File No. 160975

Committee Item No. 2
Board Item No. ____________

COMMITTEE/BOARD OF SUPERVISORS

AGENDA PACKET CONTENTS LIST

Committee: Government Audit and Oversight **Date:** October 18, 2017
Board of Supervisors Meeting: **Date:** ____________

Cmte Board

Cmte	Board	
☒	☐	**Introduction Form**
☒	☐	**Public Correspondence**

OTHER **(Click the text below for a direct link to the document)**

Cmte	Board	
☒	☐	Oath to Witness Derrick Roorda - October 18, 2017
☒	☐	City Admin Memo - July 28, 2017
☒	☐	Simpson Gumpertz & Heger Report - July 28, 2017
☒	☐	Oath to Witness Hardip Pannu - April 28, 2017
☒	☐	Hardip Pannu Submittal - April 27, 2017
☒	☐	· Building Inspection Commission Letter - April 27, 2017
☒	☐	Oath to Witness Jack Mohele - February 2, 2017
☒	☐	Tomio Takeshita Presentation - January 12, 2017
☒	☐	DBI Letter - December 16, 2016
☒	☐	DBI Letters - December 15, 2016
☒	☐	Duane Morris Letter and Exhibits A-H - November 22, 2016
☒	☐	DBI Letter - November 29, 2016
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☒	☐	Millennium Litigation Group Letter
☒	☐	Desimone Consulting Engineers Memos
☒	☐	Treadwell and Rollo Memos
☒	☐	Arup North America Memos
☒	☐	Referral FYI - September 12, 2016

Prepared by: John Carroll **Date:** October 13, 2017
Prepared by: ____________ **Date:** ____________

Board of Supervisors
City and County of San Francisco

Government Audit and Oversight Committee
October 18, 2017 ◆ 10:00 a.m.
Derrick Roorda

Prepare to affirm this oath by raising your right hand, and affirm by saying "I Do."

"You do solemnly state that the testimony you may give in the hearing now pending before this Government Audit and Oversight Committee, of the San Francisco Board of Supervisors, in the City and County of San Francisco, shall be the truth, the whole truth, and nothing but the truth."

When recalling the witness:
"Mr. Roorda, I will remind you, you have been previously placed under oath and remain so. Please take the podium, and restate your name for the record."

Civil Procedure Oath to Witness
(Chapter Law 688, Statutes of 2000)
Dated: October 18, 2017

BOARD of SUPERVISORS

City Hall
1 Dr. Carlton B. Goodlett Place, Room 244
San Francisco 94102-4689
Tel. No. 554-5184
Fax No. 554-5163
TDD/TTY No. 554-5227

SUBPOENA

To: **Derrick Roorda**
BuroHappold Engineering
535 Mission Street, Suite 1771
San Francisco, CA 94105

Pursuant to Section 16.114 of the San Francisco Charter and California Government Code Sections 25170 and 37104, the San Francisco Board of Supervisors hereby commands you to appear at **10:00 a.m. on October 18, 2017** at the following location:

City Hall
1 Dr. Carlton B. Goodlett Place
Legislative Chamber, Room 250
San Francisco, CA 94102

- To provide oral information and respond to questions at a public hearing of the Board of Supervisors' Government Audit and Oversight Committee regarding your participation in and knowledge regarding the design, engineering, review, and approval process for the project at 301 Mission Street in San Francisco.

- To produce and permit inspection and copying of all documents, records, and other materials in your possession related to those two projects.

If you have any questions regarding compliance with this subpoena, contact:

Angela Calvillo, Clerk of the Board of Supervisors, Tel. (415) 554-5184

Failure to comply with the commands of this subpoena may subject you to enforcement proceedings before the Superior Court of the State of California.

Date: 9/28/17

By: Angela Calvillo
Angela Calvillo, Clerk of the Board

City Hall
1 Dr. Carlton B. Goodlett Place
San Francisco, CA 94102-4689

170998 **[Issuance of Subpoena Duces Tecum - Derrick Roorda]**

Sponsor: Peskin

Motion directing the Clerk of the Board of Supervisors to issue a subpoena duces tecum to Derrick Roorda, requiring him to appear at the Government Audit & Oversight Committee on October 4, 2017, at 10:00 a.m., to provide oral information at the hearing of File No. 160975 and respond to questions regarding the design, engineering, and cost benefit analysis for the project at 301 Mission Street; and requiring him to produce documents, correspondence, records, and other materials in his possession related to that project.

9/19/2017 Board of Supervisors - APPROVED

Ayes: 8 - Breed, Cohen, Fewer, Kim, Peskin, Ronen, Sheehy and Yee

Excused: 3 - Farrell, Safai and Tang

STATE OF CALIFORNIA
CITY AND COUNTY OF SAN FRANCISCO

CLERK'S CERTIFICATE

I do hereby certify that the foregoing Motion is a full, true, and correct copy of the original thereof on file in this office.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the offical seal of the City and County of San Francisco.

September 21, 2017
Date

Angela Calvillo
Clerk of the Board

[Issuance of Subpoena Duces Tecum - Derrick Roorda]

Motion directing the Clerk of the Board of Supervisors to issue a subpoena duces tecum to Derrick Roorda, requiring him to appear at the Government Audit & Oversight Committee on October 4, 2017, at 10:00 a.m., to provide oral information at the hearing of File No. 160975 and respond to questions regarding the design, engineering, and cost benefit analysis for the project at 301 Mission Street; and requiring him to produce documents, correspondence, records, and other materials in his possession related to that project.

WHEREAS, News accounts in August 2016 revealed that the high-rise building at 301 Mission Street, commonly known as the Millennium Tower, was settling differentially at double the anticipated amount predicted for the entire life of the project, and has sunk a total of 17 inches since its 2009 completion; and

WHEREAS, Recent legal filings indicate that the Millennium Tower will tilt another ten inches to the west by 2019; and

WHEREAS, Mr. Roorda previously served as the Senior Associate Principal of DeSimone Consulting Engineers, Inc. starting in 1997, where he designed and shepherded the approvals of the 60-story Millennium Tower, which upon its completion in 2009 was the tallest concrete structure on the west coast, as well as the tallest residential building west of Chicago; and

WHEREAS, A shorter and less heavy project at 80 Natoma with a similar mat foundation was ultimately halted for reasons that included concerns about the structure's performance during a seismic event; and

WHEREAS, During the approximate time period from 2005 through 2007, DeSimone Consulting Engineers retained a two-member peer review panel to vet the structural and seismic soundness of Mr. Roorda's calcuations and design specifications, a process which specifically omitted the involvement of a geotechnical engineer, and which eventually led to the recommendation that a foundation permit be issued for the project; and

WHEREAS, Supervisor Aaron Peskin, Member of the Government Audit and Oversight Committee, has requested that Mr. Roorda attend a hearing of the Committee to respond to questions regarding his intimate knowledge of the 301 Mission project and provide the Committee with relevant records in his possession, but Mr. Roorda has not yet indicated his willingness to participate; and

WHEREAS, A draft subpoena requiring Mr. Roorda to attend a hearing of the Committee and to produce documents is on file with the Clerk of the Board of Supervisors in File No. 170998; now, therefore, be it

MOVED, That pursuant to its authority under Charter, Section 16.114, and Government Code, Sections 25170 and 37104, the Board of Supervisors hereby directs the Clerk of the Board to issue a subpoena duces tecum in substantially the form and substance of the draft subpoena referenced above, requiring Mr. Roorda to (1) attend the Government Audit and Oversight Committee meeting at 10:00 a.m. on October 4, 2017, to provide oral information and respond to questions regarding his participation in and knowledge regarding the design, engineering, review, and cost benefit analysis for the project at 301 Mission Street in San Francisco; and (2) produce and permit inspection and copying of all documents, records, and other materials in his possession related to that project; and, be it

FURTHER MOVED, That the Clerk of the Board of Supervisors, in consultation with the City Attorney, may amend the draft subpoena prior to issuing it, consistent with the direction in this Motion; and, be it

FURTHER MOVED, That the Clerk and the Chairperson of the Government Audit and Oversight Committee may in their discretion modify the time and date set forth in the subpoena, and may reissue the subpoena with a modified time and date, in order to accommodate Mr. Roorda's and the Committee's schedules.

City and County of San Francisco

Tails

Motion: M17-146

City Hall
1 Dr. Carlton B. Goodlett Place
San Francisco, CA 94102-4689

File Number: 170998 **Date Passed:** September 19, 2017

Motion directing the Clerk of the Board of Supervisors to issue a subpoena duces tecum to Derrick Roorda, requiring him to appear at the Government Audit & Oversight Committee on October 4, 2017, at 10:00 a.m., to provide oral information at the hearing of File No. 160975 and respond to questions regarding the design, engineering, and cost benefit analysis for the project at 301 Mission Street; and requiring him to produce documents, correspondence, records, and other materials in his possession related to that project.

September 19, 2017 Board of Supervisors - APPROVED

Ayes: 8 - Breed, Cohen, Fewer, Kim, Peskin, Ronen, Sheehy and Yee
Excused: 3 - Farrell, Safai and Tang

File No. 170998

I hereby certify that the foregoing Motion was APPROVED on 9/19/2017 by the Board of Supervisors of the City and County of San Francisco.

Angela Calvillo
Clerk of the Board

Carroll, John (BOS)

From: Pamela Cheeseborough <Pamela.Cheeseborough@sfgov.org>
Sent: Thursday, October 05, 2017 9:57 AM
To: Givner, Jon (CAT); Carroll, John (BOS)
Subject: Confirmation re Service of Subpoena on Derrick Roorda
Attachments: Proof of Service of Roorda Subpoena.pdf

Categories: 170998

You requested tracking info on the service of the Subpoena for Derrick Roorda.

Mr. Roorda was served via UPS through his attorney Michael De Chiara on October 2, 2017. Destiny signed for the package. The tracking number is 1ZR3773V0102562108.

Thank you.

Pamela Cheeseborough
Legal Secretary
Office of the City Attorney
1 Dr. Carlton B. Goodlett Place
CityHall, Room 325
San Francisco, CA 94102
(415) 554-4688 direct
(415) 554-4699 fax
----- Forwarded by Pamela Cheeseborough/CTYATT on 10/05/2017 09:54 AM -----

From: Pamela Cheeseborough/CTYATT
To: Sunny.Angulo@sfgov1.onmicrosoft.com,
Cc: Jon Givner/CTYATT@CTYATT
Date: 09/29/2017 10:32 AM
Subject: Proof of Service of Subpoena for Derrick Roorda

Sunny,

As requested, here's a pdf of the Subpoena for Mr. Roorda.

Pamela Cheeseborough
Legal Secretary
Office of the City Attorney
1 Dr. Carlton B. Goodlett Place
CityHall, Room 325
San Francisco, CA 94102
(415) 554-4688 direct
(415) 554-4699 fax

PROOF OF SERVICE

I, Pamela Cheeseborough, declare as follows:

I am a citizen of the United States, over the age of eighteen years and not a party to the above-entitled action. I am employed at the City Attorney's Office of San Francisco, Fox Plaza Building, 1390 Market Street, Fifth Floor, San Francisco, CA 94102.

On September 29, 2017, I served the following document(s):

SUBPOENA DUCES TECUM FOR DERRICK ROORDA

MOTION M17-146 RE ISSUANCE OF SUBPOENA

on the following persons at the locations specified:

Michael K. De Chiara, Esq.
Zetlin & De Chiara LLP
801 Second Avenue
New York, NY 10017

in the manner indicated below:

☒ **BY OVERNIGHT DELIVERY:** I sealed true and correct copies of the above documents in addressed envelope(s) and placed them at my workplace for collection and delivery by overnight courier service. I am readily familiar with the practices of the San Francisco City Attorney's Office for sending overnight deliveries. In the ordinary course of business, the sealed envelope(s) that I placed for collection would be collected by a courier the same day.

☐ **BY ELECTRONIC MAIL:** Based on a court order or an agreement of the parties to accept electronic service, I caused the documents to be sent to the person(s) at the electronic service address(es) listed above. Such document(s) were transmitted *via* electronic mail from the electronic address: first.last@sfgov.org ☐ in portable document format ("PDF") Adobe Acrobat or ☐ in Word document format. OR

☐ **BY ELECTRONIC MAIL:** Based on a court order or an agreement of the parties to accept electronic service, I caused the documents to be served electronically through **File & ServeXpress or TrueFiling** in portable document format ("PDF") Adobe Acrobat.

☐ **BY FACSIMILE:** Based on a written agreement of the parties to accept service by fax, I transmitted true and correct copies of the above document(s) via a facsimile machine at telephone number Fax #' to the persons and the fax numbers listed above. The fax transmission was reported as complete and without error. The transmission report was properly issued by the transmitting facsimile machine, and **a copy of the transmission report ☐ is attached or ☐ will be filed separately with the court.**

I declare under penalty of perjury pursuant to the laws of the State of California that the foregoing is true and correct.

Executed September 29, 2017, at San Francisco, California.

Pamela Cheeseborough

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Member, Board of Supervisors
District 3

AARON PESKIN

City and County of San Francisco

MEMORANDUM

DATE: July 28, 2017

TO: Naomi Kelly, City Administrator

CC: Gregory Deierlein, City Peer Review lead for 301 Mission
John Carroll, Committee Clerk

FROM: Supervisor Aaron Peskin

SUBJECT: Emergency Hearing on 301 Mission – August 1, 2017

Madame City Administrator:

In light of the recent public revelations that the Millennium Tower at 301 Mission Street continues to sink and tilt at an accelerated rate, the Government Audit & Oversight Committee has called for an emergency hearing to receive an update on the status of the peer review of the building, per staff's July 20 email correspondence.

The Chair has confirmed Room 263 for the special Government Audit and Oversight Committee hearing on Tuesday, August 1 at 1:00 PM.

Chair Kim and I are also requesting an update directly from Mr. Deierlein, the City's contracted peer review lead, on the status of the City's safety inquiry, including any potential fixes for the outriggers and foundation mat issues. Mr. Deierlein should come prepared to explain the performance modeling that the panel has done for the building in the event of an earthquake.

If there are additional safety violations that have been cured, such as the non-compliant ramp, please be prepared to update the committee on these items, as well. Thank you for your ongoing leadership and work to prioritize the safety of our downtown.

Aaron

City Hall • 1 Dr. Carlton B. Goodlett Place • Room 244 • San Francisco, California 94102-4689 • (415) 554-7450
Fax (415) 554 - 7454 • TDD/TTY (415) 554-5227 • E-mail: aaron.peskin@sfgov.org

Supplemental Report for Foundation Settlement Investigation

301 Mission Street
San Francisco, CA
21 July 2017
Revised 26 July 2017

SGH Project 147041.10

SIMPSON GUMPERTZ & HEGER
Engineering of Structures and Building Enclosures

PREPARED FOR:

Ms. Naomi Maria Kelly
Office of the City Administrator
City Hall, Room 362
1 Dr. Carlton B. Goodlett Place
San Francisco, CA 94102

PREPARED BY:

Simpson Gumpertz & Heger Inc.
100 Pine Street, Suite 1600
San Francisco, CA 94111
Tel: 415.495.3700
Fax: 415.495.3550

SIMPSON GUMPERTZ & HEGER
Engineering of Structures
and Building Enclosures

26 July 2017

Ms. Naomi Maria Kelly
Office of the City Administrator
City Hall, Room 362
1 Dr. Carlton B. Goodlett Place
San Francisco, CA 94102

Project 147041.10 – Structural Evaluation of the Millennium Tower, 301 Mission Street, San Francisco, CA; Revised Supplemental Report

Dear Ms. Kelly:

We are pleased to send the attached report documenting supplemental evaluations performed by us in response to requests forwarded by Professor Gregory Deierlein, Chair of the City of San Francisco-appointed review panel for the Millennium Tower. This revised report includes a corrected plot of ground motion spectra used in our analysis, plots for shear wall strain demand capacities and residual drift, and a discussion of settlement that has occurred since the readings upon which our analyses are based.

Sincerely yours,

REGISTERED PROFESSIONAL ENGINEER
RONALD O. HAMBURGER
No. 2951
STRUCTURAL
STATE OF CALIFORNIA
07/26/2017

Ronald O. Hamburger, SE
Senior Principal
CA License No. 2951
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Encl.

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Letter of Transmittal

ABSTRACT

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ABSTRACT

The building at 301 Mission Street, San Francisco, California is a fifty-eight-story residential structure founded on a pile-supported mat foundation. The building, which was completed in 2009, has experienced and continues to experience significant foundation settlement. Paul Hastings, LLP retained Simpson Gumpertz & Heger Inc. in 2014 to conduct an evaluation of the impact of site settlement on the building's structural stability and earthquake resistance. We performed initial evaluations in 2014 and updated these in 2016 to consider additional settlement that occurred in the interim period. In an October 2016 report we concluded that settlement had not compromised the building's stability or its ability to resist strong earthquakes.

The City of San Francisco retained a panel of structural and geotechnical engineers to review our October 2016 report and provide the City an independent opinion of the building's safety. In performing their work, this panel requested that we supplement our original evaluations to:

- Address the effects of potential strength degradation of reinforced concrete coupling beams in outrigger elements.
- Select and scale ground motions used in our analyses in accordance with the requirements of ASCE 7-10.
- Evaluate the adequacy of the foundation piles to support the structure under strong ground shaking.
- Evaluate the effect of additional settlement that occurred since June, 2016.

We performed a literature search to obtain information on the potential strength degradation of the outrigger coupling beams. We obtained data on the construction and installation of the foundation piles and worked with SAGE Engineers, a geotechnical consultant retained by Paul Hastings LLP to improve our modeling of the pile foundation's response. We also reviewed updated building settlement data provided by Arup in June 2017.

Our supplemental analyses and evaluations confirm the conclusions of our October 2016 report. We conclude that although the coupling beams are expected to degrade in strength when the building is subjected to strong ground shaking, this does not affect the response to earthquake shaking of the building overall, which has adequate capacity to withstand the Maximum Considered Earthquake shaking specified by the present San Francisco Building Code. Further, the foundation piles are adequate to withstand the shaking associated with such an event. Finally, the additional settlement that has occurred since June 2016 has not caused any significant impact on stress in the structure to date, nor had significant impact on the building's stability or ability to

resist strong earthquakes; and does not change any of our conclusions expressed in our October 2016 report or in this report of our supplemental analyses and evaluations.

SUPPLEMENTAL REPORT
FOUNDATION SETTLEMENT INVESTIGATION
301 MISSION STREET
SAN FRANCISCO, CALIFORNIA

1. INTRODUCTION

1.1 Background

The building at 301 Mission Street, San Francisco, California, also known as the Millennium Tower, is a fifty-eight-story, reinforced concrete structure developed by Mission Street Development LLC in 2007 for sale as residential condominium units. The building is located at the southeast corner of Mission Street and Fremont Street. The building comprises two separate structures, a fifty-eight-story tower and an adjacent, functionally connected, twelve-story reinforced concrete podium.

The project site is underlain by approximately 15 ft of 19th century fill, approximately 30 ft of recently deposited clays and silts, known as Bay Mud; approximately 50 ft of dense silty sands, known as the Colma formation; more than 100 ft of silts and clays known as Older Bay Clay and then by Franciscan formation bedrock. The tower structure is founded on a thick reinforced concrete mat, supported by 946, 14 in. square precast concrete piles that extend into the Colma formation at depths that vary from approximately 50 to 90 ft below surrounding grade. Since construction initiated, the tower has been experiencing noticeable settlement. At this time, total settlement exceeds 16 in. with some dishing and tilting of the mat foundation.

In 2014, Paul Hastings LLP retained Simpson Gumpertz & Heger Inc. (SGH) on behalf of Mission Street Development LLC to provide an independent evaluation of the effects of this settlement on the building's stability and earthquake resistance. SGH completed these analyses and prepared a preliminary draft report of findings. The building continued to settle. In 2016, Paul Hastings LLP again retained SGH to update our analyses in order to evaluate the effect of additional settlement which had occurred since our initial investigation. On 3 October 2016, we published a report documenting the results of our investigation and our conclusion that building settlement to date had not impacted the building's stability or its ability to resist strong earthquake shaking.

Following publication of our investigation report in October 2016, the City of San Francisco (City) retained an independent engineering review panel to provide the City an opinion as to the safety of the building. This independent panel reviewed our October 2016 report, met with us over a period of approximately 7 months, and requested additional data and analyses in support of their investigation. This report presents the supplemental analyses we performed in response to the review panel's requests.

1.2 Objective

The overall objective of our investigation, since inception of our work, is to determine if the differential settlement experienced by the 301 Mission Street building significantly affects the building's stability and capacity to resist strong earthquakes.

A secondary objective of our investigation, and the subject of this report, is to provide the City-appointed review panel information on the building's structural characteristics to assist the panel in responding to questions posed to the panel by the City. We also revisit our prior conclusions given the updated evaluations we performed at the request of the City panel.

1.3 Scope of Work

Our 3 October 2016 report presents the scope of work we performed in our initial investigation. Supplemental tasks we performed, at the request of the City's independent panel, include:

1. Modify our nonlinear settlement and earthquake analysis to simulate the effects of potential strength degradation of outrigger coupling beams under cyclic earthquake action.
2. Modify our nonlinear settlement and earthquake analysis to use re-scaled ground motions complying with the requirements of ASCE 7-10 for MCE_R shaking.
3. Evaluate the axial, flexural and shear demands on individual piles.
4. Evaluate the effect of additional settlement that has occurred since our analyses presented in our October 2016 report.
5. Meet with the City panel to present our results and respond to supplemental questions.
6. Prepare this report documenting our findings and conclusions.

Our original work scope and also this supplemental work scope address only the fifty-eight-story tower and its foundation, not the adjacent podium.

1.4 Project Description

The building at 301 Mission Street, San Francisco, California, also known as the Millennium Tower is a fifty-eight-story, 628 ft tall, reinforced concrete tower with an adjacent, structurally separate, podium. The podium structure is further divided into a three-story low-rise and a twelve-story mid-rise. Refer to our 3 October 2016 report for a more complete description of the building.

2. SOURCES OF INFORMATION

Our 3 October 2016 report presents a complete list of documents we reviewed as part of our original work scope. This section discusses additional information we obtained to support our supplemental analyses.

2.1 Outrigger Coupling Beam Hysteresis

The building's outrigger elements have low aspect (length to depth) ratio of 0.5. Recent testing of coupling beams has typically used specimens with aspect ratios in the range of 2.5 or higher. We therefore focused our literature search on test data for walls with lower aspect ratios.

2.1.1 Paulay and Binney

Paulay and Binney[1] report the results of cyclic testing of a series of low aspect ratio coupling beams that formed the basis for the ACI 318 requirements for diagonally reinforced coupling beams. Paulay and Binney tested four specimens with diagonal reinforcement, negligible conventional reinforcing steel and minimal hoop reinforcement. Three specimens had aspect ratios of 1.29 and one specimen had an aspect ratio of 1.0. One specimen (Figure 1) with an aspect ratio of 1.29 exhibited stable strain hardening behavior with minimal stiffness degradation through cyclic response to 0.01 radian followed by a monotonic push to 0.06 radian. A second similar specimen (Figure 2) exhibited stable, strain hardening response through multiple unsymmetrical cycles to 0.03 radians positive displacement and 0.06 radians negative displacement. The specimen with an aspect ratio of 1.0 (Figure 3) exhibited stable behavior in response to cyclic positive loading to 0.06 radians before initiation of buckling of the diagonal bars in compression.

2.1.2 Canbolat, Parra-Montesinos and Wight

Canbolat, Parra-Montesinos and Wight[2] report the results of a testing program conducted at the University of Michigan to evaluate the behavior of low aspect ratio coupling beams using fiber-reinforcement of concrete to control cracking and spalling behavior. One specimen, used as a control, was a standard diagonally reinforced coupling beam with an aspect ratio of 1.0 (Figure

[1] Paulay, T. and Binney, J.R. "Diagonally Reinforced Coupling Beams of Shear Walls SP 4-26" ACI Structural Journal, 1974, pp.579-598

[2] Canbolat, B.A., Parra-Montesinos, G.J., Wight, J.K., "Experimental Study on Seismic Behavior of High Performance Fiber-Reinforced Cement Composite Coupling Beams, 102 S-17", *ACI Structural Journal*, January –February 2005

4). This specimen exhibited stable behavior in response to fully reversed cyclic loading to 0.04 radians. Under positive loading (loading within the upper right hand quadrant of the force-deformation plot), the specimen exhibited stable response with no apparent degradation. Under negative loading (loading within the lower left hand quadrant of the plot) the specimen exhibited stable response through the first cycle to -.02 radian, then lost approximately 25% of its strength. Strength under negative loading then stabilized through displacements to 0.04 radian.

2.2 Pile Capacity Data

2.2.1 Information Obtained from Shop Drawings

We reviewed a series of documents prepared by Kie-Con, the pile supplier for the project, documenting the construction of the precast concrete piles. Specifically we reviewed:

- Kie-Con Drawing 568-7 Revision 2, dated 19 August 2005 and entitled: 14" Square P/S Concrete Pile Details, Production Pile, 301 Mission Street, San Francisco, California.
- Kie-Con Drawing 568-8, Revision 0, dated 16 June 2005 and entitled: 14" Square P/S Concrete Pile Details, Indicator Pile, 301 Mission Street, San Francisco, California.

Drawing 568-7 (Figure 5) shows:

1. Production piles are 14 in. square.
2. Concrete has a specified 28-day compressive strength of 7,000 psi.
3. Prestress reinforcement consist of eight strands of 1/2 in. diameter, Grade 270 steel, arranged in a circular pattern. Strands extend 4 ft beyond the top of the pile for embedment in the mat.
4. Eight #8, Grade 60 reinforcing bars (either ASTM A615 or A706), 23 ft long are present at the top of each pile and project 4 ft beyond the pile top for embedment in the mat.
5. The pile tops are provided with a 10 ft long cut-off length.

Drawing 568-8 (Figure 6) shows that Indicator Piles are identical to Production Piles except that a total of 20 ft long cut-off length is provided.

2.2.2 Information Obtained from Treadwell & Rollo

We reviewed a 2 May 2005 letter report prepared by Treadwell & Rollo re: Summary of Pile Driving, 301 Mission Street, San Francisco, California. Treadwell & Rollo served as project geotechnical engineer for the original development of the building. The letter includes a pile plan for the project, reproduced here as Figure 7. This pile plan indicates a numbering system for the piles and also the locations of Indicator Piles. Attachments to this letter also include a table, reproduced in Appendix A to this report that indicates for each pile: the date driven; furnished length; design cut-off elevation; actual top of pile elevation; approximate tip elevation; approximate cut-off length; and number of blows per foot during the last 5 ft of driving.

2.2.3 Information Obtained from SAGE Engineers

SAGE Engineers is a geotechnical engineering consultant, retained on behalf of Mission Street Development LLC by Paul Hastings LLP, to evaluate various matters related to the foundation behavior. SAGE Engineers evaluated geotechnical reports prepared by Treadwell & Rollo, as well as available data for adjacent sites prepared by other geotechnical engineers, reviewed pile driving and other construction records for the 301 Mission project, and performed independent calculations of foundation geotechnical capacity and settlement characteristics. At our request, SAGE provided data related to the likely capacity of piles and resistance of soils for our use in our analyses.

Primarily based on the driving data, shown in Appendix A, SAGE provided a spreadsheet indicating their estimate of pile ultimate static axial compressive capacity as limited by a combination of skin friction and end bearing in the surrounding soils. The spreadsheet provides a unique value for each pile. Projected values generally range from approximately 400 kips to 1,175 kips. Figure 8 is a plan view of the foundation derived from the tabulated values showing these capacities in the form of contours. The lowest values occur near the northeast corner of the core. These capacities relate to the ability of the piles to transfer loads to the surrounding soil and do not represent the structural capacity of the pile itself.

In addition to estimates of pile ultimate compressive capacity, SAGE provided a plot, reproduced here as Figure 9, indicating the load-deformation characteristics of the piles under static axial load normalized to the ultimate compressive capacity. This figure additionally shows a similar relationship for the piles under dynamic compressive loading, applicable to seismic load cases and also static and dynamic uplift loading.

SAGE also provided an estimate of the modulus of subgrade reaction of the soils beneath the PG&E vault, which is directly supported by soil at the south end of the mat. Figure 10 presents this data.

2.3 Settlement Data

Since 2009, Arup, geotechnical engineer for the Transbay Transit Center project under construction adjacent to and south of the 301 Mission Street Building, and also the Salesforce Tower, across Fremont Street to the west of the building, has obtained and published survey data at 33 points across the plan of the 301 Mission tower mat. Arup periodically updates this data. As noted in our October 2016 report, we obtained information on the building's settlement from a June, 2016 Arup report on settlement and compared this against earlier reports of settlement used as the basis for analyses we conducted in 2014. That report included plots, produced by us using the Arup data, showing the settlement profile across different sections of the mat between 2014 and 2016. Figure 11 presents a plot showing the change in settlement for 31 of Arup's data points over the period June 2016 to June 2017. Data for two of the points was not reported by Arup.

3. STRUCTURAL ANALYSIS

3.1 Coupling Beam Degradation

Our 3 October 2016 report documents the three-dimensional, nonlinear, PERFORM-3D, analytical model we developed to simulate the 301 Mission Street building's response to foundation settlement and earthquake ground motions. At the request of the City-appointed review panel, we modified our analytical model to incorporate strength degradation for the low-aspect ratio coupling beams located in outriggers at Levels 8 through 12, 17 through 21 and 42 through 48, along framing Lines C and F. Figure 12 presents an elevation of a typical outrigger indicating the locations of these low aspect ratio beams.

Of the available test data for low aspect ratio walls, the tests by Paulay and Binney indicate relatively little strength degradation while the test by Canbolat, et. al. do show some degradation. This is likely because the Canbolat tests used a ramped, fully reversed, cyclic loading protocol similar to that commonly used as the basis for most recent nonlinear response modeling, while the Paulay tests employed a loading protocol more like that of real earthquakes, with little reversed cyclic loading. Recent research, by Lignos[3] and others suggests that fully reversed cyclic loading protocols over-estimate the strength degradation that typically occurs in structures in response to earthquakes. However, to be consistent with the modeling approaches used for other elements, and to conservatively model the effects of strength degradation, we adopted the Canbolat tests as the basis for our updated hysteretic model for the coupling beams.

For these elements, we implemented the degrading hysteretic model illustrated in Figure 13. The cyclic backbone for this model maintains elastic-perfectly-plastic behavior through a shear deformation of 2% radians then degrades to a residual strength equal to 25% of the yield strength at a shear deformation of 4% radians. The model retains this residual displacement through shear deformation of 6% radians, after which it has nil residual strength. Figure 14 shows an overlay of the response obtained from this hysteretic model with that recorded in the University of Michigan testing discussed in Section 2.1.2 of this report. The hysteretic model conservatively represents the behavior obtained in the test and exhibits greater strength and stiffness degradation than did the tested specimen.

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[3] Applied Technology Council, *Recommended Modeling Parameters and Acceptance Criteria for Nonlinear Analysis in Support of Seismic Evaluation, Retrofit and Design, NIST GCR 17-917-45,* National Institute of Standard and Technology, Gaithersburg, Md., 2017

3.2 Ground Motions

The City-appointed review panel requested that we re-evaluate the building using the degrading hysteretic model for outrigger coupling beams described in the previous section and a suite of ground motions selected and scaled to the requirements of ASCE 7-10[4]. ASCE 7-10 is the loading standard referenced by the present edition of the San Francisco Building Code. We selected and amplitude-scaled a suite of seven ground motion pairs to the criteria of ASCE 7-10 Section 16.1.3.1. Section 16.1.3.1 states:

> "*Where three-dimensional analyses are performed, ground motions shall consist of pairs of appropriate horizontal ground motion acceleration components that shall be selected and scaled from individual recorded events. Appropriate ground motions shall be selected from events having magnitudes, fault distance, and source mechanisms that are consistent with those that control the maximum considered earthquake. Where the required number of recorded ground motion pairs is not available, appropriate simulated ground motion pairs are permitted to be used to make up the total number required. For each pair of horizontal ground motion components, a square root of the sum of the squares (SRSS) spectrum shall be constructed by taking the SRSS of the 5% damped response spectra for the scaled components (where an identical scale factor is applied to both components of a pair). Each pair of motions shall be scaled such that in the period range from 0.2T to 1.5T, the average of the SRSS spectra from all horizontal component pairs does not fall below the corresponding ordinate of the response spectrum used in the design, determined in accordance with Section 11.4.5 or 11.4.7.*"

Table 1 indicates the seven records we selected and scaled for our analysis. The table indicates for each record the earthquake event, station name, fault mechanism, magnitude, distance of the recording station from the site and scale factor we applied. Figure 15 overlays plots of the scaled SRSS spectra for the seven records with the MCE_R spectrum specified in ASCE 7 Section 11.4.5; the average of the scaled SRSS spectra; and the period range (0.2T to 1.5T) over which the average SRSS spectrum is required to envelope the MCE_R spectrum. Figure 16 compares the average X and Y components of the records, as they were applied to the model against the MCE_R spectrum.

[4] American Society of Civil Engineers. *Minimum Design Loads for Buildings and Other Structures, ASCE 7-10*; ASCE, Reston, VA

Table 1 – Suite of Ground Motion Records

Earthquake	Mag.	Rupture Type	Station	Distance (km)	Scale Factor
1989 Loma Preita	6.9	Reverse Oblique	West Valley College	9.3	1.40
1999 Koaceli, Turkey	7.5	Strike Slip	Duzce	15.4	1.24
1999 Chi Chi Taiwan	7.6	Reverse Oblique	TCU123	14.9	1.47
1990 Manjil, Iran	7.4	Strike Slip	Abbar	12.6	1.87
2002 Denali, Alaska	7.9	Strike Slip	Pumps Station #10	2.7	1.25
2010 El Mayor, Mx	7.2	Strike Slip	Michoacan de Ocampo	15.9	1.86
2010 Darfield, NZ	7.0	Strike Slip	HORC	7.3	0.95

3.3 Pile Modeling

To more accurately capture the demands on the foundation mat and the piles supporting this mat, we updated the way in which our analytical model represents the soil and piles supporting the mat and the effects of site settlement. We also implemented a series of elements to represent the lateral behavior of the piles under earthquake response. Section 3.3.1 describes our updated modeling of vertical foundation response and Section 3.3.2 describes our implementation of lateral behavior of the piles in our analytical model.

3.3.1 Vertical Foundation Response

We used a staged analysis approach to represent the vertical stiffness and action of the piles. As noted in our October 2016 report, our model does not explicitly include each of the 946 piles. To facilitate the meshing of the mat and the soil supporting the mat in our model, we use a total of 853 pile/soil springs (738 springs representing piles and 115 representing soil), distributed throughout the foundation plan, and located at the nodes connecting the grid beams that represent the mat. The 115 soil springs are all located at the 3 ft thick soil-supported region along the south edge of the mat.

As a first stage in the analysis we applied springs representing the soil/pile stiffness under long-term loading. We applied these as non-linear, compression only springs. In the soil-supported portion of the mat these springs are simply taken as having the force-deformation relationship shown in Figure 10, factored by the tributary area for each spring. For the pile springs, we obtained the value of the spring force-deformation relationship by interpolating between the data provided by SAGE (Figure 8 and Figure 9) for the piles nearest to the grid point at which we applied a spring, and then factoring these properties by the tributary area for each spring. We used the Kriging Method available in the Surfer 8 computer program to perform the 2-dimensional interpolation.

We next applied gravity loads (Dead Load + 25% Live Load) to the structure, resulting in downward displacement of the pile springs and deformation of the mat. We then iteratively applied thermal loading to the individual piles to produce a deformed shape of the mat that reasonably represented the surface we obtained from the 10 June 2016 Arup settlement data. Figure 17 compares the deformation contours across the mat resulting from our model, and those computed from the settlement data.

As a next step in the analysis we applied an additional set of springs at each of the node points representing a pile support. One compression-only spring added at each node represents the incremental pile strength and stiffness estimated by SAGE for seismic response and illustrated in Figure 9 as a solid blue line. We also added a tension-only spring to represent the dynamic strength and stiffness of the piles in uplift, as indicated in Figure 9. We connected the tension only springs to the mat using a combination of gap and hook elements, such that the springs are effective only when the piles actually experience uplift forces. We determined the strength and stiffness values for each of these spring elements using the normalized relationships in Figure 9 and the long term compressive capacities obtained using the geographic interpolation approach described earlier.

3.3.2 Lateral Foundation Response

To determine the lateral response of the piles we conducted a series of individual nonlinear static analyses of a typical pile to determine its force-deformation characteristics at different levels of displacement and under different levels of axial loading.

The piles have three critical sections with unique reinforcing including a top section, having eight #9 vertical reinforcing bars, 8-1/2 in. diameter prestressing strands, and W10 spiral reinforcing at a 2 in. pitch; a middle section containing the same prestressing steel and spiral reinforcing, but no vertical steel bars; and a bottom section having the same prestressing steel, no vertical steel bars, and larger, W4 spirals at a larger, 6 in. pitch. Figure 5 and Figure 6 show the location of these three sections along the pile respectively for production piles and indicator piles.

Notes on the pile drawings (Figure 5 and Figure 6) indicate that pile cut-off lengths of 10 ft and 20 ft are provided respectively on production and indicator piles. The cutoff length is a sacrificial section at the pile top having the same reinforcing as the pile top and intended to be removed in the field, if necessitated by the pile reaching refusal (design driving resistance) without driving to the design length. We performed independent calculations of the required development length for the prestressing and mild reinforcing steel and determined that in actuality, the production piles have 12 ft-3 in. of sacrificial length at the top.

We used XTRACT Version 3.0.7 software to perform section analysis of the three different pile sections and determined both their axial force-moment envelopes and their moment-curvature relationships under a series of axial loads ranging from 0 to 950 kips. Originally developed at the University of California at Berkeley, XTRACT is presently maintained and marketed by the TRC Company of Rancho Cordova, California. XTRACT uses a fiber element formulation to evaluate the nonlinear behavior of reinforced concrete sections comprising confined and unconfined concrete, reinforcing steel and prestressing steel. This software is widely used to evaluate the nonlinear force-deformation behaviors of concrete elements subjected to bending and axial loads.

Next, we used LPile, version 2016.9.08 to obtain P-Y values for the soil at various depths below grade. LPile, developed and marketed by Ensoft, Inc. of Austin, TX, was specifically developed to evaluate the lateral resistance of piles in soil under different levels of applied displacement. The program models piles as a linear series of beam-column elements, with user-defined linear or nonlinear properties supported laterally by a series of nonlinear springs. The software has default properties for spring nonlinear behavior based on input of basic geotechnical data including soil type and soil index properties. We used the soil properties presented for boring B-1 in the 2005 Treadwell & Rollo[5] project geotechnical report. We used an in-house computer program to calculate a group factor for the piles based on the empirical method outlined in Reese[6] et al. We obtained a group factor of 0.6 and assigned it to LPile as a modifier. We then used LPile to obtain P-Y curves that represent the nonlinear force-deformation characteristics of the soil strata at the site. Figure 18 shows some of the P-Y curves we obtained. The figure shows representative plots at depths of 2.5, 7.5, 12.5, 17.5, 22.5 and 27.5 below the top of pile. We obtained P-Y curves for the soil in 2 ft depth increments for the upper 25 ft and in 4 ft increments

[5] Treadwell & Rollo, *Revised Geotechnical Investigation, 301 Mission Street, San Francisco, California, Project no. 3157.02* 13 January 2005
[6] Reese, L.C., Isenhower, W.M., and Wang, S-T, Analysis and Design of Shallow and Deep Foundations, Dec 2007

below. Figure 19 illustrates the definition of depth and the boring log data we used for our analysis.

Next, we developed a simple nonlinear model using SAP 2000, version 17.3.0. SAP 2000 is a general structural analysis finite element program developed and marketed by Computers and Structures Inc. of Berkeley, California. It is used by engineers worldwide to evaluate linear and nonlinear behavior of structures. Figure 20 illustrates our SAP 2000 model. In this model, we implemented nonlinear soil springs obtained from the LPile analysis and illustrated in Figure 18 and moment-curvature properties for the different stations along the pile length, obtained from our XTRACT analyses. We modeled the pile as having a fixed-end condition at the top. For each of eleven axial loads, representing the range of gravity loads on individual piles obtained from our PERFORM analysis under modeling of gravity loading and settlement effects, we performed three different non-linear static analysis cases: Case 1 having zero end rotation; Case 2 having positive 0.01 radian and Case 3 negative 0.01 radian of end rotation at the pile top. These end rotations (-0.01 radian to +0.01 radian) represent the range of pile end rotations predicted by our PERFORM analysis under gravity load and site settlement. Figure 21 presents the force-deformation plots we obtained from these thirty-three (eleven axial loads, three load cases each) individual non-linear static analyses.

Next, using the predicted gravity load and initial head rotation at each spring from our PERFORM analysis of the gravity load and settlement case, we performed 2-dimensional interpolation to determine the appropriate nonlinear force deformation curve for each pile spring from the set of analyses under varying head rotation and axial loads. We then summed these individual nonlinear force-deformation relationships to form the properties for a global nonlinear force-deformation behavior for each of positive translations to the north, east, south and west. As shown in Figure 22, the nonlinear force-deformation plots in each of these directions are quite similar. Therefore, we adopted a single nonlinear-force deformation relationship, shown in the figure as the 'global" force-deformation plot to represent the nonlinear behavior of the piled foundation in response to seismic shaking.

3.4 Acceptance Criteria

Table 2 below summarizes the acceptance criteria we used to evaluate building response to gravity loads, settlement and earthquake. This section provides brief discussion of the derivation of these criteria. Our October, 2016 report provide a more thorough presentation of this.

Table 2 – Nonlinear Acceptance Criteria

Element	Deformation	Limit (CP)
Core shear wall	Confined Concrete compressive strain, $\varepsilon_{cu,Compr}$	0.011
	Reinforcing steel tensile strain, $\varepsilon_{su,Tens}$	0.05
	Shear strain (drift ratio, Δ/h)	1.0%
Outrigger coupling beams	Shear strain	2.5%
Reinforced concrete frame beams	Plastic hinge rotation, θ_{pl}	varies 3.6%-5.0%
Embedded steel coupling beams	Plastic hinge rotation, θ_{pl}	3.0%
Reinforced concrete columns	Plastic hinge rotation, θ_{pl}	varies 0.8-0.9%
Pile cap foundation	Plastic hinge rotation, θ_{pl}	1.0%
Building	Interstory drift ratio	3.0%

3.4.1 Core Wall and Outrigger Column Compressive Strain

We computed permissible compressive stress-strain relationships for 7, 8, and 10 ksi concrete using the method developed by Mander and Chang[7]. We used vertical spacing of confinement reinforcing consistent with the core and outrigger wall details shown in the project drawings. We calculated ε_{cu} values ranging from 0.0225 to 0.0304. We conservatively reduced these values by a factor of 2.0, and adopted a limit of 0.011 for confined concrete compressive strain.

[7] Chang, G.A. and Mander, J.B., 1994, Seismic energy based fatigue damage analysis of bridge columns: Part I — evaluation of seismic capacity, NCEER Technical Report No. NCEER-94-0006. State University of New York, Buffalo, NY

3.4.2 Core Wall and Outrigger Column Tensile Strain

We adopted a limit of 0.05 for steel tensile strains. This value is commonly used for the design of tall buildings using performance-based procedures.

3.4.3 Wall Shear Strain

We defined shear behavior of concrete walls using the recommendations for walls with high axial load listed in ASCE 41-13 Table 10-20. The collapse prevention limit for such walls is 1.0% total shear strain.

3.4.4 Outrigger Coupling Beam Shear Strain

At the request of the City-appointed panel we modified our analytical model to incorporate strength degradation for the low-aspect ratio outrigger coupling beams. We adopted a collapse prevention limit of 2.5% total shear strain based on hysteretic results from testing by Canbolat, Parra-Montesinos and Wight and following the procedures of ASCE 41-13, Section 7.6.3.

3.4.5 Reinforced Concrete Beams

We used ASCE 41-13 Table 10-7 to define the backbone parameters and acceptance criteria of the reinforced concrete perimeter moment frame beams. We computed the shear stress and longitudinal steel ratio of these beams and used linear interpolation between the shear demands and reinforcement ratios given in Table 10-7 for conforming transverse reinforcement. We obtained CP inelastic rotation limits ranging from 3.6% to 5.0%.

For conventionally-reinforced concrete core wall coupling beams, we adopted the recommendations of Table 10-19 in ASCE 41-13 for beams with conforming transverse reinforcement and low shear stress. For those beams we used an inelastic rotation CP limit of 5.0%.

3.4.6 Steel Coupling Beams

We matched coupling beam nonlinear shear behavior including element stiffness, yield, and degradation characteristics to coupling beam testing performed by Dr. John Wallace[8] at UCLA.

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[8] Wallace, J.W., "Large-Scale Testing and Analysis of Concrete Encased Steel Coupling Beams under High Ductility Demands", *Proceedings of the 15th World Conference on Earthquake Engineering*, September 2012

We defined the limiting inelastic shear strain between 2.6% and 3.0% depending on the beam aspect ratio. This value corresponds to the initiation of strength loss in the beam. Test results indicate that beams are able to maintain a significant portion of their strength under rotations on the order of 7% to 13%.

3.4.7 Reinforced Concrete Columns

We used the values listed in ASCE 41-13 Table 10-8 for columns with high axial load to define the backbone parameters and acceptance criteria of the reinforced concrete perimeter moment frame beams. We computed the shear stress and vertical steel ratio of the columns and used linear interpolation between the shear demands and reinforcement ratios given in Table 10-8 for transverse reinforcement conforming to condition ii. We obtained CP inelastic rotation limits ranging from 0.8% to 0.9%.

3.4.8 Pile Cap Grillage

We used ASCE 41-13 Table 10-7 to define the backbone parameters and acceptance criteria for pile cap grillage beams. We assumed conforming transverse reinforcement and high shear stress to obtain the backbone parameters. We adopted a CP inelastic rotation limit of 1.0% which is less than the ASCE 41-13 recommended value of 2.0%.

3.5 Analysis Results

We evaluated the building's response to the seven scaled ground motions described in Section 3.2 using two different versions of our PERFORM-3D model. Both versions of the model implemented the degrading hysteresis model for the outrigger coupling beams described in 3.1 and the nonlinear vertical pile springs described in Section 3.3.1. Both versions also include the application of gravity loading and settlement as initial load steps. One of these models is fixed against lateral translation at the foundation level. The second model implements the nonlinear lateral springs at the base mat described in Section 3.3.2.

3.5.1 Fixed Lateral Translation Model

Figure 23 and Figure 24 respectively present the predicted peak absolute value story drift obtained from the analysis in the east-west and north-south directions. Mean drift in each direction is substantially below the 3% limit recommended by the PEER Tall Buildings Design

Guideline[9]. All records exhibit story drifts less than the 4.5% limit recommended by the PEER Guideline.

Figure 25 and Figure 26 present the residual drift obtained for each of the seven ground motions for response in the east-west and north-south directions, respectively. Average and individual drifts for the seven records are all substantially less than the 1% limit for mean residual drift recommended by the PEER Guidelines.

Figure 27 presents the demand to capacity ratios, in percent, for column plastic rotation. A value of 100% represents the ASCE 41-13 CP limit, which ranges from 0.008 to 0.009 radians for columns in this structure. The figure shows the maximum predicted value for any of the columns at each story, for each ground motion, and also the average peak value for all ground motions.

Figure 28Figure 28 presents the demand to capacity ratios, in percent, for compressive strains in concrete walls and also outrigger columns, which were also modeled using shell elements. As extreme fibers of the walls and the columns at all levels are confined, an acceptable value of strain is taken as 0.011. Demands are substantially below these values at all levels and for all ground motions.

Figure 29Figure 29 presents the demand to capacity ratios, in percent, for concrete core wall and outrigger column reinforcing tensile strains. An acceptable value of 0.05 is used. Demands are substantially below these values at all levels and for all ground motions.

Figure 30 shows the demand to capacity ratios for core wall shear strain. Strain for all records is substantially less than the 0.01 permitted by ASCE 41.

Figure 31 shows the demand to capacity ratios for coupling beams in outriggers. A value of 100% represents a chord rotation of 0.025 radian and the hysteretic relationship illustrated in Figure 13. All coupling beams degrade in strength without negative impact on other elements or overall stability.

Figure 32 presents demand to capacity ratios for reinforced concrete beams in moment frames and core walls. Acceptable values range from 0.03 radians to 0.05 radians depending on the

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[9] Pacific Earthquake Engineering Research Center, *PEER TBI Guidelines for Performance-based Seismic Design of Tall Buildings, Version 2, Report No. 2017/06*, April, 2017

beam horizontal reinforcing ratio and shear stress, in accordance with ASCE 41. All beams at all levels and for all ground motions are substantially below these values.

Figure 33 presents demand to capacity ratios for steel coupling beams. A value of 100% corresponds to a plastic hinge rotation of 0.03 radians. Mean demands are substantially less than this amount although two ground motions do produce locally somewhat higher demands at upper levels. The predicted demands are within the valid modeling range at all levels for all ground motions.

Figure 34 shows the peak mat grillage beam plastic rotation demands from the 1999 Chi Chi Taiwan, TCU3 record, which of the suite of records evaluated, was the most taxing on the mat. The peak value at any location is 0.003 radians. A value of 0.01 is taken as acceptable. All values are substantially less than this.

Figure 35 shows the peak compressive demand to capacity ratio for piles. A value of 1.0 indicates that a pile has achieved its estimated geotechnical capacity as indicated in Figure 8 and Figure 9. It is important to note that this plot shows the peak value obtained for all ground motions. Individual ground motions would have lower peak values at most piles. Regardless, no piles exceed a value of 0.98. Also, since pile geotechnical capacity exceeds pile structural capacity, a value of 1.0 would indicate the onset of a yielding mode of behavior, rather than failure.

Figure 36 indicates peak pile uplift demand to capacity ratios for all ground motions. As with Figure 35, any one ground motion will produce lower values for most piles. For an individual pile spring, a value of 1.0 represents the lesser of the pile geotechnical seismic capacity, as given by Figure 8 and Figure 9 or the steel yield strength, whichever is less. Several piles are predicted to have a peak demand equal to their capacity. This is suggestive of a benign yielding mode of behavior.

3.5.2 Nonlinear Lateral Translational Pile Springs

Figure 37 and Figure 38 respectively present the peak lateral displacement demands on the pile cap in the east-west and north-south directions, overlain on the global pile nonlinear force-displacement behavior previously shown in Figure 22. Predicted pile lateral displacement is typically less than 1 inch and does not approach the displacement at which foundation strength degradation initiates.

Figure 39 compares plots of mean story drift in the east-west and north-south directions for the model fixed against lateral translation at the base and the model with nonlinear lateral translational pile springs. In each of the two directions, the story drift predicted by our analyses is nearly identical for the two models.

4. DISCUSSION

In response to requests from the City's review panel we evaluated the effect of the following on our predictions of building response and behavior:

1. Inclusion of strength degradation in hysteretic modeling of outrigger coupling beams.
2. Selection and scaling of ground motions to comply with the procedures in ASCE 7-10.

In addition, the panel requested that we evaluate the demands on foundation piles.

As described in Chapter 3 of this report, we modified our PERFORM-3D model used in our previous analyses to include a strength-degrading hysteretic behavior for the coupling beams, as described in Section 3.1. We also improved representation of foundation piles to represent both their nonlinear vertical and lateral behaviors.

The updated outrigger coupling beam model, updated suite of ground motions, and improved representation of the piles had negligible effect on our predictions of the behavior of the building superstructure, when subjected to MCE motions. The coupling beams degrade in strength without negative impact on other structural elements, which have adequate capacity to resist these ground motions. The building retains adequate lateral resistance in other elements to remain stable under these ground motions and to maintain lateral drift under these earthquake motions at levels that are comparable to those predicted by our earlier analyses.

Compared with our earlier modeling, our updated model, incorporating pile behavior and resistance information obtained from SAGE Engineers, provides a more reliable estimate of the demands on piles under the combined effects of dead and live loads, settlement and MCE shaking. Although our analyses predict demands on some piles close to their computed capacities, these analyses indicate that the foundation has adequate strength to support the structure. Of particular importance, pile capacity is generally controlled by the geotechnical capacity, that is the ability of the piles to transfer load to the surrounding soil, rather than structural capacity. Should overstress of individual piles occur, this will result in yielding of the pile to soil interface, which allows deformation to occur without loss of load carrying capacity. This should enable the structure to experience demands substantially larger than we have evaluated without failure.

Our analyses reported above are based on settlement data reported by Arup in June 2016. Following completion of these analyses, the City's panel requested that we evaluate the effect of settlement that occurred since that time.

Figure 49 through 56 of our October 2016 report compare settlement profiles for the mat across east-west and north-south framing lines, based on Arup's measurements in June 2014 and June 2016. These figures indicate that during that two-year period settlement of the mat consisted largely of downward translation and tilting to the west, with the building undergoing primarily rigid body translation. As described in our October 2016 report, we found negligible difference in the effect on the building of the additional settlement that had occurred over that two-year period. This is also consistent with the building moving as a rigid body. Under such conditions the only change in stress that occurs in the building is a result of P-delta effects, as the structure leans to the side and the line of action of the building's weight is displaced relative to the building's center of resistance.

Figure 11 of this report compares the settlement of 31 of the 33 measurement points during the period between June 2016 and June 2017. The profiles indicate continued motion of the building as a rigid body without noticeable difference from linear differential settlement across the mat. In this period approximately 1/2 in. additional settlement occurred at the west edge of the mat than at the east edge. Given the 100-foot width of the mat, this amounts to an incremental tilting of the building of 0.04%. This amount is negligible and has not caused any significant impact on stress in the structure.

5. CONCLUSIONS

Our updated analyses confirm the findings of our earlier analyses, as set forth in our October 2016 report. Specifically, these analyses confirm that settlement recorded to date has not compromised the ability of the building to resist strong earthquakes. Our analyses also confirm that the response of the outrigger coupling beam elements to seismic demands does not significantly affect the building's earthquake behavior and the building otherwise meets criteria commonly used for the design of tall buildings today using performance-based design procedures. Pile foundations are adequate to resist the MCE demands. Further, given the current pattern of settlement, the additional settlement that has occurred since June 2016 has not caused any significant impact on stress in the structure, nor had significant impact on the building's stability or ability to resist strong earthquakes; and does not change any of our conclusions expressed in our October 2016 report or in this report of our supplemental analyses and evaluations.

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ILLUSTRATIONS

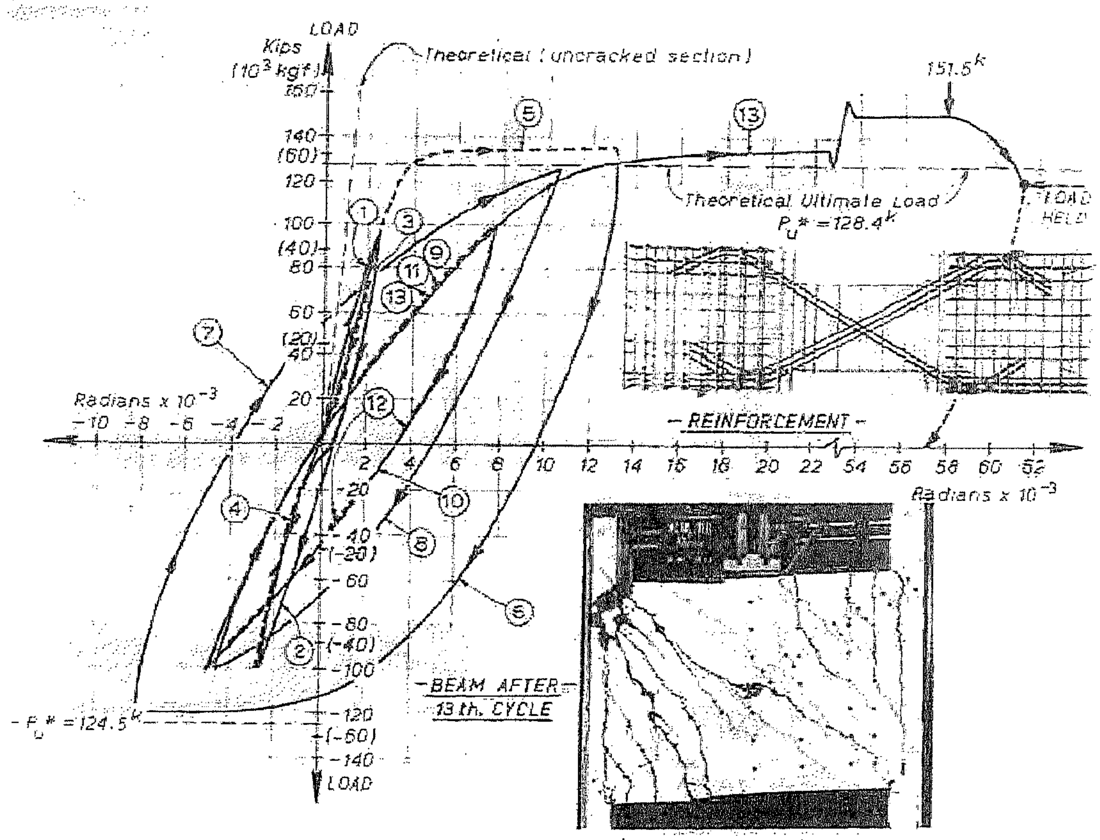


Figure 1. Paulay and Binney Specimen 316

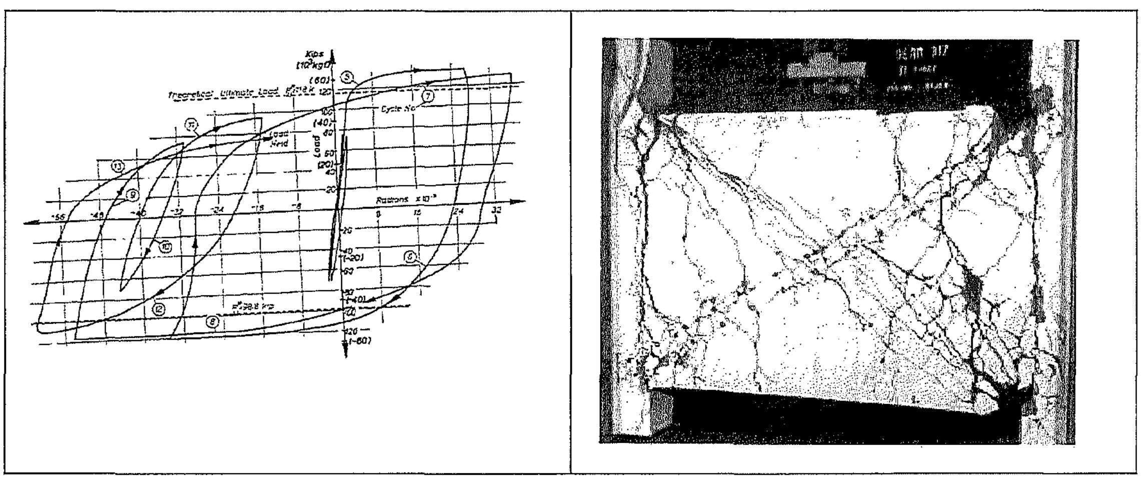


Figure 2. Paulay and Binney Specimen 317

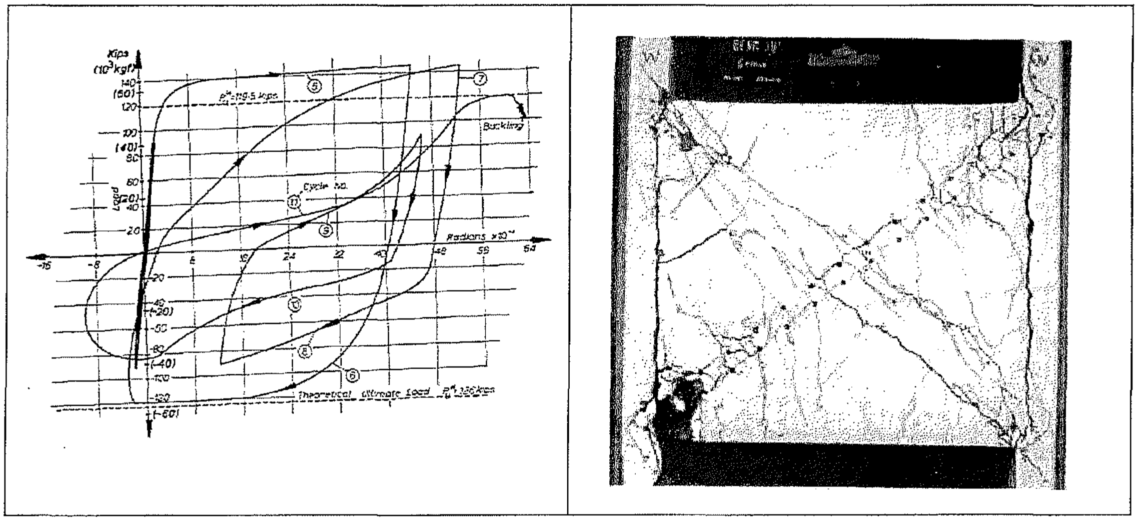


Figure 3. Paulay and Binney Specimen 395

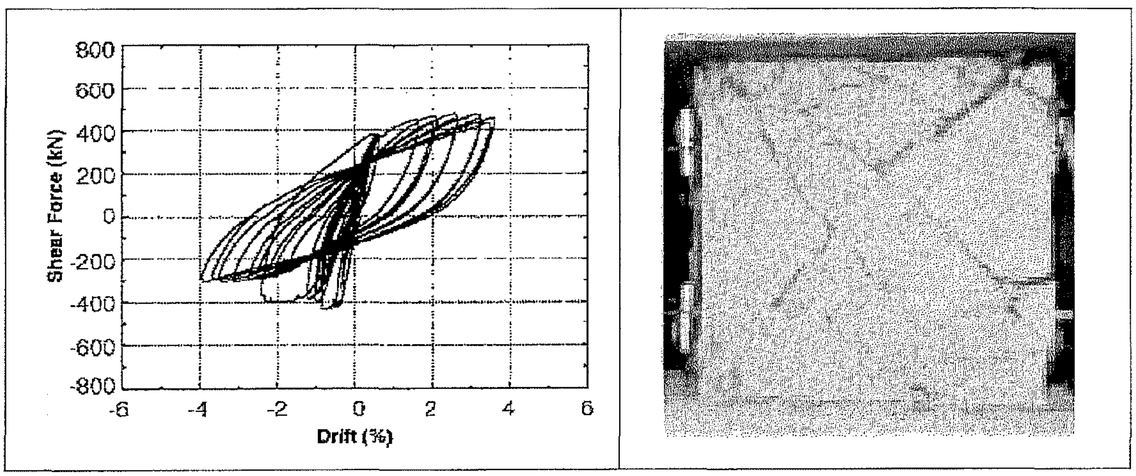


Figure 4. Canbolat, et. al. Control Specimen

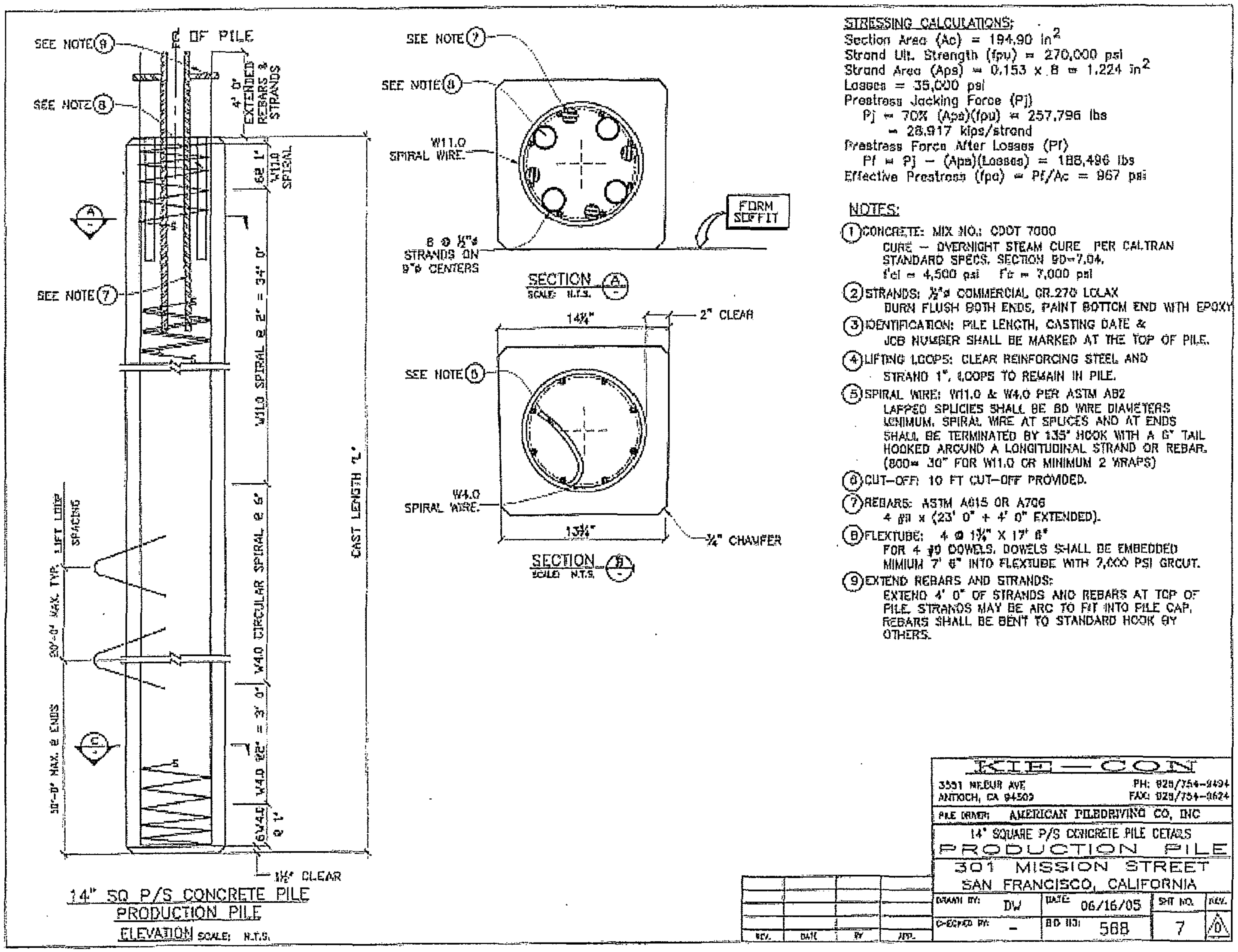


Figure 5. KieCon Drawing 568-7, Production Pile

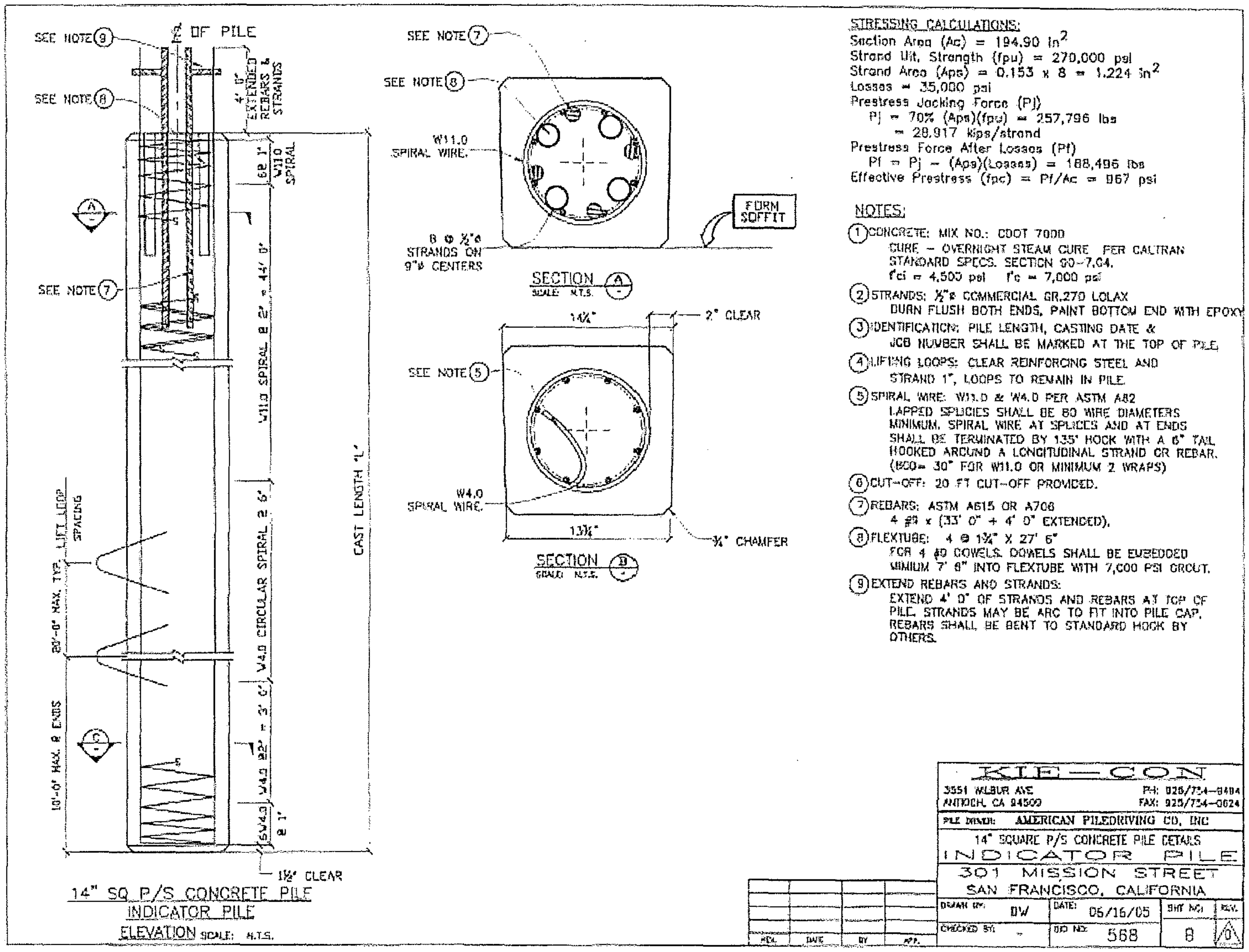


Figure 6. KieCon Drawing 568-8, Indicator Pile

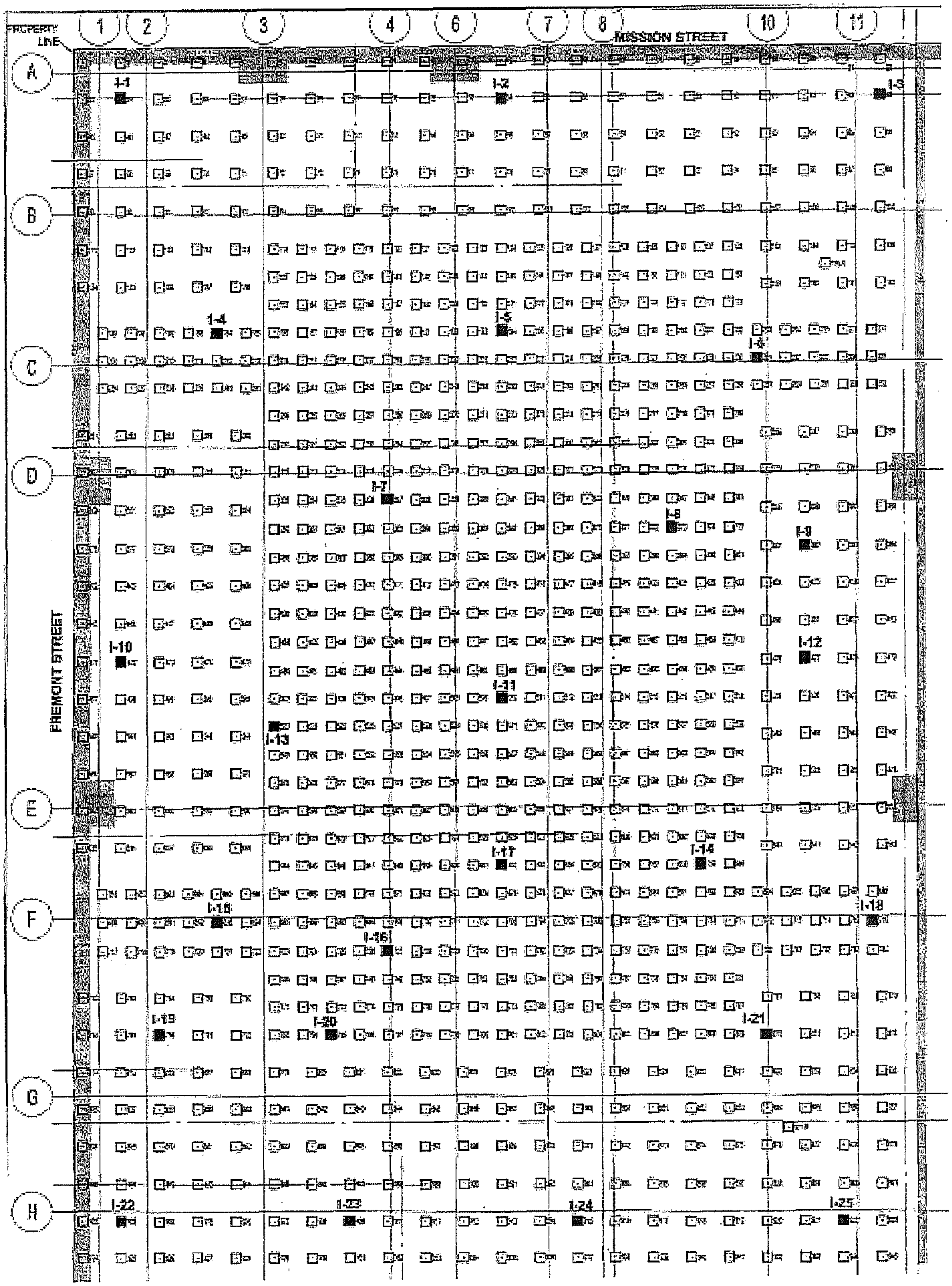


Figure 7. Pile Plan (Treadwell & Rollo)

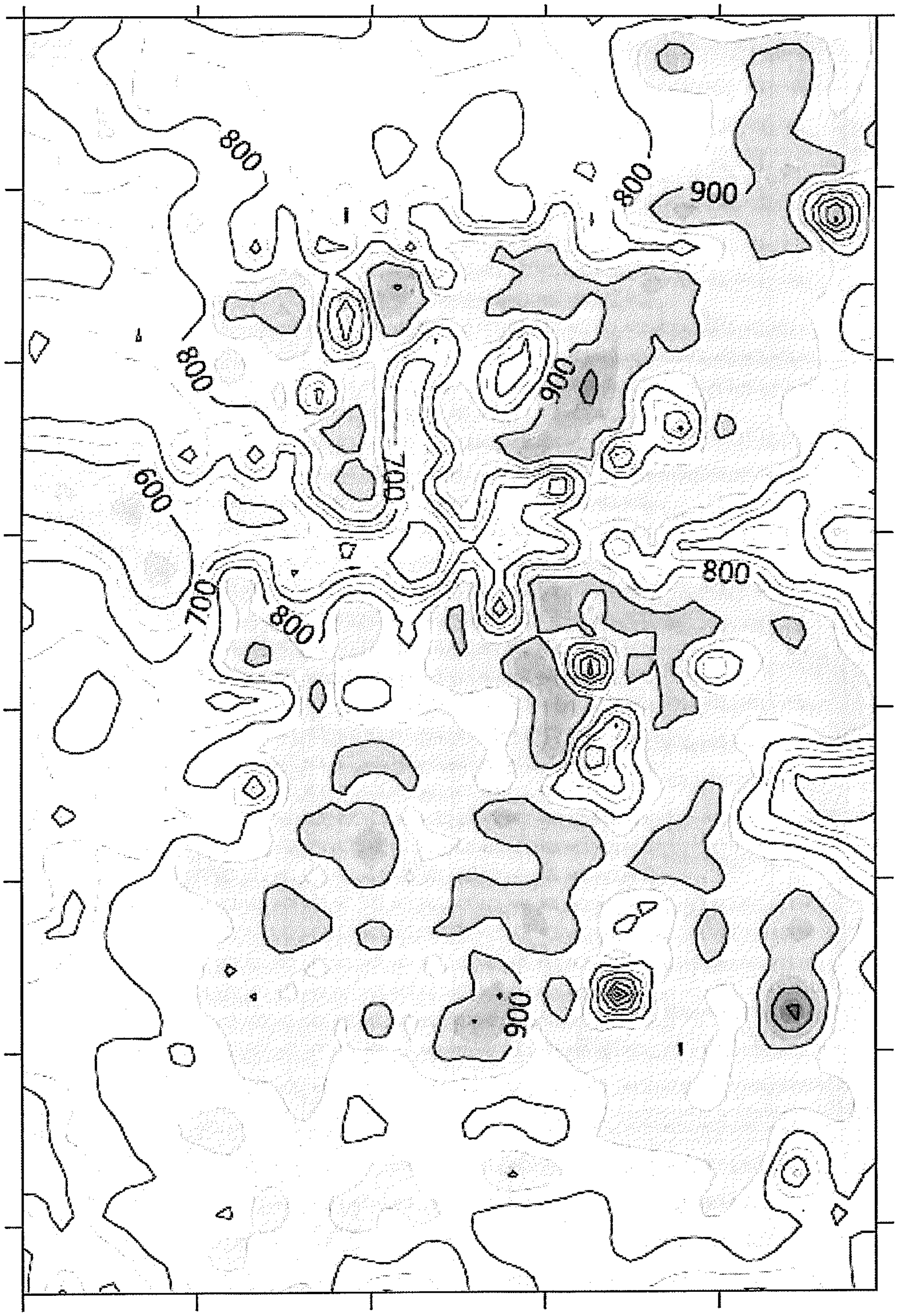


Figure 8. Estimated Ultimate Long Term Static Axial Pile Capacity (SAGE)

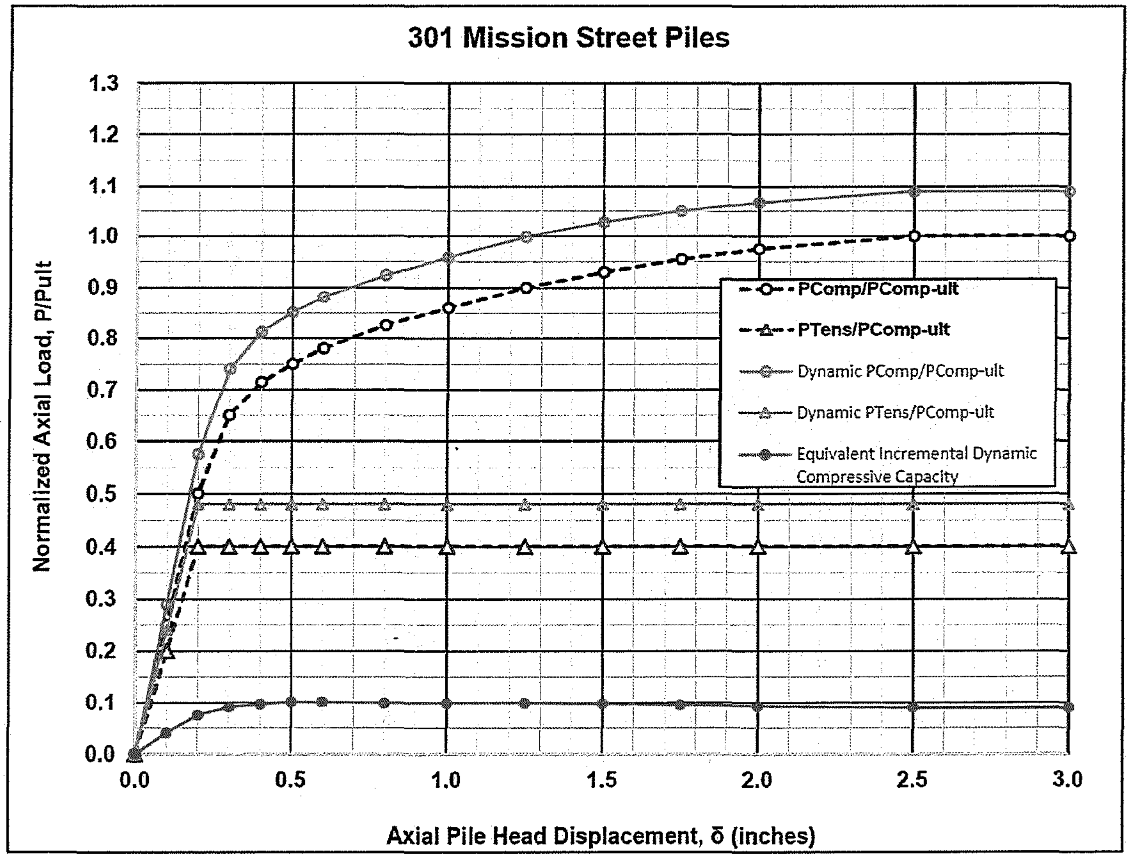


Figure 9. Pile Load – Deformation Characteristics (SAGE)

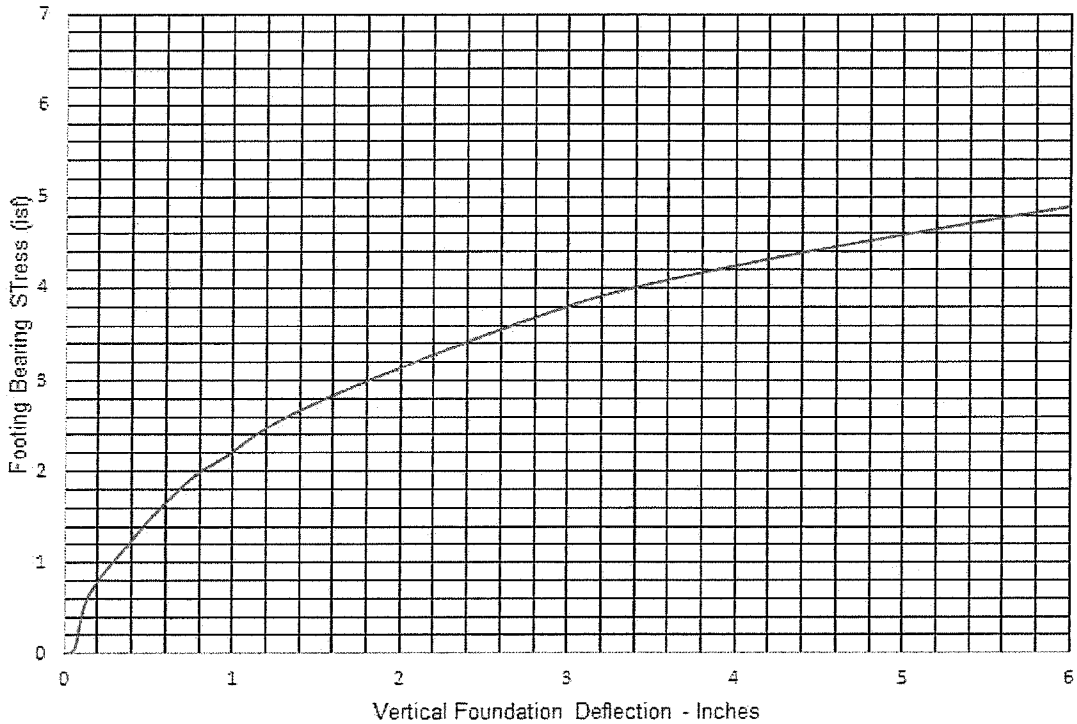


Figure 10. Soil Modulus of Subgrade Reaction (SAGE)

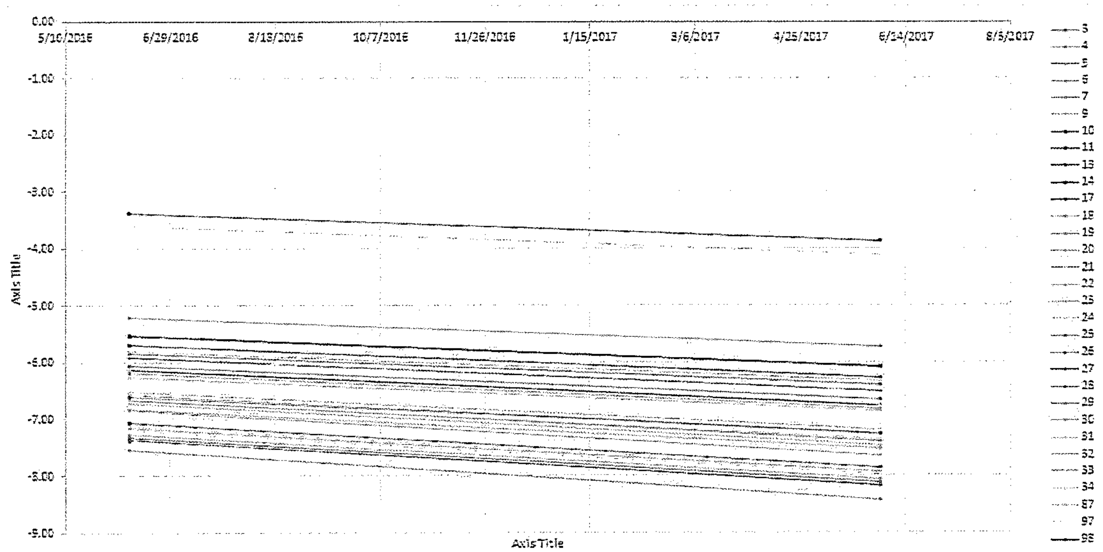


Figure 11. Settlement data, June 2016 through June 2017

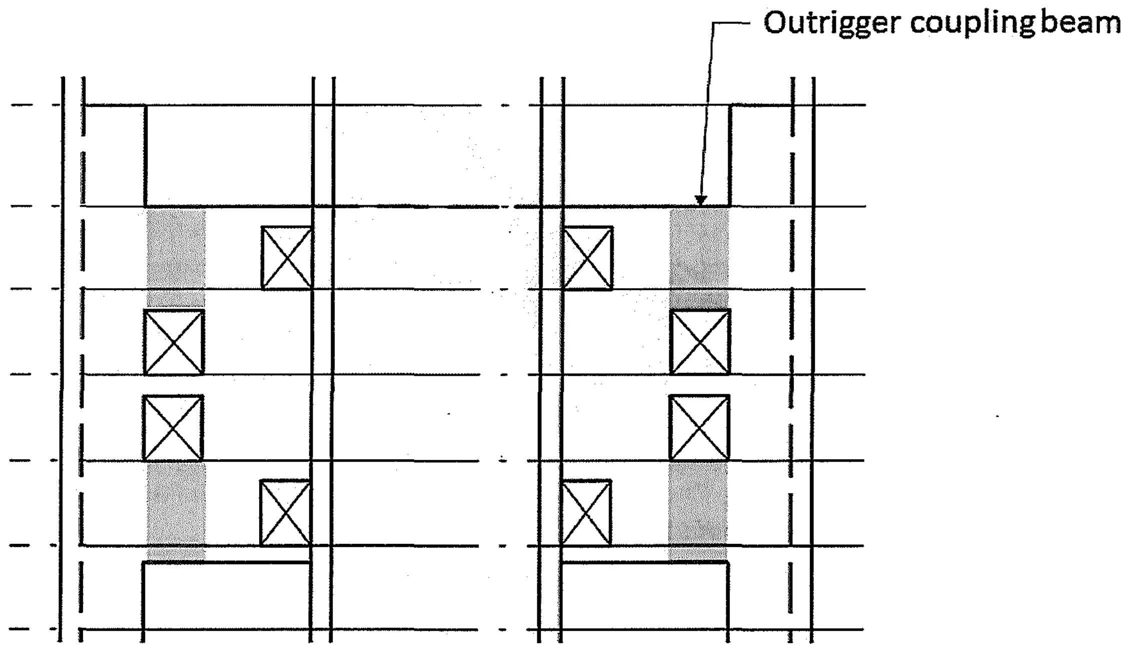


Figure 12. Outrigger Elevation Showing Coupling Beams

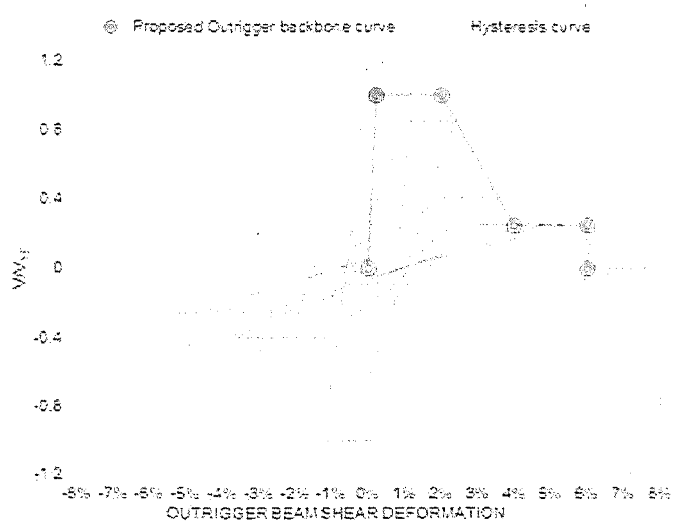


Figure 13. Coupling Beam Degrading Hysteretic Model

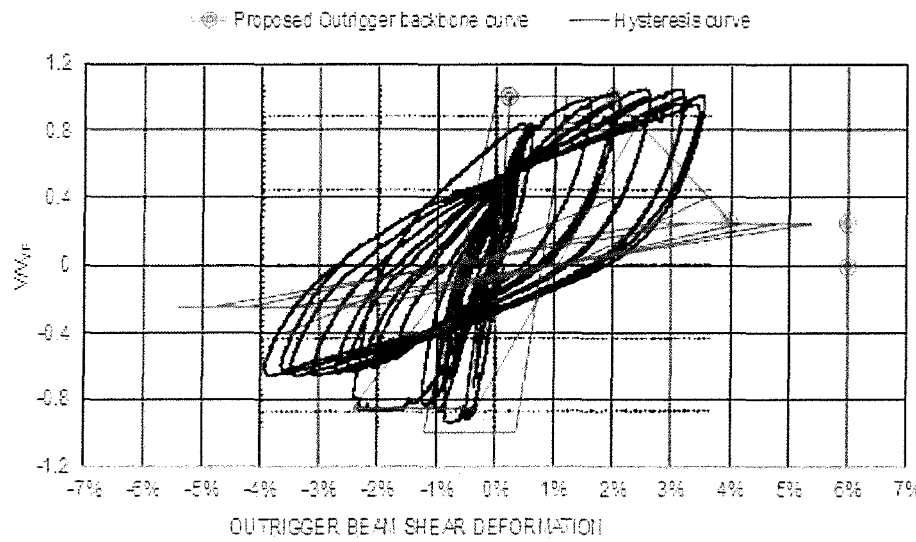


Figure 14. Comparison of Coupling Beam Model with Canbolat Test

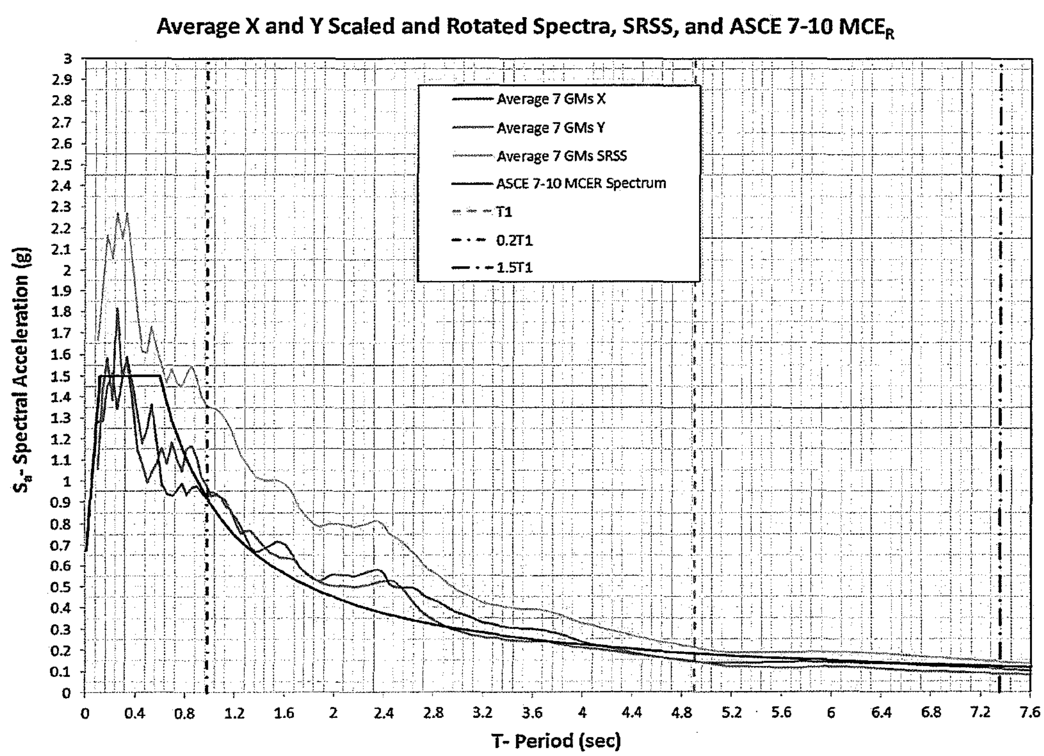


Figure 15. Comparison of Scaled Spectra and Target Spectrum

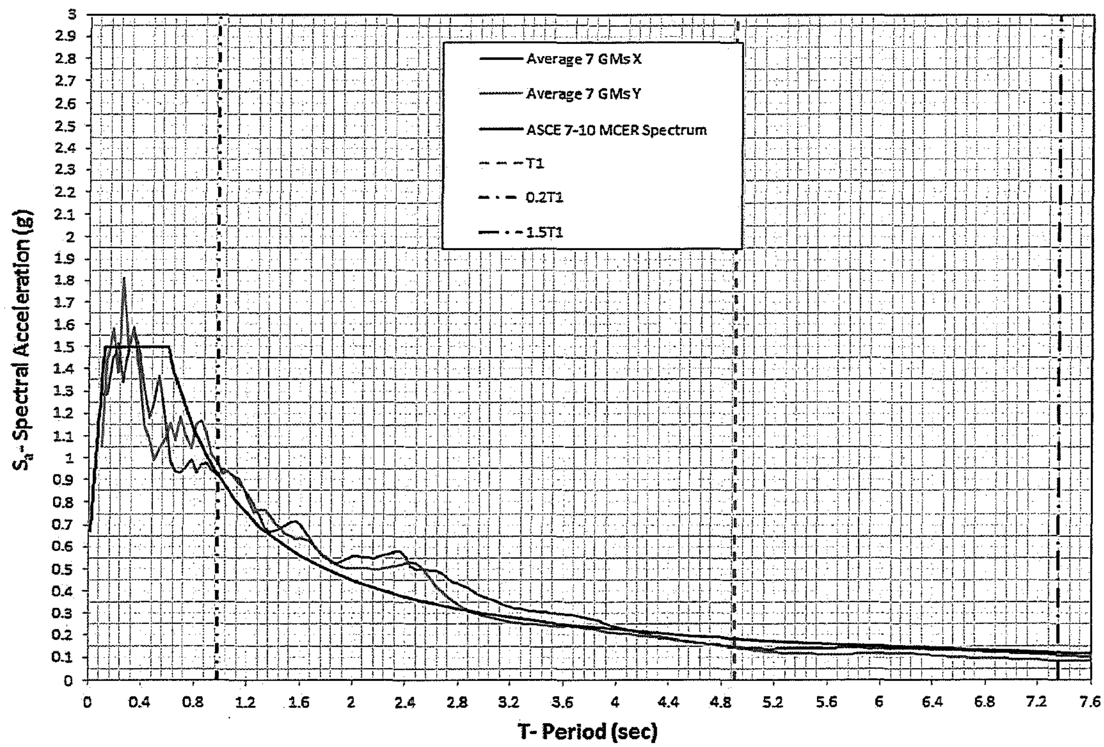


Figure 16. Average X, Y,and MCE$_R$ spectra

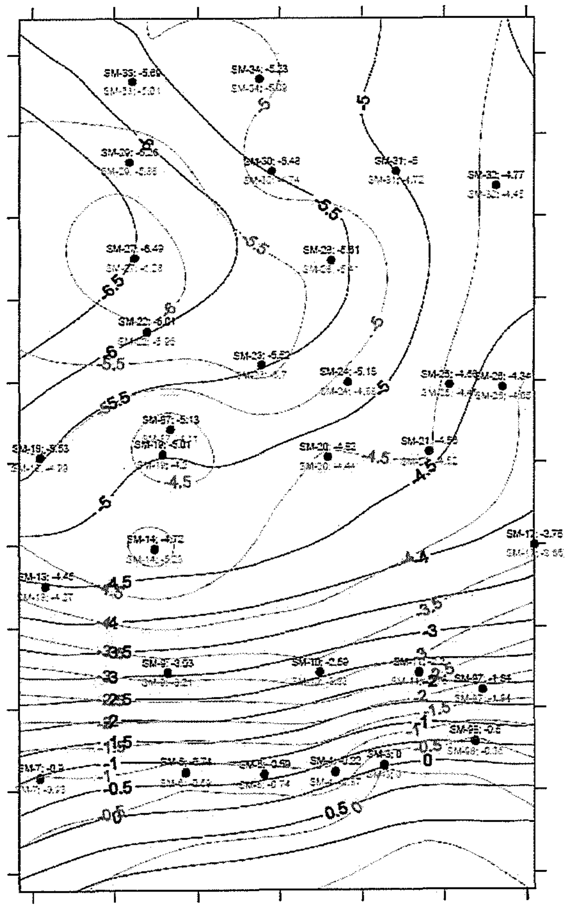


Figure 17. Comparison of Measured and Analytical Representation of Mat Deformation Profile

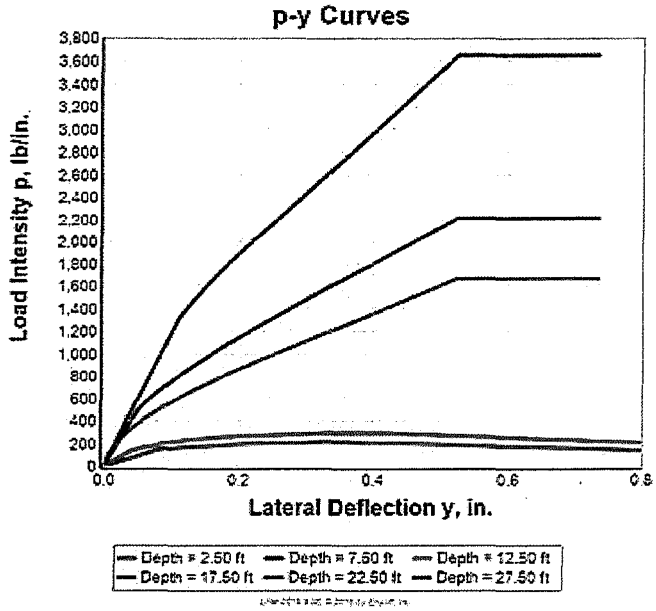


Figure 18. P-Y Curves Obtained From LPile

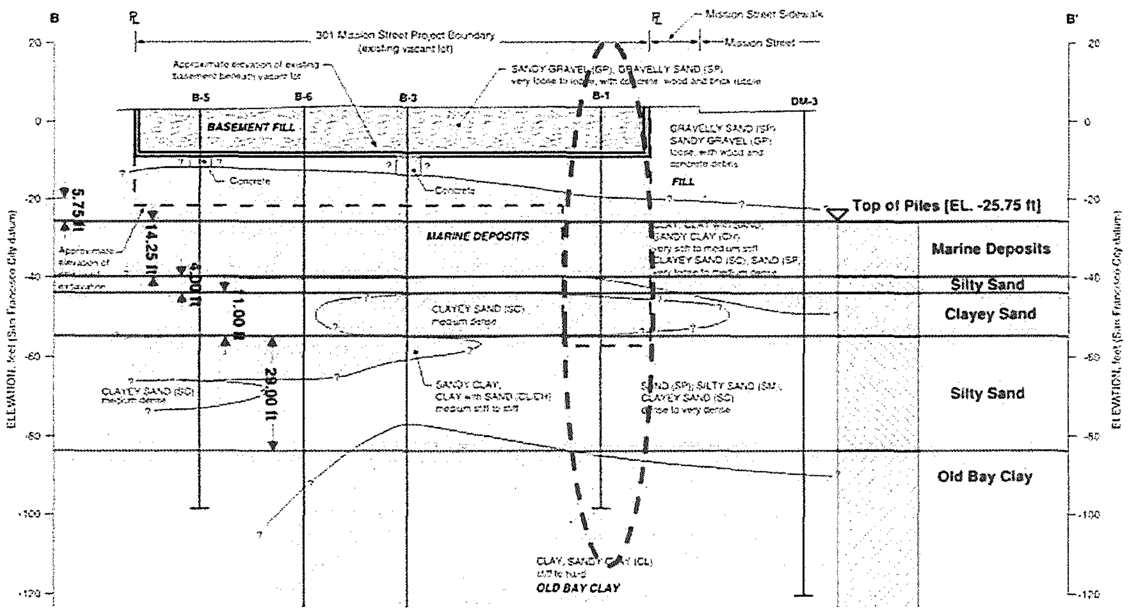


Figure 19. Soil Profile used in LPile Analysis (Treadwell & Rollo)

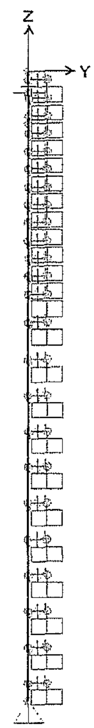


Figure 20. SAP2000 Pile Lateral Analysis Model

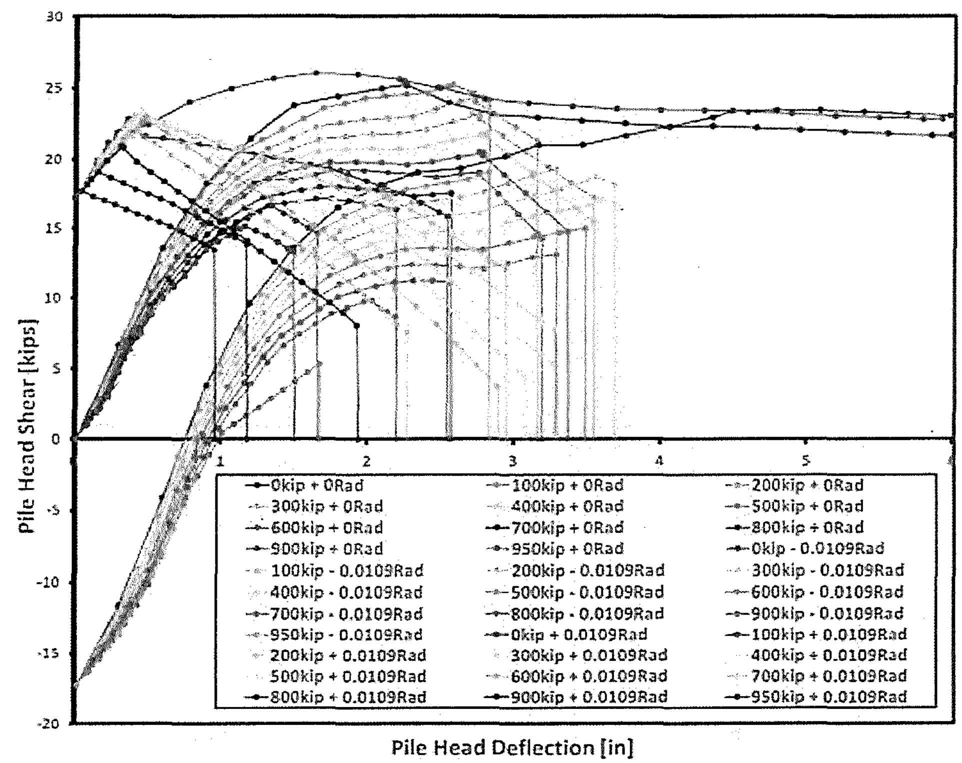


Figure 21. Pile nonlinear force-deformation plots

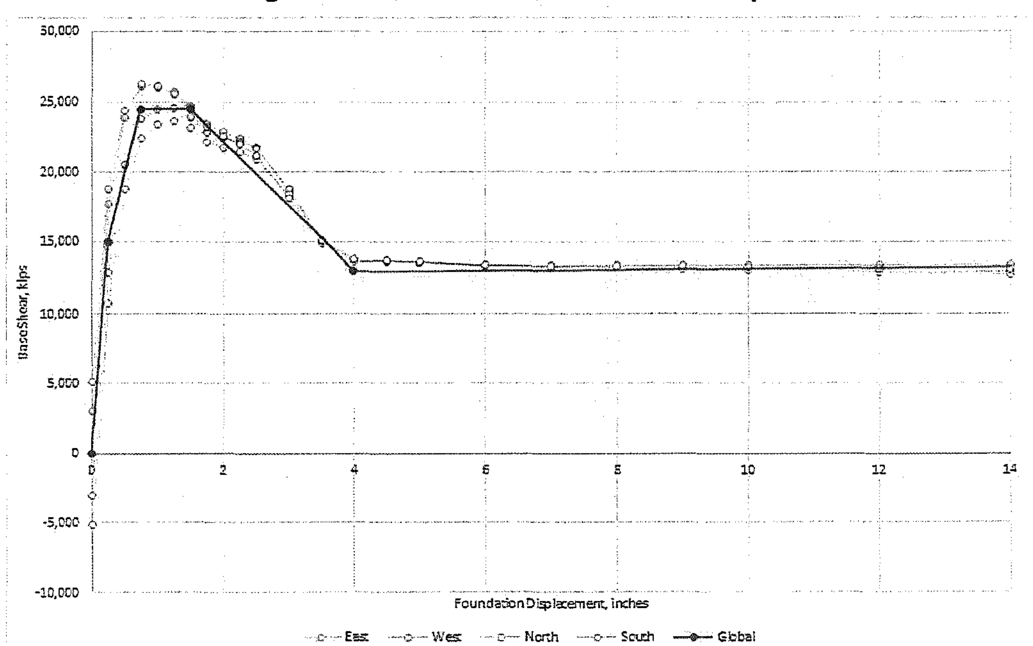


Figure 22. Global Foundation Nonlinear Force-Deformation Behaviors

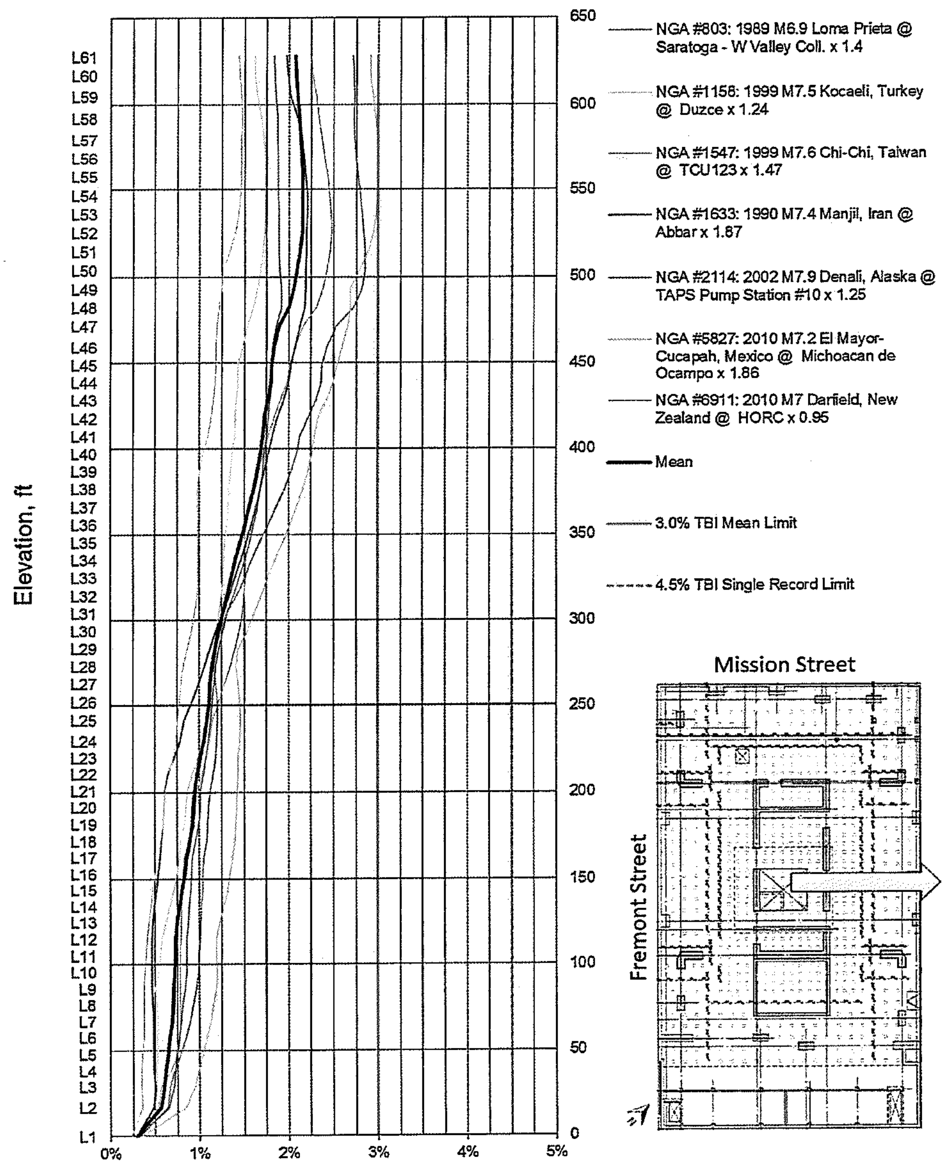


Figure 23. East-West Transient Story Drift, Fixed Translation Model

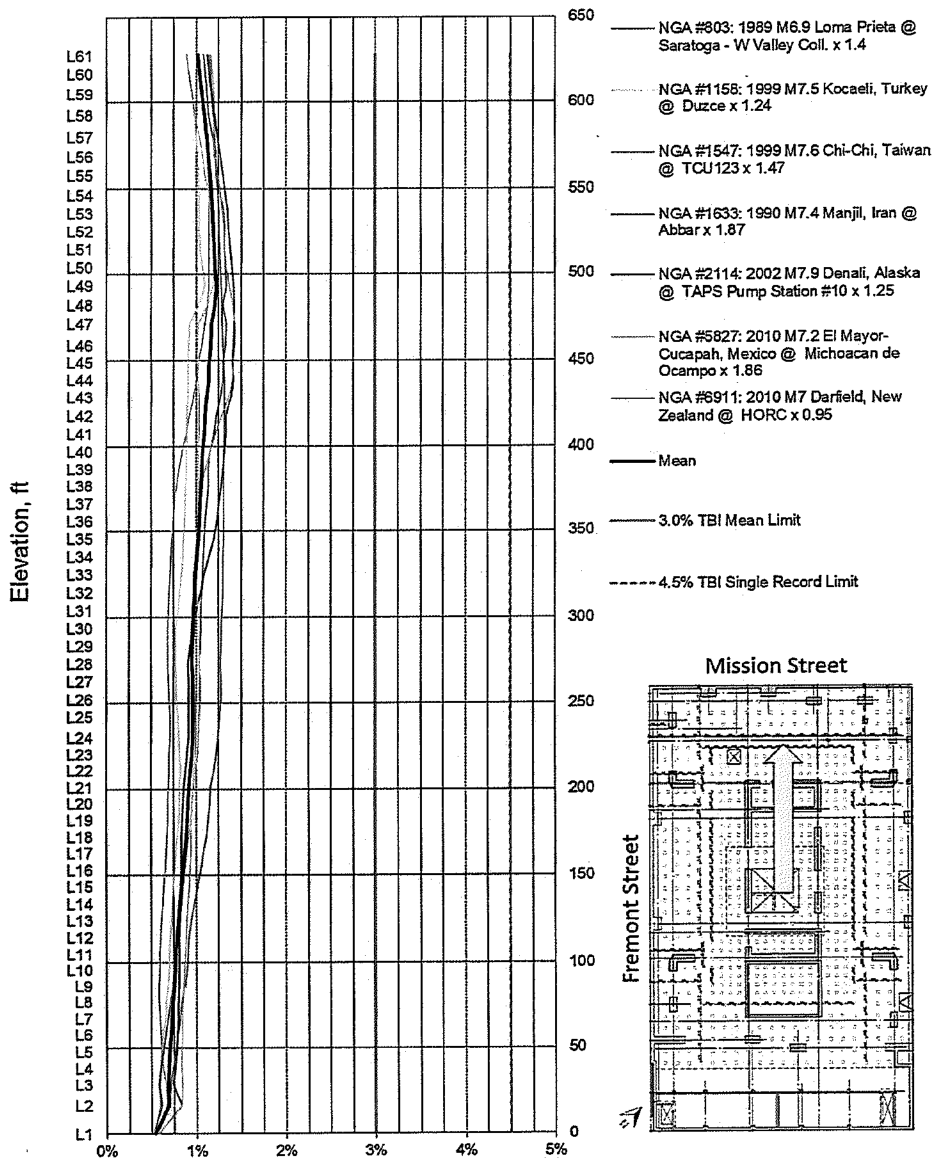
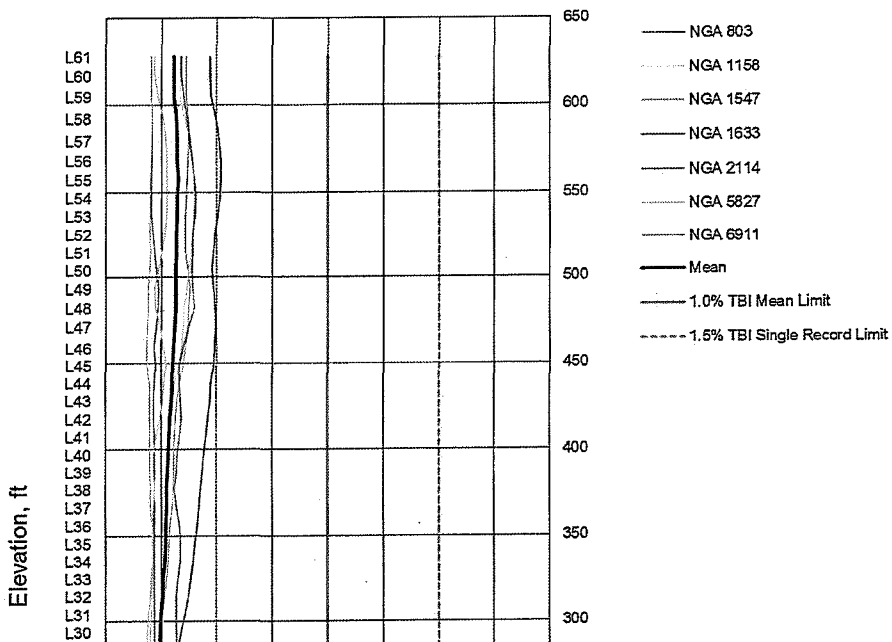


Figure 24. North-South Transient Story Drift, Fixed Translation Model



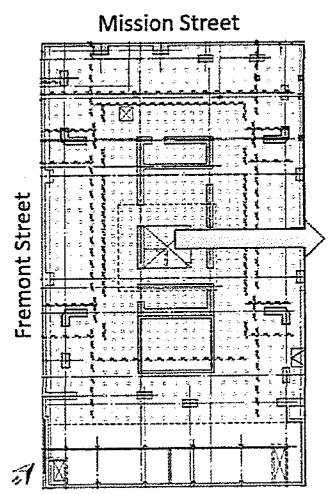


Figure 25. Residual Story Drift East-West Response

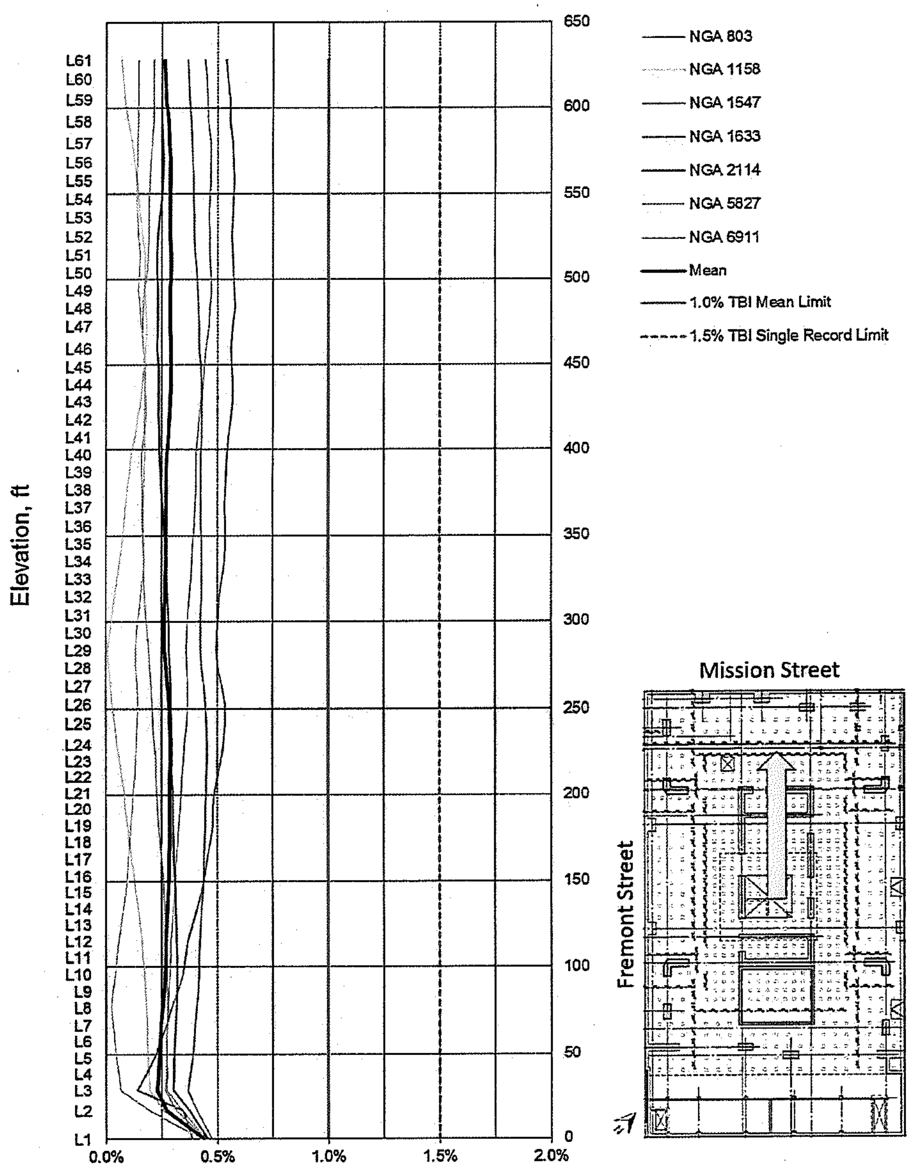


Figure 26. Residual Story Drift North-South Response

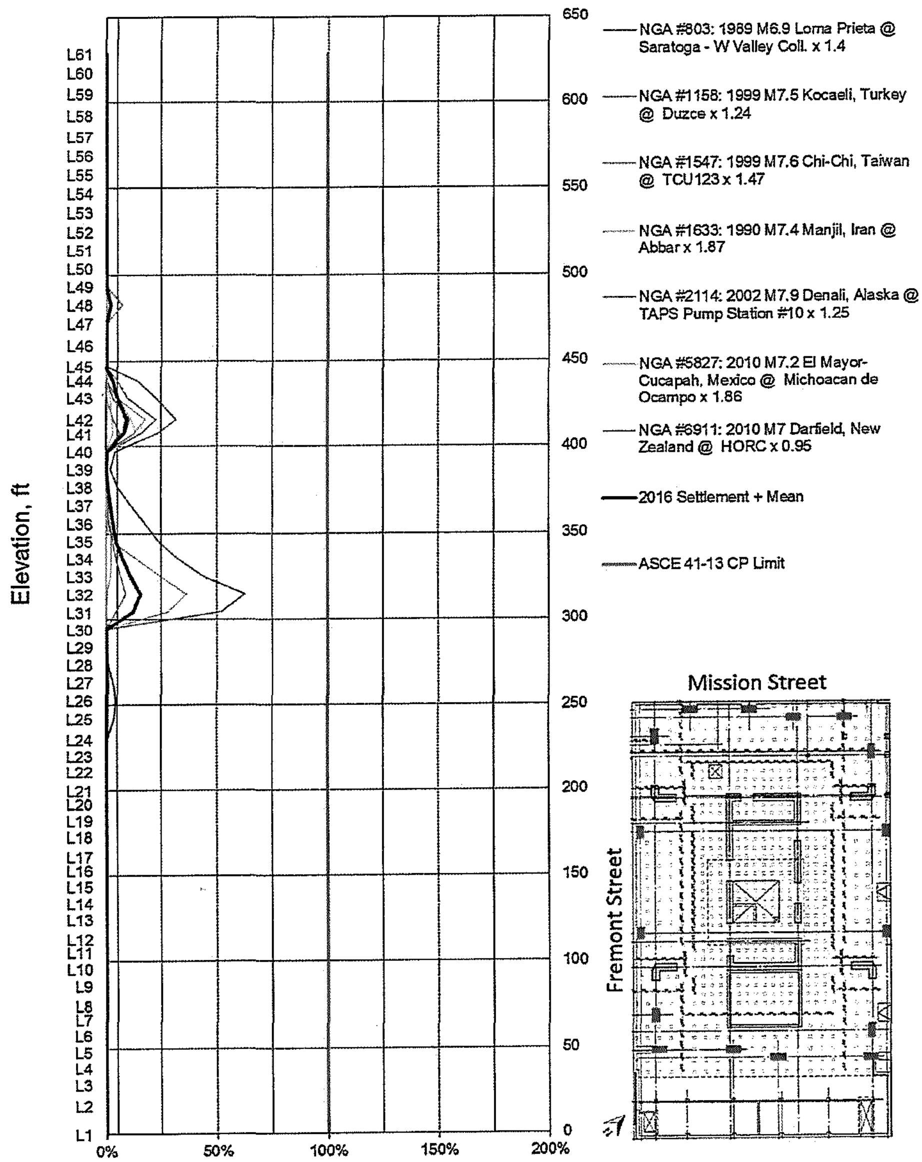


Figure 27. Demand to Capacity Ratios, Column Plastic Rotation, Fixed Translation Model

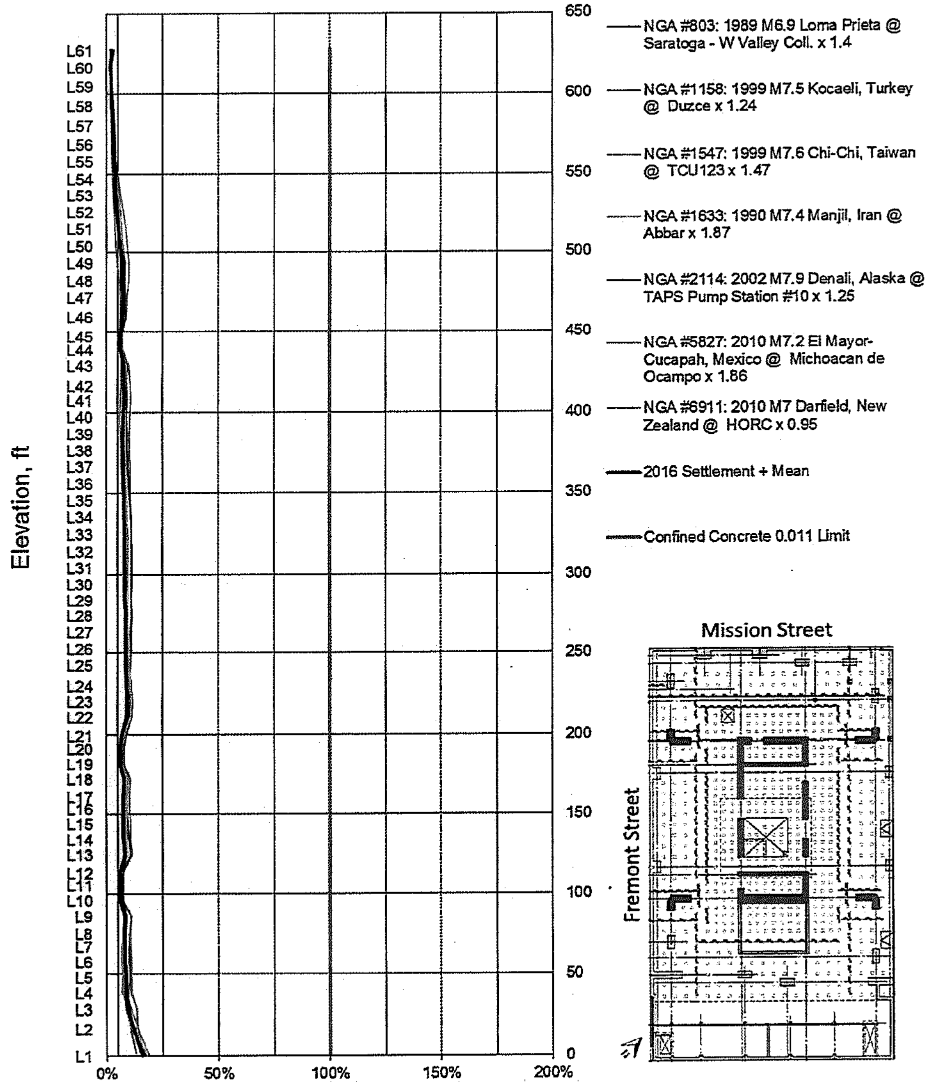


Figure 28. Demand to Capacity Ratio, Core Wall and Outrigger Column Compressive Strain, Fixed Translation Model

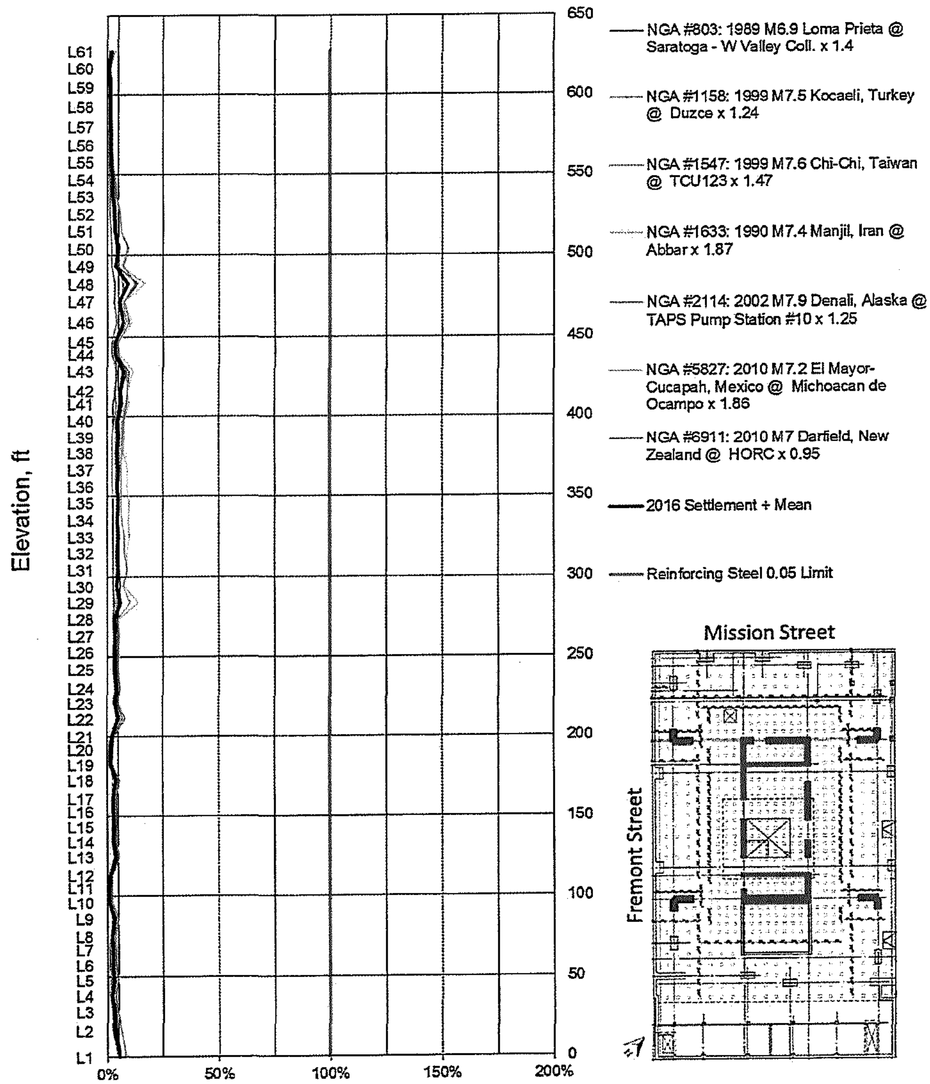


Figure 29. Demand to Capacity Ratio, Core Wall and Outrigger Column Tensile Strain, Fixed Translation Model

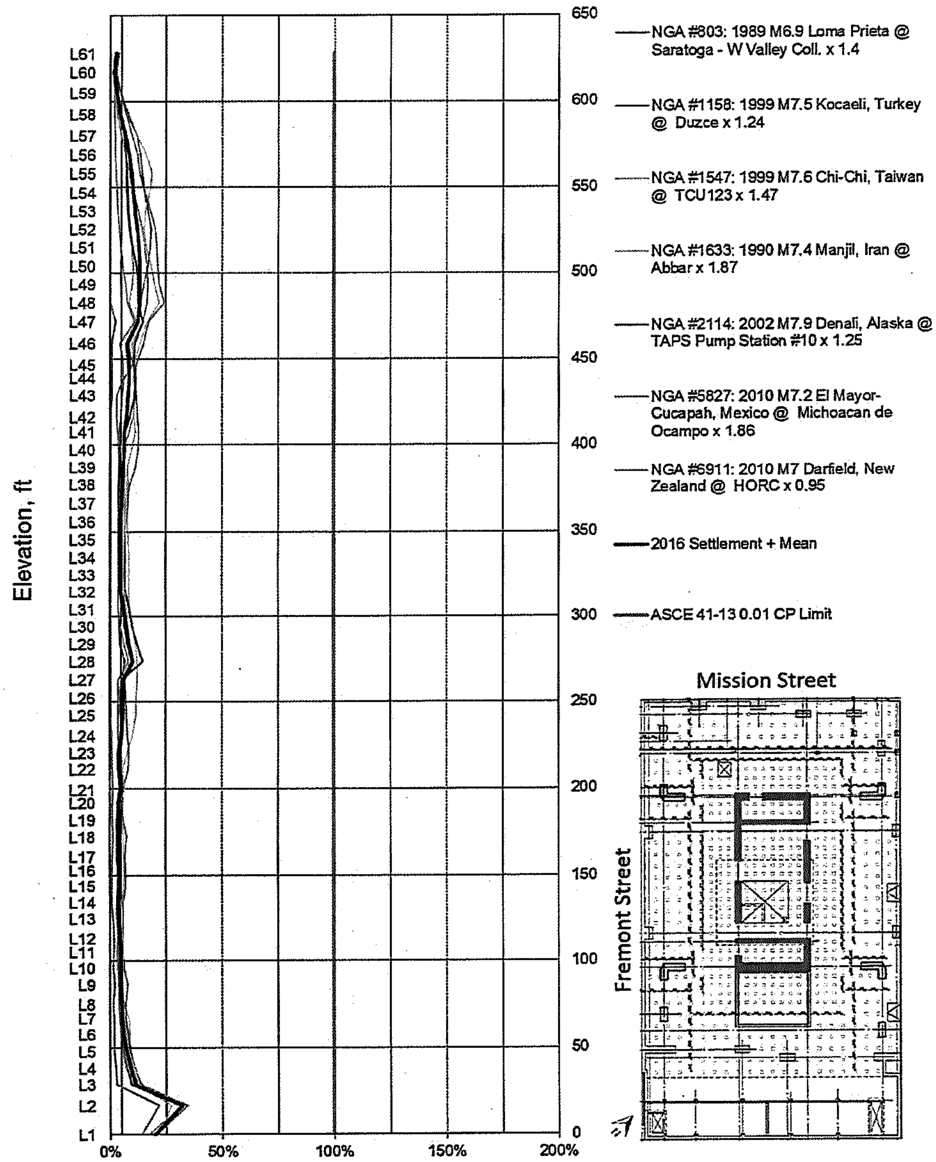


Figure 30. Demand to Capacity Ratio, Core Wall Shear Strain

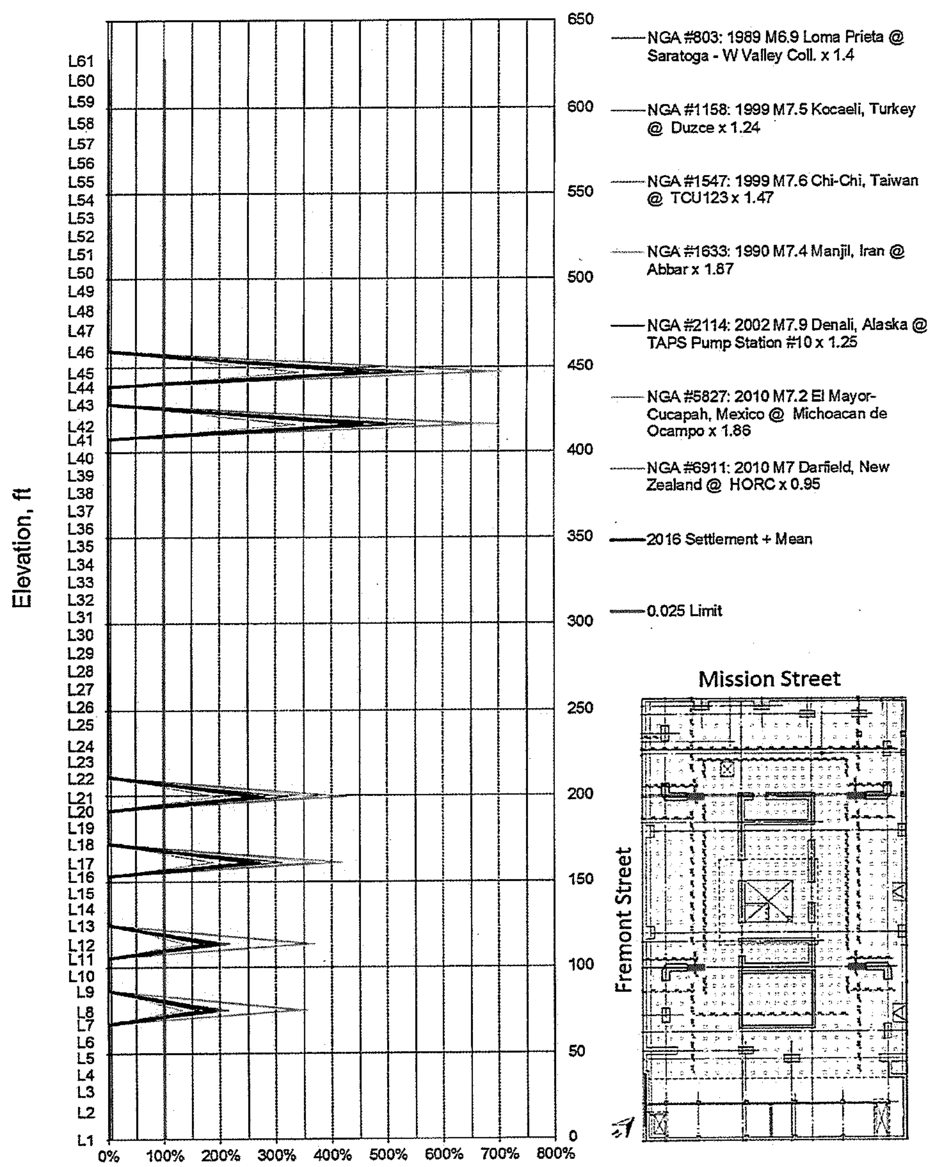


Figure 31. Demand to Capacity Ratios, Outrigger Coupling Beam Rotation, Fixed Translation Model

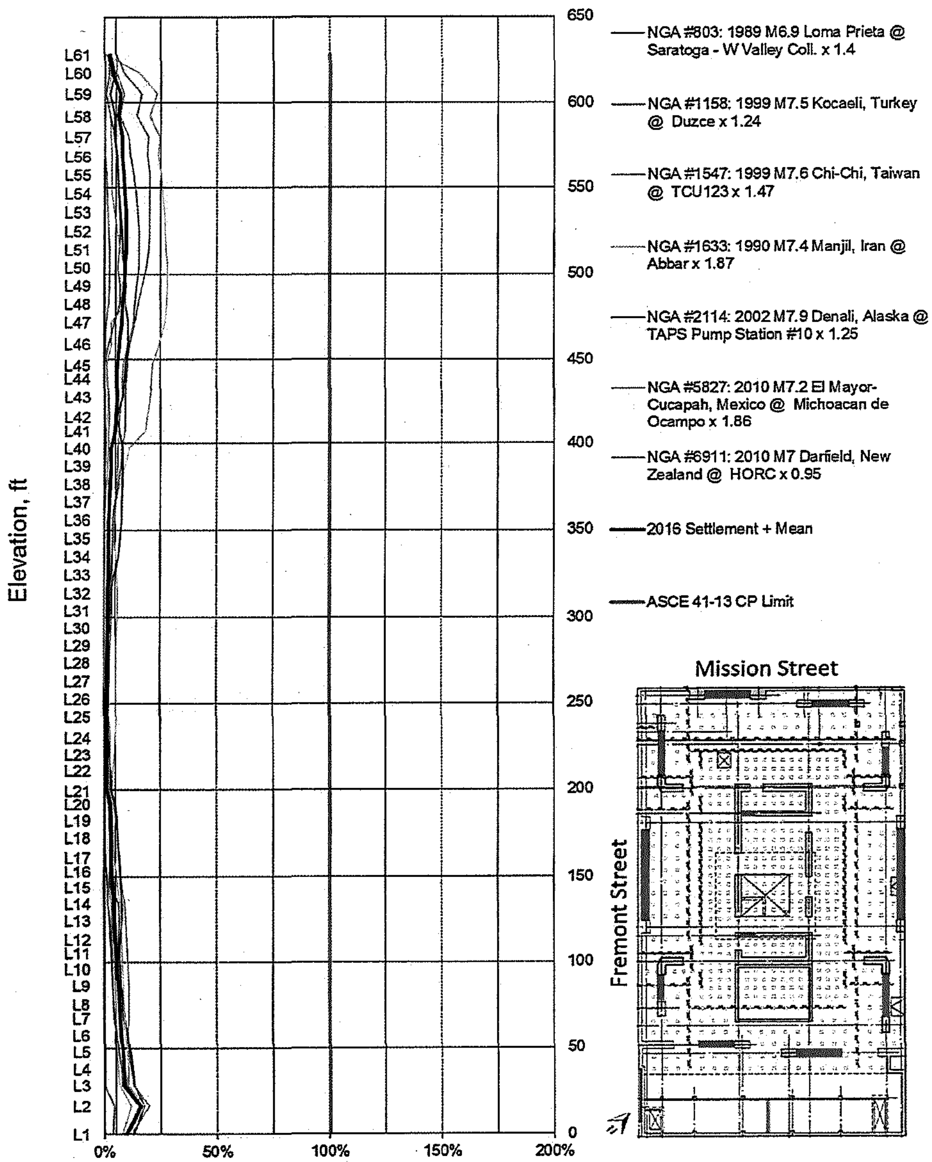


Figure 32. Demand to Capacity Ratios, Concrete Beams, Fixed Translation Model

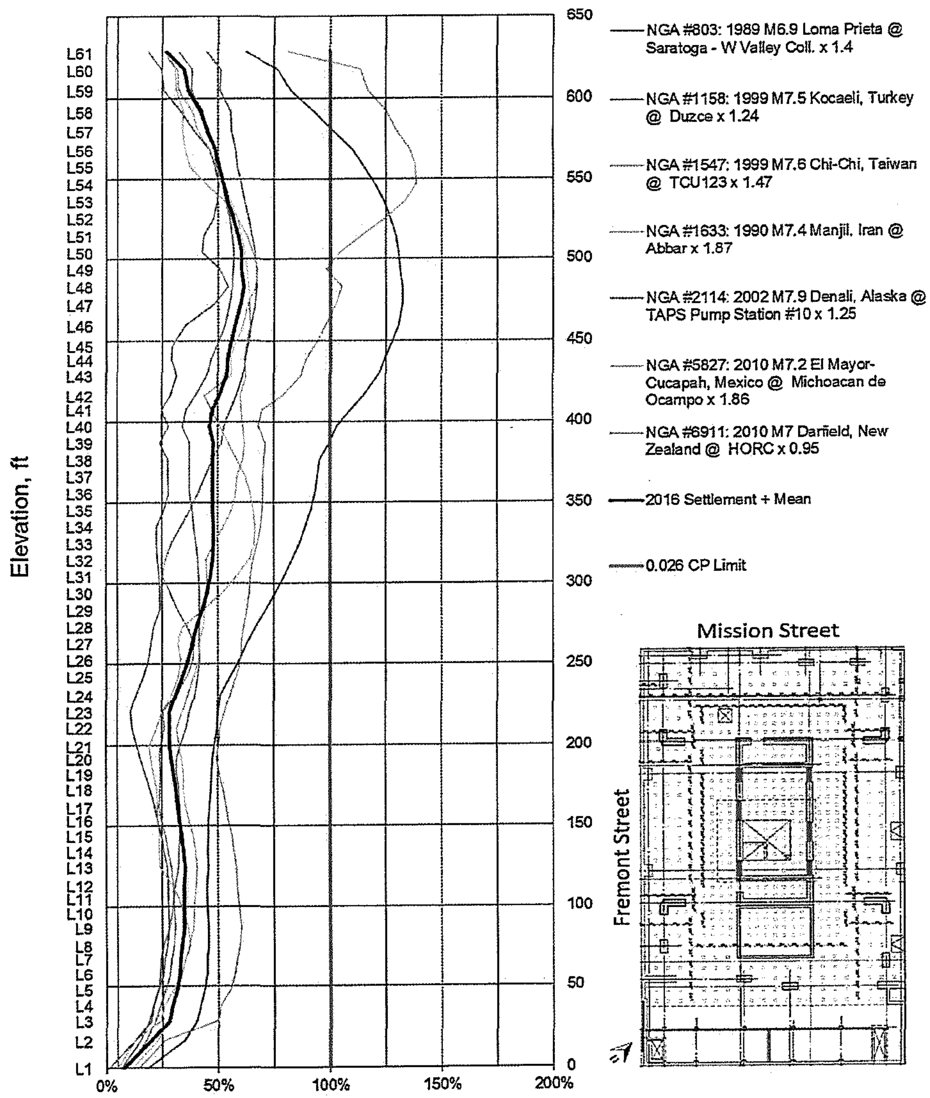


Figure 33. Demand to Capacity Ratios, Steel Coupling Beams, Fixed Translation Model

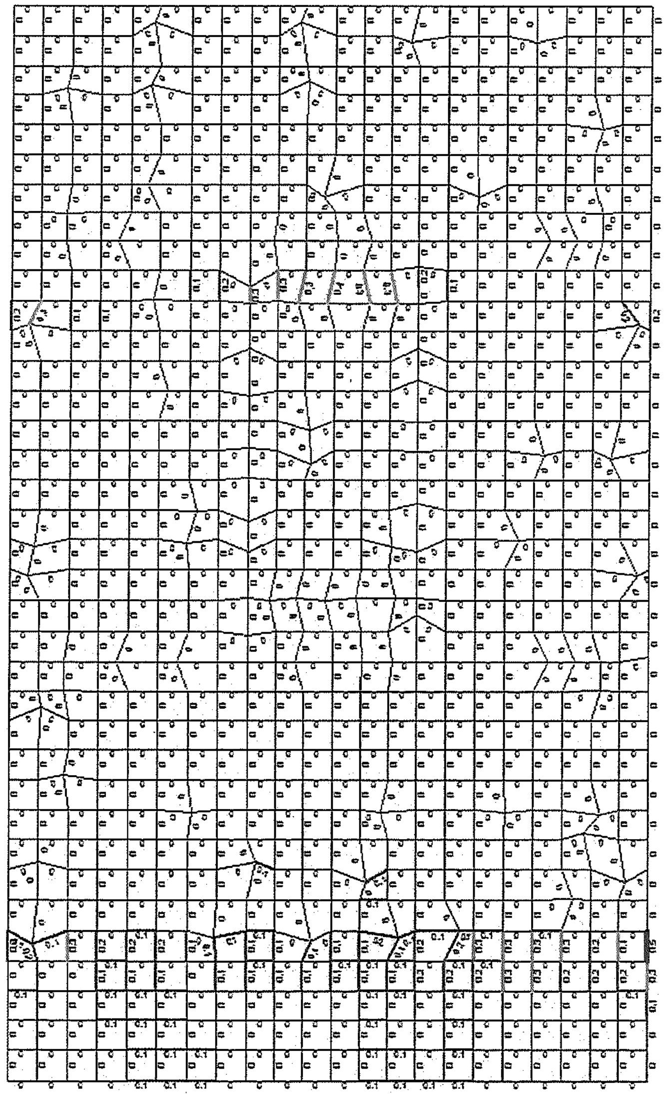


Figure 34. Peak Plastic Hinge Rotations (1999 Chi Chi, TCU3), Mat Grillage, Fixed Translation Model

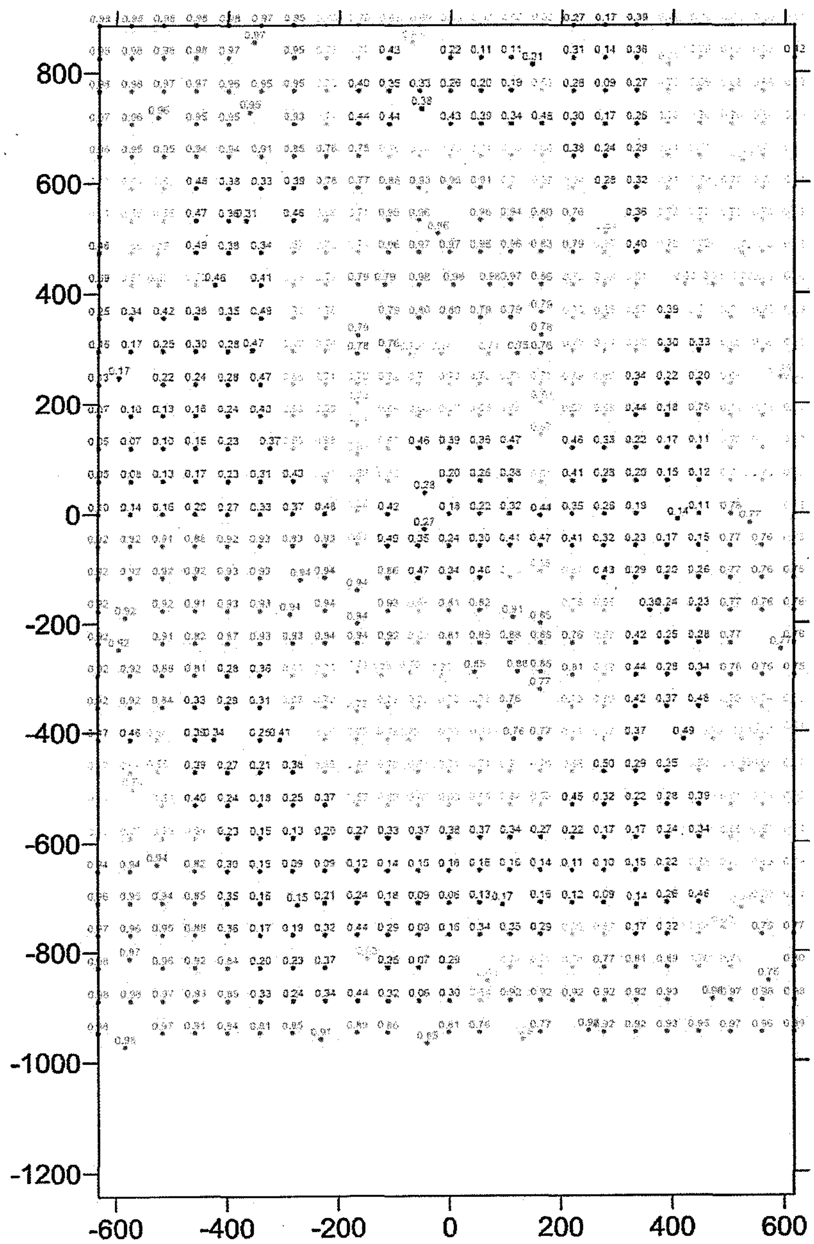


Figure 35. Pile Compressive Demand to Capacity Ratios, Maximum of Seven Ground Motions, Fixed Translation Model

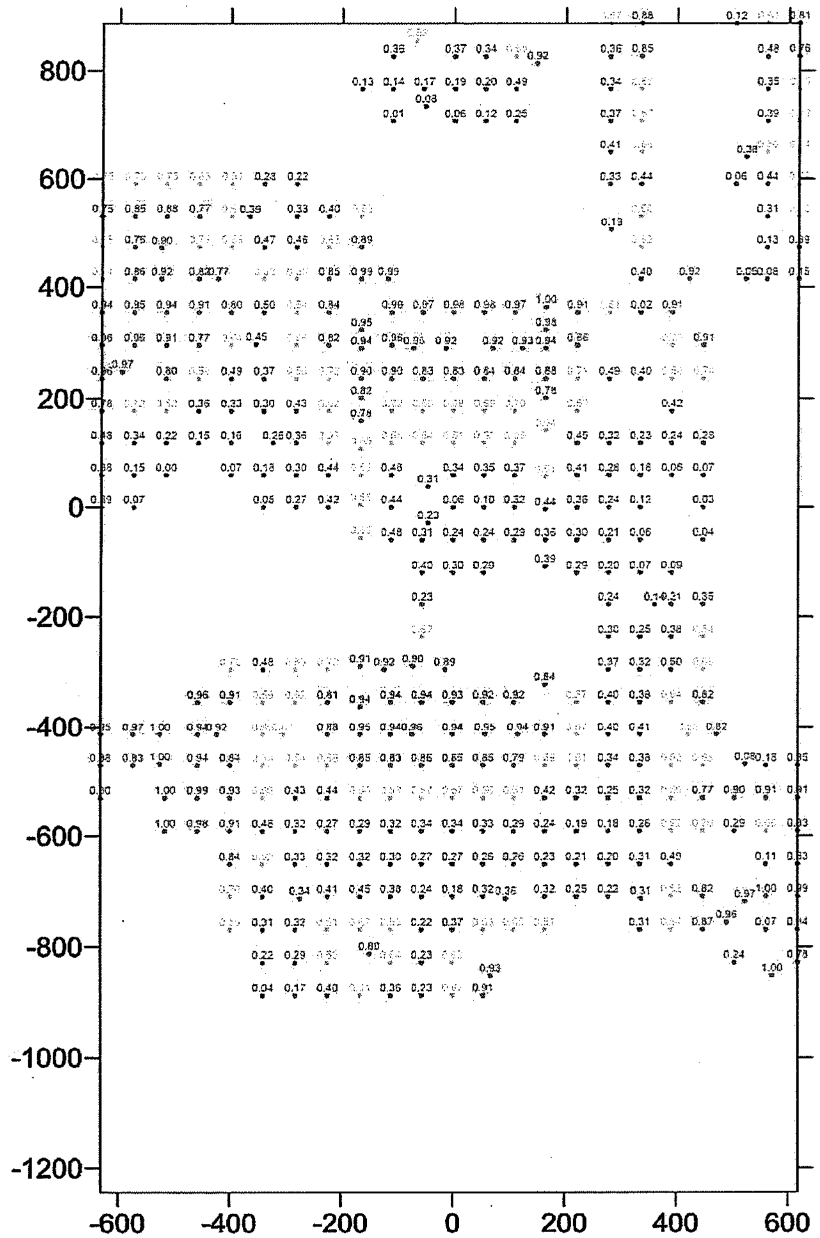


Figure 36. Peak Pile Tensile Demands to Capacity Ratios, Maximum of Seven Ground Motions, Fixed Translation Model

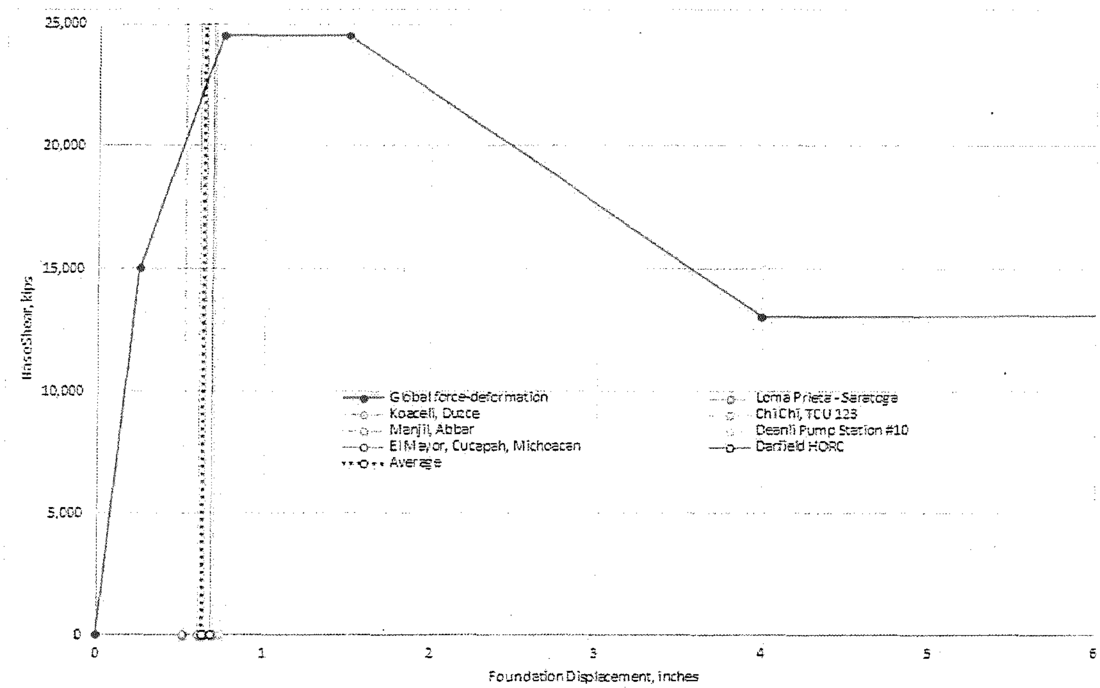


Figure 37. Peak East-West Pile Lateral Displacement Demand from Seven ground motions

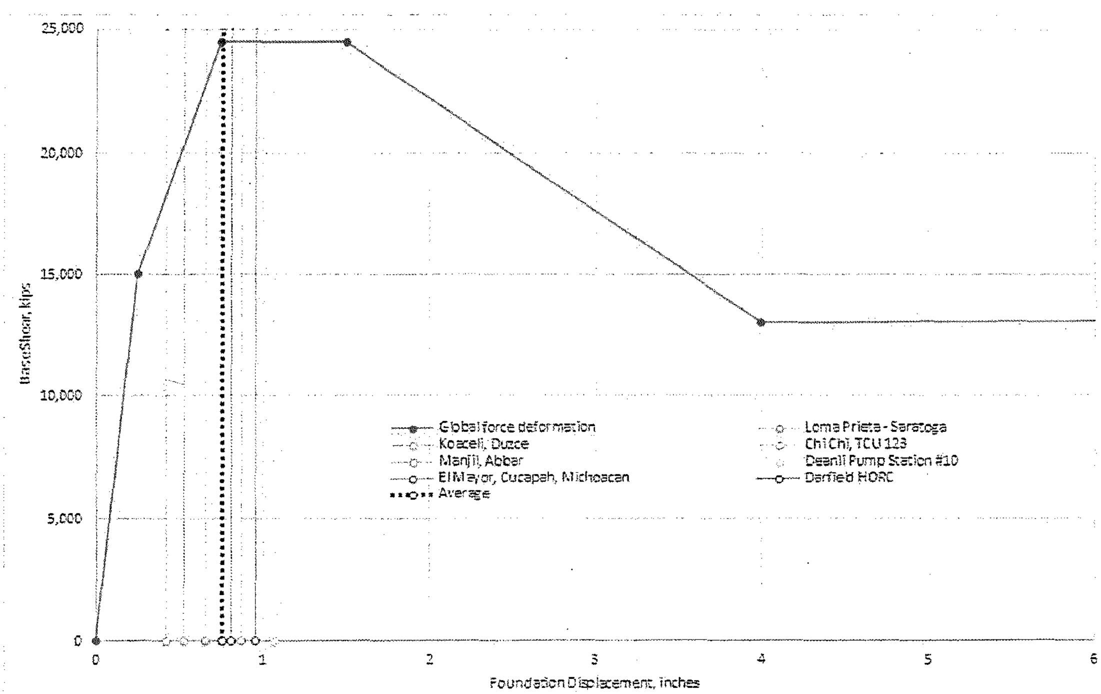


Figure 38. Peak North-South Pile Lateral Displacement Demand from seven Ground Motions

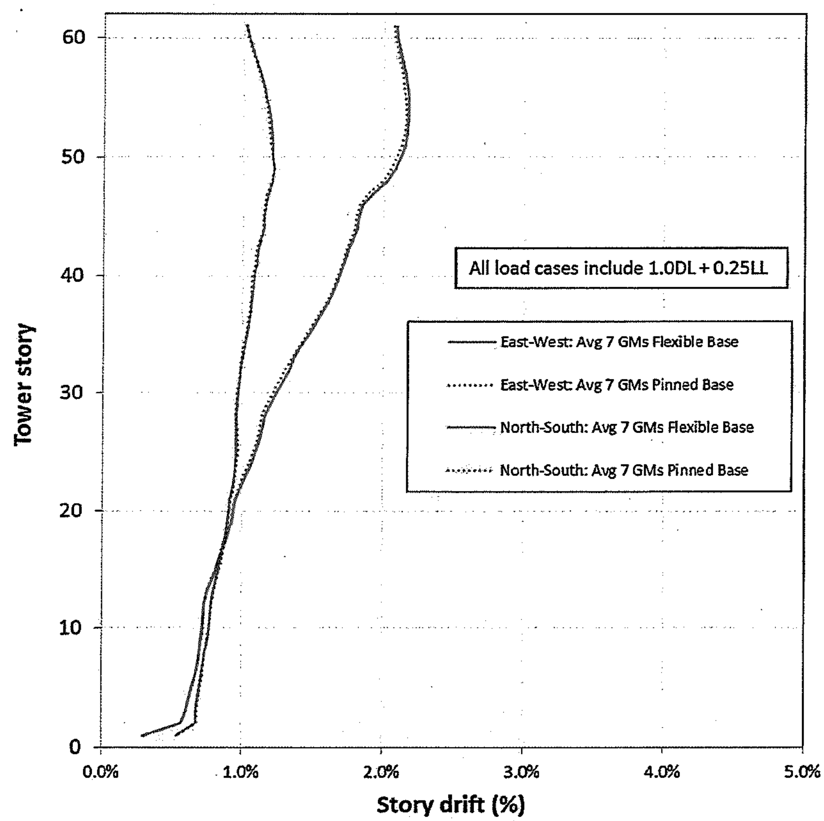


Figure 39. Comparison of Story Drift Ratios for Fixed Translation and Nonlinear Pile Models

APPENDIX A

PILE DRIVING RECORDS

TABLE 1
Indicator and Production Pile Summary
301 Mission Street
San Francisco, California

Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
I-1	24	10/31/05	68	5	-21.90	-23.25	-91.3	-1.4	24	20	21	20	5-3"	PDA performed
I-2	34	10/31/05	67	5	-21.90	-24.00	-91.0	-2.1	24	19	18	19	15	PDA performed
I-3	44	10/31/05	67	5	-21.90	-26.50	-93.5	-4.6	24	31	27	24	21	PDA & CAPWAP performed
I-4	184	10/31/05	70	5	-21.90	DNO[5]	DNO[5]	DNO[5]						PDA performed, T&R did not observe the final 14 feet of driving
I-5	194	11/04/05	67	5	-21.90	-25.00	-92.0	-3.1	32	28	26	22	27	
I-6	231	10/31/05	67	5	-21.90	-26.00	-93.0	-4.1	62	76	80	32	24	PDA & CAPWAP performed
I-7	337	11/04/05	68	5	-21.90	-24.30	-92.3	-2.4	24	20	23	34	8-3"	
I-8	373	11/03/05	83	5	-21.90	-24.00	-107.0	-2.1	18	17	18	17	18	PDA & CAPWAP performed
I-9	382	11/02/05	67	10	-21.90	-25.30	-92.3	-3.4	30	19	22	24	8-3"	
I-10	472	11/03/05	70	5	-21.90	-13.80	-83.8	8.1	38	31	40	68	100-10"	
I-11	510	11/04/05	68	5	-32.90	-24.50	-92.5	8.4	69	38	40	32	14-6"	
I-12	477	10/28/05	67	20	-21.90	-21.70	-88.7	0.2	34	50	58	50	40-8"	
I-13	523	11/03/05	70	5	-21.90	-23.30	-93.3	-1.4	47	18	24	21	8-4"	PDA & CAPWAP performed
I-14	659	10/27/05	70	5	-21.90	-22.00	-92.0	-0.1	41	32	24	20	17	
I-15	693	11/03/05	78	5	-21.90	-5.50	-83.5	16.4	14	36	37	62	90-6"	
I-16	727	11/03/05	73	5	-21.90	-25.30	-98.3	-3.4	20	18	16	15	7-4"	
I-17	653	11/04/05	73	5	-21.90	-10.80	-83.8	11.1	9	15	42	72	95-10"	
I-18	716	11/03/05	68	5	-21.90	-17.80	-85.8	4.1	50	48	50	79	95-10"	PDA performed
I-19	790	10/27/05	82	5	-21.90	-20.00	-102.0	1.9	16	15	13	13	14	
I-20	795	11/03/05	80	5	-21.90	-2.80	-82.8	19.1	23	20	39	70	92-10"	PDA & CAPWAP performed
I-21	810	11/03/05	73	5	-21.90	-25.70	-98.7	-3.8	24	12	12	13	8-8"	PDA performed
I-22	903	02/22/06	78	20	-21.90	-22.00	-100.0	-0.1	15	24	16	11	12	
I-23	909	02/22/06	83	20	-21.90	-16.50	-99.5	5.4	17	13	11	12	6-6"	
I-24	915	02/22/06	75	20	-21.90	-22.00	-97.0	-0.1	22	17	17	16	15	
I-25	922	02/22/06	73	20	-21.90	-22.00	-95.0	-0.1	13	13	13	14	15	
1	13	03/01/06	50.1	15	-21.90	-21.90	-72.0	0.0	31	32	38	43	28-9"	
2	12	03/01/06	50.1	15	-21.90	-21.00	-71.1	0.9	18	26	34	30	72	
3	35	03/01/06	50.1	15	-21.90	-21.90	-72.0	0.0	23	36	34	33	20-6"	
4	56	03/01/06	50.1	15	-21.90	-21.90	-72.0	0.0	20	23	28	29	29	
5	57	03/01/06	50.1	15	-21.90	-21.90	-72.0	0.0	18	25	31	33	27	
6	1	03/01/06	50.1	5	-21.90	-21.90	-72.0	0.0	31	30	44	50	29-9"	
7	2	03/01/06	50.1	10	-21.90	-21.90	-72.0	0.0	13	20	33	44	49	
8	25	03/02/06	50.1	10	-21.90	-21.90	-72.0	0.0	22	30	40	48	23-6"	
9	3	03/02/06	50.1	10	-21.90	-21.00	-71.1	0.9	13	13	28	38	73	
10	350	03/02/06	56.1	10	-21.90	-21.90	-78.0	0.0	19	16	13	13	14	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
11	351	03/02/06	56.1	10	-21.90	-21.90	-78.0	0.0	17	16	16	12	11	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
12	352	03/02/06	56.1	10	-21.90	-21.90	-78.0	0.0	15	13	14	11	12	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
13	307	03/02/06	56.1	10	-21.90	-21.90	-78.0	0.0	20	16	16	15	13	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
14	308	03/02/06	56.1	10	-21.90	-21.90	-78.0	0.0	29	24	25	21	14	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
15	309	03/02/06	56.1	10	-21.90	-21.90	-78.0	0.0	26	24	18	20	18	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
16	689	03/02/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	8	13	20	27	
17	635	03/02/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	8	14	20	48	
18	661	03/02/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	8	12	34	28-6"	
19	690	03/02/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	8	9	26	28	

TABLE 1
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San Francisco, California

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20	662	03/02/06	61.1	15	-21.90	-21.90	-83.0	0.0	7	7	9	10	22	
21	691	03/02/06	61.1	15	-21.90	-21.30	-82.4	0.6	9	9	11	23	57	
22	663	03/02/06	61.1	15	-21.90	-21.90	-83.0	0.0	8	12	18	49	25-6"	
23	636	03/02/06	61.1	15	-21.90	-21.90	-83.0	0.0	7	10	13	28	29	
24	637	03/02/06	61.1	15	-21.90	-21.90	-83.0	0.0	7	7	14	30	21-6"	
25	14	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	17	27	34	32	20-6"	
26	15	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	31	34	50	48	28-6"	
27	16	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	26	39	46	42	47	
28	36	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	18	30	34	46	19-6"	
29	37	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	28	37	39	43	44	
30	38	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	30	50	53	58	33-6"	
31	58	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	20	32	36	34	18-6"	
32	59	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	22	34	38	37	36	
33	60	03/03/06	50.1	15	-21.90	-20.90	-71.0	1.0	22	30	46	43	61	
34	17	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	21	39	44	41	47	
35	39	03/03/06	50.1	15	-21.90	-19.90	-70.0	2.0	85	77	79	120	70-6"	
36	61	03/03/06	50.1	15	-21.90	-20.90	-71.0	1.0	27	33	52	52	63	
37	18	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	45	34	57	53	13-3"	
38	40	03/03/06	50.1	15	-21.90	-19.90	-70.0	2.0	42	29	44	60	40-6"	
39	592	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	12	11	17	32	
40	566	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	10	11	15	30	
41	540	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	7	9	12	29	
42	497	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	9	10	27	36	
43	471	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	8	11	14	40	
44	445	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	7	7	9	24	
45	593	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	13	18	31	66	
46	567	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	9	10	22	40	
47	541	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	9	16	28	66	
48	498	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	9	11	16	46	
49	446	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	8	11	22	36	
50	447	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	6	7	15	32	
51	473	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	8	9	13	51	
52	499	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	9	10	31	60	
53	542	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	11	12	35	58	
54	568	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	9	18	33	38	
55	594	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	10	17	30	34	
56	717	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	5	7	16	30	36	
57	762	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	10	19	31	44	
58	788	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	7	14	30	54	
59	789	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	8	20	35	50	
60	763	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	8	13	26	48	
61	718	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	8	16	34	49	
62	764	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	7	15	30	51	
63	719	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	10	21	37	50	

TABLE 1
Indicator and Production Pile Summary
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Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
64	62	03/04/06	50.1	15	-21.90	-19.90	-70.0	2.0	45	28	49	68	35-6"	
65	4	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	27	28	31	36	35	
66	5	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	22	22	25	27	28	
67	6	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	22	26	29	23	18-9"	
68	7	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	21	25	30	30	27	
69	8	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	21	29	26	29	26	
70	9	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	25	29	24	30	26	
71	10	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	17	26	30	34	32	
72	11	03/04/06	50.1	15	-21.90	-19.40	-69.5	2.5	27	24	39	61	32-6"	
73	26	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	21	34	40	41	19-6"	
74	48	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	19	26	33	31	14-6"	
75	27	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	20	31	41	44	21-6"	
76	49	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	14	26	38	40	44	
77	28	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	32	39	41	32	18-6"	
78	50	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	14	29	36	38	24-6"	
79	29	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	30	41	46	44	32	
80	51	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	15	31	37	37	36	
81	30	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	30	50	45	39	17-6"	
82	52	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	25	34	32	35	33	
83	31	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	20	30	37	35	32	
84	32	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	38	39	35	41	15-6"	
85	33	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	28	40	38	40	40	
86	53	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	23	32	31	32	15-6"	
87	54	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	16	29	35	36	36	
88	55	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	31	44	57	39	20-6"	
89	19	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	30	39	35	35	42	
90	20	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	31	39	45	44	47	
91	402	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	9	13	30	3-1"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
92	376	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	7	9	13	15-9"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
93	377	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	10	10	14	21	
94	403	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	13	11	11	25	18-6"	
95	378	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	10	9	10	14	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
96	404	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	9	10	22	13-5"	
97	924	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	9	17	22	13-6"	
98	902	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	12	17	26	11-5"	
99	880	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	9	15	18	4-1"	
100	858	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	10	7	10	10-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
101	836	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	9	7	11	15-11"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
102	814	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	6	6	10	18-9"	
103	925	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	7	17	26	5-1"	
104	926	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	8	10	25	13-6"	
105	904	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	12	12	12	18	13-5"	
106	881	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	12	9	13	20-10"	
107	882	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	13	14	33	29-6"	

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Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
108	859	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	13	8	10	16	7-3"	
109	21	03/07/06	50.1	15	-21.90	-20.90	-71.0	1.0	24	26	39	41	62	
110	22	03/07/06	50.1	15	-21.90	-19.90	-70.0	2.0	26	34	47	80	37-6"	
111	43	03/07/06	50.1	15	-21.90	-19.90	-70.0	2.0	44	34	47	63	67	
112	42	03/07/06	50.1	15	-21.90	-20.40	-70.5	1.5	28	31	43	50	70-6"	
113	41	03/07/06	50.1	15	-21.90	-19.90	-70.0	2.0	32	41	58	66	25-3"	
114	63	03/07/06	50.1	15	-21.90	-19.90	-70.0	2.0	55	42	51	74	90	
115	64	03/07/06	50.1	15	-21.90	-19.90	-70.0	2.0	42	56	86	117	31-3"	
116	65	03/07/06	50.1	15	-21.90	-20.90	-71.0	1.0	27	40	46	64	63	
117	66	03/07/06	50.1	15	-21.90	-19.90	-70.0	2.0	26	34	63	65	40-6"	
118	281	03/07/06	50.1	15	-21.90	-21.90	-72.0	0.0	16	20	23	30	30	
119	236	03/07/06	50.1	15	-21.90	-21.90	-72.0	0.0	23	26	23	30	29	
120	208	03/07/06	50.1	15	-21.90	-21.90	-72.0	0.0	33	27	29	27	14-6"	
121	180	03/07/06	50.1	15	-21.90	-21.90	-72.0	0.0	30	30	25	30	30	
122	154	03/07/06	50.1	15	-21.90	-21.90	-72.0	0.0	25	30	26	37	29	
123	860	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	10	11	25	34-9"	
124	837	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	13	11	22	14-4"	
125	838	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	5	5	31	32-9"	
126	815	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	10	10	23	26-9"	
127	816	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	11	14	37	42-9"	
128	927	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	11	12	14	17-6"	
129	928	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	8	31	46	67	
130	924	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	12	27	46	53	
131	930	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	11	26	37	18-3"	
132	931	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	13	28	45	19-3"	
133	932	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	14	20	24	7-2"	
134	933	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	4	10	22	27	20-9"	
135	934	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	15	20	25	9-3"	
136	912	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	13	22	39	21-6"	
137	911	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	7	20	42	36-6"	
138	910	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	5	8	17	40	53	
139	908	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	19	26	40	47-10"	
140	907	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	12	29	58	70-9"	
141	906	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	14	22	49	42-9"	
142	905	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	9	12	31	54	
143	282	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	16	25	21	24	31	
144	237	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	31	32	33	31	34	
145	209	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	37	43	42	43	37	
146	181	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	38	40	40	41	20-6"	
147	283	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	24	24	30	26	32	
148	238	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	33	35	38	44	17-6"	
149	210	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	40	48	34	42	38	
150	182	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	62	57	54	47	25-6"	
151	155	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	40	35	38	39	42	

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152	156	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	42	48	40	40	22-6"	
153	111	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	39	50	48	54	26-6"	
154	112	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	34	34	35	40	35	
155	113	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	45	47	38	36	18-6"	
156	89	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	32	32	38	32	15-6"	
157	90	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	38	40	46	44	21-6"	
158	91	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	38	43	55	57	44	
159	23	03/08/06	50.1	15	-21.90	-20.40	-70.5	1.5	12	24	38	44	40-6"	
160	45	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	28	42	42	41	22-6"	
161	883	3/7 & 3/8/06	61.1	10	-21.90	-21.90	-83.0	0.0	12	9	15	40	62	
162	884	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	11	24	45	61	
163	885	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	17	30	43	36-9"	
164	886	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	16	38	51	46-6"	
165	887	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	13	30	52	48-10"	
166	888	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	14	32	51	23-3"	
167	889	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	10	29	45	49-9"	
168	890	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	15	35	51	49-7"	
169	891	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	8	13	35	53	
170	892	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	11	33	36	18-5"	
171	913	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	7	24	50	24-5"	
172	893	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	9	18	34	22-6"	
173	914	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	8	16	36	46	
174	935	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	6	17	42	54	
175	936	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	5	14	32	41	6-1"	
176	937	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	11	28	39	8-2"	
177	938	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	10	22	35	13-4"	
178	939	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	12	15	27	30-9"	
179	940	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	11	11	25	34	
180	941	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	9	14	26	37	
181	942	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	12	25	32	11-5"	
182	943	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	13	25	29	15-6"	
183	944	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	13	26	33	14-4"	
184	67	03/09/06	50.1	15	-21.90	-21.90	-72.0	0.0	28	35	37	48	38	
185	46	03/09/06	50.1	15	-21.90	-20.40	-70.5	1.5	20	35	54	57	35-6"	
186	68	03/09/06	50.1	15	-21.90	-21.90	-72.0	0.0	30	40	34	48	40	
187	47	03/09/06	50.1	15	-21.90	-20.40	-70.5	1.5	15	25	28	39	36-6"	
188	69	03/09/06	50.1	15	-21.90	-19.90	-70.0	2.0	13	14	39	44	40-6"	
189	945	03/09/06	61.1		-21.90	-21.90	-83.0	0.0	8	11	32	46	34-6"	
190	894	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	10	13	30	39-11"	
191	895	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	10	22	41	32-6"	
192	896	03/09/06	61.1	10	-21.90	-21.90	-83	0.0	7	10	23	37	31-6"	
193	917	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	14	25	51	10-2"	
194	897	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	11	30	45	13-2"	
195	918	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	9	21	32	36-9"	

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Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
196	898	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	8	17	37	45-9"	
197	919	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	7	16	26	42	
198	916	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	5	8	11	31	47	
199	920	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	10	26	41	6-1"	
200	899	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	11	23	42	27-6"	
201	921	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	11	25	37	47	
202	900	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	9	23	36	9-2"	
203	923	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	10	35	55	24-5"	
204	901	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	7	17	36	48	
205	183	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	54	43	50	41	25-6"	
206	157	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	34	36	31	44	38	
207	114	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	48	42	53	43	18-6"	
208	92	03/10/06	50.1	20	-21.90	-21.90	-72.0	0.0	29	39	37	44	36	
209	70	03/10/06	50.1	20	-21.90	-21.90	-72.0	0.0	30	34	56	48	30-6"	
210	71	03/10/06	50.1	15	-21.90	-20.90	-71.0	1.0	16	24	38	36	63	
211	93	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	27	41	53	52	44	
212	115	03/10/06	50.1	15	-21.90	-19.90	-70.0	2.0	21	32	44	57	40-6"	
213	158	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	38	51	50	46	27-6"	
214	185	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	30	49	31	45	39	
215	72	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	12	20	27	53	53	
216	94	03/10/06	50.1	15	-21.90	-20.90	-71.0	1.0	15	23	39	52	36-6"	
217	116	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	22	29	56	49	54	
218	137	03/10/06	50.1	15	-21.90	-20.90	-71.0	1.0	28	43	52	53	38-6"	
219	163	03/10/06	50.1	15	-21.90	-19.90	-70.0	2.0	16	40	70	64	33-6"	
220	186	03/10/06	50.1	15	-21.90	-19.90	-70.0	2.0	27	52	70	105	32-3"	
221	73	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	23	42	48	42	21-6"	
222	95	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	33	52	49	53	54	
223	692	03/10/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	12	27	56	30-6"	
224	720	03/10/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	11	25	52	23-5"	
225	765	03/10/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	8	12	27	45	
226	791	03/10/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	8	12	32	60	
227	817	3/10/2006	61.1	10	-21.90	-21.90	-83.0	0.0	7	12	30	54	17-3"	
228	818	3/10/2006	61.1	10	-21.90	-21.90	-83.0	0.0	7	9	32	52	26-5"	
229	819	3/10/2006	61.1	10	-21.90	-21.90	-83.0	0.0	10	11	22	56	63-11"	
230	820	3/10/2006	61.1	10	-21.90	-21.40	-82.5	0.5	7	9	10	34	62	
231	117	3/13/2006	50.1	15	-21.90	-21.90	-72.0	0.0	41	42	48	46	20-6"	
232	118	3/13/2006	50.1	15	-21.90	-20.90	-71.0	1.0	26	36	48	56	32-6"	
233	284	3/13/2006	50.1	15	-21.90	-21.90	-72.0	0.0	23	21	24	23	15-6"	
234	239	3/13/2006	50.1	15	-21.90	-21.90	-72.0	0.0	29	33	27	36	34	
235	211	3/13/2006	50.1	15	-21.90	-21.90	-72.0	0.0	54	48	38	48	14-3"	
236	212	3/13/2006	50.1	15	-21.90	-21.90	-72.0	0.0	42	43	39	46	48	
237	240	3/13/2006	50.1	15	-21.90	-21.90	-72.0	0.0	42	47	39	36	10-3"	
238	285	3/13/2006	50.1	15	-21.9	-21.9	-72.0	0.0	29	28	37	31	33	
239	241	3/13/2006	50.1	15	-21.9	-21.9	-72.0	0.0	24	42	38	47	53	

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Treadwell & Rollo Pile No.	Project Pile Number	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
240	213	3/13/2006	50.1	15	-21.9	-19.9	-70.0	2.0	26	40	54	65	63	
241	138	3/13/2006	50.1	15	-21.9	-19.9	-70.0	2.0	19	22	40	59	72	
242	139	3/13/2006	50.1	15	-21.9	-19.9	-70.0	2.0	15	29	45	83	62	
243	164	3/13/2006	50.1	15	-21.9	-19.9	-70.0	2.0	21	28	42	73	65	
244	165	3/13/2006	50.1	15	-21.9	-19.9	-70.0	2.0	20	25	49	88	79	
245	187	3/13/2006	50.1	15	-21.9	-19.9	-70.0	2.0	32	49	74	107	50-6"	
246	188	3/13/2006	50.1	15	-21.9	-19.9	-70.0	2.0	29	68	100	143	82-6"	
247	290	3/13/2006	50.1	15	-21.9	-21.9	-72.0	0.0	33	30	41	37	35	
248	264	3/13/2006	50.1	15	-21.9	-19.9	-70.0	2.0	21	32	45	56	64	
249	861	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	12	12	24	35	50	
250	839	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	8	9	20	45	42-8"	
251	862	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	8	9	14	38	55	
252	840	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	10	10	21	46	75	
253	863	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	9	9	17	51	64	
254	841	3/13/2006	61.1	10	-21.9	-21.15	-82.3	0.8	9	10	11	30	62-9"	
255	864	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	9	9	26	48	45-8"	
256	842	3/13/2006	61.1	10	-21.9	-20.7	-81.8	1.2	14	12	12	20	62	
257	721	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	10	12	24	48	44-8"	
258	792	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	8	12	37	55	8-2"	
259	766	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	9	9	9	41	68	
260	722	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	10	14	34	62	16-3"	
261	694	3/13/2006	61.1	10	-21.9	-21.4	-82.5	0.5	12	10	11	15	62	
262	695	3/13/2006	61.1	10	-21.9	-21.4	-82.5	0.5	10	12	12	34	67	
263	723	3/13/2006	61.1	10	-21.9	-21.4	-82.5	0.5	14	13	16	35	61-7"	
264	745	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	14	16	24	49	50-7"	
265	242	3/14/2006	50.1	15	-21.9	-19.9	-70.0	2.0	23	40	63	73	87	
266	214	3/14/2006	50.1	15	-21.9	-19.9	-70.0	2.0	36	52	60	67	34-6"	
267	215	3/14/2006	50.1	15	-21.9	-19.9	-70.0	2.0	24	32	59	60	33-6"	
268	243	3/14/2006	50.1	15	-21.9	-19.9	-70.0	2.0	24	43	69	78	64	
269	265	3/14/2006	50.1	15	-21.9	-19.9	-70	2	20	30	42	62	61	
270	291	3/14/2006	50.1	15	-21.9	-21.9	-72	0	34	33	47	34	35	
271	216	3/14/2006	50.1	15	-21.9	-19.9	-70	2	30	56	65	71	45-6"	
272	244	3/14/2006	50.1	15	-21.9	-20.9	-71	1	21	48	48	45	67	
273	353	3/14/2006	56.1	15	-21.9	-21.9	-78	0	17	18	16	12	11	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
274	310	3/14/2006	56.1	15	-21.9	-21.9	-78	0	21	20	20	14	8-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
275	354	3/14/2006	56.1	15	-21.9	-21.9	-78	0	23	19	21	21	12-6"	
276	311	3/14/2006	56.1	15	-21.9	-16.9	-73	5	44	40	45	50	73	
277	359	3/14/2006	56.1	15	-21.9	-21.9	-78	0	30	22	18	20	16	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
278	333	3/14/2006	56.1	15	-21.9	-21.9	-78	0	26	28	17	22	15	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
279	312	3/14/2006	56.1	15	-21.9	-21.9	-78	0	42	35	28	24	13-6"	
280	360	3/14/2006	56.1	15	-21.9	-21.9	-78	0	24	20	19	15	13	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
281	334	3/14/2006	56.1	15	-21.9	-21.9	-78	0	50	38	35	29	25	
282	313	3/14/2006	56.1	15	-21.9	-14.9	-71	7	24	52	65	65	82	
283	266	3/14/2006	56.1	15	-21.9	-13.9	-70	8	16	32	50	109	86	

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284	771	3/14/2006	61.1	10	-21.9	-21.9	-83	0	10	11	13	32	74	
285	793	3/14/2006	61.1	10	-21.9	-21.65	-82.75	0.25	10	10	12	38	68	
286	664	3/14/2006	61.1	10	-21.9	-21.9	-83	0	10	9	24	43	36-6"	
287	638	3/14/2006	61.1	10	-21.9	-21.9	-83	0	11	10	11	26	27-9"	
288	595	3/14/2006	61.1	10	-21.9	-21.9	-83	0	9	9	14	27	18-6"	
289	569	3/14/2006	61.1	10	-21.9	-21.9	-83	0	8	8	8	13	30	
290	543	3/14/2006	61.1	10	-21.9	-21.9	-83	0	8	10	9	20	29	
291	500	3/14/2006	61.1	10	-21.9	-21.9	-83	0	7	9	12	28	12-3"	
292	665	3/14/2006	61.1	10	-21.9	-21.9	-83	0	7	9	23	51	34-6"	
293	666	3/14/2006	61.1	10	-21.9	-21.9	-83	0	10	11	17	43	64	
294	639	3/14/2006	61.1	10	-21.9	-21.9	-83	0	11	10	15	52	37-5"	
295	596	3/14/2006	61.1	10	-21.9	-21.9	-83	0	9	9	12	26	37	
296	570	3/14/2006	61.1	10	-21.9	-21.9	-83	0	11	10	11	25	24-5"	
297	544	3/14/2006	61.1	10	-21.9	-21.9	-83	0	12	14	20	37	10-3"	
298	501	3/14/2006	61.1	10	-21.9	-21.9	-83	0	8	9	14	17	16-6"	
299	502	3/14/2006	61.1	10	-21.9	-21.9	-83	0	8	8	10	12	21	
300	503	3/14/2006	61.1	10	-21.9	-21.9	-83	0	9	9	9	17	26	
301	524	3/14/2006	61.1	10	-21.9	-21.9	-83	0	11	9	13	31	32-6"	
302	549	3/14/2006	61.1	10	-21.9	-21.9	-83	0	10	12	33	56	12-2"	
303	550	3/14/2006	61.1	10	-21.9	-21.9	-83	0	13	13	15	28	70	
304	292	3/15/2006	56.1	15	-21.9	-13.9	-70	8	22	37	54	67	72	
305	314	3/15/2006	56.1	15	-21.9	-21.9	-78	0	25	24	21	15	9-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
306	335	3/15/2006	56.1	15	-21.9	-21.9	-78	0	36	29	26	21	12-6"	
307	361	3/15/2006	56.1	15	-21.9	-21.9	-78	0	26	23	16	18	14	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
308	74	3/15/2006	50.1	15	-21.9	-21.9	-72	0	20	30	29	35	36	
309	75	3/15/2006	50.1	15	-21.9	-21.9	-72	0	24	26	30	36	33	
310	76	3/15/2006	50.1	15	-21.9	-21.9	-72	0	16	23	29	30	26	
311	77	3/15/2006	50.1	15	-21.9	-21.9	-72	0	17	29	31	30	15-6"	
312	96	3/15/2006	50.1	20	-21.9	-21.9	-72	0	31	38	41	36	15-6"	
313	97	3/15/2006	50.1	15	-21.9	-21.9	-72	0	28	49	44	49	39	
314	98	3/15/2006	50.1	15	-21.9	-21.9	-72	0	25	44	40	42	28	
315	119	3/15/2006	50.1	15	-21.9	-21.9	-72	0	28	39	44	41	25-9"	
316	140	3/15/2006	50.1	15	-21.9	-21.9	-72	0	58	44	45	36	15-6"	
317	99	3/15/2006	50.1	15	-21.9	-21.9	-72	0	25	28	37	39	17-6"	
318	120	3/15/2006	56.1	15	-21.9	-14.9	-71	7	20	37	39	51	68	
319	575	3/15/2006	61.1	10	-21.9	-21.9	-83	0	11	11	14	27	30-7"	
320	576	3/15/2006	61.1	10	-21.9	-21.9	-83	0	12	11	14	14	5-4"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
321	597	3/15/2006	61.1	10	-21.9	-21.9	-83	0	11	10	10	21	35-10"	
322	598	3/15/2006	61.1	10	-21.9	-21.9	-83	0	11	9	9	15	67	
323	618	3/15/2006	61.1	10	-21.9	-21.9	-83	0	12	13	13	28	38-9"	
324	644	3/15/2006	61.1	10	-21.9	-20.9	-82	1	11	12	14	24	70-9"	
325	667	3/15/2006	61.1	10	-21.9	-21.65	-82.75	0.25	16	16	20	41	61-10"	
326	474	3/15/2006	61.1	10	-21.9	-21.9	-83	0	8	8	10	12	27	
327	448	3/15/2006	61.1	10	-21.9	-21.9	-83	0	10	9	10	11	13-8"	

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328	405	3/15/2006	61.1	10	-21.9	-21.9	-83	0	10	10	10	10	10-11"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
329	379	3/15/2006	61.1	10	-21.9	-21.9	-83	0	10	7	10	12	12	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
330	380	3/15/2006	61.1	10	-21.9	-21.9	-83	0	11	13	9	14	8-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
331	406	3/15/2006	61.1	10	-21.9	-21.9	-83	0	9	10	9	10	12	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
332	449	3/15/2006	61.1	10	-21.9	-21.9	-83	0	10	7	10	12	10-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
333	141	3/16/2006	56.1	15	-21.9	-14.65	-70.75	7.25	22	53	52	57	66	
334	121	3/16/2006	56.1	15	-21.9	-21.9	-78	0	20	26	21	22	21	
335	142	3/16/2006	56.1	15	-21.9	-14.4	-70.5	7.5	20	30	43	45	65	
336	122	3/16/2006	56.1	15	-21.9	-15.15	-71.25	6.75	20	38	40	52	64	
337	143	3/16/2006	56.1	15	-21.9	-21.9	-78	0	25	23	24	23	22	
338	123	3/16/2006	56.1	15	-21.9	-14.9	-71	7	12	22	33	57	72	
339	144	3/16/2006	56.1	15	-21.9	-13.9	-70	8	17	32	56	76	90	
340	475	3/16/2006	61.1	10	-21.9	-21.9	-83	0	13	9	11	16	25-9"	
341	385	3/16/2006	61.1	10	-21.9	-21.9	-83	0	14	13	13	11	11-11"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
342	386	3/16/2006	61.1	10	-21.9	-21.9	-83	0	13	16	15	17	15	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
343	407	3/16/2006	61.1	10	-21.9	-10.33	-71.43	11.57	32	41	50	55	85	
344	408	3/16/2006	61.1	10	-21.9	-10	-71.1	11.9	41	50	67	69	77	
345	428	3/16/2006	61.1	10	-21.9	-10.33	-71.43	11.57	19	34	48	50	64	
346	429	3/16/2006	61.1	10	-21.9	-10	-71.1	11.9	28	34	47	58	68	
347	454	3/16/2006	61.1	10	-21.9	-10.43	-71.53	11.47	25	44	48	60	61	
348	455	3/16/2006	61.1	10	-21.9	-10.33	-71.43	11.57	37	60	95	118	80-10"	
349	480	3/16/2006	61.1	10	-21.9	-10.33	-71.43	11.57	39	58	61	62	81	
350	481	3/16/2006	61.1	10	-21.9	-10	-71.1	11.9	23	35	51	90	110	
351	166	3/17/2006	50.1	15	-21.9	-20.9	-71	1	27	37	62	49	65	
352	189	3/17/2006	50.1	15	-21.9	-20.4	-70.5	1.5	33	35	53	59	62	
353	217	3/17/2006	50.1	15	-21.9	-20.15	-70.25	1.75	21	40	44	60	65	
354	267	3/17/2006	56.1	15	-21.9	-21.9	-78	0	24	22	20	18	17	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
355	293	3/17/2006	56.1	15	-21.9	-14.9	-71	7	28	46	57	55	98	
356	315	3/17/2006	56.1	15	-21.9	-14.9	-71	7	35	46	59	55	63	
357	336	3/17/2006	56.1	15	-21.9	-14.4	-70.5	7.5	25	46	53	75	88	
358	362	3/17/2006	56.1	15	-21.9	-21.9	-78	0	35	30	26	26	12-6"	
359	363	3/17/2006	56.1	15	-21.9	-14.9	-71	7	40	41	55	56	67	
360	364	3/17/2006	56.1	15	-21.9	-15.9	-72	6	41	39	57	43	65	
361	338	3/17/2006	56.1	15	-21.9	-13.9	-70	8	17	42	70	71	117	
362	316	3/17/2006	56.1	15	-21.9	-14.15	-70.25	7.75	37	60	71	80	46-6"	
363	317	3/17/2006	56.1	15	-21.9	-14.65	-70.75	7.25	39	50	57	66	69	
364	294	3/17/2006	56.1	15	-21.9	-13.9	-70	8	61	60	116	124	100-9"	
365	619	3/17/2006	61.1	10	-21.9	-21.9	-83	0	13	14	16	40	19-4"	
366	645	3/17/2006	61.1	10	-21.9	-21.9	-83	0	15	14	17	34	69-9"	
367	668	3/17/2006	61.1	10	-21.9	-21.4	-82.5	0.5	11	13	15	48	64-9"	
368	696	3/17/2006	61.1	10	-21.9	-21.9	-83	0	12	12	16	49	67-9"	
369	724	3/17/2006	61.1	10	-21.9	-21.9	-83	0	14	11	16	48	84	
370	746	3/17/2006	61.1	10	-21.9	-21.9	-83	0	14	14	14	25	99	
371	772	3/17/2006	61.1	10	-21.9	-20.9	-82	1	14	10	17	25	71-9"	

TABLE 1
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Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
372	794	3/17/2006	61.1	10	-21.9	-21.9	-83	0	11	10	22	58	94	
373	773	3/17/2006	61.1	10	-21.9	-20.9	-82	1	11	11	14	30	66-9"	
374	747	3/17/2006	61.1	10	-21.9	-21.5	-82.6	0.4	11	11	13	24	64	
375	725	3/17/2006	61.1	10	-21.9	-20.9	-82	1	15	16	20	36	65-9"	
376	697	3/17/2006	61.1	30	-21.9	-21.4	-82.5	0.5	11	12	17	47	62-6"	
377	796	3/17/2006	61.1	30	-21.9	-21.9	-83	0	11	11	13	35	78	
378	245	3/18/2006	50.1	15	-21.9	-19.9	-70	2	21	32	45	69	63	
379	268	3/18/2006	56.1	15	-21.9	-14.4	-70.5	7.5	31	47	61	66	44-6"	
380	246	3/18/2006	56.1	15	-21.9	-13.9	-70	8	32	46	77	103	83	
381	218	3/18/2006	56.1	15	-21.9	-21.9	-78	0	21	10	8	10	12	Pile Broken, no replacement pile needed, see RFI #139
382	190	3/18/2006	56.1	15	-21.9	-21.9	-78	0	38	9	7	6	7	Pile Broken, no replacement pile needed, see RFI #139
383	167	3/18/2006	56.1	15	-21.9	-13.9	-70	8	23	29	41	64	72	
384	295	3/18/2006	56.1	15	-21.9	-13.9	-70	8	19	39	65	65	70	
385	269	3/18/2006	56.1	15	-21.9	-13.9	-70	8	19	33	57	66	74	
386	247	3/18/2006	56.1	15	-21.9	-13.9	-70	8	25	42	69	77	76	
387	219	3/18/2006	56.1	15	-21.9	-12.4	-68.5	9.5	69	50	44	66	90	
388	191	3/18/2006	56.1	15	-21.9	-13.9	-70	8	40	65	118	116	45-3"	
389	168	3/18/2006	56.1	15	-21.9	-13.9	-70	8	35	50	84	118	70-6"	
390	169	3/18/2006	56.1	15	-21.9	-13.1	-69.2	8.8	22	42	150	172	35-2"	
391	646	3/18/2006	61.1	10	-21.9	-21.9	-83	0	12	14	29	53	15-2"	
392	669	3/18/2006	61.1	10	-21.9	-21.9	-83	0	15	16	23	57	75-7"	
393	647	3/18/2006	61.1	30	-21.9	-21.9	-83	0	10	9	13	44	9-2"	
394	670	3/18/2006	61.1	30	-21.9	-20.9	-82	1	12	14	16	32	64-8"	
395	698	3/18/2006	61.1	30	-21.9	-19.9	-81	2	29	39	55	54	64-7"	
396	648	3/18/2006	61.1	30	-21.9	-21.9	-83	0	11	9	12	23	99	
397	671	3/18/2006	61.1	30	-21.9	-21.9	-83	0	11	12	13	29	92	
398	699	3/18/2006	61.1	30	-21.9	-21.9	-83	0	12	12	19	37	89	
399	649	3/18/2006	61.1	30	-21.9	-21.9	-83	0	9	10	15	54	32-3"	
400	672	3/18/2006	61.1	35	-21.9	-21.6	-82.7	0.3	10	11	13	21	67	
401	700	3/18/2006	61.1	30	-21.9	-20.9	-82	1	13	15	19	30	68-6"	
402	726	3/18/2006	61.1	30	-21.9	-20.9	-82	1	18	12	13	22	62	
403	748	3/18/2006	61.1	30	-21.9	-20.7	-81.8	1.2	14	16	12	25	65-9"	
404	774	3/18/2006	61.1	30	-21.9	-20.9	-82	1	11	13	14	22	77	
405	504	3/20/2006	51.77	15	-32.9	-32.9	-84.67	0	10	12	15	18	34	
406	505	3/20/2006	51.77	15	-32.9	-32.9	-84.67	0	12	15	22	34	71-6"	
407	506	3/20/2006	55.77	15	-32.9	-32.9	-88.67	0	27	39	57	43	20-6"	
408	507	3/20/2006	55.77	15	-32.9	-32.9	-88.67	0	31	46	51	52	43	
409	525	3/20/2006	51.77	15	-32.9	-32.9	-84.67	0	14	16	32	54	62	
410	526	3/20/2006	51.77	15	-32.9	-31.9	-83.67	1	11	13	23	49	46-6"	
411	879	3/20/2006	61.1	45	-21.9	-21.9	-83	0	8	11	15	30	49	
412	857	3/20/2006	61.1	45	-21.9	-21.9	-83	0	10	10	30	55	23-4"	
413	835	3/20/2006	61.1	45	-21.9	-21.9	-83	0	9	8	16	30	43-9"	
414	813	3/20/2006	61.1	45	-21.9	-21.9	-83	0	9	9	19	45	28-6"	
415	770	3/20/2006	61.1	45	-21.9	-21.9	-83	0	8	7	12	34	24-5"	

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Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
416	749	3/20/2006	61.1	35	-21.9	-21.6	-82.7	0.3	11	11	15	42	64-9"	
417	775	3/20/2006	61.1	35	-21.9	-21.9	-83	0	13	12	16	50	67	
418	797	3/20/2006	61.1	35	-21.9	-21.9	-83	0	9	9	12	34	35-6"	
419	822	3/20/2006	61.1	0	-21.9	-21.9	-83	0	8	10	13	28	39-9"	
420	844	3/20/2006	61.1	35	-21.9	-21.9	-83	0	7	8	14	50	50	
421	866	3/20/2006	61.1	35	-21.9	-21.9	-83	0	7	10	22	35	58	
422	821	3/20/2006	61.1	35	-21.9	-21.9	-83	0	9	8	14	38	89	
423	387	3/21/2006	56.1	15	-21.9	-21.9	-78	0	20	19	15	18	15	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
424	388	3/21/2006	56.1	15	-21.9	-21.9	-78	0	22	20	13	15	12	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
425	389	3/21/2006	56.1	15	-21.9	-21.9	-78	0	47	39	41	31	14-6"	
426	390	3/21/2006	56.1	15	-21.9	-21.9	-78	0	28	28	18	20	15	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
427	88	3/21/2006	50.1	45	-21.9	-19.9	-70	2	33	36	60	81	112	
428	110	3/21/2006	50.1	45	-21.9	-19.9	-70	2	22	24	35	59	63	
429	136	3/21/2006	56.1	45	-21.9	-14.65	-70.75	7.25	36	52	66	79	50-6"	
430	162	3/21/2006	56.1	45	-21.9	-13.9	-70	8	28	32	47	73	75	
431	207	3/21/2006	56.1	45	-21.9	-21.9	-78	0	50	46	26	29	36	
432	235	3/21/2006	56.1	45	-21.9	-21.9	-78	0	32	36	28	29	35	
433	263	3/21/2006	56.1	45	-21.9	-14.9	-71	7	13	13	37	65	71	
434	843	3/21/2006	61.1	30	-21.9	-21.9	-83	0	10	12	13	29	70	
435	865	3/21/2006	61.1	35	-21.9	-21.9	-83	0	10	15	30	52	34-6"	
436	823	3/21/2006	61.1	35	-21.9	-21.9	-83	0	10	9	17	35	31-6"	
437	845	3/21/2006	61.1	35	-21.9	-21.9	-83	0	10	11	16	42	51	
438	867	3/21/2006	61.1	35	-21.9	-21.9	-83	0	11	16	42	54	25-3"	
439	744	3/21/2006	61.1	45	-21.9	-21.9	-83	0	7	8	10	25	38-9"	
440	688	3/21/2006	61.1	45	-21.9	-21.9	-83	0	14	12	19	39	30-5"	
441	643	3/21/2006	61.1	45	-21.9	-21.9	-83	0	17	12	14	15	11-6"	
442	617	3/21/2006	61.1	45	-21.9	-21.9	-83	0	18	11	11	11	4-3"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
443	574	3/21/2006	61.1	45	-21.9	-21.9	-83	0	18	12	10	10	9-9"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
444	551	3/21/2006	51.77	10	-32.9	-32.9	-84.67	0	14	13	25	63	92	
445	289	3/22/2006	56.1	45	-21.9	-14.9	-71	7	16	32	42	44	67	
446	332	3/22/2006	56.1	45	-21.9	-15.9	-72	6	32	44	51	58	62	
447	358	3/22/2006	56.1	45	-21.9	-21.9	-78	0	25	27	32	27	26	
448	384	3/22/2006	56.1	45	-21.9	-21.9	-78	0	21	19	22	22	17-9"	
449	427	3/22/2006	56.1	45	-21.9	-21.9	-78	0	31	28	30	26	23	
450	87	3/22/2006	50.1	45	-21.9	-20.4	-70.5	1.5	25	26	48	55	73	
451	109	3/22/2006	50.1	45	-21.9	-19.9	-70	2	23	45	55	87	30-3"	
452	135	3/22/2006	56.1	45	-21.9	-19.9	-76	2	6	6	4	2	2	Pile Broken, replacement pile (#135-R) driven on 4/17/06 see RFI #163
453	161	3/22/2006	56.1	45	-21.9	-13.9	-70	8	22	33	46	48	35-6"	
454	206	3/22/2006	56.1	45	-21.9	-14.9	-71	7	18	35	43	47	67	
455	205	3/22/2006	56.1	45	-21.9	-13.9	-70	8	21	24	30	54	70	
456	160	3/22/2006	56.1	45	-21.9	-9.4	-65.5	12.5	34	62	77	76	45-6"	
457	134	3/22/2006	56.1	40	-21.9	-11.4	-67.5	10.5	71	58	42	44	17-2"	
458	577	3/22/2006	51.77	10	-32.9	-32.9	-84.67	0	12	21	38	47	72	
459	599	3/22/2006	51.77	10	-32.9	-32.9	-84.67	0	14	18	30	52	90	

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460	620	3/22/2006	51.77	10	-32.9	-31.9	-83.67	1	14	15	20	56	79	
461	409	3/22/2006	46.77	10	-32.9	-32.9	-79.67	0	20	18	16	14	13	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
462	410	3/22/2006	46.77	10	-32.9	-32.9	-79.67	0	22	21	20	19	17	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
463	411	3/22/2006	46.77	10	-32.9	-32.9	-79.67	0	65	65	45	35	30	
464	412	3/22/2006	46.77	10	-32.9	-32.9	-79.67	0	34	30	27	23	32	
465	432	3/22/2006	55.77	10	-32.9	-32.9	-88.67	0	21	29	81	73	50-6"	
466	458	3/22/2006	55.77	10	-32.9	-31.9	-87.67	1	22	25	31	57	67-9"	
467	484	3/22/2006	55.77	10	-32.9	-30.4	-86.17	2.5	16	20	21	43	64	
468	527	3/22/2006	55.77	10	-32.9	-29.4	-85.17	3.5	13	22	54	57	79	
469	108	3/23/2006	50.1	45	-21.9	-10	-60.1	11.9	14	23	36	65	75-6"	
470	86	3/23/2006	50.1	45	-21.9	-18.9	-69	3	34	35	41	62	92	
471	234	3/23/2006	56.1	45	-21.9	-14.4	-70.5	7.5	18	15	22	52	62	
472	262	3/23/2006	56.1	45	-21.9	-14.1	-70.2	7.8	19	17	37	54	68	
473	288	3/23/2006	56.1	45	-21.9	-15.7	-71.8	6.2	29	50	49	53	62	
474	331	3/23/2006	56.1	45	-21.9	-21.9	-78	0	43	35	33	34	16-6"	
475	357	3/23/2006	56.1	45	-21.9	-21.9	-78	0	42	47	38	35	31	
476	383	3/23/2006	56.1	45	-21.9	-21.9	-78	0	43	43	37	31	28	
477	426	3/23/2006	56.1	45	-21.9	-21.9	-78	0	29	24	23	23	22	
478	233	3/23/2006	56.1	45	-21.9	-13.9	-70	8	20	23	34	82	40-6"	
479	261	3/23/2006	56.1	45	-21.9	-13.9	-70	8	21	22	27	74	77	
480	287	3/23/2006	56.1	45	-21.9	-14.9	-71	7	21	26	45	59	65	
481	330	3/23/2006	56.1	45	-21.9	-13.9	-70	8	19	28	36	50	93	
482	356	3/23/2006	56.1	45	-21.9	-21.9	-78	0	28	27	27	24	24	
483	453	3/23/2006	64.1	45	-21.9	-21.9	-86	0	8	9	7	8	9-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
484	479	3/23/2006	65.1	45	-21.9	-21.9	-87	0	10	17	20	48	61	
485	522	3/23/2006	65.1	45	-21.9	-21.9	-87	0	14	13	21	29	70	
486	548	3/23/2006	65.1	45	-21.9	-19.9	-85	2	21	21	26	71	65	
487	431	3/23/2006	51.77	10	-32.9	-32.9	-84.67	0	18	19	24	29	13-4"	
488	430	3/23/2006	51.77	10	-32.9	-32.9	-84.67	0	26	33	34	47	10-3"	
489	457	3/23/2006	51.77	10	-32.9	-22.4	-74.17	10.5	98	101	98	54	45	
490	456	3/23/2006	51.77	10	-32.9	-17.9	-69.67	15	43	71	96	97	20-3"	
491	482	3/23/2006	51.77	35	-32.9	-32.9	-84.67	0	18	24	29	56	82	
492	452	3/24/2006	65.1	45	-21.9	-21.9	-87	0	14	17	34	54	75	
493	478	3/24/2006	65.1	45	-21.9	-21.9	-87	0	19	16	28	55	78	
494	521	3/24/2006	65.1	45	-21.9	-21.9	-87	0	48	30	58	81	45-6"	
495	547	3/24/2006	65.1	45	-21.9	-21.9	-87	0	20	33	54	85	46-6"	
496	520	3/24/2006	65.1	45	-21.9	-21.9	-87	0	12	19	34	75	88	
497	451	3/24/2006	65.1	45	-21.9	-9.9	-75	12	52	66	57	60	107	
498	425	3/24/2006	56.1	45	-21.9	-21.9	-78	0	27	23	25	21	22	
499	573	3/24/2006	61.1	45	-21.9	-21.9	-83	0	28	18	17	16	8-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
500	616	3/24/2006	61.1	45	-21.9	-21.9	-83	0	21	18	12	13	12	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
501	483	3/24/2006	51.77	35	-32.9	-19.9	-71.67	13	68	80	110	95	85	
502	552	3/24/2006	51.77	15	-32.9	-30.9	-82.67	2	14	15	20	44	72-10"	
503	578	3/24/2006	51.77	35	-32.9	-31.9	-83.67	1	12	14	23	58	79-10"	

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504	600	3/24/2006	51.77	35	-32.9	-31.9	-83.67	1	14	16	20	57	73-9"	
505	621	3/24/2006	51.77	35	-32.9	-30.9	-82.67	2	20	25	25	65	32-3"	
506	553	3/24/2006	55.77	35	-32.9	-19.9	-75.67	13	110	75	61	60	104	
507	579	3/24/2006	51.77	35	-32.9	-31.9	-83.67	1	19	14	17	28	98	
508	601	3/24/2006	51.77	35	-32.9	-20.9	-72.67	12	40	67	108	116	97	
509	622	3/24/2006	51.77	35	-32.9	-31.4	-83.17	1.5	20	18	20	39	40-4"	
510	78	3/27/2006	50.1	15	-21.9	-21.9	-72	0	20	25	31	30	24	
511	79	3/27/2006	50.1	15	-21.9	-21.9	-72	0	19	22	29	27	27	
512	80	3/27/2006	50.1	15	-21.9	-21.9	-72	0	22	24	33	28	33	
513	81	3/27/2006	50.1	15	-21.9	-21.9	-72	0	22	24	36	28	33	
514	82	3/27/2006	50.1	15	-21.9	-21.9	-72	0	34	33	45	38	32-9"	
515	83	3/27/2006	50.1	15	-21.9	-20.15	-70.25	1.75	28	36	52	49	65	
516	100	3/27/2006	50.1	15	-21.9	-21.9	-72	0	17	26	30	32	27	
517		3/27/2006	50.1	15	-21.9	-21.9	-72	0	29	31	35	38	17-6"	
518	102	3/27/2006	50.1	15	-21.9	-21.9	-72	0	30	32	40	32	15-6"	
519	103	3/27/2006	50.1	15	-21.9	-21.9	-72	0	33	35	43	37	20-9"	
520	104	3/27/2006	50.1	15	-21.9	-21.9	-72	0	30	40	38	58	48	
521	105	3/27/2006	50.1	15	-21.9	-19.9	-70	2	31	33	46	50	70	
522	124	3/27/2006	56.1	15	-21.9	-21.9	-78	0	26	27	26	23	11-6"	
523	125	3/27/2006	56.1	15	-21.9	-21.9	-78	0	24	30	24	24	11-6"	
524	126	3/27/2006	56.1	15	-21.9	-21.9	-78	0	26	31	26	24	22	
525	743	3/27/2006	61.1	45	-21.9	-21.9	-83	0	9	12	17	58	35-6"	
526	715	3/27/2006	61.1	45	-21.9	-21.9	-83	0	16	10	32	80	18-2"	
527	687	3/27/2006	61.1	45	-21.9	-21.9	-83	0	17	14	19	53	26-4"	
528	642	3/27/2006	61.1	45	-21.9	-21.9	-83	0	15	17	18	22	51	
529	572	3/27/2006	61.1	45	-21.9	-22.9	-84	-1	12	10	9	11	15	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
530	615	3/27/2006	61.1	45	-21.9	-21.9	-83	0	18	20	17	16	14-7"	
531	641	3/27/2006	61.1	45	-21.9	-21.9	-83	0	20	20	19	25	69	
532	686	3/27/2006	61.1	45	-21.9	-21.9	-83	0	21	18	18	45	118	
533	714	3/27/2006	61.1	45	-21.9	-21.9	-83	0	17	16	19	52	116-9"	
534	742	3/27/2006	61.1	45	-21.9	-21.9	-83	0	10	10	18	61	49-6"	
535	769	3/27/2006	61.1	45	-21.9	-21.9	-83	0	9	8	12	33	72	
536	812	3/27/2006	61.1	45	-21.9	-21.9	-83	0	8	11	12	35	56	
537	834	3/27/2006	61.1	45	-21.9	-21.9	-83	0	10	11	37	70	22-3"	
538	485	3/28/2006	55.77	15	-32.9	-32.9	-88.67	0	30	36	57	64	30-6"	
539	459	3/28/2006	55.77	15	-32.9	-32.9	-88.67	0	21	27	40	47	74	
540	433	3/28/2006	55.77	15	-32.9	-32.9	-88.67	0	23	31	46	57	78	
541	127	3/28/2006	56.1	15	-21.9	-14.4	-70.5	7.5	19	29	60	72	112	
542	128	3/28/2006	56.1	15	-21.9	-21.9	-78	0	31	33	29	27	24	
543	129	3/28/2006	56.1	15	-21.9	-13.9	-70	8	55	32	65	62	82	
544	130	3/28/2006	56.1	15	-21.9	-8.4	-64.5	13.5	23	39	85	103	101	
545	84	3/28/2006	50.1	15	-21.9	-19.9	-70	2	49	53	50	57	70	
546	85	3/28/2006	50.1	15	-21.9	-17.4	-67.5	4.5	115	73	51	71	33-3"	
547	106	3/28/2006	50.1	45	-21.9	-18.4	-68.5	3.5	110	70	55	54	81	

TABLE 1
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Treadwell & Rollo Pile No.	Project Pile Number	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
548	107	3/28/2006	50.1	15	-21.9	-16.9	-67	5	95	52	44	63	88	
549	131	3/28/2006	56.1	15	-21.9	-7.4	-63.5	14.5	17	35	67	123	85-6"	
550	623	3/28/2006	51.77	35	-32.9	-32.9	-84.67	0	18	22	58	113	29-2"	
551	856	3/28/2006	61.1	45	-21.9	-21.9	-83	0	9	12	30	44	28-5"	
552	878	3/28/2006	61.1	45	-21.9	-21.9	-83	0	8	10	22	44	31-6"	
553	811	3/28/2006	61.1	45	-21.9	-21.9	-83	0	11	11	33	50	13-2"	
554	768	3/28/2006	61.1	45	-21.9	-21.9	-83	0	8	10	12	34	46-11"	
555	833	3/28/2006	61.1	45	-21.9	-21.9	-83	0	10	12	36	62	34-5"	
556	855	3/28/2006	61.1	45	-21.9	-21.9	-83	0	9	9	16	32	13-3"	
557	877	3/28/2006	61.1	45	-21.9	-21.9	-83	0	12	15	38	63	9-7"	Pile Broken, replacement pile (#877-R) driven on 4/20/06 see RFI #163
558	832	3/28/2006	61.1	10	-21.9	-21.9	-83	0	10	12	30	57	31-4"	
559	854	3/28/2006	61.1	10	-21.9	-21.9	-83	0	10	17	38	68	29-4"	
560	876	3/28/2006	61.1	10	-21.9	-21.9	-83	0	11	15	39	74	36-5"	
561	528	3/28/2006	55.77	35	-32.9	-27.9	-83.67	5	12	13	32	65	73	
562	554	3/28/2006	55.77	35	-32.9	-27.1	-82.87	5.8	14	15	18	73	64-6"	
563	413	3/29/2006	46.77	15	-32.9	-32.9	-79.67	0	35	24	19	13	12	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
564	391	3/29/2006	56.1	15	-21.9	-20.9	-77	1	35	35	25	22	21	
565	365	3/29/2006	56.1	15	-21.9	-21.9	-78	0	29	24	21	17	8-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
566	339	3/29/2006	56.1	15	-21.9	-21.9	-78	0	26	30	21	21	17	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
567	318	3/29/2006	56.1	15	-21.9	-21.9	-78	0	26	26	23	19	16	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
568	296	3/29/2006	56.1	15	-21.9	-21.9	-78	0	28	27	20	20	17	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
569	270	3/29/2006	56.1	15	-21.9	-21.9	-78	0	22	23	26	20	15	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
570	248	3/29/2006	56.1	15	-21.9	-21.9	-78	0	22	27	22	21	21	
571	220	3/29/2006	56.1	15	-21.9	-13.9	-70	8	23	36	66	81	90	
572	192	3/29/2006	56.1	15	-21.9	-11.9	-68	10	87	73	49	48	102	
573	170	3/29/2006	56.1	15	-21.9	-21.9	-78	0	29	29	26	24	12-6"	
574	580	3/29/2006	51.77	35	-32.9	-30.9	-82.67	2	16	17	18	17	73	
575	602	3/29/2006	51.77	35	-32.9	-31.9	-83.67	1	13	16	22	46	62-6"	
576	868	3/29/2006	61.1	10	-21.9	-21.9	-83	0	9	15	35	47	14-3"	
577	846	3/29/2006	61.1	35	-21.9	-21.9	-83	0	9	12	30	46	38-6"	
578	824	3/29/2006	61.1	20	-21.9	-21.9	-83	0	8	12	21	30	21-4"	
579	869	3/29/2006	61.1	35	-21.9	-21.9	-83	0	8	8	19	30	65	
580	847	3/29/2006	61.1	35	-21.9	-21.9	-83	0	8	10	16	35	49	
581	825	3/29/2006	61.1	10	-21.9	-21.9	-83	0	8	9	11	23	58	
582	848	3/29/2006	61.1	35	-21.9	-21.9	-83	0	7	9	11	29	56	
583	870	3/29/2006	61.1	35	-21.9	-21.9	-83	0	8	10	34	72	37-4"	
584	826	3/29/2006	61.1	10	-21.9	-21.9	-83	0	10	10	15	34	53	
585	871	3/29/2006	61.1	10	-21.9	-21.9	-83	0	9	10	36	50	22-3"	
586	849	3/29/2006	61.1	10	-21.9	-21.9	-83	0	9	9	12	21	39	
587	827	3/29/2006	61.1	10	-21.9	-21.9	-83	0	11	14	30	57	21-4"	
588	872	3/29/2006	61.1	10	-21.9	-21.9	-83	0	10	17	42	53	15-3"	
589	193	3/30/2006	56.1	15	-21.9	-11.9	-68	10	44	33	37	77	30-3"	
590	221	3/30/2006	56.1	15	-21.9	-21.9	-78	0	25	47	36	28	13-6"	
591	249	3/30/2006	56.1	15	-21.9	-21.9	-78	0	34	37	38	33	31	

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Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
592	271	3/30/2006	56.1	15	-21.9	-13.9	-70	8	16	35	55	78	86	
593	297	3/30/2006	56.1	15	-21.9	-16.9	-73	5	74	63	69	58	65	
594	319	3/30/2006	56.1	15	-21.9	-21.9	-78	0	41	36	27	23	11-6"	
595	340	3/30/2006	56.1	15	-21.9	-13.9	-70	8	19	38	49	69	84	
596	366	3/30/2006	56.1	15	-21.9	-21.9	-78	0	38	35	25	22	21	
597	392	3/30/2006	56.1	15	-21.9	-21.9	-78	0	33	25	24	17	16	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
598	145	3/30/2006	56.1	15	-21.9	-21.9	-78	0	29	27	34	29	23	
599	171	3/30/2006	56.1	15	-21.9	-13.9	-70	8	32	30	48	61	80	
600	146	3/30/2006	56.1	15	-21.9	-21.9	-78	0	44	34	41	33	27	
601	850	3/30/2006	61.1	10	-21.9	-21.9	-83	0	10	13	34	68	18-3"	
602	873	3/30/2006	61.1	10	-21.9	-21.9	-83	0	10	16	34	59	15-3"	
603	851	3/30/2006	61.1	10	-21.9	-21.9	-83	0	8	11	19	60	79	
604	874	3/30/2006	61.1	35	-21.9	-21.9	-83	0	9	11	30	52	48-9'	
605	852	3/30/2006	61.1	35	-21.9	-21.9	-83	0	10	10	15	50	80	
606	853	3/30/2006	61.1	35	-21.9	-21.9	-83	0	11	12	16	38	82	
607	875	3/30/2006	61.1	35	-21.9	-21.9	-83	0	10	17	35	58	51-9"	
608	831	3/30/2006	61.1	10	-21.9	-21.9	-83	0	10	11	18	50	35-7"	
609	728	3/30/2006	61.1	10	-21.9	-21.9	-83	0	32	33	34	55	76	
610	750	3/30/2006	61.1	35	-21.9	-21.9	-83	0	15	18	23	65	63-9"	
611	776	3/30/2006	61.1	35	-21.9	-21.9	-83	0	10	20	26	84	80-6"	
612	798	3/30/2006	61.1	35	-21.9	-21.9	-83	0	12	13	19	35	63	
613	172	3/31/2006	56.1	15	-21.9	-13.9	-70	8	21	33	52	71	84	
614	195	3/31/2006	56.1	15	-21.9	-13.9	-70	8	26	36	60	94	105	
615	222	3/31/2006	56.1	15	-21.9	-13.9	-70	8	21	36	57	60	80	
616	250	3/31/2006	56.1	15	-21.9	-13.9	-70	8	21	30	56	64	72	
617	272	3/31/2006	56.1	15	-21.9	-13.9	-70	8	26	42	56	66	85	
618	298	3/31/2006	56.1	15	-21.9	-13.9	-70	8	44	52	78	93	45-6"	
619	320	3/31/2006	56.1	15	-21.9	-13.9	-70	8	39	53	76	75	43-6"	
620	341	3/31/2006	56.1	15	-21.9	-13.9	-70	8	22	36	64	103	46-6"	
621	367	3/31/2006	56.1	15	-21.9	-13.9	-70	8	23	43	59	72	42-6"	
622	223	3/31/2006	56.1	15	-21.9	-13.9	-70	8	21	36	55	75	82	
623	251	3/31/2006	56.1	15	-21.9	-21.9	-78	0	40	33	28	30	13-6"	
624	273	3/31/2006	56.1	15	-21.9	-21.9	-78	0	36	29	27	25	23	
625	393	3/31/2006	56.1	15	-21.9	-21.65	-77.75	0.25	34	28	22	17	19-3"	Restrike performed on final 3-inches of driving on 4/1/06
626	729	3/31/2006	61.1	35	-21.9	-21.9	-83	0	11	13	14	31	82	
627	701	3/31/2006	61.1	35	-21.9	-21.9	-83	0	10	12	20	59	29-5"	
628	673	3/31/2006	61.1	35	-21.9	-21.9	-83	0	10	14	22	60	44-6"	
629	650	3/31/2006	61.1	35	-21.9	-21.9	-83	0	10	11	14	39	49-9"	
630	730	3/31/2006	61.1	35	-21.9	-21.9	-83	0	9	9	11	16	60	
631	702	3/31/2006	61.1	35	-21.9	-21.9	-83	0	10	9	13	43	62-7"	
632	674	3/31/2006	61.1	35	-21.9	-21.9	-83	0	10	10	11	46	40-6"	
633	651	3/31/2006	61.1	35	-21.9	-21.9	-83	0	9	12	13	40	69-9"	
634	731	3/31/2006	61.1	35	-21.9	-21.9	-83	0	10	12	14	46	52-6"	
635	703	3/31/2006	61.1	35	-21.9	-21.9	-83	0	11	10	12	32	71-9"	

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636	675	3/31/2006	61.1	35	-21.9	-21.9	-83	0	11	12	24	72	29-3"	
637	652	3/31/2006	61.1	35	-21.9	-21.9	-83	0	11	12	27	70	51-6"	
638	732	3/31/2006	61.1	35	-21.9	-21.9	-83	0	10	10	13	56	50-6"	
639	704	3/31/2006	61.1	35	-21.9	-21.9	-83	0	10	10	13	47	80	
640	299	4/1/2006	56.1	15	-21.9	-13.9	-70	8	27	33	48	72	46-6"	
641	321	4/1/2006	56.1	15	-21.9	-13.9	-70	8	34	38	60	79	82	
642	342	4/1/2006	56.1	15	-21.9	-21.9	-78	0	41	39	30	26	24	
643	368	4/1/2006	56.1	15	-21.9	-21.9	-78	0	31	31	24	22	19	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
644	394	4/1/2006	56.1	15	-21.9	-21.9	-78	0	34	28	26	27	23	
645	434	4/1/2006	55.77	15	-32.9	-32.9	-88.67	0	23	51	61	58	32-9"	
646	414	4/1/2006	46.77	15	-32.9	-32.9	-79.67	0	25	20	18	23	17	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
647	415	4/1/2006	46.77	15	-32.9	-22.9	-69.67	10	32	45	68	88	105	
648	416	4/1/2006	46.77	15	-32.9	-32.9	-79.67	0	35	31	30	24	12-6"	
649	460	4/1/2006	55.77	15	-32.9	-32.9	-88.67	0	32	68	73	54	22-6"	
650	676	4/1/2006	61.1	35	-21.9	-21.9	-83	0	15	15	22	66	25-3"	
651	627	4/1/2006	51.77	35	-32.9	-32.9	-84.67	0	13	24	57	79	30-4"	
652	606	4/1/2006	51.77	35	-32.9	-31.9	-83.67	1	9	12	28	56	60-4"	
653	584	4/1/2006	51.77	35	-32.9	-32.9	-84.67	0	13	33	54	55	13-3"	
654	624	4/1/2006	51.77	35	-32.9	-32.9	-84.67	0	13	14	16	38	79	
655	603	4/1/2006	51.77	35	-32.9	-32.9	-84.67	0	13	14	15	19	56	
656	581	4/1/2006	51.77	35	-32.9	-31.9	-83.67	1	12	14	16	55	79-9"	
657	625	4/1/2006	51.77	35	-32.9	-31.9	-83.67	1	13	13	13	20	63	
658	604	4/1/2006	51.77	35	-32.9	-31.9	-83.67	1	16	16	15	30	97	
659	582	4/1/2006	51.77	35	-32.9	-31.9	-83.67	1	13	13	16	54	70-9"	
660	626	4/1/2006	51.77	35	-32.9	-30.9	-82.67	2	15	16	19	20	69	
661	605	4/1/2006	51.77	35	-32.9	-31.9	-83.67	1	18	17	18	30	90	
662	583	4/1/2006	51.77	35	-32.9	-30.9	-82.67	2	18	17	15	19	73	
663	147	4/3/2006	56.1	15	-21.9	-14.9	-71	7	26	30	58	81	78	
664	173	4/3/2006	56.1	15	-21.9	-13.9	-70	8	16	27	53	87	48-6"	
665	148	4/3/2006	56.1	15	-21.9	-21.9	-78	0	38	38	28	28	11-6"	
666	196	4/3/2006	56.1	15	-21.9	-13.4	-69.5	8.5	24	28	48	86	60-6"	
667	174	4/3/2006	56.1	15	-21.9	-13.4	-69.5	8.5	32	22	25	61	110	
668	149	4/3/2006	56.1	15	-21.9	-14.9	-71	7	20	42	66	73	75	
669	224	4/3/2006	56.1	15	-21.9	-21.9	-78	0	27	38	33	26	26	
670	197	4/3/2006	56.1	15	-21.9	-13.4	-69.5	8.5	23	33	53	93	60-6"	
671	175	4/3/2006	56.1	15	-21.9	-12.9	-69	9	42	33	30	44	103	
672	150	4/3/2006	56.1	15	-21.9	-12.65	-68.75	9.25	63	41	49	67	25-3"	
673	252	4/3/2006	56.1	15	-21.9	-21.9	-78	0	39	41	35	32	25	
674	225	4/3/2006	56.1	15	-21.9	-14.4	-70.5	7.5	22	33	68	79	82	
675	198	4/3/2006	56.1	15	-21.9	-11.9	-68	10	74	52	39	59	83	
676	555	4/3/2006	55.77	35	-32.9	-27.9	-83.67	5	13	17	25	57	72-9"	
677	529	4/3/2006	55.77	35	-32.9	-28.9	-84.67	4	12	16	36	44	74	
678	508	4/3/2006	55.77	35	-32.9	-32.9	-88.67	0	56	46	50	67	31-6"	
679	486	4/3/2006	55.77	35	-32.9	-29.9	-85.67	3	15	18	25	35	65	

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680	556	4/3/2006	55.77	35	-32.9	-27.9	-83.67	5	18	17	17	21	72	
681	530	4/3/2006	55.77	35	-32.9	-27.9	-83.67	5	16	15	16	27	86	
682	509	4/3/2006	55.77	35	-32.9	-29.9	-85.67	3	19	27	60	57	64	
683	487	4/3/2006	55.77	35	-32.9	-29.9	-85.67	3	21	21	34	55	85	
684	461	4/3/2006	55.77	35	-32.9	-28.9	-84.67	4	17	21	24	37	82	
685	435	4/3/2006	55.77	35	-32.9	-30.9	-86.67	2	22	24	26	46	89	
686	436	4/3/2006	55.77	35	-32.9	-18.9	-74.67	14	130	109	117	107	102	
687	176	4/4/2006	56.1	15	-21.9	-11.4	-67.5	10.5	95	55	36	54	48-6"	
688	274	4/4/2006	56.1	15	-21.9	-15.9	-72	6	55	64	69	69	66	
689	253	4/4/2006	56.1	15	-21.9	-13.4	-69.5	8.5	28	25	50	90	106	
690	226	4/4/2006	56.1	15	-21.9	-13.9	-70	8	25	32	70	96	20-3"	
691	199	4/4/2006	56.1	15	-21.9	-14.9	-71	7	49	35	39	80	110	
692	300	4/4/2006	56.1	15	-21.9	-15.7	-71.8	6.2	60	68	51	42	82	
693	275	4/4/2006	56.1	15	-21.9	-13.9	-70	8	31	46	81	92	132	
694	254	4/4/2006	56.1	15	-21.9	-12.9	-69	9	63	30	40	85	94-6"	
695	227	4/4/2006	56.1	15	-21.9	-12.9	-69	9	51	34	43	75	71-6"	
696	322	4/4/2006	56.1	15	-21.9	-11.9	-68	10	52	37	35	50	100-6"	
697	301	4/4/2006	56.1	15	-21.9	-11.4	-67.5	10.5	54	38	34	73	130-10"	
698	276	4/4/2006	56.1	15	-21.9	-12.9	-69	9	51	37	45	80	100-6"	
699	557	4/4/2006	55.77	35	-32.9	-28.9	-84.67	4	16	15	18	36	90	
700	531	4/4/2006	55.77	35	-32.9	-27.9	-83.67	5	17	15	19	22	66	
701	488	4/4/2006	55.77	35	-32.9	-30.9	-86.67	2	22	27	37	56	93	
702	462	4/4/2006	55.77	35	-32.9	-17.9	-73.67	15	127	94	133	100	102	
703	255	4/5/2006	56.1	15	-21.9	-8.5	-64.6	13.4	22	45	86	141	125	
704	323	4/5/2006	56.1	15	-21.9	-11.9	-68	10	52	49	42	50	107	
705	302	4/5/2006	56.1	15	-21.9	-11.9	-68	10	67	41	41	89	60-6"	
706	277	4/5/2006	56.1	15	-21.9	-12.4	-68.5	9.5	71	54	31	49	107	
707	343	4/5/2006	56.1	15	-21.9	-21.9	-78	0	42	37	29	24	26	
708	369	4/5/2006	56.1	15	-21.9	-21.9	-78	0	47	39	33	40	20-6"	
709	344	4/5/2006	56.1	15	-21.9	-21.9	-78	0	5	5	6	8	6	Pile Broken, no replacement pile needed, see RFI #179
710	370	4/5/2006	56.1	15	-21.9	-12.4	-68.5	9.5	40	32	54	60	40-6"	
711	324	4/5/2006	56.1	15	-21.9	-11.9	-68	10	49	39	39	61	30-3"	
712	345	4/5/2006	56.1	15	-21.9	-11.65	-67.75	10.25	58	41	40	69	20-3"	
713	371	4/5/2006	56.1	15	-21.9	-12.4	-68.5	9.5	47	44	34	44	91	
714	303	4/5/2006	56.1	15	-21.9	-11.15	-67.25	10.75	87	70	44	46	30-3"	
715	325	4/5/2006	56.1	15	-21.9	-21.9	-78	0	7	7	9	11	10	Pile Broken, no replacement pile needed, see RFI #179
716	346	4/5/2006	56.1	15	-21.9	-10.65	-66.75	11.25	55	51	37	45	20-3"	
717	751	4/5/2006	61.1	35	-21.9	-21.9	-83	0	16	16	21	36	88	
718	752	4/5/2006	61.1	35	-21.9	-21.9	-83	0	11	14	15	25	87	
719	777	4/5/2006	61.1	35	-21.9	-21.9	-83	0	16	19	20	27	61	
720	799	4/5/2006	61.1	35	-21.9	-21.9	-83	0	18	22	30	56	72	
721	778	4/5/2006	61.1	35	-21.9	-21.9	-83	0	17	15	24	56	69-9"	
722	800	4/5/2006	61.1	35	-21.9	-21.9	-83	0	17	19	39	63	27-3"	
723	753	4/5/2006	61.1	35	-21.9	-21.9	-83	0	13	13	12	28	78	

TABLE 1
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Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
724	779	4/5/2006	61.1	35	-21.9	-21.9	-83	0	12	15	22	79	49-3"	
725	801	4/5/2006	61.1	35	-21.9	-21.9	-83	0	15	14	26	42	50-6"	
726	754	4/5/2006	61.1	35	-21.9	-21.9	-83	0	18	18	28	90	47-3"	
727	780	4/5/2006	61.1	35	-21.9	-21.9	-83	0	19	19	30	42	153	
728	802	4/5/2006	61.1	35	-21.9	-21.23	-82.33	0.67	36	30	30	42	85-9"	
729	375	4/6/2006	56.1	15	-21.9	-12.9	-69	9	39	35	33	44	79	
730	398	4/6/2006	56.1	15	-21.9	-21.9	-78	0	33	29	25	22	15	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
731	397	4/6/2006	56.1	15	-21.9	-21.9	-78	0	33	31	24	25	23	
732	132	4/6/2006	56.1	35	-21.9	-7.5	-63.6	14.4	15	17	39	71	30-3"	
733	133	4/6/2006	56.1	35	-21.9	-7	-63.1	14.9	9	11	30	53	102	
734	396	4/6/2006	56.1	15	-21.9	-21.9	-78	0	40	38	28	29	22	
735	395	4/6/2006	56.1	15	-21.9	-11.4	-67.5	10.5	44	44	42	64	94	
736	418	4/6/2006	46.77	15	-32.9	-23.9	-70.67	9	46	67	74	77	105	
737	419	4/6/2006	46.77	15	-32.9	-20.9	-67.67	12	38	50	59	81	28-3"	
738	417	4/6/2006	46.77	25	-32.9	-19.4	-66.17	13.5	36	43	72	71	126	
739	439	4/6/2006	55.77	25	-32.9	-13.75	-69.52	19.15	69	102	116	165	50-3"	
740	440	4/6/2006	55.77	25	-32.9	-30.9	-86.67	2	20	21	27	46	63	
741	437	4/6/2006	55.77	35	-32.9	-32.9	-88.67	0	13	10	10	9	4-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
742	438	4/6/2006	55.77	35	-32.9	-30.4	-86.17	2.5	16	18	20	45	65-9"	
743	464	4/6/2006	55.77	35	-32.9	-32.9	-88.67	0	22	39	70	84	90	
744	465	4/6/2006	55.77	35	-32.9	-32.9	-88.67	0	22	52	56	90	30-5"	
745	463	4/6/2006	55.77	35	-32.9	-29.9	-85.67	3	21	22	30	37	61	
746	489	4/6/2006	55.77	35	-32.9	-29.9	-85.67	3	19	28	37	51	70-9"	
747	511	4/6/2006	55.77	35	-32.9	-28.9	-84.67	4	25	26	37	50	61	
748	151	4/7/2006	56.1	25	-21.9	-7.4	-63.5	14.5	20	40	58	93	50-6"	
749	152	4/7/2006	56.1	15	-21.9	-7.4	-63.5	14.5	16	30	45	75	100	
750	177	4/7/2006	56.1	15	-21.9	-6.9	-63	15	24	42	47	85	80-6"	
751	200	4/7/2006	56.1	15	-21.9	-11.4	-67.5	10.5	71	52	45	50	55-6"	
752	228	4/7/2006	56.1	15	-21.9	-11.4	-67.5	10.5	80	57	46	59	45-6"	
753	256	4/7/2006	56.1	15	-21.9	-11.15	-67.25	10.75	52	66	50	49	95	
754	278	4/7/2006	56.1	15	-21.9	-10.65	-66.75	11.25	53	57	65	47	37	
755	304	4/7/2006	56.1	15	-21.9	-11.4	-67.5	10.5	67	86	61	47	50	
756	326	4/7/2006	56.1	15	-21.9	-12.15	-68.25	9.75	54	35	31	43	55-9"	
757	347	4/7/2006	56.1	15	-21.9	-14.2	-70.3	7.7	26	39	74	82	90	
758	178	4/7/2006	56.1	15	-21.9	-11.15	-67.25	10.75	68	61	43	46	20-2"	
759	201	4/7/2006	56.1	15	-21.9	-11.4	-67.5	10.5	86	71	57	48	50-6"	
760	229	4/7/2006	56.1	15	-21.9	-6.9	-63	15	7	15	33	71	130	
761	257	4/7/2006	56.1	15	-21.9	-8.15	-64.25	13.75	32	45	67	72	12-2"	
762	279	4/7/2006	56.1	15	-21.9	-10.65	-66.75	11.25	93	67	43	38	65	
763	532	4/7/2006	55.77	35	-32.9	-30.9	-86.67	2	45	54	37	54	64	
764	558	4/7/2006	55.77	35	-32.9	-27.9	-83.67	5	16	15	22	36	69	
765	654	4/7/2006	61.1	35	-21.9	-21.9	-83	0	13	13	11	51	41-6"	
766	655	4/7/2006	61.1	35	-21.9	-21.9	-83	0	10	11	13	57	38-4"	
767	656	4/7/2006	61.1	35	-21.9	-21.9	-83	0	12	11	13	25	87	

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Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
768	657	4/7/2006	61.1	35	-21.9	-21.9	-83	0	12	10	15	22	100	
769	628	4/7/2006	51.77	35	-32.9	-31.9	-83.67	1	13	12	17	35	95	
770	607	4/7/2006	51.77	35	-32.9	-30.9	-82.67	2	15	15	16	27	60-6"	
771	585	4/7/2006	51.77	35	-32.9	-32.9	-84.67	0	19	15	16	42	88	
772	629	4/7/2006	51.77	35	-32.9	-30.9	-82.67	2	12	16	17	54	63-6"	
773	608	4/7/2006	51.77	35	-32.9	-30.9	-82.67	2	16	16	20	25	94	
774	305	4/8/2006	56.1	15	-21.9	-21.9	-78	0	8	7	10	8	12	Pile Broken, no replacement pile needed, see RFI #182
775	327	4/8/2006	56.1	15	-21.9	-8.4	-64.5	13.5	5	17	43	55	67	
776	348	4/8/2006	56.1	15	-21.9	-12.4	-68.5	9.5	38	26	23	37	69	
777	374	4/8/2006	56.1	15	-21.9	-12.4	-68.5	9.5	32	26	19	44	77	
778	153	4/8/2006	56.1	15	-21.9	-6.9	-63	15	23	25	39	66	99	
779	179	4/8/2006	56.1	15	-21.9	-6.9	-63	15	11	26	34	60	90	
780	202	4/8/2006	56.1	15	-21.9	-11.65	-67.75	10.25	69	47	31	35	40-6"	
781	230	4/8/2006	56.1	15	-21.9	-7.4	-63.5	14.5	8	12	37	67	42-6"	
782	258	4/8/2006	56.1	15	-21.9	-7.65	-63.75	14.25	12	18	35	53	70	
783	280	4/8/2006	56.1	15	-21.9	-6.75	-62.85	15.15	6	7	11	41	80	
784	306	4/8/2006	56.1	15	-21.9	-6.9	-63	15	6	11	30	70	55-6"	
785	328	4/8/2006	56.1	15	-21.9	-11.65	-67.75	10.25	51	26	19	39	42-6"	
786	349	4/8/2006	56.1	15	-21.9	-13.15	-69.25	8.75	19	17	27	52	80	
787	375	4/8/2006	56.1	15	-21.9	-13.4	-69.5	8.5	13	14	32	50	67	
788	159	4/8/2006	56.1	15	-21.9	-6.5	-62.6	15.4	12	32	48	45	98	
789	203	4/8/2006	56.1	15	-21.9	-6.9	-63	15	19	17	32	56	80	
790	204	4/8/2006	56.1	15	-21.9	-11	-67.1	10.9	62	61	54	41	40-6"	
791	232	4/8/2006	56.1	15	-21.9	-7.9	-64	14	18	19	35	57	75	
792	259	4/8/2006	56.1	15	-21.9	-7.9	-64	14	10	20	42	72	77	
793	586	4/8/2006	51.77	35	-32.9	-32.9	-84.67	0	15	18	39	44	35	
794	630	4/8/2006	51.77	35	-32.9	-31.9	-83.67	1	14	16	21	55	63-6"	
795	609	4/8/2006	51.77	35	-32.9	-31.9	-83.67	1	16	14	16	22	84	
796	587	4/8/2006	51.77	35	-32.9	-32.9	-84.67	0	19	25	48	58	20-6"	
797	559	4/8/2006	55.77	35	-32.9	-28.4	-84.17	4.5	20	18	19	50	89	
798	533	4/8/2006	55.77	35	-32.9	-29.4	-85.17	3.5	15	17	29	49	85	
799	512	4/8/2006	55.77	35	-32.9	-29.9	-85.67	3	21	20	26	40	76	
800	490	4/8/2006	55.77	35	-32.9	-14	-69.77	18.9	59	78	117	168	78-4"	
801	560	4/8/2006	55.77	35	-32.9	-16	-71.77	16.9	50	110	129	170	209	
802	534	4/8/2006	55.77	35	-32.9	-16	-71.77	16.9	63	84	110	134	154	
803	513	4/8/2006	55.77	35	-32.9	-14.5	-70.27	18.4	32	76	96	150	100-6"	
804	260	4/10/2006	56.1	15	-21.9	-7.5	-63.6	14.4	7	12	20	34	72	
805	286	4/10/2006	56.1	15	-21.9	-7.75	-63.85	14.15	4	22	44	72	85	
806	329	4/10/2006	56.1	15	-21.9	-13.9	-70	8	18	22	46	67	75	
807	355	4/10/2006	56.1	15	-21.9	-13.9	-70	8	15	22	48	74	74	
808	399	4/10/2006	56.1	15	-21.9	-21.9	-78	0	36	32	23	21	21	
809	421	4/10/2006	56.1	15	-21.9	-21.9	-78	0	47	38	30	30	24	
810	420	4/10/2006	56.1	15	-21.9	-12.65	-68.75	9.25	34	28	48	70	86	
811	400	4/10/2006	56.1	15	-21.9	-12.65	-68.75	9.25	32	28	36	54	88	

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812	401	4/10/2006	56.1	15	-21.9	-13.4	-69.5	8.5	19	25	49	63	82	
813	422	4/10/2006	56.1	15	-21.9	-12.65	-68.75	9.25	28	23	32	56	87	
814	423	4/10/2006	56.1	15	-21.9	-13.15	-69.25	8.75	17	18	33	73	82	
815	828	4/10/2006	61.1	35	-21.9	-21.9	-83	0	14	14	23	48	55	
816	829	4/10/2006	61.1	35	-21.9	-21.9	-83	0	12	13	26	39	49-6"	
817	803	4/10/2006	61.1	35	-21.9	-21.9	-83	0	12	14	21	51	24-4"	
818	781	4/10/2006	61.1	35	-21.9	-21.9	-83	0	11	11	15	50	30-6"	
819	755	4/10/2006	61.1	35	-21.9	-21.9	-83	0	13	15	20	50	40-6"	
820	733	4/10/2006	61.1	35	-21.9	-21.9	-83	0	17	17	20	28	37-6"	
821	705	4/10/2006	61.1	35	-21.9	-21.9	-83	0	12	15	19	79	70-6"	
822	677	4/10/2006	61.1	35	-21.9	-21.9	-83	0	18	19	21	34	70-6"	
823	678	4/10/2006	61.1	35	-21.9	-21.9	-83	0	17	15	17	34	50-6"	
824	706	4/10/2006	61.1	35	-21.9	-21.9	-83	0	21	20	19	25	130	
825	734	4/10/2006	61.1	35	-21.9	-12.9	-74	9	43	55	74	71	85	
826	756	4/10/2006	61.1	35	-21.9	-21.9	-83	0	15	14	28	56	100-9"	
827	782	4/10/2006	61.1	35	-21.9	-21.9	-83	0	15	15	14	21	83-10"	
828	804	4/13/2006	61.1	30	-21.9	-21.9	-83	0	14	15	22	61	17-3"	
829	805	4/13/2006	61.1	30	-21.9	-21.9	-83	0	15	17	30	66	25-3"	
830	783	4/13/2006	61.1	30	-21.9	-21.9	-83	0	15	16	18	37	32-6"	
831	757	4/13/2006	61.1	30	-21.9	-21.9	-83	0	23	20	18	27	65	
832	735	4/13/2006	61.1	30	-21.9	-11.9	-73	10	34	47	56	66	55-10"	
833	707	4/13/2006	61.1	25	-21.9	-9.9	-71	12	18	24	41	57	85	
834	679	4/13/2006	61.1	25	-21.9	-10.4	-71.5	11.5	26	45	53	58	82	
835	561	4/13/2006	55.77	30	-32.9	-32.9	-88.67	0	37	10	6	8	6	Pile Broken, no replacement pile needed, see RFI #203
836	535	4/13/2006	55.77	30	-32.9	-29.9	-85.67	3	22	26	30	42	70	
837	514	4/13/2006	55.77	30	-32.9	-21.9	-77.67	11	76	66	86	71	101	
838	681	4/14/2006	61.1	30	-21.9	-21.9	-83	0	11	13	12	34	34-9"	
839	709	4/14/2006	61.1	25	-21.9	-21.9	-83	0	13	14	14	35	56-9"	
840	737	4/14/2006	61.1	25	-21.9	-21.9	-83	0	13	17	25	70	13-3"	
841	682	4/14/2006	61.1	30	-21.9	-21.9	-83	0	17	19	17	30	78	
842	710	4/14/2006	61.1	30	-21.9	-21.9	-83	0	23	17	19	37	75	
843	738	4/14/2006	61.1	30	-21.9	-21.9	-83	0	13	14	20	63	38-6"	
844	683	4/14/2006	61.1	30	-21.9	-21.9	-83	0	21	18	22	65	70-9"	
845	711	4/14/2006	61.1	30	-21.9	-21.9	-83	0	18	17	20	44	66-6"	
846	739	4/14/2006	61.1	30	-21.9	-9.9	-71	12	26	43	57	72	102	
847	761	4/14/2006	61.1	30	-21.9	-21.9	-83	0	13	12	20	41	65	
848	760	4/14/2006	61.1	30	-21.9	-21.9	-83	0	17	17	22	33	93	
849	491	4/15/2006	55.77	30	-32.9	-15.9	-71.67	17	67	81	102	85	100	
850	492	4/15/2006	55.77	30	-32.9	-30.9	-86.67	2	7	7	6	3	3	Pile Broken, no replacement pile needed, see RFI #203
851	466	4/15/2006	55.77	30	-32.9	-13	-68.77	19.9	26	54	68	77	106	
852	441	4/15/2006	65.1	30	-21.9	-3	-68.1	18.9	38	42	61	110	130	
853	381	4/15/2006	56.1	30	-21.9	-21.9	-78	0	31	25	23	18	19	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
854	424	4/15/2006	56.1	30	-21.9	-14.9	-71	7	16	32	49	72	78	
855	467	4/17/2006	65.1	30	-21.9	-3	-68.1	18.9	27	34	36	75	90	

TABLE 1
Indicator and Production Pile Summary
301 Mission Street
San Francisco, California

Treadwell & Rollo Pile No.	Project Pile Number	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
856	493	4/17/2006	65.1	30	-21.9	-18.2	-83.3	3.7	30	30	41	85	105	
857	442	4/17/2006	61.1	30	-21.9	-3.5	-64.6	18.4	30	26	46	90	98	
858	468	4/17/2006	61.1	25	-21.9	-3.9	-65	18	28	28	52	91	89	
859	494	4/17/2006	61.1	35	-21.9	-5.7	-66.8	16.2	32	55	67	78	93	
860	443	4/17/2006	61.1	30	-21.9	-3	-64.1	18.9	24	22	31	71	95	
861	469	4/17/2006	61.1	30	-21.9	-4	-65.1	17.9	29	43	68	75	64-6"	
862	495	4/17/2006	61.1	30	-21.9	-4	-65.1	17.9	20	29	53	81	94	
863	444	4/17/2006	61.1	30	-21.9	-5	-66.1	16.9	18	34	68	72	92	
864	470	4/17/2006	61.1	30	-21.9	-4.3	-65.4	17.6	11	23	51	73	103	
865	496	4/17/2006	61.1	30	-21.9	-21.9	-83	0	12	11	16	15	10-6"	
866	135-R	4/17/2006	56.1	25	-21.9	-6.9	-63	15	11	18	33	73	95	Replacement pile for pile #135 broken during driving on 3/22/06
867	450	4/17/2006	65.1	30	-21.9	-4.3	-69.4	17.6	24	37	61	73	98	
868	476	4/17/2006	65.1	30	-21.9	-20.9	-86	1	18	18	20	44	60	
869	515	4/18/2006	65.1	0	-21.9	-4.2	-69.3	17.7	20	37	62	77	95	
870	536	4/18/2006	65.1	0	-21.9	-21.9	-87	0	15	15	10	6	12	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
871	562	4/18/2006	65.1	25	-21.9	-21.9	-87	0	19	29	50	65	12-3"	
872	588	4/18/2006	61.1	25	-21.9	-21.9	-83	0	15	15	14	17	7-4"	
873	516	4/18/2006	65.1	0	-21.9	-4.5	-69.6	17.4	20	42	70	62	82	
874	537	4/18/2006	65.1	0	-21.9	-4	-69.1	17.9	18	33	68	81	100	
875	563	4/18/2006	65.1	0	-21.9	-5	-70.1	16.9	41	68	65	74	85	
876	589	4/18/2006	61.1	0	-21.9	-4	-65.1	17.9	62	58	73	67	64	
877	517	4/18/2006	65.1	0	-21.9	-3	-68.1	18.9	21	20	28	86	122	
878	538	4/18/2006	65.1	0	-21.9	-6.5	-71.6	15.4	42	64	67	73	86	
879	564	4/18/2006	65.1	0	-21.9	-4	-69.1	17.9	34	44	68	81	85	
880	590	4/18/2006	61.1	0	-21.9	-10	-71.1	11.9	57	53	57	68	73	
881	518	4/18/2006	65.1	25	-21.9	-4.5	-69.6	17.4	16	39	54	73	85	
882	539	4/18/2006	65.1	0	-21.9	-3.2	-68.3	18.7	19	21	46	76	90	
883	610	4/19/2006	61.1	0	-21.9	-21.9	-83	0	18	16	15	20	49	
884	631	4/19/2006	61.1	20	-21.9	-9.9	-71	12	33	52	58	63	73	
885	680	4/19/2006	61.1	20	-21.9	-21.9	-83	0	19	15	18	32	61	
886	611	4/19/2006	61.1	0	-21.9	-8	-69.1	13.9	27	42	45	72	83	
887	632	4/19/2006	61.1	0	-21.9	-7	-68.1	14.9	18	35	49	70	103	
888	658	4/19/2006	61.1	0	-21.9	-7.2	-68.3	14.7	18	29	47	74	110	
889	612	4/19/2006	61.1	0	-21.9	-7	-68.1	14.9	21	35	51	86	88	
890	633	4/19/2006	61.1	0	-21.9	-6	-67.1	15.9	18	41	67	94	62-6"	
891	519	4/19/2006	65.1	0	-21.9	-5.5	-70.6	16.4	36	51	58	77	92	
892	565	4/19/2006	65.1	0	-21.9	-7	-72.1	14.9	64	57	70	72	68	
893	591	4/19/2006	61.1	0	-21.9	-7	-68.1	14.9	22	36	45	77	109	
894	613	4/19/2006	61.1	0	-21.9	-5.7	-66.8	16.2	13	29	47	73	125	
895	634	4/19/2006	61.1	0	-21.9	-7	-68.1	14.9	22	37	52	75	86	
896	660	4/19/2006	61.1	0	-21.9	-8	-69.1	13.9	36	48	65	82	110	
897	708	4/20/2006	61.1	0	-21.9	-14.5	-75.6	7.4	86	68	57	52	15-4"	
898	736	4/20/2006	61.1	0	-21.9	-10.5	-71.6	11.4	29	46	56	75	100	
899	877-R	4/20/2006	65.1	30	-21.9	-17.9	-83	4	14	14	19	42	68	Replacement pile for pile #877 broken during driving on 3/28/06

TABLE 1
Indicator and Production Pile Summary
301 Mission Street
San Francisco, California

Treadwell & Rollo Pile No.	Project Pile Number	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
900	758	4/20/2006	61.1	0	-21.9	-21.9	-83	0	19	18	22	56	39-4"	
901	784	4/21/2006	61.1	0	-21.9	-21.9	-83	0	21	17	20	34	92	
902	806	4/21/2006	61.1	0	-21.9	-21.9	-83	0	16	15	18	39	74	
903	759	4/21/2006	61.1	0	-21.9	-12	-73.1	9.9	43	54	66	56	73	
904	785	4/21/2006	61.1	0	-21.9	-12	-73.1	9.9	32	33	48	57	69	
905	807	4/21/2006	61.1	0	-21.9	-12	-73.1	9.9	28	34	42	55	76	
906	830	4/21/2006	61.1	15	-21.9	-21.9	-83	0	15	16	20	61	75	
907	786	4/21/2006	61.1	0	-21.9	-10	-71.1	11.9	19	22	44	58	90	
908	808	4/21/2006	61.1	0	-21.9	-21.9	-83	0	22	20	25	57	105	
909	787	4/21/2006	61.1	0	-21.9	-21.9	-83	0	20	20	27	57	76	
910	809	4/21/2006	61.1	0	-21.9	-11.5	-72.6	10.4	27	41	58	57	65	
911	767	4/21/2006	61.1	3	-21.9	-11	-72.1	10.9	21	38	52	58	69	
912	545	4/21/2006	65.1	0	-21.9	-21.9	-87	0	18	18	38	51	60	
913	571	4/21/2006	61.1	0	-21.9	-8	-69.1	13.9	24	24	46	73	88	
914	614	4/21/2006	61.1	0	-21.9	-21.9	-83	0	21	18	17	10	30	
915	640	4/22/2006	61.6	0	-21.9	-9	-70.6	12.9	42	51	60	73	75	
916	684	4/22/2006	61.1	0	-21.9	-9	-70.1	12.9	37	52	51	77	83	
917	712	4/22/2006	61.1	0	-21.9	-9	-70.1	12.9	20	37	55	72	78	
918	740	4/22/2006	61.1	0	-21.9	-9	-70.1	12.9	14	17	40	59	70	
919	546	4/22/2006	65.1	30	-21.9	-21.9	-87	0	15	19	30	47	60	
920	685	4/22/2006	61.1	30	-21.9	-8	-69.1	13.9	22	25	48	58	83	
921	713	4/22/2006	61.1	30	-21.9	-8	-69.1	13.9	26	24	48	87	60-6"	
922	741	4/22/2006	61.1	30	-21.9	-9	-70.1	12.9	18	21	40	65	96	

1. Pile Location as designated on drawing titled "Martin Ron Pile Numbering Diagram as tranmitted electroncally to us by WEBCOR Building on 11 November 2005.
2. Casted pile length
3. All Elevations refer to San Francisco City datum (SFCD).
4. Recorded visually, accuracy may vary by +/- 6 inches
5. DNO denotes Did Not Observe

Total number of piles requiring cutoff:	381	40%
Number of piles requiring more than 5 feet of cutoff:	238	25%
Number of piles requiring more than 12 feet of cutoff:	80	8%
Number of piles requiring more than 15 feet of cutoff:	34	4%
Number of piles that broke during installation:	9	1%
Number of replacement piles driven:	2	0.2%

City and County of
San Francisco

Board of Supervisors
City and County of San Francisco

Government Audit and Oversight Committee

April 28, 2017 ◆ 10:00 a.m. ◆ File No. 160975

Hardip S. Pannu

Please state your name for the record.

