results in a threat to public safety.

Mitigation Measure M-UT-3f: Ensure Prompt Reconnection of Utilities. The SFPUC or its contractor(s) shall promptly notify utility providers to reconnect any disconnected utility lines as soon as it is safe to do so.

Mitigation Measure M-UT-3g: Coordinate Final Construction Plans with Affected Utilities. The SFPUC or its contractor(s) shall coordinate final construction plans and specifications with affected utilities.

Impact UT-4: Project construction would potentially result in a substantial adverse effect related to the relocation of local utilities. (Less than Significant with Mitigation)

The proposed alignments for the San Francisco Groundwater Supply Project pipelines would cross beneath existing utilities at several locations, including but not limited to the MUNI light rail crossings. The San Francisco Groundwater Supply Project does not propose to relocate utilities, but it is possible that relocation would be necessary once the locations and characteristics of any potentially conflicting utilities are confirmed. Consequently, installation of the project pipelines could require the temporary relocation of utility lines that are owned and operated by other utility companies. For the above reasons, potential impacts related to utility relocation could be significant. However, with implementation of **Mitigation Measure M-UT-3a, Preconstruction Utility Identification and Coordination** and **Mitigation Measure M-UT-3g, Coordinate Final Construction Plans with Affected Utilities,** which serve to avoid or minimize the potential for disrupting utilities and utility services by identification and protection or temporary disconnection of utility lines, this potential impact would be reduced to a less-than-significant level.

Mitigation Measures

> **Mitigation Measures M-UT-3a: Preconstruction Utility Identification and Coordination** and **M-UT-3g: Coordinate Final Construction Plans with Affected Utilities.** (see Impact UT-3 for description)

Facility Siting, Operations, and Maintenance Impacts

Impact UT-5: Project operations would not result in the construction or expansion of wastewater treatment facilities, exceed wastewater treatment requirements, or result in a determination by the wastewater treatment provider that there is insufficient capacity to serve the project. (Less than Significant)

The six well facilities would include floor drains and, at the Lake Merced and West Sunset well facilities, sinks and emergency eye wash/shower stations. The proposed project would generate wastewater during operation of the sinks and eye wash stations. As part of the project, the SFPUC would include connections from these well facilities to existing SFPUC wastewater pipelines. The sinks would be used a maximum of once a day by a single operations staff person, and the eye wash/shower would only be used in the case of emergencies. Therefore, the quantity of wastewater that would be produced would be minimal and would not be of a quality that could exceed the SFPUC's wastewater treatment requirements. Thus, potential impacts related to wastewater treatment and capacity would be less than significant.

Impact UT-6: Project operations would not require more water supply than would be available through existing entitlements and resources, nor would it require new or expanded water supply resources or entitlements. (Less than Significant)

As described in Chapter 3, Project Description, the proposed project is a component of the SFPUC's adopted Water System Improvement Program (WSIP) and would provide up to approximately 4 mgd of groundwater to San Francisco's municipal water supply. Water supply availability and resources related to groundwater pumping is discussed in Section 5.16, Hydrology and Water Quality, Impact HY-12 regarding groundwater depletion. Project operation water supply needs would be minimal and restricted to eye wash/shower stations and sinks required for worker safety, and this water would be provided through the SFPUC regional water system. Operation of the Groundwater Supply Project is not expected to require more water supply than would be available through existing entitlements and resources, nor would it require new or expanded water supply resources or entitlements; therefore this potential impact would be less than significant.

Cumulative Impacts

Impact C-UT: Project implementation would result in cumulatively considerable impacts related to disruption or relocation of utilities, landfill capacity, or compliance with solid waste statutes and regulations. (Less than Significant with Mitigation)

The geographic scope of potential cumulative utilities and service systems impacts consists of the project area, immediate vicinity, and the service areas of regional service/utility providers. For landfill capacity, the geographic scope includes the service areas of San Francisco, Alameda, and San Mateo Counties where recycling, reuse and disposal of construction-related waste could occur. For compliance with solid waste statutes and regulations, the geographic area encompasses San Francisco County. Section 5.1.4, Cumulative Impacts, describes the approach to the cumulative analysis used throughout this EIR; Table 5.1-6 and Figure 5.1-1 summarize cumulative projects in the vicinity of the Groundwater Supply Project.

Damage to or Disruption of Existing Utilities and Relocation of Utilities

As described in Impacts UT-3 and UT-4, construction of the San Francisco Groundwater Supply Project could damage existing utilities and could disrupt utility services where utility lines would be crossed during construction, and could require the temporary relocation of some utilities. Seven cumulative projects would be located adjacent to or near the proposed well facilities and/or pipeline routes, including: the San Francisco Westside Recycled Water Project, the San Francisco State University Campus Master Plan, Vista Grande Drainage Basin Improvement Project, Significant Natural Areas Management Plan, Lake Merced Pump Station Essential Upgrade, and the 3711 19th Avenue (Parkmerced) Project. However, most of these projects would either not overlap geographically with the Groundwater Supply Project or would not occur within the same timeframe as the proposed project; therefore the likelihood for potential disruption of the same utility lines would be minor. Two of the projects listed in Table 5.1-6 and above could also damage existing utilities or disrupt utility services, or cause relocation of utilities. In particular, San Francisco Westside Recycled Water Project could involve new connections between existing electrical, water, and wastewater utilities in the project vicinity. The Beach Chalet Athletic Fields Renovation Project would also occur within the geographic scope of the Groundwater Supply Project and could overlap in schedule with the proposed project. Concurrent implementation of this project in the Golden Gate Park area could cause service disruptions for the same set of customers within a short timeframe. Therefore, potential cumulative impacts related to disruption of utility operations or accidental damage to existing utilities and relocation of regional or local utilities could be significant.

For purposes of this analysis, it is conservatively assumed that, without mitigation, the project's contribution to this potential cumulative impact could be cumulatively considerable. However, as discussed in Impacts UT-3 and UT-4, the proposed project's impacts related to damaging existing utilities and disrupting utility services, and relocation of utilities would be less than significant with implementation of Mitigation Measures M-UT-3a (Preconstruction Utility Identification and Coordination), M-UT-3b (Protection of Other Utilities during Construction), M-UT-3c (Safeguard Employees from Potential Accidents Related to Underground Utilities), M-UT-3d (Notify San Francisco Fire Department), M-UT-3e (Emergency Response Plan and Notification), M-UT-3f (Ensure Prompt Reconnection of Utilities), and M-UT-3g (Coordinate Final Construction Plans with Affected Utilities). Collectively, implementation of these mitigation measures would ensure that existing utilities are accurately located and protected during construction and that emergency response procedures are in place to address the situation if an existing utility is damaged during construction. With implementation of these mitigation measures, the project's contribution to potential cumulative impacts related to damage or disruption of existing utilities and relocation of utilities would not be cumulatively considerable (less than significant).

Landfill Capacity

As discussed in Impact UT-1, the proposed project would generate an estimated 3,040 cubic yards of excess spoils and a maximum of approximately 1,065 cubic yards of the project's construction waste would be deposited in a landfill (assuming compliance with the City's 65 percent diversion requirement). Most of the cumulative projects listed in Table 5.1-6 would also generate construction-related waste. For the purposes of this analysis, it is conservatively assumed that if all of these wastes were disposed of in offsite disposal facilities, there could be a significant cumulative impact on landfill capacity. With the exception of the Regional Groundwater Storage and Recovery Project, each cumulative project listed in Table 5.1-6, would occur within the City of San Francisco and would also be required to divert at least 65 percent (see Impact UT-1 for requirements). Since the Regional Groundwater Storage and Recovery Project would be located in San Mateo County, this particular project would be subject to the diversion goals of the applicable cities in San Mateo County. If feasible, the proposed project would aim to meet the 75 percent diversion goal for its construction and demolition wastes. Both the 35 percent of spoils that would be disposed of offsite (approximately 1,065 cubic yards), and potentially the 25 percent of the spoils that could be disposed of offsite (approximately 760 cubic yards), represent a very small fraction of the total remaining landfill capacity at Corinda Los Trancos (Ox Mountain) Landfill and the Altamont Landfill. Therefore, the project's contribution to cumulative demand on landfill capacity would not be cumulatively considerable (less than significant).

Compliance with Solid Waste Statutes and Regulations

The proposed project and all of the projects listed in Table 5.1-6 would generate wastes that require offsite disposal. However, the proposed project would utilize registered C&D waste recycling and reuse facilities, which would divert at least 65 percent of the project's construction waste from local landfills. Additionally, CCSF agencies completing construction projects within the city have a goal to divert 75 percent of their C&D waste by 2020. Both of these diversion rates exceed the state-mandated goal of 50 percent diversion. Additionally, each of the potentially cumulative projects would also be required to utilize a registered facility in compliance with the San Francisco Construction and Demolition Recycling Ordinance and each project would aim to meet the City of San Francisco's 75 percent diversion goal. Therefore, the potential cumulative impact related to compliance with solid waste statutes and regulations would be less than significant.

5.12.4 References

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5.13 Public Services

This section describes the existing conditions and regulatory setting for public services in the Groundwater Supply Project area and assesses potential impacts on public services that could result from implementation of the proposed project. Public services addressed in this section include law enforcement services, fire protection services, and emergency services.

5.13.1 Setting

The project would be located entirely within the city of San Francisco. San Francisco encompasses approximately 46.7 square miles of land. The city is generally densely populated and urbanized, except for publicly owned open spaces that make up approximately 20 percent of the city's total land area.

The project area would be located on the western side of San Francisco, in the Outer Parkside and Outer Sunset neighborhoods. As shown in Figure 3-1, the project area is generally situated between 19th Avenue (Highway 1) to the east, the Great Highway to the west, Fulton Street to the north, and Lake Merced to the south. The project area overlies the North Westside Groundwater Basin. It also includes four city parks: Golden Gate Park, Lake Merced, West Sunset Playground, and South Sunset Playground, as well as public open space at Sunset Reservoir. These park areas are described in Section 5.11, Recreation.

Law Enforcement Services

Both the San Francisco Sheriff's Department and Police Department provide law enforcement services to the City and County of San Francisco (CCSF). The police office closest to the project locations is the Taraval District Station at 2345 24th Avenue. However, considering that responders are on mobile patrol, most responses are not made from a specific office. Responses to calls within the project vicinity could also dispatch from the Richmond District Station at 461 6th Avenue. A deputy or officer of higher rank would respond to calls in the project vicinity, and the response time would depend on whether the Sheriff's Department and Police Department were addressing other calls or emergencies at the time of the call (CCSF, 2011c, 2011d).

Fire Protection Services

The San Francisco Fire Department (SFFD) provides fire protection services to the CCSF, including the project vicinity. The SFFD also responds to other emergency situations, including hazardous materials incidents, and provides medical aid and fire prevention and safety training. Several SFFD stations are located in the project vicinity, as summarized below in **Table 5.13-1**. In the event of a fire emergency within the project vicinity, the SFFD would be dispatched as the first response team.

TABLE 5.13-1
FIRE STATIONS IN THE PROJECT VICINITY

Fire Station No.	Address
18	1935 32nd Avenue at Pacheco Street
19	390 Buckingham Way
22	1290 16th Avenue at Irving Street
23	1349 45th Avenue at Judah Street
34	499 41st Avenue at Geary Boulevard
40	2155 18th Avenue at Rivera Street

SOURCE: CCSF, 2011b.

Emergency Services

The San Francisco Department of Emergency Management consists of two divisions: the Division of Emergency Communications (DEC) and the Division of Emergency Services (DES). The DEC provides emergency dispatch services for the police and fire departments as well as the emergency medical system, and the DES coordinates disaster preparation and response planning in partnership with CCSF agencies, nonprofit entities, schools, and the private sector. The DES is also responsible for the Emergency Medical Services Agency, which coordinates all components of San Francisco's pre-hospital care system (CCSF, 2011a).

5.13.2 Regulatory Framework

Federal Regulations

There are no federal regulations governing public services that apply to the Groundwater Supply Project.

State Regulations

California Master Mutual Aid Agreement

The California Master Mutual Aid Agreement is a framework agreement between the State of California and local governments that provides for aid and assistance through the interchange of services and facilities. This aid agreement includes but is not limited to the following: fire, police, medical and health, communication, and transportation services, as well as facilities to cope with issues related to rescue, relief, evacuation, rehabilitation, and reconstruction.

California Fire Code

State fire regulations are set forth in Section 13000 et seq. of the California Health and Safety Code, which includes regulations pertaining to building standards (i.e., the California Building Code); fire protection and notification systems; fire protection devices (such as fire extinguishers and smoke alarms); high-rise building and childcare facility standards; and fire suppression training.

Local Regulations

San Francisco Police Code

The San Francisco Police Code contains regulations for various types of activities such as automobile use, permitting and licensing, use of ports, and disorderly conduct.

San Francisco Fire Code

The San Francisco Fire Code, as revised in 2007, governs the safeguarding of life and property from fire and explosion hazards arising from the storage, handling, and use of hazardous substances, materials, and devices, as well as from conditions that are potentially hazardous to life or property in the occupancy of buildings and premises. The San Francisco Fire Code also provides for the issuance of permits, inspections, and other SFFD services and regulates fees associated with those permits, inspections, and services. The SFFD reviews building plans to ensure fire and life safety in the buildings under its jurisdiction. As standard practice, SFPUC designs facilities to meet the requirements of the San Francisco Fire Code and other building codes. This practice includes consultation with SFFD plan check engineers on an as-needed basis.

5.13.3 Impacts and Mitigation Measures

Significance Criteria

For the purposes of this EIR, the Groundwater Supply Project would have a significant effect on public services if it were to:

- Result in substantial adverse physical impacts associated with the provision of, or the need for, new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any public services such as fire protection, police protection, schools, parks, or other services.

Approach to Analysis

Potential impacts related to parks and recreational resources in the project vicinity are addressed in Section 5.11, Recreation. This topic is not discussed further in this section. Due to the nature of the proposed project, there would be no impacts related to the following criterion for the reasons described below:

- ***Result in Substantial Adverse Impacts Associated with the Provision of, or the Need for, New or Physically Altered Governmental Facilities.*** During the proposed 26-month construction period, up to 63 construction workers would be employed at the project site, depending on the phase of construction and the construction activities taking place (see Sections 3.4.1, Groundwater Well Facilities Construction and 3.4.2, and Pipeline Construction). It is expected that construction workers could come from any part of the Bay Area. While it is possible that some workers might temporarily relocate from other areas, the proposed project would not result in a substantial increase in the local population. Potential incidents requiring law enforcement, fire protection, or emergency services could occur during construction; however, any temporary increase in incidents would not exceed the capacity of local law enforcement, fire protection, and emergency facilities such that new or expanded facilities would be required, because any temporary increase in the local population during project construction would be negligible and could be accommodated by existing service providers. Construction of the proposed project would not result in impacts related to the need for new or physically altered governmental facilities in order to maintain existing levels of public services, and no construction-related public service impacts would occur.

The proposed project would not result in a permanent increase in the local population. Operation and post-construction maintenance activities would be similar to existing maintenance activities and would not result in substantial increases in demand for public services, including fire protection, police protection, libraries, schools, hospitals, or other services. Therefore, operational impacts related to public services are not applicable.

Because there would be no construction or operational impacts, the criterion related to the need for new or modified governmental facilities is not applicable to the project and is not discussed further.

Impact Analysis

As described above, implementation of the proposed project would not result in impacts related to public services.

Cumulative Impacts

Implementation of the proposed project would not result in any cumulative impacts related to public services because the project would not cause any project-specific impacts related to this topic.

5.13.4 References

City and County of San Francisco (CCSF), San Francisco Department of Emergency Management website. Available online at http://www.sfdem.org/. Accessed January 5, 2011a.

City and County of San Francisco (CCSF), *San Francisco Fire Department Fire Station Locations*. Available online at http://www.sf-fire.org/Modules/ShowDocument.aspx?documentid=1579. Accessed January 3, 2011b.

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5.14 Biological Resources

This section describes the existing conditions for biological resources in the Groundwater Supply Project vicinity and assesses potential impacts on biological resources resulting from construction and operation of the proposed project. The section also presents regulations and guidelines relevant to biological resources and identifies mitigation measures for potentially significant impacts.

The information on natural communities, plant and animal species, and sensitive biological resources used in the preparation of this section was obtained from: the California Natural Diversity Database (CNDDB) (CDFG, 2011), California Native Plant Society (CNPS) Electronic Inventory (CNPS, 2011), the U.S. Fish and Wildlife Service (USFWS, 2011a), a wetland delineation prepared for the project (Jones and Stokes, 2007a), a California red-legged frog habitat assessment prepared for the project (Jones and Stokes, 2007b), botanical surveys conducted for the Lake Merced area (May and Associates, 2009; Nomad Ecology, 2011), standard biological literature, and reconnaissance-level site visits. On June 25, August 23, and August 24, 2010, botanical and wildlife surveys of the project sites, including a tree inventory, were conducted in order to characterize existing conditions within the project sites and vicinity, assess habitat quality, and assess the potential presence of special-status species and sensitive natural communities.

5.14.1 Setting

Regional Setting

The project would be located in the Bay Area–Delta Bioregion,[1] as defined by the State of California's Natural Communities Conservation Program. This bioregion consists of a variety of natural communities that range from the open waters of San Francisco Bay and Delta to salt and brackish marshes to grassland, chaparral, and oak woodlands. The temperate climate is Mediterranean in nature, with relatively mild, wet winters and warm, dry summers. The high diversity of vegetation and wildlife found in the region is a result of soil, topographic, and microclimate variations that combine to promote relatively high levels of endemism.[2] This, in combination with a long history of uses that have altered the natural environment and the increasingly rapid pace of development in the region, has endangered some of the local flora and fauna.

1 A *bioregion* is an area defined by a combination of ecological, geographic, and social criteria and consists of a system of related, interconnected ecosystems. The Bay-Delta Bioregion is considered the immediate watershed of the Bay Area and the Delta, not including the major rivers that flow into the Delta. It is bounded on the north by the northern edge of Sonoma and Napa Counties and the Delta, and extends east to the edge of the valley floor; on the south, it is bounded by the southern edge of San Joaquin County, the eastern edge of the Diablo Range, and the southern edge of Santa Clara and San Mateo Counties.

2 *Endemism* refers to the degree to which organisms or taxa are restricted to a geographical region or locality and thus are individually characterized as endemic to that area.

The San Francisco Bay–Delta is the second-largest estuary in the United States and supports numerous aquatic habitats and biological communities. It encompasses 479 square miles, including shallow mudflats, tidal marshes, and open waters. The San Francisco Bay–Delta is an important wintering and migratory stopover site on the Pacific Flyway. More than 300,000 wintering waterfowl use the region.

Project Setting

The project area would be located on the western side of San Francisco, in the Outer Parkside and the Outer Sunset neighborhoods. The project area overlies the North Westside Groundwater Basin. All of the proposed project facilities, with the exception of the Lake Merced well facility, would be located in Golden Gate Park and the Outer Sunset neighborhood. The western edge of San Francisco, including today's Outer Sunset neighborhood and Golden Gate Park, was in a natural state of sand dunes with a sparse covering of chaparral for most of recorded history. Development in San Francisco has almost entirely removed sand dune habitat, and within the city sand dunes and native sand dune vegetation are restricted to areas such as Fort Funston and the Presidio. Today, very little native vegetation remains in the project site or vicinity. Golden Gate Park contains large groves of mature landscape trees, natural and landscaped areas, ponds and lakes with wetland vegetation, and recreational turfgrass fields. While the park habitats have been extensively modified, the park contains several habitats capable of supporting a significant diversity of wildlife species, especially nesting and migratory birds.

Lake Merced is the largest natural freshwater lake in the city and is comprised of four lakes: North, East, South, and Impound Lakes. Lake Merced was historically a lagoon fed by five relatively small streams and groundwater, with occasional connection to the Pacific Ocean (SFPUC, 2011). Lagoons typically form along the California coast in areas where sand is regularly deposited on beaches and streams only flow during the rainy months. Because the Lake Merced watershed is relatively small and the streams that historically fed it had small watersheds themselves, it was likely rare that flows were great enough to breach the sand bar that blocked them. Beginning in the 1870's the lake was used as a municipal water supply for the City of San Francisco and by the late 1880's the lake was completely separated from the ocean due in large part to water diversions for municipal use and urban development. At the same time berms were constructed to divide the lagoon into separate lakes.

San Francisco's climate is strongly influenced by its proximity to the Pacific Ocean and San Francisco Bay, which moderates temperature swings and helps produce its characteristic fog, in particular in the western part of the city where the project is located. Data from the Western Regional Climate Center for the San Francisco–Richmond weather station indicate that average annual precipitation is 20 inches in the project vicinity. The average maximum annual temperature is 61.5 degrees Fahrenheit, and average minimum annual temperature is 49.4 degrees Fahrenheit (Western Regional Climate Center, 2012).

Project Area Vegetation Communities and Wildlife Habitats

Vegetation communities in the project area and immediate vicinity include non-native forest, landscaped, barren/ruderal, developed, lake, and freshwater marsh. "Barren," "developed," and "lake" habitats are not natural vegetation communities per se, as they lack natural vegetation, but are used in this analysis to describe areas that cannot be classified as vegetation communities. The following subsections describe these communities and their locations in the project area.

Landscaped

Landscaped areas supporting a variety of ornamental trees, shrubs and non-native vegetation are present at the South Sunset and West Sunset well facility sites; Sunset Reservoir; and at the edge of several proposed pipeline routes (although most of the pipeline routes themselves are in paved streets). There are large areas of irrigated, non-native grasslands throughout or adjacent to several of these landscaped areas.

Landscaped areas in an otherwise urban environment can provide cover, foraging, and nesting habitat for a variety of bird species as well as reptiles and small mammals, especially those that are tolerant of disturbance and human presence. Birds commonly found in such areas include non-native species such as English sparrow (*Passer domesticus*) and European starling (*Sturnus vulgaris*) as well as birds native to the area, including American robin (*Turdus migratorius*), house finch (*Carpodacus mexicanus*), dark-eyed junco (*Junco hyemalis*), western scrub jay (*Aphelocoma californica*), mourning dove (*Zenaida macroura*), and Anna's hummingbird (*Calypte anna*). Reptiles using this type of habitat may include native species such as garter snake (*Thamnophis* spp.) and western fence lizard (*Sceloporus occidentalis*). Other wildlife present in these urban landscaped areas include striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), and roosting bats as well as the non-native Virginia opossum (*Didelphis virginiana*). Coyotes have been sighted occasionally in Golden Gate Park. Irrigated, non-native grasslands such as those found at Sunset Reservoir and the playgrounds adjacent to the West Sunset well facility sites can provide foraging habitat for flocks of Canada geese (*Branta canadensis*) as well as red-tailed hawks (*Buteo jamaicensis*) that prey on Botta's pocket gophers (*Thomomys bottae*) and other small rodents.

Non-native Forest

The non-native forest throughout the project area is primarily comprised of blue gum eucalyptus[3] (*Eucalyptus globulus*), Monterey pine (*Pinus radiata*), and Monterey cypress (*Hesperocyparis macrocarpa*) trees (Monterey pine and Monterey cypress are native to California but not to the San Francisco area). Several of the proposed well facility sites in Golden Gate Park, including the Central Pump Station, and proposed access areas for the South Windmill Replacement, North Lake, and Lake Merced well facility sites, are adjacent to or support non-native forest.

[3] As shown in Figure 5.14-2 and discussed later in *Sensitive Natural Communities, including Wetlands* and the *Operational Impacts Analysis*, the blue-gum eucalyptus forest at Lake Merced that supports cormorant and heron rookeries is considered a sensitive biological resource. This vegetation type is not considered sensitive elsewhere in the project area.

During biological surveys conducted on behalf of the San Francisco Planning Department for this EIR on June 25, August 23, and August 24, 2010, Environmental Science Associates observed several birds and squirrels in the eucalyptus and closed-cone pine/cypress forest, including native species such as American robin, chestnut-backed chickadee (*Poecile rufescens*), pygmy nuthatch (*Sitta pygmaea*), Anna's hummingbird, California towhee (*Pipilo crissalis*), and the non-native eastern gray squirrel (*Sciurus carolinensis*). Special-status species that could be present in these areas include nesting raptors such as red-shouldered hawk (*Buteo lineatus*) and red-tailed hawk, and overwintering monarch butterflies (*Danaus plexippus*).

Barren/Ruderal

Some of the proposed well facility sites have been almost entirely cleared of vegetation to make room for new buildings and structures, or to stockpile material or debris (e.g., logs and mulch). Specifically, the South Windmill Replacement well facility site and areas immediately around the North Lake well facility site in Golden Gate Park are predominantly barren or ruderal areas. Ruderal areas differ from completely barren areas in that they support scattered weedy, non-native plant species such as wild radish (*Raphanus sativus*), dallisgrass (*Paspalum dilatatum*), and scarlet pimpernel (*Anagallis arvensis*).

All of these well facilities are adjacent to landscaped areas or non-native forest, and thus the species found here are similar to those found in the landscaped and non-native forest communities described above.

Lake and Freshwater Marsh

While not part of the proposed project footprint, several lakes and ponds are located in the vicinity of the project sites (e.g., Lloyd Lake, North Lake, and Lake Merced). Some of the lakes are man-made while others, such as Lake Merced and North Lake, are modified from historical conditions. The lakes in Golden Gate Park and Lake Merced are suitable habitat for aquatic wildlife, including native species such as mallard (*Anas platyrhynchos*), American coot (*Fulica americana*), great blue heron (*Ardea herodias*), grebe (*Podiceps* spp.), egret (*Egretta* spp.), and the non-native red-eared slider (*Trachemys scripta*). Special-status species that may be present in these lakes include western pond turtle (*Actinemys marmorata)*, which is known to occur in Lake Merced immediately west of the Lake Merced well facility site, and Lloyd Lake approximately 0.1 mile north of the Central Pump Station; and California red-legged frog (*Rana draytonii*), which may occur at ponds in Golden Gate Park and has recently been observed in the artificial ponds at the San Francisco Botanical Garden/Strybing Arboretum, approximately 0.5 mile east of the Central Pump Station. California red-legged frogs were known to occur historically at Lake Merced, but the species is now considered extirpated from the lake based on a lack of recent sightings, survey results since 2000, and the presence of predators, such as bullfrogs (Jones and Stokes, 2007b; San Francisco Planning Department, 2011a).

Freshwater marsh has largely vanished from San Francisco, but there are still areas of native bulrush-cattail marsh at Lake Merced, and a restoration project is ongoing for the Chain of Lakes marshes. In particular, there is a healthy freshwater marsh approximately 100 feet west of the proposed Lake Merced well facility site, and freshwater marsh approximately 50 feet west of the proposed groundwater pipeline to the North Lake well facility site. Freshwater emergent wetland habitat is valuable for many aquatic species, including nesting songbirds. For example, there are records of native species such as nesting marsh wren (*Cistothorus palustris*), common yellowthroat (*Geothlypis trichas*), pied-billed grebes (*Podilymbus podiceps*), and ruddy duck (*Oxyura jamaicensis*) in Lake Merced marshes (San Francisco Field Ornithologists, 2003), and recent records showing nesting red-winged blackbirds (*Agelaius phoeniceus*) and song sparrows (*Melospiza melodia*) at North Lake.

Developed

The proposed pipeline alignments are predominantly in paved streets (e.g., along 41st Avenue and Ortega Street), which provide little habitat for wildlife. Although paved roads themselves generally lack habitat for wildlife, wildlife occasionally cross roads in the project area to get to nearby landscaped habitat or non-native forest. Thus, developed areas often have similar wildlife species as the landscaped and non-native forest communities discussed above, but with lower rates of occurrence.

Lake Merced Vegetation Communities and Habitat Types

Vegetation communities and habitat types at Lake Merced are shown in **Figure 5.14-1** and described below.

Annual Grassland

Annual grassland is present north of East Lake near Sunset Circle and on the west and east sides of Impound Lake. Dominant species include non-natives such as ripgut brome (*Bromus diandrus*), wild oats (*Avena fatua*), brome fescue (*Festuca bromoides*), hare's tail grass (*Lagurus ovatus*), cut-leaved geranium (*Geranium dissectum*), broadleaf filaree (*Erodium botrys*), sheep sorrel (*Rumex acetosella*), spring vetch (*Vicia sativa*), smooth cat's ear (*Hypochaeris glabra*), and wild radish. Native herbs include Canadian horseweed (*Conyza canadensis*), beach strawberry (*Fragaria chiloensis*), and annual lupine (*Lupinus bicolor*). Scattered native shrubs are present, including coyote brush (*Baccharis pilularis*) and dune bush lupine (*Lupinus chamissonis*). Annual grassland at Lake Merced would support a similar set of wildlife species as described above for landscaped areas.

Central Dune Scrub

Central dune scrub is present at Impound Lake, on the north side of East Lake and on the north side of North Lake, on very sandy soils. Dune scrub vegetation is located in restoration areas where dune plants have been planted. Dune scrub at Lake Merced is characterized by a mix of dune species with varying cover, including dune bush lupine, yellow lupine (*Lupinus arboreus*), coast buckwheat (*Eriogonum latifolium*), coyote brush, coastal sagewort (*Artemisia pycnocephala*), dune knotweed (*Polygonum paronychia*), California goldenbush (*Ericameria ericoides*), and lizard-tail (*Eriophyllum staechadifolium*). Characteristic herbs include California acaena (*Acaena pinnatifida* var. *californica*), contorted sun cup (*Camissonia contorta*), beach evening primrose (*Camissonia cheiranthifolia* subsp. *cheiranthifolia*), hairy gumweed (*Grindelia hirsutula* var. *hirsutula*), and seaside fiddleneck (*Amsinckia spectabilis* var. *spectabilis*). Dune scrub is highly variable in terms of which species are dominant or co-dominant. These areas contain high plant species diversity and high native species cover. Non-native herbs present in dune scrub vegetation include ripgut brome, soft chess (*Bromus hordeaceus*), rattlesnake grass (*Briza maxima*), wild oats, hare's tail grass, little quaking grass (*Briza minor*), and sheep sorrel. Central dune scrub at Lake Merced also supports several special-status plant species, including blue coast gilia (*Gilia capitata* subsp. *chamissonis*; CNPS List 1B.1), San Francisco spineflower (*Chorizanthe cuspidata* var. *cuspidata*; CNPS 1B.2), and dune tansy (*Tanacetum camphoratum*; locally rare). Central dune scrub at Lake Merced likely supports western fence lizard, garter snakes, small rodents such as mice and voles, and a variety of birds similar to those found in landscaped areas, as described above.

Coast Live Oak Woodland

Coast live oak woodland is present at Lake Merced on the northwest side of East Lake. These stands are characterized by native coast live oak (*Quercus agrifolia*) trees of different sizes that form a fairly continuous to intermittent canopy. The understory supports both native shrubs and herbs, including California blackberry (*Rubus ursinus*), California coffeeberry (*Frangula californica*), poison oak (*Toxicodendron diversilobum*), California manroot, bracken fern, and miner's lettuce (*Claytonia perfoliata* ssp. *intermontana*). Non-native species include English ivy (*Hedera helix*), fine-leaved fumitory (*Fumaria parviflora*), upright veldt grass (*Ehrharta erecta*), ripgut brome, Bermuda buttercup (*Oxalis pes-caprae*), common chickweed (*Stellaria media*), and rattlesnake grass (*Briza maxima*).

Coastal Scrub

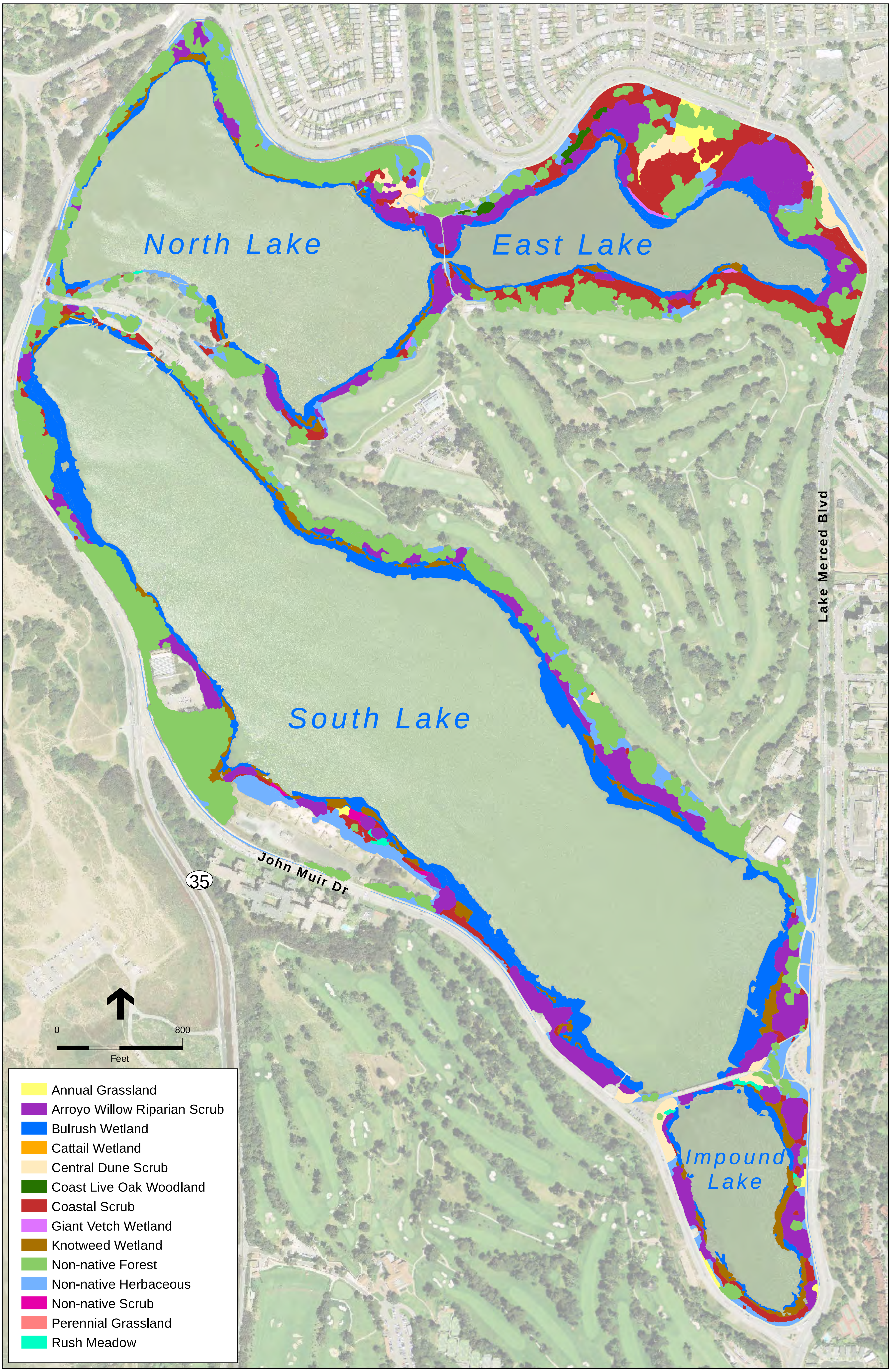
Coastal scrub at Lake Merced is made up of 14 different vegetation types classified according to their dominant species, including native California blackberry scrub, California sage scrub, poison oak scrub, and coyote brush scrub. For the purpose of this EIR analysis, these scrub types were grouped together under the broader classification of coastal scrub and mapped as such (see Figure 5.14-1). However, three scrub types were also identified as sensitive resources because the CNPS considers their dominant species to be locally significant. These sensitive scrub types at Lake Merced are canyon live oak scrub, thimbleberry scrub, and wax myrtle scrub. Coastal scrub at Lake Merced likely supports a similar set of species as described above for landscaped areas, central dune scrub, and annual grasslands.

Non-native Forest

As described above, the non-native forest throughout the project area, including the Lake Merced area, is primarily comprised of blue gum eucalyptus, Monterey pine, and Monterey cypress (Monterey pine and Monterey cypress are native to California but not to the San Francisco area).

Non-native Herbaceous

Areas mapped as non-native herbaceous are dominated by weedy, non-native plant species; they can be difficult to characterize and are often temporary assemblages. In areas of frequent human disturbance, the majority of wild plants are often introduced weeds rather than natives. Around Lake Merced, this vegetation type was identified adjacent to developed areas such as sidewalks, roads, the golf course, and the Pacific Rod and Gun Club. Non-native plant species typical of



SOURCE: ESA, 2012; USGS, 2011

Figure 5.14-1
Lake Merced 2012 Vegetation Types

ruderal vegetation in this area include ripgut brome, wild oats, soft chess (*Bromus hordeaceus*), hare barley (*Hordeum murinum* ssp. *leporinum*), Italian ryegrass (*Festuca perennis*), red-stemmed filaree, wild radish, black mustard, prickly lettuce (*Lactuca serriola*), bristly ox-tongue (*Helminthotheca echioides*), cheeseweed (*Malva parviflora*), rattlesnake grass, hare's tail grass (*Lagurus ovatus*), scarlet pimpernel, miner's lettuce, everlasting cudweed (*Pseudognaphalium luteoalbum*), red sand spurrey (*Spergularia rubra*), crimson clover (*Trifolium incarnatum*), cut-leaved geranium, spring vetch, kikuyu grass (*Pennisetum clandestinum*), cape ivy (*Delairea odorata*), poison hemlock (*Conium maculatum*), and iceplant (*Carpobrotus edulis*).

Non-native Scrub

The non-native scrub present at Lake Merced consists of Himalayan blackberry scrub. There are four areas of Himalayan blackberry scrub at Lake Merced, three of which are in the vicinity of the Pacific Rod and Gun Club; the other is near the Lake Merced Boathouse. Native species, including California blackberry and swamp knotweed, are present at low cover. Non-native herbs in the area include sheep sorrel (*Rumex acetosella*) and ripgut brome. Himalayan blackberry scrub is fairly uncommon around the lake compared to native California blackberry scrub. Blackberries provide food and dense protective cover for a variety of birds, particularly ground nesters such as California towhee.

Perennial Grassland

There is a small patch of perennial grassland on the north shore of East Lake at the base of a steep slope adjacent to stands of blue gum forest and rush meadow. The dominant species within this grassland is Vancouver rye, which is a hybrid between the native species American dunegrass (*Elymus mollis*) and creeping wildrye (*Elymus triticoides*). Other species include the native shrub California blackberry as well as the non-natives sheep sorrel, wild radish, ripgut brome, hairy vetch (*Vicia villosa* ssp. *villosa*), spiny sowthistle (*Sonchus asper*), and Zorro fescue (*Festuca myuros*). This patch of Vancouver rye grassland is too small to support a distinct wildlife species assemblage. However, this EIR analysis considers Vancouver rye grassland to be a sensitive resource due to its local rarity.

Arroyo Willow Riparian Scrub

This vegetation community is present at Lake Merced around all of the lakes, forming dense thickets with a continuous canopy of native arroyo willow (*Salix lasiolepis*). Arroyo willow riparian scrub is typically adjacent to bulrush wetland or swamp knotweed wetland. Additional native species such as California blackberry, California bulrush (*Schoenoplectus californicus*), swamp knotweed (*Persicaria coccinea*), bracken fern (*Pteridium aquilinum* var. *pubescens*), and California manroot (*Marah fabacea*) are also present. Arroyo willow riparian scrub at Lake Merced is important habitat for migratory and resident birds, including Townsend's warbler (*Dendroica townsendi*), ruby-crowned kinglet (*Regulus calendula*), green heron (*Butorides virescens*), western kingbird (*Tyrannus verticalis*), and warbling vireo (*Vireo gilvus*).

Bulrush Wetland

Bulrush wetland is the most abundant wetland herbaceous vegetation type mapped at Lake Merced. Bulrush wetland forms an emergent, almost continuous band along the margin of the lakes, with the exception of the east side of South Lake. California bulrush is dominant, with swamp knotweed and scattered tules (*Schoenoplectus acutus* var. *occidentalis*) also present. The wildlife species using this vegetation type at Lake Merced are described above under the heading "Lake and Freshwater Marsh."

Cattail Wetland

A small cattail wetland was mapped at Lake Merced on the east side of South Lake. This wetland is near the Tournament Players Cup Harding Park on the edge of the lake in an area of standing water. The stand is dominated by the native broadleaf cattail (*Typha latifolia*), with small amounts of swamp knotweed and California bulrush.

Giant Vetch Wetland

Giant vetch wetland is present on the north and south shores of East Lake and North Lake, growing as dense stands adjacent to bulrush wetlands. Giant vetch (*Vicia gigantea*) (native) wetland occurs at the base of a steep slope covered with the native California sagebrush (*Artemisia californica*) scrub. Other native species within this vegetation community include bracken fern and California blackberry and small amounts of California bulrush, bee plant (*Scrophularia californica*), and Hooker's evening primrose (*Oenothera elata* ssp. *hookeri*). The non-natives black mustard (*Brassica nigra*) and wild radish are also present. This vegetation type may support Sierran treefrog (*Pseudacris sierra*), garter snake, and seed-eating birds such as house finch.

Swamp Knotweed Wetland

This vegetation community is abundant along the margins of the lakes making up Lake Merced, growing as emergent vegetation often interspersed with bulrush wetland. Swamp knotweed is the dominant species in this community. Natives such as California bulrush, stinging nettle (*Urtica dioica* ssp. *holosericea*), Pacific rush (*Juncus effusus* var. *pacificus*), and Pacific oenanthe (*Oenanthe sarmentosa*) are also present. Swamp knotweed also occurs in slightly elevated adjacent habitats that are moist but not inundated. This vegetation type supports similar wildlife as described above for freshwater marsh.

Rush Meadow

Rush meadow was mapped at Lake Merced on North, East, and Impound Lakes. This community is generally located on the margin of the lake just above bulrush wetland and swamp knotweed wetland. The native Baltic rush (*Juncus balticus*) is dominant in the herbaceous layer. California blackberry is also present. This vegetation type may support Sierran treefrog (*Pseudacris sierra*), garter snake, and seed-eating birds such as lesser goldfinch (*Carduelis psaltria*).

Well Facility Site Descriptions

Lake Merced Well Facility

The proposed well facility would be constructed in a mostly barren/ruderal area, within and on the west side of an existing paved road. Vegetation in the immediate vicinity of the construction footprint includes: non-native Monterey pine and Monterey cypress trees and other non-native species such as wild radish, myoporum (*Myoporum laetum*), nightshade (*Solanum* sp.), Sydney golden wattle (*Acacia longifolia*), scarlet pimpernel; and the native California blackberry. The proposed staging area would be located in a barren area that is being used as staging for upgrades to the pump station and currently includes work trailers. A viewing area for the groundwater well facility would be constructed along Lake Merced Boulevard in an area of non-native forest.

South Sunset Well Facility

The proposed well facility would be located in a landscaped area on the southeast corner of an athletic field, at the intersection of Wawona Street and 40th Avenue. There are shrubs and New Zealand Christmas trees (*Metrosideros excelsus*) planted along the sidewalks in this area.

West Sunset Well Facility

The majority of the West Sunset well facility construction footprint would be in a ruderal area that is currently covered with woodchips, but it also supports several mature Monterey cypress trees that were likely planted during construction of the adjacent athletic field and parking lot.

Central Pump Station Well Facility

The proposed Central Pump Station would be located immediately south of Overlook Drive, north of Middle Drive West, and west of a 2-million-gallon reservoir, pump station, and green recycling/composting yard. The proposed construction footprint is in undeveloped non-native forest that is dominated by large blue gum eucalyptus trees and several Monterey cypress trees. Non-native herbs and shrubs (e.g., garden nasturtium [*Tropaeolum majus*], fumitory [*Fumaria capreolata*], tea trees [*Leptospermum* spp.], and wild radish) and non-native trees, mostly wild plum (*Prunus* spp.), dominate the understory.

South Windmill Replacement Well Facility

The South Windmill Replacement well facility site would be located at a currently developed well facility, which is surrounded by disturbed habitat composed of mounds of rubble, old buildings, bare ground, and sparse weeds throughout the site. The San Francisco Recreation and Park Department (SFRPD) currently uses this site to store logs and other materials. This site is surrounded by non-native forest dominated by blue gum eucalyptus and Monterey cypress, with tree-sized myoporum shrubs.

North Lake Well Facility

The proposed well facility would be located at a currently developed well facility about 60 feet south of Fulton Street, east of the intersection of Chain of Lakes Drive East and Chain of Lakes

Drive, and approximately 0.l mile northeast of North Lake. This area is disturbed and dominated by non-native trees and shrubs such as tea trees, Himalayan blackberry, Monterey pine, and Monterey cypress. Two inactive mud nests were observed along the wall of the North Lake well facility, and additional birds foraging in the surrounding non-native forest, during the 2010 surveys.

Sunset Reservoir

The Sunset Reservoir site contains irrigated, non-native grassland and a patch of lily of the Nile (*Agapanthus africanus*).

Sensitive Natural Communities, Including Wetlands

The CNDDB reports no sensitive natural community occurrences for the two-quadrangle area containing and surrounding the project area (CDFG, 2011), and most of the vegetation within the project area is non-native.

The SFRPD has identified Significant Natural Resource Areas, which are fragments of unique plant and animal habitats within San Francisco and Pacifica that have been preserved within SFRPD-managed parks. The SFRPD identified approximately 395 of Lake Merced's 614 acres as a Significant Natural Resource Area. This acreage generally encompasses the lake waters, the bordering freshwater marsh wetland, and upland vegetation. This area includes double-crested cormorant rookeries; several areas that support sensitive plant species; Impound Lake and its associated wetlands; tule marsh around East, North, and South Lakes; the water of East Lake, which supports western pond turtles; the habitat between the marshes and the Significant Natural Resource Area boundary; urban forests; and North and South Lakes (San Francisco Planning Department, 2011). The Significant Natural Areas Management Plan has not yet been approved. However, most of the resources designated as such are also considered sensitive by regulatory agencies, such as California Department of Fish and Wildlife (CDFW) (formerly the California Department of Fish and Game), the California Coastal Commission (CCC), and the U.S. Army Corps of Engineers (Corps) and are afforded protections under federal and state regulations and policies.

As noted above in the vegetation communities descriptions, several vegetation types at Lake Merced have been identified as sensitive resources for the purpose of this analysis: canyon live oak scrub, thimbleberry scrub, wax myrtle scrub, Vancouver rye grassland, and blue-gum eucalyptus. Each of these vegetation types is dominated by a species that is considered locally significant by the Yerba Buena Chapter of the CNPS.

No potentially jurisdictional wetlands were observed within the proposed construction areas. Lake Merced and its associated freshwater marsh wetlands are located immediately west and southwest of the Lake Merced well facility site. North Lake in Golden Gate Park is located to the west of Chain of Lakes Drive East and the North Lake well facility site.

Trees and Shrubs

The proposed project area was surveyed in May and August 2010 for the presence of trees and large shrubs; the results of the survey are presented in the *San Francisco Groundwater Supply Project Tree and Large Shrub Assessment Report* (Environmental Science Associates, 2012). Biologists evaluated all plants larger than 6 inches in diameter to determine their health and structural condition, and rated each tree and shrub for its suitability for preservation. The evaluation considered each plant's health, age, and structural condition; and assessed its potential to remain an asset to the site in the future. A total of 111 trees and 39 large shrubs were surveyed and evaluated; all 150 surveyed plants had been installed as part of landscape development. None of the species are native to San Francisco.

Wildlife Movement Corridor

Rugged terrain, changes in vegetation, or areas of human disturbance or urban development can fragment wildlife habitats and impede wildlife movement between areas of suitable habitat. This fragmentation creates isolated "islands" of vegetation that may not provide sufficient area to accommodate sustainable populations, and can adversely affect genetic and species diversity. Wildlife movement corridors link habitat areas and mitigate the effects of this fragmentation by allowing animals to move between remaining habitats, in turn allowing depleted populations to be replenished and promoting genetic exchange between separate populations.

The San Francisco Peninsula is an important migratory stopover for birds along the Pacific Flyway—one of the four major migratory routes in North America. Raptors, songbirds, shorebirds, and waterfowl stop in San Francisco, including Golden Gate Park and Lake Merced, during their fall and spring migrations.

Special-Status Species

A number of species known to occur in the vicinity of the proposed project area are protected pursuant to federal and/or State endangered species laws, or have been designated species of special concern by the CDFW. In addition, Section 15380(b) of the CEQA Guidelines provides a definition of rare, endangered, or threatened species that are not currently included in an agency listing, but whose "survival and reproduction in the wild are in immediate jeopardy" (endangered) or which are "in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens" or "is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and may be considered 'threatened' as that term is used in the federal Endangered Species Act."[4] Species recognized under these terms are collectively referred to as "special-status species." For the purpose of this EIR, special-status species include:

[4] For example, the CDFW interprets Lists 1A, 1B, and 2 of the California Native Plant Society's *Inventory of Rare and Endangered Vascular Plants of California* to consist of plants that, in a majority of cases, would qualify for listing as rare, threatened, or endangered. However, the determination as to whether an impact is significant is made by the lead agency, absent the protection of other laws.

- Plant and wildlife species listed as rare, threatened, or endangered under the federal or State endangered species acts;
- Species that are candidates for listing under either federal or State law;
- Species formerly designated by the USFWS as species of concern or by the CDFW as species of special concern;[5]
- Species designated as "special animals" by the State;[6]
- Species designated as "fully protected" by the State (there are about 35, most of which are also listed as either endangered or threatened);[7]
- Raptors (birds of prey), which are specifically protected by California Fish and Game Code Section 3503.5, thus prohibiting the take, possession, or killing of raptors and owls, their nests, and their eggs;[8] and
- Species, such as candidate species, that may be considered rare or endangered pursuant to Section 15380(b) of the CEQA Guidelines.

Comprehensive lists of the special-status plant and animal species that have been documented to occur or have the potential to occur in suitable habitat within the project area were developed based on data obtained from the CNDDB, the CNPS Electronic Inventory, and the USFWS and other biological literature pertaining to these areas. It was then determined whether there is a low, moderate, or high potential for species occurrence at the project sites based on previous special-status species record locations and current site conditions. These species lists are provided in **Tables 5.14-1** and **5.14-2**. **Figure 5.14-2** depicts the locations of sensitive communities and special-status species that are known to occur at Lake Merced. **Figure 5.14-3** identifies the location of CNDDB records for special-status species with a moderate or high potential to occur in the project area, and these species are discussed in further detail below.

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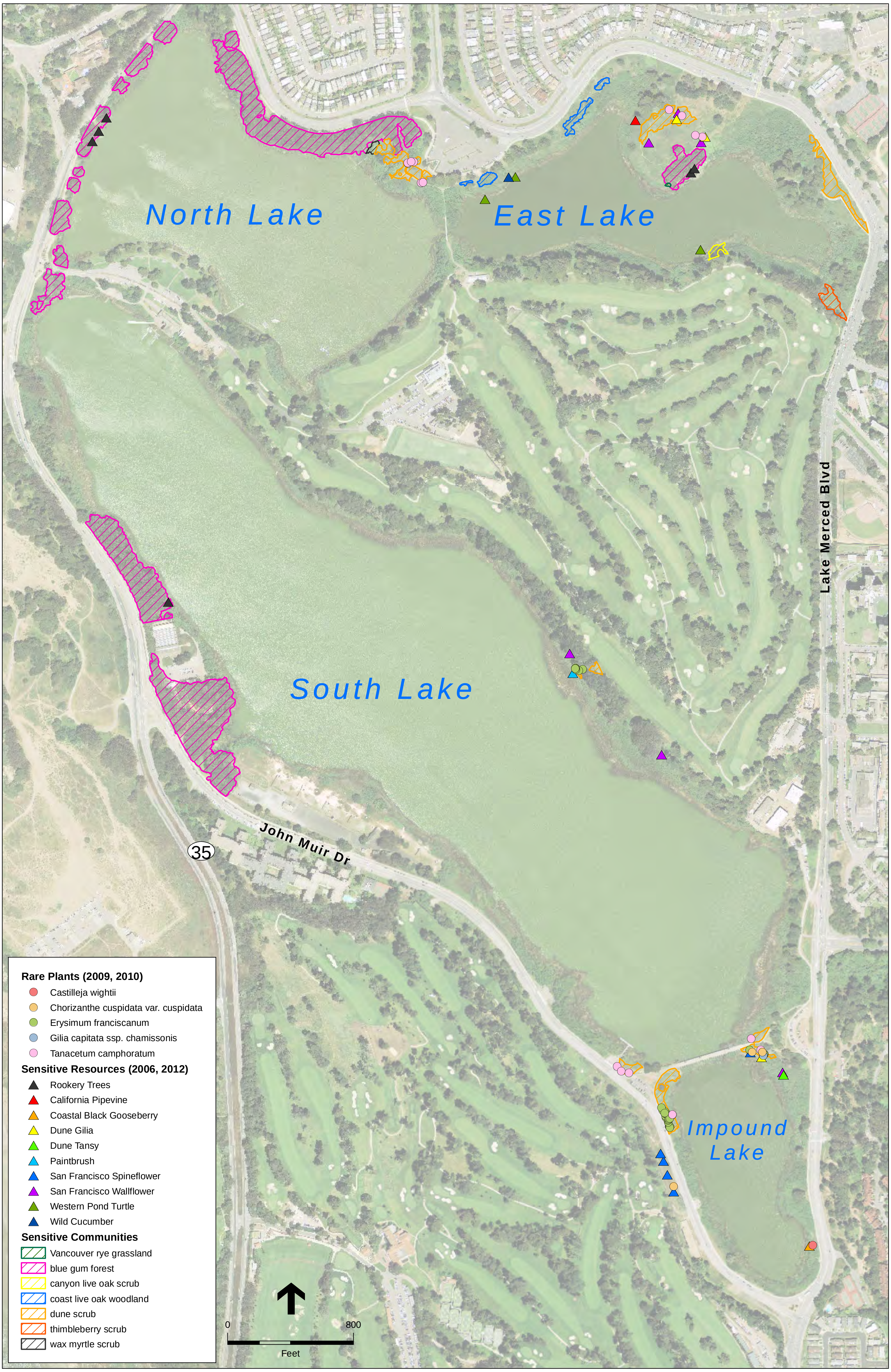
[5] A California species of special concern is one that: has been extirpated from the state; meets the state definition of threatened or endangered but has not been formally listed; is undergoing or has experienced serious population declines or range restrictions that put it at risk of becoming threatened or endangered; and/or has naturally small populations susceptible to high risk from any factor that could lead to declines that would qualify it for threatened or endangered status.

[6] Species listed on the current CDFW "special animals" list (January 2011), which includes 898 species. This list includes species that CDFW considers "those of greatest conservation need."

[7] The "fully protected" classification was California's initial effort in the 1960s to identify and provide additional protection to those animals that were rare or faced possible extinction. The designation can be found in the Fish and Game Code.

[8] The inclusion of birds protected by Fish and Game Code Section 3503.5 is in recognition of the fact that these birds are substantially less common in California than most other birds, having lost much of their habitat to development, and that the populations of these species are therefore substantially more vulnerable to further loss of habitat and to interference with nesting and breeding than most other birds. It is noted that a number of raptors and owls are already specifically listed as threatened or endangered by State and federal wildlife authorities.

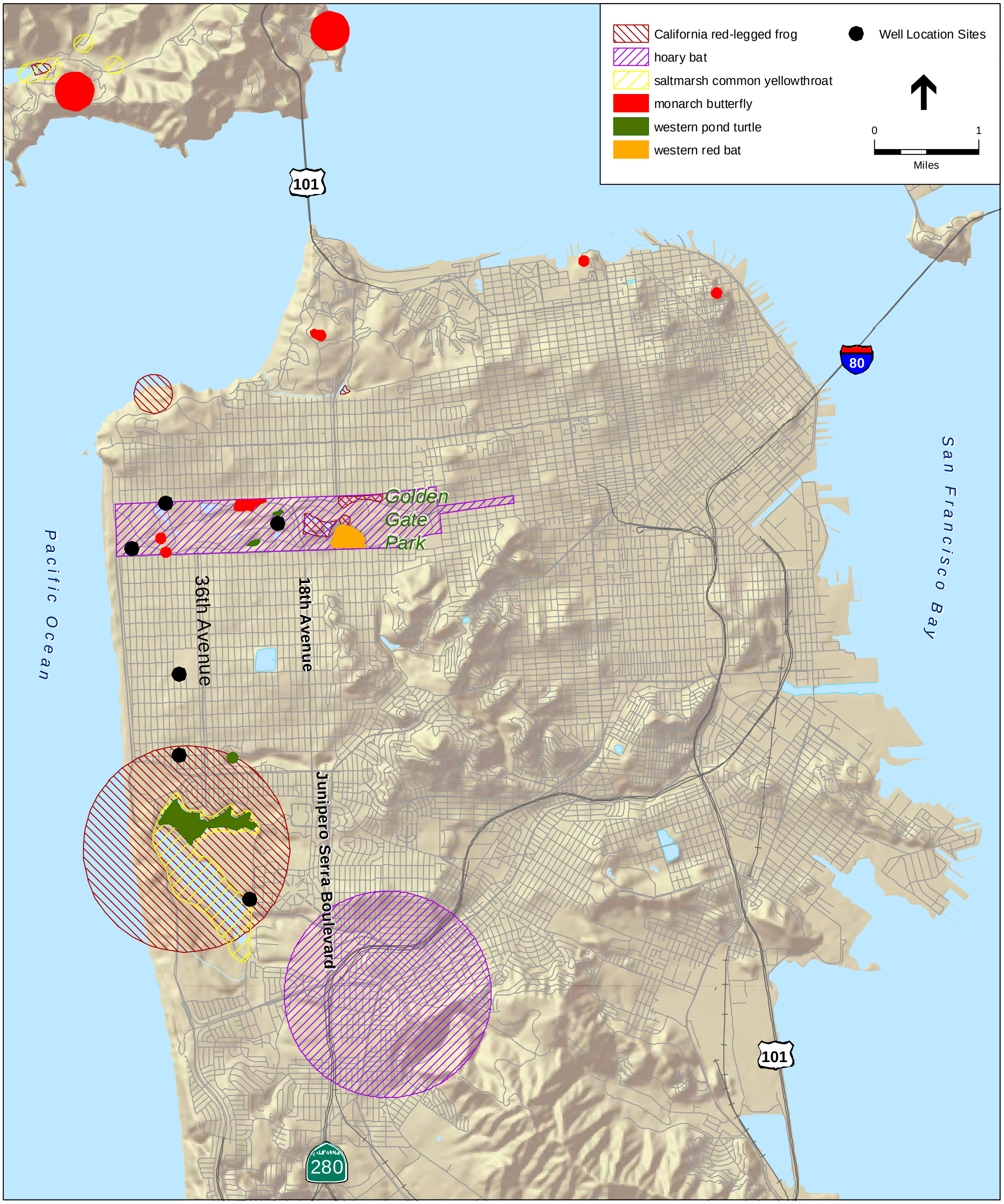


* See Figure 5.14-1 for Wetlands Locations

SOURCE: ESA, 2012; USGS, 2011; Nomad Ecology, 2011; May and Associates, 2009; SFRPD, 2006

San Francisco Groundwater Supply Project EIR

Figure 5.14-2
Lake Merced Sensitive Habitats and Species



SOURCE: CNDDB, 2011; ESRI, 2009; and ESA, 2011

San Francisco Groundwater Supply Project EIR

Figure 5.14-3
CNDDB Occurrences

TABLE 5.14-1
SPECIAL-STATUS PLANT SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR THE GROUNDWATER SUPPLY PROJECT

Common Name *Scientific Name*	**Listing Status USFWS/ CDFW/CNPS**	**Habitat**	**Potential to Occur**[a]	**Flowering Period**
SPECIES LISTED OR PROPOSED FOR LISTING				
Plants				
San Bruno Mountain manzanita *Arctostaphylos imbricada*	–/CE/1B.1	Chaparral and coastal scrub, usually on sandstone outcrops.	**Low potential.** No suitable habitat present.	February–May
Presidio manzanita *Arctostaphylos montana* ssp. *Ravenii*	FE/CE/1B.1	Open, rocky, serpentine slopes in chaparral, coastal scrub, and coastal prairie.	**Low potential.** No suitable habitat present.	February–April
Pacific manzanita *Arctostaphylos pacifica*	–/CE/1B.1	Coastal scrub and chaparral.	**Low potential.** No suitable habitat present.	February–April
Marsh sandwort *Arenaria paludicola*	FE/CE/1B.1	Freshwater or brackish marshes and swamps.	**Low potential.** Potentially suitable habitat present at Lake Merced, but species not observed there (May and Associates, 2009; Nomad Ecology, 2011; San Francisco Planning Department, 2011a); species presumed extirpated in San Francisco.	May–August
Robust spineflower *Chorizanthe robusta var. robusta*	FE/–/1B.1	Sandy or gravelly coastal dunes, coastal scrub, cismontane woodland and maritime chaparral.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not observed there (San Francisco Planning Department, 2011a; May and Associates, 2009; Nomad Ecology, 2011); species presumed extirpated in San Francisco.	April–September
Presidio clarkia *Clarkia franciscana*	FE/CE/1B.1	Serpentine outcrops in coastal scrub, and valley and foothill grassland.	**Low potential.** No suitable habitat present.	May–July
Marin western flax *Hesperolinon congestum*	FT/CT/1B.1	Chaparral and grassland, usually on serpentine barrens	**Low potential.** No suitable habitat present.	April–July
Beach layia *Layia carnosa*	FE/CE/1B.1	Sparsely vegetated, semi-stabilized coastal dunes and scrub.	**Low potential.** No suitable habitat present; presumed extirpated in San Francisco.	March–July
San Francisco lessingia *Lessingia germanorum*	FE/CE/1B.1	Open, sandy, coastal dunes and scrub.	**Low potential.** No suitable habitat present.	July–November
White-rayed pentachaeta *Pentachaeta bellidiflora*	FE/CE/1B.1	Open, dry, rocky slopes and grassy areas, usually on serpentine.	**Low potential.** No suitable habitat present.	March–May
San Francisco popcorn-flower *Plagiobothrys diffusus*	–/CE/1B.1	Coastal prairie, and valley and foothill grasslands.	**Low potential.** No suitable habitat present.	March–June
FEDERAL SPECIES OF CONCERN OR STATE SPECIES OF SPECIAL CONCERN				
Bent-flowered fiddleneck *Amsinckia lunaris*	–/–/1B.2	Coastal bluff scrub, cismontane woodland, and valley and foothill grassland.	**Low potential.** No suitable habitat present.	March–June
Franciscan manzanita *Arctostaphylos franciscana*	–/–/1B.1	Open, rocky, serpentine outcrops in chaparral.	**Low potential.** No suitable habitat present. This species was believed to be extinct in the wild (although still extant through cultivation), but was rediscovered in Presidio National Park in late 2009.	February–April
Montara manzanita Arctostaphylos montaraensis	–/–/1B.2	Slopes and ridges in chaparral and coastal scrub.	**Low potential. No suitable habitat present.**	January–March

TABLE 5.14-1 (Continued)
SPECIAL-STATUS PLANT SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR THE GROUNDWATER SUPPLY PROJECT

Common Name *Scientific Name*	**Listing Status USFWS/ CDFW/CNPS**	**Habitat**	**Potential to Occur**[a]	**Flowering Period**
FEDERAL SPECIES OF CONCERN OR STATE SPECIES OF SPECIAL CONCERN (cont.)				
Alkali milk-vetch *Astragualus tener* var. *tener*	–/–/1B.2	Alkali flats, flooded grassland, playas and vernal pools.	**Low potential.** No suitable habitat present; species presumed extirpated in San Francisco.	March–June
Bristly sedge *Carex comosa*	–/–/2.1	Lake margins, marshes, swamps, coastal prairie, and valley and foothill grasslands.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not observed there (San Francisco Planning Department, 2011a; May and Associates, 2009; Nomad Ecology, 2011)	May–September
Pappose tarplant *Centromadia parryi* ssp. *parryi*	–/–/1B.2	Chaparral, coastal prairie, meadows, seeps, coastal salt marshes and swamps, and vernally mesic, often alkaline, valley and foothill grasslands.	**Low potential.** No suitable habitat present.	May–November
San Francisco spineflower *Chorizanthe cuspidata* var. *cuspidata*	–/–/1B.2	Coastal bluff scrub, dunes, prairie, and coastal scrub; sandy soils on terraces and slopes.	**High potential.** No suitable habitat present at facility sites but species is known to occur at Lake Merced (May & Associates, 2009; Nomad Ecology, 2011).	April–August
Franciscan thistle *Cirsium andrewsii*	–/–/1B.2	Coastal bluff scrub, coastal prairie, coastal mesic scrub, and broadleaf upland forest; sometimes on serpentine.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not observed there (San Francisco Planning Department, 2011a; May and Associates, 2009; Nomad Ecology, 2011)	March–July
Compact cobwebby thistle *Cirsium occidentale* var. *compactum*	–/–/1B.2	On dunes or clay in chaparral, coastal dunes, coastal prairie, coastal scrub, and grasslands.	**Low potential.** Suitable habitat present at Lake Merced but species not documented to occur there (May & Associates, 2009; Nomad Ecology, 2011).	April–June
Round-headed Chinese-houses *Collinsia corymbosa*	–/–/1B.2	Coastal dunes and coastal prairie.	**Low potential.** No suitable habitat present; species has not been seen in San Francisco for more than 100 years.	April–June
San Francisco collinsia *Collinsia multicolor*	–/–/1B.2	On humus-covered soil derived from mudstone in closed-cone coniferous forest and coastal scrub.	**Low potential.** Potentially suitable habitat present in coastal scrub at Lake Merced but species not documented to occur there (May & Associates, 2009; Nomad Ecology, 2011).	March–May
Pont Reyes bird's-beak *Cordylanthus maritimus* ssp. *palustris*	–/–/1B.2	Coastal salt marshes and swamps.	**Low potential.** No suitable habitat present.	June–October
Fragrant fritillaria *Fritillaria liliacea*	–/–/1B.2	On clay, often serpentine derived soils in coastal scrub, grassland, and coastal prairie.	**Low potential.** No suitable habitat present.	February–April
Blue coast gilia *Gilia capitata* ssp. *chamissonis*	–/–/1B.1	Coastal scrub and coastal dunes.	**High potential.** No suitable habitat present at facilities sites but species is known to occur in dune scrub habitat at Lake Merced (May & Associates, 2009; Nomad Ecology, 2011).	April–July

TABLE 5.14-1 (Continued)
SPECIAL-STATUS PLANT SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR THE GROUNDWATER SUPPLY PROJECT

Common Name *Scientific Name*	Listing Status USFWS/ CDFW/CNPS	Habitat	Potential to Occur[a]	Flowering Period
FEDERAL SPECIES OF CONCERN OR STATE SPECIES OF SPECIAL CONCERN (cont.)				
Dark-eyed gilia *Gilia millefoliata*	–/–/1B.2	Coastal dunes.	**Low potential.** No suitable habitat present; species potentially extirpated in San Francisco.	April–July
San Francisco gumplant *Grindelia hirsutula* var. *maritima*	–/–/1B.2	On sandy or serpentine slopes of sea bluffs in coastal scrub, or valley and foothill grasslands.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not documented to occur there (San Francisco Planning Department, 2011a, May and Associates, 2009; Nomad Ecology, 2011); species reintroduced in Pine Lake Park (SFRPD, 2006), but not known to occur in project area.	June–September
Diablo helianthella *Helianthella castanea*	–/–/1B.2	On rocky soils in broadleaf upland forest, cismontane woodland, coastal scrub, riparian woodland, and valley and foothill grassland.	**Low potential.** No suitable habitat present.	March–June
Seaside tarplant *Hemizonia congesta* ssp. *congesta*	–/–/1B.2	Grassy valleys and hills, often on fallow fields in coastal scrub.	**Low potential.** No suitable habitat present.	April–November
Short-leaved evax *Hesperevax sparsiflora* var. *brevifolia*	–/–/1B.2	Sandy bluffs and flats in coastal scrub and coastal dunes.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not observed there (May and Associates, 2009; Nomad Ecology, 2011; San Francisco Planning Department, 2011a); nearest species record is McLaren Park.	March–June
Kellogg's horkelia *Horkelia cuneata* ssp.*sericea*	–/–/1B.1	Openings in old dunes coastal and sandhill in closed-cone coniferous forest, coastal scrub, and chaparral.	**Low potential.** No suitable habitat present.	April–September
Rose leptosiphon *Leptosiphon rosaceus*	–/–/1B.1	Coastal bluff scrub.	**Low potential.** No suitable habitat present.	April–July
Arcuate bush mallow *Malacothamnus arcuatus*	–/–/1B.2	Gravelly alluvium in chaparral and cismontane woodland.	**Low potential.** No suitable habitat present.	April–September
Marsh microseris *Microserus paludosa*	–/–/1B.2	Closed-cone coniferous forest, cismontane woodland, coastal scrub, and valley and foothill grassland.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not observed there (May and Associates, 2009; Nomad Ecology, 2011; San Francisco Planning Department, 2011a).	April–June (July)
Choris's popcorn-flower *Plagiobothrys chorisianus* var. *chorisianus*	–/–/1B.2	Mesic sites in chaparral, coastal scrub, and coastal prairie.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not observed there (May and Associates, 2009; Nomad Ecology, 2011; San Francisco Planning Department, 2011a); historical record of species occurrence in Golden Gate Park.	March–June
Hairless popcorn-flower *Plagiobothrys glaber*	–/–/1A	Coastal salt marshes and alkaline meadows.	**Low potential.** No suitable habitat present.	March–May

TABLE 5.14-1 (Continued)
SPECIAL-STATUS PLANT SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR THE GROUNDWATER SUPPLY PROJECT

Common Name *Scientific Name*	**Listing Status USFWS/ CDFW/CNPS**	**Habitat**	**Potential to Occur**[a]	**Flowering Period**
FEDERAL SPECIES OF CONCERN OR STATE SPECIES OF SPECIAL CONCERN (cont.)				
Oregon polemonium *Polemonium carneum*	–/–/1B.1	Coastal prairie, coastal scrub, lower montane coniferous forest.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not observed there (May and Associates, 2009; Nomad Ecology, 2011; San Francisco Planning Department, 2011a).	April–September
Adobe sanicle *Sanicula maritima*	–/Rare/1B.1	Moist clay or ultramafic soil in chaparral, coastal prairie, meadows, seeps, and valley and foothill grassland.	**Low potential.** No suitable habitat present.	February–March
San Francisco campion *Silene verecunda* ssp. *verecunda*	–/–/1B.2	Mudstone, shale, or serpentine substrates in coastal scrub, coastal prairie, chaparral and valley and foothill grassland.	**Low potential.** No suitable habitat present.	March–August
Santa Cruz microseris *Stebbinsoseris decipiens*	–/–/1B.2	On sandstone, shale or serpentine derived seaward facing slopes in broadleaf upland forest, closed-cone coniferous forest, chaparral, coastal prairie, and coastal scrub.	**Low potential.** No suitable habitat present.	April–May
San Francisco owl's-clover *Triphysaria floribunda*	–/–/1B.2	Coastal prairie, and valley and foothill grasslands; occasionally on serpentine.	**Low potential.** No suitable habitat present.	April–June
Coastal triquetrella *Triquetrella californica*	–/–/1B.2	On soil in coastal bluff and coastal scrub.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not observed there (May and Associates, 2009; Nomad Ecology, 2011; San Francisco Planning Department, 2011a).	N/A

[a] High Potential = Species is expected to occur and habitat meets special requirements.
Moderate Potential = Habitat is only marginally suitable or is suitable but not within species geographic range.
Low Potential = Habitat does not meet species requirements as currently understood in the scientific community. Project site is outside species geographic range.

NOTES:

Federal Categories (USFWS)
FE = Listed as endangered by the federal government
FT = Listed as threatened by the federal government
FPE = Proposed for listing as endangered
FPT = Proposed for listing as threatened
FC = Candidate for federal listing
FSC = Former federal species of concern. Species designated as such in this EIR were listed by the Sacramento USFWS office until 2006, when they stopped maintaining their list. These species are still considered to be at-risk species by other federal and State agencies, as well as various organizations with recognized expertise such as the Audubon Society.

State Categories (CDFW)
CE = Listed as endangered by the State of California
CT = Listed as threatened by the State of California
CR = Listed as rare by the State of California

CNPS
Rare Plant Rank 1A = Plants presumed extinct in California.
Rare Plant Rank 1B = Plants rare, threatened, or endangered in California and elsewhere.
Rare Plant Rank 2 = Plants rare, threatened, or endangered in California, but more common elsewhere.
Rare Plant Rank 3 = Plants about which more information is needed.
Rare Plant Rank 4 = Plants of limited distribution.

SOURCES: CDFG, 2011; CNPS, 2011; USFWS, 2011a (San Francisco North and San Francisco South quadrangles).

TABLE 5.14-2
SPECIAL-STATUS ANIMAL SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR THE GROUNDWATER SUPPLY PROJECT

Common Name ***Scientific Name***	**Listing Status USFWS/CDFW**	**Habitat**	**Potential to Occur**[a]
SPECIES LISTED OR PROPOSED FOR LISTING			
Invertebrates			
San Bruno elfin butterfly *Callophrys mossii bayensis*	FE/–	Coastal scrub on rocky outcrops with broadleaf stonecrop (*Sedum spathulifolium*)	**Low potential.** No suitable habitat present. Three known populations at San Bruno Mountain, Montara, and Pacifica.
Bay checkerspot butterfly *Euphydryas editha bayensis*	FT/–	Serpentine grasslands.	**Low potential.** No suitable habitat present.
Mission blue butterfly *Plebejus icarioides missionensis*	FE/–	Grassland with *Lupinus albifrons*, *L. formosa*, and *L. varicolor.*	**Low potential.** No suitable habitat present.
Callippe silverspot butterfly *Speyeria callippe callippe*	FE/–	Found in native grasslands with *Viola pedunculata* as larval food plant.	**Low potential.** No suitable habitat present.
Amphibians			
California red-legged frog *Rana draytonii*	FT/CSC	Freshwater ponds and slow streams with emergent vegetation for egg attachment.	**Moderate potential.** No suitable aquatic habitat present on project facility sites; however, suitable habitat is present nearby in ponds in Golden Gate Park. Several recent CNDDB records for this species in Golden Gate Park, including a 2005 record at Strybing Arboretum, approximately 0.5 mile east of the Central Pump Station well facility (CDFG, 2011). Historically present at Lake Merced (SFRPD, 2006) but currently presumed extirpated from this area (Jones and Stokes, 2007b; San Francisco Planning Department, 2011a).
Reptiles			
San Francisco garter snake *Thamnophis sirtalis tetrataenia*	FE/CE	Freshwater ponds and slow streams with emergent vegetation.	**Low potential.** Potentially suitable habitat present at Lake Merced but species not documented at this area.
Birds			
Western snowy plover *Charadrius alexandrinus nivosus*	FT/CSC	Nests and forages on sandy beaches on marine and estuarine shores; requires sandy, gravely, or friable soils for nesting.	**Low potential.** No suitable habitat present.
California black rail *Laterallus jamaicensis coturniculus*	–/CT	Tidally influenced, heavily vegetated, high-elevation marshlands.	**Low potential.** No suitable habitat present.
California brown pelican *Pelecanus occidentalis californicus*	Delisted/3511	Nests on coastal islands of small to moderate size that affords protection from predators.	**Low potential.** No suitable habitat present.

TABLE 5.14-2 (Continued)
SPECIAL-STATUS ANIMAL SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR THE GROUNDWATER SUPPLY PROJECT

Common Name *Scientific Name*	**Listing Status USFWS/CDFW**	**Habitat**	**Potential to Occur**[a]
SPECIES LISTED OR PROPOSED FOR LISTING (cont.)			
Birds (cont.)			
California clapper rail *Rallus longirostris obsoletus*	FE/CE	Salt marsh wetlands along the San Francisco Bay.	**Low potential.** No suitable habitat present.
Bank swallow *Riparia riparia*	–/CT	Colony nester on sandy cliffs near water, marshes, lakes, streams, the ocean. Forages in fields.	**Low potential.** No suitable nesting habitat present. However, this species nests nearby and Lake Merced is an important foraging ground for bank swallows nesting at Fort Funston.
California least tern *Sterna antillarum browni*	FE/CE	Colonial breeder on bare or sparsely vegetated flat substrates including sand beaches, alkali flats, landfills, or paved areas.	**Low potential.** No suitable habitat present.
Mammals			
Salt marsh harvest mouse *Reithrodontomys raviventris*	FE/CE	Salt marshes along the San Francisco Bay.	**Low potential.** No suitable habitat present.
FEDERAL SPECIES OF CONCERN OR STATE SPECIES OF SPECIAL CONCERN			
Invertebrates			
Incredible harvestman *Banksula incredula*	–/*	Franciscan sandstone talus slope.	**Low potential.** No suitable habitat present; species only known to occur at San Bruno Mountain.
Tomales isopod *Caecidotea tomalensis*	FSC/*	Shallow freshwater ponds or streams with still or very slow water. Known only to occur in several Bay Area counties.	**Low potential.** No suitable habitat present at facility locations; species was collected in 1971 (one individual) and 1984 (three individuals) from Lake Merced but not more recently (SFRPD, 2006).
Sandy beach tiger beetle *Cicindela hirticollis gravida*	FSC/*	Sandy areas around water; larva live in burrows in sand along sea beaches, creeks, seepages, and lake shores.	**Low potential.** Potentially suitable habitat present at Lake Merced, but species not documented to occur there; known population of this species in the project area has been extirpated.
Monarch butterfly *Danaus plexippus*	–/*	Eucalyptus groves (winter sites).	**Moderate potential.** Several records of this species in Golden Gate Park.
Stage's dufourine bee *Dufourea stagei*	–/*	Ground-nesting bee in coastal scrub habitat.	**Low potential.** Potentially suitable habitat present at Lake Merced; known species range is south of the project area (only known to occur at San Bruno Mountain and in Santa Cruz County).
Leech's skyline diving beetle *Hydroporus leechi*	FSC/–	Found in freshwater ponds, shallow water of streams marshes and lakes.	**Low potential.** No suitable habitat present at facility locations; potentially suitable habitat at Lake Merced, but there are no known populations of this species in project vicinity.

TABLE 5.14-2 (Continued)
SPECIAL-STATUS ANIMAL SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR THE GROUNDWATER SUPPLY PROJECT

Common Name *Scientific Name*	**Listing Status USFWS/CDFW**	**Habitat**	**Potential to Occur**[a]
FEDERAL SPECIES OF CONCERN OR STATE SPECIES OF SPECIAL CONCERN (cont.)			
Invertebrates (cont.)			
Bumblebee scarab beetle *Lichnanthe ursina*	FSC/–	Inhabits coastal sand dunes.	**Low potential.** Suitable habitat is not present within the project area; CNDDB records indicate historical presence of this species along Ocean Beach.
A leaf-cutter bee *Trachusa gummifera*	–/*	Unknown	**Low potential.** Known from two historical collections in Marin and San Francisco Counties; no records of this species in the project area.
Marin hesperian *Vespericola marinensis*	–/–	Moist areas in coastal brushfield and chaparral vegetation, in Marin County.	**Low potential.** Known species range is north of the proposed project area.
Reptiles			
Western pond turtle *Actinemys marmorata*	–/CSC	Freshwater ponds and slow streams edged with sandy soils for laying eggs.	**High potential.** No suitable aquatic habitat present on project facility sites; however, this species is known to occur at Lake Merced (SFRPD, 2006; San Francisco Planning Department, 2011a), and species may occur in nearby man-made ponds in Golden Gate Park. Recent CNDDB records of this species in the project vicinity.
Birds			
Cooper's hawk *Accipiter cooperi*	--/3503.5	Typically nests in riparian growths of deciduous trees and live oak woodlands. Becoming more common as an urban breeder.	**Moderate potential.** Large trees in the project area, including eucalyptus and Monterey cypress, could support nests for this species.
● Tricolored blackbird *Agelaius tricolor*	–/* (nesting colony)	Colonial nester in freshwater marshes. Nests over or near the water, typically in emergent vegetation.	**Low potential.** Although the species has been observed at Lake Merced during the nonbreeding season, no known nesting colonies are present.
Great horned owl *Bubo virginianus*	--/3503.5	Often uses abandoned nests of corvids or squirrels; nests in large oaks, conifers, eucalyptus.	**Moderate potential.** Large trees in the project area, including eucalyptus and Monterey cypress, could support nests for this species.
Red-tailed hawk *Buteo jamaicensis*	--/3503.5	Almost any open habitat, including grassland and urbanized areas.	**Moderate potential.** Large trees in the project area, including eucalyptus and Monterey cypress, could support nests for this species.
Red-shouldered hawk *Buteo lineatus*	--/3503.5	Forages along edges of marshes and grasslands; nests in mature trees in a variety of habitats.	**Moderate potential.** Large trees in the project area, including eucalyptus and Monterey cypress, could support nests for this species.
American kestrel *Falco sparverius*	--/3503.5	Frequents generally open grasslands, pastures, and fields; primarily a cavity nester.	**Moderate potential.** Large trees in the project area, including eucalyptus and Monterey cypress, could support nests for this species.

**TABLE 5.14-2 (Continued)
SPECIAL-STATUS ANIMAL SPECIES REPORTED OR WITH POTENTIAL TO OCCUR
NEAR THE GROUNDWATER SUPPLY PROJECT**

Common Name ***Scientific Name***	**Listing Status** **USFWS/CDFW**	**Habitat**	**Potential to Occur**[a]
FEDERAL SPECIES OF CONCERN OR STATE SPECIES OF SPECIAL CONCERN (cont.)			
Salt-marsh common yellowthroat *Geothlypis trichas sinuosa*	FSC/CSC	Inhabits tidal salt and brackish marshes in winter, but breeds in freshwater brackish marshes and riparian woodlands during spring to early summer.	**High potential.** This species is known to breed in the freshwater marshes at Lake Merced.

**TABLE 5.14-2 (Continued)
SPECIAL-STATUS ANIMAL SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR THE GROUNDWATER SUPPLY PROJECT**

Common Name *Scientific Name*	**Listing Status USFWS/CDFW**	**Habitat**	**Potential to Occur**[a]
FEDERAL SPECIES OF CONCERN OR STATE SPECIES OF SPECIAL CONCERN (cont.)			
Birds (cont.)			
Alameda song sparrow *Melospiza melodia pusillula*	–/CSC	Salt marshes of eastern and south San Francisco Bay.	**Low potential.** No suitable habitat is present for this species in the project area.
San Pablo song sparrow *Melospiza melodia samuelis*	–/CSC	Salt marshes of eastern and north San Francisco Bay.	**Low potential.** No suitable habitat is present for this species in the project area.
● Double-crested cormorant *Phalacrocorax auritus*	–/–	Nests along coast on isolated islands or in trees along lake margins.	**High potential.** There are three double-crested cormorants rookeries at Lake Merced (SF Field Ornithologists, 2003)
Mammals			
Pallid bat *Antrozous pallidus*	–/CSC	Roosts in caves, old buildings, and under bark. Forages in open lowland areas, and forms large maternity colonies in the spring.	**Low potential.** Potential roosting habitat is available in buildings and large-diameter trees in Golden Gate Park and Lake Merced, but this species was not detected during recent surveys in San Francisco parks (Krauel, 2009). Not expected to breed here but may be present on a transient basis.
Townsend's big-eared bat *Corynorhinus townsendii*	FSC/CSC	Roosts in caves, buildings, bridges, rock crevices, and hollow trees.	**Low potential.** While roosting habitat is available in buildings in Golden Gate Park and Lake Merced, the species was not detected during recent surveys in San Francisco parks (Krauel, 2009).
Western red bat *Lasiurus blossevillii*	–/CSC	Roosts in tree/shrub foliage, particularly in riparian areas.	**Moderate potential.** Roosting habitat is available in tree/shrub foliage in Golden Gate Park and at Lake Merced. In recent surveys, this species was one of the most commonly encountered bat species in San Francisco (Krauel, 2009) and was found in parks containing water bodies.
Hoary bat *Lasiurus cinereus*	–/*	Roosts in tree/shrub foliage.	**Low potential.** Potential roosting habitat is available in large-diameter trees in Golden Gate Park and at Lake Merced, but this species was not detected during recent surveys in San Francisco parks (Krauel, 2009). May be present on a transient basis.
Yuma myotis *Myotis yumanensis*	--/*	Open forests and woodlands with sources of water over which to feed.	**Moderate potential.** Roosting habitat is available in tree/shrub foliage in Golden Gate Park and at Lake Merced. In recent surveys, this species was one of the most commonly encountered bat species in San Francisco (Krauel, 2009), especially in parks with water bodies such as lakes.
American badger *Taxidea taxus*	–/CSC	Open grasslands with loose, friable soils.	**Low potential.** Suitable habitat for this species is no longer present in the project vicinity.

TABLE 5.14-2 (Continued)
SPECIAL-STATUS ANIMAL SPECIES REPORTED OR WITH POTENTIAL TO OCCUR NEAR THE GROUNDWATER SUPPLY PROJECT

Common Name *Scientific Name*	**Listing Status USFWS/CDFW**	**Habitat**	**Potential to Occur**[a]
FEDERAL SPECIES OF CONCERN OR STATE SPECIES OF SPECIAL CONCERN (cont.)			
Mammals (cont.)			
Point Reyes jumping mouse *Zapus trinotatus orarius*	–/CSC	Upland areas of bunch grass marshes in Point Reyes.	**Low potential.** Project area is south of the known range for this species.

[a] High Potential = Species is expected to occur and habitat meets species requirements.
Moderate Potential = Habitat is only marginally suitable or is suitable but not within species geographic range.
Low Potential = Habitat does not meet species requirements as currently understood in the scientific community.

NOTES:

Federal Categories (USFWS)
FE = Listed as endangered by the federal government
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FPE = Proposed for listing as endangered
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FSC = Former federal species of concern. Species designated as such in this EIR were listed by the Sacramento FWS office until 2006, when they stopped maintaining their list. These species are still considered to be at-risk species by other federal and State agencies, as well as various organizations with recognized expertise such as the Audubon Society.

State Categories (CDFW)
CE = Listed as endangered by the State of California
CT = Listed as threatened by the State of California
CSC = California species of special concern
* = California special animal

3511 = A Fully Protected Species

SOURCES: CDFG, 2011; USFWS, 2011a (San Francisco North and San Francisco South quadrangles); Krauel, 2009.

Special-Status Plants

Table 5.14-1 presents the name, status, habitat, and potential to occur of special-status plant species known to occur in the project vicinity (i.e., the San Francisco North and San Francisco South quadrangles). Most of the special-status plant species listed in Table 5.14-1 are considered to have a low potential to occur in the project area, and no special-status plant species were observed during the biological resources reconnaissance surveys conducted in 2010. Although these reconnaissance surveys do not constitute a detailed botanical inventory of the project sites, the overall potential of the project area to support special-status plant species is considered low based on the lack of native plants and native plant habitats, and on the disturbed and heavily managed condition of the area. However, the designated Significant Natural Resource Areas surrounding Lake Merced support two special-status species: San Francisco spineflower, a CNPS Rare Plant Rank 1B.2 species, and blue coast gilia, a CNPS Rare Plant Rank 1B.1 species. In addition, several locally rare species, designated as such by the Yerba Buena Chapter of the CNPS, are also found at Lake Merced. These include San Francisco wallflower (*Erysimum franciscanum*), dune tansy (*Tanacetum camphoratum*), California pipevine (*Aristolochia californica*), Wight's paintbrush (*Castilleja wightii*), Vancouver rye (*Leymus* x *vancouverensis*), wild cucumber (*Marah oreganus*), canyon live oak (*Quercus chrysolepis*), coastal black gooseberry (*Ribes divaricatum*), and thimbleberry (*Rubus parviflorus*). These species occur in areas of dune scrub or coastal scrub located at Lake Merced.

Special-Status Animals

Table 5.14-2 presents the name, status, habitat, and potential to occur of special-status wildlife species known to occur in the general project vicinity (i.e., the San Francisco North and San Francisco South quadrangles). Of the special-status animals listed in Table 5.14-2, only species classified as having a moderate or high potential for occurrence in the project area were considered in the impact analysis. Species addressed in detail include the following:

- California red-legged frog
- Western pond turtle
- Special-status birds
- Special-status bats
- Monarch butterfly

Aside from breeding birds, special-status wildlife species are not likely to occur within the project sites, because most of these areas are highly fragmented and paved or dominated by non-native ornamental or ruderal species, which have poor habitat attributes for wildlife. However, there are maintained ponds in the project vicinity that provide habitat for aquatic special-status species, including California red-legged frog (*Rana draytonii*) and western pond turtle (*Actinemys marmorata*). In addition, monarch butterflies (*Danaus plexippus*) are known to overwinter in Golden Gate Park, and several bat species are known to roost in the park as well. These species are described in further detail below.

California red-legged frog. This species is a federal threatened species and California species of special concern. Preferred breeding habitat for this species is permanent water (ponded or slow-moving streams) with densely vegetated shorelines. During the nonbreeding season, dispersal habitat includes nearly any area within two miles of a breeding site that stays moist and cool through the summer. There are several records of this species occurring in Golden Gate Park, including a 2005 record indicating species presence approximately 0.5 mile east of the Central Pump Station (CDFG, 2011). In addition, while this species has been observed at Lake Merced in the past, it is highly unlikely that any California red-legged frogs are currently present in Lake Merced (Jones and Stokes, 2007b; San Francisco Planning Department, 2011a). Although California red-legged frogs were common in Lake Merced in the 1950s and were observed in the lake during the 1970s and one sighting in Impound Lake in 2000, they have not been documented since that time despite considerable vegetation management activities by the SFRPD (Jones and Stokes, 2007b). In addition, the existence of predators likely precludes the occurrence of California red-legged frogs in Lake Merced. Bullfrogs (a voracious predator that will consume California red-legged frog eggs, juveniles, and small adults) have been observed in Lake Merced. Largemouth bass may also be present in Lake Merced and, if so, would prey on any amphibians within the lake (Jones and Stokes, 2007b). For these reasons, this analysis assumes that red-legged frog have been extirpated from Lake Merced.

Western pond turtle. This species—a California species of special concern—inhabits rivers, streams, natural and artificial ponds, and lakes. Adjacent terrestrial habitat is also critical for oviposition,[9] winter refuge, and dispersal. Although suitable habitat is not present within the

[9] The process of laying eggs by certain animals.

proposed project boundaries, there are several known occurrences of this species in the project vicinity, including two 2005 records indicating species presence in ponds less than 0.25 mile north and southwest of the Central Pump Station (CDFG, 2011). In addition, this species occurs in Lake Merced (SFRPD, 2006).

Migratory and special-status birds. Several non-special-status migratory birds could nest in or adjacent to the project sites in trees, shrubs, and buildings. Several raptors are known to nest in Golden Gate Park and/or San Francisco, including red-tailed hawk (*Buteo jamaicensis*) red-shouldered hawk (*Buteo lineatus*), American kestrel (*Falco sparverius*), Cooper's hawk (*Accipiter cooperi*) and great horned owl (*Bubo virginianus*). In addition, saltmarsh common yellowthroats (*Geolthlypis trichas sinuosa*) (a former federal species of concern and current California species of special concern) are known to nest in the wetlands along the periphery of Lake Merced (CDFG, 2011), and there is a double-crested cormorant (*Phalacrocorax auritus*) rookery in trees at Lake Merced (SFRPD, 2006). Additional native birds may also nest in the area, such as pygmy nuthatch, Anna's hummingbird, and white-crowned sparrow. The federal Migratory Bird Treaty Act (MBTA) and California Fish and Game Code protect raptors and most native migratory birds and breeding birds (see Section 5.14.2 below).

Special-status bats. Several bat species are listed as a California species of special concern or California special animals, and are either known or have the potential to occur in Golden Gate Park, including western red bat (*Lasiurus blossevillii*) and Yuma myotis (*Myotis yumanensis*). Suitable roosting habitat for these bats includes open spaces within buildings and sheds, in tree foliage, underneath the exfoliating bark of trees, and in tree cavities. Bat surveys conducted in natural areas and parks in San Francisco found that the three most commonly encountered species in the area are Mexican free-tailed bat (*Tadaridia brasiliensis*), Yuma myotis, and western red bat, a California species of concern (Krauel, 2009). While Mexican free-tailed bats, which have no special status, were widespread and abundant throughout the sampled natural areas, Yuma myotis and western red bat were much less abundant and generally restricted to parks with lakes (Krauel, 2009). Yuma myotis and Mexican free-tailed bats were the only species Krauel recorded at Lake Merced in 2009.

No signs of bat roosts (e.g., observations of actual bats, bat guano, bat urine staining, or audible sounds of bats in a roost) were observed in trees or buildings at any of the proposed project sites during June 24, 2010 and August 23 and 24, 2010 wildlife surveys. However, bats could be present seasonally in any of the buildings at the South Windmill Replacement, Central Pump Station well facility, Sunset Reservoir, or Lake Merced well facility sites, or in tree foliage, in tree cavities, or under the loose, peeling bark of trees at or in proximity to these sites.

Monarch butterfly. This insect is a California special animal, and the butterfly's overwintering sites are tracked by the CNDDB because they are considered vulnerable in the State due to their restricted range (overwintering sites are primarily found only near the coast) and relatively rare distribution in California. This species migrates along the Pacific Coast, and often overwinters in wind-protected groves of trees, such as eucalyptus and Monterey cypress, between October and March. There are three CNDDB records of this species overwintering in Golden Gate Park (CDFG, 2011). The recorded locations are 0.25 mile south of the North Lake well facility site, 0.2 mile east of the South Windmill Replacement well facility site, and 0.2 mile north of the Central Pump Station well facility site. These recorded observations are all over 20 years old, with the most recent being from October 1990. It is not known whether this species continues to use trees in Golden Gate Park for overwintering, and no monarch butterflies were observed during surveys conducted for this project.

Designated Critical Habitat

The USFWS designates critical habitat for certain species listed by the agency as threatened or endangered. "Critical habitat" is defined in Section 3(5)(A) of the federal Endangered Species Act (ESA) as those lands within a listed species' current range that contain the physical or biological features considered essential to the species' conservation, as well as areas outside the species' current range that are determined to be essential to its conservation. However, the project area is not located within designated critical habitat for any federally listed species.

5.14.2 Regulatory Framework

This section briefly describes federal, state, and local regulations, permits, and policies pertaining to biological resources and wetlands as they apply to the proposed project.

Special-Status Species

Federal Endangered Species Act

The federal ESA protects the fish and wildlife species, and their habitats, that have been identified by the USFWS or National Marine Fisheries Service (NMFS) as threatened or endangered. The term "endangered" refers to species, subspecies, or distinct population segments that are in danger of extinction through all or a significant portion of their range. The term "threatened" refers to species, subspecies, or distinct population segments that are likely to become endangered in the near future.

The ESA is administered by the USFWS and NMFS. In general, the NMFS is responsible for the protection of ESA-listed marine species and anadromous fishes, whereas listed, proposed, and candidate wildlife, plant species, and fish species are under USFWS jurisdiction. "Take"[10] of listed species can be authorized through either the Section 7 consultation process (for actions by federal agencies) or the Section 10 permit process (for actions by non-federal agencies). Federal agency actions include activities located on federal land or that are conducted by a federal agency, funded by a federal agency, or authorized by a federal agency (including issuance of federal permits and licenses).

[10] The federal ESA defines the term "take" as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

Under Section 7 of the ESA, the federal agency conducting, funding, or permitting an action (the federal lead agency) must consult the USFWS and/or NMFS, as appropriate, to ensure that the proposed action will not jeopardize endangered or threatened species or destroy or adversely modify designated critical habitat. If a proposed project "may affect" a listed species or designated critical habitat, the lead agency is required to prepare a biological assessment evaluating the nature and severity of the expected effect. In response, the USFWS issues a biological opinion determining whether (1) the proposed action may either jeopardize the continued existence of one or more listed species (jeopardy finding) or result in the destruction or adverse modification of critical habitat (adverse modification finding), or (2) will not jeopardize the continued existence of any listed species (no jeopardy finding) or result in adverse modification of critical habitat (no adverse modification finding).

Critical Habitat. Under the ESA, the Secretary of the Interior (or the Secretary of Commerce, as appropriate) formally designates critical habitat for certain federally listed species and publishes these designations in the Federal Register. Critical habitat is not automatically designated for all federally listed species; so many listed species have no formally designated critical habitat.

Critical habitat is defined as the specific areas that are essential to the conservation of a federally listed species, and that may require special management consideration or protection. Critical habitat is determined using the best available scientific information about the physical and biological needs of the species. These needs, or primary constituent elements, include: space for individual and population growth and for normal behavior; food, water, light, air, minerals, or other nutritional or physiological needs; cover or shelter; sites for breeding, reproduction, and rearing of offspring; and habitat that is protected from disturbance or is representative of the historical geographic and ecological distribution of a species. There is no federally designated critical habitat in the project area.

California Endangered Species Act

Under the California Endangered Species Act (CESA), the CDFW has the responsibility for maintaining a list of threatened and endangered species (California Fish and Game Code, Section 2070). The CDFW also maintains a list of "candidate species," which are species formally noticed as being under review for addition to either the list of endangered species or the list of threatened species. In addition, the CDFW maintains lists of "species of special concern," which serve as watch lists.

The CESA prohibits the take of plant and animal species designated by the Fish and Game Commission as either threatened or endangered in the State of California. "Take" in the context of the CESA means to hunt, pursue, kill, or capture a listed species, as well as any other actions that may result in adverse impacts when attempting to take individuals of a listed species. The take prohibitions also apply to candidates for listing under the CESA. However, Section 2081 of the CESA allows the CDFW to authorize exceptions to the state's take prohibition for educational, scientific, or management purposes.

Pursuant to the requirements of the CESA, an agency reviewing a proposed project within its jurisdiction must determine whether any State-listed endangered or threatened species could be present on the project area and determine whether the proposed project could have a potentially significant impact on such species. In addition, the CDFW encourages informal consultation on any proposed project that could affect a candidate species.

California Native Plant Protection Act

State listing of plant species began in 1977 with the passage of the California Native Plant Protection Act (NPPA), which directed the CDFW to carry out the legislature's intent to "preserve, protect, and enhance endangered plants in this state." The NPPA gave the California Fish and Game Commission the power to designate native plants as endangered or rare and to require permits for collecting, transporting, or selling such plants. The CESA expanded on the original NPPA and enhanced legal protection for plants. The CESA established threatened and endangered species categories, and grandfathered all rare animals—but not rare plants—into the act as threatened species. Thus, three listing categories for plants are employed in California: rare, threatened, and endangered.

Special-Status Natural Communities

Special-status natural communities are identified as such by the CDFW's Natural Heritage Division and include those that are naturally rare and those whose extent has been greatly diminished through changes in land use. The CNDDB tracks 135 such natural communities in the same way that it tracks occurrences of special-status species: information is maintained on each site in terms of its location, extent, habitat quality, level of disturbance, and current protection measures. The CDFW is mandated to seek the long-term perpetuation of the areas in which these communities occur. While there is no statewide law that requires protection of all special-status natural communities, CEQA requires consideration of the potential impacts of a project on biological resources of statewide or regional significance.

Federal Migratory Bird Treaty Act

The federal MBTA (United States Code, Title 16, Section 703, Supplement I, 1989) prohibits taking, killing, possessing, or trading in migratory birds, except in accordance with regulations prescribed by the Secretary of the Interior. This act encompasses whole birds, parts of birds, and bird nests and eggs. *Take* is defined in the federal Endangered Species Act as "…harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any threatened or endangered species." Harm may include significant habitat modification where it actually kills or injures a listed species through impairment of essential behavior (e.g., nesting or reproduction). Therefore, for projects that would not result in the direct mortality of birds, the MBTA is generally also interpreted in CEQA analyses as protecting active nests of all species of birds that are included in the "List of Migratory Birds" published in the Federal Register in 1995. With respect to nesting birds, while the MBTA itself does not provide specific take avoidance measures, a set of measures sufficient to demonstrate take avoidance have been developed over time by USFWS and CDFW. Since these measures are typically required as permitting conditions by these agencies, they are often incorporated as mitigation measures for projects during the environmental review process, unless the project as proposed incorporates and is consistent with these protections. These requirements include preconstruction nesting bird surveys and establishment of appropriate buffers from construction if active nests are found. (See also Section 3.4.1, Groundwater Well Facilities.)

California Fish and Game Code

Under Section 3503 of the California Fish and Game Code, it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto. Section 3503.5 of the code prohibits take, possession, or destruction of any birds in the orders Falconiformes (hawks) or Strigiformes (owls), or of their nests and eggs. Code Sections 3511 (birds), 4700 (mammals), 5050 (reptiles and amphibians), and 5515 (fish) allow the designation of a species as fully protected. This is a greater level of protection than is afforded by CESA. Except for take related to scientific research, all take of fully protected species is prohibited**.**

Waters of the United States and Waters of the State (Wetlands)

Two definitions of "wetland" are considered for purpose of this EIR, one administered by the Corps under the federal Clean Water Act and the other administered by the San Francisco Bay Regional Water Quality Control Board (RWQCB) under the Porter-Cologne Water Quality Control Act and the CCC under the California Coastal Act. Both definitions are presented below.

Federal Wetland Definition

Wetlands are a subset of waters of the United States and receive protection under Section 404 of the Clean Water Act. The term "waters of the United States,"[11] as defined in the Code of Federal Regulations (33 CFR 328.3[a]; 40 CFR 230.3[s]), includes:

1. All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide.

2. All interstate waters including interstate wetlands. (Wetlands are defined by the federal government [CFR, Section 328.3(b)] as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.)

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[11] Based on the Supreme Court ruling in *Solid Waste Agency for Northern Cook County v. U.S. Army Corps of Engineers* related to federal jurisdiction over isolated waters (January 9, 2001), non-navigable, isolated, intrastate waters are no longer defined as waters of the United States based solely on their use by migratory birds. Jurisdiction over non-navigable, isolated, intrastate waters may be exercised if their use, degradation, or destruction could affect other waters of the Unites States or interstate or foreign commerce. According to this ruling, jurisdiction over such other waters must be analyzed on a case-by-case basis, as should impoundments of waters, tributaries of waters, and wetlands adjacent to waters. The Supreme Court's recent decisions (e.g., *Rapanos* and *Carabel*) have yet to be interpreted in Corps regulations or definitions.

3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mud flats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce including any such waters which are or could be used by interstate or foreign travelers for recreational or other purposes; or from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or which are used or could be used for industrial purposes by industries in interstate commerce.

4. All impoundments of waters otherwise defined as waters of the United States under the definition.

5. Tributaries of waters identified in paragraphs (1) through (4).

6. Territorial seas.

7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (1) through (6).

8. Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with the U.S. Environmental Protection Agency.

California Wetland Definition

California agencies have adopted the Cowardin et al. (1979) classification system to define wetlands. According to this classification system, wetlands must have one or more of the following three attributes: (1) at least periodically, the land predominantly supports hydrophytes;[12] (2) the substrate is predominantly undrained hydric soil; or (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al., 1979).

Under normal circumstances, the federal definition of wetlands requires all three wetland identification parameters to be met, whereas the Cowardin definition requires the presence of at least one of these parameters.

Regulation of Activities in Wetlands

The regulations and policies of various federal agencies, such as the Corps, U.S. Environmental Protection Agency (USEPA), USFWS, and NMFS, mandate that filling wetlands be avoided unless it can be demonstrated that no practicable alternatives exist. The Corps has primary federal responsibility for administering regulations that concern waters and wetlands. In this regard, the Corps acts under two statutory authorities: the Rivers and Harbors Act (Sections 9 and 10), which governs specified activities in "navigable waters," and the Clean Water Act (Section 404), which governs the fill of waters of the United States, including wetlands. The Corps

[12] The USFWS has developed the following definition for hydrophytic vegetation: "plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content" (Cowardin et al., 1979).

requires that a permit be obtained if a project proposes to place fill in navigable waters and/or to alter waters of the United States below the ordinary high-water mark in nontidal waters. The USEPA, USFWS, NMFS, and several other agencies may comment on Corps permit applications. The USEPA provides the primary criteria for evaluating the biological impacts of Corps permit actions in wetlands.

The State's authority to regulate activities in wetlands and waters at the project site resides primarily with the RWQCB, which regulates fill in and discharges to Waters of the United States and Waters of the State of Califonia, including activities in wetlands, under Section 401 of the Clean Water Act, and the Porter-Cologne Water Quality Control Act. The CDFW provides comment on Corps permit actions under the Fish and Wildlife Coordination Act. Moreover, under Sections 1600–1616 of the California Fish and Game Code, the CDFW regulates activities that would substantially divert, obstruct the natural flow of, or change rivers, streams, and lakes. The jurisdictional limits of the CDFW are defined in Section 1602 of the California Fish and Game Code as the bed, channel, or bank of any river, stream, or lake. The CDFW regulates activities that would result in the deposit or disposal of debris, waste, or other materials into any river, stream, or lake, and requires preparation of a streambed alteration agreement for activities that are proposed within or near a river, stream, or lake.

Within the California Coastal Zone, the CCC also has authority to regulate development that would conflict with the provisions of the California Coastal Act. The coastal zone generally extends three miles seaward and about 1,000 yards inland from the mean high tide line of the sea. In significant coastal estuarine, habitat, and recreational areas it extends inland to the first major ridgeline paralleling the sea or five miles from the mean high tide line of the sea, whichever is less, and in developed urban areas the zone generally extends inland less than 1,000 yards. In order to carry out the policies of the Coastal Act, each of the 73 cities and counties in the coastal zone is required to prepare a local coastal program (LCP) for the portion of its jurisdiction within the coastal zone and to submit the program to the Commission for certification. The CCC manages protection of biological resources through a permitting process for all projects in the coastal zone. Once the CCC certifies a LCP, the local government gains authority to issue most coastal development permits (CDP). The CCC generally retains permit authority over certain specified lands (such as public trust lands or tidelands). Only the CCC can grant a coastal development permit for development in areas of its retained jurisdiction. The CCC has unusually broad authority to regulate development in the coastal zone, and a permit is required for any project that might change the intensity of land use in the coastal zone. For example, a project that would require a building or grading permit from a city or county would also require a CDP. Other projects, such as major vegetation clearing or subdividing, may also require a CDP. The local government or the CCC reviews applications before it to determine whether the proposed development would substantially change any existing biological resources, including wetlands, and to consider the net effects of the project on rare and endangered species.

San Francisco's LCP is discussed further below as the *Western Shoreline Plan* in the Applicable Local Plans subsection.

Applicable Local Plans

Standards for Bird-Safe Buildings

The San Francisco Planning Department adopted *Standards for Bird-Safe Buildings* in 2011, adding Planning Code Section 139 (San Francisco Planning Department, 2011b). These standards guide the use and types of glass and façade treatments, wind generators and grates, and lighting treatments. The standards impose requirements for bird-safe glazing and lighting in structures or at sites that represent a hazard to birds and provide information on educational and voluntary programs related to bird hazards. The standards define two types of bird hazards. "Location-related hazards" are buildings located inside of, or within a clear flight path of less than 300 feet from, an Urban Bird Refuge.[13] Such buildings require treatment when new buildings are constructed; additions are made to existing buildings; or existing buildings replace 50 percent or more of the glazing within the "bird collision zone."[14] The standards require implementation of the following treatments for façades facing, or located within, an Urban Bird Refuge:

- No more than 10 percent untreated glazing is allowed on building façades within the bird collision zone.
- Lighting must be shielded, and no uplighting is permitted. No event searchlights are permitted.
- Sites are not permitted to use horizontal access windmills or vertical access wind generators that do not appear solid.

"Feature-related hazards" include building- or structure-related features that are considered potential "bird traps" regardless of location (e.g., glass courtyards, transparent building corners, or clear glass walls on rooftops or balconies). Structures that include these elements must treat 100 percent of these elements in the building with bird safe glazing.

Western Shoreline Plan

As discussed in Chapter 4, Plans and Policies, the Western Shoreline Area Plan of the San Francisco General Plan is the San Francisco plan for the Local Coastal Zone and sets forth several policies governing development in the coastal zone. Most coastal development permits are issued by the San Francisco Planning Commission pursuant to the provisions of Section 330 et seq. of the San Francisco Planning Code. However, within the proposed project area the CCC has retained jurisdiction over the waters of Lake Merced and its associated wetlands. In addition, coastal development permits issued for projects located within a 100-foot buffer of Lake Merced are appealable to the CCC, as are coastal development permits issued for major public works projects. In addition to Lake Merced, the proposed North Lake and South Windmill Replacement well facility sites are located within the coastal zone and will require a CDP. Specific objectives

13 An Urban Bird Refuge is defined in the Standards for Bird-Safe Buildings as: any area of open space two acres or larger that is dominated by vegetation, including vegetated landscaping, forest, meadows, grassland, water features, or wetlands; open water; and some green rooftops.

14 The "bird collision zone" is that portion of the building that begins at grade and extends upward for 60 feet.

and policies in the Western Shoreline Area Plan relating to development in Golden Gate Park focus on recreational uses and coastal access rather than biological resources. The Western Shoreline Plan does not map any Environmentally Significant Habitat Areas[15] or establish objectives or policies specific to biological resources within San Francisco's coastal zone. However, the Planning Commission will review the project effects in its review of the coastal development permit for the project facilities located within the coastal zone, and upon appeal, if any, the CCC would consider the effects of the project within the coastal zone, including the waters and wetlands at Lake Merced.

San Francisco Recreation and Parks Department Significant Natural Resources Areas Management Plan

The San Francisco Recreation and Park Department is currently completing a Significant Natural Resource Areas Management Plan (SNRAMP) for designated significant natural areas in the City and County of San Francisco. The purpose of the management plan is to establish a maintenance and preservation program related to the protection and enhancement of natural resource values. The SNRAMP itself has not been finalized and adopted; however, the process of developing the SNRAMP began in 1995, with the preparation of a staff report on the SNRAMP.[16] The staff report set forth general objectives, policies, and management actions to guide development of the SNRAMP and the protection and enhancement of natural areas under the City's jurisdiction. General policies and management actions presented in the staff report relevant to biological resources in parts of Golden Gate Park and at Lake Merced include the following:

III. General Policies and Management Actions

A. Vegetation

a. Maintain/promote indigenous plant species; propagate native plants using seed collected from the specific site to avoid alteration of unique genetic strains of native plant species.

b. Control/remove invasive species; remove exotic plants which adversely affect indigenous plant growth.

c. Enhance riparian areas.

d. Reforest and/or replant areas where appropriate to maintain diversity of indigenous plant communities.

e. Preserve habitat which supports wildlife.

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15 Section 30107.5 of the Coastal Act provides a definition of *environmentally sensitive area* as: "Any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments. Section 30240 of the California Public Resources Code states: (a) Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas [and] (b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.

16 The San Francisco Recreation and Park Commission adopted the staff report on January 19, 1995 by Resolution No. 9501-008.

B. Water Resources

a. Maintain/improve water quality of streams and ponds

b. Protect riparian zones from erosion and sedimentation.

c. Maintain drainage and erosion prevention devices along roads and service trails.

d. Control drainage/runoff from roads.

e. Establish and maintain tule encroachment zone around lakes.

f. Use proper controls when using aquatic herbicide.

Golden Gate Park Master Plan

The *Golden Gate Park Master Plan* provides a framework and guidelines to ensure responsible and enlightened stewardship of the park (SFRPD, 1998). The main goal of the plan is to balance public recreation in the park with the preservation of the park's historical significance. Objectives and policies in the plan aim to preserve the park's contribution to the diversity of cultural, natural, and recreational resources available to park visitors from San Francisco, the Bay Area, and elsewhere. Policies relevant to biological resources are described include:

Objective II, Policy B – Preserve and Renew the Park's Forests

2. The forest management program should focus on:

b. Removal of hazardous, diseased and dying trees; replacement with appropriate tree species. (Some dead/dying trees should be retained for wildlife habitat ecological purposes.)

g. Control of invasive plant species.

The *Golden Gate Park Master Plan* (SFRPD, 1998) proposes the following recommendations for preserving Golden Gate Park's forests:

- Structurally weak trees that pose a significant risk to the public and to property need to be identified, monitored, and removed as part of an ongoing safety program.
- Individual large trees should be replaced in kind with similar species. Specimen sized trees should be used where judged to be feasible.

Objective II, Policy C – Wildlife and Habitat

1. Manage, protect, and enhance the park's landscape for wildlife habitat and other natural values. Managing the landscape for these values should include preserving and enhancing food sources, nesting sites, and roosting sites, thinning and providing openings in the forest canopy, and maintaining understory vegetation.

2. Continue diversification of tree species within the park by planting California native species such as oak, buckeye, madrone, bay laurel, and toyon, where appropriate.

3. Preserve selected dead and aging trees for habitat value.

5. Designate areas within the park that have special resources or habitat values as natural resource areas. Natural resource areas should be managed to preserve and

enhance the natural resource values. Control park uses in and near natural resource areas to preserve natural values.

San Francisco Recreation and Parks Department Park Code

Section 4.06 – Removal of Trees, Wood, etc. The SFRPD has jurisdiction over all trees in Golden Gate Park. Thus, the SFRPD must grant permission for any trimming or removal of trees in these areas.

San Francisco Public Works Code

The San Francisco's Urban Forestry Ordinance (Article 16 of the Public Works Code) protects San Francisco's street trees, significant trees, and landmark trees regardless of species. The ordinance protects the following three categories of trees, which are defined as follows:

A **street tree** is "any tree growing within the public right-of-way, including unimproved public streets and sidewalks, and any tree growing on land under the jurisdiction of the Department [of Public Works]" as defined in Section 802 of the ordinance. Section 806b requires entities (other than the Department of Public Works) to obtain a permit from the department prior to removing any street trees.

A **significant tree** is defined in Section 810A of the ordinance as any tree: (1) located on property under the jurisdiction of the Department of Public Works or on privately owned property with any portion of its trunk within 10 feet of the public right-of-way, and (2) that satisfies at least one of the following criteria: (a) a diameter at breast height in excess of 12 inches, (b) a height in excess of 20 feet, or (c) a canopy in excess of 15 feet. Any entity other than the Department of Public Works must obtain a permit to remove significant trees according to the process described in Section 806b.

A **landmark tree** is any tree that: (1) has been nominated as such by a member of the public, a landowner, the San Francisco Planning Commission, the Board of Supervisors, or the Historic Preservation Commission, (2) the Urban Forestry Council (within the San Francisco Department of the Environment) has subsequently recommended as a landmark tree, and (3) is designated a landmark tree by ordinance approved by the Board of Supervisors. According to Section 810 of the ordinance, nominated trees undergoing review are protected according to the same standards as designated landmark trees until the review process is completed.

Permits are required for planting or removing street trees and significant trees, and protection measures are required for these trees if construction work would occur within the trees' dripline.

5.14.3 Impacts and Mitigation Measures

Significance Criteria

The Groundwater Supply Project would have a potentially significant impact on biological resources if it were to:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations or by the CDFW, the USFWS, or NMFS;

- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by CDFW or USFWS;

- Have a substantial adverse effect on federally protected wetlands, as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;

- Substantially interfere with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;

- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or

- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan.

Overall Approach to Analysis

This section describes the impacts that have been screened out from further analysis and the reasons why; and describes the approach to impact analysis.

Because of the nature of the proposed project, it would have no impacts related to the following criterion; therefore, this report does not discuss impacts related to these topics for the reasons described below:

- ***Substantially Interfere with the Movement of any Native Resident or Migratory Fish or Wildlife Species or with Established Native Resident or Migratory Wildlife Corridors, or Impede the Use of Native Wildlife Nursery Sites (project construction and siting).*** The project sites include limited marginal habitat that could serve as wildlife corridors; however, well facility construction would not substantially interfere with the use of this habitat as wildlife corridors, as the project would result in the disturbance or removal of only small developed, landscaped, and non-native forest areas (up to 0.5 acre for the largest site—the Lake Merced well facility). In addition, there is substantial connecting habitat of similar or better quality in the vicinity of project sites (i.e., Lake Merced, Golden Gate Park).

  The Central Pump Station, North Lake, South Windmill Replacement, and Lake Merced well facility sites are each located within an Urban Bird Refuge as defined by the San Francisco's *Standards for Bird-Safe Buildings*. The proposed facilities at the Central Pump Station, North Lake, and Lake Merced well facility sites do not include windows (see Figures 3-9-b, 3-12b, 3-14b, 5.3-11, 5.3-17, and 5.3-21). The proposed South Windmill Replacement well facility would have windows without glazing. Windows would consist of precast concrete grids set into the walls, with black metal louvers behind them for ventilation. All facilities would also have a removable 'Kalwall' skylight, made of translucent fiberglass, which is not transparent or reflective (see Section 3.4.1, Groundwater Well Facilities) In addition, all proposed well facilities would have minimal exterior lighting and would not include up-lighting. Therefore, the proposed facility buildings would be consistent with *Standards for Bird-Safe Buildings* with respect to window treatments and lighting and are not expected to pose an increased risk for avian collisions over existing conditions

Therefore, the project would not substantially interfere with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. The criterion related to wildlife movement or migration or to wildlife nursery sites is not applicable to project construction and siting.

- ***Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan.*** There are no adopted habitat conservation plans, natural community plans, or other approved plan that cover the project area; therefore, the criterion related to conflicts with such a plan is not applicable to the project.

Impacts on biological resources are evaluated based on the likelihood that special-status species, sensitive habitats, wildlife corridors, and protected trees are present within the project area (as described in Section 5.14.1, Setting), and the likely effects that construction or facility siting, operation, and maintenance might have on these resources. Special-status resources that have no or low potential to occur in the project area (as presented in Tables 5.14-1 and 5.14-2) are not considered in the impact analysis.

For the purposes of this EIR, the word "substantial" as used in the significance criteria above is defined by the following three principal components:

- Magnitude and duration of the impact (e.g., substantial/not substantial)
- Uniqueness of the affected resource (rarity)
- Susceptibility of the affected resource to disturbance

The approach to analysis of impacts related to construction and operation of project facilities are described below under the heading Facility Construction, Siting, Operations, and Maintenance. For impacts related to groundwater pumping, the specific approach to analysis is described below under the heading Groundwater Pumping Operations.

Impact Summary

Table 5.14-3 summarizes the proposed project's biological resources impacts and significance determinations.

TABLE 5.14-3
SUMMARY OF IMPACTS – BIOLOGICAL RESOURCES

Impacts	Significance Determinations
Impact BI-1: Construction of the proposed project would potentially adversely affect species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS.	LSM
Impact BI-2: Construction of the proposed project would not adversely affect federally protected wetlands.	LS
Impact BI-3: Construction of the proposed project would conflict with applicable local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.	LSM
Impact BI-4: The proposed project's facility siting and maintenance would not result in substantial biological resources impacts.	LS
Impact BI-5: Operation of the proposed project would not adversely affect species identified as candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS.	LS
Impact BI-6: Operation of the proposed project would potentially adversely affect sensitive habitat types associated with Lake Merced.	LSM
Impact BI-7: Operation of the proposed project would adversely affect wetland habitats and other waters of the United States associated with Lake Merced.	LSM
Impact C-BI: The proposed project would result in cumulative impacts related to special-status species, wetlands, waters of the United States, riparian habitat, wildlife nursery sites, and compliance with local policies and ordinances protecting biological resources.	LSM

NOTES:
LS = Less than Significant impact, no mitigation required
LSM = Less than Significant impact with Mitigation

Impact Analysis

Facility Construction, Siting, Operations, and Maintenance Impacts

Approach to Analysis: Facility Construction, Siting, Operations, and Maintenance Impacts

The preceding *Environmental Setting* identifies special-status species that were determined to have a moderate or high potential to occur within the project vicinity. Potential impacts of the project on the identified special-status species were assessed based on the literature review conducted for this analysis, professional judgment, and the following steps. First, the potential for occurrence within and adjacent to the project area was analyzed in detail starting with a general assessment of potential occurrence within the study area (i.e., within the terrestrial and aquatic habitats of the project sites and their immediate vicinity), followed by an assessment of potential occurrence within the proposed project footprint area. If no potential habitat for a given species was found to exist in the project study area, then it was determined that the species was unlikely to be found in the study area and no further consideration was given to that species. If a species was determined to have the potential to occur in the project study area, further analyses were made of life history and habitat requirements, as well as the suitability of habitat for the species found within the study area or its immediate vicinity. The results of this determination for each species are provided in the "Potential for Occurrence" column of Tables 5.14-1 and 5.14-2 in the *Environmental Setting*. If suitable habitat was determined present within the project vicinity and the species has been documented within the proposed project sites or has at least a moderate potential to occur, additional analysis considered whether the species would be adversely impacted by the project. Both direct effects (e.g., displacement or loss of habitat) and indirect effects (e.g., noise) were considered. In addition, life history and habitat requirements were evaluated to ascertain the likelihood and severity of impact.

As previously indicated, potential impacts resulting from project facility construction, siting, operations, and maintenance were evaluated based on field reconnaissance surveys performed by qualified Environmental Science Associates biologists and a review of the following sources:

- Existing resource information and aerial photographs of the project site and greater study area;
- Data presented in the CNDDB (CDFG, 2011), CNPS *Electronic Inventory of Rare and Endangered Vascular Plants of California* (CNPS, 2011), and USFWS (2011a) for the San Francisco North and San Francisco South USGS 7.5 minute topographic quadrangles, which include the project site and vicinity;
- Standard biological references (e.g., Hickman, 1993; Mayer and Laudenslayer, 1988; Jennings, 1994);
- Surveys and environmental documents including specific information on species or habitats found in the biological resources study area (e.g., Krauel, 2009; Nomad Ecology, 2011);
- Other available literature regarding the natural resources of the area (as specified in the *References* at the end of this chapter).

Impact BI-1: Construction of the proposed project would potentially adversely affect species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS. (Less than Significant with Mitigation)

As noted above in Section 5.14.1, Setting, the overall potential of the project area to support special-status plant species is considered extremely low, based on the lack of native plants and native plant communities, and on the high degree of disturbance associated with ongoing and past uses of the project area. All of the proposed facility sites are located in areas that experience recurrent disturbance associated with human use of the areas and surrounding vicinity. The Lake Merced well facility would be constructed in mostly barren/ruderal areas surrounded by non-native forest. The South Sunset well facility site would be located in a landscaped area. The West Sunset well facility would be located in a ruderal area covered with woodchips. The Central Pump Station well facility would be located within an area of non-native forest. The South Windmill Replacement well facility would be located within disturbed habitat. The North Lake well facility would be located in a disturbed area dominated by non-native trees. No special-status plant species have been observed on the sites and for reasons noted above, none of these sites is likely to support special-status plant species. Therefore, implementation of the project would not affect any special-status plants.

Section 5.14.1, Setting, also indicates that several special-status animals might use habitat in certain parts of the project area or vicinity for roosting, foraging, or breeding purposes, including California red-legged frog, western pond turtle, Yuma myotis, western red bat, and monarch butterfly. In addition, there are a number of native resident and migratory bird species protected under federal and State legislation with the potential to use trees, shrubs, and other habitats as well as buildings within the project area for nesting and foraging.

Several lakes and Golden Gate Park ponds (including Lake Merced and North Lake) in the vicinity of the project sites provide potentially suitable aquatic habitat for western pond turtle and California red-legged frog (except that red-legged frogs are considered extirpated from Lake Merced), with suitable upland habitat occurring within 300 feet of aquatic habitat. The project sites themselves do not provide suitable breeding or foraging habitat for these species, as the project sites lack aquatic features used for these purposes. Based on the high degree of disturbance associated with ongoing and past uses of the sites, the upland habitat located in the project area is of marginal quality. However, potentially suitable aquatic habitat for western pond turtle is located approximately 100 feet from the Lake Merced well facility site, and for both species 50 feet from the North Lake well facility site. Potentially suitable aquatic habitat is also located approximately 400 feet from the Central Pump Station well facility site and approximately 0.5 mile from the South Windmill Replacement well facility site. These aquatic features support both lacustrine[17] habitat and adjacent wetland habitats. Construction of the proposed project would not directly affect this aquatic habitat (potential indirect effects to aquatic features from project construction are discussed below in Impact BI-2). Due to the proximity of aquatic habitats to the Lake Merced, North Lake, and Central Pump Station well facility sites, western pond turtle and California red-legged frog could utilize these project well facility sites for dispersal or migratory movement to other aquatic features in the immediate area. Although the South Windmill Replacement well facility site is located within the dispersal distance for red-legged frog, it is separated from Middle and South Lakes by busy roads and the upland habitat there is disturbed on an ongoing basis; therefore, California red-legged frog are not expected to be found in upland habitat at this site. However, because project construction at the other sites could adversely affect these species, should they be present, by direct mortality or temporary or permanent upland habitat removal, this impact on biological resources could be significant. Implementation of **Mitigation Measure M-BI-1a, Avoidance and Minimization Measures for California Red-Legged Frog and Western Pond Turtle** would reduce potential impacts on California red-legged frog and western pond turtle to a less-than-significant level by requiring the installation of exclusion fencing and preconstruction surveys, and by requiring additional measures during construction.

[17] Living or growing in lakes.

Mitigation Measures

Mitigation Measure M-BI-1a: Avoidance and Minimization Measures for California Red-Legged Frog and Western Pond Turtle. During construction at the Lake Merced, North Lake, and Central Pump Station well facility sites, the SFPUC shall ensure a biological monitor is present during installation of exclusion fencing and initial vegetation clearing and/or grading, and shall implement the following measures:

- Within one week before work at these sites begins (including demolition and vegetation removal), a qualified biologist shall supervise the installation of exclusion fencing along the boundaries of the work area, as deemed necessary by the biologist, to prevent California red-legged frogs, western pond turtles, and incidental, common wildlife from entering the work area. The construction contractor shall install suitable fencing with a minimum height of 3 feet above ground surface with an additional 4-6 inches of fence material buried such that species cannot crawl under the fence.
- A qualified biologist shall conduct environmental awareness training for all construction workers prior to construction workers beginning their work efforts on the project. The training shall include information on species identification, avoidance measures to be implemented by the project, and the regulatory requirements and penalties for noncompliance. If necessary, the content shall vary according to specific construction areas (e.g., workers on city streets will receive training on nesting birds but not on California red-legged frog identification).
- A qualified biologist shall survey the excluded area within 48 hours before the onset of initial ground-disturbing activities and shall be present during initial vegetation clearing and ground-disturbing activities. The biological monitor shall monitor the exclusion fencing weekly to confirm proper maintenance and inspect for frogs and turtles. If frogs or turtles are found, the SFPUC shall halt construction and contact the USFWS and/or CDFW for instructions on how to proceed. Construction shall resume after approval from the USFWS and/or CDFW.
- During project activities, excavations deeper than 6 inches shall be covered overnight or an escape ramp of earth or a wooden plank at a 3:1 rise shall be installed; openings such as pipes where California red legged frogs or western pond turtles might seek refuge shall be covered when not in use; and all trash that may attract predators or hide California red-legged frogs or western pond turtles shall be properly contained on a daily basis, removed from the worksite, and disposed of regularly. Following construction, the construction contractor shall remove all trash and construction debris from work areas.

Vegetation clearing, including tree removal, could destroy nests in trees at the project sites. The loss of an active nest would be considered a significant impact under CEQA, if that nest were occupied by a special-status bird species. Moreover, as noted in Section 5.14.2, disruption of nesting migratory or native birds is not permitted under the federal MBTA or the California Fish and Game Code, as it could constitute a take. Thus, the loss of any active nest (i.e., removing a tree or shrub or demolishing a building containing a nest) must be avoided under federal and State law.

Construction requirements have been incorporated into the project description to reduce the potential for adverse effects on nesting birds. As described in Section 3.4.1, Groundwater Well Facilities, the SFPUC would conduct tree removal and pruning activities, as well as other construction activities, outside the bird nesting season (January 15 to August 15), to the extent feasible. If construction during bird nesting season cannot be fully avoided, preconstruction nesting surveys will be conducted by a qualified wildlife biologist prior to work. Preconstruction bird nesting surveys would be conducted within seven days of the start of construction (i.e., active ground disturbance, vegetation removal, building demolition). If active nests are located during the preconstruction bird nesting survey, SFPUC would, with guidance and input from the CDFW, take actions that may include setting up and maintaining a line-of-sight buffer area around the active nest and prohibiting construction activities within the buffer; modifying construction activities; and/or removing or relocating active nests. The Project, as proposed, is consistent with the prohibitions in the MBTA and with the set of take avoidance measures that have been developed by and often imposed as mitigation by the USFWS and CDFW(addressed above in Section 5.14.2) to address potential impacts to migratory birds. Thus, with the Project as proposed, potential impacts associated with the direct mortality of special-status and otherwise protected birds, through vegetation removal or building demolition activities, would be less than significant.

Vegetation clearing (including tree removal), irrigation well facility demolition, and exterior construction activities at the Sunset Reservoir Chlorine Station could result in direct mortality of special-status bats at the well facilities and Sunset Reservoir. Direct mortality of special-status bats would be a significant impact. However, implementation of **Mitigation Measure M-BI-1b, Avoidance and Minimization Measures for Special-Status Bats**, would reduce potential impacts on special-status bats to a less-than-significant level by requiring preconstruction surveys, and implementing avoidance measures if active roosts are located.

Mitigation Measures

> **Mitigation Measure M-BI-1b: Avoidance and Minimization Measures for Special-Status Bats.** A qualified wildlife biologist shall conduct preconstruction special-status bat surveys when large trees are to be removed, or when occasionally used or vacant buildings are to be demolished. If active day or night roosts are found, the wildlife biologist shall take actions to make such roosts unsuitable habitat prior to tree removal or building demolition. A no-disturbance buffer of 100 feet shall be created around active bat roosts being used for maternity or hibernation purposes. Bat roosts initiated during construction are presumed to be unaffected, and no buffer would necessary.

Non-native trees in Golden Gate Park, such as eucalyptus and Monterey cypress, could be used for migrating monarch butterflies between October and March. While none of the recorded overwintering monarch locations in Golden Gate Park would be affected by the proposed project (CDFG, 2011), there is the potential for this species to utilize trees within the Golden Gate Park project sites. Vegetation clearing, including tree removal, could destroy or impact overwintering sites in these areas. The loss of an active overwintering site would be a significant impact under CEQA. However, implementation of **Mitigation Measure M-BI-1c, Avoidance and Minimization**

Measures for Monarch Butterfly, would reduce potential impacts on this species to a less-than-significant level by requiring the SFPUC to conduct construction activities outside of the overwintering season, perform preconstruction surveys, and implement avoidance measures if active overwintering sites are located.

Mitigation Measure M-BI-1c: Avoidance and Minimization Measures for Monarch Butterfly. Construction activities in and around potential butterfly overwintering sites shall occur outside of the overwintering season (October to March), to the greatest extent feasible, to avoid potential impacts on monarch butterfly at the Golden Gate Park sites. However, when it is not feasible to avoid the overwintering season and construction activities take place during this time, the following measures shall apply:

- Preconstruction surveys shall be conducted for overwintering monarch butterfly sites within 100 feet of the construction areas.
- If an active overwintering site is located, work activities shall be delayed within 100 feet of the site location until avoidance measures have been implemented. Appropriate avoidance measures shall include the following measures (which may be modified as a result of consultation with the CDFW to provide equally effective measures):
  - If the qualified wildlife biologist determines that construction activities shall not affect an active overwintering site, activities may proceed without restriction.
  - A no-disturbance buffer may be established around the overwintering site to avoid disturbance or destruction until after the overwintering.
  - The extent of the no-disturbance buffers shall be determined by a qualified wildlife biologist in consultation with the CDFW.

Impact BI-2: Construction of the proposed project would not adversely affect federally protected wetlands. (Less than Significant)

As indicated in Section 5.14.1, Setting, the project sites do not support federally protected wetlands or waters of the U.S. However, there are a number of maintained lakes, ponds, and associated freshwater marsh wetlands present in the project vicinity, including wetlands and waters of the U.S. located approximately 100 feet from the Lake Merced and 50 feet from the North Lake well facility sites. These habitats would not be directly impacted by construction of the proposed project. However, project construction would involve activities such as grading and excavation that would generate loose, erodible soils. These activities could result in substantial erosion or siltation off-site to adjacent areas including Lake Merced, North Lake, and wetlands associated with these aquatic features.

As discussed in Section 5.16.2, Regulatory Framework, of Section 5.16, Hydrology and Water Quality, in accordance with the City's Green Building Ordinance (San Francisco Building Code Chapter 13C), Article 4.1 of the San Francisco Public Works Code, and consistent with the SFPUC's Water Pollution Prevention Program, the SFPUC would be required to develop and implement an Erosion and Sediment Control Plan specifying measures to be implemented at each construction site to prevent stormwater pollution and control runoff at each site. The plan must include the following information: location and perimeter of the site; location of nearby storm drains and/or catch basins; existing and proposed roadways and drainage pattern within the site; and a drawing or diagram of the sediment and erosion control devices to be used on site. At a minimum, the plan would also contain a visual monitoring program and a chemical monitoring program for nonvisible pollutants. The Erosion and Sediment Control Plan would also specify minimum best management practices (BMPs) related to housekeeping (storage of construction materials, waste management, vehicle storage and maintenance, landscape materials, pollutant control); non-stormwater management; erosion control; sediment control; and run-on and runoff control. Additional BMPs could be required for construction of the Lake Merced well facility because it would be constructed near Lake Merced, which supports the identified beneficial uses of fish spawning and cold freshwater habitat. Additional BMPs could include activities such as implementation of more stringent runoff controls; soil stabilization measures for active construction areas; use of linear sediment controls along any exposed slopes; use of designated site access points that employ effective controls to eliminate off-site tracking of sediment; more stringent inspection and record keeping requirements for BMPs implemented at the construction site; and advanced planning for a rain event to ensure that measures are in place to prevent a discharge of sediment or construction-related materials to Lake Merced, and to respond to a release if one occurred.

The SFPUC would require compliance with the plan in the construction contracts and would also be able toconduct routine inspection of all BMPs. The regulatory requirements for the Erosion and Sediment Control Plan address, and are intended to avoid, the adverse effects to water bodies associated with runoff and sediment during construction. Therefore, since an Erosion and Sediment Control Plan would be required for the Project, potential impacts on wetlands and waters of the U.S. from erosion would be less than significant through compliance with applicable regulatory requirements.

Impact BI-3: Construction of the proposed project would conflict with applicable local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance. (Less than Significant with Mitigation)

This impact discussion addresses trees that are under the jurisdiction of the SFRPD and provisions of the San Francisco Public Works Code.

As designed, the Groundwater Supply Project would require the removal of trees that are under the jurisdiction of the SFRPD.[18] **Table 5.14-4** identifies the number of existing trees and large shrubs within the project area that would be removed and retained at each well facility construction area (see Figures 3-2 through 3-7), based on survey results presented in the *San Francisco Groundwater*

[18] Each of the well facilities is located on land managed by the SFRPD, with the exception of the Lake Merced well facility site, which is managed by the SFPUC. The adjacent Lake Merced areas are managed by SFRPD.

TABLE 5.14-4
TREES AND LARGE SHRUBS TO BE REMOVED AND RETAINED UNDER THE PROPOSED PROJECT

Species	Number to be Removed	Number to be Retained
Trees		
Monterey cypress (*Cupressus macrocarpa*)	5	42
Blue gum eucalyptus (*Eucalyptus globulus*)	0	47
Monterey pine (*Pinus radiata*)	1	8
New Zealand Christmas tree (*Metrosideros excelsus*)	0	5
Wild plum (*Prunus* sp.)	0	3
Tree subtotal	**6**	**105**
Shrubs		
Myoporum (*Myoporum laetum*)	20	19

SOURCE: Environmental Science Associates

Supply Project Tree and Large Shrub Assessment Report (Environmental Science Associates, 2012; see Section 5.14.1, Setting under the heading "Trees and Shrubs", for an overview of the tree survey). Figures 3-9a, 3-11a, and 3-14a in Chapter 3, Project Description, identify the location of trees that would be removed at each site, as summarized below.

- ***Lake Merced Well Facility.*** Construction of the Lake Merced well facility would require removal of one Monterey pine tree.
- ***West Sunset Well Facility.*** Construction of the West Sunset well facility would require the removal of three Monterey cypress trees.
- ***North Lake Well Facility.*** Two Monterey cypress trees located directly east of the existing well facility would be removed.

Of the 150 trees and shrubs surveyed, 6 trees would be removed under the project, while the remainder of the trees surveyed would be retained.[19] The Tree and Large Shrub Assessment (Environmental Science Associates, 2012) included an evaluation of tree and shrub health and identified any potential public safety hazards. One tree was recommended for removal due to structural deficiencies that make the tree a potential hazard (Environmental Science Associates, 2012). Many of the trees in Golden Gate Park are nearing or at maturity and are in a state of decline. As described in Section 5.14.2, Regulatory Framework, the Golden Gate Park forest management program objective presented in the *Golden Gate Park Master Plan* addresses long-term care and replacement of trees within the park. The California Invasive Plant Council considers the shrub proposed for removal—*Myoporum laetum*—to be an invasive plant species (Cal-IPC, 2006). All of the trees to be removed are not native to the San Francisco area.

[19] The tree survey included four wild plum trees at the Central Pump Station well facility that were in poor health. These trees, which have been removed since the tree survey was conducted, are not considered in this impact analysis.

Consistent with Section 4.06—Removal of Trees, Wood, Etc., the SFRPD must give permission for any trimming or removal of trees in the project area. In addition, the *Golden Gate Park Master Plan* states that individual large trees should be replaced in kind with similar species. Consequently, the removal of trees within SFRPD-managed lands would result in a significant impact, given that their removal would conflict with applicable local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance. However, implementation of **Mitigation Measure M-BI-3**, **Plant Replacement Trees**, would reduce this impact to a less-than-significant level by replacing any trees removed with trees of equivalent ecological value (i.e., similar species).

Mitigation Measures

> **Mitigation Measure M-BI-3: Plant Replacement Trees.** The SFPUC shall replace the trees removed within SFRPD-managed lands with trees of equivalent ecological value (i.e., similar species) at a 1:1 ratio. If planting trees of equivalent ecological value at a 1:1 ratio is not feasible or such trees are not available, removed trees shall be replaced at a ratio of 1 inch for every 1 inch of the removed tree's diameter at breast height. If the project site does not have adequate room for replanting trees, the SFPUC shall coordinate with SFRPD to identify acceptable replanting locations in the vicinity of the project site. The SFPUC shall monitor tree replacement plantings annually for a minimum of three years after completion of construction to ensure the plantings have become established and, if necessary, shall replant to ensure the success of the replacement plantings.

The proposed pipeline alignments are predominantly in paved streets (e.g., along 41st Avenue and Ortega Street) (see Figure 3-7), and no trees would be removed for pipeline installation within paved streets. Trees and shrubs located along Wawona Street at the South Sunset well facility are under the jurisdiction of the San Francisco Department of Public Works. Construction of discharge pipelines along Wawona Street would require the removal of several shrubs, but the New Zealand Christmas trees at the site would be preserved. As discussed in Section 3.4.1, Groundwater Well Facilities trees adjacent to construction areas that are not proposed for removal (as described above) would be protected and no significant trees under Article 16 of the Public Works Code would be removed or damaged by project construction. Any removed shrubs, which are not considered significant trees under Article 16 of the Public Works Code, would be salvaged for reuse. Therefore, the project would not conflict with the applicable local requirements related to tree removal at the South Sunset well facility.

Impact BI-4: The proposed project's facility siting and maintenance would not result in substantial biological resources impacts. (Less than Significant)

Equipment and facility operation and maintenance of the project facilities are not expected to affect biological resources. Normal operations and maintenance of the facilities include daily pumping to extract groundwater, groundwater monitoring, overboard pumping, groundwater sampling and treatment, remote monitoring, and daily visits to check the equipment at each of the groundwater well facility and pump sites. These actions would not result in impacts on biological resources. Once construction of the project is completed, noise and human activity at project facilities are expected to be similar to pre-project conditions. Therefore, potential impacts on biological resources from operation and maintenance of project facilities would be less than significant.

Groundwater Pumping Operations Impacts

Approach to Analysis: Groundwater Pumping Operations Impacts

Impacts on biological resources would be significant if project operations were to result in substantial effects on the biological resources of Lake Merced, which is hydraulically connected to the underlying groundwater basin. Biological resources around lakes and other water bodies are affected by both water level increases and decreases. However, groundwater pumping associated with the proposed project could only result in lake level decreases; therefore, since there would be no groundwater increases associated with the proposed project, potential effects relating to lake level increases are not discussed in the approach to analysis or impact analysis.

As described in Section 5.16, Hydrology and Water Quality, Lake Merced water sources are primarily precipitation, limited local runoff, and groundwater inflow. Lake Merced water levels have fluctuated widely over time in response to climatic conditions, water discharges, and regional and local groundwater pumping. Surface water level (hydrologic) modeling conducted in support of this EIR (Kennedy/Jenks, 2012), as well as the related biological resources impacts analysis, relied on historical data to project estimated water levels over a future 47-year period under several scenarios, including estimated conditions expected to exist in the future without operation of the proposed project (referred to throughout this EIR as "modeled existing conditions"), estimated conditions expected to exist in the future with operation of the proposed project (or, "project conditions"), and a cumulative scenario. The cumulative scenario takes into account the effects of other reasonably forseeable projects that, should they be implemented, would play a role in influencing Lake Merced water levels (see Section 5.1.5, Overview of Modeling Approach, for further details on the modeling).

The following subsections describe the significance thresholds applicable to the biological resources of Lake Merced (described in Section 5.14.1, Setting), the approach to analysis for determining the effect of water level changes on those resources, and the results of the lake-level modeling conducted for the proposed project. This section is followed by the analysis of impacts on the biological resources of Lake Merced.

Pine Lake, which is discussed in Section 5.16, Hydrology and Water Quality, is not addressed in this section since project operations would have no effect on biological resources at Pine Lake. No facilities would be built at Pine Lake and as discussed in greater detail in Section 5.16, Hydrology and Water Quality, existing lake level augmentation would continue and be increased, if necessary, to maintain the existing lake level. Therefore, no impacts to biological resources at Pine Lake are expected.

Significance Thresholds

In large part, the annual average water level of lake systems drives the elevational distribution of upland, wetland, and aquatic plant species around lakes and other water bodies, such as Lake Merced, primarily due to variations in adaptation to, and tolerance of, inundation. Seasonal timing, duration, water depth, and frequency of inundation are all critical factors in determining which species would persist in a given area.

A decrease in water levels could leave portions of existing wetland habitats at elevations too high relative to the annual average water level for time periods too long to allow the wetlands to persist. These wetlands would then be expected to convert to upland vegetation types. Depending on how quickly and to what degree water levels recede, some existing wetlands would persist, although their species composition could change due to the altered pattern (i.e., duration and depth) of inundation. For example, bulrush is found at depths up to 5 feet below the annual average water surface elevation, and herbacous wetlands are found up to 2 feet below and 1 foot above the annual average water surface elevation. If water levels were to recede by 4 feet, all existing herbaceous wetlands would be lost but some bulrush would persist. All existing willow riparian scrub would be expected to persist and also to expand into areas downslope that remain above the new annual water surface elevation. New herbaceous and bulrush wetlands would then also establish within the new, lower annual fluctuation zone at elevations that are currently open water. Upland vegetation types would not be affected by receding water levels, given that their distribution is not tied to water elevation.

Under receding water levels, much of the land surface that becomes available for vegetation to occupy (with the exception of existing bulrush patches) would be newly exposed, unvegetated sediments of the former lake bottom. Therefore, some upland types (such as non-native herbaceous and non-native and perennial grassland) are expected to move downslope rapidly if water levels drop substantially for even relatively short periods (one to several months depending on the time of year), given that receding water levels would result in the exposure of unvegetated sediment suitable for colonization by upland species at elevations of more than one foot above the new annual average water surface elevation. Woody upland vegetation would move downslope at a slower rate and would therefore require longer periods of consistent lower water levels (several years) in order to establish.

The following describes the impact thresholds utilized in this EIR to assess the potential for impacts on the biological resources of Lake Merced to result from water level changes caused by the proposed project (for the resources described in Section 5.14.1, Setting).

Adverse Effects on Special-Status Wildlife

As the only remaining large coastal lake and wetland between Pescadero to the south and Point Reyes to the north, Lake Merced provides valuable wildlife habitat, especially for birds. Many of these are special-status or otherwise protected water birds, which are discussed below relative to their nesting habitat. In addition, large eucalyptus along North and South Lake support rookeries for double-crested cormorant and great blue heron, and red-shouldered and red-tailed hawks nest in large trees around the lake (SFRPD, 2006). This issue is discussed in detail below, under the subsection for adverse effects on wildlife nursery sites. Other special-status birds, such as

Wilson's warbler, green backed heron, and black-crowned night heron nest in willow scrub around the lakes (SFRPD, 2006; Murphy, 1999). Impacts on willow scrub are discussed further below under the subsection for adverse effects on wetlands. Still other species protected under the California Fish and Game Code, such as California towhee and Bewick's wren, nest in coastal scrub, which may also be lost in small amounts as discussed below in the next subsection.

Several special-status bird species are known to nest or have potential to nest at or near the water line at Lake Merced, including Clark's and pied-bill grebes, sora, and Virginia rail (SFPRD, 2006). Additional species protected under the MBTA and the California Fish and Game Code, Section 3503, that nest in emergent vegetation at or near the water's edge include marsh wren, ruddy duck, mallard (Murphy, 1999), and the California species of special concern, San Francisco common yellowthroat (Gardali and Evens, 2008). Loss of emergent wetland breeding habitat for these species is discussed below under the subsection for adverse effects on wetlands. Decreases in lake levels could result in stranding of floating nests, such as those constructed by Clark's grebes. Research has shown that marsh birds are sensitive to fluctuations in water levels, especially rapid fluctuations. Thus, direct impacts on birds nesting at or near the water line would begin to occur with even seemingly minor fluctuations in lake levels during the breeding season. For example, Virginia rail and sora nest up to 6 inches above the water surface (Desgranges, et al., 2006). Marsh wren typically nest 2 or more feet above the water line and Clark's grebes have been documented as abandoning their nests after a 16-inch reduction in water levels occurred over three weeks (Riensche et al., 2009); therefore these species are expected to be sensitive to water surface level fluctuations during the breeding season.

Virginia rail (Desgranges, et al., 2006) and sora (Erlich et al., 1988) nesting success would appear to be highly sensitive to water fluctuations, and these can therefore be utilized as indicator species to determine significance thresholds. An examination of the typical nest height above water for each of these species combined with their egg incubation period of approximately 2.5 weeks[20] (Erlich et al., 1988) suggests that a decrease in water level of 0.5 feet over a 2.5-week period during the nesting season would impact the reproductive success of birds nesting near the water line. Therefore, project-caused water level decreases of 0.5 feet or more over a 2.5-week period in any single nesting season (conservatively March 1 through August 15) would be considered to result in a significant impact on nesting birds.

Other special-status species documented at Lake Merced include western pond turtle sightings in East Lake and a California red-legged frog sighting in Impound Lake in 2000 (SFRPD, 2006). However, California red-legged frog has not been observed since a single sighting in 2000 and prior to that had not been observed since the 1970's (SFPUC, 2011). Therefore, based on the lack of sightings, negative protocol-survey results from 2000, and the presence of predacious bullfrogs and largemouth bass, red-legged frog were considered extirpated from Lake Merced (SFRPD, 2006; San Francisco Planning Department, 2011; SFPUC, 2011) and, with no evidence to the contrary, are presumed extirpated for the purposes of this analysis.

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[20] Nests that are not yet supporting eggs can be rebuilt, and chicks of all the species in question are precocial, meaning they are capable of a high degree of independent activity immediately after hatching and can leave the nest and be relocated by their mother in response to fluctuations in water level.

It is presumed that western pond turtle are still present in East Lake, although the presence of red-eared sliders and bullfrogs was considered a threat to the population over 5 years ago (SFRPD, 2006) and they may have been extirpated since that time. It is unknown whether suitable western pond turtle nesting habitat is present at Lake Merced, but typical nesting habitat requirements of the species include dry sandy to hard soils on low gradient slopes with low, sparse vegetation (Jones and Stokes, 2004). However, water surface elevation decreases, whether gradual or by several feet in less than a year, would not impact nesting pond turtles, if present, as their nests would remain above water. Therefore, the potential for impacts on nesting pond turtles are not considered further in this analysis.

Adverse Effects on Rare Plants and Sensitive Communities

Rare plants and Sensitive Communities. There are four special-status plant species documented recently at Lake Merced (May & Associates, 2009; Nomad Ecology, 2011): San Francisco spine-flower, San Francisco wallflower, blue coast gilia, and dune tansy. In addition, there are seven plant species of local concern that occur at Lake Merced (May & Associates, 2009; Nomad Ecology, 2011): California pipevine, Wight's paintbrush, Vancouver rye, wild cucumber, canyon live oak, coastal black gooseberry, and thimbleberry. See Figure 5.14-3 in the Setting section for locations of rare plants and sensitive plant communities.

None of these eleven species are federally or State listed, three are listed by CNPS, and the rest are listed by CNPS as locally rare and significant in the City and County of San Francisco. Normally, only federal, State, and CNPS List 1 and 2 species are considered under CEQA. However, all eleven species noted occur in coastal dune scrub and coastal scrub habitat types, further described below, which have been severely reduced from their original extent within the City and County of San Francisco.

The following have been identified as sensitive vegetation and habitat types at Lake Merced: Central dune, thimbleberry, wax myrtle, and canyon live oak scrubs, Vancouver rye grassland (perennial grassland), fish-related habitat, wetlands (including arroyo willow riparian scrub), and blue gum eucalyptus forest. Arroyo willow riparian scrub is discussed below under wetlands, and eucalyptus forest is discussed below under wildlife nursery sites.

Because special-status plants and their habitat are locally rare and thus at high risk of local extinction, impacts on rare plant habitat at Lake Merced would be considered significant under CEQA. All of these plant species occur outside the Lake Merced watershed and most are more common elsewhere throughout their range, and extirpation of a local population would not pose a risk to the overall survival of the species. Given this context, some habitat loss could be acceptable and result in a less than significant impact under CEQA. However, due to the general lack of local habitat, even small losses of habitat should be considered substantial on the local level. These plant habitats are not affected by lake level declines because their distribution is not tied to lake elevations, other than the fact that they cannot persist at elevations where they are inundated regularly. In fact, these vegetation types may increase over time with lake level declines as newly exposed areas become available for colonization by species intolerant of inundation. Therefore, impacts on Central dune, thimbleberry, wax myrtle, and canyon live oak scrubs, and Vancouver rye grassland (perennial grassland), as well as the special-status plants within those habitats, are not considered further in this analysis.

Fisheries and fish habitat. The open waters and emergent wetlands of Lake Merced provide aquatic habitat, cover, and foraging habitat for a variety of native and non-native fish. Twenty-seven species have been collected there over the years, 18 of which are native species. Tidewater goby, a federally endangered species, is known to have occurred historically (1894) but is now presumed extirpated (CDFG, 2011). Several other species, including starry flounder, staghorn sculpin, and topsmelt, may have been present at least intermittently when Lake Merced was hydrologically connected to the ocean. At least 11 species have been introduced to the lake since 1893, and the most abundant species in recent studies (Lake Merced Task Force, 2007) were introduced largemouth bass and Sacramento blackfish. There is no spawning habitat for rainbow trout, so this species must be stocked in order to maintain a fishery and stocked adults persist in the lake for only a short time. Native fishes with currently self-sustaining populations at Lake Merced include: tule perch, prickly sculpin, Sacramento blackfish, and threespine stickleback. Non-native fishes with self-sustaining populations include largemouth bass, common carp, and goldfish (Lake Merced Task Force, 2007). There currently are no special-status fish species found in Lake Merced.

In 2004, the SFPUC retained EDAW (a San Francisco-based environmental consulting firm that has since merged with AECOM) to assess the effect of water level rise on Lake Merced fisheries and anticipated that the greatest potential effect would come from reductions in littoral habitat (defined as areas with 3 feet or less of water around the lake perimeters) with rising lake levels.[21] However, it was predicted that most of the loss would be in Impound Lake and much of this loss has likely already occurred. Average lake levels have risen to nearly 6 feet City Datum and EDAW's 2004 models predicted that over 85 percent of littoral habitat would be lost at elevations of six feet or more. Decreases in littoral area were expected to impact warmwater species. But the EDAW study found that littoral area was already a very small component of the overall lake habitat, and that since there were other factors more likely to control warmwater species (i.e., temperature, cover, and water clarity) this change was expected to have minimal impacts on warmwater fish population abundance, growth rates, or ability to reproduce. Water level decreases could result in increases of littoral habitat, at least to begin with, by regaining habitat lost when lake levels rose from the EDAW study baseline of 0.5 feet City Datum, and eventually, reductions in coldwater habitat through rising water temperatures, which could increase warmwater and reduce coldwater fish populations, respectively. Coldwater fish at Lake Merced are trout, which are not self-sustaining and are regularly stocked, and prickly sculpin, which as of 2007 appeared to be self sustaining (LMTF, 2007). The remaining fish are warmwater species.

As described above, there are no special-status fish in Lake Merced, and the species most important for recreational purposes are regularly stocked; however, if decreased water levels were to cause fish populations to drop below levels needed to sustain the local bird populations

[21] ESA, the EIR consultant to the Planning Department for the proposed project, has reviewed the EDAW study and has found its methodology and conclusions to be adequately supported by the information presented therein.

that rely upon them—which include special-status and otherwise protected birds—the impact could potentially be significant. Population numbers for fish-eating birds as well as fish at Lake Merced are presently unknown. The Lake Merced Task Force Fish Community Study (2007) noted that cormorants were not documented as nesting at Lake Merced prior to 1997 and that nest numbers increased from 18 in 1997 to around 200 in 2004. In 2007, 11 great blue heron and 319 double-crested cormorant nests were documented at Lake Merced, and their increase in numbers may be attributable to lake level rises over low levels seen in the 1970's through the 1990's and consequent improvements in habitat (GGAS, 2007). This conclusion would be speculative though, since no definitive studies have been conducted on fish population numbers or the foraging habits of fish-eating birds at Lake Merced. Nesting cormorants have been documented as flying to and from the ocean to forage while nesting at Lake Merced, which suggests that they, and presumably other fish-eating birds present at Lake Merced, do not depend exclusively on the fish available in Lake Merced (LMTF, 2007). As noted above, the health of Lake Merced's fisheries is closely tied to availability of littoral habitat, and water quality also plays an important role. These factors are likely the main drivers of fish abundance in Lake Merced and can be tied to the lake's beneficial uses.

The San Francisco Regional Water Quality Control Board defines several fish-related beneficial uses for Lake Merced: cold freshwater habitat, warm freshwater habitat, and fish spawning. A substantial degradation or loss of these beneficial uses, for example through significant changes in water temperature, loss of littoral habitat, or reduction in dissolved oxygen, would be considered significant. The 2004 EDAW report prepared for the SFPUC assessed potential impacts on beneficial uses in relation to lake level rise up to 8 feet City Datum and water inputs from various potential sources and found that no effect on beneficial uses was expected. Similarly, as noted in Section 5.16, Hydrology and Water Quality, no significant correlation was found between lake levels and water quality in recent years, when lake levels were rising or stable. However, as discussed in greater detail in Section 5.16, Hydrology and Water Quality, lake levels below 0 feet City Datum could result in adverse impacts on water quality through a variety of mechanisms, such as increased sedimentation due to erosion of exposed sediments or reductions in dissolved oxygen due to increased algal growth and eutrophication. These impacts could have a substantial adverse effect on Lake Merced's beneficial uses related to fish habitat and, therefore, fish populations and, indirectly, fish-eating bird populations, which, depending on the magnitude, duration, and frequency of the effect, could potentially be a significant impact.

Adverse Effects on Wetlands

As the only remaining large coastal lake and wetland between Pescadero to the south and Point Reyes to the north, Lake Merced provides valuable wildlife habitat, especially for birds. The lake's wetlands and willow riparian scrub provide wintering habitat for thousands of birds, resting and foraging habitat for fall and spring migrants, and are used as breeding and feeding habitat for nearly 50 species. The lake's wetlands also provide cover, foraging habitat, and nursery sites for warmwater fish as well as cover and foraging habitat for western pond turtle. Impacts on wetlands resulting from changing water levels could include direct wetland losses. Indirect effects due to water quality degradation at low water surface elevations are not expected to significantly affect wetland vegetation since healthy wetland vegetation has been maintained in the past at lower water levels. For example, the extent of bulrush wetlands was greater in 1996 (SFRPD, 2006) and 2002 (Nomad Ecology, 2011), with a mean water surface elevation of 0.5 feet City Datum, than it is today.

The slopes surrounding Lake Merced currently support approximately 27 acres of willow riparian scrub (see **Table 5.14-5**). Since most of the willow scrub habitat at Lake Merced would also be considered jurisdictional (whether as wetlands or riparian habitat) by CDFW and RWQCB, impacts on willow scrub are considered as part of the wetlands impact. This vegetation community is common throughout central and coastal California and as such is not always considered a sensitive natural community. However, willow scrub at Lake Merced provides high quality riparian habitat for a variety of special-status and common birds and is therefore considered sensitive by CDFW and RWQCB. In addition, the CCC often considers willow scrub as an Environmentally Significant Habitat Area, whether or not it also has wetland status, and, in accordance with Section 30240 of the Public Resources Code, generally prohibits development within Environmentally Significant Habitat Areas and requires that development in areas adjacent to these areas be sited and designed to prevent impacts which would significantly degrade the areas, and to be compatible with the continuance of those habitat areas (see Section 5.14.2, Regulatory Framework).

Because wetlands at Lake Merced would likely be considered jurisdictional by the Corps and/or CDFW and RWQCB (see Section 5.14.2, Regulatory Framework), the federal and State no-net-loss policies described in the Regulatory Section would reasonably be applied to the proposed project when determining the significance of impacts on wetlands that may be caused by the project.

Adverse Effects on Wildlife Nursery Sites

Large eucalyptus along the shores of North and South Lakes support several double crested cormorant and great blue heron rookeries, and red-shouldered and red-tailed hawks nest in large trees (eucalyptus, Monterey cypress, and pines) around all of the lakes (SFRPD, 2006). Although red-shouldered and red-tailed hawks nest in parks throughout the City, heron rookeries are found only at Lake Merced and Stow Lake, with one small colony reported at the Palace of Fine Arts that may have since been extirpated (Kelly et al., 2006). In May, 2012, several rookery trees were located in the same general areas as previously mapped (SFRPD, 2006) and most were approximately 1 to 5 feet above the water surface elevation, which was at or near its seasonally highest level of approximately 6.5 to 7 feet City Datum. Results of the 2012 vegetation mapping update, described below, show that there are a total of 50.5 acres of non-native forest around Lake Merced, including nearly 18 acres of eucalyptus. As noted above, red-tailed and red-shouldered hawks nest in parks, open space, and some residential areas throughout the City and County of San Francisco (SFFO, 2003) and, therefore, with relatively abundant nesting substrate available to raptors elsewhere, the loss of non-native forest at Lake Merced would not be considered significant for raptors.

Rookery trees typically die over time due to bird use and buildup of 'whitewash' on their branches. When a tree dies completely, the birds typically move their nests to an adjacent tree (USFWS, 2011b) so the death of individual trees in and of itself is not considered significant. However, the distance from disturbance is typically important for nesting herons, and a buffer of at least 300 feet is recommended (VFWD, 2002). The rookery trees on North and South Lakes are about 80 feet and 200 feet, respectively, from busy roadways and a well-used trail. The third rookery, on East Lake, is more isolated and less prone to disturbance. Lake level reductions are not expected to impact rookery trees since wetlands would 'migrate' downslope along with gradually falling water levels and the trees would still be proximate to wetland and open water foraging habitat. Therefore, impacts on wildlife nursery sites are not considered further in this analysis.

Estimating Vegetation Response to Changes in Lake Levels

In order to determine whether project-related impacts on biological resources could reach the thresholds defined above, vegetation responses to changes in lake levels were assessed. In support of this EIR analysis, and building on the prior studies that are summarized in Section 5.14.1, Setting, Environmental Science Associates updated a geographic information system-based (GIS-based) vegetation map created by Nomad Ecology in 2011. Using the computer program ArcGIS, Environmental Science Associates overlaid the 2010 vegetation data on high resolution 2010 aerial photographs and then compared the resulting imagery with existing conditions in the field. **Table 5.14-5** presents the results of the vegetation mapping update, along with results from 2002 and 2010 for comparative purposes (see Figure 5.14-1 in Section 5.14.1, Setting, for the Lake Merced vegetation map).

TABLE 5.14-5
LAKE MERCED VEGETATION ACREAGE: 2002, 2010, AND 2012

Vegetation Community and Cover Type	2002[a] vegetation (acres)	2010[a] vegetation (acres)	2012[a] vegetation (acres)	Acreage change 2002–2012
Annual Grassland	7.11	1.24	1.26	-5.85
Perennial Grassland	0.49	0.01	0.01	0.48
Non-native Herbaceous	17.18	12.52	11.76	-5.42
Coastal Scrub	13.48	14.82	14.78	+1.30
Dune Scrub	0.00	3.32	3.30	+3.30
Non-native Scrub	0.86	0.29	0.23	-0.63
Coast Live Oak Woodland	0.13	0.58	0.54	+0.41
Non-native Forest	63.32	50.49	50.51	-12.81
Developed	188.82	197.81	198.44	+9.62
Arroyo Willow Riparian Scrub	28.33	26.11	26.78	-1.55
Giant Vetch Wetland	1.13	0.29	0.25	-0.88
Rush Meadow	0.71	0.20	0.32	-0.39
Swamp Knotweed Wetland	6.93	8.97	6.42	-0.51
Cattail Wetland	0.03	0.01	0.01	-0.02
Bulrush Wetland	35.14	21.10	28.16	-6.98
Open Water	244.94	269.91	264.69	+19.75

[a] The mean annual average water surface elevation was 1 foot City Datum in 2002 and was 5.9 feet City Datum in 2010. Water surface elevation survey equipment were offline between ___ 2011 and ___ 2012 due to construction activities at the Lake Merced Pump Station. The annual average water surface elevation for 2012 is unknown as a result.

SOURCES: Nomad Ecology, 2011; Environmental Science Associates, 2012.

A GIS-based analysis was then conducted to estimate vegetation response to changes in lake levels over time using the newly updated vegetation data, topography, bathymetry, slope, and output from the hydrologic modeling (Kennedy/Jenks, 2012) to dictate how vegetation would respond. For the purpose of the vegetation change analysis, the initial estimates of existing vegetation acreages were considered to be the acreages that would occur at an annual average water surface elevation of 6 feet City Datum. This water level is slightly higher than the baseline water surface elevation of 5.7 feet used for the hydrologic modeling, but was necessary in order to correspond to the topographic data, which were created at 1-foot elevation intervals. The 2012 vegetation mapping update was based on an aerial photograph from April 2011; at that time, according to historical water surface elevation data (SFPUC, 2011), Lake Merced's water surface elevation was at about 7 feet City Datum. The acreages given for the 6-foot water surface elevation were obtained by running a GIS-based receding water level analysis on the 2012 vegetation data. In addition, the analysis only examined vegetation at or below 13 feet City Datum, which is the existing spillway height and thus the maximum possible lake level at which vegetation changes would be expected due to changes in water level. Therefore, upland vegetation types and arroyo willow riparian scrub acreage above the 13-foot elevation, as mapped in Figure 5.14-1, would remain unchanged (see **Appendix C**, Vegetation Change Analysis Methodology, for further details on the methodology used to analyze vegetation change in response to changing water surface elevations).

A statistical approach was used to estimate vegetation response to decreasing water levels where the majority of land that would become available for plants to establish as water levels decrease is currently inundated and free of vegetation (except for certain wetland species). Under receding water levels, much of the land surface that becomes available for vegetation to occupy (with the exception of existing bulrush patches) would be newly exposed, unvegetated sediments of the former lake bottom. The GIS-based analysis is best able to predict vegetation types near the waterline (i.e., bulrush, knotweed, and willow) because these vegetation types have predictable distribution patterns relative to water surface elevation, as well as timing and duration of inundation. However, this analysis also acknowledges the uncertainty with respect to the patterns of upland vegetation establishment on newly exposed terrain. Early phases of vegetation establishment are characterized by a patchy distribution of plants that lack organization into recognizable, or easily mapped, plant communities, and may be dominated by weedy and non-native species for years before native plants and communities take hold. For this reason, the GIS-based analysis does not attempt to predict changes under receding water levels for specific upland vegetation types, but instead consolidates them into a single category. For this approach, Environmental Science Associates analyzed the proportions of vegetation at each elevation contour relative to the current water level and applied the statistics to lower water levels. This approach maintains an equal vegetation distribution for each elevation range relative to the water level, but due to differences in area driven by topography, the vegetation area totals change at each decreasing water level. For example, if the contour range of 0 to 1 foot is currently inhabited by 60 percent bulrush wetland and 40 percent knotweed wetland, those proportions would be assigned to the -1 to 0 foot contour range when modeling a water surface decrease of 1 foot. In other words, the decreasing water level GIS-based analysis assumes that the same basic mix of species and percentages of each vegetation type that exist currently (in 2012) are maintained on the newly exposed ground as water levels recede.

Lake-level data provide direct insight into the likelihood of impacts on riparian communities and wetlands and are represented in the hydrologic model (Kennedy/Jenks, 2012) by the following summary statistics: project performance summary (percentage of time at a given level), and lake-level continuity (number of consecutive months at a given level). In other words, an examination of the percentage of time the lake levels were modeled to be at a given elevation combined with the length of time the lake level was modeled to stay at that elevation provided information on whether or not there could be a net loss under each modeled hydrologic scenario.

Several assumptions were made in the vegetation change analysis:

- The water surface elevations used represent the annual average water surface elevation. Lake Merced water levels vary seasonally due to hydrologic and climatic conditions; therefore, an annual average range in water surface elevation from about 1 foot above and below the mean is assumed, based on the Kennedy/Jenks (2012) hydrologic modeling, which predicts a 1.6-foot annual average range in lake levels over the 47-year model period for the modeled existing conditions scenario. So, for example, an elevation of 6 feet City Datum actually represents a range in water surface elevation between 5 and 7 feet City Datum.

- The acreages given for each vegetation type at each annual average water surface elevation assume that the water level has been at that particular elevation for a long enough period of time for the changes predicted by the action rules, which incorporate a temporal element based on the tolerances of each general vegetation type, to have taken place. For example, wetlands are predicted to establish in areas inundated for more than one month's time; however, the different wetland types are expected to become fully established over periods of time ranging from several months (herbaceous wetlands) to several years (willow riparian scrub).

- The acreages estimated by the GIS-based analysis represent the vegetation that would establish if the mean water surface elevation remained at or near the same level for durations long enough for the various wetland types to establish. The analysis is consistent with the fluctuations depicted in the Lake-level Model hydrographs (Kennedy/Jenks, 2012) in that the predicted rate of change associated with groundwater pumping under the project would be generally slow and water surface elevations remain relatively consistent for relatively long periods of time.

The impact analysis sections that follow include the results of the GIS-based analysis of vegetation and habitat changes resulting from water level changes described above; determine the project's contribution to biological resources impacts; and determine whether the project-related impact would be significant according to the thresholds described above.

Estimated Lake Level Changes

Modeled Existing Conditions

The modeled existing conditions represent a modeled estimation of hydrologic conditions that are expected to occur over the 47-year modeling period without construction and operation of the proposed project, based upon historical hydrologic conditions. Under the modeled existing conditions, modeled water levels clearly respond to modeled climatic variations, including wet, normal, and dry precipitation years. The same hydrologic sequencing is used for each model scenario. See Section 5.1.5, Overview of Groundwater Modeling Approach, for further details on the hydrologic modeling. The modeled mean monthly lake level for the modeled existing conditions is 6.3 feet City Datum. Maximum lake levels over the model period are predicted to be 12.4 feet. Minimum water surface elevations could reach as low as -0.8 feet City Datum (Kennedy/Jenks, 2012).

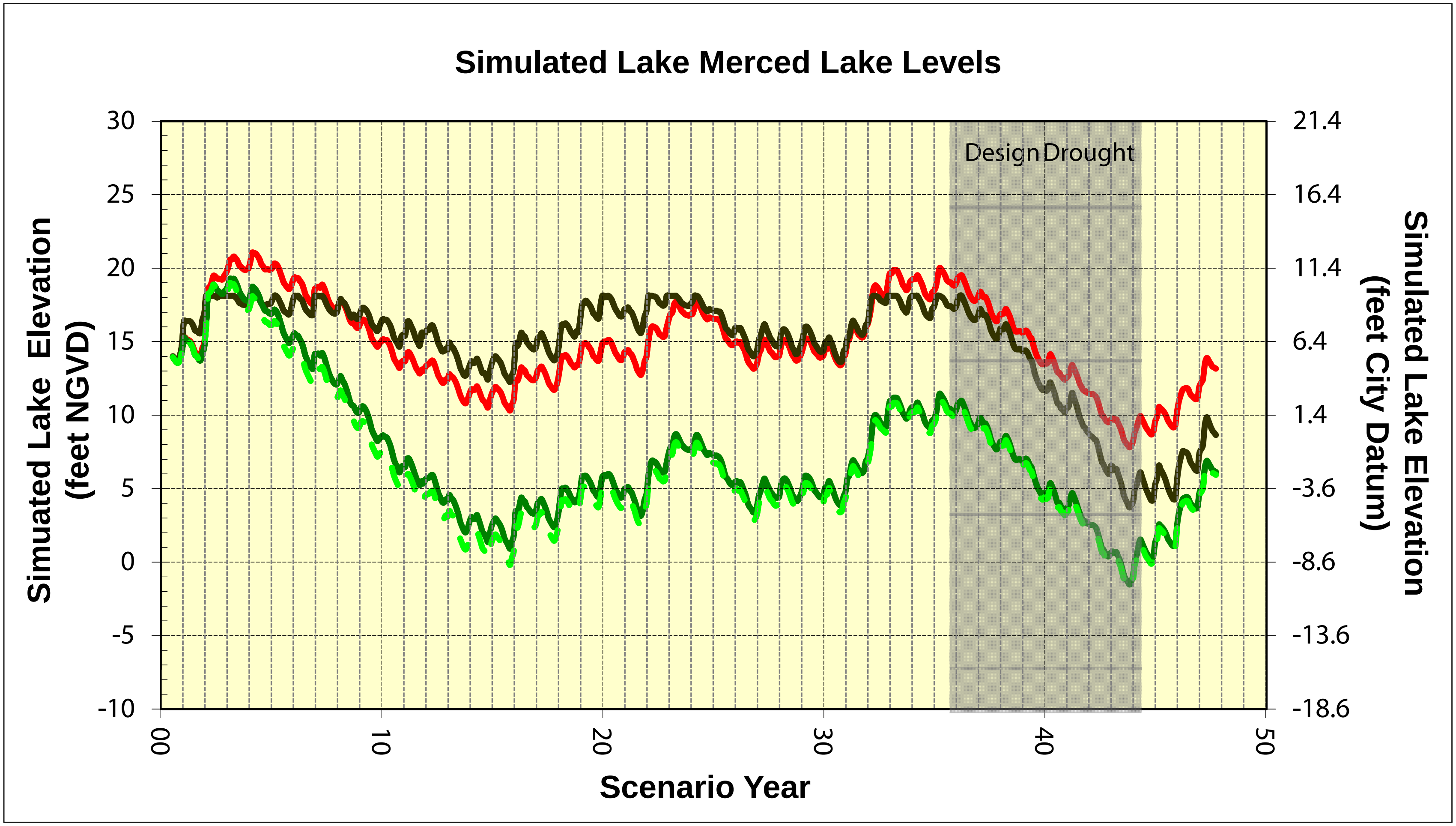
While the lake-level model scenarios are based on historical records, the various hydrologic conditions would not necessarily happen in the same sequence as modeled, although it is assumed for the purpose of the lake-level model and for this analysis that they would occur at some point during a similar future time period. The modeled existing conditions (see **Figure 5.14-4**) show an initial sharp increase in lake levels from 5.7 feet City Datum to over 12 feet City Datum, responding to a period of above-average precipitation in model years 1 to 4. Years 4 through 16 show a steady decline in modeled lake levels during a relatively dry period to about 1.5 feet City Datum. Between years 16 and 36, modeled lake levels fluctuate in response to relatively normal climatic conditions and show an increasing trend through the period, rising again to about 11 feet City Datum. Years 36 to 44 simulate a "design drought" period (see Section 5.1.5, Overview of Modeling Approach for a discussion on the design drought) more severe than any observed historical drought, and modeled lake levels decline over this eight-year period to a low of -0.8 feet City Datum. In the 3 years following the drought, modeled lake levels recover to about 5 feet City Datum.

Predicted Lake Levels Under the Proposed Project Relative to Modeled Existing Conditions

For the purposes of this EIR, changes in water surface elevation modeled for the Groundwater Supply Project are compared to changes predicted under the modeled existing conditions, to determine whether the potential effects of varying lake levels on biological resources due to the proposed project would be significant when compared to modeled existing conditions.

As with modeled water levels under the modeled existing conditions, modeled water levels under the proposed project also respond to modeled climatic variations in the same hydrologic sequence. Two model scenarios were produced for the proposed project, each assuming different amounts of pumping (see Figure 5.14-4 and Section 5.1.5, Overview of Groundwater Modeling Approach). The modeled mean monthly lake level for Phase 1 of the project would be -1.3 feet City Datum, a decrease of 7.6 feet from the mean water surface elevation under modeled existing conditions. The modeled annual average range between the maximum and minimum lake levels would be 1.8 feet (Kennedy/Jenks, 2012). The maximum lake level over the model period is predicted to be 10.7 feet City Datum. The minimum level could reach as low as -10.1 feet City Datum (Kennedy/Jenks, 2012).

The modeled mean monthly lake level for Phase 2 (which would be inclusive of both phases of the Project) would be -1.9 feet City Datum, a decrease of 8.2 feet from the modeled mean water surface elevation under modeled existing conditions. As with Phase 1, the modeled annual average range between the maximum and minimum lake levels would be 1.8 feet (Kennedy/Jenks, 2012). The maximum lake level over the model period is predicted to be 10.4 feet



Note: Zero elevation NGVD is equivalent to mean sea level. City Datum = NGVD - 8.62 feet.

Lake Levels:

Modeled Existing Conditions

SFGW, Phase I

SFGW, Phase 2

Cumulative

SOURCE: Kennedy/Jenks Consultants, 2012 d

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Figure 5.14-4

Simulated Lake Merced Lake Levels

City Datum, or 2 feet below the maximum level under the modeled existing conditions. The minimum lake level could reach as low as -10.4 feet City Datum, or 9.6 feet below the minimum level under modeled existing conditions (Kennedy/Jenks, 2012).

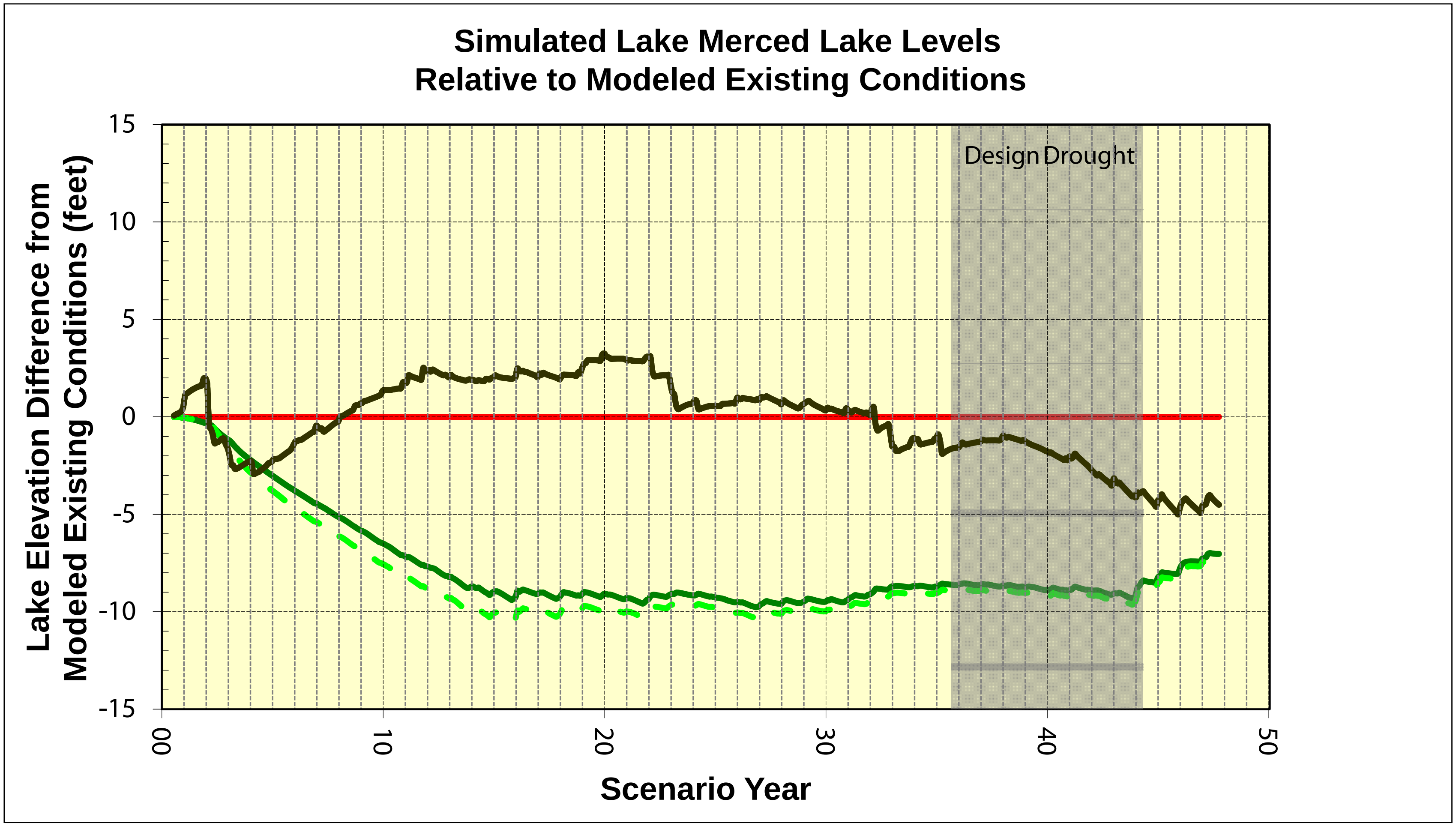
Because the changes in pumping would be minor, the response to groundwater levels and lake levels during each phase would be similar, and the phases are discussed together in this impact analysis.

Compared to water levels under the modeled existing conditions, the modeled water levels for the proposed project (see Figures 5.14-4 and **5.14-5**) show a similar initial sharp increase in lake levels (from 5.7 feet City Datum to over 10 feet City Datum), responding to a period of above-average precipitation in years 1 and 2. Years 3 through 15, however, show a steady decline in lake levels (to about -8 feet City Datum) in response to groundwater pumping under the proposed project. From years 15 through 44, modeled lake levels fluctuate in response to relatively normal climatic conditions and show an increasing trend through the period, rising again to about 3 feet City Datum. Years 36 to 44 simulate the design drought period, and modeled lake levels decline over this eight-year period to a low of about -10 feet City Datum. In the 3 years following the drought, modeled lake levels recover to about -2 feet City Datum. So, while lake level rise and fall can generally be expected to parallel modeled existing conditions, water surface elevations as a result of the project are predicted to be 7 to 10 feet lower than under modeled existing conditions throughout much of the model period.

Impact BI-5: Operation of the proposed project would not adversely affect species identified as a candidate, sensitive, or special-status wildlife species in local or regional plans, policies, or regulations, or by the CDFW or USFWS. (Less than Significant)

For special-status nesting birds, project-related water surface elevation decreases of 0.5 feet or more over a 2.5-week period in any single nesting season (conservatively March 1 through August 15) would be considered by this analysis to result in a significant impact on the reproductive success of special-status nesting birds. If water level decreases were to occur rapidly, nests could be stranded, resulting in the loss of nests and eggs and thus adversely affecting productivity.

Attachment 10.2-A to Technical Memorandum 10.2, *Assessment of Groundwater-Surface Water Interactions for the Regional Groundwater Storage and Recovery Project and San Francisco Groundwater Supply Project* (Kennedy/Jenks, 2012), provides a summary of estimates generated by the Lake Merced Lake-Level Model for the modeled existing conditions, as well as the proposed project. The Monthly Lake Level Change Summary provided therein predicts that under modeled existing conditions the maximum modeled monthly lake level decrease could be up to 0.48 feet. The maximum lake level change resulting from modeled existing conditions would occur during dryer/warmer periods when inflow to the lake (primarily precipitation) is low and evaporation is higher. Given the overall size and depth of the lake, it is unlikely that evaporation and reduced lake inflow would result in the predicted 0.48 feet lake level decrease occurring within a 2.5-week period.



Lake Levels:

- Modeled Existing Conditions
- SFGW, Phase I
- SFGW, Phase 2
- Cumulative

SOURCE: Kennedy/Jenks Consultants, 2012d

Figure 5.14-5
Simulated Lake Merced Lake Levels
Relative to Modeled Existing Conditions

The Monthly Lake Level Change Summary predicts that the project would result in a maximum modeled monthly lake level decrease of 0.04 feet. The lake level change resulting from project pumping would not occur all at once but in a consistent fashion over the period of a month. Thus, it is expected that the maximum lake level change that could occur as a result of the project would be approximately 0.025 feet over a 2.5-week period. Therefore, relative to the significance threshold, project-related water surface elevation decreases of 0.5 feet or more over a 2.5-week period in any single nesting season would not occur and the project would not have a significant impact on the reproductive success of special-status birds nesting at or near the water line and no mitigation is required.

Mitigation: None required.

Impact BI-6: Operation of the proposed project would potentially adversely affect sensitive habitat types associated with Lake Merced. (Less than Significant with Mitigation)

Decreasing water levels could substantially reduce aquatic habitat and degrade water quality, thereby negatively affecting fish populations through impacts on fish habitat-related beneficial uses, which could be significant. As noted in Section 5.16, Hydrology and Water Quality, water level decreases below 0 feet City Datum, which is predicted to occur under modeled existing conditions, could result in decreases in water quality with resulting adverse effects on fish-related beneficial uses.

Under the modeled existing conditions, lake levels are predicted to drop as low as -0.8 feet City Datum. At 5 feet City Datum, all of the individual lakes are hydraulically connected, and below this water level, reduced hydraulic connection would eliminate water exchanges between these water bodies. Lake volume would decrease and thus lake temperatures and eutrophication would be expected to increase, as would periods of low dissolved oxygen. These factors could combine to lower water quality, thereby affecting beneficial uses related to fish habitat, as described previously in the discussion on the significance thresholds for fisheries and fish habitat in the Approach to Analysis section.

As shown on Figure 5.14-5, the proposed project is predicted to result in water levels that are approximately 7 to 10 feet lower than levels expected under the modeled existing conditions for most of the modeled time period. During drought periods, water levels expected as a result of operating the project are predicted to fall as low as -10.4 feet City Datum, or 9.6 feet lower than the predicted minimum under the modeled existing conditions. This could mean a decrease in water quality, as compared to modeled existing conditions, that would be attributable to the project. However, **Mitigation Measure M-HY-9, Lake Level Management for Lake Merced** (see Section 5.16, Hydrology and Water Quality) requires the SFPUC to implement lake level management procedures to maintain Lake Merced at water levels similar to conditions that would likely occur without the project. Implementation of this mitigation measure would therefore also serve to mitigate potential significant impacts on the fish habitat-related beneficial uses of Lake Merced, through management of water levels to avoid a significant project-related degradation of water quality.

Mitigation Measures

Mitigation Measure M-HY-9: Lake Level Management for Lake Merced. (see Section 5.16, Hydrology and Water Quality, for description)

Impact BI-7: Operation of the proposed project would adversely affect wetland habitats and other waters of the United States associated with Lake Merced. (Less than Significant with Mitigation)

In order to determine the proposed project effect on wetlands, simulated Lake Merced lake levels under the project and cumulative scenarios were compared to the results of the modeled existing conditions scenario (Kennedy/Jenks, 2012) to assess whether wetland impacts would occur.

Wetland extent at Lake Merced is determined primarily by water levels and topography and has moved up slope with the water levels over time (Stillwater, 2009; Nomad Ecology, 2011). As seen in **Table 5.14-6** there are five distinct freshwater marsh and seasonal wetland types at Lake Merced and the wetlands vegetation type is one of the most widespread around the lake, although overall wetland acreage has decreased since 2002 as annual average lake levels have risen. As noted above, willow riparian scrub has also decreased in acreage since 2002. As lake levels rise and fall, emergent wetlands are expected to follow closely, as is willow riparian scrub, although relative proportions of the various wetland types are expected to change as they move upslope and downslope, depending on topography and adjacent plant communities. Since this basic pattern has been observed and is borne out in the GIS-based vegetation change analysis, it is predicted to occur over the time period modeled for the various scenarios under consideration in this EIR.

The predicted vegetation response to declining water levels would differ depending on the water level without the project for a given period, which changes annually due to natural hydrological variation that would remain independent of project operation. Additionally, the amount of shoreline available for wetland establishment at a given water surface elevation differs according to the topography of the lakeshore, which generally is steeper at higher elevations and flatter at lower elevations. The GIS-based analysis predicted vegetation changes for decreasing water levels compared to each one-foot unit of potential water level change, as shown in Appendix C. As an example of the predicted vegetation changes for decreasing water levels compared to a 6-foot water surface elevation without the project, Table 5.14-6 summarizes predicted vegetation changes for decreasing water levels compared to this 6-foot water surface elevation without the project.

Under the example where the water surface elevation without the project is 6 feet City Datum, the vegetation change analysis predicts loss of bulrush wetlands at water surface elevations lower than 6 feet City Datum, and continuing down to approximately -5 feet City Datum. This is due primarily to topography as areas of low gradient topography allow for areas of greater wetland

TABLE 5.14-6
PREDICTED VEGETATION CHANGE AND PERCENT CHANGE RELATIVE TO A 6-FOOT CITY DATUM WATER SURFACE ELEVATION WITHOUT THE PROJECT: RECEDING WATER LEVELS[a]

Cover Type	Annual Average Water Surface Elevation (feet City Datum)																
	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6[b]
Arroyo Willow Riparian Scrub	**37.89**	**32.02**	**27.15**	**24.11**	**21.80**	**20.15**	**19.31**	**18.82**	**18.35**	**17.77**	**18.36**	**21.15**	**24.45**	**26.07**	**24.95**	**21.54**	17.03
Percent change[c]	122.5%	88.0%	59.4%	41.5%	28.0%	18.3%	13.4%	10.5%	7.7%	4.4%	7.8%	24.2%	43.6%	53.1%	46.5%	26.5%	--
Bulrush Wetland	**49.12**	**46.43**	**31.72**	**30.60**	**28.06**	*21.76*	*16.28*	*14.36*	*12.78*	*11.78*	*10.82*	*10.42*	*10.58*	*11.80*	*14.49*	*19.23*	25.05
Percent change	96.1%	85.4%	26.6%	22.2%	12.0%	-13.1%	-35.0%	-42.7%	-49.0%	-53.0%	-56.8%	-58.4%	-57.7%	-52.9%	-42.2%	-23.2%	
Giant Vetch Wetland	**0.38**	**0.33**	**0.27**	*0.20*	*0.17*	*0.17*	*0.17*	*0.17*	*0.17*	*0.16*	*0.20*	**0.29**	**0.38**	**0.43**	**0.42**	**0.35**	0.25
Percent change	52.3%	33.2%	7.2%	-19.6%	-29.5%	-31.1%	-31.7%	-32.3%	-32.9%	-33.6%	-20.7%	16.8%	54.9%	74.4%	70.2%	40.7%	--
Knotweed Wetland	***9.56***	*6.15*	*4.94*	*4.75*	*3.41*	*1.91*	*1.40*	*1.38*	*1.39*	*1.41*	*1.43*	*1.45*	*1.50*	*1.97*	*3.46*	*5.63*	7.02
Percent change	36.2%	-12.4%	-29.6%	-32.4%	-51.4%	-72.7%	-80.0%	-80.4%	-80.2%	-79.9%	-79.7%	-79.3%	-78.6%	-71.9%	-50.7%	-19.8%	--
Rush Meadow	**0.49**	**0.40**	*0.32*	*0.24*	*0.18*	*0.16*	*0.15*	*0.15*	*0.15*	*0.16*	*0.18*	*0.27*	*0.38*	**0.48**	**0.53**	**0.50**	0.40
Percent change	23.6%	0.7%	-19.3%	-39.3%	-55.2%	-60.1%	-61.5%	-61.4%	-61.3%	-61.1%	-54.4%	-33.0%	-3.8%	21.1%	31.6%	24.4%	--
Cattail Wetland	**0.01**	**0.01**	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.01*	**0.01**	**0.01**	**0.01**	**0.01**	0.01
Percent change	35.2%	5.0%	-28.4%	-52.5%	-60.8%	-60.4%	-59.9%	-59.4%	-58.9%	-58.4%	-50.4%	-15.3%	44.0%	87.1%	85.6%	47.2%	--
Total – Herbaceous Wetland	**59.54**	**53.31**	**37.24**	**35.79**	*31.83*	*24.01*	*18.01*	*16.05*	*14.49*	*13.51*	*12.63*	*12.43*	*12.85*	*14.68*	*18.89*	*25.70*	32.71
Percent change	82.0%	63.0%	13.9%	9.4%	-2.7%	-26.6%	-45.0%	-50.9%	-55.7%	-58.7%	-61.4%	-62.0%	-60.7%	-55.1%	-42.2%	-21.4%	--
Total Wetland (Riparian + Herbaceous)	**97.44**	**85.33**	**64.39**	**59.90**	**53.62**	*44.16*	*37.31*	*34.88*	*32.84*	*31.29*	*30.99*	*33.58*	*37.31*	*40.75*	*43.85*	*47.24*	49.74
Percent change	95.9%	71.5%	29.5%	20.4%	7.8%	-11.2%	-25.0%	-29.9%	-34.0%	-37.1%	-37.7%	-32.5%	-25.0%	-18.1%	-11.9%	-5.0%	--
Open Water	*128.78*	*149.87*	*176.77*	*185.61*	*196.09*	*208.97*	*218.34*	*223.08*	*227.45*	*231.36*	*235.23*	*238.76*	*242.17*	*245.57*	*249.14*	*252.35*	265.75
Percent change	-51.5%	-43.6%	-33.5%	-30.2%	-26.2%	-21.4%	-17.8%	-16.1%	-14.4%	-12.9%	-11.5%	-10.2%	-8.9%	-7.6%	-6.2%	-5.0%	--

[a] Acreages in the table are for vegetation at and below 13 feet City Datum
[b] Vegetation change is measured against a 6-foot (City Datum) annual average water surface elevation under conditions without the project.
[c] Percent change is relative to vegetation acreage at 6 feet City Datum.

NOTES:

Values in **bold** indicate an increase in cover type.
Values in *italic* indicate a decrease in cover type.

SOURCE: Environmental Science Associates establishment and, when topography steepens, wetland establishment is restricted by more rapidly increasing water depths. Then wetland acreage begins to increase again to above the estimated acreage without the project at some point between -5 and -6 feet City Datum and continues to increase to -10 feet City Datum. Below 6 feet City Datum, the extent of the various emergent wetland types would vary with elevation and topography relative to water surface elevations, with initial losses primarily of bulrush wetland and increases in the other emergent types, as well as willow scrub. Losses would occur in non-bulrush wetlands generally between 2 and -8 feet City Datum, and then increases in all wetland types would occur at the low end of the water surface elevation range.

In general, the predicted vegetation areas compare relatively well with those documented in previous studies at lower water surface elevations (see Table 5.14-5). However, for bulrush, there are considerable differences between the current analysis and observations at lower water levels. In part, this may be explained by the uncertainty inherent in predicting patterns of establishment on newly exposed terrain, as described above. In addition, it is recognized that earlier accounts of the extent of bulrush were effectively under rising water surface elevation conditions. For example, bulrush will not establish as readily in deeper water as the water surface drops, so the amount of area available to colonize, in the near term, is more limited.

As described above, for each unit of water surface elevation that could occur due to hydrologic conditions alone, the GIS-based vegetation change analysis conducted for this EIR predicts that there is an elevation range within which there would be no net loss as a result of the project, as shown in Appendix C and summarized in **Table 5.14-7**. The three columns of the table are water surface elevation without the project, corresponding project water surface elevation resulting in no-net-loss of wetlands, and increment of decline as a result of the project with no-net-loss of wetlands or the range within which no significant impact on wetlands would occur, and therefore, no mitigation would be required. If project operations exceed these ranges, then a net wetland loss would likely occur and, therefore, a significant impact would result.

In order to distinguish the project's contribution to effects on wetlands habitats from modeled existing conditions (i.e., the project's incremental effect), the threshold for net loss of wetlands was compared with the simulated Lake Merced water levels (Kennedy/Jenks, 2012) to assess whether impacts would occur. During the first two modeled years, no net loss is expected to occur as a result of the project. However, once project pumping is fully implemented, wetlands losses are expected, relative to modeled existing conditions, throughout the rest of the model sequence. For instance, as shown on Figure 5.14-4, by model year 3 lake levels under modeled existing conditions are predicted to be approximately 12 feet City Datum and lake levels under project conditions are predicted to be approximately 10 feet City Datum. However, as shown on Table 5.14-7, at a starting elevation of 12 feet City Datum (i.e., conditions due to modeled existing conditions' hydrology alone), a decrease of 2 feet below conditions without the project would not result in a net loss of wetlands.

As simulated project pumping continues, lake levels under modeled existing conditions for model year 8 (see Figure 5.14-4) are predicted to be at about 8.2 feet City Datum, while for the same year,

TABLE 5.14-7
LAKE MERCED WATER SURFACE ELEVATION DECLINES WITH NO-NET-LOSS OF WETLANDS[a]

Water Surface Elevation Without the Project (feet City Datum)	Corresponding Project Water Surface Elevation Resulting in No-Net-Loss of Wetlands (feet City Datum)	Increment of Decline as a Result of the Project with No-Net-Loss of Wetlands
13	13 to -10	Up to 23 feet of decline. At 13 feet City Datum, all wetlands would be inundated due to natural hydrology; thus, any project-related declines from this elevation could not result in an additional net loss of wetlands attributable to the project. Water level declines from 13 feet City Datum (natural or project related) would result in the reestablishment of wetlands.
12	4 to 12	Up to 8 feet of decline
11	9 to 11	Up to 2 feet of decline
10	9 to 10	Up to 1 foot of decline
9	8 to 9	Up to 1 foot of decline
8	7 to 8	Up to 1 foot of decline
7	4 to 7	Up to 3 feet of decline
6	5 to 6	Up to 1 foot of decline
5	4 to 5 -6 to -10	Up to 1 foot of decline; or decline of more than 11 feet[b]
4	3 to 4 -5 to -10	Up to 1 foot of decline; or decline of more than 9 feet
3	2 to 3 -5 to -10	Up to 1 foot of decline; or decline of more than 8 feet
2	1 to 2 -4 to -10	Up to 1 foot of decline; or decline of more than 6 feet
1	0 to 1 -3 to -10	Up to 1 foot of decline; or decline of more than 4 feet
0	0 to -10	Decline of up to 10 feet
-1	-1 to -10	Decline of up to 9 feet
-2	-2 to -10	Decline of up to 8 feet
-3	-3 to -10	Decline of up to 7 feet
-4	-4 to -10	Decline of up to 6 feet
-5	-5 to -10	Decline of up to 5 feet
-6	-6 to -10	Decline of up to 4 feet
-7	-7 to -10	Decline of up to 3 feet
-8	-8 to -10	Decline of up to 2 feet
-9	-9 to -10	Decline of up to 1 foot
-10	-10	No change; lake would be dewatered as a result of climatic conditions.

[a] The water surface elevation values represent the annual average water surface elevation. Lake Merced water levels vary seasonally due to hydrologic and climatic conditions; therefore, an annual average range in water surface elevation from about 1 foot above and below the mean is assumed. So, for example, an elevation of 6 feet City Datum actually represents a range in water surface elevation between 5 and 7 feet City Datum.

[b] Due primarily to bank topography and bathymetry of the lake bed, predicted vegetation changes are not always linear.

SOURCE: Environmental Science Associates (derived from Appendix C tables) project conditions are predicted to be at about 4 feet City Datum. As shown in Table 5.14-7, when background hydrologic conditions result in a water surface elevation of about 8 feet, a decline in elevation of more than 1 foot from that point would result in wetland losses. The project is predicted to result in a water surface level about 4 feet lower than modeled existing conditions, and therefore, project pumping would result in a significant impact on wetlands under such conditions.

As simulated project pumping continues further, lake levels under modeled existing conditions for model year 16 are predicted to be approximately 1.4 feet City Datum, and for the same model year, lake levels under project conditions are predicted to be approximately -8.6 feet City Datum. Model year 16 represents modeled existing conditions under a normal climatic water year and project conditions after about 16 years of project implementation, when the difference between the two scenarios is the greatest. As shown on Table 5.14-7, a decrease of between more than 1 and less than 4 feet below conditions without the project would result in loss of wetlands, causing a significant impact. However, further declines (those between more than 4 and up to 10 feet) would be allowable without mitigation because wetland acreage would re-establish at these water surface elevations, to the degree that there would be no net loss.

Lake levels near the end of the design drought (model year 44) are predicted to be approximately -2 feet City Datum for modeled existing conditions and approximately -10 feet City Datum for the project. As shown in Table 5.14-7, in this case, project-related water declines from -2 feet City Datum would not result in a net loss of wetlands, but rather, would result in an increase in wetland extent.

In any case, implementation of **Mitigation Measure M-HY-9, Lake Level Management for Lake Merced**, would maintain water levels to avoid or minimize water quality and biological resources impacts. This measure requires continued lake-level modeling to postulate lake levels that would occur absent implementation of the project; that is, lake levels based on naturally occurring hydrologic conditions that would persist without the project. Under this mitigation measure, for each one foot unit of water surface elevation that could occur due to hydrologic conditions alone, the GIS-based vegetation change analysis conducted for this EIR indicates the elevation range within which no net loss of wetlands would occur as a result of the project. Mitigation Measure HY-9, indicates the water level ranges that would avoid significant impacts on wetlands, as well as on water quality, and requires that lake levels be maintained within these ranges, thereby reducing potential impacts on wetlands resulting from project implementation to less-than-significant levels.

Mitigation Measures

Mitigation Measure M-HY-9: Lake Level Management for Lake Merced. (see Section 5.16, Hydrology and Water Quality, for description)

Cumulative Impacts

Impact C-BI: The proposed project would result in a considerable contribution to cumulative impacts related to special-status species, wetlands, waters of the United States, riparian habitat, wildlife nursery sites, or conflicts with local policies and ordinances protecting biological resources. (Less than Significant with Mitigation)

This analysis evaluates whether the impacts of the project, together with the impacts of the cumulative projects, would result in cumulatively significant impacts on special-status species or other biological resources protected by federal, State, or local regulations or policies (based on the significance criteria and thresholds presented earlier). This analysis then considers whether the incremental contribution of the Groundwater Supply Project to such cumulative impacts would be considerable. Both conditions must apply for a project's contribution to cumulative effects to rise to a significant level.

The geographic context for the analysis of cumulative impacts on biological resources encompasses Golden Gate Park, the Lake Merced area, and the Sunset District of San Francisco, as well as biologically linked areas (e.g., by bird movement) and ecologically similar areas throughout San Francisco (i.e., parks and open space areas). Section 5.1.4, Cumulative Impacts, describes the approach to the cumulative analysis used in this EIR. The analysis of potential cumulative impacts on biological resources considers the projects listed in Table 5.1-6 and shown in Figure 5.1-1.

Impacts on biological resources associated with the proposed project include possible impacts on special-status species, including California red-legged frog, western pond turtle, raptors, migratory birds, special-status bats, and monarch butterfly; indirect impacts on wetlands and aquatic habitats; the removal of 6 trees and 20 shrubs that provide potential foraging opportunities, cover, and nesting and roosting habitat for birds and bats; and impacts on Lake Merced habitats associated with operation of the project.

Past cumulative projects, including the development of civic facilities, residences, commercial and industrial areas, and infrastructure, have already caused substantial adverse cumulative changes to biological resources in San Francisco. For example, the project area was converted from its original sand dune habitat beginning over a century ago, with a nearly complete loss of the original habitat types and many of the species that once occurred. Revegetated areas have matured over time and provide a "new normal" in terms of habitat, often simplified in terms of diversity, and supporting a different suite of species than once existed. Overall, this is true of many areas throughout the region.

Not all projects listed in Table 5.1-6 and shown in Figure 5.1-1 would affect biological resources. The majority of current and reasonably foreseeable cumulative projects that could result in significant cumulative construction impacts on biological resources are those that would be implemented in Golden Gate Park and the Sunset District. These projects include infill development or renovation of existing facilities, such as the Murphy Windmill/Millwright's Cottage Restoration, the Beach Chalet Athletic Fields Renovation Project, the Parkmerced Project, and the San Francisco Botanical Garden Sustainable Gardening Project; and construction of new pipelines and facilities associated with the San Francisco Westside Recycled Water Project, and the Lake Merced Pump Station Essential Upgrade Project. These projects would primarily have temporary, construction-related impacts on biological resources and are not expected to result in the conversion or removal of more than minor areas of existing habitat for plants and wildlife. Other projects, such as the *Ocean Beach Coastal Plan*, the *Golden Gate National Recreation Area Management Plan*, and the *CCSF Significant Natural Areas Management Plan*, would include elements likely to result in beneficial effects on biological resources.

- Not all projects listed in Table 5.1-6 and shown in Figure 5.1-1 would affect Lake Merced lake levels and the biological resources supported by the Lake and its surrounding habitats. Specific additional proposed and existing projects that would affect lake levels were considered in this Lake Merced operational cumulative analysis. As described in greater detail in Section 5.1.5, Overview of Groundwater Modeling Approach, these include the SFPUC's proposed Regional Groundwater Storage and Recovery project and Daly City's proposed Vista Grande Drainage Basin Improvement project. The former would affect Lake Merced water surface elevations most directly through groundwater pumping and non-pumping periods, and the latter through direct additions of stormwater and baseflow in the Vista Grande Canal to the lake.

With respect to potential operational impacts on lake levels, as with the modeled existing conditions, expected water levels, as modeled under the cumulative project conditions, respond to modeled climatic variations in the same hydrologic sequence (see Figure 5.14-4). The annual average range between the maximum and minimum lake levels under cumulative conditions is predicted to be 1.6 feet over the model period. The maximum lake level over the model period is predicted to be 9.5 feet City Datum, or 2.9 feet below the maximum level under modeled existing conditions (Kennedy/Jenks, 2012). The minimum level is expected to reach as low as -4.9 feet City Datum, or 4.1 feet below the minimum water surface elevation under modeled existing conditions (Kennedy/Jenks, 2012).

The water surface elevation under cumulative conditions is predicted to be consistently within 3 feet above or below the level predicted for the modeled existing conditions until the last few years of the modeled 'design drought,' at which time lake levels under cumulative conditions are predicted to be 4 to 5 feet lower than under the modeled existing conditions (Kennedy/Jenks, 2012).

Maximum lake levels under the cumulative conditions are predicted to be nearly 3 feet lower than those expected under modeled existing conditions, and minimum lake levels are predicted to be a little more than 4 feet lower than the minimum water surface elevation under modeled existing conditions (Kennedy/Jenks, 2012). Overall, the cumulative conditions are expected to exhibit less dramatic water surface elevation fluctuations than those predicted for the proposed project alone, as the combined cumulative projects would provide hydrologic inputs that would balance the losses from cumulative groundwater pumping. For example, the proposed Vista Grande Drainage Basin Improvement Project would provide water additions to Lake Merced in the form of excess stormwater and canal baseflow, and the Regional Groundwater Storage and Recovery Project is also expected to result in higher lake levels due to increased groundwater storage in the basin. These gains would be offset, however, by pumping under the Groundwater Supply Project, as well as by the Regional Groundwater Storage and Recovery Project during drought years and by the Partner Agencies.

Facility Construction, Siting, Operations, and Maintenance Cumulative Impacts

Impacts on Special-Status Species

As described above, construction of the project has the potential to adversely affect special-status species, if present, including California red-legged frog, western pond turtle, special-status bats, and monarch butterfly (see Impact BI-1). It is assumed that the cumulative projects described above could affect at least some of the same special-status species, which if so, could result in a potentially significant cumulative impact on biological resources. However, mitigation measures have been identified to reduce effects that are attributable to the project to a less-than-significant level. Implementation of the following mitigation measures would ensure that project activities do not result in the loss of habitat for, or direct mortality of, any of the special-status species potentially present: M-BI-1a, Avoidance and Minimization Measures for California Red-Legged Frog and Western Pond Turtle; M-BI-1b, Avoidance and Minimization Measures for Special-Status Bats; and M-BI-1c, Avoidance and Minimization Measures for Monarch Butterfly. Therefore, with project-level mitigation, the project's incremental contribution to this potential cumulative impact on biological resources would not be cumulatively considerable (less than significant).

Construction-Related Impacts on Wetlands

As discussed in Impact BI-2, above, and Impact HY-1 (see Section 5.16, Hydrology and Water Quality), construction activities associated with the proposed project could result in increased soil erosion and associated sedimentation of water bodies. However, construction of the proposed well facilities and all of the potentially cumulative projects listed in Table 5.1-6 would be required to comply with the City's Green Building Ordinance and Article 4.1 of the San Francisco Public Works Code, described in Section 5.16.2, Regulatory Framework. Accordingly, and consistent with the SFPUC's Water Pollution Prevention Program, each project sponsor would be required to implement an Erosion and Sediment Control Plan or SWPPP for construction (depending on the area of soil disturbance at each site) specifying measures to prevent stormwater pollution and control site runoff. The Erosion and Sediment Control Plan or SWPPP would specify minimum BMPs related to housekeeping (storage of construction materials, waste management, vehicle storage and maintenance, landscape materials, pollutant control); non-stormwater management; erosion control; sediment control; and run-on and runoff control. Therefore, assuming full compliance with these regulatory requirements, potential cumulative wetland impacts due to the discharge of construction-related stormwater runoff would be less than significant.

Conflicts with Local Policies and Ordinances

The proposed project could conflict with local policies or ordinances protecting biological resources because project construction would require the removal of trees that are under the jurisdiction of the SFRPD (see Impact BI-3). It is also assumed that several of the projects discussed above are likely to require the removal of trees within Golden Gate Park. In particular, the Beach Chalet Athletic Fields Renovation Project would require the removal of a number of Monterey pine and Monterey cypress trees (San Francisco Planning Department, 2012). Therefore, the potential exists for tree removal resulting from these multiple projects to rise to the level of cumulative significance. However, mitigation measures have been identified to reduce these effects that are attributable to the project to a less-than-significant level. In addition, the *Golden Gate Park Master Plan* states that individual large trees should be replaced in kind with similar species. The proposed Groundwater Supply Project, as well as other projects within Golden Gate Park, would be subject to the tree replacement requirement. The proposed project's impacts related to tree removal would be reduced to a less-than-significant level with replacement or compensation for the removed trees, as prescribed in Mitigation Measure M-BI-3, Plant Replacement Trees. Therefore, with project-level mitigation, the project's contribution to this impact would not be cumulatively considerable (less than significant).

Groundwater Pumping Operations Cumulative Impacts

Special-Status Species

As indicated in Impact BI-5, the proposed Groundwater Supply Project would not result in rapid decreases in water levels. Similarly, the Regional Groundwater Storage and Recovery Project would not result in rapid decreases in water levels. The incremental combined rate of water level increase from both projects would be minimal and would be approximately 0.08 feet per month, compared to the impact threshold of 0.5 feet over a 2.5 week period in any single nesting season (conservatively March 1 through August 15). Further, water level increases would be countered by water level increases resulting from the Vista Grande Drainage Basin Improvement Project. Thus, the cumulative impact associated with rapid water level increases would be less than significant.

Sensitive Communities

As noted in the modeled existing conditions and project-specific impacts analyses, water levels decreasing below 0 feet City Datum could substantially reduce aquatic habitat and degrade water quality, thereby negatively affecting fish populations and fish-related beneficial uses of Lake Merced (see discussion above under Impact BI-6), as well as potentially indirectly impacting special-status birds by reducing their food source (see discussion above in the Fisheries and Fish Habitat section of the Approach to Analysis: Operational Impacts Associated With Groundwater Pumping).

As modeled by Kennedy/Jenks (2012), the cumulative project operations are predicted to result in lake levels above 0 feet City Datum for about 90 percent of the model period and during that time would have no adverse impacts on fisheries or fish habitat. However, during pumping associated with the Take Periods" of the SFPUC's proposed Regional Groundwater Storage and Recovery Project, combined with pumping associated with the Groundwater Supply Project during the simulated design drought (see Figure 5.14-4), lake levels are predicted to fall as low as -4.9 City Datum, or 4.1 feet lower than the corresponding predicted lake surface elevation for modeled existing conditions. Relative to the modeled existing conditions, this would likely result in a further potential for a decrease in the water quality of Lake Merced, as compared to modeled existing conditions. Therefore, a significant cumulative impact on the water quality of Lake Merced could occur. For the majority of the approximately 10 percent of the cumulative model period during which the lake surface elevation is predicted to fall below 0 feet City Datum, the modeling consistently predicts that the lake surface elevation under the proposed project would be significantly lower than the lake surface elevation that is predicted by the modeled existing conditions, as well as the expected cumulative lake surface elevation, while the lake surface elevation under the Regional Groundwater Storage and Recovery Project is predicted to be significantly higher than under the proposed project. This suggests that the proposed project could have a cumulatively considerable incremental contribution to the significant cumulative impact on the water quality of Lake Merced. However, Mitigation Measure M-HY-9, Lake Level Management for Lake Merced, requires the SFPUC to implement lake level management procedures to maintain Lake Merced at water levels similar to conditions that are predicted to occur without the project. With implementation of this mitigation measure, the project's cumulatively considerable contribution to the significant cumulative impact on fisheries and fish habitat, as well as its potential indirect impacts on special-status birds, would not be cumulatively considerable (less than significant).

Wetlands

Under the modeled cumulative conditions, the water surface elevation of Lake Merced is predicted to fluctuate between -4.9 and 9.5 feet City Datum, with a mean of 6.1 feet (Kennedy/Jenks 2012). In addition, the water surface elevation is predicted to be between 6 and 9.5 feet City Datum (levels at which the extent of wetlands is predicted to increase such that there would be no net loss of wetlands) for about 65 percent of the time, and for periods of up to 19 to 26 months. For the remaining 35 percent of time, the water surface elevation of Lake Merced is predicted to be less than 6 feet City Datum, lasting for periods of up to 12 to 68 consecutive months. These durations would provide ample time to induce a loss of wetlands and their conversion to other habitat types. The GIS-based vegetation change analysis prepared for this EIR predicts losses, when compared to existing conditions, of up to 37 percent of wetland area (about 16 acres) at a lake surface elevation of 1 foot City Datum, much of which (about 10.5 acres) would be regained as water levels decline further to the cumulative predicted minimum of -4.9 feet City Datum. Therefore, wetland loss is also expected under the cumulative conditions, but the losses would be less than those under modeled existing conditions, due to less frequent and shorter durations of inundation. Wetland extent is expected to change incrementally and naturally over time with or without the cumulative projects and there would be temporary losses and gains on a relatively continual basis due to natural hydrology alone. For example, 2 acres of wetlands might be lost due to inundation one year and then reestablish over the next three years. While it is possible to determine from the hydrological models (Kennedy/Jenks 2012) the percentage of time water surface elevations would be at levels promoting wetland gains or losses, it would be speculative to attempt to estimate and correlate specific areal extent of losses and gains with those percentages, because, unlike a static system, the acreage would constantly vary over time with changing lake levels. Nonetheless, with implementation of the cumulative projects, changes in water surface elevations would promote wetland loss for about 35 percent of the model period, and changes in water surface elevations would promote wetland increases for about 65 percent of the model period. Therefore, over the model period, it is not expected that there would be a permanent cumulative loss of wetlands (less than significant).

5.14.4 References

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5.15 Geology and Soils

This section describes the existing conditions and regulatory framework for geology and soils in the Groundwater Supply Project area, and assesses potential impacts on geology and soils that could result from implementation of the proposed project. The geology, soils, and seismic data presented in this section are based on information from the U.S. Geological Survey (USGS), the California Geological Survey (CGS) (formerly the California Division of Mines and Geology), and geotechnical investigations performed for the Groundwater Supply Project well facilities and pipeline alignments, and other SFPUC projects in the vicinity.

5.15.1 Setting

Topography

The project would be located on the San Francisco Peninsula, which lies within the Coast Range Geomorphic Province of California. The topography of the Coast Ranges is characterized by northwest-southeast-trending mountain ridges and intervening valleys that have formed over millions of years due to movements of the earth's crust (referred to as tectonics). Much of the bedrock underlying the northern Coast Ranges is referred to as the Franciscan Complex—a mixture of ancient seafloor sediments and volcanic rocks that have been altered by heat and pressure deep within the earth. The prominent northwesterly structural and topographic trend of the northern Coast Ranges is not evident in the city of San Francisco, except for minor hills and valleys. The present local topography is the result of the erosion of Franciscan Complex rocks of varying hardness with deposition of windblown sand that locally overlies bedrock exposures. In addition, artificial fill (man-made land) has also contributed to the local topography in portions of the project area (CDMG, 2000).

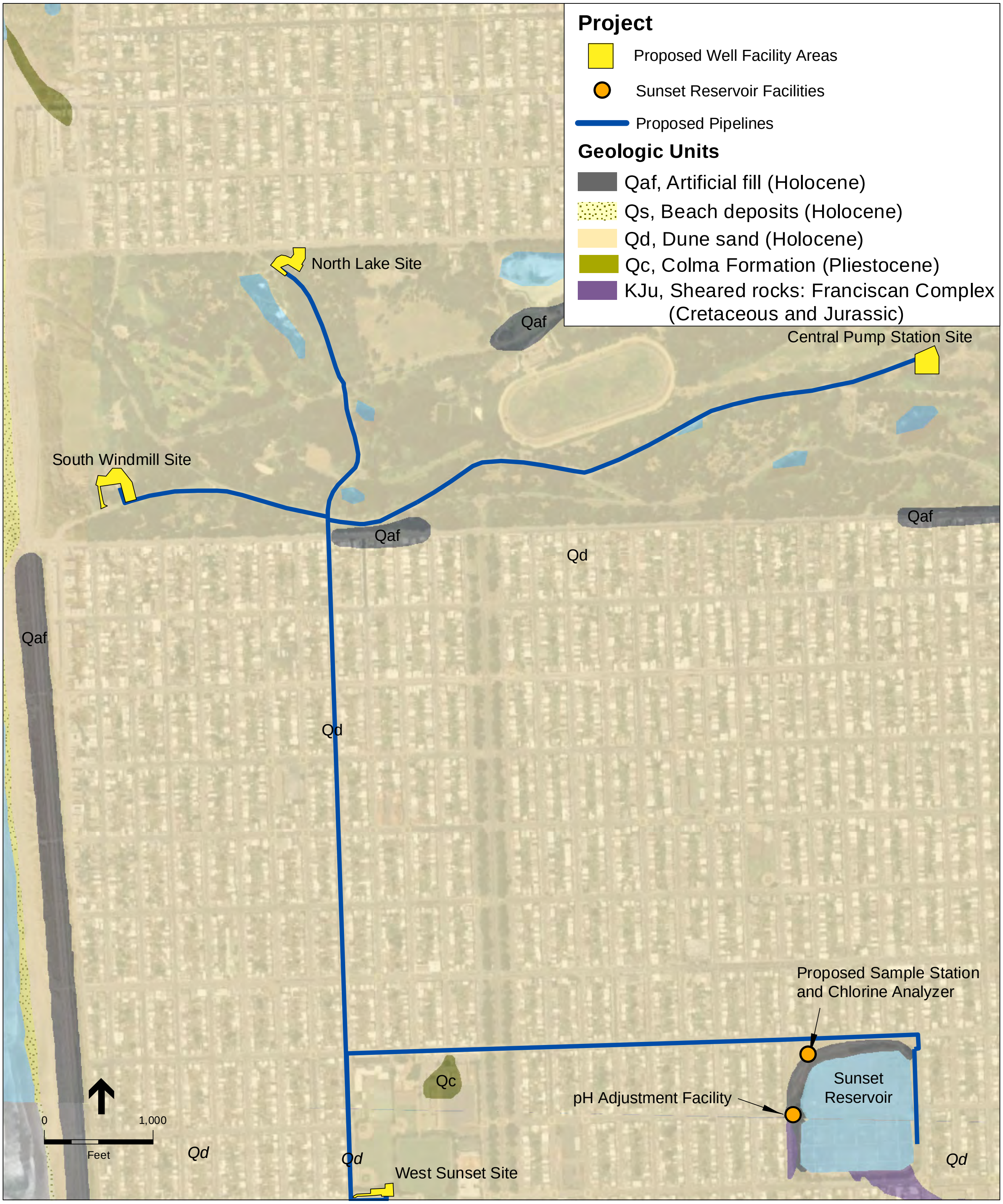
The proposed project facilities are located within the Outer Parkside and Outer Sunset neighborhoods, Golden Gate Park, and Lake Merced. The topography of this area is relatively level, with a gentle slope to the west and a topographic gradient of approximately 50 feet per mile (USGS, 1980). The placement of artificial fills in former drainage channels in the vicinity of the proposed Lake Merced well facility during the development of San Francisco has reduced topographic variation, although the overall gradient in this specific area also slopes to the west.

Geology

Information on geologic conditions is based on regional geologic mapping and geotechnical investigations at project sites in the vicinity.

Regional Geologic Setting

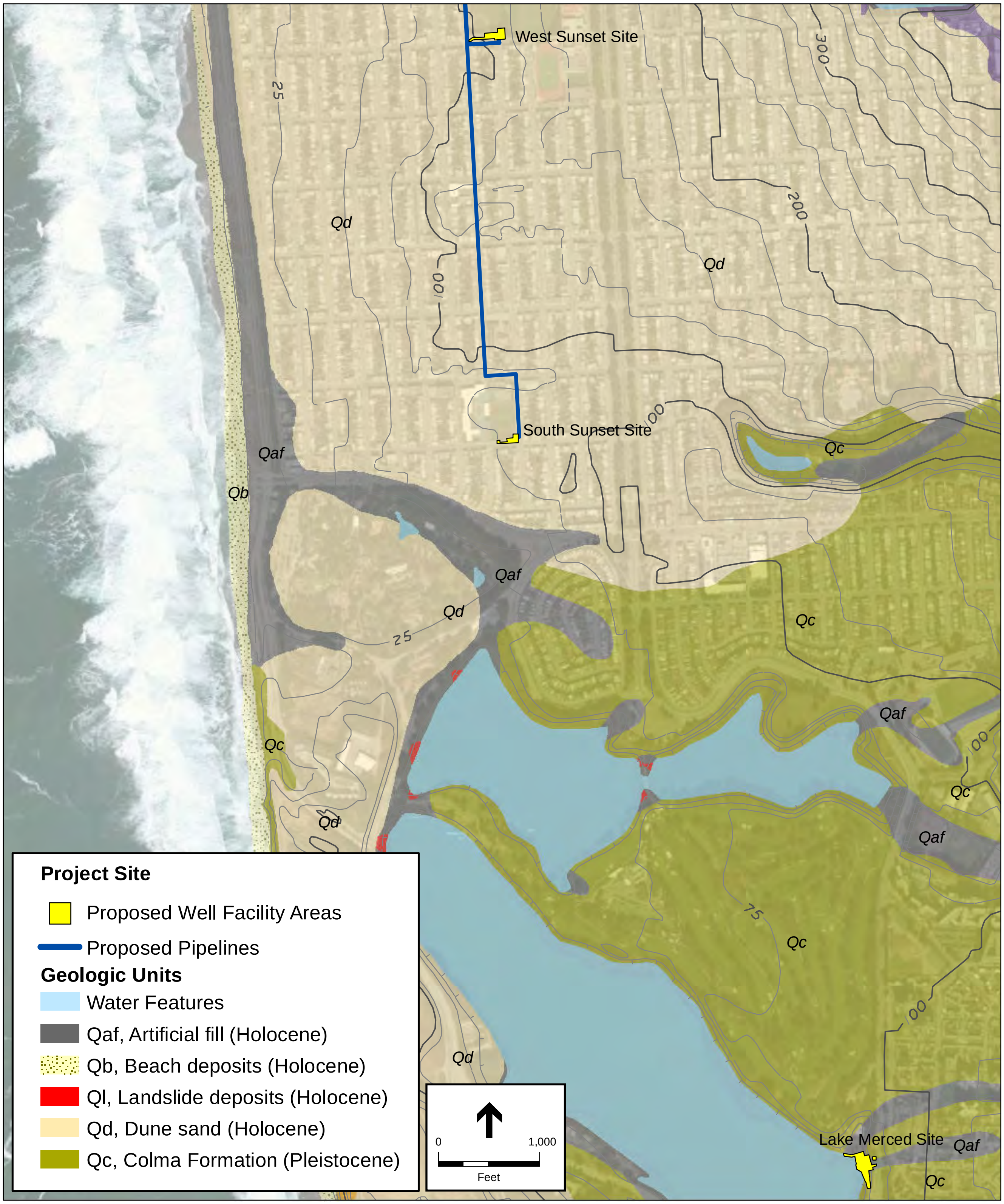
The entire project area, with the exception of the Lake Merced well facility site, is underlain by unconsolidated Holocene-age dune sand deposits (**Figure 5.15-1a** and **5.15-1b**). These deposits consist of windblown, loose to medium dense, poorly graded sands (CDMG, 2000). Dune sand in this area was derived predominantly from Ocean Beach and was transported by prevailing winds



SOURCE: USGS, 2000

San Francisco Groundwater Supply Project EIR

Figure 5.15-1a
Geologic Map - North Project Area



SOURCE: USGS, 1998

San Francisco Groundwater Supply Project EIR

Figure 5.15-1b

Geologic Map - South Project Area

across the relatively level topography with few obstructions. Dune sand deposits are estimated to be at least 100 feet thick in the project area (Schlocker et al., 1958). The Lake Merced well facility site is underlain by the Colma Formation and artificial fill. The Colma Formation consists of loose, fine- to medium-grained sands deposited in a shallow marine environment (Bonilla, 1998). A thick layer of artificial fill appears to have been placed into a former stream channel at this location. In addition, artificial fill was observed during geotechnical investigations at the other proposed groundwater well facilities. Fill thicknesses vary from 2.5 feet at the West Sunset and South Sunset well facility sites to up to 16 feet at the Lake Merced well facility site.

Site-Specific Geotechnical Conditions

Geotechnical investigations performed at all of the project well facility sites and pipeline alignment locations provide additional site-specific information regarding subsurface materials. This information is summarized below.

Lake Merced Well Facility Site

A geotechnical investigation (Treadwell & Rollo, 2007) indicates that the Lake Merced well facility site is predominantly underlain by between 6.5 and 16 feet of fill, consisting of loose to medium dense sand and silty sand, over native sand. The native sand varies from loose to medium dense to a depth of about 24 feet, where it becomes dense to very dense. Groundwater was measured at depths between 9.5 and 14.5 feet below ground surface. Notably, loose sands are situated beneath the water table at this site.

West Sunset and South Sunset Well Facility Sites

Geotechnical investigations (Treadwell & Rollo, 2008) indicate that the West Sunset and South Sunset well facility sites are generally underlain by about 2.5 feet of sandy silt fill over sand with varying silt and clay contents to the maximum depth explored of approximately 32 feet. The sand ranges from very loose to loose at both sites from the surface to a depth of about 8 to 9 feet, and becomes increasingly dense below this depth. Groundwater is estimated at depths of 30 feet and 50 feet at the West Sunset and South Sunset well facility sites, respectively.

South Windmill Replacement Well Facility Site

Geotechnical investigations (AGS, Inc., 2009) describe the area as fill material of loose sand with silt, gravel, and rubble to depths of 6 to 14 feet, underlain by medium dense to very dense dune sand. Groundwater was encountered at approximately 26 feet below ground surface.

North Lake Well Facility Site

Geotechnical investigations (AGS, Inc., 2011) indicate that the well facility site is generally underlain by baserock, fine- to medium-grained sand, and silt fill material to depths of up to 7 feet. Below this layer, poorly graded, fine-grained dune sand is present to the maximum depth explored of approximately 66 feet. The dune sand is generally loose to medium dense to depths of 25 feet, and then becomes dense to very dense from 25 feet to the maximum depth explored. Groundwater was encountered at approximately 41 feet below ground surface.

Central Pump Station Well Facility Site

Geotechnical investigations (AGS, Inc., 2011) describe the area as predominantly poorly graded, fine-grained dune sand extending from the ground surface to depths of 46 to 49.5 feet. The dune sand is generally loose to medium dense at depths of 30 to 40 feet, and then becomes dense to very dense until the formation ends at 46 to 49.5 feet. Below the dune sand, the silty, fine-grained sand of the Colma Formation begins at a depth between 46 and 49.5 feet and extends to the maximum depth explored of 65.8 feet. Groundwater was encountered at approximately 59.3 feet below ground surface.

Groundwater Pipeline Alignment

The pipeline alignment geotechnical investigation (San Francisco Department of Public Works [SFDPW], 2011) included a review of published geotechnical and geological reports for the site vicinity as well as a subsurface exploration consisting of 18 geotechnical borings along the proposed groundwater pipeline alignment. Subsurface conditions are described as loose to medium dense, poorly graded, dune sand to a depth of 8 to 12 feet, underlain by dense to very dense sand of the Colma Formation. Groundwater seepage was only encountered in the borings at 41st and Taraval Street and at 41st and Judah Street, at 30 and 38 feet below ground surface, respectively.

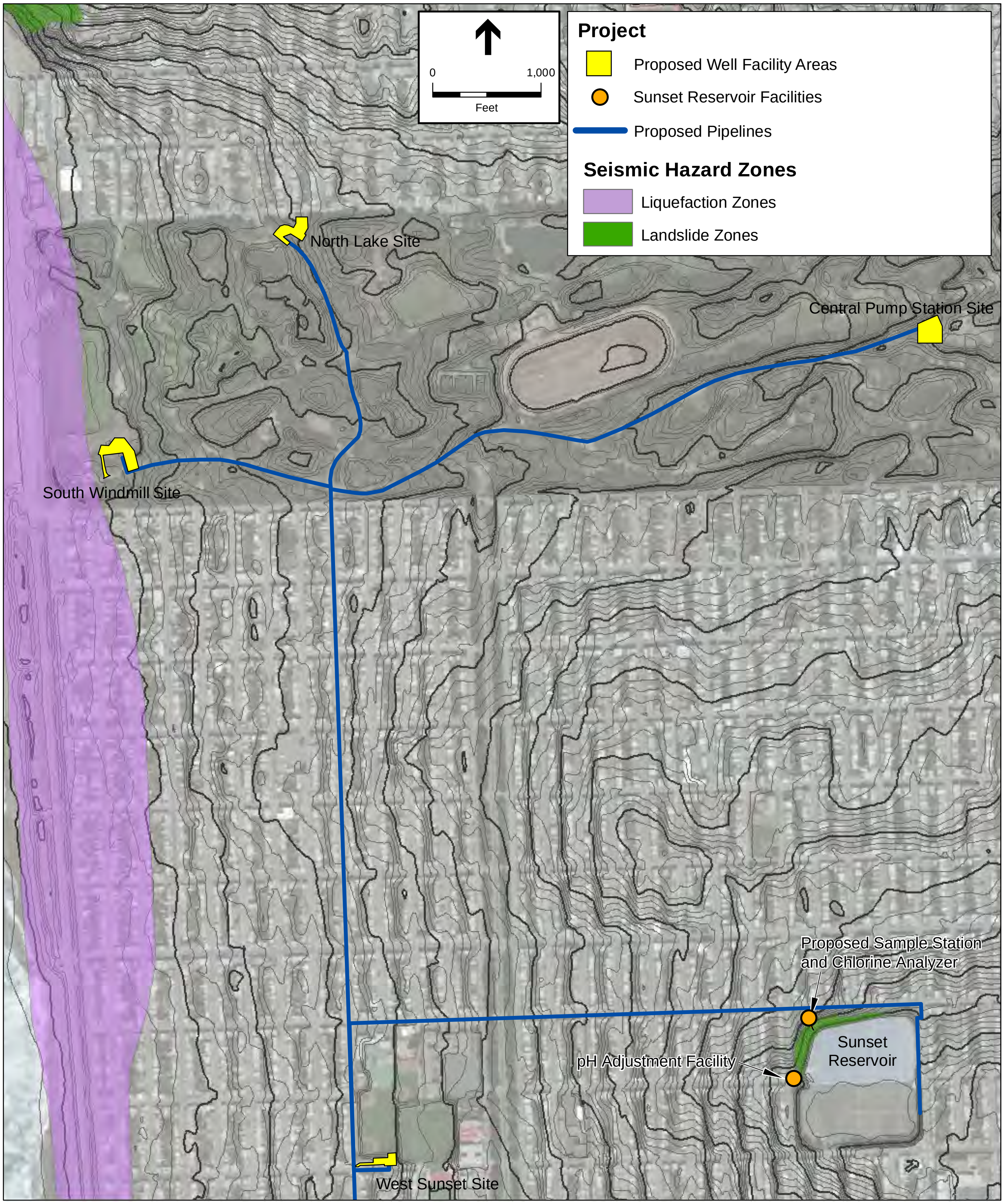
Geologic Hazards

Slope Failure

Slope failures, commonly referred to as landslides, include many phenomena that involve the downslope displacement and movement of material, either triggered by static (i.e., gravity) or dynamic (i.e., earthquake) forces. Exposed rock slopes are susceptible to rockfalls, rockslides, and rock avalanches, while soil slopes can experience shallow soil slides, rapid debris flows, and deep-seated rotational slides. Slope stability can depend on a number of variables, including the geology, structure, and degree of saturation, as well as external processes such as climate, topography, slope geometry, and human activity. The factors that contribute to slope movements include those that decrease the resistance in the slope materials and those that increase the stresses on the slope.

Landslides can occur on slopes of 15 percent or less, but the probability is greater on steeper slopes that exhibit old landslide features such as scarps, slanted vegetation, and transverse ridges. Landslides typically occur within slide-prone geologic units that contain large amounts of water or are located on steep slopes, or where planes of weakness are parallel to the slope angle. Such conditions are not present in the project area.

As indicated on a San Francisco seismic hazard zone map prepared by the California Division of Mines and Geology (now the California Geological Survey) (CDMG, 2000) and presented on **Figures 5.15-2a** and **5.15-2b**, landslide zones are generally not present in the project area. A seismically induced liquefaction hazard zone is located along the Pacific shoreline, extending 500 to 1,000 feet inland as far as 47th Avenue. The South Windmill Replacement well facility site is located just east of this liquefaction hazard zone. Small landslide areas are identified on the bluffs between Sutro Heights Park and Point Lobos Avenue, and on the banks of Lake Merced, adjacent to project sites.



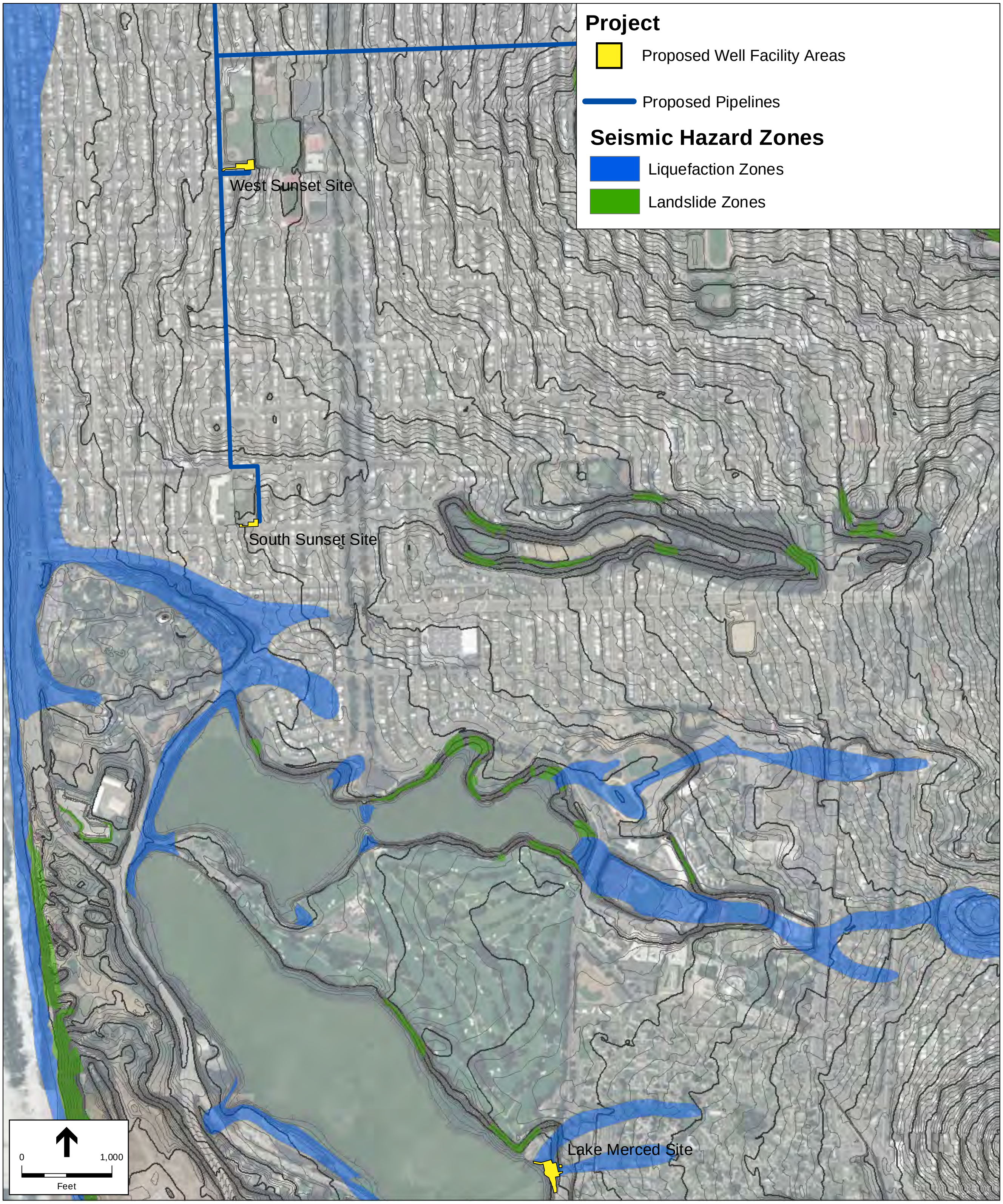
Note: The landslide hazard zone adjacent to the Sunset Reservoir was remediated under the Sunset Reservoir Seismic Upgrade Project, completed in 2008.

SOURCE: CDMG, 2000

San Francisco Groundwater Supply Project EIR

Figure 5.15-2a

Seismic Hazard Map - North Project Area



SOURCE: CDMG, 2000

San Francisco Groundwater Supply Project EIR

Figure 5.15-2b

Seismic Hazard Map - South Project Area

Naturally Occurring Asbestos

As discussed above, geologic units in the project area primarily consist of dune sands and the Colma Formation. Naturally occurring asbestos is generally associated with serpentinite, mélange, or greenstone of the Franciscan Complex, which is not present near the surface in most of the project area, based on geologic mapping. A small area of sheared rocks derived from the Franciscan Complex near the Sunset Reservoir (Figure 5.15-1a) may contain naturally occurring asbestos.

Expansive Soils

Expansive soils are characterized by their ability to undergo significant volume change (i.e., to shrink and swell) due to variations in soil moisture content. Changes in soil moisture can result from rainfall, landscape irrigation, utility leakage, roof drainage, and/or perched groundwater. Expansive soils are typically very fine grained and contain a high percentage of clay. Swelling and shrinking of expansive soils in response to changes in moisture content can lead to differential and cyclical movements that can, in turn, cause damage and/or stress to structures and equipment.

Soil surveys performed by the Natural Resources Conservation Service provide information on surface and near-surface soil materials in the project area (NRCS, 2011). The soils generally comprise mixtures of urban land and orthent[1] soils that form on alluvial materials. These soils have a low shrink-swell potential and tend not to swell when water is absorbed.

Corrosive Soils

The corrosivity of soils is commonly related to several key parameters, including soil resistivity, the presence of chlorides and sulfates, oxygen content, and pH. Typically, the most corrosive soils are those with the lowest pH and highest concentration of chlorides and sulfates. Wet/dry conditions can result in a concentration of chlorides and sulfates as well as movement in the soil that tends to break down protective corrosion films and coatings on the surface of building materials. High-sulfate soils are also corrosive to concrete and may prevent complete curing, reducing its strength considerably. Low pH and/or low-resistivity soils can corrode buried or partially buried metal structures. Depending on the degree of corrosivity of the subsurface soils, building materials such as concrete, reinforcing steel in concrete structures, and bare-metal structures exposed to these soils can deteriorate, eventually leading to structural failures.

Corrosion testing was conducted on soil samples from the West Sunset, South Sunset, and Lake Merced well facility sites by CERCO Analytical to evaluate the potential of corrosion for buried metals and concrete (Treadwell & Rollo, 2007, 2008). On the basis of resistivity tests results, these well facility site soils were classified as mildly corrosive. In addition, corrosion analysis performed for the groundwater pipeline alignment also indicated a slight to moderate corrosion potential (SFDPW, 2011).

[1] Orthents are soils that are typically shallow and lack a horizon development because they are located on a steep slope or are derived from parent materials that contain no permanent weatherable materials.

Regional Faulting and Seismic Hazards

Seismicity

The project would be located in the San Francisco Bay Area, which is considered one of the most seismically active regions in the United States. Faults in the Bay Area have produced measurable historic ground motion and movement. In 2007, the USGS, along with the CGS and the Southern California Earthquake Center, formed the Working Group on California Earthquake Probabilities to summarize the probability of one or more earthquakes of magnitude 6.7 or higher occurring in the state of California over the next 30 years. Accounting for the wide range of possible earthquake sources, it is estimated that the Bay Area has a 63 percent chance of experiencing such an earthquake (Working Group on California Earthquake Probabilities, 2008). According to the Working Group on California Earthquake Probabilities, the individual faults posing the greatest threat to the Bay Area are the Hayward and San Andreas Faults. Other principal faults capable of producing significant earthquakes in the Bay Area include the Calaveras, Concord–Green Valley, Marsh Creek–Greenville, and San Gregorio Faults.

Buildings or structures that lie within a fault zone designated by the State of California's Alquist-Priolo Earthquake Fault Zoning Act have a high risk for surface fault rupture. Although the project area is not located within an Alquist-Priolo Earthquake Fault Zone, the nearest fault (the San Andreas Fault) is located within 2.5 miles of the Lake Merced portion of the project area. **Table 5.15-1** and **Figure 5.15-3** indicate the approximate distances of the project area to the closest known mapped active faults. Each fault is briefly described below.

TABLE 5.15-1
ACTIVE FAULTS IN THE PROJECT AREA VICINITY

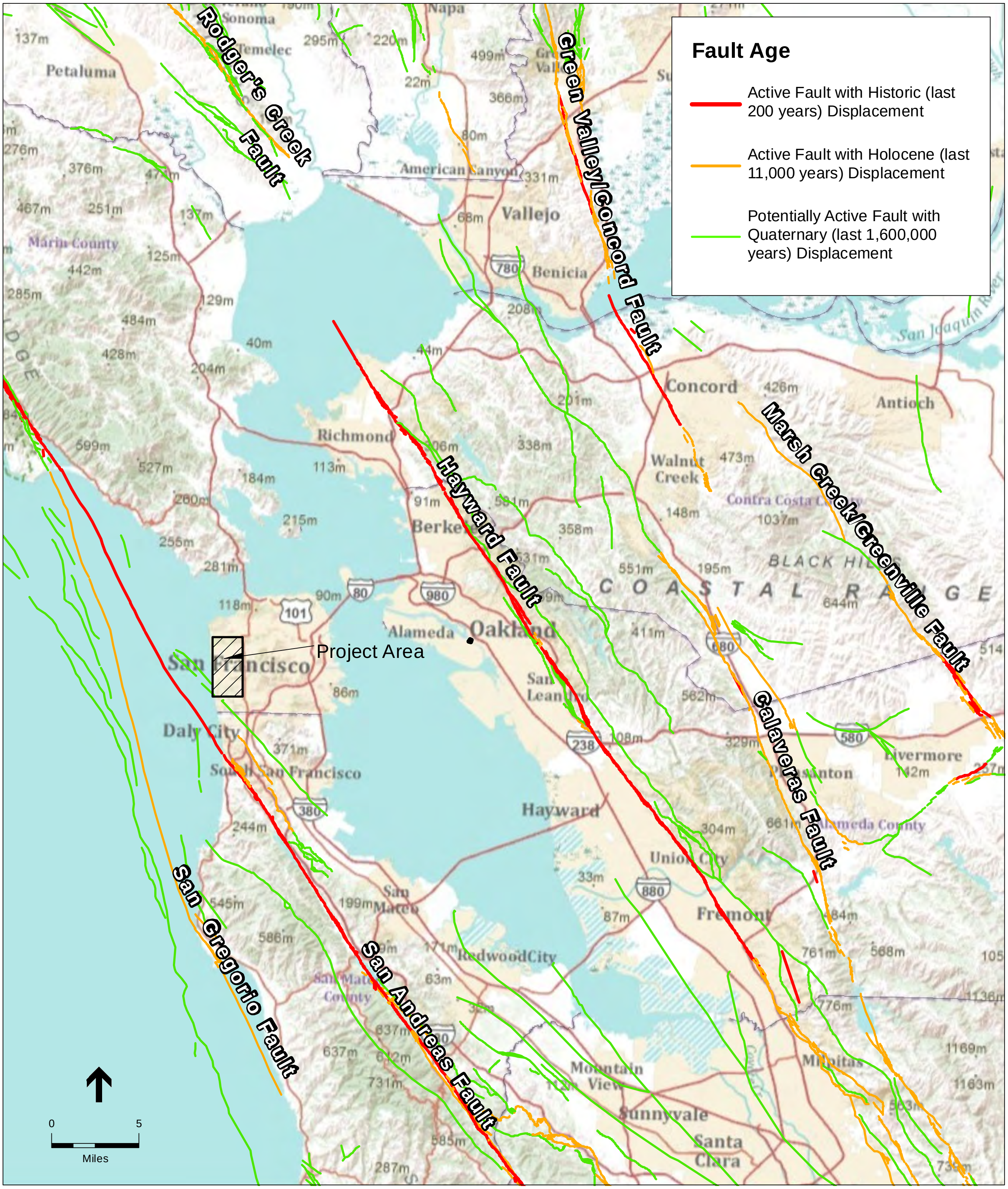
Fault	Approximate Distance and Direction from Project Area	30-year Probability (2002 to 2031) of Magnitude 6.7 or Greater Earthquake	Maximum Moment Magnitude (Mw)[a]
San Andreas (Peninsula Section)	2.5 miles southwest	21%	7.9
Hayward (Northern Section)	26 miles northeast	31%	7.0
San Gregorio (Northern Section)	9 miles south	6%	7.2
Calaveras (Total)	43 miles east	7%	6.9
Concord–Green Valley (Avon Section)	48 miles northeast	3%	6.9
Serra	½-mile southwest	na	na

[a] Mw is related to the physical size of a fault and the type of motion during a fault rupture. It provides a physically meaningful measure of the size of a faulting event. The maximum moment magnitude that a particular fault is reasonably capable of producing is derived from the PSHA Model (CGS, 2009).

NOTES:

na Although showing Holocene movement, the Serra fault is not considered seismogenic (capable of producing an earthquake) (Gilpin, 2007).

SOURCES: Bryant, 2005; Peterson et al., 1996; Gilpin, 2007.



SOURCE: ESRI, 2008; Bryant, 2005

San Francisco Groundwater Supply Project EIR

Figure 5.15-3
Regional Faults

San Andreas Fault

The San Andreas Fault Zone, located about 2.5 miles southwest of the Lake Merced portion of the project area, is a major structural feature that forms at the boundary between the North American and Pacific tectonic plates. It is a right-lateral strike-slip[2] fault, extending from the Salton Sea in Southern California near the border with Mexico to north of Point Arena, where the fault trace continues out into the Pacific Ocean. The main trace of the San Andreas Fault through the Bay Area trends northwest from the Santa Cruz Mountains to the eastern side of the San Francisco Peninsula.

In the San Francisco Bay Area, the San Andreas Fault Zone was the source of the two major earthquakes in recent history that affected the San Francisco Bay region. The 1906 San Francisco earthquake, estimated at a moment magnitude (Mw) of 7.8, resulted in approximately 267 miles of surface fault rupture, the longest of any known continental strike slip fault. Horizontal displacement along the fault approached 21 feet near the epicenter (USGS, 2009). The more recent 1989 Loma Prieta earthquake, with a Mw of 6.9, was centered in the Santa Cruz Mountains and resulted in widespread damage throughout the Bay Area. The Working Group on California Earthquake Probabilities (2008) identifies the San Andreas Fault as having a 21 percent chance of generating one or more earthquakes of Mw 6.7 or greater in the next 30 years.

Hayward Fault

The Hayward Fault Zone, located 26 miles northeast of the project area, extends for 60 miles from San Pablo Bay in Richmond south to the San Jose area. The Hayward Fault has generated one sizable earthquake: the 1868 Mw 7 earthquake on the southern segment of this fault, which ruptured the ground for a distance of about 30 miles (Bryant, 2005). Lateral ground surface displacement during this event was at least 3 feet.

A characteristic feature of the Hayward Fault is its well-expressed and relatively consistent fault creep. Large earthquakes on the Hayward Fault have been rare since 1868, possibly because slow fault creep has continued to occur, causing measurable offset and relieving stress. Fault creep on the East Bay segment of the Hayward Fault is estimated at 9 millimeters per year (mm/yr) (Peterson et al., 1996). However, a large earthquake could occur on the Hayward Fault with an estimated Mw 6.9 (Table 5.15-1). The Working Group on California Earthquake Probabilities (2008) identifies the combined Hayward-Rodgers Creek Fault Systems as having a 31 percent chance of generating one or more earthquake of Mw 6.7 or greater in the next 30 years.

Calaveras Fault

The Calaveras Fault, located 43 miles east of the project area, is a major right-lateral strike-slip fault that has been active during the last 11,000 years. The Calaveras Fault is located in the eastern San Francisco Bay region and generally trends from north to south along the eastern side of the Oakland Hills into the western Diablo Range, eventually joining the San Andreas Fault

[2] Refers to relative motion on either side of a fault that is primarily horizontal (as opposed to vertical).

zone south of Hollister. The northern extent of the fault zone is somewhat speculative and could be linked with the Concord Fault.

There is a distinct change in slip rate and fault behavior north and south of the vicinity of Calaveras Reservoir. North of Calaveras Reservoir, the fault is characterized by a relatively low slip rate of 5 to 6 mm/yr and sparse seismicity (Bryant, 2005). South of Calaveras Reservoir, the fault zone is characterized by a higher rate of surface fault creep that has been evidenced in historic times. The Calaveras Fault has been the source of several moderate magnitude earthquakes, and the probability of a large earthquake (greater than Mw 6.7) is much lower than on the San Andreas or Hayward Faults. The Working Group on California Earthquake Probabilities (2008) identifies the Calaveras Fault as having a 7 percent chance of generating one or more earthquakes of Mw 6.7 or greater in the next 30 years.

Concord–Green Valley Fault

The Concord–Green Valley Fault, located 48 miles northeast of the project area, extends from Walnut Creek north to Wooden Valley (east of Napa Valley). Historical record indicates that no large earthquakes have occurred on the Concord or Green Valley Faults (Bryant, 2005). A moderate earthquake of Mw 5.4 occurred on the Concord Fault segment in 1955. The Concord and Green Valley Faults exhibit active fault creep and are considered to have a small probability of causing a significant earthquake. The Working Group on California Earthquake Probabilities (2008) identifies the Concord–Green Valley Fault as having a 3 percent chance of generating one or more earthquakes of Mw 6.7 or greater in the next 30 years.

San Gregorio Fault

The San Gregorio Fault, located nine miles south of the project area, is an active, structurally complex fault zone as much as five kilometers wide. The fault zone is mainly located offshore, west of San Francisco Bay and Monterey Bay, with onshore locations at promontories such as Moss Beach, Pillar Point, Pescadero Point, and Point Año Nuevo. While there is no record of historic seismicity, the most recent earthquake along the San Gregorio Fault Zone is thought to have occurred between 1270 A.D. and the arrival of Spanish missionaries in 1775 A.D. (Bryant, 2005). The Working Group on California Earthquake Probabilities (2008) identifies the San Gregorio Fault as having a 6 percent chance of generating one or more earthquakes of Mw 6.7 or greater in the next 30 years.

Serra Fault

The Serra Fault, located about ½-mile southwest of Lake Merced, parallels the San Andreas fault and is a southwest dipping reverse fault with the west side upthrust relative to the east side. The plane of the fault may extend to and connect with the San Andreas Fault at depth. The fault extends from south of San Bruno to the Olympic Club area and extends offshore (Kennedy, 2005). The onshore area between the Serra Fault and the San Andreas Fault is referred to as the Serra Block. The fault has only recently been recognized as having movement during Holocene time (Kennedy, 2005). However, the fault is probably not seismogenic (capable of generating an earthquake) (Gilpin, 2007).

Fault Rupture

Surface rupture occurs when movement on a fault deep within the earth breaks through to the surface. Surface ruptures associated with the 1906 San Francisco earthquake extended for more than 267 miles, with displacements of up to 21 feet. However, not all earthquakes result in surface rupture. For instance, the Loma Prieta earthquake of 1989 caused major damage in the San Francisco Bay Area, but the fault movement did not break through to the ground surface.

Fault rupture almost always follows preexisting faults, which are zones of weakness. Rupture may occur suddenly during an earthquake or slowly in the form of fault creep. Sudden displacements are more damaging to structures because they can suddenly displace structures and are accompanied by shaking. Fault creep is the slow rupture of the earth's crust. In developed areas, fault creep can offset and deform curbs, streets, buildings, and other structures that lie on the fault trace. Fault rupture is unlikely to occur in the project area due to the distance from known active faults.

Groundshaking

According to the Association of Bay Area Governments (ABAG) Shaking Intensity Maps and Information, the project area is located in an area subject to "violent" groundshaking (Modified Mercalli Intensity[3] IX) from earthquakes along the entire San Andreas Fault (similar to the 1906 earthquake), "very strong" groundshaking along the Northern San Gregorio Fault, and "strong" groundshaking (Modified Mercalli Intensity VII) throughout the northern and southern segments of the Hayward Fault (ABAG, 2011). The area is also subject to "moderate" groundshaking along the northern and central portions of the Calaveras Fault.

The intensity of earthquake-induced ground motions and the potential forces affecting structures within the project area can be described using peak ground accelerations, which are represented as a fraction of the acceleration of gravity (g).[4] The CGS estimates the peak ground accelerations for the 10 percent probability of exceedance in 50 years (475-year return period) at approximately 0.67 g (CGS, 2009). However, site-specific peak ground motions will vary based on the character of the underlying geology (with low-strength soils yielding higher peak ground acceleration values than high-strength soils for a given earthquake).

Site-specific geotechnical evaluations were conducted for all proposed well facility sites and for the groundwater pipeline alignment. "Strong" to "very strong" groundshaking is anticipated to occur at the West Sunset, South Sunset, and Lake Merced well facility sites (Treadwell & Rollo, 2007, 2008). The peak horizontal accelerations for the North Lake well and Central Pump Station well facility sites are estimated to be 0.55g for a 475-year return earthquake, 0.73g for a 950-year return earthquake, and 0.97g for a 2,475-year return earthquake (AGS, Inc., 2011). The peak

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3 A scale composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction. The levels on the scale are designated by Roman numerals.

4 Acceleration of gravity (g) = 980 centimeters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

ground acceleration for the groundwater pipeline alignment is estimated to be 0.51g for a 475-year return earthquake (SFDPW, 2011).

Liquefaction or Settlement

Liquefaction is a phenomenon in which a soil located below the water table experiences a temporary but sudden loss of shear strength during and after earthquake-induced groundshaking due to a buildup of excess pore water pressures. Recently deposited (geologically young) and relatively loose natural soils and uncompacted or poorly compacted fills are most susceptible to liquefaction. Dense natural soils and well-compacted fills have low susceptibility to liquefaction, while clayey soils and bedrock generally are not subject to liquefaction.

The consequences of liquefaction include vertical settlement, lateral displacement, loss of load bearing capacity for foundations, increased lateral loading on structures, and flotation of lightweight structures in liquefied soil. As a result of the 1957 Daly City earthquake, about 4 to 6 inches of settlement severed a 12-inch-diameter pipe from the Lake Merced Pump Station, which is located near the Lake Merced well facility site (Youd and Hoose, 1978). To address liquefaction potential, the SFPUC is currently modifying the Lake Merced Pump Station by performing seismic upgrades to the existing pump station structure, constructing a new pump station building, and constructing a new electrical utility building. Furthermore, ground improvements are being made to stabilize the soil, including the use of compaction grouting and cement deep soil mixing (SFPUC, 2012).

The CDMG seismic hazard mapping (CDMG, 2000) identifies liquefaction zones in San Francisco (Figures 5.15-2a and 5.15-2b). According to these maps, the only liquefaction zone within the project area occurs at the Lake Merced well facility site. This area of liquefaction aligns with the area overlain by fill shown on Figure 5.15-1b. Fill of various depths was also encountered during the site-specific geotechnical investigations performed for the groundwater well facilities. Due to the greater thickness of fill material at the Lake Merced well facility site and relatively shallow water table, the potential for earthquake-induced liquefaction settlement is increased to an anticipated 3 to 4.5 inches of settlement, in the absence of engineering soil improvements. In addition, because the site is adjacent to a free face (i.e., the lakeside slope), the potential for lateral spreading is high (Treadwell & Rollo, 2007).

According to a geotechnical evaluation prepared by Treadwell & Rollo (2008), the West Sunset and South Sunset well facility sites are underlain by very loose and loose sand between the respective depths of 3.5 and 8.5 feet below existing grades. While the potential for liquefaction is considered low, a major earthquake is anticipated to cause up to 2.5 inches of seismically induced settlement at these sites, in the absence of engineering soil improvements. Similarly, up to several inches of settlement is anticipated at the South Windmill Replacement well facility site due to the varying depths of fill material at this site, in the absence of engineering soil improvements (SFDPW, 2009).

The geotechnical investigation prepared for the North Lake and Central Pump Station well facility sites (AGS, Inc., 2011) indicates that both sites have a low liquefaction potential; however, both sites have a high potential for densification (dynamic compaction) in the soils extending from the ground surface to a depth of 20 feet. During a major earthquake, loose to medium dense soils could densify as a result of groundshaking, causing 1.5 inches of seismically induced settlement at the Central Pump Station well facility site, and 2.5 inches of seismically induced settlement at the North Lake well facility site, in the absence of engineering soil improvements (AGS Inc., 2011).

A geotechnical investigation of the groundwater pipeline alignment (SFDPW, 2011) indicates that the potential for saturation of loose sands and liquefaction is very low, because loose sands were only encountered in areas that are well above the groundwater table. Saturated soils beneath the groundwater table are dense to very dense with little potential for liquefaction. Minor settlement along the pipeline is anticipated during seismic events due to dynamic compaction of loose to medium dense sand. Differential settlement on the order of 1 inch over a 20-foot section of the pipeline could occur during a strong seismic event, although it was noted that differential settlement may be much less than 1 inch because loose sand layers are sporadic and not continuous (SFDPW, 2011).

5.15.2 Regulatory Framework

Federal Regulations

Federal Occupational Safety and Health Administration

The federal Occupational Safety and Health Administration's (OSHA) mission, as set forth in Title 29 of the Code of Federal Regulations, Section 1910, is to ensure the safety and health of America's workers by setting and enforcing standards; providing training, outreach, and education; establishing partnerships; and encouraging continual improvement in workplace safety and health. OSHA establishes and enforces protective standards and offers technical assistance and consultation programs to employers and employees.

State Regulations

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act was passed in 1990 following the Loma Prieta earthquake to reduce threats to public health and safety and to minimize property damage caused by earthquakes. The act directs the Department of Conservation to identify and map areas prone to the earthquake hazards of liquefaction, earthquake-induced landslides, and amplified groundshaking. For structures intended for human occupancy, the act requires site-specific geotechnical investigations to identify potential seismic hazards and formulate mitigation measures prior to permitting most developments designed for human occupancy within the Zones of Required Investigation. As mentioned above, the CGS has mapped seismic hazards throughout portions of the project area that are susceptible to liquefaction. However, because the proposed project would not involve the construction of any structures for human occupancy, the provisions of this act related to requirements for structures intended for human occupancy do not apply.

Building Codes

The California Building Code (CBC), which is codified in Title 24 of the California Code of Regulations, Part 2, was promulgated to safeguard the public health, safety, and general welfare by establishing minimum standards related to structural strength, egress facilities, and general building stability. The purpose of the CBC is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all building and structures within its jurisdiction. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under State law, all building standards must be centralized in Title 24 or they are not enforceable. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

The CBC is based on the International Building Code (IBC), formerly known as the Uniform Building Code (UBC). The 2010 CBC is based on the 2009 IBC published by the International Code Conference. In addition, the CBC contains necessary California amendments that are based on reference standards obtained from various technical committees and organizations such as the American Society of Civil Engineers (ASCE), the American Institute of Steel Construction, and the American Concrete Institute. ASCE Minimum Design Standard 7-05 provides requirements for general structural design, and includes means for determining earthquake loads as well as other loads (flood, snow, wind, etc.) for inclusion into building codes. Seismic design provisions of the building code generally prescribe minimum lateral forces applied statically to the structure, combined with the gravity forces of dead and live loads. The prescribed lateral forces are generally considered to be substantially smaller than the actual peak forces that would be associated with a major earthquake. Consequently structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some nonstructural damage, and (3) resist major earthquakes without collapse, but with some structural as well as nonstructural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake. However, it is reasonable to expect that a structure designed in-accordance with the seismic requirements of the CBC should not collapse in a major earthquake.

The earthquake design requirements take into account the occupancy category of the structure, site class, soil classifications, and various seismic coefficients, all of which are used to determine a seismic design category (SDC) for a project. The SDC is a classification system that combines the occupancy categories with the level of expected ground motions at the site; SDC ranges from A (very small seismic vulnerability) to E/F (very high seismic vulnerability and near a major fault). Seismic design specifications are determined according to the SDC in accordance with Chapter 16 of the CBC. Chapter 16, Section 1613 provides earthquake loading specifications for every structure, and portion thereof, including nonstructural components that are permanently attached to structures and their supports and attachments, which shall be designed and constructed to resist the effects of earthquake motions in accordance with American Society of Civil Engineers (ASCE) Minimum Design Standards 7-05. Chapter 18 of the CBC covers the requirements of geotechnical investigations (Section 1803), excavation, grading, and fills (Section 1804), load-bearing of soils (1805), as well as foundations (Section 1808), shallow foundations (Section 1809), and deep foundations (Section 1810). Chapter 18 also describes analysis of expansive soils and the determination of the depth to groundwater table. For Seismic Design Categories D, E, and F, Chapter 18 requires analysis of slope instability, liquefaction, and surface rupture attributable to faulting or lateral spreading, plus an evaluation of lateral pressures on basement and retaining walls, liquefaction and soil strength loss, and lateral movement or reduction in foundation soil-bearing capacity. It also addresses measures to be considered in structural design, which may include ground stabilization, selecting appropriate foundation type and depths, selecting appropriate structural systems to accommodate anticipated displacements, or any combination of these measures. The potential for liquefaction and soil strength loss must be evaluated for site-specific peak ground acceleration magnitudes and source characteristics consistent with the design earthquake ground motions.

California Occupational Safety and Health Administration

Similar to the federal OSHA, the California Occupational Safety and Health Administration (Cal-OSHA) regulates worker safety but also requires preparation of an Injury and Illness Prevention Program, an employee safety program of inspections, procedures to correct unsafe conditions, employee training, and occupational safety communication. In addition, Cal-OSHA regulations indirectly protect the public by requiring construction managers to post warnings signs, limit public access to construction areas, and obtain permits for work considered to present a significant risk of injury, such as excavations greater than 5 feet.

Local Regulations

SFPUC General Seismic Design Requirements

While not a codified regulatory requirement, the SFPUC's *General Seismic Design Requirements for Design of New Facilities and Upgrade of Existing Facilities* (SFPUC, 2006) sets forth consistent criteria for the seismic design and retrofit of all facilities and components of the regional water system. In accordance with these design requirements, every project must have specific design criteria based on the seismic environment and importance of the facility in achieving water service delivery goals in the event of a major earthquake.[5] The design criteria are generally based on the referenced codes, standards, and industry publications; however, in some cases, design criteria exceed these requirements for facilities (such as the proposed project) that are located in a severe seismic environment and are needed to achieve water service delivery goals.

Under these design requirements, each proposed facility is assigned a seismic performance class for the purpose of determining appropriate seismic design criteria. Facilities needed to achieve a basic level of service within 24 hours of a major earthquake are assigned a seismic performance

[5] In the *General Seismic Design Requirements*, the term "major earthquake" is defined as an earthquake of Richter magnitude 7.8 or larger on the San Andreas Fault, 7.1 or larger on the Hayward Fault, or 6.8 or larger on the Calaveras Fault.

class of "critical." This class includes structures and components of the storage, distribution, treatment, and control system, either with redundancy or without redundancy, that have common-cause failure modes (such as the same fault crossing) and for which the failure would result in an unacceptable service level. Facilities that may experience damage but should be capable of restoration to service within 30 days are assigned a seismic performance class of "important." This class includes structures and components of the storage, distribution, treatment, and control systems that have some level of redundancy or for which failure would not result in an unacceptable service level.

5.15.3 Impacts and Mitigation Measures

Significance Criteria

For the purposes of this EIR, the Groundwater Supply Project would have a significant effect on geology and soils if it were to:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the state geologist for the area or based on other substantial evidence of a known fault (refer to CDMG Special Publication 42 [2007]),
  - Strong seismic groundshaking,
  - Seismic-related ground failure, including liquefaction,
  - Landslides;
- Result in substantial soil erosion or the loss of topsoil;
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse;
- Be located on expansive soil, as defined in Table 18-1-B of the UBC, creating substantial risks to life or property;
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater; or
- Substantially change the topography or any unique geologic or physical features of the site.

Approach to Analysis

This section describes the impacts that have been screened out from further analysis, and reasons why, and describes the approach to impact analysis.

Due to the nature of the proposed project, there would be no impacts related to the following significance criteria; therefore, no impact discussion is provided for these topics for the reasons described below:

- ***Expose People or Structures to Potential Adverse Effects Involving Rupture of a Known Earthquake Fault.*** Ground rupture is considered most likely to occur along active faults, which are referenced in Table 5.15-1. As indicated previously, the project sites are not located within an Alquist-Priolo Fault Zone, and no mapped active or potentially active faults are known to pass through the project area (Bryant, 2005; Peterson et al., 1996). Therefore, the significance criterion related to exposing people or structures to risk of ground rupture along a fault line is not applicable to the proposed project and is not discussed further.

- ***Result in a Substantial Change to the Topography or Any Unique Geologic or Physical Features of the Site.*** While construction at the West Sunset and South Sunset well facility sites would require excavation into the adjacent slopes to create a flat area for the well facilities, such alterations would not substantially change the topography of the surrounding landscape and would not affect a unique geologic or physical feature. Thus, there would be no impact related to substantial changes to topography or geologic or physical features of the site, and no additional discussion is provided.

- ***Have Soils Incapable of Adequately Supporting the Use of Septic Tanks or Alternative Wastewater Disposal Systems Where Sewers are Not Available for the Disposal of Wastewater.*** The project would not involve the use of septic tanks or alternative wastewater disposal systems. Therefore, the significance criterion related to the presence of soils that are not capable of supporting the use of septic tanks or alternative wastewater disposal systems is not applicable to the proposed project and is not discussed further.

This analysis evaluates the proposed project's potential effects related to geology, soils, and seismicity during project construction and operation according to the significance criteria listed above. The analysis assumes that the SFPUC would design and construct proposed facilities in accordance with its *General Seismic Design Requirements* and the CBC, described above in Section 5.15.2, Regulatory Framework. The *General Seismic Design Requirements*, which are consistent with or more stringent than those contained in the CBC, require a site-specific investigation and development of project-specific design criteria based on the seismic performance class of the facility as well as the site-specific geologic and seismic hazards. The Seismic Performance Class of the West Sunset and North Lake well facilities would be "Critical" (Class III). The Seismic Performance Class of the other four facilities would be "Important" (Class II). While the CBC defines the minimum requirements for seismic resistant design, which has proven to be effective to protect life safety, the SFPUC's *General Seismic Design Requirements* prescribe more stringent requirements depending upon facility importance. To achieve these objectives, the engineering standard outlines the following: geologic, seismic, and geotechnical information needed; analysis methodology appropriate to the facility; preliminary design considerations for gravity loads and seismic loads; and analysis of facilities under seismic loads and code capacities to determine if seismic capacities are adequate (SFPUC, 2006). With implementation of the SFPUC's *General Seismic Design Requirements*, water service delivery goals would be achieved in the event of an earthquake with a magnitude less than or equal to the project's design standard. (Note, however, that water delivery goals might not be met if facilities were damaged in an earthquake with a magnitude that exceeded the project's design standard.)

Impact Summary

Table 5.15-2 summarizes the proposed project's geology and soils impacts and significance determinations.

TABLE 5.15-2
SUMMARY OF IMPACTS AND SIGNIFICANCE – GEOLOGY AND SOILS

Impacts	Significance Determinations
Impact GE-1: The proposed project is not located on a geologic unit that could become unstable as a result of project construction.	LS
Impact GE-2: The proposed project would not result in substantial soil erosion or the loss of topsoil during construction.	LS
Impact GE-3: The proposed project would not expose people or structures to substantial adverse effects related to the risk of property loss, injury, or death due to seismically induced groundshaking.	LS
Impact GE-4: The proposed project would not expose people or structures to substantial adverse effects related to the risk of property loss, injury, or death due to seismically induced ground failure, including liquefaction, lateral spreading, and settlement.	LS
Impact GE-5: The proposed project would not create substantial risks to life or property due to expansive or corrosive soils.	LS
Impact C-GE: Project implementation would not result in cumulatively considerable impacts related to geology, soils, and seismicity.	LS

NOTES:
LS = Less than Significant impact, no mitigation required

Impact Analysis

Construction Impacts

Impact GE-1: The proposed project is not located on a geologic unit that could become unstable as a result of project construction. (Less than Significant)

Natural or constructed slopes could become destabilized during construction-related excavation and/or grading operations. Excavations for the new pipeline and groundwater well facilities could result in slope instability, potentially triggering slope failures that could result in landslides, slumps, soil creep, or debris flows. Slope failures are more likely to occur in areas with a history of previous failure and in weak geologic units exposed on unfavorable slopes. However, as described in Section 5.15.1, Setting, the proposed facilities do not lie within designated landslide zones, and thus landsliding would not be expected. Small landslide hazard areas have been identified adjacent to Sunset Reservoir and the Lake Merced well facility sites, but they are far enough outside of the proposed construction areas that construction activities would not destabilize these geologic units. Pipeline installation would include open-cut excavation to a depth of up to 6 feet, and construction of well facilities at the West Sunset and South Sunset sites would require excavation into the adjacent small hillslopes. Implementation of shoring techniques, as required by OSHA and as part of standard geotechnical practice, would ensure that any impacts related to slope instability during construction would be less than significant.[6]

This discussion is limited to differential settlement impacts related to soil densification. Section 5.16, Hydrology and Water Quality, addresses subsidence of the land surface resulting from groundwater withdrawal. Geotechnical reports (Treadwell & Rollo, 2007, 2008; SFDPW, 2009; AGS, Inc., 2011) indicate that the proposed project sites are generally underlain by loose to medium dense sand that is susceptible to soil densification. Soil densification can lead to land differential settlement as stresses applied to the soil cause air to be displaced between soil grains. However, while soils underlying project facilities are susceptible to densification, engineered fill has been incorporated into the project design that is less susceptible to settlement (see Section 3.4.1, Setting). For this reason, potential settlement impacts would be less than significant.

Impact GE-2: The proposed project would not result in substantial soil erosion or the loss of topsoil during construction. (Less than Significant)

Construction activities such as backfilling, grading, and compaction can remove stabilizing vegetation and expose areas of loose soil that, if not properly stabilized during construction, can be subject to erosion by wind and stormwater runoff, potentially resulting in a significant impact with respect to soils. Although soil erosion is a common construction-related occurrence, especially during wintertime construction activities, project construction activities are subject to the requirements of the San Francisco Green Building Ordinance and Article 4.1 of the San Francisco Public Works Code (see Impact HY-1 in Section 5.16, Hydrology and Water Quality). In accordance with these ordinances and consistent with the SFPUC's Water Pollution Prevention Program, the SFPUC's construction contractor will be required to develop and implement an Erosion and Sediment Control Plan specifying measures to control erosion and prevent stormwater pollution and control runoff at each site to reduce the impact of runoff from the construction area. The plan must include the following information: location and perimeter of the site; location of nearby storm drains and/or catch basins; existing and proposed roadways and drainage pattern within the site; and a drawing or diagram of the sediment and erosion control devices to be used on site. At a minimum, the plan would contain a visual monitoring program and a chemical monitoring program for nonvisible pollutants. The plan would specify minimum

[6] Shoring: techniques used in construction to describe the process of supporting a structure in order to prevent collapse so that construction can proceed. In buildings, vertical supports (shoring) are used to support the beams and floors while a column or wall is removed; in trenches, horizontal supports (shoring) are designed to prevent collapse and speed excavation.

best management practices (BMPs) related to housekeeping (storage of construction materials, waste management, vehicle storage and maintenance, landscape materials, pollutant control); non-stormwater management; erosion control; sediment control; and run-on and runoff control. Additional BMPs could be required for construction of the Lake Merced well facility because it would be constructed near Lake Merced, which supports the identified beneficial uses of fish spawning and cold freshwater habitat. The additional BMPs may include activities such as implementation of more stringent runoff controls; soil stabilization measures for active construction areas; use of linear sediment controls along any exposed slopes; use of designated site access points that employ effective controls to eliminate off-site tracking of sediment; more stringent inspection and record keeping requirements for BMPs implemented at the construction site; and advanced planning for a rain event to ensure that measures are in place to prevent a discharge of sediment or construction-related materials to Lake Merced, and to respond to a release if one occurred. The SFPUC can conduct routine inspection of all BMPs. Implementation of standard erosion control measures in accordance with the Erosion and Control Plan, as required under City ordinances and consistent with the SFPUC's Water Pollution Prevention Program, would ensure that this potential soils impact is less than significant.

Facility Siting, Operations, and Maintenance Impacts

Impact GE-3: The proposed project would not expose people or structures to substantial adverse effects related to the risk of property loss, injury, or death due to seismically induced groundshaking. (Less than Significant)

Groundshaking is the most widespread effect of earthquakes, and poses a greater overall seismic threat than local ground rupture. Depending on the level of groundshaking, distance to the epicenter, and composition of underlying materials, an earthquake could damage pipelines, groundwater wells, and well control facilities, resulting in a disruption of water service and/or endangering the health and welfare of people. Such damage could require short-term temporary service interruptions for inspections and repairs, as well as long-term repairs.

As discussed in Section 5.15.1, Setting, groundshaking during an earthquake in the project area is expected to be quite strong, with peak ground accelerations around 0.67g. Although strong groundshaking could be experienced at any of the project sites, the proposed pipeline and groundwater well facilities would be designed to meet current seismic standards in accordance with the SFPUC's *General Seismic Design Requirements* and the CBC, as described above, thereby ensuring that project facilities are appropriately designed to withstand seismic damage due to groundshaking. Therefore, given compliance with the *General Seismic Design Requirements*, potential seismic impacts related to groundshaking would be less than significant.

Impact GE-4: The proposed project would not expose people or structures to substantial adverse effects related to the risk of property loss, injury, or death due to seismically induced ground failure, including liquefaction, lateral spreading, and settlement. (Less than Significant)

Damage from liquefaction and lateral spreading is generally most severe from liquefaction of materials located within 15 to 20 feet of the ground surface. Where pipelines are buried in soil overlying deeper liquefiable soil layers, liquefaction of the deeper layers can result in substantial lateral spreading of the upper competent soil layer. Lateral spreading can extend several hundred feet from a slope, and displacements of tens of feet can occur if soil conditions are especially favorable for liquefaction and if earthquake shaking is of sufficient duration. Lateral spreading was responsible for most of the pipeline failures that occurred in San Francisco during the 1989 Loma Prieta earthquake (San Francisco Planning Department, 2008).

During an earthquake, underground utilities tend to fail at the interface between a softer unit and a stiffer unit due to the settlement that occurs within the softer unit, a phenomenon known as differential settlement. Differential settlement is a concern because it can cause uneven movement of pipelines and building foundations, resulting in substantial damage, including cracks and breakage (San Francisco Planning Department, 2008).

As discussed in Section 5.15.1, Setting, liquefaction zones were not identified in the project area, with the exception of the Lake Merced well facility site (in an area now overlain by artificial fill). The geotechnical investigation (Treadwell & Rollo, 2007) confirmed a high potential for seismically induced liquefaction, densification, and lateral spreading at this site. Some seismically induced ground settlement is anticipated to occur at the other groundwater well facility locations due to the loose to medium dense soils underlying these sites (Treadwell & Rollo, 2008; SFDPW, 2009; AGS, Inc., 2011). In addition, differential settlement on the order of 1 inch over a 20-foot section of the entire pipeline segment is estimated to occur during a strong seismic event (SFDPW, 2011).

As discussed above, all project facilities would be designed to meet current seismic standards in accordance with the *General Seismic Design Requirements*, thereby improving the ability of the pipeline and groundwater well facilities to withstand seismic damage due to liquefaction and related phenomena. Therefore, given compliance with the *General Seismic Design Requirements,* potential impacts related to seismically induced ground failure, including liquefaction, lateral spreading, and settlement, would be less than significant.

Impact GE-5: The proposed project would not create substantial risks to life or property due to expansive or corrosive soils. (Less than Significant)

Expansive Soils

As described in Section 5.15.1, Setting, the project would be located on soils with a low shrink-swell potential; therefore, potential impacts related to expansive soils would be less than significant at these sites.

Corrosive Soils

As described in Section 5.15.1, Setting, the geotechnical investigations conducted for the proposed project concluded that project area soils have a mild to moderate corrosion potential, and advised that all buried ductile iron or steel pipelines be protected against corrosion. Because corrosion protection measures have been incorporated into the design of the groundwater pipeline (see Section 3.4.2, Pipeline Construction), this potential impact would be less than significant.

Cumulative Impacts

Impact C-GE: Project implementation would not result in cumulatively considerable impacts related to geology, soils, and seismicity. (Less than Significant)

The geographic scope for the analysis of potential cumulative geologic and soils impacts is limited to the immediate vicinity around the project sites. Impacts related to geologic and seismic hazards are generally site-specific and depend on the localized geology and soil conditions. As a result, they are not typically additive or cumulative in nature. Therefore, of the cumulative projects listed in Table 5.1-6 and Figure 5.1-1 in Section 5.1.4, Cumulative Impacts, only one project (the Lake Merced Pump Station Essential Upgrade) substantially overlaps with the Groundwater Supply project facilities. This project would have similar facility siting, operations and maintenance impacts related to potential groundshaking, ground failure, and expansive soils as the proposed project. However, because the both of these projects would be designed to meet current seismic standards in accordance with the *General Seismic Design Requirements*, described above, which would ensure that facilities are constructed in accordance with the CBC and appropriate SFPUC design standards, the Lake Merced Pump Station Upgrade Project, in combination with the Groundwater Supply Project, would not result in a significant cumulative impact.

The proposed project and all of the cumulative projects listed in Table 5.1-6 that involve ground disturbance could contribute to a potential cumulative impact related to erosion and loss of topsoil during construction. As described above under Impact GE-2, each project would be required to prepare and implement an Erosion and Sediment Control Plan to reduce erosion and topsoil loss. Accordingly, no significant cumulative impact would result from the cumulative scenario to which the proposed project's incremental impact could contribute.

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5.16 Hydrology and Water Quality

This section describes the existing conditions and regulatory framework for hydrology and water quality in the project area for the Groundwater Supply Project and assesses potential impacts on hydrology and water quality that could result from implementation of the proposed project. For project construction, the surface water effects would generally be associated with construction-related stormwater runoff and discharges; therefore, the study area is restricted to the individual well facility sites, Sunset Reservoir facilities, and the pipeline alignments. For project operation, surface water effects would be related to stormwater runoff from the well facilities, but groundwater and surface water effects could also occur in the Westside Groundwater Basin as a whole because of project-related groundwater pumping. Therefore, for the analysis of impacts associated with withdrawals of groundwater from the basin, the study area encompasses the Westside Groundwater Basin.

5.16.1 Setting

This section presents information on the physical setting of the project area and provides the basis for the impact analyses presented in Section 5.16.3, Impacts and Mitigation Measures. Specifically, this section describes:

- The topography of the project area.
- The climate of the project area.
- The Westside Groundwater Basin, including regional geology, the aquifer system, the existing monitoring network, groundwater levels and flow directions, historical and existing groundwater uses, groundwater quality, the history of land subsidence, and conditions related to seawater intrusion.
- Surface water features in the North Westside Groundwater Basin, including Lake Merced, Pine Lake, and Golden Gate Park lakes.
- California Department of Public Health Drinking Water Source Assessment and Protection (DWSAP) program reports prepared for each of the planned groundwater production wells to identify potentially contaminating activities that could affect the wells.
- The In-Lieu Recharge Demonstration study conducted by the SFPUC to evaluate the effects of the groundwater recharge component of a conjunctive-use program planned in the southern portion of the Westside Groundwater Basin.
- Storm sewer systems within the project area including San Francisco's combined sewer system and a separate storm sewer system located at Lake Merced.
- Potential flood zones in the project area under existing conditions; in the event of a tsunami; and with the rise in sea level projected to occur due to climate change.

Topography

The project facilities would be located in the western portion of San Francisco in the Outer Sunset and Outer Parkside neighborhoods, within Golden Gate Park and at Lake Merced. The topography of this area is relatively level, with a gentle slope to the west and a topographic gradient of approximately 50 feet per mile (USGS, 1980). During the city's development, the placement of artificial fills in former drainage channels near the proposed Lake Merced well facility reduced topographic variation, although the overall gradient in this specific area also slopes to the west.

Climate

The Bay Area has a Mediterranean climate, with cool dry summers and mild wet winters. Based on meteorological data collected between 1914 and 2010, the mean annual precipitation in San Francisco is approximately 21.1 inches, with 84 percent occurring between November and March (WRCC, 2011). The mean annual temperature is 63.6 degrees Fahrenheit (°F), with the minimum mean monthly temperature occurring in January (45.6 °F) and the maximum mean monthly temperature occurring in September (69.8 °F).

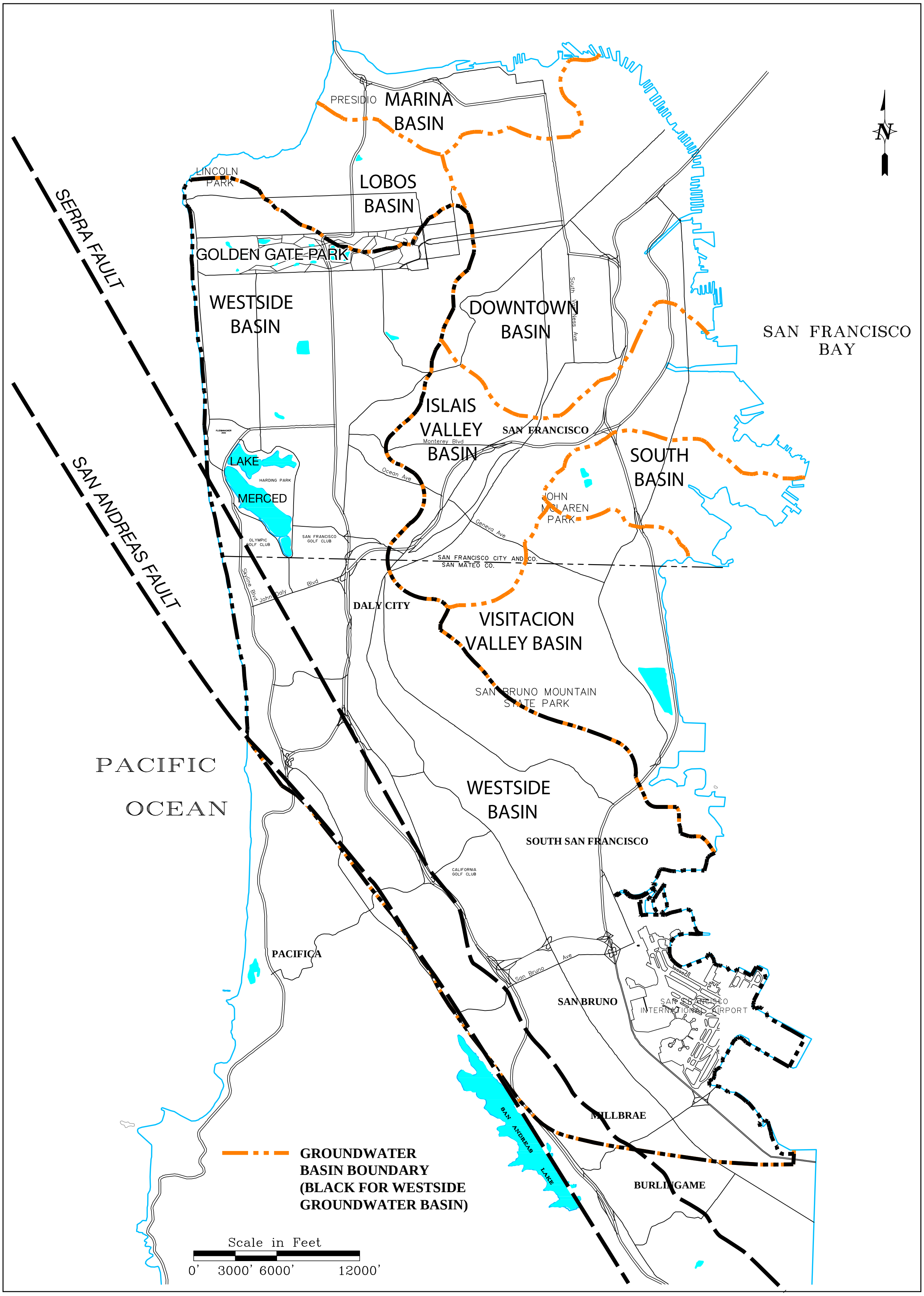
Vertical Datum used in San Francisco

Elevations in San Francisco are commonly referenced to three vertical datums, including the North American Vertical Datum of 1988 (NAVD 88), the National Geodetic Vertical Datum of 1929 (NGVD 29), and the San Francisco City Datum (City Datum). NAVD 88 was established in 1991 and is the most up-to-date and accurate datum. NGVD 29 was used by surveyors and engineers for most of the 20th century and is 2.76 feet lower than NAVD 88. The San Francisco City Datum was set at 6.7 feet above the city's former high water mark and is 11.38 feet higher than NAVD 88 and 8.62 feet higher than NGVD 29. Lake Merced elevations have commonly been referenced to the City Datum. The technical reports prepared in support of the Groundwater Supply Project used all three datums; therefore, for consistency, this EIR uses the same datum employed in a given technical report when discussing information obtained from that report.

Westside Groundwater Basin

The Westside Groundwater Basin is one of seven groundwater basins underlying San Francisco (see **Figure 5.16-1**). This groundwater basin underlies most of western San Francisco and extends from the western portion the city south to the eastern portion of San Mateo County (DWR, 2006). With an area of about 45 square miles, the Westside Groundwater Basin is the largest in San Francisco and was selected for development as a groundwater supply because it has the highest development potential based on the lateral extensiveness of the basin, thickness of the aquifer,[1] existing water quality, the amount of recharge to the basin, and the relative absence of clay layers

[1] An aquifer is a geologic unit that transmits and stores water and can yield a substantial quantity of water to wells and/or springs. In the Westside Groundwater Basin, aquifer materials are typically sand ranging in grain size from medium to fine.



SOURCE: LSCE, 2010a

Figure 5.16-1
Westside Groundwater Basin Location Map

that could contribute to subsidence effects (SFPUC, 1997). The Westside Groundwater Basin is separated from the Lobos Basin to the north by a northwest-trending bedrock ridge through the northeastern part of Golden Gate Park. San Bruno Mountain and San Francisco Bay form the eastern boundary, and the San Andreas Fault and Pacific Ocean form the western boundary. The southern limit of the Westside Groundwater Basin is defined by an area of high bedrock that separates it from the San Mateo Plain Groundwater Basin. The basin opens to the Pacific Ocean on the northwest and San Francisco Bay on the southeast.

No geologic features restrict groundwater flow between the northern and southern parts of the groundwater basin. For discussion purposes, the 14-square-mile portion of the Westside Groundwater Basin north of the San Francisco/San Mateo County line is referred to in this EIR as the North Westside Groundwater Basin, and the 31-square-mile portion of the Westside Groundwater Basin south of the San Francisco/San Mateo County line is referred to as the South Westside Groundwater Basin. The south part of the basin underlies Daly City, Colma, South San Francisco, San Bruno, Millbrae, and parts of Burlingame and Hillsborough. Conditions in the two parts of the basin are different, and groundwater from the South Westside Groundwater Basin has been developed as a municipal water supply.

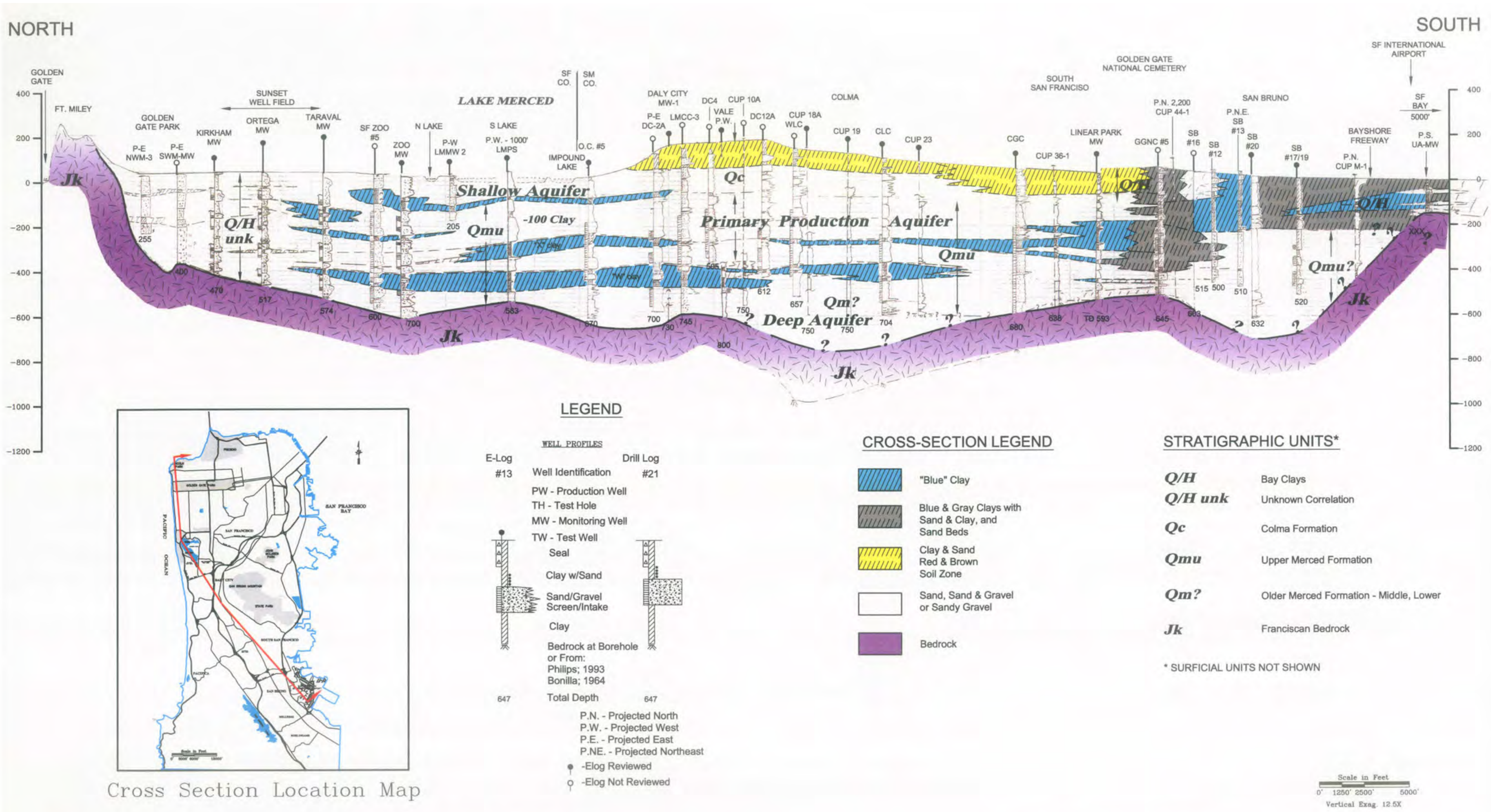
Regional Geology

This section supplements the regional geologic information presented in Section 5.15, Geology and Soils, by providing a description of the major geologic units related to groundwater conditions throughout the Westside Groundwater Basin. The five major geologic units in the Westside Groundwater Basin are the Mesozoic-age Franciscan Complex, Pleistocene-age Merced and Colma Formations, and the Pleistocene to recent Dune Sands and Bay Mud deposits (LSCE, 2010a). There are also minor but widespread units of recent alluvium along historical stream channels.