Prepare to affirm this oath by raising your right hand, and affirm by saying "I do."

"You do solemnly state that the testimony you may give in the hearing now pending before this Government Audit and Oversight Committee, of the San Francisco Board of Supervisors in the City and County of San Francisco, shall be the truth, the whole truth, and nothing but the truth - so help you God."

When recalling the witness:

"Mr. Pannu, I will remind you, you have been previously placed under oath and remain so. Please take the podium, and re-state your name for the record.

Civil Procedure Oath to Witness
(Chapter Law 688, Statutes of 2000)
Dated: April 28, 2017

Board of Supervisors
City and County of San Francisco

Government Audit and Oversight Committee
April 28, 2017 ◆ 10:00 a.m.
Hardip S. Pannu

Prepare to affirm this oath by raising your right hand, and affirm by saying "I Do."

"You do solemnly state that the testimony you may give in the hearing now pending before this Government Audit and Oversight Committee, of the San Francisco Board of Supervisors, in the City and County of San Francisco, shall be the truth, the whole truth, and nothing but the truth."

When recalling the witness:
"Mr. Pannu, I will remind you, you have been previously placed under oath and remain so. Please take the podium, and restate your name for the record."

Civil Procedure Oath to Witness
(Chapter Law 688, Statutes of 2000)
Dated: April 28, 2017

160975
HARDIP PANNU'S
SUBMITTAL
RECEIVED 4/27/2017

MIDDLEBROOK + LOUIE
Structural Engineers

PROJECT DATA SHEET

1. **Project No.** 6977 **Sub-Project No:** 00 **Date:** 1/19/05
2. **Project Name:** 301 MISSION STREET - PEER REVIEW
3. **Location:** SF **Type:** PEER REVIEW/HI-RISE OB
   Primary Code: 220 Secondary Code(s): H06
4. **Client:**
   Full Name: MILLENIUM PARTNERS
   Street & Ste.: 735 MARKET STREET, 3RD FLOOR
   City/State: SAN FRANCISCO Zip 94103
   Attn: STEPHEN M. PATTERSON Client Job No.
5. **Owner:**
   Name: MILLENIUM PARTNERS
   Street & Ste.
   City/State Zip
6. **Project Statistics:**
   Total Estimated Construction Cost:
   No. of Structures:
   Total Gross Area:
   No. of Stories - Above Grade:
   Below Grade:
   Estimated Completion Date:
   Bldg. Type (Steel, Concrete, etc.):
7. **Description of Services for Billing:** STRUCTURAL ENGINEERING PEER REVIEW
8. **Labor Billing:** Maximum Amount: $60,000 Estimated Amount:
   A. Normal Rates and Multipliers Yes: ☒ No: ☐
   Different Rates (indicate)
   Different Multipliers (indicate)
   B. Normal Reimbursables Yes: ☒ No: ☐
   Different Reimbursables (indicate)
9. **Fee Billing:**
   A. Fee billing schedule (Attach, if applicable.)
   B. Fee Billing by Phase: Lump Sum Fee Amount:
   SD (Schematic Design) % or Amount
   DD (Design Development) % or Amount
   CD (Construction Documents) % or Amount
   BN (Bidding and Negotiation) % or Amount
   CA (Construction Administration) % or Amount
   Other % or Amount
10. **Remarks:**

Project Manager: H. PANNU **Approval:** [signature]

Accounting ✓ Contract File ✓

MIDDLEBROOK + LOUIE
Structural Engineers

PROJECT DATA SHEET

1. **Project No.** 6977 **Sub-Project No:** 01 **Date:** 12/21/05
2. **Project Name:** 301 MISSION
3. **Location:** SF Type: ____
   Primary Code: ____ Secondary Code(s): ____ ____
4. **Client:** Full Name MILLENNIUM PARTNERS
   Street & Ste. 735 MARKET STREET, 3RD FLOOR
   City/State SAN FRANCISCO Zip 94103
   Attn: CHRIS VAUGHN-HULBERT Client Job No. ____
5. **Owner:** Name ____
   Street & Ste. ____
   City/State ____ Zip ____
6. **Project Statistics:**
   Total Estimated Construction Cost: ____
   No. of Structures: ____
   Total Gross Area: ____
   No. of Stories - Above Grade: ____
   Below Grade: ____
   Estimated Completion Date: ____
   Bldg. Type (Steel, Concrete, etc.): ____
7. **Description of Services for Billing:** STRUCTURAL ENGINEERING REVIEW OF SHORING IMPACT ON CALTRAN BUILDING
8. **Labor Billing:** Maximum Amount: $5000 Estimated Amount: ____
   A. Normal Rates and Multipliers Yes: ☒ No: ☐
   Different Rates (indicate) ____
   Different Multipliers (indicate) ____
   B. Normal Reimbursables Yes: ☒ No: ☐
   Different Reimbursables (indicate) ____
9. **Fee Billing:**
   A. Fee billing schedule (Attach, If applicable.)
   B. Fee Billing by Phase: Lump Sum Fee Amount: ____
   SD (Schematic Design) % ____ or Amount ____
   DD (Design Development) % ____ or Amount ____
   CD (Construction Documents) % ____ or Amount ____
   BN (Bidding and Negotiation) % ____ or Amount ____
   CA (Construction Administration) % ____ or Amount ____
   Other ____ % ____ or Amount ____
10. **Remarks:** ____

Project Manager: H. PANNU **Approval:** [signature]

Accounting ____ Contract File ____

6977.01

December 14, 2005

Chris Vaughn-Hulbert
Millennium Partners
735 Market Street, 3rd floor
Dan Francisco, CA 94103

RE: Structural Engineering Services Proposal for review of shoring impact on CALTRAN building
301 Mission Street, San Francisco

CHRIS, thank you for requesting our proposal for structural engineering service for the reference project.

ITEMS	FEE
• To review the impact of shoring and about 10 to 12 feet of excavation on the CALTRAN building on the south side of property. In addition, we will fill out CALTRAN form about our findings. Our fee estimate to review and prepare CALTRAN form on T&M basis N.T.E is.....................:	$ 5,000

Changes in direction given to M + L which cause significant rework will be brought to your attention. Such additional compensation will be based on M + L's billing rates.

The stated fees include such things as telephone, postage and the like. We would like to be reimbursed for any printing cost, travel and subsistence (if required), express mail, express deliveries, etc.

Billing to Millennium Partners for services completed will be made at completion of work or at appropriate progress points.

CHRIS, we are pleased to provide the proposal for the above items and we look forward to continuing a long working relationship with you.

Please let us know if you have any questions.

MIDDLEBROOK + LOUIE

Hardip S. Pannu, S.E.
Principal

HSP/rhc

for MILLENNIUM PARTNERS

Sign: [signature] Date: 12/14/05

Stephen Patterson, Construction Manager
Typed Name, Title

MP

MILLENNIUM PARTNERS
735 Market Street, 3rd Floor
San Francisco, CA 94103
415.537.3890 Tel
415.537.3895 Fax
SPatterson@MillenniumPtrs.com

FACSIMILE TRANSMITTAL SHEET

DATE:	January 18, 2005
TO:	Hardip Pannu
FAX NO.:	415.477.9099
FROM:	Steve Patterson
RE:	**Proposal Acceptance**
TOTAL PAGE(S)	6 including cover

☐ URGENT ☐ FOR YOUR INFORMATION ☐ FOR REVIEW / COMMENT
☐ PLEASE HANDLE ☐ PER YOUR REQUEST ☒ FOR YOUR FILES

NOTES/COMMENTS:

See attached.

MP

MILLENNIUM PARTNERS
735 Market Street, 3rd Floor
San Francisco, CA 94103
415.593.1100 Tel
415.537.3895 Fax

January 18, 2004

Mr. Hardip Pannu
Middlebrook + Louie
One Bush Street, Suite 250
San Francisco, CA 94104

RE: **301 Mission Street, San Francisco**
Structural Engineering Peer Review Services

Dear Hardip,

I am pleased to award Middlebrook + Louie, the Structural Engineering Peer Review Services for the 301 Mission Street project, in San Francisco. The Services provided will be in accordance with your proposal dated December 17, 2004 which I have approved and attached for reference.

I very much look forward to working with yourself and team to deliver a very exciting project. I will contact you shortly to coordinate the "kick-off" meeting with the project team.

Please do not hesitate to contact me at anytime on the numbers listed above and on my attached business card.

Yours truly,

Steve Patterson
Millennium Partners

Cc: CS-011 Structural Peer Review

01/18/2005 15:34 4152749150 MILLENNIUM PARTNERS PAGE 02

CS-011

MIDDLEBROOK + LOUIE
Structural Engineers

RECEIVED
DEC 20 2004
MILLENNIUM PARTNERS

One Bush Street
Suite 250
San Francisco, CA 94104
415.477.9000
Fax 415.477.9099
email mlbox@MplusL.com

Jason J.C. Louie, S.E.
Ronald F. Middlebrook, S.E.
Hardip S. Pannu, S.E.
Robert D. McCarney, S.E.
Jeppe Larsen, EUR ING, S.E.
Navin R. Amin, S.E.

December 17, 2004

Stephen M. Patterson
Millennium Partners
735 Market Street, 3rd floor
San Francisco, CA 94103

RE: Structural Engineering Services Proposal
301 Mission Street - Peer Review
San Francisco, California

STEPHEN, thank you for including Middlebrook + Louie for the peer review of the referenced project. Before getting into our proposal, I'd like to briefly describe some qualified and capable peer review experience.

- 560 Mission Street Design Review: design review for the Department of Building Inspection, San Francisco City & County.
- 575 Market Street (San Francisco): peer review of a highrise office building.
- "The Century" (San Francisco): peer review of a 50-story condo tower.
- 225 W. Santa Clara (San Jose): Schematic Design of a 16-story office building. This project also entailed peer review of the final design.
- 819 Virginia Street Design Review, City of Seattle: a 34-story reinforced concrete mixed-use tower, with 9 floors for parking and the remaining floors for residential use. The gross area of the building is 350,000 square feet with the top of the building approaching 450 feet.
- 700 Olive / 1700 - 7th Street, City of Seattle: design analysis of a 23-story office tower with 7 basement levels for parking; 700,000 gross square feet. The building is of composite construction.
- 600 Van Ness (San Francisco): Peer review services for a 15-story assisted living residential tower.
- 1017 Van Ness (San Francisco): Structural value engineering and peer review services for a 14-story residential project; 250,000 sf.
- San Francisco Redevelopment Agency: M + L performed a load analysis of Marriott Hotel's underground ballroom complex to support Sony Metreon Center.
- Cathedral Hill Apartments And Retail (San Francisco): Structural review resulting in minor modifications to original design.
- Scanticon Conference Center (Denver, Colorado): Structural review and analysis of suspended precast reinforced concrete walkways located above one another.

These and a multitude of others demonstrate that M + L has lot of peer review experience

Second, in addition to the projects listed above, M + L has a great deal of experience with large and tall projects in seismic zone 4, generally in the Bay Area. These include a half dozen of the high rise office buildings recently built in San Francisco and Oakland. On the list would be the "W" Hotel, the 26 story, 101 Second St., the 23 story 150 California, the 25 story 535 Mission Street, the 26 story One Second Street all in San Francisco, and the 22 story Elihu M. Harris State Office Building in Oakland.

Here then is our proposal:

SPatt
1/18/05

<u>SERVICES TO BE PROVIDED</u> (In general accord with SEAOC Guidelines)

A. Consideration of Design Criteria and configuration with respect to:

1. Architectural/functional constraints.
2. Site topography, soils, and adjacent property constraints.
3. Environmental effects such as wind and earthquake forces.

B. Performance evaluation, including the following:

1. Structural serviceability including deflection, lateral drift, and other movement.
2. Vibration.
3. Crack control.
4. Foundation movement.
5. Effect of deflection, lateral drift, and other movement on non-structural elements such as roof top units, etc., excluding building skin.
6. Wind and earthquake.

C. Structural System

1. Ability of selected structural materials and framing systems to meet performance criteria with given loads and configuration.
2. Degree of redundancy, ductility, and compatibility, particularly in relation to lateral forces.
3. Appropriateness of member sizes and locations.
4. Appropriateness of foundation type and design.
5. Compatibility of structural system and non-structural elements excluding building skin.
6. Detailing of the structural system.
7. Basic constructability of structural elements and connections.

D. Detailed Design

1. Spot checking of structural calculations and/or optional independent calculations for lateral components, diaphragm design, etc.
2. Structural design drawings and specifications for adequacy, clarity, basic constructability, and testing and inspection requirements.

M + L will discuss the findings with the Engineer of Record as the review progresses. Following the meetings and resolution of suggestions, M + L will prepare and present to the client a written report that covers all aspects of the Peer Review.

It is understood and agreed that the Peer Review is undertaken to enhance the quality of the design and to provide additional assurance regarding the performance of the completed project. Although M + L will exercise usual and customary professional care in providing this review, the responsibility for the structural design remains fully with the Engineer of Record. Accordingly, the Owner agrees to indemnify and hold M + L harmless from and against any and all claims, liabilities, demands, losses, damages, and costs (collectively, "Losses"), including but not limited to costs of defense, arising out of or in any way connected with this project excepting only those losses arising out of the sole negligence of the Peer Reviewer established by the court of law.

S Patt
1/18/05

MIDDLEBROOK + LOUIE
Structural Engineers

PROJECT DESCRIPTION

The project consists of a 60 story tall residential concrete building and an 11 story tall lowrise building. There is 5-story basement below the buildings. The fee is based upon Design Development structural set provided by DeSimone Consulting Engineers, printed on December 15, 2004.

FEE DATA

Basic compensation to M + L for the above described Services and Project Description for the building(s) proper shall be on Time and Material basis, not to exceed $60,000

If design input from M + L is desired during the completion of construction document phases, we would be happy to participate in that for an additional fee. The fee amount will depend on the scope of services desired.

Any significant change (increase or decrease) in the "Services To Be Provided" may cause the fees shown above to be adjusted, as agreed between the parties.

Changes in direction given M + L which cause significant rework will be brought to Millennium Partners attention. Additional compensation for any such changes will be negotiated, and authorized amounts will be billed monthly as they accrue. Such additional compensation may be based on M + L's Billing Rates, copy attached.

The stated fees include travel within the San Francisco Bay Area, telephonic, communications, postage and the like. We would like to be reimbursed for any long distance travel and subsistence required, express mail, express deliveries, etc.

Billing to Millennium Partners for services completed will be made monthly, or at appropriate progress points.

STEPHEN, please let me know if you have any questions or changes that you would like me to make to our proposal so that I can amend it accordingly.

MIDDLEBROOK + LOUIE

Hardip S. Pannu, S.E.
Principal

/hsp

1/18/05

MIDDLEBROOK + LOUIE
Structural Engineers

2004 HOURLY BILLING RATES

Principal	$165.00 - $260.00
Project Manager / Structural Engineer	$150.00 - $185.00
Civil Engineer	$120.00 - $140.00
Design Engineer	$ 85.00 - $110.00
Construction Administrator	$110.00 - $130.00
Senior CAD Drafter	$110.00 - $155.00
CAD Drafter	$ 85.00 - $105.00
Junior CAD Drafter	$ 65.00 - $ 80.00
Administrative Staff	$ 65.00 - $105.00

Note: Hourly Billing Rates are adjusted at the beginning of each calendar year.

1/18/05

√

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Jeppe Larsen, EUR ING, S.E.
Navin R. Amin, S.E.

December 17, 2004

Stephen M. Patterson
Millennium Partners
735 Market Street, 3rd floor
San Francisco, CA 94103

RE: Structural Engineering Services Proposal
301 Mission Street - Peer Review
San Francisco, California

STEPHEN, thank you for including Middlebrook + Louie for the peer review of the referenced project. Before getting into our proposal, I'd like to briefly describe some qualified and capable peer review experience.

- 560 Mission Street Design Review: design review for the Department of Building Inspection, San Francisco City & County.
- 575 Market Street (San Francisco): peer review of a highrise office building.
- "The Century" (San Francisco): peer review of a 50-story condo tower.
- 225 W. Santa Clara (San Jose): Schematic Design of a 16-story office building. This project also entailed peer review of the final design.
- 819 Virginia Street Design Review, City of Seattle: a 34-story reinforced concrete mixed-use tower, with 9 floors for parking and the remaining floors for residential use. The gross area of the building is 350,000 square feet with the top of the building approaching 450 feet.
- 700 Olive / 1700 - 7th Street, City of Seattle: design analysis of a 23-story office tower with 7 basement levels for parking; 700,000 gross square feet. The building is of composite construction.
- 600 Van Ness (San Francisco): Peer review services for a 15-story assisted living residential tower.
- 1017 Van Ness (San Francisco): Structural value engineering and peer review services for a 14-story residential project; 250,000 sf.
- San Francisco Redevelopment Agency: M + L performed a load analysis of Marriott Hotel's underground ballroom complex to support Sony Metreon Center.
- Cathedral Hill Apartments And Retail (San Francisco): Structural review resulting in minor modifications to original design.
- Scanticon Conference Center (Denver, Colorado): Structural review and analysis of suspended precast reinforced concrete walkways located above one another.

These and a multitude of others demonstrate that M + L has lot of peer review experience

Second, in addition to the projects listed above, M + L has a great deal of experience with large and tall projects in seismic zone 4, generally in the Bay Area. These include a half dozen of the high rise office buildings recently built in San Francisco and Oakland. On the list would be the "W" Hotel, the 26 story, 101 Second St., the 23 story 150 California, the 25 story 535 Mission Street, the 26 story One Second Street all in San Francisco, and the 22 story Elihu M. Harris State Office Building in Oakland.

Here then is our proposal:

SERVICES TO BE PROVIDED (In general accord with SEAOC Guidelines)

A. Consideration of Design Criteria and configuration with respect to:
   1. Architectural/functional constraints.
   2. Site topography, soils, and adjacent property constraints.
   3. Environmental effects such as wind and earthquake forces.

B. Performance evaluation, including the following:
   1. Structural serviceability including deflection, lateral drift, and other movement.
   2. Vibration.
   3. Crack control.
   4. Foundation movement.
   5. Effect of deflection, lateral drift, and other movement on non-structural elements such as roof top units, etc., excluding building skin.
   6. Wind and earthquake.

C. Structural System
   1. Ability of selected structural materials and framing systems to meet performance criteria with given loads and configuration.
   2. Degree of redundancy, ductility, and compatibility, particularly in relation to lateral forces.
   3. Appropriateness of member sizes and locations.
   4. Appropriateness of foundation type and design.
   5. Compatibility of structural system and non-structural elements excluding building skin.
   6. Detailing of the structural system.
   7. Basic constructability of structural elements and connections.

D. Detailed Design
   1. Spot checking of structural calculations and/or optional independent calculations for lateral components, diaphragm design, etc.
   2. Structural design drawings and specifications for adequacy, clarity, basic constructability, and testing and inspection requirements.

M + L will discuss the findings with the Engineer of Record as the review progresses. Following the meetings and resolution of suggestions, M + L will prepare and present to the client a written report that covers all aspects of the Peer Review.

It is understood and agreed that the Peer Review is undertaken to enhance the quality of the design and to provide additional assurance regarding the performance of the completed project. Although M + L will exercise usual and customary professional care in providing this review, the responsibility for the structural design remains fully with the Engineer of Record. Accordingly, the Owner agrees to indemnify and hold M + L harmless from and against any and all claims, liabilities, demands, losses, damages, and costs (collectively, "Losses"), including but not limited to costs of defense, arising out of or in any way connected with this project excepting only those losses arising out of the sole negligence of the Peer Reviewer established by the court of law.

PROJECT DESCRIPTION

The project consists of a 60 story tall residential concrete building and an 11 story tall lowrise building. There is 5-story basement below the buildings. The fee is based upon Design Development structural set provided by DeSimone Consulting Engineers, printed on December 15, 2004.

FEE DATA

Basic compensation to M + L for the above described Services and Project Description for the building(s) proper shall be on Time and Material basis, not to exceed $60,000

If design input from M + L is desired during the completion of construction document phases, we would be happy to participate in that for an additional fee. The fee amount will depend on the scope of services desired.

Any significant change (increase or decrease) in the "Services To Be Provided" may cause the fees shown above to be adjusted, as agreed between the parties.

Changes in direction given M + L which cause significant rework will be brought to Millennium Partners attention. Additional compensation for any such changes will be negotiated, and authorized amounts will be billed monthly as they accrue. Such additional compensation may be based on M + L's Billing Rates, copy attached.

The stated fees include travel within the San Francisco Bay Area, telephonic, communications, postage and the like. We would like to be reimbursed for any long distance travel and subsistence required, express mail, express deliveries, etc.

Billing to Millennium Partners for services completed will be made monthly, or at appropriate progress points.

STEPHEN, please let me know if you have any questions or changes that you would like me to make to our proposal so that I can amend it accordingly.

MIDDLEBROOK + LOUIE

Hardip Singh

Hardip S. Pannu, S.E.
Principal

/hsp

MIDDLEBROOK + LOUIE
Structural Engineers

2004 HOURLY BILLING RATES

Principal	\$165.00 - \$260.00
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Carlos Y.L. Chang, S.E.
Edward X. Qi, Ph.D., S.E.
Roumen V. Mladjov, S.E.

June 26, 2006

Hanson Tom
City and County of San Francisco
1660 Mission Street, 2nd Floor
San Francisco, CA 94103

RE: 301 Mission Street – Peer Review – P/T anchor detail
San Francisco, California
M + L Job #6977

As a follow up to our final peer review letter dated June 12, 2006, we are writing this letter to state our understanding of the P/T anchors in the slab near a shear wall. Should you have any questions, don't hesitate to call us.

The slab design should include appropriate reinforcement for gravity dead and live loads and the connection to the shear wall should meet the deformation compatibility criteria per CBC section 1633.2.4. The building code provides guidelines for post-tensioned and regular cast in place slab design. In our opinion these systems can be mixed and as long as the code requirements are met for each of the system, the slab design should be acceptable. The placement of P/T anchors in the slab, outside of the shear wall effects the slab shortening due to shrinkage, but the slab to shear wall connection can be designed without the Post Tensioning cables being taken through the wall. The engineer of record has completed the design of the structure and upon verification of the design by a plan checker, the building permit should be issued.

The scope of Middlebrook + Louie's (M + L) review was to provide a professional opinions on the design based on the Building Code design provisions. The review was limited to reviewing the structural system concepts and general design approaches for compliance with requirements of the building code. It was not intended for M + L to verify the validity and/or correctness of any particular numerical values in the design calculations.

MIDDLEBROOK + LOUIE

Hardip S. Pannu, S.E.
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DESIMONE

NEW YORK
MIAMI
SAN FRANCISCO
NEW HAVEN
LAS VEGAS

MINUTES

FROM:	**DERRICK D ROORDA**	MEETING DATE:	**07-15-2005**
PROJECT NO.:	**4069B**	MEETING TIME:	**9:30 A.M.**
PROJECT NAME:	**301 MISSION - STRUCTURAL DESIGN SERVICES**		
MEETING LOCATION:	**SAN FRANCISCO DEPARTMENT OF BUILDING INSPECTION**		

ATTENDEES:

Gary Ho **Hanson Tom** **Y.Y. Chew**	**City and County of San Francisco - Department of Building Inspection** 1660 Mission Street, 2nd Floor, San Francisco, CA 94103	P: (415) 558-6083	F: (415) 558-6686
Derrick Roorda **Ronald Polivka** **Nicolas Rodrigues**	**DeSimone Consulting Engineers, PLLC - San Francisco** 160 Sansome Street, 16th Floor, San Francisco, CA 94104	P: (415) 490-4305	F: (415) 398-9834
Jack Moehle	**University of California, Berkeley - Earthquake Engineering Research Center** 1301 South 46th Street, Richmond, CA 94804-4698	P: (510) 231-9554	F: (510) 231-9471
Steve Patterson	**Millennium Partners - San Francisco** 735 Market Street, 3rd Floor, San Francisco, CA 94103	P: (415) 593-2500	F: (415) 537-3895
Hardip Pannu **Danil Botoshansky**	**Middlebrook + Louie Structural Engineers** One Bush Street, Suite 250, San Francisco, CA 94104	P: (415) 477-9000	F: (415) 477-9099

The following is not a comprehensive list of all comments made during the meeting, but rather is intended as a summary of key points of discussion and a list of action items to be addressed by various participants.

No.	Issue	Action
01	Introductions of all attendees were made, and their roles in the project were explained. Of special note: • J.M. has been working with DeSimone since July of 2004 and has been involved in the establishment of the design criteria and procedures. • M+L has been involved in the project since January of 2005 and are performing a peer review of the project.	N/A
02	H.T. indicated that due to the involvement of J.M. and the peer review by M+L, he is satisfied with the design and review process that is in place. He further indicated that because of this process, and the fact that the design incorporates a dual system as required by the Code, additional peer review by other outside parties will not be required by SFDBI.	N/A
03	D.R. indicated that the peer review with M+L is ongoing and presented an updated summary of all comments and responses made by DeSimone. D.R. pointed out that while several topics are still to be addressed, M+L has agreed that so long as the design of the lateral system is not changed, there are no items standing in the way of their recommending that a foundation permit be issued.	N/A

04	H.T. had the following requests of the design and review team comprised of DeSimone, J.M., and M+L: • SFDBI should be copied on all correspondence exchanged between the various parties • The design and review process should culminate with a binder containing a summary of the discussions, as well as all correspondence that was exchanged • SFDBI should be invited to attend periodic meetings with the team.	DeSimone
05	H.T. indicated that the site permit, foundation permit, and superstructure permit drawing sets should include a separate drawing outlining the structural design criteria. That sheet should also contain copies of letters from both J.M. and M+L. For the site permit application, these letters should state the author's acceptance of the design criteria. For the foundation and superstructure applications, additional letters should be provided to state the author's acceptance of the design criteria, and should state that the author recommends that the permit be granted. It may be permissible for the letters to indicate that the author's recommendations are conditional upon certain issues. In such an event, SFDBI would follow up with DeSimone to insure that these conditions had been met.	DeSimone / J.M. / M+L
06	D.R. presented an overview of the structural design, including that of the foundation. Special mention was made of the capacity design approach used to limit the amount of force transferred from the outriggers to the outrigger columns through the use of link beams with diagonal reinforcing. D.R. explained that the outrigger columns have been designed to remain elastic when subjected to the full demand of all outriggers, including overstrength considerations, in addition to tributary gravity loads.	N/A
07	H.T. indicated that he liked the fact that the building includes a dual system. H.T. and G.H. inquired about the use of diagonal reinforcing in the outriggers and agreed that the approach was good for understanding the capacities of these elements. H.T. asked J.M. to review the detailing of the outriggers.	J.M.
08	D.R. discussed the steel link beams used within the core walls and explained that they had been designed per AISC requirements for "links" in EBF's.	N/A
09	D.R. indicated that, per J.M.'s suggestion and in addition to the criteria specified by the UBC, the building has been designed for the drift criteria specified by the 2003 NEHRP provisions. This approach utilizes a higher force level but allows the designer to ignore the effects of 5% mass eccentricity. H.T. requested that SFDBI be given a copy of the 2003 NEHRP provisions for review.	DeSimone
10	D.R. indicated that the tower pile cap, which includes vertical shear reinforcing, has been designed for the capacities of the lateral system elements and that this is beyond the requirements of the code. J.M. agreed that this approach is desired. H.T. asked that J.M. and M+L review the foundation design and detailing.	J.M. / M+L
11	H.T. asked about wind loads. D.R. indicated that a wind tunnel study had been performed and that the forces were much lower than those resulting from seismic loading. H.T. requested a copy of the wind tunnel report and suggested that occupant comfort be addressed. D.R. indicated that wind drifts were below typical standards for high-rise buildings and that occupant safety has been considered.	DeSimone
12	H.T. asked about detailing for PT slabs, specifically the connections to the shear core. The current drawings were reviewed. J.M. indicated that he was familiar with the concerns of SFDBI and would discuss this issue with DeSimone.	J.M. / DeSimone

MINUTES

FROM:	DERRICK D. ROORDA	MEETING DATE:	02-14-2006
PROJECT NO.:	4069B	MEETING TIME:	2:00 P.M.
PROJECT NAME:	301 MISSION - STRUCTURAL DESIGN SERVICES		
MEETING LOCATION:	DESIMONE CONSULTING ENGINEERS, P.L.L.C. 160 SANSOME ST., 16TH FLOOR SAN FRANCISCO, CA 94104		

ATTENDEES:			
Gary Ho **Hanson Tom** **Y.Y. Chew**	**City and County of San Francisco - Department of Building Inspection** 1660 Mission Street, 2nd Floor, San Francisco, CA 94103	P: (415) 558-6083	F: (415) 558-6686
Derrick Roorda **Ronald Polivka** **Nicolas Rodrigues**	**DeSimone Consulting Engineers, PLLC - San Francisco** 160 Sansome Street, 16th Floor, San Francisco, CA 94104	P: (415) 490-4305	F: (415) 398-9834
Tony Sanchez-Corea III	**AR Sanchez-Corea & Associates, Inc. - San Francisco** 301 Junipero Serra Boulevard, Suite 270, San Francisco, CA 94127	P: (415) 333-8080	F: (415) 333-8990
Jack Moehle	**University of California, Berkeley - Earthquake Engineering Research Center** 1301 South 46th Street, Richmond, CA 94804-4698	P: (510) 231-9554	F: (510) 231-9471
Steve Patterson	**Millennium Partners - San Francisco** 735 Market Street, 3rd Floor, San Francisco, CA 94103	P: (415) 593-2500	F: (415) 537-3895
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The following is not a comprehensive list of all comments made during the meeting, but rather is intended as a summary of key points of discussion and a list of action items to be addressed by various participants.

No.	Issue	Action
01	Introductions of all attendees were made, and their roles in the project were explained.	N/A
02	H.T. explained that a lot has changed at SFDBI since we last met on July 15, 2005. There is an increased political interest in how high-rise buildings are designed and reviewed. More peer review meetings need to occur with the city's participation. D.R. explained that there have been no peer review meetings since our July 15 meeting, and that SFDBI will be invited to attend all future meetings.	N/A
03	S.P. indicated that the shoring work for the tower is complete, the soil mix wall is installed, and pile driving is to start the week of February 20.	

04	H.T. asked both J.M. and H.P. if they had reviewed the foundation permit package in detail. Both J.M. and H.P. indicated that they had reviewed the foundation package calculation package, plans and details, and that they were satisfied that the foundation meets or exceeds the requirements set forth in the building code.	N/A
05	D.R. indicated that because the design of the project complies with the code, it is permissible to take the results from a response spectrum analysis, combine them with gravity loads, and design the foundation for those forces. However, at the suggestion of J.M., the foundation has been designed for the capacities of the lateral system elements. This is beyond code, and insures extra capacity in the foundation.	
06	H.P. indicated that the foundation was designed for the capacities of the building and so the foundation design was designed for more than what was required by code. In his opinion, this design philosophy was more than adequate.	N/A
07	H.T. asked H.P. if Middlebrook had looked into the assumptions of the analysis model. H.P. indicated that they looked into the analysis model created by DeSimone and understands the assumptions made. He further explained that in order to perform an independent check of DeSimone's design forces, M&L created their own analysis model. After comparing the two models, H.P. was satisfied that DeSimone's model was comparable.	N/A
08	H.T. asked J.M. if he had looked into the assumptions of the analysis model. J.M. explained that he had been advising during the inception of DeSimone's analysis model. He indicated that it is his recollection that many model assumptions had been changed and updated at his request. He also explained that the 301 model is Linear Response Spectrum Analysis, and that this type of model is different than the Non-Linear Time History Analysis models being used on other projects. The model used for 301 does not require as much scrutiny, and the models assumptions are mainly dictated by code.	N/A
09	H.T. asked the peer reviewers if they required more time to perform an adequate check of the design. Both H.P. and J.M. indicated that more time was not necessary, the foundation design meets or exceeds the codes requirements, and that they have provided letters indicating their positions on this matter.	N/A
10	G.H. asked about effects of Transbay terminal on the project. S.P. and D.R. explained the status of negotiations with the Transbay joint Power Authority. H.T. indicated that it is not the responsibility of the design team or the peer reviewers to review this information.	N/A
11	H.T. asked about how the foundation was modeled and specifically asked about pier springs in model, and interaction with the mid-rise building. D.R and N.R. explained that the buildings are completely separate. D.R. explained that Treadwell & Rollo were familiar with DeSimone's design procedures, have reviewed the design, and their letter is included on the foundation permit drawings. D.R. explained that T&R consider the pile cap to be supported almost continuously, much like a mat foundation, and that T&R recommended it be analyzed as a mat with varying stiffness under different areas, according to the expected displacements. D.R. and N.R. explained that an area spring matching the overall foundation stiffness was used in the ETABS analysis for the superstructure. H.T. asked J.M. if this was done properly, and J.M. responded that he thought the assumption was appropriate. H.P. indicated that they M+L made their own ETABS model to check this assumption and agreed that it is appropriate.	N/A

12	H.T. asked both J.M. and H.P. if they had checked calculations specifics, including rebar quantities. H.P. indicated that that level of review was beyond a peer review level and therefore outside their current scope of services. H.P. further indicated that if the city was interested, his firm could provide a plan check level of review under an additional scope of services. J.M. indicated that he too could provide a plan check level of review, but this more detailed level of review is also outside his current scope of services. J.M. indicated that this level of review is beyond what has been asked by SFDBI of peer reviewers for other high-rise projects in the city.	
13	Y.Y.C. suggested that DeSimone meet with G.H. and explain the building design procedures for the superstructure in more detail. H.P and D.R. agreed that this may help speed the SFDBI review process.	N/A
14	H.T. requested that H.P. and J.M. bring the drawings they reviewed for the foundation permit submittal to SFDBI to compare with the official permit drawing set. A meeting time was set for 2/16/05 at 2pm at D.B.I. D.R. indicated that he would attend the meeting also. H.T. indicated that once this was complete the foundation permit would be issued.	D.R., J.M., H.P., & G.H.
15	H.T. requested that DeSimone meet with SFDBI to discuss criteria and procedures used to design the superstructure. Meeting was set for 2/22/06 at 2pm at SFDBI	D.R. & G.H.
16	D.R. requested that a superstructure peer review meeting be scheduled. Meeting was set for 3/9/06 at 2pm at DeSimone's office.	All

June 12, 2006

Steve Patterson
735 Market Street, 3rd Floor
San Francisco, CA 94103

RE: 301 Mission Street – Peer review, Final.
San Francisco, California
M + L Job #6977

We have completed the peer review of the super structure design prepared by DeSimone Consulting Engineers for the 301 Mission Street project dated May 26, 2006. Our peer review included only the review of 58-story tower. The engineer of record's decision was to design this building to conform to the 2001 San Francisco Building Code and our peer review followed the same approach.

Our entire peer review comments and responses are included in the two binders (Peer Review 1 and 2, dated May 31st, 2006) compiled by DeSimone Consulting Engineers.

- Our peer review included key details and major components of the building system, such as design of shear walls and shear links, design of moment frames, column shortening etc. There were two comments (comment 11 and 20) where the engineer of record took exception to our suggestions. Based on our review of the project, it is our opinion that the design of the tower follows the general principals of engineering design and after the plan check review by the City a permit can be issued for construction.

- We were not asked to review the effects of the Transbay Terminal project on this project.

The engineer of record has completed the design of the structure. It is our understanding that the scope of Middlebrook + Louie's (M + L) review was to provide our professional opinions on the design based on the Building Code design provisions. We also understand that M + L's review is limited to reviewing the structural system concepts and general design approaches for compliance with requirements of the building code. It is not intended for M + L to verify the validity and/or correctness of any particular numerical values in the design calculations.

MIDDLEBROOK + LOUIE

Hardip S. Pannu, S.E.
Principal

HSP/rhc

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Roumen V. Mladjov, S.E.

June 26, 2006

Hanson Tom
City and County of San Francisco
1660 Mission Street, 2nd Floor
San Francisco, CA 94103

RE: 301 Mission Street – Peer Review – P/T anchor detail
San Francisco, California
M + L Job #6977

As a follow up to our final peer review letter dated June 12, 2006, we are writing this letter to state our understanding of the P/T anchors in the slab near a shear wall. Should you have any questions, don't hesitate to call us.

The slab design should include appropriate reinforcement for gravity dead and live loads and the connection to the shear wall should meet the deformation compatibility criteria per CBC section 1633.2.4. The building code provides guidelines for post-tensioned and regular cast in place slab design. In our opinion these systems can be mixed and as long as the code requirements are met for each of the system, the slab design should be acceptable. The placement of P/T anchors in the slab, outside of the shear wall effects the slab shortening due to shrinkage, but the slab to shear wall connection can be designed without the Post Tensioning cables being taken through the wall. The engineer of record has completed the design of the structure and upon verification of the design by a plan checker, the building permit should be issued.

The scope of Middlebrook + Louie's (M + L) review was to provide a professional opinions on the design based on the Building Code design provisions. The review was limited to reviewing the structural system concepts and general design approaches for compliance with requirements of the building code. It was not intended for M + L to verify the validity and/or correctness of any particular numerical values in the design calculations.

MIDDLEBROOK + LOUIE

Hardip S. Pannu, S.E.
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Navin R. Amin, S.E.

August 30, 2005

Hanson Tom
City and County of San Francisco
1660 Mission Street, 2nd Floor
San Francisco, CA 94103

RE: 301 Mission Street – Foundation Permit Only
San Francisco, California
M + L Job #6977

We have completed the peer review of the foundation system prepared by DeSimone Consulting Engineers for the 301 Mission Street project dated May 24, 2005 for the Foundation Permit Submittal Only with following assumptions and exceptions:

The design of the superstructure has not been completed at this time. Our understanding from meetings with DeSimone is that the superstructure's lateral system will be designed to comply with the following:

- The outriggers connecting to the central shear core of the tower contains links connecting to the Special Moment Resisting Frame columns. These links will be designed to remain elastic under the code-prescribed Gravity, Wind and Seismic load combinations; including loads caused by column shortening effects in tall buildings.

- The Special Moment Resisting Frame Columns will be designed to remain elastic under gravity plus loads caused by the yielding of outrigger link. In order to ensure this behavior, the capacities of the outrigger links will be calculated and increased by an over-strength factor. The resulting forces were used as the seismic loads.

- The pile cap under the tower is designed to remain elastic when subjected to the capacities of the Special Moment Resisting Frame/outrigger columns, as well as the expected maximum moment at the base of the shear wall core.

- We were not asked to review the effects of the Transbay Terminal project on this project.

The Structural Peer Review is ongoing at this time for the superstructure portion. It is our understanding that the scope of Middlebrook + Louie's (M + L) review is to provide our professional opinions on the design based on the Building Code design provisions. We also understand that M + L's review is limited to reviewing the structural system concepts and general design approaches for compliance with requirements of the building code. It is not intended for M + L to verify the validity and/or correctness of any particular numerical values in the design calculations.

MIDDLEBROOK + LOUIE

Hardip Singh

Hardip S. Pannu, S.E.
Principal

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MIDDLEBROOK + LOUIE
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Navin R. Amin, S.E.

August 30, 2005
Revised Jan 24th, 2006

Hanson Tom
City and County of San Francisco
1660 Mission Street, 2nd Floor
San Francisco, CA 94103

RE: 301 Mission Street – Foundation Permit Only
San Francisco, California
M + L Job #6977

We have completed the peer review of the foundation system prepared by DeSimone Consulting Engineers for the 301 Mission Street project dated May 24, 2005 for the Foundation Permit Submittal Only including all the structural drawings listed on sheet S0.01 with following assumptions and exceptions:

The design of the superstructure has not been completed at this time. Our understanding from meetings with DeSimone is that the superstructure's lateral system will be designed to comply with the following:

- The outriggers connecting to the central shear core of the tower contains links connecting to the Special Moment Resisting Frame columns. These links will be designed to remain elastic under the code-prescribed Gravity, Wind and Seismic load combinations, including loads caused by column shortening effects in tall buildings.
- The Special Moment Resisting Frame Columns will be designed to remain elastic under gravity plus loads caused by the yielding of outrigger link. In order to ensure this behavior, the capacities of the outrigger links will be calculated and increased by an over-strength factor. The resulting forces were used as the seismic loads.
- The pile cap under the tower is designed to remain elastic when subjected to the capacities of the Special Moment Resisting Frame/outrigger columns, as well as the expected maximum moment at the base of the shear wall core.
- We were not asked to review the effects of the Transbay Terminal project on this project.

The Structural Peer Review is ongoing at this time for the superstructure portion. It is our understanding that the scope of Middlebrook + Louie's (M + L) review is to provide our professional opinions on the design based on the Building Code design provisions. We also understand that M + L's review is limited to reviewing the structural system concepts and general design approaches for compliance with requirements of the building code. It is not intended for M + L to verify the validity and/or correctness of any particular numerical values in the design calculations.

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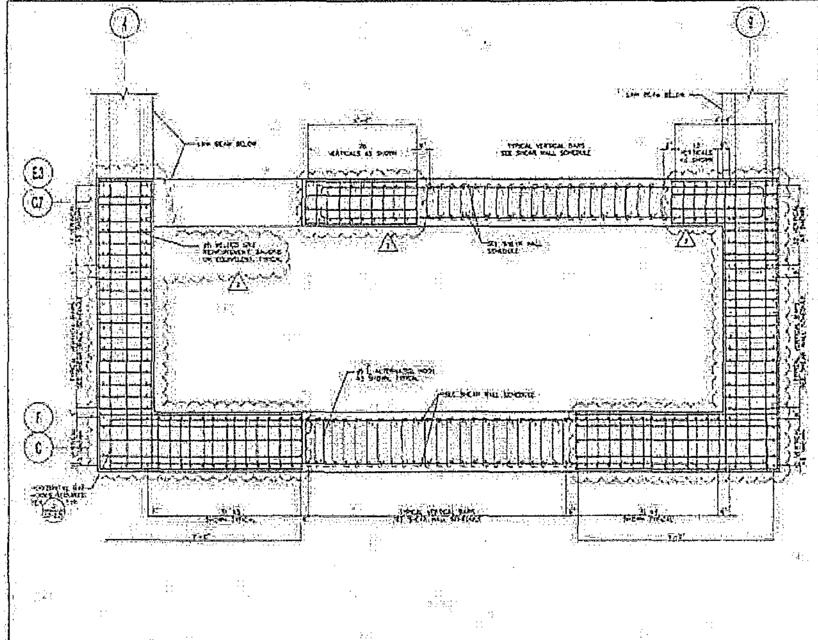
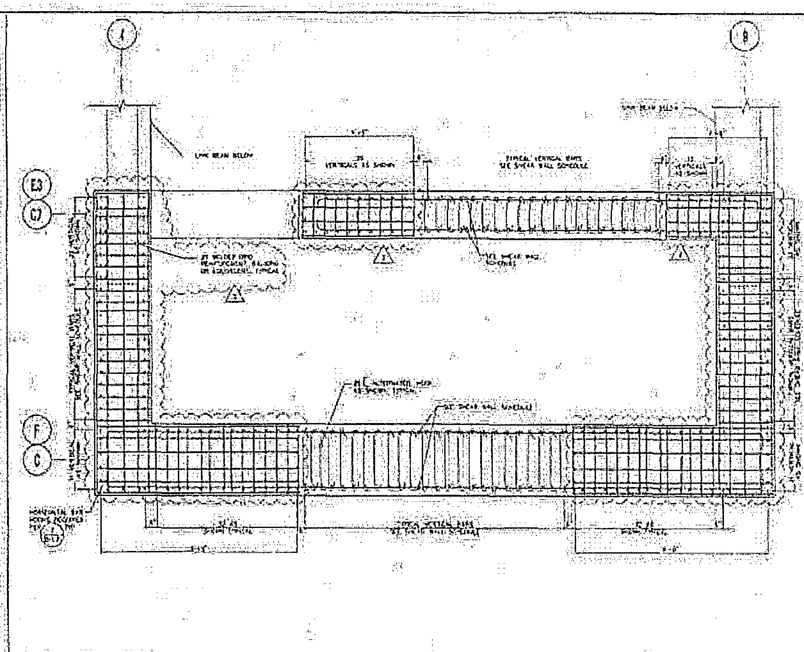
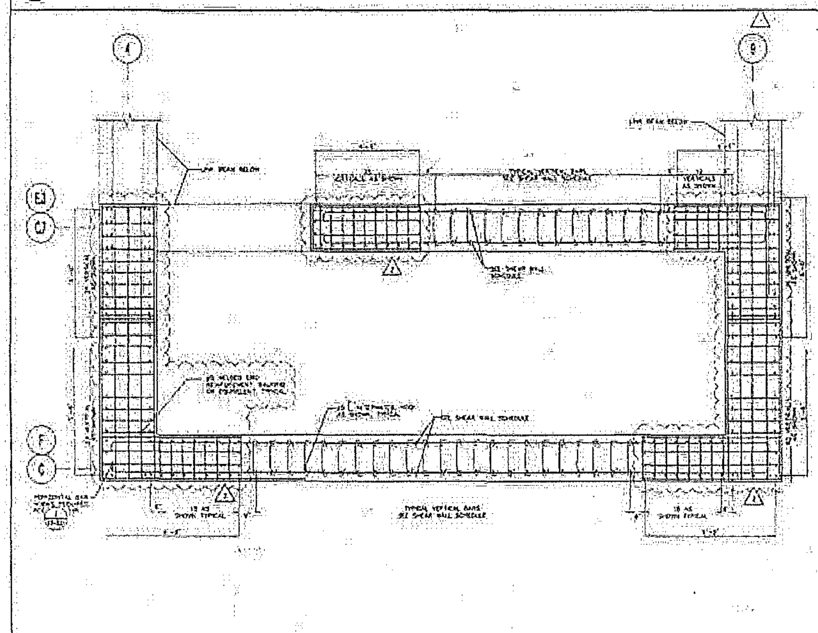


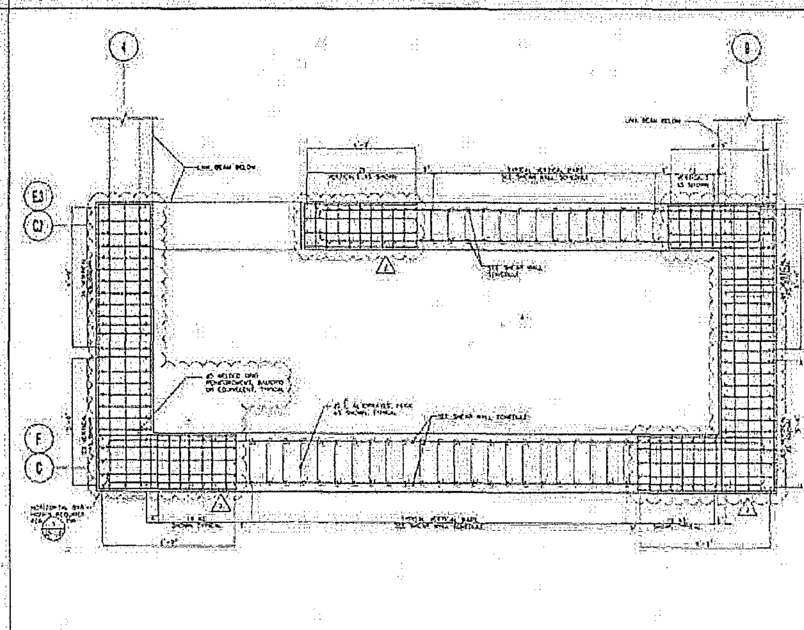
(2) SHEAR WALL DETAIL



(1) SHEAR WALL DETAIL



(4) SHEAR WALL DETAIL



(3) SHEAR WALL DETAIL

301 MISSION STREET

OWNER:

ARCHITECT:

STRUCTURAL ENGINEER:

MECHANICAL/ELECTRICAL/PLUMBING ENGINEER:

FIRE PROTECTION ENGINEER:

CODE CONSULTANT:

REV	DESCRIPTION	DATE
	FOUNDATION PERMIT	[illegible]
1	ADDENDUM 3 STRUCTURE	[illegible]
	ADDENDUM 3 REVISIONS	[illegible]
2	[illegible]	[illegible]

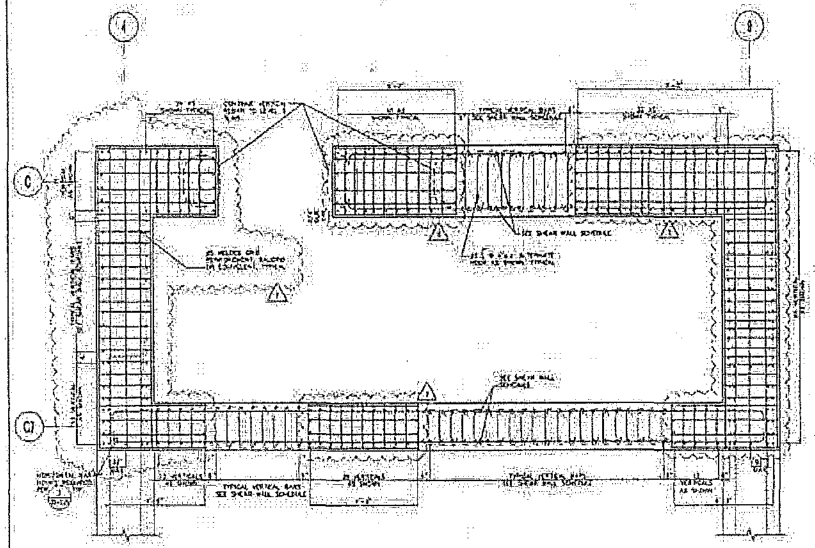
DESIMONE

STAMP:

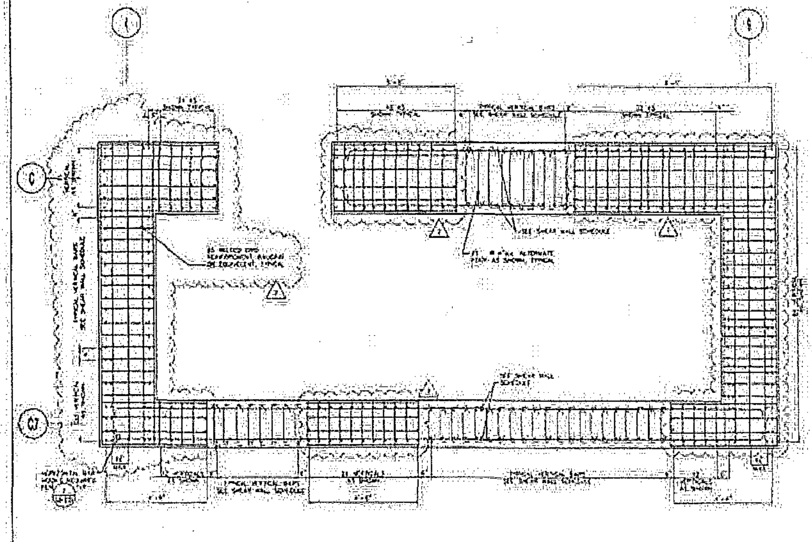
VERTICAL SYSTEMS

SHEAR WALL DETAILS

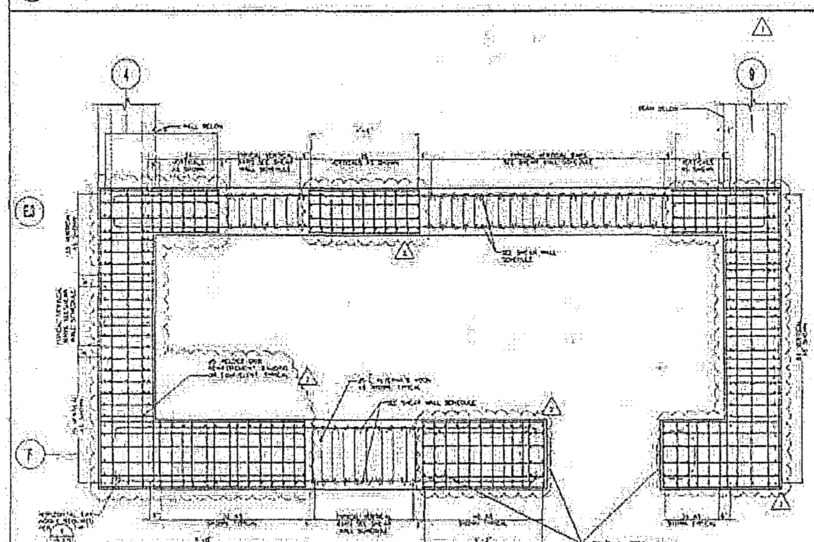
S3-2.53



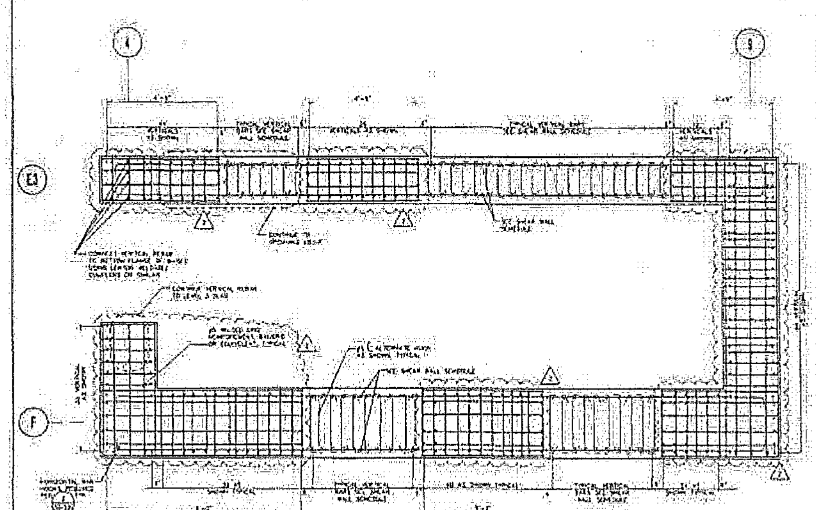
2 SHEAR WALL DETAIL - LEVEL 01



1 SHEAR WALL DETAIL - LEVEL B1



4 SHEAR WALL DETAIL - LEVEL 01



3 SHEAR WALL DETAIL - LEVEL B1

301 MISSION STREET

OWNER:

ARCHITECT:

STRUCTURAL ENGINEER:

MECHANICAL/ELECTRICAL/PLUMBING ENGINEER:

FIRE PROTECTION ENGINEER:

CODE CONSULTANT:

REV.	DESCRIPTION	DATE
	FOUNDATION PERMIT	[illegible]
1	ADDENDUM 2 STRUCTURE	[illegible]
	ADDENDUM 3 REVISIONS	[illegible]
2	[illegible]	[illegible]

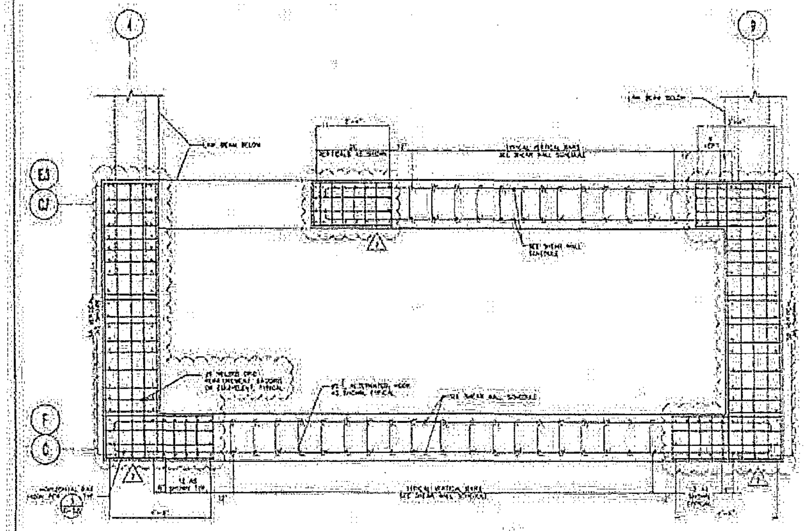
DESIMONE

SCALE: AS NOTED

VERTICAL SYSTEMS

SHEAR WALL DETAILS

S3-2.51



(1) SHEAR WALL DETAIL

(2) NOT USED

SCALE:

(3) NOT USED

SCALE:

(4) NOT USED

SCALE:

301 MISSION STREET

OWNER:

ARCHITECT:

STRUCTURAL ENGINEER:

MECHANICAL, ELECTRICAL, PLUMBING ENGINEER:

FIRE PROTECTION ENGINEER:

CODE CONSULTANT:

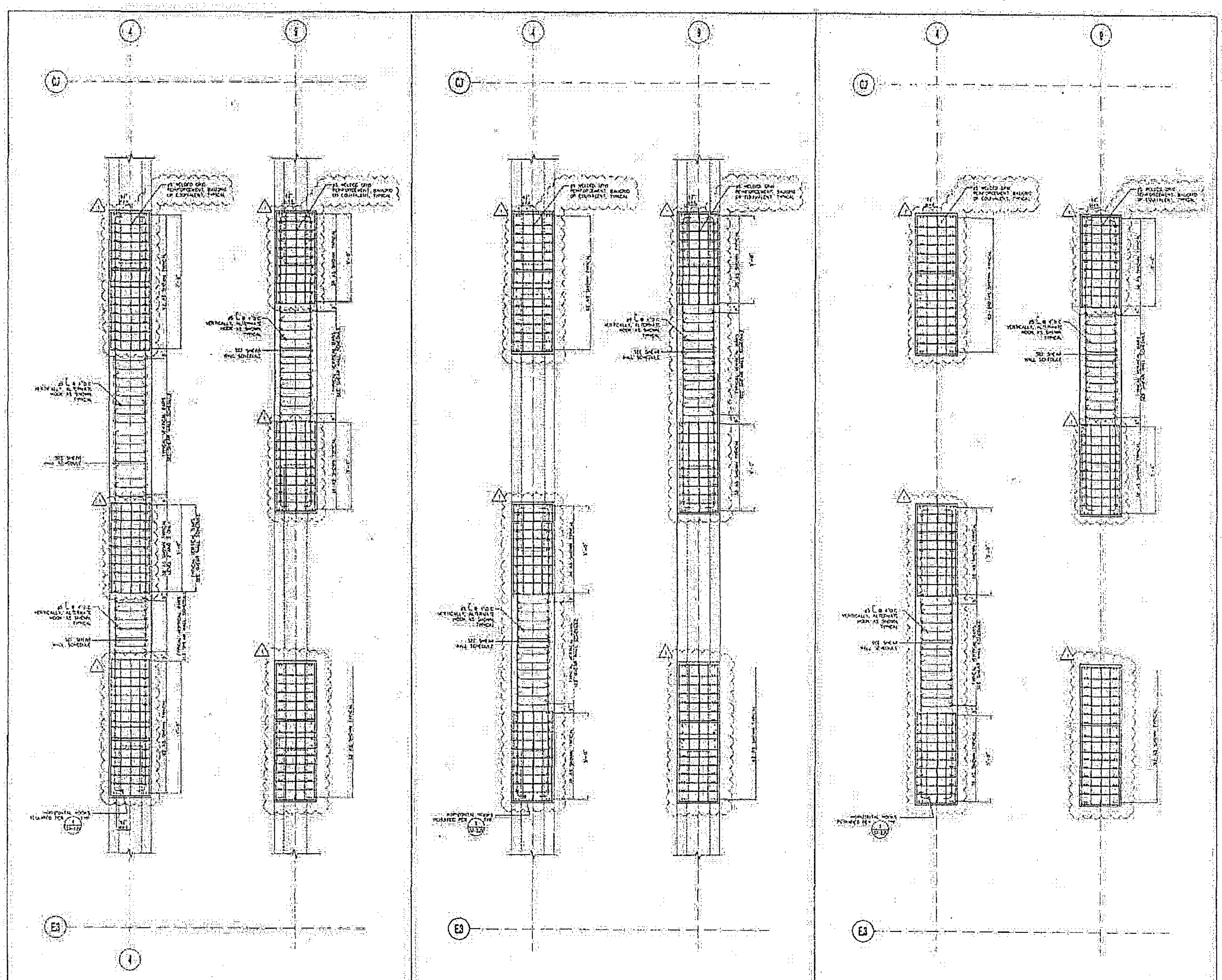
REV.	DESCRIPTION	DATE
	FOUNDATION PERMIT	[illegible]
1	ADDENDUM 2 STRUCTURE	[illegible]
	ADDENDUM 2 REVISIONS	[illegible]
2	ADD2 REV3 BALGRID	[illegible]

DESIMONE

VERTICAL SYSTEMS

SHEAR WALL DETAILS

S3-2.54



(3) SHEAR WALL DETAIL

(2) SHEAR WALL DETAIL - LEVEL 01

(1) SHEAR WALL DETAIL - LEVEL B1

301 MISSION STREET

OWNER:

ARCHITECT:

STRUCTURAL ENGINEER:

MECHANICAL/ELECTRICAL/PLUMBING ENGINEER:

FIRE PROTECTION ENGINEER:

CODE CONSULTANT:

REV.	DESCRIPTION	DATE
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	ADDENDUM 3 REVISIONS	[illegible]
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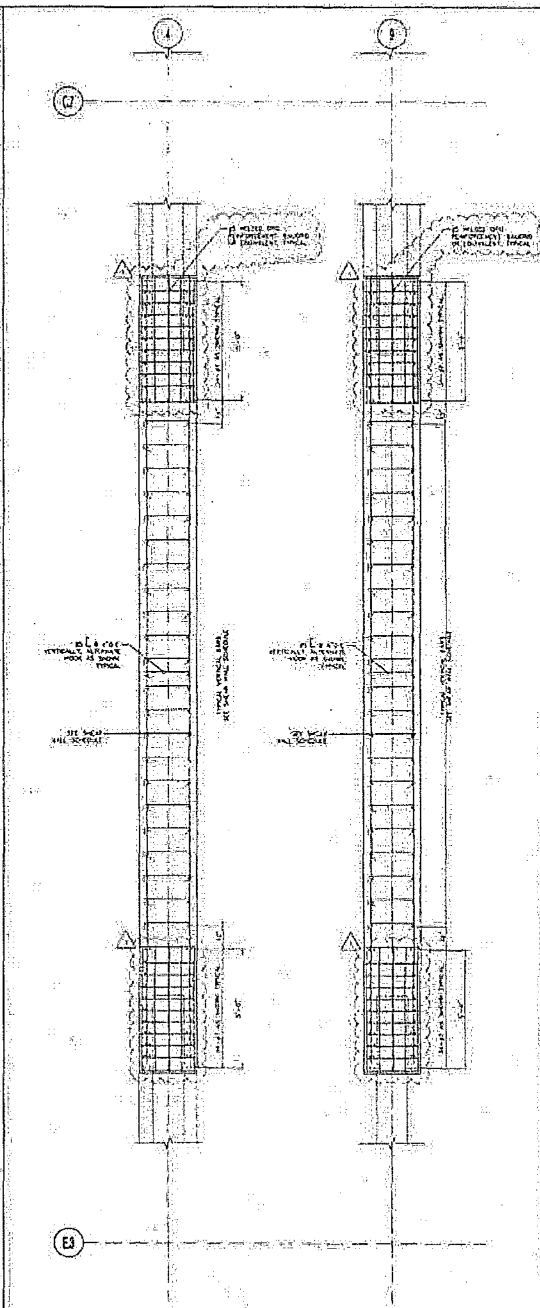
DESIMONE

VERTICAL SYSTEMS

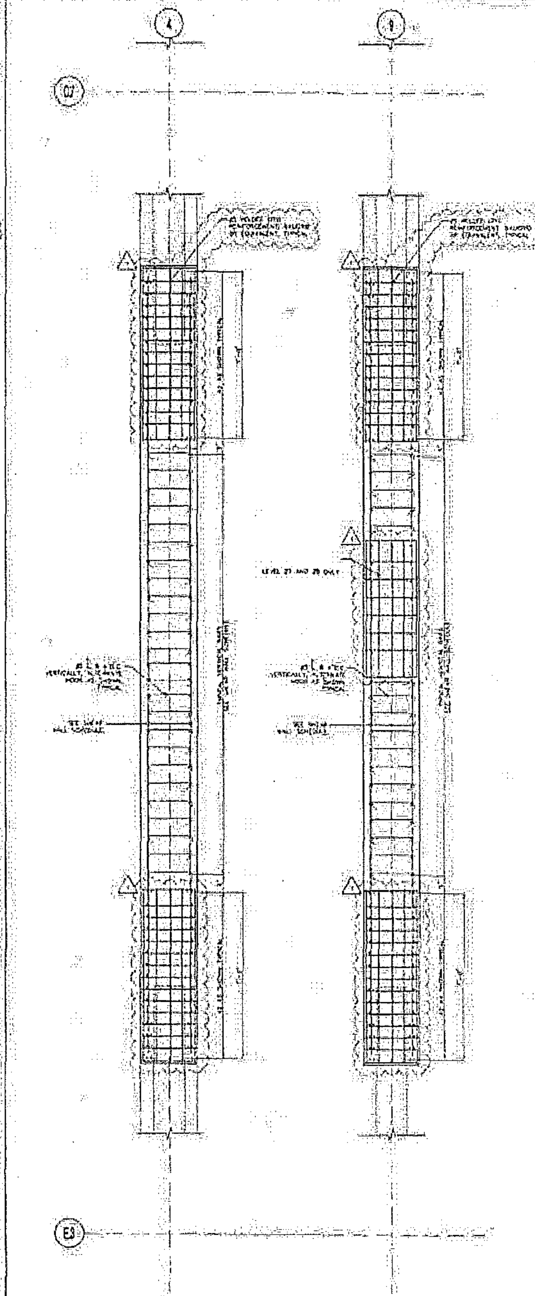
SHEAR WALL DETAILS

S3-2.55

3 NOT USED



2 SHEAR WALL DETAIL



1 SHEAR WALL DETAIL

301 MISSION STREET

OWNER:

ARCHITECT:

STRUCTURAL ENGINEER:

MECHANICAL/ELECTRICAL/PLUMBING ENGINEER:

FIRE PROTECTION ENGINEER:

CODE CONSULTANT:

REV	DESCRIPTION	DATE
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	ADDENDUM 2 REVISIONS	[illegible]
1	[illegible]	[illegible]

DESIMONE

SAN FRANCISCO, CA

SCALE: AS NOTED

VERTICAL SYSTEMS

SHEAR WALL DETAILS

S3-2.56

TOWER MOMENT FRAME BEAM SCHEDULE

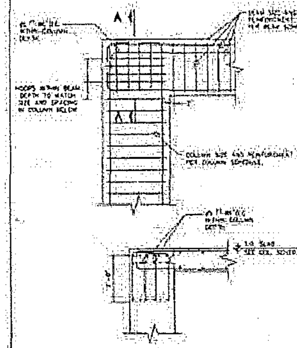
MARK	LEVEL	SIZE	ORIENTATION	TOP BARS CONT	TOP BARS ADDED	BOTTOM BARS CONT	BOTTOM BARS ADDED	HOOPS SIZE	[illegible]	[illegible]	[illegible]	[illegible]
B1	[illegible]	[illegible]	UP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	UP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	UP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	UP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	UP/DOWN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	UP/DOWN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	DOWN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	UP/DOWN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	DOWN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTES:

1. [illegible]
2. [illegible]
3. [illegible]
4. SEE SHEET S3-2.72

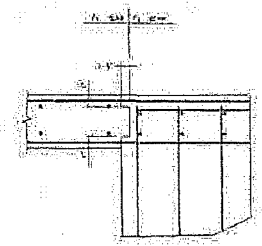
(15) TOWER MOMENT FRAME BEAM SCHEDULE

(3) NOT USED

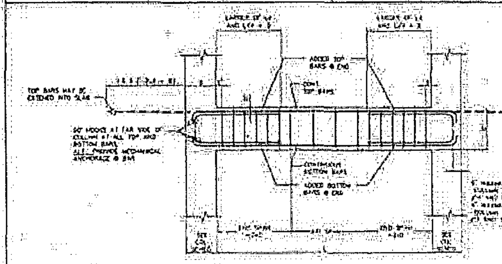


SECTION A-A

(2) TYPICAL BEAM-COLUMN KNEE JOINT DETAIL



(1) BEAM - SLAB KEY DETAIL



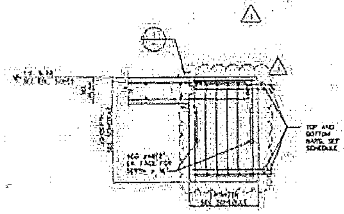
DEVELOPMENT LENGTHS FOR MOMENT FRAME BEAM BARS

[illegible]	BAR SIZE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

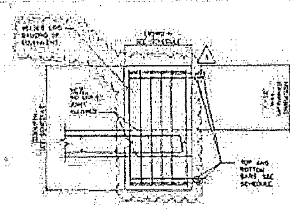
NOTES:

1. Ld = TENSION DEVELOPMENT LENGTH PER SCHEDULE THIS DETAIL
2. Ldh = TENSION DEVELOPMENT LENGTH FOR STANDARD HOOK PER SCHEDULE THIS DETAIL
3. SEE TOWER MOMENT FRAME BEAM SCHEDULE FOR BEAM SIZE AND REINFORCING
4. LONGITUDINAL BARS MUST PASS BETWEEN COLUMN VERTICAL BARS UNLESS SPECIFICALLY SHOWN OR NOTED OTHERWISE.

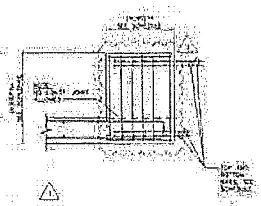
(7) TYPICAL CONCRETE MOMENT FRAME BEAM DETAIL



DOWNTURNED BEAM



UP/DOWN BEAM



UPTURNED BEAM

NOTES:

1. [illegible]
2. [illegible]
3. [illegible]

(13) TYPICAL TOWER MOMENT FRAME DETAILS

301 MISSION STREET

OWNER: [illegible]

ARCHITECT: [illegible]

STRUCTURAL ENGINEER: [illegible]

MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS: [illegible]

FIRE PROTECTION ENGINEER: [illegible]

CODE CONSULTANT: [illegible]

REV.	DESCRIPTION	DATE
	FOUNDATION PERMIT	[illegible]
1	ADDENDUM 2 STRUCTURE	[illegible]
	ADDENDUM 2 REVISIONS	[illegible]
3	ADD3 - REV3 PEER REVIEW	[illegible]
3	ADD3 REV3 [illegible]	[illegible]

DESIMONE

VERTICAL SYSTEMS

TOWER MOMENT FRAME SCHEDULE AND DETAILS

S3-2.71

DRAWING INDEX

DWG. NO.	DRAWING TITLE	FOUNDATION PERMIT	ADDENDUM 1 - STRUCTURE	CITY COMMENTS	ADDENDUM 1 REVISIONS	ADDENDUM 2 - PEER REVIEW	ADDENDUM 2 - BRACING
	STRUCTURAL						
S0-0	GENERAL INFORMATION						
S0-0.10	DRAWING INDEX	●	●		●	●	●
S0-0.11	STRUCTURAL DESIGN CRITERIA	●	●		●	●	
S0-0.12	STRUCTURAL REVIEW LETTERS	●	●	●	●	●	
S0-0.20	GENERAL NOTES	●	●		●		
S2-0	FULL PROJECT PLANS						
S2-0.B5.11	LEVEL B5 PLAN	●	●		●		
S2-0.B4.11	LEVEL B4 PLAN	●	●		●		
S2-0.B3.11	LEVEL B3 PLAN	●	●		●		
S2-0.B2.11	LEVEL B2 PLAN	●	●		●		
S2-0.B1.01	LEVEL B1 - REFERENCE PLAN	●	●		●		
S2-0.B1.11	LEVEL B1 WEST PLAN	●	●		●	●	
S2-0.B1.12	LEVEL B1 WEST PLAN BOTTOM REINFORCEMENT	●	●		●		
S2-0.B1.13	LEVEL B1 WEST PLAN TOP REINFORCEMENT	●	●		●		
S2-0.B1.14	LEVEL B1 WEST PLAN [illegible] LOCATION		●		●		
S2-0.B1.21	LEVEL B1 EAST PLAN	●	●		●		
S2-0.01.01	LEVEL 1 - REFERENCE PLAN	●	●		●		
S2-0.01.11	LEVEL 1 WEST PLAN	●	●		●	●	
S2-0.01.21	LEVEL 1 EAST PLAN	●	●		●		
S2-0.02.01	LEVEL 2 - REFERENCE PLAN	●	●		●		
S2-0.02.11	LEVEL 2 WEST PLAN	●	●		●	●	
S2-0.02.12	LEVEL 2 WEST PLAN - PUBLIC CONCRETE STRUCTURE		●		●		
S2-0.02.21	LEVEL 2 EAST PLAN	●	●		●		
S2-0.03.01	LEVEL 3 - REFERENCE PLAN	●	●		●		
S2-0.03.11	LEVEL 3 WEST PLAN	●	●		●	●	
S2-0.03.21	LEVEL 3 EAST PLAN	●	●		●		
S2-1	TOWER FRAMING PLANS						
S2-1.04.01	LEVELS 4-7, [illegible] 33, 37 PLAN	●	●		●	●	
S2-1.08.01	LEVELS 8, 12, 41, 21 PLAN	●	●		●		
S2-1.09.01	LEVELS 9, 10 PLAN	●	●		●	●	
S2-1.10.01	LEVEL 10, 11, 18, 20 PLAN				●		
S2-1.13.01	LEVELS 13, 22 PLAN	●	●		●		
S2-1.25.01	LEVEL 25 PLAN	●	●		●		
S2-1.26.01	LEVEL 26 PLAN	●	●		●		
S2-1.27.01	LEVEL 27 PLAN	●	●		●		
S2-1.28.01	LEVELS 28-41 PLAN		●		●		
S2-1.42.01	LEVELS 42, 45 PLAN	●	●		●		
S2-1.43.01	LEVEL 43 PLAN	●	●		●		
S2-1.44.01	LEVEL 44 PLAN				●		
S2-1.46.01	LEVEL 46 PLAN	●	●		●		
S2-1.47.01	LEVEL 47 PLAN	●	●		●		
S2-1.48.01	LEVELS 48-51 PLAN	●	●		●		
S2-1.52.01	LEVEL 52 PLAN	●	●		●		
S2-1.50.01	LEVEL 50 PLAN	●	●		●		
S2-1.53.01	LEVEL 53 PLAN	●	●		●		
S2-1.54.01	LEVEL 54 PLAN	●	●		●		
S2-1.55.01	LEVEL 55 PLAN	●	●		●		
S2-1.56.01	LEVEL 56 PLAN	●	●		●		
S2-2	MID-RISE FRAMING PLANS						
S2-2.04.01	LEVELS 4-8 PLANS	●	●		●		
S2-2.10.01	LEVEL 10 PLAN				●		
S2-2.11.01	LEVEL 11 PLAN				●		
S2-2.12.01	LEVEL 12 PLAN	●	●		●		
S2-2.13.01	LEVEL 13 PLAN	●			●		
S2-2.14.01	LEVEL 14 PLAN		●		●		
S3-1	FOUNDATION						
S3-1.01	TYPICAL FOUNDATION SECTIONS AND DETAILS	●	●		●	●	
S3-1.11	FOUNDATION SECTIONS AND DETAILS	●	●		●		
S3-1.12	FOUNDATION SECTIONS AND DETAILS	●	●		●		
S3-1.13	FOUNDATION SECTIONS AND DETAILS	●	●		●		
S3-1.14	FOUNDATION SECTIONS AND DETAILS	●	●		●		
S3-1.15	FOUNDATION SECTIONS AND DETAILS	●	●		●		
S3-2	VERTICAL SYSTEMS						
S3-2.01	TOWER COLUMN SCHEDULE	●	●		●		
S3-2.02	TOWER COLUMN DETAILS	●	●		●	●	●
S3-2.03	TOWER COLUMN DETAILS				●		
S3-2.04	PODIUM/OFFICE/AMENITIES COLUMN SCHEDULE	●	●		●		
	STRUCTURAL CONTINUE						
S3-2.11	TOWER SHEAR WALL ELEVATIONS	●	●		●		
S3-2.12	PODIUM SHEAR WALL ELEVATIONS	●	●		●		
S3-2.21	TOWER SHEAR WALL SCHEDULE	●	●		●	●	
S3-2.23	TOWER LINK BEAM SCHEDULE AND DETAILS	●	●		●	●	
S3-2.24	MID-RISE LINK BEAM SCHEDULE AND DETAILS	●	●		●		
S3-2.31	TOWER SHEAR WALL PLANS	●	●		●		
S3-2.32	TOWER SHEAR WALL PLANS	●	●		●		
S3-2.33	TOWER SHEAR WALL PLANS	●	●		●		
S3-2.34	TOWER SHEAR WALL PLANS	●	●		●		
S3-2.35	TOWER SHEAR WALL PLANS	●	●		●		
S3-2.36	TOWER SHEAR WALL PLANS	●	●		●		
S3-2.37	TOWER SHEAR WALL PLANS		●		●		
S3-2.38	TOWER SHEAR WALL PLANS		●		●		
S3-2.39	TOWER SHEAR WALL PLANS		●		●		
S3-2.41	PODIUM SHEAR WALL PLANS	●	●		●	●	
S3-2.42	PODIUM SHEAR WALL PLANS	●	●		●	●	
S3-2.43	PODIUM SHEAR WALL PLANS	●	●		●		
S3-2.51	TOWER SHEAR WALL DETAILS	●	●		●		●
S3-2.52	TOWER SHEAR WALL DETAILS	●	●		●		●
S3-2.53	TOWER SHEAR WALL DETAILS	●	●		●		●
S3-2.54	TOWER SHEAR WALL DETAILS	●	●		●		●
S3-2.55	TOWER SHEAR WALL DETAILS	●	●		●		●
S3-2.56	TOWER SHEAR WALL DETAILS		●		●		●
S3-2.57	TOWER SHEAR WALL DETAILS				●	●	
S3-2.58	TOWER SHEAR WALL DETAILS	●	●		●	●	
S3-2.59	TOWER SHEAR WALL DETAILS		●		●	●	
S3-2.71	TOWER BRACED FRAME SCHEDULE AND DETAILS	●	●		●	●	●
S3-2.72	TOWER BRACED FRAME DETAILS	●	●		●	●	
S3-2.73	TOWER BRACED FRAME DETAILS	●	●		●	●	
S3-3	SUPERSTRUCTURE						
S3-3.01	TYPICAL CONCRETE DETAILS	●	●		●		
S3-3.02	TYPICAL CONCRETE DETAILS	●	●		●		
S3-3.03	TYPICAL CONCRETE DETAILS	●	●		●		
S3-3.11	SUPERSTRUCTURE SECTIONS AND DETAILS	●	●		●		
S3-3.12	SUPERSTRUCTURE SECTIONS AND DETAILS	●	●		●		
S3-3.13	SUPERSTRUCTURE SECTIONS AND DETAILS	●	●		●		
S3-3.14	SUPERSTRUCTURE SECTIONS AND DETAILS	●	●		●		
S3-3.15	SUPERSTRUCTURE SECTIONS AND DETAILS	●	●		●		
S3-3.16	SUPERSTRUCTURE SECTIONS AND DETAILS		●		●		
S3-3.17	SUPERSTRUCTURE SECTIONS AND DETAILS		●		●		
S3-3.18	SUPERSTRUCTURE SECTIONS AND DETAILS		●		●		
S3-3.21	TYPICAL POST-TENSION SECTIONS AND DETAILS	●	●		●		
S3-3.22	TYPICAL POST-TENSION SECTIONS AND DETAILS	●	●		●	●	

301 MISSION STREET

OWNER:

ARCHITECT:

STRUCTURAL ENGINEER:

MECHANICAL/ELECTRICAL/PLUMBING ENGINEER:

FIRE PROTECTION ENGINEER:

CODE CONSULTANT:

REV.	DESCRIPTION	DATE
	FOUNDATION PERMIT	[illegible]
	ADDENDUM 1 STRUCTURE	[illegible]
	ADDENDUM 1 REVISIONS	[illegible]
	ADD1-REV2 PEER REVIEW	05/26/2006
	ADD1-REV2 BRACING	05/25/2006

DESIMONE

SCALE: N.T.S.

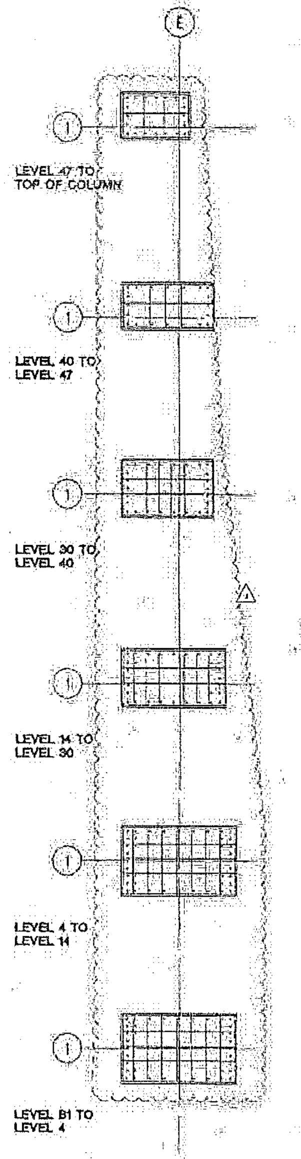
DRAWN BY:

PROJECT #:

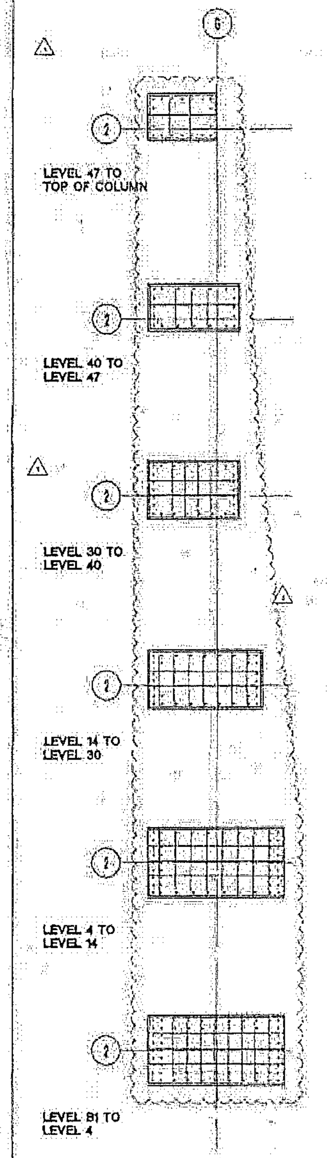
GENERAL INFORMATION

DRAWING INDEX

S0-0.10



15 COLUMN A DETAILS



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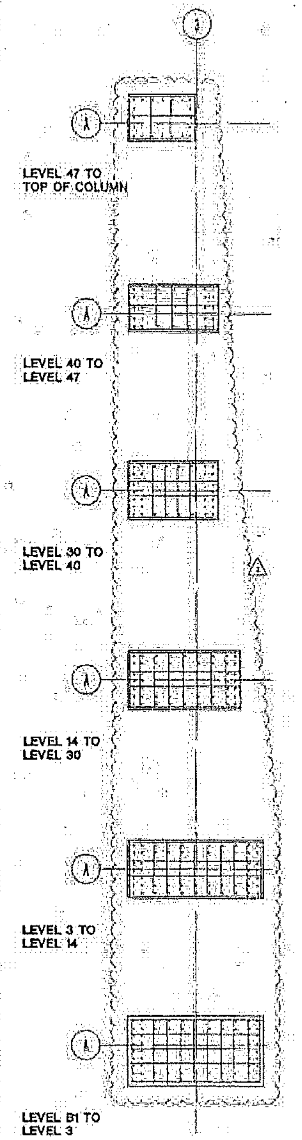
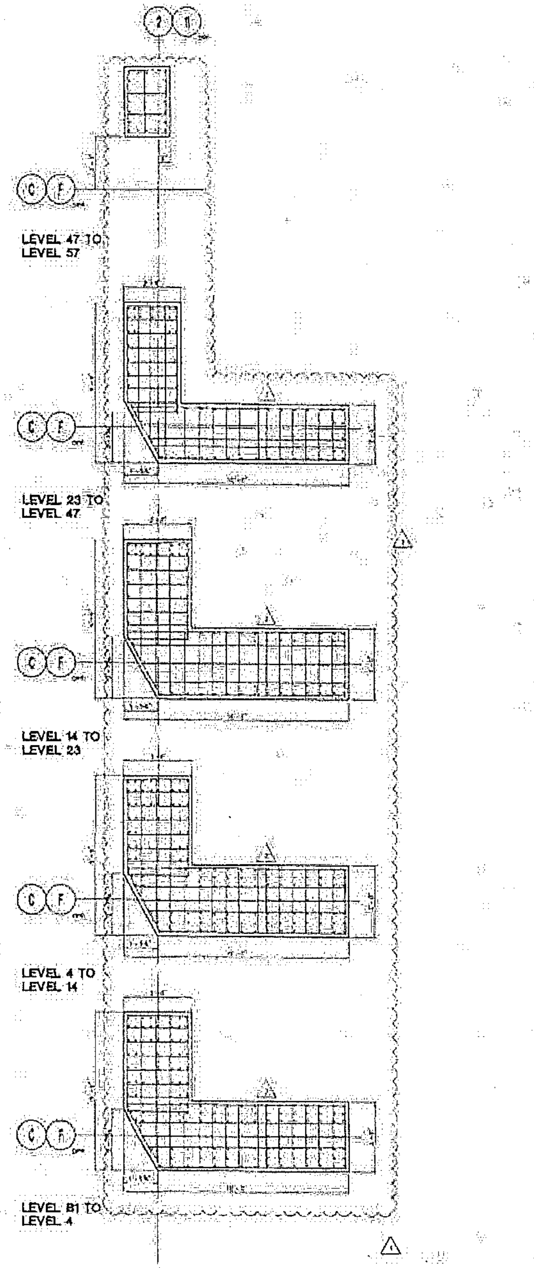


NOTES:

13 COLUMN D DETAILS



12 COLUMN B DETAILS

301 MISSION STREET

OWNER:

ARCHITECT:

STRUCTURAL ENGINEER:

MECHANICAL/ELECTRICAL/PLUMBING ENGINEER:

FIRE PROTECTION ENGINEER:

CODE CONSULTANT:

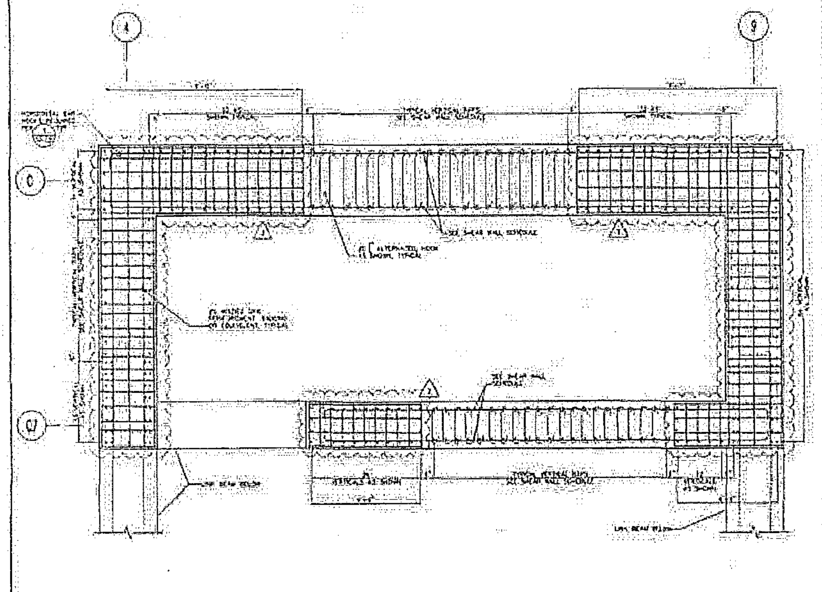
REV.	DESCRIPTION	DATE
	FOUNDATION PERMIT	[illegible]
1	ADDENDUM 2 STRUCTURE	[illegible]
	ADDENDUM 2 REVISIONS	[illegible]
2	[illegible]	[illegible]
3	[illegible]	[illegible]

DESIMONE

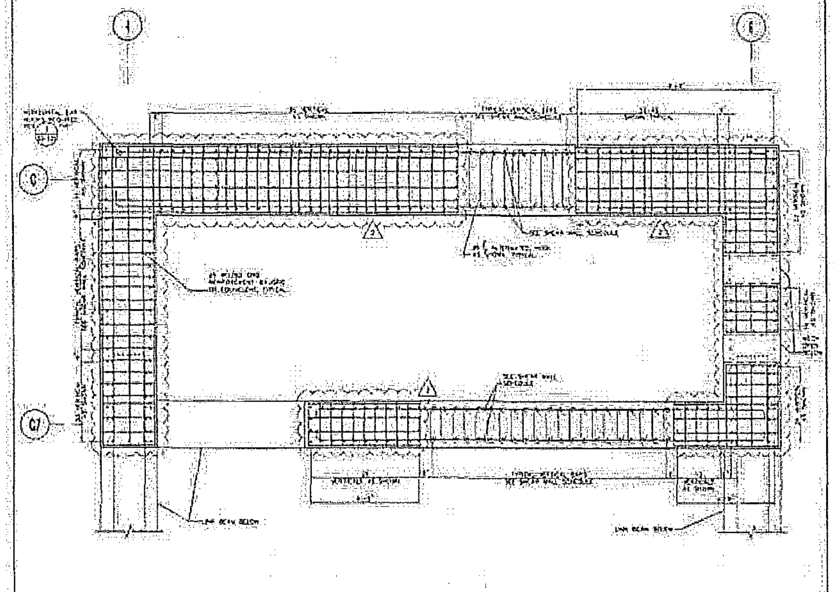
VERTICAL SYSTEMS

TOWER COLUMN DETAILS

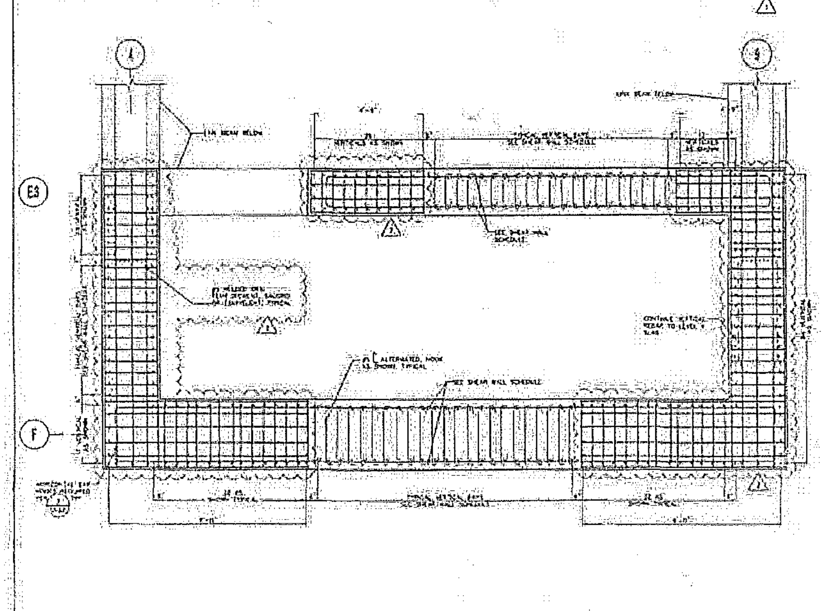
S3-2.02



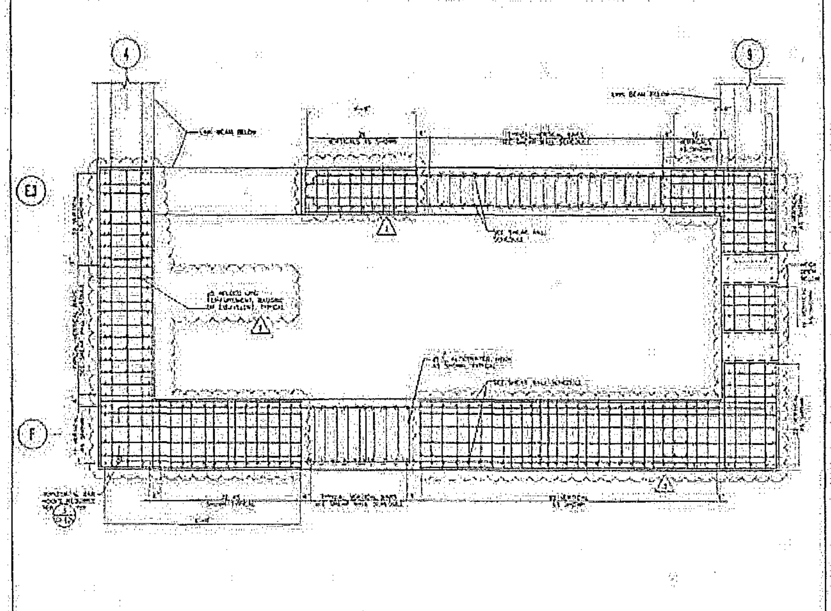
2 SHEAR WALL DETAIL



1 SHEAR WALL DETAIL - LEVEL 02



4 SHEAR WALL DETAIL



3 SHEAR WALL DETAIL - LEVEL 02

301 MISSION STREET

OWNER

ARCHITECT

STRUCTURAL ENGINEER

MECHANICAL/ELECTRICAL/PLUMBING ENGINEER

FIRE PROTECTION ENGINEER

REV	DESCRIPTION	DATE
	FOUNDATION PERMIT	[illegible]
1	[illegible]	[illegible]
	[illegible]	[illegible]
2	[illegible]	[illegible]

DESIMONE

VERTICAL SYSTEMS:

SHEAR WALL DETAILS

S3-2.52

Concrete. Concrete strengths in the Tower walls and frames vary between 7 and 10 ksi, and in the Mid-rise between 7 and 8 ksi. All floor slabs are 5 ksi.

Reinforcing. The shear walls in both buildings and the moment frames in the Tower use Grade 75 reinforcing for bars larger than #8's. All shear wall confinement steel is Grade 75 for areas where the concrete strength is 8 ksi and higher. Steel of all grades used as part of the lateral system must meet the ductility requirements of ASTM A706.

Foundations

Tower. The Tower foundation consists of a 10-foot thick pile cap supported by pre-cast concrete piles. The bottom of the pile cap is approximately 25' below the existing grade. The initial vertical pile displacement due to slippage required to fully engage the pile is expected to be approximately 1" by the time of project construction completion. Additional long-term pile settlement due to compression of the underlying clay layers is expected to be as much as 5". As the piles are only located directly below the Tower footprint, the settlement is expected to occur uniformly over the Tower foundation area.

Mid-rise. The Mid-rise structure rests on a mat foundation that varies between 6 feet and 8 feet in thickness. The bottom of this excavation is approximately 43 feet below the existing grade. Tie-downs resist hydrostatic uplift pressures under the portion of the deep excavation that is not directly below the Mid-rise, i.e., the area between the Mid-rise and the Tower.

Building Separation

The foundations and lateral systems of the two buildings are considered completely separate because a joint is located between them at the B1, Ground, 2nd, and 3rd Floors. "Hinge slabs" allow circulation between the two buildings while still accommodating differential settlement and seismic displacements between the two structures.

Wind Loads

A wind tunnel study was performed and a report issued by Rowan Williams Davies & Irwin Inc. (RWDI). The results of the report were used to evaluate both the Tower and Mid-rise. Wind does not control either design forces or interstory drifts for either structure.

Seismic Loads

Site-specific ground motions provided by the geotechnical engineer of record, Treadwell and Rollo, were used for the analyses of both structures. Earthquake design forces acting on individual elements were obtained by performing response spectrum analyses with the proprietary computer program "ETABS" written by Computers and Structures, Inc. of Berkeley, California.

center of mass.

Mid-rise. Due to the eccentricity of the shear walls relative to the center of mass of the building, t Mid-rise exhibits a slight torsional irregularity. For this reason the base shear was not reduced accordance with 1631.5.4.2.

Different base shears were used for checking design forces and building interstory drifts. (Since period of the structure is relatively short, the minimum base shear equations of 30-6 and 30-7 do apply.)

Design Procedures

All elements of the structure are designed and detailed in accordance with the load combinations (requirements of the 2001 SFBC. Additional procedures were also followed as listed below.

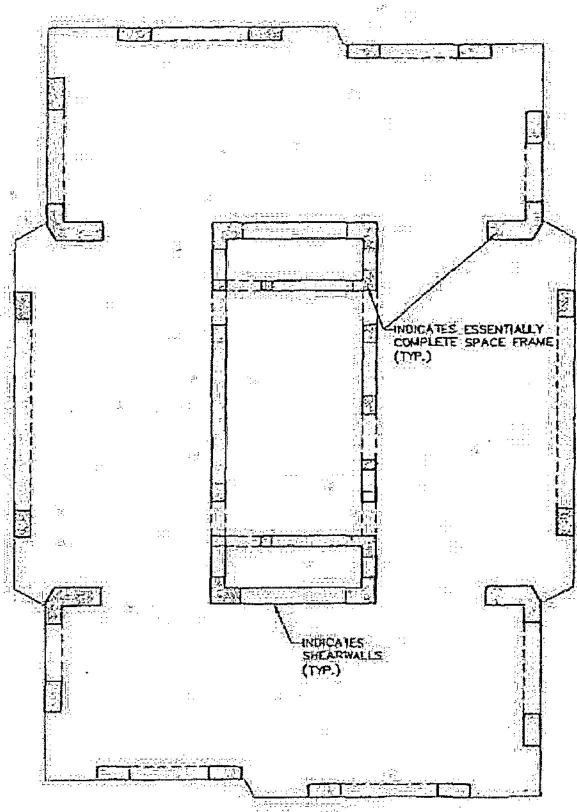
Steel Link Beams. The 2001 SFBC does not address the steel link beams used within the core of Tower. These elements are designed using the 2002 AISC Seismic Provisions requirements for Spe Reinforced Concrete Shear Walls Composite with Structural Steel Elements.

Capacity Design. Each of the 12 outriggers connecting to the central shear core of the Tower cont two diagonally reinforced link beam elements. These links are designed to remain elastic under code-prescribed seismic loads, but it is desirable for them to yield first once the design loads exceeded by a major earthquake. In order to insure this behavior, the capacities of the link bo were calculated and increased by an overstrength factor. The resulting forces were used as demands for which the following elements were designed: the portion of each outrigger connectin the core walls, the outrigger columns, and the pile cap.

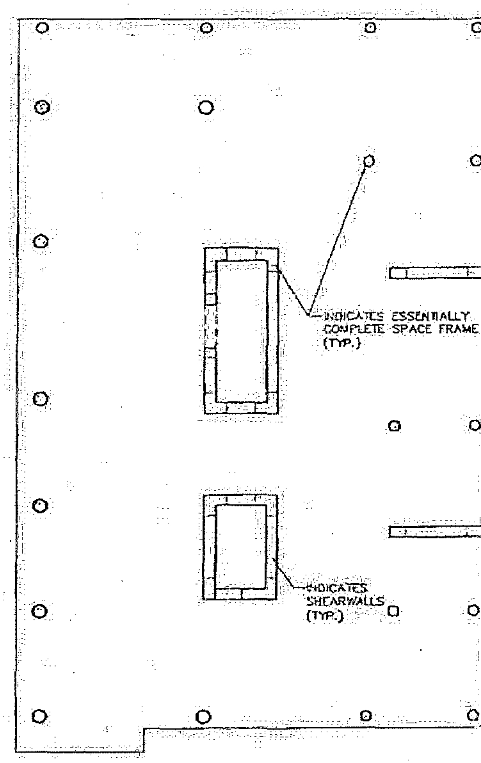
Note that this approach is not required by the SFBC and represents an effort to "go beyond the co This increases our confidence that in a large earthquake the very ductile link beam elements wil first, and the critical connecting elements of the structure will remain essentially undamaged. design of all elements still meets the requirements of the SFBC.

The outriggers columns are designed to remain elastic when simultaneously subjected to the cap of all link beams, as well as all tributary gravity loads.

The pile cap under the Tower is designed to remain elastic when subjected to the capacities o outrigger columns, as well as the expected maximum moment at the base of the shear wall core.



TOWER



MID-RISE

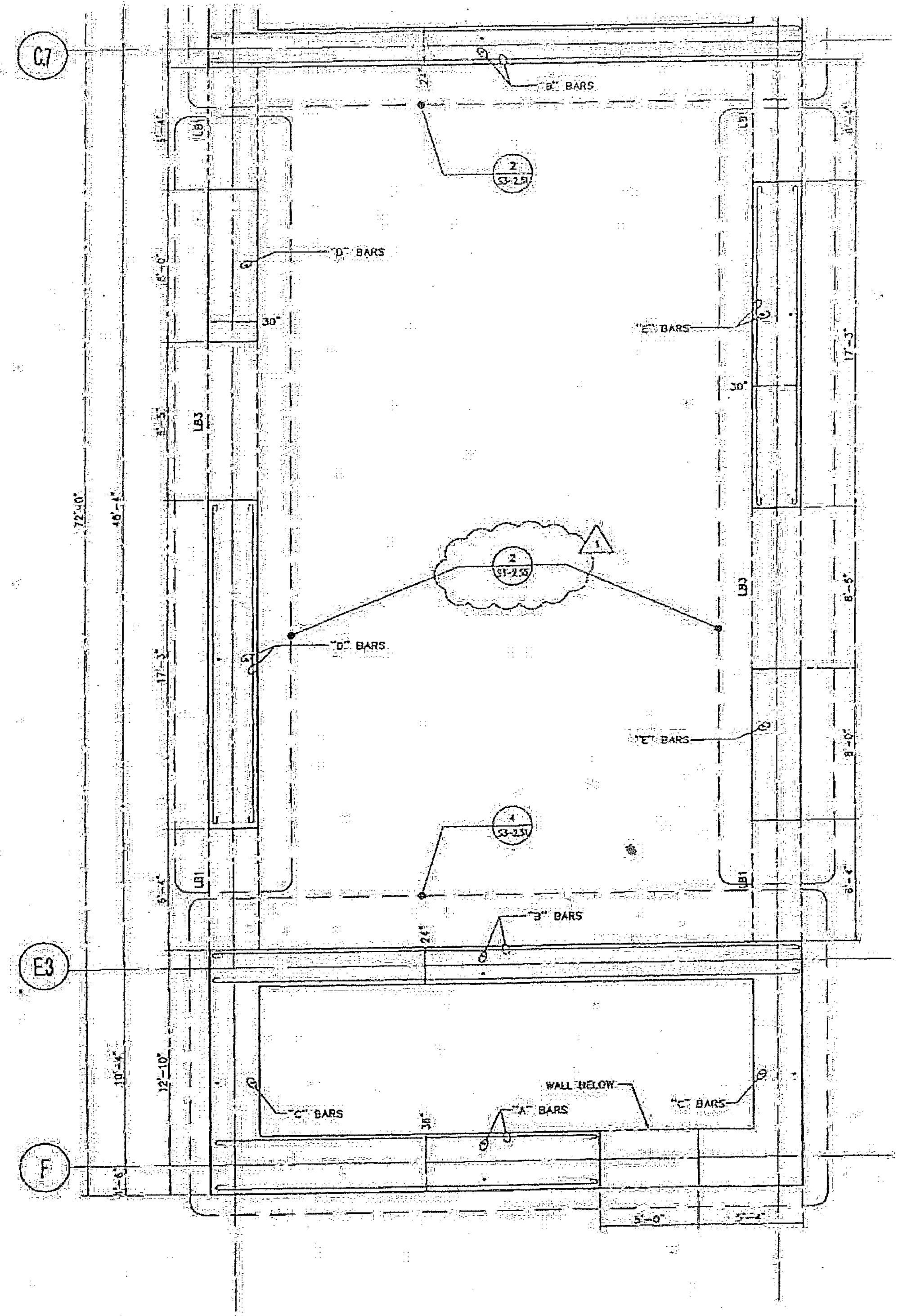
NOTES:

TOWER:

AN ESSENTIALLY COMPLETE SPACE FRAME PER UBC 1629.6.5 IS PROVIDED BY SPECIALLY REINFORCED MOMENT FRAME COLUMNS AND THE BOUNDARY ELEMENTS OF THE SHEARWALLS. THE CORE SHEARWALLS MAKE UP A CONTINUOUS GRAVITY LOAD RESISTING SPACE FRAME.

MID-RISE:

GRAVITY LOAD IS RESISTED BY THE COLUMNS SURROUNDING THE CORE AND THE BOUNDARY ELEMENT COLUMNS EMBEDDED IN THE SHEARWALLS. THESE ELEMENTS ... SPACE FRAME NEEDED TO CLASSIFY THE



NOTES:

1. SEE SHEAR WALL SCHEDULE FOR SIZE AND SPACING OF TYPICAL BARS.
2. TYPICAL BARS APPLY TO E.F. OF WALL.

2 SHEAR WALL PLAN - LEVEL 01

SCALE: 1/4" = 1'-0"

WALL REINFORCEMENT SCHEDULE

BUILDING LEVEL		A BARS	B BARS	C BARS	D BARS	E BARS
56–61	VERTICAL	#7@12"	#7@12"	#7@12"	#7@12"	#7@12"
	HORIZONTAL	#7@8"	#7@12"	–	#7@12"	#7@12"
52–56	VERTICAL	#7@12"	#7@12"	#7@12"	#7@12"	#7@12"
	HORIZONTAL	#7@8"	#7@12"	–	#7@12"	#7@12"
48–52	VERTICAL	#7@12"	#7@12"	#7@12"	#7@12"	#7@12"
	HORIZONTAL	#7@8"	#7@12"	–	#7@12"	#7@12"
44–48	VERTICAL	#7@9"	#7@9"	#7@9"	#7@12"	#7@12"
	HORIZONTAL	#7@8"	#7@12"	–	#7@12"	#7@12"
40–44	VERTICAL	#7@9"	#7@9"	#7@9"	#7@12"	#7@12"
	HORIZONTAL	#7@4"	#7@12"	–	#7@12"	#7@6"
36–40	VERTICAL	#7@9"	#7@9"	#7@9"	#7@12"	#7@12"
	HORIZONTAL	#7@4"	#7@12"	–	#7@8"	#7@6"
32–36	VERTICAL	#7@9"	#7@9"	#7@9"	#7@12"	#7@12"
	HORIZONTAL	#7@4"	#7@12"	–	#7@8"	#7@6"
28–32	VERTICAL	#7@9"	#7@9"	#7@9"	#7@12"	#7@12"
	HORIZONTAL	#7@4"	#7@12"	–	#7@8"	SEE NOTE 6
24–28	VERTICAL	#8@6"	#8@6"	#8@6"	#7@12"	#7@12"
	HORIZONTAL	#7@4"	#7@12"	–	#7@6"	#8@8"
20–24	VERTICAL	#8@6"	#8@6"	#8@6"	#7@12"	#7@12"
	HORIZONTAL	#7@4"	#7@12"	–	#7@6"	#8@8"
15–20	VERTICAL	#8@6"	#8@6"	#8@6"	#7@6"	#7@6"
	HORIZONTAL	#8@4"	#7@12"	–	#7@6"	#8@8"
12–16	VERTICAL	#8@6"	#8@6"	#8@6"	#7@6"	#7@6"
	HORIZONTAL	#8@4"	#7@12"	–	#7@4"	#8@6"
08–12	VERTICAL	#8@6"	#8@6"	#8@6"	#7@6"	#7@6"
	HORIZONTAL	#8@4"	#7@12"	–	#8@4"	#8@8"
04–08	VERTICAL	#8@6"	#8@6"	#8@6"	#7@6"	#7@6"
	HORIZONTAL	#8@4"	#7@12"	–	#8@4"	#8@8"
01–04	VERTICAL	#9@6"	#9@6"	#9@6"	#8@6"	#8@6"
	HORIZONTAL	#8@4"	#8@8"	–	#8@4"	#8@4"
B1–01	VERTICAL	#9@6"	#9@6"	#9@6"	#8@6"	#8@6"
	HORIZONTAL	#8@4"	#8@8"	–	#8@4"	#8@4"

1

NOTES:

1. CONCRETE STRENGTHS ARE:
   10 ksi B1 – L20
   8 ksi L21 – L40
   7 ksi L41 – ROOF
2. fy = 75 ksi (#9 AND HIGHER), fy = 60 ksi (#8 AND LOWER)
3. USE fy = 75 ksi FOR ALL TIES.
4. ALL BARS E.F., U.O.N.
5. ALL SPACING IS CENTER-TO-CENTER. SPACING IS TYPICAL U.O.N.
6. #8@6" DOWN TO LEVEL 27 SLAB

1

7 SHEAR WALL SCHEDULE

SCALE: N.T.S.

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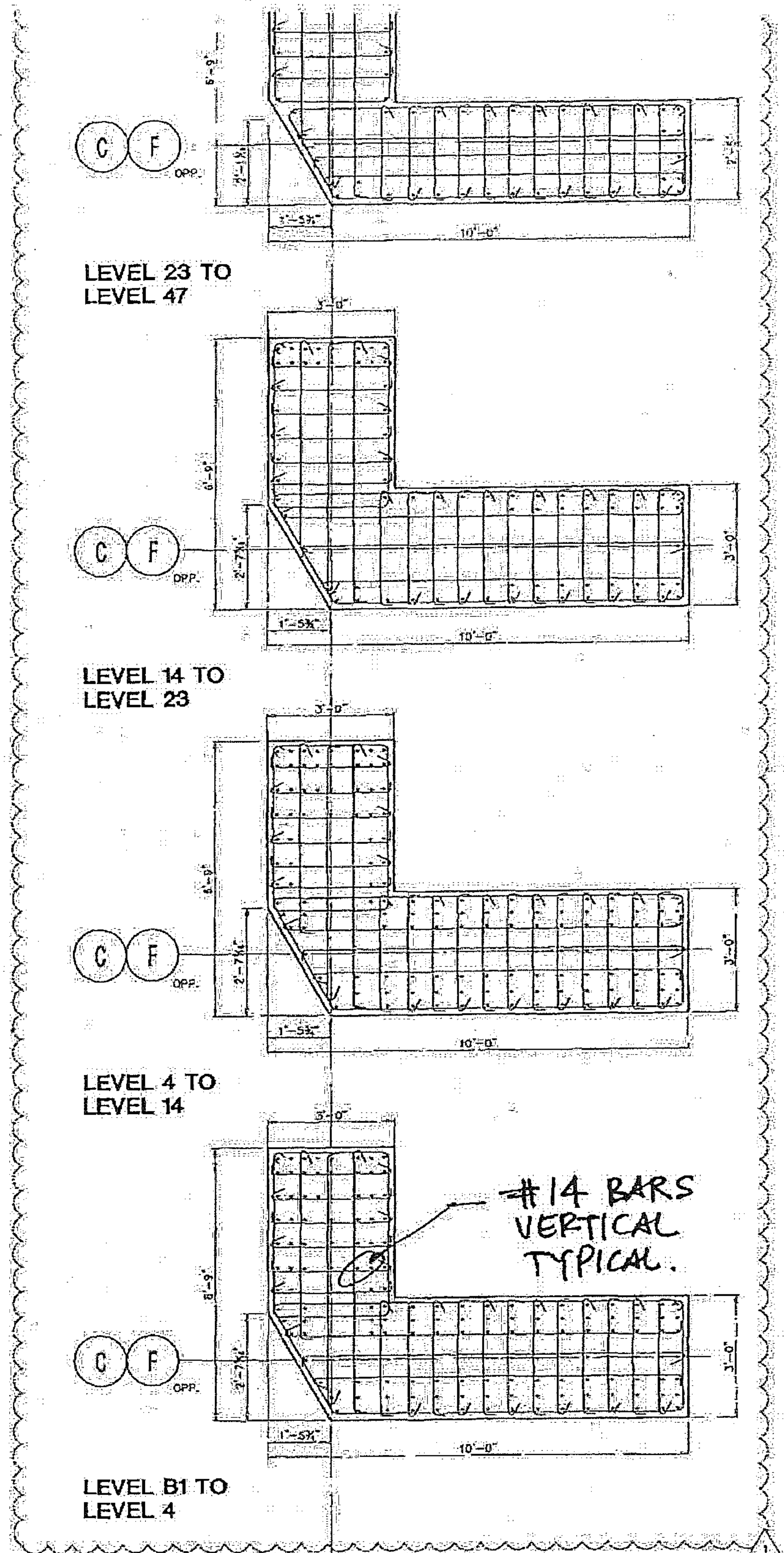

12 COLUMN B DETAILS
SCALE: 1/2"=1'-0"

180 SANSOME STREE
SAN FRANCISCO, CA
(415) 398-5740

MECHANICAL/E
FLACK & KURTZ INC.
405 HOWARD STREE
SAN FRANCISCO, CA
(415) 398-3833

FIRE PROTECTI
HUGHES ASSOCIATE
2551 SAN RAMON VA
SAN RAMON, CA 945
(925) 314-7910

CODE CONSUL
ARS & ASSOCIATES
301 JUNIPERO SERF
SAN FRANCISCO, CA
(415) 333-8080

REV.
1

DI
160 SAN
SAN F
T. 415.

STAMP:

SCALE:
DRAWN BY:
PROJECT #:

VERTICA
TOWEI

S3-2

301 MISSION STREET, SAN FRANCISCO

PEER REVIEW

1. The L-shaped columns will be in torsion for frame action along axis 2 and axis 11. Consider torsion for design.

   We disagree with your simple response. Please provide detailed calculations that account for eccentricity between the center of resistance of column and outriggers and frame beams.

2. The L-shaped columns support outriggers of the prime lateral system. It should be shown that participation or failure of the more rigid element will not impair the vertical and lateral resisting ability of the gravity load and lateral moment resisting system. (See section 1633.2.4.1).

   Our intent here is that the backup moment frame should not be impaired by the failure of outriggers or shearwalls. Please provide detailed calculations to demonstrate that Moment Frame will be able to take its demand once the shearwalls have failed.

3. Low-rise mat show 69 psf reinforce for total area. It looks excessive. (It is #11 @ 4.3" E.W. T & B for 8' mat.)

   Resolved.

4. At one side of shear wall at line D.5, a ramp that has an opening in the diaphragm. Clarify how the shear will travel to both basement walls at A.1 and K.

   Resolved.

5. Verify by calculations that ground floor diaphragm behave as a rigid diaphragm transferring forces to the perimeter basement walls and to the core. Possible reverse shear might happen in the basement and in the core walls below.

   We disagree with your response. We believe that there will be reverse shear and floor needs to be modeled to account for it or properly detailed that it is not connected with the shear walls. Please provide detailed calculations as requested above or floor to wall connection details.

6. The mid-rise and the high-rise towers are joined at the ground floor and B1 levels. The high-rise tower has mat with piles more rigid than mid-rise 5-story basement. Verify deformation compatibility and amount of base shear that will be resisted by piles.

   We are generally in agreement with your approach but we would like to get the calculations for lateral loads on piles and any horizontal movement that occurs from the lateral load.

7. There are shear walls surrounded by openings at both sides. Verify collectors requirements to deliver shear to these walls.

   We agree with your response but would like to have calculations for at least ground floor level.

8. Settlement compatibility between high-rise on piles and mid-rise on mat footing total settlement for both could be different, but there is ground floor slab without a joint that could get cracked.

   Resolved.

9. At 9' deep mat on piles, how is the modulus of subgrade reaction applied to pile footings.

   Resolved.

10. Is 9' deep pile cap required in full building area? There are areas where depth could be greatly reduced. (K-H for example)

    Resolved.

11. The differential shortening in columns and walls will produce additional significant moments on outrigger beams. Is there a mechanism to relieve them from these forces?

    We disagree with your response. Please provide detailed stress calculations (moments, shears) that account for shortening of all vertical members.

12. Optimize P/T slab thickness at all locations.

    This item should be reviewed with the contractor for cost impact.

13. Main tower moment frames are all single bay frames that are not effective. Some of the bays can't be considered as a frame because clear span to depth is less than 4 – for example B0403.

    We disagree, for example check the span to depth ratio of beam B3 on third floor.

14. Please provide design criteria for outrigger beams. Are they designed as a "deep beam" with a consideration for non-linear strain distribution. What forces will be considered for designing columns that get forces from outriggers?

    The capacity of the frame columns should be more than the capacity of outrigger or omega x outrigger forces. Please provide the capacity of the outrigger using non-linear failure analysis of outrigger + shear walls.

15. a. Column transfer at 2nd floor line H with sloped column at 1st floor will create additional lateral component on both levels that will require beams and slab between frames to be designed for additional axial force.

    Please provide calculations when this design is finalized.

    b. Very deep column section – 26' deep will act as a shear wall and attract a lot of additional seismic load to this frame. Careful considerations should be taken to design this transfer column for all applied loads.

    This member does not qualify as frame member. It should be properly modeled in ETABS and designed for omega x seismic forces. Additionally, Beam at level 1 should comply with UBC 1921.3.1.1.

c. Sloped column should be included in the building model.

We agree with your response in concept. Please submit the properties of the sloped column that were used in the ETABS model.

16. There are 4 or 5 different round column sizes on one level – ground level mid-rise. Please verify if unification of sizes is possible to reduce cost.

Resolved.

17. a. Design criteria on drawings describes dual system, shear wall with SMRF, and R = 8.5. Mid-rise building has no SMRF. This building also has vertical structural irregularities such as discontinuous shear wall that should be considered.

Resolved.

b. Code equations 30-6 and 30-7 need not be considered for drift check.

Resolved.

c. Drift check should include accidental torsion.

Resolved.

18. Please specify wind load design criteria for strength and for drift. Compare wind load and seismic.

Resolved.

19. All outriggers are unusual in shape and can't be clearly designed as a deep beams or discontinuous shear walls. Based on their importance for overall stability of the building non-linear time history analysis should be performed to investigate performance of these important elements and bring factor of safety for them to a desirable level.

We reserve our response to this comment till we see the response to comment 14 above.

20. Provide design calculations and details that account for P/T slab shortening due to concrete shrinkage.

21. Please provide the detailed design and analysis of W14 steel link beams.

22. Please submit the ETABS model and backup calculations justifying cracked section properties.

23. Please provide calculations for diaphragm design.

NOTES:

1. TESTS SHALL BE PERFORMED FOR BOTH #4 AND #5 BAUGRIDS AS SHOWN ON PAGE 29 OF THE BAUGRID QUALITY CONTROL MANUAL (REPRODUCED HERE FOR CLARITY.) ALL APPLICABLE ASTM PROCEDURES AND/OR THE BAUGRID QUALITY CONTROL MANUAL SHALL BE ADHERED TO.

2. COLUMN TEST BAUGRID FABRICATION SHOULD ONLY PROCEED IF BAUGRID COUPONS TESTS ARE SATISFACTORY.

3. TESTS SHALL BE PERFORMED IN THE MANUFACTURING FACILITY IN CHINA USING THE SAME TESTING APPARTUS AS USED FOR THE 301 MISSION PROJECT.

4. ALL TESTS SHALL BE PERFORMED WITH SMITH-EMERY AS WITNESS. SMITH-EMERY SHALL PRODUCE A REPORT PRESENTING ALL TESTING RESULTS AND A STATEMENT AS TO THE TESTS CONFORMANCE WITH THE BAUGRID QUALITY CONTROL MANUAL. ALL RAW STRESS-STRAIN DATA SHALL ALSO BE INCLUDED IN THE REPORT.

PROJECT: 301 MISSION	JOB #: 4069	SCALE: N.T.S.	
TITLE: BAUGRID COUPON TEST SETUP	DATE: 11/03/2006	DWG. NO.	
DESIMONE 160 SANSOME STREET 16TH FLOOR SAN FRANCISCO, CA 94104 - 3722 T. 415.398.5740 F. 415.398.9834	DRAWN: NJR	SK-02	
	CHECKED: DDR, RMP		

PROCEDURE:

1. TEST SPECIMENS
   a. SHAKEDOWN TEST. SPECIMENS A1, A2, & A3. THREE (3) SPECIMENS CONTAINING BAUGRID WILL BE BUILT PER SK-01.
   b. CITY TEST. SPECIMENS B1, B2, & B3. THREE (3) SPECIMENS CONTAINING BAUGRID WILL BE BUILT PER SK-01.

2. TEST INSTRUMENTATION
   a. ALL SPECIMENS WILL BE INSTRUMENTED WITH TWO (2) AXIAL STRAIN MEASUREMENT DEVICES (LVDT'S) ON THE EXTERIOR AND ON OPPOSITE SIDES OF THE SPECIMEN ACROSS THE TESTING REGION.
   b. ALL SPECIMENS WILL BE INSTRUMENTED WITH TWO (2) STRAIN GAGES ON THE LONGITUDINAL REINFORCEMENT. THESE GAGES WILL BE PLACED ON OPPOSITE SIDES OF THE SPECIMEN, NEAR THE LVDT'S, WITHIN THE TESTING REGION.
   c. ALL SPECIMENS WILL BE INSTRUMENTED WITH FOUR (4) STRAIN GAGES ON THE TRANSVERSE REINFORCEMENT. STRAIN GAGES ON THE TRANSVERSE BAUGRID REINFORCEMENT WILL BE PLACED AS CLOSE AS POSSIBLE TO THE WELDS.

3. PURPOSE OF EACH TEST
   a. SPECIMENS A1, A2, & A3 WILL BE TESTED WHEN THE CONCRETE STRENGTH HAS REACHED 8,000 PSI. THE PURPOSE OF THESE TESTS WILL BE TO MAKE SURE THE TESTING PROCEDURE IS UNDERSTOOD PRIOR TO TESTING THE CITY TEST SPECIMENS.
   b. SPECIMENS B1, B2, & B3 WILL BE TESTED WHEN THE CONCRETE STRENGTH HAS REACHED 10,000 PSI. THE OUTCOME OF THESE TESTS WILL DETERMINE IF BAUGRID IS ACCEPTABLE FOR USE ON THE 301 MISSION STREET PROJECT.

4. CONCRETE STRENGTH TESTS
   a. FORTY (40) CONCRETE CYLINDERS SHALL BE TAKEN FROM THE SAME CONCRETE USED FOR THE TEST SPECIMENS.
   b. TWO (2) CYLINDERS SHALL BE BROKEN ON THE 5TH DAY AFTER CONCRETE PLACMENT AND ON EACH DAY THEREAFTER UNTIL THE CONCRETE REACHES 10,000 PSI, WHICH IS EXPECTED AT APPROXIMATELY FOURTEEN (14) DAYS AFTER PLACEMENT.
   c. TWO (2) ADDITIONAL CYLINDERS SHALL BE BROKEN AT 28, 56, AND 90 DAYS AFTER CONCRETE PLACEMENT.

5. TESTING PROCEDURE
   a. EACH SPECIMEN WILL BE SUBJECTED TO MONOTONIC CONCENTRIC LOADING. (THE APPROPRIATE RATE OF LOADING IS TO BE DETERMINED AND AGREED TO PRIOR TO TESTING.)
   b. SPECIMENS A1, A2, AND A3 WILL BE LOADED UNTIL FAILURE.
   c. SPECIMENS B1, B2, AND B3 WILL BE LOADED UNTIL THEY HAVE REACHED THE ACCEPTANCE CRITERIA ONLY. ADDITIONAL LOADING MAY BE APPLIED AT THE OWNER'S SOLE DISCRETION.

6. TEST ACCEPTABILITY CRITERIA
   a. CITY TEST SPECIMENS B1, B2, & B3. EACH TEST WILL BE DEEMED SUCCESSFUL IF THE AVERAGE OF THE TWO AXIAL STRAIN DEVICES REACHES 0.6%.

7. BAUGRID EQUIVALENCY TESTS
   a. BAUGRID QUALITY CONTROL TESTS 1-5 AS SHOWN IN SK-02 WILL BE PERFORMED ON THE #4 BAUGRIDS USED IN THE TEST SPECIMENS, AS WELL AS REPRESENTATIVE #5 BAUGRIDS TO THOSE BEING USED AT THE 301 MISSION STREET PROJECT.
   b. SUCCESSFUL COMPLETION OF THESE TESTS WILL BE DEMONSTRATED IF THE #4 BAUGRIDS AND #5 BAUGRIDS ALL PASS THE ASSOCIATED ASTM AND BAUGRID QUALITY CONTROL MANUAL CRITERIA.

PROJECT: 301 MISSION	JOB #: 4069	SCALE: N.T.S.	
TITLE: BAUGRID COLUMN TEST SETUP PROCUDURES	DATE: 11/03/2006	DWG. NO.	
DESIMONE 160 SANSOME STREET 16TH FLOOR SAN FRANCISCO, CA 94104-3722 T. 415.398.5740 F. 415.398.9834	DRAWN: NJR	SK-00	
	CHECKED: DDR, RMP		

MIDDLEBROOK + LOUIE
Structural Engineers

One Bush Street
San Francisco, CA 94105
415.477.9000
Fax 415.477.9099

CLIENT :
PROJECT : 301 Mission
ENGR : CL

JOB #: 6977
DATE:

Story Information:

Level	F.F. EL	F.F. EL	H (ft)	Area (ft^2)	Perimeter (ft)
62	645 ' - 0 "	645.00	17.25	13647	482
61	627 ' - 9 "	627.75	11.00	13647	482
60	616 ' - 9 "	616.75	11.75	13647	482
59	605 ' - 0 "	605.00	12.50	13647	482
58	592 ' - 6 "	592.50	12.50	13647	482
57	580 ' - 0 "	580.00	10.75	13647	482
56	569 ' - 3 "	569.25	10.75	13647	482
55	558 ' - 6 "	558.50	10.75	13647	482
54	547 ' - 9 "	547.75	10.75	13647	482
53	537 ' - 0 "	537.00	10.75	13647	482
52	526 ' - 3 "	526.25	12.25	13647	482
51	514 ' - 0 "	514.00	10.50	13647	482
50	503 ' - 6 "	503.50	10.50	13647	482
49	493 ' - 0 "	493.00	10.50	13647	482
48	482 ' - 6 "	482.50	10.50	13647	482
47	472 ' - 0 "	472.00	10.50	13647	482
46	461 ' - 6 "	461.50	10.50	13647	482
45	451 ' - 0 "	451.00	10.50	13647	482
44	440 ' - 6 "	440.50	10.50	13647	482
43	430 ' - 0 "	430.00	12.00	13647	482
42	418 ' - 0 "	418.00	10.50	13647	482
41	407 ' - 6 "	407.50	10.50	13647	482
40	397 ' - 0 "	397.00	10.50	13647	482
39	386 ' - 6 "	386.50	10.50	13647	482
38	376 ' - 0 "	376.00	10.50	13647	482
37	365 ' - 6 "	365.50	10.50	13647	482
36	355 ' - 0 "	355.00	10.50	13647	482
35	344 ' - 6 "	344.50	10.50	13647	482
34	334 ' - 0 "	334.00	10.50	13647	482
33	323 ' - 6 "	323.50	10.50	13647	482
32	313 ' - 0 "	313.00	10.50	13647	482
31	302 ' - 6 "	302.50	10.50	13647	482
30	292 ' - 0 "	292.00	10.50	13647	482
29	281 ' - 6 "	281.50	10.50	13647	482
28	271 ' - 0 "	271.00	10.50	13647	482
27	260 ' - 6 "	260.50	10.50	13647	482
26	250 ' - 0 "	250.00	10.50	13647	482
25	239 ' - 6 "	239.50	11.25	13647	482
24	228 ' - 3 "	228.25	9.50	13647	482

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ENGR : CL

JOB #: 6977
DATE:

Story Information:

Level	F.F. EL	F.F. EL	H (ft)	Area (ft^2)	Perimeter (ft)
23	218 ' - 9 "	218.75	9.50	13647	482
22	209 ' - 3 "	209.25	9.50	13647	482
21	199 ' - 9 "	199.75	9.50	13647	482
20	190 ' - 3 "	190.25	9.50	13647	482
19	180 ' - 9 "	180.75	9.50	13647	482
18	171 ' - 3 "	171.25	9.50	13647	482
17	161 ' - 9 "	161.75	9.50	13647	482
16	152 ' - 3 "	152.25	9.50	13647	482
15	142 ' - 9 "	142.75	9.50	13647	482
14	133 ' - 3 "	133.25	9.50	13647	482
13	123 ' - 9 "	123.75	9.50	13647	482
12	114 ' - 3 "	114.25	9.50	13647	482
11	104 ' - 9 "	104.75	9.50	13647	482
10	95 ' - 3 "	95.25	9.50	13647	482
9	85 ' - 9 "	85.75	9.50	13647	482
8	76 ' - 3 "	76.25	9.50	13647	482
7	66 ' - 9 "	66.75	9.50	13647	482
6	57 ' - 3 "	57.25	9.50	13647	482
5	47 ' - 9 "	47.75	9.50	13647	482
4	38 ' - 3 "	38.25	9.50	13647	482
3	28 ' - 9 "	28.75	12.17	13647	482
2	16 ' - 7 "	16.58	16.58	13647	482
1	0 ' - 0 "	0.00	15.75	13647	482
B1	-15 ' - 9 "	-15.75	0.00	13647	482

301 MISSION STREET, SAN FRANCISCO

PEER REVIEW

1. The L-shaped columns will be in torsion for frame action along axis 2 and axis 11. Consider torsion for design.

2. The L-shaped columns support outriggers of the prime lateral system. It should be shown that participation or failure of the more rigid element will not impair the vertical and lateral resisting ability of the gravity load and lateral moment resisting system. (See section 1633.2.4.1)

3. Low-rise mat show 69 psf reinforce for total area. It looks excessive. (It is #11 @ 4.3" E.W. T & B for 8' mat.)

4. At one side of shear wall at line D.5, a ramp that has an opening in the diaphragm. Clarify how the shear will travel to both basement walls at A.1 and K.

5. Verify by calculations that ground floor diaphragm behave as a rigid diaphragm transferring forces to the perimeter basement walls and to the core. Possible reverse shear might happen in the basement and in the core walls below.

6. The mid-rise and the high-rise towers are joined at the ground floor and B1 levels. The high-rise tower has mat with piles more rigid than mid-rise 5-story basement. Verify deformation compatibility and amount of base shear that will be resisted by piles.

7. There are shear walls surrounded by openings at both sides. Verify collectors requirements to deliver shear to these walls.

8. Settlement compatibility between high-rise on piles and mid-rise on mat footing total settlement for both could be different, but there is ground floor slab without a joint that could get cracked.

9. At 9' deep mat on piles, how is the modulus of subgrade reaction applied to pile footings.

10. Is 9' deep pile cap required in full building area? There are areas where depth could be greatly reduced. (K-H for example)

11. The differential shortening in columns and walls will produce additional significant moments on outrigger beams. Is there a mechanism to relieve them from these forces?

12. Optimize P/T slab thickness at all locations.

13. Main tower moment frames are all single bay frames that are not effective. Some of the bays can't be considered as a frame because clear span to depth is less than 4 – for example B0403.

14. Please provide design criteria for outrigger beams. Are they designed as a "deep beam" with a consideration for non-linear strain distribution. What forces will be considered for designing columns that get forces from outriggers?

15. a. Columns transfer at 2nd floor line H with sloped column at 1st floor will create additional lateral component on both levels that will require beams and slab between frames to be designed for additional axial force.

    b. Very deep column section – 26' deep will act as a shear wall and attract a lot of additional seismic load to this frame. Careful considerations should be taken to design this transfer column for all applied loads.

    c. Sloped column should be included in the building model.

16. There are 4 or 5 different round column sizes on one level – ground level mid-rise. Please verify if unification of sizes is possible to reduce cost.

17. a. Design criteria on drawings describes dual system, shear wall with SMRF, and R = 8.5. Mid-rise building has no SMRF. This building also has vertical structural irregularities such as discontinuous shear wall that should be considered.

    b. Code equations 30-6 and 30-7 need not be considered for drift check.

    c. Drift check should include accidental torsion.

18. Please specify wind load design criteria for strength and for drift. Compare wind load and seismic.

19. All outriggers are unusual in shape and can't be clearly designed as a deep beams or discontinuous shear walls. Based on their importance for overall stability of the building non-linear time history analysis should be performed to investigate performance of these important elements and bring factor of safety for them to a desirable level.

301 MISSION STREET, SAN FRANCISCO

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From: HARDIP PANNU
To: Jack P. Moehle
Date: 1/10/2007 5:07 PM
Subject: Re: 301 mission final letter on column test criteria ...
Attachments: ML8821.pdf

I have attached the revised letter.
Hardip

>>> "Jack P. Moehle" <moehle@berkeley.edu> 1/10/07 4:27 PM >>>
Hardip

I trust you have been following the exchange regarding testing. We can discuss if you like on the phone.

DBI wants us to get a letter regarding the acceptance of the column tests. The letter you have drafted is fine, and I am willing to put my signature to it, but it has "draft" on the top so it is not appropriate to sign in this format. So you will need to redraft this removing the word "draft."

In discussions with Derrick, he indicates a willingness/interest to run the tests to failure, provided he has an assurance that observations beyond 0.71% strain will not be used as a basis for denying acceptance of the Baugrids in columns and walls. One option would be to insert a sentence someone where in the letter as follows:
"The undersigned encourage that the project sponsors permit testing beyond the agreed-upon longitudinal strain limit of 0.71%, with the understanding that behavior past this limit will not be considered in deciding the acceptance of Baugrids as confinement reinforcement in columns and walls." Running the tests to failure will enable us to see what stresses the Baugrids can develop in situ, which is valuable for judging the beams.

Jack

~~~~~~~~~~~~~~~~~~~~~~~~
Jack P. Moehle
email: moehle@berkeley.edu
cell: 510-407-6124
office: 510-642-3437
~~~~~~~~~~~~~~~~~~~~~~~~

MIDDLEBROOK + LOUIE
Structural Engineers

One Bush Street
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San Francisco, CA 94104
415.477.9000
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email mlbox@MplusL.com

Jason J.C. Louie, S.E.
Ronald F. Middlebrook, S.E.
Hardip S. Pannu, S.E.
Robert D. McCartney, S.E.
Jeppe Larsen, EUR ING, S.E.
Navin R. Amin, S.E.

December 16, 2005

Chris Vaughn-Hulbert
Millennium Partners
735 Market Street, 3rd floor
San Francisco, CA 94103

RE: Review of Shoring Impact on CALTRANS Building
301 Mission Street, San Francisco
M + L Job #6977

CHRIS, we have completed our review regarding the impact of the shoring and about 10 to 12 feet of excavation on 151 Fremont Street CALTRANS building. The extent of review was limited to the effect of shoring and excavation work limited to the clouded area shown on the attached sketch. Our review was based on the following drawings that were made available by Millennium Partners. The drawings were labeled as "SAN FRANCISCO OAKLAND BAY BRIDGE RECONSTRUCTION DIVISION OFFICES".

Sheet No.	Date
2	May 19, 1960
3	May 22, 1958
5	May 23, 1958
6	May 19, 1960
12	May 26, 1958
14	May 28, 1958
15	May 28, 1958
16	May 28, 1958

Based on our review of above drawings, we believe that there will be no structural effect on the building from shoring and excavation work. There may be some settlement due to vibrations that are caused when the shoring is driven into the ground. We suggest that the contractor should monitor the area in the nearby vicinity for potential settlements.

CHRIS, let us know if you have any questions.

MIDDLEBROOK + LOUIE

Hardip S. Pannu, S.E.
Principal

HSP/rhc

HPANNU@MPLUSL.COM
WWW.MPLUSL.COM

(H:\ADMIN\Jobs\6977\Corres\121605 Hulbe.doc)

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

CERTIFICATION OF STRUCTURAL EXPERIENCE

TR-0133 (NEW 02/2004)

I, Hardip S. Pannu, a licensed Structural (STRUCTURAL / CIVIL) Engineer in the State of California, attest to, that I am / was responsible for the plan set design and preparation of calculations for the project described as City heights (PROJECT NAME), located at Pellier Park (STREET ADDRESS or DISTRICT / COUNTY / ROUTE / POST MILE), San Jose (CITY / TOWN), California.

I certify and attest to, that I have five years or more of experience in Structural (SUB-STRUCTURAL / STRUCTURAL) plan set design and preparation of calculations, to include Structural Review Approval (STRUCTURAL REVIEW APPROVAL, SUB-STRUCTURAL REVIEW APPROVAL, TUNNELS, TUNNEL SUPPORT SYSTEMS, OR STRUCTURAL FALSEWORK).

List prior projects of responsibility:

PROJECT NAME	CONTACT NUMBER
Highland Hospital, Oakland, California	(510)452-2118
Franchise Tax Board, Sacramento	(925) 558-1900
621 Capitol Mall, Sacramento	(415)356-8625

PREPARING REGISTERED ENGINEER'S STAMP

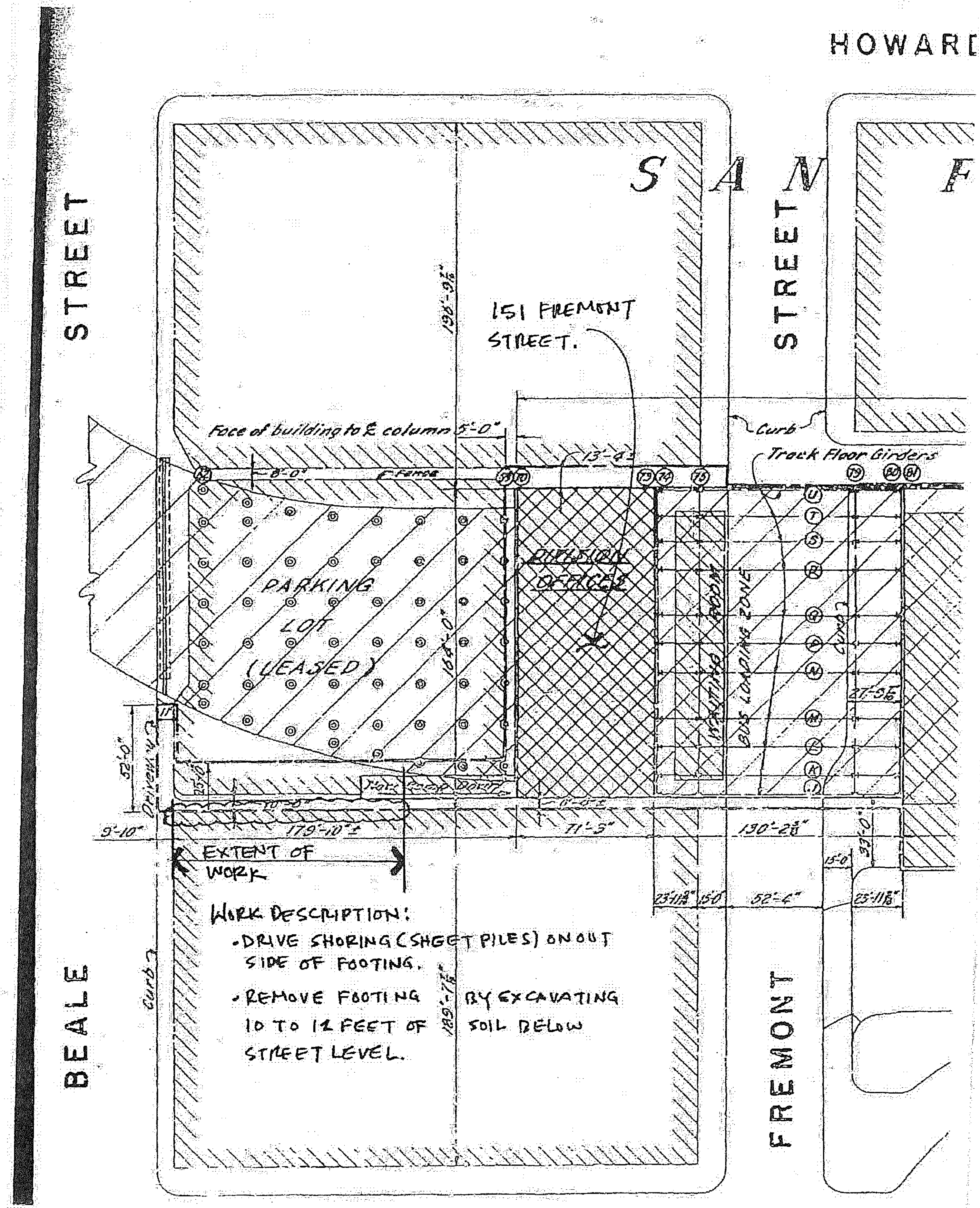
REGISTERED PROFESSIONAL ENGINEER
HARDIP S. PANNU
NO. 3168
EXP. JUNE 30, 2006
STRUCTURAL
STATE OF CALIFORNIA

I attest to the technical information contained herein and have judged the qualifications of all technical specialists providing engineering data upon which recommendations, conclusions, and decisions were based.

SIGNATURE Hardip S. Pannu

S-3168 REGISTERED ENGINEER

DATE 12/16/05


HOWARD
S A N F
STREET
STREET
151 FREMONT STREET.
Face of building to ℄ column 5'-0"
13'-4"
Curb
Truck Floor Girders
8'-0"
Fence
PARKING LOT (LEASED)
DIVISION OFFICES
WAITING ROOM
BUS LOADING ZONE
Curb
198'-9 7/8"
164'-0"
52'-0"
Driveway
25'-0"
Main Power Board
9'-10"
179'-10" ±
71'-5"
190'-2 3/8"
33'-0"
15'-0"
23'-11 5/8"
15'-0"
52'-4"
23'-11 5/8"
EXTENT OF WORK
WORK DESCRIPTION:
· DRIVE SHORING (SHEET PILES) ON OUT SIDE OF FOOTING.
· REMOVE FOOTING BY EXCAVATING 10 TO 12 FEET OF SOIL BELOW STREET LEVEL.
189'-7 7/8"
Curb
BEALE
FREMONT

301 MISSION STREET, SAN FRANCISCO

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DEPARTMENT OF BUILDING INSPECTION

City & County of San Francisco
1660 Mission Street, 2nd Floor, San Francisco, California 94103-2414

December 6, 2006

Mr. Hardip Pannu
Middlebrook + Louie
One Bush Street, Suite 1300
San Francisco, CA 94104

sent via email: hpannu@mplusl.com

Subject: 301 Mission Street (Permit Application Nos. 2002/1023/9696 & 2006/0926/3344)
BauGrid® Reinforcement

Dear Jack,

Thank you for your continued work in peer reviewing the use of BauGrid reinforcement at the 301 Mission Street project. At this time, our original charge to the Structural Peer Review Panel (SPRP) regarding the review of BauGrid reinforcement has changed. Previously, the Engineer of Record (EOR), DeSimone Consulting Engineers, requested a review of the BauGrid reinforcement as a one-to-one substitution for conventional stirrups and tie reinforcement in columns, beams, and shear walls. It is apparent from the studies to date that the adequacy of the BauGrid reinforcement as a one-to-one substitution will be difficult to prove and beyond the planned scope of testing. Consequently, the Department of Building Inspection (DBI) is requesting the SPRP to continue their review with a modified charge.

DBI respectfully requests that the SPRP review the use of BauGrid reinforcement in compression dominated members (columns and shear walls) based on a performance criteria developed by the EOR, reviewed and agreed upon by the SPRP, and approved by DBI. The performance criteria shall be based on expected building performance for a Maximum Considered Earthquake including orthogonal affects and an appropriate safety factor.

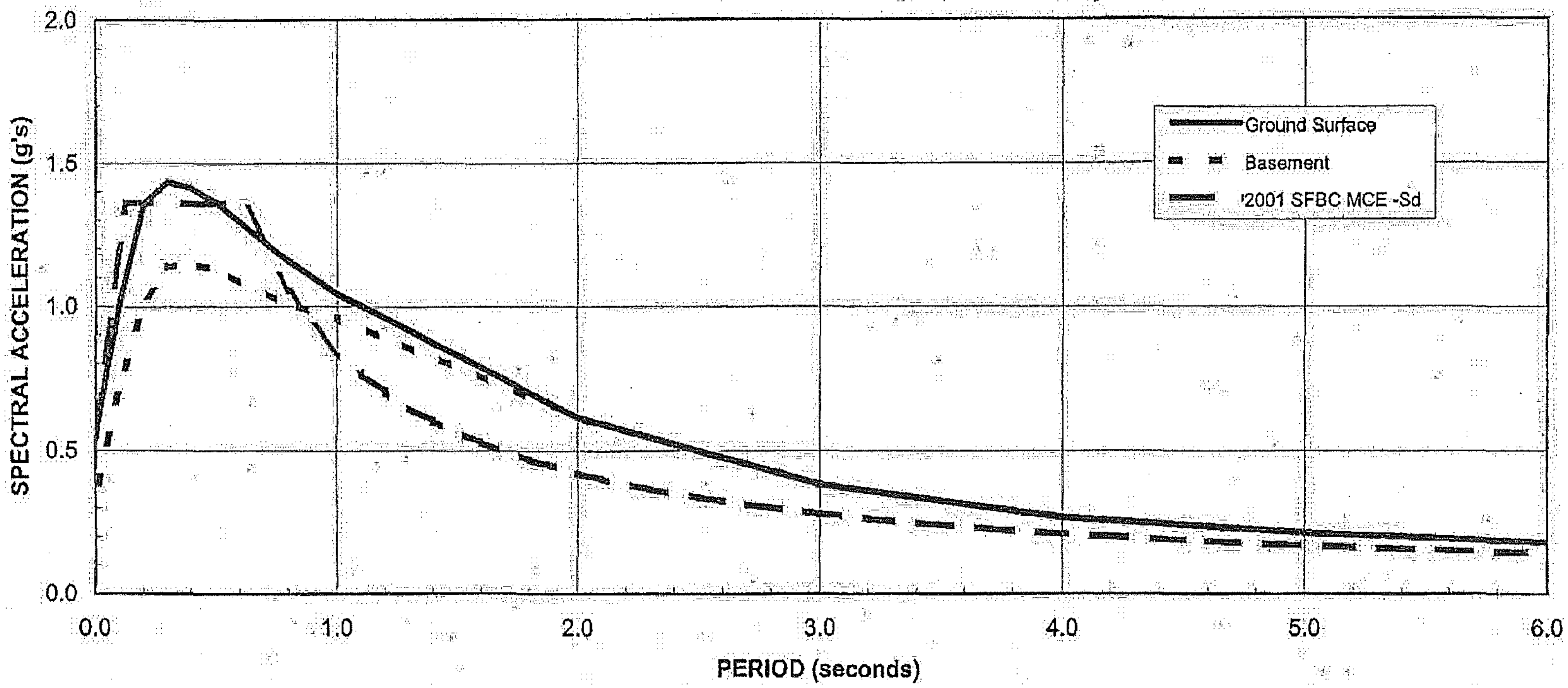
Once again, thank you for your efforts. If you have any questions or comments, please do not hesitate to call.

Sincerely,

Hanson Tom

Hanson Tom, S.E.
Principal Engineer

Cc: Amy Lee, Acting-Director
Wing Lau, Deputy Director
Carla Johnson, Acting-Deputy Director
Yan Yan Chew, Gary Ho, Howard Zee, C.S. Hwang, Raymond Lui, DBI
Dan Lowrey, Tam Chiu, DBI
Jonathan Rothstein, Senior Project Manager, Millennium Partners
Steve Hood, Project Manager, Millennium Partners
Derrick Roorda, DeSimone Consulting Engineers



Damping Ratio = 5%

Note: MCE has a 10% probability of exceedance in 100 years.

301 MISSION STREET San Francisco, California		
RECOMMENDED SPECTRA - MCE		
Date 03/07/05	Project No. 3157.02	Figure D-5
Treadwell&Rollo		

301 Mission Street
10 percent probability of Exceedance in 100 years (MCE)
Spectral Acceleration (g's)
Damping Ratio = 5 percent

Period (seconds)	Ground Surface	Basement
0.01	0.600	0.385
0.1	1.015	0.711
0.2	1.360	1.019
0.3	1.435	1.136
0.4	1.413	1.144
0.5	1.364	1.129
0.75	1.187	1.019
1.0	1.044	0.958
2.0	0.616	0.616
3.0	0.384	0.384
4.0	0.268	0.268
5.0	0.214	0.214
6.0	0.179	0.179

PSHA based on Working Group 2002 Seismic Hazard Model

Note: We recommend the basement spectrum be used at the foundation level for design.

PRELIMINARY REPORT
WIND-INDUCED STRUCTURAL RESPONSES
301 MISSION STREET
SAN FRANCISCO, CALIFORNIA

Project #04-1633
August 20, 2004

Prepared By:
Rowan Williams Davies & Irwin Inc.
650 Woodlawn Road West, Guelph, Ontario, Canada N1K 1B8

Matthew T. L. Browne, P.Eng., Senior Engineer
Jonathan B. Lankin, P.Eng., Project Manager

Wind tunnel tests to determine the wind-induced structural responses for the proposed 301 Mission Street tower in San Francisco, California, have been completed. This report provides the preliminary results. The objectives of this study were (i) to provide data on the wind-induced forces and moments for the structural design of the tower, and (ii) to determine the wind-induced accelerations at the top occupied floor of the tower.

The model study was carried out using the high-frequency force-balance technique. The tests were conducted on a 1:400 scale model of the building in the presence of all surroundings within a full-scale radius of 1600 ft in RWDI's boundary-layer wind tunnel. Beyond the modelled area, the upwind terrain was simulated appropriately for each wind direction. The tests were conducted for the following three configurations of surroundings:

Configuration 1:	301 Mission Street development in place with all existing surrounding buildings.
Configuration 2:	301 Mission Street development in place with all existing and future (Transbay redevelopment) surrounding buildings, with the Transbay Tower at 550 ft.
Configuration 3:	301 Mission Street development in place with all existing and future (Transbay redevelopment) surrounding buildings, with the Transbay Tower at 800 ft.

Details of testing and analysis methods will be provided in the final report. The figures and tables in this preliminary report are numbered as they will appear in the final report.

The results have been analysed including the effects of the directionality in the San Francisco wind climate. The statistical wind climate model used to determine the predicted peaks was based on local surface wind measurements taken at San Francisco International Airport. This statistical model of the local wind climate accounts for the variability of extreme wind speed with wind direction. The wind climate model was scaled so that the magnitude of the wind velocity for a 50-year return period corresponds to a fastest-mile wind speed of 70 mph at 33 ft above ground in open terrain. This speed corresponds to the value identified for the San Francisco area in the 1998 California Building Code.

Wind-Induced Forces and Moments

The overall wind-induced overturning moments, shear forces, and torsional moments acting on the 301 Mission Street tower at the "BASE" level (at grade) have been predicted for a return period of 50 years and are presented in Table 2 for the three test configurations. Note that the wind loads provided herein are for the overall design of the tower. Based on correspondence with the structural engineer, the loading provided considers only the wind loads acting on the footprint of the tower extending down to grade through the atrium (low-rise structure attached to the tower on the east side). Therefore, the loads acting on the rest of the development, outside the tower footprint, are not included in the results presented in this report. The coordinate system and reference axis used to define the forces and moments is illustrated in Figure 2. The loads were determined using the fundamental building vibration frequencies, listed in Table 2, and the corresponding mode shapes, as provided by DeSimone Consulting Engineers, PLLC on July 22, 2004. The wind-induced loads were determined for a damping ratio of 2% of critical, which was specified by the structural engineer.

Note that the wind loads provided in this report include the effects of the directionality in the local wind climate. These loads do not contain safety or load factors and are to be applied to the building's structural system in the same manner as would wind loads calculated by code analytical methods.

Effective static wind loads that correspond to the predicted overall moments and shears are provided on a floor-by-floor basis in Table 3. These loads represent the worst-case results from the three test configurations. The load distributions were determined by considering the effects of both the mean and dynamic wind loads for representative wind directions producing high loads in each of the x, y, and z (torsional) directions.

In using the predicted wind loads from Table 3, it is important to consider how the x, y, and z (torsional) components of the wind load should be combined when applying them to the structure. A set of recommended load combinations are provided in Table 4. There are basically 24 combinations in the table which represent each of eight possible sign sets (+++, ++-, +-+ etc.) with each of Fx, Fy, and Mz reaching their individual maximum percentages for that sign set. As an example of applying the combination factors, let us consider Load Case 1 of Table 4. This load case requires the application of +100% of the Fx floor-by-floor loads, +60% of the Fy floor-by-floor loads, and +45% of the Mz floor-by-floor loads from Table 3. **It is recommended that all load cases be considered for overall structural design.**

Deflections

Deflections have not been specifically evaluated in this study. Normally the structural engineer evaluates floor-to-floor and overall deflections by applying the wind load distributions derived from the wind tunnel tests to a structural computer model of the building. These deflections may then be reviewed by the structural engineer to assess the potential for problems in wall systems and partitions due to excessive shearing.

Discussion of Acceleration Criteria

The accelerations discussed herein are peak values expected to occur a few times each hour during a wind storm, not root-mean-square values which are sometimes also used in discussions of building motion issues. It should be noted that acceleration levels that are acceptable to people are dependent on many physiological factors and consequently are subjective to some degree. Some background to the suggested criteria for acceptability of building accelerations is discussed below.

Research indicates that people first begin to perceive accelerations when they reach about 5 milli-g (where milli-g is 1/1000 of the acceleration of gravity). This benchmark is thus a value that one would not want occurring too frequently in a building. However, it is not realistic to require that no accelerations ever occur above this level and so criteria have been developed that relate acceleration level to various frequencies of occurrence.

The first building code document to give guidance on building motions was the National Building Code of Canada (NBCC). It suggested that 10-year return period accelerations in the range of 1.0% to 3.0% of gravity (10 to 30 milli-g) were acceptable, with the upper end of the range being appropriate for office buildings and the lower end for residential buildings. Many towers constructed during the 1980's and 1990's were wind tunnel tested. For these towers, acceleration criteria were developed based on a consensus of the design teams, the developers and the wind engineering community. The commonly used acceleration criteria were to use a 10-year limit of between 20 and 25 milli-g for office buildings and approximately 15 to 18 milli-g for residential buildings. For the 301 Mission Street tower, in view of its residential usage, a 10-year criterion of about 15 to 18 milli-g appears appropriate according to these traditional criteria.

Research conducted subsequent to the introduction of motion criteria in the NBCC indicates that peoples' sensitivity to motion becomes less as the natural frequency of the building becomes lower (at least in the range of interest for tall buildings, 0.1 Hz to 1.0 Hz). This dependence is not reflected in the NBCC which provides a single set of criteria based on results for frequencies primarily in the range 0.15 to 0.3 Hz. The criteria suggested by the International Organization for Standardization (ISO) do include a frequency dependence and set limits where approximately 2% of those occupying the upper third of a building may object to its motions. Also the ISO criteria generally use a shorter return period than 10 years (i.e., 1 and 5 years). RWDI estimates the corresponding 10-year criterion to be about 1.2 times the 5-year criterion. For residential buildings it may be desirable to be somewhat lower than the ISO criteria.

Acceleration Predictions and Acceptability

The predicted wind-induced accelerations at the top occupied floor of the 301 Mission Street tower, taken as the "60" level (592.50 ft above the "BASE" level), are summarized in Figure 6. These accelerations represent the worst-case results from the three test configurations. Figure 6 also presents various acceleration criteria as described above. The peak total accelerations were determined as a function of return period for the provided building masses, frequencies, and an overall damping ratio of 2% of critical. The torsional acceleration component was calculated at a representative distance (47.9 ft), equal to the mass radius of gyration of the upper floors, from the central axis of the tower (given in Figure 2).

From Figure 6, it can be seen that the predicted peak accelerations are within the ISO based criteria for the 1, 5, and 10-year return periods. The 10-year accelerations are also within the commonly used criteria of 15 to 18 milli-g for a residential tower. Therefore, it is our opinion that the predicted accelerations are acceptable for human comfort in a residential building. It should be noted that building accelerations are a serviceability issue and typically not a safety issue provided the associated deflections are accounted for in the structural design and the cladding/glazing system design.

Should you have any comments or questions, or wish us to re-analyse the results for different structural properties (i.e., frequencies, damping or floor masses), please contact us.

TABLES

Table 2: Summary of Predicted 50-Year Return Period Peak Wind-Induced Overall Structural Loads on Tower at the Base Level

Configuration	Moments			Shears	
	My (lb-ft)	Mx (lb-ft)	Mz (lb-ft)	Fx (lb)	Fy (lb)
1	7.31e+08	5.00e+08	3.84e+07	2.00e+06	1.30e+06
2	7.64e+08	5.14e+08	5.25e+07	1.96e+06	1.32e+06
3	7.67e+08	5.22e+08	5.49e+07	1.95e+06	1.34e+06

Notes: (1) The above loads are the cumulative summation of the wind-induced loads at the "BASE" level (at grade) centered about the reference axis shown in Figure 2, exclusive of combination factors.

(2) A total damping ratio of 2.0% of critical was used for structural load calculations.

(3) The above loads are based on the structural properties provided by DeSimone Consulting Engineers, PLLC on July 22, 2004. The natural building frequencies were as follows:

Mode 1: 0.226 Hz (primarily X)
Mode 2: 0.230 Hz (primarily Y)
Mode 3: 0.236 Hz (primarily torsion).

Table 3: 50-Year Return Period Effective Static Floor-by-Floor Wind Loads Acting on Tower - Worst-Case Results

Floor Level	Height above Base Level (ft)	Fx (lb)	Fy (lb)	Mz (lb-ft)
BASE	0.00	9700	7800	75000
2	15.00	18500	14500	183000
3	28.00	15400	11800	187000
4	37.75	15600	10100	205000
5	47.50	15600	10100	226000
6	57.25	15600	10100	247000
7	67.00	15600	10100	266000
8	76.75	15500	10100	283000
9	86.50	15500	10100	300000
10	96.25	15500	10100	314000
11	106.00	15400	10100	327000
12	115.75	15400	10100	340000
13	125.50	15900	10100	359000
14	135.25	17800	10900	401000
15	146.63	18700	11200	431000
16	156.38	18100	11000	439000
17	166.13	18500	11400	452000
18	175.88	19000	11900	471000
19	185.63	19700	12500	497000
20	195.38	20400	13000	521000
21	205.13	21200	13600	545000
22	214.88	21900	14200	572000
23	224.63	22800	14800	599000
24	234.38	23600	15400	627000
25	244.13	24400	16000	654000
26	253.88	25200	16600	682000
27	263.63	26100	17200	710000
28	273.38	26900	17800	738000
29	283.13	27800	18400	766000
30	292.88	28600	19000	794000
31	302.63	29500	19600	823000
32	312.38	30400	20300	852000
33	322.13	33400	22300	933000
34	333.50	34200	23700	1004000
35	343.25	33200	23000	997000
36	353.00	33300	23100	993000
37	362.75	33800	23400	1004000
38	372.50	34700	24000	1033000
39	382.25	35600	24600	1063000
40	392.00	36500	25200	1094000
41	401.75	37200	25700	1110000

Table 3: 50-Year Return Period Effective Static Floor-by-Floor Wind Loads Acting on Tower - Worst-Case Results

Floor Level	Height above Base Level (ft)	Fx (lb)	Fy (lb)	Mz (lb-ft)
42	411.50	38100	26300	1140000
43	421.25	39100	26900	1170000
44	431.00	40000	27400	1200000
45	440.75	40900	28000	1231000
46	450.50	41900	28600	1261000
47	460.25	42800	29100	1292000
48	470.00	43700	29700	1323000
49	479.75	44600	30200	1354000
50	489.50	45500	30800	1385000
51	499.25	46400	31300	1416000
52	509.00	48100	32300	1476000
53	518.75	50400	33600	1566000
54	528.50	53200	35600	1637000
55	539.88	54300	36400	1646000
56	550.29	53400	35600	1676000
57	560.71	54300	36200	1712000
58	571.13	55300	36700	1749000
59	581.54	56500	37600	1788000
60	592.50	60300	40400	1850000
ROOF	605.00	84800	57100	2363000
UPPER ROOF	627.00	50500	36900	594000
Total		2.00e+06	1.34e+06	5.49e+07

Notes: (1) The loads given in this table should be used with the load combination factors given in Table 4.

(2) The loads given in this table are centered about the reference axis shown in Figure 2.

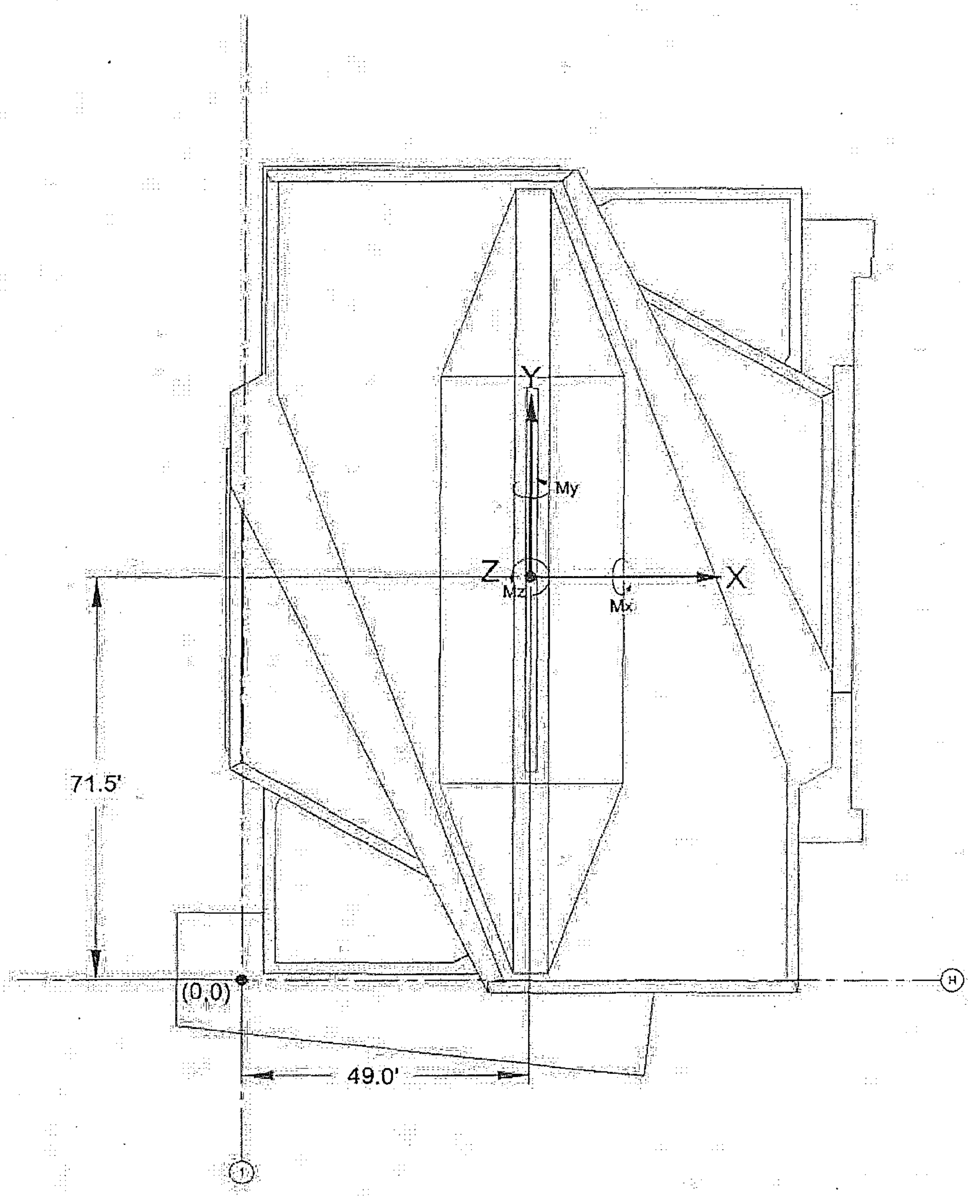
(3) The loading provided considers only the wind loads acting on the footprint of the tower extending down to grade through the atrium.

Table 4: Recommended Load Combinations for Simultaneous Application of Effective Static Floor-by-Floor Loads from Table 3

Load Combination	Recommended Load Combination Factors of 50-Year Return Period Wind Loads		
	X Forces (F_x)	Y Forces (F_y)	Torsional Moment (M_z)
1	+100%	+60%	+45%
2	+100%	+60%	-30%
3	+100%	-30%	+45%
4	+100%	-30%	-30%
5	-90%	+35%	+30%
6	-90%	+35%	-30%
7	-90%	-40%	+30%
8	-90%	-40%	-30%
9	+55%	+100%	+45%
10	+55%	+100%	-30%
11	+30%	-85%	+30%
12	+30%	-85%	-30%
13	-40%	+100%	+45%
14	-40%	+100%	-30%
15	-50%	-85%	+30%
16	-50%	-85%	-30%
17	+55%	+60%	+100%
18	+55%	+60%	-90%
19	+55%	-30%	+100%
20	+55%	-30%	-90%
21	-30%	+60%	+100%
22	-30%	+60%	-90%
23	-30%	-30%	+100%
24	-30%	-30%	-90%

Note: (1) Load combination factors have been produced through consideration of the structure's response to various wind directions, modal coupling, correlation of wind gusts and the directionality of strong winds in the local wind climate.

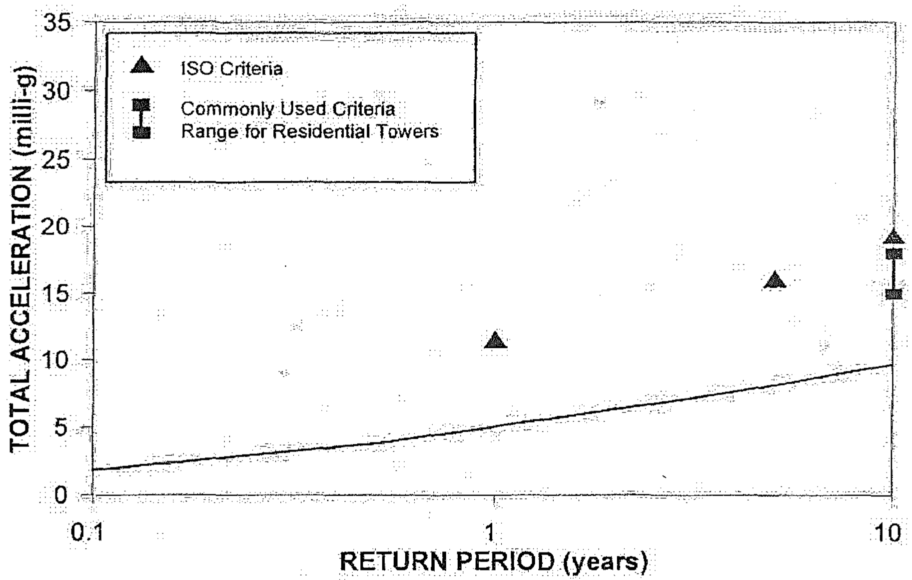
FIGURES



Note:
Point (0,0) indicates co-ordinate origin provided by the structural engineer.

0 15 30ft

Co-ordinate System for Structural Loading	True North	Drawn by: DJM	Figure: 2	RWDI
		Approx. Scale: 1"=30'		
301 Mission Street - San Francisco, California	Project #04-1633	Date Revised: Aug. 17, 2004		



Return Period (Years)	Peak Total Accelerations (milli-g)	ISO (3) Criteria (milli-g)
1	5.1	11.6
5	8.2	16.1
10	9.7	19.4 (4)

Notes:

(1) A damping ratio of 2% of critical was used.

(2) Accelerations are predicted at the "60" level (592.50 ft above the "BASE" level) at a radial distance of 47.9 ft from the central axis of the tower (given in Figure 2).

(3) ISO is the International Organization for Standardization, and provides acceleration criteria for buildings for the 1 and 5-year return periods.

(4) RWDI extrapolation of ISO criteria to the 10-year return period.

(5) The commonly used acceleration criteria range for a residential tower is 15 to 18 milli-g at the 10-year return period.

Predicted Peak Accelerations at Top Occupied Floor **Worst-Case Results**	Figure No. 6	RWDI
301 Mission Street - San Francisco, California — Project #04-1633	Date: Aug. 20, 2004	

DESIMONE

NEW YORK
MIAMI
SAN FRANCISCO
NEW HAVEN
LAS VEGAS

October 23, 2006

City and County of San Francisco
Department of Building Inspection
1660 Mission Street, 2nd Floor
San Francisco, CA 94103

DeSimone Project #4069B
301 Mission Street

Attn: Mr. Hanson Tom, S.E.
Principal Engineer

Re: Letter from H. Tom (City of SF) to D. Roorda (DeSimone), dated October 13, 2006,
Re. 301 Mission Street (Permit No. 2002/1023/9696) - BauGrid® Reinforcement

Dear Hanson,

DeSimone has worked closely and collaboratively over the last week with Professor Jack Moehle from the University of California at Berkeley, and Professor Murat Saatcioglu from the University of Ottawa, with a goal of developing a test procedure to demonstrate that BauGrid reinforcement is appropriate for use with 10,000 psi concrete in conjunction with the 301 Mission Street project.

As a result of these discussions, we have agreed to test three identical concrete column specimens as depicted in the attached sketch. As you can see, this specimen differs in a number of ways from that which you described verbally in your letter of October 13. However, we believe, and both Professors Moehle and Saatcioglu agree, that this test specimen accurately reflects the actual conditions being used at 301 Mission Street, and that successful testing of this specimen will demonstrate the adequacy of BauGrid for this project.

Please note the following:

- The 15"x15" cross section is the same as you suggested.
- We propose to use a 9-cell BauGrid arrangement consisting of #4 size bars. We realize that #4 bars are smaller than the #5 BauGrids being used at the 301 Mission Street project. However, this scaling of reinforcement is necessary to provide a test column configured with similar transverse reinforcing steel ratio and confinement efficiency as the cross tie configurations used in the actual project. We will work with Prof's Moehle and Saatcioglu to develop a testing procedure for the BauGrid material in order to demonstrate equivalent performance of #5 and #4 materials. We expect that this test will be similar to those performed previously by Prof. Saatcioglu in which he demonstrated that BauGrids had sufficient ductility to act effectively as confinement reinforcing.
- We propose to use 12-#7 vertical bars. This represents a vertical steel ratio of 3.2%, which is nearly two times greater than that in the boundary elements at 301 Mission Street. Note that a 12-bar pattern is necessary for use in conjunction with the 9-cell BauGrid configuration.

- We propose to use Gr. 60 vertical bars since the grade of the vertical steel should not significantly influence the outcome of the tests. Further, we know that these bars are readily available and we do not know if additional time would be required to procure Gr. 75 #7 bars.

We have not yet concluded our discussions with Professors' Moehle and Saatcioglu regarding the specifics of the testing procedure (loading application, instrumentation, etc.) and appropriate acceptance criteria. However, we are all in agreement with the test specimen as shown in the attached sketch. If you are in agreement, we would like to proceed with fabrication of the test specimens immediately, and will continue our discussions of these related and important issues while that effort takes place.

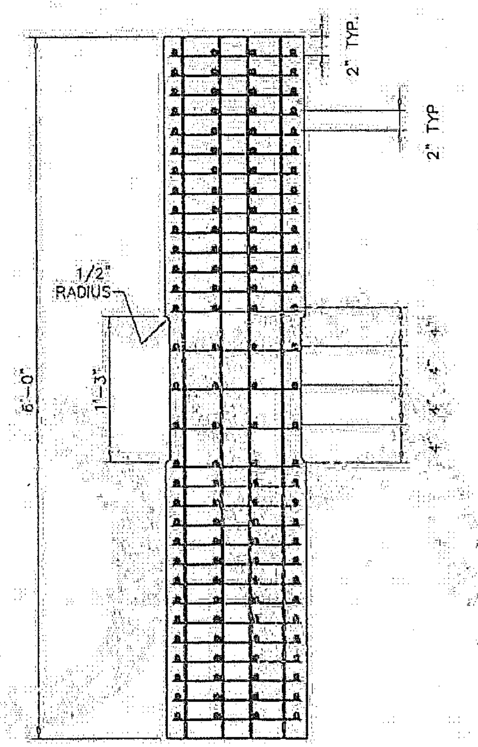
Please review the sketch and provide us with a statement indicating that testing of these specimens will be adequate to demonstrate to SFDBI that BauGrid is acceptable for use on the 301 Mission Street project. Upon receipt of this statement, we will forward this information to the project sponsor and contractors so that fabrication of the specimens can begin immediately. As you and I have discussed, the timeframe associated with fabrication of the test specimens will be controlled by the contractors. We will update you upon receipt of any and all information regarding this timeframe. Please accept our assurances that we want this test to be completed in the timeliest manner possible.

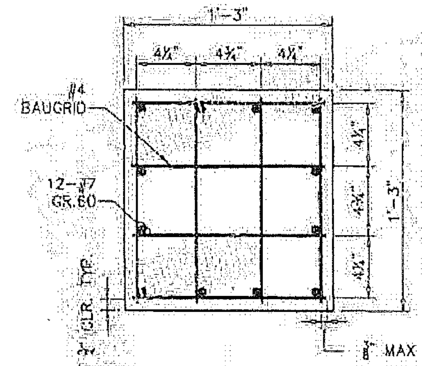
We trust that you will find the above explanation a satisfactory response to your concerns. If you have any additional concerns, please contact me directly at your earliest convenience.

DESIMONE CONSULTING ENGINEERS, PLLC

Derrick D. Roorda, SE
Senior Associate

cc: Mr. Gary Ho, City & County of SF
Jonathan Rothstein, Steven Hood (Millennium Partners)
Mr. Stephen DeSimone, Dr. Ronald Polivka, Mr. Nicolas Rodrigues (DeSimone)
Prof. Jack Moehle, U.C. Berkeley
Prof. Murat Saatcioglu, University of Ottawa
Hardip Pannu, Middlebrook + Louie



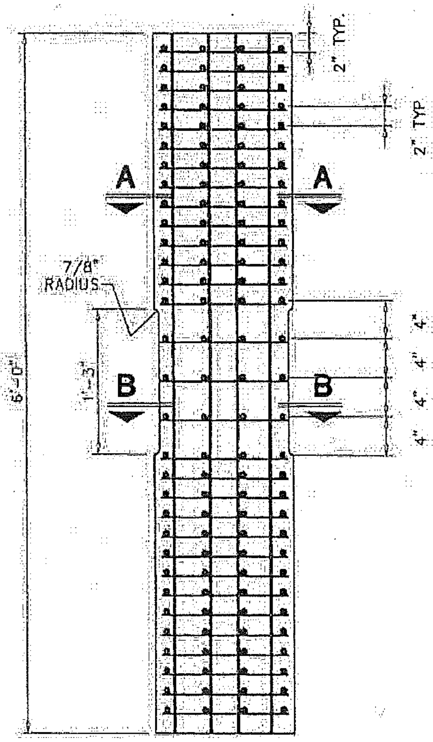


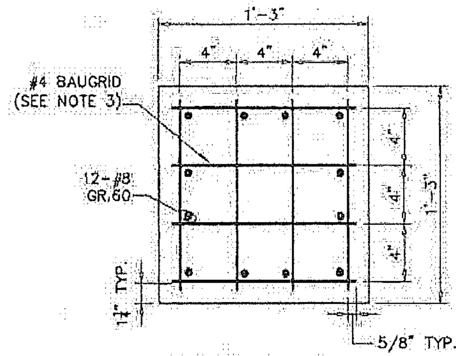
BAUGRID PLAN DETAIL

NOTES:

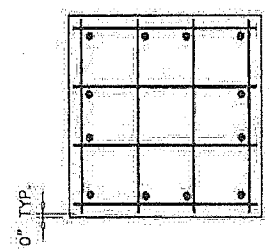
1. 31 BAUGRIDS PER SPECIMEN.

PROJECT: 301 MISSION	JOB #: 4069	SCALE: 1" = 1'-0"
TITLE: BAUGRID COLUMN TEST SETUP	DATE: 10/20/2006	DWG. NO. SK-01
DESIMONE 160 SANSOME STREET 16TH FLOOR SAN FRANCISCO, CA 94104 - 3722 T. 415.398.5740 F. 415.398.9834	DRAWN: NJR CHECKED: NJR	





SECTION A-A

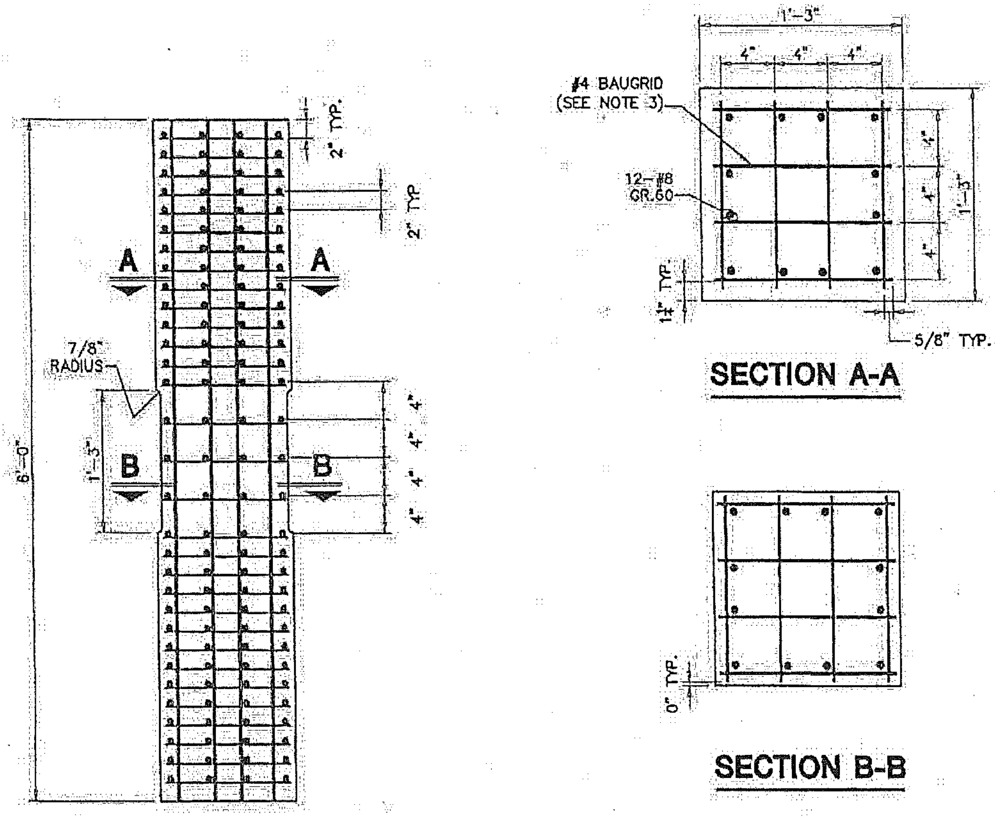


SECTION B-B

NOTES:

1. 31 BAUGRIDS PER SPECIMEN.
2. CONCRETE F'c = 10,000 PSI MIN.
3. THE MATERIAL SHALL BE THE SAME AS THE MATERIAL USED IN THE 301 MISSION STREET PROJECT.

PROJECT: 301 MISSION	JOB #: 4069	SCALE: 1" = 1'-0"
TITLE: BAUGRID COLUMN TEST SETUP	DATE: 10/30/2006	DWG. NO.
DESIMONE 160 SANSOME STREET 16TH FLOOR SAN FRANCISCO, CA 94104-3722 T. 415.398.5740 F. 415.398.9834	DRAWN: NJR	SK-01
	CHECKED: DDR, RMP	



SECTION A-A

SECTION B-B

NOTES:

1. 31 BAUGRIDS PER SPECIMEN.
2. CONCRETE F'c = 10,000 PSI MIN.
3. THE MATERIAL SHALL BE THE SAME AS THE MATERIAL USED IN THE 301 MISSION STREET PROJECT.

"CITY APPROVED"

NJR
DeSimone
10/30/06 6:20 pm

PROJECT: 301 MISSION	JOB #: 4069	SCALE: 1" = 1'-0"	
TITLE: BAUGRID COLUMN TEST SETUP	DATE: 10/30/2006	DWG. NO.	
DESIMONE 160 SANSOME STREET 16TH FLOOR SAN FRANCISCO, CA 94104-3722 T. 415.398.5740 F. 415.398.9834	DRAWN: NJR	SK-01	
	CHECKED: DDR, RMP		

DESIMONE
NEW YORK
MIAMI
SAN FRANCISCO
NEW HAVEN
LAS VEGAS

November 03, 2006

City and County of San Francisco
Department of Building Inspection
1660 Mission Street, 2nd Floor
San Francisco, CA 94103

DeSimone Project #4069B
301 Mission Street

Attn: Mr. Hanson Tom, S.E.
Principal Engineer

Re: 301 Mission Street (Permit No. 2002/1023/9696) - BauGrid® Reinforcement Test Procedure, drawings SK-00 to SK-02

Dear Hanson,

DeSimone has developed a testing procedure and acceptance criteria that will demonstrate BauGrid reinforcement is appropriate for use on the 301 Mission St. project. The details are provided on the attached drawings SK-00 and SK-02 dated 11/03/2006. Drawing SK-01, which contains details as to the proposed BauGrid test column, was previously approved by DBI on 10/30/06, and is contained herein for completeness.

We would appreciate your timely review and approval of the proposed testing procedure and acceptance criteria. Please contact me directly if you have any questions or comments.

DESIMONE CONSULTING ENGINEERS, PLLC

Derrick D. Roorda, SE
Senior Associate

Enclosures (3) – Sheets SK-01, SK-02, and SK-03

cc: Mr. Gary Ho, City & County of SF
Mr Ray Liu, City & County of SF
Jonathan Rothstein, Steven Hood (Millennium Partners)
Mr. Stephen DeSimone, Dr. Ronald Polivka, Mr. Nicolas Rodrigues (DeSimone)
Prof. Jack Moehle, U.C. Berkeley
Prof. Murat Saatcioglu, University of Ottawa
Hardip Pannu, Middlebrook + Louie

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PROCEDURE:

1. TEST SPECIMENS
   a. SHAKEDOWN TEST. SPECIMENS A1, A2, & A3. THREE (3) SPECIMENS CONTAINING BAUGRID WILL BE BUILT PER SK-01.
   b. CITY TEST. SPECIMENS B1, B2, & B3. THREE (3) SPECIMENS CONTAINING BAUGRID WILL BE BUILT PER SK-01.

2. TEST INSTRUMENTATION
   a. ALL SPECIMENS WILL BE INSTRUMENTED WITH TWO (2) AXIAL STRAIN MEASUREMENT DEVICES (LVDT'S) ON THE EXTERIOR AND ON OPPOSITE SIDES OF THE SPECIMEN ACROSS THE TESTING REGION.
   b. ALL SPECIMENS WILL BE INSTRUMENTED WITH TWO (2) STRAIN GAGES ON THE LONGITUDINAL REINFORCEMENT. THESE GAGES WILL BE PLACED ON OPPOSITE SIDES OF THE SPECIMEN, NEAR THE LVDT'S, WITHIN THE TESTING REGION.
   c. ALL SPECIMENS WILL BE INSTRUMENTED WITH FOUR (4) STRAIN GAGES ON THE TRANSVERSE REINFORCEMENT. STRAIN GAGES ON THE TRANSVERSE BAUGRID REINFORCEMENT WILL BE PLACED AS CLOSE AS POSSIBLE TO THE WELDS.

3. PURPOSE OF EACH TEST
   a. SPECIMENS A1, A2, & A3 WILL BE TESTED WHEN THE CONCRETE STRENGTH HAS REACHED 8,000 PSI. THE PURPOSE OF THESE TESTS WILL BE TO MAKE SURE THE TESTING PROCEDURE IS UNDERSTOOD PRIOR TO TESTING THE CITY TEST SPECIMENS.
   b. SPECIMENS B1, B2, & B3 WILL BE TESTED WHEN THE CONCRETE STRENGTH HAS REACHED 10,000 PSI. THE OUTCOME OF THESE TESTS WILL DETERMINE IF BAUGRID IS ACCEPTABLE FOR USE ON THE 301 MISSION STREET PROJECT.

4. CONCRETE STRENGTH TESTS
   a. FORTY (40) CONCRETE CYLINDERS SHALL BE TAKEN FROM THE SAME CONCRETE USED FOR THE TEST SPECIMENS.
   b. TWO (2) CYLINDERS SHALL BE BROKEN ON THE 5TH DAY AFTER CONCRETE PLACMENT AND ON EACH DAY THEREAFTER UNTIL THE CONCRETE REACHES 10,000 PSI, WHICH IS EXPECTED AT APPROXIMATELY FOURTEEN (14) DAYS AFTER PLACEMENT.
   c. TWO (2) ADDITIONAL CYLINDERS SHALL BE BROKEN AT 28, 56, AND 90 DAYS AFTER CONCRETE PLACEMENT.

5. TESTING PROCEDURE
   a. EACH SPECIMEN WILL BE SUBJECTED TO MONOTONIC CONCENTRIC LOADING. (THE APPROPRIATE RATE OF LOADING IS TO BE DETERMINED AND AGREED TO PRIOR TO TESTING.)
   b. SPECIMENS A1, A2, AND A3 WILL BE LOADED UNTIL FAILURE.
   c. SPECIMENS B1, B2, AND B3 WILL BE LOADED UNTIL THEY HAVE REACHED THE ACCEPTANCE CRITERIA ONLY. ADDITIONAL LOADING MAY BE APPLIED AT THE OWNER'S SOLE DISCRETION.

6. TEST ACCEPTABILITY CRITERIA
   a. CITY TEST SPECIMENS B1, B2, & B3. EACH TEST WILL BE DEEMED SUCCESSFUL IF THE AVERAGE OF THE TWO AXIAL STRAIN DEVICES REACHES 0.6%.

7. BAUGRID EQUIVALENCY TESTS
   a. BAUGRID QUALITY CONTROL TESTS 1-5 AS SHOWN IN SK-02 WILL BE PERFORMED ON THE #4 BAUGRIDS USED IN THE TEST SPECIMENS, AS WELL AS REPRESENTATIVE #5 BAUGRIDS TO THOSE BEING USED AT THE 301 MISSION STREET PROJECT.
   b. SUCCESSFUL COMPLETION OF THESE TESTS WILL BE DEMONSTRATED IF THE #4 BAUGRIDS AND #5 BAUGRIDS ALL PASS THE ASSOCIATED ASTM AND BAUGRID QUALITY CONTROL MANUAL CRITERIA.

PROJECT: 301 MISSION	JOB #: 4069	SCALE: N.T.S.
TITLE: BAUGRID COLUMN TEST SETUP PROCUDURES	DATE: 11/03/2006	DWG. NO. SK-00
DESIMONE 160 SANSOME STREET 16TH FLOOR SAN FRANCISCO, CA 94104-3722 T. 415.398.5740 F. 415.398.9834	DRAWN: NJR CHECKED: DDR, RMP	

NOTES:

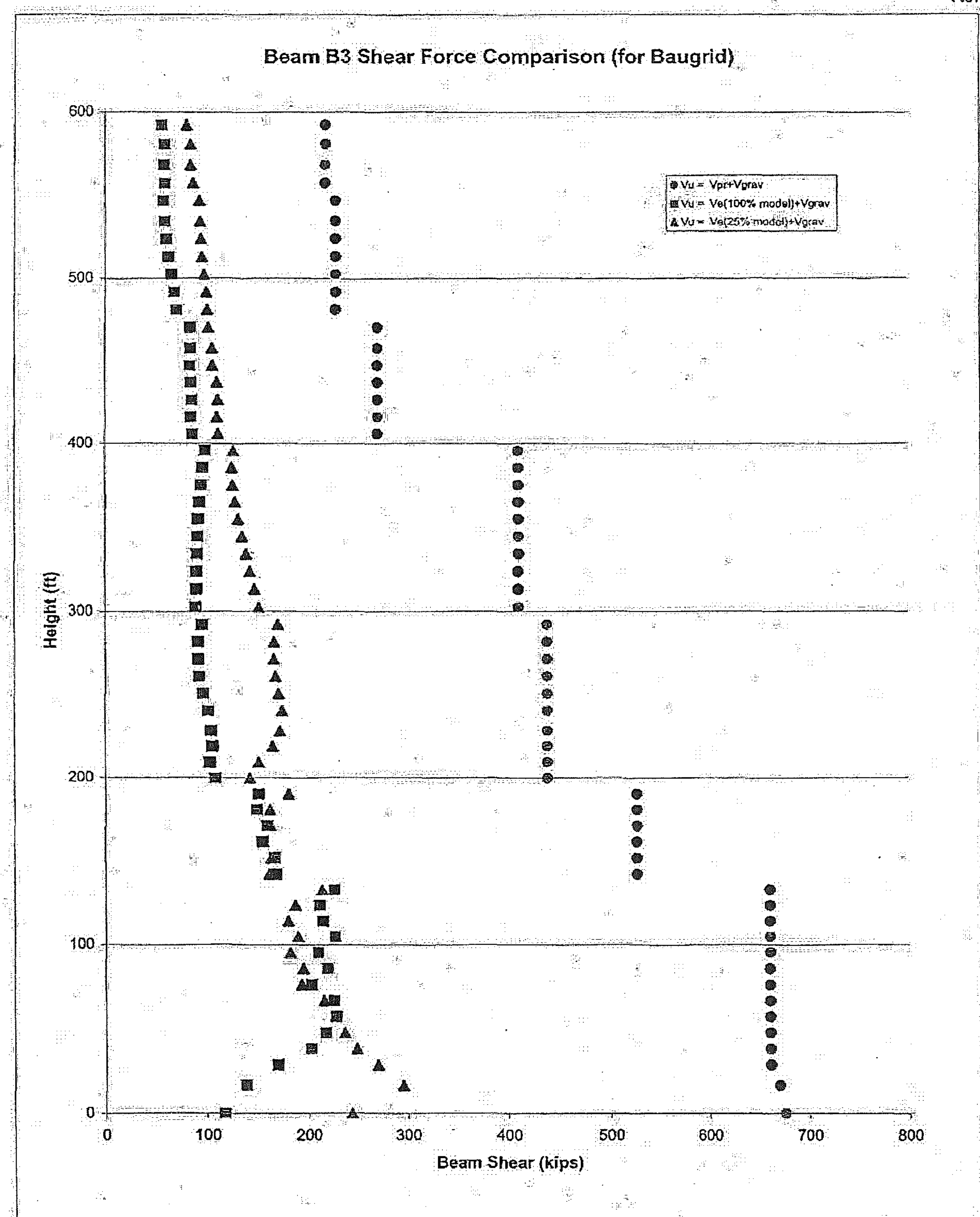
1. TESTS SHALL BE PERFORMED FOR BOTH #4 AND #5 BAUGRIDS AS SHOWN ON PAGE 29 OF THE BAUGRID QUALITY CONTROL MANUAL (REPRODUCED HERE FOR CLARITY.) ALL APPLICABLE ASTM PROCEDURES AND/OR THE BAUGRID QUALITY CONTROL MANUAL SHALL BE ADHERED TO.

2. COLUMN TEST BAUGRID FABRICATION SHOULD ONLY PROCEED IF BAUGRID COUPONS TESTS ARE SATISFACTORY.

3. TESTS SHALL BE PERFORMED IN THE MANUFACTURING FACILITY IN CHINA USING THE SAME TESTING APPARTUS AS USED FOR THE 301 MISSION PROJECT.

4. ALL TESTS SHALL BE PERFORMED WITH SMITH-EMERY AS WITNESS. SMITH-EMERY SHALL PRODUCE A REPORT PRESENTING ALL TESTING RESULTS AND A STATEMENT AS TO THE TESTS CONFORMANCE WITH THE BAUGRID QUALITY CONTROL MANUAL. ALL RAW STRESS-STRAIN DATA SHALL ALSO BE INCLUDED IN THE REPORT.

PROJECT: 301 MISSION	JOB #: 4069	SCALE: N.T.S.
TITLE: BAUGRID COUPON TEST SETUP	DATE: 11/03/2006	DWG. NO.
DESIMONE 160 SANSOME STREET 16TH FLOOR SAN FRANCISCO, CA 94104-3722 T. 415.398.5740 F. 415.398.9834	DRAWN: NJR CHECKED: DDR, RMP	SK-02


Beam B3 Shear Force Comparison (for Baugrid)
Vu = Vpr+Vgrav
Vu = Ve(100% model)+Vgrav
Vu = Ve(25% model)+Vgrav
Height (ft)
600
500
400
300
200
100
0
Beam Shear (kips)
0
100
200
300
400
500
600
700
800

The 301 Mission Street project consists of two separate structures located on the same site. The western structure (Tower) is a 58-story, 605-foot tall building over one sub-grade level. The eastern structure (Mid-rise) is a 12-story, 128-foot tall building over five sub-grade levels. The two structures are separated by a seismic joint at the B1, Ground, 2nd, and 3rd Floors.

Gravity System Description

Both structures are of cast-in-place concrete construction. The floor slabs above ground level in both structures will utilize post-tensioning, whereas the lower slabs utilize only mild steel reinforcing.

Lateral System Description

Tower. The Tower relies on a dual lateral system comprised of concrete shear walls with outriggers, and concrete special moment-resisting frames. Lateral forces from the Tower are transmitted by the core walls and the columns all the way to the pile cap at B1. The ground floor slab is not required to transfer forces to the perimeter basement walls.

Mid-rise. The Mid-rise relies solely on a concrete shear wall system. The core walls of the Mid-rise, unlike those of the Tower, have the shear shifted to the perimeter basement walls through the ground floor and basement level diaphragms.

Materials

Concrete. Concrete strengths in the Tower walls and frames vary between 7 and 10 ksi, and in the Mid-rise between 7 and 8 ksi. All floor slabs are 5 ksi.

Reinforcing. The shear walls in both buildings and the moment frames in the Tower use Grade 75 reinforcing for bars larger than #8's per the General Notes sheet.

BauGrid Welded Reinforcement Grids (WRG) manufactured by BauTech, Inc. will be used in lieu of conventional reinforcing in the Tower for ties in the walls and columns, and stirrups in beams. While the Baugrid product has ICBO approval (ER-5192), the City of San Francisco's Department of Building Inspection believed that the ICBO approval was not sufficient and that the substituted WRG may not meet various prescriptive code requirements. By utilizing section 104.2.8 of the code, the alternative materials section, DeSimone subsequently demonstrated that the substituted WRG met the same performance goals that the code implies are to be provided by conventional reinforcing.

For walls and columns, calculations were provided demonstrating the maximum demand required by a 4/3 MCE event, and a laboratory testing program was completed which showed that the WRG provided a capacity that met the demand.

For beams, calculations were provided demonstrating that the shear demand required by code is resisted by beam shear capacity with contributions from both concrete and the WRG. Capacity of the concrete in shear is based on published research. Capacity of the WRG is based on relevant testing data obtained through BauTech's QC/QA program on WRG material to be used on this project.

Foundations

Tower. The Tower foundation consists of a 10-foot thick pile cap supported by pre-cast concrete piles. The bottom of the pile cap is approximately 25' below the existing grade. The initial vertical pile displacement due to slippage required to fully engage the pile is expected to be approximately 1" by the time of project construction completion. Additional long-term pile settlement due to compression of the underlying clay layers is expected to be as much as 5". As the piles are only located directly below the Tower footprint, this settlement is expected to occur uniformly over the Tower foundation area.

Mid-rise. The Mid-rise structure rests on a mat foundation that varies between 6 feet and 8 feet in thickness. The bottom of this excavation is approximately 63 feet below the existing grade. Tie-downs resist hydrostatic uplift pressures under the portion of the deep excavation that is not directly below the Mid-rise, i.e., the area between the Mid-rise and the Tower.

Building Separation

The foundations and lateral systems of the two buildings are considered completely separate because a joint is located between them at the B1, Ground, 2nd, and 3rd Floors. "Hinge slabs" allow circulation between the two buildings, while still accommodating differential settlement and seismic displacements between the two structures.

Wind Loads

A wind tunnel study was performed and a report issued by Rowan Williams Davies & Irwin Inc. (RWDI). The results of the report were used to evaluate both the Tower and Mid-rise. Wind does not control either design forces or interstory drifts for either structure.

Seismic Loads

Site-specific ground motions provided by the geotechnical engineer of record, Treadwell and Rollo, were used for the analyses of both structures. Earthquake design forces acting on individual elements were obtained by performing response spectrum analyses with the proprietary computer program "ETABS" written by Computers and Structures, Inc. of Berkeley, California.

The following information was used to determine the seismic design forces.

Z	=	0.40Na		=	1.0
I	=	1.0	Nv	=	1.064
R	=	8.5 (Tower)	Ca	=	0.44
R	=	5.5 (Mid-rise)	Cv	=	0.67
Soil	=	Sd			

Tower. The lateral system is "regular" as defined by UBC 1629.5.2. The design forces were therefore reduced by 80% as allowed by 1631.5.4.2.

Different base shears were used for checking design forces and building interstory drifts.

Forces – Includes the building period limitation of 1.3 T_A and the minimum base shear of equation 30-6, reduced by 80% as allowed by 1631.5.4.2. (T_A is the period of the structure determined with Method A using equation 30-8.)

Drift check #1 – Per UBC. Neglecting period limitations and minimum base shears prescribed by equations 30-6 and 30-7, further reduced by 80% as allowed by 1631.5.4.2, but including the effects of torsion and of 5% mass eccentricity.

Drift check #2 – Per 2003 NEHRP provisions. This approach is widely held as the appropriate check for tall buildings with long periods and conservatively includes the equivalent of UBC equation 30-7, reduced by 80% as allowed by 1631.5.4.2. For buildings that are torsionally regular, this approach allows neglecting torsion effects for drift considerations, accomplished by evaluating drifts at diaphragm center of mass.

Mid-rise. Due to the eccentricity of the shear walls relative to the center of mass of the building, the Mid-rise exhibits a slight torsional irregularity. For this reason the base shear was not reduced in accordance with 1631.5.4.2.

Different base shears were used for checking design forces and building interstory drifts. (Since the period of the structure is relatively short, the minimum base shear equations of 30-6 and 30-7 do not apply.)

Design Procedures

All elements of the structure are designed and detailed in accordance with the load combinations and requirements of the 2001 SFBC. Additional procedures were also followed as listed below.

Steel Link Beams. The 2001 SFBC does not address the steel link beams used within the core of the Tower. These elements are designed using the 2002 AISC Seismic Provisions requirements for Special Reinforced Concrete Shear Walls Composite with Structural Steel Elements.

Capacity Design. Each of the 12 outriggers connecting to the central shear core of the Tower contains two diagonally reinforced link beam elements. These links are designed to remain elastic under the code-prescribed seismic loads, but it is desirable for them to yield first once the design loads are exceeded by a major earthquake. In order to insure this behavior, the capacities of the link beams were calculated and increased by an overstrength factor. The resulting forces were used as the demands for which the following elements were designed: the portion of each outrigger connecting to the core walls, the outrigger columns, and the pile cap.

Note that this approach is not required by the SFBC and represents an effort to "go beyond the code". This increases our confidence that in a large earthquake the very ductile link beam elements will yield first, and the critical connecting elements of the structure will remain essentially undamaged. The design of all elements still meets the requirements of the SFBC.

The outriggers columns are designed to remain elastic when simultaneously subjected to the capacity of all link beams, as well as all tributary gravity loads.

The pile cap under the Tower is designed to remain elastic when subjected to the capacities of the outrigger columns, as well as the expected maximum moment at the base of the shear wall core.

DESIMONE

Structural Calculations

301 Mission Street
San Francisco, CA

Shear Capacity of Moment Frame Beams
Reinforced with BauGrid

Prepared for:
San Francisco Department of Building Inspection

Prepared by:
DeSimone Consulting Engineers
160 Sansome Street, 16th Floor
San Francisco, CA 94104

DeSimone Project #4069

February 22, 2007

DESIMONE

NEW YORK
MIAMI
SAN FRANCISCO
NEW HAVEN
LAS VEGAS

September 28, 2006

City and County of San Francisco
Department of Building Inspection
1660 Mission Street, 2nd Floor
San Francisco, CA 94103

DeSimone Project #4069B
301 Mission Street

Attn: Mr. Hanson Tom, S.E.
Principal Engineer

Re: Summary of Meeting Between The City of San Francisco Department of Building Inspection and Millennium Partners and DeSimone Consulting Engineers, held on September 26, 2006, Re. 301 Mission Street (Permit No. 2002/1023/9696) - BauGrid® Reinforcement

Dear Hanson,

It was a pleasure meeting with you and your staff yesterday to discuss the repercussions on the 301 Mission Street project of a recent test performed by Professor Jack Moehle of UC Berkeley, in which a reinforced concrete column containing a sample of wire mesh reinforcement similar to BauGrid appears to have performed in an unexpected manner. As you have requested, we are pleased to offer the following summary of our discussions and the action items to which we mutually agreed.

SFDBI started the meeting by summarizing their concern regarding this issue, and their concern about the performance of the BauGrid product as a result of the recent test. DeSimone, as well as Millennium Partners, the project sponsor, indicated that they share the concern of SFDBI regarding this issue.

SFDBI suggested that additional testing might be the easiest way to resolve this issue. DeSimone expressed their concern that testing would not be a simple process since agreeing to an acceptable test and acceptance criteria would be the subject of much debate.

DeSimone also indicated that the recent test performed by Prof. Moehle differed from the conditions of the 301 Mission Street project in the several ways, including the following:

- The materials are not the same strength
- The reinforcing is not the BauGrid product that was manufactured by one of their certified facilities, nor was it of the same size or configuration as that product being used on our project.
- The loading conditions are different

DeSimone stated that additional testing to substantiate the integrity of the BauGrid product should not be required for the 301 Mission Street project for the following reasons:

- BauGrid is an ICC/ICBO approved product.
- BauGrid is being used on this project as a one-to-one substitution for cross ties in shear walls and columns in a manner consistent with the ICC/ICBO approvals
- BauGrid has been used on previous permitted and constructed projects in San Francisco in the same manner as our project without any requirements for additional testing
- The intended use of BauGrid on the 301 Mission Street project has been previously discussed and reviewed with both SFDBI and the Structural Peer Review Panel (SPRP). This discussion, which is included in the official SPRP binder, can be summarized as follows: The SPRP asked if additional testing of BauGrid was planned for the project, DeSimone indicated that it was not, and the SPRP indicated that our position was acceptable.

All parties discussed the letter dated September 19, 2006 from BauTech indicating that the materials tested by Prof. Moehle had not been subjected to their rigorous QA/QC procedures. SFDBI indicated that in light of these statements, they have reason to question the quality of the materials being delivered to the project site.

At the end of the meeting it was agreed that the following actions would be required to bring closure to this issue:

- DeSimone will submit revised construction drawings to SFDBI showing all structural elements where BauGrid is planned to be used on the project
- DeSimone will send a copy of the revised construction drawings to the individuals comprising the SPRP, Prof. Moehle and Hardip Pannu. At the request of SFDBI, an advance copy will be sent electronically to Prof. Moehle.
- The SPRP will be asked to review the drawings and to comment only and specifically on whether or not the drawings represent an appropriate implementation of the BauGrid product, i.e., is it being used as a one-to-one substitution for the cross ties previously shown on the permitted contract drawings.
- Millennium Partners and DeSimone will work with the project constructors to furnish SFDBI with the following information:
  - A copy of the BauTech QA/QC manual and procedures used for the production of BauGrid
  - A letter of certification from the testing and inspection agency responsible for overseeing the production of BauGrid for this project indicating that all QA/QC procedures are being followed
  - A letter from BauTech certifying that they have inspected the product being delivered to the project site and indicating that it has been manufactured in conformance with their own QA/QC procedures and with the ICBO approval documents.

We trust that you will agree that the above accurately summarizes the discussions and action items resulting from our recent meeting. If you have any comments on the above please do not hesitate to contact me directly. We look forward to working with you to resolve this issue to the satisfaction of SFDBI in the most expeditious way possible.

Very truly yours,

DESIMONE CONSULTING ENGINEERS, PLLC

Derrick D. Roorda, SE
Senior Associate

cc: Jonathan Rothstein, Steven Hood (Millennium Partners)
Jack Moehle, UC Berkeley
Hardip Pannu, Middlebrook + Louie

Comments on the Use of BauGrids as Shear Reinforcement

By: Murat Saatcioglu PhD., P.Eng.

A total of 13 large scale column specimens were tested at the University of Ottawa, with BauGrids used as column transverse (confinement) reinforcement. The specimens had 350 mm (13.7 in) square cross-sections and 1645 mm (5.4 ft) shear span between the column footing and the point of inflection (of a first story building column). All the columns were flexure dominant elements. They were subjected to constant axial compression, either at approximately 20% P_o (20% of column concentric capacity) or 40% P_o, and tested under incrementally increasing inelastic deformation reversals (lateral shear force reversals). No beam tests were performed. In the absence of beam test results, column test data obtained under a relatively low axial load of 20% P_o may be used, while keeping in mind that the effect of axial compression is to reduce ductility. Hence these results should provide a somewhat conservative perspective of BauGrid behavior under shear force reversals. Of the 13 columns tested, 10 had 4,900 psi concrete and the remaining three (BG-11, BG-12 and BG-13) had 11,800 psi concrete. Hysteretic relationships for all columns subjected to 20%P_o are included in the following pages. Also shown are sample strain gauge data recorded.

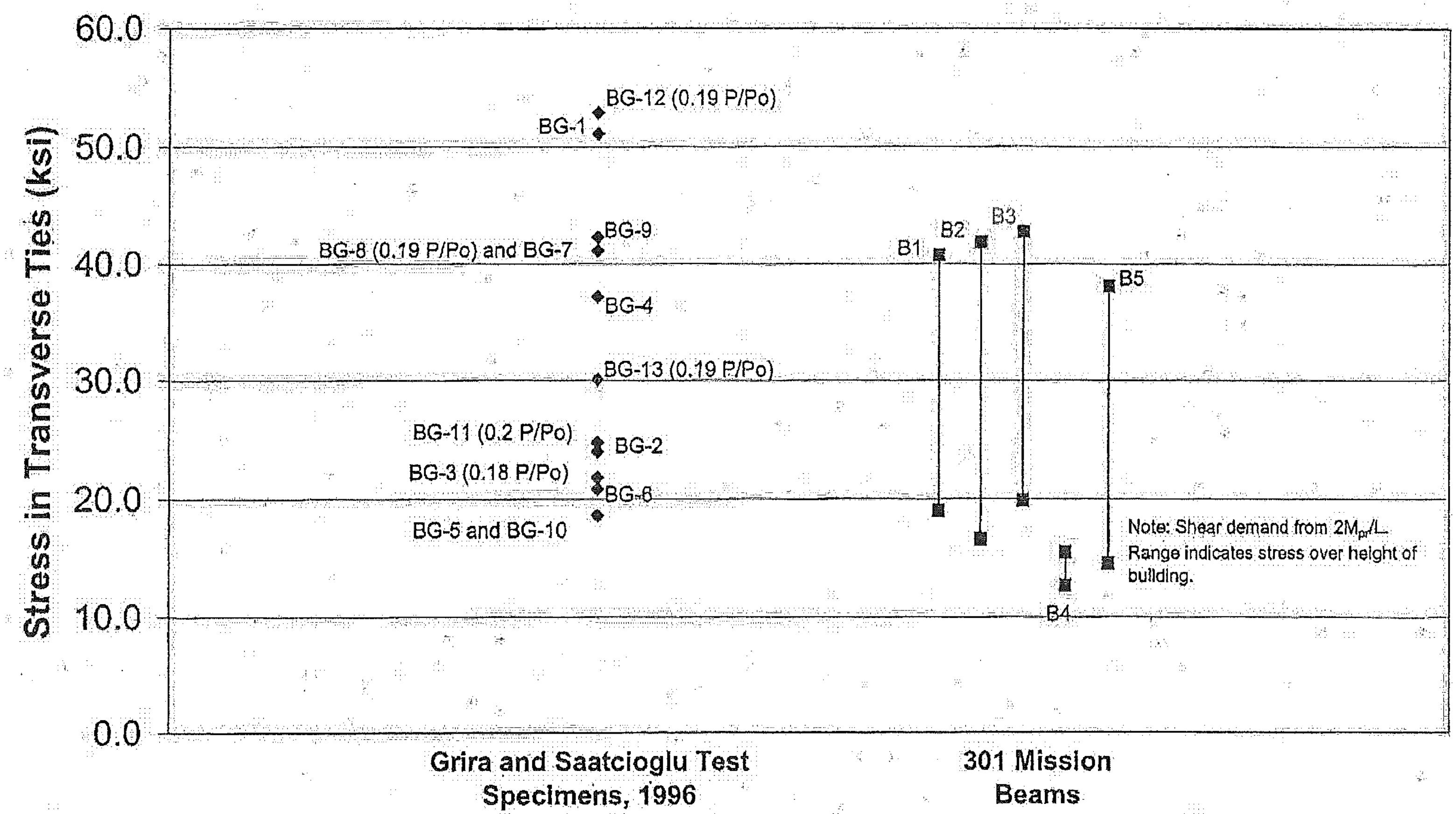
Observations:

- The seismic beam shear design forces required by ACI 318-05 is the larger of; i) shear force under factored earthquake loads and ii) shear associated with the formation of plastic hinges at the ends of the beams, with the latter often governing. Hence, one has to protect the beams against premature brittle shear failure prior to the development of probable moment resistances, computed with 1.25 f_y, which accounts for possible strain hardening in the longitudinal beam reinforcement and possible increases in moments and shears upon the formation of plastic hinges. In the columns tested, plastic hinges have formed and the specimens developed 4% to 7% lateral drift ratios, depending on the amount of confinement reinforcement. All the column specimens developed their inelastic flexural capacities (probable moment resistances) without any sign of shear failure.
- Normal Strength Concrete columns (BG-3 and BG-8) had approximately the same amount of confinement reinforcement required by ACI 318 (one had 30% more the other had 17% less) and they both developed 6% drift without any sign of failure in the columns and in the grids. The welds maintained their integrity until after the columns failed due to either the longitudinal bar rupturing in tension or the compression buckling and subsequent concrete crushing.
- High-Strength Concrete columns (BG-11, BG-12 and BG-13) had approximately 70%, 30% or 50% of the confinement steel required by ACI 318. BG-11, with about 70% of the ACI confinement steel requirement developed 6% drift with little or no degradation in flexural resistance and failed during 7% drift cycles due to the rupturing of longitudinal tension reinforcement. Transverse strains recorded on BauGrids showed yielding of the second grid at 2% drift. The grid developed

strains of 0.02%, 0.3%, 0.7% and 1% at the third cycles of 1%, 2%, 3% and 4% drift levels, respectively.

- HSC Column BG-12 (with 34% of confinement reinforcement required by ACI-318) developed 4% drift before failure. The yielding of longitudinal reinforcement and of the second grid was recorded during the first cycle of 2% drift. The strain in the grid increased to 0.6% during the third cycle of 2% drift. The strain further increased to 0.98% during the third cycle of 3% drift. The grid ruptured at 4% drift level, followed by the rupturing of the second grid at 5% drift. The compression bars buckled during the second cycle at 5% drift and the test was discontinued. Although shear cracks were observed on the side faces (parallel to the direction of loading), they were well controlled hairline cracks.
- HSC Column BG-13 (with 53% of confinement reinforcement required by ACI 318-05) showed similar behavior as BG-12. Strain Gauges #4 and #5 placed on the outer perimeter of the second grid indicated yielding during the first load excursion at 1% drift. Strain readings of 0.2%, 0.3% and 0.4% were recorded on the same grid at 0.5%, 1% and 2% drift ratios, respectively. This column did experience a wide diagonal tension crack above the plastic hinge region, as depicted in the attached figure (Fig. 5-51), indicating possible yielding of the grids due to shear. However the grids were able to control the crack and the column failure was due to flexure.
- It should be noted that the above observations are only valid for the BauGrids provided for the test program conducted at the University of Ottawa in 1996.

Stress in Baugrid Ties from Shear Demand
(Grira and Saatcioglu Tests vs. 301 Mission)



4 April 2007

Mr. Hanson Tom
City and County of San Francisco
Building Inspection Department
160 Mission Street
San Francisco, CA 94103-2414

Subject: Peer Review Panel Recommendation to Accept Baugrid Reinforcement as Beam Transverse Reinforcement in the 301 Mission Project

Dear Hanson:

We have received the Structural Calculations package dated 22 February 2007, prepared and submitted by DeSimone Consulting Engineers, under the direction of the Derrick Roorda, the Engineer of Record on the 301 Mission Street Project. The package is subtitled *Shear Capacity of Moment Frame Beams Reinforced with BauGrid*, which is the main focus of the package. The package contains a detailed evaluation of the reasons why BauGrids can be accepted as transverse reinforcement in this specific project, including calculations, test data, and opinions from an outside consultant, Murat Saatcioglu, who is an expert in the use of BauGrids.

It is our understanding that the use of BauGrids in the moment frame beams is not being considered as a one-for-one, equivalent replacement of conventional transverse reinforcement. Instead, it is our understanding that the use of BauGrids in the moment frame beams is being proposed on the basis of a performance approach. According to this approach, the use of Baugrids is deemed acceptable if the calculated performance of the buildings is equivalent to or better than the performance anticipated if those buildings were reinforced with conventional transverse reinforcement.

With this understanding, and after review of the information provided in the 22 February 2007 package as well as previous information provided to us about the design of these buildings, it is our opinion that the use of BauGrids in the moment frame beams is acceptable as proposed.

Although we have exercised usual and customary professional care in providing this review, we have not independently verified the accuracy of the calculations provided by DeSimone. Our professional opinions are based on their calculations and further the responsibility of the structural design remains fully with the Engineer of Record.

Respectfully,

Jack Moehle

Jack P. Moehle

Hardip Pannu

Stress-Strain Relationship of 10 ksi Concrete Confined by Baugrids

Confinement efficiency parameter:

$$k_2 = 0.15\sqrt{\frac{b_c}{s}\frac{b_c}{s_\ell}} = 0.15\sqrt{\frac{12}{4}\frac{12}{4}} = 0.45$$

b_c : center to center core dimension = 12 in

s_ℓ : spacing of crossties = 4 in.

Average lateral pressure (at yielding of transverse reinforcement):

f_ℓ = 4 x (0.2sq in) (83ksi)/ (12 in x 4 in) = 1.38 ksi (9.54 MPa)

Equivalent uniform pressure:

$f_{\ell e} = k_2\ f_\ell$ = (0.45) (1.38) = 0.62 ksi (4.29 MPa)

Confined Concrete Strength

$$f'_{cc} = f'_{co} + k_1 f_{\ell e}$$

$k_1 = 6.7\ (f_{le})^{-0.17}$
$k_1 = 6.7\ (4.29)^{-0.17} = 5.23$ (note that this equation is unit dependent and must be used with lateral pressure in MPa)

$f'_{co} = f'_c$ x 0.9 = 10 x 0.9 = 9 ksi (in-place strength of concrete in member – as opposed to cylinder strength)

f'_{cc} = 9 ksi + 5.23 (0.62) = 12.2 ksi (confined concrete strength in the core)

Ratio of additional strength due to confinement to in-place strength of unconfined concrete (K);

$K = k_1\ f_{\ell e} / f'_{co}$ = 5.23 (0.62) / 9.0 = 0.36 (36% more strength due to confinement)

HSC adjustment factors; k_3 and k_4 (strengths are both in MPa):

$k_3 = 40/f'_{co} = 40/(62) = 0.64$ (strengths in MPa)
$k_4 = f_{yt}/500 = 572/500 = 1.14$ (strengths in MPa)

Unconfined concrete strains at peak stress and at 85% of peak beyond the peak stress:

$\varepsilon_{01} = 0.0028 - 0.0008\ k_3 = 0.00229$

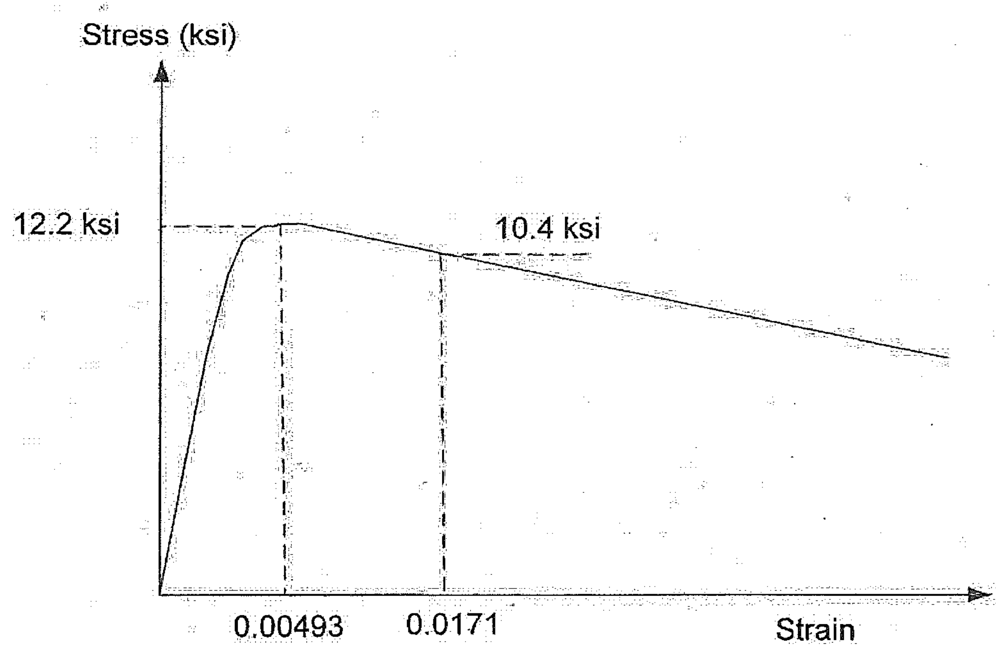
$\varepsilon_{85} = \varepsilon_{01} + 0.0018\ (k_3)^2 = 0.0030$

Confined concrete strains:

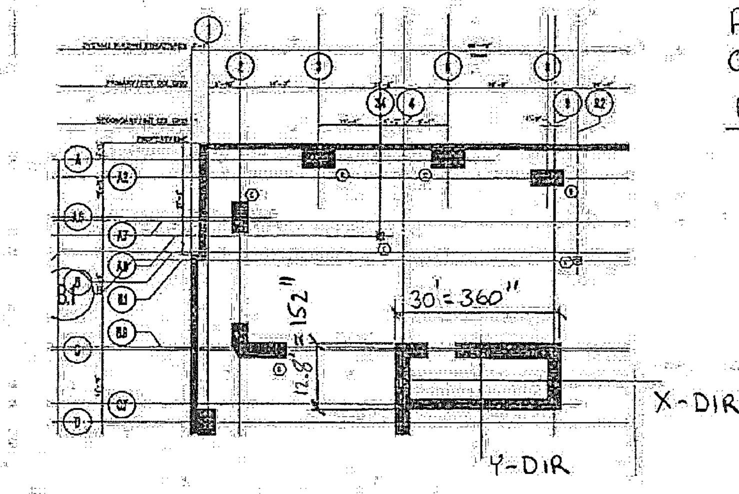
$\varepsilon_1 = \varepsilon_{01}\ (1+5\ k_3\ K) = 0.00229\ [1 + 5(0.64)(0.36)] = 0.00493$

$\varepsilon_{85} = 260\ k_3\ \rho_c\ \varepsilon_1\ [1+0.5k_2(k_4-1)] + \varepsilon_{085}$

$= (260)(0.64)(4*0.2/(12*4))\ (0.00493)[1+0.5(0.45)(1.14-1.0)] + 0.0030 = 0.0171$



Project 301 MISSION
Page 1 Of 9
Project No. 4069
Date 11/21/06
Item STRAIN DEMAND PER UBC 1921.6.6.5
By NJR Ch'kd



NORTH CORE FOR 301

ROOF DISPLACEMENT IN CONFORMANCE WITH UBC 1921.6.6.5

$$\Delta_{m_{y\text{-DIR}}} = 73'' = \Delta_{t_y}$$

$$\Delta_{m_{x\text{-DIR}}} = 78'' = \Delta_{t_x}$$

ASSUMPTIONS:

$$\phi_y = \frac{0.003}{l_w} = \begin{cases} \phi_{y_{y\text{-AXIS}}} = 8.3 \times 10^{-6}\ 1/in \\ \phi_{y_{x\text{-AXIS}}} = 19.7 \times 10^{-6}\ 1/in \end{cases}$$

$$l_p = \frac{l_w}{2} = \begin{cases} l_{p_x} = \frac{l_{w_x}}{2} = \frac{360''}{2} = 180'' \\ l_{p_y} = \frac{l_{w_y}}{2} = \frac{152''}{2} = 76'' \end{cases}$$

GIVENS

$h_w = 605\ ft = 7260\ in$

$l_{w_y} = 152''$

$l_{w_x} = 360''$

$P'_{u_y} = 1.2(28{,}800^k) + 0.5(5600^k) + 13{,}000^k$
$= 37{,}400 + 13{,}000 = 50{,}400^k$

$P'_{u_x} = 37{,}400 + 600^k$
$= 38{,}000^k$

Δ YIELD IN X-DIR EQ ($V_{BASE} = 6268$ kips)

BASED ON GROSS SECTION ELASTIC MODEL:

$\Delta_E = 9.7''$

$V_E = 2900$ kips
$M_E = 7400$ kip-ft
} MAX FORCES IN OUTRIGGER LINKS

YIELD IN OUTRIGGERS WILL START WHEN NOMINAL CAPACITIES ARE REACHED

$V_n' = 4988$ kips $\quad SCALE = \frac{V_n'}{V_E} = \frac{4988}{2900} = 1.72$ ← GOVERNS

$M_n' = 15808$ kip-ft $\quad SCALE = \frac{M_n'}{M_E} = \frac{15808}{7400} = 2.13$

∴ SCALE FOR FIRST YIELD IS 1.7

$\Delta_y = SCALE \cdot \Delta_E$
$= 1.7 \cdot 9.7''$
$= 16.5''$

$\boxed{\Delta_{y_x} = 16.5''}$

DESIMONE

PROJECT
PROJECT NO.
ITEM

DATE 11/21/06
BY NJR CHK'D

Δ YIELD IN Y-DIR. EQ (V_{BASE} = 6268 kips)

BASED ON GROSS SECTION ELASTIC MODEL:

$\Delta_E = 8.7''$

$V_E = 330$ kips (SHEAR IN STEEL LINK BEAM)

$T_E = 12{,}900$ kips (UPLIFT IN TENSION FLANGE OF CORE)

$M_E = 41{,}000$ kip-ft (MOMENT IN COMP. FLANGE OF CORE.)

→ WHAT ARE THE SCALE FACTORS TO CAUSE THE ABOVE ELEMENTS TO YIELD?

SHEAR LINK: $V_n' = 620$ kips $\therefore$ SCALE $= \frac{V_n'}{V_E} = \frac{620k}{330k} = 1.88$ ← GOVERNS

TENSION FLANGE: $T_n' = \overset{(GRAV)}{28{,}000} + 6000k$ (UPLIFT) $= 35{,}000$ kips
@ $M_E = 41{,}000$

$\therefore$ SCALE $= \frac{35{,}000 \text{ kips}}{12{,}900 \text{ kips}} = 2.71$

MOMENT IN COMP. FLANGE: $M_n' = 400{,}000$ k-ft

SCALE $= \frac{M_n'}{M_E} = \frac{400{,}000}{41{,}000} = 9.7$

$\therefore$ SCALE @ FIRST YIELD IS 1.9

$\Delta_y = 1.9\,\Delta_E = 1.9(8.7'')$
$= 16.5''$

$\boxed{\Delta_{y_y} = 16.5''}$

DETERMINE INELASTIC DEFLECTION

X DIR EQ: $\Delta_{i_x} = \Delta_{t_x} - \Delta_{y_x}$

$= 78'' - 16.5''$

$= 61.5''$

$\boxed{\Delta_{i_x} = 61.5''}$

Y DIR EQ: $\Delta_{i_y} = \Delta_{t_y} - \Delta_{y_y}$

$= 73'' - 16.5''$

$= 56.5''$

$\boxed{\Delta_{i_y} = 56.5''}$

TOTAL CURVATURE DEMAND

$$\phi_{t_{y\text{-AXIS}}} = \frac{\Delta_{ix}}{\left(h_w - \frac{l_p}{2}\right) l_p} + \phi_{y_{y\text{-AXIS}}}$$

$$= \frac{61.5''}{\left(7260'' - 180''/2\right)(180'')} + 8.3 \times 10^{-6}\ 1/\text{in}$$

$$= 47.6 \times 10^{-6}\ 1/\text{in} + 8.3 \times 10^{-6}\ 1/\text{in}$$

$$= 55.9 \times 10^{-6}\ 1/\text{in}$$

$$\boxed{\phi_{t_{y\text{-AXIS}}} = 55.9 \times 10^{-6}\ 1/\text{in}}$$

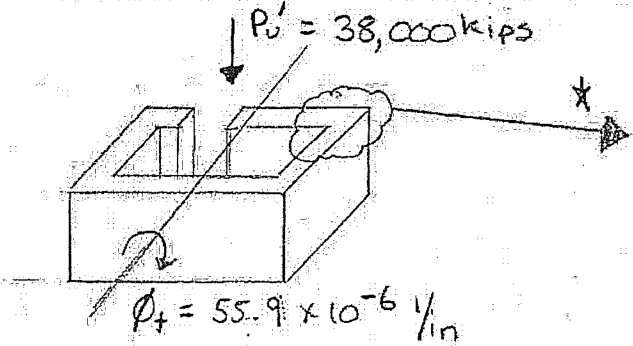
$$\phi_{t_{x\text{-AXIS}}} = \frac{56.5''}{\left(7260'' - \frac{76''}{2}\right)(76'')} + 19.7 \times 10^{-6}\ 1/\text{in}$$

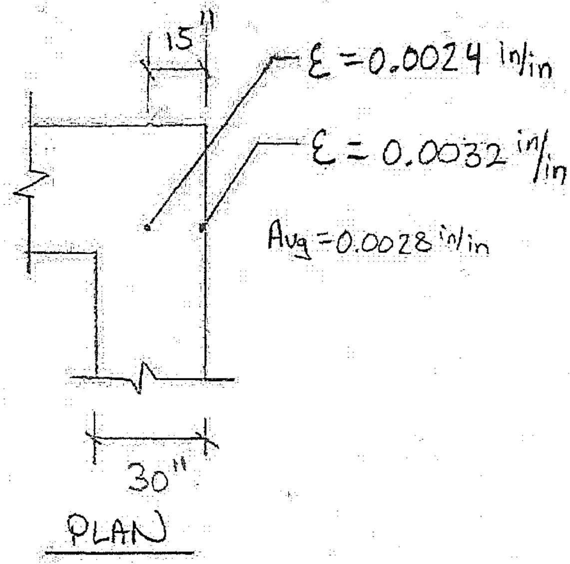
$$= 102.9 \times 10^{-6}\ 1/\text{in} + 19.7 \times 10^{-6}\ 1/\text{in}$$

$$= 122.6 \times 10^{-6}\ 1/\text{in}$$

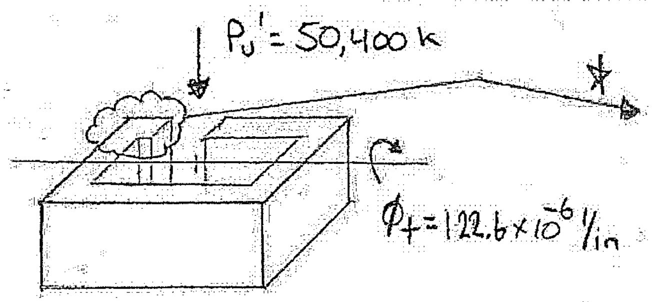
$$\boxed{\phi_{t_{x\text{-AXIS}}} = 122.6 \times 10^{-6}\ 1/\text{in}}$$

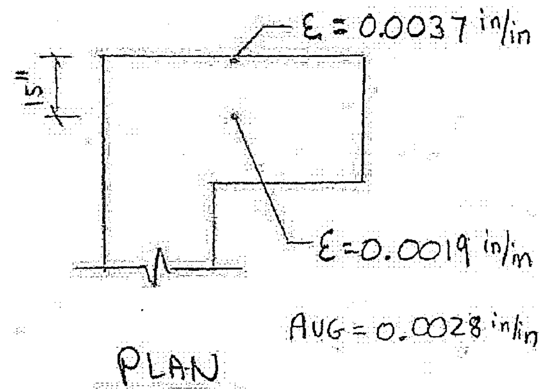
DETERMINATION OF STRAIN DEMAND





$$\boxed{\varepsilon_{AVG_x} = 0.0028 \text{ in/in}}$$





$$\boxed{\varepsilon_{AVG_y} = 0.0028 \text{ in/in}}$$

* STRAINS DETERMINED BY STRAIN COMPATIBILITY ANALYIS USING THE SOFTWARE XTRACT. P_U' WAS ASSUMED CONSTANT. SEE PAGE 8 AND 9.