Exposed in the low hills east and northeast of Lake Merced, the Franciscan Complex forms the basement rock for the aquifer system that defines the lateral and vertical limits of the primary groundwater-bearing formations in the Westside Groundwater Basin.[2] To the north of Lake Merced, the bedrock slopes gently westward towards the Pacific Ocean, and beneath Golden Gate Park is an apparent buried stream valley that has created a thicker accumulation of sediment in that area. South of Lake Merced, the surface of the bedrock slopes southwestward to Daly City, occurring at depths of almost 600 feet near the center of Lake Merced and nearly 1,000 feet beneath the southern portion of Daly City. Less is known about the bedrock configuration beneath the ocean to the west of the Westside Groundwater Basin.

The Merced Formation is a 5,000-foot-thick sequence of shallow marine and non-marine deposits comprising three units (lower, middle, and upper). It is the deepest water-bearing formation overlying the basement rock (see **Figure 5.16-2**). The lower unit of the Merced Formation is about 4,000 feet thick and is composed of fine sandstone to siltstone. This unit is strongly to moderately deformed and shows some evidence of folding. The middle unit of the Merced Formation is up to

2 Basement rock is impermeable bedrock that restricts groundwater flow, forming the vertical boundary of a groundwater basin and sometimes the lateral boundary.



SOURCE: LSCE, 2010a

San Francisco Groundwater Supply Project EIR

Figure 5.16-2
North-South Geologic Cross Section
Westside Groundwater Basin

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about 600 feet thick and is composed of more thinly bedded, near-shore marine, beach, estuary, dune, and fluvial deposits of fine sandstone, siltstone, and mudstone. The middle unit of the Merced Formation is moderately deformed, with some evidence of folding and a steeper dip near the Serra Fault. The upper unit of the Merced Formation is approximately 500 feet thick and consists of a sequence of thinly bedded beach, dune, estuarine, and fluvial deposits of weakly consolidated fine sandstone with some gravel and mudstone beds. This unit is only deformed in a minor fashion. A thick clay unit referred to as the "W" clay layer occurs within the upper portion of the Merced Formation.

The Colma Formation and Dune Sands constitute the majority of the surficial geologic units in the North Westside Groundwater Basin. The Colma Formation is a surficial unit consisting of fine- to medium-grained sand with some clay, silt, and gravel beds of fluvial, floodplain, alluvial fan, and Dune Sand origin. It is exposed from Lake Merced south to San Bruno, and the maximum thickness is 200 feet. The separation between the Colma Formation and the Merced Formation is not clearly defined because of the similarity in the geologic materials making up the units.

Dune Sands are a surficial unit of fine- to medium-grained sands that are exposed across the San Francisco Peninsula north of Lake Merced. Because of the similarity in geologic materials making up the Dune Sands and older formations, the thickness of this unit is not well defined.

The Bay Mud deposits generally consist of clays and silts with some sand. In the Westside Groundwater Basin, the extent of this surficial unit is limited to the San Francisco Bay shore in the South Westside Groundwater Basin.

There are two primary structural features affecting the groundwater basin: the San Andreas Fault System and the Serra Fault (Figure 5.16-1). The northwest-trending San Andreas Fault System, defining the southwest boundary of the Westside Groundwater Basin, is an active right-lateral, strike-slip fault with the west side moving northward relative to the east side. The Serra Fault parallels the San Andreas Fault and is a southwest-dipping reverse fault with the west side thrusting upward relative to the east side. The fault extends from south of San Bruno to the Olympic Club area and then moves offshore. The onshore area between the Serra Fault and the San Andreas Fault is referred to as the Serra Block.

The ocean floor dips gently westward offshore of the Westside Groundwater Basin, with ocean depths reaching only 60 feet at 2 miles offshore, 100 feet at 8 miles offshore, and 300 feet at 25 miles offshore at the edge of the continental shelf. The continental shelf is underlain by a thick sequence of Quaternary- and Tertiary-age sedimentary deposits and is crossed by the San Andreas Fault approximately 2 miles offshore (and possibly by the Serra Fault as well). These faults may act as hydraulic barriers and, combined with the thick sequence of sedimentary rocks beneath the ocean floor, may preclude direct communication between the water-bearing units of the Westside Groundwater Basin and the Pacific Ocean.

Shallow Aquifer, Primary Production Aquifer, and Deep Aquifer

The Westside Groundwater Basin contains three aquifers known as the Shallow Aquifer, Primary Production Aquifer, and Deep Aquifer, as shown on Figure 5.16-2 (LSCE, 2010a). In the North Westside Groundwater Basin, the unconfined[3] Shallow Aquifer is present to a depth of about 100 feet. In the Lake Merced area and southern portion of the Sunset District, south to Daly City, this aquifer is separated from the Primary Production Aquifer by a clay layer referred to as the "-100-foot" clay layer. The Primary Production Aquifer is at least partially confined[4] and is separated from the Deep Aquifer by the "W" clay layer. The Primary Production Aquifer also includes two discontinuous clay layers referred to as the "X" and "Y" clay layers that may locally restrict groundwater flow within the aquifer. The Deep Aquifer underlies the "W" clay layer.

The "-100-foot" clay layer and "W" clay layer extend north to the vicinity of the proposed West Sunset well facility and are absent from that point to the northern extent of the groundwater basin. Because these clay layers are absent, the aquifers are hydraulically connected and can effectively be considered one aquifer beneath Golden Gate Park and other areas to the north of the proposed West Sunset well facility. Although the aquifers are connected to the north of the proposed West Sunset well facility, for the purposes of this EIR the shallow portion of the aquifer in this area of the basin is referred to as the Shallow Aquifer and the deeper portion of the aquifer is referred to as the Primary Production Aquifer.

The Shallow Aquifer is absent in the South Westside Groundwater Basin from Daly City to the south. The Serra Fault separates the areas to the west of the fault from the remainder of the groundwater basin.

Existing Monitoring Network and Program

The SFPUC has implemented a groundwater monitoring program in the Westside Groundwater Basin to evaluate groundwater elevations and quality, along with water elevations in Lake Merced. The wells that make up the current monitoring network in the North Westside Groundwater Basin are listed in **Table 5.16-1** and shown in **Figure 5.16-3** (SFPUC, 2012a). The monitoring system includes a single well or clusters of two or more wells at 19 locations. Groundwater levels in each well are monitored continuously using pressure transducers or are measured quarterly by hand.

Generally, each of the wells in the North Westside Basin is included as part of the coastal monitoring network or lake-aquifer monitoring network. The groundwater monitoring network also includes nested wells at Fort Funston and a well cluster at Thornton Beach, as well as several wells used for measuring groundwater elevations and monitoring groundwater quality in the North Westside Groundwater Basin. These wells are referred to as "Other Wells" on Figure 5.16-3.

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3 An unconfined aquifer is not overlain by a confining layer, such as a clay layer, and the aquifer is not under pressure.

4 A confined aquifer is overlain by a relatively impermeable layer, such as a clay layer, and the water in the aquifer is confined under pressure.

TABLE 5.16-1
EXISTING NORTH WESTSIDE GROUNDWATER BASIN MONITORING NETWORK

Well	Aquifer Monitored	Elevation Monitoring Frequency	Included in Elevation Contouring?	General Aquifer Monitoring Frequency	Iron/Manganese Water Quality Monitoring Frequency
Coastal Monitoring Network					
USGS South Windmill MW57	Shallow	C	Y	–	–
Kirkham MW130	Shallow	C	Y	–	–
Ortega MW125	Shallow	C	Y	–	–
Taraval MW145	Shallow	C	Y	–	–
USGS South Windmill MW140	Shallow and Primary Production	C	–	–	–
Kirkham MW255	Primary Production	Q	Y	–	–
Kirkham MW385	Primary Production	Q	–	–	–
Ortega MW265	Primary Production	Q	Y	–	–
Ortega MW400	Primary Production	Q	–	–	–
Taraval MW240	Primary Production	Q	Y	–	–
Taraval MW400	Primary Production	Q	–	–	–
Zoo MW275	Primary Production	C	Y	–	–
Zoo MW450	Primary Production	Q	–	–	–
Kirkham MW435	Deep	C	–	–	–
Ortega MW475	Deep	C	–	–	–
Taraval MW530	Deep	C	–	–	–
Zoo MW565	Deep	C	–	–	–
Lake-Aquifer Monitoring Network					
LMMW-1S	Shallow	C	Y	S	–
LMMW-2SS	Shallow	Q	–	–	–
LMMW-2S	Shallow	Q	Y	S	–
LMMW-3SS	Shallow	C	–	–	–
LMMW-3S	Shallow	Q	Y	S	–
LMMW-4SS	Shallow	Q	–	*	–
LMMW-4S	Shallow	C	Y	–	–
LMMW-5SS	Shallow	C	–	–	–
LMMW-5S	Shallow	C	Y	–	–
LMMW-7SS	Shallow	Q	Y	*	–
LMMW-8SS	Shallow	Q	Y	–	–
Lake Merced Pump Station MW155	Shallow	Q	–	*	*
LMMW-1D	Primary Production	C	Y	S	–

TABLE 5.16-1 (Continued)
EXISTING NORTH WESTSIDE GROUNDWATER BASIN MONITORING NETWORK

Well	Aquifer Monitored	Elevation Monitoring Frequency	Included in Elevation Contouring?	General Aquifer Monitoring Frequency	Iron/Manganese Water Quality Monitoring Frequency
Lake-Aquifer Monitoring Network (cont.)					
LMMW-2D	Primary Production	C	Y	S	–
LMMW-3D	Primary Production	C	Y	S	–
LMMW-6D	Primary Production	C	Y	S	–
Lake Merced Pump Station MW270	Primary Production	C	Y	*	*
Lake Merced Pump Station MW440	Primary Production	C	–	*	*
Lake Merced Pump Station MW575	Deep	Q	–	*	–
Fort Funston Area					
Fort Funston - S	Upper Merced Formation	Q	–	–	*
Fort Funston - M	Middle Merced Formation	Q	–	–	*
Thornton Beach MW225	Middle Merced Formation	Q	–	–	*
Thornton Beach MW360	Middle Merced Formation	Q	–	–	*
Thornton Beach MW670	Lower Merced Formation	Q	–	–	*
Other Wells					
Central Pump Station (CPS) MW190	Shallow	Q	–	*	*
LMMW-9SS	Shallow	C	Y	–	–
Central Pump Station (CPS) MW270	Primary Production	Q	Y	*	*
SF#41 – West Sunset Playground	Primary Production	Q	Y	S	*
Other Wells Historically Sampled (Locations not shown on Figure 5.16-3)					
SF#01 Arboretum 5	Primary Production[a]	–	–	–	*
SF#02 Edgewood School	Shallow and Primary Production	–	–	*	*
SF#03 Elk Glen 2	Primary Production	–	–	*	*
SF#17 - (NE) Windmill	Primary Production	–	–	*	*
SF#18 - New GG Park (N) Lake	Primary Production	–	–	*	*
SF#19 - New GG Park (S) Windmill	Primary Production	–	–	*	*

TABLE 5.16-1 (Continued)
EXISTING NORTH WESTSIDE GROUNDWATER BASIN MONITORING NETWORK

Well	Aquifer Monitored	Elevation Monitoring Frequency	Included in Elevation Contouring?	General Aquifer Monitoring Frequency	Iron/Manganese Water Quality Monitoring Frequency
Other Wells Historically Sampled (Locations not shown on Figure 5.16-3) (cont.)					
SF#20 - (NW) Windmill	Primary Production	–	–	*	*
SF#22 – Olympic Club #8	Primary Production and Deep	–	–	*	–
SF#23 – Pine Lake Production Well	Shallow	D	D	D	D
SF#24 - (S) Sunset Playground	Primary Production	D	D	D	D
SF#25 - (S) Windmill	Primary Production	–	–	*	*
SF#38 USGS (S) Windmill (D)	Primary Production	NA	NA	NA	NA
SF#44 Zoo 05	Primary Production and Deep	v	–	–	*
Zoo 04	Primary Production[a]	D	D	D	D

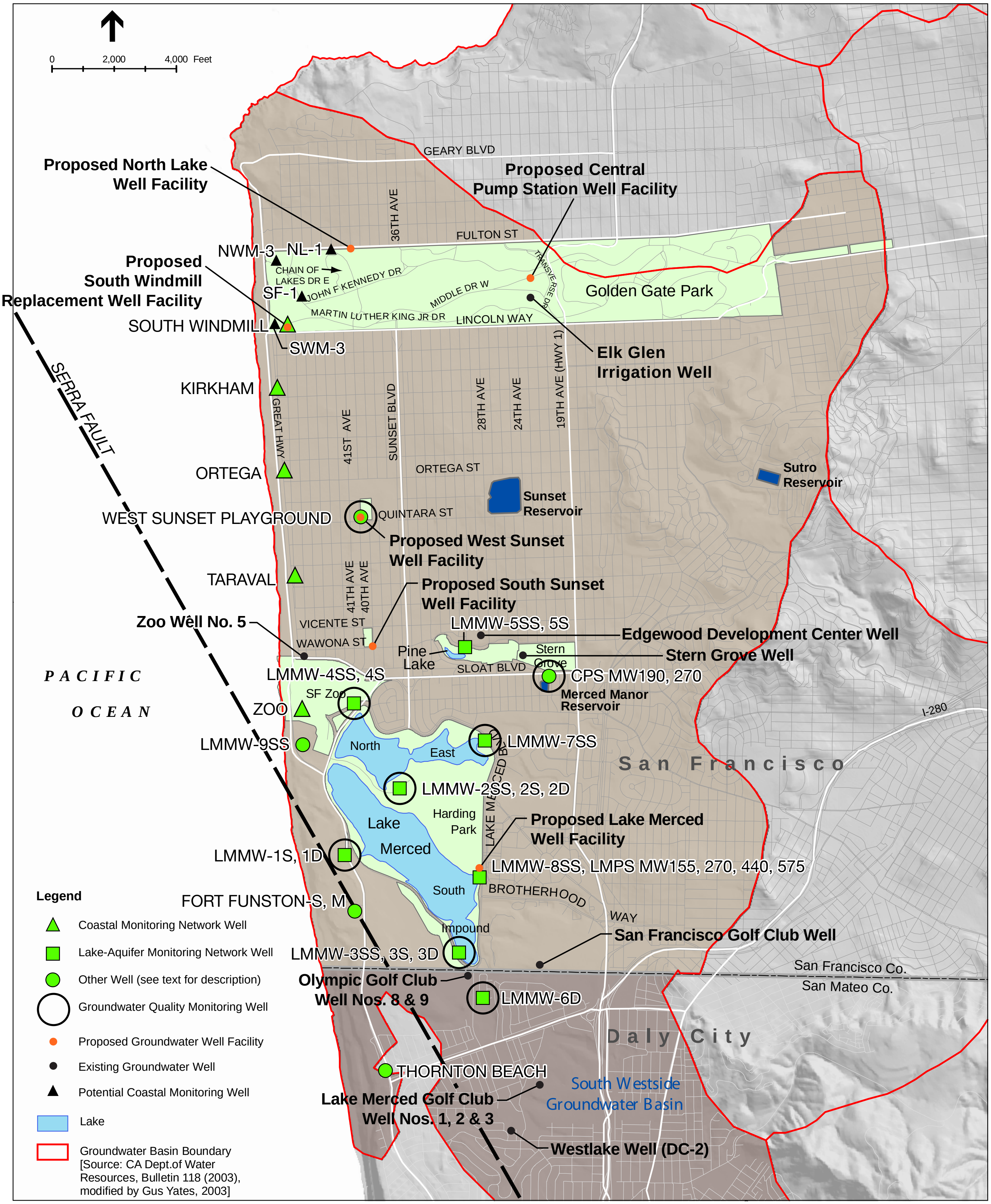
[a] Detailed construction information is not available for wells SF#01 Arboretum 5 or Zoo 04, but based on their total depth, the SFPUC has estimated that they monitored the Primary Production Aquifer (SFPUC, 2012b).

NOTES:
C = Continuous groundwater level monitoring with a transducer.
Q = Quarterly groundwater level measurements collected by hand.
Y = Well is included in the elevation contouring.
S = Semiannual groundwater quality monitoring is conducted at this well.
* = Well is monitored at an irregular frequency.
– = Well is not included in the program indicated.
D = Well has been destroyed (decommissioned).
NA = Well is no longer accessible.

SOURCE: SFPUC, 2012a.

The coastal monitoring network, which extends from the western end of Golden Gate Park south to the vicinity of Lake Merced, consists of five locations along the Pacific Coast (South Windmill, Kirkham, Ortega, Taraval, and San Francisco Zoo). Each of these monitoring locations includes two to four individual monitoring wells completed at different depths to monitor groundwater quality in the Shallow, Primary Production, or Deep Aquifers. Each well in the coastal monitoring network is sampled for water quality parameters that are indicative of the potential for seawater intrusion, including chloride, total dissolved solids (TDS), and specific conductance.[5] Groundwater-level monitoring of the zoo wells began in 2002; monitoring of the other four well clusters began in 2004, when the coastal monitoring network wells were first installed.

[5] Specific conductance is a measure of the ability of water to conduct an electrical current. It is highly dependent on the amount of dissolved solids (such as salt) in the water.



SOURCE: SFPUC, 2010; LSCE, 2012

San Francisco Groundwater Supply Project EIR

Figure 5.16-3
Well Location Map

The lake-aquifer monitoring network provides continuous monitoring of water levels in South Lake and includes a dedicated network of seven groundwater monitoring well clusters around Lake Merced that are screened in the Shallow, Primary Production, or Deep Aquifers. At least one well in each well cluster is screened in the Shallow Aquifer. At some locations two wells are completed in the Shallow Aquifer, with one well in the shallower part of the aquifer (designated in Figure 5.16-3 with an "SS") and one well in the deeper portion of that aquifer (designated with an "S"). There are five locations that include monitoring wells in the Primary Production Aquifer, and one location that includes a monitoring well in the Deep Aquifer. One well cluster (LMMW-5SS and -5S) is located near Pine Lake, and both wells are completed in the Shallow Aquifer. The SFPUC monitors water levels in Lake Merced continuously.

In addition to those wells that are currently part of the groundwater monitoring network, the SFPUC has identified several existing groundwater wells in the Golden Gate Park area that have been used in the past for groundwater monitoring. These include wells NL-1, SF-1, SWM-3, and NWM-3 shown on Figure 5.16-3 (SFPUC, 2010b). The SFPUC has confirmed the location of wells NL-1 and SF-1 and determined that they are operational. Well NL-1 is screened between depths of 110 and 320 feet below ground surface, and well SF-1 is screened between 110 and 240 feet below ground surface (similar to the North Lake well, which is screened between 140 and 320 feet below ground surface). The SFPUC has confirmed the location of wells SWM-3 and NWM-3 but has not confirmed that they are operational. SWM-3 is likely screened between 100 and 200 feet below ground surface (similar to the South Windmill Replacement well, which is screened between 120 and 260 feet below ground surface). NWM-3 is likely screened between 90 and 230 feet below ground surface.

Groundwater is sampled semiannually to monitor general water quality in the groundwater basin at five locations, including four locations near Lake Merced and one at the West Sunset Playground well. Three of the locations near Lake Merced include both a Shallow Aquifer and Primary Production Aquifer monitoring well. The monitored parameters include total alkalinity, calcium, magnesium, sodium, potassium, bicarbonate, hardness, chloride, nitrate, sulfate, TDS, pH, and specific conductance. In addition, some wells have been monitored for iron and manganese.

One cluster of three wells at Thornton Beach is used to monitor groundwater levels in the middle and lower Merced Formation. Two nested wells at Fort Funston are used to monitor groundwater levels in the upper and middle Merced Formation in this area.

The SFPUC conducts water quality monitoring in Lake Merced on a quarterly basis at four locations identified as North, Northeast, South – Pistol Range, and South – Pump Station. The monitored parameters are:

- Algal Biomass
- Alkalinity
- Ammonium
- Chloride
- Chlorophyll
- Conductivity
- Dissolved oxygen
- Nitrate
- Orthophosphate
- Oxidation-reduction potential
- pH
- Plankton
- Secchi depth
- Temperature

- Escherichia coli (E. Coli)
- Fluoride
- Hardness
- Iron
- Lead
- Manganese
- Methyl tertiary-butyl ether (MTBE)
- Total coliform
- Total dissolved solids
- Total Kjeldahl nitrogen
- Total organic carbon
- Total phosphorus
- Turbidity

Groundwater Levels and Flow Directions

North Westside Groundwater Basin

Prior to the early 1940s, water levels in the North Westside Groundwater Basin and in the northern portion of San Mateo County were above sea level, with a northwesterly gradient in the Shallow and Primary Production Aquifers (SFPUC, 2005). **Appendix D-**1 presents hydrographs showing historical groundwater levels in each well within the groundwater monitoring network. Based on regular groundwater monitoring conducted in the North Westside Groundwater Basin since 2004, groundwater levels along the Pacific Coast and north of Lake Merced have generally remained above sea level in the Shallow and Primary Production Aquifers, with occasional exceptions near the San Francisco Zoo and at the South Windmill location in Golden Gate Park (SFPUC, 2012a). At the San Francisco Zoo, groundwater levels in the Primary Production Aquifer have generally ranged from approximately 2 feet NAVD88 to 8 feet NAVD88 and have generally been on the rise since 2004. At this location, there were brief excursions below sea level (to a maximum of approximately 1.5 feet below sea level) in 2004, 2006, and 2007, probably due to pumping at the zoo. At the South Windmill location, Primary Production Aquifer levels have periodically decreased to below sea level due to irrigation pumping at the South Windmill well.

To the south of Lake Merced, Primary Production Aquifer groundwater levels in LMMW-3D and LMMW-6D[6] have historically been below sea level, probably due to pumping in the adjacent South Westside Groundwater Basin and golf courses (SFPUC, 2012a). Groundwater levels in LMMW-3D show seasonal fluctuations, and groundwater levels in both wells have been increasing overall since 2003. Deep Aquifer levels in the North Westside Groundwater Basin have historically been below sea level at some locations, but as of 2007 were generally on the rise.

Groundwater levels generally remained stable or increased from 2004 through 2010, but declined slightly in 2011 (SFPUC, 2012a). The overall increase is possibly due to decreased pumping from the groundwater basin, including reduced golf course irrigation pumping in the vicinity of Lake Merced and reduced municipal pumping in the South Westside Groundwater Basin (discussed below under the heading “In-lieu Recharge Demonstration Study”).

[6] Monitoring Well LMMW-6D is located in the South Westside Groundwater Basin, but is discussed here because this well is part of the Lake-Aquifer Monitoring Network.

In the fall of 2011, the groundwater flow direction in the Shallow Aquifer of the North Westside Groundwater Basin was westerly (see **Figure 5.16-4**), and groundwater elevations ranged from approximately 4 to 38 feet NAVD 88. In the vicinity of Lake Merced and to the north, the groundwater flow direction in the Primary Production Aquifer was also westerly (see Figure 5.16-4), and groundwater levels ranged from approximately 7 to 77 feet NAVD 88. South of Lake Merced, the groundwater flow direction in the Primary Production Aquifer shifted to the south towards the South Westside Groundwater Basin, and groundwater levels dipped to approximately -13 feet NAVD 88 at LMMW-6D (a groundwater monitoring well located just south of the North Westside Groundwater Basin).

The coastal monitoring wells at Fort Funston, which are located west of the Serra Fault, indicate groundwater elevations above sea level in both the upper and middle portions of the Merced Formation. The coastal monitoring wells at Thornton Beach, which are also located west of the Serra Fault, indicate groundwater elevations above sea level in both the middle and lower portions of the Merced Formation. The Merced Formation at these locations appears to have been uplifted relative to the Merced Formation east of the Serra Fault, and is hydraulically separated from the main portion of the Westside Groundwater Basin by the fault and the steeply dipping geologic units, which act as hydraulic barriers to flow (LSCE, 2010a).

South Westside Groundwater Basin

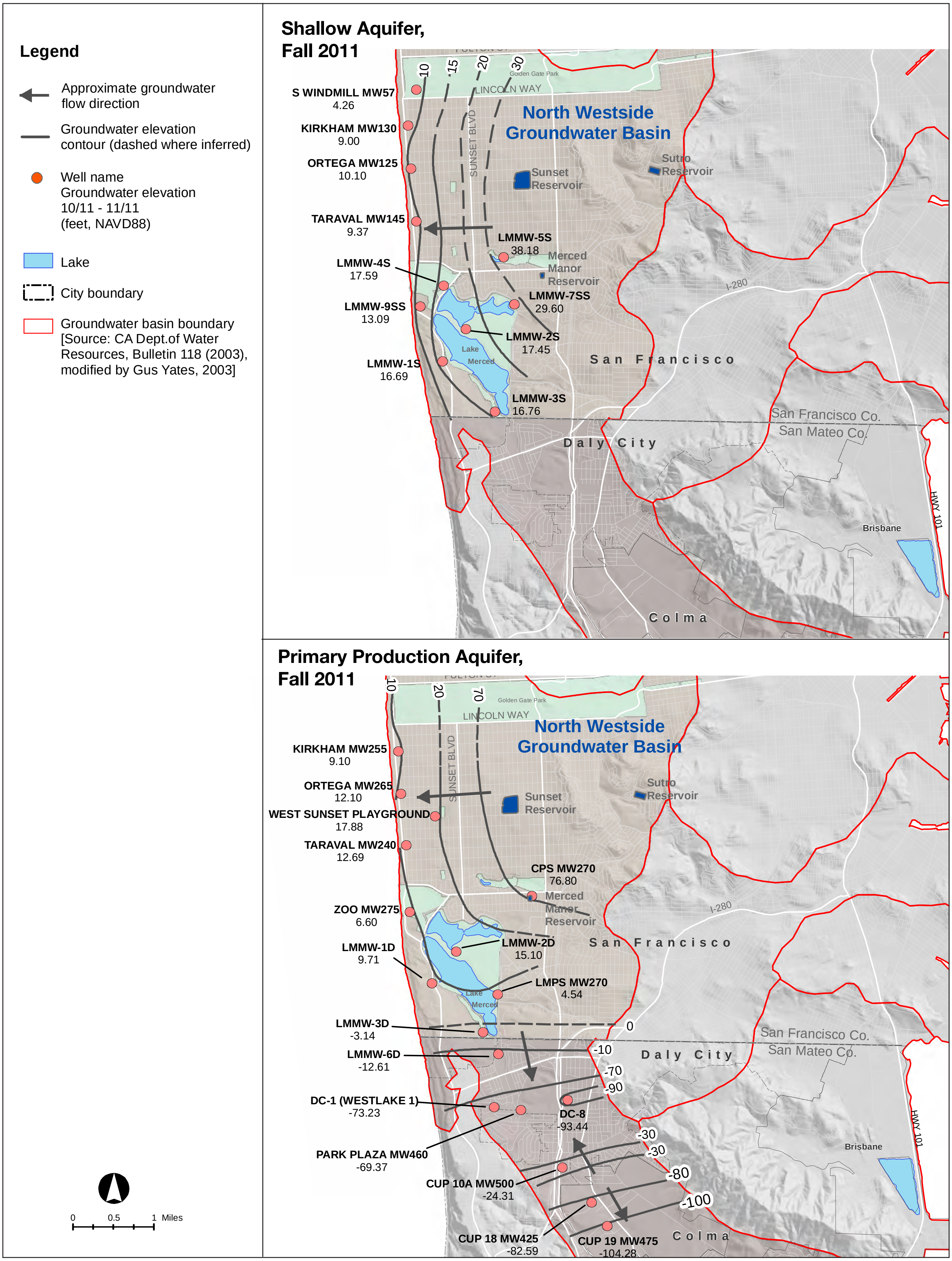
Beginning in the 1950s and 1960s, groundwater levels in the South Westside Groundwater Basin declined to below sea level. This decline continued into the 1970s, after which groundwater levels stabilized at elevations of more than 100 feet below mean sea level, resulting in vacated aquifer storage[7] of up to 75,000 acre-feet in the Daly City, South San Francisco, and northern San Bruno areas (Kirker, Chapman & Associates, 1972; LSCE, 2005).

In 2005, groundwater elevations in the Primary Production Aquifer in the South Westside Groundwater Basin ranged from approximately -8 feet NAVD 88 immediately south of Lake Merced to -102 feet NAVD 88 in Daly City and -75 feet NAVD 88 in South San Francisco. At that time, groundwater flow in the vicinity of Lake Merced continued to be to the south; the steepest groundwater gradient was between Lake Merced and Daly City (LSCE, 2006). On the bayside, groundwater levels in the Primary Production Aquifer beneath San Bruno were approximately -180 feet NAVD 88 in 2005.

Historical and Existing Groundwater Uses

While some groundwater development has occurred in the North Westside Groundwater Basin (primarily for nonpotable irrigation), the South Westside Groundwater Basin has historically been the primary groundwater production area, and the basin as a whole continues to be used for a number of purposes.

[7] Vacated aquifer storage is the volume of groundwater estimated to have been present historically in the aquifer but which is no longer present, usually due to pumping.



SOURCE: SFPUC

San Francisco Groundwater Supply Project EIR

Figure 5.16-4
Groundwater Elevation Contours

North Westside Groundwater Basin

By the early 1900s, wells were drilled to the north, east, and south of Lake Merced for farming and drinking water supply (SFPUC, 2012a). During that time, the Spring Valley Water Company operated two wells near the Lake Merced outlet that pumped about 0.1 million gallons per day (mgd), or 100 acre-feet per year (afy). At that time, the total pumpage for Lake Merced, the Sunset District, and Golden Gate Park averaged 0.4 mgd (400 to 500 afy). In the early 1930s, the San Francisco Board of Public Works installed production wells with a capacity of about 6.5 mgd (7,280 afy) in the Sunset District as an emergency water supply (SFWD, 1994). Between 1930 and 1935, these wells pumped an average of 5 mgd (5,600 afy) from the Sunset District as an emergency water supply, but use of these wells was discontinued after Tuolumne River water from Hetch Hetchy Reservoir became available to San Francisco in the mid-1930s.

Currently, groundwater in the North Westside Groundwater Basin is used for irrigation and other nonpotable uses. Based on 2009 data, these uses consist primarily of 1.14 mgd (1,277 afy) at Golden Gate Park for irrigation (South Windmill Replacement well, North Lake well, and Elk Glen well) and 0.32 mgd (358 afy) at the San Francisco Zoo for irrigation and other nonpotable uses as well as a standby emergency water supply; and 0.035 mgd (39 afy) at the San Francisco Golf Club for irrigation. In addition, less than 0.02 mgd (22 afy) was used for other purposes, including 0.009 mgd (10 afy) at the Edgewood Development Center (Edgewood School) for irrigation, and 0.004 mgd (5 afy) in Stern Grove for maintaining Pine Lake water levels (Kennedy/Jenks, 2012a). The location of each of these uses is shown in Figure 5.16-3. As of 2011, there were no other substantial groundwater users in the North Westside Groundwater Basin.

In addition, the Olympic Golf Club, San Francisco Golf Club, and Lake Merced Golf Club (also shown in Figure 5.16-3) are located in the vicinity of Lake Merced. Although these golf clubs use mostly recycled water for irrigation, they have a combined total of six wells to provide supplemental groundwater that is also used for irrigation (LSCE, 2012). These wells include Olympic Golf Club Wells Nos. 8 and 9, the San Francisco Golf Club Well No. 2, and Lake Merced Golf Club Wells Nos. 1, 2, and 3.

Table 5.16-2 lists the rated capacity for the pump installed in each of the existing wells in the North Westside Groundwater Basin and the golf club wells, as well as the estimated peak daily demand for each well. The rated capacity of the pump is the discharge rate, established by the manufacturer, that applies under specified conditions. The peak daily demand is the maximum amount of groundwater that could be required within one day to support the existing land use. The peak daily demand for the Stern Grove well is not available, but this well is operated three to four days per year to maintain water levels in Pine Lake (LSCE, 2012). It is typical for well capacity to exceed demand to allow for operational flexibility.

The San Francisco Golf Club, Olympic Club, and Lake Merced Golf Club use mostly recycled water to irrigate their golf courses, but groundwater is used to supplement the recycled water (Carollo, 2008). The annual average recycled water and groundwater use for these golf clubs is known; however, the peak daily demand is not known. A number of calculations were used to calculate the peak daily demand. First, the total annual irrigation requirements for each golf club

TABLE 5.16-2
RATED PUMP CAPACITY AND ESTIMATED PEAK DAILY DEMAND FOR EXISTING WELLS THAT COULD BE AFFECTED BY THE PROJECT

Well Name	Rated Pump Capacity (gallons per minute/ million gallons per day)	Estimated Peak Daily Groundwater Demand (million gallons per day)	Difference Between Peak Daily Groundwater Demand and Pump Capacity (million gallons per day)
Golden Gate Park, South Windmill Replacement Well	1,500 / 2.16	1.14	1.02
Golden Gate Park, North Lake Well	750 / 1.08	0.96	0.12
Golden Gate Park, Elk Glen Well	1,250 / 1.80	1.11	0.69
Edgewood Development Center (Edgewood School) Well	25 / 0.036	0.01	0.026
San Francisco Zoo Well No. 5	1,160 / 1.67	0.25	1.42
Stern Grove Well	250 / 0.36	Not applicable[a]	Not applicable
San Francisco Golf Club Well No. 2	700 / 1.01	0.20	0.81
Olympic Club Well No. 8	1,000 / 1.44	0.07	1.37
Olympic Club Well No. 9	700 / 1.01	0.07	0.94
Lake Merced Golf Club Wells Nos. 1, 2, and 3	Not available[b]	0.13	Not available

[a] The Stern Grove well is only operated 3 to 4 days per year to maintain water levels in Pine Lake, and can operate at a reduced rate to achieve the goal of water level maintenance; therefore, there is no peak daily demand for this well.
[b] The rated pump capacity for the Lake Merced Golf Club wells is not known because the model of the pump is not known.

SOURCE: LSCE, 2012.

(both recycled water and groundwater) were estimated based on evapotranspiration[8] rates, standard irrigation use coefficients, and the size of the irrigated area. Using this information, the SFPUC estimated that the golf course water demand was 1.7 afy per irrigated acre. The estimated daily peak demand would not be the same throughout the year, but the highest demand would occur on the hottest day of the hottest month. The peak month is estimated to require 20 percent of the total annual demand, and the peak day is estimated to require 30 percent more than the average day in the peak month (Carollo 2008). Finally, the golf courses must be irrigated at night to accommodate daytime use by golfers, so the water must be delivered over a period of approximately 12 hours. Therefore, the peak demand is estimated to be 0.0147 acre-feet (4,800 gallons) per acre over a 12-hour period. The acreage of the golf courses was multiplied by this factor to determine the peak demand, as shown in **Table 5.16-3**.[9]

[8] Evapotranspiration is a term used to describe the sum of evaporation and plant transpiration of water from the earth's land surface to the atmosphere.
[9] In Table 5.16-3, the estimated peak daily demand is shown in acre-feet per 12-hour period to retain consistency with the source documents, and in million gallons per day to allow direct comparison to groundwater use rates discussed in this EIR. To obtain million gallons per day (mgd), the 12-hour demand was multiplied by 2 to obtain a 24-hour demand, then multiplied by 0.325848 million gallons per day.

TABLE 5.16-3
EXISTING ANNUAL AVERAGE RECYCLED WATER AND GROUNDWATER USE AND PEAK DEMAND AT GOLF CLUBS IN THE LAKE MERCED AREA[a]

Golf Club	Annual Average Recycled Water Use 2005–2008 (acre-feet)	Annual Average Groundwater Use 2005–2008 (acre-feet)	Estimated Peak Daily Demand for Groundwater (acre-feet per 12-hour period / million gallons per day)	Total Estimated Peak Irrigation Demand (acre-feet per 12-hour period / million gallons per day)
San Francisco Golf Club[b]	134	39	0.3 / 0.20	1.3 / 0.87
Olympic Golf Club 8	321	10	0.1 / 0.07	3.3 / 2.16
Lake Merced Golf Club[c]	94	21	0.2 / 0.13	1.1 / 0.71

[a] Data for the annual average recycled water use and groundwater use were obtained from the Final Task 8B Technical Memorandum #1, Hydrologic Setting of the Westside Basin (LSCE 2010a). The subsequent Final - 2011 Annual Groundwater Monitoring Report (SFPUC, 2012a provided slightly different data for the years 2005 through 2008 and additional data for the year 2009, but the difference in groundwater use presented in the two sources was insubstantial; therefore, the 2010 data were retained for analysis in this EIR.
[b] Groundwater use for the San Francisco Golf Club is available for 2005, 2007, and 2008 only.
[c] Groundwater use for the Lake Merced Golf Club is available for 2005 and 2007 only.

SOURCE: LSCE, 2010a.

Because the golf club wells were originally designed to provide all of the irrigation water for the golf courses, the capacity of these wells is greater than the existing peak daily demand for groundwater now that recycled water is used for the bulk of irrigation needs. However, it is important for the golf club wells to have enough capacity to provide the total irrigation demand for each golf course in the event that recycled water becomes temporarily or permanently unavailable for irrigation. Table 5.16-3 lists the total irrigation demand for each golf club. The rated capacity at the golf club wells (listed in Table 5.16-2) exceeds the total irrigation demand at each of the golf clubs. As indicated in Table 5.16-2, the rated capacities at the golf club wells range from 0.81 mgd (907 afy) over the existing peak daily groundwater demand at San Francisco Golf Club Well No. 2 to 1.37 mgd (1,535 afy) over the existing peak daily groundwater demand at Olympic Golf Club Well No. 8.

South Westside Groundwater Basin

Groundwater in the South Westside Groundwater Basin has principally been used for municipal and irrigation supply. There are some private residential wells in the basin, but the estimated amount of pumping by residential well owners is small compared to municipal and irrigation pumping. Total pumping for metered municipal and estimated irrigation uses reached a combined maximum of approximately 12.8 mgd (14,300 afy) in the 1960s (LSCE, 2006). In 2005, total pumping from the South Westside Groundwater Basin (including municipal and irrigation uses) was reduced to about 4.1 mgd (4,600 afy). This reduction can be attributed to the following factors: (1) nearly all irrigation pumping around Lake Merced was replaced with recycled water; and (2) there was a temporary reduction in municipal pumping as part of the In-lieu Recharge Demonstration Study (as described further below).

Groundwater Quality

The SFPUC is conducting groundwater quality monitoring in the North Westside Groundwater Basin to establish background water quality and observe for evidence of seawater intrusion. This monitoring includes basinwide sampling of the wells in the existing monitoring network (described above under the heading "Existing Monitoring Network and Program"), as well as sampling of the test wells at each of the proposed Groundwater Supply Project well facilities (described in Chapter 3, Project Description). Monitoring of the coastal monitoring wells began as early as 2004 when the majority of the coastal monitoring wells were installed, and monitoring of other wells began between 2002 and 2010.

As discussed in Section 5.16.2, Regulatory Framework, under the heading "Drinking Water Standards," the California Department of Public Health has established primary and secondary maximum contaminant levels (MCLs) for drinking water. Primary MCLs are established to protect public health; secondary MCLs are established to prevent drinking water from appearing colored or from tasting or smelling bad, thus causing people to stop using water from their public water system (USEPA, 2012). Title 22 of the California Code of Regulations specifies recommended, upper, and short-term secondary MCLs for four parameters including TDS, specific conductance, chloride, and sulfate. Public water utilities seek to maintain concentrations of these constituents below the recommended secondary MCLs to assure a high degree of consumer satisfaction. In the sections that follow, the results of SFPUC's groundwater quality monitoring are discussed relative to the applicable MCLs.

Basinwide Groundwater Quality Monitoring in the North Westside Groundwater Basin

Basinwide groundwater quality monitoring in the North Westside Groundwater Basin has primarily focused on general minerals, including nitrate, iron, manganese, and chloride (discussed below), in selected coastal and inland locations. Historical groundwater quality data for each well are included in **Appendix D-2**. The results for all water quality parameters monitored have been below primary or secondary MCLs, except for chloride, iron, manganese, nitrate, specific conductance, and TDS at some locations. Water quality data for these parameters are summarized in **Table 5.16-4** and described below:

- Chloride concentrations remained below the recommended secondary MCL (250 milligrams per liter [mg/L]) throughout the monitoring period at all monitoring wells screened in the Shallow Aquifer and Primary Production Aquifer, with the exception of the LMMW-1S monitoring location near Lake Merced in the Shallow Aquifer. At the LMMW-1S monitoring well, chloride concentrations fluctuated between 129 and 393 mg/L from 2009 to 2011, with the highest concentration detected in 2009. All chloride detections at this location were below the upper secondary MCL of 500 mg/L. At all other Shallow Aquifer monitoring locations, chloride concentrations ranged from 25 to 193 mg/L throughout the entire monitoring period, and concentrations in the Primary Production Aquifer ranged from 15 to 116 mg/L.

TABLE 5.16-4
SUMMARY OF GROUNDWATER QUALITY DATA FOR PARAMETERS THAT HAVE EXCEEDED DRINKING WATER STANDARDS IN THE GROUNDWATER MONITORING NETWORK

Parameter	Units	Range in Values	Drinking Water Standard	Number of Detections Greater than Primary MCL or Recommended Secondary MCL	Number of Detections Greater than Upper Secondary MCL	Number of Samples Analyzed
Chloride	mg/L	15 – 393	Recommended Secondary MCL: 250 Upper Secondary MCL: 500 Short-Term Secondary MCL: 600	3	0	319
Iron[a]	mg/L	<0.003 – 0.095	Secondary MCL: 0.30	0	NA	12
Manganese[a]	mg/L	0.001 – 0.59	Secondary MCL: 0.05	6	NA	13
Nitrate	mg/L	Not detected - 65	Primary MCL: 45	24	NA	161
Specific conductance	µmhos/cm	405 – 1,558	Recommended Secondary MCL: 900 Upper Secondary MCL: 1,600 Short-Term Secondary MCL: 2,200	16	0	319
Total dissolved solids	mg/L	131 – 1,035	Recommended Secondary MCL: 500 Upper Secondary MCL: 1,000 Short-Term Secondary MCL: 1,500	9	1	320

[a] Sampling data are provided for dissolved concentrations of iron and manganese, not total concentrations

NOTES:
See Appendix D-2 for a complete compilation of available analytical data.
µmhos/cm = micromhos per centimeter.
mg/L = milligrams per liter.
MCL = maximum contaminant level.
NA= not applicable because there is no Upper Secondary MCL for this parameter.

SOURCE: SFPUC, 2012a.

- Iron concentrations were sporadically monitored between 1993 and 2010 and included monitoring for total and/or dissolved iron.[10] Total iron concentrations did not exceed the secondary MCL (0.30 mg/L) at any Shallow Aquifer locations but did exceed the secondary MCL at five Primary Production Aquifer locations, including SF#2 – Edgewood School[11] in

[10] Analysis for total metals concentrations in groundwater involves analyzing the entire sample, including entrained sediment. Groundwater samples for dissolved metals are filtered to remove sediment from the sample. Because dissolved concentrations are representative of groundwater quality, these concentrations are compared to maximum contaminant levels for drinking water to determine compliance.

[11] As noted in Table 5.16-1, the Edgewood School well is screened in both the Shallow and Primary Production Aquifers.

the vicinity of Pine Lake, with concentrations ranging from 0.13 to 1.36 mg/L between 1993 and 2000; SF#18 – New GG Park (N) Lake in Golden Gate Park, with concentrations ranging from 0.02 to 0.34 mg/L between 2005 and 2007; SF#19 – New GG Park (S) Windmill in Golden Gate Park, with concentrations ranging from 0.003 to 5.07 mg/L (the highest concentration observed) in 2005; SF#24 – South Sunset Playground at the South Sunset Playground, with concentrations ranging from 0.25 to 0.33 mg/L between 2005 and 2006; and SF#41 – West Sunset Playground at the West Sunset Playground, with concentrations ranging from 0.16 to 0.40 mg/L between 1993 and 2010. None of the measured dissolved iron concentrations exceeded the secondary MCL.

- Manganese concentrations were sporadically monitored between 1993 and 2010 and included monitoring for total and/or dissolved manganese. Total manganese concentrations exceeded the secondary MCL (0.05 mg/L) at one Shallow Aquifer location and six Primary Production Aquifer locations. At the Shallow Aquifer location Central Pump Station MW-190, located near 22nd Avenue and Sloat Boulevard, manganese concentrations ranged from 0.002 to 0.06 mg/L between 2005 and 2008. Primary Production Aquifer locations with detected manganese concentrations that exceeded the secondary MCL include SF#2 – Edgewood School in the vicinity of Pine Lake, with a concentration of 0.09 mg/L in 2000; SF#19 – New GG Park (S) Windmill in Golden Gate Park, with concentrations ranging from not detected to 0.09 mg/L in 2005; SF#24 – South Sunset Playground at the South Sunset Playground, with a concentration of 0.12 mg/L in both 2005 and 2006; Lake Merced Pump Station MW-270 at Lake Merced, with concentrations ranging from 0.57 to 0.63 mg/L between 2005 and 2006; Lake Merced Pump Station MW-440 at Lake Merced, with concentrations ranging from 0.007 to 0.07 mg/L between 2005 and 2007; and SF#53 – Central Pump Station MW-270, located near 22nd Avenue and Sloat Boulevard, with concentrations ranging from 0.11 to 0.13 mg/L between 2005 and 2008. In addition, in 2007 dissolved manganese was identified in the groundwater sample from Deep Aquifer monitoring well SF#49 – Lake Merced Pump Station MW-575 at Lake Merced at 0.24 mg/L. Six of the measured dissolved manganese concentrations exceeded the secondary MCL, and the maximum detected concentration was 0.59 mg/L.

- Nitrate concentrations have remained below the primary MCL (45 mg/L) during the entire monitoring period except at four locations in the Primary Production Aquifer and three locations in the Shallow Aquifer. Monitoring wells with detected concentrations that exceeded the primary nitrate MCL in the Primary Production Aquifer include LMMW-1D at Lake Merced, with concentrations ranging from 45.5 to 48.7 mg/L in 2010 and 2011; LMMW-6D at Lake, with concentrations ranging from 32 to 55 mg/L between 2004 and 2011; SF#2 – Edgewood School near Pine Lake, with concentrations ranging from 46 to 51 mg/L between 2002 and 2004; and SF #03 – Elk Glen 2 in Golden Gate Park, with concentrations ranging from 48.9 to 55.0 between 2000 and 2005. At other wells completed in the Primary Production Aquifer, the nitrate concentrations ranged from not detected to 41 mg/L throughout the monitoring period. Monitoring wells with detected concentrations that exceeded the primary MCL in the Shallow Aquifer include LMMW-7SS at Lake Merced, with concentrations of 50.9 mg/L in 2004 and 52.0 mg/L in 2009; Lake Merced Pump Station MW-155 (the shallowest of a cluster of four monitoring wells at the Lake Merced Pump Station monitoring location at Lake Merced), with concentrations ranging from 48 to 49 mg/L between 2005 and 2007; and SF#23 – Pine Lake Production Well near Pine Lake, with a concentration of 65 mg/L in 2004 (the only monitoring data available at that well). At other locations in the Shallow Aquifer, nitrate concentrations have ranged from not detected to 41 mg/L.

- Specific conductance remained below the recommended secondary MCL (900 micromhos per centimeter [µmhos/cm]) throughout the monitoring period at all monitoring wells in the

Primary Production Aquifer; the specific conductance of the groundwater in all wells completed in this aquifer ranged from 257 to 811 μmhos/cm. Only three wells completed in the Shallow Aquifer exhibited specific conductance greater than the recommended secondary MCL. At the South Windmill MW-57 monitoring location in Golden Gate Park, the specific conductance ranged from 963 to 1,281 μmhos/cm, all of which are in excess of the recommended secondary MCL. At the LMMW-1S location near Lake Merced, the specific conductance ranged from 1,170 to 1,936 μmhos/cm between 2009 and 2011. All values were above the recommended secondary MCL, and only one value in 2009 was greater than the upper secondary MCL of 1,600 μmhos/cm. At the LMMW-3S location, the specific conductance ranged from 612 to 917 μmhos/cm, and only the highest value (which was recorded in 2009) exceeded the recommended secondary MCL of 900 μmhos/cm. At all other Shallow Aquifer monitoring locations, the specific conductance ranged from 386 to 839 μmhos/cm.

- TDS concentrations remained below the recommended secondary MCL (500 mg/L) throughout the monitoring period at all monitoring wells screened in the Primary Production Aquifer; the TDS concentration in the groundwater from all wells screened in this aquifer ranged from 131 to 460 mg/L. Five wells completed in the Shallow Aquifer exhibited TDS concentrations in excess of the recommended secondary MCL. At the South Windmill MW-57 monitoring location in Golden Gate Park, TDS concentrations in the Shallow Aquifer ranged from 600 to 705 mg/L between 2007 and 2011; all detected concentrations were above the recommended secondary MCL, but below the upper secondary MCL of 1,000 mg/L. At the LMMW-1S location near Lake Merced, TDS concentrations in the Shallow Aquifer ranged from 657 to 1,035 mg/L between 2009 and 2011; all detected concentrations were above the recommended secondary MCL; but only the maximum detection (recorded in 2009) was above the upper secondary MCL of 1,000 mg/L. At location LMMW-3S, also near Lake Merced, TDS concentrations ranged from 342 to 518 mg/L; only the maximum concentration, reported in 2009 and 2010, exceeded the recommended secondary MCL. In 2011, maximum TDS concentrations at locations LMMW-2S and LMMW-1D were 507 mg/L and 512 mg/L, respectively, but all concentrations before this date were below the recommended secondary MCL At all other Shallow Aquifer monitoring locations, TDS concentrations ranged from 216 to 496 mg/L.

Groundwater Quality at Proposed Production Wells

As described in Chapter 3, Project Description, the SFPUC installed test wells at each of the proposed Phase 1 well facility locations. One groundwater sample from each of these wells was analyzed between 2007 and 2011. The South Windmill Replacement well and North Lake well, proposed for conversion to municipal supply wells during Phase 2, were sampled three and four to five times, respectively, between 2004 and 2009 to evaluate the suitability of the groundwater as a drinking water source. The maximum value for each parameter detected is listed in **Table 5.16-5** along with the applicable drinking water standard specified in Title 22 of the California Code of Regulations, Chapter 15. As summarized in Table 5.16-5, the results for all analyzed parameters were below applicable MCLs, with the following exceptions (MWH, 2005; SFPUC, 2007; SFPUC, 2009a; SFWPS, 2011a; SFWPS, 2011b; SFPUC, 2012c; SFPUC, 2012d):

- The color of the groundwater sample from the North Lake well was 20 color units in the one sample analyzed for this parameter in May 9, 2005, and this level exceeds the secondary MCL of 15 color units.

TABLE 5.16-5
SUMMARY OF GROUNDWATER ANALYTICAL DATA FOR PROPOSED PRODUCTION WELLS

		Maximum Concentration						Drinking Water Standard				
Parameter	**Units**	**Lake Merced**	**South Sunset**	**West Sunset**	**Central Pump Station**	**South Windmill Replace-ment Well**	**North Lake Well**	**Primary MCL**	**Secondary MCL**	**Recommended Secondary MCL**	**Upper Secondary MCL**	**Short-Term Secondary MCL**
General Water Chemistry												
Alkalinity as HCO3	mg/L	96	120	92	130	162	158	–	–	–	–	–
Bromide	mg/L	0.189	NA	0.140	0.212	0.199	0.173	–	–	–	–	–
Chloride	mg/L	51	34	29	40	46	44	–	–	250	500	600
Color	CU	<5	<5	<5	<5	9	**20**	–	15	–	–	–
Fluoride	mg/L	0.07	<0.1	0.11	<0.1	0.1	0.1	2	–	–	–	–
Hardness as CaCO3	mg/L	164	154	150	232	240	200	–	–	–	–	–
Nitrite as N	mg/L	<0.02	0.21	<0.02	<0.02	1.13	<0.02	10	–	–	–	–
Nitrate as NO3	mg/L	21	23	32	**58.5**	37.4	31	45	–	–	–	–
pH	standard units	8.06	7.97	7.81	7.6	8.04	7.79	–	–	–	–	–
Specific Conductance	μmhos/cm	428	428	420	621	598	530	–	–	900	1600	2200
Sulfate	mg/L	7.3	24	35.8	65.5	49.0	31.1	–	–	250	500	600
Total Dissolved Solids	mg/L	238	271	258	369	373	337	–	–	500	1000	1500
Turbidity	NTU	0.28	0.23	0.11	0.12	57	2.1	–	5	–	–	–
Metals												
Arsenic	mg/L	0.001	0.003	0.002	<0.001	<0.001	<0.001	0.010	–	–	–	–
Barium	mg/L	0.011	0.053	0.013	0.023	0.017	0.012	1	–	–	–	–
Boron	mg/L	0.022	0.029	0.041	0.026	0.060	0.053	–	–	–	–	–
Calcium	mg/L	18.8	25.2	20.6	33.1	35.2	28.6	–	–	–	–	–
Chromium (total)	mg/L	0.005	0.009	0.021	0.021	0.011	0.015	0.05	–	–	–	–
Chromium (hexavalent)	mg/L	0.005	0.009	0.020	0.020	<0.0001	<0.0001	–	–	–	–	–
Copper	mg/L	<0.001	<0.001	0.005	<0.001	0.002	0.002	1.3	1	–	–	–
Iron	mg/L	0.014	**0.069**	0.003	<0.003	5.1	**0.341**	–	0.3	–	–	–
Lead	mg/L	<0.001	0.005	0.001	<0.001	<0.001	<0.001	0.015	–	–	–	–
Magnesium	mg/L	21.3	23.5	22.3	35.7	40.3	35.1	–	–	–	–	–
Manganese	mg/L	0.002	**0.079**	<0.002	<0.002	**0.086**	0.019	–	0.05	–	–	–
Nickel	mg/L	<0.001	0.003	<0.001	<0.001	0.002	<0.001	0.1	–	–	–	–
Potassium	mg/L	1.4	1.3	1.3	0.8	1.7	1.4	–	–	–	–	–
Silica	mg/L	38.8	36.2	34.3	41.3	30.8	39.8	–	–	–	–	–
Sodium	mg/L	30.8	27.1	24.2	25.0	31.8	35.1	–	–	–	–	–
Vanadium	mg/L	0.007	0.003	0.007	0.006	0.003	0.005	–	–	–	–	–
Zinc	mg/L	<0.002	0.005	<0.002	0.006	0.010	0.006	–	5	–	–	–

TABLE 5.16-5 (Continued)
SUMMARY OF GROUNDWATER ANALYTICAL DATA FOR PROPOSED PRODUCTION WELLS

Parameter	Units	Maximum Concentration						Drinking Water Standard				
		Lake Merced	South Sunset	West Sunset	Central Pump Station	South Windmill Replace-ment Well	North Lake Well	Primary MCL	Secondary MCL	Recommended Secondary MCL	Upper Secondary MCL	Short-Term Secondary MCL
Volatile Organic Compounds												
Tetrachloroethene	mg/L	<0.0005	<0.0005	<0.0005	0.0005	<0.0005	<0.0005	0.005	–	–	–	–
M-Xylene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	1.75	–	–	–	–
O-Xylene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	0.002	0.0006	1.75	–	–	–	–
P-Xylene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	1.75	–	–	–	–
Radionuclides												
Radon 222	pCi/L	NA	233	NA	NA	NA	NA	600[a]	–	–	–	–
Radium 228	pCi/L	<1	<1	<1	1.6	0.67	0.52	5	–	–	–	–

[a] There is no established level for radon monitoring; the listed level is proposed by the California Department of Public Health

NOTES:

CU = color units.
MCL = maximum contaminant level.
mg/L = milligrams per liter.
NTU = nephelometric turbidity units.
pCi/L = picocuries per liter.
μmhos/cm = micromhos per centimeter.
"–" indicates that an MCL has not been established for this parameter.
"<" indicates that the parameter was not detected in the sample at the detection limit indicated.
"NA" indicates that sample was not analyzed for this parameter.
bold indicates values that exceed the MCL for that parameter.

SOURCE: MWH, 2005; SFPUC, 2007; SFPUC, 2009a; SFWPS, 2011a; SFWPS, 2011b; SFPUC, 2012c; SFPUC, 2012d.

- The concentration of nitrate in the groundwater sample from the Central Pump Station well, collected on February 9, 2011, was 58.5 mg/L, which exceeds the primary MCL of 45 mg/L.

- The concentration of iron in the groundwater sample from the South Windmill Replacement well on May 9, 2005 was 5.1 mg/L, and the concentration in the North Lake well sample from May 9, 2005 was 0.341 mg/L, both of which exceed the secondary MCL of 0.3 mg/L. However, the May 2005 samples were analyzed for total iron, which would include analysis of sediment in the sample. The concentrations of total and dissolved iron in three subsequent samples collected from each well did not exceed the secondary MCL.

- The concentration of manganese in the July 9, 2007 groundwater sample from the South Sunset Well was 0.74 mg/L and the concentration in the South Windmill Replacement well sample from May 9, 2005 was 0.086 mg/L, both of which exceed the secondary MCL of 0.050 mg/L. However, the May 2005 sample from the South Windmill well was analyzed for total manganese, which would include analysis of sediment in the sample. The concentration of total and dissolved manganese in the two subsequent samples collected from the South Windmill Replacement well did not exceed the secondary MCL.

The volatile organic compound (VOC) tetrachloroethene was detected in the groundwater sample from the Central Pump Station well, and xylenes (also VOCs) were detected in groundwater samples from the South Windmill Replacement well and North Lake well, but all concentrations were below the primary MCL by one order of magnitude at a minimum. Other VOCs (e.g., methyl tertiary butyl ether, or MTBE), pesticides, and perchlorate have not been detected at the proposed production wells.

Groundwater Ambient Monitoring and Assessment Program

Information on the quality of raw groundwater in the North Westside Groundwater Basin is also available from the studies performed as part of the Groundwater Ambient Monitoring and Assessment (GAMA) program. The GAMA program is a comprehensive assessment of statewide groundwater quality implemented by the State Water Resources Control Board (SWRCB) in coordination with the U.S. Geological Survey (USGS) and Lawrence Livermore National Laboratory. The North Westside Groundwater Basin was included in a 2007 GAMA study as part of the investigation of the San Francisco Bay study unit, which encompasses portions of San Francisco, San Mateo, Santa Clara, and Alameda Counties. Between April and June of 2007, the GAMA program investigators conducted an assessment of raw groundwater quality in the San Francisco Bay study unit by sampling 79 wells, six of which were located in the North Westside Groundwater Basin (Ray, 2009).

As part of the GAMA study, groundwater samples were analyzed for numerous organic constituents, including VOCs, pesticides, pharmaceutical compounds, and potential wastewater-indicator compounds. Groundwater samples were also analyzed for constituents of special interest (perchlorate and N-nitrosodimethylamine); naturally occurring inorganic constituents (e.g., nutrients, major and minor ions, trace elements); radioactive constituents; and microbial indicators.

The study was designed to assess the quality of raw groundwater. Although regulatory thresholds apply to treated water rather than raw water, the GAMA report compared the constituent concentrations measured in raw groundwater with MCLs for drinking water in an effort to provide context for the raw groundwater results. Analytical results for the wells located within the North Westside Groundwater Basin are summarized in **Table 5.16-6** along with applicable MCLs. As shown in this table, the only parameters that exceeded MCLs are as follows:

- The concentrations of combined nitrite and nitrate exceeded the MCL of 10.0 mg/L in groundwater samples from two wells. The concentrations that exceeded the MCL were 11.2 and 12.7 mg/L.
- The concentration of TDS exceeded the recommended secondary MCL of 500 mg/L in one well. The concentration was 517 mg/L.
- The concentrations of dissolved manganese exceeded the secondary MCL of 0.05 mg/L in three of the four wells sampled for this parameter. The concentrations in excess of the secondary MCL ranged from 0.0636 to 0.590 mg/L.

Groundwater Budget

A groundwater budget (also referred to as a water balance or hydrologic budget) is a measure of the balance between the quantity of water supplied to a groundwater basin and the amount leaving the basin (Todd, 1980). Groundwater entering a groundwater basin is called an "inflow" and groundwater leaving the basin is called an "outflow." The volume of groundwater in a basin is called "groundwater storage," and storage changes as the respective quantities of groundwater inflow and outflow vary from season to season and from year to year.

In the Westside Groundwater Basin, inflow or "recharge" components of the groundwater basin include subsurface inflows from outside of the basin, recharge from precipitation, recharge from applied water (irrigation), recharge from surface water such as Lake Merced and Pine Lake, and recharge from leakage of sewer and water pipes (LSCE, 2010a). In the North Westside Groundwater Basin, outflow or "discharge" components include groundwater pumping, evaporation, evapotranspiration, subsurface outflows to the Pacific Ocean, and discharge to Lake Merced. Lake Merced can either lose water to the groundwater system or gain water and therefore can be considered both a component of groundwater "inflow" and "outflow" depending on lake and groundwater levels, which vary seasonally and annually. Pine Lake, on the other hand, discharges water to the groundwater system and would only be considered a component of the groundwater "inflow."

Based on modeling of historical groundwater conditions in the Westside Groundwater Basin between 1982 and 2002,[12] the annual average recharge to the basin from outside of the basin has been 1,756 afy and the annual average recharge from other sources has been 11,967 afy (HydroFocus, 2011), for a total estimated annual average recharge of 13,723 afy. Historical

[12] The 1982 to 2002 averaging period was selected for the model calibration because: (1) the average annual rainfall during this period approximates the average of the long-term record from 1959 to 2009; (2) it generally represents existing land-use and water-use conditions; and (3) it does not include water level and storage changes that resulted of the In-Lieu Recharge Demonstration Study, conducted from the fall of 2002 through 2005, which were not typical of normal operations (HydroFocus, 2011).

TABLE 5.16-6
SUMMARY OF GROUNDWATER ANALYTICAL DATA FOR GROUNDWATER AMBIENT MONITORING AND ASSESSMENT PROGRAM

Parameter	Units	Range of Detected Concentrations	Drinking Water Standard					Number of Samples Analyzed	Number of Detections	Number of Detections Above MCL
			Primary MCL	Secondary MCL	Recommended Secondary MCL	Upper Secondary MCL	Short-Term Secondary MCL			
General Water Chemistry										
Alkalinity as CaO3	mg/L	112 – 211	–	–	–	–	–	6	6	NA
Ammonia as N	mg/L	0.017 – 0.679	–	–	–	–	–	6	3	NA
Bicarbonate	mg/L	137 – 256	–	–	–	–	–	4	4	NA
Bromide	mg/L	0.18 – 0.32	–	–	–	–	–	4	4	NA
Carbonate	mg/L	ND	–	–	–	–	–	4	0	NA
Chloride	mg/L	37.9 – 105	–	–	250	500	600	4	4	0
Fluoride	mg/L	0.06 – 0.19	2.0	–	–	–	–	4	3	0
Iodide	mg/L	0.003 – 0.023	–	–	–	–	–	4	4	NA
Nitrite as N	mg/L	0.002 – 0.92	1.0	–	–	–	–	6	4	0
Nitrite plus Nitrate as N	mg/L	4.82 – 12.7	10.0	–	–	–	–	6	5	2
Total Nitrogen	mg/L	0.7 – 13.9	–	–	–	–	–	6	6	NA
Orthophosphates	mg/L	0.043 – 0.105	–	–	–	–	–	6	6	NA
pH	standard units	7.3 – 8.1	–	–	–	–	–	6	6	NA
Specific Conductance	µmhos/cm	427 – 880	–	–	900	1600	2200	6	6	0
Sulfate	mg/L	7.97 – 81.5	–	–	250	500	600	4	4	0
Total Dissolved Solids	mg/L	232 – 517	–	–	500	100	1500	4	4	1
Turbidity	NTU	0.1 – 0.3	–	5.0	–	–	–	4	1	0
Metals										
Aluminum	mg/L	0.0011 – 0.0015	0.2	0.2	–	–	–	4	3	0
Antimony	mg/L	0.00004 – 0.00029	0.006	–	–	–	–	4	3	0
Arsenic	mg/L	0.0013 – 0.0033	0.010	–	–	–	–	10	8	0
Barium	mg/L	0.016 – 0.125	1.0	–	–	–	–	4	4	0
Boron	mg/L	0.019 – 0.097	–	–	–	–	–	4	4	NA

TABLE 5.16-6 (Continued)
SUMMARY OF GROUNDWATER ANALYTICAL DATA FOR GROUNDWATER AMBIENT MONITORING AND ASSESSMENT PROGRAM

Parameter	Units	Range of Detected Concentrations	Drinking Water Standard					Number of Samples Analyzed	Number of Detections	Number of Detections Above MCL
			Primary MCL	Secondary MCL	Recommended Secondary MCL	Upper Secondary MCL	Short-Term Secondary MCL			
Metals (cont.)										
Cadmium	mg/L	ND	0.05	–	–	–	–	4	0	0
Calcium	mg/L	20.1 – 50.7	–	–	–	–	–	4	4	NA
Chromium (total)	mg/L	0.00008 – 0.027	0.05	–	–	–	–	10	8	0
Chromium (hexavalent)	mg/L	0.003 – 0.025	–	–	–	–	–	6	4	NA
Cobalt	mg/L	0.00002 – 0.00041	–	–	–	–	–	4	3	NA
Copper	mg/L	0.00029	1.3	1.0	–	–	–	4	3	0
Iron	mg/L	0.004 – 0.202	–	0.3	–	–	–	10	9	0
Lead	mg/L	ND	0.015	–	–	–	–	4	0	0
Lithium	mg/L	0.0015 – 0.0424	–	–	–	–	–	4	4	NA
Magnesium	mg/L	20.3 – 29.5	–	–	–	–	–	4	4	NA
Manganese	mg/L	0.0006 – 0.590	–	0.05	–	–	–	4	4	3
Molybdenum	mg/L	0.0003 – 0.0042	–	–	–	–	–	4	4	NA
Nickel	mg/L	0.00026 – 0.0013	0.1	–	–	–	–	4	4	0
Potassium	mg/L	1.67 – 3.97	–	–	–	–	–	4	4	NA
Selenium	mg/L	0.0046 – 0.001	0.05	–	–	–	–	4	3	0
Silica	mg/L	29.0 – 34.9	–	–	–	–	–	4	4	NA
Sodium	mg/L	31.3 – 90.4	–	–	–	–	–	4	4	NA
Strontium	mg/L	0.133 – 0.517	4.0[a]	–	–	–	–	4	0	
Tungsten	mg/L	0.00005 – 0.00029	–	–	–	–	–	4	4	NA
Uranium	mg/L	0.00002 – 0.00057	0.030	–	–	–	–	4	0	
Vanadium	mg/L	0.00007 – 0.0081	–	–	–	–	–	4	4	NA
Zinc	mg/L	0.00059 – 0.0032	–	5.0	–	–	–	4	4	0

TABLE 5.16-6 (Continued)
SUMMARY OF GROUNDWATER ANALYTICAL DATA FOR GROUNDWATER AMBIENT MONITORING AND ASSESSMENT PROGRAM

Parameter	Units	Range of Detected Concentrations	Drinking Water Standard					Number of Samples Analyzed	Number of Detections	Number of Detections Above MCL
			Primary MCL	Secondary MCL	Recommended Secondary MCL	Upper Secondary MCL	Short-Term Secondary MCL			
Perchlorate										
Perchlorate	mg/L	0.0008 – 0.0038	0.006	–	–	–	–	4	2	0
Volatile Organic Compounds										
Chloroform	mg/L	0.00003 – 0.00027	–	–	–	–	–	4	4	NA
Carbon Tetrachloride	mg/L	0.00004 – 0.00022	0.0005	–	–	–	–	4	2	0
1,2,3,4-tetra-methyl-benzene	mg/L	0.0003	–	–	–	–	–	4	1	NA
Tetrachloroethene	mg/L	0.00448	0.005	–	–	–	–	4	1	0
Radionuclides										
Radon 222	pCi/L	160 – 250	600[b]	–	–	–	–	4	4	0
Tritium	pCi/L	0.3 – 13.8	20000	–	–	–	–	6	5	0

[a] The MCL provided for strontium is the lifetime health advisory level provided by the U.S. Environmental Protection Agency
[b] There is no established level for radon monitoring. The listed level is proposed by the California Department of Public Health

NOTES:
MCL = maximum contaminant level.
mg/L = milligrams per liter.
NTU = nephelometric turbidity units.
pCi/L = picocuries per liter.
umhos/cm = micromhos per centimeter.
"ND" indicates that the parameter was not detected in samples.
"NA" indicates "not applicable" because an MCL has not been established for this parameter.
"–" indicates that an MCL has not been established for this parameter.

groundwater pumping has averaged 10,448 afy. In the North Westside Groundwater Basin, discharges to the Pacific Ocean have averaged 3,021 afy and discharges to Lake Merced have averaged 80 afy (i.e., the net annual average difference between Lake Merced inflow and outflow). Thus, the total estimated annual average discharge is 13,549 afy. Based on these estimates, groundwater storage in the entire groundwater basin increased an average of 174 afy between 1982 and 2002 (HydroFocus, 2011).

History of Land Subsidence in the Westside Groundwater Basin

Land subsidence is a gradual settling or sudden sinking of the earth's surface due to subsurface movement of earth materials (Galloway et al., 1999). While land subsidence can result from a number of processes, subsidence from groundwater pumping is the focus of the analysis for the Groundwater Supply Project. Land subsidence due to groundwater pumping can occur when groundwater elevations are lowered and water drains out of an aquifer or clay layers that are within or between aquifers.

Land subsidence either has not occurred in the Westside Groundwater Basin or insufficient monitoring information exists to document its occurrence (Fugro, 2012). Subsidence has not been observed in the North Westside Groundwater Basin despite historical pumping from the Sunset District emergency supply wells at rates of up to 6.5 mgd (7,280 afy) in the early 1930s, and pumping at the San Francisco Zoo and in Golden Gate Park. There are no existing records of historical groundwater levels for the time period during which the Sunset District wells were in operation, and no records of groundwater levels in Golden Gate Park prior to the late 1980s. Groundwater-elevation data for the North Westside Groundwater Basin are generally not available until the 1980s, and the majority of available data have been obtained from the SFPUC monitoring efforts that began in 2001 (Fugro, 2012).

Seawater Intrusion in the North Westside Groundwater Basin

Seawater intrusion refers to the migration of seawater into a freshwater aquifer and can occur when groundwater levels are lowered by pumping. Seawater intrusion becomes an environmental concern when the degradation of groundwater quality would make the groundwater potentially unsuitable for its identified use, or when inland surface water features are affected by the seawater, compromising habitats or uses of the surface water.

Two areas of the Westside Groundwater Basin are susceptible to seawater intrusion under certain conditions. One area is in the North Westside Groundwater Basin along the Pacific Coast, where the Shallow Aquifer is open to the ocean near the shoreline; this area is discussed below. The other is in the South Westside Groundwater Basin along San Francisco Bay; however, this area is outside of the project's area of potential effects and therefore is not discussed further.

In the North Westside Groundwater Basin, the Shallow Aquifer is in direct hydraulic connection with the Pacific Ocean between Lincoln Park (north of Golden Gate Park) and the San Francisco Zoo area, indicating a potential for seawater intrusion to occur in the Shallow Aquifer in this area. Although existing studies of offshore seismic suggest the potential for some depositional or structural features in the offshore sediments that would preclude seawater intrusion directly from the ocean into the Primary Production and Deep Aquifers, the geologic information for this offshore area is not sufficient to conclusively make this determination (Kennedy/Jenks, 2012b). Therefore, seawater intrusion into the Primary Production Aquifer as a result of direct hydraulic connection with the ocean is considered possible.

If seawater intrusion were to occur within the Shallow Aquifer, the Primary Production Aquifer could also be affected in areas where no clay layer separates the aquifers or where gaps are present in the clay layers that separate the aquifers, assuming a downward hydraulic gradient between the two aquifers. South of the proposed South Sunset well facility, the "-100-foot" clay layer separating the Shallow Aquifer and the Primary Production Aquifer may protect the Primary Production Aquifer from potential seawater intrusion in the Shallow Aquifer. However, there are gaps in the "-100-foot" clay layer (as illustrated in Figure 5.16-2), including one between the Taraval and San Francisco Zoo coastal groundwater monitoring locations, and at these gaps the Shallow and Primary Production Aquifers could be hydraulically connected. North of the proposed South Sunset well facility, including Golden Gate Park, there are not pronounced or laterally extensive clay layers, and the Shallow Aquifer and Primary Production Aquifers are merged, meaning that in this area the aquifers are hydraulically connected to a greater degree and can effectively be considered one aquifer. South of the San Francisco Zoo, in the vicinity of Lake Merced, the Serra Fault could act as a barrier to seawater intrusion as far north as the Great Highway, where the fault heads offshore (LSCE, 2010a).

Coastal Groundwater Levels

Coastal groundwater levels measured in the coastal monitoring network and described above under the heading "Existing Monitoring Network and Program" provide an indication of the potential for seawater intrusion to occur. Appendix D-1 includes hydrographs showing historical groundwater levels for all five coastal monitoring locations, and the following discussion is based on these hydrographs. In general, the potential for seawater intrusion is lower when coastal groundwater levels are above sea level. Although coastal groundwater levels below sea level indicate a potential for seawater intrusion, the actual occurrence of seawater intrusion would need to be confirmed through other means, such as groundwater quality monitoring.

Shallow Aquifer Coastal Groundwater Levels

Between 2004 and 2011, groundwater levels in all Shallow Aquifer coastal monitoring wells have been consistently above sea level by 3 to 15 feet, except for occasional measurements at the USGS South Windmill MW-57 well (SFPUC, 2012a). Groundwater levels in the Shallow Aquifer at this location have varied as much as approximately 19 feet seasonally, and have historically declined to below sea level by as much as 2 feet during the irrigation season. Groundwater elevations in this well have shown an overall decline since 2006. However, none of the groundwater levels were below sea level in 2010 and 2011, likely because of reduced irrigation pumping at the South Windmill Replacement well facility, because the well pump and electrical controls were periodically broken. To compensate, the North Lake irrigation well was pumped more in these years.

Primary Production Aquifer Coastal Groundwater Levels

Primary Production Aquifer groundwater levels at the coastal monitoring locations have consistently remained 3 to 14 feet above sea level, except for brief deviations of 1 to 1.5 feet below sea level at the San Francisco Zoo location and more pronounced excursions below sea level during the irrigation season at the USGS South Windmill MW-140 location in Golden Gate Park. Continuous monitoring at USGS South Windmill MW-140[13] in Golden Gate Park was not conducted in the Primary Production Aquifer until 2008; however, current monitoring indicates that Primary Production Aquifer groundwater levels at this location have declined to below sea level by as much as 20 feet during the irrigation season. Groundwater levels in the Primary Production Aquifer at this location have not shown the same declining trend as groundwater levels in the shallower portion of the aquifer at this monitoring location (USGS South Windmill MW-57).

At the Kirkham location, the Primary Production Aquifer groundwater levels also show a seasonal variation that may be a response to irrigation pumping at the South Windmill well facility, with dry-season elevations as low as approximately 3 feet NAVD 88 in 2007 (SFPUC, 2012a).

Deep Aquifer Coastal Groundwater Levels

Groundwater levels in the Deep Aquifer have periodically declined to below sea level at the Kirkham, Ortega, Taraval, and San Francisco Zoo monitoring locations (SFPUC, 2012a). In August and September of 2007, groundwater levels in the Deep Aquifer at the Kirkham location briefly declined to -1 foot NAVD 88. At the Ortega monitoring location, groundwater levels in the Deep Aquifer were below sea level for parts of 2006, 2007, and 2011, with a minimum elevation of -5 feet NAVD 88; groundwater levels at this location were on the rise and consistently above sea level between 2008 and 2010, but declined slightly in 2011, with elevations ranging from a low of approximately -0.5 feet NAVD 88 to a maximum of 6.7 feet NAVD 88 in 2011.

At the Taraval monitoring location, groundwater levels were below sea level for most of the period between August 2004 and January 2009, declining to a minimum of -9 feet NAVD 88 in September of 2007. In 2010, Deep Aquifer groundwater levels at this location were above sea level, reaching approximately 4 feet NAVD 88 by the end of 2010. Groundwater elevations at the Taraval monitoring location decreased in 2011, reaching a minimum level of approximately -4.5 feet NAVD 88 in the fall of 2011.

Except for March and April of 2006, Deep Aquifer groundwater levels at the San Francisco Zoo monitoring location were consistently below sea level between January 2004 and January 2009 due to pumping from San Francisco Zoo Well No. 5 and Daly City's municipal wells, with a minimum elevation of approximately -14 feet NAVD 88. Throughout 2010, Deep Aquifer groundwater levels at this location were much higher, ranging from about -2 to 2 feet NAVD 88.

[13] Note that this well located in an area where the Shallow and Primary Production Aquifers are merged, but it is screened at an elevation that corresponds to the upper part of the Primary Production Aquifer to the south, where the aquifers are separated by a clay layer and the sand pack extends partially into the uppermost portion of the aquifer.

Groundwater elevations at the zoo monitoring location decreased in 2011, reaching a minimum level of approximately -8.5 feet NAVD 88 in the fall of 2011.

Coastal Chloride Concentrations

Appendix D-2 provides groundwater quality data for the coastal monitoring network (including chloride data), and chloride concentrations are also shown on the hydrographs provided in Appendix D-1. With the exception of the South Windmill monitoring locations in the southwestern part of Golden Gate Park (discussed below), chloride concentrations in the coastal monitoring wells were less than 76 mg/L between 2004 and 2011 (SFPUC, 2012a). The highest concentrations were detected at the San Francisco Zoo monitoring location, and observed concentrations over the seven years of reported monitoring data for all four coastal monitoring locations have been relatively constant. These results indicate that seawater intrusion into the Shallow, Primary Production, and Deep Aquifers has not occurred despite long-term irrigation pumping at the zoo since the 1930s and in Golden Gate Park since the 1920s.

Between 2006 and 2011, chloride concentrations in the Shallow Aquifer at the USGS South Windmill MW-57 monitoring location ranged from a low of 115 mg/L in April 2006 to a high of 193 mg/L in November 2009. Since 2009, chloride concentrations have decreased; the concentration in November 2011 was 154 mg/L. Chloride concentrations in the Primary Production Aquifer at the USGS South Windmill MW-140 monitoring location ranged from a low of 48 mg/L in October 2007 to a high of 70 mg/L in November 2009. Since 2009, chloride concentrations have decreased; the concentration in November 2011 was 59 mg/L.

Monitoring results indicate that the highest chloride concentration (393 mg/L) was detected in the November 2009 Shallow Aquifer groundwater sample from well LMMW-1S; this well is not part of the coastal monitoring network but is located between Lake Merced and the Pacific Ocean (SFPUC, 2012a). As of November 2011, this concentration had declined to 250 mg/L. The maximum chloride concentration in the Primary Production Aquifer at the same location (LMMW-1D) was 109 mg/L measured in May 2011. The cause of the high chloride concentrations is unknown. While the proximity of these wells to the Pacific Ocean (approximately 1,300 feet to the west) indicates that the ocean is a potential source, LMMW-1S is separated from the ocean by the Serra Fault, which acts as a barrier to seawater intrusion (Kennedy/Jenks, 2012b). Further, the average pH of the groundwater at this location is 6.8, which is lower than the pH of seawater (about 7.8 to 8.4) and suggests a freshwater source. In addition, this pH is lower than the values measured in other monitoring wells in the basin (7.2 to 8.6), and other detected chemical constituents are not typical of seawater.

Surface Water Features

The native San Francisco coastal landscape originally included a substantial number of freshwater ponds, lakes, springs, and wetlands; most of these natural features, however, were filled during the city’s development (Oakland Museum, 2007). Although Lake Merced, Pine Lake, and five of the Golden Gate Park lakes have natural origins, these lakes have been substantially altered by human activity. The Pacific Ocean is located between 1,000 and 10,000 feet to the west of all proposed project sites (the South Windmill Replacement well facility being the nearest to the ocean).

Lake Merced

This 300-acre freshwater lake is the largest freshwater lake in San Francisco and is composed of four individual but connected water bodies (North Lake, South Lake, East Lake, and Impound Lake). Lake Merced is located in southwestern San Francisco, approximately 0.25 mile east of the Pacific Ocean (see Figures 5.16-1 and 5.16-3, and 5.11-1 in Section 5.11, Recreation). The lake is incised into the upper portion of the Shallow Aquifer and is hydraulically connected to that aquifer (see Figure 5.16-2) (Kennedy/Jenks, 2012c). Previous investigations have shown that the lake is essentially an exposed part of the water table that defines the upper boundary of the Shallow Aquifer.

North and East Lakes, which are joined by way of a narrow channel, are almost completely separated from South Lake by natural or constructed barriers; however, a conduit connects South and North Lakes at an elevation of 3.35 feet City Datum.[14] Therefore, when the lake level drops below the conduit, North and South Lakes are completely separated and typically exhibit different elevations. When the lake elevation in North and South Lakes is sufficiently higher than the bottom of the conduit, water can freely flow through the conduit between the two lakes. South and Impound Lakes are also partially separated by a low berm, and flow between these lakes is restricted below an elevation of approximately 4.3 feet City Datum.

Lake Merced does not have a natural outlet to the Pacific Ocean, but discharges occur to the Vista Grande Canal, a Daly City stormwater discharge channel that serves a 2.5-square-mile basin within Daly City and discharges from an outfall structure to the Pacific Ocean in the vicinity of Fort Funston (Jacobs Associates, 2011). Lake Merced discharges to the Vista Grande Canal at a spillway located near the midpoint of the southwest bank of South Lake at an elevation of 13 feet City Datum (Kennedy/Jenks, 2012c). The spillway is a 30-inch-diameter pipe that connects to the existing Daly City Tunnel immediately downstream of the tunnel connection to the Vista Grande Canal. This spillway limits the operational level of the lake to 13 feet City Datum.

The elevation of the bottom of each individual lake varies. The bottom of the two largest lakes, South Lake and North Lake, are at elevations of approximately -17 and -15 feet City Datum, respectively (EDAW/Talavera & Richardson, 2003). East Lake and Impound Lake are smaller and shallower, and the bottoms of these lakes are at elevations of approximately -11 and -6 feet City Datum, respectively.

Existing Uses of Lake Merced

Lake Merced supports numerous recreational activities, including boating and fishing as well as other uses managed by the San Francisco Recreation and Park Department (SFRPD), as described in Section 5.11, Recreation. The SFPUC also maintains Lake Merced as a nonpotable emergency

[14] City Datum is a measurement system that has been used at Lake Merced since at least 1926 and does not represent the depth of the lake. An elevation of 0 feet City Datum is equal to 11.37 feet above mean sea level (NAVD 88). Thus, a lake level of -11.37 City Datum is equal to mean sea level, and negative lake elevations above this level are not below mean sea level.

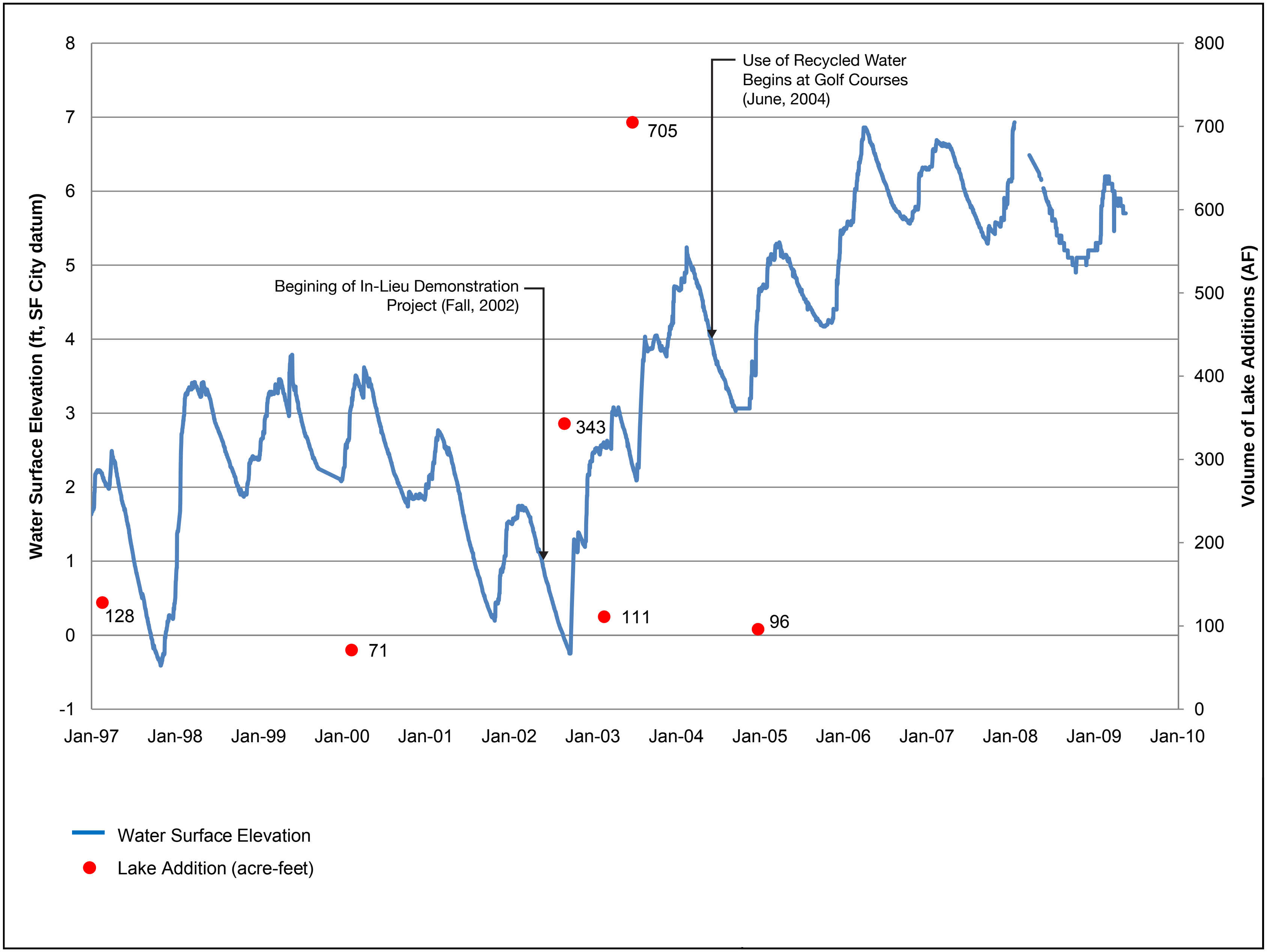
water supply for the city to be used for firefighting or sanitation purposes if no other sources of water are available (SFPUC, 2011a). In the event of a major disaster (i.e., catastrophic earthquake), Lake Merced water could be pumped into the city's drinking water distribution system to maintain firefighting, basic sanitary (e.g., toilet flushing), and other critical needs. In the event of such an emergency, residents would be directed to boil tap water before consuming it.

Historical Water-Level Fluctuations and Water Additions

Historically, Lake Merced was fed by a combination of groundwater, surface water from local streams, direct precipitation, and occasional saltwater inputs from the ocean. Urbanization during the 1900s resulted in the development of the lake's watershed, which rerouted streams out of the lake and closed it off from the ocean. The lake has historically experienced water-level declines due: to rerouting of the natural streams; closing off the lake from the ocean; diversions of stormwater runoff to the city's combined sewer system that previously discharged to the lake (described under the heading "Storm Sewer Systems" below); drought conditions; and regional and local groundwater pumping. Increases in the amount of impervious surfaces within San Francisco have also reduced natural recharge to the Shallow Aquifer. Lake Merced is now replenished primarily by direct precipitation, limited runoff from immediately adjacent areas, periodic overflows of the Vista Grande Canal, and shallow groundwater inflows; as a result, lake levels are sensitive to annual changes in precipitation and can be slow to recover from drought conditions.

Prior to 1935 (before the completion of the Hetch Hetchy water system), the lake was used for municipal water supplies. Lake levels typically ranged from -10 to 0 feet City Datum, but increased to over 13 feet City Datum by the late 1930s and early 1940s after water deliveries from the Hetch Hetchy water system began (Kennedy/Jenks, 2012c). However, water levels began to decline again in the 1940s. During the 1940s to late 1950s, lake elevations varied between 8 and 13 feet City Datum. Between the late 1950s and early 1980s, lake levels experienced a long-term declining trend, with lake elevations ranging between 4 and 10 feet City Datum. The reasons for the overall decline in lake levels between the 1940s and 1980s are reported to be drought, increased municipal groundwater pumping in the Westside Groundwater Basin, and diversion of stormwater runoff into the city's combined sewer system due to increased.

During the late 1980s and early 1990s, Lake Merced water levels declined to well below historical averages. The lowest water level observed was about -3.2 feet City Datum in 1993 following the major drought of the late 1980s and early 1990s. Since that time, the lake levels have steadily risen as a result of above-average precipitation; SFPUC water additions to the lake between 2002 and 2005; reduced irrigation pumping at the Lake Merced–area golf courses as a result of recycled water deliveries, and reduced municipal groundwater pumping as a result of the In-Lieu Recharge Demonstration Study (see **Figure 5.16-5** for 1997 to 2009 water levels). Since 2006, lake levels have consistently remained between about 5 and 7 feet City Datum. In 2009, the lake level ranged from approximately 4.9 to 6.9 feet City Datum. As of June 2009, the lake level was 5.7 feet City Datum (Kennedy/Jenks, 2012c).



SOURCE: Kennedy/Jenks Consultants, 2010; ESA

San Francisco Groundwater Supply Project EIR

Figure 5.16-5
Historic Lake Merced Water Levels

Groundwater Interactions

As stated above, Lake Merced is incised in the Shallow Aquifer, and the lake surface is essentially considered an exposed part of the water table. This hydraulic connection was further demonstrated by groundwater monitoring conducted during the SFPUC's water additions in 2002 and 2003, when 70 to 80 percent of the volume of water additions contributed to lake storage and the remaining 20 to 30 percent contributed to the net outflow and evaporative losses during the water addition periods (Kennedy/Jenks, 2012c).

Currently, the direction of groundwater flow in the unconfined Shallow Aquifer in the vicinity of Lake Merced is predominantly toward the southwest. However, north of Lake Merced, groundwater flow in this aquifer is more westerly (see Figure 5.16-4). The general direction of groundwater flow in the underlying Primary Production Aquifer exhibits a more pronounced north-to-south flow direction between Lake Merced and Daly City (see Figure 5.16-4), probably due to greater pumping stresses to the south.

A 2009 aquifer test conducted on the Lake Merced Pump Station test well, completed in the lowermost portion of the Primary Production Aquifer between the "W" and "X" clays (shown on Figure 5.16-2), demonstrated that in the vicinity of Lake Merced, this portion of the Primary Production Aquifer is confined (Kennedy/Jenks, 2012c). The aquifer test also demonstrated that the Shallow Aquifer is unconfined and hydraulically separated from the portion of the Primary Production Aquifer screened by the Lake Merced Pump Station well by multiple confining layers in the vicinity of Lake Merced.

Lake Merced Water Quality

Regulatory Considerations

As described in more detail below in Section 5.16.2, Regulatory Framework, the San Francisco Bay Regional Water Quality Control Board (RWQCB) has identified the following existing beneficial uses for Lake Merced: body-contact recreation, noncontact recreation, warm freshwater habitat, cold freshwater habitat, fish spawning, and wildlife habitat. Potential beneficial uses include municipal and domestic supplies. The RWQCB has established water quality objectives that are designed to be protective of beneficial uses. In addition, the RWQCB has listed Lake Merced as an impaired water body for dissolved oxygen and pH because of a listing made by the U.S. Environmental Protection Agency (USEPA) (SWRCB, 2011). The listing does not identify a source for the impairment.

SFPUC's Existing Water Quality Monitoring Program

To monitor lake health, the SFPUC monitors a broad range of water quality parameters at various depths within Lake Merced on a quarterly basis at four locations: North, Northeast, South–Pistol Range, and South–Pump Station (Kennedy/Jenks, 2010). The sampling is conducted between three and eight times per year but is typically conducted quarterly. For the majority of the parameters, samples at each location are collected at various depths, starting at the lake surface, and decreasing at 5-foot intervals to the lake bottom. **Table 5.16-7** shows the range of values for

TABLE 5.16-7
LAKE MERCED WATER QUALITY DATA AND BASIN PLAN WATER QUALITY OBJECTIVES

Parameter	Units	Range in Values 1997–2009	Basin Plan Water Quality Objective
Algal biomass	μg/L	402 – 6,705	• Waters shall not contain biostimulatory substances such as nitrogen and phosphorous in concentrations that would promote aquatic growths to the extent that the growths would cause nuisance or adversely affect beneficial uses. Adverse effects are indicated by irregular and extreme levels of chlorophyll a or phytoplankton blooms.
Alkalinity	mg/L	136 – 230	None
Ammonium	mg/L	Not detected to 0.65	None
Bromide	mg/L	0.22 – 0.34	None
Chloride	mg/L	58 – 98	• Controllable water quality factors shall not increase the total dissolved solids or salinity of the water so as to affect any designated beneficial uses, particularly fish migration and estuarine habitat.
Chlorophyll	μg/L	4.7 – 100	• Waters shall not contain biostimulatory substances such as nitrogen and phosphorous in concentrations that would promote aquatic growths to the extent that the growths would cause nuisance or adversely affect beneficial uses. Adverse effects are indicated by irregular and extreme levels of chlorophyll a or phytoplankton blooms.
Specific conductance	μmhos/cm	431 – 715	• Controllable water quality factors shall not increase the total dissolved solids or salinity of the water so as to affect any designated beneficial uses, particularly fish migration and estuarine habitat.
Dissolved oxygen	mg/L	0.1 – 12.2	• Warmwater habitat: 7.0 mg/L • Coldwater habitat: 5.0 mg/L • The median dissolved oxygen level shall not be less than 80 percent saturation for three months.
E. Coli	CFU/100 mL	2.0 – 100	• Moderately used area: 298 • Lightly used area: 406 • Infrequently used area: 576
Fluoride	mg/L	0.22 – 0.68	None
Hardness	mg/L	140 – 230	None
Iron	mg/L	Not detected to 0.14	None
Lead	μg/L	0.03 – 0.81	• 4-day average: 2.5 • 1-hour average: 2.4
Manganese	mg/L	0.02 – 0.3	None
MTBE	μg/L	Not detected to 1.9	None

TABLE 5.16-7 (Continued)
LAKE MERCED WATER QUALITY DATA AND BASIN PLAN WATER QUALITY OBJECTIVES

Parameter	Units	Range in Values 1997–2009	Basin Plan Water Quality Objective
Nitrate	mg/L	Not detected to 0.62	• Waters shall not contain biostimulatory substances such as nitrogen and phosphorous in concentrations that would promote aquatic growths to the extent that the growths would cause nuisance or adversely affect beneficial uses. Adverse effects are indicated by irregular and extreme levels of chlorophyll a or phytoplankton blooms.
Orthophosphate	mg/L	Not detected to 0.2	• Waters shall not contain biostimulatory substances such as nitrogen and phosphorous in concentrations that would promote aquatic growths to the extent that the growths would cause nuisance or adversely affect beneficial uses. Adverse effects are indicated by irregular and extreme levels of chlorophyll a or phytoplankton blooms.
Oxidation-reduction potential	mV	29 – 543	None
pH	–	6.8 – 8.8	• The pH shall not be depressed below 6.5 or raised above 8.5. • Controllable water quality factors shall not cause changes greater than 0.5 units in normal ambient pH levels.
Plankton	NU/mL	17 – 2511	• Waters shall not contain biostimulatory substances such as nitrogen and phosphorous in concentrations that would promote aquatic growths to the extent that the growths would cause nuisance or adversely affect beneficial uses. Adverse effects are indicated by irregular and extreme levels of chlorophyll a or phytoplankton blooms.
Secchi depth (lake clarity)	Feet	1.0 – 3.0	None
Sulfate	mg/L	6.5 – 16	None
Temperature	°F	50 – 72	• The temperature of any coldwater or warmwater freshwater habitat shall not be increased by more than 5 °F above the natural receiving water temperature.
Total coliform	MPN/100 mL	109 – 2,420	• Municipal Supply: geometric mean less than 100 • Water Contact Recreation: median less than 240 and no sample greater than 10,000
Total dissolved solids	mg/L	276 – 458	• Controllable water quality factors shall not increase the total dissolved solids or salinity of the water so as to affect any designated beneficial uses, particularly fish migration and estuarine habitat.
Total Kjeldahl nitrogen	mg/L	Not detected to 28.2	• Waters shall not contain biostimulatory substances such as nitrogen and phosphorous in concentrations that would promote aquatic growths to the extent that the growths would cause nuisance or adversely affect beneficial uses. Adverse effects are indicated by irregular and extreme levels of chlorophyll a or phytoplankton blooms.

TABLE 5.16-7 (Continued)
LAKE MERCED WATER QUALITY DATA AND BASIN PLAN WATER QUALITY OBJECTIVES

Parameter	Units	Range in Values 1997–2009	Basin Plan Water Quality Objective
Total organic carbon	mg/L	Not detected to 16.4	None
Total phosphorous	mg/L	Not detected to 0.26	• Waters shall not contain biostimulatory substances such as nitrogen and phosphorous in concentrations that would promote aquatic growths to the extent that the growths would cause nuisance or adversely affect beneficial uses. Adverse effects are indicated by irregular and extreme levels of chlorophyll a or phytoplankton blooms.
Turbidity	NTU	2.5-33	• Increases from normal background light penetration or turbidity relatable to waste discharge shall not be greater the 10 percent in areas where natural turbidity is greater than 50 NTU.

NOTES:
°C = degrees Celsius
CFU = colony forming units
°F = degrees Fahrenheit
μg/L = micrograms per liter
μmhos/cm = micromhos per centimeter
mg/L = milligrams per liter
mL = milliliters
mV = millivolts
MPN = most probable number
NTU = nephelometric turbidity units
NU = natural units

SOURCES: Kennedy/Jenks Consultants, 2010; RWQCB, 2010.

each constituent measured between 1997 and 2009 as well as the corresponding water quality objectives provided in the *Water Quality Control Plan for the San Francisco Bay Basin* (Basin Plan, further discussed in Section 5.16.2, Regulatory Framework); **Appendix D-3** provides a compilation of historical water quality data. A water quality evaluation conducted in 2010 (Kennedy/Jenks, 2010) identified seven water quality parameters that represent lake health; these parameters can be grouped as follows:

- Dissolved oxygen, which is required for fish habitat and healthy biological processes
- Secchi depth, which is a measurement of lake clarity, and can be affected by algae production and suspended solids
- Algae, total available nitrogen, and nitrogen-to-phosphorous ratio (N:P), which are indicators of algal production and nutrients, both of which affect long-term lake health
- Total coliform and *Esherichia coli* (*E. coli*), both of which are indicators of pathogenic microorganisms and fecal contamination

Based on a review of these parameters, the 2010 water quality evaluation (Kennedy/Jenks, 2010) determined that the water quality of Lake Merced remained relatively constant from 1997 to 2009, and that the lake clarity (secchi depth) improved slightly. Also, during the 1997 to 2009 sampling period, no substantial changes in algal biomass levels occurred, although there were periodic increases in concentration due to algae blooms. Dissolved oxygen levels remained above the warmwater habitat criterion of 5 mg/L and the coldwater habitat criterion of 7 mg/L for the majority of the data set. However, it was determined that dissolved oxygen levels were affected by periods of weak stratification,[15] and episodes of dissolved oxygen lower than 5 mg/L occurred during the summer and late fall in the deeper portions of the lake. Average pH levels have never exceeded the freshwater criterion of 8.5.

Lake Level-Water Quality Analysis Conducted for the EIR

Existing water quality data from 1997 to 2009 were reviewed as part of this EIR analysis to identify any potential relationships among lake levels, stratification, and water quality. This analysis considered water quality data collected at various depths (lake surface, 10-foot depth, and lake bottom) and compared the data to lake levels at the time of sampling. During the monitoring period, lake levels ranged from approximately 0 to 7 feet City Datum, with the minimum level of 0 feet City Datum occurring in 1998 and 2003, before implementation of the In-Lieu Recharge Demonstration Study discussed below. The analysis focused on the following constituents and processes, as they are the primary drivers of ecosystem health, eutrophication,[16] biogeochemistry,[17] and the suitability of the lake for the Basin Plan's identified beneficial uses of freshwater habitat, recreation, and, potentially, municipal water supply:

- **Dissolved oxygen:** Dissolved oxygen is critical to the survival of aquatic species such as fish and invertebrates, and is an indicator of the lake's overall ecological health. Dissolved oxygen is affected by (and can in turn affect) a broad range of drivers such as external pollution inputs, internal loads of certain nutrients, mixing, and primary production (described below). Low dissolved oxygen levels limit habitat for aquatic organisms and can contribute to internal nutrient loading (the release of ammonia, orthophosphates, and other compounds) from bottom sediments.

- **Algal biomass and chlorophyll:** Algal biomass and chlorophyll are indicators of the levels of primary productivity in the lake. Primary productivity is the conversion of inorganic nutrients such as nitrogen and phosphorus into organic biomass through uptake by organisms such as algae and cyanobacteria. Algae and other primary producers can increase dissolved oxygen during the day due to photosynthesis, and take up dissolved oxygen at night through respiration. In addition, the decomposition of dead algae uses dissolved oxygen and can exacerbate eutrophication.

- **Secchi depth:** Secchi depth is an indicator of turbidity (i.e., the cloudiness of the water) which can also be empirically linked to algal biomass/chlorophyll concentrations. Low secchi depths (high turbidity) can indicate the presence of organic and inorganic suspended solids that influence dissolved oxygen and nutrient levels. In general, areas with low secchi depths are considered aesthetically unappealing.

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15 Lake stratification is the separation of a lake into three layers: the top of the lake, referred to as the epilimnion; the middle of the lake, referred to as the metalimnion; and the bottom layer of the lake, referred to as the hypolimnion. The amount of lake stratification can vary over the day as well as seasonally, depending on a number of factors.

16 The process by which a body of water acquires a high concentration of nutrients, especially phosphorous and nitrogen, which can promote excessive growth of algae.

17 The scientific discipline that involves the study of the chemical, physical, geological, and biological processes and reactions that govern the composition of the natural environment.

- **Nitrogen and phosphorus:** Nitrogen and phosphorus are the main nutrients that drive eutrophication and primary production in Lake Merced. They enter the lake primarily through external stormwater and internal nutrient cycling. High levels of nitrogen and phosphorus can contribute to blooms of algae and cyanobacteria within a lake. At Lake Merced, nitrogen is measured as nitrate, ammonia/ammonium, and total Kjeldahl nitrogen (the sum of organic nitrogen and ammonia/ammonium). This analysis focuses on inorganic nitrogen (nitrate and ammonia/ammonium). Phosphorus at Lake Merced is measured as both orthophosphate and total phosphorus; the former is considered in this analysis.

- **pH:** The pH of a water body describes its acidity or alkalinity on a scale of 0 to 14, where 7 is neutral. Water bodies with a pH of less than 7 are acidic, and water bodies with a pH above 7 are alkaline or basic. The pH level is influenced by a broad range of factors, including basin geology, watershed runoff, bacterial respiration/decomposition of organic matter, and primary productivity (more productive ecosystems tend to have higher pH levels).

The EIR investigation included the preparation of a series of graphs in an effort to ascertain any possible correlation between water quality and lake levels (see **Appendix D-4**). For each of the above-described water quality parameters, the analysis plotted the monitored data collected at various depths at the South-Pump Station location against the lake level at the time the reading was collected. Based on these graphs, it was determined that further analysis of water quality data from the other three sampling locations should focus on dissolved oxygen, orthophosphate, and ammonia, and these data were then plotted against the lake level at the time the data were collected. The analysis focused on these three constituents to evaluate whether lower lake levels would lead to decreased (less frequent, weaker, shorter in duration) stratification and increased mixing within the lake. Increased mixing affects water quality in two primary ways:

- It brings surface water with generally higher dissolved oxygen levels into contact with hypoxic (less than 5 mg/L dissolved oxygen) or anoxic (less than 2 mg/L dissolved oxygen) bottom sediments. This contact can help form an oxygenated layer on the bottom sediments and biogeochemically "seal" them off from the water column, minimizing the release of nutrients such as ammonia and orthophosphate from sediments into the lake. The release of nutrients from bottom sediments is called "internal nutrient loading," and this phenomenon can have a substantial effect on water quality within lakes, ponds, and reservoirs.

- It brings bottom water that has been in contact with sediments up to the surface into the photic zone,[18] where any nutrients released from bottom sediments due to internal nutrient loading can fuel the growth of phytoplankton blooms. These blooms can exacerbate the process of eutrophication and create a positive feedback loop that results in further degradation of water quality.

This EIR investigation found that when the lake stratifies during the summer, dissolved oxygen levels are typically near saturation (approximately 10 mg/L) at the lake surface (or epilimnion), with hypoxic (dissolved oxygen levels of less than 5 mg/L) or anoxic (dissolved oxygen levels of less than 2 mg/L) conditions in the lake bottom (or hypolimnion). The lake usually "turns over," or mixes, in the fall and stays well mixed throughout the winter. When the lake is mixed,

[18] The upper layer of a body of water, limited by the depth to which sunlight can penetrate to permit photosynthesis.

dissolved oxygen levels are typically consistent throughout the entire water column, but these levels tend to be below saturation (approximately 8 mg/L, with a range of 6 to 10 mg/L).

Data analysis for the EIR investigation also indicates that, from 1997 through 2009, there appeared to be no substantial correlations between the depth of Lake Merced and the indicator water quality variables evaluated. While a depth threshold for Lake Merced water quality may exist (i.e., a depth below which water quality consistently and significantly decreases), none of the depths recorded from 1997 through 2005 appeared to represent such a threshold for the constituents analyzed. It is likely that factors external to Lake Merced are largely driving water quality, or at least are a more dominant driver than lake level on its own. Specifically, the magnitude, duration, frequency, and characteristics of urban runoff to the lake (from either the local watershed or the Vista Grande Canal), as well as groundwater inputs to the lake, likely play a major role in introducing nutrients and other pollutants that can drive water quality impacts. Shallow, urban lakes such as Lake Merced tend to be strongly influenced by episodic events such as storms and wind events as well as by more regular events such as urban runoff. While lake level is an important factor, it is likely that these other factors have a greater influence on water quality within Lake Merced than lake levels.

Pine Lake

Pine Lake is a relatively shallow, 3.4-acre freshwater lake located in the westernmost portion of Stern Grove and Pine Lake Park, about 0.5 mile northeast of Lake Merced (Figure 5.16-3). Like Lake Merced, Pine Lake is incised into the upper portion of the Shallow Aquifer. Although records pertaining to Pine Lake were limited until the past 10 to 15 years, it has been reported that in the 1930s as much as one-third of the total lake was filled at the eastern end to accommodate additional park development (Kennedy/Jenks, 2012c).

Historically, Pine Lake has received inflows from precipitation and stormwater runoff, and the primary outflows have been evapotranspiration and groundwater outflows (Kennedy/Jenks, 2012c). Over time, the lake has become shallower; in the early 1900s, the depth of the lake was reportedly about 20 feet deep. During a period of low lake levels in the early 2000s, maximum depths were only 7 to 8 feet. In 2004, the lake level was reported to be very low, at an elevation of 33.5 feet NGVD 29, or 3 to 5 feet deep. The historical shallowing of Pine Lake has been attributed to a combination of long-term sedimentation and local declines in groundwater levels. It is also likely that intense urbanization in the area surrounding Pine Lake reduced the amount of natural inflow to the lake (Kennedy/Jenks, 2012c). Pine Lake is primarily a scenic resource for recreational use at Pine Lake Park (i.e., aesthetic enjoyment), and has never been used as a drinking water supply.

The SFRPD has conducted studies and implemented several projects under its capital improvement program to address declining water levels and ecological issues at Pine Lake. As part of these efforts, the SFRPD eradicated invasive plants in 2007 and replaced them with native vegetation. In addition, the SFRPD installed a new pump in the Stern Grove well and constructed a 6-inch-diameter pipe from the well to an outlet channel that drains to Pine Lake with the goal of maintaining lake levels at a water elevation of 40.1 feet NGVD 29. This elevation is about 4 feet higher than average historical lake levels, and about 7 feet higher than the lake level in 2004 (Kennedy/Jenks, 2012c).

Lake levels in Pine Lake are currently maintained at the desired water elevation with groundwater input from the Stern Grove well, which has resulted in a lake depth of about 10 to 12 feet. The Stern Grove well is 270 feet deep and draws water from the Primary Production Aquifer. Based on information from the well operator, this well is operated approximately three to four times each year to maintain Pine Lake water levels (LSCE, 2012). At that pumping rate and operational duration, the total amount of water added to Pine Lake to maintain water levels is approximately 4.8 afy (Kennedy/Jenks, 2012c). The SFRPD continues to use groundwater from the Stern Grove well to augment water levels in Pine Lake as part of its long-term goal of maintaining lake levels at 40.1 feet NGVD.

Groundwater Interactions and Lake Levels

Shallow Aquifer groundwater levels in the vicinity of Pine Lake are monitored in two nearby monitoring wells: LMMW-5SS and LMMW-5S. These monitoring wells are shown on Figure 5.16-3 (Kennedy/Jenks, 2012c); hydrographs illustrating historical groundwater elevations at these wells are included in Appendix D-1. Monitoring well LMMW-5SS (a shallow well adjacent to Pine Lake and screened between 38 and 48 feet below ground surface) was designed to monitor the uppermost groundwater zone in the Shallow Aquifer near Pine Lake, and measurements from this well can be used to infer water levels in Pine Lake. Since 2002, groundwater elevations in this well have typically ranged from 37 to 40 feet NGVD 29. However, during periods of low water levels in Pine Lake, groundwater levels in this well declined to about 33 feet NGVD 29 (Kennedy/Jenks, 2012c). Variations in groundwater elevations measured in this well appear to closely approximate changes in water levels in Pine Lake.

LMMW-5S, which is screened between 65 and 85 feet below ground surface in the Shallow Aquifer, is also designed to monitor groundwater levels in the Shallow Aquifer near Pine Lake. However, this well monitors water from deeper within the Shallow Aquifer than does LMMW-5SS, and may be separated from the shallower portions of the aquifer by a clay layer. Generally, groundwater levels in LMMW-5SS are about 1 to 4 feet higher than those observed in LMMW-5S (Kennedy/Jenks, 2012c). Pine Lake levels can also be inferred to be slightly higher than groundwater levels in LMMW-5S. The Stern Grove well pumps groundwater from the Primary Production Aquifer, below the clay aquitard[19] that forms the base of the Shallow Aquifer, and pumping from this well is not considered to directly affect shallow groundwater levels near Pine Lake.

As part of the studies discussed above, the SFRPD added approximately 14 acre-feet of groundwater from the nearby Stern Grove well to Pine Lake in November 2004 to evaluate the potential use of the well to maintain Pine Lake at the elevation goal of 40.1 feet NGVD. During the test, groundwater levels in LMMW-5SS rapidly rose about 5 to 6 feet and leveled out at an elevation of 40.2 feet NGVD 29, which was near the lake elevation at that time, confirming that

[19] A semi-permeable layer that confines an aquifer.

Pine Lake is in direct hydraulic communication with the shallower portion of the Shallow Aquifer. Groundwater levels in LMMW-5S rose less than 1 foot during the test and were about 8 feet lower than the lake level at the end of the test, thus confirming that direct hydraulic communication between the lake and the deeper parts of the Shallow Aquifer is limited (possibly due to an intervening clay layer) (Kennedy/Jenks, 2012c). This limited hydraulic communication with the deeper parts of the Shallow Aquifer limits losses from Pine Lake to the aquifer and allows Pine Lake water levels to be maintained with minimal water additions.

Golden Gate Park

Existing Lakes

Golden Gate Park is located in the northernmost part of the North Westside Groundwater Basin, approximately three miles north of the Lake Merced area. There are 13 lakes, ponds, or water features within Golden Gate Park in the northernmost extent of the Westside Groundwater Basin: Stow Lake, Spreckels Lake, North Lake, Lily Pond, Lloyd Lake, Elk Glen Lake, Metson Lake, Mallard Lake, South Lake, Middle Lake, Alvord Lake, Fly Casting Pools, and Rainbow Falls and Pond. The largest lakes are Stow, Spreckels, and North, with surface areas of approximately 13, 6, and 4 acres, respectively (Kennedy/Jenks, 2012c). The other lakes are smaller, ranging from about 0.2 acre to 0.5 acre in surface area. Alvord Lake, Fly Casting Pools, and Rainbow Falls and Pond are very small, with paved bottoms and fountains or falls; they are considered ornamental water features rather than lakes.

All of the Golden Gate Park lakes are either manmade or have been substantially altered by human activity. It is believed that Elk Glen, Middle, and North Lakes were originally natural groundwater-fed ponds that were deepened, while the other lake locations may or may not have coincided with preexisting natural surface water features.

The constructed Golden Gate Park lakes were excavated into the shallow soils approximately 100 years ago. Most of these lakes were constructed to a maximum depth of 5 feet, and Elk Glen Lake was originally 7 feet deep. With subsequent accumulation of sediment in the lakes, the average depths by 1994 were about 1 foot shallower than originally constructed, except for the northern portion of North Lake, which was deepened to approximately 9 to 10 feet in 1990.

Groundwater Conditions

As discussed above, the Shallow Aquifer is not present in this area. Rather, the Shallow and Primary Production Aquifers are merged because of the absence of the “-100-foot” clay layer in this area. Historically, shallow groundwater levels throughout most of Golden Gate Park have ranged from 40 to 60 feet below ground surface, but are as shallow as 14 to 15 feet below ground surface at the far western edge of Golden Gate Park, near the Pacific Coast (Kennedy/Jenks, 2012c).

Most of the lakes were constructed with a gravelly clay liner in an attempt to minimize leakage of lake water into the shallow soils. Lily Pond did not require this addition of material because it was constructed within an old shale quarry, and the existing gravelly clay bottom already minimized leakage. The natural lakes (Elk Glen, Middle, and North) have not been lined. A 1994 study determined that most of the Golden Gate Park lakes leak appreciable amounts of water, including those lined with clay materials. The study estimated that the combined leakage from the park lakes was about 0.5 mgd (560 afy), with about 77 percent of the leakage coming from Elk Glen Lake, Middle Lake, and North Lake, the three natural lakes confirmed to be unlined (Kennedy/Jenks, 2012c). Some of the water lost from the lakes is periodically made up by additions of groundwater pumped from the Elk Glen, South Windmill, and North Lake irrigation wells in Golden Gate Park, while the remainder is replenished by direct precipitation and stormwater runoff.

The average depths to groundwater in the Golden Gate Park area indicate that the shallow lakes do not intersect the groundwater table and are hydraulically separated from the groundwater. On the other hand, the lakes do recharge the aquifer through leakage to the shallow soils described above. However, this exchange is not considered a groundwater/surface water interaction because the water flows in one direction only, and the water table is too far below the bottom of the lakes for changes in groundwater levels to affect lake levels.

Drinking Water Source Assessment and Protection Program Findings

The SFPUC conducted drinking water source assessments for the proposed well facilities between 2006 and 2011 to identify potentially contaminating activities and to rank the vulnerability of the well to contamination during use, in accordance with California's DWSAP program, as described in greater detail below in Section 5.16.2, Regulatory Framework. For each well, the drinking water source assessment calculated groundwater protection zones representing the overlying areas where groundwater could be drawn into the wells during two, five, and ten years of pumping, and also determined the degree to which the well would be protected from contamination based on the local hydrogeology and construction features of the well (referred to as the "physical barrier effectiveness" of the well). Potentially contaminating activities within the groundwater protection zones were identified, and a vulnerability score was developed for each potentially contaminating activity based on: the groundwater protection zone in which the activity was identified; the physical barrier effectiveness of the well; and the nature of the potentially contaminating activity. The vulnerability score can range from 1 to 17, and the California Department of Public Health considers water supply wells to be vulnerable to potentially contaminating activities with a vulnerability score of 8 or higher. The DWSAP reports for each of the proposed production wells found the following:

- **North Lake Well Facility.** This existing irrigation well is constructed within an unconfined aquifer (with no intervening clay layer) with a surface seal constructed to a depth of 130 feet, and would therefore have a physical barrier effectiveness rating of "moderate." There are no documented cases of groundwater contamination within the groundwater protection zones. Potentially contaminating activities with a vulnerability score of 8 or higher that have been identified within the groundwater protection zones for the well include sewer collection systems, housing, parks, dry cleaners, historical gas stations, transportation corridors, surface water, golf courses, and illegal activities (LSCE, 2009a).

- **South Windmill Replacement Well Facility.** This existing irrigation well is constructed within an unconfined aquifer (with no intervening clay layer) with a surface seal constructed to a depth of 110 feet, and would therefore have a physical barrier effectiveness rating of "moderate." A gas station at 1200 La Playa Street experienced a leak from its underground storage tank in 1981. However, the leak was closed, and affected soil was removed and properly disposed. The site is currently in the remediation phase. The resulting groundwater contamination plume is limited to the uppermost part of the aquifer and is stable. In addition, a sensitive receptor survey conducted for the site determined that the South Windmill Replacement well facility is cross gradient from the leak site, and groundwater quality at the South Windmill Replacement well is not likely to be affected as a result of this underground storage tank leak (Antea Group, 2011).

  Other potentially contaminating activities with vulnerability scores of 8 or higher that have been identified within the groundwater protection zones include automobile gas stations, historical gas stations, sewer collection systems, housing, parks, golf courses, contractor or government storage yards, water treatment plants, irrigation wells, monitoring wells, underground storage tanks, hotels, transportation corridors, fire stations, schools, and illegal activities/dumping (LSCE, 2009b).

- **Central Pump Station Well Facility.** This test well would be upgraded to a production well with implementation of the proposed project. It is constructed within an unconfined aquifer (with no intervening clay layer) with a surface seal constructed to a depth of approximately 100 feet, and would therefore have a physical barrier effectiveness rating of "moderate." There are no documented cases of groundwater contamination within the groundwater protection zones. Potentially contaminating activities with vulnerability scores of 8 or higher that have been identified within the groundwater protection zones include irrigation wells, sewer collection systems, parks, contractor or government agency equipment storage yards, automobile gas stations, historical gas stations, underground storage tank sites with leaking tanks, storm drain discharge points, transportation corridors, surface water, housing, and monitoring wells (LSCE, 2010b). The leaking underground storage tank site—a private residence located northeast of the proposed well on 21st Avenue near the intersection with Fulton Street—has been remediated and the case has been closed (SWRCB, 2012).

- **West Sunset Playground Well Facility.** This test well would be upgraded and converted to a production well with implementation of the proposed project. It is completed in an unconfined aquifer (with no intervening clay layer) with a surface seal constructed to a depth of 120 feet, and would therefore have a physical barrier effectiveness rating of "moderate." There are no documented cases of groundwater contamination within the groundwater protection zones. Potentially contaminating activities with vulnerability scores of 8 or higher that have been identified within the groundwater protection zones include sewer collection systems, housing, parks, transportation corridors, schools, and monitoring wells (LSCE, 2008).

- **Lake Merced Well Facility.** This test well would be upgraded and converted to a production well with implementation of the proposed project. It is completed in the Primary Production Aquifer (which is confined) with a surface seal constructed to a depth of 340 feet, and would therefore have a physical barrier effectiveness rating of "high." There are no documented cases of groundwater contamination within the groundwater protection zones. Potentially contaminating activities with vulnerability scores of 8 or higher that have been identified within the groundwater protection zones include pesticide/fertilizer/petroleum storage areas, pesticide/fertilizer/herbicide application, sewer collection systems, automobile gas stations, golf courses, housing, and transportation corridors (LSCE, 2006).

- **South Sunset Well Facility.** This test well would be upgraded and converted to a production well with implementation of the proposed project. It is constructed within an unconfined aquifer (with no intervening clay layer) with a surface seal constructed to a depth of approximately 120 feet, and would therefore have a physical barrier effectiveness rating of "moderate." There are no documented cases of groundwater contamination within the groundwater protection zones. Potentially contaminating activities with vulnerability scores of 8 or higher that have been identified within the groundwater protection zones include sewer collection systems, high density housing, parks, dry cleaners, historical gas stations, transportation corridors, and hardware/lumber/parts stores (LSCE, 2011).

In-Lieu Recharge Demonstration Study

From October 2002 through April 2007, the SFPUC and three Partner Agencies (Daly City; California Water Service Company [Cal Water]; and the City of San Bruno)[20] participated in the In-Lieu Recharge Demonstration Study in the South Westside Groundwater to study the effects of the groundwater recharge component of a conjunctive use program. During the Demonstration Study, the Partner Agencies received approximately 20,000 acre-feet of supplemental surface water from the SFPUC "in-lieu" of their normal groundwater pumping. The purpose of the study was to determine if providing supplemental water to the Partner Agencies would result in increased groundwater availability for pumping in dry years and for emergency supply when the SFPUC regional water supply may be reduced (Kennedy/Jenks, 2012a).

Before, during, and after the Demonstration Study, the SFPUC undertook groundwater monitoring throughout the South Westside Groundwater Basin and adjacent areas along the Pacific Coast and San Francisco Bay to determine the extent to which groundwater levels and storage were affected. After approximately three years of operating the Demonstration Study(from fall 2002 to spring 2005), the SFPUC reported that the reduction of pumping by the Partner Agencies resulted in increased groundwater levels in the Primary Production Aquifer, where the Partner Agencies' wells are screened (LSCE 2005).

The 20,000 acre-feet of groundwater savings accrued under the Demonstration Study was credited to an SFPUC Storage Account. However, this water would not be withdrawn unless the SFPUC approves the Groundwater Storage and Recovery Project (discussed in Section 5.1.5, Overview of Groundwater Modeling Approach); the SFPUC and the Partner Agencies approve

[20] Since the 1990's, the SFPUC has worked cooperatively on Westside Groundwater Basin investigations, monitoring and coordinated projects with water suppliers in the southern part of the basin, including Daly City, Cal Water, and San Bruno, collectively referred to as the Partner Agencies (SFPUC, 2011d). The Partner Agencies have typically used groundwater from the Westside Groundwater Basin for municipal water supply in combination with SFPUC imported surface water. Daly City's Department of Water and Wastewater Resources is responsible for the management and operation of Daly City's drinking water supply system. The City of San Bruno's Water Division of the Public Works Department is responsible for the management and operation of San Bruno's drinking water supply system. Cal Water is an investor-owned utility that, within the Westside Groundwater Basin, serves South San Francisco, Colma, and a very small part of Daly City.

the associated Operating Agreement;, and the Groundwater Storage and Recovery Project wells are constructed to enable use of the water in storage (Kennedy/Jenks, 2012a).

Storm Sewer Systems

Stormwater runoff from the western portions of San Francisco drains to the city's combined stormwater and sewage system, or one of seven separate sewer systems administered by the SFPUC (SFPUC, 2010a). With the exception of the Lake Merced well facility site (discussed further below), the project sites would be located in areas served by the combined system. These stormwater collection systems are described below.

SFPUC Combined Sewer System

The majority of stormwater runoff from the western portions of San Francisco, including flow from most of the project area, is diverted to the city's combined sewer and stormwater system, which collects and transports both sanitary sewage and stormwater runoff in the same set of pipes. In 2010, approximately 14 mgd of treated wastewater (effluent) were discharged from San Francisco's Westside drainage area to the Pacific Ocean through the Oceanside Water Pollution Control Plant (WPCP) located at 3500 Great Highway (SFPUC, 2011b). This plant has the capability to treat up to 43 mgd of sewage to a secondary level[21] and has a permitted dry-weather capacity of 21 mgd. Therefore, the Oceanside WPCP can accommodate all existing dry-weather flows, which are treated to a secondary level prior to discharge to the ocean through the Southwest Ocean Outfall located 3.75 miles offshore.

During wet weather, the combined wastewater and stormwater flow is conveyed to treatment facilities before eventual discharge to the Pacific Ocean. Depending on the amount of rainfall, wet-weather flows are treated to varying levels before being discharged. Up to 43 mgd of wet-weather flows receive secondary treatment at the Oceanside WPCP (SFPUC, 2006). Up to an additional 22 mgd of wet-weather flows are treated to a primary standard[22] at the Oceanside WPCP and discharged through the Southwest Ocean Outfall. Wet-weather flows in excess of 65 mgd—the combined primary and secondary treatment capacity of the Oceanside WPCP—receive flow-through treatment equivalent to primary treatment in three large storage/transport boxes: the Westside Transport, Richmond Transport, and Lake Merced Transport, which have a combined storage capacity of 73.5 million gallons, including 2.2 million gallons of storage in the sewer lines. Wet-weather flows between 65 mgd and 175 mgd (approximately 37 percent of the total wet-weather flows) are discharged to the ocean through the Southwest Ocean Outfall, and flows in excess of 175 mgd (about 13 percent of the total wet-weather flows) are discharged at the shoreline through one of seven combined sewer discharge structures located along the coast.

[21] Secondary effluent treatment is a process that reduces suspended solids and biological oxygen demand in wastewater by approximately 90 percent.

[22] In 1989, the RWQCB deleted the requirement for disinfection of the primary treated wastewater discharged from the Oceanside WPCP because studies conducted in 1987 and 1988 indicated that the nondisinfected wastewater discharges from the Southwest Ocean Outfall did not violate the bacteriological body-contact standards presented in the *Water Quality Control Plan, Ocean Waters of California*. Monitoring conducted since 1986 supports this conclusion (RWQCB, 2009).

These discharge facilities are designed to capture and store flows sufficient to reduce such discharges to a long-term average of eight overflows per year. During the eight-year period from 1997 to 2004, the Westside drainage basin combined sewer discharges were less than the long-term average of eight discharges per year (SFPUC, 2006).

Because the ocean outfall is located beyond the California territorial limit of three miles, regulatory authority for the near-shore discharges and outfall discharge is jointly administered by the RWQCB and the USEPA. All dry- and wet-weather discharges from the combined sewer system to the Pacific Ocean, through either the Southwest Ocean Outfall or the combined sewer discharge structures, are operated in compliance with the federal Clean Water Act and the State of California's Porter-Cologne Water Quality Control Act through National Pollutant Discharge Elimination System (NPDES) permit CA0037681, issued by the RWQCB and the USEPA (RWQCB, 2009).

SFPUC Separate Stormwater Collection Systems

The SFPUC administers several small Municipal Separate Storm Sewer System (MS4) facilities within western San Francisco, one of which is the Lake Merced system that discharges to Lake Merced (SFPUC, 2010a). This system, which encompasses the Lake Merced well facility site, consists of catch basins that do not provide stormwater treatment prior to discharge to the lake. The Lake Merced system is regulated by the Phase II General Permit (described in Section 5.16.2, under the heading "NPDES Discharge Permits"). The Lake Merced well facility would be served by this system.

Pacific Ocean

The SFPUC conducts the Southwest Ocean Outfall Regional Monitoring Program (SFPUC, 2006) to assess the environmental effects on ocean water quality related to discharges of treated stormwater and wastewater from the Oceanside WPCP and associated facilities. The Pacific Ocean is listed as an impaired water body for bacteria at Baker Beach (SRWQCB, 2011). The Southwest Ocean Outfall Regional Monitoring Program includes a Beach Monitoring Program to evaluate bacterial concentrations at recreational beaches. Under this program, the SFPUC posts public notices at beaches when any state bacterial standards for recreational uses are exceeded or a combined sewer discharge occurs. The program has demonstrated that water quality at San Francisco beaches remained below the thresholds for water-contact recreation for 95 percent or more of the time during the eight-year (1997–2004) monitoring period. The Southwest Ocean Outfall Regional Monitoring Program also includes a regional Offshore Monitoring Program; under this program, ocean water samples are analyzed for various physical, chemical, and biological parameters to allow for a comparison of conditions in the Southwest Ocean Outfall area to reference conditions. The results of this program indicate that biological parameters and sediment pollutant concentrations at the Southwest Ocean Outfall discharge area have generally been the same or essentially the same as at the reference stations.

Flooding, Seiche, and Tsunami Hazards

Flooding

The Federal Emergency Management Agency (FEMA) is currently preparing flood insurance rate maps (FIRMs) for San Francisco.[23] FIRMs identify areas that are subject to inundation during a "base flood," this is a flood having a 1 percent chance of occurring in a given year (also known as the "100-year flood," or "1 percent annual chance flood"). FEMA refers to the area at risk from a flood of this magnitude as a "special flood hazard area." As proposed, the FIRMs would designate portions of waterfront piers, Mission Bay, Bayview–Hunters Point, Hunters Point Shipyard, Candlestick Point, and Treasure Island as Zone A (areas subject to inundation by tidal surge) or Zone V (areas of coastal flooding subject to wave hazards) (CCSF, 2011).

Pending completion of the federal FIRMs for San Francisco, the CCSF has created an interim floodplain map that identifies areas of flooding within the city limits (CCSF, 2008). FEMA approved San Francisco's application for participation in the National Flood Insurance Program in April 2010, meaning that homeowners, renters, and business owners in the city are now eligible to purchase federally subsidized flood insurance to protect their property. The CCSF Administrator's Office and the San Francisco Department of Emergency Management are also working to identify potential hazard mitigation projects that may be eligible for grants from FEMA. None of the proposed project areas are located within a special flood hazard zone identified on the San Francisco interim floodplain map. Furthermore, none of the proposed project facilities are located in an area identified as prone to flooding under existing conditions or to combined sewer backups (San Francisco Planning Department, 2007).

Tsunami and Seiche

Tsunamis (seismic sea waves) are long-period waves that are typically caused by underwater seismic disturbances, volcanic eruptions, or submerged landslides. Tsunamis, which travel at speeds up to 700 miles per hour, are typically only 1 to 3 feet high in open ocean water, but may increase in height to up to 90 feet as they reach coastal areas, potentially causing widespread damage when they reach land (URS Corporation, 2008). Low-lying coastal areas (such as tidal flats, marshlands, and former bay margins that have been artificially filled but are still at or near sea level) are generally the most susceptible to tsunami inundation. A seiche is caused by oscillation of the surface of an enclosed body of water, such as San Francisco Bay, during an earthquake. Seiches can result in long-period waves that overtop adjacent land masses, similar to a tsunami. Only one tsunami has been recorded as originating along the central California coast: it occurred shortly after the 1906 earthquake and had a height of 4 inches as recorded at the

[23] In September 2007, FEMA issued a preliminary FIRM of San Francisco for review and comment by the City and County of San Francisco (CCSF). The CCSF submitted comments that year, and FEMA anticipates publishing a revised preliminary FIRM, after completing a detailed analysis of flood hazards associated with San Francisco Bay as requested by Port and CCSF staff. FEMA will finalize the FIRM and publish it for flood insurance and floodplain management purposes after reviewing comments and appeals related to the revised preliminary FIRM.

Presidio gauge station. In March 2011, a tsunami originating in Japan caused a swell of approximately 2 feet in San Francisco Bay (NOAA and TWC, 2011).

In 2009, the state's official tsunami inundation maps were completed (California Emergency Management Agency, California Geological Survey, and University of Southern California, 2009). Although much of the Pacific Coast is subject to potential inundation, none of the proposed project facilities are located within any of the identified inundation areas.

Future Flooding Areas

Rising sea levels increase the potential for coastal flooding, and the issue of sea level rise is important in land use planning and hazard analysis in coastal areas. California Executive Order S-13-08, signed on November 14, 2008, specifies that all state agencies planning construction projects in areas that are vulnerable to future sea level rise must consider a range of scenarios for 2050 and 2100 to assess project vulnerability, and, to the extent feasible, must reduce expected risks and increase resiliency with respect to sea level rise. This executive order directed the California Resources Agency, in cooperation with the Department of Water Resources (DWR) and the California Energy Commission, to prepare a report assessing the risk and providing recommendations as to how California should plan for sea level rise. In December 2010, the DWR released a report entitled *Climate Change Characterization and Analysis in California Water Resources Planning Studies* (DWR, 2010).

For planning purposes, the Governor of California's Delta Vision Blue Ribbon Task Force adopted a projected sea level rise of 55 inches (4.6 feet) by 2100—until such time that an executive order determines otherwise (Delta Vision Blue Ribbon Task Force, 2008). The DWR—along with four other State of California agencies, the states of Oregon and Washington, and three federal agencies engaged with the National Research Council to prepare a scientific review of sea-level rise for the West Coast (NRC, 2012). This report, entitled "Sea Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future," estimates that sea level rise along the California coast south of Cape Mendocino (which includes the project area) relative to conditions in 2000 will be 2 to 12 inches by the year 2030, 5 to 24 inches by the year 2050, and 17 to 66 inches by the year 2100. While these estimated levels have not been adopted for planning purposes, the upper end of these ranges are relatively consistent with the projected sea level rise adopted by the Delta Vision Blue Ribbon Task Force.

Based on mapping completed by the Pacific Institute, much of the Pacific Coast could be subject to flooding associated with a 100-year flood event with a sea level rise of 55 inches (Pacific Institute, 2009a, 2009b, 2009c). The South Windmill Replacement well facility site is located in a mapped area of potential coastal flooding under both existing conditions, as well as with a 55-inch sea level rise (Pacific Institute, 2009a). FEMA has not mapped a flood zone in this area under existing conditions, as discussed above.

Until the year 2050, most of the climate models predict a similar degree of sea level rise; however, after 2050, projections of sea level rise become less certain because of divergent modeling results and differences in various estimates of the degree to which the international community will decrease greenhouse gas emissions (California Climate Action Team, 2010). Therefore, projections of sea level rise after the year 2050 are considered more speculative.

5.16.2 Regulatory Framework

Federal and State Regulations

Clean Water Act

The federal Clean Water Act and subsequent amendments, under the enforcement authority of the USEPA, was established "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The act established the basic structure for regulating discharges of pollutants into the waters of the United States. It gave the USEPA the authority to implement pollution control programs, such as setting wastewater standards for industry. The Clean Water Act also set water quality standards for all contaminants in surface waters and made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit is obtained under its provisions.

NPDES Waste Discharge Regulations

The federal Clean Water Act established the NPDES program to protect the water quality of receiving waters. Under the Clean Water Act, Section 402, discharging pollutants to receiving waters is prohibited unless the discharge is in compliance with an NPDES permit. For California, the USEPA determined that the state's water pollution control program had sufficient authority to manage the NPDES program under California law in a manner consistent with the Clean Water Act. Therefore, implementation and enforcement of the NPDES program is conducted through the SWRCB and the nine RWQCBs, as discussed below.

Water Quality Criteria

The Clean Water Act established ambient water quality criteria for the protection of aquatic life and human health that serve as guidance for states to use in adopting water quality standards. In 1980, the USEPA published water quality criteria for 64 pollutants and pollutant classes, and considered noncancer, cancer, and taste and odor effects. Additional criteria were adopted under the 1992 National Toxics Rule, and criteria specific to California were adopted under the 2000 California Toxics Rule. In 2002, the USEPA revised its recommended water quality criteria for 83 chemicals based on a revised methodology adopted in 2000 in order to protect human health, and in 2003 the USEPA published an additional 15 revised human health criteria (USEPA, 2005). Human health criteria are based on the assumption that a person could: (1) eat fish and drink water from a water body, or (2) only eat fish from a water body. The 2002 revisions incorporate new toxicity information on compounds and other changes in the calculation method.

Section 303(d) List of Impaired Water Bodies and Total Maximum Daily Loads

In accordance with Section 303(d) of the Clean Water Act, states must present the USEPA with a list of "impaired water bodies," defined as those water bodies that do not meet water quality standards. The RWQCB listed Lake Merced as an impaired water body for dissolved oxygen and pH, and Baker Beach on the Pacific Coast is listed for bacteria (RWQCB, 2007).

In an effort to improve the water quality of impaired water bodies, the Clean Water Act requires state entities to develop total maximum daily loads (TMDLs) which specify the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards. The first step of the TMDL process is preparation of a TMDL report that describes the water quality problem to be addressed, details the pollutant sources, and outlines the solutions. An implementation plan, included in the TMDL report, describes how and when pollution prevention, control, or restoration activities will be accomplished and who is responsible for these actions. The final step of the TMDL process is adopting and amending the Basin Plan to legally establish the TMDL and to specify regulatory requirements for compliance. As part of the Basin Plan Amendment, waste load allocations are specified for entities that have permitted discharges.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Division 7 of the California Water Code) regulates water quality within California and established the authority of the SWRCB and the nine regional water boards. The quality of San Francisco Bay Area water resources is regulated under the jurisdiction of the San Francisco Bay RWQCB (Region 2).

Water Quality Control Plans and Beneficial Uses

The RWQCB's Basin Plan, which was most recently updated in 2010, established regulatory standards and objectives for water quality in the San Francisco Bay region (RWQCB, 2010). The Basin Plan identifies existing, limited, and potential beneficial uses for surface water and groundwater and provides numerical and narrative water quality objectives designed to protect those uses. Applicable water quality criteria for a specific water body are determined on the basis of the beneficial use(s) of the water. The Basin Plan also specifies that beneficial use designations for any given water body do not rule out the possibility that other beneficial uses exist or have the potential to exist. Existing beneficial uses that have not been formally designated in this Basin Plan are protected whether or not they are identified.

Existing beneficial uses of Lake Merced designated in the Basin Plan include body-contact recreation (e.g., swimming, wading, and fishing), noncontact recreation (e.g., rowing), warm freshwater habitat, cold freshwater habitat, fish spawning, and wildlife habitat. Municipal and domestic supplies are also potential beneficial uses of Lake Merced. However, while the Basin Plan lists body-contact recreation as a beneficial use of Lake Merced, swimming and wading are not allowed by the CCSF. Although the Basin Plan does not designate any beneficial uses for Pine Lake identified in the Basin Plan, Pine Lake Park has walking/running trails and turf areas, and the lake provides a scenic backdrop for these recreational activities.

The SWRCB regulates water quality in the Pacific Ocean through regulatory standards and objectives outlined in the *Water Quality Control Plan, Ocean Waters of California* (commonly referred to the Ocean Plan) (SWRCB, 2005). The Ocean Plan identifies beneficial uses of ocean waters and provides water quality objectives that are protective of these uses. The plan provides objectives for bacteriological, physical, chemical, biological, and radioactive characteristics, as well as general requirements for the management of waste discharges to the Pacific Ocean. The Southwest Ocean Outfall discharges to federal ocean waters 3.75 miles from shore and the USEPA relies upon the water quality objectives of the Ocean Plan for the purposes of regulating discharges from the Southwest Ocean Outfall. The Ocean Plan designates the following beneficial uses for the ocean waters of the State of California: industrial water supply; water-contact and noncontact recreation, including aesthetic enjoyment; navigation; commercial and sport fishing; mariculture; preservation and enhancement of designated Areas of Special Biological Significance; rare and endangered species; marine habitat; fish migration; and fish spawning and shellfish harvesting.

Statement of Policy with Respect to Maintaining High Quality Waters in California

In 1968, the SWRCB adopted the "Statement of Policy with Respect to Maintaining High Quality Waters in California" (Resolution No. 68-16) to ensure that the existing high quality of state waters would be maintained. Activities that would lower water quality are only allowed if the change: would be consistent with the concept of "maximum benefit to the people of the State"; would not unreasonably affect present and potential beneficial uses; and would not result in water quality that is lower than applicable water quality standards. Under this policy, dischargers must use best practicable treatment or control methods to ensure that no pollution or nuisance would occur as a result of the discharge, and that the highest water quality consistent with the "maximum benefit" concept is maintained. For groundwater, this policy employs a pollutant-by-pollutant approach to determine if the groundwater is of high quality.

Drinking Water Standards and Regulations

Drinking Water Standards

The California Department of Public Health implements the California Safe Drinking Water Act which provides that drinking water in the state shall meet primary and secondary MCLs (CDPH, 2012). Primary and secondary MCLs for specific constituents are set in Title 22 of the California Code of Regulations, Chapter 15. Primary MCLs are established to protect public health; secondary MCLs are established to prevent drinking water from appearing colored or from tasting or smelling bad, thus causing people to stop using water from their public water system (USEPA, 2012). The USEPA also sets primary and secondary MCLs through its National Primary Drinking Water Regulations. State and federal MCLs are generally similar, although state levels may be more stringent. MCLs are set for bacteria and other microorganisms, chemicals, and radionuclides.

Title 22 of the California Code of Regulations, Chapter 15, Section 64449, specifies recommended, upper, and short-term secondary MCLs for four parameters including TDS, specific conductance, chloride, and sulfate. Public water utilities seek to maintain concentrations of these constituents below the recommended secondary MCLs to assure a high degree of consumer satisfaction. Constituent concentrations up to the upper secondary MCL are acceptable if providing more suitable water is neither reasonable nor feasible. For existing community water systems, constituent concentrations between the upper secondary MCL and the short-term secondary MCL are acceptable only on a temporary basis, pending the construction of treatment facilities or development of acceptable new water sources. For new community water systems, constituent concentrations between the upper and short-term secondary MCL are only acceptable if the service provider is demonstrating adequate progress toward providing water of improved mineral quality, or for other compelling reasons approved by the California Department of Public Health.

In accordance with Title 22 of the California Code of Regulations, public water systems with 10,000 service connections or more must also fluoridate their water supplies to protect oral health; fluoride concentrations are specified by the regulations.

Groundwater Rule

The USEPA Groundwater Rule (Title 40 of the Code of Federal Regulations, Part 141) provides protection against microbial pathogens in public water sources that use groundwater resources, including systems that mix groundwater and surface water (USEPA, 2006). In accordance with the Groundwater Rule, municipalities that use groundwater resources must conduct periodic sanitary surveys and source water monitoring, and must implement corrective actions if a significant deficiency is noted in the water system, or if fecal contamination is identified in the source water.

Lead and Copper Rule

The USEPA Lead and Copper Rule (Title 40 of the Code of Federal Regulations, Part 141, Subpart I) limits the concentration of lead and copper allowed in public drinking water at the consumer's tap, primarily by limiting the water corrosivity (USEPA, 2008). The primary source of the lead and copper at the consumer tap is plumbing fixtures that contain these materials, and water that is corrosive can mobilize both lead and copper from the fixtures. If the concentration of lead or copper exceeds the action levels specified in the rule, the water supplier can be required to conduct water quality monitoring, implement corrosion control treatment, implement source water monitoring and or treatment, educate their consumers about how to reduce exposure to lead, and replace lead service lines. For the SFPUC regional water system, pH adjustment is the optimal corrosion control treatment that has been approved by the California Department of Public Health (formerly the California Department of Health Services) (CDHS, 2006).

Drinking Water Source Assessment and Protection Program

The State of California's DWSAP program requires public water utilities to conduct a drinking water source assessment be conducted to determine the potential for contamination of their water sources (CDHS, 2000). If the assessment determines that the drinking water source would be vulnerable to potentially contaminating activities, a voluntary source-water protection program is recommended. Source-water protection is not a mandated element of the DWSAP program, but is required for a complete wellhead protection program under guidance prepared for implementation of the DWSAP program. Source-water protection provides the and affords a public water utility or community the opportunity to build on work performed during preparation of the drinking water source assessment.