PROJECT

PROJECT NO.

ITEM STRAIN DEMAND BEYOND THAT REQUIRED BY SECTION UBC 1921.6.6.5.

DATE 11/21/06

BY NJR CHK'D

ORTHOGONAL EFFECTS

SIMILAR TO WHAT IS SUGGESTED IN UBC 1633.1, ORTHOGONAL EFFECTS WILL BE ACCOUNTED FOR BY USING 100% + 30% COMBINATION RULE.

$$\varepsilon_{TOTAL} = 1.00(\varepsilon_{AVG_x}) + 0.30(\varepsilon_{AVG_y})$$

$$= 1.0(0.0028\ in/in) + 0.30(0.0028\ in/in)$$

$$= 0.0036\ in/in$$

MCE EFFECTS

ASSUME $\dfrac{DEMAND_{MCE}}{DEMAND_{DBE}} \approx 1.6$

$\therefore\ TOTAL_{MCE}\ \varepsilon_{DEMAND} \approx 1.6(0.0036\ in/in)$

$= 0.0058\ in/in$

THE MAXIMUM DEMAND THAT CAN BE EXPECTED FOR THE MCE EVENT INCLUDING ORTHOGONAL EFFECT IS TAKEN TO BE

$$\boxed{\varepsilon_{MAX\ DEMAND} = 0.006\ in/in}$$

DeSimone
11/21/06 NJR

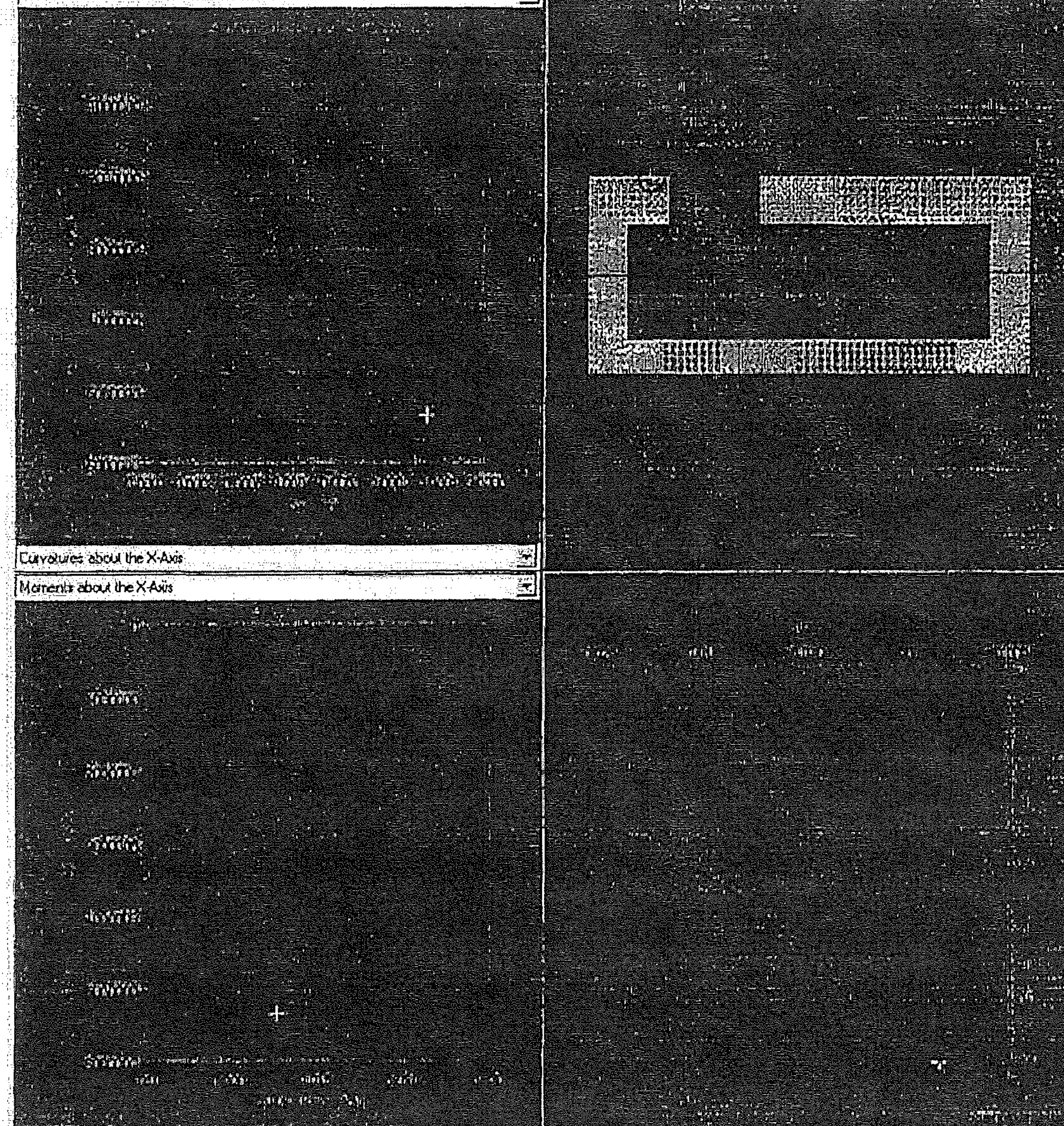
Section1 - Pu_50400

26 — LOAD STEP

kip-in

PG 8 OF 9

Moments about the X-Axis



Curvatures about the X-Axis

Moments about the X-Axis

Axial Strain at the Centroid

Select Data to View

Fiber/Bar Property

Section Analysis Property

Material Totals

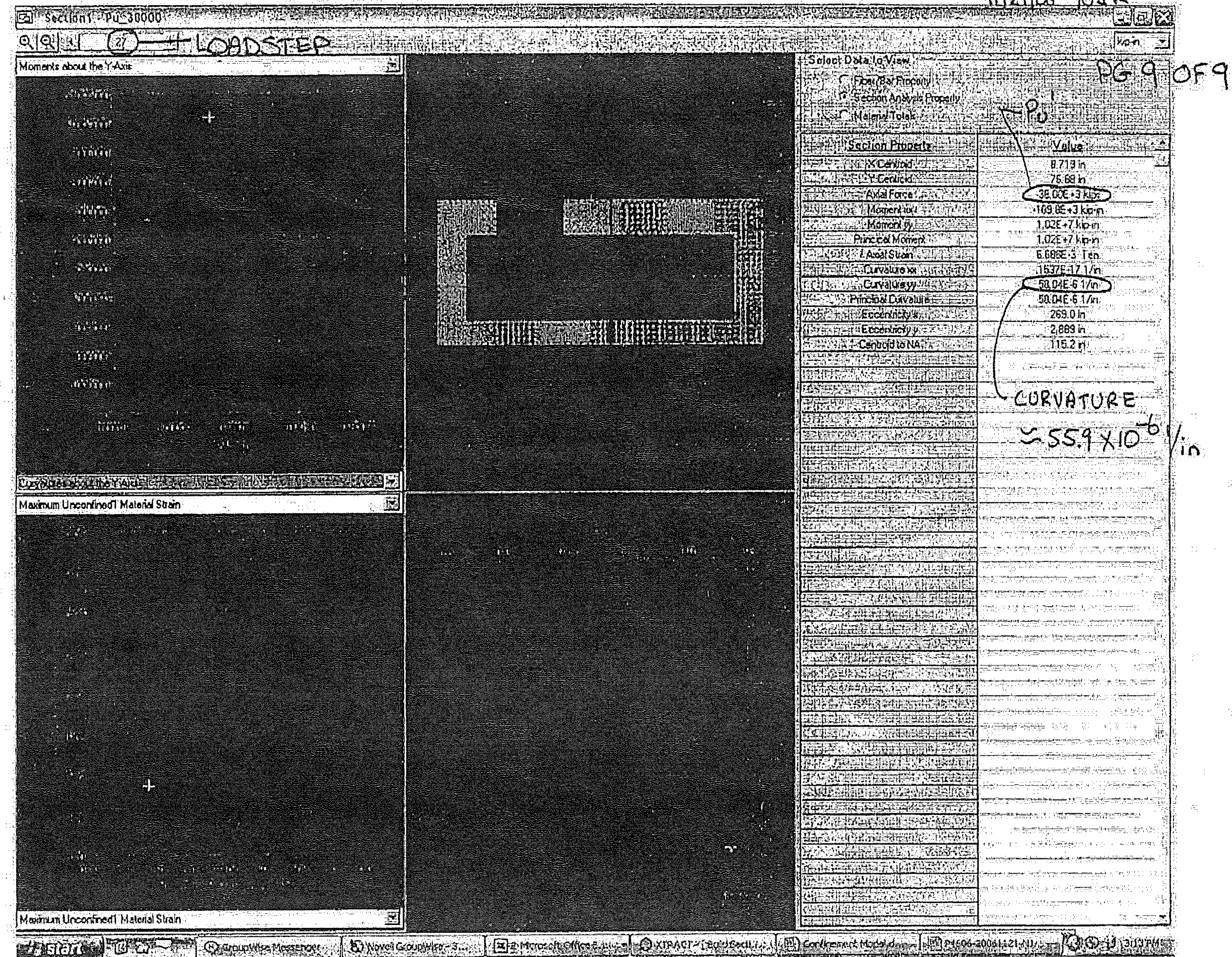
P_u'

Section Property	Value
X Centroid	8.719 in
Y Centroid	76.88 in
Axial Force	-50.40E+3 kips
Moment xx	-5.313E+6 kip-in
Moment yy	625.4E+3 kip-in
Principal Moment	5.349E+6 kip-in
Axial Strain	5.605E-3 Ten
Curvature xx	-121.4E-3 1/in
Curvature yy	6.432E-17 1/in
Principal Curvature	121.4E-3 1/in
Eccentricity x	12.41 in
Eccentricity y	105.4 in
Centroid to NA	46.16 in

CURVATURE
$\cong 122 \times 10^{-6}$

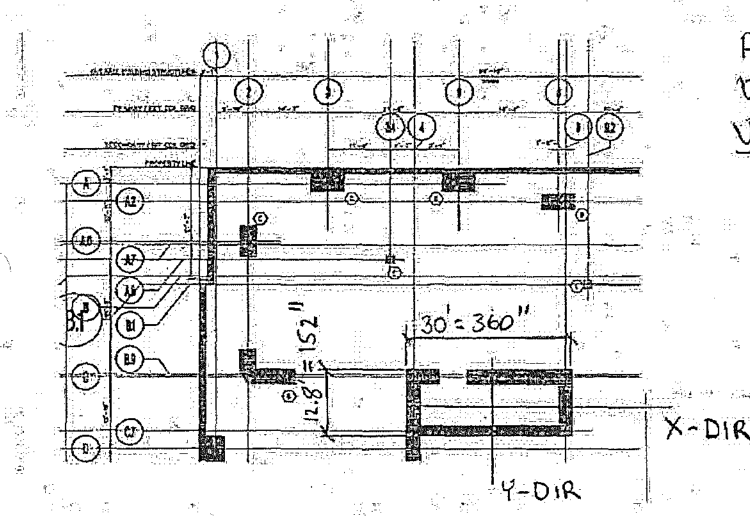
start | GroupWise Mess... | Novell GroupWise... | P4606-2006112... | F4606-2006112... | My Documents | XTRACT - [Sub... | Confinement Mo... | 2:40 PM

DeSimone
11/21/06 NJR



DESIMONE

Project	301 MISSION	Page 1 Of 7	
Project No.	4069	Date 12/1/06	
Item	STRAIN DEMAND BEYOND CODE	By	Ch'kd



NORTH CORE FOR 301

ROOF DISPLACEMENTS OBTAINED USING ELASTIC R.S.A. WITH UNREDUCED MCE SPECTRA

$$\Delta_{MCE_{Y\text{-}DIR}} = 85'' = \Delta_{t_y}$$

$$\Delta_{MCE_{X\text{-}DIR}} = 97'' = \Delta_{t_x}$$

ASSUMPTIONS:

$$\phi_y = \frac{0.003}{l_w} = \begin{cases} \phi_{y_{Y\text{-}AXIS}} = 8.3 \times 10^{-6}\ 1/in \\ \phi_{y_{X\text{-}AXIS}} = 19.7 \times 10^{-6}\ 1/in \end{cases}$$

$$l_p = \frac{l_w}{2} = \begin{cases} l_{p_x} = \frac{l_{w_x}}{2} = \frac{360''}{2} = 180'' \\ l_{p_y} = \frac{l_{w_y}}{2} = \frac{152''}{2} = 76'' \end{cases}$$

GIVENS

BUILDING OVERSTRENGTH PER PEER REVIEW J.M. COMMENT 7

$\phi = 1.75$

$P_{E_y} = 13,000$ kips

$h_w = 605$ ft $= 7260$ in

$l_{w_y} = 152''$ $\quad l_{w_x} = 360$ in

$P_{ULT_y} = \phi \cdot P_{E_y} = (1.75)(13,000)$
$= 22,750$ kips

$P'_{u_y} = 1.2(28,800^k) + 0.5(5600^k) + 22,750^k$
$= 37,400 + 22,750 = 60,150^k$

$P'_{u_x} = 37,400 + 600^k$
$= 38,000^k$

Δ YIELD IN X-DIR EQ (V_{BASE} = 6268 kips)

BASED ON GROSS SECTION ELASTIC MODEL:

$\Delta_E = 9.7''$

$V_E = 2900$ kips
$M_E = 7400$ kip-ft
} MAX FORCES IN OUTRIGGER LINKS

YIELD IN OUTRIGGERS WILL START WHEN NOMINAL CAPACITIES ARE REACHED

$V_n' = 4988$ kips $SCALE = \frac{V_n'}{V_E} = \frac{4988}{2900} = 1.72$ ← GOVERNS

$M_n' = 15808$ kip-ft $SCALE = \frac{M_n'}{M_E} = \frac{15808}{7400} = 2.13$

∴ SCALE FOR FIRST YIELD IS 1.7

$\Delta_y = SCALE \cdot \Delta_E$
$= 1.7 \cdot 9.7''$
$= 16.5''$

$\boxed{\Delta_{y_x} = 16.5''}$

Δ YIELD IN Y-DIR EQ ($V_{BASE} = 6268$ kips)

BASED ON GROSS SECTION ELASTIC MODEL -

$\Delta_E = 8.7''$

$V_E = 330$ kips (SHEAR IN STEEL LINK BEAM)

$T_E = 12{,}900$ kips (UPLIFT IN TENSION FLANGE OF CORE)

$M_E = 41{,}000$ kip-ft (MOMENT IN COMP. FLANGE OF CORE.)

→ WHAT ARE THE SCALE FACTORS TO CAUSE THE ABOVE ELEMENTS TO YIELD?

SHEAR LINK: $V_n' = 620$ kips $\therefore$ SCALE $= \frac{V_n'}{V_E} = \frac{620\,k}{330\,k} = 1.88$ ← GOVERNS

TENSION FLANGE: $T_n' = 28{,}000$ (GRAV) $+ 6000\,k$ (UPLIFT) $= 35{,}000$ kips
@ $M_E = 41{,}000$

$\therefore$ SCALE $= \frac{35{,}000\text{ kips}}{12{,}900\text{ kips}} = 2.71$

MOMENT IN COMP. FLANGE: $M_n' = 400{,}000$ k-ft

SCALE $= \frac{M_n'}{M_E} = \frac{400{,}000}{41{,}000} = 9.7$

$\therefore$ SCALE @ FIRST YIELD IS 1.9

$\Delta_y = 1.9\,\Delta_E = 1.9(8.7'')$
$= 16.5''$

$\boxed{\Delta_{y_y} = 16.5''}$

DETERMINE INELASTIC DEFLECTION

X DIR EQ: $\Delta_{i_x} = \Delta_{t_x} - \Delta_{y_x}$

$= 97'' - 16.5''$

$= 80.5''$

$\boxed{\Delta_{i_x} = 80.5''}$

Y DIR EQ: $\Delta_{i_y} = \Delta_{t_y} - \Delta_{y_y}$

$= 85'' - 16.5''$

$= 68.5''$

$\boxed{\Delta_{i_y} = 68.5''}$

DESIMONE

Project
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Page 5 Of 7
Date 12/1/06
By Ch'kd

TOTAL CURVATURE DEMAND

$$\phi_{t_{y\text{-AXIS}}} = \frac{\Delta_{ix}}{\left(h_w - \frac{l_p}{2}\right) l_p} + \phi_{y_{y\text{-AXIS}}}$$

$$= \frac{80.5''}{\left(7260'' - 180''/2\right)(180'')} + 8.3\times10^{-6}\ 1/in$$

$$= 62.3\times10^{-6}\ 1/in + 8.3\times10^{-6}\ 1/in$$

$$= 70.7\times10^{-6}\ 1/in$$

$$\boxed{\phi_{t_{y\text{-AXIS}}} = 70.7\times10^{-6}\ 1/in}$$

$$\phi_{t_{X\text{-AXIS}}} = \frac{68.5''}{\left(7260'' - \frac{76''}{2}\right)(76'')} + 19.7\times10^{-6}\ 1/in$$

$$= 124.8\times10^{-6}\ 1/in + 19.7\times10^{-6}\ 1/in$$

$$= 144.5\times10^{-6}\ 1/in$$

$$\boxed{\phi_{t_{X\text{-AXIS}}} = 144.5\times10^{-6}\ 1/in}$$

DESIMONE

Project

Project No.

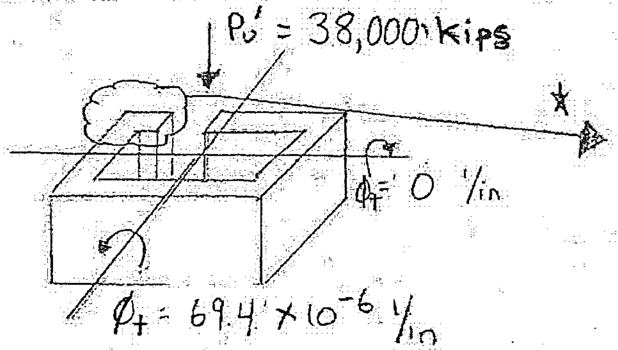
Item

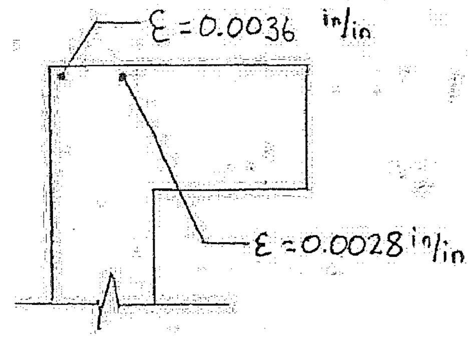
Page 6 Of 7

Date 12/1/06

By Ch'kd

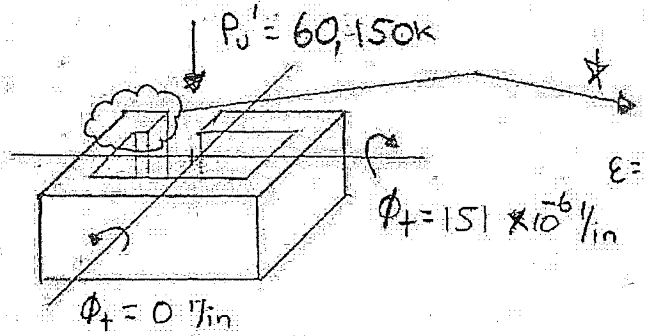
DETERMINATION OF STRAIN DEMAND

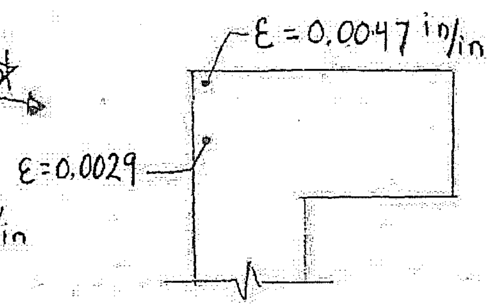




PLAN

$\boxed{\varepsilon_{max_x} = 0.0036 \text{ in/in}}$





PLAN

$\boxed{\varepsilon_{max_y} = 0.0047 \text{ in/in}}$

* STRAINS DETERMINED BY STRAIN COMPATIBILITY ANALYSIS USING THE SOFTWARE XTRACT. CONFINED CONCRETE MATERIAL MODEL BY SAATCIOGLU.

ORTHOGONAL EFFECTS

1) $30\%(X\text{-LOAD}) + 100\%(Y\text{-LOAD})$

$= 30\%(\varepsilon_{MAX_X}) + 100\%(\varepsilon_{MAX_Y})$

$= 0.3(0.0036) + 1.0(0.0047)$

$= 0.0058 \text{ in/in}$ ← GOVERNS

2) $100\%(X\text{-LOAD}) + 30\%(Y\text{-LOAD})$

$= 100\%(\varepsilon_{MAX_X}) + 30\%(\varepsilon_{MAX_Y})$

$= 1.0(0.0036) + 0.3(0.0047)$

$= 0.0050 \text{ in/in}$

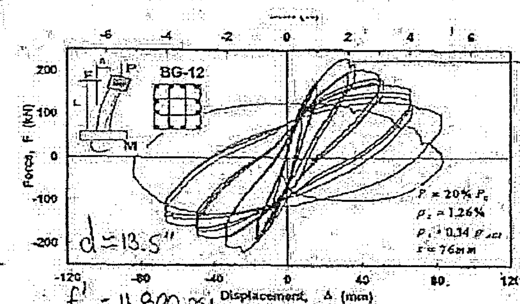
$\boxed{\therefore \text{ TEST BAUGRID TO } \varepsilon = 0.006 \text{ in/in}}$

PROJECT 301 MISSION PAGE 1 OF 4

PROJECT NO. 4069B DATE 12/22/06

ITEM SUMMARY OF CALCULATIONS PROVIDED FOR BEAM BAUGRID BY NJR CHK'D

STRESS FOR SAATCIOGLU TEST



$f'_c = 11{,}800$ psi

a) Hysteretic force-displacement relationship

MAX SHEAR OBTAINED ≅ 225 kN (50.6 kips)

$$V_s = \frac{A_s}{S}\, d\, f_s$$

BG-12

$$\Rightarrow f_s = \frac{V_s \cdot S}{A_s \cdot d}$$

$S = 3$ in

$A_s = (0.05\,in^2)(4) = 0.21\,in^2$

$$\therefore f_s = \frac{(50.6k)(3\,in)}{(0.21\,in^2)(13.5\,in)}$$

$= 53$ ksi

NOTES: 1 - SINCE WELD SHEAR IS THE ACCEPTANCE CRITERIA, THE SHEAR DEMAND WAS NOT REDUCED BY V_c.

2 - ~~BG-1 THROUG BG-13 WERE DONE SIMILARILY.~~

~~VALUE REPORTED ON PLOT:~~

$\boxed{BG\text{-}12 \quad F_s = 53\ ksi}$

STRESS FOR 301 MISSION

BEAM B3 AT LEVEL 1

$$V_s = \frac{2M_{pr}}{L} - V_c \quad ; \quad V_c = 1 \cdot \sqrt{f'_c}\, b_w d$$

$= 619^k - 84^k$

$= 535^k$

(PAPERS BY PRIESTLEY AND OTHERS SHOW $1\sqrt{f'_c}$ to be the lower bound for CONCRETE SHEAR CONTRIBUTION TO STRENGTH.)

NOTE: M_{pr} per ACI 21.0

STRESS FOR 301 MISSION (CONT.)

$$f_s = \frac{V_s \cdot S}{A_s \cdot d} \; ; \quad S = 4.5'' \quad d = 35''$$

$$A_s = 6(0.31 in^2) = 1.86 in^2$$

$$= \frac{(535^k)(4.5'')}{(1.86 in^2)(35'')}$$

$$= 37.0 \text{ ksi}$$

VALUE REPORTED ON PLOT

B3
UPPER BOUND → $f_s = 37$ ksi

STRESS FOR WELD SHEAR

$$STRESS = \frac{ULTIMATE\ LOAD}{AREA\ OF\ \#5}$$

Ultimate loads (N)	Ultimate loads (lb)	Area of #5 (In^2)	Stress (ksi)
68228	15338	0.31	49
62428	14034	0.31	45
70257	15794	0.31	51
67171	15101	0.31	49
60114	13514	0.31	44
61628	13855	0.31	45
61400	13803	0.31	45
60142	13520	0.31	44

← UPPER BOUND

← LOWER BOUND

LOADS FROM ASTM 185 WELD SHEAR TEST. THE WELD FAILED AT THESE LOADS.

PROJECT

PROJECT NO.

ITEM

PAGE 3 OF 4

DATE 12/22/06

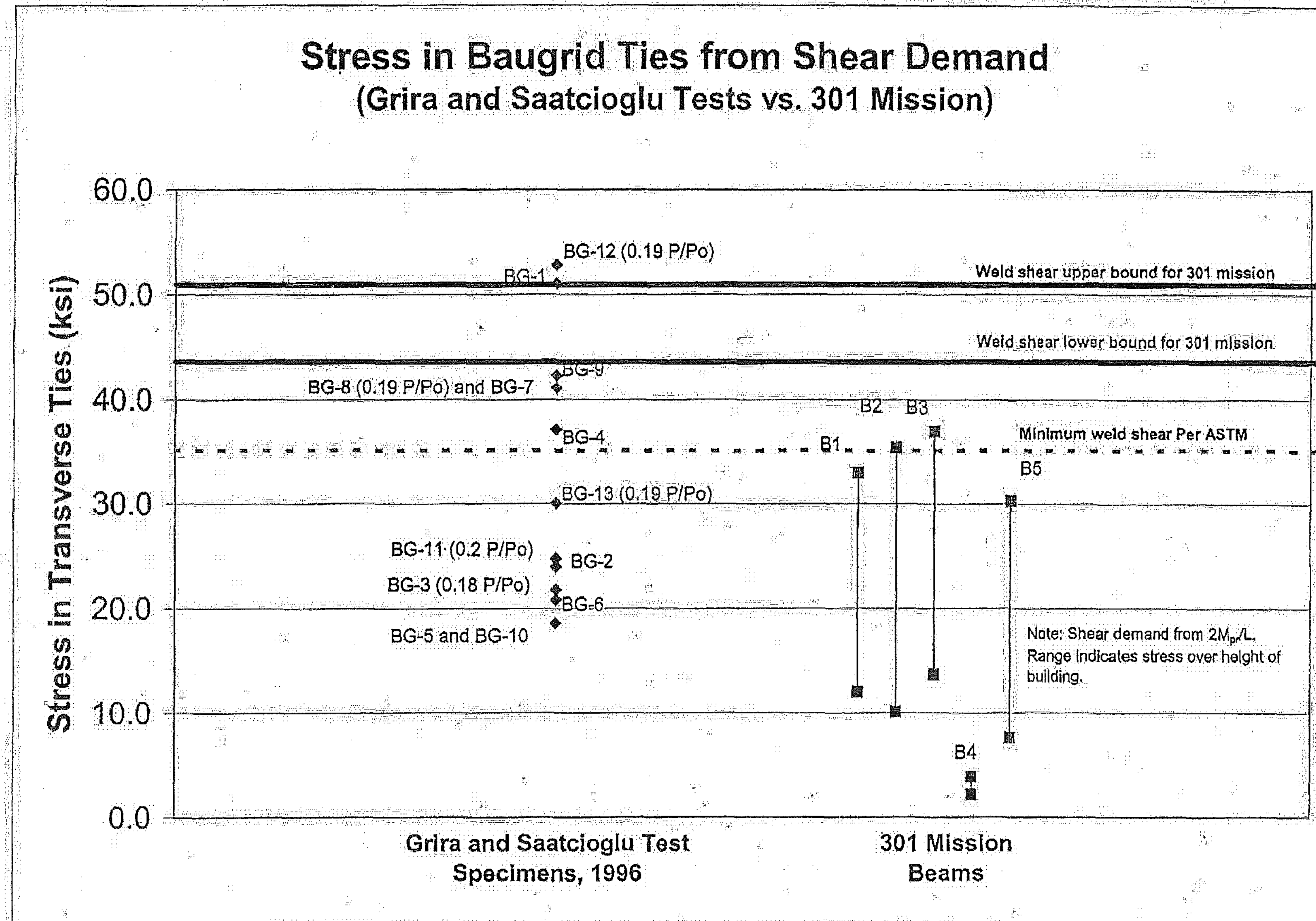
BY NJR CHK'D

CRITERIA AND CONCLUSION

CRITERIA: THE STRESS DEMANDS IN THE 301 MISSION BEAM BAUGRID SHOULD BE LESS THAN THE STRESS REQUIRED TO BREAK THE WELD PER THE ASTM 185 PROCEDURE.

CONCLUSIONS: SINCE THE DEMAND IN THE 301 MISSION BEAM BAUGRID IS LESS THAN THE FORCE REQUIRED TO BREAK THE WELDS, THE BEAM BAUGRID IS OK FOR USE ON THE 301 MISSION PROJECT.

THE SAATCIOGLU BAUGRID TESTS EXHIBIT DUCTILE BEHAVIOR AT BAUGRID STRESS LEVELS SIMILAR TO STRESS LEVELS EXPECTED ON THE 301 MISSION PROJECT.


Stress in Baugrid Ties from Shear Demand
(Grira and Saatcioglu Tests vs. 301 Mission)
Stress in Transverse Ties (ksi)
60.0
50.0
40.0
30.0
20.0
10.0
0.0
BG-12 (0.19 P/Po)
BG-1
Weld shear upper bound for 301 mission
Weld shear lower bound for 301 mission
BG-9
BG-8 (0.19 P/Po) and BG-7
B2
B3
BG-4
B1
Minimum weld shear Per ASTM
B5
BG-13 (0.19 P/Po)
BG-11 (0.2 P/Po)
BG-2
BG-3 (0.18 P/Po)
BG-6
BG-5 and BG-10
Note: Shear demand from 2Mp/L. Range indicates stress over height of building.
B4
Grira and Saatcioglu Test Specimens, 1996
301 Mission Beams

PG 4 OF 4

Background

Welded reinforcement grids are available in various sizes and shapes that are suitable for use in structural members as concrete reinforcement. Research conducted on reinforced concrete columns, shear walls, and beams indicate that welded grids offer superior performance and easy cage assembly when used as transverse reinforcement. The grid pattern improves concrete confinement and results in enhanced deformability in the inelastic range of deformations. This feature makes welded grids especially suitable for seismic resistant structures.

The specific grid product being used for the 301 Mission Street project is BauGrid, manufactured by BauTech, which has been approved for use by the ICBO Evaluation Service, Inc. as documented on ER-5192 dated August 1, 2000. BauTech maintains it's approved ICBO status by adhering to strict quality control requirements, which are audited quarterly by an independent inspection and testing agency, Smith Emery Laboratories. BauTech's Quality Assurance Program requires daily production sampling and testing to assure the quality of the product, and those tests have been duplicated on the specific batch of material utilized in these test columns.

Mission Street Development LLC. has been asked by the City of San Francisco Department of Building Inspection (SFDBI) to perform some additional tests to confirm the performance of BauGrid specific to the 301 Mission Street project.

DeSimone proposes to demonstrate that BauGrid is acceptable for use on the 301 Mission Street project through a testing program to be executed at UC Berkeley under the direction of Prof. Jack Moehle. The testing program outlined herein has been developed in response to the December 6, 2006 letter from SFDBI, and has been agreed to by the project SPRP and by SFDBI.

Test Specimens

- A total of six specimens shall be built and instrumented in accordance with SK-01.
- Preliminary Test. Specimens A1, A2, and A3.
- City Test. Specimens B1, B2, and B3.

Concrete Placement and Cylinders

- Concrete with expected 28-day strength of 10,000 shall be placed in all six specimens on the same day.
  A total of forty (40) concrete cylinders shall be taken from the same batch of concrete for the purpose of determining compressive strength.
- Two (2) cylinders shall be tested on the 5th day after concrete placement and on each day thereafter until the concrete strength reaches 10,000 psi.
- Two (2) additional cylinders shall be tested at 28, 56, and 90 days after concrete placement.

Test Procedure

- Each specimen shall be subjected to monotonic concentric axial compression loading.
- Data shall be continuously gathered and recorded from each of the instrumentation devices depicted in SK-01.
- The strain of any specimen shall be defined as the average reading from the two LVDT devices shown in SK-01.
- Each specimen shall be loaded only until such time as the specimen reaches a strain of 0.71%. Upon reaching this strain the specimen shall be removed from the testing machine.

Preliminary Test

- Specimens A1, A2, and A3 shall be tested when the concrete strength reaches 8,000 psi.
- This test is intended solely to make sure the testing procedure and loading rate are acceptable, and that the data acquisition systems are functioning properly prior to completing the City Test.
- The results of the Preliminary Test shall have no bearing on the decision of SFDBI to allow the use of BauGrid on the 301 Mission Street project.

City Test

- Specimens B1, B2, and B3 shall be tested when the concrete strength reaches 10,000 psi.
- This test shall form the basis for determination of the acceptability of the use of BauGrid on the 301 Mission Street project.

Test Acceptance Criteria

- The City Test shall be deemed successful, and SFDBI shall permit the use of BauGrid for the 301 Mission Street project, if the following criteria are met:
  - Each of the three specimens achieves a strain of at least 0.71%. This corresponds to the beyond-code MCE demand increased to include dispersion.

PROJECT: 301 MISSION	JOB #: 4069	SCALE: 1" = 1'-0"
TITLE: BAUGRID TEST PROCEDURE	DATE: 12/28/2006	DWG. NO.
DESIMONE 160 SANSOME STREET 16TH FLOOR SAN FRANCISCO, CA 94104-3722 T. 415.398.5740 F. 415.398.9834	DRAWN: NJR CHECKED: DDR, RMP	SK-00

4 April 2007

Mr. Hanson Tom
City and County of San Francisco
Building Inspection Department
160 Mission Street
San Francisco, CA 94103-2414

Subject: Peer Review Panel Recommendation to Accept Baugrid Reinforcement as Beam Transverse Reinforcement in the 301 Mission Project

Dear Hanson:

We have received the Structural Calculations package dated 22 February 2007, prepared and submitted by DeSimone Consulting Engineers, under the direction of the Derrick Roorda, the Engineer of Record on the 301 Mission Street Project. The package is subtitled *Shear Capacity of Moment Frame Beams Reinforced with BauGrid*, which is the main focus of the package. The package contains a detailed evaluation of the reasons why BauGrids can be accepted as transverse reinforcement in this specific project, including calculations, test data, and opinions from an outside consultant, Murat Saatcioglu, who is an expert in the use of BauGrids.

It is our understanding that the use of BauGrids in the moment frame beams is not being considered as a one-for-one, equivalent replacement of conventional transverse reinforcement. Instead, it is our understanding that the use of BauGrids in the moment frame beams is being proposed on the basis of a performance approach. According to this approach, the use of Baugrids is deemed acceptable if the calculated performance of the buildings is equivalent to or better than the performance anticipated if those buildings were reinforced with conventional transverse reinforcement.

With this understanding, and after review of the information provided in the 22 February 2007 package as well as previous information provided to us about the design of these buildings, it is our opinion that the use of BauGrids in the moment frame beams is acceptable as proposed.

Although we have exercised usual and customary professional care in providing this review, we have not independently verified the accuracy of the calculations provided by DeSimone. Our professional opinions are based on their calculations and further the responsibility of the structural design remains fully with the Engineer of Record.

Respectfully,

Jack P. Moehle

Hardip Pannu

5 January 2007

Mr. Hanson Tom
City and County of San Francisco
Building Inspection Department
160 Mission Street
San Francisco, CA 94103-2414

Subject: Acceptance criteria for tests of Baugrid columns associated with 301 Mission Street project

Dear Hanson:

This letter is to state the position of the undersigned regarding the test specimens, test procedure, and acceptance criteria for Baugrid column tests to be conducted at the Richmond Field Station of the University of California, Berkeley.

The test column geometry is shown in the attached drawing SK-01, dated 10/30/2006. The column test geometry was agreed upon by the undersigned following a review of the geometry of core wall boundary element reinforcement in the 301 Mission Street project, and in consultation with Dr. Murat Saatcioglu, University of Ottawa, who is an expert in the properties and testing of confined concrete columns. We recommend acceptance of this geometry as representative of that in the 301 Mission Street project.

The undersigned also recommend acceptance of the test procedure as described on the attached drawing SK-00, dated 12/28/2006. While we prefer that tests be continued to failure so that we might better understand the limits of behavior of columns made with Baugrids, we accept that this interest in understanding the limits of behavior is outside the scope of this review. Therefore, we are willing to recommend acceptance of the test procedure as described in SK-00.

The undersigned also agree with the acceptance criteria as defined in SK-00, dated 12/28/2006. Our understanding is that the strain limit of 0.71% is based on the strain calculated using the UBC-97 procedure for shear walls, considering orthogonal effects, with displacements amplified by factors **a** and **b**, where factor **a** amplifies the DBE displacement to the expected MCE displacement, and factor b amplifies the expected MCE displacement to account for uncertainty in the calculated results. We find this procedure to be acceptable, and therefore recommend that the strain limit 0.71% be accepted. Furthermore, the proposal that all three test specimens reach the strain limit of 0.71% is conservative and we recommend that it also be accepted.

Should the tests pass the acceptance criteria as outlined in SK-00, we recommend that the Department of Building Inspection approve the use of Baugrid reinforcement for columns and walls in the 301 Mission Street project.

Respectfully,

Jack P. Moehle

Hardip Pannu

4 April 2007

Mr. Hanson Tom
City and County of San Francisco
Building Inspection Department
160 Mission Street
San Francisco, CA 94103-2414

Subject: Peer Review Panel Recommendation to Accept Baugrid Reinforcement as Beam Transverse Reinforcement in the 301 Mission Project

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Respectfully,

Jack P. Moehle

Hardip Pannu

160975

BUILDING INSPECTION COMMISSION (BIC)

Department of Building Inspection **Voice (415) 558-6164 - Fax (415) 558-6509**
1660 Mission Street, San Francisco, California 94103-2414

April 27, 2017

Tom C. Hui, S.E., C.B.O
Director, Department of Building Inspection
1660 Mission Street, Sixth Floor
San Francisco, CA 94103

Dear Director Hui:

The Building Inspection Commission (BIC) is committed to providing the public with the highest levels of accountability, transparency and efficiency, and in continuing to ensure that the San Francisco Department of Building Inspection (DBI) remains a national leader in setting and maintaining safe building standards.

This commitment was recently demonstrated in the 75-page report prepared by DBI staff, "The Department of Building Inspection's Tall Building Review Process," and presented to the BIC by Assistant Director Ron Tom at the March 15, 2017, meeting. The March report addressed questions received by DBI from members of the Commission and included in my December 6, 2016, letter. Though thorough in replying to the BIC, it is evident from the report that the regulations and procedures that guide DBI are continually evolving and therefore require frequent communications to better monitor ongoing progress towards their implementation and evaluation of their effectiveness.

In this Strategic Initiatives Letter (SIL), the BIC continues the positive momentum from the March report and presentation and looks to add to the goals and objectives of the Department's Fiscal Year 2015-16/2016-17 Strategic Plan, approved September 1, 2015.

The Commission requests the Department provide regular reports on the following topics:

1. **Best practices approach** for Tall Building review, including the peer review panel selection and participant qualification requirements;
2. Establishing an **interim policy** that monitors Tall Buildings constructed of concrete, including possible local requirements that foundations go to bedrock and/or a more rigorous geotechnical review process for projects in Class F, or softest, soils and involving at least two geotechnical engineers;
3. **Technology Improvement Implementation Plan**. Progress report on building a new Enterprise-class system to replace the older Oracle system (Accela Permit and Project tracking system) ;
4. **Ongoing Digitalization and Indexation** of DBI records—a conversion program that is now under way—as well as updates to record retention requirements and practices;

5. Progress updates on the **new DBI headquarters** at 1500 Mission Street in terms of achieving the Mayor's goal of an approved One-Stop permit reviews and issuance.

As noted by the Commission in its discussion following the March presentation of the report, these are areas requiring greater depth than could be fully summarized in the 75-page report and include important policy changes that are already in progress. Furthermore, in initiating several of these policies, including being one of the first departments nationally to adopt a codified definition and rigorous building safety review process for tall buildings, DBI has demonstrated itself to be a leader among its peers. In dedicating separate staff reports to each of the critical topics listed above, DBI will be providing the BIC and broader public with periodically updated information on the crucial practices and regulations enforced by DBI to ensure that tall buildings in San Francisco continue to be as safe as modern engineering permits.

Thank you for your consideration.

Sincerely,

Angus McCarthy
President, Building Inspection Commission

Board of Supervisors
City and County of San Francisco

Government Audit and Oversight Committee

February 2, 2017 ◆ 9:30 a.m.

Prepare to affirm this oath by raising your right hand, and affirm by saying "I do."

"You do solemnly state that the testimony you may give in the hearing now pending before this Government Audit and Oversight Committee, of the San Francisco Board of Supervisors in the City and County of San Francisco, shall be the truth, the whole truth, and nothing but the truth - so help you God."

When recalling the witness:

"Mr. Mohele, I will remind you, you have been previously placed under oath and remain so. Please take the podium, and re-state your name for the record.

Civil Procedure Oath to Witness
(Chapter Law 688, Statutes of 2000)
Dated: February 2, 2017

JPM 1

160975
SUBMITTED BY
JACK MOEHLE
02/02/2017
PG 1/6

MP

MILLENNIUM PARTNERS
735 Market Street, 3rd Floor
San Francisco, CA 94103
415.537.3890 Tel
415.537.3895 Fax
SPatterson@MillenniumPtrs.com

FACSIMILE TRANSMITTAL SHEET

DATE:	July 12, 2004
TO:	Jack. P. Moehle
FAX NO.:	925-949-7595/ 415-398-9834
FROM:	Steve Patterson SP.
RE:	**Contract Acceptance**
TOTAL PAGE(S)	6

☐URGENT ☐FOR YOUR INFORMATION ☐FOR REVIEW / COMMENT
☒PLEASE HANDLE ☐PER YOUR REQUEST ☐FOR YOUR FILES

NOTES/COMMENTS:

See attached.

MP

MILLENNIUM PARTNERS
735 Market Street, 3rd Floor
San Francisco, CA 94103
415.537.3890 Tel
415.537.3895 Fax

July 12, 2004

Jack P. Moehle
Consulting Civil Engineer
3444 Echo Springs Road
Lafayette, CA 94549

RE: 301 Mission Street Project
Structural Design Review Services

Dear Jack:

I am pleased to accept your proposal to provide Structural Design Review Services for the above mentioned project. As you are aware De-Simone Consulting Engineers are currently designing the concrete structure for the project. Please work directly with them to analyze the structural system they have proposed for this residential high rise tower and keep me informed as your review progresses.

The timing of your review is very important to our design schedule. Should you recommend changes to the structural system, we will need to know as soon as possible so that design development drawings can progress. I would particularly like to know your views on the proposed traditional shear wall core and frame system vs performance design.

Also for your information, I have Webcor Builders on board as my preconstruction contractor, currently working through estimates and constructability issues.

Please call me if you have any questions.

Sincerely,

Steve Patterson

Jack P. Moehle
Consulting Civil Engineer

3444 Echo Springs Road
Lafayette, CA 94549
Ph. (925) 937-5225
FAX (925) 949-7595

12 July 2004

Mr. Steve Patterson, Owner's Representative
Millennium Partners
735 Market Street, 3rd Floor
San Francisco, CA 94103
SPatterson@millenniumptrs.com
Office: (415) 537-3890
Mobile: (415) 902-0523
Fax: (415) 537-3895

RE: Proposed scope of structural design review services
301 Mission Street Project in San Francisco, California
DeSimone Project # 4069B

Dear Mr. Patterson:

At the request of Stephen DeSimone and Ron Polivka of DeSimone, I am pleased to submit my proposal for structural design review services for the above referenced project.

1) <u>DESCRIPTION OF THE PROJECT</u>

301 Mission Street Project is a proposed residential high-rise tower with basement, located at 301 Mission Street in San Francisco, California. The current design shows 60 floors, totalling approximately 600 feet above grade, with several basement levels extending below grade.

The proposed structural system uses cast-in-place reinforced concrete construction. A dual system of cast-in-place concrete shear wall core and frame with mild (nonprestressed) reinforcement resists gravity and lateral loads. Floor slabs may comprise cast-in-place mild or post-tensioned concrete floor slabs. The foundation currently is contemplated to be a concrete mat.

The proposed design is anticipated to satisfy requirements of the applicable Building Code. Special considerations include the relatively tall height in comparison with other similar projects in regions of high seismicity in the US. Some review and discussion of the applicability of Building Code provisions may be required in consideration of the building height, as outlined in the scope of services, below.

2) <u>SCOPE OF SERVICES</u>

a) Review analysis & design assumptions and results. Provide technical suggestions. This review may include but not necessarily be limited to

JM.

i) Design methodology and sequence;

ii) Earthquake design basis, including the applicability of design basis earthquake and/or maximum considered earthquake design levels; associated design response spectra and ground motions;

iii) Modeling and analysis methods;

iv) Building strength, stiffness and ductility; proposed R value and stiffness assumptions;

v) Concrete, rebar, and other material acceptance values (e.g., stress and strain limits);

vi) Allowable displacements/drifts and procedures for their determination;

vii) Review analysis results to check reasonableness and consistency with design assumptions and detailing provisions.

b) Review selected structural drawings, with particular attention placed to detailing practices. Provide technical comments and suggestions, including

i) Early identification of special problem areas, considering constructability and force and ductility demands;

ii) Typical reinforcement, confinement and splice details for consistency with design criteria, special details to provide increased toughness for unanticipated loadings and to ensure vertical load integrity;

iii) Quality control / Quality assurance in drawing notes and specifications. Special inspection provisions in drawing notes and specifications.

c) Participate in occasional technical discussion meetings with either members of the DeSimone staff or with the 301 Design Team.

d) Attend as-required meetings with City Officials and other Peer Review Panels.

e) Provide technical assistance in responding to comments from City and Peer Review Panels.

3) <u>CLIENT RESPONSIBILITY</u>

a) Provide all applicable drawings, specifications, and other data, including subsurface and foundation data, geotechnical engineers report & foundation design recommendations, and drawings prepared by the Engineer of Record.

b) Provide copies of all pertinent letters and memoranda pertaining to design of the various disciplines and Owner's requirements.

4) <u>FEES</u>

a) <u>Basic Fee</u>

i) The above-mentioned scope of services will be completed on a timecard basis.

ii) The hourly rate for engineering effort of Jack P. Moehle will be $190 per hour.

iii) Based on the above scope of work, it is estimated that the the effort by Jack P. Moehle can be completed within $25,000. Client will be informed of progress relative to this estimate, and total billing for services will not exceed the estimate without Client's prior approval.

iv) Fees are payable within 60 days of date of invoice.

b) <u>Expenses</u>

i) The following expenses are excluded from, and in addition to, the basic fee and shall be billed at cost:

AK

(1) Travel and out-of-town living and related expenses, long distance telephone calls, fax, courier service and express mail.

5) STANDARD CONDITIONS

The Standard Terms and Conditions for work done by Jack Moehle, which are attached hereto, are made part of the Agreement.

I look forward to your response to my proposal.

Very truly yours,

Jack Moehle

Jack P. Moehle, P.E., Ph.D.

ACCEPTED AND AGREED TO:
Millennium Partners

BY: Steve Patterson

DATE: S Patt 7/12/04

TERMS AND CONDITIONS

Consultant and Client will be jointly referred to as "we," or "us."

Services: Consultant will provide the Professional Services contemplated herein in accordance with the standards of competent professionals providing similar services under similar conditions. Consultant does not warrant or guarantee the Services.

Fess for Professional Services: Unless otherwise agreed in writing, Services will be billed on a time-and-materials basis using Consultant's current schedule of fees and costs. Limitations on the amount to be billed are estimates only, and are not an agreement by Consultant that the Services will be completed for the estimated amount. All time, including travel hours, spent on the project by professional, technical, and clerical personnel will be billed.

Reimbursable Expenses: Travel expenses and accommodations necessary for execution of the project including business class air fares, rental vehicles, and highway mileage in company or personal vehicles at going rates are billed directly. Other expenses directly attributable to the project are billed at cost, including telephone and fax charges, postage and freight, printing and reproduction, and computer fees.

Payment: Client will pay Consultant's invoices no later than sixty (60) days after the invoice date. Client will also pay a late payment charge at the rate of 1.5% per month after that date. At Consultant's option, Consultant may suspend or terminate this Agreement if payments are not made when due.

Site Access: Unless the Scope of Services described in this Agreement states otherwise, Client will obtain all necessary authorizations and permits to allow Consultant to have access to the site for the purpose of providing the Services contemplated herein.

Limitation of Liability. Consultant's liability, and the liability of its employees and/or subcontractors, to Client for damages, including cost of defense, arising from Services is limited to an aggregate $25,000 or its fees received under this Agreement, whichever is less. Neither Client nor Consultant will be liable for consequential damages incurred by either party.

Mediation: Prior to any litigation, arbitration, or other proceeding, both parties will attempt to mediate any dispute between them. The American Arbitration Association will conduct the mediation, unless otherwise agreed. Consultant and Client will equally share all fees and costs of the mediation.

Termination: Either Client or Consultant may terminate this Agreement for convenience by giving fourteen (14) days written notice. Either party may terminate this Agreement for cause by giving seven (7) days written notice. If this Agreement is terminated by Client, Client shall pay Consultant, in addition to any other compensation due under this Agreement, any amount incurred by Consultant in performing Services, and in orderly terminating Services.

Full and Final Agreement: This Agreement is the full and final agreement between Client and Consultant, supersedes any prior agreements, and may not be modified except by a writing executed by both parties.

AH.

Jack P. Moehle

160975
SUBMITTED BY JACK WOEHLE
07/07/2017
PG 1/14

DESIMONE

Design Criteria, Analysis Methodology, and Peer Review Process

301 Mission Street
San Francisco, CA

Prepared for:
San Francisco Department of Building Inspection
1660 Mission Street 2nd Floor
San Francisco, CA 94103

Prepared by:
DeSimone Consulting Engineers, PLLC
10 United Nations Plaza, Suite 410
San Francisco, CA 94102

DeSimone Project #4069
March 22, 2005

Table of Contents

Project Summary

The 301 Mission Street project consists of two separate structures located on the same site. The western structure (tower) is a 58-story, 605-foot tall building over a single subgrade level. The eastern structure (mid-rise) is a 12-story, 128-foot tall building over five subgrade levels. The two structures are connected at the B1, Ground, 2nd, and 3rd Floors. All portions of the project are being designed in conformance with the 2001 San Francisco Building Code.

Gravity Systems

Both structures are to be of cast-in-place concrete construction. The upper floor levels of both structures will utilize post-tensioning for the floor slabs.

Lateral System – Tower

The tower structure relies on a dual lateral system comprised of concrete shear walls with outriggers, and concrete special moment-resisting frames. This system is "regular" as defined by UBC 1629.5.2. For this reason the forces calculated by UBC 1630.2 have been reduced by 80% as allowed by 1631.5.4.2.

Two drift checks have been performed for the tower:

1. Per UBC. Forces scaled to base shear neglecting both equations (30-6) and (30-7), and including 5% accidental mass eccentricity.

2. Per 2003 NEHRP. Forces scaled to base shear including equation (30-6), but neglecting torsional effects. (Drifts are taken at center of mass). This second approach is widely held as the appropriate check for tall buildings with long periods, and was recommended for use on this project by Professor Jack Moehle of U.C. Berkeley.

Lateral forces in the tower are to be transmitted by the core walls and the columns all the way to the pile cap at B1. The ground floor slab is not required to transfer forces to the perimeter basement walls. This will allow the ground floor slab to be provided with numerous steps, depressions, and openings that are typically needed to accommodate architectural requirements.

Lateral System – Mid-Rise

The mid-rise building relies solely on a concrete shear wall system. Due to the eccentricity of the shear walls relative to the center of mass of the building, the mid-rise building exhibits a slight torsional irregularity. For this reason the base shear cannot be reduced by 80% in accordance with 1631.5.4.2.

The core walls of the mid-rise building, unlike those of the tower, will have the shear shifted to the perimeter basement walls through the ground floor diaphragm.

Materials

Concrete strengths in the tower walls and frames will vary between 7 and 10 ksi. Strengths in the mid-rise walls will be 7 to 8 ksi. All floor slabs will be 5 ksi.

The shear walls in both buildings, as well as the moment frames in the tower, will use Grade 75 reinforcing for bars larger than #8's. All shear wall confinement steel will also be Grade 75 for areas where the concrete strength is 8 ksi and higher.

Foundations

The tower foundation will consists of a 10-foot thick pile cap supported by approximately 950 14-inch square, pre-cast concrete piles. The bottom of the pile cap will be approximately 25' below the existing grade. The initial vertical pile displacement due to slippage required to fully engage the pile is expected to be approximately 1" by the time of project construction completion. Additional long-term pile settlement due to compression of the underlying clay layers is expected to be as much as 5". As the piles are only located directly below the tower footprint, this settlement is expected to occur uniformly over the tower foundation area.

The mid-rise structure will rest on a mat foundation that varies between 6 feet and 8 feet in thickness. The bottom of this excavation will be approximately 63 feet below the existing grade. Tie-downs are required to resist hydrostatic uplift pressures under the portion of the deep excavation that is not directly below the mid-rise building, i.e., the area between the mid-rise and the tower.

Building Separation

As the foundations and lateral systems of the two buildings are completely separate, a joint will be placed between them at the B1, Ground, 2nd, and 3rd Floors. "Hinge slabs" will be detailed to accommodate differential settlement, as well as expected seismic displacements, between the two structures.

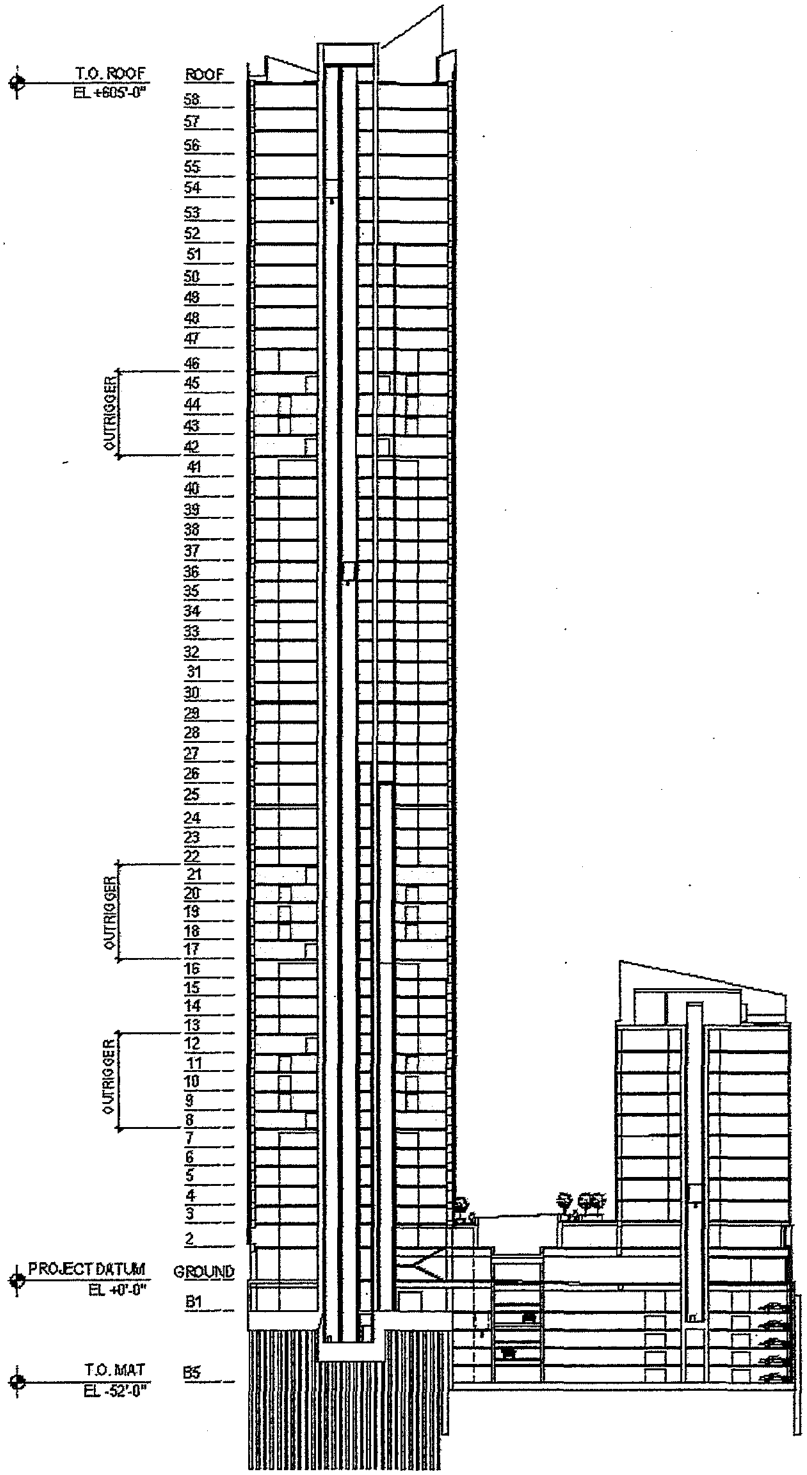


Figure 1. Building Section

Lateral Forces Summary

Tower	220,000
Mid-rise, above grade	47,341
Mid-rise, below grade	37,173

Table 1. Building Weight, kips

	Seismic Forces	Seismic Drift	Wind
Tower			
N-S	8,514	7,040	1,300
E-W			2,000
Midrise, above grade			
N-S	6,514	6,514	750
E-W	5,922	4,100	450

Table 2. Summary of Lateral Forces, kips

Table 3. Tower Base Shear

		N-S		E-W		
Basic Structural System:	R=	**8.5**		**8.5**		Table 16.N
Height of Building	h_n=	**605**	ft	**605**	ft	
Seismic Zone	z=	**0.40**		**0.40**		Table 16.I
Near-Source Factor	N_a=	**1.00**		**1.00**		Table 16-S
Near-Source Factor	N_v=	**1.064**		**1.064**		Table 16-T
Soil Profile Type		**SD**		**SD**		
Seismic Coefficients	Ca=	**0.44**	$*N_a$	**0.44**	$*N_a$	Table 16.Q
	=	**0.440**		**0.440**		
	C_v=	**0.64**	$*N_v$	**0.64**	$*N_v$	Table 16.R
	=	**0.681**		**0.681**		
	C_t=	**0.020**		**0.020**		
Importance Factor	I=	**1.00**		**1.00**		Table 16-K
Calculate the period of the building using Method A:						
$T_A = C_t(h_n)^{3/4}$	T_A=	**2.44**	sec	**2.44**	sec	
Building period from ETABS analysis:						
	T_B=	**5.47**		**5.84**		
Maximum period for determining forces:						
$T_{MAX} = 1.3 \times T_A$	T_{MAX}=	**3.17**		**3.17**		
Building period to be used for forces:						
	T=	**3.17**		**3.17**		
Calculate the design base shear, V, to use for forces:						
V = $(C_v * I / (R T))$ W	=	0.0253	*W	0.0253	*W	Eqn 30-4
V <= $(2.5 C_a I W) / R$	=	0.1294	*W	0.1294	*W	Eqn 30-5
V >= $0.11 C_a I W$	=	0.0484	*W	0.0484	*W	Eqn 30-6
V >= $((0.8\ Z\ N_v I) / R)$ W	=	0.0401	*W	0.0401	*W	Eqn 30-7
V	=	0.0484	*W	0.0484	*W	
Reduce the above by 80% since building is regular:						
V	**=**	**0.0387**	***W**	**0.0387**	***W**	
Calculate the design base shear, V, to use for displacments:						
	T_B=	**5.47**		**5.84**		
V = $(C_v * I / (R T))$ W	=	0.0146	*W	0.0137	*W	Eqn 30-4
V <= $(2.5 C_a I W) / R$	=	0.1294	*W	0.1294	*W	Eqn 30-5
V >= $0.11 C_a I W$	=	N/A	*W	N/A	*W	Eqn 30-6
V >= $((0.8\ Z\ N_v I) / R)$ W	=	0.0401	*W	0.0401	*W	Eqn 30-7
V	=	0.0401	*W	0.0401	*W	
Reduce the above by 80% since building is regular:						
V	**=**	**0.0320**	***W**	**0.0320**	***W**	

301 Mission - Tower Design Spectra

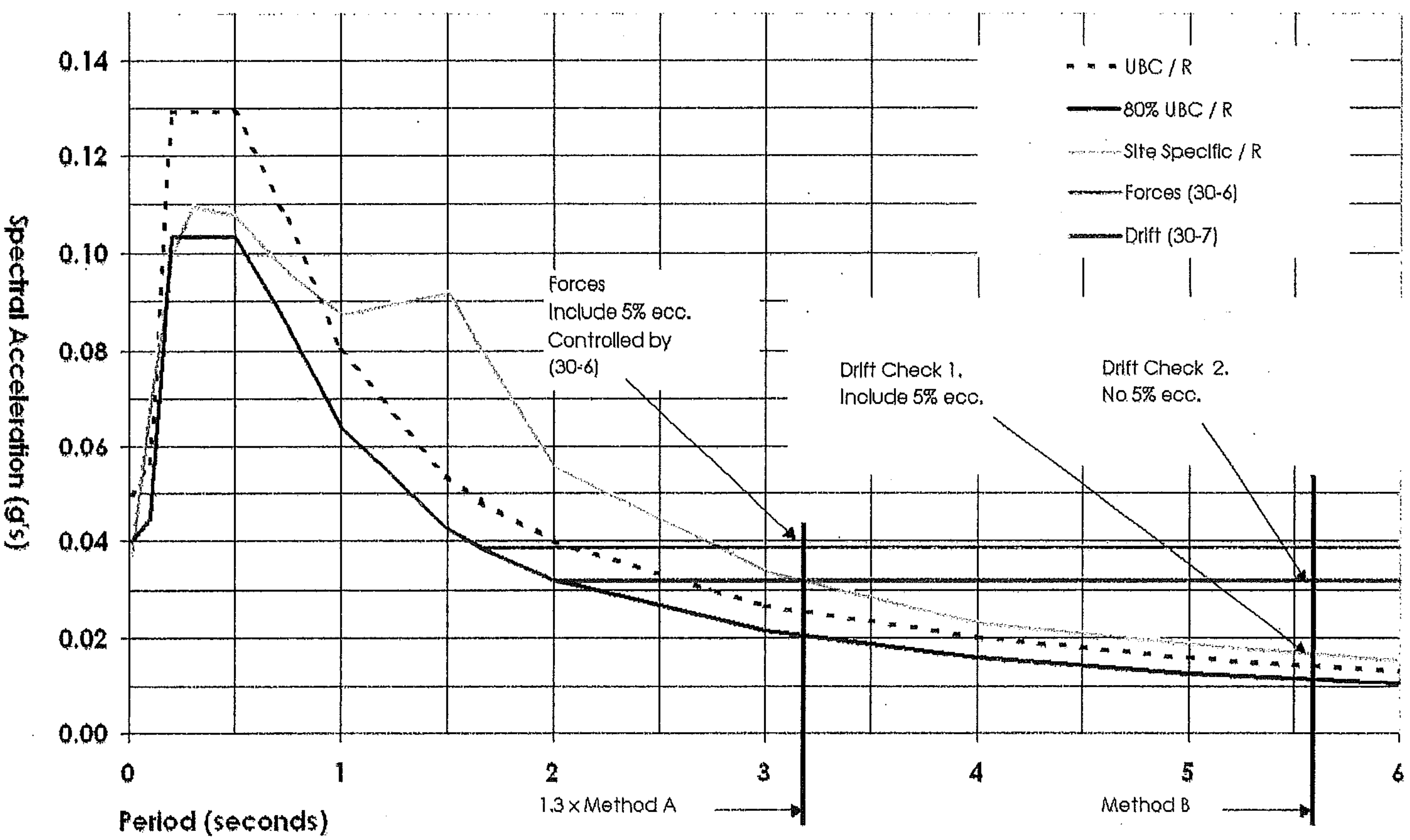


Figure 2. Tower Design Spectra

Table 4. Mid-Rise Base Shear

		N-S		E-W		
Basic Structural System:	$R=$	**5.5**		**5.5**		Table 16.N
Height of Building	$h_n=$	**128**	ft	**128**	ft	
Seismic Zone	$Z=$	**0.40**		**0.40**		Table 16.I
Near-Source Factor	$N_a=$	**1.00**		**1.00**		Table 16-S
Near-Source Factor	$N_v=$	**1.064**		**1.064**		Table 16-T
Soil Profile Type		**SD**		**SD**		
Seismic Coefficients	$C_a=$	**0.44**	$*N_a$	**0.44**	$*N_a$	Table 16.Q
	=	**0.440**		**0.440**		
	$C_v=$	**0.64**	$*N_v$	**0.64**	$*N_v$	Table 16.R
	=	**0.681**		**0.681**		
	$C_t=$	**0.020**		**0.020**		
Importance Factor	$I=$	**1.00**		**1.00**		Table 16-K
Calculate the period of the building using Method A:						
$T_A=C_t(h_n)^{3/4}$	$T_A=$	**0.76**	sec	**0.76**	sec	
Building period from ETABS analysis:						
	$T_B=$	**1.43**		**0.90**		
Maximum period for determining forces:						
$T_{MAX} = 1.3 \times T_A$	$T_{MAX}=$	**0.99**		**0.99**		
Building period to be used for forces:						
	$T=$	**0.99**		**0.90**		

Calculate the design base shear, V, to use for forces:

			N-S		E-W		
V =	$(C_v * I / (R\ T))\ W$	=	0.1251	*W	0.1376	*W	Eqn 30-4
V <=	$(2.5\ C_a\ I\ W) / R$	=	0.2000	*W	0.2000	*W	Eqn 30-5
V >=	$0.11\ C_a\ I\ W$	=	0.0484	*W	0.0484	*W	Eqn 30-6
V >=	$((0.8\ Z\ N_v\ I) / R)\ W$	=	0.0619	*W	0.0619	*W	Eqn 30-7
	V	=	**0.1251**	*W	**0.1376**	*W	

Calculate the design base shear, V, to use for displacments:

$T_B=$ **1.43** (N-S), **0.90** (E-W)

			N-S		E-W		
V =	$(C_v * I / (R\ T))\ W$	=	0.0866	*W	0.1376	*W	Eqn 30-4
V <=	$(2.5\ C_a\ I\ W) / R$	=	0.2000	*W	0.2000	*W	Eqn 30-5
V >=	$0.11\ C_a\ I\ W$	=	N/A	*W	N/A	*W	Eqn 30-6
V >=	$((0.8\ Z\ N_v\ I) / R)\ W$	=	0.0619	*W	0.0619	*W	Eqn 30-7
	V	=	**0.0866**	*W	**0.1376**	*W	

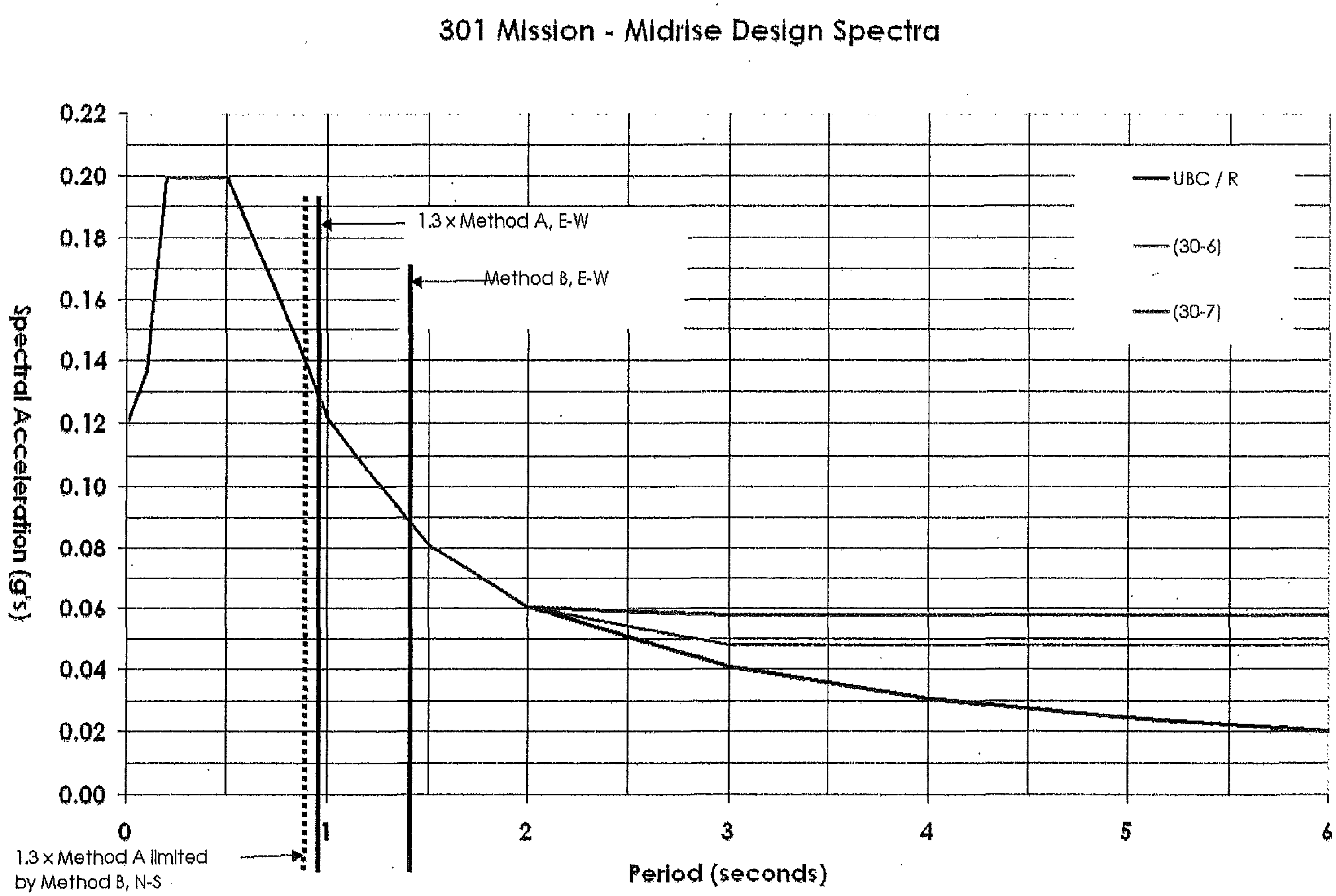


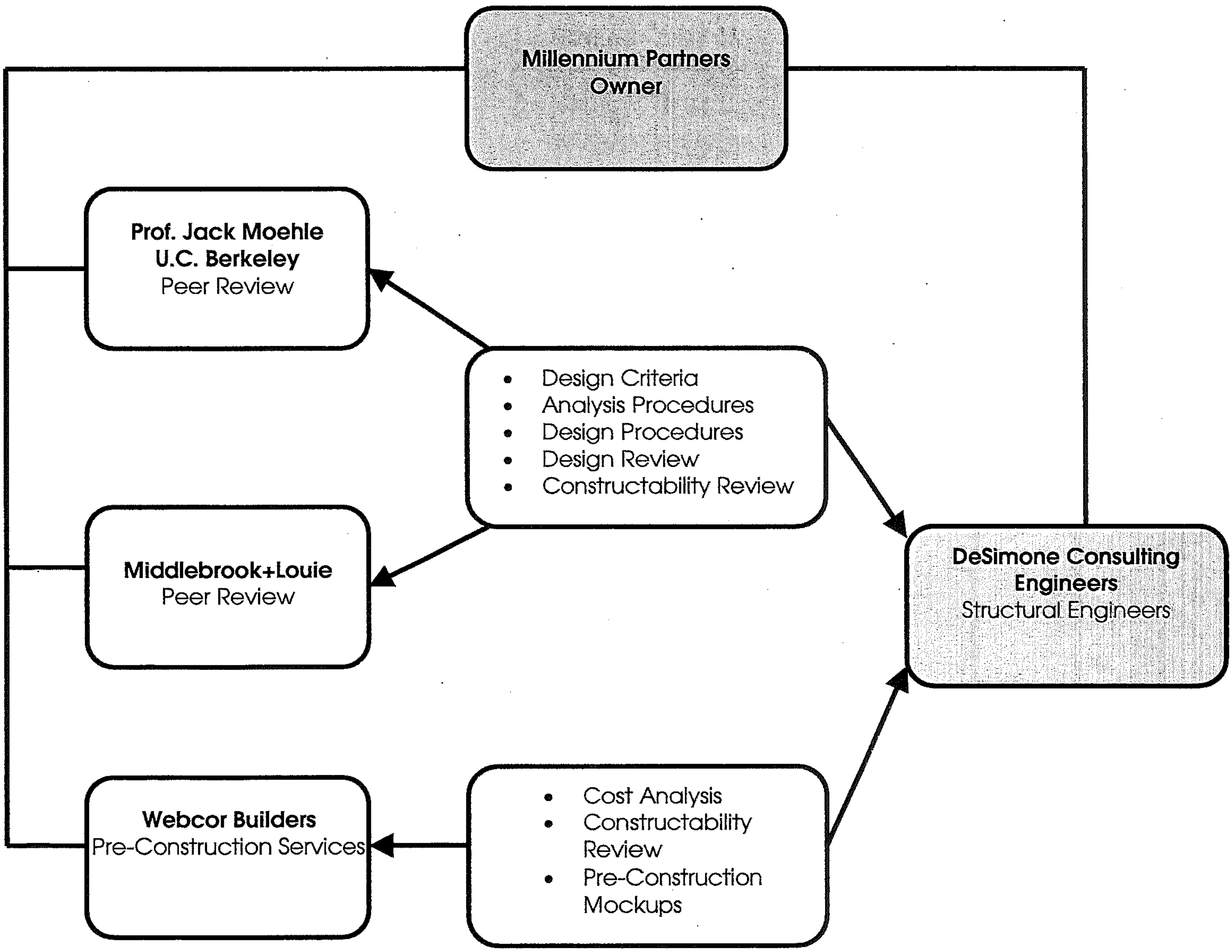
Figure 3. Mid-Rise Design Spectra

Structural Engineering and Peer Review Team

Webcor Builders have been involved in the design process since early in 2004 in order to provide cost estimating and constructability feedback and assistance to the project design team.

Additional technical expertise has been brought to the team by Professor Jack Moehle of U.C. Berkeley, who has been advising on the project since July of 2004.

Middlebrook + Louie of San Francisco are also performing an independent peer review of the entire project design.



Peer Review by
Professor Jack Moehle, U.C. Berkeley

Professor Moehle has consulted with DeSimone on the design of the tower portion of the project since July 2004. His contribution to the design, especially in the area of appropriate analysis assumptions, has been significant. The following summarizes the significant key points of our numerous discussions and meetings:

Regular vs. Irregular

The tower lateral system configuration, which incorporates the combination of concrete outrigger walls and columns acting together with the central core walls, represents a "regular" structure as defined by UBC 1629.5.2.

Force Level

So long as the structure can be classified as "regular", and since site specific design spectra have been provided by the Geotechnical Engineer, it is appropriate to use 80% of the base shear determined in accordance with UBC 1630.2. (See UBC 1631.5.4.2)

Due to the long period, the base shear used for determining all reinforcing, member sizes, etc. will be controlled by 80% of the value obtained with Eq. (30-6).

Drift Limits

UBC 1630.10.3 allows the designer to ignore Eq. (30-6) and Eq. (30-7) when checking building displacements and inter-story drifts. When checking drifts at this lower force level the designer must include 5% accidental torsion per 1630.6.

Professor Moehle recommended a second drift check be performed per the 2003 NEHRP provisions, whereby the higher base shear associated with Eq. (30-7) is used. At this force level the building drifts can be checked at the center of mass, thereby effectively ignoring any contribution to drift resulting from the 5% accidental torsion.

Effective Stiffness

The same effective concrete stiffness modifiers should be used for checking both drifts and forces.

The axial modifiers used for the outrigger columns, as well as those of the moment frames, are the average of tension-only (approx. 0.10) and compression-only (approx. 1.1) values. This averaging is appropriate for modal analysis, since directionality of forces cannot be controlled.

Bending modifiers for the core should range from 0.7 for cracked sections, to 0.9 or even 1.0 for locations where analysis shows sections are un-cracked for a MCE event.

A shear modifier of 0.4 is appropriate for all elements.

Rebar Strength

Use of Grade 75 rebar should be acceptable for use in the lateral system so long as ductility requirements similar to those of ASTM A706 can be obtained.

Concrete Modulus

Modulus of Elasticity of concrete should be computed based on the equation given by ACI 363 for high strength concrete. The equation given by ACI 318 is not appropriate for concrete in the 8 – 10 ksi range planned for use on this project.

Foundation design

A capacity design approach should be used for the pile cap. The capacities of the outrigger columns and the core walls should be used to determine pile cap reinforcing. These forces could be capped at Ω_o times the seismic forces obtained through modal analysis, if combined appropriately with gravity forces.

Shear wall design

The box-shaped area around each of the stairs at the north and south ends of the core will act as solid units and could be designed as such. Doing so would not require any length of wall beyond the code-required 0.25 Lw to be confined as a boundary element.

It is appropriate to consider horizontal wall reinforcing as able to simultaneously resist horizontal shear and provide confinement within boundary element regions.

Outrigger design

A capacity design approach should be used for the outriggers. The single-story height areas where the concrete outrigger walls connect to the columns should be designed as concrete link beams with diagonal reinforcing. The portions of the outriggers between the link beams and the core walls should then be designed for the capacities of the link beams to insure the ductility demand is concentrated in the link beams. The outrigger columns should also be designed for the capacities of the link beams.

Steel Link Beams

The steel beams used to link the wall segments running north-south in the core area should be designed as structural steel eccentrically braced frame (EBF) links. No penetrations should be allowed in these beams.

The use of built-up shapes from plate material should be acceptable so long as the webs are welded to the flanges with complete penetration welds.

Peer Review by
Middlebrook + Louie, San Francisco, CA

Middlebrook + Louie of San Francisco are presently engaged in a peer review of the project. The following timeline summarizes the course of related events to date.

- January 24, 2005. M+L was introduced to the project by attending the weekly structural review meeting at DeSimone's office with Webcor and Millenium Partners in attendance.
- January 31, 2005. M+L and DeSimone met independently at DeSimone's office to discuss the basic design criteria and the Schematic Design drawings issued on November 3, 2004.
- February 28, 2005. M+L issued their initial peer review comments.
- March 14, 2005. M+L observed first concrete mockup completed by Webcor. DeSimone, Webcor, and Millennium Partners in attendance.
- March 18, 2005. DeSimone responded to M+L's February 28 comments.

1 Woy TD

JPM 3

REVIEW LETTERS

SUBMITTED BY JACK MOEHLE
07/07/2017

JPM 3/9

MIDDLEBROOK + LOUIE
Structural Engineers

One Bush Street
Suite 250
San Francisco, CA 94104
415.477.9000
Fax 415.477.9099
email mlbox@Mplusl.com

Jason J.C. Louie, S.E.
Ronald F. Middlebrook, S.E.
Hardip S. Pannu, S.E.
Robert D. McCartney, S.E.
Jeppe Iversen, B.R.ING, S.E.
Navin R. Amin, S.E.

July 20, 2005

Hanson Tom
City and County of San Francisco
1660 Mission Street, 2nd Floor
San Francisco, CA 94103

RE: 301 Mission Street—Site Permit Only
San Francisco, California
M + L Job #6977

I/We have reviewed the design criteria prepared by DeSimone Consulting Engineers for the 301 Mission Street project dated July 20, 2005 for the Site Permit Submittal Only and find it to be acceptable. The Structural Peer Review is ongoing at this time and more information will become part of the Design Criteria.

MIDDLEBROOK + LOUIE

Hardip S. Pannu, S.E.
Principal

HSP/rhc

HPannu@MplusL.com
www.MplusL.com

(H:\ADMIN\Jobs\6977\Corres\07... Tom.doc)

Jack P. Moehle
Consulting Civil Engineer

3444 Echo Springs Road
Lafayette, CA 94549
Ph. (925) 937-5225
FAX (925) 937-5225

25 July 2005

City and County of San Francisco
1660 Mission Street
2nd Floor
San Francisco, CA 94103

Attn: Hanson Tom
Re: 301 Mission Street – Structural Design Criteria

Mr. Tom,

I have reviewed the design criteria prepared by DeSimone Consulting Engineers for the 301 Mission Street project dated July 20, 2005 and find it acceptable for use on the project.

Respectfully,

Jack Moehle

Jack P. Moehle, Ph.D., PE

APPROVED
Dept. of Building
MAR
DEPT.

JPM 5

MIDDLEBROOK + LOUIE
Structural Engineers

One Bush Street
Suite [illegible]
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Jason J.C. Louie, S.E.
Ronald F. Middlebrook, S.E.
Hardip S. Pannu, S.E.
Robert D. [illegible], S.E.
[illegible], EUR ING, S.E.
[illegible], S.E.

1

August 30, 2005
Revised Jan 24th, 2006

Hanson Tom
City and County of San Francisco
1660 Mission Street, 2nd Floor
San Francisco, CA 94103

RE: 301 Mission Street – Foundation Permit Only
San Francisco, California
M + L Job #6977

1

We have completed the peer review of the foundation system prepared by DeSimone Consulting Engineers for the 301 Mission Street project dated May 24, 2005 for the Foundation Permit Submittal Only including all the structural drawings listed on sheet S0.01 with following assumptions and exceptions:

The design of the superstructure has not been completed at this time. Our understanding from meetings with DeSimone is that the superstructure's lateral system will be designed to comply with the following:

- The outriggers connecting to the central shear core of the tower contains links connecting to the Special Moment Resisting Frame columns. These links will be designed to remain elastic under the code-prescribed Gravity, Wind and Seismic load combinations; including loads caused by column-shortening effects in tall buildings.

- The Special Moment Resisting Frame Columns will be designed to remain elastic under gravity plus loads caused by the yielding of outrigger link. In order to ensure this behavior, the capacities of the outrigger links will be calculated and increased by an over-strength factor. The resulting forces were used as the seismic loads.

- The pile cap under the tower is designed to remain elastic when subjected to the capacities of the Special Moment Resisting Frame/outrigger columns, as well as the expected maximum moment at the base of the shear wall core.

- We were not asked to review the effects of the Transbay Terminal project on this project.

The Structural Peer Review is ongoing at this time for the superstructure portion. It is our understanding that the scope of Middlebrook + Louie's (M + L) review is to provide our professional opinions on the design based on the Building Code design provisions. We also understand that M + L's review is limited to reviewing the structural system concepts and general design approaches for compliance with requirements of the building code. It is not intended for M + L to verify the validity and/or correctness of any particular numerical values in the design calculations.

MIDDLEBROOK + LOUIE

Hardip S. Pannu, S.E.
Principal

HSP/mc
HPANNU@MPLUSL.COM
www.Mplusl.com

Jack P. Moehle
Consulting Civil Engineer

1

29 January 2006

Hanson Tom
City and County of San Francisco
1660 Mission Street
2nd Floor
San Francisco, CA 94103

Attn: Hanson Tom
Re: 301 Mission Street – Foundation Permit

Mr. Tom,

I have completed my peer review of the foundation system supporting materials prepared by DeSimone Consulting Engineers for the 301 Mission Street Project, including:

1

- the foundation permit calculations and drawings (dated 24 May 2005), including the 80 drawings listed on S0-010.
- ~~supplemental written clarifications (dated 1 September 2005).~~

On the basis of my review, it is my opinion that the foundation design is compliant with the principles and requirements of the building code, and that a foundation permit can be issued for this project.

1

This review is for the purpose of the foundation Permit Submittal only. The structural peer review is ongoing at this time. It is my understanding that the scope of my review is to provide my professional opinion on the design based on the building code provisions, for the sole purpose of advising you in your capacity as the responsible building official. I also understand that my review is limited to the structural system concepts and general design approaches for compliance with the building code. It is not intended that my review verify any particular numerical values in the design calculations. Furthermore, this review in no way accepts responsibility for the building design or the issuance of permits, which remain responsibilities of the Engineer of Record and the San Francisco Department of Building Inspection, respectively.

Respectfully,

Jack Moehle

Jack P. Moehle, Ph.D., PE

Treadwell&Rollo

21 June 2005
Project 3157.02

Mr. Gary Ho
Department of Building Inspection
City and County of San Francisco
1660 Mission Street, 2nd Floor
San Francisco, California 94103-2414

Subject: Geotechnical Review of Structural Drawings (Application #2002/1023/9696)
301 Mission Street
San Francisco, California

Dear Mr. Ho:

This letter presents the results of a review by Treadwell & Rollo, Inc. of the geotechnical aspects of the structural drawings for the 301 Mission Street project in San Francisco. The architect and structural engineers for the project are Gary E. Handel Architects, Inc. and DeSimone Consulting Engineers, respectively. We previously performed a geotechnical investigation for the project and presented our conclusions and recommendations in a report titled "Geotechnical Investigation, 301 Mission Street, San Francisco, California" dated 13 January 2005.

We reviewed the geotechnical aspects of the following documents:

- Structural Drawings (Foundation Permit Set), Sheets S0.0.10, S0.0.20, S2-0B5.11, S2-0B1.11, S3-1.01, S3-1.11, S3-1.12, S3-1.13, S3-1.14, S3-1.15, S3-3.12 and S3-3.13, titled "301 Mission Street, Mission Street Development Partners LLC" prepared by DeSimone Consulting Engineers, dated 24 May 2005.

On the basis of our review, we conclude the geotechnical aspects of the design are in general conformance with the intent of the geotechnical recommendations presented in our 13 January 2005 report.

We trust this letter provides the information requested. If you have any questions, please call.

Sincerely yours,
TREADWELL & ROLLO, INC.

Christopher A. Ridley
Civil Engineer

REGISTERED PROFESSIONAL ENGINEER CHRISTOPHER A. RIDLEY No. C 61373 Exp. 6/30/07 CIVIL STATE OF CALIFORNIA

Ramin Golesorkhi
Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER RAMIN GOLESORKHI GE 2351 Exp. 6/30/06 GEOTECHNICAL STATE OF CALIFORNIA

31570201.CAR

cc: Mr. Steve Patterson – Millennium Partners
Mr. Gerald Sams – Gary E. Handel Architects
Mr. Derrick Roorda – DeSimone Consulting Engineers

Treadwell & Rollo, Inc. Environmental & Geotechnical Consultants
555 Montgomery Street, Suite 1300, San Francisco, CA 94111
Telephone (415) 955-9040 Facsimile (415) 955-9041

MIDDLEBROOK + LOUIE
Structural Engineers

-S0-0.16.dwg [Permit] January 31, 2008 - 4:03PM

Jack P. Moehle
Consulting Civil Engineer

3444 Echo Springs Road
Lafayette, CA 94549
Ph. (925) 937-5225
FAX (925) 949-7595

12 June 2006

Hanson Tom
City and County of San Francisco
1660 Mission Street
2nd Floor
San Francisco, CA 94103

RE: Independent Peer Review - Final
301 Mission Street Project in San Francisco, California

Dear Mr. Tom:

This letter summarizes the structural peer review conducted by the undersigned for the proposed 301 Mission Street project. The review is limited to the highrise tower and that portion of the substructure that is integrally attached to and supporting it; the review excludes the midrise tower. This peer review was conducted by the undersigned in parallel with independent review by engineers from Middlebrook + Louie. This letter documents only the review provided by the undersigned.

As noted on the project construction documents, dated 26 May 2006, this project consists of two separate structures located on the same site. This review is limited to the western structure (tower), which is a 58-story, 605-foot tall building over one sub-grade level. The eastern structure (mid-rise) is a 12-story, 128-foot tall building over five sub-grade levels. The two buildings are completely separate structurally, being connected through joints at the B1, Ground, 2nd, and 3rd floors. The structures are to be of cast-in-place concrete construction. The floor slabs above grade level will be post-tensioned, whereas the lower slabs will use only mild reinforcement. The tower has a dual system comprising concrete shear walls with outriggers, and concrete special moment-resisting frames. The tower foundation consists of a 10-foot thick cap supported by precast concrete piles.

The basic criterion of the review is that it be in accordance with the requirements of the 2001 San Francisco Building Code. The specific elements of the review have included:

1. The structural design concepts proposed by the Engineering of Record and their suitability for this building considering the building code requirements, the building site, and principles of mechanics;
2. The structural design criteria, including appropriate prescriptive criteria of the building code and supplementary design procedures to account for unique components of the lateral force resisting system;
3. The design procedures and verification procedures to meet the code requirements;
4. The project geotechnical report, as a basis for design of foundations and assessing seismic hazards;
5. The architectural design and layout of the building, to develop an understanding of the building configuration and loading;
6. The analytical models used to evaluate compliance with the building code provisions;
7. Summary calculations of dynamic response indicating compliance with the building code provisions;

8. Summary calculations of structural capacity of critical elements including piles, mat foundation, walls, columns, beams, beam-column joints, link beams, and outrigger beams;
9. Detailing of critical elements of the structural system to ensure compliance with the criteria, compatibility with anticipated behavior modes, and constructability;
10. The structural drawings, to confirm that design and modeling assumptions are consistent with the overall structural configuration, design, and detailing;
11. The project specifications, to assure that critical aspects of the design and construction are appropriately portrayed.

In addition to the above, I relied on my own professional judgment derived through many years of professional practice, research, and participation in the development of design codes and standards.

My review was initiated in July of 2004, at which time Millennium Partners (the owners) hired me to review design work and advise them of its progress. Formal peer review work was initiated on 15 July 2005, at which time the San Francisco Department of Building Inspection requested that I act as an independent peer reviewer. In the period since then, I have reviewed several submittals of criteria, calculations, drawings, specifications, and supporting reports submitted by the Engineer of Record. I have met with the design team and with reviewers from Middlebrook + Louie several times to clarify questions, present comments, and reach resolution on the various technical issues that arose in the course of our review. The review process is documented in the document "Peer Review, Volumes 1 and 2," dated 31 May 2006, prepared by DeSimone Consulting Engineers.

I have completed my independent peer review of the above-mentioned project, including the following supporting materials prepared by DeSimone Consulting Engineers for the 301 Mission Street Project:

- The foundation permit calculations and drawings (dated 24 May 2005), including the 80 drawings listed on S0-010;
- Supplemental written clarifications (dated 1 September 2005);
- The superstructure permit submittal (dated 18 November 2005);
- Various clarifications and modifications as documented in the "Peer Review, Volumes 1 and 2," dated 31 May 2006, prepared by DeSimone Consulting Engineers
- Addendums to the Foundation Permit drawings (Addendum-2 Structure, dated 11/18/2005; Addendum 2 Revisions, dated 03/06/2006; and Add2-Rev2 Peer Review, dated 05/26/2006). Review included the 103 sheets listed on the drawing index of sheet S0-0.10 dated 05/26/2006.

On the basis of my review as outlined above, it is my opinion that the tower design is compliant with the principles and requirements of the building code, and that a permit can be issued for its construction.

It is my understanding that the scope of my review is to provide my professional opinion on the design based on the building code provisions, for the sole purpose of advising you in your capacity as the responsible building official. I also understand that my review is limited to the structural system concepts and general design approaches for compliance with the building code. It is not intended that my review verify any particular numerical values in the design calculations. Furthermore, this review in no way accepts responsibility for the building design or the issuance of permits, which remain responsibilities of the Engineer of Record and the San Francisco Department of Building Inspection, respectively.

Respectfully,

Jack Moehle

Jack P. Moehle, Ph.D., PE

APPROVED
Dept. of Building Insp.
JUL - 7 2006
ACTING DIRECTOR
DEPT. OF BUILDING INSPECTION

2002.10/23/9695/S2

Jack P. Moehle
Consulting Civil Engineer

3444 Echo Springs Road
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FAX (925) 949-7595

29 June 2006

Mr. Hanson Tom
Department of Building Inspection
1660 Mission Street, 2nd Floor
San Francisco, CA 94103

Subject: Termination of Post Tensioning Tendons at Core Wall
301 Mission Project

Dear Mr. Tom:

As part of my independent peer review of the structural design of the 301 Mission project, I have investigated the performance of the detail proposed for termination of floor slab post-tensioning tendons that are interrupted by the building's central shear core. The proposed detail consists of terminating the tendons, with a tendon anchor, in the slab a short distance from the exterior face of the wall. The slab is then connected to the core wall using "form saver" dowel inserts within the wall to which dowels are attached, following removal of the wall forms.

In an unrelated project, I have worked with engineers at MKA to test a full-scale laboratory specimen having details closely resembling the subject details of the 301 Mission project. You previously have received a draft test report summarizing test details and the results. Of the two test specimens reported, the second incorporated improved details including use of equal amounts of dowel reinforcement in the top and bottom of the slab and placement of the tendon anchors approximately one slab depth from the face of the wall. It is my opinion that this test specimen performed well within the expectations of the building code.

The details of the aforementioned second test are representative of those proposed for use in the 301 Mission building. In my opinion, results of this test are applicable to the 301 Mission building. Therefore, based on the testing performed, and my understanding of the response of the 301 Mission building, I believe that termination of post tensioning tendons outside the core wall using form-saver type dowel bar inserts to provide gravity and shear attachment of the slab to the wall, as shown on the structural drawings for the 301 Mission building, is acceptable.

Please feel to contact me should you have any questions on this matter.

Respectfully,

Jack Moehle

Jack P. Moehle, Ph.D., PE

cc: Gary Ho
Nic Rodriguez
Derek Roorda
Steve Patterson
Hardip Pannu

APPROVED
Dept. of Building Insp.
JUL - 7 2006
ACTING DIRECTOR
DEPT. OF BUILDING INSPECTION

CITY AND COUNTY OF SAN FRANCISC
DEPARTMENT OF BUILDING INSPECTION

GAVIN NEWSOM, MAYOR
FRANK Y. CHIU, C.B.O., DIRECTOR

1 66975

JPM 10

SUBMITTED BY JACK MOEHLE
07/07/2017

July 27, 2004

80 Natoma Street

Jack P. Moehle
3444 Echo Springs Road
Lafayette, CA 94549

Leonard Joseph
The Thornton-Tomasetti Group
15892 South Pasadena Avenue
Tustin, CA 92780-5415

Shah Vahdani
Fugro West, Inc.
1000 Broadway, Suite 200
Oakland, CA 94662

Dear Gentlemen:

I wanted to let you know that we have retained Professor Juan Pestana of the UC Berkeley Geo Engineering faculty to do the type of evaluations that Professor Andrew Whittle was doing with respect to the 80 Natoma project. I am enclosing a copy of my letter to Professor Pestana that lists the items that I have sent to him. I would appreciated it if you would each review your files and see if you have any additional items that might be relevant to his work on this project.

I would also like to schedule a meeting with our DBI staff, the PRP members and Professor Pestana. I have cancelled the vacation I had planned, so I will be here until the end of September. I would appreciate hearing from each of you as to your schedules, so that we can set up a meeting at the earliest convenient date. You can call me at (415) 575-6893 or e-mail me at: ken.harrington@sfgov.org.

I look forward to hearing from you.

Very truly yours,

Kenneth J Harrington

Kenneth J. Harrington
Office of the Director

cc: Juan Pestana

Kenneth J. Harrington, Special Assistant to the Director
1660 Mission Street, Sixth Floor - San Francisco, CA 94103
Office (415) 575-6893 - FAX (415) 558-6225
www.sfgov.org/dbi - Ken.Harrington@sfgov.org

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF BUILDING INSPECTION

GAVIN NEWSOM, MAYOR
RANK Y. CHIU, C.B.O., DIRECTOR

July 26, 2004

80 Natoma Street

Professor Juan Pestana
104 Marsha Place
Lafayette, CA 94549

Dear Professor Pestana:

This is a follow-up to our recent conversation, wherein I told you that the Department of Building Inspection wants to retain you as a consultant on a development project at the above address.

You will recall, I informed you that the subject project is a 51-story concrete residential high rise that is planned for construction at 80 Natoma Street, which is near the intersection of 2nd and Mission Streets in downtown San Francisco.

I am enclosing the following items, which will give you an overview of the project and the issues involved:

1. Report of Treadwell & Rollo dated October 24, 2003 with attached report dated September 15, 1998.
2. Report from Jack P. Moehle dated April 2, 2004.
3. Report from T.D. O'Rourke dated May 9, 2004.
4. Report from Youssef Hashash, Ph.D, P.E. dated May 12, 2004.
5. Report from Dennis C. McCarry dated May 14, 2004.
6. Report from Jonathan D. Bray, Ph.D., P.E. dated May 25, 2004.
7. Report from T.D. O'Rourke dated May 31, 2004.
8. Report from Youssef Hashash, Ph.D, P.E. dated June 2, 2004.
9. Report from Charles C. Ladd, Sc.D., P.E. dated June 2, 2004.
10. Report from Ron Klemenic, MKA; Mr. Hadi Yap, Treadwell & Rollo dated June 3, 2004.
11. Report from Andrew J. Whittle dated June 11, 2004.
12. Report from Demetrious C. Koutsoftas, P.E., G.E. dated June 14, 2004.
13. Report from Hadi J. Yap dated June 15, 2004.
14. Report from Hadi J. Yap dated June 17, 2004.
15. Report from Shah Vahdani dated June 24, 2004.

Our department, the Department of Building Inspection, had issued an addendum to begin the installation of piles, that, in retrospect, was premature, due to a great many unresolved questions.

The developer was in the process of installing piles, when we became aware of some questions with regard to the foundation. A number of experts who were retained to assess the construction of a train tunnel adjacent to the building foundation raised these questions. The

Kenneth J. Harrington, Special Assistant to the Director
1660 Mission Street, Sixth Floor - San Francisco, CA 94103
Office (415) 575-6893 - FAX (415) 558-6225
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project has been on hold since June 7, 2004 for some permit/entitlement questions, and due to our concern about the foundation as currently designed.

The Department's purpose in retaining you is to have you work with out peer review panel[1] to do the kind of assessment that Andrew Whittle did with respect to the design.

As you can see, there are conflicts among the various experts who have looked at the project. It is the Department's usual practice to hire its own independent consultants where there are such conflicts.

I would appreciate if you would review the enclosed materials and then call me so that we can discuss how we should proceed. I would like to set up a meeting with our peer review panel at your earliest convenience.

I know that I told you that I was going to be in Italy for the next 3 weeks, but I have decided to postpone my vacation because of this 80 Natoma matter, so you can reach me at the office whenever you would like to discuss the matter.

Thank you for agreeing to assist us in this matter.

Very truly yours,

Kenneth J. Harrington

Kenneth J. Harrington
Office of the Director

[1] Jack Moehle, Leonard Joseph and Shah Vahdani.

SFPUC Batch Discharge Program

Tomio Takeshita

Manager of the SFPUC Pretreatment Program

January 12, 2017

160975
SUBMITTED PRESENTATION
IN COMMITTEE

Regulatory Requirement

- Environmental Protection Agency regulations require San Francisco to have a Pretreatment Program

- San Francisco Public Works Code - Article 4.1 (Sewer Use Ordinance) requires that we regulate all discharges into the sewage system

San Francisco Public Works Code: Article 4.1

- Article 4.1 approved in 1992.
- Purpose of Article 4.1 and Pretreatment Program:
  - Protect human health, the environment, the sewage system, and wastewater treatment plants
  - Prevent the discharge of pollutants into sewage system that would:
    - obstruct or damage the system;
    - interfere with, inhibit or disrupt treatment facilities;
    - harm or threaten to harm human health or the environment; or
    - contribute to violations of regulatory requirements imposed on the City.
- Dischargers shall pay sewer service charges.

Batch Wastewater Discharge Permit Program

- The purpose of the permit program is to protect our wastewater infrastructure by regulating the quality and quantity of dischargers.
- All periodic discharges to the sewage system must obtain a Batch Wastewater Discharge Permit.
- Federal regulatory requirement of EPA that SFPUC regulate periodic discharges.

Who Must Comply

- Any activity that generates periodic discharges to the sewage system:
  - Construction sites;
  - Well water testing and pumping;
  - Auxiliary water supply testing; and
  - Any other activity that generates non-routine discharges.

SFPUC Batch Discharge Permit Requirements

- May require discharger to install water meters to report quantity discharged.
- May require discharger to sample water and submit water quality reports.
- May require the removal of pollutants prior to discharge; pretreatment.
- Dischargers shall pay sewer service charges.

Questions?

RECEIVED VIA EMAIL
160975 01/27/2017

City and County of San Francisco
Department of Building Inspection

Edwin M. Lee, Mayor
Tom C. Hui, S.E., C.B.O., Director

December 16, 2016

Mr. Denis F. Shanagher
Duane Morris LLP
Spear Tower, One Market Plaza, Suite 2200
San Francisco, CA 94105-1127
Via E-mail: dfshanagher@duanemorris.com

Dear Denis:

We understand that you have completed survey activities to determine whether 301 Mission is leaning/tilting and, if so, by how much.

We also understand that the survey activities may not yet be completed. Please send us a status report by December 22, 2016 on the status of such activities, and your schedule for completion of the work.

Also, please send us data measured thus far, as well as a complete report when the survey activities are complete. If you also could provide a timeline for providing the complete report, that would be much appreciated.

Many thanks for your assistance, and for your ongoing cooperation.

Sincerely,

Ron Tom

For Tom Hui, S.E., C.B.O. and Director

cc: Naomi Kelly, City Administrator

City and County of San Francisco
Department of Building Inspection

Edwin M. Lee, Mayor
Tom C. Hui, S.E., C.B.O., Director

December 15, 2016

The Honorable Aaron Peskin, San Francisco Supervisor
City Hall, Room 244, San Francisco, CA 94102-4689
Via E-mail: aaron.peskin@sfgov.org

Dear Supervisor Peskin:

Please see below DBI responses to the questions you raised in your letter dated November 16, 2016.

Q. 1 Please produce or explain the absence of the August 30, 2005 letter from Hardip Pannu.
A. We did not retain a hard copy version of the Hardip Pannu August 30, 2005 letter per DBI engineering practice at that time. Plan Review scanned only the final peer review letters into the plan set.

Q. 2 Why is there "...no documentation that DBI formally retained the services of either Mr. Pannu or Professor Moehle specifically as peer review panelists..., or any documentation delineating their anticipated scope of work....."
A. There is no documentation because DBI has never 'retained' a peer review expert. DBI engineering practice in 2005 was to select appropriately skilled experts jointly with the Project Sponsor; the contractual retainer has always been between the peer review expert and the project sponsor.

Q. 3 Why is there no documentation delineating the peer review panelists' anticipated scope of work?
A. As Principal Engineer Hanson Tom explained at the November 17th hearing, the practice in effect in 2005-2006 was to hold a meeting with the project sponsor's engineers of record, and with those engaged as peer review experts, from which a scope of work was determined, with detailed notes taken by the project sponsor's engineer of record. Per the records' retention policy in effect in 2005-2006, DBI did not retain any of these records.

Q. 4 Why is there no letter confirming DBI engineer Hanson Tom directed or requested peer review panelists in 2005-2006 ...to include the Transbay Project in their review and analysis?
A. According to DBI Principal Engineer Hanson Tom, 301 Mission pre-dated the Transbay Project by approximately five years and thus there was no Transbay Project yet to include in any of the 301 Mission peer review and analysis.

Q. 5 Please explain whether Mr. Pannu and Professor Moehle were hired as peer review panelists before or after they did work for DeSimone Consulting Engineers.
A. DBI did not 'hire' Mr. Pannu and Professor Moehle; that contractual relationship was between them and the project sponsor.

Q. 6 Why has DBI not provided you with its copy of "...the four-volume foundation permit application...dated May 24, 2005 and prepared by DeSimone Consulting Engineers for the Department of Building Inspection, referencing Project 4069....."
A. Per the City Attorney-approved departmental retention and destruction policy, DBI retains for its permanent records permit applications, permits, job cards, approved plans and certificates of final completion. We do not retain, per State law, project structural calculations, which we believe were the four-volumes you referenced.

I also would like to clarify Principal Engineer Hanson Tom's statement at the November 17th hearing that DBI's responsibilities "...pretty much stop at the property line...." Per building code section 3307.1, Protection of Adjoining Property, any excavation that adversely affects an adjacent property requires the responsible party to correct immediately any adverse impact caused by such an excavation, and to obtain required permits to perform the repair work. Please see the attached Code Section 3307.1 for specific details. In 2005-2006, the Transit Center area was still a vacant lot and thus this adjacency excavation responsibility was still several years away from actual construction conditions.

Finally, I would like to update you on some of our efforts since the last hearing. Our Inspection Division has completed inspections of 301 Mission's accessible areas. We are preparing a report to share in the near future. Our Commission has requested a presentation on performance-based applications for Tall Buildings and the peer review process at the February 17, 2017 BIC meeting. We also are researching other jurisdictions' performance-based plan checking and peer review process (please see enclosed December 6th letter from President McCarthy).

We are copying this DBI response letter to the Clerk of the Board, and Assistant Clerk Erica Major, and we request, respectfully, that it be made part of the official Board file number 160975.

Thank you for your consideration, and understanding, of these 2005-2006 DBI engineering and plan review practices.

Sincerely,

Tom C. Hui

Tom Hui, S.E., C.B.O. and Director

Enclosures: SF Building Code Section 3307, Protection of Adjoining Property;
December 6, 2016 Letter to Director Hui from President McCarthy, BIC

CC: Members of Board of Supervisors; Members of Building Inspection Commission; City Administrator Naomi Kelly; DEM Director Anne Kronenberg; John Malamut; Randall Parent; Edward Sweeney; Taras Madison; Daniel Lowrey; Ronald Tom; Lily Madjus; William Strawn

BUILDING INSPECTION COMMISSION (BIC)
DEPARTMENT OF BUILDING INSPECTION
1660 Mission Street | San Francisco CA 94103 | Office (415) 558-6164 | Fax (415) 558-6509

December 6, 2016

Director Tom C. Hui
Department of Building Inspection
1660 Mission Street, 6th Floor
San Francisco, CA 94103

Dear Director Hui,

After the events of the past few months, I will be calendaring a meeting in February to review the procedures and policies for performance based applications. Please be prepared to address the points outlined below in great detail. Please have the Department start preparing this report and presentation at your earliest convenience. The report and presentation should address each of the points below.

Process

- Which applications are performance based and which are prescriptive based?
- What is the criteria for each? Are the standards for performance and prescriptive the same?
- Provide historical data for the number of applications for each type for the last 10 years.
- Provide a description of a typical building for each type. (Survey and quantify each type.)
- Describe how or if an application could be both performance based and prescriptive based.
- Does the State of California's Code or any law speak to the retention of records for design professionals in the building profession?

Comparison showing Performance Based plan checking & Peer Review in the 2000-2007 era compared to the present day. How does our current system compare to San Diego, Los Angeles, San Jose and Seattle.

- What is the criteria to decide if something was performance based or Code prescribed?
- What is the criteria to qualify for the Peer Review team for the projects and who picked the teams?

- Who paid for the Peer Review and what was the process of payment?
- What is the design/seismic criteria? Do all buildings share the same standards?
- Were there any conflict of interest rules for the Peer Review team?
- What role did special inspections play? Which portions of the process or approval relies upon special inspection, and explain how Chapter 17 of the state Building Code gives priority to the special inspector. Explain how the state Building Code delegates jurisdiction for special inspections and soils reports by others.
- Were the piles part of the special inspection program or does the regular inspector cover pile driving?
- What was the record retention policy for Peer Review?
- How was dewatering reviewed or supervised, and describe the review process?

Sincerely,

Angus McCarthy
Building Inspection Commission President

Chutes, floors, stairways and other places affected shall be watered sufficiently to keep down the dust.

3306.11 Add a section as follows:

3306.11 Falling Debris. Wood or other construction materials shall not be allowed to fall in large pieces onto an upper floor. Bulky materials, such as beams and columns, shall be lowered and not allowed to fall.

3306.12 Add a section as follows:

3306.12 Structure stability. In buildings of wood frame construction, the supporting structure shall not be removed until the parts of the structure being supported have been removed.

In buildings with basements, the first floor construction shall not be removed until the basement walls are braced to prevent overturning, or an analysis acceptable to the Building Official is submitted which shows the walls to be stable without bracing.

SECTION 3307 – PROTECTION OF ADJOINING PROPERTY

3307.1 Insert a note at the end of this section as follows:

3307.1 Protection required. Adjoining public and private property shall be protected from damage during construction, remodeling and demolition work. Protection must be provided for footings, foundations, party walls, chimneys, skylights, and roofs. Provisions shall be made to control water runoff and erosion during construction or demolition activities. The person making or causing an excavation to be made shall provide written notice to the owners of adjoining buildings advising them that the excavation is to be made and that the adjoining buildings should be protected. Said notification shall be delivered not less than 10 days prior to the scheduled starting date of the excavation.

Note: Other requirements for protection of adjacent property of adjacent and depth to which protection is requested are defined by California Civil Code Section 832, and is reprinted herein for convenience.

Section 832. Each coterminous owner is entitled to the lateral and subjacent support which his land receives from the adjoining land, subject to the right of the owner of the adjoining land to make proper and usual excavations on the same for purposes of construction or improvement, under the following conditions:

1. Any owner of land or his lessee intending to make or to permit an excavation shall give reasonable notice to the owner or owners of adjoining lands and of buildings or other structures, stating the depth to which such excavation is intended to be made, and when the excavating will begin.

2. In making any excavation, ordinary care and skill shall be used, and reasonable precautions taken to sustain the adjoining land as such, without regard to any building or other structure which may be thereon, and there shall be no liability for damage done to any such building or other structure by reason of the excavation, except as otherwise provided or allowed by law.

3. If at any time it appears that the excavation is to be of a greater depth than are the walls or foundations of any adjoining building or other structure, and is to be so close as to endanger the building or other structure in any way, then the owner of the building or other structure must be allowed at least 30 days, if he so desires, in which to take measures to protect the same from any damage, or in which to extend the foundations thereof, and he must be given for the same purposes reasonable license to enter on the land on which the excavation is to be or is being made.

4. If the excavation is intended to be or is deeper than the standard depth of foundations, which depth is defined to be a depth of nine feet below the adjacent curb level, at the point where the joint property line intersects the curb and if on the land of the coterminous owner there is any building or other structure the wall or foundation of which goes to standard depth or deeper then the owner of the land on which the excavation is being made shall, if given the necessary license to enter on the adjoining land, protect the said adjoining land and any such building or other structure thereon without cost to the owner thereof, from any damage by reason of the excavation, and shall be liable to the owner of such property for any such damage, excepting only for minor settlement cracks in buildings or other structures.

RECEIVED VIA EMAIL
1/27/2017

City and County of San Francisco
Department of Building Inspection

Edwin M. Lee, Mayor
Tom C. Hui, S.E., C.B.O., Director

160975

Sean Jeffries
Millennium Partners
735 Market Street, Suite 302
San Francisco, CA 94103

December 15, 2016

Dear Mr. Jeffries:

Thank you for providing us with a copy of the report that was prepared by Mr. Ronald Hamburger of Simpson Gumpetz and Heger Inc., dated October 16, 2016. We have reviewed the report and DBI's engineers seek some additional information.

In addition, we have provided copies of the information to a team of consulting engineers retained by the City Administrator. The consultants will be advising the City Administrator and DBI on the safety of your building at 301 Mission.

DBI's Request for Additional Information:

1) We request you provide copies of the following documents referenced in the Hamburger report:

   a. Documents prepared by Treadwell & Rollo listed as items 1 thru 15 in Sect. 2.1 of the report.

   b. Documents prepared by Arup listed as items 1 thru 42 in Sect. 2.2 of the report.

   c. Documents prepared by DeSimone Consulting Engineers listed as items 1 thru 12 in Sect. 2.3 of the report.

2) The conclusion of Mr. Hamburger's report did not provide a prediction on any future settlement related to geotechnical aspects of the site conditions. Please provide us with any information you have on this issue.

3) Do you have a plan to achieve building settlement stabilization and an associated timeline? Please provide us with pertinent information regarding your approach to addressing the settlement issue.

Questions from the City's Consulting Engineers:

Unless otherwise noted, the page and section references cited in these questions pertain to the final Foundation Settlement Investigation report, dated October 3, 2016.

City and County of San Francisco
Department of Building Inspection

Edwin M. Lee, Mayor
Tom C. Hui, S.E., C.B.O., Director

4) Please report the total weight (Dead Load and Superimposed Dead Load) of the building, including the below grade structure. Has an independent check of the building weight been performed to confirm the gravity loads used in the PERFORM and ETABS models?

5) Please report the periods of vibration from the elastic ETABS and nonlinear PERFORM models. Have these been compared to measured periods in the building, e.g., using acceleration data available from CSMIP?

6) The study (Section 4.2.4.1 on page 28) has estimated roof displacements resulting from settlements of 2.7in toward the west and 7.0in toward the north based on the elastic ETABS model:

   a. Please also report initial roof displacements from the nonlinear PERFORM model based on the two methods of applying settlements.

   b. Please discuss how sensitive the predicated building responses are to the assumptions made in Section 4.3.3.1 and Section 5 regarding the portion of the measured total mat settlement that is applied in the analyses.

   c. Please compare the initial out-of-plumb predictions from the analyses to the actual measured lean/tilt of the building so as to validate underlying assumptions.

7) The study has used an elastic ETABS model to identify the impact of the settlements on the building's stability under gravity loads. Several structural elements were identified that experienced high stress levels, some in excess of expected design strengths. Please discuss how the initial states of stresses and deformations under gravity loads and settlement deformations in the nonlinear PERFORM model compare to the stress levels predicted by the elastic ETABS model, and what the effect of any stress redistribution has on the structural collapse safety.

8) The study concludes that the settlements measured through June 2016 have not compromised the building's safety. Please comment on the extent of additional (future) settlements the building can sustain without compromising the building's stability under gravity loads, and the building's expected performance under earthquake loading.

9) There are differences between the observations and conclusions in the 2014 draft report and 2016 final report. For example, the draft report commented on the performance of the building under 'lower intensity earthquakes' in the Conclusions, but this statement was removed in the final version of the Conclusions. Please comment on these differences.

1660 Mission Street – San Francisco CA 94103
Office (415) 558-6088 – FAX (415) 558-6401
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City and County of San Francisco
Department of Building Inspection

Edwin M. Lee, Mayor
Tom C. Hui, S.E., C.B.O., Director

10) There is a lack of specificity in the discussion of the building's performance in Sections 6 and 7 of the final report:

a. Please clarify, in the first paragraph of Section 6, which building elements (including their number and location) experience significantly elevated stresses due to the settlements, the associated 'failure' mode, and what effect this has on the overall performance of the building.

b. Please quantify, in the fourth paragraph of Section 6, the effect of the building's settlements on the ability to resist earthquake shaking.

c. Please clarify, in the fifth and sixth paragraphs of Section 6, which building elements do not meet design criteria, or experience significantly increased demands, and what effect this has on the building's performance.

d. Please clarify, in Section 7, which building elements do not meet "criteria commonly adopted for design of similar new buildings", and how the (substandard?) performance of these elements affects the overall performance of the building.

e. Both the elastic ETABS model and the nonlinear PERFORM model show demands in the outrigger beams that exceed the standard acceptance criteria for these beams (e.g, the high elastic stresses in Figure 28 and large inelastic deformations in Fig. 60). Please describe the implications of these high stress and deformation demands on the performance of the outrigger beams as related to the safety of the building. [Note - Figure 28 of the ETABS model report shows the largest outrigger shears in the south plane of outriggers, whereas the mat dishing is largest below the north plane of outriggers. Please confirm if the plots in Figure 28 are labeled correctly and, if so, describe why the forces are lower away from the dished area of the slab.]

11) The nonlinear PERFORM model has distributed spring supports beneath the grillage model of the mat, which represent the stiffness and settlement of the piles. Please report the following information on the pile loads and performance:

a. Gravity and earthquake forces developed in the pile supports. Please indicate the peak compression forces and tension forces (if any) developed in the pile supports and the locations of these forces. Report forces for both gravity loading alone and gravity plus earthquake loading.

b. Please comment on whether you have considered axial force, shear force and moment demand/capacity ratios in the piles due the effects of gravity and gravity plus earthquake.

City and County of San Francisco
Department of Building Inspection

Edwin M. Lee, Mayor
Tom C. Hui, S.E., C.B.O., Director

c. Please plot axial force versus axial deformation for several representative support points to confirm the gap opening/closing behavior under gravity load and the range of deformations under the input earthquake ground motions.

d. Please confirm the acceptance limit for deformations in the mat and whether this limit is exceeded in the analysis. Table 8 indicates that the CP limit is 1% plastic rotation, whereas the text on page 74 refers to the "1% strength loss limit", which implies a rotation at a strength loss of 1%. Please confirm the definition of acceptance criteria. In addition, in Table 8, demand/capacity ratios of up to 2.627 are reported for the mat foundation, whereas the discussion on page 74 related to Figure 64 indicates that "The demands shown here ... are entirely within acceptable levels". Please provide justification for considering the demand/capacity ratios of 2.627 to be within acceptable levels.

12) MCER Spectra for Ground Motion Scaling: In Section 4.3.3.2 (Pg. 51-52), the input ground motions are scaled to a target spectrum equal to 80% of the standard MCER code spectra, based on the justification that "The Treadwell & Rollo geotechnical report indicates that at long periods, the site-specific spectrum developed for the design of the tower is governed by a building code requirement that site spectra not be taken less than 80% of the standard spectrum defined by the building code." However, as shown in Figure D-4 of Treadwell & Rollo's 2005 report (included below), the probabilistic site-specific spectra developed by Treadwell and Rollo is higher (not lower) than the standard code spectra for all periods longer than about 0.8 seconds. Therefore, this plot in Figure D-4 appears to contradict the justification in the 2016 analysis report for targeting a spectrum that is 20% less than the MCER spectrum. Please confirm.

Thank you for your earliest response to these questions.

Sincerely,

Tom C. Hui

Tom Hui, S.E., C.B.O., and Director

Department of Building Inspection

cc: Naomi Kelly

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1/27/2017
160975

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November 22, 2016

VIA EMAIL & HAND DELIVERY

Mr. Tom Hui
Director, Department of Building Inspection
City and County of San Francisco
1660 Mission Street, 6th Floor
San Francisco, CA 94103

Re: 301 Mission Street
Notice No. 201632051

Dear Mr. Hui:

As discussed, this firm represents the Millennium Tower Association (the "Association"), which is in receipt of the above-referenced Notice dated August 26, 2016. Due to the nature of the request, the Association has previously requested an extension of time to respond to the information requests in the Notice. We now provide a response herewith.

The Notice appeared to request an engineering report regarding structural and building life-safety systems. We understand you are in receipt of a copy of the Simpson Gumpertz & Heger "Structural Evaluation of 301 Mission" Report, dated October 3, 2016, which concludes that the total and differential settlements experienced to date have not impaired the Tower's ability to resist dead, live and earthquake-related loading and have not had a significant impact on the building's safety. We have not included a copy of that report with this submission.

The Association has commissioned a Property Survey Assessment by Russell Hoeltzel, Senior Risk Consultant of Hub International, who has analyzed the building's existing risk reduction programs, fire protection systems and major equipment. In a report dated October 26, 2016, the Assessment Summary concluded that building conditions were found to be very good for property-related perils. A copy of the Assessment is attached as **Exhibit A**. Any and all recommendations therein are being implemented.

The Association has retained the forensic engineering firm of Allana Buick & Bers ("ABB") to, among other things, conduct a field investigation and analysis of the utility pipe connections in the building. A progress report from ABB of November 15, 2016 advises that no stresses on utility pipes have been observed to date. There is documentation that certain of the utility pipes were installed with flexible connections in anticipation of building settlement. We are currently working to confirm that all of those flexible connections were installed under the sidewalk and street, and the Association intends to excavate at various locations outside the building for absolute confirmation, and to improve those connections if and as necessary. A copy of the ABB progress report in that regard is attached as **Exhibit B.**

A test for potential leaks from natural gas lines inside or outside the building was conducted on October 20, 2016. No gas leaks were detected. A copy of the report in that regard is attached as **Exhibit C.**

There are three natural gas mains that enter the facility at Level 1 on Beal Street, each with seismic shutoff valve. Additional seismic bracing was recommended for the natural gas main piping that supplies the high-rise Millennium Tower. This seismic upgrade project was completed in December of 2015 pursuant to the plans attached as **Exhibit D.**

The Association has a regular building systems inspection protocol with regard to fire protection systems, emergency generators, elevators, water systems and roofs, among other things. Attached as **Exhibit E** is a spreadsheet that provides details on the type and frequency of testing, the responsible vendor where relevant, and the dates thereof. Please advise if DBI desires more detail on any of the testing.

An example of back-up data for testing are summary reports of the Annual and Semi-Annual Automatic Fire Alarm System Inspections and Certifications that occurred on February 22, 2016 and September 6, 2016, respectively, copies of which are attached as **Exhibit F** and **Exhibit G.**

As noted above, at the direction of the Association, ABB plans to excavate at five locations around the building to inspect approximately 10 utility line connections, including but not limited to storm and sanitary drain, fire, domestic water and natural gas, and make any corrections or repairs as necessary at the time. ABB's scope of work proposal in that regard is attached as **Exhibit H**, which identifies the various locations on Fremont (1), Mission (3) and Fremont (1) Streets. ABB is currently soliciting bids for that work and it is expected that plans and permit submittals to will follow in December, with the expectation of work in January.

DBI has issued a number of Notices of Violation with respect to the garage (lack of permits for repair), ramps (handicap slope) and sidewalks. We understand that Millennium Partners has or is in the process of obtaining the necessary permits for the garage repair work, which is related to an ongoing water intrusion issue arising from faulty below-grade waterproofing. We also understand that Millennium Partners is in the process of preparing plans to address the ramp slope issues for the review and approval of the Association and DBI.

As for the sidewalk repair, given the anticipated excavation work to be undertaken with regard to the utility connections, the Association suggests that that repair be addressed as part of the utility excavation and inspection project discussed above.

Thank you for your consideration in this regard. Please address any questions to the Association regarding building safety systems through this office. We will continue to provide you with information as requested and as it becomes available.

Very truly yours,

Denis F. Shanagher

Exhibits

EXHIBIT

A

EXHIBIT A

PROPERTY MARKETING REPORT

Prepared for:

Millennium Tower Association San Francisco, The Residences at Millennium Tower A

301 Mission Street
San Francisco, CA 94105

October 26, 2016

Prepared by:

Russell Hoeltzel, PE,
Senior Risk Consultant
Hub Risk Services
4695 MacArthur Ct.
Newport Beach, CA 92660

russell.hoeltzel@hubinternational.com

Table of Contents

Scope

The purpose of this Property Marketing Report is to describe the construction, occupancy, protection and exposures to these facilities. In addition human element programs are described as well as maintenance and testing of fire protection equipment. Major building equipment, HVAC and electrical equipment are addressed. The information provided is based on information provided by the client and from observations during site visits.

It is understood that each facility has its own specific conditions that characterize its design and operating procedures. Generally, national and industry recognized standards are the basis for the evaluation and suggestions. This is not to preclude a consultant's qualified judgment when evaluating the adequacy of existing programs.

Conferred With

Denis F. Shanagher	*Attorney at Law, Duane Morris LLP*
Damon Partridge	*Director of Hospitality Services, Action Property Management, Inc., ACMF*
Antonio Nunez	*Chief Engineer*
Dorothy McCorkindale	*Hub International Insurance Services*

Legal Notice

All consulting services performed by HUB are advisory in nature. All resultant reports are based upon conditions and practices observed by HUB and information supplied by the client. Any such reports may not identify or contemplate all unsafe conditions and practices; others may exist. HUB does not imply, guarantee or warrant the safety of any of the client's properties or operations or that the client or any such properties or operations are in compliance with all federal, state or local laws, codes, statutes, ordinances, standards or recommendations. All decisions in connection with the implementation, if any, of any of HUB's advice or recommendations shall be the sole responsibility of, and made by, the client. The advice and recommendations submitted in this plan constitute neither a warranty of future results nor an assurance against risk. This material represents the best judgment of HUB and is based on information obtained from both open and closed sources.

Executive Summary

A Property Survey Assessment was performed for Millennium Tower Association located in San Francisco, CA on October 26, 2016.

A tour of the premises was conducted along with a review of special hazards present, protective systems, building construction details, management loss control programs and other related aspects of the building.

This report discusses issues with settling and tilting that have been prominently highlighted in the media. This report documents studies, mitigation and discussion of the solution the issues.

A report, from a respected structural engineering firm, was commissioned on behalf of management to determine what effects the settling and tilting may have had on the safety and earthquake resistance of the building. The conclusion, based on extensive analysis of data from instrumentation installed in the building and visual observations are as follows:

"On the basis of our updated analyses of the 301 Mission tower, we conclude that the effect of settlement on most building elements is negligible. Under the influence of Maximum Considered Earthquake shaking together with the settlements that have occurred to date, most building elements continue to meet criteria commonly adopted for design of similar new buildings in the City of San Francisco today. We conclude that the settlements experienced by the 301 Mission tower have not compromised the building's ability to resist strong earthquakes and have not had a significant impact on the building's safety."

Risk Reduction Programs – Overall rated *Excellent.* Written programs are provided for Hot Work, Impairments and there is an excellent emergency plan in place.

Fire Protection – Overall rated *Good.* Fire sprinkler protection is provided throughout all areas.

Major Equipment – Overall rated *Good.* Equipment is well maintained and protected.

Assessment Summary

Overall, conditions were found to be Very *Good* for property-related perils.

Recommendations

No recommendations are being made by Hub. Previous recommendations made by AFM are discussed below.

09-02-002 Improve the fire sprinkler supervision and testing program.

Part A. Lock all sprinkler valves in the open position.
Hub comment: The valves are provided with tamper switches which are monitored 24/7. The valves are located in the stairwells where only residents have access. All valves are checked monthly with results recorded. Management will consider sealing the valves.

Part B. Perform weekly documented inspections of the automatic fire sprinkler control valves.
Hub Comment: This is currently done monthly.

Part D. Conduct quarterly documented waterflow alarm testing.
Hub Comment: This is currently done semiannually, which is the frequency recommended by NFPA 25.

Part E. Conduct documented flow tests for all pressure-reducing valves (PRVS)

There are two types of pressure-reducing valves at the Millennium Tower: direct-acting PRVs (direct PRVs), and pilot-operated PRVs (pilot PRVs). Direct PRVs are located in the stairwells, and pilot PRVs are located in the fire pump configurations. The following tests should be performed in order to ensure the pressure-reducing valves are functioning properly:

- All PRVs should be visually examined weekly.
- All floor PRVs should be physically inspected and operationally tested on a monthly basis.
- All PRVs should be flow tested annually and compared with the manufacturer's performance curves to ensure that they are operating in a satisfactory manner.

Hub Comment: All PRV'S are examined monthly.
All PRVs are flow tested on a 5-year basis. There are approximately 240 PRVs in the Tower. The five year test is the frequency required by NFPA 25.

Part F. Perform all waterflow tests with the fire pumps running.
Hub Comment: Due to the complexity of the high rise system this is not considered practical

09-02-008 Implement the FM Global Hot Work Permit System to manage hot work operations.
Hub Comment: This has been completed

13-04-002 Ensure that all penetrations within electrical rooms are properly sealed with FM approved fire stop.
Hub Comment: This will be completed.

13-04-003 Create a comprehensive emergency plan (ERP) for this location.

Part A. Improve the ERP to include property loss prevention roles.
Part B. Develop a site-specific earthquake ERP.
Hub Comment: Parts A&B have been completed.

09-02-006 Improve Seismic bracing for the automatic fire sprinkler system.
Hub Comment: Management is reviewing this recommendation. Seismic bracing on gas piping was recently completed.

General Information

Description & Occupancy

The Millennium Tower is a fifty-eight-story, 605 ft. tall (645 ft. overall), reinforced concrete tower and adjacent podium. The Podium structure is further divided into a three-story low-rise and a twelve-story mid-rise.

Podium Features

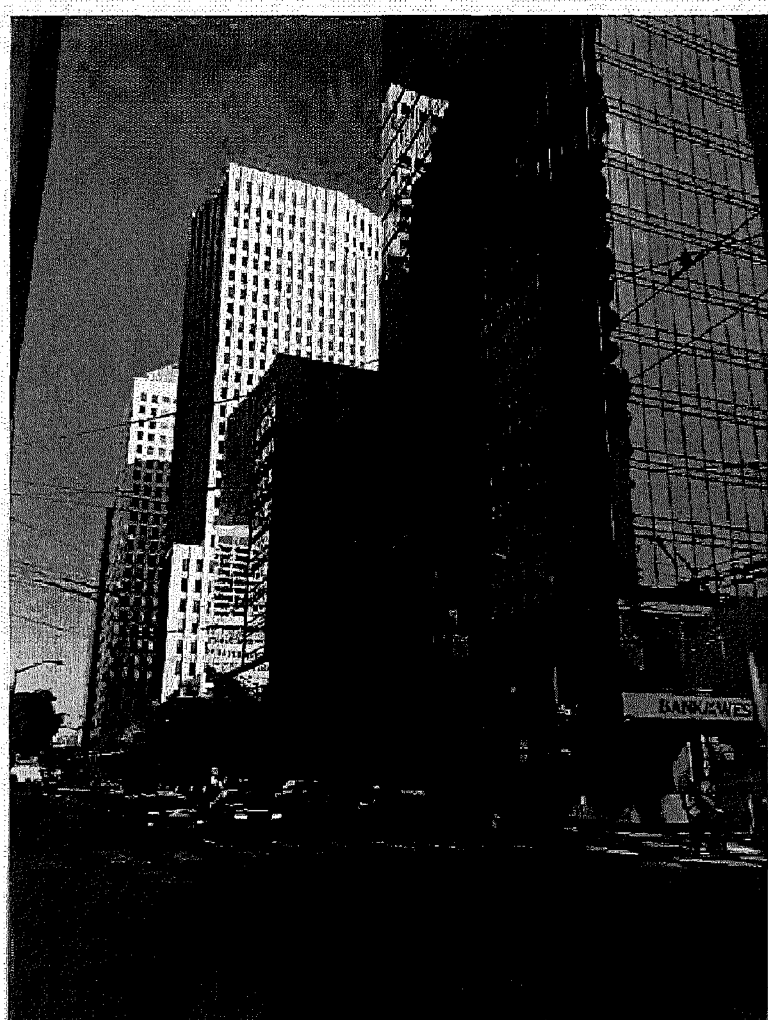
- 21,500 sq. ft. of exclusive common area facilities
- Indoor 75 ft. competition lap pool & expansive outdoor terrace
- Wine tasting room & cellar
- Bar and lounge
- 5,500 sq. ft. Sports Club/LA fitness center
- Children's play & crafts room
- Michael Mina's RN74 Restaurant at ground floor level.

The US$350 million project was developed by Millennium Partners of New York City, designed by Handel Architects, engineered by DeSimone Consulting Engineers and constructed by Webcor Builders. At 645 ft., it is the tallest concrete structure in San Francisco, the fourth tallest building in San Francisco overall. The tower is slender, with each floor containing 14,000 sq. ft. of floor space. In addition to the 58-story tower, there is a 130 ft. tall, 11-story tower on the northeast end of the complex. Between the two towers is a 43 ft. high, two-story glass atrium. In total, the project has 419 units.

The residences are said to be the priciest on the West Coast, with penthouse units on the top two floors selling for around US$12 million. The bottom 25 floors of the main tower are called Residences while the floors from 26 to the top have the name Grand Residences. The 53 units in the separate 12-story tower are called the City Residences. Below street level, there are 339 parking spaces in a five-level subterranean garage located under the Podium. The building is located next to the site of the future Transbay Transit Center. Overall, the tower's design is intended to resemble a translucent crystal, and is a landmark for the Transbay Redevelopment and the southern skyline of San Francisco.

Millennium Tower is also home to RN74, a restaurant and wine bar under the direction of Chef Michael Mina, located on the ground floor. Resident services include a private concierge and exclusive access to the 20,000-square-foot Club Level, featuring an owners' lounge, tasting room and cellar, private dining room (serviced by Chef Michael Mina's RN74), screening room, children's playroom, outdoor terrace, and a 5,500-square-foot fitness center,

Location	Occupancy
Tower	Residences 3-25, Grand Residences 26 - Penthouse
Tower	1st floor lobby/residence lounge, Bank of the West
Tower	Basement – Building Offices, maintenance shop, mechanical rooms
Podium	12 story mid-rise, Club level (Gym meeting private dining rooms) RN74 Restaurant



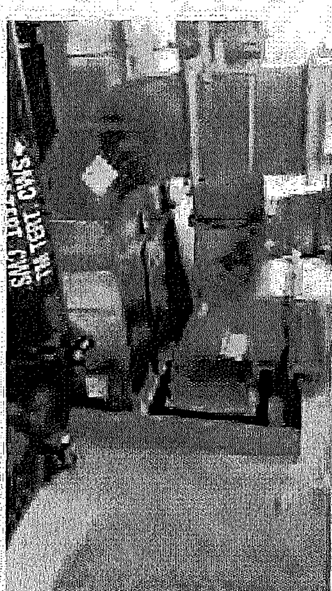
Buildings and Structures

The Millennium Tower is a fifty-eight-story, reinforced concrete structure developed by Mission Street Development LLC in 2007 for sale as residential condominium units. The building is located at the southeast corner of Mission Street and Fremont Street. The building comprises two separate structures, a fifty-eight-story tower and an adjacent, functionally connected, twelve-story reinforced concrete podium. The Podium structure is further divided into a three-story low-rise and a twelve-story mid-rise. A seismic joint separates the Tower and Podium.

The tower is constructed of flat post-tensioned concrete slabs supported by perimeter reinforced concrete frames (beams and columns) and a centrally located tube comprising reinforced concrete load-bearing walls. It is supported on a single, continuous 10 ft. thick pile cap over 658 14 in. square pre-cast concrete piles. The piles are driven into the Bay Mud and Colma formation 50 to 90 feet below grade. The basement contains a PG&E vault supported on a 3 ft. thick slab cantilevered off of the pile cap. The Tower's lateral (wind and earthquake) resistance is a dual system consisting of concrete special moment frames around the perimeter and a concrete shear wall core with outriggers. The base dimensions are 178 ft. by 100 ft. or 17,800 sq. ft. per floor.

The Podium contains five sub-grade levels supported on a soil-supported mat foundation. Hinge slabs are used to connect the Tower and Podium in certain locations and allow differential movement between the two structures. Tie down anchors located under the low-rise portion of the Podium are used to resist hydraulic uplift pressure. The lateral system for the mid-rise consists solely of concrete shear walls. The base dimensions 170 ft. by 178 or 29,750 sq. ft. per floor for the parking areas and club level. The mid-rise tower is 80 ft. by 178 ft. or 14,240 sq. ft. per floor.

Curbs are provided in mechanical rooms where water piping is present. Most curbs are 6-inch high concrete with one metal curb observed around the metal dryer ducts on the 26th floor.



Metal Curb around Dryer Ducting

Settlement

A building normally settles during and after construction due to a number of factors including the weight of the structure. In the case of the Millennium Tower the structure has settled 16 inches. There has been some differential settling and some tilting. The amout of settling has been documented, analyzed. A detailed study was conducted and deemed safe structurally as well as deemed within earthquake design parameters by a reputable structural engineering firm.

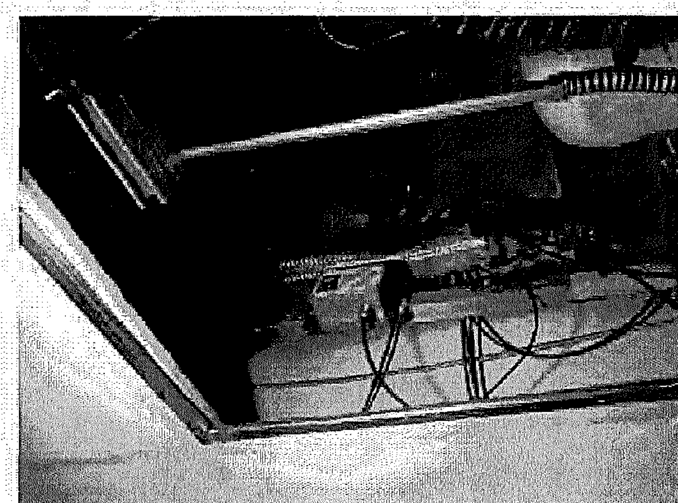
Mitigation

The settling was monitored during construction and measures were added by Architects and Consulting engineers to insure the integrity of piping and other systems. The included:

- Installing utility lines with flexible connections where they cross the seismic joint between the tower and mid-rise podium.
- Installing handrails at hinge slabs between the Podium and Tower to account for the increased slope due to settlement.
- Re-routing utilities. Re-routing utilities.
- Re-designing seismic joint covers at walls, ceilings, and floors.
- Raising interior floor levels or installing new trench drains to prevent water drainage towards entry and exit doors.

The building is monitored with inclinometers and piezometers. The information was initially real time monitoring and was recently restored to real time monitoring. Crack gauges are installed the basement for visual crack monitoring.

Piping is equipped with tiltmeters.



Proposed Mitigation

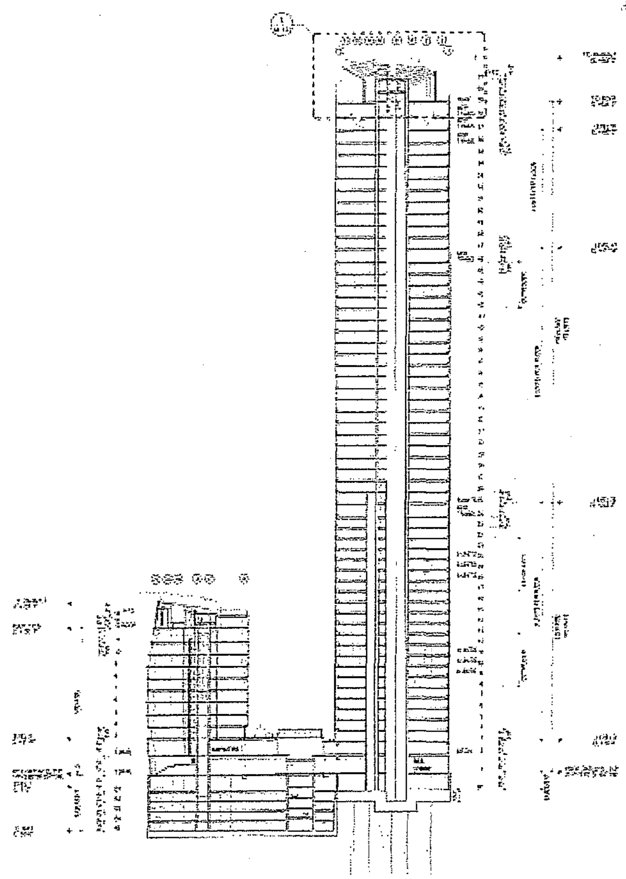
At this time there are discussions taking place to correct settlement and tilting.

A study is scheduled to begin shortly by Alona Buick & Bers to investigate the strain on piping connections to city/utility systems in the street.

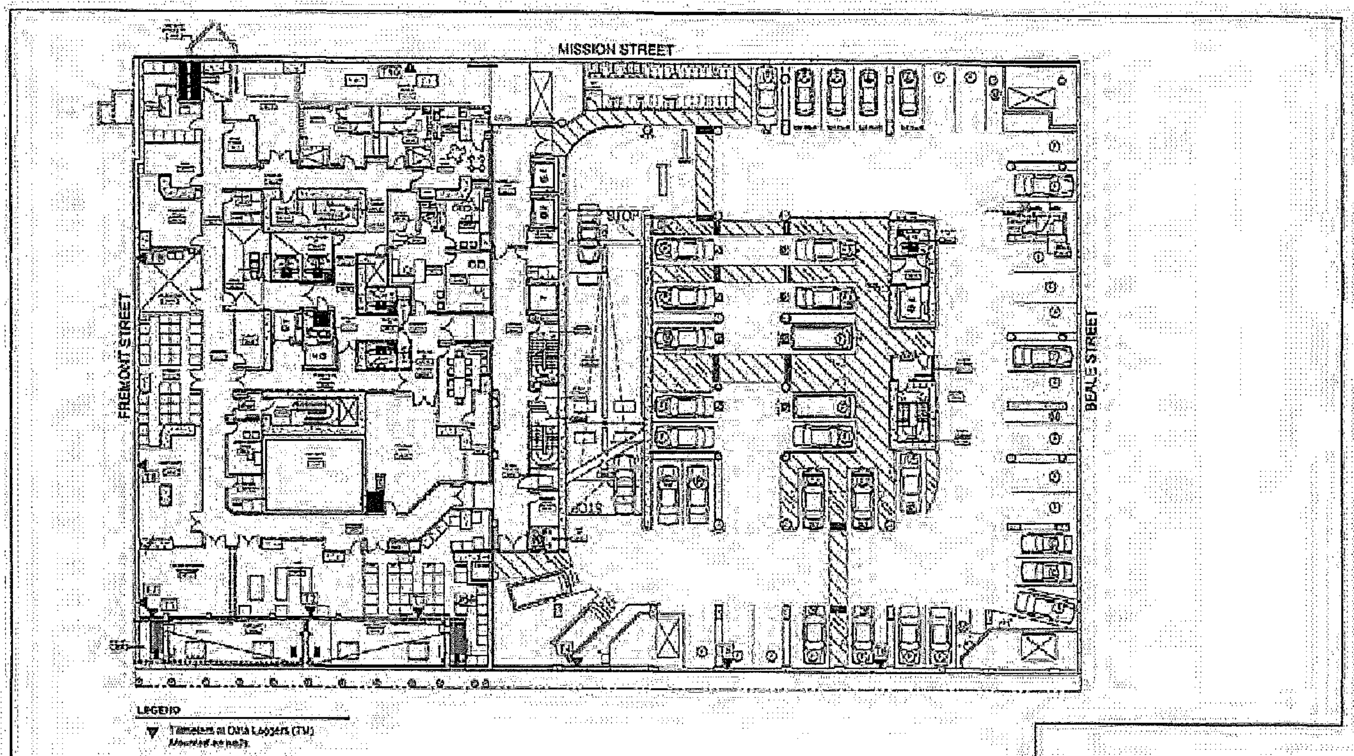
Additional Measures

Three borings to bedrock were recently completed. The borings will monitor water level, and movement using piezometers and inclinometers. Monitoring will be real time. There are two borings in Mission Street and one in Fremont Street.

A laser sight was in the process of installation in a Tower elevator shaft for inclination monitoring. The laser will provide real time monitoring.



OVERALL SECTION LOOKING SOUTH (1)



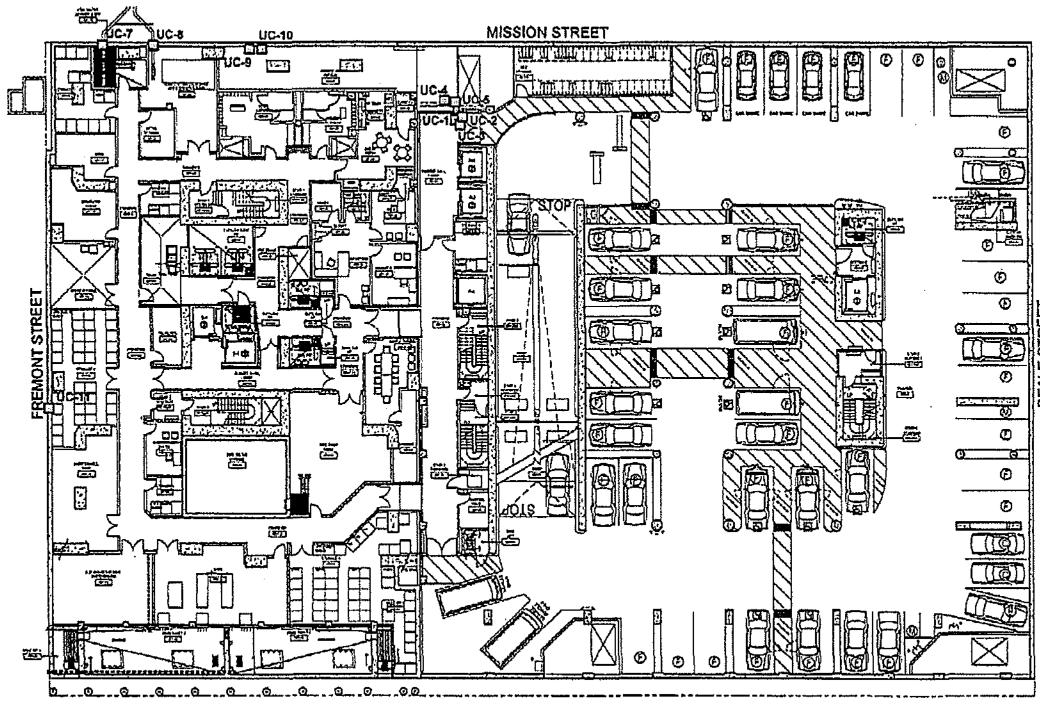
LOCATION OF TILTMETERS;
301 MISSION STREET BASEMENT LEVEL B-1

Transbay Transit Center
301 Mission Monitoring - Tiltmeters
Transbay Joint Powers Authority
San Francisco, California

April 2013

ARUP

PLATE 14



LEGEND

☐ Utility Displacement Gauge
Mounted on the utility conduit

LOCATION OF UTILITY CROSSING MONITORING:
301 MISSION STREET BASEMENT LEVEL B-1

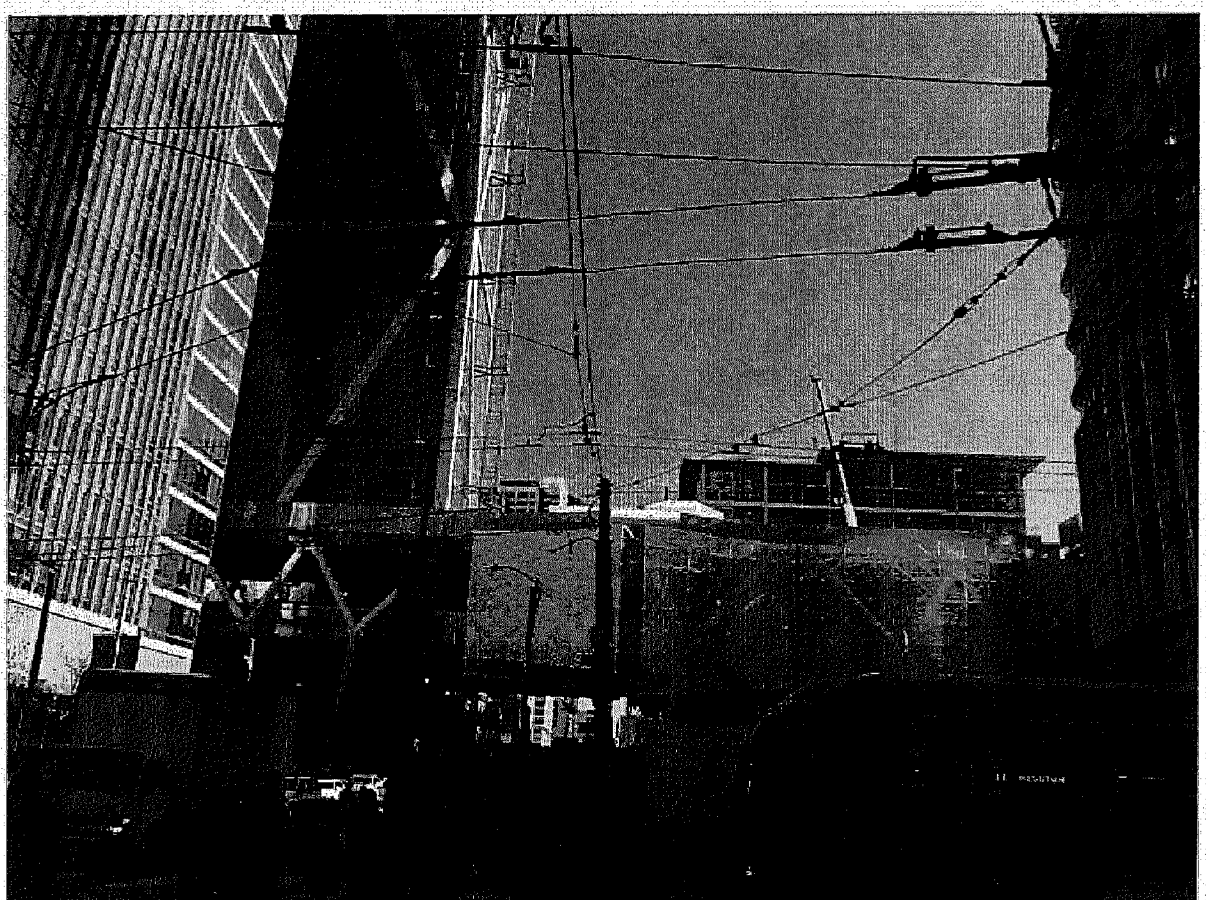
Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

ARUP

PLATE 1

Aerial of Millennium Complex. See below for new construction to East and South.



New Buildings to East and South. Light Rail Construction Immediately South

Exposures

Latitude	Longitude
37.790543 N	122.395922 W

Earthquake

Earthquake Hazard Category	Risk Rating
Total Earthquake Risk	*10*
Controlling Fault Name	*N San Andreas*
Distance to Controlling Fault	*9 miles*
Soil Type	*Soft Soil*
Liquefaction Susceptibility	*Yes*
MMI Value 100 yr.	*9.25*
MMI Value 250 yr.	*10.14*
MMI Value 500 yr.	*10.77*
Peak Ground Acceleration 100 yr.	*0.62*
Peak Ground Acceleration 250 yr.	*1.15*
Peak Ground Acceleration 500 yr.	*1.78*
PML – 500 Year	*35%*

Key to Earthquake Risk Ratings

The Modified Mercalli Intensity Scale (MMI) is a qualitative ranking of earthquake intensity as categorized into 12 ratings by the US Geological Survey

I.	**Vibrations felt only by a few people under very special circumstances.**
II.	**Vibrations felt a few people on upper floors of buildings and in position to observe the swinging of suspended objects.**
III.	**Vibrations felt generally by people indoors but may not be any more intense than those due to a passing vehicle.**
IV.	**Vibrations felt almost all people indoors and some outdoors. Some objects displaced. Sounds produced in structures. Some vehicles perceptibly rocked**
V.	**Vibrations felt by everyone. Some objects rocked off of tables and shelves. Some objects overturned.**
VI.	**Vibrations and motion felt by everyone. Even heavy objects displaced. Some structural damage such as to plaster or wallboard.**
VII.	**Some structures, such as brick chimneys, damaged. Slight damage in other structures such as wood-frame buildings.**
VIII.	**Structural damage to even well-designed structures. Frame structure walls pushed out of shape. Masonry structures destroyed. Heavy objects overturned.**
IX.	**Considerable damage to structures, even partial collapse. Some structures shifted off of foundations.**
X.	**Even wood-frame structures destroyed. Foundations damaged. Rails bent.**
XI.	**Almost all masonry structures destroyed. Wood-frame structures generally damaged and some destroyed. Metal structures such as bridges destroyed and rails severely bent.**
XII.	**Most structures destroyed. Elevation or subsidence of land forms. Some objects thrown into the air.**

Information obtained from RiskMeter

Flood

Information obtained from RiskMeter

Flood Risk Analysis	
Risk Score *(Sliding Scale from 10-100)*	73
Risk Rating	High
Flood Zone	N
Elevation Variance Feet	N/A
Definition: *A variance calculated in feet between the Property Elevation Feet and Water Surface Elevation feet.*	
Property Elevation Feet	12.8
Definition: *Ground elevation in feet of the property using the location coordinates and is component for deriving the Elevation Variance Feet.*	
Water Surface Elevation Feet	N/A
Definition: *Serves as the proxy for the elevation of the 100-year flood and is component for deriving the Elevation Variance Feet.*	
Distance One Hundred Year Flood Plain Feet	
Definition: *Distance in feet between the property and the boundary of the 100-year flood zone located in the same catchment or subwatershed.*	
Notes	N/A
Subwatershed Name	Angel Island- San Francisco Bay Estuaries
Definition: *Name of the subwatershed in which the property is located.*	
Subwatershed Code	180500021001
Definition: *Hydrological Unit Code (HUC) in which the property is located.*	
Community Number	060298
Community Name	SAN FRANCISCO, CITY OF
Map Panel	001
Map Suffix	N
Map Date	
Original FIRM Date	
Participation Status	R
State County FIPS Code	06075
Additional Impact Areas	No additional impact areas found

Wind Probability	
Hurricane Wind Probability Risk Description	Very Low
Hurricane Wind Probability Risk Level	1
Hurricane Wind 100-Year Probability	0
Straight Wind Probability Risk Description	Very Low
Straight Wind Probability Risk Level	1
Straight Wind 10-Year Probability	0.001
Tornado Wind Probability Risk Description	Very Low
Tornado Wind Probability Risk Level	1
Tornado Wind 10-Year Probability	0.026
Is in Special Wind Area	False

External

North	AS High rise building across Mission Street
South	Underground station (partial AS)
East	AS high rise across Beale Street plus 100 feet setback
West	AS high rise across Fremont Street

Risk Reduction Programs

Housekeeping

Excellent with a few minor exceptions.

Hot Work Program

A written hot work permit system is in use. The permit requires a 30 minute fire watch after the completion of any hot work.

Emergency Organization & Pre-Planning

A written comprehensive emergency plan has been prepared for the buildings. The plan includes an emergency plan that is provided for each resident. There is also a plan that includes all emergencies for building management and engineering. The plan is reviewed and updated as necessary.

Organization	Response	Type	Distance	Comments
San Francisco Fire Department	Structural	Paid	0.60 miles	Excellent resources and training. Three Stations within 1.5 miles

There is a formal water mitigation program that includes a response program, pressure regulating valve inspections and every shift back of house inspection. Curbs are provided in mechanical rooms where water piping is present.

Fire Protection System Testing & Maintenance

System	Weekly	Monthly	Quarterly	Six Months	Annual
Extinguishers – Visual		X			
Extinguishers – Maintenance					X
Fire Pump – Inspection/Operation		X			
Fire Pump – Capacity Test					X
Control Valves – Visual Inspection		X			
Control Valves – Maint./Operation					
Valve Tamper Switches				X	
Sprinkler Waterflow Alarms				X	

System	Weekly	Monthly	Quarterly	Six Months	Annual
Fire Alarms				X	
Wet Pipe Systems		X			X
Kitchen Wet Chemical Extinguishing Systems				X	
Hose Stations		X			
Detection Systems and Notification Devices				X	
Fire Doors, Dampers and Penetrations					X

Fire Protection Impairment Handling

Impairments are reported to the insurance carrier and to the fire department.

Fire Protection

Water Supply & Distribution System

Water Supply Description

Water supply is from an 8-inch fire service connected to the city water main in Mission Street. The city supply is reduced to 30 psi at the pressure regulating valve (PRV) valve on the suction side of the low zone fire pumps. The low zone fire pumps supply low zone standpipes and sprinkler systems.

Low zone standpipes supplied from the low zone fire pumps supply the high zone fire pumps. The low zone fire pumps can also take suction from the fire water tank in the basement.

Pump	UL Listed	Driver	Rated Flow	Rated Pressure	Suction Source
01A	Yes	Electric	1000	180	Basement Tank
01B	Yes	Electric	1000	180	Basement Tank
02A	Yes	Electric	750	255	26TH Floor main from Bsmt fire pumps
02B	Yes	Electric	750	255	26TH Floor main from Bsmt fire pumps

Distribution System Description

Testing Results

Driver	Rating			Flow	Suction	Discharge	Press	RPM	Speed Correction	
	GPM	PSI	RPM						Flow	Pressure
LR01A Electric	0	199	3550	0	3	201	198	3550	0	198
	1000	180		1000	3	180	177	3550	1000	177
	1500	144		1500	3	144	139	3550	1500	139
LR01B Electric	0	199	3550	0	3	203	200	3550	0	200
	1000	150		1000	3	184	181	3550	1000	181
	1500	143		1500	3	146	143	3550	1500	143

Driver	Rating			Flow	Suction	Discharge	Press	RPM	Speed Correction	
	GPM	PSI	RPM						Flow	Pressure
HR02A Electric	0	290	3550	0	0	281	281	3550	0	281
	750	255		750	0	252	252	3550	750	252
	1125	217		1125	0	207	207	3550	1125	207
HR02B Electric	0	285	3550	0	0	273	273	3550	0	273
	750	255		750	0	243	24	3550	1000	181
	1500	143		1500	3	146	143	3550	1500	143

Fire Protection Systems & Equipment

Water Based Systems

Area	Design Density/Area	Demand (no hose)	Detection
Wet Pipe Sprinkler Systems			
Retail Areas	0.20/1549	569.9 @ 74.0	
Parking	0.15/1045	624.7 @ 43.4	
Parking	0.15/1540	441.5 @ 79.1	
Parking	0.15/1565	486.3 @ 58.2	
Residences	0.10/1540	123.1 @ 65.6	
Residences	0.10/1552	404.3 @ 77.6	
Residences	0.10/1519	476.7 @ 46.2	

Standpipe and Hose Stations

Standpipe hose outlets are provided in each stairwell on every floor.

Portable Extinguishing Equipment

An adequate number and proper type of portable fire extinguishers are distributed throughout. Residents are required to have extinguishers however there is no annual maintenance recorded or monthly checks

Fire Signaling System

All fire alarms are received at the security center which is occupied 24/7.

Fire Detection Systems

Smoke detection is provided in all areas with the exception of the gym. Residence smoke alarms are not connected to the security center.

Major Equipment

Transformers

Power is supplied by a PG&E owned transformer located in a concrete vault in the basement. Walls and ceiling are rated for 3-hours.

Power is distributed to the main panel, rated at 1200 amperes, in an adjacent room at 480 volt 3-phase power. The power is distributed to other electrical rooms in the Tower and the Podium. An emergency generator is rated at 1,000 KW located in a cut-off room in the Podium and supplies emergency power to selected areas of the buildings through automatic transfer switches.

The fire pumps have separate breakers and transfer switches.

All electrical rooms have fire sprinklers and smoke detection.

An IR survey was conducted on all major electrical panels. Problems found were corrected. The IR survey is currently done on a 5-year basis.

Natural Gas Supply

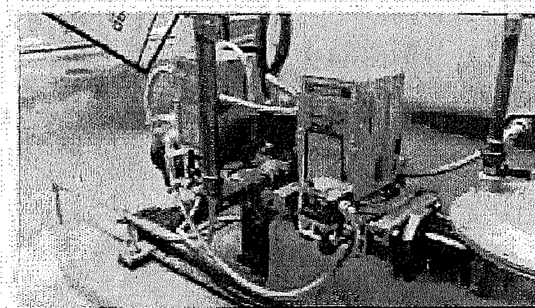
A 4-inch natural gas main enters the building on Beale Street. The main line splits into three lines with each line provided with a seismic gas shutoff valve. The pipe entering the Tower from the Podium structure side and is provided with welded stainless steel braided flex pieces to provide flexibility to allow for settling and earthquake induced motion. Seismic bracing was recently added to all gas piping to Factory Mutual requirements. Leak testing was recently conducted on main gas lines.

Boilers

There are three natural gas fired hot water boilers in the Tower. The boilers are rated at 2,400,000 btu/hr. input. All are equipped with safety shut-off valves and flame failure.

There are three natural gas fired hot water boilers provided for the common area and the twelve story mid-rise. These boilers are rated at 4,000,000 btu/hr each. All boilers are equipped with flame failure, double block and bleed safety shut-off valves and high and low gas pressure switches. In addition the boilers are provided with low water cut-off.

Podium Boilers



Double Safety Shut-off Valves with Vent Line Between

HVAC

Heating and cooling is provided by heat pumps in residential units.

Package units are provided for the common areas

Two cooling tower is provided on the roof of the Podium Tower. The towers are metal frame with PVC fill. Vibration monitoring is provided for the fans.

Loss History

No property related losses have been reported for this location.

EXHIBIT

B

EXHIBIT B

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ALLANA BUICK & BERS

Making Buildings Perform Better

November 15, 2016

John Gill
Hughes Gill Cochrane
1600 South Main Street, Suite 215
Walnut Creek, California 94596

Denis F. Shanagher
Duane Morris LLP
Spear Tower
One Market Plaza, Suite 2200
San Francisco, CA 94105-1127

Re: **The Millennium Tower Site Utilities Connections Investigation Progress Report - DRAFT**

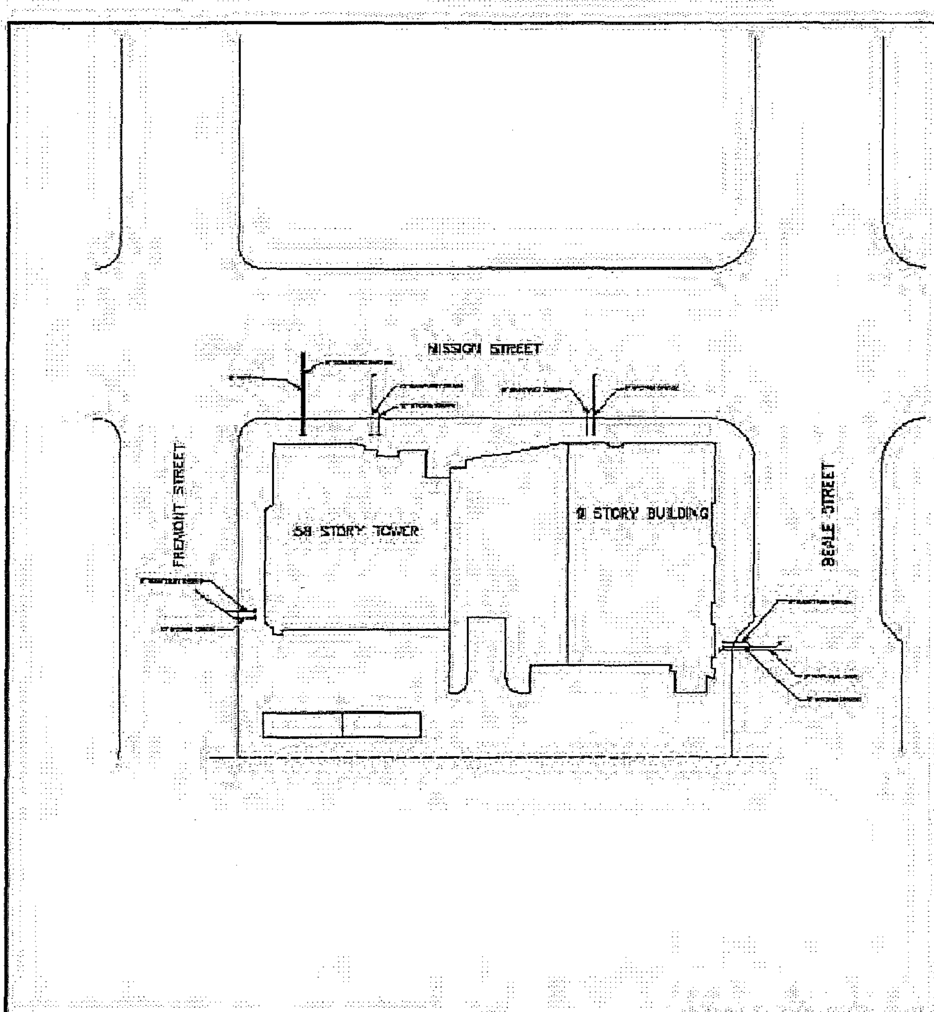
John and Denis,

In accordance with your request, Allana Buick & Bers, Inc. (ABBAE) is in the process of conducting a field investigation and analysis of the site utility pipe connections at The Millennium Tower in San Francisco, CA. We are pleased to present Hughes Gill Cochrane (HGC) with a progress report of our investigation and preliminary findings.

Background

The Millennium Tower site consists of a 58 story multi residential hi-rise and a 9 story lo-rise building, built during 2008 and 2009. Reports of the building sinking 16 inches has caused concern for the status of the building utility connections and their ability to sustain the building's vertical movement of that magnitude relative to the surrounding site. The focus of the investigation will be to report on the existing conditions of the building utility connections and to provide analysis and repair recommendations based on our findings.

- The Millennium Tower site utilities include domestic water service, fire water service, sanitary drain laterals, storm drain laterals, electrical power supply and natural gas supply.
- The Fremont Street building side has set of 8" sanitary drain and a 10" storm drain connections.
- The Mission Street building side has an 8" fire water service connection, an 8" domestic water connection, one set of 10" sanitary drain and 10" storm drain connections and one set of 8" sanitary drain and 8" storm drain connections.
- The Beale Street building side has a set of 8" sanitary drain and 8" storm drain connections and a 3" natural gas supply connection.



ALLANA BUICK & BERS

Making Buildings Perform Better

UTILITY SITE PLAN

MILLENIUM TOWER

UTILITY CONNECTION INVESTIGATION

Huges Gill Cochrane, P.C.
1600 South Main Street, Suite 215, Walnut Creek, CA

PROJECT NO.	DRAWN	CHECKED	SCALE	ISSUE	DATE	DRAWING NO.	REV.
16-4004.01	TE	EM	NTS	-	10/10/2016	-	-

Site Survey

An initial non-destructive site survey was conducted by ABBAE staff on October 3, 2016. The Millennium Tower utility pipes were observed, where each pipe enters the building perimeter at the first level of the parking garage (B1). With the exception of the natural gas supply pipe all the utility pipe penetrations through the basement wall are routed through concrete "cored" openings and sealed with Link-Seal sleeves. The condition of the visible pipe sections in the parking garage level appeared to be in good condition.

The natural gas supply pipe is routed through the perimeter basement wall and encased in concrete and then rises into the gas meter room (facing Beale Street). The gas pipe is therefore not visible until it enters the gas meter room floor. On October 17, 2016 a gas leak test was conducted on site which included these locations:

- Gas meter room at supply pipe floor penetration
- Side walk control joints on Beale street side adjacent to gas meter room
- Natural gas street shutoff valve vault

No gas leaks were detected.

On October 27, 2016, ABBAE staff conducted a site observation of the piping routed through the expansion joint between the high rise and low rise towers at the B1 basement level. Hot water piping, chilled water piping, natural gas piping, domestic water piping that cross the expansion joint are equipped with "expansion loops" made up of flexible fittings and piping offsets. The observed piping joints appeared to be functioning properly. A 4" domestic water supply main, which is routed through the expansion joint, appears to be wedged between an adjacent chilled water line and the bottom of the floor slab. No damage was observed. We recommend further assessment of this site condition.

Construction Period RFI Review

ABBAE has reviewed the record Millennium Tower- Plumbing As-built drawings and the submitted construction period RFIs regarding plumbing issues.

The following is a brief summary of the submitted Webcor RFI's pertaining to the Millennium building utility line entries:

5.4.06 (RFI 222)
Handel Architects recommends the use of flexible connections at building utility line entries (the high rise only), despite Webcor's understanding from Geotech & Structural Engineers opinion that flex connections are not necessary because the building will settle together with the surrounding site.

5.18.06 (RFI 251 R1)
Flack & Kurtz Engineers describe methods of providing flexible connections for building utility line entries:

- Pressure piping (Fire / Domestic Water) – (4) 90 degree ells using ductile iron piping and mechanical couplings
- Drain piping (Storm / Sanitary) – (2) 1/8 bends using cast iron piping with heavy duty couplings

7.7.06 (RFI 354)
Flack & Kurtz Engineers provide details of flexible connection applied to the 8" fire service pipe (Mission St side of building):

- (2) flanged ball joints distanced 36" apart with connector pipe.
- Ball joints to be Hyspan Barco BB31533-68-11 Type N
- Sizing based on **total building settlement of 6"**

10.5.06 (RFI 354 R1)
4.13.07 (RFI 354 R1)
Flack & Kurtz Engineers provide design and specification revisions to flexible connection for the 8" fire service pipe (Mission St side of building):

- Add expansion joint fitting in the connector pipe between the (2) flanged ball joints.
- The expansion joint fitting is to be Hyspan 1501-167-2
- Change Ball joints to be Hyspan Barco BB31533-68-21 Type N
- Sizing based on total building settlement of 6"

7.31.07 (RFI 354 R2)
Flack & Kurtz Engineers confirm that the design and specification revisions to the flexible connection for the 8" fire service pipe (Mission St side of building) will accommodate the two building settlement scenarios: 1)building settles 6" alone 2)building settles 6" with surrounding site.

7.10.08 (RFI 2492)
7.24.08 (RFI 2492 R1)
Due to a 6" settlement of the building, causing back sloping of the storm and sanitary pipes on the Mission Street side , Flack & Kurtz has approved restoring the slope of the drain piping by raising the pipe penetrations through the B1 level foundation wall by 8".

7.25.08 (RFI 2525 R1)
Flack & Kurtz Engineers provides details of flexible connections to be applied to the storm and sanitary service pipes at entry to building:

- (2) flanged ball joints distanced 48" apart with connector pipe.
- Ball joints to be Hyspan Barco

8.4.08 (RFI 2525 R2)
Flack & Kurtz Engineers provides specification revisions to flexible connections applied to the storm and sanitary service pipes at entry to building:

- Ball joints to be Starflex

7.24.08 (RFI 2564)
7.31.08 (RFI 2564 R1)
Due to a 6" settlement of the building, causing back sloping of the storm and sanitary pipes on the Fremont Street side , Flack & Kurtz has approved restoring the slope of the drain piping by raising the pipe penetrations through the B1 level foundation wall by 8".

Preliminary Findings

In review of the Webcor construction RFIs submitted above which pertain to building utility line entries it appears that the design team had addressed the future building settlement with the assumption of a maximum vertical movement of 6 inches. Flexible connections consisting of (2) or (3) pipe ball joints were proposed for the Fire Service main, the storm and sanitary sewers and possibly the domestic water main. It is not clear from these documents if in fact the flexible connection assemblies were installed.
A review of the Plumbing (Broadway Mechanical) and Civil (Telemon Engineering) As-built drawings did not result in finding any detailed reference to the flexible connection assemblies discussed or described in the RFIs.

To date, we have no confirmation as to the actual installation details of the building utility line connections at the perimeter of the building site. We therefore recommend subgrade investigation work to confirm the existing conditions at the utility pipe entries to the building. The purpose of the investigation, going forward, will include the following:

- Verify the existing utility pipe connection methods at each entry location to accommodate building settlement or movement.
- Verify condition and integrity of the subgrade piping at each location.
- Analyze the excavation findings and recommend repair work.

Further Investigation

This next step in the investigation will entail exterior street side excavation at each building utility entry location. This investigation will include observations around storm and sanitary drains, fire, domestic water and natural gas lines. Excavations will need to extend at least 3 feet wider than the marked utility lines and approximately 10 feet away from the building. The entire circumference of the utility lines needs to be exposed in order to assess the condition of the pipes and the construction of any flexible connections to accommodate settlement.

This investigation needs to be coordinated with local building officials, utility companies, telecommunication companies, and trades people that are capable of performing emergency repairs as needed. This investigation should include electrical, plumbing, cabling, fire sprinkler, and sewer. The photo section in this report shows locations of pipe penetrations from the garage and street level.

Sincerely,

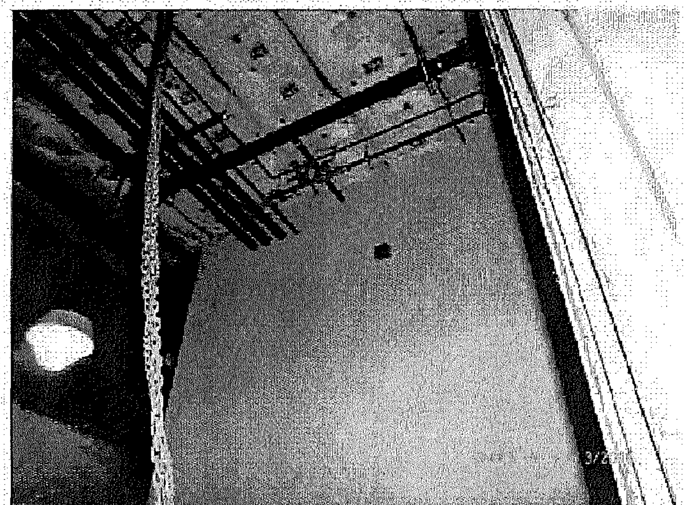
Allana Buick & Bers, Inc.

Eli Margalit, P.E., LEED AP
Forensic Mechanical Engineer

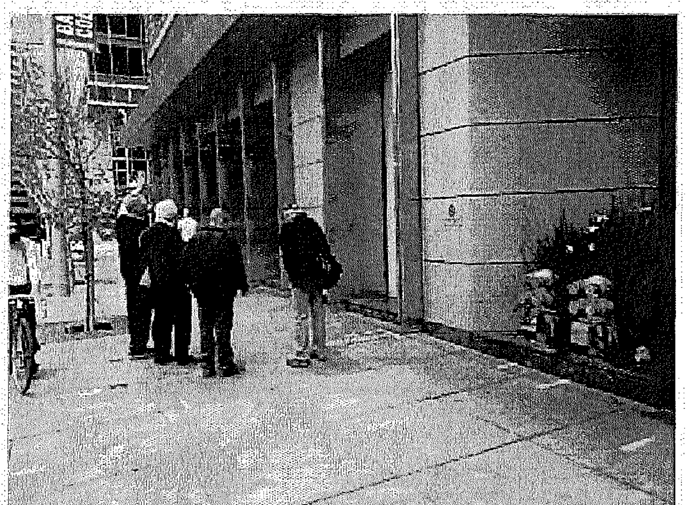
Photo Section

UP-1 Beale Street Elevation

UP-1 Beale Street Elevation: Storm, Sanitary and Natural Gas



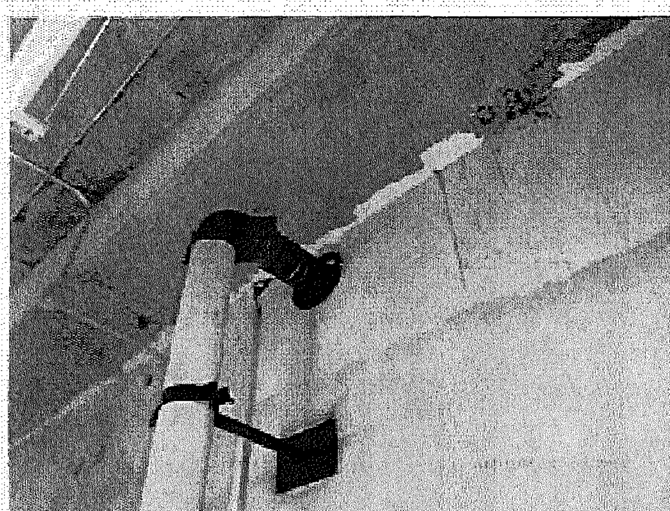
UP-1 Beale Street Elevation: Garage View



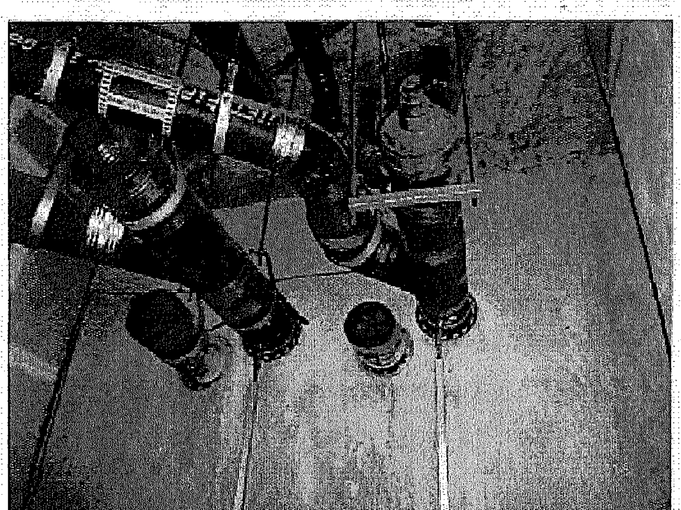
UP-2 Fremont Street: Storm, Sanitary Drains


UP-2 Fremont Street Elevation: Garage View


UP-3 Mission Street: Domestic Water and Fire

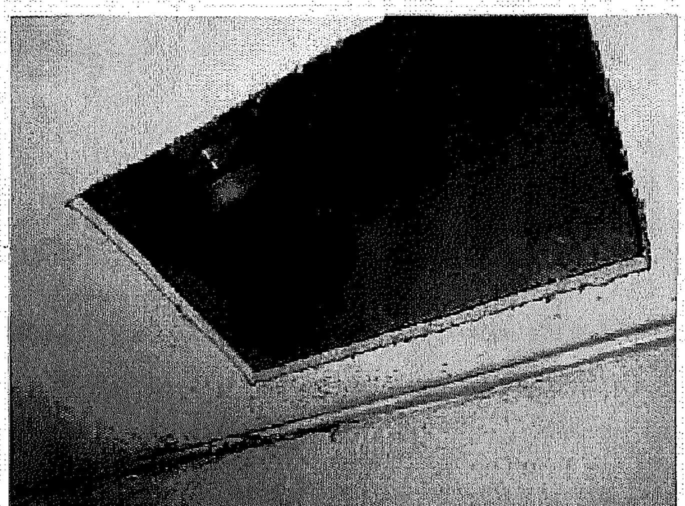


UP-3 Mission Street: Garage View



UP-4 Mission Street Elevation: Storm, Sanitary

UP-5 Mission Street Elevation: Storm and Sanitary



UP-5 Mission Street: Garage View

EXHIBIT

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EXHIBIT C

subtronic corp

NULCA - NASSCC - APWA - AWWA - Members

5031 Blum Road
Martinez, California 94553
Telephone (925) 228-8771
Fax No. (925) 228-8737
www.subtronic.com

GAS LEAK INVESTIGATION REPORT

Date: 10/20/2016 **Date of Inspection: 10/17/2016**

Site address: Millennium Tower, 301 Mission Street, San Francisco, CA

Client: Allana, Buick and Bers

990 Commercial Street, Palo Alto CA 94303

Attn: Eli Margalit, 650 543-5605

Reason for Inspection: Check for natural gas leaks on service from gas valve on Beale St to utility room.

Investigations: On 10/17/2016 at 9 am, we arrived at the property on **301 Mission Street in San Francisco** and began an inspection of the area from the PG&E gas valve in the sidewalk to and into the utility room where the gas line comes up to feed the building.

A portable flame irrigation detector (DP4) was used to detect trace amounts of natural gas (down to 1 ppm) by placing its sensor into the gas valve sleeve for 30 seconds with no gas detected. This same 30 second interval was used to check the entire sidewalk area between the valve and the building's exterior as well as the interior of the utility room where the gas supply line comes up to feed the building.

Conclusions: No natural gas was detected outside the building in the vicinity of the service line or inside in the meter room where it rises.

Report Prepared By: Mark Sturdevant

Report QA by: Jon Taylor J. C. Taylor

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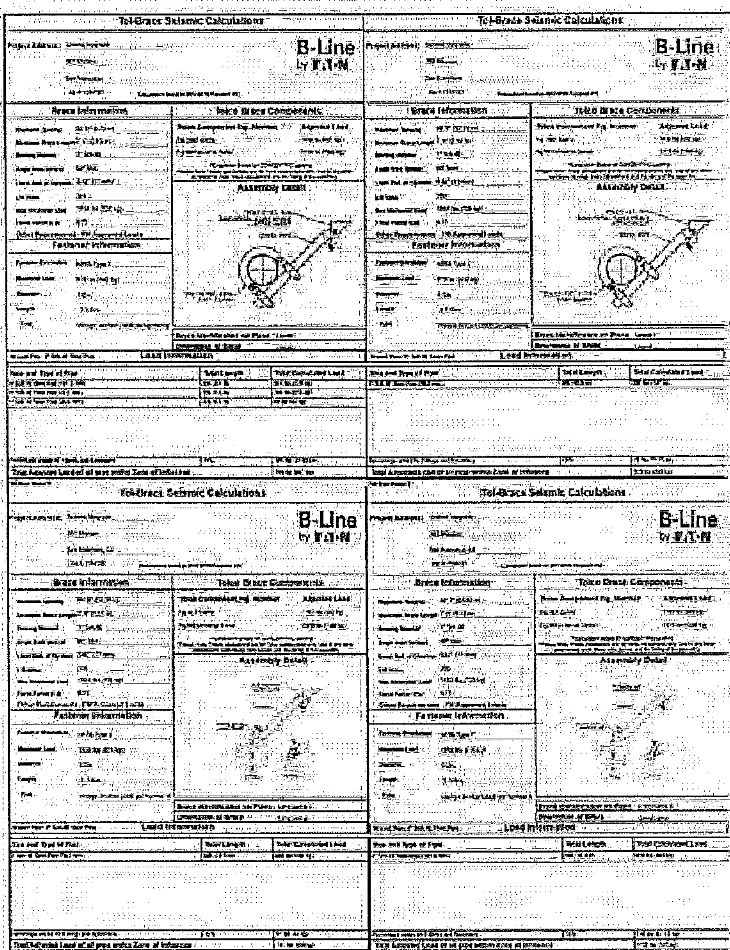
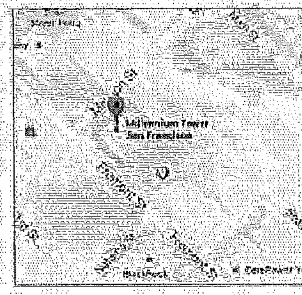
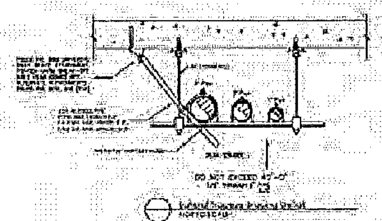


Seismic Upgrade

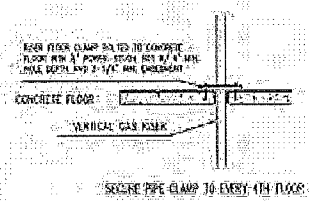
301 Mission, Garage Floor



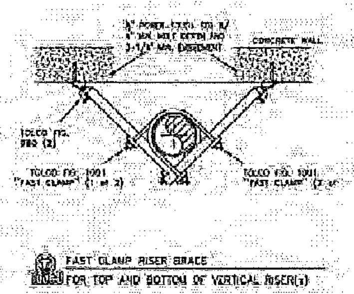
SITE MAP



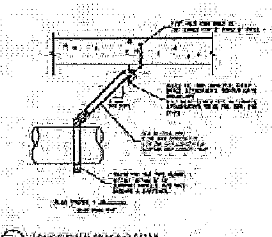
Detail 1



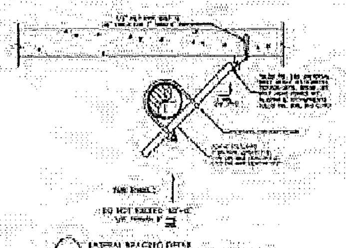
Detail 3



Detail 2



Detail 4



Detail 5

GENERAL NOTES:

1. [illegible]
2. All pipe locations and elevations to be verified in the field.
3. [illegible]
4. [illegible]
5. [illegible]

SCOPE OF WORK

[illegible]

CODES & REGULATIONS

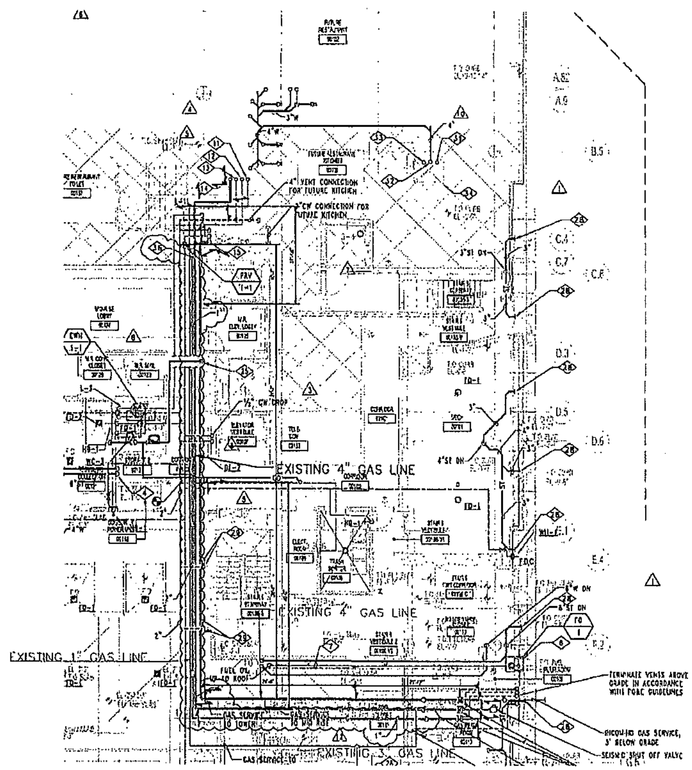
[illegible]

Fire Protection

SEISMIC UPGRADE
Millennium Tower
301 Mission St.
San Francisco

COVER SHEET

FP1



LEVEL 1 PIPING PLAN

SCALE: 1/8" = 1'-0"

SUMMARY

- There are three natural gas mains that enter the building on Level 1 on Beale St. that are hanging from a trapeze. Additional seismic bracing is warranted for the natural gas main piping that supplies the high-rise Millennium Tower.

-On Level 1, for the 3" & 4" natural gas pipe, add lateral and longitudinal bracing within 2'-0" of a change in direction. The existing 1" natural gas pipe does not need bracing per FM Global.

-On Level 1, for the 4" natural gas pipe, add lateral bracing there is an existing trapeze. Look to detail 1 on FP-1. Lateral bracing is not to exceed 40'-0" per seismic calculations.

-On Level 1, for the 4" & 3" natural gas pipe, add longitudinal bracing. Look to detail 4 on FP-1. Longitudinal bracing is not to exceed 80'-0".

-On Level 1, for natural gas main riser, add four way bracing within 24 in. of the top and bottom of riser. Look to detail 2 on FP-1.

Design, Installation, Inspection, and Repair of Fire Sprinkler Systems

Fire Protection

SYMBOLS & ABBREVIATIONS

MILLENNIUM TOWER

301 MISSION ST.

SAN FRANCISCO

ANTONIO NUNEZ

SEISMIC UPGRADE

LEVEL 1

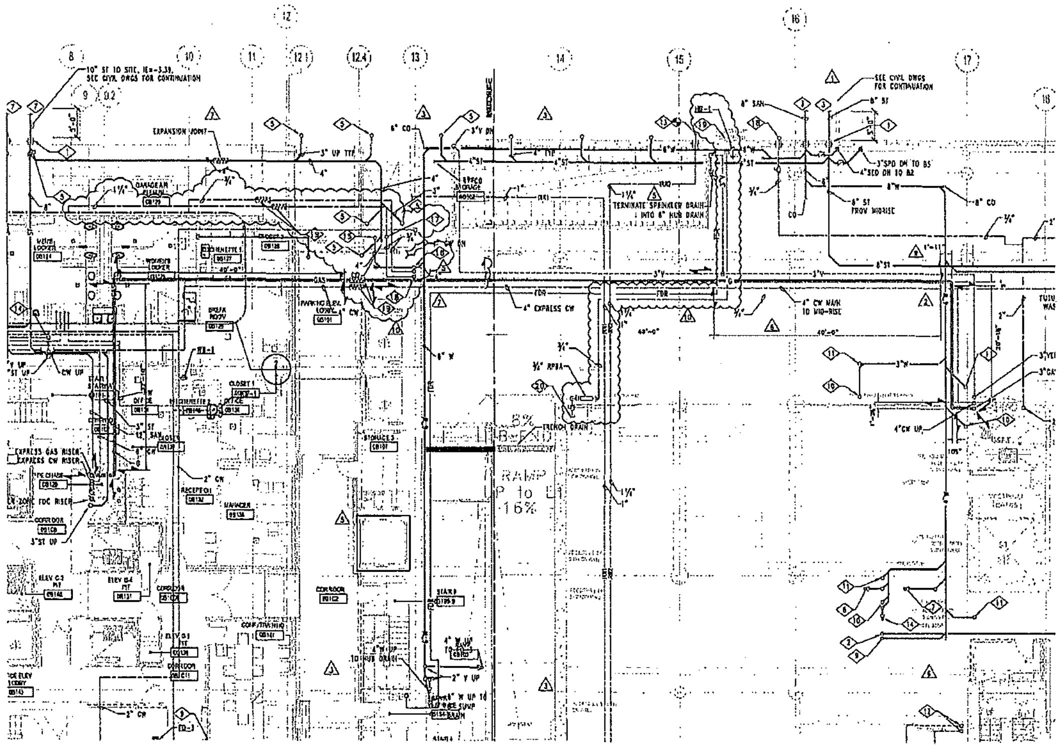
301 MISSION ST.

SAN FRANCISCO

Piping Plan

FP-2

2 of 4



BASEMENT LEVEL PIPING PLAN

SCALE: 1/8" = 1'-0"

SUMMARY

- *In the Basement level, for the 4" natural gas pipe, add lateral and longitudinal bracing within 2'-0" of a change in direction.*

-In the Basement Level, for the 4" natural gas pipe, add lateral bracing. Lateral bracing is not to exceed 40'-0" per seismic calculations. Look to detail 5 on FP-1.

-In the Basement level, for the 4" natural gas pipe, add longitudinal bracing. Longitudinal bracing is not the exceed 80'-0" per seismic calculations. Look to Detail 4 on FP-1.

-In the Basement Level, for the 4" natural gas main riser, add four way bracing within 24 in of the top and the bottom of the riser. Look to detail 2 on FP-1.

Design, Installation Inspection, and Repair of Fire Sprinkler Systems

Fire Protection

SYMBOLS & ABBREVIATIONS

MILLENIUM TOWER

301 MISSION ST.

SAN FRANCISCO

415-874-4703

STATUS	DATE
ISSUE FOR PLAN CHECK	11/20/15

SEISMIC UPGRAD

BASEMENT

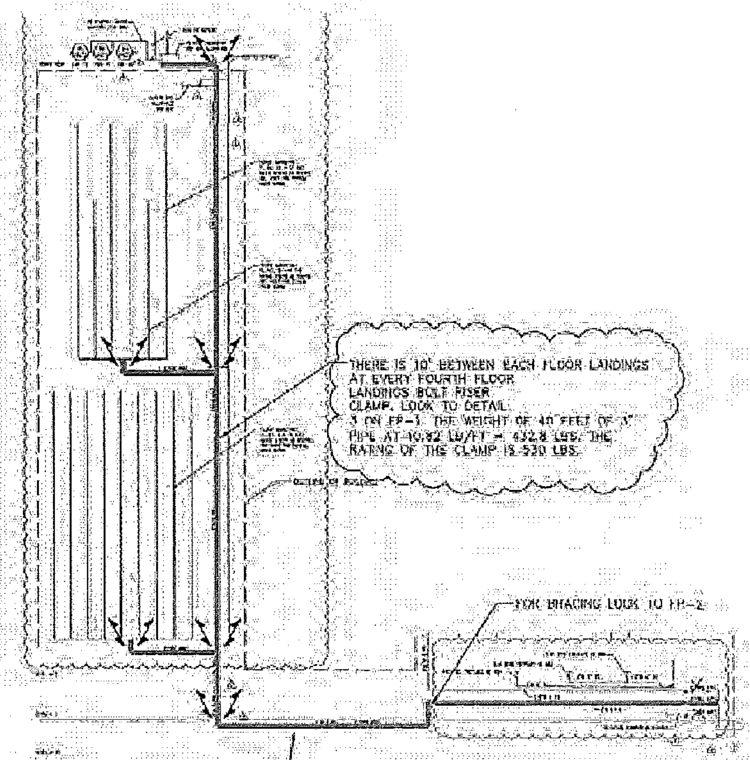
301 MISSION

SAN FRANCISCO

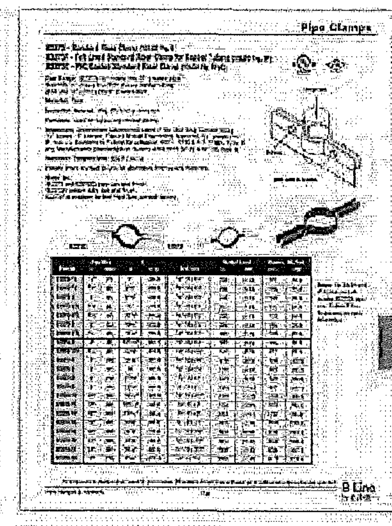
Piping Plan

FP-3

3 of 4



GAS MAIN PIPING PLAN



SUMMARY

- The natural gas riser in the Millennium Tower needs seismic bracing upgrade.
- On natural gas riser, install secure pipe clamps every 4th floor landings for seismic bracing. Look to detail 3 on FP-1.
- Sections of horizontal branches coming off of the natural gas riser for the high-rise Millennium Tower that are larger in diameter than 2.5in. are subject to upgrading seismic bracing.
- For the horizontal branches coming off the vertical gas riser, add four way bracing to both ends of pipe as shown.

RLH Fire Protection

SEISMIC UPGRADE
GAS RISER
301 MISSION
SAN FRANCISCO

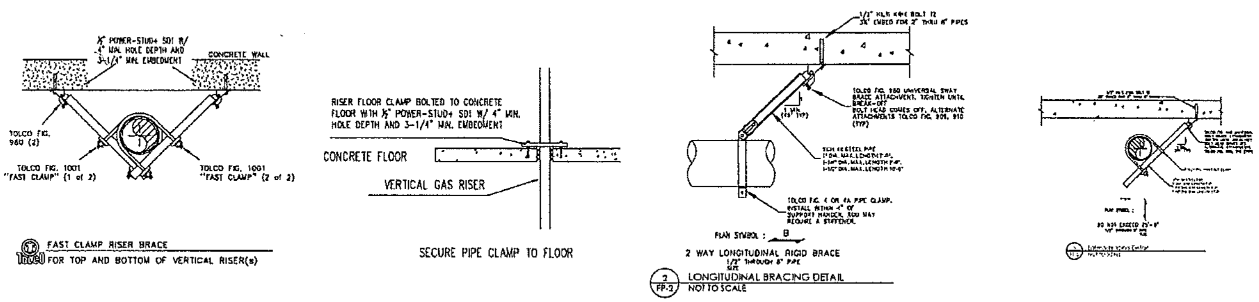
PIPING PLAN

FP-4

4 of 4

Gas Siesmic Upgrade

301 Mission, Basement

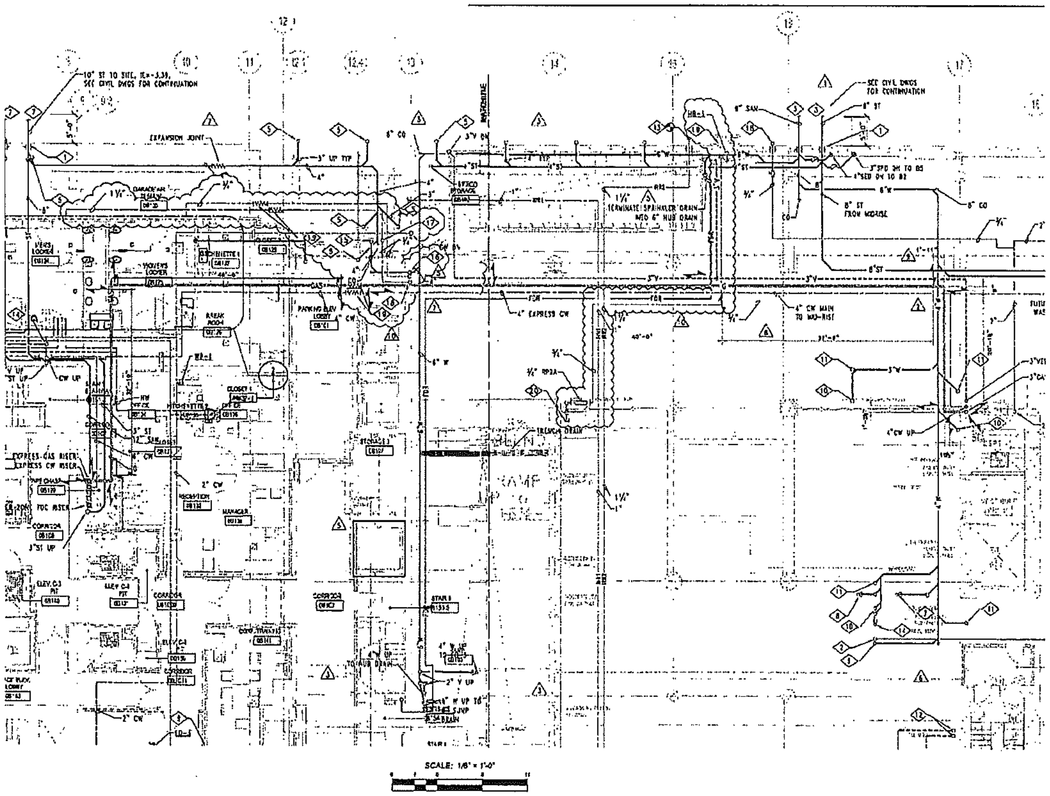


FAST CLAMP RISER BRACE
FOR TOP AND BOTTOM OF VERTICAL RISER(s)

SECURE PIPE CLAMP TO FLOOR

2 WAY LONGITUDINAL RIGID BRACE

2 FP-2 LONGITUDINAL BRACING DETAIL
NOT TO SCALE



SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. The new improvements to the existing gas system shall be installed and in accordance with NFPA 13-2013 Edition, Data Sheet 1-11 *Fire Following Earthquake*, Data Sheet 2-8 *Earthquake Protection for Water-Based Fire Protection Systems*, Data Sheet 7-54 *Natural gas and Gas Piping* Per FM Global.
2. All pipe locations and elevations to be verified in the field.
3. Block/ Lot #. 3719/312
4. All piping shall be hydrostatically tested in accordance with requirements of section 24-2.1.1 of NFPA-13
5. Design Data .
   - A. Construction Type: I
   - B. Occupancy Class: B
   - C. # of Floors. 58
   - D. Hazard Classification: N/A
   - E. Remote Area. N/A
   - F. Area of Density: N/A
   - G. Number of Sprinklers Calculated : N/A
   - H. Hose Stream Allowance : 100 (Inside)
   - I. Pipe Type: Black Pipe Sch-40 C=120 (100)
   - J. Fittings : #125 Cast Iron

SCOPE OF WORK

UPGRADE OF THE EXISTING GAS PIPING WITHIN FACILITY

EXCLUSIONS:

1. RELOCATION OF EXISTING MAIN AND BRANCHLINE PIPING DUE TO NEW CONSTRUCTION FRAMING, CEILINGS, HVAC AND ELECTRICAL.
2. SEISMIC/RESTRAINT UPGRADES.
3. CLEANING, PRIMING, OR PAINTING OF PIPE, FITTING, HANGER, ETC.
4. PROTECTION OF SPRINKLERS FROM PAINTING.
5. ELECTRICAL WIRING OF ANY NATURE, INCLUDING ALARM/MONITORING SYSTEM
6. FURRING OR BOXING FOR CONCEALMENT OF PIPE.
7. FIRE EXTINGUISHERS, HAND HOSES AND CABINETS.
8. CUTTING AND PATCHING OF EXISTING FINISHED SURFACES.
9. FIRE STOPPING OF RATED WALL ASSEMBLIES.

CODES & REGULATIONS

THIS PROJECT SHALL BE DESIGNED AND INSTALLED TO COMPLY WITH ALL CODES, STATUTES AND ORDINANCES IN FORCE IN THE CITY AND COUNTY OF SAN FRANCISCO, AND CALIFORNIA ADMINISTRATIVE CODE TITLE-24 INCLUDING:

2013 CALIFORNIA BUILDING CODE (PART 1 OF TITLE 24) and SAN FRANCISCO Code Amendments
2013 CALIFORNIA BUILDING CODE (2009 IBC=PART 2 OF TITLE 24)
2013 CALIFORNIA ELECTRICAL CODE (2008 NEC=PART 3 OF TITLE 24)
2013 CALIFORNIA MECHANICAL CODE (2009 UMC=PART 4 OF TITLE 24)
2013 CALIFORNIA PLUMBING CODE (2009 UPC=PART 5 OF TITLE 24)
2013 CALIFORNIA ENERGY CODE (PART 6 OF TITLE 24)
2013 CALIFORNIA FIRE CODE (2009 IFC = PART 9 OF TITLE 24)
2013 NFPA 13 AS MODIFIED BY THE STATE FIRE MARSHAL and SAN FRANCISCO
2013 NFPA 24 AS MODIFIED BY THE STATE FIRE MARSHAL and SAN FRANCISCO

ALONG WITH ANY OTHER APPLICABLE LOCAL AND STATE LAWS AND REGULATIONS AS REFERENCED IN PART 9 OF TITLE 24.

Fire Protection

Design, Installation, Inspection, and Repair of Fire Sprinkler Systems

MILLENIUM TOWER
301 MISSION ST.
SAN FRANCISCO

SEISMIC UPGRAD
BASEMENT
301 MISSION
SAN FRANCISCO

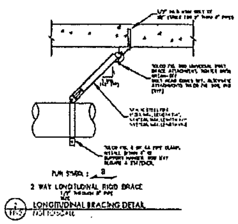
PIPING PLAN

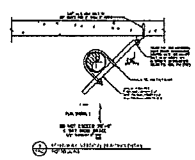
FP1

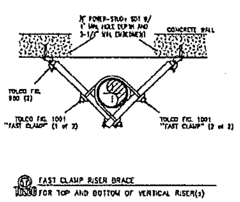
1 of 1

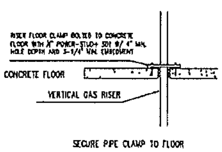
Seismic Upgrade

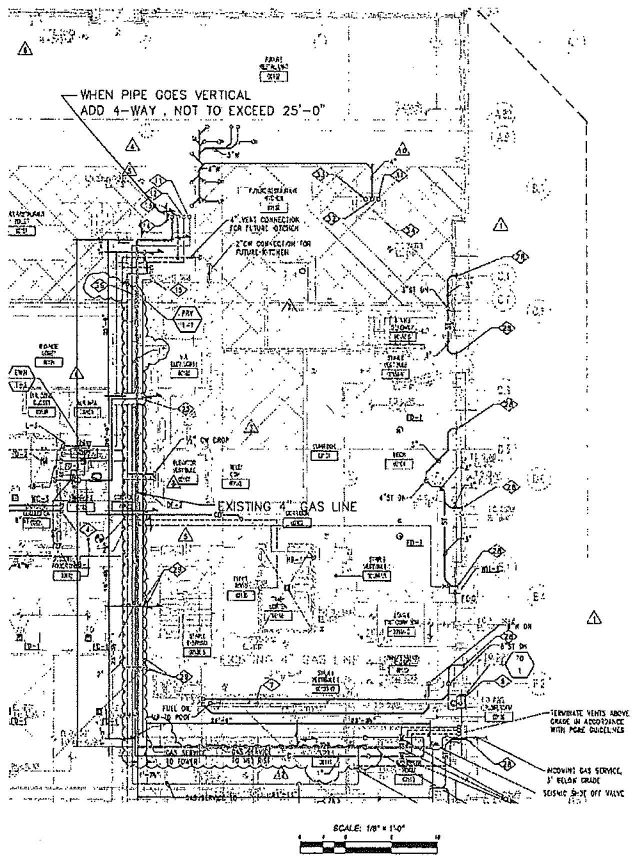
301 Mission, Garage Floor











GENERAL NOTES:

1. The new improvements to the existing gas system shall be installed and in accordance with NFPA 13-2013 Edition, Data Sheet 1-11 *Fire Following Earthquake*, Data Sheet 2-8 *Earthquake Protection for Water-Based Fire Protection Systems*, Data Sheet 7-34 *Natural gas and Gas Piping* Per FM Global.
2. All pipe locations and elevations to be verified in the field.
3. Block/ Lot #: 3719/312
4. All piping shall be hydrostatically tested in accordance with requirements of section 24-2.1.1 of NFPA-13
5. Design Data :
   - A. Construction Type. I
   - B. Occupancy Class: B
   - C. # of Floors: 56
   - D. Hazard Classification: N/A
   - E. Remote Area: N/A
   - F. Area of Density: N/A
   - G. Number of Sprinklers Calculated : N/A
   - H. Hose Stream Allowance : 100 (Inside)
   - I. Pipe Type: Black Pipe Sch-40 C=120 (100)
   - J. Fittings : #125 Cast Iron

SCOPE OF WORK

SEISMIC UPGRADE FOR GAS PIPING WITHIN THE FACILITY

EXCLUSIONS:

1. RELOCATION OF EXISTING MAIN AND BRANCHLINE PIPING DUE TO NEW CONSTRUCTION FRAMING, CEILINGS, HVAC AND ELECTRICAL
2. CLEANING, PRIMING, OR PAINTING OF PIPE, FITTING, HANGER, ETC.
3. PROTECTION OF SPRINKLERS FROM PAINTING.
4. ELECTRICAL WIRING OF ANY NATURE, INCLUDING ALARM/MONITORING SYSTEM.
5. FURRING OR BOXING FOR CONCEALMENT OF PIPE.
6. FIRE EXTINGUISHERS, HAND HOSES AND CABINETS.
7. CUTTING AND PATCHING OF EXISTING FINISHED SURFACES.
8. FIRE STOPPING OF RATED WALL ASSEMBLIES.

CODES & REGULATIONS

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2013 CALIFORNIA PLUMBING CODE (2009 UPC-PART 5 OF TITLE 24)
2013 CALIFORNIA ENERGY CODE (PART 6 OF TITLE 24)
2013 CALIFORNIA FIRE CODE (2009 IFC + PART 9 OF TITLE 24)
2013 NFPA 13 AS MODIFIED BY THE STATE FIRE MARSHAL and SAN FRANCISCO
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ALONG WITH ANY OTHER APPLICABLE LOCAL AND STATE LAWS AND REGULATIONS AS REFERENCED IN PART 9 OF TITLE 24.

Fire Protection

MILLENNIUM TOWER
301 MISSION ST.
SAN FRANCISCO

SEISMIC UPGRADE
GAS LINE: LEVEL ONE
301 MISSION ST.
SAN FRANCISCO
COVER SHEET
FP1
1 of 1

EXHIBIT

E

EXHIBIT E

NAME OF TEST	VENDOR RESPONSIBLE	FREQUENCY OF TEST	DATE OF RENEWAL	COST	NOTES	AGENCY OVERSIGHT
Fire Sprinkler System Test 5yr	RLH/ Eng	every 5 years	2019		done 2014	$23,000
Fire Sprinkler System Test	RLH/Eng	1X per year	March		visual in units needed	$11,674
Fire Alarm/life safety testing	redhawk/eng	2X per year	March/oct		testing in units needed	$19,809
SFFD inspection	SFFD/Eng	1X per year	SFFD		dates by SFFD	$15,000
Fire Extinguisher Testing	Coast Fire Equipment	1X per year	November			$2,050
Fire Extinguisher Testing/6yr	Coast Fire Equipment	every 6 years	2020		6 yr service done oct 2014	
Fire Extinguisher Testing/12yr	Coast Fire Equipment	every 12 years	2020		Hydro test at 12 yrs	
Fire System inspection	Engineering	3x daily			Daily rounds	
Fire system Monitoring	Engineering	3x daily			on line with Red Hawk	
Fire Pump Test	Engineering Dept.	weekly			in house run test	
Fire pump annual Test	RLH/eng	1x per year	march			
Fire Pump inspection	Engineering Dept.	3x daily			walk through inspt	
Fire Drill	Engineering Dept.	1X per year	August		building wide drill	
Life Safety Systems Checks	Engineering Dept.	Monthly			standpipe pressure cks	
Fire Safety System Training	Engineering Dept.	Monthly			review with security	
smoke detector cleaning	Engineering Dept.	2x per year				
Fire place inspections	Attractions services	Annually	call		cl indoor and outdoor	$1,500
Fire place inspections	Engineering Dept.	3x daily			cl indoor and outdoor	
Emer Generator Test/Maintenance	Cummins/Eng	Quarterly/Annually				$7,135
Emer Generator Test	Engineering Dept.	Monthly			In house run/load test	
Emer Generator inspection	Engineering Dept.	3x daily			walk through inspt	
Elevator Testing/Maintenance	Mitsubishi/Eng	1X per year	March		run with emerg power	$228,889
Elevator Testing 5yr	Mitsubishi/Eng	every 5 years	2019		5 yr load test done 2014	
Elevator Testing	Mitsubishi	Monthly			Firemen safety test	
Elevator License Renewal	Mitsubishi/Eng	Annually	May			
Elevators C1-C6 Cosmetic Maint./CL	Interior Wood	Quarterly			all cars and cl lounge area	$9,580
Man lift Test/Service	Cromer	Monthly			B1-b5 garage	$2,700
Man lift Test	Engineering Dept.	Weekly			B1-b5 garage	
Manntech Inspection	AC3	Annually	September		Tower window rig	$2,000
Spider/Sky rider Inspection	AC3	Annually	April		Midrise window rig	$6,000
Manntech Rope change	AC3	every 5 years	2020		Tower window rig	$31,340
Manntech/sky rider preuse	AC3	as needed			Tower/midrise	$1,000
Mains Drain Maintenance	Impressive Plumbing	Quarterly			Jet all mains	$2,400
Domestic PRV Inspection	Engineering Dept.	Annually	July		Rebuild all prvs as necessary	
Circuit setter maintenance	Engineering Dept.	every 5 years	2020		access and clean all strainers	
Backflow Testing/certification	Backflow Prevention Specialists	Annually	March			
Expansion Tanks Checks/refill	Engineering Dept.	Annually	June		Domestic tanks	
Rn74 Jetting	Impressive Plumbing	Semi-Annually			Jet all mains in RN74	RN74 Covers
Planter box drain Maintenance	Engineering Dept.	Quarterly			Snake all drains	
Domestic water PSI check	Engineering Dept.	Bi-weekly			ck pressure all loops	
Drain clearing @ units 301&305	Engineering Dept.	Quarterly			inspect and clean	

Cl and 3rd fl drain check	Engineering Dept.	every 2 weeks			inspect and clean	
Eyewash station maintenance	Engineering Dept.	Semi-Annually				
All HVAC/boilers PM	Downing/ENG	Quarterly/annually				$61,971
BMS system PM	Automated Controls	Quarterly			BMS systems CK	$7,160
Boiler Permits	Downing/ENG	Annually	June		City of SF plumbing div	
Thermo Graphic Survey	Thermotest Inc	Every 5 years	2018		done 2013	$8,000
Expansion Tanks Checks/refill	Engineering Dept.	Annually	June		Closed loop tanks	
Midrise Primary Loop Bleed	Engineering Dept.	Monthly				
Closed loops Chem Supply /testing	Garratt-Callahan	Monthly			all 7 loops	$10,800
Closed loops Chem testing	Engineering Dept.	Weekly			all 7 loops	
A/C T2 + T3 prefilter media	Engineering Dept.	monthly			inspect/replace	
FSD prefilter media	Engineering Dept.	Quarterly			inspect/replace	
Steam Generator PM	Engineering Dept.	Daily			Blowdown/inspect	
All HVAC/boilers inspections	Engineering Dept.	3x Daily			Daily Rounds	
Pool inspections	Hills Pool	Daily			chemical testing/cleaning	
Pool Inspections	Engineering Dept.	3X Daily			Daily Rounds	
Pool floor scrubbing	Engineering Dept.	3x per week			Install pool machine	
Pool inspections	Engineering Dept.	every 2 weeks			Chemical testing	
Roll-up door PM's	CA Door and glass	Quarterly			garage in/out	
Roll-up door PM's	CA Door and glass	Semi-Annually			Loading dock	
Roll up doors Barrel Change	CA Door and glass	1x per 3 years	Jul-18	10K (5K each door)	garage in/out	
Trash chute testing	Engineering Dept.	Daily				
Trash chute vent clearing	Engineering Dept.	Quarterly				
Trash Room exhaust checks	Engineering Dept.	Bi-Weekly				
Hazardous Material registration	Engineering Dept.	Annually	January	~$1,000	SF Health Dept	
Defibrillator Battery	Engineering Dept.	Annually	January		New Battery install	
Pest Control	EcoLab	Monthly			inspect/maintain	$4,920
Rn74 bag filters hood	Engineering Dept.	Bi-weekly			Change filters	
Rn74 charcoal filters hood	Engineering Dept.	Quarterly			Change filters	
Roof Inspection	AL Cal	Annually			inspection	$2,115
Metal/Marble	Marble West					
Exercise Equipment	Club Care	Monthly			service	$2,460

EXHIBIT

F

EXHIBIT F

RED HAWK
Fire & Security

AUTOMATIC FIRE ALARM SYSTEM INSPECTION/CERTIFICATION

Job Name: MILLENNIUM TOWER
Address: 301 MISSION ST
City: SAN FRANCISCO State: CA Zip: 94105
Tech. Name: DARWIN
Central Station Name: RED HAWK
Central Station Account #: 04-050
Central Station Phone #: 408-629-4414

Date: 2/22/2016
Work Order #: 3212232

Preliminaries

Building Personnel Advised:	Name: ANTONIO	Time: 6:30 AM	By:DA
Central Station off-Line:	Operator: GABRIEL	Time: 6:45 AM	By:DA
Pretest Status	☐ Normal	☒ Abnormal (Explain) 27 DISABLED POINTS	
Disconnect Aux & NAC Function Type:	DISABLED BUTTONS	☒ Disconnect after tested	
Location of As-Built Drawings	ENGINEERING		
Original Certification ☐	Periodic System Inspection ☒		

Inspection Type	Service Performed	Scope of Work Performed	% of Device Tested:
☒ Fire Alarm	☐ Monthly Inspection	☒ Full Inspection	☐ 10%
☐ Sprinkler	☐ Bi-Monthly Inspection	☐ Water Flow Inspection	☐ 25%
☐ Preaction	☐ Quarterly Inspection	☐ Battery Load Testing	☐ 50%
☐ FM200	☐ Semi-Annual Inspection	☐ 10% Trouble Testing	☒ 100%
☐ Exit/ Emergency Lights	☒ Annual Inspection	☐ NAC Testing	☐ 1 Device/Zone
☐ Fire Extinguisher	☐ Service	☐ Service Repair	☐ Other
☐ Other	☐ Fire Drill	☐ Monitoring Install /Programming	

Basic Information

Local Alarm Yes ☐
Central Station Yes ☒
Municipal Yes ☐
Proprietary Yes ☐
Voice Yes ☐
System Model : EST-3

Qty of Zones or Loops: 10 LOOPS
Wired: ☐A ☒B

Qty of Active NAC Circuits: 137
Wired: ☐ A ☒ B

4384 Enterprise Place, Fremont, CA 94538
Phone: 510-438-1300 / Fax 510-438-1350

C10 License # 713099

RED HAWK
Fire & Security

CONTROL PANEL TEST				COMMENTS:
Visual Display	☐N/A	☒Pass	☐Fail	NODE 1 (MAIN FIRE PANEL)
AC Power On – LED	☐N/A	☒Pass	☐Fail	
Alarm Silence – LED	☐N/A	☒Pass	☐Fail	
Program Fault – LED	☐N/A	☒Pass	☐Fail	
Alarm – LED	☐N/A	☒Pass	☐Fail	
System Trouble – LED	☐N/A	☒Pass	☐Fail	
Check all Fuse Ratings	☒N/A	☐Pass	☐Fail	
Set Time/Date	☐N/A	☒Pass	☐Fail	
Walk Test Silent	☒N/A	☐Pass	☐Fail	
Print Log	☐N/A	☒Pass	☐Fail	
Print Detector Sensitivity	☒N/A	☐Pass	☐Fail	
Cancel Access	☒N/A	☐Pass	☐Fail	
Alarm/Trouble Acknowledge	☐N/A	☒Pass	☐Fail	
Alarm Silence Resound	☐N/A	☒Pass	☐Fail	
Reset/Lamp Test	☐N/A	☒Pass	☐Fail	
Panel Sounder	☐N/A	☒Pass	☐Fail	
Ground Type	☐N/A	☒Pass	☐Fail	ELECTRICAL
Positive Ground Fault	☐N/A	☒Pass	☐Fail	
Negative Ground Fault	☐N/A	☒Pass	☐Fail	
Signal Circuit-Short	☐N/A	☒Pass	☐Fail	
Signal Circuit-Open	☐N/A	☒Pass	☐Fail	
Subsequent Alarm/Trouble	☐N/A	☒Pass	☐Fail	
Point Dis/Reconnect	☐N/A	☒Pass	☐Fail	
AC Disconnect Labeled	☐N/A	☐Pass	☒Fail	AC DISCONNECT NOT LABELED
AC Breaker Locked On	☐N/A	☐Pass	☒Fail	UNABLE TO VERIFY IF CKT HAS A LOCK
Clean Door & Window	☐N/A	☒Pass	☐Fail	
AC Voltage	120.0 V.		PASS	
Battery Voltage (AC On)	26.5 V.		PASS	
Battery Voltage (AC Off)	26.3 V.		PASS	
System Voltage (AUX)	26.3 V.		PASS	
Battery Load Test (end V)	12.4 V.		PASS	
Charging Current	.030 A.		PASS	
Battery Size (AH)	75 AH.		PASS	
Expiration date	4/2018			PASS
Batteries labeled	YES			PASS

VOICE EVAC. SYSTEM				COMMENTS:
Model Number	☐N/A	☒Pass	☐Fail	3-ASU/FT
Manufactuer Name	☐N/A	☒Pass	☐Fail	EST-3
Number of Amps	☐N/A	☒Pass	☐Fail	(30) 3-ZA20B; (13) 3-ZA40 B
Amp. Model Number	☐N/A	☒Pass	☐Fail	3-ZA20B, 3-ZA40B
Number of Speaker Zones	☐N/A	☒Pass	☐Fail	17
Number of Phone Zones	☐N/A	☒Pass	☐Fail	27
Test all Speakers	☐N/A	☒Pass	☐Fail	
Short Test	☐N/A	☒Pass	☐Fail	
Open Test	☐N/A	☒Pass	☐Fail	
Ground Test	☐N/A	☒Pass	☐Fail	
Test all Handsets	☐N/A	☒Pass	☐Fail	BUILT-IN EVAC SYSTEM (SHARES AC AND DC WITH MAIN
Test all Phone Jacks	☐N/A	☒Pass	☐Fail	FIRE PANEL)
Battery Load Test (end V)	NAV.			
Battery Size	NA AH.			
Expiration Date	NA			
Batteries labeled	NA			

4384 Enterprise Place, Fremont, CA 94538
Phone: 510-438-1300 / Fax 510-438-1350

C10 License # 713099

RED HAWK
Fire & Security

Page
Of

NODE PANEL — **COMMENTS:**

Location 1	FACP RM	
Number of node tested	NODE 2	
Visual Display	☒N/A ☐Pass ☐Fail	
AC Power On – LED	☒N/A ☐Pass ☐Fail	
Alarm Silence – LED	☒N/A ☐Pass ☐Fail	
Program Fault – LED	☒N/A ☐Pass ☐Fail	
Alarm – LED	☒N/A ☐Pass ☐Fail	
System Trouble – LED	☒N/A ☐Pass ☐Fail	
Check all Fuse Ratings	☒N/A ☐Pass ☐Fail	
Set Time/Date	☒N/A ☐Pass ☐Fail	
Walk Test Silent	☒N/A ☐Pass ☐Fail	
Print Log	☒N/A ☐Pass ☐Fail	
Print Detector Sensitivity	☒N/A ☐Pass ☐Fail	
Cancel Access	☒N/A ☐Pass ☐Fail	
Alarm/Trouble Acknowledge	☒N/A ☐Pass ☐Fail	
Alarm Silence Resound	☒N/A ☐Pass ☐Fail	
Reset/Lamp Test	☒N/A ☐Pass ☐Fail	
Panel Sounder	☒N/A ☐Pass ☐Fail	
Ground Type	☐N/A ☒Pass ☐Fail	ELECTRICAL
Positive Ground Fault	☐N/A ☒Pass ☐Fail	
Negative Ground Fault	☐N/A ☒Pass ☐Fail	
Signal Circuit-Short	☐N/A ☒Pass ☐Fail	
Signal Circuit-Open	☐N/A ☒Pass ☐Fail	
Subsequent Alarm/Trouble	☐N/A ☒Pass ☐Fail	
Point Dis/Reconnect	☐N/A ☒Pass ☐Fail	
AC Disconnect Labeled	☐N/A ☒Pass ☐Fail	ELP-TCLA / CKT 13 (CL ELEC. RM)
AC Breaker Locked On	☐N/A ☒Pass ☐Fail	
Clean Door & Window	☐N/A ☒Pass ☐Fail	
AC Voltage	120.1 V. PASS	
Battery Voltage (AC On)	26.5 V. PASS	
Battery Voltage (AC Off)	26.4 V. PASS	
System Voltage (AUX)	26.5 V. PASS	
Battery Load Test (end V)	12.3 V. PASS	
Charging Current	.030 A. PASS	
Battery Size (AH)	55 AH. PASS	
Expiration date	4/2018	PASS
Batteries labeled	YES	PASS

Tech Name: DA	Date: 2/22/2016	Review deficiencies with Customer ☒ Yes

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NODE PANEL | | | | COMMENTS:

Location 1	B3 LEVEL ELEC. RM			
Number of node tested	NODE 3			
Visual Display	☒N/A	☐Pass	☐Fail	
AC Power On – LED	☒N/A	☐Pass	☐Fail	
Alarm Silence – LED	☒N/A	☐Pass	☐Fail	
Program Fault – LED	☒N/A	☐Pass	☐Fail	
Alarm – LED	☒N/A	☐Pass	☐Fail	
System Trouble – LED	☒N/A	☐Pass	☐Fail	
Check all Fuse Ratings	☒N/A	☐Pass	☐Fail	
Set Time/Date	☒N/A	☐Pass	☐Fail	
Walk Test Silent	☒N/A	☐Pass	☐Fail	
Print Log	☒N/A	☐Pass	☐Fail	
Print Detector Sensitivity	☒N/A	☐Pass	☐Fail	
Cancel Access	☒N/A	☐Pass	☐Fail	
Alarm/Trouble Acknowledge	☒N/A	☐Pass	☐Fail	
Alarm Silence Rescund	☒N/A	☐Pass	☐Fail	
Reset/Lamp Test	☒N/A	☐Pass	☐Fail	
Panel Sounder	☒N/A	☐Pass	☐Fail	
Ground Type	☐N/A	☒Pass	☐Fail	ELECTRICAL
Positive Ground Fault	☐N/A	☒Pass	☐Fail	
Negative Ground Fault	☐N/A	☒Pass	☐Fail	
Signal Circuit-Short	☐N/A	☒Pass	☐Fail	
Signal Circuit-Open	☐N/A	☒Pass	☐Fail	
Subsequent Alarm/Trouble	☐N/A	☒Pass	☐Fail	
Point Dis/Reconnect	☐N/A	☒Pass	☐Fail	
AC Disconnect Labeled	☐N/A	☒Pass	☐Fail	PANEL ELP B2A/ CKT 20 (B2 ELEC. RM)
AC Breaker Locked On	☐N/A	☒Pass	☐Fail	
Clean Door & Window	☐N/A	☒Pass	☐Fail	
AC Voltage	119.3 V.		PASS	
Battery Voltage (AC On)	26.8 V.		PASS	
Battery Voltage (AC Off)	26.6 V.		PASS	
System Voltage (AUX)	26.8 V.		PASS	
Battery Load Test (end V)	12.5 V.		PASS	
Charging Current	.030 A.		PASS	
Battery Size (AH)	55 AH.		PASS	
Expiration date	10/2018			PASS
Batteries labeled	YES			PASS

Tech Name: DA	Date: 2/22/2016	Review deficiencies with Customer ☒ Yes

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NODE PANEL — **COMMENTS:**

Location 1	L LEVEL (MID RISE) ELEC. RM			
Number of node tested	NODE 4			
Visual Display	☒N/A	☐Pass	☐Fail	
AC Power On – LED	☒N/A	☐Pass	☐Fail	
Alarm Silence – LED	☒N/A	☐Pass	☐Fail	
Program Fault – LED	☒N/A	☐Pass	☐Fail	
Alarm – LED	☒N/A	☐Pass	☐Fail	
System Trouble – LED	☒N/A	☐Pass	☐Fail	
Check all Fuse Ratings	☒N/A	☐Pass	☐Fail	
Set Time/Date	☒N/A	☐Pass	☐Fail	
Walk Test Silent	☒N/A	☐Pass	☐Fail	
Print Log	☒N/A	☐Pass	☐Fail	
Print Detector Sensitivity	☒N/A	☐Pass	☐Fail	
Cancel Access	☒N/A	☐Pass	☐Fail	
Alarm/Trouble Acknowledge	☒N/A	☐Pass	☐Fail	
Alarm Silence Resound	☒N/A	☐Pass	☐Fail	
Reset/Lamp Test	☒N/A	☐Pass	☐Fail	
Panel Sounder	☒N/A	☐Pass	☐Fail	
Ground Type	☐N/A	☒Pass	☐Fail	ELECTRICAL
Positive Ground Fault	☐N/A	☒Pass	☐Fail	
Negative Ground Fault	☐N/A	☒Pass	☐Fail	
Signal Circuit-Short	☐N/A	☒Pass	☐Fail	
Signal Circuit-Open	☐N/A	☒Pass	☐Fail	
Subsequent Alarm/Trouble	☐N/A	☒Pass	☐Fail	
Point Dis/Reconnect	☐N/A	☒Pass	☐Fail	
AC Disconnect Labeled	☐N/A	☒Pass	☐Fail	PANEL ELP-M3 / CKT 2 (3RD ELEC. RM)
AC Breaker Locked On	☐N/A	☒Pass	☐Fail	
Clean Door & Window	☐N/A	☒Pass	☐Fail	
AC Voltage	120.1 V.		PASS	
Battery Voltage (AC On)	26.8 V.		PASS	
Battery Voltage (AC Off)	26.7 V.		PASS	
System Voltage (AUX)	26.7 V.		PASS	
Battery Load Test (end V)	12.6 V.		PASS	
Charging Current	.03. A.		PASS	
Battery Size (AH)	55 AH.		PASS	
Expiration date	10/2018			PASS
Batteries labeled	YES			PASS

Tech Name: DA	Date: 2/22/2016	Review deficiencies with Customer ☒ Yes

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NODE PANEL | **COMMENTS:**

Location 1	10TH FLR (MID RISE) ELEC. RM			
Number of node tested	NODE 5			
Visual Display	☒N/A	☐Pass	☐Fail	
AC Power On – LED	☒N/A	☐Pass	☐Fail	
Alarm Silence – LED	☒N/A	☐Pass	☐Fail	
Program Fault – LED	☒N/A	☐Pass	☐Fail	
Alarm – LED	☒N/A	☐Pass	☐Fail	
System Trouble – LED	☒N/A	☐Pass	☐Fail	
Check all Fuse Ratings	☒N/A	☐Pass	☐Fail	
Set Time/Date	☒N/A	☐Pass	☐Fail	
Walk Test Silent	☒N/A	☐Pass	☐Fail	
Print Log	☒N/A	☐Pass	☐Fail	
Print Detector Sensitivity	☒N/A	☐Pass	☐Fail	
Cancel Access	☒N/A	☐Pass	☐Fail	
Alarm/Trouble Acknowledge	☒N/A	☐Pass	☐Fail	
Alarm Silence Resound	☒N/A	☐Pass	☐Fail	
Reset/Lamp Test	☒N/A	☐Pass	☐Fail	
Panel Sounder	☒N/A	☐Pass	☐Fail	
Ground Type	☐N/A	☒Pass	☐Fail	ELECTRICAL
Positive Ground Fault	☐N/A	☒Pass	☐Fail	
Negative Ground Fault	☐N/A	☒Pass	☐Fail	
Signal Circuit-Short	☐N/A	☒Pass	☐Fail	
Signal Circuit-Open	☐N/A	☒Pass	☐Fail	
Subsequent Alarm/Trouble	☐N/A	☒Pass	☐Fail	
Point Dis/Reconnect	☐N/A	☒Pass	☐Fail	
AC Disconnect Labeled	☐N/A	☒Pass	☐Fail	PANEL ELP 12B/ CKT 4 (12TH ELEC. RM)
AC Breaker Locked On	☐N/A	☒Pass	☐Fail	
Clean Door & Window	☐N/A	☒Pass	☐Fail	
AC Voltage	119.8 V.		PASS	
Battery Voltage (AC On)	26.7 V.		PASS	
Battery Voltage (AC Off)	26.6 V.		PASS	
System Voltage (AUX)	26.7 V.		PASS	
Battery Load Test (end V)	12.3 V.		PASS	
Charging Current	.030 A.		PASS	
Battery Size (AH)	55 AH.		PASS	
Expiration date	8/2016			PASS
Batteries labeled	YES			PASS

Tech Name: DA	Date: 2/22/2016	Review deficiencies with Customer ☒ Yes

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NODE PANEL		**COMMENTS:**
Location 1	11TH FLR (TOWER) ELEC. RM	
Number of node tested	NODE 6	
Visual Display	☒N/A ☐Pass ☐Fail	
AC Power On – LED	☒N/A ☐Pass ☐Fail	
Alarm Silence – LED	☒N/A ☐Pass ☐Fail	
Program Fault – LED	☒N/A ☐Pass ☐Fail	
Alarm – LED	☒N/A ☐Pass ☐Fail	
System Trouble – LED	☒N/A ☐Pass ☐Fail	
Check all Fuse Ratings	☒N/A ☐Pass ☐Fail	
Set Time/Date	☒N/A ☐Pass ☐Fail	
Walk Test Silent	☒N/A ☐Pass ☐Fail	
Print Log	☒N/A ☐Pass ☐Fail	
Print Detector Sensitivity	☒N/A ☐Pass ☐Fail	
Cancel Access	☒N/A ☐Pass ☐Fail	
Alarm/Trouble Acknowledge	☒N/A ☐Pass ☐Fail	
Alarm Silence Resound	☒N/A ☐Pass ☐Fail	
Reset/Lamp Test	☒N/A ☐Pass ☐Fail	
Panel Sounder	☒N/A ☐Pass ☐Fail	
Ground Type	☐N/A ☒Pass ☐Fail	ELECTRICAL
Positive Ground Fault	☐N/A ☒Pass ☐Fail	
Negative Ground Fault	☐N/A ☒Pass ☐Fail	
Signal Circuit-Short	☐N/A ☒Pass ☐Fail	
Signal Circuit-Open	☐N/A ☒Pass ☐Fail	
Subsequent Alarm/Trouble	☐N/A ☒Pass ☐Fail	
Point Dis/Reconnect	☐N/A ☒Pass ☐Fail	
AC Disconnect Labeled	☐N/A ☒Pass ☐Fail	PANEL ELP-TCLA/ CKT 7 (CL ELEC. RM)
AC Breaker Locked On	☐N/A ☒Pass ☐Fail	
Clean Door & Window	☐N/A ☒Pass ☐Fail	
AC Voltage	120.0 V. PASS	
Battery Voltage (AC On)	26.8 V. PASS	
Battery Voltage (AC Off)	26.7 V. PASS	
System Voltage (AUX)	26.8 V. PASS	
Battery Load Test (end V)	12.3 V. PASS	
Charging Current	.030 A. PASS	
Battery Size (AH)	55 AH. PASS	
Expiration date	4/2018	PASS
Batteries labeled	YES	PASS

Tech Name: DA	Date: 2/22/2016	Review deficiencies with Customer ☒ Yes

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NODE PANEL		**COMMENTS:**
Location 1	21ST FLR (TOWER) ELEC. RM	
Number of node tested	NODE 7	
Visual Display	☒N/A ☐Pass ☐Fail	
AC Power On – LED	☒N/A ☐Pass ☐Fail	
Alarm Silence – LED	☒N/A ☐Pass ☐Fail	
Program Fault – LED	☒N/A ☐Pass ☐Fail	
Alarm – LED	☒N/A ☐Pass ☐Fail	
System Trouble – LED	☒N/A ☐Pass ☐Fail	
Check all Fuse Ratings	☒N/A ☐Pass ☐Fail	
Set Time/Date	☒N/A ☐Pass ☐Fail	
Walk Test Silent	☒N/A ☐Pass ☐Fail	
Print Log	☒N/A ☐Pass ☐Fail	
Print Detector Sensitivity	☒N/A ☐Pass ☐Fail	
Cancel Access	☒N/A ☐Pass ☐Fail	
Alarm/Trouble Acknowledge	☒N/A ☐Pass ☐Fail	
Alarm Silence Resound	☒N/A ☐Pass ☐Fail	
Reset/Lamp Test	☒N/A ☐Pass ☐Fail	
Panel Sounder	☒N/A ☐Pass ☐Fail	
Ground Type	☐N/A ☒Pass ☐Fail	ELECTRICAL
Positive Ground Fault	☐N/A ☒Pass ☐Fail	
Negative Ground Fault	☐N/A ☒Pass ☐Fail	
Signal Circuit-Short	☐N/A ☒Pass ☐Fail	
Signal Circuit-Open	☐N/A ☒Pass ☐Fail	
Subsequent Alarm/Trouble	☐N/A ☒Pass ☐Fail	
Point Dis/Reconnect	☐N/A ☒Pass ☐Fail	
AC Disconnect Labeled	☐N/A ☒Pass ☐Fail	PANEL ELP-T16A/ CKT 2 (15TH ELEC. RM)
AC Breaker Locked On	☐N/A ☒Pass ☐Fail	
Clean Door & Window	☐N/A ☒Pass ☐Fail	
AC Voltage	120.4 V. PASS	
Battery Voltage (AC On)	26.6 V. PASS	
Battery Voltage (AC Off)	26.5 V. PASS	
System Voltage (AUX)	26.6 V. PASS	
Battery Load Test (end V)	12.4 V. PASS	
Charging Current	.030 A. PASS	
Battery Size (AH)	55 AH. PASS	
Expiration date	4/2018	PASS
Batteries labeled	YES	PASS

Tech Name: DARWIN	Date: 2/22/2016	Review deficiencies with Customer ☒ Yes

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NODE PANEL — **COMMENTS:**

Location 1	30TH FLR (TOWER) ELEC. RM	
Number of node tested	NODE 8	
Visual Display	☒N/A ☐Pass ☐Fail	
AC Power On – LED	☒N/A ☐Pass ☐Fail	
Alarm Silence – LED	☒N/A ☐Pass ☐Fail	
Program Fault – LED	☒N/A ☐Pass ☐Fail	
Alarm – LED	☒N/A ☐Pass ☐Fail	
System Trouble – LED	☒N/A ☐Pass ☐Fail	
Check all Fuse Ratings	☒N/A ☐Pass ☐Fail	
Set Time/Date	☒N/A ☐Pass ☐Fail	
Walk Test Silent	☒N/A ☐Pass ☐Fail	
Print Log	☒N/A ☐Pass ☐Fail	
Print Detector Sensitivity	☒N/A ☐Pass ☐Fail	
Cancel Access	☒N/A ☐Pass ☐Fail	
Alarm/Trouble Acknowledge	☒N/A ☐Pass ☐Fail	
Alarm Silence Resound	☒N/A ☐Pass ☐Fail	
Reset/Lamp Test	☒N/A ☐Pass ☐Fail	
Panel Sounder	☒N/A ☐Pass ☐Fail	
Ground Type	☐N/A ☒Pass ☐Fail	ELECTRICAL
Positive Ground Fault	☐N/A ☒Pass ☐Fail	
Negative Ground Fault	☐N/A ☒Pass ☐Fail	
Signal Circuit-Short	☐N/A ☒Pass ☐Fail	
Signal Circuit-Open	☐N/A ☒Pass ☐Fail	
Subsequent Alarm/Trouble	☐N/A ☒Pass ☐Fail	
Point Dis/Reconnect	☐N/A ☒Pass ☐Fail	
AC Disconnect Labeled	☐N/A ☒Pass ☐Fail	PANEL ELP-T28A/ CKT 11 (28TH ELEC. RM)
AC Breaker Locked On	☐N/A ☒Pass ☐Fail	
Clean Door & Window	☐N/A ☒Pass ☐Fail	
AC Voltage	120.2 V. PASS	
Battery Voltage (AC On)	26.8 V. PASS	
Battery Voltage (AC Off)	26.6 V. PASS	
System Voltage (AUX)	26.7 V. PASS	
Battery Load Test (end V)	12.6 V. PASS	
Charging Current	.030 A. PASS	
Battery Size (AH)	55 AH. PASS	
Expiration date	4/2018	PASS
Batteries labeled	YES	PASS

Tech Name: DA	Date: 2/22/2016	Review deficiencies with Customer ☒ Yes

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NODE PANEL		COMMENTS:
Location 1	39TH FLR (TOWER) ELEC. RM	
Number of node tested	NODE 9	
Visual Display	☒N/A ☐Pass ☐Fail	
AC Power On – LED	☒N/A ☐Pass ☐Fail	
Alarm Silence – LED	☒N/A ☐Pass ☐Fail	
Program Fault – LED	☒N/A ☐Pass ☐Fail	
Alarm – LED	☒N/A ☐Pass ☐Fail	
System Trouble – LED	☒N/A ☐Pass ☐Fail	
Check all Fuse Ratings	☒N/A ☐Pass ☐Fail	
Set Time/Date	☒N/A ☐Pass ☐Fail	
Walk Test Silent	☒N/A ☐Pass ☐Fail	
Print Log	☒N/A ☐Pass ☐Fail	
Print Detector Sensitivity	☒N/A ☐Pass ☐Fail	
Cancel Access	☒N/A ☐Pass ☐Fail	
Alarm/Trouble Acknowledge	☒N/A ☐Pass ☐Fail	
Alarm Silence Resound	☒N/A ☐Pass ☐Fail	
Reset/Lamp Test	☒N/A ☐Pass ☐Fail	
Panel Sounder	☒N/A ☐Pass ☐Fail	
Ground Type	☐N/A ☒Pass ☐Fail	ELECTRICAL
Positive Ground Fault	☐N/A ☒Pass ☐Fail	
Negative Ground Fault	☐N/A ☒Pass ☐Fail	
Signal Circuit-Short	☐N/A ☒Pass ☐Fail	
Signal Circuit-Open	☐N/A ☒Pass ☐Fail	
Subsequent Alarm/Trouble	☐N/A ☒Pass ☐Fail	
Point Dis/Reconnect	☐N/A ☒Pass ☐Fail	
AC Disconnect Labeled	☐N/A ☒Pass ☐Fail	PANEL ELP T28A/ CKT 13 (28TH ELEC. RM)
AC Breaker Locked On	☐N/A ☒Pass ☐Fail	
Clean Door & Window	☐N/A ☒Pass ☐Fail	
AC Voltage	120.5 V. PASS	
Battery Voltage (AC On)	26.8 V. PASS	
Battery Voltage (AC Off)	26.7 V. PASS	
System Voltage (AUX)	26.8 V. PASS	
Battery Load Test (end V)	12.5 V. PASS	
Charging Current	.030 A. PASS	
Battery Size (AH)	55 AH. PASS	
Expiration date	10/2018	PASS
Batteries labeled	YES	PASS

Tech Name: DA	Date: 2/22/2016	Review deficiencies with Customer ☒ Yes

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NODE PANEL **COMMENTS:**

Location 1	49TH FLR (TOWER) ELEC. RM			
Number of node tested	NODE 10			
Visual Display	☒N/A	☐Pass	☐Fail	
AC Power On – LED	☒N/A	☐Pass	☐Fail	
Alarm Silence – LED	☒N/A	☐Pass	☐Fail	
Program Fault – LED	☒N/A	☐Pass	☐Fail	
Alarm – LED	☒N/A	☐Pass	☐Fail	
System Trouble – LED	☒N/A	☐Pass	☐Fail	
Check all Fuse Ratings	☒N/A	☐Pass	☐Fail	
Set Time/Date	☒N/A	☐Pass	☐Fail	
Walk Test Silent	☒N/A	☐Pass	☐Fail	
Print Log	☒N/A	☐Pass	☐Fail	
Print Detector Sensitivity	☒N/A	☐Pass	☐Fail	
Cancel Access	☒N/A	☐Pass	☐Fail	
Alarm/Trouble Acknowledge	☒N/A	☐Pass	☐Fail	
Alarm Silence Resound	☒N/A	☐Pass	☐Fail	
Reset/Lamp Test	☒N/A	☐Pass	☐Fail	
Panel Sounder	☒N/A	☐Pass	☐Fail	
Ground Type	☐N/A	☒Pass	☐Fail	ELECTRICAL
Positive Ground Fault	☐N/A	☒Pass	☐Fail	
Negative Ground Fault	☐N/A	☒Pass	☐Fail	
Signal Circuit-Short	☐N/A	☒Pass	☐Fail	
Signal Circuit-Open	☐N/A	☒Pass	☐Fail	
Subsequent Alarm/Trouble	☐N/A	☒Pass	☐Fail	
Point Dis/Reconnect	☐N/A	☒Pass	☐Fail	
AC Disconnect Labeled	☐N/A	☒Pass	☐Fail	PANEL ELP-T43A/ CKT 4 (43RD ELEC. RM)
AC Breaker Locked On	☐N/A	☒Pass	☐Fail	
Clean Door & Window	☐N/A	☒Pass	☐Fail	
AC Voltage	120.5 V.		PASS	
Battery Voltage (AC On)	26.9 V.		PASS	
Battery Voltage (AC Off)	26.8 V.		PASS	
System Voltage (AUX)	26.8 V.		PASS	
Battery Load Test (end V)	12.3 V.		PASS	
Charging Current	.030 A.		PASS	
Battery Size (AH)	55 AH.		PASS	
Expiration date	9/2016			PASS
Batteries labeled	YES			PASS

Tech Name: DA	Date: 2/22/2016	Review deficiencies with Customer ☒ Yes

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NODE PANEL		COMMENTS:
Location 1	56TH FLR (TOWER) ELEC. RM	
Number of node tested	NODE 11	
Visual Display	☒N/A ☐Pass ☐Fail	
AC Power On – LED	☒N/A ☐Pass ☐Fail	
Alarm Silence – LED	☒N/A ☐Pass ☐Fail	
Program Fault – LED	☒N/A ☐Pass ☐Fail	
Alarm – LED	☒N/A ☐Pass ☐Fail	
System Trouble – LED	☒N/A ☐Pass ☐Fail	
Check all Fuse Ratings	☒N/A ☐Pass ☐Fail	
Set Time/Date	☒N/A ☐Pass ☐Fail	
Walk Test Silent	☒N/A ☐Pass ☐Fail	
Print Log	☒N/A ☐Pass ☐Fail	
Print Detector Sensitivity	☒N/A ☐Pass ☐Fail	
Cancel Access	☒N/A ☐Pass ☐Fail	
Alarm/Trouble Acknowledge	☒N/A ☐Pass ☐Fail	
Alarm Silence Resound	☒N/A ☐Pass ☐Fail	
Reset/Lamp Test	☒N/A ☐Pass ☐Fail	
Panel Sounder	☒N/A ☐Pass ☐Fail	
Ground Type	☐N/A ☒Pass ☐Fail	ELECTRICAL
Positive Ground Fault	☐N/A ☒Pass ☐Fail	
Negative Ground Fault	☐N/A ☒Pass ☐Fail	
Signal Circuit-Short	☐N/A ☒Pass ☐Fail	
Signal Circuit-Open	☐N/A ☒Pass ☐Fail	
Subsequent Alarm/Trouble	☐N/A ☒Pass ☐Fail	
Point Dis/Reconnect	☐N/A ☒Pass ☐Fail	
AC Disconnect Labeled	☐N/A ☒Pass ☐Fail	PANEL ELP T43A/ CKT 2 (43RD ELEC. RM)
AC Breaker Locked On	☐N/A ☒Pass ☐Fail	
Clean Door & Window	☐N/A ☒Pass ☐Fail	
AC Voltage	120.4 V. PASS	
Battery Voltage (AC On)	26.7 V. PASS	
Battery Voltage (AC Off)	26.6 V. PASS	
System Voltage (AUX)	26.6 V. PASS	
Battery Load Test (end V)	12.3 V. PASS	
Charging Current	.030 A. PASS	
Battery Size (AH)	55 AH. PASS	
Expiration date	4/2018	PASS
Batteries labeled	YES	PASS

Tech Name: DARWIN	Date: 2/22/2016	Review deficiencies with Customer ☒ Yes

Modified on : 04/03/2011

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NAC BOOSTERS/POWER SUPPLY					COMMENTS:
Location 1	FCC RM				
Number booster tested	PS5				
Short NAC Trouble	☐N/A	☒Pass	☐Fail		
Open NAC Trouble	☐N/A	☒P	☐Fail		
Ground Trouble	☐N/A	☒P	☐Fail		
A/C Voltage	☐N/A	☒P	☐Fail	120.1	
Battery Voltage	☐N/A	☒P	☐Fail	27.2	
Battery Load Test	☐N/A	☒P	☐Fail	12.3	
Operate w/ no a/c	☐N/A	☒P	☐Fail		
Trouble w/ no a/c	☐N/A	☒P	☐Fail		
Battery A/H	☐N/A	☒P	☐Fail	35	
Battery Labeled	☐N/A	☒P	☐Fail		
Battery Expires	☐N/A	☒P	☐Fail	4/2018	
Location 2	B3 LEVEL ELEC. RM				
Number booster tested	BPS 1				
Short NAC Trouble	☐N/A	☒Pass	☐Fail		
Open NAC Trouble	☐N/A	☒Pass	☐Fail		
Ground Trouble	☐N/A	☒Pass	☐Fail		
A/C Voltage	☐N/A	☒Pass	☐Fail	119.2	
Battery Voltage	☐N/A	☒Pass	☐Fail	26.3	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.2	
Operate w/ no a/c	☐N/A	☒Pass	☐Fail		
Trouble w/ no a/c	☐N/A	☒Pass	☐Fail		
Battery A/H	☐N/A	☒Pass	☐Fail	8	
Battery Labeled	☐N/A	☒Pass	☐Fail		
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018	
Location 3	B3 LEVEL ELEC. RM				
Number booster tested	BPS 2				
Short NAC Trouble	☐N/A	☒Pass	☐Fail		
Open NAC Trouble	☐N/A	☒Pass	☐Fail		
Ground Trouble	☐N/A	☒Pass	☐Fail		
A/C Voltage	☐N/A	☒Pass	☐Fail	119.2	
Battery Voltage	☐N/A	☒Pass	☐Fail	26.3	
Battery Load Test	☐N/A	☐Pass	☒Fail	11.7 (FAILED)	
Operate w/ no a/c	☐N/A	☒Pass	☐Fail		
Trouble w/ no a/c	☐N/A	☒Pass	☐Fail		
Battery A/H	☐N/A	☒Pass	☐Fail	7.2	
Battery Labeled	☐N/A	☒Pass	☐Fail		
Battery Expires	☐N/A	☒Pass	☐Fail	6/2016	
Location 4	B3 LEVEL ELEC. RM				
Number booster tested	BPS 3				
Short NAC Trouble	☐N/A	☒Pass	☐Fail		
Open NAC Trouble	☐N/A	☒Pass	☐Fail		
Ground Trouble	☐N/A	☒Pass	☐Fail		
A/C Voltage	☐N/A	☒Pass	☐Fail	119.2	
Battery Voltage	☐N/A	☒Pass	☐Fail	26.4	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.2	
Operate w/ no a/c	☐N/A	☒Pass	☐Fail		
Trouble w/ no a/c	☐N/A	☒Pass	☐Fail		
Battery A/H	☐N/A	☒Pass	☐Fail	8	
Battery Labeled	☐N/A	☒Pass	☐Fail		
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018	

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RED HAWK
Fire & Security

NAC BOOSTERS/POWER SUPPLY

Location 1	L LEVEL (MID RISE) ELEC. RM			
Number booster tested	BPS 4			
Short NAC Trouble	☐N/A	☒Pass	☐Fail	
Open NAC Trouble	☐N/A	☒P	☐Fail	
Ground Trouble	☐N/A	☒P	☐Fail	
A/C Voltage	☐N/A	☒P	☐Fail	119.8
Battery Voltage	☐N/A	☒P	☐Fail	26.4
Battery Load Test	☐N/A	☒P	☐Fail	12.3
Operate w/ no a/c	☐N/A	☒P	☐Fail	
Trouble w/ no a/c	☐N/A	☒P	☐Fail	
Battery A/H	☐N/A	☒P	☐Fail	8
Battery Labeled	☐N/A	☒P	☐Fail	
Battery Expires	☐N/A	☒P	☐Fail	4/2018

Location 2	L LEVEL (MID RISE) ELEC. RM			
Number booster tested	BPS 5			
Short NAC Trouble	☐N/A	☒Pass	☐Fail	
Open NAC Trouble	☐N/A	☒Pass	☐Fail	
Ground Trouble	☐N/A	☒Pass	☐Fail	
A/C Voltage	☐N/A	☒Pass	☐Fail	119.8
Battery Voltage	☐N/A	☒Pass	☐Fail	26.3
Battery Load Test	☐N/A	☒Pass	☐Fail	12.4
Operate w/ no a/c	☐N/A	☒Pass	☐Fail	
Trouble w/ no a/c	☐N/A	☒Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	8
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018

Location 3	L LEVEL (MID RISE) ELEC. RM			
Number booster tested	BPS 6			
Short NAC Trouble	☐N/A	☒Pass	☐Fail	
Open NAC Trouble	☐N/A	☒Pass	☐Fail	
Ground Trouble	☐N/A	☒Pass	☐Fail	
A/C Voltage	☐N/A	☒Pass	☐Fail	119.8
Battery Voltage	☐N/A	☒Pass	☐Fail	26.3
Battery Load Test	☐N/A	☒Pass	☐Fail	12.4
Operate w/ no a/c	☐N/A	☒Pass	☐Fail	
Trouble w/ no a/c	☐N/A	☒Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	8
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018

Location 4	CL LEVEL (MID RISE) ELEC. RM			
Number booster tested	BPS 7			
Short NAC Trouble	☐N/A	☒Pass	☐Fail	
Open NAC Trouble	☐N/A	☒Pass	☐Fail	
Ground Trouble	☐N/A	☒Pass	☐Fail	
A/C Voltage	☐N/A	☒Pass	☐Fail	119.7
Battery Voltage	☐N/A	☒Pass	☐Fail	26.4
Battery Load Test	☐N/A	☒Pass	☐Fail	12.3
Operate w/ no a/c	☐N/A	☒Pass	☐Fail	
Trouble w/ no a/c	☐N/A	☒Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	8
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018

Tech Name: DA	Date: 2/22/2016	Review deficiencies with Customer ☒ Yes

RED HAWK
Fire & Security

NAC BOOSTERS/POWER SUPPLY

Location 1	B1 LEVEL (TOWER) ELEC. RM			
Number booster tested	BPS 8			
Short NAC Trouble	☐N/A	☒Pass	☐Fail	
Open NAC Trouble	☐N/A	☒P	☐Fail	
Ground Trouble	☐N/A	☒P	☐Fail	
A/C Voltage	☐N/A	☒P	☐Fail	120.2
Battery Voltage	☐N/A	☒P	☐Fail	26.3
Battery Load Test	☐N/A	☒P	☐Fail	12.2
Operate w/ no a/c	☐N/A	☒P	☐Fail	
Trouble w/ no a/c	☐N/A	☒P	☐Fail	
Battery A/H	☐N/A	☒P	☐Fail	7.5
Battery Labeled	☐N/A	☒P	☐Fail	
Battery Expires	☐N/A	☒P	☐Fail	1/2017

Location 2	L LEVEL (TOWER) ELEC. RM			
Number booster tested	BPS 9			
Short NAC Trouble	☐N/A	☒Pass	☐Fail	
Open NAC Trouble	☐N/A	☒Pass	☐Fail	
Ground Trouble	☐N/A	☒Pass	☐Fail	
A/C Voltage	☐N/A	☒Pass	☐Fail	120.0
Battery Voltage	☐N/A	☒Pass	☐Fail	26.4
Battery Load Test	☐N/A	☒Pass	☐Fail	12.4
Operate w/ no a/c	☐N/A	☒Pass	☐Fail	
Trouble w/ no a/c	☐N/A	☒Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	8
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018

Location 3	CL LEVEL (TOWER) ELEC. RM			
Number booster tested	BPS 10			
Short NAC Trouble	☐N/A	☒Pass	☐Fail	
Open NAC Trouble	☐N/A	☒Pass	☐Fail	
Ground Trouble	☐N/A	☒Pass	☐Fail	
A/C Voltage	☐N/A	☒Pass	☐Fail	120.2
Battery Voltage	☐N/A	☒Pass	☐Fail	26.3
Battery Load Test	☐N/A	☒Pass	☐Fail	12.3
Operate w/ no a/c	☐N/A	☒Pass	☐Fail	
Trouble w/ no a/c	☐N/A	☒Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	8
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018

Location 4	L LEVEL (MID RISE) RESTAURANT STORAGE			
Number booster tested	BPS 11			
Short NAC Trouble	☐N/A	☒Pass	☐Fail	
Open NAC Trouble	☐N/A	☒Pass	☐Fail	
Ground Trouble	☐N/A	☒Pass	☐Fail	
A/C Voltage	☐N/A	☒Pass	☐Fail	118.7
Battery Voltage	☐N/A	☒Pass	☐Fail	26.5
Battery Load Test	☐N/A	☐Pass	☒Fail	11.6 (FAILED)
Operate w/ no a/c	☐N/A	☒Pass	☐Fail	
Trouble w/ no a/c	☐N/A	☒Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	7.2
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	6/2016

Tech Name: DA	Date: 2/22/2016	Review deficiencies with Customer ☒ Yes

RED HAWK
Fire & Security

NAC BOOSTERS/POWER SUPPLY

Location 1	PH2 (TOWER) ELEC. RM			
Number booster tested	BPS 12			
Short NAC Trouble	☐N/A	☒Pass	☐Fail	
Open NAC Trouble	☐N/A	☒P	☐Fail	
Ground Trouble	☐N/A	☒P	☐Fail	
A/C Voltage	☐N/A	☒P	☐Fail	119.8
Battery Voltage	☐N/A	☒P	☐Fail	26.7
Battery Load Test	☐N/A	☒P	☐Fail	12.5
Operate w/ no a/c	☐N/A	☒P	☐Fail	
Trouble w/ no a/c	☐N/A	☒P	☐Fail	
Battery A/H	☐N/A	☒P	☐Fail	7.5
Battery Labeled	☐N/A	☒P	☐Fail	
Battery Expires	☐N/A	☒P	☐Fail	3/2019

Location 2	NA		
Number booster tested			
Short NAC Trouble	☐N/A	☒Pass	☐Fail
Open NAC Trouble	☐N/A	☒Pass	☐Fail
Ground Trouble	☐N/A	☒Pass	☐Fail
A/C Voltage	☐N/A	☒Pass	☐Fail
Battery Voltage	☐N/A	☒Pass	☐Fail
Battery Load Test	☐N/A	☒Pass	☐Fail
Operate w/ no a/c	☐N/A	☒Pass	☐Fail
Trouble w/ no a/c	☐N/A	☒Pass	☐Fail
Battery A/H	☐N/A	☒Pass	☐Fail
Battery Labeled	☐N/A	☒Pass	☐Fail
Battery Expires	☐N/A	☒Pass	☐Fail

Location 3	NA		
Number booster tested			
Short NAC Trouble	☐N/A	☒Pass	☐Fail
Open NAC Trouble	☐N/A	☒Pass	☐Fail
Ground Trouble	☐N/A	☒Pass	☐Fail
A/C Voltage	☐N/A	☒Pass	☐Fail
Battery Voltage	☐N/A	☒Pass	☐Fail
Battery Load Test	☐N/A	☒Pass	☐Fail
Operate w/ no a/c	☐N/A	☒Pass	☐Fail
Trouble w/ no a/c	☐N/A	☒Pass	☐Fail
Battery A/H	☐N/A	☒Pass	☐Fail
Battery Labeled	☐N/A	☒Pass	☐Fail
Battery Expires	☐N/A	☒Pass	☐Fail

Location 4	NA		
Number booster tested			
Short NAC Trouble	☐N/A	☒Pass	☐Fail
Open NAC Trouble	☐N/A	☒Pass	☐Fail
Ground Trouble	☐N/A	☒Pass	☐Fail
A/C Voltage	☐N/A	☒Pass	☐Fail
Battery Voltage	☐N/A	☒Pass	☐Fail
Battery Load Test	☐N/A	☒Pass	☐Fail
Operate w/ no a/c	☐N/A	☒Pass	☐Fail
Trouble w/ no a/c	☐N/A	☒Pass	☐Fail
Battery A/H	☐N/A	☒Pass	☐Fail
Battery Labeled	☐N/A	☒Pass	☐Fail
Battery Expires	☐N/A	☒Pass	☐Fail

Tech Name: DARWIN	Date: 2/22/2016	Review deficiencies with Customer ☒ Yes

RED HAWK
Fire & Security

DACT PERIODIC TESTING

Job: MILLENNIUM TOWERS — Date: 2-22-16
Address: 301 MISSION ST, SF, CA 94105 — Tech Name: DA

FACP Type: EST-3 — DACT Type: MOD COM — Format: 4+2 (4+2 etc)

Take system off-line with Central Station: ☐N/A ☒P ☐F — Acct Number: 04-050

Request zone schedule from Central Station and list below: ☐N/A ☒P ☐F

1. ALARM	2. SUPERVISORY
3. TROUBLE	4.
5.	6.
7.	8.
Additional Information:	BUILT-IN DIALER (SHARES AC AND DC W/ MAIN FIRE PANEL)

AC Voltage: NA	DC Voltage: NA	Load Test: NA	Battery Expiration: NA

Primary Phone Line	N/A	P	F	Secondary Phone Line	N/A	P	F
Manual zone trip	☒	☐	☐	Manual zone trip	☒	☐	☐
Correct trip and restoral? (@ CS)	☐	☒	☐	Correct trip and restoral? (@ CS)	☐	☒	☐
<90 sec. End-to-End Transmission	☐	☒	☐	<90 sec. End-to-End Transmission	☐	☒	☐
Proper DACT zone trip	☐	☒	☐	Proper DACT zone trip	☐	☒	☐
Primary phone disconnected	☐	☒	☐	Primary phone disconnected	☐	☒	☐
Local trouble signal (within 4 min)?	☐	☒	☐	Local trouble signal (within 4 min)?	☐	☒	☐
Primary Line Trouble (within 4 min)?	☐	☒	☐	Primary Line Trouble (within 4 min)?	☐	☒	☐
Reconnect primary, and	☐	☒	☐	Reconnect primary, and	☐	☒	☐
RJ31X Jack Proper Line Seizure?				RJ31X Jack Proper Line Seizure?			