California Coastal Act of 1976

The California Coastal Commission, in partnership with coastal cities and counties, plans and regulates the use of land and water in coastal areas under the California Coastal Act of 1976 (see Division 20 of the Public Resources Code). This act includes policies that address issues such as shoreline public access and recreation, lower cost visitor accommodations, terrestrial and marine habitat protection, visual resources, landform alteration, agricultural lands, commercial fisheries, industrial uses, water quality, offshore oil and gas development, transportation, development design, power plants, ports, and public works. The policies of the Coastal Act constitute the statutory standards applied to planning and regulatory decisions made by the Commission and by local governments, pursuant to the Coastal Act.

Under the California Coastal Act, the state legislature mapped an official coastal zone addressed by the California Coastal Act was specifically mapped by the Legislature and covers an area larger than the state of Rhode Island. On land, the coastal zone varies in width from several hundred feet in highly urbanized areas up to five miles in certain rural areas; offshore the coastal zone encompasses a three-mile-wide band of ocean. The coastal zone does not include San Francisco Bay, which is regulated by the Bay Conservation and Development Commission. Along with the Bay Conservation and Development Commission, the Coastal Commission is one of California's two designated coastal management agencies for the purpose of administering the federal Coastal Zone Management Act in California.

In accordance with the California Coastal Act, a permit is required for development activities within the coastal zone. The Coastal Act broadly defines development activities to include (among others) the construction of buildings, division of land, and any activity that changes the land use intensity or public access to coastal waters.

Western Shoreline Area Plan

As described in Chapter 4, Plans and Policies, the *Western Shoreline Area Plan* (an area plan contained in the *San Francisco General Plan*) is the CCSF's plan for the local coastal zone established by the California Coastal Act of 1976. The *Western Shoreline Area Plan* outlines objectives and policies pertaining to open space in the area covered by the plan; this area includes the western portion of Golden Gate Park—specifically, the sites of the South Windmill Replacement and North Lake well facilities, and the Lake Merced well facility. The San Francisco Planning Commission is responsible for issuing coastal development permits for development within the local coastal zone.

NPDES Discharge Permits

Oceanside Water Pollution Control Plant, Collection System, and Westside Wet Weather Facilities Permit (RWQCB Order No. R2-2009-0062)

The CCSF currently holds NPDES permit No. CA0037681 (adopted in August 2009), which covers the Oceanside WPCP, Southwest Ocean Outfall, and Westside Wet Weather Facilities (RWQCB, 2009). The permit specifies discharge prohibitions, dry-weather effluent limitations, wet-weather effluent performance criteria, receiving water limitations, sludge management practices, and monitoring and reporting requirements. The permit also prohibits overflows from the combined sewer overflow structures during dry weather, and requires that wet-weather discharges comply with the nine minimum controls specified in the federal Combined Sewer Overflow Control Policy, described below.

In April 1994, the USEPA adopted the Combined Sewer Overflow Control Policy, which became part of the Clean Water Act in December 2000. This policy established a consistent national approach for controlling discharges from combined sewers to the nation's water. As specified in the NPDES permit, the policy initiated a two-phased process, with higher priority given to more environmentally sensitive areas.

During the first phase, the permittee is required to implement the following nine minimum controls that constitute the technology-based requirements of the Clean Water Act and that can reduce the frequency of combined sewer overflows and their effects on receiving water quality:

1. Conduct proper operation and regular maintenance programs for the combined sewer system and combined sewer overflow outfalls.
2. Maximize the use of the collection system for storage.
3. Review and modify pretreatment programs to ensure that combined sewer overflow impacts are minimized.
4. Maximize flow to the treatment plant for treatment.
5. Prohibit combined sewer overflows during dry weather.
6. Control solids and floatable materials in combined sewer overflows.
7. Develop and implement pollution prevention programs that focus on contaminant reduction activities.
8. Notify the public.
9. Monitor to effectively characterize combined sewer overflow impacts and the efficacy of combined sewer overflow controls.

The CCSF is currently implementing these controls, as required by the Combined Sewer Overflow Control Policy. This included development of the SFPUC Water Pollution Prevention Program to minimize pollutant entry into the city's combined sewer system and to address pollutants from residential, commercial, industrial, and nonpoint sources.

During the second phase, the permittee is required to continue implementation of the nine minimum controls, properly operate and maintain the completed combined sewer discharge controls in accordance with the operational plan, and implement the post-construction monitoring program. In conformance with the Combined Sewer Overflow Control Policy, the CCSF has developed and fully implemented a long-term control plan to select combined sewer discharge controls to protect the beneficial uses of the receiving waters. The control plan utilized the "presumptive approach" for the protection of water quality and in accordance with the Combined Sewer Overflow Control Policy, this approach must meet at least one of the following criteria:

- An average of four combined sewer overflow events per year
- Elimination or capture of no less than 85 percent by volume of the combined sewage collected in the combined sewer system during precipitation events on a systemwide average basis
- Removal of the mass of any contaminant causing water quality impairment that would be otherwise removed by eliminating or capturing the flow as specified above

The Combined Sewer Overflow Control Policy requires that any combined sewer discharges that occur after implementation of the nine minimum control measures receive a minimum of primary clarification (removal of floatables and settleable solids), solids and floatable disposal, and disinfection (if necessary to meet water quality standards and protect the beneficial uses of the receiving water). However, the San Francisco Wastewater Control Program exceeds the specifications of the Combined Sewer Overflow Policy because 100 percent of the combined sewer flows are captured and treated rather than the 85 percent specified in the Combined Sewer Overflow Policy. As defined in the policy, San Francisco has no remaining untreated overflow events because all combined flows are captured and treated to a minimum of the equivalent of primary treatment within the storage/transport boxes, and this treatment consists of removal of floatables and settleable solids.

In 1997, the CCSF completed improvements associated with the 20-year, $1.6 billion *Wastewater Master Plan*, which included extensive storage, transport, and treatment upgrades to the combined sewer system that met approved design criteria for the overall protection of beneficial uses. Operation of the improved facilities satisfies the requirements of the Combined Sewer Overflow Control Policy, including maximizing use of the system during wet weather.

Phase II General Stormwater Permit (SWRCB Order No. 2003-0005-DWQ)

In 2003, the SWRCB adopted the General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems, SWRCB Order No. 2003-0005-DWQ (Phase II General Stormwater Permit). The Phase II General Permit sets forth the following primary requirements:

- Develop, implement, and enforce a stormwater management plan/program designed to minimize the discharge of pollutants into receiving waters
- Identify appropriate stormwater treatment practices with measurable performance criteria

- Use an ordinance or other regulatory mechanism to control post-construction runoff from new and redevelopment projects
- Ensure that the program includes provisions to address six minimum measures to promote pollutant load reduction

These measures include: public education, public participation and involvement, illicit discharge detection and elimination, construction site runoff control, post-construction runoff control and pollution prevention, and good housekeeping.

Construction General Stormwater Permit (SWRCB Order No. 2009-09-DWQ)

For stormwater discharges associated with construction activity within California, the SWRCB has adopted the General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities, Order No. 2009-0009-DWQ (Construction General Stormwater Permit) to avoid and minimize water quality impacts attributable to such activities. The Construction General Stormwater Permit became effective on July 1, 2010 and expires on September 2, 2014; it applies to all projects where construction activity disturbs one or more acres of soil. Construction activities subject to this permit includes clearing, grading, and disturbances to the ground, such as stockpiling or excavation. The Construction General Stormwater Permit requires the development and implementation of a stormwater pollution prevention plan (SWPPP); the plan must specify best management practices (BMPs) designed to prevent pollutants from contacting stormwater and to keep all products of erosion from migrating offsite into receiving waters. The Construction General Stormwater Permit applies only to those construction activities in San Francisco that would be conducted in areas served by a separate storm sewer system and would disturb one or more acres of soil. Therefore, construction activities under the proposed project would not be subject to this permit.

California Groundwater Elevation Monitoring

In accordance with the requirements of Senate Bill X7-6, enacted in 2009, the DWR established the California Statewide Groundwater Elevation Monitoring Program. This program requires responsible parties to monitor and submit seasonal groundwater-elevation data from the groundwater basins within their jurisdiction. The SFPUC was designated as the responsible party for reporting groundwater elevations within all seven groundwater basins in San Francisco. To that end, SFPUC conducted a comprehensive evaluation of basin conditions and available monitoring wells within each basin, and submitted a groundwater monitoring plan to DWR that established procedures for collecting and reporting groundwater levels. Following approval of the monitoring plan, 16 wells were selected for additional seasonal monitoring as part of the Elevation Monitoring Program. In fall 2011, the SFPUC measured groundwater levels in all 16 groundwater monitoring wells, compiled the groundwater-elevation data, and entered the data into the DWR Elevation Monitoring Program system in accordance with state requirements (SFPUC, 2012a).

Regional and Local Regulations

Wastewater Discharges

Discharges of non-sewage wastewater to the combined sewer system, including groundwater produced during excavation dewatering, are subject to the permit requirements specified in Article 4.1 of the San Francisco Public Works Code and supplemented by Department of Public Works Order No. 158170. The SFPUC Water Pollution Prevention Program includes requirements for BMPs to minimize the amount of pollutants carried by stormwater to the combined sewer system from industrial uses, and the CCSF conducts periodic inspections to ensure compliance. The BMP requirements also apply to discharges to separate stormwater systems, pursuant to Article 4.1.

SFPUC Stormwater Management Plan

The federal Clean Water Act requires local governments to prepare plans for managing stormwater. The SFPUC *Stormwater Management Plan* describes measures to minimize stormwater pollution in areas of the city that are served by separate storm sewer systems (SFPUC, 2010a). The plan is required under the federal Clean Water Act, within NPDES regulations, and is applicable to those portions of San Francisco that are served by separate stormwater and sanitary wastewater systems.

The SFPUC *Stormwater Management Plan* consists of six program areas meant to address water quality: public education; public involvement/participation; illicit discharge detection and elimination; pollution prevention/good housekeeping for municipal operations; construction site stormwater runoff; and post-construction stormwater management in new developments and redevelopment areas. The Stormwater Management Plan thereby requires implementation of a variety of stormwater pollution reduction measures, including the implementation of stormwater BMPs (including construction-period BMPs and long-term post-construction BMPs). Required BMP categories mirror the six program areas discussed above: public education and outreach on stormwater impacts; public involvement/participation; illicit discharge detection and elimination; construction site stormwater runoff control; post-construction stormwater management in new development and redevelopment; and pollution prevention/good housekeeping for municipal operations.

Construction-Related Stormwater Discharges

In accordance with the San Francisco Green Building Ordinance (Chapter 13C of the San Francisco Building Code) and SFPUC controls developed pursuant to Article 4.1 of the Public Works Code, construction projects of all sizes in San Francisco must develop and implement pollution prevention and construction site runoff controls, as specified in LEED® prerequisite SSp1, Construction Activity Pollution Prevention. These ordinances require development and implementation of an erosion and sediment control plan specifying measures to control erosion and prevent stormwater pollution and control runoff from construction sites. The plan must conform to any applicable requirements of the Construction General Stormwater Permit described above and must comply with stormwater management controls adopted by the SFPUC.

Specifically, the plan must include: a site map showing the location and perimeter of the site, the location of nearby storm drains and/or catch basins, and existing and proposed roadways and drainage pattern within the site; a drawing or diagram of the sediment and erosion control devices to be used on site; a visual monitoring program and a chemical monitoring program for nonvisible pollutants; and minimum BMPs. BMPs specified in the plan must address housekeeping (storage of construction materials, waste management, vehicle storage and maintenance, landscape materials, and pollutant control); non-stormwater management; erosion control; sediment control; and run-on and runoff control. Additional BMPs could be required, and the SFPUC can conduct inspections of all BMPs to ensure compliance with regulatory requirements.

Post-Construction Stormwater Management Requirements

Development projects that discharge stormwater to either the combined sewer system or a separate storm sewer system must comply with Article 4.2 of the San Francisco Public Works Code. The SFPUC and the Port of San Francisco have developed Stormwater Design Guidelines that guide compliance with the specified stormwater management requirements (SFPUC and Port of San Francisco, 2009). The Stormwater Design Guidelines offer five tools to help project developers achieve compliance with stormwater management requirements:

- A step-by-step guide describing how to manage stormwater onsite
- A set of stormwater BMP fact sheets
- A vegetation palette to assist in BMP-appropriate plant selection
- Sizing calculators to determine the required size of each BMP
- Maintenance checklists explaining the types and frequencies of the maintenance activities associated with each BMP

In accordance with the San Francisco Stormwater Design Guidelines, developers of projects that would disturb more than 5,000 square feet of ground and discharge to the combined sewer system must implement BMPs to reduce the flow rate and volume of stormwater entering into the combined sewer system by achieving LEED® Sustainable Sites Credit 6.1 (Stormwater Design: Quantity Control). For covered projects with less than 50 percent existing impervious surfaces, the stormwater management approach must prevent the runoff flow rate and volume from exceeding existing conditions for the one- and two-year 24-hour design storm. For covered projects that include more than 50 percent impervious surfaces, the stormwater management approach must reduce the existing runoff flow rate and volume by 25 percent for a two-year 24-hour design storm. The Stormwater Design Guidelines require implementation of these low-impact development measures to reduce runoff as well as to reduce and delay the volume of discharge entering the combined sewer system, thereby reducing the frequency of combined sewer overflows, minimizing flooding effects, and protecting water quality. Examples of BMPs that may be implemented include rainwater harvesting, rain gardens, green roofs, and permeable paving.

Developers of projects that would disturb more than 5,000 square feet of ground and discharge to a separate storm sewer system must implement BMPs to reduce the flow rate and volume of discharges and improve the quality of stormwater entering the sewer system by achieving LEED® Sustainable Sites Credit 6.2 (Stormwater Design: Quality Control). For covered projects, the stormwater management approach must capture and treat rainfall from the design storm of 0.75 inches. These projects should reduce or eliminate downstream water pollution by reducing impervious cover, eliminating sources of contaminants, treating pollutants in stormwater runoff, or increasing onsite infiltration.

The SFPUC inspects stormwater BMPs once they are constructed, and any issues noted by the inspection must be corrected. The owner is responsible for completing an annual self-certification inspection and must submit completed checklists and maintenance logs for the year to the SFPUC. In addition, the SFPUC inspects all stormwater BMPs every third year. Any issues identified by either inspection must be resolved before the SFPUC can renew the certificate of compliance.

Projects that are required to implement the San Francisco Stormwater Design Guidelines are also subject to review by the San Francisco Department of Building Inspection and must comply with building codes that include provisions for managing drainage for new construction. Specifically, Section 306.2 of the San Francisco Plumbing Code and Section 1503.4 of the San Francisco Building Code allow roofs and other building areas to drain to locations other than the combined sewer.

Alternate Water Systems

In July 2012, the CCSF adopted the On-Site Water Reuse for Commercial, Multi-Family, and Mixed Use Developments ordinance. This ordinance applies to the installation and operation of alternate water source systems at sites containing multi-family and non-residential buildings, but not to systems that utilize rainwater solely for subsurface irrigation, drip irrigation, or non-sprinkled surface applications. The San Francisco Department of Public Health has determined that water derived from these latter applications does not require disinfection.

In December 2012, the San Francisco Department of Public Health published draft rules and regulations regarding the operation of alternate water source systems.[24] These regulations address water quality criteria, monitoring and reporting requirements, and operation and maintenance requirements. The draft regulations were available for public review and comment until January 28, 2013.

To utilize an alternate water source system, project proponents must submit an application to the San Francisco Department of Public Health; the application must include a nonpotable engineering report that demonstrates compliance with the new regulations. Other city agencies may not issue a permit installing an alternate water source system until the San Francisco Department of Public Health has approved the nonpotable water engineering report. The San Francisco Department of

[24] An alternate water source system is one that uses a source of non-potable water such as graywater, on-site treated non-potable water, rainwater, or any other source approved by the San Francisco Department of Public Health.

Building Inspection reviews applications for compliance with applicable requirements of the San Francisco Plumbing Code.

The Department of Public Health's requirements do not apply to the proposed project because no alternate water sources would be used, other than rainwater in the green roofs at three of the well facilities.

Well Permitting Requirements

In accordance with Article 12B of the San Francisco Health Code, the Department of Public Health refers permit applications for water supply wells to the San Francisco Planning Department for an environmental determination under CEQA. Following CEQA review, the applicant must obtain approval from the SFPUC authorizing the withdrawal of groundwater. For the purposes of managing groundwater resources in San Francisco, the operator of the well must comply with any conditions or restrictions imposed by the SFPUC, or any mitigation measures identified by the Planning Department, regarding how the water well will be used. If an agreement with the SFPUC for operation of a proposed water well cannot be reached, the Department of Public Heath would deny the water well permit application; failure to comply with any conditions or restrictions on the use of the water well would result in revocation of the permit.

Groundwater Management Plans for the Westside Groundwater Basin

California Assembly Bill 3030, codified in California Water Code Section 10750 et seq., provides a procedure for local agencies overlying a groundwater basin to develop groundwater basin management plans. Three groundwater management plans have been prepared for the Westside Groundwater Basin in the past 20 years. The groundwater management plan for the South Westside Groundwater Basin, prepared for the City of San Bruno in cooperation with the SFPUC, Daly City, and the California Water Service Company (WRIME, 2012), was adopted by the San Bruno City Council in July 2012. This is the only groundwater management plan prepared for the Westside Groundwater Basin that has been adopted.

● The SFPUC prepared the final draft of the *North Westside Groundwater Basin Management Plan* (SFPUC, 2005) in April 2005. The document was not adopted, but was circulated for public review. The SFPUC plans to prepare an updated groundwater management plan in accordance with Water Code Section 10753 that could incorporate the monitoring and adaptive management requirements related to the implementation of the Groundwater Supply Project as well as additional elements that would consolidate and highlight existing programs that CCSF administers to protect groundwater resources in the North Westside Basin. The updated groundwater management plan would specify the management objectives for the North Westside Groundwater Basin and would address:

- Avoidance of well interference effects with existing groundwater users
- Avoidance of inelastic land subsidence;
- Avoidance of seawater intrusion
- Protection of interrelated surface water resources including Lake Merced and Pine Lake;
- Maintenance of groundwater quality;

- Management of wellhead protection areas under the DWSAP program
- Avoidance of long-term overdraft of the basin;
- Monitoring protocols that are designed to measure groundwater pumping and to detect changes in groundwater levels, groundwater quality and surface water affected by groundwater pumping;

The SFPUC anticipates completing the updated plan by 2016 (Gilman, 2013a).

5.16.3 Impacts and Mitigation Measures

Significance Criteria

Project-related impacts on hydrology and water quality are related primarily to construction and operation of the proposed facilities, as well as pumping groundwater from the North Westside Groundwater Basin. Because these two types of impacts are different from each other, they are described separately below and separate significance standards are identified for each of the two types of impacts.

For the purposes of this EIR, the Groundwater Supply Project would have a significant effect on hydrology and water quality if it were to:

Facility Construction, Siting, Operations, and Maintenance

- Violate any water quality standards or waste discharge requirements;
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on or off the site;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on or off the site;
- Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- Otherwise substantially degrade water quality;
- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other authoritative flood hazard delineation map;
- Place within a 100-year flood hazard area structures that would impede or redirect flood flows;
- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam; or

- Expose people or structures to a significant risk of loss, injury, or death involving inundation by seiche, tsunami, or mudflow.

Groundwater Pumping Operations

- Deplete groundwater supplies in a manner that would result in a lowering of the local groundwater level to a level where the production rate of preexisting nearby wells would drop to a level that would not support existing or planned land uses;
- Lower groundwater levels in a manner that would result in onsite or offsite land subsidence that would cause substantial structural damage, increased flooding, or altered drainage patterns;
- Lower groundwater levels in a manner that would result in seawater intrusion such that loss of beneficial uses of groundwater would occur;
- Change groundwater levels in a manner that would adversely affect water quality and subsequently affect the affect beneficial uses of surface water bodies;
- Violate any water quality standards or waste discharge requirements;
- Otherwise substantially degrade water quality; or
- Deplete groundwater supplies or interfere with groundwater recharge in a manner that would result in a substantial regional deficit in aquifer storage that would not support existing or planned land uses.

Overall Approach to Analysis

This section describes the impacts that have been screened out from further analysis and the reasons why. The overall approach to impact analysis is also described. The specific approach to analyzing impacts related to construction and operation of project facilities is described below under the heading "Facility Construction, Siting, Operations, and Maintenance". For impacts related to groundwater pumping, the approach to analyzing each impact is described following the related impact statement.

Due to the nature of the proposed project, there would be no impacts related to the following topics for the reasons described below:

- ***Substantially Deplete Groundwater Supplies or Interfere Substantially with Groundwater Recharge as a Result of Facilities Construction, Siting, Operations, or Maintenance.*** The proposed project would construct or replace approximately 7,000 square feet of impervious surfaces that could restrict groundwater recharge at the well facilities and Sunset Reservoir that could restrict groundwater recharge. However, the proposed new impervious surfaces represent less than 0.002 percent of the entire 14-square-mile area of the North Westside Groundwater Basin and would not substantially reduce groundwater recharge to the basin. Further, the proposed grass-pavement system that would be installed at the Central Pump Station well facility, South Windmill Replacement well facility, and North Lake well facility (described in Section 3.4.1 of Chapter 3, Project Description and implemented pursuant to the San Francisco Stormwater Design Guidelines) would promote the stormwater infiltration and recharge of the groundwater basin. Although groundwater dewatering could be required during construction activities below the water table, the amount of groundwater withdrawn would be minimal and the duration of groundwater dewatering would be limited to the construction period. Therefore, impacts related to depletion of groundwater resources or interference with groundwater recharge as a result of facility construction, siting, operations, or maintenance of the proposed facilities would be less than significant (groundwater depletion associated with groundwater pumping is discussed in Impact HY-12).

- ***Place Housing within a 100-Year Flood Hazard Area as Mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or Other Authoritative Flood Hazard Delineation Map.*** The proposed project does not propose the construction of housing. Therefore, this criterion is not applicable to the project and is not discussed further.

- ***Expose People or Structures to a Significant Risk of Loss, Injury, or Death Involving Flooding, including Flooding as a Result of the Failure of a Levee or Dam.*** The project area is not located in a dam inundation zone or in an area where there are levees and dams. Therefore, this criterion is not applicable to the project and is not discussed further.

- ***Expose People or Structures to a Significant Risk of Loss, Injury, or Death Involving Inundation by Seiche, Tsunami, or Mudflow.*** As discussed in Section 5.16.1, Setting, the proposed project is not located in an area that would be subject to seiche or tsunami inundation, or near a volcano or area with geologic conditions that would generate mudflow. Therefore, this criterion is not applicable to the project and is not discussed further.

- ***Change Groundwater Levels in a Manner that would Affect Beneficial Uses of Surface Water Bodies in Golden Gate Park.*** As discussed in Section 5.16.1, Setting, the Golden Gate Park lakes do not intersect the water table and are not hydraulically connected with the aquifer. Groundwater pumping under the project would lower groundwater elevations and would further reduce the likelihood of any interaction. Therefore, changes in groundwater levels would not affect water levels or water quality in the Golden Gate Park lakes, and water quality impacts on these lakes are not discussed further.

Impact Summary

Table 5.16-8 summarizes the proposed project's hydrology and water quality impacts and significance determinations.

TABLE 5.16-8
SUMMARY OF IMPACTS – HYDROLOGY AND WATER QUALITY

Impacts	Significance Determinations
Impact HY-1: Project construction would possibly violate water quality standards and waste discharge requirements or otherwise substantially degrade water quality.	LSM
Impact HY-2: Project operation would not violate any water quality standards or waste discharge requirements or otherwise degrade water quality.	LS
Impact HY-3: The proposed project would not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion, siltation, or flooding on or off the site.	LS
Impact HY-4: Project operation would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide an additional source of polluted runoff.	LS
Impact HY-5: The proposed project would not result in adverse effects related to the placement of structures within a 100-year flood hazard area.	LS

TABLE 5.16-8 (Continued)
SUMMARY OF IMPACTS – HYDROLOGY AND WATER QUALITY

Impacts	Significance Determinations
Impact HY-6: Project operations would not decrease the production rate of existing nearby wells as a result of localized groundwater drawdown within the Westside Groundwater Basin such that existing or planned land use(s) would not be supported.	LS
Impact HY-7: Project operations would not result in substantial land subsidence due to decreased groundwater levels in the Westside Groundwater Basin.	LS
Impact HY-8: Project operations would possibly result in seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin.	LSM
Impact HY-9: The proposed project would possibly have a substantial, adverse effect on water quality that could affect the beneficial uses of Lake Merced.	LSM
Impact HY-10: The proposed project would not have a substantial adverse effect on water quality in Pine Lake.	LS
Impact HY-11: Project operation would possibly cause a violation of water quality standards.	LSM
Impact HY-12: Project operation would not have a substantial adverse effect on groundwater depletion in the Westside Groundwater Basin.	LS
Impact C-HY-1: Facility construction, siting, operations, and maintenance, in combination with past, present, and reasonably foreseeable future projects in the site vicinity, would not adversely affect hydrology and water quality.	LS
Impact C-HY-2: The proposed project, in combination with past, present, and reasonably foreseeable future projects, would not have a substantial adverse effect related to well interference.	LS
Impact C-HY-3: Operation of the proposed project would not result in a cumulatively considerable contribution to cumulative impacts related to subsidence.	LS
Impact C-HY-4: The proposed project, in combination with past, present, and reasonably foreseeable future projects, would possibly have a substantial adverse effect related to seawater intrusion.	LSM
Impact C-HY-5: The proposed project, in combination with past, present, and reasonably foreseeable future projects, would possibly have a substantial adverse effect on water quality that could affect the beneficial uses of Lake Merced or water quality in Pine Lake.	LSM
Impact C-HY-6: Operation of the proposed project would not result in a cumulatively considerable contribution to cumulative impacts related to water quality standards.	LS
Impact C-HY-7: Operation of the proposed project would not result in a cumulatively considerable contribution to cumulative impacts related to groundwater depletion.	LS

NOTES:
LS = Less than Significant impact, no mitigation required
LSM = Less than Significant impact with Mitigation

Impact Summary

Facility Construction, Siting, Operations, and Maintenance

Approach to Analysis: Facility Construction, Siting, Operations, and Maintenance

This analysis evaluates potential impacts from construction of the well facilities and proposed pipelines, and considers how project construction and long-term operations and maintenance of the well facilities would affect the hydrology and water quality of regional and local surface waters with respect to identified beneficial uses and established water quality standards for those surface water bodies. The analysis of construction impacts considers project effects associated with stormwater runoff and groundwater dewatering discharges and the applicability of existing regulations to reduce potential impacts on surface hydrology and water quality. The analysis of operational impacts considers long-term increases in stormwater runoff and sanitary sewage that could be discharged to the combined sewer system and any associated potential for impacts on water quality or surface drainage hydrology.

Impact HY-1: Project construction would possibly violate water quality standards and waste discharge requirements or otherwise substantially degrade water quality. (Less than Significant with Mitigation)

The proposed project could violate water quality standards or waste discharge requirements or otherwise degrade water quality due to erosion or a release of hazardous materials during construction activities, or to discharges of groundwater during construction dewatering, as discussed below.

Stormwater Runoff

The South Sunset well facility, West Sunset well facility, Central Pump Station well facility, South Windmill Replacement well facility, and North Lake well facility, as well as all project-related pipelines and Sunset Reservoir facilities, would be constructed within areas served by the combined sewer system. The Lake Merced well facility would be constructed within approximately 100 feet of Lake Merced in an area served by the SFPUC separate storm sewer system at the lake; the total area of project disturbance for this site would be approximately 22,140 square feet.

During construction at these sites, water quality in the combined sewer system or Lake Merced could be affected by grading and earthmoving operations, which would expose soil during construction and could result in erosion and excess sediments loads in stormwater runoff. In addition, the use of fuels and other chemicals during construction could be spilled and carried in stormwater runoff, and other construction activities could generate stormwater pollutants such as trash and excess materials.

However, in accordance with the Green Building Ordinance (San Francisco Building Code Chapter 13C), Article 4.1 of the San Francisco Public Works Code, and consistent with the SFPUC's Water Pollution Prevention Program, described in Section 5.16.2, Regulatory Framework, the SFPUC would be required to develop and implement an erosion and sediment control plan specifying measures to prevent stormwater pollution and control runoff at each site. The plan must include the following information: location and perimeter of the site; location of nearby storm drains and/or catch basins; existing and proposed roadways and drainage pattern within the site; and a drawing or diagram of the sediment and erosion control devices to be used on site. At a minimum, the plan would also contain a visual monitoring program and a chemical monitoring program for nonvisible pollutants. The erosion and sediment control plan would also specify minimum BMPs related to housekeeping (storage of construction materials, waste management, vehicle storage and maintenance, landscape materials, pollutant control); non-stormwater management; erosion control; sediment control; and run-on and runoff control. Additional BMPs could be required for the Lake Merced well facility because it would be constructed near Lake Merced, which supports the identified beneficial uses of fish spawning and cold freshwater habitat. Additional BMPs could include activities such as implementation of more stringent runoff controls; soil stabilization measures for active construction areas; use of linear sediment controls along any exposed slopes; use of designated site access points that employ effective controls to eliminate off-site tracking of sediment; more stringent inspection and record keeping requirements for BMPs implemented at the construction site; and advanced planning for a rain event to ensure that measures are in place to prevent a discharge of sediment or construction-related materials to Lake Merced, and to respond to a release if one occurred.

The SFPUC would require in the project construction contract that the contractor develop and implement the Erosion and Sediment Control Plan and could conduct routine inspection of all BMPs. Implementation of construction site stormwater requirements developed to comply with San Francisco ordinances would therefore ensure that water quality impacts related to stormwater runoff during construction would be less than significant.

Groundwater Dewatering

As noted in Chapter 3, Project Description, limited groundwater dewatering could be required for construction of the well facilities and pipelines. During construction at these sites, water quality in the combined sewer system or Lake Merced could be affected by discharges of dewatered groundwater, as described below.

Groundwater Dewatering Discharges to the Sewerage System. In accordance with Article 4.1 of the San Francisco Public Works Code, as supplemented by Order No. 158170, industrial waste discharge limits are imposed on groundwater dewatering discharges to the sewerage system, which covers both the combined system and separate sanitary and stormwater systems. Article 4.1 requires a permit from the SFPUC; in the proposed project, the construction contractor would be required to submit its plans to the Wastewater Enterprise division of the SFPUC for review and approval of a permit for any planned groundwater dewatering discharges during project construction. This permit would contain appropriate standards to regulate the quantity and quality of discharges and could require the installation of meters to measure the volume of discharge. Although the groundwater could contain contaminants related to past activities (as discussed in Section 5.17, Hazards and Hazardous Materials), as well as sediment and suspended solids, the groundwater would be treated as necessary to meet permit requirements prior to discharge.

All project-related discharges to the sewerage system would be performed in accordance with regulatory requirements; therefore, impacts related to violating water quality standards or degrading water quality due to discharges of groundwater to the sewerage system during construction dewatering would be less than significant.

Groundwater Dewatering Discharges to Areas Other than the Sewerage System. The Lake Merced well facility would be constructed within approximately 100 feet of Lake Merced in an area served by the separate storm sewer system at the lake. While the provisions of Article 4.1 discussed above would apply if groundwater produced during construction of this well facility were discharged to the sewer system, groundwater could also be discharged into Lake Merced. If the water were discharged to Lake Merced, these discharges could degrade water quality, resulting in a potentially significant water quality impact. However, **Mitigation Measure M-HY-1, Implement Groundwater Dewatering BMPs at Lake Merced Well Facility**, would reduce this potential impact on water quality to a less-than-significant-level by requiring the implementation of standard BMPs to remove sediment from the groundwater discharge and to control the rate of discharge such that adverse effects related to runoff, flooding, and damage to adjacent structures would not occur.

Mitigation Measures

> **Mitigation Measure M-HY-1: Implement Groundwater Dewatering BMPs at Lake Merced Well Facility.** If groundwater produced during construction of the Lake Merced facility is not discharged to the sewer system, the SFPUC shall include a requirement in construction contracts that its construction contractor(s) develop and implement standard BMPs for the treatment of sediment-laden water produced during groundwater dewatering. BMPs could include discharging water through filtration media, such as filter bags or a similar filtration device, or allowing the filtered water to infiltrate into the soil. If infiltration is used, application of the groundwater shall be conducted at a rate and location that does not allow runoff into Lake Merced or drainage conveyances, such as storm drains, and does not cause flooding or runoff to adjacent properties. The discharge of groundwater shall also be conducted at a rate that does not allow ponding, unless the ponding is a result of implementing BMPs to reduce the velocity of the flow and occurs within constructed containment, such as an excavation or berm with no outlet. The discharge must also be applied at a sufficient distance from building foundations or other areas that could be damaged from ground settling or swelling. No chemicals shall be added to the discharged groundwater. Alternatively, rather than discharging groundwater, filtered groundwater could be used to spray disturbed areas and the soil stockpile to reduce fugitive dust emissions, if there is sufficient water and it is determined feasible by the construction contractor.

Impact HY-2: Project operation would not violate any water quality standards or waste discharge requirements or otherwise degrade water quality. (Less than Significant)

The South Sunset, West Sunset, Central Pump Station, South Windmill Replacement, and North Lake well facilities, and the Sunset Reservoir are located in a geographical area served by the combined sewer system. The proposed project would make a small incremental increase in impervious surfaces in the Westside drainage area. Stormwater runoff from the Central Pump Station, South Windmill Replacement, and North Lake well facilities in Golden Gate Park (which do not currently drain to the combined sewer system) would be directed to sumps and grass-pavement systems that would infiltrate to the groundwater (see Chapter 3, Project Description, Section 3.4.1, Groundwater Well Facilities). With implementation of these project design features, there would be no stormwater discharges to the combined sewer system from the well facilities constructed in Golden Gate Park.

However, during the wet season, post-construction stormwater runoff from the South Sunset well facility, West Sunset well facility, and Sunset Reservoir could contribute to the volume or frequency of combined sewer overflows along the Pacific Coast due to the small incremental increase in impervious surfaces at these facilities. Increased project-related flows to the combined sewer system could affect compliance with the NPDES permit for the Oceanside WPCP, Southwest Ocean Outfall, and Westside Wet Weather Facilities if these facilities were to experience an increase in the frequency or duration of combined sewer overflows that could affect the beneficial uses of the receiving water. Impacts related to exceeding the capacity of the combined sewer system or providing an additional source of polluted runoff are addressed below in Impact HY-4.

During wet weather (typically mid-October to the end of April), there is a wide variation in the volume of wet-weather flow to the combined sewer system resulting from the addition of stormwater discharges. The variation is directly related to rainfall intensity, and the treatment of wet-weather flows depends on the characteristics of the individual rainstorm. As discussed above (see Section 5.16.1, Setting, under the heading "Storm Sewer Systems"), flows in excess of 175 mgd (about 13 percent of the total wet-weather flows) are discharged at the shoreline through one of seven combined sewer discharge structures located along the coast. These discharge facilities are constructed to capture flows for a long-term average of eight overflows per year, and all combined flows are captured and treated to a minimum of the equivalent of primary treatment.

The incremental increase in stormwater runoff from the approximately 7,000 square feet of impervious surface proposed for the well facilities and Sunset Reservoir would be very small. Further, in accordance with the San Francisco Stormwater Design Guidelines, the SFPUC would be required to ensure that the stormwater runoff flow rate and volume do not exceed existing conditions for the one- and two-year 24-hour design storm for any well facilities that would disturb more than 5,000 square feet and would be constructed in areas with less than 50 percent existing impervious surfaces (i.e., the West Sunset well facility, Central Pump Station well facility, South Windmill Replacement well facility, North Lake well facility). Accordingly, a green roof would be installed at the West Sunset well facility and this would capture and detain much of the rainfall onto the facility. As discussed above, the Central Pump Station, South Windmill Replacement, and North Lake well facilities would not discharge stormwater to the combined sewer system.

Compliance with the San Francisco Stormwater Design Guidelines could also require that the SFPUC prepare a stormwater control plan for these facilities describing the BMPs that would be implemented and a plan for post-construction operation and maintenance of the BMPs. If required, the plan could include the following elements:

- Site characterization
- Design and development goals
- Site plan
- Site design
- Source controls to prevent pollutant generation and discharge by controlling pollution at its source
- Treatment control BMPs to remove pollutants from the stormwater runoff
- Comparison of design to established goals
- Operations and maintenance plan

The project would be required to achieve the standards specified in LEED® SS6.1 (Stormwater Design: Quantity Control) to minimize the flow and volume of stormwater into the combined sewer system. The operations and maintenance plan, prepared as part of the stormwater control plan, would identify the individual(s) with operational responsibility for the facility, applicable maintenance requirements for each stormwater control, detailed requirements for each BMP, and required maintenance of facilities.

The stormwater control plan must be reviewed and stamped by a licensed landscape architect, architect, or engineer. The SFPUC Wastewater Enterprise would review the plan, certify compliance with the San Francisco Stormwater Design Guidelines, and inspect stormwater BMPs once they are constructed; any issues noted by the inspection must be corrected. In accordance with the San Francisco Stormwater Design Guidelines, the SFPUC would also complete an annual self-certification inspection and compile completed checklists and maintenance logs for the year. In addition, the SFPUC would inspect all stormwater BMPs every third year, and any issues identified by the inspection must be resolved.

The South Sunset well facility would be constructed in a landscaped area, the entire surface of which is currently pervious, but would only disturb approximately 1,000 square feet; therefore, this facility would not be subject to the San Francisco Stormwater Design Guidelines. Regardless, as described in Chapter 3, Project Description, the SFPUC would construct the well facility with a green roof (see Section 3.4.1, Groundwater Well Facilities), which would capture and detain much of the rainfall onto the facility. No new impervious surfaces (other than the building) would be constructed. Although the water feature would drain to the combined sewer through a metal-clad steel planter (see Section 3.4.1, Groundwater Well Facilities), the increase in discharges to the combined sewer would be minimized because the green roof of the well facility would capture and detain much of the rainfall onto that facility, and most of the water from the water feature would be used in the planter.

The implementation of stormwater controls proposed under the project and compliance with the San Francisco Stormwater Design Guidelines would ensure that the volume of stormwater flows to the sewer system after project implementation would not be greater than flows under existing conditions.

None of the proposed well facilities would be staffed; thus, there would be no increase in sanitary sewage that would contribute to combined sewer discharges. Therefore, because the project would not increase long-term flow to the combined sewer system from either stormwater runoff or sanitary sewage, water quality impacts related to a violation of waste discharge requirements and degradation of water quality would be less than significant.

Impact HY-3: The proposed project would not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion, siltation, or flooding on or off the site. (Less than Significant)

As discussed in Impacts HY-2 and HY-4, design and construction of the Lake Merced, West Sunset, Central Pump Station, South Windmill Replacement, and North Lake well facilities would be required to incorporate stormwater control measures as specified in San Francisco's Stormwater Design Guidelines. Although the South Sunset well facility would not be subject to these guidelines (because the amount of land disturbance would be less than 5,000 square feet as described in Impact HY-2), the design of this facility would include a green roof and planter to reduce stormwater flows to the combined sewer system. Implementation of stormwater BMPs in compliance with the San Francisco Stormwater Design Guidelines and as part of the project would reduce the peak quantity and peak rate of stormwater runoff to the city's combined sewer system and the separate storm sewer system at the Lake Merced well facility, decreasing the potential for erosion and flooding. Therefore, potential impacts related to the alteration of drainage patterns would be less than significant.

Impact HY-4: Project operation would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide an additional source of polluted runoff. (Less than Significant)

Runoff from new impervious surfaces constructed at the proposed well facilities and Sunset Reservoir could increase stormwater flows to the sewer system and potentially exceed the capacity of the storm sewer systems. In addition, the use of chemicals at the Lake Merced well facility, West Sunset well facility, and Sunset Reservoir could provide additional sources of polluted runoff, as described below.

Lake Merced Well Facility

The Lake Merced well facility would include the construction of approximately 9,700 square feet of new impervious surfaces in an area that currently has limited pavement or other impervious surfaces. Without stormwater controls, runoff from this facility could increase flows to the separate storm sewer system at Lake Merced, and at sufficient volumes the additional runoff could potentially exceed the capacity of the storm sewer system. However, as described in Section 5.16.2, Regulatory Framework, above, this facility would be required to implement stormwater BMPs to capture and treat rainfall from the design storm of 0.75 inches in accordance with the San Francisco Stormwater Design Guidelines. To help meet this goal, a green roof would be constructed on the well facility to capture and use rainwater, as described in Chapter 3, Project Description (see Section 3.4.1, Groundwater Well Facilities). With implementation of control measures consistent with the San Francisco Stormwater Design Guidelines, the volume of runoff to the stormwater drainage system at Lake Merced would be similar to or less than the volume existing conditions, and the capacity of the storm sewer system would therefore not be exceeded.

For water treatment purposes, the Lake Merced well facility would contain two chemical tanks. This facility would not be a source of polluted runoff to the stormwater drainage or combined sewer system because the water treatment chemicals would be stored and used in the chemical room and pump room within the enclosed well facility building, thus preventing contact with stormwater runoff.

Compliance with the San Francisco Stormwater Design Guidelines could require that the SFPUC prepare a stormwater control plan for the Lake Merced well facility describing the BMPs to be implemented and a plan for post-construction operation and maintenance of the BMPs. Furthermore, pursuant to the San Francisco Stormwater Design Guidelines, the SFPUC would regularly inspect the installed BMPs and resolve any issues identified. Therefore, potential impacts related to exceeding the capacity of a stormwater drainage system or providing additional sources of polluted runoff would be less than significant for the Lake Merced well facility.

Well Facilities Located in Areas Served by the Combined Sewer System

As described in Impact HY-2, in accordance with the San Francisco Stormwater Design Guidelines, the SFPUC would be required to ensure that the stormwater runoff flow rate and volume do not exceed existing conditions for the one- and two-year 24-hour design storm at the four well facilities that would be constructed in an area with less than 50 percent existing impervious surfaces (West Sunset, Central Pump Station, South Windmill Replacement, and North Lake well facilities). Although the South Sunset well facility would not be subject to these guidelines (because less than 5,000 feet of ground would be disturbed), the design of this facility would include a green roof and planter to reduce stormwater flows to the combined sewer system, as described in Chapter 3, Project Description (see Section 3.4.1, Groundwater Well Facilities). With implementation of stormwater BMPs in accordance with the San Francisco Stormwater Design Guidelines and as part of the project, stormwater flows from well facilities located within the service area of the combined sewer system would not be greater than those under existing conditions. Stormwater runoff from these sites would not provide an additional source of polluted runoff because the green roofs, stormwater collection sumps, and/or grass pavement systems that would be installed to reduce or prevent stormwater flows to the combined sewer system would also reduce pollutant loads in stormwater runoff via infiltration. In addition, the chemical treatment facilities at the West Sunset well facility, consisting of two sodium hypochlorite tanks would be designed to prevent chemicals from contacting stormwater runoff, as the chemicals would be stored and used in the chemical room and pump room within the enclosed well facility building. Therefore, potential impacts related to creating or contributing runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff would be less than significant for well facilities located within areas served by the combined sewer system.

Impact HY-5: The proposed project would not result in adverse effects related to the placement of structures within a 100-year flood hazard area. (Less than Significant)

As described in Section 5.16.1, Setting, under the heading "Flooding," none of the proposed project sites are within a special flood hazard zone designated on the San Francisco interim floodplain map or in area identified as prone to flooding due to combined sewer backups or other flooding. Therefore, the proposed project would not result in adverse effects related to the placement of structures within a 100-year flood hazard area.

As described in Section 5.16.1, Setting, under the heading "Future Flooding Areas," sea level rise increases the potential for future coastal flooding and is an important issue in development planning and hazard analysis in coastal areas. For planning purposes, the Governor of California's Delta Vision Blue Ribbon Task Force has adopted a projected sea level rise of 55 inches (4.6 feet) by 2100 (Delta Vision Blue Ribbon Task Force, 2008). Based on mapping completed by the Pacific Institute, much of the Pacific Coast could be subject to flooding associated with a 100-year flood event with a sea level rise of 55 inches (Pacific Institute, 2009a, 2009b, 2009c). The South Windmill Replacement well facility site is within an area of potential flooding under both existing conditions as well as with a 55-inch sea level rise (Pacific Institute, 2009a). However, the approximately 800-square-foot proposed well facility would be smaller than the existing 900-square-foot irrigation well building at the same location that would be demolished under the proposed project; thus, any potential for the well facility to redirect or exacerbate floodflows would be reduced as compared to existing conditions. Further, the facility would not be large enough to substantially alter floodflow directions or worsen flooding in another area. In addition, no people would be exposed to a risk of loss, injury, or death because the facility would not be inhabited and it would not be located in the vicinity of occupied structures. Therefore, potential impacts related to placement of structures within a 100-year flood hazard area in the event of sea level rise would be less than significant.

Groundwater Pumping Operations

Approach to Analysis: Groundwater Pumping Operations

The analysis of the potential impacts related groundwater pumping operations relies on groundwater-level changes in the North Westside Groundwater Basin that were modeled using the Westside Basin Groundwater Model, Version 3.1, supplemented by the spreadsheet-based Lake-level Model to evaluate changes in Lake Merced water levels, as described in Section 5.1.5, Overview of Groundwater Modeling Approach. The technical report describing the groundwater modeling analysis is included as **Appendix D-5** (Kennedy/Jenks, 2012a). The results derived from two models were used to assess the potential for groundwater pumping to result in effects related to well interference, subsidence, seawater intrusion, surface water quality (and beneficial uses), groundwater quality, and groundwater depletion. The following impact discussions describe the specific approach to analysis for each impact topic, and the remainder of this overall approach to analysis section summarizes the results of the groundwater and lake-level modeling used to evaluate potential impacts.

Groundwater-level Modeling

The Westside Basin Groundwater Model was used to model groundwater-level changes for a 47-year period beginning in 2009, the year the Notice of Preparation of an Environmental Impact Report (NOP) was issued (the NOP is provided in Appendix A). Four scenarios were modeled for the Groundwater Supply Project: modeled existing conditions; pumping under both phases of the proposed project (Phase 1 and Phase 2); and cumulative pumping, which includes the proposed project together with other reasonably foreseeable future groundwater pumping and surface water projects in the groundwater basin.

As shown in Table 5.1-7 of Section 5.1.5, Overview of Groundwater Modeling Approach, the modeled existing conditions included a continuation of existing groundwater pumping for the entire 47-year simulation period. For Phase 1 of the Groundwater Supply Project, the model included 3.0 mgd (3,360 afy) of project-related pumping from four wells (the Lake Merced, South Sunset, West Sunset, and Central Pump Station well facilities) and a continuation of existing pumping in the groundwater basin. For Phase 2 of the Groundwater Supply Project, the model included 4.0 mgd (4,480 afy) of project-related pumping from six wells (the four new Phase 1 wells and the converted South Windmill Replacement and North Lake wells in Golden Gate Park). Under Phase 2, irrigation pumping in Golden Gate Park would be discontinued but other existing pumping would continue. For both phases, the model also included an additional 0.008 to 0.009 mgd (9 to 10 afy) of pumping from the Stern Grove well to maintain water levels in Pine Lake. Under Phase 1, the total pumping from the North Westside Groundwater Basin would be 4.51 mgd (5,041 afy). With discontinuation of irrigation pumping in Golden Gate Park, the total pumping from the North Westside Groundwater Basin under Phase 2 would be 4.37 mgd (4,895 afy).

The cumulative model scenario combines existing pumping in the Westside Groundwater Basin, the project pumping described above for Phase 2, and other reasonably foreseeable projects in the basin (described in Section 5.1.5), including the Regional Groundwater Storage and Recovery Project and the Holy Cross Cemetery buildout. The Vista Grande Drainage Basin Improvement Project is also included in the cumulative model scenario. While this project does not propose groundwater pumping, it is considered in the cumulative modeling because it calls for additions of stormwater to Lake Merced, which would increase Lake Merced water levels and associated groundwater levels in the Shallow Aquifer.

As discussed in Section 5.1.5, the Westside Basin Groundwater Model is best used for evaluating relative changes in groundwater levels, and also employs an assumed set of hydrologic conditions over the 47-year simulation period for each model scenario. Although future hydrologic conditions are not expected to occur exactly as modeled, a reasonable evaluation of changes in groundwater levels over the simulation period can be performed by using a broad range of hydrologic conditions, as observed over a recent 47-year historical period. The modeled existing conditions include groundwater-level changes that are predicted to occur over the 47-year simulation period in response to the assumed hydrology without project-related or cumulative pumping. Therefore, in the impact analyses, the project-related effects under Phases 1 and 2 of the Groundwater Supply Project and cumulative conditions are compared to the modeled existing conditions to distinguish the effect of project-related pumping from the effects that would likely occur based only on changes in hydrologic conditions. Additional information used to evaluate specific impacts is provided in the approach to analysis discussion for each impact below.

Appendix D-5 presents hydrographs showing modeled groundwater levels from representative locations in both the North and South Westside Groundwater Basins to characterize basin-wide groundwater conditions, which is necessary for the analysis of cumulative impacts. The hydrographs present results for each water year during the 47-year simulation period, which extends from October of the previous year through September of the subsequent year.

The hydrographs show groundwater levels for modeled existing conditions, with the proposed project conditions, and cumulative conditions in the Shallow Aquifer and Primary Production Aquifer. The water-level trends observed in these hydrographs provides a basis for determining how the project would affect groundwater levels in the North and South Westside Groundwater Basins. These effects are detailed in the relevant hydrology and water quality impact discussions below.

Summary of Groundwater-level Modeling Results

As indicated in the hydrographs, under the modeled existing conditions there would likely be a normal variation in groundwater levels in response to changing hydrologic conditions. Under both phases of the Groundwater Supply Project groundwater levels in the North Westside Groundwater Basin would be lower than the levels under modeled existing conditions in both the Shallow and Primary Production Aquifers. The estimated groundwater levels in this part of the basin would be relatively unaffected or slightly higher than modeled existing conditions with implementation of the Regional Groundwater Storage and Recovery Project, which would be implemented in the South Westside Groundwater Basin (see Section 5.1.4, Approach to Cumulative Impact Analysis and Cumulative Projects for a description of this project). However, there would be a few cases where the estimated groundwater levels in the Primary Production Aquifer would be lower than the estimated groundwater levels under modeled existing conditions at the end of the design drought (see Section 5.1.5, Overview of Groundwater Modeling Approach for a description of the design drought).

In the South Westside Groundwater Basin, groundwater levels in both aquifers would generally be higher under the Regional Groundwater Storage and Recovery Project compared to modeled existing conditions, except at the end of the design drought. Pumping from the North Westside Groundwater Basin under either phase of the Groundwater Supply Project would result in slightly lower estimated groundwater levels relative to modeled existing conditions in the Daly City area, but this effect would be diminished farther to the south (farther from the project-related pumping), and no effect would likely be observed as far south as San Bruno.

In the North Westside Groundwater Basin, the changes in estimated groundwater levels under the cumulative conditions generally follow the trend that would occur with implementation of the Groundwater Supply Project. In the South Westside Groundwater Basin, changes in estimated groundwater levels under cumulative conditions generally follow the trend that would occur with implementation the Regional Groundwater Storage and Recovery Project, except with slightly lower groundwater levels relative to modeled existing conditions in the Daly City area, as a result of pumping under the Groundwater Supply Project. This effect would be diminished farther to the south, and no effect would likely be observed as far south as San Bruno.

Impact HY-6: Project operations would not decrease the production rate of existing nearby wells as a result of localized groundwater drawdown within the Westside Groundwater Basin such that existing or planned land use(s) would not be supported. (Less than Significant)

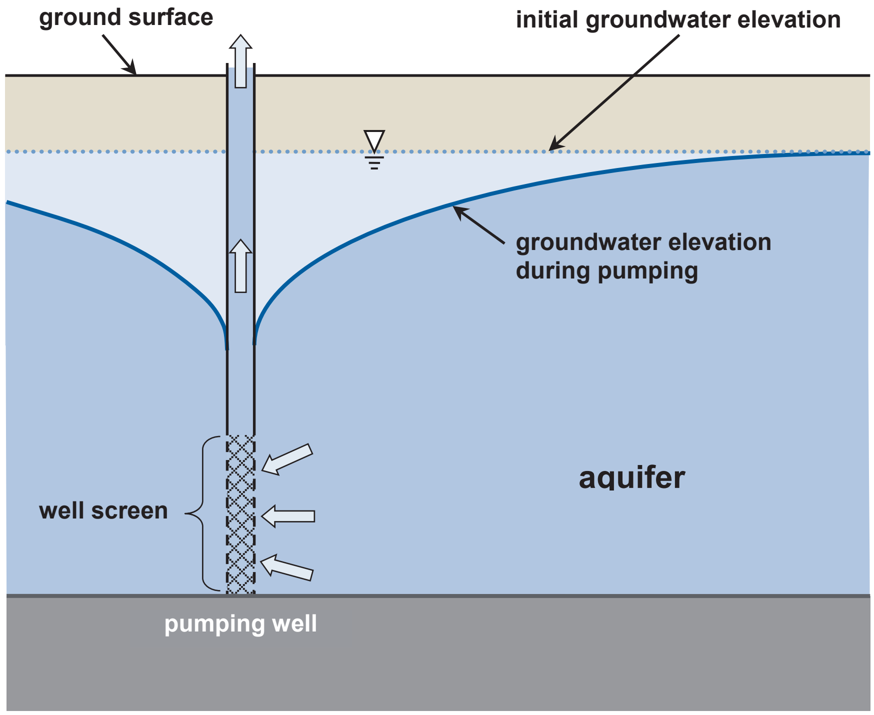
Interference with the pumping of existing wells could result if the project were to cause decreased groundwater levels in the Westside Groundwater Basin near these wells. If the well interference were great enough, the production of the existing wells could be decreased to the extent that existing or planned land uses that rely on the water for irrigation and other nonpotable uses would not be supported.

Description of Well Interference

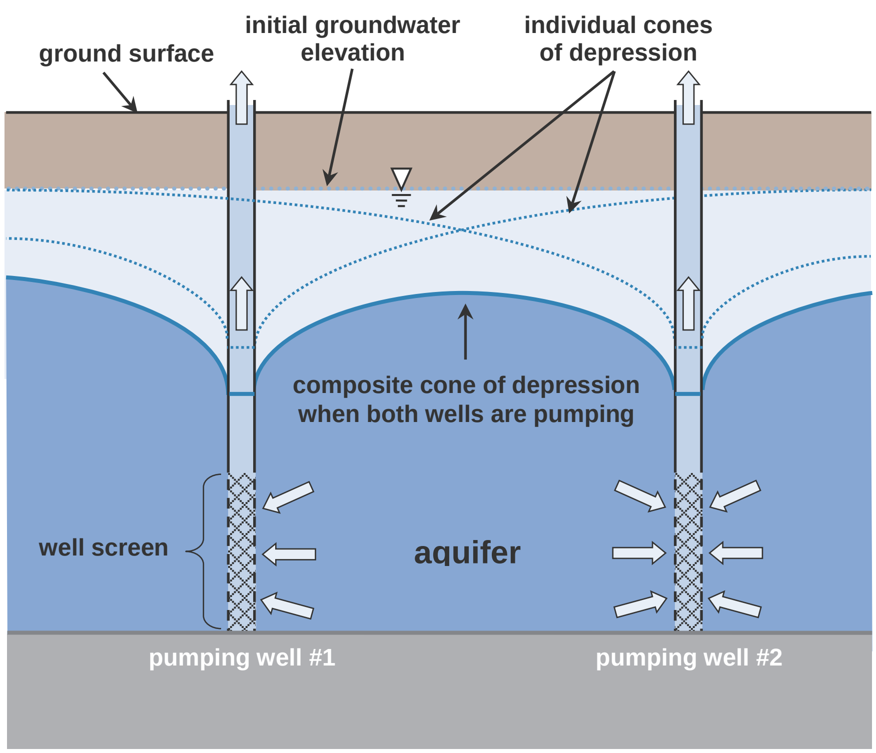
When a well is pumped, groundwater levels decline in the area around the well. The amount of this decline is greatest close to the well, and the decline decreases with distance from the well. The area of groundwater-level decline surrounding a well is known as the 'cone of depression.' Well interference occurs when a well's cone of depression comes into contact with or overlaps another well's cone of depression, resulting in a greater decline in groundwater levels than would occur if only one of the wells were pumped. This phenomenon is illustrated in **Figure 5.16-6** (Driscoll, 1986).

Well interference can result in lower groundwater levels at an affected well, and this lower groundwater level increases the distance the water has to travel vertically to reach the surface when the well is pumped. This distance is known as the 'pumping lift.' Greater pumping lift decreases the pump's discharge rate, which is the rate that water is pumped from the aquifer to the surface. With a sufficient decline in discharge rate, the affected well may not be able to meet the demand for the land use it supports (e.g., irrigation or nonpotable water supply). In some cases, if the water level were to drop below the pump intake, the pump can be lowered or the well can be deepened to enable the well pump to be placed at a lower depth.

To evaluate the magnitude of well interference effects on the pump discharge rate of a nearby well and determine whether these effects would be detrimental to the well's ability to supply water, it is important to know the capacity of the pump in the affected well and the amount that its discharge rate would be reduced because of well interference as a result of project-related pumping. In general, the effect of well interference would not be substantial if the well's discharge rate were to remain above the amount necessary to provide the peak daily demand of the well.



Cone of Depression around a Pumping Well in an Unconfined Aquifer



Well Interference from Overlapping Cones of Depression in an Unconfined Aquifer

SOURCE: GHD

San Francisco Groundwater Supply Project EIR

Figure 5.16-6

Well Interference Schematic

Approach to Analysis—Well Interference

To evaluate the potential decline in the production capacity at each existing well within the North Westside Groundwater Basin, the degree of groundwater decline at the well as a result of project-related pumping was estimated, and the loss of production capacity due to this decline in groundwater levels was then calculated. This analysis assumes that if the reduced production capacity would still accommodate the peak daily demand for that well, impacts related to well interference would be less than significant. However, a significant impact could result if the reduced production capacity were could not accommodate the peak daily demand and the existing land use(s) in turn could not be supported.

A numerical flow model was constructed using MODFLOW specifically to simulate how the pumping cones of depression at the project wells would affect existing wells in the North Westside Groundwater Basin (LSCE, 2012). This interference model was not the basin-wide numerical flow model developed by Daly City (HydroFocus, 2011) and used in this EIR to evaluate other project operational effects. Instead, the interference model incorporated the varying hydrogeologic conditions north and south of Lake Merced, which could not be simulated realistically with a simpler analytical approach, and it allowed evaluation of the interference effects independently from regional influences from other non-project groundwater pumping and annual variations in recharge. Modeled groundwater elevations at the end of one year of pumping (which is when the majority of the drawdown would occur) were used in the estimation of well interference effects. The modeled drawdown effects were similar for both phases of the Groundwater Supply Project; however, where effects differed, this analysis presents the maximum extent of drawdown.

Impact Analysis—Well Interference

As discussed in Section 5.16.1, Setting, a total of six wells in the North Westside Groundwater Basin could be affected by project-related pumping the Golden Gate Park irrigation wells (South Windmill Replacement, North Lake, and Elk Glen); the Edgewood Development Center (Edgewood School) well; the San Francisco Zoo well; and the Stern Grove well. Although the South Windmill Replacement and North Lake wells would be converted to drinking water wells under Phase 2 of the Groundwater Supply Project, and the Elk Glen well would no longer be used, these wells are included in the analysis because they would continue to be used as irrigation supply during Phase 1 of the project. In addition, six wells at golf clubs in the Westside Groundwater Basin that are in the Lake Merced area could be affected by pumping under the project: Olympic Golf Club Wells Nos. 8 and 9; the San Francisco Golf Club Well No. 2; and Lake Merced Golf Club Wells Nos. 1, 2, and 3.

Table 5.16-9 shows the maximum modeled drawdown at each of these wells along with the resulting estimated decrease in production capacity of the well (LSCE, 2012). **Table 5.16-10** compares the estimated reduced production capacity to the peak daily demand provided in Section 5.16.1, Setting. As shown in Table 5.16-10, the estimated reduced well capacity would greater than the peak daily demand for each well. The maximum estimated reduction in production capacity would occur at the San Francisco Zoo well (approximately 11 percent), as shown in Table 5.16-9.

TABLE 5.16-9
ESTIMATED REDUCTION IN PRODUCTION CAPACITY AT EXISTING WELLS

Existing Well	Estimated Maximum Drawdown as a Result of Project-Related Pumping (feet)	Estimated Reduction in Production Capacity with Project (gallons per minute)	Estimated Percent Reduction due to Project
Golden Gate Park, South Windmill Replacement Well	9	22	1.5%
Golden Gate Park, North Lake Well	9	11	1.5%
Golden Gate Park, Elk Glen Well	19	45	3.6%
Edgewood Development Center (Edgewood School) Well	12	<1	<4%
San Francisco Zoo Well No. 5	12	110 to 130	11.2%
Stern Grove Well	11	10	4%
San Francisco Golf Club Well No. 2	6	10 to 25	3.6%
Olympic Golf Club Well No. 8	6	10 to 25	2.5%
Olympic Golf Club Well No. 9	6	10 to 25	3.6%
Lake Merced Golf Club Well No. 3	4	Not available	<1%

SOURCE: LSCE, 2012.

TABLE 5.16-10
COMPARISON OF ESTIMATED REDUCED PRODUCTION CAPACITY TO PEAK DAILY DEMAND AT EXISTING WELLS

Existing Well	Rated Capacity of Pump (gallons per minute/million gallons per day)	Estimated Percent Reduction due to Project	Capacity of Pump under Project Conditions (gallons per minute/million gallons per day)	Estimated Peak Demand for Groundwater (million gallons per day)	Difference Between Capacity of Pump Under Project Conditions and Estimated Peak Daily Demand (million gallons per day)
Golden Gate Park, South Windmill Replacement Well	1,500 / 2.16	1.5%	1,478 / 2.13	1.14	0.99
Golden Gate Park, North Lake Well	750 / 1.08	1.5%	739 / 1.06	0.96	0.10
Golden Gate Park, Elk Glen Well	1,250 / 1.8	3.6%	1,205 / 1.74	1.11	0.63
Edgewood Development Center (Edgewood School) Well	25 / 0.04	4.0%	24 / 0.03	0.01	0.02
San Francisco Zoo Well No. 5	1,160 / 1.67	11.2%	1,030 / 1.48	0.25	1.23
Stern Grove Well	250 / 0.36	4.0%	240 / 0.35	Not applicable[a]	Not applicable
San Francisco Golf Club Well No. 2	700 / 1.01	3.6%	675 / 0.97	0.20	0.77
Olympic Golf Club Well No. 8	1,000 / 1.44	2.5%	975 / 1.40	0.07	1.33
Olympic Golf Club Well No. 9	700 / 1.01	3.6%	675 / 0.97	0.07	0.90
Lake Merced Golf Club Well No. 3	Not available[b]	<1%	Not available	0.13	Not available

[a] The Stern Grove well is only operated three to four days per year to maintain water levels in Pine Lake, and can operate at a reduced rate to achieve the goal of water level maintenance; therefore there is no peak daily demand for this well.
[b] The rated pump capacity for the Lake Merced Golf Club well is not known because the model of the pump is not known.

SOURCE: LSCE, 2012.

However, the estimated reduced capacity of 1.48 mgd (1,658 afy) would still be greater than the capacity needed to meet the estimated peak daily demand of 0.25 mgd (280 afy) (see Table 5.16-10). The Stern Grove well is only used three to four times per year to replenish Pine Lake. Well interference at the Stern Grove well, as a result of the project, is estimated to result in only a 10-gallon-perminute (gpm) reduction in pump capacity; therefore, it would take slightly longer to replenish Pine Lake than it would under existing conditions, but the capacity of the well would remain sufficient to replenish the lake.

The production capacity of the Lake Merced Golf Club wells is not known because the model and size of the pumps in the wells are not known. However, due to the limited drawdown that is estimated to occur in this area, the wells would likely experience a reduction similar to the drawdown expected at the nearby Westlake well, which is located to the south in the South Westside Groundwater Basin. The estimated reduction in production capacity at this well is less than 3 gpm, or less than 1 percent of the total pumping capacity—a negligible effect that would not likely be discernible and would therefore not affect the ability of the wells to meet the peak daily demand at the Lake Merced Golf Club (LSCE, 2012). For all other wells, the estimated peak daily demand could still be met, although the production capacity of the well is expected to be reduced with the implementation of project-related pumping, as shown in Table 5.16-10. The estimated reduced capacity at the San Francisco Golf Club is 0.97 mgd, which would be greater than its total peak irrigation demand of 0.87 mgd (listed in Table 5.16-3). The estimated combined reduced capacity of Olympic Golf Club Well Nos. 8 and 9 is 2.37 mgd, which would exceed their total peak irrigation demand of 2.16 mgd (listed in Table 5.16-3). As a result, these golf clubs could continue to meet their irrigation demands, even if recycled water were temporarily unavailable for irrigation. Therefore, existing groundwater-dependent land uses would continue to be supported, and impacts related to well interference would be less than significant for each of the existing wells.

Impact HY-7: Project operations would not result in substantial land subsidence due to decreased groundwater levels in the Westside Groundwater Basin. (Less than Significant)

Operation of the Groundwater Supply Project could cause land subsidence if project-related groundwater pumping were to result in decreased groundwater levels in the North Westside Groundwater Basin that are lower than the historical low groundwater levels. The potential for this effect would be greatest in areas where thick sequences of clay layers are present within or between the aquifers.

Description of Land Subsidence

Land subsidence is a gradual settling or sudden sinking of the earth's surface due to subsurface movement of earth materials (Galloway et al., 1999). While land subsidence can result from a number of processes, subsidence from groundwater pumping is the focus of the analysis for the Groundwater Supply Project. Land subsidence due to groundwater pumping can occur when groundwater elevations are lowered, and water drains out of an aquifer or the clay layers that are within or between aquifers, or when the water pressure in those layers is reduced.

Subsidence in granular materials (such as sand and gravel) that typically make up the water-bearing portion of an aquifer is generally minor in relation to clays. As groundwater drains from clay layers, there is less water supporting the clay particles, and the clay layers can compress or compact. This process can be slow, occurring over several months or even years. However, with sufficient time and magnitude, the compaction can result in a permanent lowering of the ground surface and related subsidence. Clays are far more compressible than sands or gravels; therefore, the potential for subsidence is greatest in areas with thick clay layers. Because subsidence effects are largely permanent in clays, further subsidence in response to new pumping would not occur unless groundwater levels were reduced below historical levels for a sufficient amount of time to cause additional compaction and permanent dewatering of the clay layer.

Subsidence can damage constructed surface features, including bridges, roads, railroads, underground utilities, canals, and buildings, by causing them to crack during settling. Subsidence can also increase flooding or change drainage patterns by lowering the ground surface. To evaluate the magnitude of potential subsidence, it is important to know the amount of drawdown that would occur under the project and historical groundwater lows, and to understand the occurrence and compressibility of clay layers in the aquifer. Subsidence would generally be substantial if it were to exceed thresholds that could cause damage to constructed features, increase flooding, or alter drainage patterns.

Approach to Analysis – Subsidence

The relevant factors that influence the expected amount of subsidence due to project operation include:

- The extent to which the project would decrease groundwater levels below historical lows compared to predicted groundwater levels under the modeled existing conditions
- The presence and thickness of clay layers or clayey sand layers
- The compressibility of the clay or clayey sand layers

In general, it is expected that the potential for subsidence effects in the North Westside Groundwater Basin would be the lowest in the northern part of the basin where no substantial clay layers separate the aquifers, and the greatest in the southern portion where the "-100-foot" clay layer, "X" clay layer, and "W" clay layer are present. Therefore, since the potential for subsidence is greatest near the proposed Lake Merced and South Sunset well facilities, calculations were performed for these two well facilities to provide a worst-case analysis of potential subsidence effects. Subsidence would be expected to be less in other areas of the groundwater basin to the north where there are no substantial clay layers.

To assess the extent of subsidence at these two worst-case well locations, the Westside Basin Groundwater Model was used to estimate historical low groundwater elevations as well as the anticipated reduction in groundwater elevations under both modeled existing conditions and with project-related pumping. Using this information, the potential extent of subsidence was calculated using equations based on the soil mechanics theories that relate the amount of subsidence to the compressibility and thickness of a clay layer, and the change in groundwater elevations.

As stated in Section 5.16.1, Setting, consistent groundwater-level data are not available for the North Westside Groundwater Basin for the time period prior to implementation of SFPUC monitoring efforts in 2001. Therefore, the lowest groundwater elevations for both well facility sites were estimated from the Westside Basin Groundwater Model simulation (discussed in Section 5.1.5, Overview of Groundwater Modeling Approach). The estimated lowest elevation for each well is based on the modeled groundwater levels for several nearby current or former well locations used in the model.[25] The reduction in groundwater levels as a result of project-related pumping was estimated by calculating the maximum difference between the modeled groundwater elevation under the modeled existing conditions and under Phases 1 and 2 of the Groundwater Supply Project, and this difference was used in the subsidence calculations.

An understanding of the compressibility properties of clay particles is required to implement the methodology described above. Because site-specific laboratory test results regarding the compressibility of clays in the North Westside Groundwater Basin are not available, typical soil compressibility values for the Merced Formation were used to calculate the potential extent of subsidence.

As discussed in Section 5.16.1, Setting, subsidence can affect surface features such as structures and pipelines, as well as drainage patterns, the extent of flooding, and proper drainage from playing fields in the project area. In general, structures can withstand subsidence or settlement of 6 inches or less without damage (Lambe and Whitman, 1969); therefore, this analysis considers projected subsidence of 6 inches or more to be a significant impact. Flood zones, as defined by the National Flood Insurance Program (Code of Federal Regulations, Title 44, Part 60.3[c][10]), are subject to revision when the base flood elevation within a 100-year flood zone changes by 1 foot or more. The 100-year flood elevations cannot be estimated more accurately than about 1 foot, and changes to flood elevations that are less than 1 foot should not be interpreted as necessarily causing a substantially increased risk of flooding. Therefore, subsidence impacts related to flooding potential are considered significant if projected subsidence would exceed 1 foot within a 100-year flood zone. Subsidence impacts on drainage patterns are considered significant if projected subsidence would exceed 6 inches.

Impact Analysis – Subsidence

As described in Section 5.16.1, Setting, no land subsidence has been documented in the North Westside Groundwater Basin despite extensive groundwater extraction from the Sunset District emergency supply wells in the early 1930s and at the San Francisco Zoo and Golden Gate Park. This

[25] The average for the Lake Merced well is based on modeled groundwater levels from the Olympic, Harding Park, and Higuera well locations. The average for the South Sunset well is based on water levels from the LMMW-4, LMMW-5, and Ortega well locations.

fact suggests that the semi-consolidated Merced Formation sediments in the Westside Groundwater Basin have limited compressibility. Therefore, based on a conceptual understanding of the mechanisms required for land subsidence and the apparent lack of historical subsidence in the area, the potential for extensive future subsidence due to the project would be limited because of the low compressibility of the semi-consolidated sediments that underlie the project area (Fugro, 2012). To quantify the estimated amount of land subsidence that could occur due to project pumping, subsidence calculations were performed for the Lake Merced and South Sunset well facilities, as described above under the heading "Approach to Analysis."

Both the Lake Merced and South Sunset well facilities would be located in the southern portion of the North Westside Groundwater Basin where substantial clay layers are present. At the Lake Merced well facility, there are clay layers both above and below the pumped zone at depths of 333 to 390 feet below ground surface and 454 to 542 feet below ground surface (Fugro, 2012). At the South Sunset well facility, there is a shallow clay layer within the upper 100 feet, several intermediate-depth clay layers between 290 and 390 feet below ground surface, and a deeper clay layer below 500 feet. In addition, sandy clay layers at multiple depths at this location exhibit similar characteristics to the clay layers and were considered in the subsidence calculations.

The subsidence modeled for these wells showed that the lowest predicted groundwater levels at each well would be similar under both Phase 1 and Phase 2 of the Groundwater Supply Project, and that the effects related to subsidence would be similar for both phases (Fugro, 2012). This analysis therefore addresses both phases of the project. Under the modeled existing conditions, the estimated low groundwater elevations at the Lake Merced well facility would exceed the estimated historical low groundwater elevations by up to 4 feet under the modeled hydrologic conditions due to existing pumping in the groundwater basin; however, under the proposed project, estimated historical low groundwater elevations would be exceeded by up to 57 feet. Under the project, the estimated lowest groundwater elevation would be up to about 62 feet lower than under the modeled existing conditions.

Under the modeled existing conditions, the estimated low groundwater elevations at the South Sunset well facility would exceed the estimated historical low groundwater elevations by up to 2 feet under the modeled hydrologic conditions due to existing pumping in the groundwater basin; however, under the project, estimated historical low groundwater elevations would be exceeded by up to 33 feet. Under the project, the estimated lowest groundwater elevation would be up to about 32 feet lower than under the modeled existing conditions.

Table 5.16-11 shows the estimated project-related subsidence at the Lake Merced and South Sunset well facilities based on a comparison to historical groundwater levels and to levels under the modeled existing conditions. The comparison to historical low groundwater elevations is based on analysis of the lowest estimated groundwater elevations that would occur as a result of project-related pumping in combination with all other pumping in the North Westside Groundwater Basin; therefore, this estimate represents a worst-case amount of subsidence, not just the amount associated with project-related pumping. As shown in Table 5.16-11, this estimated worst-case subsidence would likely range between 2.0 and 3.5 inches, and the estimated subsidence due to project-related pumping would likely range between 1.9 and

3.0 inches. This estimated subsidence is less than the significance threshold of 6 inches for structures and changes in drainage patterns, and less than the significance threshold of 1 foot for flooding impacts on land within a 100-year flood zone. Therefore, potential impacts related to land subsidence would be less than significant relative to structures, drainage patterns, and flooding.

TABLE 5.16-11
ESTIMATED SUBSIDENCE DUE TO PROJECT OPERATION

Well Facility	Estimated Subsidence Compared to Historical Lows (inches)	Estimated Subsidence Compared to Modeled Existing Conditions (inches)
Lake Merced well facility	3.5	3.0
South Sunset well facility	2.0	1.9

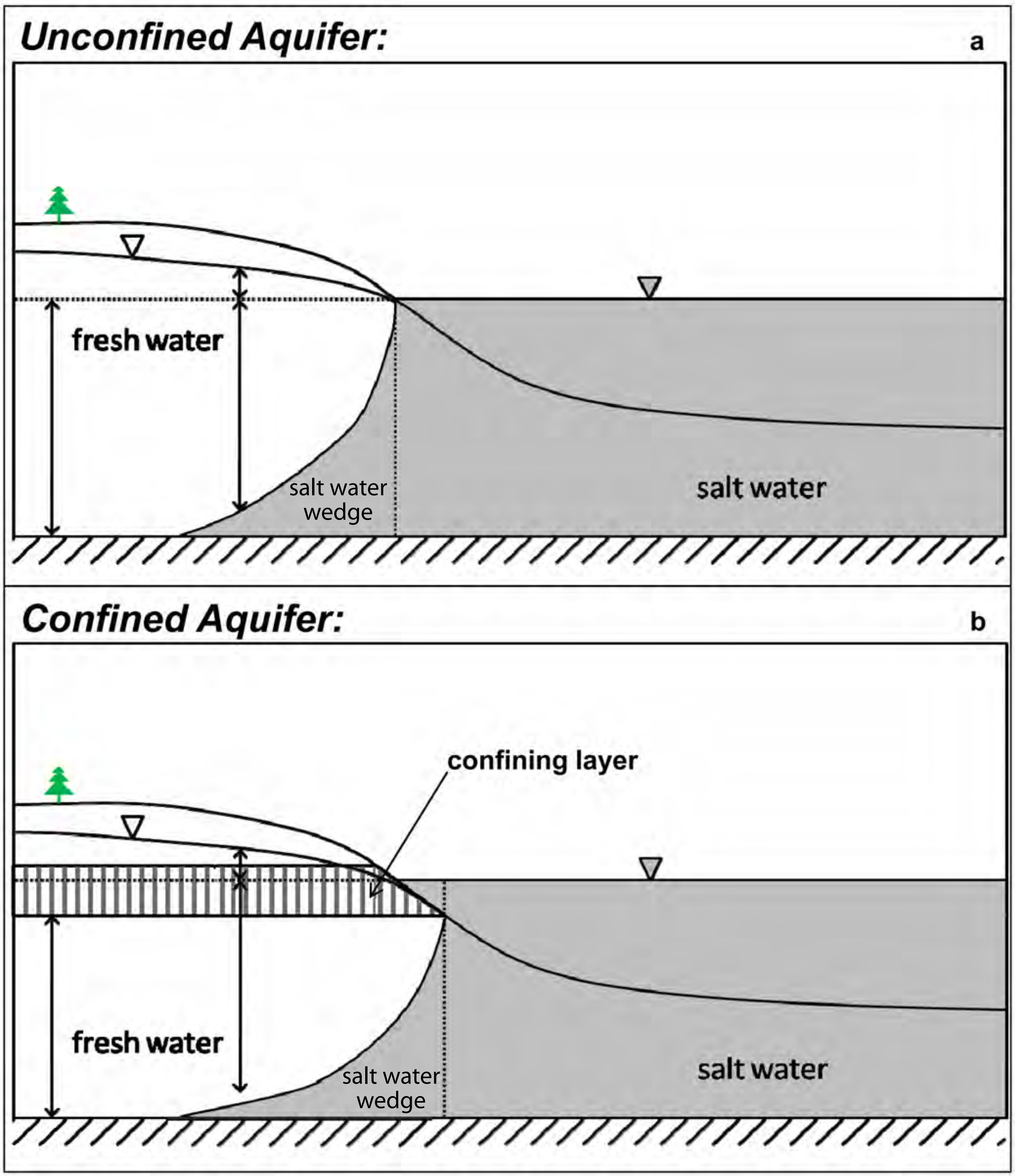
SOURCE: Fugro, 2012.

Impact HY-8: Project operations would possibly result in seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin. (Less than Significant with Mitigation)

Seawater intrusion refers to the migration of seawater into a freshwater aquifer and can occur when groundwater levels are lowered by pumping. Seawater intrusion becomes an environmental concern when the degradation of groundwater quality would make the groundwater potentially unsuitable for its identified use, or when inland surface water features are affected by the seawater, thereby compromising habitats or other uses of the surface water.

Where an aquifer is in direct hydraulic connection with an ocean or bay, the hydrologic zone where fresh groundwater and ocean saltwater meet—referred to as the saltwater/freshwater interface—is comprised of brackish water (a mixture of freshwater and saltwater) to saline water (water with high concentrations of salt); this interface is typically wedge-shaped because of the higher density of saltwater, with the less dense freshwater floating above the saltwater (**Figure 5.16-7**). Aquifers that are not actively pumped typically provide freshwater outflow at the coast. Because this freshwater outflow exerts seaward hydraulic pressure, it can generally hold seawater at equilibrium offshore from the coast and hinders its onshore advancement.

Seawater intrusion occurs when the freshwater/groundwater gradient declines toward the ocean or bay, resulting in a shift in the "saltwater wedge" (Figure 5.16-7). Because of the wedge-shaped boundary, the shallowest portion of the landward side of the saltwater/freshwater interface may remain relatively close to the point where the aquifer is in communication with the ocean or bay, but the deepest portion of the landward side of the saltwater wedge may extend farther landward, even when freshwater is flowing to the ocean.



SOURCE: Kennedy/Jenks Consultants, 2012 b

San Francisco Groundwater Supply Project EIR

Figure 5.16-7
Seawater Intrusion Schematics for Unconfined and Confined Aquifers

The extent of seawater intrusion into a freshwater aquifer is affected by the relative difference in water levels in the ocean or bay and the freshwater aquifer with which it is in direct hydraulic communication. The theoretical groundwater level necessary to prevent seawater intrusion is termed the "exclusion head." When groundwater levels drop below the exclusion head, the interface between the seawater and freshwater can theoretically move inland under certain conditions. The interface would move back toward the ocean or bay if groundwater levels were raised again. However, some of the salt can remain in the freshwater (even after the interface has moved back toward the ocean or bay); although it is possible that water quality can be improved if not fully restored, this remaining saltwater can be difficult to remove (Kennedy/Jenks, 2012b). Also, the seawater/freshwater interface is not a sharp interface. Instead, diffusion and dispersion result in a transition zone at the interface where salt concentrations (typically measured as chloride or TDS) range from values typical of freshwater at the leading edge (farthest inland) to those typical of seawater at the following edge (closest to the ocean or bay). The movement of the interface is controlled by changing conditions on the freshwater side of the interface. Seawater contains approximately 35,000 mg/L of TDS, which includes about 19,000 mg/L of chloride (USGS, 2003). As discussed Section 5.16.1, Setting, under the heading "Coastal Chloride Concentrations," existing chloride concentrations in the Shallow, Primary Production, and Deep Aquifers in the North Westside Groundwater Basin are all below 400 mg/L. Therefore, there is a large contrast between the chloride concentrations in the seawater and the groundwater. In the North Westside Groundwater Basin, seawater intrusion has not been observed in coastal monitoring wells, and the seawater/freshwater interface is assumed to be west of the shoreline.

Movement of the seawater/freshwater interface can be a slow process. The rate of movement depends on aquifer conditions, and seawater intrusion occurs only when the conditions that cause seawater intrusion are sustained for a sufficient period of time given the existing conditions. Fluctuating groundwater elevations can result in a wider transition zone. To evaluate the potential for seawater intrusion to occur, it is important to understand the geologic conditions along the Pacific Ocean coast and to evaluate changes in groundwater levels along the Pacific Ocean coast and changes in flux[26] to or from the ocean.

Approach to Analysis – Seawater Intrusion

The Westside Basin Groundwater Flow Model does not simulate seawater and freshwater flows or their interface but instead simulates groundwater-level changes. Therefore, the potential for seawater intrusion to occur in the North Westside Groundwater Basin was evaluated using the results of the groundwater flow model in conjunction with groundwater contours, changes in flux to the ocean or bay, and analytical approaches to evaluate exclusion heads in the aquifer and the estimated rate of seawater intrusion (Kennedy/Jenks, 2012b).

Seawater intrusion into the Shallow, Primary Production, and Deep Aquifers has not occurred despite long-term irrigation pumping at the zoo since the 1930s and in Golden Gate Park since the 1920s. However, there are three conditions under which seawater intrusion could occur in the

[26] Groundwater flux is the amount of groundwater discharged per unit area of coastline. This analysis considers total flux along the Pacific Ocean coastline of the North Westside Groundwater Basin.

North Westside Groundwater Basin. Sufficient declines in groundwater levels could cause seawater intrusion within the Shallow Aquifer, which is in direct hydraulic connection with the Pacific Ocean along the coastline. Seawater intrusion could also occur within the Primary Production and Deep Aquifers if groundwater levels were to decline sufficiently and if these aquifers were open to the ocean. However, as discussed in Section 5.16.1, Setting, under the heading "Aquifer Systems," it is not certain how far the "-100-foot" clay and "W" clay layers extend offshore and whether offshore faulting would prevent direct hydraulic connection with the ocean. Finally, seawater intrusion into the Shallow Aquifer could cause seawater to flow into the Primary Production Aquifer through gaps in the "-100-foot" clay layer if there were sufficient groundwater-level declines in the Primary Production Aquifer.

Because the Shallow Aquifer is known to be in direct hydraulic connection with the ocean, the primary focus of this analysis is on groundwater conditions in the Shallow Aquifer. However, because of the uncertainty regarding the connection of the Primary Production and Deep Aquifers to the ocean, the potential for seawater intrusion into these aquifers is also addressed.

Three lines of evidence are used to estimate the potential for seawater intrusion at any location in the Westside Groundwater Basin:

- Comparison of simulated groundwater elevations to calculated exclusion heads
- Analysis of simulated groundwater contours
- Analysis of the changes in the simulated flux of groundwater flowing to the ocean

Groundwater Elevations and Exclusion Heads

To assess the potential for seawater intrusion to occur, changes in groundwater elevations were evaluated at all five coastal monitoring locations (South Windmill, Kirkham, Ortega, Taraval, and San Francisco Zoo), as well as at the North Windmill and West Sunset locations. The North Windmill location corresponds to a historical well location, but is not an active monitoring well. The West Sunset monitoring well, located approximately 3,000 feet inland, is at the opposite end of the West Sunset Playground parking lot from the proposed West Sunset well facility.

Modeled groundwater levels at these wells under the Groundwater Supply Project were compared to water levels under the modeled existing conditions to determine the effect of project-related pumping on the potential for seawater intrusion. These groundwater levels were also compared to the exclusion head (i.e., the theoretical groundwater level that must be maintained at a well location to prevent seawater from reaching the well). Modeled groundwater elevations at a well that are higher than the exclusion head indicate that seawater would not likely reach that well location. Groundwater levels lower than the exclusion head do not indicate that seawater intrusion would definitely occur, but that the potential exists if the groundwater level remained below the exclusion head for a sufficient period of time. **Appendix D-6** includes hydrographs prepared for a technical analysis of potential seawater intrusion which was performed using the groundwater modeling results and technical approaches described above (Kennedy/Jenks, 2012b). The hydrographs show the modeled groundwater elevations for each well considered in this analysis, including the exclusion head at each well. The hydrographs show groundwater elevations for the modeled existing conditions as well as with project conditions. To evaluate whether the aquifers would experience groundwater-level declines sufficient to render the aquifer more susceptible to seawater intrusion during the dry season, this analysis also considered seasonal fluctuations in groundwater levels, with May representing the high groundwater level and November representing the low groundwater level.

Groundwater Contours

Groundwater contours were used to evaluate groundwater elevations and flow directions in the Shallow Aquifer throughout the basin. In general, when groundwater levels are estimated to be above sea level and groundwater flow directions are estimated to be toward the ocean or bay, the potential for seawater intrusion to occur is considered low.

Groundwater Flux

The flux of groundwater moving towards the ocean or bay at the coast represents the amount of water discharging from the aquifer. The flux values are representative of the groundwater basin as a whole and indicate total discharge along the coast, which means that this analysis would not identify localized changes in flux that could allow localized seawater intrusion to occur. However, calculating flux values provides a gross evaluation of the amount of water discharging from the aquifer. A positive flux indicates a lower potential for seawater intrusion. However, a positive flux value does not necessarily preclude seawater intrusion from occurring because the seawater wedge could still enter the lowest part of the freshwater aquifer. Rather, the calculated flux is used as an indication of whether seawater intrusion is expected to be a substantial concern.

Significance Threshold

The recommended secondary MCL for chloride is 250 mg/L, and the upper limit is 500 mg/L; an increase in chloride concentrations above these levels could render at least part of the groundwater basin unsuitable for use as a drinking water source. Therefore, this analysis considers that impacts related to seawater intrusion to be significant if chloride concentrations were to exceed 250 mg/L at one of the coastal monitoring locations along the Pacific Coast. The Basin Plan specifies a water quality threshold of 142 mg/L chloride for agricultural purposes, and this analysis uses 142 mg/L as an intermediate action level for the implementation of corrective actions to ensure that chloride concentrations do not reach 250 mg/L at any of the coastal monitoring locations.

This impact analysis does not discuss groundwater levels and quality at the Thornton Beach and Fort Funston monitoring locations because these monitoring points are located southwest of the Serra Fault, between the San Andreas Fault and Lake Merced, as described in the Regional Geology subsection of Section 5.16.1, Setting. Previous analyses have determined that this area would not be subject to seawater intrusion because the Serra Fault acts as an effective barrier (Kennedy/Jenks, 2012b).

Impact Analysis – Seawater Intrusion

As discussed in Section 5.16.1, Setting, under the heading "Seawater Intrusion in the North Westside Groundwater Basin," the Shallow Aquifer is in direct hydraulic connection with the Pacific Ocean between Lincoln Park (north of Golden Gate Park) and Lake Merced. Because operation of the Groundwater Supply Project would increase groundwater withdrawals from the basin and the project wells are located relatively close to the Pacific Coast, there is the potential for seawater intrusion in the Shallow Aquifer. If seawater intrusion into the Shallow Aquifer were to occur, intrusion into the Primary Production Aquifer could also occur where these two aquifers are in hydraulic communication. Therefore, the analysis below focuses on the potential for seawater intrusion into the Shallow Aquifer, and on potential areas where the two aquifers are in hydraulic communication.

As discussed in Section 5.16.1, some depositional or structural features in the offshore sediments may impede or preclude seawater intrusion into the Primary Production and Deep Aquifers directly from the ocean. However, there is no certainty regarding this potential barrier, and therefore the potential for seawater intrusion into the Primary Production and Deep Aquifers is also addressed.

Potential for Seawater Intrusion under Modeled Existing Conditions

Under the modeled existing conditions, there is a low potential for seawater intrusion into the Shallow Aquifer for several reasons (Kennedy/Jenks, 2012b):

- The groundwater levels for the Shallow Aquifer are predicted to be above sea level, and groundwater flow is expected to be toward the ocean throughout the North Westside Groundwater Basin for the entire 47-year simulation period, which includes the lowest groundwater conditions that could occur at the end of the design drought.
- Shallow Aquifer groundwater levels would likely remain above the Shallow Aquifer exclusion head at all locations throughout the entire simulation period.
- There would likely be a relatively large flux toward the ocean, with a maximum of 432 acre-feet per month and a minimum of 149 acre-feet per month.

In the Primary Production Aquifer, the groundwater levels are predicted to be consistently below the Primary Production Aquifer exclusion head at the Kirkham location and at all locations to the south. While these values indicate the potential for groundwater levels to drop to a point where seawater intrusion could occur into the Primary Production Aquifer, this aquifer may not be in direct hydraulic connection with the ocean in this area, depending on the offshore extent of the "-100-foot" clay layer. At the South Windmill location where the "-100-foot" clay layer is absent, the Primary Production Aquifer groundwater levels are predicted to be below the exclusion head for approximately 99 percent of the simulation period. While these values also indicate the potential for groundwater levels to drop to a point where seawater intrusion could occur into the Primary Production Aquifer, the aquifer has experienced conditions that were similar to the simulated conditions in this area and seawater intrusion has not been identified (see Section 5.16.1, Setting, under the heading "Seawater Intrusion in the North Westside Groundwater Basin").

In the Deep Aquifer, the groundwater levels are predicted to be consistently below the Deep Aquifer exclusion head for the duration of the simulation period at all locations. While these values indicate the potential for groundwater levels to drop to a point where seawater intrusion could occur into the Deep Aquifer, it is noted that the aquifer has experienced conditions that were similar to the simulated conditions and seawater intrusion has not been identified (see Section 5.16.1, Setting, under the heading "Seawater Intrusion in the North Westside Groundwater Basin"). Further, this aquifer may not be in direct hydraulic connection with the ocean, depending on the offshore extent of the "W" clay layer.

Potential for Seawater Intrusion – Phase 1 Pumping, Shallow Aquifer

During Phase 1, the Groundwater Supply Project would pump a total of 3 mgd (3,360 afy) from the North Westside Groundwater Basin. The Shallow Aquifer groundwater levels at the coastal monitoring wells are predicted to decline quickly over the first approximately 10 to 15 years of project operation and exhibit a much slower decline over the remainder of the simulation period (see hydrographs in Appendix D-6). By the end of the 47-year simulation period, the Shallow Aquifer groundwater levels at the coastal monitoring locations from the Kirkham location to the south are predicted to decline from 5 to 7 feet relative to the modeled existing conditions (Kennedy/Jenks, 2012b). The Shallow Aquifer groundwater levels at the North Windmill monitoring location and South Windmill monitoring location are predicted to decline up to 13 and 10 feet, respectively, over the entire 47-year simulation period relative to existing conditions.

At the North Windmill location, the Shallow Aquifer groundwater levels are predicted to remain above sea level for the entire 47-year simulation period (Kennedy/Jenks, 2012b). At the South Windmill, Kirkham, Ortega, and Taraval locations, the Shallow Aquifer groundwater levels are predicted to be at or near sea level for much of the simulation period after year 10, with periodic drops to several feet below sea level at some locations, particularly during the design drought at the end of the simulation period. At the San Francisco Zoo location, the Shallow Aquifer groundwater levels are predicted to decline to below sea level only at the end of the design drought, and the lowest groundwater level is predicted to be approximately 3 feet below mean sea level.

At the West Sunset monitoring location, which is 3,000 feet inland, the Shallow Aquifer groundwater levels is predicted to decline up to 24 feet by the end of the simulation period relative to existing conditions because of the proximity of this monitoring location to the proposed West Sunset well facility (Kennedy/Jenks, 2012b). At this location, the predicted groundwater levels would likely be below sea level for much of the simulation period after year 6, with a maximum predicted decline to approximately 11 feet below mean sea level by the end of the design drought.

Under Phase 1, the groundwater levels in the Shallow Aquifer at the end of the simulation period are predicted to be lower than they would be under the modeled existing conditions, with groundwater levels below sea level along much of the Pacific Coast. This indicates the potential for groundwater pumping under Phase 1 to increase the landward migration of the seawater/freshwater interface in the Shallow Aquifer.

While the Shallow Aquifer groundwater levels at the coastal monitoring locations are predicted to remain above the Shallow Aquifer exclusion head for the entire simulation under modeled existing conditions, they are predicted to be below the Shallow Aquifer exclusion head for 5 to 91 percent of the simulation period, depending upon well location, under Phase 1 of the project (Kennedy/Jenks, 2012b). The groundwater levels are predicted to be below the exclusion head for the least amount of time at the North Windmill monitoring location in Golden Gate Park (i.e., 5 percent of the time), and for the greatest amount of time at the Ortega, West Sunset, and Taraval monitoring locations to the south (i.e., 89 to 91 percent of the time). Estimated groundwater levels below the Shallow Aquifer exclusion heads at these monitoring locations provide further indication that groundwater pumping could increase the potential for the landward migration of the seawater/freshwater interface along the Pacific Coast south of the North Windmill monitoring location. The Shallow Aquifer groundwater levels at the South Windmill monitoring location are predicted to be below the Shallow Aquifer exclusion head for 73 percent of the simulation period, which also indicates the potential for groundwater pumping under Phase 1 to increase the landward migration of the seawater/freshwater interface in the Shallow Aquifer.

Based on the predicted decline of groundwater levels, the seaward freshwater flux would likely decrease during Phase 1. Modeling results indicate that the expected groundwater flux to the ocean could decline from a maximum of 432 acre-feet per month and a minimum of 149 acre-feet per month under the modeled existing conditions to a maximum of 367 acre-feet per month and a minimum of 9 acre-feet per month under the project (Kennedy/Jenks, 2012b). This reduction in the estimated groundwater flux to the ocean also indicates that groundwater pumping could increase the potential for the landward migration of the seawater/freshwater interface in the Shallow Aquifer.

If seawater intrusion into the Shallow Aquifer were to occur, seawater intrusion into the Primary Production Aquifer could also occur through the gap in the clay layer separating the two aquifers between the Taraval and San Francisco Zoo monitoring locations, and where the separating clay layer is not continuous to the north of the Taraval location (Figure 5.16-2).

Based on the groundwater modeling conducted, seasonal fluctuations in the estimated Shallow Aquifer groundwater elevations would likely be similar to those under existing conditions. The seasonal variation ranges from about ±0.5 feet at the West Sunset monitoring location to ±1.6 feet at the North Windmill monitoring location (Kennedy/Jenks, 2012b). These results indicate that changes in seasonal fluctuations as a result of project-related pumping during Phase 1 would not have a substantial effect related to seawater intrusion.

Potential for Seawater Intrusion – Phase 1 Pumping, Primary Production and Deep Aquifers

During Phase 1, the groundwater levels in the Primary Production Aquifer are predicted to decline 6 to 19 feet relative to the modeled existing conditions over the entire 47-year simulation period, and the Deep Aquifer groundwater levels are predicted to decrease 5 to 7 feet over the same period (Kennedy/Jenks, 2012b). The Primary Production Aquifer groundwater level at the South Windmill monitoring location is predicted to be below the exclusion head in the Primary Production Aquifer for 100 percent of the 47-year simulation period during Phase 1 operation, compared to 99 percent of the simulation period under modeled existing conditions. All other locations are predicted to be below the Primary Production Aquifer exclusion head for the entire simulation period during Phase 1 operation, similar to modeled existing conditions. Also similar to the modeled existing conditions, the Deep Aquifer groundwater level is predicted to be below the Deep Aquifer exclusion head at all locations for the 47-year simulation period during Phase 1 operation.

Potential for Seawater Intrusion – Phase 2 Pumping, Shallow Aquifer

During Phase 2, the South Windmill and North Lake irrigation wells would be converted from irrigation use to drinking water supply. The total amount of groundwater pumping under the Groundwater Supply Project would be increased from 3 to 4 mgd (3,360 to 4,480 afy). The total amount of groundwater pumping at Golden Gate Park would be reduced from 2.59 to 2.52 mgd (2,901 to 2,823 afy), but pumping at the South Windmill Replacement well facility would be increased from 0.50 to 0.65 mgd (560 to 728 afy), and pumping at the North Lake well facility would be decreased from 0.56 to 0.50 mgd (627 to 560 afy) (Kennedy/Jenks, 2012a).

Based on the groundwater modeling estimates, Phase 2 groundwater levels at most coastal monitoring locations are not predicted to substantially differ from those provided in the above discussion for Phase 1 (Kennedy/Jenks, 2012b). However, the projected Shallow Aquifer water levels at the North Windmill and South Windmill monitoring locations could be approximately 1 to 2 feet lower throughout most of the 47-year simulation period because of the greater amount of groundwater pumped from this area.

During Phase 2, the predicted groundwater levels in the Shallow Aquifer at the end of the simulation period would likely be lower than levels under the modeled existing conditions, with estimated groundwater levels below sea level along much of the Pacific Coast (Kennedy/Jenks, 2012b). This indicates the potential for groundwater pumping under Phase 2 to increase the landward migration of the seawater/freshwater interface in the Shallow Aquifer.

While the Shallow Aquifer groundwater levels at the coastal monitoring locations are predicted to remain above the Shallow Aquifer exclusion head for the entire simulation period under modeled existing conditions, they are predicted to be below the Shallow Aquifer exclusion head for 4 to 91 percent of the simulation period (depending on well location) during Phase 2 (Kennedy/Jenks, 2012b). The groundwater levels are predicted to be below the exclusion head for the least amount of time at the North Windmill location in Golden Gate Park, and for the greatest amount of time at the Ortega, West Sunset, and Taraval monitoring locations in the vicinity of the West and South Sunset well facilities. The Shallow Aquifer groundwater levels at the South Windmill monitoring location are predicted to be below the Shallow Aquifer exclusion head for 85 percent of the simulation period due to the higher pumping rates from this well relative to existing conditions (0.65 mgd [728 afy] under the proposed project vs. 0.50 mgd [560 afy] under existing conditions). This also indicates the potential for groundwater pumping under Phase 2 to increase the landward migration of the seawater/freshwater interface in the Shallow Aquifer.

The projected decline in groundwater levels indicates that the seaward freshwater flux can be expected to decrease. Based on modeling estimates, the expected groundwater flux to the ocean could decline from a maximum of 432 acre-feet per month and a minimum of 149 acre-feet per month under the modeled existing conditions to a maximum of 351 acre-feet per month and a minimum of 9 acre feet per month under the project (Kennedy/Jenks, 2012b).

Similar to Phase 1, the pumping of 4 mgd (4,480 afy) during Phase 2 would decrease Shallow Aquifer groundwater levels along the coast to at or near sea level, and these groundwater levels are predicted to be below the Shallow Aquifer exclusion head for much of the simulation period at most locations. The groundwater flux to the ocean would also be greatly reduced. These factors indicate that groundwater pumping under Phase 2 could increase the potential for the landward migration of the seawater/freshwater interface in the Shallow Aquifer of the North Westside Groundwater Basin.

If seawater intrusion into the Shallow Aquifer were to occur, seawater intrusion into the Primary Production Aquifer could also occur through the gap in the clay layer separating the two aquifers between the Taraval and San Francisco Zoo monitoring locations, and where the separating clay layer is not continuous to the north of the Taraval location (Figure 5.16-2).

The seasonal fluctuations in Shallow Aquifer groundwater elevations at the North Windmill location are predicted to be reduced to ±0.8 feet (from ±1.7 feet under the modeled existing conditions), but the estimated seasonal fluctuations in other Shallow Aquifer coastal wells are assumed to be similar to those under the modeled existing conditions. The values for seasonal fluctuations range from about ±0.5 feet at the West Sunset and Taraval monitoring wells to ±1.2 feet at the San Francisco Zoo well. These results indicate that changes in seasonal fluctuations as a result of project-related pumping during Phase 2 would not have a substantial effect related to seawater intrusion.

Potential for Seawater Intrusion – Phase 2 Pumping, Primary Production and Deep Aquifers

During Phase 2, the groundwater levels in the Primary Production Aquifer are predicted to decline 6 to 18 feet relative to modeled existing conditions over the entire simulation period, and the Deep Aquifer groundwater levels are predicted to decrease 5 to 7 feet over the same period. Similar to modeled existing conditions, the Primary Production Aquifer groundwater level at all locations is predicted to be below the Primary Production Aquifer exclusion head for the entire simulation period. Similar to modeled existing conditions, the Deep Aquifer groundwater level is predicted to be below the Deep Aquifer exclusion head at all locations for the entire simulation period.

Impact Discussion and Significance Determination

The results of the above analysis indicate that the increased pumping in the North Westside Groundwater Basin under both Phases 1 and 2 could result in the landward migration of the seawater/freshwater interface to a greater degree than would occur under existing conditions. If the landward migration of the interface were to adversely affect the identified beneficial uses of the North Westside Groundwater Basin, impacts related to seawater intrusion would be significant.

As discussed in Section 5.16.2, Regulatory Framework, under the heading "Water Quality Control Plans and Beneficial Uses," the Basin Plan lists agricultural supply, industrial supply, municipal and domestic supply, and industrial process supply as the identified beneficial uses for the Westside Groundwater Basin. The recommended secondary MCL for chloride is 250 mg/L and the upper limit is 500 mg/L; therefore, impacts related to seawater intrusion would be significant if chloride concentrations were to exceed 250 mg/L in the groundwater basin, making the groundwater less suitable as a potable water source. Because seawater typically contains chloride at concentrations of approximately 19,000 mg/L, chloride concentrations could exceed the 250-mg/L criterion with sufficient landward migration of the seawater/freshwater interface under either phase of the Groundwater Supply Project. Therefore, this impact could be significant for both phases of the Groundwater Supply Project. The rate of seawater intrusion that may be attributable to the project could vary widely and would depend on a number of factors, including the groundwater gradient, proximity of the existing interface to the coastline, thickness of the aquifer, and the amount of flux to the ocean. Using an analytical equation that incorporates these variables, the rate of landward migration of the seawater/freshwater interface during Phase 1 is projected to be approximately 4 feet after 1 year, 19 feet after 10 years, and 57 feet after 50 years (Kennedy/Jenks, 2012b). During Phase 2, the rate of landward migration of the seawater/freshwater interface is projected to be approximately 4 feet after 1 year, 20 feet after 10 years, and 59 feet after 50 years. However, current estimates of climate change effects indicate higher sea levels (Delta Vision Blue Ribbon Task Force, 2008), which could change the saltwater wedge and potentially increase the rate of landward migration of the seawater/freshwater interface beyond that projected by the groundwater modeling.

As discussed above in Section 5.16.1, Setting, under the heading "Existing Monitoring Network and Program," the SFPUC currently conducts coastal groundwater monitoring at five locations along the Pacific Coast, extending from Lake Merced to approximately the southern edge of Golden Gate Park. These monitoring wells are located near the Pacific Ocean, and an increase of chloride concentrations in these wells would provide an early indication of the landward migration of the seawater/freshwater interface. However, because there are no coastal monitoring wells in the northern portion of Golden Gate Park, the seawater/freshwater interface could migrate landward and adversely affect groundwater quality at the North Lake well facility before seawater intrusion could be detected. In addition, the monitoring wells at the South Windmill location are not screened in the same zone as the existing well at that location and therefore may not provide adequate detection of seawater intrusion.

Therefore, because chloride concentrations could exceed the recommended secondary MCL of 250 mg/L with sufficient landward migration of the seawater/freshwater interface under either phase of the Groundwater Supply Project, this impact is considered potentially significant for both phases of the project. However, as previously described, the rate of seawater intrusion would be slow, and the implementation of mitigation measures would reduce this impact to a less-than-significant level by requiring of the SFPUC to expand the groundwater monitoring network and actions to prevent seawater intrusion from causing a loss of beneficial uses of groundwater. These measures are described below.

As described above, the locations of the existing monitoring wells may not enable early detection of the landward migration of the seawater/freshwater interface at Golden Gate Park. To address this issue, **Mitigation Measure M-HY-8a, Expand Coastal Monitoring Network,** requires the SFPUC to either rehabilitate existing wells in Golden Gate Park or install new coastal monitoring wells between the Pacific Coast and the South Windmill Replacement and North Lake well facilities to provide coastal monitoring locations for the detection of seawater intrusion. The SFPUC expects that existing wells NL-1 and SF-1 (shown on Figure 5.16-3), which are screened similarly to the North Lake irrigation well, can be rehabilitated, and that wells SWM-3 and NWM-3 (shown on Figure 5.16-3) may also be able to be rehabilitated.

In addition, the current monitoring program includes only quarterly groundwater-level monitoring in the coastal monitoring wells completed in the Primary Production Aquifer. The Groundwater Supply Project proposes an increase in groundwater pumping from this aquifer, and this pumping could cause substantial changes in groundwater levels in the Primary Production Aquifer; therefore, quarterly groundwater monitoring might not be sufficient to rapidly identify changes in groundwater levels, which could affect the potential for seawater intrusion. To address this issue, **Mitigation Measure M-HY-8b, Continuous Groundwater Monitoring in the Primary Production Aquifer**, requires the SFPUC to install pressure transducers in the coastal monitoring wells for monitoring groundwater levels in the Primary Production Aquifer and to conduct continuous groundwater monitoring in these wells.

All six of the proposed well facilities are located from 950 to 7,500 feet inland, and the San Francisco Zoo irrigation well is approximately 1,500 feet inland. Based on this distance and the estimated rate of progression in the North Westside Groundwater Basin, it would take over 16 years for the freshwater/seawater interface, if unimpeded, to reach the South Windmill Replacement well facility (located 950 feet from the coastline) and over 120 years to reach the Central Pump Station well facility (located 7,500 feet inland) once the interface reaches the coastline (Kennedy/Jenks, 2012b). Therefore, by using information from the existing coastal monitoring wells and from wells to be incorporated into the coastal network under Mitigation Measure M-HY-8a, the SFPUC would have sufficient warning time to halt the progression of the freshwater/seawater interface near the coastline and prevent the interface from reaching irrigation or project wells. **Mitigation Measure M-HY-8c, Adaptive Management Program for Seawater Intrusion**, requires the SFPUC to implement the proposed project in a stepwise manner, conduct monitoring of the expanded coastal monitoring network, and alter pumping as needed to prevent chloride concentrations from reaching 250 mg/L at the coastal monitoring locations. Other third party wells, including the Stern Grove well and Edgewood Development Center (Edgewood School) well, are located farther inland than the proposed production wells; and therefore water quality at these wells would also be protected by implementation of this mitigation measure. Seawater intrusion is not expected to occur at the wells in the area of the Lake Merced - golf clubs because the wells are located landward of the Serra Fault, which acts as a barrier to seawater intrusion.

This mitigation measure incorporates an adaptive management approach to minimize the potential for seawater intrusion through ongoing monitoring and analysis of the monitoring data.

To ensure that chloride concentrations do not reach 250 mg/L at any location, this mitigation measure establishes an intermediate action level of 142 mg/L of chloride to trigger the need for additional monitoring. This action level is equal to the threshold for agricultural use specified in the Basin Plan as discussed above in Section 5.16.2, Regulatory Framework. If the increased monitoring indicates that the chloride concentration could reach 250 mg/L within three years at any location, this measure specifies that pumping patterns should be temporarily altered so that the 250 mg/L threshold is not reached, and maintained at a level that would avoid seawater intrusion. In the event that this threshold is reached at a coastal monitoring location, pumping would be stopped in the vicinity of the exceedance and then reduced in a stepwise manner at other locations. With implementation of these measures, potential adverse effects related to seawater intrusion would be reduced to a less-than-significant level.

As stated above, and specified in Mitigation Measure M-HY-8, the SFPUC would temporarily alter pumping patterns if monitoring indicates that the chloride concentration in a coastal monitoring well could reach 250 mg/L within three years from the date of the groundwater monitoring event in which the rising chloride trend was detected. This is achievable because the design capacity for each of the project wells ranges from 0.18 to 0.79 mgd over the planned pumping rate under the project (Kennedy/Jenks, 2012a) which provides the flexibility to shift some of the pumping from one well to another and still maintain the total desired production rate under the project, provided that other effects such as adverse effects on Lake Merced water levels do not occur as a result of redistributing the pumping. Mitigation Measure M-HY-9, Lake-Level Management for Lake Merced, which requires the SFPUC to implement monitoring and corrective actions as needed to avoid adverse effects on Lake Merced water levels, would ensure that the revised pumping rates implemented in accordance with this mitigation measure would not induce adverse effects on Lake Merced water levels.

Mitigation Measures – Seawater Intrusion

Mitigation Measure M-HY-8a: Expand Coastal Monitoring Network. A minimum of one year prior to operating the South Windmill Replacement well, North Lake well, and/or Central Pump Station well facilities in Golden Gate Park, the SFPUC shall rehabilitate existing groundwater wells in the western portion of the park or install new groundwater monitoring wells between the Pacific Coast and the South Windmill Replacement and North Lake well facilities. The SFPUC expects that existing wells NL-1 and SF-1, which are screened similarly to the North Lake irrigation well, can be rehabilitated, and wells SWM-3 and NWM-3 may also be able to be rehabilitated. If the wells cannot be rehabilitated, the SFPUC shall coordinate with the SFRPD and install new wells in the same approximate location in areas of Golden Gate Park that are not highly used by the public and are currently developed/disturbed or are substantially devoid of vegetation in order to minimize the effects of installation. These wells shall be incorporated into the coastal groundwater monitoring network and monitored as part of the SFPUC's ongoing monitoring program for the detection of seawater intrusion.

To establish a baseline of groundwater quality at the locations of these wells (which have not been previously monitored as part of the SFPUC's groundwater monitoring program), shall be monitored on a quarterly basis for a minimum of one year prior to operation of the South Windmill Replacement well, North Lake well, and/or Central Pump Station well facilities. For each monitoring event, a groundwater sample from each well shall be analyzed for the same parameters as are measured under the existing coastal groundwater monitoring program (chloride, TDS, and specific conductance).

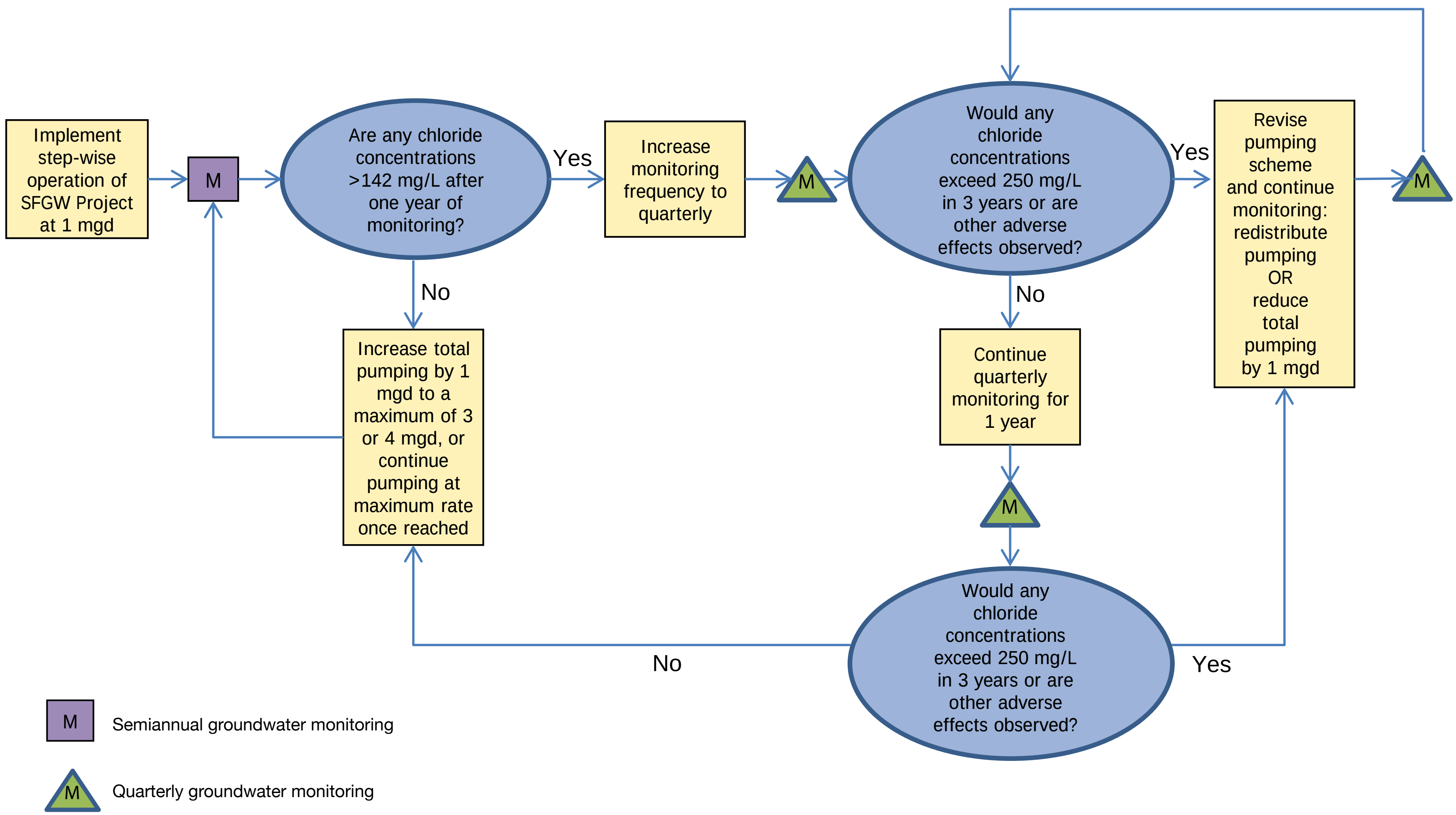
Mitigation Measure M-HY-8b: Continuous Groundwater Monitoring in the Primary Production Aquifer. The SFPUC shall install pressure transducers in coastal monitoring wells Kirkham MW-255, Kirkham MW-385, Ortega MW-265, Ortega MW-400, Taraval MW-240, Taraval MW-400, and San Francisco Zoo MW-450, which are completed in the Primary Production Aquifer, and shall conduct continuous groundwater-level monitoring in these monitoring wells. These groundwater levels shall be monitored as part of the ongoing monitoring program for the detection of seawater intrusion.

Mitigation Measure M-HY-8c: Adaptive Management Program for Seawater Intrusion. The SFPUC shall implement the Groundwater Supply Project in a stepwise manner, conduct monitoring to detect seawater intrusion, and alter pumping to prevent seawater intrusion from advancing to the coastal monitoring network in accordance with the process described below and shown in **Figure 5.16-8**.

Prior to beginning full operation of the proposed project, the SFPUC shall begin pumping at a reduced rate and continue monitoring the expanded coastal monitoring network (including the new wells added under Mitigation Measure M-HY-8a) for evidence of seawater intrusion according to the following procedure:

- At initial startup, the project wells shall be operated at a maximum combined capacity of 1 mgd.
- The SFPUC shall continue semiannual groundwater quality monitoring of the coastal network (including the new wells added under Mitigation Measure M-HY-8a) in accordance with the ongoing monitoring program as revised by Mitigation Measure M-HY-8b.
- After one year of monitoring, the SFPUC may increase annual pumping by 1 mgd each year, up to a total of 3 mgd during Phase 1 of the project and 4 mgd when Phase 2 is implemented, if none of the chloride concentrations detected in the coastal monitoring network equals or exceeds 142 mg/L. If this limit is not met, semiannual groundwater quality monitoring of the coastal network shall continue.
- In the event that the chloride concentration in any of the coastal monitoring wells equals or exceeds 142 mg/L, the SFPUC shall increase the coastal groundwater quality monitoring frequency in that well to quarterly.
- If there is an upward trend in chloride levels after three quarterly monitoring periods such that projected chloride levels could reach the secondary MCL of 250 mg/L within three years (based on a trend analysis using the most recent three quarters of groundwater sampling), the SFPUC shall either temporarily redistribute pumping to decrease pumping rates closest to the affected monitoring well, or decrease the overall pumping rate.

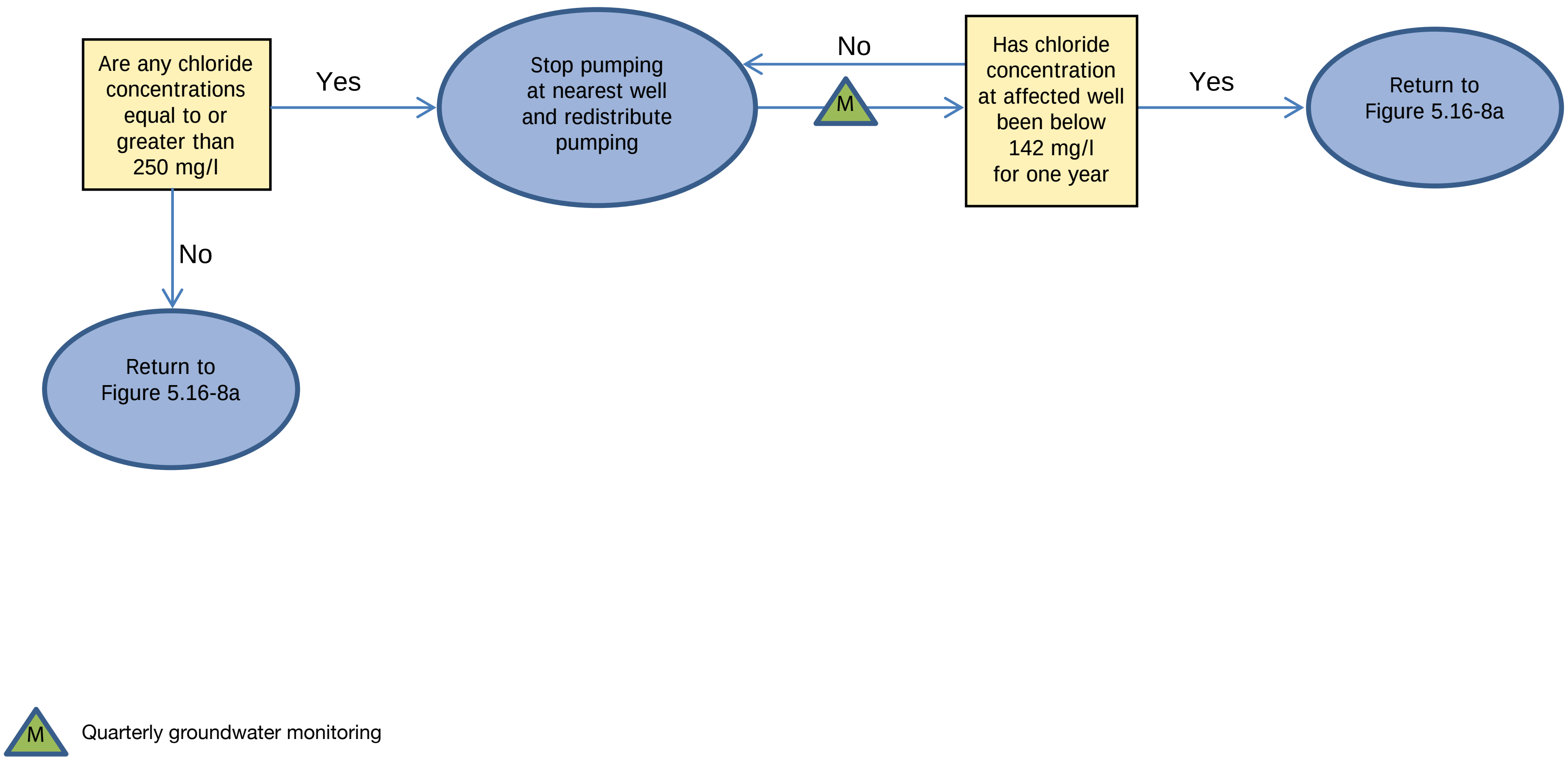
  However, if the SFPUC can demonstrate to the satisfaction of the San Francisco Planning Department Environmental Review Officer, with independent 3rd party concurrence, that the upward trend is not due to the project, the SFPUC may continue pumping subject to the requirements of this mitigation measure.



(see Figure 5.16-8b for actions should chloride concentrations reach 250 mg/l)

SOURCE: SFPUC

Figure 5.16-8a
Flow Chart for Seawater Intrusion Mitigation



SOURCE: SFPUC

Figure 5.16-8b
Flow Chart for Seawater Intrusion Mitigation

- Pumping may continue at the adjusted production rate and pattern as long as none of the coastal monitoring wells exhibit chloride concentrations that are projected to reach 250 mg/L within three years (based on a trend analysis using the most recent three quarters of groundwater sampling).
- The total annual pumping rate may be increased by 1 mgd (up to a maximum of 3 mgd during Phase 1 of the project and 4 mgd when Phase 2 is implemented) after 12 months of quarterly monitoring indicate that none of the chloride concentrations at the coastal monitoring locations are projected to reach 250 mg/L within the next three years.
- If the chloride concentration reaches 250 mg/L at any of the coastal monitoring points, the SFPUC shall stop pumping at the nearest project well, and reduce other groundwater pumping in a step-wise manner as necessary to prevent seawater intrusion from progressing further. Pumping shall not be resumed until chloride concentrations at the affected well have been below 142 mg/L for one year based on quarterly monitoring.
- The monitoring frequency may be reduced to semiannual once the chloride concentration in an affected well decreases to 142 mg/L or lower for one year based on quarterly monitoring.

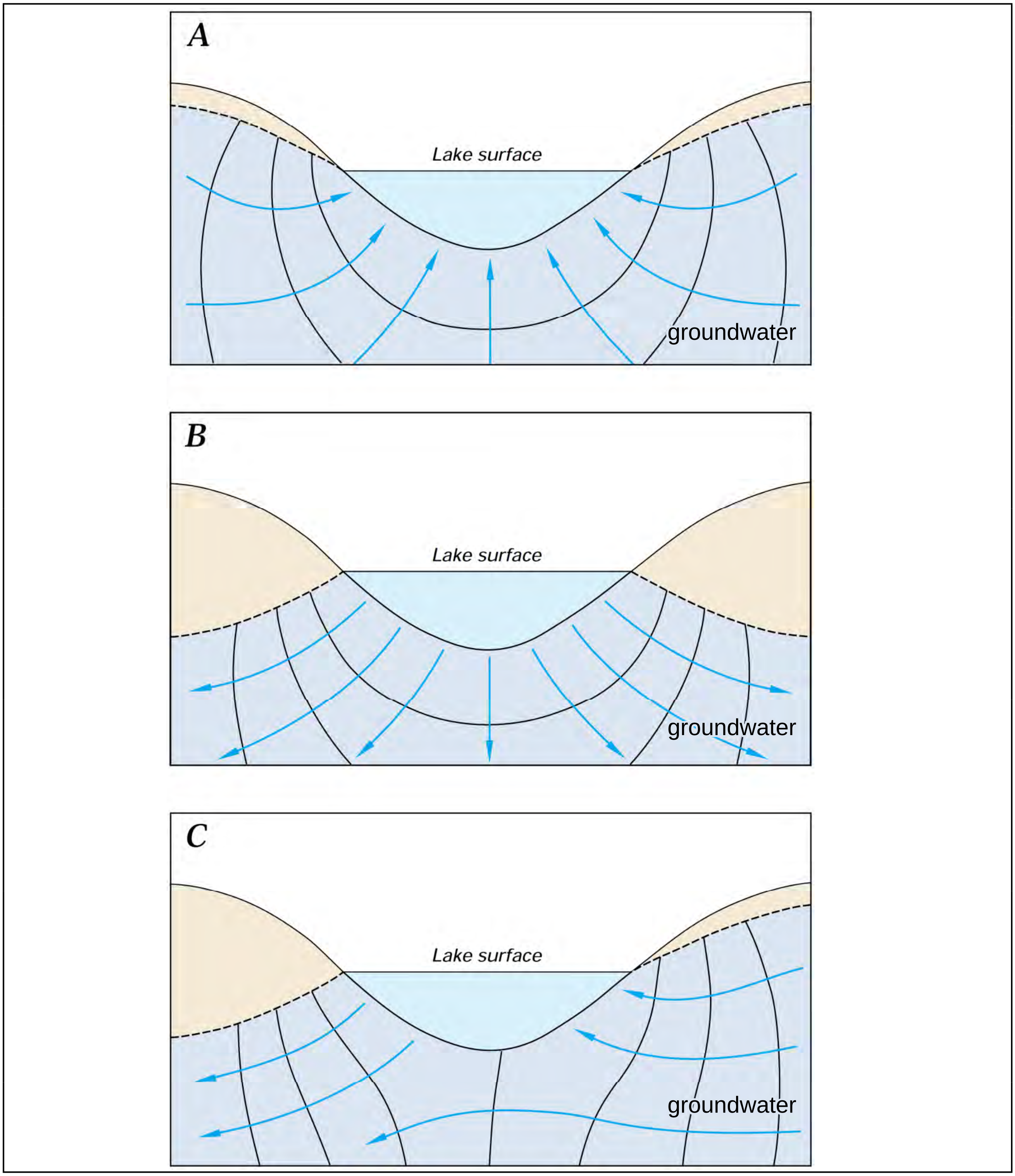
● Mitigation Measures M-HY-8a through M-HY-8c could be incorporated into the SFPUC's North Westside Basin Groundwater Management Plan. The Groundwater Management Plan would be submitted to the Planning Department prior to the operation of the San Francisco Groundwater Supply Project for review of consistency with the mitigation requirements for this project.

Impact HY-9: The proposed project would possibly have a substantial, adverse effect on water quality that could affect the beneficial uses of Lake Merced. (Less than Significant with Mitigation)

The project has the potential to affect Lake Merced due to groundwater/surface water interactions. The term "groundwater/surface water interactions" refers to the movement of water beneath the land surface (groundwater) to or from water bodies on the ground surface, such as streams, lakes, and wetlands (surface water). Several general conditions are required for groundwater/surface water interactions to occur. First, the depth to groundwater (the water table) has to be sufficiently shallow in relation to the bottom of the surface water body. While the water table does not have to connect with the surface water for interactions to occur, there cannot be a substantial distance between the two, and separations of tens or hundreds of feet would generally preclude groundwater/surface water interactions. There must also be a relatively permeable pathway (such as a sandy lakebed) between the groundwater and surface water.

The presence of a clay layer or other low-permeability layer could preclude groundwater/surface water interactions, even if the water table were sufficiently shallow to otherwise allow interactions. Even with a natural sand lakebed, the settling of silt and organic-rich sediments from the lake water could reduce the permeability of the lake bottom, often restricting groundwater/surface water interactions to the areas along the sides of the lake where fine sediments have not accumulated.

Surface water bodies such as lakes and streams can interact with groundwater in three basic ways (Kennedy/Jenks, 2012c). They can gain water from the inflow of groundwater through the lakebed or streambed when the groundwater level is higher than the water level in the surface water body; this is referred to as a gaining system (illustration "A" on **Figure 5.16-9**). Surface water bodies can



Lakes can receive groundwater inflow (A), lose water as seepage to groundwater (B), or both (C). From Winter et al. (1998).

SOURCE: Kennedy/Jenks, 2012c

San Francisco Groundwater Supply Project EIR

Figure 5.16-9
Interaction of Groundwater and Lakes

also lose water to the groundwater through the lakebed or streambed when the groundwater level is lower than the water level in the surface water body; this is referred to as a losing system (illustration "B" on Figure 5.16-9). In many cases, surface water bodies can both gain and lose water depending on the relative elevations of the groundwater table, the water level in the surface water body, as well as the groundwater flow direction in the aquifer (illustration "C" on Figure 5.16-9). The seepage rate between the lakebed or streambed and groundwater system is controlled by the permeability of the subsurface geology and the characteristics of the lakebed or streambed. In both gaining and losing systems, surface water levels can be affected by changes in groundwater elevations. Where the groundwater and surface water systems are disconnected, changes in groundwater elevations would not affect surface water levels.

To evaluate the potential for adverse effects on surface water bodies, this analysis considers changes in groundwater levels and associated changes in surface water levels as well as potential water quality effects related to such changes in surface water levels. In general, a decrease in surface water levels would not be substantial unless the beneficial uses of the surface water were adversely affected.

Approach to Analysis – Lake Merced

This impact analysis evaluates whether the proposed project would result in significant changes in water quality that could affect the beneficial uses of Lake Merced and is based on the relationship of lake levels to water quality. First, Lake Merced water levels under the modeled existing conditions are described and compared with the lake water levels modeled to occur with implementation of the project. Then, based on the magnitude, frequency, and duration of predicted changes in lake levels resulting from the project, the analysis identifies the potential for water quality impacts that could affect beneficial uses.

As discussed above in Section 5.16.1, Setting, under the heading "Lake Merced Water Quality," the relationship between water quality and lake levels varies, with no substantial correlations observed at lake levels between 0 and 7 feet City Datum, which is the range of lake levels observed between 1997 and 2009. Since 2003, Lake Merced has been at a water surface elevation of at least 3 feet City Datum, and this level has increased to at least 5 feet City Datum since early 2006. At 5 feet City Datum, all of the individual lakes are hydraulically connected, which is assumed to allow circulation between the four water bodies that comprise the lake, which in turn would be expected to enhance water quality in the lake. Therefore, if Lake Merced water levels remained above 0 feet City Datum under the project (consistent with the water levels observed since 1997), it could be expected that the current water quality conditions observed in the lake would continue.

Water quality monitoring between 1997 and 2009 indicates that water quality parameters in the lake have generally achieved the objectives specified in the Basin Plan, with the exception of some occurrences of dissolved oxygen levels that were less than the warmwater habitat criterion of 5 mg/L during the summer and late fall in the deeper portions of the lake (Kennedy/Jenks, 2010). Based on a review of available data, water quality conditions in Lake Merced remained relatively constant from 1997 to 2009, with a slight improvement in lake clarity (secchi depth) during this period.

Therefore, it is expected that if Lake Merced water levels remained at or above 0 feet City Datum (the lowest lake level for which there are water quality data), then potential impacts on water quality and associated beneficial uses due to project operation would be less than significant. If project-related groundwater pumping (rather than hydrologic or other factors) reduced lake levels to below 0 feet City Datum, then water quality impacts could occur, including changes in pH and dissolved oxygen levels—the parameters for which Lake Merced is listed as an impaired water body (see discussion in the Section 5.16.1, Setting under the heading "Lake Merced Water Quality"). For the purposes of this EIR, such a reduction in lake levels would be considered a potentially significant impact. To evaluate changes in Lake Merced water levels, the Westside Basin Groundwater Model (Kennedy/Jenks, 2012a) was used to estimate project-related groundwater-level changes in the vicinity of Lake Merced and to derive the magnitude and direction of the flux of the groundwater/surface water interactions at Lake Merced. Because this model does not take into account the site-specific geometry of the lakebed, the simulation of Lake Merced surface water levels is not always accurate. Therefore, the output from the groundwater flow model was used as input to the Lake-Level Model (a spreadsheet-based mass-balance model calibrated to 70 years of historical water levels in Lake Merced) to provide a more accurate estimate of Lake Merced water levels in response to changes in groundwater levels and groundwater flux. Use of the Lake-Level Model allows for changes in the surface area of Lake Merced as a function of lake level, a dynamic simulation of changes in lake volume, a more complete evaluation of stormwater runoff, and an evaluation of flooding events resulting from overflows of the Vista Grande Canal.

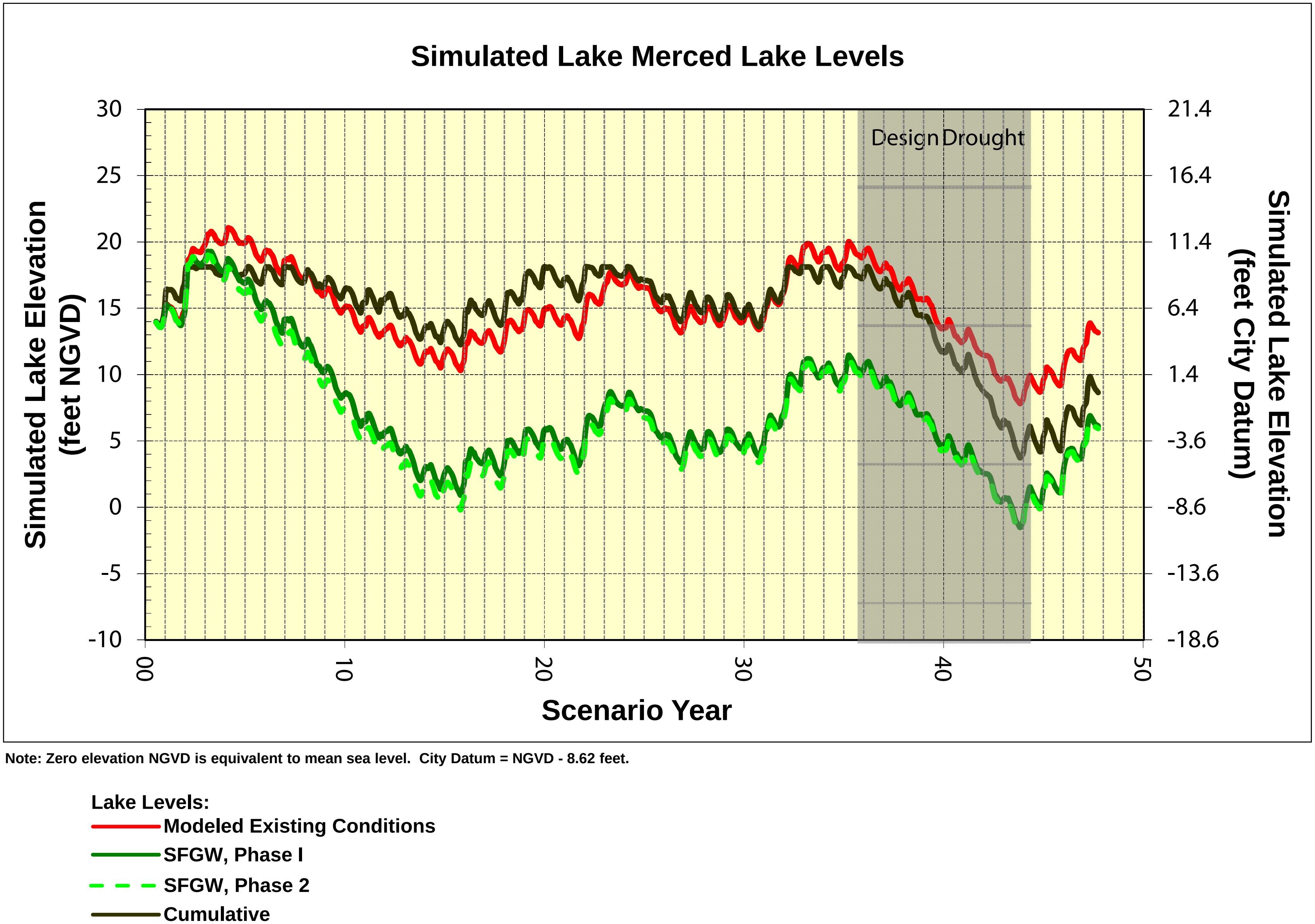
The modeled groundwater elevations from the following four monitoring well clusters in the vicinity of Lake Merced (see Figure 5.16-3) were used to analyze changes in groundwater levels:

- LMMW-1, located along the west shore of South Lake
- LMMW-2, located between North and South Lakes
- LMMW-3, located adjacent to the west shore of Impound Lake
- LMMW-4, located north of North Lake

Impact Analysis – Lake Merced

Lake Merced Water Levels under Modeled Existing Conditions

Figure 5.16-10 shows the estimated Lake Merced water levels over the 47-year simulation period under modeled existing conditions. The modeled existing conditions respond directly to the assumed hydrologic sequence and existing groundwater practices described in Section 5.1.5, Overview of Groundwater Modeling Approach. Lake levels are predicted to increase during years 1 to 4 (a period with above-average precipitation), followed by a predicted decline in lake levels in years 4 through 16 (a dry period), to a predicted low of 1.5 feet City Datum. From years 16 to 36, predicted lake levels fluctuate with simulated hydrologic conditions but show an overall increasing trend to over 11 feet City Datum. The model also depicts the hypothetical design drought in years 36 to 44, during which the estimated lake levels decline sharply to -0.8 feet City Datum, then are predicted to recover to about 5 feet City Datum. Over the simulation period, the estimated mean monthly lake level is 6.3 feet City Datum and the estimated mean annual range is



SOURCE: Kennedy/Jenks, 2012c

Figure 5.16-10
Simulated Lake Merced Lake Levels

1.6 feet. The mean monthly estimated lake levels are below an elevation of 1 foot City Datum for 4 percent of the simulation period.

Under modeled existing conditions, estimated Shallow Aquifer groundwater levels in the nearby monitoring wells (illustrated in **Appendix D-7**) also show a response to simulated hydrologic conditions, but predicted groundwater levels in the Primary Production Aquifer show less variability than in the Shallow Aquifer. Characteristic of the Westside Groundwater Basin, the estimated groundwater levels are generally higher for locations to the north of Lake Merced and lower for locations to the south. This pattern reflects the influence of existing groundwater pumping in the South Westside Groundwater Basin. For Lake Merced, this means that under modeled existing conditions, there could be a higher net outflow of lake water to the groundwater from South and Impound Lakes, and more inflow of groundwater to North and East Lakes. The overall pattern of estimated flux indicates that under the modeled existing conditions, there is a net inflow of groundwater to the lake during periods of higher precipitation and a net outflow of lake water to groundwater during dry periods when groundwater levels decline.

Effects of Project-Related Pumping on Lake Merced Water Levels

Figure 5.16-10 also shows the estimated Lake Merced water levels over the 47-year simulation period under modeled project conditions. During Phase 1, the Groundwater Supply Project would pump a total of 3 mgd (3,360 afy) from the North Westside Groundwater Basin. For Phase 2, the South Windmill and North Lake irrigation wells would be converted to use for domestic drinking water supply, and the total quantity of groundwater pumping under the project would be increased from 3 to 4 mgd (3,360 to 4,480 afy). The total groundwater pumping from the Lake Merced well facility, completed in the Primary Production Aquifer, would be 0.43 mgd (482 afy) during both phases. Basinwide, groundwater pumping would decrease by 0.142 mgd (159 afy) when Phase 2 is implemented (as compared to basinwide pumping during Phase 1) because the municipal pumping in Golden Gate Park under the proposed project would be less than the current irrigation pumping, as discussed in Section 5.1.5, Overview of Groundwater Modeling Approach. Because the changes in pumping would be minor, the response to groundwater levels during each phase of the project would be similar, and the phases are therefore discussed together in this impact analysis.

Project-related pumping would affect groundwater levels in both the Shallow and Primary Production Aquifers, as indicated in the hydrographs provided in Appendix D-7. In the Shallow Aquifer, groundwater elevations at the LMMW-3 location (in the southwestern part of Lake Merced) following the design drought are predicted to be about 15 feet lower than levels predicted under the modeled existing conditions and are predicted to remain at about that level for the last five years of the simulation; and at LMMW-4 to the north, groundwater elevations are predicted to be about 13 feet lower than predicted under the modeled existing conditions and are also predicted to remain at about that level for the last five years of the simulation. The Shallow Aquifer groundwater levels under the project are predicted to be about 10 feet lower in LMMW-3 to the south than they are predicted to be in LMMW-4 to the north.

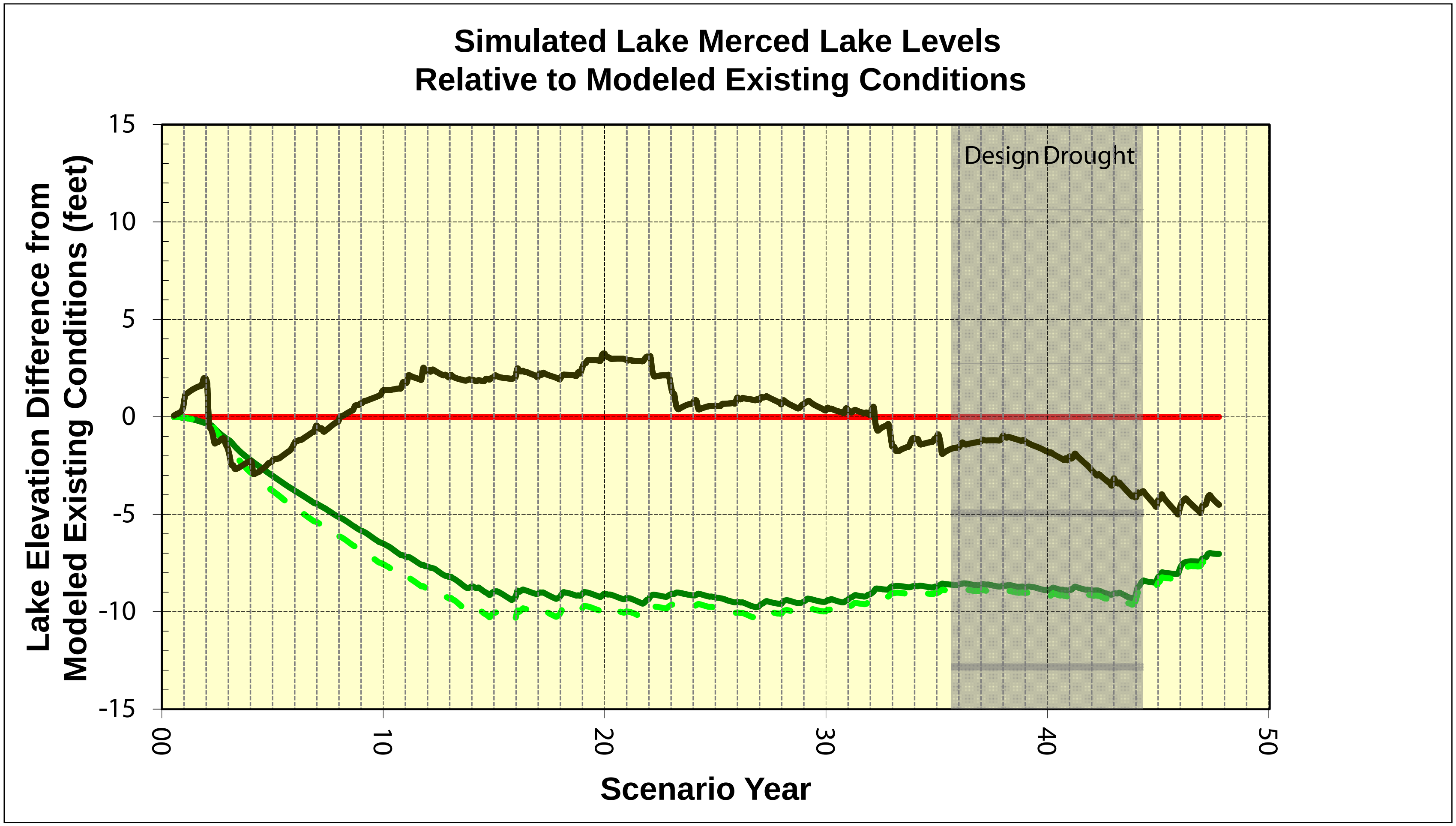
At the end of the design drought, the groundwater elevations in the Primary Production Aquifer at LMMW-3 are predicted to be about 26 feet lower than levels predicted under the modeled existing conditions and are predicted to remain at about that level for the last five years of the simulation period. At LMMW-4 to the north, the Primary Production Aquifer groundwater elevations are predicted to be about 22 feet lower than predicted under the modeled existing conditions and are also predicted to remain at about that level for the last five years of the simulation period. The groundwater elevations at LMMW-3 under the project are predicted to be about 14 feet lower than those predicted at LMMW-4. The greater groundwater elevation declines predicted at LMMW-3 are probably due to the proximity of the LMMW-3 well to the proposed Lake Merced well facility.

As shown in Figure 5.16-10, for the first two years of the simulation, the Lake Merced water levels are predicted to be similar to those predicted for the modeled existing conditions, but are then predicted to decline rapidly to approximately -8.6 feet City Datum by year 16 as a result of lowered groundwater levels in the Shallow Aquifer. While the lake levels are predicted to respond to changes in hydrologic conditions for the remainder of the simulation period (similar to the modeled existing conditions), the modeled lake levels are predicted to be approximately 10 feet lower than those predicted under the modeled existing conditions, as shown on **Figure 5.16-11**. During year 44 to the end of the simulation, the project-related lake levels after the design drought are expected to recover slightly faster than they would under the modeled existing conditions, but could still be about 7 feet below the level predicted under the modeled existing conditions at the end of the simulation period. This faster recovery is likely because at lower lake elevations—such as those that would occur under the proposed project—the lake has a smaller surface area (i.e., recharge of the same amount of water from precipitation would result in greater increases in lake elevations with a smaller surface area than would occur when the same amount of water is added to the lake when water levels are higher and the lake has a greater surface area).

The lowest modeled lake level, predicted to occur after the end of the design drought, is approximately -10 feet City Datum, which would be below the bottom of Impound Lake at -6 feet City Datum and near the bottom of East Lake at -11 feet City Datum. Similarly, during the dry years 4 through 16, the modeled lake level would approach -8 to -9 feet City Datum (see Figure 5.16-10).

During Phase 1, the estimated mean monthly lake level is -1.3 feet City Datum and the estimated mean annual range is 1.8 feet. The lake levels during this phase are predicted to be below 1 foot City Datum for 73 percent of the simulation period. During Phase 2, the estimated mean monthly lake level is -1.9 feet City Datum, and the estimated mean annual range is 1.8 feet. The lake levels during this phase are predicted to be below 1 foot City Datum for 76 percent of the simulation period compared to 4 percent predicted under the modeled existing conditions.

Relative to the modeled existing conditions, the net outflow from Lake Merced to groundwater under the proposed project is predicted to be higher due to the lower groundwater levels. The relative difference is predicted to be greatest during the beginning of the simulation sequence. However, in the later portions of the simulation the differences are predicted to diminish. During



Lake Levels:

- Modeled Existing Conditions
- SFGW, Phase I
- SFGW, Phase 2
- Cumulative

SOURCE: Kennedy/Jenks, 2012c

San Francisco Groundwater Supply Project EIR

Figure 5.16-11

Simulated Lake Merced Lake Levels Relative to Modeled Existing Conditions the design drought, the estimated groundwater flux under the proposed project is predicted to be similar to the estimated flux under the modeled existing conditions.

Under the proposed project, the South Sunset and West Sunset wells would be the project wells with the greatest effect on Lake Merced water levels because they draw groundwater from above the "X" clay layer of the Primary Production Aquifer. Also, in the vicinity of these wells, the "-100-foot" clay layer separating the Shallow and Primary Production Aquifers is absent. Therefore, groundwater pumping from these wells would have a direct effect on groundwater levels in the Shallow Aquifer and lowered groundwater levels in response to pumping could reduce groundwater inflows to Lake Merced, which is in direct communication with the Shallow Aquifer. While the Lake Merced well is closer to Lake Merced, pumping from this well is expected to have similar or less direct effects on Lake Merced water levels because the well is screened from 380 to 450 feet below ground surface, which is below the "X" clay layer of the Primary Production aquifer, and thus pumping would have minimal direct effects on groundwater levels in the Shallow Aquifer. Lake Merced water levels would also decrease more due to pumping at the Sunset wells because the proposed production rate for the West Sunset well is 37 percent greater than the Lake Merced well under Phase 2, and the proposed pumping rate at the South Sunset well is 7 percent greater than that of the Lake Merced well.

Impact Discussion and Significance Determination

As discussed above, Lake Merced water levels are predicted to be lowered to below 1 foot City Datum for 73 to 76 percent of the simulation period due to project-related pumping, compared to 4 percent predicted under the modeled existing conditions. If water levels were reduced to this extent, more of the lake bed would be exposed, making it susceptible to erosion and associated sedimentation of the lake, and the four individual lakes would separate hydraulically. Further, Impound Lake could be entirely dewatered if lake levels were to drop below -6 feet City Datum. This scenario could occur briefly at the end of the hypothetical design drought, and lake levels are also predicted to approach or exceed this level during the dry years 4 through 16. Groundwater inflows to the lake are also predicted to be reduced relative to the modeled existing conditions.

As described in Section 5.16.1, Setting, Lake Merced is currently affected by periods of weak stratification, and episodes of low dissolved oxygen were noted between 1997 and 2009. When the lake stratifies during the summer, dissolved oxygen levels are typically near saturation (approximately 10 mg/L) at the surface, or" epilimnion", with hypoxic[27] (or anoxic[28] conditions in the bottom, or "hypolimnion". The lake usually "turns over," or mixes, in the fall and stays well mixed throughout the winter. When the lake is mixed, dissolved oxygen levels are typically consistent throughout the entire water column, but these levels tend to be below saturation (approximately 8 mg/L, with a range of 6 to 10 mg/L). The lake is listed by the RWQCB as impaired for pH and dissolved oxygen.

27 Hypoxic conditions indicate dissolved oxygen levels of less than 5 mg/L.
28 Anoxic conditions indicate dissolved oxygen levels of less than 2 mg/L.

Reduced water levels and groundwater flows into the lake could increase eutrophication because nutrients discharged to the lake would be concentrated in a smaller lake volume. Also, with a smaller volume, the lake would likely mix more frequently, and, as a result (based on the patterns described above), would likely experience an increase in time-averaged dissolved oxygen levels in the hypolimnion. Therefore, depending on conditions, increased pumping under the proposed project could increase the episodic occurrences of low dissolved oxygen and could also affect the pH of the lake water, potentially exacerbating the conditions responsible for Lake Merced's listing as an impaired water body. Reduced groundwater inflows could decrease nitrogen inflow to the lake from groundwater and also result in the increased concentration of suspended solids, metals, hydrogen sulfide, and bacteria already present in the lake, and less dilution of these constituents if they were discharged to the lake from stormwater flows.

As discussed in Section 5.16.2, Regulatory Framework, under the heading "Water Quality Control Plans and Beneficial Uses," the Basin Plan identifies existing beneficial uses of Lake Merced as body-contact recreation (i.e., swimming, wading), noncontact recreation (e.g., fishing, rowing), warm freshwater habitat, cold freshwater habitat, fish spawning, and wildlife habitat. Municipal and domestic supplies are also potential beneficial uses of Lake Merced. Changes in water quality parameters such as dissolved oxygen and pH as well as increased algal levels could adversely affect the identified beneficial uses of Lake Merced that are related to warm freshwater habitat, cold freshwater habitat, and fish spawning, which, depending on the magnitude, duration, and frequency of the changes, could be considered a significant impact.

Because the project is predicted to cause Lake Merced water levels to fall below 0 feet City Datum substantially more frequently than is predicted to occur under modeled existing conditions, the resulting water quality changes under the project could cause exceedeences of water quality objectives related to warm and cold freshwater habitat (e.g., dissolved oxygen), which in turn could affect associated beneficial uses. Changes in dissolved oxygen levels and pH could also exacerbate the conditions responsible for Lake Merced's listing as an impaired water body. This would be a potentially significant impact.

Municipal and domestic supplies are listed as potential beneficial uses of Lake Merced. However, the CCSF has not used the lake as a municipal supply since the 1930s, as discussed in Section 5.16.1, Setting, under the heading "Existing Uses of Lake Merced." Further, as discussed below, the SFPUC would implement corrective action to ensure that long-term changes in water quality do not occur. Short-term changes in water quality associated with lowered lake levels are not expected to affect the potential beneficial use of Lake Merced as a municipal supply because the need to rely on Lake Merced for CCSF's water supply would occur only during a catastrophic emergency, in which case the City would direct residents to boil tap water.

Impacts related to water quality and associated beneficial uses of Lake Merced would be reduced to a less-than-significant level with implementation of **Mitigation Measure M-HY-9, Lake-Level Management for Lake Merced.** This measure requires the SFPUC to implement the proposed project in a stepwise manner, starting at 1 mgd, to monitor for adverse effects before pumping at the full operational rate and to use lake-level management procedures to maintain Lake Merced at a specified water level. By starting groundwater production at the reduced rate, any adverse effects on Lake Merced water levels would be minimized while sufficient monitoring data are collected to assess the potential effects of project-related pumping on lake levels.

To avoid potentially adverse water quality effects, the lake level needs to be maintained above 0 feet City Datum. However, as discussed in Section 5.14, Biological Resources (Impact BI-7), impacts on wetlands would occur at varying elevations, depending on what lake levels would otherwise be without implementation of the project. Therefore, Mitigation Measure M-HY-9 also incorporates trigger levels to avoid impacts on wetlands as a result of a project-related decline in lake levels. The trigger levels specified in the mitigation measure depend on what the naturally occurring lake level would be without the effects from project-related pumping and the corresponding allowable range in lake levels necessary to avoid impacts on both water quality and wetlands. At most naturally occurring lake levels above 0 feet City Datum, there would be some allowable decline in lake levels as a result of project-related pumping, but no allowable decline at a naturally occurring lake level of 0 feet City Datum or less.

In accordance with Mitigation Measure M-HY-9, corrective action is required if project-related lake levels decline below trigger levels. The corrective actions to be implemented in accordance with the mitigation measure would include adding supplemental water (either SFPUC system water, treated stormwater, or recycled water), if available, and/or altering or redistributing pumping patterns. Implementation of this measure would ensure that any lake-level decline resulting from the project would be temporary, lasting only until corrective actions could be implemented. With the addition of supplemental water and/or the alteration or redistribution of pumping patterns as needed, the project would not result in long-term changes in water quality that would affect the potential beneficial uses of Lake Merced.

The SFPUC has estimated that it could require up to approximately 190 afy of water to maintain Lake Merced water levels under the project in accordance with Mitigation Measure M-HY-9 and evaluated the feasibility of providing potential supplemental water sources to supplement lake levels (SFPUC, 2012e; Gilman, 2013b). The SFPUC could proceed with lake augmentation and management with stormwater diversions or could provide up to 1,000 afy of recycled water during the low-irrigation season (roughly November to April).[29] Surface water from SFPUC's regional water system may also be available when the demand on the system is less than 265 mgd, although the amount of water available would depend on the demand by wholesale and retail customers, and the total deliveries by the SFPUC would not exceed an annual average of 265 mgd. As stated above, and specified in Mitigation Measure M-HY-9, if these supplemental water sources were not available or sufficient to maintain Lake Merced water levels, the SFPUC would alter pumping patterns in place of providing a supplemental water source to maintain lake levels. This is achievable because the design capacity for each of the project wells ranges from 0.18 to 0.79 mgd over the planned pumping rate under the project (Kennedy/Jenks, 2012a) which provides the flexibility to shift some of the pumping from one well to another and still maintain the total desired production rate under the project, provided that other adverse effects

[29] Stormwater and recycled water projects that may make supplemental water supplies available in the future are undergoing environmental review (see Section 2.2.3, Other Related Projects).

such as sea water intrusion do not occur as a result of redistributing the pumping. Implementation of Mitigation Measure M-HY-8c, Adaptive Management Program for Seawater Intrusion, which requires the SFPUC to implement monitoring and corrective actions to avoid seawater intrusion, would ensure that the revised pumping rates implemented in accordance with this mitigation measure would not induce seawater intrusion.

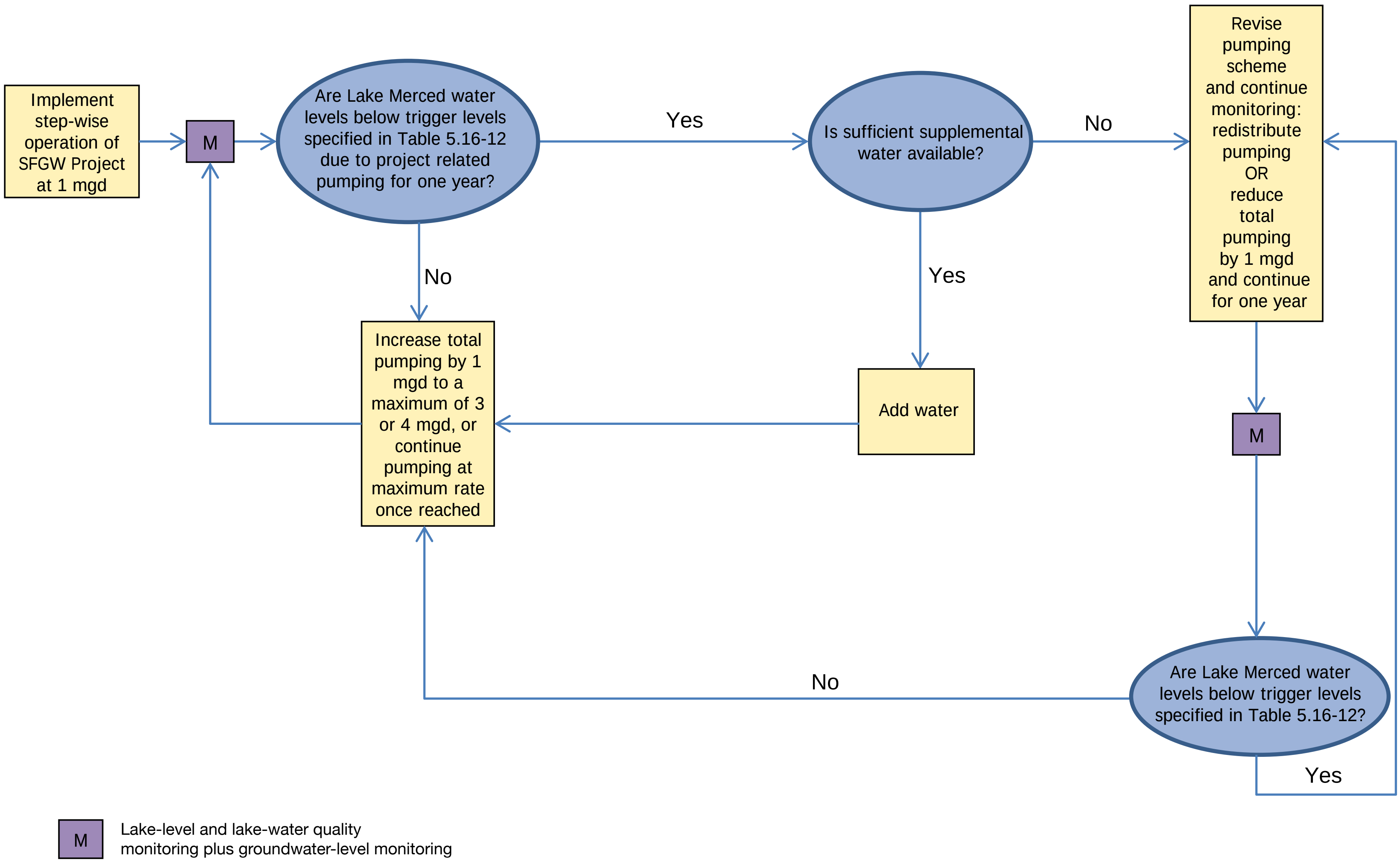
In the event that surface water supplies were not available, due to a declared emergency resulting from an earthquake or other disaster, the SFPUC may have to rely more heavily on groundwater to serve its customers and total groundwater production could temporarily be greater than 3.0 mgd during Phase 1 or greater than 4.0 mgd during Phase 2. However, in accordance with WSIP seismic reliability goals the water system should be restored to normal operation within 30 days, and therefore, any outages would not be expected to last longer than 30 days. Once the water system is restored following an emergency, groundwater pumping would return to the levels as proposed under the project, and any effect on groundwater levels and associated Lake Merced water levels due to an increased reliance on groundwater during an emergency would be temporary.

The project's effect on Lake Merced water levels could also affect the soil and sediments of Lake Merced near the former Pacific Rod and Gun Club on the western shore of South Lake. Lead and other metals as well as clay target fragments (including associated organic chemicals) have been identified in the soil and sediments in this area. However, the Groundwater Supply Project would not result in adverse water quality effects related to this site because Lake Merced water levels would decrease, as discussed above, and the project would not result in inundation of additional areas containing lead or clay target fragments. Thus, water quality would not be affected by contact with lead, other metals, and other identified chemicals, and there would be no impact.

Mitigation Measure – Lake Merced

Mitigation Measure M-HY-9: Lake-Level Management for Lake Merced. The SFPUC shall implement a lake-level management program in accordance with the process described below and shown in **Figure 5.16-12**. The program requires the SFPUC to implement the Groundwater Supply Project in a stepwise manner and to conduct monitoring to detect changes in lake level and water quality as well as groundwater-level elevations, and shall respond to project-related changes. Lake levels may be augmented by adding supplemental water (SFPUC system water, treated stormwater, or recycled water), if available. The SFPUC may also alter or redistribute pumping as necessary to avoid adverse effects on Lake Merced in the event a supplemental water source is not available or is insufficient to restore lake levels. Implementation of this measure shall be coordinated with the SFPUC's ongoing Lake Merced lake-level, lake water quality, and groundwater monitoring programs to document and maintain the database of these parameters throughout project operations.

Prior to beginning full operation of the Groundwater Supply Project, the SFPUC shall begin pumping at a reduced rate and continue lake-level, lake water-quality, and groundwater-level monitoring for the purpose of detecting potential adverse effects on the water quality of Lake Merced according to the following procedures:



SOURCE: SFPUC

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Figure 5.16-12

Flow Chart for Lake Merced Mitigation

- At initial startup, the wells shall be operated at a maximum combined capacity of 1 mgd.

- The SFPUC shall continue to maintain the Lake-Level Model so as to be able to evaluate what lake levels would be without implementation of the project based on the actual hydrologic conditions that occur during project implementation. The SFPUC shall use the model to determine the amount of lake-level decreases that are attributable to the project rather than to hydrologic or other factors.

- If lake levels are projected to be within the range that would occur without the project, based on maintenance of the Lake-Level Model, then no project impact is indicated and no corrective action shall be required.

- If after one year of monitoring, lake levels are above the trigger levels specified in Table 5.16-12, the SFPUC may increase pumping by 1 mgd per year, up to a total of 3 mgd during Phase 1, and up to a total of 4 mgd after Phase 2 is implemented.

- If project-related lake levels are projected to be below the range that would occur without the project, the allowable deviation from naturally occurring lake levels that would prevent significant wetlands and water quality impacts from occurring is dependent on what the naturally occurring lake levels would be without the project. Corrective action shall be implemented if the trigger levels identified in the final column of **Table 5.16-12** and shown on **Figure 5.16-13** are projected to be exceeded, compared to water levels that would occur without the project.

- If, after one year of monitoring, lake levels drop below the trigger levels specified in Table 5.16-12 and groundwater-level monitoring, in combination with the Lake-Level Model results, indicate that the decline is due to project-related pumping, the SFPUC shall augment lake levels by adding supplemental water of suitable quality (such as surplus potable water that is dechloraminated at the Lake Merced Pump Station, stormwater from the Vista Grande Canal, recycled water, or stormwater diverted from other development in the Lake Merced watershed), if available, to maintain lake levels at the specified trigger level based on Lake-Level modeling. At the end of the subsequent year of monitoring, the SFPUC may increase pumping by 1 mgd (up to a total of 3 mgd during Phase 1 and up to 4 mgd after Phase 2 is implemented) if water levels can be maintained at the above-specified trigger levels. The SFPUC shall continue lake-level and groundwater monitoring, lake water-quality monitoring, and maintenance of the Lake-Level Model, and if warranted based on monitoring data and model results, continue supplemental water additions.

  The rate of supplemental water additions shall be controlled such that water surface elevation increases are no greater than 0.5 feet over a 2.5-week period in any single nesting season (conservatively March 1 through August 15) and no greater than 3 feet in any given year to avoid impacts to nesting birds and western pond turtle.[30]

- If a supplemental water source is not available or is insufficient to maintain lake levels above the trigger levels specified in Table 5.16-12, the SFPUC shall implement other corrective actions to maintain lake levels at or above the specified trigger

[30] Water rate limitations taken from Section 5.14, Biological Resources, under the heading "Approach to Analysis: Operational Impacts Associated with Groundwater Pumping."

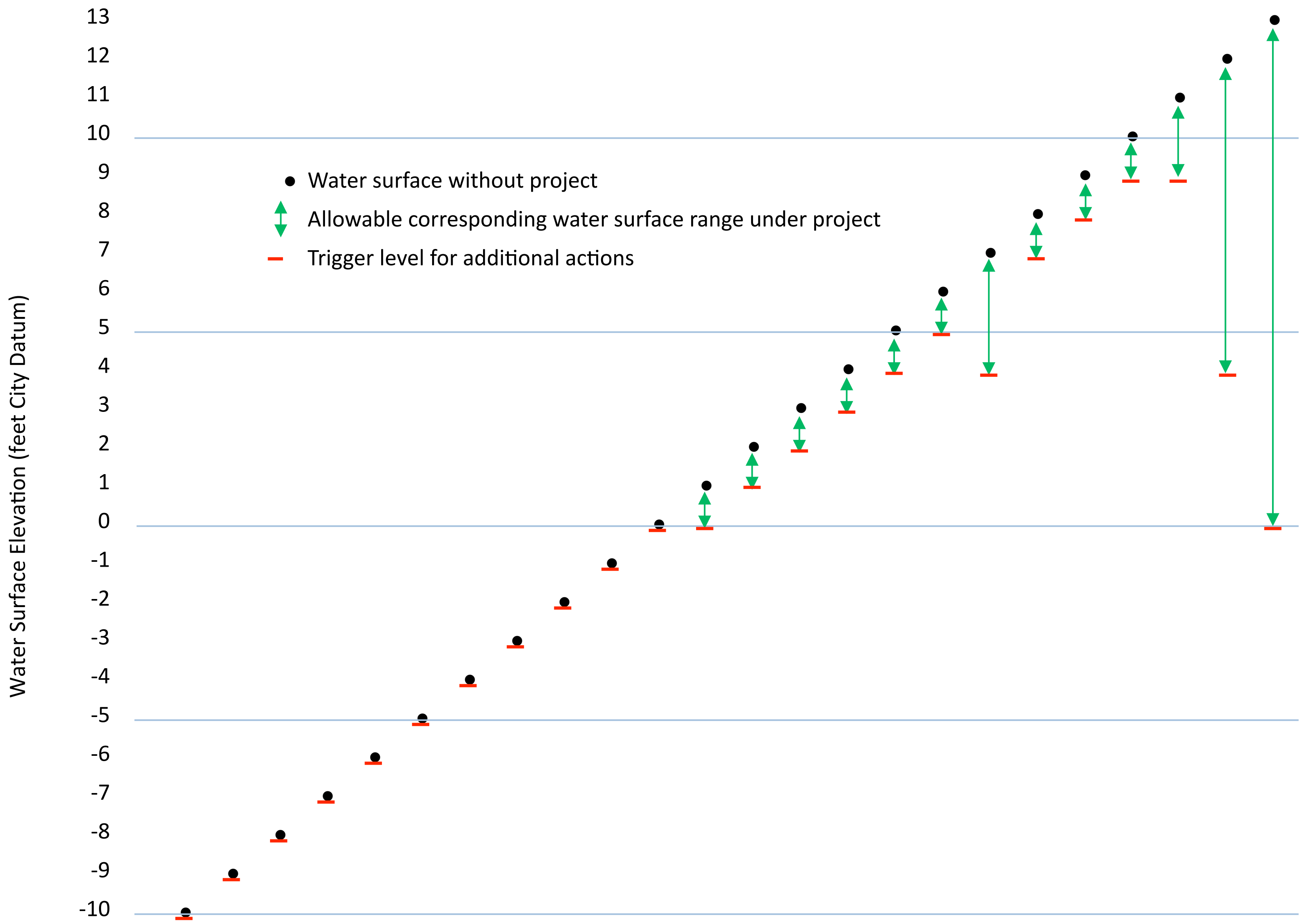
TABLE 5.16-12
LAKE MERCED WATER SURFACE ELEVATION RANGE FOR AVOIDANCE OF SIGNIFICANT SURFACE WATER INTERACTION EFFECTS[a]

Water Surface Elevation Without the Project (feet City Datum)	Corresponding Allowable Project-Related Water Surface Elevation Range (feet City Datum)			Allowable Increment of Change as a Result of Project	Trigger Level for Additional Actions (feet City Datum)
	Wetlands	Water Quality	Combined Range[b]		
13	13 to -10	0 to 13	0 to 13	Up to 13 feet of decline	0
12	4 to 12	0 to 12	4 to 12	Up to 8 feet of decline	4
11	9 to 11	0 to 11	9 to 11	Up to 2 feet of decline	9
10	9 to 10	0 to 10	9 to 10	Up to 1 foot of decline	9
9	8 to 9	0 to 9	8 to 9	Up to 1 foot of decline	8
8	7 to 8	0 to 8	7 to 8	Up to 1 foot of decline	7
7	4 to 7	0 to 7	4 to 7	Up to 3 feet of decline	4
6	5 to 6	0 to 6	5 to 6	Up to 1 foot of decline	5
5	4 to 5; -6 to -10	0 to 5	4 to 5	Up to 1 foot of decline	4
4	3 to 4; -5 to -10	0 to 4	3 to 4	Up to 1 foot of decline	3
3	2 to 3; -5 to -10	0 to 3	2 to 3	Up to 1 foot of decline	2
2	1 to 2; -4 to -10	0 to 2	1 to 2	Up to 1 foot of decline	1
1	0 to 1; -3 to -10	0 to 1	1	Up to 1 foot of decline	0
0	0 to -10	0	0	No decline permitted	0
-1	-1 to -10	-1	-1	No decline permitted	-1
-2	-2 to -10	-2	-2	No decline permitted	-2
-3	-3 to -10	-3	-3	No decline permitted	-3
-4	-4 to -10	-4	-4	No decline permitted	-4
-5	-5 to -10	-5	-5	No decline permitted	-5
-6	-6 to -10	-6	-6	No decline permitted	-6
-7	-7 to -10	-7	-7	No decline permitted	-7
-8	-8 to -10	-8	-8	No decline permitted	-8
-9	-9 to -10	-9	-9	No decline permitted	-9
-10	-10	-10	-10	No change; lake would be dewatered as a result of climatic conditions	-10

[a] The water surface elevation values represent the mean annual water surface elevation. Lake Merced water levels vary seasonally due to hydrologic and climatic conditions; therefore, an annual range in water surface elevation from about 1 foot above and below the mean is assumed; for example, an elevation of 6 feet City Datum, as seen in the table, actually represents a range in water surface elevation between of 5 and 7 feet City Datum.

[b] The combined range is the maximum and minimum mean annual water surface elevation that would avoid net loss of wetlands and substantial adverse effects on water quality.

SOURCE: ESA (wetlands information derived from Appendix C tables)



SOURCE: ESA, 2013

San Francisco Groundwater Supply Project EIR

Figure 5.16-13
Lake Merced Water Surface Elevation Range for Avoidance of Significant Surface Water Interaction Effects

levels, such as redistributing pumping to reduce or eliminate groundwater withdrawals or decreasing the overall pumping rate. The SFPUC shall continue lake-level and groundwater-level monitoring, Lake Merced water quality monitoring, and maintenance of the Lake-Level Model to determine the effectiveness of the corrective measures such that lake levels shall be maintained at the above-specified trigger levels.

As shown in Figure 5.16-12, the SFPUC shall continue to monitor lake levels and shall continue supplemental water additions or redistribution / reduction of groundwater pumping to maintain Lake Merced water levels at the above-specified trigger levels.

- Mitigation Measure M-HY-9 could be incorporated into the SFPUC's North Westside Basin Groundwater Management Plan. The Groundwater Management Plan would be submitted to the Planning Department prior to the operation of the San Francisco Groundwater Supply Project for review of consistency with the mitigation requirements for this project.

Impact HY-10: The proposed project would not have a substantial adverse effect on water quality in Pine Lake. (Less than Significant)

Approach to Analysis – Pine Lake

As discussed in Section 5.16.1, Setting, Pine Lake is incised in the Shallow Aquifer and, therefore, lake levels are directly affected by changes in groundwater elevations in the Shallow Aquifer. While there are no formally designated beneficial uses for Pine Lake, the water quality of the lake could be affected by lake-level decreases, similar to effects at Lake Merced. The SFRPD maintains Pine Lake water levels at an elevation of 40.1 feet NGVD 29 (31.5 feet City Datum), which is the SFRPD's water elevation goal, with additions of groundwater from the Stern Grove well. If water levels remain at this elevation, consistent with recent years, it is expected that lake water quality would not occur as a result of increased groundwater pumping from the North Westside Groundwater Basin. Therefore, this impact analysis evaluates whether Pine Lake levels can be maintained at or above 40.1 feet NGVD 29 through water additions from the Stern Grove well without causing adverse effects, in which case potential water quality impacts would be less than significant.

The Westside Basin Groundwater-Flow Model does not include Pine Lake as a discrete feature and does not simulate groundwater levels in the shallowest part of the Shallow Aquifer monitored by LMMW-5SS, which is in direct communication with Pine Lake. However, simulated groundwater levels for LMMW-5S located near Pine Lake (Figure 5.16-3) can be used to evaluate general changes in groundwater conditions in the Shallow Aquifer during the simulation period, and these changes would be proportional to losses from Pine Lake to the Shallow Aquifer (Kennedy/Jenks, 2012c). Therefore, a mass-balance approach was employed using groundwater-level changes in LMMW-5S to estimate the increased outflows from Pine Lake as a result of project-related pumping.[31]

Because of the sparse historical data, the mass balance incorporated the results of the test filling conducted in November 2004 and described in Section 5.16.1, Setting, under the heading

[31] For Pine Lake, the mass balance is an accounting of the inflows to and outflows from the lake. An increase in lake levels indicates greater inflows than outflows and a decrease in lake levels indicates greater outflows than inflows.

"Groundwater Interactions and Lake Levels." Inflows to Pine Lake derive primarily from precipitation, stormwater runoff, and lake additions from the Stern Grove well. Outflows from the lake primarily involve evapotranspiration and groundwater outflow. Because modeling for the modeled existing conditions and both phases of the proposed project relied on the same background hydrology, the values for precipitation, stormwater runoff, and evapotranspiration are the same for the modeled existing conditions and both phases of the project. Therefore, the only differences are related to lake additions and groundwater outflows, which must be equal to maintain consistent lake levels.

The mass-balance analysis for Pine Lake estimated the amount of groundwater pumping needed from the Stern Grove well to maintain water levels in Pine Lake at the SFRPD's elevation goal of 40.1 feet NGVD 29 under existing conditions. This mass balance was used in conjunction with modeled changes in Shallow Aquifer groundwater elevations at LMMW-5S to estimate the amount of groundwater pumping needed from the Stern Grove well to maintain Pine Lake at the elevation goal under both Phases 1 and 2 of the project and cumulative conditions. As discussed in Section 5.1.5, Overview of Groundwater Modeling Approach, this increased pumping is included in the model for both phases of the project.

Impact Analysis – Pine Lake

If Pine Lake levels could not be maintained at 40.1 feet NGVD 29 without adverse effects related to increased pumping from the Stern Grove well under the project, then water levels in Pine Lake could decline and water quality in Pine Lake could decrease, which could result in a significant impact.

Effects on Pine Lake under the Modeled Existing Conditions

Under the modeled existing conditions, inflows to the lake include an annual average of 14.3 afy of stormwater runoff and 5.8 afy of precipitation. Outflows include an annual average of 15.3 afy of evapotranspiration and 9.6 afy of outflows to the Shallow Aquifer. Therefore, approximately 4.8 afy (0.0043 mgd) of groundwater from the Stern Grove well would be required as inflow to the lake in order to maintain Pine Lake levels at the SFRPD's elevation goal of 40.1 feet NGVD 29.

Under the modeled existing conditions, the average modeled groundwater level in well LMMW-5S, completed in the deeper portion of the Shallow Aquifer, is 33.2 feet NGVD 29, or 7 feet below the elevation goal.

Effects on Pine Lake during Project Operations

Under Phase 1 of the project, the estimated average modeled groundwater level in well LMMW-5S, completed in the deeper portion of the Shallow Aquifer, is 20.7 feet NGVD 29, or 19.5 feet lower than the SFRPD's elevation goal of 40.1 feet NGVD 29 and 12.5 feet lower than the average level predicted under the modeled existing conditions. Based on this groundwater-level decline, groundwater outflows from the lake would increase, and relative to the modeled existing conditions, 0.008 mgd (8.8 afy) more pumping from the Stern Grove well would be required to maintain Pine Lake at an elevation of 40.1 feet NGVD 29.

Under Phase 2 of the project, the estimated average modeled groundwater level in well LMMW-5S, completed in the deeper portion of the Shallow Aquifer, is 21.2 feet NGVD 29, or 19 feet lower than the SFRPD's elevation goal of 40.1 feet NGVD 29and 12 feet lower than the average level predicted under the modeled existing conditions. Relative to the modeled existing conditions, groundwater outflows from the lake would increase, and 0.009 mgd (10 afy) more pumping from the Stern Grove well would be required to maintain Pine Lake at an elevation of 40.1 feet NGVD 29 relative to the modeled existing conditions.

Impact Discussion and Significance Determination

As discussed above, the Groundwater Supply Project would require an increase in Stern Grove well pumping to maintain Pine Lake levels during project operations. Under both phases of the project, the estimated increase in the amount of water needed to maintain lake levels at 40.1 feet NGVD 29 would be 0.008 to 0.009 mgd (8.8 to 10 afy). However, the Stern Grove well draws groundwater from the Primary Production Aquifer, which is separated from the Shallow Aquifer by a clay layer in this area. Because of the clay layer, the small incremental increase in pumping from the Stern Grove well would not be expected to adversely affect water levels in the Shallow Aquifer. Further, the well has a capacity of 250 gpm (0.36 mgd), and the increased groundwater pumping required to maintain Pine Lake levels during project operations would be within this capacity. The Westside Basin Groundwater-Flow Model also incorporates a sufficient amount of pumping (a total of 0.012 mgd [13 afy] for Phase 1 and 0.013 mgd [15 afy] for Phase 2) to maintain Pine Lake at an elevation of 40.1 feet NGVD 29. Therefore, the lake would be maintained at similar levels to those under the modeled existing conditions without adverse effects on the Shallow Aquifer, and the project would not result in any changes to the water quality of the lake. Therefore, water quality impacts related to changes in Pine Lake water levels would be less than significant.

Impact HY-11: Project operation would possibly cause a violation of water quality standards. (Less than Significant with Mitigation)

Approach to Analysis – Water Quality Standards

The Groundwater Supply Project could cause a violation of water quality standards in two ways, as analyzed below: (1) if the addition of groundwater to the SFPUC system would cause the system water to exceed MCLs after blending as proposed under the project or (2) if pumping under the proposed project were to change groundwater levels or flow directions in a way that could mobilize contaminants from a nearby potentially contaminating activity.

Compliance with Drinking Water Standards and Regulations

In accordance with the requirements of Title 22, Division 4, Chapter 15 of the California Code of Regulations, the SFPUC would prepare a water quality monitoring plan describing the proposed methods for complying with domestic water quality and monitoring regulations, as described in Chapter 3, Project Description, under the heading "Groundwater Sampling and Treatment.". To meet the water quality goals, the SFPUC would blend (or mix) the groundwater with the SFPUC surface water supply at a target percentage of up to 15 percent. The SFPUC intends for blended water quality to meet or surpass drinking water standards of the California DPH and the USEPA (see Chapter 3, Project Description, Section 3.5.1, Operations). In addition to blending, disinfection would be provided at the Lake Merced and West Sunset well facilities, to control potential microbial contamination and as a contingency for ensuring compliance with the USEPA Ground Water Rule (USEPA, 2006). Also, pH adjustment would be provided at the Lake Merced well facility and Sunset Reservoir to maintain pH values consistent with the system water pH for corrosion protection (see Section 5.16.2, Regulatory Framework, "Lead and Copper Rule" subsection).

Blending, pH adjustment, and disinfection of the groundwater to meet State and federal regulations regarding drinking water standards are included as part of the project, as described in Chapter 3, Project Description. Therefore, no additional analysis is needed, as there would be no impact related to compliance with drinking water standards.

Contamination by Potentially Contaminating Activities

As discussed in the Section 5.16.1, Setting, under the heading "Drinking Water Source Assessment and Protection Program Findings," the SFPUC has prepared preliminary DWSAP reports for each of the proposed well facilities to evaluate their vulnerability to potentially contaminating activities. As presented in the reports, the SFPUC determined the size of the groundwater protection zones for the wells representing the overlying areas where groundwater could be drawn into the well during two, five, and ten years of pumping. The reports also indicate the degree to which the wells would be protected from contamination based on the local hydrogeology and construction features (physical barrier effectiveness) and identify potentially contaminating activities within the groundwater protection zones established for the wells. Each potentially contaminating activity is assigned a risk score correlated to the potential for that activity to contaminate groundwater. The risk score is based on the land use type of the potentially contaminating activity; the groundwater protection zone in which the potentially contaminating activity is located; and the effectiveness of local hydrogeology and well design to prevent potential contamination in groundwater from entering the well. The combined vulnerability score for a potentially contaminating activity can range from 3 to 17 points, and the California Department of Public Health considers water supply wells to be vulnerable to potentially contaminating activities with a score of 8 or higher. Therefore, potential impacts related to a violation of water quality standards are considered potentially significant if a well facility has one or more potentially contaminating activities with a vulnerability score of 8 or higher.

Impact Analysis – Water Quality Standards

As discussed in Section 5.16.1, Setting, under the heading "Drinking Water Source Assessment and Protection Program Findings," potentially contaminating activities with a vulnerability score of 8 or higher were identified within the groundwater protection zones for each of the production wells proposed under the Groundwater Supply Project. The types of potentially contaminating activities identified include the sewer system as well as illegal dumping and a number of land uses such as housing, parks, dry cleaners, historical gas stations, transportation corridors, golf courses, existing gas stations, fire stations, fertilizer/pesticide/herbicide application, and contractor or government storage yards. In addition, a leaking underground storage tank site with documented groundwater contamination was identified within the groundwater protection zone for the South Windmill Replacement well facility. However, the groundwater contamination plume is limited to the uppermost part of the aquifer and is stable. Further, a sensitive receptor survey for the site determined that the South Windmill Replacement well facility is located cross gradient[32] from the site and that groundwater quality at this well is not likely to be affected as a result of the underground storage tank leak at this site (Antea Group, 2011). Because the DWSAP reports identified potentially contaminating activities with a vulnerability score of 8 or higher for each proposed well facility, each well is considered vulnerable to contamination that could cause a violation of water quality standards. Therefore, impacts related to violation of water quality standards would be potentially significant. However, this potential impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure M-HY-11, Prepare a Source Water Protection Program and Update Drinking Water Source Assessment**, because it requires implementation of a source water protection program to prevent contamination of the well facilities, as well as regular updating of the drinking water source assessment for each well.

Mitigation Measure – Water Quality Standards

Mitigation Measure M-HY-11: Prepare a Source Water Protection Program and Update Drinking Water Source Assessment. Because the DWSAP reports for each proposed well facility identified potentially contaminating activities with a vulnerability score of 8 or higher, the SFPUC shall develop and implement a source water protection program including the following components to be implemented to prevent contamination of the well facility:

- Integration with the Westside Basin Groundwater Monitoring Program to identify changes in water quality that would warrant further study and response.
- Continued cooperation with the San Francisco Department of Public Health in that department's implementation of the existing well construction and well destruction permit program. The goal of protecting and preserving groundwater quality requires that all wells be properly constructed and maintained during their operational lives, and properly destroyed after their useful lives.
- Continued cooperation with the San Francisco Department of Public Health in that department's management of cases in the North Westside Basin where spills or leaks of chemicals (e.g., leaking underground fuel tanks) could threaten groundwater quality to ensure that the responsible party adequately investigates and cleans up any contamination that could threaten drinking water quality.
- Continued cooperation with the SFPUC Wastewater Enterprise's Urban Watershed Management Program in the implementation of guidelines to maintain appropriate

[32] The groundwater flow direction is determined by the slope of the water surface. Groundwater flows from upgradient (higher elevation) to downgradient (lower elevation). Locations that are cross gradient are at generally similar elevations, and groundwater would not flow between the locations.

buffers between low impact development stormwater facilities and drinking water well facilities.

- Continued coordination with the San Francisco Planning Department to ensure the SFPUC's review of and comment on CEQA documents for proposed projects in the North Westside Groundwater Basin to ensure that groundwater quality would not be degraded as a result of project implementation.

The source water protection program shall specify that in the event that potential contamination is identified, the SFPUC shall increase the monitoring frequency at the potentially affected well, investigate the potential source of contamination, coordinate with the San Francisco Department of Public Health or RWQCB to require responsible parties to address identified sources of contamination, and shut down the affected well or provide additional treatment for the groundwater if contamination of the drinking water supply cannot otherwise be avoided.

In addition, the SFPUC shall update the drinking water source assessment for each well facility every five years to review existing and planned land uses as well as to identify potentially contaminating activities, as required by the California Department of Public Health, and revise monitoring requirements, if necessary to address additional potentially contaminating activities.

The SFPUC shall encourage public participation in the development of the source water protection program and shall update the program every five years along with the drinking water source assessments for each project well, to prevent contamination that could cause an exceedance of drinking water MCLs at the project wells.

- Mitigation Measure M-HY-11 could be incorporated into the SFPUC's North Westside Basin Groundwater Management Plan. The Groundwater Management Plan would be submitted to the Planning Department prior to the operation of the San Francisco Groundwater Supply Project for review of consistency with the mitigation requirements for this project.

Impact HY-12: Project operation would not have a substantial adverse effect on groundwater depletion in the Westside Groundwater Basin. (Less than Significant)

Impacts related to groundwater depletion would be significant if project-related pumping were to reduce groundwater supplies or interfere with groundwater recharge in a manner that would result in a substantial regional deficit in aquifer storage and the deficit in aquifer storage would lead to insufficient water supply to support existing or planned land uses.

Approach to Analysis—Groundwater Depletion

To assess potential changes in the volume of groundwater stored in the Westside Groundwater Basin, the SFPUC first determined the existing storage volume in 2009 and then compared that volume to the predicted volume of storage at the end of the 47-year simulation period with project implementation (Kennedy/Jenks, 2012d). This analytical approach provides a conservative estimate of the magnitude of project impacts on overall long-term groundwater storage using the modeled data for the 47-year simulation period. A volumetric calculation was performed to estimate the total volume of groundwater present in the basin in June 2009; the volume of water in the aquifer was derived from the Westside Basin Groundwater Model and an estimate of the available pore space (or porosity) within the aquifer to store water. To estimate the effects of project-related pumping on the amount of groundwater in storage, the annual change in storage was estimated using modeled groundwater levels for both phases of the Groundwater Supply Project, which also takes into account simulated seasonal variations in hydrologic conditions over the 47-year simulation period. The total estimated change in storage over the simulation period was calculated as the sum of changes in storage volume that were modeled for each year of the simulation period.

Project-related changes in groundwater storage were estimated by subtracting the estimated amount of groundwater in storage under the modeled existing conditions at year 47 of the simulation from the estimated amount of groundwater storage with project implementation at the same point in time. The analysis then compared the estimated project-related change in storage to the total estimated amount of groundwater in the basin in 2009. The potential to adversely affect existing or planned land uses as a result of the estimated changes in groundwater storage was then evaluated.

As described in Section 5.16.1, Setting, groundwater depletion may have other negative effects on the groundwater basin; therefore, this EIR also evaluates impacts on groundwater resources relative to subsidence, seawater intrusion, groundwater/surface water interactions, and water quality (Impacts HY-7 through HY-11) and includes mitigation measures to avoid these adverse effects as may be necessary.

Impact Analysis – Groundwater Depletion

Modeled Existing Conditions

To facilitate the analysis of groundwater storage, the Westside Groundwater Basin is defined as three onshore subareas, including the North Westside Groundwater Basin, South Westside Groundwater Basin, and the Serra Block (Kennedy/Jenks, 2012d). These subareas and the estimated maximum amount of groundwater storage in each subarea based on June 2009 groundwater levels are described as follows:

- The North Westside Groundwater Basin subarea is defined as the portion of the basin north of the San Mateo–San Francisco county line and east of either Ocean Beach or the Serra Fault (where it is located onshore). The total estimated groundwater volume in this subarea is 223,000 acre-feet.

- The South Westside Groundwater Basin subarea is defined as the portion of the basin east of the Serra Fault, south of the San Mateo–San Francisco county line, and west of the San Francisco International Airport. The total estimated groundwater volume in this subarea is 513,000 acre-feet.

- The Serra Block subarea is defined as the portion of the basin east of the Pacific Coast and west of the Serra Fault (where it is located onshore). The total estimated groundwater volume in this subarea is 340,000 acre-feet.

The total estimated groundwater volume in the onshore Westside Groundwater Basin in June 2009 using this method is 1,076,000 acre-feet.

Although the historical groundwater conditions described above under "Groundwater Budget" indicate that groundwater storage increased by an average of 174 afy between 1982 and 2002, the Westside Basin Groundwater Model predicts that under the modeled existing conditions, groundwater storage in the entire groundwater basin would decline by approximately 709 afy, or approximately 28,000 acre-feet over the 47 years of hydrologic modeling (Kennedy/Jenks, 2012d). The 28,000-acre-foot decline in groundwater storage is due to the assumptions used in the modeling, which included a design drought that is a planning and operational tool that water supply agencies use to define a reasonable worst-case drought scenario, and is a more severe drought than any that occurred from 1958 to 2009, as discussed in Section 5.1.5, Overview of Modeling Approach. Incorporation of the design drought into the Westside Basin Groundwater Model results in about 20 fewer inches of simulated rainfall over the 47-simulation period than was seen in the entire historical period between 1958 and 2005. This is nearly equivalent to losing a full year of precipitation and its associated recharge for the entire basin. Therefore, the 709 acre-feet of annual average decline in groundwater storage is attributed to the incorporation of the design drought into the Westside Basin Groundwater Model (Kennedy/Jenks, 2012d). Over the 47 years of the hydrologic modeling, the estimated 28,000-acre-foot decline (which includes the design drought) constitutes 2.6 percent of the estimated total groundwater storage of 1,076,000 acre-feet. However, if a drought as severe the design drought does not actually occur, the total resulting groundwater storage decline could be substantially less, or groundwater storage could increase as occurred between 1982 and 2002.

Potential for Groundwater Depletion due to Project-Related Pumping

The total modeled decrease in groundwater storage under Phase 1 of the Groundwater Supply Project would result in a decline of approximately 684 afy more than the modeled existing conditions. Over the 47-year simulation period, the total decline in groundwater storage under Phase 1 would be 60,170 acre-feet, or a decline of approximately 32,170 acre-feet more than the modeled existing conditions. The total modeled decrease in groundwater storage due to Phase 2 of the Groundwater Supply Project would result in a decline of approximately 640 afy more than the modeled existing conditions. Over the 47-year simulation period, the total decline in groundwater storage under Phase 2 would be 58,080 acre-feet, or a decline of approximately 30,080 acre-feet more than the modeled existing conditions indicated above. The slight differences in estimated storage changes between the phases are attributable primarily to the somewhat greater total basin pumping rate of 12.75 mgd in Phase 1 (14,282 afy) compared to 12.61 mgd in Phase 2 (14,125 afy). These potential project-related declines represent only about 3 percent of the estimated total groundwater volume of 1,076,000 acre-feet in the entire onshore portion of Westside Groundwater Basin. Further, as described in Impact HY-6, existing land uses that are dependent on groundwater, including Stern Grove, the Edgewood Development Center (Edgewood School), San Francisco Zoo, and golf courses in the vicinity of Lake Merced would still be able to provide enough water to meet their peak demand, even with the predicted well interference effects from the project wells.

Because this projected groundwater storage loss would be relatively small after 47 years of operations, and existing groundwater-dependent land uses would still be able to meet their peak demands, the deficit in aquifer storage would not lead to insufficient water supply to support existing or planned land uses. Therefore, the impact of project operations on groundwater depletion in the Westside Groundwater Basin would be less than significant.

Cumulative Impacts

Facility Construction, Siting, Operations, and Maintenance

Impact C-HY-1: Facility construction, siting, operations, and maintenance, in combination with past, present, and reasonably foreseeable future projects in the site vicinity, would not adversely affect hydrology and water quality. (Less than Significant)

The geographic scope for the analysis of potential cumulative hydrology and water quality impacts consists of those areas of San Francisco located in the Westside drainage basin of the San Francisco combined sewer system; within the area served by the SFPUC separate storm drain system at Lake Merced; and areas that contribute runoff or other recharge to Lake Merced. The analysis of potential cumulative impacts on hydrology and water quality considers those cumulative projects listed in Table 5.1-6 and shown in Figure 5.1-1.

Violation of Water Quality Standards or Waste Discharge Requirements, and Degradation of Water Quality – Construction Effects

Construction-Related Erosion and Accidental Release of Hazardous Materials

As discussed in Impact HY-1, construction activities associated with the proposed project could result in the degradation of water quality from increased soil erosion and associated sedimentation of water bodies, as well as an accidental release of hazardous materials. All of the projects listed in Table 5.1-6 that involve soil excavation and construction activities could also result in soil erosion, sedimentation, or a release of hazardous materials to the combined sewer system or Lake Merced, including the Beach Chalet Athletic Fields Renovation Project, San Francisco Westside Recycled Water Project, San Francisco Botanical Gardens Sustainable Gardening Project, development at 2800 Sloat Boulevard, Harding Park Recycled Water Project, Lake Merced Pump Station Essential Upgrade, and the Parkmerced Project.

However, construction of the proposed well facilities and all of the potentially cumulative projects listed in Table 5.1-6 would be required to comply with the City's Green Building Ordinance and Article 4.1 of the San Francisco Public Works Code, described in Section 5.16.2, Regulatory Framework. Accordingly, and consistent with the SFPUC's Water Pollution Prevention Program, each project sponsor would be required to implement an erosion and sediment control plan or SWPPP for construction (depending on the area of soil disturbance at each construction site) specifying measures to prevent stormwater pollution and control site runoff. The erosion and sediment control plan or SWPPP would specify minimum BMPs related to housekeeping (storage of construction materials, waste management, vehicle storage and maintenance, landscape materials, pollutant control); non-stormwater management; erosion control; sediment control; and run-on and runoff control. Additional BMPs could be required for construction near a water body with higher risk for stormwater pollution based on its beneficial uses. Routine inspection of all BMPs would be conducted by the SFPUC, and the Erosion and Sediment Control Plan or SWPPP would contain a visual monitoring program and a chemical monitoring program for nonvisible pollutants at a minimum. Implementation of control measures in compliance with construction site stormwater requirements of the City's Green Building Code Ordinance and Article 4.1 of the San Francisco Public Works Code would ensure that cumulative water quality impacts related to stormwater runoff during construction would be less than significant.

Groundwater Dewatering

As discussed in Impact HY-1, limited construction dewatering could be required for construction of the proposed well facilities and pipelines. Most of the dewatering discharges would be made to the sewerage system. Many of the projects listed in Table 5.1-6 could also involve dewatering discharges to the sewerage system, including development or renovation of existing facilities for the Parkmerced Project, development at 2800 Sloat Boulevard, and the San Francisco Botanical Garden Sustainable Gardening Project; and construction of new pipelines and facilities associated with the San Francisco Westside Recycled Water Project, the Lake Merced Pump Station Essential Upgrade Project, and the Harding Park Recycled Water Project.

However, the proposed project and each of the projects with potential discharges to the sewerage system would be required to conduct the discharges in accordance with Article 4.1 of the San Francisco Public Works Code, as supplemented by Order No. 158170, which regulates the quantity and quality of discharges to the sewerage system. This permit would contain appropriate discharge standards and could require installation of meters to measure the volume of the discharge. Therefore, given the requirement to implement control measures to comply with these discharge regulations, cumulative water quality impacts related to dewatering discharges to the sewerage system would be less than significant.

If not discharged to the sewer system, groundwater dewatering discharges from the project at the Lake Merced well facility would likely be allowed to infiltrate to the soil, or would be beneficially used for dust control. Therefore, there would not be significant cumulative water quality impacts related to these discharges.

Combined Sewer Discharges – Facilities Siting, Operations, and Maintenance

As described in Impact HY-2, the West Sunset well facility, Central Pump Station well facility, South Windmill Replacement well facility, and North Lake well facility would be located in geographical areas served by combined sewer system. Many of the projects listed in Table 5.1-6 would also be located in geographical areas served by the combined sewer system and could involve stormwater discharges to the combined sewer system as a result of construction of new impervious surfaces, including San Francisco Westside Recycled Water Project, development at 2800 Sloat Boulevard, the Parkmerced Project, and the San Francisco Botanical Garden Sustainable Gardening Project. In accordance with the San Francisco Stormwater Design Guidelines, developers of projects that would disturb more than 5,000 square feet of ground and discharge to the combined sewer system must implement BMPs to reduce the flow rate and volume of stormwater entering into the combined sewer system by achieving LEED® Sustainable Sites Credit 6.1 (Stormwater Design: Quantity Control). For covered projects with less than 50 percent existing impervious surfaces, the stormwater management approach must prevent the runoff flow rate and volume from exceeding existing conditions for the one- and two-year 24-hour design storm. For covered projects that include more than 50 percent impervious surfaces, the stormwater management approach must reduce the existing runoff flow rate and volume by 25 percent for a two-year 24-hour design storm. The Stormwater Design Guidelines require implementation of these low-impact development measures to reduce runoff as well as to reduce and delay the volume of discharge entering the combined sewer system, thereby reducing the frequency of combined sewer overflows, minimizing flooding effects, and protecting water quality. Examples of BMPs that may be implemented include rainwater harvesting, rain gardens, green roofs, and permeable paving.

Further, project design features proposed for the Golden Gate Park well facilities (Central Pump Station, South Windmill, and North Lake) would ensure that there would be no stormwater discharges to the combined sewer system. While the South Sunset well facility would not be subject to the San Francisco Stormwater Design Guidelines because construction would disturb less than 5,000 square feet, the project design as described in Chapter 3, Project Description (see Section 3.4.1, Groundwater Well Facilities), would minimize flows to the combined sewer system. Further, each of the potentially cumulative projects would also need to comply with the San Francisco Stormwater Design Guidelines and would not contribute substantially to the frequency or duration of combined sewer overflows. Therefore, potential cumulative hydrologic impacts on combined sewer overflows would not be significant.

Alteration of Drainage Patterns, Exceedance of Stormwater Drainage Capacity, and Additional Sources of Polluted Runoff – Facilities Siting, Operations, and Maintenance

As discussed in Impacts HY-3 and HY-4, the Lake Merced, West Sunset, Central Pump Station, South Windmill Replacement, and North Lake well facilities would be located in geographical areas served by the combined sewer system or the separate storm sewer system at Lake Merced. Many of the projects listed in Table 5.1-6 could involve stormwater discharges to these systems as a result of construction of new impervious surfaces, including San Francisco Westside Recycled Water Project, development at 2800 Sloat Boulevard, the Parkmerced Project, and the San Francisco Botanical Garden Sustainable Gardening Project. However, the proposed project and each of these projects would be required to implement stormwater control measures as required by San Francisco's Stormwater Design Guidelines. Although the South Sunset well facility would not be subject to these guidelines, the design of this facility would include stormwater BMPs as described in Chapter 3, Project Description (see Section 3.4.1, Groundwater Well Facilities), to reduce stormwater flows to the combined sewer system. Implementation of stormwater BMPs by the proposed project and the other cumulative projects, in compliance with the San Francisco Stormwater Design Guidelines, would maintain or reduce the peak quantity and peak rate of stormwater runoff, and the green roofs and infiltration BMPs proposed as part of the project would reduce the runoff of pollutants to the city's combined sewer system and the separate storm sewer system. Therefore, cumulative impacts related to alteration of drainage patterns, exceedance of stormwater drainage capacity, and additional sources of polluted runoff would be less than significant.

Groundwater Pumping Operations

● The geographic scope for the analysis of cumulative impacts on groundwater and surface water resources encompasses the entire Westside Groundwater Basin. The potential cumulative projects in the groundwater basin also include the SFPUC Regional Groundwater Storage and Recovery Project as well as the potential buildout of the Holy Cross Cemetery and the Daly City Vista Grande Drainage Basin Improvement Project, which are described in Section 5.1.5, Overview of Groundwater Modeling Approach. Because the Vista Grande Drainage Basin Improvement Project includes the addition of stormwater to Lake Merced, this project would directly raise lake levels in Lake Merced.

In addition, the Regional Groundwater Storage and Recovery Project includes alternating cycles of storage and withdrawals of groundwater. As such, groundwater levels in the affected aquifers would be expected to rise during Put Periods, while groundwater levels would be expected to decline during Take Periods. The effects of the Regional Groundwater Storage and Recovery Project on groundwater levels in the North Westside Groundwater Basin would be expected to be greatest in the vicinity of Lake Merced, with decreasing effects further north in the basin. In addition, higher groundwater levels during Put and Hold Periods could indirectly result in an increase in Lake Merced levels due to the potential declines in outflows from the lake that may result.

As discussed in Section 5.1.5, Overview of Groundwater Modeling Approach, there are two cumulative projects listed in Table 5.1-6 that could include infiltration of stormwater and additions to Lake Merced as a result of construction of stormwater controls: the Parkmerced and San Francisco State University master plan projects (San Francisco Planning Department, 2010; SFSU, 2007). If implemented, infiltration of stormwater could result in slightly raised Shallow Aquifer groundwater levels in the vicinity of these two projects and could have a net benefit related to well interference and subsidence. Discharges to Lake Merced under these projects could also have a net benefit on Lake Merced water levels and associated recharge of the Shallow Aquifer. However, the amount of stormwater that would be infiltrated or discharged to Lake Merced under these projects has not been quantified and the timing of implementation stormwater management project components is uncertain. Therefore, these projects were not included in the groundwater modeling described in Section 5.1.5 and are not specifically addressed in the individual cumulative impact analyses below.

Impact C-HY-2: The proposed project, in combination with past, present, and reasonably foreseeable future projects, would not have a substantial adverse effect related to well interference. (Less than Significant)

Although groundwater pumping could increase at the Holy Cross Cemetery if its operations are expanded, this facility is located approximately 3.5 miles to the south of Lake Merced in the South Westside Groundwater Basin and therefore would not contribute to well interference in the Lake Merced area or other portions of the North Westside Groundwater Basin. The Daly City Vista Grande Drainage Basin Improvement Project would include additions of supplemental stormwater to maintain lake levels in Lake Merced and supplemental water deliveries under this project would raise groundwater levels in the Shallow Aquifer in the vicinity of Lake Merced. However, the beneficial effect of the Vista Grande Drainage Basin Improvement Project is not considered quantitatively in this cumulative analysis in order to present a worst-case estimate of well interference effects that could occur as a result of concurrent implementation of the Groundwater Supply Project and Regional Groundwater Storage and Recovery Project, without considering the beneficial effect of elevated groundwater levels that would occur under the Vista Grande Drainage Basin Improvement Project. The only area where the adverse effects of well interference could accumulate is in the Lake Merced area, because other locations in the South Westside Groundwater Basin are too far from the Groundwater Supply Project to result in cumulative well interference impacts in the North Westside Groundwater Basin. Similarly, existing wells located in the North Westside Groundwater Basin are too far north to result in cumulative well interference impacts in the South Westside Groundwater Basin.

To assess the cumulative effects of the SFPUC's Groundwater Supply Project and Regional Groundwater Storage and Recovery Project, the drawdown effects and related decrease in production capacity was estimated at golf club wells in the Lake Merced area (LSCE, 2012). Under cumulative conditions, the capacity of the San Francisco Golf Club well is predicted to be reduced by 4 percent to 0.98 mgd, which is 0.78 mgd greater than the peak daily groundwater demand of 0.20 mgd. The capacity of Olympic Golf Club Well No. 8 is predicted to be reduced by 7 percent to 1.34 mgd, which is 1.27 mgd greater than the peak daily groundwater demand of 0.07 mgd. Further, the predicted reduced capacity at the San Francisco Golf Club of 0.98 mgd would be greater than the total peak irrigation demand of 0.87 mgd (listed in Table 5.16-3) and the predicted combined reduced capacity of Olympic Golf Club Well Nos. 8 and 9 would be 2.28 mgd, which would exceed the total peak irrigation demand of 2.16 mgd (listed in Table 5.16-3). Based on this, these golf clubs could continue to meet their irrigation demands, even if recycled water were no longer available for irrigation. Therefore, the wells would have the capacity to meet peak demand under cumulative conditions, and cumulative impacts related to well interference at the San Francisco Golf Club and Olympic Golf Club wells would be less than significant.

Although the Lake Merced Golf Club wells are predicted to experience a 10 to 30 percent reduction in production capacity under cumulative conditions (a potentially significant cumulative impact), the Groundwater Supply Project's contribution to this reduction is estimated to be less than 3 gpm (less than 1 percent), which would be barely discernible and would therefore not impede the ability of the Lake Merced Golf Club to meet its peak daily demand, as described in Impact HY-6. The remaining 9 to 29 percent predicted reduction in capacity would be due to the Regional Groundwater Storage and Recovery Project. Therefore, the project's contribution to cumulative impacts related to well interference at the Lake Merced Golf Club wells would not be cumulatively considerable.

If stormwater from the Vista Grande Drainage Basin Improvement Project were eventually directed to Lake Merced, it can be reasonably assumed that the discharges would raise water levels in Lake Merced and increase recharge to the Shallow Aquifer from the lake. As a result, cumulative well interference impacts on the golf club wells in the vicinity of Lake Merced would be less than is indicated by the worst-case analysis above.

Impact C-HY-3: Operation of the proposed project would not result in a cumulatively considerable contribution to cumulative impacts related to subsidence. (Less than Significant)

Both the SFPUC Regional Groundwater Storage and Recovery Project and the potential buildout of the Holy Cross Cemetery would increase pumping in the Westside Groundwater Basin, potentially leading to lower groundwater levels. One cumulative project (the Vista Grande Drainage Basin Improvement Project) would discharge stormwater to Lake Merced, which could, in turn, potentially increase groundwater levels near Lake Merced and could therefore lessen the potential for subsidence to occur.

Based on a technical analysis conducted by the SFPUC (Fugro, 2012), the estimated subsidence at the South Sunset well facility location, Lake Merced well facility location, and two locations in the South Westside Groundwater Basin due to the cumulative projects ranges between 1.7 and 3.4 inches when compared to historical lows and between 1.6 and 3.5 inches when only the contribution of the cumulative projects is included. The estimated subsidence due to the cumulative projects at each of the locations is less than the significance threshold of 6 inches set for structures and drainage patterns and less than the significance threshold of 1 foot set for flooding impacts on land within a 100-year flood zone. Therefore, cumulative impacts related to land subsidence would be less than significant relative to structures, changes to drainage patterns, and flooding.

Impact C-HY-4: The proposed project, in combination with past, present, and reasonably foreseeable future projects, would possibly have a substantial adverse effect related to seawater intrusion. (Less than Significant with Mitigation)

Shallow Aquifer

Under cumulative conditions, groundwater level changes relative to existing conditions would be different in the northern and southern portions of the North Westside Groundwater Basin, as shown on the hydrographs included in Appendix D-6. In the northern portion, the Shallow Aquifer groundwater levels at the North Windmill monitoring location and South Windmill monitoring location are predicted to decline by up to 13 and 11 feet (respectively), relative to modeled existing conditions, which is similar to declines that are predicted to occur when considering the potential effects of the proposed project alone (Kennedy/Jenks, 2012b). At the Kirkham location, the cumulative Shallow Aquifer groundwater-level declines are also predicted to be similar to those predicted under the proposed project by itself.

The effects of the Groundwater Storage and Recovery Project and the Daly City Vista Grande Drainage Basin Improvement Project would likely be observed in the southern portion of the North Westside Groundwater Basin at the San Francisco Zoo, Taraval, and Ortega locations, given their relative proximity to Lake Merced and the Groundwater Storage and Recovery Project. In these locations, the Shallow Aquifer groundwater-level declines under cumulative conditions are predicted to be approximately 4, 1, and 0.5 feet less, respectively, than those that are predicted to occur under just the proposed project. Similarly, the Shallow Aquifer groundwater levels at the West Sunset monitoring location are predicted to be approximately 2 feet less than those that are predicted to occur under the proposed project alone. Cumulative seasonal fluctuations are predicted to be similar to those predicted with operation of just the proposed project at all locations.

The modeled groundwater levels in the Shallow Aquifer under the cumulative scenario at the end of the simulation period are predicted to be lower than levels predicted under modeled existing conditions. The lowest elevations are predicted to occur at the Central Pump Station and West Sunset well facilities in the northern portion of the North Westside Groundwater Basin, with elevations slightly below sea level at the West Sunset location. The cumulative Shallow Aquifer groundwater levels immediately north of Lake Merced are predicted to be higher than levels predicted with operation of just the proposed project, but estimated cumulative groundwater elevations at or near sea level along much of the Pacific Coast north of Lake Merced indicate that groundwater pumping under the cumulative scenario could still increase the potential for the landward migration of the seawater/freshwater interface compared to the modeled existing conditions.

While the Shallow Aquifer groundwater levels at the coastal monitoring locations are predicted to remain above the Shallow Aquifer exclusion head for the entire simulation period under modeled existing conditions, the cumulative Shallow Aquifer groundwater levels are predicted to be below the Shallow Aquifer exclusion head for 0 to 86 percent of the simulation period, depending upon the well location, under the cumulative scenario. Similar to effects predicted with operation of just the proposed project, the cumulative Shallow Aquifer groundwater levels are predicted to be below the Shallow Aquifer exclusion head for the least amount of time at the North Windmill monitoring location in Golden Gate Park (i.e., 4 percent of the time), and for the greatest amount of time at the South Windmill, Ortega, West Sunset, and Taraval monitoring locations (i.e., 66 to 86 percent of the time), but in each of these cases the duration that groundwater levels would likely be below the exclusion head is predicted to be slightly less than what is predicted to occur with operation of just the proposed project. Regardless, estimated groundwater levels below the Shallow Aquifer exclusion heads at these wells provide further indication that cumulative groundwater pumping could increase the potential for the landward migration of the seawater/freshwater interface. Unlike the effects expected with operation of the proposed project by itself, the cumulative Shallow Aquifer groundwater levels are not predicted to be below the Shallow Aquifer exclusion head at the San Francisco Zoo location for any of the simulation period, similar to modeled existing conditions (Kennedy/Jenks, 2012b).

Based on modeling results, the predicted groundwater flux to the ocean under cumulative conditions declines from a maximum of 432 acre-feet per month and a minimum of 149 acre-feet per month under modeled existing conditions to a maximum of 352 acre-feet per month and minimum of 15 acre-feet per month, similar to effects predicted with operation of just the proposed project.

Together, these results indicate that the potential for seawater intrusion under cumulative conditions would be similar to the potential expected with operation of just the proposed project, except at the San Francisco Zoo location. In this area, near Lake Merced, the cumulative Shallow Aquifer groundwater levels are predicted to be approximately 4 feet higher than under the proposed project by itself, and would likely not decline below the Shallow Aquifer exclusion head due to contributions from the Regional Groundwater Storage and Recovery Project and the Daly City Vista Grande Drainage Basin Improvement Project. Therefore, in this area, the potential for seawater intrusion into the Shallow Aquifer under cumulative conditions would be lower than would likely occur under the proposed project alone.

Primary Production Aquifer

Cumulatively, the estimated groundwater levels in the Primary Production Aquifer at the South Windmill, Kirkham, and Ortega monitoring locations are predicted to decline from 5 to 8 feet relative to modeled existing conditions, which are similar to declines that are predicted to occur with operation of just the proposed project. The estimated Primary Production Aquifer groundwater levels at the West Sunset and Taraval monitoring locations, farther south, are predicted to decline from 10 to 11 feet relative to modeled existing conditions, and about 1 foot less than what is predicted to occur with operation of just the proposed project. At the San Francisco Zoo location, the estimated Primary Production Aquifer groundwater levels are predicted to decline 16 feet relative to modeled existing conditions, but about 2 feet less than occur with operation of just the proposed project. Estimated seasonal fluctuations under cumulative conditions would likely be similar to those that would occur with operation of just the proposed project, and all of the estimated Primary Production Aquifer groundwater elevations are predicted to be below the Primary Production Aquifer exclusion head for the entire simulation period, which is the same as is predicted under the modeled existing conditions and with operation of just the proposed project. Therefore, there would still be the potential for seawater intrusion, but possibly at a slower rate than under the proposed project alone, given the higher cumulative groundwater levels at the West Sunset, Taraval, and San Francisco Zoo monitoring locations.

Together, these results indicate that the potential for seawater intrusion into the Primary Production Aquifer under cumulative conditions would likely be similar to the potential expected with operation of just the proposed project.

Deep Aquifer

The Deep Aquifer groundwater levels at the Kirkham and Ortega monitoring locations are predicted to decline 5 to 6 feet relative to modeled existing conditions, which are similar to declines that are predicted to occur with operation of just the proposed project. At the West Sunset and Taraval monitoring locations to the south, the Deep Aquifer groundwater elevations are predicted to decline up to approximately 9 feet relative to modeled existing conditions. The greatest declines are observed during Take periods of the Groundwater Storage and Recovery Project, but all groundwater levels are similar to or above what would occur under the proposed project, except at the end of the design drought. At the San Francisco Zoo location, the southernmost location, the Deep Aquifer groundwater elevations are predicted to decline up to approximately 17 feet relative to modeled existing conditions. As for the West Sunset and Taraval monitoring locations, the greatest declines are observed during Take periods of the Groundwater Storage and Recovery project, and during Take periods of the GSR project, the groundwater levels could be below what would occur under the proposed project, particularly at the end of the design drought. The estimated seasonal fluctuations under cumulative conditions would likely be similar to those expected with operation of just the proposed project.

The Deep Aquifer groundwater elevations under cumulative conditions are predicted to be below the Deep Aquifer exclusion head at the West Sunset, Taraval, and San Francisco Zoo monitoring locations for the entire simulation period, the same as is predicted for the modeled existing conditions and with operation of just the proposed project. At the Kirkham monitoring location, the Deep Aquifer groundwater levels are predicted to be below the Deep Aquifer exclusion head for 75 percent of the simulation period, compared to 0 percent predicted under modeled existing conditions, and 83 to 86 percent predicted with operation of just the proposed project. At the Ortega monitoring location, the Deep Aquifer groundwater levels are predicted to be below the Deep Aquifer exclusion head for 96 percent of the simulation period, compared to 55 percent predicted under modeled existing conditions, and 98 percent predicted with operation of just the proposed project.

Together, these results indicate that the potential for seawater intrusion under cumulative conditions would likely be similar to the potential predicted with operation of just the proposed project, except in the vicinity of the San Francisco Zoo location. In this area, the Deep Aquifer groundwater level declines are predicted to be 2 to 11 feet greater than what is predicted to occur with operation of just the proposed project because of pumping in the South Westside Groundwater Basin under the Regional Groundwater Storage and Recovery Project during Take Periods, particularly at the end of the design drought.

Impact Discussion and Significance Determination

The above analysis indicates that the potential for seawater intrusion under cumulative conditions would likely be similar to or less than what is predicted with operation of just the proposed project, except in the area south of the West Sunset well facility where the potential for seawater intrusion would likely be greater in the Deep Aquifer due to pumping under the Regional Groundwater Storage and Recovery Project during Take Periods. Therefore, cumulative impacts related to seawater intrusion could be significant. The project's contribution to this impact could be cumulatively considerable because the project would be almost entirely responsible for causing any seawater intrusion that would occur. However, similar to the analysis for the proposed project alone, the project's contribution to this cumulative impact would be reduced to a less-than-cumulatively considerable level (less than significant) with implementation of Mitigation Measure M-HY-8a, Expand Coastal Monitoring Network, Mitigation Measure M-HY-8b, Continuous Groundwater Monitoring in the Primary Production Aquifer, and Mitigation Measure M-HY-8c, Adaptive Management Program for Seawater Intrusion, because these measures would ensure that chloride concentrations do not reach 250 mg/L at any coastal monitoring location, thereby protecting beneficial uses of the groundwater from seawater intrusion.

Impact C-HY-5: The proposed project, in combination with past, present, and reasonably foreseeable future projects, would possibly have a substantial adverse effect on water quality that could affect the beneficial uses of Lake Merced or water quality in Pine Lake. (Less than Significant with Mitigation)

Lake Merced

As discussed above, the Daly City Vista Grande Drainage Basin Improvement Project would include the addition of stormwater to maintain Lake Merced levels. For the purposes of the cumulative analysis, the groundwater model assumes that the Vista Grande Drainage Basin Improvement Project would lower the Lake Merced spillway to an elevation of approximately 9.5 feet City Datum, as discussed in greater detail in Section 5.1.5, Overview of Groundwater Modeling Approach. The cumulative analysis also assumes that Vista Grande Canal stormwater flows in excess of 75 cubic feet per second (cfs) that meet water quality criteria would be discharged to Lake Merced under that project, and the total resulting annual additions to Lake Merced would range from 19 to 681 acre-feet, with an annual average of 209 acre-feet. In addition, the baseflow in the Vista Grande Canal would likely be diverted to an onsite engineered wetland for treatment and then discharged to Lake Merced on an ongoing basis. The resulting annual additions to Lake Merced would range from 78 to 277 acre-feet, with a long-term annual average of 220 acre-feet. Using these assumptions, the mean monthly lake level would be 7.5 feet City Datum as a result of additions to Lake Merced under the Vista Grande Drainage Basin Improvement Project, without influences from the proposed project or other potentially cumulative projects.

As shown in Figures 5.16-10 and 5.16-11, the estimated Lake Merced water levels under cumulative conditions are predicted to be higher than under the modeled existing conditions for much of the simulation period, largely as a result of the Vista Grande Drainage Basin Improvement Project and the Regional Groundwater Storage and Recovery Project (Kennedy/Jenks, 2012c). However, the lake levels are predicted to be below the levels predicted under the modeled existing conditions for years 2 through 8 of the simulation period and after year 32 during the modeled design drought conditions. The lake levels under cumulative conditions are also predicted to be consistently higher than those predicted to occur under the proposed project alone for the entire simulation period, except for a brief period at the beginning of the simulation. Cumulatively, the mean monthly water level in Lake Merced is predicted to be 6.1 feet City Datum, and the mean annual range is predicted to be 1.6 feet. This estimated mean monthly lake level is 1.4 feet lower under cumulative conditions than it is predicted to be under the Vista Grande Drainage Basin Improvement Project alone, and 3 feet lower than it is predicted to be under the Regional Groundwater Storage and Recovery Project alone (Kennedy/Jenks, 2012c).

The conservatively estimated lake levels under cumulative conditions are predicted to be below 1 foot City Datum for 13 percent of the simulation period compared to 4 percent under the modeled existing conditions. In addition, as noted above, the lake levels are predicted to be below the levels predicted under the modeled existing conditions for years 2 through 8 of the simulation period and after year 32. Therefore, cumulative impacts on Lake Merced water levels could be significant because water level declines below 0 foot City Datum could occur. These water level declines could potentially cause increased eutrophication of the lake, and could also affect the pH and dissolved oxygen levels (the parameters responsible for the listing of Lake Merced as an impaired water body) as well as other water quality parameters, potentially resulting in significant cumulative water quality impacts. The project's contribution to this potentially significant cumulative impact would be cumulatively considerable because the lake level declines would primarily be due to declines in groundwater levels resulting from project-related pumping during years 2 through 8 and due to all groundwater pumping after year 32.

However, similar to the analysis for the proposed project alone, the project's contribution to this impact would be reduced to a less-than-cumulatively considerable level (less than significant) with implementation of Mitigation Measure M-HY-9, Lake-Level Management for Lake Merced, because, in accordance with this measure, the SFPUC would implement a lake level management program requiring implementation of the Groundwater Supply Project in a stepwise manner to monitor for adverse effects before pumping at the full operational rate; continuation of lake-level, lake water quality, and groundwater monitoring; additions of supplemental water, if available, should lake levels decline below the trigger levels specified in Mitigation Measure M-HY-9; and alteration or redistribution of pumping patterns should adverse effects on Lake Merced water levels be observed and no supplemental water source is available or is insufficient to maintain lake levels at the desired level. With use of the specified trigger levels and implementation of the corrective actions specified in Mitigation Measure M-HY-9 (additions of supplemental water and/or alteration or redistribution of pumping), Lake Merced water levels would not decline substantially as a result of the project, and the project's contribution to this cumulative impact would be reduced to a less than significant level.

As discussed in Section 5.1.5, Overview of Groundwater Modeling Approach, the final design of the Daly City Vista Grande Drainage Basin Improvement Project has not been determined. Options under consideration include diverting a broad range of stormwater flows to Lake Merced from the Vista Grande Canal, ranging from diversion of flows above 35 cfs to diversion of flows above 170 cfs (Jacobs Associates, 2011). Under this range of options, the direct stormwater flow diversions to Lake Merced would range from an average of 66 to 357 afy and the baseflow to Lake Merced from the engineered wetland would range from an average of 203 to

233 afy, resulting in total diversions to Lake Merced ranging from 299 to 560 afy (Kennedy/Jenks, 2012e). The values on either end of the range are within 30 percent of the 429-afy volume used in the cumulative analysis. While the specific option selected for the Vista Grande Drainage Basin Improvement Project could result in a different amount of stormwater discharged to Lake Merced than the amount considered in the cumulative modeling scenario, the resulting mean monthly lake level range for each of the Vista Grande options is estimated to be 6.7 to 7.9 feet City Datum (Kennedy/Jenks, 2012e) compared to 6.3 feet City Datum predicted under the modeled existing conditions. Therefore, any additions to Lake Merced would result in an increase in mean lake levels relative to the modeled existing conditions.

Pine Lake

Under cumulative conditions, in addition to the Groundwater Supply Project, it is assumed that the SFPUC Regional Groundwater Storage and Recovery, Holy Cross Cemetery and Daly City Vista Grande Drainage Basin Improvement projects would be implemented. The estimated average modeled groundwater level in well LMMW-5S, completed in the deeper portion of the Shallow Aquifer, is 26.5 feet NGVD 29 under cumulative conditions, or 13.7 feet lower than the SFRPD's lake elevation goal of 40.1 feet NGVD 29 and 6.7 feet lower than what is estimated under the modeled existing conditions. Based on this potential decrease in groundwater levels, groundwater outflows from the lake would be increased, and an additional 0.0085 mgd (9.5 afy) would be required from the Stern Grove well to maintain Pine Lake at the SFRPDs goal of 40.1 feet NGVD 29. This would represent an increase of 0.0042 mgd (5 afy) over the modeled existing conditions.

While additional groundwater would be required to maintain Pine Lake water levels, the estimated amount of additional groundwater pumping is within the 250-gallon-per-minute (0.36-mgd) capacity of the Stern Grove well. Further, the Westside Basin Groundwater-Flow Model incorporates a sufficient amount of pumping (0.013 mgd [15 afy] for cumulative conditions) to maintain Pine Lake at an elevation of 40.1 feet NGVD 29. Therefore, the lake would be maintained at similar levels to those under the modeled existing conditions without adverse effects on the Shallow Aquifer, and maintenance of the lake at this level would not result in any changes to water quality or the health of the lake. Therefore, cumulative water quality impacts on Pine Lake water levels would be less than significant.

Impact C-HY-6: Operation of the proposed project would not result in a cumulatively considerable contribution to cumulative impacts related to water quality standards. (Less than Significant)

As described in Impact HY-11 and Chapter 3, Project Description, the SFPUC would blend (or mix) the groundwater with the SFPUC surface water supply to meet or surpass the drinking water standards of the California Department of Public Health and the USEPA. In addition to blending, disinfection would be provided at the Lake Merced and West Sunset well facilities to control potential microbial contamination, ensuring compliance with the USEPA Ground Water

Rule (USEPA, 2006); also, pH adjustment would be provided at the Lake Merced well facility and Sunset Reservoir to maintain pH values consistent with the system water pH to ensure corrosion protection and compliance with the USEPA Lead and Copper Rule (USEPA, 2008). None of the other past, present, or reasonably foreseeable projects would involve blending of groundwater with the existing potable water supply, so there would be no cumulative impact.

As discussed in Impact HY-11, the DWSAP reports identified potentially contaminating activities with a vulnerability score of 8 or higher within the groundwater protection zones for each proposed well facility to be constructed under the Groundwater Supply Project. Although this potential impact would be significant, the potential cumulative impact would be less than significant because none of the cumulative projects related to groundwater and surface water resources would introduce new potentially contaminating activities within the groundwater protection zones of the proposed well facilities, or affect groundwater levels in such a way that the groundwater protection zones would be substantially changed. Although the Vista Grande Drainage Basin Improvement Project would introduce a new source of water to Lake Merced that could affect groundwater quality, that project would be required to meet water quality standards in accordance with the discharge requirements of the RWQCB. Therefore, there would be no cumulative impact related to water quality standards.

Impact C-HY-7: Operation of the proposed project would not result in a cumulatively considerable contribution to cumulative impacts related to groundwater depletion. (Less than Significant)

Under cumulative conditions it is assumed that the SFPUC Regional Groundwater Storage and Recovery, Holy Cross Cemetery and Daly City Vista Grande Drainage Basin Improvement projects would be implemented in addition to the Groundwater Supply Project,. As described under Impact HY-12, the change in groundwater storage under the modeled existing conditions, following the design drought, is predicted to be a decrease of 709 afy or a total of approximately 28,000 acre-feet. This represents about 2.6 percent of the estimated total groundwater volume in storage within the entire onshore portion of the Westside Basin. The change in groundwater storage due to modeled cumulative conditions is estimated to be a decline of approximately 968 afy more than modeled existing conditions. Over the 47-year simulation period, the total modeled decline in groundwater storage under cumulative conditions would be approximately 45,480 acre-feet more than modeled existing conditions. The estimated decline resulting from cumulative conditions would represent about 4.2 percent more of the estimated total groundwater volume in storage within the entire onshore portion of the Westside Basin than is indicated for the modeled existing condition.

As described in Impact C-HY-2, the San Francisco Golf Club and Olympic Golf Club in the vicinity of Lake Merced would still be able to provide enough water to meet their peak demand, even with cumulative well interference effects. Adverse cumulative effects related to well interference could occur at the Lake Merced Golf Club wells as a result of cumulative groundwater pumping as discussed in Impact C-HY-2, and therefore cumulative impacts related to groundwater depletion would be significant. However, the San Francisco Groundwater Supply Project's contribution to this cumulative impact would not be cumulatively considerable because it would cause only about a 3 gpm reduction in capacity and the small reduction in groundwater storage would not lead to insufficient water supply to support existing or planned land uses.

Impacts of Mitigation Measures

Seawater Intrusion

As discussed in Impact HY-8, potentially significant impacts related to seawater intrusion would be reduced to a less-than-significant level with implementation of Mitigation Measure M-HY-8a, Expand Coastal Monitoring Network, Mitigation Measure M-HY-8b, Continuous Groundwater Monitoring in the Primary Production Aquifer, and Mitigation Measure M-HY-8c, Adaptive Management Program for Seawater Intrusion. This section provides an evaluation of potential physical environmental effects resulting from the implementation of Mitigation Measures M-HY-8a and M-HY-8c, because these mitigation measures would either involve additional construction activities, or could adversely affect groundwater or surface water resources. Mitigation Measure M-HY-8b would include only minor activities to install pressure transducers in existing wells, which would not require any earthwork or operation of major equipment, and therefore would not result in significant impacts on the environment.

Mitigation Measure M-HY-8a, Expand Coastal Monitoring Network, requires the SFPUC to rehabilitate existing wells in Golden Gate Park or install new coastal monitoring wells located between the Pacific Ocean coast and the South Windmill Replacement and North Lake well facilities to provide a coastal monitoring location for the detection of seawater intrusion. Monitoring wells would consist of wells with a maximum diameter of approximately 12-inches and that could extend a maximum height of approximately 3 feet above ground that would not be housed in buildings. Monitoring wells would likely be located within areas of Golden Gate Park not highly used by the public and that are currently developed/disturbed or are substantially devoid of vegetation in order to minimize the effects of installation. Because long-term operation of the existing monitoring network would only involve a minor increase in the existing periodic sampling, monitoring, and maintenance activities, impacts related to implementation of this mitigation measure would be restricted to construction-related impacts:

- **Aesthetics.** As discussed in Section 5.3, Aesthetics, Golden Gate Park has a high level of visual quality as well as high visual sensitivity. Implementation of Mitigation Measure M-HY-8a could require drilling activities, resulting in temporary aesthetic impacts during construction due to the presence of construction equipment and vehicles. However, construction activities would be temporary and monitoring wells would not include features that would be noticeable or degrade the existing visual character or quality of the area.

- **Cultural Resources.** Implementation of Mitigation Measure M-HY-8a could require ground disturbance that could result in disturbance of previously unknown archeological resources or buried human remains. However, impacts related to cultural resources would be less than significant with implementation of Mitigation Measure M-CP-2a and M-CP-4, which include treatment procedures to be followed in the event of an accidental discovery.

- **Noise.** Implementation of Mitigation Measure M-HY-8a could temporarily increase noise levels in Golden Gate Park during construction if drilling is required. Implementation of Mitigation Measure M-NO-1 (Administrative and Source Controls) would reduce noise impacts to a less-than-significant level. Therefore, noise impacts during construction would also be less than significant.

- **Biological Resources.** Implementation of Mitigation Measure M-HY-8a could disrupt biological resources in Golden Gate Park, including tree resources, and special-status bat species. However, impacts related to biological resources would be less than significant with implementation of Mitigation Measures M-BI-1a through M-BI-1c and M-BI-3, which would ensure that sensitive species habitat is avoided and protected, and any trees removed are replaced.

- **Hydrology and Water Quality.** Implementation of Mitigation Measure M-HY-8a could require ground disturbance that could result in soil erosion and associated sedimentation as well as the use of hazardous materials, similar to other construction activities under the proposed project. However, as for the project, these impacts would be less than significant with implementation of control measures in compliance with Article 4.1 of the San Francisco Public Works Code and the SFPUC's Water Pollution Prevention Program (described in Section 5.16.2, Regulatory Framework), which would require the SFPUC to develop and implement an Erosion and Sediment Control Plan specifying measures to prevent stormwater pollution and control runoff at each site.

- **Hazards and Hazardous Materials.** Implementation of Mitigation Measure M-HY-8a could result in hazardous materials impacts from the potential release of construction-related fuels, oils and lubricants, and cleaning fluids for equipment and materials during well construction and development. However, as for the project, impacts related to construction-related hazardous materials would be less than significant with implementation of Mitigation Measures M-HZ-2a, Preconstruction Hazardous Materials Assessment; M-HZ-2b, Health and Safety Plan; and M-HZ-2c, Hazardous Materials Management Plan, specifying measures to prevent or respond to the release of hazardous materials through accidents or the routine use of chemicals.

Implementation of Mitigation Measure M-HY-8a would not result in any impacts related to the following resource areas:

- Land Use
- Population and Housing
- Transportation and Circulation
- Air Quality
- Greenhouse Gas Emissions
- Recreation
- Utilities and Service Systems
- Public Services
- Wind and Shadow
- Geology and Soils
- Mineral and Energy Resources
- Agriculture and Forest Resources

Mitigation Measure M-HY-8c, Adaptive Management Program for Seawater Intrusion, requires the SFPUC to implement the San Francisco Groundwater Supply Project in a step-wise manner, conduct monitoring of the expanded coastal monitoring network, and alter pumping as needed to prevent chloride concentrations from reaching 250 mg/L at the coastal monitoring locations.

There would be no additional construction activities required for implementation of this mitigation measure, and therefore no construction impacts would result. Impacts associated with implementation of this mitigation measure would be restricted to potential impacts on groundwater and surface water resources because the volume of pumping at one or more of the project wells could be changed if the pumping were redistributed. In this case, some wells could be pumped at a higher rate than anticipated and others could be pumped at a lower rate. Impacts related to implementation of this mitigation measure would include:

- **Well Interference.** Increased pumping at a project well as a result of redistributed pumping could cause increased well interference. Under the proposed pumping distribution, the maximum reduction in well capacity at a non-project well is predicted to be 11.2 percent at Zoo Well No. 5. However, even with the reduced capacity of 1.48 mgd, the capacity of the well would still be far greater than the estimated peak daily demand of 0.25 mgd. In addition, the reduced capacities at other non-project wells would still provide a minimum capacity that is approximately three times greater than the estimated peak daily demand, as shown in Table 5.16-10. Therefore, increased pumping at a project well would not likely result in significant well interference at any of the non-project wells in the North Westside Groundwater Basin. Impacts of this mitigation measure related to well interference would therefore be less than significant.

- **Subsidence.** Increased pumping at a project well as a result of redistributed pumping could cause increased subsidence. However, the estimated maximum subsidence based on the proposed pumping distribution is less than 60 percent of the significance threshold (3.5 inches at the Lake Merced well facility as shown in Table 5.16-11 compared to the significance threshold of 6 inches). Therefore, increased pumping, even at the well where the potential for subsidence is the greatest, would not likely result in subsidence in excess of the significance threshold for subsidence. Therefore, impacts of this mitigation measure related to subsidence would be less than significant.

- **Adverse Effects on Beneficial Uses of Lake Merced.** Increased pumping at a project well as a result of redistributed pumping under Mitigation Measure M-HY-8c could cause increased effects on water levels and associated water quality in Lake Merced. However, the SFPUC would implement Mitigation Measure M-HY-9, Lake Level Management for Lake Merced, concurrently and in conjunction with Mitigation Measure M-HY-8c. In accordance with this measure, the SFPUC would redistribute or reduce pumping should adverse effects on Lake Merced be observed. With implementation of this mitigation measure, impacts of this mitigation measure related to adverse effects on the beneficial uses Lake Merced would be less than significant.

- **Water Quality Standards.** Increased pumping at a project well as a result of redistributed pumping under Mitigation Measure M-HY-8c could increase the size of the groundwater protection zone at that well, potentially introducing new potentially contaminating activities. However, the SFPUC would implement Mitigation Measure M-HY-11, Prepare a Source Water Protection Program and Update Drinking Water Source Assessment. In accordance with this measure, the SFPUC would prepare a source water protection program that would include nonregulatory components to prevent contamination of the well facility. Implementation of this measure would reduce the impacts of this mitigation measure related to violation of water quality standards to a less-than-significant level.

- **Groundwater Depletion.** Implementation of Mitigation Measure M-HY-8c would require redistributed or reduced groundwater pumping to prevent seawater intrusion. However, the total pumping would not exceed 3.0 mgd (3,360 afy) during Phase 1 or 4.0 mgd (4,480 afy) after Phase 2 is implemented. If reduced groundwater pumping were required, less groundwater would be pumped and less groundwater depletion would occur. Therefore, impacts of this mitigation measure related to groundwater depletion would be less than significant.

Because Mitigation Measure M-HY-8c could result in temporarily reduced groundwater pumping under the project, the SFPUC may not completely fulfill the WSIP systemwide level of service objectives. However, implementation of this measure allows the SFPUC to maximize groundwater use without causing significant seawater intrusion impacts to occur.

Adverse Effects on Beneficial Uses of Lake Merced

As discussed in Impact HY-9, significant impacts related to adverse effects on the beneficial uses of Lake Merced would be reduced to a less-than-significant level with implementation of Mitigation Measure M-HY-9, Lake Level Management for Lake Merced. This mitigation measure requires the SFPUC to implement the S an Francisco Groundwater Supply Project in a step-wise manner to monitor for adverse effects before pumping at the full operational rate; continue lake-level, lake water quality, and groundwater monitoring; provide additions of supplemental water, if available, should lake levels decline below trigger levels that are protective of water quality, biological resources, and recreational resources; and/or alter pumping patterns should adverse effects on Lake Merced water levels be observed and no supplemental water source is available, or the amount of supplemental water is insufficient.

Implementation of Mitigation Measure M-HY-9 could include the addition of SFPUC system water, stormwater, or recycled water to augment lake levels in Lake Merced. Stormwater and recycled water projects that may make supplemental water supplies available in the future are undergoing environmental review (see Section 2.2.3, Other Related Projects). If SFPUC system water were used it would be discharged from the adjacent Lake Merced Pump Station.

Operational impacts associated with implementation of this mitigation measure would be restricted to potential impacts on biological resources and groundwater and surface water resources because the volume of pumping at one or more of the project wells could be changed if the pumping were redistributed, and a new water source could be added to Lake Merced. If pumping were redistributed, some wells could be pumped at a higher rate than anticipated and others could be pumped at a lower rate. Operational impacts related to implementation of this mitigation measure would include:

- **Well Interference.** Increased pumping at a project well as a result of redistributed pumping could cause increased well interference. Under the proposed pumping distribution, the maximum reduction in well capacity at a non-project well is predicted to be 11.2 percent at Zoo Well No. 5. However, even with the reduced capacity of 1.48 mgd the capacity of the well would still be far greater than the estimated peak daily demand of 0.25 mgd. In addition, the reduced capacities at other non-project wells would maintain a capacity that would be a minimum of approximately three times greater than the estimated peak daily demand as shown in Table 5.16-10. Therefore, increased pumping at a project well would not likely result in significant well interference at any of the non-project wells in the North Westside Groundwater Basin. Impacts of this mitigation measure related to well interference would therefore be less than significant.

- **Subsidence.** Increased pumping at a project well as a result of redistributed pumping could cause increased subsidence. However, the estimated maximum subsidence based on the proposed pumping distribution is less than 60 percent of the significance threshold (3.5 inches at the Lake Merced well facility as shown in Table 5.16-11 compared to the significance threshold of 6 inches). Therefore, increased pumping, even at the well where the potential for subsidence is the greatest, would not likely result in subsidence in excess of the significance threshold for subsidence. Therefore, impacts of this mitigation measure related to subsidence would be less than significant.

- **Seawater Intrusion.** Increased pumping at a project well as a result of redistributed pumping under Mitigation Measure M-HY-9 could result in an increased potential for seawater intrusion. However, the SFPUC would implement Mitigation Measure M-HY-8a, Expand Coastal Monitoring Network, Mitigation Measure M-HY-8b, Continuous Groundwater Monitoring in the Primary Production Aquifer, and Mitigation Measure M-HY-8c, Adaptive Management Program for Seawater Intrusion, to ensure that adverse effects associated with seawater intrusion do not occur. Mitigation Measure M-HY-8c, which requires an adaptive management program for seawater intrusion, would be implemented concurrently with Mitigation Measure M-HY-9. In accordance with this measure, the SFPUC would redistribute or reduce pumping should adverse effects related to seawater intrusion be observed. With implementation of the mitigation measures for seawater intrusion, impacts of this mitigation measure related to adverse effects caused by seawater intrusion would be less than significant.

- **Adverse Effects on Beneficial Uses of Lake Merced.** Addition of supplemental water to Lake Merced to maintain lake levels above trigger levels to avoid impacts on water quality, biological resources, and recreational resources could affect water quality, and therefore affect the beneficial uses of the lake. However, the discharge of supplemental water to the lake would be subject to oversight by the RWQCB, which would ensure that the water quality is sufficient to protect the beneficial uses of the lake. Therefore, there would be no adverse effects on the beneficial uses of Lake Merced as a result of supplemental water additions under this mitigation measure.

- **Water Quality Standards.** Increased pumping at a project well as a result of redistributed pumping under Mitigation Measure M-HY-9 could increase the size of the groundwater protection zone at that well, potentially introducing new potentially contaminating activities. However, the SFPUC would implement Mitigation Measure M-HY-11, Prepare a Source Water Protection Program and Update Drinking Water Source Assessment. In accordance with this measure, the SFPUC would prepare a source water protection program that would include nonregulatory components to prevent contamination of the well facility. Implementation of this measure would reduce the impacts of this mitigation measure related to violation of water quality standards to a less-than-significant level.

- **Groundwater Depletion.** Implementation of Mitigation Measure M-HY-9 would require redistributed or reduced groundwater pumping to prevent adverse effects on the beneficial uses of Lake Merced. However, the total pumping would not exceed 3.0 mgd (3,360 afy) during Phase 1 or 4.0 mgd (4,480 afy) after Phase 2 is implemented. If reduced groundwater pumping were required, less groundwater would be pumped and less groundwater depletion would occur. Therefore, impacts of this mitigation measure related to groundwater depletion would be less than significant.

Because this measure could result in temporarily reduced groundwater pumping under the project, the SFPUC may not completely fulfill the WSIP systemwide level of service objectives. However, implementation of this measure allows the SFPUC to maximize groundwater use without causing significant impacts on the beneficial uses of Lake Merced.

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5.17 Hazards and Hazardous Materials

This section evaluates the potential for the Groundwater Supply Project to result in hazardous materials impacts or in hazards related to fire, airports, or impairment of emergency response. Section 5.16, Hydrology and Water Quality, evaluates the potential for identified groundwater contamination sites to adversely affect water quality during project pumping operation or for groundwater pumping to affect remediation activities.

5.17.1 Setting

This subsection describes the project area's existing conditions related to hazards and hazardous materials. It identifies the project well facility sites and pipeline locations that could be affected by naturally occurring asbestos, wildfire hazards, and hazardous materials in soil or groundwater. The study area for each project site includes a ¼-mile buffer zone.

Definition of Hazardous Materials

A hazardous material is defined as any material that, because of quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment.[1] The term "hazardous materials" refers to both hazardous substances and hazardous wastes. Under federal and State laws, any material, including wastes, may be considered hazardous if it is specifically listed by statute as such or if it is toxic (causes adverse human health effects), ignitable (has the ability to burn), corrosive (causes severe burns or damage to materials), or reactive (causes explosions or generates toxic gases).

In some cases, past industrial or commercial activities on a site have resulted in spills or leaks of hazardous materials to the ground, resulting in soil and/or groundwater contamination. Hazardous materials may also be present in building materials and released during building demolition activities. If improperly handled, hazardous materials and wastes can cause public health hazards when released to the soil, groundwater, or air. The four basic exposure pathways through which an individual can be exposed to a hazardous material include: inhalation, ingestion, bodily contact, and injection. Exposure can come as a result of an accidental release of hazardous materials during transportation, storage, or handling. Disturbance of contaminated subsurface soil during construction can also cause exposures to workers, the public, or the environment through stockpiling, handling, or transportation of soils.

Potential Presence of Hazardous Materials in Soil and Groundwater

Information regarding the potential presence of hazardous materials in the project area is based on a review of regulatory agency lists of hazardous materials sites in the area as well as site-specific sampling and analysis performed at the proposed well facility sites.

1 State of California, Health and Safety Code, Chapter 6.95, Section 25501(o).

Regulatory Database Review

This evaluation of the potential to encounter hazardous materials in soil and groundwater at the project sites is based on federal, State, and local regulatory database reviews. Environmental Data Resources (EDR, 2010) performed database searches to identify permitted hazardous materials uses,[2] environmental cases,[3] and spill sites[4] within ¼ mile of the proposed project sites. Additional information regarding identified environmental cases was obtained from site investigation reports available from the State Water Resources Control Board (SWRCB) Geotracker website (SWRCB, 2010), as well as from the California Environmental Protection Agency (Cal-EPA) Department of Toxic Substances Control (DTSC) Envirostor online database (DTSC, 2010a), to evaluate whether documented hazardous materials releases have affected soil or groundwater quality. Facilities that are permitted to use or store hazardous waste but have not had a documented release were considered to have a low potential to affect soil and groundwater conditions at the project sites. Facilities were evaluated according to the following criteria:

1) Whether the status of the environmental case is active (indicating ongoing environmental investigation or remediation) or unknown; cases that are listed as closed, because remediation or cleanup has been completed and approved by the regulatory agency, were considered to have low potential to affect the project sites.

2) Whether soil quality has been affected at the facility; only facilities located within or immediately adjacent to a project site would have the potential to affect soil quality at the project site.

3) Whether groundwater contamination has been identified at the facility. Because groundwater plumes can migrate over greater distances, they can affect groundwater at a project site if they originate at a facility that is upgradient from the project site.

Table 5.17-1 lists the hazardous materials sites identified within ¼ mile of the project sites and their potential to have caused contamination of soil and groundwater. Soil and/or groundwater contamination, if present, could be encountered during proposed excavation, thus exposing construction workers, the public, or the environment to hazardous materials. **Figure 5.17-1** shows the location of these identified facilities.

Soil Sampling Investigations

Site-specific environmental investigations were performed to determine the potential for hazardous materials to be present at the well facility sites, as described below.

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[2] Permitted hazardous materials uses are facilities that use and/or store hazardous materials or handle hazardous wastes and that comply with current hazardous materials and hazardous waste regulations.

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

[4] Spill sites are locations where a spill has been reported to the state or federal regulatory agencies. Such spills do not always involve a release of hazardous materials.

TABLE 5.17-1
HAZARDOUS MATERIALS SITES IDENTIFIED WITHIN 1/4 MILE OF EACH PROJECT SITE

Site Name/Address	Map #	Approximate Distance from Project Site	Regulatory List	Hazardous Materials Site Summary	Potential for Contamination at Project Site
SFPUC Lake Merced Pump Station 990 Lake Merced Boulevard	–	200 feet north	Permitted UST	Permitted USTs. No reported leaks.	Low
Tosco/Unocal #3390 3701 Noriega Street at 44th Avenue	1	600 feet west	LUST	Groundwater contamination plume located downgradient of project site; contamination not reported east of 44th Avenue (Delta, 2008).	Low
Unocal Station #3243 / 76 Gas Station 3601 Lawton Street at 42nd Avenue	2	300 feet west	LUST, Permitted UST	Groundwater contamination located downgradient of project site; contamination not reported east of 42nd Avenue (Delta, 2010a).	Low
Abraham Lincoln High School Bungalow Replacement 2162 24th Avenue	3	200 feet southeast	School Investigation, UST	Potential concern regarding naturally occurring asbestos. Based on soil sampling analytical results, no further action required (DTSC, 2010b). UST closure; no reported leaks or incidents.	Low
Tosco/Unocal #0433 1200 La Playa Street at Lincoln	4	500 feet southwest	LUST, Permitted UST	Site assessment and interim remedial action is under way for groundwater contamination. Groundwater flow to northwest; facility is cross gradient of project site (Delta, 2010b).	Low
Standard Termite Control 1271 48th Avenue	5	600 feet south	UST	UST closure. No reported leaks.	Low
Private Residence 1319 47th Avenue	6	1,000 feet south	UST	UST closure 2005. No reported leaks.	Low
Chevron Service Station 4000 Irving Street	7	40 feet west	Permitted UST, Historical UST	Permitted UST. No reported leaks.	Low
Private Residence 1346 40th Avenue	8	300 feet east	Permitted UST	UST closure. No reported leaks.	Low
Residence 1295 39th Avenue	9	600 feet east	UST	UST closure in 2003. No reported leaks.	Low
Francis Scott Key Elementary School 1530 42nd Avenue	10	300 feet west	UST	UST closure. No reported leaks.	Low
A.P. Giannini Middle School 3151 Ortega Street	11	100 feet north	UST	UST closure 1993. No reported leaks.	Low
San Francisco Fire Department 1933 32nd Avenue	12	300 feet south	Permitted UST	Permitted UST. No reported leaks.	Low

TABLE 5.17-1 (Continued)
HAZARDOUS MATERIALS SITES IDENTIFIED WITHIN 1/4 MILE OF THE PROJECT SITE

Site Name/Address	Map #	Approximate Distance from Project Site	Regulatory List	Hazardous Materials Site Summary	Potential to Affect Project Site
Habelt Auto Service 3865 Irving Street	13	400 feet east	UST, Permitted UST, Historical UST	Active and closed USTs. No reported leaks.	Low
Walgreens, 3001 Taraval	14	700 feet east	RCRA SQG, FINDS	Small quantity generator of hazardous waste.	Low
St. Ignatius College Preparatory 2001 37th Avenue	15	700 feet southeast	UST	Former UST. Closed 1997.	Low
Clean Craft Cleaners 3138 Noriega Street	16	700 feet north	EDR Historical Cleaners	Former cleaners. No reported leaks.	Low
Rio Grande Service Station 3100 Noriega Street	17	700 feet north	EDR Historical Gasoline Station	Former service station. No reported leaks	Low
Various Cleaners 2427-2547 Noriega Street	18	700 feet north	EDR Historical Cleaners	Former cleaners. No reported leaks.	Low
Chevron 2301 Noriega Street	19	700 feet north	Historical UST, LUST, Permitted UST	LUST case closed. Permitted USTs onsite.	Low
Olsons Cleaners 3140 Vicente	20	700 feet north	RCRA SQG, FINDS, Dry Cleaners	Small quantity generator (SQG) of hazardous waste.	Low
Residence 1218 26th Avenue	21	1,500 feet south	UST	UST closure 2003. No reported leaks.	Low
Unocal 1700 Noriega Street	22	700 feet north	LUST, UST, RCRA SQG, HIST UST, FINDS	LUST case closed. Located cross gradient of project site.	Low

NOTES:

Regulatory Lists:
LUST (Leaking Underground Storage Tank List); Permitted UST (Permitted Underground Storage Tank); Historical UST (Historical Underground Tank Site); School Investigation Site; RCRA SQG (Small Quantity Generator); FINDS (Facility Index System); EDR Proprietary lists of Historical Cleaners and Historical Gasoline Stations.

Potential to affect project Site – Key:

Low Potential = The potential for identified hazardous materials release to affect the project site is considered to be low for one or several reasons including, but not limited to, the following:

(1) the direction of groundwater flow is away from the project site; (2) remedial action is under way or has been completed at an offsite location; (3) distance from the project site; (4) only soil was affected at the contaminated site, and the site is not located adjacent to the project site; (5) the reporting agency has determined that no further action is necessary (case closed).

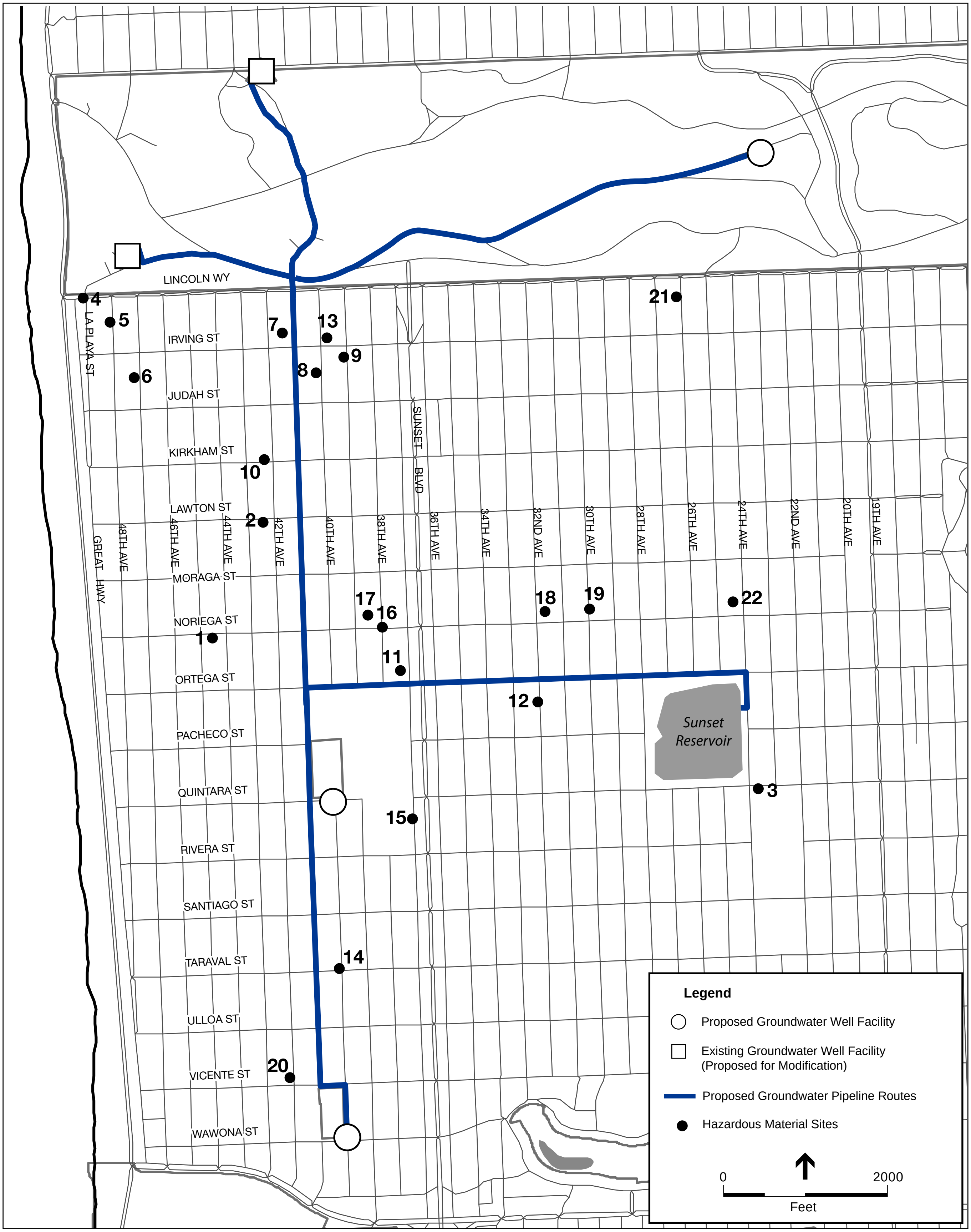
Moderate Potential = The potential for contamination to affect the project site is considered to be moderate, and further investigation might be necessary for one or several reasons including, but not limited to, the following:

(1) a hazardous materials release was reported but the remedial action status is unknown; (2) this analysis unable to confirm whether remedial action has been completed; (3) the hazardous materials release was in proximity to the project site; (4) groundwater flow is toward the project site

High Potential = The potential for contamination to affect the project site is considered to be high, and further investigation is necessary for one or several reasons, including the following:

(1) a hazardous materials release was noted onsite, and the status of the remedial action is unknown; (2) the hazardous materials release has affected groundwater that is flowing towards the project site.

SOURCES: EDR, 2010, SWRCB, 2010, DTSC, 2010.



SOURCE: SFPUC, 2010; EDR, 2010; SWRCB, 2010; DTSC, 2010

San Francisco Groundwater Supply Project EIR

Figure 5.17-1
Hazardous Material Sites Identified within 1/4-mile of Project Facilities

West Sunset, South Sunset, and Lake Merced Facility Sites

Investigators drilled soil borings to a depth of up to 10 feet and collected two soil samples per boring. Three soil borings were drilled at the West Sunset well facility site, and two soil borings each at the South Sunset and Lake Merced well facility sites. Soil samples were submitted for laboratory analysis of the following: TPH as gasoline, diesel, and oil; volatile organic compounds (VOCs); organochlorine pesticides; polychlorinated biphenyls (PCBs); and metals. Samples from the South Sunset and Lake Merced well facility sites contained low levels (less than 10 milligrams per kilogram [mg/kg]) of TPH-motor oil, and one of the samples from the West Sunset well facility site contained less than 5 mg/kg of TPH-diesel. However, all of the reported concentrations of hydrocarbons were well below the Environmental Screening Levels (ESLs) for unrestricted land use and the ESLs for construction worker exposure established by the California Regional Water Quality Control Board (RWQCB). Similarly, low levels of the pesticides DDT and DDE were detected in one sample from both the West Sunset and South Sunset well facility sites; the concentrations were well below the health-based screening standards for unrestricted land use. Metals were present in the samples at concentrations representative of naturally-occurring background levels. Based on the chemical test results, soil in the proposed construction excavation areas at these well facility sites meets all regulatory screening standards for unrestricted onsite or offsite use (Northgate Environmental Management, 2010).

North Lake Well Facility Site

Soil sampling consisted of collecting 10 soil samples from four soil borings: two shallow borings to 2 feet and two deeper borings to 10 feet. Composite and discrete soil samples were submitted for laboratory analysis of TPH as gasoline, diesel, and motor oil; organochlorine pesticides; PCBs; and Title 22 metals.[5] TPH-gasoline was not detected. TPH-diesel was reported at concentrations ranging from 2.5 to 80 mg/kg, which are below the ESLs. TPH-motor oil was reported at concentrations ranging from 14 to 550 mg/kg; two of the samples contained concentrations that exceeded the residential ESL (unrestricted use) of 370 mg/kg, but concentrations were below the ESL for commercial/industrial site use and the construction worker exposure scenarios. Organochlorine pesticides and PCBs were not detected.

Concentrations of three metals—arsenic, lead, and vanadium—in some soil samples exceeded residential ESLs and California Human Health Screening Levels (CHHSLs).[6] Arsenic concentrations (up to 4.6 mg/kg) exceeded the residential and commercial ESLs and CHHSLs but were below the construction worker exposure ESL. However, the concentrations are below the upper 99th percentile estimate of 11.0 mg/kg for background arsenic concentrations in soil within the San Francisco Bay area, as cited in a recent background arsenic study conducted for the RWQCB

5 Listed in Title 22, Chapter 11, Article 3, and Section 66261.24: Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, and Zinc. (Asbestos and fluoride are also on the list, but are not usually done. Chromium VI and III are both on list, but often only total chromium is done).

6 The Cal-EPA's CHHSLs (Cal-EPA, 2005) are concentrations of 54 hazardous chemicals in soil or soil gas that the agency considers to be below thresholds of concern for risks to human health. The CHHSLs can be used to screen sites for potential human health concerns where releases of hazardous chemicals have occurred. The presence of a chemical at concentrations in excess of a CHHSL does not indicate that adverse impacts are occurring or will occur, but suggests that further evaluation is warranted. The CHHSLs are for guidance purposes only.

(Duvergé, 2011) and it is not expected that additional site characterization or remediation would be required. Lead concentrations from one boring exceeded the residential ESL but were below the ESLs for commercial use and construction worker exposure scenarios. The results of testing using the Waste Extraction Test (WET) and Toxicity Characteristic Leaching Procedure (TCLP) for the purpose of waste classification indicated that shallow soil at and around this boring, if excavated, would be considered California non-RCRA hazardous waste (i.e., not subject to the provisions of the Resource Conservation and Recovery Act). Vanadium concentrations of 32 to 54 mg/kg exceeded the residential ESL but were well below the commercial and construction worker exposure ESLs. It is anticipated that residual concentrations of TPH and metals in soils would not be considered a human health risk after construction if the soil were removed or the construction area paved (AEW, 2011a).

In its summary cover letter to the soil investigation report, Northgate Environmental Management concluded that soil on the east side of the North Lake well facility site (near boring SB-4), from the ground surface to a depth of about 0.5 feet, contains elevated levels of lead, and recommended that shallow soil in this area be excavated and temporarily stockpiled for additional testing to determine offsite disposal requirements. Alternatively, affected soil could be isolated beneath building foundations or pavement areas during construction, pending approval from the San Francisco Department of Public Health, and soil excavation should be conducted under an appropriate health and safety plan (Northgate Environmental Management, 2011).

Central Pump Station Facility Site

At the Central Pump Station well facility site, investigators conducted four shallow soil borings and two deeper borings and collected a total of 14 soil samples. Composite and discrete soil samples were submitted for laboratory analysis of TPH as gasoline, diesel, and motor oil; organochlorine pesticides; PCBs; and Title 22 metals. TPH-diesel was reported at concentrations ranging from 14 to 540 mg/kg, in exceedance of the residential and commercial ESLs but below the ESL for construction workers. TPH-motor oil was reported at concentrations ranging from 44 to 2,400 mg/kg, in exceedance of the residential ESL but below the ESL for commercial use and construction worker exposure scenarios. No organochlorine pesticides or PCBs were detected.

The results of metals analyses showed exceedances of arsenic, lead, and vanadium that were similar to those reported above for the North Lake well facility site. Arsenic was detected at concentrations up to 4.6 mg/kg, which is below the background level for San Francisco Bay Area soils (Duvergé, 2011). Lead concentrations ranged from undetectable to 2,000 mg/kg; the shallow soil surrounding two borings would be characterized as California non-RCRA hazardous waste if excavated for disposal. Vanadium concentrations were below the ESLs for commercial use and construction worker scenarios. Similarly, it is anticipated that residual concentrations of TPH and metals in soils would not be considered a human health risk after construction if the soil were removed or the construction area paved (AEW, 2011a).

Northgate Environmental Management also concluded that soil along the proposed entrance driveway at the Central Pump Station (near borings SB-6 and SB-8) contains elevated levels of lead from the ground surface to a depth of about 2 feet. Northgate recommended that shallow soil in this area be excavated and temporarily stockpiled for additional testing to determine offsite disposal requirements or potential onsite reuse beneath building foundations or pavement areas, and indicated that soil excavation should be conducted under an appropriate health and safety plan (Northgate Environmental Management, 2011).

South Windmill Replacement Well Facility Site

At the proposed South Windmill Replacement well facility site, investigators collected four soil samples from one 12-foot soil boring and submitted the samples for laboratory analysis of TPH as gasoline, diesel, and motor oil; VOCs; semivolatile organic compounds (SVOCs); and metals. Laboratory analysis results indicated that low levels of TPH-diesel and TPH-motor oil were present (at concentrations below the ESLs); VOCs and SVOCs were not detected; and metals were not detected at concentrations exceeding the ESLs, with the exception of arsenic (which was detected at 2.1 to 2.8 mg/kg). The detected concentrations of arsenic are below the background level for San Francisco Bay Area soils (Duvergé, 2011). Based on the chemical testing results, two landfills gave preliminary approval for disposal of excavated soil as a nonhazardous waste (AEW Engineering, 2011b).

Potential Presence of Hazardous Building Materials

Demolition or renovation of older structures that contain hazardous building materials could pose a public health risk if such materials were released during project construction. Hazardous building materials include asbestos-containing materials, lead-based paint, and electrical equipment, such as transformers and fluorescent-light ballasts that contain PCBs, di (2 ethylhexyl) phthalate, or mercury vapors.

The project would demolish structures at the North Lake and South Windmill Replacement well facility sites. An asbestos-containing materials and lead-based paint survey was performed in January 2011. Fourteen samples of suspect asbestos-containing materials were collected for laboratory analysis by polarized light microscopy. No asbestos was detected in any of the samples. Up to 35 samples of paint taken from each facility were analyzed using an X-ray fluorescence spectrum analyzer. All of the samples contained detectable concentrations of lead; however, none of the concentrations exceeded the U.S. Department of Housing and Urban Development definition of lead-based paint, which is 0.5 percent by weight or 1.0 mg/square centimeter (North Tower Environmental, 2011).

Potential Presence of Naturally Occurring Asbestos

Asbestos is a common name for a group of naturally occurring silicate minerals that are made up of thin but strong, durable fibers. Asbestos is a known carcinogen and poses a public health hazard if it is present in the friable (easily crumbled) form. Naturally occurring asbestos can be associated with Franciscan ultramafic rocks containing serpentinite[7] or Franciscan mélange.[8]

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

8 Mélange is a mixture of rock materials of differing sizes and types typically contained within a sheared matrix.

Construction workers and the public could be exposed to asbestos if project-related excavation were to disturb bedrock units or fill that contain these materials.

As discussed in Section 5.15, Geology and Soils, the project area is primarily underlain by sedimentary deposits, primarily dune sands. Naturally occurring asbestos is unlikely to be present within these materials. A small area of sheared rocks derived from the Franciscan Complex near the southeastern corner of the Sunset Reservoir (Figure 5.15-1a) may contain naturally occurring asbestos; however, this area is more than 500 feet from project facilities. Subsurface sampling for naturally occurring asbestos was performed in conjunction with a bungalow replacement project at Abraham Lincoln High School at 2162 24th Avenue (Site #3 on Figure 5.17-1), near the Sunset Reservoir in the project area. Analytical testing did not detect asbestos above action levels in these samples (DTSC, 2010).

Wildfire Hazards

The California Department of Forestry and Fire Protection (CAL FIRE) is required by law to map areas of significant fire hazard based on fuels, terrain, weather, and other relevant factors (PRC 4201-4204 and Govt. Code 51175-89). Factors that increase an area's susceptibility to fire hazards include slope, vegetation type and condition, and atmospheric conditions. The CAL FIRE San Francisco County Fire Hazard Severity Zone Map does not identify any very high or high fire hazard zones in the project area (CAL FIRE, 2007).

Airports

Aviation safety hazards can result if projects are sited in the vicinity of airports. The nearest public airport to the proposed project is San Francisco International Airport, located approximately nine miles southeast of the project area in South San Francisco. There are no private airstrips in the project vicinity.

5.17.2 Regulatory Framework

The following sections summarize the federal, State, and local regulations related to hazards and hazardous waste that would apply to this project.

Federal Regulations

The U.S. Environmental Protection Agency (U.S. EPA) is the lead federal agency responsible for enforcing federal regulations regarding hazardous materials and hazardous waste. The primary legislation governing hazardous materials and hazardous waste are the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the Superfund Amendments and Reauthorization Act (SARA). For this project, RCRA would apply if contaminated soil and/or groundwater were encountered during excavation for the pipeline, well improvements, or building foundations. CERCLA and SARA apply to Superfund sites, none of which are located in the project area. The Occupational Safety and Health Administration (OSHA) is the lead agency enforcing worker and workplace safety regulations, including some applicable to hazardous materials.

Resource Conservation and Recovery Act

RCRA Subtitle C regulates the generation, transportation, treatment, storage, and disposal of hazardous waste by "large-quantity generators" (1,000 kilograms per month or more) through comprehensive life-cycle or "cradle-to-grave" tracking requirements. The requirements include maintaining inspection logs of hazardous waste storage locations, records of quantities being generated and stored, and manifests of pickups and deliveries to licensed treatment/storage/ disposal facilities. RCRA also identifies standards for treatment, storage, and disposal.

According to RCRA Subtitle C and the U.S. EPA, materials and waste are considered hazardous based on four characteristics:

- ***Ignitability.*** Ignitable wastes can create fires under certain conditions, are spontaneously combustible, or have a flash point less than 60 degrees Celsius (140 degrees Fahrenheit). Waste oils and used solvents are examples.

- ***Corrosivity.*** Corrosive wastes are acids or bases (pH less than or equal to 2, or greater than or equal to 12.5) that are capable of corroding metal containers, such as storage tanks, drums, and barrels. Battery acid is an example.

- ***Reactivity.*** Reactive wastes are unstable under normal conditions. They can cause explosions, toxic fumes, gases, or vapors when heated, compressed, or mixed with water. Lithium-sulfur batteries and explosives are examples.

- ***Toxicity.*** Toxic wastes are harmful or fatal when ingested or absorbed (e.g., contain mercury, lead, etc.).

Occupational Safety and Health Act

The federal OSHA administers the Occupational Safety and Health Act, which requires special training of handlers of hazardous materials, notification to employees who work in the vicinity of hazardous materials, and acquisition from the manufacturer of material safety data sheets, which describe the proper use of hazardous materials. The act also requires training of employees to remediate any hazardous material accidental releases.

State and Local Regulations

DTSC is primarily responsible for regulating hazardous materials in California. DTSC is responsible for managing hazardous substances and oversees the investigation and remediation of some contaminated sites. The San Francisco Bay RWQCB is primarily responsible for protecting groundwater and surface water resources from hazardous materials, and oversees the investigation and remediation of some contaminated sites. The California Occupational Safety and Health Administration (Cal-OSHA) is the lead agency enforcing worker and workplace safety regulations, including some related to hazardous materials.

Construction General Stormwater Permit (State Water Resources Control Board Order No. 2009-09-DWQ)

For stormwater discharges associated with construction activity within California, the State Water Resources Control Board has adopted the General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, Order No. 2009-0009-DWQ (Construction General Stormwater Permit) to avoid and minimize water quality impacts attributable to such activities. The Construction General Stormwater Permit became effective on July 1, 2010, and expires on September 2, 2014; it applies to all projects where construction activity disturbs one or more acres of soil. Construction activities subject to this permit include clearing, grading, and disturbances to the ground, such as stockpiling or excavation. The Construction General Stormwater Permit requires the development and implementation of a stormwater pollution prevention plan, which includes and specifies best management practices (BMPs) designed to prevent pollutants from contacting stormwater and keep all products of erosion from moving offsite into receiving waters. The Construction General Stormwater Permit applies only to those construction activities in San Francisco that would be conducted in areas served by a separate storm sewer system and would disturb one or more acres of soil. Therefore, construction activities under the proposed project would not be subject to this permit.

Construction-Related Stormwater Discharges

In accordance with the San Francisco Green Building Ordinance (Chapter 13C of the San Francisco Building Code) and SFPUC controls developed pursuant to Article 4.1 of the Public Works Code, construction projects of all sizes in San Francisco must develop and implement pollution prevention and site runoff controls, as specified in LEED® prerequisite SSp1, Construction Activity Pollution Prevention. These ordinances require development and implementation of an erosion and sediment control plan specifying measures to control erosion and prevent stormwater pollution and control runoff from construction areas. The plan must conform to any applicable requirements of the Construction General Stormwater Permit described above and must comply with stormwater management controls adopted by the SFPUC.

Specifically, the plan must include a site map showing the location and perimeter of the construction area, location of nearby storm drains and/or catch basins, existing and proposed roadways and drainage pattern within the site, and a drawing or diagram of the sediment and erosion control devices to be used on site; a visual monitoring program and a chemical monitoring program for nonvisible pollutants; and minimum BMPs. BMPs specified in the plan must address housekeeping (storage of construction materials, waste management, vehicle storage and maintenance, landscape materials, and pollutant control); non-stormwater management; erosion control; sediment control; and run-on and runoff control. Additional BMPs can be required and the SFPUC can conduct inspection of all BMPs to ensure compliance with regulatory requirements.

California Building Code

The California Building Code (CBC), which is codified in Title 24 of the California Code of Regulations (CCR), Part 2, was promulgated to safeguard the public health, safety, and general welfare by establishing minimum standards related to structural strength, egress facilities, and general building stability. The purpose of the CBC is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all building and structures within its jurisdiction. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under State law, all building standards must be centralized in Title 24, or they are not enforceable.

The CBC is based on the International Building Code (IBC), formerly known as the Uniform Building Code. The 2010 CBC is based on the 2009 IBC published by the International Code Conference. The CBC also contains necessary California amendments, which are based on reference standards obtained from various technical committees and organizations such as the American Society of Civil Engineers, the American Institute of Steel Construction, and the American Concrete Institute. American Society of Civil Engineers Minimum Design Standard 7-05 provides requirements for general structural design and includes means of determining earthquake as well as other loads (flood, snow, wind, etc.) for inclusion in building codes. The CBC provisions apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to buildings or structures throughout California.

California Hazardous Waste Control Law, California Health and Safety Code, Division 20, Chapter 6.5

The California Hazardous Waste Control Law is the basic hazardous waste statute in California, administered by DTSC. This law is similar to, but more stringent than RCRA, applying to a broader range of hazardous wastes and requiring recycling and waste reduction programs.

Hazardous materials and wastes can result in public health hazards if released to soil, groundwater, or air. Hazardous materials as defined in Section 25501(o) of the California Health and Safety Code are materials that, because of their "quantity, concentration, or physical or chemical characteristics, pose a significant present or potential hazard to human health and safety or to the environment if released to the workplace or environment." Hazardous materials have been and are commonly used in commercial, agricultural, and industrial applications, as well as to a limited extent in residential areas. Hazardous materials released from historical land uses could be encountered within the footprint of the proposed project (i.e., the underground pipeline alignment and the proposed wells).

In accordance with 22 CCR 66261.20 et seq., excavated soil would be classified as a hazardous waste if it exhibits the characteristics of ignitability, corrosivity, reactivity, or toxicity. A waste is considered toxic in accordance with 22 CCR 66261.24 if it contains:

- Total concentrations of certain substances at concentrations greater than the Total Threshold Limit Concentration (TTLC);
- Soluble concentrations greater than the Soluble Threshold Limit Concentration (STLC);
- Soluble concentrations of certain substances greater than federal toxicity regulatory levels using the Toxicity Characteristic Leaching Procedure (TCLP); or
- Specified carcinogenic substances at a single or combined concentration of 0.001 percent.

A waste is considered hazardous under State and federal regulations if the soluble concentration exceeds the federal regulatory level as determined by the TCLP. Because the TCLP involves a 20-to-1 dilution of the sample, the total concentration of a substance in the soil would need to exceed 20 times the regulatory level for the soluble concentration to exceed the regulatory level in the extract. A waste is also considered hazardous under State regulations if the soluble contaminant concentration exceeds the STLC as determined by the WET method. Because the WET is performed using a 10-to-1 dilution of the sample, the total concentration of a substance would need to exceed 10 times the STLC for the soluble concentration to exceed the STLC in the extract. A waste may also be classified as toxic if testing indicates toxicity greater than the specified criteria.

Naturally Occurring Asbestos

In 2001, the California Air Resources Board adopted the Asbestos Airborne Toxic Control Measure (Asbestos ATCM) for Construction, Grading, Quarrying, and Surface Mining Operations in areas of serpentine[9] and other ultramafic rocks[10] (17 CCR 93105), which became effective in July 2002. The ATCM protects public health and the environment by requiring the use of best available dust mitigation measures to prevent the offsite migration of asbestos-containing dust from road construction and maintenance activities, construction and grading operations, and quarrying and surface mining operations in areas of ultramafic rock, serpentine, or asbestos.[11] The Bay Area Air Quality Management District implements the regulation as Regulation 11, Rule 2.

Environmental Screening Levels

The RWQCB ESLs (RWQCB, 2008) are guidelines used to evaluate the potential risk associated with chemicals found in soil or groundwater where a release of hazardous materials has occurred. ESLs have been established for both residential and commercial/industrial land uses. Residential screening levels are the most restrictive; soil with chemical concentrations below these levels generally would not require remediation and would be suitable for unrestricted uses if disposed of offsite. Commercial/industrial screening levels are generally higher than residential screening levels because they are based on potential worker exposure to hazardous materials in the soil (and these are generally less than residential exposures). Screening levels for construction workers are also higher than for commercial/industrial workers because construction workers are only exposed to the chemical of concern during the duration of construction, while industrial workers are assumed to be exposed over a working lifetime.

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

10 Ultramafic rocks (also referred to as ultrabasic rocks) are igneous and meta-igneous rocks with very low silica content (less than 45%) and low potassium, and are composed of usually greater than 90% mafic minerals (dark colored, high magnesium and iron content). The Earth's mantle is composed of ultramafic rocks.

11 Asbestos includes several types of naturally occurring fibrous materials found in many parts of California.

California Fire Code

Pipeline construction could involve cutting and welding, using the electric-shielded arc method, of pipe sections, appurtenances, vault covers, stainless-steel ladders, and supports. The main risk in welding is to the health and safety of the welder and nearby workers from an accidental fire or unforeseen contact with hazardous materials. Workers would be required to conform with government standards, including the federal "Standard for Fire Prevention in Use of Cutting and Welding Processes" (OSHA, Title 29 of the Code of Federal Regulations [CFR], Section 1910.252[a][1]) and Cal-OSHA regulations, which require that portable fire extinguishers be maintained within 10 feet of active welding and cutting. The public would be separated from active work areas by barricades.

Chapter 14 of the California Fire Code addresses fire safety during construction and demolition, including underground activities. It specifies requirements for construction area accessibility for firefighting vehicles; storage of combustibles and flammable liquids; limitations on smoking and other potential sources of ignition; cutting, welding, and other hot work; accumulation of combustible materials including oily rags; provision of phone service at the construction site; and provision of appropriate fire protection devices. Standard SFPUC specifications for construction projects require compliance with these regulatory requirements.

California Occupational Safety and Health Act

The Cal-OSHA regulates worker safety in a manner similar to the federal OSHA but also requires an Injury and Illness Prevention Program, an employee safety program of inspections, procedures to correct unsafe conditions, employee training, and occupational safety communication. In addition, Cal-OSHA regulations indirectly protect the general public by requiring construction managers to post warnings signs, limit public access to construction areas, and obtain permits for work considered to pose a significant risk of injury, such as excavations with depth of 5 feet or greater.

Unified Hazardous Waste and Hazardous Materials Management Regulatory Program

Cal-EPA adopted regulations in 1996 to establish a Unified Hazardous Waste and Hazardous Materials Management Regulatory Program and designated local agencies called Certified Unified Program Agencies (CUPAs). These local agencies regulate hazardous substances management with respect to the following areas:

- Hazardous waste generators and hazardous waste onsite treatment
- Underground storage tanks (USTs)
- Aboveground storage tanks
- Hazardous materials release response plans and inventories (business plans), including Unified Fire Code hazardous materials management plans and inventories
- Risk management and accidental release prevention programs

The CUPA for the project area is the San Francisco Department of Public Health, Environmental Health Division.

Universal Waste Regulatory Program

California's Universal Waste Rule allows businesses to transport, handle and recycle certain common hazardous wastes, termed universal wastes, in a manner that differs from the requirements for most hazardous wastes. Universal wastes (as defined in CCR, Title 22, Division 4.5, Chapter 11, Section 66261.9) include seven categories of hazardous wastes: electronic devices; batteries; electric lamps (e.g., fluorescent tubes and lamps containing mercury); mercury-containing equipment (e.g., thermostats, switches); cathode ray tubes and glass; and non-empty aerosol cans. These items should be handled, transported and recycled in accordance with universal waste regulations (CCR Title 22, Division 4.5, Chapter 23) to ensure that they are managed safely and are not disposed of in the trash. Handling requirements include segregation and proper containment of universal wastes, proper labeling and marking, maintenance of spill cleanup kits for accidental spills, personnel training, and record-keeping. Universal wastes must be disposed at a licensed recycling facility or hazardous waste landfill.

California Fire Code

The California Fire Code, Chapters 27 through 44, includes specific requirements for the safe storage and handling of hazardous materials. These requirements reduce the potential for a release of hazardous materials and for mixing of incompatible chemicals, and specify the following specific design features to reduce the potential for a release of hazardous materials that could affect public health or the environment:

- Separation of incompatible materials with a noncombustible partition;
- Spill control in all storage, handling, and dispensing areas; and
- Separate secondary containment for each chemical storage system. The secondary containment must hold the entire contents of the tank, plus the volume of water needed to supply the fire suppression system for a period of 20 minutes in the event of a catastrophic spill.

Emergency Response

California has developed an emergency response plan to coordinate emergency services provided by federal, State, and local governments and private agencies. Response to hazardous materials incidents is one part of this plan. The plan is administered by the State Office of Emergency Services, which coordinates the responses of other agencies. The San Francisco Fire Department coordinates response to hazardous materials emergencies within the project area. Emergency response team members work with local fire and police agencies, emergency medical providers, the California Highway Patrol, California Department of Fish and Wildlife, and California Department of Transportation.

San Francisco Hazardous Waste Management Plan

The Community Safety Element – Assembly Bill 2948 (Chapter 1504, Statutes of 1986), commonly known as the Tanner Bill, authorized counties to prepare Hazardous Waste Management Plans (HWMPs). An HWMP was adopted by the City of San Francisco Board of Supervisors and approved by the Cal-EPA in 1995. The HWMP serves as the primary planning document for managing hazardous waste in San Francisco. The HWMP identifies goals, policies, and actions for effective hazardous waste management.

The San Francisco Department of Public Health, Environmental Health Division is the local agency responsible for enforcing a variety of hazardous materials management requirements. These requirements include: a) the preparation of a Hazardous Materials Certificate of Registration; b) a Hazardous Materials Business Plan for storage of hazardous materials; and c) the preparation of a risk management plan for regulated substances.

San Francisco Wastewater Discharges

Discharges of non-sewage wastewater to the combined sewer system, including groundwater produced during excavation dewatering, are subject to the permit requirements specified in Article 4.1 of the San Francisco Public Works Code and supplemented by Department of Public Works Order No. 158170. The San Francisco pollution prevention program includes requirements for BMPs to minimize the amount of pollutants carried by stormwater to the combined sewer system from industrial uses, and the CCSF conducts periodic inspections to ensure compliance. The BMP requirements also apply to discharges to separate stormwater systems, pursuant to Article 4.1.

San Francisco Emergency Management Program

The City and County of San Francisco (CCSF) Emergency Management Program is a jurisdiction-wide system that provides the CCSF with management actions for the prevention of, preparedness for, response to, and recovery from, any emergency or disaster. The Emergency Management Program includes the following plans: *Administrative Plan*; *Preparedness Plan*; *Hazard Mitigation Plan*; and *Recovery Plan* (forthcoming). The *Emergency Response Plan* (CCSF, 2010) addresses the roles and responsibilities of the CCSF during emergency situations in San Francisco and on CCSF-owned lands, including earthquakes, hurricanes, tsunamis, floods, winter storms, and acts of terrorism. The Transportation Annex (Emergency Support Function #1, Appendix B) of the *Emergency Response Plan* outlines the San Francisco Department of Public Work's priority emergency routes. The primary priority routes in the project area are: Lincoln Way, the Great Highway, Sunset Boulevard, Noriega Street, Taraval Street, Sloat Boulevard, Lake Merced Boulevard, and Brotherhood Way. Parallel priority routes include Irving Street, Judah Street, Moraga Street, Ortega Street, and Ulloa Street. The Tsunami Response Annex (CCSF, 2008) also identifies Lincoln Way, Noriega Street, Taraval Street, and Sloat Boulevard as emergency evacuation routes.

San Francisco Environment Code

The San Francisco Environment Code consolidates the City's ordinances governing protection of the environment, natural resources and sustainability. The Resource Efficiency Requirements (Chapter 7) require that all fluorescent lamps discarded by City departments shall be recycled (Section 705 (e)).

5.17.3 Impacts and Mitigation Measures

Significance Criteria

For the purposes of this EIR, the Groundwater Supply Project would have a significant hazards and hazardous materials effect if it were to:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within ¼ mile of an existing or proposed school;
- Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, create a significant hazard to the public or the environment;
- Be located within an area covered by an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, and result in a safety hazard for people residing or working in the project area;
- Be located within the vicinity of a private airstrip and result in a safety hazard for people residing or working in the project area;
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or
- Expose people or structures to a significant risk of loss, injury, or death involving fires.

Approach to Analysis

This section describes the impacts that have been screened out from further analysis and the reasons why, and describes the approach to impact analysis.

Because of the nature of the project and its physical setting, the project would not result in impacts related to the following significance criteria; these criteria are not discussed in the impact analysis for the following reasons:

- ***Be Located on a Site that is Included on a List of Hazardous Materials Sites Compiled Pursuant to Government Code Section 65962.5.*** According to the environmental database review, the project sites are not included on any lists of hazardous materials sites compiled pursuant to Government Code Section 65962.5. Therefore, this criterion is not applicable to the proposed project and is not discussed further.

- ***Be Located within an Airport Land Use Plan or in the Vicinity of a Private Airstrip.*** The project sites are not within an area covered by an airport land use plan, and are located more than two miles from any public airport or private airstrip. The nearest airport or airstrip is the San Francisco International Airport, which is approximately nine miles southeast of the project area. Therefore, the criteria related to safety hazards near airports and private airstrips are not applicable to the proposed project and are not discussed further.

- ***Expose People or Structures to a Significant Risk of Loss, Injury, or Death Involving Fires.*** According to CAL FIRE fire hazard mapping, the project sites are not within areas designated as very high or high fire hazard zones. The project sites are in an urban area that is serviced by the San Francisco Fire Department. In addition, the project would not construct any habitable structures. Therefore, this significance criterion is not applicable to the proposed project and is not discussed further.

This impact analysis focuses on potential effects related to hazards and hazardous materials in the project area. The evaluation was performed in light of current conditions at the project sites, the results of the environmental database review and site investigation reports, applicable regulations and guidelines, and project construction activities and operations. In many cases, compliance with laws, regulations, and mandatory regulatory permits requires actions that would reduce the adverse effects of the project. Should project impacts remain significant or potentially significant under CEQA even after such actions are implemented, the analysis proposes mitigation measures to reduce project impacts to less-than-significant levels.

Impact Summary

Table 5.17-2 summarizes the proposed project's hazards and hazardous materials impacts and significance determinations.

TABLE 5.17-2
SUMMARY OF IMPACTS AND SIGNIFICANCE – HAZARDS AND HAZARDOUS MATERIALS

Impacts	Significance Determinations
Impact HZ-1: Project construction would not result in a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials or result in reasonably foreseeable upset and accident conditions involving the release of hazardous construction materials to the environment.	LS
Impact HZ-2: Project construction would possibly result in a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials present in soil and groundwater.	LSM
Impact HZ-3: Project construction would not cause hazardous emissions or handle acutely hazardous materials within ¼ mile of a school.	LS
Impact HZ-4: Project construction would not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.	LS
Impact HZ-5: Project operations would not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials.	LS

TABLE 5.17-2 (Continued)
SUMMARY OF IMPACTS AND SIGNIFICANCE – HAZARDS AND HAZARDOUS MATERIALS

Impacts	Significance Determinations
Impact HZ-6: Project operations would not cause hazardous emissions or handle acutely hazardous materials within ¼ mile of a school.	LS
Impact HZ-7: Project operations would possibly impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.	LSM
Impact C-HZ: Implementation of the proposed project would possibly result in cumulatively considerable impacts related to hazards and hazardous materials.	LSM

NOTES:
LS = Less than Significant impact, no mitigation required
LSM = Less than Significant impact with Mitigation

Impact Analysis

Construction Impacts

Impact HZ-1: Project construction would not result in a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials or result in reasonably foreseeable upset and accident conditions involving the release of hazardous construction materials to the environment. (Less than Significant)

As described under Impact HY-1 of Section 5.16, Hydrology and Water Quality, the South Sunset, West Sunset, Central Pump Station, South Windmill Replacement, and North Lake well facilities, as well as all project-related pipelines, would be constructed within areas served by SFPUC's combined sewer system. The SFPUC operates a separate storm sewer system in the vicinity of the Lake Merced well facility. This separate storm sewer system is also subject to Article 4.1 of the San Francisco Public Works Code.

During construction at these sites, water quality in the combined sewer system or Lake Merced could be affected by potential spills of fuels and other construction chemicals that could be carried in stormwater runoff. However, construction activities would be subject to the requirements of San Francisco's Green Building Ordinance and Article 4.1 of the San Francisco Public Works Code (see Impact GE-2 in Section 5.15, Geology and Soils). In accordance with these ordinances and consistent with the SFPUC's Water Pollution Prevention Program, the contractor will be required to develop and implement an Erosion and Sediment Control Plan specifying measures to prevent stormwater pollution and control runoff at each site, in conformance with any applicable requirements of the state NPDES Construction Stormwater Permit and stormwater management controls adopted by the SFPUC (SFPUC, 2011a). At a minimum, the plan would contain a visual monitoring program and a chemical monitoring program for nonvisible pollutants. The plan would specify minimum BMPs related to housekeeping (storage of construction materials, waste management, vehicle storage and maintenance, landscape materials, pollutant control); and run-on and runoff control. The SFPUC would require the construction contractor to develop and implement the plan and also could conduct routine inspection of all BMPs. Implementation of these standard BMP measures in accordance with the Erosion and Sediment Control Plan would ensure that the potential impact of the use of hazardous materials during construction is less than significant.

Project construction would include the demolition, transportation, and disposal of existing structures at the North Lake and South Windmill Replacement well facility sites. Analytical testing of building materials indicated that asbestos-containing materials are not present and lead concentrations in paint are below the U.S. Department of Housing and Urban Development definition of lead-based paint. Any universal wastes, such as fluorescent lights, other mercury-containing lights and thermostats, batteries, etc., (as defined by California Code of Regulations Section 66261.9a) that may be present at existing structures to be demolished or during operation of new facilities would be removed and recycled in accordance with applicable regulations. These regulations require that handlers of universal wastes properly label, segregate and contain wastes; have available spill cleanup equipment; train workers; dispose of wastes at appropriate facilities; and, maintain records. Therefore, the potential hazard to the public or the environment related to the demolition, transportation and disposal of hazardous building materials would be less than significant.

Impact HZ-2: Project construction would possibly result in a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials present in soil and groundwater. (Less than Significant with Mitigation)

Project construction activities would involve excavating, trenching, and grading to install water pipelines and construct groundwater well facilities. If hazardous materials were present in excavated soil or groundwater, they could be released to the environment, and construction workers and the public could be exposed to contaminated soil and groundwater and chemical vapors during construction. Depending on the nature and extent of any contamination encountered, adverse health effects could result if proper precautions were not taken. Contaminated soil or groundwater could require disposal as hazardous waste.