ELEVATOR PHONE MONITORING TESTING

CS Name: NA

Elevator Location	Acct#	Caller I.D.#	Pass	Fail	CS Operator	Remarks
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		

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REMOTE DISPLAY				COMMENTS:
Visual Display	☐N/A	☒Pass	☐Fail	LOCATED AT:
AC Power LED – ON	☐N/A	☒Pass	☐Fail	- (ANN 14) B1 MAINTENACE OFFICE / ENGINEERING
Alarm Silence – LED	☐N/A	☒Pass	☐Fail	- (ANN 16) B1 RECEPTION / MANAGEMENT OFFICE
Program Fault – LED	☐N/A	☒Pass	☐Fail	- (ANN 15) L LEVEL SECURITY
Alarm – LED	☐N/A	☒Pass	☐Fail	
Alarm/Trouble Acknowledge	☐N/A	☒Pass	☐Fail	
Alarm Silence Resend	☐N/A	☒Pass	☐Fail	
Reset/Lamp Test	☐N/A	☒Pass	☐Fail	
Panel Sounder	☐N/A	☒Pass	☐Fail	

REMOTE ANNUNCIATOR				
Power On Lamp	☐N/A	☒Pass	☐Fail	GANN 12 (GRAPHIC ANN.)
Trouble Buzzer	☒N/A	☐Pass	☐Fail	LOCATED AT FACP (TOWER L LEVEL)
Signal Silence Lamp	☒N/A	☐Pass	☐Fail	
Lamp Test	☐N/A	☒Pass	☐Fail	
Reset (Remote)	☒N/A	☐Pass	☐Fail	
Alarm Lamp Operation Qty	☐N/A	☒Pass	☐Fail	
Alarm Lamp Labeled	☐N/A	☒Pass	☐Fail	
Signal Silence	☒N/A	☐Pass	☐Fail	

NOTIFICATION APPLIANCES		COMMENTS:
NAC's Tested	☐N/A	
	☒Yes	TESTED: 3/8/16 & 3/9/16
	☐No	
Synchronization Verified	☐N/A	
	☒Pass	
	☐Fail	

FINAL SYSTEM SUMMARY				COMMENTS:
Note all Deficiencies	☐N/A	☒Yes	☐No	SEE DEFICIENCY PAGE
Reconnect All Aux Functions	☐N/A	☒Yes	☐No	
Reconnect Signal Circuits	☐N/A	☒Yes	☐No	
Place System Online	☐N/A	☒Yes	☐No	
Appropriate field devices have been tested for proper out puts and recorded on Device Data Sheets	☐N/A	☒Yes	☐No	
Program Disk is on Site	☐N/A	☒Yes	☐No	

Work Complete/Building Management Notified: Time: 3:00 PM
Central Station Notified: Time: 3:00 PM Operator #: GABRIEL

THIS TESTING WAS PERFORMED IN ACCORDANCE WITH APPLICABLE NFPA 2010 EDITION STANDARDS.

Inspection Completed by(Tech Name): DA Date: 2-22-16

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RED HAWK
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Inspection Deficiencies Sheet

Job Name	Site Address	Work Order	Page
MILLENNIUM TOWERS	301 MISSION ST. SF, CA 94105	3212232	1 Of 1

Ranking Explanation
(1) Critical Life Safety System Issue (2) Life Safety Functional Issue (3) Untested (4) Non-Required Recommendation

Scope of work explanation
(A) Coordinate w/Red Hawk (B) Facilities to coordinate w/additional vendor

Rank: 2	Scope: A	Device Type: BOOSTER BATTERIES	Add/Zone: NA
Make/Model: BAT12V-7.5		Loc./Desc.: SEE BELOW	
Deficiency Desc.:	BATTERIES FAILED THE LOAD TEST: - L LEVEL (MID RISE) RESTAURANT STORAGE BPS 11 - B3 LEVEL ELEC. RM BPS 2 completed under WO#3220424 COMPLETED		
Recommendation	COORDINATE W/ RED HAWK SERVICE DEPT. TO REPLACE FAILED BATTERIES.		

Rank: 2	Scope: A	Device Type: SMOKE DETECTOR	Add/Zone: 01020022
Make/Model: EST SIGA-PS		Loc./Desc.: B1 LEVEL MAINT. SHOP SMOKE DETECTOR	
Deficiency Desc.:	SMOKE DETECTOR HAS WRONG DESCRIPTION. SHOULD SAY "B1 LEVEL STORAGE RM B1-D SMOKE DETECTOR". NOT INSIDE B1 MAINTENANCE SHOP. COMPLETED		
Recommendation	COORDINATE W/ RED HAWK SERVICE DEPT. TO REPROGRAM THE SMOKE DETECTOR DESCRIPTION. completed under WO#3220424		

Rank: 2	Scope: A	Device Type: FIRE PHONE JACK	Add/Zone: SEE BELOW
Make/Model: 6833-1		Loc./Desc.: SEE BELOW	
Deficiency Desc.:	FIRE PHONES FAILED TO CONNECT TO THE MAIN FIRE PANEL: - 23^{RD} FLR STAIR #2 - 31^{ST} FLR STAIR #1 completed under WO#3220424 COMPLETED		
Recommendation	COORDINATE W/ RED HAWK SERVICE DEPT. TO REPLACE BAD PHONE JACKS.		

Rank: Please Select	Scope: Please Select	Device Type:	Add/Zone:
Make/Model:		Loc./Desc.:	
Deficiency Desc.:	NA		

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RED HAWK
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Recommendation	NA

Tech Name: DARWIN	Date: 2/22/2016	Review deficiencies with Customer ☒ Yes

Modified on : 12/5/12

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RED HAWK
Fire & Security

Fire Alarm System Points List

Name: MILLENNIUM TOWERS DARWIN
Address: 301 MISSION ST 2-22-16
City: SF State: CA Zip: 94105
Notes: 30/2010

Address	Message	Device	Test	Trbl	Visual	Annun	Remarks
01020001	B1 LEVEL TELCO ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020002	B1 LEVEL HOUSEKEEPING SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020003	B1 LEVEL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020004	B1 LEVEL COMPUTER RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020005	B1 LEVEL STORAGE RM 6 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020006	B1 LEVEL TELCO/ SEC. SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020007	B1 LEVEL STORAGE RM 2 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020008	B1 LEVEL DOMESTIC H2O ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020009	B1 LEVEL STORAGE RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020010	B1 LEVEL CORRIDOR SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020011	B1 LEVEL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020012	B1 LEVEL CORRIDOR SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020013	B1 LEVEL SERVICE ELEV LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020014	B1 LEVEL SERVICE ELEV LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020015	B1 LEVEL CORRIDOR SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020016	B1 LEVEL FIRE PUMP RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020017	B1 LEVEL ELEV S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
01020018	B1 LEVEL SERVICE ELEV LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020019	B1 LEVEL CORRIDOR SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020020	B1 LEVEL MAINT OFFICE SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020021	B1 LEVEL STORAGE RM 5 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020022	B1 LEVEL MAINT. SHOP SMOKE DETECTOR	SD	X		X	X	WRONG DESCRIPTION; SHOULD SAY "B1 LEVEL STORAGE RM B1-D SMOKE DETECTOR"
01020023	B1 LEVEL MAINT. SHOP SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020024	B1 LEVEL EMERG ELECT. ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020025	B1 LEVEL EMERG ELECT. ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020026	B1 LEVEL EMERG ELECT. ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020027	B1 LEVEL SWITCHGEAR ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020028	B1 LEVEL SWITCHGEAR ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020029	B1 LEVEL SWITCHGEAR ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020030	B1 LEVEL FIRE PUMP RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020031	B1 LEVEL STORAGE RM 1 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020032	B1 LEVEL STORAGE RM 1 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020033	B1 LEVEL STORAGE RM 1 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020034	B1 LEVEL STORAGE RM 1 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020035	B1 LEVEL CORRIDOR SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020036	B1 LEVEL CORRIDOR SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020037	B1 LEVEL FAN ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020038	B1 LEVEL ELEVATOR F1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/10/16, RECALLED
01020039	B1 LEVEL NEAR ELEV P1 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020040	B1 LEVEL ELEV P1 & P2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/10/16, RECALLED
01020041	B1 LEVEL CORRIDOR SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020042	B1 LEVEL CORRIDOR SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020043	B1 LEVEL FSD TB1-9 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
01020044	B1 LEVEL FSD TB1-3 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
01020045	B1 LEVEL FSD TB1-5 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
01020046	B1 LEVEL FSD TB1-4 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
01020047	L LEVEL BANK FAN HP-1 DUCT DETECTOR	DD	X		X	X	TESTED: 3/17/16
01020048	B1 LEVEL FSD TB1-15 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
01020049	B1 LEVEL FSD TB1-2 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16

01020050	B1 LEVEL FSD TB1-17 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
01020051	B1 LEVEL FSD TB1-10 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
01020052	B1 LEVEL FSD TB1-8 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
01020053	B1 LEVEL FAN SF TB1-4 FAN DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
01020054	B1 LEVEL FSD TB1-1 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
01020055	B1 LEVEL FAN SF TB1-3 FAN DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
01020056	L LEVEL FIRE CONTROL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020057	L LEVEL ELEV P1 & P2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/10/16, RECALLED
01020058	L LEVEL SECURITY RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020059	L LEVEL HIRISE LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020060	L LEVEL ELEV C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/15/16, RECALLED
01020061	L LEVEL TELECOM ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020063	L LEVEL HIRISE LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020064	L LEVEL ELEV S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
01020065	L LEVEL CORRIDOR SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020066	L LEVEL CORRIDOR SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020068	L LEVEL AT ELEVATOR SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020069	L LEVEL ELEV C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
01020070	L LEVEL FSD L-5 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/17/16
01020071	L LEVEL FSD L-4 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/17/16
01020072	L LEVEL BANK SERVER ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020073	L LEVEL BANK ELECTRIC ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020074	L LEVEL BANK ELECTRIC ROOM DUCT DETECTOR	DD	X		X	X	TESTED: 3/17/16
01020075	B1 LEVEL FSD B1-18 DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
01020076	L LEVEL BANK FAN HP-2 DUCT DETECTOR	DD	X		X	X	TESTED: 3/17/16
01020077	L LEVEL BANK FAN HP-3 DUCT DETECTOR	DD	X		X	X	TESTED: 3/17/16
01020078	CL LEVEL OUTSIDE AIR BANK DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020079	CL LEVEL MECH. ROOM BANK DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020124	B1 LEVEL STORAGE RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
01020125	B1 LEVEL ELEV P1 & P2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/10/16, RECALLED
01020126	B1 LEVEL TELCO ROOM DOOR HOLDER RELAY	CR	X				TESTED: 3/3/16
01020127	B1 LEVEL HP TB1-12 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
01020128	B1 LEVEL HP TB1-5 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
01020129	B1 LEVEL HP TB1-6 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
01020130	B1 LEVEL HP TB1-9 FSD B1-6,7,14 RELAY	CR	X				TESTED: 2/24/16
01020131	B1 LEVEL HP TB1-7 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
01020132	B1 LEVEL ACU TB1-1 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
01020133	B1 LEVEL HP TB1-8 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
01020134	B1 LEVEL FSD TB1-4 CONTROL RELAY	CR	X				TESTED: 2/24/16
01020135	B1 LEVEL HP TB1-3 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
01020136	B1 LEVEL HP TB1-4 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
01020137	B1 LEVEL HP TB1-10 SUTDOWN RELAY	CR	X				TESTED: 3/15/16
01020138	B1 LEVEL HP TB1-11 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
01020139	B1 LEVEL HP TB1-2 FSD TB1-10 RELAY	CR	X				TESTED: 2/24/16
01020140	B1 LEVEL ACU TB1-2 FSD TB1-8,9 RELAY	CR	X				TESTED: 2/24/16
01020141	B1 LEVEL HP TB1-1 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
01020142	B1 LEVEL ELEVATOR F1 DOOR RELEASE RELAY	CR	X				TESTED: 3/10/16
01020143	B1 LEVEL FIRE PUMP RM PUMP B1-2 PHASE REV.	CT	X			X	TESTED: 3/3/16
01020144	B1 LVL MAIN FIRE SVC SHUTOFF VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5 (MULTIPLE VALVES W/ SAME ADDRESS)
01020145	L LEVEL STAIR 1 VON DUPRIN LOCK RELEASE	CR	X				TESTED: 3/9/16
01020146	L LEVEL STAIR 1 VEST VON DUPRIN RELEASE	CR	X				TESTED: 3/9/16
01020147	MR L-LEVEL RESTAURANT STROBE PANEL TROUBLE	CC	X				TESTED: 3/9/16
01020149	B1 LEVEL FSD TB1-2 CONTROL MODULE	CR	X				TESTED: 2/24/16
01020150	B1 LEVEL FSD TB1-17 CONTROL MODULE	CR	X				TESTED: 2/24/16
01020151	B1 LEVEL FIRE PUMP RM PUMP B1-1 RUNNING	CT	X			X	TESTED: 3/3/16
01020152	B1 LEVEL FIRE PUMP RM PUMP B1-1 TROUBLE	CT	X			X	TESTED: 2/29/16
01020153	B1 LEVEL FIRE PUMP RM PUMP B1-1 PHASE REV.	CT	X			X	TESTED: 3/3/16
01020154	B1 LEVEL FIRE PUMP RM PUMP B1-2 RUNNING	CT	X			X	TESTED: 3/3/16
01020155	B1 LEVEL FIRE PUMP RM PUMP B1-2 TROUBLE	CT	X			X	TESTED: 2/29/16
01020157	B1 LEVEL FIRE PUMP RM SPARE CIRCUIT	WF	#				(STRAPPED OUT)
01020158	B1 LEVEL FIRE PUMP RM VALVE TAMPERS	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5 (MULTIPLE VALVES W/ SAME ADDRESS)
01020159	B1 LEVEL FIRE PUMP WATER TANK HIGH	CT	X			X	TESTED: 3/3/16

01020160	B1 LEVEL FIRE PUMP WATER TANK LOW	CT	X			X	TESTED: 3/3/16
01020161	L LEVEL FSD L-1-7,9 DAMPER CONTROL RELAY	CR	X				TESTED: 2/24/16
01020162	L LEVEL FCC ROOM PS-5 PANEL TROUBLE	CT	X			X	TESTED: 2/22/16
01020163	L LEVEL BANK ELECTRIC ROOM FSD RELAY	CR	X				TESTED: 2/24/16
01020165	L LEVEL FCC ROOM PULL STATION	PS	X		X	X	TESTED: 3/8/16
01020166	STAIR #1 FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
01020167	STAIR #2 FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
01020168	ELEV C4&C5 LOBBY FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
01020169	ELEV C1-C3 LOBBY FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
01020170	ELEV S1 LOBBY FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
01020171	FIRE PUMP ROOM FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
01020172	STAIR #1 SPEAKER CIRCUIT	CC	X				TESTED: 3/8/16
01020173	STAIR #2 SPEAKER CIRCUIT	CC	X				TESTED: 3/8/16
01020174	B1 LEVEL TELCO ROOM STROBE PANEL TROUBLE	CC	X				TESTED: 3/8/16
01020175	L LEVEL TELECOM ROOM STROBE PANEL TROUBLE	CC	X				TESTED: 3/8/16
01020176	CL LEVEL ELECTRIC RM STROBE PANEL TROUBLE	CC	X				TESTED: 3/8/16
01020177	MR L LVL ELECTRIC RM STROBE PANEL TROUBLE	CC	X				TESTED: 3/9/16
01020178	MR CL LVL ELECTRIC RM STROBE PANEL TROUBLE	CC	X				TESTED: 3/9/16
01020179	MR B3 LVL STORAGE RM STROBE PANEL TROUBLE	CC	X				TESTED: 3/9/16
01020180	B1 LEVEL FSD TB1-3 CLOSED STATUS	CT	X				TESTED: 2/24/16
01020181	B1 LEVEL FSD TB1-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01020182	B1 LEVEL FSD TB1-15 CLOSED STATUS	CT	X				TESTED: 2/24/16
01020183	B1 LEVEL FSD TB1-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
01020184	B1 LEVEL FSD B1-3, 5 B1-19,20 RELAY	CR	X				TESTED: 2/24/16
01020185	L LEVEL ELEV P1 & P2 DOOR RELEASE RELAY	CR	X				TESTED: 3/10/16
01020186	B1 LEVEL ELEV P1 & P2 DOOR RELEASE RELAY	CR	X				TESTED: 3/10/16
01020187	B1 LEVEL STAIR 1 RISER VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01020188	B1 LEVEL STAIR 2 RISER VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01020189	B1 LEVEL FIRE PUMP RM VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01020192	B1 LEVEL FAN SF TB1-4 POWER DISCONNECT	CT	X				TESTED: 3/3/16
01020193	B1 LEVEL FAN SF TB1-4 'ON' MODULE	CT	X				TESTED: 2/24/16
01020194	B1 LEVEL FAN SF TB1-4 'OFF' MODULE	CT	X				TESTED: 2/24/16
01020195	L LEVEL BANK FAN HP-1 SHUTDOWN RELAY	CR	X				TESTED: 3/17/16
01020196	L LEVEL BANK FAN HP-2 SHUTDOWN RELAY	CR	X				TESTED: 3/17/16
01020197	L LEVEL BANK FAN HP-3 SHUTDOWN RELAY	CR	X				TESTED: 3/17/16
01020205	MR L LVL ELECTRIC RM STROBE PANEL TROUBLE	CC	X				TESTED: 3/9/16
01020243	B1 LEVEL FAN SF TB1-3 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
01020244	B1 LEVEL ELEV C4-C5 SHUNT POWER TROUBLE	CT	X				TESTED: 3/14/16
01020245	B1 LEVEL C1-C3 S1-S2 SHUNT POWER TROUBLE	CT	X				TESTED: 3/15/16
01020246	ELEV P1-P2 LOBBY FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
01020247	ELEV F1 LOBBY FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
01020248	L LEVEL ELECTRIC RM DOOR HOLDER RELAY	CR	X				TESTED: 3/9/16
01020249	B1 LEVEL B1-1, 15 DAMPER CONTROL RELAY	CR	X				TESTED: 2/24/16
01020251	CL LEVEL ELECTRIC RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020252	CL LEVEL MECH ROOM 2 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020253	CL LEVEL MECH ROOM 2 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020254	CL LEVEL MECH ROOM 2 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020255	CL LEVEL MECH ROOM 2 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020256	CL LEVEL MECH ROOM 2 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020257	CL LEVEL MECH ROOM 2 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020258	CL LEVEL FAN ROOM 2 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020259	CL LEVEL FAN ROOM 2 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020260	CL LEVEL MECH ROOM 3 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020261	CL LEVEL MECH ROOM 3 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020262	CL LEVEL MECH ROOM 3 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020263	CL LEVEL ELEV P1 & P2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/10/16
01020264	CL LEVEL MECH ROOM 1 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020265	CL LEVEL MECH ROOM 1 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020266	CL LEVEL MECH ROOM 1 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020267	CL LEVEL FAN ROOM 1 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020268	CL LEVEL MECH ROOM 2 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020269	CL LEVEL MECH ROOM 2 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020270	CL LEVEL FAN ROOM 1 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020271	CL LEVEL MECH ROOM 2 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020272	CL LEVEL MECH ROOM 2 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020273	CL LEVEL MECH ROOM 2 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16

01020275	CL LEVEL ELEV S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
01020276	CL LEVEL CORRIDOR SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020277	CL LEVEL ELEV C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
01020278	CL LEVEL ELEV C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
01020279	CL LEVEL FSD CL-36 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020280	CL LEVEL FSD CL-56 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020281	CL LEVEL FSD CL-4 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020282	CL LEVEL FSD CL-46 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020283	CL LEVEL FSD CL-47 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020284	CL LEVEL FSD CL-33 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020285	CL LEVEL FSD CL-35 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020286	CL LEVEL FSD CL-34 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020287	CL LEVEL FSD CL-39 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020288	CL LEVEL FSD CL-40 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020289	CL LEVEL FSD CL-41 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020290	CL LEVEL FSD CL-37 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020291	CL LEVEL FSD CL-38 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020292	CL LEVEL FSD CL-50 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020293	CL LEVEL AC TCL-3 FAN DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020294	CL LEVEL AC TCL-2 FAN DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020295	CL LEVEL SF TCL-1 FAN DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020296	CL LEVEL AC TCL-1 FAN DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020297	CL LEVEL AC TCL-4 FAN DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020298	CL LEVEL SF TCL-2 FAN DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020299	CL LEVEL FSD CL-2 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020301	3FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020302	3FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020303	3FL CORRIDOR AT #3J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020304	3FL CORRIDOR AT #3H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020305	3FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
01020306	3FL CORRIDOR AT #3E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020307	3FL CORRIDOR AT ELEV. SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020308	3FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
01020309	3FL CORRIDOR AT #3D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020310	4FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020311	4FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020312	4FL CORRIDOR AT #4J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020313	4FL CORRIDOR AT #4H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020314	4FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
01020315	4FL CORRIDOR AT #4E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020316	4FL CORRIDOR AT ELEV. SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020317	4FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
01020318	4FL CORRIDOR AT #4D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020319	4FL CORRIDOR AT #4C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020320	CL LEVEL FSD CL-52 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020321	CL LEVEL FSD CL-53 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020322	CL LEVEL A/V CLOSET SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020323	CL TOWER SCREENROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
01020324	CL LEVEL FAN AC TCL-2 FAN DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020325	CL LEVEL FAN AC TCL-3 DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
01020376	CL LEVEL RES. EXH F-J FSD CONTROL RELAY	CR	X				TESTED: 2/24/16
01020379	CL LEVEL AC TCL-3 SHUTDOWN RELAY	CR	X		X	X	TESTED: 3/7/16
01020381	CL LEVEL FSD CL-4, 56&TRASH RM RISER RELAY	CR	X				TESTED: 2/24/16
01020383	CL LEVEL FAN AC TCL-1 SHUTDOWN RELAY	CR	X		X	X	TESTED: 3/7/16
01020386	CL LEVEL FAN AC TCL-4 SHUTDOWN RELAY	CR	X		X	X	TESTED: 3/7/16
01020389	CL LEVEL EXHAUST FANS SHUTDOWN RELAY	CR	X		X	X	TESTED: 3/7/16
01020390	CL LEVEL RES. EXH A-D FSD CONTROL RELAY	CR	X				TESTED: 2/24/16
01020391	CL LEVEL SUPPLY FSD STAIR 2 RISER RELAY	CR	X				TESTED: 2/24/16
01020393	CL LEVEL FAN AC TCL-2 POWER DISCONNECT	CT	X				TESTED: 3/3/16
01020394	CL LEVEL FAN EF TCL24 POWER DISCONNECT	CT	X				TESTED: 3/3/16
01020395	CL LEVEL FSD TCL-4 CLOSED STATUS	CT	X				TESTED: 2/24/16
01020397	CL LEVEL FAN SF TCL-1 POWER DISCONNECT	CT	X				TESTED: 3/3/16
01020398	CL LEVEL FAN SF TCL-2 POWER DISCONNECT	CT	X				TESTED: 3/3/16
01020399	CL LEVEL FSD TCL-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
01020401	CL LEVEL FAN AC TCL-2 'ON' RELAY	CT	X				TESTED: 2/24/16
01020402	CL LEVEL FAN AC TCL-2 'OFF' RELAY	CT	X				TESTED: 2/24/16

01020403	CL LEVEL FAN EF TCL24 'ON' MODULE	CT	X				TESTED: 2/24/16
01020404	CL LEVEL FAN EF TCL24 'OFF' MODULE	CT	X				TESTED: 2/24/16
01020405	CL LEVEL FAN SF TCL-1 'ON' MODULE	CT	X				TESTED: 2/24/16
01020406	CL LEVEL FAN SF TCL-1 'OFF' MODULE	CT	X				TESTED: 2/24/16
01020407	CL LEVEL FAN SF TCL-2 'ON' MODULE	CT	X				TESTED: 2/24/16
01020408	CL LEVEL FAN SF TCL-2 'OFF' MODULE	CT	X				TESTED: 2/24/16
01020409	3FL SUPPLY FSD T3-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
01020410	3FL SUPPLY FSD T3-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
01020411	3FL EXHAUST FSD T3-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
01020412	4FL SUPPLY FSD T4-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
01020413	4FL SUPPLY FSD T4-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
01020414	4FL EXHAUST FSD T4-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
01020415	CL LEVEL FSD TCL-46 CLOSED STATUS	CT	X				TESTED: 2/24/16
01020416	CL LEVEL FSD TCL-47 CLOSED STATUS	CT	X				TESTED: 2/24/16
01020417	CL LEVEL FSD TCL-33 CLOSED STATUS	CT	X				TESTED: 2/24/16
01020419	CL LVL EXH FSD TCL-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
01020420	CL LEVEL ELEV P1 & P2 DOOR RELEASE RELAY	CR	X				TESTED: 3/10/16
01020422	CL LEVEL A/V CLOSET A/V SHUTDOWN RELAY	CR	X				TESTED: 3/9/16
01020423	CL LEVEL A/V ROOM A/V SHUTDOWN RELAY	CR	X				TESTED: 3/9/16
01020492	L LEVEL ELEV LOBBY DOOR HOLDER RELAY	CR	X				TESTED: 3/9/16
01020495	CL LVL FSD TCL-67 CONTROL MODULE	CR	X				TESTED: 2/24/16
01020496	CL LEVEL ELEV C4-C5 DOOR HOLDER RELAY	CR	X				TESTED: 3/9/16
01020497	CL LEVEL FSD TCL-66, 30-41, 46-47, 51-57	CR	X				TESTED: 2/24/16
01020498	CL LEVEL ELEV DOOR DOOR HOLDER RELAY	CR	X				TESTED: 3/9/16
01020499	4FL ELECTRIC ROOM DOOR HOLDER RELAY	CR	X				TESTED: 3/8/16
01030001	CL LEVEL STAIR 1 FSD CL-1 DUCT DET	DD	X		X	X	TESTED: 3/7/16
01030126	L LEVEL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030127	L LEVEL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030128	CL LEVEL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030129	CL LEVEL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030130	3FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030131	3FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030132	4FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030133	4FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030134	5FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030135	5FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030136	6FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030137	6FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030138	7FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030139	7FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030140	8FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030141	8FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030142	9FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030143	9FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030144	10FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030145	10FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030146	11FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030147	11FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030148	12FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030149	12FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030150	14FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030151	14FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030152	15FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030153	15FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030154	16FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030155	16FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030156	17FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030157	17FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030158	18FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030159	18FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030160	19FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030161	19FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030162	20FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030163	20FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030164	21FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030165	21FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5

01030166	22FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030167	22FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030168	23FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030169	23FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030170	24FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030171	24FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030172	25FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030173	25FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030174	26FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030175	26FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030176	27FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030177	27FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030178	28FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030179	28FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030180	29FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030181	29FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030182	30FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030183	30FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030184	31FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030185	31FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030186	32FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030187	32FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030188	33FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030189	33FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030190	34FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030191	34FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030192	35FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030193	35FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030194	36FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030195	36FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030196	37FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030197	37FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030198	38FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030199	38FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030200	39FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030201	39FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030202	40FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030203	40FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030204	41FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030205	41FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030206	42FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030207	42FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030208	43FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030209	43FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030210	45FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030211	45FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030212	46FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030213	46FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030214	47FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030215	47FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030216	48FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030217	48FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030218	49FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030219	49FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030220	50FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030221	50FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030222	51FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030223	51FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030224	52FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030225	52FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030226	53FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030227	53FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030228	54FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030229	54FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030230	55FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030231	55FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5

01030232	56FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030233	56FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030234	57FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030235	57FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030236	PH1 STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030237	PH1 STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030238	PH2 STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030239	PH2 STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030240	GPH LEVEL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030241	GPH LEVEL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030242	59FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030243	59FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030244	26FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030245	CL LEVEL SUPPLY FSD STAIR 1 RISER RELAY	CR	X				TESTED: 2/24/16
01030246	CL LEVEL FSD TCL-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
01030247	59FL STAIR 1 RELIEF DAMPER STATUS	CT	X				TESTED: 2/24/16
01030248	59FL STAIR 1 RELIEF FSD CONTROL RELAY	CR	X				TESTED: 2/24/16
01030249	B1 LEVEL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030250	B1 LEVEL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
01030376	CL LEVEL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030377	CL LEVEL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030378	3FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030379	3FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030380	4FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030381	4FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030382	5FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030383	5FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030384	6FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030385	6FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030386	7FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030387	7FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030388	8FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030389	8FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030390	9FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030391	9FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030392	10FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030393	10FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030394	11FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030395	11FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030396	12FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030397	12FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030398	14FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030399	14FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030400	15FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030401	15FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030402	16FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030403	16FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030404	17FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030405	17FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030406	18FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030407	18FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030408	19FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030409	19FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030410	20FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030411	20FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030412	21FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030413	21FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030414	22FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030415	22FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030416	23FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030417	23FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030418	24FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030419	24FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030420	25FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030421	25FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030422	26FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC

01030423	26FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030424	27FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030425	27FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030426	28FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030427	28FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030428	29FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030429	29FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030430	30FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030431	30FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030432	31FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030433	31FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030434	32FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030435	32FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030436	33FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030437	33FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030438	34FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030439	34FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030440	35FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030441	35FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030442	36FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030443	36FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030444	37FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030445	37FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030446	38FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030447	38FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030448	39FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030449	39FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030450	40FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030451	40FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030452	41FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030453	41FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030454	42FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030455	42FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030456	43FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030457	43FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030458	45FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030459	45FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030460	46FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030461	46FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030462	47FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030463	47FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030464	48FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030465	48FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030466	49FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030467	49FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030468	50FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030469	50FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030470	51FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030471	51FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030472	52FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030473	52FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030474	53FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030475	53FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030476	54FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030477	54FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030478	55FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030479	55FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030480	56FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030481	56FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030482	57FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030483	57FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030484	PH1 STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 3/1/16 TIME: < 90 SEC
01030485	PH1 STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030486	PH2 STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030487	PH2 STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030488	GPH LEVEL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC

01030489	GPH LEVEL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030490	59FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030491	59FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030492	59FL STAIR 2 RELIEF DAMPER STATUS	CT	X				TESTED: 2/24/16
01030493	59FL STAIR 2 RELIEF FSD CONTROL RELAY	CR	X				TESTED: 2/24/16
01030494	26FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030495	B1 LVL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030496	B1 LVL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030497	L LVL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030498	L LVL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01030499	60FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 2/29/16 TIME: < 90 SEC
01030500	60FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 2/29/16 TURNS: < 2.5
01040126	CL LEVEL FSD CL-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040127	CL LEVEL FSD CL-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040128	CL LEVEL FSD CL-6 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040130	CL LEVEL FSD CL-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040131	CL LEVEL FSD CL-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040132	CL LEVEL FSD CL-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040133	CL LEVEL FSD CL-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040134	3FL UNIT 3A FSD T3-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040136	3FL UNIT 3C FSD T3-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040137	3FL UNIT 3D FSD T3-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040138	4FL UNIT 4A FSD T4-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040139	4FL UNIT 4B FSD T4-6 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040140	4FL UNIT 4C FSD T4-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040141	4FL UNIT 4D FSD T4-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040142	5FL UNIT 5A FSD T5-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040143	5FL UNIT 5B FSD T5-6 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040144	5FL UNIT 5C FSD T5-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040145	5FL UNIT 5D FSD T5-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040146	6FL UNIT 6A FSD T6-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040147	6FL UNIT 6B FSD T6-6 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040148	6FL UNIT 6C FSD T6-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040149	6FL UNIT 6D FSD T6-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040150	7FL UNIT 7A FSD T7-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040151	7FL UNIT 7B FSD T7-6 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040152	7FL UNIT 7C FSD T7-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040153	7FL UNIT 7D FSD T7-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040154	8FL UNIT 8A FSD T8-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040155	8FL UNIT 7B FSD T8-6 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040156	8FL UNIT 8C FSD T8-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040157	8FL UNIT 8D FSD T8-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040158	9FL UNIT 9A FSD T9-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040160	9FL UNIT 9C FSD T9-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040161	9FL UNIT 9D FSD T9-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040162	10FL #10A FSD T10-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040164	10FL #10C FSD T10-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040165	10FL #10D FSD T10-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040166	11FL #11A FSD T11-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040168	11FL #11C FSD T11-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040169	11FL #11D FSD T11-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040170	12FL #12A FSD T12-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040171	12FL #12B FSD T12-6 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040172	12FL #12C FSD T12-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040173	12FL #12D FSD T12-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040174	14FL #14A FSD T14-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040175	14FL #14B FSD T14-6 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040176	14FL #14C FSD T14-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040177	14FL #14D FSD T14-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040178	15FL #15A FSD T15-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040179	15FL #15B FSD T15-6 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040180	15FL #15C FSD T15-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040181	15FL #15D FSD T15-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040182	16FL #16A FSD T16-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040183	16FL #16B FSD T16-6 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040184	16FL #16C FSD T16-7 CLOSED STATUS	CT	X				TESTED: 2/24/16

01040185	16FL #16D FSD T16-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040186	17FL #17A FSD T17-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040187	17FL #17B FSD T17-6 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040188	17FL #17C FSD T17-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040189	17FL #17D FSD T17-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040190	18FL #18A FSD T18-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040191	18FL #18B FSD T18-6 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040192	18FL #18C FSD T18-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040193	18FL #18D FSD T18-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040194	19FL #19A FSD T19-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040196	19FL #19C FSD T19-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040197	19FL #19D FSD T19-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040198	20FL #20A FSD T20-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040200	20FL #20C FSD T20-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040201	20FL #20D FSD T20-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040202	21FL #21A FSD T21-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040204	21FL #21C FSD T21-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040205	21FL #21D FSD T21-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040206	22FL #22A FSD T22-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040207	22FL #22B FSD T22-6 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040208	22FL #22C FSD T22-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040209	22FL #22D FSD T22-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040210	23FL #23A FSD T23-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040211	23FL #23B FSD T23-6 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040212	23FL #23C FSD T23-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040213	23FL #23D FSD T23-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040214	24FL #24A FSD T24-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040215	24FL #24B FSD T24-6 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040216	24FL #24C FSD T24-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040217	24FL #24D FSD T24-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040218	25FL #25A FSD T25-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040219	25FL #25B FSD T25-6 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040220	25FL #25C FSD T25-7 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040221	25FL #25D FSD T25-8 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040376	CL LEVEL FSD CL-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040377	CL LEVEL FSD CL-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040378	CL LEVEL FSD CL-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040380	CL LEVEL FSD CL-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040381	CL LEVEL FSD CL-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040383	CL LEVEL FSD CL-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040384	CL LEVEL FSD CL-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040386	3FL UNIT 3E FSD T3-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040387	3FL UNIT 3G FSD T3-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040388	3FL UNIT 3F FSD T3-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040389	3FL UNIT 3J FSD T3-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040390	3FL UNIT 3H FSD T3-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040391	4FL UNIT 4E FSD T4-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040392	4FL UNIT 4G FSD T4-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040393	4FL UNIT 4F FSD T4-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040394	4FL UNIT 4J FSD T4-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040395	4FL UNIT 4H FSD T4-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040396	5FL UNIT 5E FSD T5-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040397	5FL UNIT 5G FSD T5-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040398	5FL UNIT 5F FSD T5-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040399	5FL UNIT 5J FSD T5-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040400	5FL UNIT 5H FSD T5-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040401	6FL UNIT 6E FSD T6-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040402	6FL UNIT 6G FSD T6-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040403	6FL UNIT 6F FSD T6-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040404	6FL UNIT 6J FSD T6-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040405	6FL UNIT 6H FSD T6-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040406	7FL UNIT 7E FSD T7-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040407	7FL UNIT 7G FSD T7-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040408	7FL UNIT 7F FSD T7-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040409	7FL UNIT 7J FSD T7-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040410	7FL UNIT 7H FSD T7-13 CLOSED STATUS	CT	X				TESTED: 2/24/16

01040411	8FL UNIT 8E FSD T8-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040412	8FL UNIT 8G FSD T8-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040413	8FL UNIT 8F FSD T8-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040414	8FL UNIT 8J FSD T8-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040415	8FL UNIT 8H FSD T8-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040416	9FL UNIT 9E FSD T9-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040417	9FL UNIT 9G FSD T9-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040418	9FL UNIT 9F FSD T9-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040419	9FL UNIT 9J FSD T9-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040420	9FL UNIT 9H FSD T9-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040421	10FL #10E FSD T10-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040422	10FL #10G FSD T10-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040423	10FL #10F FSD T10-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040424	10FL #10J FSD T10-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040425	10FL #10H FSD T10-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040426	11FL #11E FSD T11-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040427	11FL #11G FSD T11-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040428	11FL #11F FSD T11-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040429	11FL #11J FSD T11-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040430	11FL #11H FSD T11-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040431	12FL #12E FSD T12-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040432	12FL #12G FSD T12-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040433	12FL #12F FSD T12-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040434	12FL #12J FSD T12-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040435	12FL #12H FSD T12-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040436	14FL #14E FSD T14-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040437	14FL #14G FSD T14-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040438	14FL #14F FSD T14-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040439	14FL #14J FSD T14-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040440	14FL #14H FSD T14-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040441	15FL #15E FSD T15-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040442	15FL #15G FSD T15-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040443	15FL #15F FSD T15-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040444	15FL #15J FSD T15-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040445	15FL #15H FSD T15-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040446	16FL #16E FSD T16-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040447	16FL #16G FSD T16-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040448	16FL #16F FSD T16-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040449	16FL #16J FSD T16-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040450	16FL #16H FSD T16-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040451	17FL #17E FSD T17-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040452	17FL #17G FSD T17-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040453	17FL #17F FSD T17-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040454	17FL #17J FSD T17-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040455	17FL #17H FSD T17-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040456	18FL #18E FSD T18-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040457	18FL #18G FSD T18-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040458	18FL #18F FSD T18-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040459	18FL #18J FSD T18-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040460	18FL #18H FSD T18-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040461	19FL #19E FSD T19-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040462	19FL #19G FSD T19-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040463	19FL #19F FSD T19-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040464	19FL #19J FSD T19-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040465	19FL #19H FSD T19-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040466	20FL #20E FSD T20-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040467	20FL #20G FSD T20-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040468	20FL #20F FSD T20-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040469	20FL #20J FSD T20-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040470	20FL #20H FSD T20-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040471	21FL #21E FSD T21-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040472	21FL #21G FSD T21-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040473	21FL #21F FSD T21-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040474	21FL #21J FSD T21-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040475	21FL #21H FSD T21-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040476	22FL #22E FSD T22-9 CLOSED STATUS	CT	X				TESTED: 2/24/16

01040477	22FL #22G FSD T22-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040478	22FL #22F FSD T22-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040479	22FL #22J FSD T22-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040480	22FL #22H FSD T22-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040481	23FL #23E FSD T23-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040482	23FL #23G FSD T23-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040483	23FL #23F FSD T23-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040484	23FL #23J FSD T23-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040485	23FL #23H FSD T23-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040486	24FL #24E FSD T24-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040487	24FL #24G FSD T24-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040488	24FL #24F FSD T24-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040489	24FL #24J FSD T24-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040490	24FL #24H FSD T24-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040491	25FL #25E FSD T25-9 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040492	25FL #25G FSD T25-10 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040493	25FL #25F FSD T25-11 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040494	25FL #25J FSD T25-12 CLOSED STATUS	CT	X				TESTED: 2/24/16
01040495	25FL #25H FSD T25-13 CLOSED STATUS	CT	X				TESTED: 2/24/16
03020001	MR B5 LVL ELEV P1-P2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/10/16, RECALLED
03020002	MR B5 LVL ELEV P1-P2 MACH RM SMOKE DET.	SD	X		X	X	TESTED: 3/10/16, RECALLED
03020003	MR B5 LVL MECH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
03020004	MR B5 LVL ELEV P1-P2 MACH RM HEAT DET.	HD	X		X	X	TESTED: 3/10/16, SHUNTED
03020005	MR B5 LVL ELECTRIC RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
03020006	MR B4 LVL ELEV P1-P2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/10/16, RECALLED
03020007	MR B4 LVL ELECTRIC RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
03020125	MR B5 LVL ELEV P1-P2 MACH RM HEAT DET.	HD	X		X	X	TESTED: 3/10/16, SHUNTED
03020126	MR B5 LVL ELEV P1-P2 DOOR RELEASE RELAY	CR	X				TESTED: 3/10/16
03020127	MR B5 LVL ELEV P1-P2 PRIMARY RECALL	CR	X				TESTED: 3/10/16
03020128	MR B5 LVL ELEV P1-P2 ALTERNATE RECALL	CR	X				TESTED: 3/10/16
03020129	MR B5 LVL ELEV P1-P2 FIRE HAT OUTPUT	CR	X				TESTED: 3/10/16
03020130	MR B5 LVL ELEV P1-P2 MACH RM FSD RELAY	CR	X				TESTED: 2/25/16
03020131	MR B5 LVL FAN SF B5-4 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020132	MR B5 LVL FAN SF B5-3 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020133	MR B5 LVL FAN EF B5-4 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020134	MR B5 LVL FAN EF B5-3 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020135	MR B5 LVL FAN EF B5-1 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020136	MR B5 LVL FAN EF B5-2 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020137	MR B5 LVL FAN SF B5-2 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020138	MR B5 LVL FAN SF B5-1 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020139	MR B5 LVL STAIR 4 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020140	MR B5 LVL STAIR 4 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020141	MR B5 LVL FAN SF B5-4 'ON' MODULE	CT	X				TESTED: 2/25/16
03020142	MR B5 LVL FAN SF B5-4 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020143	MR B5 LVL FAN SF B5-3 'ON' MODULE	CT	X				TESTED: 2/25/16
03020144	MR B5 LVL FAN SF B5-3 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020145	MR B5 LVL FAN EF B5-4 'ON' MODULE	CT	X				TESTED: 2/25/16
03020146	MR B5 LVL FAN EF B5-4 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020147	MR B5 LVL FAN EF B5-3 'ON' MODULE	CT	X				TESTED: 2/25/16
03020148	MR B5 LVL FAN EF B5-3 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020149	MR B5 LVL FAN EF B5-1 'ON' MODULE	CT	X				TESTED: 2/25/16
03020150	MR B5 LVL FAN EF B5-1 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020151	MR B5 LVL FAN EF B5-2 'ON' MODULE	CT	X				TESTED: 2/25/16
03020152	MR B5 LVL FAN EF B5-2 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020153	MR B5 LVL FAN SF B5-2 'ON' MODULE	CT	X				TESTED: 2/25/16
03020154	MR B5 LVL FAN SF B5-2 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020155	MR B5 LVL FAN SF B5-1 'ON' MODULE	CT	X				TESTED: 2/25/16
03020156	MR B5 LVL FAN SF B5-1 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020158	MR B4 LVL ELEV P1-P2 DOOR RELEASE RELAY	CR	X				TESTED: 3/10/16
03020159	MR B4 LVL FAN SF B4-4 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020160	MR B4 LVL FAN SF B4-3 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020161	MR B4 LVL FAN EF B4-4 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020162	MR B4 LVL FAN EF B4-3 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020163	MR B4 LVL FAN EF B4-1 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020164	MR B4 LVL FAN EF B4-2 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020165	MR B4 LVL FAN SF B4-2 POWER DISCONNECT	CT	X				TESTED: 3/3/16

03020166	MR B4 LVL FAN SF B4-1 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020167	MR B4 LVL STAIR 4 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020168	MR B4 LVL STAIR 4 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020169	MR B4 LVL FAN SF B4-4 'ON' MODULE	CT	X				TESTED: 2/25/16
03020170	MR B4 LVL FAN SF B4-4 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020171	MR B4 LVL FAN SF B4-3 'ON' MODULE	CT	X				TESTED: 2/25/16
03020172	MR B4 LVL FAN SF B4-3 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020173	MR B4 LVL FAN EF B4-4 'ON' MODULE	CT	X				TESTED: 2/25/16
03020174	MR B4 LVL FAN EF B4-4 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020175	MR B4 LVL FAN EF B4-3 'ON' MODULE	CT	X				TESTED: 2/25/16
03020176	MR B4 LVL FAN EF B4-3 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020177	MR B4 LVL FAN EF B4-1 'ON' MODULE	CT	X				TESTED: 2/25/16
03020178	MR B4 LVL FAN EF B4-1 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020179	MR B4 LVL FAN EF B4-2 'ON' MODULE	CT	X				TESTED: 2/25/16
03020180	MR B4 LVL FAN EF B4-2 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020181	MR B4 LVL FAN SF B4-2 'ON' MODULE	CT	X				TESTED: 2/25/16
03020182	MR B4 LVL FAN SF B4-2 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020183	MR B4 LVL FAN SF B4-1 'ON' MODULE	CT	X				TESTED: 2/25/16
03020184	MR B4 LVL FAN SF B4-1 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020185	MR B5 LVL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020186	MR B5 LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020187	MR B4 LVL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020188	MR B4 LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020189	MR B3 LVL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020190	MR B3 LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020191	MR B2 LVL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020192	MR B2 LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020193	MR B1 LVL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020194	MR B1 LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020195	MR L LVL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020196	MR L LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020197	MR CL LVL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020198	MR CL LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020199	MR 3FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020200	MR 3FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020201	MR 4FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020202	MR 4FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020203	MR 5FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020204	MR 5FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020205	MR 6FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020206	MR 6FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020207	MR 7FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020208	MR 7FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020209	MR 8FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020210	MR 8FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020211	MR 9FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020212	MR 9FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020213	MR 10FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020214	MR 10FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020215	MR PH LVL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020216	MR PH LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020217	MR 12FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020218	MR 12FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020219	MR B5 LVL ELEV P1-P2 DOOR HOLDER RELAY	CR	X				TESTED: 3/10/16
03020241	MR L LEVEL VON DUPRIN CORR LOCK RELEASE	CR	X				TESTED: 3/9/16
03020242	MR L LEVEL VON DUPRIN STAIR 6 DOOR RELEASE	CR	X				TESTED: 3/9/16
03020243	MR B5 LVL ELEV P1 CAR BATTERY SHUNT	CR	X				TESTED: 3/10/16
03020244	MR B5 LVL ELEV P2 CAR BATTERY SHUNT	CR	X				TESTED: 3/10/16
03020245	MR B3 LVL STAIR #4 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020246	MR B3 LVL STAIR #4 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020247	MR B2 LVL STAIR #4 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020248	MR B2 LVL STAIR #4 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020249	B1 LVL STAIR #4 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
03020250	B1 LVL STAIR #4 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
03020251	MR B3 LVL STORAGE RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
03020252	MR B3 LVL ELEV P1-P2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/10/16, RECALLED

03020253	MR B2 LVL ELECTRIC RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
03020254	MR B2 LVL ELEV P1-P2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/10/16, RECALLED
03020255	MR B2 LVL ELEVATOR F1 MACH RM SMOKE DET.	SD	X		X	X	TESTED: 3/10/16, RECALLED
03020256	MR B2 LVL MECH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
03020257	MR B2 LVL ELEVATOR F1 HEAT DETECTOR	HD	X		X	X	TESTED: 3/10/16, SHUNTED
03020259	MR B1 LVL ELEVATOR S3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/9/16, RECALLED
03020260	MR B1 LVL ELEVATOR S4 MACH RM SMOKE DET.	SD	X		X	X	TESTED: 3/10/16, RECALLED
03020261	MR B1 LVL ELEVATOR S4 MACH RM HEAT DET.	HD	X		X	X	TESTED: 3/10/16, SHUNTED
03020263	B1 LEVEL FAN MUA-1 FAN DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
03020265	B1 LEVEL FAN TF-1 FAN DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
03020376	MR B3 LVL ELEV P1-P2 DOOR RELEASE RELAY	CR	X				TESTED: 3/10/16
03020377	MR B3 LVL FAN SF B3-4 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020378	MR B3 LVL FAN SF B3-3 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020379	MR B3 LVL FAN EF B3-3 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020380	MR B3 LVL FAN EF B3-4 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020381	MR B3 LVL FAN EF B3-2 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020382	MR B3 LVL FAN EF B3-1 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020383	MR B3 LVL FAN SF B3-2 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020384	MR B3 LVL FAN SF B3-1 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020387	MR B3 LVL FAN SF B3-4 'ON' MODULE	CT	X				TESTED: 2/25/16
03020388	MR B3 LVL FAN SF B3-4 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020389	MR B3 LVL FAN SF B3-3 'ON' MODULE	CT	X				TESTED: 2/25/16
03020390	MR B3 LVL FAN SF B3-3 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020391	MR B3 LVL FAN EF B3-3 'ON' MODULE	CT	X				TESTED: 2/25/16
03020392	MR B3 LVL FAN EF B3-3 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020393	MR B3 LVL FAN EF B3-4 'ON' MODULE	CT	X				TESTED: 2/25/16
03020394	MR B3 LVL FAN EF B3-4 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020395	MR B3 LVL FAN EF B3-2 'ON' MODULE	CT	X				TESTED: 2/25/16
03020396	MR B3 LVL FAN EF B3-2 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020397	MR B3 LVL FAN EF B3-1 'ON' MODULE	CT	X				TESTED: 2/25/16
03020398	MR B3 LVL FAN EF B3-1 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020399	MR B3 LVL FAN SF B3-2 'ON' MODULE	CT	X				TESTED: 2/25/16
03020400	MR B3 LVL FAN SF B3-2 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020401	MR B3 LVL FAN SF B3-1 'ON' MODULE	CT	X				TESTED: 2/25/16
03020402	MR B3 LVL FAN SF B3-1 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020403	STAIR 5 FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
03020404	STAIR 6 FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
03020405	ELEV C6&S3 LOBBY FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
03020406	STAIR 4 FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
03020409	ELEV P1-P2 CAB FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
03020410	ELEV F1 CAB FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
03020411	ELEV S4 LOBBY FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
03020412	ELEV S4 CAB FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
03020413	STAIR 5 SPEAKER TRBL CIRCUIT A81	CC	X				TESTED: 3/8/16
03020414	STAIR 6 SPEAKER TRBL CIRCUIT A82	CC	X				TESTED: 3/8/16
03020415	STAIR 4 SPEAKER TRBL CIRCUIT A80	CC	X				TESTED: 3/8/16
03020416	ELEV P1-P2 SPKR TRBL CIRCUIT A83	CC	X				TESTED: 3/8/16
03020417	ELEV F1 SPEAKER TRBL CIRCUIT A84	CC	X				TESTED: 3/8/16
03020418	ELEV S4 SPEAKER TRBL CIRCUIT A94	CC	X				TESTED: 3/8/16
03020419	MR B2 LVL ELEV P1-P2 DOOR RELEASE RELAY	CR	X				TESTED: 3/10/16
03020420	MR B2 LVL ELEV F1 MACH RM FSD RELAY	CR	X				TESTED: 2/25/16
03020421	MR B2 LVL ELEVATOR F1 PRIMARY RECALL	CR	X				TESTED: 3/10/16
03020422	MR B2 LVL ELEVATOR F1 ALTERNATE RECALL	CR	X				TESTED: 3/10/16
03020423	MR B2 LVL ELEVATOR F1 FIRE HAT OUTPUT	CR	X				TESTED: 3/10/16
03020424	MR B2 LVL FAN SF B2-2 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020425	MR B2 LVL FAN EF B2-3 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020426	MR B2 LVL FAN EF B2-4 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020427	MR B2 LVL FAN EF B2-2 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020428	MR B2 LVL FAN EF B2-1 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020429	MR B2 LVL FAN SF B2-1 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020432	MR B2 LVL FAN SF B2-2 'ON' MODULE	CT	X				TESTED: 2/25/16
03020433	MR B2 LVL FAN SF B2-2 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020434	MR B2 LVL FAN EF B2-3 'ON' MODULE	CT	X				TESTED: 2/25/16
03020435	MR B2 LVL FAN EF B2-3 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020436	MR B2 LVL FAN EF B2-4 'ON' MODULE	CT	X				TESTED: 2/25/16
03020437	MR B2 LVL FAN EF B2-4 'OFF' MODULE	CT	X				TESTED: 2/25/16

03020438	MR B2 LVL FAN EF B2-2 'ON' MODULE	CT	X				TESTED: 2/25/16
03020439	MR B2 LVL FAN EF B2-2 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020440	MR B2 LVL FAN EF B2-1 'ON' MODULE	CT	X				TESTED: 2/25/16
03020441	MR B2 LVL FAN EF B2-1 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020442	MR B2 LVL FAN SF B2-1 'ON' MODULE	CT	X				TESTED: 2/25/16
03020443	MR B2 LVL FAN SF B2-1 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020444	MR B2 LVL ELEVATOR F1 SHUNT POWER TROUBLE	CT	X				TESTED: 3/10/16
03020445	MR B1 LVL ELEVATOR S4 PRIMARY RECALL	CR	X				TESTED: 3/10/16
03020446	MR B1 LVL ELEVATOR S4 ALTERNATE RECALL	CR	X				TESTED: 3/10/16
03020447	MR B1 LVL ELEVATOR S4 FIRE HAT OUTPUT	CR	X				TESTED: 3/10/16
03020448	MR B1 LVL ELEVATOR S4 MACH ROOM FSD RELAY	CR	X				TESTED: 2/25/16
03020449	MR B1 LVL FAN EF B1-3 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020450	MR B1 LVL FAN EF B1-4 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020451	MR B1 LVL FAN EF B1-2 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020452	MR B1 LVL FAN EF B1-1 POWER DISCONNECT	CT	X				TESTED: 3/3/16
03020453	MR B1 LVL ELEVATOR S4 SHUNT POWER TROUBLE	CT	X				TESTED: 3/10/16
03020454	MR B1 LVL FAN EF B1-3 'ON' MODULE	CT	X				TESTED: 2/25/16
03020455	MR B1 LVL FAN EF B1-3 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020456	MR B1 LVL FAN EF B1-4 'ON' MODULE	CT	X				TESTED: 2/25/16
03020457	MR B1 LVL FAN EF B1-4 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020458	MR B1 LVL FAN EF B1-2 'ON' MODULE	CT	X				TESTED: 2/25/16
03020459	MR B1 LVL FAN EF B1-2 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020460	MR B1 LVL FAN EF B1-1 'ON' MODULE	CT	X				TESTED: 2/25/16
03020461	MR B1 LVL FAN EF B1-1 'OFF' MODULE	CT	X				TESTED: 2/25/16
03020462	MR B1 LVL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
03020463	MR B1 LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 3/1/16 TURNS: < 2.5
03020465	MR L LVL FAN MUA-1 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
03020466	MR L LVL FAN TF-1 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
03020467	MR L LVL FAN MUA-1 DAMPER RELAY	CR	X				TESTED: 2/25/16
03020469	MR L LVL FAN TF-1 DAMPER RELAY	CR	X				TESTED: 2/25/16
03020498	MR B1 LVL ELEV S4 CAR BATTERY SHUNT	CR	X				TESTED: 3/10/16
03020499	MR B2 LVL ELEV F1 CAR BATTERY SHUNT	CR	X				TESTED: 3/10/16
03020500	MR B5 LVL ELEV P1&P2 SHUNT POWER TROUBLE	CT	X				TESTED: 3/10/16
04020001	MR L LVL ELECTRIC RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020002	MR L LVL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020003	MR L LVL MECH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020004	MR L LVL MECH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020005	MR L LVL ELEVATOR S4 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/10/16, RECALLED
04020007	MR L LVL CORRIDOR SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020008	MR L LVL TELECOM ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020009	MR L LVL CORR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020010	MR L LVL ELEVATOR S3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/9/16, RECALLED
04020012	MR L LVL TOILET 122 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020013	MR L LVL MR LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020014	MR L LVL ELEV C6 & S3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/9/16, RECALLED
04020015	MR L LVL LOADING DOCK SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020016	MR L LVL FUEL PUMP RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020017	MR L LVL SCISSOR LIFT ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020018	MR L LVL LOADING DOCK SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020019	MR L LVL RECYCLING RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020020	MR L LVL STORAGE ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020021	MR L LVL LOADING DOCK SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020022	MR L LVL CORRIDOR SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020023	MR L LVL POOL EQUIP ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020024	MR L LVL ELEVATOR F1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/10/16, RECALLED
04020025	MR L LVL FSD L-22 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020026	MR L LVL FSD L-25 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020028	MR L LVL FSD L-19 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020029	MR L LVL FSD L-15 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020030	MR L LVL FSD L-17 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020031	MR L LVL FSD L-16 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020032	MR L LVL FAN AC ML-2 DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020033	MR L LVL FAN AC ML-1 DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020034	MR CL LVL ELECTRIC RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020035	MR CL LVL TELECOM RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020036	MR CL LVL ELEV C6& S3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/9/16, RECALLED

04020037	MR CL LVL ELEVATOR S4 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/10/16, RECALLED
04020038	MR CL LVL TASTING RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020039	MR CL LVL HALLWAY 221 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020040	MR CL LVL POOL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020041	MR CL LVL HALLWAY 221 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020042	MR CL LEVEL CORRIDOR SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020043	MR CL LVL FSD CL-63 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020044	MR CL LVL FSD CL-62 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020045	MR CL LVL FSD CL-61 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020046	MR CL LVL FSD CL-42 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020047	MR CL LVL FSD CL-43 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020048	MR CL LVL FSD CL-45 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020049	MR CL LVL FSD CL-44 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020052	MR 3FL ELECTRICAL RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020053	MR 3FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020054	MR 3FL CORRIDOR @ 304 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020055	MR 3FL CORR @ TERRACE SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020056	MR 3FL CORRIDOR @ 303 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020057	MR 3FL ELEV C6 & S3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/9/16, RECALLED
04020058	MR 3FL TELECOM ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020059	MR 3FL CORRIDOR @ 302 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020060	MR 4FL ELECTRIC ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020061	MR 4FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020062	MR 4FL CORRIDOR @ 404 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020063	MR 4FL CORRIDOR @ 403 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020064	MR 4FL ELEV C6& S3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/9/16, RECALLED
04020065	MR 4FL TELECOM ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020066	MR 4FL CORRIDOR @ 402 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020067	MR 5FL ELECTRIC ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020068	MR 5FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020069	MR 5FL CORRIDOR @ 504 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020070	MR 5FL CORRIDOR @ 503 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020071	MR 5FL ELEV C6 & S3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/9/16, RECALLED
04020072	MR 5FL TELECOM ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020073	MR 5FL CORRIDOR @ 502 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020074	MR 6FL ELECTRIC ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020075	MR 6FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020076	MR 6FL CORRIDOR @ 604 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020077	MR 6FL CORRIDOR @ 603 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020078	MR 6FL ELEV C6 & S3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/9/16, RECALLED
04020079	MR 6FL TELECOM ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020080	MR 6FL CORRIDOR @ 602 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
04020083	MR CL LVL FSD CL-66 FSD DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020086	MR L LEVEL ELEV F1 SHAFT SMOKE DETECTOR	SD	X				TESTED: 3/10/16, RECALLED
04020087	MR L LEVEL ELEV F1 SHAFT HEAT DETECTOR	HD	X				TESTED: 3/10/16, SHUNTED
04020091	MR L LEVEL RESTAURANT STORAGE RM SMOKE DE	SD	X		X	X	TESTED: 2/25/16
04020092	MR L LEVEL RESTAURANT MECH. ROOM DUCT DET.	DD	X		X	X	TESTED: 3/15/16
04020093	MR L LEVEL RESTAURANT HP-3 DUCT DETECTOR	DD	X		X	X	TESTED: 3/17/16
04020094	MR L LEVEL RESTAURANT HP-2 DUCT DETECTOR	DD	X		X	X	TESTED: 3/17/16
04020095	MR L LEVEL RESTAURANT HP-1 DUCT DETECTOR	DD	X		X	X	TESTED: 3/17/16
04020096	MR L LEVEL RESTAURANT HP-4 DUCT DETECTOR	DD	X		X	X	TESTED: 3/17/16
04020098	MR CL LVL FSD CL-64 DUCT DETECTOR	DD	X		X	X	TESTED: 3/15/16
04020100	MR L LVL SECURITY OFFICE SMOKE DETECTOR	SD	X		X	X	TESTED: 2/25/16
04020113	MR L LEVEL RESTAURANT HP-5 DUCT DETECTOR	DD	X		X	X	TESTED: 3/17/16
04020126	MR L LVL FAN AC ML-2 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
04020127	MR L LVL FAN AC ML-1 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
04020128	MR L LEVEL ELECT. RM DOOR RELEASE RELAY	CR	X				TESTED: 3/9/16
04020129	MR L LVL ELEVATOR S4 DOOR RELEASE RELAY	CR	X				TESTED: 3/9/16
04020130	MR L LVL FSD L-15,25,L-32-33,19,20-23	CR	X				TESTED: 2/25/16
04020131	MR L LVL FSD L-16-17,L-12-14,26,	CR	X				TESTED: 2/25/16
04020132	MR L LVL TELECOM ROOM SECURITY INTERFACE	CR	X				TESTED: 3/9/16
04020133	MR 1FL LVL KITCHEN FRYER ANSUL	CT	X			X	TESTED: 3/3/16 (SHORTED MODULE ONLY)
04020134	MR CL LEVEL POOL ROOM FSD CONTROL RELAY	CR	X				TESTED: 2/25/16
04020135	MR CL LVL FSD CL-63 CONTROL RELAY	CR	X				TESTED: 2/25/16
04020136	MR CL LVL FSD CL-42, 43,44,45,64,65 RELAY	CR	X				TESTED: 2/25/16

04020137	MR CL LVL FSD CL-62 CONTROL RELAY	CR	X				TESTED: 2/25/16
04020139	MR CL LVL TELCO ROOM SECURITY INTERFACE	CR	X				TESTED: 3/9/16
04020140	MR CL LVL FIREPLACE GAS SHUTDOWN RELAY	CR	X				TESTED: 3/9/16
04020142	MR 3FL SUP FSD M3-1 CLOSED STATUS	CT	X				TESTED: 2/25/16
04020143	MR 3FL EXH FSD M3-2 CONTROL MODULE	CR	X				TESTED: 2/25/16
04020144	MR 4FL SUP FSD M4-1 CLOSED STATUS	CT	X				TESTED: 2/25/16
04020145	MR 4FL EXH FSD M4-2 CONTROL MODULE	CR	X				TESTED: 2/25/16
04020146	MR 5FL SUP FSD M5-1 CLOSED STATUS	CT	X				TESTED: 2/25/16
04020147	MR 5FL EXH FSD M5-2 CONTROL MODULE	CR	X				TESTED: 2/25/16
04020148	MR 6FL SUP FSD M6-1 CLOSED STATUS	CT	X				TESTED: 2/25/16
04020149	MR 6FL EXH FSD M6-2 CONTROL MODULE	CR	X				TESTED: 2/25/16
04020150	MR L LVL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
04020151	MR L LVL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
04020152	MR CL LVL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
04020153	MR CL LVL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
04020154	MR 3FL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
04020155	MR 3FL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
04020156	MR 4FL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
04020157	MR 4FL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
04020158	MR 5FL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
04020159	MR 5FL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
04020160	MR 6FL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
04020161	MR 6FL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
04020162	MR 7FL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
04020163	MR 7FL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
04020164	MR 8FL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
04020165	MR 8FL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
04020166	MR 9FL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
04020167	MR 9FL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
04020168	MR 10FL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
04020169	MR 10FL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
04020170	MR PH STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 3/2/16 TIME: < 90 SEC
04020171	MR PH STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 3/2/16 TURNS: < 2.5
04020174	MR L LVL ELEVATOR F1 DOOR RELEASE RELAY	CR	X				TESTED: 3/10/16
04020178	MR L LEVEL RESTAURANT MECH. ROOM FSD RELAY	CR	X				TESTED: 2/25/16
04020179	MR L LEVEL RESTAURANT HP-3 SHUTDOWN RELAY	CR	X				TESTED: 3/17/16
04020180	MR L LEVEL RESTAURANT HP-2 SHUTDOWN RELAY	CR	X				TESTED: 3/17/16
04020181	MR L LEVEL RESTAURANT HP-1 SHUTDOWN RELAY	CR	X				TESTED: 3/17/16
04020182	MR L LEVEL RESTAURANT HP-4 SHUTDOWN RELAY	CR	X				TESTED: 3/17/16
04020184	MR L LEVEL RESTAURANT MUSIC SHUTDOWN RELA	CR	X				TESTED: 3/9/16
04020185	MR L LEVEL RESTAURANT KITCHEN HOOD ANSUL	CT	X			X	TESTED: 3/3/16 (SHORTED MODULE ONLY)
04020189	MR L LEVEL RESTAURANT HP-5 SHUTDOWN RELAY	CR	X				TESTED: 3/17/16
04020242	MR L LEVEL RESTAURANT SMOG HOG ANSUL	CT	X			X	TESTED: 3/3/16 (SHORTED MODULE ONLY)
04020243	MR L LEVEL FAN EFM1-5 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
04020244	MR L LEVEL FAN EFM1-6 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
04020245	MR L LEVEL FAN EFM1-1 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
04020246	MR L LVL STAIR 5 VON DUPRIN LOCK RELEASE	CR	X				TESTED: 3/9/16
04020247	MR CL LEVEL FSD CL-66 CONTROL RELAY	CR	X				TESTED: 2/25/16
04020248	MR 12FL FUEL FILL LEAK DETECTION	CT	X			X	TESTED: 3/3/16
04020249	MR L LVL FUEL PUMP RM LEAK DETECTION	CT	X			X	TESTED: 3/3/16
04020250	MR 3FL SUPPLY FSD RISER CONTROL RELAY	CR	X				TESTED: 2/25/16
05020001	MR 7FL ELECTRIC ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020002	MR 7FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020003	MR 7FL CORRIDOR @ 704 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020004	MR 7FL CORRIDOR @ 703 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020005	MR 7FL ELEV C6 & S3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/9/16, RECALLED
05020006	MR 7FL TELECOM ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020007	MR 7FL CORRIDOR @ 702 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020008	MR 8FL ELECTRIC ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020009	MR 8FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020010	MR 8FL CORRIDOR @ 804 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020011	MR 8FL CORRIDOR @ 803 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020012	MR 8FL ELEV C6 & S3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/9/16, RECALLED
05020013	MR 8FL TELECOM ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16

05020014	MR 8FL CORRIDOR @ 802 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020015	MR 9FL ELECTRIC ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020016	MR 9FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020017	MR 9FL CORRIDOR @ 904 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020018	MR 9FL CORRIDOR @ 903 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020019	MR 9FL ELEV C6 & S3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/9/16, RECALLED
05020020	MR 9FL TELECOM ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020021	MR 9FL CORRIDOR @ 902 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020022	MR 10FL ELECTRIC ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020023	MR 10FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020024	MR 10FL CORR. @ 1004 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020025	MR 10FL CORR. @ 1003 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020026	MR 10FL ELEV C6 & S3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/9/16, RECALLED
05020027	MR 10FL TELECOM ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020028	MR 10FL CORR. @ 1002 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020029	MR PH ELECTRIC ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020030	MR PH TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020031	MR PH CORRIDOR @ PH4 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020032	MR PH CORRIDOR @ PH3 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020033	MR PH ELEV C6 & S3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/9/16, RECALLED
05020034	MR PH TELECOM ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020035	MR PH CORRIDOR @ PH2 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020036	MR 12FL FAN ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020037	MR 12FL EMERGENCY ELECTRIC RM SMOKE	SD	X		X	X	TESTED: 2/24/16
05020038	MR 12FL ELECTRIC ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020039	MR 12FL MECHANICAL RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020040	MR 12FL MECHANICAL RM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020041	MR 12FL BOILER ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020042	MR 12FL BOILER ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020043	MR 12FL BOILER ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020044	MR 12FL BOILER ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020045	MR 12FL BOILER ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020046	MR 12FL FAN ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020047	MR 12FL BOILER ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
05020048	MR 12FL FAN SF M12-3 FAN DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
05020049	MR 12FL FAN SF M12-4 FAN DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
05020050	MR 12FL FAN SF M12-2 FAN DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
05020051	MR 13FL ELEV MACH RM SMOKE DETECTOR	SD	X		X	X	TESTED: 3/9/16, RECALLED
05020053	MR 13FL ELEV MACH RM HEAT DETECTOR	HD	X		X	X	TESTED: 3/9/16, SHUNTED
05020055	MR 13FL ELEV MACH RM HEAT DETECTOR	HD	X		X	X	TESTED: 3/9/16, SHUNTED
05020057	MR 13FL ELEV MACH RM HEAT DETECTOR	HD	X		X	X	TESTED: 3/9/16, SHUNTED
05020124	MR 12FL FAN AC M12-1 DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
05020125	MR 13FL ELEV MACH RM HEAT DETECTOR	HD	X		X	X	TESTED: 3/9/16, SHUNTED
05020126	MR 7FL SUP FSD M7-1 CLOSED STATUS	CT	X				TESTED: 2/25/16
05020127	MR 7FL EXH FSD M7-2 CONTROL MODULE	CR	X				TESTED: 2/25/16
05020128	MR 8FL SUP FSD M8-1 CLOSED STATUS	CT	X				TESTED: 2/25/16
05020129	MR 8FL EXH FSD M8-2 CONTROL MODULE	CR	X				TESTED: 2/25/16
05020130	MR 9FL SUP FSD M9-1 CLOSED STATUS	CT	X				TESTED: 2/25/16
05020131	MR 9FL EXH FSD M9-2 CONTROL MODULE	CR	X				TESTED: 2/25/16
05020132	MR 10FL SUP FSD M10-1 CLOSED STATUS	CT	X				TESTED: 2/25/16
05020133	MR 10FL EXH FSD M10-2 CONTROL MODULE	CR	X				TESTED: 2/25/16
05020134	MR PH SUP FSD MPH-1 CLOSED STATUS	CT	X				TESTED: 2/25/16
05020143	MR PH EXH FSD MPH-2 CONTROL MODULE	CR	X				TESTED: 2/25/16
05020144	MR 12FL EXHAUST FANS LOW SPEED RELAY	CR	X				TESTED: 2/25/16
05020151	MR 12FL FAN SF M12-3 POWER DISCONNECT	CT	X				TESTED: 3/3/16
05020152	MR 12FL FAN AC M12-1 POWER DISCONNECT	CT	X				TESTED: 3/3/16
05020153	MR 12FL GENERATOR LOW FUEL LEVEL	CT	X			X	TESTED: 3/3/16
05020154	MR 12FL FAN EF M12-19 POWER DISCONNECT	CT	X				TESTED: 3/3/16
05020155	MR 12FL FAN SF M12-2 POWER DISCONNECT	CT	X				TESTED: 3/3/16
05020156	MR 12FL GENERATOR IS RUNNING	CT	X			X	TESTED: 3/3/16
05020157	MR 12FL GENERATOR IS IN TROUBLE	CT	X			X	TESTED: 3/3/16
05020158	MR 12FL FAN SF M12-3 'ON' MODULE	CT	X				TESTED: 2/25/16
05020159	MR 12FL FAN SF M12-3 'OFF' MODULE	CT	X				TESTED: 2/25/16
05020160	MR 12FL FAN AC M12-1 'ON' MODULE	CT	X				TESTED: 2/25/16
05020161	MR 12FL FAN AC M12-1 'OFF' MODULE	CT	X				TESTED: 2/25/16
05020162	MR 12FL FAN EF M12-19 'ON' MODULE	CT	X				TESTED: 2/25/16

05020163	MR 12FL FAN EF M12-19 'OFF' MODULE	CT	X				TESTED: 2/25/16
05020164	MR 12FL FAN SF M12-2 'ON' MODULE	CT	X				TESTED: 2/25/16
05020165	MR 12FL FAN SF M12-2 'OFF' MODULE	CT	X				TESTED: 2/25/16
05020167	MR 13FL ELEV MACH RM PRIMARY RECALL	CR	X				TESTED: 3/9/16
05020168	MR 13FL ELEV MACH RM ALTERNATE RECALL	CR	X				TESTED: 3/9/16
05020169	MR 13FL ELEV MACH RM FIRE HAT OUTPUT	CR	X				TESTED: 3/9/16
05020171	MR 13FL ELEV C6 & S3 SHUNT POWER TROUBLE	CT	X				TESTED: 3/9/16
05020172	ELEV C6 FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
05020173	ELEV S3 FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
05020174	ELEV CAB C6 SPEAKER TROUBLE A92	CC	X				TESTED: 3/8/16
05020175	ELEV CAB S3 SPEAKER TROUBLE A93	CC	X				TESTED: 3/8/16
05020176	GENERATOR ROOM FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
05020178	MR 12FL FAN SF M12-1 'ON' MODULE	CT	X				TESTED: 2/25/16
05020179	MR 12FL FAN SF M12-1 'OFF' MODULE	CT	X				TESTED: 2/25/16
05020180	MR 12FL FAN SF M12-1 POWER DISCONNECT	CT	X				TESTED: 3/3/16
05020246	MR 12FL GENERATOR RUPTURE BASIN	CT	X			X	TESTED: 3/3/16
05020247	MR 12FL STAIR5 RELIEF FSD CONTROL RELAY	CR	X				TESTED: 2/25/16
05020248	MR 12FL STAIR5 RELIEF FSD OPEN STATUS	CT	X				TESTED: 2/25/16
05020249	MR 12FL STAIR6 RELIEF FSD OPEN STATUS	CT	X				TESTED: 2/25/16
05020250	MR 12FL STAIR6 RELIEF FSD CONTROL RELAY	CR	X				TESTED: 2/25/16
06020001	5FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
06020002	5FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
06020003	5FL CORRIDOR AT #5J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
06020004	5FL CORRIDOR AT #5H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
06020005	5FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
06020006	5FL CORRIDOR AT #5E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
06020007	5FL CORRIDOR AT ELEV. SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
06020008	5FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
06020009	5FL CORRIDOR AT #5D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
06020010	5FL CORRIDOR AT #5C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/24/16
06020011	6FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020012	6FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020013	6FL CORRIDOR AT #6J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020014	6FL CORRIDOR AT #6H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020015	6FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
06020016	6FL CORRIDOR AT #6E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020017	6FL CORRIDOR AT ELEV. SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020018	6FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
06020019	6FL CORRIDOR AT #6D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020020	6FL CORRIDOR AT #6C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020021	7FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020022	7FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020023	7FL CORRIDOR AT #7J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020024	7FL CORRIDOR AT #7H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020025	7FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
06020026	7FL CORRIDOR AT #7E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020027	7FL CORRIDOR AT ELEV. SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020028	7FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
06020029	7FL CORRIDOR AT #7D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020030	7FL CORRIDOR AT #7C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020031	8FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020032	8FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020033	8FL CORRIDOR AT #8J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020034	8FL CORRIDOR AT #8H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020035	8FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
06020036	8FL CORRIDOR AT #8E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020037	8FL CORRIDOR AT ELEV. SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020038	8FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
06020039	8FL CORRIDOR AT #8D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020040	8FL CORRIDOR AT #8C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020041	9FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020042	9FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020043	9FL CORRIDOR AT #9J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020044	9FL CORRIDOR AT #9J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020045	9FL CORRIDOR AT #9H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020046	9FL CORRIDOR AT #9H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16

06020047	9FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
06020048	9FL CORRIDOR AT #9E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020049	9FL CORRIDOR AT ELEV. SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020050	9FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
06020051	9FL CORRIDOR AT #9D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020052	9FL CORRIDOR AT #9D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020053	10FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020054	10FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020055	10FL CORRIDOR AT #10J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020056	10FL CORRIDOR AT #10J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020057	10FL CORRIDOR AT #10H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020058	10FL CORRIDOR AT #10H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020059	10FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
06020060	10FL CORRIDOR AT #10E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020061	10FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020062	10FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
06020063	10FL CORRIDOR AT #10D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020064	10FL CORRIDOR AT #10D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020065	11FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020066	11FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020067	11FL CORRIDOR AT #11J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020068	11FL CORRIDOR AT #11J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020069	11FL CORRIDOR AT #11H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020070	11FL CORRIDOR AT #11H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020071	11FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
06020072	11FL CORRIDOR AT #11E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020073	11FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020074	11FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
06020075	11FL CORRIDOR AT #11D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020076	11FL CORRIDOR AT #11D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020077	12FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020078	12FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020079	12FL CORRIDOR AT #12J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020080	12FL CORRIDOR AT #12H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020081	12FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
06020082	12FL CORRIDOR AT #12E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020083	12FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020084	12FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
06020085	12FL CORRIDOR AT #12D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020086	12FL CORRIDOR AT #12C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020087	14FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020088	14FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020089	14FL CORRIDOR AT #14J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020090	14FL CORRIDOR AT #14H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020091	14FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
06020092	14FL CORRIDOR AT #14E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020093	14FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020094	14FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
06020095	14FL CORRIDOR AT #14D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020096	14FL CORRIDOR AT #14C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020097	15FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020098	15FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020099	15FL CORRIDOR AT #15J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020100	15FL CORRIDOR AT #15H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020101	15FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
06020102	15FL CORRIDOR AT #15E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020103	15FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020104	15FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
06020105	15FL CORRIDOR AT #15D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020106	15FL CORRIDOR AT #15C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
06020126	5FL SUPPLY FSD 5-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020127	5FL SUPPLY FSD 5-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020128	5FL EXHAUST FSD 5-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
06020129	6FL SUPPLY FSD 6-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020130	6FL SUPPLY FSD 6-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020131	6FL EXHAUST FSD 6-3 CONTROL MODULE	CR	X				TESTED: 2/24/16

06020132	7FL SUPPLY FSD 7-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020133	7FL SUPPLY FSD 7-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020134	7FL EXHAUST FSD 7-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
06020135	8FL SUPPLY FSD 8-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020136	8FL SUPPLY FSD 8-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020137	8FL EXHAUST FSD 8-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
06020138	9FL SUPPLY FSD 9-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020139	9FL SUPPLY FSD 9-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020140	9FL EXHAUST FSD 9-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
06020141	10FL SUPPLY FSD 10-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020142	10FL SUPPLY FSD 10-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020143	10FL EXHAUST FSD 10-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
06020144	11FL SUPPLY FSD 11-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020145	11FL SUPPLY FSD 11-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020146	11FL EXHAUST FSD 11-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
06020147	12FL SUPPLY FSD 12-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020148	12FL SUPPLY FSD 12-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020149	12FL EXHAUST FSD 12-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
06020150	14FL SUPPLY FSD 14-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020151	14FL SUPPLY FSD 14-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020152	14FL EXHAUST FSD 14-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
06020153	15FL SUPPLY FSD 15-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020154	15FL SUPPLY FSD 15-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
06020155	15FL EXHAUST FSD 15-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
07020001	16FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020002	16FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020003	16FL CORRIDOR AT #16J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020004	16FL CORRIDOR AT #16H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020005	16FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
07020006	16FL CORRIDOR AT #16E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020007	16FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020008	16FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
07020009	16FL CORRIDOR AT #16D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020010	16FL CORRIDOR AT #16C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020011	17FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020012	17FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020013	17FL CORRIDOR AT #17J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020014	17FL CORRIDOR AT #17H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020015	17FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
07020016	17FL CORRIDOR AT #17E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020017	17FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020018	17FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
07020019	17FL CORRIDOR AT #17D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020020	17FL CORRIDOR AT #17C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020021	18FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020022	18FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020023	18FL CORRIDOR AT #18J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020024	18FL CORRIDOR AT #18H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020025	18FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
07020026	18FL CORRIDOR AT #18E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020027	18FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020028	18FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
07020029	18FL CORRIDOR AT #18D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020030	18FL CORRIDOR AT #18C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020031	19FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020032	19FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020033	19FL CORRIDOR AT #19J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020034	19FL CORRIDOR AT #19A SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020035	19FL CORRIDOR AT #19H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020036	19FL CORRIDOR AT #19G SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020037	19FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
07020038	19FL CORRIDOR AT #19E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020039	19FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020040	19FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
07020041	19FL CORRIDOR AT #19D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020042	19FL CORRIDOR AT #19C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16

07020043	20FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020044	20FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020045	20FL CORRIDOR AT #20J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020046	20FL CORRIDOR AT #20A SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020047	20FL CORRIDOR AT #20H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020048	20FL CORRIDOR AT #20G SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020049	20FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
07020050	20FL CORRIDOR AT #20E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020051	20FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020052	20FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
07020053	20FL CORRIDOR AT #20D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020054	20FL CORRIDOR AT #20C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020055	21FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020056	21FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020057	21FL CORRIDOR AT #21J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020058	21FL CORRIDOR AT #21A SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020059	21FL CORRIDOR AT #21H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020060	21FL CORRIDOR AT #21G SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020061	21FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
07020062	21FL CORRIDOR AT #21E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020063	21FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020064	21FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
07020065	21FL CORRIDOR AT #21D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020066	21FL CORRIDOR AT #21C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020067	22FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020068	22FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020069	22FL CORRIDOR AT #22J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020070	22FL CORRIDOR AT #22H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020071	22FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
07020072	22FL CORRIDOR AT #22E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020073	22FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020074	22FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
07020075	22FL CORRIDOR AT #22D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020076	22FL CORRIDOR AT #22C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020077	23FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020078	23FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020079	23FL CORRIDOR AT #23J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020080	23FL CORRIDOR AT #23H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020081	23FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
07020082	23FL CORRIDOR AT #23E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020083	23FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020084	23FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
07020085	23FL CORRIDOR AT #23D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020086	23FL CORRIDOR AT #23C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020087	24FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020088	24FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020089	24FL CORRIDOR AT #24J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020090	24FL CORRIDOR AT #24H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020091	24FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
07020092	24FL CORRIDOR AT #24E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020093	24FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020094	24FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
07020095	24FL CORRIDOR AT #24D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020096	24FL CORRIDOR AT #24C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020097	25FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020098	25FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020099	25FL CORRIDOR AT #25J SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020100	25FL CORRIDOR AT #25H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020101	25FL ELEVATOR S1 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
07020102	25FL CORRIDOR AT #25H SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020103	25FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020104	25FL ELEVATOR C4 & C5 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
07020105	25FL CORRIDOR AT #25D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020106	25FL CORRIDOR AT #25C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
07020126	16FL SUPPLY FSD 16-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020127	16FL SUPPLY FSD 16-2 CLOSED STATUS	CT	X				TESTED: 2/24/16

07020128	16FL EXHAUST FSD 16-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
07020129	17FL SUPPLY FSD 17-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020130	17FL SUPPLY FSD 17-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020131	17FL EXHAUST FSD 17-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
07020132	18FL SUPPLY FSD 18-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020133	18FL SUPPLY FSD 18-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020134	18FL EXHAUST FSD 18-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
07020135	19FL SUPPLY FSD 19-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020136	19FL SUPPLY FSD 19-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020137	19FL EXHAUST FSD 19-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
07020138	20FL SUPPLY FSD 20-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020139	20FL SUPPLY FSD 20-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020140	20FL EXHAUST FSD 20-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
07020141	21FL SUPPLY FSD 21-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020142	21FL SUPPLY FSD 21-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020143	21FL EXHAUST FSD 21-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
07020144	22FL SUPPLY FSD 22-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020145	22FL SUPPLY FSD 22-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020146	22FL EXHAUST FSD 22-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
07020147	23FL SUPPLY FSD 23-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020148	23FL SUPPLY FSD 23-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020149	23FL EXHAUST FSD 23-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
07020150	24FL SUPPLY FSD 24-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020151	24FL SUPPLY FSD 24-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020152	24FL EXHAUST FSD 24-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
07020153	25FL SUPPLY FSD 25-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020154	25FL SUPPLY FSD 25-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
07020155	25FL EXHAUST FSD 25-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
08020001	26FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020002	26FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020003	26FL CORRIDOR AT #26F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020004	26FL CORRIDOR AT #26E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020005	26FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
08020006	26FL CORRIDOR AT #26D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020007	26FL MECHANICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020008	26FL PUMP ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020009	26FL MECHANICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020010	26FL MECHANICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020011	26FL MECHANICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020012	27FL ELEVATOR C4 & C5 MACH ROOM HEAT DET.	HD	X		X	X	TESTED: 3/14/16, SHUNTED
08020013	26FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020014	26FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
08020015	26FL CORRIDOR AT #26B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020016	27FL ELEVATOR C4 & C5 MACH ROOM SMOKE DET.	SD	X		X	X	TESTED: 3/14/16, RECALLED
08020017	27FL ELEVATOR C4 & C5 MACH ROOM SMOKE DET.	SD	X		X	X	TESTED: 3/14/16, RECALLED
08020018	27FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020019	27FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020020	27FL CORRIDOR AT #27F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020021	27FL CORRIDOR AT #27E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020022	27FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
08020023	27FL CORRIDOR AT #27D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020024	27FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020025	27FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
08020026	27FL CORRIDOR AT #27B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020027	27FL ELEVATOR C4 & C5 MACH ROOM HEAT DET.	HD	X		X	X	TESTED: 3/14/16, SHUNTED
08020028	27FL ELEVATOR C4 & C5 MACH ROOM HEAT DET.	HD	X		X	X	TESTED: 3/14/16, SHUNTED
08020030	28FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020031	28FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020032	28FL CORRIDOR AT #28F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020033	28FL CORRIDOR AT #28E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020034	28FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
08020035	28FL CORRIDOR AT #28C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020036	28FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020037	28FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/15/16, RECALLED
08020038	28FL CORRIDOR AT #28B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020039	29FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16

08020040	29FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020041	29FL CORRIDOR AT #29F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020042	29FL CORRIDOR AT #29E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020043	29FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
08020044	29FL CORRIDOR AT #29C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020045	29FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020046	29FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
08020047	29FL CORRIDOR AT #29B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020048	30FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020049	30FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020050	30FL CORRIDOR AT #30F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020051	30FL CORRIDOR AT #30E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020052	30FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
08020053	30FL CORRIDOR AT #30C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020054	30FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020055	30FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
08020056	30FL CORRIDOR AT #30B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020057	31FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020058	31FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020059	31FL CORRIDOR AT #31F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020060	31FL CORRIDOR AT #31E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020061	31FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
08020062	31FL CORRIDOR AT #31C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020063	31FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020064	31FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
08020065	31FL CORRIDOR AT #31B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020066	32FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020067	32FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020068	32FL CORRIDOR AT #32F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020069	32FL CORRIDOR AT #32E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020070	32FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
08020071	32FL CORRIDOR AT #32C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020072	32FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020073	32FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
08020074	32FL CORRIDOR AT #32B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020075	33FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020076	33FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020077	33FL CORRIDOR AT #33F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020078	33FL CORRIDOR AT #33E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020079	33FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
08020080	33FL CORRIDOR AT #33C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020081	33FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020082	33FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/15/16, RECALLED
08020083	33FL CORRIDOR AT #33B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020084	34FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020085	34FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020086	34FL CORRIDOR AT #34F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020087	34FL CORRIDOR AT #34E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020088	34FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
08020089	34FL CORRIDOR AT #34C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020090	34FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020091	34FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
08020092	34FL CORRIDOR AT #34B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
08020126	26FL ELECTRICAL ROOM DOOR HOLDER RELAY	CR	X				TESTED: 3/8/16
08020127	26FL FIRE PUMP ROOM ACU 26-2 SHUTDOWN	CR	X				TESTED: 3/14/16
08020128	26FL ELEV MACH ROOM ACU T26-1 SHUTDOWN	CR	X				TESTED: 3/14/16
08020129	26FL SUPPLY FSD T26-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020130	26FL SUPPLY FSD T26-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020131	26FL FAN SF T26-1 POWER DISCONNECT	CT	X				TESTED: 3/3/16
08020132	26FL FSD T26-5 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020133	26FL EXHAUST FSD 26-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
08020134	26FL FAN SF T26-1 'ON' MODULE	CT	X				TESTED: 2/24/16
08020135	26FL FAN SF T26-1 'OFF' MODULE	CT	X				TESTED: 2/24/16
08020136	26FL FSD T26-4, T26-5 CONTROL MODULE	CR	X				TESTED: 2/24/16
08020137	26FL FIRE PUMP T26-1 IS RUNNING	CT	X			X	TESTED: 3/3/16
08020138	26FL FIRE PUMP T26-1 IS IN TROUBLE	CT	X			X	TESTED: 2/29/16

08020139	26FL FIRE PUMP T26-1 PHASE REVERSAL	CT	X			X	TESTED: 3/3/16
08020140	26FL FIRE PUMP T26-2 IS RUNNING	CT	X			X	TESTED: 3/3/16
08020141	26FL FIRE PUMP T26-2 IS IN TROUBLE	CT	X			X	TESTED: 2/29/16
08020142	26FL FIRE PUMP T26-2 PHASE REVERSAL	CT	X			X	TESTED: 3/3/16
08020143	26FL FIRE PUMP ROOM MAIN WATERFLOW	CT	#				(STRAPPED OUT)
08020144	26FL FIRE PUMP ROOM VALVE TAMPERS	VT	X		X	X	TESTED: 3/1/16 TURNS: ≤ 2.5 (MULTIPLE VALVES W/ SAME ADDRESS)
08020145	27FL ELEVATOR C4 & C5 PRIMARY RECALL	CR	X				TESTED: 3/14/16
08020146	27FL ELEVATOR C4 & C5 ALTERNATE RECALL	CR	X				TESTED: 3/14/16
08020147	27FL ELEVATOR C4 & C5 FIRE HAT OUTPUT	CR	X				TESTED: 3/14/16
08020148	27FL SUPPLY FSD T27-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020149	27FL SUPPLY FSD T27-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020150	27FL EXHAUST FSD 27-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
08020152	27FL ELEV C4& MACH RM FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
08020153	27FL ELEV C5 FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
08020154	26FL FIRE PUMP RM FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
08020155	ELEV CAB C4 SPEAKER TROUBLE A85	CC	X				TESTED: 3/8/16
08020156	ELEV CAB C5 SPEAKER TROUBLE A86	CC	X				TESTED: 3/8/16
08020157	28FL SUPPLY FSD T28-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020158	28FL SUPPLY FSD T28-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020159	28FL EXHAUST FSD 28-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
08020160	29FL SUPPLY FSD 29-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020161	29FL SUPPLY FSD 29-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020162	29FL EXHAUST FSD 29-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
08020163	30FL SUPPLY FSD 30-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020164	30FL SUPPLY FSD 30-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020165	30FL EXHAUST FSD 30-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
08020166	31FL SUPPLY FSD 31-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020167	31FL SUPPLY FSD 31-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020168	31FL EXHAUST FSD 31-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
08020169	32FL SUPPLY FSD 32-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020170	32FL SUPPLY FSD 32-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020171	32FL EXHAUST FSD 32-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
08020172	33FL SUPPLY FSD 33-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020173	33FL SUPPLY FSD 33-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020174	33FL EXHAUST FSD 33-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
08020175	34FL SUPPLY FSD 34-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020176	34FL SUPPLY FSD 34-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
08020177	34FL EXHAUST FSD 34-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
08020179	26FL SUPPLY FSD RISER STAIR 2 RELAY	CR	X				TESTED: 2/24/16
08020180	26FL SUPPLY FSD RISER STAIR 1 RELAY	CR	X				TESTED: 2/24/16
08020182	26FL EXHAUST FANS LOW SPEED RELAY	CR	X				TESTED: 2/24/16
09020001	35FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020002	35FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020003	35FL CORRIDOR AT #35F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020004	35FL CORRIDOR AT #35E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020005	35FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
09020006	35FL CORRIDOR AT #35C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020007	35FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020008	35FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
09020009	35FL CORRIDOR AT #35C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020010	36FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020011	36FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020012	36FL CORRIDOR AT #36F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020013	36FL CORRIDOR AT #36E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020014	36FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
09020015	36FL CORRIDOR AT #36C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020016	36FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020017	36FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
09020018	36FL CORRIDOR AT #36B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020019	37FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020020	37FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020021	37FL CORRIDOR AT #37F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020022	37FL CORRIDOR AT #37E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020023	37FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED

09020024	37FL CORRIDOR AT #37C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020025	37FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020026	37FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
09020027	37FL CORRIDOR AT #37B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020028	38FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020029	38FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020030	38FL CORRIDOR AT #38F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020031	38FL CORRIDOR AT #38E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020032	38FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
09020033	38FL CORRIDOR AT #38C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020034	38FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020035	38FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/15/16, RECALLED
09020036	38FL CORRIDOR AT #38B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020037	39FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020038	39FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020039	39FL CORRIDOR AT #39F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020040	39FL CORRIDOR AT #39E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020041	39FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
09020042	39FL CORRIDOR AT #39C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020043	39FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020044	39FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
09020045	39FL CORRIDOR AT #39B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020046	40FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020047	40FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020048	40FL CORRIDOR AT #40F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020049	40FL CORRIDOR AT #40E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020050	40FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
09020051	40FL CORRIDOR AT #40C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020052	40FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020053	40FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
09020054	40FL CORRIDOR AT #40B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020055	41FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020056	41FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020057	41FL CORRIDOR AT #41F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020058	41FL CORRIDOR AT #41E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020059	41FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
09020060	41FL CORRIDOR AT #41C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020061	41FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020062	41FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
09020063	41FL CORRIDOR AT #41B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020064	42FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020065	42FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020066	42FL CORRIDOR AT #42F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020067	42FL CORRIDOR AT #42E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020068	42FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
09020069	42FL CORRIDOR AT #42C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020070	42FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020071	42FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
09020072	42FL CORRIDOR AT #42B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020073	43FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020074	43FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020075	43FL CORRIDOR AT #43F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020076	43FL CORRIDOR AT #42E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020077	43FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
09020078	43FL CORRIDOR AT #43C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020079	43FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020080	43FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/15/16, RECALLED
09020081	43FL CORRIDOR AT #43B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020082	45FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020083	45FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020084	45FL CORRIDOR AT #45F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020085	45FL CORRIDOR AT #45E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020086	45FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
09020087	45FL CORRIDOR AT #45C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020088	45FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020089	45FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED

09020090	45FL CORRIDOR AT #45B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
09020126	35FL SUPPLY FSD 33-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020127	35FL SUPPLY FSD 35-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020128	35FL EXHAUST FSD 35-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
09020129	36FL SUPPLY FSD 36-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020130	36FL SUPPLY FSD 36-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020131	36FL EXHAUST FSD 36-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
09020132	37FL SUPPLY FSD 37-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020133	37FL SUPPLY FSD 37-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020134	37FL EXHAUST FSD 37-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
09020135	38FL SUPPLY FSD 38-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020136	38FL SUPPLY FSD 38-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020137	38FL EXHAUST FSD 38-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
09020138	39FL SUPPLY FSD 39-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020139	39FL SUPPLY FSD 39-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020140	39FL EXHAUST FSD 39-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
09020141	40FL SUPPLY FSD 40-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020142	40FL SUPPLY FSD 40-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020143	40FL EXHAUST FSD 40-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
09020144	41FL SUPPLY FSD 41-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020145	41FL SUPPLY FSD 41-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020146	41FL EXHAUST FSD 41-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
09020147	42FL SUPPLY FSD 42-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020148	42FL SUPPLY FSD 42-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020149	42FL EXHAUST FSD 42-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
09020150	43FL SUPPLY FSD 43-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020151	43FL SUPPLY FSD 43-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020152	43FL EXHAUST FSD 43-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
09020153	45FL SUPPLY FSD 45-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020154	45FL SUPPLY FSD 45-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
09020155	45FL EXHAUST FSD 45-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
10020001	46FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020002	46FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020003	46FL CORRIDOR AT #46F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020004	46FL CORRIDOR AT #46E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020005	46FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020006	46FL CORRIDOR AT #46C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020007	46FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020008	46FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020009	46FL CORRIDOR AT #46B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020010	47FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020011	47FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020012	47FL CORRIDOR AT #47F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020013	47FL CORRIDOR AT #47E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020014	47FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020015	47FL CORRIDOR AT #47C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020016	47FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020017	47FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020018	47FL CORRIDOR AT #47B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020019	48FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020020	48FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020021	48FL CORRIDOR AT #48F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020022	48FL CORRIDOR AT #48E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020023	48FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
10020024	48FL CORRIDOR AT #48C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020025	48FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020026	48FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020027	48FL CORRIDOR AT #48B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020028	49FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020029	49FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020030	49FL CORRIDOR AT #49F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020031	49FL CORRIDOR AT #49E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020032	49FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020033	49FL CORRIDOR AT #49C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020034	49FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020035	49FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/15/16, RECALLED

10020036	49FL CORRIDOR AT #49B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020037	50FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020038	50FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020039	50FL CORRIDOR AT #50F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020040	50FL CORRIDOR AT #50E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020041	50FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020042	50FL CORRIDOR AT #50C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020043	50FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020044	50FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020045	50FL CORRIDOR AT #50B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
10020046	51FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020047	51FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020048	51FL CORRIDOR AT #51F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020049	51FL CORRIDOR AT #51E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020050	51FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
10020051	51FL CORRIDOR AT #51C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020052	51FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020053	51FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020054	51FL CORRIDOR AT #51B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020055	52FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020056	52FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020057	52FL CORRIDOR AT #52F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020058	52FL CORRIDOR AT #52E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020059	52FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020060	52FL CORRIDOR AT #52C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020061	52FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020062	52FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020063	52FL CORRIDOR AT #52B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020064	53FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020065	53FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020066	53FL CORRIDOR AT #53F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020067	53FL CORRIDOR AT #53E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020068	53FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020069	53FL CORRIDOR AT #53C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020070	53FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020071	53FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020072	53FL CORRIDOR AT #53B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020073	54FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020074	54FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020075	54FL CORRIDOR AT #54F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020076	54FL CORRIDOR AT #54E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020077	54FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020078	54FL CORRIDOR AT #54C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020079	54FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020080	54FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/15/16, RECALLED
10020081	54FL CORRIDOR AT #54B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020082	55FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020083	55FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020084	55FL CORRIDOR AT #55F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020085	55FL CORRIDOR AT #55E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020086	55FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020087	55FL CORRIDOR AT #55C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020088	55FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020089	55FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020090	55FL CORRIDOR AT #55B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020091	56FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020092	56FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020093	56FL CORRIDOR AT #56F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020094	56FL CORRIDOR AT #56E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020095	56FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020096	56FL CORRIDOR AT #56C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020097	56FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020098	56FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
10020099	56FL CORRIDOR AT #56B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
10020126	46FL SUPPLY FSD 46-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020127	46FL SUPPLY FSD 46-2 CLOSED STATUS	CT	X				TESTED: 2/24/16

10020128	46FL EXHAUST FSD 46-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
10020129	47FL SUPPLY FSD 47-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020130	47FL SUPPLY FSD 47-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020131	47FL EXHAUST FSD 47-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
10020132	48FL SUPPLY FSD 48-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020133	48FL SUPPLY FSD 48-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020134	48FL EXHAUST FSD 48-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
10020135	49FL SUPPLY FSD 49-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020136	49FL SUPPLY FSD 49-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020137	49FL EXHAUST FSD 49-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
10020138	50FL SUPPLY FSD 50-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020139	50FL SUPPLY FSD 50-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020140	50FL EXHAUST FSD 50-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
10020141	51FL SUPPLY FSD 51-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020142	51FL SUPPLY FSD 51-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020143	51FL EXHAUST FSD 51-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
10020144	52FL SUPPLY FSD 52-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020145	52FL SUPPLY FSD 52-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020146	52FL EXHAUST FSD 52-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
10020147	53FL SUPPLY FSD 53-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020148	53FL SUPPLY FSD 53-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020149	53FL EXHAUST FSD 53-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
10020150	54FL SUPPLY FSD 54-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020151	54FL SUPPLY FSD 54-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020152	54FL EXHAUST FSD 54-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
10020153	55FL SUPPLY FSD 55-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020154	55FL SUPPLY FSD 55-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020155	55FL EXHAUST FSD 55-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
10020156	56FL SUPPLY FSD 56-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020157	56FL SUPPLY FSD 56-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
10020158	56FL EXHAUST FSD 56-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
10020159	48FL FSD T48-4 CONTROL MODULE	CR	X				TESTED: 2/24/16
10020249	48FL SUPPLY FSD RISER T41-2 THRU T59-2 RLY	CR	X				TESTED: 2/24/16
10020250	48FL SUPPLY FSD RISER T41-1 THRU T59-1 RLY	CR	X				TESTED: 2/24/16
11020001	57FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020002	57FL TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020003	57FL CORRIDOR AT #57F SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020004	57FL CORRIDOR AT #57E SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020005	57FL ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/14/16, RECALLED
11020006	57FL CORRIDOR AT #57C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020007	57FL CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020008	57FL ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
11020009	57FL CORRIDOR AT #57B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020010	PH1 ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020011	PH1 TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020012	PH1 CORRIDOR AT #PH1A SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020013	PH1 CORRIDOR AT #PH1D SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020014	PH1 ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
11020015	PH1 CORRIDOR AT #PH1C SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020016	PH1 CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020017	PH1 ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
11020018	PH1 CORRIDOR AT #PH1B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020019	PH2 ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020020	PH2 TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020021	PH2 CORRIDOR AT #PH2A SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020022	PH2 CORRIDOR AT #PH2B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020023	PH2 ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
11020024	PH2 CORRIDOR AT #PH2B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020025	PH2 CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020026	PH2 ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/15/16, RECALLED
11020027	PH2 CORRIDOR AT #PH2A SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020028	GPH ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020029	GPH TRASH ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020030	GPH CORRIDOR AT #GPHA SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020031	GPH CORRIDOR AT #GPHB SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020032	GPH ELEVATOR S1 & S2 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED

11020033	GPH CORRIDOR AT #GPHB SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020034	GPH CORRIDOR AT ELEV SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020035	GPH ELEVATOR C1-C3 LOBBY SMOKE DETECTOR	SD	X		X	X	TESTED: 3/16/16, RECALLED
11020036	GPH STE A ENTERANCE SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020037	59FL BOILER ROOM #2 SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
11020038	59FL ELECTRICAL ROOM SMOKE DETECTOR	SD	X		X	X	TESTED: 2/23/16
11020039	59FL FAN SF T59-2 DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
11020040	59FL FAN SF T59-1 DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
11020041	60FL ELEVATOR MACH RM SMOKE DETECTOR	SD	X		X	X	TESTED: 3/15/16, RECALLED
11020042	60FL ELEVATOR MACH RM SMOKE DETECTOR	SD	X		X	X	TESTED: 3/15/16, RECALLED
11020043	60FL ELEVATOR MACH RM HEAT DETECTOR	HD	X		X	X	TESTED: 3/15/16, SHUNTED
11020044	60FL ELEVATOR MACH RM HEAT DETECTOR	HD	X		X	X	TESTED: 3/15/16, SHUNTED
11020045	60FL ELEVATOR MACH RM HEAT DETECTOR	HD	X		X	X	TESTED: 3/15/16, SHUNTED
11020046	60FL ELEVATOR MACH RM HEAT DETECTOR	HD	X		X	X	TESTED: 3/15/16, SHUNTED
11020047	60FL ELEVATOR MACH RM HEAT DETECTOR	HD	X		X	X	TESTED: 3/15/16, SHUNTED
11020048	60FL ELEVATOR MACH RM HEAT DETECTOR	HD	X		X	X	TESTED: 3/15/16, SHUNTED
11020049	60FL ELEVATOR MACH RM HEAT DETECTOR	HD	X		X	X	TESTED: 3/15/16, SHUNTED
11020050	60FL ELEVATOR MACH RM HEAT DETECTOR	HD	X		X	X	TESTED: 3/15/16, SHUNTED
11020051	60FL ELEVATOR MACH RM HEAT DETECTOR	HD	X		X	X	TESTED: 3/15/16, SHUNTED
11020052	60FL ELEVATOR MACH RM HEAT DETECTOR	HD	X		X	X	TESTED: 3/15/16, SHUNTED
11020053	60FL ELEVATOR MACH RM HEAT DETECTOR	HD	X		X	X	TESTED: 3/15/16, SHUNTED
11020054	PH2 CORRIDOR AT #PH2B SMOKE DETECTOR	SD	X		X	X	TESTED: 2/22/16
11020055	PH2B DUCT DETECTOR FAN HP-4	DD	X		X	X	TESTED: 3/17/16
11020056	PH2B DUCT DETECTOR FAN HP-5	DD	X		X	X	TESTED: 3/17/16
11020057	PH2B DUCT DETECTOR FAN HP-6	DD	X		X	X	TESTED: 3/17/16
11020125	59FL FAN AC T59-1 DUCT DETECTOR	DD	X		X	X	TESTED: 3/7/16
11020126	57FL SUPPLY FSD 57-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
11020127	57FL SUPPLY FSD 57-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
11020128	57FL EXHAUST FSD 57-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
11020129	PH1 SUPPLY FSD PH1-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
11020130	PH1 SUPPLY FSD PH1-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
11020131	PH1 EXHAUST FSD PH1-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
11020132	PH2 SUPPLY FSD PH1-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
11020133	PH2 SUPPLY FSD PH2-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
11020134	PH2 EXHAUST FSD PH2-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
11020135	GPH SUPPLY FSD GPH-1 CLOSED STATUS	CT	X				TESTED: 2/24/16
11020136	GPH SUPPLY FSD GPH-2 CLOSED STATUS	CT	X				TESTED: 2/24/16
11020137	GPH EXHAUST FSD GPH-3 CONTROL MODULE	CR	X				TESTED: 2/24/16
11020138	GPHB A/V CLOSET FSD AND SF-1 SHUTDOWN RLY	CR	X				TESTED: 2/24/16
11020139	PH2B CONTROL RELAY AUDIO SHUTDOWN	CR	X				TESTED: 3/8/16
11020144	59FL SUPPLY FSD T32 CLOSED STATUS	CT	X				TESTED: 2/24/16
11020145	59FL SUPPLY FSD T31 CLOSED STATUS	CT	X				TESTED: 2/24/16
11020146	59FL FAN SF T59-2 POWER DISCONNECT	CT	X				TESTED: 3/3/16
11020147	59FL FAN EF-T59-26 POWER DISCONNECT	CT	X				TESTED: 3/3/16
11020148	59FL FAN SF T59-1 POWER DISCONNECT	CT	X				TESTED: 3/3/16
11020149	59FL FAN AC T59-1 POWER DISCONNECT	CT	X				TESTED: 3/3/16
11020150	59FL FAN SF T59-2 'ON' MODULE	CT	X				TESTED: 2/24/16
11020151	59FL FAN SF T59-2 'OFF' MODULE	CT	X				TESTED: 2/24/16
11020152	59FL FAN EF T59-26 'ON' MODULE	CT	X				TESTED: 2/24/16
11020153	59FL FAN EF T59-26 'OFF' MODULE	CT	X				TESTED: 2/24/16
11020154	59FL FAN SF T59-1 'ON' MODULE	CT	X				TESTED: 2/24/16
11020155	59FL FAN SF T59-1 'OFF' MODULE	CT	X				TESTED: 2/24/16
11020156	59FL FAN AC T59-1 'ON' MODULE	CT	X				TESTED: 2/24/16
11020157	59FL FAN SF T59-1 'OFF' MODULE	CT	X				TESTED: 2/24/16
11020160	ELEV CAB C1 & MACH RM FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
11020161	ELEV CAB C2 FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
11020162	ELEV CAB C3 FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
11020163	ELEV CAB S1 FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
11020164	ELEV CAB S2 FIREFIGHTER'S PHONE	CC	X				TESTED: 3/4/16
11020165	ELEVATOR CAB C1 SPEAKER TROUBLE	CC	X				TESTED: 3/8/16
11020166	ELEVATOR CAB C2 SPEAKER TROUBLE	CC	X				TESTED: 3/8/16
11020167	ELEVATOR CAB C3 SPEAKER TROUBLE	CC	X				TESTED: 3/8/16
11020168	ELEVATOR CAB S1 SPEAKER TROUBLE	CC	X				TESTED: 3/8/16
11020169	ELEVATOR CAB S2 SPEAKER TROUBLE	CC	X				TESTED: 3/8/16
11020170	60FL ELEV MACH RM S2 PRIMARY RECALL	CR	X				TESTED: 3/15/16
11020171	60FL ELEV MACH RM S2 ALTERNATE RECALL	CR	X				TESTED: 3/15/16

11020172	60FL ELEV MACH RM S1 PRIMARY RECALL	CR	X				TESTED: 3/14/16
11020173	60FL ELEV MACH RM S1 ALTERNATE RECALL	CR	X				TESTED: 3/14/16
11020174	60FL ELEV MACH RM C1-C3 PRIMARY RECALL	CR	X				TESTED: 3/15/16
11020175	60FL ELEV MACH RM C1-C3 ALTERNATE RLY	CR	X				TESTED: 3/15/16
11020176	60FL HEAT PUMP T60-2 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
11020177	60FL HEAT PUMP T60-1 SHUTDOWN RELAY	CR	X				TESTED: 3/15/16
11020178	61FL FAN SF T61-1 'ON' MODULE	CT	X				TESTED: 2/24/16
11020179	61FL FAN SF T61-1 'OFF' MODULE	CT	X				TESTED: 2/24/16
11020180	61FL FAN SF T61-1 POWER DISCONNECT	CT	X				TESTED: 3/3/16
11020181	PH2B CONTROL RELAY FAN HP-1 SHUTDOWN	CR	X				TESTED: 3/17/16
11020182	PH2B CONTROL RELAY FAN HP-2 SHUTDOWN	CR	X				TESTED: 3/17/16
11020183	PH1 UNIT FSD PH1-4 CONTROL MODULE	CR	X				TESTED: 2/24/16
11020184	PH1 UNIT FSD PH1-5 CONTROL MODULE	CR	X				TESTED: 2/24/16
11020185	PH2A SPEAKER CIRCUIT	CC	X				TESTED: 3/8/16
11020186	PH2B SPEAKER CIRCUIT	CC	X				TESTED: 3/8/16
11020187	PH2 LEVEL PH2B DOOR HOLDER RELAY	CR	X				TESTED: 3/8/16
11020188	PH2B STROBE TROUBLE CHECK BOOSTER PANEL	CC	X				TESTED: 3/8/16
11020189	PH2B SUPERVISORY CO2 / SMOKE DETECTOR	CT	X		X	X	TESTED: 3/17/16
11020190	PH2B SUPERVISORY FIREPLACE CO2 SENSORS	CT	X		X	X	TESTED: 3/17/16
11020191	PH2B CONTROL RELAY GAS SHUTOFF SOLINOID	CR	X				TESTED: 3/8/16
11020192	PH2B CONTROL RELAY FAN HP-4 SHUTDOWN	CR	X				TESTED: 3/17/16
11020193	PH2B CONTROL RELAY FAN HP-5 SHUTDOWN	CR	X				TESTED: 3/17/16
11020194	PH2B CONTROL RELAY FAN HP-3 SHUTDOWN	CR	X				TESTED: 3/17/16
11020195	PH2B CONTROL RELAY FAN HP-6 SHUTDOWN	CR	X				TESTED: 3/17/16
11020248	59FL EXH FAN RELAY E-EXH FANS LOW SPEED	CR	X				TESTED: 2/24/16
11020249	59FL EXH FAN RELAY EXH FANS LOW SPEED	CR	X				TESTED: 2/24/16
11020250	59FL FAN T59-26 POWER DISCONNECT	CT	X				TESTED: 3/3/16

EXHIBIT

G

EXHIBIT G

RED HAWK
Fire & Security

AUTOMATIC FIRE ALARM SYSTEM INSPECTION/CERTIFICATION

Job Name: MILLENNIUM TOWER
Date: 9/6/2016
Address: 301 MISSION ST
Work Order #: 3219865
City: SAN FRANCISCO State: CA Zip: 94105
Tech. Name: DARWIN ALVAREZ
Central Station Name: RED HAWK
Central Station Account #: 04-050
Central Station Phone #: 408-629-4414

Preliminaries

Building Personnel Advised:	Name: ANTONIO	Time: 6:30 AM	By:DA
Central Station off-Line:	Operator: BRITNEY	Time: 6:40 AM	By:DA
Pretest Status	☐ Normal	☒ Abnormal (Explain) PANEL DISABLED	
Disconnect Aux & NAC Function Type:	DISABLE BUTTONS	☒ Disconnect after tested	
Location of As-Built Drawings	NA		
Original Certification ☐	Periodic System Inspection ☒		

Inspection Type	Service Performed	Scope of Work Performed	% of Device Tested:
☒ Fire Alarm	☐ Monthly Inspection	☒ Full Inspection	☐ 10%
☒ Sprinkler	☐ Bi-Monthly Inspection	☐ Water Flow Inspection	☐ 25%
☐ Preaction	☐ Quarterly Inspection	☐ Battery Load Testing	☐ 50%
☐ FM200	☒ Semi-Annual Inspection	☐ 10% Trouble Testing	☒ 100%
☐ Exit/ Emergency Lights	☐ Annual Inspection	☐ NAC Testing	☐ 1 Device/Zone
☐ Fire Extinguisher	☐ Service	☐ Service Repair	☒ Other
☐ Other	☐ Fire Drill	☐ Monitoring Install /Programming	VALVE TAMPERS

Basic Information

Local Alarm Yes ☐
Central Station Yes ☒
Municipal Yes ☐
Proprietary Yes ☐
Voice Yes ☐
System Model : EST-3

Qty of Zones or Loops: NA
Wired : ☐A ☒B

Qty of Active NAC Circuits: NA
Wired: ☐A ☒B

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C10 License # 713099

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CONTROL PANEL TEST				COMMENTS:
Visual Display	☒N/A	☐Pass	☐Fail	
AC Power On – LED	☒N/A	☐Pass	☐Fail	
Alarm Silence – LED	☒N/A	☐Pass	☐Fail	
Program Fault – LED	☒N/A	☐Pass	☐Fail	
Alarm – LED	☒N/A	☐Pass	☐Fail	
System Trouble – LED	☒N/A	☐Pass	☐Fail	
Check all Fuse Ratings	☒N/A	☐Pass	☐Fail	
Set Time/Date	☒N/A	☐Pass	☐Fail	
Walk Test Silent	☒N/A	☐Pass	☐Fail	
Print Log	☒N/A	☐Pass	☐Fail	
Print Detector Sensitivity	☒N/A	☐Pass	☐Fail	
Cancel Access	☒N/A	☐Pass	☐Fail	
Alarm/Trouble Acknowledge	☒N/A	☐Pass	☐Fail	
Alarm Silence Resound	☒N/A	☐Pass	☐Fail	
Reset/Lamp Test	☒N/A	☐Pass	☐Fail	
Panel Sounder	☒N/A	☐Pass	☐Fail	
Ground Type	☒N/A	☐Pass	☐Fail	
Positive Ground Fault	☒N/A	☐Pass	☐Fail	
Negative Ground Fault	☒N/A	☐Pass	☐Fail	
Signal Circuit-Short	☒N/A	☐Pass	☐Fail	
Signal Circuit-Open	☒N/A	☐Pass	☐Fail	
Subsequent Alarm/Trouble	☒N/A	☐Pass	☐Fail	
Point Dis/Reconnect	☒N/A	☐Pass	☐Fail	
AC Disconnect Labeled	☒N/A	☐Pass	☐Fail	
AC Breaker Locked On	☒N/A	☐Pass	☐Fail	
Clean Door & Window	☒N/A	☐Pass	☐Fail	
AC Voltage	NA V.			
Battery Voltage (AC On)	NA V.			
Battery Voltage (AC Off)	NA V.			
System Voltage (AUX)	NA V.			
Battery Load Test (end V)	12.4 V.		PASS	
Charging Current	NA A.			
Battery Size (AH)	75 AH.		PASS	
Expiration date	4/2018			PASS
Batteries labeled	YES			PASS

VOICE EVAC. SYSTEM				COMMENTS:
Model Number	☒N/A	☐Pass	☐Fail	
Manufactuer Name	☒N/A	☐Pass	☐Fail	
Number of Amps	☒N/A	☐Pass	☐Fail	
Amp, Model Number	☒N/A	☐Pass	☐Fail	
Number of Speaker Zones	☒N/A	☐Pass	☐Fail	
Number of Phone Zones	☒N/A	☐Pass	☐Fail	
Test all Speakers	☒N/A	☐Pass	☐Fail	
Short Test	☒N/A	☐Pass	☐Fail	
Open Test	☒N/A	☐Pass	☐Fail	
Ground Test	☒N/A	☐Pass	☐Fail	
Test all Handsets	☒N/A	☐Pass	☐Fail	
Test all Phone Jacks	☒N/A	☐Pass	☐Fail	
Battery Load Test (end V)	V.			
Battery Size	AH.			
Expiration Date				
Batteries labeled				

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RED HAWK
Fire & Security

NAC BOOSTERS/POWER SUPPLY — **COMMENTS:**

Location 1	FACP RM			
Number booster tested	PS5			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐P	☐Fail	
Ground Trouble	☒N/A	☐P	☐Fail	
A/C Voltage	☒N/A	☐P	☐Fail	
Battery Voltage	☒N/A	☐P	☐Fail	
Battery Load Test	☐N/A	☒P	☐Fail	12.3
Operate w/ no a/c	☒N/A	☐P	☐Fail	
Trouble w/ no a/c	☒N/A	☐P	☐Fail	
Battery A/H	☐N/A	☒P	☐Fail	35
Battery Labeled	☐N/A	☒P	☐Fail	
Battery Expires	☐N/A	☒P	☐Fail	4/2018

Location 2	B3 ELEC. RM			
Number booster tested	BPS 1			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.4
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	8
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018

Location 3	B3 ELEC. RM			
Number booster tested	BPS 2			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.8
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	7.5
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	6/2020

Location 4	B3 ELEC. RM			
Number booster tested	BPS 3			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.4
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	8
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018

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RED HAWK
Fire & Security

NAC BOOSTERS/POWER SUPPLY

Location 1	L (MID RISE) ELEC. RM			
Number booster tested	BPS 4			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐P	☐Fail	
Ground Trouble	☒N/A	☐P	☐Fail	
A/C Voltage	☒N/A	☐P	☐Fail	
Battery Voltage	☒N/A	☐P	☐Fail	
Battery Load Test	☐N/A	☒P	☐Fail	12.4
Operate w/ no a/c	☒N/A	☐P	☐Fail	
Trouble w/ no a/c	☒N/A	☐P	☐Fail	
Battery A/H	☐N/A	☒P	☐Fail	8
Battery Labeled	☐N/A	☒P	☐Fail	
Battery Expires	☐N/A	☒P	☐Fail	4/2018

Location 2	L (MID RISE) ELEC. RM			
Number booster tested	BPS 5			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.3
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	8
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018

Location 3	L (MID RISE) ELEC. RM			
Number booster tested	BPS 6			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.3
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	8
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018

Location 4	CL (MID RISE) ELEC. RM			
Number booster tested	BPS 7			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.3
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	8
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018

Tech Name: DARWIN	Date: 9/6/2016	Review deficiencies with Customer ☒ Yes

RED HAWK
Fire & Security

NAC BOOSTERS/POWER SUPPLY

Location 1	B1 (TOWER) ELEC. RM			
Number booster tested	BPS 8			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐P	☐Fail	
Ground Trouble	☒N/A	☐P	☐Fail	
A/C Voltage	☒N/A	☐P	☐Fail	
Battery Voltage	☒N/A	☐P	☐Fail	
Battery Load Test	☐N/A	☐P	☒Fail	11.6 (FAILED), REPLACED BY DA 9/9/16
Operate w/ no a/c	☒N/A	☐P	☐Fail	
Trouble w/ no a/c	☒N/A	☐P	☐Fail	
Battery A/H	☐N/A	☒P	☐Fail	7.5
Battery Labeled	☐N/A	☒P	☐Fail	
Battery Expires	☐N/A	☒P	☐Fail	1/2017

Location 2	L (TOWER) ELEC. RM			
Number booster tested	BPS 9			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.4
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	8
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018

Location 3	CL (TOWER) ELEC. RM			
Number booster tested	BPS 10			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.5
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	8
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018

Location 4	L (MID RISE) RESTAURANT STORAGE			
Number booster tested	BPS 11			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.8
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	7.5
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	6/2020

Tech Name: DARWIN	Date: 9/6/2016	Review deficiencies with Customer ☒ Yes

RED HAWK
Fire & Security

NAC BOOSTERS/POWER SUPPLY

Location 1	FACP RM			
Number booster tested	NODE 2			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐P	☐Fail	
Ground Trouble	☒N/A	☐P	☐Fail	
A/C Voltage	☒N/A	☐P	☐Fail	
Battery Voltage	☒N/A	☐P	☐Fail	
Battery Load Test	☐N/A	☒P	☐Fail	12.4
Operate w/ no a/c	☒N/A	☐P	☐Fail	
Trouble w/ no a/c	☒N/A	☐P	☐Fail	
Battery A/H	☐N/A	☒P	☐Fail	55
Battery Labeled	☐N/A	☒P	☐Fail	
Battery Expires	☐N/A	☒P	☐Fail	4/2018

Location 2	B3 ELEC. RM			
Number booster tested	NODE 3			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.6
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	55
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	10/2018

Location 3	L (MID RISE) ELEC. RM			
Number booster tested	NODE 4			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.6
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	55
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☐Pass	☒Fail	10/2018

Location 4	10TH (MID RISE) ELEC. RM			
Number booster tested	NODE 5			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☒N/A	☐Pass	☐Fail	EXPIRED (REPLACED BY DA 9/9/16)
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	55
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☐Pass	☒Fail	EXPIRED (REPLACED BY DA 9/9/16)

Tech Name: DARWIN	Date: 9/6/2016	Review deficiencies with Customer ☒ Yes

RED HAWK
Fire & Security

NAC BOOSTERS/POWER SUPPLY

Location 1	11TH (TOWER) ELEC. RM			
Number booster tested	NODE 6			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐P	☐Fail	
Ground Trouble	☒N/A	☐P	☐Fail	
A/C Voltage	☒N/A	☐P	☐Fail	
Battery Voltage	☒N/A	☐P	☐Fail	
Battery Load Test	☐N/A	☒P	☐Fail	12.3
Operate w/ no a/c	☒N/A	☐P	☐Fail	
Trouble w/ no a/c	☒N/A	☐P	☐Fail	
Battery A/H	☐N/A	☒P	☐Fail	55
Battery Labeled	☐N/A	☒P	☐Fail	
Battery Expires	☐N/A	☒P	☐Fail	4/2018

Location 2	21ST (TOWER) ELEC. RM			
Number booster tested	NODE 7			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.4
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	55
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018

Location 3	30TH (TOWER) ELEC. RM			
Number booster tested	NODE 8			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.5
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	55
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018

Location 4	39TH (TOWER) ELEC. RM			
Number booster tested	NODE 9			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.5
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	55
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☐Pass	☒Fail	10/2018

Tech Name: DARWIN	Date: 9/6/2016	Review deficiencies with Customer ☒ Yes

RED HAWK
Fire & Security

NAC BOOSTERS/POWER SUPPLY

Location 1	49TH (TOWER) ELEC. RM			
Number booster tested	NODE 10			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐P	☐Fail	
Ground Trouble	☒N/A	☐P	☐Fail	
A/C Voltage	☒N/A	☐P	☐Fail	
Battery Voltage	☒N/A	☐P	☐Fail	
Battery Load Test	☒N/A	☐P	☐Fail	EXPIRED (REPLACED BY DA 9/9/16)
Operate w/ no a/c	☒N/A	☐P	☐Fail	
Trouble w/ no a/c	☒N/A	☐P	☐Fail	
Battery A/H	☐N/A	☒P	☐Fail	55
Battery Labeled	☐N/A	☒P	☐Fail	
Battery Expires	☐N/A	☐P	☒Fail	EXPIRED (REPLACED BY DA 9/9/16)

Location 2	56TH (TOWER) ELEC. RM			
Number booster tested	NODE 11			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.4
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	55
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	4/2018

Location 3	PH2 (TOWER) ELEC. RM			
Number booster tested	BPS 12			
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	12.5
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	7.5
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	3/2019

Location 4	NA			
Number booster tested				
Short NAC Trouble	☒N/A	☐Pass	☐Fail	
Open NAC Trouble	☒N/A	☐Pass	☐Fail	
Ground Trouble	☒N/A	☐Pass	☐Fail	
A/C Voltage	☒N/A	☐Pass	☐Fail	
Battery Voltage	☒N/A	☐Pass	☐Fail	
Battery Load Test	☐N/A	☒Pass	☐Fail	
Operate w/ no a/c	☒N/A	☐Pass	☐Fail	
Trouble w/ no a/c	☒N/A	☐Pass	☐Fail	
Battery A/H	☐N/A	☒Pass	☐Fail	
Battery Labeled	☐N/A	☒Pass	☐Fail	
Battery Expires	☐N/A	☒Pass	☐Fail	

Tech Name: DARWIN	Date: 9/6/2016	Review deficiencies with Customer ☒ Yes

RED HAWK
Fire & Security

DACT PERIODIC TESTING

Job: MILLENNIUM TOWER
Address: 301 MISSION ST, SF, CA 94105

Date: 9-6-16
Tech Name: DARWIN

FACP Type: EST-3   DACT Type: MOD COM   Format: NA   (4+2 etc)

Take system off-line with Central Station: ☒N/A ☐P ☐F   Acct Number: 04-050

Request zone schedule from Central Station and list below: ☒N/A ☐P ☐F

1. NA	2.
3.	4.
5.	6.
7.	8.
Additional Information:	BUILT-IN DIALER

AC Voltage: NA	DC Voltage: NA	Load Test: NA	Battery Expiration: NA

Primary Phone Line				Secondary Phone Line			
Manual zone trip	☒N/A	☐P	☐F	Manual zone trip	☒N/A	☐P	☐F
Correct trip and restoral? (@ CS)	☒N/A	☐P	☐F	Correct trip and restoral? (@ CS)	☒N/A	☐P	☐F
<90 sec. End-to-End Transmission	☒N/A	☐P	☐F	<90 sec. End-to-End Transmission	☒N/A	☐P	☐F
Proper DACT zone trip	☒N/A	☐P	☐F	Proper DACT zone trip	☒N/A	☐P	☐F
Primary phone disconnected	☒N/A	☐P	☐F	Primary phone disconnected	☒N/A	☐P	☐F
Local trouble signal (within 4 min)?	☒N/A	☐P	☐F	Local trouble signal (within 4 min)?	☒N/A	☐P	☐F
Primary Line Trouble (within 4 min)?	☒N/A	☐P	☐F	Primary Line Trouble (within 4 min)?	☒N/A	☐P	☐F
Reconnect primary, and RJ31X Jack Proper Line Seizure?	☒N/A	☐P	☐F	Reconnect primary, and RJ31X Jack Proper Line Seizure?	☒N/A	☐P	☐F

ELEVATOR PHONE MONITORING TESTING

CS Name: NA

Elevator Location	Acct#	Caller I.D.#	Pass	Fail	CS Operator	Remarks
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		
			☐	☐		

4384 Enterprise Place, Fremont, CA 94538
Phone: 510-438-1300 / Fax 510-438-1350

C10 License # 713099

RED HAWK
Fire & Security

REMOTE DISPLAY — **COMMENTS:**

Visual Display	☒N/A	☐Pass	☐Fail
AC Power LED – ON	☒N/A	☐Pass	☐Fail
Alarm Silence – LED	☒N/A	☐Pass	☐Fail
Program Fault – LED	☒N/A	☐Pass	☐Fail
Alarm – LED	☒N/A	☐Pass	☐Fail
Alarm/Trouble Acknowledge	☒N/A	☐Pass	☐Fail
Alarm Silence Resend	☒N/A	☐Pass	☐Fail
Reset/Lamp Test	☒N/A	☐Pass	☐Fail
Panel Sounder	☒N/A	☐Pass	☐Fail

REMOTE ANNUNCIATOR

Power On Lamp	☒N/A	☐Pass	☐Fail
Trouble Buzzer	☒N/A	☐Pass	☐Fail
Signal Silence Lamp	☒N/A	☐Pass	☐Fail
Lamp Test	☒N/A	☐Pass	☐Fail
Reset (Remote)	☒N/A	☐Pass	☐Fail
Alarm Lamp Operation Qty	☒N/A	☐Pass	☐Fail
Alarm Lamp Labeled	☒N/A	☐Pass	☐Fail
Signal Silence	☒N/A	☐Pass	☐Fail

NOTIFICATION APPLIANCES — **COMMENTS:**

NAC's Tested ☒N/A ☐Yes ☐No

Synchronization Verified ☒N/A ☐Pass ☐Fail

FINAL SYSTEM SUMMARY — **COMMENTS:**

Note all Deficiencies	☐N/A	☒Yes	☐No	SEE DEFICIENCY PAGE
Reconnect All Aux Functions	☐N/A	☒Yes	☐No	
Reconnect Signal Circuits	☐N/A	☒Yes	☐No	
Place System Online	☐N/A	☒Yes	☐No	
Appropriate field devices have been tested for proper out puts and recorded on Device Data Sheets	☐N/A	☒Yes	☐No	
Program Disk is on Site	☐N/A	☒Yes	☐No	

Work Complete/Building Management Notified: Time: 3:00 PM
Central Station Notified: Time: 3:00 PM Operator #: RICK

THIS TESTING WAS PERFORMED IN ACCORDANCE WITH APPLICABLE NFPA 2010 EDITION STANDARDS.

Inspection Completed by(Tech Name): DARWIN ALVAREZ Date: 9-6-16

4384 Enterprise Place, Fremont, CA 94538
Phone: 510-438-1300 / Fax 510-438-1350

C10 License # 713099

RED HAWK
Fire & Security

Inspection Deficiencies Sheet

Job Name	Site Address	Work Order	Page
MILLENNIUM TOWER	301 MISSION ST. SF, CA 94105	3219865	1 Of 1

Ranking Explanation
(1) Critical Life Safety System Issue (2) Life Safety Functional Issue (3) Untested (4) Non-Required Recommendation

Scope of work explanation
(A) Coordinate w/Red Hawk (B) Facilities to coordinate w/additional vendor

Rank: 2	Scope: A	Device Type: NODE BATTERIES	Add/Zone: NA
Make/Model: BAT12V-55 (2 EACH)		Loc./Desc.: SEE BELOW	
Deficiency Desc.:	EXPIRED BATTERIES: - 10TH FLR (MID RISE) ELEC RM. NODE 5 - 49TH FLR (TOWER) ELEC. RM NODE 10		
Recommendation	BATTERIES REPLACED DURING INSPECTION ON 9/916		

Rank: 2	Scope: A	Device Type: BOOSTER BATTERIES	Add/Zone: NA
Make/Model: BAT12V-7.5 (2 EACH)		Loc./Desc.: B1 ELEC. RM (BPS 8)	
Deficiency Desc.:	BATTERIES FAILED LOAD TEST.		
Recommendation	BATTERIES REPLACED DURING INSPECTION ON 9/916		

Rank: Please Select	Scope: Please Select	Device Type:	Add/Zone:
Make/Model:		Loc./Desc.:	
Deficiency Desc.:	NA		
Recommendation	NA		

Rank: Please Select	Scope: Please Select	Device Type:	Add/Zone:
Make/Model:		Loc./Desc.:	
Deficiency Desc.:	NA		
Recommendation	NA		

4384 Enterprise Place, Fremont, CA 94538
Phone: 510-438-1300 / Fax 510-438-1350

C10 License # 713099

RED HAWK
Fire & Security

Tech Name: DARWIN A	Date: 9/6/2016	Review deficiencies with Customer ☒ Yes

Modified on : 12/5/12

4384 Enterprise Place, Fremont, CA 94538
Phone: 510-438-1300 / Fax 510-438-1350

RED HAWK
Fire & Security

Fire Alarm System Points List

Name: MILLENNIUM TOWER
Address: 301 MISSION ST
City: SAN FRANCISCO | State: CA | Zip: 94105

Notes: TECH: DA DATE: 9/6/16 126/159

Address	Message	Device	Test	Trbl	Visual	Annun	Remarks
01020144	B1 LVL MAIN FIRE SVC SHUTOFF VALVE TAMPER	VT	X		X	X	TESTED: 9/9/16 TURNS: < 2.5 MULTIPLE VALVES W/ SAME ADDRESS
01020152	B1 LEVEL FIRE PUMP RM PUMP B1-1 TROUBLE	CT	X			X	TESTED: 9/7/16
01020155	B1 LEVEL FIRE PUMP RM PUMP B1-2 TROUBLE	CT	X			X	TESTED: 9/7/16
01020156	B1 LEVEL FIRE PUMP RM VALVE TAMPERS	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5 MULTIPLE VALVES W/ SAME ADDRESS
01020187	B1 LEVEL STAIR 1 RISER VALVE TAMPER	VT	X		X	X	TESTED: 9/9/16 TURNS: < 2.5
01020188	B1 LEVEL STAIR 2 RISER VALVE TAMPER	VT	X		X	X	TESTED: 9/9/16 TURNS: < 2.5
01020189	B1 LEVEL FIRE PUMP RM VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030126	L LEVEL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030127	L LEVEL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030128	CL LEVEL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030129	CL LEVEL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030130	3FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030131	3FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030132	4FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030133	4FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030134	5FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030135	5FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030136	6FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030137	6FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030138	7FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030139	7FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030140	8FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030141	8FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030142	9FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030143	9FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030144	10FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030145	10FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030146	11FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030147	11FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030148	12FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030149	12FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030150	14FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030151	14FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030152	15FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030153	15FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030154	16FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030155	16FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030156	17FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030157	17FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030158	18FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030159	18FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030160	19FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030161	19FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030162	20FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC

01030163	20FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030164	21FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030165	21FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030166	22FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030167	22FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030168	23FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030169	23FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030170	24FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030171	24FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030172	25FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030173	25FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030174	26FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030175	26FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030176	27FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030177	27FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030178	28FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030179	28FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030180	29FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030181	29FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030182	30FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030183	30FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030184	31FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030185	31FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030186	32FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030187	32FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030188	33FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030189	33FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030190	34FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030191	34FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030192	35FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030193	35FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030194	36FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030195	36FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030196	37FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030197	37FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030198	38FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030199	38FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030200	39FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030201	39FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030202	40FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030203	40FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030204	41FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030205	41FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030206	42FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030207	42FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030208	43FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030209	43FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030210	45FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030211	45FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030212	46FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030213	46FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030214	47FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030215	47FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030216	48FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030217	48FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030218	49FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030219	49FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030220	50FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030221	50FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030222	51FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030223	51FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030224	52FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030225	52FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5

01030226	53FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030227	53FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030228	54FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030229	54FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030230	55FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030231	55FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030232	56FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030233	56FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030234	57FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030235	57FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030236	PH1 STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030237	PH1 STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030238	PH2 STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030239	PH2 STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030240	GPH LEVEL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030241	GPH LEVEL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030242	59FL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030243	59FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030244	26FL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030249	B1 LEVEL STAIR 1 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030250	B1 LEVEL STAIR 1 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030376	CL LEVEL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030377	CL LEVEL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030378	3FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030379	3FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030380	4FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030381	4FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030382	5FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030383	5FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030384	6FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030385	6FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030386	7FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030387	7FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030388	8FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030389	8FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030390	9FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030391	9FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030392	10FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030393	10FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030394	11FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030395	11FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030396	12FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030397	12FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030398	14FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030399	14FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030400	15FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030401	15FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030402	16FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030403	16FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030404	17FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030405	17FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030406	18FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030407	18FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030408	19FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030409	19FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030410	20FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030411	20FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030412	21FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030413	21FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030414	22FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030415	22FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030416	23FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030417	23FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5

01030418	24FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030419	24FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030420	25FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030421	25FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030422	26FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030423	26FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030424	27FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030425	27FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030426	28FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030427	28FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030428	29FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030429	29FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030430	30FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030431	30FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030432	31FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030433	31FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030434	32FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030435	32FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030436	33FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030437	33FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030438	34FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030439	34FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030440	35FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030441	35FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030442	36FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030443	36FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030444	37FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030445	37FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030446	38FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030447	38FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030448	39FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030449	39FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030450	40FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030451	40FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030452	41FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030453	41FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030454	42FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030455	42FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030456	43FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030457	43FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030458	45FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030459	45FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030460	46FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030461	46FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030462	47FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030463	47FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030464	48FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030465	48FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030466	49FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030467	49FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030468	50FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030469	50FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030470	51FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030471	51FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030472	52FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030473	52FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030474	53FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030475	53FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030476	54FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030477	54FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030478	55FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030479	55FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030480	56FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC

01030481	56FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030482	57FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030483	57FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030484	PH1 STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030485	PH1 STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030486	PH2 STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030487	PH2 STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030488	GPH LEVEL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030489	GPH LEVEL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030490	59FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030491	59FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030494	26FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
01030495	B1 LVL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030496	B1 LVL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030497	L LVL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/7/16 TIME: < 90 SEC
01030498	L LVL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5
01030499	60FL STAIR 2 WATERFLOW	WF	X		X	X	TESTED: 9/6/16 TIME: < 90 SEC
01030500	60FL STAIR 2 VALVE TAMPER	VT	X		X	X	TESTED: 9/6/16 TURNS: < 2.5
03020139	MR B5 LVL STAIR 4 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020140	MR B5 LVL STAIR 4 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020167	MR B4 LVL STAIR 4 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020168	MR B4 LVL STAIR 4 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020185	MR B5 LVL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020186	MR B5 LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020187	MR B4 LVL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020188	MR B4 LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020189	MR B3 LVL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020190	MR B3 LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020191	MR B2 LVL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020192	MR B2 LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020193	MR B1 LVL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020194	MR B1 LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020195	MR L LVL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020196	MR L LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020197	MR CL LVL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020198	MR CL LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020199	MR 3FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020200	MR 3FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020201	MR 4FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020202	MR 4FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020203	MR 5FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020204	MR 5FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020205	MR 6FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020206	MR 6FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020207	MR 7FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020208	MR 7FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020209	MR 8FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020210	MR 8FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020211	MR 9FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020212	MR 9FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020213	MR 10FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020214	MR 10FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020215	MR PH LVL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020216	MR PH LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020217	MR 12FL STAIR 6 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020218	MR 12FL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020245	MR B3 LVL STAIR #4 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020246	MR B3 LVL STAIR #4 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020247	MR B2 LVL STAIR #4 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020248	MR B2 LVL STAIR #4 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020249	B1 LVL STAIR #4 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
03020250	B1 LVL STAIR #4 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
03020462	MR B1 LVL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 9/9/16 TURNS: < 2.5

03020463	MR B1 LVL STAIR 6 VALVE TAMPER	VT	X		X	X	TESTED: 9/9/16 TURNS: < 2.5
04020150	MR L LVL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
04020151	MR L LVL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
04020152	MR CL LVL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
04020153	MR CL LVL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
04020154	MR 3FL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
04020155	MR 3FL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
04020156	MR 4FL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
04020157	MR 4FL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
04020158	MR 5FL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
04020159	MR 5FL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
04020160	MR 6FL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
04020161	MR 6FL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
04020162	MR 7FL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
04020163	MR 7FL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
04020164	MR 8FL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
04020165	MR 8FL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
04020166	MR 9FL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
04020167	MR 9FL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
04020168	MR 10FL STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
04020169	MR 10FL STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
04020170	MR PH STAIR 5 WATERFLOW	WF	X		X	X	TESTED: 9/8/16 TIME: < 90 SEC
04020171	MR PH STAIR 5 VALVE TAMPER	VT	X		X	X	TESTED: 9/8/16 TURNS: < 2.5
08020136	26FL FIRE PUMP T26-1 IS IN TROUBLE	CT	X			X	TESTED: 9/7/16
08020141	26FL FIRE PUMP T26-2 IS IN TROUBLE	CT	X			X	TESTED: 9/7/16
08020144	26FL FIRE PUMP ROOM VALVE TAMPERS	VT	X		X	X	TESTED: 9/7/16 TURNS: < 2.5 MULTIPLE VALVES W/ SAME ADDRESS

EXHIBIT

H

EXHIBIT H

Allana Buick & Bers, Inc.
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ALLANA BUICK & BERS

Making Buildings Perform Better

November 15, 2016

John Gill
Hughes Gill Cochrane
1600 South Main Street, Suite 215
Walnut Creek, CA 94596

Denis F. Shanagher
Duane Morris LLP
Spear Tower
One Market Plaza, Suite 2200
San Francisco, CA 94105-1127

Re: Site Excavation at Utilities – DRAFT Scope
The Millennium Tower
301 Mission St.
San Francisco, CA 94105

JN: 16-4094.01

Dear Mr. Gill and Mr. Shanagher,

In accordance with your request, **Allana Buick & Bers, Inc.** (ABBAE) is pleased to provide a description of the testing scope for excavation around utilities at the Millennium Towers, located at 301 Mission Street in San Francisco, CA. The description of the services is intended as a general outline of services that will be performed on site; further investigation may be required. All additional services will be discussed between the attorneys' representative, testing contractor, and ABBAE managerial staff to discuss the extent of investigation. Please distribute testing protocol to the management and contractor in efforts to assist them with their notices for testing.

Destructive testing projected date. (Subject to change)

1. **DT and water testing is currently scheduled for TBA**
2. **Workday Schedule:**
   - 7:30 am set-up for DT
   - 8:00 am – 4:15 pm DT (1-hour break for lunch)
   - 4:15 pm – 5:00 pm temporarily close up all DT areas.

GENERAL SCOPE

Contractor to provide access and control to all building components scheduled for testing. Prior to start of the testing, a responsible contractor's representative will meet with owner's representative to identify general test locations, review testing and forensic investigation requirements, and schedule arrival and set up of all necessary equipment prior to the first day of testing. Testing includes access to building exterior at the ground level.

1. Contractor is to coordinate testing locations and procedures with building management.
2. Provide equipment for investigation as required to demolish concrete sidewalk, excavate dirt, provide shoring, remove or store dirt as necessary.
3. Effectively communicate with local building officials to secure the necessary permits required for testing and repairs. This includes the excavation, street access, pedestrian traffic, build-back and any other items included in this scope of work. Coordinate with PG&E as needed.
4. Contractor to have a USA inspection performed prior to the start of the excavation to accurately map out the utility lines.
5. Coordinate with retail tenants that will be affected prior to your start date.
6. Contractor to provide proper debris protection for all personal property including vehicles
7. Provide all necessary materials to properly repair and restore all work areas to match existing sidewalks.
8. Contractor to perform under the direction of the consultant at each respective location.
9. Contractor needs to be aware of all utility shut-offs prior to excavation. This includes gas, electrical, fire sprinkler, irrigation, water, etc.
10. Prepare trades (i.e., electrical, plumbing, telecommunication) that will be available for any possible emergency repairs that may be needed during or after the excavation.
11. Temporarily close and protect testing locations at the end of each workday prior to leaving the site.

EXCAVATION AT EXISTING UTILITIES

ABBAE will observe excavations at 5 areas around the perimeter of the building, which includes approximately 10 individual utility lines. These lines include storm and sanitary drain, fire, domestic water, and natural gas. Contractor is responsible for making all the necessary arrangements in order to perform all excavations in a timely fashion. Excavations will need to extend at least 3 feet wider than the marked utility lines and approximately 10 feet away from the building. The contractor should be prepared to excavate approximately 8 feet deep, depending on the location of the utility lines. The entire circumference of the utilities needs to be exposed. Below is a map of the utilities and photos that show the garage and street views at the testing locations:

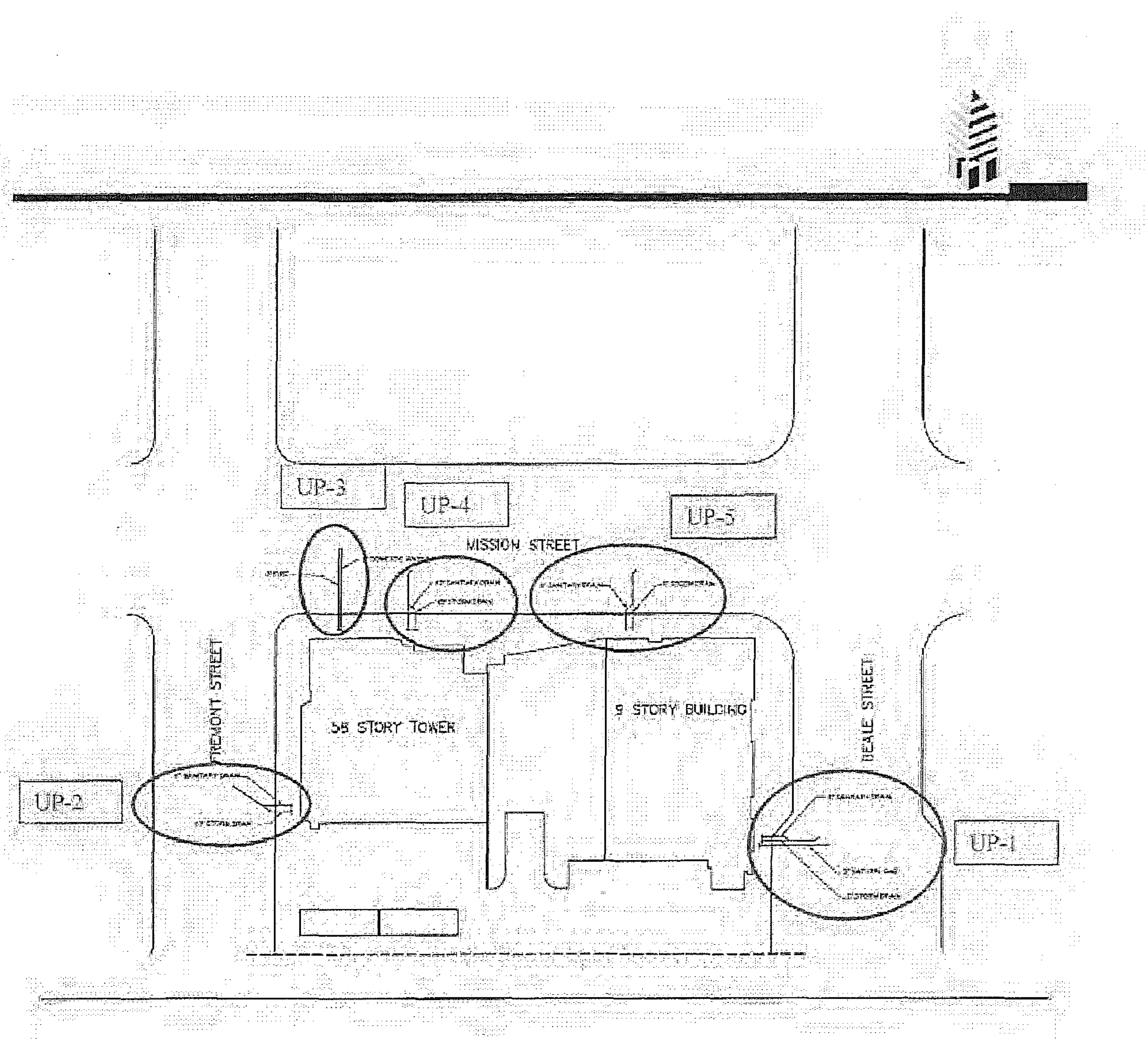
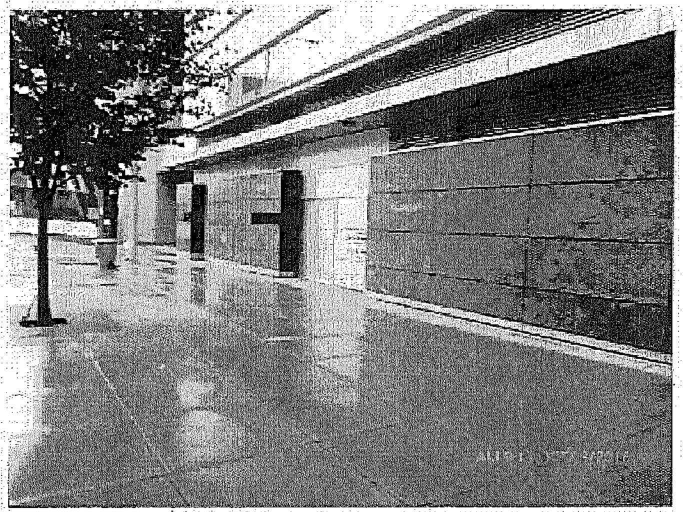
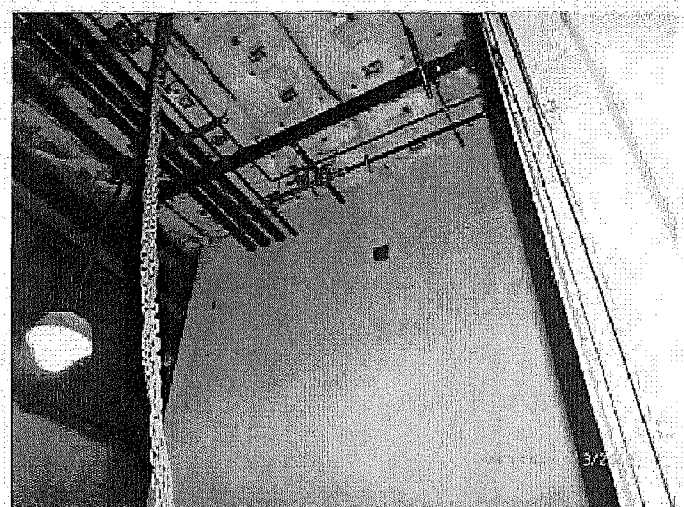

UP-3
UP-4
UP-5
MISSION STREET
FREMONT STREET
58 STORY TOWER
9 STORY BUILDING
BEALE STREET
UP-2
UP-1

Photo Section

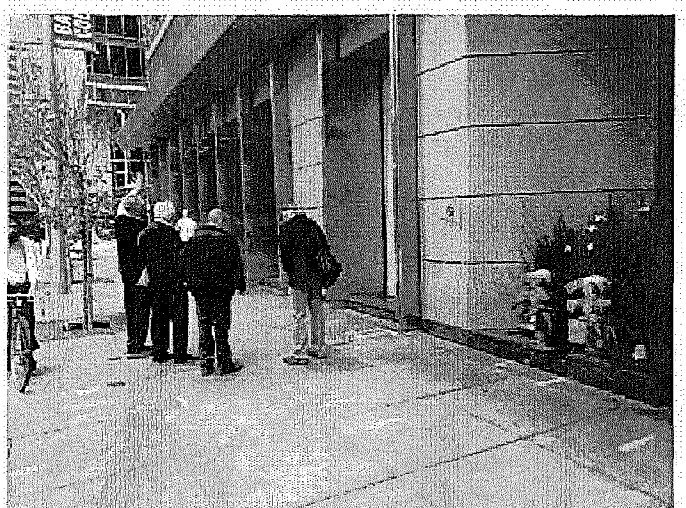


UP-1 Beale Street Elevation

UP-1 Beale Street Elevation: Storm, Sanitary and Natural Gas

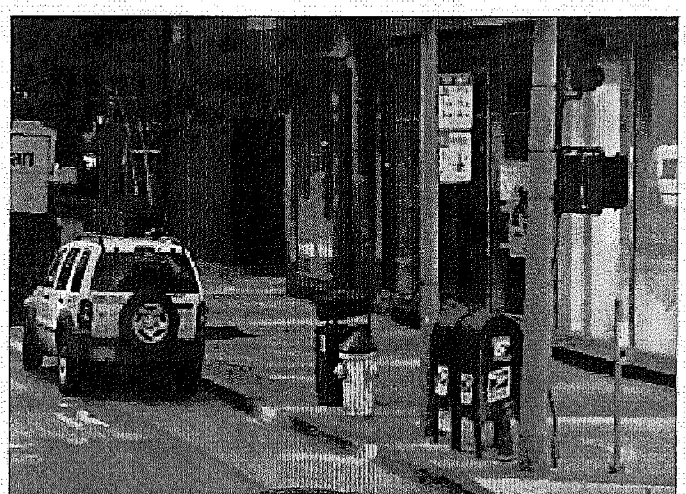


UP-1 Beale Street Elevation: Garage View

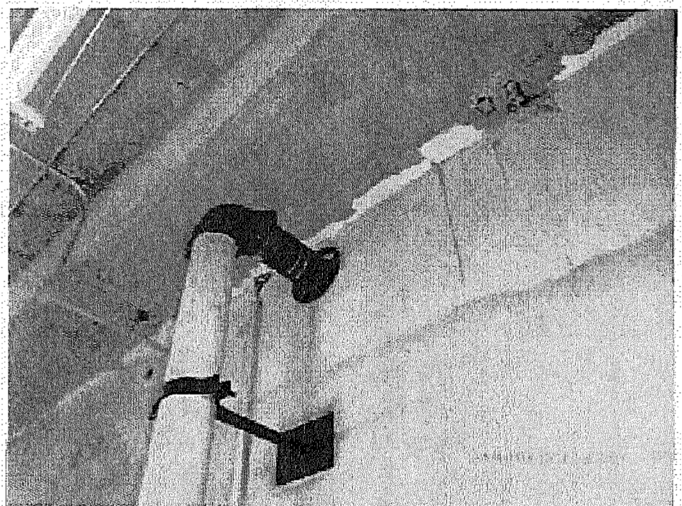


UP-2 Fremont Street: Storm, Sanitary Drains

UP-2 Fremont Street Elevation: Garage View

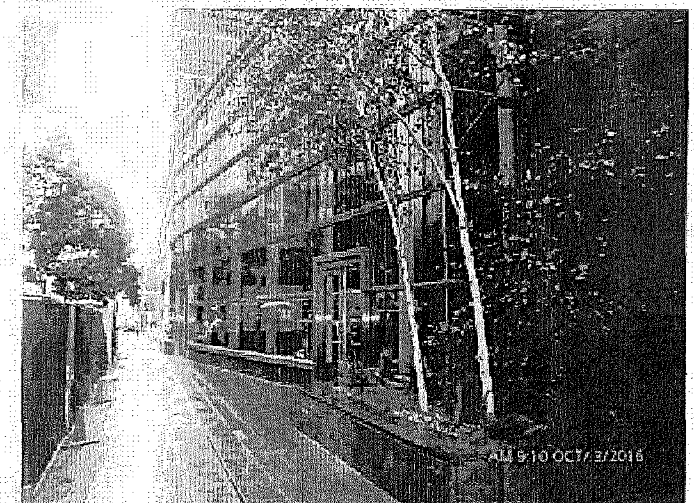


UP-3 Mission Street: Domestic Water and Fire

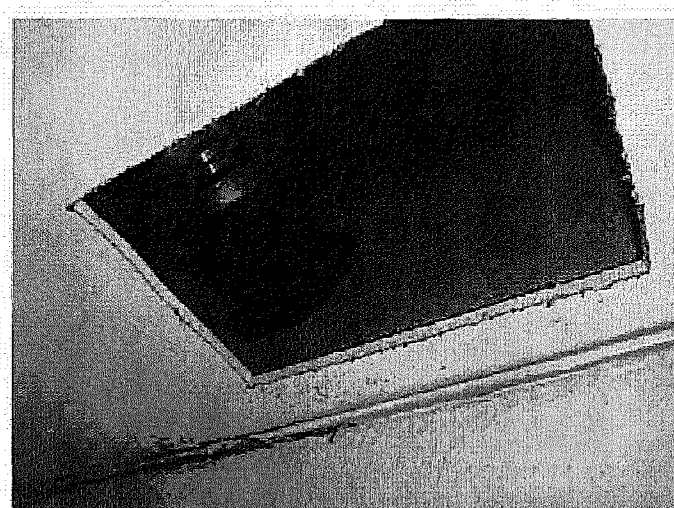


UP-3 Mission Street: Garage View

UP-4 Mission Street Elevation: Storm, Sanitary



UP-5 Mission Street Elevation: Storm and Sanitary



UP-5 Mission Street: Garage View

Please don't hesitate to contact me if there are any questions.

Sincerely,

Allana Buick & Bers, Inc.

Roberto Hernandez
Forensic Services Manager

CC: Karim Allana
Eugene Buick

City and County of San Francisco
Department of Building Inspection

Edwin M. Lee, Mayor
Tom C. Hui, S.E., C.B.O., Director

November 29, 2016

Mr. Denis F. Shanagher, Partner
Duane Morris LLP
Spear Tower
One Market Plaza, Suite 2200
San Francisco, CA 94105-1127

Via E-mail: dfshanagher@duanemorris.com

Dear Mr. Shanagher:

Please transmit a copy of all monitoring data obtained to date by Patrick Shires through his geotechnical investigation at 301 Mission Street to DBI Principal Engineer Hanson Tom by December 1, 2016. As you know, Mr. Shires agreed in his September 29, 2016, letter to Director Hui to provide such reports on a monthly basis. To date DBI has not received any of the promised monthly monitoring reports.

Thank you for offering to have Mr. Shires come to DBI to discuss the status of his geotechnical investigation, preliminary findings, and other data and findings related to building safety on December 14 at 10 a.m. We will schedule the meeting for the proposed date and time at DBI. Please note that a meeting or meetings, while useful, do not take the place of the promised monthly written reports.

Thank you in advance for your much appreciated continuing efforts to work cooperatively with the Department of Building Inspection on its 301 Mission Street investigations.

Sincerely,

Tom C. Hui

Tom C. Hui, S.E., C.B.O.
Director

OFFICE OF THE DIRECTOR
1660 Mission Street – San Francisco CA 94103
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Email: Tom.Hui@sfgov.org

Member, Board of Supervisors
District 3

AARON PESKIN

City and County of San Francisco

November 16, 2016

Professor Jack P. Moehle
Civil and Environmental Engineering
University of California Berkeley
775 Davis Hall, Berkeley CA

Dear Prof. Moehle:

Thank you for your initial willingness to participate in tomorrow's hearing at the Government Audit and Oversight Committee. As you know, the details of the review and approval process of both the 80 Natoma and 301 Mission projects have profound implications not only for the safety and habitability of existing high-rises in our downtown core, but also for future developments in this seismically vulnerable area.

I understand that you are no longer willing to attend the hearing. As I relayed to you in our phone conversation earlier this week, I have directed our City Attorney to draft legislation allowing the Board of Supervisors to subpoena you and any related documents in your possession relative to the 80 Natoma and 301 Mission projects, including correspondence with peer review panelists, as a result.

I believe that your institutional knowledge of both of these projects, as well as your familiarity with the civil and environmental engineering requirements necessary to ensure state-of-the-art building standards are critical for the City to consider as we move forward with our own policy reforms.

I hope that you will reconsider the valuable role that you can play in assisting the City with these reforms, and I look forward to eventually working with you toward that end.

Best,

Aaron Peskin
San Francisco Supervisor
District 3

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Member, Board of Supervisors
District 3

AARON PESKIN

City and County of San Francisco

November 16, 2016

Tom C. Hui
Department of Building Inspection, Director
1660 Mission Street, Sixth Floor
San Francisco, CA 94103
CC: William Strawn; Lily Madjus; Erica Major

Dear Director Hui,

Thank you again for your cooperation thus far in the ongoing hearings on San Francisco building standards in seismic zones, as well as the specific safety review process for the 301 Mission Street project, otherwise known as the Millennium Tower.

In preparation for tomorrow's hearing, I wanted to follow up on any progress that the Department of Building Inspection (DBI) has made relative to securing and compiling relevant documents from key points in the 301 Mission vetting and approval process.

I have reviewed a screen shot of a revised January 2006 letter written by Hardip Pannu, one of the experts tapped to review the structural safety of the 301 Mission project. A reference to correspondence dated August 30, 2005 is included therein, but this 2005 correspondence is not included in the previous data dumps that you have transmitted, to the best of my knowledge. Please produce this or explain its absence.

I am curious as to why there is no documentation that DBI formally retained the services of either Mr. Pannu or Professor Moehle specifically as peer review panelists (as opposed to consultants) or any documentation delineating their anticipated scope of work. I am also curious as to why there is no letter confirming that DBI engineer Hanson Tom directed or requested peer review panelists Mr. Pannu and Professor Moehle to include the Transbay project in their review and analysis, as indicated in Mr. Pannu's January 2006 revision of the August 30, 2005 letter? By way of understanding the review timeline, please explain whether Mr. Pannu and Professor Moehle were hired before or after they did work for DeSimone Consulting Engineers?

Finally, I am still waiting for the four volume foundation permit application for the 301 Mission project, dated May 24, 2005 and prepared by DeSimone Consulting Engineers for the Department of Building Inspection, referencing Project 4069. At our last hearing, we touched on the practice of keeping original hard copies of key documents like permits, charge letters and permit applications, much like marriage or business license applications. I wanted to confirm in writing what the Department's practice has been with respect to these documents and whether or not you have retained the actual letters themselves, as required.

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Fax (415) 554 - 7454 • TDD/TTY (415) 554-5227 • E-mail: aaron.peskin@sfgov.org

Please let my staff know if we can expect these documents or written responses to these questions within the next week.

Thank you again for your cooperation,

Aaron Peskin
San Francisco Supervisor
District 3

City and County of San Francisco
Department of Building Inspection

Edwin M. Lee, Mayor
Tom C. Hui, S.E., C.B.O., Director

MEMORANDUM

DATE: October 31, 2016

TO: Naomi Kelly, City Administrator

FROM: Tom C. Hui Tom C. Hui, S.E., C.B.O.
Director

SUBJECT: **301 Mission Peer Review**

Given the many questions Supervisor Peskin directed to DBI at last Friday's hearing on when we may be able to inform him that we have the technical peer review experts onboard we need for the independent peer review work, I am writing to ask you to expedite this process.

Even if we might be able to recruit immediately only some of the peer review expertise fields, I urge you to move forward so that we might begin, for example, review of at least some building safety aspects of the newly-released Hamburger Report. Perhaps the first thing we can get the peer reviewers to do –once they are on contract with the City – is to focus on what they need to reach an initial conclusion about general building safety (vs. imminent public safety threat), and focus their first efforts on this.

While I do understand the complexities involved, and the time these types of consultant contracts can take, I do hope we can speed up this process ASAP – and let the Supervisors know as soon as we have a definite date.

Thank you, as always, for your support and assistance.

cc: Mayor Ed Lee
President London Breed and Members of the Board of Supervisors
Department of Emergency Management Director Anne Kronenberg
Ron Tom, Assistant Director
Ed Sweeney, Deputy Director, Permit Services
Dan Lowrey, Deputy Director, Inspection Services
Taras Madison, Deputy Director, Administrative Services
Hanson Tom, Principal Engineer
Gary Ho, Structural Engineer
Lily Madjus, Communications Officer
William Strawn, Legislative and Public Affairs Manager

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City and County of San Francisco
Department of Building Inspection

Edwin M. Lee, Mayor
Tom C. Hui, S.E., C.B.O., Director

160975

October 27, 2016

Angus McCarthy
President, Building Inspection Commission
1660 Mission Street, Suite 600
San Francisco, CA 94103

Dear President McCarthy and Members of the Commission:

Per the discussion at last week's regular Building Inspection Commission meeting, where you requested more details on what DBI has been doing to address the settlement issues at 301 Mission Street, please note the following:

Generally, as you know, DBI's overall mission is to oversee the effective, efficient, fair and safe enforcement of the City and County of San Francisco's Building, Housing, Plumbing, Electrical and Mechanical Codes, along with Disability Access regulations, as applied to the more than 200,000 residential and commercial buildings in the City. Through a long-established complaint process, any San Francisco citizen can contact DBI with a concern, which may trigger an immediate inspection of any alleged building code violation and related life safety hazards.

Our housing code protects renters and homeowners from a wide range of reported habitability issues. Our building safety work includes responding to structural integrity and imminent public safety hazards from possible structure collapse following severe fires, as well as being among the City's 'First Responders' following an earthquake and/or natural disaster.

In addition to these broad building safety responsibilities, DBI's core services includes oversite of building code compliance through three specific activities: (1) to review plans and designs developed and stamped by licensed, registered architects and engineers hired by project sponsors for compliance with building code provisions in effect at the time the plans are submitted for review; (2) to conduct site inspections to verify that the performance of construction work is in accordance with approved plans; and (3) to address code compliance issues raised through complaints submitted by San Francisco residents.

<u>301 Mission Street's Building Permit Process (2002-2009)</u>

DBI provided a careful and thorough review of the 301 Mission Street building's permit application from 2002 to 2005, checking to ensure that the plans conformed to the requirements of the 1998-2001 San Francisco Building Code – the code in effect at the time the original project application was filed at DBI. This project consisted of a 12-story mixed-use building, tied to a 58-story concrete tower of more than 400 residential condo units, with a mat-slab foundation and piles that go down approximately 90 feet into Bay mud. After DBI's issuance of the

Certificate of Final Completion (CFC) and occupancy for the 301 Mission project in 2009, the project's immediate neighbor, the Transbay Joint Powers Authority (TJPA), as part of its construction of the Transbay Transit Center, installed an impermeable wall around the entire Transit Center site that reaches down into the clay layer substrate. In addition, along its property boundary line with 301 Mission Street, the TJPA constructed an approximately 30-foot wide buttress wall that goes down to bedrock, approximately 200-feet below grade.

The engineer of record submitted plans for this project as a code-prescriptive design building, which meant the project would adhere strictly adhering to design and construction requirements set forth in the 1998 SF Building code (SFBC). The SFBC provides the minimum code requirements –though more restrictive than State codes to help manage the City's unique geography, topography and location adjacent to major earthquake faults -- developers must follow when constructing their buildings. DBI's role in this process is to ensure they do this by reviewing the plans and addenda submitted during the plan review process.

At the time DBI was reviewing 301 Mission, DBI did not have the authority to require the developer to retain a geotechnical engineer as prescriptive code requirements –the design submitted for this project—did not require it; however, DBI did negotiate with the developer and persuaded the engineer of record to retain a third-party structural engineer, and a highly respected academic with seismic expertise, to review and approve the addenda produced by the developer's retained licensed experts.

The peer-review panel members were: (1) Jack P. Moehle, Ph.D., PE, a nationally recognized U.C. Berkeley engineering professor with expertise in the design and behavior of structures with emphasis on seismic performance of concrete buildings and infrastructure; and (2) Hardip S. Pannu, S.E., a Principal in the engineering firm of Middlebrook & Louie. The developer's engineer of record rejected DBI's explicit request to fund the addition of a geotechnical engineer to this peer-review panel. Nonetheless, Professor Moehle issued a letter to DBI dated January 29, 2006, stating: "On the basis of my review, it is my opinion that the foundation design is compliant with the principles and requirements of the building code, and that a foundation permit can be issued for this project."

From January 2006 (project construction start) to August 2009 (certificate of final completion issuance), DBI conducted more than 500 visual site inspections, in addition to hundreds of special inspections conducted by third-party experts hired by the project sponsors to review Building Code-compliant installations of specific technical building components. The purpose of all of these inspections was to ensure that the general contractor's construction activities were in accordance with the various Building Codes and DBI-permitted, and approved, plans and specifications.

On February 2, 2009, based on concerns of settlement at the site, DBI's Deputy Director Raymond Lui sent a letter to the projects Engineer of Record, DeSimone Consulting Engineers, raising specific questions about larger than anticipated amount of settlement that the 301 Mission building experienced. Mr. Lui asked pointed questions about the settlement of the building, including the actual amount and rate of settlement, deferential settlement, reasons for the settlement, how the existing settlement might affect the structural safety of the building then and in the future.

The Engineer of Record DeSimone Consulting Engineers; the Geotechnical Engineer of Record, Treadwell & Rollo; and the project Architect, Handel Architects, provided written responses in a letter from DeSimone dated February 25, 2009. DeSimone wrote:

> The original project design by DeSimone and Handel Architects accommodated 6 inches of total settlement under the Tower... No differential settlements between the adjacent walls/columns are expected and none have been reported to DeSimone...Since settlement of the Tower was anticipated and planned for during design, it has created no known problems for the Tower or Mid-rise Structures... It is our professional opinion that the structures are safe.

Treadwell & Rollo's response stated:

> The actual settlement of the Tower is 8.3 inches... The results of our latest evaluations indicate that approximately two to four inches of additional settlement could occur in the future...Treadwell & Rollo, Inc., as the geotechnical engineer of record has been aware of the settlement of the Tower and continues to evaluate the results of monitoring... While the settlement of the Tower is greater than originally anticipated, this settlement should not pose issues with foundation support for the Tower.

Handel Architects offered the following additional information:

> We are aware that additional settlement has occurred, and may continue to occur, and we have taken these conditions into account with modifications to the original design where necessary... Utility lines have been designed and installed with flexible connections (allowing for horizontal and vertical movement...to avoid possible interference from future anticipated settlement.

In short, these responses from 301 Mission's engineers of record made it very clear to DBI that the building was stable and safe for occupancy even though the building had settled more than originally estimated. DBI engineers were satisfied with these explanations and the assurances of overall building safety. In addition, DBI's site inspections for all critical building systems and design showed that the design team and general contractor had achieved code compliance in the building's construction. In reliance on the information, assurances, and professional opinions expressed by DeSimone, Treadwell & Rollo, and Handel Architects, DBI issued a certificate of final completion (CFC) in August 2009 upon construction completion. The CFC allowed occupation of the building by homeowners and other tenants.

Millennium Tower was one of the first high-rise buildings constructed in the downtown neighborhood. Since then, DBI has expanded the breadth of its peer-review process to apply to any buildings built over 240 feet high and to buildings using performance-based design, which uses an alternative method of construction and differs greatly from a code-prescriptive design building. Based in part on DBI's experience with 301 Mission and other tall building projects being proposed at that time, DBI issued in March 2008 two new Administrative Bulletins (AB), Numbers 082 and 083, requiring peer review of any proposed "performance-based" designs by a geotechnical specialist, a structural specialist, and by an academic professor with expertise in seismic safety elements. This expansion of required peer review by DBI was regarded as 'cutting edge' in 2008, and is now used by other major cities throughout the U.S. These 2008 AB technical guidelines and requirements added an extra dimension of building safety scrutiny – and continue to help DBI staff review the complex designs of tall buildings.

<u>New Concerns Surface over Additional Settlement at Millennium Tower (July 2016 to Present)</u>

Until DBI received a phone inquiry from SF Chronicle reporter Andy Ross in July 2016, DBI had been unaware of ongoing settlement issues at 301 Mission Street. DBI records show that DBI did not receive a single homeowner or citizen complaint, or information from any source expressing concern from 2009 until this contact from the SF Chronicle about possible settlement impact on any of the building's essential systems, or any impact on any residents' homes, such as plumbing or electrical problems, a non-functioning elevator, etc.

Once DBI heard about the settlement concerns from the Chronicle and other media in mid-July, 2016, DBI Director Tom Hui also heard from a representative of Millennium Partners about a draft engineering report. Millennium Partners then delivered to DBI on July 20, 2016 a Draft copy of a 2014 report by Structural Engineer, Ronald Hamburger, of Simpson, Gumpertz & Heger, who had been retained by Millennium Partners. DBI also requested and received some settlement monitoring data from ARUP Engineers, one of the Transbay Joint Powers Authority's consultants, who had been tracking settlement data from equipment installed inside the basement of 301 Mission Street. After reviewing this information, Director Hui directed staff to perform an informal visual site inspection, pull together all relevant building records, and draft a preliminary report on the status of the 301 Mission buildings based upon the still limited available data. DBI staff conducted the informal site visit on July 20, 2016 and, on August 4, 2016, DBI engineering staff completed a draft preliminary engineering report relying upon available information in its possession at that time. Having been told by Mr. Hamburger that he was continuing to work on updating his review and analysis, DBI decided to await the arrival of requested additional engineering updates before finalizing and releasing its draft August 4th preliminary report.

Mr. Hamburger's final and signed report was recently issued on October 3, 2016. This report concludes, "...On the basis of our updated analysis of the 301 Mission tower, **we conclude that the effect of settlement on most building elements is negligible...We conclude that the settlements experienced by the 301 Mission tower have not compromised the building's ability to resist strong earthquakes and have not had a significant impact on the building's safety**." DBI has performed a preliminary review of this report and, based upon this report and other evidence such as site visits from City staff representing DBI, Fire and PUC, concludes that the building is currently safe for occupancy. DBI is awaiting the input of a peer review team of experts the City is in the process of hiring before it will issue a final opinion on the conclusions reached in this report and any other reports or information directly related to the safety of the 301 Mission Street buildings.

In addition to Mr. Hamburger's signed 2016 report, DBI also requested updated engineering reports from the Homeowners' Association by the end of September 2016, per a Correction Notice a DBI inspector issued on August 26, 2016 in response to a 311 complaint and site inspection on August 19, 2016. The HOA has engaged a geotechnical engineer, Mr. Patrick Shires, to conduct extensive tests and analyses that began on September 26th. Consequently, the HOA asked DBI for a time extension in producing its engineering report, which DBI granted with the stipulation that the engineer of record keep DBI updated monthly on findings and results. DBI also has been provided over 140 data records -- with thousands of pages of data -- from Millennium Partners and is in the process of reviewing these records.

In summary, DBI professionals did exactly what they were supposed to do with respect to the 301 Mission plan review and approvals from submittal in 2002, to multiple inspections performed over several years during the building construction by building inspectors, fire inspectors, and Special Inspectors, up to the issuance of the Certificate of Final Completion in August 2009. As noted above, and based upon reports provided to DBI to date by the owners' engineering experts, and upon our own inspectors' observations during recent visits, the building remains safe for occupancy.

DBI staff members and other affected City departments are continuing to monitor the building's settlement situation closely, especially with respect to any possible impact upon the building's life-safety systems. We are obtaining, and reviewing carefully, updated technical studies by the owners' technical teams that also will be given to the expert peer review panel once that panel is engaged by the City.

<u>DBI Next Steps</u>
We also have initiated a number of immediate action steps to consider more stringent construction requirements for tall buildings over 240 feet located on soft soils, including:

- Changing immediately the selection process for peer review experts, as announced at the October 17, 2016 Building Inspection Commission, whereby DBI will make these appointments without participation by the project sponsor.
- Reviewing and modifying ABs 082 and 083 to reflect best engineering practices and to benefit from 'lessons learned' for the 301 Mission settlement issues.
- Working closely with the City Administrator to identify, and engage, independent peer review experts and establish an effective process for obtaining highly skilled professionals on an as-needed basis to ensure we have the expertise required to review and approve highly complex tall building construction.

- Taking immediate steps to improve DBI's records' retention process, including making certain that all engineering letters related to tall building construction projects are retained, and made more readily retrievable.

I will continue to provide you with periodic updates on the 301 Mission settlement situation as new information becomes available to DBI. Please call me directly if I may answer any questions on this important, and highly complicated, building safety matter.

Sincerely,

Tom C. Hui

Tom C. Hui, S.E., C.B.O.
Director

cc: Mayor Ed Lee
President London Breed and Members of the Board of Supervisors
City Administrator Naomi Kelly
Department of Emergency Management Director Anne Kronenberg
Ed Sweeney, Deputy Director, Permit Services
Dan Lowrey, Deputy Director, Inspection Services
Hanson Tom, Principal Engineer
Gary Ho, Structural Engineer
Lily Madjus, Communications Officer
William Strawn, Legislative and Public Affairs Manager

ADMINISTRATIVE BULLETIN

NO. AB-082 :

DATE : March 25, 2008 (Updated 1/1/14 for code references)

SUBJECT : Permit Processing and Issuance

TITLE : **Guidelines and Procedures for Structural Design Review**

PURPOSE : The purpose of this Administrative Bulletin is to present guidelines and procedures for Structural Design Review. Structural Design Review may be required by the San Francisco Building Code, by another Administrative Bulletin, or at the request of the Director of the Department of Building Inspection.

REFERENCES : 2013 San Francisco Building Code

- Section 101A.2, Purpose
- Section 104A.2, Powers and Duties of Building Official
- Section 104A.2.8, Alternate materials, design, and methods of construction
- Section 105A.6, Structural Advisory Committee
- Chapter 16, Structural Design

ASCE 7-10

- Section 16.2.5 Design Review, Seismic Response History Procedures
- Section 17.7 Design Review, Seismically Isolated Structures
- Section 18.8 Design Review, Structures with Damping Systems

DISCUSSION :

1. STRUCTURAL DESIGN REVIEWER

The Director may request the assistance of a Structural Design Reviewer to provide additional and specialized expertise to supplement the Department of Building Inspection plan review. The Structural Design Reviewer is distinct from a Structural Advisory Committee, which is a formal, public body that the Director may convene regarding matters pertaining to special features or special design procedures. The Structural Design Reviewer meets with the Engineer of Record and with Department of Building Inspection staff as the need arises throughout the design process, providing the Director with a report of its findings after completion of their work.

Review by the Structural Design Reviewer is not intended to replace quality assurance measures ordinarily exercised by the Engineer of Record in the structural design of a building. Responsibility for the structural design remains solely with the Engineer of Record, and the burden to demonstrate conformance of the structural design to the letter and intent of San Francisco Building Code provisions resides solely with the Engineer of Record. The responsibility for conducting the structural review for the plan check resides with the Director and any plan review consultants.

The San Francisco Building Code (through reference to ASCE 7) requires design review by independent registered design professionals in several cases. These include use of seismic response history procedures, use of seismic isolation, and use of seismic dampers. The Structural Design Reviewer will provide this review where required by the San

Francisco Building Code. The Structural Design Reviewer will also provide review as required by other Department of Building Inspection Administrative Bulletins and when otherwise deemed necessary by the Director. Structural Design Review, as discussed herein, and design review, as discussed in ASCE 7, are equivalent.

Qualifications and Selection of Structural Design Reviewer

The Structural Design Reviewer shall be a recognized expert in relevant fields such as structural engineering, earthquake engineering, performance-based earthquake engineering, nonlinear response history analysis, building design, earthquake ground motion, geotechnical engineering, geological engineering, and other areas of knowledge and experience relevant to the project.

The Structural Design Reviewer shall be selected by the Project Sponsor from a project specific list provided by the Director. The Project Sponsor may then engage a Structural Design Reviewer as a consultant for assistance as appropriate. The Structural Design Reviewer shall bear no conflict of interest with respect to the project and shall not be considered part of the design team for the project. The responsibility of the Structural Design Reviewer is to assist the Department of Building Inspection in ensuring compliance of the structural design with the San Francisco Building Code. While the Structural Design Reviewer will contract with the Project Sponsor, their responsibility is to the Department of Building Inspection.

The Structural Design Reviewer shall be registered as a Professional Engineer in California. The Structural Design Reviewer shall sign all written communication to the Director.

Administration of Structural Design Review

The Project Sponsor is responsible for the payment of hourly fees and other expenses for the professional services of the Structural Design Reviewer. The Structural Design Reviewer shall provide to the Department of Building Inspection a written copy of a proposed scope of work of their contract with the Project Sponsor. The proposed scope of services in the contract and any changes proposed to be made thereto shall be approved by the Director.

2. PROJECTS REQUIRING STRUCTURAL DESIGN REVIEW

The Director may require Structural Design Review for any project at his discretion. The following types of projects will generally require Structural Design Review:

1. Projects incorporating non-prescriptive or performance-based design.
2. Projects incorporating building heights that exceed 240 feet.
3. Projects incorporating seismic response-history analyses per Chapter 16 of ASCE 7.*
4. Projects incorporating seismic isolation per Chapter 17 of ASCE 7.*
5. Projects incorporating seismic damping per Chapter 18 of ASCE 7.*
6. Projects with irregular and unusual configurations or systems.

Project Sponsors are strongly encouraged to contact the Department of Building Inspection early in the design to determine Structural Design Review requirements.

*Note: To the extent design review is required under ASCE 7-10, Sections 16.2.5, 17.7 or 18.8, such review process shall be conducted in accordance with the specific requirements of the Building Code and all applicable law."

3. SCOPE OF STRUCTURAL DESIGN REVIEW SERVICES

The scope of services for the Structural Design Reviewer shall be indicated by the Director to provide required expertise to supplement the Department of Building Inspection plan review. It may, therefore, be only for specific portions or structural elements of a project. This scope of services may include, but shall not be limited to, review of the following:

1. Earthquake hazard determination.
2. Site-specific ground motion characterization.
3. Seismic performance goals.
4. Basis of design, design methodology and acceptance criteria.
5. Mathematical modeling and simulation.

6. Interpretation of results of analysis.
7. Member selection and design.
8. Detail concepts and design.
9. Construction Documents, including drawings and specifications.
10. Isolator or damper testing requirements and quality control procedures.
11. At the discretion of the Director, the scope of services for the Structural Design Reviewer may include the review of other building aspects, including design for wind resistance, design of special foundation or earth retaining systems, or the design of critical non-structural elements.

4. STRUCTURAL DESIGN REVIEW PROCESS

The Structural Design Reviewer should be engaged as early in the structural design phase as practicable. This affords the Structural Design Reviewer an opportunity to evaluate fundamental design decisions, which could disrupt design development if addressed later in the design phase. Early in the design process, the Engineer of Record and the Structural Design Reviewer should jointly establish the frequency and timing of Structural Design Reviewer review milestones, and the degree to which the Engineer of Record anticipates the design will be developed for each milestone.

The Structural Design Reviewer shall provide written comments to the Engineer of Record, and the Engineer of Record shall prepare written responses thereto. The Structural Design Reviewer shall maintain a log that summarizes Structural Design Reviewer comments, Engineer of Record responses to comments, and resolution of comments. The Structural Design Reviewer shall make the log available to the Engineer of Record as requested. The Structural Design Reviewer may also issue interim reports as appropriate relative to the scope and project requirements. At the conclusion of the review the Structural Design Reviewer shall submit to the Director a written report that references the scope of the review, includes the comment log and supporting documents, and indicates the professional opinions of the Structural Design Reviewer regarding the design's general conformance to the requirements and guidelines in this bulletin.

Commentary:: None of the reports or documents from the Structural Design Reviewer are Construction Documents. Under no circumstances should letters or other documents from the Structural Design Reviewer be put into the Engineer of Record's drawings or reproduced in any other way that makes Structural Design Reviewer documents appear to be part of the Construction Contract Documents. The Engineer of Record is solely responsible for the Construction Contract Documents. Documents from the Structural Design Reviewer will be retained as part of the Department of Building Inspection's project files.

5. DISPUTE RESOLUTION

The Engineer of Record and the Structural Design Reviewer shall work in a collegial manner, as independent and reasonable professionals. The Structural Design Reviewer shall prepare comments in a respectful manner and shall make reasonable requests of the Engineer of Record for additional analyses or backup information. The Engineer of Record shall address the Structural Design Reviewer comments cordially and respond directly and clearly.

The Engineer of Record and the Structural Design Reviewer shall attempt to develop a consensus on each issue raised by the Structural Design Reviewer. If the Engineer of Record and the Structural Design Reviewer are unable to resolve particular comments, the Structural Design Reviewer shall report the impasse to the Director.

The Director, as Building Official, shall make final decisions concerning all permits. The Director, should the need arise, may address differences of opinion between the Engineer of Record and the Structural Design Reviewer in whatever method he deems appropriate. The Director also may engage additional outside experts to assist in issue resolution.

Originally signed by:

Isam Hasenin, P.E., C.B.O.,Director
Department of Building Inspection

Approved by the Building Inspection Commission on March 19, 2008

ADMINISTRATIVE BULLETIN

NO. AB-083	:	
DATE	:	March 25, 2008 (Updated 01/01/14 for code references)
SUBJECT	:	Permit Processing and Issuance
TITLE	:	**Requirements and Guidelines for the Seismic Design of New Tall Buildings using Non-Prescriptive Seismic-Design Procedures**

PURPOSE : The purpose of this Administrative Bulletin is to present requirements and guidelines for the seismic structural design and submittal documents for building permits for new tall buildings in San Francisco that use non-prescriptive seismic design procedures.

REFERENCES :

2013 San Francisco Building Code, Section 104A.2.8 Alternate materials, design and methods of construction

SEAONC, 2007, *Recommended Administrative Bulletin on the Seismic Design & Review of Tall Buildings Using Non-Prescriptive Procedures*, prepared by Structural Engineers Association of Northern California (SEAONC) AB-083 Tall Buildings Task Group

ASCE, 2011, *Minimum Design Loads for Buildings and Other Structures* (ASCE/SEI 7-10, Prepared by the Structural Engineering Institute of the American Society of Civil Engineers

2003 NEHRP Recommended Provisions For New Buildings And Other Structures Part 1: Provisions and Part 2: Commentary (FEMA 450)

SEAONC, 1999, *Contractual Provisions to Address the Engineer's Liability when Using Performance-Based Seismic Design*, Structural Engineers Association of Northern California

SEAOC, 2001, "Seismology Committee Background and Position Regarding 1997 UBCEq. 30-7 and Drift," Structural Engineers Association of California (http://www.seaoc.org/seismpdfs/UBC/30_7.pdf)

DISCUSSION :

1. SCOPE

This bulletin presents requirements and guidelines for seismic structural design and submittal documents for building permit for new tall buildings in San Francisco that use non-prescriptive seismic design procedures.

Commentary: It is intended that buildings designed to the requirements and guidelines of this bulletin will have seismic performance at least equivalent to that intended of code-prescriptive seismic designs, consistent with the San Francisco Building Code sections indicated below. To demonstrate that a building design is capable of providing code equivalent seismic performance, a three-step procedure shall be performed as specified in Section 4 of this Administrative Bulletin. Intended code seismic performance can be found in the commentary of FEMA 450.

This bulletin intentionally contains both requirements, which are stated in mandatory language (e.g., "shall") and guidelines, which use non-mandatory language.

This bulletin is not written to cover essential facilities.

For the purposes of this Administrative Bulletin, a non-prescriptive seismic design is one that takes exception to one or more of the prescriptive requirements of the San Francisco Building Code and Chapter 12 of ASCE/SEI 7-05 and the standards referenced therein, by invoking San Francisco Building Code, Section 104A.2.8, which allows alternative materials and methods of construction as approved by the Building Official.

For the purposes of this bulletin, tall buildings are defined as those with *hn* greater than 160 feet above average adjacent ground surface.

The height, *hn* is defined in the San Francisco Building Code as the height of Level *n* above the average level of the ground surface adjacent to the structure. Level *n* is permitted to be taken as the roof of the structure, excluding mechanical penthouses and other projections above the roof whose mass is small compared with the mass of the roof.

Procedures other than those presented herein may be acceptable pursuant to the approval of the Director of the Department of Building Inspection.

Commentary: ASCE/SEI 7-10 Sections that discuss non-prescriptive or "alternative" seismic design procedures are reproduced below:

11.1.4 Alternate Materials and Methods of Construction. Alternate materials and methods of construction to those prescribed in the seismic requirements of this standard shall not be used unless approved by the authority having jurisdiction. Substantiating evidence shall be submitted demonstrating that the proposed alternate, for the purpose intended, will be at least equal in strength, durability, and seismic resistance.

12.1.1 Basic Requirements. ...An approved alternative procedure shall not be used to establish the seismic forces and their distribution unless the corresponding internal forces and deformations in the members are determined using a model consistent with the procedure adopted.

San Francisco Building Code sections that discuss non-prescriptive or "alternative" seismic design procedures are reproduced below:

104A.2.8 Alternate materials, design and methods of construction. The provisions of this code are not intended to prevent the use of any material, alternate design or method of construction not specifically prescribed by this code, provided any alternate has been approved and its use authorized by the building official.

The building official may approve any such alternate, provided the building official finds that the proposed design is satisfactory and complies with the provisions of this code and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in suitability, strength, effectiveness, fire resistance, durability, safety and sanitation.

The building official shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding its use. The details of any action granting approval of an alternate shall be recorded and entered in the files of the code enforcement agency.

1604.4 Analysis. Any system or method of construction to be used shall be based on a rational analysis in accordance with well-established principles of mechanics. Such analysis shall result in a system that provides a complete load path capable of transferring all loads and forces from their point of origin to the load-resisting elements.

2. STRUCTURAL DESIGN REVIEW

Structural Design Review shall be in accordance with AB-082. At the conclusion of the review, the Structural Design Reviewer shall provide a written statement that, in their professional opinion, the building elements under their review are equivalent in strength, durability, and seismic resistance of the building to those of a building designed according to the prescriptive provisions of the San Francisco Building Code.

3. SUBMITTAL REQUIREMENTS

Project submittal documents shall be in accordance with the San Francisco Building Code and Department of Building Inspection interpretations, Administrative Bulletins, and policies. In addition, documents relevant to the Structural Design Review shall be submitted by the Engineer of Record to the Director and to the Structural Design Reviewer.

As early as practicable, the Engineer of Record shall submit to the Director an initial Seismic Design Criteria along with a description and initial drawings of the structure. The Seismic Design Criteria shall be consistent with the requirements of this bulletin, and shall be updated to incorporate issues resolved during the Structural Design Review process.

The Seismic Design Criteria shall describe the proposed building and structural system, proposed analysis methodology, and acceptance criteria. The Seismic Design Criteria shall include any proposed exceptions to the prescriptive provisions of the San Francisco Building Code, modeling parameters, material properties, drift limits, element force capacities and deformation capacities. The Seismic Design Criteria shall identify all exceptions to the San Francisco Building Code prescriptive requirements that the Engineer of Record proposes. The Seismic Design Criteria shall be subject to review by the Structural Design Reviewer and approval by the Director. A summary of the Engineer of Record's final Seismic Design Criteria shall be included in the general notes of the structural drawings.

4. SEISMIC DESIGN REQUIREMENTS

The Engineer of Record shall evaluate the structure at the levels of earthquake ground motion as indicated in the subsections below.

If nonlinear response is anticipated under any of the Maximum Considered Earthquake (MCE) ground motions specified in Section 4.3, the Engineer of Record shall apply capacity design principles and design the structure to have a suitable ductile yielding mechanism, or mechanisms, under nonlinear lateral deformation. The code-level analysis shall be used to determine the required strength of the yielding actions. The Engineer of Record shall include in the Seismic Design Criteria all assumptions and factors used in the application of capacity design principles.

Commentary: The purpose of each level of seismic evaluation is as follows:

The code-level evaluation of Section 4.1 is used to identify the exceptions being taken to the prescriptive requirements of the San Francisco Building Code and to define the minimum required strength and stiffness for earthquake resistance. Minimum strength is defined according to San Francisco Building Code minimum base shear equations, with a response modification coefficient *R*, proposed by the Engineer of Record, reviewed by the Structural Design Reviewer, and approved by the Director Minimum stiffness is defined by requiring the design to meet San Francisco Building Code-specified drift limits, using traditional assumptions for effective stiffness. Providing a non-prescriptive seismic design with minimum strength and stiffness comparable to code- prescriptive designs helps produce seismic performance at least equivalent to the code. Minimizing the number of exceptions to prescriptive requirements also helps achieve this aim.

As indicated in Section 4.2, a service-level evaluation is required by this bulletin to demonstrate acceptable seismic performance for moderate earthquakes.

The MCE-level evaluation of Section 4.3 is intended to verify that the structure has an acceptably low probability of collapse under severe earthquake ground motions. The evaluation uses nonlinear response-history analysis to demonstrate an acceptable mechanism of nonlinear lateral deformation and to determine the maximum forces to be considered for structural elements and actions designed to remain elastic.

4.1 Code-Level Evaluation

The seismic structural design shall be performed in accordance with the prescriptive provisions of the San Francisco Building Code, except for those provisions specifically identified by the Engineer of Record in the Seismic Design Criteria as Code Exceptions.

Commentary: Code exceptions that have typically been taken for non-prescriptive designs of tall buildings in high seismic design categories include exceeding the height limitations of ASCE/SEI 7-10 Table 12.2.1. Other exceptions, including provisions related to *R*, , *0*, limitations on *T*, and various detailing requirements, may be considered at the discretion of the Director. The Engineer of Record is required to justify all exceptions to prescriptive code provisions. The scope of structural design review shall include all proposed code exceptions.

The lower limit of ASCE/SEI 7-10 Eq. 12.8-5 and 12.8-6 for the calculation of the Seismic Response Coefficient applies to the scaling process of ASCE/SEI 7-05 Section 12.9. The value of *R* used shall be indicated in the SeismicDesign Criteria, and shall not be greater than 8.5.

The Engineer of Record shall demonstrate that the structure meets the story drift ratio limitations of the San Francisco Building Code using a code-level response-spectrum analysis and the following requirements:

a) The design lateral forces used to determine the calculated drift need not include the minimum base shear limitation of ASCE/SEI 7-10 eq. 12.8-5 and 12.8-6.

b) Stiffness properties of non-prestressed concrete elements shall not exceed 0.5 times gross-section properties.

c) Foundation flexibility shall be considered, using recommendations provided by the Geotechnical Engineerof Record that are defined in the Seismic Design Criteria.

d) The analysis shall account for P-delta effects.

Commentary: ASCE/SEI 7-10 requires the consideration of the minimum base shear of Eq. 12.8-5 and 12.8-6 for checking design story drifts relative to allowable story drifts. However, the consensus of SEAONC's AB-083Task Group for this Administrative Bulletin, approved by the SEAONC Board, is that UBC Formula 30-7 (equivalent to ASCE/SEI 7-10 Eq. 12.8-6) need not be applied to the check of drift limits for tall buildings designed according to this bulletin, because the MCE-level Evaluation of Section 4.3 includes a check of drift for site-specific ground motions. Such ground motions are required to take account of near-fault and directivity effects. The consensus of the task group is that this is an appropriate and more explicit way of addressing the intended purpose of applying Formula 30-7 to the check of drift limits.

Actual concrete stiffness properties may vary significantly from the value of 0.5 times gross-section properties referenced for the code-level check of story drift limits. This assumption is specified to provide a consistent requirement for minimum building stiffness. This requirement is intended to lead to earthquake serviceability performance related to story drift that is at least comparable to that expected of prescriptively-designed tall buildings designed to the San Francisco Building Code.

For the deformation compatibility evaluation of critical non-structural elements, such as exterior curtain wall and cladding systems and egress stairways, the drift ratio demand shall be calculated using the minimum base shear limitations of ASCE/SEI 7-10 Eq. 12.8-5 and 12.8-6. In lieu of this requirement, these critical non-structural elements may be designed for drift ratios at the MCE-level.

4.2 Service-Level Evaluation

A service-level evaluation of the primary structural system is required to demonstrate acceptable, essentially elastic seismic performance at the service-level ground motion.

Commentary: To ensure code-equivalent seismic performance, the Director is requiring a service-level evaluation for new tall buildings utilizing non-prescriptive design procedures.

There are circumstances where there is a reason to believe that the serviceability performance of the design wouldbe worse than that anticipated for a code-prescriptive design. Some of these circumstances have been identified as follows:

a) Where the Engineer of Record has taken any exception to code-prescriptive requirements for non- structural elements (ASCE/SEI 7-10, Chapter 13)

b) Where the stiffness representation of any structural element in the code-level evaluation is significantly less than the effective linear-elastic stiffness described in applicable research

c) For a structure that exhibits disproportionably large drift or accelerations for ground motions less than the San Francisco Building Code Design Basis Ground Motion (not reduced by *R*).

While this bulletin does not require checking all non-structural elements at the service-level evaluation, it is expected that the building cladding will remain undamaged and that egress from the building will not be impeded when the building is subjected to the service-level ground motion.

For the purposes of this bulletin, the service-level ground motion shall be that having a 43-year mean return period (50% probability of exceedance in 30 years).

Structural models used in the service-level evaluation shall incorporate realistic estimates of stiffness and damping considering the anticipated levels of excitation and damage. The evaluation shall demonstrate that the elements being evaluated exhibit serviceable behavior.

Commentary: While essentially elastic performance is required in the service-level ground motion, it is not the intent of this bulletin to require that a structure remain fully linear and elastic. It is permissible for the analysis to indicate minor yielding of ductile elements of the primary structural system, provided such results do not suggest appreciable permanent deformation in the elements, strength degradation, or significant damage to the elements requiring more than minor repair. It is permissible for the analysis to indicate minor and repairable cracking of concrete elements.

Where numerical analysis is used to demonstrate serviceability, the analysis model should represent element behavior that is reasonably consistent with the expected performance of the elements. In typical cases it may be suitable to use a linear response spectrum analysis, with appropriate stiffness and damping, and with the earthquake demands represented by a linear response spectrum corresponding to the service-level ground motion. Where response history analysis is used, the selection and scaling of ground motion time series should comply with the requirements of ASCE/SEI 7-10, Section 16.1.3, with the service-level response spectrum used instead of the design basis earthquake response spectrum, and with the design demand represented by the mean of calculated responses for not less than seven appropriately selected and scaled time series.

As expressed by SEAONC [1999], it should be understood "that the current state of knowledge and available technology is such that the design profession's ability to accurately predict the earthquake performance of a specific building is limited and subject to a number of uncertainties." Actual performance may differ from intended performance.

4.3 Maximum Considered Earthquake-Level Evaluation

Ground Motion: The ground motion representation for this evaluation shall be the Maximum Considered Earthquake(MCE) as defined in ASCE/SEI 7-10, Chapter 21.

A suite of not less than seven pairs of appropriate horizontal ground motion time series shall be used in the analyses. The selection and scaling of these ground motion time series shall comply with the requirements of ASCE/SEI 7-10, Chapter 16, with the following modifications:

a) The MCE response spectrum shall be the basis for ground motion time series scaling instead of the design response spectrum.

b) Either amplitude-scaling procedures or spectrum-matching procedures may be used.

c) Where applicable, an appropriate number of the ground motion time series shall include near fault and directivity effects such as velocity pulses producing relatively large spectral ordinates at relatively long periods.

Commentary: The procedures for selecting and scaling ground motion records, as presented here, represent the current state of practice. The procedures are written to retain some flexibility so that engineering judgment can be used to identify the best approach considering the unique characteristics of the site and the building.

Selection and scaling of earthquake ground motion records for design purposes is a subject of much current research. The Engineer of Record may wish to consider alternative approaches recently proposed; however, some of the proposed approaches have not been adequately tested on tall buildings so their adoption should only be considered with caution. Aspects of particular concern include the long vibration period of many tall buildings and the contributions of multiple vibration "modes" to key response quantities.

At near-fault sites, the average fault-normal response spectrum usually is larger than the average fault-parallel response spectrum due to the presence of a rupture directivity pulse in the fault-normal component of the ground motion. It is important to include in the suite of ground motions an appropriate number of motions that include near-fault and directivity effects so that design drift demands are appropriately determined, especially considering that Section 4.1 permits the design to be exempt from applying Equations 12.8-5 and 12.8-6 to drift calculations. If spectral matching is used, individual ground motion components should account for the distinction between fault-normal and fault-parallel hazard.

Mathematical Model: The three-dimensional mathematical analysis model of the structure shall conform to ASCE/SEI 7-10 Section 12.7.3.

The analyses shall consider the interaction of all structural and non-structural elements that materially affect the linear and nonlinear response of the structure to earthquake motions, including elements not designated as part of the lateral-force-resisting system in the code-level analysis (Section 4.1).

Commentary: This requires explicit modeling of those parts of the structural and non-structural systems that affect the dynamic response of the building. In addition, the effect of building response on all materially affected parts of the building must be evaluated.

The stiffness properties of reinforced concrete shall consider the effects of cracking and other phenomena on initial stiffness.

Commentary: In addition to cracking, effective stiffness can be affected by other phenomena. These include bond slip, yield penetration, tension-shift associated with shear cracking, panel zone deformations, and other effects.

The effective initial stiffness of steel elements embedded in concrete shall include the effect of the embedded zone. For steel moment frame systems, the contribution of panel zone (beam-column joint) deformations shall be included.

The Engineer of Record shall identify any structural elements for which demands for any of the response-history runs are within a range for which significant strength degradation could occur, and shall demonstrate that these effects are appropriately considered in the dynamic analysis.

Commentary: For typical situations, element strength degradation of more than 20% of peak strength should be considered significant.

P- effects that include all the building dead load shall be included explicitly in the nonlinear response history analyses.

Documentation submitted for Structural Design Reviewer review shall clearly identify which elements are modeled linearly and which elements are modeled nonlinearly. For elements that are modeled as nonlinear elements, submitted documentation shall include suitable laboratory test results or analyses that justify the hysteretic propertiesrepresented in the model.

The properties of elements in the analysis model shall be determined considering earthquake plus expected gravity loads. In the absence of alternative information, gravity load shall be based on the load combination $1.0D + Lexp$, where D is the service dead load and $Lexp$ is the expected service live load.

Commentary: In typical cases it will be sufficient to take $Lexp = 0.2L$, where L is the code-prescribed live loadwithout live load reduction.

The foundation strength and stiffness contribution to the building seismic response shall be represented in the model. The foundation strength and stiffness characterization shall be consistent with the strength and stiffness properties of the soils at the site, considering both strain rate effects and soil deformation magnitude.

Analysis Procedure: Three-dimensional nonlinear response history (NLRH) analyses of the structure shall be performed. Inclusion of accidental torsion is not required. When the ground motion components represent site- specific fault-normal ground motions and fault-parallel ground motions, the components shall be applied to the three- dimensional mathematical analysis model according to the orientation of the fault with respect to the building. When the ground motion components represent random orientations, the components shall be applied to the model at orientation angles that are selected randomly; individual ground motion pairs need not be applied in multiple orientations.

Commentary: Three-dimensional analyses are required to represent the inherent torsional response of the building to earthquake ground shaking. This is done by including in the NLRH model the actual locations and distribution of the building mass, stiffness, and strength. Accidental torsion is not required to be included in the NLRH analyses. (Accidental torsion is required for the code-level analysis of Section 4.1.)

The Engineer of Record shall report how damping effects are included in the NLRH analyses. The equivalent viscous damping level shall not exceed 5%, unless adequately substantiated by the Engineer of Record.

Commentary: The effects of damping in an analysis depend on the type of damping model implemented. Some models may over-damp higher modes or have other undesirable effects.

For each horizontal ground motion pair, the structure shall be evaluated for the following load combination:

$$1.0D + Lexp + 1.0E$$

Alternative load combinations, if used, shall be adequately substantiated by the Engineer of Record.

Demands for ductile actions shall be taken not less than the mean value obtained from the NLRH. Demands for low-ductility actions (e.g., axial and shear response of columns and shear response of walls) shall consider the dispersion of the values obtained from the NLRH.

Commentary: In typical cases the demand for low-ductility actions can be defined as the mean plus one standard deviation of the values obtained from the NLRH. Procedures for selecting and scaling ground motions, and for defining the demands for low-ductility actions, should be defined and agreed to early in the review process.

Acceptance Criteria: Calculated force and deformation demands on all elements required to resist lateral and gravityloads shall be checked to ensure they do not exceed element force and deformation capacities. This requirement applies to those elements designated as part of the lateral-force-resisting system in the code-level analysis (Section 4.1), as well as those elements not designated as part of the lateral-force-resisting system in the code-level analysis but deemed to be materially affected.

Commentary: Elements not designated as part of the lateral-force-resisting system in the code-level analysis (gravity systems) may be subjected to substantial deformations and forces, including axial forces accumulated over many stories, as they interact with the primary lateral-force-resisting system. Non-structural elements such as cladding are evaluated according to code requirements. This bulletin does not require checking non-structural elements at the MCE level.

The Engineer of Record shall identify the structural elements or actions that are designed for nonlinear seismic response. All other elements and actions shall be demonstrated by analysis to remain essentially elastic.

Commentary: Essentially elastic response may be assumed for elements when force demands are less than design strengths. Design strengths for non-ductile behaviors (e.g., shear and compression) of these essentially elastic elements are defined as nominal strengths, based on specified material properties, multiplied by strength reduction factors as prescribed in the SFBC. Design strengths for ductile behaviors of these essentially elastic elements are defined as nominal strengths, based on expected material properties, multiplied by ϕ=1.0. Alternative approaches to demonstrating essentially elastic response may be acceptable where appropriately substantiated by the Engineer of Record.

For structural elements or actions that are designed for nonlinear seismic response, the Engineer of Record shall evaluate the adequacy of individual elements and their connections to withstand the deformation demands. Force and deformation capacities shall be based on applicable documents or representative test results, or shall be substantiated by analyses using expected material properties.

The average result, over the NLRH analyses, of peak story drift ratio shall not exceed 0.03 for any story.

All procedures and values shall be included in the Seismic Design Criteria and are subject to review by the Structural Design Reviewer and approval by the Director.

Originally signed by:

Isam Hasenin, P.E., C.B.O.,
Director
Department of Building Inspection

Approved by the Building Inspection Commission on March 19, 2008

OFFICE OF THE MAYOR
SAN FRANCISCO

EDWIN M. LEE
MAYOR

September 9, 2016

The Honorable Dianne Feinstein
United States Senate
331 Hart Senate Office Building
Washington, D.C. 20510

Dear Senator Feinstein:

Thank you for your letter regarding seismic safety of high-rise buildings in San Francisco. As you know, earthquake resilience has been a key priority of mine stretching back to my days as DPW Director and City Administrator.

You asked for more information about the Millennium Tower at 301 Mission Street. Specifically, the building permit approval process for this building commenced in 2002 under the 2001 California Building Code, and the Department of Building Inspection initiated a peer review process from a panel of experts, as they typically do for high-rise construction that employs a design-based approach. 301 Mission Street went through that process and was designed and constructed to the approved plans, building codes and standards in place at the time. That said, the Department of Building Inspection has suggested the Homeowners' Association make corrective actions to improve the joints, plumbing, and other operational parts of the building.

More broadly, you also expressed concern about the potential number of buildings in San Francisco that are not anchored to bedrock. Modern high rises typically employ a performance-based design to ensure that the building meets the structural requirements of the current code. To this end, the Department of Building Inspection has already enhanced and clarified their process for having skyscrapers peer-reviewed by a panel of experts prior to approval to begin construction.

As all Mayors of San Francisco know so deeply, earthquake preparedness is always a first priority, and we must strive for continual improvement. In my time as City Administrator and Mayor, I led and initiated my 30-year Earthquake Safety Implementation Plan (ESIP), a multi-point program to evaluate and retrofit seismically vulnerable buildings and to pass new laws to make our City more resilient. I'm proud of the progress my Administration has made thus far which includes the retrofit of more than 5,000 dangerous soft story buildings by 2020, evaluating all of the City's private schools for earthquake risks by 2017 and tougher regulations requiring façade inspections of every building in San Francisco more than five stories in height. We have also successfully passed $812 million in Earthquake Safety & Emergency Response general obligation bonds.

To address the specific issue in your letter about high-rise resiliency, I am requesting the Department of Building Inspection's Code Advisory Structural Subcommittee immediately

1 DR. CARLTON B. GOODLETT PLACE, ROOM 200
SAN FRANCISCO, CALIFORNIA 94102-4681
TELEPHONE: (415) 554-6141

review ground failure mitigation measures for buildings in geologically hazardous areas and make recommendations to the Building Inspection Commission.

As a further result of your writing, I have directed the Department of Building Inspection and the Office of Resilience & Recovery to amend our 30-year ESIP plan to expedite the safety of new and existing high-rise buildings. Specifically, I have ordered immediate inclusion into this year's work plan of:

- Reviewing ground failure mitigation measures for buildings in geologically hazardous areas (ESIP Task B.6.c)
- Mandatory earthquake evaluations at the time of sale (ESIP Tasks A.2.a and B.2.c)
- Mandatory evaluation and retrofit of buildings with more than 300 occupants (ESIP Task C.2.c)
- Mandatory evaluation and retrofit of other low performing buildings (ESIP Task C.2.e)

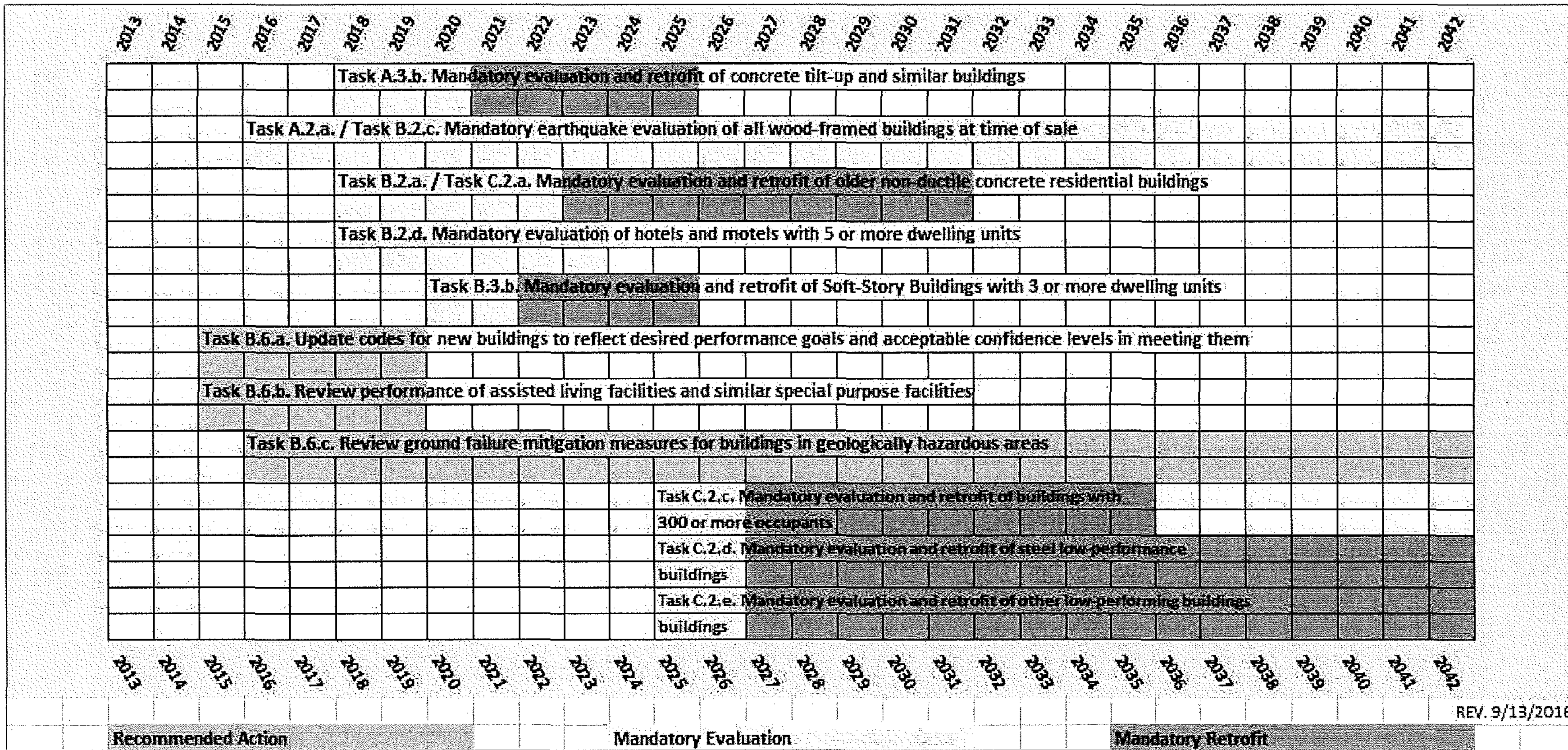
Previously, several of these tasks were spread over the next 25 years. As a result of your letter, and my direction to staff, we're starting this work right away.

I appreciate your attention to this issue, and I always welcome your continued guidance on protecting San Francisco.

Sincerely,

Edwin M. Lee
Mayor, City & County of San Francisco

2016-2017 Earthquake Safety Implementation Committee (ESIC) Tasks



From: Otellini, Patrick (ADM)
Sent: Wednesday, September 21, 2016 11:16 AM
To: Peskin, Aaron (BOS); Angulo, Sunny (BOS)
Cc: Major, Erica (BOS); Calvillo, Angela (BOS); Elliott, Jason (MYR); Elliott, Nicole (MYR); Kelly, Naomi (ADM)
Subject: RE: Letter of Inquiry in advance of Thursday's hearing
Attachments: 160909 MEL Feinstein Letter.pdf; 2016.2017 ESIC Tasks.pdf

Good morning Supervisor Peskin,

In reference to your letter and in anticipation of tomorrow's hearing I am happy to provide this response to your request regarding the building located at 301 Mission Street. Our office has not issued any official responses in the form of letters, emails, memorandums or bulletins in reference to this project. We provided guidance to the Mayor's office in responding to Senator Feinstein's letter by advising on the following items from the City's 30 Year Earthquake Safety Implementation Program that could be accelerated and added to our current policy agenda for the coming year:

- Reviewing ground failure mitigation measures for buildings in geologically hazardous areas (ESIP Task B.6.c) *– This task is already underway by the Department of Building Inspection and they will be directing their Structural Subcommittee of the Code Advisory Committee to review this issue and make recommendations to the Building Inspection Commission per the Mayor's letter to Senator Feinstein (Mayor's letter attached).*

- Mandatory earthquake evaluations at the time of sale (ESIP Tasks A.2.a and B.2.c)
- Mandatory evaluation and retrofit of buildings with more than 300 occupants (ESIP Task C.2.c)
- Mandatory evaluation and retrofit of other low performing buildings (ESIP Task C.2.e) *– These three existing tasks from the City's 30 Year ESIP plan have been included in this year's legislative work plan. The second attached file shows the existing identified policy initiatives from the larger 30 year timeline that we are actively working on now through the Earthquake Safety Implementation Committee.*

Your letter also mentioned the work I do as the City's Chief Resilience Officer. In addition to overseeing the City's 30 year ESIP plan, our office also recently released Resilient San Francisco – Stogner Today, Stronger Tomorrow which is a strategy on building greater resilience in San Francisco and includes much of our work on earthquake safety but also brings the issues of climate change and sea level rise and other hazards that an uncertain future will most certainly bring to our City. I look forward to the opportunity to brief you and your staff on this strategy as well as review the status and development of our current programs such as the Mandatory Soft Story Retrofit Program, the Private School Earthquake Evaluation Program and our new Façade Maintenance Program.

Thank you and please don't hesitate to contact myself or my staff with any additional questions.

Best,

Patrick Otellini
Chief Resilience Officer
Director, Office of Resilience and Recovery
City and County of San Francisco
Office of the City Administrator

1 Dr. Carlton B. Goodlett Place
City Hall, Room 362
San Francisco, CA 94102
Direct: (415) 554-5404 | E-Mail: Patrick.otellini@sfgov.org
www.sfgov.org/orr

From: Peskin, Aaron (BOS)
Sent: Tuesday, September 20, 2016 7:09 PM
To: Otellini, Patrick (ADM) <patrick.otellini@sfgov.org>; Elliott, Nicole (MYR) <nicole.elliott@sfgov.org>
Cc: Calvillo, Angela (BOS) <angela.calvillo@sfgov.org>; Major, Erica (BOS) <erica.major@sfgov.org>; Angulo, Sunny (BOS) <sunny.angulo@sfgov.org>
Subject: Letter of Inquiry in advance of Thursday's hearing

Mr. Otellini and Ms. Elliott:

Attached, please find a letter of inquiry in the furtherance of this Thursday's hearing objectives. Please transmit responses to me and my staff, Sunny Angulo, before Thursday.
I look forward to your response.

Best,

Aaron

****

Aaron Peskin
District 3 Supervisor
415.554.7450 – VOICE
Aaron.Peskin@sfgov.org

From: Elliott, Nicole (MYR)
Sent: Wednesday, September 21, 2016 11:20 AM
To: Peskin, Aaron (BOS); Otellini, Patrick (ADM)
Cc: Calvillo, Angela (BOS); Major, Erica (BOS); Angulo, Sunny (BOS)
Subject: RE: Letter of Inquiry in advance of Thursday's hearing
Attachments: 8.10.16 Feinstein.pdf; 9.9.16 Lee.pdf; 9.14.16 Feinstein.pdf

Good afternoon Supervisor Peskin,

Please find the following letters attached:

1) August 10th letter from Senator Feinstein to Mayor Lee
2) September 9th letter from Mayor Lee to Senator Feinstein
3) September 14th letter from Senator Feinstein to Mayor Lee

Please feel free to be in touch if you have questions related to these letters.

Best,
Nicole

Nicole A. Elliott
Director, Legislative & Government Affairs
Office of Mayor Edwin M. Lee
(415) 554-7940

From: Peskin, Aaron (BOS)
Sent: Tuesday, September 20, 2016 7:09 PM
To: Otellini, Patrick (ADM) <patrick.otellini@sfgov.org>; Elliott, Nicole (MYR) <nicole.elliott@sfgov.org>
Cc: Calvillo, Angela (BOS) <angela.calvillo@sfgov.org>; Major, Erica (BOS) <erica.major@sfgov.org>; Angulo, Sunny (BOS) <sunny.angulo@sfgov.org>
Subject: Letter of Inquiry in advance of Thursday's hearing

Mr. Otellini and Ms. Elliott:

Attached, please find a letter of inquiry in the furtherance of this Thursday's hearing objectives. Please transmit responses to me and my staff, Sunny Angulo, before Thursday.
I look forward to your response.

Best,

Aaron

****
Aaron Peskin
District 3 Supervisor
415.554.7450 – VOICE
Aaron.Peskin@sfgov.org

DIANNE FEINSTEIN
CALIFORNIA

SELECT COMMITTEE ON INTELLIGENCE - VICE CHAIRMAN
COMMITTEE ON APPROPRIATIONS
COMMITTEE ON THE JUDICIARY
COMMITTEE ON RULES AND ADMINISTRATION

United States Senate

WASHINGTON, DC 20510-0504
http://feinstein.senate.gov

August 10, 2016

The Honorable Edwin Lee
Mayor
City Hall
1 Dr. Carlton B. Goodlett Place
San Francisco, CA, 94102

Dear Mayor Lee:

I have been reading with increasing alarm the recent stories about the Millennium Tower and its reported sinking and tilting. As you know, I have had great concern, generally, with the recent residential and commercial density increase in San Francisco, as well as concern about the City's preparedness for a large scale seismic event. Now, to add to that mix of concern, I am left wondering if the City's building code played any role in allowing this sinking and tilting to happen, and whether or not other approved buildings are suffering the same fate.

The fact most alarming to me is that the Millennium's engineers constructed the building only over a thick concrete slab, supported by piles roughly 80 feet into dense sand **as opposed to drilling piles into the bedrock 200 feet down**. While I was always under the impression that buildings needed to be anchored to bedrock, I have learned that there are numerous buildings throughout San Francisco (e.g. the Embarcadero buildings, AT&T Park, Moscone Center) that have used a similar type of foundation.

I met recently with Patrick Otellini, your Chief Resiliency Officer, who spoke at great length about the work you are leading to keep the City safe in the event of a large seismic event. Thank you for that work. However, I believe answering the question of the seismic stability of these new high buildings, other such buildings currently in the construction or review phase, and whether or not they can sufficiently survive a large scale earthquake without being anchored into bedrock should become a top priority for you.

I suggest reaching out to leaders in the world of academia to solicit their guidance and input, as opposed to current geotechnical engineers currently practicing in the field in order to avoid any appearance of conflict of interest. Consider forming a "Mayoral Seismic Safety Advisory Committee," or other panel of independent experts who can advise you and the Department of Building Inspection thoroughly and independently. If I can be of any help to you in this endeavor, please know I am at your service.

Sincerely,

Dianne Feinstein
United States Senator

OFFICE OF THE MAYOR
SAN FRANCISCO

EDWIN M. LEE
MAYOR

September 9, 2016

The Honorable Dianne Feinstein
United States Senate
331 Hart Senate Office Building
Washington, D.C. 20510

Dear Senator Feinstein:

Thank you for your letter regarding seismic safety of high-rise buildings in San Francisco. As you know, earthquake resilience has been a key priority of mine stretching back to my days as DPW Director and City Administrator.

You asked for more information about the Millennium Tower at 301 Mission Street. Specifically, the building permit approval process for this building commenced in 2002 under the 2001 California Building Code, and the Department of Building Inspection initiated a peer review process from a panel of experts, as they typically do for high-rise construction that employs a design-based approach. 301 Mission Street went through that process and was designed and constructed to the approved plans, building codes and standards in place at the time. That said, the Department of Building Inspection has suggested the Homeowners' Association make corrective actions to improve the joints, plumbing, and other operational parts of the building.

More broadly, you also expressed concern about the potential number of buildings in San Francisco that are not anchored to bedrock. Modern high rises typically employ a performance-based design to ensure that the building meets the structural requirements of the current code. To this end, the Department of Building Inspection has already enhanced and clarified their process for having skyscrapers peer-reviewed by a panel of experts prior to approval to begin construction.

As all Mayors of San Francisco know so deeply, earthquake preparedness is always a first priority, and we must strive for continual improvement. In my time as City Administrator and Mayor, I led and initiated my 30-year Earthquake Safety Implementation Plan (ESIP), a multi-point program to evaluate and retrofit seismically vulnerable buildings and to pass new laws to make our City more resilient. I'm proud of the progress my Administration has made thus far which includes the retrofit of more than 5,000 dangerous soft story buildings by 2020, evaluating all of the City's private schools for earthquake risks by 2017 and tougher regulations requiring façade inspections of every building in San Francisco more than five stories in height. We have also successfully passed $812 million in Earthquake Safety & Emergency Response general obligation bonds.

To address the specific issue in your letter about high-rise resiliency, I am requesting the Department of Building Inspection's Code Advisory Structural Subcommittee immediately review ground failure mitigation measures for buildings in geologically hazardous areas and make recommendations to the Building Inspection Commission.

As a further result of your writing, I have directed the Department of Building Inspection and the Office of Resilience & Recovery to amend our 30-year ESIP plan to expedite the safety of new and existing high-rise buildings. Specifically, I have ordered immediate inclusion into this year's work plan of:

- Reviewing ground failure mitigation measures for buildings in geologically hazardous areas (ESIP Task B.6.c)
- Mandatory earthquake evaluations at the time of sale (ESIP Tasks A.2.a and B.2.c)
- Mandatory evaluation and retrofit of buildings with more than 300 occupants (ESIP Task C.2.c)
- Mandatory evaluation and retrofit of other low performing buildings (ESIP Task C.2.e)

Previously, several of these tasks were spread over the next 25 years. As a result of your letter, and my direction to staff, we're starting this work right away.

I appreciate your attention to this issue, and I always welcome your continued guidance on protecting San Francisco.

Sincerely,

Edwin M. Lee
Mayor, City & County of San Francisco

DIANNE FEINSTEIN
CALIFORNIA

SELECT COMMITTEE ON INTELLIGENCE - VICE CHAIRMAN
COMMITTEE ON APPROPRIATIONS
COMMITTEE ON THE JUDICIARY
COMMITTEE ON RULES AND ADMINISTRATION

United States Senate
WASHINGTON, DC 20510-0504
http://feinstein.senate.gov

September 14, 2016

Dear Mayor Lee: Ed

Thank you for your September 9, 2016 response to my August 10, 2016 letter to you raising concerns about the reported "sinking and tilting" of the Millennium Tower. I am very encouraged by your response detailing your commitment to moving forward action items within the City's Earthquake Safety Implementation Plan for high rise buildings. Your letter makes clear you remain steadfast, as you have throughout your public service career, to ensuring the seismic safety of San Francisco – thank you!

Specifically to the Millennium Tower, I also appreciate your response summarizing the building permit approval process prior to the construction of the Tower. Moving forward, what role will the City play in addressing the continued "sinking and tilting" of the building? What role can you play as Mayor to ensure that all impacted City Departments stand at the ready to assist the developer, the homeowner's association, and other impacted parties, as they formulate a plan to fix the problem? Most importantly, what can you do to ensure the residents of San Francisco that its City government is on top of the issue?

As always, I am more than pleased to offer any assistance I can to the City of San Francisco.

Sincerely,

Dianne

The Honorable Edwin Lee
Mayor
City Hall
1 Dr. Carlton B. Goodlett Place
San Francisco, CA, 94102

Member, Board of Supervisors
District 3

City and County of San Francisco

AARON PESKIN

September 20, 2016

Patrick Otellini, Chief Resilience Officer
Office of the City Administrator, Room 362

Nicole Elliott, Director of Legislative & Government Affairs
Office of Mayor Edwin M. Lee, Room 200

Mr. Otellini and Ms. Elliott:

Thank you for making yourself available to participate in the hearing this Thursday, September 22, 2016 at 10:00am at the Government Audit and Oversight Committee (GAO).

I understand that you are the world's first Chief Resilience Officer, and I am eager to know more about your office and the specific work you have undertaken to address resiliency and recovery efforts here in San Francisco. I also understand that you have considerable experience after spending a decade in the private sector dealing with building code compliance issues, so I appreciate the guidance you have been giving the City on these issues since assuming your post.

The GAO committee members will be using the recent revelations around 301 Mission Street as a case study in the first of a series of hearings on buildings standards in seismic zones, and I am requesting your assistance in providing any and all letters, emails, memorandums or bulletins that you have submitted to city staff or drafted for the Mayor or any of his staff in your role as the City's resident expert as to the condition and seismic safety and sustainability of the 301 Mission Street project.

Ms. Elliott, the September 13, 2016 *SF Magazine* article "Millennium Tower Goes on Trial" includes a letter from Mayor Lee to Senator Dianne Feinstein dated September 9, 2016. Please provide any correspondence that triggered Mayor Lee's official response on behalf of the City.

Thank you both in advance for your help in facilitating this hearing by transmitting these documents in advance of this Thursday. Please feel free to contact my staff, Sunny Angulo, with further questions.

Best,

Aaron Peskin

City Hall • 1 Dr. Carlton B. Goodlett Place • Room 244 • San Francisco, California 94102-4689 • (415) 554-7450
Fax (415) 554 - 7454 • TDD/TTY (415) 554-5227 • E-mail: aaron.peskin@sfgov.org

Member, Board of Supervisors
District 3

AARON PESKIN

City and County of San Francisco

September 20, 2016

Tom C. Hui
Department of Building Inspection, Director
1660 Mission Street, Sixth Floor
San Francisco, CA 94103

Dear Director Hui:

Thank you for working to prepare for this Thursday's Government Audit and Oversight hearing. In addition to the questions we transmitted on September 12, 2016, please be advised of the following questions, as well:

- What other projects have been built on friction piles in the city? Out of those projects, which friction piles go into clay and which go into sand? Please provide a list for the hearing and indicate whether the buildings are constructed out of steel or concrete.

- Please provide an overview of the dewatering and drilling preparation work that happened at 301 Mission Street prior to 2010.

- How many permit expeditors were involved with the 301 Mission project over the course of its vetting and approval process?

- How many inspectors does the Department of Building Inspection (DBI) employ and how many are necessary to evaluate projects over 120 feet? How many inspectors were assigned to evaluate the seismic safety and structural soundness of 301 Mission Street?

- What is the relationship of Consolidation Engineering Laboratories (CEL) to the 301 Mission Street project and any other projects since? What about Construction Testing Service (CTS) Inspection Company?

- Who signs off on Requests for Information from engineers within DBI typically? Who signed off on any Requests for Information on the 301 Mission Street project, as well as any inspection punch lists?

- Has the successful performance of tower buildings on pads in a seismic zone (particularly on poor quality soil deposits) been proven?

Thank you for your attention to these inquiries, and I look forward to the September 22 hearing.

Aaron Peskin

City Hall • 1 Dr. Carlton B. Goodlett Place • Room 244 • San Francisco, California 94102-4689 • (415) 554-7450
Fax (415) 554 - 7454 • TDD/TTY (415) 554-5227 • E-mail: aaron.peskin@sfgov.org

Member, Board of Supervisors
District 3

City and County of San Francisco

AARON PESKIN

September 12, 2016

Tom C. Hui
Department of Building Inspection, Director
1660 Mission Street, Sixth Floor
San Francisco, CA 94103
CC: Angela Calvillo; William Strawn; Lily Madjus

Dear Director Hui:

Thank you for copying me on the public records request regarding 301 Mission Street. After review of the documents, I have asked the Clerk of the Board to transmit this letter of inquiry in order to obtain further information and to give the Department of Building Inspection official notice that I am convening a special meeting of the Government Audit and Oversight Committee to hear File #160975 on Thursday, September 22, 2016 at 10:00am.

I request the following individuals to be present: William Strawn, Daniel Lowrey, Gary Ho and former staff and Acting Director Amy Lee.

The documents responsive to the NBC Investigative Unit's disclosure request seem woefully incomplete. Please identify what documents were not turned over and why.

Additional questions in advance of the September 22nd hearing:

- In 2005, geotechnical engineers, Treadwell & Rollo wrote that the project's structural engineer would determine the depth of the piles, yet there are no documents identifying this review or approval process. Please provide this written determination.
- The 2006 correspondence between the Department of Building Inspection and the lead at DeSimone Consulting Engineers focuses primarily on DBI concerns with the proposed BauGrid® reinforcement system installed at 301 Mission. All but one of of these 22 pages of documents deal with these prefabricated joints, which received review and approval by the structural review panel consisting of Mr. Hardip Pannu and Professor Jack Moehle. Oddly, the subject of the structural foundation was *not* covered in the correspondence, leading me to inquire whether or not there was peer review of this critical aspect of the project.
- What is the Department of Building Inspection's current policy on performance-based peer review of structural foundations for projects over 120 ft? Has this policy always been in place, or did it come about at a certain time? Why was it changed or created?
- Why does the Department of Building Inspection have an inquiry in 2009 regarding the larger than expected settlements of the high-rise and mid-rise buildings at 301 Mission, but no response included in its disclosure? Please provide the response from DeSimone Consulting Engineers.
- The DeSimone Consulting Engineers letter from February 2009 states that they *do not* expect differential settlement to occur. What was the Department's response to this

assertion and was this the understanding when the Certificates of Occupancy were issued, that no differentiated settlement had been noticed to any oversight agency?

- In 2008 negotiations appear to have been ongoing to expedite life safety inspections in order to obtain a temporary occupancy for the 60 story residential high rise at 301 Mission. On what basis did the city feel it should expedite the issuance of temporary occupancy permits? Who was the permit expediter for the 301 Mission project?
- Why does the City have an unsigned report put together by an independent structural engineer, with no responses or follow-up from Department officials? The Draft Foundation Settlement investigation by Ronald Hamburger identifies a number of issues, including aggressive dewatering during construction (even *before* additional dewatering as a result of the Transbay project), as well as projected sinkage over the anticipated norm.
- As stated prior, the DeSimone Consulting Engineers 2009 report stipulated to no differential settlement but that marginal shift can be expected. Yet the Hamburger report later identified foundational cracking as a serious concern. Please explain this information and assessment gap. Whose responsibility is it to notify the City when new verifiable concerns are flagged or found to be substantive? Did the Hamburger report cause the City concern and are there any additional geotechnical structural reviews that have additional information warranting analysis that we have not been made aware of?
- According to the Hamburger report, the pile drives were built into mud clay *not* dense sand. Does this sediment create enough "friction" for friction piles to maintain their depth and stability and not sink? Was this evaluated before approval?
- Please also submit a complete list in advance of the hearing of projects within the waterfront, Transbay and Rincon Hill neighborhood plan areas that have opted to drill down to bedrock and those that have not, along with their height and whether they utilized performance-based design with peer review.
- Please provide a comparison of the structural analysis and approval standards required in Section 1701 of the San Francisco Building Code, the California Uniform Building Code and the federal requirements, including whether peer review of project foundations is required or encouraged as a best practice.
- What are the implications of the existing aggravated lean at 301 Mission Street on the seismic sustainability of the adjacent Transbay project and what steps is the City undertaking to ensure we protect our investment in this public project, given the new information?
- How many Certificates of Occupancy has the Department of Building Inspection issued since 301 Mission Street in the Transbay and Rincon neighborhoods?
- What steps is the Department undertaking to remediate the issues that have been uncovered at 301 Mission and the potential projects in the surrounding neighborhood? What recommendations can you offer that we must pursue immediately?

Please work with my staff to transmit this information in advance of the September 22 hearing and be prepared to discuss it as a part of our collective efforts to ensure the appropriate standards for our city-approved projects moving forward.

Thank you for your cooperation.

Best,

Aaron Peskin

Millennium Litigation Group
930 Montgomery Street, Suite 600
San Francisco, CA 94133
Tel: (415) 433-3475
Fax: (415) 781-8030
www.millenniumlitigation.com

Re: Item 160975, Special Meeting September 22, Government Audit and Oversight Committee

We represent the homeowners of the Millennium Tower in a Class Action - Superior Court Of The State of California City and County Of San Francisco, case number: Ct CGC -16-553574. For more information you may see www.Millenniumlitigation.com

We thank the Government Audit and Oversight Committee, and particularly Supervisor Peskin, for the good work they are doing to probe the background of 301 Mission, and better understand the challenges of erecting high-rise, and skyscraper structures on precarious soil conditions in San Francisco. Their concerns to establish whether there was political pressure, or corruption involved in the approvals is commendable. While it is very important to understand and learn from the history of this building, and what may have gone wrong along the way, it is far, far more important to fully understand what public safety issues are posed by its present condition, and how it may further be detrimentally impacted by future causes.

As the various stakeholders position their interests to pursue litigation, they have each retained experts to opine on what the causes of the sinking and tilting may be. Each party and their experts, will for obvious reasons, spin, and nuance the opinions to advance their ultimate agenda, laying blame at the feet of others. Additionally, the various experts' opinions will not be made known until years from now when depositions will be taken before trial. During the course of litigation, the investigation results and conclusions, which are considered attorney work product, will be shielded from public scrutiny, and even from the homeowners by their own HOA experts. The various stakeholders have financial interests in assuaging the homeowners and the city, with opinions that the building is currently safe. However, such opinions must be viewed with suspicion. There currently is no independent, unbiased review of the life safety condition of Millennium Tower, and it is unlikely with pending complex litigation that there will be any such reliable independent, unbiased opinion in the near future.

It is without dispute that the Millennium Tower skyscraper currently stands in a compromised state, as it continues to sink and lean. There is very serious life safety concern by all, for the homeowners, the other buildings in the vicinity (including the Transbay Terminal), and the citizens of San Francisco. The failure of the Millennium Tower could potentially cause catastrophic damage to property, and life, unlike anything this city has previously experienced.

There are allegations that the foundation was improperly designed, and/or has been adversely impacted by changes in the water table brought about by construction activities. There has been no independent investigation to date, to determine how much of a life safety hazard this massive skyscraper is currently posing, or may cause in the future. Many factors may have the potential to turn this magnificent structure, the crown jewel of the Transbay Terminal, into an instrument of mass destruction. Earthquakes, changes in the water table, either man made or through natural causes such as the rising sea level, or a prolonged drought in California, are just a few obvious factors to investigate and consider. This building may be totally safe for a long time in the future, or may be a ticking time bomb, resulting in a catastrophe of epic proportions. It is critical that the City and County of San Francisco act immediately to protect the homeowners, and the public. A complete independent investigation into the current and future public safety condition of the building must be implemented immediately.

The appropriate agencies of the San Francisco government, who have the power to do so, should immediately implement a full investigation by well qualified, unbiased experts, under their public supervision, who owe no loyalty to any of the stakeholders in this conflict. Such work product and findings should be transparent and made public to avoid any bias and maintain integrity.

We hope and trust that the Honorable Mayor, Board of Supervisors, Senator Diane Feinstein who has expressed interest, and appropriate city officials, will agree that such an investigation is urgently needed, and will take immediate steps to bring it about.

Sincerely,

Millennium Litigation Group

www.millinniumlitigation.com
Mark M. Garay, Esq.
Law Offices Of Mark M. Garay

Department of Building Inspection

Building Standards in Seismic Safety Zones

Tom Hui, Director, S.E., C.B.O.

September 22, 2016

Role of DBI in Construction Process

- Review plans and designs developed by architects and engineers hired by project sponsor to verify compliance with code in force at time plans are submitted for review.
- Conduct site inspections to verify that construction is in accordance with approved plans.
- Address code compliance issues raised through complaints submitted by San Francisco residents.

301 Mission - General Project Information

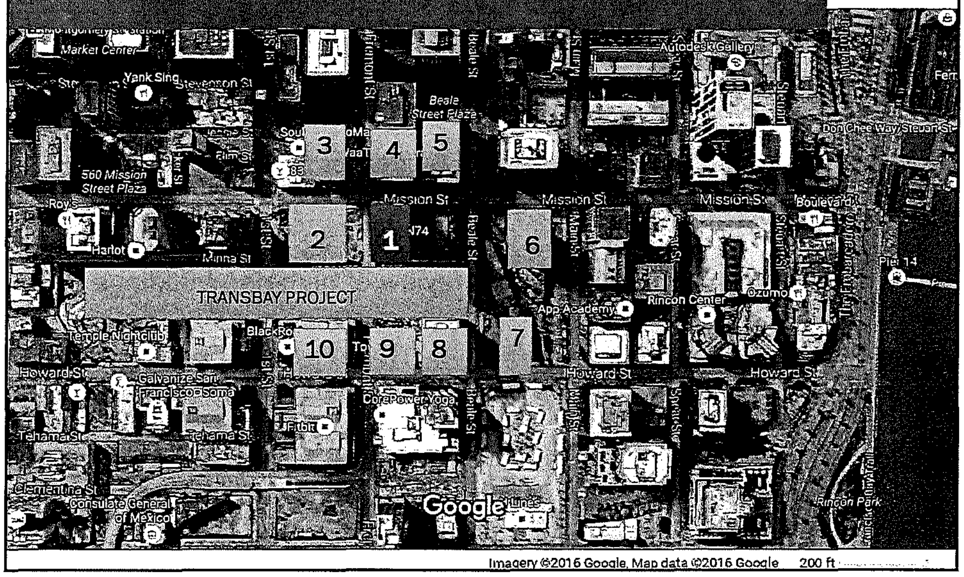
Permit Application	200210239696
Project Description	Erect 58-story 420 residential units
Type of Construction	Type I (Concrete)
Project Valuation	$175M
Foundation Type	Mat slab with 900+ 14 inch square piles driven down 66-91 feet
Building Code In Effect	2001 CA Building Code

301 Mission
Permit Issuance & CFC Timeline

Permit Filed	October 2002
Permit Issued	September 2005
TCOs	March 19/May 8, 2009
CFC Issued	August 2009

- DBI issues a TCO only after verifying that life safety components are installed in accordance with plans and are functional (plumbing, electrical, building, and fire).
- DBI inspected project site regularly from Jan 2006 – Aug 2009 and found no signs of settlement.

Map of Surrounding Buildings



Building Foundation Types

Number	Address	Stories	Sub	Foundation	Building Permit Issuance	Type of Construction
1	301 Mission Residential Tower	58	1	Tower: Mat w/ 14 insq piles 66ft-91ft	2006	Concrete
	Retail	12	5	Retail: Mat w/o piles		
2	415 Mission	61	3	Bedrock	2013	Concrete
3	50 Fremont	42	1	Piles: 49 feet long	1981	Steel
4	350 Mission	30	4	Mat w/ no piles	2012	Concrete
5	50 Beale	23	1	Piles: 55 feet long	1967	Steel
6	201 Mission	30	1	Piles: 95 feet piles	1979	Steel
7	250 Howard	45	2	4 to 6'0 pier into bedrock	Currently in review: foundation permit issued 2015	Concrete
8	199 Fremont	27	3	Matt no piles	2001	Steel
9	181 Fremont	56	5	5'0 pier into bedrock	2013	Steel
10	400 Howard	10	2	43 feet piles	2006	Concrete

Current Policies for Tall Buildings

- Use of Administrative Bulletins (adopted in March 8, 2008) for Tall Buildings:
  1. **AB 082** – Guidelines and Procedures for Structural Design Review and
  2. **AB 083** – Requirements & Guidelines for the Seismic Design of New Tall Buildings Using Non-Prescriptive Seismic Design Procedures.
- Mandatory structural design review of high-rise buildings over 240 ft. in height
- Any performance based design building structure will require AB 082 review.
- These ABs have been used as a model by other jurisdictions

Status

1. DBI is investigating reports of settlement at 301 Mission.
2. DBI has requested a final, signed copy of the 2014 Foundation Settlement Investigation report and a copy of the 2016 updated report by Simpson Gumpertz & Heger on behalf of project sponsor.
3. DBI has issued a request to the building owners and its engineering and technical teams to keep DBI informed specifically about any observed effects on the building's life safety systems that may be connected to the settlement, and to provide us with an updated engineering report by the end of September.

Allana Buick & Bers, Inc.
990 Commercial Street
Palo Alto, CA 94303
t 650.543.5600
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www.abbae.com

ALLANA BUICK & BERS
Making Buildings Perform Better

December 15, 2016

Denis F. Shanagher
Duane Morris LLP
Spear Tower
One Market Plaza, Suite 2200
San Francisco, CA 94105-1127

Re: The Millennium Tower – Residential Unit 31B, Odor Transfer Investigation Progress Report - DRAFT

Denis,

In accordance with your request, Allana Buick & Bers, Inc. (ABBAE) is in the process of conducting a field investigation and analysis of residential unit 31B at The Millennium Tower in San Francisco, CA. We are pleased to present Duane Morris (DM) with a progress report of our investigation and preliminary findings.

Background

The Millennium Tower site consists of a 58 story multi residential hi-rise and a 9 story mid-rise building, built during 2008 and 2009. The resident of Unit 31B has been reporting infiltration of assorted odors into her condominium unit for the last 4 years. The focus of the investigation will be to test the existing conditions of the residence, the integrity of the unit surrounding walls, ceilings & floors and to provide analysis and repair recommendations based on our findings.

- The Millennium Tower, Unit 31B has a typical 2 bedroom 2.5 bathroom floor plan.
- The two bathrooms, the toilet room and the kitchen hood are served by a common exhaust duct which discharges into a vertical exhaust shaft routed up to a rooftop exhaust fan.
- A separate exhaust riser serves the clothes dryer exhaust.
- The unit heating and cooling is provided by two water source heat pumps. One heat pump [HP-C] supplies the master bedroom and part of the living room/dining room and the other heat pump [HP-B] supplies the small bedroom and part of the living room.
- As reported to us by the resident of 31B; the detection of undesirable indoor odors occurred at seemingly random periods of the day. The locations within the residence, where the smells were noticed, also varied without any consistency. And finally the types of odors were varied, from different food sources to smoke smells.
- The Building Engineers, we interviewed, stated that very few odor transfer issues have been reported by other units in the Millennium. There were some odor complaints, in the past, that were resolved by adjusting and balancing the building common exhaust and supply air systems.

Site Investigation

An initial non-destructive site survey at the Millennium Tower Unit 31B was conducted by ABBAE staff on October 7, 2016. It included a general walk through of the residence and an interview with the unit resident and the building engineers.

On December 8, 2016; ABBAE staff conducted a series of onsite **smoke tests.** The object of the test was to determine if a path of air transfer existed between the subject residence in Unit 31B and the residence directly below, Unit 30B.

The smoke tests were performed utilizing "smoke emitters" by Regin HVAC Products [Model S104, 3 minute cartridges] which emit white colored and scented smoke.

Unit 31B/30B SmokeTest Description

Six test locations were selected within the residence (as indicated in the attached unit floor plan):

ST1 – Wall cavity behind Heat Pump [HP-C]
*Note that access to this location required a 24"x24" wall opening to be cut in the master bedroom of Units 30B and 31B.
ST2 – Area below living room window, adjacent to heat pump closet.
ST3 – Area below living room window, to the right of ST2.
ST4 – Area below kitchen exhaust hood
ST5 – Heat Pump [HP-B] closet
ST6 – Master bathroom.

Test 1
11:00 AM (1) smoke emitter cartridge was setoff in Unit 30B at ST2
- Odor detected in Unit 31B kitchen area near heat pump HP-C closet.
- Faint smoke haze in same area.

Test 2
11:40 AM (1) smoke emitter cartridge was setoff in Unit 30B at ST1
- Significant amount of smoke streaming out of gaps in exterior wall (curtain wall) within the cavity behind the heat pump.

Test 3
12:00 PM (2) smoke emitter cartridges was setoff in Unit 30B at ST1
- Significant amount of smoke streaming out of gaps in exterior wall (curtain wall) within the cavity behind the heat pump.
- Similar to Test 2 but resulting in more intense smoke transfer.

Test 4
12:30 PM (1) smoke emitter cartridge was setoff in Unit 30B at ST6

- Slight odor detected in Unit 31B entry hallway near laundry room
- No smoke detected.

Test 5
1:00 PM (1) smoke emitter cartridge was setoff in Unit 30B at ST5

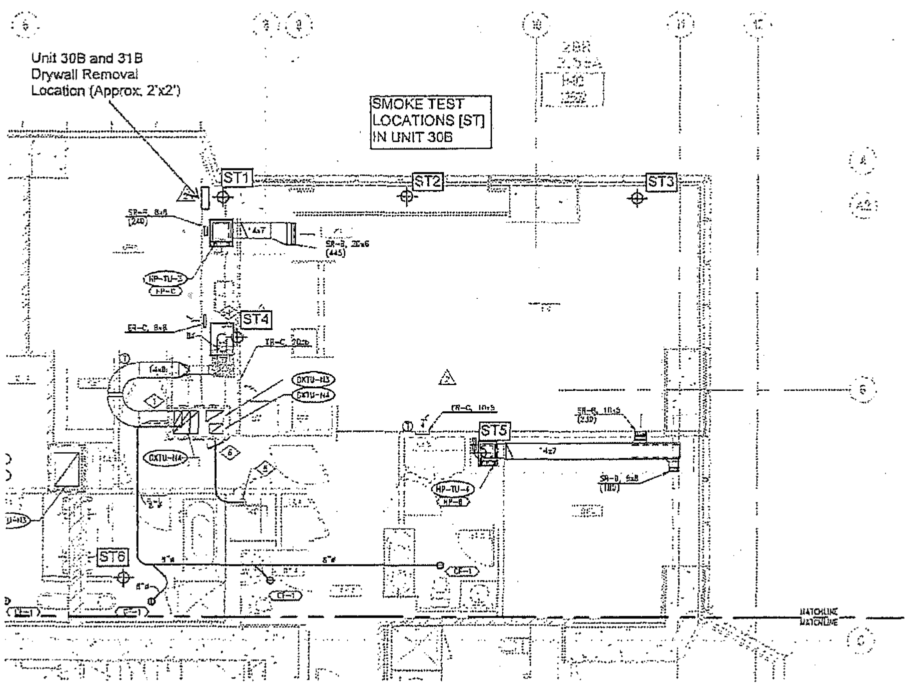
- Significant amount of smoke streaming out of hydronic piping floor penetrations in heat pump closet.
- Similar to Test 2 but resulting in more intense smoke transfer.

Test 6
1:25 PM (2) smoke emitter cartridges was setoff in Unit 30B at ST5

- Significant amount of smoke streaming out of hydronic-piping floor penetrations in heat pump closet.
- Similar to Test 5 but resulting in more intense smoke transfer.

Test 7
1:45 PM (1) smoke emitter cartridge was setoff in Unit 30B at ST4

- Odor detected in Unit 31B kitchen area.
- Faint smoke haze in same area.



Investigation Findings

The smoke test results clearly verified the existence of air transfer pathways between Unit 30B and Unit 31B. Suspended particles in the air can communicate between these neighboring residences through the same air transfer pathways, resulting in odors from one unit detected in the adjoining unit.

Two significant air leakage locations have been identified:

1. At site ST1;
   Large gaps on the interior surface of the exterior wall (curtain wall) within the cavity behind the heat pump [HP-C]. This condition exists on both floors 30B and 31B. The location of air leak is directly across from the intake of the forced air heat pump unit. The odor transfer is enhanced and further distributed into the residence with the operation of the heat pump fan.

2. At site ST5;
   Gaps around the hydronic-piping floor penetrations in the closet of heat pump [HP-B]. Here too the location of air leaks are close to the intake of the forced air heat pump unit. The odor transfer again is enhanced and further distributed into the residence with the operation of the heat pump fan.

[redacted]

Repair Recommendations

The recommended repair consists of providing an air tight seal of the identified air gaps causing leaks between Units 30B and 31B.

1. At site ST1;
   Seal the air gaps on the interior surface of the exterior wall (curtain wall) within the cavity behind the heat pump [HP-C]. This condition exists on both floors 30B and 31B:
   - Provide sufficient access opening in bedroom wall to perform work in subject area.
   - Prep, patch and seal exterior wall gaps in curtain wall, air tight.
   - Patch, seal and finish access opening.

2. At site ST5;

Seal the gaps around the hydronic-piping floor penetrations in the closet of heat pump [HP-B]:

- Provide sufficient access opening in hallway wall to perform work in subject area.
- Remove any existing fire stopping sealant at riser pipes.
- Apply new fire-stopping sealant to the full circumference of each riser pipe penetrating the floor of the heat pump closet of unit 31B and each riser pipe penetrating the ceiling of the heat pump closet of unit 30B
- Patch, seal and finish access opening.

Seal the gaps around the hydronic-piping floor penetrations in the closet of heat pump [HP-C]:

- Provide sufficient access opening in kitchen wall to perform work in subject area.
- Remove any existing fire stopping sealant at riser pipes.
- Apply new fire-stopping sealant to the full circumference of each riser pipe penetrating the floor of the heat pump closet of unit 31B and each riser pipe penetrating the ceiling of the heat pump closet of unit 30B
- Patch, seal and finish access opening.

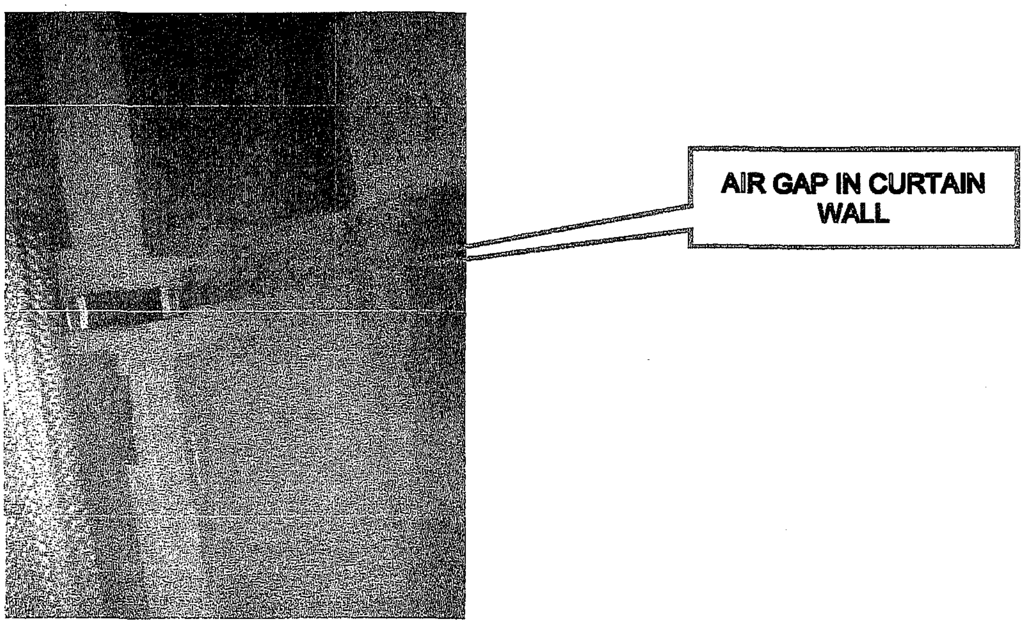
Sincerely,

Allana Buick & Bers, Inc.

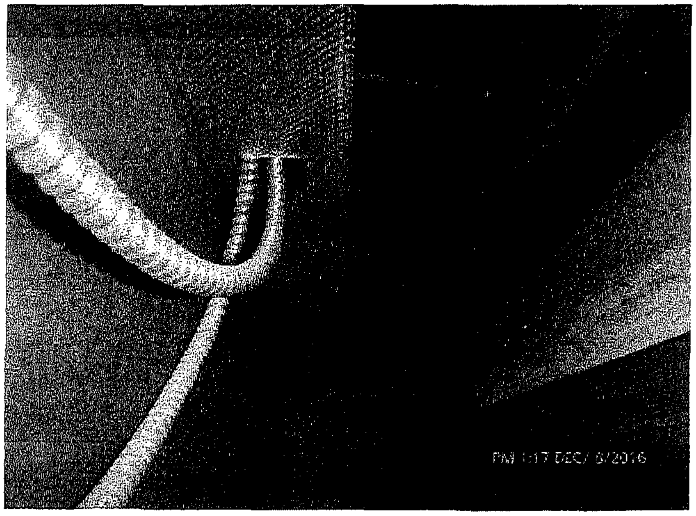
Eli Margalit, P.E., LEED AP
Forensic Mechanical Engineer

Photo Section

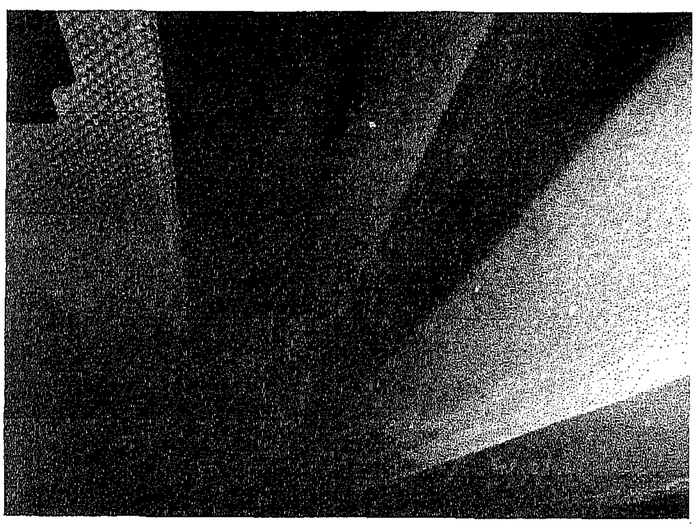
Test access opening in bedroom wall at site ST1 in unit 31B



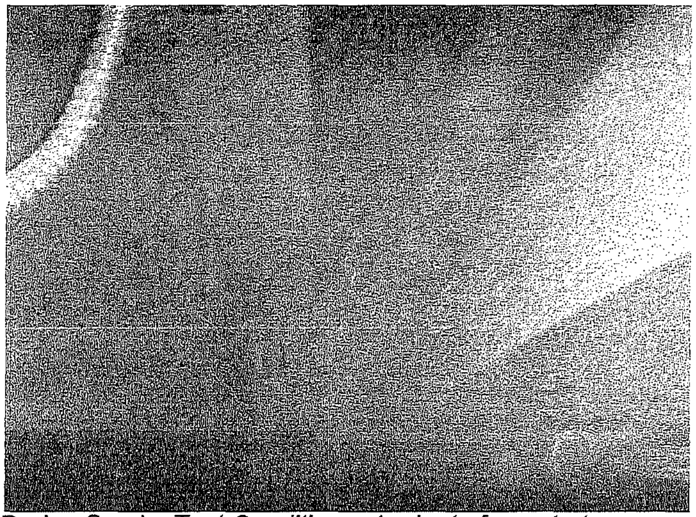
Smoke test site ST1 in unit 31B



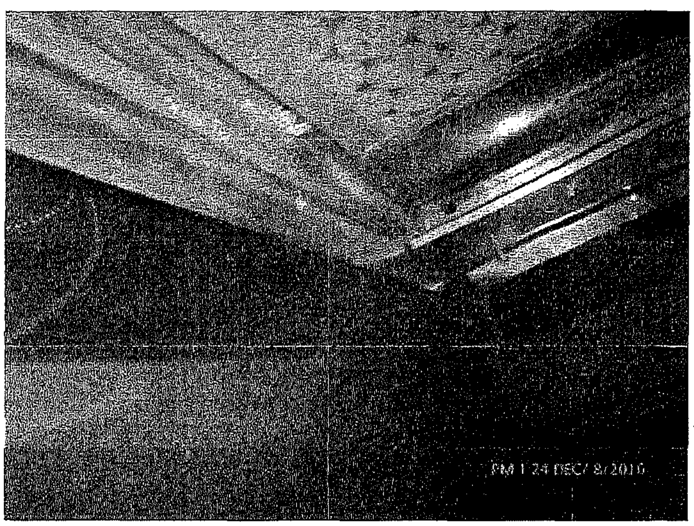
Pre-Test Conditions:
Test site ST5 in unit 31B heat pump closet.
Note pipe risers routed through closet floor



During Smoke Test Conditions – 1/2 minute from start:
Test site ST5 in unit 31B heat pump closet.
Note white test smoke at pipe risers routed through closet floor



During Smoke Test Conditions- 1 minute from start:
Test site ST5 in unit 31B heat pump closet.
Note white test smoke completely filling closet



Test site ST5 in unit 31B heat pump closet.
Note test smoke flowing up through heat pump closet door opening

160975
11/17/2016
GAO MEETING

Hello Supervisors and others:

My name is Janet Campbell, I am an architect with an MBA in Real Estate, and have 38 years' experience in Architecture and Real Estate Development.

I came here today to help shed some light on what I have seen over the past 17 years of working to have clients' projects approved within the Planning, Building and other departments.

In 49 states, the blurring of lines of responsibility to produce plans is not allowed. Architects, Structural Engineers and Contractors are not allowed to practice each others' professions. They are to use a standard of due care particular to their professions for the good of the life, safety and welfare of the public, including financial, with regards to those who hold loans on such properties.

And in of all places, earthquake country, those lines have been blurred.

Further, while the license laws are clear as to who can and cannot practice architecture and engineering, time and again, we see "Paper napkin-like" drawings allowed to be taken in against License Laws and then approved - on commercial spaces or residential properties with multiple units on them.

Against the law. And in multiple Departments.

Why and How does this happen?

We see time and again glad-handing "expediters" who discuss issues of properties with Planning, Building and other Department personnel, representing clients - against license laws.

We see restaurants built out without plans and the appropriate permits. And contractors "crowing" in emails about how they "got 'er done".

The affect has been brutal on a number of my clients. Because of illegal units, at least two of my clients are stuck in a round hell of having based buying prices through clueless realtors with mortgages on the income from those units.

In one case the illegal units were approved by Planning against their codes and bought later by my clients, having now been to Director's Hearings and now with a lien against their property, and unable to sell or refinance.

Another client found herself represented by an expediter, who also represented the landlord. She signed a commercial lease prior to hiring me, and when I got into the project, found no way to accommodate a necessary second exit. She lost her investment, around $250,000.

I have prevented a number of other clients from similar mistakes - IF they get to me soon enough, before the realtors, landlords and expediters get to them.

Other clients decide to steal architect's drawings, to use expediters. Recently, one walked off with much of 7 months' work, and is using it, to employ expediters to "get around the rules" and put things through Planning and Building much faster.

Another recently had a contractor who acts as an "expediter machine" with employees to take my drawings in, sign them as if he was myself, until an honest plan reviewer alerted me. Building tried to get me to take a payment from the expediter, then tried to get the City Attorney to prosecute him for fraud, and the City Attorney refused.

Even in Planning, there is a Design Team where one member told me a couple of years ago, "You sit down, Shut Up, We Design It and you detail it after it gets to Building."

They are not architects nor the architect-of-record, with certain duties and responsibilities, and do not understand the import of what they are doing, at the risk of the clients and those holding mortgages.

Despite attempts to get a planner to read a survey and understand that the two lots were two lots, I watched a client go belly-up, the Planner deliberately yelling us down and put him through a three-year "lot split" that finally took six months through the Assessor Recorder's Offices and DPW to prove that it was as recorded and surveyed, two lots. An architect in their position would never have done so.

And in the past month alone, I have caught three persons practicing on paper as architects and engineers, unlicensed.

When will it end?

In Summary:

ONLY When you:

1. Enforce the License Laws.

2. Separate all Disciplines into reviewing only their Disciplines.

3. Have clear Processes to go through, on Charts publicly available, without personnel interpretations allowed.

4. Have the appropriately trained Personnel, with licenses in those professions and at least 10-20 years experience, in Management and reviewing plans - in every department that has to review them in the city. At Planning, Building, Fire, Health, DPW/BSM, MOD and etc.

For instance:

Architects do Architectural, including all Zoning, Design, Exiting, ADA and Health Code issues in all Departments reviewing plans.
Structural Engineers review Structural Engineering - only - at Building.
Geologists and GeoTechnical Engineers should at least be consulting at Buidling.
Civil Engineers should and are reviewing plans at DPW.

5. Have only the Architect or Engineer of Record pulling the plans through, or their direct employees
"Under their supervision" - as an employee, not consultant - is what the license law dictates.

6. Have Clear and Unchanged Standards on Plans, laid out in great detail, that all have to go through.
No personal interpretations should be allowed by Staff.

In Conclusion:

Familiarity and other methods used by expediters, plying the unlicensed and inappropriate employees reviewing plans in order to get a favorable interpretation, further erodes application of the codes and standards that matter to all of us.

It repeatedly has and is destroying the life, safety, health and welfare of the public - as seen in the Millenium Towers.

- Janet C. Campbell, Architect
November 17, 2016

IN SUMMARY

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DESIMONE

NEW YORK
MIAMI
SAN FRANCISCO
NEW HAVEN
LAS VEGAS
HONG KONG
ABU DHABI

February 25, 2009

City and County of San Francisco
1660 Mission Street, 2nd Floor
San Francisco, CA 94103

DeSimone Project # 4069B
301 Mission - Structural Design Services

Attn: Raymond Lui
Re: 301 Mission Settlement

Mr. Lui:

The following is offered in response to your letter dated February 2, 2009 regarding settlement of Millennium Tower at 301 Mission Street.

1. The original project design by DeSimone and Handel Architects accommodated 6 inches of total settlement under the Tower. The adjacent podium and 12-story Mid-rise building are completely separated structurally from the Tower, and are not expected to settle at all. In fact, part of the podium and Mid-rise is actually tied down to prevent upward movement due to the net upward pressure supplied by groundwater.
2. See attached letter from Treadwell & Rollo dated February 18, 2009.
3. All columns and shear walls comprising the Tower structure are supported on a single, continuous pile cap. No differential settlements between adjacent walls/columns are expected and none have been reported to DeSimone. See also the attached letter from Treadwell & Rollo dated February 18, 2009.
4. See attached letter from Treadwell & Rollo dated February 18, 2009.
5. See attached letter from Treadwell & Rollo dated February 18, 2009.
6. See attached letter from Treadwell & Rollo dated February 18, 2009.
7. Since settlement of the Tower was anticipated and planned for during design, it has created no known problems for the Tower or Mid-rise structures. The only connections between the Tower and Mid-rise structures are at "hinge slabs", which were detailed to allow settlement of the Tower to occur relative to the Mid-rise. These slabs could accommodate at least an additional 6" of settlement with no detrimental structural impact. DeSimone has not observed, and has not been informed, of any cracks in walls or any other negative structural impact from the Tower settlement. It is our professional opinion that the structures are safe.
8. See attached letter from Handel Architects dated February 18, 2009.

DESIMONE CONSULTING ENGINEERS

Derrick D. Roorda, SE, LEED AP
Senior Associate Principal

Cc: Steve Hood, Millennium Partners
Glenn Rescalvo, Handel Architects
Ramin Golesorkhi, Treadwell & Rollo

Treadwell&Rollo

18 February 2009
Project 3157.04

Mr. Derrick Roorda, SE
DeSimone Consulting Engineers
160 Sansome Street, 16th Floor
San Francisco, California 94111

Subject: Response to DBI Letter
Settlements at 301 Mission Street
San Francisco, California

Dear Mr. Roorda:

This letter presents our responses to a letter by San Francisco Department of Building Inspection dated 2 February 2009 regarding settlements at 301 Mission Street. Specifically, our responses to questions two through six in the referenced letter are presented below:

Question 2: *What are the actual settlements now? What is the rate of settlements? Are the settlements still continuing? What the expected final total settlement of each building?*

Response 2: The actual settlement of the Tower is 8.3 inches. This is based on the latest survey of the benchmark on the core wall which was read on 12 February 2009. The rate of settlement from the latest survey reading is 0.003 inches/day. A plot of the settlement is attached. The results of our latest evaluations indicate that approximately two to four inches of additional settlement could occur in the future. We do not anticipate settlement for the Podium/Mid-Rise structure.

Question 3: *Are there any differential settlements within the high-rise building?*

Response 3: We are not aware of any differential settlement issues within the high-rise Tower.

Question 4: *Are the actual total and differential settlements being monitored now?*

Response 4: Currently the benchmark on the core wall is being monitored.

Question 5: *What are the reasons for the larger than expected settlements?*

Response 5: The larger than anticipated settlement can be attributed to several possible factors including extensive and longer than expected dewatering during the construction of Podium/Mid-Rise structure and limited effectiveness of predrilling during the installation of pile foundations for the Tower.

Question 6: *Has the geotechnical engineer of record been alerted to the settlement and what is their course of action?*

Response 6: Treadwell & Rollo, Inc. as the geotechnical engineer of record has been aware of the settlement of the Tower and continues to evaluate the results of the monitoring by Martin M. Ron Associates, Inc. While the settlement of the Tower is greater than originally anticipated, this settlement should not pose issues with foundation support for the Tower.

We trust this letter provides the responses requested. If you have any questions, please call.

Sincerely yours,
TREADWELL & ROLLO, INC.

Ramin Golesorkhi, G.E.
Principal

31570417.RG

Attachment: Settlement Plot

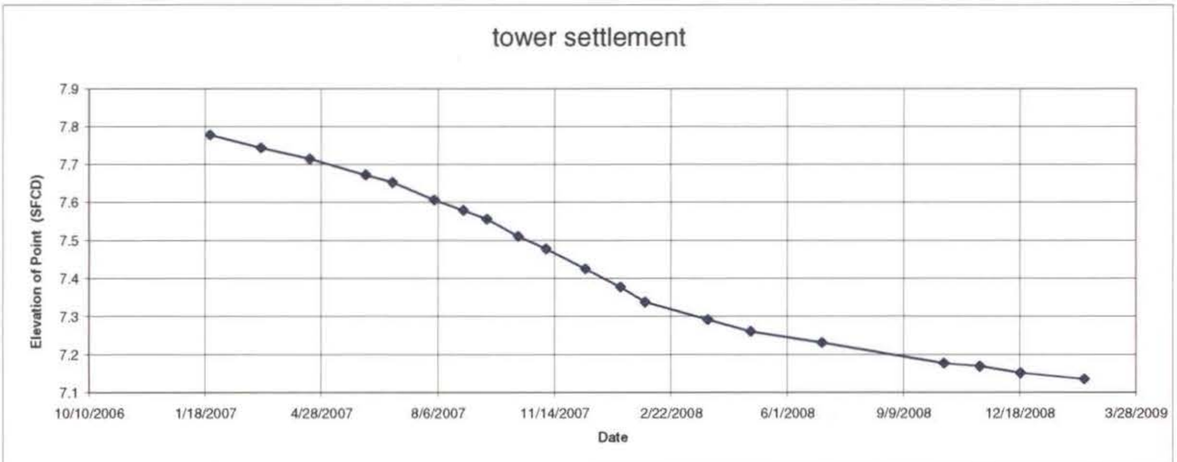
cc: Mr. Steven Hood (Millennium Partners)

Treadwell&Rollo

Project No. 3157.04
301 Mission TOWER Settlement

Type	date	El (feet)	Movement between readings (feet)	inches	days between readings	inches per day	Total Elapsed Time (days)	Total Settlement (inches)
Webcor reading	9/20/2006	7.829				0.000	0	0
MR reading	1/22/2007	7.779	0.050	0.602	124	0.005	124	0.602
MR reading	3/7/2007	7.744	0.035	0.420	44	0.010	168	1.022
MR reading	4/18/2007	7.715	0.029	0.348	42	0.008	210	1.370
MR reading	6/5/2007	7.673	0.042	0.504	48	0.011	258	1.874
MR reading	6/28/2007	7.653	0.020	0.240	23	0.010	281	2.114
MR reading	8/3/2007	7.607	0.046	0.552	36	0.015	317	2.666
MR reading	8/28/2007	7.58	0.027	0.324	25	0.013	342	2.990
MR reading	9/17/2007	7.557	0.023	0.276	20	0.014	362	3.266
MR reading	10/14/2007	7.511	0.046	0.552	27	0.020	389	3.818
MR reading	11/7/2007	7.478	0.033	0.396	24	0.017	413	4.214
MR reading	12/11/2007	7.425	0.053	0.636	34	0.019	447	4.850
MR reading	1/10/2008	7.377	0.048	0.576	30	0.019	477	5.426
MR reading	1/31/2008	7.338	0.039	0.468	21	0.022	498	5.894
MR reading	3/25/2008	7.292	0.046	0.552	54	0.010	552	6.446
MR reading	5/1/2008	7.261	0.031	0.372	37	0.010	589	6.818
MR reading	7/1/2008	7.231	0.030	0.360	61	0.006	650	7.178
MR reading	10/14/2008	7.177	0.054	0.648	105	0.006	755	7.826
MR reading	11/14/2008	7.169	0.008	0.096	31	0.003	786	7.922
MR reading	12/19/2008	7.151	0.018	0.216	35	0.006	821	8.138
MR reading	2/12/2009	7.136	0.015	0.180	55	0.003	876	8.318
		0.693						

6/17/2006 Tower Mat Pour
9/13/2006 street level poured (core up ~3 levels)
1/22/2007 Decks to L9, core to L13
3/7/2007 Decks to L13, core to L18
4/18/2007 Decks to L18, core to L22
2/7/2008 Dewatering wells shut-off



HANDEL ARCHITECTS LLP

Gary E. Handel AIA
Glenn Rescalvo AIA
D.B. Middleton AIA
Frank Fusaro AIA
Michael Arad AIA

February 18, 2009

Derrick Roorda, SE
DeSimone Consulting Engineers
160 Sansome Street, 16th Floor
San Francisco, CA 94104

RE: 301 Mission Street, Settlement Issues

Dear Derrick,

Handel Architects, in conjunction with DeSimone Consulting Engineers, has designed 301 Mission for the settlement anticipated in the original Geotechnical Report prepared by Treadwell & Rollo. In addition, we are aware that additional settlement has occurred, and may continue to occur, and we have taken these conditions into account with modifications to the original design where necessary:

- Utility lines have been designed and installed with flexible connections (allowing for horizontal and vertical movement) wherever they cross the expansion joint between the buildings and at service entry points in the tower.
- Hinge slabs between the two buildings, which were originally designed for settlement that would not result in slopes exceeding requirements where handrails would have been required, have now been equipped with handrails which can be adjusted in the future if required.
- Utilities under portions of the tower but above ceilings and walls supported from the Mid-Rise have been routed to avoid possible interference from future anticipated settlement.
- Expansion joint covers at walls, ceilings and floors have been designed to accommodate settlement and seismic movement. Where the current additional or anticipated future settlement has affected waterproofing design at settlement joints, we have worked with the installer to modify the joint design to accommodate the anticipated future settlement up to 4" and continue to function as originally intended.
- Interior floor surfaces adjoining exterior walkways on the north and west of the tower have been raised where possible to allow for increased sidewalk slope away from entry and exit doors in case future settlement might decrease or negate the current slope. Where interior floor levels could not be raised, new trench drains have been installed outside the entry doors in case settlement causes a reversal of sidewalk water flow. The porte cochere driveway elevations were redesigned, taking into account the current settlement and relationship to existing street and sidewalk elevations, so that the main entries, stairs and elevator sills could remain at their original floor elevations relative to floors above, even though they are now lower than originally predicted.

Sincerely yours,

Gerald W. Sams

Gerald W. Sams, AIA
Handel Architects, LLP

cc: Glenn Rescalvo
Steve Hood

DESIMONE

MEMORANDUM

NEW YORK
MIAMI
SAN FRANCISCO
NEW HAVEN
LAS VEGAS
HONG KONG
ABU DHABI

FROM:	**NICOLAS RODRIGUES**	DATE:	**06 Jun 2012**
PROJECT NO.:	**4069G**	VIA:	**EMAIL**
PROJECT NAME:	**301 MISSION STREET – MAY SETTLEMENT EVALUATION**	PAGES:	**5**

TO:
Steven Hood SHood@millenniumptrs.com
Millennium Partners
301 Mission Street, Level B-1, San Francisco, CA 94103
T: (415) 874-4707
F: (415) 874-4750

RE: SETTLEMENT MONITORING

As requested, we continue to evaluate the settlement of the Millennium Tower and Mid-Rise, located at 301 Mission Street. We reviewed the data provided in the April 27th, 2012 settlement survey provided by ARUP and the data as provided in the Global Analyzer website (http://ga.arup.com/global_analyzer/) managed by ARUP.

Following is a list of data available on the website:

Data Type	Date of Previous Data	Date of Latest Data	Manual/Automatic
Settlement Markers	March 7, 2012	April 18, 2012	Manually Read
Inclinometer*	None	None	Manually Read
Tiltmeter	N/A	May 23, 2012	Automatically Input
Piezometer	N/A	May 17, 2012	Automatically Input
Vibration	N/A	June 2, 2012	Automatically Input

*Inclinometer data (I-16, I-17A, I-18, I-18M, I-19, I-20, I-21, and I-22) at the Millennium Tower site are not reported on the website. Only offsite inclinometer I-15 is on the website. The only data available is in the March 7th ARUP report and then only data for I-18 and I-19. *This data should immediately be made available as it will show the first signs of any lateral movement of soil, which is indicative of impending tower vertical settlement.*

It is our understanding that Treadwell and Rollo shall report on Settlement, Inclinometers, and Piezometers. DeSimone will report on:

1) Settlement Data, Transbay trigger limits, and structural impacts
2) Tiltometer Data, and structural impacts
3) Vibration Data, Transbay trigger limits, and structural impacts

Settlement Data:

Analysis of the latest data from Global Analyzer continues to show a varying rate of settlement as in preceding settlement reports by Arup. The Transbay excavation continues to coincidentally affect the rate of settlement of the Millennium Tower. Generally, an increased rate of settlement has been observed since the Transbay subsurface construction activities have commenced.

<u>Between the Tower and Mid-Rise Along Gridline 12 Joint</u>

Several settlement markers were reviewed at the building separation joint between the tower and Mid-Rise along gridline 12. It can be clearly observed that since Transbay construction activities have begun, that there is increasing differential across the joint, more than what was naturally occurring prior to the beginning of Transbay construction. The largest impact is near the south side of the building, and little to no impact in natural differential on the north side. It does appear that the joint is performing as expected and allowing free movements between both structures. DeSimone plans to walk the site on June 7, 2012 to observe the structural conditions along the joint.

<u>Inside Tower Core Versus Outside Tower Core</u>

Several settlement markers were chosen to evaluate the relative settlement between the area inside tower core and outside – SM-032, SM-023, SM-009 and SM006. SM-023 represents measurements taken inside the core area. Settlement appears to be uniform across the site.

<u>3 foot Thick Cantilever Slab Versus the Mid-Rise - Between Gridline H and K</u>

Several Settlement Markers were chosen to evaluate the relative settlement between the 3 foot thick cantilever slab and the Mid-Rise – SM-006, SM-003 and SM-041. Between March 6, 2012 and April 17, 2012, settlement between the 3 foot thick cantilever slab was approximately 1.4 inches greater than the Mid-Rise. This indicates that, the joint between the two buildings is allowing for independent rates of settlement and the tower is likely not dragging the Mid-Rise with it as it settles.

<u>Overall Settlement the Tower</u>

DeSimone recreated the log versus time plot as shown in the ARUP report. We have taken the data prior to the start of Transbay construction and extrapolated these curves out to the upper and lower bounds of the final Tower settlement prediction as reported by Treadwell and Rollo in their February 18th, 2009 letter to SFDBI. It is clear that the measured settlement is showing more deflection than would be predicted by natural settlement alone and thus the Transbay construction has begun to cause an increase in vertical settlement of the 301 Mission Tower.

These plots show that the actual recorded settlement is more than what would have occurred naturally, leading us to the conclusion that the increase is due to the Transbay construction activities. Since Treadwell has predicted a range of total settlement it is difficult to quantify precisely the amount of settlement attributed to Transbay. From a simple reading of the measured displacement versus the predictive curves, Transbay Construction has caused the 301 Mission Tower to settle between 0.2 to 0.9 inches. Since 0.75 inches is the "Action Trigger Level" as specified by Transbay, it is recommended that Millennium insist on a response from Transbay.

The plot includes an average of settlement on the north side of the tower and on the south end of the tower. Before construction activities began at Transbay we observe a 0.2" settlement difference between the North and South sides. After construction activities have started, we now observe a 0.2 inch differential in the opposite direction. The foundation has rotated towards the Transbay project 0.4", which may lead to movement at the top of the 301 Mission tower. We can conclude that the activities at Transbay have caused the south end to begin settling faster than the north.

If it were not for the construction at Transbay, the rate at which settlement is occurring would be slowing. The report issued by Treadwell and Rollo on 4/27/2012, and their latest draft report dated 6/5/2012, discusses this at length. The Treadwell report focus on constant average rate of settlement and extrapolates these rates to predict current natural settlement versus Transbay construction caused settlement. Thus the settlements due to Transbay reported by Treadwell and Rollo (0.3 to 0.9 inches) should be considered minimums and the actual settlements may be larger.

Tiltmeter and Tape Extensometers Data:

DeSimone will record and observe the location of these measurement devices during the June 7th site visit, and analysis will be provided in next month's report.

Vibration Data:

Vibration monitor data has been updated through May 21, 2012. Vibration monitor VM-003 continues to not allow for data to be downloaded. Only VM-001at the Tower and VM-004 at the Mid-Rise allow for downloadable data. For the month of May there have several sudden spikes in the vibration data, however the level has been no greater than 0.06 in/s. This value indicates a distinctly perceivable vibration but not one that can cause damage to architectural or structural components. However, vibrations have generally been below a perceivable level.

DeSimone
NJR
6/5/2012

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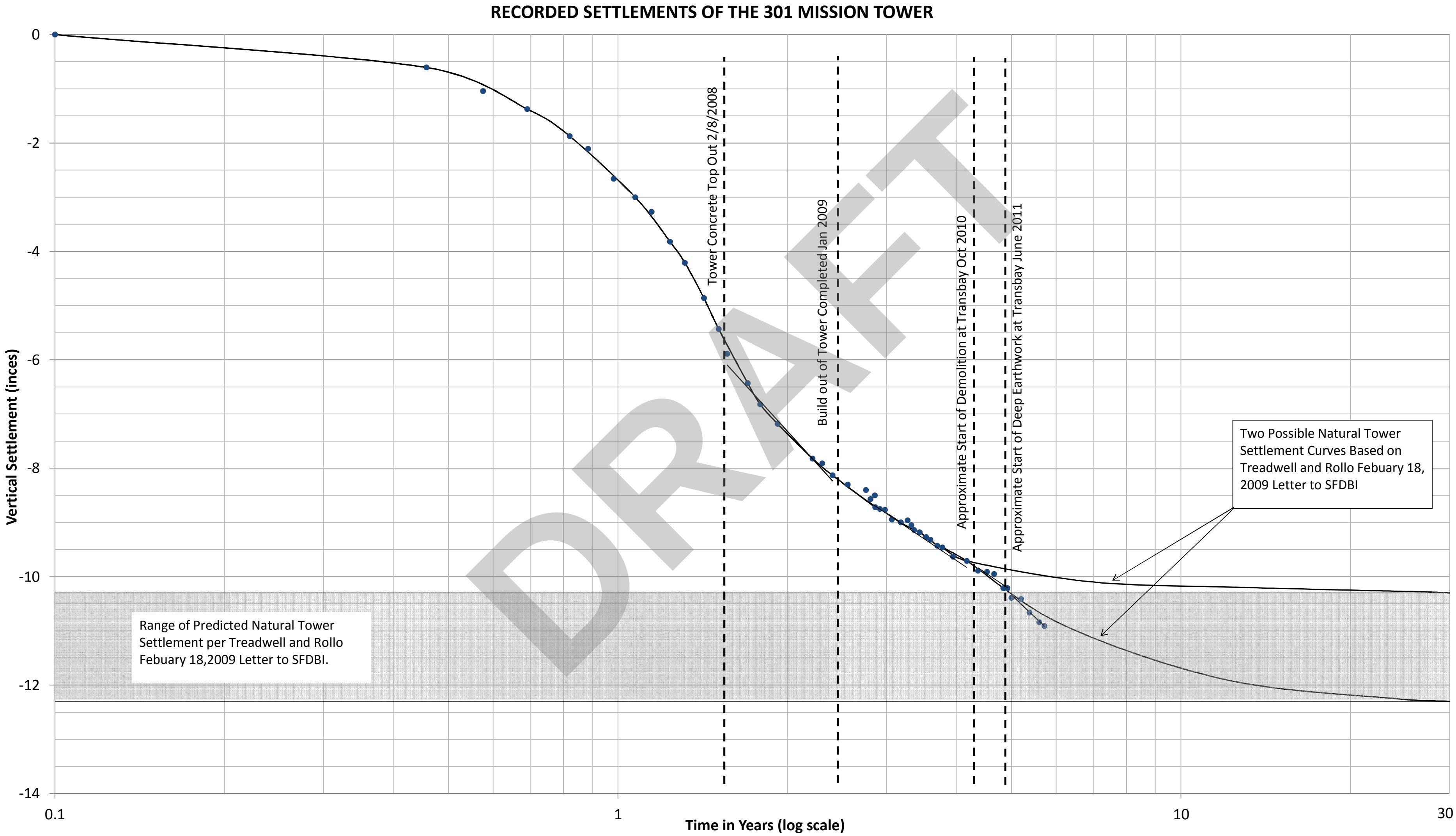

FIGURE 1

DeSimone
NJR
6/5/2012

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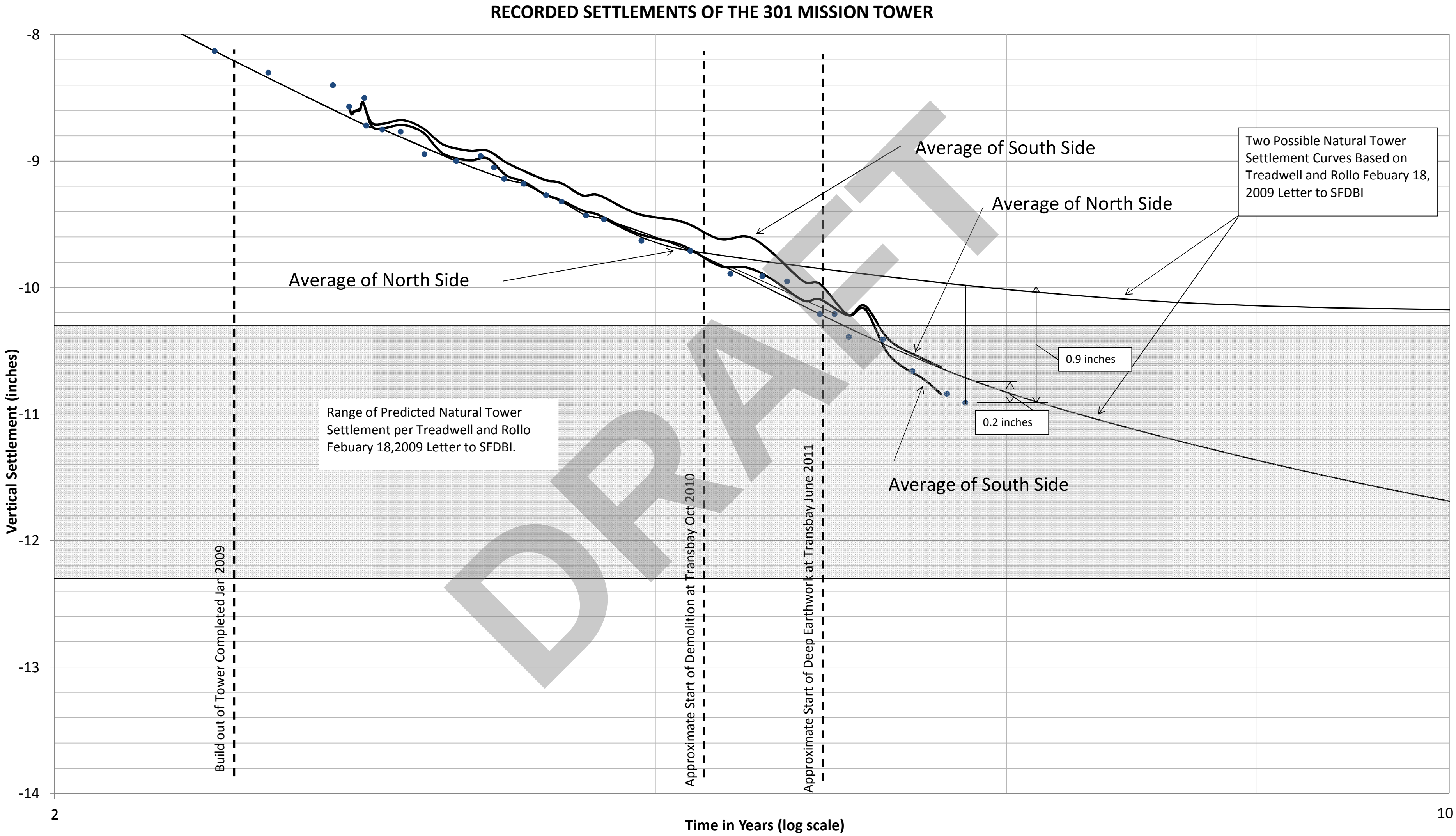

FIGURE 2

DPD
6/6/2012

DESIMONE

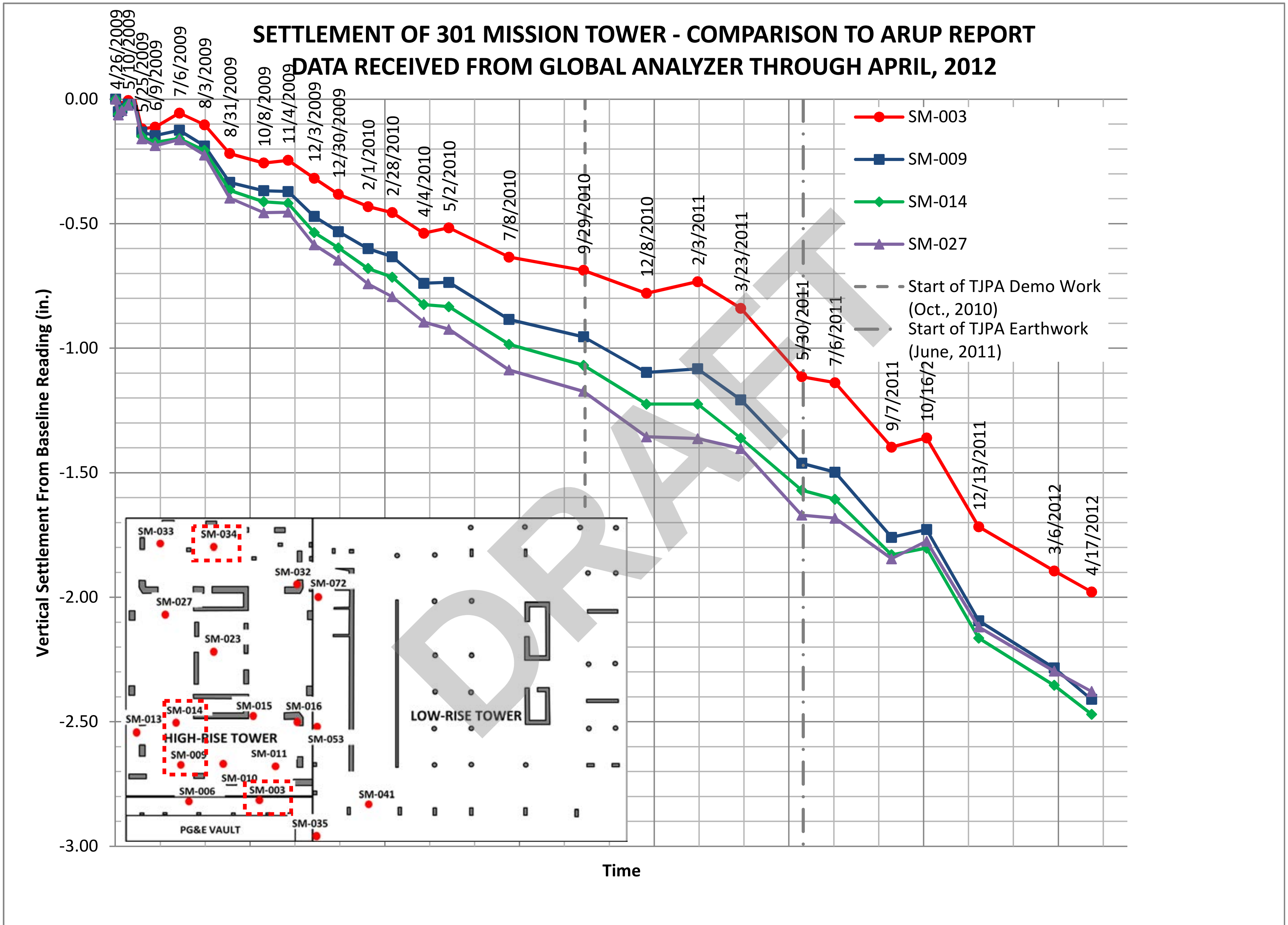

FIGURE 3

DPD
6/6/2012

DESIMONE

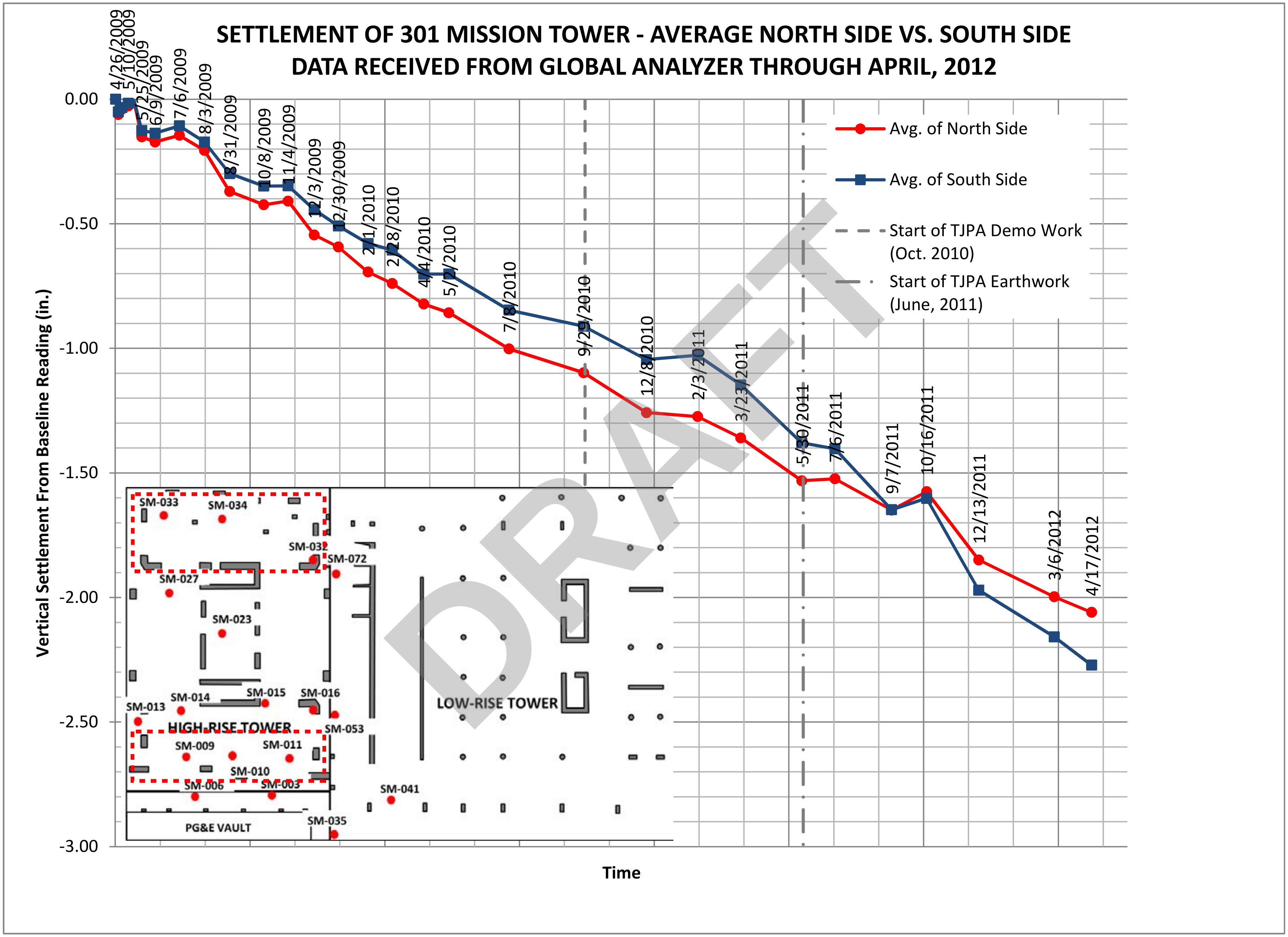

FIGURE 4

DPD
6/6/2012

DESIMONE

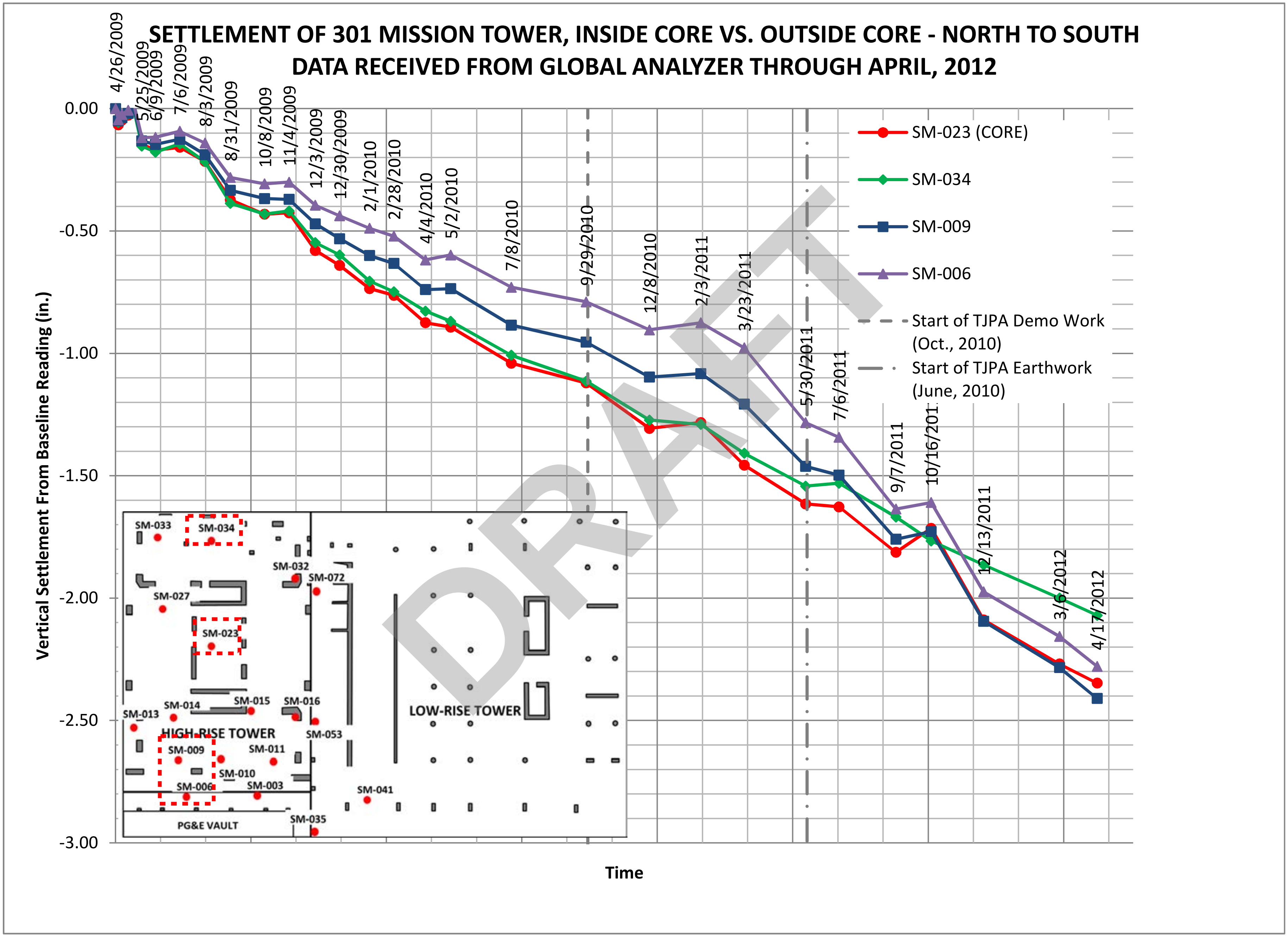

FIGURE 5

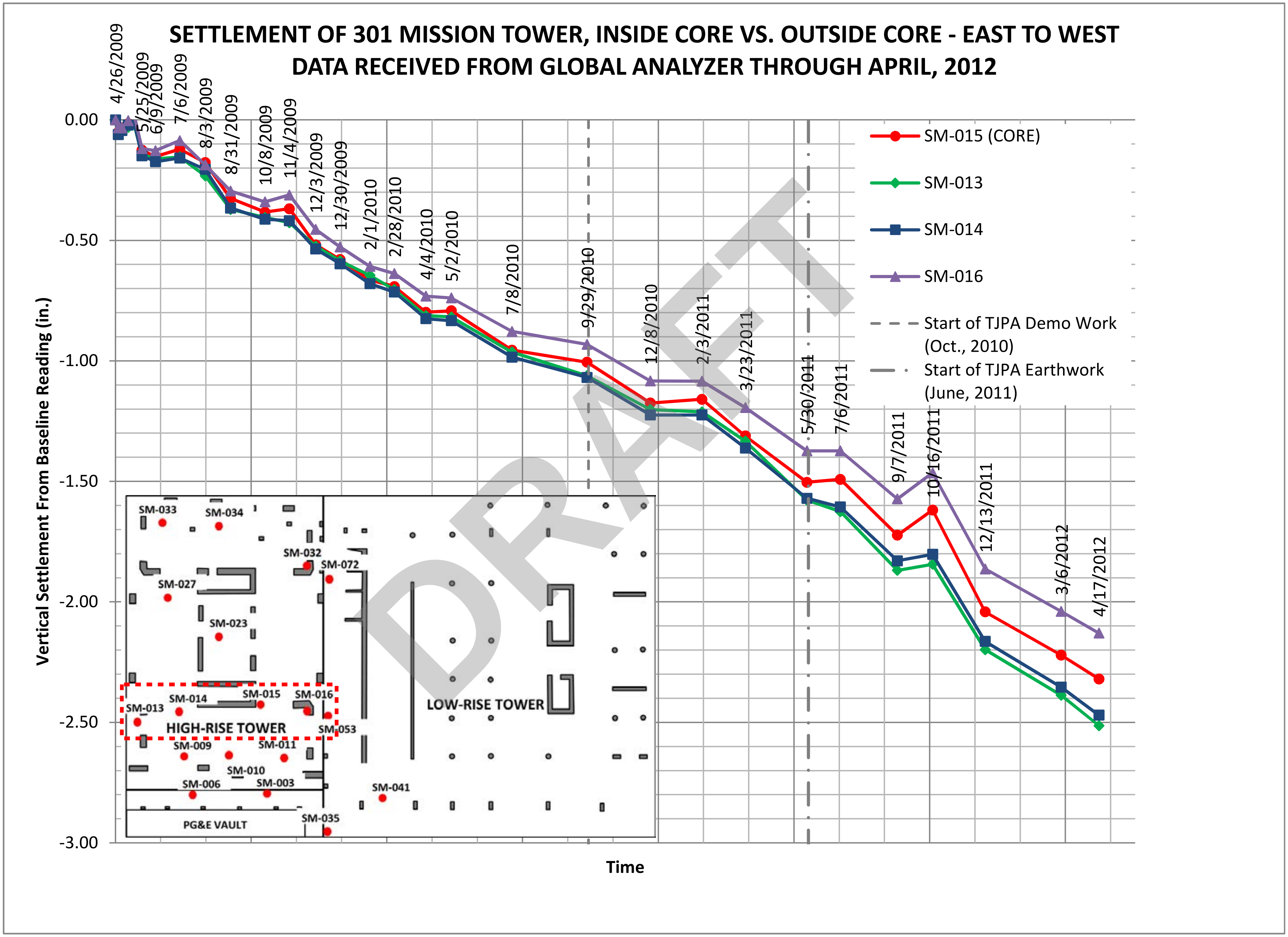
SETTLEMENT OF 301 MISSION TOWER, INSIDE CORE VS. OUTSIDE CORE - EAST TO WEST
DATA RECEIVED FROM GLOBAL ANALYZER THROUGH APRIL, 2012
Vertical Settlement From Baseline Reading (in.)
Time
SM-015 (CORE)
SM-013
SM-014
SM-016
Start of TJPA Demo Work (Oct., 2010)
Start of TJPA Earthwork (June, 2011)
HIGH-RISE TOWER
LOW-RISE TOWER
PG&E VAULT
DRAFT

FIGURE 6

DESIMONE

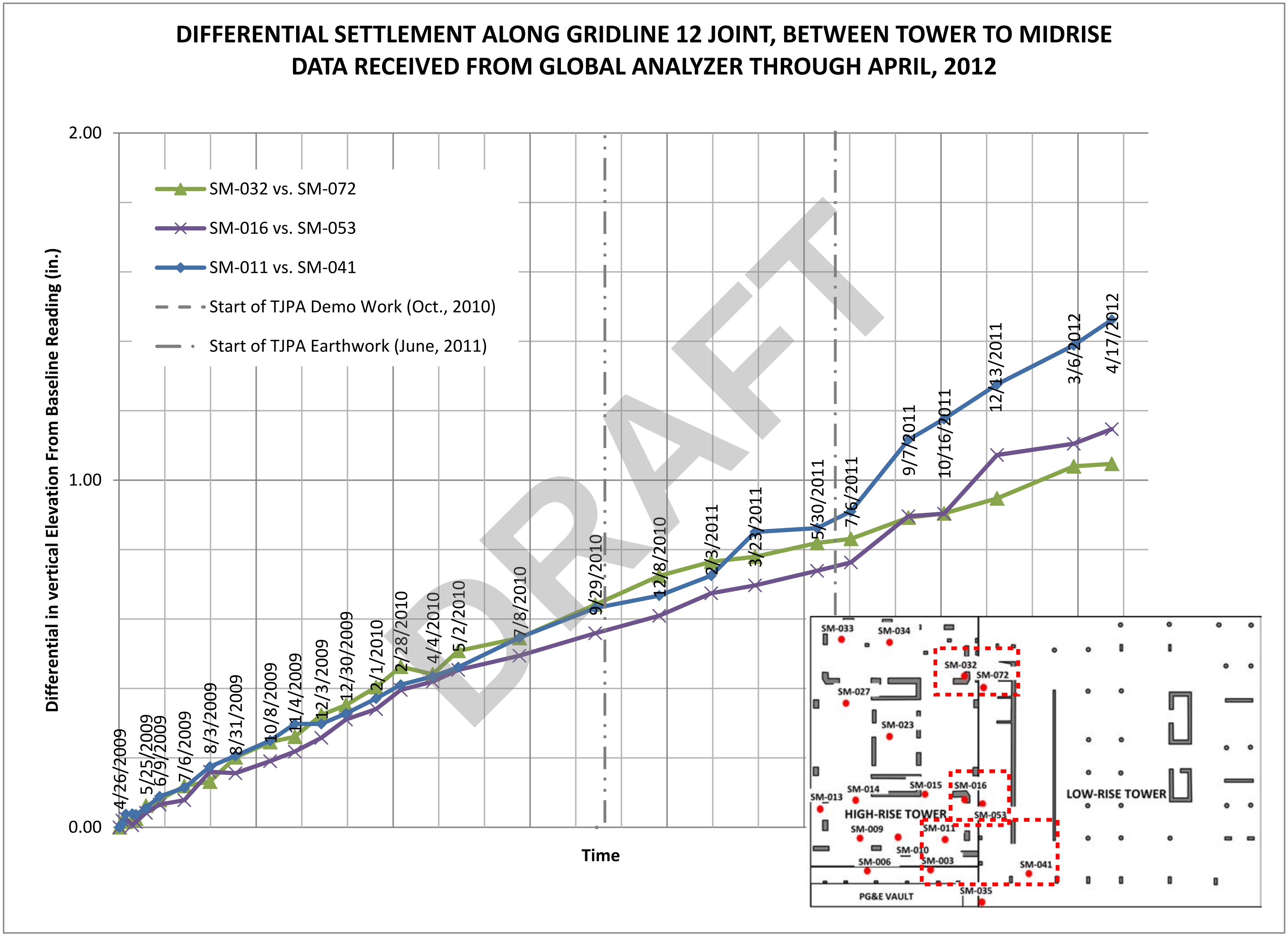

FIGURE 7

DPD
6/6/2012

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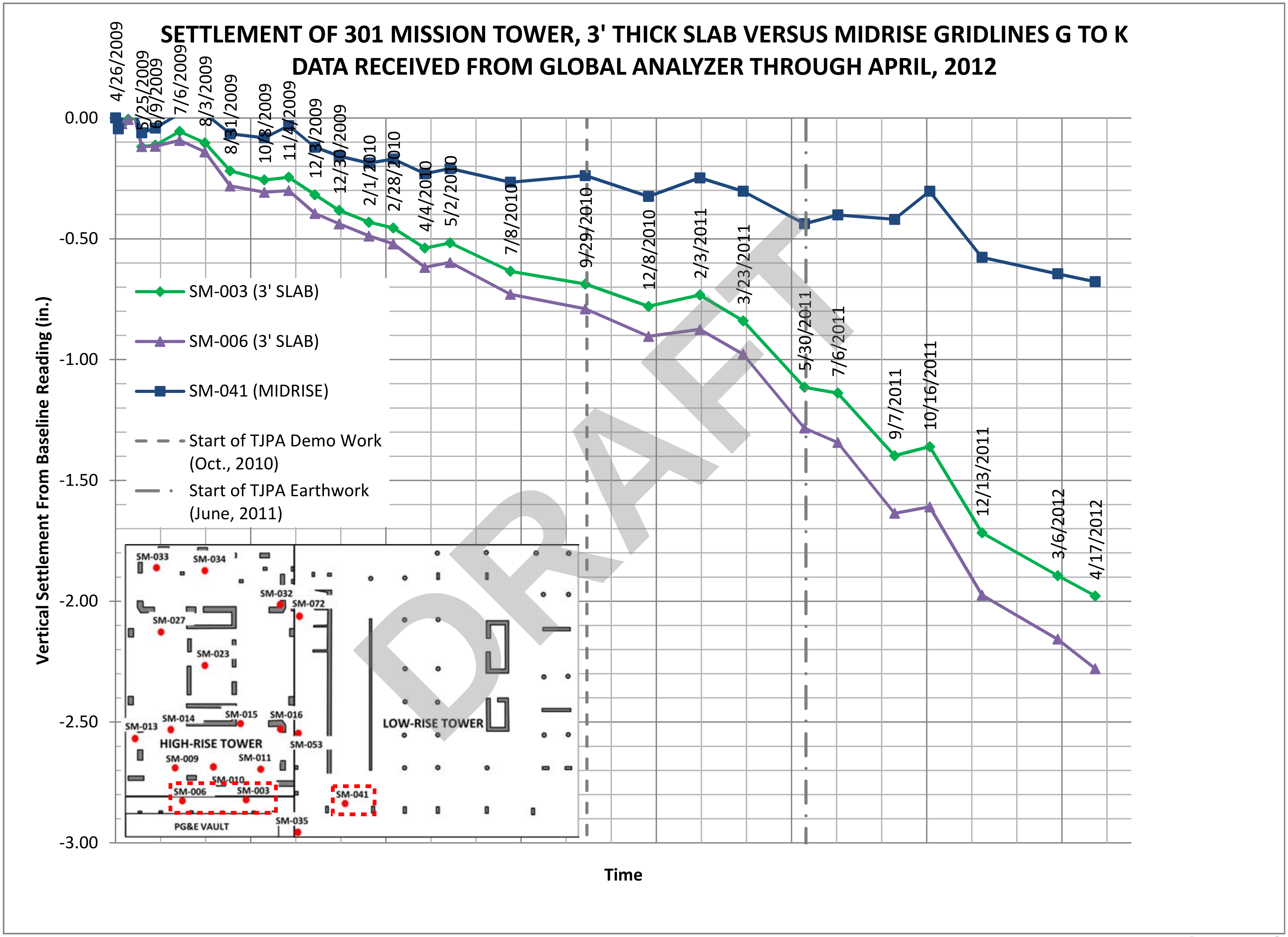

FIGURE 8

DPD
6/6/2012

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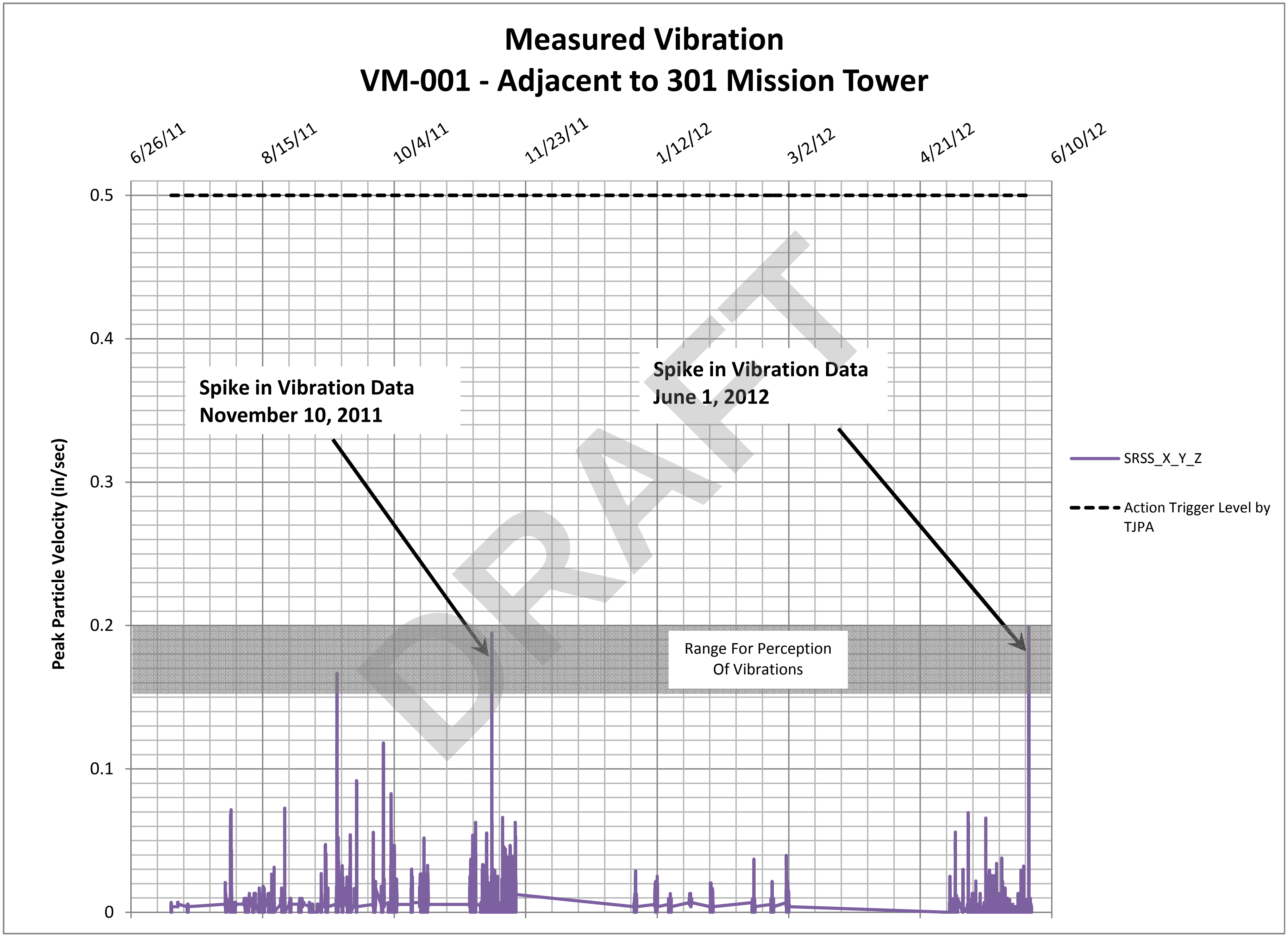

FIGURE 9

DPD
6/6/2012

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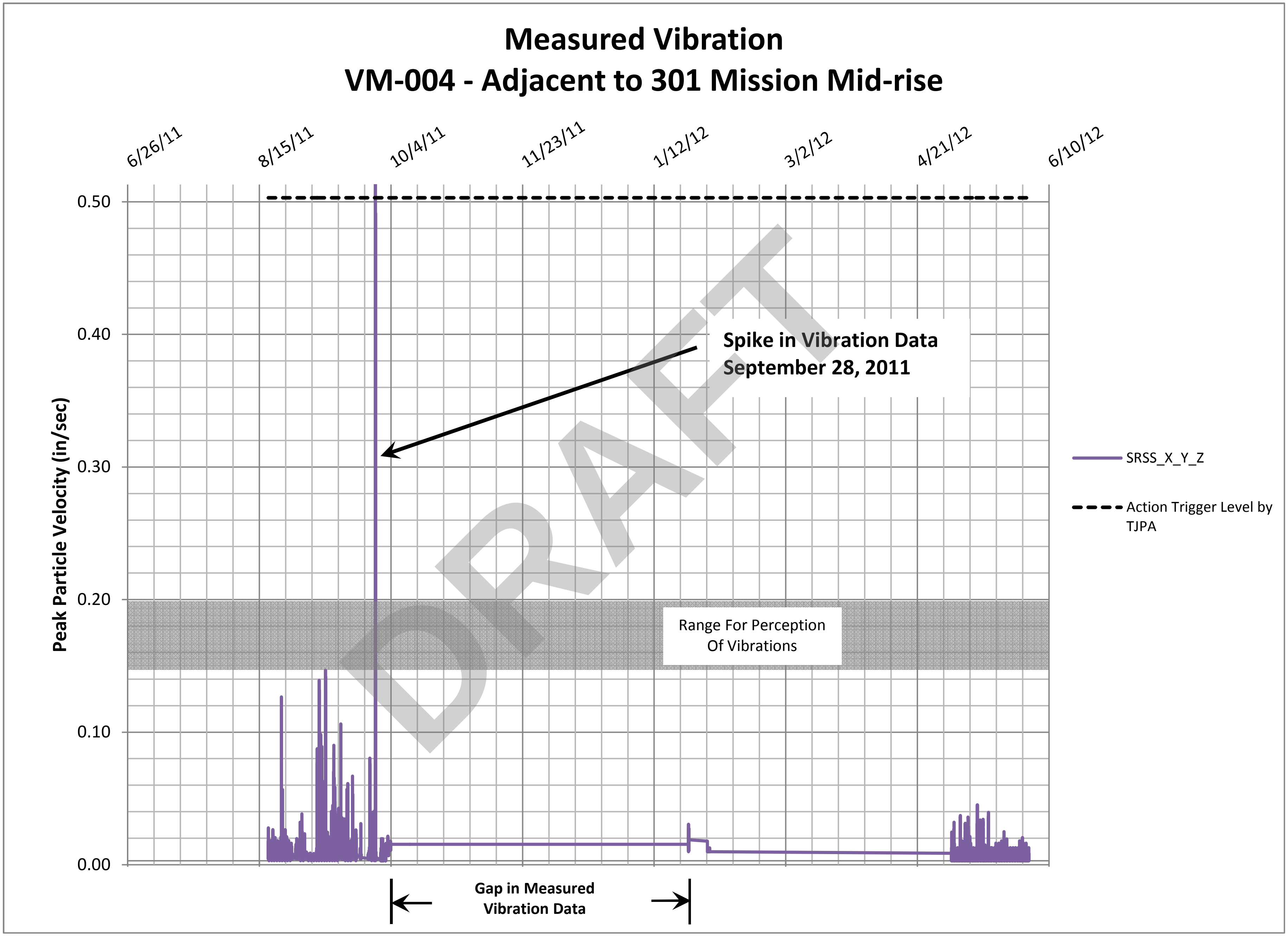


FIGURE 10

DESIMONE

MEMORANDUM

NEW YORK
MIAMI
SAN FRANCISCO
NEW HAVEN
LAS VEGAS
HONG KONG
ABU DHABI

FROM:	**NICOLAS RODRIGUES**	DATE:	**28 Nov 2012**
PROJECT NO.:	**4069G**	VIA:	**EMAIL**
PROJECT NAME:	**301 MISSION STREET – SETTLEMENT EVALUATION**	PAGES:	**4**

TO:
Steven Hood SHood@millenniumptrs.com
Millennium Partners 301 Mission Street, Level B-1, San Francisco, CA 94103
T: (415) 874-4707
F: (415) 874-4750

RE: SETTLEMENT MONITORING

As requested, we continue to evaluate the settlement of the Millennium Tower and Mid-Rise, located at 301 Mission Street. We reviewed the data provided in the November 6th, 2012 settlement survey provided by ARUP, the data in the November 9th, 2012 tape extensometer readings, and the data as provided on the Global Analyzer website (http://ga.arup.com/global_analyzer/) managed by ARUP. This memo serves as an update to the DeSimone memo issued to Millennium on June 6, 2012.

Settlement data was last updated on the Global Analyzer website on April 17, 2012. No new settlement data has been uploaded to the website since that time. Based on the ARUP reports, it is clear that readings have been taken since that time; however, this data has not been made available on the website.

It is our understanding that Treadwell and Rollo shall report on Settlement, Inclinometers, and Piezometers. DeSimone will report on:

1) Settlement Data, Transbay trigger limits, and structural impacts
2) Tiltometer Data, and structural impacts
3) Vibration Data, Transbay trigger limits, and structural impacts
4) Tape Extensometer Data, and structural impacts.

Settlement Data:

Analysis of the latest data from the Arup Reports continues to show a varying rate of overall settlement as in preceding settlement reports by Arup. The Transbay deep foundation activities continue to coincidentally affect the rate of settlement of the Millennium Tower. Generally, an increased rate of settlement has been observed since the Transbay subsurface construction activities have commenced.

Due to no new data being provided to DeSimone, analyses performed for the June 6, 2012 report cannot be updated. Specifically, we cannot comment as we did in our last report on:

1) Between the Tower and Mid-Rise Along Gridline 12 Joint
2) Inside Tower Core Versus Outside Tower Core
3) 3 foot Thick Cantilever Slab Versus the Mid-Rise - Between Gridline H and K

Overall Settlement the Tower

DeSimone recreated the log versus time plot as shown in the ARUP report. We have taken the data prior to the start of Transbay construction and extrapolated these curves out to the upper and lower bounds of the final Tower settlement prediction as reported by Treadwell and Rollo in their February 18th, 2009 letter to SFDBI. It is clear that the measured settlement is showing more movement than would be predicted by natural settlement alone and thus it can be concluded that the Transbay construction must be causing an increase in vertical settlement of the 301 Mission Tower.

As reported in our previous report, it appears clear that the "Action Trigger Levels" as specified by Transbay have been exceeded, and it is recommended that Millennium insist on a response from Transbay.

We recommend asking Arup to provide you with all of the marker data.

Tiltmeter Data:

Tiltometer data has been updated in the Global Analyzer and is current from May 2009 till November 2012. Tiltometer measurements for TL-301-001, TL-301-002, TL-301-003, TL-301-UX11 and TL-301-UZ11 were collected and analyzed. TL-301-001, TL-301-002 and TL-301-003 are located along the south basement wall. These measurements did not indicate any appreciable amount of tilt in any one direction. One observation of note is that between June, 2012 and October 2012, each device shows a change in tilt direction. This may be an indication of effects due to adjacent construction, and this finding is consistent with our June 6, 2012 report conclusions.

UX11 and UZ11 both show a lack of data collection between February, 2012 and July, 2012. At the beginning of data collection in July, the value of tilt was two orders of magnitude higher than previously measured in February. By correcting the data for this shift (normalizing July data to February data) we observe that there is a consistent trend of increasing tilt towards the center of the tower. UX11 shows the largest change in tilt of nearly 2 degrees. Two degrees of movement over such a short period of time may be an indication that some damage occurred.

We recommend asking Arup if these measurements for UX11 are in error. We also recommend asking ARUP to provide the missing data between February and July.

Tape Extensometers Data:

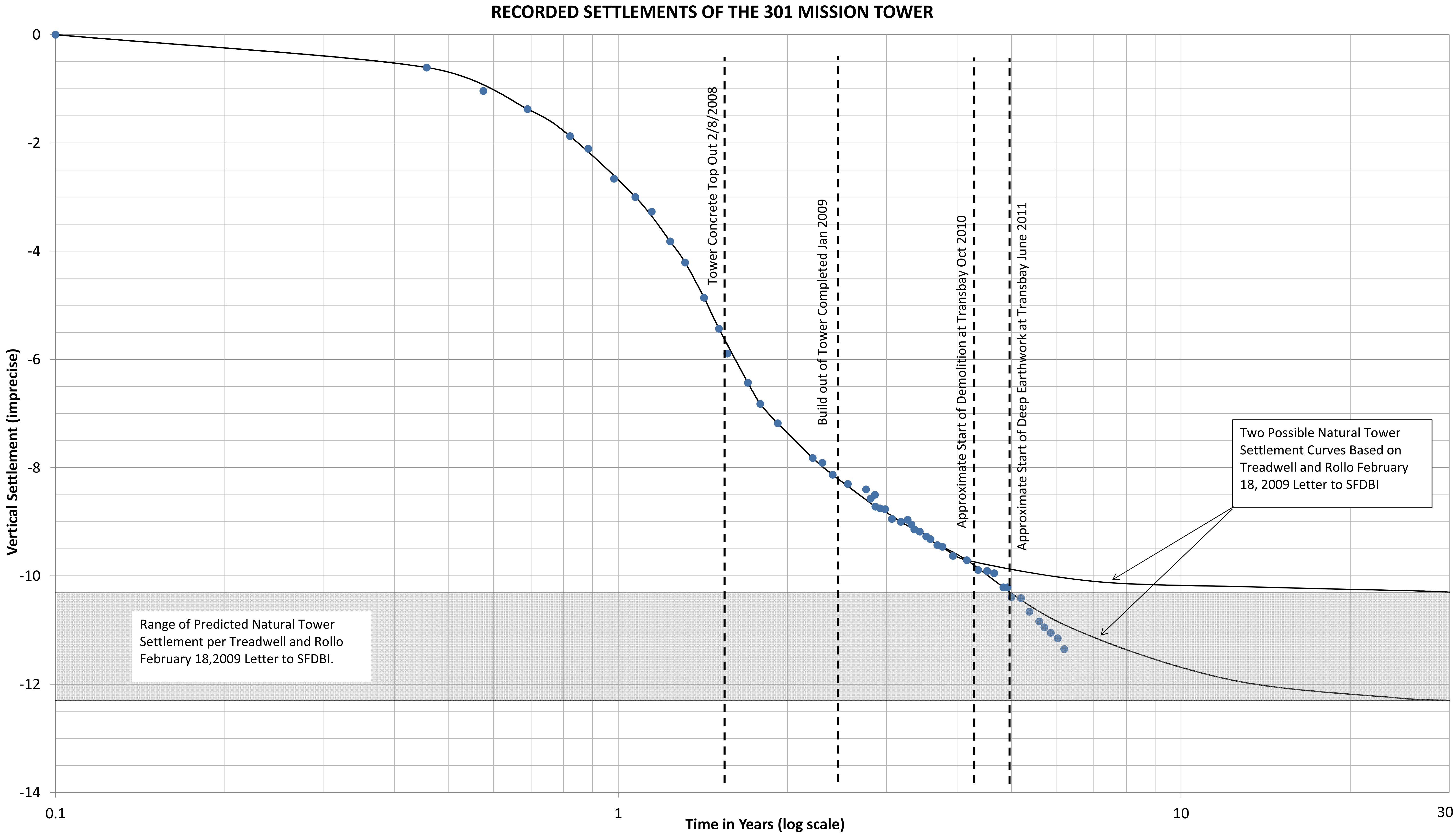
Tape extensometer data has been presented in the Arup report but was not uploaded on the Global Analyzer. All tape readings between May, 2009 and September 2012 are presented by Arup.

The tape extensometer data show a general trend of reduction in tape length along the gridline 12 wall. This type of measurement may be an indication about cracking, however, visual inspection is another good technique. The values of movement are less than a tenth of an inch. We will continue to monitor this movement and will plan a site visit soon.

Vibration Data:

Vibration monitor data has been updated through November 2012. Vibration monitor VM-003 continues to not allow for data to be downloaded. Only VM-001at the Tower and VM-004 at the Mid-Rise allow for downloadable data. For the months of May, June and October there have several sudden spikes in the vibration data. The spikes in the vibration data are instantaneous and not considered to cause structural damage. Generally the level of vibration has been no greater than 0.07 in/s. This value indicates a distinctly perceivable vibration but not one that can cause damage to architectural or structural components. Generally, vibrations have generally been below a perceivable level.

DeSimone
NJR
11/28/2012



DESIMONE

NEW YORK
MIAMI
SAN FRANCISCO
NEW HAVEN
LAS VEGAS
HONG KONG
ABU DHABI

MEMORANDUM

FROM:	**NICOLAS RODRIGUES**	DATE:	**14 Dec 2012**
PROJECT NO.:	**4069G**	VIA:	**EMAIL**
PROJECT NAME:	**301 MISSION STREET – SETTLEMENT EVALUATION**	PAGES:	**12**

TO:
Steven Hood SHood@millenniumptrs.com
Millennium Partners 301 Mission Street, Level B-1, San Francisco, CA 94103
T: (415) 874-4707
F: (415) 874-4750

RE: SETTLEMENT MONITORING

As requested, we continue to evaluate the settlement of the Millennium Tower and Mid-Rise, located at 301 Mission Street. We reviewed the settlement data provided by Millennium to DeSimone via email on November 29th 2012. This memo serves as an update to the DeSimone memo issued to Millennium on November 28, 2012.

It seems that for settlement data, the Global Analyzer website has not been used since about April of 2012.

It is our understanding that Treadwell and Rollo shall report on Settlement, Inclinometers, and Piezometers. DeSimone will report on:

1) Settlement Data, Transbay trigger limits, and structural impacts
2) Tiltometer Data, and structural impacts
3) Vibration Data, Transbay trigger limits, and structural impacts
4) Tape Extensometer Data, and structural impacts.

Settlement Data:

Analysis of the latest data from the Arup Reports continues to show a varying rate of overall settlement as in preceding settlement reports by Arup. The Transbay deep foundation activities continue to coincidentally affect the rate of settlement of the Millennium Tower. Generally, an increased rate of settlement has been observed since the Transbay subsurface construction activities have commenced.

Overall Settlement the Tower (Figures 1 and 2)
DeSimone recreated the log versus time plot as shown in the ARUP report. We have taken the data prior to the start of Transbay construction and extrapolated these curves out to the upper and lower bounds of the final Tower settlement prediction as reported by Treadwell and Rollo in their February 18th, 2009 letter to SFDBI. It is clear that the measured settlement is showing more deflection than would be predicted by natural settlement alone.

These plots show that the actual recorded settlement is more than what would have occurred naturally based on the T&R prediction. There are three distinct explanations:

1) The natural settlement predicted by T&R is incorrect.
2) The Transbay construction activities have created additional settlement.
3) Some combination of the above.

Since Treadwell has predicted a range of total settlement it is difficult to quantify the amount of settlement in excess of what would have occurred naturally. From a simple reading of the measured displacement versus the predictive curves (Figure 1), the additional settlement is between 0.5 to 1.2 inches. Since 0.75 inches is the "Action Trigger Level" as specified by Transbay, it is recommended that Millennium obtain a response from Transbay.

Figure 2 includes an average of settlement on the north side of the tower and on the south end of the tower. Before construction activities began at Transbay we observe that the north side had settled at a greater rate than the south. After construction activities started, we now observe a greater rate of settlement on the south side. The foundation has rotated towards the Transbay project. If the T&R prediction was incorrect as suggested by ARUP, then it would be expected that the additional settlement would have been uniform. However, the fact that the south end of the foundation seems now to be moving faster than the north, it follows that the activities at Transbay have caused the additional settlement.

Figure 2 also shows that the overall settlement reported by ARUP (and duplicated in Figure 1) is the worst case settlement anywhere across the foundation and does not represent the average.

<u>Settlement as Shown in the ARUP Plot (Figure 3)</u>
DeSimone recreated this plot in order to understand the information provided by ARUP. This plot shows that the southeast corner near SM-03 is settling less than comparable points on the west side of the tower. DeSimone believes that the SM-03 reduced settlement is a local phenomenon due to this area of the slab being supported in some way, and is not a good point to look at when considering overall settlement of the tower due to Transbay construction activities.

<u>Settlement of the North vs. South Side of the Foundation (Figure 4)</u>
Before construction at Transbay began, the North Side was settling more, and now, after construction has been going for some time, the south side is settling more. This seems to clearly show that the construction is causing settlement. It is recommended that Millennium seek an explanation for this from Transbay.

It should also be noted that this figure shows differential movement across the foundation causing a tilt to the building. This kind of moment can cause damage to the structure of the building as opposed to uniform settlement which would typically not cause damage. However, 0.2" is too small a value to cause any damage.

<u>Settlement Across a North-South Slice of the Foundation (Figure 5)</u>
Before construction, the building was settling more in the North and in a consistent linear pattern. Once construction began, the points in the south started settling faster than the ones in the north.

Note: the 10/17/2011 reading of SM-34 is likely an erroneous reading.

<u>Settlement Across an East-West Slice of the Foundation (Figure 6)</u>
The construction does not seem to have affected the settlement in the east-west direction. The settlement along this slice seems to be close to linear with the west side settling more than the east.

<u>Between the Tower and Mid-Rise Along Gridline 12 Joint (Figure 7)</u>
Several settlement markers were reviewed at the building separation joint between the tower and Mid-Rise along gridline 12. It can be clearly observed that since Transbay construction activities have begun, that there is increasing differential across the joint, more than what was naturally occurring prior to the beginning of Transbay construction. The largest impact is near the south side of the building, and little to no impact in natural differential on the north side. It does appear that the joint is performing as expected and allowing free movements between both structures.

<u>3 foot Thick Cantilever Slab Versus the Mid-Rise - Between Gridline H and K (Figure 8)</u>
Several Settlement Markers were chosen to evaluate the relative settlement between the 3 foot thick cantilever slab and the Mid-Rise – SM-006, SM-003 and SM-041. Between April 2009 and October, 2012, settlement between the 3 foot thick cantilever slab is approximately 1.7 inches greater than the Mid-Rise. This indicates that, the joint between the two buildings is allowing for independent rates of settlement and the tower is likely not dragging the Mid-Rise with it as it settles.

<u>Rate of Settlement Over Time (Figure 9)</u>
This plot is brand new and shows the rate of settlement and how that rate has changed over time. We use a moving average which includes 9 data points (an average of about a year each data point.) The following is a list of observations from Figure 9:

- Before construction, the settlement was faster in the north than the south. After construction, the settlement was faster in the south.
- Between March 2010 and March 2011 the rate of settlement was slowing
- The rate of settlement increased for the most southerly markers in about March of 2010
- The rate of settlement on the northerly markers began increasing in June 2011.
- The current rate of settlement is approaching the rate which was observed in 2009.
- The marker showing the slowest rate is SM-32 in the northeast corner of the site.
- The marker showing the greatest rate is SM-07 in the southwest corner of the site.

Tiltmeter Data:

No update since the November 28, 2012 report.

Tape Extensometers Data:

No update since the November 28, 2012 report.

Vibration Data:

No update since the November 28, 2012 report.

DESIMONE

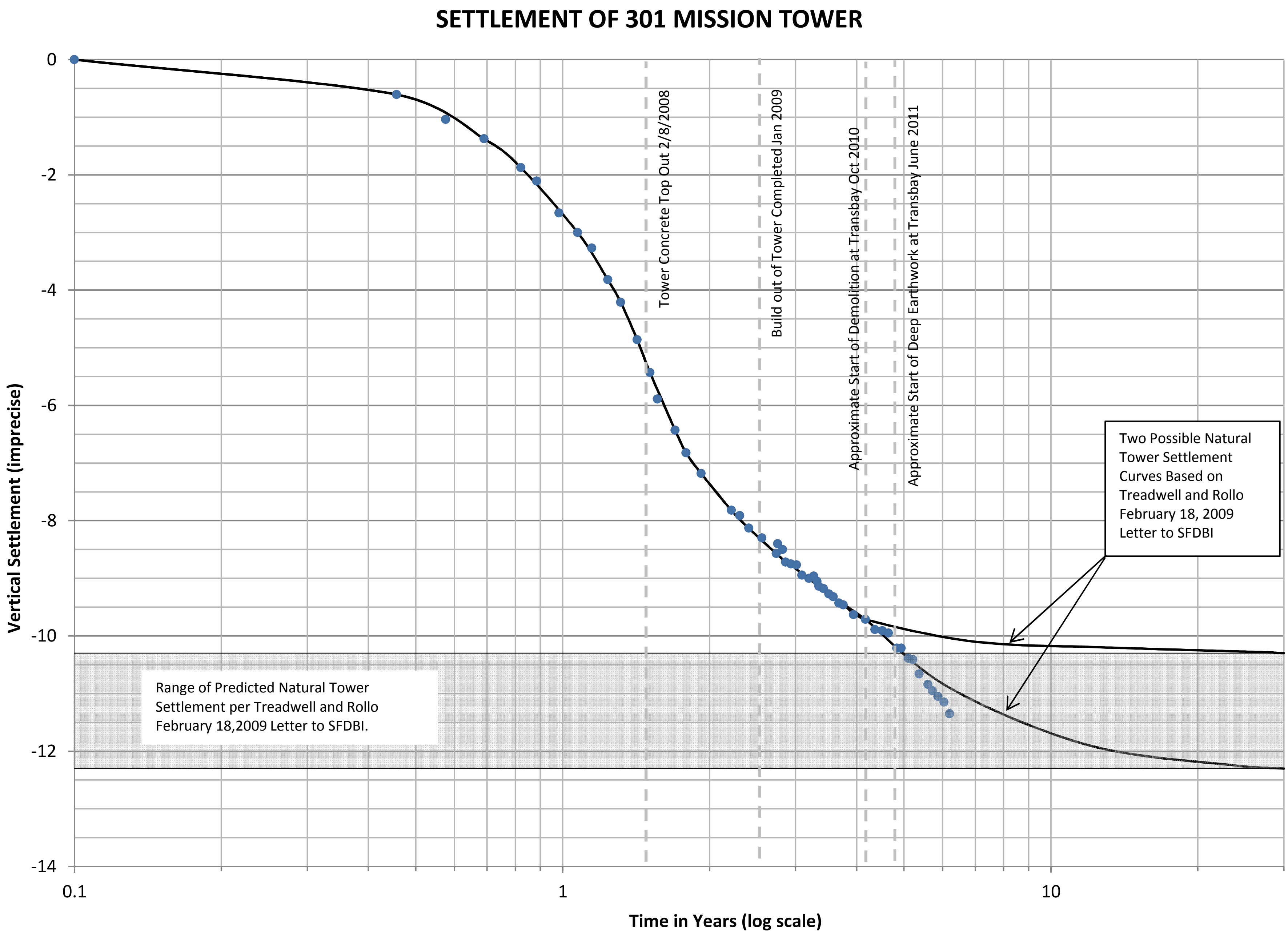


Figure 1

DESIMONE

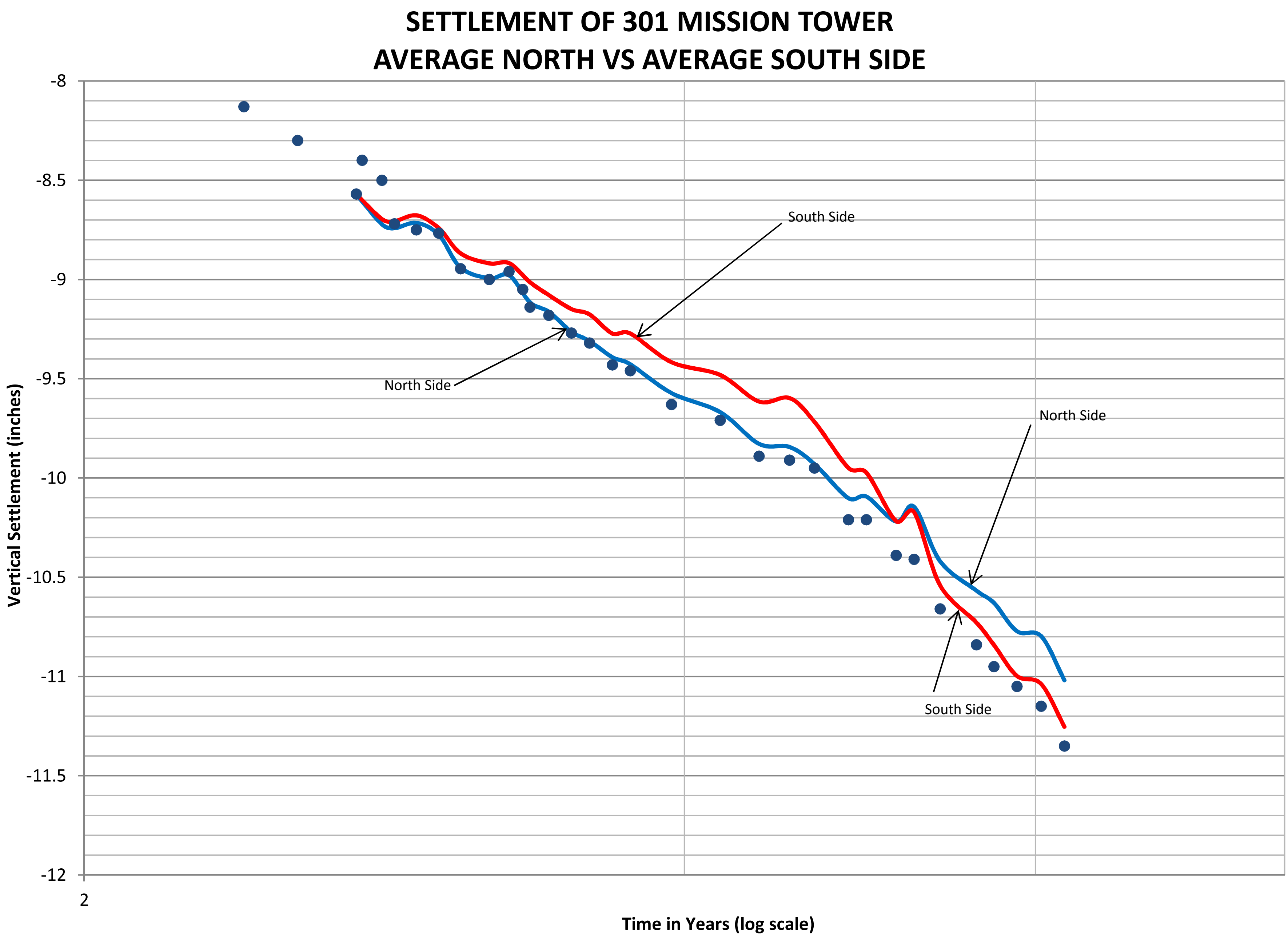


Figure 2

DESIMONE

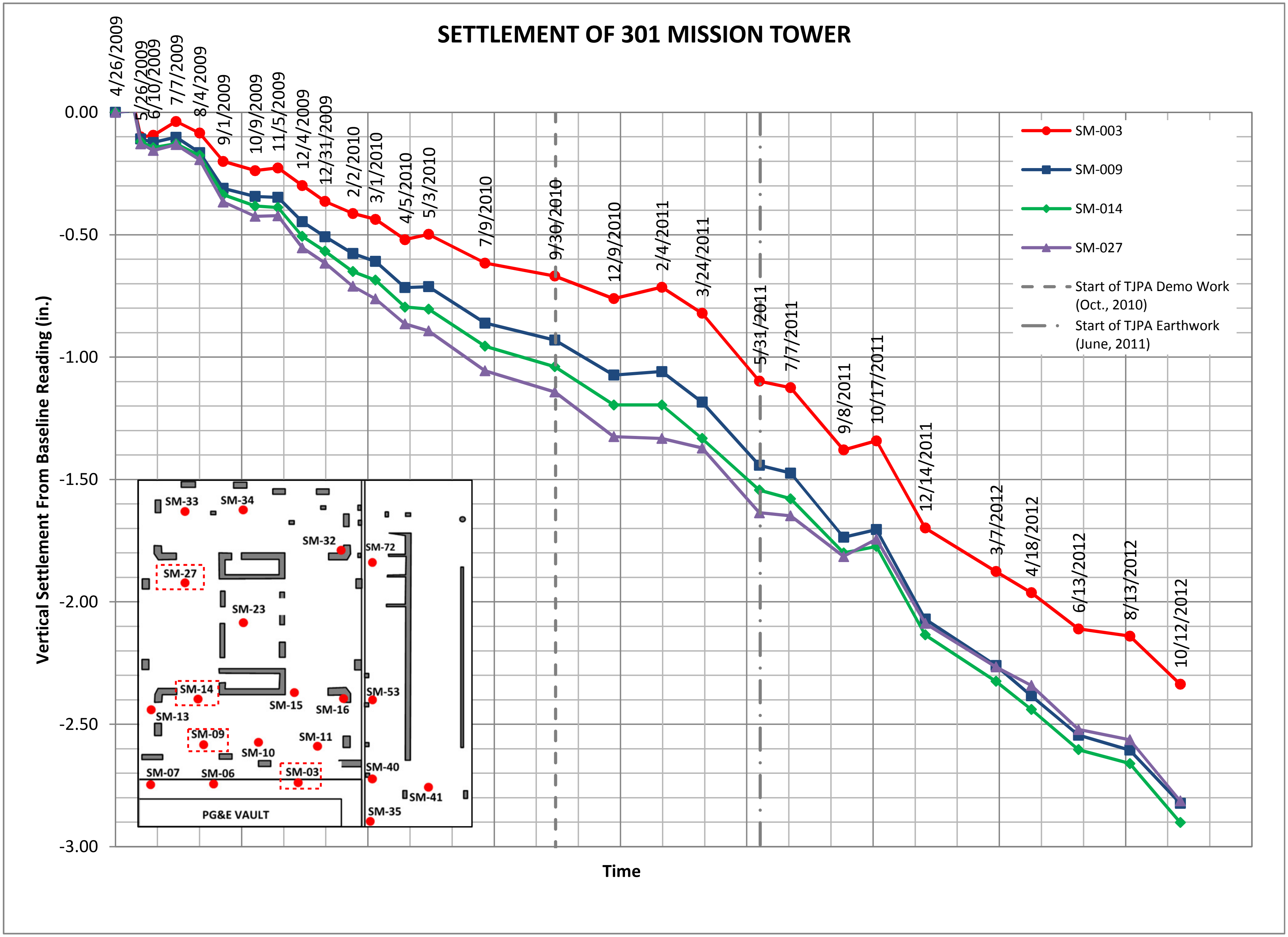


Figure 3

DESIMONE

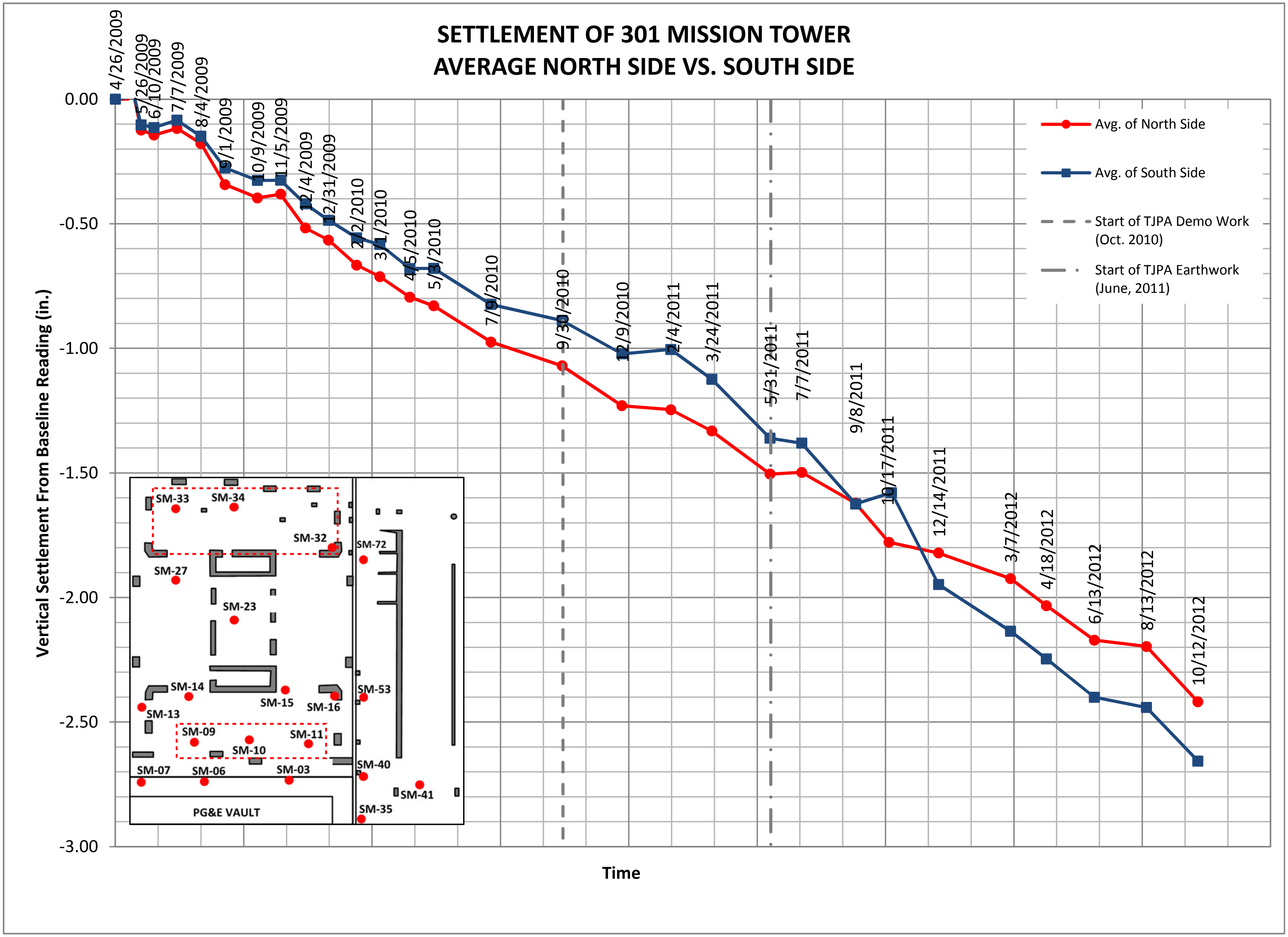


Figure 4

DESIMONE

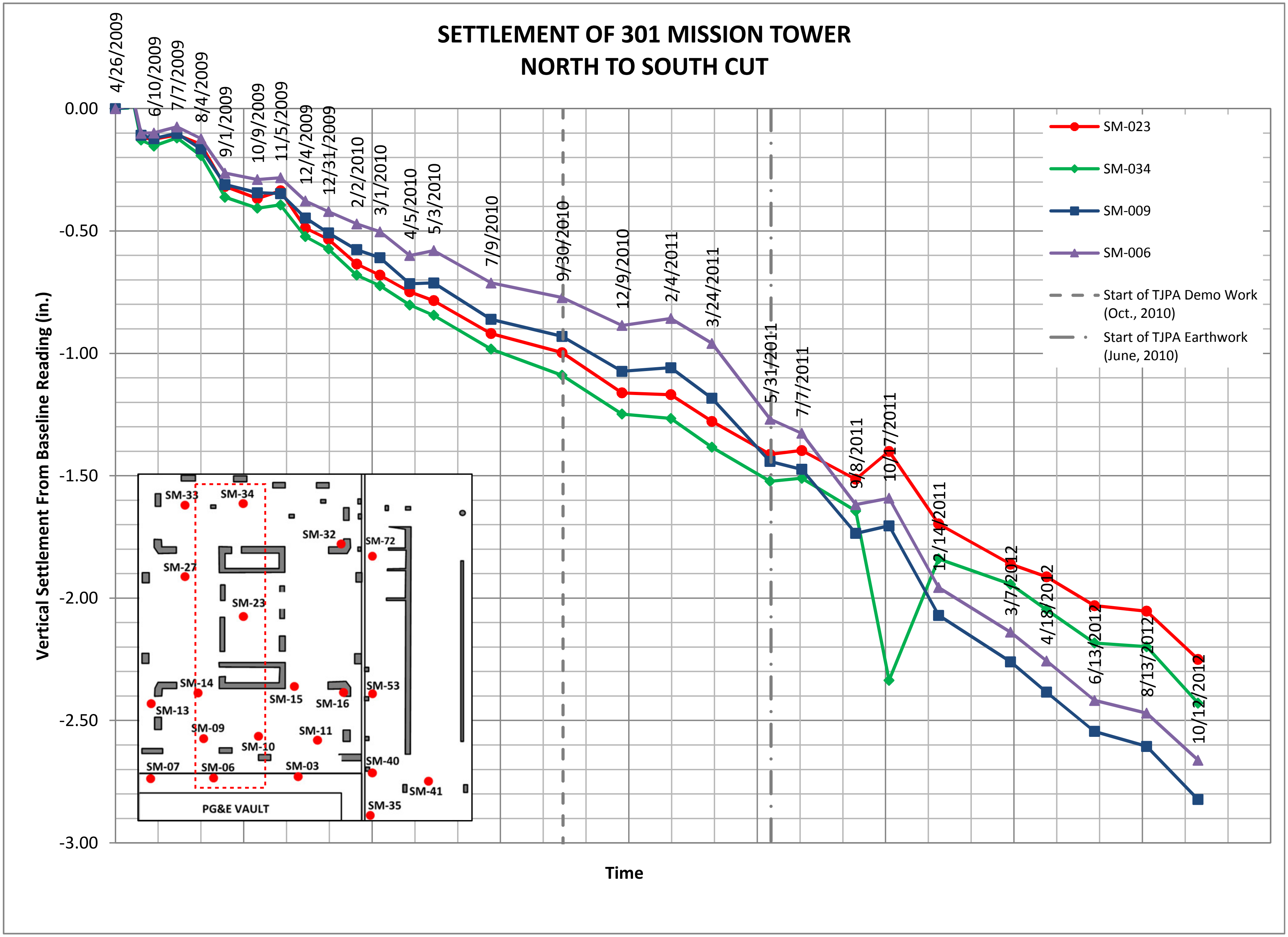


Figure 5

12/14/2012

DESIMONE

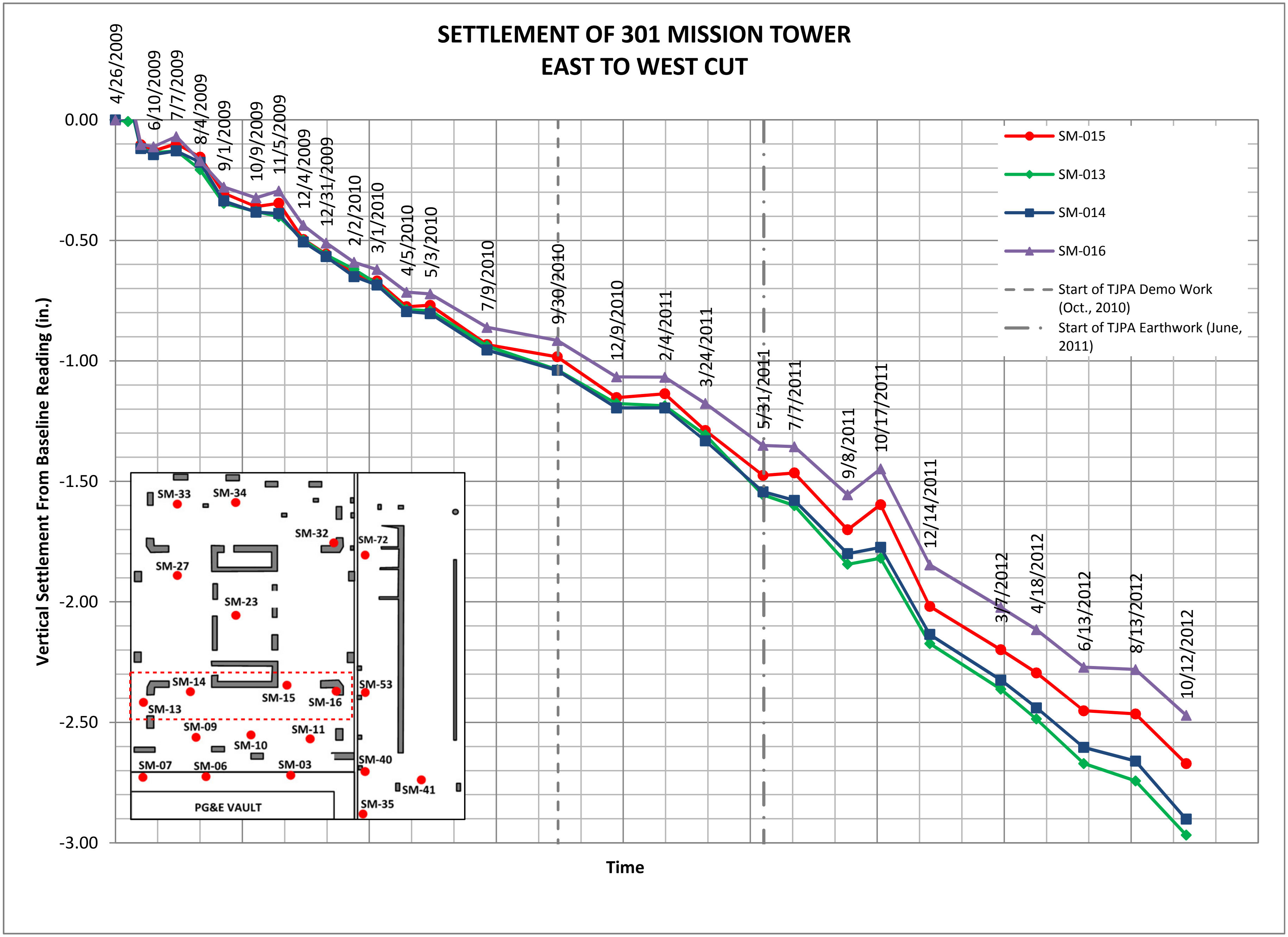


Figure 6

DIFFERENTIAL SETTLEMENT ALONG THE GRIDLINE 12 JOINT BETWEEN TOWER TO MIDRISE

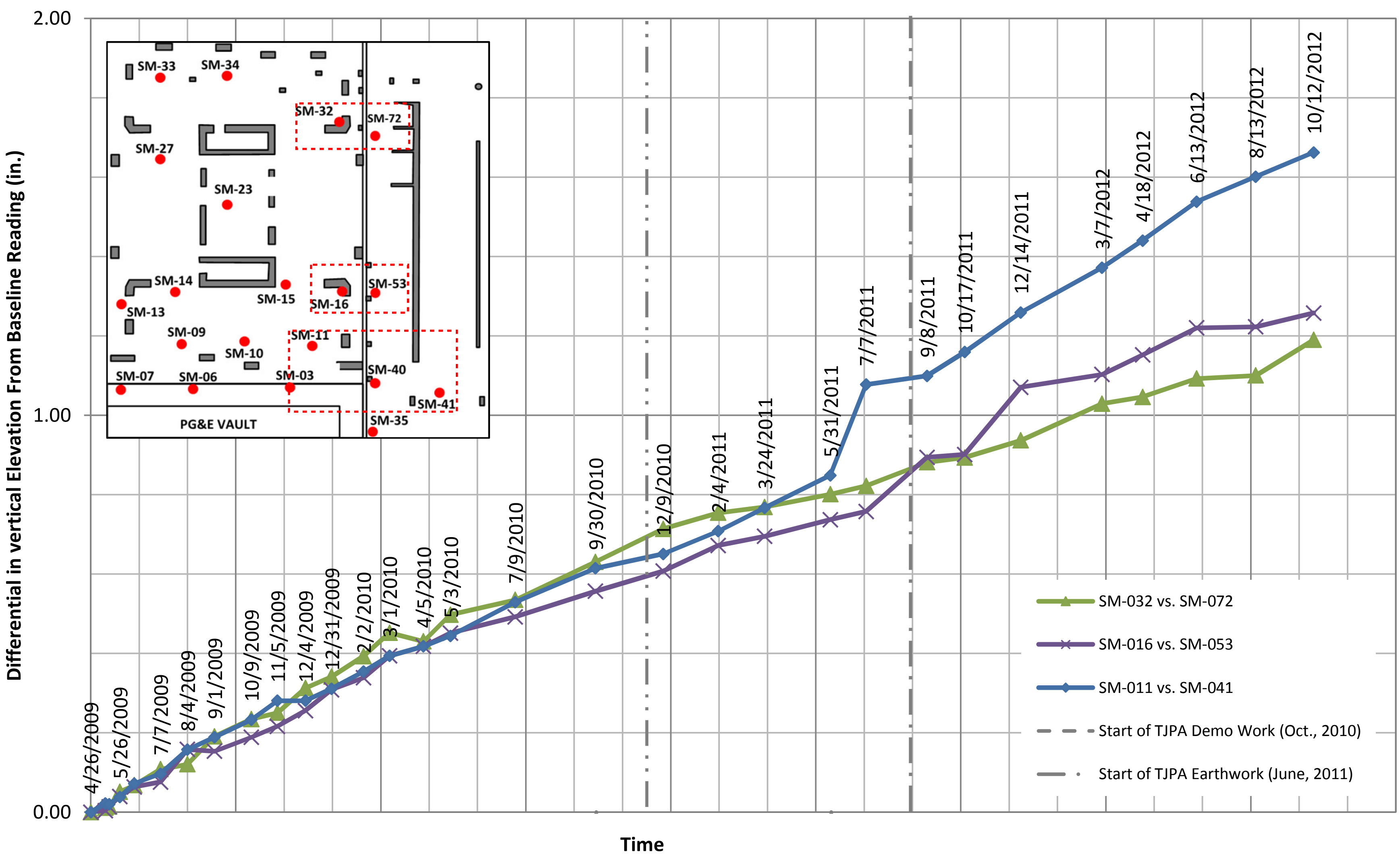


Figure 7

DESIMONE

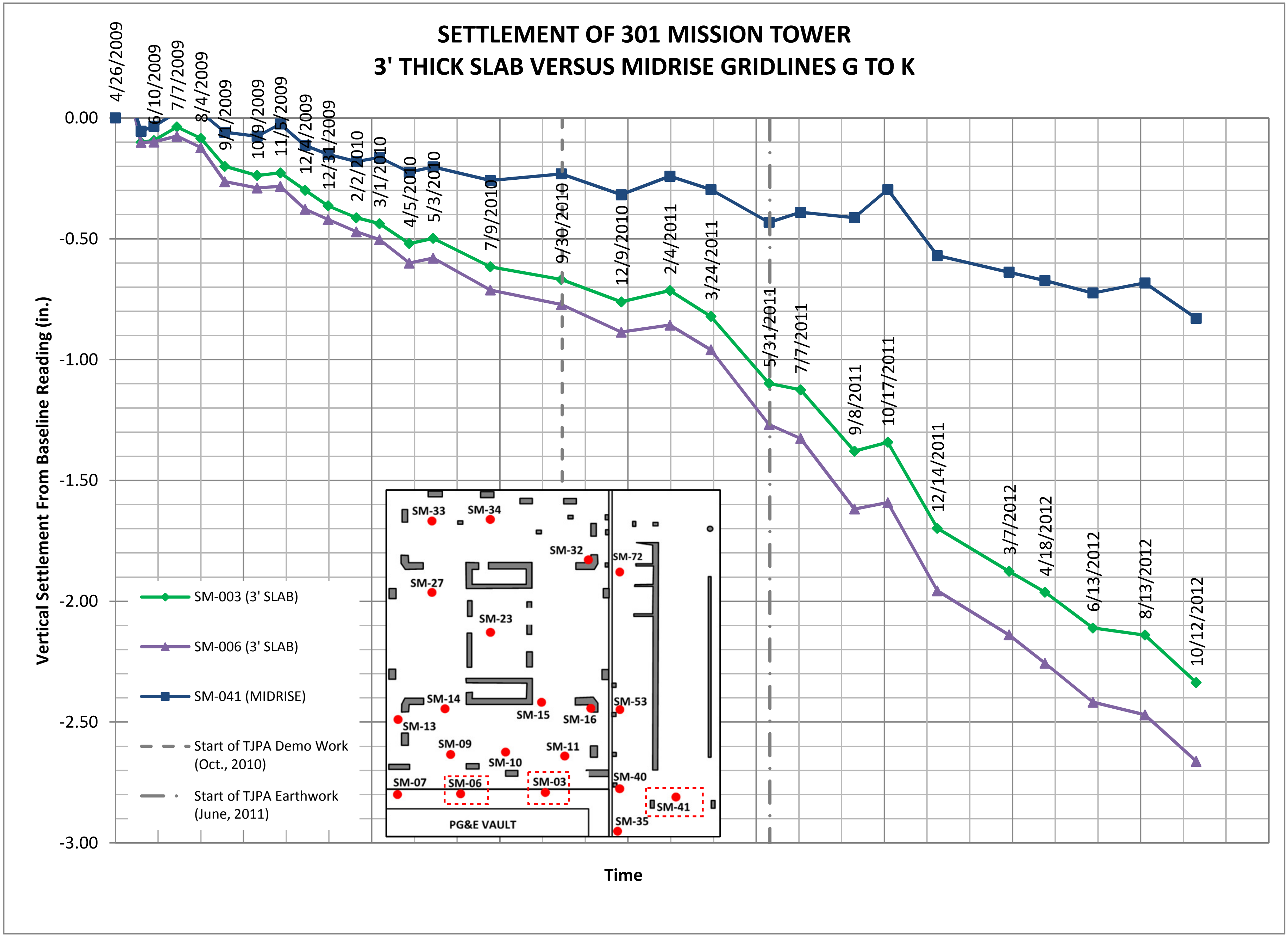


Figure 8

12/14/2012

DESIMONE

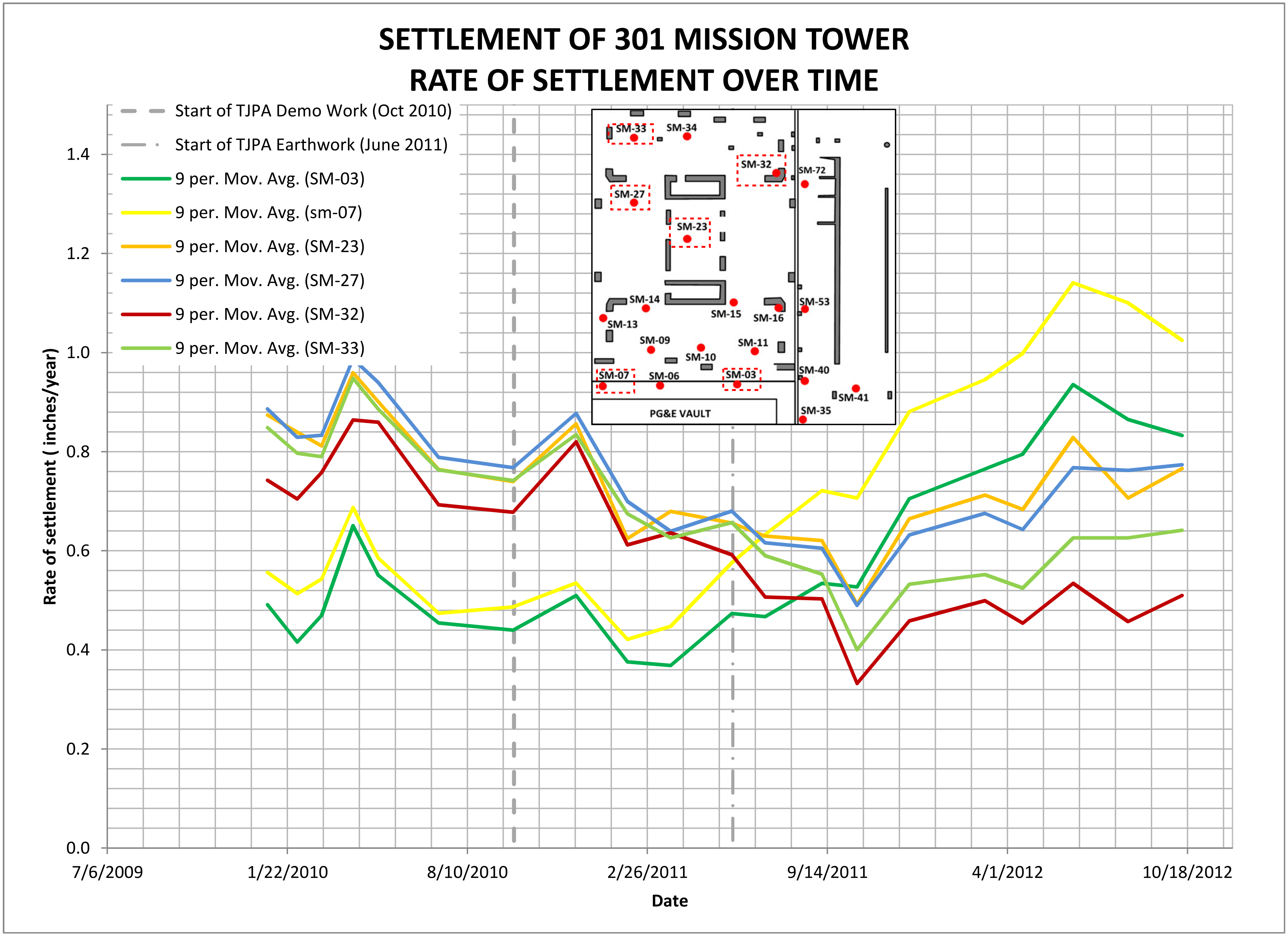


Figure 9

DESIMONE

MEMORANDUM

NEW YORK
MIAMI
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NEW HAVEN
LAS VEGAS
HONG KONG
ABU DHABI

FROM:	**NICOLAS RODRIGUES**	DATE:	**05 Apr 2013**
PROJECT NO.:	**4069G**	VIA:	**EMAIL**
PROJECT NAME:	**301 MISSION STREET – SETTLEMENT EVALUATION**	PAGES:	**12**

TO:
Steven Hood
SHood@millenniumptrs.com
Millennium Partners
301 Mission Street, Level B-1, San Francisco, CA 94103
T: (415) 874-4707
F: (415) 874-4750

RE: SETTLEMENT MONITORING

As requested, we continue to evaluate the settlement of the Millennium Tower and Mid-Rise, located at 301 Mission Street. We reviewed the settlement data provided by Millennium to DeSimone via email on Febuary 14th 2013. The data provided has survey elevation measurements for all settlement markers between April 26, 2009 and 12/26/2012. This memo serves as an update to the DeSimone memo issued to Millennium on December 14, 2012.

It is our understanding that Treadwell and Rollo shall report on Settlement, Inclinometers, and Piezometers. DeSimone will report on:

1) Settlement Data, Transbay trigger limits, and structural impacts
2) Tiltometer Data, and structural impacts
3) Vibration Data, Transbay trigger limits, and structural impacts
4) Tape Extensometer Data, and structural impacts.

Settlement Data:

Analysis of the latest data from the Arup Reports continues to show a varying rate of overall settlement as in preceding settlement reports by Arup. The Transbay deep foundation activities continue to coincidentally affect the rate of settlement of the Millennium Tower. Generally, an increased rate of settlement has been observed since the Transbay subsurface construction activities have commenced.

Overall Settlement the Tower (Figures 1 and 2)
DeSimone recreated the log versus time plot as shown in the ARUP report. We have taken the data prior to the start of Transbay construction and extrapolated these curves out to the upper and lower bounds of the final Tower settlement prediction as reported by Treadwell and Rollo in their February 18th, 2009 letter to SFDBI. It is clear that the measured settlement is showing more deflection than would be predicted by natural settlement alone.

These plots show that the actual recorded settlement is more than what would have occurred naturally based on the T&R prediction. There are three distinct explanations:
1) The natural settlement predicted by T&R is incorrect.
2) The Transbay construction activities have created additional settlement.

3) Some combination of the above.

Since Treadwell has predicted a range of total settlement it is difficult to quantify the amount of settlement in excess of what would have occurred naturally. From a simple reading of the measured displacement versus the predictive curves (Figure 1), the additional settlement is between 0.6 to 1.6 inches. Since 0.75 inches is the "Action Trigger Level" for other buildings as specified by Transbay, it is recommended that Millennium obtain a response from Transbay. Further, Transbay only recently infomred Millinnium that they actually changed their project specification (Dec 10, 2010) to exclude the 301 Mission Tower from all actioin trigger levels. This late alteration to their specification is a clear indication that Transbay feels that 301 Mission is a special case, and is unwilling to limit how much settlement they may cause. This should be considered carefully by ownership.

Figure 2 includes an average of settlement on the north side of the tower and on the south end of the tower. Before construction activities began at Transbay we observe that the north side had settled at a greater rate than the south. After construction activities started, we now observe a greater rate of settlement on the south side. The foundation has rotated towards the Transbay project. Since the south end of the foundation seems now to be moving faster than the north, it follows that the activities at Transbay have caused the additional settlement.

Figure 2 also shows that the overall settlement reported by ARUP (and duplicated in Figure 1) is the worst case settlement anywhere across the foundation and does not represent the average. Based on this plot, the average overall settlement on the site is currently about 11.3 overall inches.

<u>Settlement as Shown in the ARUP Plot (Figure 3)</u>
DeSimone recreated this plot in order to understand the information provided by ARUP. This plot shows that the southeast corner near SM-03 is settling less than comparable points on the west side of the tower. DeSimone believes that the SM-03 reduced settlement is a local phenomenon due to this area of the slab being supported in some way, and is not a good point to look at when considering overall settlement of the tower due to Transbay construction activities.

<u>Settlement of the North vs. South Side of the Foundation (Figure 4)</u>
Before construction at Transbay began, the North Side was settling more, and now, after construction has been going for some time, the south side is settling more. This seems to clearly show that the construction is causing settlement. It is recommended that Millennium seek an explanation for this from Transbay.

It should also be noted that this figure shows differential movement across the foundation causing a tilt to the building. This kind of moment can cause damage to the structure of the building as opposed to uniform settlement which would typically not cause damage. However, 0.24" of differential accorss the site is a small enough value to make damage unlikely.

<u>Settlement Across a North-South Slice of the Foundation (Figure 5)</u>
Before construction, the building was settling more in the North and in a consistent linear pattern. Once construction began, the points in the south started settling faster than the ones in the north.

Note: the 10/17/2011 reading of SM-34 is likely an erroneous reading and has been removed.

<u>Settlement Across an East-West Slice of the Foundation (Figure 6)</u>
The construction does not seem to have affected the settlement in the east-west direction. The

settlement along this slice seems to be close to linear with the west side settling slightly more than the east.

Between the Tower and Mid-Rise Along Gridline 12 Joint (Figure 7)
Several settlement markers were reviewed at the building separation joint between the tower and Mid-Rise along gridline 12. It can be clearly observed that since Transbay construction activities have begun, that there is increasing differential across the joint, more than what was naturally occurring prior to the beginning of Transbay construction. The largest impact is near the south side of the building, and little to no impact in natural differential on the north side. It does appear that the joint is performing as expected and allowing free movements between both structures.

3 foot Thick Cantilever Slab Versus the Mid-Rise - Between Gridline H and K (Figure 8)
Several Settlement Markers were chosen to evaluate the relative settlement between the 3 foot thick cantilever slab and the Mid-Rise – SM-006, SM-003 and SM-041. Between April 2009 and October, 2012, settlement between the 3 foot thick cantilever slab is approximately 1.8 inches greater than the Mid-Rise. This indicates that, the joint between the two buildings is allowing for independent rates of settlement and the tower is likely not dragging the Mid-Rise with it as it settles.

Rate of Settlement Over Time (Figure 9)
This plot shows the rate of settlement and how that rate has changed over time. We use a moving average which includes 9 data points (an average of about a year for each data point.) The following is a list of observations from Figure 9:

- Before construction, the settlement was faster in the north than the south. After construction, the settlement was faster in the south.
- Between March 2010 and March 2011 the rate of settlement was slowing
- The rate of settlement increased for the most southerly markers in about March of 2010
- The rate of settlement on the northerly markers began increasing in June 2011.
- The current rate of settlement is approaching the rate which was observed in 2009.
- The marker showing the slowest rate is SM-32 in the northeast corner of the site.
- The marker showing the greatest rate is SM-07 in the southeast corner of the site.

Tiltmeter Data:

No update since the December 14, 2012 report.

Tape Extensometers Data:

No update since the December 14, 2012 report.

Vibration Data:

No update since the December 14, 2012 report.

DESIMONE

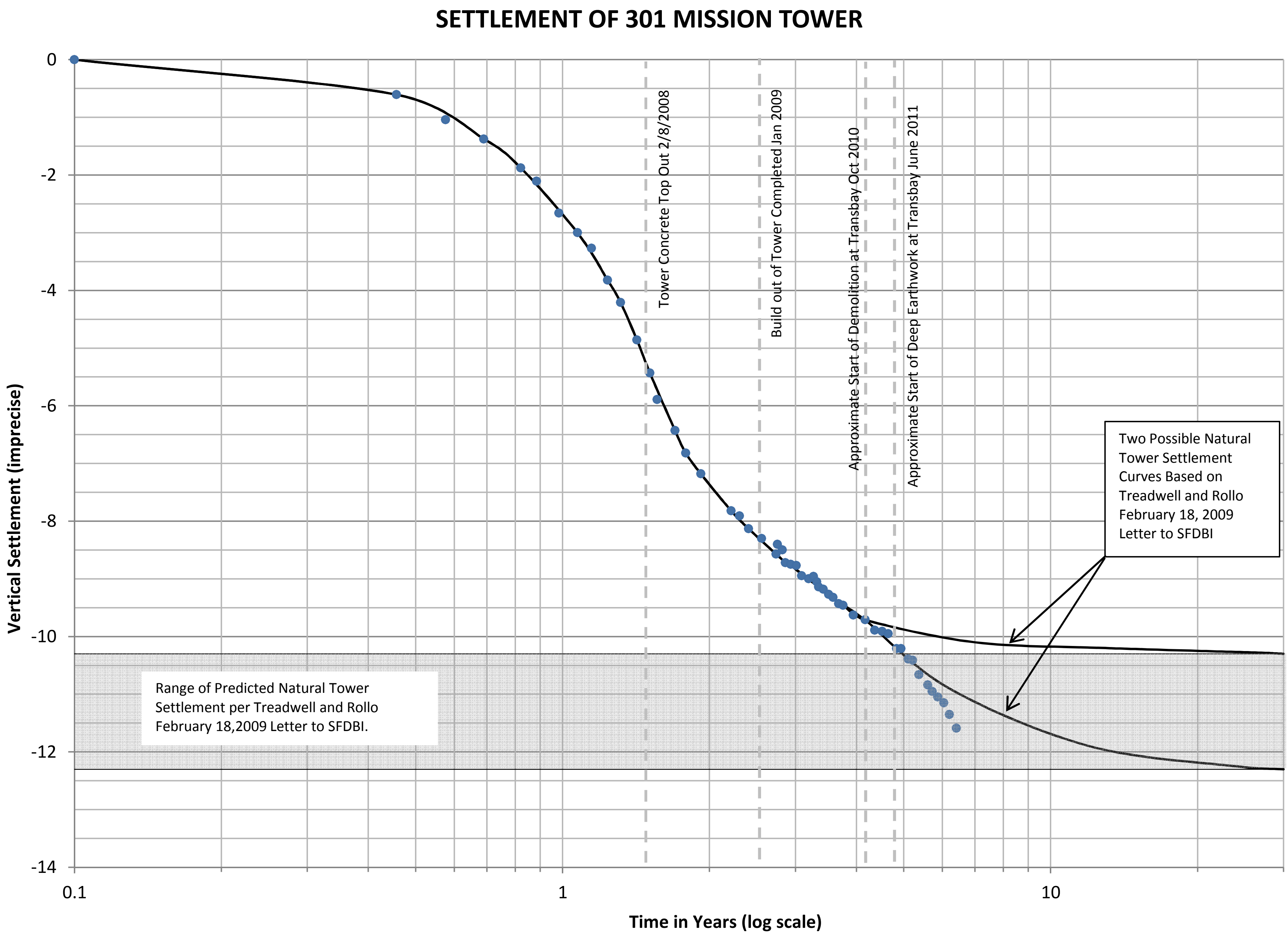

Figure 1

DESIMONE

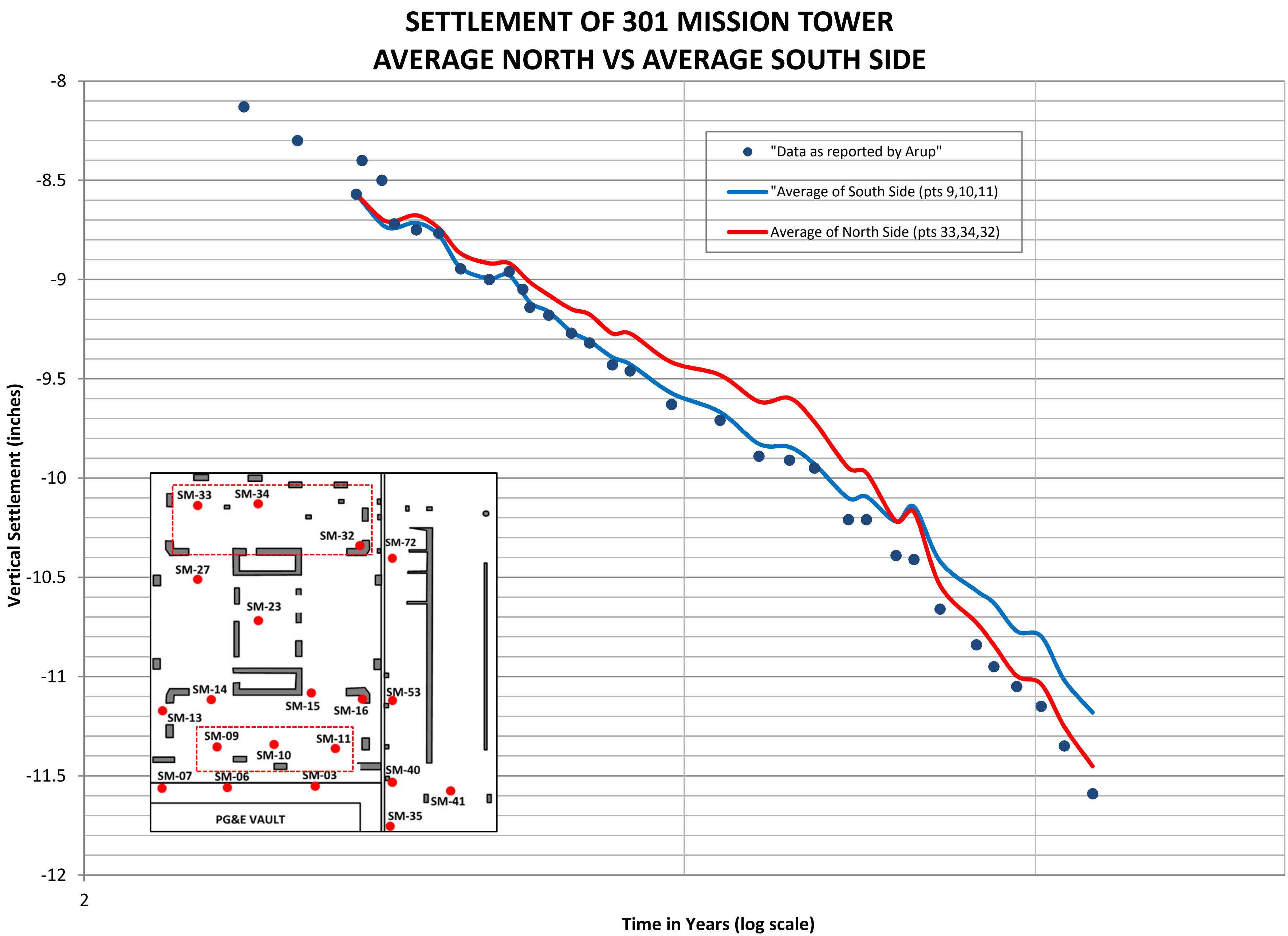

Figure 2

4/5/2013

DESIMONE

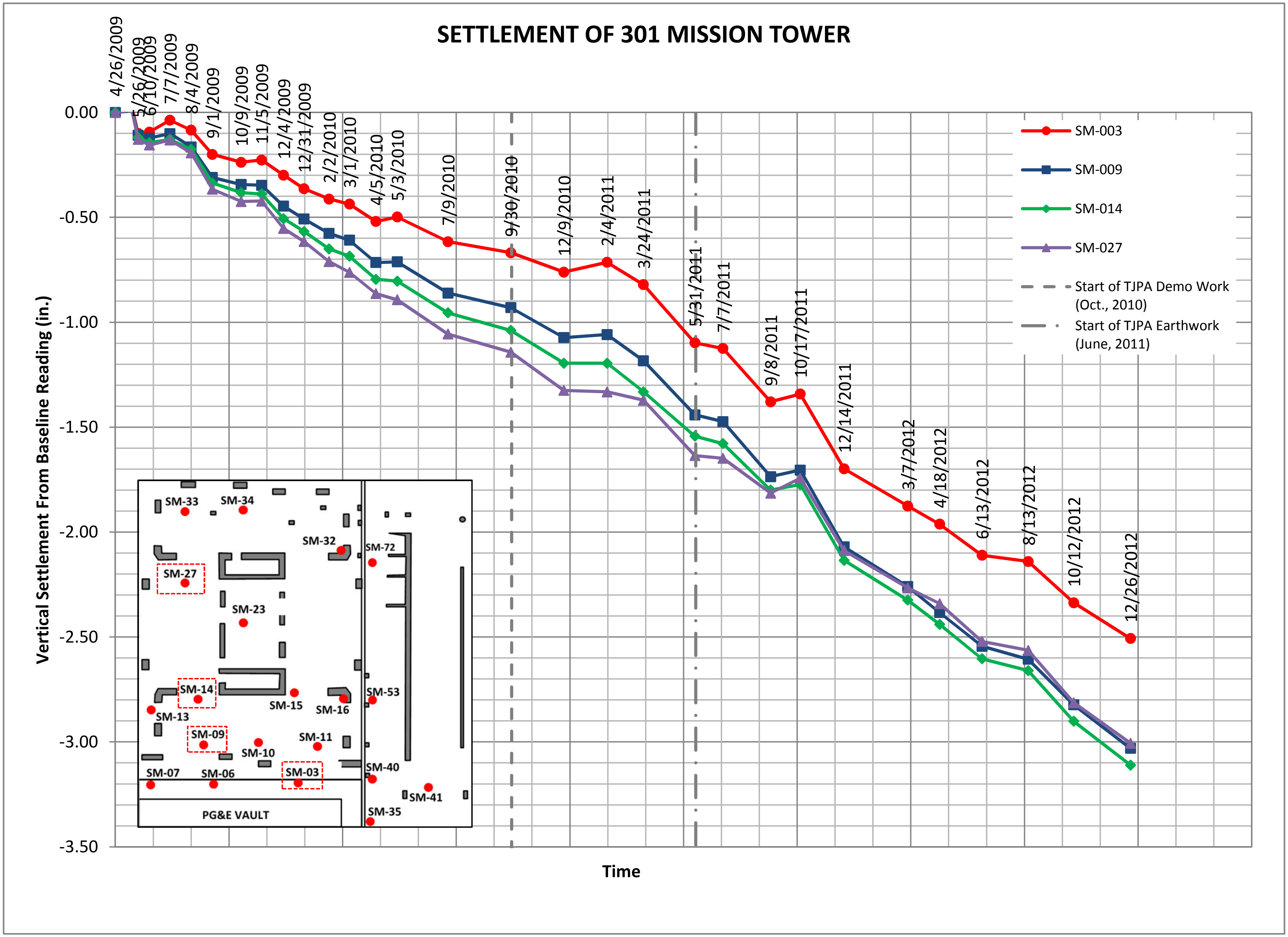

Figure 3

4/5/2013

DESIMONE

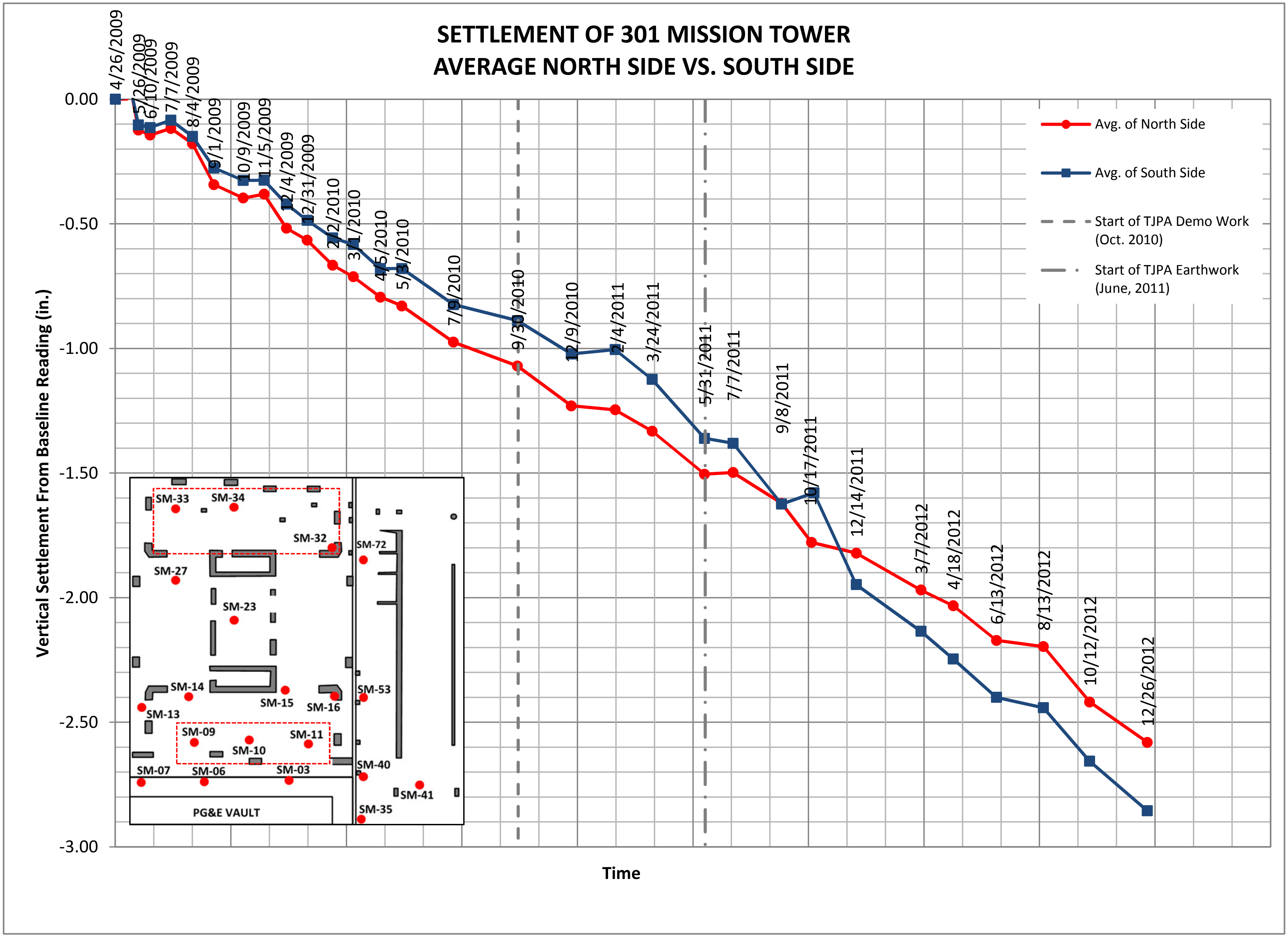

Figure 4

DESIMONE

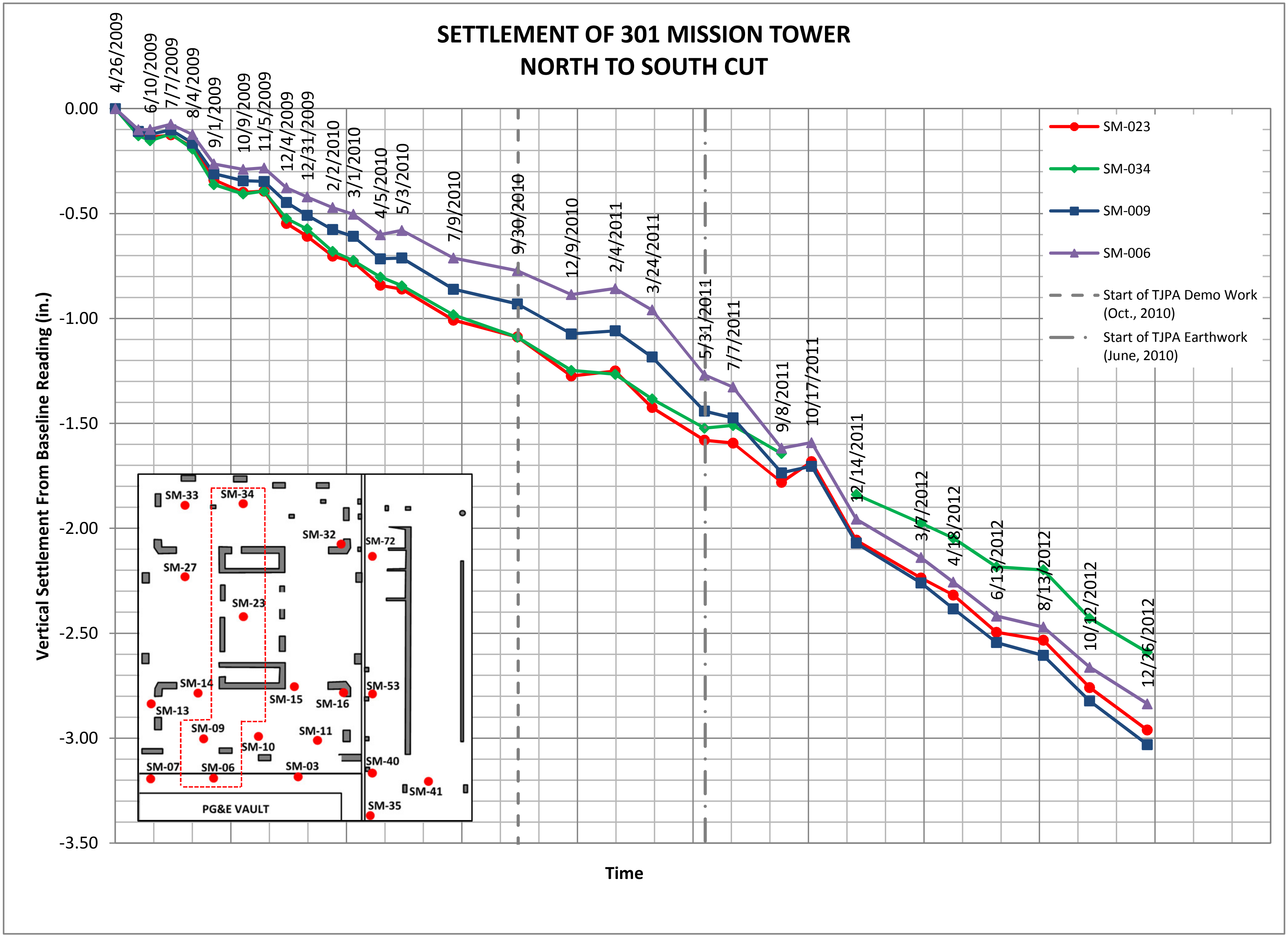

Figure 5

DESIMONE

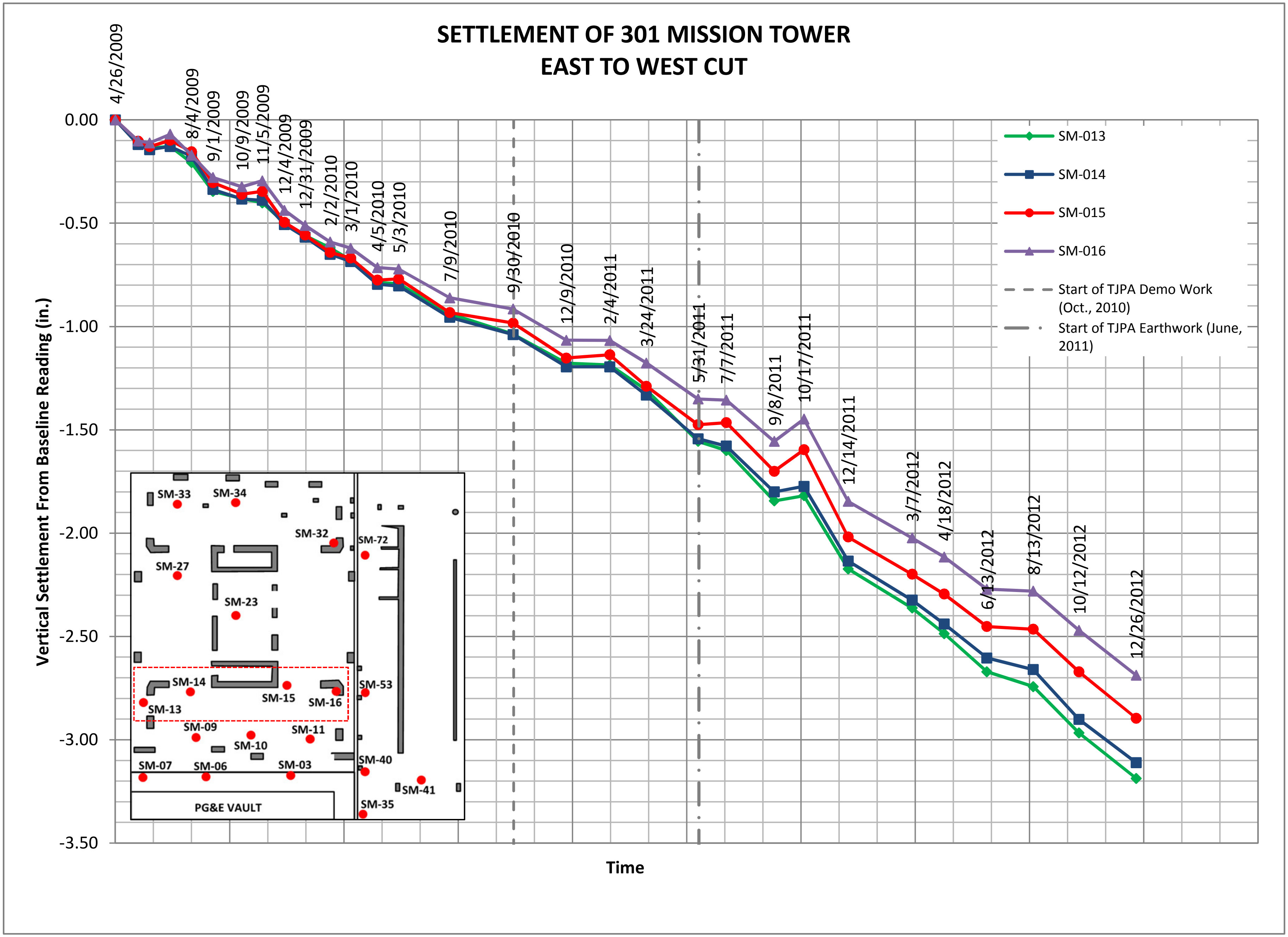

Figure 6

4/5/2013

DESIMONE

DIFFERENTIAL SETTLEMENT ALONG THE GRIDLINE 12 JOINT BETWEEN TOWER TO MIDRISE

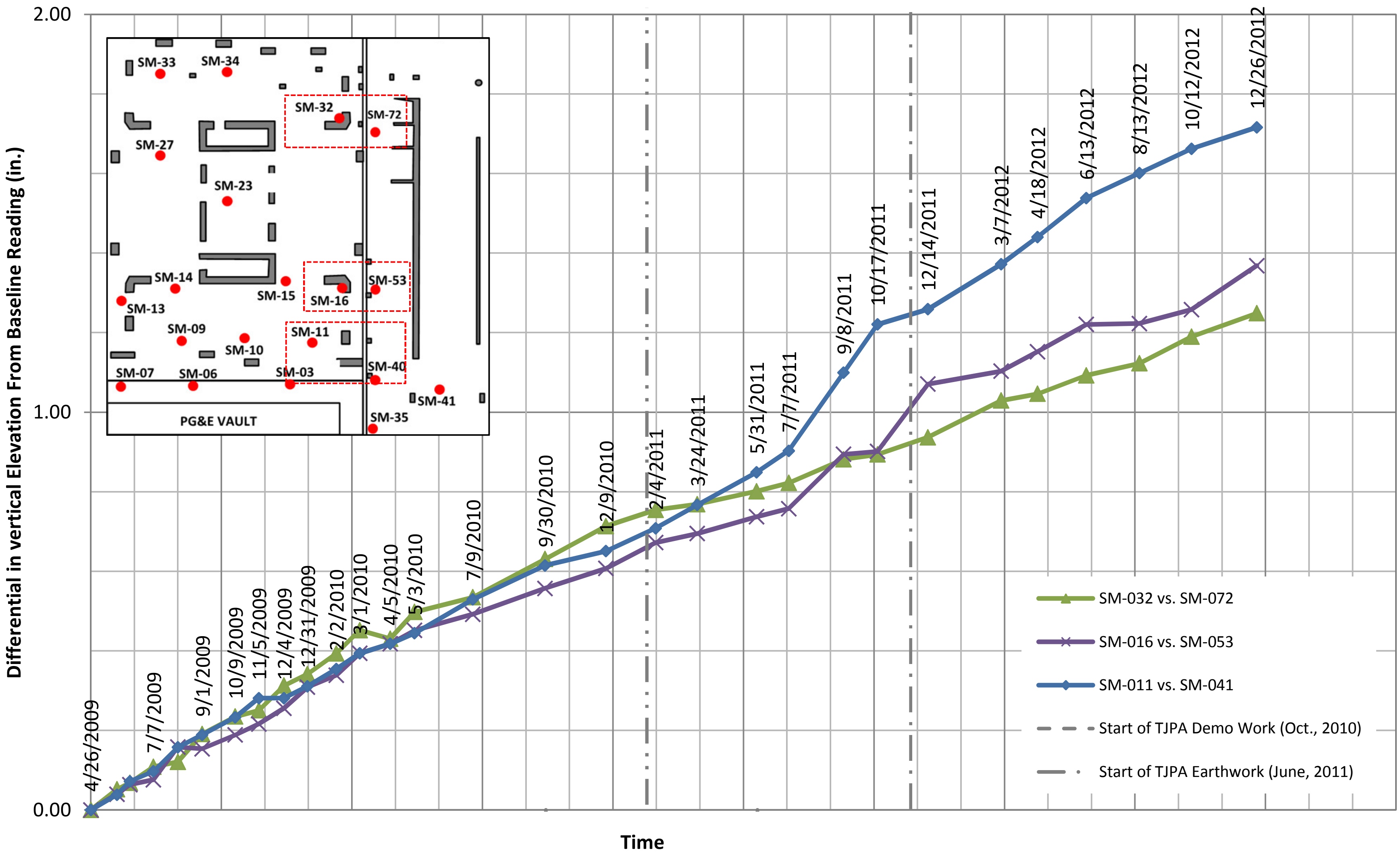

Figure 7

DESIMONE

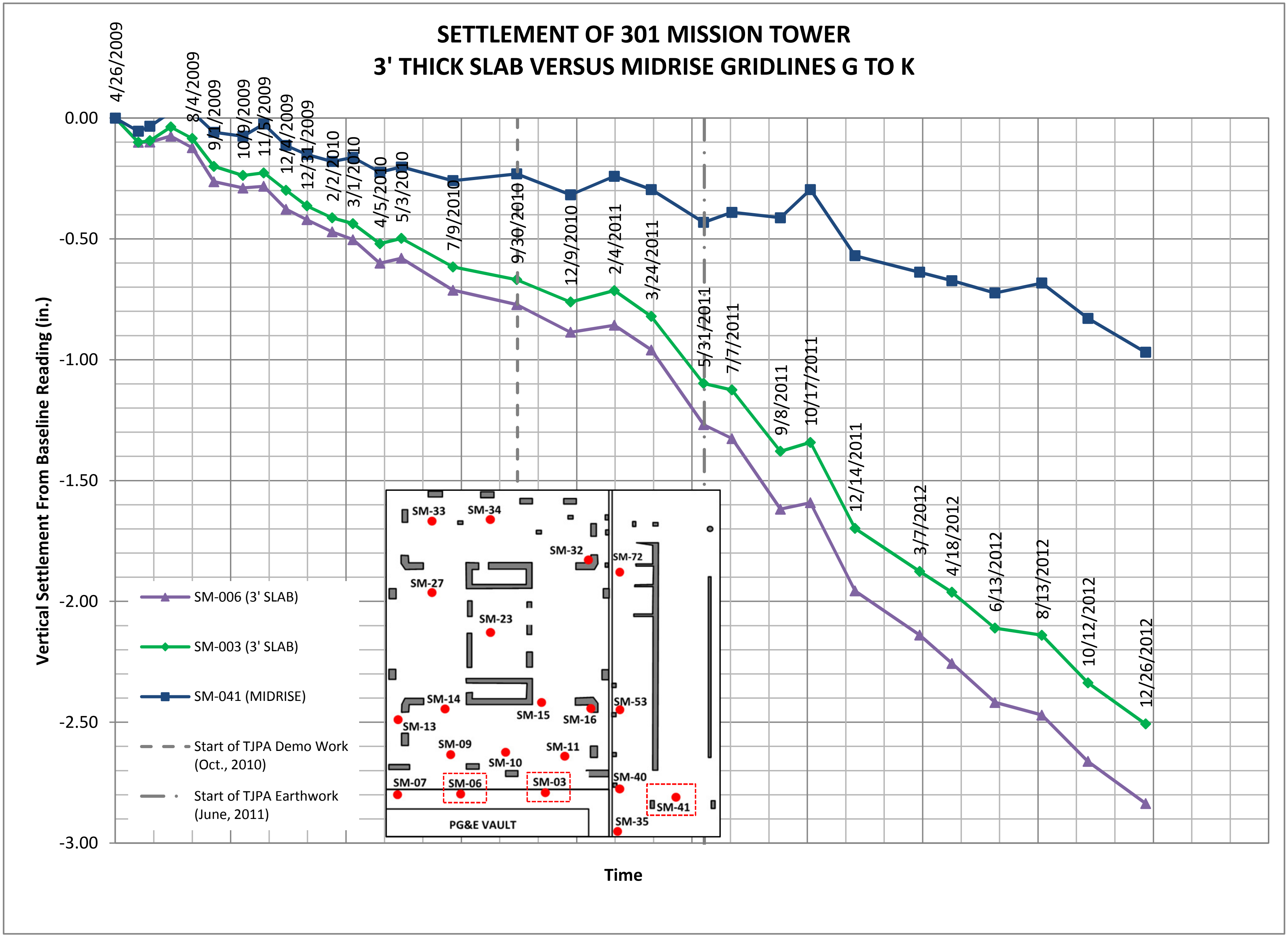

Figure 8

DESIMONE

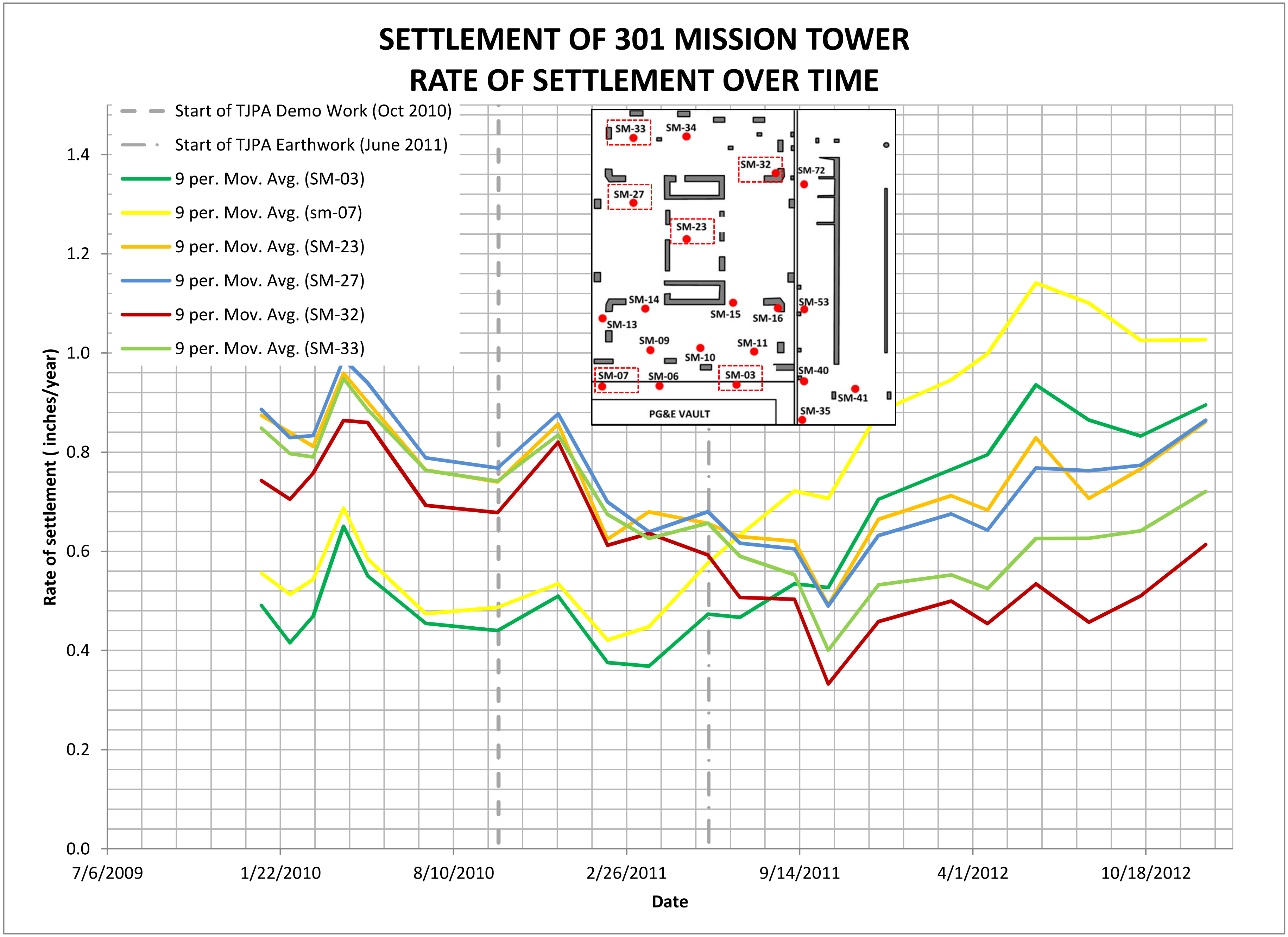

Figure 9

DESIMONE

MEMORANDUM

NEW YORK
MIAMI
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HONG KONG
ABU DHABI

FROM:	**NICOLAS RODRIGUES**	DATE:	**24 June 2013**
PROJECT NO.:	**4069G**	VIA:	**EMAIL**
PROJECT NAME:	**301 MISSION STREET – SETTLEMENT EVALUATION**	PAGES:	**12**

TO:
Steven Hood SHood@millenniumptrs.com
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301 Mission Street, Level B-1, San Francisco, CA 94103
T: (415) 874-4707
F: (415) 874-4750

RE: SETTLEMENT MONITORING

As requested, we continue to evaluate the settlement of the Millennium Tower and Mid-Rise, located at 301 Mission Street. We reviewed the settlement data provided by Millennium to DeSimone via email on June 17th 2013. The data provided has survey elevation measurements for all settlement markers between April 26, 2009 and February 23 2013. This memo serves as an update to the DeSimone memo issued to Millennium dated April 5, 2012.

It is our understanding that Treadwell and Rollo shall report on Settlement, Inclinometers, and Piezometers. DeSimone will report on:

1) Settlement Data, Transbay trigger limits, and structural impacts
2) Tiltometer Data, and structural impacts
3) Vibration Data, Transbay trigger limits, and structural impacts
4) Tape Extensometer Data, and structural impacts.

Settlement Data:

Analysis of the latest data from the Arup Reports continues to show a varying rate of overall settlement as in preceding settlement reports by Arup. Transbay has now completed the deep foundation activities and are now working at the surface level. It is our understanding that excavation has begun approximately on May 1st, 2013 but was slowed by the deep foundation cut-off effort. However, work on-site continues to coincidentally affect the rate of settlement of the Millennium Tower. Generally, an increased rate of settlement has been observed since the Transbay subsurface construction activities have commenced.

<u>Overall Settlement the Tower (Figures 1 and 2)</u>
DeSimone recreated the log versus time plot as shown in the ARUP report. We have taken the data prior to the start of Transbay construction and extrapolated these curves out to the upper and lower bounds of the final Tower settlement prediction as reported by Treadwell and Rollo in their February 18th, 2009 letter to SFDBI. It is clear that the measured settlement is showing more deflection than would be predicted by natural settlement alone.

These plots show that the actual recorded settlement is more than what would have occurred naturally based on the T&R prediction. There are three distinct explanations:

1) The natural settlement predicted by T&R is incorrect.
2) The Transbay construction activities have created additional settlement.
3) Some combination of the above.

Since Treadwell has predicted a range of total settlement, it is difficult to quantify the amount of settlement in excess of what would have occurred naturally. From a simple reading of the measured displacement versus the predictive curves (Figure 1), the additional settlement due to Transbay activity is between 0.8 to 1.6 inches. Since 0.75 inches is the "Action Trigger Level" for other buildings as specified by Transbay, it is recommended that Millennium obtain a response from Transbay. Further, Transbay changed their specification (Dec 10, 2010) to exclude the 301 Mission Tower from all action trigger levels. It is unclear why they would have changed their specification after construction had begun. This should be considered carefully by ownership.

Figure 2 includes an average of settlement on the north side of the tower and on the south end of the tower. Before construction activities began at Transbay we observe that the north side had settled at a greater rate than the south. After construction activities started, we now observe a greater rate of settlement on the south side. The foundation has rotated slightly towards the Transbay project. Since the south end of the foundation seems now to be moving faster than the north, it follows that the activities at Transbay have caused the additional settlement.

Figure 2 also shows that the overall settlement reported by ARUP (and duplicated in Figure 1) is the worst case settlement anywhere across the foundation (about 11.85") and does not represent the average. Based on this plot, the average overall settlement on the site is currently about 11.5 overall inches.

<u>Settlement as Shown in the ARUP Plot (Figure 3)</u>
DeSimone recreated this plot in order to understand the information provided by ARUP. This plot shows that the southeast corner near SM-03 is settling less than comparable points on the west side of the tower. DeSimone believes that the SM-03 reduced settlement is a local phenomenon due to this area of the slab being supported in some way, and is not a good point to look at when considering overall settlement of the tower due to Transbay construction activities.

<u>Settlement of the North vs. South Side of the Foundation (Figure 4)</u>
Before construction at Transbay began, the North Side was settling more, and now, after construction has been going for some time, the south side is settling more. This seems to clearly show that the construction has caused a change. It is recommended that Millennium seek an explanation for this from Transbay.

It should also be noted that this figure shows differential movement across the foundation causing a tilt to the building. This kind of movement can cause damage to the structure which reduces the buildings reserve strength for earthquakes.

<u>Settlement Across a North-South Slice of the Foundation (Figure 5)</u>
Before construction, the building was settling more in the North and in a consistent pattern. Once construction began, the points in the south started settling faster than the ones in the north.

Note: the 10/17/2011 reading of SM-34 is likely an erroneous reading and has been removed.

<u>Settlement Across an East-West Slice of the Foundation (Figure 6)</u>
The construction does not seem to have affected the settlement in the east-west direction. The

settlement along this slice seems to be close to linear with the west side settling slightly more than the east.

Between the Tower and Mid-Rise Along Gridline 12 Joint (Figure 7)
Several settlement markers were reviewed at the building separation joint between the tower and Mid-Rise along gridline 12. It can be clearly observed that since Transbay construction activities have begun, that there is increasing differential across the joint, more than what was naturally occurring prior to the beginning of Transbay construction. The largest impact is near the south side of the building, and little to no impact in natural differential on the north side. It does appear that the joint is performing as expected and allowing free movements between both structures.

3 foot Thick Cantilever Slab Versus the Mid-Rise - Between Gridline H and K (Figure 8)
Several Settlement Markers were chosen to evaluate the relative settlement between the 3 foot thick cantilever slab and the Mid-Rise – SM-006, SM-003 and SM-041. Between April 2009 and October, 2012, settlement between the 3 foot thick cantilever slab is approximately 1.8 inches greater than the Mid-Rise. This indicates that, the joint between the two buildings is allowing for independent rates of settlement and the tower is likely not dragging the Mid-Rise with it as it settles.

Rate of Settlement Over Time (Figure 9)
This plot shows the rate of settlement and how that rate has changed over time. We use a moving average which includes 9 data points (an average of about a year for each data point.) The following is a list of observations from Figure 9:

- Before construction, the settlement was faster in the north than the south. After construction, the settlement was faster in the south.
- Between March 2010 and about March 2011 the rate of settlement was slowing
- The rate of settlement increased for the most southerly markers in about March of 2011
- The rate of settlement on all markers show significant increase beginning in Oct 2011.
- **The current rate of settlement is higher than ever observed before.**
- The marker showing the slowest rate is SM-32 in the northeast corner of the site.
- The marker showing the greatest rate is SM-07 in the southeast corner of the site.

Tiltmeter Data:

No update since the December 14, 2012 report.

Tape Extensometers Data:

No update since the December 14, 2012 report.

Vibration Data:

No update since the December 14, 2012 report.

6/24/2013

DESIMONE

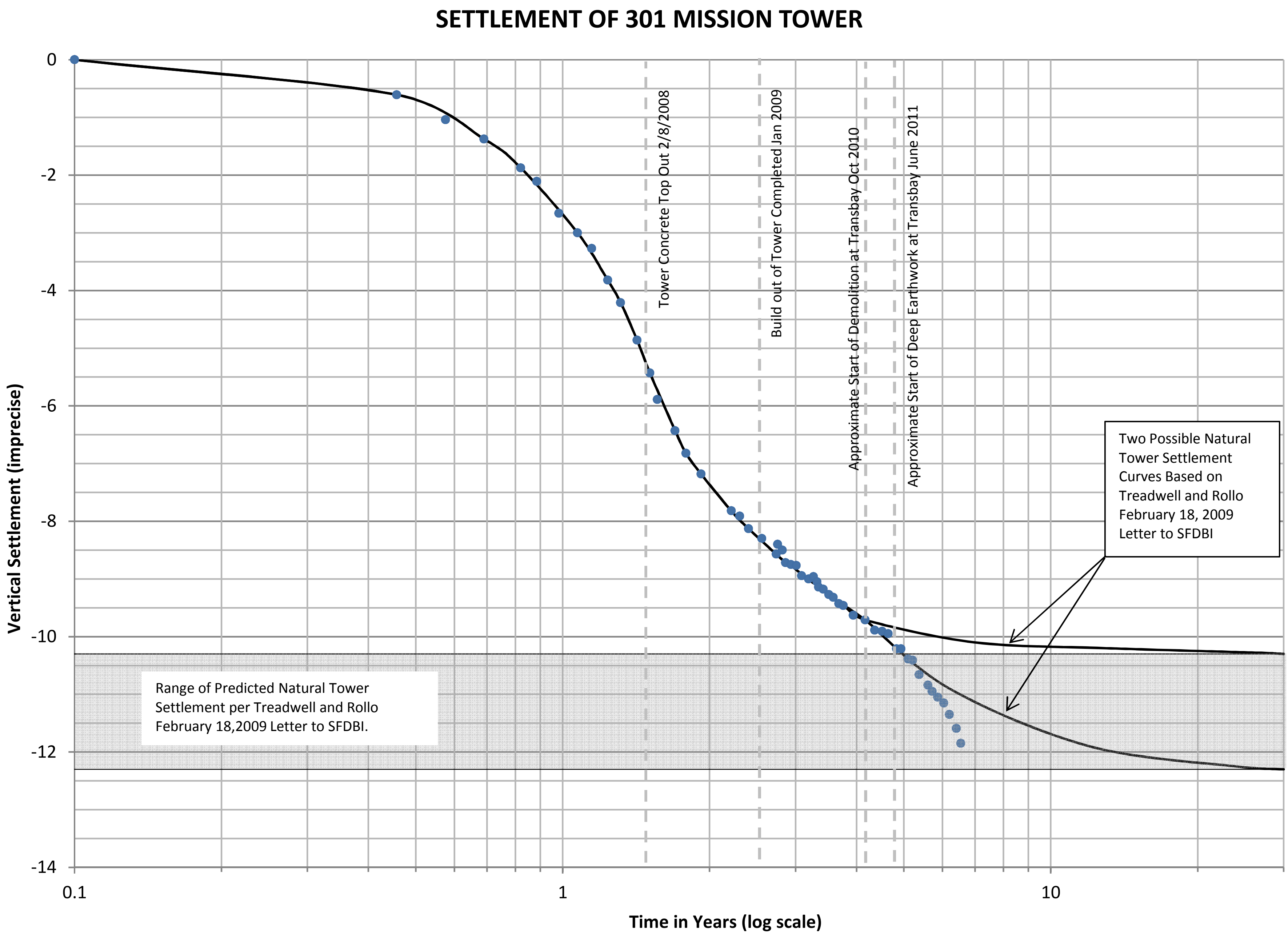

Figure 1

DESIMONE

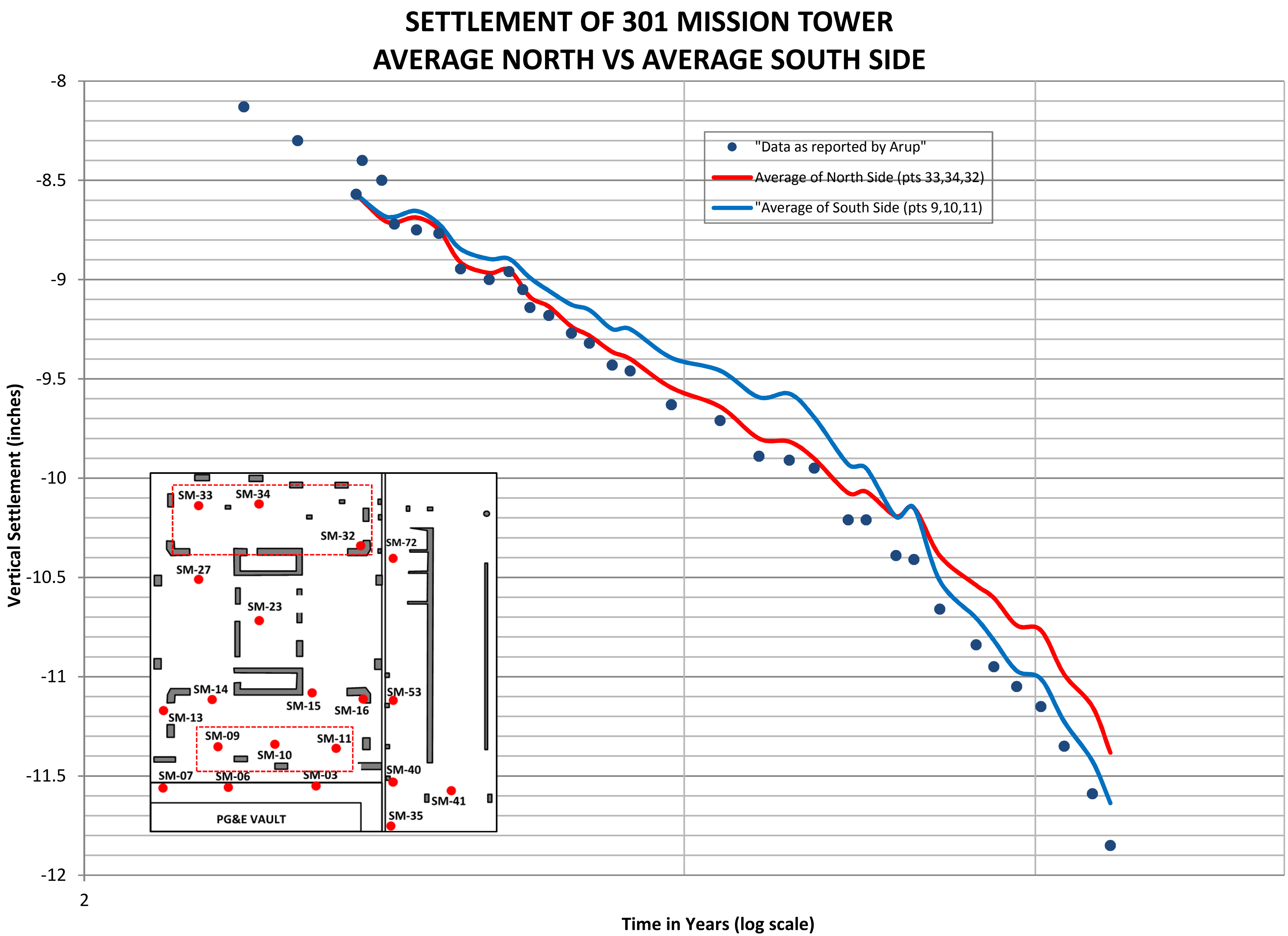

Figure 2

DESIMONE

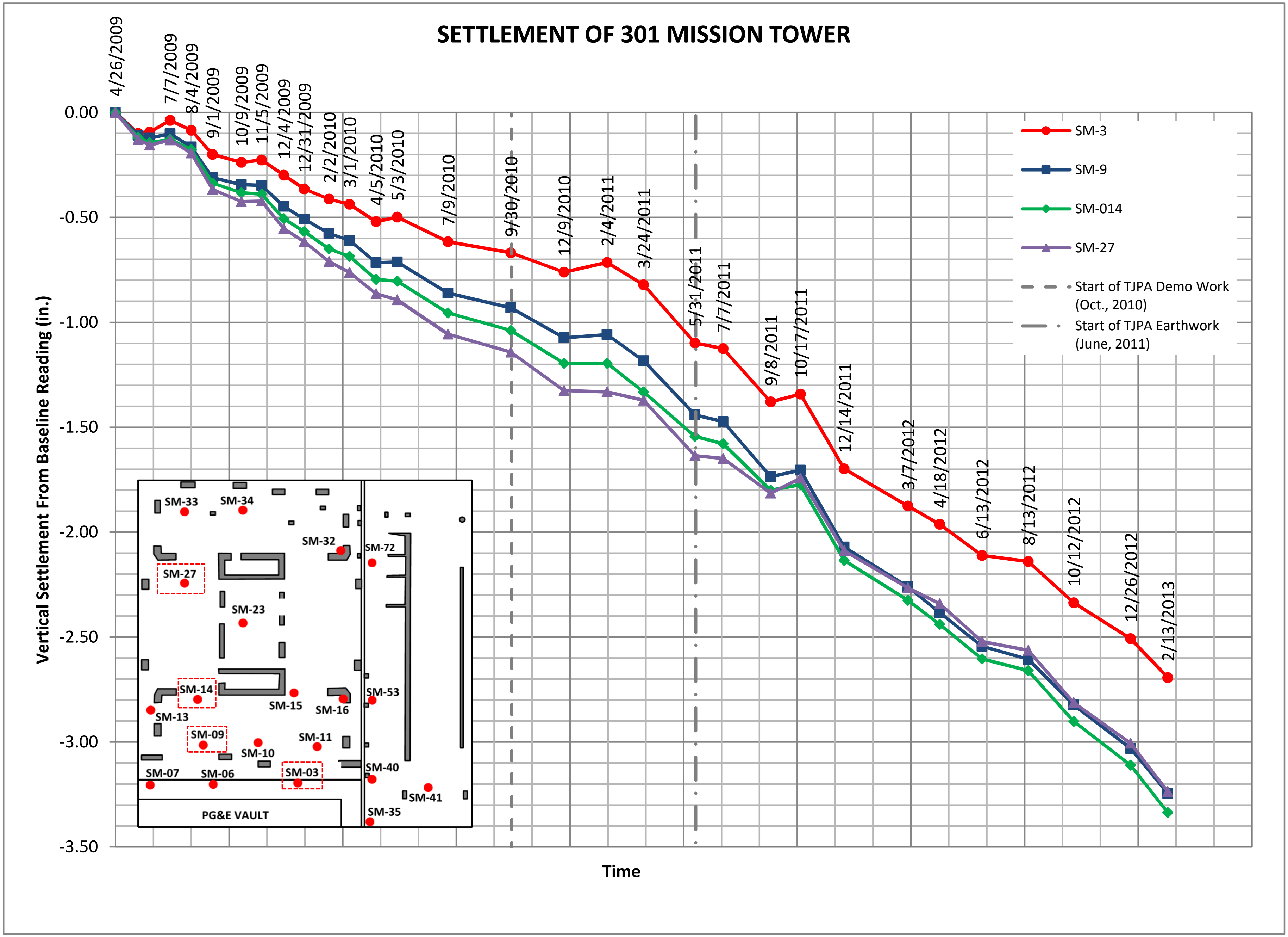

Figure 3

6/24/2013

DESIMONE

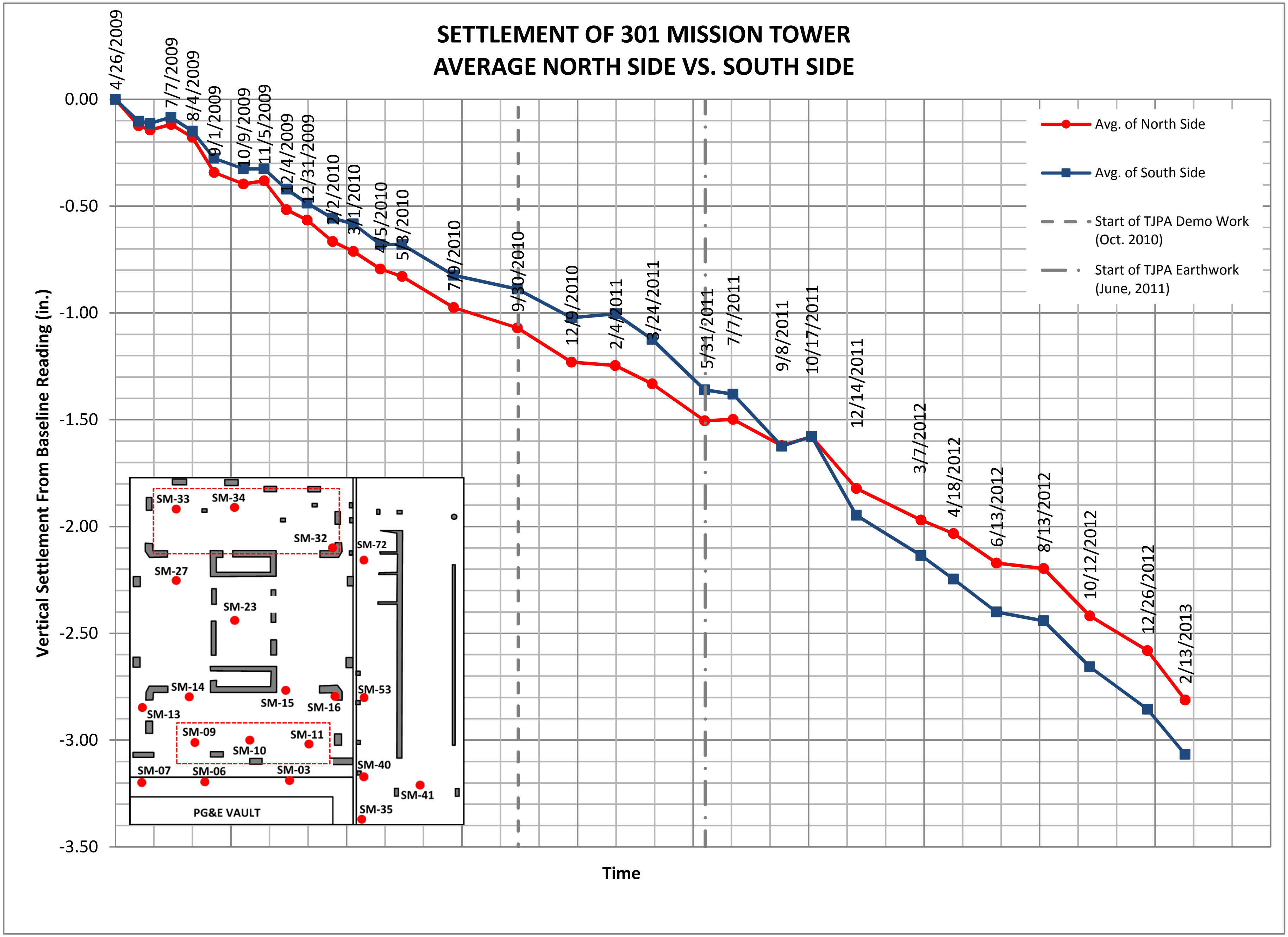

Figure 4

DESIMONE

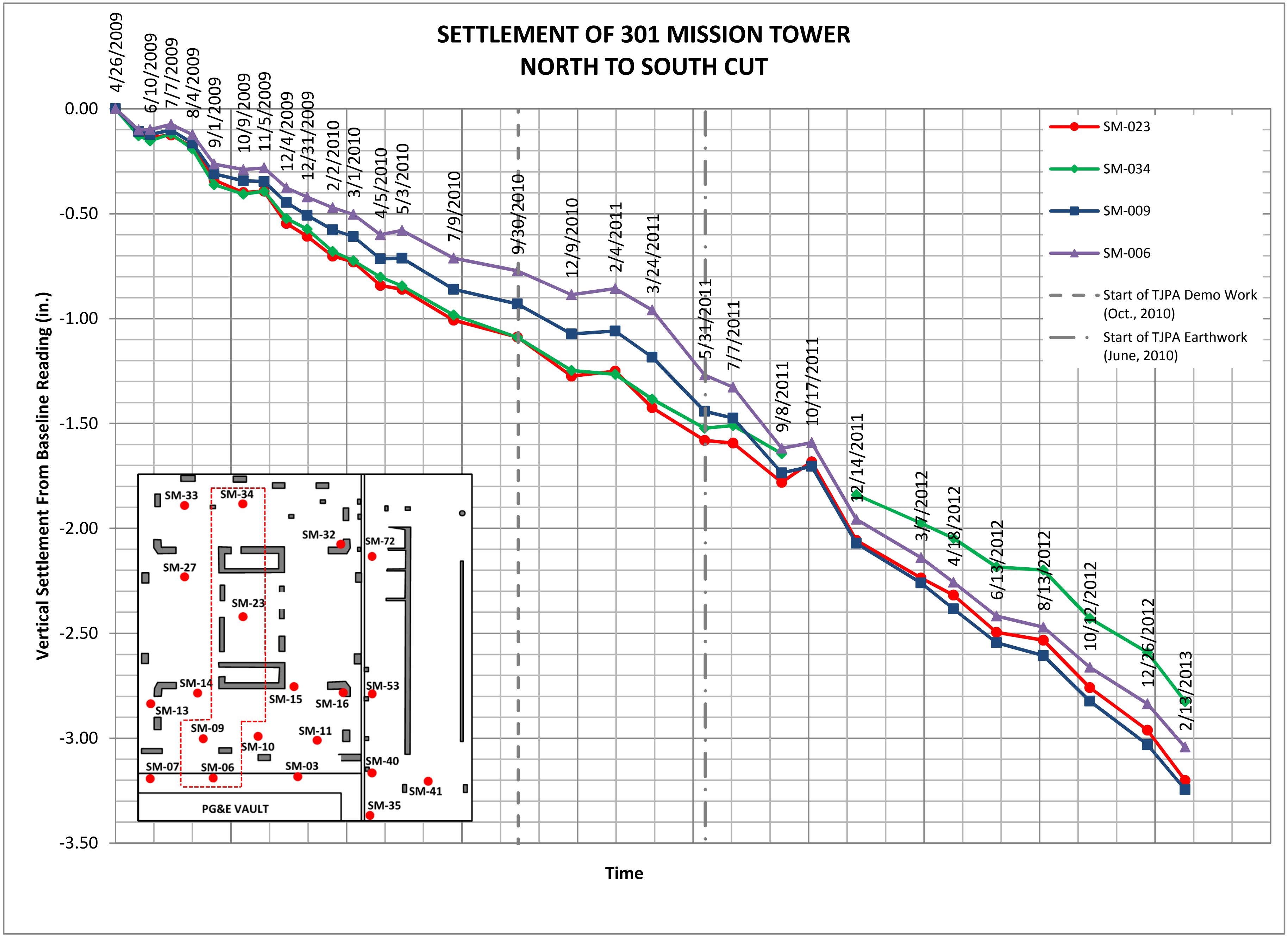

Figure 5

DESIMONE

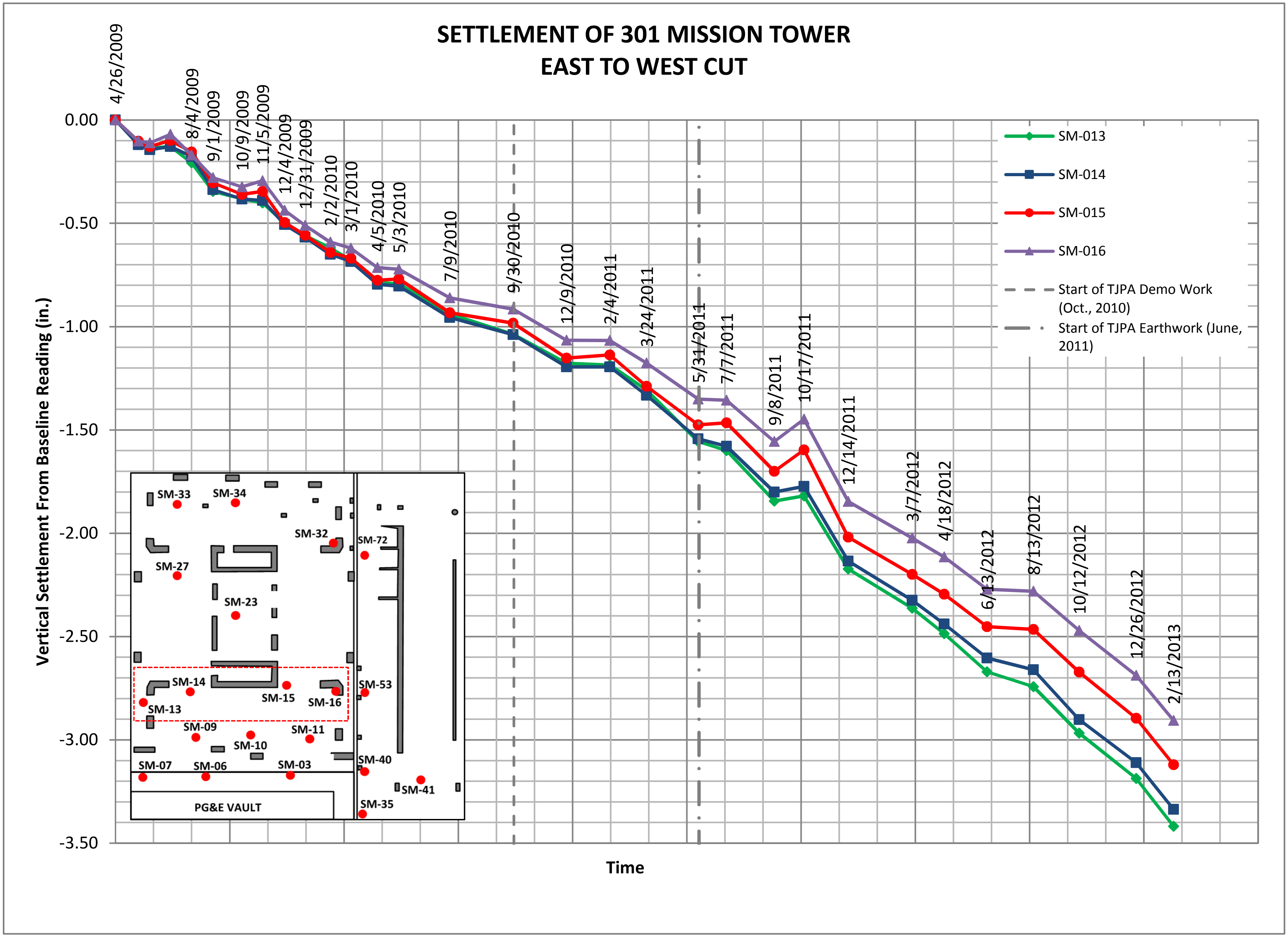

Figure 6

DESIMONE

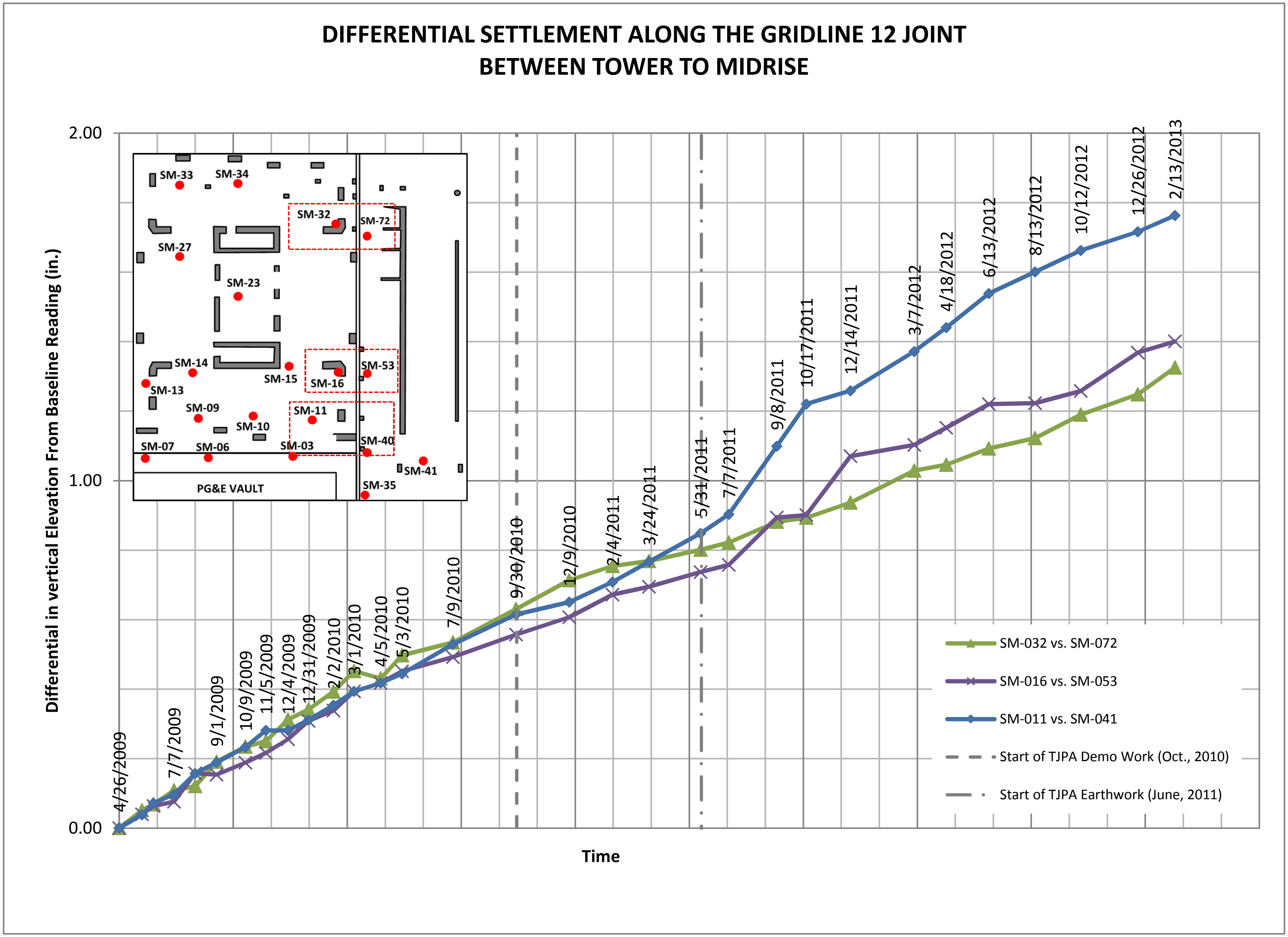

Figure 7

DESIMONE

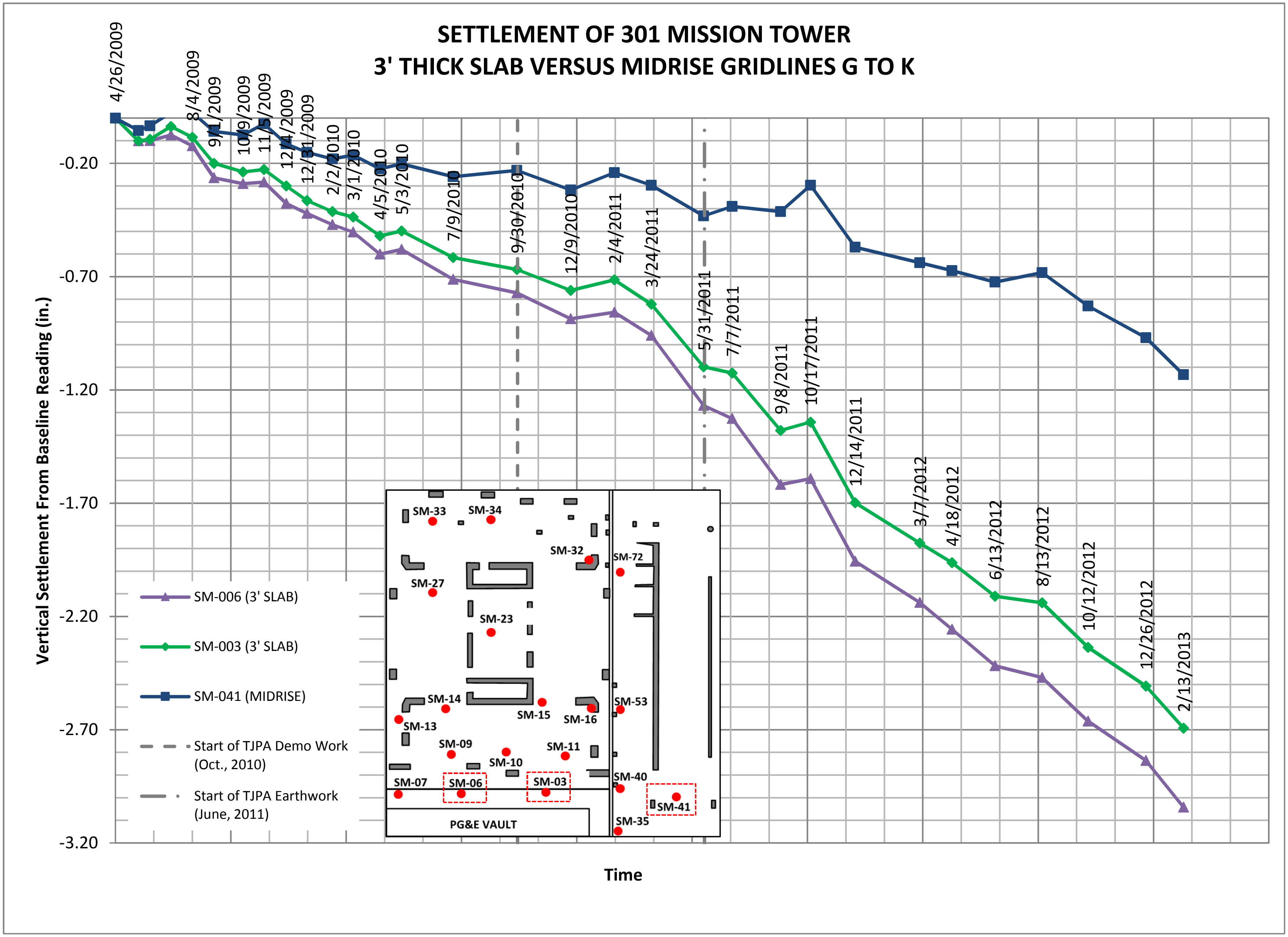

Figure 8

DESIMONE

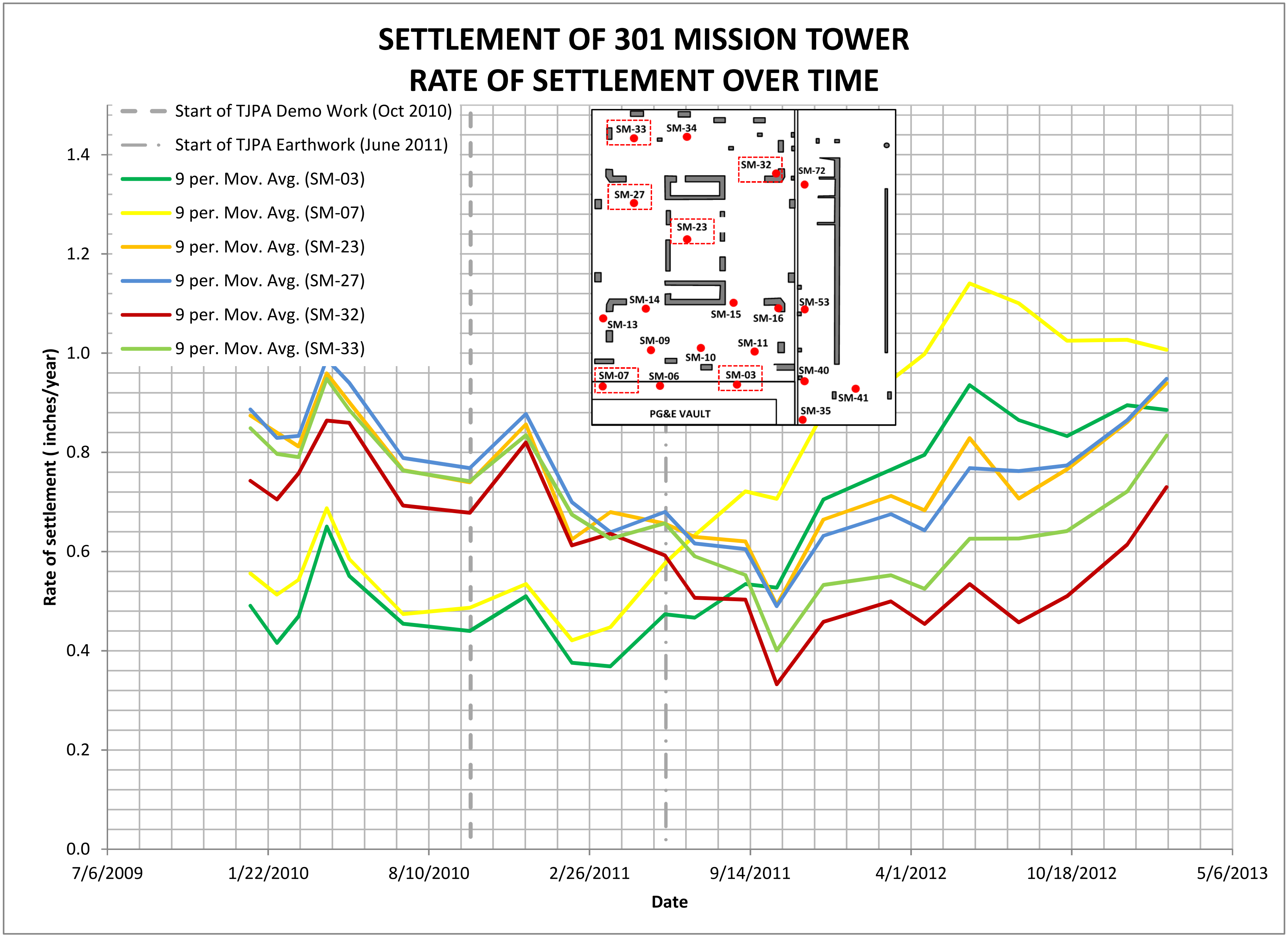

Figure 9

DESIMONE

MEMORANDUM

NEW YORK
MIAMI
SAN FRANCISCO
NEW HAVEN
LAS VEGAS
HONG KONG
ABU DHABI

FROM:	**NICOLAS RODRIGUES**	DATE:	**23 July 2013**
PROJECT NO.:	**4069G**	VIA:	**EMAIL**
PROJECT NAME:	**301 MISSION STREET – SETTLEMENT EVALUATION**	PAGES:	**12**

TO:
Steven Hood
SHood@millenniumptrs.com

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301 Mission Street, Level B-1, San Francisco, CA 94103

T: (415) 874-4707
F: (415) 874-4750

RE: SETTLEMENT MONITORING

As requested, we continue to evaluate the settlement of the Millennium Tower and Mid-Rise, located at 301 Mission Street. We reviewed the settlement data provided by Millennium to DeSimone via email on July 17, 2013. The data provided has survey elevation measurements for all settlement markers between April 26, 2009 and June 03, 2013. This memo serves as an update to the DeSimone memo issued to Millennium dated June 24, 2013. Two new settlement surveys were completed on April 19, 2013 and on June 03, 2013 and both date's data are included herein.

A major Transbay construction milestone has recently occurred. Excavation has begun as of May 2013. The excavation is approximately 15 feet below grade at the current time, immediately below the elevation of the first set of cross lot bracing. The cross-lot bracing has begun to be installed but has not yet been connected to the far side.

Construction progress immediately adjacent to 301 Mission Street. Photos taken July 22, 2013.

It is our understanding that Treadwell and Rollo shall report on Settlement, Inclinometers, and Piezometers. DeSimone will report on:

1) Settlement Data, Transbay trigger limits, and structural impacts
2) Tiltometer Data, and structural impacts
3) Vibration Data, Transbay trigger limits, and structural impacts
4) Tape Extensometer Data, and structural impacts.

Settlement Data:

Analysis of the latest data from the Arup Reports (from June 28, 2013) continues to show a varying rate of overall settlement as in preceding settlement reports by Arup. Transbay has now completed the deep foundation activities and have excavated to approximately 15 feet. The excavation begun approximately on May 1st, 2013 but was slowed by the deep foundation cut-off effort. The top-most level of cross-lot bracing has begun to be installed, but is not yet completely installed. Work on-site continues to coincidentally affect the rate of settlement of the Millennium Tower. Generally, an increased rate of settlement has been observed since the Transbay subsurface construction activities have commenced.

<u>Overall Settlement the Tower (Figures 1 and 2)</u>
DeSimone recreated the log versus time plot as shown in the ARUP report. We have taken the data prior to the start of Transbay construction and extrapolated these curves out to the upper and lower bounds of the final Tower settlement prediction as reported by Treadwell and Rollo in their February 18, 2009 letter to SFDBI. It is clear that the measured settlement is showing more deflection than would be predicted by natural settlement alone.

These plots show that the actual recorded settlement is more than what would have occurred naturally based on the T&R prediction. There are three distinct explanations:

1) The natural settlement predicted by T&R is incorrect.
2) The Transbay construction activities have created additional settlement.
3) Some combination of the above.

Since Treadwell has predicted a range of total settlement, it is difficult to quantify the amount of settlement in excess of what would have occurred naturally. From a simple reading of the measured displacement versus the predictive curves (Figure 1), the additional settlement due to Transbay activity is between 1.0 to 2.1 inches. Since 0.75 inches is the "Action Trigger Level" for other buildings as specified by Transbay, it is recommended that Millennium obtain a response from Transbay. Further, Transbay changed their specification (Dec 10, 2010) to exclude the 301 Mission Tower from all action trigger levels. It is unclear why they would have changed their specification after construction had begun. This should be considered carefully by ownership.

Figure 2 includes an average of settlement on the north side of the tower and on the south end of the tower. Before construction activities began at Transbay we observe that the north side had settled at a greater rate than the south. After construction activities started, we now observe a greater rate of settlement on the south side. The foundation has rotated slightly towards the Transbay project. Since the south end of the foundation seems now to be moving faster than the north, it follows that the activities at Transbay have caused the additional settlement.

Figure 2 also shows that the overall settlement reported by ARUP (and duplicated in Figure 1) is the worst case settlement anywhere across the foundation (about 12.2") and does not represent the average. Based on this plot, the average overall settlement on the site is currently about 11.8 overall inches.

Settlement as Shown in the ARUP Plot (Figure 3)
DeSimone recreated this plot in order to understand the information provided by ARUP. This plot shows that the southeast corner near SM-03 is settling less than comparable points on the west side of the tower. DeSimone believes that the SM-03 reduced settlement is a local phenomenon due to this area of the slab being supported in some way, possibly by direct connection with the Mid-Rise building, and is not a good point to look at when considering overall settlement of the tower due to Transbay construction activities. Points SM-9 and SM-14 have slowed in comparison to SM-27 the point furthest from the Transbay site.

Settlement of the North vs. South Side of the Foundation (Figure 4)
Before construction at Transbay began, the North Side was settling more, and now, after construction has been going for some time, the south side is settling more. This seems to clearly show that the construction has caused a change. It is recommended that Millennium seek an explanation for this from Transbay.

It should also be noted that this figure shows differential movement across the foundation causing a tilt to the building. This kind of movement can cause damage to the structure which reduces the buildings reserve strength for earthquakes.

The last two readings show an overall slowing of settlement on the South side of the site while the North side of the site has had a steady increase in settlement. This change is coincidental with the finishing of the Transbay buttress installation and the lack of deep foundation work on site.

Settlement Across a North-South Slice of the Foundation (Figure 5)
Before construction, the building was settling more in the North and in a consistent pattern. Once construction began, the points in the south started settling faster than the ones in the north.

The 4/19 and 6/3 2013 readings show a show that the settlement pattern has changed. Now, the points on the South side seem to have slowed compared to those on the North.

Note: the 10/17/2011 reading of SM-34 is likely an erroneous reading and has been removed.

Settlement Across an East-West Slice of the Foundation (Figure 6)
The construction does not seem to have affected the settlement in the east-west direction. The settlement along this slice seems to be close to linear with the west side settling slightly more than the east. The total differential is 0.6 inches.

Between the Tower and Mid-Rise Along Gridline 12 Joint (Figure 7)
Several settlement markers were reviewed at the building separation joint between the tower and Mid-Rise along gridline 12. It can be clearly observed that since Transbay construction activities have begun, that there is increasing differential across the joint, more than what was naturally occurring prior to the beginning of Transbay construction. The largest impact is near the south side of the building, and little to no impact in natural differential on the north side. It does appear that the joint is performing as expected and allowing free movements between both structures.

<u>3-foot Thick Cantilever Slab Versus the Mid-Rise - Between Gridline H and K (Figure 8)</u>
Several Settlement Markers were chosen to evaluate the relative settlement between the 3 foot thick cantilever slab and the Mid-Rise – SM-6, SM-3 and SM-41. Between April 2009 and June 2013, settlement of the 3 foot thick cantilever slab is approximately 2.1 inches greater than the Mid-Rise. This indicates that, the joint between the two buildings is allowing for independent rates of settlement.

<u>Rate of Settlement Over Time (Figure 9)</u>
This plot shows the rate of settlement and how that rate has changed over time. We use a moving average which includes 9 data points (an average of about a year for each data point.) The following is a list of observations from Figure 9:

- Before construction, the settlement was faster in the north than the south. After construction, the settlement was faster in the south.
- Between March 2010 and about March 2011 the rate of settlement was slowing
- The rate of settlement increased for most southerly markers in about March of 2011 up until May 2013.
- The rate of settlement on all markers show significant increase beginning in Oct 2011 up until May 2013.
- The marker showing the slowest rate is SM-32 in the northeast corner of the site.
- The marker showing the greatest rate is SM-07 in the southeast corner of the site.
- Since the deep buttress work has stopped, the rate of settlement has slowed.

Tiltmeter Data:

No update since the December 14, 2012 report.

Tape Extensometers Data:

No update since the December 14, 2012 report.

Vibration Data:

No update since the December 14, 2012 report.