As explained below, the potential to encounter hazardous materials in soil and groundwater at the project sites resulting from migration of offsite contamination is considered low, based on a review of environmental databases conducted during preparation of this EIR, existing groundwater levels in the project area, soil sampling results, and the maximum depth of excavation during project construction. The project sites are not listed as hazardous materials sites, as defined in Government Code Section 65962.5. Information obtained from the site investigation reports reviewed for the active environmental cases described in Table 5.17-1 and the geotechnical engineering reports discussed in Section 5.15, Geology and Soils, indicate that groundwater levels are generally deeper than 20 feet below ground surface and that the groundwater flow direction is generally to the northwest and west. In addition, as described in Section 5.16, Hydrology and Water Quality, groundwater levels are as shallow as 14 to 15 feet below ground surface at the far western edge of Golden Gate Park. At the Lake Merced well facility site, groundwater was measured at depths between 19.5 and 14.5 feet below ground surface but excavation would mostly extend up to 8 feet. Because excavations would not extend deeper than approximately 14 feet,[12] it is unlikely that groundwater would be encountered during project construction. Furthermore, the environmental database review did not identify any contaminated groundwater sites within approximately ¼ mile upgradient of the proposed pipeline alignments and well facilities. Therefore, it is unlikely that contaminated soil or groundwater originating from offsite sources would be encountered during project construction.

Naturally occurring asbestos is a hazardous material that could be encountered during excavation and trenching in the project vicinity. Geologic mapping shows a small area of sheared rocks derived from the Franciscan Complex that may contain naturally occurring asbestos; this area is located near the southeast corner of the Sunset Reservoir (see Section 5.15, Figure 5.15-1a). Pipeline trenching would not occur in this area; therefore, it is not expected that naturally occurring asbestos would be encountered.

Site-specific soil sampling was conducted to determine whether hazardous materials are present at the six proposed well facility locations. In general, TPH as diesel and/or motor oil was detected in soil at each facility; however, the concentrations of these substances were below the health-based screening levels for construction worker exposure and commercial land use, as well as below hazardous waste criteria. PCBs were not detected at any of the well facility sites. Low levels of pesticides were detected at the West Sunset and South Sunset well facility sites. Metals concentrations—in particular, arsenic, lead, and vanadium—were considered to be within the range of background levels and were below screening levels and hazardous waste criteria, with the exception of lead concentrations in shallow soil at the proposed North Lake and Central Pump Station well facility sites. At these two well facility sites, excavation, segregation, and additional characterization of small areas of affected soil would be needed to determine offsite disposal or onsite reuse options.

The potential hazard to construction workers and/or the environment from exposure to known elevated lead levels in soil at the North Lake and Central Pump Station well facility sites would be potentially significant. In addition, although the potential to encounter hazardous materials in soil or groundwater arising from offsite sources is low, site conditions could change prior to construction if new contaminated sites are identified in the project vicinity or if there are substantial changes in the extent of contamination at known release sites. This potential hazardous materials impact could also be significant at other proposed well facility sites within the project area. However, this potential impact would be reduced to a less-than-significant level with implementation of **Mitigation Measures M-HZ-2a through 2c, Preconstruction Hazardous Materials Assessment, Health and Safety Plan, and Hazardous Materials Management Plan**, because these measures require: (1) a preconstruction hazardous materials assessment within three months of construction to identify new hazardous materials sites or substantial changes in

[12] As described in Chapter 3, Project Description, the proposed pipeline trench excavation depth is 6 feet. Auger borings could extend to 12 feet under Judah and Taraval streets. Construction of the West Sunset and South Sunset well facilities would require excavations of up to 14 feet into the adjacent slopes.

the extent of contamination at known groundwater contamination sites that could affect subsurface conditions at the project sites; (2) preparation of a site health and safety plan to protect construction worker health and safety; and (3) a hazardous materials management plan to ensure that appropriate procedures are followed in the event that hazardous materials, including unanticipated hazardous materials, are encountered during project construction, and to ensure that hazardous materials are transported and disposed of in a safe and lawful manner.

Mitigation Measures

Mitigation Measure M-HZ-2a: Preconstruction Hazardous Materials Assessment. Within three months prior to construction, the SFPUC shall retain a qualified environmental professional to conduct a regulatory agency database review to update and identify hazardous materials sites within ¼ mile of the project sites and to review appropriate standard information sources to determine the potential for soil or groundwater contamination at the project sites. Should this review indicate a high likelihood of encountering contamination at the project sites, follow-up sampling shall be conducted to characterize soil and groundwater quality prior to construction to provide necessary data for the site health and safety plan (Mitigation Measure M-HZ-2b) and hazardous materials management plan (Mitigation Measure M-HZ-2c). If needed, site investigations or remedial activities shall be performed at the project site in accordance with applicable laws.

Mitigation Measure M-HZ-2b: Health and Safety Plan. The construction contractor shall, prior to construction, prepare a site-specific health and safety plan in accordance with federal OSHA regulations (29 CFR 1910.120) and Cal-OSHA regulations (8 CCR Title 8, Section 5192) to address worker health and safety issues during construction. The health and safety plan shall identify the potentially present chemicals, health and safety hazards associated with those chemicals, all required measures to protect construction workers and the general public from exposure to harmful levels of any chemicals identified at the site (including engineering controls, monitoring, and security measures to prevent unauthorized entry to the work area), appropriate personal protective equipment, and emergency response procedures. The health and safety plan shall designate qualified individuals responsible for implementing the plan and for directing subsequent procedures in the event that unanticipated contamination is encountered. The plan shall include requirements for management of soil on the east side of the North Lake well facility site (near boring SB-4), from the ground surface to a depth of about 0.5 feet, that contains elevated levels of lead: shallow soil in this area shall be excavated and temporarily stockpiled for additional testing to determine offsite disposal requirements. Alternatively, affected soil shall be isolated beneath building foundations or pavement areas during construction, pending approval from the San Francisco Department of Public Health.

Mitigation Measure M-HZ-2c: Hazardous Materials Management Plan. The contractor shall, prior to construction, prepare a hazardous materials management plan that specifies the method for handling and disposal of contaminated soil and building debris, should any be encountered during construction. Contract specifications shall mandate full compliance with all applicable local, State, and federal regulations related to identifying, transporting, and disposing of hazardous materials, including those encountered in excavated soil, and demolition debris. The contractor shall provide the SFPUC with copies of hazardous waste manifests documenting that disposal of all hazardous materials has been performed in accordance with the law.

Impact HZ-3: Project construction would not cause hazardous emissions or handle acutely hazardous materials within ¼ mile of a school. (Less than Significant)

As shown in Table 5.13-2 (see Section 5.13, Public Services), 13 schools are within approximately ¼ mile of the project sites. Vehicles and equipment used during project construction would cause emissions of diesel particulate matter and hazardous materials would be used.

Hazardous air emissions are toxic air contaminants identified by the California Air Resources Board and the Bay Area Air Quality Management District. Diesel particulate matter, a toxic air contaminant, would be emitted during project construction. However, based on a construction health risk assessment (as discussed in Section 5.8, Air Quality, Impact AQ-2), child receptors at the nearest school would be exposed to an incremental cancer risk of 0.59 in 1 million from project-related construction activities, which is well below the significance threshold of 10 in 1 million. Therefore, the impacts related to hazardous air emissions would be less than significant.

During construction, hazardous materials could be used or stored near a school. Hazardous materials typically used for project construction include fuels, lubricants, hydraulic fluids, paints, and solvents, none of which are considered extremely hazardous materials.[13] These types of hazardous materials are commonly used throughout the project area at gasoline stations, dry cleaners, and other construction areas. Although construction activities could result in the inadvertent release of small quantities of hazardous construction chemicals, a spill or release at a project construction area is not expected to endanger individuals at nearby schools given the nature of the materials, the small quantities that would be used, and the standard BMPs that would be implemented under the required erosion and Sediment Control Plan in order to contain such a release. Therefore, the potential impact related to the use of hazardous materials at the project sites during construction would be less than significant.

Impact HZ-4: Project construction would not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. (Less than Significant)

The *CCSF Emergency Response Plan* identifies primary evacuation routes in the project area. The proposed pipeline would cross several of these evacuation routes, such as Lincoln Way, Noriega Street, Taraval Street, and Sunset Boulevard. Five nearby east-west parallel routes are also identified as alternate routes, including Irving, Judah, Moraga, Ortega, and Ulloa Streets. Project construction could interfere with implementation of the *CCSF Emergency Response Plan* if construction activities were to interfere with identified evacuation routes, otherwise restrict access for emergency response vehicles, or restrict access to critical facilities such as hospitals or fire stations. As discussed in Section 5.6, Transportation and Circulation, pipeline construction could affect the availability of travel lanes when construction occurs within or adjacent to public roadways. Construction at various project sites could require temporary alternating one-way

[13] Acutely and extremely hazardous materials are defined in Title 22 CCR Section 66261.110 and 66261.113.

traffic flow adjacent to the work zone, temporary partial and/or full road closures, and could also affect access to adjacent land uses by emergency service providers. If construction of a pipeline segment were to potentially interfere with any nearby primary evacuation routes, numerous alternate parallel routes would be available, as pipeline construction would only occur within one city block at a time. Preparation of a Construction Management Plan, as described in Section 5.6, Transportation and Circulation, would address localized construction effects (such as increased traffic and the need for coordination with emergency response providers) prior to construction to minimize construction-related disruptions. The construction management plan would be reviewed by the multi-agency Transportation Advisory Staff Committee. Due to the short duration and limited magnitude of traffic disruptions, and required coordination and review of the project's construction management plan, construction would not likely interfere with the *CCSF Emergency Response Plan*. Therefore, this potential impact would be less than significant.

Facility Siting, Operations, and Maintenance Impacts

Impact HZ-5: Project operations would not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials. (Less than Significant)

Project operations would involve the use of sodium hypochlorite (similar to bleach) for disinfection of groundwater at the Lake Merced and West Sunset well facilities. Sodium hypochlorite would be stored in one aboveground storage tank at the Lake Merced well facility and in two aboveground storage tanks at the West Sunset facility. Sodium hydroxide would be stored in one aboveground storage tank each at the Lake Merced well facility and Sunset Reservoir for pH adjustment treatment. As required by the California Fire Code and Health and Safety Code regulations, these tanks would be equipped with appropriate spill containment basins inside the chemical storage room, and project personnel would be trained to handle these materials in a safe manner to avoid inadvertent releases. In addition, feeder piping would also be installed within a secondary containment pipe, further limiting the potential for releases of these materials. Numerous laws and regulations (see Section 5.17.2, Regulatory Framework) ensure the safe transportation, use, storage, and disposal of hazardous materials. Routine transport of hazardous materials to and from project sites could result in an incremental increase in a potential accident; however, the California Department of Transportation and California Highway Patrol regulate the transportation of hazardous materials and wastes, including container and packaging requirements, as well as licensing and training for truck operators, chemical handlers, and hazardous waste haulers. Because the SFPUC and all service providers would be required to comply with existing and future hazardous materials laws and regulations for transporting, using, and disposing of hazardous materials, the impacts associated with the potential for operation of the project to create a significant hazard to the public or the environment would be less than significant.

Impact HZ-6: Project operations would not cause hazardous emissions or handle acutely hazardous materials within ¼ mile of a school. (Less than Significant)

Project operation would involve the use of sodium hypochlorite at the Lake Merced and West Sunset well facilities and sodium hydroxide at the Lake Merced and Sunset Reservoir facilities. The West Sunset well facility is within ¼ mile of two schools, Sunset Elementary and Saint Ignatius College Preparatory; the Lake Merced well facility is within ¼ mile of Holy Trinity School; and the Sunset Reservoir is within ¼ mile of Abraham Lincoln High School. As discussed above under Impact HZ-5, sodium hypochlorite and sodium hydroxide would be stored in tanks inside the chemical storage building and used in small doses to disinfect groundwater or adjust the pH. The tanks and pipelines would have secondary containment to minimize the potential for releases. Since this process would occur within a closed system, use of these chemicals would not result in hazardous emissions or releases with the potential to affect students at the nearby schools. Therefore, given the SFPUC's required compliance with hazardous materials storage and handling regulations, the potential impact of hazardous materials use within ¼ mile of schools during project operation would be less than significant.

Impact HZ-7: Project operations would possibly impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. (Less than Significant with Mitigation)

Project operations would involve routine maintenance of groundwater facilities. A facility operator would make daily visits to each of the groundwater well facilities. Chemicals would also be delivered occasionally, as needed, to the facilities. Regardless, vehicular traffic to the project sites would not increase such that it could impair or interfere with an adopted emergency response or evacuation plan.

As discussed in Section 5.16 (Hydrology and Water Quality), project operations associated with groundwater pumping would result in the lowering of the estimated mean monthly Lake Merced lake level. Because the project would result in lowering of Lake Merced water levels, there is the potential for the project to result in a smaller volume of water in the lake. The SFPUC maintains Lake Merced as a nonpotable emergency water supply for the city to be used for firefighting or sanitation purposes if no other sources of water are available (SFPUC, 2011b). In the event of a major disaster (i.e., catastrophic earthquake), Lake Merced water could be pumped into the city's drinking water distribution system to maintain firefighting, basic sanitary (i.e., toilet flushing), and other critical needs, as part of the emergency response. Decreased lake levels could result in less available water for firefighting and sanitation purposes, which would be considered a significant impact.

Mitigation Measure M-HY-9, Lake Level Management for Lake Merced (see Section 5.16, Hydrology and Water Quality) requires the SFPUC to implement lake level management procedures to maintain Lake Merced at water levels similar to conditions predicted to occur without the project. These corrective actions include the addition of supplemental water and/or alteration of pumping pattern. Therefore, with implementation of Mitigation Measure M-HY-9, Lake Merced would be maintained at conditions similar to that which would be expected without project-related pumping. No additional hazards and hazardous materials-specific mitigation is required.

Mitigation Measures

Mitigation Measure M-HY-9: Lake Level Management for Lake Merced. (see Section 5.16, Hydrology and Water Quality, for description)

Cumulative Impacts

Impact C-HZ: Implementation of the proposed project would possibly result in cumulatively considerable impacts related to hazards and hazardous materials. (Less than Significant with Mitigation)

The geographic scope for the analysis of cumulative impacts associated with hazards and hazardous materials encompasses the project sites and general vicinity. Section 5.1.4, Cumulative Impacts, describes the approach to the cumulative analysis used throughout this EIR. The analysis of potential cumulative impacts related to hazards and hazardous materials considers the cumulative projects listed in Table 5.1-6 and shown in Figure 5.1-1.

Hazardous Materials in Soil

With respect to hazardous materials in the environment, effects are generally limited to site-specific conditions and depend on past, present, and future industrial uses and existing soil and groundwater conditions. Several other projects listed in Table 5.1-6, including the adjacent Lake Merced Pump Station Project, would also use hazardous materials during construction. However, during construction of the proposed project, and as discussed in Impact HZ-1, the contractor would be required to implement an Erosion and Sediment Control Plan, subject to SFPUC approval, that would specify appropriate methods for storing hazardous materials, preventing spills, inspecting for hazardous conditions, and reporting. Because the cumulative projects listed in Table 5.1-6 would be subject to similar federal, State, and local requirements as discussed above in Section 5.17.2, Regulatory Framework, potential cumulative impacts related to use of hazardous materials during construction would be less than significant.

Use of Hazardous Materials

Accidental spills of small quantities of hazardous materials during construction (i.e., motor fuels, oils, solvents, lubricants) could expose the public or the environment to such substances. The project would be required to adhere to all applicable regulations regarding hazardous materials storage and handling, as well as to implement all construction BMPs to prevent such a release and to promptly contain and clean up any spills. Similarly, the storage and handling of chemicals for project operations would be subject to regulations that would minimize the potential for harmful exposures. With compliance with existing laws and regulations discussed above in Section 5.17.2, Regulatory Framework, the project's impact would be less than significant. Construction and operation of cumulative projects in the project area vicinity would also involve the use of hazardous materials and could result in accidental releases of these materials. None of the planned projects listed in Table 5.1-6 are industrial in nature, and none are expected to use large quantities of hazardous materials. Therefore, potential impacts related to reasonably foreseeable upset and accident conditions involving a release of hazardous materials at the cumulative project areas are likewise anticipated to be less than significant. Although the potential exists for releases to occur in connection with the Groundwater Supply Project and other cumulative projects, there is no way of predicting whether any such releases would occur. Further, the likelihood that more than one of the cumulative projects would have a substantial hazardous materials release that affects the same area within the same temporal period is low. Therefore, the effects of the Groundwater Supply Project in combination with those of other planned projects would not result in a significant cumulative hazardous materials impact.

Several of the projects listed in Table 5.1-6 would be constructed near existing schools. None of the planned projects is industrial in nature, nor would any of the planned projects emit hazardous materials during operation. As discussed above, hazardous materials would be used during construction and operation of the Groundwater Supply Project and other planned projects; however, the combined effects of these projects would not result in a significant cumulative impact related to a release of hazardous materials, including releases that could affect nearby schools, given that none of the projects would use large quantities of hazardous materials and all are required to comply with laws and regulations intended to ensure the safe handling, storage and disposal of hazardous materials.

Emergency Response

Project construction activities could require temporary partial and/or full lane closures and alternating one-way traffic flow adjacent to the work zone, which could interfere with evacuation routes identified in the *CCSF Emergency Response Plan*. This potential impact would be less than significant because numerous alternate parallel evacuation routes exist within one block of the primary routes, and the project's Construction Management Plan would require coordination with emergency response providers prior to construction. Construction of other planned projects in the vicinity during the same time period could cause a cumulative impact with respect to emergency response/evacuation routes if these projects were to cause closures of additional roads in the project vicinity that could be used as alternate evacuation routes. Two of the projects listed in Table 5.1-6 are scheduled for construction during the same time period in the vicinity of the Groundwater Supply Project: the Beach Chalet Athletic Fields Renovation and the San Francisco Westside Recycled Water Project. Neither of these projects would cause closures of additional roads in the project vicinity that could be used as alternate evacuation routes; therefore, construction of the proposed project, in combination with the other planned projects, would not cause a significant cumulative hazards impact.

Project operations would require up to one daily vehicle trip by a facility operator, which is expected to have a negligible effect on local area roadways; therefore, operation of the project in combination with other cumulative projects would not cause a significant cumulative hazards impact related to the impairment of emergency response.

- Specific additional proposed and existing projects that would affect lake levels were considered in the Lake Merced operational cumulative analysis. As described in greater detail in Section 5.1.5, Overview of Groundwater Modeling Approach, these include the SFPUC's proposed Regional Groundwater Storage and Recovery Project and Daly City's proposed Vista Grande Drainage Basin Improvement Project. The former would affect Lake Merced water surface elevations most directly through groundwater pumping and non-pumping periods, and the latter through direct hydrologic input of stormwater and baseflow from the Vista Grande Canal to the lake. With operation of the identified cumulative projects, the estimated Lake Merced water levels are expected to mostly be higher than under modeled existing conditions (i.e., those that are projected to occur without operation of the cumulative projects). However, during some dry years, Lake Merced water levels are predicted to be less than those that would occur without operation of the cumulative projects (source). In the event of a major disaster (i.e., catastrophic earthquake), Lake Merced water could be pumped into the city's drinking water distribution system to maintain firefighting, basic sanitary (i.e., toilet flushing), and other critical needs. Decreased lake levels could result in less available water for firefighting and sanitation purposes, thereby resulting in a significant cumulative impact. However, similar to the project-specific impact, the project's contribution to this impact would be reduced to a less-than-cumulatively considerable (less-than-significant) level with implementation of Mitigation Measure M-HY-9, Lake Level Management for Lake Merced, which requires the SFPUC to implement lake level management procedures to maintain Lake Merced at water levels similar to conditions that are predicted to occur without the project. Therefore, Lake Merced would be maintained at conditions similar to those expected without project-related pumping. As a result, the Groundwater Supply Project's contribution to significant cumulative hazards impact related to reliance on Lake Merced water in an emergency would not be cumulatively considerable.

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5.18 Mineral and Energy Resources

Mineral resources include sand, clay, gravel and rock deposits that could be located within the project area. In general, energy resources include fuel, electricity, and water that would be used during construction and operation of the project. This section analyzes the Groundwater Supply Project's potential impacts on mineral and energy resources and the potential for project implementation to adversely affect these resources.

5.18.1 Setting

Mineral Resources

In accordance with the Surface Mining and Reclamation Act of 1975 (discussed below in Section 5.18.2), the California Department of Conservation, Division of Mines and Geology, currently known as the California Geological Survey (CGS), has mapped nonfuel mineral resources of the State to show where economically significant mineral deposits are either present or likely to occur based on the best available scientific data. These resources have been mapped using the California Mineral Land Classification System, which includes the following four Mineral Resource Zones (MRZs):

- ***MRZ-1.*** Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
- ***MRZ-2.*** Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood exists for their presence.
- ***MRZ-3.*** Areas containing mineral deposits, the significance of which cannot be evaluated.
- ***MRZ-4.*** Areas where available information is inadequate for assignment to any other zone.

The northern portion of the project area is mapped as MRZ-3 and the southern portion of the project area (including the Lake Merced well facility site) is mapped as MRZ-1 (CDMG, 1987; CDC, 1996). However, the *San Francisco General Plan* does not discuss mineral resources because no mineral deposits or other mineral resources have been found nor has the significance of any mineral deposits been adequately evaluated in the city of San Francisco (CCSF, 1988).

Energy

California's Electricity Supply

California's electricity is supplied by a number of sources, including natural gas (45.7 percent), coal (18.2 percent), large hydroelectric plants (11 percent), and nuclear (14.4 percent) (CEC, 2011). The remaining 10.6 percent is classified as renewable energy, which is supplied by geothermal, biomass, small hydroelectric, wind, and solar sources.

In 2002, California imposed a requirement that companies supplying electrical power in the State must increase procurement of eligible renewable energy resources by at least 1 percent per year so that 20 percent of their retail sales are obtained from renewable resources by 2017 (Public Utilities Code, Section 399.15). Publicly owned utilities have been asked to consider establishing a similar target. This requirement was revised by Executive Order S-14-08, which requires all retail sellers of electricity in California to serve 33 percent of their electrical load from renewable energy sources by 2020.

San Francisco Public Utilities Commission

The SFPUC provides a long-term annual average of 1.7 billion kilowatt-hours (kWh) of electrical power, which is generated by the SFPUC's hydroelectric facilities in the Hetch Hetchy system. The system includes 150 miles of high-voltage transmission lines that carry this power from the SFPUC power generation facilities on the Tuolumne River to Newark, where the Hetch Hetchy power system is linked to California's electricity grid. The SFPUC provides electricity to its facilities in the Sunol Valley as well as to all City and County of San Francisco (CCSF) facilities, San Francisco International Airport, Norris Industries (a federal defense contractor), and the Modesto and Turlock Irrigation Districts (for municipal and agricultural water supply pumping). Although the quantity of power that the SFPUC produces exceeds the CCSF's municipal power needs on an annual basis, the CCSF must supplement its power sources to meet municipal demand and its contractual obligations during the summer and fall months when power generation is reduced so that water can be stored.

Pacific Gas and Electric Company

Pacific Gas and Electric Company (PG&E) supplies natural gas and electricity to most of northern California. PG&E produces and purchases electricity from both renewable and nonrenewable resources, with power derived from fossil fuels, nuclear, and hydroelectric sources. In 2006, PG&E's power came from the following sources: 44 percent from hydroelectric sources, 54 percent from the Diablo Canyon nuclear plant, and 2 percent from fossil fuels. This portfolio supplied about 40 percent of the power provided by PG&E, with the remainder procured from outside sources or transmitted on behalf of the California Department of Water Resources (DWR). PG&E provides the SFPUC Power Enterprise with transmission and distribution services west of Newark, pursuant to an interconnection agreement regulated by the Federal Energy Regulatory Commission (PG&E, 2011). Under this agreement, PG&E transmits and distributes electricity to SFPUC Power Enterprise customers, which would include the proposed Groundwater Water Supply Project facilities.

Current Energy Use

The SFPUC Power Enterprise (through connections with PG&E) provides power to SFPUC water supply facilities in the San Francisco region. The SFPUC's current power usage in the San Francisco region is 13,882,397 kWh per year, or 0.8 percent of the long-term annual average production rate of the Hetch Hetchy system (San Francisco Planning Department, 2008). In 2009, the annual energy demand by PG&E customers in San Francisco was 5.55 billion kWh (CEC, 2011).

5.18.2 Regulatory Framework

Federal Regulations

No federal regulations governing mineral and energy resources apply to the Groundwater Supply Project.

State Regulations

Surface Mining and Reclamation Act of 1975

The Surface Mining and Reclamation Act (SMARA) of 1975 (Chapter 9, Division 2, Section 2710 et seq. of the Public Resources Code) requires the State Mining and Geology Board to adopt state policies for reclaiming mined lands and conserving mineral resources. Title 24 of the California Code of Regulations, Division 2, Chapter 8, Subchapter 1 contains these policies.

In accordance with SMARA, the State has established the California Mineral Land Classification System to help identify and protect mineral resources in areas that are subject to urban expansion or other irreversible land uses that would preclude mineral extraction. Protected mineral resources include construction materials, industrial and chemical mineral materials, metallic and rare minerals, and nonfluid mineral fuels. No known mineral resources pursuant to SMARA were identified in or adjacent to the project area (CDMG, 1987).

California Energy Action Plan

California's *2008 Energy Action Plan Update* updates the *2005 Energy Action Plan II,* which is the State's principal energy planning and policy document (CPUC and CEC, 2008). The plan maintains the goals of the original *Energy Action Plan*, describes a coordinated implementation plan for state energy policies, and identifies specific action areas to ensure that California's energy is adequate, affordable, technologically advanced, and environmentally sound. First-priority actions to address California's increasing energy demands are to promote energy efficiency, demand response (i.e., reducing customer energy usage during peak periods to address power system reliability and support the best use of energy infrastructure), and use of renewable power sources. To the extent that these strategies are unable to satisfy increasing energy and capacity needs, the plan supports clean and efficient fossil-fuel fired generation.

Building Energy-Efficiency Standards

The Energy Efficiency Standards for Residential and Nonresidential Buildings specified in Title 24, Part 6 of the California Code of Regulations were established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow for consideration and possible incorporation of new energy-efficiency technologies and methods. The California Energy Commission adopted an update to its standards in 2008, and the new standards became effective on January 1, 2010. California's building energy-efficiency standards (along with those for energy-efficient appliances) have saved more than $56 billion in electricity and natural gas costs since 1978, and will save an additional estimated $23 billion by 2013 (CEC, 2008).

Local Plans and Policies

Sustainability Plan for San Francisco

The *Sustainability Plan for San Francisco* contains a set of general goals and specific objectives and actions for San Francisco to ensure that the city's current energy needs are met without sacrificing the ability of future generations to meet their own needs (SFDE, 1996). The major energy goals expressed in the plan are to reduce overall power use by maximizing energy efficiency; to maintain an energy supply based on renewable, environmentally sound resources; to eliminate climate-changing and ozone-depleting emissions and toxic contaminants associated with energy production and use; and to base energy decisions on the goal of creating a sustainable society.

The plan includes the following goals: develop energy-efficiency requirements that exceed Title 24 standards by 25 percent, provide every building with a renewable energy provider, retrofit mechanically cooled buildings with passive cooling, provide a reliable energy supply system even in times of natural or economic disaster, and install alternative fuels for backup of electrical systems in critical buildings.

Electricity Resource Plan

The *Electricity Resource Plan* for San Francisco is an action plan to meet the growth in electricity demand for electricity and to facilitate the shutdown of the Hunters Point power plant and replacement of the aging power plants at Potrero (SFDE and SFPUC, 2002). The plan's main components include demand reduction through energy efficiency and load management; use of renewable energy resources; construction of medium-sized generation plants using the most efficient gas-fired generators and cogeneration plants; construction of small-scale distributed generation such as fuel cells, package cogeneration plants, and microturbines; and improved power transmission from the Peninsula. The plan calls for a renewed commitment and an accelerated pace to achieving the goals of the *1997 Sustainability Plan*, including the elimination of all fossil-fuel power; an energy supply based on renewable, environmentally sound resources; and maximum energy efficiency. The *Electricity Resource Plan* identifies specific energy savings and production goals for each of its components.

SFPUC Strategic Sustainability Plan

The SFPUC's 2011 *Strategic Sustainability Plan* provides a framework for planning, managing and evaluating SFPUC-wide performance that takes into account the long-term economic, environmental and social impacts of the SFPUC's business activities. This plan consists of a "Durable Section", which contains goals, objectives, and performance indicators to implement SFPUC's vision and values. The goals and objectives are then used to drive the "Dynamic Section" of the *Sustainability Plan*, which contains specific actions, targets, measures and budgeting. The SFPUC utilizes this document to evaluate its performance semi-annually, to provide an annual score card, and to help the SFPUC measure progress on an annual basis (SFPUC, 2011).

San Francisco Building Code 13C

In 2008, San Francisco implemented its green building ordinance (San Francisco Building Code 13C) for newly constructed residential and commercial buildings, and major renovations to existing buildings. Chapter 13C of the San Francisco Building Code combines the mandatory elements of the 2010 California Green Building Standards Code (Title 24 Part 11) and stricter local requirements into one chapter. San Francisco Building Code 13C requires green building standards to be met by all newly constructed buildings (of any size or occupancy), as well as renovations to areas over 25,000 square feet in existing buildings that are undergoing major structural upgrades and mechanical, electrical or plumbing upgrades (SFDBI, 2012).

5.18.3 Impacts and Mitigation Measures

Significance Criteria

For the purposes of this EIR, the Groundwater Supply Project would have a significant effect on mineral and energy resources if it were to:

- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state;
- Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan; or
- Encourage activities that result in the use of large amounts of fuel, water, or energy, or use these resources in a wasteful manner.

Approach to Analysis

Because of the nature of the proposed project, it would have no impacts related to the following significance criteria; therefore, this section does not discuss impacts for these topics for the reasons described below:

- ***Result in the Loss of Availability of a Mineral Resource of Value to the Region or State.*** The proposed project is not located within a significant mineral, oil, or gas resource area, and therefore would not result in the loss of known mineral resources or make such resources inaccessible. Therefore, this significance criterion would not be applicable to the proposed project.
- ***Result in the Loss of Availability of a Locally Important Mineral Resource Recovery Site.*** The proposed project is not located within a significant mineral, oil, or gas resource area, and therefore would not result in the loss of a locally important mineral resource recovery site. Therefore, this significance criterion is not applicable to the proposed project.

This impact analysis therefore focuses on the potential for the proposed project to result in a substantial increase in energy demand and/or wasteful use of energy during project construction and project operations. This analysis also discusses the extent to which construction activities would be conducted to minimize the use of fuels and ensure that fuels are not used in a wasteful manner.

With respect to water usage, construction of the proposed facilities would require the use of some water for dust control and revegetation purposes but this usage would be incidental to these specific construction activities such that it would not result in a wasteful or large use of water. Operation of the well facilities would include new water service connections at the Lake Merced and West Sunset well facilities, which include chemical rooms containing an eye wash/shower and sink. However, because the eye wash/showers and sinks would be used for worker safety purposes, operation of these facilities would be infrequent and would not consume a substantial amount of water or encourage the wasteful use of water. Also, as described in Section 3.5.1, Operations, operation of the well facilities would require that the initial volume of water pumped from each well upon startup be discharged rather than directed into the water supply. This initial pumping, referred to as "overboard pumping," would automatically occur for one to five minutes each time a well has been shut down and needs to be restarted. The purpose of overboard pumping is to prevent groundwater that might contain minor amounts of sand/or suspended sediment from entering the water supply, which would not be a wasteful use of water. Thus, because the proposed project would not result in the wasteful use of water or encourage activities that use large amounts of water, this section does not discuss water usage further.

Impact Summary

Table 5.18-1 summarizes the potential mineral and energy resource impacts associated with implementation of the Groundwater Supply Project.

TABLE 5.18-1
SUMMARY OF IMPACTS – MINERAL AND ENERGY RESOURCES

Impacts	Significance Determinations
Impact ME-1: Project construction would not result in substantial adverse effects related to the use of large amounts of fuel or energy, or the use of these resources in a wasteful manner.	LS
Impact ME-2: Project operations would not result in substantial adverse effects related to the long-term use of large amounts of fuel or energy, or the use of these resources in a wasteful manner.	LS
Impact C-ME: Project implementation would not result in cumulatively considerable impacts related to mineral and energy resources.	LS

NOTES:
LS = Less than Significant impact, no mitigation required

Impact Analysis

Construction Impacts

Impact ME-1: Project construction would not result in substantial adverse effects related to the use of large amounts of fuel or energy, or the use of these resources in a wasteful manner. (Less than Significant)

Construction of the proposed project would require the use of fuels (primarily gasoline, diesel, and motor oil) for a variety of construction activities, including excavation, grading, demolition, and vehicle travel during the estimated 24-month construction period (fall 2014 through fall 2016). Fuel use for construction worker commute trips is difficult to determine because workers would be commuting from various locations; however, fuel use for construction worker commute trips is expected to be minor. For the reasons described above, the precise amount of construction-related energy consumption is uncertain. Although fuels would only be used during construction of the proposed project, excessive idling and other inefficient site operations could result in the wasteful use of fuels. Implementation of SFPUC actions would reduce greenhouse gases (see Section 3.4.5, SFPUC Standard Construction Measures and Greenhouse Gas Reduction Measures), and as described in Section 5.8, Air Quality, compliance with the the Airborne Toxic Control Measure (ATCM) to Limit Diesel-Fueled Commercial Motor Vehicle Idling, would require shutting equipment off when not in use and would restrict idling time to five minutes. Implementation of the above-mentioned measures would increase fuel efficiency and ensure that fuels would not be used in a wasteful manner; thus this potential energy impact would be less than significant.

Facility Siting, Operations, and Maintenance Impacts

Impact ME-2: Project operations would not result in substantial adverse effects related to the long-term use of large amounts of fuel or energy, or the use of these resources in a wasteful manner. (Less than Significant)

As described in Section 3.5.1, Operations, normal daily extraction rates would be 0.6 to 0.7 million gallons per day (mgd) per well for a total annual average of up to 3.0 mgd during Phase 1 and up to 4 mgd with implementation of Phase 2. Also as discussed in Chapter 3, Project Description, the facility plans include vertical turbine and centrifugal (horizontal split-case) well pumps and pump motors. The proposed well facility operational requirements and pump rates were used to determine the energy use requirements for the proposed project. Under Phase 1, the Groundwater Supply Project would require an estimated total of 3,762,000 kWh per year. If all Phase 1 and Phase 2 wells operate, the Groundwater Supply Project would require an estimated total of 4,994,000 kWh per year to operate the new groundwater well facilities.[1] Hydroelectric power from the Hetch Hetchy Regional Water System would provide all of this power. As described in Section 5.18.1, Setting, the long-term annual average production of the Hetch Hetchy system is 1.7 billion kWh (San Francisco Planning Department, 2008). Under Phase 1, the increased consumption of energy produced by the project would represent approximately 0.2 percent of the Hetch Hetchy System; under Phase 2, the project's estimated energy demand would constitute approximately 0.3 percent of the total energy produced by the Hetch Hetchy system. The proposed project's consumption of energy would therefore represent a very small portion of the total energy produced for the Hetch Hetchy system.

Also, as described in Section 3.5.1, Operations, the six wells in the Groundwater Supply Project would be capable of producing up to 6 mgd (total) during a catastrophic emergency and could operate at this rate for up to 30 days (SFPUC, 2009). In such an event, if all six wells operated for

[1] Operational energy usage values for the two scenarios were calculated by converting the horsepower ratings of each proposed well pump (see Table 3-3 in the Project Description) to kilowatts (1 hp = 0.7457 kW). The calculations assume that proposed well pumps would be in operation 24 hours per day, account for pump utilization factors, and operation of HVAC, metering pumps, and other associated electrical equipment (SFPUC, 2012).

30 days, the project could consume an estimated 605,000 kWh.[2] If power were not available during such an emergency event, portable diesel generators would provide backup power to enable use of the West Sunset and North Lake well facilities. If operated for 30 days, these generators would consume approximately 268,000 kWh of energy.[3] Consequently, any emergency use of the proposed wells would incrementally increase the estimated total annual energy consumption for the project.

Furthermore, as described in Section 3.4.5, SFPUC Standard Construction Measures and Greenhouse Gas Reduction Measures, the SFPUC has consulted with the SFPUC Power Enterprise's Energy Efficiency Group to incorporate all feasible energy efficiency best practice measures for unoccupied well facilities into the project design. Because the total amount of energy used by the project would constitute both a small portion of the City's existing energy use and of the total energy produced by the Hetch Hetchy System, and because the design of Groundwater Supply Project facilities would comply with applicable energy efficiency measures specified by the SFPUC Power Enterprise's Energy Efficiency Group (see Section 3.4.5, SFPUC Standard Construction and Greenhouse Gas Reduction Measures), the proposed project would not use large amounts of energy or use the energy in a wasteful manner, and this impact would be less than significant.

Cumulative Impacts

Impact C-ME: Project implementation would not result in cumulatively considerable impacts related to mineral and energy resources. (Less than Significant)

The geographic scope for the analysis of potential cumulative impacts related to energy resources encompasses the project area and the broader region, including Golden Gate Park, the Sunset District, and the Lake Merced vicinity. Section 5.1.4, Cumulative Impacts, describes the approach to the cumulative analysis used throughout this EIR; Table 5.1-6 and Figure 5.1-1 summarize cumulative projects in the vicinity of the Groundwater Supply Project.

Construction Use of Energy

Construction activities associated with the proposed project and cumulative projects described in Table 5.1-6, would use fuels and electricity to operate equipment and transport employees and materials, resulting in a significant cumulative increase in the use of energy resources. However, the proposed project would be subject to the California Air Resources Board's idling limits, thereby limiting the potential for the wasteful or inefficient use of fuels. Implementation of the SFPUC's

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2 Energy usage values during a catastrophic emergency event were calculated by converting the horsepower ratings of each proposed well pump (see Table 3-3 in the Project Description) to kilowatts (1 hp = 0.7457 kW). The calculations assume that proposed well pumps would be in operation 24 hours over a 30-day period, account for pump utilization factors, and account for operation of HVAC, metering pumps, and other associated electrical equipment (SFPUC, 2012).

3 This analysis assumes operation of two 250 hp backup generators (one at the West Sunset facility and one at the North Lake facility) over a 30-day period. Horsepower ratings of generators were converted to kilowatts (1 hp = 0.7457) (ESA, 2013).

Greenhouse Gas Reduction Actions (see Section 3.4.5, SFPUC Standard Construction Measures and Greenhouse Gas Reduction Measures) and as described in Section 5.8, Air Quality, compliance with the the Airborne Toxic Control Measure (ATCM) to Limit Diesel-Fueled Commercial Motor Vehicle Idling, would require shutting equipment off when not in use and would restrict idling time to five minutes. Therefore, with compliance with these measures, the proposed project's contribution to the cumulative increase in construction-related energy consumption would not be cumulatively considerable (less than significant).

Long-Term Energy Use during Operation

As noted above, operation of the Groundwater Supply project would require a total of 3,762,000 kWh per year (under Phase 1) and 4,994,000 kWh per year (under Phase 2) (see Impact ME-2). Operational activities associated with the cumulative projects would generally use fuels and electricity to operate vehicles, run facilities, and supply homes. Projects listed in Table 5.1-6 that would also contribute to increases in energy consumption in San Francisco include the Beach Chalet Athletic Fields Renovation Project, the San Francisco Westside Recycled Water Project, the Harding Park Recycled Water Project, the 3711 19th Avenue (Parkmerced) development project, San Francisco State Master Plan, and the Regional Groundwater Storage and Recovery Project, resulting in a significant cumulative increase in the use of energy resources. However, the operational energy requirements for the Groundwater Supply Project would represent up to 0.3 percent of total energy produced by the Hetch Hetchy system. Further, the design of the proposed project's well facilities would incorporate applicable energy efficiency measures specified by the SFPUC Power Enterprise's Energy Efficiency Group as discussed above and identified in Section 3.4.5, SFPUC Standard Construction and Greenhouse Gas Reduction Measures. Therefore, the Groundwater Supply Project's contribution to cumulative impacts related to energy usage during operation would not be cumulatively considerable (less than significant).

5.18.4 References

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5.19 Agricultural and Forest Resources

This section analyzes the potential impacts on agricultural resources that could occur during construction and operation of the proposed Groundwater Supply Project and assesses the potential for project implementation to adversely affect such resources.

5.19.1 Setting

Agricultural Resources

The project facilities would be located on the western side of San Francisco, in the Outer Parkside and the Outer Sunset neighborhoods the project area is generally situated between 19th Avenue (Highway 1) to the east, the Great Highway to the west, Fulton Street to the north, and Lake Merced to the south. The proposed project area overlies the North Westside Groundwater Basin. There are no existing agricultural resources in the project area. The California Department of Conservation, Division of Land Resource Protection, maps important farmlands throughout California. Important farmlands include prime farmland, farmland of statewide importance, unique farmland, farmland of local importance, and grazing land. In the CCSF, there are no important farmlands mapped in the project area (California Department of Conservation, 2007).

Forest Resources

Section 12220(g) of the California Public Resources Code defines forest land as "land that can support 10 percent native tree cover of any species, including hardwoods, under natural conditions, and that allows for management of one or more forest resources, including timber, aesthetics, fish and wildlife, biodiversity, water quality, recreation, and other public benefits." Timberland is land (other than land owned by the federal government and land designated by the California Board of Forestry and Fire Protection (CDFFP) as experimental forest land) that is available for and capable of growing a crop of trees of any commercial species used to produce lumber and other forest products. Statewide land cover mapping prepared by the CDFFP as part of the Forest and Range 2003 Assessment classify land cover into ten "Major Land Cover" classes. The land cover maps characterize land cover in the project area as urban; therefore there are no timber harvesting activities in the project area (CDFFP, 2003).

5.19.2 Regulatory Framework

Federal Regulations

The Farmland Protection and Policy Act requires an evaluation of the relative value of farmland that could be affected by decisions sponsored in whole or part by the federal government. The Farmland Protection and Policy Act would not apply to the proposed project, since it is not a federal government action or program.

State Regulations

The California Land Conservation Act of 1965, commonly referred to as the Williamson Act, provides financial incentives, through reduced property taxes, to deter the conversion of farmland and open space preserves to other land uses. The act enables local governments to enter into contracts with private landowners to ensure that specific parcels are kept in agricultural or open space use as "agricultural preserves."

No agricultural lands in the Groundwater Supply Project area are under Williamson Act contract, and this state regulation would not be applicable.

There are no state regulations pertaining to forest resources that apply to the proposed project.

Local Regulations

There are no local regulations governing agricultural or forest resources that apply to the Groundwater Supply Project.

5.19.3 Impacts and Mitigation Measures

Significance Criteria

For the purposes of this EIR, the Groundwater Supply Project would have a significant effect on agricultural or forest resources if it were to:

- Convert prime farmland, unique farmland, or farmland of statewide importance, as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use;
- Conflict with existing zoning for agricultural use, or a Williamson Act contract;
- Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220[g]) or timberland (as defined by Public Resources Code Section 4526);
- Result in the loss of forest land or the conversion of forest land to non-forest use; or
- Involve other changes in the existing environment, which, due to their location or nature, could result in the conversion of farmland to non-agricultural use.

Approach to Analysis

Due to the nature of the proposed project, there would be no impacts related to the significance criteria; therefore, no impact discussion is provided for these topics for the reasons described below:

- ***Conflict with Zoning for Agricultural Use or with a Williamson Act Contract.*** The proposed project would not be located on land used for agricultural activities. Furthermore, the project sites are not zoned for agricultural use, nor are they subject to a Williamson Act contract. Therefore, this criterion is not applicable to the proposed project.

- ***Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to Non-agricultural Use.*** The proposed project would not be located on land designated as prime farmland, unique farmland, or farmland of statewide importance. Therefore, this criterion is not applicable to the proposed project.

- ***Conflict with Existing Zoning for Forest Land, or Result in the Loss of Forest Land or the Conversion of Forest Land to Non-forest Use.*** There is no forest land in the project area; thus, implementation and operation of the project would not conflict with zoning regulations for forest land, result in the loss of forest land, or result in the conversion of forest land to non-forest use. Therefore, the third and fourth criteria are not applicable to the proposed project.

- ***Involve Other Changes that Could Result in the Conversion of Farmland to Non-agricultural Use.*** The proposed project would not be located on land used for agricultural activities. The proposed project aims to improve or modify existing infrastructure and would not involve changes that would result in the conversion of farmland to non-agricultural use. Therefore, this criterion is not applicable to the proposed project.

Impact Analysis

As described above, implementation of the proposed project would not result in impacts related to agricultural or forest resources.

Cumulative Impacts

Implementation of the proposed project would not result in any cumulative impacts related to agricultural or forest resources because the project would not cause any project-specific impacts related to this topic.

5.19.4 References

California Department of Conservation, Division of Land Resource Protection, *Bay Area Region Important Farmland 2004 and Urbanization 1984-2004*, published March 2007. Available online at ftp://ftp.consrv.ca.gov/pub/dlrp/FMMP/pdf/urban_change/bayarea_urban_change1984_2004.pdf. Accessed May 2011.

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CHAPTER 6
Other CEQA Issues

6.1 Growth-Inducing Impacts

6.1.1 Introduction and Overview

This section analyzes the growth-inducement potential and associated secondary effects of growth impacts of the proposed project, as required by the California Environmental Quality Act (CEQA). CEQA requires that an Environmental Impact Report (EIR) evaluate the growth-inducing impacts of a proposed project.[1] A growth-inducing impact is defined as follows:

> [T]he ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth…. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.

As described in Chapter 2, Section 2.2, the San Francisco Planning Department prepared a Program Environmental Impact Report (PEIR) on the SFPUC's Water System Improvement Program (WSIP), which was certified in October 2008 (San Francisco Planning Department, 2008). The PEIR includes a detailed analysis of the growth-inducement potential of the overall WSIP water supply strategy, concluding that "The WSIP would support planned growth in the existing SFPUC service area (WSIP PEIR, Vol. 4, Chapter 7, Impact 7-1)."

The proposed San Francisco Groundwater Supply Project (Groundwater Supply Project or project), as a facility improvement project of the WSIP, would be a contributing factor in that growth-inducement potential and the associated indirect effects of growth. By removing the lack of a reliable water supply and supply system as one potential obstacle to growth within the SFPUC service area, the WSIP, and thus the proposed project, would have an indirect growth-inducing effect according to the CEQA definition above.[2]

This EIR tiers from the WSIP PEIR, and the growth-inducement analysis contained in PEIR Chapter 7 and associated Appendix E are incorporated by reference into this EIR. All impacts

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1 *CEQA Guidelines* section 15126.2(d).

2 The WSIP would not *directly* induce growth as it does not involve the development of new housing to attract additional population, nor would it indirectly induce growth by establishing substantial permanent or even short-term construction employment opportunities that could stimulate population growth. Construction of the WSIP projects is not expected to involve employment opportunities substantially beyond what would normally be available to construction workers in the area, and workers are expected to be drawn from the local labor pool.

related to the WSIP water supply strategy to which this project contributes have been examined at a sufficient level of detail in the PEIR and no additional review is necessary in this EIR. The significant environmental impacts have been adequately addressed in the PEIR, and the SFPUC has adopted the CEQA Findings on the PEIR related to the growth-inducing impacts of the WSIP. A summary of the growth-inducement analysis in the PEIR is provided below.

6.1.2 Summary of PEIR Growth-Inducement Analysis

Implementation of the WSIP would achieve the WSIP goals and objectives through 2018, allowing the SFPUC to: (1) meet customer water supply needs in nondrought periods through 2018; and (2) limit rationing to a maximum 20 percent reduction in water service systemwide during extended droughts. Achieving the WSIP water supply goal would increase the reliability of water service to existing customers and allow for service to additional residential and business customers as a result of planned growth in the existing SFPUC service area.

A variety of factors influence new development or population growth in the area served by SFPUC water, including the economic conditions of the region, adopted growth management policies in the affected communities, and the availability of adequate infrastructure (e.g., water service, sewer service, public schools, roadways), with economic factors generally the lead driver. While many factors affect the growth potential of a community, water service is one of the chief public services needed to support urban development; lack of a reliable water supply, as well as a service capacity deficiency, could constrain future development.

Pursuant to CEQA, growth per se is not necessarily assumed to be beneficial, detrimental, or of little significance to the environment; however, the secondary, or indirect, effects of growth can cause adverse changes to the physical environment. Potential indirect effects of population and/or economic growth and accompanying development include increased demand on community services and public service infrastructure; increased traffic and noise; degradation of air and water quality; and conversion of agricultural land and open space to urban uses. Local land use plans (e.g., general plans and specific plans) of the jurisdictions served by the SFPUC establish land use development patterns and growth policies that are intended to allow for the orderly expansion of urban development supported by adequate public services (including water supply, roadway infrastructure, sewer service, and solid waste service). Local jurisdictions conduct CEQA environmental reviews on their general and specific plans to assess the secondary effects of planned growth and identify feasible mitigation for significant adverse effects. A project that would induce growth and is inconsistent with local land use plans and policies could indirectly cause adverse environmental impacts, as well as impacts on public services; this could occur if the local land use jurisdictions have not previously addressed these issues during the CEQA reviews of their land use plans and development proposals.

By increasing the available water supply through groundwater and recycled water projects and increasing the reliability of the SFPUC water delivery system, the WSIP would have an indirect growth-inducing effect according to the CEQA definition. The WSIP would support growth in the SFPUC service area through 2018, although it appears that some growth would occur irrespective of the WSIP due to increased water delivery efficiencies (e.g., plumbing code changes), conservation, and other water supply sources. Growth would in turn result in indirect effects. In most cases, the effects of population and employment growth have been identified and addressed in the EIRs for the general plans and associated area plans and specific plans adopted by the jurisdictions in the service area. Some of the identified indirect effects of growth are significant and unavoidable; others are significant but can be mitigated.

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

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

The PEIR does not identify any mitigation measures for implementation by the SFPUC that could substantially decrease or eliminate growth-inducing impacts, because the SFPUC does not control the decisions of the local agencies with respect to growth in their respective jurisdictions. Individual agencies' general plans and environmental documents contain actions, limitations, and mitigation measures that will be implemented in the individual jurisdictions with local development project or program approvals. These types of mitigation measures were identified in the PEIR (see PEIR Chapter 7 and PEIR Appendix E, which are incorporated by reference into this EIR).

To assess the growth-inducement potential of the WSIP and characterize the secondary effects of growth, the PEIR investigates the following questions:

- *What assumptions did the SFPUC and its wholesale customers make regarding growth (population and employment) in projecting future (2030) total water demand and customer purchases from the SFPUC?*

- *Are these assumptions consistent with forecasts prepared and used by local and regional planning agencies (e.g., Association of Bay Area Governments [ABAG], counties and cities) within the service area? What are the growth trends in the Bay Area region?*

- *Are there any notable inconsistencies between the population and employment forecasts used by the SFPUC and the wholesale customers and those of the local and regional planning agencies that suggest that the water supply planning efforts are inconsistent with land use planning efforts?*

- *Is the level of growth projected for 2030 consistent with that identified and planned for in existing adopted general plans?*

- *What are the potential environmental impacts (secondary effects) associated with growth projected to occur in the service area? Have these impacts been evaluated in previous CEQA review documents on existing general and specific plans?*

- *What mitigation measures and findings have the local jurisdictions adopted as part of approving their future growth plans?*

The issues raised in these questions are summarized below and addressed in detail in PEIR Chapter 7 (Vol. 4) and supplemented by PEIR Appendix E (Vol. 5).

- ***SFPUC Projections (PEIR Section 7.2).*** Accurate demand projections are important in ensuring that future water supplies will be adequate while not surpassing the needs of planned growth. SFPUC and its customers used computer models to forecast future water demand. Section 7.2 presents an overview of the SFPUC water service area, and describes key factors (assumptions, inputs, and methodologies) used in estimating future demand that relate to growth and to inform comparisons between water demand and land use planning projections. These factors include baseline population, methodology used to determine existing water usage by land use/account type, the current water supply agreement between the SFPUC and its wholesale customers, and assumptions regarding future land use patterns, water conservation and recycling, and water from other (non-SFPUC) sources through 2030. The demand estimates, in conjunction with estimates of savings from conservation and use of other water sources, provide the basis for the 2030 purchase estimates.

- ***Growth-Inducement Potential (PEIR Section 7.3).*** This section analyzes the WSIP's growth-inducement potential: whether the demand to be met by the WSIP would be consistent with local plans and policies or could contribute to growth in the service area beyond that called for in the existing general plan. To gauge the consistency of the WSIP with growth planned in the jurisdictions served by the SFPUC, the analysis compares the growth assumed in the SFPUC projections with growth forecasts (a) developed by ABAG, and (b) reflected in adopted land use plans in the service area. With respect to ABAG, this section also describes ABAG's changing expectations about growth as reflected in its updated projections issued in 2002, 2003, and 2005.

- ***Indirect Effects of Growth (PEIR Section 7.4).*** Growth (whether planned or unplanned) can cause environmental impacts. Section 7.4 describes the potential impacts of growth that could be supported, in part, by implementation of the WSIP. This section also identifies measures adopted to reduce, eliminate, or otherwise mitigate the impacts of planned growth.

6.1.3 Summary of Conclusions

A review of historical growth trends of a selection of jurisdictions in the service area, based primarily on information in general plans and Bay Area Water Supply and Conservation Association profiles, shows that:

- Cities in the service area are largely urbanized, most having experienced their most rapid growth in the postwar decades through the 1970s.
- Milpitas and East Palo Alto have experienced high rates of growth more recently.
- San Francisco's population fluctuated somewhat, but on average has been essentially stable over the past 50 years.
- Many jurisdictions cannot grow laterally, and their general plans include policies to manage growth; many general plans identify strategies consistent with "smart growth" principles, such as encouraging infill development and the redevelopment of previously developed areas, to accommodate future growth.
- The SFPUC's wholesale customers vary widely, in a variety of ways: by size, overall demand projected for 2030, the change that the 2030 demand represents in absolute terms and as a percentage of 2001 demand, and the degree to which the customers depend on the SFPUC for their water supply. As such, the WSIP would remove growth obstacles to varying degrees within the service area.

As stated above, the complete growth-inducement analysis is included in PEIR Chapter 7 and PEIR Appendix E, which are incorporated into this EIR by reference.

6.1.4 Indirect Effects of Growth

The indirect effects of growth expected in the general plans of jurisdictions in the service area have been identified in the EIRs prepared for those plans. Impacts commonly identified as significant and unavoidable and those commonly identified as significant but mitigable are presented in PEIR Section 7.4 and summarized briefly below.

- The most commonly identified significant and unavoidable impacts of growth are:
  - Increased traffic congestion
  - Deterioration of air quality
  - Cumulative effects of increased air pollutant emissions and noise
- Mitigation measures have been adopted by local jurisdictions as part of their general plan approval processes to address the secondary effects of planned growth. These measures are summarized in PEIR Appendix E.
- Two cities identified increased demand for potable water supply as a significant and unavoidable effect of growth; the WSIP would address this issue in those two cities.

- Overriding considerations commonly adopted by the decision-making bodies in adopting their general plans include:
  - Accommodation of growth in an orderly, fiscally sound manner
  - Economic diversification and job generation
  - Creation of housing, furtherance of regional housing share objectives, and provision of affordable housing
  - Improvements of the local jobs/housing balance
  - Increased sales revenue and positive fiscal impact
  - Promotion of alternative modes of travel to reduce reliance on private vehicles
  - Establishment of policies to preserve natural areas and open space lands
- For many cities that receive water from the SFPUC regional system, the supply to be provided under the WSIP supports and is consistent with the planned growth reflected in their existing adopted general plans. For other communities, it appears that the WSIP supply (in combination with other supply sources available to those communities) could serve a level of growth beyond that identified in the existing general plans. In those cases, secondary effects of such growth could include impacts related to increased density and impacts related to development of new land areas.
  - Density-related impacts could include increased traffic congestion, air pollution, traffic noise, construction noise, and demand on public services.
  - Land-area-related impacts could include loss of open space and agricultural land, and loss of and degradation of water quality due to increases in impervious surface area.

The proposed San Francisco Groundwater Supply Project would not directly induce population or economic growth, and it would not tax existing community service facilities or encourage other activities that could significantly affect the environment. However, as described above, the project is one of the facility improvement projects that comprise the WSIP; therefore, its implementation would contribute to the growth-inducement potential of the WSIP and the associated indirect effects of growth. Implementation of the project would thus contribute to an incremental portion of the growth-inducement impacts and associated indirect impacts of growth of the WSIP. See Chapter 7 of the PEIR for a detailed analysis of the WSIP's growth-inducement effects (San Francisco Planning Department, 2008).

6.2 Summary of Cumulative Impacts

As described in Chapter 5, Section 5.1.4, Cumulative Impacts, cumulative impacts result from two or more individual effects that, when considered together, are considerable or that compound or increase other environmental impacts (CEQA Guidelines, Section 15355). The cumulative impacts from several projects are the change in the environment that results from the incremental impact of the project when added to other closely related past, present, or reasonably foreseeable future projects. The cumulative analysis in this EIR identifies project impacts that would be individually limited, but when viewed in connection with the effects of other past, present, and probable future projects, could be "cumulatively considerable" (i.e., significant) with regard to the project's contribution to a cumulative impact.

In Chapter 5, Environmental Setting and Impacts, cumulative impacts are discussed and analyzed under each resource area immediately following the description of the direct impacts of the proposed project and the identified mitigation measures for that resource area. The analyses of cumulative impacts are based on the same setting, regulatory framework, and significance criteria as the direct impacts, and they apply the results of the project-level, direct impact analysis within the context of the identified geographic scope of area affected by the cumulative effect. Table 5.1-6 lists the relevant past, present, or reasonably foreseeable future projects proposed by the SFPUC and other jurisdictions that are considered in the cumulative impact analysis. Figure 5.1-1 shows the cumulative project locations.

All cumulative impacts were determined to have a significance determination of either no impact, less than significant, or less than significant with mitigation. **Table 6.1-1** summarizes the proposed project's cumulative impacts and significance determinations.

6.3 Significant and Unavoidable Impacts

In accordance with Section 21067 of CEQA and Sections 15126(b) and 15126.2(b) of the *CEQA Guidelines*, the purpose of this section is to identify project-related environmental impacts that could not be eliminated or reduced to a less-than-significant level with implementation of all mitigation measures identified in Chapter 5, Environmental Setting and Impacts. The findings in this chapter are subject to final determination by the San Francisco Planning Commission as part of its certification of the EIR.

6.3.1 Significant and Unavoidable, and Potentially Significant and Unavoidable Effects of the Proposed Project

This section identifies project impacts that, even with the implementation of all identified mitigation measures, would remain potentially significant or significant, and are therefore considered *unavoidable*. The analyses presented in Chapter 5, Environmental Setting and Impacts, of this EIR indicate that implementation of the proposed project would not result in significant unavoidable impacts. All impacts would either be no impact, less than significant, or reduced to less-than-significant levels with implementation of the identified mitigation measures.

6.3.2 Significant and Unavoidable Effects of the WSIP

The proposed project is one of the facility improvement projects that comprise the SFPUC's WSIP. Insofar as the proposed project is a component of the WSIP, it would contribute to the WSIP's significant and unavoidable, and potentially significant and unavoidable water supply and growth-inducement impacts, as identified in the WSIP PEIR (San Francisco Planning Department, 2008) and summarized below:

TABLE 6.1-1
SUMMARY OF IMPACTS AND SIGNIFICANCE – CUMULATIVE IMPACTS

Impacts	Significance Determinations
Impact C-LU: Implementation of the proposed project would not result in a cumulatively considerable contribution to a significant cumulative impact on the existing character of the vicinity.	LS
Impact C-AE: The proposed project would have a cumulatively considerable contribution to a significant cumulative aesthetic impact.	LS
Impact C-CP: The proposed project would possibly result in cumulatively considerable impacts related to historical, archeological, or paleontological resources or human remains.	LS
Impact C-TR: The proposed project, in combination with past, present, and reasonably foreseeable future projects, would not substantially contribute to cumulative traffic increases on local and regional roads.	LS
Impact C-NO: Construction and operation of the proposed project, in combination with other past, present and reasonably foreseeable future projects in the project vicinity, would not result in a cumulatively considerable contribution to significant noise and vibration impacts.	LS
Impact C-AQ: Construction and operation of the proposed project could result in cumulative air quality impacts associated with criteria pollutant and precursor emissions and health risks, but the project's contribution would not be cumulatively considerable.	LS
Impact C-GG-1: The proposed project would generate greenhouse gas emissions, but not in levels that would result in a significant impact on the environment or conflict with any policy, plan, or regulation adopted for the purpose of reducing greenhouse gas emissions.	LS
Impact C-RE: The project's contribution to cumulative impacts on recreational resources and uses would be cumulatively considerable.	LS
Impact C-UT: Project implementation would result in cumulatively considerable impacts related to disruption or relocation of utilities, landfill capacity, or compliance with solid waste statutes and regulations.	LS
Impact C-BI: The proposed project would result in a considerable contribution to cumulative impacts related to special-status species, wetlands, waters of the United States, riparian habitat, wildlife nursery sites, and compliance with local policies and ordinances protecting biological resources.	LSM
Impact C-GE: Project implementation would not result in cumulatively considerable impacts related to geology, soils, and seismicity.	LS
Impact C-HY-1: Facility construction, siting, operations, and maintenance, in combination with past, present, and reasonably foreseeable future projects in the site vicinity, would not adversely affect hydrology and water quality.	LS
Impact C-HY-2: The proposed project, in combination with past, present, and reasonably foreseeable future projects, would not have a substantial adverse effect related to well interference.	LS
Impact C-HY-3: Operation of the proposed project would not result in a cumulatively considerable contribution to cumulative impacts related to subsidence.	LS
Impact C-HY-4: The proposed project, in combination with past, present, and reasonably foreseeable future projects, would possibly have a substantial adverse effect related to seawater intrusion.	LSM
Impact C-HY-5: The proposed project, in combination with past, present, and reasonably foreseeable future projects, would possibly have a substantial adverse effect on water quality that could affect the beneficial uses of Lake Merced or water quality in Pine Lake.	LSM
Impact C-HY-6: Operation of the proposed project would not result in a cumulatively considerable contribution to cumulative impacts related to water quality standards.	LS
Impact C-HY-7: Operation of the proposed project would not result in a cumulatively considerable contribution to cumulative impacts related to groundwater depletion.	LS
Impact C-HZ: Implementation of the proposed project would possibly result in cumulatively considerable impacts related to hazards and hazardous materials.	LS

TABLE 6.1-1 (Continued)
SUMMARY OF IMPACTS AND SIGNIFICANCE – CUMULATIVE IMPACTS

Impacts	Significance Determinations
Impact C-ME: Project implementation would not result in cumulatively considerable impacts related to mineral and energy resources.	LS
Population and Housing: Implementation of the proposed project would not result in any cumulative impacts related to population and housing because the project would not result in any project-specific impacts related to this topic.	NI
Agricultural and Forest Resources: Implementation of the proposed project would not result in any cumulative impacts related to agricultural and forest resources because the project would not result in any project-specific impacts related to this topic.	NI
Wind and Shadow: Implementation of the proposed project would not result in any cumulative impacts related to wind and shadow because the project would not result in any project-specific impacts related to this topic.	NI
Public Services: Implementation of the proposed project would not result in any cumulative impacts related to public services because the project would not result in any project-specific impacts related to this topic.	NI

NOTES:
LS = Less than Significant impact, no mitigation required
LSM = Less than significant with mitigation
NI = No impact

- By providing water to support planned growth in the SFPUC service area, the WSIP will result in significant and unavoidable growth-inducement impacts that are primarily due to secondary effects such as air quality, traffic congestion, and water quality. These impacts were adequately addressed in the PEIR at a sufficient level of detail such that no further analysis is required in this EIR. The analysis contained in the PEIR is incorporated into this EIR by this reference (see PEIR Chapter 7).

- Based on the best available information at that time, the PEIR made the conservative determination that the WSIP would result in a potentially significant and unavoidable impact on fishery resources in Crystal Springs Reservoir related to inundation of spawning habitat upstream of the reservoir (see PEIR Chapter 5, Section 5.5.5, Impact 5.5.5-1). The project-level fisheries analysis in the Lower Crystal Springs Dam Improvements Project EIR modified certain PEIR impact determinations based on more detailed site-specific data and analysis. Project-level conclusions supersede any contrary impact conclusions in the PEIR. Project-level review of updated site-specific information that was developed following certification of the PEIR was incorporated into the project-level EIR for the Lower Crystal Springs Dam Improvements Project, and the project-level analysis determined that impacts on fishery resources due to inundation effects would be less than significant (San Francisco Planning Department, 2010).

- Based on the best available information at that time, the PEIR made the conservative determination that the WSIP would result in a significant and unavoidable impact related to flow along Alameda Creek below the Alameda Creek Diversion Dam ("Alameda Creek Hydrologic Impact") (see PEIR Chapter 4, Section 5.4.1, Impact 5.4.1-2). The project-level analysis in the Calaveras Dam Replacement Project EIR modified this PEIR impact determination to less than significant based on more detailed site-specific data and analysis

(San Francisco Planning Department, 2011). Project-level conclusions supersede any contrary impact conclusions in the PEIR. Project-level review of updated site-specific information that was developed following certification of the PEIR was incorporated into the project-level EIR for the Calaveras Dam Replacement Project, and the project-level analysis determined that impacts related to reduced flow along Alameda Creek below the Alameda Creek Diversion Dam would be less than significant (San Francisco Planning Department, 2011).

6.4 Areas of Known Controversy and Issues to be Resolved

In accordance with Sections 15063 and 15082 of the *CEQA Guidelines*, the San Francisco Planning Department, as lead agency, sent a Notice of Preparation (NOP) to responsible agencies, trustee agencies, and other interested entities and individuals to begin the formal CEQA scoping process for the Groundwater Supply Project. These included approximately 3,700 contacts for local, State, and federal agencies; regional and local interest groups; and property owners and tenants within 300 feet of the project area (see **Appendix A-1**). The scoping period began on December 30, 2009 and ended on January 30, 2010. Pursuant to *CEQA Guidelines* Section 15083, the San Francisco Planning Department held a public scoping meeting on January 20, 2010 at Golden Gate Senior Center in San Francisco, California.

Following the NOP and scoping meeting, the SFPUC made certain changes to the proposed project (as discussed in Chapter 3, Project Description). Consequently, a revised NOP was prepared and a new scoping period began on March 2, 2011 and ended on April 1, 2011 (see Appendix A-2). No public scoping meeting was held for the revised NOP. A more detailed description of the NOP process and a summarized list of concerns that were noted in the public comments on the NOP and at the public scoping meetings are provided in Chapter 2, Introduction and Background.

The San Francisco Planning Department prepared draft scoping reports to summarize the public scoping process and the comments received in response to both the initial NOP and the revised NOP (see Appendix A). Based on the number of comments received on each of the topics listed in the scoping reports, the most controversial issues for the proposed project, as expressed by community members, are: surface and groundwater impacts (discussed in Section 5.16, Hydrology and Water Quality); land subsidence (discussed in Sections 5.15, Geology and Soils, and 5.16, Hydrology and Water Quality); potential conflicts with existing plans and policies, particularly the Golden Gate Park Master Plan (discussed in Chapter 4, Plans and Policies); and cumulative impacts (discussed in each resource topic discussed in Chapter 5, Environmental Setting and Impacts).

6.5 References

San Francisco Planning Department, *Final Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program*, File No. 2005.0159E, State Clearinghouse No. 2005092026. Certified October 30, 2008.

San Francisco Planning Department, *Final Environmental Impact Report for the San Francisco Public Utilities Commission's Lower Crystal Springs Dam Improvements Project*, File No. 2005.0161E, State Clearinghouse No. 2007012002. Certified October 7, 2010.

San Francisco Planning Department, *Draft Environmental Impact Report for the San Francisco Public Utilities Commission's Calaveras Dam Replacement Project*, File No. 2005.0161E, State Clearinghouse No. 2005102102. Certified January 27, 2011.

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CHAPTER 7
Alternatives

7.1 Introduction

This chapter presents the California Environmental Quality Act (CEQA) alternatives analysis for the proposed San Francisco Groundwater Supply Project (Groundwater Supply Project). The CEQA Guidelines, Section 15126.6(a), state that an Environmental Impact Report (EIR) must describe and evaluate a reasonable range of alternatives to the proposed project that would feasibly attain most of the project's basic objectives and would avoid or substantially lessen any identified significant adverse environmental effects of the project. Specifically, the CEQA Guidelines (Section 15126.6) set forth the following criteria for selecting and evaluating alternatives:

- ***Identifying Alternatives.*** The selection of alternatives is limited to those that would avoid or substantially lessen any of the significant effects of the project, are feasible, and would attain most of the basic objectives of the project. Factors that may be considered when addressing the feasibility of an alternative include site suitability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries, economic viability, and whether the proponent can reasonably acquire, control, or otherwise have access to an alternative site. An EIR need not consider an alternative whose impacts cannot be reasonably ascertained and whose implementation is remote and speculative. The specific alternative of "no project" must also be evaluated.

- ***Range of Alternatives.*** An EIR need not consider every conceivable alternative, but must consider and discuss a reasonable range of feasible alternatives in a manner that will foster informed decision-making and public participation. The "rule of reason" governs the selection and consideration of EIR alternatives, requiring that an EIR set forth only those alternatives necessary to permit a reasoned choice. The lead agency (the City and County of San Francisco) is responsible for selecting a range of project alternatives to be examined and for disclosing its rationale for choosing the alternatives.

- ***Evaluation of Alternatives.*** EIRs are required to include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed project. Matrices may be used to display the major characteristics and the environmental effects of each alternative. If an alternative would cause one or more significant effects that would not result from the project as proposed, the significant effects of the alternative must be discussed, but in less detail than the significant effects of the project.

The Groundwater Supply Project is one of the key regional facility improvement projects under the San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program (WSIP). Section 7.2 summarizes the systemwide, programmatic alternatives that were analyzed in the WSIP

Program EIR (San Francisco Planning Department, 2008) to provide context for the alternatives to the Groundwater Supply Project within the overall WSIP. Section 7.3 describes the alternatives selection process and the objectives of the project; summarizes the significant impacts of the project; describes the alternatives selected for detailed analysis; and compares the environmental impacts of each alternative to those of the proposed project. Section 7.4 identifies the environmentally superior alternative. Section 7.5 discusses the preliminary alternatives that were considered but rejected from further consideration.

7.2 WSIP Alternatives

As discussed in Chapter 2, Introduction and Background, of this EIR, the SFPUC approved implementation of the Phased WSIP in October 2008. The WSIP is a comprehensive program to improve the reliability of the SFPUC regional water system with respect to water quality, seismic response, and water delivery based on a planning horizon through the year 2030, and to improve the system with respect to water supply to meet water delivery needs in the service area through the year 2018. It includes a series of key regional facility improvement projects, including the Groundwater Supply Project. To the extent that the project would contribute to achieving the goals and objectives of the WSIP, the analysis of the WSIP alternatives applies to the alternatives analysis of the Groundwater Supply Project.

The San Francisco Planning Department, Environmental Planning Division (formerly the Major Environmental Analysis Division) considered systemwide alternatives to the WSIP in the Program EIR (PEIR), which the San Francisco Planning Commission certified on October 30, 2008. The PEIR evaluated seven alternatives to the WSIP based on their apparent ability to meet most of the WSIP's goals, their ability to reduce one or more of the significant impacts associated with program implementation, their potential feasibility, and their collective ability to provide a reasonable range of alternatives to foster informed decision-making and public participation. Analysis of the No Program Alternative was included in the PEIR as required by CEQA.

The San Francisco Planning Commission certified the PEIR in October 2008 (Planning Commission Motion No. 17734). Thereafter, the SFPUC approved the Phased WSIP, and the SFPUC approved the PEIR and adopted the CEQA Findings on the WSIP (SFPUC Resolution 08-0200). The Phased WSIP incorporates elements of three alternatives analyzed in the PEIR: the No Purchase Request Increase Alternative, the Aggressive Conservation/Water Recycling and Groundwater Alternative, and the Modified WSIP Alternative. Chapters 9 and 14 of the PEIR include more detailed descriptions of these WSIP alternatives, and also present the associated program-level environmental analysis of these alternatives. Chapter 13 of the PEIR includes additional information about the adopted Phased WSIP. All three of these chapters are incorporated into this EIR by reference. The proposed program and the alternatives examined in the PEIR are summarized below for informational purposes.

- ***WSIP Proposed Program.*** The proposed program described and analyzed in the PEIR established program goals and system performance objectives in the areas of water quality, seismic reliability, delivery reliability, and water supply. The WSIP would provide for water supplies to serve customer purchase requests during nondrought and drought periods through 2030, including increased average annual diversions from the Tuolumne River, and would implement all key regional facility improvement projects.

- ***No Program Alternative.*** Under the No Program Alternative, the SFPUC would implement only those facility improvement projects driven by regulatory requirements or existing agreements with regulatory agencies. It would meet only the water quality goals of the WSIP and would fail to meet the other goals and objectives. It would endeavor to meet increasing customer purchase requests through the year 2030 by diverting additional Tuolumne River water only when available under City and County of San Francisco's (CCSF) existing water rights.

- ***No Purchase Request Increase Alternative.*** The No Purchase Request Increase Alternative was designed to serve the wholesale customers the amount of water required under the existing Master Water Sales Agreement between the CCSF and each of the wholesale customers. It would thereby limit the ability of the system to meet customer purchase requests through 2030, but would include implementation of all key regional facility improvement projects.

- ***Aggressive Conservation/Water Recycling and Local Groundwater Alternative.*** Under the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, the SFPUC would implement all of the key regional facility improvement projects, but would endeavor to serve the projected increase in customer purchase requests through 2030 only through additional conservation, water recycling, and local groundwater projects.

- ***Lower Tuolumne River Diversion Alternative.*** Under the Lower Tuolumne River Diversion Alternative, the SFPUC would implement all of the key regional facility improvement projects and would serve the projected increase in customer purchase requests through 2030 through diversions from the lower Tuolumne River near its confluence with the San Joaquin River. This alternative would include construction and operation of additional conveyance and treatment facilities to divert, transport, treat, and blend the new supply into the regional water system.

- ***Year-round Desalination at Oceanside Alternative.*** Under the Year-round Desalination at Oceanside Alternative, the SFPUC would implement all of the key regional facility improvement projects and would construct a 25-million-gallon-per-day (mgd) desalination plant in San Francisco to serve the projected increase in customer purchase requests through 2030.

- ***Regional Desalination for Drought Alternative.*** Under the Regional Desalination for Drought Alternative, the SFPUC would implement all of the key regional facility improvement projects and would partner with other Bay Area water agencies to construct and operate a regional desalination plant that would provide the SFPUC with supplemental supply during drought years.

- ***Modified WSIP Alternative.*** Under the Modified WSIP Alternative, the SFPUC would implement all of the key regional facility improvement projects, but would modify proposed system operations to minimize environmental effects. This alternative would include the implementation of key mitigation measures identified in the PEIR.

The alternatives analysis in the PEIR identified the Modified WSIP Alternative as the environmentally superior alternative. As described above, the Phased WSIP that was ultimately adopted by the SFPUC incorporates elements of the No Purchase Request Increase Alternative, the Aggressive Conservation/Water Recycling and Groundwater Alternative, and the Modified WSIP Alternative.

7.3 Groundwater Supply Project Alternatives Analysis

This section describes the process of developing a reasonable range of Groundwater Supply Project alternatives for analysis in this EIR. Consistent with CEQA, the approach to alternatives selection for this EIR focused on identifying alternatives that: (1) could meet most of the basic objectives of the project while reducing one or more of its significant impacts, (2) could foster informed decision-making and public participation, and (3) could be feasibly implemented. The alternatives selection process considered multiple alternatives by the SFPUC and Environmental Planning. Certain alternatives were eliminated from consideration based on their inability to meet most of the project's basic objectives, their infeasibility, or their inability to reduce the project's environmental impacts.

7.3.1 Project Objectives

As discussed in Chapter 3, Section 3.3, Project Goals and Objectives, the objectives of the San Francisco Groundwater Supply Project are to:

- Expand and diversify the SFPUC's water supply portfolio to increase system reliability
- Increase the use of local water supply sources
- Reduce dependence on imported surface water

In addition, the project would provide potable groundwater for emergency supply in the event of an earthquake or other major catastrophe (SFPUC, 2009).

The Groundwater Supply Project objectives support the goals and objectives of the SFPUC's WSIP (SFPUC Resolution No. 08-200). Specifically, the above-listed project-specific objectives relate directly to the following WSIP goals and objectives:

- ***Seismic reliability.*** Deliver basic service to the three regions in the service area within 24 hours after a major earthquake and restore facilities to meet average-day demand within 30 days after a major earthquake.

- ***Delivery reliability.*** Provide operational flexibility to allow planned maintenance shutdown of individual facilities without interrupting customer service; provide operational flexibility to minimize the risk of service interruption from unplanned facility upsets or outages; provide operational flexibility and system capacity to replenish local reservoirs as needed; meet the estimated average annual demand under the conditions of one planned shutdown of a major facility for maintenance concurrent with one unplanned facility outage.

- ***Water supply reliability.*** Meet the average annual water purchase requests during nondrought years; meet dry-year delivery needs while limiting rationing to a maximum

20 percent systemwide reduction in water service during extended droughts; diversify water supply options during nondrought and drought years; improve use of new water resources, including the use of groundwater, recycled water, conservation, and transfers.

The Groundwater Supply Project would provide 3 to 4 mgd of groundwater to San Francisco's municipal water supply, thereby increasing the water supply over existing conditions. This increase in water supply would improve the SFPUC's ability to deliver water to its customers in San Francisco during both drought and nondrought periods.

The SFPUC considers the proposed project to be a fundamental component in achieving the established WSIP performance objectives for seismic reliability, delivery reliability, and water supply reliability listed above. The WSIP objectives address the regional water system as a whole, and the Groundwater Supply Project—in combination with other facility improvement projects identified in the WSIP—is needed to fully meet these WSIP goals and objectives. The proposed project was designed to function in combination with the other WSIP projects to meet the overall level of service objectives for the SFPUC regional water system.

7.3.2 Significant Environmental Impacts

This section summarizes the impacts of the Groundwater Supply Project, as analyzed in Chapter 5 of this EIR, and that were considered during the alternatives identification process. All project impacts[1] were determined to be less than significant with mitigation (LSM), meaning that all significant project impacts could be reduced to a less-than-significant level through the implementation of mitigation measures identified in this EIR.

Long-Term Impacts

Project operation would result in the following potentially significant and significant long-term impacts, all of which could be mitigated to a less-than-significant level with the implementation of mitigation measures identified in Chapter 5:

- ***Aesthetics.*** Groundwater pumping under the project is expected to decrease Lake Merced water levels by approximately 10 feet lower than levels predicted under the modeled existing conditions for most of the projected operational conditions. Reduced lake levels from project pumping during either a high precipitation year or during the lowest estimated lake levels would detract from the scenic quality of the lake as viewed from the trail/pedestrian sidewalk around the perimeter of the lake, adjacent roadways, trails, docks, and golf courses, as well as from picnic areas on John Muir Drive and Lake Merced Boulevard (Impacts AE-4 and C-AE, LSM).

[1] As discussed in Chapter 6, Section 6.1, Growth-Inducing Impacts, the Groundwater Supply Project, as a facility improvement project in the WSIP, would contribute to the WSIP's growth-inducement potential and associated significant and unavoidable *indirect* effects of growth. Alternatives that would reduce or avoid indirect effects of growth were evaluated in the WSIP PEIR (including the No Program and No Purchase Request Increase Alternatives described in Section 7.2).

- ***Cultural Resources.*** Reduced Lake Merced lake levels resulting from project pumping could result in exposure and damage of known or currently unknown archeological resources, which would be a significant impact (Impacts CP-5 and C-CP, LSM).

- ***Recreation.*** Groundwater pumping under the project could cause Lake Merced water levels to be 10 feet lower than levels predicted under the modeled existing conditions for most of the projected operational conditions, and could cause water levels to fall below 1 foot City Datum for 73 to 76 percent of the simulation period. East Lake could nearly dry up, and the overall size of Impound Lake would be substantially reduced or dry up altogether. At the lowest projected water levels under the proposed project, the available surface area of North and South Lakes would be greatly reduced and the water depth would be fairly shallow, reducing the capacity available to support the approximately 250 existing daily on-water recreationists. Further, the water's edge would be substantially farther from the existing shoreline, and stationary docks would not be in contact with the water's edge or surface. Floating docks would have to be moved to provide water access (Impacts RE-3 and C-RE, LSM).

- ***Biological Resources.*** Decreasing Lake Merced water levels under the proposed project could substantially reduce aquatic habitat and degrade water quality, thereby adversely affecting fish populations. To the extent that fish in Lake Merced support special-status and otherwise protected birds, such as double-crested cormorants, great blue herons, ducks, and grebes, this impact would be significant. Impacts on beneficial uses related to fish habitat would also be significant (BI-6, LSM). Relative to modeled existing conditions, a net loss of freshwater marsh wetlands at Lake Merced would occur over time under the proposed project, and that loss is expected to be greater than the loss predicted under the hydrologic conditions expected without the project (BI-7, LSM). Under the project, there could be a significant cumulative impact on aquatic habitat and water quality, thereby adversely affecting fish populations and fish-related beneficial uses of Lake Merced under cumulative conditions (Impact C-BI, LSM).

- ***Hydrology and Water Quality.*** Increased pumping in the North Westside Groundwater Basin under both Phases 1 and 2 of the proposed project could result in the landward migration of the seawater/freshwater interface to a greater degree than would occur under existing conditions. If the landward migration of the interface due to project pumping were to cause chloride concentrations to exceed 250 milligrams per liter at one of the coastal monitoring locations along the Pacific Coast, impacts related to seawater intrusion would be significant (Impact HY-8, LSM). Estimated Lake Merced water levels are predicted to be 10 feet lower than levels predicted under the modeled existing conditions for most of the simulation period, and are predicted to decrease to below 1 foot City Datum for 73 to 76 percent of the simulation period due to project-related pumping. Reduced water levels and decreased groundwater inflows to the lake could possibly cause water quality impacts, including changes in pH and dissolved oxygen levels (the parameters that are responsible for the listing of Lake Merced as an impaired water body), as well as increased eutrophication of the lake (Impact HY-9, LSM). Each of the production wells would be considered potentially vulnerable to contamination under the Drinking Water Source Assessment and Protection Program of the California Department of Public Health because potentially contaminating activities with a vulnerability score of 8 or higher were identified within the groundwater protection zones (HY-11, LSM). The cumulative potential for seawater intrusion is predicted to be similar to or less than that predicted for the proposed project, except in the area of the San Francisco Zoo monitoring location where the potential for seawater intrusion could be greater in the Deep Aquifer due to pumping under the

Regional Groundwater Storage and Recovery Project during "take" periods (C-HY-4, LSM). Under cumulative conditions, Lake Merced water-levels are predicted to decline below the modeled existing conditions for years 2 through 8 of the simulation period and after year 32. Lake levels are predicted to decline to below 1 foot City Datum more frequently than under modeled existing conditions and these declines could possibly cause deterioration of water quality, such as increased eutrophication and changes in pH and dissolved oxygen levels, resulting in significant cumulative water quality impacts (C-HY-5, LSM).

- ***Hazards and Hazardous Materials.*** Project operations associated with groundwater pumping would lower the estimated mean monthly Lake Merced water level, resulting in a smaller volume of water in the lake. The SFPUC maintains Lake Merced as a nonpotable emergency water supply for the city to be used for firefighting or sanitation purposes if no other sources of water are available (SFPUC, 2011b). In the event of a major disaster (i.e., catastrophic earthquake), Lake Merced water could be pumped into the city's drinking water distribution system to maintain firefighting, basic sanitary (i.e., toilet flushing), and other critical needs as part of the emergency response. Decreased lake levels could result in less available water for firefighting and sanitation purposes, which would be a significant impact (Impacts HZ-7 and C-HZ, LSM).

Short-Term Impacts

Project construction would result in the following significant short-term impacts, all of which could be mitigated to a less-than-significant level with the implementation of mitigation measures identified in Chapter 5:

- ***Cultural and Paleontological Resources.*** Ground-disturbing activities during project construction at the Lake Merced Pump Station well facility could adversely impact legally-significant prehistoric deposits, a significant impact (Impact CP-2b, LSM). Ground disturbing activities at the other well sites and along the pipeline routes could expose and cause impacts on previously unrecorded and buried (or otherwise obscured) archeological deposits, archeological resources, and/or human remains (that may have been interred outside of formal cemeteries), also a significant impacts (Impacts CP-2a and CP-4, LSM).

- ***Noise and Vibration.*** Project construction would be required to comply with the San Francisco Noise Ordinance, which limits noise from any individual piece of construction equipment to 80 decibels at 100 feet (except for impact tools and equipment, provided that such impact tools and equipment have intake and exhaust mufflers recommended by the manufacturer and approved by the Department of Public Works). Temporary, construction-related noise levels could exceed the daytime noise standard at sensitive receptors in the vicinity of construction activities (Impact NO-1, LSM).

- ***Utilities and Service Systems.*** Well facilities and pipelines would be constructed near a number of underground and aboveground utility lines that could be damaged during construction, including natural gas pipelines, electrical power lines, telecommunication lines, and other water supply pipelines. Well facility construction would also require new connections to existing electrical, water, and sewer lines. Accidental rupture of or damage to utility lines during project construction could temporarily disrupt utility services and, in the case of high-priority utilities, could result in significant safety hazards for construction workers and the public (Impact UT-3, LSM). In addition, the project does not propose to relocate utilities, but it is possible that relocation would be necessary once the locations and characteristics of any intervening utilities are confirmed (Impact UT-4, LSM).

- ***Biological Resources.*** Project construction could adversely affect western pond turtle at the Lake Merced well facility site, and could affect western pond turtle and California red-legged frog in the vicinity of the North Lake and Central Pump Station well facility sites. Direct mortality of special-status bats could occur through vegetation removal or building demolition at the Lake Merced site, West Sunset site, South Sunset site, and Golden Gate Park sites. Vegetation clearing during construction, including tree removal, could affect or destroy overwintering sites for monarch butterflies at the Golden Gate Park sites (BI-1, LSM). The removal of six trees at the Lake Merced, North Lake, and West Sunset well facility sites would conflict with applicable San Francisco Recreation and Park Department (SFRPD) policies and thus result in a significant impact related to tree removal (Impact BI-3, LSM). Construction of the project has the potential to adversely affect special-status species, including California red-legged frog, western pond turtle, special-status bats, and monarch butterfly, resulting in significant cumulative impacts. In addition, because project construction would require the removal of trees that are under the jurisdiction of the SFRPD, the project could conflict with local policies or ordinances protecting biological resources, resulting in significant cumulative impacts (Impact C-BI, LSM).

- ***Hydrology and Water Quality.*** Groundwater produced during construction dewatering at the Lake Merced well facility (an area not served by the combined sewer system) could contain sediments. If the water were discharged to Lake Merced, these sediments could degrade water quality (Impact HY-1, LSM).

- ***Hazards and Hazardous Materials.*** Construction activities at the North Lake and Central Pump Station well facility sites could expose construction workers and/or the environment to known elevated lead levels in shallow soil. In addition, although the potential to encounter hazardous materials in soil or groundwater arising from offsite sources is low, site conditions could change prior to construction if new contaminated sites were identified in the project vicinity or if there were substantial changes in the extent of contamination at known release sites (Impact HZ-2, LSM).

7.3.3 Approach to Alternatives Selection

The alternatives selection process for the Groundwater Supply Project was guided, in part, by the magnitude and severity of the impacts identified above. The SFPUC determined that the North Westside Groundwater Basin has the highest development potential of all San Francisco groundwater basins based on the aquifer thicknesses, susceptibility to land subsidence and seawater intrusion, historical groundwater levels, groundwater recharge and use, and groundwater quality (SFPUC, 1997). Therefore, this analysis focuses on alternatives that could be implemented in the North Westside Groundwater Basin, meet most of the project objectives, and:

- Lessen or avoid short-term construction-phase impacts;
- Lessen long-term effects related to seawater intrusion (Impact HY-8); and/or
- Lessen the potential to lower Lake Merced water levels and result in related effects on water quality (Impact HY-9), recreational resources (Impact RE-1), aesthetics (Impact AE-4), and freshwater marsh wetlands (Impact BI-7).

7.3.4 Selected CEQA Alternatives

This section describes the project alternatives that were selected and analyzed in accordance with CEQA Guidelines Section 15126.6(a). The four alternatives to the proposed project selected for detailed analysis in this EIR are:

- Alternative 1: No Project Alternative
- Alternative 2: Reduced Yield Alternative
- Alternative 3: Local Desalination Plant Alternative
- Alternative 4: Pipeline Location Alternative

Table 7-1 provides a brief description of these alternatives and highlights how they differ from the proposed project. This section also evaluates the impacts of the selected alternatives relative to those of the proposed project. Since the alternatives are conceptual, the evaluation is based on the available information and reasonable assumptions about how each alternative would be implemented. For each alternative, this section presents the following:

- A description of the alternative, including the rationale for its selection, and associated facility improvements and auxiliary components
- An evaluation of the alternative's ability to meet project goals and objectives
- Analysis of the environmental impacts of each alternative compared to those of the proposed project

Table 7-2 summarizes the environmental impacts of the selected alternatives compared to those of the proposed project. This table presents the significant impacts of the proposed project as well as less-than-significant impacts whose severity would be different under the project alternatives than under the proposed project. Table 7-2 does not include less-than-significant impacts of the proposed project that would have the same significance determination and/or impact severity as those of the project alternatives.

Alternative 1: No Project Alternative

CEQA Guidelines Section 15126.6(e) requires that EIRs include an evaluation of the No Project Alternative to provide decision-makers the information necessary to compare the relative impacts of approving the project and not approving the project. The No Project Alternative is defined as a continuation of existing conditions, as well as conditions that are reasonably expected to occur in the event that the proposed project is not implemented.

Description of the No Project Alternative

In the event that the SFPUC does not approve the San Francisco Groundwater Supply Project, the proposed well facilities and associated disinfection facilities, distribution pipelines, and pH-adjustment facilities would not be constructed, and the two existing irrigation wells in Golden Gate Park would not be converted to potable groundwater well facilities. The existing test wells would not be utilized as production wells and would be decommissioned in accordance with the well destruction requirements of the California Water Well Standards implemented by the

TABLE 7-1
SELECTED CEQA ALTERNATIVES

Alternative	How Does the Alternative Differ from the Proposed Project?
Alternative 1: No Project – The SFPUC would not construct the proposed well facilities or distribution pipelines, and San Francisco's municipal water supply would continue to operate as it does under existing conditions with implementation of other projects under the WSIP.	• The SFPUC would not construct new well facilities and associated disinfection facilities, distribution pipelines, or pH-adjustment facilities. • The SFPUC would not convert two existing irrigation wells in Golden Gate Park to potable groundwater well facilities. • The SFPUC would not produce 3 to 4 mgd of groundwater proposed under the project to meet the project objectives.
Alternative 2: Reduced Yield Alternative – The SFPUC would construct four new well facilities and operate four municipal supply wells instead of six, and would produce up to 2.9 mgd of local groundwater instead of the 4 mgd that would be produced under the Groundwater Supply Project.	• The SFPUC would construct four new well facilities and associated disinfection and pH-adjustment facilities and operate four municipal supply wells instead of six; well facilities would not be constructed at the Lake Merced site or the South Sunset site. • The 4,460-foot distribution pipeline connecting the South Sunset well facility to the West Sunset well facility would not be constructed. • The SFPUC would produce 1.75 to 2.9 mgd of groundwater instead of the 3 to 4 mgd planned under the proposed project.
Alternative 3: Local Desalination Plant Alternative – The SFPUC would construct a small desalination plant to supplement or replace the water supply that would be provided by the Groundwater Supply Project.	• For local water supply purposes, the SFPUC would construct a small desalination plant at or near the Oceanside Water Pollution Control Plant along with the associated seawater intake structure, intake pipeline, pump stations, treatment facilities, and distribution pipelines. • The SFPUC would not construct new well facilities and associated disinfection facilities, distribution pipelines for the groundwater well facilities, or pH-adjustment facilities. • The SFPUC would not convert two existing irrigation wells in Golden Gate Park to potable groundwater well facilities. • The SFPUC would produce a sustained capacity of 4 mgd, with an emergency capacity of up to 6 mgd, of desalinated seawater instead of groundwater to achieve the project objectives (same capacity as the proposed project).
Alternative 4: Pipeline Location Alternative – The SFPUC would construct most of the pipeline reaches extending to the north and south of Ortega Street along Sunset Boulevard.	• The SFPUC would construct pipeline segments 2 and 4 along Sunset Boulevard, within the street or adjacent unpaved footpath. • The SFPUC would not construct pipeline segments 2 and 4 along 40th and 41st Avenues.

California Department of Water Resources and the San Francisco Health Code. Existing groundwater pumping in the Westside Groundwater Basin would continue at approximately 9.74 mgd. In the South Westside Groundwater Basin, this includes 6.84 mgd of municipal pumping by the City of Daly City, the City of San Bruno, and the California Water Services Company (Cal Water); 1.101 mgd of irrigation pumping by the golf courses and cemeteries; and 0.291 mgd of irrigation pumping at residences in Hillsborough. In the North Westside Groundwater Basin, this includes 1.14 mgd of irrigation pumping in Golden Gate Park, 0.009 mgd of pumping for irrigation at the Edgewood Development Center, 0.32 mgd of pumping at the San Francisco Zoo, 0.004 mgd of pumping to maintain Pine Lake water levels, and 0.035 mgd of irrigation pumping at the San Francisco Golf Club. The modeled existing conditions, described in Chapter 5, Overview, Section 5.1.5, Overview of Groundwater Modeling Approach, represent the groundwater conditions that are predicted to occur under the No Project scenario.

TABLE 7-2
COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Yield	Alternative 3: Local Desalination Plant[a]	Alternative 4: Pipeline Location
LONG-TERM IMPACTS					
Aesthetics					
Impact AE-4: The project would have a substantial adverse effect on scenic resources or the existing visual character or quality of the site and its surroundings. (Less than Significant with Mitigation) **Impact C-AE:** The proposed project would have a cumulatively considerable contribution to a significant cumulative aesthetic impact. (Less than Significant with Mitigation)	Pumping of 3 to 4 mgd of groundwater could reduce Lake Merced water levels to approximately 10 feet lower than under the modeled existing conditions. Under cumulative conditions, Lake Merced water levels would likely be higher than under the modeled existing conditions for much of the simulation period. However, the estimated lake levels would be lower than levels under either the Groundwater Storage and Recovery Project and the Vista Grande Drainage Basin Improvement Project. Lower water levels in Lake Merced would detract from the scenic quality of the lake as viewed from the trail/pedestrian sidewalk around the perimeter of the lake, adjacent roadways, trails, docks, and golf courses, and picnic areas on John Muir Drive and Lake Merced Boulevard.	**Decreased** There would be no additional groundwater pumping or associated decline in Lake Merced water levels that could affect the scenic quality of Lake Merced. However, lake levels could decline in response to naturally occurring hydrologic conditions or ongoing existing groundwater pumping in the basin. There would be no contribution to any cumulative impacts.	**Decreased** Under Alternative 2, redistribution of the groundwater pumping to all three Golden Gate Park wells and the West Sunset well, combined with a lower production rate (a total of 2.9 mgd compared to 4 mgd under the proposed project), would decrease groundwater-level declines in the vicinity of Lake Merced and associated declines in lake levels that could affect the scenic quality of Lake Merced.	**Decreased** There would be no additional groundwater pumping or associated decline in Lake Merced water levels that could affect the scenic quality of Lake Merced. However, lake levels could decline in response to naturally occurring hydrologic conditions or ongoing existing groundwater pumping in the basin. There would be no contribution to any cumulative impacts. **Increased** Scenic resources would degrade under this alternative if the desalination plant were visible in the foreground of views from the Great Highway.	**No Change** Under this alternative, 3 to 4 mgd of groundwater would be pumped using the same well stations as the proposed project. Therefore, changes in Lake Merced water levels that could affect the scenic quality of the lake would be the same as under the proposed project. Further, there would be no construction of additional buildings that would change the aesthetics impacts. As with the proposed project, the pipeline would be below ground and would not introduce any new aesthetics impacts.
Cultural Resources					
Impact CP-1: The proposed project would not cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines Section 15064.5, including those resources listed in Article 10 or Article 11 of the San Francisco Planning Code. (Less than Significant)	The proposed project would not adversely affect any identified historic resources.	**No Change** No historic resources would be adversely affected.	**No Change** No historic resources would be adversely affected.	**Increased** Construction of the desalination plant at the National Guard Armory could potentially affect a historic resource if the existing buildings are found to be eligible for inclusion on the National Register of Historic Places.	**No Change** No historic resources would be adversely affected under this alternative.

TABLE 7-2 (Continued)
COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Yield	Alternative 3: Local Desalination Plant[a]	Alternative 4: Pipeline Location
LONG-TERM IMPACTS (cont.)					
Cultural Resources					
Impact CP-5: The proposed project would potentially cause a substantial adverse change in the significance of an archeological resource pursuant to Section 15064.5. (Less than Significant with Mitigation) **Impact C-CP:** The proposed project would possibly result in cumulatively considerable impacts related to historical, archeological, or paleontological resources or human remains. (Less than Significant with Mitigation)	Pumping of 3 to 4 mgd of groundwater could reduce Lake Merced water levels to approximately 10 feet lower than under the modeled existing conditions. Under cumulative conditions, Lake Merced water levels would likely be higher than under the modeled existing conditions for much of the simulation period. However, the estimated lake levels would be lower than levels under the Groundwater Storage and Recovery Project and the Vista Grande Drainage Basin Improvement Project. Lower water levels in Lake Merced could expose and damage known and currently unknown archeological resources.	**Decreased** There would be no additional groundwater pumping or associated decline in Lake Merced water levels attributable to groundwater pumping under the proposed project that could expose archeological resources at Lake Merced. However, lake levels could decline in response to naturally occurring hydrologic conditions or ongoing existing groundwater pumping in the basin. There would be no contribution to any cumulative impacts.	**Decreased** Under Alternative 2, redistribution of the groundwater pumping to all three Golden Gate Park wells and the West Sunset well, combined with a lower production rate (a total of 2.9 mgd compared to 4 mgd under the proposed project), would decrease groundwater-level declines in the vicinity of Lake Merced and associated declines in lake levels that could expose archeological resources at Lake Merced.	**Decreased** There would be no additional groundwater pumping or associated decline in Lake Merced water levels attributable to groundwater pumping under the proposed project that could expose archeological resources at Lake Merced. However, lake levels could decline in response to naturally occurring hydrologic conditions or ongoing existing groundwater pumping in the basin. There would be no contribution to any cumulative impacts. **Increased** Historic or archeological resources could be affected if the desalination plant were constructed at the Fleishhacker Bath House site or National Guard Armory Site.	**No Change** Under this alternative, 3 to 4 mgd of groundwater would be pumped using the same well stations as the proposed project. Therefore, impacts related to changes in Lake Merced water levels that could expose archeological resources at Lake Merced would be the same as under the proposed project. **Similar** Although a portion of the pipeline would be constructed in Sunset Boulevard instead of residential streets, this alternative would install approximately the same overall length of pipeline as the proposed project. Therefore, there would be a similar potential to encounter known and previously unidentified archeological resources.
Recreation					
Impact RE-3: The proposed project would physically degrade existing recreation resources. (Less than Significant with Mitigation) **Impact C-RE:** The project's contribution to cumulative impacts on recreational resources and uses would be cumulatively considerable. (Less than Significant with Mitigation)	Pumping of 3 to 4 mgd of groundwater could reduce Lake Merced water levels to approximately 10 feet lower than under the modeled existing conditions. Under cumulative conditions, Lake Merced water levels would likely be higher than under the modeled existing conditions for much of the simulation period. However, the estimated lake	**Decreased** There would be no additional groundwater pumping or associated decline in Lake Merced water levels that could degrade recreational resources at Lake Merced. However, lake levels could decline in response to naturally occurring hydrologic conditions or ongoing existing groundwater pumping in the	**Decreased** Under Alternative 2, redistribution of the groundwater pumping to all three Golden Gate Park wells and the West Sunset well, combined with a lower production rate (a total of 2.9 mgd compared to 4 mgd under the proposed project), would decrease groundwater-level declines in the vicinity of Lake Merced and	**Decreased** There would be no additional groundwater pumping or associated decline in Lake Merced water levels that could degrade recreational resources at Lake Merced. However, lake levels could decline in response to naturally occurring hydrologic conditions or ongoing existing groundwater pumping in the	**No Change** Under this alternative, 3 to 4 mgd of groundwater would be pumped using the same well stations as the proposed project. Therefore, there would be no change in impacts related to degradation of recreational resources at Lake Merced compared to the proposed project.

TABLE 7-2 (Continued)
COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Yield	Alternative 3: Local Desalination Plant[a]	Alternative 4: Pipeline Location
LONG-TERM IMPACTS (cont.)					
Recreation (cont.)					
Impact RE-3 and Impact C-RE (cont.)	levels would be lower than levels under the Groundwater Storage and Recovery Project and the Vista Grande Drainage Basin Improvement Project. Lower water levels in Lake Merced would reduce the capacity available to support the approximately 250 daily on-water recreationists. Further, the water's edge would be substantially farther from the existing shoreline, and stationary docks would not be in contact with the water's edge or surface. Floating docks would have to be moved to provide water access.	basin. There would be no contribution to any cumulative impacts.	associated declines in lake levels that could degrade recreational resources at Lake Merced.	basin. There would be no contribution to any cumulative impacts.	**Increased** If the pipeline were located within the unpaved footpath adjacent to Sunset Boulevard, recreational resources could be adversely affected. However, the pipeline would be below ground and the path would be restored following the installation of each one-block pipeline segment.
Biological Resources					
Impact BI-5: Operation of the proposed project would not adversely affect species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service. (Less than Significant)	Operation of the proposed project would have no adverse effects on species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS.	**No Change** There would be no additional groundwater pumping and none of the proposed facilities would be constructed or operated; therefore, there would be no impact on species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS.	**No Change** Two less well facilities would be constructed and operated under this alternative, and the total amount of groundwater pumping would be reduced from 4 mgd to 2.9 mgd. Similar to the proposed project, operation under this alternative would have no adverse effects on species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS.	**Increased** Operation of the desalination plant could result in the entrainment and/or impingement of marine organisms in the intake pipeline. While this impact could be addressed by installing fine screens at the intake structure, there would be a greater potential under this alternative for effects on a species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS.	**No Change** Under this alternative, 3 to 4 mgd of groundwater would be pumped using the same well stations as the proposed project. Therefore, as with the proposed project, operation under this alternative would have no adverse effects on species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS.

TABLE 7-2 (Continued)
COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Yield	Alternative 3: Local Desalination Plant[a]	Alternative 4: Pipeline Location
		LONG-TERM IMPACTS (cont.)			
Biological Resources (cont.)					
Impact BI-6: Operation of the proposed project would potentially adversely affect sensitive habitat types associated with Lake Merced. (Less than Significant with Mitigation) **Impact C-BI:** The proposed project would result in a considerable contribution to cumulative impacts related to special-status species, wetlands, waters of the United States, riparian habitat, wildlife nursery sites, or conflicts with local policies and ordinances protecting biological resources. (Less than Significant with Mitigation)	Pumping of 3 to 4 mgd of groundwater could reduce Lake Merced water levels to approximately 10 feet lower than under the modeled existing conditions. Under cumulative conditions, Lake Merced water levels would likely be higher than under the modeled existing conditions for much of the simulation period. However, the estimated lake levels would be lower than levels under the Groundwater Storage and Recovery Project and the Vista Grande Drainage Basin Improvement Project. Decreased water levels during operation of the proposed project could reduce aquatic habitat and degrade water quality. This could result in adverse effects on fish habitat-related beneficial uses of Lake Merced.	**Decreased** There would be no additional groundwater pumping or associated decline in Lake Merced water levels that could affect the scenic quality of Lake Merced. However, lake levels could decline in response to naturally occurring hydrologic conditions or ongoing existing groundwater pumping in the basin. There would be no contribution to any cumulative impacts.	**Decreased** Under Alternative 2, redistribution of the groundwater pumping to all three Golden Gate Park wells and the West Sunset well, combined with a lower production rate (a total of 2.9 mgd compared to 4 mgd under the proposed project), would decrease groundwater-level declines in the vicinity of Lake Merced and associated declines in lake levels that could affect fish habitat-related beneficial uses of Lake Merced.	**Decreased** There would be no additional groundwater pumping or associated decline in Lake Merced water levels that could affect fish habitat-related beneficial uses of Lake Merced. However, lake levels could decline in response to naturally occurring hydrologic conditions or ongoing existing groundwater pumping in the basin. There would be no contribution to any cumulative impacts.	**No Change** Under this alternative, 3 to 4 mgd of groundwater would be pumped using the same well stations as the proposed project. Therefore, changes in Lake Merced water levels that could affect fish habitat-related beneficial uses of the lake would be the same as under the proposed project.
Impact BI-7: Operation of the proposed project would adversely affect wetland habitats and other waters of the United States associated with Lake Merced. (Less than Significant with Mitigation)	Pumping of 3 to 4 mgd of groundwater could reduce Lake Merced water levels to approximately 10 feet lower than under the modeled existing conditions. Lowered water levels in Lake Merced would adversely affect freshwater marsh wetlands at Lake Merced.	**Decreased** There would be no additional groundwater pumping or associated decline in Lake Merced water levels that could affect freshwater marsh wetlands at Lake Merced. However, lake levels could decline in response to naturally occurring hydrologic conditions or ongoing existing groundwater pumping in the basin.	**Decreased** Under Alternative 2, redistribution of the groundwater pumping to all three Golden Gate Park wells and the West Sunset well, combined with a lower production rate (a total of 2.9 mgd compared to 4 mgd under the proposed project), would decrease groundwater-level declines in the vicinity of Lake Merced and associated declines in lake levels that could affect freshwater marsh wetlands at Lake Merced.	**Decreased** There would be no additional groundwater pumping or associated decline in Lake Merced water levels that could affect freshwater marsh wetlands at Lake Merced. However, lake levels could decline in response to naturally occurring hydrologic conditions or ongoing existing groundwater pumping in the basin.	**No Change** Under this alternative, 3 to 4 mgd of groundwater would be pumped using the same well stations as the proposed project. Therefore, changes in Lake Merced water levels that could affect freshwater marsh wetlands at the lake would be the same as under the proposed project.

TABLE 7-2 (Continued)
COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Yield	Alternative 3: Local Desalination Plant[a]	Alternative 4: Pipeline Location
LONG-TERM IMPACTS (cont.)					
Geology and Soils					
Impact GE-1: The proposed project is not located on a geologic unit that could become unstable as a result of project construction. (Less than Significant)	Engineered fill has been incorporated into the project design and thus, the well facility locations would not experience differential settlement. None of the well facilities or distribution pipelines are located in areas of landslide susceptibility or faulting.	**No Impact** There would be no facilities or structures constructed that could be subject to impacts associated with fault rupture or unstable slopes.	**No Change** Although only four well facilities would be constructed under this alternative instead of six, none would be located in an area of landslide susceptibility or faulting.	**Increased** Under Alternative 3, the intake structure and pipeline would terminate in or near the surface rupture zone of the active San Andreas Fault, which is located on the ocean floor about two miles west of the Oceanside Water Pollution Control Plant (WPCP). In addition, areas along the coast (such as ocean bluffs) can be unstable and are subject to erosion. If the desalination plant were sited to the west of the Oceanside WPCP, the plant location could be subject to instability and erosion.	**No Change** Impacts would not change compared to those of the proposed project because the same facilities would be constructed in the same locations. The new pipeline would not be located in an area of landslide susceptibility or faulting.
Hydrology and Water Quality					
Impact HY-8: Project operations would possibly result in seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin. (Less than Significant with Mitigation) **Impact C-HY-4:** The proposed project, in combination with past, present, and reasonably foreseeable future projects, could have a substantial adverse effect related to seawater intrusion. (Less than Significant with Mitigation)	Under the proposed project and cumulative conditions, pumping of 3 to 4 mgd of groundwater could cause Shallow Aquifer levels near the Pacific Ocean coastline to be below the "exclusion head" (the theoretical groundwater level necessary to prevent seawater intrusion) for a greater amount of time than would occur under the modeled existing conditions, with some coastal groundwater elevations below sea level. Because operation of the proposed project would reduce some groundwater levels to below the exclusion head (with some coastal groundwater elevations below sea level), and a	**Decreased** There would be no additional groundwater pumping or associated decline in groundwater levels that could increase the potential for seawater intrusion. However, groundwater levels could decline in response to naturally occurring hydrologic conditions or ongoing existing groundwater pumping in the basin. As for the modeled existing conditions, the potential for seawater intrusion would be low. There would be no contribution to any cumulative impacts.	**Decreased** Under Alternative 2, redistribution of the groundwater pumping to all three Golden Gate Park wells and the West Sunset well, combined with a lower production rate (a total of 2.9 mgd compared to 4 mgd under the proposed project), would decrease the decline in groundwater levels and associated potential for seawater intrusion in the portion of the North Westside Groundwater Basin that is south of the West Sunset well.	**Decreased** There would be no additional groundwater pumping or associated decline in groundwater levels that could increase the potential for seawater intrusion. However, groundwater levels could decline in response to naturally occurring hydrologic conditions or ongoing existing groundwater pumping in the basin. As for modeled existing conditions, the potential for seawater intrusion would be low. There would be no contribution to any cumulative impacts.	**No Change** Under this alternative, 3 to 4 mgd of groundwater would be pumped using the same well stations as the proposed project. Therefore, there would be no change in the potential for seawater intrusion.

TABLE 7-2 (Continued)
COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Yield	Alternative 3: Local Desalination Plant[a]	Alternative 4: Pipeline Location
LONG-TERM IMPACTS (cont.)					
Hydrology and Water Quality (cont.)					
Impact HY-8 and Impact C-HY-4 (cont.)	portion of the Shallow Aquifer is open to the Pacific Ocean, the potential exists for seawater intrusion to occur.				
Impact HY-9: The proposed project would possibly have a substantial, adverse effect on water quality that could affect the beneficial uses of Lake Merced. (Less than Significant with Mitigation) **Impact C-HY-5:** The proposed project, in combination with past, present, and reasonably foreseeable future projects, would possibly have a substantial adverse effect on water quality that could affect the beneficial uses of Lake Merced. (Less than Significant with Mitigation)	Pumping of 3 to 4 mgd of groundwater could reduce Lake Merced water levels to approximately 10 feet lower than under the modeled existing conditions. Under cumulative conditions, Lake Merced water levels would likely be higher than under the modeled existing conditions for much of the simulation period. However, the estimated lake levels would be lower than levels under the Groundwater Storage and Recovery Project and the Vista Grande Drainage Basin Improvement Project. The decline in water levels could cause degradation of lake water quality that could affect beneficial uses of Lake Merced.	**Decreased** There would be no additional groundwater pumping or associated decline in Lake Merced water levels that could degrade lake water quality or result in associated effects on the beneficial uses of Lake Merced. However, lake levels could decline in response to naturally occurring hydrologic conditions or ongoing existing groundwater pumping in the basin. There would be no contribution to any cumulative impacts.	**Decreased** Under Alternative 2, redistribution of the groundwater pumping to all three Golden Gate Park wells and the West Sunset well, combined with a lower production rate (a total of 2.9 mgd compared to 4 mgd under the proposed project), would decrease groundwater-level declines in the vicinity of Lake Merced and associated declines in lake levels that could affect water quality. Therefore, there would be less potential for degradation of lake water quality and the associated effects on the beneficial uses of Lake Merced.	**Decreased** There would be no additional groundwater pumping or associated decline in Lake Merced water levels that could cause degradation of lake water quality, or result in associated effects on the beneficial uses of Lake Merced. However, lake levels could decline in response to naturally occurring hydrologic conditions or ongoing existing groundwater pumping in the basin. There would be no contribution to any cumulative impacts.	**No Change** Under this alternative, 3 to 4 mgd of groundwater would be pumped using the same well stations as the proposed project. Therefore, the decline in lake levels would not change the identified impacts related to lake water quality or associated effects on the beneficial uses of Lake Merced.
Impact HY-11: Project operation would possibly cause a violation of water quality standards. (Less than Significant with Mitigation)	Each well is considered vulnerable to contamination based on potentially contaminating activities with a vulnerability score of 8 or higher, as identified by the Drinking Water Source Assessment and Protection Program reports.	**No Impact** There would be no groundwater pumping or associated vulnerability to groundwater contamination.	**Decreased** The South Sunset and Lake Merced wells would not be operated. Therefore, the total number of wells would be four instead of six, resulting in a reduction of the potential for the project wells to produce contaminated groundwater.	**No Impact** There would be no groundwater pumping under this alternative or associated vulnerability to groundwater contamination. **Increased** Operation of a desalination plant could result in the degradation of water quality as a result of high-salinity discharges into the Pacific Ocean from the existing outfall structure.	**No Change** Under this alternative, 3 to 4 mgd of groundwater would be pumped using the same well stations as the proposed project. Therefore, there would be no change in impacts related to violations of water quality standards.

TABLE 7-2 (Continued)
COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Yield	Alternative 3: Local Desalination Plant[a]	Alternative 4: Pipeline Location
			LONG-TERM IMPACTS (cont.)		
Hazards and Hazardous Materials					
Impact HZ-5: Project operations wound not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials. (Less than Significant)	The proposed project would use a minor amount of hazardous materials for the disinfection and pH adjustment of groundwater introduced into the distribution system, in accordance with applicable regulations.	**Decreased** There would be no groundwater pumping or associated treatment of groundwater that would require the use of hazardous materials.	**Decreased** Production of 2.9 mgd of groundwater under this alternative instead of 4 mgd under the proposed project would require less disinfection and pH adjustment and the associated use of hazardous materials.	**Increased** Although impacts related to hazardous materials use would be less than significant based on compliance with applicable regulations, operation of the desalination plant under this alternative would require the use of chemicals for pH adjustment, disinfection, particulate removal, control of scale, prevention of biological fouling, cleaning, and reverse-osmosis to remove salts.	**No Change** Under this alternative, 3 to 4 mgd of groundwater would be treated using the same disinfection and pH-adjustment facilities as the proposed project. Therefore, there would be no change in impacts related to the use of hazardous materials.
Impact HZ-7: Project operations would possibly impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. (Less than Significant with Mitigation) **Impact C-HZ:** Implementation of the proposed project would possibly result in cumulatively considerable impacts related to hazards and hazardous materials. (Less than Significant with Mitigation)	Pumping of 3 to 4 mgd of groundwater could reduce Lake Merced water levels to approximately 10 feet lower than under the modeled existing conditions. Under cumulative conditions, Lake Merced water levels would likely be higher than under the modeled existing conditions for much of the simulation period. However, the estimated lake levels would be lower than levels under the Groundwater Storage and Recovery Project and the Vista Grande Drainage Basin Improvement Project. Decreased water levels could result in less Lake Merced water available for firefighting and sanitation purposes.	**Decreased** There would be no additional groundwater pumping or associated decline in Lake Merced water levels that could reduce the amount of water in Lake Merced. However, lake levels could decline in response to naturally occurring hydrologic conditions or ongoing existing groundwater pumping in the basin. There would be no contribution to any cumulative impacts.	**Decreased** Under Alternative 2, redistribution of the groundwater pumping to all three Golden Gate Park wells and the West Sunset well, combined with a lower production rate (a total of 2.9 mgd compared to 4 mgd under the proposed project), would decrease groundwater-level declines in the vicinity of Lake Merced and associated declines in lake levels that would decrease the amount of water in the lake. Therefore, there would be less potential to decrease the amount of Lake Merced water available for firefighting and sanitation purposes.	**Decreased** There would be no additional groundwater pumping or associated decline in Lake Merced water levels that could decrease the amount of water in the lake. However, lake levels could decline in response to naturally occurring hydrologic conditions or ongoing existing groundwater pumping in the basin. There would be no contribution to any cumulative impacts.	**No Change** Under this alternative, 3 to 4 mgd of groundwater would be pumped using the same well stations as the proposed project. Therefore, the decline in lake levels would not change the identified impacts related to the amount of Lake Merced water available for emergency purposes.

TABLE 7-2 (Continued)
COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Yield	Alternative 3: Local Desalination Plant[a]	Alternative 4: Pipeline Location
LONG-TERM IMPACTS (cont.)					
Energy and Mineral Resources					
Impact ME-2: Project operations would not result in substantial adverse effects related to the long-term use of large amounts of fuel or energy, or the use of these resources in a wasteful manner. (Less than Significant)	The proposed project would not use large amounts of energy or use the energy in a wasteful manner. The total amount of energy used by the project would constitute both a small portion of San Francisco's existing energy use and of the total energy produced by the Hetch Hetchy System; in addition, the design of the proposed facilities would comply with applicable energy efficiency measures specified by the SFPUC Power Enterprise's Energy Efficiency Group.	**No Impact** There would be no groundwater pumping or associated energy use for pumping, distribution, and treatment of the groundwater.	**Decreased** Production of 2.9 mgd of groundwater under this alternative instead of 4 mgd under the proposed project would require less energy for pumping, distribution, and treatment of the groundwater.	**Increased** Although the design of the small desalination plant would comply with applicable energy-efficiency measures specified by the SFPUC Power Enterprise's Energy Efficiency Group, operation of the desalination plant under this alternative would require substantial increases in energy consumption to desalinate the feed water.	**No Change** Under this alternative, 3 to 4 mgd of groundwater would be produced using the same well stations and treatment facilities as the proposed project. Therefore, there would be no change in energy use during operation.
SHORT-TERM IMPACTS					
Cultural Resources and Paleontological Resources					
Impact CP-2a: The proposed project would potentially cause a substantial adverse change in the significance of an archeological resource pursuant to Section 15064.5. (Less than Significant with Mitigation) **Impact CP-4:** The proposed project would potentially disturb human remains, including those interred outside of formal cemeteries. (Less than Significant with Mitigation)	Previously unrecorded and buried (or otherwise obscured) archeological deposits, archeological resources, and/or human remains could be encountered during construction of six well facilities and 28,860 feet of distribution pipelines.	**No Impact** Because there would be no construction under Alternative 1, there would be no potential to encounter previously unrecorded and buried (or otherwise obscured) archeological deposits, archeological resources, or human remains.	**Decreased** Only four well facilities would be constructed as compared to six under the proposed project. The length of distribution pipelines would be reduced from 28,860 feet to 24,400 feet. With less excavation and soil disturbance, there would be a decreased potential to encounter previously unrecorded and buried (or otherwise obscured) archeological deposits, archeological resources, or human remains.	**Increased** No well facilities would be constructed under this alternative. Rather, a desalination plant would be constructed at or near the Oceanside WPCP. The total length of distribution pipeline would be approximately 16,160 feet less than under the proposed project. However, the desalination plant and portions of the distribution pipeline would be constructed in a more sensitive area with respect to cultural resources compared to the proposed project, resulting in a greater potential to encounter previously unrecorded and buried (or otherwise obscured)	**Similar** Under Alternative 4, there would be no change in the total length of distribution pipelines, and the same number of well facilities would be constructed. Further, the alternate pipeline alignment would be located within a road and disturbed areas, similar to the proposed project, and would not be constructed in a more sensitive area. Therefore, the potential to encounter previously unrecorded and buried (or otherwise obscured) archeological deposits, archeological resources, or human remains would be similar to the proposed project.

TABLE 7-2 (Continued)
COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Yield	Alternative 3: Local Desalination Plant[a]	Alternative 4: Pipeline Location
SHORT-TERM IMPACTS (cont.)					
Cultural Resources and Paleontological Resources (cont.)					
Impact CP-2a and Impact CP-4 (cont.)				archeological deposits, archeological resources, and human remains.	
Impact CP-2b: Construction of the proposed Lake Merced well facility would potentially cause a substantial adverse change in the significance of an archeological resource pursuant to Section 15064.5. (Less than Significant with Mitigation)	Ground-disturbing activities associated with the proposed Lake Merced well facility may adversely impact legally-significant prehistoric deposits.	**No Impact** Because there would be no construction under Alternative 1, there would be no potential to encounter legally-significant prehistoric deposits at the Lake Merced well facility location.	**No Impact** The Lake Merced well facility would not be constructed under this alternative; therefore, there would be no potential to encounter legally-significant prehistoric deposits at the Lake Merced well facility location.	**No Impact** The Lake Merced well facility would not be constructed under this alternative; therefore, there would be no potential to encounter legally-significant prehistoric deposits at the Lake Merced well facility location.	**No Change** Under Alternative 4, there would be no change related to construction of the Lake Merced well facility, therefore there would be the same potential to encounter legally-significant prehistoric deposits at the Lake Merced well facility location.
Traffic					
Impact TR-1: Closure of travel lanes during project construction would temporarily reduce roadway capacity and increase traffic delays on area roadways, causing temporary and intermittent conflicts with all modes of travel, but the effects would be of short duration and limited in magnitude. (Less than Significant)	The proposed project would not require the closure of any traffic lanes, with the exception of a staging area that would occupy part of a roadway right-of-way.	**No Impact** Because there would be no construction under Alternative 1, there would be no construction-related transportation and circulation effects.	**Decreased** Only four well facilities would be constructed as compared to six under the proposed project, and the length of distribution pipelines would be reduced from 26,860 feet to 22,400 feet. Therefore, the traffic delays and transportation effects would be even less intense than the already less-than-significant effects of the proposed project.	**Decreased** Only 12,700 feet of distribution pipeline would be constructed compared to 26,860 feet under the proposed project. Therefore, fewer traffic delays and transportation effects would occur compared to the less-than-significant effects that would occur under the project.	**Increased** Construction of Segments 2 and 4 of the distribution pipelines (8,800 feet of pipeline) along Sunset Boulevard could require closure of up to one lane of traffic for one block at a time, resulting in increased travel delays that would not occur under the proposed project.
Noise and Vibration					
Impact NO-1: The proposed project would result in the exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise	Use of some construction equipment could result in noise levels greater than allowed under the San Francisco Noise Ordinance, which limits noise from any individual piece of construction equipment to 80 A-weighted decibels at 100 feet.	**No Impact** Because there would be no construction under Alternative 1, there would be no construction-related noise.	**Decreased** The same construction equipment would be used for this alternative as for the proposed project. However, only four well facilities would be constructed as compared to six under the	**Decreased** No well facilities would be constructed under this alternative. Rather, a desalination plant would be constructed at or near the Oceanside WPCP. The total length of distribution	**No Change** The same number of well facilities would be constructed under this alternative, resulting in the same noise impacts.

TABLE 7-2 (Continued)
COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Yield	Alternative 3: Local Desalination Plant[a]	Alternative 4: Pipeline Location
SHORT-TERM IMPACTS (cont.)					
Noise and Vibration (cont.)					
ordinance or result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above noise levels existing without the project. (Less than Significant with Mitigation)			proposed project. The length of distribution pipelines would also be reduced from 26,860 feet to 22,400 feet. With less construction, there would be a decrease in the use of equipment that could exceed the noise limits of the San Francisco Noise Ordinance.	pipeline would be approximately 14,160 feet less than under the proposed project. With less construction, there would be a decrease in the use of equipment that could exceed the noise limits of the San Francisco Noise Ordinance.	**Decreased** Although the same types of equipment would be used for similar construction durations, residential receptors along the relocated pipeline alignment would be farther from the construction activities and would not be subjected to noise levels in excess of the speech interference threshold.
Utilities and Service Systems					
Impact UT-3: Project construction would potentially result in a substantial adverse effect related to disruption of utility operations or accidental damage to existing utilities. (Less than Significant with Mitigation)	Accidental rupture of or damage to utility lines could occur during construction of six well facilities and 28,860 feet of distribution pipelines.	**No Impact** Because there would be no construction under Alternative 1, there would be no potential to accidentally rupture a utility line.	**Decreased** Only four well facilities would be constructed as compared to six under the proposed project. The length of distribution pipelines would be reduced from 26,860 feet to 22,400 feet. With less construction involving excavation, there would be less potential to accidentally rupture a utility line.	**Decreased** No well facilities would be constructed under this alternative. Rather, a desalination plant would be constructed at or near the Oceanside WPCP. The length of distribution pipelines constructed through developed neighborhoods would be approximately 4,950 feet less than under the proposed project. With less construction involving excavation in developed areas, there would be less potential to accidentally rupture a utility line.	**Increased** Under Alternative 4, there would be no change in the total length of distribution pipelines, and the same number of well facilities would be constructed. However, 8,800 feet of pipeline would be installed along Sunset Boulevard instead of 41st Avenue. Because Sunset Boulevard is a major thoroughfare, there are likely more underground utilities beneath the street, and the potential for rupture of a utility line during construction would be greater.
Impact UT-4: Project construction would potentially result in a substantial adverse effect related to the relocation of local utilities. (Less than Significant with Mitigation)	Utility relocation could potentially be required for installation of 28,860 feet of distribution pipelines.	**No Impact** Because there would be no construction under Alternative 1, it would not be necessary to relocate any utilities.	**Decreased** The length of distribution pipelines under this alternative would be reduced from 26,860 feet to 22,400 feet. With less excavation, there would be a decreased potential to encounter utilities that would require relocation.	**Decreased** No well facilities would be constructed under this alternative. Rather, a desalination plant would be constructed at or near the Oceanside WPCP. The length of distribution pipelines constructed through developed neighborhoods would be	**Increased** Under Alternative 4, there would be no change in the total length of distribution pipelines, and the same number of well facilities would be constructed. However, 8,800 feet of pipeline would be installed along Sunset Boulevard instead of 41st Avenue. Because

TABLE 7-2 (Continued)
COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Yield	Alternative 3: Local Desalination Plant[a]	Alternative 4: Pipeline Location
SHORT-TERM IMPACTS (cont.)					
Utilities and Service Systems (cont.)					
Impact UT-4 (cont.)				approximately 4,950 feet less than under the proposed project. With less excavation in developed areas, there would be a decreased potential to encounter utilities that would require relocation.	Sunset Boulevard is a major thoroughfare, there are likely more underground utilities beneath the street, and potential need to relocate utilities during construction would be greater.
Biological Resources					
Impact BI-1: Construction of the proposed project would potentially adversely affect species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS. (Less than Significant with Mitigation)	Project construction could adversely affect western pond turtle at Lake Merced, and western pond turtle and California red-legged frog at the North Lake and Central Pump Station well facility sites. Direct mortality of special-status bats could occur through vegetation removal or building demolition at the well facilities and Sunset Reservoir. Vegetation clearing during construction, including tree removal, could destroy or affect overwintering sites for monarch butterflies at the Golden Gate Park project sites. These species would not be affected by construction of the distribution pipelines.	**No Impact** Because there would be no construction under Alternative 1, no special-status species would be adversely affected.	**Decreased** The Lake Merced well facility would not be constructed under this alternative. Therefore, the adverse effect on the western pond turtle and special-status bats would be reduced. The South Sunset well facility would not be constructed, reducing the adverse effect on special-status bats.	**Similar** The areas available for the desalination plant are located in potential habitat for western pond turtle, California-red legged frog, and special-status bats. Impacts on these resources would be similar to those of the proposed project. **Increased** The desalination plant and part of the distribution pipeline would be constructed near the zoo, and zoo animals could be subjected to construction noise and dust, which would not occur under the proposed project.	**No Change** The same number of well facilities would be constructed in the same locations as the proposed project. Therefore, there would be no change in effects on species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS. **Similar** Similar to the proposed project, the distribution pipelines would be installed within the street or grass median strip, and no special-status species would be adversely affected.
Impact BI-3: Construction of the proposed project would conflict with applicable local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance. (Less than Significant with Mitigation)	Six trees would be removed, none of which are native to the San Francisco area.	**No Impact** Because there would be no construction under Alternative 1, no tree removal would be required.	**Decreased** The Lake Merced well facility would not be constructed under this alternative, resulting in removal of one less tree (a Monterey pine).	**Similar** The areas available for the desalination plant contain mature trees. Impacts on these resources would be similar to those of the proposed project.	**No Change** The same number of well facilities would be constructed in the same locations as the proposed project. Therefore, there would be no change in the need to remove trees.

TABLE 7-2 (Continued)
COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Yield	Alternative 3: Local Desalination Plant[a]	Alternative 4: Pipeline Location
SHORT-TERM IMPACTS (cont.)					
Biological Resources (cont.)					
Impact BI-3 (cont.)					**Increased** If the distribution pipelines were installed within the footpath adjacent to Sunset Boulevard, removal of additional trees could be required.
Impact C-BI: The proposed project would result in a considerable contribution to cumulative impacts related to special-status species, wetlands, waters of the United States, riparian habitat, wildlife nursery sites, or conflicts with local policies and ordinances protecting biological resources. (Less than Significant with Mitigation)	Project construction has the potential to adversely affect special-status species, including California red-legged frog, western pond turtle, special-status bats, and monarch butterfly. In addition, the project could conflict with local policies or ordinances protecting biological resources by removing six trees that provide potential foraging opportunities, cover, and nesting and roosting habitat for birds and bats.	**No Impact** Because there would be no construction under Alternative 1, there would be no impact on special-status species and no tree removal would be required. There would be no contribution to any cumulative impacts.	**Decreased** The Lake Merced well facility would not be constructed under this alternative. Therefore, the adverse effect on the western pond turtle and special-status bats would be reduced. The South Sunset well facility would not be constructed, reducing the adverse effect on special-status bats.	**Similar** Construction under this alternative could adversely affect special-status species, including California red-legged frog, western pond turtle, special-status bats, monarch butterfly, and zoo animals. In addition, Alternative 3 could result in the removal of trees, thus conflicting with local policies or ordinances protecting biological resources.	**No Change** The same number of well facilities would be constructed in the same locations as the proposed project. Therefore, there would be no change in effects on species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS. In addition, there would be no change in the need to remove trees. **Similar** Similar to the proposed project, the distribution pipelines would be installed within the street or grass median strip, and no special-status species would be adversely affected. **Increased** If the distribution pipelines were installed within the footpath adjacent to Sunset Boulevard, removal of additional trees could be required.

TABLE 7-2 (Continued)
COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Yield	Alternative 3: Local Desalination Plant[a]	Alternative 4: Pipeline Location
SHORT-TERM IMPACTS (cont.)					
Hydrology and Water Quality					
Impact HY-1: Project construction would possibly violate water quality standards and waste discharge requirements or otherwise substantially degrade water quality. (Less than Significant with Mitigation)	Groundwater produced during construction dewatering at the Lake Merced well facility could contain sediments. If the water were discharged to Lake Merced, these sediments could degrade water quality.	**No Impact** Because there would be no construction under Alternative 1, no groundwater dewatering would be required.	**Decreased** The Lake Merced well facility would not be constructed under this alternative; therefore, all groundwater produced during dewatering could be discharged to the combined sewer system instead of Lake Merced.	**Similar** Under Alternative 3, construction of the distribution pipeline could occur partially within the area served by the separate storm sewer system at Lake Merced. As with the proposed project, the groundwater produced during construction dewatering could contain sediments that could degrade water quality in Lake Merced if the water were discharged to the lake.	**No Change** Groundwater dewatering would be required at the Lake Merced well facility, the same as under the proposed project.
Hazards and Hazardous Materials					
Impact HZ-2: Project construction would possibly result in a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials in soil and groundwater. (Less than Significant with Mitigation)	Construction activities at the North Lake and Central Pump Station well facility sites could expose construction workers and/or the environment to known elevated lead levels in shallow soil.	**No Impact** Because there would be no construction under Alternative 1, there would be no potential to encounter lead or other hazardous materials in the soil.	**No Change** Both the North Lake and Central Pump Station well facilities would be constructed under this alternative; therefore, the potential to encounter elevated lead levels at these locations would be the same as under the proposed project.	**Decreased** Neither the North Lake nor Central Pump Station well facilities would be constructed under this alternative, and there is no documented contamination at the Oceanside WPCP. Therefore, there would be a decreased potential to encounter elevated lead levels at these locations. **Increased** If the desalination plant were constructed at the Fleishhacker Bath House site, there would be the potential to encounter hazardous materials in the soil. If the desalination plant were constructed at the National Guard Armory site, there would be the potential to encounter hazardous building materials if the existing buildings required demolition or alteration.	**No Change** Both the North Lake and Central Pump Station well facilities would be constructed under this alternative; therefore, the potential to encounter elevated lead levels at these locations would be the same as under the proposed project. **Similar** Land uses along Sunset Boulevard are similar to those along 41st Avenue; therefore, there would be a similar potential to encounter hazardous materials in the soil during construction of Segments 2 and 4.

TABLE 7-2 (Continued)
COMPARISON OF THE ENVIRONMENTAL IMPACTS OF THE CEQA ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Yield	Alternative 3: Local Desalination Plant[a]	Alternative 4: Pipeline Location
SHORT-TERM IMPACTS (cont.)					
Hazards and Hazardous Materials (cont.)					
Impact HZ-2 (cont.)				**Similar** The distribution pipeline would traverse neighborhoods similar to those that would be crossed under the proposed project. Therefore, the potential to encounter hazardous materials in the soil during pipeline construction would be similar.	

[a] Alternative 3, Desalination Plant, is described below under the heading Alternative 2: Local Desalination Plant. Under this alternative, the desalination plant could be sited at one of several undeveloped areas near the Oceanside WPCP site, such as near the former Fleishhacker Bath House, the San Francisco Zoo overflow parking lot, or in the vicinity of the National Guard Armory.

Ability to Meet Project Objectives

The No Project Alternative would not meet any of the project objectives, which are to: expand and diversify the SFPUC's water supply portfolio to increase system reliability; increase the use of local water supply sources; and reduce dependence on imported surface water. It would also fail to meet the WSIP goals and objectives that rely directly on the contribution of the Groundwater Supply Project to fulfill systemwide level of service objectives. If the Groundwater Supply Project were not constructed, the SFPUC's water supply portfolio would not include 3 to 4 mgd of a local groundwater resource. The SFPUC would be limited in its ability to meet (and could possibly be prevented from meeting) its adopted WSIP seismic delivery and water supply reliability goals, particularly in the San Francisco region, because of reduced water supply in San Francisco. This would curtail the SFPUC's ability to restore service after a major earthquake as well as restrict/prevent the SFPUC from conducting planned maintenance of individual facilities without interrupting customer service. In the event of an unplanned facility outage (such as a power failure or other unforeseen event), the SFPUC would be limited in its ability to serve water to customers in San Francisco. During drought periods, the SFPUC might be unable to limit rationing to a maximum 20 percent systemwide reduction, and customers in San Francisco would likely be subject to cutbacks in water supply because of the reduced amount of water available in San Francisco compared to the proposed project. Overall, with the reduction in water supply that could occur under the No Project Alternative, the SFPUC would be limited in its ability to provide water to customers during both drought and nondrought periods and would not be able to fulfill part of its basic mission with respect to water supply reliability, which is "to serve San Francisco and its Bay Area customers with reliable, high-quality, and affordable water."

Implementation of the No Project Alternative would leave San Francisco without a high-quality emergency water supply during any emergency situation, such as earthquake damage, that interrupted the city's sources of imported water. Although Lake Merced would remain available for firefighting and as an emergency supply, the lake water quality does not meet drinking water standards; if the lake water were used, the CCSF would need to direct residents to boil their tap water. Therefore, the No Project Alternative could jeopardize the SFPUC's ability to fully meet the WSIP goals and objectives adopted as part of approval of the WSIP pursuant to SFPUC Resolution 08-0200.

Environmental Impacts of the No Project Alternative Compared to those of the Project

As summarized in Table 7-2, the No Project Alternative would have fewer long-term impacts than the proposed project because groundwater pumping would continue at existing rates, and no additional groundwater would be pumped from the North Westside Groundwater Basin. Although groundwater levels would continue to change in response to hydrologic conditions and ongoing existing pumping in the Westside Groundwater Basin, there is a low potential for seawater intrusion to occur for the modeled existing conditions, as discussed in Impact HY-8. While the mean monthly water level in Lake Merced is predicted to be 6.3 feet City Datum, and the mean annual range is predicted to be 1.6 feet (as described in Impact HY-9 for the modeled existing conditions), lake levels would continue to respond to hydrologic conditions and are predicted to range from approximately 13.5 feet City Datum to -0.5 feet City Datum throughout the simulation period. Therefore, changes in Lake Merced water levels and associated effects on water quality (Impact HY-9), aquatic habitat and special-status species (Impact BI-6), freshwater wetlands (Impact BI-7), recreational resources (Impact RE-3), scenic resources (Impact AE-4), archeological resources (Impact CP-5), and the availability of Lake Merced water for fire and sanitation purposes (Impact HZ-7) could still occur under the No Project Alternative. However, these effects would occur at a much lower frequency because lake levels are predicted to be approximately 10 feet higher than those under the proposed project, as shown in Section 5.16, Hydrology and Water Quality, Figure 5.16-10. A violation of water quality standards (Impact HY-11) would not occur under the No Project Alternative because there would be no municipal groundwater pumping in the North Westside Groundwater Basin; therefore, no municipal supply wells would be subject to potentially contaminating activities.

Impacts related to hazardous materials use (Impact HZ-5) would be less than under the proposed project because the No Project Alternative would not use hazardous materials to disinfect or pH-adjust groundwater. Under the No Project Alternative, no groundwater would be pumped, and no well facilities would be operated; therefore, no additional energy would be used (Impact ME-2).

The No Project Alternative would avoid all construction-related impacts of the project because no well facilities and associated disinfection facilities, pH-adjustment facilities, or distribution pipelines would be constructed. Therefore, there would be no potential to encounter legally-significant prehistoric deposits at the Lake Merced well facility location (Impact CP-2b) or previously unrecorded and buried (or otherwise obscured) archeological deposits, archeological resources, or human remains (Impacts CP-2a and CP-4); no construction equipment would exceed the noise limits of the San Francisco Noise Ordinance or result in an increase in ambient noise levels (Impact NO-1); there would be no potential to inadvertently rupture a utility line or require the relocation of a utility (Impacts UT-3 and UT-4); species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service would not be adversely affected (Impact BI-1); no tree removal would be required (Impact BI-3); no discharges to Lake Merced would be conducted (Impact HY-1); and soils containing lead at the North Lake and Central Pump Station well facilities would not be disturbed (Impact HZ-2).

Alternative 2: Reduced Yield

Description of Alternative 2

The Reduced Yield Alternative would include construction of four well facilities, including construction of disinfection facilities at the West Sunset Playground well facility and a pH-adjustment facility at Sunset Reservoir. This alternative would result in operation of four municipal supply wells instead of six, as would occur under the proposed project at full implementation. To reduce effects on groundwater levels in the vicinity of Lake Merced and associated effects on Lake Merced water levels, well facilities would not be constructed at the Lake Merced site or South Sunset site, and the existing test wells at these sites would not be converted to municipal supply wells. With this configuration, all groundwater production would occur at well sites from the West Sunset Playground and northward, shifting pumping away from Lake Merced and implementing the majority of groundwater production in Golden Gate Park.

During Phase 1, the Central Pump Station well facility would be constructed in Golden Gate Park, and the West Sunset well facility would be constructed at the West Sunset Playground; the existing test wells at these sites would be converted to municipal supply wells. The Central Pump Station well would be operated at an average rate of 1.45 mgd, the same as under the proposed project. The West Sunset well would be operated at a rate of approximately 0.3 mgd (one-half the rate of this well under the proposed project). The total average Phase 1 production rate under this alternative would be approximately 1.75 mgd, compared to 2.5 to 3 mgd under Phase 1 of the proposed project. The North Lake well and South Windmill Replacement well facilities would be constructed in Golden Gate Park during Phase 2. The existing irrigation wells would be converted to municipal supply wells and operated at 0.65 and 0.5 mgd, respectively, the same as would occur under the proposed project. The total average groundwater production rate at full capacity would be approximately 2.9 mgd compared to 4 mgd under Phase 2 of the proposed project.

The four wells would be capable of producing up to 4 mgd during a catastrophic emergency and could operate at this rate for up to 30 days. Portable generators would provide backup power to enable use of the West Sunset and North Lake well facilities during a catastrophic emergency. The well facilities in Golden Gate Park would continue to serve as a backup irrigation supply for the park, the same as under the proposed project. The existing test wells at Lake Merced and the South Sunset Playground would not be utilized as production wells and would be decommissioned in accordance with the well destruction requirements of the California Water Well Standards implemented by the California Department of Water Resources and the San Francisco Health Code.

As for the proposed project, disinfection equipment would be installed at the West Sunset well facility and a chlorine analyzer and sample station would be constructed at the northwest corner of the Sunset Reservoir, where the groundwater supply would be tested for chlorine levels. In addition, a pH-adjustment facility would be installed at the Sunset Reservoir. Disinfection and pH-adjustment equipment would not be installed at the Lake Merced site. The distribution system would be the same as under the proposed project, except that the 4,460-foot distribution pipeline connecting the South Sunset well facility to the West Sunset well facility would not be constructed.

The Reduced Yield Alternative is similar to Phase 1 of the proposed project in that four wells would be operated for municipal supply. However, under Phase 1 of the proposed project, the municipal supply wells would include the Central Pump Station well in Golden Gate Park along with the West Sunset, South Sunset, and Lake Merced wells to the south. Irrigation pumping would continue at the South Windmill, Elk Glen, and North Lake irrigation wells under Phase 1. Phase 1 and Phase 2 of the project would result in similar impacts related to well interference, subsidence, seawater intrusion, adverse effects on Lake Merced, violation of water quality standards, and groundwater depletion, as discussed in Section 5.16, Hydrology and Water

Quality. Therefore, implementation of Phase 1 only was not considered as an alternative to the proposed project. The Reduced Yield Alternative differs from Phase 1 because it relies on the provision of recycled water to Golden Gate Park in order to utilize the South Windmill Replacement and North Lake wells in Golden Gate Park for municipal supply. Unlike Phase 1 of the proposed project, this alternative shifts pumping to areas north of Lake Merced and results in an overall 1.1-mgd reduction in groundwater pumping in the North Westside Groundwater Basin relative to the proposed project at full implementation once recycled water becomes available.

Ability to Meet Project Objectives

The Reduced Yield Alternative (Alternative 2) would meet all of the project objectives, which are to: expand and diversify the SFPUC's water supply portfolio to increase system reliability; increase the use of local water supply sources; and reduce dependence on imported surface water. However, because the total average yield under normal operations would be 2.9 mgd compared to 4 mgd under the proposed project, it would only partially meet the WSIP goals and objectives that rely directly on the contribution of the Groundwater Supply Project to fulfill systemwide level of service objectives. If Alternative 2 were implemented, the SFPUC's water supply portfolio would have up to 1.1 mgd less of a local groundwater resource than it would under the proposed project. Therefore, the SFPUC would be limited in its ability to serve water to customers in San Francisco as planned under the WSIP and could be restricted from conducting planned maintenance of individual facilities without interrupting customer service, because less water (1.1 mgd) would be available during the maintenance activities.

In the event of a catastrophic emergency, the SFPUC would also be limited in its ability to meet (and could possibly be prevented from meeting) its adopted WSIP seismic, delivery, and water supply reliability goals, particularly in the San Francisco region, because the total amount of groundwater available in the event of an emergency would be 1.1 mgd less than would be available under the proposed project. This could curtail the SFPUC's ability to restore service after a major earthquake or an unplanned facility outage (such as a power failure or other unforeseen event).

During drought periods, the SFPUC may be unable to limit rationing to a maximum 20 percent systemwide reduction, and customers in San Francisco would likely be subject to cutbacks in water supply because less water (1.1 mgd) would be available compared to the project. Overall, with the reduction in water supply that could occur under Alternative 2, the SFPUC could be limited in its ability to provide water to customers during both drought and nondrought periods and may not be able to fulfill part of its basic mission with respect to water supply reliability, which is "to serve San Francisco and its Bay Area customers with reliable, high-quality, and affordable water." Further, the Reduced Yield Alternative could jeopardize the SFPUC's ability to fully meet the WSIP goals and objectives, adopted as part of approval of the WSIP under SFPUC Resolution 08-0200. Per the adopted resolution, the SFPUC will reevaluate 2030 demand projections, regional water system purchase requests, and water supply options by 2018. If this alternative were adopted, the up to 1.1 mgd reduction in overall WSIP water supply goals would be included as part of the re-evaluation and taken into consideration as a part of the separate

SFPUC decision regarding water deliveries after 2018. With the reduction in yield from this project alternative, the SFPUC may need to revise the WSIP goals and objectives or develop additional water supply projects to make up the reduction in yield, depending on demand projections.

Environmental Impacts of Alternative 2

As summarized in Table 7-2, implementation of the Reduced Yield Alternative would decrease the intensity of long-term impacts compared to those of the proposed project because groundwater pumping would be conducted primarily in Golden Gate Park (including the Central Pump Station well, South Windmill Replacement well, and North Lake well); pumping would be reduced by half at the West Sunset well and would be eliminated at the South Sunset and Lake Merced wells. The total average groundwater production under this alternative would be 2.9 mgd, compared to 4 mgd under the proposed project.

The South Sunset well was not included in this alternative because, as discussed in Impact HY-8 (see Section 5.16, Hydrology and Water Quality), pumping from this well could directly affect Shallow Aquifer groundwater levels and associated Lake Merced water levels because it draws groundwater from above the "X" clay layer of the Primary Production Aquifer and is located in an area where the "-100-foot" clay layer separating the Shallow and Primary Production Aquifers is absent. The Lake Merced well was also not included in this alternative because, while pumping from this well is expected to have similar or less direct effects on lake water levels, it is located closest to Lake Merced and could result in impacts on Lake Merced water levels. Although pumping from the West Sunset Well facility could also directly affect Shallow Aquifer groundwater levels and associated Lake Merced water levels, this well was retained under this alternative because facilities at the well site are needed to provide treatment of the pumped groundwater. However, the production rate from this well was reduced by half from an average of 0.6 to 0.3 mgd to reduce potential effects on the Shallow Aquifer groundwater levels and Lake Merced water levels.

Therefore, under the Reduced Yield Alternative, the elimination of pumping at the Lake Merced and South Sunset wells, along with reduced pumping at the West Sunset well, would cause less of a decline in Shallow Aquifer groundwater levels in the Lake Merced area than would occur under the proposed project. Alternative 2 would also reduce the related effects on Lake Merced water levels and water quality (Impact HY-9), aquatic habitat and special-status species (Impact BI-6), freshwater wetlands (Impact BI-7), recreational resources (Impact RE-3), scenic resources (Impact AE-4), archeological resources (Impact CP-5), and the availability of Lake Merced water for fire and sanitation purposes (Impact HZ-7). Under the Reduced Yield Alternative, there would also be less potential for seawater intrusion in this area (Impact HY-8). A violation of water quality standards (Impact HY-11) could still occur, because potentially contaminating activities have been identified at each of the wells; however, there would be no impact on water quality at the well sites eliminated under this alternative (the South Sunset and Lake Merced wells).

Impacts related to hazardous materials use (Impact HZ-5) would be less than under the proposed project because treatment facilities would not be constructed at the Lake Merced well facility.

Under the Reduced Yield Alternative, only four well facilities would be operated; therefore, less energy would be used (Impact ME-2).

The Reduced Yield Alternative would decrease the intensity of all but one construction-related impact of the proposed project because well facilities would not be constructed at the South Sunset Playground and Lake Merced sites, and the 4,460-foot distribution pipeline connecting the South Sunset well facility to the West Sunset well facility would not be constructed. Therefore, there would be less potential to encounter legally-significant prehistoric deposits at the Lake Merced well facility location (Impact CP-2b) or previously unrecorded and buried (or otherwise obscured) archeological deposits, archeological resources, and/or human remains (Impacts CP-2a and CP-4); less construction-related traffic and lane closures would occur (Impact TR-1); less construction equipment would exceed the noise limits of the San Francisco Noise Ordinance or result in an increase in ambient noise levels (Impact NO-1); there would be less potential to inadvertently rupture a utility line or require relocation of a utility (Impacts UT-3 and UT-4); the western pond turtle would not be adversely affected at Lake Merced, and special-status bats would not be affected at the Lake Merced or South Sunset Playground sites (Impact BI-1); no tree removal would be required at the Lake Merced well facility, resulting in the removal of one less tree (Impact BI-3); and no discharges to Lake Merced would be conducted (Impact HY-1). As for the proposed project, soils containing lead at the North Lake and Central Pump Station well facilities would be disturbed (Impact HZ-2).

In summary, the intensity of operational impacts under the Reduced Yield Alternative would be reduced compared to the proposed project because Alternative 2 would eliminate pumping in the vicinity of Lake Merced and at the South Sunset Playground site and reduce the total average pumping from 4 mgd to 2.9 mgd. Therefore, the potential would be less for adverse effects on Lake Merced water levels and associated impacts on water quality, biological resources, aesthetics, recreational resources, archeological resources, and the availability of Lake Merced water for firefighting and sanitation purposes, as well as potential seawater intrusion effects. Construction impacts would generally be less as well, because the 4,460-foot distribution pipeline connecting the South Sunset well facility to the West Sunset well facility would be eliminated. All of the significant impacts of the proposed project would remain significant under the Reduced Yield Alternative. However, the magnitude of significance would generally be less, and all of the impacts would be reduced to a less-than-significant level with implementation of the same mitigation measures specified in this EIR for the proposed project. However, this alternative would not meet WSIP level of service goals to the same extent as the proposed project.

Alternative 3: Local Desalination Plant

Description of Alternative 3

The Local Desalination Plant Alternative would construct a small seawater desalination plant in San Francisco at or near the Oceanside Water Pollution Control Plant (WPCP), which is located near the Pacific Ocean coastline adjacent to the San Francisco Zoo, to provide a sustained capacity of 4 mgd and an emergency capacity of 6 mgd of desalinated water, consistent with the amount of groundwater pumping provided under the proposed project. At this time, only conceptual design information is available for this alternative, but sufficient detail is provided below to allow for an analysis of expected impacts compared to those of proposed project. However, should this alternative be selected over the proposed project, any additional specific analysis that may be required for such facility would be dependent upon specific project description details that have not yet been developed. At such time as the specific project details would be developed, Environmental Planning would determine whether and the extent to which additional environmental review would be necessary prior to the SFPUC's consideration of final approval of the desalination facility proposed under this alternative.

This alternative is similar to one of the WSIP alternatives analyzed in the PEIR—the Year-round Desalination at Oceanside Alternative, with a capacity of 25 mgd—but is much smaller in scale. The PEIR alternative was not adopted as the preferred project for the WSIP because of the technical feasibility issue of being able to site a year-round desalination plant of the size required within the available area at the existing Oceanside WPCP, among other reasons. However, the Local Desalination Plant Alternative would be considerably smaller and also potentially could be located at other areas beyond the Oceanside WPCP, as described further below.

Conceptually, the Alternative 3 plant would provide year-round supplies during all hydrologic year types to blend into the regional system. A small desalination plant and associated seawater intake structure, intake pipeline, treatment facilities, and raw and treated water pump station would be constructed. While the required facilities would be similar to those needed for the Year-round Desalination Oceanside Alternative of the PEIR, the footprint and sizing of the Alternative 3 facilities would be much smaller because the local plant would have approximately one-quarter the capacity of the 25-mgd plant analyzed in the PEIR.

Similar to the larger 25-mgd plant analyzed in the PEIR, the desalinated water would be introduced into the local water system at Sunset Reservoir, requiring construction of approximately 2.4 miles (12,700 feet) of distribution pipelines. The Sunset Reservoir serves customers in San Francisco only. The analysis of this alternative assumes the desalination plant would be constructed within undeveloped portions of the existing Oceanside WPCP or at nearby undeveloped areas, such as near the former Fleishhacker Bath House, the San Francisco Zoo overflow parking lot, or the National Guard Armory. There are four potential building sites at the Oceanside WPCP, including three areas located on landscaped or bermed areas and one area located over existing underground facilities at the WPCP (Kennedy/Jenks, 2011). While there may be sufficient room for the desalination facilities in the landscaped and bermed areas, these man-made areas may require improvements such as earthwork and concrete demolition to make them geotechnically able to support the desalination facilities. The fourth potential area, located over existing underground facilities, could require substantial structural and seismic modifications to the underground facilities to support the weight of the new desalination plant. The construction of improvements and operation and maintenance of the desalination plant at any of the four potential locations could interfere with operations at the WPCP.

The Fleishhacker Bath House was badly damaged in a fire in December 2012, and the building was subsequently demolished for safety reasons. As a result, the potential exists for hazardous materials to be present in the open space where the building once stood (Kennedy/Jenks, 2011). The San Francisco Zoo overflow parking lot is a 2.3-acre flat dirt field located between the Oceanside WPCP and the zoo. The National Guard Armory is an approximately 4.2-acre site located adjacent to the Oceanside WPCP. Use of this latter site could require demolition of existing buildings or construction in a currently undeveloped area, depending on the selected location for the desalination plant.

The analysis of this alternative also assumes that seawater would be pumped through an offshore intake structure and pipeline to the desalination plant, which, like the project would be designed with a sustained capacity of 4 mgd and an emergency capacity of 6 mgd. The intake structure would be located west of the desalination plant, approximately one to two miles offshore at a depth of approximately 40 to 50 feet. It would be sited and designed to minimize sediment intrusion and impingement of marine organisms as well as to maximize water quality. The intake pipeline would convey seawater from the intake structure to a new raw water pump station, which would pump water to the desalination plant.

The conceptual process for the desalination plant includes pretreatment using advanced technologies to remove pathogens and suspended solids, a dual-stage reverse-osmosis system to remove salts, and post-treatment to stabilize and disinfect the product water and make it suitable for mixing in the regional water system. This analysis assumes that the desalination plant would make use of the existing ocean outfall at the Oceanside WPCP to discharge the reverse-osmosis and pretreatment brine. Based on a water recovery rate of approximately 50 percent in modern-day desalination plants, the capacity of the seawater intake structure and pipeline is estimated at 12 mgd. A treated-water pump station would be constructed and used to pump the treated water to the Sunset Reservoir through 2.4 miles (12,700 feet) of distribution pipeline constructed in city streets, primarily through residential neighborhoods.

Implementation of the Local Desalination Plant Alternative would require numerous additional permits and approvals, including preparation of a watershed sanitary survey in accordance with the California Department of Public Health's safety regulations, approval by the U.S. Army Corps of Engineers for construction of structures in coastal areas, and approval by the Regional Water Quality Control Board for brine disposal. In addition, as required by Clean Water Act Section 316(b), the SFPUC would be required to submit a study to the California Coastal Commission describing the potential impingement and entrainment impacts on aquatic resources.

While there would be no restrictions on the availability of seawater, there remain site-specific uncertainties regarding the permit conditions for brine disposal and for minimizing impacts on aquatic resources. In addition, this alternative would add substantial cost to the overall WSIP associated with building and operating a new intake structure, pump station, treatment plant, and transmission pipelines, as well as any required mitigation measures. In addition, an extended period of time could be required to complete the engineering design, potential additional CEQA review, and permitting for the small desalination plant.

Under this alternative, the proposed well facilities and associated disinfection facilities, distribution pipelines, and pH-adjustment facility would not be constructed, and the two existing irrigation wells in Golden Gate Park would not be converted to potable groundwater well facilities. The existing test wells would not be utilized as production wells and would be decommissioned in accordance with the well destruction requirements of the California Water Well Standards implemented by the California Department of Water Resources and the San Francisco Health Code. Existing groundwater pumping in the Westside Groundwater Basin would continue at approximately 9.74 mgd, as described under the No Project Alternative.

Ability to Meet Project Objectives

The Local Desalination Plant Alternative would meet all of the project objectives, which are to: expand and diversify the SFPUC's water supply portfolio to increase system reliability; increase the use of local water supply sources; and reduce dependence on imported surface water. It would also help meet the WSIP goals and objectives that rely directly on the contribution of the Groundwater Supply Project to fulfill systemwide level of service objectives.

Because this alternative would provide a sustained capacity of 4 mgd treated water and an emergency capacity of 6 mgd, it would contribute to the SFPUC's ability to meet its adopted WSIP seismic, delivery, and water supply reliability goals. The desalination plant would contribute to the SFPUC's ability to restore service after a major earthquake and the ability of the SFPUC to conduct planned maintenance of individual facilities without interrupting customer service. In the event of an unplanned facility outage (such as a power failure or other unforeseen event), this alternative would contribute to the SFPUC's ability to serve water to customers in San Francisco. During drought periods, the SFPUC would retain the ability to limit rationing to a maximum 20 percent systemwide reduction. Implementation of this alternative would help the SFPUC fulfill part of its basic mission with respect to water supply reliability, which is "to serve San Francisco and its Bay Area customers with reliable, high-quality and affordable water."

Environmental Impacts of Alternative 3

As summarized in Table 7-2, implementation of the Local Desalination Plant Alternative would decrease the intensity of the significant long-term impacts identified for the proposed project; under the alternative, groundwater pumping would continue at existing rates, and no additional groundwater would be pumped from the North Westside Groundwater Basin. Although groundwater levels would continue to change in response to hydrologic conditions and ongoing groundwater pumping in the North Westside Groundwater Basin, the potential for seawater intrusion would be low for the modeled existing conditions, as discussed in Impact HY-8. While the estimated mean monthly water level in Lake Merced is predicted to be 6.3 feet City Datum under the modeled existing conditions, and the estimated mean annual range is predicted to be 1.6 feet (as described in Impact HY-9), lake levels would continue to respond to hydrologic conditions and ongoing groundwater pumping and are predicted to range from approximately 13.5 feet City Datum to -0.5 feet City Datum throughout the simulation period. Therefore, changes in Lake Merced water levels and associated effects on water quality (Impact HY-9), aquatic habitat and special-status species (Impact BI-6), freshwater wetlands (Impact BI-7), recreational resources (Impact RE-3), scenic resources (Impact AE-4), archeological resources (Impact CP-5), and the availability of Lake Merced water for fire and sanitation purposes (Impact HZ-7) could still occur. However, these effects would occur much less frequently under Alternative 3 because lake levels are predicted to be approximately 10 feet higher than levels under the proposed project, as shown in Figure 5.16-10. A violation of water quality standards (Impact HY-11) would not occur because there would be no municipal groundwater pumping in the North Westside Groundwater Basin; therefore, no municipal supply wells would be subject to potentially contaminating activities.

The Local Desalination Plant Alternative would introduce several additional short-term and long-term impacts. These impacts are discussed below along with identification of the related impact of the proposed project:

- If the desalination plant were located in the vicinity of the Great Highway, the plant could result in adverse effects on scenic resources if the plant were visible within foreground views from the Great Highway (related to Impact AE-4 in Section 5.3, Aesthetics).

- The areas available for development of a desalination plant contain mature trees (within landscaped and undeveloped areas of the existing plant grounds and at the armory) and are located in potential habitat for western pond turtle, California-red legged frog, and special-status bats. Construction of the desalination plant could require the removal of trees or existing structures, causing associated effects on special-status wildlife. In addition, animals at the San Francisco Zoo could be subject to construction-related noise, dust, and vibration, which would not occur under the proposed project (related to Impact BI-1 in Section 5.14, Biological Resources).

- Operation of the desalination plant could result in the entrainment and/or impingement of marine organisms in the intake pipeline, potentially resulting in adverse effects on species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations (potentially including those of the National Marine Fisheries Service), or by the California Department of Fish and Wildlife or the U.S. Fish and Wildlife Service (related to Impact BI-5 in Section 5.14, Biological Resources). However, as discussed above, the intake pipeline would be sited and designed to minimize this potential impact.

- The intake structure and pipeline would terminate in or near the surface rupture zone of the active San Andreas Fault, which is located on the ocean floor about two miles west of the Oceanside WPCP, and could therefore be subject to fault rupture. Therefore, construction of a desalination plant could result in the exposure of the pipeline to substantial adverse effects involving rupture of a known earthquake fault where the pipeline is in proximity to the fault. In addition, areas along the coast (such as ocean bluffs) can be unstable and are subject to erosion (related to Impact GE-3 in Section 5.15, Geology and Soils).

- Operation of the desalination plant could result in the degradation of water quality as a result of high-salinity discharges into the Pacific Ocean from the existing outfall structure (related to Impact HY-11 in Section 5.16, Hydrology and Water Quality).

- Operation of the desalination plant would require the use of chemicals for pH adjustment, disinfection, particulate removal, control of mineral deposition (scale), prevention of biological fouling, cleaning, and reverse-osmosis to remove salts thereby increasing the routine transport, use, or disposal of hazardous materials (Related to Impact HZ-5 in Section 5.17, Hazards and Hazardous Materials).

- Operation of the desalination plant would substantially increase energy consumption for desalination and pumping (related to Impact ME-2 in Section 5.18, Mineral and Energy Resources).

- It is uncertain whether the existing buildings at the National Guard Armory have been evaluated for inclusion on the National Register of Historic Places, and cultural resource surveys would be required to identify potential impacts on historic resources if the buildings would be demolished or altered (related to Impact CP-1 in Section 5.5, Cultural and Paleontological Resources).

- Demolition of existing buildings at the National Guard Armory could result in exposure to hazardous building materials such as asbestos-containing materials, PCBs, and lead-based paint, if present. Construction of the desalination plant at the former Fleishhacker Bath House site could encounter hazardous materials in the soil (related to Impact HZ-2 in Section 5.17, Hazards and Hazardous Materials).

Depending on the location selected for the plant, some of the construction impacts of the Local Desalination Plant Alternative could be either less or more intense than those of the proposed project. While only one water desalination facility would be constructed under Alternative 3 (as opposed to six well facilities under the proposed project), and the length of distribution pipelines for the alternative would be 12,700 feet (compared to 26,860 feet under the proposed project), it is unknown whether the total amount of construction would be similar to, less than, or more than that required for the proposed project. However, the locations available for development of a desalination plant are not near sensitive noise receptors and utilities serving residential/business neighborhoods. Therefore, fewer residences and other sensitive receptors would be subjected to construction-related noise (Impact NO-1); and there would be less potential to inadvertently rupture a utility line (Impact UT-3) or encounter a utility line that required relocation (Impact UT-4). Legally-significant prehistoric deposits at the Lake Merced well facility location would not be encountered (Impact CP-2b) and soils known to contain lead at the North Lake and Central Pump Station well facilities would not be disturbed (Impact HZ-2). Similar to the proposed project, groundwater dewatering in the vicinity of Lake Merced could involve discharges to the lake (Impact HY-1). In addition, the desalination plant and portions of the distribution pipeline would be constructed in a more sensitive area with respect to the potential presence of cultural resources compared to the proposed project areas (Dean, 2013). Therefore, compared to the proposed project, the potential would be greater to encounter previously unrecorded and buried (or otherwise obscured) archeological deposits, archeological resources, and/or human remains (Impact CP-2). As with the proposed project, potential biological impacts associated with tree removal and disturbance of special-status wildlife could occur (Impacts BI-1 and BI-3).

In summary, while the Local Desalination Plant Alternative would avoid all of the long-term groundwater-related impacts of the proposed project, it would require a significant increase in hazardous materials use and long-term energy use compared to the project, and could also be subject to hazards such as fault rupture and unstable slopes. Marine organisms could become entrained and/or impinged in the intake pipeline, and water quality effects could result from discharges of saline water from the desalination plant. Construction-related impacts would generally be less intense, although zoo animals could be exposed to construction-related noise and dust, which would not occur under the proposed project.

Alternative 4: Pipeline Location Alternative

Description of Alternative 4

The Pipeline Location Alternative would construct the pipeline Segments 2 and 4 along Sunset Boulevard rather than along 40th and 41st Avenues. The overall pipeline length would be similar to the proposed project, but a portion of the pipeline would be moved from residential streets to Sunset Boulevard, which provides regional access through the project vicinity. The pipeline segments are described below.

Under Alternative 4, Segment 1 of the pipeline would connect the West Sunset well facility to Sunset Reservoir. This segment would be the same as under the proposed project and would extend west along Quintara Street, north along 41st Avenue to Ortega Street, and east along Ortega Street to 24th Avenue. At this location, the pipeline would continue southward along 24th Avenue for approximately one block before entering the Sunset Reservoir facility.

Within Golden Gate Park, the pipeline segments from the potable water wells would be connected to Segment 2, similar to the proposed project. However, under Alternative 4, the pipeline segment would begin the intersection of Martin Luther King Jr. Drive and Sunset Boulevard. The pipeline would continue south for approximately one mile along Sunset Boulevard to the intersection with Ortega Street. This segment would then extend west on Ortega Street for four blocks, south on 41st Avenue for two blocks, then east on Quintara Street for one block to where it would connect with the West Sunset well facility.

The same as the proposed project, Segment 3 of the pipeline would connect the Central Pump Station well facility to Segment 2. Segment 3 would extend eastward along Martin Luther King Jr. Drive from the intersection with Sunset Boulevard, and then for approximately one mile along Middle Drive West. The pipeline would then continue for approximately 700 feet along Middle Drive West and Overlook Drive to the Central Pump Station well facility.

Similar to the proposed project, Segment 4 of the pipeline would connect the South Sunset well facility to the West Sunset well facility. However, under Alternative 4, this segment would extend from the South Sunset site along Wawona Street three blocks to Sunset Boulevard, then north approximately 3,350 feet to the intersection of Sunset Boulevard and Rivera Street. From there, the pipeline segment would extend three blocks to the west on Rivera Street, then one block north on 40th Avenue to the West Sunset well facility.

Phase 2 of the project would include connecting the North Lake well and South Windmill Replacement well facilities to the pipeline junction at the intersection of Martin Luther King Jr.

Drive and Sunset Boulevard the same as the proposed project. Segment 5 would extend west from the pipeline junction to the intersection of Chain of Lakes Drive East and Martin Luther King Jr. Drive, then north along Chain of Lakes Drive East to the North Lake well facility. Segment 6 would extend approximately 0.4 mile west, from the intersection of Chain of Lakes Drive East and Martin Luther King Jr. Drive and along Martin Luther King Jr. Drive to the South Windmill Replacement well facility.

Ability to Meet Project Objectives

The Pipeline Location Alternative would meet all of the project objectives, which are to: expand and diversify the SFPUC's water supply portfolio to increase system reliability; increase the use of local water supply sources; and reduce dependence on imported surface water. It would also help meet the WSIP goals and objectives that rely directly on the contribution of the Groundwater Supply Project to fulfill systemwide level of service objectives. Because this alternative would also provide a sustained capacity of 4 mgd and emergency capacity of 6 mgd of a treated water source (as would the proposed project), it would contribute to the SFPUC's ability to meet its adopted WSIP seismic, delivery, and water supply reliability goals.

Environmental Impacts of Alternative 4 Compared to the Proposed Project

As summarized in Table 7-2, all but one of the long-term impacts of the Pipeline Location Alternative would be the same as those of the proposed project because the groundwater production rates would be the same, and the same well facilities would be used to pump the groundwater. Therefore, changes in groundwater levels would be identical to those under the proposed project, and the potential for seawater intrusion would be the same (Impact HY-8). Similarly, there would be the same potential for adverse effects on Lake Merced water levels and associated effects on lake water quality (Impact HY-9), aquatic habitat and special-status species (Impact BI-6), freshwater wetlands (Impact BI-7), recreational resources (Impact RE-3), scenic resources (Impact AE-4), archeological resources (Impact CP-5), and the availability of Lake Merced water for fire and sanitation purposes (Impact HZ-7). The potential for a violation of water quality standards (Impact HY-11) would also be the same because the wells would be subject to the same potentially contaminating activities. If the pipeline under Alternative 4 were installed within the footpath adjacent to Sunset Boulevard, recreational uses could temporarily be disrupted along the footpath (Impact RE-3), but the pipeline would be below ground and the path would be restored at the completion of construction; therefore, long-term impacts on this recreational resource would be less than significant.

Impacts related to construction of the well facilities would also be identical to those of the proposed project because the Pipeline Location Alternative includes construction of the same well facilities. However, the 8,800 feet of relocated pipelines in Segments 2 and 4 would be constructed along Sunset Boulevard, where residential receptors are located a minimum of 125 feet from the edge of Sunset Boulevard, compared to a minimum of 20 feet along 41st Avenue where the pipelines would be constructed under the proposed project. Residential receptors along the relocated pipeline alignment would be subjected to lower noise levels because they would be located further away from construction activities, and impacts associated with construction-related noise (Impact NO-1) would be less intense than under the proposed project.

The Pipeline Location Alternative could result in greater traffic impacts than the proposed project because the relocated Segments 2 and 4 would be installed in Sunset Boulevard, which is a major thoroughfare and would have more traffic than 41st Avenue, where the pipelines would be constructed under the proposed project (Impact TR-1). During construction, up to one lane of traffic could be closed for one block at a time under the Pipeline Location Alternative, resulting in increased travel delays that would not occur under the proposed project. In addition, bus stops along Sunset Boulevard would need to be temporarily relocated during lane closures along blocks that include bus stops. Regardless, as with the proposed project, the SFPUC's construction management plan, developed in coordination with the multiagency Transportation Advisory Staff Committee, would reduce the potential for significant localized construction effects related to reductions in roadway capacity, increased traffic delays, and conflicts with bus stops.

Under the Pipeline Location Alternative, the potential would be greater to inadvertently rupture an underground utility (Impact UT-3) or encounter a utility that required relocation (Impact UT-4) because Sunset Boulevard has more utilities within the street than does 41st Avenue. However, similar to the proposed project, these impacts would likely be less than significant with implementation of mitigation measures requiring the SFPUC to conduct preconstruction utility identification and coordination; protect existing conditions; safeguard employees and provide appropriate emergency response in the event of accidental damage to a utility; and promptly reconnect utilities in the event of damage. If the pipeline were installed beneath the footpath adjacent to Sunset Boulevard, removal of additional trees could be required (Impact BI-3). However, as with the proposed project, this impact would be less than significant with implementation of mitigation measures requiring the SFPUC to plant replacement trees of equivalent ecological value.

Because the total length of pipeline would be the same as under the proposed project, all pipelines would be constructed in previously disturbed areas, and all of the well facilities would be constructed in the same locations, the remaining construction impacts would be similar to those of the proposed project. These impacts include the potential to encounter legally-significant prehistoric deposits at the Lake Merced well facility (Impact CP-2b) or previously unrecorded and buried (or otherwise obscured) archeological deposits, archeological resources, and/or human remains (Impact CP-2a); the potential to affect species identified as a candidate, sensitive, or special-status species (Impact BI-1); and the potential to encounter hazardous materials in the soil (Impact HZ-2).

In summary, the operational impacts of the Pipeline Location Alternative would be identical to those of the proposed project. While construction-related noise effects would be less intense, implementation of this alternative could result in increased impacts associated with traffic, temporary impacts related to disruption of the footpath along Sunset Boulevard, potential utility conflicts, and tree removal, all of which could be reduced to a less-than-significant level with implementation of mitigation measures similar to those specified for the proposed project. Other impacts associated with construction would be similar or identical to those of the proposed project.

7.4 Comparison of Alternatives

The CEQA Guidelines require the identification of an environmentally superior alternative to the proposed project (Section 15126.6[e]). If it is determined that the "no project" alternative would be the environmentally superior alternative, then the EIR shall also identify an environmentally superior alternative among the other project alternatives (Section 15126.6[3]).

As described above, the No Project Alternative and Reduced Yield Alternative would both reduce operational effects relative to the proposed project because: (1) there would be no new groundwater pumping under the No Project Alternative, and (2) under the Reduced Yield Alternative, groundwater pumping would be conducted primarily in Golden Gate Park, and pumping would be reduced by half at the West Sunset well and would be eliminated at the South Sunset and Lake Merced wells. The total average groundwater production under the Reduced Yield Alternative would be 2.9 mgd compared to 4 mgd under the proposed project. Construction impacts would be eliminated under the No Project Alternative. In addition, the Reduced Yield Alternative would decrease the intensity of all but one construction-related impact of the proposed project because well facilities would not be constructed at the South Sunset Playground and Lake Merced sites; the disinfection facilities would not be constructed at Lake Merced; and the 4,460-foot distribution pipeline connecting the South Sunset well facility to the West Sunset well facility would not be constructed. While the significant impacts of the proposed project would remain significant under the Reduced Yield Alternative, they would be reduced to a less-than-significant level with the implementation of mitigation measures specified in this EIR for the proposed project.

While the Reduced Yield Alternative would meet the project objectives, the No Project Alternative would not. Neither alternative would fully meet the WSIP goals and objectives that rely directly on the contribution of the Groundwater Supply Project to fulfill systemwide level of service objectives. Therefore, both alternatives could jeopardize the SFPUC's ability to meet the adopted WSIP goals and objectives adopted as part of the WSIP under SFPUC Resolution 08-0200. Further, in the event of a catastrophic emergency, the SFPUC could be limited in its ability to meet the adopted WSIP seismic, delivery, and water supply reliability goals, particularly in the San Francisco region, because less (or no) groundwater would be available. This could affect the SFPUC's ability to restore service after a major earthquake or an unplanned facility outage (such as a power failure or other unforeseen event).

While the Local Desalination Plant Alternative would reduce all of the operational impacts related to groundwater pumping under the proposed project, it would introduce different operational impacts related to scenic resources, recreational resources, entrainment and/or impingement of marine organisms in the intake pipeline, fault rupture and unstable slopes, degradation of water quality as a result of saline water, increased use of hazardous materials during operation, and increased energy use during operation. Many of the construction impacts would be reduced relative to the proposed project, but because this alternative would be located in a more sensitive area with respect to cultural resources compared to the proposed project, there would be a greater potential to encounter previously unrecorded and buried (or otherwise obscured) archeological deposits, archeological resources, and/or human remains (Impacts CP-2a and CP-4). In addition, animals at the zoo could be subjected to construction-related noise and dust (Impact BI-1); historic resources could be disturbed if the desalination plant were constructed at the National Guard Armory and the existing buildings were eligible for inclusion on the National Register of Historic Places (Impact CP-1); and demolition or alteration of the existing buildings at the National Guard Armory could encounter hazardous building materials (Impact HZ-2).

Because this alternative would provide a sustained capacity of 4 mgd treated water and an emergency capacity of 6 mgd, it would be identical to the proposed project with respect to helping the SFPUC meet its adopted WSIP seismic, delivery, and water supply reliability goals. However, as discussed above, there are challenges associated with this alternative, including, among others, uncertainties regarding regulatory and permitting conditions for brine disposal and for minimizing impacts on aquatic resources.

The Pipeline Location Alternative would have the same operational impacts as the proposed project because the same amount of groundwater would be pumped from the same wells. Construction-related noise impacts would be less than those of the proposed project, but this alternative could result in construction impacts related to traffic disruption on Sunset Boulevard (Impact TR-1); a greater potential to accidentally rupture or require relocation of utilities (Impacts UT-3 and UT-4); and removal of a larger number of trees (Impact BI-3). Because this alternative would produce the same amount of groundwater as the proposed project, it would be identical with regard to helping the SFPUC meet its adopted WSIP seismic, delivery, and water supply reliability goals.

Based on the evaluation above, the Reduced Yield Alternative is considered to be the environmentally superior alternative among the project alternatives (other than the No Project Alternative). The Reduced Yield Alternative would decrease the intensity of both the operational and construction-related impacts relative to those of the project. However, this alternative would not meet WSIP level of service goals to the same extent as the proposed project.

7.5 Alternatives Considered but Rejected from Further Analysis

The alternatives to the Groundwater Supply Project that were considered by the SFPUC during project development included alternate routes for the proposed distribution pipelines rather than along 40th and 41st Avenues as would occur under the proposed project (Option 1); installation of groundwater production wells in different locations within the North Westside Groundwater Basin (Option 2); development of groundwater resources in a different groundwater basin in San Francisco (Option 3); and development of other water resources (Option 4). These options are summarized in **Table 7-3** and described below. As indicated in the table, Option 1 would meet all of the project objectives, which are to: expand and diversify the SFPUC's water supply portfolio; increase the use of local water supply sources; and reduce dependence on imported surface water. However, this option would not reduce potential impacts compared to the proposed project, and it could result in greater soil instability impacts, as explained below.

TABLE 7-3
ALTERNATIVES CONSIDERED BUT REJECTED FROM FURTHER CONSIDERATION

Potential Alternative Identified	Description	Ability to Meet Project Objectives and Constraints on Implementation
Option 1. Different distribution pipeline routes.	Install pipeline segments (or portions thereof) along the following roads: • Great Highway • 40th Avenue north of Vicente Street • Pacheco, Quintara, and Rivera Streets	• Meets All Project Objectives: – Expands and diversifies the SFPUC's water supply portfolio – Increases the use of local water supply sources – Reduces dependence on imported surface water • Meets WSIP Level of Service Objectives • Reasons for Rejection: – Would not reduce potential impacts of the proposed project and could result in greater soil instability impacts.
Option 2. Different well locations within the North Westside Groundwater Basin.	Install groundwater production wells in different locations within the North Westside Groundwater Basin.	• Meets or Partially Meets All Project Objectives: – Expands and diversifies the SFPUC's water supply portfolio – Increases the use of local water supply sources – Reduces dependence on imported surface water • May Not Meet WSIP Level of Service Objectives • Reasons for Rejection: – Alternate well locations evaluated in the western portion of the basin were not retained for further analysis primarily because they would not substantially lessen the impacts of the project related to seawater intrusion or adverse effects on Lake Merced without substantially reducing the project yield or requiring construction of a greater number of wells than the proposed project. Further, the well sites evaluated would not have sufficient room for a well facility, would result in excessive well interference between the project wells, do not have a sufficient saturated thickness to support a pumping rate of 1 mgd, or are located near known groundwater contamination. – Wells installed to the east of the proposed locations would not have a sufficient capacity to provide the full 3 to 4 mgd that is needed to fulfill the project and WSIP level of service objectives.
Option 3. Develop groundwater resources in a different groundwater basin in San Francisco.	Install groundwater production wells in a different groundwater basin in San Francisco and construct new distribution pipelines and pump stations.	• Meets All Project Objectives: – Expands and diversifies the SFPUC's water supply portfolio – Increases the use of local water supply sources – Reduces dependence on imported surface water • Would Not Meet WSIP Level of Service Objectives • Reasons for Rejection: – Does not provide the full 3 to 4 mgd of water supply to meet the WSIP level of service objectives without substantially increasing construction-related impacts and operational complexity related to more dispersed well facilities.

TABLE 7-3 (Continued)
ALTERNATIVES CONSIDERED BUT REJECTED FROM FURTHER CONSIDERATION

Potential Alternative Identified	Description	Ability to Meet Project Objectives and Constraints on Implementation
Option 4. Other Water Supply Options.	Develop an alternate water supply in place of the use of local groundwater to meet the water supply proposed under the project.	• May not Meet All Project Objectives: – May not expand or diversify the SFPUC's water supply portfolio – Could partially increase the use of local water supply sources – Could partially reduce dependence on imported surface water • Reasons for Rejection: – May not meet all of the project objectives nor provide the full 3 to 4 mgd of water supply to meet the WSIP level of service objectives

SOURCES: SFPUC, 1997; SFPUC, 2011a; SFPUC, 2011b.

Options 2 through 4 vary in their ability to meet the project objectives, as detailed below. Depending on the location, selecting alternate well locations under Option 2 could provide 3 to 4 mgd of groundwater to meet the WSIP goals and objectives that rely directly on the contribution of the Groundwater Supply Project to fulfill systemwide level of service objectives. However, these locations are not desirable because they would not substantially lessen the impacts of the project related to seawater intrusion or the adverse effects on Lake Merced without substantially reducing the project yield or requiring construction of a greater number of wells than the proposed project. Further, the alternate locations considered under Option 2 either do not have enough space for a well facility, would result in excessive well interference effects between the project wells, or are near areas of known groundwater contamination. Use of wells developed in areas with less saturated thickness[2] under Option 2, or development of groundwater resources in another San Francisco groundwater basin under Option 3, would not yield the full 3 to 4 mgd of groundwater or would require the construction of more well facilities than the proposed project. In addition, Option 4, which includes development of alternate water supplies, would not meet the targeted yield of 3 to 4 mgd. As a result, all four of these options were eliminated from further consideration in this EIR as potential alternatives to the proposed project.

7.5.1 Option 1: Different Distribution Pipeline Routes

This option would construct new pipeline segments in alternate locations, rather than along 40th and 41st Avenues as would occur under the proposed project. The alternate routes include construction of a portion of the north-south pipeline segments within the Great Highway; construction of a pipeline segment along 40th Avenue north of Vicente Street; or construction of a

[2] The saturated thickness is the total water-bearing thickness of an aquifer. In general, aquifers with a greater saturated thickness will yield more groundwater than aquifers with a smaller saturated thickness.

portion of the east-west pipeline segments on Pacheco, Quintara, and Rivera Streets. These alternate routes were evaluated as part of the project planning process (SFPUC, 2011a), and this option was derived from that evaluation. In addition, public comments submitted during the Notice of Preparation scoping period requested consideration of a pipeline alignment within the Great Highway (see Table 2-2).

Locating a portion of the north-south pipeline segments within the Great Highway would avoid construction in the vicinity of sensitive receptors along 40th Avenue and 41st Avenue; however, additional pipe segments would be required to connect well sites with the Great Highway to the west. These additional segments would be located within residential areas and in the vicinity of a similar number of sensitive receptors as the proposed project. Unlike Alternative 4 (discussed above), this potential pipeline location would not reduce any of the significant effects of the project, because the same types of construction equipment would be required, a similar number of sensitive receptors would be exposed to construction-related noise, and there would be a similar potential to inadvertently disrupt utilities or to encounter unidentified utilities that would then require relocation. In addition, construction within the Great Highway could result in greater traffic impacts than would be generated by the proposed project, given the larger volume of traffic on the Great Highway than on the residential streets where the pipelines would be constructed under the proposed project.

Under Option 1, the pipeline segment along 40th Avenue north of Vicente Street would be installed within residential areas, and construction activities would occur in the vicinity of a similar number of sensitive receptors as the proposed project. Unlike Alternative 4 (discussed above), this potential pipeline location would not reduce any of the significant effects of the project, because the same types of construction equipment would be required, a similar number of sensitive receptors would be exposed to construction-related noise, there would be a similar potential to inadvertently disrupt utilities or to encounter unidentified utilities that would then require relocation. Further, the block between Rivera Street and Santiago Street has noticeable localized depressions in the street and curb areas, indicating that there are potentially unstable below-ground conditions in these areas.

A portion of the east-west pipeline segments along Pacheco, Quintara, and Rivera Streets would also be installed within residential areas, and construction activities would be in the vicinity of a similar number of sensitive receptors as the proposed project. Unlike Alternative 4 (discussed above), this potential pipeline location would not reduce any of the significant effects of the project, because the same types of construction equipment would be required, a similar number of sensitive receptors would be exposed to construction-related noise, and there would be a similar potential to inadvertently disrupt utilities or to encounter unidentified utilities that would then require relocation.

The alternate routes for the distribution pipeline described above were rejected from further analysis in this EIR because none of the routes evaluated would reduce the significant impacts of the project, and construction within the Great Highway could increase traffic impacts during construction relative to the proposed project.

7.5.2 Option 2: Different Well Locations within the North Westside Groundwater Basin

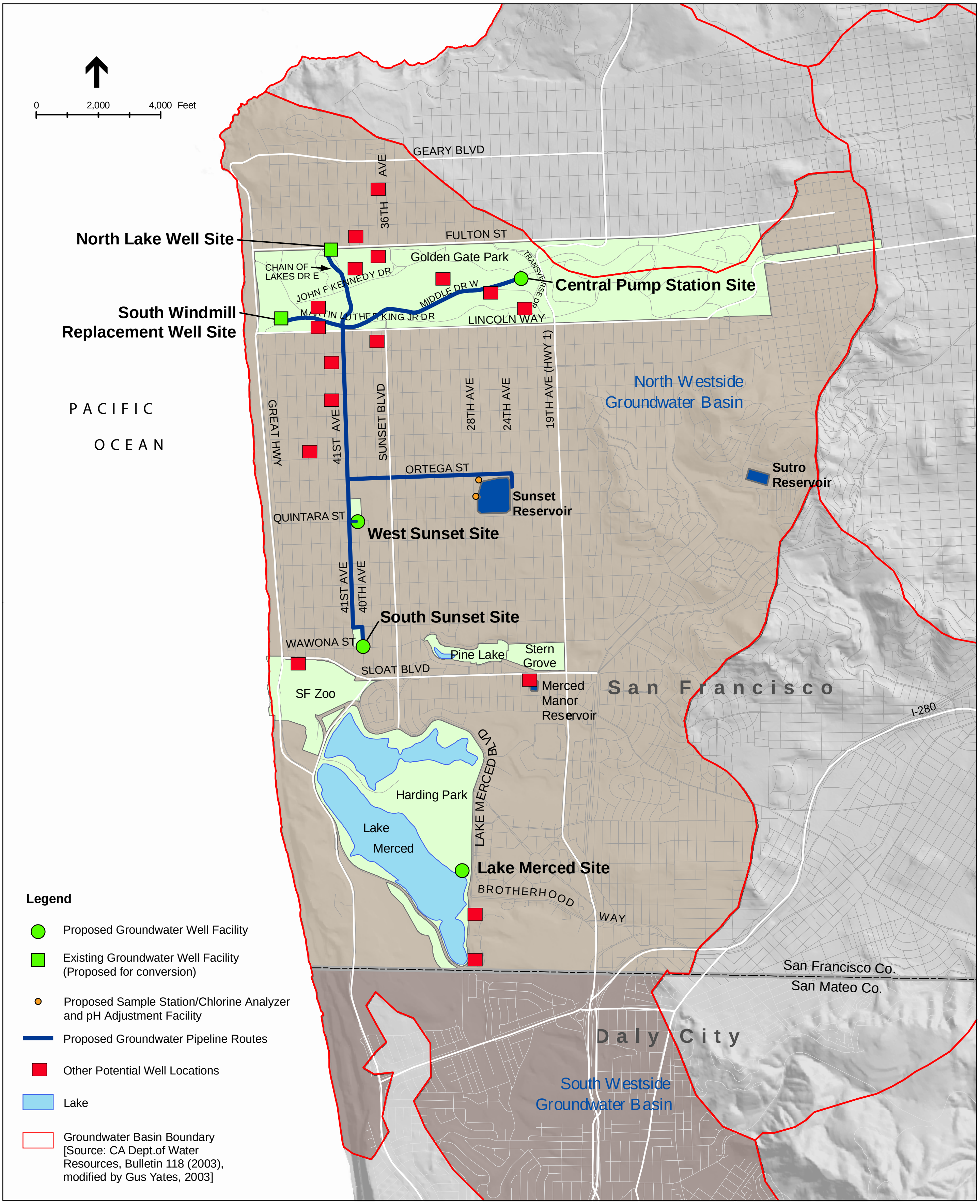
Option 2 would construct new well facilities in a different part of the North Westside Groundwater Basin. This option was evaluated to determine whether there are potential well facility locations farther from the Pacific Coast that would reduce potential impacts related to seawater intrusion, and/or farther away from Lake Merced that would reduce effects on Lake Merced water levels. Because Alternative 2 would result in reduced groundwater yield compared to the proposed project, Option 2 focused on different well locations that, in combination, could produce the 3 to 4 mgd of groundwater pumping proposed under the project. Alternate locations that would yield less than the 3 to 4 mgd of groundwater pumping were not considered under this option because the Reduced Yield Alternative included in the alternatives analysis above evaluated this scenario.

As part of the project planning process, the SFPUC evaluated 23 locations in the North Westside Groundwater Basin for the construction of new well facilities, including 4 existing irrigation well sites and 19 potential new sites (SFPUC, 2011b). As shown on **Figure 7-1**, these locations are in the same three geographical areas as the proposed well facilities—including Golden Gate Park and vicinity, the Sunset District west of 19th Avenue, and the vicinity of the Lake Merced Pump Station to the east of Lake Merced—because these areas have a sufficient saturated thickness to yield a flow rate of approximately 1 mgd per well. Locations to the east of the proposed well facilities would generally not have a sufficient aquifer thickness to produce the desired amount of groundwater (Phillips et al., 1993).

Each potential well location the SFPUC considered during the project planning process was also evaluated in this EIR for its potential to decrease the project's potential effects related to seawater intrusion and adverse effects on Lake Merced while still achieving the required 4 mgd. For this evaluation, it was assumed that the potential well locations would need to be distributed throughout the North Westside Groundwater Basin, similar to the proposed project, in order to lessen any adverse effects of concentrating pumping in one portion of the basin. Therefore, the alternate well sites were evaluated relative to the proposed well sites, as discussed below.

Alternate Well Locations for the South Windmill Replacement and North Lake Well Facilities

Based on the approach described above, it was assumed that selecting alternate well locations for the South Windmill Replacement and North Lake project wells outside of Golden Gate Park could slightly decrease the potential for seawater intrusion by distributing 2 mgd of pumping among three or more wells farther from the coastline. However, the alternate wells locations considered for this option are generally about 1,000 feet or less to the east of the proposed North Lake well and South Windmill Replacement well; therefore, the resulting improvement in seawater intrusion effects might be minimal given the proximity of the alternate wells to the proposed North Lake and South Windmill wells. Also, distributing more pumping to the south of Golden Gate Park could increase the potential for seawater intrusion in the Sunset area.



SOURCE: SFPUC, 2009; 2010

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Figure 7-1
Option 2: Other Potential Well Locations within the North Westside Groundwater Basin

By choosing well locations outside of Golden Gate Park rather than the proposed locations within the park, the project could avoid biological impacts related to tree removal, potential impacts on monarch butterfly roosts, and potential impacts on special-status bats during tree removal or building demolition. However, selecting alternate well locations outside of Golden Gate Park could create land use impacts because the available locations are at recreational facilities or other existing developed land uses. Increased noise impacts could also occur because sensitive receptors would likely be closer to construction activities at the alternate sites than to the proposed sites within Golden Gate Park. Further, based on the estimated well yields (SFPUC, 2011b), it may be necessary to construct up to four wells and associated pipelines to provide the combined yield of the South Windmill Replacement and North Lake wells, which would increase construction-related impacts compared to those under the proposed project.

Alternate Well Locations for the South Sunset Well Facility

Only one of the alternate well locations considered under this option would serve as a replacement for the South Sunset well and thereby lessen seawater intrusion effects compared to those of the proposed project, but this well would have less than half the capacity of the South Sunset well (SFPUC, 2011b). Selecting this well location could reduce the Phase 1 production rate to less than 3 mgd or require installation of an additional well near Golden Gate Park to meet the full Phase 1 yield (resulting in greater noise impacts due to a presumed increase in proximity to areas with sensitive noise receptors). It would also distribute a larger amount of pumping to the Golden Gate Park area where the aquifer is in communication with the ocean and could therefore increase the potential for seawater intrusion compared to the proposed project, which would not be preferable.

Alternate Well Locations for the Lake Merced Well Facility

The two alternate well locations for the Lake Merced well facility are about the same distance from the lake as the proposed well site and thus would have the same potential for seawater intrusion effects and impacts on Lake Merced. In addition, the alternate wells would be located in undeveloped areas with the potential for impacts on biological resources and thus could have similar such impacts as the proposed project. One of the alternate sites considered under this option is located at Camp Ida Smith (a Girl Scout Camp); selection of this site could conflict with this use, thus resulting in land use impacts that would not occur under the proposed project. The other potential site is located near the Lake Merced Hills Club and residential areas, and construction at this site could cause greater noise impacts than would occur under the proposed project.

Alternate Well Locations for the West Sunset Well and Central Pump Station Facilities

No alternate well locations were identified for the West Sunset well under this option. Locations that could replace the Central Pump Station site in Golden Gate Park would not reduce any of the significant impacts of the project and could have increased construction impacts because the alternate locations could interfere with existing land uses near Lindley Meadow or the Urban Forestry Center.

Based on the above information, the alternate well locations considered under this option were rejected from further analysis because they would not substantially lessen the impacts of the proposed project related to seawater intrusion or adverse effects on Lake Merced without substantially reducing the project yield or requiring construction of a greater number of wells than would the proposed project. Further, while some of the alternate well locations outside of Golden Gate Park could avoid biological impacts related to tree removal, potential impacts on monarch butterfly roosts, and potential impacts on special-status bats during tree removal or building demolition, there would be tradeoffs related to conflicts with existing land uses at the alternate well locations and potential recreational impacts that would not occur under the proposed project. In addition, noise impacts would increase because sensitive noise receptors would be closer to the alternate well locations.

7.5.3 Option 3: Develop Groundwater Resources in Different Groundwater Basins in San Francisco

Option 3 would construct new well facilities in a different groundwater basin in San Francisco. As discussed in Section 5.16, Hydrology and Water Quality, and shown on Figure 5.16-1, there are seven groundwater basins underlying San Francisco. These include the Westside, Lobos, Marina, Downtown, Islais Valley, South, and Visitacion Valley Groundwater Basins. The Lobos, Marina, Downtown, and South Groundwater Basins are contained wholly within the limits of San Francisco (SFPUC, 1997). The Islais Valley basin extends beneath Daly City; the Visitacion Valley basin extends beneath the city of Brisbane; and the Westside Basin extends beneath San Francisco and several cities in San Mateo County.

The Groundwater Master Plan prepared in 1997 (SFPUC, 1997) evaluated the development potential of each basin based on the estimated annual recharge and likely groundwater quality. The groundwater quality in the Islais Valley, South, and Visitacion Valley Groundwater Basins is unknown because groundwater resources in these basins are generally undeveloped, although it is noted that areas of the basins close to San Francisco Bay include past and existing industrial uses. Therefore, the development potential of these basins could not be ascertained without conducting additional field investigations to evaluate the groundwater basins. However, the estimated recharge to the Islais Valley and South Basins is 1,800 acre-feet per year (afy) and 700 afy, respectively. Because the annual recharge to these basins is less than the needed project yield of 4,480 afy (4 mgd), these basins alone could not be developed for the project without substantially depleting groundwater supplies within the basins. The estimated annual recharge to the Visitacion Valley Basin is unknown, but based on the size of the basin the amount of recharge would likely be similar to that of the Islais Valley Basin, which is substantially less than the needed project yield. Therefore, this basin alone would also not likely support the proposed project without substantial groundwater depletion.

The Marina Groundwater Basin is ranked with a low development potential because the groundwater quality is unknown and the potential for subsidence is high due to extensive clay layers (SFPUC, 1997). In addition, the saturated thickness of the aquifer is low, and the estimated annual recharge to the groundwater basin is 1,300 afy, which, by itself, is less than the needed project yield.

The annual recharge to the Downtown Groundwater Basin of 5,900 afy is greater than the needed project yield of 4,480 afy; however, this basin has a medium to low development potential because the water quality is nonpotable as a result of historical industrial uses in the groundwater basin and existing cases of groundwater contamination (SFPUC, 1997). In addition, this groundwater basin has a high potential for subsidence due to extensive clay layers throughout the basin.

The estimated annual recharge to the Lobos Groundwater Basin is 1,600 afy, which, by itself, is less than the needed project yield of 4,480 afy (SFPUC, 1997). This basin has a medium development potential because the groundwater is of potable quality. The Lobos Groundwater Basin is the source of streamflow in Lobos Creek and also feeds Mountain Lake. This basin serves as the Presidio's main domestic water supply; in 1997, it was estimated that the Presidio used 530 afy of groundwater from this basin and 1,800 afy of creek water from Lobos Creek for domestic use. This water is supplemented with water purchased from the SFPUC. The Presidio no longer uses its wells for water supply, but still uses Lobos Creek (Williams, 2012). Additional groundwater pumping in this groundwater basin would likely reduce the amount of Lobos Creek water available to the Presidio, which would require additional supplementation by the SFPUC, and therefore use of this groundwater basin would not meet the project goal of reducing dependence on imported surface water. Additional groundwater pumping could also decrease groundwater inflows to Lobos Creek and Mountain Lake, potentially resulting in biological resources and hydrology and water quality effects on the creek and lake.

Development of groundwater resources in one of the other San Francisco groundwater basins described above has been rejected from further consideration in this EIR because the Westside Groundwater Basin is the only groundwater basin considered to have a high development potential; the water quality is potable and the basin has the highest estimated annual recharge, making more water available for pumping (SFPUC, 1997). In 1997, the annual recharge to the basin was 14,800 afy—only 1,000 afy greater than the existing uses at that time. However, since then the SFPUC and its Partner Agencies[3] have replaced most of the groundwater pumping at the Olympic Golf Club, San Francisco Golf Club, and Lake Merced Golf Club with recycled water for irrigation, as described in Section 5.16, Hydrology and Water Quality, which makes more groundwater available to the project. As for the proposed project, prior to pumping at the full rate of 4 mgd during Phase 2, the SFPUC would provide recycled water for irrigation pumping in Golden Gate Park,[4] and no further irrigation pumping would be conducted in that area (except as a backup supply during planned or unplanned outages and for filling the park's ornamental lakes).

The Islais Valley, South, and Visitacion Valley Groundwater Basins could be developed in combination provided that the SFPUC verifies their development potential through additional

3 Since the 1990s, the SFPUC has worked cooperatively on Westside Groundwater Basin investigations, monitoring, and coordinated projects with water suppliers in the southern part of the basin, including the City of Daly City, California Water Service Company, and the City of San Bruno, collectively referred to as the Partner Agencies (SFPUC, 2011d).

4 The San Francisco Westside Recycled Water Project (San Francisco Planning Department Case No. 2008.0091E) is currently undergoing environmental review. On September 8, 2010, the San Francisco Planning Department published a Notice of Preparation that an environmental impact report would be prepared for this project (http://www.sf-planning.org/ftp/files/MEA/2008.0091E_Westside_Water_NOP.pdf).

investigations and can verify that they contain high quality groundwater suitable for municipal supply. However, as discussed above, they could not produce the total project yield without depleting groundwater supplies because the combined recharge to these groundwater basins is estimated to be on the order of 4,300 afy which is less than the project yield of 4,480 afy. Therefore, additional wells would still be required in the North Westside Groundwater Basin, resulting in the installation of wells more widely dispersed throughout the city than would occur under the proposed project. This option could require installation of more distribution pipelines, resulting in greater construction-related impacts (such as exposure of sensitive receptors to construction-related noise and the potential to inadvertently disrupt or encounter unidentified utilities). In addition, development in more widely dispersed areas of the city would introduce more operational complexities related to distribution and treatment of the groundwater than would occur under the proposed project). Further, these groundwater basins are in the proximity of San Francisco Bay and groundwater pumping could result in seawater intrusion, similar to the proposed project.

7.5.4 Option 4: Develop Other Water Resources

This option would incorporate increased production of recycled water by the SFPUC, increased conservation by San Francisco customers, and/or development of an alternate water supply in place of using local groundwater to meet the water supply proposed under the project. This option would require the development of 4 mgd of additional water supply resources (the water supply proposed by the project)—that is, 4 mgd beyond the amount that is already part of the WSIP.

The feasibility of implementing an additional 4 mgd of recycled-water programs beyond the projects included in the WSIP water supply portfolio is uncertain because of unknown factors related to water quality issues, end-users, long-term sustainable yield, production rates, feasibility, institutional arrangements, and permitting. Further, there are a limited number of customers for recycled water in San Francisco at this time. The SFPUC already considered the largest potential recycled water users in the west side of San Francisco during evaluation of the Westside Recycled Water Project, which is already included in the WSIP, and extensive piping would be required to serve additional smaller parks or other potential users on the west side of the city. The demand for recycled water on the east side of San Francisco is still under evaluation. Increased recycled-water programs would meet the project objectives to reduce dependence on imported surface water and to expand and diversify the SFPUC’s water supply portfolio.

The feasibility of implementing an additional 4 mgd in conservation programs beyond those included in the WSIP water supply portfolio is uncertain because of unknown factors related to long-term feasibility. Considering that 4 mgd of conservation is already included as part of the WSIP, it is uncertain whether conservation measures could be further increased to provide some or all of the 4 mgd proposed under the project. Further, while increased conservation programs could slightly meet the project objective to reduce dependence on imported surface water, additional conservation would not meet the project objectives of expanding and diversifying the SFPUC water supply portfolio or increasing the use of local water supply sources.

The feasibility of developing an additional 4 mgd in alternative water supplies beyond that included in the WSIP water supply portfolio is uncertain because doing so could require additional diversions from the Tuolumne River or from other water districts not within SFPUC's control; and local watersheds currently are at capacity in terms of water supply and the Calaveras Reservoir and Crystal Springs Reservoir cannot be easily further increased in size. Further, development of alternative water supplies would not meet the project objectives to reduce dependence on imported surface water, or increase the use of local water supply sources.

Although the SFPUC continues to evaluate other options for increasing the available water supply to address water supply needs and demands beyond 2018 (SFPUC, 2008), recycled water, conservation, and water supply programs are already included as part of the WSIP and it would be unlikely that these water supplies could be further increased in the immediate future to provide the 4 mgd proposed under the project. Therefore, in addition to not meeting most of the project objectives, this option would not likely allow the SFPUC to achieve the targeted yield under the proposed project of 3 to 4 mgd as part of the WSIP or current water supply needs. Therefore, this option was eliminated from further consideration in this EIR.

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CHAPTER 8
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CHAPTER 9
Responses to Comments

9.1 Introduction

9.1.1 Purpose of the Responses to Comments Document

This Responses to Comments document completes the final environmental impact report (Final EIR) analyzing potential environmental effects associated with the proposed San Francisco Public Utilities Commission (SFPUC) San Francisco Groundwater Supply Project. The proposed project would provide an average of up to 4 million gallons per day (mgd) of groundwater to augment San Francisco's municipal water supply. All of the proposed groundwater well facilities would supply groundwater to existing reservoirs, where it would be blended with San Francisco's existing municipal water supply before distribution within the city. All project components would be located on the west side of San Francisco on land owned by the City and County of San Francisco (CCSF). The well facilities would be managed by the SFPUC, including those located on land currently managed by the San Francisco Recreation and Park Department (SFRPD).

The San Francisco Planning Department, as lead agency responsible for administering the environmental review of CCSF projects under the California Environmental Quality Act[1] (CEQA), published a Draft EIR[2] on the proposed project on March 13, 2013. The Draft EIR review met the CEQA 45-day minimum public review. This Responses to Comments document provides written responses to comments received during the public review period.

The Draft EIR together with this Responses to Comments document constitutes the Final EIR for the proposed project in fulfillment of CEQA requirements and consistent with CEQA Guidelines Section 15132. This Responses to Comments document contains the following: (1) a list of persons, organizations, and public agencies commenting on the Draft EIR; (2) copies of comments received on the Draft EIR; (3) the San Francisco Planning Department's responses to those comments; and (4) revisions to the Draft EIR to clarify or correct information in the Draft EIR. See Section 9.1.3, below, for a description of the overall contents and organization of the Draft EIR and Responses to Comments document.

1 California Public Resources Code, Section 21000 et seq.
2 State Clearinghouse No. 200912275 and San Francisco Planning Department Case No. 2009.1122E.

The Final EIR has been prepared in compliance with CEQA, including the CEQA Guidelines[3] and the San Francisco Administrative Code, Chapter 31. It is an informational document for use by: (1) governmental agencies (in addition to the CCSF) and the public to aid in the planning and decision-making process by disclosing the physical environmental effects of the project and identifying possible ways of reducing or avoiding the potentially significant impacts; and (2) the CCSF and SFPU Commission prior to their decision to approve, disapprove, or modify the proposed project. If the SFPUC approves the proposed project, it would be required to adopt CEQA findings and a mitigation monitoring and reporting program (MMRP) to ensure that mitigation measures identified in the Final EIR are implemented. See Section 9.1.2, below, for further description of the environmental review process.

In accordance with CEQA, the responses to comments focus on clarifying the project description and addressing physical environmental issues associated with the proposed project. These issues include physical impacts or changes attributable to the project rather than any social or financial implications of the project. Therefore, this document provides limited responses to comments received during the public review period that were not relevant to the proposed project or its physical environmental effects.

9.1.2 Environmental Review Process

Notice of Preparation and Public Scoping

On December 30, 2009, as described in the Draft EIR, the San Francisco Planning Department sent a Notice of Preparation (NOP) to governmental agencies, organizations, and persons interested in the proposed project (see Appendix A in the EIR). During the approximately 30-day public scoping period that ended on January 30, 2010, the Planning Department accepted comments from agencies and interested parties identifying environmental issues that should be addressed in the EIR. A public scoping meeting was held on January 20, 2010 at the Golden Gate Park Senior Center to receive oral comments on the scope of the EIR. After issuing the NOP in 2009, the SFPUC made changes to the proposed project. Consequently, a revised NOP was published on March 2, 2011 to identify those changes and to describe the proposed facilities and potential environmental effects of the revised project (see Appendix A in the EIR). The second scoping period began on March 2, 2011 and ended on April 1, 2011. In preparing the EIR on the proposed project, the San Francisco Planning Department considered the public and agency comments made on both NOPs.

Draft EIR Public Review

The Draft EIR for the proposed project was published on March 13, 2013 and circulated to local, State, and federal agencies and to interested organizations and individuals for a 45-day public review period. Paper copies of the Draft EIR were made available for public review at the following locations: (1) San Francisco Planning Department, 1660 Mission Street, 1st Floor, Planning Information Counter, San Francisco, California; and (2) San Francisco Main Library, 100 Larkin

[3] Title 14, California Code of Regulations, Chapter 3, Guidelines for Implementation of the California Environmental Quality Act.

Street, and other area libraries.[4] On March 13, 2013, the Planning Department also distributed notices of availability of the Draft EIR; published notification of its availability in a newspaper of general circulation in San Francisco; and posted notices at locations within the project area. The distribution list for the Draft EIR and all documents referenced in the EIR were also available for review at the San Francisco Planning Department, 1650 Mission Street, Suite 400.

During the 45-day public review period, the San Francisco Planning Department conducted a public hearing to receive oral comments on the Draft EIR. The public hearing was held before the San Francisco Planning Commission on April 18, 2013 at San Francisco City Hall. A court reporter present at the public hearing transcribed the oral comments verbatim and prepared written transcripts.

During the Draft EIR public review period, the Planning Department received comments from six public agencies, one non-governmental organization, and eight individuals (or groups of individuals). Attachment A of this Responses to Comments document includes copies of the comment letters submitted during the Draft EIR public review period. Attachment B includes copies of the public hearing transcripts. See Section 9.3 for a complete list of persons commenting on the Draft EIR.

Responses to Comments Document and Final EIR

The San Francisco Planning Department distributed this Responses to Comments document for review to the San Francisco Planning Commission as well as to the agencies, organizations, and individuals that commented on the Draft EIR. The Planning Commission will consider the adequacy of the Final EIR – consisting of the Draft EIR and the Responses to Comments document – in complying with the requirements of CEQA. If the Planning Commission finds that the Final EIR complies with CEQA requirements, it will certify the Final EIR.

Following certification of the Final EIR, the SFPUC will review and consider the certified Final EIR and the associated MMRP before making a decision and taking an approval action on the proposed project. Consistent with CEQA Guidelines Section 15097, the MMRP is a program designed to ensure that the mitigation measures identified in the Final EIR and adopted by decision-makers to mitigate or avoid the project's significant environmental effects are implemented. CEQA also requires the adoption of findings prior to project approval in cases where the certified EIR identifies significant environmental effects (CEQA Guidelines Sections 15091 and 15092). If the EIR identifies significant adverse impacts that cannot be mitigated to less-than-significant levels and the project is approved, the findings must include a statement of overriding considerations for those impacts (CEQA Guidelines Section 15093[b]). The project sponsor (in this case, the SFPUC) is required to adopt CEQA findings and the MMRP as conditions of project approval.

4 Electronic copies of the EIR could be accessed through the internet at the following address: http://tinyurl.com/puccases.

9.1.3 Document Organization

This Responses to Comments document is organized to complement the Draft EIR and follows its sequential numbering of chapters. The Draft EIR consists of Chapters 1 through 8 as follows:

- **Chapter 1, Executive Summary.** This chapter summarizes the proposed project, identifies potentially significant environmental impacts and mitigation measures, and describes the alternatives considered in this EIR. It also identifies areas of controversy and issues to be resolved.
- **Chapter 2, Introduction and Background.** This chapter provides project background information and describes the purpose and organization of the EIR, as well as the environmental review process.
- **Chapter 3, Project Description.** This chapter describes the proposed project (including project objectives), summarizes project components, and provides information about project construction. The chapter also lists required permits and approvals.
- **Chapter 4, Plans and Policies.** This chapter describes applicable land use plans and policies and their relevance to the project and then discusses the project's consistency with those plans.
- **Chapter 5, Environmental Setting and Impacts.** This chapter is subdivided into sections for each environmental resource topic. Each section describes the environmental and regulatory setting, the criteria used to determine impact significance, and the approach to the analysis for that resource topic. It then analyzes potential environmental impacts and the project-specific mitigation measures that have been developed to address significant and potentially significant impacts. Each section also includes an evaluation of cumulative impacts with respect to that resource topic.
- **Chapter 6, Other CEQA Issues.** This chapter discusses growth-inducing effects, summarizes the cumulative impacts, identifies the significant environmental effects that cannot be avoided if the proposed project is implemented, and describes the significant irreversible impacts, as well as known areas of controversy.
- **Chapter 7, Alternatives.** This chapter describes the alternatives to the proposed project and compares their impacts to those of the proposed project. This chapter also summarizes the alternatives that were considered but eliminated from further analysis.
- **Chapter 8, EIR Authors and Consultants.** This chapter lists the authors of this EIR.

This Responses to Comments document consists of EIR Chapter 9 plus supplemental attachments, as follows:

- **Chapter 9, Responses to Comments**

  9.1 Introduction
  9.2 Project Description Revisions
  9.3 List of Persons Commenting
  9.4 Comments and Responses
  9.5 DEIR Revisions
  Attachment A – DEIR Comment Letters
  Attachment B – DEIR Hearing Transcript

9.2 Project Description Revisions

9.2.1 Introduction to the Project Description Revisions

The SFPUC has refined the project design since publication of the Draft EIR and, as a result, has updated the Sunset Reservoir facility previously described and analyzed in the Draft EIR. These changes are described in Section 9.2.2, below, and updates to the project description are included as part of the revisions provided in Section 9.5, DEIR Revisions. Section 9.2.3 of this Responses to Comments document evaluates the environmental effects of implementing the project with the revisions to the Sunset Reservoir facility. The evaluation considers whether incorporating the project description revisions would alter the impact analysis or conclusions presented in the Draft EIR; it also describes how the project updates are accounted for in the Draft EIR and indicates any appropriate adjustments to the Draft EIR analysis.

In general, and as detailed below, the project description revisions would not substantially change the construction and operations impacts identified in the Draft EIR. In some instances the project description revisions would result in small increases in the type of or duration of construction activities required; however, these revisions would not affect the impact conclusions presented in the Draft EIR, and mitigation measures identified in the EIR would adequately address the environmental effects resulting from the revisions. Finally, the project description revisions would not require any changes to the No Project Alternative or the range of alternatives already addressed in the Draft EIR.

In summary, the environmental analysis of the project description revisions presented below indicates that no significant new information has been added to the EIR. Consistent with CEQA Guidelines Section 15088.5, the supplemental environmental analysis of the project description revisions presented below concludes that: no significant impacts would result from the project description revisions or from a new mitigation measure proposed to be implemented; there is no substantial increase in the severity of an environmental impact with the implementation of mitigation measures; and there are no additional alternatives or mitigation measures considerably different than those analyzed in the Draft EIR.

9.2.2 Description of the Project Description Revisions

The Draft EIR analyzed effects related to project facilities located at Sunset Reservoir, based on project design information available as of spring 2013. The facilities at Sunset Reservoir included the following:

- Installation of two 12-inch flow meters within vaults located on the east side of Sunset Reservoir.
- Installation of a concrete pad and a chlorine analyzer and sample station at the northwest corner of Sunset Reservoir.
- Modification of an interior room within the existing Sunset Chlorine Station located west of the west side of the reservoir's north and south basins. Modifications would include

installation of a sodium hydroxide storage tank and two chemical metering pumps, installation of a low concrete berm within the room to provide secondary chemical containment, installation of a removable skylight, installation of an emergency shower/eyewash, and relocation of an existing electrical box to the northwest building exterior.

- Installation of 300 feet of chemical injection piping below grade between the building and the north and south basins of the reservoir.

Since publication of the Draft EIR, the SFPUC has made changes to the project design of the pH adjustment facility at the Sunset Chlorine Station, and the associated piping and infrastructure. Accordingly, the EIR has been revised[5] to reflect the following changes and additions to proposed facilities at the Sunset Reservoir:

- Installation of two 12-inch flow meters within vaults located on the east side of Sunset Reservoir.

- Installation of a concrete pad and a chlorine analyzer and sample station at the northwest corner of Sunset Reservoir.

- Modification of ~~an interior room within~~ the existing Sunset Chlorine Station located west of the west side of the reservoir's north and south basins. Modifications would include the addition of a pH adjustment facility on the northeast side of the existing chlorine station. The facility would be approximately 15 feet long by 11 feet wide and approximately 11 feet high. The existing Sunset Chlorine Station is approximately 32 feet long by 17 feet wide and approximately 13 feet high. The proposed facility would have two ~~installation of a~~ sodium hydroxide storage tanks and two chemical metering pumps, ~~installation of a low concrete berm within the room to provide~~ including secondary chemical containment features, ~~installation of a removable skylight, installation of~~ and an emergency shower/eyewash~~, and relocation of an existing electrical box to the northwest building exterior~~.

- Installation of ~~300~~approximately 350 feet of chemical injection piping below grade between the building and the north and south basins of the reservoir. Some of the piping would be installed along the side of an existing culvert; however, approximately 95 feet of the piping would be installed via an excavated trench.

- Construction of a concrete vault west of the south basin, near the existing fence along 28th Avenue, which would provide installation and maintenance access for a proposed reservoir surface water inlet flow meter. The vault would be approximately 5 feet wide, 5 feet long, and 25 feet deep.

- Installation of approximately 165 linear feet of electrical conduit that would connect the proposed flow meter to the existing Sunset Chlorine Station.

The required excavation and spoils, dewatering, equipment usage, and construction schedule have been revised, as presented in Section 9.5, DEIR Revisions.

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5 For each change, new language is double underlined, while deleted text is shown in ~~strikethough~~.

9.2.3 Environmental Effects of the Project Description Revisions

The text changes that incorporate the proposed project updates into the individual impact analyses from EIR Chapter 5 are summarized below and are presented in Section 9.5, DEIR Revisions:

- **Land Use.** Sunset Reservoir facility revisions were incorporated into EIR Section 5.2; however, the minor changes to the existing Sunset Chlorine Station structure to include a small new facility rather than minor modification of the existing structure would have no effect on the analysis with respect to altering the existing character of the project area (Impact LU-1).

- **Aesthetics.** Sunset Reservoir facility revisions were incorporated into EIR Section 5.3; however, the proposed facility would be smaller in both size and height than the adjacent Sunset Chlorine Station, and would be sited between the existing station and public viewpoints to the west. The project change would not affect the analysis of impacts on scenic resources and visual character (Impacts AE-1 and AE-4).

- **Cultural and Paleontological Resources.** Sunset Reservoir facility revisions were incorporated into the EIR Section 5.5 setting discussion identifying the location of proposed project components; however, the area of disturbance considered in the impact analysis was not revised, so no change to the impact analysis was required (Impacts CP-1 through CP-4).

- **Transportation and Circulation.** The increase in spoils material that would be removed from the Sunset Reservoir construction area was revised in EIR Section 5.6 from 20 cubic yards to 100 cubic yards. Accordingly, the estimate of truck trips associated with spoils off-haul was revised from 3 to 11; however, the daily vehicle trips associated with construction activities would continue to represent less than 1 percent of existing traffic on regional roads, and the project change would not affect the impact analysis related to performance of the circulation system (Impact TR-2).

- **Noise.** Sunset Reservoir facility revisions were incorporated into the EIR Section 5.7 discussion identifying the location of proposed project components; however, the noise analysis included in the EIR considered all of the construction equipment types currently proposed and the distance between the construction work area and sensitive receptors is the same as considered in the EIR, so no change to the construction-phase impact analysis was required (Impact NO-1).

- **Air Quality.** The increase in equipment use for the Sunset Reservoir construction area was discussed in EIR Section 5.8. Accordingly, the estimate of construction-related pollutant emissions was revised; however, the minor increase in emissions would not cause the project to exceed the significance thresholds for construction-related pollutant emissions. Thus, the project change would not affect the impact analysis related to emission of criteria pollutants and pollutant concentrations (Impacts AQ-1 and AQ-2).

- **Utilities and Service Systems.** The increase in spoils material that would be removed from the Sunset Reservoir construction area was revised in EIR Section 5.6 from 20 cubic yards to 100 cubic yards. However, the total volume of spoils hauled to a landfill would continue to be less than 0.01 percent of the remaining capacity of the area's landfills, and the project change would not affect the impact analysis related to landfill capacity (Impact UT-1).

The revisions to Sunset Reservoir facilities analyzed in the Draft EIR would result in a slight increase in the magnitude of some impacts, but in no case would these updates result in new or substantially more severe impacts than those previously disclosed in the Draft EIR; change the impact conclusions presented in the Draft EIR; or require new or modified mitigation measures. Thus, inclusion of the project description revisions into the EIR as part of Section 9.5, DEIR Revisions, does not require recirculation of the EIR.

9.3 List of Persons Commenting

This Responses to Comments document is organized to respond to all comments received on the Draft EIR, including written comments submitted by letter, fax, or email as well as oral comments presented at the public hearing. This section lists all individuals and organizations that submitted comments on the Draft EIR. Commenters are grouped according to whether they commented as individuals or represented a public agency or non-governmental organization. The complete set of written and oral comments received on the Draft EIR is provided in Attachment A, DEIR Comment Letters, and Attachment B, DEIR Hearing Transcripts.

9.3.1 Federal, State, Regional, and Local Agencies, Boards, and Commissions

- California Department of Fish and Wildlife; Letter, May 2, 2013
- City of Daly City, Department of Water and Wastewater Resources; Letter, April 26, 2013
- Commissioner Michael J. Antonini; Public Hearing, April 18, 2013
- Commissioner Hisashi Sugaya; Public Hearing, April 18, 2013
- Commissioner Katherin Moore; Public Hearing, April 18, 2013
- San Francisco Recreation and Park Department; Letter, June 11, 2013

9.3.2 Organizations

- Golden Gate Audubon Society; letter, April 27, 2013

9.3.3 Individuals

- Carmen Chu, Orson Chang, Ellen Chu, Norman Chu; letter, April 27, 2013
- Edmund Chu, Orson Chang, Ellen Chu, Carmen Chu, and Eunice Chue; letter, April 24, 2013
- Megan Kennedy; letter, undated
- Tim Kennedy; Public Hearing, April 18, 2013
- Steve Lawrence; email, March 18, 2013
- Steve Lawrence; email, April 8, 2013
- Derek Leung; email, March 17, 2013
- Bill Wong; email, March 18, 2013

9.4 Comments and Responses

This section presents summaries of the substantive comments received on the Draft EIR and responses to those comments. The comments and responses are organized by subject and are generally in the same order as presented in the Draft EIR, with general comments on the EIR or proposed project elements grouped together at the beginning of the section. Comments on Chapter 1, Summary, or specific mitigation measures are included under the relevant topical section of the Draft EIR. The order of the comments and responses in this section is shown below, along with the prefix to the topic codes (indicated in square brackets):

9.4.1 General Comments [GC]
9.4.2 Project Description [PD]
9.4.3 Transportation and Circulation [TR]
9.4.4 Recreation [RE]
9.4.5 Biological Resources [BI]
9.4.6 Hydrology and Water Quality [HY]
9.4.7 Alternatives [AL]

Within each subsection under each topic area, similar comments are grouped together and identified using the topic code prefix and sequential numbering for each subtopic. For example, General Comments [GC] are listed as GC-1, GC-2, GC-3, and so on. Each topic code has a corresponding heading that introduces the comment subject; these subsections present quotes of comments and include the commenter's name. However, the reader is referred to Attachments A and B for the full text and context of each comment.

Following each comment or group of comments, a comprehensive response is provided to address issues raised in the comment and to clarify or augment information in the Draft EIR as appropriate. Response numbers correspond to the topic code; for example, the response to comment GC-1 is presented under Response GC-1. The responses may clarify the Draft EIR text or revise or add text to the EIR. Revisions to the Draft EIR are shown as indented text. New or revised text is double underlined; deleted material is shown in ~~strikethrough~~.

9.4.1 General Comments

Comment GC-1: The SFPUC system needs more storage and supplies.

"Finally, the other thing is probably we're seeing only part of the picture here because you did allude to the fact we're going to see in a few weeks a storage facility planned on the Peninsula, which is a separate project. But I think the answer to our quandary which we're in, we have a – I think it's 280 million gallons per day sort of is the point that we need. And we have to -- you know, we can only take so much out of the Tuolumne. And we're trying to find other sources.

But I think your biggest solution -- I'm not against these sources as emergency sources, but the biggest solution will be storage, to -- years are wetter and drier, and population is going to grow, and with water needs are going to grow." (Michael J. Antonini, Commissioner, Public Hearing Transcript, April 18, 2013)

"COMMISSIONER ANTONINI: I think I have another question that, again, could come in comments and responses.

As reported in the DEIR, and we've we had this throughout the entire water -- we know that – I think the figure was 265 million gallons per day total system. I may be off, but I think that's what's stated. And of that, 184- is wholesale, and 81- is retail -- "retail" being City and County of San Francisco, couple of other exceptions. Castlewood Country Club or something. But retail is basically City of San Francisco.

Then the wholesale is all our customers who buy water from SFPUC, which is important because we make revenue out of it. It makes a lot of sense. One of the few parts of the City that actually has a positive cash flow.

But I think that the biggest probably increase in demand or bigger increase in demand may come from our wholesale side or from the retail side – although we've seen a lot of growth in San Francisco recently, and we're going to have an increase there.

But I'm not against this project for groundwater. But I'm wondering if you're exploring sources on the peninsula in land you own, in the Livermore Valley, particularly around Pleasanton, where you historically have had a lot of really good water supply there. And I know there's still a lot of pumping going on out there. And if we can expand some of the pumping in those areas -- because much of what we're pumping into the system will be used for wholesale customers. So we probably should utilize their aquifers also to meet our demand.

So that's question for responses and for another day. But I think it's an important one to answer." (Michael J. Antonini, Commissioner, Public Hearing Transcript, April 18, 2013)

Response GC-1

The commenter generally indicates support for the proposed project but requests information regarding additional water supply options. The comment regarding the need for additional water supply storage options and consideration of the availability of other groundwater basin supplies is noted. Development of the additional water supply options discussed in this comment would not meet most of the objectives of the San Francisco Groundwater Supply Project, which are to:

- Expand and diversify the SFPUC's water supply portfolio to increase system reliability
- Increase the use of local water supply sources
- Reduce dependence on imported surface water

The proposed project is a component of the overall SFPUC WSIP, for which a Program EIR (PEIR) evaluation was performed related to potential increases in, and improvements to, the SFPUC water supply portfolio through 2018. Potential options involved water storage improvements as well as new sources of water, including groundwater. As such, the proposed project would increase the SFPUC's water supply portfolio and the EIR analyzes the impacts associated with implementing the project as proposed, as well as alternatives to the proposed project that meet most of the project objectives. The environmental analysis of the project and alternatives did not identify significant impacts that would indicate that development of additional water supply should be considered as part of this project.

While potential development of additional water supply options is not the subject of the proposed project, the SFPUC continues to evaluate other options for increasing the available water supply to address water supply needs and demands beyond 2018 (SFPUC, 2008). In addition, the SFPUC prepares an analysis of forecasted water supply and demand in its urban water management plan (UWMP), in accordance with the requirements of the 1983 California Urban Water Management Planning Act.[6] The purpose of the act is to assure that water suppliers plan for long-term reliability, conservation, and efficient use of California's water supplies to meet existing and future demands. The act requires all urban water suppliers to prepare a UWMP every 5 years.

The *2010 Urban Water Management Plan for the City and County of San Francisco*—the SFPUC's most recent UWMP—was adopted in 2011. It analyzed water supply and demand to year 2035 under both normal and dry-year conditions (SFPUC, 2013a). However, the report entitled *2013 Water Availability Study for the City and County of San Francisco* provides a more recent analysis of the SFPUC's water supply planning for San Francisco (SFPUC, 2013b). The *2013 Water Availability Study* was updated primarily to incorporate the San Francisco Planning Department's 2012 Land Use Allocation (LUA) projections of housing and employment growth in San Francisco to estimate future retail water demands.

The updated 2012 San Francisco Planning Department's LUA projections result in a retail demand in 2035 of 84.2 mgd, which represents a 3.3 mgd, or 4%, increase over the 2035 demand projections estimated in the 2010 UWMP. The ability to meet the future demand of the retail customers depends in large part upon development of 10 mgd of local WSIP supplies, including conservation, groundwater, and recycled water. These supplies are anticipated to be fully implemented over the next 10 years. Implementation of planned, future water supply projects (i.e., San Francisco Groundwater Supply Project, San Francisco Westside Recycled Water Project, and Eastside Recycled Water Project) would be part of normal-year supplies and would help to meet projected retail demands.

[6] California Water Code Division 6, Part 2.6, Sections 10610 through 10656, as amended.

Comment GC-2: The EIR is too technical in nature and too lengthy.

"The documents are lengthy." (Steve Lawrence, email, March 18, 2013)

"FWIW, your EIRs are too long, and too technical. This one, as one example, is not reasonably aimed at the decision-makers: the Commissioners. Real world non-expert people make these important decisions. How can they make them with best information if they will not be able to read and comprehend what you provide? Driving nearly blind, they approve. The process has become a formality." (Steve Lawrence, email, April 8, 2013)

Response GC-2

Comment GC-2 consists of the opinions of the commenter regarding the length and technical detail of the EIR. An EIR is an informational document intended to inform public agency decision-makers (in this case, the San Francisco Planning Commission) and the public of the significant environmental effects of a project; identify possible ways to minimize the significant effects; and describe reasonable alternatives to the project (CEQA Guidelines Section 15121). As such, the San Francisco Groundwater Supply Project EIR includes the technical information and project description details necessary to convey the environmental effects of a complex project that proposes several facilities and locations over a large area of San Francisco as well as pumping operations within a groundwater basin that has multiple existing uses and hydrologic connections to the Pacific Ocean, San Francisco Bay, and several surface water bodies. The document, as a result, is longer than EIRs prepared for less complex projects.

Comment GC-3: The Draft EIR Notice of Availability should have been more broadly distributed.

"We have a concern on the Sunset Ground Water Project 200S.1122E because of the distribution of the ground water to almost the entire city, yet not everyone in the city has received mailings of this project. We, residents in the Sunset district and the undersigned, are the ones who were not informed of such project. Reliance on posting on the internet in your web site is not an acceptable notification.

Hence, project of this magnitude because of its impact should inform all residents concerned (basically entire city) to bring to their awareness and let them voice their opinions." (Carmen Chu, Orson Chang, Ellen Chu, Norman Chu, letter, April 27, 2013)

Response GC-3

Comment GC-3 opines that mailings for the project (i.e., the Notice of Availability for the Draft EIR) should have been distributed to all San Francisco parcels that would receive groundwater under the project. Two of the basic purposes of CEQA are to (1) inform governmental decision-makers and the public about the potential significant effects, if any, of proposed activities, and (2) provide opportunities for other agencies and the public to review and comment on draft environmental documents. CEQA Guidelines Section 15087, Public Review of Draft EIR, includes the following requirements regarding public and agency notification:

> "(a) The lead agency shall provide public notice of the availability of a draft EIR at the same time it sends a notice of completion to the Office of Planning and Research. This public notice shall be given as provided under Section 15105 (a sample form is provided in Appendix L). Notice shall be mailed to the last known name and address of all organizations and individuals who have previously requested such notice in writing, and shall also be given by at least one of the following procedures:
>
> (1) Publication at least one time by the public agency in a newspaper of general circulation in the area affected by the proposed project. If more than one area is affected, the notice shall be published in the newspaper of largest circulation from among the newspapers of general circulation in those areas.
>
> (2) Posting of notice by the public agency on and off the site in the area where the project is to be located.
>
> (3) Direct mailing to the owners and occupants of property contiguous to the parcel or parcels on which the project is located. Owners of such property shall be identified as shown on the latest equalized assessment roll.
>
> …
>
> (d) The notice required under this section shall be posted in the office of the county clerk of each county in which the project will be located for a period of at least 30 days. The county clerk shall post such notices within 24 hours of receipt.
>
> …
>
> (f) Public agencies shall use the State Clearinghouse to distribute draft EIRs to state agencies for review and should use areawide clearinghouses to distribute the documents to regional and local agencies.
>
> (g) To make copies of EIRs available to the public, Lead Agencies should furnish copies of draft EIRs to public library systems serving the area involved. Copies should also be available in offices of the Lead Agency. …
>
> (i) Public hearings may be conducted on the environmental documents, either in separate proceedings or in conjunction with other proceedings of the public agency. Public hearings are encouraged, but not required as an element of the CEQA process."

> Chapter 31 of the San Francisco Administrative Code governs the CCSF's CEQA procedures and goes beyond requirements provided in the CEQA Guidelines. San Francisco Administrative Code Section 31.13(d) reads:
>
> > When the draft EIR has been prepared, the Environmental Review Officer shall file a notice of completion of such draft as required by CEQA. A copy of such notice, or a separate notice containing the same information, shall thereupon be posted in the offices of the Planning Department and on the subject site, and mailed to the applicant, the board(s), commission(s) or department(s) that will carry out or approve the project, and to any individual or organization that has requested such notice in writing. The notice of completion shall be sent by mail to the owners of all real property within the area that is the subject of the environmental impact report and within 300 feet of all exterior boundaries of such area. A copy of the draft EIR shall be provided to the applicant and to such board(s), commission(s) or department(s) and to any individual or organization that has so requested.

Distribution of the Draft EIR Notice of Availability met the noticing requirements of both CEQA Guidelines Section 15087 and Chapter 31 of the San Francisco Administrative Code. Regarding Section 15087(a), the EIR Notice of Availability was mailed to the last known name and address of all organizations and individuals who had previously requested such notice in writing. More than 6,300 notices were distributed to organizations and individuals, including parties interested in issues related to Lake Merced, Golden Gate Park, and the WSIP. In addition, although Section 15087(a) provides for additional notice by one of the three ways listed in Section 15087(a)(1) through (a)(3), notice was provided by all three additional methods. Regarding Section 15087(a)(1), the EIR Notice of Availability and notice of a public hearing were published in the San Francisco Chronicle on March 13, 2013. Regarding Section 15087(a)(2), the EIR Notice of Availability, including notice that a public hearing would be held, was posted at three locations in the vicinity of each of the six proposed well facilities and in the vicinity of proposed Sunset Reservoir project components. Regarding Section 15087(a)(3), and San Francisco Administrative Code Section 31.13(d), the EIR Notice of Availability, including notice that a public hearing would be held, was mailed to the owners and occupants of all properties within 300 feet of the parcels on which the project would be located, including the six proposed well facilities, pipeline routes, and Sunset Reservoir project components. CEQA Guidelines Section 15087(3) provides for notice to owners and occupants contiguous to the *parcel or parcels on which the project is located* (italicized for emphasis).

Regarding Section 15087(d), the EIR Notice of Availability, including notice that a public hearing would be held, was posted at the City and County of San Francisco Office of the County Clerk at City Hall, Room 168, 1 Dr. Carlton B. Goodlett Place. Regarding Section 15087(f), the Draft EIR was distributed to state agencies directly from the San Francisco Planning Department as well as from the State Clearinghouse. The Draft EIR was distributed to regional and local agencies directly from the Planning Department. Regarding Section 15087(g), the Draft EIR was available to the public from the Planning Department's EIR Coordinator for this project, Tim Johnston, from the Planning Department's Planning Information Center, and at the following libraries: the

San Francisco Main Library and the Ortega, Anza, Richmond, Park, and Sunset branches; the Stanford University Jonsson Library of Government Documents; the Government Publications Department of the San Francisco State University Library; the Hastings College of Law Library; and the University of California Institute of Government Studies. Regarding Section 15087(i), a public hearing on the Draft EIR was held on April 18, 2013.

Comment GC-4: Thorough community outreach should be conducted.

"Finally, RPD recommends that the PUC conduct thorough community outreach with nearby residents, park users, and other concerned stakeholders as the proposed projects moves through the planning and approval process, in order to identify and address any potential concerns.

Thank you for considering our comments and we look forward to further collaboration with the project sponsor as the project moves forward." (San Francisco Recreation and Park Department, letter, June 11, 2013)

Response GC-4

Section 9.1.2, Environmental Review Process describes public outreach conducted during the CEQA process, including NOP and Scoping, Draft EIR review, and this Responses to Comments document. In addition, see the response to Comment GC-3 regarding public outreach conducted during the Draft EIR review period.

In addition to CEQA public outreach, the SFPUC has conducted public outreach activities for the proposed project since 2009. Their over 30 outreach activities included mailers to properties in the vicinity of proposed well facilities, informal presentations, advertisements and announcements in neighborhood newspapers, open house and coffee meetings, and participation at street festivals and farmers markets (SFPUC, 2013c). In addition, SFPUC maintains and frequently updates a project website located at: http://sfwater.org/bids/projectDetail.aspx?prj_id=322.

Finally, as described on EIR page 3-52, in advance of construction activities, SFPUC would provide a 10-day public notice describing project construction activities, schedule information, and anticipated effects such as temporary closure of parking spaces or detours, and contact information. The notice would be distributed to adjacent properties and included on the SFPUC website along with project information.

Comment GC-5: The term "adaptive management" should be added to the EIR Glossary.

"The Golden Gate Audubon Society (GGAS), representing about 4000 members in the Bay Area, is pleased to give it's support to the proposed ground water supply project with some limited reservations. Most of our comments and concerns regard Lake Merced.

In the introductory glossary we think it would be wise to add "adaptive management". It is a critical aspect of this project and it should be defined." (Golden Gate Audubon Society, letter, April 27, 2013)

Response GC-5

In response to this comment, the EIR Glossary, page xvii, has been revised to include the following term:

> **Adaptive management.** The iterative process of learning from experience and adjusting management practices based on the feedback received through monitoring.

This revision does not change the analysis or conclusions presented in the EIR.

Comment GC-6: Basin recharge should be improved.

"One thing we did not see in this document is reference to aquifer recharge. Admittedly, our focus in reading the EIR was focused on Lake Merced and impacts on birds. So if our concern has been addressed we apologize for having missed it. If it is not addressed it should be. Groundwater recharge is becoming a more significant issue in San Francisco with each passing day. The problem is that many property owners are paving open space on their property with impervious materials such as concrete, artificial grass, and plastic with river rocks on top. The solution is two-fold. First, an education program should be developed and presented. It would be wise to include information about the use of water gardens and other infrastructure that can be used to decrease runoff. Second, zoning regulations requiring open ground on all lots should be strictly enforced. Third, all existing and new public and private parking lots, paved open space areas, and commercial buildings that require covering large areas of ground should be required to construct infrastructure on their property that would capture and retain rain water that could percolate into the ground.

Thank you for the opportunity to comment on this document. GGAS looks forward to the successful conclusion of this project and the integration of groundwater into the water system in San Francisco. If you have questions or if there is anything GGAS can do to provide more information please feel free to contact us." (Golden Gate Audubon Society, letter, April 27, 2013)

"Secondly, how does the city plan on replenishing the North Westside Groundwater Basin? There is nothing in the Draft EIR that explains how this aquifer will be replenished. The Outer Sunset District is covered by concrete. How is the aquifer going to be recharged? Lake Merced is already low. What are the city's plans for replenishing the aquifer?" (Megan Kennedy, letter, undated)

Response GC-6

Comment GC-6 discusses the need for aquifer recharge. EIR pages 5.16-27 and 5.16-31 discuss the existing groundwater budget (or water balance) for the basin, that is, the amount of water going in and coming out. As discussed, inflow or "recharge" components of the groundwater basin include subsurface inflows from outside of the basin, recharge from precipitation, recharge from applied water (irrigation), recharge from surface water such as Lake Merced and Pine Lake, and recharge from leakage of sewer and water pipes (LSCE, 2010). Lake Merced can either lose water to the groundwater system or gain water and therefore can be considered both a component of groundwater "inflow" and "outflow" depending on lake and groundwater levels, which vary seasonally and annually. Pine Lake, on the other hand, discharges water to the groundwater system and would only be considered a component of groundwater inflow. Based on modeling of historical groundwater conditions in the Westside Groundwater Basin between 1982 and 2002, groundwater storage in the entire groundwater basin increased an average of 174 acre-feet per year (afy) during this time period (HydroFocus, 2011).

See also the response to Comment HY-9 regarding the project's potential to substantially deplete the groundwater basin. As discussed in that response, groundwater pumping by the proposed project would not result in substantial basin depletion. Regarding the comment that aquifer recharge should be increased, a separate effort to improve aquifer recharge is not a component of the San Francisco Groundwater Supply Project. Consequently, the EIR analysis takes into account existing conditions and existing recharge processes to determine what effect the project would have on the groundwater budget. This comment has been provided to the project proponent for their consideration in future planning processes.

Comment GC-7: Comment regarding Responses to Comments process.

"COMMISSIONER ANTONINI: Okay. Thank you. No, I'm not saying it isn't within the document. I just was raising that concern publicly so people would realize that they have to read the documents, pay attention to it, and hopefully then there will be responses -- comments and responses." (Michael J. Antonini, Commissioner, Public Hearing Transcript, April 18, 2013)

"And one last comment to the gentleman who testified earlier, our only person who testified, you can of course submit written comments on this if you want to expand on your ideas or concerns or whatever. You don't have to -- you don't have to just do it here. You can write a letter to the PUC on your concerns." (Hisashi Sugaya, Commissioner, Public Hearing Transcript, April 18, 2013)

"The California Department of Fish and Wildlife (CDFW) has reviewed the draft Environmental Impact Report (EIR) for the San Francisco Groundwater Supply Project (Project), proposed by the San Francisco Public Utilities Commission (SFPUC). The Project consists of the construction and operation of six potable groundwater well facilities: two that would be converted from existing irrigation well facilities and four that would be newly constructed. Each facility would include a groundwater production well and a pump station. Included in the Project is construction of a distribution system, including pipelines and connection points, that would connect five of the well facilities to Sunset Reservoir; the sixth well would connect to the existing Lake Merced Pump Station and require a short length of distribution piping to make this connection. The SFPUC would also construct a pH adjustment facility at Sunset Reservoir within an existing reservoir building and a chlorine analyzer at the reservoir.

CDFW is identified as a Trustee Agency pursuant to the California Environmental Quality Act (CEQA) Section 15386, and is responsible for the conservation, protection, and management of the state's biological resources. Pursuant to Fish and Game Code Section 1801, it is the policy of the state to encourage preservation, conservation, and maintenance of wildlife resources, including perpetuation of all species of wildlife for their intrinsic and ecological values. In addition, pursuant to Fish and Game Code Section 1802, CDFW has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species. CDFW is submitting comments on the draft EIR to inform the Lead Agency of our concerns regarding sensitive resources which could potentially be affected by the Project, and provide guidance to the SFPUC to ensure that biological resources are protected." (California Department of Fish and Wildlife, letter, May 2, 2013)

Response GC-7

Comment GC-7 regarding the Draft EIR public review and comment process is noted and is consistent with the purpose of the Responses to Comments document and the public review process, as described in Sections 9.1.1 and 9.1.2 above.

9.4.2 Project Description

Comment PD-1: Facility design and existing traffic could result in pipeline rupture.

"So I would hope -- the third question I want to ask, and you didn't have to answer it today, but are we addressing in this report -- it may be in here -- the intra-city pipeline conditions? Because we're going to be putting in new pipelines -- although it isn't part of this project -- there may be changes in pressure that were alluded to by the speaker that spoke from the public, and making sure that we don't have any recurrences of situations that happened at 15th and Wawona and analyzing what effects, if any, this new water supply might have on the pressures within the existing pipes, many of which are fairly old." (Michael J. Antonini, Commissioner, Public Hearing Transcript, April 18, 2013)

"TIM KENNEDY: Hello. My name is Tim Kennedy. I live at 2587, 41st Avenue, San Francisco, California 94116.

I've come in here today because I am a certified distribution operator and a certified treatment operator. I have nine years in the water industry. And my concern today is as a resident of 41st Avenue.

My primary concern is not with the idea of groundwater wells. I think it's a great idea, especially for -- in cases of emergency such as earthquakes, give us a local water source.

My primary concern is with the pipeline location and particularly with the South Sunset well location.

In the EIR, it says that the well is located on 40th and Wawona, and then the pipeline will go north on 40th; it will make a 90 -- goes up one block north, makes a 90-degree angle; goes one block west, makes another 90 degree angle, and then goes north.

That's going to cause a -- when a well runs, it's like a pump. It's like a vertical turbine pump. It's going to cause a lot of stress on those 90-degree angles. I think that's going to cause problems for the residents and the homeowners in that area. It could cause main breaks." (Tim Kennedy, Public Hearing Transcript, April 18, 2013)

"My other concern is that, on the two wells at both South Sunset and West Sunset, in the -- around homeowners, there's no surge tanks. Normally when you run a well, there should be a surge tank following the discharge side of a well that absorbs the initial impact of the well coming on or the pump coming on and creates less stress on any of the pipelines." (Tim Kennedy, Public Hearing Transcript, April 18, 2013)

"As a homeowner I'm concerned with the 90s the fact that there could be some pipeline rupture without surge tanks. Thank you." (Tim Kennedy, Public Hearing Transcript, April 18, 2013)

"Thirdly, with regards to the South Sunset Well Location and the West Sunset Well Location, why is the city building a well in a residential area without a discharge surge tank. Discharge surge tanks relieve stress on pipelines from sudden changes is pressure and flow. They prevent damage and pipeline rupture. Does the city not understand that discharge surge tanks in residential areas are common practice? Is the city not concerned with property damage and pipeline rupture?" (Megan Kennedy, letter, undated)

"Finally, as a resident of 2587 41st Avenue, I am concerned with the pipeline location of the South Sunset Well project. The city plans to have a vertical turbine pump (without a discharge surge tank) pump north for one block to 40th Ave and Vicente, then take a 90 degree turn west for one block to 41st Ave and Vicente, then make another 90 degree turn north on 41st Ave. This is not a good idea and may cause pipeline ruptures, especially at those 90 degree turns. Why not go north on 40th Avenue until the West Sunset Well Location? This would call for only one 90 degree turn instead of two in such a short distance." (Megan Kennedy, letter, undated)

"2. The area going to be the drilling site is not the best due to the high traffic. Do you realize how many truck and school bus use 41st ave. as their main traffic lane. The weight of heavy traffic will damage the water pipeline in the long run." (Bill Wong, email, March 18, 2013)

Response PD-1

The circumstances regarding pipeline design and pipeline pressures discussed in these comments have been accounted for in the project design. That level of technical detail was not included in Chapter 3, Project Description, of the EIR because it was not information that was needed to support the analysis of CEQA environmental topics, but has been provided by the SFPUC as follows (SFPUC, 2013a):

The project design engineers conducted a surge analysis to account for starting and stopping of the six wells. Surge tanks were designed and would be installed in each well facility. Concrete thrust blocks would be installed at pipeline turn locations, including the 90-degree turns along Vicente Street.

The specified pipeline materials would be rated for installation beneath city streets and would meet building code requirements. The type of earthen backfill around the pipelines, the degree of compaction of the backfill, and the thickness of paving would be designed to withstand the heavy surface vehicular traffic without damage to the pipelines.

Comment PD-2: Existing Golden Gate Park windmills could be utilized as part of the project.

"And then my final question will be are we going to utilize the two windmills that we have at the end of Golden Gate Park, which I think are operational, to help with this whole process because it would make sense to use -- there's a lot of wind out there, and it probably would be a good way to -- that's a different site from where your wells are going to be, but it would be good if we could figure out a way to use what's already there." (Michael J. Antonini, Commissioner, Public Hearing Transcript, April 18, 2013)

Response PD-2

While the Golden Gate Park windmills formerly provided power to pump groundwater for irrigation purposes, restoration of the windmills did not include restoration of substantial groundwater pumping capabilities such that the windmills could provide the power required to support the proposed project. Further, the proposed project does not include restoring the groundwater pumping capabilities of the windmills. Rather, hydroelectric power from the Hetch Hetchy Regional Water System is available and would provide the power to operate the new groundwater well facilities without the need to construct additional facilities.

Comment PD-3: Consider improving the areas around the South Windmill well facility project site.

"COMMISSIONER SUGAYA: Just a quick comment on Figure 3-13A, which is the South Windmill replacement well facility figure. It shows in green proposed native grass. But the site that you're going to be proposing the building and the rest of the construction and the pipelines and everything are sitting in an area which currently is void of a lot of vegetation.

And I think some of it is being used as a trash dump or something -- or used to be. But the magenta line, the limit of ground disturbance, doesn't take into consideration this whole -- I don't know if it was a quarry at one time or something. Whatever it was -- doesn't encompass the rest of the area.

And I think that it behoove the PUC and Rec Park to take a look at that area, as long as work is going to proceed, to see if it can't be -- if the vegetation program, whether it's native grasses or trees, couldn't be expanded somewhat to include re-vegetating that entire area." (Hisashi Sugaya, Commissioner, Public Hearing Transcript, April 18, 2013)

Response PD-3

This comment is noted. The SFRPD currently uses the area surrounding the proposed South Windmill Replacement well facility to store logs, construction debris, and construction materials. Extended planting in the vicinity of the well facility is not part of the proposed project; the project does include revegetation of any areas disturbed by the project. The San Francisco Clean and Safe Neighborhoods Park Bond (Prop B – 2012) provides funding for restoration activities in Golden Gate Park, which could include the log storage area that is outside of the project area. Planning and environmental review have not commenced for such a future project.

Comment PD-4: Well facilities would be vulnerable due to locations.

"COMMISSIONER MOORE: I find the entire story about the San Francisco's water supply extremely fascinating. I am concerned that the addition of new wells in strategic locations makes these wells highly visible. And what are we considering for these facilities becoming vulnerable, which is very important part when you have visible water supply facilities." (Katherin Moore, Commissioner, Public Hearing Transcript, April 18, 2013)

Response PD-4

The aboveground facilities (well facilities and pH adjustment facility) have been designed in accordance with SFPUC Security Department requirements. Such features include: providing stronger hardware for doors and locks; installing vents instead of windows; placing security grills behind vents and beneath skylights; implementing secure card-reader access to buildings; installing intrusion alarms at all potential openings; using security cameras; restricting vegetation height to maintain a minimum of 10 feet of clear space around buildings; and providing at least 8 feet of height between the ground surface and a building or fence to prevent access to the building roof (SFPUC, 2013a).

Comment PD-5: Potential cross-contamination between recycled water and groundwater could occur.

"A second part of that question is when you combine potable and recycled water in one project, what do we do about absolutely being sure about cross-connections. Those would be two questions I would like to see specifically answered." (Katherin Moore, Commissioner, Public Hearing Transcript, April 18, 2013)

Response PD-5

The proposed project would not combine potable and recycled water. The proposed project would develop a potable water source from groundwater. SFPUC is developing a separate project proposal to provide recycled water to Golden Gate Park to meet its irrigation needs. As described in the Chapter 3, Project Description, of the EIR, it is expected that landscaping in Golden Gate Park would be irrigated with recycled water in the future. If recycled water is eventually delivered to Golden Gate Park by a separate project included in the WSIP, groundwater would still be available as a backup irrigation supply in case recycled water was ever not available for irrigation. Measures have been incorporated into the project design to prevent cross-contamination of groundwater and recycled water, including piping features such as a "swivel-ell" pipe coupling or an air gap. In addition, State regulations require that irrigation systems be designed and operated to prevent recycled water irrigation within 50 feet of drinking water wells (SFPUC, 2013a). While not included as part of the proposed project, it is noted that implementation of the recycled water project will require compliance with California Department of Public Health's California Safe Drinking Water Requirements, including use of purple piping to identify recycled water distribution pipelines (Section 116815) and California Code of Regulations Title 22 Section 64572, including separation of recycled water pipelines and water mains by at least 4 or 10 feet horizontally (depending on the level of recycled water treatment) and 1 foot vertically.

Comment PD-6: Expression of support for project objectives.

"GGAS agrees with and supports the project objectives:

Expand and diversify the SFPUC's water supply portfolio to increase system reliability
Increase the use of local water supply sources
Reduce dependence on imported surface water

In addition, the project would provide potable groundwater for emergency supply in the event of an earthquake or other major catastrophe (SFPUC, 2009)." (Golden Gate Audubon Society, letter, April 27, 2013)

Response PD-6

The commenter's agreement with and support of the project objectives is noted.

Comment PD-7: Request for information regarding potential Golden Gate Park supplemental lake water supply.

"And another comment, which is a question, I guess, regarding the lakes in Golden Gate Park, particularly Chain of Lakes, which are naturally occurring lakes. I think they're the only ones in Golden Gate Park which are naturally occurring. In recent years, they seem to be virtually stagnant, you know, overgrown and not in very good shape. And I'm wondering if your plan addresses the needs of these lakes to have enough water supply and movement in the water, even though these are Rec Park facilities, I understand, but they're dependent upon water that's come from their pumping at Golden Gate Park which will be somewhat affected by your groundwater pump.

So, I mean, you don't have to necessary reply but that's -- you know." (Michael J. Antonini, Commissioner, Public Hearing Transcript, April 18, 2013)

Response PD-7

The proposed project includes groundwater pumping to secure additional municipal water supply for distribution to SFPUC system customers. The SFPUC currently provides some water supply to Golden Gate Park (and all irrigation water supply for the Golden Gate Park Panhandle); the SFPUC would continue to do so in the future while the proposed project is operational, including supplementing the water supply of the park lakes, including Chain of Lakes. In addition, the proposed project would provide backup water supply to the park's irrigation water supply system.

Under Phase 1 of the proposed project, the existing Golden Gate Park irrigation wells would continue to supply most of Golden Gate Park's irrigation water supply. Project groundwater pumping of a new well located in Golden Gate Park and 3 wells to the south of the park would not substantially affect the production capacity of the existing Golden Gate Park irrigation wells and groundwater-dependent land uses (including lake fill) would continue to be supported (see Impact HY-6, EIR pages 5.16-80 to 5.16-84). Phase 2 of the proposed project would not be implemented unless and until a separate recycled water project were approved and constructed, which would provide Golden Gate Park irrigation supply, including lake fill. Phase 2 conversion of the existing irrigation wells to provide municipal water supply could then occur, which would result in a slight reduction in the existing total groundwater pumping in the North Westside Groundwater Basin because the pumping rate of existing Golden Gate Park irrigation wells is slightly greater than the proposed pumping rate of wells to be converted from irrigation wells to municipal water supply wells under the proposed project (see EIR Section 5.1.5, Overview of Groundwater Modeling Approach, EIR pages 5.1-40 to 5.1-51).

As discussed on EIR page 5.16-68, the Golden Gate Park lakes do not intersect the groundwater table and are not hydraulically connected with the aquifer. Groundwater pumping under the proposed project would, therefore, not affect the water levels of the Golden Gate Park lakes.

Comment PD-8: Coordinate project construction and implementation of mitigation measures with the San Francisco Recreation and Park Department.

"RPD staff plans to work with the PUC to ensure that the mitigation measures proposed in the DEIR are fully and successfully implemented. In particular, we request that the PUC coordinate closely with RPD's Natural Areas Program staff on the mitigation measures relating to biological resources at Lake Merced and Golden Gate Park, in order to ensure protection of the special-status species that are identified in the DEIR. Additionally, we request that the PUC coordinate with RPD's Planning Unit and/or Recreation Programs staff to ensure that changing water levels at Lake Merced do not negatively affect recreational boating programs and activities.

We also wish to note the following important considerations for successful implementation of the proposed project:

- Implementation and construction of the proposed facilities should be coordinated closely with our Operations Division and recreation program staff to ensure that work does not disrupt public access to the park facilities.
- Renovations are planned at the West Sunset Playground through the 2012 Clean and Safe Neighborhood Parks Bond. It is anticipated that construction on these park improvements will begin in May 2015 and be completed in August 2016. All work proposed at the West Sunset Playground as part of the proposed project should be planned and carried out in close coordination with RPD and the bond-funded renovation work.
- The facilities at South Sunset Playground will need to be constructed entirely from the street side of the park in order to avoid interruptions to the field programming.

- These projects have been presented to the Recreation and Park Commission as informational items only. The project details for each proposed location, including final design, scope and schedule, will need to be brought before to the Commission formally for their approval.
- Per City Charter requirements, the proposed new Central Pump Station Well Facility in Golden Gate Park will require approval from the Board of Supervisors." (San Francisco Recreation and Park Department, letter, June 11, 2013)

Response PD-8

In response to Comment PD-8 requesting that project construction and implementation of mitigation measures be coordinated with San Francisco Recreation and Park Department staff and that Recreation and Park Commission approval would be required, it is noted that implementation of Mitigation Measure M-BI-3: Plant Replacement Trees (EIR page 5.14-49) specifically requires coordination with SFRPD. In addition, EIR Section 3.6.1, Approvals Required, includes the following required approval: San Francisco Recreation and Parks Commission approval and adoption of findings necessary for construction and maintenance of well facility structures on park lands, and approval of an agreement with the SFPUC regarding construction in and use of park-managed property (EIR page 3-61). It is expected that SFPUC coordination with San Francisco Recreation and Park Department would be required to develop the agreement with SFPUC regarding construction in and use of park-managed property, and that such coordination could include the details identified by department staff in Comment PD-8. It is also expected that the agreement would include necessary conditions to ensure that field programming, park access, ongoing park maintenance activities, and repairs and renovations are not disrupted.

EIR Section 3.6.1, Approvals Required, also includes the following required approval: San Francisco Board of Supervisors adoption of CEQA findings, approval of the well facility structures in Golden Gate Park, and appropriation funding (EIR page 3-61).

9.4.3 Transportation and Circulation

Comment TR-1: The West Sunset well facility would affect parking.

"4. Putting a pump station on 40th Ave and Quintrar (sic) street will only create parking problem. During weekend and summer, The parking lot is always occupy full. With pump station at the location, it will going force more parking problem in the neighborhood." (Bill Wong, email, March 18, 2013)

Response TR-1

Comment TR-1 discusses parking conditions at the West Sunset Playground. A discussion of parking conditions is included in the EIR on pages 5.6-25 and 5.6-26. As noted there, construction staging and construction worker parking would be temporarily located at a staging area within the parking lane along Quintara Street, from 41st Avenue to just east of 40th Avenue, during the approximately 15- to 18-month construction period at the West Sunset well facility. In addition, a portion of the West Sunset Playground parking lot would be included in the project construction area. During construction, the number of on-street parking spaces and the capacity of the parking lot would be reduced, temporarily affecting automobile parking, and area residents may have to find alternate parking spaces in the surrounding area. Following project construction, on-street parking and off-street parking at the West Sunset Playground parking lot would be restored, with the possible exception of one parking space associated with the well facility (at the edge of the proposed concrete paving area).

9.4.4 Recreation

Comment RE-1: Siting of well facilities would not likely affect prominent park locations or uses.

"Staff from the RPD Capital and Planning Division worked with the PUC on the planning and design of the proposed project from 2006 to 2010, and provided written comments to PUC stating general conditions for the construction of facilities at RPD properties. We are pleased to see that the proposed project as presented and analyzed in the DEIR is consistent with the feedback provided by RPD staff through our earlier correspondence with the PUC, thereby minimizing potential adverse impacts on recreational uses and facilities. Specifically, the proposed new well facilities are generally small in footprint and designed to be compatible with adjacent recreational uses and open space. In the case of Golden Gate Park and Lake Merced, the new pump facilities are located adjacent to existing utility and/or maintenance facilities and therefore are not expected to affect prominent locations or actively used recreational areas within the parks." (San Francisco Recreation and Park Department, letter, June 11, 2013)

Response RE-1

The comment summarizing coordination that occurred between the San Francisco Recreation and Park Department and SFPUC regarding well facility siting and design is noted. Consistent with Comment RE-1, EIR Impact RE-2 (EIR page 5.11-10) indicates that proposed well facilities would not be located on active play fields at South Sunset or West Sunset Playgrounds, or in high visitor use areas of Golden Gate Park. The Lake Merced well facility site is within an area managed by SFPUC and is not open to the public. Thus, project siting and operation would not result in the greater use of recreational facilities elsewhere in the park or outside of the park due to loss of recreational use areas within the park. For these reasons, there would be a less-than-significant impact relative to a potential increase in the use of existing neighborhood and regional parks or other recreational facilities, and substantial physical deterioration of the facilities would not occur or be accelerated; therefore no mitigation is required.

Comment RE-2: The project could affect Lake Merced water levels and recreational boating programs.

"Thank you for providing the San Francisco Recreation and Park Department (RPD) with the opportunity to review the Draft Environmental Impact Report (DEIR) for the San Francisco Groundwater Supply Project.

The proposed project would involve construction of new groundwater well facilities at three RPD properties: West Sunset Playground, South Sunset Playground, and Golden Gate Park. In addition, two existing well facilities in Golden Gate Park would be replaced (the existing irrigation well facilities would be demolished, and new groundwater wells of similar size would be constructed in the same locations).

A fourth new groundwater well facility would be built at Lake Merced on land owned by the project sponsor, the San Francisco Public Utilities Commission (PUC). This facility would be located adjacent to RPD-owned and managed lands surrounding Lake Merced, and the operation of this well could also potentially affect RPD's recreational boating programs at the lake." (San Francisco Recreation and Park Department, letter, June 11, 2013)

The following topics identified in the DEIR are of particular interest to RPD:

- Water Levels at Lake Merced, …" (San Francisco Recreation and Park Department, letter, June 11, 2013)

Response RE-2

In response to Comment RE-2, EIR Impact RE-3 (EIR pages 5.11-20 to 5.11-27) discusses the potential for the project to physically degrade existing recreational resources. As discussed, the lake itself is a recreational resource used for boating/paddling and fishing, including fishing from floating and stationary docks. Reduced water levels would reduce the lake acreage available for boating and fishing and detract from the scenic quality of the lake. There may be periods during operation of the project in drought conditions when there is not a sufficient lake depth to support the approximately 250 existing daily on-water users (Kinsey, 2012). Further, the water's edge could be more than 150 feet farther from the existing shoreline, in which case stationary docks would not be in contact with the water's edge and floating docks would have to be moved to provide water access. In addition, under the proposed project, East Lake would nearly dry up and Impound Lake would dry up altogether during an extended drought. Following an extended drought, lake level conditions and associated effects on recreational resources would improve as water levels increase due to increased precipitation. Recreational resources would likely be degraded substantially, as described above, and therefore, operation of the proposed project would result in a significant impact on Lake Merced as a recreational resource. However, Mitigation Measure M-HY-9, Lake Level Management for Lake Merced requires the SFPUC to implement lake level management procedures to maintain Lake Merced at water levels similar to conditions that are predicted to occur without the project. Therefore, with implementation of Mitigation Measure M-HY-9, Lake Merced would be maintained as a recreational resource at conditions similar to that which would be expected without project-related pumping. These corrective actions include the additions of supplemental water and/or alteration of pumping patterns, as necessary. As a result, no additional recreation-specific mitigation is required.

9.4.5 Biological Resources

Comment BI-1: Tree and vegetation effects should be addressed.

"And also, if you're going to be constructing new pipelines, I assume trenching would -- may effect the trees between the current and existing road, which is Martin Luther King, and your well site. So I would hope that any kind of vegetative disturbance would be replaced in kind or that there would be a vegetation program for that area as well. That means between the well site and the road." (Hisashi Sugaya, Commissioner, Public Hearing Transcript, April 18, 2013)

"Mitigation for vegetation destruction at project sites should include replanting with native vegetation when possible or with habitat appropriate non-native vegetation if necessary. Under no circumstances should weeds be allowed to take over areas near any of the project sites. Should additional mitigation be necessary, it would be beneficial to remove non-native, invasive vegetation from the shoreline of Lake Merced and replant it with native vegetation." (Golden Gate Audubon Society, letter, April 27, 2013)

"*Mitigation Measure M-BI-3: Plant Replacement Trees.*

M-BI-3 states that the SFPUC shall replace trees removed with trees of equivalent ecological value (i.e., similar species) at a 1: 1 ratio, or if that is not feasible, at a ratio of one-inch for every one-inch removed at the tree's diameter at breast height (dbh); and that tree replacement plantings shall be monitored annually for a minimum of three years, and if necessary, replanted to ensure success of the replacement plantings.

CDFW recommends replacing trees and non-native vegetation with native trees and native vegetation that will attain similar height and canopy cover. Replacement vegetation and trees should be monitored for a minimum of 5 years. Trees should have a 60% success rate at the end of 5 years." (California Department of Fish and Wildlife, letter, May 2, 2013)

"The following topics identified in the DEIR are of particular interest to RPD:

…

- Tree Removal" (San Francisco Recreation and Park Department, letter, June 11, 2013)

Response BI-1

Comment BI-1 discusses vegetation disturbance, particularly at the South Windmill Replacement well facility. As shown on EIR Figure 3-13a, most of the ground disturbance associated with construction of the South Windmill Replacement well facility would be within the existing storage area for logs, construction debris, and construction materials, which is substantially devoid of vegetation. The area surrounding the well facility that would be disturbed by the project would be seeded with native grass following project construction. The project would include installation of a groundwater pipeline and an overboard pipeline between the well facility and Martin Luther King Jr. Drive that would traverse a non-native forest area dominated by blue gum eucalyptus and Monterey cypress and containing tree-sized *Myoporum* shrubs (EIR page 5.14-11). As discussed in Impact BI-3 (EIR pages 5.14-47 through 5.14-48), tree removal would only be required at the Lake Merced, West Sunset, and North Lake well facilities. Tree removal would not be required at the South Windmill Replacement well facility. It is also noted that protection of trees adjacent to the construction areas is proposed to be adopted by the SFPUC as part of the project (see EIR page 3-17, Site Preparation and Construction).

As described above, tree removal would be required at the Lake Merced, West Sunset, and North Lake well facilities. The five trees to be removed from SFRPD-managed lands are Monterey cypress and would be replaced with trees of equivalent ecological value (EIR Mitigation Measure M-BI-3). The CDFW recommendation to extend monitoring of tree replacements to 5 years to achieve a 60% success rate (rather than 3 years and replacement of trees at a 1:1 ratio, as indicated in Mitigation Measure M-BI-3) is noted, but is not required to avoid a significant impact related to conflicts with applicable local policies or ordinances. The mitigation measure requires replanting within the first 3 years if necessary to ensure the success of the replacement plantings at a 1:1 ratio, or 100 percent replacement. Monterey cypress are typical species that establish successfully within the Golden Gate Park and West Sunset Playground areas, and existing Monterey cypress in the vicinity of the proposed project areas are mostly in fair to good health (Environmental Science Associates, 2012). It is expected that this species would establish quickly following planting, and monitoring for three years is deemed appropriate to ensure replaced trees have become established and are in good health. Because the land where tree replantings would occur is managed by the SFRPD, the selection of tree species, and whether to use native trees, would be determined in coordination with that city agency; however, as stated in the mitigation, removed trees would be replaced with trees of equivalent ecological value. As noted above, SFPUC proposes as part of the project to protect trees adjacent to the construction areas. The proposed project facility footprints and areas of disturbance are primarily located in landscaped areas, areas devoid of vegetation, or ruderal areas (see EIR pages 5.14-11 through 5.14-12). Thus, project construction activities and facility siting would not cause substantial loss of sensitive vegetation habitat. Native grass seeding and other landscaping would be installed, as discussed in EIR Chapter 3, Project Description, Section 3.4.1, Groundwater Well Facilities, and in Section 5.3, Aesthetics, Impacts AE-4 and AE-5, which include representation of the draft landscape plans for each well facility.

Comment BI-2: Breeding bird nest avoidance measures should be incorporated as a mitigation measure.

"Pages 5.14-44 and 5.14-45 of the draft EIR indicate a potential for impacts to bird nests by vegetation, tree removal and project activities. CDFW recommends the methodologies discussed for nest avoidance in this section be incorporated into a mitigation measure that also includes mitigation, such as additional tree plantings, for any potential significant effects.

CDFW appreciates the opportunity to comment on the San Francisco Groundwater Supply Project. CDFW staff is available to meet with you to further clarify our comments and provide technical assistance on any changes necessary to protect resources. If you have any questions, please contact Ms. Jeanne Chinn, Environmental Scientist, at (707) 944-5523 or jeanne.chinn@wildlife.ca.gov; or Mr. Craig Weightman, Senior Environmental Scientist, at (707) 944-5577." (California Department of Fish and Wildlife, letter, May 2, 2013)

"Construction timing should be geared toward starting projects in sensitive areas like woodlands, grasslands, marshes, etc., prior to the nesting season so as to reduce impacts on nesting birds. The nesting season in and around San Francisco begins as early as January for a very few species. The most likely to be impacted would be Great Blue Heron, Great Horned Owl and Anna's Hummingbird. The nesting season for the bulk of our nesting species begins in mid February, peaks in late April, fledging occurs through May and early June, and most nesting is completed by mid July. However, depending on various other variables the season can continue into August or later. Surveys are necessary to determine if nesting birds are present." (Golden Gate Audubon Society, letter, April 27, 2013)

Response BI-2

Preconstruction surveys for nesting birds have been incorporated into the project description as project construction requirements, as discussed in EIR Section 5.14, Biological Resources, Impact BI-1. As described in Chapter 3, Project Description, Section 3.4.1, Groundwater Well Facilities, under the heading "Site Preparation and Construction," the SFPUC would conduct tree removal and pruning activities as well as other construction activities outside of the bird nesting season (January 15 to August 15) to the extent feasible. If construction during the bird nesting season could not be fully avoided, a qualified wildlife biologist would conduct preconstruction surveys for nesting birds prior to project work. The SFPUC would ensure that the preconstruction surveys are conducted within 7 days of the start of construction (i.e., activities involving active ground disturbance, vegetation removal, or building demolition). If active nests are located during the preconstruction survey, the SFPUC would set up and maintain a line-of-sight buffer area around the active nest and prohibit construction activities within the buffer; modify construction activities; and/or remove or relocate active nests. The project requirements to conduct nesting bird surveys and install appropriate buffers are proposed to be adopted by the SFPUC as part of the project, and their implementation would be adequate to protect the reproductive success of nesting birds. Tree planting would not be necessary to address significant impacts on nesting birds because the requirements proposed to be adopted by SFPUC as part of the project would avoid impacts to nesting birds. However, to the extent that trees would be removed under the proposed project within areas managed by the SFRPD, the SFPUC would be required to replace those trees by Mitigation Measure M-BI-3, Plant Replacement Trees. This mitigation measure is required to address potential conflicts with applicable local policies or ordinances, such as a tree preservation policy.

Comment BI-3: The EIR description of bird species should be revised.

"Though we agree there is a low potential for impacts on Bank Swallows, it is incorrect to state they occasionally forage at Lake Merced (Table 5.14-2). The hundreds of Bank Swallows that utilize the nesting colony at Fort Funston depend almost entirely on Lake Merced for foraging. Since they forage on flying insects, there little chance this project will have any impact on them." (Golden Gate Audubon Society, letter, April 27, 2013)

"We realize Impact RE-3 deals with our concerns, at least in part. Impact BI-1 should be expanded to include monitoring of Tri-colored Blackbird (fall and winter in marsh roosts) and "San Francisco" Common Yellowthroat (year round resident in marsh). Both are species of concern." (Golden Gate Audubon Society, letter, April 27, 2013)

"As stated above, Tri-colored Blackbird and "San Francisco" Common Yellowthroat should be discussed in this document. Both occur at Lake Merced, but given the proposed project sites there would seem to be a low potential for impacts on either species. The same would be true for unusual migrant species, some of which may be listed, that might occur at any of the project sites during fall migration." (Golden Gate Audubon Society, letter, April 27, 2013)

"Double-crested Cormorants do not nest in a single colony at Lake Merced. There are 3 colonies, none of which are located near a project site. It is questionable if there will be any impact on this species from project construction." (Golden Gate Audubon Society, letter, April 27, 2013)

Response BI-3

Comment BI-3 provides recommendations regarding the potential presence of special-status species in the project area. EIR Section 5.14, Biological Resources, is consistent with the comment that the project is highly unlikely to have any direct or indirect impacts on bank swallows.

San Francisco common yellowthroat—or "salt-marsh" common yellowthroat (*Geothlypis trichas sinuosa*) as it is discussed in the EIR—are both names used to identify the common yellowthroat subspecies within the San Francisco Bay region. The species is included in Section 5.14, Biological Resources, Table 5.14-2 as having a high potential to occur in the project area, since it is known to breed at Lake Merced. Common yellowthroat is also discussed, along with other migratory and special-status birds that are known to or may occur at Lake Merced, on EIR page 5.14-28. Furthermore, common yellowthroat is discussed on EIR page 5.14-52 as a species that nests close to the waterline and could potentially be affected by rapid decreases in water levels if such decreases were to result from project operations. As noted on EIR page 5.14-52, Virginia rail and sora nesting success would appear to be highly sensitive to water fluctuations, so these birds were utilized as indicator species to determine significance thresholds for impacts on birds nesting at or near the waterline.

Tricolored blackbird is not mentioned in the EIR, as it was not listed in the California Natural Diversity Database search for the project area. The species is apparently uncommon at Lake Merced but has been seen during the nonbreeding season. On the basis of this new information, EIR Table 5.14-2 is revised to include tricolored blackbird (see revisions below). Since tricolored blackbird has not apparently established a nesting colony at Lake Merced and does not appear abundant in the area during the non-nesting season, there is no need to discuss the species further in the EIR.

Section 5.14, Biological Resources, Impact BI-1 discusses potential construction-related impacts on nesting birds. Project construction is not expected to specifically affect salt-marsh common yellowthroat or tricolored blackbird any differently than other nesting species, and the proposed project incorporates preconstruction surveys for nesting birds (see the response to Comment BI-2). Therefore, it is not necessary to add a discussion to Impact BI-1 related to monitoring for these species.

With respect to double-crested cormorants, EIR Table 5.14-2 notes the presence of a colony, but EIR page 5.14-36 goes on to note the presence of three rookeries, and page 5.14-56 mentions several rookeries. It is a matter of semantics as to whether the three rookeries make up a single colony or whether each should be called a separate colony, as the terms are sometimes used synonymously. While it is true that none of the rookeries is located near the project facility sites at Lake Merced and direct impacts on the species are unlikely, potential indirect impacts on the species (and nesting great blue herons as well) could occur if the lake's water surface were to rise to elevations sufficient to kill the rookery trees currently in use. This potential impact is discussed on EIR page 5.14-56, which concludes that the project would not cause an impact on rookery trees. The proposed project would not contribute to increasing lake levels, and decreasing lake levels would not adversely affect eucalyptus and other large trees currently being used or with potential for use as rookery trees. The EIR authors agree with the commenter that direct and indirect impacts on double-crested cormorants are unlikely.

In response to Comment BI-3, EIR page 5.14-23, Table 5.14-2, line 5 has been revised:

Bank swallow *Riparia riparia*	–/CT	Colony nester on sandy cliffs near water, marshes, lakes, streams, the ocean. Forages in fields.	**Low potential.** No suitable nesting habitat present~~, although~~ <u>However,</u> this species nests nearby and ~~occasionally forages at~~ Lake Merced<u> is an important foraging ground for bank swallows nesting at Fort Funston.</u>

In response to Comment BI-3, EIR page 5.14-24, Table 5.14-2, new line 11 has been added:

<u>Tricolored blackbird</u> <u>*Agelaius tricolor*</u>	<u>–/*</u> <u>(nesting colony)</u>	<u>Colonial nester in freshwater marshes. Nests over or near the water, typically in emergent vegetation.</u>	<u>**Low potential.** Although the species has been observed at Lake Merced during the nonbreeding season, no known nesting colonies are present.</u>

In response to Comment BI-3, EIR page 5.14-25, Table 5.14-2, line 6 has been revised:

Double-crested cormorant *Phalacrocorax auritus*	–/–	Nests along coast on isolated islands or in trees along lake margins.	**High potential.** There ~~is a colony of~~ <u>are three </u>double-crested cormorant~~s~~ <u>rookeries</u> at Lake Merced (SF Field Ornithologists, 2003).

These revisions do not change the analysis or conclusions presented in the EIR.

Comment BI-4: Mitigation Measure M-BI-1a should be revised.

"**Biological Resources**

Mitigation Measure M-BI-1a: Avoidance and Minimization Measures for California Red-Legged Frog and Western Pond Turtle

M-BI-1 a states that prior to disturbing California red-legged frog (CRLF) and western pond turtle (WPT) habitat, the SFPUC will provide environmental awareness training for all construction workers, install exclusion fencing along the work area boundaries one week prior to work activities at each site, a qualified biologist shall survey the excluded work area within 48 hours before onset of initial ground-disturbing activities as well as be present during initial vegetation clearing and ground-disturbing activities, and provide overnight cover or escape ramps for any excavations deeper than two feet. If frogs or turtles are found, the SFPUC will halt construction and contact the U.S. Fish and Wildlife Service (USFWS) and CDFW for instruction on how to proceed and only resume construction after approval by both agencies.

CDFW recommends that it would be more efficient as well as protective of the species for the SFPUC to develop contingency plans for CRLF and WPT should an individual of either species be found rather than rely on consultation after the fact. A relocation plan should identify a specific area or areas where WPT and CRLF can be relocated, a protocol for how injured individuals will be handled, and provide a protocol for retention and documentation of dead individuals. Please note, CRLF is a federally threatened species, and authorization from the USFWS is required for relocation activities.

Additionally, given the possible presence of WPT on the Project sites, CDFW recommends any excavated, steep-walled holes or trenches more than six inches deep are provided cover at night or one or more escape ramps constructed of earth fill or wooden planks at a 3:1 slope (run:rise) and be inspected by a qualified biologist each morning prior to work activities." (California Department of Fish and Wildlife, letter, May 2, 2013)

Response BI-4

Comment BI-4 indicates that in the unlikely event that a California red-legged frog or western pond turtle were encountered during project construction, an agency-approved relocation plan would streamline the response process and be more protective of the species. However, given the low-likelihood of potential occurrence of these species, preparation of a relocation plan in advance of construction would be not be necessary.

In response to this comment, EIR page 5.14-44, Mitigation Measure M-BI-1a, bullet 4 is revised as follows:

- During project activities, excavations deeper than ~~2 feet~~ 6 inches shall be covered overnight or an escape ramp of earth or a wooden plank at a 3:1 rise shall be installed; openings such as pipes where California red legged frogs or western pond turtles might seek refuge shall be covered when not in use; and all trash that may attract predators or hide California red-legged frogs or western pond turtles shall be properly contained on a daily basis, removed from the worksite, and disposed of regularly. Following construction, the construction contractor shall remove all trash and construction debris from work areas.

These revisions do not change the analysis or conclusions presented in the EIR.

Comment BI-5: Impacts on special-status species in Golden Gate Park and at Lake Merced are of interest.

"The following topics identified in the DEIR are of particular interest to RPD:

…

- Special-Status Species in Golden Gate Park and at Lake Merced …" (San Francisco Recreation and Park Department, letter, June 11, 2013)

Response BI-5

EIR Impacts BI-1, BI-4, and BI-5 address project impacts on special-status species. As discussed in Impact BI-1 (EIR pages 5.14-42 to 5.14-6), project construction activities could adversely affect western pond turtle (Lake Merced, Central Pump Station, and North Lake well facility sites), California red-legged frog (Central Pump Station and North Lake well facility sites), special-status bat species (all well facility sites and Sunset Reservoir), and monarch butterflies (Golden Gate Park well facilities). EIR mitigation measures M-BI-1a through 1c include avoidance and minimization measures that would reduce potential impacts on these species to a less-than-significant level by requiring preconstruction surveys, exclusion methods, and additional construction measures. Facility siting and maintenance activities would not result in substantial biological resources effects because noise and human activity levels at the well facilities during project operations would be similar to pre-project conditions (Impact BI-4, EIR pages 5.14-49 and 5.14-20). As discussed in Impact BI-5 (EIR pages 5.14-62 through 5.14-64), operation of the proposed wells would result in Lake Merced water surface elevation decreases, which if rapid, could strand nests, resulting in adverse biological impacts. However, because the rate of decreases would not be substantial, the project would not have a significant impact on the reproductive success of special-status birds nesting at or near the water line and no mitigation is required.

9.4.6 Hydrology and Water Quality

Comment HY-1: The rationale for use of the selected groundwater model for analysis of well interference effects should be explained.

"The City of Daly City welcomes the opportunity to comment on the Draft Environmental Impact. Report for the San Francisco Groundwater Supply Project. The comments provided have been coordinated with Daly City's groundwater consultant, HydroFocus Inc. of Davis, CA. Daly City and San Francisco have a well established track record of mutual cooperation aimed at preserving the Westside Groundwater Basin as a potable drinking water supply. These efforts include securing grant funding to drill a series of groundwater sentinel wells, activities to construct and distribute recycled water, creating a fully vetted groundwater aquifer model, and ongoing semi-annual groundwater monitoring among basin users. It is from that vantage Daly City offers the following comments.

1. **Impact HY-6: Project operations would not decrease the production rate of existing nearby wells as a result of localized groundwater drawdown within the Westside Groundwater Basin such that existing or planned land use(s) would not be supported. (Less than Significant).** Daly City concurs. In "Approach to Analysis: Groundwater Pumping Operations," the DEIR indicates that groundwater-level changes in the North Westside Groundwater Basin were modeled using the Westside Basin Groundwater-Flow Model Version 3.1, supplemented by a spreadsheet-based Lake Merced lake-level model. However in the "Approach to Analysis: Well Interference" section, the DEIR indicates that groundwater level changes in existing pumping wells due to project operations (well interference effects) were determined with a different model developed specifically for the EIR analysis. There is no explanation of why the publically available, peer-reviewed Westside Basin Groundwater-Flow Model was rejected for use in favor of the new model. Comparisons between simulated drawdown at specified well locations indicated that the DEIR's Well Interference Model simulated 2 to more than 10 feet greater drawdown than the Westside Basin Groundwater-Flow Model, indicating that the DEIR analysis is conservative

(i.e., expected drawdowns due to project pumping are less than simulated with the DEIR Well Interference Model)." (City of Daly City, Department of Water and Wastewater Resources, letter, April 26, 2013)

Response HY-1

In response to the comment regarding use of the MODFLOW numerical flow model to analyze well interference effects, this model was specifically employed to simulate how the pumping cones of depression at the project wells would affect existing wells in the North Westside Groundwater Basin (as discussed on EIR Section 5.16, Hydrology and Water Quality, page 5.16-80) (LSCE, 2012). The basinwide numerical flow model developed by Daly City (HydroFocus, 2011) was used in this EIR to evaluate other operational effects of the project, but was not used to support the analysis of well interference potential because the basinwide numerical flow model does not allow evaluation of well interference effects independently from the regional influences resulting from other non-project groundwater pumping and/or annual variations in recharge. Therefore, a less complex numerical model (MODFLOW) was developed that could account for varying hydrogeologic conditions north and south of Lake Merced, which allowed for the evaluation of the interference effects independently from the regional influences of other non-project groundwater pumping and from annual variations in recharge.

Comment HY-2: The project could result in subsidence effects.

"I am writing this letter to voice my concerns in regards to the Draft Environmental Impact Report for the San Francisco Groundwater Supply Project. I am a homeowner and resident of the Sunset District. I have a number of problems with this Draft Environmental Impact Report.

First off, pumping water out of the ground in an area where the houses are built on sand dunes is going to cause subsidence. There are already subsidence problems throughout the Outer Sunset District. Disturbing what lies beneath these sand dunes will cause severe damage to the foundations of the houses and buildings in the area. Is the city going to take responsibility for any damage to my home's foundation? Where is the proof that subsidence will not occur?" (Megan Kennedy, letter, undated)

"Hopefully …, land does not subside, …. But if these or some of them do happen, likely it will be during a drought emergency." (Steve Lawrence, email, April 8, 2013)

"3. Underneath this area were sand support the housing. Drilling in this area will cause structure settlement problem as the water table under the sand is extract. Who is going to pay for the damage? You can drive around and observe the structure settlement problem already happening.” (Bill Wong, email, March 18, 2013)

“Residence settlement will become a big problem because the reduction of water table under the sunset area.” (Bill Wong, email, March 18, 2013)

Response HY-2

Comment HY-2 discusses the potential for land subsidence to occur due to decreased groundwater levels. EIR Section 5.16, Hydrology and Water Quality, Impact HY-7 addresses the potential for the project to result in substantial land subsidence (EIR pages 5.16-84 through 5.16-88). Land subsidence can result from a number of processes, including groundwater pumping. Clays are more compressible than sands when dewatered for a sufficient amount of time; the fact that the Outer Sunset is built on former sand dunes and that the underlying aquifer is composed of sand decreases its susceptibility to subsidence caused by groundwater extraction. Observations of differential settlement, as described in the comments, may be the result of decomposition of organic matter (e.g., garbage or vegetation) in underlying areas that were filled during grading for development, or the fill may have been inadequately compacted (SFPUC, 2013a). However, as described in Impact HY-7, no land subsidence resulting from groundwater extraction has been documented in the North Westside Groundwater Basin despite extensive groundwater extraction in the early 1930s, and current extraction at the San Francisco Zoo and Golden Gate Park. This suggests that the sediments in the Westside Groundwater Basin have limited compressibility. Therefore, based on a conceptual understanding of the mechanisms required for land subsidence and the apparent lack of historical subsidence in the area, the potential for extensive future subsidence due to the project would be limited because of the low compressibility of the semiconsolidated sediments that underlie the project area (Fugro, 2012).

To quantify the estimated amount of land subsidence that could occur due to project pumping, subsidence calculations were performed for the Lake Merced and South Sunset well facilities because these areas have the greatest portion of clay layers and, therefore, a greater potential for subsidence (EIR Figure 5.16-2). The impact analysis conducted for the EIR presented substantial evidence regarding the potential for subsidence to occur, based on the extent to which the project would decrease groundwater levels below historical lows, the presence and thickness of clay layers or clayey sand layers, and the compressibility of those layers. As discussed in Impact HY-7, the estimated subsidence due to project-related pumping would likely range between 1.9 and 3.0 inches. In general, structures can withstand subsidence or settlement of 6 inches or less without damage (Lambe and Whitman, 1969); therefore, the EIR considers projected subsidence of 6 inches or more to be a significant impact. The estimated subsidence due to project pumping is less than the significance threshold of 6 inches for structures and changes in drainage patterns. Also, it is less than the significance threshold of 1 foot for flooding impacts on land within a 100-year flood zone (EIR page 5.16-86). Therefore, potential impacts related to land subsidence would be less than significant relative to structures, drainage patterns, and flooding.

As to the effect of subsidence during a drought emergency, as stated on EIR page 5.16-115, increased pumping in the event of a declared emergency resulting from an earthquake or other disaster (including a drought) would be limited to a 30-day time period. Once the water system is restored following an emergency, groundwater pumping would return to the rates proposed under the project. The effect of pumping the project wells at higher rates for a 30-day period was considered in the groundwater modeling used to evaluate potential well interference LSCE, 2012). In that modeling, the pumping rates of the project wells were increased by approximately 50 percent to approximate a one-month emergency pumping period. The magnitude and extent of drawdown of groundwater levels were evaluated for that emergency pumping period and did not result in discernible change from the drawdown estimated to occur under normal project operations. Since the analysis of land subsidence also depends on the magnitude of groundwater level drawdown, the well interference evaluation is a justifiable basis for concluding that the temporary increase in project pumping rates during an emergency would not cause a substantial increase in subsidence effects.

Comment HY-3: Comment regarding soil compressibility.

"**2. Impact HY-7: Project operations would not result in substantial land subsidence due to decreased groundwater levels in the Westside Groundwater Basin. (Less than Significant). Daly City concurs.** The subsidence analysis provides reasonable results given the tools and data available. However, in "Approach to Analysis: Subsidence," the DEIR states that "typical soil compressibility values for the Merced Formation" were used to calculate potential subsidence. No measured values for soil compressibility are available for Westside Basin sediment deposits, and the values used in the analysis are therefore assumed. Furthermore, plans are being made to significantly increase groundwater extractions from the deepest parts of the aquifer system (the "deep" aquifer), which is beneath the thickest and most extensive continuous clay bed identified in the basin (the "W-clay"). These factors introduce uncertainty in the subsidence analysis results and its conclusion of no significant impact. It is prudent therefore to establish baseline land surface elevation information from which future data can be compared to reliably conclude whether or not subsidence occurs. The South Westside Basin Groundwater Management Plan specifies similar actions to collect evidence of active subsidence should basin water levels decrease below historic levels." (City of Daly City, Department of Water and Wastewater Resources, letter, April 26, 2013)

Response HY-3

Comment HY-3 suggests that because of uncertainties in the subsidence analysis, the proposed project should identify baseline land surface elevations for use in determining whether subsidence would occur under the proposed project. The uncertainties stated are related to the soil compressibility values used for the Merced Formation and also increased pumping from the Deep Aquifer, which is below a clay layer known as the "W" clay that could be compressed as a result of the increased pumping.

The Comment suggests that pumping from the Deep Aquifer would occur and that such pumping would affect the clay layer above the Deep Aquifer. It is important to note that none of the proposed project wells would pump from the Deep Aquifer (Kennedy/Jenks, 2012a), and therefore sediments in the "W" clay layer would be unaffected by project pumping. Regarding the compressibility values used for the Merced Formation, site-specific compressibility data are not available for the Merced Formation, as stated in the technical memorandum presenting the results of the subsidence analysis for the proposed project (Fugro, 2012). Compression ratios derived from areas of known land subsidence in Santa Clara Valley were used in the subsidence estimates for the project to provide a conservative analysis. The compression ratios used are based on younger and less-consolidated sediments compared to those in the proposed project area. Therefore, the analysis in Impact HY-7 (EIR pages 5.16-84 through 5.16-88) is conservative and there is no basis for requiring the establishment of baseline land surface elevations in order to compare such data to future data.

Comment HY-4: The project could result in seawater intrusion.

"3) The North Westside Groundwater Basin is susceptible to seawater intrusion under certain conditions. The Shallow Aquifer is in direct hydraulic connection with the Pacific Ocean between Lincoln Park and the San Francisco Zoo area, indicating a potential for seawater intrusion to occur in the Shallow Aquifer in this area (page 5.16-31).

There are gaps in the "-100-foot" clay layer south of the proposed South Sunset well facility, including one between the Taraval and San Francisco Zoo coastal groundwater monitoring locations. At these gaps the Shallow and Primary Production Aquifers could be hydraulically connected (page 5.16-32).

This potential seawater intrusion poses a risk in degradation of groundwater quality and thus would make the groundwater potentially unsuitable for its identified use." (Edmund Chu, Orson Chang, Ellen Chu, Carmen Chu, and Eunice Chue, letter, April 24, 2013)

"… Please report the quantities you actually intercept (prevent from flowing to the ocean), and how you measure this. …" (Steve Lawrence, email, April 8, 2013)

"Hopefully …, and salt sea water does not intrude. But if these or some of them do happen, likely it will be during a drought emergency." (Steve Lawrence, email, April 8, 2013)

"The Ocean Beach Master Plan (SPUR, 2012) embraces a "managed retreat" strategy. This may result in the ocean re-opening a water pathway to Lake Merced, I have heard. If re-opening occurs, how is the aquifer affected? The ocean is rising (about two inches every three years in the near term, according to a recent estimate). Absent a plan to prevent the ocean's intrusion, you should plan for foreseeable intrusion. Eventually an El Nino winter storm at high tide will assault Ocean Beach; that is foreseeable. … What happens if salt water comes to pollute the Lake and aquifer? Is that something that can be dealt with without major expense and environmental consequence?" (Steve Lawrence, email, April 8, 2013)

Response HY-4

Comment HY-4 states that the North Westside Groundwater Basin could be susceptible to seawater intrusion under existing conditions, and those conditions might be more likely to occur due to sea level rise, so groundwater pumped from the aquifer may have degraded water quality. Further, groundwater pumping under the proposed project also has the potential to cause seawater intrusion and degrade groundwater quality, making it unsuitable for its identified use.

In accordance with the requirements of CEQA, the EIR contains a detailed analysis of the existing conditions of the aquifer related to seawater intrusion and then analyzes whether the project would cause seawater intrusion (see EIR pages 5.16-88 to 5.16-104). It also considers the cumulative effects of the project and any other reasonably foreseeable projects that might contribute to seawater intrusion (see EIR pages 5.16-133 to 5.16-137).

As stated on EIR page 5.16-90, seawater intrusion has not been observed in coastal monitoring wells in the North Westside Groundwater Basin, and the seawater/freshwater interface is assumed to be west of the shoreline. As discussed in this impact analysis, a sufficient decline in groundwater levels for a sufficient amount of time could cause seawater to intrude into the Shallow Aquifer, where the Shallow Aquifer is in direct communication with the ocean, as well as into the Primary Production Aquifer. Because the modeling effort conducted for the EIR analysis concluded that seawater intrusion could occur with implementation of the proposed project, the EIR identifies impacts related to seawater intrusion as potentially significant and provides a mitigation measure to ensure that the beneficial uses of the North Westside Groundwater Basin are not adversely affected by project operation.