DESIMONE

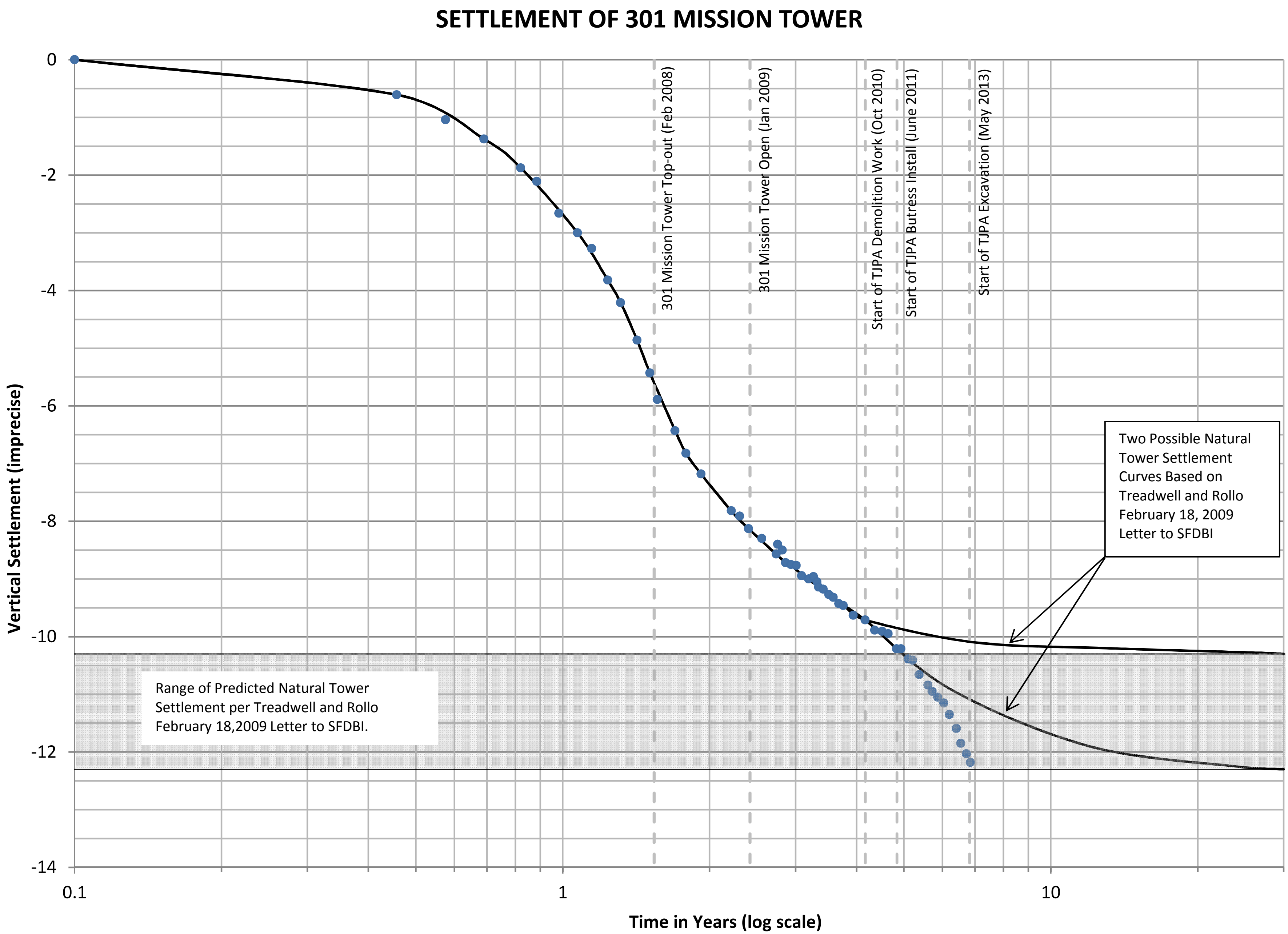


Figure 1

DESIMONE

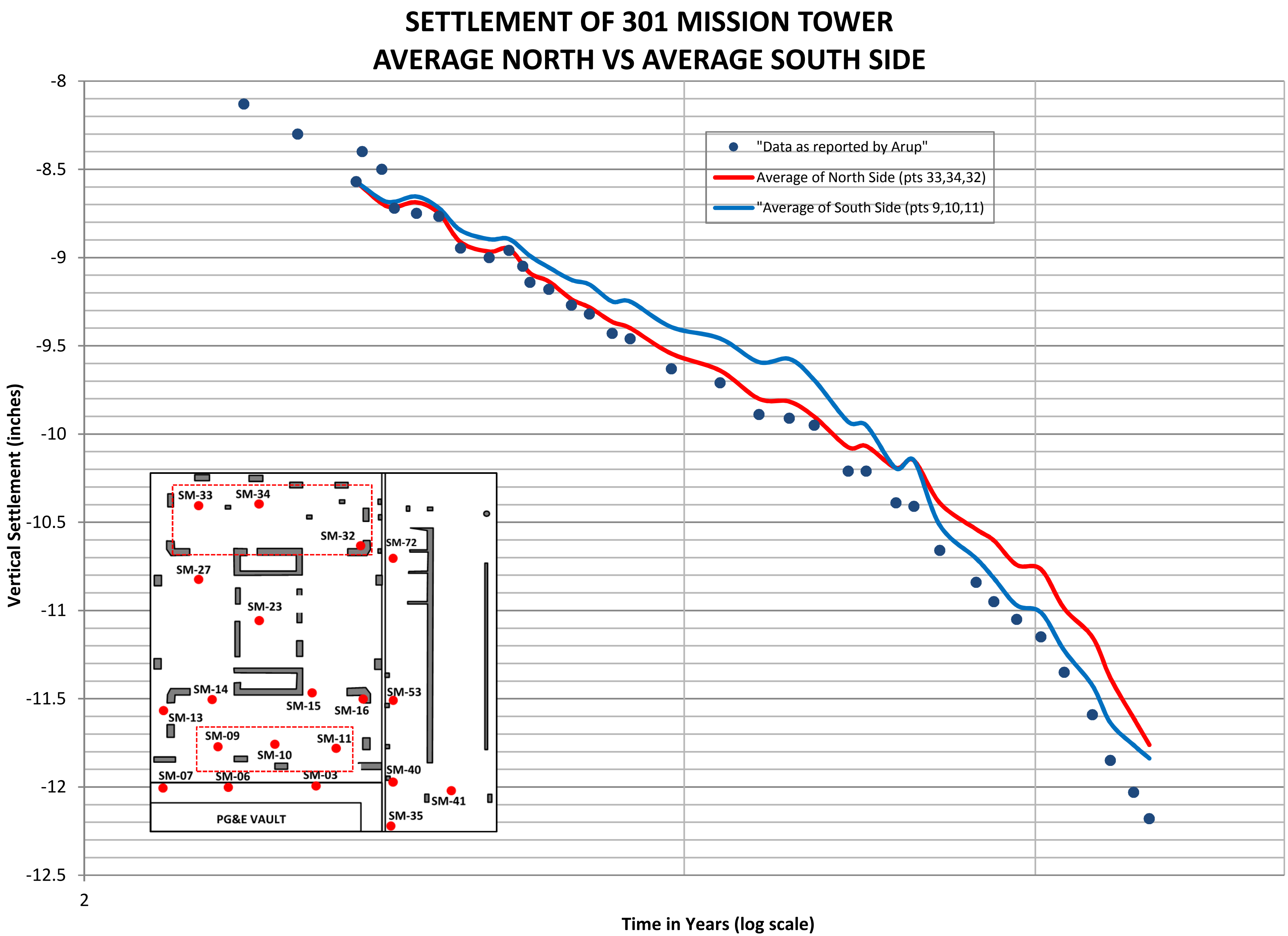


Figure 2

7/22/2013

DESIMONE

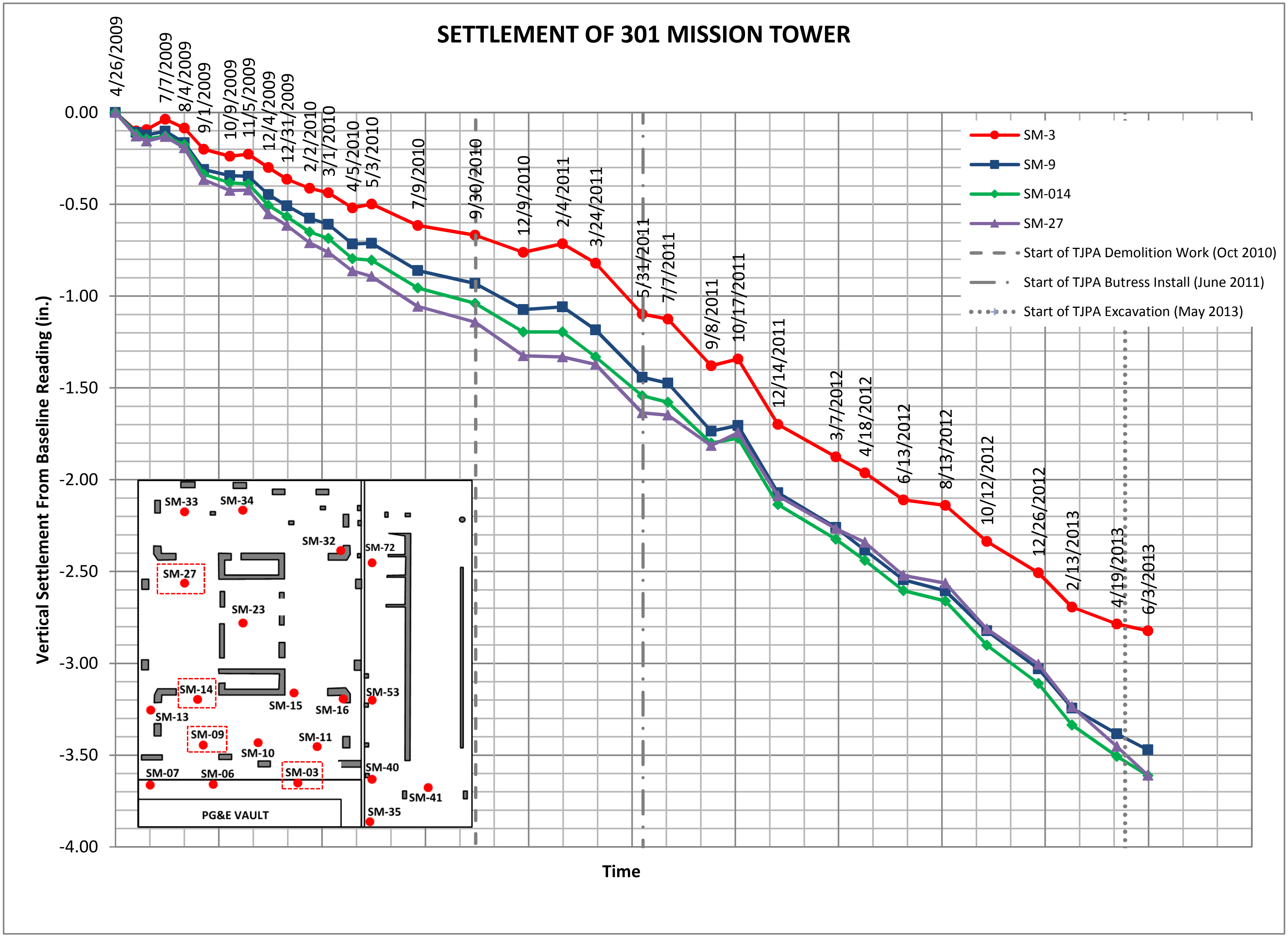


Figure 3

DESIMONE

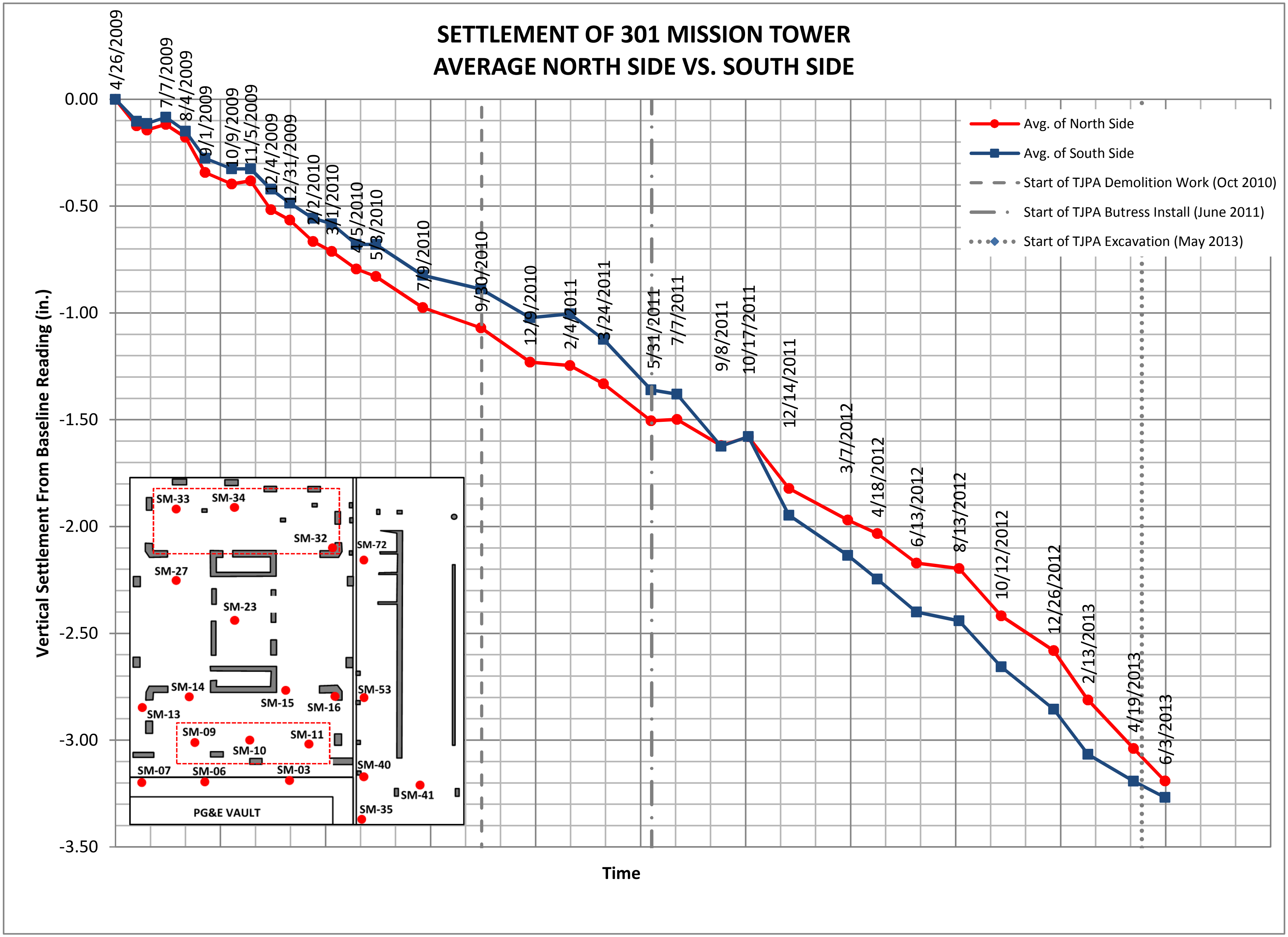


Figure 4

7/22/2013

DESIMONE

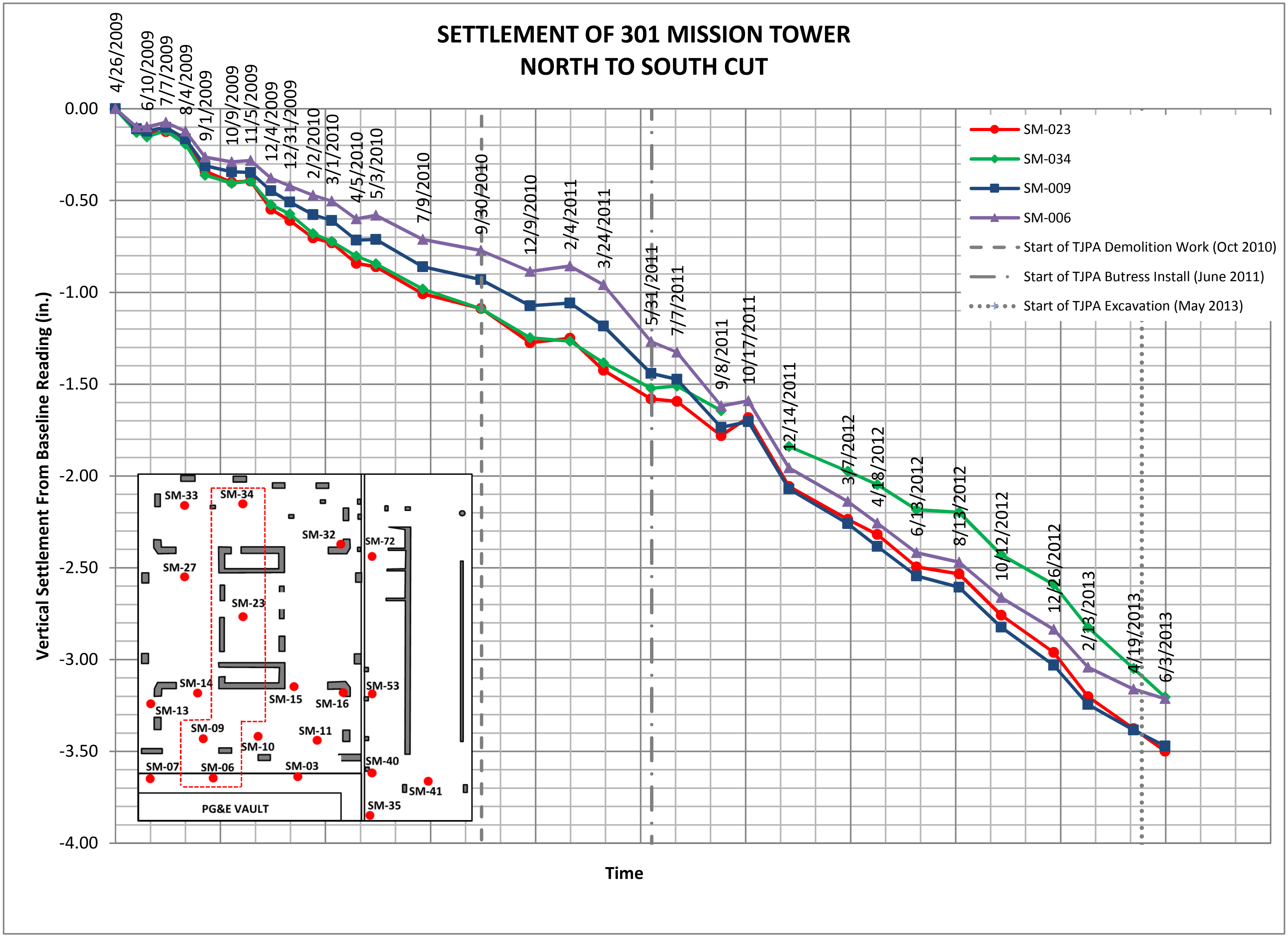


Figure 5

DESIMONE

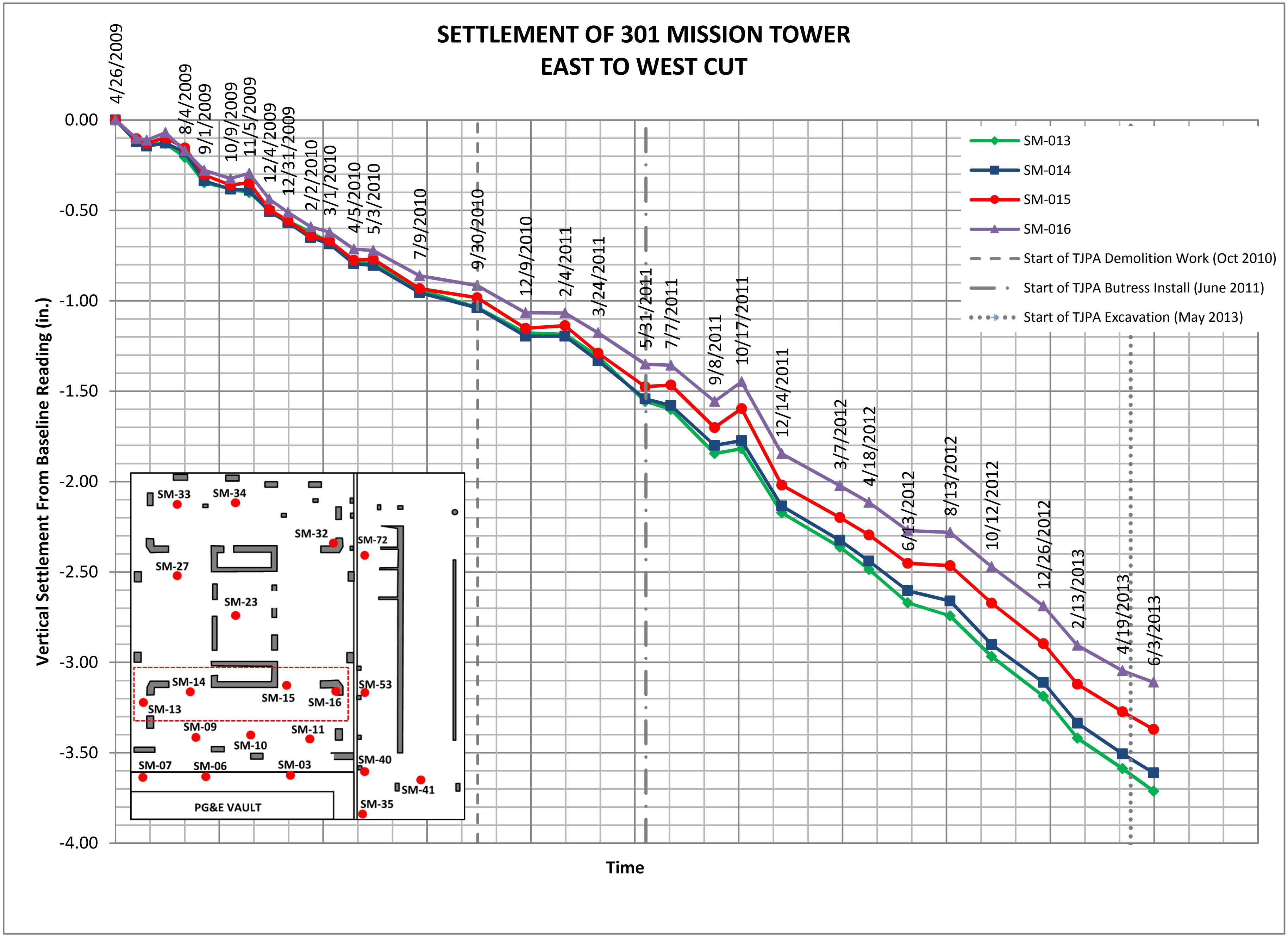
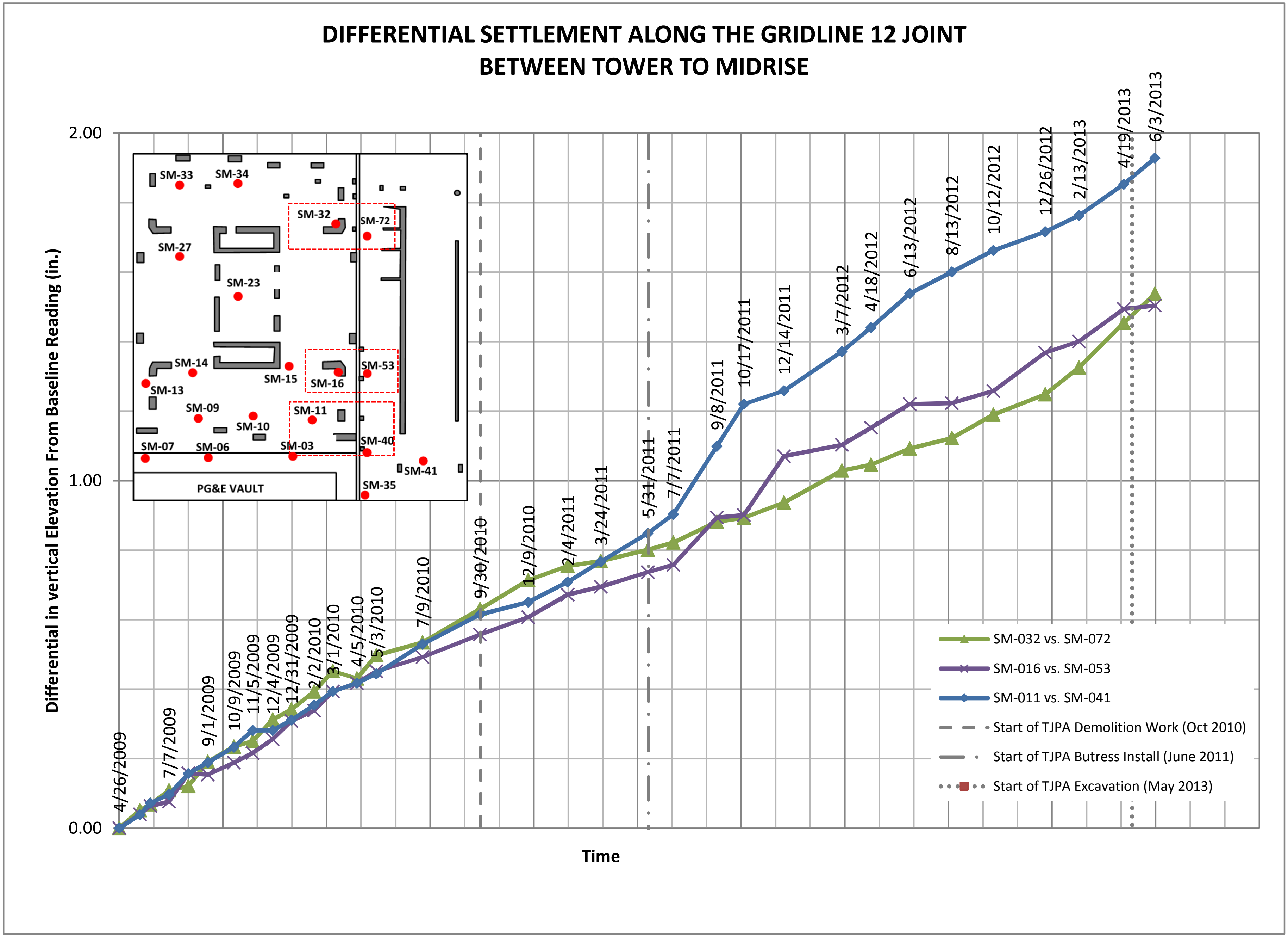


Figure 6


DIFFERENTIAL SETTLEMENT ALONG THE GRIDLINE 12 JOINT
BETWEEN TOWER TO MIDRISE
Differential in vertical Elevation From Baseline Reading (in.)
2.00
1.00
0.00
Time
4/26/2009
7/7/2009
9/1/2009
10/9/2009
11/5/2009
12/4/2009
12/31/2009
2/2/2010
3/1/2010
4/5/2010
5/3/2010
7/9/2010
9/30/2010
12/9/2010
2/4/2011
3/24/2011
5/31/2011
7/7/2011
9/8/2011
10/17/2011
12/14/2011
3/7/2012
4/18/2012
6/13/2012
8/13/2012
10/12/2012
12/26/2012
2/13/2013
4/19/2013
6/3/2013
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SM-32
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SM-27
SM-23
SM-14
SM-13
SM-15
SM-16
SM-53
SM-09
SM-10
SM-11
SM-07
SM-06
SM-03
SM-40
SM-41
SM-35
PG&E VAULT
SM-032 vs. SM-072
SM-016 vs. SM-053
SM-011 vs. SM-041
Start of TJPA Demolition Work (Oct 2010)
Start of TJPA Butress Install (June 2011)
Start of TJPA Excavation (May 2013)

Figure 7

7/22/2013

DESIMONE

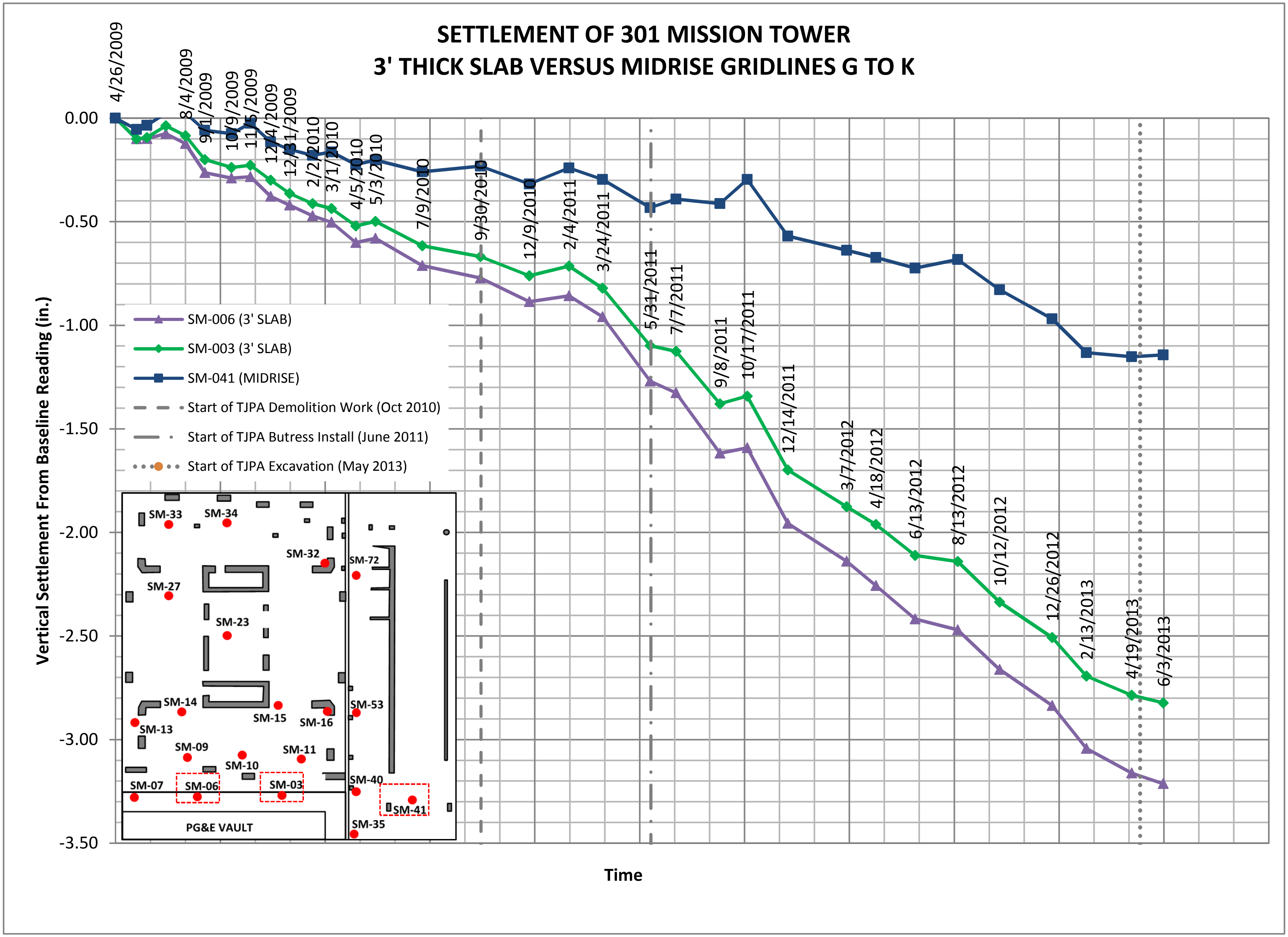


Figure 8

DESIMONE

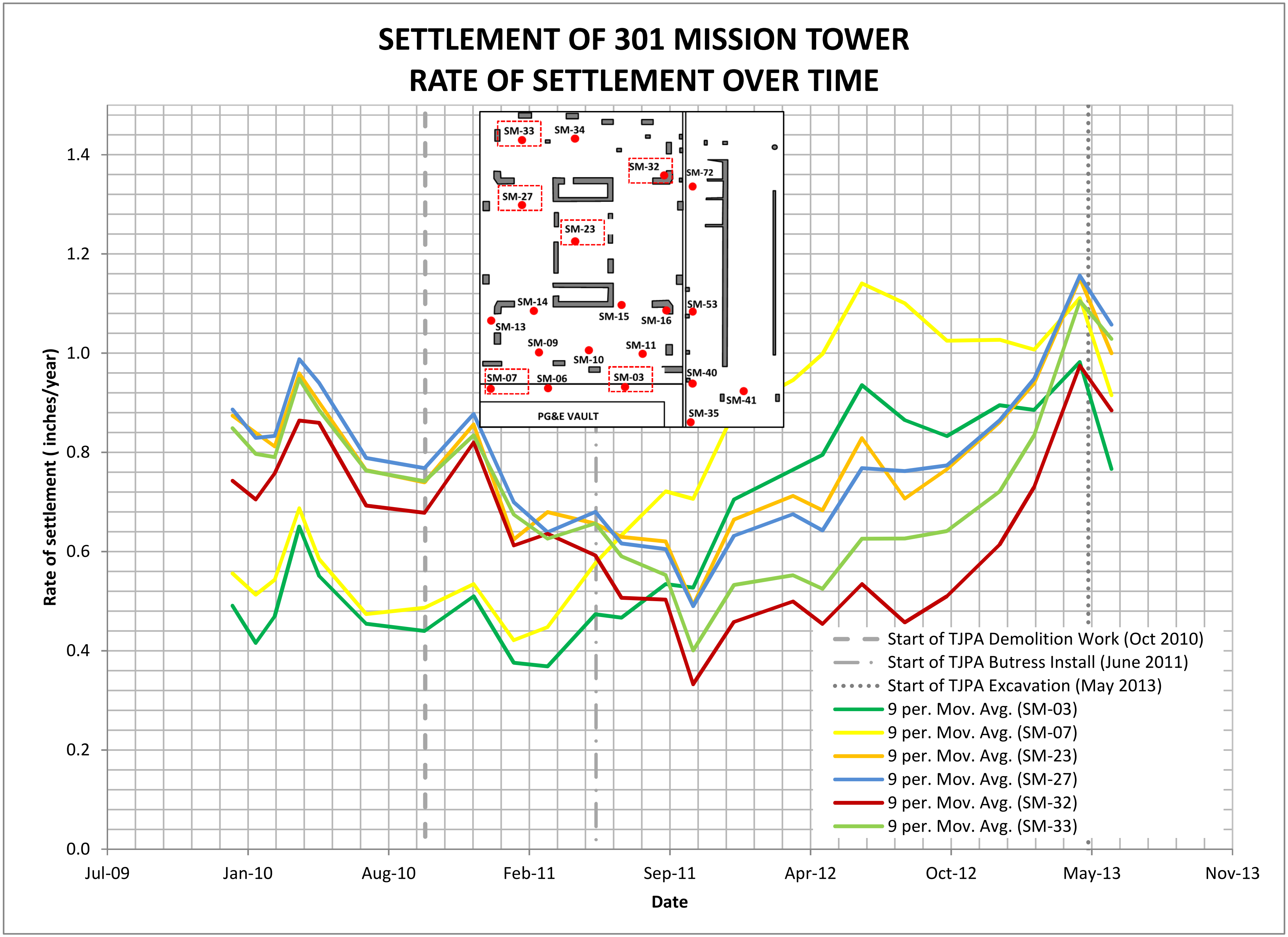


Figure 9

DESIMONE

MEMORANDUM

NEW YORK
MIAMI
SAN FRANCISCO
NEW HAVEN
LAS VEGAS
SHANGHAI
ABU DHABI

FROM:	**NICOLAS RODRIGUES**	DATE:	**13 Dec 2013**
PROJECT NO.:	**4069G**	VIA:	**EMAIL**
PROJECT NAME:	**301 MISSION STREET – SETTLEMENT EVALUATION**	PAGES:	**15**

TO:
Steven Hood SHood@millenniumptrs.com
Millennium Partners
735 Market Street, Suite 302, San Francisco, CA 94103
T: (415) 593-1111
F: (415) 874-4750

RE: 301 MISSION STREET - SETTLEMENT MONITORING

As requested, DeSimone continues to evaluate settlement data for the Millennium Tower and Mid-Rise, located at 301 Mission Street. We have reviewed the Nov. 13, 2013 ARUP report and the most recent settlement data provided by Millennium Partners (Millennium) to DeSimone via email on Dec. 4, 2013. The data provided has elevation measurements for all settlement markers between April 26, 2009 and Oct. 9, 2013. This memo serves as an update to the DeSimone settlement evaluation memo issued to Millennium dated July 22, 2013. Two additional settlement surveys were completed on Aug. 12, 2013 and Oct. 9, 2013 and an evaluation of this data is included herein.

As part of the settlement evaluation by DeSimone, a site visit to the Transbay project site was performed on December 6, 2013. The purpose of this visit was to review current construction progress on adjacent sites. The Transbay excavation directly south of 301 Mission is approximately 90% complete with 52 feet of excavated soil. The buttress piles that were installed next to the 301 Mission south foundation wall were visible at the surface. The new salesforce.com tower at 350 Mission has been excavated to approximately 60 feet, and the new tower construction has progressed from the bottom of the excavation back up to street level.

December 6, 2013 Excavation progress at Transbay site.
Photo taken on Beale St. between Mission St. and Howard St.

It is our understanding that Treadwell and Rollo (Langan) will provide an updated evaluation of Settlement, Inclinometers, and Piezometers data. DeSimone is reporting herein on:

1) Settlement Data, Transbay trigger limits, and structural impacts
2) Tiltmeter Data, and the structural impacts
3) Tape Extensometer Data, and structural impacts.
4) Vibration Data, Transbay trigger limits, and structural impacts

Settlement Data:

Analysis of the most recent available settlement data as contained the November 13, 2013 settlement report by Arup, continues to show a varying rate of overall settlement as compared to the preceding settlement reports by Arup. Generally, an increased rate of settlement has been observed coincidental with the commencement of the Transbay subsurface construction activities.

Overall Settlement of the Millennium Tower (Figures 1 and 2)
DeSimone recreated the logarithmic time-scale as shown in the ARUP report. However, we have included the measured settlement data prior to the start of Transbay construction and extrapolated this data out to the upper and lower bounds of the final Tower settlement prediction as reported by Treadwell and Rollo (Langan) in their February 18, 2009 letter to SFDBI. After review of the current data as compared to the extrapolated data, it is clear that both the measured settlement and trend of settlement with time is greater than would be anticipated by natural settlement alone.

The actual recorded settlement appears to be greater than what would have occurred naturally based on the T&R prediction. There are three distinct explanations why this is likely:

1) The natural settlement predicted by T&R is incorrect.
2) The Transbay construction activities have created settlement in addition to natural settlement.
3) Some combination of the above.

Comparison of Predicted Settlement to Measured Settlement (Figure 1)
If we use Treadwell and Rollo's (Langan) predicted range of total settlement and read the difference between the measured displacement data points and the settlement prediction curves (Figure 1), the additional settlement is between 1.5 to 2.8 inches. Since 0.75 inches is the "Action Trigger Level" for "other buildings" as described in the Transbay Specification, it is recommended, as we had recommended in earlier reports, that Millennium Partners (Millennium) obtain a response from Transbay regarding this discrepancy in predicted settlement. Furthermore, Transbay revised their specification (the Dec 10, 2010 version) to exclude the 301 Mission Tower from all action trigger levels. It is unclear why Transbay would have changed their specification after construction had begun. The rationale behind this action should be both understood and carefully considered by Millennium.

Further, the total measured settlement is now officially outside of the maximum predicted value provided by Treadwell and Rollo (Langan). It is unclear how much more settlement will be realized before it will slow down and stop. Given that the Transbay excavation is near complete, it may be possible for a Geotechnical Engineer to now predict accurately how much additional settlement is to be expected.

Settlement of the North vs. South Side of the Foundation - Logarithmic Scale (Figure 2)
Figure 2 presents an average of settlement on the north side of the tower versus the south end of the tower, as measured in logarithmic scale. Before construction activities began at Transbay we observed that the north side had settled at a greater rate than the south. After buttress installation activities started, we observed a greater rate of settlement on the south side. After June 2013, the north side again shows to have a higher rate of settlement than the south side. The foundation has rotated slightly away from the south side. Since the south end of the foundation now seems to be moving faster than the north, this suggests that the activities at Transbay have caused the additional settlement.

Figure 2 also shows that the overall settlement reported by ARUP (duplicated in Figure 1) is the worst case settlement anywhere across the foundation (about 12.7 inches) and does not accurately represent the average. The average overall settlement for the north side currently shows about 12.3 inches. The average overall settlement for the south side currently shows about 12.1 inches.

Settlement as Shown in the ARUP Plot (Figure 3)
DeSimone recreated this plot in order to understand the information provided by ARUP. This plot shows that the southeast corner near SM-03 is settling less than comparable points on the west side of the tower. DeSimone believes that the reduced settlement at SM-03 is a unique phenomenon to this area of the slab. Either the slab is being supported by something in addition to the soil or, the slab is possibly supported by direct connection with the Mid-Rise building. DeSimone suggests this is not the most representative settlement measurement point to use when considering overall settlement of the tower due to Transbay construction activities. Points SM-9 and SM-14 have slowed in comparison to SM-27 which is the point furthest from the Transbay site.

Settlement of the North vs. South Side of the Foundation (Figure 4)
Before Transbay buttress installation began, the north Side was settling more than the south side, but since August, 2011 the south side has been settling more than the north side. This seems to indicate that the Transbay buttress installation activities affected the overall direction of tilt. Beginning in June 2013, the north side is again showing a greater amount of settlement than the south side. This change is coincidental with the completion of the Transbay buttress installation, along with the start of excavation at both the Transbay site and the 350 Mission site.

It should also be noted that this figure indicates differential movement across the foundation in the north-south direction causing a slight tilt to the building. If this movement was larger, damage to the structure can occur. In general the tilt, while measurable, is generally small and not of the type which would cause damage.

Settlement across a North-South Section Cut of the Foundation (Figure 5)
Before buttress installation activities began, the Tower was settling more at the north side and at a consistent rate. After buttress installation activities began, the settlement in the south started settling faster than the ones in the north. At present time, following the last of the buttress installation, the highest settlement along the north-south direction is nearly at the center of the foundation. DeSimone considers the change in location of highest settlement as directly correlated to the Transbay buttress installation activities.

Starting around 4/18/2013, settlement measurements show that the settlement trend with time along the north-south dimension changed. By 6/3/2013, the settlement on the south side seem to have slowed compared to those on the north.

Note: the 10/17/2011 reading of SM-34 is likely an erroneous reading and has been removed from Figure 5.

Settlement across the East-West Section Cut of the Foundation (Figure 6)
The construction does not seem to have affected the settlement in the east-west direction. The settlement along this cut seems to be close to linear, with the west side settling slightly more than the east. The total differential is about 0.8 inches.

Between the Tower and Mid-Rise along Gridline 12 Joint (Figure 7)
Several settlement markers were reviewed at the building separation joint between the Tower and Mid-Rise along gridline 12. It can be clearly observed in Figure 7 that since Transbay buttress installation activities have begun, that there is increasing differential settlement (increase in rate of settlement) across the joint. This settlement is more than what was naturally occurring prior to the beginning of Transbay construction.

The largest observed differential settlement across the joint is near the south side of the building, and much less differential settlement on the north side. It does appear that the joint is performing as expected and allowing free movements between both structures. Continued on-site observation of the joint should be made to ensure its intended performance is being met.

3-foot Thick Tower Cantilever Slab Versus the Mid-Rise - Between Gridline H and K (Figure 8)
Several settlement markers were chosen to evaluate the relative settlement between the 3-foot thick cantilever slab and the Mid-Rise. Between April, 2009 and October, 2013, settlement of the 3-foot thick cantilever slab is approximately 2.2 inches greater than the Mid-Rise. This indicates that, the joint between the two buildings is allowing for independent rates of settlement, which meets the design intent.

Rate of Settlement over Time (Figure 9)
Figure 9 shows the rate of settlement across the site and how that rate has changed over time. A moving average is used including 9 data points (an average of about a year for each data point.) The following is a list of observations from Figure 9:

- Generally, the rate of settlement site-wide was decreasing until the commencement of Transbay buttress pile installation.
- Before Transbay construction began, the settlement was faster in the north than in the south. After completion of buttress installation, the settlement was faster in the south.
- Between March 2010 and about March 2011 the rate of settlement was slowing.
- The rate of settlement increased consistently for the two southerly markers around March, 2011 up until May, 2013.
- The rate of settlement for all markers show a significant increase beginning in Oct, 2011.
- The marker showing the slowest rate is SM-32 in the northeast corner of the site.
- The marker showing the fastest rate is SM-07 in the southeast corner of the site.
- A slight dip is observed in the yearly average rates in May, 2013.
- The rate of settlement for SM-27, SM-32, and SM-33 is higher than ever before observed indicating that the northern side of the site has seen a significant change.

The Effect of Settlement on Mid-Rise near Gridline 12 (Figure 10)

The area of the Mid-Rise structure between Gridline 12 and Gridline 16 is an area that has 5 levels of basement and only three levels of above ground structure. Treadwell and Rollo (Langan) recommended that mat foundation tie-downs be used as the water pressure and the weight of the structure were such that it was thought that the structure may float. DeSimone implemented this recommendation and the tie-downs were originally pre-tensioned in order to hold the foundation to the soil. Because the mat is tied-down, normal seasonal fluctuations in water levels can occur without significant movement of the foundation.

As can be seen in Figure 10, the foundation has settled along gridline 12 of the Mid-Rise since 2009. The highest level of settlement occurs near the middle of the site, with slightly less at the north and south edges. The settlement is of such a magnitude that the tie-downs may no longer be functioning as intended. DeSimone recommends that Treadwell and Rollo (Langan) address this issue.

Tiltmeter Data:

No update since the December 14, 2012 report.

Tape Extensometers Data:

No update since the December 14, 2012 report.

Vibration Data:

Vibration caused by adjacent construction activities continues to be monitored through the Global Analyzer website. Fluctuations can be seen, and various spikes can be observed. While it appears that most of the vibration is below the perceptible level, several occupants of the building have mentioned that they noticed the vibration. Building movements can occur from wind, small day-to-day earthquakes, and due to adjacent construction activities. It is difficult to discern the difference between these sources. The magnitude of the measured vibration is below the levels which can damage the structure.

DESIMONE

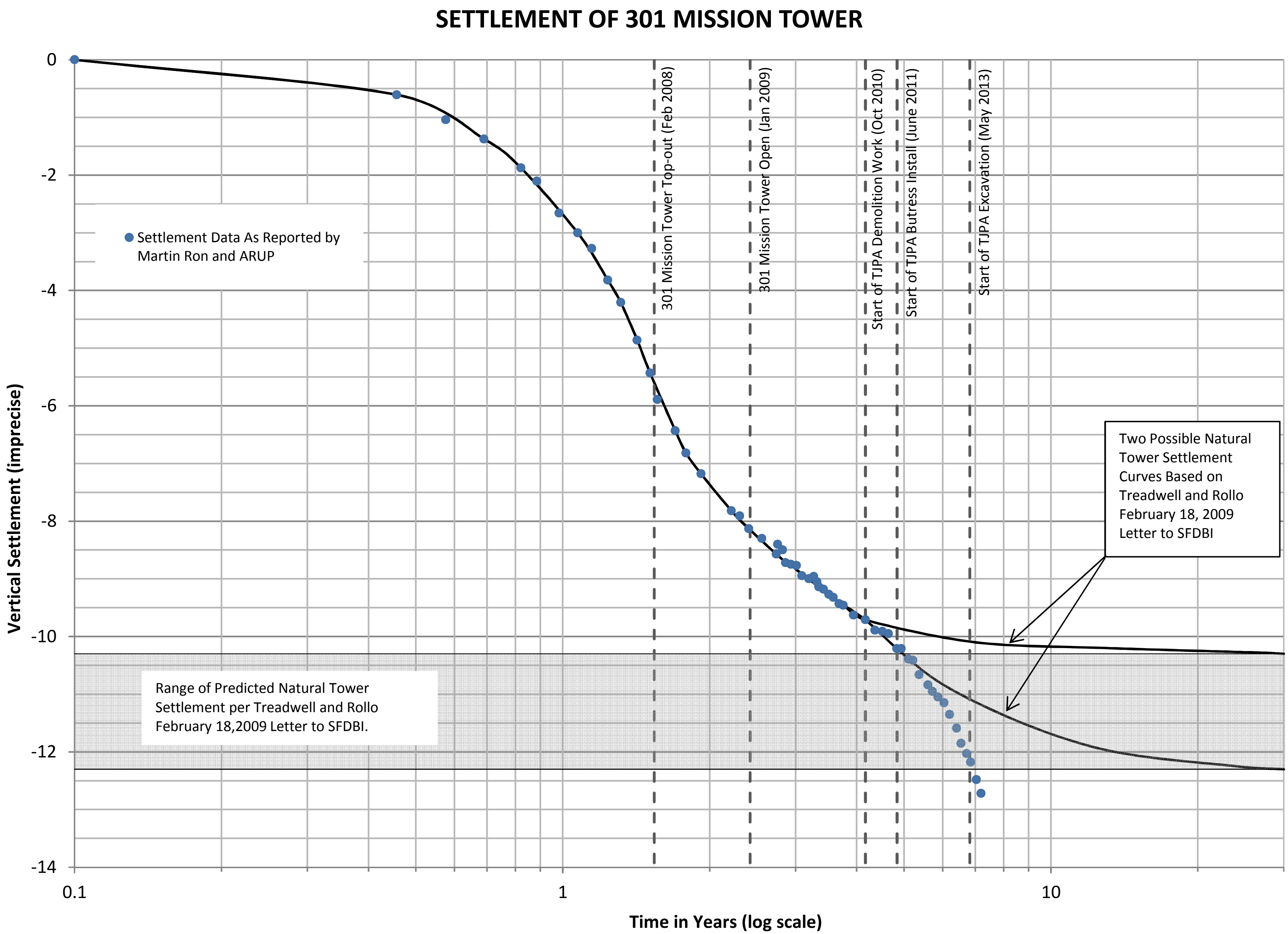


Figure 1

DESIMONE

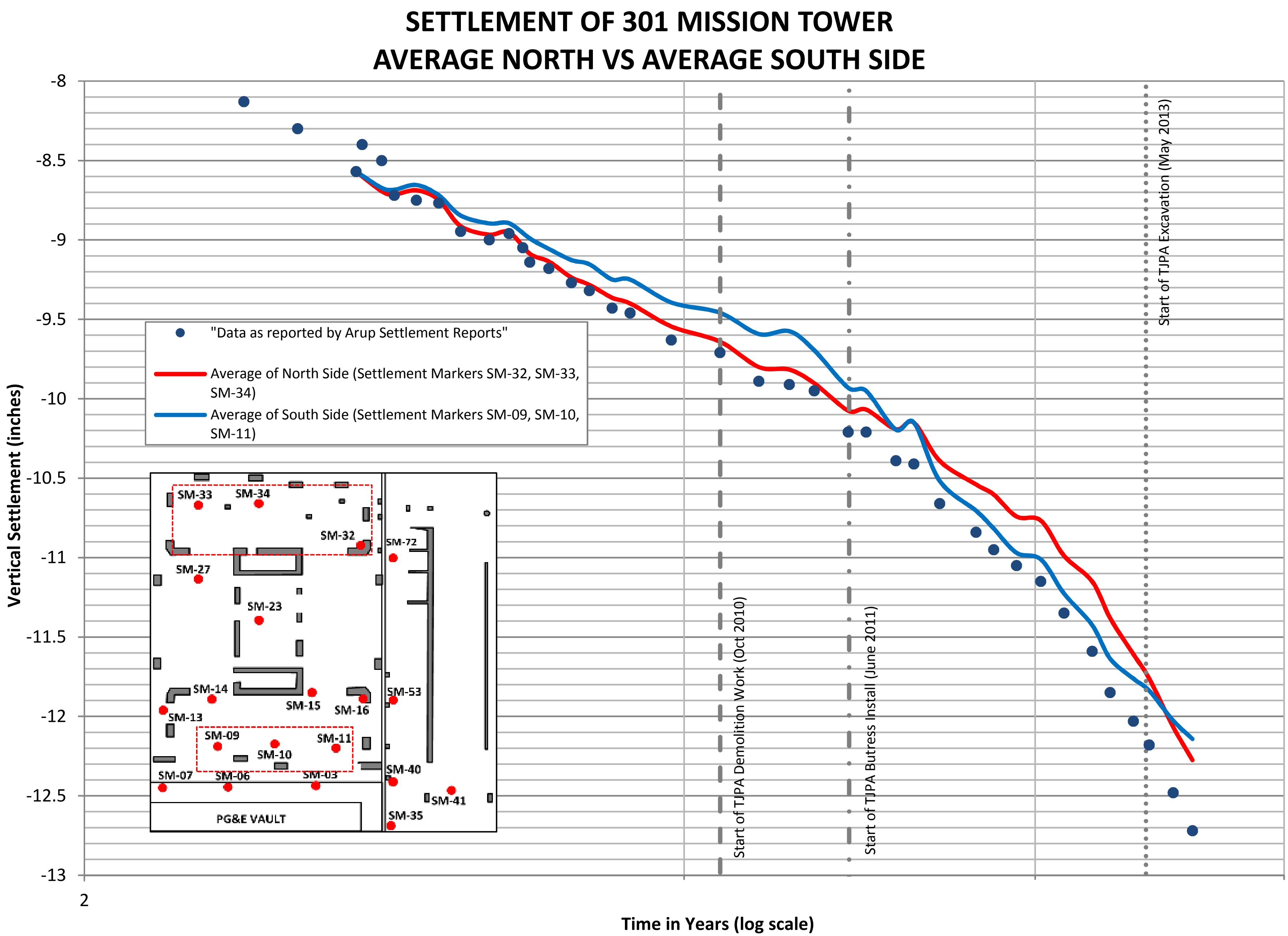


Figure 2

12/13/2013

DESIMONE

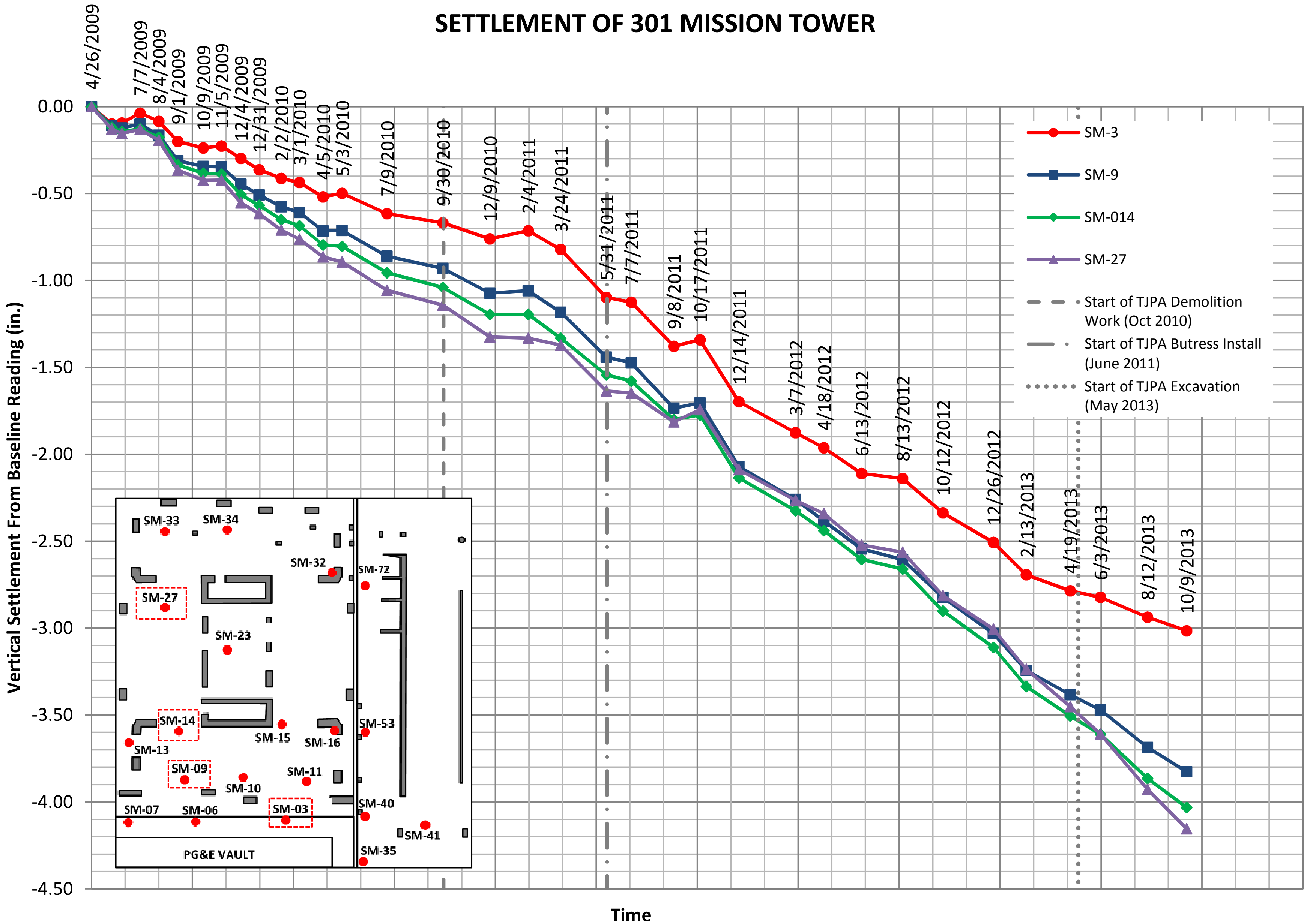
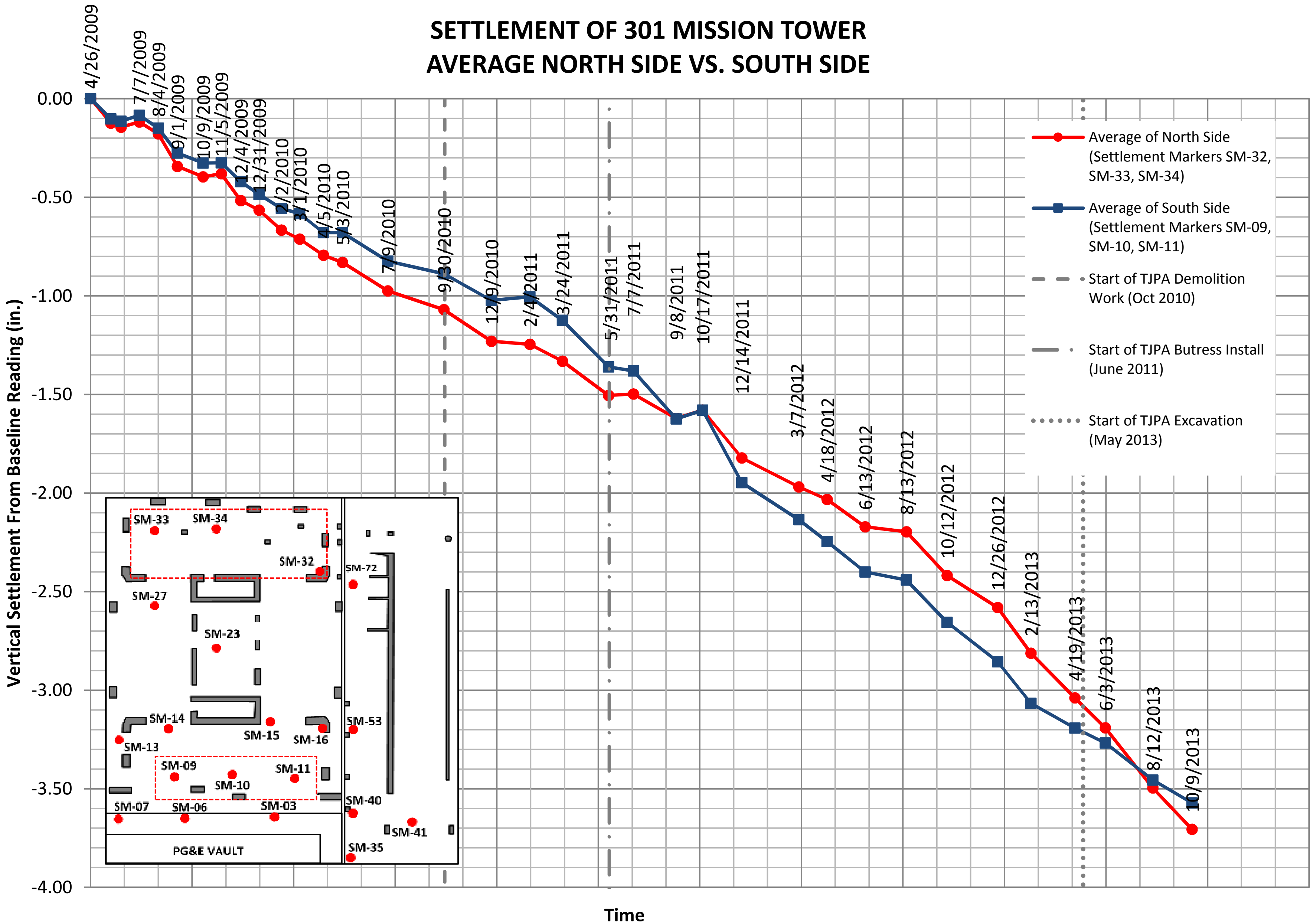


Figure 3


SETTLEMENT OF 301 MISSION TOWER
AVERAGE NORTH SIDE VS. SOUTH SIDE
Vertical Settlement From Baseline Reading (in.)
Time
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
4/26/2009
7/7/2009
8/4/2009
9/1/2009
10/9/2009
11/5/2009
12/4/2009
12/31/2009
2/2/2010
3/1/2010
4/5/2010
5/3/2010
7/9/2010
9/30/2010
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2/4/2011
3/24/2011
5/31/2011
7/7/2011
9/8/2011
10/17/2011
12/14/2011
3/7/2012
4/18/2012
6/13/2012
8/13/2012
10/12/2012
12/26/2012
2/13/2013
4/19/2013
6/3/2013
8/12/2013
10/9/2013
Average of North Side (Settlement Markers SM-32, SM-33, SM-34)
Average of South Side (Settlement Markers SM-09, SM-10, SM-11)
Start of TJPA Demolition Work (Oct 2010)
Start of TJPA Butress Install (June 2011)
Start of TJPA Excavation (May 2013)
SM-33
SM-34
SM-32
SM-72
SM-27
SM-23
SM-14
SM-13
SM-15
SM-16
SM-53
SM-09
SM-10
SM-11
SM-07
SM-06
SM-03
SM-40
SM-41
SM-35
PG&E VAULT

Figure 4

DESIMONE

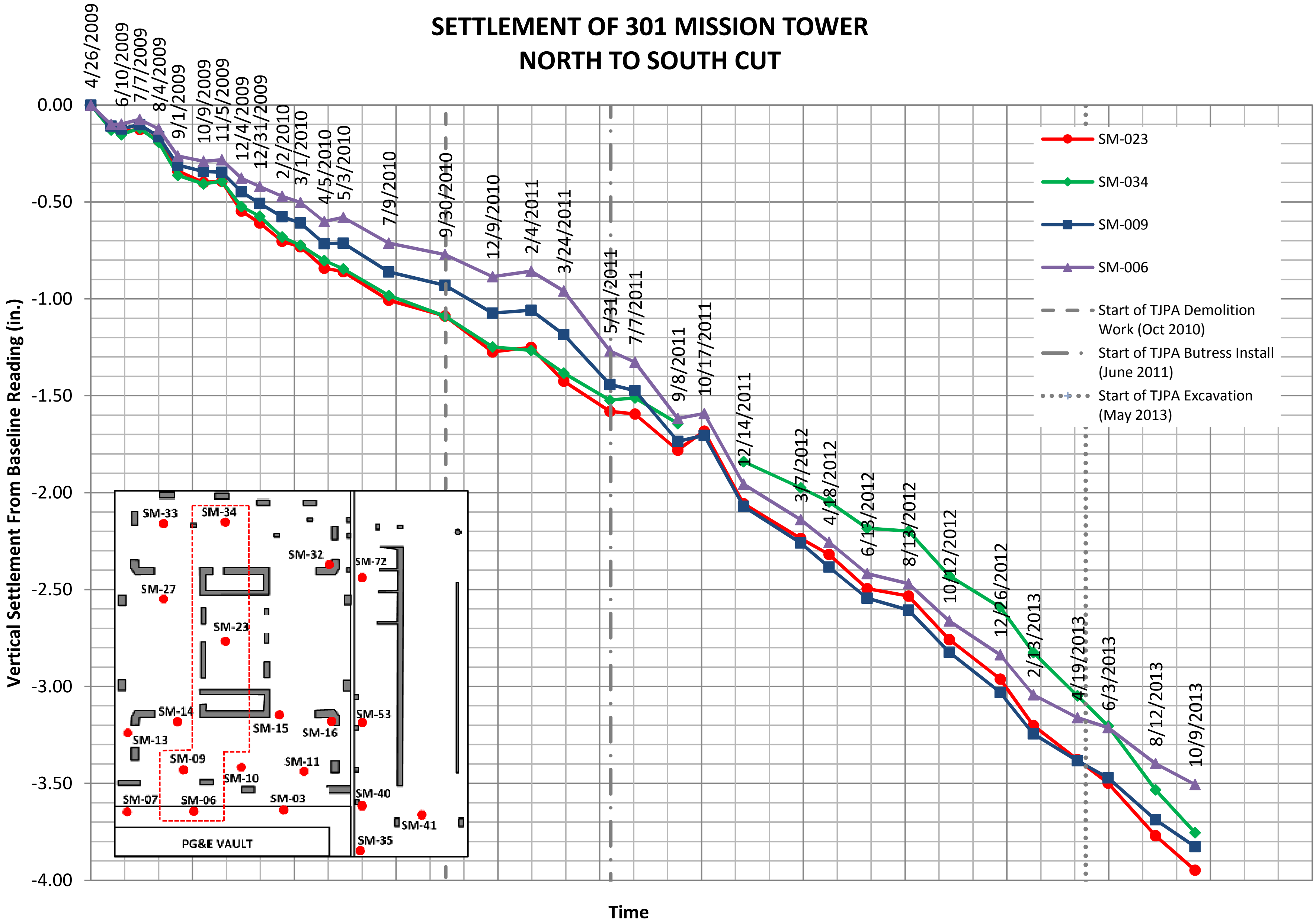


Figure 5

DESIMONE

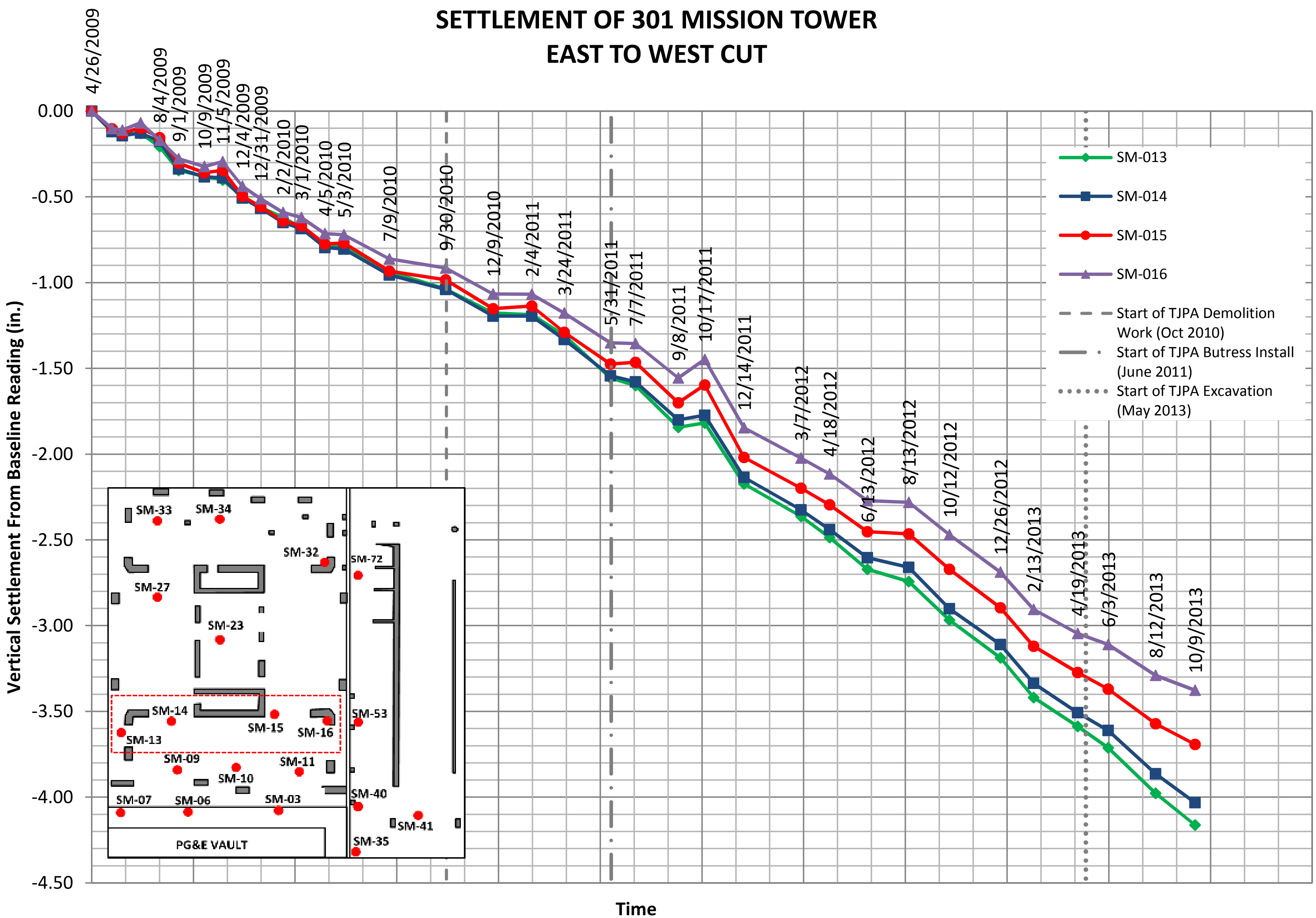


Figure 6

DESIMONE

DIFFERENTIAL SETTLEMENT ALONG THE GRIDLINE 12 JOINT BETWEEN TOWER TO MIDRISE

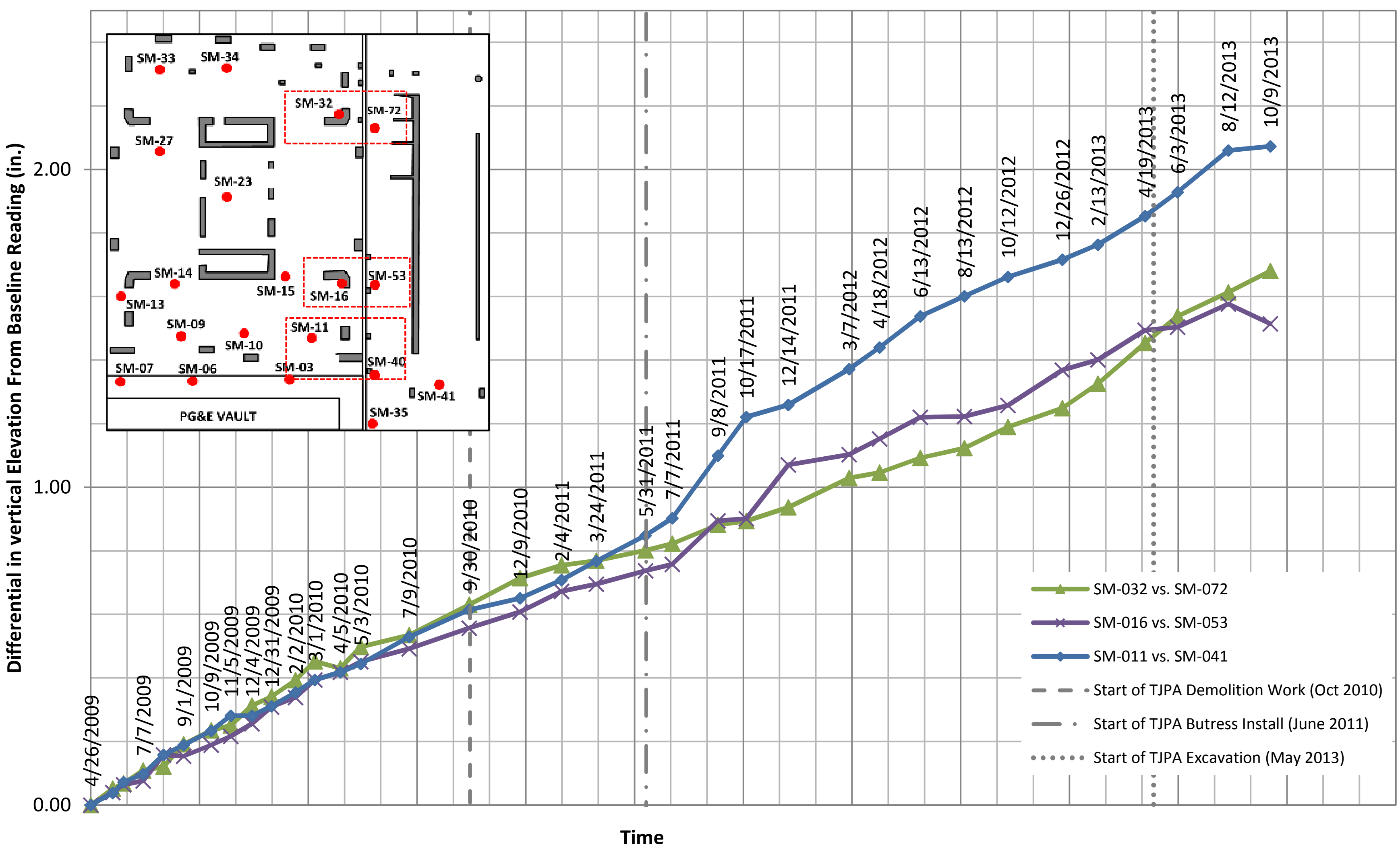


Figure 7

DESIMONE

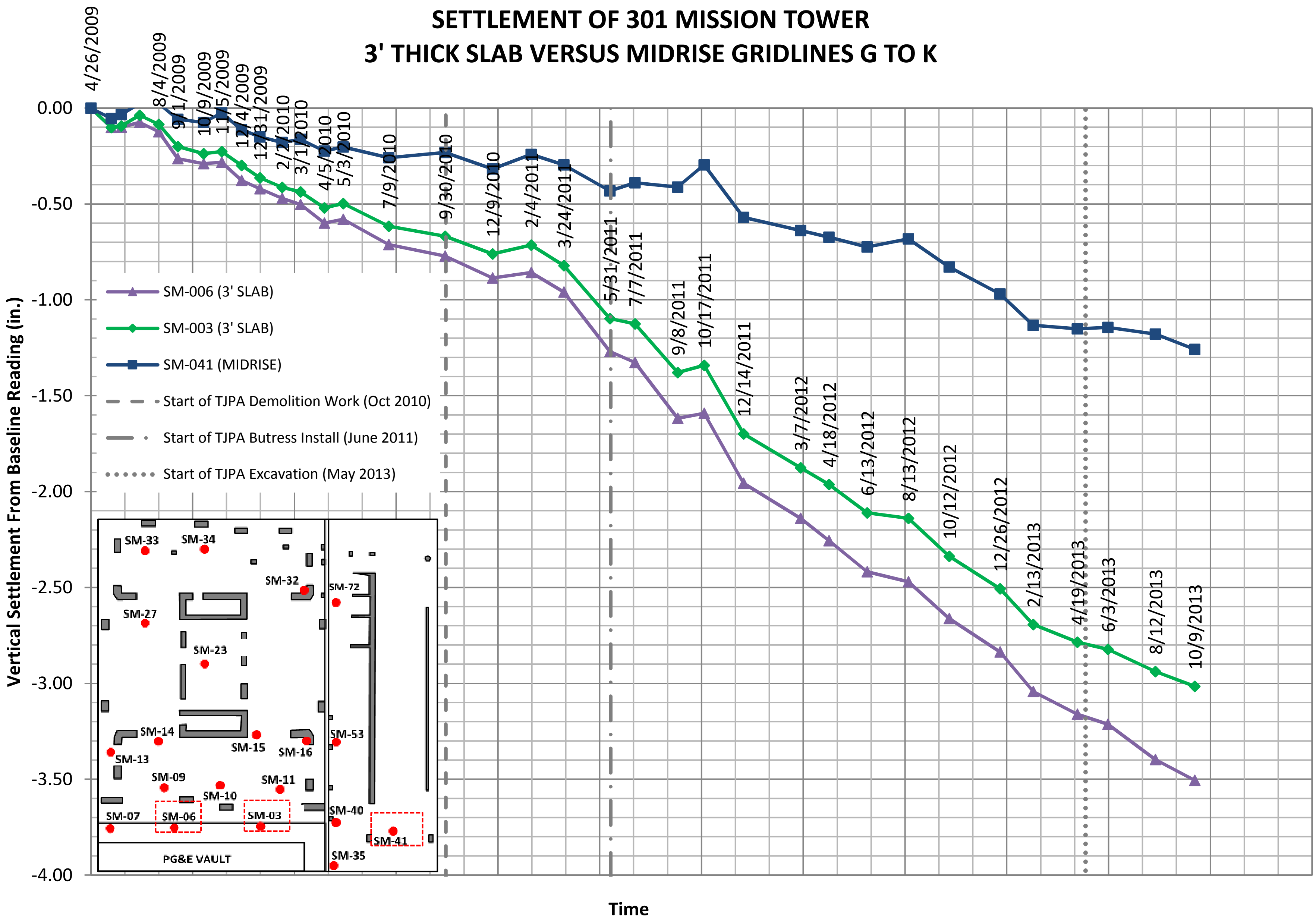


Figure 8

DESIMONE

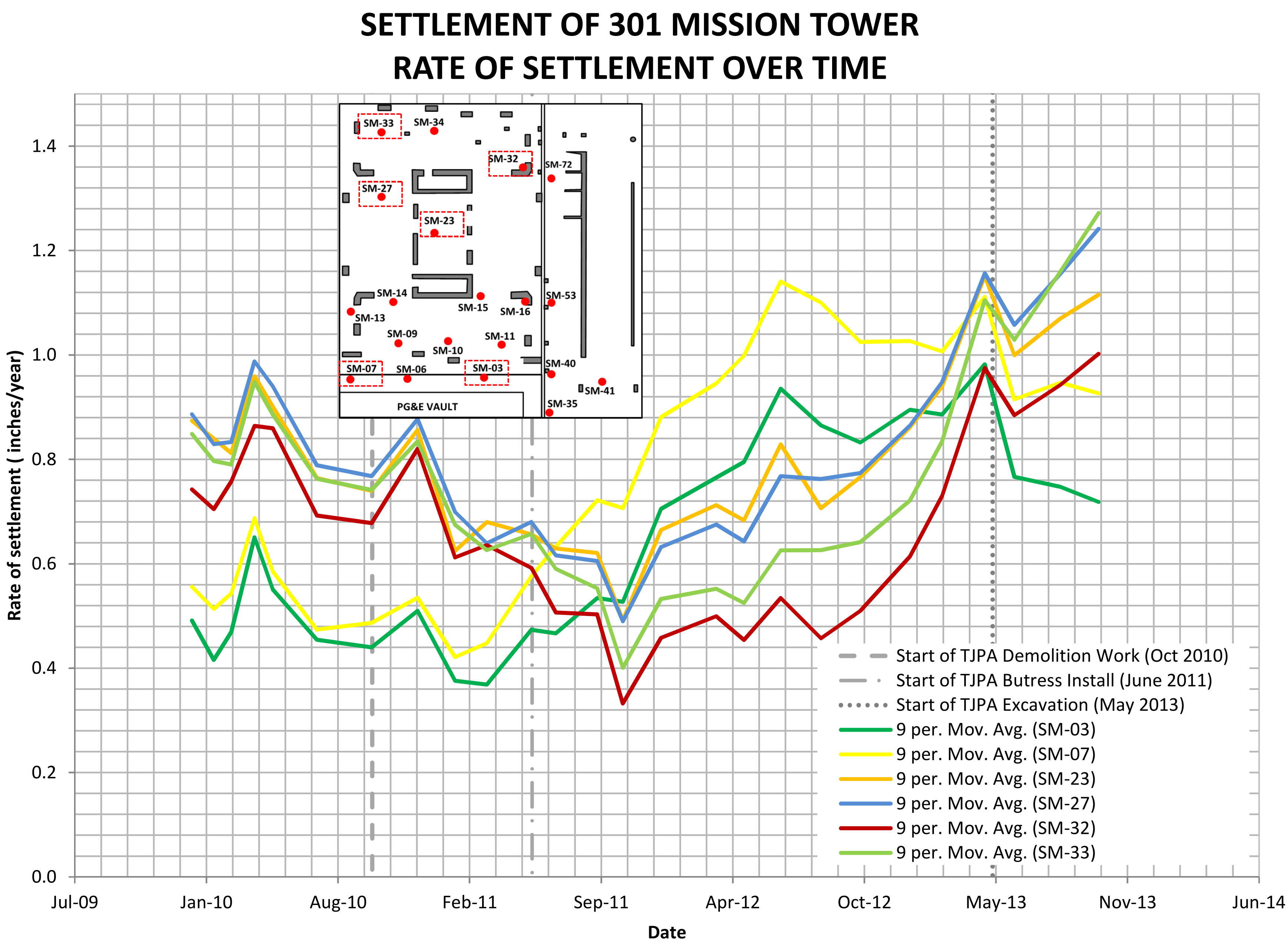
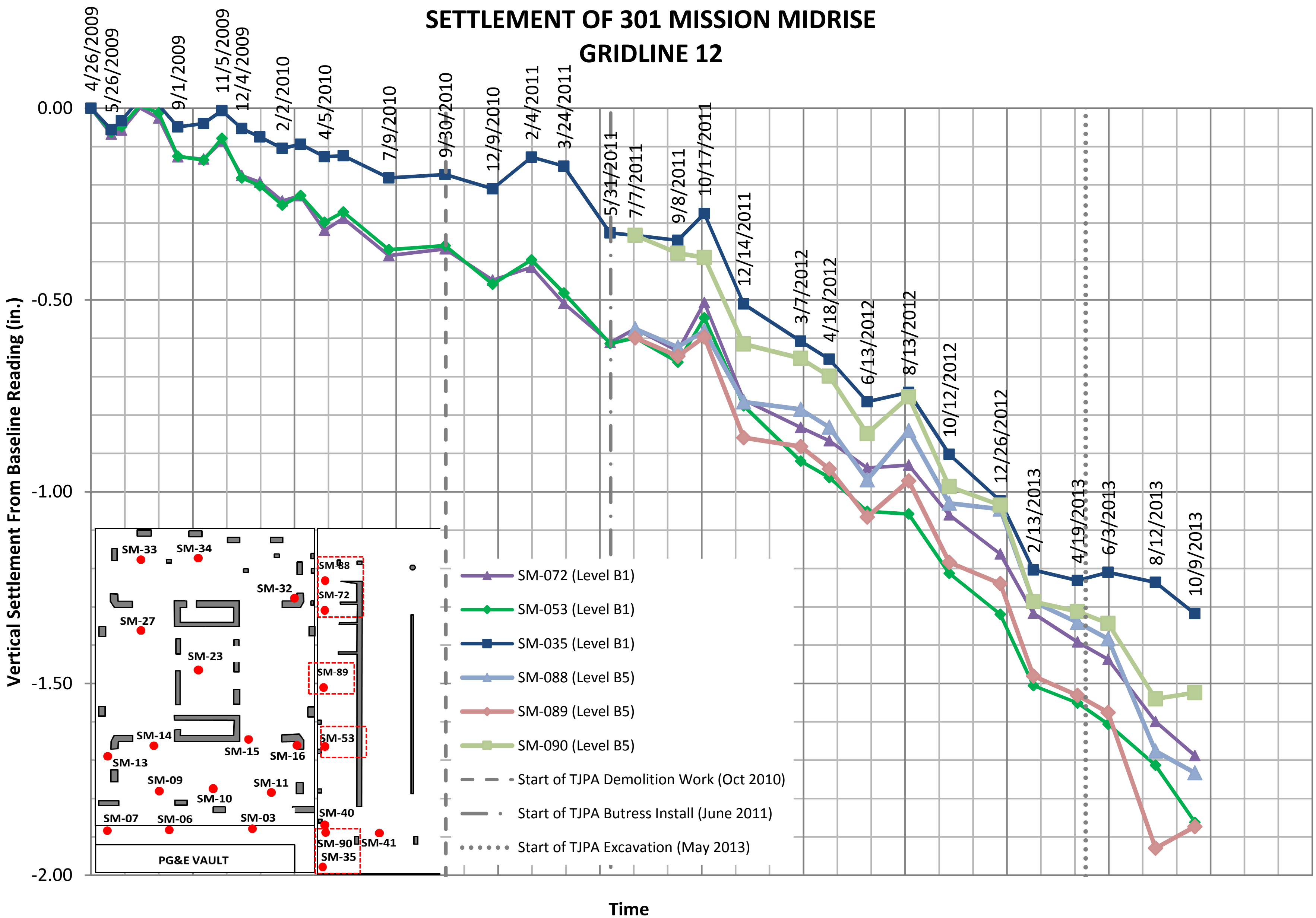


Figure 9


SETTLEMENT OF 301 MISSION MIDRISE
GRIDLINE 12
Vertical Settlement From Baseline Reading (in.)
0.00
-0.50
-1.00
-1.50
-2.00
Time
4/26/2009
5/26/2009
9/1/2009
11/5/2009
12/4/2009
2/2/2010
4/5/2010
7/9/2010
9/30/2010
12/9/2010
2/4/2011
3/24/2011
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7/7/2011
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10/17/2011
12/14/2011
3/7/2012
4/18/2012
6/13/2012
8/13/2012
10/12/2012
12/26/2012
2/13/2013
4/19/2013
6/3/2013
8/12/2013
10/9/2013
SM-072 (Level B1)
SM-053 (Level B1)
SM-035 (Level B1)
SM-088 (Level B5)
SM-089 (Level B5)
SM-090 (Level B5)
Start of TJPA Demolition Work (Oct 2010)
Start of TJPA Butress Install (June 2011)
Start of TJPA Excavation (May 2013)
SM-33
SM-34
SM-32
SM-27
SM-23
SM-14
SM-13
SM-15
SM-16
SM-09
SM-10
SM-11
SM-07
SM-06
SM-03
PG&E VAULT
SM-88
SM-72
SM-89
SM-53
SM-40
SM-90
SM-41
SM-35

Figure 10

DESIMONE

MEMORANDUM

NEW YORK
MIAMI
SAN FRANCISCO
NEW HAVEN
LAS VEGAS
SHANGHAI
ABU DHABI

FROM:	**NICOLAS RODRIGUES**	DATE:	**21 Jan 2014**
PROJECT NO.:	**4069G**	VIA:	**EMAIL**
PROJECT NAME:	**301 MISSION STREET – SETTLEMENT EVALUATION**	PAGES:	**14**

TO:
Steven Hood
SHood@millenniumptrs.com
Millennium Partners
735 Market Street, Suite 302, San Francisco, CA 94103
T: (415) 593-1111
F: (415) 874-4750

RE: 301 MISSION STREET - SETTLEMENT MONITORING

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It is our understanding that Langan Treadwell Rollo will provide an updated evaluation of Settlement, Inclinometers, and Piezometers data. DeSimone is reporting herein on:

1) Settlement Data, Transbay trigger limits, and structural impacts
2) Tiltmeter Data, and the structural impacts
3) Tape Extensometer Data, and structural impacts.
4) Vibration Data, Transbay trigger limits, and structural impacts

Settlement Data:

Analysis of the most recent available settlement data as contained the settlement report by Arup, continues to show a varying rate of overall settlement as compared to the preceding settlement reports by Arup. Generally, an increased rate of settlement has been observed coincidental with the Transbay subsurface construction activities.

<u>Overall Settlement of the Millennium Tower (Figures 1 and 2)</u>
DeSimone recreated the logarithmic time-scale as shown in the ARUP report. However, we have included the measured settlement data prior to the start of Transbay construction and extrapolated this data out to the upper and lower bounds of the final Tower settlement prediction as reported by Langan Treadwell Rollo in their February 18, 2009 letter to SFDBI. After review of the current data as compared to the extrapolated data, it is clear that both the measured settlement and trend of settlement with time is greater than would be anticipated by natural settlement alone.

The actual recorded settlement appears to be greater than what would have occurred naturally based on the T&R prediction. There are three distinct explanations why this is likely:

1) The natural settlement predicted by T&R is incorrect.
2) The Transbay construction activities have created settlement in addition to natural settlement.
3) Some combination of the above.

Comparison of Predicted Settlement to Measured Settlement (Figure 1)
If we use Langan Treadwell Rollo's predicted range of total settlement and read the difference between the measured displacement data points and the settlement prediction curves (Figure 1), the additional settlement is between 1.8 to 3.0 inches. Since 0.75 inches is the "Action Trigger Level" for "other buildings" as described in the Transbay Specification, it is recommended, as we had recommended in earlier reports, that Millennium Partners (Millennium) obtain a response from Transbay regarding this discrepancy in predicted settlement. Furthermore, Transbay revised their specification (the Dec 10, 2010 version) to exclude the 301 Mission Tower from all action trigger levels. It is unclear why Transbay would have changed their specification after construction had begun. The rationale behind this action should be both understood and carefully considered by Millennium.

Further, the total measured settlement is now officially outside of the maximum predicted value provided by Langan Treadwell Rollo. It is unclear how much more settlement will be realized before it will slow down and stop. Given that the Transbay excavation is near complete, it may be possible for a Geotechnical Engineer to now predict accurately how much additional settlement is to be expected. However, it is of great concern that the settlement shows no sign of slowing and in fact it is settling faster than ever before.

Settlement of the North vs. South Side of the Foundation - Logarithmic Scale (Figure 2)
Figure 2 presents an average of settlement on the north side of the tower versus the south end of the tower, as measured in logarithmic scale. Before construction activities began at Transbay we observed that the north side had settled at a greater rate than the south. After buttress installation activities started, we observed a greater rate of settlement on the south side. After June 2013, the north side again shows a higher rate of settlement than the south side. The foundation has rotated slightly away from the south side. Since the south end of the foundation now seems to be moving faster than the north, this suggests that the activities at Transbay have caused the additional settlement.

Figure 2 also shows that the overall settlement reported by ARUP (duplicated in Figure 1) is the worst case settlement anywhere across the foundation (13.1 inches) and does not accurately represent the average. The average overall settlement for the north side currently shows about 12.6 inches. The average overall settlement for the south side currently shows about 12.4 inches.

Settlement as Shown in the ARUP Plot (Figure 3)
DeSimone recreated this plot in order to understand the information provided by ARUP. This plot shows that the southeast corner near SM-03 is settling less than comparable points on the west side of the tower. DeSimone believes that the reduced settlement at SM-03 is a unique phenomenon to this area of the slab. Either the slab is being supported by something in addition to the soil or, the slab is possibly supported by direct connection with the Mid-Rise building. DeSimone suggests this is not the most representative settlement measurement point to use when considering overall settlement of the tower due to Transbay construction activities. Points SM-9 and SM-14 have slowed in comparison to SM-27 which is the point furthest from the Transbay site.

Settlement of the North vs. South Side of the Foundation (Figure 4)
Before Transbay buttress installation began, the north Side was settling more than the south side, but since August, 2011 the south side has been settling more than the north side. This seems to indicate that the Transbay buttress installation activities affected the overall direction of tilt. Beginning in June 2013, the north side is again showing a greater amount of settlement than the south side. This change is coincidental with the completion of the Transbay buttress installation, along with the start of excavation at both the Transbay site and the 350 Mission site.

It should also be noted that this figure indicates differential movement across the foundation in the north-south direction causing a slight tilt to the building. If this movement was larger, damage to the structure can occur. In general the tilt, while measurable, is generally small and not of the type which would cause damage.

Settlement across a North-South Section of the Foundation (Figure 5)
Before buttress installation activities began, the Tower was settling more at the north side and at a consistent rate. After buttress installation activities began, the settlement in the south started settling faster than the ones in the north. At present time, following the last of the buttress installation, the highest settlement along the north-south direction is nearly at the center of the foundation. DeSimone considers the change in location of highest settlement as directly correlated to the Transbay buttress installation activities.

Starting around 4/19/2013, settlement measurements show that the settlement trend with time along the north-south dimension changed. By 6/3/2013, the settlement on the south side seem to have slowed compared to those on the north.

Note: the 10/17/2011 reading of SM-34 is likely an erroneous reading and has been removed from Figure 5.

Settlement across the East-West Section of the Foundation (Figure 6)
The construction does not seem to have affected the settlement in the east-west direction. The settlement along this cut seems to be close to linear, with the west side settling slightly more than the east. The total differential is about 0.9 inches.

Between the Tower and Mid-Rise along Gridline 12 Joint (Figure 7)
Several settlement markers were reviewed at the building separation joint between the Tower and Mid-Rise along gridline 12. It can be clearly observed in Figure 7 that since Transbay buttress installation activities have begun, that there is increasing differential settlement (increase in rate of settlement) across the joint. This settlement is more than what was naturally occurring prior to the beginning of Transbay construction.

The largest observed differential settlement across the joint is near the south side of the building, and less differential settlement on the north side. It does appear that the joint is performing as expected and allowing free movements between both structures. Continued on-site observation of the joint should be made to ensure its intended performance is being met.

3-foot Thick Tower Cantilever Slab Versus the Mid-Rise - Between Gridline H and K (Figure 8)
Several settlement markers were chosen to evaluate the relative settlement between the 3-foot thick cantilever slab and the Mid-Rise. Between April, 2009 and December, 2013, settlement of the 3-foot thick cantilever slab is approximately 2.3 inches greater than the Mid-Rise. This indicates

that, the joint between the two buildings is allowing for independent rates of settlement, which meets the design intent.

Rate of Settlement over Time (Figure 9)
Figure 9 shows the rate of settlement across the site and how that rate has changed over time. A moving average is used including 4 data points (an average of about a 3 to 4 months for each data point.) The following is a list of observations from Figure 9:

- Generally, the rate of settlement site-wide was decreasing until the commencement of Transbay buttress pile installation.
- Before Transbay construction began, the settlement was faster in the north than in the south. After completion of buttress installation, the settlement was faster in the south.
- Between March 2010 and about March 2011 the rate of settlement was slowing.
- The rate of settlement increased consistently for the two southerly markers around March, 2011 up until May, 2013.
- The rate of settlement for all markers show a significant increase beginning in Oct, 2011.
- The rate of settlement for SM-27 and SM-33 is higher than ever before indicating that the northern-western side of the site has seen a significant change.

The Effect of Settlement on Mid-Rise near Gridline 12 (Figure 10)

The area of the Mid-Rise structure between Gridline 12 and Gridline 16 is an area that has 5 levels of basement and only three levels of above ground structure. Langan Treadwell Rollo recommended that mat foundation tie-downs be used as the water pressure and the weight of the structure were such that it was thought that the structure may float. DeSimone implemented this recommendation and the tie-downs were originally pre-tensioned in order to hold the foundation to the soil. Because the mat is tied-down, normal seasonal fluctuations in water levels can occur without significant movement of the foundation.

As can be seen in Figure 10, the foundation has settled along gridline 12 of the Mid-Rise since 2009. The highest level of settlement occurs near the middle of the site, with slightly less at the north and south edges. The settlement is of such a magnitude that the tie-downs may no longer be functioning as intended. DeSimone recommends that Langan Treadwell Rollo address this issue.

Tiltmeter Data:

No update since the December 14, 2012 report.

Tape Extensometers Data:

No update since the December 14, 2012 report.

Vibration Data:

No update since the December 13, 2013 report

DESIMONE

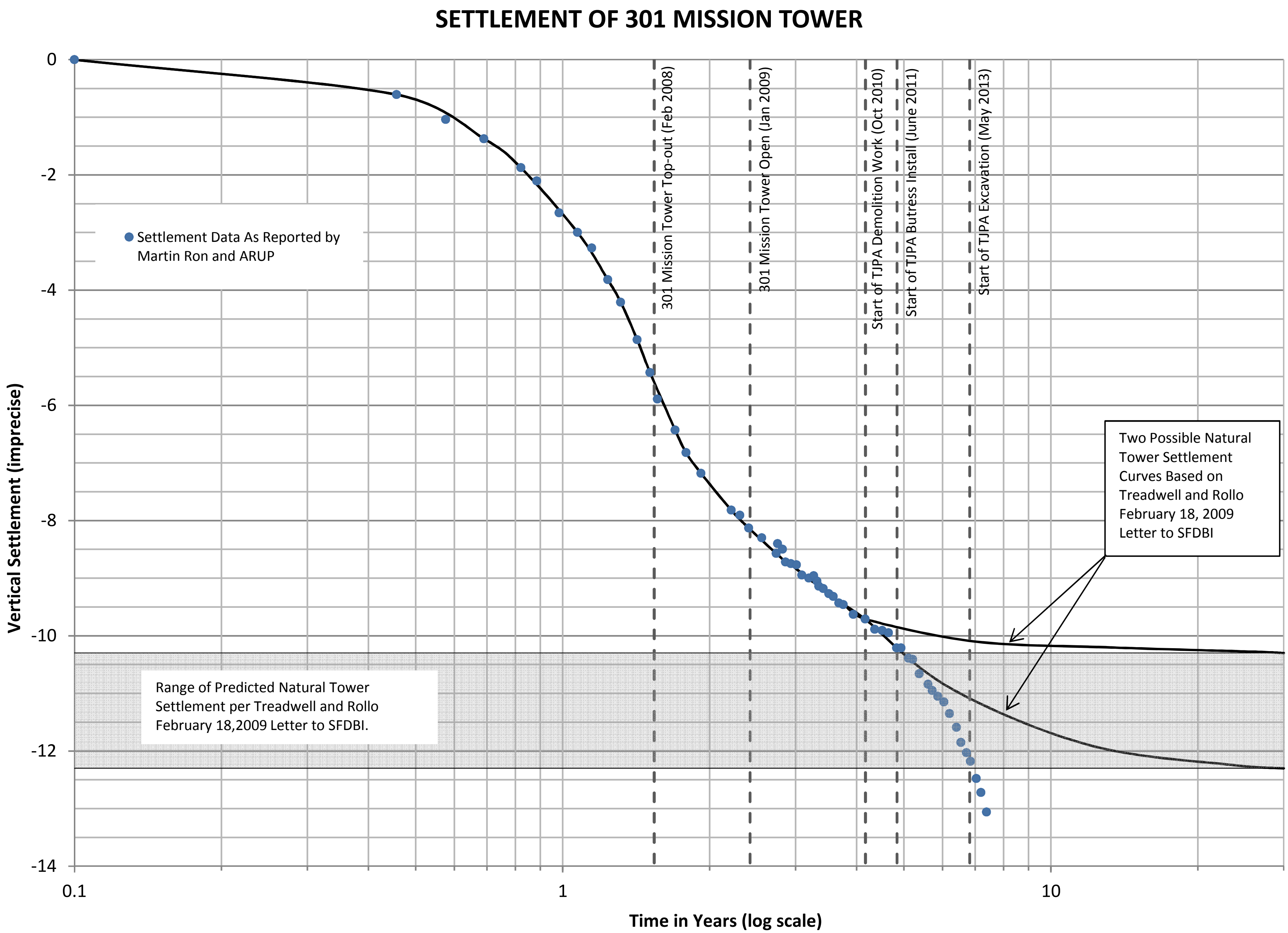

Figure 1

DESIMONE

SETTLEMENT OF 301 MISSION TOWER
AVERAGE NORTH VS AVERAGE SOUTH SIDE

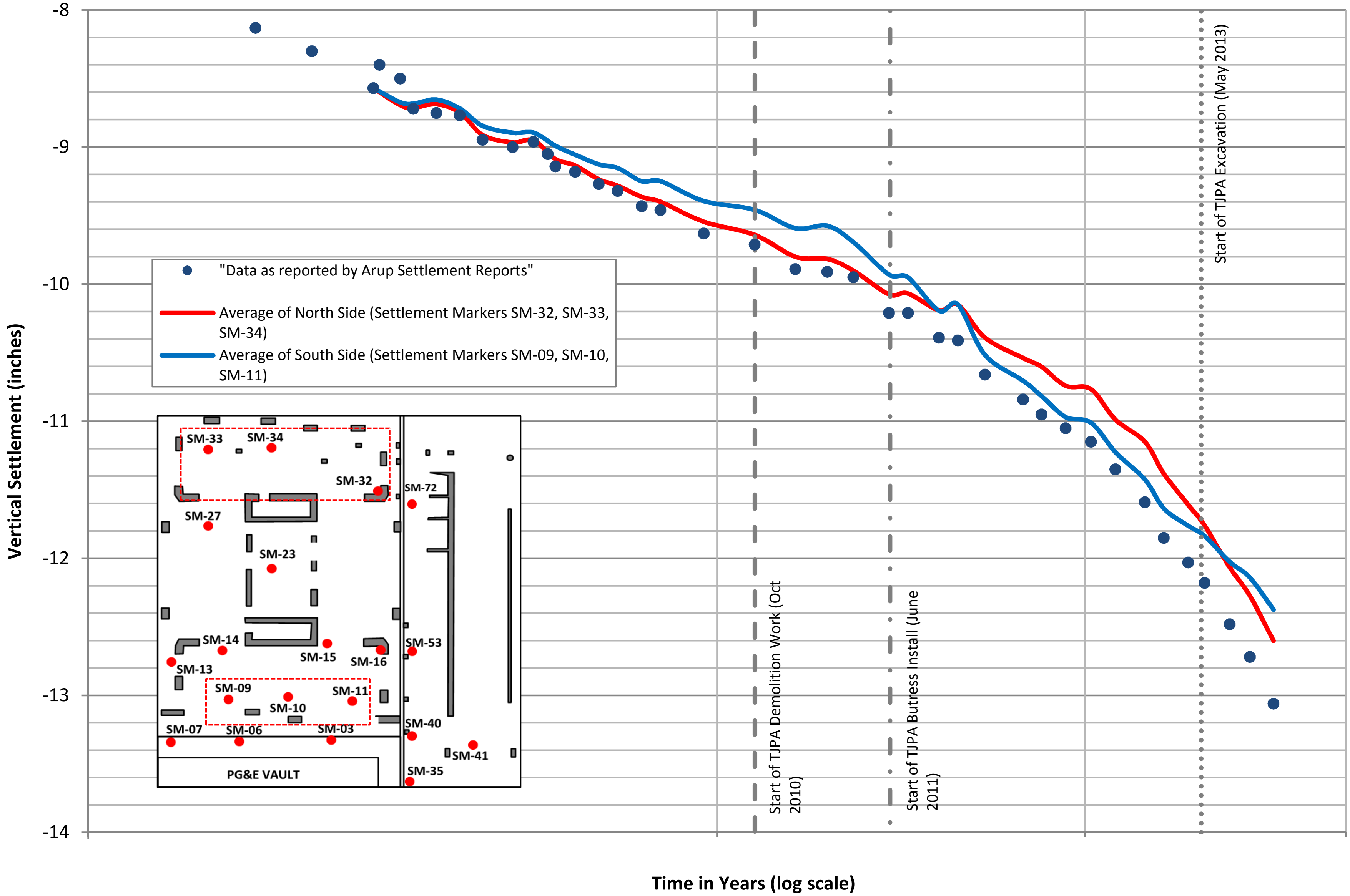

Figure 2

DESIMONE

SETTLEMENT OF 301 MISSION TOWER

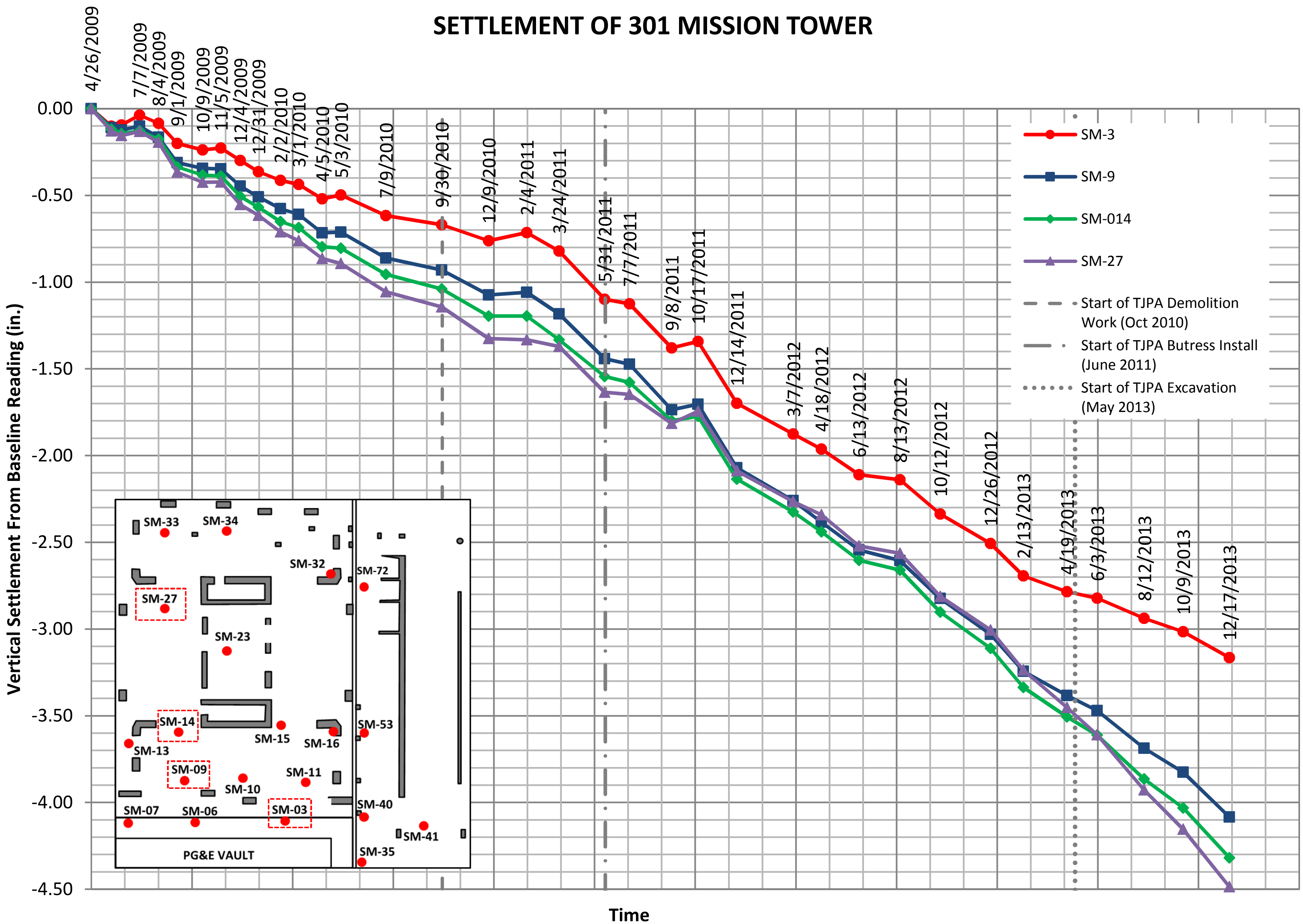

Figure 3

01/21/14

DESIMONE

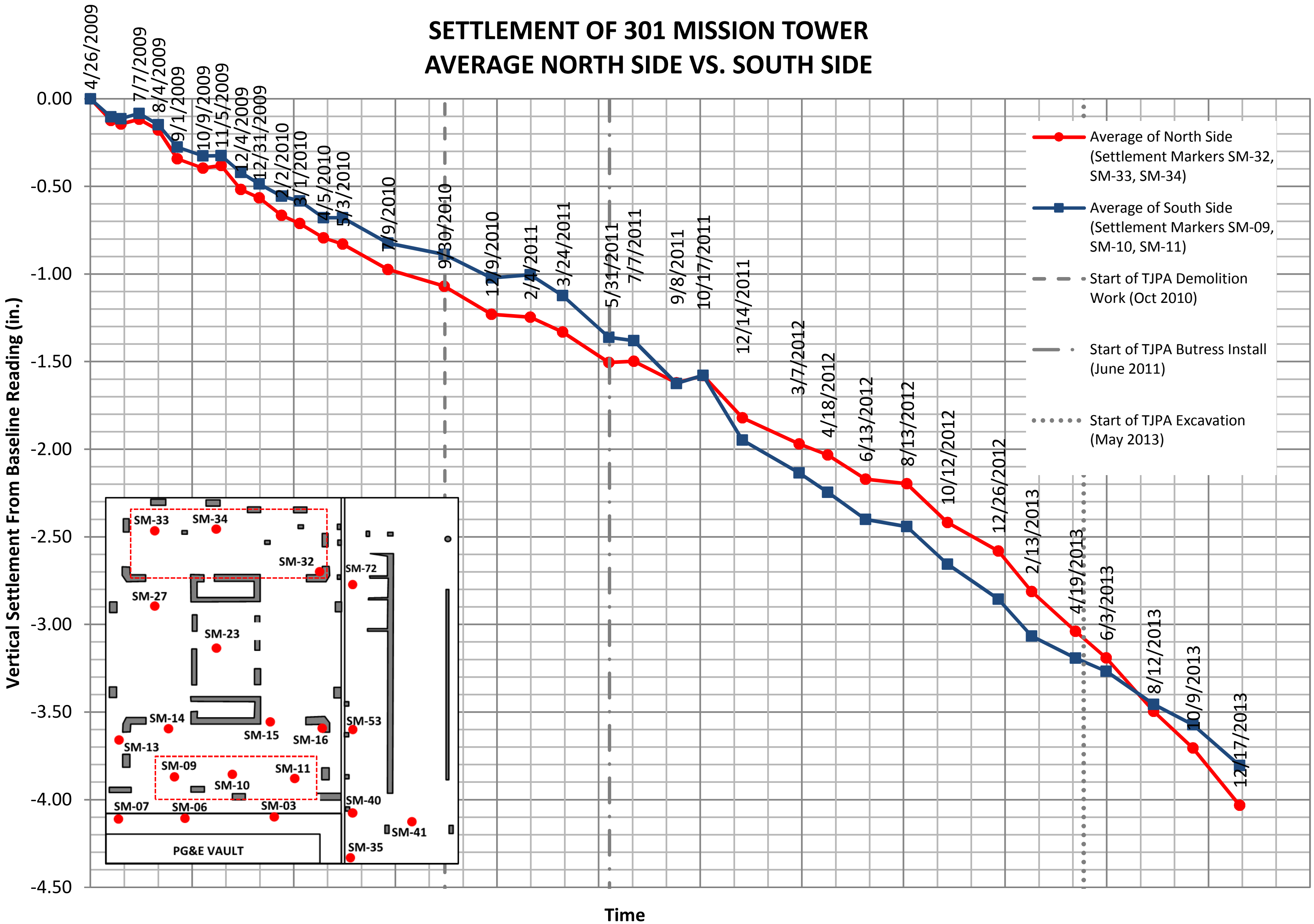

Figure 4

DESIMONE

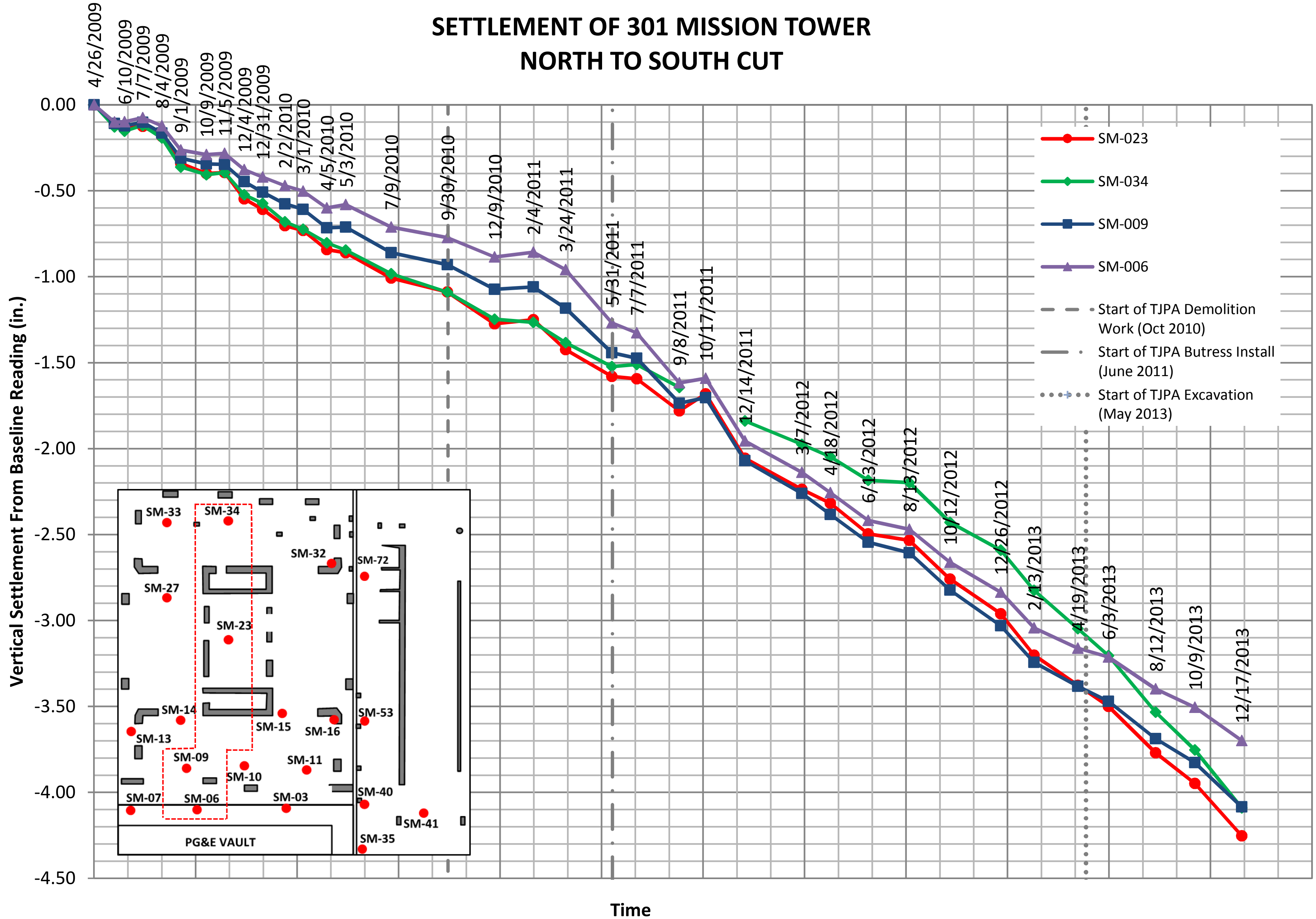

Figure 5

DESIMONE

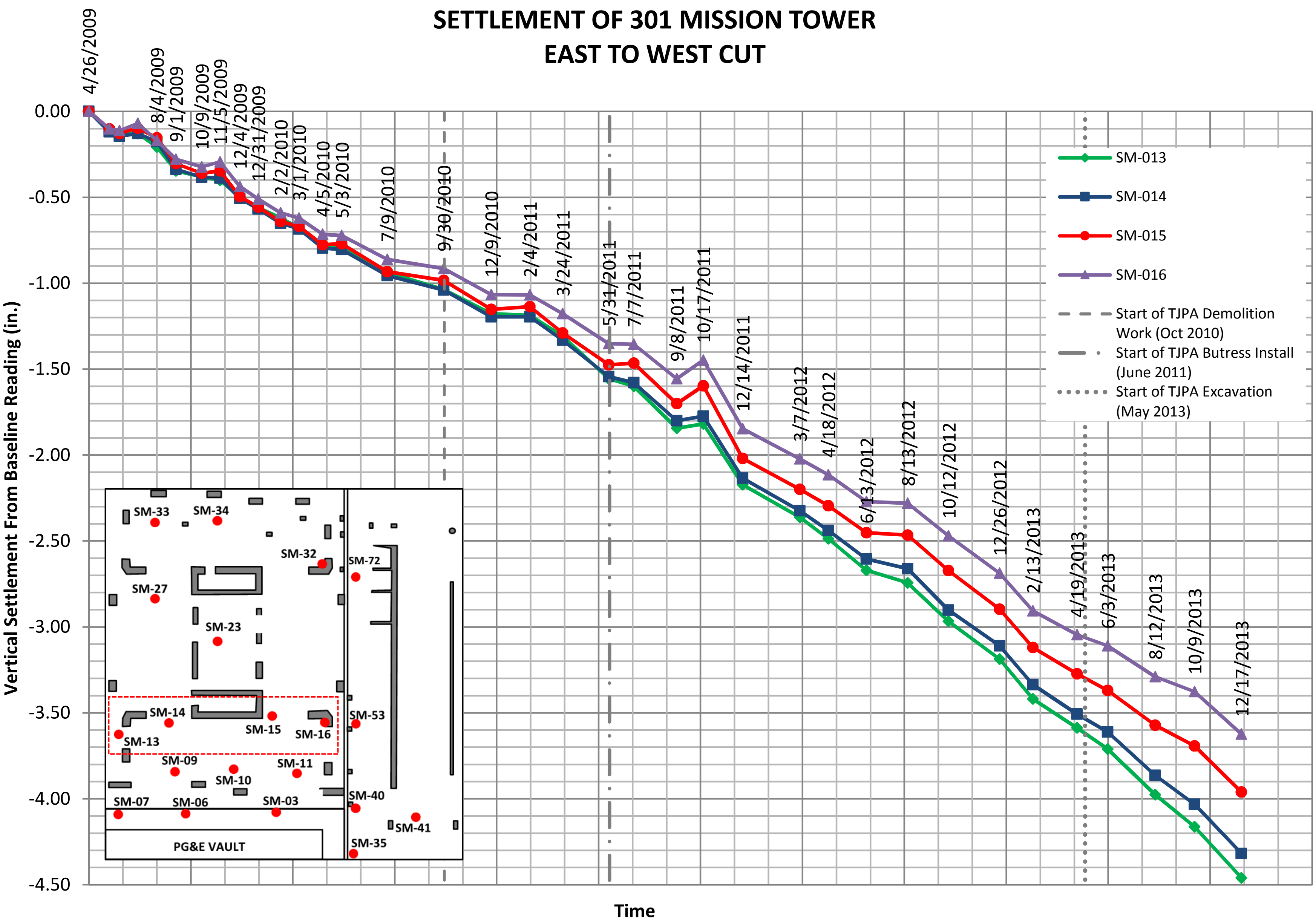

Figure 6

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DIFFERENTIAL SETTLEMENT ALONG THE GRIDLINE 12 JOINT BETWEEN TOWER TO MIDRISE

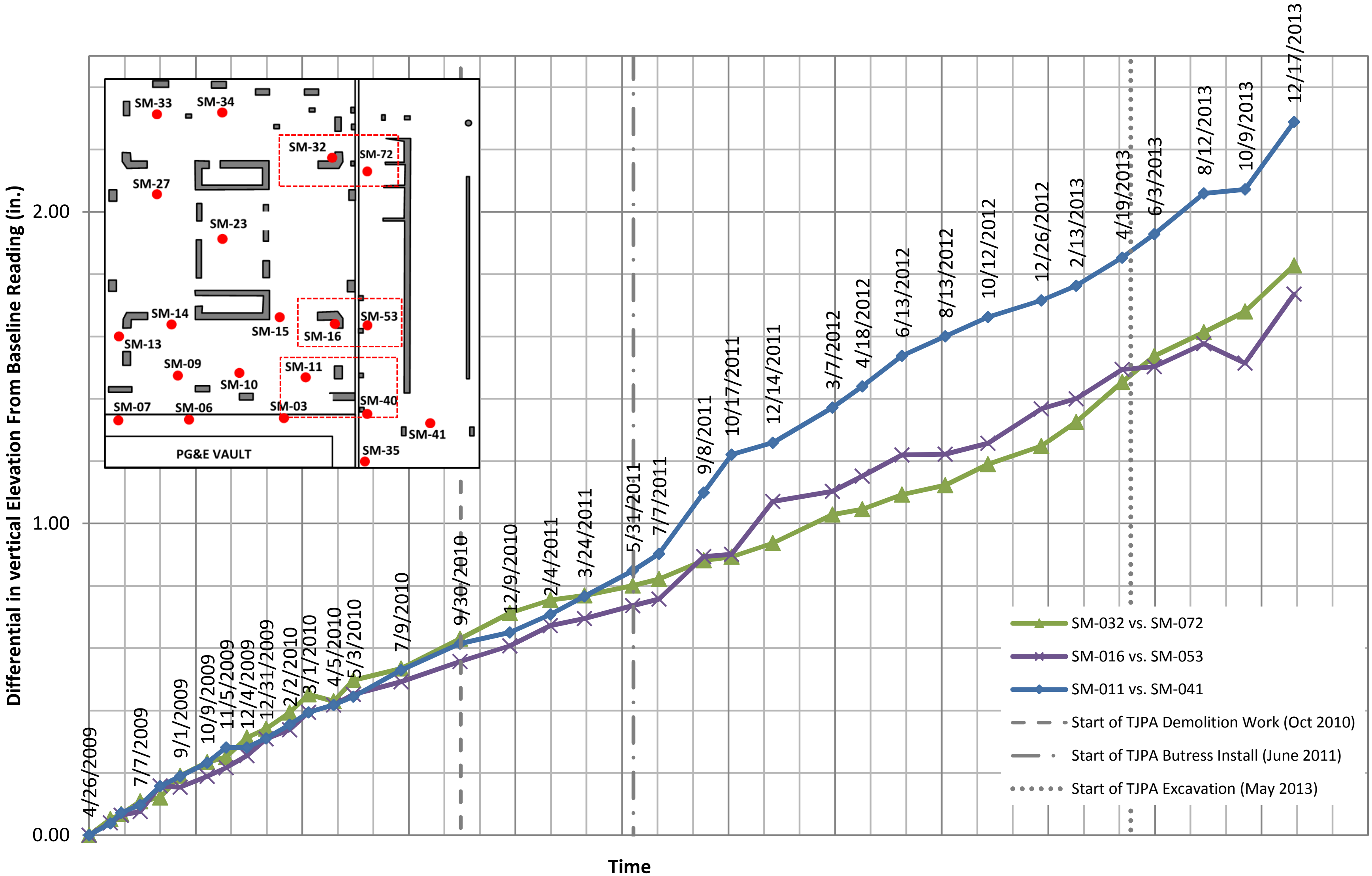

Figure 7

DESIMONE

SETTLEMENT OF 301 MISSION TOWER
3' THICK SLAB VERSUS MIDRISE GRIDLINES G TO K

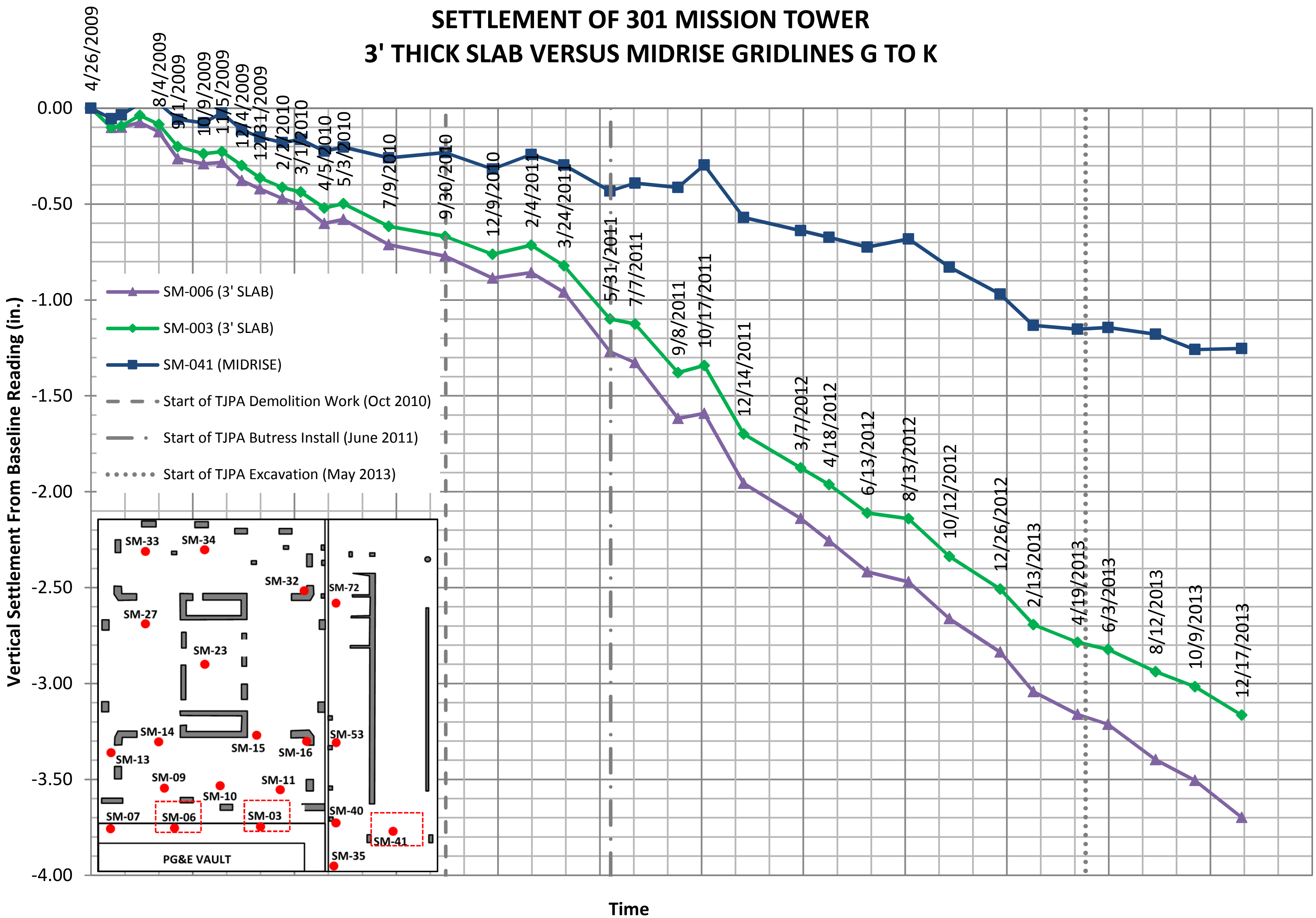

Figure 8

SETTLEMENT OF 301 MISSION TOWER
RATE OF SETTLEMENT OVER TIME

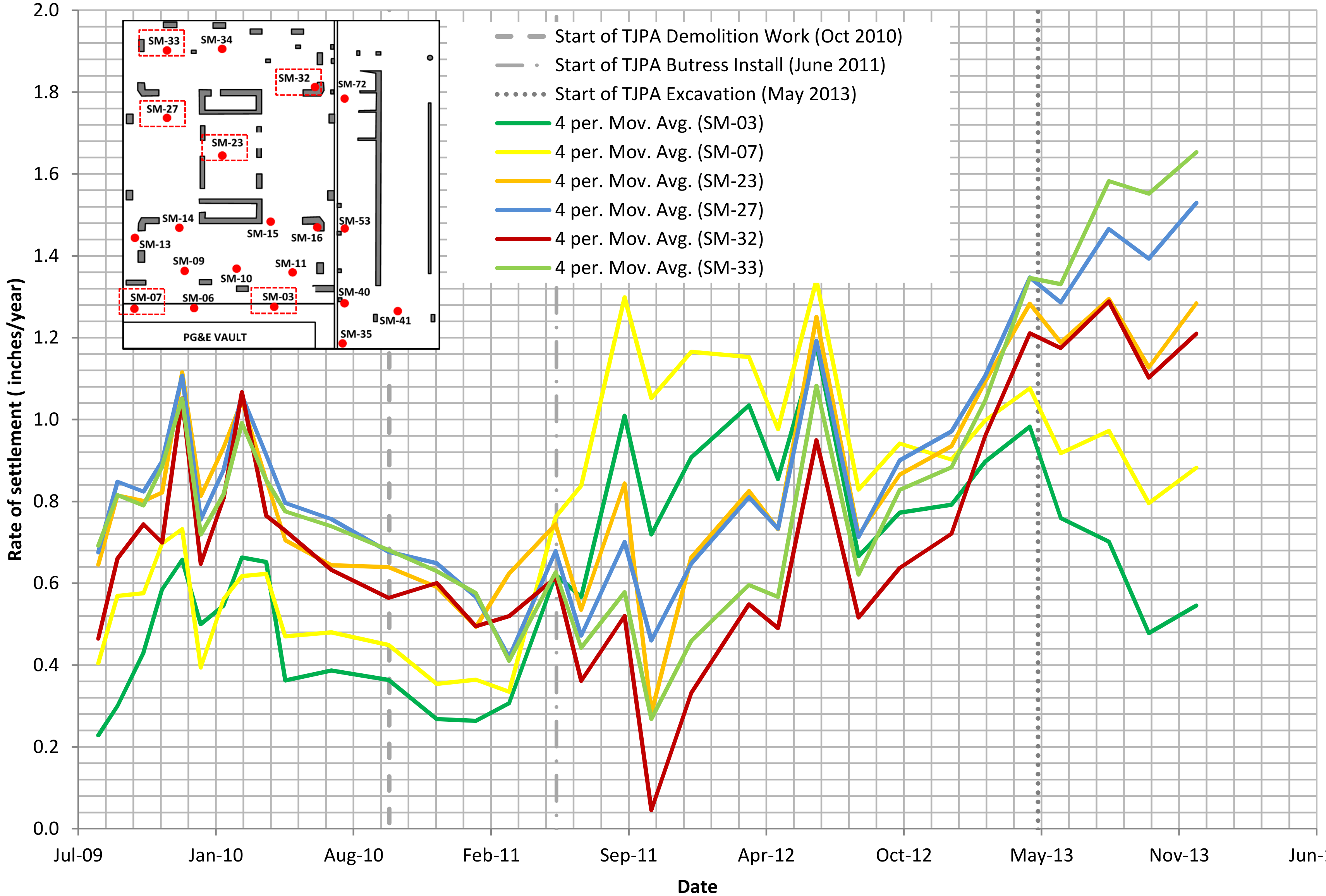

Figure 9

DESIMONE

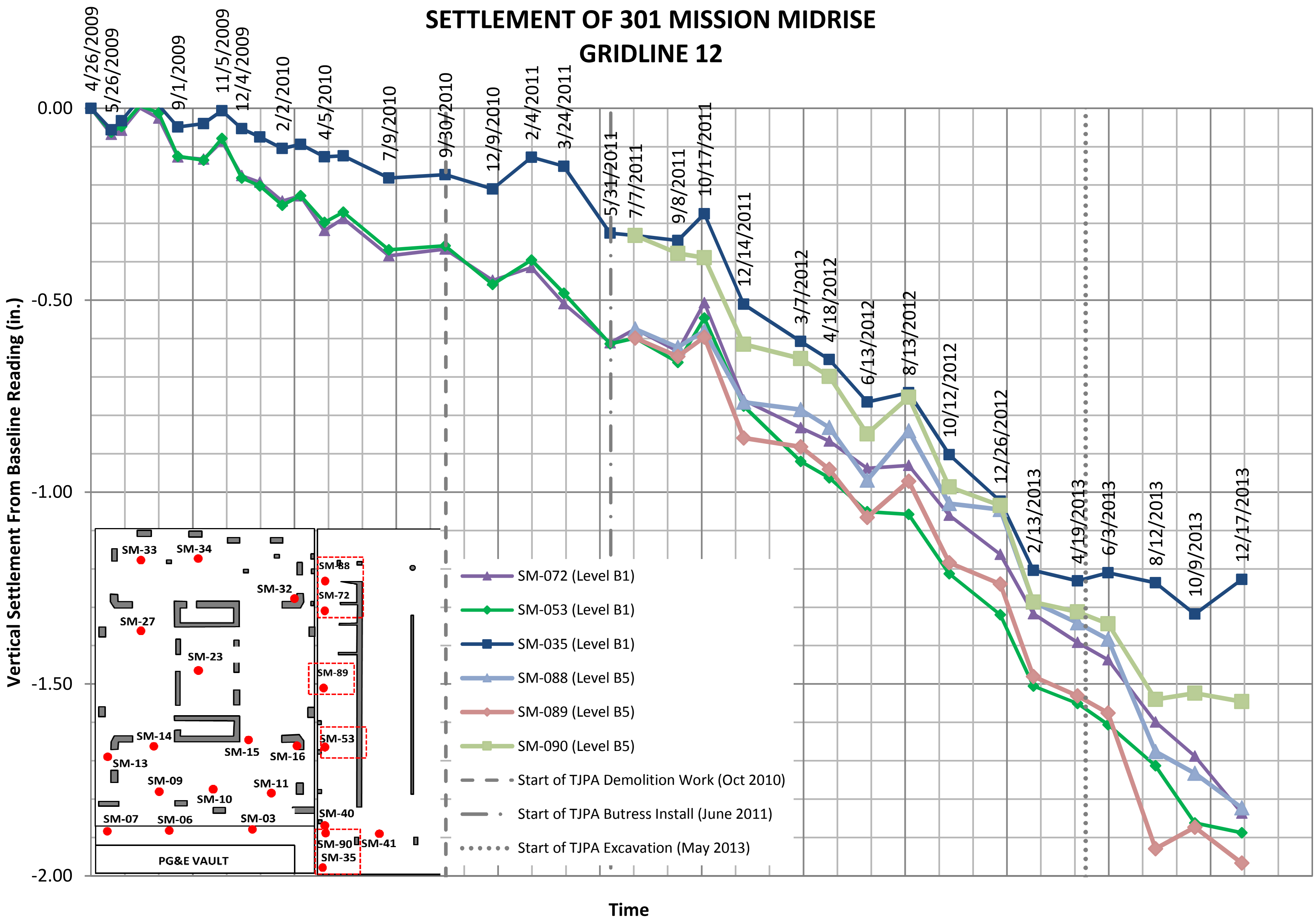

Figure 10

DESIMONE

MEMORANDUM

NEW YORK
MIAMI
SAN FRANCISCO
NEW HAVEN
LAS VEGAS
SHANGHAI
ABU DHABI

FROM:	**NICOLAS RODRIGUES**	DATE:	**6 Mar 2014**
PROJECT NO.:	**4069G**	VIA:	**EMAIL**
PROJECT NAME:	**301 MISSION STREET – SETTLEMENT EVALUATION**	PAGES:	**14**

TO:
Steven Hood
SHood@millenniumptrs.com
Millennium Partners
735 Market Street, Suite 302, San Francisco, CA 94103
T: (415) 593-1111
F: (415) 874-4750

RE: 301 MISSION STREET - SETTLEMENT MONITORING

As requested, DeSimone continues to evaluate settlement data for the Millennium Tower and Mid-Rise, located at 301 Mission Street. We have reviewed the Feb. 28, 2014 ARUP report and the most recent settlement data provided by Millennium Partners (Millennium) to DeSimone via email on Mar. 5, 2014. The data provided has elevation measurements for all settlement markers between Apr. 26, 2009 and Feb. 13, 2014. This memo serves as an update to the DeSimone settlement evaluation memo issued to Millennium dated January 21, 2014. One additional settlement surveys was completed on Feb. 13, 2014 and an evaluation of this data is included herein.

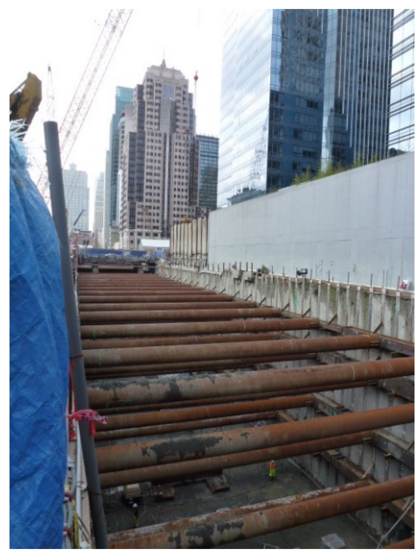

Photo of TJPA site from Beale Street, 3/6/14

As part of the settlement evaluation by DeSimone, a sidewalk survey of the Transbay project site was performed on Mar. 6, 2014. The purpose of this visit was to review current construction progress on adjacent sites. Based on information provided via email by Millennium recently and confirmed during the sidewalk survey, the Transbay excavation directly south of 301 Mission is approximately 100% complete, has been since Feb. 7, 2014. Micro piles were visible at the surface. The new Kilroy tower development at 350 Mission has been excavated to approximately 60 feet, and the new tower construction has progressed from the bottom of the excavation back up to street level, and now is built up to approximately 3 stories.

Photo of TJPA site from 301 Mission, 3/6/14

It is our understanding that Langan Treadwell Rollo will provide an updated evaluation of Settlement, Inclinometers, and Piezometers data. DeSimone is reporting herein on Settlement Data, Transbay trigger limits, and structural impacts.

Settlement Data:

Analysis of the most recent available settlement data as contained the settlement report by Arup, continues to show a varying rate of overall settlement as compared to the preceding settlement reports by Arup. Generally, an increased rate of settlement has been observed coincidental with the Transbay subsurface construction activities.

Overall Settlement of the Millennium Tower (Figures 1 and 2)
DeSimone recreated the logarithmic time-scale as shown in the ARUP report. However, we have included the measured settlement data prior to the start of Transbay construction and extrapolated this data out to the upper and lower bounds of the final Tower settlement prediction as reported by Langan Treadwell Rollo in their February 18, 2009 letter to SFDBI. After review of the current data as compared to the extrapolated data, it is clear that both the measured settlement and trend of settlement with time is greater than would be anticipated by natural settlement alone.

The actual recorded settlement appears to be greater than what would have occurred naturally based on the Langan Treadwell Rollo prediction. There are three distinct explanations why this is likely:

1) The natural settlement predicted by Langan Treadwell Rollo is incorrect.
2) The Transbay construction activities have created settlement in addition to natural settlement.
3) Some combination of the above.

Comparison of Predicted Settlement to Measured Settlement (Figure 1)
If we use Langan Treadwell Rollo's predicted range of total settlement and read the difference between the measured displacement data points and the settlement prediction curves (Figure 1), the additional settlement is between 2.0 to 3.3 inches. Since 0.75 inches is the "Action Trigger Level" for "other buildings" as described in the Transbay Specification, it is recommended, as we had recommended in earlier reports, that Millennium Partners (Millennium) obtain a response from Transbay regarding this discrepancy in predicted settlement. Furthermore, Transbay revised their specification (the Dec 10, 2010 version) to exclude the 301 Mission Tower from all action trigger levels. It is unclear why Transbay would have changed their specification after construction had begun and why no action trigger limit for this site has since been published by TJPA.

Further, the total measured settlement is now officially outside of the maximum predicted value provided by Langan Treadwell Rollo. It is unclear how much more settlement will be realized before it will slow down and stop. Given that the Transbay excavation is now complete, it may be possible for a Geotechnical Engineer to now predict accurately how much additional settlement is to be expected. While the excavation is now complete and one could surmise that the settlement will now begin to slow, there has been no sign of slowing and in fact the settlement is occurring at a faster rate than ever before.

Settlement of the North vs. South Side of the Foundation - Logarithmic Scale (Figure 2)
Figure 2 presents an average of settlement on the north side of the tower versus the south end of the tower, as measured in logarithmic scale. Before construction activities began at Transbay we observed that the north side had settled at a greater rate than the south. After buttress installation activities started, we observed a greater rate of settlement on the south side. After June 2013, the north side again shows a higher rate of settlement than the south side. The foundation has rotated slightly away from the south side.

Figure 2 also shows that the overall settlement reported by ARUP (duplicated in Figure 1) is the worst case settlement anywhere across the foundation (13.1 inches) and does not accurately represent the average. The average overall settlement for the north side currently shows about 12.8 inches. The average overall settlement for the south side currently shows about 12.5 inches.

Settlement as Shown in the ARUP Plot (Figure 3)
DeSimone recreated this plot in order to understand the information provided by ARUP. This plot shows that the southeast corner near SM-03 is settling less than comparable points on the west side of the tower. DeSimone believes that the reduced settlement at SM-03 is a unique phenomenon to this area of the slab. Either the slab is being supported by something in addition to the soil or, the slab is possibly supported by direct connection with the Mid-Rise building. DeSimone suggests this is not the most representative settlement measurement point to use when considering overall settlement of the tower due to Transbay construction activities. Points SM-9 and SM-14 have slowed in comparison to SM-27 which is the point furthest from the Transbay site.

Settlement of the North vs. South Side of the Foundation (Figure 4)
Before Transbay buttress installation began, the north Side was settling more than the south side, but starting in August, 2011 the south side was settling more than the north side. This seems to indicate that the Transbay buttress installation activities affected the overall direction of tilt. Beginning in June 2013, the north side is again showing a greater amount of settlement than the south side. This change is coincidental with the completion of the Transbay buttress installation, along with the start of excavation at both the Transbay site and the 350 Mission site.

It should also be noted that this figure indicates differential movement across the foundation in the north-south direction causing a slight tilt to the building. If this movement was larger, damage to the structure can occur. In general the tilt, while measurable, is generally small and not of the type which would cause damage.

Settlement across a North-South Section of the Foundation (Figure 5)
Before buttress installation activities began, the Tower was settling more at the north side and at a consistent rate. After buttress installation activities began, the settlement in the south started settling faster than the ones in the north. At present time, following the completion of the excavation, the highest settlement along the north-south direction is nearly at the center of the foundation.

Starting around 4/19/2013, coincidental with the start of TJPA excavation, settlement measurements show that the settlement trend with time along the north-south dimension changed. By 6/3/2013, the settlement on the south side seem to have slowed compared to those on the north.

Note: the 10/17/2011 reading of SM-34 is likely an erroneous reading and has been removed from Figure 5.

Settlement across the East-West Section of the Foundation (Figure 6)
The construction does not seem to have affected the settlement in the east-west direction. The settlement along this cut seems to be close to linear, with the west side settling slightly more than the east. The total differential is about 0.9 inches.

Between the Tower and Mid-Rise along Gridline 12 Joint (Figure 7)

Several settlement markers were reviewed at the building separation joint between the Tower and Mid-Rise along gridline 12. It can be clearly observed in Figure 7 that since Transbay buttress installation activities have begun, that there is increasing differential settlement (increase in rate of settlement) across the joint. This settlement is more than what was naturally occurring prior to the beginning of Transbay construction.

The largest observed differential settlement across the joint is near the south side of the building, and less differential settlement on the north side. It does appear that the joint is performing as expected and allowing free movements between both structures. Continued on-site observation of the joint should be made to ensure its intended performance is being met.

3-foot Thick Tower Cantilever Slab Versus the Mid-Rise - Between Gridline H and K (Figure 8)
Several settlement markers were chosen to evaluate the relative settlement between the 3-foot thick cantilever slab and the Mid-Rise. Between Apr. 2009 and Dec. 2013, settlement of the 3-foot thick cantilever slab is approximately 2.3 inches greater than the Mid-Rise. This indicates that, the joint between the two buildings is allowing for independent rates of settlement, which meets the design intent.

Rate of Settlement over Time (Figure 9)
Figure 9 shows the rate of settlement across the site and how that rate has changed over time. The rate fluctuates sporadically when considered over any one particular time frame. As such, it is statistically more correct to consider average fluctuations over time. A moving average is used which including 4 data points. Each plotted point is the average of the previous six months. The following is a list of observations from Figure 9:

- Generally, the rate of settlement site-wide was decreasing until the commencement of adjacent Transbay activity.
- Before Transbay construction began, the settlement was faster in the north than in the south. After completion of buttress installation, the settlement was faster in the south.
- Between March 2010 and about March 2011 the rate of settlement was slowing.
- The rate of settlement increased consistently for the two southerly markers around March, 2011 up until May, 2013.
- The rate of settlement for all markers show a significant increase beginning in Oct, 2011.
- The rate of settlement for SM-27 and SM-33 is higher than ever before indicating that the northern-western side of the site has seen a significant change.

The Effect of Settlement on Mid-Rise near Gridline 12 (Figure 10)

The area of the Mid-Rise structure between Gridline 12 and Gridline 16 is an area that has 5 levels of basement and only three levels of above ground structure. Langan Treadwell Rollo recommended that mat foundation tie-downs be used as the water pressure and the weight of the structure were such that it was thought that the structure may float. DeSimone implemented this recommendation and the tie-downs were originally pre-tensioned in order to hold the foundation to the soil. Because the mat is tied-down, normal seasonal fluctuations in water levels can occur without significant movement of the foundation.

As can be seen in Figure 10, the foundation has settled along gridline 12 of the Mid-Rise since 2009. The highest level of settlement occurs near the middle of the site, with slightly less at the north and south edges. The settlement is of such a magnitude that the tie-downs may no longer be functioning as intended. DeSimone recommends that Langan Treadwell Rollo address this issue.

DESIMONE

SETTLEMENT OF 301 MISSION TOWER

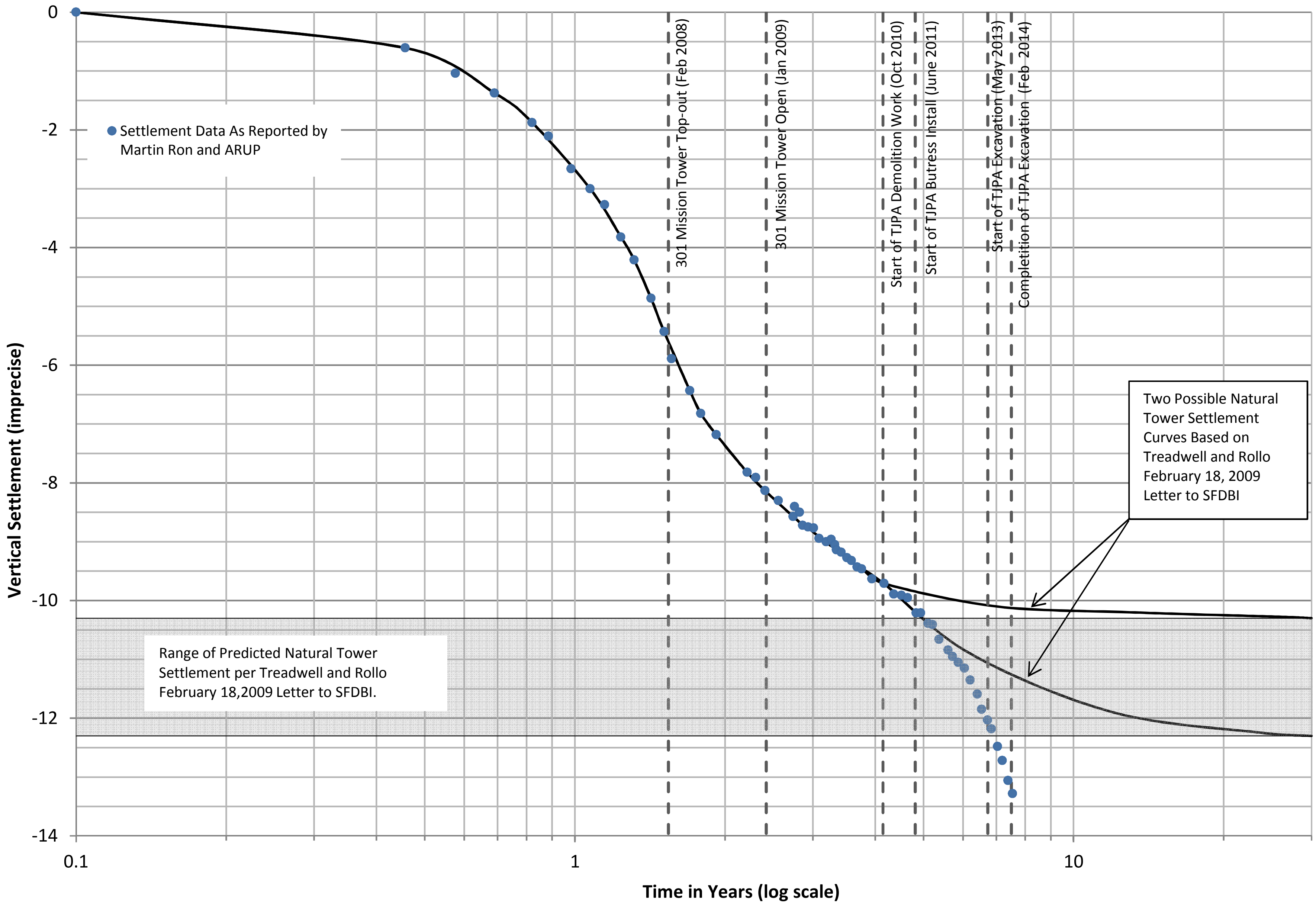

Figure 1

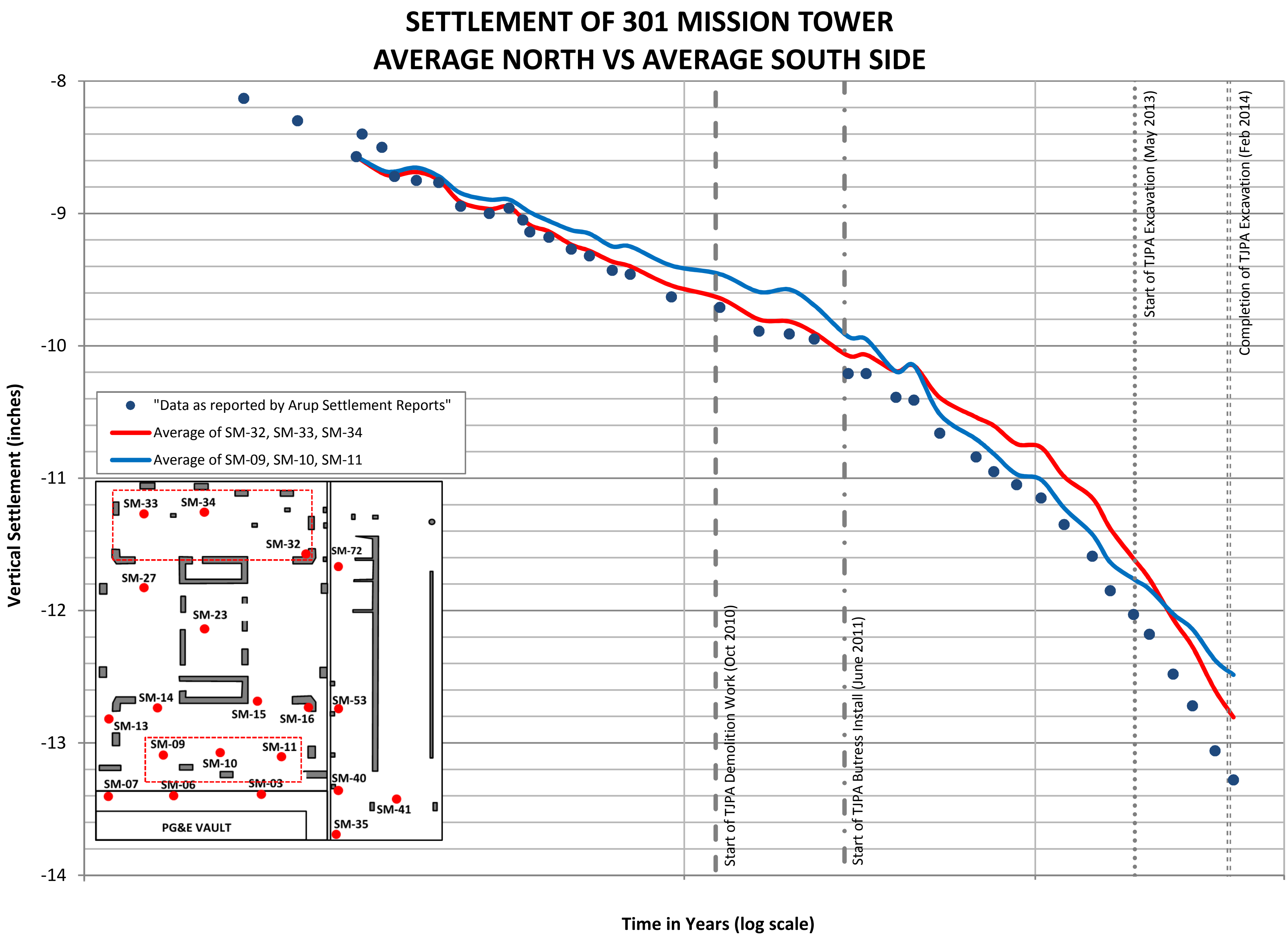
SETTLEMENT OF 301 MISSION TOWER
AVERAGE NORTH VS AVERAGE SOUTH SIDE
Vertical Settlement (inches)
-8
-9
-10
-11
-12
-13
-14
Time in Years (log scale)
"Data as reported by Arup Settlement Reports"
Average of SM-32, SM-33, SM-34
Average of SM-09, SM-10, SM-11
Start of TJPA Demolition Work (Oct 2010)
Start of TJPA Butress Install (June 2011)
Start of TJPA Excavation (May 2013)
Completion of TJPA Excavation (Feb 2014)
SM-33
SM-34
SM-32
SM-72
SM-27
SM-23
SM-14
SM-13
SM-15
SM-16
SM-53
SM-09
SM-10
SM-11
SM-07
SM-06
SM-03
SM-40
SM-41
SM-35
PG&E VAULT

Figure 2

March 6, 2014

DESIMONE

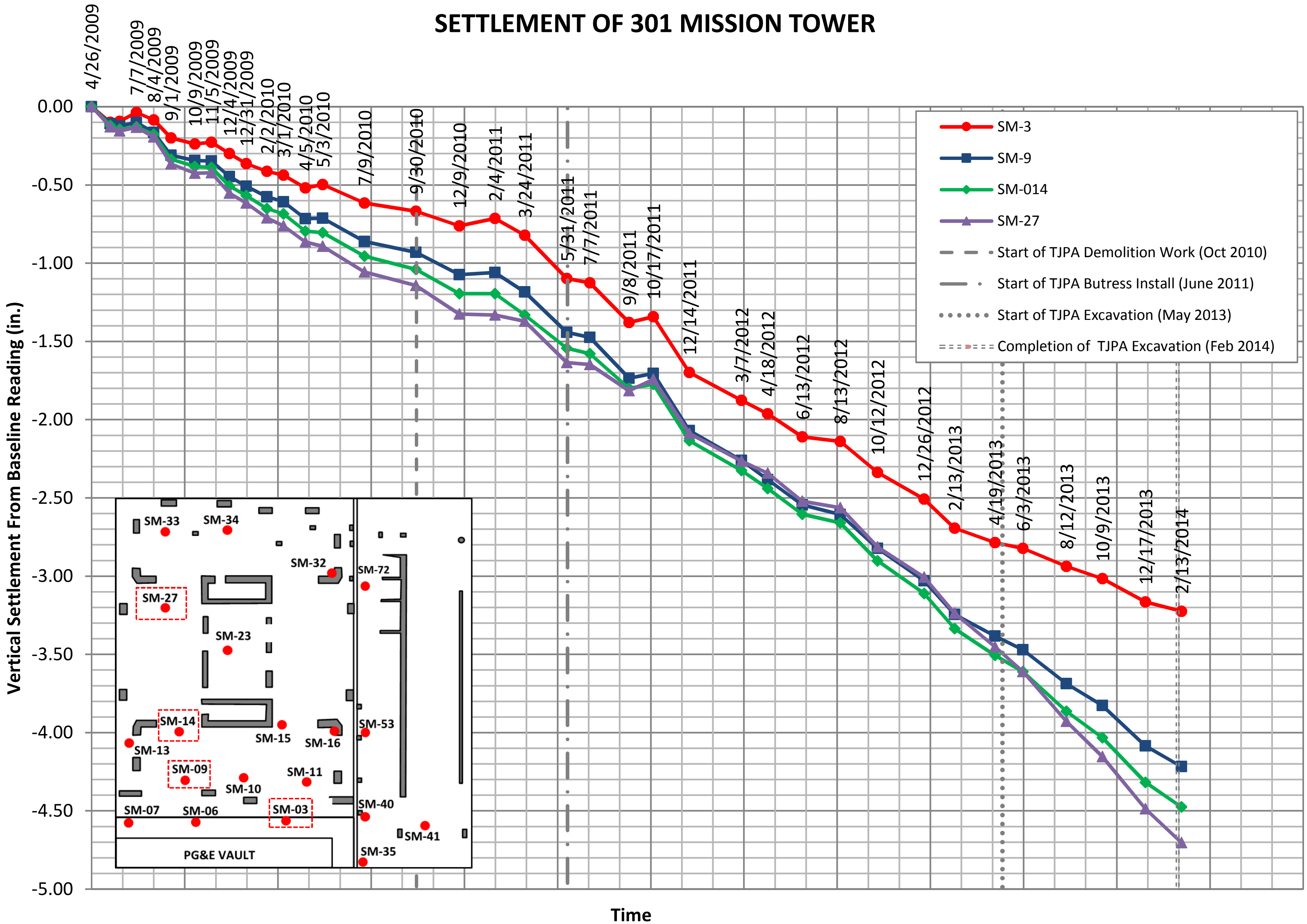

Figure 3

March 6, 2014

DESIMONE

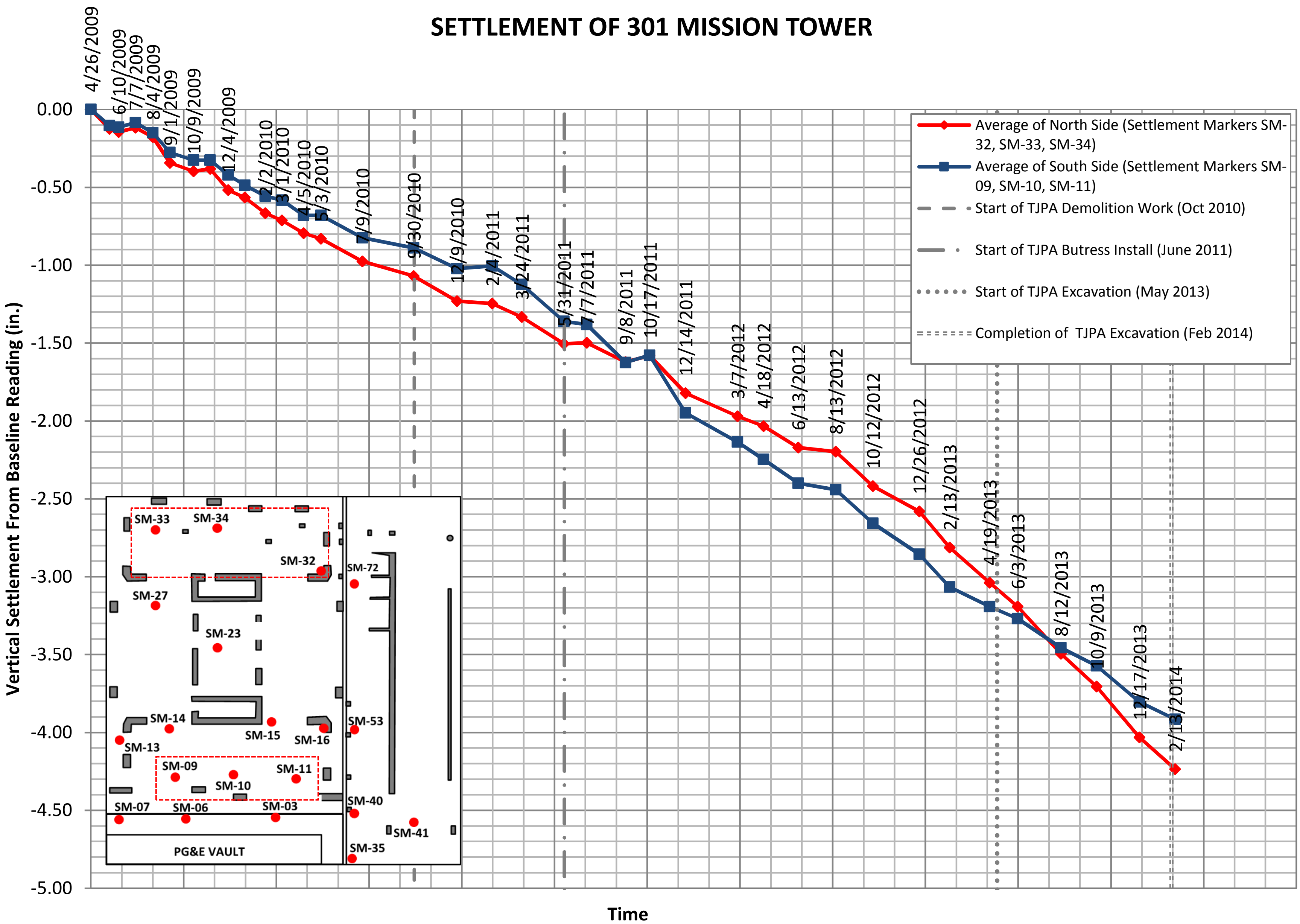

Figure 4

DESIMONE

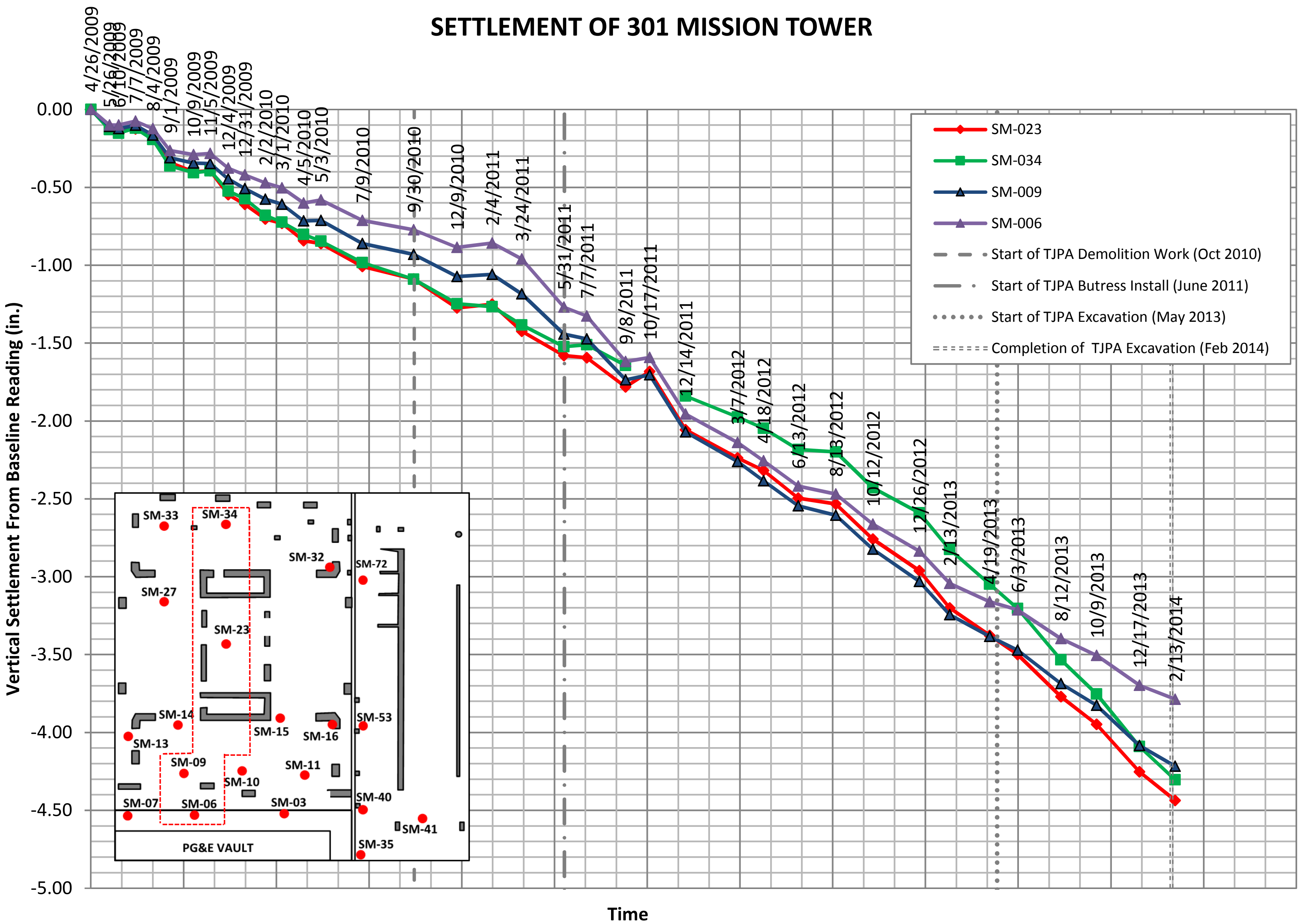

Figure 5

March 6, 2014

DESIMONE

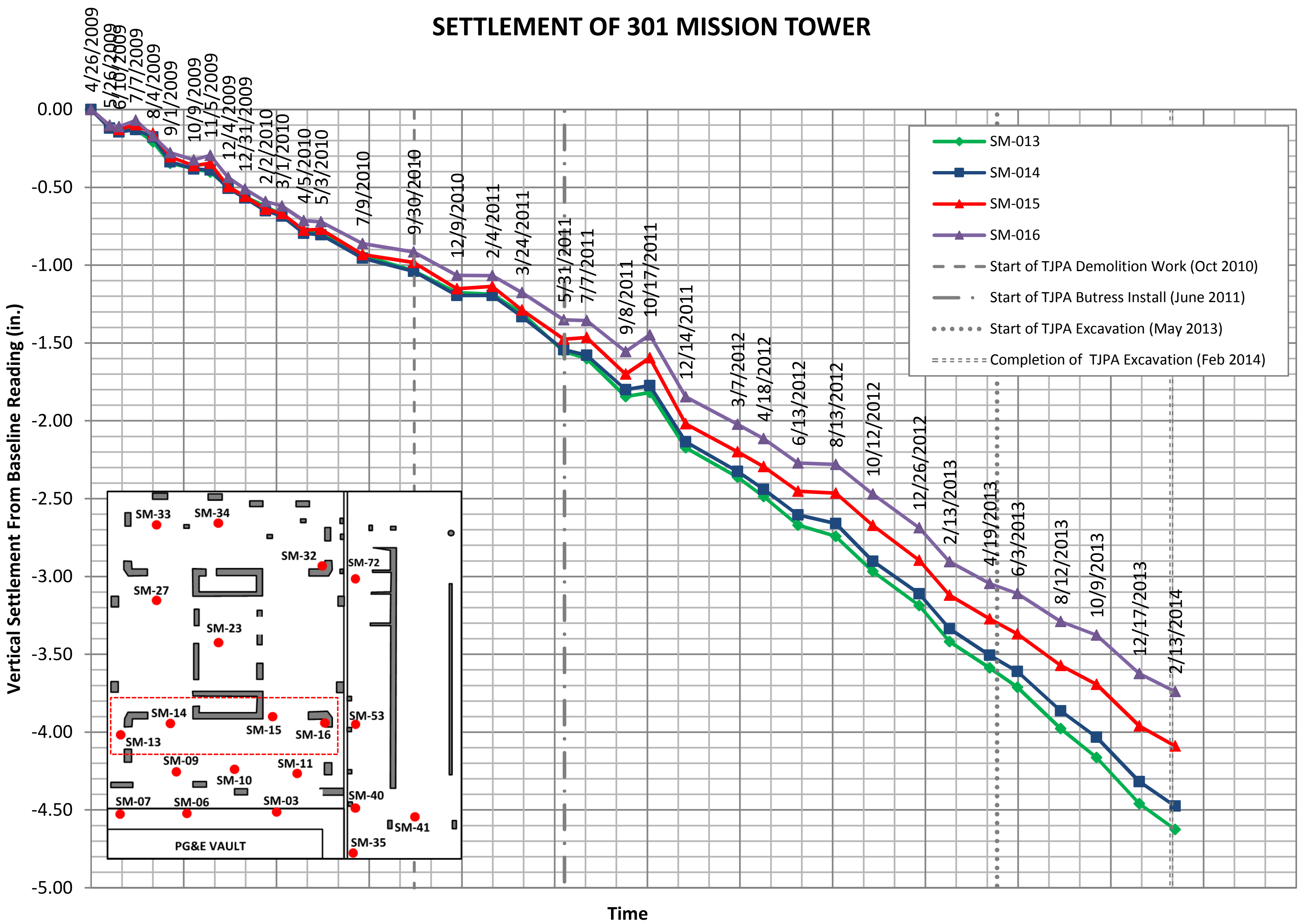

Figure 6

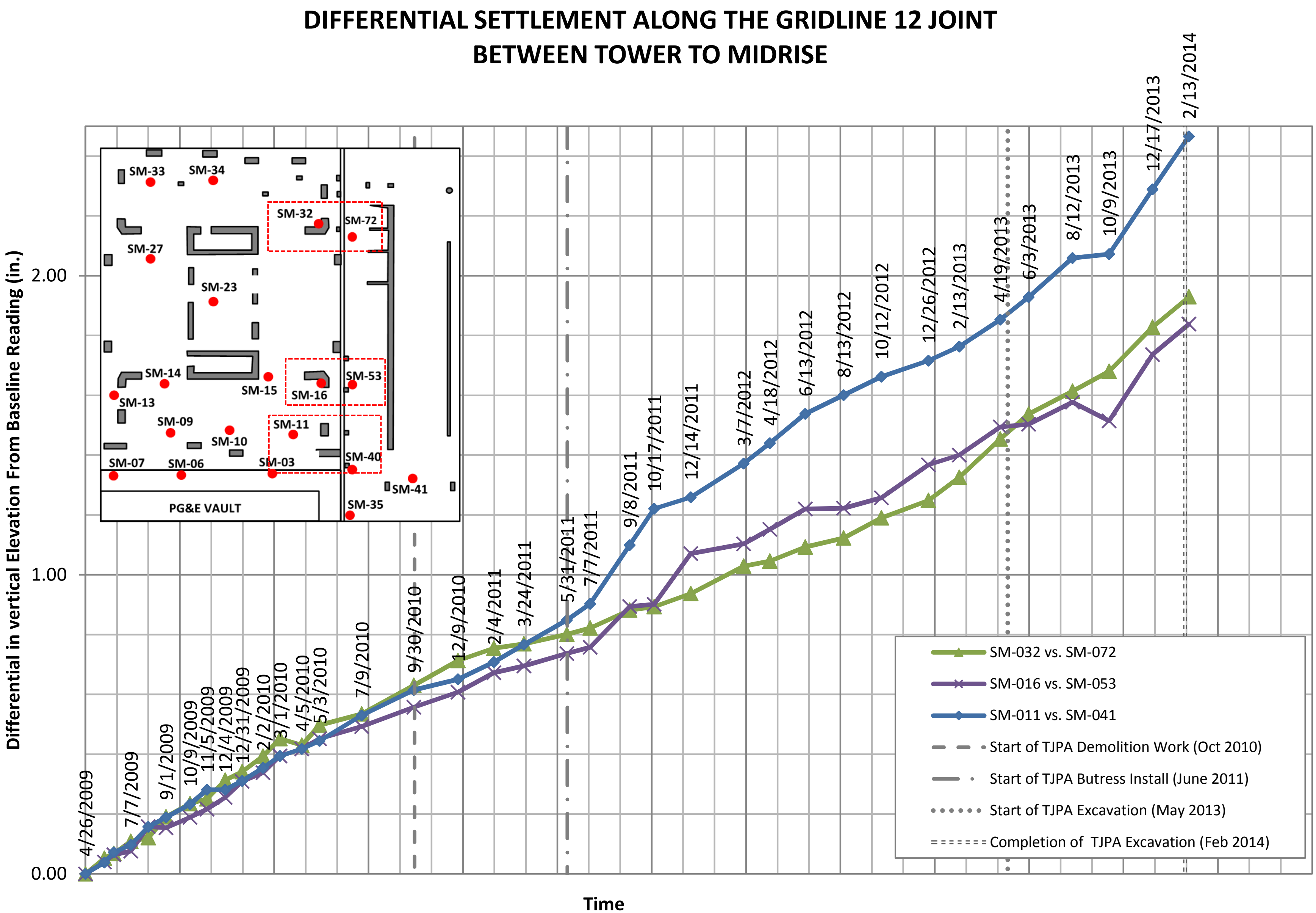
DIFFERENTIAL SETTLEMENT ALONG THE GRIDLINE 12 JOINT
BETWEEN TOWER TO MIDRISE
Differential in vertical Elevation From Baseline Reading (in.)
Time
0.00
1.00
2.00
4/26/2009
7/7/2009
9/1/2009
10/9/2009
11/5/2009
12/4/2009
12/31/2009
2/2/2010
3/1/2010
4/5/2010
5/3/2010
7/9/2010
9/30/2010
12/9/2010
2/4/2011
3/24/2011
5/31/2011
7/7/2011
9/8/2011
10/17/2011
12/14/2011
3/7/2012
4/18/2012
6/13/2012
8/13/2012
10/12/2012
12/26/2012
2/13/2013
4/19/2013
6/3/2013
8/12/2013
10/9/2013
12/17/2013
2/13/2014
SM-33
SM-34
SM-32
SM-72
SM-27
SM-23
SM-14
SM-13
SM-15
SM-16
SM-53
SM-09
SM-10
SM-11
SM-07
SM-06
SM-03
SM-40
SM-41
SM-35
PG&E VAULT
SM-032 vs. SM-072
SM-016 vs. SM-053
SM-011 vs. SM-041
Start of TJPA Demolition Work (Oct 2010)
Start of TJPA Butress Install (June 2011)
Start of TJPA Excavation (May 2013)
Completion of TJPA Excavation (Feb 2014)

Figure 7

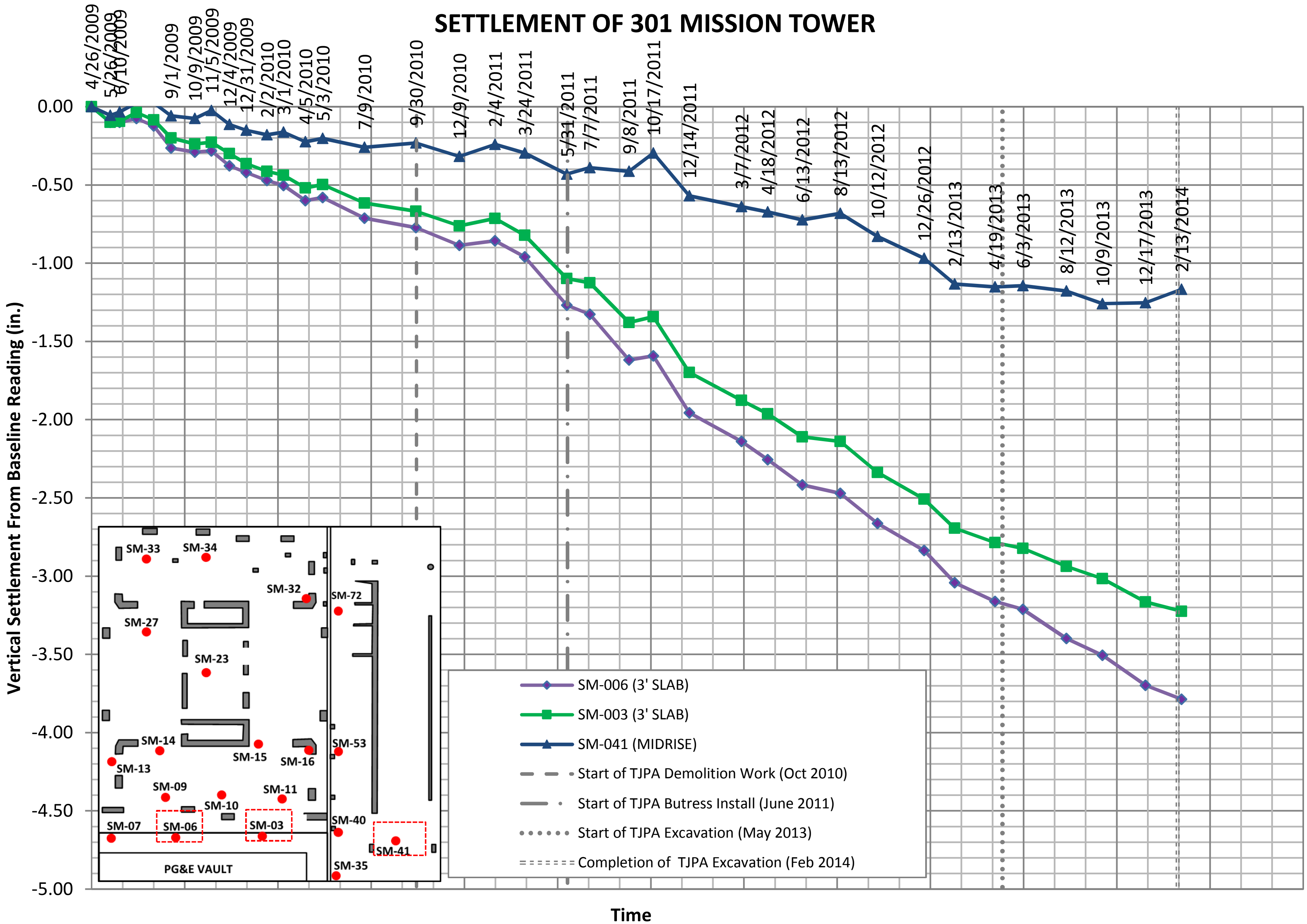
SETTLEMENT OF 301 MISSION TOWER
Vertical Settlement From Baseline Reading (in.)
Time
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
-5.00
4/26/2009
5/26/2009
6/10/2009
9/1/2009
10/9/2009
11/5/2009
12/4/2009
12/31/2009
2/2/2010
3/1/2010
4/5/2010
5/3/2010
7/9/2010
9/30/2010
12/9/2010
2/4/2011
3/24/2011
5/31/2011
7/7/2011
9/8/2011
10/17/2011
12/14/2011
3/7/2012
4/18/2012
6/13/2012
8/13/2012
10/12/2012
12/26/2012
2/13/2013
4/19/2013
6/3/2013
8/12/2013
10/9/2013
12/17/2013
2/13/2014
SM-006 (3' SLAB)
SM-003 (3' SLAB)
SM-041 (MIDRISE)
Start of TJPA Demolition Work (Oct 2010)
Start of TJPA Butress Install (June 2011)
Start of TJPA Excavation (May 2013)
Completion of TJPA Excavation (Feb 2014)
SM-33
SM-34
SM-32
SM-72
SM-27
SM-23
SM-14
SM-15
SM-16
SM-53
SM-13
SM-09
SM-10
SM-11
SM-07
SM-06
SM-03
SM-40
SM-41
SM-35
PG&E VAULT

Figure 8

March 6, 2014

DESIMONE

SETTLEMENT OF 301 MISSION TOWER
RATE OF SETTLEMENT OVER TIME

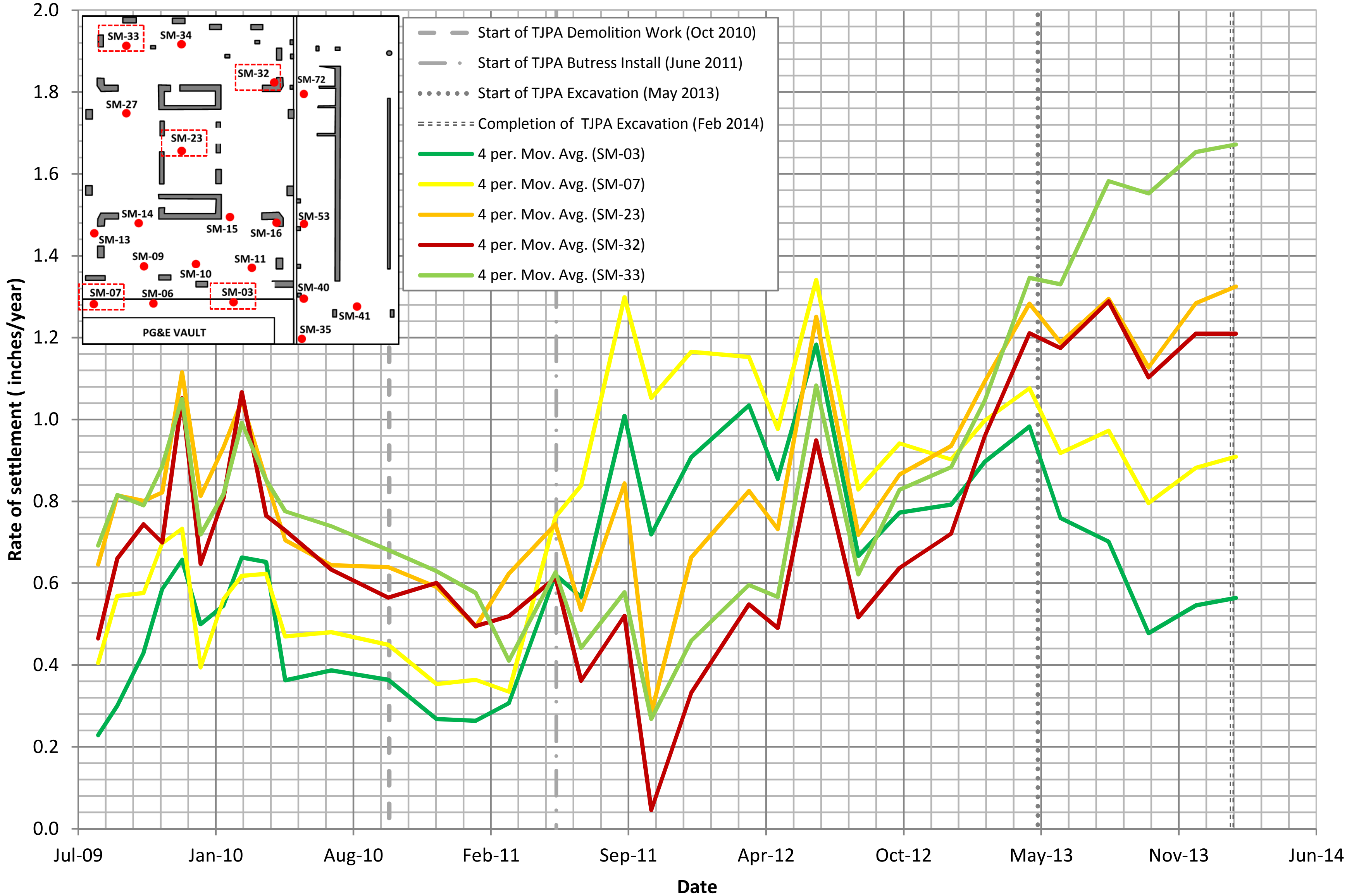

Figure 9

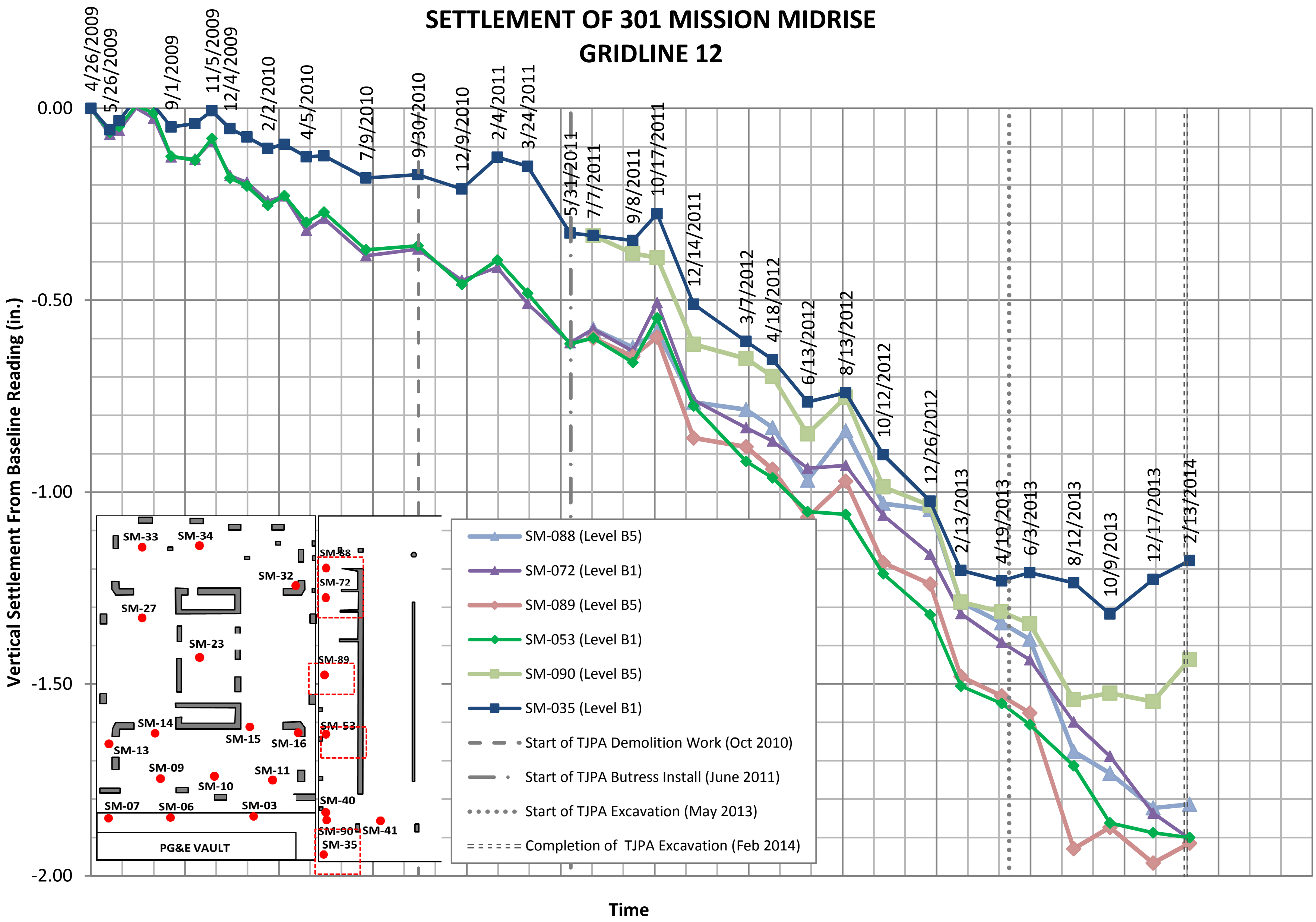
SETTLEMENT OF 301 MISSION MIDRISE
GRIDLINE 12
Vertical Settlement From Baseline Reading (in.)
0.00
-0.50
-1.00
-1.50
-2.00
Time
4/26/2009
5/26/2009
9/1/2009
11/5/2009
12/4/2009
2/2/2010
4/5/2010
7/9/2010
9/30/2010
12/9/2010
2/4/2011
3/24/2011
5/31/2011
7/7/2011
9/8/2011
10/17/2011
12/14/2011
3/7/2012
4/18/2012
6/13/2012
8/13/2012
10/12/2012
12/26/2012
2/13/2013
4/19/2013
6/3/2013
8/12/2013
10/9/2013
12/17/2013
2/13/2014
SM-088 (Level B5)
SM-072 (Level B1)
SM-089 (Level B5)
SM-053 (Level B1)
SM-090 (Level B5)
SM-035 (Level B1)
Start of TJPA Demolition Work (Oct 2010)
Start of TJPA Butress Install (June 2011)
Start of TJPA Excavation (May 2013)
Completion of TJPA Excavation (Feb 2014)
SM-33
SM-34
SM-32
SM-27
SM-23
SM-14
SM-13
SM-15
SM-16
SM-09
SM-10
SM-11
SM-07
SM-06
SM-03
PG&E VAULT
SM-88
SM-72
SM-89
SM-53
SM-40
SM-90
SM-41
SM-35

Figure 10

REVISED GEOTECHNICAL INVESTIGATION
301 MISSION STREET
San Francisco, California

Millennium Partners
San Francisco, California

13 January 2005
Project No. 3157.02

Treadwell&Rollo
Environmental and Geotechnical Consultants

13 January 2005
Project No. 3157.02

Mr. Steve Patterson
Millennium Partners
735 Market Street, 3rd Floor
San Francisco, California 94102

Subject: Revised Geotechnical Investigation
301 Mission Street
San Francisco, California

Dear Mr. Patterson:

Treadwell & Rollo, Inc. is pleased to present this geotechnical investigation report for the proposed 301 Mission Street project in San Francisco. This report presents our revised findings, conclusions and recommendations for the project site and replaces our previous geotechnical report dated 14 August 2000 and the two supplemental reports dated 2 July 2004 and 1 September 2004. Additional copies have been distributed as indicated at the end of this report. This letter omits detailed findings, conclusions and recommendations; therefore, anyone relying on the report should read it in its entirety.

Subsurface conditions at the site consist of heterogeneous fill over Marine Deposits underlain by clayey sand with interbedded layers of sandy clay, and Old Bay Clay to the maximum explored depth of about 220 feet below the existing ground surface. The proposed development will consist of a 60-story tower comprised of residential and retail space, a nine-story structure with residential and retail space, and a three-story-high atrium and lobby. The tower portion of the site will have one basement level, while the nine-story building and atrium will have five levels of underground parking. We recommend the tower structure be supported on a pile foundation system with the other portions on a mat foundation, as discussed in the following report.

The recommendations contained in this report are based on a limited subsurface exploration program. Consequently, variations between expected and actual soil conditions may be found in localized areas during construction. We should be retained to observe site excavation and shoring, compaction of backfill, and installation of pile foundations, during which time we may make any changes to our recommendations, if necessary.

We appreciate the opportunity to assist you with this project and look forward to working with you during final design.

Sincerely yours,
TREADWELL & ROLLO, INC.

Christopher A. Ridley
Civil Engineer

Ramin Golesorkhi
Geotechnical Engineer

31570206.CAR

REVISED GEOTECHNICAL INVESTIGATION
301 MISSION STREET
San Francisco, California

Millennium Partners
San Francisco, California

13 January 2005
Project No. 3157.02

Treadwell&Rollo
Environmental and Geotechnical Consultants

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GEOTECHNICAL INVESTIGATION
301 MISSION STREET
San Francisco, California

1.0 INTRODUCTION

This report presents the results of our geotechnical investigation and revised recommendations for the proposed development at 301 Mission Street in San Francisco, California. The project site occupies a portion of Assessor's Block No. 3719 and is bound by Mission Street to the north[1], the Transbay Bus Terminal to the south, Fremont Street to the west, and Beale Street to the east as shown on the Site Location Map, Figure 1. Presently, the project site is comprised of four addresses: 129 Fremont Street, 124 Beale Street, 301 and 345 Mission Street, as shown on the Site Plan, Figure 2.

Treadwell & Rollo, Inc. performed a geotechnical investigation for the proposed project as was planned in 2001 and presented our conclusions and recommendations in a report dated 14 August 2001. Subsequently, we issued two design memoranda dated 11 December 2002 and 16 October 2003 and two supplemental reports dated 2 July 2004 and 1 September 2004 which addressed changes in the planned project. The 14 August 2001 report included design parameters for a 52-story tower, an adjacent 12-story structure, and interconnecting 5-story atrium with the entire project site underlain by three levels of underground parking. The 2 July 2004 letter contained supplemental recommendations for a 60-story tower with an adjacent 9-story structure, connected by a 2-story atrium underlain by four to six basement levels. The 1 September 2004, included the results of additional geotechnical field work and refined the recommendations given in the 2 July 2004 letter for four basement levels.

This report supersedes the previous two memoranda and three reports and provides our conclusions and recommendations for the project as currently planned, which includes the 60-story tower over one basement level adjacent to a 3-story atrium connected to a 9-story

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1 Assumed project north is along Fremont Street, toward Mission Street.

structure. The atrium and the connecting 9-story structure will be constructed over five basement levels, collectively called the podium building.

2.0 PROJECT DESCRIPTION

Plans by Gary Edward Handel + Associates, the project architect, show the proposed development consists of a 60-story residential tower, a 9-story structure for retail and living space, and a 3-story-high atrium and lobby which connects the two structures and will contain amenities for the residents, such as a health club and pool. One basement level is planned below the tower and five levels of underground parking are planned under the 9-story structure and atrium. The excavation for the tower (including foundation) will extend about 25 feet below existing ground surface. The excavation for the 5 basements levels and foundation will extend about 60 feet below the ground surface. Therefore, on the basis of the available topographic information, which shows that the average surrounding grade at approximately Elevation 4 feet[2], we estimate the finished floor of the lowest level of the parking garage will be at about Elevation -52 feet, while the top of the basement slab below the tower will be about Elevation -11 feet. The footprints of the proposed buildings and the two excavations are shown on Figure 3.

3.0 SCOPE OF SERVICES

A detailed geotechnical investigation was performed; the results of which are included herein. To supplement existing subsurface information, seven borings were drilled during two separate field investigations in June of 2001 and May 2004. Soil cuttings generated during drilling were either spread on-site or stored on-site in 55-gallon drums, tested for environmental contamination and appropriately disposed of off-site.

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2 All elevations referenced in this report are based on the San Francisco City datum (SFCD). Elevations used in this report are interpolated from spot elevations provided on an ALTA Survey prepared by Martin M. Ron Associates, Inc., for a portion of Assessor's Block No. 3719, dated 11 June 2001.

Selected soil samples recovered from the borings were tested to measure moisture content, dry density, gradation, Atterberg Limits, consolidation, and shear strength. Using the results of our field exploration, laboratory testing, and engineering analysis, we developed geotechnical conclusions and recommendations regarding:

- soil and groundwater conditions at the site
- site seismicity and seismic hazards, including evaluation of liquefaction potential and associated ground deformation
- appropriate foundation type(s)
- design criteria for the recommended foundation type(s)
- estimates of foundation settlement
- site grading and excavation, including criteria for fill quality and compaction
- lateral earth pressures for design of below-grade walls
- shoring
- dewatering
- site-specific response spectrum
- 2001 San Francisco Building Code near-source and site factors
- construction considerations

4.0 FIELD INVESTIGATION

Prior to performing the field investigation, we reviewed available subsurface information from previous geotechnical investigations performed in the site vicinity, which are listed in the references section of this report.

4.1 Borings Performed for the Geotechnical Investigation

To evaluate subsurface conditions beneath the site, we performed two separate field investigations. In June of 2001, we drilled five exploratory borings (designated as B-1 through

B-5). In May of 2004, we drilled two additional borings (designated as B-6 and B-7). The approximate locations of these borings are shown on Figure 2. Because of the presence of existing buildings at the site, and underground utility and overhead obstructions on the adjacent streets, geotechnical borings were drilled within the vacant lot only (see Section 6.1). Prior to commencing drilling, we obtained a soil boring permit from the Monitoring Wells Section of the San Francisco Department of Public Health (SFDPH), and notified Underground Service Alert (USA).

The borings were drilled to depths ranging from 60.5 to 220 feet below the existing ground surface. Drilling was performed by Pitcher Drilling Company of Palo Alto, California, using truck-mounted rotary wash drilling equipment, under the direction of our field engineer.

During drilling, our engineer logged the borings and obtained representative samples of the material encountered for visual classification and laboratory testing. Logs of the borings are presented in Appendix A on Figures A-1 through A-8. The material encountered was classified according to the soil classification system described on Figure A-9.

Soil samples were obtained using the following sampler types:

- Standard Penetration Test (SPT) sampler with a 2.0-inch-outside diameter and a 1.5-inch-inside diameter, without liners
- Sprague and Henwood (S&H) split-barrel sampler with a 3.0-inch-outside diameter, 2.5-inch-inside diameter, lined with brass tubes with an inside diameter of 2.43 inches
- Osterberg (O) piston sampler using 3.0-inch outside diameter, thin-walled Shelby tubes
- Thin-walled Shelby Tubes (ST) with 3.0-inch-outside diameter

The SPT and S&H samplers were driven with a 140-pound, above-ground, safety hammer falling 30 inches. The blow counts required to drive the S&H sampler the final 12 inches of an 18-inch drive (N-values) were converted to approximate SPT N-values using a conversion factor of 0.6

and are shown on the boring logs. Where the SPT sampler was used, the actual blow counts are shown on the boring logs. The Osterberg sampler and Shelby Tubes were advanced into the soil using hydraulic pressure. The hydraulic pressure required to advance the Osterberg sampler and Shelby Tubes is shown on the boring logs.

After completion, the borings were backfilled with cement-bentonite grout under the observation of a San Francisco Department of Public Health inspector.

4.2 Borings Performed for the Environmental Investigation

On 5 July 2001, Treadwell & Rollo, Inc. performed six shallow borings at the site as part of the environmental investigation. The borings, designated as TR-1 through TR-6, were hand-augered inside existing buildings to depths ranging from 3.5 to 8 feet below existing basement or ground floor slabs at the approximate locations shown on Figure 2. The logs of the borings performed as part of our environmental investigation are presented on Figures B-1 through B-6 in Appendix B.

4.3 Borings Performed by Dames & Moore

Two borings (DM-1 and DM-3) performed by Dames & Moore for previous investigations in the vicinity of the site were also used in our evaluations. See Figure 2 for the approximate locations of these borings and Appendix E for copies of the logs.

5.0 LABORATORY TESTING

Soil samples obtained during our field investigation were re-examined to confirm field classifications, and representative samples were selected for testing. Samples were tested to measure moisture content, dry density, gradation, Atterberg Limits, unconsolidated-undrained triaxial shear strength, and consolidation characteristics. The laboratory test results are presented on the boring logs and in Appendix C on Figures C-1 through C-15.

6.0 SITE AND SUBSURFACE CONDITIONS

The surface, subsurface and groundwater conditions across the site are described in the following sections.

6.1 Surface Conditions

The project site has plan dimensions of approximately 183.5 by 275 feet, and occupies just under 50,500 square-feet of the northern portion of Assessor's Block No. 3719 in San Francisco.

Three existing buildings and a vacant lot presently occupy the site as shown on Figure 2. The existing buildings include: 1) a 6-story concrete/brick building with one basement at 301 Mission Street, which may be timber-pile supported, 2) a 6-story concrete building with one basement at 124 Beale Street, and 3) a 2-story concrete building with no basement at 129 Fremont Street.

A structure with one basement level previously existed at 345 Mission Street, which is now the vacant lot (at the corner of Mission and Fremont Streets). The structure was demolished and the vacant lot was created by filling the basement with rubble and building demolition debris. The old basement slab and foundations are still present beneath the site. The type of foundation system the building was supported on is unknown, as foundation plans for the previous building are not available at this time. However, on the basis of our field investigation, it appears the structure was supported on shallow concrete foundations below the basement slab.

The site is relatively level with sidewalk/ground surface ranging from approximately Elevation 1.5 to 4 feet across the site.

6.2 Subsurface Conditions

The site is bayward of the historic 1852 San Francisco high tide line; therefore, it is within the Article 22A (Maher Ordinance) zone of San Francisco. Construction projects located within the

Maher zone that will disturb more than 50 cubic yards of soil are required, by the ordinance, to have their site history and soil quality assessed. Studies required by Article 22A were performed as part of our environmental studies and are presented in a separate report.

On the basis of our interpretation of conditions encountered in the borings, two idealized subsurface profiles have been prepared and are presented on Figures 4 and 5. The locations of the profiles are shown on Figure 2.

The borings indicate the site is blanketed by up to 23 feet of fill. The fill generally consists of very loose to loose sandy gravel and gravelly sand with large amounts of rubble, which includes concrete, wood and brick debris. An old basement slab, about five to twelve inches of concrete, was encountered approximately 11 feet below the ground surface in each of our test borings. In borings B-3 and B-5, about three feet of concrete was encountered below the old basement slab, to depths of almost 17 and 15 feet below ground surface, respectively. In borings B-6 about six feet of concrete was encountered below the old basement slab, to depths of about 17 feet below ground surface. This concrete is likely the remnants of the foundation system for the structure that previously existed at the 345 Mission Street lot.

The fill is underlain by relatively compressible Marine Deposits extending to depths ranging from 41 to 45 feet below the site grade, corresponding to Elevations ranging from -37.5 to -41.5 feet. On the basis of the subsurface data, it appears the Marine Deposits could extend down to about Elevation -45 feet along the Mission Street boundary of the site. The Marine Deposits consist primarily of very soft to medium stiff clay, clay with sand and sandy clay interbedded with very loose to medium dense sand and clayey sand. Consolidation tests performed on representative samples of the clay indicate it is overconsolidated[3].

---

[3] Overconsolidated soil has experienced greater loads than the present weight of soil overburden.

Below the Marine Deposits, dense to very dense sand with varying amounts of clay and silt was encountered. The sand extended to depths ranging from 80 to 101 feet below the site grade, corresponding to Elevations ranging from -76.5 to -98 feet. Some interbedded layers of medium dense sand, also with varying amounts of clay and silt and approximately seven to twelve feet in thickness, were encountered in borings B-1, B-2, B-3 and B-4 within the dense to very dense sand layer. A five- to eleven-foot-thick layer of medium stiff to stiff sandy clay was also encountered within the dense to very dense sand layer in borings B-3, B-5, B-6, and B-7 at depths of about 60 to 70 feet. Laboratory tests on this material from other projects in the vicinity indicate it is normally consolidated[4].

The sandy soil is underlain by stiff to hard clay, sandy clay and clay with sand, locally known as Old Bay Clay, that ranges from 103.5 to 112 feet thick. The Old Bay Clay extends to a depth of about 200 feet below the site grade, corresponding to Elevation -196 feet. Consolidation tests performed indicate the soil is overconsolidated. The Old Bay Clay is underlain by very stiff to hard clay and sandy clay and very dense sand and silty sand to the maximum explored depth (approximately 220 feet).

6.3 Groundwater

The groundwater level in our geotechnical borings was generally obscured by the drilling fluid, and because of requirements to backfill the borings immediately after drilling, groundwater levels could not be allowed to stabilize. At borings B-1 and B-3, unstabilized groundwater levels were noted during drilling at depths of 13 and 10 feet below ground surface (corresponding to Elevations -9.5 and -6.5 feet), respectively.

The environmental borings (TR-1 through TR-6) were hand-augered, which allowed for groundwater level measurements. Groundwater was measured in the environmental borings at

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4 Normally consolidated soil has not experienced greater loads than the present weight of soil overburden.

Elevations ranging from -9 to -11.5 feet. The approximate elevations where groundwater was encountered is noted next to the environmental boring locations shown on Figure 2.

On the basis of the available information at nearby sites, including the 199 Fremont Street site, we estimate the groundwater level at the project site is about 10 to 12 feet below the existing ground surface. We anticipate the groundwater level will vary seasonally a few feet depending on rainfall amounts and time of year. On the basis of the available groundwater information at the site vicinity we judge the high groundwater level within the project site is near Elevation -3 feet.

7.0 SEISMIC CONSIDERATIONS

Because the project site is in a seismically active region, we evaluated the potential for earthquake-induced geologic hazards including ground shaking, ground rupture, liquefaction and differential compaction. Our evaluation of seismic considerations for the project site is presented in the following sections.

7.1 Regional Seismicity

The major active faults in the area are the San Andreas, San Gregorio, Hayward, and Calaveras Faults. These and other faults of the region are shown on Figure 6. For each of the active faults, the distance from the site and estimated maximum or mean characteristic Moment magnitude[5] [Working Group on California Earthquake Probabilities (WGCEP) (2003) and Cao et al. (2003)] are summarized in Table 1.

[5] Moment magnitude is an energy-based scale and provides a physically meaningful measure of the size of a faulting event. Moment magnitude is directly related to average slip and fault rupture area.

TABLE 1
Regional Faults and Seismicity

Fault Segment	Approximate Distance from Site (km)	Direction from Site	Mean Characteristic/ Maximum Magnitude
San Andreas – 1906 Rupture	13.4	West	7.90
San Andreas – Peninsula	13.4	West	7.15
North Hayward	16	East	6.49
Hayward-Rodgers Creek	16	East	7.26
South Hayward	17	East	6.67
San Gregorio	19	West	7.44
Mt Diablo	33	East	6.65
Rodgers Creek	33	North	6.98
Calaveras	34	East	6.93
Concord/Green Valley	37	East	6.71
Monte Vista-Shannon	41	Southeast	6.80
Point Reyes	42	West	6.80
West Napa	44	Northeast	6.50
Greenville	51	East	6.94
Hayward – South East Extension	57	Southeast	6.40
Great Valley 6	61	East	6.70
Great Valley 5	65	East	6.50
Great Valley 4	72	Northeast	6.60
San Andreas – Santa Cruz Mnts.	77	Southeast	7.03
Sargent	83	Southeast	6.80
Monterey Bay-Tularcitos	100	Southeast	7.10

Figure 6 also shows the earthquake epicenters for events with magnitude greater than 5.0 from January 1800 through January 1996. Since 1800, four major earthquakes have been recorded on the San Andreas Fault. In 1836 an earthquake with an estimated maximum intensity of VII on the Modified Mercalli (MM) scale (Figure 7) occurred east of Monterey Bay on the San Andreas Fault (Toppozada and Borchardt 1998). The estimated Moment magnitude, M_w, for this earthquake is about 6.25. In 1838, an earthquake occurred with an estimated intensity of about VIII-IX (MM), corresponding to a M_w of about 7.5. The San Francisco Earthquake of 1906 caused the most significant damage in the history of the Bay Area in terms of loss of lives and property damage. This earthquake created a surface rupture along the San Andreas Fault from Shelter Cove to San Juan Bautista approximately 470 kilometers in length. It had a maximum intensity of XI (MM), a M_w of about 7.9, and was felt 560 kilometers away in Oregon, Nevada, and Los Angeles. The most recent earthquake to affect the Bay Area was the Loma Prieta Earthquake of 17 October 1989, in the Santa Cruz Mountains with a M_w of 6.9, approximately 95 km from the site.

In 1868 an earthquake with an estimated maximum intensity of X on the MM scale occurred on the southern segment (between San Leandro and Fremont) of the Hayward Fault. The estimated M_w for the earthquake is 7.0. In 1861, an earthquake of unknown magnitude (probably a M_w of about 6.5) was reported on the Calaveras Fault. The most recent significant earthquake on this fault was the 1984 Morgan Hill earthquake ($M_w = 6.2$).

In 2003 the Working Group on California Earthquake Probabilities (WGCEP 2003) at the U.S. Geologic Survey (USGS) predicted a 70 percent probability of a magnitude 6.7 or greater earthquake occurring in the San Francisco Bay Area by the year 2031. More specific estimates of the probabilities for different faults in the Bay Area are presented in Table 2.

TABLE 2
WGCEP (2003) Estimates of 30-Year Probability (2002 to 2031) of a Magnitude 6.7 or Greater Earthquake

Fault	Probability (percent)
Hayward-Rodgers Creek	32
San Andreas	21
Calaveras	18
San Gregorio	10
Concord-Green Valley	6
Greenville	6
Mount Diablo	4

7.2 Geologic Hazards

During a major earthquake on a segment of one of the nearby faults, strong to very strong shaking is expected to occur at the project site. Strong shaking during an earthquake can result in ground failure such as that associated with soil liquefaction[6], differential compaction[7] and ground rupture. We used the results of the test borings to evaluate the potential of liquefaction and differential compaction at the project site.

7.2.1 Liquefaction and Differential Compaction

The site is in an area of San Francisco that is designated as a seismic hazard area by the California Division of Mines and Geology (CDMG 2000). The primary purpose of this designation is to identify areas of potential soil liquefaction. Typically the soil layers of concern for liquefaction are uncontrolled sandy fill and loose to medium dense native sand.

We evaluated the potential of liquefaction and differential compaction at the proposed project site. Below the podium structure footprint (atrium/9-story building), the site will be excavated to a depth of about 60 feet to accommodate the basement levels. Therefore, the loose to medium dense sand encountered in our investigation will be removed within the podium footprint. Therefore, seismically-induced settlement will be negligible below the podium foundation level.

However, layers of saturated, loose to medium dense sand exist below the proposed tower basement excavation, within the Marine Deposits and below. The results of our analyses indicate these layers are susceptible to liquefaction during a moderate to large earthquake on one of the nearby faults. We estimate liquefaction-induced settlement on the order of 1 inch may

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6 Liquefaction is a phenomenon in which saturated, cohesionless soil experiences a temporary loss of strength due to the buildup of excess pore water pressure, especially during cyclic loading such as that induced by earthquakes. Soil most susceptible to liquefaction is loose, clean, saturated, uniformly graded, fine-grained sand and silt of low plasticity that is relatively free of clay.

7 Differential compaction is a phenomenon in which non-saturated, cohesionless soil is compacted by earthquake vibrations, causing differential settlement.

occur beneath the shallower tower basement. However, this settlement will not effect the tower since it will be supported on a pile foundation that extends through these layers.

Outside of the excavation, we judge that significant subsidence of streets and sidewalks could occur during an earthquake. This settlement is expected to be random and erratic, and will most likely disrupt utilities and damage sidewalks and streets.

7.2.2 Ground Rupture

Historically, ground surface ruptures closely follow the trace of geologically young faults. The site is not within an Earthquake Fault Zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Act and no known active or potentially active faults exist on the site. We therefore conclude the risk of fault offset at the site from a known active fault is low. In a seismically active area, the remote possibility exists for future faulting in areas where no faults previously existed; however, we conclude the risk of surface faulting and consequent secondary ground failure is very low.

8.0 DISCUSSION AND CONCLUSIONS

We conclude that, from a geotechnical engineering standpoint, the site can be developed as proposed provided the recommendations presented in this report are incorporated into the project plans and specifications and implemented during construction. The primary geotechnical concerns are:

- the magnitude of seismically-induced ground settlement resulting from liquefaction
- the presence of compressible Marine and Old Bay Clay Deposits below the tower footprint
- the depth of excavation for the basement levels (tower and podium excavations)
- the presence of Marine Deposits at the proposed base of the tower excavation
- the presence of groundwater at a level higher than the proposed excavation depths
- issues resulting from the difference in depth between the tower and podium excavations

These geotechnical concerns and their impact on the proposed grading, foundation design, and construction are discussed in the following sections. Discussion of environmental issues associated with excavation of the onsite fill is presented in our environmental report.

8.1 Foundations

8.1.1 Tower

We considered deep (piles) and shallow (mat) foundations for the support of the proposed tower structure. The sandy fill encountered in the upper 12 to 23 feet of the borings will be removed in its entirety during excavation for the proposed basement. However, Marine Deposits will be exposed at the base of the planned excavation and are unsuitable for support of a mat foundation. In addition, medium dense sandy layers encountered are expected to liquefy in the event of a major earthquake, as discussed in Section 7.2.1. Therefore, we judge a mat foundation would not be appropriate for the proposed 60-story tower.

On the basis of the results of our analyses and evaluation, we conclude the proposed structure should be supported on piles. Piles would derive their capacity from a combination of skin friction in the medium dense to very dense sand and medium stiff to stiff clay, and end bearing in the dense to very dense sand. From our experience with similar projects, we conclude precast, prestressed concrete piles or an auger displacement pile system (details are described in Section 9.2) are the most appropriate pile types for the project. We understand on the order of about 1,000 piles will be required to support the tower. Although piles will transfer building loads to less compressible strata, some settlement of the pile foundations will still occur. The settlement of the large group of piles will be due to the consolidation settlement of the underlying overconsolidated Old Bay Clay. We estimate settlements on the order of four to six inches could occur under the tower.

8.1.2 Podium Structure (Atrium/9-Story Building)

The podium structure will include a five level of underground portion which will require an excavation on the order of about 60 feet deep. The excavation will remove the fill and the marine deposits in their entirety. The subgrade will mostly consist of the dense to very dense sand with possible zones of sandy clay. On the basis of the subsurface conditions we recommend the podium structure be supported on a reinforced mat provided the calculated settlements are acceptable. The estimated settlements range from about 1 to 3 inches. The estimated settlement under the 9-story building is about 1 to 1.5 inches. These settlements were calculated using the foundation pressures provided by DeSimone Consulting Engineers (DCE) dated 17 June 2004. The largest settlements would occur near the boundary of the podium and adjacent tower. These are due to the effect of the tower loads and their shadowing effect on the adjacent structure.

8.2 Construction Considerations

The main construction considerations are shoring requirements and dewatering for the basement excavations. Additional concerns are the need for predrilling to facilitate pile installation, the presence of concrete rubble and debris in the near-surface fill, and the Marine Deposits that will be exposed at the bottom of the basement excavation. These issues are discussed in the following sections.

8.2.1 Shoring

8.2.1.1 Tower

We understand the finished floor for the tower basement will be about 15 feet below existing ground surface. Currently, a 10-foot thick pile supported mat is being considered for the tower. This will require an excavation of about 25 feet. Because there is insufficient space to slope the sides of the excavation, shoring will be required. Several methods of shoring are available, and the system selected should take into account the requirements for protecting adjacent property as well as cost. We have qualitatively evaluated the following systems:

- soil nailing
- sheet piles
- conventional soldier pile and lagging
- soldier pile tremie concrete (SPTC) or mixed-in-place soil/cement walls

Soil nailing is a method of shoring using grouted reinforcing bars (nails), which are typically spaced, horizontally and vertically, between 4 and 6 feet. Considering the excavation will be performed primarily in sandy soil and there is a high groundwater level at the site, we do not recommend soil nailing for this project.

Sheet piles with internal bracing may be appropriate but it would likely be difficult to drive the sheet piles through the fill due to the presence of concrete and brick debris.

We conclude soldier pile and lagging is a feasible shoring system. However, it would require extensive dewatering which may be cost-prohibitive. Additionally, it would be difficult to install lagging in areas where perched water is encountered. Perched water can transport soil through the lagging resulting in the creation of voids behind the lagging.

Soldier pile tremie concrete (SPTC) or mixed-in-place soil/cement walls would likely be the most watertight shoring systems and thus require the least dewatering. In addition, SPTC or mixed-in-place soil/cement walls would be relatively rigid and could significantly limit lateral deflections and ground subsidence related to the excavation. The disadvantages of these systems are cost and space requirements. Installation for these systems will require a width of about three feet around the perimeter of the site.

Lateral resistance against movement may be mobilized by extending the shoring below the bottom of the excavation and using internal braces or tiebacks. Tiebacks will have relatively low capacities in the fill and Marine Deposits that extend to approximately Elevation -41 feet. Because the depth of excavation (25 feet) is relatively shallow, tiebacks with low capacities may still be feasible. However, the use of tiebacks as lateral support for the tower excavation will be limited to the Mission and Fremont Streets sides because an excavation is planned for the podium along the east side and the Caltrans Transbay Terminal facility is on the south side. Our experience leads us to believe that Caltrans will not allow installation of tiebacks below the pile supported Transbay Terminal facility. Therefore internal bracing should be anticipated along the east and south sides and can be either cross-lot or inclined rakers.

We conclude that the SPTC and soil/cement walls are the best options to shore the tower excavation. The selection, design, construction, and performance of the shoring system should be the responsibility of the contractor. However, the shoring should be designed by a structural engineer knowledgeable in this type of construction, and we should review the design to confirm it incorporates our concerns regarding the shoring.

8.2.1.2 Podium Structure

We understand the finished floor for the five-level basement will be about 52 feet below existing ground surface. Currently, an 8-foot thick concrete mat is planned to support the podium structure. This will require an excavation of about 60 feet to accommodate basements and mat. Because there is insufficient space to slope the sides of the deep excavations, shoring will be required.

We understand mixed-in-place soil/cement walls are being considered by the design team for shoring. This would likely be the most watertight shoring systems and thus require the least dewatering. In addition, mixed-in-place soil/cement walls would be relatively rigid and could significantly limit lateral deflections and ground subsidence related to the excavation. Considering the adjacent facilities, subsurface conditions, and the depth of excavation, we concur that this is the most appropriate shoring system. It should be noted, however, that installation of this system will require a width of about three feet around the perimeter of the site.

Lateral resistance against movement may be mobilized by extending the shoring below the bottom of the excavation and using internal braces. As discussed in the previous section, tiebacks will have low capacities in the fill and Marine Deposits that extend to approximately Elevation -40 feet and therefore impractical. Internal bracing can be either cross-lot or inclined rakers.

The selection, design, construction, and performance of the shoring system should be the responsibility of the contractor. However, the shoring should be designed by a structural engineer knowledgeable in this type of construction.

8.2.2 Dewatering

Current plans for the tower and the podium will result in excavations which will be below the design ground water level. The design ground water level should be taken as Elevation -3 feet. Assuming an approximate ground surface elevation of about +4 feet, the tower excavation will extend to about Elevation -21 feet (about 18 feet below design groundwater), while the excavation for the podium will extend to about Elevation -56 feet (about 53 feet below design groundwater). The groundwater level at the site should be lowered to a depth of at least three feet below the bottom of the planned maximum excavations and maintained at this level until sufficient weight and/or uplift capacity is available to resist the hydrostatic uplift forces on the bottom of the structure. The project structural engineer should evaluate when the dewatering can be stopped.

The efficiency of the dewatering system will depend to some extent on the type of shoring system used. For example, a soil/cement mix wall would likely be relatively more water-tight than a soldier pile lagging wall and thus require less dewatering. The depth of the shoring will also affect the quantity of water required to be extracted to effectively dewater the site. Relatively impervious shoring extending into the Old Bay Clay would reduce dewatering.

The selection and design of the dewatering system should be the responsibility of the contractor. The contractor will need to obtain a dewatering permit from the City and County of San Francisco for discharging water into the local municipal storm drain system. The dewatering permit requires chemical testing for characterizing the water to be discharged into the storm drain system. The results of the chemical tests performed for the environmental investigation indicate treatment will likely not be required to remove petroleum hydrocarbons prior to discharging pumped groundwater from the site to the sanitary sewer system. Prior to discharging pumped groundwater into the sanitary sewer, the City will require additional groundwater analytical testing for total oil and grease (TOG), total suspended solids (TSS) and chemical oxygen demand (COD). Currently, there is a fee for disposing of construction generated water into the City's wastewater collection system. Selection of the shoring and dewatering systems should be coordinated to minimize overall costs.

Variables which significantly influence the performance of the dewatering system and the quantity of water produced include the number, depth, and positioning of the wells, the interval over which each well is screened, and the rate at which each well is pumped. Different combinations of these variables can be used to dewater the site. The site dewatering should be designed and implemented by an experienced dewatering contractor. However, we should check the dewatering system proposed by the contractor prior to installation.

Excessive site dewatering could result in subsidence of the immediate area due to increases in effective stress in the soil. Therefore, adjacent improvements should be monitored for vertical movement, and groundwater levels outside the excavation monitored through wells while dewatering is in progress. Should excessive settlement or groundwater drawdown be measured, the contractor should be prepared to recharge the groundwater outside the excavation through recharge wells.

8.2.3 Excavation Monitoring

During excavation, the shoring system is expected to yield and deform, which could cause surrounding improvements to settle and move laterally. The magnitude of shoring movements and resulting ground deformations are difficult to estimate because they depend on many factors, including the type of shoring system used and the contractor's skill in the shoring installation. We believe ground movements of a properly designed and constructed soil/cement wall shoring system should be within about one to one and a half inches. A monitoring program should be established to evaluate the effects of the construction on the adjacent improvements. The contractor should install surveying points to monitor the movement of shoring and settlement of adjacent structures during excavation. This monitoring system should provide timely data which can be used to modify the shoring system during construction if needed. In addition, geotechnical instrumentation including inclinometers and piezometers should be installed to monitor movement of the shoring system and the groundwater level during excavation and construction.

8.2.4 Pile Driving

The on-site fill includes rubble, and old slabs and foundations that may damage the piles during driving if piles are driven from the existing ground surface. In this event, pile locations should be predrilled and cased through the fill and other obstructions prior to driving the piles. Predilling will help maintain pile alignment, and reduce pile damage and heave of adjacent improvements.

In addition, predrilling may be required to ensure that the piles gain sufficient embedment into the bearing layer and are also below the bottom of the adjacent podium excavation. In addition, predrilling will decrease the amount of subgrade heave caused by the displacement of the soil during pile driving. Detailed predrilling requirements will be determined from an indicator pile program. For cost estimating purposes (drilling and disposal), assume 35 feet of predrilling will be required, measured from the bottom of the mat.

8.2.5 Unstable Subgrade

Saturated, soft to medium stiff clay and loose to medium dense sand may be encountered at the subgrade level of the tower and podium excavations, respectively. This soil may become unstable under the weight of the construction equipment. To provide a suitable working surface in these areas, it may be necessary to stabilize the subgrade by removing 18 to 24 inches of the soft subgrade and replacing it with a geotextile fabric and gravel fill to provide a working surface.

9.0 RECOMMENDATIONS

Our recommendations regarding site preparation and grading, pile design, mat design, lateral earth pressures for basement walls, seismic design and shoring design are presented in this section of the report.

9.1 Site Preparation and Grading

We anticipate excavation for this project can be made using conventional earth moving equipment. Old slabs and foundations (including timber piles), and other obstructions may be encountered during shoring installation and excavation within the sandy fill and Marine deposits.

Onsite sandy fill is suitable for reuse as backfill provided it is acceptable from an environmental standpoint, and meets the requirements given below for general fill. Soil below the groundwater will require drying by aeration prior to its reuse as compacted fill. All materials to be used as fill, including onsite soil, should be free of organic material, contain no rocks or lumps larger than three inches in greatest dimension, and have a low expansion potential (defined by a liquid limit of less than 40 and a plasticity index lower than 12). Fill should be placed in lifts not exceeding eight inches in loose thickness and compacted to at least 95 percent relative compaction[8]. During construction, we should check that the on-site and any proposed import material is suitable for use as fill.

In areas where wet, compressible Marine Deposits are encountered at the subgrade level, pumping or yielding may occur under the weight of construction equipment. To provide a suitable working surface, it may be necessary to stabilize the subgrade before construction can proceed. An acceptable method to stabilize the subgrade is to excavate the weak soil and place a geotextile (Mirafi 500X or equivalent); then import granular material such as baserock to provide a working surface. We estimate that about 18 to 24 inches of gravel or crushed rock will be sufficient.

9.2 Pile Foundations

We recommend either driven pile or auger displacement pile foundations be used to support the proposed 60-story tower. The piles will derive their support from skin friction in the medium dense to very dense sand and medium stiff to stiff clay, and end bearing in the dense to very dense sand. Compression, uplift, and lateral pile capacities for the recommended piles are presented in the following subsections.

9.2.1 Driven Piles

9.2.1.1 Axial Pile Capacity

We recommend 14-inch-square prestressed precast concrete piles driven to acceptable end bearing in the very dense sand be used. Piles driven at least 5 to 10 feet into the dense sand and to acceptable driving resistance (established during indicator pile driving) may be designed using an allowable compressive capacity of 260 kips for 14-inch-square, prestressed, precast concrete piles (dead plus live load conditions). This capacity may be increased by one-third for total load

[8] Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, as determined by the ASTM D1557-00 laboratory compaction procedure.

conditions. The recommended pile capacity relates only to pile support. The structural designer should check the structural capacity.

Because of the variability in the density of sand layer across the site, refined pile lengths cannot be determined prior to driving. For estimating purposes, we recommend the top of bearing contours presented on Figure 8, plus 10 feet, be used to determine pile lengths. Prior to the start of production pile driving, we recommend an indicator pile program be performed to verify the elevation of the top of the bearing layer.

For the proposed finished basement slab elevation and assuming a ten-foot-thick pile supported mat, (pile cutoff at Elevation -21 feet), we estimate lengths for end bearing piles will range from approximately 47 to 65 feet. A better estimate of pile lengths should be determined from an indicator pile program as discussed in Section 9.2.3. Piles should be spaced no closer than three pile widths center to center to avoid reductions to the axial capacities due to group effects.

Based on the available subsurface information and our experience, we expect some piles may not meet refusal. Refusal criteria will be developed following the results of the indicator pile program. Such piles may be assigned a reduced allowable capacity on the basis of the driving resistance criteria and final embedment depth. Additional or longer piles may need to be driven to meet the loading requirements as determined by the structural engineer. It may be possible to identify areas where friction piles would be required through the indicator pile driving program (discussed in Section 9.2.3).

Piles will develop resistance to temporary uplift loads through skin friction in the Marine Deposits, and medium dense to very dense sand. Pile uplift capacities may be obtained from the curve presented on Figure 9.

9.2.1.2 Lateral Pile Capacity

The lateral capacity of piles will depend on the amount of deflection and bending moment that can be tolerated. Lateral loads and corresponding moments have been calculated for both free-head and fixed-head conditions, with a top deflection of 1/2 inch. The resulting bending moment profiles for single piles are presented on Figure 10. The pile was analyzed under a compressive load of 260 kips and a minimum pile tip elevation of -76 feet. Figure 10 was developed for 45-foot long piles, with a cutoff Elevation at -21 feet. The geotechnical parameters used in the lateral pile capacity analyses do not include a factor of safety.

For pile groups where the center-to-center spacing is less than eight pile widths in the direction of loading, the single pile lateral capacities should be reduced. Reduction factors, corresponding to the pile width center to center spacing, are given in Table 3.

TABLE 3
Pile Group Reduction Factors for Varying Pile Center to Center Spacing

Pile Center to Center Spacing	Reduction Factor
3	0.35
4	0.55
5	0.68
6	0.80

However, the moment profile for a single pile with an unfactored load should be used to check the design of individual piles in a group. We can provide lateral load analyses for different spacing configurations when the arrangement, number, and spacing of piles have been established.

9.2.2 Auger Displacement Piles

9.2.2.1 Axial Pile Capacity

As an alternative, auger displacement piles can be used for foundation support. This piling system minimizes concerns with pile-driving induced vibrations and noise. One type of auger displacement pile consists of a 12.75-inch diameter closed-end steel pipe pile that has a wall thickness of 3/8 inch. The bottom two feet of the pile is tapered and has drill teeth that extend to a width slightly wider than the outside diameter of the pile shaft. The hollow pipe is screwed to a pre-determined depth or until refusal is met. Once installed, the hollow pipe is filled with structural concrete. From our experience, this type of piling system is more cost-effective than the typical drilled pier option. If these piles are installed to refusal (mostly likely in the underlying very dense sand), the piles can be designed for an allowable dead plus live load of 300 kips (Factor of Safety = 2.0). This capacity may be increased by 1/3 for total loads, including wind or seismic forces. Temporary uplift capacities (tension) may be taken as frictional to a maximum of 50% of the compression load; this does not include the weight of the piles, which may be added at the discretion of the structural engineer. The structural capacity of the pile may govern the design, and it should be checked by the project structural engineer. Piles should be spaced no closer than three pile diameters center to center to avoid reductions to the axial capacities due to group effects. In addition, an indicator pile program and pile load tests should be performed to verify the lengths and the capacities stated above.

Our field engineer should be on-site during pile installation to observe the soil encountered and to verify the piles are founded in suitable material.

9.2.2.1 Lateral Load Resistance

The piles should develop lateral resistance due to the passive pressure acting on the upper portion of the piles and their structural rigidity. The allowable lateral capacity of the piles depends on 1) the stiffness of the pile, 2) the strength of the surrounding soil, 3) axial load on the pile, 4) the allowable deflection at the top of the pile, 5) fixity at the top of the pile (fixed or free head), 6) the allowable bending moment capacity of the pile and 7) the pile spacing of the surrounding piles. If this pile type is selected for this project, we can provide load versus deflection and bending moment profiles and present our results in a subsequent memorandum.

9.2.3 Indicator Pile Program

Before production concrete piles are cast or steel piles are ordered, we recommend at least 25 indicator piles be installed to observe the driving characteristics of the piles and the performance of the equipment used. Indicator piles should be installed at production pile locations selected by us and approved by the structural engineer. The indicator piles will provide blow count data or drilling data to correlate with information obtained from the test borings, to aid in evaluating predrilling requirements (for driven piles) and to be used as the basis for establishing final production pile lengths. We can provide indicator pile lengths once the indicator pile locations are selected.

We recommend indicator piles be at least 10 feet longer than the lengths of the anticipated production piles. Pile reinforcement (precast piles) for lateral loads should be extended an additional 10 feet to allow pile cutoff of 20 feet, if required.

In the event that the indicator piles are installed from current grade (surrounding street grade), the pile locations should be predrilled and cased through the rubble fill. In addition, the contractor should assume predrilling to the top of the bearing layer. Predrilling should be at least 90 percent of the pile diagonal width and not exceed the diagonal width. The effectiveness of this predrilling criteria will be evaluated as part of the indicator program. Indicator piles should be installed with the same equipment that will be used to drive production piles so that appropriate practical refusal blow count criteria can be established.

For driven piles, we recommend performing a Wave Equation Analysis of Pile (WEAP) for the proposed concrete pile-hammer combination prior to the indicator pile installation. We will use the WEAP results to evaluate the potential pile driving situation including the use of a follower, as appropriate. We also recommend attaching pile driving analyzer (PDA) transducers to four concrete indicator piles selected by us before driving the indicator piles. The pile integrity and dynamic capacity of these piles should be monitored with the PDA during initial driving and retap. A Case Pile Wave Analysis Program (CAPWAP) should be performed on the PDA results based on one representative blow on each of the four selected indicator piles.

For the auger displacement piles, two of the indicator piles should be tested for static load capacity in both tension and compression. The tests should be performed to twice the design loads in both the tension and compression load tests. The load tests should be in accordance with ASTM D1143 and ASTM D3689 for compression as tension testing, respectively.

9.2.4 Pile Installation

Determination of driving equipment for this project should take into account the "matching" of the pile hammer with the pile size and length. Special consideration should be given in selecting a hammer that can deliver enough energy to the tip of the piles to drive them efficiently without damaging them. We recommend the piles be driven with a hammer delivering at least 75,000 foot-pounds of energy per blow.

If the piles are driven from the existing ground surface, we recommend predrilling and casing through the existing fill at the pile locations to reduce pile damage and breakage and help maintain pile alignment. The pile location should be drilled or excavated with a diameter larger than the diameter of the follower for a depth extending from the pile-driving grade to the pile cutoff elevation. Any rubble encountered during excavation of pile caps and grade beams should be removed. Furthermore, because of the large number of piles planned for the project, ground and pile heave will be an issue. To reduce this effect, we recommend predrilling should extend to at least the top of the bearing layer. Production predrilling requirements will be developed following the indicator program.

9.2.5 Vibration Monitoring

If driven piles are used, the existing improvements adjacent to the site, specifically the Transbay Terminal, should be monitored for pile driving-induced vibrations during pile installation. Survey points should be established at various locations on buildings within 50 feet of the site. To check for movements, these points should be monitored daily during indicator pile driving and weekly during production pile installation. To evaluate the effects of vibrations during driving, ground vibration monitoring should be performed on adjacent buildings during indicator pile driving and if warranted, during production pile driving. If excessive vibrations are recorded, pile driving operations should be halted and different methods of installation should be considered. Peak particle velocity at the ground surface in front of the adjacent structures should not exceed 0.1 inch per second.

9.3 Mat Foundation

We recommend that the podium structure be founded on a mat. The structural engineer has indicated that the bearing pressures will range from 2,000 to 6,000 pounds per square foot (psf). In localized areas (less than 10% of the mat area), bearing pressures are as high as 8,000 psf. However, the hydrostatic uplift pressure caused by the groundwater table will exceed the weight of the structure; therefore the structure will have to be held down with tiedown anchors.

For the analysis of the mat, we calculated moduli of vertical subgrade reactions ranging from about 20 to 100 kips per cubic foot (kcf) over the footprint of the building. Specific estimates of predicted settlement and associated subgrade moduli have been provided to DCE Engineers through an iterative process to develop the mat design.

Lateral forces can be resisted by a combination of passive resistance against the vertical face of the mat and basement walls, and friction along the base of the mat. Friction along the bottom of the foundation should be reduced because of the waterproofing at the base of the mat; a value of 0.2 times the dead load is recommended. To calculate the passive resistance, we recommend using the basement wall pressures given in Section 9.5. In the event the passive resistance is used to resist lateral loads, the walls should be designed for the approximate passive earth pressure.

Since it is anticipated that the weight of the building will not be sufficient to resist full hydrostatic uplift pressure, tiedown anchors will be required. Tiedown anchors should extend into the dense to very dense sand and Old Bay Clay beneath the mat and be spaced at least four shaft diameters apart. Uplift resistance will be developed in skin friction between the anchor shafts and the surrounding soil. For estimating purposes, we recommend friction values of 1,500 and 800 psf be used in the sand and Old Bay Clay layers, respectively. Higher values can be obtained depending upon the grout techniques employed by the contractor and the results of pullout tests.

Special attention should be given to waterproofing the connections between the tiedown anchors and the mat. Because the tiedowns will be permanent, encapsulated tendons or bars should be used (double corrosion protection). Corrosion protection requirements regarding the bonded and unbonded length, and stressing anchorage are outlined below:

- encapsulations used to provide an additional corrosion protection layer over the tendon or bar bond length should consist of a grout filled, corrugated plastic sheathing, or grout filled deformed steel tube; the prestressing steel can be grouted inside the encapsulation prior to inserting the anchor into the drill hole or after the anchor has been placed; centralizers or grouting techniques should provide a minimum of ½ inch of grout cover over the encapsulation

- a sheath filled with corrosion inhibiting compound or grout, or a heat shrinkable tube internally coated with a mastic compound should be used to provide corrosion protection of the unbonded length

- the trumpet should be sealed to the bearing plate and overlap the unbonded length corrosion protection by at least four inches; it should be completely filled with a corrosion inhibiting compound or grout
- all stressing anchorages permanently exposed to the atmosphere should be grout-filled; stressing anchorages encased with at least two inches of concrete do not require a cover

The tiedowns will be installed below the water table; therefore, the contractor should use smooth-cased, auger-cast system (such as a Klemm-rig) to prevent the holes from caving. If water is present in the shaft, grout should be placed using a tremie system. High strength bars or strand may be used as tensile reinforcement in the anchors. For stressing, the free length for a steel bar and for strand should be 10 and 15 feet, respectively. We recommend at least 10 percent of the anchors be performance-tested to at least 150 percent of the design load under our observation. The remainder should be proof-tested to 150 percent of the design load. The movement of each tiedown anchor should be monitored with a free-standing, tripod-mounted dial gauge during proof and performance testing. The maximum test load should be held for a minimum of 10 minutes, with readings taken at 0, 1, 3, 6, and 10 minutes. If the difference between the 1- and 10-minute reading is more than 0.04 inches, the load shall be held for an additional 50 minutes. The tiedown anchor should not move more than 0.08 inches between the 6- and 60-minute reading. In addition, total movement at the maximum test load should not exceed 80 percent of the theoretical elastic elongation of the unbonded length and the total deflection of the tiedowns should not exceed ¾ inch at the design load. Replacement anchors should be provided, as directed by the structural engineer, for anchors that fail the test. After testing, all anchors should be loaded to 10 percent of their design load (higher if specified by the structural engineer) and locked off.

9.4 Waterproofing

As mentioned previously, the tower and podium basements will extend below groundwater level and should therefore be appropriately waterproofed. The waterproofing should be designed by the waterproofing consultant; however, typically, waterproofing is placed directly on the soil subgrade and be covered by a mud slab (thin layer of lean concrete). The mud slab will reduce the potential for subgrade disturbance and protect the waterproofing from damage during mat construction. The mud slab should also provide a firm, smooth working surface for placement of reinforcing steel.

If it is essential to prevent moisture accumulation on the garage floor, we recommend a back-up moisture barrier be included between the structural mat and a topping slab as an additional precaution. A typical moisture barrier includes a capillary moisture break consisting of at least a six-inch-thick layer of clean, free-draining crushed rock (½- to ¾-inch gradation) overlain by a moisture-proof membrane of at least 10 mil thickness. The membrane should be covered with two inches of sand to protect it during construction and to aid in curing the concrete floor slab. Perforated pipes may be installed in the capillary break to collect any water that accumulates and direct it to a sump or other suitable outlet. Water should not be allowed to accumulate in the drain rock or sand prior to casting the slab.

9.5 Basement Walls

Basement walls should be waterproofed. We recommend all below-grade and retaining walls be designed to resist lateral pressures imposed by the adjacent soil and vehicles. Lateral earth pressures on basement walls will depend partially on the restraint at the top of the walls. Accordingly, walls should be designed for the pressures presented below, where H is the height of the wall in feet.

TABLE 3
Lateral Earth Pressures Restrained Wall Condition

	Static	Seismic
Above the water table[9]	60 pcf	40 pcf + 15H psf
Below the water table	90 pcf	85 pcf + 15H psf

[9] Design groundwater level is Elevation -3 feet.

If surcharge loads fall above an imaginary 45-degree line (from the horizontal) projected up from the bottom of a retaining wall, a surcharge pressure should be included in the wall design. If this condition exists, we should be consulted to estimate the added pressure on a case-by-case basis. Where truck traffic will pass within 10 feet of retaining walls, temporary traffic loads should be considered in the design of the walls. Traffic loads may be modeled by a uniform pressure of 100 psf applied in the upper 10 feet of the walls.

The 35-foot high wall that will separate the tower and podium structures should be designed to resist an additional surcharge from the tower pile foundation. This surcharge is equal to an equivalent fluid weight of 75 pcf to Elevation -40 feet increasing to 150 pcf to the bottom of the mat foundation (Elevation -56 feet).

The recommended design pressures assume the walls will be properly backdrained above Elevation -3 feet. One acceptable method for backdraining a basement wall is to place a prefabricated drainage panel against the backside of the newly cast wall. If this method of drainage is chosen, we recommend using Mirafi 6200 or equivalent. This product has a bentonite surface providing waterproofing in addition to drainage. The drainage panel should extend down to Elevation -3 feet. The drainage panel will reduce the risk of hydrostatic pressure against the upper portion of the basement wall by allowing water to drain to the groundwater level, about Elevation -3 feet. We should review the manufacturer's specifications regarding the proposed prefabricated drainage panel material to check it is appropriate for the intended use.

To protect against moisture migration, basement walls should be waterproofed and water stops should be placed at all construction joints.

Wall backfill should be compacted to at least 90 percent relative compaction using light compaction equipment. If heavy equipment is used, the wall should be appropriately designed to withstand loads exerted by the equipment and/or temporarily braced.

9.6 Seismic Design

9.6.1 Probabilistic Seismic Hazard Analysis

We expect the site will experience strong ground shaking during a major earthquake on any of the nearby faults. To estimate the ground shaking for the seismic design of the structures, we performed a site-specific probabilistic seismic hazard analysis (PSHA). In response to the request by the project structural engineer, and in accordance with our proposal, we developed design ground motions for a hazard level having 10 percent probability of exceedance in 50 years. This hazard level is consistent with the definitions of the Design Basis Earthquake (DBE) in the 2001 version of the San Francisco Building Code (SFBC).

We performed the PSHA using the computer code EZFRISK 6.22 (Risk Engineering 2004). This approach is based on the probabilistic seismic hazard model developed by Cornell (1968) and McGuire (1976). Our analysis modeled the faults in the Bay Area as linear sources and earthquake activities were assigned to the faults based on WGCEP (1999) and CDMG (1996) data. Based on subsurface conditions, the site is categorized as stiff soil (SFBC designation S_D). In order to estimate site-specific spectra at the ground surface at this site we used attenuation relationships for stiff soil conditions. These relationships are primarily dependent on the magnitude of the earthquake and the distance from the site to the fault. Details of our analysis are presented in Appendix D.

The proposed tower and podium structures will both have underground portion which at foundation level will both have underground portions which at foundation level will either be about 25 feet or about 60 feet below the ground surface, respectively. It has long been recognized that spectral values show reductions with depth below the ground surface. Such effects have been supported analytically and have shown by recordings from downhole arrays and in comparisons of recordings in the free field and in adjacent structures at their basement levels. Golesorkhi and Gouchon (2000) developed recommended ratios that modify the surface spectrum to account for depth effects for different spectral periods. Furthermore, FEMA 440 Appendix B discusses effects of reduction of surface spectrum as a function of depth of embedment of the foundation. We used ratios by Golesorkhi and Gouchon (2000) to modify the surface spectra and develop the basement level spectra. We recommend the use of the basement level spectra at the foundation level for design. Table 4 presents the recommended spectra.

TABLE 4
Spectral Acceleration (g) for Damping Ratio of 5 percent
10 percent probability of Exceedance in 50 years (DBE)

Period (sec)	Ground Surface	Basement
0.01	0.495	0.318
0.1	0.842	0.590
0.2	1.132	0.849
0.3	1.179	0.933
0.4	1.153	0.933
0.5	1.108	0.918
0.75	0.953	0.818
1.0	0.811	0.745
2.0	0.473	0.473
3.0	0.290	0.290
4.0	0.199	0.199
5.0	0.160	0.160
6.0	0.133	0.133

9.6.2 San Francisco Building Code

For seismic design in accordance with the 2001 San Francisco Building Code, we recommend using soil profile type S_D. The site is about 13.4 kilometers from the San Andreas Fault, a type A fault; hence near-source factors N_a=1.0 and N_v=1.064 should be used.

9.7 Utilities and Utility Trenches

The design of the underground utilities should consider earthquake-induced settlement may occur in the fill surrounding the site. Flexible utility connections that can accommodate differential movement between the ground and the proposed structure should be used.

Utility trenches should be excavated a minimum of four inches below the bottom of pipes or conduits and have clearances of at least four inches on both sides. Where necessary, trench excavations should be shored and braced to prevent cave-ins and/or in accordance with safety regulations. Where sheet piling is used as shoring for trenches and is to be removed after backfilling, it should be placed a minimum of two feet away from the pipes or conduits to prevent disturbance to them as the sheet piles are extracted. Where trenches extend below the groundwater level, it will be necessary to temporarily dewater them to allow for placement of the pipe and/or conduits and backfill.

To provide uniform support, pipes or conduits should be bedded on a minimum of four inches of sand or fine gravel. After pipes and conduits are tested, inspected (if required), and approved, they should be covered to a depth of six inches with sand or fine gravel, which should then be mechanically tamped. Backfill should be placed in lifts of eight inches or less, moisture-conditioned to near the optimum moisture content, and compacted to at least 95 percent relative compaction.

9.8 Shoring

The proposed excavation will need to be shored. The shoring should be designed to limit ground deformations to less than an inch.

We recommend that a soil-cement mixed in-place wall with internal bracing be used to support the sides of the excavation. Three temporary shoring conditions will exist at the site as discussed below and depicted on Figure 2. They are:

- Case 1 – Shoring for the 60-foot deep excavation
- Case 2 – Shoring for the 25-foot deep excavation
- Case 3 – Shoring for the 35-foot high wall between the tower and podium excavations

We have developed three lateral earth pressure diagrams for the three different shoring wall conditions listed above and they are presented on Figures 11 through 13. The surcharge pressure presented on Figure 13 is based on foundation pressure from the tower constructed to 33 floors. This is based on our discussion with Webcor Builders regarding the construction schedule. According to Webcor's schedule, the permanent podium basement wall next to the tower will be constructed to the level of the tower mat foundation when the tower is constructed to the 33rd floor. The permanent basement wall will be designed to resist the surcharge of the fully constructed tower. If this sequence changes, the surcharge pressure should be re-evaluated. In addition, we understand this interior shoring wall will be constructed below the proposed eastern edge of the tower mat foundation. The top of the shoring should be separated from the bottom of the mat by a minimum of 12 inches to prevent the shoring from influencing the mat behavior.

The selection, design, construction, and performance of the shoring system should be the responsibility of the contractor. The contractor or his designer should be responsible for determining the type and size of bracing and struts required to resist the given pressures.

Control of ground movement will depend as much on the timeliness of installation of lateral restraint as on the design. Internal bracing should be installed as close to the time of excavation as possible. Excavation should not proceed below a level of bracing until the all bracing at that level has been installed. Jacking (preloading) of the bracing against the sides of the excavation can reduce movement of the shoring.

If traffic will occur within a distance equal to the shoring depth, a uniform surcharge load of 100 psf acting on the upper 10 feet should be used in the design. An increase in lateral design pressure for the shoring may be required where heavy construction equipment or stockpiled equipment is within a distance equal to the shoring depth. Construction equipment should not be allowed within five feet from the edge of the excavation unless the shoring is specifically designed for the surcharge. The increase in pressure should be determined after the surcharge loads are known. The anticipated deflections of the shoring system should be estimated to check if they are acceptable. The shoring system should be sufficiently rigid to prevent detrimental movement and possible damage to adjacent streets, utilities and structures.

The shoring system should be designed by a licensed engineer, experienced in the design of shoring. The shoring engineer should be responsible for the design of temporary shoring in accordance with applicable regulatory requirements.

We recommend both Treadwell & Rollo and DCE Engineers review shoring plans. In addition, we recommend a representative from our office observe the installation of the shoring system.

9.9 Dewatering

The groundwater should be drawn down so that the piezometric level in the soil layers below the base of the two excavations is at least three feet below the bottom of the respective excavation. These levels should be maintained until sufficient building weight and/or uplift capacity is available to resist the hydrostatic uplift pressure of the groundwater once it is allowed to rise to its normal elevation. The structural engineer should evaluate and provide recommendations when the dewatering system can be turned off. The number and depth of dewatering wells should be determined by a specialty dewatering contractor. The volume of water discharged should be monitored and a record of the amount should be submitted to the owner.

9.10 Construction Monitoring

To monitor ground movements, groundwater levels, and shoring movements, we recommend installing the instrumentation listed below:

Slope indicators: We recommend installing at least six slope indicators. A slope indicator should be installed behind each of the exterior walls. The remaining two slope indicators should be embedded in the shoring walls along the north and south sides of the site.

Piezometers: One piezometer should be installed behind each exterior shoring wall. The piezometers should each have two casings, one to measure groundwater level in the sand and the other in the bedrock. The upper portions of the piezometers should be properly sealed with cement-bentonite mix to reduce surface water infiltration.

Survey points: Survey points should be installed on the adjacent buildings and streets that are within 100 feet of the site.

The instrumentation should be read regularly and the results should be reviewed in a timely manner. Initially, the instrumentation should be read weekly. The frequency of readings may, in the later stage of construction, be modified as appropriate. In addition, the conditions of existing buildings within 100 feet of the site should be photographed and surveyed prior to the start of construction and monitored periodically during construction.

10.0 GEOTECHNICAL SERVICES DURING CONSTRUCTION

Treadwell & Rollo, Inc. can provide review of the project plans and specifications as required by the City and County of San Francisco for building permit approval. This will allow us to check conformance with the intent of our recommendations.

During construction, an engineer from our office should observe installation of groundwater wells, the shoring system, indicator and production piles, placement and compaction of any backfill and the excavation for the mat foundation. These observations will allow us to compare actual with anticipated soil conditions and verify that the contractors work conforms to the geotechnical aspects of the plans and specifications.

11.0 LIMITATIONS

The conclusions and recommendations presented in this report result from limited subsurface investigation. Actual subsurface conditions may vary. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that described in this report, Treadwell & Rollo, Inc. should be notified so that supplemental recommendations can be made.

REFERENCES

Abrahamson, N. A. and Silva, W. J. (1997). "Empirical response spectral attenuation relations for shallow crustal earthquakes." *Seismological Research Letter*, 68(1), 94-128.

California Division of Mines and Geology (1996). "Probabilistic seismic hazard assessment for the State of California." DMG Open-File Report 96-08.

California Division of Mines and Geology (1997). "Geologic and Engineering Aspect of San Francisco Bay Fill." Special Report 97.

Campbell, K. W. (1997). "Empirical near-source attenuation relationships for horizontal and vertical components of peak ground acceleration, peak ground velocity, and pseudo-absolute acceleration response spectra." *Seismological Research Letter*, 68(1), 154-179.

City and County of San Francisco Building Code, 2001 Edition (2001)

Cao, T., Bryant, W. A., Rowshandel, B., Branum D. and Wills, C. J. (2003). "The Revised 2002 California Probabilistic Seismic Hazard Maps"

Cornell, C. A. (1968). "Engineering seismic risk analysis." *Bulletin of the Seismological Society of America*, 58(5).

Dames & Moore (1981). "Geotechnical Investigation, Proposed Five Fremont Center Project, San Francisco, California" prepared for Metropolitan Bechtel Shorenstein

FEMA 440 – Improvement of Inelastic Seismic Analysis Procedures, Appendix 8. "Supplementary information and data on soil-structure interaction effects."

Golesorkhi, R. and Gouchon, J. (2000). "Effect of embedment on surface spectra." Proceedings of the Sixth International Conference on Seismic Zonation.

ICBO (1997). *Uniform Building Code, Volume 2, Structural Engineering Design Provisions.*

Lienkaemper, J. J. (1992). "Map of recently active traces of the Hayward Fault, Alameda and Contra Costa counties, California." Miscellaneous Field Studies Map MF-2196.

McGuire, R. K. (1976). "FORTRAN computer program for seismic risk analysis." U.S. Geological Survey, Open-File Report 76-67.

Ostadan, F. (1992). "Soil-structure interaction." *Proceedings of the Earthquake Ground Motion and Foundation Design, Fall Seminar by Structural Engineers Association of Northern California.*

REFERENCES (Cont.)

Risk Engineering Inc. (2004). "EZFRISK computer program." Version 6.22.

Sadigh, K., Chang, C.-Y., Egan, J. A., Makdisi, F., and Youngs, R. R. (1997). "Attenuation relationships for shallow crustal earthquakes based on California strong motion data." *Seismological Research Letter*, 68(1), 180-189.

Schlocker, J. (1974). "Geology of the San Francisco north quadrangle, California."

Seed, H. B. (1986). "Influence of local soil conditions on ground motions and building damage during earthquakes." *Eight Nabor Cabrillo Lecture*, Mexican Society of Soil Mechanics, Mexico.

Stewart, J. P. (1999). "Evaluation of soil-structure interaction effects from strong motion recordings." *Proceedings of SMIP99 Seminar*, Huang, M. editor, 83-95.

Sykora, D. W. and Bastani, S. A. (1998). "Distribution of peak horizontal acceleration and peak horizontal particle velocity with depth measured during earthquakes." *Proceedings of 6th U.S. National Conference on Earthquake Engineering*, Seattle, Washington.

Toppozada, T. R. and Borchardt G. (1998). "Re-Evaluation of the 1836 "Hayward Fault" and the 1838 San Andreas Fault earthquakes." *Bulletin of Seismological Society of America*, 88(1), 140-159.

Townley, S. D. and Allen, M. W. (1939). "Descriptive catalog of earthquakes of the Pacific coast of the United States 1769 to 1928." *Bulletin of the Seismological Society of America*, 29(1).

Treadwell & Rollo, Inc., (1997). "Geotechnical Investigation, 350 Mission Street Building Seismic Strengthening, San Francisco, California" Project No. 2152.01

Treadwell & Rollo, Inc. (1999). "Geotechnical Investigation, First and Howard Project, City Block No. 3720, San Francisco, California" Project No. 2550.01

Treadwell & Rollo, Inc. (1998). "Geotechnical Investigation, 199 Fremont Street, San Francisco, California, Project No. 2277.01

Tsai, J.S. (1990) "Validation of soil-structure interaction analysis methods." Dissertation Submitted in Partial Satisfaction of the Requirements of the Degree of Doctor of Philosophy, University of California at Berkeley.

Wells, D. L. and Coppersmith, K. J. (1994). "New empirical relationships among magnitude, rupture length, rupture width, rupture area, and surface displacement." *Bulletin of the Seismological Society of America*, 84(4), 974-1002.

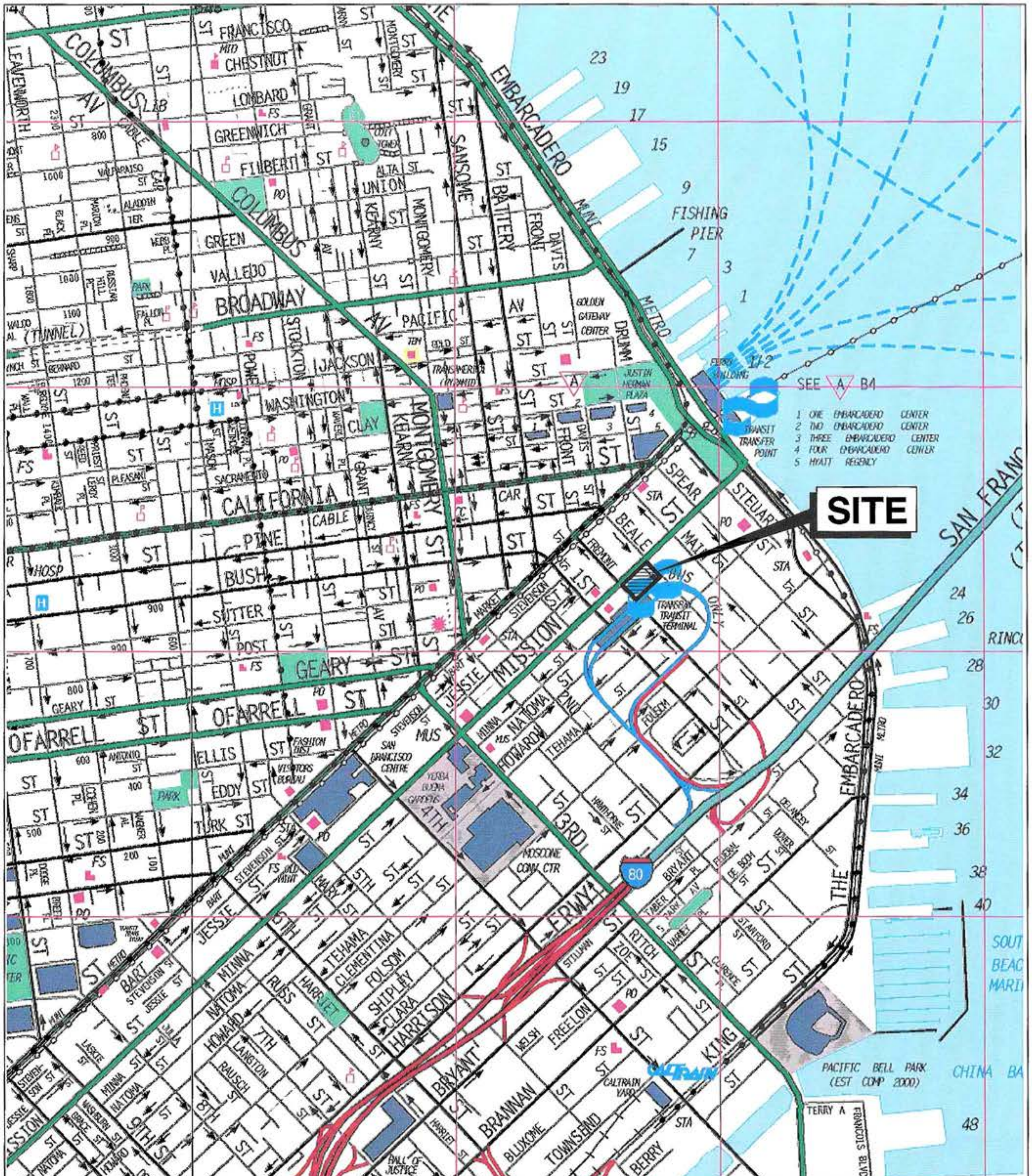
REFERENCES (Cont.)

Wesnousky, S. G. (1986). "Earthquakes, quaternary faults, and seismic hazards in California." *Journal of Geophysical Research*, 91(1312).

Working Group on California Earthquake Probabilities (WGCEP) (2003). "Earthquake probabilities in the San Francisco Bay region: 2000 to 2030." Open File Report 03-214.

Youngs, R. R., and Coppersmith, K. J. (1985). "Implications of fault slip rates and earthquake recurrence models to probabilistic seismic hazard estimates." *Bulletin of the Seismological Society of America*, 75( ), 939-964.

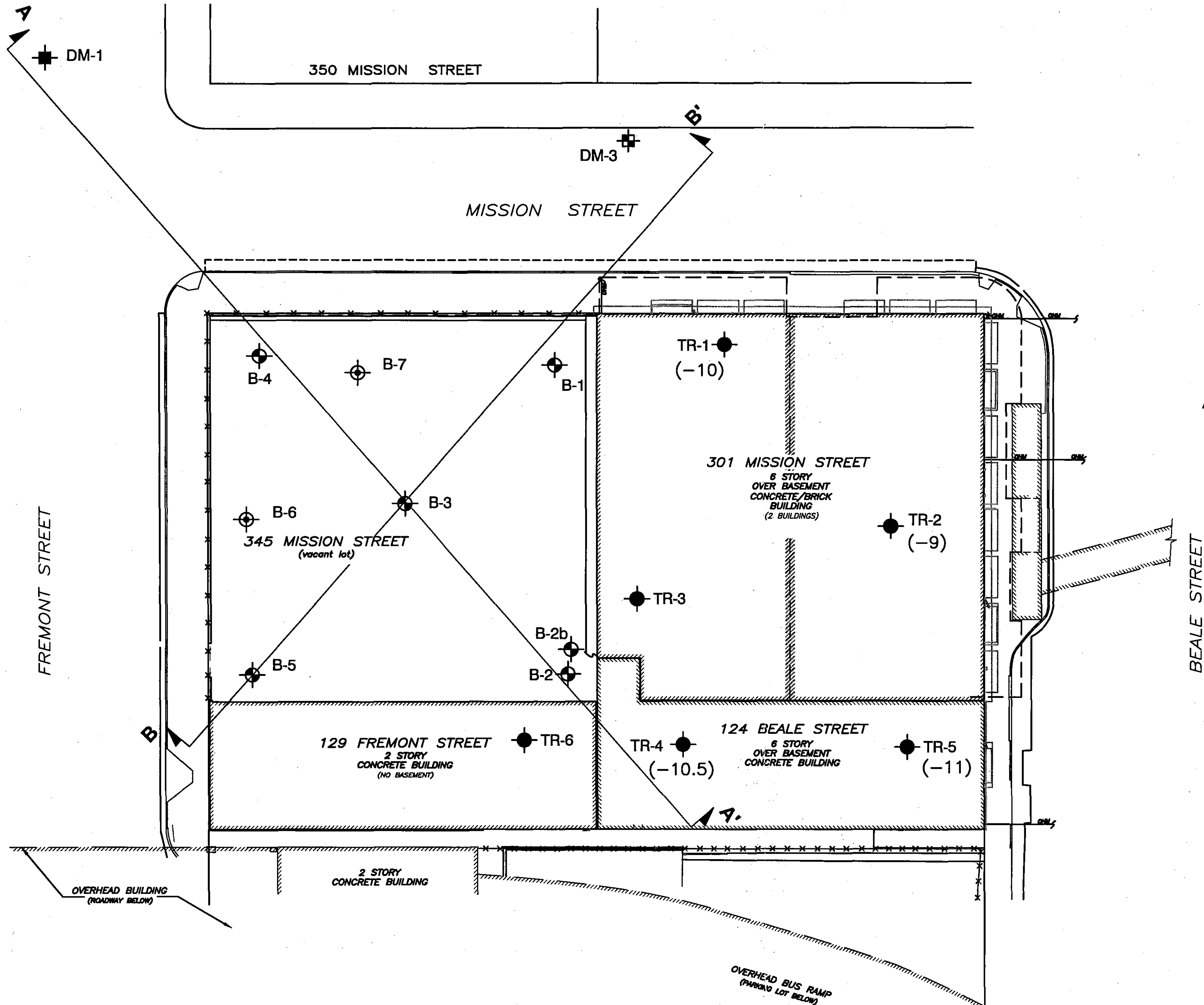
FIGURES



Base map: The Thomas Guide
San Francisco County
1999

0 1/4 1/2 Mile
Approximate scale

301 MISSION STREET San Francisco, California	**SITE LOCATION MAP**
Treadwell&Rollo	Date 12/29/04 | Project No. 3157.02 | Figure 1



EXPLANATION

B-1 Approximate location of soil boring by Treadwell & Rollo, Inc., June to July 2001

B-7 Approximate location of soil boring by Treadwell & Rollo, Inc., May 2004

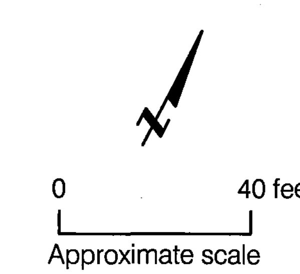
TR-1 Approximate location of environmental soil boring by Treadwell & Rollo, Inc., 5 June 2001

(−9) Approximate elevation at which groundwater was encountered, feet (San Francisco City datum)

DM-1 Approximate location of soil boring by Dames & Moore, November 1980

DM-3 Approximate location of soil boring by Dames & Moore, February 1966

A A' Approximate location of idealized subsurface profile



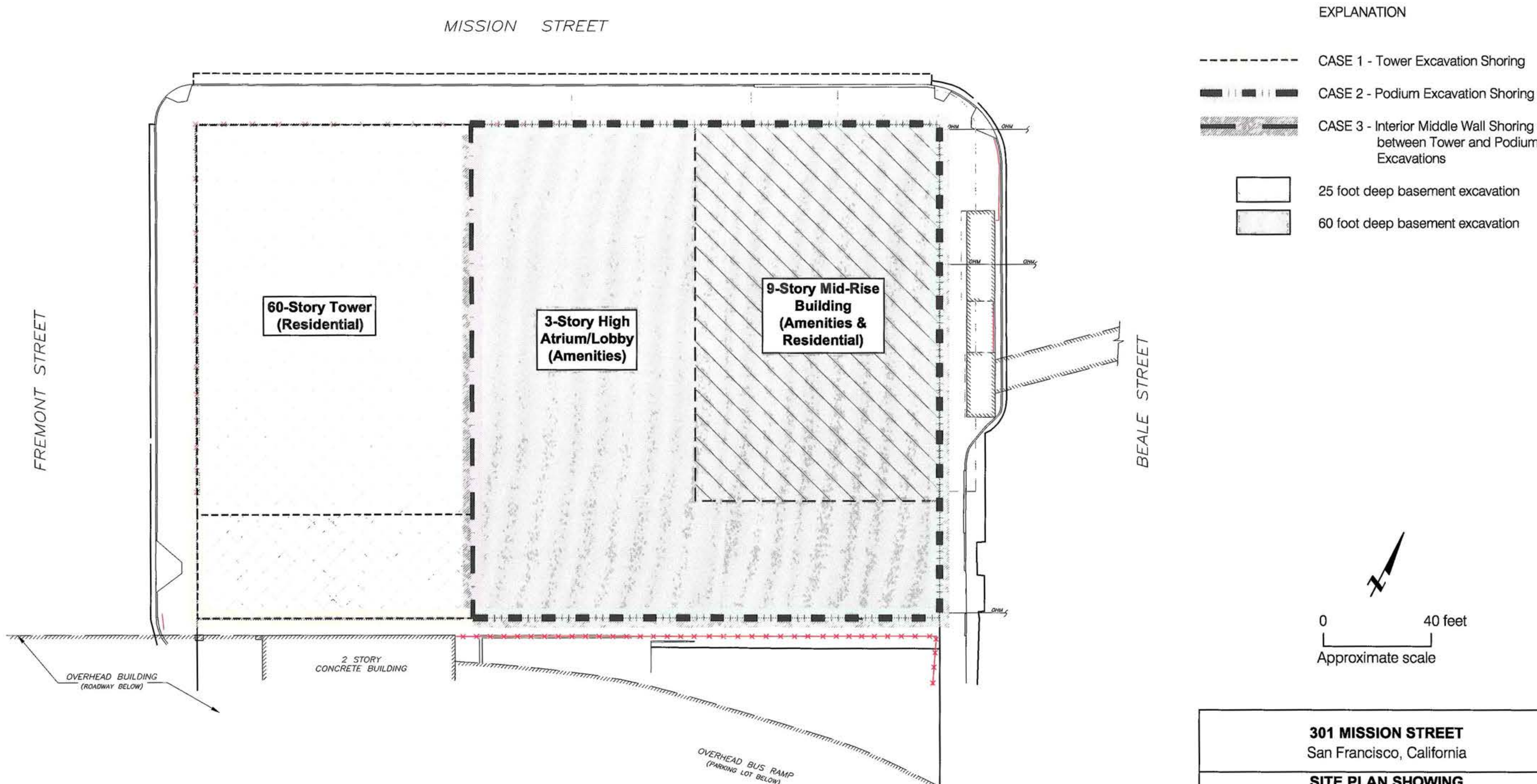
301 MISSION STREET
San Francisco, California

SITE PLAN

Date 01/11/05	Project No. 3157.02	Figure 2

Treadwell&Rollo

3157.02–Site Plan.dwg

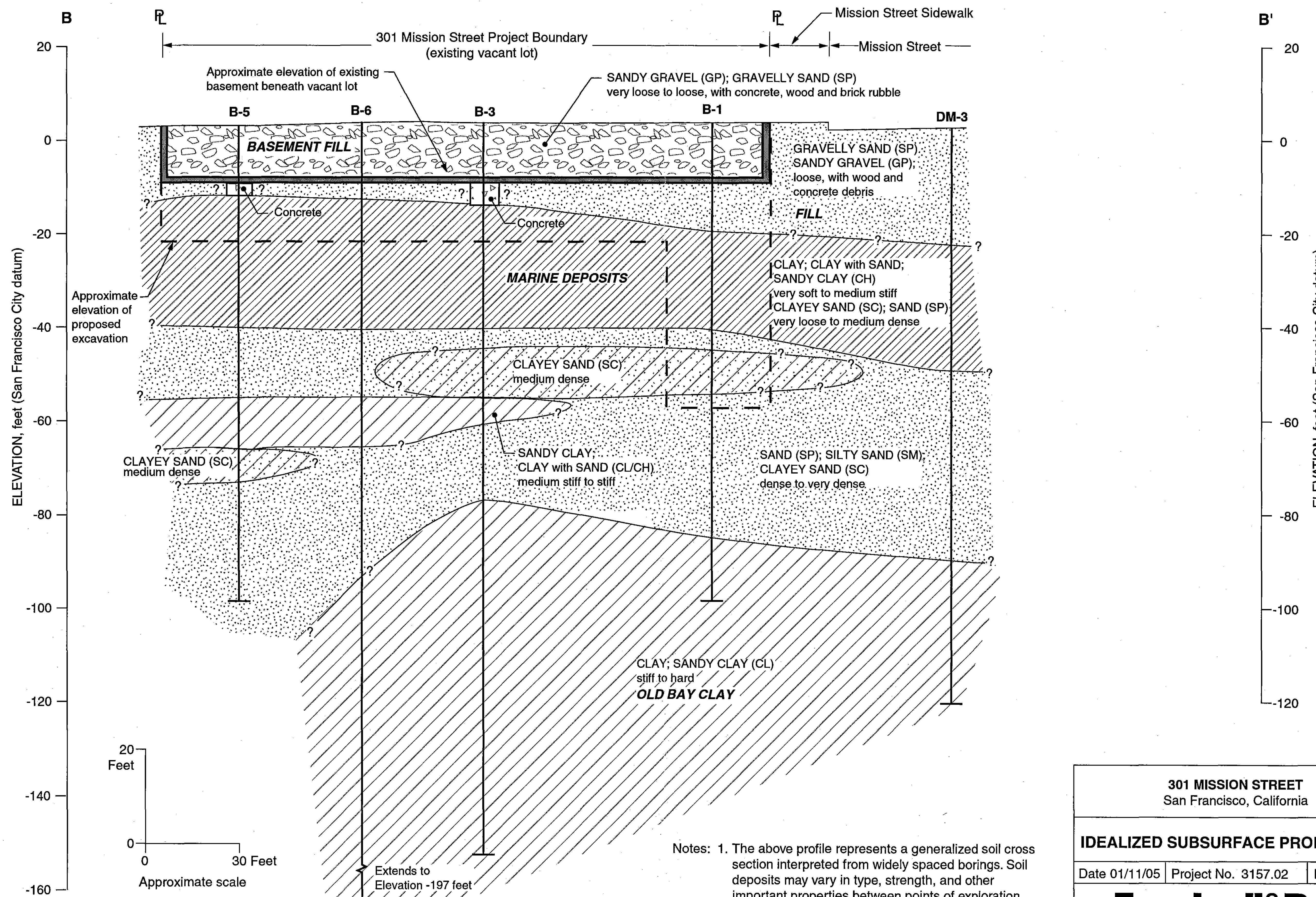


301 MISSION STREET
San Francisco, California

SITE PLAN SHOWING PROPOSED DEVELOPMENT AND TEMPORARY SHORING CONDITIONS

Date 01/04/05 | Project No. 3157.02 | Figure 3

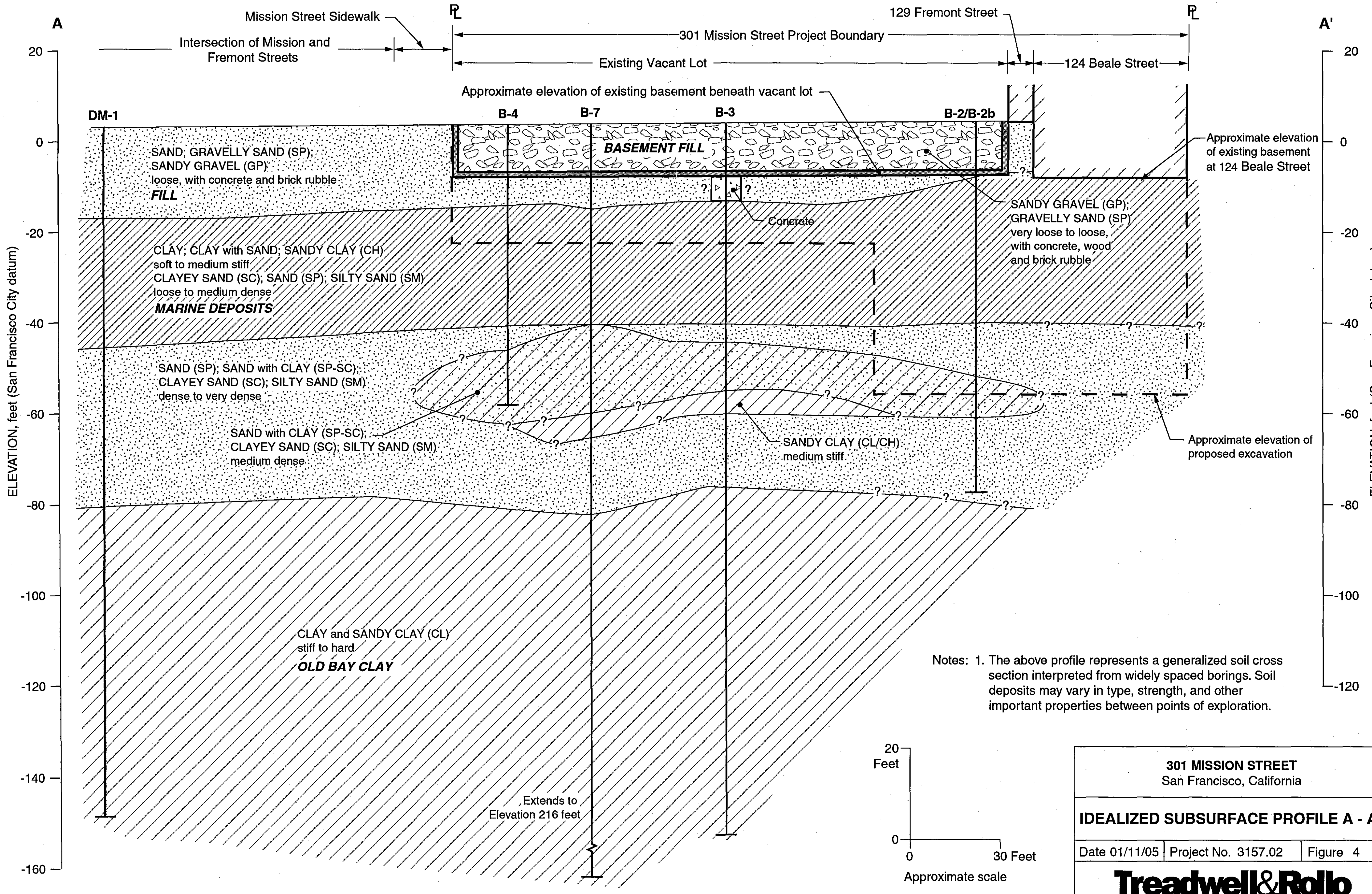
Treadwell&Rollo



Notes: 1. The above profile represents a generalized soil cross section interpreted from widely spaced borings. Soil deposits may vary in type, strength, and other important properties between points of exploration.

301 MISSION STREET San Francisco, California		
IDEALIZED SUBSURFACE PROFILE B - B'		
Date 01/11/05	Project No. 3157.02	Figure 5

Treadwell&Rollo



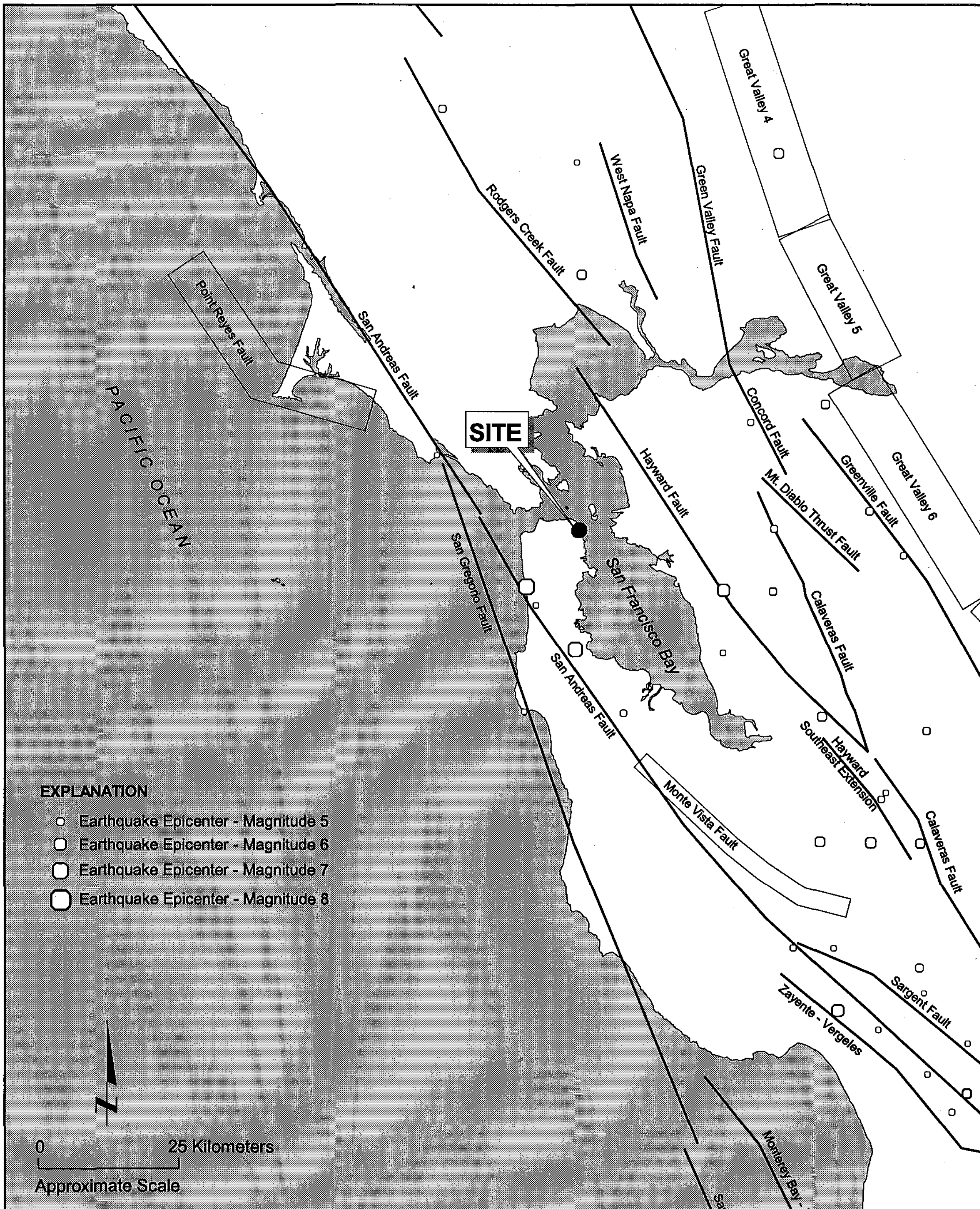
Notes: 1. The above profile represents a generalized soil cross section interpreted from widely spaced borings. Soil deposits may vary in type, strength, and other important properties between points of exploration.

301 MISSION STREET
San Francisco, California

IDEALIZED SUBSURFACE PROFILE A - A'

Date 01/11/05	Project No. 3157.02	Figure 4

Treadwell&Rollo



NOTES:
Digitized data for fault coordinates and earthquake catalog was developed by the California Department of Conservation Division of Mines and Geology. The historic earthquake catalog includes events from January 1800 to December 2000.

301 MISSION STREET San Francisco, California	**MAP OF MAJOR FAULTS AND EARTHQUAKE EPICENTERS IN THE SAN FRANCISCO BAY AREA**
Treadwell&Rollo	Date: 01/04/05 | Project No. 3157.02 | Figure: 6

I **Not felt by people, except under especially favorable circumstances. However, dizziness or nausea may be experienced.**
Sometimes birds and animals are uneasy or disturbed. Trees, structures, liquids, bodies of water may sway gently, and doors may swing very slowly.

II **Felt indoors by a few people, especially on upper floors of multi-story buildings, and by sensitive or nervous persons.**
As in Grade I, birds and animals are disturbed, and trees, structures, liquids and bodies of water may sway. Hanging objects swing, especially if they are delicately suspended.

III **Felt indoors by several people, usually as a rapid vibration that may not be recognized as an earthquake at first. Vibration is similar to that of a light, or lightly loaded trucks, or heavy trucks some distance away. Duration may be estimated in some cases.**
Movements may be appreciable on upper levels of tall structures. Standing motor cars may rock slightly.

IV **Felt indoors by many, outdoors by a few. Awakens a few individuals, particularly light sleepers, but frightens no one except those apprehensive from previous experience. Vibration like that due to passing of heavy, or heavily loaded trucks. Sensation like a heavy body striking building, or the falling of heavy objects inside.**
Dishes, windows and doors rattle; glassware and crockery clink and clash. Walls and house frames creak, especially if intensity is in the upper range of this grade. Hanging objects often swing. Liquids in open vessels are disturbed slightly. Stationary automobiles rock noticeably.

V **Felt indoors by practically everyone, outdoors by most people. Direction can often be estimated by those outdoors. Awakens many, or most sleepers. Frightens a few people, with slight excitement; some persons run outdoors.**
Buildings tremble throughout. Dishes and glassware break to some extent. Windows crack in some cases, but not generally. Vases and small or unstable objects overturn in many instances, and a few fall. Hanging objects and doors swing generally or considerably. Pictures knock against walls, or swing out of place. Doors and shutters open or close abruptly. Pendulum clocks stop, or run fast or slow. Small objects move, and furnishings may shift to a slight extent. Small amounts of liquids spill from well-filled open containers. Trees and bushes shake slightly.

VI **Felt by everyone, indoors and outdoors. Awakens all sleepers. Frightens many people; general excitement, and some persons run outdoors.**
Persons move unsteadily. Trees and bushes shake slightly to moderately. Liquids are set in strong motion. Small bells in churches and schools ring. Poorly built buildings may be damaged. Plaster falls in small amounts. Other plaster cracks somewhat. Many dishes and glasses, and a few windows break. Knickknacks, books and pictures fall. Furniture overturns in many instances. Heavy furnishings move.

VII **Frightens everyone. General alarm, and everyone runs outdoors.**
People find it difficult to stand. Persons driving cars notice shaking. Trees and bushes shake moderately to strongly. Waves form on ponds, lakes and streams. Water is muddied. Gravel or sand stream banks cave in. Large church bells ring. Suspended objects quiver. Damage is negligible in buildings of good design and construction; slight to moderate in well-built ordinary buildings; considerable in poorly built or badly designed buildings, adobe houses, old walls (especially where laid up without mortar), spires, etc. Plaster and some stucco fall. Many windows and some furniture break. Loosened brickwork and tiles shake down. Weak chimneys break at the roofline. Cornices fall from towers and high buildings. Bricks and stones are dislodged. Heavy furniture overturns. Concrete irrigation ditches are considerably damaged.

VIII **General fright, and alarm approaches panic.**
Persons driving cars are disturbed. Trees shake strongly, and branches and trunks break off (especially palm trees). Sand and mud erupts in small amounts. Flow of springs and wells is temporarily and sometimes permanently changed. Dry wells renew flow. Temperatures of spring and well waters varies. Damage slight in brick structures built especially to withstand earthquakes; considerable in ordinary substantial buildings, with some partial collapse; heavy in some wooden houses, with some tumbling down. Panel walls break away in frame structures. Decayed pilings break off. Walls fall. Solid stone walls crack and break seriously. Wet grounds and steep slopes crack to some extent. Chimneys, columns, monuments and factory stacks and towers twist and fall. Very heavy furniture moves conspicuously or overturns.

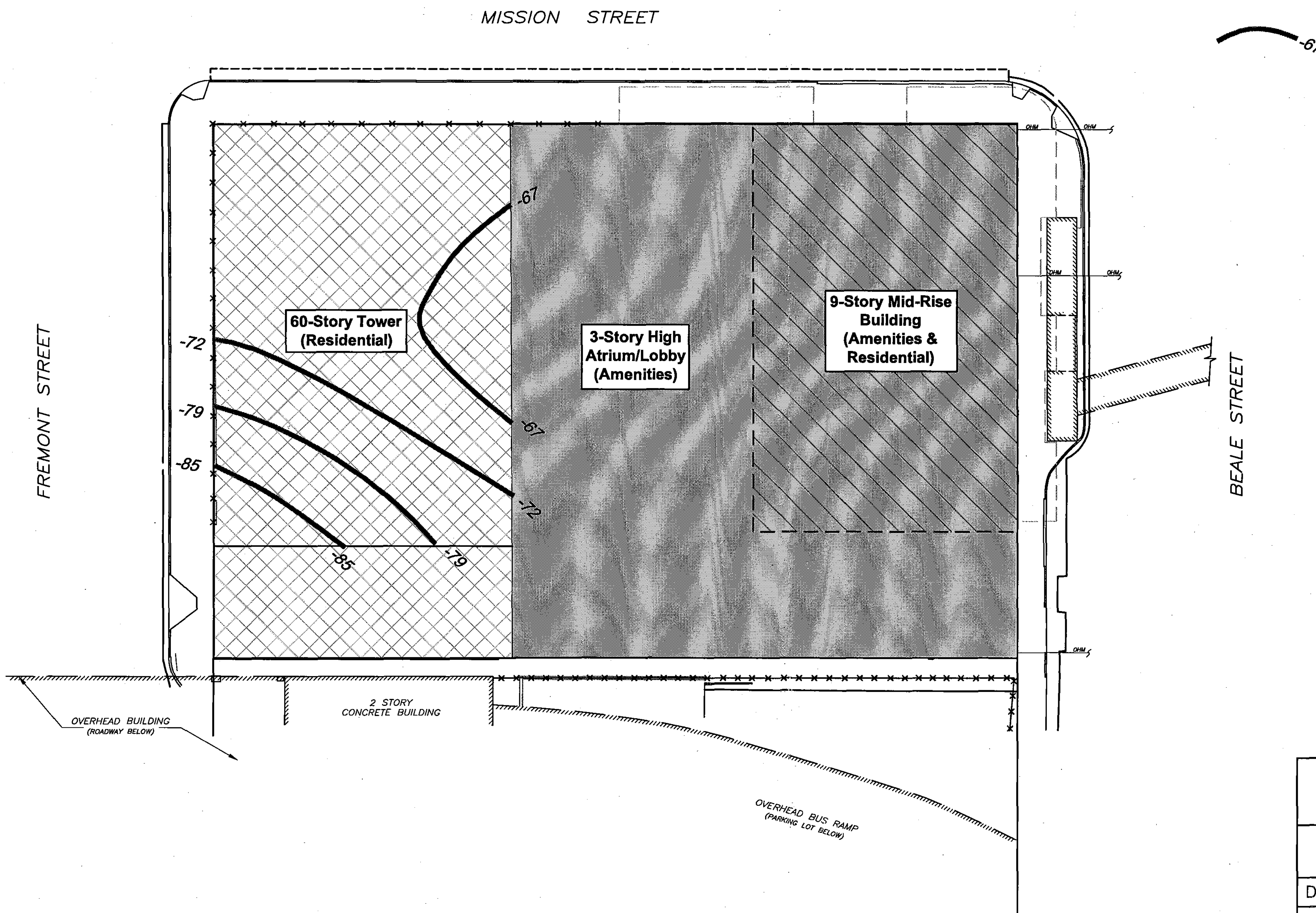
IX **Panic is general.**
Ground cracks conspicuously. Damage is considerable in masonry structures built especially to withstand earthquakes; great in other masonry buildings - some collapse in large part. Some wood frame houses built especially to withstand earthquakes are thrown out of plumb, others are shifted wholly off foundations. Reservoirs are seriously damaged and underground pipes sometimes break.

X **Panic is general.**
Ground, especially when loose and wet, cracks up to widths of several inches; fissures up to a yard in width run parallel to canal and stream banks. Landsliding is considerable from river banks and steep coasts. Sand and mud shifts horizontally on beaches and flat land. Water level changes in wells. Water is thrown on banks of canals, lakes, rivers, etc. Dams, dikes, embankments are seriously damaged. Well-built wooden structures and bridges are severely damaged, and some collapse. Dangerous cracks develop in excellent brick walls. Most masonry and frame structures, and their foundations are destroyed. Railroad rails bend slightly. Pipe lines buried in earth tear apart or are crushed endwise. Open cracks and broad wavy folds open in cement pavements and asphalt road surfaces.

XI **Panic is general.**
Disturbances in ground are many and widespread, varying with the ground material. Broad fissures, earth slumps, and land slips develop in soft, wet ground. Water charged with sand and mud is ejected in large amounts. Sea waves of significant magnitude may develop. Damage is severe to wood frame structures, especially near shock centers, great to dams, dikes and embankments, even at long distances. Few if any masonry structures remain standing. Supporting piers or pillars of large, well-built bridges are wrecked. Wooden bridges that "give" are less affected. Railroad rails bend greatly and some thrust endwise. Pipe lines buried in earth are put completely out of service.

XII **Panic is general.**
Damage is total, and practically all works of construction are damaged greatly or destroyed. Disturbances in the ground are great and varied, and numerous shearing cracks develop. Landslides, rock falls, and slumps in river banks are numerous and extensive. Large rock masses are wrenched loose and torn off. Fault slips develop in firm rock, and horizontal and vertical offset displacements are notable. Water channels, both surface and underground, are disturbed and modified greatly. Lakes are dammed, new waterfalls are produced, rivers are deflected, etc. Surface waves are seen on ground surfaces. Lines of sight and level are distorted. Objects are thrown upward into the air.

301 MISSION STREET San Francisco, California	**MODIFIED MERCALLI INTENSITY SCALE**		
Treadwell&Rollo	Date 01/04/05	Project No. 3157.02	Figure 7



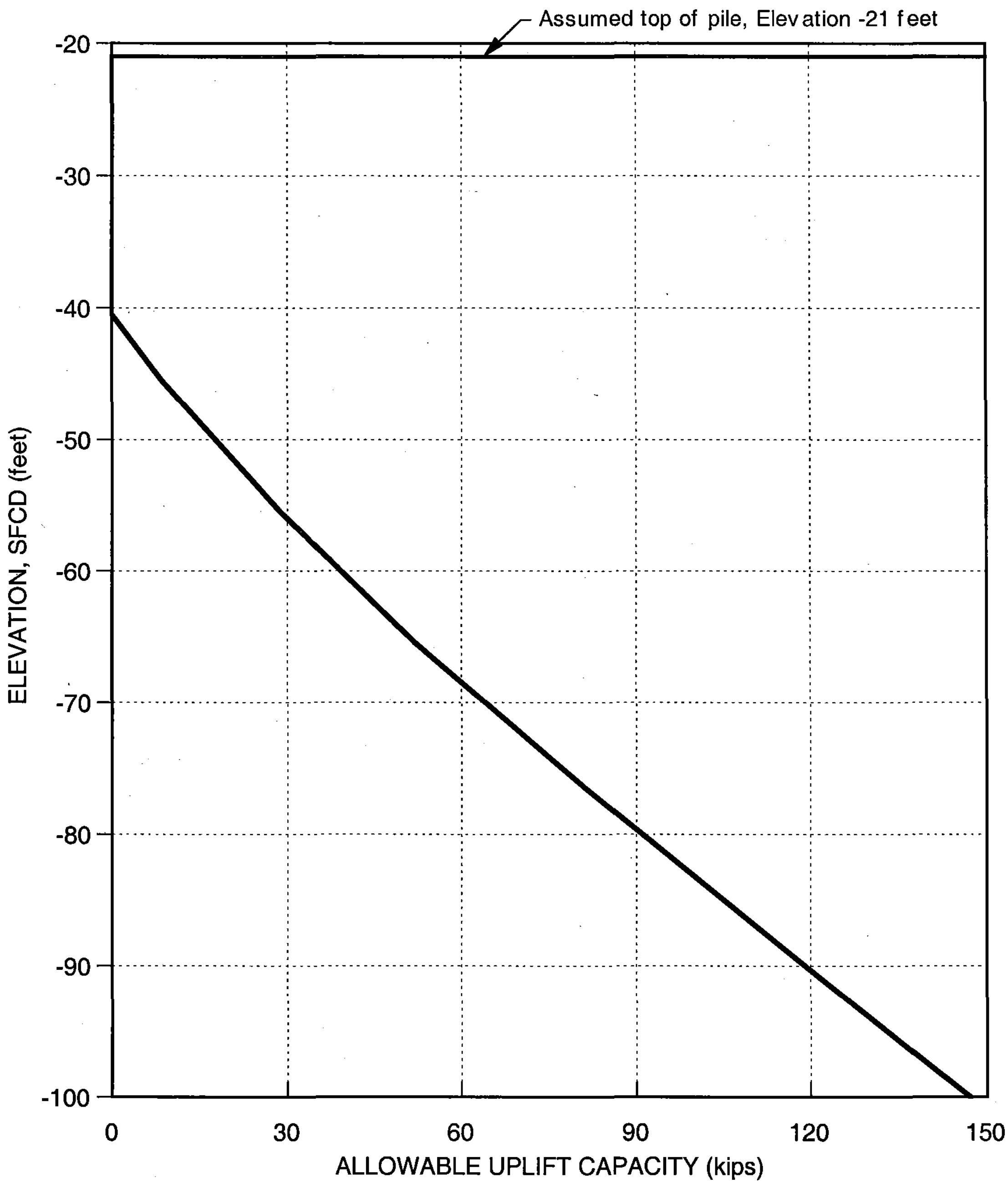
EXPLANATION

-67 Approximate elevation at the top of bearing layer, feet (San Francisco City datum)

Note:

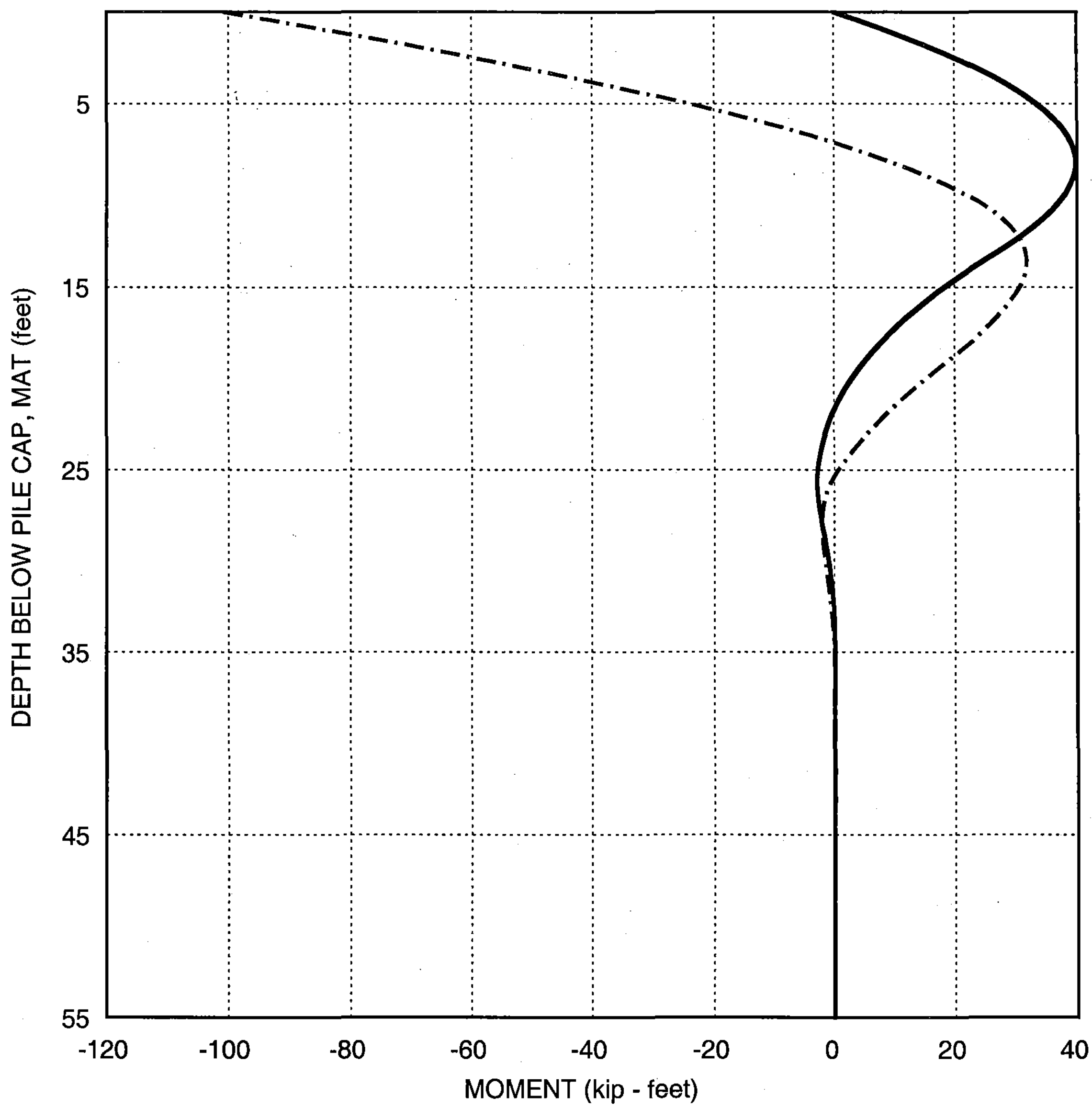
Piles should pentrate the bearing layer a distance of at least ten feet. To be verified by the indicator pile program.

301 MISSION STREET San Francisco, California		
TOP OF BEARING LAYER CONTOURS		
Date 01/11/05	Project No. 3157.02	Figure 8
Treadwell&Rollo		



Notes:
1. The indicated capacities are based on the shear strength of the supporting soil; the structural capacity of the pile may govern.
2. Piles should be spaced no closer than three pile widths center to center.
3. City and County of San Francisco datum.

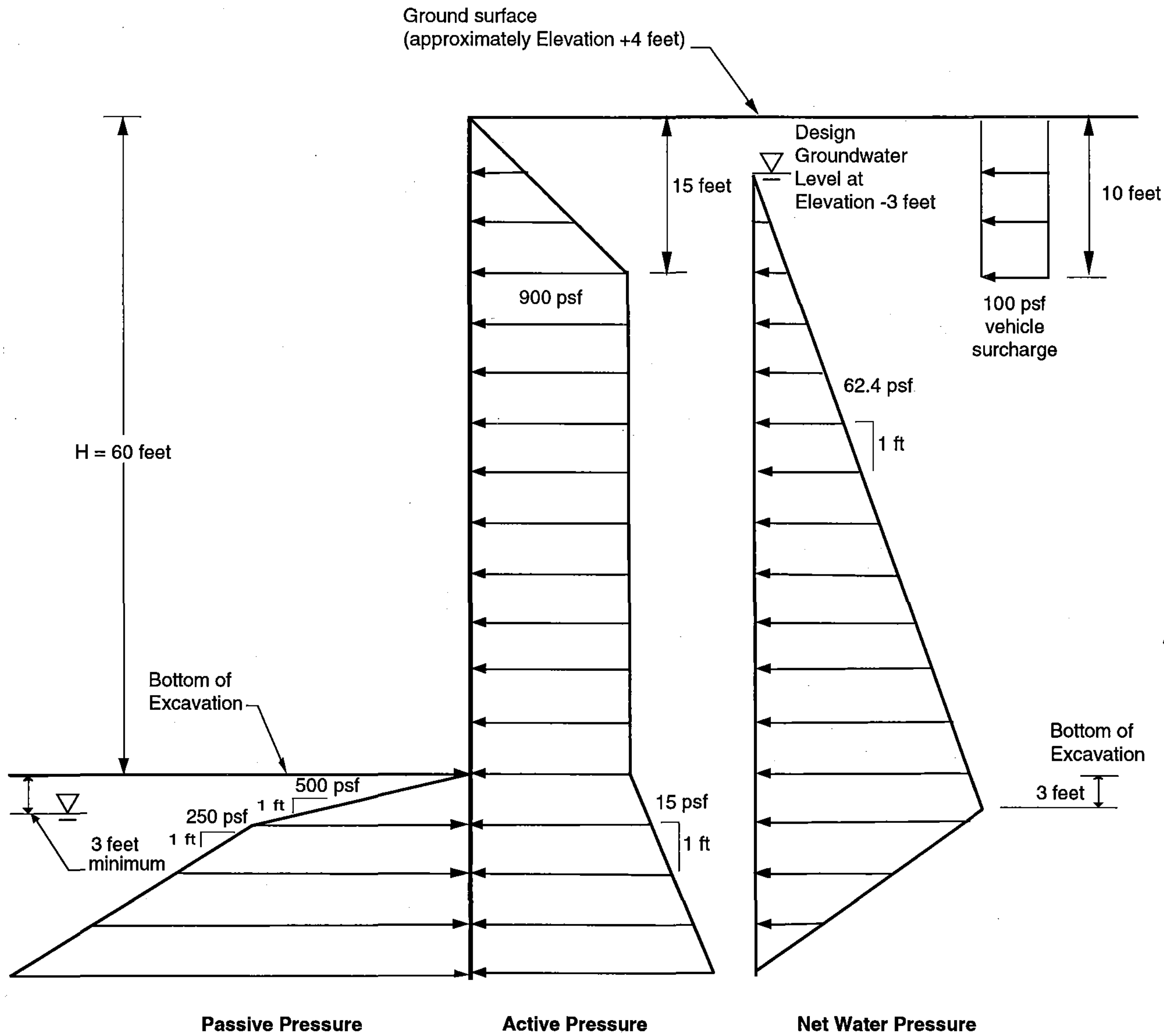
301 MISSION STREET San Francisco, California	PILE UPLIFT CAPACITY FOR SUSTAINED LOADS 14-INCH SQUARE PRECASE-PRESTRESSED CONCRETE PILE		
Treadwell&Rollo	Date 01/12/05	Project No. 3157.02	Figure 9



Curve	Condition	Lateral Load, H (kips)
———	14-inch free head	7.8
—·—·—·—·	14-inch fixed head	17.3

Notes: 1. The moment profiles are for 14-inch square, precast-prestressed concrete piles,at least 30 feet long.
2. Assumes maximum deflection of 0.5 inch at top of pile.
3. Assumes center to center spacing of piles is at least 8 times the pile width; for spacing less than 8 widths, see Section 9.2.1.2 of report.
4. Assumes there is no applied moment at the pile head.

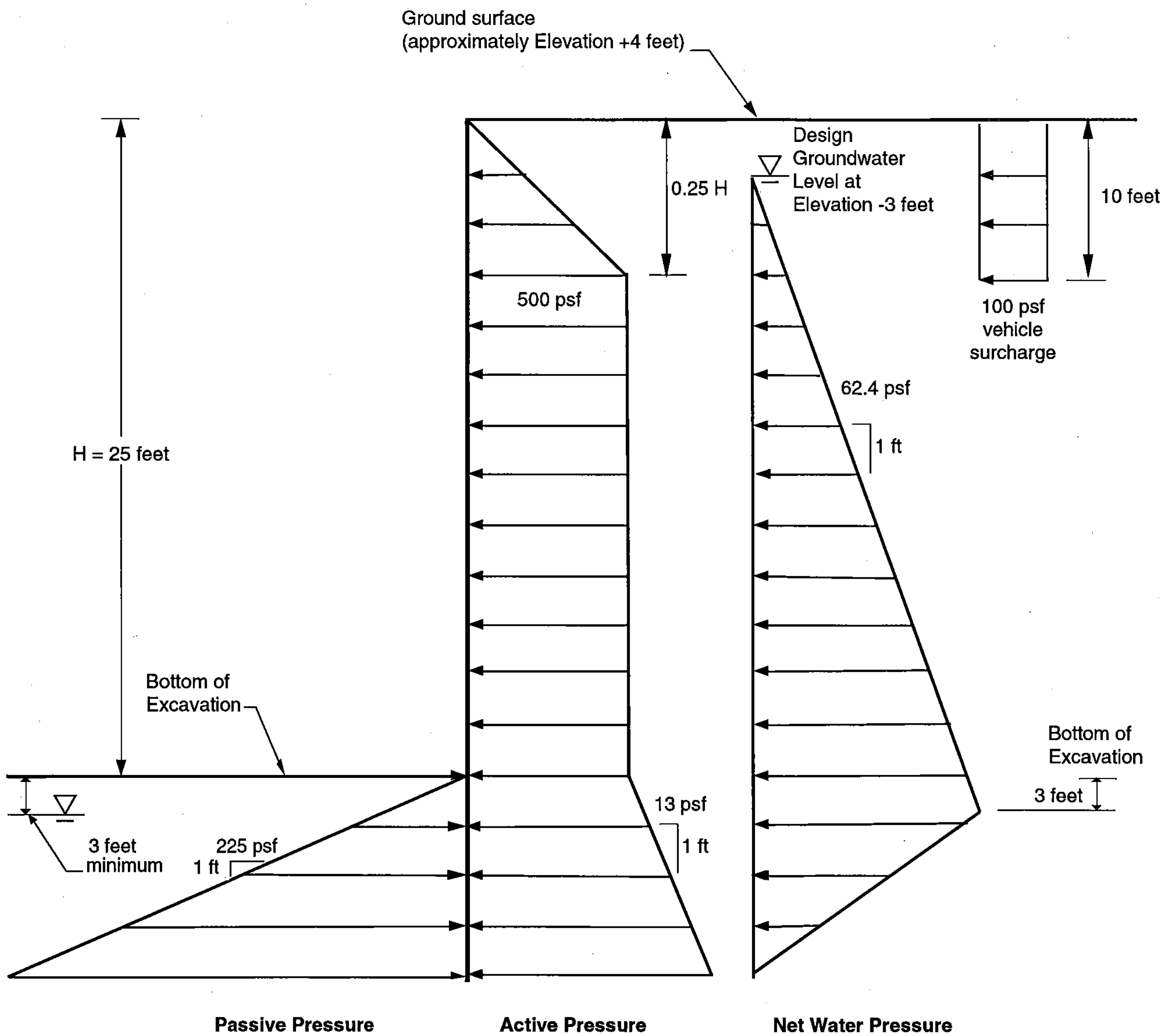
301 MISSION STREET San Francisco, California	BENDING MOMENT PROFILE FOR 14-INCH SQUARE PRECAST-PRESTRESSED CONCRETE PILES
Treadwell&Rollo	Date 01/12/05 · Project No. 3157.02 · Figure 10



CASE 1 (see Figure 3)

Notes:
1. The groundwater within the site will be lowered to at least 3 feet below the base of the excavation.
2. Passive pressure values do not include a factor of safety.
3. All elevations refer to San Francisco City Datum.

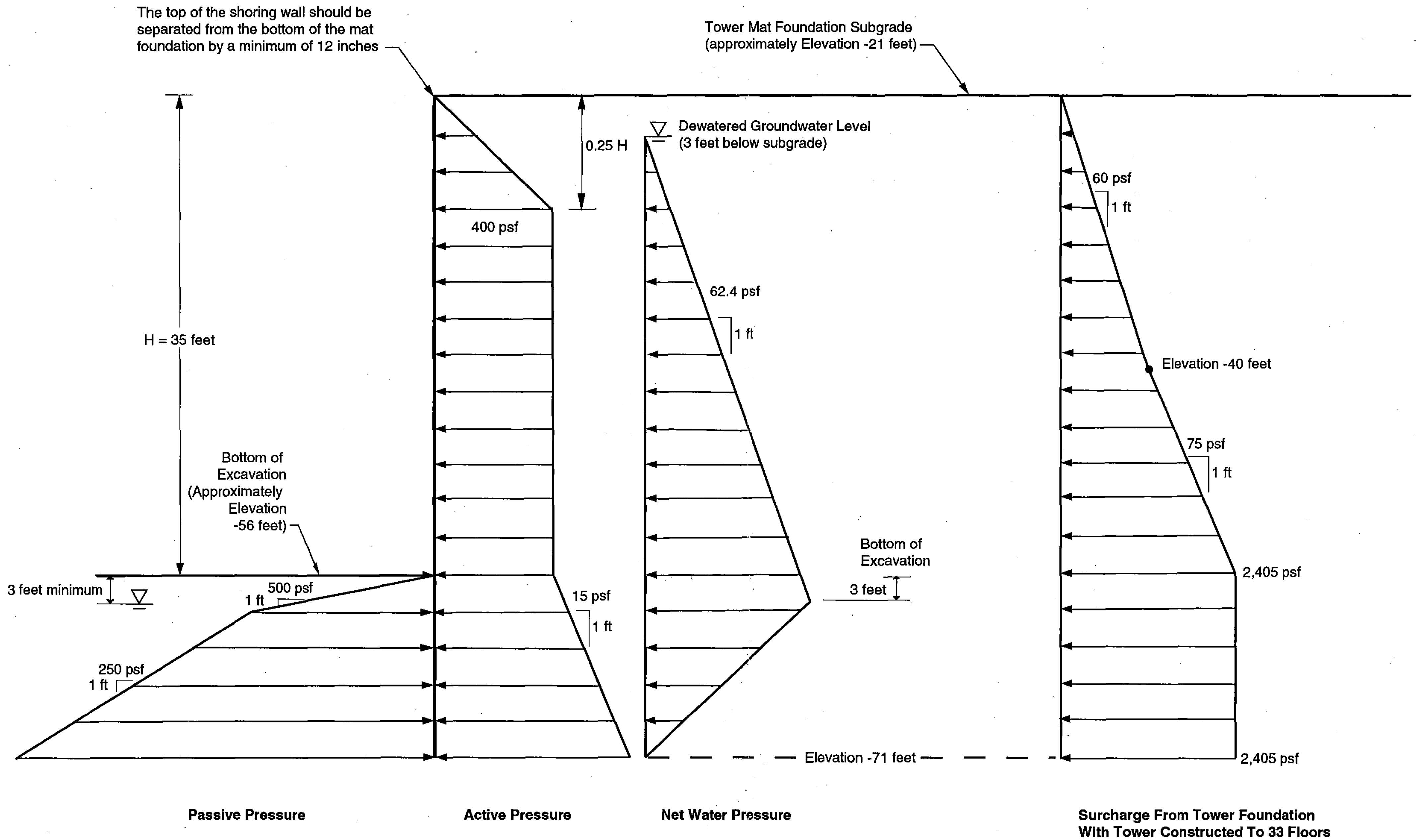
301 MISSION STREET San Francisco, California	**LATERAL EARTH PRESSURES FOR SOIL CEMENT WALL SHORING SYSTEM WITH INTERNAL BRACING FOR THE 60 FOOT DEEP EXCAVATION**
Treadwell&Rollo	Date 01/11/05 | Project No. 3157.02 | Figure 11



CASE 2 (see Figure 3)

Notes:
1. The groundwater within the site will be lowered to at least 3 feet below the base of the excavation.
2. Passive pressure values do not include a factor of safety.
3. All elevations refer to San Francisco City Datum.

301 MISSION STREET San Francisco, California	**LATERAL EARTH PRESSURES FOR SOIL CEMENT WALL SHORING SYSTEM WITH INTERNAL BRACING FOR THE 25 FOOT DEEP EXCAVATION**
Treadwell&Rollo	Date 01/11/05 | Project No. 3157.02 | Figure 12



CASE 3 (see Figure 3)

Notes:
1. The groundwater within the site will be lowered to at least 3 feet below the base of the excavation.
2. Passive pressure values do not include a factor of safety.
3. All elevations refer to San Francisco City Datum.
4. We assumed a 15 foot penetration of soil-mix wall below bottom of excavation. this should be checked by the shoring designer.

LATERAL EARTH PRESSURES FOR SOIL CEMENT WALL SHORING SYSTEM WITH INTERNAL BRACING FOR WALL BETWEEN THE TOWER AND PODIUM EXCAVATIONS

301 MISSION STREET
San Francisco, California

Date 01/11/05	Project No. 3157.02	Figure 13

Treadwell&Rollo

APPENDIX A

Geotechnical Boring Logs

PROJECT: **301 MISSION STREET** San Francisco, California

Log of Boring B-1

Boring location: See Site Plan, Figure 2

Logged by: R. Nelson

Date started: 6/28/01 | Date finished: 6/29/01

Drilling method: Rotary Wash

Hammer weight/drop: 140 lbs./30-inches | Hammer type: Safety, rope & pulley

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT), Osterberg (O)

Ground Surface Elevation: 3.5 feet[2]

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–11				GP	SANDY GRAVEL (GP) light brown, loose, dry, with concrete and brick debris						
11–11.5					CONCRETE SLAB 6-inches thick						
11.5–23				GP	SANDY GRAVEL (GP) light brown, loose, moist, with wood and concrete debris; unstabilized groundwater level at 13 feet noted during drilling						
13	S&H		30/3"								
21	S&H		4								
0–23					FILL						
23–30				CH	CLAY with SAND (CH) gray, very soft to soft, wet, with shells						
26	O		50 psi							52.9	69

Treadwell&Rollo

Project No.: 3157.01 | Figure: A-1a

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
				CH	CLAY with SAND (CH) (continued)						
31	S&H		0								
36	O		50 psi			TxUU	1,400	685		37.1	85
37				CH	Consolidation Test, See Figure C-8					35.0	87
41	S&H		2							48.4	72
44				SP	SAND (SP) gray, very dense, wet						
46	SPT		51	SP							
48				SC	CLAYEY SAND (SC) gray, medium dense, wet						
51	SPT		13		LL=17, PI=9, See Figure C-1				19	24.1	
53				SC							
58				SC	CLAYEY SAND (SC) olive-gray, dense, wet						
60											

PROJECT:	301 MISSION STREET San Francisco, California	Log of Boring B-1	PAGE 3 OF 4

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
61	S&H		43	SC	CLAYEY SAND (SC) (continued)					16.2	119
67–70				SC	CLAYEY SAND (SC) yellow-brown, very dense, wet						
70	S&H		30/5"								
78				SM	SILTY SAND (SM) olive-brown, very dense, wet						
80	S&H		30/5"							18.7	116
88–90				CL	CLAY (CL) **[OLD BAY CLAY]** gray, very stiff, wet						

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Project No.: 3157.01

Figure: A-1c

PROJECT:	301 MISSION STREET San Francisco, California	Log of Boring B-1

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					CLAY (CL) (continued)						
91	O		100 psi			TxUU	3,000	1,910		20.5	110
92											
93											
94											
95											
96				CL							
97											
98											
99											
100					green-gray, hard						
101	S&H		34								
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

Boring terminated at 101.5 feet below ground surface.
Boring backfilled with cement grout.
Unstabilized groundwater encountered at 13 feet during drilling.

[1] S&H blow counts converted to SPT N-Values using a factor of 0.6.
[2] Elevations based on San Francisco City datum.

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Project No.: 3157.01

Figure: A-1d

PROJECT:	**301 MISSION STREET** San Francisco, California	**Log of Boring B-2**

Boring location: See Site Plan, Figure 2

Logged by: R. Nelson

Date started: 6/29/01

Date finished: 6/29/01

Drilling method: Rotary Wash

Hammer weight/drop: 140 lbs./30-inches

Hammer type: Safety, rope & pulley

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT), Osterberg (O)

Ground Surface Elevation: 3.5 feet[2]

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–11				GP	SANDY GRAVEL with RUBBLE (GP) light brown, loose, dry, with concrete and brick debris (FILL, 0 to about 11.5 feet)						
11–11.5					CONCRETE SLAB, 5 to 6-inches thick						
11.5–20				SC	CLAYEY SAND (SC) dark gray, very loose, wet, with shells						
15–16.5	S&H		2	SC							
20–30				CH	CLAY with SAND (CH) gray, very soft to soft, wet, with shells						
20–22.5	O		50 psi	CH						39.0	85
25–26.5	S&H		0	CH							

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Project No.: 3157.01

Figure: A-2a

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					CLAY with SAND (CH) (continued)						
31	O	•		CH							
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											

Boring terminated at 32.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater obscured by drilling method.

[1] S&H blow counts converted to SPT N-Values using a factor of 0.6.
[2] Elevations based on San Francisco City datum.

PROJECT:	**301 MISSION STREET** San Francisco, California	**Log of Boring B-2b**

Boring location: See Site Plan, Figure 2

Logged by: R. Nelson

Date started: 7/3/01 | Date finished: 7/3/01

Drilling method: Rotary Wash

Hammer weight/drop: 140 lbs./30-inches | Hammer type: Safety, rope & pulley

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT)

Ground Surface Elevation: 3.5 feet[2]

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–11				GP	SANDY GRAVEL with RUBBLE (GP) light brown, loose, dry, with concrete, brick and metal debris (FILL)						
11					CONCRETE SLAB 5- to 6-inches thick						
11.5				CH	SANDY CLAY (CH) black, very soft, wet						
15–16.5	S&H	■	1	CH							
30											

PROJECT:	301 MISSION STREET San Francisco, California	Log of Boring B-2b	PAGE 2 OF 3

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
31				SC	CLAYEY SAND (SC) gray, loose, wet						
32											
33											
34											
35											
36	S&H		7		Particle Size Analysis, See Figure C-2				24	22.6	104
37											
38				CH	CLAY with SAND (CH) gray, soft to medium stiff, wet, with shells						
39											
40											
41	S&H		4								
42											
43											
44				SP-SC	SAND with CLAY (SP-SC) dark gray, very dense, wet						
45											
46	S&H		49/9"								
47											
48											
49											
50											
51	SPT		58								
52											
53											
54											
55											
56				SP-SC	SAND with CLAY (SP-SC) gray, medium dense to dense, wet						
57											
58											
59											
60											

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Project No.: 3157.01

Figure: A-3b

TEST GEOTECH LOG 3157/01 G.GPJ TR.GDT 1/12/05

PROJECT:	301 MISSION STREET San Francisco, California	Log of Boring B-2b

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
61	SPT		30	SP-SC	SAND with CLAY (SP-SC) (continued)						
65											
66					SAND with CLAY (SP-SC) green-gray and gray, very dense, wet						
70	S&H		30/6"	SP-SC							
76											
77				SC	CLAYEY SAND (SC) light gray-brown, very dense, wet						
80	S&H		30/4"								
90											

Boring terminated at 80.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater obscured by drilling method.

[1] S&H blow counts converted to SPT N-Values using a factor of 0.6.
[2] Elevations based on San Francisco City datum.

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Project No.: 3157.01

Figure: A-3c

TEST GEOTECH LOG 315701 G.GPJ TR.GDT 1/12/05

PROJECT:	**301 MISSION STREET** San Francisco, California	**Log of Boring B-3** PAGE 1 OF 6

Boring location: See Site Plan, Figure 2

Date started: 6/26/01 — Date finished: 6/27/01

Drilling method: Rotary Wash

Hammer weight/drop: 140 lbs./30-inches — Hammer type: Safety, rope & pulley

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT), Shelby Tube (ST), Osterberg (O)

Logged by: R. Nelson

Ground Surface Elevation: 3.5 feet[2]

DEPTH (feet)	Sampler Type	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–11			SP	GRAVELLY SAND (SP) gray-brown, dense, dry, with concrete and brick debris (FILL)						
6	SPT	46								
10				∇ 6-27-01						
11				∇ 6-26-01						
11–11.6				CONCRETE SLAB 7-inches thick						
11.6–14				WOOD						
13	S&H	24/5"								
14–17				CONCRETE						
17–22			SP	SAND (SP) dark gray, loose, wet						
19	S&H	5								
22–30			CH	CLAY (CH) gray, soft, wet, with shells and some fine sand						
26	O	50 psi							28.9	95

FILL: 0 to 17 feet.

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Project No.: 3157.01 — Figure: A-4a

TEST GEOTECH LOG 315701 G.GPJ TR.GDT 1/12/05

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					CLAY (CH) (continued)						
31	O		50 psi	CH						51.2	72
32											
33											
34											
35					SANDY CLAY (CH)						
36	O		50 psi	CH	gray, soft, wet, with silty sand lenses					37.6	65
37					Consolidation Test, See Figure C-9					44.6	75
38											
39					CLAYEY SAND (SC) gray, medium dense, wet						
40											
41	O		50 psi	SC		TxUU	1,500	595	39	32.0	91
42											
43											
44					SILTY SAND (SM)						
45	S&H		30/4"	SM	green-gray, very dense, wet						
46											
47											
48					CLAYEY SAND (SC) green-gray, medium dense, wet						
49											
50											
51	SPT		23								
52											
53				SC							
54											
55											
56											
57											
58											
59											
60				CH							

PROJECT:	301 MISSION STREET San Francisco, California	Log of Boring B-3

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
61	ST		25 psi	CH	SANDY CLAY (CH) dark gray, medium stiff, wet, with shells					47.1	75
62											
63											
64				SM	SILTY SAND (SM) green-gray, very dense, wet						
65											
66											
67	SPT		54								
68											
69											
70											
71											
72											
73											
74											
75											
76	SPT		50/6"								
77											
78											
79											
80				CL	SANDY CLAY (CL) orange-brown and olive, hard, wet						
81											
82											
83											
84											
85	S&H		38							20.1	112
86											
87											
88											
89											
90											

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Project No.: 3157.01 | Figure: A-4c

PROJECT:	**301 MISSION STREET** San Francisco, California	**Log of Boring B-3**

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
				CL	SANDY CLAY (CL) (continued)						
91											
92											
93											
94											
95	SPT		45		olive						
96											
97											
98											
99											
100											
101											
102											
103				CL	CLAY (CL) **[OLD BAY CLAY]** gray, very stiff, wet, with trace fine sand						
104											
105	S&H		22			TxUU	3,500	1,865		25.2	100
106											
107											
108											
109											
110											
111											
112											
113											
114					stiff						
115	S&H		11								
116											
117											
118											
119											
120											

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					CLAY (CL) (continued)						
121											
122											
123											
124											
125	ST		50 psi		Consolidation Test, See Figure C-10					44.6	76
126											
127											
128											
129											
130											
131											
132											
133											
134											
135	S&H		17		very stiff						
136											
137											
138											
139											
140											
141											
142											
143											
144											
145	ST		50 psi								
146											
147											
148											
149											
150											

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					CLAY (CL) (continued)						
151											
152											
153											
154											
155	S&H		20								
156											
157											
158											
159											
160											
161											
162											
163											
164											
165											
166											
167											
168											
169											
170											
171											
172											
173											
174											
175											
176											
177											
178											
179											
180											

Boring terminated at 155.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater encountered at 10 to 11 feet during drilling.

[1] S&H blow counts converted to SPT N-Values using a factor of 0.6.
[2] Elevations based on San Francisco City datum.

PROJECT: **301 MISSION STREET** San Francisco, California

Log of Boring B-4

Boring location: See Site Plan, Figure 2

Logged by: R. Nelson

Date started: 6/27/01 | Date finished: 6/28/01

Drilling method: Rotary Wash

Hammer weight/drop: 140 lbs./30-inches | Hammer type: Safety, rope & pulley

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT), Osterberg (O)

LABORATORY TEST DATA

Ground Surface Elevation: 3.5 feet[2]

DEPTH (feet)	Sampler Type	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–11			GP	SANDY GRAVEL (GP) gray-brown, dry, with concrete and brick debris (FILL)						
11–11.6				CONCRETE SLAB 7.5-inches thick						
11.6–18				RUBBLE loose, concrete, brick (FILL)						
15–16.5	S&H	5								
18–23.5			CH	SANDY CLAY (CH) dark gray, soft, wet						
20–22.5	O	50 psi								
23.5–30			CH	CLAY with SAND (CH) gray, soft, wet, with shells						
25–27.5	O	50 psi							47.0	71

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Project No.: 3157.01 | Figure: A-5a

PROJECT:	**301 MISSION STREET** San Francisco, California	**Log of Boring B-4** PAGE 2 OF 3

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					CLAY with SAND (CH) (continued)						
31	O		50 psi							33.2	86
32				CH							
33											
34					CLAYEY SAND (SC) gray, medium dense, wet						
35											
36	O		75 psi			TxUU	1,400	980	19	24.0	103
37											
38											
39				SC							
40											
41	S&H		19						24	25.4	101
42											
43											
44					SAND (SP) green-gray, very dense, wet						
45	S&H		30/5"								
46				SP							
47											
48											
49					SILTY SAND (SM) gray, medium dense, wet LL=17, PI=4, See Figure C-1						
50											
51	SPT		12						21	27.7	
52											
53				SM							
54											
55											
56											
57											
58					CLAYEY SAND (SC) green-gray, medium dense, wet						
59				SC							
60											

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Project No.: 3157.01 Figure: A-5b

TEST GEOTECH LOG 315701_G.GPJ TR.GDT 1/12/05

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
61	S&H		28	SC	CLAYEY SAND (SC) (continued)				14	20.2	111
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											

Boring terminated at 61.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater obscured by drilling method.

[1] S&H blow counts converted to SPT N-Values using a factor of 0.6.
[2] Elevations based on San Francisco City datum.

PROJECT:	301 MISSION STREET San Francisco, California	Log of Boring B-5	PAGE 1 OF 4

Boring location: See Site Plan, Figure 2	Logged by: R. Nelson
Date started: 6/29/01 / Date finished: 7/1/01	
Drilling method: Rotary Wash	
Hammer weight/drop: 140 lbs./30-inches / Hammer type: Safety, rope & pulley	LABORATORY TEST DATA
Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT), Osterberg (O)	

DEPTH (feet)	SAMPLES: Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION Ground Surface Elevation: 3 feet[2]	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–11				GP	SANDY GRAVEL with RUBBLE (GP) brown, loose, dry, with concrete and brick debris (FILL)						
11–12					CONCRETE SLAB ~11-inches thick (FILL)						
12–15					CONCRETE (FILL)						
15–30				SC-CH	CLAYEY SAND/SANDY CLAY (SC/CH) dark-gray, very loose/very soft to soft, wet, with shells						
21	S&H	▨	2								

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Project No.: 3157.01

Figure: A-6a

TEST GEOTECH LOG 315701 G.GPJ TR.GDT 1/12/05

PROJECT: **301 MISSION STREET** San Francisco, California

Log of Boring B-5

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
31	S&H		5	SC-CH	CLAYEY SAND/SANDY CLAY (SC/CH) (continued) loose/medium stiff					23.6	101
38–43				SC	CLAYEY SAND (SC) dark gray, medium dense, wet, with some fine gravel						
41	S&H		25	SC						22.0	101
43–58				SP	SAND (SP) green-gray, very dense, wet						
45	S&H		30/4"	SP							
51	SPT		42	SP	dense					16.7	
58–60				CL	CLAY with SAND (CL) gray, medium stiff to stiff, wet						

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Project No.: 3157.01 Figure: A-6b

PROJECT:	**301 MISSION STREET** San Francisco, California	**Log of Boring B-5** PAGE 3 OF 4

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
61	SPT		8	CL	CLAY with SAND (CL) (continued)						
62											
63											
64											
65											
66											
67											
68											
69				SC	CLAYEY SAND (SC) green-gray, medium dense, wet						
70											
71	S&H		19							32.2	87
72											
73											
74											
75											
76				SP	SILTY SAND (SM) yellow-brown, dense, wet						
77											
78											
79											
80											
81	S&H		37								
82											
83											
84											
85											
86				SP	SAND (SP) gray, very dense, wet						
87											
88											
89											
90											

PROJECT: **301 MISSION STREET** San Francisco, California

Log of Boring B-5

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
90–91	SPT		50/6"	SP	SAND (SP) (continued)						
95–101				SC	CLAYEY SAND (SC) green-gray, very dense, wet						
100	SPT		50/3"								

Depth scale: 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120

Boring terminated at 101.0 feet below ground surface.
Boring backfilled with cement grout.
Groundwater obscured by drilling method.

[1] S&H blow counts converted to SPT N-Values using a factor of 0.6.
[2] Elevations based on San Francisco City datum.

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Project No.: 3157.01 | Figure: A-6d

PROJECT:	**301 MISSION STREET** San Francisco, California	**Log of Boring B-6** PAGE 1 OF 7

Boring location: See Site Plan, Figure 2	Logged by: R. Reindl
Date started: 5/12/04 Date finished: 5/13/04	
Drilling method: Rotary Wash	
Hammer weight/drop: 140 lbs./30-inches Hammer type: Safety	LABORATORY TEST DATA
Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT), Shelby Tube (ST)	

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION (Ground Surface Elevation: +4 feet[2])		Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–11				GP	GRAVEL with SAND (GP) gray brown, dry, with concrete and brick debris	FILL						
11–17					6-feet-thick Concrete Slab	FILL						
17–30				CH	CLAY (CH) gray, soft, wet, with shells, sand and silt							
25–26.5	S&H	■	2									

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Project No.: 3157.02 Figure: A-7a

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					CLAY (CH) (continued)						
31											
32											
33											
34											
35											
36											
37				CH							
38					sandy, gravelly cuttings from 38 to 42 feet						
39											
40											
41											
42					less sand and gravel in cuttings from 42 to 45 feet						
43											
44											
45	SPT		50/ 6"		SAND (SP) gray, very dense, wet, fine grained						
46											
47											
48											
49											
50											
51											
52				SP							
53											
54											
55											
56											
57											
58											
59				CH	CLAY (CH)						
60											

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
61	S&H		2		CLAY (CH) (continued) gray, soft, wet						
62											
63											
64											
65				CH							
66											
67											
68											
69											
70					SAND (SP) gray, very dense, moist, fine grained						
71											
72											
73											
74											
75											
76	SPT		65								
77											
78											
79											
80				SP							
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											

PROJECT:	301 MISSION STREET San Francisco, California	Log of Boring B-6

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					SAND (SP) (continued)						
91											
92				SP	grades with clay and dark brown organics						
93											
94				SP	SAND (SP) gray, dense, wet, fine grained						
95	S&H		33								
96					CLAY (CH) dark gray, stiff, wet						
97											
98				CH							
99											
100					CLAY with SAND (CH) greenish-gray, stiff, wet, with trace of sand						
101–103											
104			100 psi to 350 psi								
105	ST					TV		400			
106–109											
110			100 to 200 psi	CH							
111	ST									40.3	82
112						TV		1,500			
113–120					OLD BAY CLAY						

PROJECT:	**301 MISSION STREET** San Francisco, California	**Log of Boring B-6** PAGE 5 OF 7

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					CLAY with SAND (CH) (continued)						
121	ST		100 to 200 psi							42.9	78
122						TV		1,400			
123					dark gray, trace organics, no sand						
124											
125											
126											
127											
128											
129											
130											
131	ST		100 to 200 psi		Consolidation Test, See Figure B-1					42.3	79
132						TV		1,400			
133											
134											
135				CH	OLD BAY CLAY						
136											
137											
138											
139											
140											
141	ST		100 to 200 psi							41.6	82
142						TV		1,600			
143											
144											
145											
146											
147											
148											
149											
150											

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Project No.: 3157.02

Figure: A-7e

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					CLAY with SAND (CH) (continued)						
151	ST		100 to 225 psi								
152						TV		1,700			
153											
154											
155											
156											
157											
158											
159											
160											
161	ST		100 to 200 psi								
162						TV		2,000			
163											
164											
165				CH	OLD BAY CLAY						
166											
167											
168											
169											
170											
171	ST		100 to 250 psi		Consolidatation Test, See Figure B-2					45.3	76
172						TV		2,700			
173											
174					sand lense						
175											
176											
177											
178					green gray, hard, wet, trace sand and organics						
179											
180											

PROJECT:	301 MISSION STREET San Francisco, California	Log of Boring B-6

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION		Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
181	ST		100 to 400 psi	CH	CLAY (CL) (continued) very stiff	OLD BAY CLAY	TV		2,250		36.9	87
182												
183												
184												
185												
186												
187												
188												
189												
190												
191	S&H		36		hard						33.3	89
192												
193												
194												
195												
196												
197												
198												
199												
200	S&H		30/ 3.5"	CL	CLAY (CL) dark brown, hard, wet							
201				SP	SAND (SP) dark brown, very dense, wet							
202												
203												
204												
205												
206												
207												
208												
209												
210												

Boring terminated at 200.75 feet below ground surface.
Boring backfilled with cement grout under the observation of the SFDPH.
Groundwater level was obscured by drilling method.

[1] S&H blow counts converted to SPT N-Values using a factor of 0.6.
[2] Elevations based on San Francisco City datum.

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Project No.: 3157.02 | Figure: A-7g

TEST GEOTECH LOG 315702.GPJ TR.GDT 1/12/05

PROJECT:	301 MISSION STREET San Francisco, California	Log of Boring B-7

Boring location:	See Site Plan, Figure 2	Logged by:	L. Bedolla
Date started:	5/14/04	Date finished:	5/17/04
Drilling method:	Rotary Wash		
Hammer weight/drop:	140 lbs./30-inches	Hammer type:	Safety
Sampler:	Sprague & Henwood (S&H), Standard Penetration Test (SPT), Shelby Tube (ST)		

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION — Ground Surface Elevation: +4 feet[2]		LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
0–11				SP	SAND with GRAVEL (SP) gray brown, loose, dry, with brick and concrete	FILL						
11–12					12-inches-thick Concrete Slab							
12–17				SM	SILTY SAND (SM) dark gray, medium dense, wet, with brick							
16	S&H		11									
17–19				CH	CLAY (CH) black, soft to medium stiff, wet, with rubble and organics							
19–30				CH	CLAY (CH) gray, soft to medium stiff, wet, trace sand and shells							

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Project No.: 3157.02 Figure: A-8a

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
30–35				CH	CLAY (CH) (continued)						
35–36	ST		100 to 200 psi								
36–41				SM	SILTY SAND (SM) gray, medium dense, wet						
41–45				CH	CLAY with SAND (CH) gray, medium stiff, wet, trace shells						
45					no sand						
48					with sand						
56	S&H		4			TV		800			

PROJECT: **301 MISSION STREET** San Francisco, California

Log of Boring B-7

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
61–64				CH	SANDY CLAY (CH) dark gray to black, medium stiff to stiff, wet						
65–67				CL	SANDY CLAY (CL) green gray, stiff, wet						
68–70				SM	SILTY SAND (SM) yellow brown, dense, wet, pockets of clayey sand and cemented sand						
71	S&H	■	33		gray yellow brown						
72–79											
80	S&H	■	30/ 6"								
81–87					very dense						
88–90				CL	CLAY with SAND (CL) olive gray, medium stiff to stiff, wet OLD BAY CLAY						

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Project No.: 3157.02

Figure: A-8c

TEST GEOTECH LOG 315702.GPJ TR.GDT 1/12/05

PROJECT: **301 MISSION STREET** San Francisco, California

Log of Boring B-7

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
91	ST		100 to 400 psi		CLAY with SAND (CL)						
92				SM	SILTY SAND (SM) dark gray, medium dense to dense, wet						
94				CL	SANDY CLAY (CL) olive gray, stiff, wet						
97				CL	CLAY (CL) dark gray, stiff, wet						
101	ST		100 to 200 psi		with silt and fine sand					33.7	90
102						TV		950			
111	ST		100 to 180 psi		less silt and no fine sand					40.2	80
112					Consolidation Test, See Figure B-3	TV		800			
120											

LABORATORY TEST DATA

OLD BAY CLAY (91–120 ft)

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Project No.: 3157.02 | Figure: A-8d

PROJECT:	301 MISSION STREET San Francisco, California	Log of Boring B-7

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					CLAY (CL) (continued)						
121	ST		100 to 200 psi							41.3	81
122						TV		900			
123											
124											
125											
126											
127											
128											
129											
130											
131	ST		100 to 200 psi							43.1	79
132						TV		1,200			
133											
134											
135					OLD BAY CLAY						
136											
137											
138											
139											
140											
141	ST		100 to 200 psi								
142						TV		1,300			
143											
144											
145											
146											
147											
148											
149											
150											

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					CLAY (CL) (continued)						
151	ST		100 to 225 psi		Consolidation Test, See Figure B-4					42.4	78
152						TV		1,500			
153											
154											
155											
156											
157											
158											
159											
160											
161	ST		100 to 200 psi							44.1	77
162						TV		1,900			
163											
164											
165				CL	OLD BAY CLAY						
166											
167											
168											
169											
170					green gray, very stiff, wet, trace sand and organics						
171	ST		100 to 200 psi								
172						TV		2,200			
173											
174											
175											
176											
177											
178											
179											
180											

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION		Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
181	ST		150 to 200 psi	CL	CLAY (CL) (continued) gray	OLD BAY CLAY						
182							TV		2,700			
183												
184												
185												
186												
187												
188												
189												
190				CL								
191	ST		0 to 150 psi		Consolidation Test, See Figure B-5						36.7	85
192							TV		2,400			
193												
194												
195												
196												
197												
198												
199												
200				CL	SANDY CLAY (CL) gray brown, very stiff, wet, trace organics							
201	ST		0 to 300 psi									
202							TV		2,300			
203												
204				CL								
205												
206												
207												
208				SM	SILTY SAND (SM) gray, very dense, wet, trace organics							
209				SM								
210												

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
	S&H		30/ 3"	SM	SILTY SAND (SM) (continued)						
211											
212											
213											
214											
215											
216											
217				CL	CLAY (CL) gray, hard, wet						
218											
219											
220											
221											
222											
223											
224											
225											
226											
227											
228											
229											
230											
231											
232											
233											
234											
235											
236											
237											
238											
239											
240											

Boring terminated at 220 feet below ground surface. Boring backfilled with cement grout under the observation of the SFDPH.
Groundwater level was obscured by drilling method.

[1] S&H blow counts converted to SPT N-Values using a factor of 0.6.
[2] Elevations based on San Francisco City datum.

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Symbols	Typical Names
Coarse-Grained Soils (more than half of soil > no. 200 sieve size	Gravels (More than half of coarse fraction > no. 4 sieve size)	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	Sands (More than half of coarse fraction < no. 4 sieve size)	SW	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
Fine -Grained Soils (more than half of soil < no. 200 sieve size)	Silts and Clays LL = < 50	ML	Inorganic silts and clayey silts of low plasticity, sandy silts, gravelly silts
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	Silts and Clays LL = > 50	MH	Inorganic silts of high plasticity
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic silts and clays of high plasticity
Highly Organic Soils		PT	Peat and other highly organic soils

GRAIN SIZE CHART

Classification	Range of Grain Sizes: U.S. Standard Sieve Size	Range of Grain Sizes: Grain Size in Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel	3" to No. 4	76.2 to 4.76
coarse	3" to 3/4"	76.2 to 19.1
fine	3/4" to No. 4	19.1 to 4.76
Sand	No. 4 to No. 200	4.76 to 0.074
coarse	No. 4 to No. 10	4.76 to 2.00
medium	No. 10 to No. 40	2.00 to 0.420
fine	No. 40 to No. 200	0.420 to 0.074
Silt and Clay	Below No. 200	Below 0.074

Unstabilized groundwater level

Stabilized groundwater level

SAMPLE DESIGNATIONS/SYMBOLS

Sample taken with Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter. Darkened area indicates soil recovered

Classification sample taken with Standard Penetration Test sampler

Undisturbed sample taken with thin-walled tube

Disturbed sample

Sampling attempted with no recovery

Core sample

Analytical laboratory sample

Sample taken with Direct Push sampler

SAMPLER TYPE

C	Core barrel
CA	California split-barrel sampler with 2.5-inch outside diameter and a 1.93-inch inside diameter
D&M	Dames & Moore piston sampler using 2.5-inch outside diameter, thin-walled tube
O	Osterberg piston sampler using 3.0-inch outside diameter, thin-walled Shelby tube
PT	Pitcher tube sampler using 3.0-inch outside diameter, thin-walled Shelby tube
S&H	Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter
SPT	Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside diameter and a 1.5-inch inside diameter
ST	Shelby Tube (3.0-inch outside diameter, thin-walled tube) advanced with hydraulic pressure

301 MISSION STREET
San Francisco, California

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CLASSIFICATION CHART

Date 01/12/05 | Project No. 3157.02 | Figure A-9

APPENDIX B

Environmental Boring Logs

PROJECT:	301 MISSION STREET San Francisco, California	Log of Boring TR-1 PAGE 1 OF 1

Boring location: See Site Plan, Figure 2	Logged by: C. Keane
Date started: 7/5/01	Date finished: 7/5/01
Drilling method: Hand Auger	
Hammer weight/drop: ---	Hammer type: ---
Sampler: ---	

DEPTH (feet)	SAMPLES: Sample Number	Sample	Blow Count	Recovery (inches)	OVM (ppm)	LITHOLOGY	MATERIAL DESCRIPTION
							CONCRETE SLAB
0–1							Concrete core to 6-inches, rubber membrane 1/4" thick, second concrete slab to total of 13-1/2"
1–2						SP	SILTY SAND brown, moist, with brick fragments **FILL**
2–4	TR-1-3.5 TR-1-4.0					SP	SAND grey, wet Groundwater encountered at 3 feet

Depth scale: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Boring terminated at 4.0 feet.
Boring backfilled with bentonite grout mix.
Groundwater encountered at 3.0 feet.

Treadwell&Rollo

Project No.: 3157.01	Figure: B-1

PROJECT:	301 MISSION STREET San Francisco, California	Log of Boring TR-2	PAGE 1 OF 1

Boring location: See Site Plan, Figure 2

Logged by: C. Keane

Date started: 7/5/01 | Date finished: 7/5/01

Drilling method: Hand Auger

Hammer weight/drop: --- | Hammer type: ---

Sampler: ---

DEPTH (feet)	Sample Number	Sample	Blow Count	Recovery (inches)	OVM (ppm)	LITHOLOGY	MATERIAL DESCRIPTION
							CONCRETE SLAB
0–1.33							16-inch concrete slab
1.33–2						SP	SILTY SAND brown, loose, with brick fragments — FILL
2–4	TR-2-3.5 TR-2-4.0					SP	SAND grey, loose, wet, fine-grained groundwater encountered at 2 feet.

Depth scale: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Boring terminated at 4.0 feet.
Boring backfilled with bentonite grout mix.
Groundwater encountered at 2.0 feet.

Treadwell&Rollo

Project No.: 3157.01 | Figure: B-2

TEST ENVIRONMENTAL 315701_E.GPJ T&R.GDT 1/11/05

PROJECT:	**301 MISSION STREET** San Francisco, California	**Log of Boring TR-3** PAGE 1 OF 1

Boring location: See Site Plan, Figure 2		Logged by: C. Keane
Date started: 7/5/01	Date finished: 7/5/01	
Drilling method: Hand Auger		
Hammer weight/drop: ---	Hammer type: ---	
Sampler: ---		

DEPTH (feet)	SAMPLES: Sample Number	Sample	Blow Count	Recovery (inches)	OVM (ppm)	LITHOLOGY	MATERIAL DESCRIPTION
							CONCRETE SLAB
0–1							10-inch layer of concrete
1–2						SP	SILTY SAND brown, moist, with brick fragments **FILL**
2–4	TR-3-3.5, TR-3-4.0					SP	SAND grey, dense, dry, trace of clayey sand

Depth scale: 1–30 feet.

Boring terminated at 4.0 feet.
Boring backfilled with bentonite grout.
Groundwater not encountered during drilling.

Treadwell&Rollo

Project No.: 3157.01 | Figure: B-3

TEST ENVIRONMENTAL 315701_E.GPJ T&R.GDT 1/11/05

PROJECT:	301 MISSION STREET San Francisco, California	Log of Boring TR-4	PAGE 1 OF 1

Boring location: See Site Plan, Figure 2		Logged by: C. Keane
Date started: 7/5/01	Date finished: 7/5/01	
Drilling method: Hand Auger		
Hammer weight/drop: ---	Hammer type: ---	
Sampler: ---		

DEPTH (feet)	SAMPLES: Sample Number	Sample	Blow Count	Recovery (inches)	OVM (ppm)	LITHOLOGY	MATERIAL DESCRIPTION
							CONCRETE SLAB
							8-inch concrete slab
1						SP	SAND brown, then grey after 1-foot, loose, moist
2							
3	TR-4-3.0 TR-4-3.5						∇
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

Boring terminated at 3.5 feet.
Boring backfilled with bentonite grout.
Groundwater encountered at 3.0 feet.

Treadwell&Rollo

Project No.: 3157.01 | Figure: B-4

PROJECT:	**301 MISSION STREET** San Francisco, California	**Log of Boring TR-5** PAGE 1 OF 1

Boring location: See Site Plan, Figure 2	Logged by: C. Keane
Date started: 7/5/01 — Date finished: 7/5/01	
Drilling method: Hand Auger	
Hammer weight/drop: ---	Hammer type: ---
Sampler: ---	

DEPTH (feet)	SAMPLES: Sample Number	Sample	Blow Count	Recovery (inches)	OVM (ppm)	LITHOLOGY	MATERIAL DESCRIPTION
							CONCRETE SLAB
							6-inch concrete slab
1						SP	SILTY SAND light-brown, moist, with brick fragments **FILL**
2							
3	TR-5-3.0 TR-5-3.5					SP	SAND ∇ grey, dense, wet, fine-grained, poorly-graded
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

Boring terminated at 3.5 feet.
Boring backfilled with bentonite grout.
Groundwater encountered at 3.5 feet.

Treadwell&Rollo

Project No.:	Figure:
3157.01	B-5

PROJECT:	**301 MISSION STREET** San Francisco, California	**Log of Boring TR-6** PAGE 1 OF 1

Boring location: See Site Plan, Figure 2		Logged by: C. Keane
Date started: 7/5/01	Date finished: 7/5/01	
Drilling method: Hand Auger		
Hammer weight/drop: ---	Hammer type: ---	
Sampler: ---		

DEPTH (feet)	SAMPLES: Sample Number	Sample	Blow Count	Recovery (inches)	OVM (ppm)	LITHOLOGY	MATERIAL DESCRIPTION	
							CONCRETE SLAB	
0.5							6-inch concrete slab	
1						SP	SAND dark brown, loose, dry, fine-grained, poorly-graded with red brick	FILL
5							black coal waste porcelain	
7							wood pieces	
8	TR-6-8.0	■						

Depth scale: 1–30 feet.

Borehole keeps collapsing in itself. Further sampling is not possible.
Boring terminated at 8.0 feet.
Boring backfilled with bentonite grout mix.
Groundwater not encountered during drilling.

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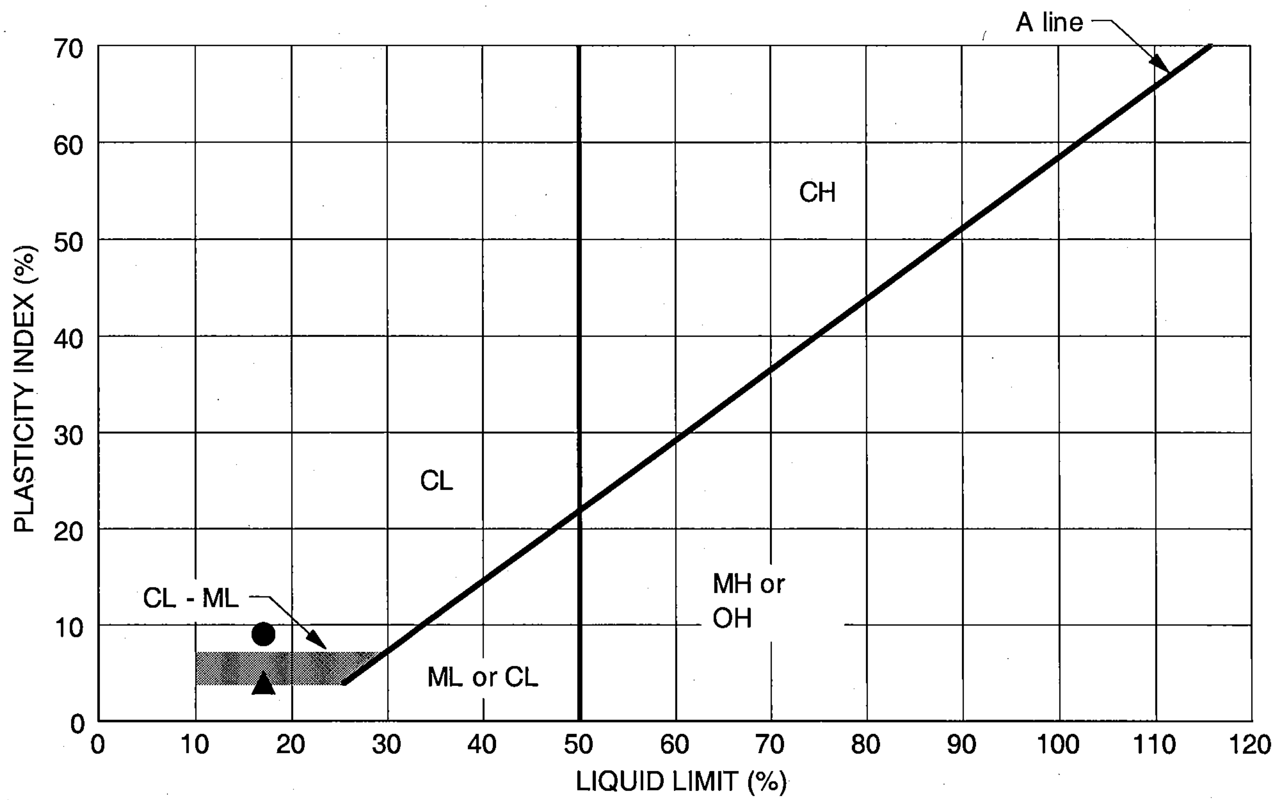
Project No.: 3157.01 | Figure: B-6

APPENDIX C

Laboratory Test Data



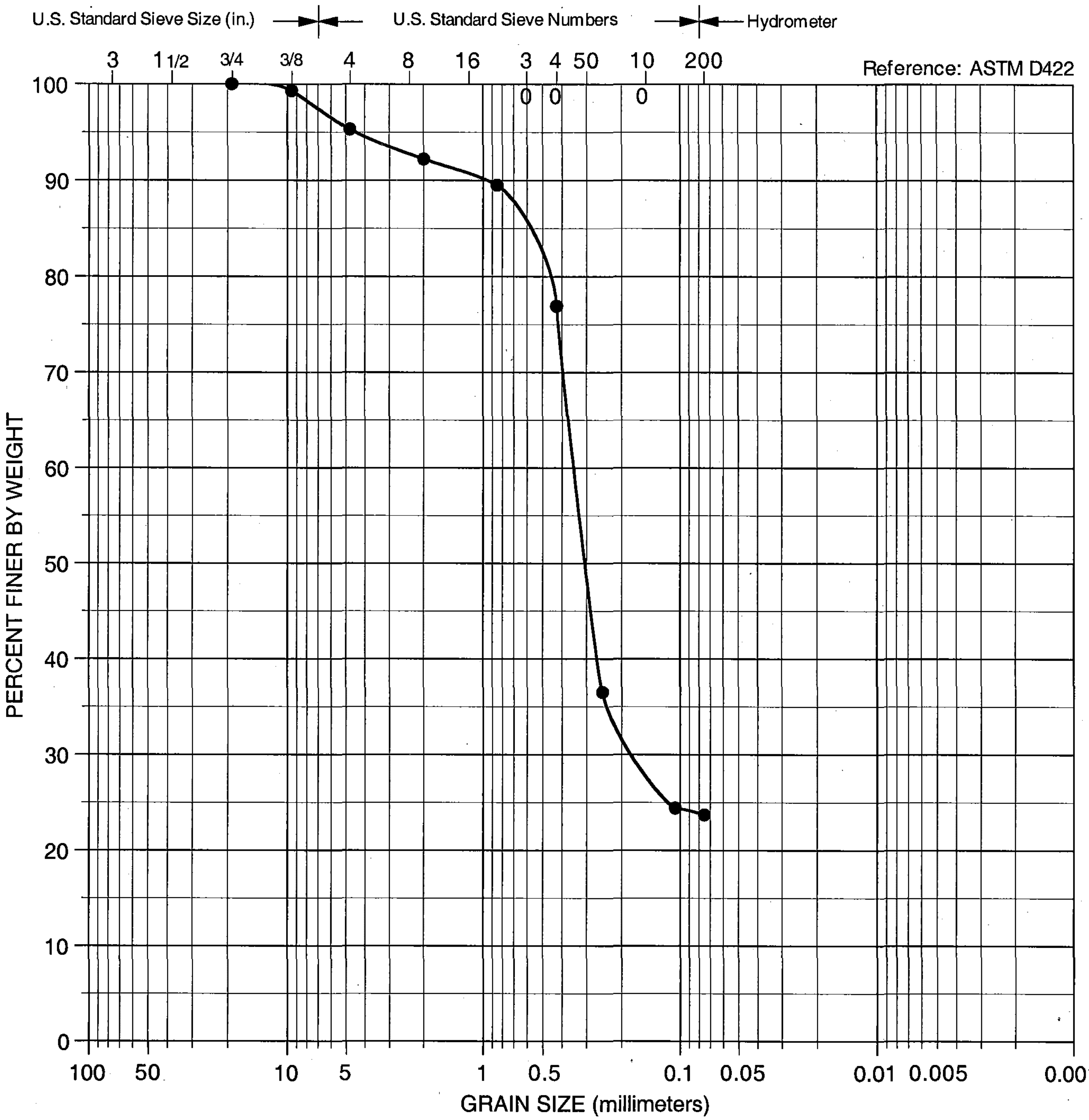
Symbol	Source	Description and Classification	Natural M.C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
●	B-1 at 50 feet	CLAYEY SAND (SC), gray	24.1	17	9	19
▲	B-4 at 50 feet	SILTY SAND (SM), gray	27.7	17	4	21

301 MISSION STREET
San Francisco, California

Treadwell&Rollo

PLASTICITY CHART

Date 08/08/01 | Project No. 3157.01 | Figure C-1



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

Symbol	Sample Source	Classification
●	B-26 at 36 feet	CLAYEY SAND (SC), gray

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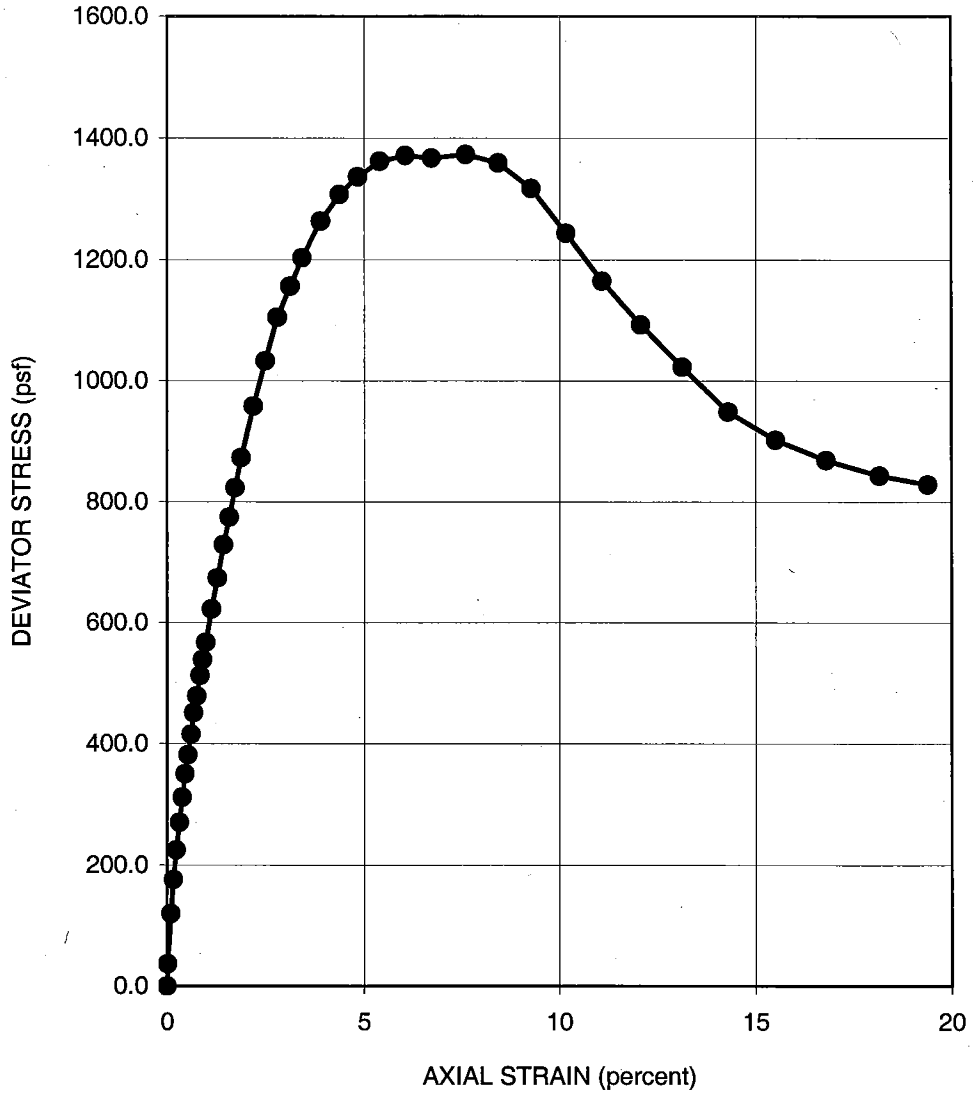
PARTICLE SIZE ANALYSIS

Date 08/13/01	Project No. 3157.01	Figure C-2



SAMPLER TYPE	Osterberg			SHEAR STRENGTH	685	psf
DIAMETER (in.)	2.9	HEIGHT (in.)	6.0	STRAIN AT FAILURE	7.6	%
MOISTURE CONTENT		37.1	%	CONFINING PRESSURE	1400	psf
DRY DENSITY		85	pcf	STRAIN RATE	0.67	% / min
DESCRIPTION	CLAY with SAND (CH), gray			SOURCE	B-1 at 35 Feet	

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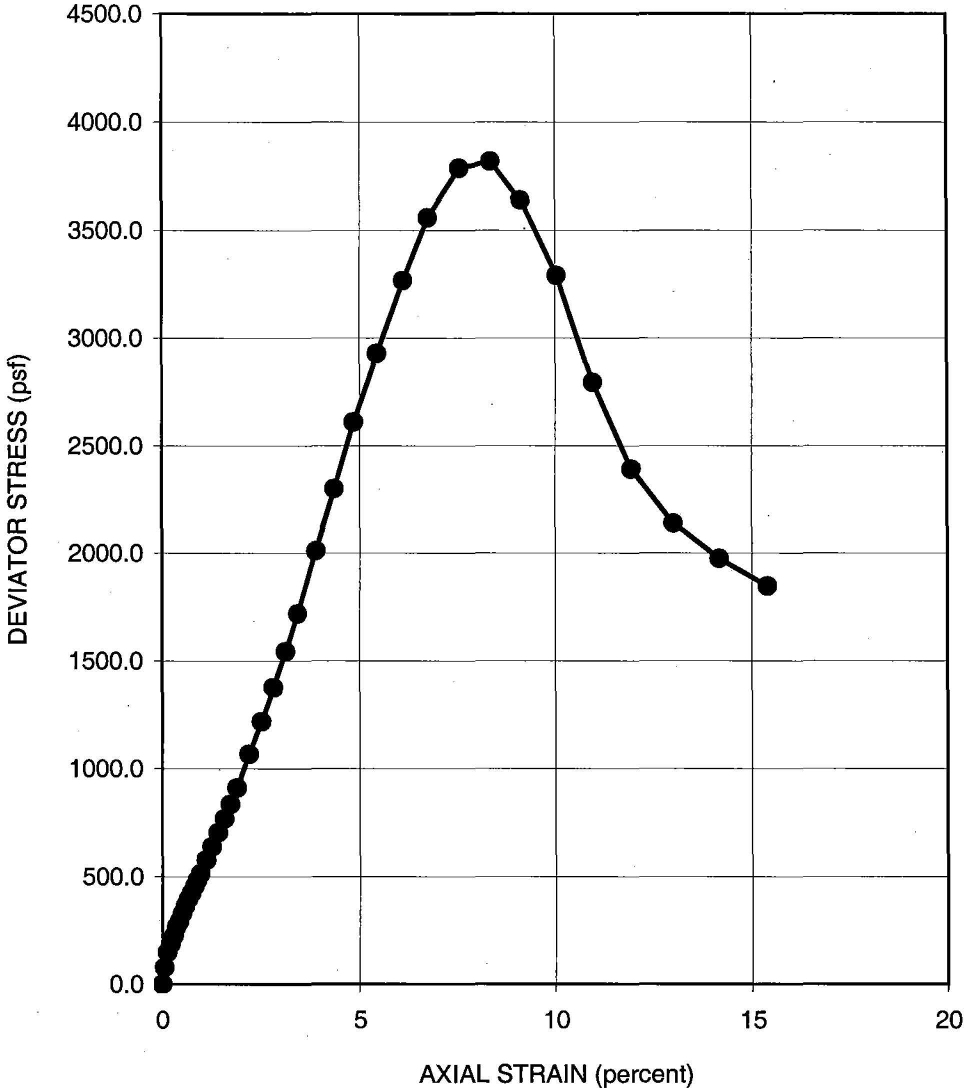
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date 01/11/05 | Project No. 3157.01 | Figure C-3



SAMPLER TYPE	Osterberg			SHEAR STRENGTH	1910	psf
DIAMETER (in.)	2.9	HEIGHT (in.)	6.0	STRAIN AT FAILURE	8.4	%
MOISTURE CONTENT		20.5	%	CONFINING PRESSURE	3000	psf
DRY DENSITY		110	pcf	STRAIN RATE	0.67	% / min
DESCRIPTION	CLAY (CL), gray			SOURCE	B-1 at 90 Feet	

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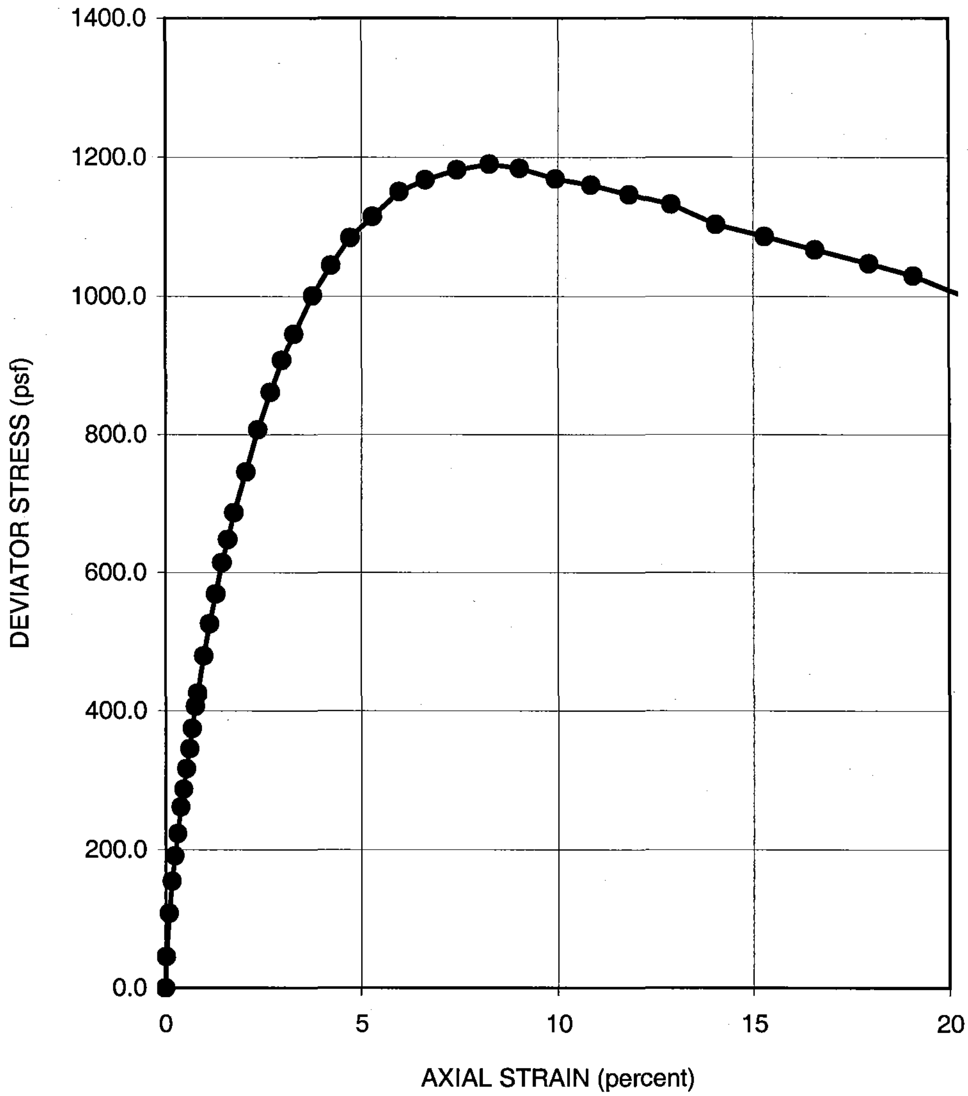
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date	01/11/05	Project No.	3157.01	Figure	C-4



SAMPLER TYPE	Osterberg			SHEAR STRENGTH	595	psf
DIAMETER (in.)	2.9	HEIGHT (in.)	6.0	STRAIN AT FAILURE	8.2	%
MOISTURE CONTENT		32.0	%	CONFINING PRESSURE	1500	psf
DRY DENSITY		91	pcf	STRAIN RATE	0.67	% / min
DESCRIPTION	SANDY CLAY (CH), gray			SOURCE	B-3 at 40 Feet	

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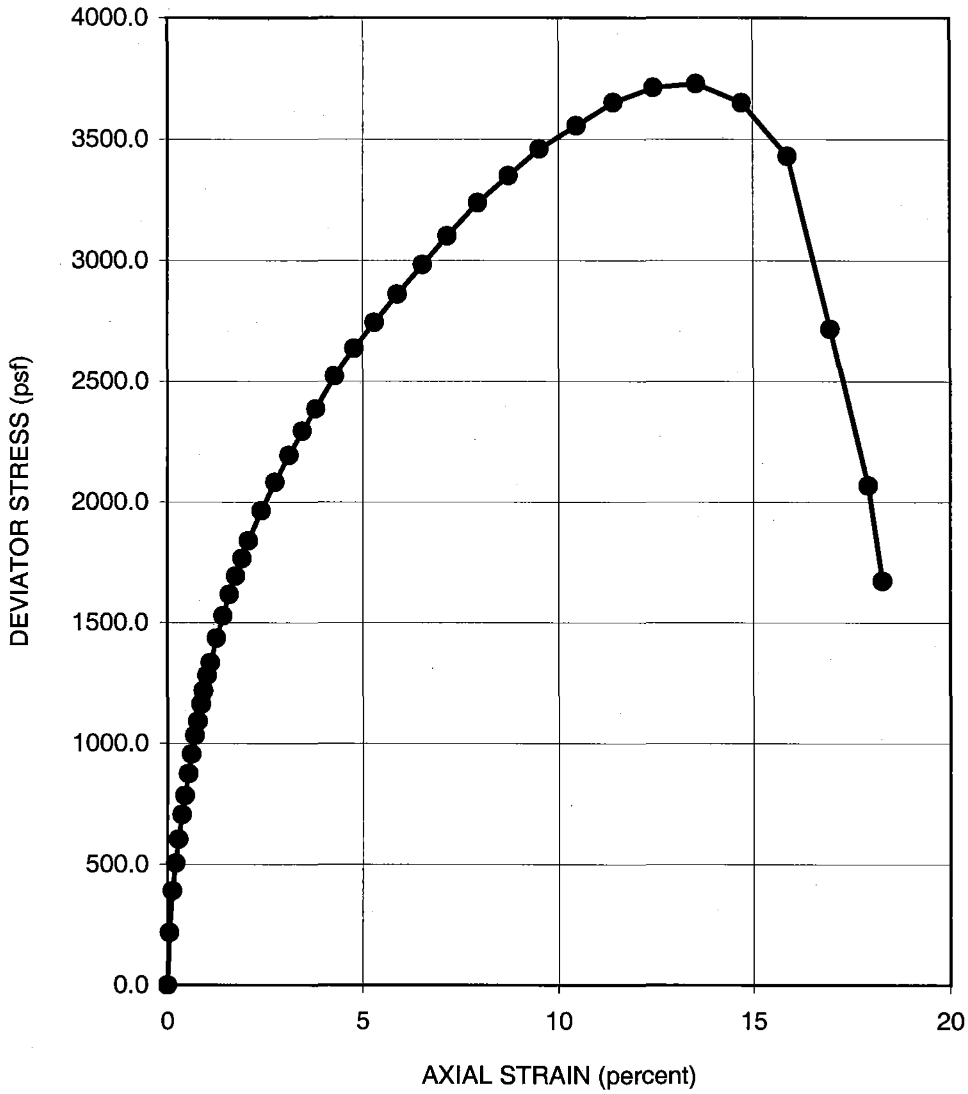
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date 01/11/05 | Project No. 3157.01 | Figure C-5



SAMPLER TYPE	Sprague & Henwood			SHEAR STRENGTH	1865	psf
DIAMETER (in.) 2.4	HEIGHT (in.) 5.8			STRAIN AT FAILURE	13.5	%
MOISTURE CONTENT		25.2	%	CONFINING PRESSURE	3500	psf
DRY DENSITY		100	pcf	STRAIN RATE	0.69	% / min
DESCRIPTION	CLAY (CL), gray			SOURCE B-3 at 105 Feet		

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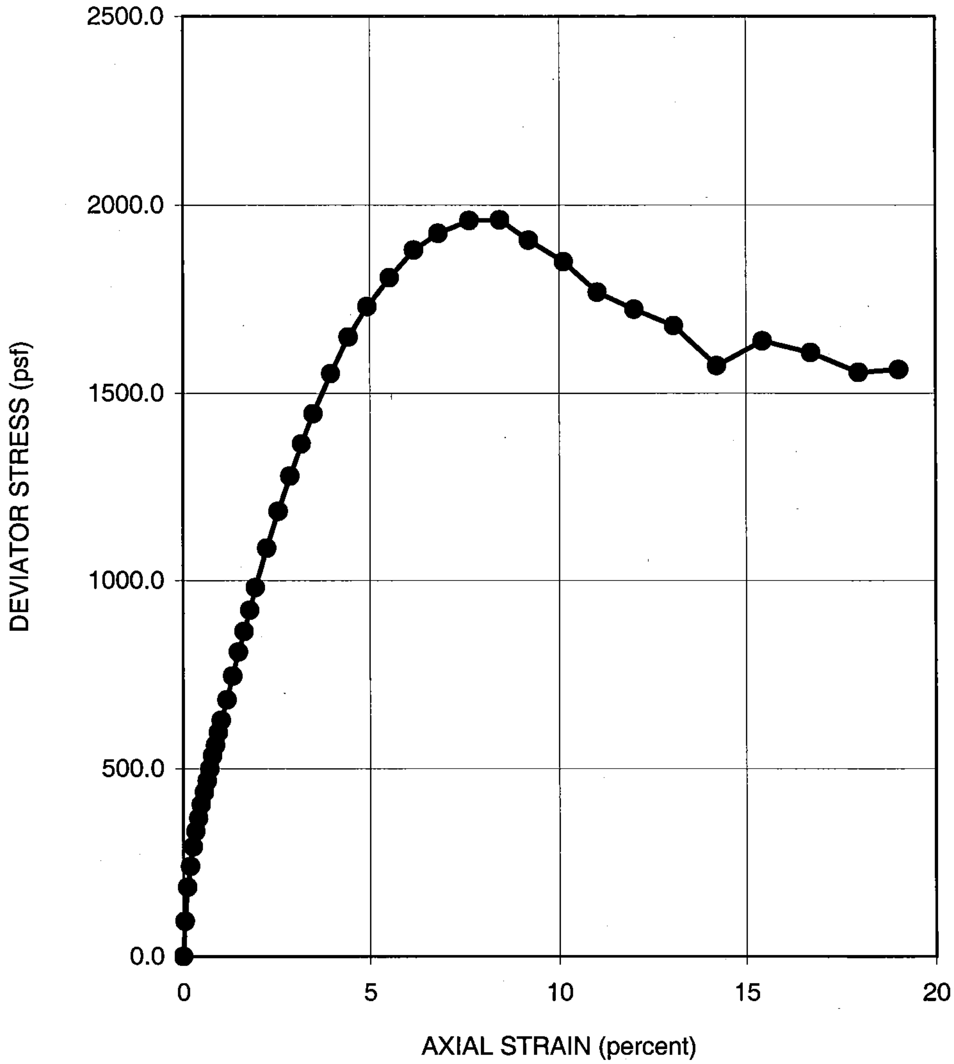
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date 01/11/05	Project No. 3157.01	Figure C-6



SAMPLER TYPE	Osterberg			SHEAR STRENGTH	980	psf
DIAMETER (in.)	2.9	HEIGHT (in.) 6.0		STRAIN AT FAILURE	8.4	%
MOISTURE CONTENT		24.0	%	CONFINING PRESSURE	1400	psf
DRY DENSITY		103	pcf	STRAIN RATE	0.67	% / min
DESCRIPTION	CLAYEY SAND (SC), gray			SOURCE	B-4 at 35 Feet	

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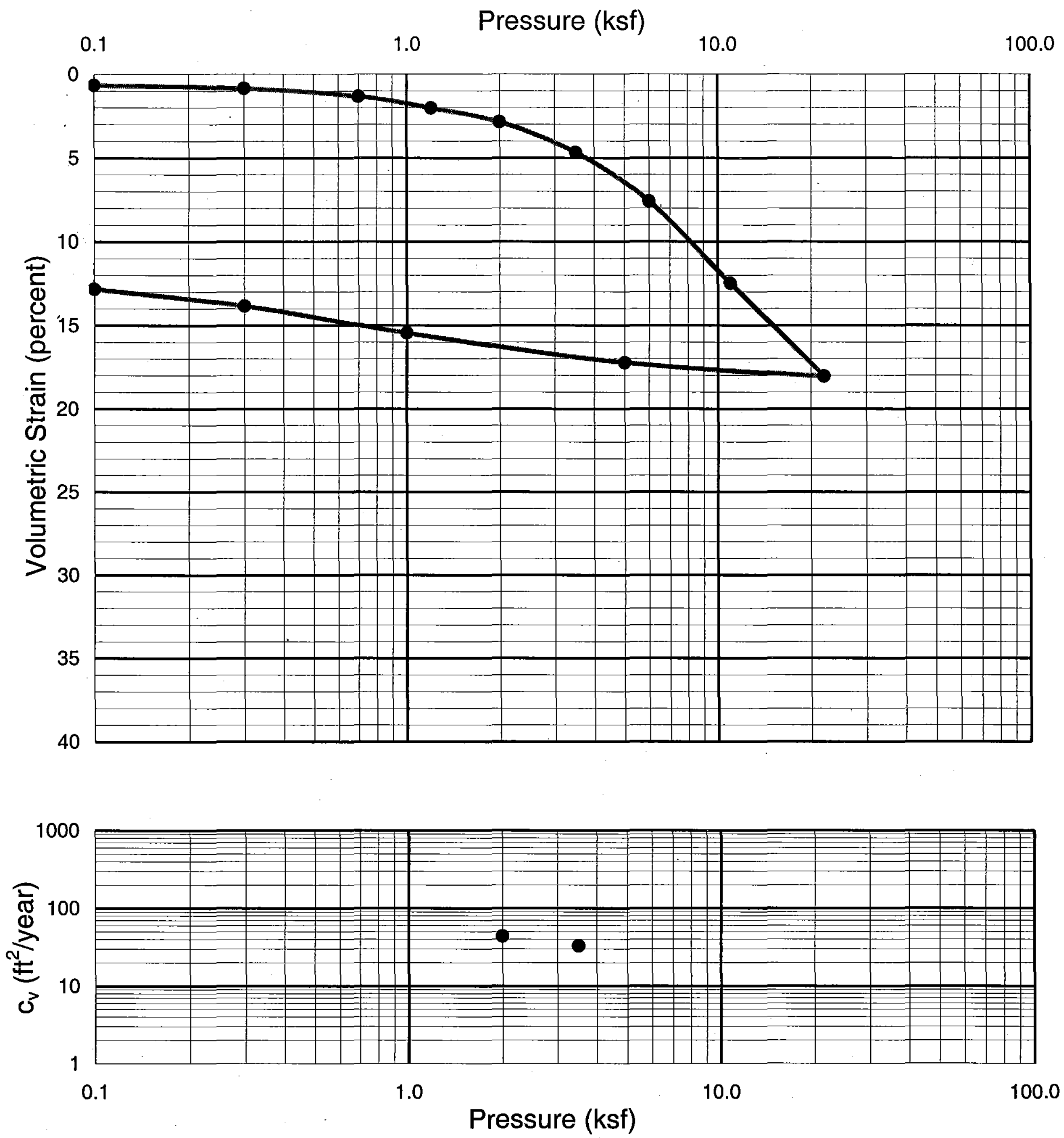
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date 01/11/05	Project No. 3157.01	Figure C-7



Sampler Type: Osterberg				Condition		Before Test		After Test	
Diameter (in) 2.42		Height (in) 1.00		Water Content	w_o	35.0 %		w_f	27.2 %
Overburden Pressure, p_o	2,660	psf		Void Ratio	e_o	0.93		e_f	0.68
Preconsol. Pressure, p_c	3,600	psf		Saturation	S_o	100 %		S_f	100 %
Compression Ratio, $C_{\varepsilon c}$	0.22			Dry Density	γ_d	87 pcf		γ_d	100 pcf
LL ---		PL ---		PI ---			G_s 2.70 (assumed)		
Classification CLAY with SAND (CH), gray				Source		B-1 at 35 Feet			

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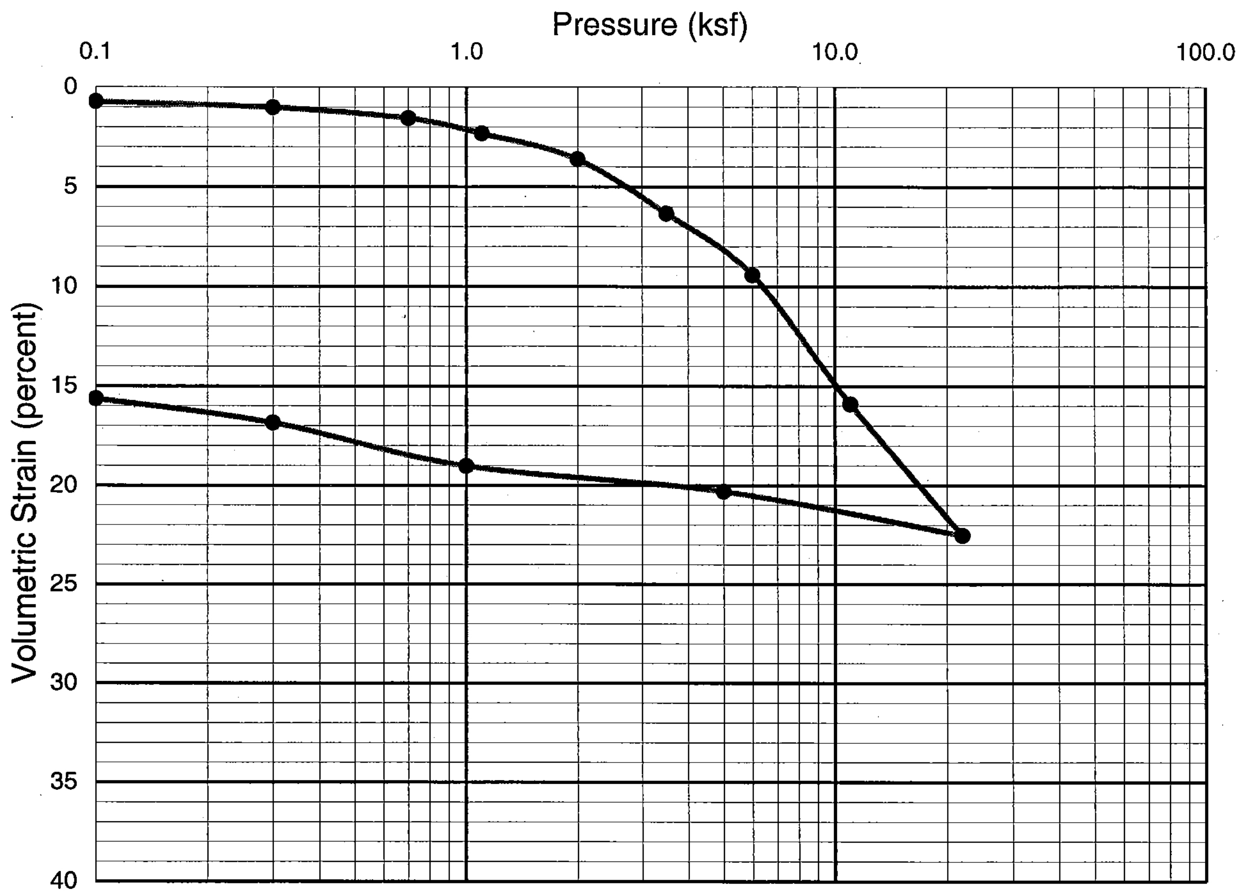
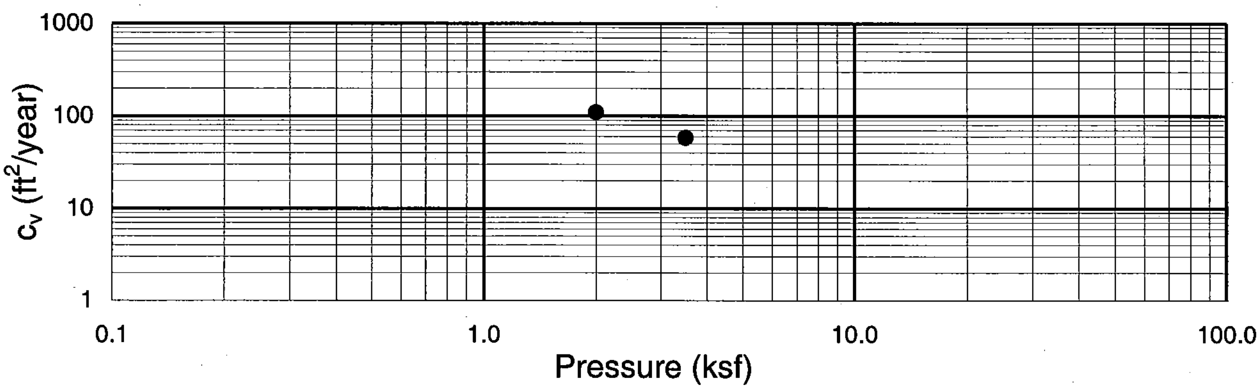
CONSOLIDATION TEST REPORT

Date 01/11/05	Project No. 3157.01	Figure C-8





Sampler Type: Osterberg			Condition		Before Test		After Test	
Diameter (in) 2.42	Height (in) 1.00		Water Content	w_o	44.6 %		w_f	33.7 %
Overburden Pressure, p_o	2,870	psf	Void Ratio	e_o	1.24		e_f	0.89
Preconsol. Pressure, p_c	3,600	psf	Saturation	S_o	97.0 %		S_f	100 %
Compression Ratio, $C_{\varepsilon c}$	0.27		Dry Density	γ_d	75 pcf		γ_d	89 pcf
LL ---	PL ---		PI ---			G_s 2.70 (assumed)		
Classification SANDY CLAY (CH), gray			Source	B-3 at 35 Feet				

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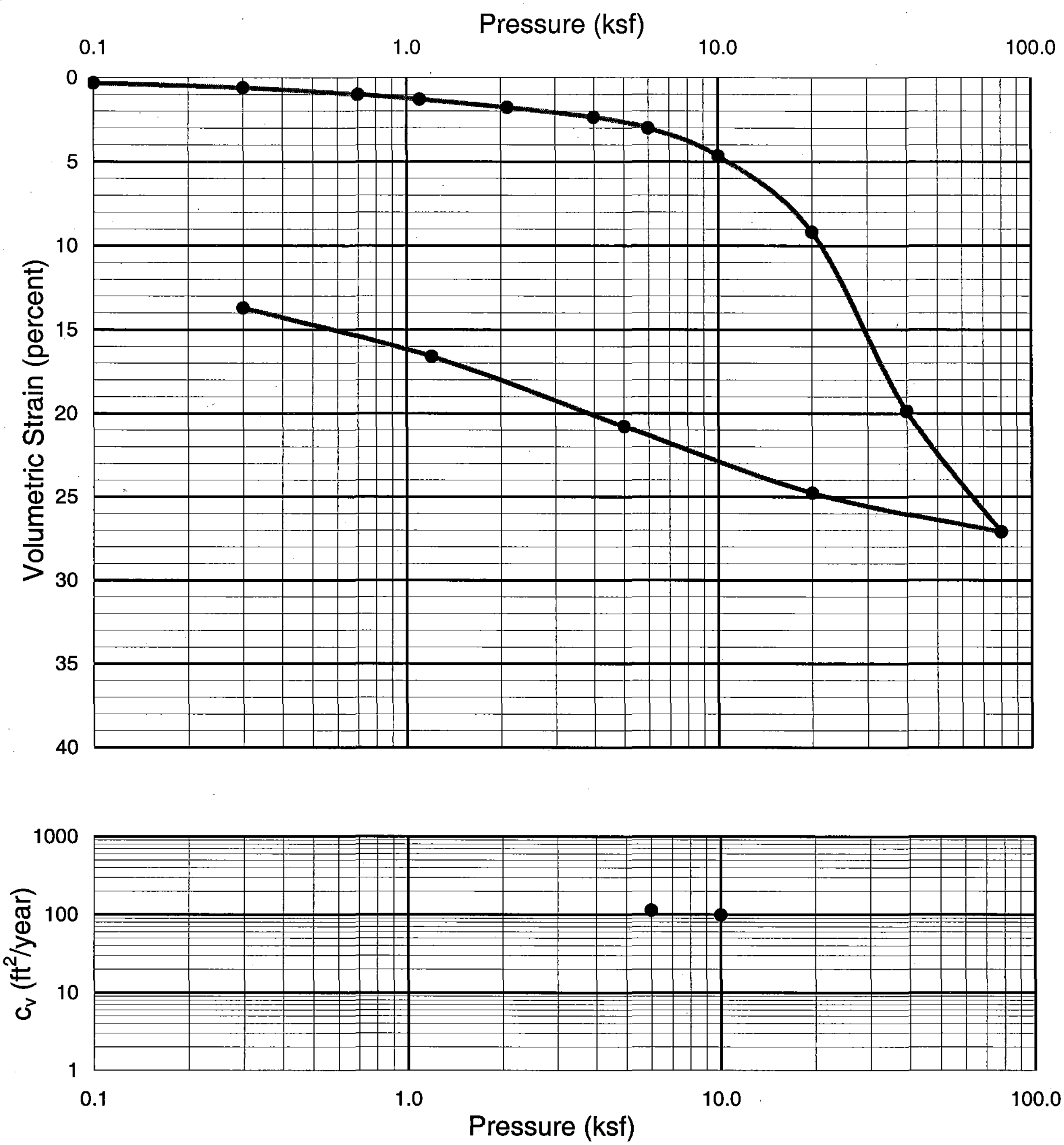
CONSOLIDATION TEST REPORT

Date 01/11/05	Project No. 3157.01	Figure C-9



Sampler Type: Shelby Tube			Condition		Before Test		After Test	
Diameter (in) 2.42	Height (in) 1.00		Water Content	w_o	44.6 %		w_f	35.2 %
Overburden Pressure, p_o 8,280 psf			Void Ratio	e_o	1.22		e_f	0.91
Preconsol. Pressure, p_c 13,000 psf			Saturation	S_o	99.1 %		S_f	100 %
Compression Ratio, $C_{\varepsilon c}$ 0.31			Dry Density	γ_d	76 pcf		γ_d	88 pcf
LL ---	PL ---		PI ---			G_s 2.70 (assumed)		
Classification CLAY (CL), gray				Source	B-3 at 124 Feet			

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CONSOLIDATION TEST REPORT

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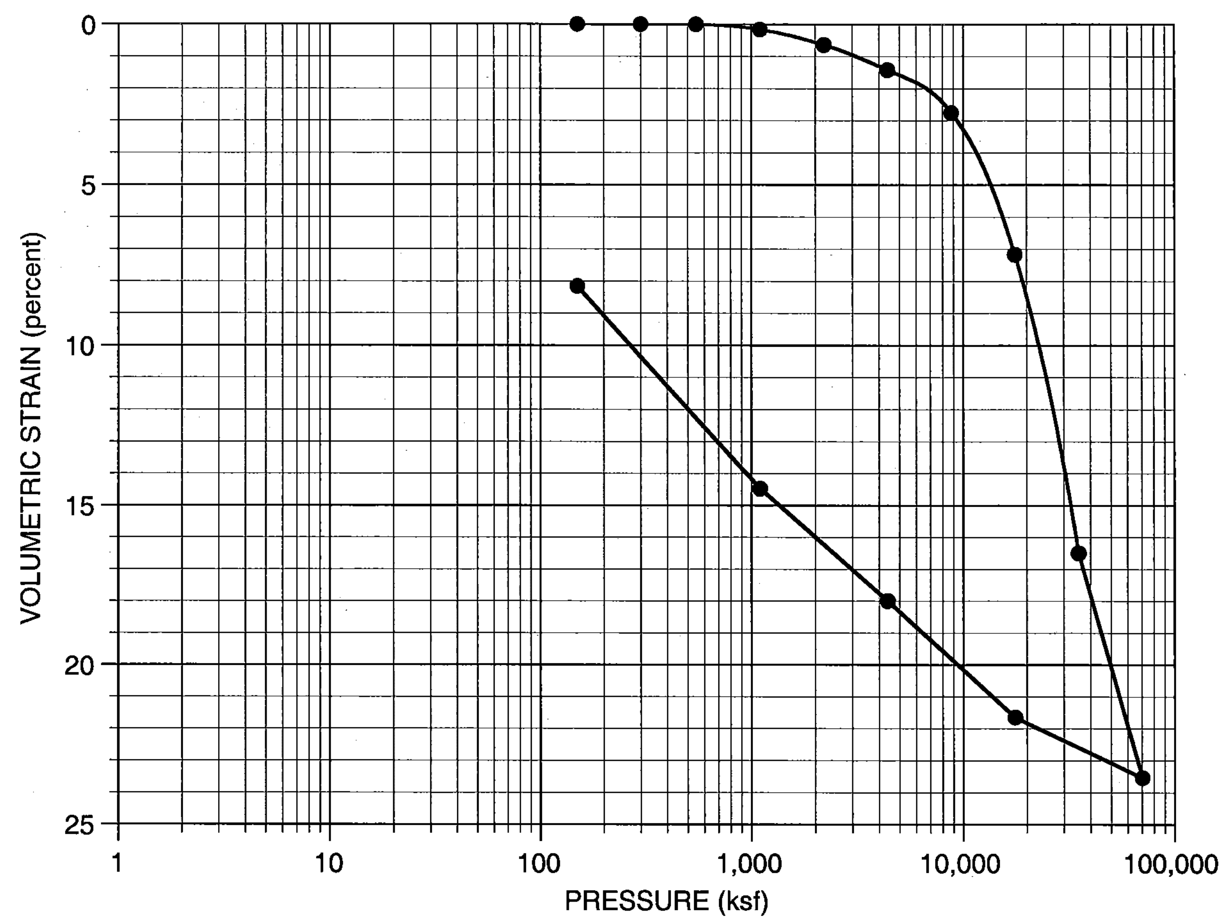
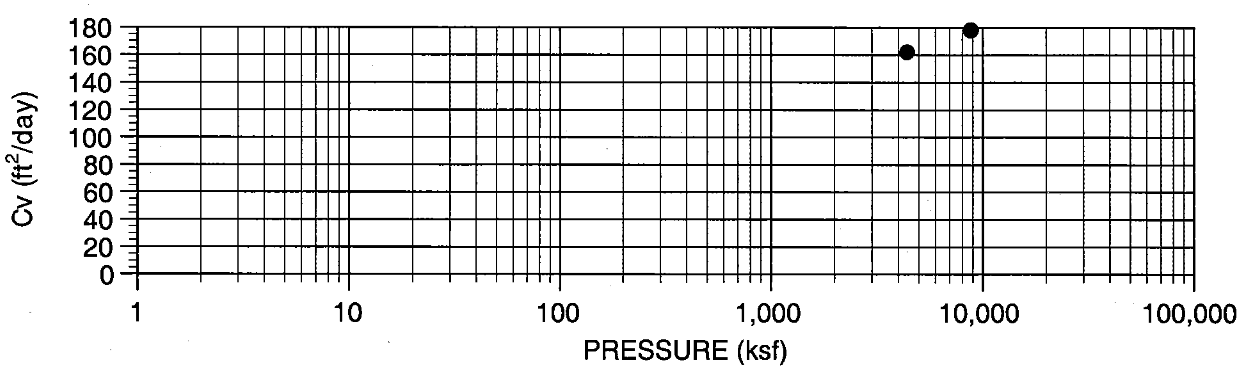
Date 01/11/05 | Project No. 3157.01 | Figure C-10





Sample Type	Shelby Tube			Condition		Before test		After test
Diameter (in)	2.4	Height (in)	1.0	Water Content	w_o	42.3 %	w_f	36.5 %
Overburden Pressure, Po		6,400 psf		Void Ratio	e_o	1.144	e_f	0.983
Preconsol. Pressure, Pc		13,000 psf		Saturation	S_o	99.7 %	S_f	100 %
Compression Ratio, Cec		0.26		Dry Density	γ_d	79 pcf	γ_d	85 pcf

LL --	PL --	PI --	G_s 2.7 (assumed)
Classification CLAY with SAND (CH), dark gray		Source B-6 at 130 feet	

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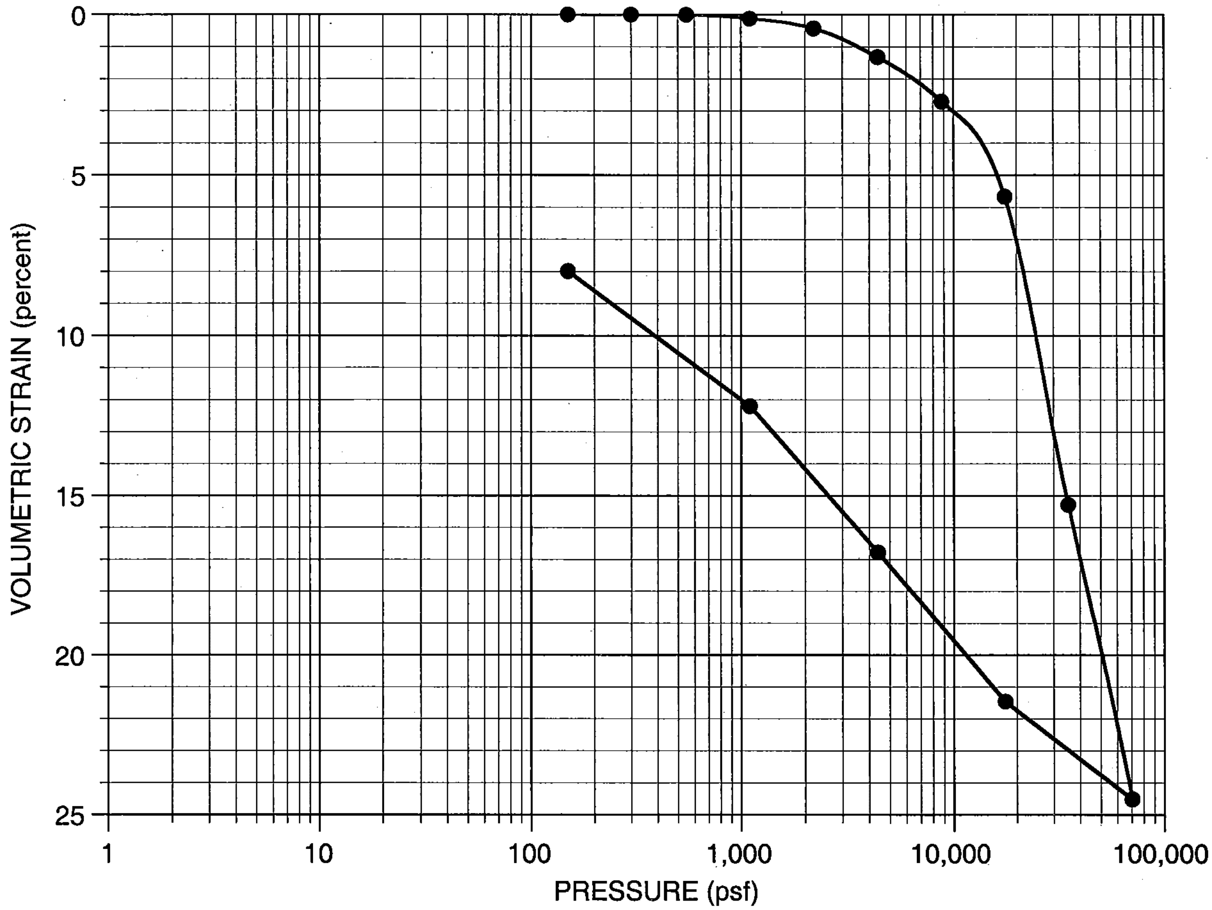
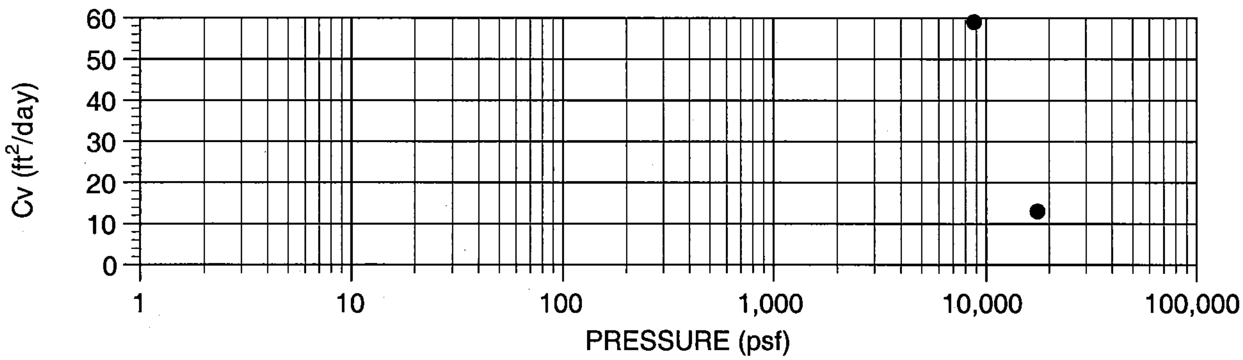
CONSOLIDATION TEST REPORT

Date 01/11/05 | Project No. 3157.02 | Figure C-11





Sample Type Shelby Tube			Condition		Before test		After test
Diameter (in) 2.4	Height (in)	1.0	Water Content	w_o	45.3 %	w_f	41.2 %
Overburden Pressure, P_o		8,000 psf	Void Ratio	e_o	1.229	e_f	1.110
Preconsol. Pressure, P_c		16,000 psf	Saturation	S_o	99.6 %	S_f	100 %
Compression Ratio, C_{ec}		0.32	Dry Density	γ_d	76 pcf	γ_d	80 pcf

LL --	PL --	PI --	G_s 2.7 (assumed)
Classification CLAY and SAND (CH), dark gray		Source B-6 at 170 feet	

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CONSOLIDATION TEST REPORT

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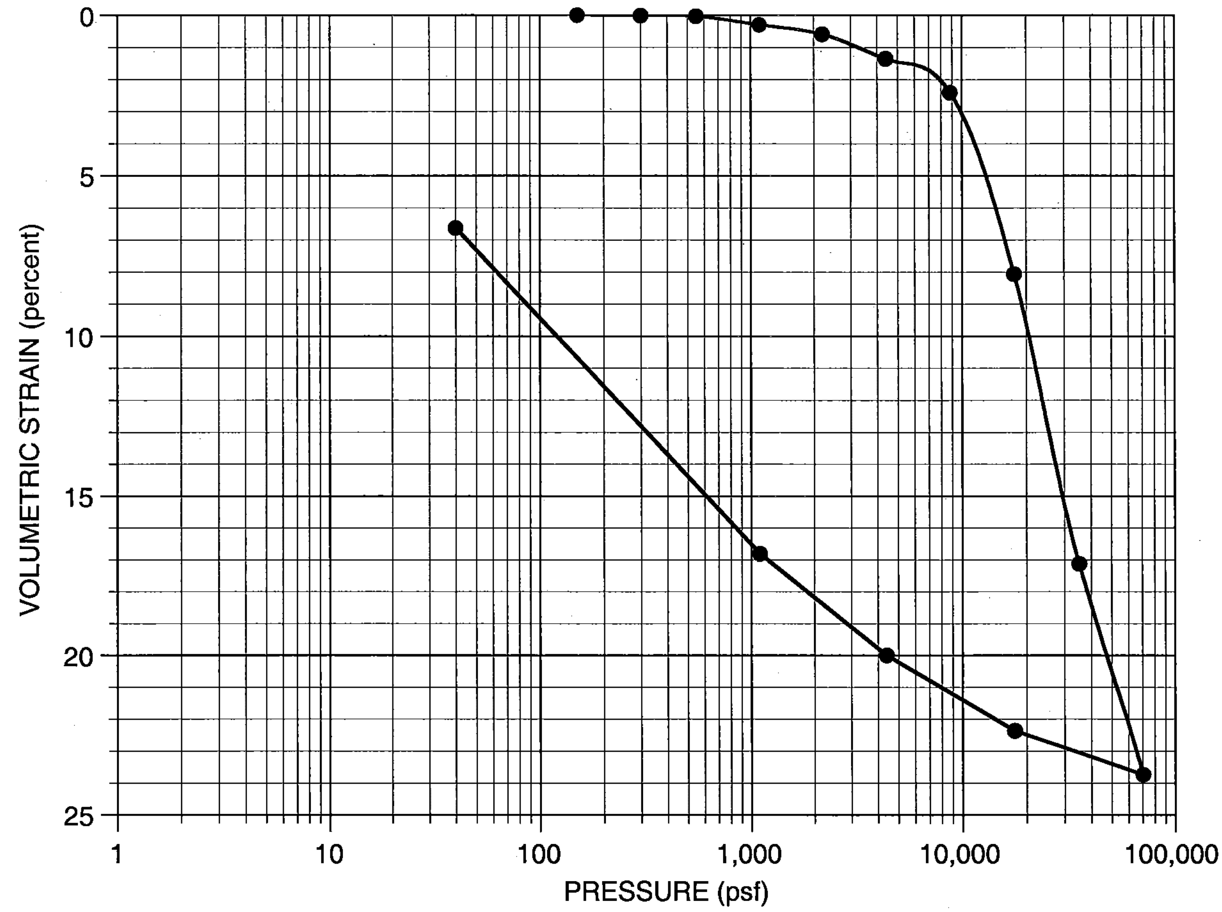
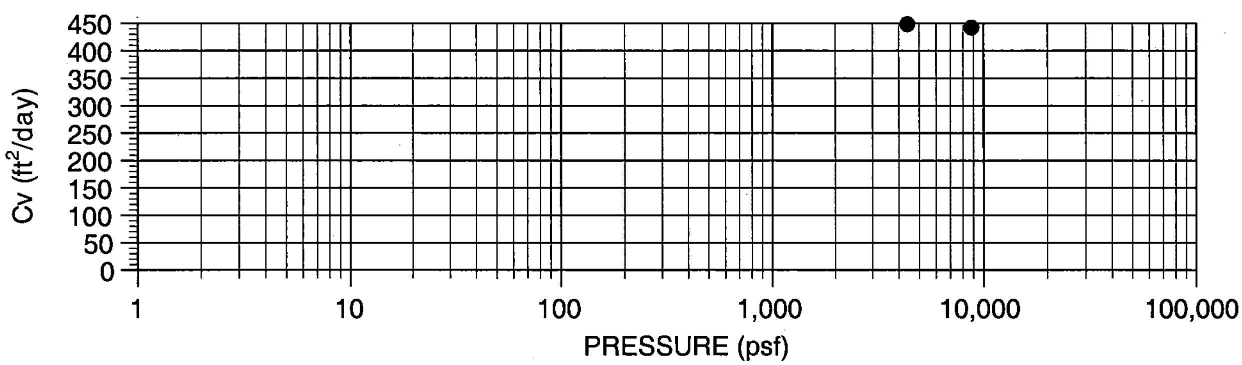
Date 01/11/05 | Project No. 3157.02 | Figure C-12





Sample Type	Shelby Tube			Condition		Before test		After test
Diameter (in)	2.7	Height (in)	1.0	Water Content	w_o	40.2 %	w_f	34.0 %
Overburden Pressure, P_o			5,300 psf	Void Ratio	e_o	1.100	e_f	0.915
Preconsol. Pressure, P_c			11,000 psf	Saturation	S_o	98.8 %	S_f	100 %
Compression Ratio, C_{ec}			0.27	Dry Density	γ_d	80 pcf	γ_d	88 pcf

LL --	PL --	PI --	G_s 2.7 (assumed)
Classification CLAY (CL), dark gray		Source B-7 at 110 feet	

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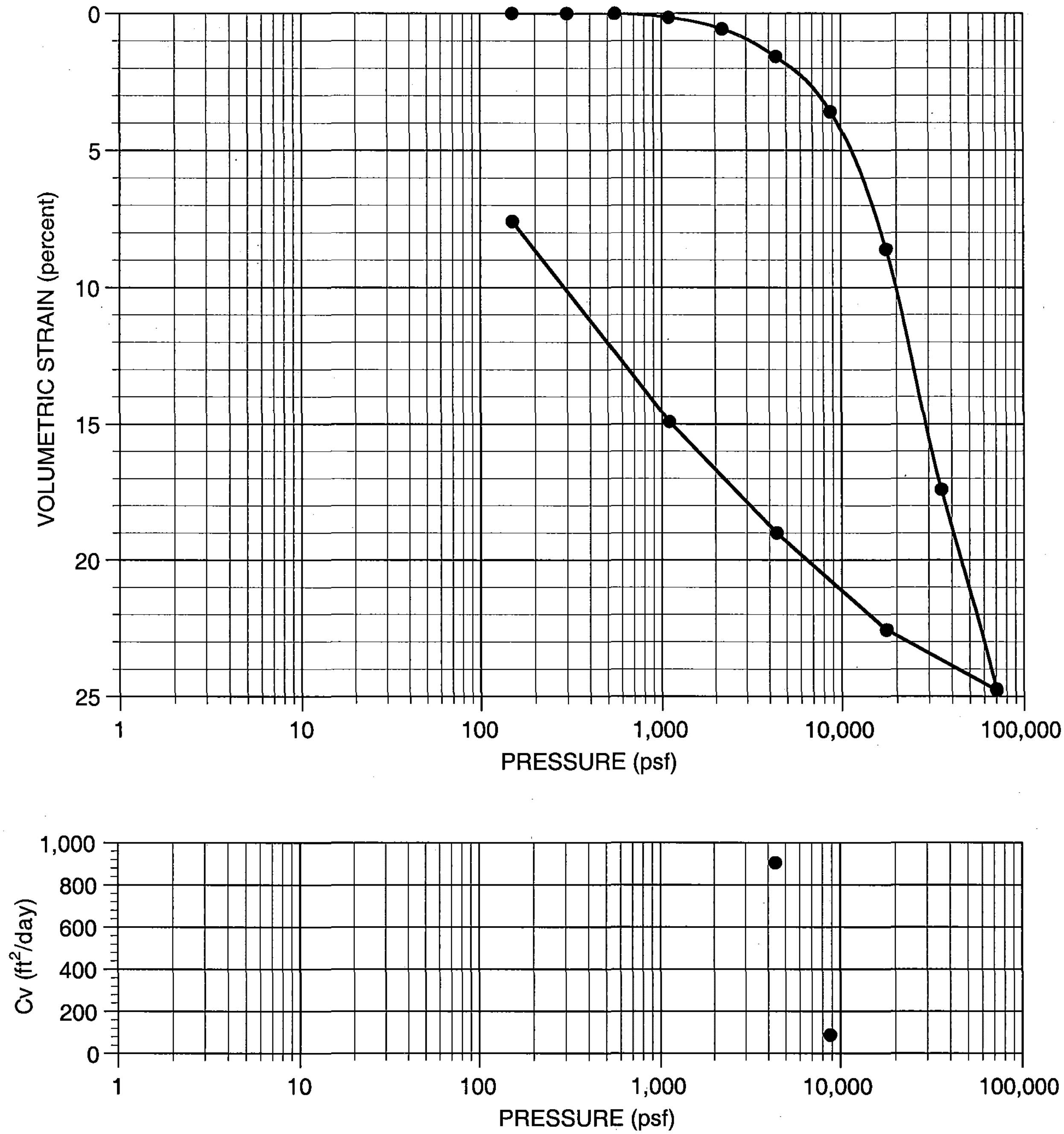
CONSOLIDATION TEST REPORT

Date 07/01/04	Project No. 3157.02	Figure C-13



Sample Type	Shelby Tube		Condition		Before test		After test
Diameter (in) --	Height (in) --		Water Content	w_o	42.4 %	w_f	38.6 %
Overburden Pressure, P_o	6,800 psf		Void Ratio	e_o	1.155	e_f	1.041
Preconsol. Pressure, P_c	11,250 psf		Saturation	S_o	99.2 %	S_f	100 %
Compression Ratio, C_{ec}	0.26		Dry Density	γ_d	78 pcf	γ_d	83 pcf
LL --	PL --		PI --		G_s 2.7 (assumed)		
Classification	CLAY (CL), dark gray			Source	B-7 at 150 feet		

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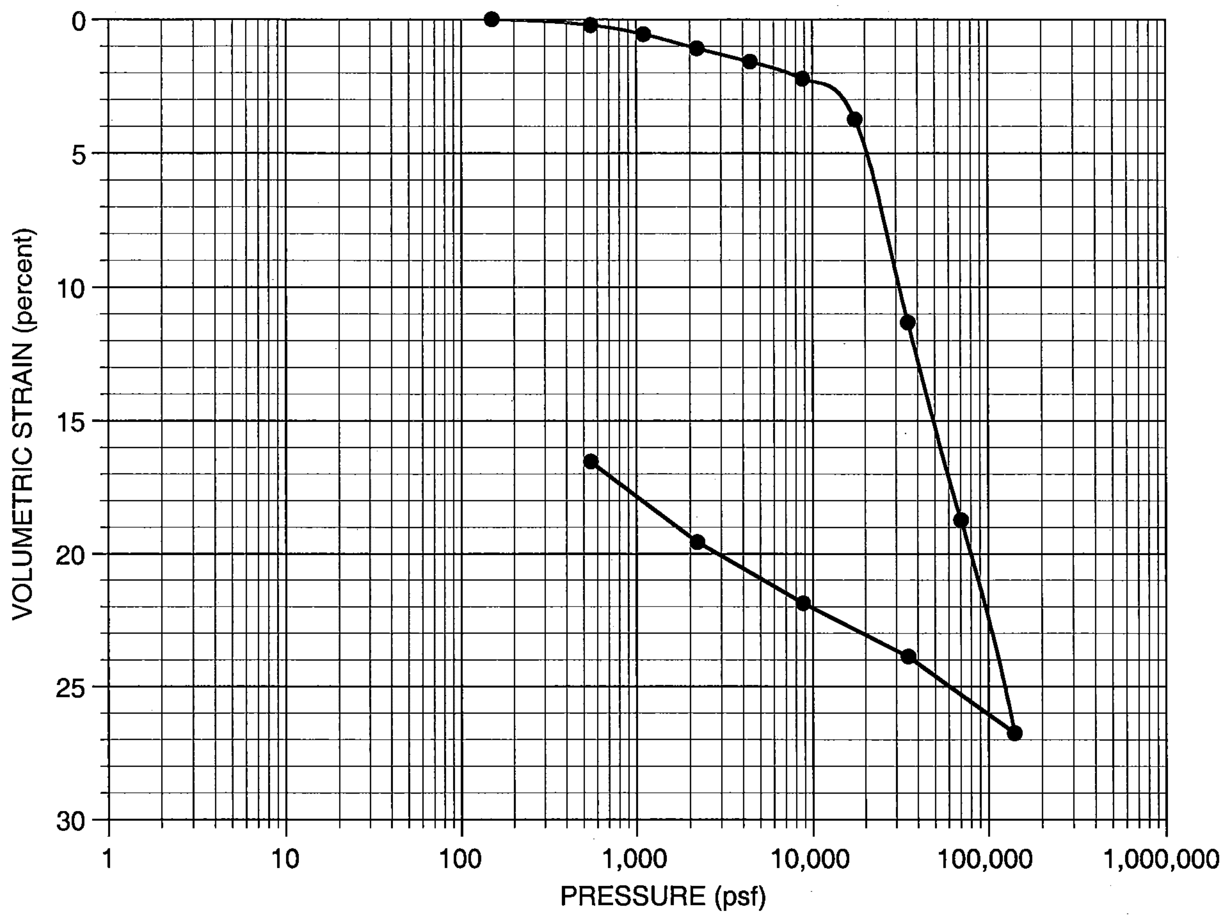
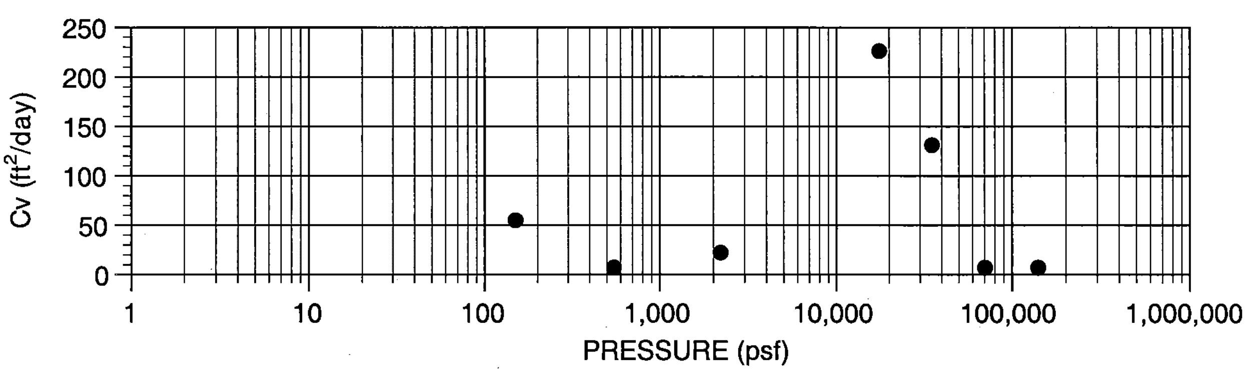
CONSOLIDATION TEST REPORT

Date	Project No.	Figure
01/11/05	3157.02	C-14





Sample Type Shelby Tube		Condition		Before test		After test
Diameter (in) 2.7	Height (in) 1.0	Water Content	w_o	36.7 %	w_f	27.5 %
Overburden Pressure, P_o	7,900 psf	Void Ratio	e_o	1.016	e_f	0.756
Preconsol. Pressure, P_c	18,100 psf	Saturation	S_o	99.2 %	S_f	100 %
Compression Ratio, C_{ec}	0.25	Dry Density	γ_d	85 pcf	γ_d	98 pcf

LL --	PL --	PI --	G_s 2.7 (assumed)
Classification CLAY (CL), green-gray		Source B-7 at 190 feet	

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CONSOLIDATION TEST REPORT

Date 01/11/05 | Project No. 3157.02 | Figure C-15

APPENDIX D

Probabilistic Seismic Hazard Analysis

APPENDIX D

PROBABILISTIC SEISMIC HAZARD ANALYSIS

This appendix presents the details of our estimation of the level of ground shaking at the site during future earthquakes. Because the location, recurrence interval, and magnitude of future earthquakes are uncertain, we performed a probabilistic seismic hazard analysis (PSHA), which systematically accounts for these uncertainties. The results of a PSHA define a uniform hazard for a site in terms of a probability that a particular level of shaking will be exceeded during the given life of the structure.

To perform a PSHA, information regarding the seismicity, location, and geometry of each source, along with empirical relationships that describe the rate of attenuation of strong ground motion with increasing distance from the source, are needed. The assumptions necessary to perform the PSHA are that:

- the geology and seismic tectonic history of the region are sufficiently known, such that the rate of occurrence of earthquakes can be modeled by historic or geologic data
- the level of ground motion at a particular site can be expressed by an attenuation relationship that is primarily dependent upon earthquake magnitude and distance from the source of the earthquake
- the earthquake occurrence can be modeled as a Poisson process with a constant mean occurrence rate.

To develop a site-specific design response spectrum for the project, we performed the following:

- a PSHA to develop a uniform hazard response spectrum for 10 percent probability of exceedance in 50 years (475-year return period). This is consistent with the definition of the Design Basis Earthquake (DBE) in the 2001 San Francisco Building Code (SFBC).
- development of horizontal recommended spectrum.

The rock spectrum for the hazard level was developed using the computer code EZFRISK 6.22 (Risk Engineering 2004). The approach used in EZFRISK is based on the probabilistic seismic hazard model developed by Cornell (1968) and McGuire (1976). Our analysis modeled the faults in the Bay Area as linear sources, and earthquake activities were assigned to the faults based on historical and geologic data. The levels of shaking were estimated using rock attenuation relationships that are primarily dependent upon the magnitude of the earthquake and the distance from the site to the fault.

D1.0 PROBABILISTIC MODEL

In probabilistic models, the occurrence of earthquake epicenters on a given fault is assumed to be uniformly distributed along the fault. This model considers ground motions arising from the portion of the fault rupture closest to the site rather than from the epicenter. Therefore, we modeled the fault rupture lengths using fault rupture length-magnitude relationships given by Wells and Coppersmith (1994).

The probability of exceedance, $P_e(Z)$, at a given ground-motion, Z, at the site within a specified time period, T, is given as:

$$P_e(Z) = 1 - e^{-V(z)T}$$

where V(z) is the mean annual rate of exceedance of ground motion level Z. V(z) can be calculated using the total-probability theorem.

$$V(z) = \sum_i \nu_i \iint P[Z > z \mid m, r] f_{M_i}(m) f_{R_i|M_i}(r; m)\, dr\, dm$$

where:

ν_i = the annual rate of earthquakes with magnitudes greater than a threshold M_{oi} in source i

P [Z > z | m,r] = probability that an earthquake of magnitude m at distance r produces ground motion amplitude Z higher than z

$f_{Mi}(m)$ and $f_{Ri|Mi}(r;m)$ = probability density functions for magnitude and distance

Z represents peak ground acceleration, or spectral acceleration values for a given frequency of vibration. The peak accelerations are assumed to be log-normally distributed about the mean with a standard error that is dependent upon the magnitude and attenuation relationship used.

A2.0 SOURCE MODELING AND CHARACTERIZATION

In 2002, the Working Group on California Earthquake Probabilities (WGCEP 2003) at the U.S. Geologic Survey (USGS) predicted a 62 percent probability of a magnitude 6.7 or greater earthquake occurring in the San Francisco Bay Area by the year 2031. More specific estimates of the probabilities for different faults in the Bay Area are presented in Table D-1.

TABLE D-1
WGCEP (2003) Estimates of 30-Year Probability (2002 to 2031) of a Magnitude 6.7 or Greater Earthquake

Fault	Probability (percent)
Hayward-Rodgers Creek	27
San Andreas	21
Calaveras	11
San Gregorio	10
Concord-Green Valley	4
Greenville	3

The segmentation of faults, maximum magnitudes, and recurrence rates were modeled using the data presented in the WGCEP (2003) and Cao et al. (2003) reports. We also included the floating sources as described by Cao et al. (2003) and WGCEP (2003) in our seismic hazard model. Table D-2 presents the distance and direction from the site to the fault, maximum magnitude, slip rate, and fault length for individual fault segments and combination segments used in our model.

TABLE D-2
Source Zone Parameters

Fault Segment	Approx. Distance from fault (km)	Direction from Site	Mean Characteristic Moment Magnitude	Mean Slip Rate (mm/yr)	Fault Length (km)
San Andreas – 1906 Rupture (SAS+SAP+SAN+SAO)	13.4	West	7.90	19	473
San Andreas – Peninsula (SAP)	13.4	West	7.15	17	85
San Andreas – SAP+SAN+SAO	13.4	West	7.83		411
San Andreas – SAS+SAP	13.4	West	7.42	17	147
San Andreas – SAS+SAP+SAN	13.4	West	7.76		338
Hayward-Rodgers Creek – NH	15.6	East	6.49	9	35
Hayward-Rodgers Creek – NH+RC	15.6	East	7.11	9	98
Hayward-Rodgers Creek – SH+NH	15.6	East	6.91	9	88
Hayward-Rodgers Creek – SH+NH+RC	15.6	East	7.26	9	151
San Andreas – SAN	15.7	West	7.45	24	191
San Andreas – SAN+SAO	15.7	West	7.70	24	330
Hayward-Rodgers Creek – SH	16.6	East	6.67	9	53
San Gregorio – SGN	19.1	West	7.23	7	110
San Gregorio – SGS+SGN	19.1	West	7.44	5	176
Mt Diablo – MTD	32.8	East	6.65	2	25
Hayward-Rodgers Creek – RC	33.2	North	6.98	9	63
Calaveras – CC+CN	34.2	East	6.90		104
Calaveras – CN	34.2	East	6.78	6	45
Calaveras – CS+CC+CN	34.2	East	6.93		123
Concord/GV – CON	37.4	East	6.25	4	20
Concord/GV – CON+GVS	37.4	East	6.58		42
Concord/GV – CON+GVS+GVN	37.4	East	6.71		56
Concord/GV – GVS	39.4	Northeast	6.24	5	22
Concord/GV – GVS+GVN	39.4	Northeast	6.24	5	36
Monte Vista-Shannon	41.4	Southeast	6.80	0.4	41
Point Reyes	42.1	West	6.80	0.3	47
West Napa	43.7	Northeast	6.50	1	30
Greenville – GN	50.6	East	6.66	2	27
Greenville – GS+GN	50.6	East	6.94	2	51
Concord/GV – GVN	56.5	Northeast	6.02	5	14
Hayward – South East Extension	57.0	Southeast	6.40	3	26
Great Valley 6	60.5	East	6.70	1.5	45
Calaveras – CC	64.6	Southeast	6.23	15	59
Calaveras – CS+CC	64.6	Southeast	6.36	15	78
Greenville – GS	65.4	East	6.60	2	24
Great Valley 5	65.4	East	6.50	1.5	28
Great Valley 4	71.5	Northeast	6.60	1.5	42
Hunting Creek-Berryessa	75.8	North	6.90	6	60
San Andreas – Santa Cruz Mnts. (SAS)	76.7	Southeast	7.03	17	62
Great Valley 7	77.0	East	6.70	1.5	45
Sargent	82.9	Southeast	6.80	3	53
Zayante-Vergeles	86.6	Southeast	6.80	0.1	56
Maacama-garberville	91.2	North	6.90	9	
Monterey Bay-Tularcitos	99.8	Southeast	7.10	0.5	84

D3.0 ATTENUATION RELATIONSHIPS

Based on subsurface conditions, the site is categorized as stiff soil (SFBC designation S_D). In order to estimate site-specific spectra at the ground surface we averaged results obtained by using various attenuation relationships for stiff soil conditions. These relationships are primarily dependent on the magnitude of the earthquake and the distance from the site to the fault. Four stiff soil attenuation relationships were used in our analyses. These included: Abrahamson and Silva (1997), Boore et al. (1997), Sadigh et al. (1997), and Campbell (1997). The attenuation relationships used in the study were developed using different earthquake databases that treat the magnitude and distance effects differently. The average of the relationships was used to develop the recommended surface spectra.

D4.0 PSHA RESULTS

The results of the PSHA for the DBE hazard level is shown on Figure D-1. The average of the attenuation relationships is also shown on the figure. Figure D-2 presents a comparison of the recommended surface spectra (DBE) with the corresponding 2001 SFBC soil profile type S_D spectra.

The proposed 60-story tower and podium structure will be both have underground portions which at foundation level will either be about 25 feet or about 60 feet below the ground surface, respectively. It has long been recognized that spectral values show reductions with depth below the ground surface. Such effects have been supported analytically and have been shown by recordings from downhole arrays and in comparisons of recordings in the free field with those in adjacent structures at their basement levels. In general the data suggest that response spectra at depths of about 15 to 40 feet below the ground surface is lower than the surface spectra for periods less than about 1.0 second.

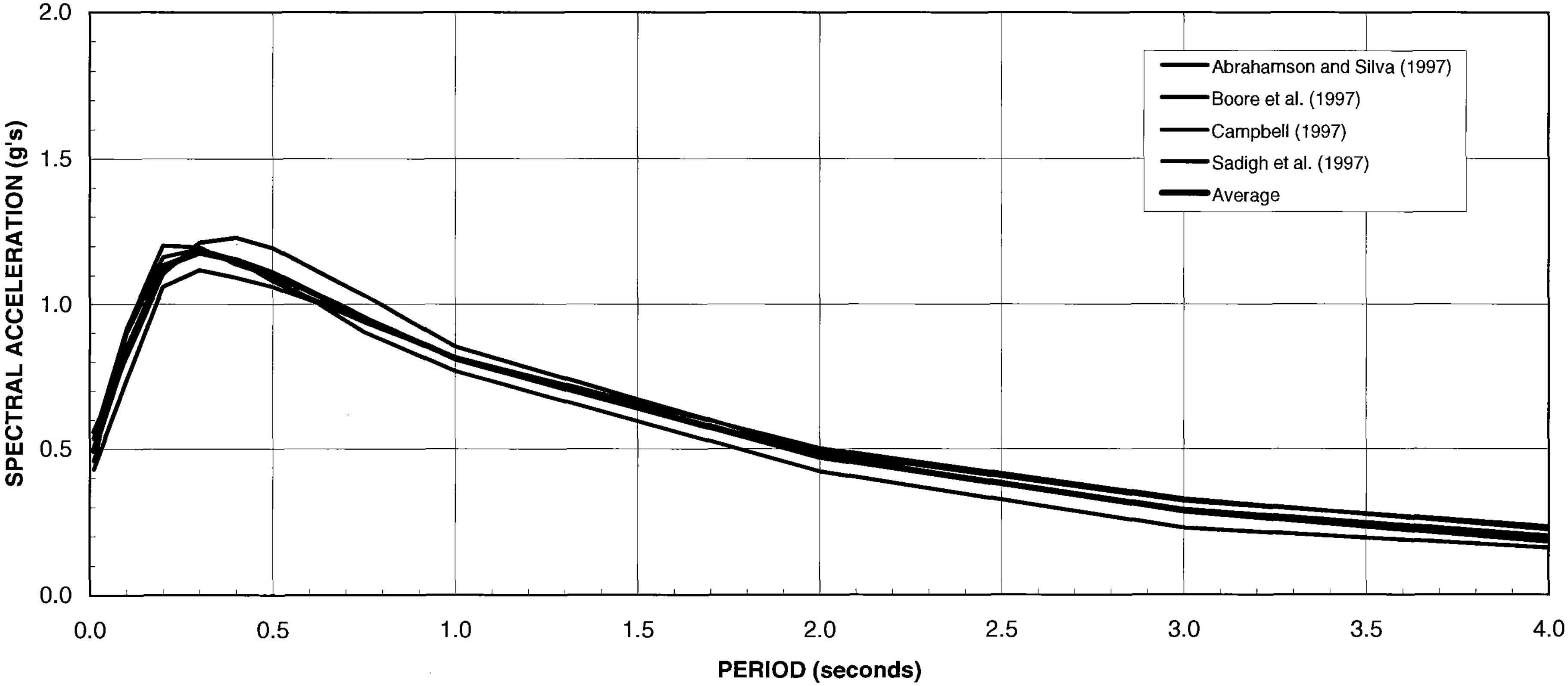
Golesorkhi and Gouchon (2000) developed recommended ratios between spectra at depth to surface spectra that can be used to modify surface spectra for basement/depth effects. Figure D-3 shows this ratio and also provides a comparison with recorded data. These ratios are based on analytical studies and data by Seed (1986), Tsai (1990), Ostadan (1992), Sykora and Bastani (1998), and most recently Stewart (1999) and were used to modify the surface spectra and develop the basement level spectra. Furthermore, FEMA 440 Appendix 8, discusses effects of reduction of surface (free field) spectrum as a function depth of embedment of the foundation. The reductions presented in the FEMA document are within the same range as recommended by Golesorkhi and Gouchon (2000). Therefore, it is our opinion that the basement reduction is justified and appropriate. The recommended horizontal surface and basement level spectra are presented on Figure D-4. We recommend the use of the basement level spectra at the foundation level for design.

Digitized values of the recommended surface and basement spectra for a damping ratio of 5 percent are presented in Table D-3.

TABLE D-3

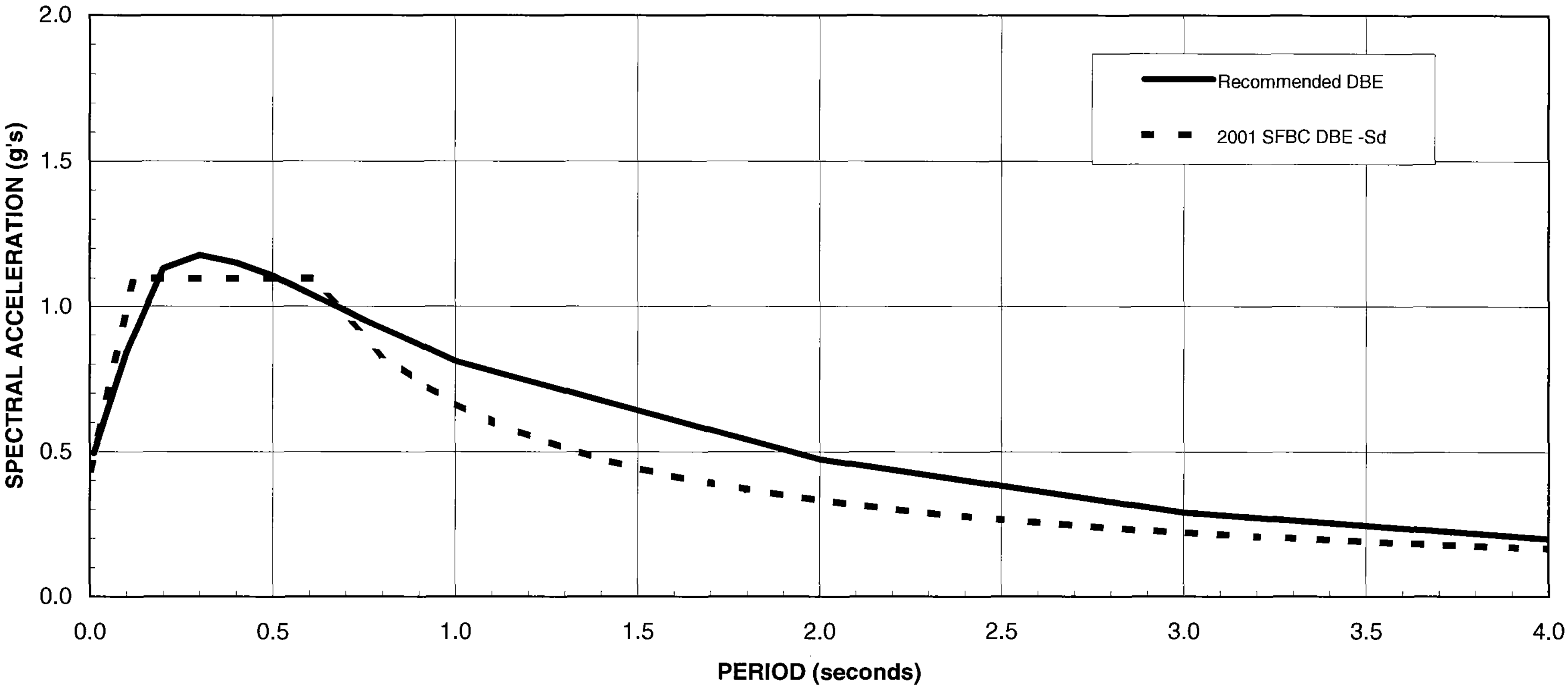
Spectral Acceleration (g) for Damping Ratio of 5 percent
10 percent probability of Exceedance in 50 years (DBE)

Period (sec)	Ground Surface	Basement
0.01	0.495	0.318
0.1	0.842	0.590
0.2	1.132	0.849
0.3	1.179	0.933
0.4	1.153	0.933
0.5	1.108	0.918
0.75	0.953	0.818
1.0	0.811	0.745
2.0	0.473	0.473
3.0	0.290	0.290
4.0	0.199	0.199
5.0	0.160	0.160
6.0	0.133	0.133



Damping Ratio = 5%

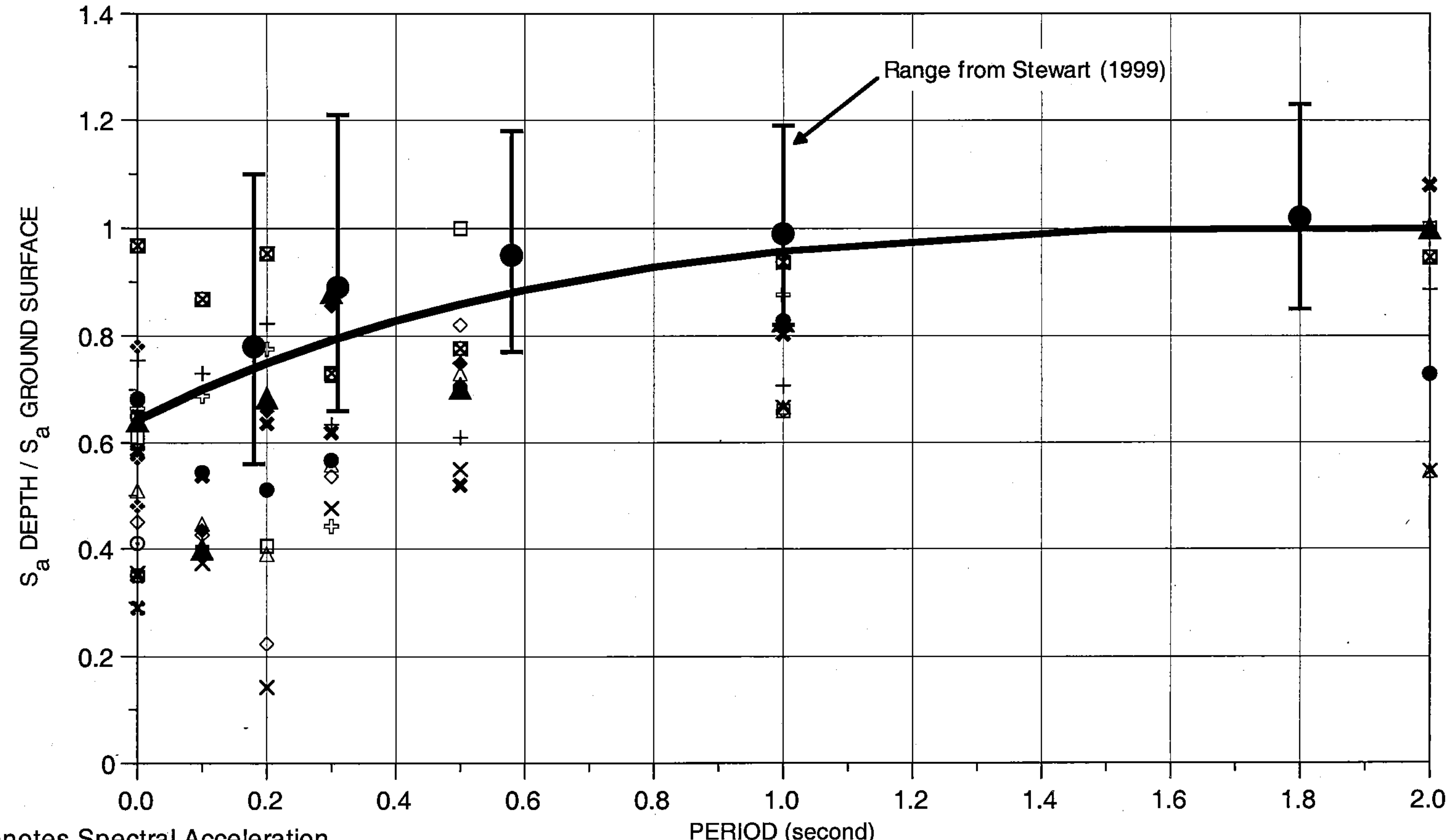
301 MISSION STREET San Francisco, California		
RESULTS OF PSHA, 10 PERCENT PROBABILITY OF EXCEEDANCE IN 50 YEARS		
Date 11/19/04	Project No. 3157.02	Figure D-1
Treadwell&Rollo		



Damping Ratio = 5%

Note: DBE has a 10% probability of exceedance in 50 years.

301 MISSION STREET San Francisco, California		
COMPARISON OF RECOMMENDED DBE SURFACE AND 2001 SFBC SPECTRA		
Date 11/19/04	Project No. 3157.02	Figure D-2
Treadwell&Rollo		



Note: S_a denotes Spectral Acceleration

▬	Remommended Ratio	×	Narimasu - 8m NS (Seed 1986)
●	Median (Stewart 1999)	✙	Lotung - 6m L (Tsai 1990)
◆	San Fernando - EW Hollywood Storage (Seed 1986)	✖	Lotung - 11m L (Tsai 1990)
▲	San Fernando - NS Hollywood Storage (Seed 1986)	⊠	Lotung - 6m T (Tsai 1990)
●	San Fernando (Seed 1986)	+	Lotung - 11m T (Tsai 1990)
□	Narimasu - 5m EW (Seed 1986)	❖	Sykora and Bastani (1998) - 5 m
◇	Narimasu - 8m EW (Seed 1986)	⊙	Sykora and Bastani (1998) - 10 m
△	Narimasu - 5m NS (Seed 1986)	✖	Sykora and Bastani (1998) - 15 m

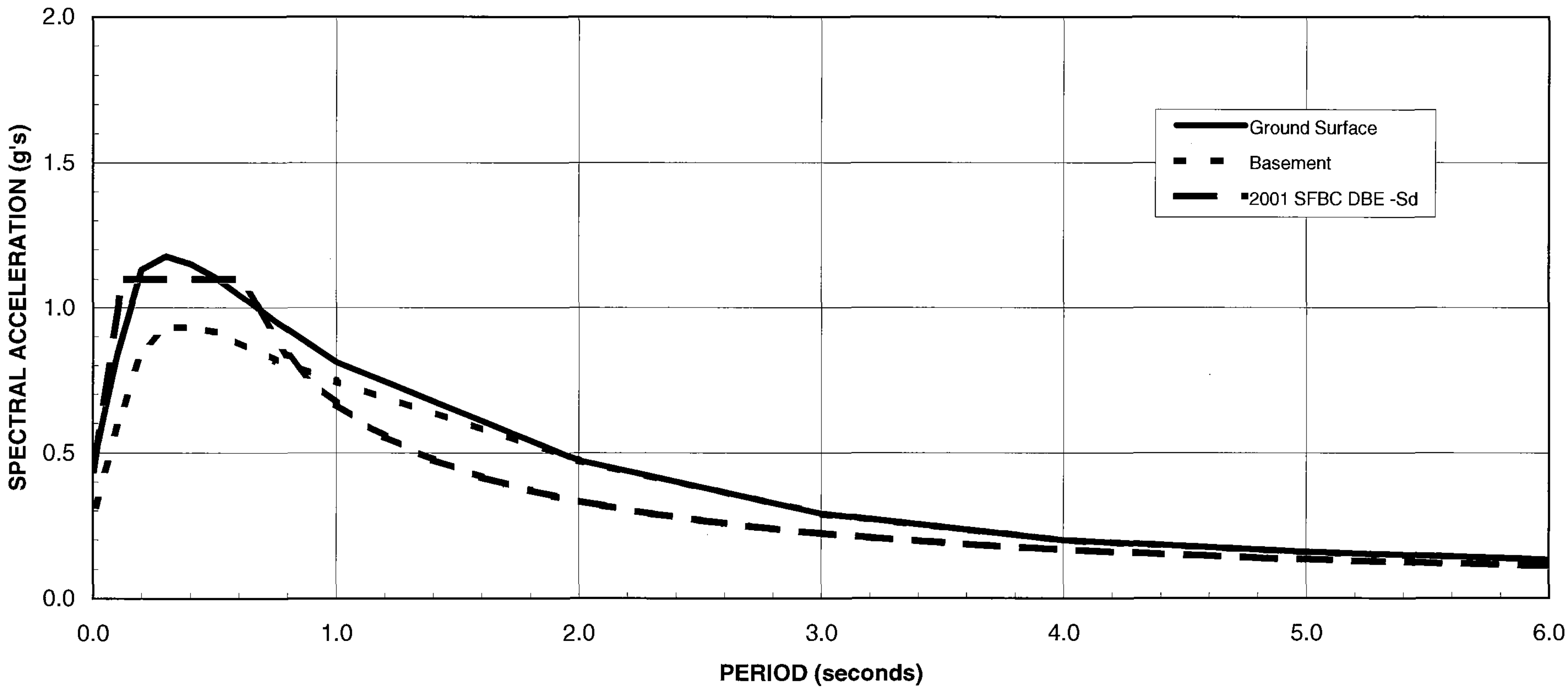
After Golesorkhi and Gouchon (2000)

301 MISSION STREET
San Francisco, California

EFFECT OF BASEMENT/DEPTH ON SURFACE SPECTRA

Date 01/04/05	Project No. 3157.02	Figure D-3

Treadwell&Rollo



Damping Ratio = 5%

Note: DBE has a 10% probability of exceedance in 50 years.

301 MISSION STREET San Francisco, California		
RECOMMENDED SPECTRA		
Date 11/19/04	Project No. 3157.02	Figure D-4

Treadwell&Rollo

APPENDIX E

Borings from Previous Investigations by Dames & Moore

BORING 1

DATE DRILLED 11/12-13/80
SURFACE ELEVATION +2.7'

LABORATORY TEST DATA / SAMPLING

DEPTH IN FEET	TESTS REPORTED ELSEWHERE	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	STRENGTH TEST DATA: TYPE OF STRENGTH TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE, PSF	STRENGTH TEST DATA: SHEAR STRENGTH, PSF	MOISTURE CONTENT, %	DRY DENSITY, PCF	SAMPLING: TYPE OF SAMPLER	SAMPLING: SAMPLING RESISTANCE
0–10				DS/CD DS/CD	600 1200	600 1080	9	116	U	13
10–20				DS/CD DS/CD	1500 3000	1340 2130	20	110	U	20
20–30				TX/UU	1700	830	43 40	79 78	P	200 PSI
30–40							22	104	TW	30
50–60	-200 (7%)						19	110	U	100/6"
50–60	-200 (15%)						20		SPT	78
60–70							20	113	U	80/6"
60–70	-200 (9%)						18		SPT	97
70–80	-200 (10%)						22	111	U	90/6"
70–80	-200 (13%)						21		SPT	119
80–90							16	116	U	68/6"
90–100	C	83	23	TX/UU	3500	2740	31 33 32	90 89 91	P	600 PSI
100–110				TX/UU	4000	2160	42 44	[illegible] 77	TW	32
120–130	C	64	28	TX/UU	4600	2800	44 45 44	76 76 77	P	400 PSI
140–150				TX/UU	5300	4330	42	78	P	400 PSI

SYMBOLS / DESCRIPTION

SYMBOLS	DESCRIPTION
GC	3" ASPHALTIC CONCRETE & 4" CONCRETE
	BROWN GRAVELLY SAND WITH SOME CLAY (MEDIUM DENSE)
SP	BROWN FINE TO MEDIUM SAND WITH SCATTERED GRAVEL (MEDIUM DENSE) (GRADING WITH SOME CRUSHED ROCK)
GW	DARK GRAY TO BLACK FINE TO COARSE GRAVEL & ROCK (MEDIUM DENSE)
SP	BLACK FINE SAND WITH TRACE OF SILT & SOME SHELLS (MEDIUM DENSE) (GRADING CLAYEY)
CH	BLACK TO GRAY SILTY CLAY WITH TRACE OF ORGANICS (MEDIUM STIFF) (GRADING WITH SOME SAND SEAMS)
SP/SC	GRAY FINE TO MEDIUM SAND WITH POCKETS OF GRAY SILTY CLAY & TRACE OF GRAVEL (DENSE)
CH	GRAY SILTY CLAY WITH TRACE OF SAND (GRADING SANDIER) (GRADING MORE CLAYEY)
SP	GRAY FINE SAND (VERY DENSE)
SP/SC	MOTTLED LIGHT GRAY & BROWN FINE SAND TO CLAYEY FINE SAND WITH SOME CEMENTATION (VERY DENSE)
SP	BROWN TO REDDISH-BROWN FINE SAND (VERY DENSE) (GRADING BROWN & FINE TO MEDIUM)
SP/SM	BROWN & REDDISH-BROWN FINE SAND TO SILTY FINE SAND WITH TRACE OF CLAY (CEMENTED) (VERY DENSE)
SP/SC	GRAYISH-BROWN FINE SAND TO CLAYEY FINE SAND (PARTIALLY CEMENTED) (VERY DENSE) (GRADING MORE CLAYEY)
SP/SM	DARK GRAY VERY FINE TO FINE SAND TO SILTY SAND (VERY DENSE)
CH	GREENISH-GRAY SILTY CLAY WITH SCATTERED LENSES OF SAND (VERY STIFF) (GRADING WITH LAYER OF FINE SAND) (GRADING WITH ORGANIC MATERIAL, WOOD & SHELL FRAGMENTS) (GRADING SANDY) (GRADING GRAY) (GRADING SANDY) (GRADING HARD) (GRADING DARK GRAY)

GENERAL NOTES:

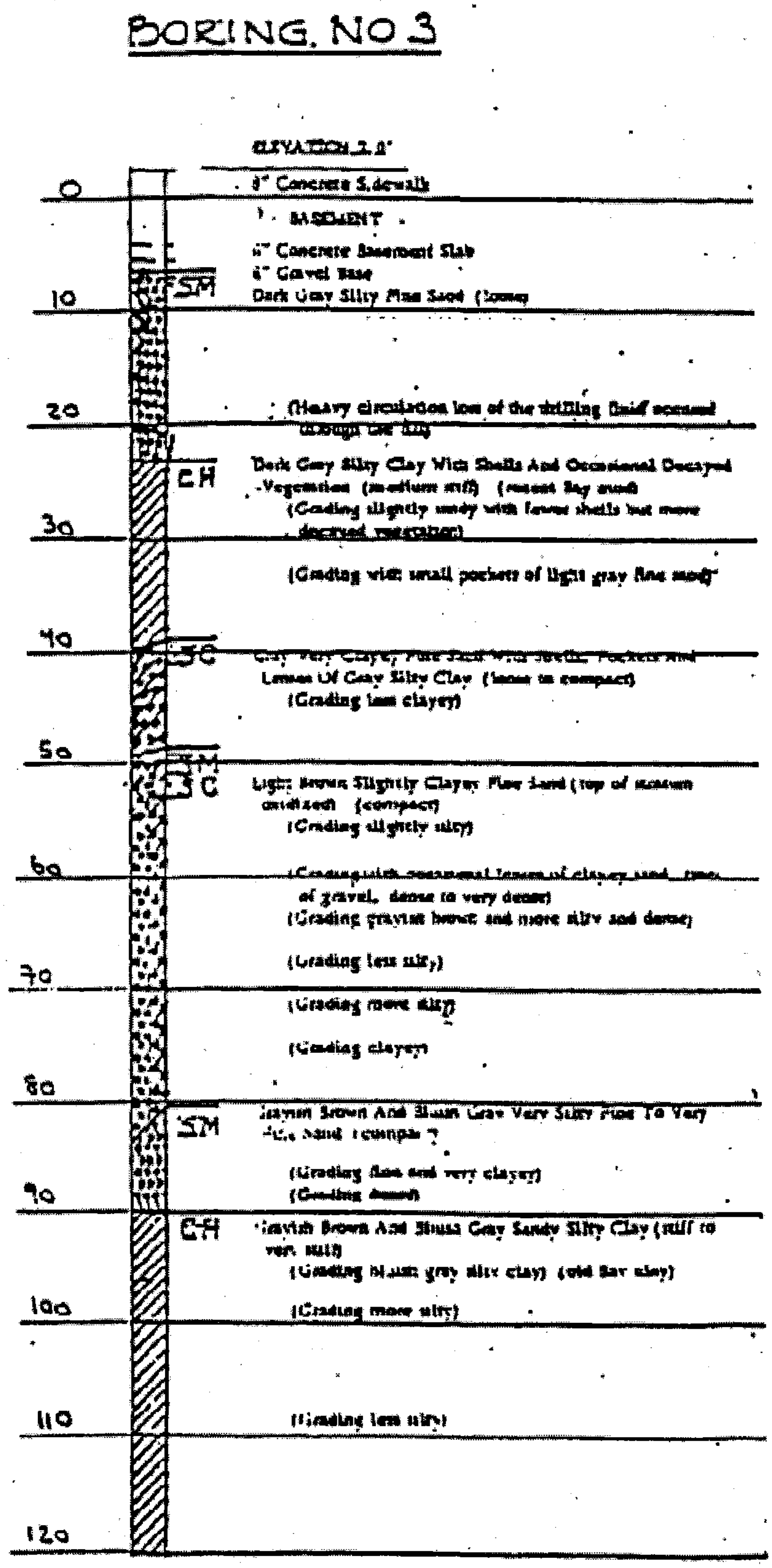
1. ELEVATIONS REFER TO CITY OF SAN FRANCISCO DATUM
2. BLOW COUNTS SHOWN ARE FOR THE LAST 12 INCHES (OR PORTION THEREOF) OF A TOTAL 18 INCHES PENETRATION OF THE SAMPLER. THE U-SAMPLER WAS DRIVEN WITH SLIP-JARS WEIGHTING 340-POUNDS AND FALLING 18 INCHES. THE SPT-SAMPLER WAS DRIVEN WITH A 140 POUND HAMMER FALLING 30-INCHES.

301 MISSION STREET
San Francisco, California

Treadwell&Rollo

LOG OF BORING 1
(BY DAMES & MOORE)

Date 01/12/05 | Project No. 3157.02 | Figure E-1



Reference: Logs of Soil Borings, Sheet S7, by Dames & Moore, dated 21 February 1966.

301 MISSION STREET San Francisco, California	**LOG OF BORING 3** **(BY DAMES & MOORE)**
Treadwell&Rollo	Date 01/12/05 | Project No. 3157.02 | Figure E-2

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QUALITY CONTROL REVIEWER:

Richard D. Rodgers

Richard D. Rodgers
Geotechnical Engineer

Treadwell&Rollo

MEMORANDUM

TO: Steve Patterson – Millennium Partners

CC: Derrick Roorda – DeSimone Consulting Engineers
Kurt Ricci – Webcor Builders
Dave Thompson – Webcor Builders

FROM: Christopher A. Ridley, G.E.
Ramin Golesorkhi, G.E.

DATE: 24 February 2006

PROJECT: 3157.04

SUBJECT: Results of Additional Indicator Pile Driving
301 Mission Street
San Francisco, California

Number of Pages: 9 (including attachments)

This memorandum presents the results of the additional indicator pile driving program that was performed on 23 February 2006 at the 301 Mission Street project in San Francisco. On 23 November 2005, we issued a letter discussing the results of the main indicator pile program. Our conclusions and recommendations summarized in that letter remain unchanged. Because the indicator piles along the southern 30 feet of tower footprint could not be driven at that time, this memorandum summarizes the results of the four remaining indicator piles and revises Figure 1 titled Recommended Production Pile Tip Elevations to include the results of this additional indicator pile driving program.

The four indicator piles were driven by American Piledriving Inc. (API) of Pleasanton, California. Our engineer was on site to observe the pile driving operation on a continuous basis, and pile driving records showing resistance to penetration versus depth were maintained for each pile. Pile driving records for these indicator piles are attached as Appendix A.

The locations of the additional four indicator piles designated as I-22 through I-25, are shown on Figure 1. These indicator piles are 14-inch-square, prestressed, precast concrete piles with total lengths of varying from 73 to 83 feet. The piles were driven from the existing ground surface,

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which is approximately Elevation -10 to -11 feet[1] San Francisco City Datum. Table 1 presents the summary of the driving records for these piles.

Each pile location was predrilled to a depth of 20 feet using a 14-inch-diameter auger. Piles were driven using a Delmag D46-32 diesel hammer set at Fuel Setting 4. At this setting the hammer has a maximum rated energy of 107,177 foot-pounds. A plywood cushion block about ten inches thick was placed between the concrete pile and the hammer. Cushion blocks were replaced once or twice during driving as indicted on the pile driving records. Piles were driven using a steel follower to allow them to be prevent below the current ground surface.

On the basis of our previous analyses, our observations of indicator pile driving and our knowledge of subsurface conditions, we conclude that production piles driven to the refusal criteria outlined in the 23 November 2005 letter using the attached revised Figure 1 are acceptable to support the allowable design compression (dead plus live) load of 260 kips.

We trust this letter presents the information required. If you have any questions, please call.

Attachments: Table 1 – Summary of Indicator Piles
Figure 1 – Site Recommended Production Pile Tip Elevations
Appendix A – Pile Driving Records (4 pages: Indicator piles: I-22 through I-25)

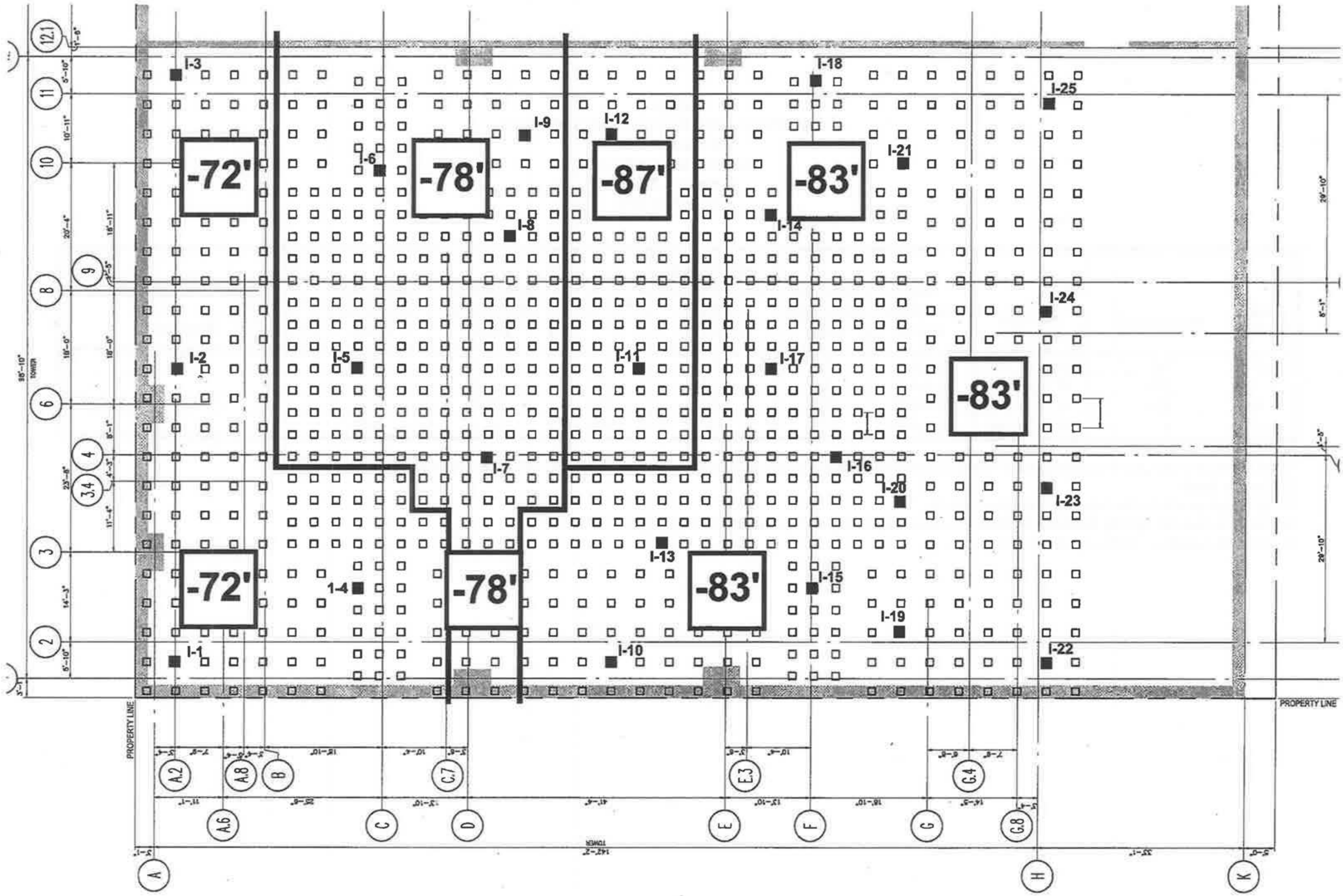
31570406.CAR

1 All elevations referenced in this letter are in feet relative to San Francisco City Datum, (SFCD).

TABLE 1
SUMMARY OF ADDITIONAL INDICATOR PILES
301 Mission Street
San Francisco, California
Project No. 3157.04
24 February 2006

T&R Pile No.	Pile Location[1]	Pile Type	Date Completed Driving	Furnished Pile Length[2] (feet)	Approximate Ground Surface Elevation (feet[3,4])	Depth Driven Below Grade[5] (feet)	Approximate Butt Elevation (feet)[3]	Approximate Tip Elevation (feet)[3]	Remarks
I-22	903	14" SQ. CON.	22-Feb-06	78	-11.0	89.0	-22.0	-100.0	
I-23	909	14" SQ. CON.	22-Feb-06	83	-11.0	88.5	-16.5	-99.5	
I-24	915	14" SQ. CON.	22-Feb-06	75	-10.0	87.0	-22.0	-97.0	
I-25	922	14" SQ. CON.	22-Feb-06	73	-11.0	85.0	-23.0	-96.0	

1. Pile Location as designated on drawing titled "Martin Ron Pile Numbering Diagram" as transmitted electroncally to us by WEBCOR Builders on 11 November 2005.
2. Cast pile length.
3. All Elevations refer to San Francisco City datum (SFCD).
4. Ground surface estimated by WEBCOR Builders at the beginning of Indicator Pile Driving and may vary by +/- 6 inches.
5. Recorded visually, accuracy may vary by +/- 6 inches.



EXPLANATION

-83' Recommended pile tip elevation in feet, San Francisco city datum (SFCD)

RECO

Treadwell&Rollo

Appendix A

Pile Driving Records (Indicator piles: I-22 through I-25)

①

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San Francisco, California 94111
(415) 955-9040

Indicator
PILE DRIVING RECORD

Date 2/23/06
Sheet 1 of 4

Project: 301 Mission Street	Project No. 3157.04-6031
Pile Contractor: American Pile Driving	Field Engineer DMC
Hammer Type: DELMAG- Model D46-32	Reviewed by
Hammer Weight: 10,100 lbs. / Drop: varies / Max. Rated Energy:	107,000 ft-lbs.
Pile Number	#909 (I-23)
Pile Location	
Pile Size & Length	14" sq. / 78'
Ground Elev.	-11' ± (SFCD)
Actual Tip Elev.	-100' ±
Actual Butt Elev.	-21.9' ±
Plan Butt Elev.	-21.9' ±
Pile Stickup	N/A
Follower Length	20'
Predrill Depth	20'
Time	10:54-11:10 / 11:12-11:17

BLOWS PER FOOT

1		26	10	51	2	76	32
2		27	7	52	1	77	21 ← stop @4 blows (11:10) - to make follower for c/o; resume drive c
3		28	6	53	2	78	17 → Follower
4		29	6	54	1	79	13
5		30	6	55	2	80	15
6		31	7	56	2	81	15
7		32	15	57	3	82	15
8		33	18	58	2	83	15
9		34	17	59	2	84	14 (44)
10		35	22	60	3	85	15
11		36	13	61	2	76	24
12		37	11	62	2	87	16
13		38	8	63	3	88	11 (44)
14		39	7	64	3	89	12
15		40	8	65	4	90	
16		41	5	66	5	91	
17		42	4	67	5	92	
18		43	4	68	4	93	
19		44	4	69	4	94	
20		45	2	70	7	95	
21		46	3	71	25		
11:00 → 22	1	47	2	72	39		
23	2	48	2	73	44 (41)		
24	2	49	2	74	55		
25	12	50	1	75	45 (41)		

Notes: - ES*44 (wide open)

②

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Indicator
PILE DRIVING RECORD

Date 2/23/06
Sheet 2 of 4

Project: 301 Mission Street		Project No. 3157.04-6031	
Pile Contractor: American Pile Driving		Field Engineer RAR	
Hammer Type: DELMAG- Model D46-32		Reviewed by	
Hammer Weight: 10,100 lbs.	Drop: varies	Max. Rated Energy:	107,000 ft-lbs.
Pile Number	#903 (I-22)		
Pile Location			
Pile Size & Length	14" sq. / 83'		
Ground Elev.	-11'± (SFCD)		
Actual Tip Elev.	-99.9'±		
Actual Butt Elev.	-16.9'±		
Plan Butt Elev.	-21.9'		
Pile Stickup	N/A		
Follower Length	20'		
Predrill Depth	20'		
Time	11:38-11:53/12:00-12:09/12:15-12:27		

Cast 8/—/05

BLOWS PER FOOT

1		26	3	51	4	76	39 (42)
2		27	6	52	4	77	28
3		28	8	53	4	78	24
4		29	11	54	4	79	15
5		30	15	55	3	80	14
6		31	19	56	4	81	31
7		32	25	57	4	82	33 (42)
8		33	22	58	3	83	23 (42)
9		34	24	59	4	84	19
10		35	19	60	3	85	17 (42)
11		36	16	61	8	86	13
12		37	15	62	9	87	11
13		38	19	63	10	88	12
14		39	19	64	9	89	6-6"
15		40	15	65	10	90	
16		41	10	66	12	91	
17		42	9	67	13	92	
18		43	7	68	12	93	
19		44	7	69	11	94	
20		45	5	70	10	95	
21	2	46	5	71	15		
22	1	47	5	72	25		
23	9	48	3	73	29		
24	9	49	4	74	70 (41)		
25	7	50	3	75	49 (42)		

• Spalling started @ 31', follower not on hammer squarely
Ok @ 34'

• Lots of stopping and starting from 31' to 34' in an effort to position the follower squarely on pile

Stop at 11:53 to change cushion block (@ 1 blows) @ 38'

Stop @ 12:09 to change cushion block @ 29 blows @ 73'

• FS #4

Notes: • Steel strands and rebar cut from butt end of pile before driving. As a result, the pile was driven to 5'± above cut-off elevation

5

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Indicator
PILE DRIVING RECORD

Date 2/23/06
Sheet 3 of 4

Project: 301 Mission Street			Project No. 3157.04-6031
Pile Contractor: American Pile Driving			Field Engineer RAR
Hammer Type: DELMAG- Model D46-32			Reviewed by
Hammer Weight: 10,100 lbs.	Drop: varies	Max. Rated Energy:	107,000 ft-lbs.

Pile Number	#918 (I-24)
Pile Location	
Pile Size & Length	14" sq. / 75'
Ground Elev.	-10'± (SFCD)
Actual Tip Elev.	-97.0'±
Actual Butt Elev.	-21.9'±
Plan Butt Elev.	-21.9'±
Pile Stickup	N/A
Follower Length	20'
Predrill Depth	20'
Time	1:30 - 1:45

BLOWS PER FOOT

1		26	8	51	1	76	57
2		27	3	52	1	77	30 (42)
3		28	2	53	1	78	20 (42)
4		29	1	54	1	79	34
5		30	1	55	2	80	18 (42)
6		31	2	56	2	81	20
7		32	7	57	3	82	23
8		33	10	58	3	83	22
9		34	12	59	3	84	17
10		35	14	60	3	85	17
11		36	14	61	4	86	16
12		37	15	62	6	87	15
13		38	8	63	3	88	
14		39	6	64	4	89	
15		40	5	65	3	90	
16		41	5	66	6	91	
17		42	4	67	4	92	
18		43	2	68	5	93	
19		44	2	69	4	94	
20		45	1	70	5	95	
21		46	2	71	6		
22		47	2	72	27		
23	1	48	2	73	40 (42)		
24	1	49	2	74	55 (41)		
25	3	50	2	75	50		

Notes: • FS #4 (wide open)

(4)

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San Francisco, California 94111
(415) 955-9040

Indicator
PILE DRIVING RECORD

Date 2/23/06
Sheet 4 of 4

Project: 301 Mission Street	Project No. 3157.04-6031
Pile Contractor: American Pile Driving	Field Engineer CAR
Hammer Type: DELMAG- Model D46-32	Reviewed by
Hammer Weight: 10,100 lbs. | Drop: varies	Max. Rated Energy: 107,000 ft-lbs.

Pile Number	#922 (I-25)
Pile Location	
Pile Size & Length	14" sq. / 73'
Ground Elev.	-11' (SFCD)
Actual Tip Elev.	-95' ±
Actual Butt Elev.	-10' ±
Plan Butt Elev.	-21.9' ±
Pile Stickup	N/A
Follower Length	20'
Predrill Depth	20' ±
Time	2:10 - 2:25

BLOWS PER FOOT

1		26		51	2	76	32
2		27		52	2	77	19
3		28		53	2	78	16
4		29		54	1	79	9
5		30		55	2	80	12
6		31		56	2	81	13
7		32		57	3	82	13
8		33	11	58	3	83	13
9		34	12	59	5	84	14
10		35	12	60	7	85	15
11		36	10	61	10	76	
12		37	9	62	9	87	
13		38	8	63	7	88	
14		39	7	64	6	89	
15		40	6	65	6	90	
16		41	4	66	6	91	
17		42	3	67	5	92	
18		43	2	68	7	93	
19		44	1	69	9	94	
20		45	2	70	7	95	
21		46	1	71	24		
22		47	1	72	30 (42)		
23		48	2	73	39 (41)		
24		49	1	74	34 (41)		
25		50	1	75	30		

Notes: - FS #4 (wide open)

Treadwell&Rollo

2 May 2006
Project No. 3157.04

Mr. Steve Patterson
Millennium Partners
753 Market Street. 3rd Floor
San Francisco, California 94103

Subject: Summary of Pile Driving
301 Mission Street
San Francisco, California

Dear Mr. Patterson:

This letter summarizes our geotechnical observations of pile driving for the 301 Mission Street project in San Francisco. We previously performed a geotechnical investigation and provided the results in our report dated 13 January 2005 for the project and issued a letter and memorandum dated 23 November 2005 and 24 February 2006, respectively that summarized indicator pile driving and provided general pile driving criteria, including recommendations for production pile lengths and driving. We also issued a memorandum dated 6 April 2005 which discussed our recommendations regarding the sequencing of existing wood pile removal and concrete pile installation. In addition, we also provided the project with pile specifications dated 8 February 2005.

BACKGROUND

Project plans include constructing a 60-story tower comprised of residential and retail space, a nine-story structure with residential and retail space, and a three-story-high atrium and lobby. The tower portion of the site will have one basement level, while the nine-story building and atrium will have five levels of underground parking. We recommended the tower structure be supported on a pile foundation system with the other portions on a mat foundation, as discussed in the geotechnical report.

Subsurface conditions at the site consist of heterogeneous fill over Marine Deposits underlain by clayey sand with interbedded layers of sandy clay, and Old Bay Clay to the maximum explored depth of about 220 feet below the street elevation. The geotechnical report and pile specifications recommended that the 14-inch square precast-prestressed concrete piles be driven into a dense to very dense sand layer beneath the site. The top of this bearing layer varies from

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66 to 91 feet below the street level. This corresponds to approximately Elevation -62 to -87 feet[1] San Francisco City Datum. The allowable dead plus live load is 260 kips per pile.

The general contractor for the project is Webcor Builders Inc. (WBI) of San Mateo, California and the pile driving contractor is American Piledriving Inc. (API) of Pleasanton, California. Project foundation plans were prepared by DeSimone Consulting Engineers (DCE) and are dated 8 January 2005.

INDICATOR PILE PROGRAM

Twenty five indicator piles were driven at the site during 2 phases between 27 October 2005 and 4 November 2005 and on 23 February 2006. Our engineer was on site to observe the pile driving operation on a continuous basis, and pile driving records showing resistance to penetration versus depth were maintained for each pile.

The locations of the indicator piles, designated by Treadwell & Rollo, Inc. (T&R) as I-1 through I-25, are shown on Figure 1. All of the indicator piles are 14-inch-square, prestressed, precast concrete piles with total lengths of varying from 67 to 83 feet. A summary of the indicator pile data is presented on the first page of the attached Table 1.

During portions of the indicator pile program, InSituTech, Ltd. (InSituTech) performed Pile Driving Analyzer (PDA) tests on ten of the indicator piles. In addition to the PDAs, InSituTech also performed a Case Pile Wave Analysis Program (CAPWAP) on five of the ten PDA indicator piles to estimate ultimate pile capacities. Our 23 November 2005 letter presents the results of the analyses by InSituTech.

PRODUCTION PILE PROGRAM

Production Piles were driven using two pile driving rigs both equipped with a Delmag D46-32 diesel hammers. This hammer has a maximum rated energy of 107,177 foot-pounds on Fuel Setting 4 (used for both indicator and production piles). To facilitate driving through the fill, pile locations were predrilled with a 14-inch diameter auger to an approximate depth of between 0 and 45 feet below the ground surface. Before driving, a 16-inch-thick plywood cushion block was placed on top of each pile. Since piles were being installed from a higher ground elevation relative to foundation subgrade, a specially fabricated steel follower was used to drive the piles below grade.

All piles are 14-inch square, precast, prestressed concrete piles with total lengths of between approximately 47 to 83 feet, with additional reinforcing steel in the top of the pile to allow for 12

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1 All elevations referenced in this letter are in feet relative to San Francisco City Datum, (SFCD).

feet of cutoff. Piles were driven to their full length, except where they reached refusal prior to achieving the design tip elevation. A total of 80 piles were stopped above the 12-foot cutoff (see Table 1) which was reviewed and accepted by DCE. In addition, 9 piles broke during installation, which required the installation of 2 replacement piles (see Table 1 for more information).

The production piles were driven between 1 March and 22 April 2005. Our engineers were on site full-time to observe pile installation and record pile lengths, driving resistances, tip elevations, approximate cut-off lengths, and depth of predrilling. A total of 947 piles (25 indicator piles, 920 production piles and 2 replacement piles) were driven for the project. Driving records for each pile are retained in our files. A summary of the pile data including the blow counts for the last 5 feet of penetration is presented in Table 1, and locations of piles are shown on the accompanying foundation plan (Figure 1).

CONCLUSIONS

On the basis of our observations during the pile driving and our engineering analyses, we conclude the piles for the 301 Mission Street project were installed in accordance with the intent of project plans and our recommendations and are capable of carrying the design loads presented in our geotechnical report.

We trust this letter presents the information required. If you have any questions, please call

Sincerely yours,
TREADWELL & ROLLO, INC.

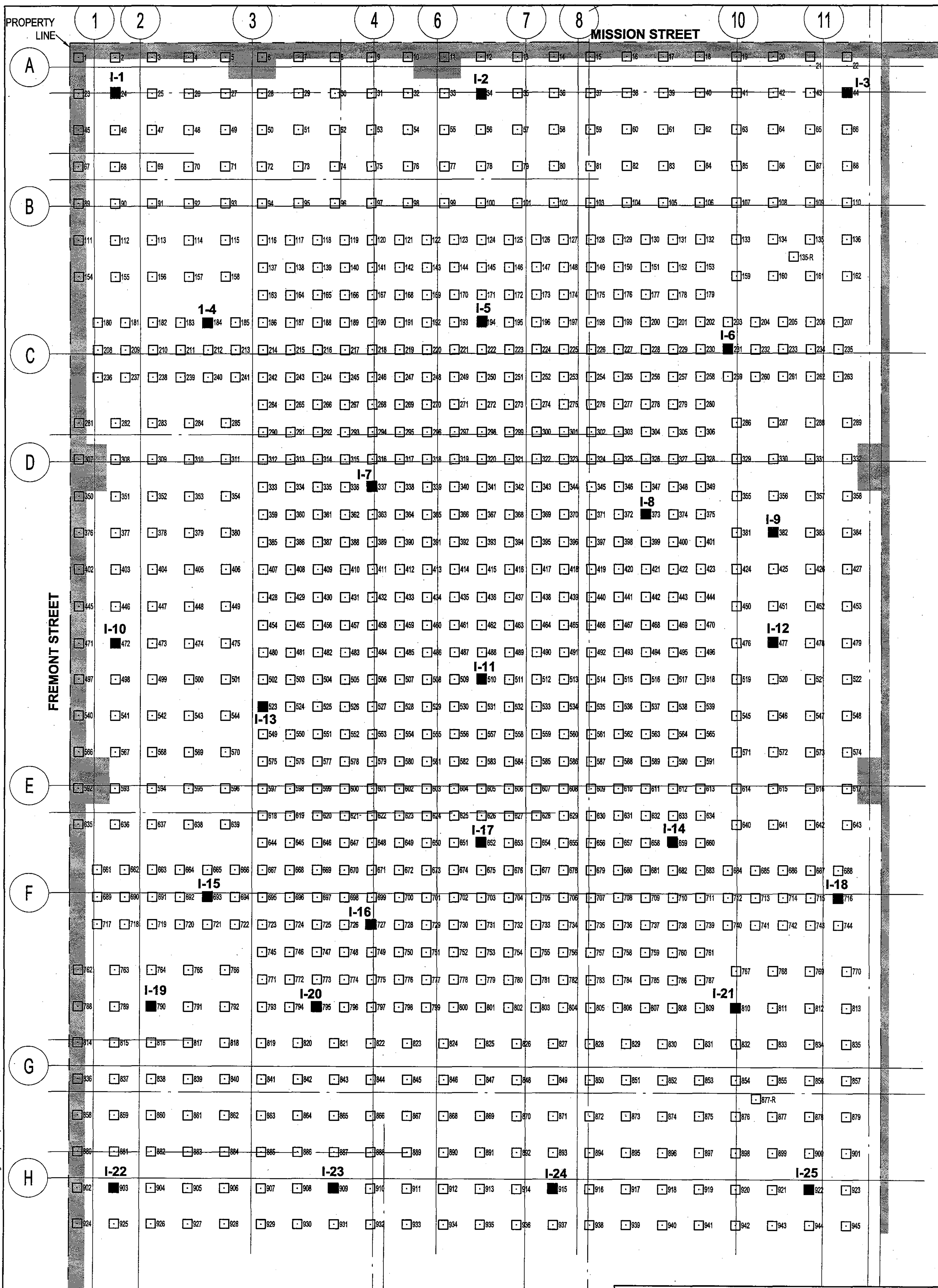
Christopher A. Ridley
Geotechnical Engineer

Ramin Golesorkhi
Geotechnical Engineer

31570409.CAR

Attachments: Figure 1 – Foundation Plan Showing Pile Numbering
Table 1 – Indicator and Production Pile Summary

cc: Mr. Kurt Ricci – WEBCOR Builders (via E-mail)



EXPLANATION

648 Approximate location of production pile

I-14 ■ Approximate location of indicator pile

Reference: "Level B-1 - West Plan" Sheet S2.0.B1.11, by Desimone Consulting Engineers, Dated 8 January 2005. Numbering system by Martin Ron Associates.