The specified mitigation measure includes expanding the coastal monitoring well network to include the Golden Gate Park area (Mitigation Measure M-HY-8a); continuous groundwater-level monitoring in coastal monitoring wells screened in the Primary

Production Aquifer (Mitigation Measure M-HY-8b); and implementing an adaptive management program to avoid seawater intrusion (Mitigation Measure M-HY-8c). The adaptive management program requires the SFPUC to implement the proposed project in a stepwise manner, conduct monitoring of the expanded coastal monitoring network, and alter pumping as needed to prevent chloride concentrations from reaching 250 milligrams per liter (mg/L) at any of the coastal monitoring locations. With implementation of this program, chloride concentrations landward of the coastal monitoring wells would never exceed the secondary drinking water Maximum Contaminant Level (MCL) of 250 mg/L for chloride. If seawater intrusion were to occur, it would be stopped near the ocean shoreline at the coastal monitoring network before the existing uses of the North Westside Groundwater Basin are adversely affected. The adaptive management program specifies trigger levels based on observed water quality and requires the SFPUC to alter its pumping program to avoid seawater intrusion. With use of these numeric trigger levels, it is not necessary to quantify the amount of groundwater intercepted by the proposed project.

As noted on EIR page 5.16-115, increased pumping in the event of a declared emergency resulting from an earthquake or other disaster (including a drought) would be limited to the 30-day time period required for the SFPUC to restore the water system to normal operations. Once the water system is restored following an emergency, groundwater pumping would return to the rates proposed under the project. As stated on EIR page 5.16-90, movement of the seawater/freshwater interface can be a slow process. The rate of movement depends on aquifer conditions, and seawater intrusion occurs only when the conditions that cause seawater intrusion are sustained for a sufficient period of time. The effect of pumping the project wells at higher rates for a 30-day period was considered in the groundwater modeling used to evaluate potential well interference (LSCE, 2012). In that modeling, the pumping rates of the project wells were increased by approximately 50 percent to approximate a one-month emergency pumping period. The magnitude and extent of drawdown of groundwater levels were evaluated for that emergency pumping period and did not result in discernible change from the drawdown estimated to occur under normal project operations. Since the analysis of seawater intrusion also depends on the magnitude of groundwater level drawdown, the well interference evaluation is a justifiable basis for concluding that the temporary increase in project pumping rates during an emergency would not cause a substantial increase in seawater intrusion effects.

Comment HY-4 also speculates that a "water pathway to" Lake Merced may eventually develop if a "managed retreat" strategy, as envisioned by the *Ocean Beach Master Plan*, were implemented in the vicinity of Lake Merced, and if so, the comment goes on to suggest that this could result in seawater intrusion to both the groundwater and Lake Merced. The commenter seems to be suggesting that a managed retreat of existing development could allow an overland connection between the Pacific Ocean and Lake Merced to form as a result of further, managed erosion of the shoreline, resulting in seawater entering Lake Merced, and then into the underlying groundwater basin. It is noted that the *Ocean Beach Master Plan*, as proposed by SPUR, has not been adopted by the CCSF or any other State or federal agency. Also, while the *Ocean Beach Master Plan* does discuss managed retreat as a potential option for the management of shoreline erosion, it does not conclude that managed retreat could result in the development of an overland connection between the Pacific Ocean and Lake Merced. However, should such a connection be made as a result of such a managed retreat, any seawater intrusion occurring as a result of actions under the *Ocean Beach Master Plan*, or as a result of sea level rise, would not constitute an impact of the proposed project. Regardless, this EIR includes a mitigation measure (described above) to ensure groundwater quality in the North Westside Groundwater Basin is not adversely affected by seawater intrusion as a result of the proposed project.

Comment HY-5: Requests clarification regarding the location of proposed monitoring for potential seawater intrusion.

"**3. Impact HY-8: Project operations would possibly result in seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin. (Less than Significant with Mitigation).** Daly City concurs. The seawater intrusion analysis concluded that the project "could result in the landward migration of the seawater/freshwater interface to a greater degree than would occur under existing conditions." Existing (background) chloride concentrations in coastal monitoring wells typically range from 30 to 50 mg/L, and the DEIR relies on the "slow" movement of the seawater/freshwater interface to design its mitigation strategy. The recommended strategy allows chloride concentrations in coastal monitoring well samples to increase, and employs the San Francisco Bay Region Basin Plan's water quality objective for agricultural water supply (142 mg/L) as the action level for implementing increased monitoring; increased monitoring is intended to project if groundwater quality continues to degrade to the secondary chloride MCL (250 mg/L) within 3 years. However, the Basin Plan specifies background as the primary groundwater objective, and the proposed action level and threshold concentrations are 3 to 5 times greater than background chloride concentrations. Therefore, it would be helpful to stipulate these levels are being monitored from the City's sentinel wells located closer to the ocean and some distance away from the potable production wells." (City of Daly City, Department of Water and Wastewater Resources, letter, April 26, 2013)

Response HY-5

Comment HY-5 states that the *Water Quality Control Plan for the San Francisco Bay Basin* (Basin Plan) specifies background as the primary groundwater quality objective, and that the trigger levels proposed in the EIR are three to five times higher than background chloride concentration levels. The Basin Plan does state, on page 3-8, that "the maintenance of existing high quality of groundwater (i.e., "background") is the primary groundwater objective." In addition, the Basin Plan specifies numeric water quality objectives for some parameters, including substances capable of producing taste and odor. For groundwater that serves as a municipal supply, the numeric water quality objective for chloride is 250 mg/L, and for groundwater that serves as an agricultural supply, the water quality objective for chloride is 142 mg/L, as discussed in Impact HY-8 (EIR page 5.16-92).

As discussed in Response HY-4, the EIR includes a mitigation approach that uses these water quality objectives for chloride as trigger levels to ensure that the beneficial uses of the North Westside Groundwater Basin are not adversely affected by operation of the proposed project. With this approach, corrective actions would be implemented if chloride concentrations were to reach the water quality objective for agricultural uses, and thus chloride concentrations would never exceed the Basin Plan water quality objective and secondary drinking water MCL of 250 mg/L for chloride landward of the coastal monitoring wells. These sentinel wells are primarily located near the Great Highway and near the ocean shoreline. As discussed on EIR page 5.16-99, the six proposed production well facilities are located from 950 to 7,500 feet inland, and the San Francisco Zoo irrigation well is approximately 1,500 feet inland. Based on this distance to the proposed production wells and the estimated rate of seawater progression in the North Westside Groundwater Basin, it would take over 16 years for the freshwater/seawater interface, if unimpeded, to reach the South Windmill Replacement well facility (located 950 feet from the coastline) and over 120 years to reach the Central Pump Station well facility (located 7,500 feet inland) once the interface reaches the coastline (Kennedy/Jenks, 2012b). Therefore, by using information from the existing coastal monitoring wells and from wells to be incorporated into the coastal network under Mitigation Measure M-HY-8a, the SFPUC would have sufficient warning time to halt the progression of the freshwater/seawater interface near the coastline and prevent the interface from reaching irrigation or project wells. Thus, chloride concentrations landward of the coastal monitoring network would not exceed the numeric water quality objectives of the Basin Plan, and would not be expected to rise substantially above background levels with implementation of the coastal monitoring program and implementation of an adaptive management program to address seawater intrusion as provided for under Mitigation Measures M-HY-8a through M-HY-8c.

Comment HY-6: Lake Merced is connected to the groundwater basin.

"… You may believe that the Lake is not connected with the underlying aquifer, but others disagree. …" (Steve Lawrence, email, April 8, 2013)

Response HY-6

Comment HY-6 indicates that there is some disagreement regarding Lake Merced's connectivity to the groundwater basin. As discussed on EIR page 5.16-35, the lake is incised into the upper portion of the Shallow Aquifer and is hydraulically connected to this Shallow Aquifer. Previous investigations have shown that the lake is essentially an exposed part of the water table that defines the upper boundary of the Shallow Aquifer, and the impact analysis included in the EIR considers the lake and groundwater basin to be hydraulically connected.

Comment HY-7: The project could result in impacts on Lake Merced.

"4. **Impact HY-9: The proposed project would possibly have a substantial, adverse effect on water quality that could affect the beneficial uses of Lake Merced. (Less than Significant with Mitigation).** Daly City concurs. Modeled lake levels are predicted to be approximately 10 feet lower than predicted under the existing condition scenario. Corrective actions are proposed that include adding supplemental water (either SFPUC system water, treated stormwater, or recycled water), if available, and/or altering or redistributing pumping patterns. Daly City is working in conjunction with San Francisco on a Lake Merced Management Plan as part of its efforts associated with the Vista Grande Drainage Basin Improvement Project." (City of Daly City, Department of Water and Wastewater Resources, letter, April 26, 2013)

"COMMISSIONER ANTONINI: Well, I have a number of comments and questions. To preface, I've been a resident of western San Francisco for almost 40 years now. And I remember the late '90s in particular with the Lake Merced water level getting precipitously low. In fact, at some times it was below sea level, and there was a lot of fears of influx of saltwater.

And fortunately, a couple of changes were made in the early part of the century. I understand that under the direction of then-Supervisor Tony Hall and Supervisor Sean Elsbernd, where -- I think my understanding was that almost all the irrigation for Harding Park was being done out of groundwater at that time. And one thing, we started using more of Hetch Hetchy to keep the water level higher.

And then the other thing that was done, with an agreement with Daly City, was to use the water from the Aqua Vista -- Vista Grande canal and put that water back into Lake Merced instead of it going into the ocean, which it was before.

And I guess my question is, if you were kind of at a line where we were losing -- now we're not quite up to the level it was historically, but it's pretty good. I'm not quite sure how we're going to take 4 million gallons per day out of the aquifer and not have that lake sink again." (Michael J. Antonini, Commissioner, Public Hearing Transcript, April 18, 2013)

"We are concerned with the following "Systemwide Operation Strategy":

"Dry-year transfer from the Modesto and/or Turlock Irrigation Districts of about 2 mgd coupled with the Westside Groundwater Basin conjunctive-use project to meet the drought year goal of limiting rationing to no more than 20 percent on a systemwide basis."

Our concern here is with Lake Merced water levels and water quality during drought cycles. Should lake levels drop significantly, or should water quality decline, particularly to the level the lake no longer can support a fishery, adaptive management strategies need to be implemented. Those measures should be outlined here.

In non drought cycles we urge that Lake Merced levels be monitored and assessed to determine if draw by wells associated with this project impact the lake. Should they do so adaptive management measures should be implemented. Those measures should be identified as part of the overall plan for this project so triggers can be established that would require the implementation of adaptive management measures. They should include reducing draw from specific wells, discontinuing the use of specific wells, drilling wells deeper, or drilling additional wells at a point in the aquifer that will have less of an impact on Lake Merced." (Golden Gate Audubon Society, letter, April 27, 2013)

"We agree with the "Systemwide Operation Strategy" of "Development of 20 mgd of conservation, recycled water and groundwater within the SFPUC service area (10 mgd in the retail service area and 10 mgd in the wholesale service area)."

An additional potentially significant but mitigable WISP water supply and System operations impact is on the Lake Merced fishery and biological resource. The fishery is almost entirely recreational, but it should be protected and enhanced. Adaptive management and mitigation measures should be in place in the event of negative impacts. The natural biological resources, both terrestrial and marine are a significant matter of concern as well. Lake Merced hosts about 50 nesting species of birds annually. Through the course of the year, 150 or more species are seen there with many dependent on it's resources for spring or fall migration or for winter residence. The marsh around the lake is natural and should be protected. Native plants, invertebrates and residual vertebrates reside at the lake and merit consideration here. We could go into listed species here, but in San Francisco we should make every effort to protect and enhance the habitat for all our wildlife and natural resources. We urge that mitigable impacts on these resources be included in the EIR." (Golden Gate Audubon Society, letter, April 27, 2013)

"… Since the degree of certainty about this conclusion is far less than 100%, it would seem more reasonable to outline adaptive management strategies in the case impacts are found. Impacts C-HY-5 … should be treated the same way." (Golden Gate Audubon Society, letter, April 27, 2013)

"Hopefully Lake Merced stays reasonably full, …. But if these or some of them do happen, likely it will be during a drought emergency." (Steve Lawrence, email, April 8, 2013)

Response HY-7

Comment HY-7 discusses the potential effects of project groundwater pumping on Lake Merced water levels, including cumulative effects. EIR Impact HY-9 addresses the project effect on water quality related to the beneficial uses of Lake Merced (EIR pages 5.16-104 through 5.16-120). EIR Impact C-HY-5 addresses cumulative impacts on Lake Merced (EIR pages 5.16-137 through 5.16-139). As discussed, the lake levels modeled for proposed project operations would be approximately 10 feet lower than those modeled without the project. Because the project is predicted to cause Lake Merced water levels to fall below 0 feet City Datum substantially more frequently than is predicted to occur without the project, the resulting water quality changes under the project could fail to meet the established water quality objectives related to warm and cold freshwater habitat (e.g., dissolved oxygen). Changes in dissolved oxygen levels and pH could also exacerbate the conditions responsible for Lake Merced's listing as an impaired water body. While these impacts related to water quality and associated beneficial uses of Lake Merced (for both project effects and the project's contribution to cumulative impacts) would be potentially significant, the impacts would be reduced to a less-than-significant level with implementation of Mitigation Measure M-HY-9, Lake-Level Management for Lake Merced, which consists of an adaptive management approach to mitigating the effects of groundwater pumping on Lake Merced. This measure requires the SFPUC to implement the proposed pumping in a stepwise manner (starting at 1 mgd) to monitor for adverse effects before pumping at the full operational rate, and to use lake-level management procedures to maintain Lake Merced at a specified water level.

In accordance with Mitigation Measure M-HY-9, corrective action is required if project-related lake levels decline below trigger levels identified in the mitigation measure. These corrective actions include adding supplemental water (either SFPUC system water, treated stormwater, or recycled water), if available, and/or altering or redistributing pumping patterns. Implementation of this measure would ensure that any lake-level decline resulting from the project would be temporary, lasting only until corrective actions could be implemented. With the addition of supplemental water and/or the alteration or redistribution of pumping patterns as needed, the project would not result in long-term changes in water quality that would affect the potential beneficial uses of Lake Merced.

In the event that surface water supplies were not available, due to a declared emergency resulting from an earthquake or other disaster, the SFPUC might have to rely more heavily on groundwater to serve its customers, and total groundwater production could temporarily be greater than 3.0 mgd during Phase 1 or greater than 4.0 mgd during Phase 2. However, in accordance with WSIP seismic reliability goals, the regional water system should be restored to normal operation within 30 days (i.e., any outages would not be expected to last longer than 30 days). Once the water system is restored following an emergency, groundwater pumping would return to the levels proposed under the project, and any effect on groundwater levels and associated Lake Merced water levels due to an increased reliance on groundwater during an emergency would be temporary.

The comment from the City of Daly City, Department of Water and Wastewater Resources, which concurs with the EIR impact analysis and refers to coordinated planning with the SFPUC regarding a Lake Management Plan and the Vista Grande Drainage Basin Improvement Project, is noted. The Vista Grande Drainage Basin Improvement Project was included in the EIR as a cumulative project, and the combined effects of the proposed project and the Vista Grande Project were described in relevant sections of the EIR. As discussed on EIR page 5.16-137, the estimated Lake Merced water levels under the cumulative conditions are expected to be higher than existing conditions for much of the modeled period, largely as a result of the Vista Grande Drainage Basin Improvement Project and the Regional Groundwater Storage and Recovery Project.

Regarding portions of Comment HY-7 referring to the policies stated in the SFPUC's Water System Improvement Program (WSIP) and potential impacts of the overall WSIP on Lake Merced and the resources of this area, the San Francisco Planning Department prepared a Program EIR (PEIR) to address the potential environmental impacts of the WSIP, as discussed on EIR page 2-7, paragraph 1, and page 5.1-3. The San Francisco Planning Commission certified the WSIP PEIR on October 30, 2008 (San Francisco Planning Department, 2008; San Francisco Planning Commission Motion No. 17734; State Clearinghouse No. 2005092026). The SFPUC approved the WSIP and made findings pursuant to CEQA, including preparation of a statement of overriding considerations and adoption of a MMRP, for the WSIP. Thus, the PEIR is no longer subject to public comment.

However, for the information of the commenter, the PEIR addressed the potential environmental impacts of constructing and operating the WSIP facility improvement projects as well as the impacts of the proposed systemwide water supply and operations strategy (San Francisco Planning Department, 2008). The PEIR analyzed potential water supply and system operations impacts (separate from the environmental impacts associated with the facility improvement projects) within the following geographic regions: the Tuolumne River, the Alameda Creek and Peninsula watersheds, and the Westside Groundwater Basin. The PEIR also identified the cumulative effects of implementing the WSIP and the associated changes in system operations in combination with other past, present, and reasonably foreseeable future projects within each of these watersheds. The WSIP PEIR analysis included consideration of all impacts at a project level of detail for the water supply components of the WSIP. The PEIR analyzed the impacts of individual facility projects proposed as part of the WSIP at a program level of detail, including the San Francisco Groundwater Supply Project.

The San Francisco Groundwater Supply Project EIR tiers off of the PEIR for the WSIP and analyzes at a project level of detail the direct and cumulative (including applicable WSIP projects) effects of constructing and operating six groundwater wells in western San Francisco, a distribution system, and support facilities at Sunset Reservoir.

Comment HY-8: EIR Impact HY-9 should be expanded to discuss the benefits of the Vista Grande Drainage Basin Improvement Project.

"Impact HY-9, which deals with Lake Merced water levels should be expanded slightly to incorporate probable benefits of the Vista Grande Watershed Project in Daly City. Since that project will overlap this one in terms of Lake Merced water quality and water level, it would seem prudent to briefly discuss it in terms of potential benefits and impacts." (Golden Gate Audubon Society, letter, April 27, 2013)

Response HY-8

The comment indicating that the Vista Grande Drainage Basin Improvement Project should be included in the project impact analysis of effects on beneficial uses of Lake Merced is noted. However, the Vista Grande Drainage Basin Improvement Project has not been approved or constructed and therefore is not part of the existing setting against which project effects must be compared, as required under CEQA. The Vista Grande project was included as a cumulative project and considered in Impact C-HY-5 (EIR pages 5.16-137 through 5.16-139); as described, the contribution of that project and the Regional Groundwater Storage and Recovery Project are expected to increase the water levels of Lake Merced under cumulative conditions. Thus, the probable benefits of the Vista Grande Drainage Basin Improvement Project have been considered in the San Francisco Groundwater Supply Project EIR.

Comment HY-9: Including groundwater in the existing potable water supply would affect water quality.

"… Since the degree of certainty about this conclusion is far less than 100%, it would seem more reasonable to outline adaptive management strategies in the case impacts are found. Impacts C-HY- … and 6 … should be treated the same way." (Golden Gate Audubon Society, letter, April 27, 2013)

"We are residents in Sunset district and have reviewed the ElR. We have following concerns of the project:

1) Only one groundwater sample from each of these wells was analyzed between 2007 and 2011 (page 5.16-23). We feel that this is insufficient sample to warrant the quality and safety of the well water for general public use." (Edmund Chu, Orson Chang, Ellen Chu, Carmen Chu, and Eunice Chue, letter, April 24, 2013)

"2) The Westside Groundwater Basin, inflow or "recharge" components of the groundwater basin include recharge from leakage of sewer and water pipes (page 5.16-27). This poses a health risk." (Edmund Chu, Orson Chang, Ellen Chu, Carmen Chu, and Eunice Chue, letter, April 24, 2013)

"It is not a good idea. Don't spoil my drinking water. Be considerate of the residents especially the western side of the City.

Please Stop the project. It is not worth it.

Please! God bless America" (Derek Leung, email, March 17, 2013)

"I received the public notice regarding ground water supply project letter. I have several comment regarding to this matter:

1. San Francisco have the best quality water supply from the reservoir, why city want to mix ground water with snow pack water. I have experience with ground water in San Jose, people can't even drink the water." (Bill Wong, email, March 18, 2013)

"For the conclusion, I think the quality of water will definitely suffer cause by mixing ground water and Hetechy water." (Bill Wong, email, March 18, 2013)

Response HY-9

Comment HY-9 indicates that potable water quality would be affected by blending groundwater with existing surface water supplies, and that insufficient groundwater sampling has been conducted to demonstrate that groundwater quality is suitable for potable use. EIR pages 5.16-20 through 5.16-27 discuss the groundwater quality of the North Westside Groundwater Basin. As noted by a commenter, each proposed well location was sampled once between 2007 and 2011. However, in addition to those samples, the South Windmill Replacement well and North Lake well, proposed for conversion to municipal supply wells during Phase 2, were sampled three and four-to-five times, respectively, between 2004 and 2009 to evaluate the suitability of the groundwater as a drinking water source. In addition, the existing monitoring network and program, which includes over 50 monitoring locations (see EIR Table 5.16-9), includes water quality monitoring conducted since 2002. Finally, the State Water Resources Control Board Groundwater Ambient Monitoring and Assessment Program evaluated raw groundwater quality from six wells located in the North Westside Groundwater Basin. The results of these studies and tests indicate that all water quality parameters have been below primary or secondary MCLs, with the exception of chloride, iron, manganese, nitrate, specific conductance, and total dissolved solids at some locations.

EIR Impact HY-11 (EIR pages 5.16-122 through 5.16-125) and Impact C-HY-6 (EIR pages 5.16-139 through 5.16-141) discuss whether the addition of groundwater to the SFPUC system would cause the system water to exceed MCLs after blending as proposed under the project or as a cumulative impact. The discussion concludes that there would be no impact related to compliance with drinking water standards. As discussed, in accordance with the requirements of Title 22, Division 4, Chapter 15 of the California Code of Regulations, the SFPUC would prepare a water quality monitoring plan describing the proposed methods for complying with domestic water quality and monitoring regulations. To meet the water quality goals, the SFPUC would blend (or mix) the groundwater with the SFPUC surface water supply at a target percentage of up to 15 percent. The surface water supply in San Francisco currently is a blend of, on average, 85 percent water from Hetch Hetchy Reservoir and 15 percent water from reservoirs in the SFPUC's Alameda and Peninsula watersheds. The SFPUC intends for blended water quality to surpass the drinking water standards of the California Department of Public Health and of the U.S. Environmental Protection Agency (USEPA) (see Chapter 3, Project Description, Section 3.5.1, Operations). The quality of the water that the SFPUC serves to its retail customers in San Francisco will continue to be published in the state-mandated annual water quality report.

In addition to blending, disinfection would be provided at the Lake Merced and West Sunset well facilities as a contingency to control potential microbial contamination, which would ensure compliance with the USEPA Ground Water Rule (USEPA, 2006). Also, pH adjustment at the Lake Merced well facility and Sunset Reservoir would maintain pH values consistent with the system water pH, which would ensure compliance with the USEPA 1991 Lead and Copper Rule, with subsequent amendments.

EIR pages 5.16-47 through 5.16-49 discuss potentially contaminating activities located within the North Westside Groundwater Basin, including activities and facilities such as sewer collection systems, housing, parks, dry cleaners, surface water, and illegal activities. EIR Impact HY-11 discusses whether groundwater pumping under the proposed project could change groundwater levels or flow directions in a way that could mobilize contaminants from a potentially contaminating activity. As discussed, each proposed potable water well is considered vulnerable to possible contaminating activities that could cause a violation of water quality standards. Therefore, impacts related to violation of water quality standards would be potentially significant. However, this potential impact would be reduced to a less-than-significant level with implementation of Mitigation Measure M-HY-11, Prepare a Source Water Protection Program and Update Drinking Water Source Assessment, because it requires implementation of a source water protection program to prevent contamination of the well facilities, as well as regular updating of the drinking water source assessment for each well. These source water assessments would be referenced in the state-mandated annual water quality report.

Comment HY-10: Proposed use of sodium hypochlorite could result in water quality impacts.

"4) Sodium hypochlorite is on the Special Health Hazard Substance List. It is a strong oxidizer and thus potentially can increase the chance of cancer. A long term health study of drinking water daily with this chemical in 12.5% solution is necessary to eliminate any long term health risk." (Edmund Chu, Orson Chang, Ellen Chu, Carmen Chu, and Eunice Chue, letter, April 24, 2013)

Response HY-10

Sodium hypochlorite is currently used in the SFPUC drinking water system for disinfection, and has a long history of use in San Francisco and throughout the U.S. While the project includes delivery of sodium hypochlorite to the treatment facilities in a 12.5 percent solution, the typical dose that would be used to treat groundwater is 2 parts per million, which is equivalent to 0.0002 percent and is consistent with the sodium hypochlorite percentage in the existing SFPUC water supply (SFPUC, 2013a).

Comment HY-11: The project could result in direct and cumulative groundwater depletion.

"**5. Impact HY-12: Project operation would not have a substantial adverse effect on groundwater depletion in the Westside Groundwater Basin. (Less than Significant).** Daly City concurs with the following caveat. For practical purposes, most of the groundwater in the basin is inaccessible. Comparisons between anticipated groundwater storage changes with the estimated total storage volume of the basin therefore provide little to no information on the significance of the impacts from estimated storage depletions. This is important because conceivably groundwater levels could show significant, unexpected long-term declines before saltwater intrusion action levels or Lake Merced water level thresholds are exceeded. Furthermore, the well interference analysis assumes the project extraction rate is within the perennial yield of the North Westside Groundwater Basin. A more meaningful metric is therefore needed that gives conclusions consistent with the analysis of potential impacts already identified in the DEIR from groundwater depletion and lowered water levels (i.e., seawater intrusion, well interference, land subsidence, and Lake Merced water level declines). For example, rather than compare storage depletion to the total volume of groundwater in the basin, the depletions can be compared to the volume of groundwater accessible to pumping wells based on well-screen depths or the estimated perennial yield of the North Westside Groundwater Basin. These comparisons will more accurately represent potential project impacts on groundwater storage. If these impacts become potentially significant, it seems an adaptive management approach similar to the saltwater intrusion, and Lake Merced water level mitigation including operational proposals envisioned by the North Westside Basin Management Plan should be included.

Thank you, Ms. Jones, for your consideration of our comments. Should you have any questions or require additional information, please do not hesitate to contact me directly." (City of Daly City, Department of Water and Water Resources, letter, April 26, 2013)

"Impact HY-12. We question the conclusion that this project will not have an impact on the Westside Aquifer. We do know that previous pumping from the aquifer has led to impacts. Since the degree of certainty about this conclusion is far less than 100%, it would seem more reasonable to outline adaptive management strategies in the case impacts are found." (Golden Gate Audubon Society, letter, April 27, 2013)

"As project sponsor, can you answer: before beginning implementation, are you doing further study of aquifer's yield and whether aquifer may be overdrawn by the project?" (Steve Lawrence, email, March 18, 2013)

"Will Anderson* determined the aquifer's yield at 10,600 AF/year. He estimated that those south of the county line were taking 8700 AF. That leaves 1900. But SF plans to take about 4500. Seems aquifer may be over-subscribed. But SF plans to intercept 2160 before it flows to ocean. If this was not included in Will's 10,600 yield, then only 440 short; perhaps insignificant, especially given all the monitoring planned. But I don't know that Will's yield did not include intercept. And it's all close. SF says "recharge" per year is 6260; sounds like plenty. But what is recharge vs yield? *Groundwater Master Plan, 2012

Further confusion: sometimes focus is aquifer, sometimes north Westside aquifer (north of line), sometimes south westside aquifer; Will does not know how much cemeteries take; they estimate; they probably do not measure.

Any clarification you can provide appreciated. (I do understand SF "go slow" plan, 1mgd first year. ...)" (Steve Lawrence, email, March 18, 2013)

"Will the Westside aquifer be overdrawn (over-subscribed)? Figures I have seen for current and planned future usage by those south-of-the-line (in northern San Mateo County; see the master plan of July 2012 done by Will Anderson) indicate or suggest usage of all but 2000 acre feet of the aquifer's yield. You plan to take on the order of 4500 acre feet per year, albeit not in the first years. Arithmetic suggests, then, that the aquifer will be overdrawn if the figures are correct. While you plan to intercept water that flows out to the ocean, even that amount (if you can accomplish your aim) is less than the 2500 acre feet difference, leaving a small over-draw. Insignificant? Maybe, given your plans to closely monitor groundwater levels. …. And please consider that the WSIP project, Regional Groundwater Recovery and Supply, plans to slowly fill the aquifer; then, when drought descends, you plan to withdraw 7.2 mgd for up to 7.5 years. This draw-down could have quite an effect. …. The point is: it is more the SF Groundwater project that may be dispensable. You need to determine now that both projects can be done without harm to the aquifer. Put another way, you should for purposes of this analysis assume that the WSIP groundwater project will go forward.

(This substantially duplicates a prior email, which may be considered a "comment;" I include it to make sure one is considered, preferably this one.)" (Steve Lawrence, email, April 8, 2013)

Response HY-11

Comment HY-11 notes that local cemeteries (which are located in the South Westside Groundwater Basin) do not meter how much groundwater they use. Because of this, groundwater use by the cemeteries was estimated using a similar methodology as used for the golf clubs in the Lake Merced vicinity, which was described on pages 5.16-17 and 5.16-18 of the EIR. This methodology included consideration of standard irrigation use amounts, as well as the size of irrigated areas.

Comment HY-11 also asks for clarification regarding the terminology used for the Westside Groundwater Basin and the aquifers in the groundwater basin. The EIR uses three terms, as described on page 5.16-3. "Westside Groundwater Basin" is used when the basin is referred to as a whole, including both the portions in San Mateo and San Francisco Counties. "North Westside Basin" is used when referring to the portion of the groundwater basin in San Francisco County and "South Westside Groundwater Basin" is used when referring to the portion of the groundwater basin in San Mateo County. Individual aquifers within the groundwater basin are identified separately, including the "Shallow Aquifer," "Primary Production Aquifer," and "Deep Aquifer," which are discussed on EIR page 5.16-8.

Comment HY-11 states that much of the groundwater in the basin is inaccessible, and that for this reason, any comparison of the change in groundwater storage to the total amount of groundwater in storage provides little information on the significance of groundwater depletion impacts. Also, groundwater levels could be substantially lowered before seawater intrusion action levels and Lake Merced trigger levels are exceeded. Therefore, according to the commenter, groundwater depletion could be compared to the volume of water accessible to pumping wells based on their screen depths, or the estimated perennial yield of the North Westside Groundwater Basin.

There are many ways to estimate the effects of groundwater depletion, and no standard methodology to do so. In order to determine the potential effects of groundwater depletion, the EIR considered whether project-related pumping could reduce groundwater supplies or interfere with groundwater recharge in a manner that would result in a substantial regional deficit in aquifer storage and that the deficit in aquifer storage would lead to insufficient water supply to support existing or planned land uses (see Impact HY-12, EIR pages 6.16-25 through 5.16-128). In considering this impact threshold, the San Francisco Groundwater Supply Project EIR assesses groundwater depletion based on potential changes in the volume of groundwater stored in the Westside Groundwater Basin. First, the SFPUC determined the existing storage volume in 2009 and then compared that volume to the predicted volume of storage at the end of the 47-year simulation period with project implementation. This analytical approach provides a conservative estimate of the magnitude of project impacts on overall long-term groundwater storage using the modeled data for the 47-year simulation period. A volumetric calculation was performed to estimate the total volume of groundwater present in the basin in June 2009; the volume of water in the aquifer was derived from the Westside Basin Groundwater Model and an estimate of the available pore space (or porosity) within the aquifer to store water. To estimate the effects of project-related pumping on the amount of groundwater in storage, the annual change in storage was estimated using modeled groundwater levels for both phases of the Groundwater Supply Project, which also took into account simulated seasonal variations in hydrologic conditions over the 47-year simulation period. The total estimated change in storage over the simulation period was calculated as the sum of changes in storage volume that were modeled for each year of the simulation period.

The total modeled decrease in groundwater storage under Phase 1 of the Groundwater Supply Project results in a predicted decline of approximately 684 afy more than what is predicted under the modeled existing conditions. Over the 47-year simulation period, the total decline in groundwater storage under Phase 1 is predicted to be 60,170 acre-feet, or a decline of approximately 32,170 acre-feet more than what is predicted under the modeled existing conditions. The total modeled decrease in groundwater storage due to Phase 2 of the Groundwater Supply Project results in a predicted decline of approximately 640 afy more than what is predicted under the modeled existing conditions. Over the 47-year simulation period, the total decline in groundwater storage under Phase 2 is predicted to be 58,080 acre-feet, or a decline of approximately 30,080 acre-feet more than what is predicted under the modeled existing conditions indicated above. The slight differences in estimated storage changes between the phases are attributable primarily to the somewhat greater total basin pumping rate of 12.75 mgd in Phase 1 (14,282 afy) compared to 12.61 mgd in Phase 2 (14,125 afy). These predicted project-related declines represent only about 3 percent of the estimated total groundwater volume of 1,076,000 acre-feet in the entire onshore portion of the Westside Groundwater Basin. While it is acknowledged that the recoverable volume would be less than the total volume of the basin, as further described in the analysis of Impact HY-6, existing land uses that are dependent on groundwater and that could be affected by the Groundwater Supply Project, including Pine Lake, the Edgewood Development Center (Edgewood School), San Francisco Zoo, and golf courses in the vicinity of Lake Merced, would still be able to provide enough water to meet their peak demand, even with the predicted well interference effects from the project wells.

Because the projected groundwater storage loss would be relatively small after 47 years of operations, and existing groundwater-dependent land uses would still be able to meet their peak demands, the deficit in aquifer storage would not lead to insufficient water supply to support existing or planned land uses. Therefore, the impact of project operations on groundwater depletion in the Westside Groundwater Basin would be less than significant.

As described above, the analysis presented under Impact HY-6 considers project effects related to well interference and identifies those wells in the vicinity of the project that could be affected by project-related pumping (EIR Table 5.16-9). As discussed in that impact analysis, the existing groundwater-dependent land uses would still be able to meet their peak demands under the proposed project. The analysis of Impact HY-6, which considers the completion details of each existing well (such as well screen depths), shows that under the proposed project even the pumping capacity after reduction due to well interference is predicted to remain greater than the peak demand for each existing well. Therefore, the project would not make substantially less groundwater available to those wells. The maximum reduction in well capacity would be 11.2 percent, and remaining well capacities after reduction due to project-related pumping would remain up to 1.33 million gallons per day greater than the peak demand, as shown in Table 5.16-10 of the EIR. Therefore, no mitigation measures are required for impacts related to well interference or groundwater depletion, and potential impacts related to groundwater depletion would remain less than significant based on the amount of water accessible to other groundwater wells, as concluded on pages 5.16-127 and 5.16-128 of the EIR.

Perennial yield is generally defined as the amount of groundwater that can be withdrawn from a groundwater basin annually without producing an undesired result (Todd, 1959). As described in Section 5.16.1, Setting, groundwater depletion may have other negative effects on the groundwater basin; therefore, the San Francisco Groundwater Supply Project EIR also evaluates impacts on groundwater resources relative to subsidence, seawater intrusion, groundwater/surface water interactions, and water quality (Impacts HY-7 through HY-11) and includes mitigation measures to avoid these adverse effects as necessary.

Comment HY-11 questions whether groundwater production under the proposed project is within the sustainable yield of the Westside Groundwater Basin, as estimated in the *South Westside Basin Groundwater Management Plan* (the "master plan of July 2012 done by Will Anderson" as referred to by Steve Lawrence). Note that the basin yield presented in the *South Westside Basin Groundwater Management Plan* is the estimated amount of groundwater that can be withdrawn by existing wells while maintaining current groundwater levels, which is a different analysis from that presented in the EIR, which considers whether project-related pumping could reduce groundwater supplies or interfere with groundwater recharge in a manner that would result in a substantial regional deficit in aquifer storage and that the deficit in aquifer storage would lead to insufficient water supply to support existing or planned land uses. As discussed above, the well interference analysis presented in Impact HY-6 on EIR pages 5.16-80 through 5.16-84 shows that the remaining pumping capacity, even after reduction predicted to result from well interference under the proposed project, would remain greater than the peak demand for each existing well. Therefore, the project would not make substantially less groundwater available to existing land uses, and impacts related to groundwater depletion remain less than significant based on the amount of water accessible to other groundwater wells, as concluded on pages 5.16-127 and 5.16-128 of the EIR. Further, the project's contribution to cumulative impacts related to well interference would not be cumulatively considerable (see Impact C-HY-2, ERI pages 5.16-132 to 5.16-133).

9.4.7 Alternatives

Comment AL-1: Consider implementing the Sunset Boulevard pipeline alternative.

"I would like to suggest that there's an -- in the EIR, there's an alternate -- alternative pipeline location for Sunset Boulevard. I would like that the Commission look at that or whoever -- maybe the SFPUC looks at that.

I know that one of the concerns was traffic during construction on Sunset Boulevard. But the construction would only -- it would be little bit at a time, like one block, probably one lane, that would need to be closed off. And like I said it, it would take a long time to build that." (Tim Kennedy, Public Hearing Transcript, April 18, 2013)

Response AL-1

Comment AL-1 suggests that the SFPUC consider approval of EIR Alternative 4: Pipeline Location Alternative. In response to this comment, it is noted that the SFPUC may consider approval of the project or an alternative of the project. The Pipeline Location Alternative (EIR pages 7-36 through 7-38) would construct portions of the proposed pipeline along Sunset Boulevard rather than along 40th and 41st Avenues. The potential impacts associated with the Pipeline Location Alternative would mostly be similar to those of the proposed project. However, residential receptors along the relocated pipeline alignment on Sunset Boulevard would be subjected to lower noise levels because they would be located farther from construction activities, and impacts associated with construction-related noise (Impact NO-1) would be less intense than under the proposed project. While construction-related noise effects would be less intense, implementation of this alternative could result in increased impacts associated with traffic, temporary impacts related to disruption of the footpath along Sunset Boulevard, potential utility conflicts, and tree removal, all of which could be reduced to a less-than-significant level with implementation of mitigation measures similar to those specified for the proposed project.

9.5 DEIR Revisions

The following changes to the text of the Draft EIR are made in response to comments on the Draft EIR or are included to clarify the Draft EIR text. For each change, new language is double underlined, while deleted text is shown in ~~strikethough~~.

9.5.1 Acronyms, Abbreviations, and Glossary

In response to Comment GC-4, page xvii has been revised to include the following:

> **Adaptive management.** The iterative process of learning from experience and adjusting management practices based on the feedback received through monitoring.

9.5.2 Summary

City staff has revised EIR page 1-7, paragraph 1, bullet 3:

*
- Construction of a pH adjustment facility at Sunset Reservoir as an addition to ~~within~~ an existing reservoir building and a chlorine analyzer/sample station at the reservoir.

City staff has revised EIR page 1-9, paragraph 2:

* **Sunset Reservoir Facilities.** A chlorine analyzer and sample station would be constructed at the northwest corner of Sunset Reservoir and a pH adjustment facility would be constructed as an addition to ~~included within~~ an existing Sunset Reservoir building, along with piping between the pH adjustment facility and the North and South basins of the Sunset Reservoir.

9.5.3 Project Description

City staff has revised EIR page 3-3, paragraph 1, bullet 3:

*
- Construction of a pH adjustment facility at Sunset Reservoir as an addition to ~~within~~ an existing reservoir building and a chlorine analyzer/sample station at the reservoir.

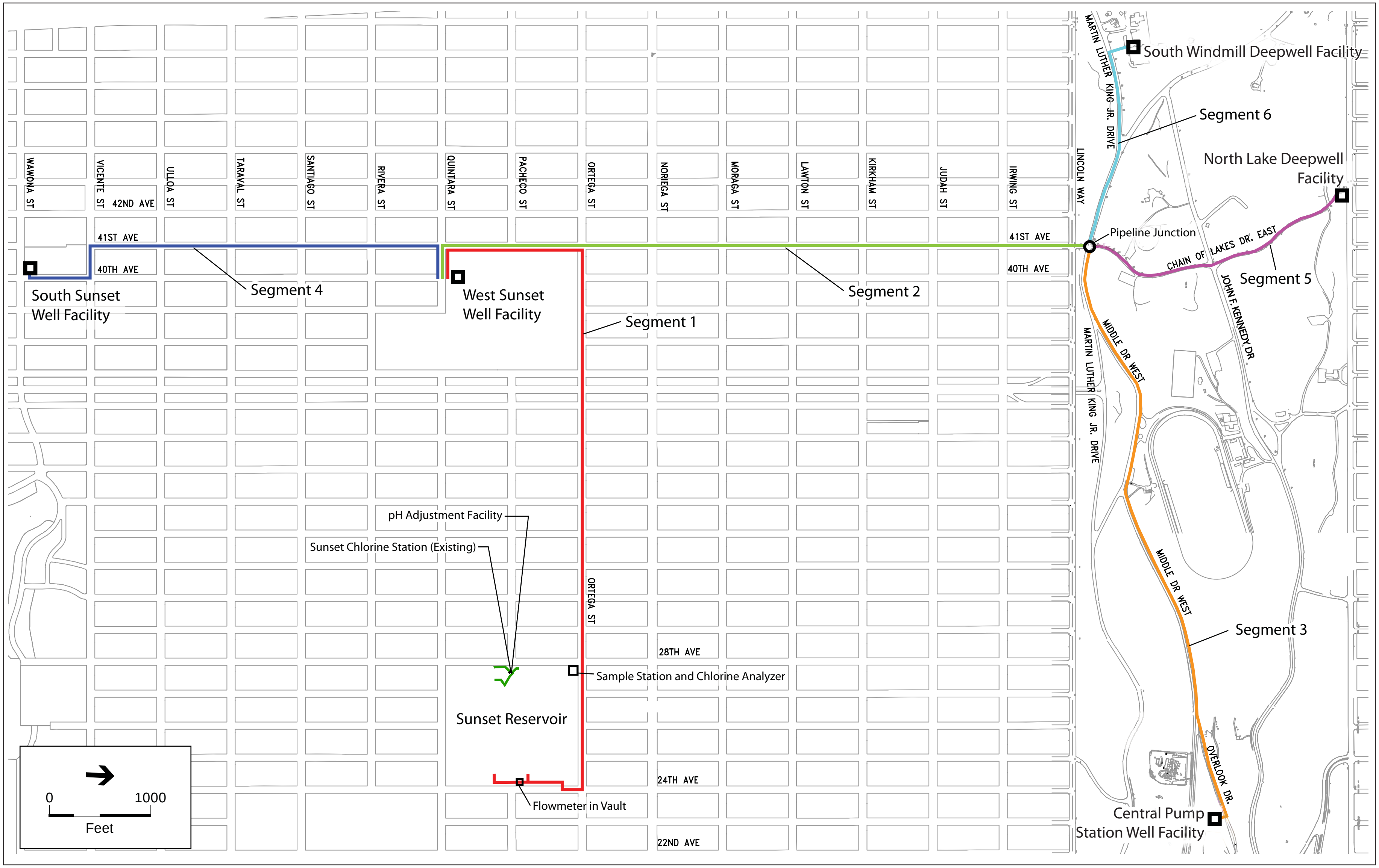
* City staff has revised EIR page 3-12, Figure 3-8 to revise Sunset Reservoir facilities (see following page).

City staff has revised EIR page 3-14, paragraph 3:

*

3.3.4 Sunset Reservoir Facility Location

As described in Section 3.3.3, Pipeline Locations, the groundwater distribution pipeline would extend along 24th Avenue before entering the Sunset Reservoir facility (see Figure 3-1). The pipeline would terminate in both the north and south basins of Sunset Reservoir, where the groundwater would be blended with the water in storage and then



SOURCE: SFPUC, 2010; ESA

Figure 3-8 (Revised)
Pipeline Segments

distributed to customers throughout much of San Francisco. A chlorine analyzer and sample station would be constructed at the northwest corner of Sunset Reservoir, where the incoming groundwater would be tested for chlorine levels. In addition, a pH adjustment facility would be ~~included within~~constructed as an addition to an existing Sunset Reservoir building, along with chemical injection piping between the pH adjustment facility and the north and south basins of the Sunset Reservoir. In addition, a concrete vault would be constructed west of the south basin to provide installation and maintenance access for a proposed reservoir surface water inlet flow meter.

City staff has revised EIR page 3-47, paragraph 5:

* 3.4.3 Sunset Reservoir Construction

The project facilities to be located at Sunset Reservoir would be within or attached to existing buildings, with the exception of the chlorine analyzer and sample station, and ~~the~~ chemical injection piping, a vault, and an electrical conduit, which would be below grade ~~and within the alignment of existing underground chemical and sample piping~~. After piping installation, surface conditions along the alignment would be restored to their general preconstruction conditions. Tree removal would not be required. Construction of the ~~groundwater distribution pipeline connection, chlorine analyzer, pH adjustment facility, and chemical injection piping at~~ Sunset Reservoir facilities ~~are~~is described below.

City staff has revised EIR page 3-48, paragraph 1, through page 3-49, paragraph 4:

* Construction Activities

Construction activities at Sunset Reservoir would include:

- Installation of two 12-inch flow meters within vaults located on the east side of Sunset Reservoir.
- Installation of a concrete pad and a chlorine analyzer and sample station at the northwest corner of Sunset Reservoir.
- Modification of ~~an interior room within~~ the existing Sunset Chlorine Station located west of the west side of the reservoir's north and south basins. Modifications would include the addition of a pH adjustment facility on the northeast side of the existing chlorine station. The facility would be approximately 15 feet long by 11 feet wide and approximately 11 feet high. The existing Sunset Chlorine Station is approximately 32 feet long by 17 feet wide and is approximately 13 feet high. The proposed facility would include two ~~installation of a~~ sodium hydroxide storage tanks and two chemical metering pumps, ~~installation of a low concrete berm within the room to provide~~ including secondary chemical containment features, ~~installation of a removable skylight, installation of~~ and an emergency shower/eyewash~~, and relocation of an existing electrical box to the northwest building exterior~~.
- Installation of ~~300~~approximately 350 feet of chemical injection piping below grade between the building and the north and south basins of the reservoir. Some of the

piping would be installed along the side of an existing culvert; however, approximately 95 feet of the piping would be installed via an excavated trench.

- Installation of a concrete vault west of the south basin, near the existing fence along 28th Avenue, which would provide installation and maintenance access for a proposed reservoir surface water inlet flow meter. The vault would be approximately 5 feet wide, 5 feet long, and 25 feet deep.
- Installation of approximately 165 linear feet of electrical conduit that would connect the proposed flow meter to the existing Sunset Chlorine Station.

* Excavation and Stockpiling of Soils

Trench excavations for the proposed chemical injection piping would be 1.25 to 2.25 feet deep by 1.25 feet wide, and trench excavations for the proposed electrical conduit would be 2 feet deep by 1.25 feet wide. Approximately 355 cubic yards of soil would be excavated for construction of the Sunset Reservoir facilities, and this The excavated soil would be used as the primary source of backfill material. The excavated materials would be, supplemented as necessary with approximately 20 cubic yards of structural fill material (e.g., imported sand and aggregate subbase). Approximately 20 cubic yards of soils would be excavated, and up to 20 cubic yards of structural fill could be required.

* Spoils Disposal

Construction of the Sunset Reservoir facilities could generate approximately 100 cubic yards of excess spoils. Chemical injection piping could generate up to approximately 20 cubic yards of excess spoils. At the end of each day, excavated soil that is not reused for grading orin a trench backfill would be stockpiled for reuse as part of the project or disposed of at an appropriate landfill. Most of the spoils material is expected to be Class III non-hazardous waste. If any soil contaminated with hazardous materials were encountered, it would be characterized, transported, and disposed of at an appropriate landfill in compliance with applicable federal, State, and local regulations.

* Dewatering

As described above, tThe chemical injection piping would be within and in the vicinity of within the alignment of existing underground chemical and sample piping and culverts, and the pH adjustment facility would be immediately adjacent to the existing Sunset Chlorine Station. Given the presence of existing piping, culverts, and structures, it is not expected that near-surface groundwater would be encountered during construction of the Sunset Reservoir facilities. However, construction of the flow meter access vault would require excavation that is slightly over 25 feet deep, and near-surface groundwater could be encountered. However, iIf water were to accumulate in an open construction pit or trench as a result of groundwater seepage or precipitation, dewatering of the construction work area would be required. Dewatering typically involves pumping water out of the trench/pit and, following appropriate onsite treatment, discharging the water over land or into a nearby sewer or open channel. Discharge to the San Francisco combined sewer system would require a permit from the SFPUC Wastewater Enterprise, and most of the proposed project sites would be subject to these requirements. Discharge to an open channel or over land must be performed in accordance with municipal stormwater permits and the requirements of the Statewide General Construction Permit for Stormwater Discharges Associated with Construction Activity issued by the State Water Resources Control Board. Permit requirements and mandatory best management practices are discussed in Section 5.16, Hydrology and Water Quality.

City staff has revised EIR page 3-50, Table 3-7:

TABLE 3-7
EQUIPMENT USAGE FOR SUNSET RESERVOIR CONSTRUCTION ACTIVITIES

	Construction Usage		
	Number of Each Equipment Type	**Duration of Use (weeks)[a]**	**Daily Use (hours/day)**
Backhoe Loader	1	~~2~~3	6
Forklift	1	~~4~~8	2
Telescopic Crane	1	1	4
Hauling Trucks	~~1~~2	~~4~~8	2
Manual Compactor	1	~~2~~4	6
Pickup[b]	3	~~16~~32	1
Bobcat Compact Excavator	1	~~2~~3	6
Excavator	1	1	6

[a] Weeks are composed of five-day work weeks.
[b] Pickup use for short-haul trips at construction areas. Does not include use for worker commuting.

SOURCE: SFPUC, 2012b

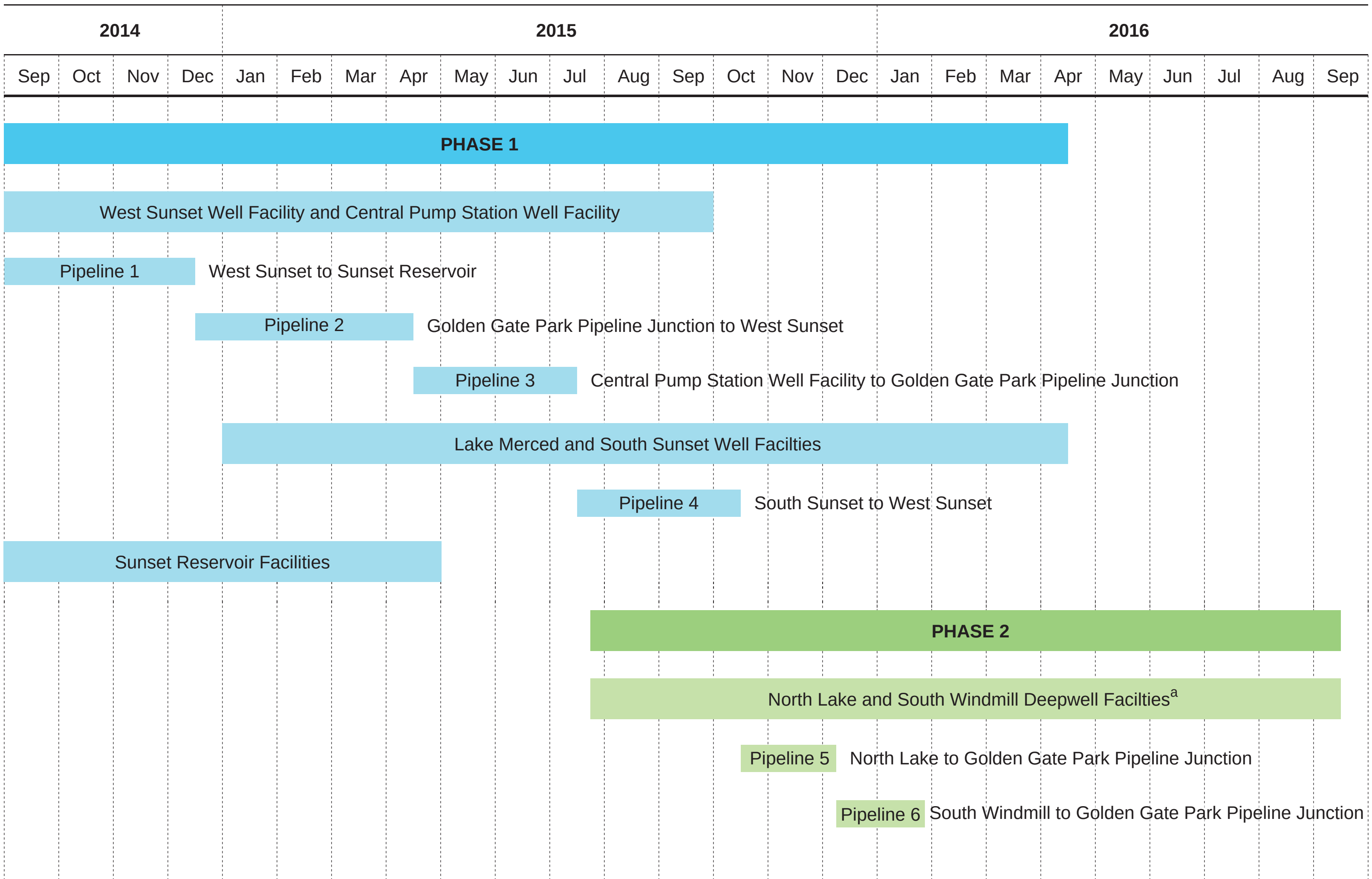
City staff has revised EIR page 3-50, paragraph 2:

Table 3-8 provides the approximate duration of construction work necessary at each well facility site and for the Sunset Reservoir facilities, as well as the installation rate for the pipeline system. Well facilities construction would require approximately 15 to 18 months at each site. Construction activities are proposed to occur primarily

City staff has revised EIR page 3-51, Figure 3-15 to update the construction period for the Sunset Reservoir facilities (see following page).

City staff has revised EIR page 3-52, Table 3-8, line 12:

Sunset Reservoir Facilities – Total Construction	**~~4~~8 months**



NOTE:
a Construction of the North Lake and South Windmill Deepwell facilities would only occur after approval of the San Francisco Westside Recycled Water Project.

SOURCE: SFPUC; ESA

San Francisco Groundwater Supply Project EIR

Figure 3-15 (Revised)
Construction Phasing

9.5.4 Environmental Setting and Impacts, Overview

City staff has revised EIR page 5.1-37, Table 5.1-6, line 3 and page 5.1-38, Table 5.1-6, line 1:

*

~~None~~	~~San Francisco Planning Department~~	~~North Westside Basin Groundwater Management Plan~~	~~The SFPUC intends to meet the requirement of AB3030 (Sections 10750-10756 of the California Water Code) by preparing and adopting the North Westside Basin Groundwater Management Plan to ensure the protection of the groundwater basin. The plan is not anticipated to provide for additional development of groundwater in the North Westside Basin. In general the plan would have the following goals:~~	~~**Long-term**: Impacts on aesthetics, recreation resources, biological resources hydrology and water quality, hazards and hazardous materials,~~	~~Not applicable~~	~~Westside Groundwater Basin.~~	~~**Status of environmental review:** None~~
~~None cont.~~			~~• Protect groundwater resources in the North Westside Basin to maintain groundwater quality and avoid long-term overdraft of the basin.~~ ~~• Protect interrelated surface water resources.~~ ~~• Ensure that existing and future uses of groundwater in the North Westside Basin would not cause adverse effects such as seawater intrusion or inelastic land subsidence.~~ ~~• Establish monitoring protocols that are designed to measure groundwater pumping and to detect changes in groundwater levels, groundwater quality and surface water affected by groundwater pumping.~~				

9.5.5 Land Use

City staff has revised EIR page 5.2-10, paragraph 4:

*

Impacts on the existing land use character in the project vicinity could result if the Groundwater Supply Project were to result in a long-term change in land use that would be incompatible or conflict with established land uses. The proposed project would be constructed entirely within lands zoned for public uses that the CCSF owns. Although the proposed project would result in temporary disruption of activities in the project vicinity as a result of construction staging, excavation, and pipeline installation activities, once construction is complete, all proposed pipelines would be installed below ground and would not be visible upon completion of construction. Sunset Reservoir facilities would be adjacent to or near~~within an~~ existing ~~building~~reservoir structures and buildings~~, with the exception of the small chlorine analyzer structure~~. Therefore, operation of the new pipelines and Sunset Reservoir facilities would not substantially alter the existing character of the project area.

9.5.6 Aesthetics

City staff has revised EIR page 5.3-25, paragraph 1:

* less than significant at pipeline segments outside Golden Gate Park. Construction activities associated with the pH adjustment facility at Sunset Reservoir would be northeast of an existing building that is sited between the proposed construction area and public areas to the west along 28th Avenue~~would primarily occur within the existing Chlorine Sampling Station building~~; however, equipment and construction vehicles would be visible from adjacent roadways and reservoir lawn areas available to the public. Nevertheless, the construction area would be within a fenced portion of the reservoir facility, in the vicinity of storage sheds, waste receptacles, and other structures associated with the reservoir. Because construction activities would be temporary, and most construction activities would be within an existing building, construction impacts on aesthetic resources would be less than significant at this site.

City staff has revised EIR page 5.3-42, paragraph 5:

* **Pipelines**

Upon completion of construction, pipelines would be below ground, and the sites would be returned to their general preexisting conditions. A proposed sample station and chlorine analyzer would be located on the northwest corner of Sunset Reservoir (see Photo 23 in Figure 5.3-8). This facility would be a small utility box on the sidewalk, similar to other utility boxes scattered throughout the Sunset District. The proposed pH adjustment facility would be located to the northeast of the existing Sunset Chlorine Station. The proposed facility would be smaller in size and height than the existing chlorine station, which would screen views of the proposed facility as seen from public areas to the west. The access vault would be at grade, and piping/electrical conduits would be below ground. While the visual quality of this area is high relative to other areas of the Sunset, the sample station, ~~and~~ chlorine analyzer, and pH adjustment facility would be a minor addition and is therefore not likely to be negatively perceived by the viewing public. For these reasons, the scenic resources and visual character impact of pipeline locations would be less than significant.

City staff has revised EIR page 5.3-45, paragraph 3:

* Projects that could have a cumulative aesthetic impact in combination with the Lake Merced well facility, given their proximity to it, include:

- Significant Natural Areas Resource Management Plan
- Harding Park Recycled Water Project
- Lake Merced Pump Station Essential Upgrade
- Parkmerced Project
- ~~North Westside Groundwater Basin Management Plan~~
- Daly City Vista Grande Basin Improvement Project
- Regional Groundwater Storage and Recovery Project

City staff has revised EIR page 5.3-46, paragraph 2:

* ~~The North Westside Groundwater Basin Management Plan would include monitoring and managing of the groundwater basin through adaptive management measures, with a goal of protecting surface water resources that are interrelated to the groundwater basin.~~ Daly City's proposed Vista Grande Drainage Basin Improvement Project involves the addition of stormwater to maintain Lake Merced levels. The SFPUC's proposed Regional Groundwater Storage and Recovery project would operate with reduced groundwater pumping during above-average rainfall years and increased groundwater pumping during drought years (see "Approach to Analysis" in Section 5.16, Hydrology and Water Quality for an explanation of cumulative operational scenarios considered in the modeling conducted for the proposed project). With operation of the identified cumulative projects, the estimated Lake Merced water levels are expected to be mostly higher than under existing conditions projected to occur without operation of the cumulative projects. However, during some years, Lake Merced water levels would likely be less than levels that would be expected to occur without operation of the cumulative projects. Under cumulative conditions, Impound Lake would likely be substantially reduced during the design drought, reducing the visual quality of that lake as seen from the paved pedestrian path around the lake perimeter and the picnic areas on John Muir Drive and Lake Merced Boulevard. While Lake Merced water level conditions would be naturally reduced under modeled existing conditions, groundwater pumping associated with the proposed project and the Regional Groundwater Storage and Recovery Project would worsen the hydrologic conditions and the scenic qualities of Lake Merced, which would likely be substantially degraded under cumulative conditions at the end of the design drought. Therefore, cumulative impacts on Lake Merced, as a scenic resource, and on the visual character and quality of the Lake Merced area would be significant. However, the contribution to this cumulative aesthetic impact would be reduced to a less-than-cumulatively considerable (less-than-significant) level with implementation of **Mitigation Measure M-HY-9, Adaptive Management Program for Lake Merced**, which requires the SFPUC to implement lake level management procedures to maintain Lake Merced at water levels similar to conditions predicted to occur without the project. Therefore, Lake Merced would be maintained at conditions similar to that which would be expected without project-related pumping. Therefore, the Groundwater Supply Project's contribution to significant cumulative impacts on aesthetic resources at Lake Merced would not be cumulatively considerable.

9.5.7 Cultural and Paleontological Resources

City staff has revised EIR page 5.5-30, paragraph 2:

* **Sunset Reservoir**

Project connections to Sunset Reservoir would be made on 24th Avenue (south of Pacheco) where the pipeline would enter the reservoir at a subterranean level. The project would also include a sample station and chlorine analyzer in the northwest corner of the reservoir property. This cabinet-sized facility would be installed on a new concrete pad within the landscaped, park-like area adjacent to the intersection of Ortega Street and 28th Avenue. A small stream of water from the groundwater pipeline would be routed to the sample station to test chlorine content and ensure levels are acceptable before blending the water into the Sunset Reservoir supply at the 24th Avenue location. In addition, a pH adjustment facility would be ~~included~~<u>located</u> ~~within an~~<u>to the northeast of the</u> existing Sunset ~~Reservoir building~~<u>Chlorine Station</u>, along with ~~300 linear feet of~~ chemical injection piping between the pH adjustment facility and the north and south basins of the Sunset Reservoir<u> and an electrical conduit between an access vault located near the existing fence along 28th Avenue and Pacheco Street and the existing Sunset Chlorine Station</u>. Finally, a new flow meter in a subterranean vault would be installed behind the reservoir fence line near 24th Avenue. These activities would not result in physical changes to the Sunset Reservoir structure~~, with the exception of the addition of a skylight to the Sunset Chlorine Station and relocation of an existing electric panel to the building exterior~~. All pipeline connections <u>and electrical conduits</u> surrounding the reservoir and connecting to it would be located below ground, and the landscaped ground surface would be restored to pre-project conditions. During the survey, no historic-period materials were observed within the C-APE adjacent to Sunset Reservoir (ESA, 2011).

City staff has revised EIR page 5.5-32, paragraph 5:

* If the ERO determines that an archeological resource may be present within the project site, the SFPUC shall retain the services of a~~n~~ <u>qualified archeological consultant, based on standards developed by the Planning Department archeologist</u>~~archeological consultant from the pool of qualified archeological consultants maintained by the Planning Department archeologist or an alternate archeological consultant upon approval of the ERO~~. The archeological consultant shall advise the ERO as to whether the discovery is an archeological resource that retains sufficient integrity and is of potential scientific/historical/cultural significance. If an archeological resource is present, the archeological consultant shall identify and evaluate the archeological resource and make a recommendation as to what action, if any, is warranted. Based on this information, the ERO may require specific additional measures to be implemented by the SFPUC.

City staff has revised EIR page 5.5-33, paragraph 5:

* **M-CP-2b:** Based on a reasonable presumption that archeological resources may be present within the project site, the following measures shall be undertaken to avoid any potentially

significant adverse effect from the proposed project on buried historical resources. The project sponsor shall retain the services of a qualified archeological consultant, based on standards developed by the Planning Department archeologist~~an archeological consultant from the pool of qualified archeological consultants maintained by the Planning Department archeologist or an alternate archeological consultant upon approval of the Environmental Review Officer (ERO)~~. The archeological consultant shall undertake an archeological testing program as specified herein. In addition, the consultant shall be available to conduct an archeological monitoring and/or data recovery program if required pursuant to this measure. The archeological consultant's work shall be conducted in accordance with this measure at the direction of the Environmental Review Officer (ERO). All plans and reports prepared by the consultant as specified herein shall be submitted first and directly to the ERO for review and comment, and shall be considered draft reports subject to revision until final approval by the ERO. Archeological monitoring and/or data recovery programs required by this measure could suspend construction of the project for up to a maximum of four weeks. At the direction of the ERO, the suspension of construction can be extended beyond four weeks only if such a suspension is the only feasible means to reduce to a less than significant level potential effects on a significant archeological resource as defined in CEQA Guidelines Sect. 15064.5 (a)(c).

City staff has revised EIR page 5.5-41, paragraph 3:

* Specific additional proposed and existing projects that would affect lake levels were considered in this Lake Merced operational cumulative impact analysis. As described in greater detail in Section 5.1.5, Overview of Groundwater Modeling Approach, these include the SFPUC's proposed Regional Groundwater Storage and Recovery project and Daly City's proposed Vista Grande Drainage Basin Improvement project. The former would affect Lake Merced water surface elevations most directly through groundwater pumping and non-pumping periods, and the latter through direct hydrologic input of stormwater to the lake. ~~The North Westside Groundwater Basin Management Plan would include monitoring and managing of the groundwater basin through adaptive management measures, with a goal of protecting surface water resources that are interrelated to the groundwater basin.~~ With operation of the identified cumulative projects, the estimated Lake Merced water levels are expected to be mostly higher than under existing conditions projected to occur without operation of the cumulative projects. However, during some years, Lake Merced water levels are predicted to be less than levels that are predicted to occur without operation of the cumulative projects as a result of groundwater pumping under the proposed project and the

9.5.8 Transportation and Circulation

City staff has revised EIR page 5.6-18, paragraph 4:

* As described in Chapter 3, Project Description, the project would be implemented in two phases. The first phase would involve the construction and operation of four new well facilities, facilities at the Sunset Reservoir, and Pipeline Segments 1, 2, 3, and 4 to deliver

groundwater from the new well facilities to the existing municipal water supply system. The second phase, which would be contingent upon approval and implementation of the SFPUC's proposed Westside Recycled Water Project (Case No. 2008.0091E), would involve the conversion and operation of two existing irrigation wells, the demolition of existing structures and construction of new well facility structures, and the extension of pipelines along Segments 5 and 6 to those converted wells to enable delivery of additional groundwater from those wells. Construction of the well facilities would occur in stages and during varying periods of time. It is expected that Phase 1 would begin in fall 2014 and conclude in spring 2016, and that Phase 2 would begin in summer 2015 and conclude in fall 2016. Within these time periods, pipeline installation would be expected to take between 7 and 16 weeks for each planned pipeline segment, well facilities would be expected to be constructed/converted and operational within approximately 15 to 18 months at each site, and construction of the proposed Sunset Reservoir facilities would be expected to take about ~~4~~8 months (see Table 3-8 in Chapter 3).

City staff has revised EIR page 5.6-20, paragraph 1:

* per well facility site and pipeline route. As described in Chapter 3, the construction of the facilities at the Sunset Reservoir could generate up to approximately ~~20~~100 cubic yards of excess spoils~~, which would either be reused as part of the project or disposed of at an appropriate landfill~~; the work at the Sunset Reservoir also could require up to approximately 20 cubic yards of structural fill. Construction truck traffic would be required to follow City-designated truck routes to the project sites (e.g., Sunset Boulevard, Lincoln Way, and Fulton Street), as well as other streets that provide the most direct route to the work site and minimize the use of local streets.

City staff has revised EIR page 5.6-20, paragraph 3:

* As shown in Figure 3-15, the majority of scheduled construction activities would occur during Phase 1, specifically between fall 2014 and spring 2016. During that period, the West Sunset well facility and Central Pump Station well facility would be completed. Pipeline Segments 1, 2, 3, and 4 would also be completed. Additionally the Lake Merced and South Sunset well facilities would be constructed, with completion scheduled for spring 2015. The Sunset Reservoir facilities would also be completed. Based on the estimated amount of traffic generated by each project component during Phase 1, concurrent construction activities for these Phase 1 project components, could result in up to 52 workers and ~~12~~13 haul trucks per day traveling to and from the work sites, resulting in up to ~~64~~65 vehicles (~~128~~130 one-way trips) per day. It is expected that construction activities would occur primarily during the weekday daytime hours (7:00 a.m. to 5:00 p.m.). Worker trips to the work sites would occur prior to the a.m. peak traffic hour, but trips from the work sites would likely occur during the p.m. peak traffic hour. Haul truck trips would be spread over the course of the day. The highest concentration of vehicle trips traveling to and from the well facility sites would be on the roads that provide direct access to the sites (e.g., on Quintara Street for the West Sunset well facility site and Lake Merced Boulevard

for the Lake Merced well facility site). However, not all of the four well facilities, four pipelines, and Sunset Reservoir associated with Phase 1 are located near each other, and it is reasonably assumed that workers' residences would be spread among Bay Area cities, and that project trips would be dispersed on different roads. On that basis, the estimated daily vehicle trips associated with concurrent construction activities would represent less than one percent of existing traffic volumes on regional roads (e.g., SR 35 and SR 1), and similarly would not substantially alter the existing operations of local roads (e.g., 41st Avenue). Construction activities associated with other (less trip-generation-intensive) project components would have less of an effect on area roadways than the above-described concurrent project components. Therefore, this impact related to temporary increases in traffic volume associated with construction vehicle traffic would be a minor lessening of their traffic-carrying capacities due to the slower movement and larger turning radii of trucks, which could affect traffic and transit operations. However, due to its temporary nature and limited magnitude, the effect of this

City staff has revised EIR page 5.6-21, Table 5.6-3, line 10:

*

Sunset Reservoir Facilities			
Total construction	3 to 5	~~3~~11	3

9.5.9 Noise

City staff has revised EIR page 5.7-17, paragraph 3:

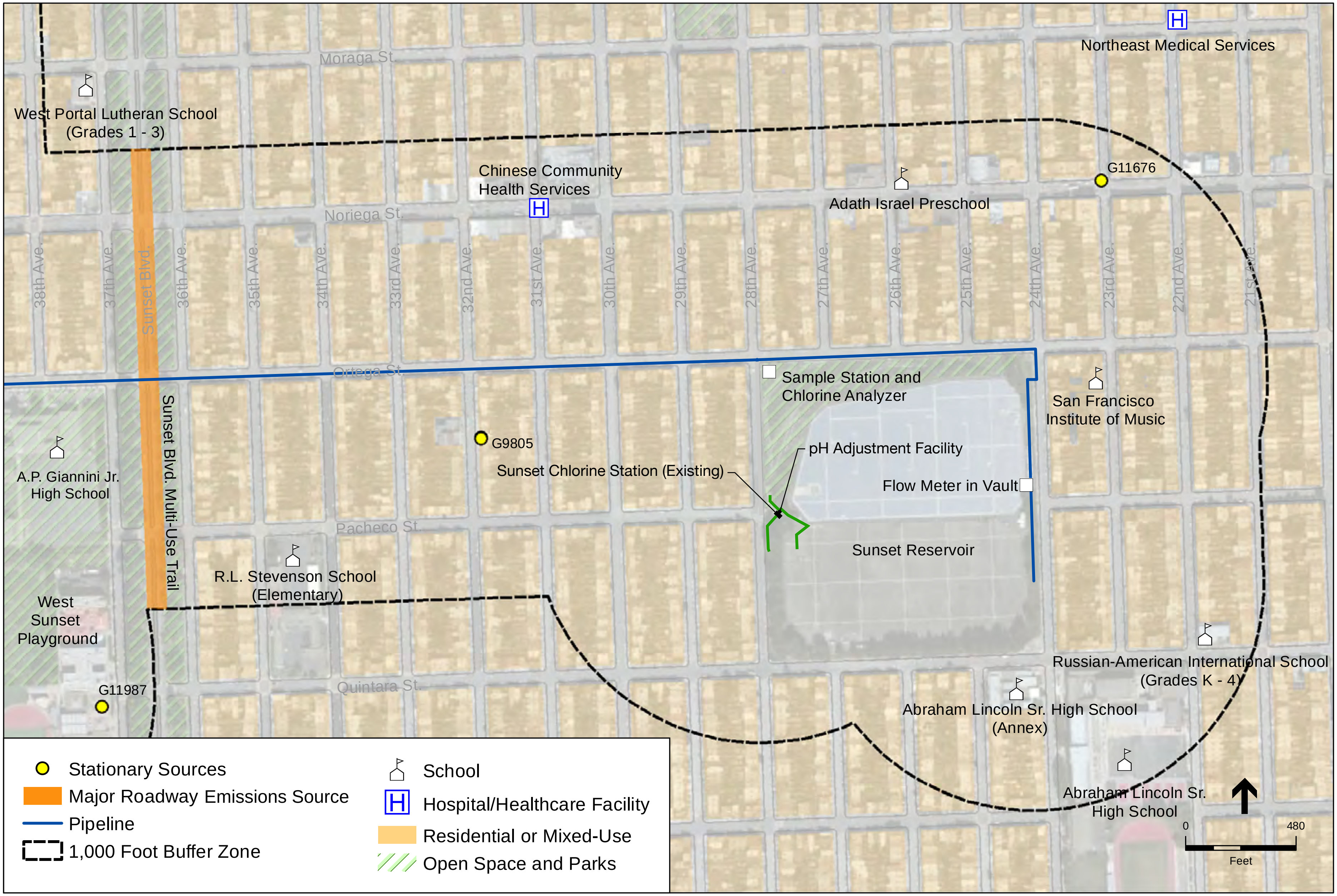
*

Sunset Reservoir

Construction at the Sunset Reservoir would include installing a concrete pad and chlorine analyzer at the northwest corner of Sunset Reservoir. However, the majority of the Sunset Reservoir activities would occur in the vicinity of Pacheco Street and 28th Avenue where a pH adjustment facility would be ~~included~~located ~~an~~to the northeast of the ~~within an~~ existing Sunset ~~building~~Chlorine Station ~~Reservoir building~~, along with ~~300 linear feet of~~ chemical injection piping between the pH adjustment facility and the north and south basins of the Sunset Reservoir. Finally, a new vault would be installed behind the reservoir fenceline near 28th Avenue, along with an electrical conduit between the vault and the existing Sunset Chlorine Station. The nearest noise-sensitive receptor to this area is 155 feet to the west.

9.5.10 Air Quality

* City staff has revised EIR page 5.8-14, Figure 5.8-5 to update the Sunset Reservoir facilities (see following page).



SOURCE: ESRI, 2010; CCSF, 2004; BAAQMD, 2010

Figure 5.8-5 (Revised)
Project Location - Sunset Reservoir

City staff has revised EIR page 5.8-28, Table 5.8-6:

*

TABLE 5.8-6
AVERAGE DAILY CONSTRUCTION-RELATED POLLUTANT EMISSIONS – PHASE 1
(pounds/day)[a]

Emission Source	ROG	NOx	Exhaust PM_{10}[b]	Exhaust $PM_{2.5}$[b]
Pipeline Construction and Installation of Facilities at Sunset Reservoir	~~1.38~~1.43	~~15.61~~16.09	~~0.67~~0.69	~~0.59~~0.61
Well Facility Installation	1.58	16.67	0.59	0.54
Total	**~~2.96~~3.01**	**~~32.28~~32.76**	**~~1.25~~1.27**	**~~1.13~~1.15**
Significance Thresholds	54	54	82	54
Significant Impact?	No	No	No	No

[a] Emissions were modeled using Tier 2 emissions factors and biodiesel B20 emission reduction rates, and assume the equipment inventory described in the project description.
[b] Significance thresholds for PM_{10} and $PM_{2.5}$ apply to exhaust emissions only and not to fugitive dust. Fugitive construction dust impacts would be regulated by the construction dust ordinance.

NOTES:
ROG = reactive organic gases; NOx = nitrogen oxides; PM_{10} and $PM_{2.5}$= particulate matter.

SOURCE: ESA, 2012.

City staff has revised EIR page 5.8-28, Table 5.8-7:

*

TABLE 5.8-7
AVERAGE DAILY CONSTRUCTION-RELATED POLLUTANT EMISSIONS – PHASES 1 AND 2
(pounds/day)[a]

Emission Source	ROG	NOx	Exhaust PM10[b]	Exhaust PM2.5[b]
Pipeline Construction and Installation of Facilities at Sunset Reservoir	~~1.44~~1.48	~~16.94~~17.31	~~0.73~~0.74	~~0.65~~0.67
Well Facility Installation	1.85	**19.81**	0.70	0.64
Total	**~~3.29~~3.33**	**~~36.75~~37.12**	**~~1.42~~1.44**	**~~1.29~~1.31**
Significance Thresholds	54	54	82	54
Significant Impact?	No	No	No	No

[a] Emissions were modeled using Tier 2 emissions factors and biodiesel B20 emission reduction rates, and assume the equipment inventory described in the project description.
[b] Significance thresholds for PM_{10} and $PM_{2.5}$ apply to exhaust emissions only and not to fugitive dust. Fugitive construction dust impacts would be regulated by the construction dust ordinance.

NOTES:
ROG = reactive organic gases; NOx = nitrogen oxides; PM_{10} and $PM_{2.5}$= particulate matter.

SOURCE: ESA, 2012.

9.5.11 Recreation

City staff has revised EIR page 5.11-29, paragraph 2:

* Specific additional proposed and existing projects that would affect lake levels were considered in this Lake Merced operational cumulative analysis. ~~The North Westside Groundwater Basin Management Plan would include monitoring and managing of the groundwater basin through adaptive management measures, with a goal of protecting surface water resources that are interrelated to the groundwater basin.~~ As described in greater detail in Section 5.1.5, Overview of Groundwater Modeling Approach, these include the SFPUC's proposed Regional Groundwater Storage and Recovery Project and Daly City's proposed Vista Grande Drainage Basin Improvement Project. The former would affect Lake Merced water surface elevations most directly through groundwater pumping and non-pumping periods, and the latter through direct hydrologic input of stormwater and baseflow from the Vista Grande Canal to the lake. With operation of the identified cumulative projects, the estimated Lake Merced water levels are expected to be higher than under the modeled existing conditions for much of the 47-year simulation period, largely as a result of the Vista Grande Drainage Basin Improvement Project and the Regional Groundwater Storage and Recovery Project (see Figures 5.11-2 and 5.11-3) (Kennedy/Jenks, 2012a).

9.5.12 Utilities and Service Systems

City staff has revised EIR page 5.12-9, paragraphs 1 and 2:

* 1,990 cubic yards of excess soils from pipeline construction activities. In addition, demolition of the two existing well facilities would also require disposal of approximately 240 cubic yards of materials and approximately ~~20~~100 cubic yards would require disposal from excavation at Sunset Reservoir, resulting in a total excess spoils volume of ~~3,040~~3,180 cubic yards with a 20 percent expansion factor accounted for. Excavated soil that is not reused would be stockpiled daily at appropriate staging areas for future reuse or would be taken to an appropriate facility for recycling, reuse, or disposal. As described in Chapter 3, Project Description, most of the spoils material is expected to be nonhazardous waste.[7] However, if contaminated soils are encountered, the waste would be trucked to the closest facility that accepts the type of contaminated soils encountered. Refer to Section 5.17, Hazards and Hazardous Materials, for information regarding disposal of hazardous materials.

* In compliance with the San Francisco Construction and Demolition Ordinance (Ordinance No. 27-06), spoils would be taken to one of the registered facilities that reuse or recycle C&D materials.[8] Two registered facilities in San Francisco would accept project waste. Each

7 Nonhazardous wastes are materials that are not contaminated and do not pose a threat to water quality once disposed. Class III waste disposal facilities are permitted to receive such wastes.

8 Facilities are registered and approved by the San Francisco Department of the Environment.

of these facilities is required to divert a minimum of 65 percent of the C&D materials it receives. As a result, the receiving landfill would receive up to ~~1,065~~1,115 cubic yards of C&D materials over the construction period. Therefore, the project's contribution to the receiving landfill would be equal to less than 0.01 percent of the remaining capacity of each of the landfills that may receive the waste (Altamont and/or Corinda Los Trancos). Because adequate capacity exists at the landfills to accept the project's construction waste, potential impacts related to exceeding permitted landfill capacity would be less than significant.

9.5.13 Biological Resources

In response to Comment BI-3, EIR page 5.14-23, Table 5.14-2, line 5 has been revised:

Bank swallow *Riparia riparia*	–/CT	Colony nester on sandy cliffs near water, marshes, lakes, streams, the ocean. Forages in fields.	**Low potential.** No suitable nesting habitat present.~~, although~~ However, this species nests nearby and ~~occasionally forages at~~ Lake Merced is an important foraging ground for bank swallows nesting at Fort Funston.

In response to Comment BI-3, EIR page 5.14-24, Table 5.14-2, new line 11 has been added:

Tricolored blackbird *Agelaius tricolor*	–/* (nesting colony)	Colonial nester in freshwater marshes. Nests over or near the water, typically in emergent vegetation.	**Low potential.** Although the species has been observed at Lake Merced during the nonbreeding season, no known nesting colonies are present.

In response to Comment BI-3, EIR page 5.14-25, Table 5.14-2, line 6 has been revised:

Double-crested cormorant *Phalacrocorax auritus*	–/–	Nests along coast on isolated islands or in trees along lake margins.	**High potential.** There ~~is a colony of~~ are three double-crested cormorant~~s~~ rookeries at Lake Merced (SF Field Ornithologists, 2003).

In response to Comment BI-4, EIR page 5.14-44, Mitigation Measure M-BI-1a, bullet 4 is revised as follows:

- During project activities, excavations deeper than ~~2 feet~~ 6 inches shall be covered overnight or an escape ramp of earth or a wooden plank at a 3:1 rise shall be installed; openings such as pipes where California red legged frogs or western pond turtles might seek refuge shall be covered when not in use; and all trash that may attract predators or hide California red-legged frogs or western pond turtles shall be properly contained on a daily basis, removed from the worksite, and disposed of regularly. Following construction, the construction contractor shall remove all trash and construction debris from work areas.

City staff has revised EIR page 5.14-49, paragraph 2:

* **Mitigation Measure M-BI-3: Plant Replacement Trees.** The SFPUC shall replace the trees removed within SFRPD-managed lands with trees of equivalent ecological value (i.e., similar species) at a 1:1 ratio. If planting trees of equivalent ecological value at a 1:1 ratio is not feasible or such trees are not available, removed trees shall be replaced at a ratio of 1 inch for every 1 inch of the removed tree's diameter at breast height. If the project site does not have adequate room for replanting trees, the SFPUC shall coordinate with SFRPD to identify acceptable replanting locations in the vicinity of the project site. The ~~SFRPD~~<u>SFPUC</u> shall monitor tree replacement plantings annually for a minimum of three years after completion of construction to ensure the plantings have become established and, if necessary, shall replant to ensure the success of the replacement plantings.

City staff has revised EIR page 5.14-71, paragraph 2:

* Not all projects listed in Table 5.1-6 and shown in Figure 5.1-1 would affect Lake Merced lake levels and the biological resources supported by the Lake and its surrounding habitats. Specific additional proposed and existing projects that would affect lake levels were considered in this Lake Merced operational cumulative analysis. ~~The North Westside Groundwater Basin Management Plan would include monitoring and managing of the groundwater basin through adaptive management measures, with a goal of protecting surface water resources that are interrelated to the groundwater basin.~~ As described in greater detail in Section 5.1.5, Overview of Groundwater Modeling Approach, these include the SFPUC's proposed Regional Groundwater Storage and Recovery project and Daly City's proposed Vista Grande Drainage Basin Improvement project. The former would affect Lake Merced water surface elevations most directly through groundwater pumping and non-pumping periods, and the latter through direct additions of stormwater and baseflow in the Vista Grande Canal to the lake.

9.5.14 Hydrology and Water Quality

City staff has revised EIR page 5.16-65, paragraph 5:

* The SFPUC prepared the final draft of the *North Westside Groundwater Basin Management Plan* (SFPUC, 2005) in April 2005. The document was not adopted, but was circulated for public review. The SFPUC plans to prepare an updated groundwater management plan in accordance with Water Code Section 10753 that ~~w~~<u>c</u>ould incorporate the monitoring and adaptive management requirements related to the implementation of the Groundwater Supply Project as well as additional elements that would <u>consolidate and highlight existing programs that CCSF administers to</u> ~~strengthen the~~ protect~~ion of~~ groundwater resources in the North Westside Basin. The updated groundwater management plan would specify the management objectives for the North Westside Groundwater Basin and would address:

City staff has revised EIR page 5.16-104, to include a new paragraph added to follow Mitigation Measure M-HY-8c:

* Mitigation Measures M-HY-8a through M-HY-8c could be incorporated into the SFPUC's North Westside Basin Groundwater Management Plan. The Groundwater Management Plan would be submitted to the Planning Department prior to the operation of the San Francisco Groundwater Supply Project for review of consistency with the mitigation requirements for this project.

City staff has revised EIR page 5.16-120, to include a new paragraph added to follow Mitigation Measure M-HY-9:

* Mitigation Measure M-HY-9 could be incorporated into the SFPUC's North Westside Basin Groundwater Management Plan. The Groundwater Management Plan would be submitted to the Planning Department prior to the operation of the San Francisco Groundwater Supply Project for review of consistency with the mitigation requirements for this project.

City staff has revised EIR page 5.16-125, to include a new paragraph added to follow Mitigation Measure M-HY-11:

* Mitigation Measure M-HY-11 could be incorporated into the SFPUC's North Westside Basin Groundwater Management Plan. The Groundwater Management Plan would be submitted to the Planning Department prior to the operation of the San Francisco Groundwater Supply Project for review of consistency with the mitigation requirements for this project.

City staff has revised EIR page 5.16-131, paragraph 2:

* The geographic scope for the analysis of cumulative impacts on groundwater and surface water resources encompasses the entire Westside Groundwater Basin. ~~The North Westside Groundwater Basin Management Plan would include monitoring and managing of the basin through adaptive management measures, to achieve goals of protecting groundwater resources in the basin to maintain groundwater quality and avoid long-term overdraft of the groundwater basin, protect surface water resources that are interrelated to the groundwater basin, and ensure that existing and future uses of groundwater in the basin would not cause adverse effects such as seawater intrusion and land subsidence.~~ The potential cumulative projects in the groundwater basin ~~also~~ include the SFPUC Regional Groundwater Storage and Recovery Project as well as the potential buildout of the Holy Cross Cemetery and the Daly City Vista Grande Drainage Basin Improvement Project, which are described in Section 5.1.5, Overview of Groundwater Modeling Approach. Because the Vista Grande Drainage Basin Improvement Project includes the addition of stormwater to Lake Merced, this project would directly raise lake levels in Lake Merced.

9.5.15 Hazards and Hazardous Materials

City staff has revised EIR page 5.17-28, paragraph 1:

* ~~The North Westside Groundwater Basin Management Plan would include monitoring and managing of the groundwater basin through adaptive management measures, with a goal of protecting surface water resources that are interrelated to the groundwater basin.~~ Specific additional proposed and existing projects that would affect lake levels were considered in the Lake Merced operational cumulative analysis. As described in greater detail in Section 5.1.5, Overview of Groundwater Modeling Approach, these include the SFPUC's proposed Regional Groundwater Storage and Recovery Project and Daly City's proposed Vista Grande Drainage Basin Improvement Project. The former would affect Lake Merced water surface elevations most directly through groundwater pumping and non-pumping periods, and the latter through direct hydrologic input of stormwater and baseflow from the Vista Grande Canal to the lake. With operation of the identified cumulative projects, the estimated Lake Merced water levels are expected to mostly be higher than under modeled existing conditions (i.e., those that are projected to occur without operation of the cumulative projects). However, during some dry years, Lake Merced water levels are predicted to be less than those that would occur without operation of the cumulative projects (source). In the event of a major disaster (i.e., catastrophic earthquake), Lake Merced water could be pumped into the city's drinking water distribution system to maintain firefighting, basic sanitary (i.e., toilet flushing), and other critical needs. Decreased lake levels could result in less available water for firefighting and sanitation purposes, thereby resulting in a significant cumulative impact. However, similar to the project-specific impact, the project's contribution to this impact would be reduced to a less-than-cumulatively considerable (less-than-significant) level with implementation of Mitigation Measure M-HY-9, Lake Level Management for Lake Merced, which requires the SFPUC to implement lake level management procedures to maintain Lake Merced at water levels similar to conditions that are predicted to occur without the project. Therefore, Lake Merced would be maintained at conditions similar to those expected without project-related pumping. As a result, the Groundwater Supply Project's contribution to significant cumulative hazards impact related to reliance on Lake Merced water in an emergency would not be cumulatively considerable.

9.6 References

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Todd, D.K., *Ground Water Hydrology*, John Wiley & Sons, New York (as referenced in Freeze, R.A. and Cherry, J.A., 1979, Groundwater), 1959.

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ATTACHMENT A
DEIR Comment Letters

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State of California – The Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Bay Delta Region
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May 2, 2013

Mr. Tim Johnston
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103-2479

Dear Mr. Johnston:

Subject: San Francisco Groundwater Supply Project, Draft Environmental Impact Report, SCH #2009122075, City and County of San Francisco

The California Department of Fish and Wildlife (CDFW) has reviewed the draft Environmental Impact Report (EIR) for the San Francisco Groundwater Supply Project (Project), proposed by the San Francisco Public Utilities Commission (SFPUC). The Project consists of the construction and operation of six potable groundwater well facilities: two that would be converted from existing irrigation well facilities and four that would be newly constructed. Each facility would include a groundwater production well and a pump station. Included in the Project is construction of a distribution system, including pipelines and connection points, that would connect five of the well facilities to Sunset Reservoir; the sixth well would connect to the existing Lake Merced Pump Station and require a short length of distribution piping to make this connection. The SFPUC would also construct a pH adjustment facility at Sunset Reservoir within an existing reservoir building and a chlorine analyzer at the reservoir. GC-7

CDFW is identified as a Trustee Agency pursuant to the California Environmental Quality Act (CEQA) Section 15386, and is responsible for the conservation, protection, and management of the state's biological resources. Pursuant to Fish and Game Code Section 1801, it is the policy of the state to encourage preservation, conservation, and maintenance of wildlife resources, including perpetuation of all species of wildlife for their intrinsic and ecological values. In addition, pursuant to Fish and Game Code Section 1802, CDFW has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species. CDFW is submitting comments on the draft EIR to inform the Lead Agency of our concerns regarding sensitive resources which could potentially be affected by the Project, and provide guidance to the SFPUC to ensure that biological resources are protected.

Biological Resources

Mitigation Measure M-BI-1a: Avoidance and Minimization Measures for California Red-Legged Frog and Western Pond Turtle

M-BI-1a states that prior to disturbing California red-legged frog (CRLF) and western pond turtle (WPT) habitat, the SFPUC will provide environmental awareness training for all construction workers, install exclusion fencing along the work area boundaries one week prior to work activities at each site, a qualified biologist shall survey the excluded work area within 48 hours before onset of initial ground-disturbing activities as well as be present during initial vegetation clearing and ground-disturbing activities, and provide overnight cover or escape ramps for any excavations deeper than two feet. If frogs or turtles are found, the SFPUC will halt construction and contact the U.S. Fish and Wildlife Service (USFWS) and CDFW for instruction on how to proceed and only resume construction after approval by both agencies.

BI-4

CDFW recommends that it would be more efficient as well as protective of the species for the SFPUC to develop contingency plans for CRLF and WPT should an individual of either species be found rather than rely on consultation after the fact. A relocation plan should identify a specific area or areas where WPT and CRLF can be relocated, a protocol for how injured individuals will be handled, and provide a protocol for retention and documentation of dead individuals. Please note, CRLF is a federally threatened species, and authorization from the USFWS is required for relocation activities.

Additionally, given the possible presence of WPT on the Project sites, CDFW recommends any excavated, steep-walled holes or trenches more than six inches deep are provided cover at night or one or more escape ramps constructed of earth fill or wooden planks at a 3:1 slope (run:rise) and be inspected by a qualified biologist each morning prior to work activities.

Mitigation Measure M-BI-3: Plant Replacement Trees.

M-BI-3 states that the SFPUC shall replace trees removed with trees of equivalent ecological value (i.e., similar species) at a 1:1 ratio, or if that is not feasible, at a ratio of one-inch for every one-inch removed at the tree's diameter at breast height (dbh); and that tree replacement plantings shall be monitored annually for a minimum of three years, and if necessary, replanted to ensure success of the replacement plantings.

BI-1

CDFW recommends replacing trees and non-native vegetation with native trees and native vegetation that will attain similar height and canopy cover. Replacement vegetation and trees should be monitored for a minimum of 5 years. Trees should have a 60% success rate at the end of 5 years.

Pages 5.14-44 and 5.14-45 of the draft EIR indicates a potential for impacts to bird nests by vegetation, tree removal and project activities. CDFW recommends the methodologies discussed for nest avoidance in this section be incorporated into a mitigation measure that also includes mitigation, such as additional tree plantings, for any potential significant effects.

CDFW appreciates the opportunity to comment on the San Francisco Groundwater Supply Project. CDFW staff is available to meet with you to further clarify our comments and provide technical assistance on any changes necessary to protect resources. If you have any questions, please contact Ms. Jeanne Chinn, Environmental Scientist, at (707) 944-5523 or jeanne.chinn@wildlife.ca.gov; or Mr. Craig Weightman, Senior Environmental Scientist, at (707) 944-5577. BI-2

Sincerely,

Scott Wilson

Scott Wilson
Acting Regional Manager
Bay Delta Region

cc: State Clearinghouse

Mr. Ryan Olah
U.S. Fish and Wildlife Service
Ryan_Olah@fws.gov

CITY OF DALY CITY

Department of Water and Wastewater Resources
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Patrick Sweetland, Director

April 26, 2013

Sarah Jones
Acting Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Subject: San Francisco Groundwater Supply Project

Dear Ms. Jones:

The City of Daly City welcomes the opportunity to comment on the Draft Environmental Impact Report for the San Francisco Groundwater Supply Project. The comments provided have been coordinated with Daly City's groundwater consultant, HydroFocus Inc. of Davis, CA. Daly City and San Francisco have a well established track record of mutual cooperation aimed at preserving the Westside Groundwater Basin as a potable drinking water supply. These efforts include securing grant funding to drill a series of groundwater sentinel wells, activities to construct and distribute recycled water, creating a fully vetted groundwater aquifer model, and ongoing semi-annual groundwater monitoring among basin users. It is from that vantage Daly City offers the following comments.

1. **Impact HY-6: Project operations would not decrease the production rate of existing nearby wells as a result of localized groundwater drawdown within the Westside Groundwater Basin such that existing or planned land use(s) would not be supported. (Less than Significant).** Daly City concurs. In "Approach to Analysis: Groundwater Pumping Operations," the DEIR indicates that groundwater-level changes in the North Westside Groundwater Basin were modeled using the Westside Basin Groundwater-Flow Model Version 3.1, supplemented by a spreadsheet-based Lake Merced lake-level model. However in the "Approach to Analysis: Well Interference" section, the DEIR indicates that groundwater level changes in existing pumping wells due to project operations (well interference effects) were determined with a different model developed specifically for the EIR analysis. There is no explanation of why the publically available, peer-reviewed Westside Basin Groundwater-Flow Model was rejected for use in favor of the new model. Comparisons between simulated drawdown at specified well locations indicated that the DEIR's Well Interference Model simulated 2 to more than 10 feet greater drawdown than the Westside Basin Groundwater-Flow Model, indicating that the DEIR analysis is conservative (i.e., expected drawdowns due to project pumping are less than simulated with the DEIR Well Interference Model). HY-1

2. **Impact HY-7: Project operations would not result in substantial land subsidence due to decreased groundwater levels in the Westside Groundwater Basin. (Less than Significant).** Daly City concurs. The subsidence analysis provides reasonable results given the HY-3

tools and data available. However, in "Approach to Analysis: Subsidence," the DEIR states that "typical soil compressibility values for the Merced Formation" were used to calculate potential subsidence. No measured values for soil compressibility are available for Westside Basin sediment deposits, and the values used in the analysis are therefore assumed. Furthermore, plans are being made to significantly increase groundwater extractions from the deepest parts of the aquifer system (the "deep" aquifer), which is beneath the thickest and most extensive continuous clay bed identified in the basin (the "W-clay"). These factors introduce uncertainty in the subsidence analysis results and its conclusion of no significant impact. It is prudent therefore to establish baseline land surface elevation information from which future data can be compared to reliably conclude whether or not subsidence occurs. The South Westside Basin Groundwater Management Plan specifies similar actions to collect evidence of active subsidence should basin water levels decrease below historic levels. HY-3 cont.

3. **Impact HY-8: Project operations would possibly result in seawater intrusion due to decreased groundwater levels in the Westside Groundwater Basin. (Less than Significant with Mitigation).** Daly City concurs. The seawater intrusion analysis concluded that the project "could result in the landward migration of the seawater/freshwater interface to a greater degree than would occur under existing conditions." Existing (background) chloride concentrations in coastal monitoring wells typically range from 30 to 50 mg/L, and the DEIR relies on the "slow" movement of the seawater/freshwater interface to design its mitigation strategy. The recommended strategy allows chloride concentrations in coastal monitoring well samples to increase, and employs the San Francisco Bay Region Basin Plan's water quality objective for agricultural water supply (142 mg/L) as the action level for implementing increased monitoring; increased monitoring is intended to project if groundwater quality continues to degrade to the secondary chloride MCL (250 mg/L) within 3 years. However, the Basin Plan specifies background as the primary groundwater objective, and the proposed action level and threshold concentrations are 3 to 5 times greater than background chloride concentrations. Therefore, it would be helpful to stipulate these levels are being monitored from the City's sentinel wells located closer to the ocean and some distance away from the potable production wells. HY-5

4. **Impact HY-9: The proposed project would possibly have a substantial, adverse effect on water quality that could affect the beneficial uses of Lake Merced. (Less than Significant with Mitigation).** Daly City concurs. Modeled lake levels are predicted to be approximately 10 feet lower than predicted under the existing condition scenario. Corrective actions are proposed that include adding supplemental water (either SFPUC system water, treated storm-water, or recycled water), if available, and/or altering or redistributing pumping patterns. Daly City is working in conjunction with San Francisco on a Lake Merced Management Plan as part of its efforts associated with the Vista Grande Drainage Basin Improvement Project. HY-7

5. **Impact HY-12: Project operation would not have a substantial adverse effect on groundwater depletion in the Westside Groundwater Basin. (Less than Significant).** Daly City concurs with the following caveat. For practical purposes, most of the groundwater in the basin is inaccessible. Comparisons between anticipated groundwater storage changes with the estimated total storage volume of the basin therefore provide little to no information on the significance of the impacts from estimated storage depletions. This is important because conceivably groundwater levels could show significant, unexpected long-term declines before saltwater intrusion action levels or Lake Merced water level thresholds are exceeded. Furthermore, the well interference analysis assumes the project extraction rate is within the HY-11

perennial yield of the North Westside Groundwater Basin. A more meaningful metric is therefore needed that gives conclusions consistent with the analysis of potential impacts already identified in the DEIR from groundwater depletion and lowered water levels (i.e., seawater intrusion, well interference, land subsidence, and Lake Merced water level declines). For example, rather than compare storage depletion to the total volume of groundwater in the basin, the depletions can be compared to the volume of groundwater accessible to pumping wells based on well-screen depths or the estimated perennial yield of the North Westside Groundwater Basin. These comparisons will more accurately represent potential project impacts on groundwater storage. If these impacts become potentially significant, it seems an adaptive management approach similar to the saltwater intrusion, and Lake Merced water level mitigation including operational proposals envisioned by the North Westside Basin Management Plan should be included.

HY-11 cont.

Thank you, Ms. Jones, for your consideration of our comments. Should you have any questions or require additional information, please do not hesitate to contact me directly.

Sincerely,

Patrick Sweetland
Director of Water and Wastewater Resources

L13-054

cc: Greg Bartow, SFPUC
John Fio, HydroFocus, Inc.
Timothy Johnston, SF Planning (via email)

Edwin M. Lee, Mayor
Philip A. Ginsburg, General Manager

June 11, 2013

Sarah Jones, Acting Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

RE: RPD Comments on Draft Environmental Impact Report for the San Francisco Groundwater Supply Project

Dear Ms. Jones:

Thank you for providing the San Francisco Recreation and Park Department (RPD) with the opportunity to review the Draft Environmental Impact Report (DEIR) for the San Francisco Groundwater Supply Project.

The proposed project would involve construction of new groundwater well facilities at three RPD properties: West Sunset Playground, South Sunset Playground, and Golden Gate Park. In addition, two existing well facilities in Golden Gate Park would be replaced (the existing irrigation well facilities would be demolished, and new groundwater wells of similar size would be constructed in the same locations). RE-2

A fourth new groundwater well facility would be built at Lake Merced on land owned by the project sponsor, the San Francisco Public Utilities Commission (PUC). This facility would be located adjacent to RPD-owned and managed lands surrounding Lake Merced, and the operation of this well could also potentially affect RPD's recreational boating programs at the lake.

Staff from the RPD Capital and Planning Division worked with the PUC on the planning and design of the proposed project from 2006 to 2010, and provided written comments to PUC stating general conditions for the construction of facilities at RPD properties. We are pleased to see that the proposed project as presented and analyzed in the DEIR is consistent with the feedback provided by RPD staff through our earlier correspondence with the PUC, thereby minimizing potential adverse impacts on recreational uses and facilities. Specifically, the proposed new well facilities are generally small in footprint and designed to be compatible with adjacent recreational uses and open space. In the case of Golden Gate Park and Lake Merced, the new pump facilities are located adjacent to existing utility and/or maintenance facilities and therefore are not expected to affect prominent locations or actively used recreational areas within the parks. RE-1

The following topics identified in the DEIR are of particular interest to RPD: RE-2

- Water Levels at Lake Merced,
- Special-Status Species in Golden Gate Park and at Lake Merced, and BI-5
- Tree Removal BI-1

RPD staff plans to work with the PUC to ensure that the mitigation measures proposed in the DEIR are fully and successfully implemented. In particular, we request that the PUC coordinate closely with RPD's Natural Areas Program staff on the mitigation measures relating to biological resources at Lake Merced and Golden Gate Park, in order to ensure protection of the special-status species that are identified in the DEIR. Additionally, we request that the PUC coordinate with RPD's Planning Unit and/or Recreation Programs staff to ensure that changing water levels at Lake Merced do not negatively affect recreational boating programs and activities.

We also wish to note the following important considerations for successful implementation of the proposed project:

- Implementation and construction of the proposed facilities should be coordinated closely with our Operations Division and recreation program staff to ensure that work does not disrupt public access to the park facilities.

- Renovations are planned at the West Sunset Playground through the 2012 Clean and Safe Neighborhood Parks Bond. It is anticipated that construction on these park improvements will begin in May 2015 and be completed in August 2016. All work proposed at the West Sunset Playground as part of the proposed project should be planned and carried out in close coordination with RPD and the bond-funded renovation work.

- The facilities at South Sunset Playground will need to be constructed entirely from the street side of the park in order to avoid interruptions to the field programming.

- These projects have been presented to the Recreation and Park Commission as informational items only. The project details for each proposed location, including final design, scope and schedule, will need to be brought before to the Commission formally for their approval.

- Per City Charter requirements, the proposed new Central Pump Station Well Facility in Golden Gate Park will require approval from the Board of Supervisors.

PD-8

Finally, RPD recommends that the PUC conduct thorough community outreach with nearby residents, park users, and other concerned stakeholders as the proposed projects moves through the planning and approval process, in order to identify and address any potential concerns.

Thank you for considering our comments and we look forward to further collaboration with the project sponsor as the project moves forward.

GC-4

Sincerely,

Karen Mauney-Brodek
Deputy Director for Park Planning
San Francisco Recreation and Park Department

2945 Ulloa St.
San Francisco, CA 94116
murphsf@comcast.net
April 27, 2013

Tim Johnston
San Francisco Planning Department
650 Mission St., Suite 400
San Francisco, CA 94103-2479

Re: Case #: 2008.1122E
San Francisco Ground Water Supply Project; Draft Environmental Impact Report.

Mr. Johnson:
The Golden Gate Audubon Society (GGAS), representing about 4000 members in the Bay Area, is pleased to give it's support to the proposed ground water supply project with some limited reservations. Most of our comments and concerns regard Lake Merced. GC-5

In the introductory glossary we think it would be wise to add "adaptive management". It is a critical aspect of this project and it should be defined.

We are concerned with the following "Systemwide Operation Strategy":
"Dry-year transfer from the Modesto and/or Turlock Irrigation Districts of about 2 mgd coupled with the Westside Groundwater Basin conjunctive-use project to meet the drought year goal of limiting rationing to no more than 20 percent on a systemwide basis."

Our concern here is with Lake Merced water levels and water quality during drought cycles. Should lake levels drop significantly, or should water quality decline, particularly to the level the lake no longer can support a fishery, adaptive management strategies need to be implemented. Those measures should be outlined here. HY-7

In non drought cycles we urge that Lake Merced levels be monitored and assessed to determine if draw by wells associated with this project impact the lake. Should they do so adaptive management measures should be implemented. Those measures should be identified as part of the overall plan for this project so triggers can be established that would require the implementation of adaptive management measures. They should include reducing draw from specific wells, discontinuing the use of specific wells, drilling wells deeper, or drilling additional wells at a point in the aquifer that will have less of an impact on Lake Merced.

We agree with the "Systemwide Operation Strategy" of "Development of 20 mgd of conservation, recycled water and groundwater within the SFPUC service area (10 mgd in the retail service area and 10 mgd in the wholesale service area)."

An additional potentially significant but mitigable WISP water supply and System operations impact is on the Lake Merced fishery and biological resource. The fishery is almost entirely recreational, but it should be protected and enhanced. Adaptive management and mitigation measures should be in place in the event of negative impacts. The natural biological resources, both terrestrial and marine are a significant matter of concern as well. Lake Merced hosts about 50 nesting species of birds annually. Through the course of the year, 150 or more species are seen there with many dependent on it's resources for spring or fall migration or for winter HY-7 residence. The marsh around the lake is natural and should be protected. Native plants, invertebrates and residual vertebrates reside at the lake and merit consideration here. We could go into listed species here, but in San Francisco we should make every effort to protect and enhance the habitat for all our wildlife and natural resources. We urge that mitigable impacts on these resources be included in the EIR.

HY-7 cont.

We realize Impact RE-3 deals with our concerns, at least in part. Impact BI-1 should be expanded to include monitoring of Tri-colored Blackbird (fall and winter in marsh roosts) and "San Francisco" Common Yellowthroat (year round resident in marsh). Both are species of concern.

BI-2

GGAS agrees with and supports the project objectives:
- Expand and diversify the SFPUC's water supply portfolio to increase system reliability
- Increase the use of local water supply sources
- Reduce dependence on imported surface water

In addition, the project would provide potable groundwater for emergency supply in the event of an earthquake or other major catastrophe (SFPUC, 2009).

PD-6

Impact HY-9, which deals with Lake Merced water levels should be expanded slightly to incorporate probable benefits of the Vista Grande Watershed Project in Daly City. Since that project will overlap this one in terms of Lake Merced water quality and water level, it would seem prudent to briefly discuss it in terms of potential benefits and impacts.

HY-8

Impact HY-12. We question the conclusion that this project will not have an impact on the Westside Aquifer. We do know that previous pumping from the aquifer has led to impacts. Since the degree of certainty about this conclusion is far less than 100%, it would seem more reasonable to outline adaptive management strategies in the case impacts are found. Impacts C-HY-5 and 6 should be treated the same way.

HY-11
HY-7
HY-9

Construction timing should be geared toward starting projects in sensitive areas like woodlands, grasslands, marshes, etc., prior to the nesting season so as to reduce impacts on nesting birds. The nesting season in and around San Francisco begins as early as January for a very few species. The most likely to be impacted would be Great Blue Heron, Great Horned Owl and Anna's Hummingbird. The nesting season for the bulk of our nesting species begins in mid February, peaks in late April, fledging occurs through May and early June, and most nesting is completed by mid July. However, depending on various other variables the season can continue into August or later. Surveys are necessary to determine if nesting birds are present.

BI-2

Mitigation for vegetation destruction at project sites should include replanting with native vegetation when possible or with habitat appropriate non-native vegetation if necessary. Under no circumstances should weeds be allowed to take over areas near any of the project sites. Should additional mitigation be necessary, it would be beneficial to remove non-native, invasive vegetation from the shoreline of Lake Merced and replant it with native vegetation.

BI-1

Though we agree there is a low potential for impacts on Bank Swallows, it is incorrect to state they occasionally forage at Lake Merced (Table 5.14-2). The hundreds of Bank Swallows that utilize the nesting colony at Fort Funston depend almost entirely on Lake Merced for foraging. Since they forage on flying insects, there little chance this project will have any impact on them.

BI-3

As stated above, Tri-colored Blackbird and "San Francisco" Common Yellowthroat should be discussed in this document. Both occur at Lake Merced, but given the proposed project sites

BI-3

there would seem to be a low potential for impacts on either species. The same would be true for unusual migrant species, some of which may be listed, that might occur at any of the project sites during fall migration. BI-3 cont.

Double-crested Cormorants do not nest in a single colony at Lake Merced. There are 3 colonies, none of which are located near a project site. It is questionable if there will be any impact on this species from project construction. BI-3

One thing we did not see in this document is reference to aquifer recharge. Admittedly, our focus in reading the EIR was focused on Lake Merced and impacts on birds. So if our concern has been addressed we apologize for having missed it. If it is not addressed it should be. Groundwater recharge is becoming a more significant issue in San Francisco with each passing day. The problem is that many property owners are paving open space on their property with impervious materials such as concrete, artificial grass, and plastic with river rocks on top. The solution is two-fold. First, an education program should be developed and presented. It would be wise to include information about the use of water gardens and other infrastructure that can be used to decrease runoff. Second, zoning regulations requiring open ground on all lots should be strictly enforced. Third, all existing and new public and private parking lots, paved open space areas, and commercial buildings that require covering large areas of ground should be required to construct infrastructure on their property that would capture and retain rain water that could percolate into the ground. GC-6

Thank you for the opportunity to comment on this document. GGAS looks forward to the successful conclusion of this project and the integration of groundwater into the water system in San Francisco. If you have questions or if there is anything GGAS can do to provide more information please feel free to contact us.

Very truly yours,

Dan Murphy
Conservation Committee

Ms. Sarah B. Jones
Acting Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

Email Address: sarah.b.jones@sfgov.org

April 27, 2013

Dear Ms. Jones,

Re: Sunset Ground Water Project:2008.1122E

We have a concern on the Sunset Ground Water Project 2008.1122E because of the distribution of the ground water to almost the entire city, yet not everyone in the city has received mailings of this project. We, residents in the Sunset district and the undersigned, are the ones who were not informed of such project. Reliance on posting on the internet in your web site is not an acceptable notification. GC-3

Hence, project of this magnitude because of its impact should inform all residents concerned (basically entire city) to bring to their awareness and let them voice their opinions.

Sincerely,

Carmen Chu Carmen Chu, 2269 17th Avenue, San Francisco, CA 94116

Orson Chang, 2190 22nd Avenue, San Francisco, Ca 94116

Ellen Chu Ellen Chu, 2190 22nd Avenue, San Francisco, Ca 94116

Norman Chu, 1755 17th Ave SF, CA 94122

Ms. Sarah B. Jones
Acting Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, Suite 400
San Francisco, CA 94103

April 24, 2013

Dear Ms. Jones,

Re: Sunset Ground Water Project:2008.1122E

We are residents in Sunset district and have reviewed the EIR. We have following concerns of the project:

1) Only one groundwater sample from each of these wells was analyzed between 2007 and 2011 (page 5.16-23). We feel that this is insufficient sample to warrant the quality and safety of the well water for general public use. HY-9

2) The Westside Groundwater Basin, inflow or "recharge" components of the groundwater basin include recharge from leakage of sewer and water pipes (page 5.16-27). This poses a health risk. HY-9

3) The North Westside Groundwater Basin is susceptible to seawater intrusion under certain conditions. The Shallow Aquifer is in direct hydraulic connection with the Pacific Ocean between Lincoln Park and the San Francisco Zoo area, indicating a potential for seawater intrusion to occur in the Shallow Aquifer in this area (page 5.16-31).

   There are gaps in the "-100-foot" clay layer south of the proposed South Sunset well facility, including one between the Taraval and San Francisco Zoo coastal groundwater monitoring locations. At these gaps the Shallow and Primary Production Aquifers could be hydraulically connected (page 5.16-32). HY-4

   This potential seawater intrusion poses a risk in degradation of groundwater quality and thus would make the groundwater potentially unsuitable for its identified use.

4) Sodium hypochlorite is on the Special Health Hazard Substance List. It is a strong oxidizer and thus potentially can increase the chance of cancer. A long term health study of drinking water daily with this chemical in 12.5% solution is necessary to eliminate any long term health risk. HY-10

Sincerely,

[signature] Edmund Chu 2245 39th Ave. San Francisco, CA 94116

[signature] Olson Chang 2190 22nd Ave. San Francisco, CA 94116

[signature] Ellen Chu 2190-22nd Ave S F, CA 94116

Carmen L. Chu CARMEN L. CHU 2269-17th Ave S.F, CA 94116

Eunice M. Chue Eunice M. Chue 1826 Kirkham St., SF, CA 94122

To: Sarah Jones, Acting Environmental Review Officer, San Francisco Planning Department

From: Megan Kennedy
2587 41st Ave.
San Francisco, CA. 94116

Re: Case No: 2008.1122E, San Francisco Groundwater Supply Project

I am writing this letter to voice my concerns in regards to the Draft Environmental Impact Report for the San Francisco Groundwater Supply Project. I am a homeowner and resident of the Sunset District. I have a number of problems with this Draft Environmental Impact Report.

First off, pumping water out of the ground in an area where the houses are built on sand dunes is going to cause subsidence. There are already subsidence problems throughout the Outer Sunset District. Disturbing what lies beneath these sand dunes will cause severe damage to the foundations of the houses and buildings in the area. Is the city going to take responsibility for any damage to my home's foundation? Where is the proof that subsidence will not occur? HY-2

Secondly, how does the city plan on replenishing the North Westside Groundwater Basin? There is nothing in the Draft EIR that explains how this aquifer will be replenished. The Outer Sunset District is covered by concrete. How is the aquifer going to be recharged? Lake Merced is already low. What are the city's plans for replenishing the aquifer? GC-6

Thirdly, with regards to the South Sunset Well Location and the West Sunset Well Location, why is the city building a well in a residential area without a discharge surge tank. Discharge surge tanks relieve stress on pipelines from sudden changes is pressure and flow. They prevent damage and pipeline rupture. Does the city not understand that discharge surge tanks in residential areas are common practice? Is the city not concerned with property damage and pipeline rupture? PD-1

Finally, as a resident of 2587 41st Avenue, I am concerned with the pipeline location of the South Sunset Well project. The city plans to have a vertical turbine pump (without a discharge surge tank) pump north for one block to 40th Ave and Vicente, then take a 90 degree turn west for one block to 41st Ave and Vicente, then make another 90 degree turn north on 41st Ave. This is not a good idea and may cause pipeline ruptures, especially at those 90 degree turns. Why not go north on 40th Avenue until the West Sunset Well Location? This would call for only one 90 degree turn instead of two in such a short distance. PD-1

Sincerely,

Megan Kennedy

Megan Kennedy
Homeowner and Concerned Resident

From:	Zhang, Yin Lan
To:	Johnston, Timothy
Subject:	FW: DEIR SF Groundwater
Date:	Tuesday, March 19, 2013 9:42:20 AM

I believe that even though he sent this to us as "project sponsor" this is a comment on the DEIR and will be addressed in the responses.

YinLan Zhang
Bureau of Environmental Management
San Francisco Public Utilities Commission
525 Golden Gate Ave, Suite 600
San Francisco, CA 94102
Voice: 415-487-5201; Fax: 415-934-5750

-----Original Message-----
From: Steve Lawrence [mailto:splawrence@sbcglobal.net]
Sent: Monday, March 18, 2013 6:34 PM
To: Zhang, Yin Lan
Subject: DEIR SF Groundwater

As project sponsor, can you answer: before beginning implementation, are you doing further study of aquifer's yield and whether aquifer may be overdrawn by the project? HY-11

The documents are lengthy. GC-2

Will Anderson* determined the aquifer's yield at 10,600 AF/year. He estimated that those south of the county line were taking 8700 AF. That leaves 1900. But SF plans to take about 4500. Seems aquifer may be over-subscribed. But SF plans to intercept 2160 before it flows to ocean. If this was not included in Will's 10,600 yield, then only 440 short; perhaps insignificant, especially given all the monitoring planned. But I don't know that Will's yield did not include intercept. And it's all close. SF says "recharge" per year is 6260; sounds like plenty. But what is recharge vs yield? *Groundwater Master Plan, 2012 HY-11

Further confusion: sometimes focus is aquifer, sometimes northwestside aquifer (north of line), sometimes southwestside aquifer; Will does not know how much cemeteries take; they estimate; they probably do not measure.

Any clarification you can provide appreciated. (I do understand SF "go slow" plan, 1mgd first year....)

Steve Lawrence

From:	Steve Lawrence
To:	Zhang, Yin Lan; Johnston, Timothy
Subject:	San Francisco Groundwater Supply -- Draft EIR -- comments three
Date:	Monday, April 08, 2013 6:37:28 PM

> Will the Westside aquifer be overdrawn (over-subscribed)? Figures I have seen for current and planned future usage by those south-of-the-line (in northern San Mateo County; see the master plan of July 2012 done by Will Anderson) indicate or suggest usage of all but 2000 acre feet of the aquifer's yield. You plan to take on the order of 4500 acre feet per year, albeit not in the first years. Arithmetic suggests, then, that the aquifer will be overdrawn if the figures are correct. While you plan to intercept water that flows out to the ocean, even that amount (if you can accomplish your aim) is less than the 2500 acre feet difference, leaving a small over-draw. Insignificant? Maybe, given your plans to closely monitor groundwater levels. Please report the quantities you *actually* intercept (prevent from flowing to the ocean), and how you measure this. And please consider that the WSIP project, Regional Groundwater Recovery and Supply, plans to slowly *fill* the aquifer; then, when drought descends, you plan to withdraw 7.2 mgd for up to 7.5 years. This draw-down could have quite an effect. Hopefully Lake Merced stays reasonably full, land does not subside, and salt sea water does not intrude. But if these or some of them do happen, likely it will be during a drought emergency. It seems hardly likely that you would stop withdrawing water, absent very serious consequences. The point is: it is more the SF Groundwater project that may be dispensable. You need to determine now that *both* projects can be done without harm to the aquifer. Put another way, you should for purposes of this analysis assume that the WSIP groundwater project *will* go forward. HY-11 HY-4 HY-2 HY-4 HY-7

(This substantially duplicates a prior email, which may be considered a "comment;" I include it to make sure one is considered, preferably this one.)

> The Ocean Beach Master Plan (SPUR, 2012) embraces a "managed retreat" strategy. This may result in the ocean re-opening a water pathway to Lake Merced, I have heard. If re-opening occurs, how is the aquifer affected? The ocean is rising (about two inches every three years in the near term, according to a recent estimate). Absent a plan to prevent the ocean's intrusion, you should plan for foreseeable intrusion. Eventually an El Nino winter storm at high tide will assault Ocean Beach; that is foreseeable. You may believe that the Lake is not connected with the underlying aquifer, but others disagree. What happens if salt water comes to pollute the Lake and aquifer? Is that something that can be dealt with without major expense and environmental consequence? HY-4 HY-6

> FWIW, your EIRs are too long, and too technical. This one, as one example, is not reasonably aimed at the decision-makers: the Commissioners. Real world non-expert people make these important decisions. How can they make them with best information if they will not be able to read and comprehend what you provide? Driving nearly blind, they approve. The process has become a formality. GC-2

Steve Lawrence

From:	D L
To:	Zhang, Yin Lan; Johnston, Timothy
Cc:	Tang, Katy
Subject:	San Francisco Ground Water Supply Project
Date:	Sunday, March 17, 2013 9:09:47 PM

All,

It is not a good idea.
Don't spoil my drinking water.
Be considerate of the residents especially the western side of the City.

Please Stop the project. It is not worth it.

Please!
God bless America !

HY-9

Derek Leung.
1974 29th Ave
San Francisco, Ca 94116

cc
Case # 2008.1122E
www.sfplanning.org
www.sfwater.org

From: Zhang, Yin Lan
To: Johnston, Timothy
Subject: FW: San Francisco ground water supply
Date: Monday, March 18, 2013 3:59:58 PM

YinLan Zhang
Bureau of Environmental Management
San Francisco Public Utilities Commission
525 Golden Gate Ave, Suite 600
San Francisco, CA 94102
Voice: 415-487-5201; Fax: 415-934-5750

-----Original Message-----
From: biwong14@gmail.com [mailto:biwong14@gmail.com]
Sent: Monday, March 18, 2013 3:59 PM
To: Zhang, Yin Lan
Subject: San Francisco ground water supply

Ms. Yin Lan,

I received the public notice regarding ground water supply project letter. I have several comment regarding to this matter:

1. San Francisco have the best quality water supply from the reservoir, why city want to mix ground water with snow pack water. I have experience with ground water in San Jose, people can't even drink the water. HY-9

2. The area going to be the drilling site is not the best due to the high traffic. Do you realize how many truck and school bus use 41st ave. as their main traffic lane. The weight of heavy traffic will damage the water pipeline in the long run. PD-1

3. Underneath this area were sand support the housing. Drilling in this area will cause structure settlement problem as the water table under the sand is extract. Who is going to pay for the damage? You can drive around and observe the structure settlement problem already happening. HY-2

4. Putting a pump station on 40th Ave and Quintrar street will only create parking problem. During weekend and summer, The parking lot is always occupy full. With pump station at the location, it will going force more parking problem in the neighborhood. TR-1

For the conclusion, I think the quality of water will definitely suffer cause by mixing ground water and Hetechy water. HY-9 Residence settlement will become a big problem because the reduction of water table under the sunset area. HY-2

Sent from my iPad

ATTACHMENT B
DEIR Hearing Transcript

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--o0o--

BEFORE THE

SAN FRANCISCO PLANNING COMMISSION

ITEM NO. 7 - 2008.1122E

SFPUC GROUNDWATER DISTRIBUTION SYSTEM

PUBLIC HEARING ON THE

DRAFT ENVIRONMENTAL IMPACT REPORT

12:00 P.M.

Thursday, April 18, 2013

Commission Chambers - Room 400

City Hall, 1 Dr. Carlton B. Goodlett Place

San Francisco, California

REPORTED BY: DEBORAH FUQUA, CSR #12948

APPEARANCES:

SAN FRANCISCO PLANNING COMMISSION

President: RODNEY FONG

Vice President: CINDY WU

Commissioners: MICHAEL ANTONINI, GWYNETH BORDEN, RICH HILLIS, KATRIN MOORE and HISASHI SUGAYA

Acting Secretary: JONAS P. IONIN

Planning Commission Staff:

Timothy Johnston, Environmental Planner
Jeffrey Gilman, Project Manager

Alisa Moore, Environmental Sciences Associates, Consultant

--o0o--

Thursday, April 18, 2013 1:28 o'clock p.m.

---o0o---

P R O C E E D I N G S

SECRETARY IONIN: Commissioners, that will place you under Item 7 for Case No. 2008.1122E, the SFPUC Groundwater Distribution System, public hearing on the Draft Environmental Impact Report. Please note that written comments on the Draft EIR will be accepted at the Planning Commission until 5:00 p.m. on April 27th, 2013.

TIM JOHNSTON: Good afternoon, President Fong and Members of the Commission. I'm Tim Johnston with the Environmental Planning section of the Planning Department, and I'm the EIR coordinator for SFPUC's proposed San Francisco groundwater supply project. This project is one of several that comprise the SFPUC's larger Water System Improvement Program or WSIP.

Here with me today is Jeff Gilman, who is the SFPUC's project manager for the proposed project. Mr. Gilman will briefly describe some of the main features of the proposed project. I will follow his presentation with request to open the Draft EIR hearing to public comment.

And Jeff will have his PowerPoint up and ready in a second.

JEFF GILMAN: Good afternoon, Commissioners. I'm Jeff Gilman, I'm the project manager for the proposed San Francisco Groundwater Supply Project. I work in the San Francisco Public Utilities Commission's Water Enterprise, Water Resources Division. And I'd like to provide you with an overview of the project today.

Today, most of San Francisco drinks a blend of treated surface water from both the Hetch Hetchy Reservoir and from our local water supply reservoirs. We currently don't use any local or San Francisco source of drinking. And while local groundwater is pumped, it's used to irrigate Golden Gate Park and also for nonpotable uses at the San Francisco Zoo not for drinking.

I want to take a moment to talk about the San Francisco Public Utilities Commission's Water System Improvement Program, or WSIP for short, because the San Francisco Groundwater Supply Project is part of that program. WSIP is a bond-funded program approved by San Francisco voters in November 2002. And the San Francisco Planning Department certified the Program EIR for WSIP in October 2008.

The adopted WSIP has a water supply strategy. And under that strategy, San Francisco has a limitation on the imported surface water we can get from our watersheds. We also made a commitment to diversify the water supply portfolio by maximizing conservation and by developing new water supplies.

The proposed project would develop a new local source, a new local water supply source for drinking, and this additional water supply source would increase the overall reliability of our water system.

Local groundwater has been used for drinking in Daly City and other cities in northern San Mateo County for over 60 years. It's not something new. Over 80 percent of people in California obtain part or all of their water supply from groundwater.

And another and quite major benefit of a local supply source is as an emergency source of drinking water in a major earthquake.

The San Francisco Groundwater Supply Project proposes to pump groundwater from wells in the West-side Groundwater Basin, or sometimes that's referred to as the West-side Basin aquifer.

There are two other proposed projects in the West-side Basin that are interrelated with the San Francisco Groundwater Supply Project. And those are also currently undergoing environmental review.

The first is the Regional Groundwater Storage and Recovery Project. That's a San Francisco Public Utilities Commission project that would provide water supply during multiple dry years. The Planning Department released the Draft EIR for that project on April 10th, and you will have a public hearing on that next month.

Another project is the Vista Grande Drainage Basin Improvement Project. That's a Daly City project that would, part of that, provide a supplemental source of water to maintain Lake Merced. And Daly City released a notice of preparation for an EIR/EIS for that project on February 28th. So that is currently also under review and public can comment on that.

This map shows the extensiveness of the groundwater monitoring program that we have in place throughout the West-side Basin. And since the 1990s, when San Francisco Public Utilities Commission prepared a Groundwater Master Plan, we've recognized the importance of developing a better understanding of groundwater conditions in the West-side Basin so the basin can be managed in a sustainable manner.

In cooperation with our partner agencies in the northern San Mateo County, we've been conducting groundwater monitoring in the basin for over a decade. To monitor the San Francisco part of the basin, we have

41 monitoring wells at 17 locations. Many of the locations have wells at multiple depths.

And in San Francisco, our primary focus of the monitoring program is along Pacific Coast and in the vicinity of Lake Merced. We think those are the two places where the groundwater basin is most vulnerable to over-extraction. And, again, I said our goal is to manage this basin in a sustainable manner.

So through over a decade of groundwater monitoring, we've developed a strong technical understanding of the groundwater basin.

This slide summarizes the major aspects of the proposed San Francisco Groundwater Supply Project. And I want to take a moment to go over it. The proposed project would pump up to 4 million gallons a day of groundwater for potable or drinking use in San Francisco. The project facilities include six wells constructed in two phases. The four Phase 1 wells are shown as orange circles. And the two Phase 2 wells are shown as yellow triangles.

The project also proposes about five miles of pipelines which would convey the groundwater from the well facilities to Sunset Reservoir, where it will be blended with the regional water system.

The Lake Merced well facility, the

southernmost one on that map, that would be connected by a short length of pipeline to the existing Lake Merced pump station where the blended water would be pumped to both the Sunset Reservoir and the Sutro Reservoir using existing pipelines.

After the groundwater is blended, it would then be distributed to customers throughout about 60 percent of San Francisco. And this distribution area is shown as the blue area on the map. So although most of the well facilities are on the west side, the people receiving the water and the blend would be throughout San Francisco.

This blended water that's delivered to customers would continue to exceed all drinking water standards, which is fits our standard and our objective today with our water system.

Now, for a more detailed overview of the well facilities and pipeline routes, first, I'll start with the Sunset District, and then a little bit later, I'll look at the proposed well facilities in Golden Gate Park.

The well facility buildings would be relatively small one-story buildings ranging -- with a footprint ranging from about 800 to 1500 square feet. And the building heights would range between 12 feet and 19 1/2 feet.

The new pipelines would be installed in city streets underground, and also along existing roadways in Golden Gate Park. Construction of the well facilities would consist of minor grading, some localized trenching for underground utilities and concrete construction for foundations and the building shell.

The duration would be about 15 to 18 months per facility. Some more extensive soil improvement work would be conducted at the Lake Merced well station to prevent liquefaction. Construction of the pipelines would mainly use the cut-and-cover or trenching method, which would progress at a rate of about 300 to 600 feet per week or up to about two weeks per city block.

And trenchless excavation, the auger-boring method, would be used at the two intersections of 41st Avenue and the Muni Light Rail lines at Judah and Taraval Street to avoid disrupting the rail service. The duration at each of these two intersections is is estimated to be about four weeks.

Also the project proposes to construct a pH adjustment facility at an existing utility building on the west side of our Sunset Reservoir property near the intersection of 28th Avenue and Pacheco Street.

Now to go through each well facility in a little more detail, this shows the overall site plan for the West Sunset well facility. It would be located in the northeast corner of the parking lot near the intersection of 40th Avenue and Quintara Street.

The parking lot is associated with the West Sunset Playground athletic fields. However, the area of the parking lot is not currently used for parking, and the only existing park space we would end up taking would be for our new handicapped parking space.

We'd also be providing some concrete dividers to the Recreation and Park Department so they can create some storage bins for the field materials. Now they're stored in mainly just some stockpiles in this general area. And this well would also serve as an emergency drinking water supply and has some design components to achieve that.

The South Sunset well facility would be located in the southeast corner of the South Sunset Playground property. And that's an area that's currently an earthen berm near the intersection of 40th Avenue and Wawona Street. This area is not used for recreation currently; it's outside of the actual field of play and bleachers and such. One room of this facility is designed to be used by the San Francisco

Recreation and Park Department for equipment storage.

The Lake Merced well facility would be located along the access road to the existing Lake Merced pump station. This is San Francisco Public Utilities Commission property. And it's near the southeastern part of Lake Merced. This area is not generally accessible to the public. The well facility design includes an overlook along Lake Merced Boulevard, which would include benches facing west towards Lake Merced and an interpretive display panel.

Now, the three facilities we propose in Golden Gate Park. As part of Phase 1 of the project, we would construct the central pump station well facility -- that's the one on the far right on the map -- and a little more than one mile of pipeline.

And Phase 2 of the project would include converting the existing North Lake and South Windmill replacement irrigation well facilities and a little less than one mile of pipeline.

The central pump station well facility would be located in the central part of Golden Gate Park, south of Overlook Drive and east of the Middle Drive West-Overlook Drive intersection. This area is directly adjacent to the central pump station, which is Golden Gate Park's main pump station and reservoir storage for their irrigation system. And that general facility also includes their wood waste composting yard. Landscaping, all the new pavements and paved areas and a new access road would primarily utilize permeable materials. And because this facility is located near Golden Gate Park central pump station, it can serve as a future backup water supply to the park.

The South Windmill Replacement well facility would be located in the southwestern part of Golden Gate Park, north of Martin Luther King Jr. Drive in an area that's currently used for storage of logs and construction debris. This facility would involve conversion of an existing irrigation well and replacement of the existing building. We would utilize the existing access road to the existing facility with grading improvements. The facility would be designed so it can serve also as a backup irrigation supply to the park.

In Phase 2 of the project, though, the primary irrigation supply would be recycled water rather than groundwater as it currently is now.

The North Lake well facility would be located in the northwestern part of Golden Gate Park near the intersection of Fulton Street and 42nd Avenue. The well facility components and overall landscape design are nearly identical to the South Windmill replacement well site. One important addition is that the North Lake well facility would also serve as an emergency drinking water source and would have design components to it to achieve that capability.

Now to spend a few minutes on how the project would operate. The project would normally operate to supplement San Francisco's water supply. And under normal operations, wells would pump daily. The average annual groundwater production would be up to 4 million gallons a day for Phase 2 or at full build-out of the project, and up to 3 million gallons a day for Phase 1 only.

The wells have excess capacity which allows pumping to be redistributed among the six wells, meaning we can shift the pumping around as needed to avoid adverse effects of pumping.

In a catastrophic emergency, the wells would produce up to 6 million gallons a day from all six wells on a short-term basis for up to 30 days, and two of the wells, as I previously mentioned -- West Sunset and North Lake -- are designed to operate on emergency power. So they are truly emergency supply -- water supply facilities. And power would be furnished by a portable generator.

So just to wrap up the presentation, I'd like to highlight the key project objectives again: project facilities, project operations.

Our project objectives are to diversify our San Francisco water supply system and provide a local drinking water source. The project facilities, which would be constructed in two phases, include six well facilities and five miles of groundwater pipeline connecting to Sunset Reservoir.

The project operations would be, under normal operations, to pump up to 4 million gallons a day of groundwater. And in an emergency, we could pump up to 6 million gallons a day of groundwater for up to 30 days.

Blended water, the groundwater would be blended in the reservoirs, and the blended water would be distributed throughout San Francisco.

Thank you. And I'd like to answer any questions that you might have.

SECRETARY IONIN: Okay.

PRESIDENT FONG: Thank you. We might have questions for you in a bit.

TIM JOHNSTON: Thanks, Jeff.

I would now like to state that this is a hearing to receive comments on the environmental impact report for Case No. 2008.1122E, which assesses the impacts on the environment that could result from implementation of the San Francisco Groundwater Supply Project.

This Draft EIR was published on March 13th, 2013 and delivered to you shortly thereafter. Staff is not here today to respond to comments on the environmental analysis. Such comments will be transcribed and responded to in writing in a responses to comments document which will respond to all verbal and written comments received during the public comment period and may include revisions made to the Draft EIR as appropriate.

This is not a hearing to consider approval or disapproval of the project. That hearing will be held by the SFPUC following certification of the Final EIR.

Comments today should be directed toward the adequacy and accuracy contained in the Draft EIR. Commenters are asked to speak slowly and clearly so that the court reporter can produce an accurate transcript. Commenters should also state their name and address so that they can be sent a copy of the response to comments document when completed.

After comment from the general public, we'll also take any comments on the Draft EIR from the

Planning Commission. The public comment for this project began on March 13th, 2013, and it extends to 5:00 p.m. on Monday, April 29th, 2013.

Since this is a local San Francisco project, this is the only hearing on the Draft EIR being held. So unless members of the Commission have any questions, I recommend that the public hearing be opened.

PRESIDENT FONG: Okay. Opening it up to public comment, I do have one speaker card, we have one speaker card. Tim Kennedy?

TIM KENNEDY: Hello. My name is Tim Kennedy. I live at 2587, 41st Avenue, San Francisco, California 94116.

I've come in here today because I am a certified distribution operator and a certified treatment operator. I have nine years in the water industry. And my concern today is as a resident of 41st Avenue.

My primary concern is not with the idea of groundwater wells. I think it's a great idea, especially for -- in cases of emergency such as earthquakes, give us a local water source.

My primary concern is with the pipeline location and particularly with the South Sunset well location.

PD-1

In the EIR, it says that the well is located on 40th and Wawona, and then the pipeline will go north on 40th; it will make a 90 -- goes up one block north, makes a 90-degree angle; goes one block west, makes another 90 degree angle, and then goes north.

That's going to cause a -- when a well runs, it's like a pump. It's like a vertical turbine pump. It's going to cause a lot of stress on those 90-degree angles. I think that's going to cause problems for the residents and the homeowners in that area. It could case main breaks.

PD-1 cont.

My other concern is that, on the two wells at both South Sunset and West Sunset, in the -- around homeowners, there's no surge tanks. Normally when you run a well, there should be a surge tank following the discharge side of a well that absorbs the initial impact of the well coming on or the pump coming on and creates less stress on any of the pipelines.

PD-1

I would like to suggest that there's an -- in the EIR, there's an alternate -- alternative pipeline location for Sunset Boulevard. I would like that the Commission look at that or whoever -- maybe the SFPUC looks at that.

I know that one of the concerns was traffic during construction on Sunset Boulevard. But the

AL-1

construction would only -- it would be little bis at a time, like one block, probably one lane, that would need to be closed off. And like I said it, it would take a long time to build that.

AL-1 cont.

As a homeowner I'm concerned with the 90s and the fact that there could be some pipeline rupture without surge tanks. Thank you.

PD-1

PRESIDENT FONG: Thank you. Is there any other public comment? Seeing none, the public comment portion is closed.

Commissioner Antonini?

COMMISSIONER ANTONINI: Well, I have a number of comments and questions. To preface, I've been a resident of western San Francisco for almost 40 years now. And I remember the late '90s in particular with the Lake Merced water level getting precipitously low. In fact, at some times it was below seal level, and there was a lot of fears of influx of saltwater.

And fortunately, a couple of changes were made in the early part of the century. I understand that under the direction of then-Supervisor Tony Hall and Supervisor Sean Elsbernd, where -- I think my understanding was that almost all the irrigation for Harding Park was being done out of groundwater at that time. And one thing, we started using more of

HY-7

Hetch Hetchy to keep the water level higher.

And then the other thing that was done, with an agreement with Daly City, was to use the water from the Aqua Vista -- Vista Grande canal and put that water back into Lake Merced instead of it going into the ocean, which it was before.

And I guess my question is, if you were kind of at a line where we were losing -- now we're not quite up to the level it was historically, but it's pretty good. I'm not quite sure how we're going to take 4 million gallons per day out of the aquifer and not have that lake sink again.

HY-7 cont.

TIM JOHNSTON: Which is a scenario contemplated by the EIR. So we do have a mitigation for that, which is mitigation HY8 -- or HY9, sorry, that requires a lake level management plan.

This mitigation measure contemplates that the PUC would add supplemental water from the system when available. It will also take advantage of water from the Vista Grande drainage canal as well as storm water from the surrounding areas such as may become available from the Park Merced project, for example. And so that will be the first option.

The second option would be for the PUC to alter pumping, pumping rates, of the surrounding -- of the wells -- the well at Lake Merced. And then another step would be to stop pumping at Lake Merced and increase pumping at the other wells, all the while monitoring lake levels and thereby, in a stepwise fashion, eventually reduce pumping if need be to allow the lake to recover.

SECRETARY IONIN: Could I have a point of order here? Isn't this properly handled through the response document instead of having it provided publicly?

DIRECTOR RAHAIM: I think what Tim is doing is just responding to what's in the EIR. But we need to clarify that with the Commissioner's questions, and it will be responded to in writing in the Final EIR document. So we shouldn't get into a lot of detail about what the actual EIR has.

TIM JOHNSTON: Sorry for going on too much.

COMMISSIONER ANTONINI: Okay. Thank you. No, I'm not saying it isn't within the document. I just was raising that concern publicly so people would realize that they have to read the documents, pay attention to it, and hopefully then there will be responses -- comments and responses. GC-7

And another comment, which is a question, I guess, regarding the lakes in Golden Gate Park, particularly Chain of Lakes, which are naturally PD-7 occurring lakes. I think they're the only ones in Golden Gate Park which are naturally occurring. In recent years, they seem to be virtually stagnant, you know, overgrown and not in very good shape. And I'm wondering if your plan addresses the needs of these lakes to have enough water supply and movement in the water, even though these are Rec Park facilities, I understand, but they're dependent upon water that's come from their pumping at Golden Gate Park which will be somewhat affected by your groundwater pump.

So, I mean, you don't have to necessary reply, but that's -- you know.

PD-7 cont.

Finally, the other thing is probably we're seeing only part of the picture here because you did allude to the fact we're going to see in a few weeks a storage facility planned on the Peninsula, which is a separate project. But I think the answer to our quandary which we're in, we have a -- I think it's 280 million gallons per day sort of is the point that we need. And we have to -- you know, we can only take so much out of the Tuolumne. And we're trying to find other sources.

But I think your biggest solution -- I'm not against these sources as emergency sources, but the biggest solution will be storage, to -- years are

GC-1

wetter and drier, and population is going to grow, and with water needs are going to grow.

GC-1 cont.

So I would hope -- the third question I want to ask, and you didn't have to answer it today, but are we addressing in this report -- it may be in here -- the intra-city pipeline conditions? Because we're going to be putting in new pipelines -- although it isn't part of this project -- there may be changes in pressure that were alluded to by the speaker that spoke from the public, and making sure that we don't have any recurrences of situations that happened at 15th and Wawona and analyzing what effects, if any, this new water supply might have on the pressures within the existing pipes, many of which are fairly old.

PD-1

And then my final question will be are we going to utilize the two windmills that we have at the end of Golden Gate Park, which I think are operational, to help with this whole process because it would make sense to use -- there's a lot of wind out there, and it probably would be a good way to -- that's a different site from where your wells are going to be, but it would be good if we could figure out a way to use what's already there.

PD-2

PRESIDENT FONG: Commissioner Sugaya?

COMMISSIONER SUGAYA: Just a quick comment on

PD-3

Figure 3-13A, which is the South Windmill replacement well facility figure. It shows in green proposed native grass. But the site that you're going to be proposing the building and the rest of the construction and the pipelines and everything are sitting in an area which currently is void of a lot of vegetation.

And I think some of it is being used as a trash dump or something -- or used to be. But the magenta line, the limit of ground disturbance, doesn't take into consideration this whole -- I don't know if it was a quarry at one time or something. Whatever it was -- doesn't encompass the rest of the area.

And I think that it behoove the PUC and Rec Park to take a look at that area, as long as work is going to proceed, to see if it can't be -- if the vegetation program, whether it's native grasses or trees, couldn't be expanded somewhat to include re-vegetating that entire area.

PD-3 cont.

And also, if you're going to be constructing new pipelines, I assume trenching would -- may effect the trees between the current and existing road, which is Martin Luther King, and your well site. So I would hope that any kind of vegetative disturbance would be replaced in kind or that there would be a vegetation program for that area as well. That means between the

BI-1

well site and the road. BI-1 cont.

And one last comment to the gentleman who testified earlier, our only person who testified, you can of course submit written comments on this if you want to expand on your ideas or concerns or whatever. You don't have to -- you don't have to just do it here. You can write a letter to the PUC on your concerns. GC-7

PRESIDENT FONG: Commissioner Moore?

COMMISSIONER MOORE: I find the entire story about the San Francisco's water supply extremely fascinating. I am concerned that the addition of new wells in strategic locations makes these wells highly visible. And what are we considering for these facilities becoming vulnerable, which is very important part when you have visible water supply facilities. PD-4

A second part of that question is when you combine potable and recycled water in one project, what do we do about absolutely being sure about cross-connections. Those would be two questions I would like to see specifically answered. PD-5

PRESIDENT FONG: Commissioner Antonini?

COMMISSIONER ANTONINI: I think I have another question that, again, could come in comments and responses. GC-1

As reported in the DEIR, and we've we had this throughout the entire water -- we know that -- I think the figure was 265 million gallons per day total system. I may be off, but I think that's what's stated. And of that, 184- is wholesale, and 81- is retail -- "retail" being City and County of San Francisco, couple of other exceptions. Castlewood Country Club or something. But retail is basically City of San Francisco.

Then the wholesale is all our customers who buy water from SFPUC, which is important because we make revenue out of it. It makes a lot of sense. One of the few parts of the City that actually has a positive cash flow.

But I think that the biggest probably increase in demand or bigger increase in demand may come from our wholesale side or from the retail side -- although we've seen a lot of growth in San Francisco recently, and we're going to have an increase there.

But I'm not against this project for groundwater. But I'm wondering if you're exploring sources on the peninsula in land you own, in the Livermore Valley, particularly around Pleasanton, where you historically have had a lot of really good water supply there. And I know there's still a lot of pumping going on out there. And if we can expand some

GC-1 cont.

of the pumping in those areas -- because much of what we're pumping into the system will be used for wholesale customers. So we probably should utilize their aquifers also to meet our demand.

So that's question for responses and for another day. But I think it's an important one to answer.

GC-1 cont.

PRESIDENT FONG: Okay. Thank you.

(Whereupon, the proceedings concluded at 2:03 o'clock p.m.)

STATE OF CALIFORNIA)
) ss.
COUNTY OF MARIN)

I, DEBORAH FUQUA, a Certified Shorthand Reporter of the State of California, duly authorized to administer oaths pursuant to Section 8211 of the California Code of Civil Procedure, do hereby certify that the foregoing proceedings were reported by me, a disinterested person, and thereafter transcribed under my direction into typewriting and is a true and correct transcription of said proceedings.

I further certify that I am not of counsel or attorney for either or any of the parties in the foregoing proceeding and caption named, nor in any way interested in the outcome of the cause named in said caption.

Dated the 14th day of June, 2013.

DEBORAH FUQUA

CSR NO. 12948