0 12 Feet

Approximate scale

301 MISSION STREET
San Francisco, California

FOUNDATION PLAN SHOWING PILE NUMBERING

Date 05/02/06	Project No. 3157.04	Figure 1

Treadwell&Rollo

R:\Trgraphics\3100's\3157.04\3157.04 Foundation Plan.dwg 5/02/06

TABLE 1
Indicator and Production Pile Summary
301 Mission Street
San Francisco, California

Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
I-1	24	10/31/05	68	5	-21.90	-23.25	-91.3	-1.4	24	20	21	20	5-3"	PDA performed
I-2	34	10/31/05	67	5	-21.90	-24.00	-91.0	-2.1	24	19	18	19	15	PDA performed
I-3	44	10/31/05	67	5	-21.90	-26.50	-93.5	-4.6	24	31	27	24	21	PDA & CAPWAP performed
I-4	184	10/31/05	70	5	-21.90	DNO[5]	DNO[5]	DNO[5]						PDA performed, T&R did not observe the final 14 feet of driving
I-5	194	11/04/05	67	5	-21.90	-25.00	-92.0	-3.1	32	28	26	22	27	
I-6	231	10/31/05	67	5	-21.90	-26.00	-93.0	-4.1	62	76	80	32	24	PDA & CAPWAP performed
I-7	337	11/04/05	68	5	-21.90	-24.30	-92.3	-2.4	24	20	23	34	8-3"	
I-8	373	11/03/05	83	5	-21.90	-24.00	-107.0	-2.1	18	17	18	17	18	PDA & CAPWAP performed
I-9	382	11/02/05	67	10	-21.90	-25.30	-92.3	-3.4	30	19	22	24	8-3"	
I-10	472	11/03/05	70	5	-21.90	-13.80	-83.8	8.1	38	31	40	68	100-10"	
I-11	510	11/04/05	68	5	-32.90	-24.50	-92.5	8.4	69	38	40	32	14-6"	
I-12	477	10/28/05	67	20	-21.90	-21.70	-88.7	0.2	34	50	58	50	40-8"	
I-13	523	11/03/05	70	5	-21.90	-23.30	-93.3	-1.4	47	18	24	21	8-4"	PDA & CAPWAP performed
I-14	659	10/27/05	70	5	-21.90	-22.00	-92.0	-0.1	41	32	24	20	17	
I-15	693	11/03/05	78	5	-21.90	-5.50	-83.5	16.4	14	36	37	62	90-6"	
I-16	727	11/03/05	73	5	-21.90	-25.30	-98.3	-3.4	20	18	16	15	7-4"	
I-17	653	11/04/05	73	5	-21.90	-10.80	-83.8	11.1	9	15	42	72	95-10"	
I-18	716	11/03/05	68	5	-21.90	-17.80	-85.8	4.1	50	48	50	79	95-10"	PDA performed
I-19	790	10/27/05	82	5	-21.90	-20.00	-102.0	1.9	16	15	13	13	14	
I-20	795	11/03/05	80	5	-21.90	-2.80	-82.8	19.1	23	20	39	70	92-10"	PDA & CAPWAP performed
I-21	810	11/03/05	73	5	-21.90	-25.70	-98.7	-3.8	24	12	12	13	8-8"	PDA performed
I-22	903	02/22/06	78	20	-21.90	-22.00	-100.0	-0.1	15	24	16	11	12	
I-23	909	02/22/06	83	20	-21.90	-16.50	-99.5	5.4	17	13	11	12	6-6"	
I-24	915	02/22/06	75	20	-21.90	-22.00	-97.0	-0.1	22	17	17	16	15	
I-25	922	02/22/06	73	20	-21.90	-22.00	-95.0	-0.1	13	13	13	14	15	
1	13	03/01/06	50.1	15	-21.90	-21.90	-72.0	0.0	31	32	38	43	28-9"	
2	12	03/01/06	50.1	15	-21.90	-21.00	-71.1	0.9	18	26	34	30	72	
3	35	03/01/06	50.1	15	-21.90	-21.90	-72.0	0.0	23	36	34	33	20-6"	
4	56	03/01/06	50.1	15	-21.90	-21.90	-72.0	0.0	20	23	28	29	29	
5	57	03/01/06	50.1	15	-21.90	-21.90	-72.0	0.0	18	25	31	33	27	
6	1	03/01/06	50.1	5	-21.90	-21.90	-72.0	0.0	31	30	44	50	29-9"	
7	2	03/01/06	50.1	10	-21.90	-21.90	-72.0	0.0	13	20	33	44	49	
8	25	03/02/06	50.1	10	-21.90	-21.90	-72.0	0.0	22	30	40	48	23-6"	
9	3	03/02/06	50.1	10	-21.90	-21.00	-71.1	0.9	13	13	28	38	73	
10	350	03/02/06	56.1	10	-21.90	-21.90	-78.0	0.0	19	16	13	13	14	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
11	351	03/02/06	56.1	10	-21.90	-21.90	-78.0	0.0	17	16	16	12	11	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
12	352	03/02/06	56.1	10	-21.90	-21.90	-78.0	0.0	15	13	14	11	12	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
13	307	03/02/06	56.1	10	-21.90	-21.90	-78.0	0.0	20	16	16	15	13	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
14	308	03/02/06	56.1	10	-21.90	-21.90	-78.0	0.0	29	24	25	21	14	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
15	309	03/02/06	56.1	10	-21.90	-21.90	-78.0	0.0	26	24	18	20	18	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
16	689	03/02/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	8	13	20	27	
17	635	03/02/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	8	14	20	48	
18	661	03/02/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	8	12	34	28-6"	
19	690	03/02/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	8	9	26	28	

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San Francisco, California

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20	662	03/02/06	61.1	15	-21.90	-21.90	-83.0	0.0	7	7	9	10	22	
21	691	03/02/06	61.1	15	-21.90	-21.30	-82.4	0.6	9	9	11	23	57	
22	663	03/02/06	61.1	15	-21.90	-21.90	-83.0	0.0	8	12	18	49	25-6"	
23	636	03/02/06	61.1	15	-21.90	-21.90	-83.0	0.0	7	10	13	28	29	
24	637	03/02/06	61.1	15	-21.90	-21.90	-83.0	0.0	7	7	14	30	21-6"	
25	14	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	17	27	34	32	20-6"	
26	15	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	31	34	50	48	28-6"	
27	16	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	26	39	46	42	47	
28	36	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	18	30	34	46	19-6"	
29	37	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	28	37	39	43	44	
30	38	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	30	50	53	58	33-6"	
31	58	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	20	32	36	34	18-6"	
32	59	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	22	34	38	37	36	
33	60	03/03/06	50.1	15	-21.90	-20.90	-71.0	1.0	22	30	46	43	61	
34	17	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	21	39	44	41	47	
35	39	03/03/06	50.1	15	-21.90	-19.90	-70.0	2.0	85	77	79	120	70-6"	
36	61	03/03/06	50.1	15	-21.90	-20.90	-71.0	1.0	27	33	52	52	63	
37	18	03/03/06	50.1	15	-21.90	-21.90	-72.0	0.0	45	34	57	53	13-3"	
38	40	03/03/06	50.1	15	-21.90	-19.90	-70.0	2.0	42	29	44	60	40-6"	
39	592	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	12	11	17	32	
40	566	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	10	11	15	30	
41	540	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	7	9	12	29	
42	497	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	9	10	27	36	
43	471	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	8	11	14	40	
44	445	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	7	7	9	24	
45	593	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	13	18	31	66	
46	567	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	9	10	22	40	
47	541	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	9	16	28	66	
48	498	03/03/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	9	11	16	46	
49	446	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	8	11	22	36	
50	447	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	6	7	15	32	
51	473	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	8	9	13	51	
52	499	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	9	10	31	60	
53	542	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	11	12	35	58	
54	568	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	9	18	33	38	
55	594	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	10	17	30	34	
56	717	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	5	7	16	30	36	
57	762	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	10	19	31	44	
58	788	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	7	14	30	54	
59	789	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	8	20	35	50	
60	763	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	8	13	26	48	
61	718	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	8	16	34	49	
62	764	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	7	15	30	51	
63	719	03/04/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	10	21	37	50	

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301 Mission Street
San Francisco, California

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64	62	03/04/06	50.1	15	-21.90	-19.90	-70.0	2.0	45	28	49	68	35-6"	
65	4	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	27	28	31	36	35	
66	5	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	22	22	25	27	28	
67	6	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	22	26	29	23	18-9"	
68	7	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	21	25	30	30	27	
69	8	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	21	29	26	29	26	
70	9	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	25	29	24	30	26	
71	10	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	17	26	30	34	32	
72	11	03/04/06	50.1	15	-21.90	-19.40	-69.5	2.5	27	24	39	61	32-6"	
73	26	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	21	34	40	41	19-6"	
74	48	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	19	26	33	31	14-6"	
75	27	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	20	31	41	44	21-6"	
76	49	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	14	26	38	40	44	
77	28	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	32	39	41	32	18-6"	
78	50	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	14	29	36	38	24-6"	
79	29	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	30	41	46	44	32	
80	51	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	15	31	37	37	36	
81	30	03/04/06	50.1	15	-21.90	-21.90	-72.0	0.0	30	50	45	39	17-6"	
82	52	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	25	34	32	35	33	
83	31	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	20	30	37	35	32	
84	32	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	38	39	35	41	15-6"	
85	33	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	28	40	38	40	40	
86	53	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	23	32	31	32	15-6"	
87	54	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	16	29	35	36	36	
88	55	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	31	44	57	39	20-6"	
89	19	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	30	39	35	35	42	
90	20	03/06/06	50.1	15	-21.90	-21.90	-72.0	0.0	31	39	45	44	47	
91	402	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	9	13	30	3-1"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
92	376	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	7	9	13	15-9"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
93	377	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	10	10	14	21	
94	403	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	13	11	11	25	18-6"	
95	378	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	10	9	10	14	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
96	404	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	9	10	22	13-5"	
97	924	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	9	17	22	13-6"	
98	902	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	12	17	26	11-5"	
99	880	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	9	15	18	4-1"	
100	858	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	10	7	10	10-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
101	836	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	9	7	11	15-11"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
102	814	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	6	6	10	18-9"	
103	925	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	7	17	26	5-1"	
104	926	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	8	10	25	13-6"	
105	904	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	12	12	12	18	13-5"	
106	881	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	12	9	13	20-10"	
107	882	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	13	14	33	29-6"	

TABLE 1
Indicator and Production Pile Summary
301 Mission Street
San Francisco, California

Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
108	859	03/06/06	61.1	10	-21.90	-21.90	-83.0	0.0	13	8	10	16	7-3"	
109	21	03/07/06	50.1	15	-21.90	-20.90	-71.0	1.0	24	26	39	41	62	
110	22	03/07/06	50.1	15	-21.90	-19.90	-70.0	2.0	26	34	47	80	37-6"	
111	43	03/07/06	50.1	15	-21.90	-19.90	-70.0	2.0	44	34	47	63	67	
112	42	03/07/06	50.1	15	-21.90	-20.40	-70.5	1.5	28	31	43	50	70-6"	
113	41	03/07/06	50.1	15	-21.90	-19.90	-70.0	2.0	32	41	58	66	25-3"	
114	63	03/07/06	50.1	15	-21.90	-19.90	-70.0	2.0	55	42	51	74	90	
115	64	03/07/06	50.1	15	-21.90	-19.90	-70.0	2.0	42	56	86	117	31-3"	
116	65	03/07/06	50.1	15	-21.90	-20.90	-71.0	1.0	27	40	46	64	63	
117	66	03/07/06	50.1	15	-21.90	-19.90	-70.0	2.0	26	34	63	65	40-6"	
118	281	03/07/06	50.1	15	-21.90	-21.90	-72.0	0.0	16	20	23	30	30	
119	236	03/07/06	50.1	15	-21.90	-21.90	-72.0	0.0	23	26	23	30	29	
120	208	03/07/06	50.1	15	-21.90	-21.90	-72.0	0.0	33	27	29	27	14-6"	
121	180	03/07/06	50.1	15	-21.90	-21.90	-72.0	0.0	30	30	25	30	30	
122	154	03/07/06	50.1	15	-21.90	-21.90	-72.0	0.0	25	30	26	37	29	
123	860	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	10	11	25	34-9"	
124	837	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	13	11	22	14-4"	
125	838	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	5	5	31	32-9"	
126	815	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	10	10	23	26-9"	
127	816	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	11	14	37	42-9"	
128	927	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	11	12	14	17-6"	
129	928	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	8	31	46	67	
130	924	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	12	27	46	53	
131	930	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	11	26	37	18-3"	
132	931	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	13	28	45	19-3"	
133	932	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	14	20	24	7-2"	
134	933	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	4	10	22	27	20-9"	
135	934	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	15	20	25	9-3"	
136	912	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	13	22	39	21-6"	
137	911	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	7	20	42	36-6"	
138	910	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	5	8	17	40	53	
139	908	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	19	26	40	47-10"	
140	907	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	12	29	58	70-9"	
141	906	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	14	22	49	42-9"	
142	905	03/07/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	9	12	31	54	
143	282	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	16	25	21	24	31	
144	237	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	31	32	33	31	34	
145	209	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	37	43	42	43	37	
146	181	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	38	40	40	41	20-6"	
147	283	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	24	24	30	26	32	
148	238	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	33	35	38	44	17-6"	
149	210	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	40	48	34	42	38	
150	182	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	62	57	54	47	25-6"	
151	155	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	40	35	38	39	42	

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152	156	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	42	48	40	40	22-6"	
153	111	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	39	50	48	54	26-6"	
154	112	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	34	34	35	40	35	
155	113	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	45	47	38	36	18-6"	
156	89	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	32	32	38	32	15-6"	
157	90	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	38	40	46	44	21-6"	
158	91	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	38	43	55	57	44	
159	23	03/08/06	50.1	15	-21.90	-20.40	-70.5	1.5	12	24	38	44	40-6"	
160	45	03/08/06	50.1	15	-21.90	-21.90	-72.0	0.0	28	42	42	41	22-6"	
161	883	3/7 & 3/8/06	61.1	10	-21.90	-21.90	-83.0	0.0	12	9	15	40	62	
162	884	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	11	24	45	61	
163	885	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	17	30	43	36-9"	
164	886	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	16	38	51	46-6"	
165	887	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	13	30	52	48-10"	
166	888	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	14	32	51	23-3"	
167	889	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	10	29	45	49-9"	
168	890	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	15	35	51	49-7"	
169	891	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	8	13	35	53	
170	892	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	11	33	36	18-5"	
171	913	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	7	24	50	24-5"	
172	893	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	9	18	34	22-6"	
173	914	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	8	16	36	46	
174	935	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	6	17	42	54	
175	936	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	5	14	32	41	6-1"	
176	937	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	11	28	39	8-2"	
177	938	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	11	10	22	35	13-4"	
178	939	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	12	15	27	30-9"	
179	940	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	11	11	25	34	
180	941	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	9	14	26	37	
181	942	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	12	25	32	11-5"	
182	943	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	13	25	29	15-6"	
183	944	03/08/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	13	26	33	14-4"	
184	67	03/09/06	50.1	15	-21.90	-21.90	-72.0	0.0	28	35	37	48	38	
185	46	03/09/06	50.1	15	-21.90	-20.40	-70.5	1.5	20	35	54	57	35-6"	
186	68	03/09/06	50.1	15	-21.90	-21.90	-72.0	0.0	30	40	34	48	40	
187	47	03/09/06	50.1	15	-21.90	-20.40	-70.5	1.5	15	25	28	39	36-6"	
188	69	03/09/06	50.1	15	-21.90	-19.90	-70.0	2.0	13	14	39	44	40-6"	
189	945	03/09/06	61.1		-21.90	-21.90	-83.0	0.0	8	11	32	46	34-6"	
190	894	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	10	13	30	39-11"	
191	895	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	10	22	41	32-6"	
192	896	03/09/06	61.1	10	-21.90	-21.90	-83	0.0	7	10	23	37	31-6"	
193	917	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	14	25	51	10-2"	
194	897	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	11	30	45	13-2"	
195	918	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	9	21	32	36-9"	

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196	898	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	8	17	37	45-9"	
197	919	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	6	7	16	26	42	
198	916	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	5	8	11	31	47	
199	920	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	10	26	41	6-1"	
200	899	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	11	23	42	27-6"	
201	921	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	11	25	37	47	
202	900	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	9	23	36	9-2"	
203	923	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	10	35	55	24-5"	
204	901	03/09/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	7	17	36	48	
205	183	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	54	43	50	41	25-6"	
206	157	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	34	36	31	44	38	
207	114	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	48	42	53	43	18-6"	
208	92	03/10/06	50.1	20	-21.90	-21.90	-72.0	0.0	29	39	37	44	36	
209	70	03/10/06	50.1	20	-21.90	-21.90	-72.0	0.0	30	34	56	48	30-6"	
210	71	03/10/06	50.1	15	-21.90	-20.90	-71.0	1.0	16	24	38	36	63	
211	93	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	27	41	53	52	44	
212	115	03/10/06	50.1	15	-21.90	-19.90	-70.0	2.0	21	32	44	57	40-6"	
213	158	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	38	51	50	46	27-6"	
214	185	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	30	49	31	45	39	
215	72	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	12	20	27	53	53	
216	94	03/10/06	50.1	15	-21.90	-20.90	-71.0	1.0	15	23	39	52	36-6"	
217	116	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	22	29	56	49	54	
218	137	03/10/06	50.1	15	-21.90	-20.90	-71.0	1.0	28	43	52	53	38-6"	
219	163	03/10/06	50.1	15	-21.90	-19.90	-70.0	2.0	16	40	70	64	33-6"	
220	186	03/10/06	50.1	15	-21.90	-19.90	-70.0	2.0	27	52	70	105	32-3"	
221	73	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	23	42	48	42	21-6"	
222	95	03/10/06	50.1	15	-21.90	-21.90	-72.0	0.0	33	52	49	53	54	
223	692	03/10/06	61.1	10	-21.90	-21.90	-83.0	0.0	10	12	27	56	30-6"	
224	720	03/10/06	61.1	10	-21.90	-21.90	-83.0	0.0	9	11	25	52	23-5"	
225	765	03/10/06	61.1	10	-21.90	-21.90	-83.0	0.0	8	8	12	27	45	
226	791	03/10/06	61.1	10	-21.90	-21.90	-83.0	0.0	7	8	12	32	60	
227	817	3/10/2006	61.1	10	-21.90	-21.90	-83.0	0.0	7	12	30	54	17-3"	
228	818	3/10/2006	61.1	10	-21.90	-21.90	-83.0	0.0	7	9	32	52	26-5"	
229	819	3/10/2006	61.1	10	-21.90	-21.90	-83.0	0.0	10	11	22	56	63-11"	
230	820	3/10/2006	61.1	10	-21.90	-21.40	-82.5	0.5	7	9	10	34	62	
231	117	3/13/2006	50.1	15	-21.90	-21.90	-72.0	0.0	41	42	48	46	20-6"	
232	118	3/13/2006	50.1	15	-21.90	-20.90	-71.0	1.0	26	36	48	56	32-6"	
233	284	3/13/2006	50.1	15	-21.90	-21.90	-72.0	0.0	23	21	24	23	15-6"	
234	239	3/13/2006	50.1	15	-21.90	-21.90	-72.0	0.0	29	33	27	36	34	
235	211	3/13/2006	50.1	15	-21.90	-21.90	-72.0	0.0	54	48	38	48	14-3"	
236	212	3/13/2006	50.1	15	-21.90	-21.90	-72.0	0.0	42	43	39	46	48	
237	240	3/13/2006	50.1	15	-21.90	-21.90	-72.0	0.0	42	47	39	36	10-3"	
238	285	3/13/2006	50.1	15	-21.9	-21.9	-72.0	0.0	29	28	37	31	33	
239	241	3/13/2006	50.1	15	-21.9	-21.9	-72.0	0.0	24	42	38	47	53	

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240	213	3/13/2006	50.1	15	-21.9	-19.9	-70.0	2.0	26	40	54	65	63	
241	138	3/13/2006	50.1	15	-21.9	-19.9	-70.0	2.0	19	22	40	59	72	
242	139	3/13/2006	50.1	15	-21.9	-19.9	-70.0	2.0	15	29	45	83	62	
243	164	3/13/2006	50.1	15	-21.9	-19.9	-70.0	2.0	21	28	42	73	65	
244	165	3/13/2006	50.1	15	-21.9	-19.9	-70.0	2.0	20	25	49	88	79	
245	187	3/13/2006	50.1	15	-21.9	-19.9	-70.0	2.0	32	49	74	107	50-6"	
246	188	3/13/2006	50.1	15	-21.9	-19.9	-70.0	2.0	29	68	100	143	82-6"	
247	290	3/13/2006	50.1	15	-21.9	-21.9	-72.0	0.0	33	30	41	37	35	
248	264	3/13/2006	50.1	15	-21.9	-19.9	-70.0	2.0	21	32	45	56	64	
249	861	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	12	12	24	35	50	
250	839	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	8	9	20	45	42-8"	
251	862	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	8	9	14	38	55	
252	840	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	10	10	21	46	75	
253	863	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	9	9	17	51	64	
254	841	3/13/2006	61.1	10	-21.9	-21.15	-82.3	0.8	9	10	11	30	62-9"	
255	864	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	9	9	26	48	45-8"	
256	842	3/13/2006	61.1	10	-21.9	-20.7	-81.8	1.2	14	12	12	20	62	
257	721	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	10	12	24	48	44-8"	
258	792	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	8	12	37	55	8-2"	
259	766	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	9	9	9	41	68	
260	722	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	10	14	34	62	16-3"	
261	694	3/13/2006	61.1	10	-21.9	-21.4	-82.5	0.5	12	10	11	15	62	
262	695	3/13/2006	61.1	10	-21.9	-21.4	-82.5	0.5	10	12	12	34	67	
263	723	3/13/2006	61.1	10	-21.9	-21.4	-82.5	0.5	14	13	16	35	61-7"	
264	745	3/13/2006	61.1	10	-21.9	-21.9	-83.0	0.0	14	16	24	49	50-7"	
265	242	3/14/2006	50.1	15	-21.9	-19.9	-70.0	2.0	23	40	63	73	87	
266	214	3/14/2006	50.1	15	-21.9	-19.9	-70.0	2.0	36	52	60	67	34-6"	
267	215	3/14/2006	50.1	15	-21.9	-19.9	-70.0	2.0	24	32	59	60	33-6"	
268	243	3/14/2006	50.1	15	-21.9	-19.9	-70.0	2.0	24	43	69	78	64	
269	265	3/14/2006	50.1	15	-21.9	-19.9	-70	2	20	30	42	62	61	
270	291	3/14/2006	50.1	15	-21.9	-21.9	-72	0	34	33	47	34	35	
271	216	3/14/2006	50.1	15	-21.9	-19.9	-70	2	30	56	65	71	45-6"	
272	244	3/14/2006	50.1	15	-21.9	-20.9	-71	1	21	48	48	45	67	
273	353	3/14/2006	56.1	15	-21.9	-21.9	-78	0	17	18	16	12	11	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
274	310	3/14/2006	56.1	15	-21.9	-21.9	-78	0	21	20	20	14	8-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
275	354	3/14/2006	56.1	15	-21.9	-21.9	-78	0	23	19	21	21	12-6"	
276	311	3/14/2006	56.1	15	-21.9	-16.9	-73	5	44	40	45	50	73	
277	359	3/14/2006	56.1	15	-21.9	-21.9	-78	0	30	22	18	20	16	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
278	333	3/14/2006	56.1	15	-21.9	-21.9	-78	0	26	28	17	22	15	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
279	312	3/14/2006	56.1	15	-21.9	-21.9	-78	0	42	35	28	24	13-6"	
280	360	3/14/2006	56.1	15	-21.9	-21.9	-78	0	24	20	19	15	13	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
281	334	3/14/2006	56.1	15	-21.9	-21.9	-78	0	50	38	35	29	25	
282	313	3/14/2006	56.1	15	-21.9	-14.9	-71	7	24	52	65	65	82	
283	266	3/14/2006	56.1	15	-21.9	-13.9	-70	8	16	32	50	109	86	

TABLE 1
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Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
284	771	3/14/2006	61.1	10	-21.9	-21.9	-83	0	10	11	13	32	74	
285	793	3/14/2006	61.1	10	-21.9	-21.65	-82.75	0.25	10	10	12	38	68	
286	664	3/14/2006	61.1	10	-21.9	-21.9	-83	0	10	9	24	43	36-6"	
287	638	3/14/2006	61.1	10	-21.9	-21.9	-83	0	11	10	11	26	27-9"	
288	595	3/14/2006	61.1	10	-21.9	-21.9	-83	0	9	9	14	27	18-6"	
289	569	3/14/2006	61.1	10	-21.9	-21.9	-83	0	8	8	8	13	30	
290	543	3/14/2006	61.1	10	-21.9	-21.9	-83	0	8	10	9	20	29	
291	500	3/14/2006	61.1	10	-21.9	-21.9	-83	0	7	9	12	28	12-3"	
292	665	3/14/2006	61.1	10	-21.9	-21.9	-83	0	7	9	23	51	34-6"	
293	666	3/14/2006	61.1	10	-21.9	-21.9	-83	0	10	11	17	43	64	
294	639	3/14/2006	61.1	10	-21.9	-21.9	-83	0	11	10	15	52	37-5"	
295	596	3/14/2006	61.1	10	-21.9	-21.9	-83	0	9	9	12	26	37	
296	570	3/14/2006	61.1	10	-21.9	-21.9	-83	0	11	10	11	25	24-5"	
297	544	3/14/2006	61.1	10	-21.9	-21.9	-83	0	12	14	20	37	10-3"	
298	501	3/14/2006	61.1	10	-21.9	-21.9	-83	0	8	9	14	17	16-6"	
299	502	3/14/2006	61.1	10	-21.9	-21.9	-83	0	8	8	10	12	21	
300	503	3/14/2006	61.1	10	-21.9	-21.9	-83	0	9	9	9	17	26	
301	524	3/14/2006	61.1	10	-21.9	-21.9	-83	0	11	9	13	31	32-6"	
302	549	3/14/2006	61.1	10	-21.9	-21.9	-83	0	10	12	33	56	12-2"	
303	550	3/14/2006	61.1	10	-21.9	-21.9	-83	0	13	13	15	28	70	
304	292	3/15/2006	56.1	15	-21.9	-13.9	-70	8	22	37	54	67	72	
305	314	3/15/2006	56.1	15	-21.9	-21.9	-78	0	25	24	21	15	9-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
306	335	3/15/2006	56.1	15	-21.9	-21.9	-78	0	36	29	26	21	12-6"	
307	361	3/15/2006	56.1	15	-21.9	-21.9	-78	0	26	23	16	18	14	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
308	74	3/15/2006	50.1	15	-21.9	-21.9	-72	0	20	30	29	35	36	
309	75	3/15/2006	50.1	15	-21.9	-21.9	-72	0	24	26	30	36	33	
310	76	3/15/2006	50.1	15	-21.9	-21.9	-72	0	16	23	29	30	26	
311	77	3/15/2006	50.1	15	-21.9	-21.9	-72	0	17	29	31	30	15-6"	
312	96	3/15/2006	50.1	20	-21.9	-21.9	-72	0	31	38	41	36	15-6"	
313	97	3/15/2006	50.1	15	-21.9	-21.9	-72	0	28	49	44	49	39	
314	98	3/15/2006	50.1	15	-21.9	-21.9	-72	0	25	44	40	42	28	
315	119	3/15/2006	50.1	15	-21.9	-21.9	-72	0	28	39	44	41	25-9"	
316	140	3/15/2006	50.1	15	-21.9	-21.9	-72	0	58	44	45	36	15-6"	
317	99	3/15/2006	50.1	15	-21.9	-21.9	-72	0	25	28	37	39	17-6"	
318	120	3/15/2006	56.1	15	-21.9	-14.9	-71	7	20	37	39	51	68	
319	575	3/15/2006	61.1	10	-21.9	-21.9	-83	0	11	11	14	27	30-7"	
320	576	3/15/2006	61.1	10	-21.9	-21.9	-83	0	12	11	14	14	5-4"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
321	597	3/15/2006	61.1	10	-21.9	-21.9	-83	0	11	10	10	21	35-10"	
322	598	3/15/2006	61.1	10	-21.9	-21.9	-83	0	11	9	9	15	67	
323	618	3/15/2006	61.1	10	-21.9	-21.9	-83	0	12	13	13	28	38-9"	
324	644	3/15/2006	61.1	10	-21.9	-20.9	-82	1	11	12	14	24	70-9"	
325	667	3/15/2006	61.1	10	-21.9	-21.65	-82.75	0.25	16	16	20	41	61-10"	
326	474	3/15/2006	61.1	10	-21.9	-21.9	-83	0	8	8	10	12	27	
327	448	3/15/2006	61.1	10	-21.9	-21.9	-83	0	10	9	10	11	13-8"	

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Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
328	405	3/15/2006	61.1	10	-21.9	-21.9	-83	0	10	10	10	10	10-11"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
329	379	3/15/2006	61.1	10	-21.9	-21.9	-83	0	10	7	10	12	12	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
330	380	3/15/2006	61.1	10	-21.9	-21.9	-83	0	11	13	9	14	8-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
331	406	3/15/2006	61.1	10	-21.9	-21.9	-83	0	9	10	9	10	12	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
332	449	3/15/2006	61.1	10	-21.9	-21.9	-83	0	10	7	10	12	10-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
333	141	3/16/2006	56.1	15	-21.9	-14.65	-70.75	7.25	22	53	52	57	66	
334	121	3/16/2006	56.1	15	-21.9	-21.9	-78	0	20	26	21	22	21	
335	142	3/16/2006	56.1	15	-21.9	-14.4	-70.5	7.5	20	30	43	45	65	
336	122	3/16/2006	56.1	15	-21.9	-15.15	-71.25	6.75	20	38	40	52	64	
337	143	3/16/2006	56.1	15	-21.9	-21.9	-78	0	25	23	24	23	22	
338	123	3/16/2006	56.1	15	-21.9	-14.9	-71	7	12	22	33	57	72	
339	144	3/16/2006	56.1	15	-21.9	-13.9	-70	8	17	32	56	76	90	
340	475	3/16/2006	61.1	10	-21.9	-21.9	-83	0	13	9	11	16	25-9"	
341	385	3/16/2006	61.1	10	-21.9	-21.9	-83	0	14	13	13	11	11-11"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
342	386	3/16/2006	61.1	10	-21.9	-21.9	-83	0	13	16	15	17	15	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
343	407	3/16/2006	61.1	10	-21.9	-10.33	-71.43	11.57	32	41	50	55	85	
344	408	3/16/2006	61.1	10	-21.9	-10	-71.1	11.9	41	50	67	69	77	
345	428	3/16/2006	61.1	10	-21.9	-10.33	-71.43	11.57	19	34	48	50	64	
346	429	3/16/2006	61.1	10	-21.9	-10	-71.1	11.9	28	34	47	58	68	
347	454	3/16/2006	61.1	10	-21.9	-10.43	-71.53	11.47	25	44	48	60	61	
348	455	3/16/2006	61.1	10	-21.9	-10.33	-71.43	11.57	37	60	95	118	80-10"	
349	480	3/16/2006	61.1	10	-21.9	-10.33	-71.43	11.57	39	58	61	62	81	
350	481	3/16/2006	61.1	10	-21.9	-10	-71.1	11.9	23	35	51	90	110	
351	166	3/17/2006	50.1	15	-21.9	-20.9	-71	1	27	37	62	49	65	
352	189	3/17/2006	50.1	15	-21.9	-20.4	-70.5	1.5	33	35	53	59	62	
353	217	3/17/2006	50.1	15	-21.9	-20.15	-70.25	1.75	21	40	44	60	65	
354	267	3/17/2006	56.1	15	-21.9	-21.9	-78	0	24	22	20	18	17	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
355	293	3/17/2006	56.1	15	-21.9	-14.9	-71	7	28	46	57	55	98	
356	315	3/17/2006	56.1	15	-21.9	-14.9	-71	7	35	46	59	55	63	
357	336	3/17/2006	56.1	15	-21.9	-14.4	-70.5	7.5	25	46	53	75	88	
358	362	3/17/2006	56.1	15	-21.9	-21.9	-78	0	35	30	26	26	12-6"	
359	363	3/17/2006	56.1	15	-21.9	-14.9	-71	7	40	41	55	56	67	
360	364	3/17/2006	56.1	15	-21.9	-15.9	-72	6	41	39	57	43	65	
361	338	3/17/2006	56.1	15	-21.9	-13.9	-70	8	17	42	70	71	117	
362	316	3/17/2006	56.1	15	-21.9	-14.15	-70.25	7.75	37	60	71	80	46-6"	
363	317	3/17/2006	56.1	15	-21.9	-14.65	-70.75	7.25	39	50	57	66	69	
364	294	3/17/2006	56.1	15	-21.9	-13.9	-70	8	61	60	116	124	100-9"	
365	619	3/17/2006	61.1	10	-21.9	-21.9	-83	0	13	14	16	40	19-4"	
366	645	3/17/2006	61.1	10	-21.9	-21.9	-83	0	15	14	17	34	69-9"	
367	668	3/17/2006	61.1	10	-21.9	-21.4	-82.5	0.5	11	13	15	48	64-9"	
368	696	3/17/2006	61.1	10	-21.9	-21.9	-83	0	12	12	16	49	67-9"	
369	724	3/17/2006	61.1	10	-21.9	-21.9	-83	0	14	11	16	48	84	
370	746	3/17/2006	61.1	10	-21.9	-21.9	-83	0	14	14	14	25	99	
371	772	3/17/2006	61.1	10	-21.9	-20.9	-82	1	14	10	17	25	71-9"	

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372	794	3/17/2006	61.1	10	-21.9	-21.9	-83	0	11	10	22	58	94	
373	773	3/17/2006	61.1	10	-21.9	-20.9	-82	1	11	11	14	30	66-9"	
374	747	3/17/2006	61.1	10	-21.9	-21.5	-82.6	0.4	11	11	13	24	64	
375	725	3/17/2006	61.1	10	-21.9	-20.9	-82	1	15	16	20	36	65-9"	
376	697	3/17/2006	61.1	30	-21.9	-21.4	-82.5	0.5	11	12	17	47	62-6"	
377	796	3/17/2006	61.1	30	-21.9	-21.9	-83	0	11	11	13	35	78	
378	245	3/18/2006	50.1	15	-21.9	-19.9	-70	2	21	32	45	69	63	
379	268	3/18/2006	56.1	15	-21.9	-14.4	-70.5	7.5	31	47	61	66	44-6"	
380	246	3/18/2006	56.1	15	-21.9	-13.9	-70	8	32	46	77	103	83	
381	218	3/18/2006	56.1	15	-21.9	-21.9	-78	0	21	10	8	10	12	Pile Broken, no replacement pile needed, see RFI #139
382	190	3/18/2006	56.1	15	-21.9	-21.9	-78	0	38	9	7	6	7	Pile Broken, no replacement pile needed, see RFI #139
383	167	3/18/2006	56.1	15	-21.9	-13.9	-70	8	23	29	41	64	72	
384	295	3/18/2006	56.1	15	-21.9	-13.9	-70	8	19	39	65	65	70	
385	269	3/18/2006	56.1	15	-21.9	-13.9	-70	8	19	33	57	66	74	
386	247	3/18/2006	56.1	15	-21.9	-13.9	-70	8	25	42	69	77	76	
387	219	3/18/2006	56.1	15	-21.9	-12.4	-68.5	9.5	69	50	44	66	90	
388	191	3/18/2006	56.1	15	-21.9	-13.9	-70	8	40	65	118	116	45-3"	
389	168	3/18/2006	56.1	15	-21.9	-13.9	-70	8	35	50	84	118	70-6"	
390	169	3/18/2006	56.1	15	-21.9	-13.1	-69.2	8.8	22	42	150	172	35-2"	
391	646	3/18/2006	61.1	10	-21.9	-21.9	-83	0	12	14	29	53	15-2"	
392	669	3/18/2006	61.1	10	-21.9	-21.9	-83	0	15	16	23	57	75-7"	
393	647	3/18/2006	61.1	30	-21.9	-21.9	-83	0	10	9	13	44	9-2"	
394	670	3/18/2006	61.1	30	-21.9	-20.9	-82	1	12	14	16	32	64-8"	
395	698	3/18/2006	61.1	30	-21.9	-19.9	-81	2	29	39	55	54	64-7"	
396	648	3/18/2006	61.1	30	-21.9	-21.9	-83	0	11	9	12	23	99	
397	671	3/18/2006	61.1	30	-21.9	-21.9	-83	0	11	12	13	29	92	
398	699	3/18/2006	61.1	30	-21.9	-21.9	-83	0	12	12	19	37	89	
399	649	3/18/2006	61.1	30	-21.9	-21.9	-83	0	9	10	15	54	32-3"	
400	672	3/18/2006	61.1	35	-21.9	-21.6	-82.7	0.3	10	11	13	21	67	
401	700	3/18/2006	61.1	30	-21.9	-20.9	-82	1	13	15	19	30	68-6"	
402	726	3/18/2006	61.1	30	-21.9	-20.9	-82	1	18	12	13	22	62	
403	748	3/18/2006	61.1	30	-21.9	-20.7	-81.8	1.2	14	16	12	25	65-9"	
404	774	3/18/2006	61.1	30	-21.9	-20.9	-82	1	11	13	14	22	77	
405	504	3/20/2006	51.77	15	-32.9	-32.9	-84.67	0	10	12	15	18	34	
406	505	3/20/2006	51.77	15	-32.9	-32.9	-84.67	0	12	15	22	34	71-6"	
407	506	3/20/2006	55.77	15	-32.9	-32.9	-88.67	0	27	39	57	43	20-6"	
408	507	3/20/2006	55.77	15	-32.9	-32.9	-88.67	0	31	46	51	52	43	
409	525	3/20/2006	51.77	15	-32.9	-32.9	-84.67	0	14	16	32	54	62	
410	526	3/20/2006	51.77	15	-32.9	-31.9	-83.67	1	11	13	23	49	46-6"	
411	879	3/20/2006	61.1	45	-21.9	-21.9	-83	0	8	11	15	30	49	
412	857	3/20/2006	61.1	45	-21.9	-21.9	-83	0	10	10	30	55	23-4"	
413	835	3/20/2006	61.1	45	-21.9	-21.9	-83	0	9	8	16	30	43-9"	
414	813	3/20/2006	61.1	45	-21.9	-21.9	-83	0	9	9	19	45	28-6"	
415	770	3/20/2006	61.1	45	-21.9	-21.9	-83	0	8	7	12	34	24-5"	

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416	749	3/20/2006	61.1	35	-21.9	-21.6	-82.7	0.3	11	11	15	42	64-9"	
417	775	3/20/2006	61.1	35	-21.9	-21.9	-83	0	13	12	16	50	67	
418	797	3/20/2006	61.1	35	-21.9	-21.9	-83	0	9	9	12	34	35-6"	
419	822	3/20/2006	61.1	0	-21.9	-21.9	-83	0	8	10	13	28	39-9"	
420	844	3/20/2006	61.1	35	-21.9	-21.9	-83	0	7	8	14	50	50	
421	866	3/20/2006	61.1	35	-21.9	-21.9	-83	0	7	10	22	35	58	
422	821	3/20/2006	61.1	35	-21.9	-21.9	-83	0	9	8	14	38	89	
423	387	3/21/2006	56.1	15	-21.9	-21.9	-78	0	20	19	15	18	15	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
424	388	3/21/2006	56.1	15	-21.9	-21.9	-78	0	22	20	13	15	12	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
425	389	3/21/2006	56.1	15	-21.9	-21.9	-78	0	47	39	41	31	14-6"	
426	390	3/21/2006	56.1	15	-21.9	-21.9	-78	0	28	28	18	20	15	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
427	88	3/21/2006	50.1	45	-21.9	-19.9	-70	2	33	36	60	81	112	
428	110	3/21/2006	50.1	45	-21.9	-19.9	-70	2	22	24	35	59	63	
429	136	3/21/2006	56.1	45	-21.9	-14.65	-70.75	7.25	36	52	66	79	50-6"	
430	162	3/21/2006	56.1	45	-21.9	-13.9	-70	8	28	32	47	73	75	
431	207	3/21/2006	56.1	45	-21.9	-21.9	-78	0	50	46	26	29	36	
432	235	3/21/2006	56.1	45	-21.9	-21.9	-78	0	32	36	28	29	35	
433	263	3/21/2006	56.1	45	-21.9	-14.9	-71	7	13	13	37	65	71	
434	843	3/21/2006	61.1	30	-21.9	-21.9	-83	0	10	12	13	29	70	
435	865	3/21/2006	61.1	35	-21.9	-21.9	-83	0	10	15	30	52	34-6"	
436	823	3/21/2006	61.1	35	-21.9	-21.9	-83	0	10	9	17	35	31-6"	
437	845	3/21/2006	61.1	35	-21.9	-21.9	-83	0	10	11	16	42	51	
438	867	3/21/2006	61.1	35	-21.9	-21.9	-83	0	11	16	42	54	25-3"	
439	744	3/21/2006	61.1	45	-21.9	-21.9	-83	0	7	8	10	25	38-9"	
440	688	3/21/2006	61.1	45	-21.9	-21.9	-83	0	14	12	19	39	30-5"	
441	643	3/21/2006	61.1	45	-21.9	-21.9	-83	0	17	12	14	15	11-6"	
442	617	3/21/2006	61.1	45	-21.9	-21.9	-83	0	18	11	11	11	4-3"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
443	574	3/21/2006	61.1	45	-21.9	-21.9	-83	0	18	12	10	10	9-9"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
444	551	3/21/2006	51.77	10	-32.9	-32.9	-84.67	0	14	13	25	63	92	
445	289	3/22/2006	56.1	45	-21.9	-14.9	-71	7	16	32	42	44	67	
446	332	3/22/2006	56.1	45	-21.9	-15.9	-72	6	32	44	51	58	62	
447	358	3/22/2006	56.1	45	-21.9	-21.9	-78	0	25	27	32	27	26	
448	384	3/22/2006	56.1	45	-21.9	-21.9	-78	0	21	19	22	22	17-9"	
449	427	3/22/2006	56.1	45	-21.9	-21.9	-78	0	31	28	30	26	23	
450	87	3/22/2006	50.1	45	-21.9	-20.4	-70.5	1.5	25	26	48	55	73	
451	109	3/22/2006	50.1	45	-21.9	-19.9	-70	2	23	45	55	87	30-3"	
452	135	3/22/2006	56.1	45	-21.9	-19.9	-76	2	6	6	4	2	2	Pile Broken, replacement pile (#135-R) driven on 4/17/06 see RFI #163
453	161	3/22/2006	56.1	45	-21.9	-13.9	-70	8	22	33	46	48	35-6"	
454	206	3/22/2006	56.1	45	-21.9	-14.9	-71	7	18	35	43	47	67	
455	205	3/22/2006	56.1	45	-21.9	-13.9	-70	8	21	24	30	54	70	
456	160	3/22/2006	56.1	45	-21.9	-9.4	-65.5	12.5	34	62	77	76	45-6"	
457	134	3/22/2006	56.1	40	-21.9	-11.4	-67.5	10.5	71	58	42	44	17-2"	
458	577	3/22/2006	51.77	10	-32.9	-32.9	-84.67	0	12	21	38	47	72	
459	599	3/22/2006	51.77	10	-32.9	-32.9	-84.67	0	14	18	30	52	90	

TABLE 1
Indicator and Production Pile Summary
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Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
460	620	3/22/2006	51.77	10	-32.9	-31.9	-83.67	1	14	15	20	56	79	
461	409	3/22/2006	46.77	10	-32.9	-32.9	-79.67	0	20	18	16	14	13	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
462	410	3/22/2006	46.77	10	-32.9	-32.9	-79.67	0	22	21	20	19	17	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
463	411	3/22/2006	46.77	10	-32.9	-32.9	-79.67	0	65	65	45	35	30	
464	412	3/22/2006	46.77	10	-32.9	-32.9	-79.67	0	34	30	27	23	32	
465	432	3/22/2006	55.77	10	-32.9	-32.9	-88.67	0	21	29	81	73	50-6"	
466	458	3/22/2006	55.77	10	-32.9	-31.9	-87.67	1	22	25	31	57	67-9"	
467	484	3/22/2006	55.77	10	-32.9	-30.4	-86.17	2.5	16	20	21	43	64	
468	527	3/22/2006	55.77	10	-32.9	-29.4	-85.17	3.5	13	22	54	57	79	
469	108	3/23/2006	50.1	45	-21.9	-10	-60.1	11.9	14	23	36	65	75-6"	
470	86	3/23/2006	50.1	45	-21.9	-18.9	-69	3	34	35	41	62	92	
471	234	3/23/2006	56.1	45	-21.9	-14.4	-70.5	7.5	18	15	22	52	62	
472	262	3/23/2006	56.1	45	-21.9	-14.1	-70.2	7.8	19	17	37	54	68	
473	288	3/23/2006	56.1	45	-21.9	-15.7	-71.8	6.2	29	50	49	53	62	
474	331	3/23/2006	56.1	45	-21.9	-21.9	-78	0	43	35	33	34	16-6"	
475	357	3/23/2006	56.1	45	-21.9	-21.9	-78	0	42	47	38	35	31	
476	383	3/23/2006	56.1	45	-21.9	-21.9	-78	0	43	43	37	31	28	
477	426	3/23/2006	56.1	45	-21.9	-21.9	-78	0	29	24	23	23	22	
478	233	3/23/2006	56.1	45	-21.9	-13.9	-70	8	20	23	34	82	40-6"	
479	261	3/23/2006	56.1	45	-21.9	-13.9	-70	8	21	22	27	74	77	
480	287	3/23/2006	56.1	45	-21.9	-14.9	-71	7	21	26	45	59	65	
481	330	3/23/2006	56.1	45	-21.9	-13.9	-70	8	19	28	36	50	93	
482	356	3/23/2006	56.1	45	-21.9	-21.9	-78	0	28	27	27	24	24	
483	453	3/23/2006	64.1	45	-21.9	-21.9	-86	0	8	9	7	8	9-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
484	479	3/23/2006	65.1	45	-21.9	-21.9	-87	0	10	17	20	48	61	
485	522	3/23/2006	65.1	45	-21.9	-21.9	-87	0	14	13	21	29	70	
486	548	3/23/2006	65.1	45	-21.9	-19.9	-85	2	21	21	26	71	65	
487	431	3/23/2006	51.77	10	-32.9	-32.9	-84.67	0	18	19	24	29	13-4"	
488	430	3/23/2006	51.77	10	-32.9	-32.9	-84.67	0	26	33	34	47	10-3"	
489	457	3/23/2006	51.77	10	-32.9	-22.4	-74.17	10.5	98	101	98	54	45	
490	456	3/23/2006	51.77	10	-32.9	-17.9	-69.67	15	43	71	96	97	20-3"	
491	482	3/23/2006	51.77	35	-32.9	-32.9	-84.67	0	18	24	29	56	82	
492	452	3/24/2006	65.1	45	-21.9	-21.9	-87	0	14	17	34	54	75	
493	478	3/24/2006	65.1	45	-21.9	-21.9	-87	0	19	16	28	55	78	
494	521	3/24/2006	65.1	45	-21.9	-21.9	-87	0	48	30	58	81	45-6"	
495	547	3/24/2006	65.1	45	-21.9	-21.9	-87	0	20	33	54	85	46-6"	
496	520	3/24/2006	65.1	45	-21.9	-21.9	-87	0	12	19	34	75	88	
497	451	3/24/2006	65.1	45	-21.9	-9.9	-75	12	52	66	57	60	107	
498	425	3/24/2006	56.1	45	-21.9	-21.9	-78	0	27	23	25	21	22	
499	573	3/24/2006	61.1	45	-21.9	-21.9	-83	0	28	18	17	16	8-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
500	616	3/24/2006	61.1	45	-21.9	-21.9	-83	0	21	18	12	13	12	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
501	483	3/24/2006	51.77	35	-32.9	-19.9	-71.67	13	68	80	110	95	85	
502	552	3/24/2006	51.77	15	-32.9	-30.9	-82.67	2	14	15	20	44	72-10"	
503	578	3/24/2006	51.77	35	-32.9	-31.9	-83.67	1	12	14	23	58	79-10"	

TABLE 1
Indicator and Production Pile Summary
301 Mission Street
San Francisco, California

Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
504	600	3/24/2006	51.77	35	-32.9	-31.9	-83.67	1	14	16	20	57	73-9"	
505	621	3/24/2006	51.77	35	-32.9	-30.9	-82.67	2	20	25	25	65	32-3"	
506	553	3/24/2006	55.77	35	-32.9	-19.9	-75.67	13	110	75	61	60	104	
507	579	3/24/2006	51.77	35	-32.9	-31.9	-83.67	1	19	14	17	28	98	
508	601	3/24/2006	51.77	35	-32.9	-20.9	-72.67	12	40	67	108	116	97	
509	622	3/24/2006	51.77	35	-32.9	-31.4	-83.17	1.5	20	18	20	39	40-4"	
510	78	3/27/2006	50.1	15	-21.9	-21.9	-72	0	20	25	31	30	24	
511	79	3/27/2006	50.1	15	-21.9	-21.9	-72	0	19	22	29	27	27	
512	80	3/27/2006	50.1	15	-21.9	-21.9	-72	0	22	24	33	28	33	
513	81	3/27/2006	50.1	15	-21.9	-21.9	-72	0	22	24	36	28	33	
514	82	3/27/2006	50.1	15	-21.9	-21.9	-72	0	34	33	45	38	32-9"	
515	83	3/27/2006	50.1	15	-21.9	-20.15	-70.25	1.75	28	36	52	49	65	
516	100	3/27/2006	50.1	15	-21.9	-21.9	-72	0	17	26	30	32	27	
517		3/27/2006	50.1	15	-21.9	-21.9	-72	0	29	31	35	38	17-6"	
518	102	3/27/2006	50.1	15	-21.9	-21.9	-72	0	30	32	40	32	15-6"	
519	103	3/27/2006	50.1	15	-21.9	-21.9	-72	0	33	35	43	37	20-9"	
520	104	3/27/2006	50.1	15	-21.9	-21.9	-72	0	30	40	38	58	48	
521	105	3/27/2006	50.1	15	-21.9	-19.9	-70	2	31	33	46	50	70	
522	124	3/27/2006	56.1	15	-21.9	-21.9	-78	0	26	27	26	23	11-6"	
523	125	3/27/2006	56.1	15	-21.9	-21.9	-78	0	24	30	24	24	11-6"	
524	126	3/27/2006	56.1	15	-21.9	-21.9	-78	0	26	31	26	24	22	
525	743	3/27/2006	61.1	45	-21.9	-21.9	-83	0	9	12	17	58	35-6"	
526	715	3/27/2006	61.1	45	-21.9	-21.9	-83	0	16	10	32	80	18-2"	
527	687	3/27/2006	61.1	45	-21.9	-21.9	-83	0	17	14	19	53	26-4"	
528	642	3/27/2006	61.1	45	-21.9	-21.9	-83	0	15	17	18	22	51	
529	572	3/27/2006	61.1	45	-21.9	-22.9	-84	-1	12	10	9	11	15	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
530	615	3/27/2006	61.1	45	-21.9	-21.9	-83	0	18	20	17	16	14-7"	
531	641	3/27/2006	61.1	45	-21.9	-21.9	-83	0	20	20	19	25	69	
532	686	3/27/2006	61.1	45	-21.9	-21.9	-83	0	21	18	18	45	118	
533	714	3/27/2006	61.1	45	-21.9	-21.9	-83	0	17	16	19	52	116-9"	
534	742	3/27/2006	61.1	45	-21.9	-21.9	-83	0	10	10	18	61	49-6"	
535	769	3/27/2006	61.1	45	-21.9	-21.9	-83	0	9	8	12	33	72	
536	812	3/27/2006	61.1	45	-21.9	-21.9	-83	0	8	11	12	35	56	
537	834	3/27/2006	61.1	45	-21.9	-21.9	-83	0	10	11	37	70	22-3"	
538	485	3/28/2006	55.77	15	-32.9	-32.9	-88.67	0	30	36	57	64	30-6"	
539	459	3/28/2006	55.77	15	-32.9	-32.9	-88.67	0	21	27	40	47	74	
540	433	3/28/2006	55.77	15	-32.9	-32.9	-88.67	0	23	31	46	57	78	
541	127	3/28/2006	56.1	15	-21.9	-14.4	-70.5	7.5	19	29	60	72	112	
542	128	3/28/2006	56.1	15	-21.9	-21.9	-78	0	31	33	29	27	24	
543	129	3/28/2006	56.1	15	-21.9	-13.9	-70	8	55	32	65	62	82	
544	130	3/28/2006	56.1	15	-21.9	-8.4	-64.5	13.5	23	39	85	103	101	
545	84	3/28/2006	50.1	15	-21.9	-19.9	-70	2	49	53	50	57	70	
546	85	3/28/2006	50.1	15	-21.9	-17.4	-67.5	4.5	115	73	51	71	33-3"	
547	106	3/28/2006	50.1	45	-21.9	-18.4	-68.5	3.5	110	70	55	54	81	

Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
548	107	3/28/2006	50.1	15	-21.9	-16.9	-67	5	95	52	44	63	88	
549	131	3/28/2006	56.1	15	-21.9	-7.4	-63.5	14.5	17	35	67	123	85-6"	
550	623	3/28/2006	51.77	35	-32.9	-32.9	-84.67	0	18	22	58	113	29-2"	
551	856	3/28/2006	61.1	45	-21.9	-21.9	-83	0	9	12	30	44	28-5"	
552	878	3/28/2006	61.1	45	-21.9	-21.9	-83	0	8	10	22	44	31-6"	
553	811	3/28/2006	61.1	45	-21.9	-21.9	-83	0	11	11	33	50	13-2"	
554	768	3/28/2006	61.1	45	-21.9	-21.9	-83	0	8	10	12	34	46-11"	
555	833	3/28/2006	61.1	45	-21.9	-21.9	-83	0	10	12	36	62	34-5"	
556	855	3/28/2006	61.1	45	-21.9	-21.9	-83	0	9	9	16	32	13-3"	
557	877	3/28/2006	61.1	45	-21.9	-21.9	-83	0	12	15	38	63	9-7"	Pile Broken, replacement pile (#877-R) driven on 4/20/06 see RFI #163
558	832	3/28/2006	61.1	10	-21.9	-21.9	-83	0	10	12	30	57	31-4"	
559	854	3/28/2006	61.1	10	-21.9	-21.9	-83	0	10	17	38	68	29-4"	
560	876	3/28/2006	61.1	10	-21.9	-21.9	-83	0	11	15	39	74	36-5"	
561	528	3/28/2006	55.77	35	-32.9	-27.9	-83.67	5	12	13	32	65	73	
562	554	3/28/2006	55.77	35	-32.9	-27.1	-82.87	5.8	14	15	18	73	64-6"	
563	413	3/29/2006	46.77	15	-32.9	-32.9	-79.67	0	35	24	19	13	12	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
564	391	3/29/2006	56.1	15	-21.9	-20.9	-77	1	35	35	25	22	21	
565	365	3/29/2006	56.1	15	-21.9	-21.9	-78	0	29	24	21	17	8-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
566	339	3/29/2006	56.1	15	-21.9	-21.9	-78	0	26	30	21	21	17	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
567	318	3/29/2006	56.1	15	-21.9	-21.9	-78	0	26	26	23	19	16	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
568	296	3/29/2006	56.1	15	-21.9	-21.9	-78	0	28	27	20	20	17	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
569	270	3/29/2006	56.1	15	-21.9	-21.9	-78	0	22	23	26	20	15	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
570	248	3/29/2006	56.1	15	-21.9	-21.9	-78	0	22	27	22	21	21	
571	220	3/29/2006	56.1	15	-21.9	-13.9	-70	8	23	36	66	81	90	
572	192	3/29/2006	56.1	15	-21.9	-11.9	-68	10	87	73	49	48	102	
573	170	3/29/2006	56.1	15	-21.9	-21.9	-78	0	29	29	26	24	12-6"	
574	580	3/29/2006	51.77	35	-32.9	-30.9	-82.67	2	16	17	18	17	73	
575	602	3/29/2006	51.77	35	-32.9	-31.9	-83.67	1	13	16	22	46	62-6"	
576	868	3/29/2006	61.1	10	-21.9	-21.9	-83	0	9	15	35	47	14-3"	
577	846	3/29/2006	61.1	35	-21.9	-21.9	-83	0	9	12	30	46	38-6"	
578	824	3/29/2006	61.1	20	-21.9	-21.9	-83	0	8	12	21	30	21-4"	
579	869	3/29/2006	61.1	35	-21.9	-21.9	-83	0	8	8	19	30	65	
580	847	3/29/2006	61.1	35	-21.9	-21.9	-83	0	8	10	16	35	49	
581	825	3/29/2006	61.1	10	-21.9	-21.9	-83	0	8	9	11	23	58	
582	848	3/29/2006	61.1	35	-21.9	-21.9	-83	0	7	9	11	29	56	
583	870	3/29/2006	61.1	35	-21.9	-21.9	-83	0	8	10	34	72	37-4"	
584	826	3/29/2006	61.1	10	-21.9	-21.9	-83	0	10	10	15	34	53	
585	871	3/29/2006	61.1	10	-21.9	-21.9	-83	0	9	10	36	50	22-3"	
586	849	3/29/2006	61.1	10	-21.9	-21.9	-83	0	9	9	12	21	39	
587	827	3/29/2006	61.1	10	-21.9	-21.9	-83	0	11	14	30	57	21-4"	
588	872	3/29/2006	61.1	10	-21.9	-21.9	-83	0	10	17	42	53	15-3"	
589	193	3/30/2006	56.1	15	-21.9	-11.9	-68	10	44	33	37	77	30-3"	
590	221	3/30/2006	56.1	15	-21.9	-21.9	-78	0	25	47	36	28	13-6"	
591	249	3/30/2006	56.1	15	-21.9	-21.9	-78	0	34	37	38	33	31	

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Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
592	271	3/30/2006	56.1	15	-21.9	-13.9	-70	8	16	35	55	78	86	
593	297	3/30/2006	56.1	15	-21.9	-16.9	-73	5	74	63	69	58	65	
594	319	3/30/2006	56.1	15	-21.9	-21.9	-78	0	41	36	27	23	11-6"	
595	340	3/30/2006	56.1	15	-21.9	-13.9	-70	8	19	38	49	69	84	
596	366	3/30/2006	56.1	15	-21.9	-21.9	-78	0	38	35	25	22	21	
597	392	3/30/2006	56.1	15	-21.9	-21.9	-78	0	33	25	24	17	16	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
598	145	3/30/2006	56.1	15	-21.9	-21.9	-78	0	29	27	34	29	23	
599	171	3/30/2006	56.1	15	-21.9	-13.9	-70	8	32	30	48	61	80	
600	146	3/30/2006	56.1	15	-21.9	-21.9	-78	0	44	34	41	33	27	
601	850	3/30/2006	61.1	10	-21.9	-21.9	-83	0	10	13	34	68	18-3"	
602	873	3/30/2006	61.1	10	-21.9	-21.9	-83	0	10	16	34	59	15-3"	
603	851	3/30/2006	61.1	10	-21.9	-21.9	-83	0	8	11	19	60	79	
604	874	3/30/2006	61.1	35	-21.9	-21.9	-83	0	9	11	30	52	48-9'	
605	852	3/30/2006	61.1	35	-21.9	-21.9	-83	0	10	10	15	50	80	
606	853	3/30/2006	61.1	35	-21.9	-21.9	-83	0	11	12	16	38	82	
607	875	3/30/2006	61.1	35	-21.9	-21.9	-83	0	10	17	35	58	51-9"	
608	831	3/30/2006	61.1	10	-21.9	-21.9	-83	0	10	11	18	50	35-7"	
609	728	3/30/2006	61.1	10	-21.9	-21.9	-83	0	32	33	34	55	76	
610	750	3/30/2006	61.1	35	-21.9	-21.9	-83	0	15	18	23	65	63-9"	
611	776	3/30/2006	61.1	35	-21.9	-21.9	-83	0	10	20	26	84	80-6"	
612	798	3/30/2006	61.1	35	-21.9	-21.9	-83	0	12	13	19	35	63	
613	172	3/31/2006	56.1	15	-21.9	-13.9	-70	8	21	33	52	71	84	
614	195	3/31/2006	56.1	15	-21.9	-13.9	-70	8	26	36	60	94	105	
615	222	3/31/2006	56.1	15	-21.9	-13.9	-70	8	21	36	57	60	80	
616	250	3/31/2006	56.1	15	-21.9	-13.9	-70	8	21	30	56	64	72	
617	272	3/31/2006	56.1	15	-21.9	-13.9	-70	8	26	42	56	66	85	
618	298	3/31/2006	56.1	15	-21.9	-13.9	-70	8	44	52	78	93	45-6"	
619	320	3/31/2006	56.1	15	-21.9	-13.9	-70	8	39	53	76	75	43-6"	
620	341	3/31/2006	56.1	15	-21.9	-13.9	-70	8	22	36	64	103	46-6"	
621	367	3/31/2006	56.1	15	-21.9	-13.9	-70	8	23	43	59	72	42-6"	
622	223	3/31/2006	56.1	15	-21.9	-13.9	-70	8	21	36	55	75	82	
623	251	3/31/2006	56.1	15	-21.9	-21.9	-78	0	40	33	28	30	13-6"	
624	273	3/31/2006	56.1	15	-21.9	-21.9	-78	0	36	29	27	25	23	
625	393	3/31/2006	56.1	15	-21.9	-21.65	-77.75	0.25	34	28	22	17	19-3"	Restrike performed on final 3-inches of driving on 4/1/06
626	729	3/31/2006	61.1	35	-21.9	-21.9	-83	0	11	13	14	31	82	
627	701	3/31/2006	61.1	35	-21.9	-21.9	-83	0	10	12	20	59	29-5"	
628	673	3/31/2006	61.1	35	-21.9	-21.9	-83	0	10	14	22	60	44-6"	
629	650	3/31/2006	61.1	35	-21.9	-21.9	-83	0	10	11	14	39	49-9"	
630	730	3/31/2006	61.1	35	-21.9	-21.9	-83	0	9	9	11	16	60	
631	702	3/31/2006	61.1	35	-21.9	-21.9	-83	0	10	9	13	43	62-7"	
632	674	3/31/2006	61.1	35	-21.9	-21.9	-83	0	10	10	11	46	40-6"	
633	651	3/31/2006	61.1	35	-21.9	-21.9	-83	0	9	12	13	40	69-9"	
634	731	3/31/2006	61.1	35	-21.9	-21.9	-83	0	10	12	14	46	52-6"	
635	703	3/31/2006	61.1	35	-21.9	-21.9	-83	0	11	10	12	32	71-9"	

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636	675	3/31/2006	61.1	35	-21.9	-21.9	-83	0	11	12	24	72	29-3"	
637	652	3/31/2006	61.1	35	-21.9	-21.9	-83	0	11	12	27	70	51-6"	
638	732	3/31/2006	61.1	35	-21.9	-21.9	-83	0	10	10	13	56	50-6"	
639	704	3/31/2006	61.1	35	-21.9	-21.9	-83	0	10	10	13	47	80	
640	299	4/1/2006	56.1	15	-21.9	-13.9	-70	8	27	33	48	72	46-6"	
641	321	4/1/2006	56.1	15	-21.9	-13.9	-70	8	34	38	60	79	82	
642	342	4/1/2006	56.1	15	-21.9	-21.9	-78	0	41	39	30	26	24	
643	368	4/1/2006	56.1	15	-21.9	-21.9	-78	0	31	31	24	22	19	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
644	394	4/1/2006	56.1	15	-21.9	-21.9	-78	0	34	28	26	27	23	
645	434	4/1/2006	55.77	15	-32.9	-32.9	-88.67	0	23	51	61	58	32-9"	
646	414	4/1/2006	46.77	15	-32.9	-32.9	-79.67	0	25	20	18	23	17	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
647	415	4/1/2006	46.77	15	-32.9	-22.9	-69.67	10	32	45	68	88	105	
648	416	4/1/2006	46.77	15	-32.9	-32.9	-79.67	0	35	31	30	24	12-6"	
649	460	4/1/2006	55.77	15	-32.9	-32.9	-88.67	0	32	68	73	54	22-6"	
650	676	4/1/2006	61.1	35	-21.9	-21.9	-83	0	15	15	22	66	25-3"	
651	627	4/1/2006	51.77	35	-32.9	-32.9	-84.67	0	13	24	57	79	30-4"	
652	606	4/1/2006	51.77	35	-32.9	-31.9	-83.67	1	9	12	28	56	60-4"	
653	584	4/1/2006	51.77	35	-32.9	-32.9	-84.67	0	13	33	54	55	13-3"	
654	624	4/1/2006	51.77	35	-32.9	-32.9	-84.67	0	13	14	16	38	79	
655	603	4/1/2006	51.77	35	-32.9	-32.9	-84.67	0	13	14	15	19	56	
656	581	4/1/2006	51.77	35	-32.9	-31.9	-83.67	1	12	14	16	55	79-9"	
657	625	4/1/2006	51.77	35	-32.9	-31.9	-83.67	1	13	13	13	20	63	
658	604	4/1/2006	51.77	35	-32.9	-31.9	-83.67	1	16	16	15	30	97	
659	582	4/1/2006	51.77	35	-32.9	-31.9	-83.67	1	13	13	16	54	70-9"	
660	626	4/1/2006	51.77	35	-32.9	-30.9	-82.67	2	15	16	19	20	69	
661	605	4/1/2006	51.77	35	-32.9	-31.9	-83.67	1	18	17	18	30	90	
662	583	4/1/2006	51.77	35	-32.9	-30.9	-82.67	2	18	17	15	19	73	
663	147	4/3/2006	56.1	15	-21.9	-14.9	-71	7	26	30	58	81	78	
664	173	4/3/2006	56.1	15	-21.9	-13.9	-70	8	16	27	53	87	48-6"	
665	148	4/3/2006	56.1	15	-21.9	-21.9	-78	0	38	38	28	28	11-6"	
666	196	4/3/2006	56.1	15	-21.9	-13.4	-69.5	8.5	24	28	48	86	60-6"	
667	174	4/3/2006	56.1	15	-21.9	-13.4	-69.5	8.5	32	22	25	61	110	
668	149	4/3/2006	56.1	15	-21.9	-14.9	-71	7	20	42	66	73	75	
669	224	4/3/2006	56.1	15	-21.9	-21.9	-78	0	27	38	33	26	26	
670	197	4/3/2006	56.1	15	-21.9	-13.4	-69.5	8.5	23	33	53	93	60-6"	
671	175	4/3/2006	56.1	15	-21.9	-12.9	-69	9	42	33	30	44	103	
672	150	4/3/2006	56.1	15	-21.9	-12.65	-68.75	9.25	63	41	49	67	25-3"	
673	252	4/3/2006	56.1	15	-21.9	-21.9	-78	0	39	41	35	32	25	
674	225	4/3/2006	56.1	15	-21.9	-14.4	-70.5	7.5	22	33	68	79	82	
675	198	4/3/2006	56.1	15	-21.9	-11.9	-68	10	74	52	39	59	83	
676	555	4/3/2006	55.77	35	-32.9	-27.9	-83.67	5	13	17	25	57	72-9"	
677	529	4/3/2006	55.77	35	-32.9	-28.9	-84.67	4	12	16	36	44	74	
678	508	4/3/2006	55.77	35	-32.9	-32.9	-88.67	0	56	46	50	67	31-6"	
679	486	4/3/2006	55.77	35	-32.9	-29.9	-85.67	3	15	18	25	35	65	

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680	556	4/3/2006	55.77	35	-32.9	-27.9	-83.67	5	18	17	17	21	72	
681	530	4/3/2006	55.77	35	-32.9	-27.9	-83.67	5	16	15	16	27	86	
682	509	4/3/2006	55.77	35	-32.9	-29.9	-85.67	3	19	27	60	57	64	
683	487	4/3/2006	55.77	35	-32.9	-29.9	-85.67	3	21	21	34	55	85	
684	461	4/3/2006	55.77	35	-32.9	-28.9	-84.67	4	17	21	24	37	82	
685	435	4/3/2006	55.77	35	-32.9	-30.9	-86.67	2	22	24	26	46	89	
686	436	4/3/2006	55.77	35	-32.9	-18.9	-74.67	14	130	109	117	107	102	
687	176	4/4/2006	56.1	15	-21.9	-11.4	-67.5	10.5	95	55	36	54	48-6"	
688	274	4/4/2006	56.1	15	-21.9	-15.9	-72	6	55	64	69	69	66	
689	253	4/4/2006	56.1	15	-21.9	-13.4	-69.5	8.5	28	25	50	90	106	
690	226	4/4/2006	56.1	15	-21.9	-13.9	-70	8	25	32	70	96	20-3"	
691	199	4/4/2006	56.1	15	-21.9	-14.9	-71	7	49	35	39	80	110	
692	300	4/4/2006	56.1	15	-21.9	-15.7	-71.8	6.2	60	68	51	42	82	
693	275	4/4/2006	56.1	15	-21.9	-13.9	-70	8	31	46	81	92	132	
694	254	4/4/2006	56.1	15	-21.9	-12.9	-69	9	63	30	40	85	94-6"	
695	227	4/4/2006	56.1	15	-21.9	-12.9	-69	9	51	34	43	75	71-6"	
696	322	4/4/2006	56.1	15	-21.9	-11.9	-68	10	52	37	35	50	100-6"	
697	301	4/4/2006	56.1	15	-21.9	-11.4	-67.5	10.5	54	38	34	73	130-10"	
698	276	4/4/2006	56.1	15	-21.9	-12.9	-69	9	51	37	45	80	100-6"	
699	557	4/4/2006	55.77	35	-32.9	-28.9	-84.67	4	16	15	18	36	90	
700	531	4/4/2006	55.77	35	-32.9	-27.9	-83.67	5	17	15	19	22	66	
701	488	4/4/2006	55.77	35	-32.9	-30.9	-86.67	2	22	27	37	56	93	
702	462	4/4/2006	55.77	35	-32.9	-17.9	-73.67	15	127	94	133	100	102	
703	255	4/5/2006	56.1	15	-21.9	-8.5	-64.6	13.4	22	45	86	141	125	
704	323	4/5/2006	56.1	15	-21.9	-11.9	-68	10	52	49	42	50	107	
705	302	4/5/2006	56.1	15	-21.9	-11.9	-68	10	67	41	41	89	60-6"	
706	277	4/5/2006	56.1	15	-21.9	-12.4	-68.5	9.5	71	54	31	49	107	
707	343	4/5/2006	56.1	15	-21.9	-21.9	-78	0	42	37	29	24	26	
708	369	4/5/2006	56.1	15	-21.9	-21.9	-78	0	47	39	33	40	20-6"	
709	344	4/5/2006	56.1	15	-21.9	-21.9	-78	0	5	5	6	8	6	Pile Broken, no replacement pile needed, see RFI #179
710	370	4/5/2006	56.1	15	-21.9	-12.4	-68.5	9.5	40	32	54	60	40-6"	
711	324	4/5/2006	56.1	15	-21.9	-11.9	-68	10	49	39	39	61	30-3"	
712	345	4/5/2006	56.1	15	-21.9	-11.65	-67.75	10.25	58	41	40	69	20-3"	
713	371	4/5/2006	56.1	15	-21.9	-12.4	-68.5	9.5	47	44	34	44	91	
714	303	4/5/2006	56.1	15	-21.9	-11.15	-67.25	10.75	87	70	44	46	30-3"	
715	325	4/5/2006	56.1	15	-21.9	-21.9	-78	0	7	7	9	11	10	Pile Broken, no replacement pile needed, see RFI #179
716	346	4/5/2006	56.1	15	-21.9	-10.65	-66.75	11.25	55	51	37	45	20-3"	
717	751	4/5/2006	61.1	35	-21.9	-21.9	-83	0	16	16	21	36	88	
718	752	4/5/2006	61.1	35	-21.9	-21.9	-83	0	11	14	15	25	87	
719	777	4/5/2006	61.1	35	-21.9	-21.9	-83	0	16	19	20	27	61	
720	799	4/5/2006	61.1	35	-21.9	-21.9	-83	0	18	22	30	56	72	
721	778	4/5/2006	61.1	35	-21.9	-21.9	-83	0	17	15	24	56	69-9"	
722	800	4/5/2006	61.1	35	-21.9	-21.9	-83	0	17	19	39	63	27-3"	
723	753	4/5/2006	61.1	35	-21.9	-21.9	-83	0	13	13	12	28	78	

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724	779	4/5/2006	61.1	35	-21.9	-21.9	-83	0	12	15	22	79	49-3"	
725	801	4/5/2006	61.1	35	-21.9	-21.9	-83	0	15	14	26	42	50-6"	
726	754	4/5/2006	61.1	35	-21.9	-21.9	-83	0	18	18	28	90	47-3"	
727	780	4/5/2006	61.1	35	-21.9	-21.9	-83	0	19	19	30	42	153	
728	802	4/5/2006	61.1	35	-21.9	-21.23	-82.33	0.67	36	30	30	42	85-9"	
729	375	4/6/2006	56.1	15	-21.9	-12.9	-69	9	39	35	33	44	79	
730	398	4/6/2006	56.1	15	-21.9	-21.9	-78	0	33	29	25	22	15	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
731	397	4/6/2006	56.1	15	-21.9	-21.9	-78	0	33	31	24	25	23	
732	132	4/6/2006	56.1	35	-21.9	-7.5	-63.6	14.4	15	17	39	71	30-3"	
733	133	4/6/2006	56.1	35	-21.9	-7	-63.1	14.9	9	11	30	53	102	
734	396	4/6/2006	56.1	15	-21.9	-21.9	-78	0	40	38	28	29	22	
735	395	4/6/2006	56.1	15	-21.9	-11.4	-67.5	10.5	44	44	42	64	94	
736	418	4/6/2006	46.77	15	-32.9	-23.9	-70.67	9	46	67	74	77	105	
737	419	4/6/2006	46.77	15	-32.9	-20.9	-67.67	12	38	50	59	81	28-3"	
738	417	4/6/2006	46.77	25	-32.9	-19.4	-66.17	13.5	36	43	72	71	126	
739	439	4/6/2006	55.77	25	-32.9	-13.75	-69.52	19.15	69	102	116	165	50-3"	
740	440	4/6/2006	55.77	25	-32.9	-30.9	-86.67	2	20	21	27	46	63	
741	437	4/6/2006	55.77	35	-32.9	-32.9	-88.67	0	13	10	10	9	4-6"	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
742	438	4/6/2006	55.77	35	-32.9	-30.4	-86.17	2.5	16	18	20	45	65-9"	
743	464	4/6/2006	55.77	35	-32.9	-32.9	-88.67	0	22	39	70	84	90	
744	465	4/6/2006	55.77	35	-32.9	-32.9	-88.67	0	22	52	56	90	30-5"	
745	463	4/6/2006	55.77	35	-32.9	-29.9	-85.67	3	21	22	30	37	61	
746	489	4/6/2006	55.77	35	-32.9	-29.9	-85.67	3	19	28	37	51	70-9"	
747	511	4/6/2006	55.77	35	-32.9	-28.9	-84.67	4	25	26	37	50	61	
748	151	4/7/2006	56.1	25	-21.9	-7.4	-63.5	14.5	20	40	58	93	50-6"	
749	152	4/7/2006	56.1	15	-21.9	-7.4	-63.5	14.5	16	30	45	75	100	
750	177	4/7/2006	56.1	15	-21.9	-6.9	-63	15	24	42	47	85	80-6"	
751	200	4/7/2006	56.1	15	-21.9	-11.4	-67.5	10.5	71	52	45	50	55-6"	
752	228	4/7/2006	56.1	15	-21.9	-11.4	-67.5	10.5	80	57	46	59	45-6"	
753	256	4/7/2006	56.1	15	-21.9	-11.15	-67.25	10.75	52	66	50	49	95	
754	278	4/7/2006	56.1	15	-21.9	-10.65	-66.75	11.25	53	57	65	47	37	
755	304	4/7/2006	56.1	15	-21.9	-11.4	-67.5	10.5	67	86	61	47	50	
756	326	4/7/2006	56.1	15	-21.9	-12.15	-68.25	9.75	54	35	31	43	55-9"	
757	347	4/7/2006	56.1	15	-21.9	-14.2	-70.3	7.7	26	39	74	82	90	
758	178	4/7/2006	56.1	15	-21.9	-11.15	-67.25	10.75	68	61	43	46	20-2"	
759	201	4/7/2006	56.1	15	-21.9	-11.4	-67.5	10.5	86	71	57	48	50-6"	
760	229	4/7/2006	56.1	15	-21.9	-6.9	-63	15	7	15	33	71	130	
761	257	4/7/2006	56.1	15	-21.9	-8.15	-64.25	13.75	32	45	67	72	12-2"	
762	279	4/7/2006	56.1	15	-21.9	-10.65	-66.75	11.25	93	67	43	38	65	
763	532	4/7/2006	55.77	35	-32.9	-30.9	-86.67	2	45	54	37	54	64	
764	558	4/7/2006	55.77	35	-32.9	-27.9	-83.67	5	16	15	22	36	69	
765	654	4/7/2006	61.1	35	-21.9	-21.9	-83	0	13	13	11	51	41-6"	
766	655	4/7/2006	61.1	35	-21.9	-21.9	-83	0	10	11	13	57	38-4"	
767	656	4/7/2006	61.1	35	-21.9	-21.9	-83	0	12	11	13	25	87	

TABLE 1
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Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
768	657	4/7/2006	61.1	35	-21.9	-21.9	-83	0	12	10	15	22	100	
769	628	4/7/2006	51.77	35	-32.9	-31.9	-83.67	1	13	12	17	35	95	
770	607	4/7/2006	51.77	35	-32.9	-30.9	-82.67	2	15	15	16	27	60-6"	
771	585	4/7/2006	51.77	35	-32.9	-32.9	-84.67	0	19	15	16	42	88	
772	629	4/7/2006	51.77	35	-32.9	-30.9	-82.67	2	12	16	17	54	63-6"	
773	608	4/7/2006	51.77	35	-32.9	-30.9	-82.67	2	16	16	20	25	94	
774	305	4/8/2006	56.1	15	-21.9	-21.9	-78	0	8	7	10	8	12	Pile Broken, no replacement pile needed, see RFI #182
775	327	4/8/2006	56.1	15	-21.9	-8.4	-64.5	13.5	5	17	43	55	67	
776	348	4/8/2006	56.1	15	-21.9	-12.4	-68.5	9.5	38	26	23	37	69	
777	374	4/8/2006	56.1	15	-21.9	-12.4	-68.5	9.5	32	26	19	44	77	
778	153	4/8/2006	56.1	15	-21.9	-6.9	-63	15	23	25	39	66	99	
779	179	4/8/2006	56.1	15	-21.9	-6.9	-63	15	11	26	34	60	90	
780	202	4/8/2006	56.1	15	-21.9	-11.65	-67.75	10.25	69	47	31	35	40-6"	
781	230	4/8/2006	56.1	15	-21.9	-7.4	-63.5	14.5	8	12	37	67	42-6"	
782	258	4/8/2006	56.1	15	-21.9	-7.65	-63.75	14.25	12	18	35	53	70	
783	280	4/8/2006	56.1	15	-21.9	-6.75	-62.85	15.15	6	7	11	41	80	
784	306	4/8/2006	56.1	15	-21.9	-6.9	-63	15	6	11	30	70	55-6"	
785	328	4/8/2006	56.1	15	-21.9	-11.65	-67.75	10.25	51	26	19	39	42-6"	
786	349	4/8/2006	56.1	15	-21.9	-13.15	-69.25	8.75	19	17	27	52	80	
787	375	4/8/2006	56.1	15	-21.9	-13.4	-69.5	8.5	13	14	32	50	67	
788	159	4/8/2006	56.1	15	-21.9	-6.5	-62.6	15.4	12	32	48	45	98	
789	203	4/8/2006	56.1	15	-21.9	-6.9	-63	15	19	17	32	56	80	
790	204	4/8/2006	56.1	15	-21.9	-11	-67.1	10.9	62	61	54	41	40-6"	
791	232	4/8/2006	56.1	15	-21.9	-7.9	-64	14	18	19	35	57	75	
792	259	4/8/2006	56.1	15	-21.9	-7.9	-64	14	10	20	42	72	77	
793	586	4/8/2006	51.77	35	-32.9	-32.9	-84.67	0	15	18	39	44	35	
794	630	4/8/2006	51.77	35	-32.9	-31.9	-83.67	1	14	16	21	55	63-6"	
795	609	4/8/2006	51.77	35	-32.9	-31.9	-83.67	1	16	14	16	22	84	
796	587	4/8/2006	51.77	35	-32.9	-32.9	-84.67	0	19	25	48	58	20-6"	
797	559	4/8/2006	55.77	35	-32.9	-28.4	-84.17	4.5	20	18	19	50	89	
798	533	4/8/2006	55.77	35	-32.9	-29.4	-85.17	3.5	15	17	29	49	85	
799	512	4/8/2006	55.77	35	-32.9	-29.9	-85.67	3	21	20	26	40	76	
800	490	4/8/2006	55.77	35	-32.9	-14	-69.77	18.9	59	78	117	168	78-4"	
801	560	4/8/2006	55.77	35	-32.9	-16	-71.77	16.9	50	110	129	170	209	
802	534	4/8/2006	55.77	35	-32.9	-16	-71.77	16.9	63	84	110	134	154	
803	513	4/8/2006	55.77	35	-32.9	-14.5	-70.27	18.4	32	76	96	150	100-6"	
804	260	4/10/2006	56.1	15	-21.9	-7.5	-63.6	14.4	7	12	20	34	72	
805	286	4/10/2006	56.1	15	-21.9	-7.75	-63.85	14.15	4	22	44	72	85	
806	329	4/10/2006	56.1	15	-21.9	-13.9	-70	8	18	22	46	67	75	
807	355	4/10/2006	56.1	15	-21.9	-13.9	-70	8	15	22	48	74	74	
808	399	4/10/2006	56.1	15	-21.9	-21.9	-78	0	36	32	23	21	21	
809	421	4/10/2006	56.1	15	-21.9	-21.9	-78	0	47	38	30	30	24	
810	420	4/10/2006	56.1	15	-21.9	-12.65	-68.75	9.25	34	28	48	70	86	
811	400	4/10/2006	56.1	15	-21.9	-12.65	-68.75	9.25	32	28	36	54	88	

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Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
812	401	4/10/2006	56.1	15	-21.9	-13.4	-69.5	8.5	19	25	49	63	82	
813	422	4/10/2006	56.1	15	-21.9	-12.65	-68.75	9.25	28	23	32	56	87	
814	423	4/10/2006	56.1	15	-21.9	-13.15	-69.25	8.75	17	18	33	73	82	
815	828	4/10/2006	61.1	35	-21.9	-21.9	-83	0	14	14	23	48	55	
816	829	4/10/2006	61.1	35	-21.9	-21.9	-83	0	12	13	26	39	49-6"	
817	803	4/10/2006	61.1	35	-21.9	-21.9	-83	0	12	14	21	51	24-4"	
818	781	4/10/2006	61.1	35	-21.9	-21.9	-83	0	11	11	15	50	30-6"	
819	755	4/10/2006	61.1	35	-21.9	-21.9	-83	0	13	15	20	50	40-6"	
820	733	4/10/2006	61.1	35	-21.9	-21.9	-83	0	17	17	20	28	37-6"	
821	705	4/10/2006	61.1	35	-21.9	-21.9	-83	0	12	15	19	79	70-6"	
822	677	4/10/2006	61.1	35	-21.9	-21.9	-83	0	18	19	21	34	70-6"	
823	678	4/10/2006	61.1	35	-21.9	-21.9	-83	0	17	15	17	34	50-6"	
824	706	4/10/2006	61.1	35	-21.9	-21.9	-83	0	21	20	19	25	130	
825	734	4/10/2006	61.1	35	-21.9	-12.9	-74	9	43	55	74	71	85	
826	756	4/10/2006	61.1	35	-21.9	-21.9	-83	0	15	14	28	56	100-9"	
827	782	4/10/2006	61.1	35	-21.9	-21.9	-83	0	15	15	14	21	83-10"	
828	804	4/13/2006	61.1	30	-21.9	-21.9	-83	0	14	15	22	61	17-3"	
829	805	4/13/2006	61.1	30	-21.9	-21.9	-83	0	15	17	30	66	25-3"	
830	783	4/13/2006	61.1	30	-21.9	-21.9	-83	0	15	16	18	37	32-6"	
831	757	4/13/2006	61.1	30	-21.9	-21.9	-83	0	23	20	18	27	65	
832	735	4/13/2006	61.1	30	-21.9	-11.9	-73	10	34	47	56	66	55-10"	
833	707	4/13/2006	61.1	25	-21.9	-9.9	-71	12	18	24	41	57	85	
834	679	4/13/2006	61.1	25	-21.9	-10.4	-71.5	11.5	26	45	53	58	82	
835	561	4/13/2006	55.77	30	-32.9	-32.9	-88.67	0	37	10	6	8	6	Pile Broken, no replacement pile needed, see RFI #203
836	535	4/13/2006	55.77	30	-32.9	-29.9	-85.67	3	22	26	30	42	70	
837	514	4/13/2006	55.77	30	-32.9	-21.9	-77.67	11	76	66	86	71	101	
838	681	4/14/2006	61.1	30	-21.9	-21.9	-83	0	11	13	12	34	34-9"	
839	709	4/14/2006	61.1	25	-21.9	-21.9	-83	0	13	14	14	35	56-9"	
840	737	4/14/2006	61.1	25	-21.9	-21.9	-83	0	13	17	25	70	13-3"	
841	682	4/14/2006	61.1	30	-21.9	-21.9	-83	0	17	19	17	30	78	
842	710	4/14/2006	61.1	30	-21.9	-21.9	-83	0	23	17	19	37	75	
843	738	4/14/2006	61.1	30	-21.9	-21.9	-83	0	13	14	20	63	38-6"	
844	683	4/14/2006	61.1	30	-21.9	-21.9	-83	0	21	18	22	65	70-9"	
845	711	4/14/2006	61.1	30	-21.9	-21.9	-83	0	18	17	20	44	66-6"	
846	739	4/14/2006	61.1	30	-21.9	-9.9	-71	12	26	43	57	72	102	
847	761	4/14/2006	61.1	30	-21.9	-21.9	-83	0	13	12	20	41	65	
848	760	4/14/2006	61.1	30	-21.9	-21.9	-83	0	17	17	22	33	93	
849	491	4/15/2006	55.77	30	-32.9	-15.9	-71.67	17	67	81	102	85	100	
850	492	4/15/2006	55.77	30	-32.9	-30.9	-86.67	2	7	7	6	3	3	Pile Broken, no replacement pile needed, see RFI #203
851	466	4/15/2006	55.77	30	-32.9	-13	-68.77	19.9	26	54	68	77	106	
852	441	4/15/2006	65.1	30	-21.9	-3	-68.1	18.9	38	42	61	110	130	
853	381	4/15/2006	56.1	30	-21.9	-21.9	-78	0	31	25	23	18	19	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
854	424	4/15/2006	56.1	30	-21.9	-14.9	-71	7	16	32	49	72	78	
855	467	4/17/2006	65.1	30	-21.9	-3	-68.1	18.9	27	34	36	75	90	

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856	493	4/17/2006	65.1	30	-21.9	-18.2	-83.3	3.7	30	30	41	85	105	
857	442	4/17/2006	61.1	30	-21.9	-3.5	-64.6	18.4	30	26	46	90	98	
858	468	4/17/2006	61.1	25	-21.9	-3.9	-65	18	28	28	52	91	89	
859	494	4/17/2006	61.1	35	-21.9	-5.7	-66.8	16.2	32	55	67	78	93	
860	443	4/17/2006	61.1	30	-21.9	-3	-64.1	18.9	24	22	31	71	95	
861	469	4/17/2006	61.1	30	-21.9	-4	-65.1	17.9	29	43	68	75	64-6"	
862	495	4/17/2006	61.1	30	-21.9	-4	-65.1	17.9	20	29	53	81	94	
863	444	4/17/2006	61.1	30	-21.9	-5	-66.1	16.9	18	34	68	72	92	
864	470	4/17/2006	61.1	30	-21.9	-4.3	-65.4	17.6	11	23	51	73	103	
865	496	4/17/2006	61.1	30	-21.9	-21.9	-83	0	12	11	16	15	10-6"	
866	135-R	4/17/2006	56.1	25	-21.9	-6.9	-63	15	11	18	33	73	95	Replacement pile for pile #135 broken during driving on 3/22/06
867	450	4/17/2006	65.1	30	-21.9	-4.3	-69.4	17.6	24	37	61	73	98	
868	476	4/17/2006	65.1	30	-21.9	-20.9	-86	1	18	18	20	44	60	
869	515	4/18/2006	65.1	0	-21.9	-4.2	-69.3	17.7	20	37	62	77	95	
870	536	4/18/2006	65.1	0	-21.9	-21.9	-87	0	15	15	10	6	12	Final blowcount < 21 b/ft, capacity is 260 kips - see restrike of pile #393 (3/31/06)
871	562	4/18/2006	65.1	25	-21.9	-21.9	-87	0	19	29	50	65	12-3"	
872	588	4/18/2006	61.1	25	-21.9	-21.9	-83	0	15	15	14	17	7-4"	
873	516	4/18/2006	65.1	0	-21.9	-4.5	-69.6	17.4	20	42	70	62	82	
874	537	4/18/2006	65.1	0	-21.9	-4	-69.1	17.9	18	33	68	81	100	
875	563	4/18/2006	65.1	0	-21.9	-5	-70.1	16.9	41	68	65	74	85	
876	589	4/18/2006	61.1	0	-21.9	-4	-65.1	17.9	62	58	73	67	64	
877	517	4/18/2006	65.1	0	-21.9	-3	-68.1	18.9	21	20	28	86	122	
878	538	4/18/2006	65.1	0	-21.9	-6.5	-71.6	15.4	42	64	67	73	86	
879	564	4/18/2006	65.1	0	-21.9	-4	-69.1	17.9	34	44	68	81	85	
880	590	4/18/2006	61.1	0	-21.9	-10	-71.1	11.9	57	53	57	68	73	
881	518	4/18/2006	65.1	25	-21.9	-4.5	-69.6	17.4	16	39	54	73	85	
882	539	4/18/2006	65.1	0	-21.9	-3.2	-68.3	18.7	19	21	46	76	90	
883	610	4/19/2006	61.1	0	-21.9	-21.9	-83	0	18	16	15	20	49	
884	631	4/19/2006	61.1	20	-21.9	-9.9	-71	12	33	52	58	63	73	
885	680	4/19/2006	61.1	20	-21.9	-21.9	-83	0	19	15	18	32	61	
886	611	4/19/2006	61.1	0	-21.9	-8	-69.1	13.9	27	42	45	72	83	
887	632	4/19/2006	61.1	0	-21.9	-7	-68.1	14.9	18	35	49	70	103	
888	658	4/19/2006	61.1	0	-21.9	-7.2	-68.3	14.7	18	29	47	74	110	
889	612	4/19/2006	61.1	0	-21.9	-7	-68.1	14.9	21	35	51	86	88	
890	633	4/19/2006	61.1	0	-21.9	-6	-67.1	15.9	18	41	67	94	62-6"	
891	519	4/19/2006	65.1	0	-21.9	-5.5	-70.6	16.4	36	51	58	77	92	
892	565	4/19/2006	65.1	0	-21.9	-7	-72.1	14.9	64	57	70	72	68	
893	591	4/19/2006	61.1	0	-21.9	-7	-68.1	14.9	22	36	45	77	109	
894	613	4/19/2006	61.1	0	-21.9	-5.7	-66.8	16.2	13	29	47	73	125	
895	634	4/19/2006	61.1	0	-21.9	-7	-68.1	14.9	22	37	52	75	86	
896	660	4/19/2006	61.1	0	-21.9	-8	-69.1	13.9	36	48	65	82	110	
897	708	4/20/2006	61.1	0	-21.9	-14.5	-75.6	7.4	86	68	57	52	15-4"	
898	736	4/20/2006	61.1	0	-21.9	-10.5	-71.6	11.4	29	46	56	75	100	
899	877-R	4/20/2006	65.1	30	-21.9	-17.9	-83	4	14	14	19	42	68	Replacement pile for pile #877 broken during driving on 3/28/06

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301 Mission Street
San Francisco, California

Treadwell & Rollo Pile No.	Project Pile Number[1]	Date Driven	Furnished Length (feet)[2]	Predrill Depth (feet)	Design Pile Cutoff Elevation (feet)[3]	Actual Top of Pile Elevation (feet)[3,4]	Approximate Tip Elevation (feet)[3]	Approximate Cut-off Length (feet)	Final Driving (Blows/foot for final 5 feet)					Remarks
900	758	4/20/2006	61.1	0	-21.9	-21.9	-83	0	19	18	22	56	39-4"	
901	784	4/21/2006	61.1	0	-21.9	-21.9	-83	0	21	17	20	34	92	
902	806	4/21/2006	61.1	0	-21.9	-21.9	-83	0	16	15	18	39	74	
903	759	4/21/2006	61.1	0	-21.9	-12	-73.1	9.9	43	54	66	56	73	
904	785	4/21/2006	61.1	0	-21.9	-12	-73.1	9.9	32	33	48	57	69	
905	807	4/21/2006	61.1	0	-21.9	-12	-73.1	9.9	28	34	42	55	76	
906	830	4/21/2006	61.1	15	-21.9	-21.9	-83	0	15	16	20	61	75	
907	786	4/21/2006	61.1	0	-21.9	-10	-71.1	11.9	19	22	44	58	90	
908	808	4/21/2006	61.1	0	-21.9	-21.9	-83	0	22	20	25	57	105	
909	787	4/21/2006	61.1	0	-21.9	-21.9	-83	0	20	20	27	57	76	
910	809	4/21/2006	61.1	0	-21.9	-11.5	-72.6	10.4	27	41	58	57	65	
911	767	4/21/2006	61.1	3	-21.9	-11	-72.1	10.9	21	38	52	58	69	
912	545	4/21/2006	65.1	0	-21.9	-21.9	-87	0	18	18	38	51	60	
913	571	4/21/2006	61.1	0	-21.9	-8	-69.1	13.9	24	24	46	73	88	
914	614	4/21/2006	61.1	0	-21.9	-21.9	-83	0	21	18	17	10	30	
915	640	4/22/2006	61.6	0	-21.9	-9	-70.6	12.9	42	51	60	73	75	
916	684	4/22/2006	61.1	0	-21.9	-9	-70.1	12.9	37	52	51	77	83	
917	712	4/22/2006	61.1	0	-21.9	-9	-70.1	12.9	20	37	55	72	78	
918	740	4/22/2006	61.1	0	-21.9	-9	-70.1	12.9	14	17	40	59	70	
919	546	4/22/2006	65.1	30	-21.9	-21.9	-87	0	15	19	30	47	60	
920	685	4/22/2006	61.1	30	-21.9	-8	-69.1	13.9	22	25	48	58	83	
921	713	4/22/2006	61.1	30	-21.9	-8	-69.1	13.9	26	24	48	87	60-6"	
922	741	4/22/2006	61.1	30	-21.9	-9	-70.1	12.9	18	21	40	65	96	

1. Pile Location as designated on drawing titled "Martin Ron Pile Numbering Diagram as tranmitted electroncally to us by WEBCOR Building on 11 November 2005.
2. Casted pile length
3. All Elevations refer to San Francisco City datum (SFCD).
4. Recorded visually, accuracy may vary by +/- 6 inches
5. DNO denotes Did Not Observe

Total number of piles requiring cutoff:	381	40%
Number of piles requiring more than 5 feet of cutoff:	238	25%
Number of piles requiring more than 12 feet of cutoff:	80	8%
Number of piles requiring more than 15 feet of cutoff:	34	4%
Number of piles that broke during installation:	9	1%
Number of replacement piles driven:	2	0.2%

DESIMONE

NEW YORK
MIAMI
SAN FRANCISCO
NEW HAVEN
LAS VEGAS
HONG KONG
ABU DHABI

February 25, 2009

City and County of San Francisco
1660 Mission Street, 2nd Floor
San Francisco, CA 94103

DeSimone Project # 4069B
301 Mission - Structural Design Services

Attn: Raymond Lui
Re: 301 Mission Settlement

Mr. Lui:

The following is offered in response to your letter dated February 2, 2009 regarding settlement of Millennium Tower at 301 Mission Street.

1. The original project design by DeSimone and Handel Architects accommodated 6 inches of total settlement under the Tower. The adjacent podium and 12-story Mid-rise building are completely separated structurally from the Tower, and are not expected to settle at all. In fact, part of the podium and Mid-rise is actually tied down to prevent upward movement due to the net upward pressure supplied by groundwater.
2. See attached letter from Treadwell & Rollo dated February 18, 2009.
3. All columns and shear walls comprising the Tower structure are supported on a single, continuous pile cap. No differential settlements between adjacent walls/columns are expected and none have been reported to DeSimone. See also the attached letter from Treadwell & Rollo dated February 18, 2009.
4. See attached letter from Treadwell & Rollo dated February 18, 2009.
5. See attached letter from Treadwell & Rollo dated February 18, 2009.
6. See attached letter from Treadwell & Rollo dated February 18, 2009.
7. Since settlement of the Tower was anticipated and planned for during design, it has created no known problems for the Tower or Mid-rise structures. The only connections between the Tower and Mid-rise structures are at "hinge slabs", which were detailed to allow settlement of the Tower to occur relative to the Mid-rise. These slabs could accommodate at least an additional 6" of settlement with no detrimental structural impact. DeSimone has not observed, and has not been informed, of any cracks in walls or any other negative structural impact from the Tower settlement. It is our professional opinion that the structures are safe.
8. See attached letter from Handel Architects dated February 18, 2009.

DESIMONE CONSULTING ENGINEERS

Derrick D. Roorda, SE, LEED AP
Senior Associate Principal

Cc: Steve Hood, Millennium Partners
Glenn Rescalvo, Handel Architects
Ramin Golesorkhi, Treadwell & Rollo

Treadwell&Rollo

18 February 2009
Project 3157.04

Mr. Derrick Roorda, SE
DeSimone Consulting Engineers
160 Sansome Street, 16th Floor
San Francisco, California 94111

Subject: Response to DBI Letter
Settlements at 301 Mission Street
San Francisco, California

Dear Mr. Roorda:

This letter presents our responses to a letter by San Francisco Department of Building Inspection dated 2 February 2009 regarding settlements at 301 Mission Street. Specifically, our responses to questions two through six in the referenced letter are presented below:

Question 2: *What are the actual settlements now? What is the rate of settlements? Are the settlements still continuing? What the expected final total settlement of each building?*

Response 2: The actual settlement of the Tower is 8.3 inches. This is based on the latest survey of the benchmark on the core wall which was read on 12 February 2009. The rate of settlement from the latest survey reading is 0.003 inches/day. A plot of the settlement is attached. The results of our latest evaluations indicate that approximately two to four inches of additional settlement could occur in the future. We do not anticipate settlement for the Podium/Mid-Rise structure.

Question 3: *Are there any differential settlements within the high-rise building?*

Response 3: We are not aware of any differential settlement issues within the high-rise Tower.

Question 4: *Are the actual total and differential settlements being monitored now?*

Response 4: Currently the benchmark on the core wall is being monitored.

Question 5: *What are the reasons for the larger than expected settlements?*

Response 5: The larger than anticipated settlement can be attributed to several possible factors including extensive and longer than expected dewatering during the construction of Podium/Mid-Rise structure and limited effectiveness of predrilling during the installation of pile foundations for the Tower.

Question 6: *Has the geotechnical engineer of record been alerted to the settlement and what is their course of action?*

Response 6: Treadwell & Rollo, Inc. as the geotechnical engineer of record has been aware of the settlement of the Tower and continues to evaluate the results of the monitoring by Martin M. Ron Associates, Inc. While the settlement of the Tower is greater than originally anticipated, this settlement should not pose issues with foundation support for the Tower.

We trust this letter provides the responses requested. If you have any questions, please call.

Sincerely yours,
TREADWELL & ROLLO, INC.

Ramin Golesorkhi, G.E.
Principal

31570417.RG

Attachment: Settlement Plot

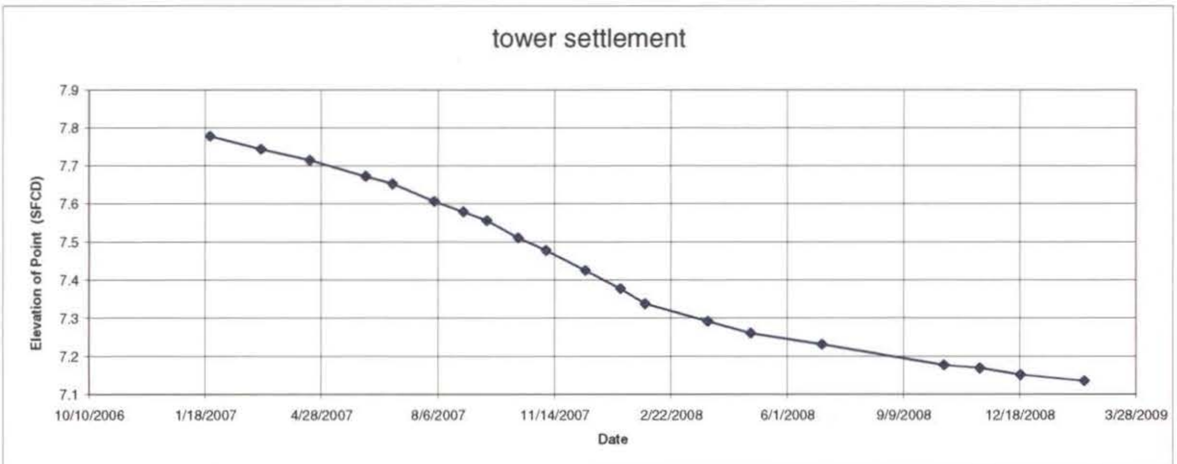
cc: Mr. Steven Hood (Millennium Partners)

Treadwell&Rollo

Project No. 3157.04
301 Mission TOWER Settlement

Type	date	El (feet)	Movement between readings (feet)	inches	days between readings	inches per day	Total Elapsed Time (days)	Total Settlement (inches)
Webcor reading	9/20/2006	7.829				0.000	**0**	**0**
MR reading	1/22/2007	7.779	0.050	0.602	124	0.005	124	0.602
MR reading	3/7/2007	7.744	0.035	0.420	44	0.010	168	1.022
MR reading	4/18/2007	7.715	0.029	0.348	42	0.008	210	1.370
MR reading	6/5/2007	7.673	0.042	0.504	48	0.011	258	1.874
MR reading	6/28/2007	7.653	0.020	0.240	23	0.010	281	2.114
MR reading	8/3/2007	7.607	0.046	0.552	36	0.015	317	2.666
MR reading	8/28/2007	7.58	0.027	0.324	25	0.013	342	2.990
MR reading	9/17/2007	7.557	0.023	0.276	20	0.014	362	3.266
MR reading	10/14/2007	7.511	0.046	0.552	27	0.020	389	3.818
MR reading	11/7/2007	7.478	0.033	0.396	24	0.017	413	4.214
MR reading	12/11/2007	7.425	0.053	0.636	34	0.019	447	4.850
MR reading	1/10/2008	7.377	0.048	0.576	30	0.019	477	5.426
MR reading	1/31/2008	7.338	0.039	0.468	21	0.022	498	5.894
MR reading	3/25/2008	7.292	0.046	0.552	54	0.010	552	6.446
MR reading	5/1/2008	7.261	0.031	0.372	37	0.010	589	6.818
MR reading	7/1/2008	7.231	0.030	0.360	61	0.006	650	7.178
MR reading	10/14/2008	7.177	0.054	0.648	105	0.006	755	7.826
MR reading	11/14/2008	7.169	0.008	0.096	31	0.003	786	7.922
MR reading	12/19/2008	7.151	0.018	0.216	35	0.006	821	8.138
MR reading	2/12/2009	7.136	0.015	0.180	55	0.003	876	8.318
		0.693						

6/17/2006 Tower Mat Pour
9/13/2006 street level poured (core up ~3 levels)
1/22/2007 Decks to L9, core to L13
3/7/2007 Decks to L13, core to L18
4/18/2007 Decks to L18, core to L22
2/7/2008 Dewatering wells shut-off



HANDEL ARCHITECTS LLP

Gary E. Handel AIA
Glenn Rescalvo AIA
D.B. Middleton AIA
Frank Fusaro AIA
Michael Arad AIA

February 18, 2009

Derrick Roorda, SE
DeSimone Consulting Engineers
160 Sansome Street, 16th Floor
San Francisco, CA 94104

RE: 301 Mission Street, Settlement Issues

Dear Derrick,

Handel Architects, in conjunction with DeSimone Consulting Engineers, has designed 301 Mission for the settlement anticipated in the original Geotechnical Report prepared by Treadwell & Rollo. In addition, we are aware that additional settlement has occurred, and may continue to occur, and we have taken these conditions into account with modifications to the original design where necessary:

- Utility lines have been designed and installed with flexible connections (allowing for horizontal and vertical movement) wherever they cross the expansion joint between the buildings and at service entry points in the tower.
- Hinge slabs between the two buildings, which were originally designed for settlement that would not result in slopes exceeding requirements where handrails would have been required, have now been equipped with handrails which can be adjusted in the future if required.
- Utilities under portions of the tower but above ceilings and walls supported from the Mid-Rise have been routed to avoid possible interference from future anticipated settlement.
- Expansion joint covers at walls, ceilings and floors have been designed to accommodate settlement and seismic movement. Where the current additional or anticipated future settlement has affected waterproofing design at settlement joints, we have worked with the installer to modify the joint design to accommodate the anticipated future settlement up to 4" and continue to function as originally intended.
- Interior floor surfaces adjoining exterior walkways on the north and west of the tower have been raised where possible to allow for increased sidewalk slope away from entry and exit doors in case future settlement might decrease or negate the current slope. Where interior floor levels could not be raised, new trench drains have been installed outside the entry doors in case settlement causes a reversal of sidewalk water flow. The porte cochere driveway elevations were redesigned, taking into account the current settlement and relationship to existing street and sidewalk elevations, so that the main entries, stairs and elevator sills could remain at their original floor elevations relative to floors above, even though they are now lower than originally predicted.

Sincerely yours,

Gerald W. Sams

Gerald W. Sams, AIA
Handel Architects, LLP

cc: Glenn Rescalvo
Steve Hood

Treadwell&Rollo
A LANGAN COMPANY

MEMORANDUM

TO: Steven Hood – Millennium Partners

FROM: Ramin Golesorkhi, GE and Hadi J. Yap, GE

CC: Nicolas Rodrigues, SE – DeSimone Consulting Engineers
Richard D. Rodgers, GE – Treadwell & Rollo

DATE: 22 February 2012

PROJECT: 730315706

SUBJECT: Evaluation of Measurements by Arup
301 Mission Street
San Francisco, California

No. of Pages: 2

As requested, this memorandum presents the results of our review and preliminary conclusions regarding the measurements obtained by Arup, Transbay Joint Powers Authority's (TJPA) consultant, from the monitoring points at the 301 Mission Tower and Low-rise. Specifically, we reviewed recent memoranda, listed below, prepared by Arup and forwarded to us by you via email:

1. Settlement data memorandum dated 23 December 2011, transmitted to us on 24 January 2012
2. Crack Gauge Survey memorandum dated 20 January 2012, transmitted to us on 24 January 2012
3. Tiltmeter Readings memorandum dated 10 February 2012, transmitted to us on 10 February 2012

Also, we reviewed the inclinometer I-18M data that were transmitted to us via email on 14 December 2011.

The inclinometer I-18M is located just south of the 301 Mission Street property boundary about 50 feet east of Fremont Street. The results from this inclinometer were accompanied by an email from Mr. Brian Dykes of TJPA explaining the measurements. The measurements indicate that ground has moved laterally towards the excavation (i.e. south) about 0.45 inches at a depth of about 30 feet and about 0.6 inches at depths ranging from about 85 to 100 feet below the ground surface. According to Mr. Dykes, this movement occurred during the extraction of timber piles, installation of the CDSM shoring wall and 28 buttress piles. The latest reading was obtained on 7 December 2011. We believe the lateral movements at the depth of 30 feet are a result of the extraction of timber piles (about 0.3 inches) and during the installation of the CDSM wall and the buttress piles (about 0.15 inches). In our opinion, the lateral movements at the depth range of 85 to 100 feet occurred during the installation of the CDSM wall and the buttress piles.

The I-18M movements at a depth of 85 to 90 feet correspond to the range of tip elevations of the foundation piles for the 301 Mission Tower.

The last settlement measurements (14 December 2011) presented with the Arup memorandum dated 23 December 2011 show an increase in the rate of settlement of all points measured and plotted in Plates 4 and 5. These accelerated rates have not been measured during previous surveys beginning on 30 April 2009. Until the fall of 2011 the only major TJPA underground construction activity near 301 Mission Street consisted of extraction of the timber piles in May 2011. The lateral deformations measured at depth in inclinometer I-18M resulted in a corresponding vertical movement in the ground behind the inclinometer. Consequently, we believe the increase in the rate of settlement is likely a result of the construction activities south of the 301 Mission site. The TJPA has installed several other inclinometers along the boundary wall between its project and the 301 Mission property boundary and along Fremont Street. To better evaluate the effects of the TJPA construction on the 301 Mission structures it is imperative that we receive the results of all the inclinometers installed in the vicinity of 301 Mission Street including the readings obtained in February 2012. Also, we ask Millennium Partners inquire whether the TJPA design team considered movements during the installation of the CDSM wall and the buttress piles in its estimation of lateral movements. Furthermore, a timely transmittal of the survey and inclinometer results is critical in evaluating the impact of the construction activities on the 301 Mission structures (e.g. the settlement measurements were received a month after they were sent by Arup to TJPA).

The crack gauge measurements show movements less than 0.1 mm for most of the gauges. DeSimone Consulting Engineer should evaluate these measurements and provide its opinion.

The tiltmeter measurements show movements of the north, west, and south walls. Some of these tiltmeters show movements inwards and some show movements outwards. The magnitudes are typically less than 0.075%. The patterns of these movements are inconclusive at this time.

We trust this memorandum provides the information requested. Should you have any questions, please call.

Treadwell&Rollo
A LANGAN COMPANY

MEMORANDUM

TO: Steven Hood – Millennium Partners

FROM: Ramin Golesorkhi, GE and Hadi J. Yap, GE

CC: Nicolas Rodrigues, SE – DeSimone Consulting Engineers
Richard D. Rodgers, GE – Treadwell & Rollo

DATE: 27 April 2012

PROJECT: 730315706

SUBJECT: Evaluation of Measurements by Arup
301 Mission Street
San Francisco, California

Number of Pages: 3

As requested, this memorandum presents the results of our review, evaluation and preliminary conclusions regarding the measurements obtained by Arup, Transbay Joint Powers Authority's (TJPA) consultant, from the monitoring points established at the 301 Mission Tower and Low-rise site. Monitoring of surrounding site is required by Section 31 09 13 – Geotechnical Instrumentation and Monitoring of the specification dated 30 July 2010. Specifically, we reviewed the recent settlement memorandum prepared by Arup dated 19 March 2012 and the results of External Instruments Adjacent to 301 Mission memorandum prepared by Arup dated 7 March 2012; these documents were forwarded to us by you via email.

Table 1 within Section 31 09 13 presents maximum allowable movements and corrective action trigger levels criteria. The levels for vertical settlement measured at monitoring points inside adjacent building are ¾ inch and 1-1/2 inches for action trigger level and maximum allowable movement, respectively. The measured levels of horizontal movement of inclinometers are ½ inch and 3 inches for action trigger level and maximum allowable level, respectively.

Horizontal Movements

Arup's memorandum dated 7 March 2012 present the results of inclinometers I-18M and I-19 which are located just south of the 301 Mission Street property boundary about 55 and 83 feet east of Fremont Street. The inclinometers show movements that Arup associates with the extraction of the timber piles and the installation of the shoring wall and the buttress piles. The movements which occur at a depth of about 90 to 95 feet show deformation over 0.5 inch towards Transbay. In our opinion, the lateral movements at the depth range of 85 to 100 feet occurred during the installation of the shoring wall and buttress piles. The depth of movements corresponds to the approximate range of tip elevations of the driven piles that support the 301 Mission Tower. We conclude the action trigger level for horizontal movement of inclinometers has been reached. TJPA should provide you with a course of action as required by Definitions 1.3L of Section 31 09 12 of the specification.

Vertical Settlement

Since 30 April 2009 Arup has been measuring settlement of various points within the Tower and the Mid-Rise structures. The last settlement measurements were obtained on 7 March 2012. Settlements of four points within the Tower are presented on Plate 4 of Arup memorandum dated 19 March 2012. SM-3 is the closest point to the southern boundary between 301 Mission Tower and the TJPA project. Measurement points SM-9, SM-14 and SM-27 are located progressively farther away (in a northerly direction) from the boundary between the 301 Mission Tower and the TJPA project.

The results of our evaluation of the readings presented on Plate 4 shows that the rate of settlement of the points has changed over time. In particular we observed distinct patterns of movement during three distinct time intervals. They intervals are: (1) 30 April 2009 to 3 May 2010, (2) 3 May 2010 to 24 March 2011, and (3) 24 March 2011 to 7 March 2012. The movements recorded during these time intervals are presented in Table 1.

TABLE 1
Results of Settlement Measurements at the Tower

Measurement Point	Date	Date	Elapsed time (days)	Settlement During Elapsed Time (inches)	Rate of Settlement (inch/day)
SM-3	4/30/2009	5/3/2010	368	0.55	0.00149
	5/3/2010	3/24/2011	325	0.25	0.00077
	3/24/2011	3/7/2012	349	1.10	0.00315
SM-9	4/30/2009	5/3/2010	368	0.70	0.00190
	5/3/2010	3/24/2011	325	0.50	0.00154
	3/24/2011	3/7/2012	349	1.05	0.00301
SM-14	4/30/2009	5/3/2010	368	0.80	0.00217
	5/3/2010	3/24/2011	325	0.55	0.00169
	3/24/2011	3/7/2012	349	0.97	0.00278
SM-27	4/30/2009	5/3/2010	368	0.90	0.00245
	5/3/2010	3/24/2011	325	0.50	0.00154
	3/24/2011	3/7/2012	349	0.85	0.00244

On the basis of our interpretation of the results presented in Table 1, we conclude that the rate of settlement between May 2010 and late March 2011 decreased about 20 to 50 percent compared to the settlement rates between 30 April 2009 and May 2010. However, since late March of 2011 to the present there has been a significant increase in the rate of settlement especially for measurement points closest to the boundary between 301 Mission Tower and the TJPA project. Because the rate of consolidation settlement decreases with time, the recorded increase in the rate of settlement since March 2011 does not represent settlement associated with consolidation. If the same rate of settlement between 3 May 2010 and 24 March 2011 continued to present, then the expected values would be 0.3 to over 0.8 inches less than the recorded amounts.

Arup reported that the inclinometer measurements are related to the extraction of timber piles which occurred sometime during the period from late March/early April 2011 to mid/late May 2011. Subsequent TJPA construction activities have continued since that time. Therefore, we conclude that the increase in the rate of settlement since late March 2011 is attributed to the TJPA's construction activities. Furthermore, we conclude that the trigger action level has been reached.

We trust this memorandum provides the information requested. Should you have any questions, please call.

Treadwell&Rollo
A LANGAN COMPANY

MEMORANDUM

TO: Steven Hood – Millennium Partners

FROM: Ramin Golesorkhi, GE

CC: Nicolas Rodrigues, SE – DeSimone Consulting Engineers

DATE: 5 June 2012

PROJECT: 730315706

SUBJECT: Evaluation of Measurements by Arup/TJPA
301 Mission Street
San Francisco, California

Number of Pages: 3

As requested, this memorandum presents the results of our review, evaluation and preliminary conclusions regarding the data obtained by Arup, Transbay Joint Powers Authority's (TJPA) consultant, from the monitoring points established at the 301 Mission Tower and Mid-rise site. Monitoring of surrounding sites is required by Section 31 09 13 – Geotechnical Instrumentation and Monitoring of the specification dated 30 July 2010. Specifically, we reviewed the recent settlement memoranda prepared by Arup dated 19 March 2012 and 27 April 2012 (forwarded to us by you via email) and the results of the instrumentation on the TJPA Global Analyzer website.

Table 1 within Section 31 09 13 presents maximum allowable movements and corrective action trigger levels criteria. The levels for vertical settlement measured at monitoring points inside adjacent buildings are ¾ inch and 1-1/2 inches for action trigger level and maximum allowable movement, respectively. The measured levels of horizontal movement of inclinometers are ½ inch and 3 inches for action trigger level and maximum allowable level, respectively. The vibration levels with respect to Peak Particle Velocity are ½ inch/sec and 1 inch/sec for action trigger level and maximum allowable movement, respectively.

Horizontal Movements

We accessed the Transbay Global Analyzer website and none of the inclinometers adjacent to 301 Mission structures have data available for review. However, Arup's memorandum dated 7 March 2012 included data from inclinometers I-18M and I-19. As stated in our 27 April 2012 memorandum the action trigger level for horizontal movement of inclinometers has been reached. We recommend that TJPA provide Millennium Partners with a course of action as required by Definitions 1.3L of Section 31 09 12 of the specification.

Vertical Settlement

Since 30 April 2009 Arup has been measuring settlement of various points within the Tower and the Mid-Rise structures. The last settlement measurements were obtained on 18 April 2012 as presented in Arup's memorandum dated 27 April 2012. Settlement plots of four points within the Tower are presented on Plate 4 of Arup's memorandum. SM-3 is the closest point to the southern boundary between 301 Mission Tower and the TJPA project. Measurement points SM-9, SM-14 and SM-27 are located progressively farther away (in a northerly direction) from the boundary between the 301 Mission Tower and the TJPA project.

We understand these measurements are obtained manually and as of today the latest measurements are not part of the data on the Global Analyzer website. Consequently, we evaluated the results plotted on Plate 4. The information shown on Plate 4 indicates that the rate of settlement of the points has changed over time. In particular we observed distinct rates of movement during three distinct time intervals. The intervals are: 30 April 2009 to 3 May 2010; 3 May 2010 to 24 March 2011; and 24 March 2011 to 18 April 2012. The movements recorded during these time intervals are presented in Table 1.

TABLE 1
Results of Settlement Measurements at the Tower

Measurement Point	Date	Date	Elapsed time (days)	Settlement During Elapsed Time (inches)	Rate of Settlement (inch/day)
SM-3	4/30/2009	5/3/2010	368	0.55	0.00149
	5/3/2010	3/24/2011	325	0.25	0.00077
	3/24/2011	4/18/2012	391	1.16	0.00297
SM-9	4/30/2009	5/3/2010	368	0.70	0.00190
	5/3/2010	3/24/2011	325	0.50	0.00154
	3/24/2011	4/18/2012	391	1.20	0.00307
SM-14	4/30/2009	5/3/2010	368	0.80	0.00217
	5/3/2010	3/24/2011	325	0.55	0.00169
	3/24/2011	4/18/2012	391	1.07	0.00274
SM-27	4/30/2009	5/3/2010	368	0.90	0.00245
	5/3/2010	3/24/2011	325	0.50	0.00154
	3/24/2011	4/18/2012	391	0.89	0.00228

On the basis of our interpretation of the results presented in Table 1, we conclude that the rate of settlement between May 2010 and late March 2011 decreased about 20 to 50 percent compared to the settlement rates between 30 April 2009 and May 2010. However, since late March of 2011 to the present there has been a significant increase in the rate of settlement especially for measurement points closest to the boundary between 301 Mission Tower and the TJPA project. Because the rate of consolidation settlement decreases with time, the recorded increase in the rate of settlement since March 2011 does not represent settlement associated with consolidation. If the same rate of settlement between 3 May 2010 and 24 March 2011 continued to the present, then the expected values would be 0.3 to about 0.9 inches less than the recorded amounts.

Arup reported that the inclinometer measurements are related to the extraction of timber piles which occurred sometime during the period from late March/early April 2011 to mid/late May 2011. Subsequent TJPA construction activities have continued since that time. Therefore, we conclude that the increase in the rate of settlement since late March 2011 is attributed to the TJPA's construction activities. Furthermore, we conclude that the trigger action level has been reached. As such, TJPA should provide Millennium Partners with a course of action as required by Definitions 1.3L of Section 31 09 12 of the specification.

Vibration Monitoring

We reviewed the vibration monitoring results for instruments VM-001, VM-002, and VM-003. On the basis of our review, we conclude that the vibration levels, in terms of measured peak particle velocity, are less than the action trigger level. In general, the measured vibration levels are low; however, on several occasions the velocities are high enough to be felt by building occupants. Specifically, we noticed two spikes in the last month in VM-001. These were: a spike of about 0.07 in/sec on 9 May and another of about 0.15 inch/sec on 1 June 2012. These velocities are within perceptible range by humans. DeSimone Consulting Engineers (DCE) should comment on the effects of the measured vibration levels on the structure.

We understand DCE will review and comment on the results of tape extensometers and tilt meters.

We trust this memorandum provides the information requested. Should you have any questions, please call.

Treadwell&Rollo
A LANGAN COMPANY

MEMORANDUM

TO: Steven Hood – Millennium Partners

FROM: Ramin Golesorkhi, GE

CC: Nicolas Rodrigues, SE – DeSimone Consulting Engineers
Richard D. Rodgers, GE

DATE: 10 December 2012

PROJECT: 730315706

SUBJECT: Evaluation of Measurements by Arup/TJPA
301 Mission Street
San Francisco, California

Number of Pages: 4

As requested, this memorandum presents the results of our review, evaluation and preliminary conclusions regarding the data obtained by Arup, Transbay Joint Powers Authority's (TJPA) consultant, from the monitoring points established at the 301 Mission Tower and Mid-rise site. Monitoring of sites surrounding the Transbay excavation is required by Section 31 09 13 – Geotechnical Instrumentation and Monitoring of the specification dated 30 July 2010. Specifically, we reviewed the recent memoranda prepared by Arup dated 6 November 2012 (Settlement Survey), 6 November 2012 (Tape Extensometer Reading), and 13 November 2012 (Manually Read Inclinometer), forwarded to us by you via email, and the results of the instrumentation monitoring on the TJPA Global Analyzer website.

Table 1 within Section 31 09 13 presents maximum allowable movements and corrective action trigger levels criteria. The action trigger level and maximum allowable movement for vertical settlement measured at monitoring points inside adjacent buildings are ¾ inch and 1-1/2, respectively. The levels of horizontal movement of inclinometers are ½ inch and 3 inches for action trigger level and maximum allowable level, respectively. Peak Particle Velocities of ½ inch/sec and 1 inch/sec for action trigger level and maximum allowable vibrations, respectively are specified in Table 1.

Horizontal Movements

The Transbay Global Analyzer website includes data obtained from inclinometers I-016, I-017B, I-018 and I-022 that are installed adjacent to 301 Mission structures. The data indicated that inclinometers I-016, I-017B, and I-018 have moved laterally about 0.25 inch towards the north since monitoring started. The inclinometer I-022 plot shows about 0.25 inch of deformation in the same northerly direction since its monitoring started except for a sharp spike of 2.0 inches in the positive direction at a depth of about 14 feet. This abrupt movement may be the result of someone accidentally striking the casing; we request that Arup provide an explanation of this movement. The result of the manually read inclinometer

I-18M was presented in the Arup memorandum dated 13 November 2012. In previous memoranda Arup had presented the results of inclinometer I-19, however, its memorandum states that I-19 was converted to an "in-place-inclinometer" on 7 July 2012. At this time we do not have access to the results from I-19. Inclinometer I-18 continues to show deformations below a depth of about 90 feet to the bottom of the inclinometer at a depth of about 250 feet. The latest reading taken on 12 November 2012 shows deformations of over 0.6 inch between the depths of about 90 and 120 feet, 0.5 inch at a depth of 150 feet and deformations of about 0.3 inch to a depth of about 220 feet. We believe the lateral deformations measured in the inclinometer are entirely related to TJPA's construction activities. As discussed in our meeting with TJPA and Arup and as stated in our 27 April 2012 memorandum the action trigger level for horizontal movement of inclinometers has been exceeded. We recommend that TJPA provide Millennium Partners with a course of action as required by Definitions 1.3L of Section 31 09 12 of the specification.

Vertical Settlement

Since 30 April 2009 Arup has been measuring settlement of various points within the Tower and the Mid-Rise structures. The latest settlement measurements were obtained on 12 October 2012; settlement plots of four points within the Tower are presented on Plate 4 of Arup's memorandum dated 6 November 2012. SM-3 is the closest point to the southern boundary between 301 Mission Tower and the TJPA project. Measurement points SM-9, SM-14 and SM-27 are located progressively farther away (in a northerly direction) from the boundary between the 301 Mission Tower and the TJPA project.

We understand these measurements are obtained manually. The results of these measurements from the start through 7 March 2012 are available on the Global Analyzer website. We received the most recent settlement data via email from you. The information shown on Plate 4 indicates that the rate of settlement of the points has changed over time. In particular we observed different rates of movement during three distinct time intervals. The intervals are: 30 April 2009 to 3 May 2010; 3 May 2010 to 24 March 2011; and 24 March 2011 to 12 October 2012. The movements recorded during these time intervals are presented in Table 1.

TABLE 1

Results of Settlement Measurements at the Tower

Measurement Point	**Date**	**Date**	**Elapsed time (days)**	**Settlement During Elapsed Time (inches)**	**Rate of Settlement (inch/day)**
SM-3	4/30/2009	5/3/2010	368	0.47	0.00129
	5/3/2010	3/24/2011	325	0.32	0.00099
	3/24/2011	10/12/12	568	1.51	0.00266
SM-9	4/30/2009	5/3/2010	368	0.69	0.00186
	5/3/2010	3/24/2011	325	0.47	0.00145
	3/24/2011	10/12/12	568	1.64	0.00288
SM-14	4/30/2009	5/3/2010	368	0.77	0.00210
	5/3/2010	3/24/2011	325	0.53	0.00162
	3/24/2011	10/12/12	568	1.56	0.00275
SM-27	4/30/2009	5/3/2010	368	0.86	0.00234
	5/3/2010	3/24/2011	325	0.48	0.00147
	3/24/2012	10/12/12	568	1.44	0.00254

On the basis of our interpretation of the results presented in Table 1, we conclude the rate of settlement between May 2010 and late March 2011 decreased about 20 to 40 percent compared to the settlement rates between 30 April 2009 and May 2010. However, since late March of 2011 to the present there has been a significant increase in the rate of settlement especially for measurement points closest to the boundary between 301 Mission Tower and the TJPA project. Because the rate of consolidation settlement decreases with time, the recorded increase in the rate of settlement since March 2011 does not represent settlement associated with consolidation. If the same rate of settlement between 3 May 2010 and 24 March 2011 continued to the present, then the expected values would be 0.6 to about 0.95 inches less than the recorded amounts.

Arup reported that the inclinometer movements are related to the extraction of timber piles that occurred sometime during the period from late March/early April 2011 to mid/late May 2011. However, TJPA construction activities have continued since March 2011; we believe the increase in the rate of settlement since late March 2011 is related to the TJPA's construction activities. As a result of its activities the trigger action level has been exceeded. Consequently, TJPA should provide Millennium Partners with a course of action as required by Definitions 1.3L of Section 31 09 12 of the specification.

Vibration Monitoring

We reviewed the vibration monitoring results for instruments VM-001, VM-002, and VM-003. On the basis of our review, we conclude that the vibration levels, in terms of measured peak particle velocity, are less than the action trigger level. In general, the measured vibration levels are low; however, on several occasions the velocities are high enough to be felt by building occupants. Specifically, we noticed four spikes in October 2012 in VM-001. These spikes ranged from about 0.02 in/sec to about 0.15 inch/sec. These velocities are within perceptible range by humans. DeSimone Consulting Engineers (DCE) should comment on the effects of the measured vibration levels on the structure.

Tape Extensometer

Since May 2009 Arup has been measuring the relative movements between eight tape extensometer (TE) points. TE points TE-1 through TE-4 are located along the east wall (Beale Street) of the podium structure. TE points TE-5 through TE-8 are along the boundary between the Tower and Podium Structure. Extensometers measure relative movements between two points; a positive relative movement represents extension. On the basis of our review of the data, we conclude that in general the relative movements between the points appear to be fairly constant since May 2011.

We understand DCE will review and comment on the results of tape extensometers and tilt meters.

We trust this memorandum provides the information requested. Should you have any questions, please call.

730315706.05_RG_Memo_301 Mission Street

MEMORANDUM

TO: Steven Hood – Millennium Partners

FROM: Ramin Golesorkhi, GE

CC: Nicolas Rodrigues, SE – DeSimone Consulting Engineers
Richard D. Rodgers, GE

DATE: 21 June 2013

PROJECT: 730315706

SUBJECT: Evaluation of Measurements by Arup/TJPA
301 Mission Street
San Francisco, California

Number of Pages: 4

This memorandum presents the results of our review and evaluation of the data from Arup, the consultant retained by Transbay Joint Powers Authority's (TJPA), to monitor points established at the 301 Mission Tower and Mid-rise site and to compute deflections anticipated from the shoring system.

Monitoring of sites surrounding the Transbay excavation is required by Section 31 09 13 – Geotechnical Instrumentation and Monitoring of the specification dated 30 July 2010. Specifically, we reviewed the recent memorandum prepared by Arup dated 27 March 2013 (Settlement Survey) forwarded to us by you via email on 17 June 2013. We also accessed the TJPA Global Analyzer website. We have not received any inclinometer I-18M readings (last measurements received on 12 November 2012).

Table 1 presented in Section 31 09 13 lists maximum allowable movements and corrective action trigger levels criteria. The action trigger level and maximum allowable movement for vertical settlement measured at monitoring points inside adjacent buildings are ¾ inch and 1-1/2, respectively. The levels of horizontal movement of inclinometers are ½ inch and 3 inches for action trigger level and maximum allowable level, respectively. Peak Particle Velocities of ½ inch/sec and 1 inch/sec for action trigger level and maximum allowable vibrations, respectively are specified in Table 1.

Vertical Settlement

Since 30 April 2009 Arup has been measuring settlement of various points within the Tower and the Mid-Rise structures. The latest settlement measurements were obtained on 13 February 2013; settlement plots of four points within the Tower are presented on Plate 4 of Arup's memorandum dated 27 March

2013. SM-3 is the closest point to the southern boundary between 301 Mission Tower and the TJPA project. Measurement points SM-9, SM-14 and SM-27 are progressively farther away (in a northerly direction) from the boundary between the 301 Mission Tower and the TJPA project.

We understand these measurements are obtained manually. Also, we received the spreadsheet summarizing the settlement point readings via email from you on 17 June 2013.

The information shown on Plate 4 indicates that the rate of settlement of the points has changed over time. In particular we observed different rates of movement during three distinct time intervals. The intervals are: 30 April 2009 to 3 May 2010; 3 May 2010 to 24 March 2011; and 24 March 2011 to 13 February 2013. The movements recorded at different locations during these time intervals are presented in Table 1.

TABLE 1

Results of Settlement Measurements at the Tower

Measurement Point	Date	Date	Elapsed time (days)	Settlement During Elapsed Time (inches)	Rate of Settlement (inch/day)
SM-3	4/30/2009	5/3/2010	368	0.47	0.00129
	5/3/2010	3/24/2011	325	0.32	0.00099
	3/24/2011	2/13/2013	692	1.87	0.00269
SM-9	4/30/2009	5/3/2010	368	0.69	0.00186
	5/3/2010	3/24/2011	325	0.47	0.00145
	3/24/2011	2/13/2013	692	2.06	0.00298
SM-14	4/30/2009	5/3/2010	368	0.77	0.00210
	5/3/2010	3/24/2011	325	0.53	0.00162
	3/24/2011	2/13/2013	692	2.00	0.00290
SM-27	4/30/2009	5/3/2010	368	0.86	0.00234
	5/3/2010	3/24/2011	325	0.48	0.00147
	3/24/2011	2/13/2013	692	1.87	0.00269

On the basis of our interpretation of the results presented in Table 1, we conclude the rate of settlement between May 2010 and late March 2011 decreased by up to 40 percent compared to the rate of settlement between 30 April 2009 and May 2010. However, since late March of 2011 there has been a significant increase in the rate of settlement especially for measurement points closest to the boundary between 301 Mission Tower and the TJPA project. Considering that consolidation theory predicts a decrease in settlement with time, the recorded increase in the rate of settlement since March 2011 cannot represent settlement associated with consolidation. If the same rate of settlement between 3 May 2010 and 24 March 2011 continued to the present and was related to consolidation theory, then the expected values would be about 0.8 to about 1.2 inches less than the recorded amounts.

Also, we reviewed the settlement measurements of four points within the Mid-rise presented on Plate 5 of Arup's memorandum dated 27 March 2013. SM-47 is the closest point to the southern boundary between 301 Mission Mid-rise and the TJPA project. Measurement points SM-55, SM-76 and SM-83 are located progressively farther away (in a northerly direction) from the boundary between the 301 Mission Mid-rise and the TJPA project. Point SM-83 is near the northeast corner of the Mid-rise and farthest away from the boundary between the 301 Mission Mid-rise and the TJPA project. Point SM-83 has effectively shown little to no movement over the duration of the Arup survey. Survey points SM-55 and SM-76 which are about 65 feet and 135 feet, respectively, from the southern boundary of the Mid-rise structure have shown a settlement of about 0.4 inch during the Arup survey period. However, by late March 2011 these points had only settled about 0.1 inch which indicates an increase in the rate of settlement by a factor of about 3.3 during the period from late March 2011 to early February 2013. Survey point SM-47 which is about 35 feet away from the southern boundary of the Mid-rise structure had settled about 0.3 inch in late March 2011 and as of the 13 February 2013 it has settled about 1.15 inches. This is an increase in the rate of settlement by a factor of about 2.85 from late March 2011 to late December 2012. The increase in the rate of settlement for these points coincides with the TJPA construction activities. Furthermore, the settlement of survey points SM-47, SM-55 and SM-76 clearly suggests that continued construction activities are affecting a greater area than just the Tower.

Lateral Movement

We accessed the TJPA Global Analyzer website (GA) to review the results of lateral deformations measured in inclinometers I-16R, I-17R, I-18R, and I-19R. From the information on the GA website, it appears that these inclinometers became operational in late February 2013 (I-16R and I-17R), early March 2013 (I-18R) and middle March 2013 (I-19R). Consistent with the nomenclature for inclinometer I-18M, we have assumed that the positive direction movements in the inclinometers are toward the south, i.e. towards TJPA site.

I-16R and I-17R are approximately inline along Fremont Street. I-16R is near the boundary of 301 Mission and TJPA property and I-17R is on the order of about 50 feet north from the boundary with TJPA. I-16R shows top of the inclinometer movement of about 0.6 inch to the north and I-17R shows about 1.0 inch of movement towards the south at the top. The pattern of the movements is conflicting. We have no information regarding the installation of these inclinometers or other factors which may explain their behavior. Arup should provide an explanation regarding the behavior of these inclinometers.

I-18R readings show little movement to the north and I-19R readings show about 0.25 inch movement in the top 65 feet to the north and a reverse of the movement by the same amount to the south between the depths of about 65 and 87 feet.

As previously mentioned, we have not received the manual readings obtained from inclinometer I-18M which was read prior to TJPA construction activities along 301 Mission property boundary. Arup reported that the I-18M inclinometer movements are related to the extraction of timber piles that occurred sometime during the period from late March/early April 2011 to mid/late May 2011. However, TJPA construction activities have continued since March 2011; we believe the increase in the rate of settlement since late March 2011 is related to the TJPA's construction activities. As a result of its activities the trigger action level has been exceeded. Consequently, TJPA should provide Millennium Partners with a course of action as required by Definitions 1.3L of Section 31 09 12 of the specification.

Water Level in Piezometers

We accessed the TJPA Global Analyzer website (GA) to review the results of water levels measured in piezometers, P-6 and P-8MS, near the boundary of the 301 Mission site and TJPA property. We do not have the information regarding the depths and the installation procedures of these piezometers. P-6 is along Fremont Street and appears to consist of a cluster of piezometers. They are: P-6-F, P-6_M. P-6MS, and P-6MS_M. The greatest drops in water levels are measured in piezometers P-6F and P-6MS which show drops of about 4.5 feet and 10 feet, respectively. Piezometer P-8MS, which is located about 65 feet east of Fremont Street along the boundary between 301 Mission site and TJPA property, shows a drop of about 13.5 feet in the water level.

We conclude that the TJPA construction-induced deformations will be over four inches. This total represents the three inches predicted by Arup as a result of the excavation this is currently underway plus one inch caused by the installation of buttress and other activities related to excavation. The computed TJPA excavation-induced settlements under the tower are relatively uniform; however, the impact of the induced settlement on the utilities entering/exiting the 301 Mission structures may be affected. Consequently, TJPA should provide Millennium Partners with a course of action related to the repairs of the affected improvements as required by Definitions 1.3L of Section 31 09 12 of the specification.

We trust this memorandum provides the information requested. Should you have any questions, please call.

730315706.07_RG_Memo_301 Mission Street

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MEMORANDUM

TO: Steven Hood – Millennium Partners

FROM: Ramin Golesorkhi, GE

CC: Nicolas Rodrigues, SE – DeSimone Consulting Engineers
Richard D. Rodgers, GE

DATE: 25 July 2013

PROJECT: 730315706

SUBJECT: Evaluation of Measurements by Arup/TJPA
301 Mission Street
San Francisco, California

Number of Pages: 4

This memorandum presents the results of our review and evaluation of the data from Arup. Arup is the consultant retained by Transbay Joint Powers Authority's (TJPA), to monitor points established at the 301 Mission Tower and Mid-rise site and to compute deflections anticipated from the shoring system.

Section 31 09 13 – Geotechnical Instrumentation and Monitoring of the specification dated 30 July 2010 requires the monitoring of sites surrounding the Transbay excavation. We reviewed the recent memorandum prepared by Arup dated 28 June 2013 (Settlement Survey) forwarded to us by you via email on 17 July 2013 and the plots of readings of inclinometer I-18M located adjacent to 301 Mission Tower that was forwarded to us by you on 16 July 2013. Also, we accessed the TJPA Global Analyzer website to access inclinometer and piezometer data.

Table 1 presented in Section 31 09 13 lists maximum allowable movements and corrective action trigger levels criteria. The action trigger level and maximum allowable movement for vertical settlement measured at monitoring points inside adjacent buildings are ¾ inch and 1-1/2, respectively. The levels of horizontal movement of inclinometers are ½ inch and 3 inches for action trigger level and maximum allowable level, respectively. Peak Particle Velocities of ½ inch/sec and 1 inch/sec for action trigger level and maximum allowable vibrations, respectively are specified in Table 1.

Vertical Settlement

Since 30 April 2009 Arup has been measuring settlement of various points within the Tower and the Mid-Rise structures. The latest settlement measurements which are read manually, were obtained on 3 June 2013; settlement plots of four points within the Tower are presented on Plate 4 of Arup's memorandum dated 28 June 2013. SM-3 is the closest point to the southern boundary between 301 Mission Tower and the TJPA project. Measurement points SM-9, SM-14 and SM-27 are progressively farther away (in a northerly direction) from the boundary between the 301 Mission Tower and the TJPA project. Also, we received the spreadsheet summarizing the settlement point readings via email from you on 17 July 2013.

The information shown on Plate 4 indicates that the rate of settlement of the points has changed over time. In particular we observed different rates of movement during three distinct time intervals. The intervals are: 30 April 2009 to 3 May 2010; 3 May 2010 to 24 March 2011; and 24 March 2011 to 3 June 2013. The movements recorded at different locations during these time intervals are presented in Table 1.

TABLE 1

Results of Settlement Measurements at the Tower

Measurement Point	Date	Date	Elapsed time (days)	Settlement During Elapsed Time (inches)	Rate of Settlement (inch/day)
SM-3	4/30/2009	5/3/2010	368	0.47	0.00129
	5/3/2010	3/24/2011	325	0.32	0.00099
	3/24/2011	6/3/2013	802	2.00	0.00250
SM-9	4/30/2009	5/3/2010	368	0.69	0.00186
	5/3/2010	3/24/2011	325	0.47	0.00145
	3/24/2011	6/3/2013	802	2.29	0.00285
SM-14	4/30/2009	5/3/2010	368	0.77	0.00210
	5/3/2010	3/24/2011	325	0.53	0.00162
	3/24/2011	6/3/2013	802	2.28	0.00284
SM-27	4/30/2009	5/3/2010	368	0.86	0.00234
	5/3/2010	3/24/2011	325	0.48	0.00147
	3/24/2011	6/3/2013	802	2.24	0.00279

On the basis of our interpretation of the results presented in Table 1, we conclude the rate of settlement between May 2010 and late March 2011 decreased by up to 40 percent compared to the rate of settlement between 30 April 2009 and May 2010. However, since late March of 2011 there has been a substantial increase in the rate of settlement especially for measurement points closest to the boundary between 301 Mission Tower and the TJPA project. Considering that consolidation theory predicts a decrease in settlement with time, the recorded increase in the rate of settlement since March 2011 cannot represent settlement associated with consolidation. If the same rate of settlement between 3 May 2010 and 24 March 2011 continued to the present and was related to consolidation theory, then the expected amounts would be about 1.0 to about 1.2 inches less than the recorded amounts.

Also, we reviewed the settlement measurements of four points within the Mid-rise presented on Plate 5 of Arup's memorandum dated 28 June 2013. SM-47 is the closest point to the southern boundary between 301 Mission Mid-rise and the TJPA project. Measurement points SM-55, SM-76 and SM-83 are located progressively farther away (in a northerly direction) from the boundary between the 301 Mission Mid-rise and the TJPA project. Point SM-83 is near the northeast corner of the Mid-rise and farthest away from the boundary between the 301 Mission Mid-rise and the TJPA project. Point SM-83 has effectively shown little to no movement over the duration of the Arup survey. Survey points SM-55 and SM-76 which are about 65 feet and 135 feet, respectively, from the southern boundary of the Mid-rise structure have shown a settlement of about 0.4 inch to 0.5 inch during the Arup survey period with an increase in the rate of most of the movement occurring since March 2011; the increase in the rate of settlement since March 2011 is 3.4 times greater than the rate prior to March 2011. As of March 2011, survey point SM-47, which is about 35 feet away from the southern boundary of the Mid-rise structure, had settled about 0.3 inch. Since then it has settled about 0.9 inches. This amount is an increase in the rate of settlement of about 2.6 from late March 2011 to early June 2013. The increase in the rate of settlement for these points coincides with the TJPA construction activities. The data from survey points SM-47, SM-55 and SM-76 clearly suggest that continued construction activities are affecting a greater area than just the Tower.

Lateral Movement

We accessed the TJPA Global Analyzer website (GA) to review the results of lateral deformations measured in inclinometers I-16R, I-17R, I-18R, and I-19R. The information on the GA website, indicates that these inclinometers became operational in late February 2013 (I-16R and I-17R), early March 2013 (I-18R) and middle March 2013 (I-19R). Consistent with the nomenclature for inclinometer I-18M, we have assumed that the positive direction movements in the inclinometers are toward the south, i.e. towards TJPA site.

I-16R and I-17R are approximately inline along Fremont Street. I-16R is near the boundary of 301 Mission and TJPA property and I-17R is approximately 50 feet north of the TJPA boundary. Inclinometer I-16R shows movement at the top of casing of about 0.6 inch to the north and I-17R shows about 1.0 inch of movement towards the south at the top. The directions of the movements are contrary to each other. We have no information regarding the installation of these inclinometers or other factors which may explain their behavior. Arup should provide an explanation regarding the behavior of these inclinometers.

I-18R readings show less than 0.25 inch movement towards TJPA site and I-19R readings show less than about 0.25 inch movement in the top 40 feet away from the TJPA site; but towards the TJPA site by less than about 0.5 between the depths of about 65 and 87 feet.

The result of the manually read inclinometer I-18M was presented in the Arup plots dated and received in July 2013. Inclinometer I-18M continues to show deformations below a depth of about 90 feet to the bottom of the inclinometer 250 feet below the ground surface. The latest reading taken on 10 July 2013 shows deformations of about 0.75 inch between the depths of about 90 and 130 feet, 0.7 inch at a depth of 150 feet and deformations of about 0.3 inch to a depth of about 220 feet. We believe the lateral deformations measured in the inclinometer are entirely related to TJPA's construction activities. As discussed in our meeting with TJPA and Arup and as stated in our previous memoranda the action trigger level for horizontal movement of inclinometers has been exceeded. We recommend that TJPA provide Millennium Partners with a course of action to mitigate the movements as required by Definitions 1.3L of Section 31 09 12 of the specification.

Water Level in Piezometers

We accessed the TJPA Global Analyzer website (GA) to review the results of water levels measured in piezometers, P-6 and P-8MS, near the boundary of the 301 Mission site and TJPA property. We do not have the information regarding the depths and the installation procedures of these piezometers. P-6 is along Fremont Street and appears to consist of a cluster of piezometers. They are: P-6-F, P-6_M, P-6MS, and P-6MS_M. The greatest drops in water levels are measured in piezometers P-6F and P-6MS which show drops of about 4.6 feet and 10 feet, respectively. Piezometer P-8MS, which is located about 65 feet east of Fremont Street along the boundary between 301 Mission site and TJPA property, shows a drop in the water level of about 13.0 feet.

On the basis of our interpretation of Arup's data, we conclude that the TJPA construction-induced deformations will be over four inches. This total represents the three inches predicted by Arup as a result of the excavation that is currently underway plus more than one inch caused by the installation of buttress and other activities related to excavation. The computed TJPA excavation-induced settlements under the tower are relatively uniform; however, the impact of the induced settlement on the utilities entering/exiting the 301 Mission structures may be affected. Consequently, TJPA should provide Millennium Partners with a course of action related to the repairs of the affected improvements as required by Definitions 1.3L of Section 31 09 12 of the specification.

We trust this memorandum provides the information requested. Should you have any questions, please call.

730315706.08_RG_Memo_301 Mission Street

MEMORANDUM

TO: Steven Hood – Millennium Partners

FROM: Ramin Golesorkhi, GE

CC: Nicolas Rodrigues, SE – DeSimone Consulting Engineers
Richard D. Rodgers, GE

DATE: 19 December 2013

PROJECT: 730315706

SUBJECT: Evaluation of Measurements by Arup/TJPA
301 Mission Street
San Francisco, California

Number of Pages: 5

This memorandum presents the results of our review and evaluation of the data from Arup received 4 December 2013 and 13 December 2013. Arup is retained by Transbay Joint Powers Authority's (TJPA), to monitor deflections of the 301 Mission Street development during construction for the Transbay project. Also, we visited the site on 18 December 2013 to observe the condition of the tiedown plugs at the midrise structure.

According to Section 31 09 13 of the Transbay project specification dated 30 July 2010, geotechnical instrumentation and monitoring of sites surrounding the Transbay excavation is required. We reviewed the recent memoranda prepared by Arup dated 13 November 2013 (Settlement Survey) and 10 December 2013 (Manually Read Inclinometer Update). Also, we accessed the TJPA Global Analyzer website to review inclinometer and piezometer data.

Table 1 presented in Section 31 09 13 lists maximum allowable movements and corrective action trigger levels criteria. The action trigger level and maximum allowable movement for vertical settlement measured at monitoring points inside adjacent buildings are ¾ inch and 1-1/2, respectively. The levels of horizontal movement of inclinometers are ½ inch and 3 inches for action trigger level and maximum allowable level, respectively. Peak Particle Velocities of ½ inch/sec and 1 inch/sec for action trigger level and maximum allowable vibrations, respectively are specified in Table 1.

Vertical Settlement

Since 30 April 2009 Arup has been measuring settlement of various points within the Tower and the Mid-Rise structures. The latest settlement measurements which are read manually, were obtained on 9

October 2013; settlement plots of four points within the Tower are presented on Plate 4 of Arup's memorandum dated 13 November 2013. SM-3 is the closest point to the southern boundary between 301 Mission Tower and the TJPA project. Measurement points SM-9, SM-14 and SM-27 are progressively farther away (in a northerly direction) from the boundary between the 301 Mission Tower and the TJPA project.

The information shown on Plate 4 indicates that the rate of settlement of the points has changed over time. In particular we observed different rates of movement during three distinct time intervals. The intervals are: 30 April 2009 to 3 May 2010; 3 May 2010 to 24 March 2011; and 24 March 2011 to 9 October 2013. The movements recorded at different locations during these time intervals are presented in Table 1.

TABLE 1

Results of Settlement Measurements at the Tower

Measurement Point	Date	Date	Elapsed time (days)	Settlement During Elapsed Time (inches)	Rate of Settlement (inch/day)
SM-3	4/30/2009	5/3/2010	368	0.47	0.00129
	5/3/2010	3/24/2011	325	0.32	0.00099
	3/24/2011	10/9/2013	930	2.20	0.00236
SM-9	4/30/2009	5/3/2010	368	0.69	0.00186
	5/3/2010	3/24/2011	325	0.47	0.00145
	3/24/2011	10/9/2013	930	2.64	0.00284
SM-14	4/30/2009	5/3/2010	368	0.77	0.00210
	5/3/2010	3/24/2011	325	0.53	0.00162
	3/24/2011	10/9/2013	930	2.70	0.00290
SM-27	4/30/2009	5/3/2010	368	0.86	0.00234
	5/3/2010	3/24/2011	325	0.48	0.00147
	3/24/2011	10/9/2013	930	2.78	0.00299

The data indicate that the rate of settlement between May 2010 and late March 2011 decreased by approximately 40 percent compared to the rate of settlement between 30 April 2009 and May 2010. However, since late March of 2011 there has been a substantial increase in the rate of settlement especially for measurement points closest to the boundary between 301 Mission Tower and the TJPA project. Considering that consolidation theory predicts a decrease in settlement amounts and rates with time, the recorded increase in the rate of settlement since March 2011 cannot represent settlement associated with consolidation. If the same rate of settlement between 3 May 2010 and 24 March 2011 continued to the present time and was related to consolidation theory, then the expected amounts would be about 1.2 to about 1.4 inches less than the recorded amounts.

Also, we reviewed the settlement measurements of four points within the Mid-rise presented on Plate 5 of Arup's memorandum dated 13 November 2013. SM-47 is the closest point to the southern boundary between 301 Mission Mid-rise and the TJPA project. Measurement points SM-55, SM-76 and SM-83 are progressively farther away (in a northerly direction) from the boundary between the 301 Mission Mid-rise and the TJPA project. Point SM-83 is near the northeast corner of the Mid-rise and farthest away from the boundary between the 301 Mission Mid-rise and the TJPA project. Point SM-83 showed little to no movement until 3 June 2013. Since early June 2013 this point has settled about 0.2 inch. Survey points SM-55 and SM-76 which are about 65 feet and 135 feet, respectively, from the southern boundary of the Mid-rise structure have shown a total settlement of about 0.5 inch to 0.6 inch during the Arup survey period. The rate of movement has increased since March 2011; the increase in the rate of the settlements of these points since March 2011 is about 3.0 to 3.7 times greater than the rate prior to March 2011. Up until March 2011, survey point SM-47, which is about 35 feet away from the southern boundary of the Mid-rise structure, settled about 0.3 inch. Since then it has settled over 1.0 inch. This amount is an increase in the rate of settlement of about 2.6 times from late March 2011 to early October 2013. The increase in the rate of settlement for these points coincides with the TJPA construction activities. The data from survey points SM-47, SM-55 and SM-76 clearly suggest that continued construction activities are affecting a greater area than just the Tower.

Lateral Movement

On 13 December 2013 we received the results of manually read inclinometers. These results were presented in a memorandum by Arup dated 10 December 2013. The plot of the last manually read inclinometer, I-18M, was forwarded to us in an email dated 16 July 2013; it depicted the movement as of 10 July 2013; prior plot of I-18M was presented in Arup memorandum dated 13 November 2012. In the November 2012 memorandum Arup indicated that inclinometer locations I-16, I-17A, I-17B, I-18, I-19, I-20, I-21, and I-22 were planned to receive "in-place-inclinometers" and be read automatically with their results available on the Global Analyzer. Contrary to statement in Arup's 13 November 2013 memorandum, these inclinometers are being read manually, with the exception of inclinometer I-20 which was destroyed during construction.

On 10 December 2013, when we started this round of review of the data, we accessed the Global Analyzer and found that only the results of I-16R were available for our review. However, Arup's 10 December 2013 memorandum indicated the readings from all the inclinometers were obtained manually and not by "in-place" method. Inclinometer I-16R shows movement at the top of casing of about 1.6 inches to the north and an abrupt movement of about ¾ inch to the north at a depth of about 120 feet (Elevation -110 NAVD88 Datum). The reason for this peculiar behavior is not explained. We have no information regarding the installation of this inclinometer or other factors that may explain the movements. Arup should provide you with explanations regarding the behavior of this inclinometer and the absence of the other inclinometer data from the GA website. As early as our 25 July 2013 memorandum we commented on the reliability of the I-16R data. At this time we assume and consider the data I-16R anomalous and unreliable.

The results of our review indicate that all of the inclinometers show movements towards Transbay for almost their entire depth, i.e. depths greater than 210 feet, except inclinometer I-17B which is on the sidewalk along Mission Street. Considering inclinometer readings are made relative to a baseline (i.e. zero reading), it is important to note that with the exception of inclinometers I-16 and I-19, the baseline measurements of the other inclinometers are from late January or February 2013. It appears that I-18M readings presented on Plate 6 of the 10 December 2013 memorandum are relative to the measurement of 21 February 2013. In the July 2013 measurement plots of I-18M the 21 February readings showed lateral movements of about ¾ inch from a depth of about 90 feet to 150 feet and about 0.35 inch between the depths of 180 feet to 210 feet. The I-18M measurements presented in the December 2013 only show about 0.2 to 0.3 inch of lateral deformation since 21 February 2013. To properly evaluate the effects of TJPA's construction on ground deformations, the I-18M readings from 5 December 2013 should be added to the 21 February 2013 reading. When adding these two measurements the total lateral deformation in I-18M is about 0.25 inch at a depth of about 70 feet and increase to about 0.9 inch between the depths of 90 to 140 feet with a peak of about 0.95 inch at a depth of about 130 feet. The lateral deformations decrease to about 0.5 inch at a depth of about 190 feet.

The inclinometer I-19 plot shows peak deformations of about 0.7 inch between the depths of 100 to 140 feet and about 0.3 inch between the depths of 170 feet to 220 feet. The plot also shows relatively large lateral deformations of about 0.6 inch toward Beale Street between depths of about 90 feet and 140 feet.

The inclinometer I-21 plot shows the largest lateral deformations towards Transbay of about 0.6 inch between 21 February 2013 and 5 December 2013. This plot also shows a lateral deformation of about 0.2 inch towards Fremont Street.

The inclinometer I-17B (on the sidewalk along Mission Street) plot shows about 0.4 to 0.6 inch of lateral deformation towards 301 Mission, i.e. south, in the top 50 feet. This is consistent with the pattern of deformation in the other inclinometers.

We believe the lateral deformations measured in the inclinometer are entirely related to TJPA's construction activities. As discussed in our meeting with TJPA and Arup and as stated in our previous memoranda the action trigger level for horizontal movement of inclinometers has been exceeded. We recommend that TJPA provide Millennium Partners with a course of action to mitigate the movements as required by Definitions 1.3L of Section 31 09 12 of the specification.

Water Level in Piezometers

We accessed the TJPA Global Analyzer website (GA) to review the results of water levels measured in piezometers, P-6 and P-8MS, near the boundary of the 301 Mission site and TJPA property. We do not have the information regarding the depths and the installation procedures of these piezometers. P-6 is along Fremont Street and appears to consist of a cluster of piezometers. They are: P-6-F, P-6_M, P-6MS, and P-6MS_M. The greatest drops in water levels are measured in piezometers P-6F and P-6MS which show drops of about 6 feet and 10 feet, respectively. Piezometer P-8MS, which is located about 65 feet east of Fremont Street along the boundary between 301 Mission site and TJPA property, shows a drop in the water level of about 14 feet.

On the basis of our interpretation of Arup's data, we conclude that the TJPA construction-induced deformations will be over four inches. This total represents the three inches predicted by Arup as a result of the excavation that is currently underway plus more than one inch caused by the installation of buttress and other activities related to excavation. The computed TJPA excavation-induced settlements under the tower are relatively uniform; however, the impact of the induced settlement on the utilities entering/exiting the 301 Mission structures may be affected. Consequently, TJPA should provide Millennium Partners with a course of action related to the repairs of the affected improvements as required by Definitions 1.3L of Section 31 09 12 of the specification.

Conditions of Tiedowns at Midrise Structure

On 18 December 2013 we visited the site to observe the conditions of the tiedown plugs. During this visit we observed that several of the tiedown plugs appear to have lifted from the mat. In our opinion this behavior is a result of the settlement of the midrise. The tiedowns were installed to resist the hydrostatic uplift on the underside of the mat and prevent buoyancy. However, settlement of the midrise mat resulting from the TJPA construction activities has caused the tiedown tendons to relax and lose tension. In effect the mat is settling around the tiedowns and the observed conditions of the tiedown plugs are consistent with this behavior. Because of the continued TJPA activities, it is our recommendation that we continue to monitor the situation for the near future.

We trust this memorandum provides the information requested. Should you have any questions, please call.

730315706.09_RG_Memo_301 Mission Street

LANGAN TREADWELL ROLLO

555 Montgomery Street, Suite 1300 San Francisco, CA 94111 T: 415.955.5200 F: 415.955.5201

Memorandum

To: Steven Hood – Millennium Partners

From: Ramin Golesorkhi, GE

cc: Nicolas Rodrigues, SE – DeSimone Consulting Engineers
Richard D. Rodgers, GE

Date: 24 February 2014

Subject: Evaluation of Measurements by Arup/TJPA
301 Mission Street
San Francisco, California
Langan Project No.: 730315706

This memorandum presents the results of our review and evaluation of the data from Arup received 9 January 2014 and 19 February 2014. Arup is retained by Transbay Joint Powers Authority's (TJPA), to monitor deflections of the 301 Mission Street development during construction for the Transbay project.

According to Section 31 09 13 of the Transbay project specification dated 30 July 2010, geotechnical instrumentation and monitoring of sites surrounding the Transbay excavation is required. The piezometer data was obtained from the TJPA Global Analyzer website.

Table 1, presented in Section 31 09 13, lists maximum allowable movements and corrective action trigger levels criteria. The action trigger level and maximum allowable movement for vertical settlement measured at monitoring points inside adjacent buildings are ¾ inch and 1-1/2, respectively. The levels of horizontal movement of inclinometers are ½ inch and 3 inches for action trigger level and maximum allowable level, respectively. Peak Particle Velocities of ½ inch/sec and 1 inch/sec for action trigger level and maximum allowable vibrations, respectively are specified in Table 1.

Vertical Settlement

Since 30 April 2009 Arup has been measuring settlement of various points within the Tower and the Mid-Rise structures. The latest settlement measurements, which are read manually, were obtained on 17 December 2013; settlement plots of four points within the Tower are presented on Plate 4 of Arup's memorandum dated 9 January 2014. SM-3 is the closest point to the southern boundary between 301 Mission Tower and the TJPA project. Measurement points SM-9, SM-14 and SM-27 are progressively farther away (in a northerly direction) from the boundary between the 301 Mission Tower and the TJPA project.

The information shown on Plate 4 indicates that the rate of settlement of the points has changed over time. In particular we observed different rates of movement during three distinct time intervals. The intervals are: 30 April 2009 to 3 May 2010; 3 May 2010 to 24 March 2011;

and 24 March 2011 to 17 December 2013. The movements and rates of movement recorded at different locations during these time intervals are presented in Table 1.

TABLE 1

Results of Settlement Measurements at the Tower

Measurement Point	Date	Date	Elapsed time (days)	Settlement During Elapsed Time (inches)	Rate of Settlement (inch/day)
SM-3	4/30/2009	5/3/2010	368	0.47	0.00129
	5/3/2010	3/24/2011	325	0.32	0.00099
	3/24/2011	12/17/2013	999	2.34	0.00235
SM-9	4/30/2009	5/3/2010	368	0.69	0.00186
	5/3/2010	3/24/2011	325	0.47	0.00145
	3/24/2011	12/17/2013	999	2.90	0.00290
SM-14	4/30/2009	5/3/2010	368	0.77	0.00210
	5/3/2010	3/24/2011	325	0.53	0.00162
	3/24/2011	12/17/2013	999	2.99	0.00299
SM-27	4/30/2009	5/3/2010	368	0.86	0.00234
	5/3/2010	3/24/2011	325	0.48	0.00147
	3/24/2011	12/17/2013	999	3.11	0.00312

The data indicate that the rate of settlement between May 2010 and late March 2011 decreased by approximately 40 percent compared to the rate of settlement between 30 April 2009 and May 2010. However, since late March of 2011 there has been a substantial increase in the rate of settlement especially for measurement points closest to the boundary between 301 Mission Tower and the TJPA project. Because the theory of consolidation predicts a decrease in settlement amounts and rates with time, the recorded increase in the rate of settlement since March 2011 does not represent settlement associated with consolidation; if the same rate of settlement between 3 May 2010 and 24 March 2011 continued to the present time and was related to consolidation theory, then the expected amounts would be about 1.35 to about 1.64 inches less than the recorded amounts.

Also, we reviewed the settlement measurements of four points within the Mid-rise presented on Plate 5 of Arup's memorandum dated 13 November 2013. SM-47 is the closest point to the southern boundary between 301 Mission Mid-rise and the TJPA project. Measurement points

SM-55, SM-76 and SM-83 are progressively farther away (in a northerly direction) from the boundary between the 301 Mission Mid-rise and the TJPA project. Point SM-83 is near the northeast corner of the Mid-rise and farthest away from the boundary between the 301 Mission Mid-rise and the TJPA project. Point SM-83 showed little to no movement until 3 June 2013. Since early June 2013 this point has settled about 0.2 inch. Survey points SM-55 and SM-76 which are about 65 feet and 135 feet, respectively, from the southern boundary of the Mid-rise structure have shown a total settlement of about 0.6 inch to 0.65 inch during the Arup survey period. The rate of movement has increased since March 2011; the increase in the rate of the settlements of these points since March 2011 is about 3.5 to 3.8 times greater than the rate prior to March 2011. Up until March 2011, survey point SM-47, which is about 35 feet away from the southern boundary of the Mid-rise structure, settled about 0.3 inch. Since then it has settled about 1.05 inches. This amount is an increase in the rate of settlement of about 2.4 times from late March 2011 to middle December 2013. The increase in the rate of settlement for these points coincides with the TJPA construction activities. The data from survey points SM-47, SM-55 and SM-76 clearly suggest that continued construction activities are affecting a greater area than just the Tower.

Lateral Movement

On 19 February 2014 we received the results of manually read inclinometers. These results were presented in a memorandum by Arup dated 14 February 2014. The previous results of the manually read inclinometers were presented in a memorandum by Arup dated 10 December 2013. Prior to the 10 December memorandum, the plot of the last manually read inclinometer, I-18M, was forwarded to us in an email dated 16 July 2013; it depicted the movement as of 10 July 2013; prior plots of I-18M were presented in Arup memorandum dated 13 November 2012.

In the November 2012 memorandum, Arup indicated that inclinometer locations I-16, I-17A, I-17B, I-18, I-19, I-20, I-21, and I-22 were planned to receive "in-place-inclinometers" and be read automatically with their results available on the Global Analyzer. Contrary to the statement in Arup's 13 November 2013 memorandum, these inclinometers are being read manually, with the exception of inclinometer I-20 which was destroyed during construction.

On 20 February 2014, when we started this round of review of the data, we accessed the Global Analyzer and found that only the results of I-16R were available for our review. As discussed in our 19 December 2013 memorandum, we assume and consider I-16R data anomalous and unreliable.

The results of our review indicate that all of the inclinometers show movements towards Transbay for almost their entire depth, i.e. depths greater than 210 feet, except inclinometer I-17B which is on the sidewalk along Mission Street; 17B data show movement above 90 feet. Considering inclinometer readings are made relative to a baseline (i.e. zero reading), the baseline measurements of all the inclinometers are from late January or February 2013. It appears that I-18M readings presented on Plate 5 of the Arup 14 February 2014 memorandum are relative to the measurement of 21 February 2013. In the July 2013 measurement plots of

I-18M the 21 February 2013 readings showed lateral movements of about ¾ inch from a depth of about 90 feet to 150 feet and about 0.35 inch between the depths of 180 feet to 210 feet. The I-18M measurements presented in the February 2014 only show about 0.2 to 0.3 inch of lateral deformation since 21 February 2013. To properly evaluate the effects of TJPA's construction on ground deformations, the I-18M readings from 28 January 2014 should be added to the 21 February 2013 reading. After adding these two measurements, the total lateral deformation in I-18M is about 0.35 inch at a depth of about 70 feet and increase to over 0.9 inch between the depths of 90 to 140 feet with a peak of about 0.95 inch between the depths of about 130 to 140 feet. The lateral deformations decrease to about 0.5 inch at a depth of about 190 feet.

The plots of inclinometer I-19 are presented relative to the 1 February 2013 baseline and show about 0.1 to 0.15 inch of movements towards Transbay. However, the plots of I-19 presented in the Arup 10 December 2013 showed peak deformations of about 0.7 inch between the depths of 100 to 140 feet and about 0.3 inch between the depths of 170 to 220 feet. The plot also shows relatively large lateral deformations of about 0.6 inch toward Beale Street between depths of about 90 feet and 140 feet with a peak of about 0.7 inch at a depth of about 100 feet. To properly evaluate the effects of TJPA's construction on ground deformations, the I-19 readings from 28 January 2014 should be added to the readings of 1 February 2013. After adding these two measurements, the total lateral deformation in 1-19 is about ¾ inch at a depth of 100 feet and about 0.7 inch between the depths of 130 to 150 feet and over 0.3 inch between the depths of 170 to 220 feet.

The inclinometer I-21 plot shows the largest lateral deformations towards Transbay of about 0.6 inch between 6 February 2013 and 28 January 2014. This plot also shows a lateral deformation of about 0.2 inch towards Fremont Street. In the December 2013 figure, the baseline plot for this inclinometer was dated 21 February 2013 not 6 February 2013. Arup should explain this apparent discrepancy.

The inclinometer I-22 plot shows a relatively large change in deformations between the 5 December 2013 and 28 January 2014 with the largest lateral deformations towards Transbay of about 0.5 inch. This plot also shows a lateral deformation of about 0.3 inch towards Fremont Street.

The inclinometer I-17B (on the sidewalk along Mission Street) plot shows about 0.4 to 0.6 inch of lateral deformation in the top 50 feet towards 301 Mission, i.e. south toward the Transbay excavation. This inclinometer also shows about 0.2 to 0.5 inch of deformation towards Fremont Street in the top 50 feet. These amounts are consistent with the pattern of deformation in most of the other inclinometers.

We believe the lateral deformations measured in the inclinometer are entirely related to TJPA's construction activities. As discussed in our meeting with TJPA and Arup and as stated in our previous memoranda the action trigger level for horizontal movement of inclinometers has been exceeded. We recommend that TJPA provide Millennium Partners with a course of action to mitigate the movements as required by Definitions 1.3L of Section 31 09 12 of the specification.

Water Level in Piezometers

We accessed the TJPA Global Analyzer website (GA) to review the results of water levels measured in piezometers, P-6 and P-8MS, near the boundary of the 301 Mission site and TJPA property. We do not have the information regarding the depths and the installation procedures of these piezometers. P-6 is along Fremont Street and appears to consist of a cluster of piezometers. They are: P-6-F, P-6_M, P-6MS, and P-6MS_M. The greatest drops in water levels are measured in piezometers P-6F and P-6MS which show drops of about 7 feet and 10 feet, respectively. Piezometer P-8MS, which is located about 65 feet east of Fremont Street along the boundary between 301 Mission site and TJPA property, shows a drop in the water level of about 16 feet.

On the basis of our interpretation of Arup's data, we conclude that the TJPA construction-induced deformations will be over four inches. This total represents the three inches predicted by Arup as a result of the excavation that is currently underway plus more than one inch caused by the installation of buttress and other activities related to excavation. The recorded TJPA excavation-induced settlements under the tower are relatively uniform; however, the impact of the induced settlement on the utilities entering/exiting the 301 Mission structures may be affected. Consequently, TJPA should provide Millennium Partners with a course of action related to the repairs of the affected improvements as required by Definitions 1.3L of Section 31 09 12 of the specification.

We trust this memorandum provides the information requested. Should you have any questions, please call.

730315706.10_RG_Memo_301 Mission Street

LANGAN TREADWELL ROLLO

555 Montgomery Street, Suite 1300 San Francisco, CA 94111 T: 415.955.5200 F: 415.955.5201

Memorandum

To: Steven Hood – Millennium Partners

From: Ramin Golesorkhi, GE

cc: Nicolas Rodrigues, SE – DeSimone Consulting Engineers
Richard D. Rodgers, GE

Date: 18 March 2014

Subject: Evaluation of Measurements by Arup/TJPA
301 Mission Street
San Francisco, California
Langan Project No.: 730315706

This memorandum presents the results of our review and evaluation of the data from Arup dated 28 February 2014 (received 5 March 2014) and 13 March 2014 (received 13 March 2014). Arup is retained by Transbay Joint Powers Authority's (TJPA), to monitor deflections of the 301 Mission Street development during construction for the Transbay project.

According to Section 31 09 13 of the Transbay project specification dated 30 July 2010, geotechnical instrumentation and monitoring of sites surrounding the Transbay excavation is required. The piezometer data was obtained from the TJPA Global Analyzer website.

Table 1, presented in Section 31 09 13, lists maximum allowable movements and corrective action trigger levels criteria. The action trigger level and maximum allowable movement for vertical settlement measured at monitoring points inside adjacent buildings are ¾ inch and 1-1/2, respectively. The levels of horizontal movement of inclinometers are ½ inch and 3 inches for action trigger level and maximum allowable level, respectively. Peak Particle Velocities of ½ inch/sec and 1 inch/sec for action trigger level and maximum allowable vibrations, respectively are specified in Table 1.

Vertical Settlement

Since 30 April 2009 Arup has been measuring settlement of various points within the Tower and the Mid-Rise structures. The latest settlement measurements, which are read manually, were obtained on 13 February 2014; settlement plots of four points within the Tower are presented on Plate 4 of Arup's memorandum dated 28 February 2014. SM-3 is the closest point to the southern boundary between 301 Mission Tower and the TJPA project. Measurement points SM-9, SM-14 and SM-27 are progressively farther away (in a northerly direction) from the boundary between the 301 Mission Tower and the TJPA project.

The information shown on Plate 4 indicates that the rate of settlement of the points has changed over time. In particular we observed different rates of movement during three distinct time intervals. The intervals are: 30 April 2009 to 3 May 2010; 3 May 2010 to 24 March 2011;

and 24 March 2011 to 13 February 2014. The movements and rates of movement recorded at different locations during these time intervals are presented in Table 1.

TABLE 1

Results of Settlement Measurements at the Tower

Measurement Point	Date	Date	Elapsed time (days)	Settlement During Elapsed Time (inches)	Rate of Settlement (inch/day)
SM-3	4/30/2009	5/3/2010	368	0.47	0.00129
	5/3/2010	3/24/2011	325	0.32	0.00099
	3/24/2011	2/13/2014	1057	2.40	0.00227
SM-9	4/30/2009	5/3/2010	368	0.69	0.00186
	5/3/2010	3/24/2011	325	0.47	0.00145
	3/24/2011	2/13/2014	1057	3.03	0.00287
SM-14	4/30/2009	5/3/2010	368	0.77	0.00210
	5/3/2010	3/24/2011	325	0.53	0.00162
	3/24/2011	2/13/2014	1057	3.14	0.00297
SM-27	4/30/2009	5/3/2010	368	0.86	0.00234
	5/3/2010	3/24/2011	325	0.48	0.00147
	3/24/2011	2/13/2014	1057	3.33	0.00315

The data indicate that the rate of settlement between May 2010 and late March 2011 decreased by approximately 40 percent compared to the rate of settlement between 30 April 2009 and May 2010. However, since late March of 2011 there has been a substantial increase in the rate of settlement especially for measurement points closest to the boundary between 301 Mission Tower and the TJPA project. Because the theory of consolidation predicts a decrease in settlement amounts and rates with time, the recorded increase in the rate of settlement since March 2011 does not represent settlement associated with consolidation; if the same rate of settlement between 3 May 2010 and 24 March 2011 continued to the present time and was related to consolidation theory, then the expected amounts would be about 1.68 to about 2.25 inches less than the recorded amounts.

Also, we reviewed the settlement measurements of four points within the Mid-rise presented on Plate 5 of Arup's memorandum dated 13 November 2013. SM-47 is the closest point to the southern boundary between 301 Mission Mid-rise and the TJPA project. Measurement points

SM-55, SM-76 and SM-83 are progressively farther away (in a northerly direction) from the boundary between the 301 Mission Mid-rise and the TJPA project. Point SM-83 is near the northeast corner of the Mid-rise and farthest away from the boundary between the 301 Mission Mid-rise and the TJPA project. Point SM-83 showed little to no movement until 3 June 2013. Since early June 2013 this point has settled about 0.2 inch. Survey points SM-55 and SM-76 which are about 65 feet and 135 feet, respectively, from the southern boundary of the Mid-rise structure have shown a total settlement of about 0.6 inch to 0.65 inch during the Arup survey period. The rate of movement has increased since March 2011; the increase in the rate of the settlements of these points since March 2011 is about 3.5 to 3.8 times greater than the rate prior to March 2011. Up until March 2011, survey point SM-47, which is about 35 feet away from the southern boundary of the Mid-rise structure, settled about 0.3 inch. Since then it has settled about 1.05 inches. This amount is an increase in the rate of settlement of about 2.4 times from late March 2011 to middle December 2013. The increase in the rate of settlement for these points coincides with the TJPA construction activities. The data from survey points SM-47, SM-55 and SM-76 clearly suggest that continued construction activities are affecting a greater area than just the Tower.

Lateral Movement

On 13 March 2014 we received the results of manually read inclinometers. These results were presented in a memorandum by Arup dated 13 March 2014. The previous results of the manually read inclinometers were presented in memoranda by Arup dated 14 February 2014 and 10 December 2013. Prior to the 10 December memorandum, the plot of the last manually read inclinometer, I-18M, was forwarded to us in an email dated 16 July 2013. The inclinometer readings depict movement as of 10 July 2013; prior plots of I-18M were presented in Arup memorandum dated 13 November 2012.

In the November 2012 memorandum, Arup indicated that inclinometer locations I-16, I-17A, I-17B, I-18, I-19, I-20, I-21, and I-22 were planned to receive "in-place-inclinometers" and be read automatically with their results available on the Global Analyzer. Contrary to the statement in Arup's 13 November 2013 memorandum, these inclinometers are being read manually, with the exception of inclinometer I-20 which was destroyed during construction.

On 18 March 2014, we accessed the Global Analyzer and found that only the results of I-16R were available for our review. As discussed in our 19 December 2013 memorandum, we assume and consider I-16R data anomalous and unreliable.

Our review of the 13 March 2014 memorandum indicates that all of the inclinometers except for Inclinometer I-17B show movement toward Transbay for almost their entire depth. Inclinometer I-17B shows movement at depth of about 25 feet of about 0.3 inch towards 301 Mission and about 0.3 inch at a depth of 90 feet towards Mission Street. According to Arup the data for I-17B had been incorrectly processed until this current memorandum submittal (13 March 2014).

Considering inclinometer readings are made relative to a baseline (i.e. zero reading), the baseline measurements of all the inclinometers are from late January or February 2013. It appears that I-18M readings presented on Plate 5 of the Arup 14 February 2014 memorandum are relative to the measurement of 21 February 2013. In the July 2013 measurement plots of I-18M the 21 February 2013 readings showed lateral movements of about ¾ inch from a depth of about 90 feet to 150 feet and about 0.35 inch between the depths of 180 feet to 210 feet. The I-18M measurements presented in the March 2014 memorandum only show about 0.2 to 0.3 inch of lateral deformation since 21 February 2013. To properly evaluate the effects of TJPA's construction on ground deformations, the I-18M readings from 3 March 2014 should be added to the 21 February 2013 reading. After adding these two measurements, the total lateral deformation in I-18M is about 0.35 inch at a depth of about 70 feet and increase to over 0.9 inch between the depths of 90 to 140 feet with a peak of about 1.0 inch between the depths of about 100 to 130 feet. The lateral deformations decrease to about 0.5 inch between the depths of about 180 to 210 feet. The plots show lateral deformations towards Transbay for the entire length of the inclinometer.

The plots of inclinometer I-19 are presented relative to the 1 February 2013 baseline and show about 0.1 to 0.2 inch of movements towards Transbay. However, the plots of I-19 presented in the Arup 10 December 2013 showed peak deformations of about 0.7 inch between the depths of 100 to 140 feet and about 0.3 inch between the depths of 170 to 220 feet. The plot also shows relatively large lateral deformations of about 0.6 inch toward Beale Street between depths of about 90 feet and 140 feet with a peak of about 0.7 inch at a depth of about 100 feet. To properly evaluate the effects of TJPA's construction on ground deformations, the I-19 readings from 28 January 2014 should be added to the readings of 1 February 2013. After adding these two measurements, the total lateral deformation in 1-19 is about 0.85 inch at a depth of 100 feet and about 0.7 inch between the depths of 130 to 150 feet and over 0.3 inch between the depths of 170 to 220 feet. The plots show lateral deformations towards Transbay for the entire length of the inclinometer.

The inclinometer I-21 plot shows the largest lateral deformations towards Transbay of about 0.6 inch at a depth of about 70 which decreases to about 0.4 inch at a depth of about 150 feet between 6 February 2013 and 3 March 2014. This plot also shows a lateral deformation of about 0.2 inch towards Fremont Street. In the December 2013 figure, the baseline plot for this inclinometer was dated 21 February 2013 not 6 February 2013. Arup should explain this apparent discrepancy. The plots show lateral deformations towards Transbay for the entire length of the inclinometer.

The inclinometer I-22 plot shows a relatively large change in deformations between the 5 December 2013 and 3 March 2014 with the largest lateral deformations towards Transbay of about 0.5 inch. This plot also shows a lateral deformation of about 0.3 inch towards Fremont Street. The plots show lateral deformations towards Transbay for the entire length of the inclinometer.

We believe the lateral deformations measured in the inclinometer are entirely related to TJPA's construction activities. As discussed in our meeting with TJPA and Arup and as stated in our previous memoranda the action trigger level for horizontal movement of inclinometers has been exceeded. We recommend that TJPA provide Millennium Partners with a course of action to mitigate the movements as required by Definitions 1.3L of Section 31 09 12 of the specification.

Water Level in Piezometers

We accessed the TJPA Global Analyzer website (GA) to review the results of water levels measured in piezometers, P-6 and P-8MS, near the boundary of the 301 Mission site and TJPA property. We do not have the information regarding the depths and the installation procedures of these piezometers. P-6 is along Fremont Street and appears to consist of a cluster of piezometers. They are: P-6-F, P-6_M, P-6MS, and P-6MS_M. The greatest drops in water levels are measured in piezometers P-6F and P-6MS which show drops of about 7 feet and 10 feet, respectively. Piezometer P-8MS, which is located about 65 feet east of Fremont Street along the boundary between 301 Mission site and TJPA property, shows a drop in the water level of about 16 feet.

On the basis of our interpretation of Arup's data, we conclude that the TJPA construction-induced deformations will be over four inches. This total represents the three inches predicted by Arup as a result of the excavation that is currently underway plus more than one inch caused by the installation of buttress and other activities related to excavation. The recorded TJPA excavation-induced settlements under the tower are relatively uniform; however, the impact of the induced settlement on the utilities entering/exiting the 301 Mission structures may be affected. Consequently, TJPA should provide Millennium Partners with a course of action related to the repairs of the affected improvements as required by Definitions 1.3L of Section 31 09 12 of the specification.

We trust this memorandum provides the information requested. Should you have any questions, please call.

730315706.10_RG_Memo_301 Mission Street

LANGAN TREADWELL ROLLO **Memorandum**

555 Montgomery Street, Suite 1300 San Francisco, CA 94111 T: 415.955.5200 F: 415.955.5201

To: Steven Hood – Millennium Partners

From: Ramin Golesorkhi, GE

cc: Stephen DeSimone, SE – DeSimone Consulting Engineers
Richard D. Rodgers, GE – Langan Treadwell Rollo

Date: 3 October 2014

Subject: Evaluation of Measurements by Arup/TJPA
301 Mission Street
San Francisco, California
Langan Project No.: 730315706

This memorandum presents the results of our review and evaluation of the data from Arup dated 4 September 2014 (received 10 September 2014) and 11 September 2014 (received 11 September 2014). Arup is retained by Transbay Joint Powers Authority's (TJPA), to monitor deflections of the 301 Mission Street development during construction for the Transbay project.

According to Section 31 09 13 of the Transbay project specification dated 30 July 2010, geotechnical instrumentation and monitoring of sites surrounding the Transbay excavation is required. The piezometer data was obtained from the TJPA Global Analyzer website.

Table 1, presented in Section 31 09 13, lists maximum allowable movements and corrective action trigger levels criteria. The action trigger level and maximum allowable movement for vertical settlement measured at monitoring points inside adjacent buildings are ¾ inch and 1-1/2, respectively. The levels of horizontal movement of inclinometers are ½ inch and 3 inches for action trigger level and maximum allowable level, respectively. Peak Particle Velocities of ½ inch/sec and 1 inch/sec for action trigger level and maximum allowable vibrations, respectively are specified in Table 1.

Vertical Settlement

Since 30 April 2009, Arup has been measuring settlement of various points within the Tower and the Mid-Rise structures. The latest settlement measurements were obtained on 5 August 2014; settlement plots of four points within the Tower are presented on Plate 4 of Arup's memorandum dated 4 September 2014. SM-3 is the closest point to the southern boundary between 301 Mission Tower and the TJPA project. Measurement points SM-9, SM-14 and SM-27 are progressively farther away (in a northerly direction) from the boundary between the Tower and the TJPA project.

In the past we observed different rates of settlement during three distinct time intervals. With the latest readings a fourth distinct rate of settlement is developing. The intervals are: 30 April 2009 to 3 May 2010; 3 May 2010 to 24 March 2011; 24 March 2011 to 11 April 2014 and 11 April 2014 to 5 August 2014. The movements and rates of movement recorded at different locations during these time intervals are presented in Table 1.

TABLE 1

Results of Settlement Measurements at the Tower

Measurement Point	Date	Date	Elapsed time (days)	Settlement During Elapsed Time (inches)	Rate of Settlement (inch/day)
SM-3	4/30/2009	5/3/2010	368	0.47	0.00129
	5/3/2010	3/24/2011	325	0.32	0.00099
	3/24/2011	4/11/2014	1114	2.52	0.00226
	4/11/2014	8/5/2014	116	0.06	0.00054
SM-9	4/30/2009	5/3/2010	368	0.69	0.00186
	5/3/2010	3/24/2011	325	0.47	0.00145
	3/24/2011	4/11/2014	1114	3.19	0.00287
	4/11/2014	8/5/2014	116	0.16	0.00137
SM-14	4/30/2009	5/3/2010	368	0.77	0.00210
	5/3/2010	3/24/2011	325	0.53	0.00162
	3/24/2011	4/11/2014	1114	3.33	0.00299
	4/11/2014	8/5/2014	116	0.18	0.00151
SM-27	4/30/2009	5/3/2010	368	0.86	0.00234
	5/3/2010	3/24/2011	325	0.48	0.00147
	3/24/2011	4/11/2014	1114	3.56	0.00320
	4/11/2014	8/5/2014	116	0.22	0.00187

The data indicate that the rate of settlement between May 2010 and late March 2011 decreased by approximately 40 percent compared to the rate of settlement between 30 April 2009 and May 2010. Since late March of 2011 to middle of April 2014 there has been a substantial increase in the rate of settlement especially for measurement points closest to the boundary between 301 Mission Tower and the TJPA project. Because the theory of consolidation predicts a decrease in settlement amounts and rates with time, the recorded increase in the rate of settlement since March 2011 does not represent settlement associated with consolidation. If the same rate of settlement between 3 May 2010 and 24 March 2011 continued to the present time and was related to consolidation theory, then the expected amounts would be approximately 1.4 to approximately 2.0 inches less than the recorded amounts.

Since middle of April 2014 to early August 2014 there has been a reduction in the rate of settlement. On the basis of our observation on 24 September 2014 of the construction activities from street level, it appears that the base slab has been installed in the area directly south of the boundary of the Tower and the Transbay excavation while the base slab in the area adjacent to the Mid-rise appears to be partially completed; we are not aware of the exact time of the installation of the base slab.

From our past experience of excavations in similar soil types, excavation-induced deformations tend to decrease once the base slab is installed. This conclusion appears to be consistent with what has been measured during the last two settlement measurements on 11 June 2014 and 5 August 2014.

Also, we reviewed the plots of settlement measurements of four points within the Mid-rise presented on Plate 5 of Arup's memorandum dated 4 September 2014. SM-47 is the closest point to the southern boundary between 301 Mission Mid-rise and the TJPA project. Measurement points SM-55, SM-76 and SM-83 are progressively farther away (in a northerly direction) from the boundary between the 301 Mission Mid-rise and the TJPA project. Point SM-83 is near the northeast corner of the Mid-rise and farthest away from the boundary between the 301 Mission Mid-rise and the TJPA project. Point SM-83 showed little to no movement until 13 February 2013. Since February 2013 this point has settled approximately 0.15 inch. Survey points SM-55 and SM-76 which are about 65 feet and 135 feet, respectively, from the southern boundary of the Mid-rise structure have settled approximately 0.6 inch to 0.65 inch during the Arup survey period. Since March 2011, the rate of movement has increased; the increase in the rate of the settlements of these points since March 2011 is about 3.5 to 4.0 times greater than the rate prior to March 2011. Prior to March 2011, survey point SM-47, which is about 35 feet away from the southern boundary of the Mid-rise structure, settled approximately 0.3 inch. Since March 2011 it has settled approximately 1.05 inches. This amount is an increase in the rate of settlement of approximately 2.2 times from late March 2011 to middle April 2014. The increase in the rate of settlement for these points coincides with the time period when TJPA construction activities occurred. The last two readings, 11 June 2014 and 5 August 2014, show a heave of approximately 0.1 inch for the four survey points presented on Plate 5 of Arup's memorandum. The data from survey points SM-47, SM-55 and SM-76 indicate clearly that construction activities are affecting a greater area than just the Tower.

Lateral Movement

On 11 September 2014 we received the results of manually read inclinometers and piezometers. These results were presented in a memorandum by Arup dated 11 September 2014. The previous results of the manually read inclinometers were presented in memoranda by Arup dated 13 March 2014, 14 February 2014 and 10 December 2013. Prior to the 10 December memorandum, the plot of the last manually read inclinometer, I-18M, was forwarded to us in an email dated 16 July 2013. The inclinometer readings depict movement as of 10 July 2013; prior plots of I-18M were presented in Arup memorandum dated 13 November 2012.

In the November 2012 memorandum, Arup indicated that inclinometer locations I-16, I-17A, I-17B, I-18, I-19, I-20, I-21, and I-22 were planned to receive "in-place-inclinometers" and be read automatically with their results available on the Global Analyzer. Contrary to the statement in Arup's 13 November 2013 memorandum, these inclinometers are being read manually, with the exception of inclinometer I-20 which was destroyed during construction.

Our review of the 11 September 2014 memorandum indicates that all of the inclinometers except for Inclinometer I-17B show movement toward Transbay below a depth of approximately 45 feet. The 29 August 2014 measurement of Inclinometer I-17B shows movement at depth of about 25 feet of approximately 0.2 inch towards 301 Mission and approximately 0.3 inch at a depth of 90 feet towards Mission Street. According to Arup the data for I-17B had been incorrectly processed until the 13 March 2014 memorandum.

Considering inclinometer readings are made relative to a baseline (i.e. zero reading), the baseline measurements of all the inclinometers are from late January or February 2013. It appears that I-18M readings presented on Plate 5 of the Arup 11 September 2014 memorandum are relative to the measurement of 21 February 2013. In the July 2013 measurement plots of I-18M the 21 February 2013 readings showed lateral movements of about ¾ inch from a depth of about 90 feet to 150 feet and about 0.35 inch between the depths of 180 feet to 210 feet. The I-18M measurements presented in the September 2014 memorandum only show approximately 0.3 to 0.35 inch of lateral deformation since 21 February 2013.

To properly evaluate the effects of TJPA's construction on ground deformations, the I-18M readings from 5 September 2014 should be added to the 21 February 2013 reading. After adding these two measurements, the total lateral deformation in I-18M is approximately 0.35 inch at a depth of approximately 70 feet and increase to over 0.9 inch between the depths of 90 to 150 feet with a peak of about 1.0 inch between the depths of about 100 to 130 feet. The lateral deformations decrease to about 0.5 inch between the depths of about 180 to 210 feet. The plots show lateral deformations towards Transbay from the depth of approximately 20 feet to the bottom of the inclinometer.

The plots of inclinometer I-19 are presented relative to the 1 February 2013 baseline and show approximately 0.2 to 0.4 inch of movements towards Transbay. However, the plots of I-19 presented in the Arup 10 December 2013 showed peak deformations of approximately 0.7 inch between the depths of 100 to 140 feet and approximately 0.3 inch between the depths of 170 to 220 feet. The plot also shows relatively large lateral deformations of about 0.6 inch toward Beale Street between depths of about 90 feet and 140 feet with a peak of about 0.7 inch at a depth of about 100 feet. To properly evaluate the effects of TJPA's construction on ground deformations, the I-19 readings from 5 September 2014 should be added to the readings of 1 February 2013. After adding these two measurements, the total lateral deformation in 1-19 is approximately 1.0 inch at a depth of 100 feet, approximately 0.9 at a depth of 130 and approximately 0.7 inch at a depth of 150 feet and over 0.3 inch between the depths of approximately 170 to 220 feet. The plots show lateral deformations towards Transbay for almost the entire length of the inclinometer.

The inclinometer I-21 plot shows the largest lateral deformations towards Transbay of approximately 0.65 inch at a depth of about 70 which decreases to approximately 0.3 inch at a depth of about 150 feet between 6 February 2013 and 9 September 2014. This plot also shows a lateral deformation of about 0.2 inch towards Fremont Street. In the December 2013 figure, the baseline plot for this inclinometer was dated 21 February 2013 not 6 February 2013. Arup should explain this apparent discrepancy. The plots show lateral deformations towards Transbay from a depth of approximately 45 feet to the bottom of the inclinometer.

The inclinometer I-22 plot shows largest lateral deformations towards Transbay of approximately 0.5 inch with lateral deformations towards Transbay between the depths of approximately 45 feet and 170 feet. This plot also shows the largest deformation of approximately 0.3 inch towards Fremont. The latest measurement taken on 9 September 2014 shows a lateral deformation of greater than 0.2 inch toward Fremont Street between the depths of 30 to 110 feet.

We believe the lateral deformations measured in the inclinometer are entirely related to TJPA's construction activities. As discussed in our meeting with TJPA and Arup and as stated in our previous memoranda the action trigger level for horizontal movement of inclinometers has been exceeded. We recommend that TJPA provide Millennium Partners with a course of action to mitigate the movements as required by Definitions 1.3L of Section 31 09 12 of the specification.

Water Level in Piezometers

Water levels measured in piezometers near the boundary of 301 Mission and TJPA property are presented in Plate 9 of Arup's 11 September 2014 memorandum. This plot presents the results for piezometers P-6F-M, P-6MS-M (manual piezometers) and P-6F, P-6MS, P-7MS, and P-8MS (vibrating wire piezometers). P-6 is along Fremont Street and appears to consist of a cluster of piezometers. The greatest drops in the water levels in the P-6 cluster of piezometers are measured in piezometers P-6MS-M and P-6MS which show drops of approximately 3 and 10 feet, respectively. Piezometer P-7MS shows a drop of approximately 12 feet. P-8MS, which is located about 65 feet east of Fremont Street along the boundary between 301 Mission site and TJPA property, shows a drop in the water level of approximately 16 feet.

Conclusions

On the basis of our interpretation of Arup's data, we conclude that the TJPA construction-induced deformations will be over four inches. This total represents the three inches predicted by Arup as a result of the excavation that is currently underway plus more than one inch caused by the installation of buttress and other activities related to excavation.

The recorded TJPA excavation-induced settlements have resulted in a slight tilt of the tower, however, according to DeSimone Consulting Engineers memorandum dated 18 June 2014, the movement is small and not of the type that would cause damage. The induced settlement may affect the utilities entering/exiting the 301 Mission structures. Consequently, TJPA should provide Millennium Partners with a course of action related to the repairs of the affected improvements as required by Definitions 1.3L of Section 31 09 12 of the specification.

We trust this memorandum provides the information requested. Should you have any questions, please call.

730315706.12 RG

ARUP

To	Brian Dykes (TJPA)	Reference number	132242/dk
cc	Robert Beck (TJPA) Gerry McClelland (PMPC), Randy Volenec (PCPA) George Metzger (AAI)	File reference	
From	Deme Koutsoftas Nick O'Riordan	Date	March 12, 2010
Subject	Transbay Transit Center: Results of Settlement Surveys at the 301 Mission Property		

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority (TJPA) through Pelli Clark Pelli Architects (PCPA), Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center (TTC) prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009 in anticipation of construction commencing in 2010 on the east end of the TTC.

Progress results of the monitoring program were presented in a memorandum dated October 15, 2009, which described the instrumentation, the scope of the monitoring program and results measured up to September 1, 2009. This memorandum updates the results of the monitoring program to include the measurements made between September 1, 2009 and March 1, 2010.

1. Plate 1 summarizes the results of the latest survey conducted on March 1, 2010 as floor elevations at the first basement level under the Tower and the Podium structures. Comparison of the high and low points under the high-rise Tower indicate a maximum differential settlement of 5.8 inches; and under the Podium of approximately 2 inches.

2. Plate 2 summarizes differential floor elevations based on the latest survey of March 1, 2010, and it is just another way of presenting the data shown on Plate 1.

3. Plate 3 shows contours of incremental settlements determined from the surveys, conducted on April 30, 2009 (baseline) and the latest survey of March 1, 2010. The results indicate an incremental settlement under the Tower of up to 0.76 inches, and under the Podium of 0.2 inches. The middle and east side of the Podium appear to be fairly level.

4. Plates 4 and 5 present plots of settlements versus time from selected monitoring points under the Tower and Podium, respectively. Over the approximately 300-day monitoring period the settlements under the Tower range from 0.25 to 0.76 inches. As reflected in Plate 3, there is an area of differential settlements along the southern portion of the Tower and the portion of the basement below the driveway where differential settlements are developing and appear to be increasing with time.

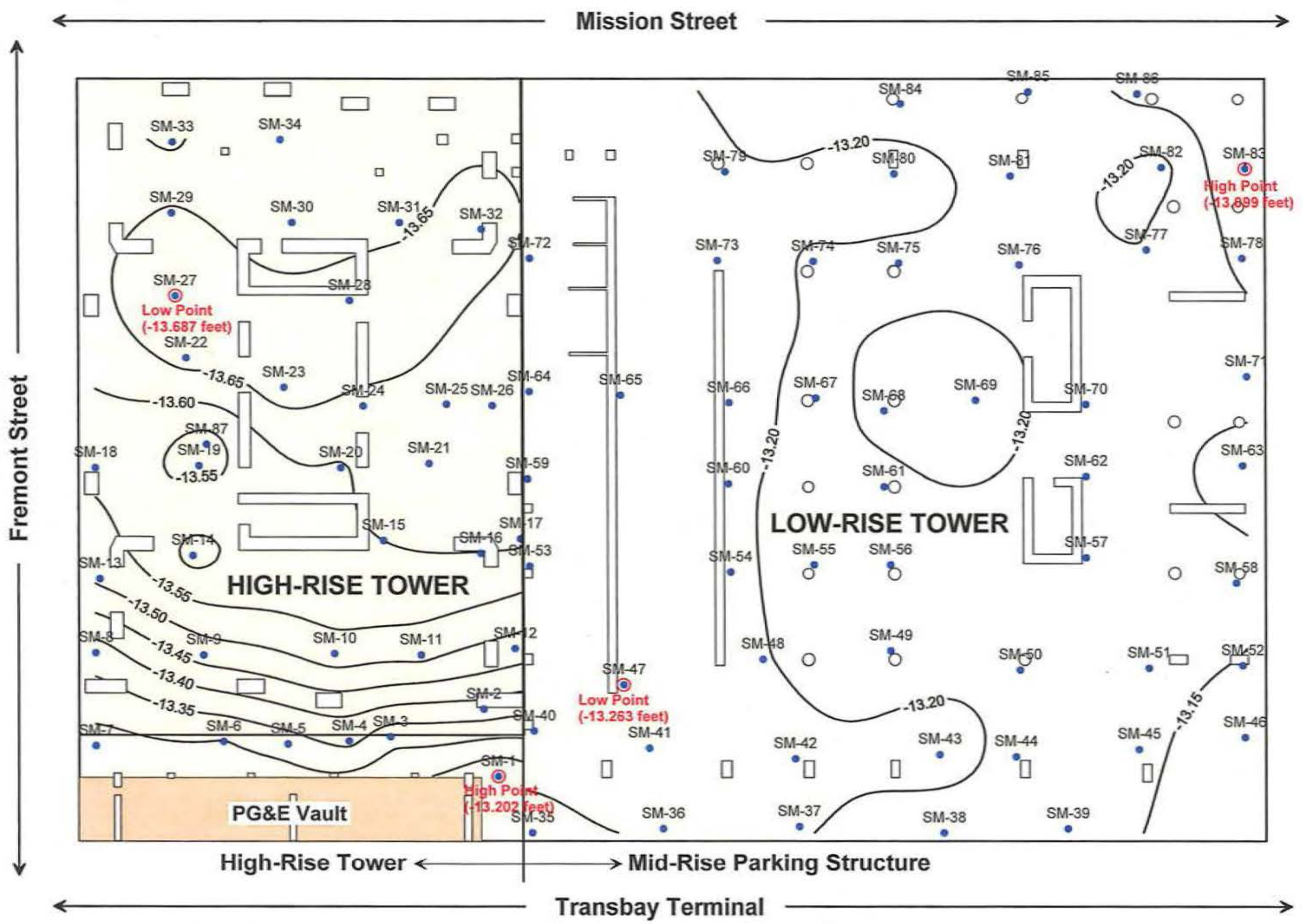
5. Under the Podium the incremental settlements are very small as reflected by the plot of settlements versus time on Plate 5. The differential settlements appear to be increasing with time between the Podium and the Tower. Near the north end of the interface between the two areas the incremental differential settlement measured over the duration of the monitoring program is approaching 0.5 inches, while at the southern end the incremental differential settlement is on the order of 0.2 inches.

6. The results of the current monitoring program have been combined with settlement data provided by Millennium partners, and are presented on a semi-logarithmic plot on Plate 6.

7. Periodic surveys of settlements will continue on a monthly basis until construction of the Transbay Transit Center begins.

List of Plates

Plate 1	Floor Elevations at Level B-1 of 301 Mission Property: Periodic Survey – March 1, 2010
Plate 2	Differential Floor Elevation (Inches) – March 1, 2010 Survey
Plate 3	Contours of Settlements Measured at the First Level Basement of the 301 Mission Street Structure Between April 30, 2009 and March 1, 2010
Plate 4	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Tower: April 30, 2009 through March 1, 2010.
Plate 5	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Midrise: April 30, 2009 through March 1, 2010
Plate 6	Settlements of the 301 Mission Tower Including Monitoring During Construction



Date of Survey Reading:
March 01, 2010

Legend:
SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	Low-Rise Tower
0.485 feet (5.82 inches)	0.165 feet (1.98 inches)

N

Notes:
Contours represent elevation, in feet (CCSF Datum), from survey readings taken on March 1, 2010.
Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.
The PG&E vault is inaccessible for monitoring.

0 25 50 75
Approximate Scale: 1" = 25'

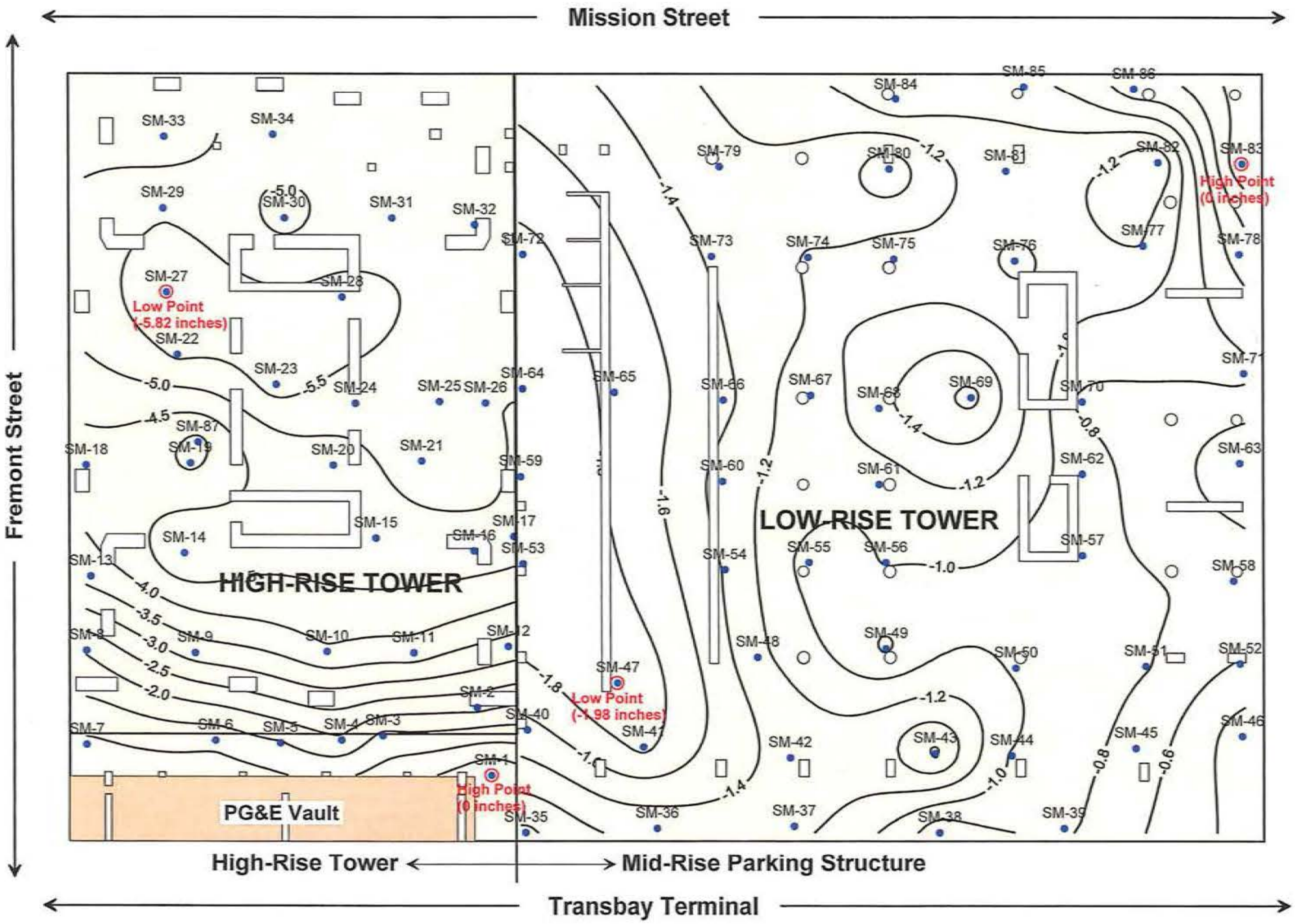
FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY: PERIODIC SURVEY - MARCH 1, 2010
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2010

ARUP

PLATE 1

Q:\132242\4 Internal Project Data\4-11 Field Work\4-11-08 Existing Building Surveys\Existing Buildings\301 Mission\Monitoring Program\Settlement Markers\March 2010\Elevations All (030110).srf



Date of Survey Reading:
March 1, 2010

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	Low-Rise Tower
0.485 feet (5.82 inches)	0.165 feet (1.98 inches)

Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on March 1, 2010.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

0 25 50 75

Approximate Scale: 1" = 25'

DIFFERENTIAL FLOOR ELEVATION (INCHES)
MARCH 1, 2010 SURVEY

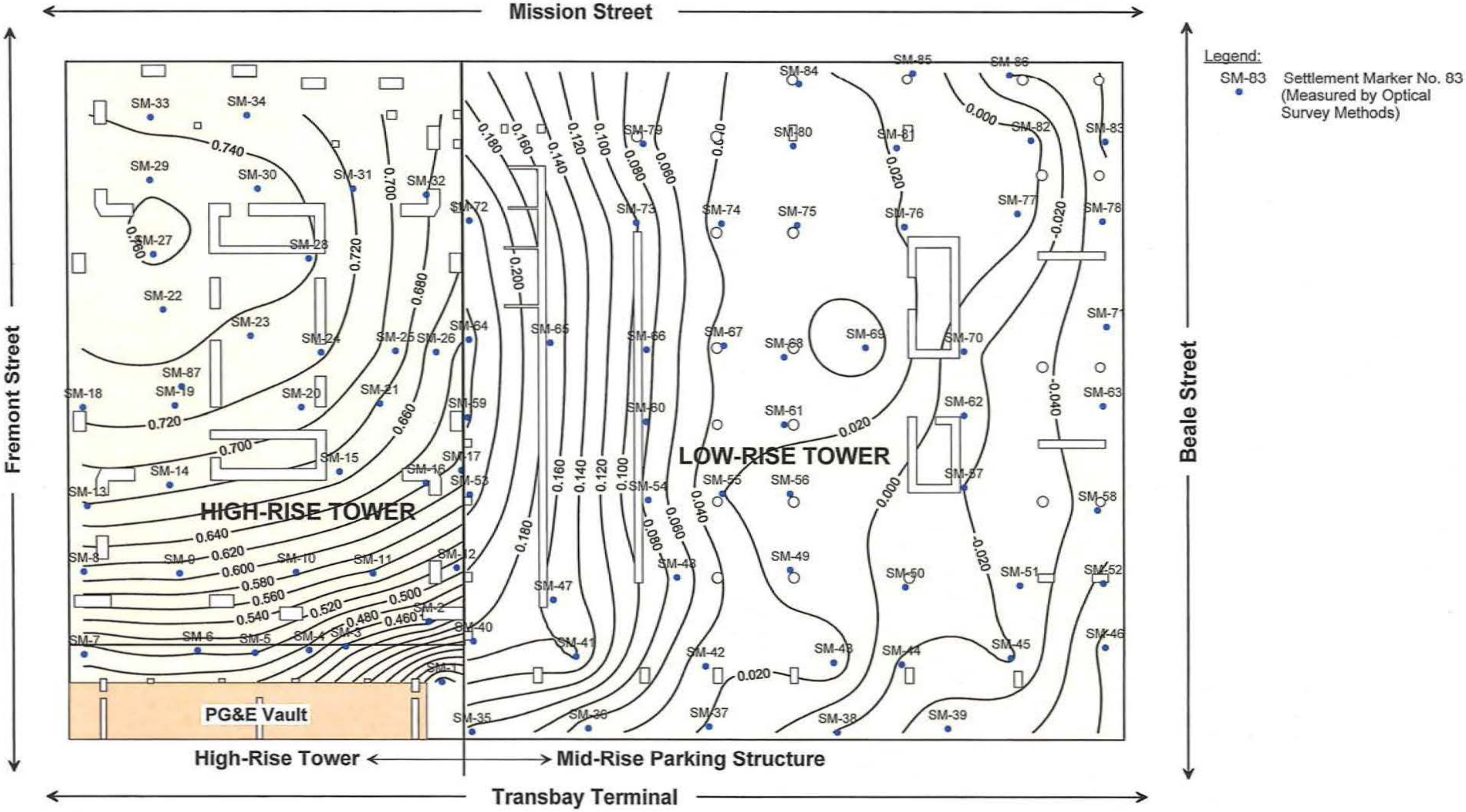
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2010

ARUP

PLATE 2

Q:\132242\4 Internal Project Data\4-11 Field Work\4-11-08 Existing Building Surveys\Existing Buildings\301 Mission\Monitoring Program\Settlement Markers\March 2010\Differential Elevation All (030110).srf



N

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on March 1, 2010.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

0 25 50 75
Approximate Scale: 1" = 25'

CONTOURS OF SETTLEMENTS MEASURED AT THE FIRST LEVEL BASEMENT OF THE 301 MISSION STREET STRUCTURE BETWEEN APRIL 30, 2009 AND MARCH 1, 2010

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2010

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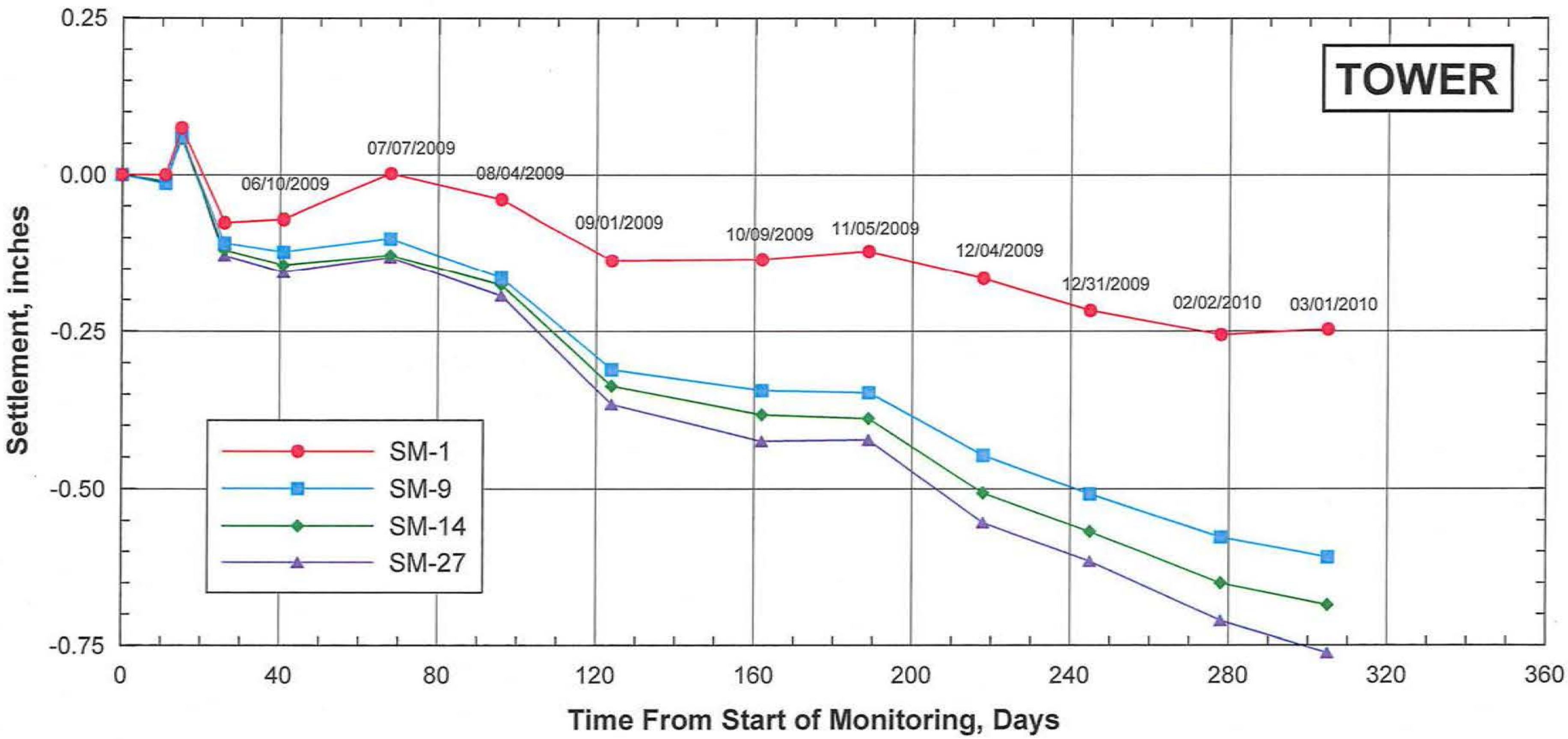
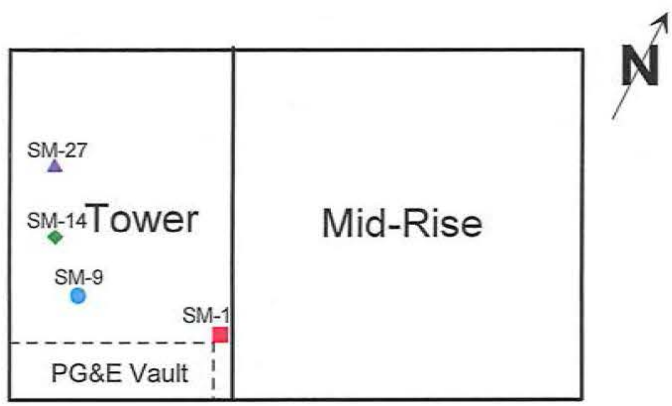
PLATE 3

Q:\132242\4 Internal Project Data\4-11 Field Work\4-11-08 Existing Building Surveys\Existing Buildings\301 Mission\Monitoring Program\Settlement Markers\March 2010\Elevation changes All (030110).srf





Note:
Initial (Baseline) reading taken on 04/30/09

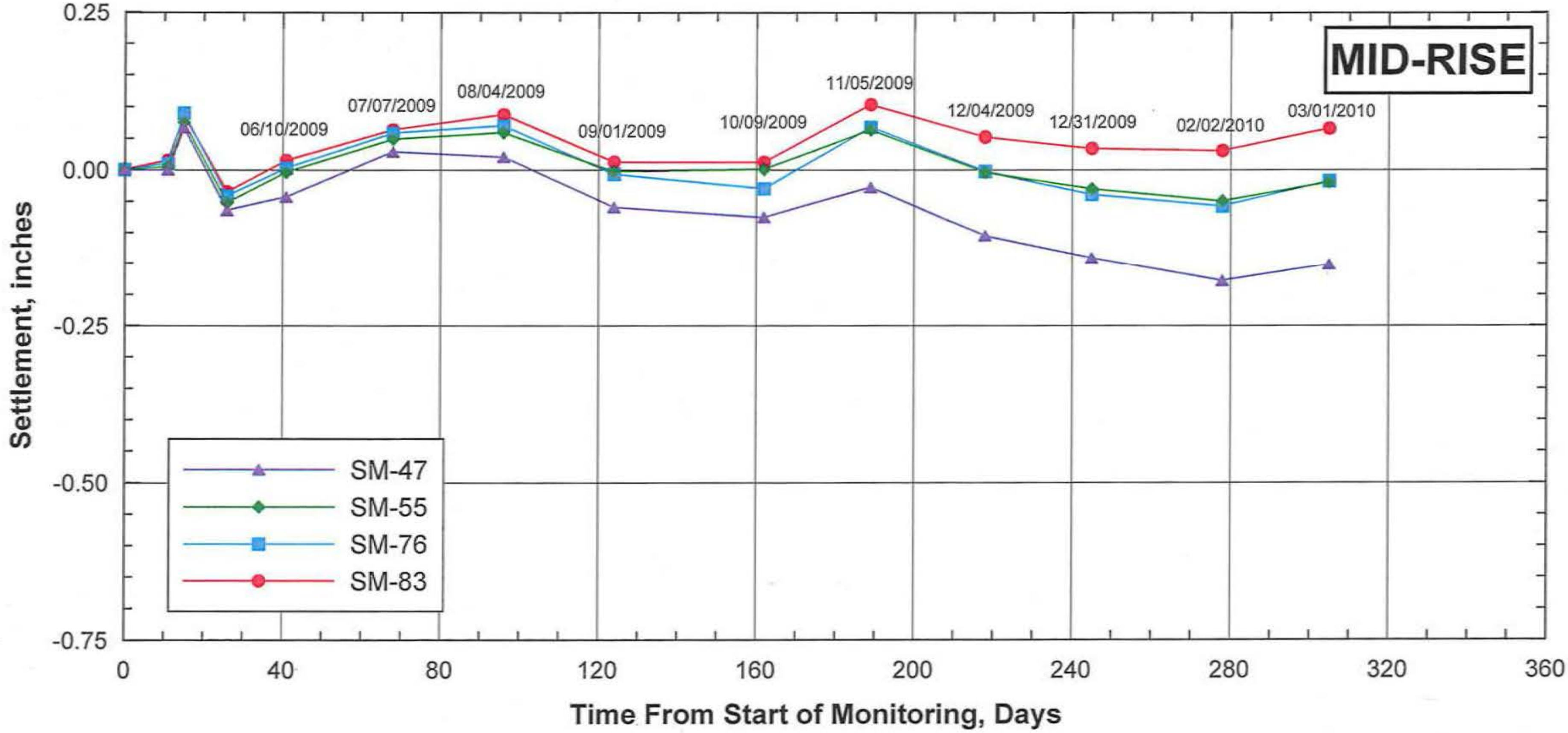
SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH MARCH 1, 2010

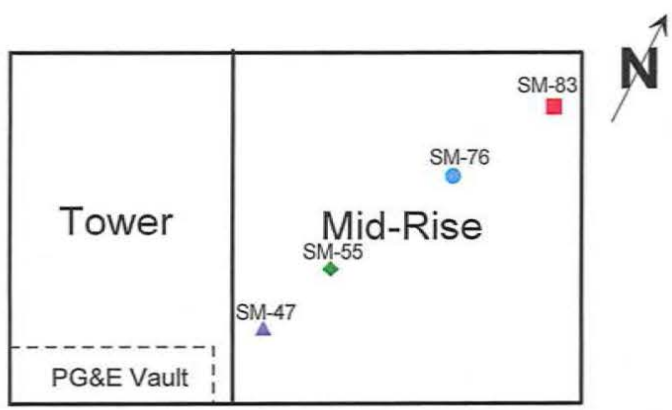
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2010

ARUP

PLATE 4





Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MIDRISE:
APRIL 30, 2009 THROUGH MARCH 1, 2010

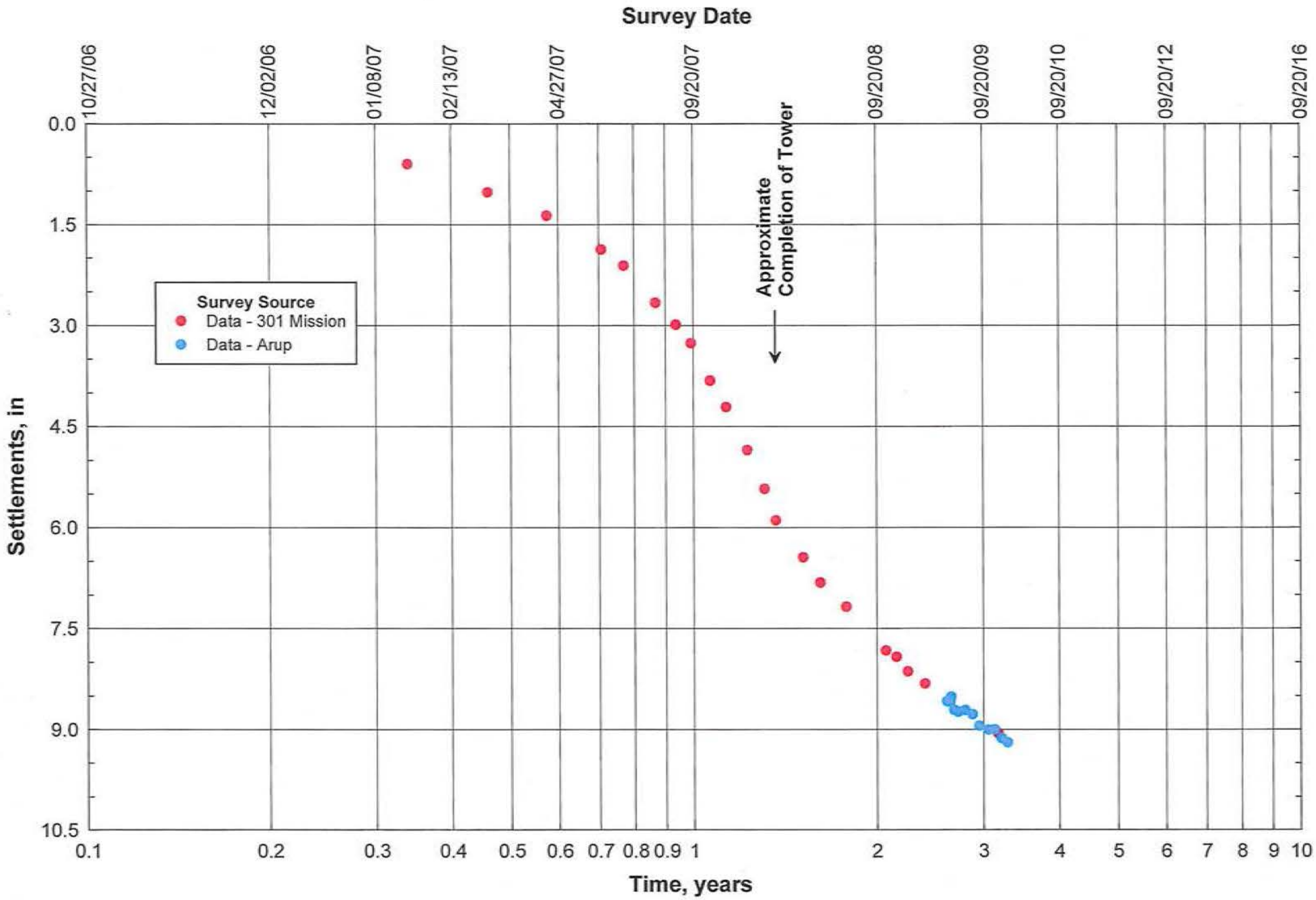
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2010

ARUP

PLATE 5

Q:\132242\4 Internal Project Data\4-11 Field Work\4-11-08 Existing Building Surveys\Existing Buildings\301 Mission\Monitoring Program\Settlement Markers\March 2010\Settlement Over Time - [illegible]



SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2010

ARUP

PLATE 6

Q:\132242\4 Internal Project Data\4-04 Calculations\Geotech\301 Mission Tower\Asaoka\Tower Settlements vs Log Time with Arup Survey As Plate 6.grf

Memorandum

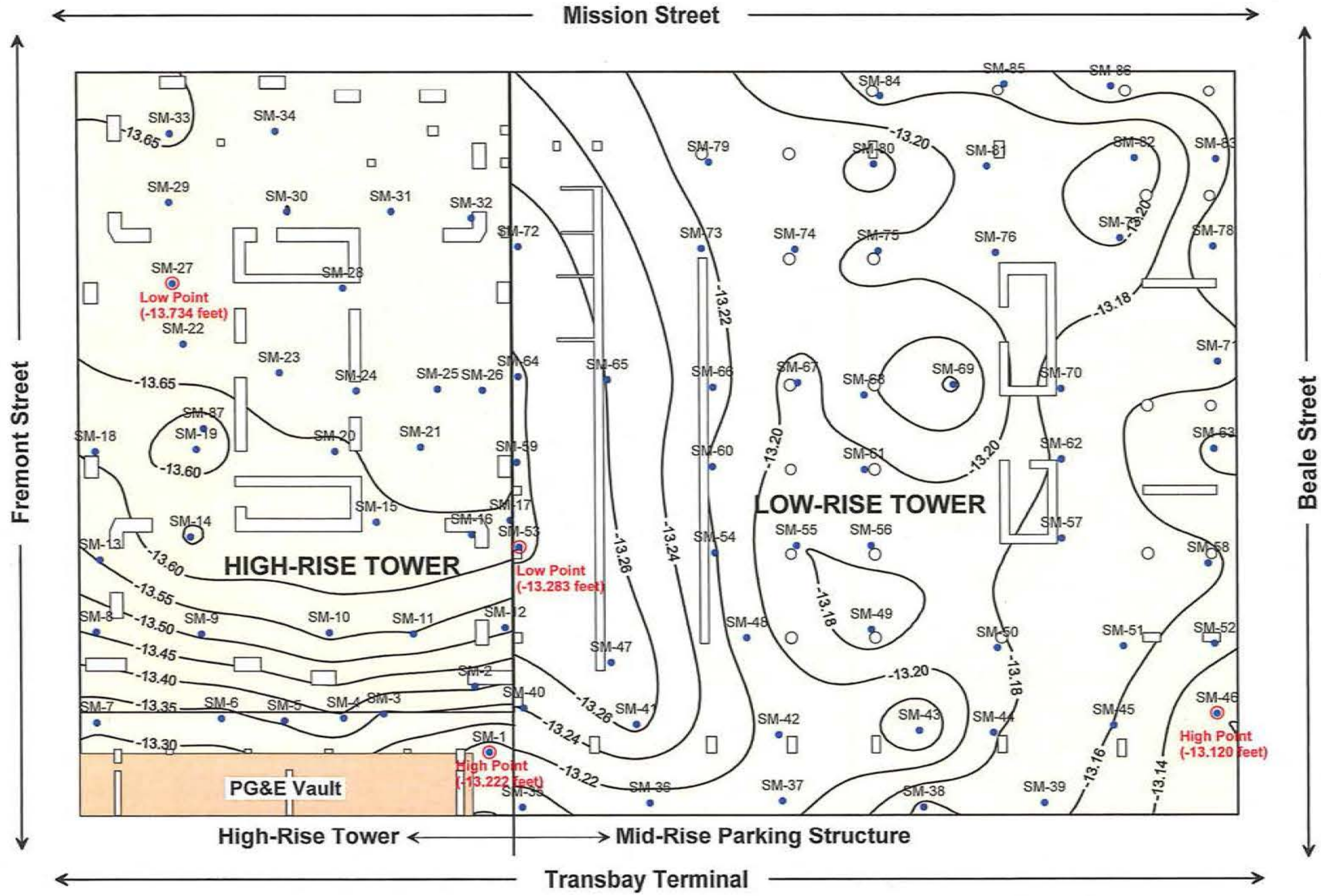
ARUP

To	Brian Dykes (TJPA)	**Date**	January 5, 2011
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/SMM
From	Stephen McLandrich (Arup) Nick O'Riordan (Arup) Kevin Clinch (Arup)	**File reference**	4-05 112
Subject	Transbay Transit Center: Results of December 2010 Settlement Survey at 301 Mission Property	**Page 1 of 1**	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated March 12, 2010 with measurements made through December 2010.

List of Plates

Plate 1	Floor Elevations at Level B-1 of 301 Mission Property: Periodic Survey – December 9, 2010
Plate 2	Differential Floor Elevation (Inches) – December 9, 2010 Survey
Plate 3	Contours of Settlements Measured at the First Level Basement of the 301 Mission Street Structure Between April 30, 2009 and December 9, 2010
Plate 4	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Tower: April 30, 2009 through December 9, 2010.
Plate 5	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Mid-Rise: April 30, 2009 through December 9, 2010
Plate 6	Settlements of the 301 Mission Tower Including Monitoring During Construction



Date of Survey Reading:
December 9, 2010

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	Low-Rise Tower
0.512 feet (6.14 inches)	0.163 feet (1.96 inches)

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on December 9, 2010.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

0 25 50 75

Approximate Scale: 1" = 25'

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\112 Memo_301 Mission Settlement - Dec 2010 Survey\Plates\Plate 1 Elevations All (2010.12.09).srf

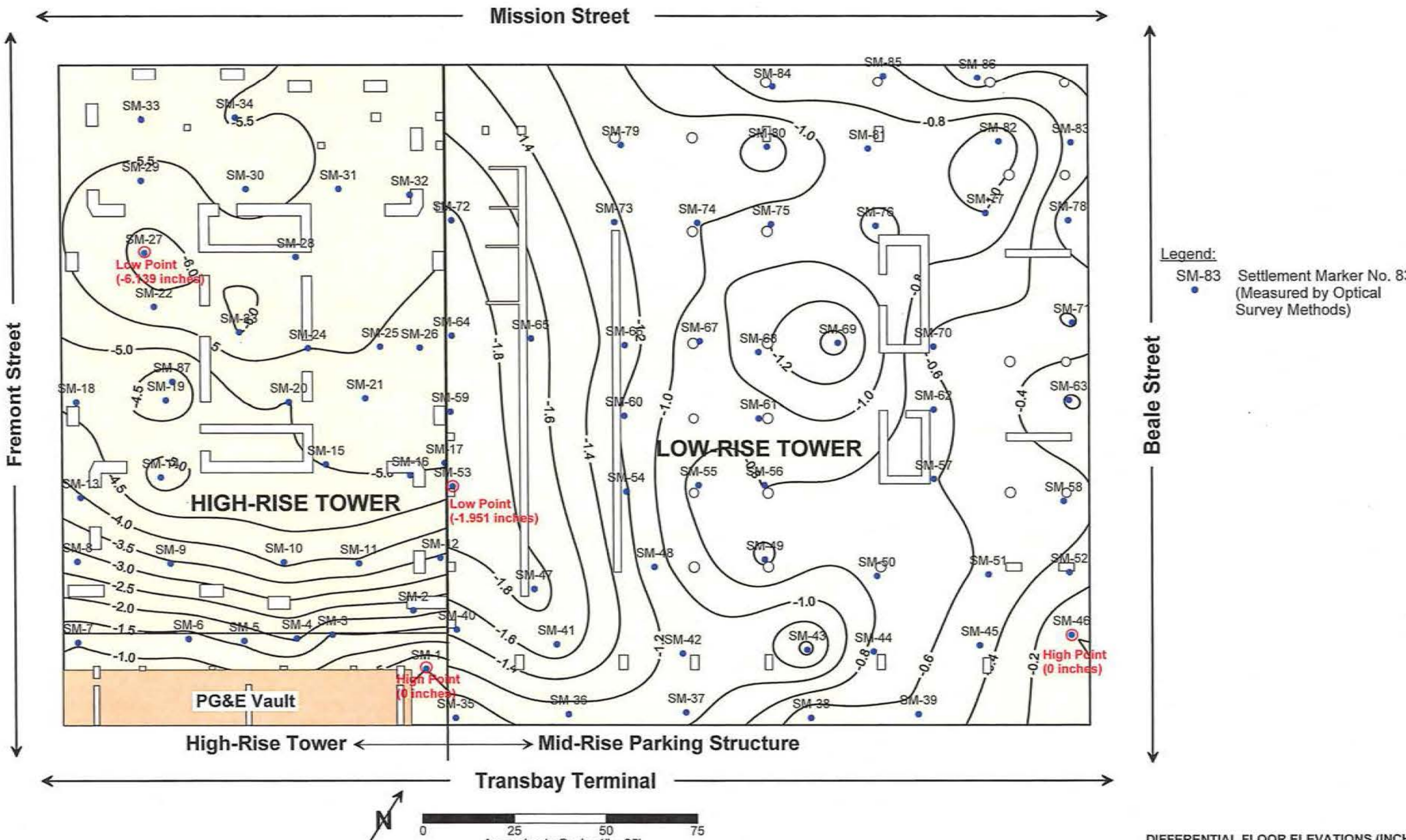
FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY: PERIODIC SURVEY - DECEMBER 9, 2010

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2011

ARUP

PLATE 1



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on December 9, 2010.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\112 Memo_301 Mission Settlement - Dec 2010 Survey\Plates\Plate 2 Differential Elevation All (2010.12.09).srf

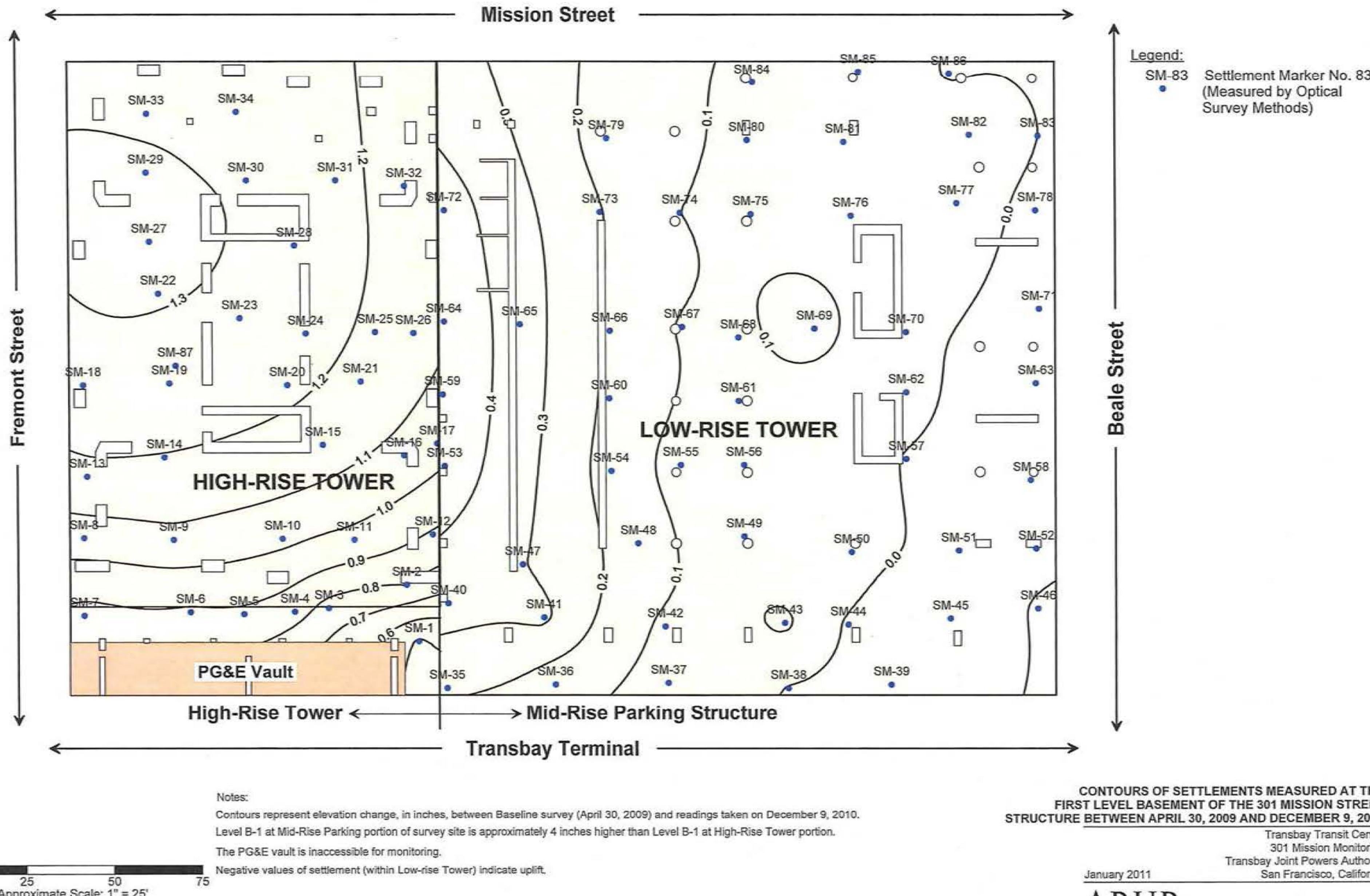
DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
DECEMBER 9, 2010 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2011

ARUP

PLATE 2



Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on December 9, 2010.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE FIRST LEVEL BASEMENT OF THE 301 MISSION STREET STRUCTURE BETWEEN APRIL 30, 2009 AND DECEMBER 9, 2010

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2011

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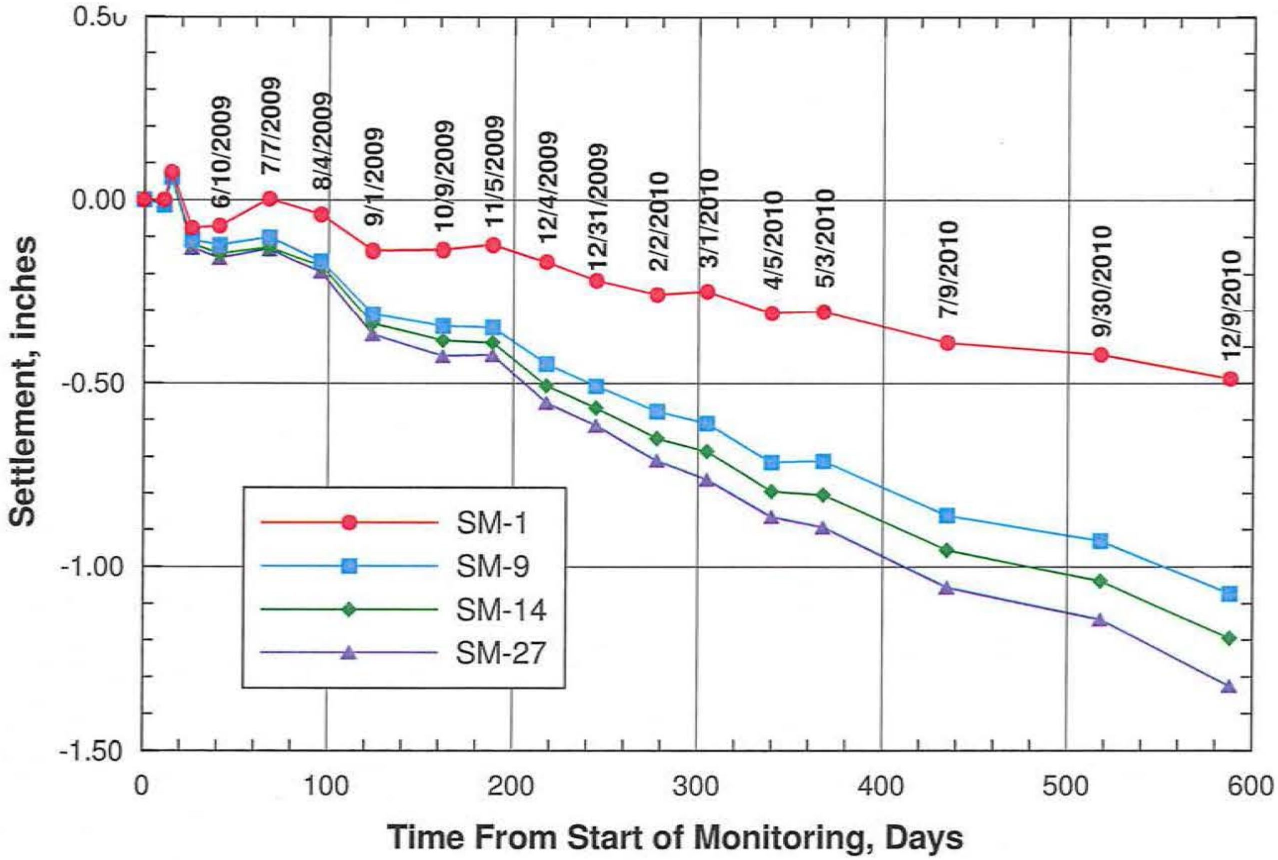
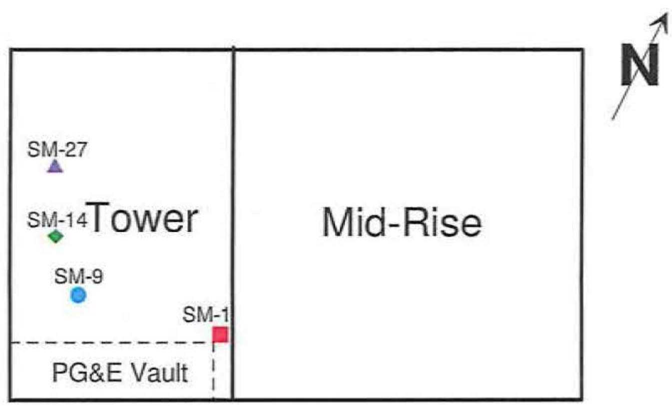
PLATE 3

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\112 Memo_301 Mission Settlement - Dec 2010 Survey\Plates\Plate 3 Elevations changes All (2010.12.09).srf



TOWER



Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH DECEMBER 9, 2010

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2011

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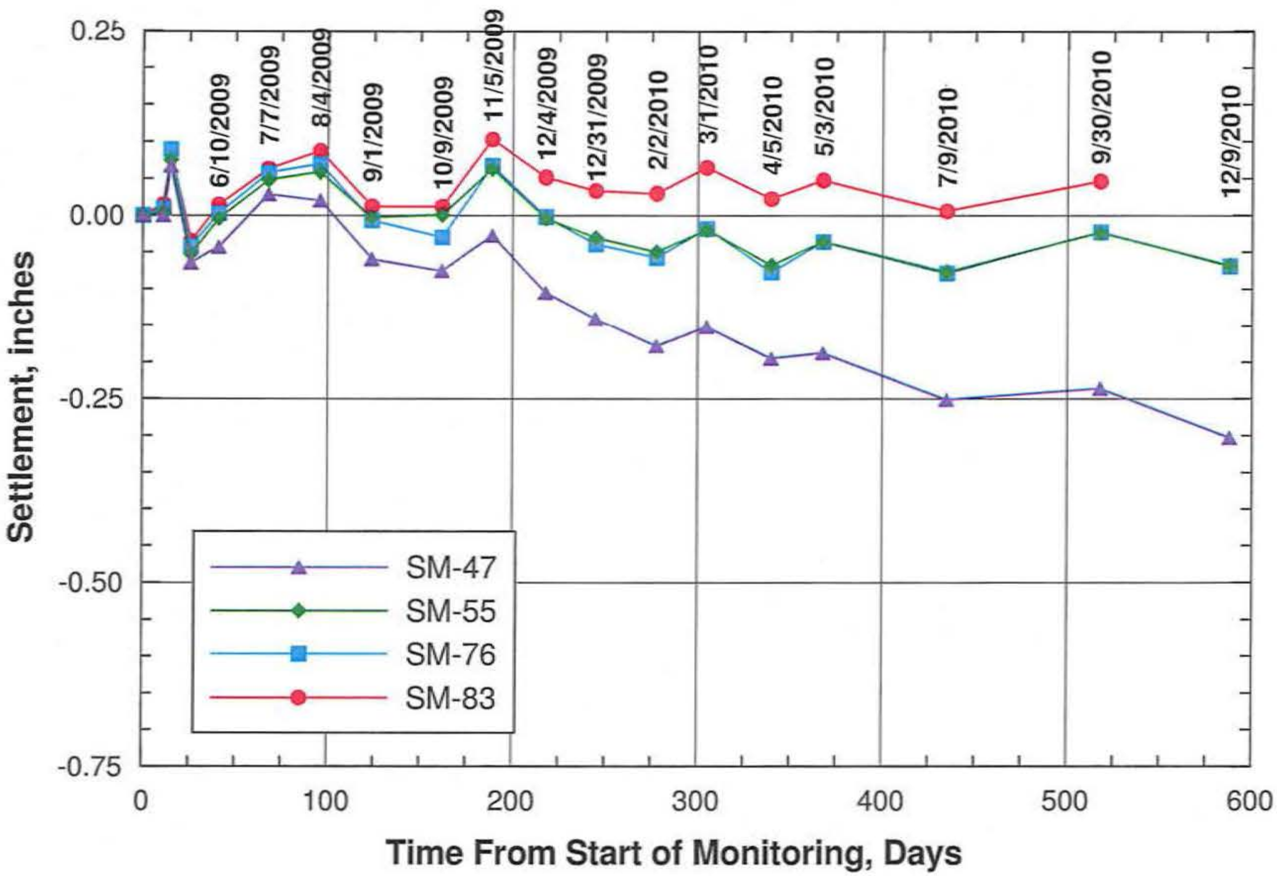
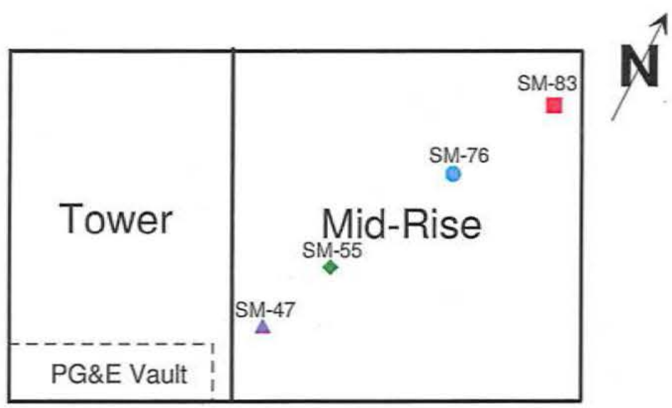
PLATE 4

\\S-fnas01\jobs\f\132242\4 Internal Project Data\4-05 Reports & Narratives\112 Memo_301 Mission Settlement - Dec 2010 Survey\Plates\Plate 4 Settlement Over Time - Tower 120910.grf



MID-RISE



SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH DECEMBER 9, 2010

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2011

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PLATE 5

Note:
Initial (Baseline) reading taken on 04/30/09

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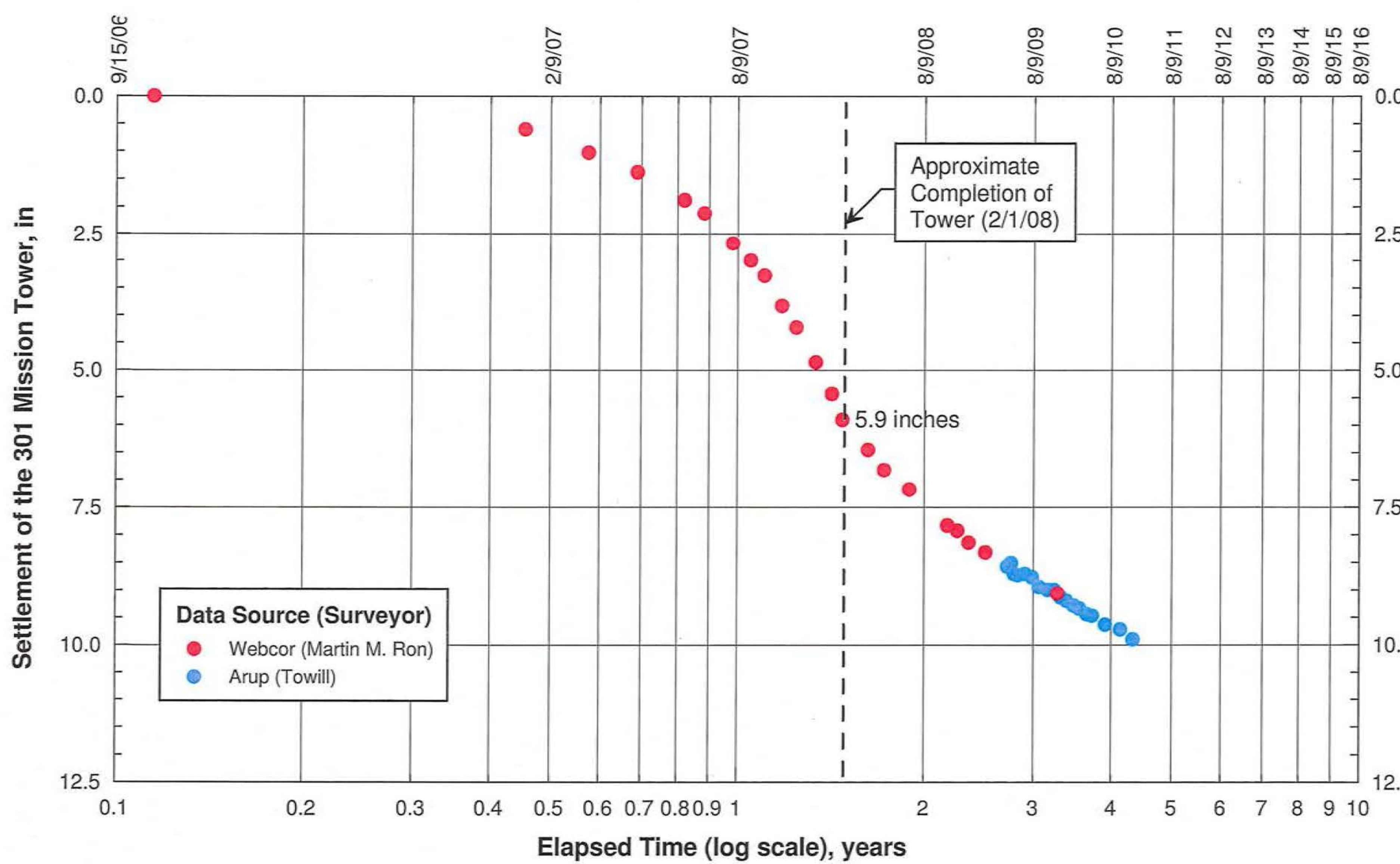

Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2011

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PLATE 6

\\S-fnas01\jobsif\132242\4 Internal Project Data\4-05 Reports & Narratives\112 Memo_301 Mission Settlement - Dec 2010 Survey\Plates\Plate 6 Tower Settlements.grf

Memorandum

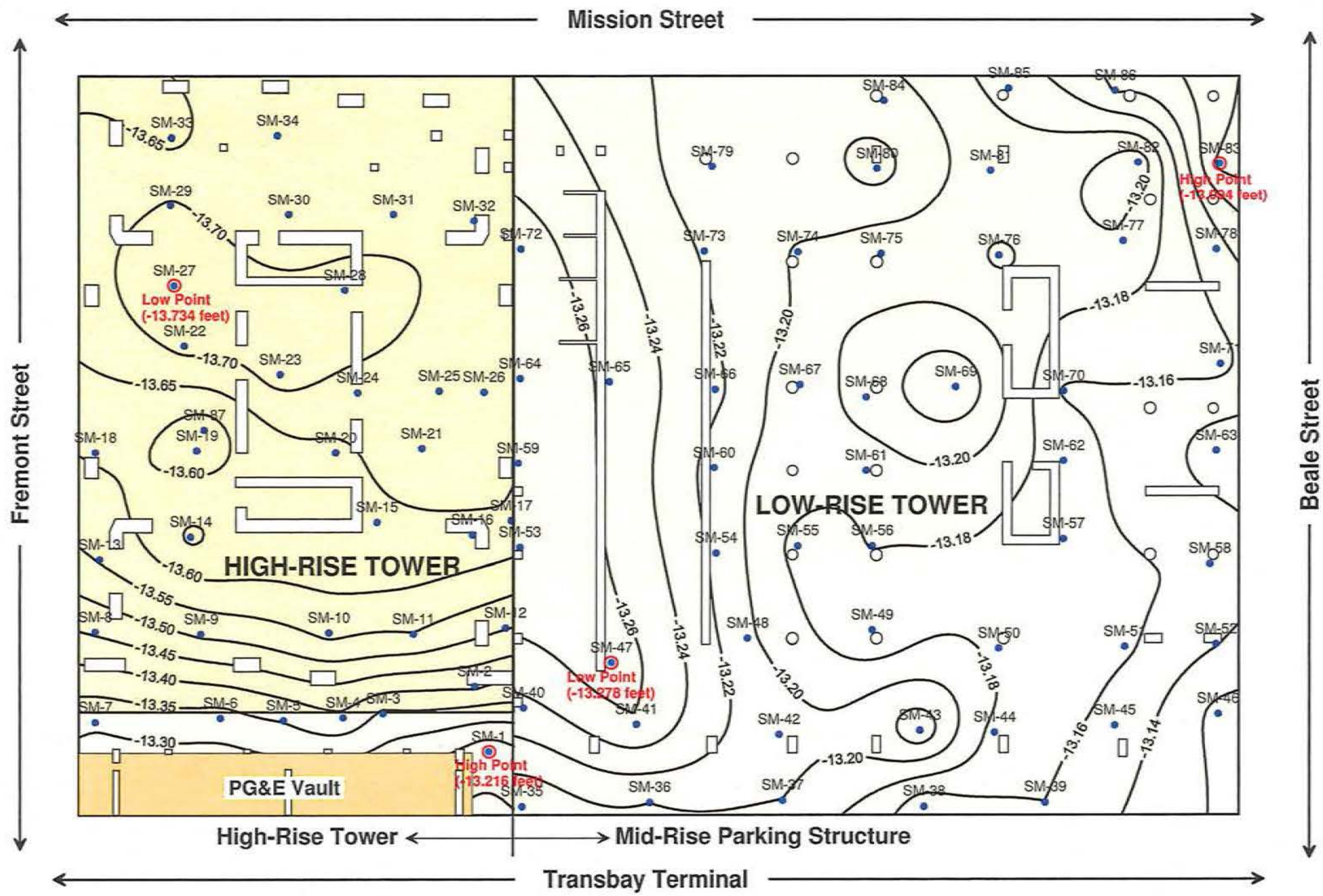
ARUP

To	Brian Dykes (TJPA)	**Date**	February 24, 2011
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/SMM
From	Stephen McLandrich (Arup) Nick O'Riordan (Arup) Kevin Clinch (Arup)	**File reference**	4-05 117
Subject	Transbay Transit Center: Results of February 2011 Settlement Survey at 301 Mission Property	**Page 1 of 1**	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated January 5, 2011 with measurements made through February 2010.

List of Plates

Plate 1	Floor Elevations at Level B-1 of 301 Mission Property: Periodic Survey – February 4, 2010
Plate 2	Differential Floor Elevation (Inches) – February 4, 2010 Survey
Plate 3	Contours of Settlements Measured at the First Level Basement of the 301 Mission Street Structure Between April 30, 2009 and February 4, 2010
Plate 4	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Tower: April 30, 2009 through February 4, 2010.
Plate 5	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Mid-Rise: April 30, 2009 through February 4, 2010
Plate 6	Settlements of the 301 Mission Tower Including Monitoring During Construction



Date of Survey Reading:
February 4, 2011

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	Low-Rise Tower
0.518 feet (6.22 inches)	0.184 feet (2.21 inches)

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on February 4, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

0 25 50 75
Approximate Scale: 1" = 25'

Q:\132242\4 Internal Project Data\4-11 Field Work\4-11-08 Existing Building Surveys\Existing Buildings\301 Mission\Monitoring Program\Settlement Markers\2010.12.09 Measurements\Elevations All (2010.12.09).srf

FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY: PERIODIC SURVEY - FEBRUARY 2011

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

February 2011

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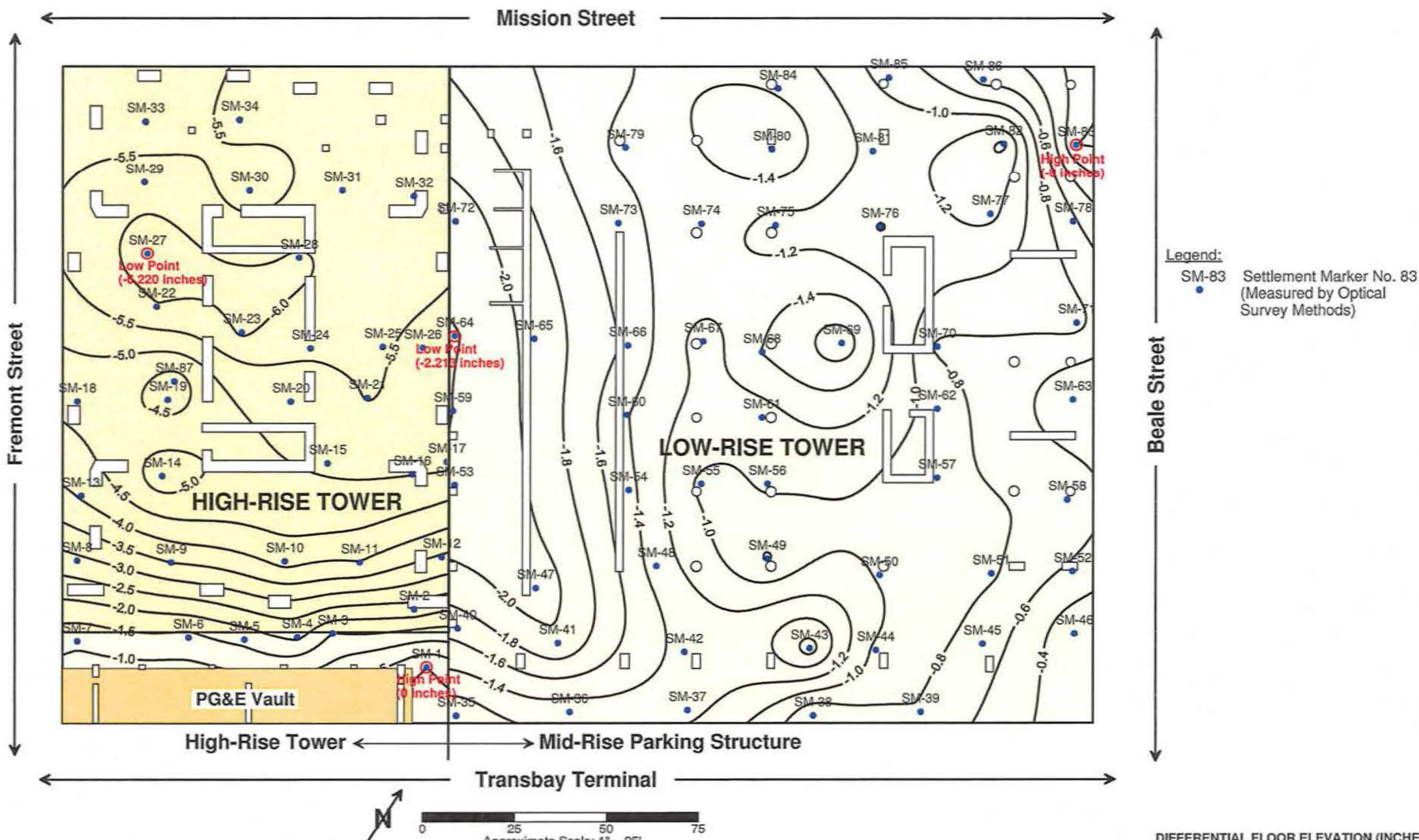
PLATE 1



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on February 4, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATION (INCHES)
FEBRUARY 4, 2011 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

February 2011

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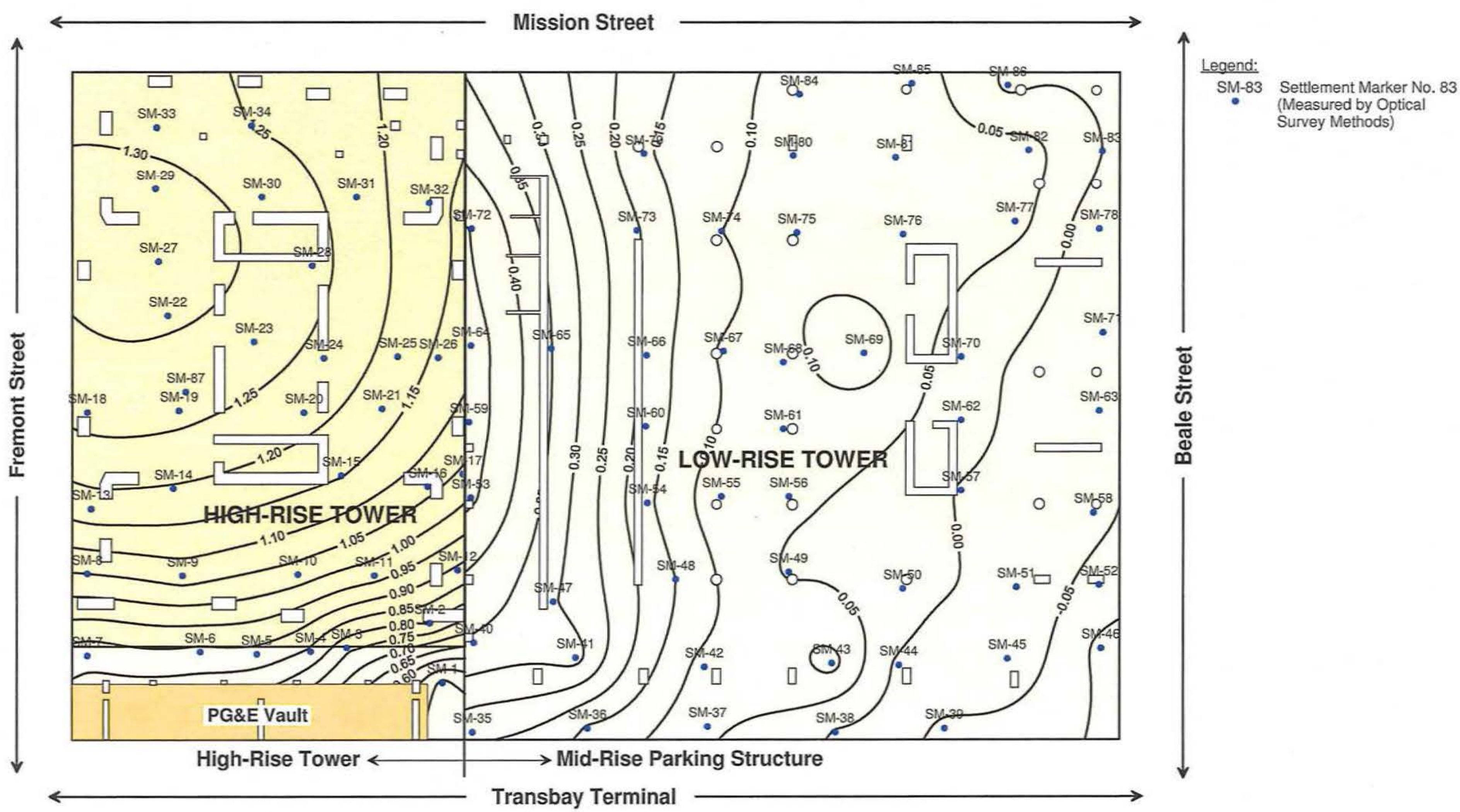
PLATE 2

Q:\132242\4 Internal Project Data\4-11 Field Work\4-11-08 Existing Building Surveys\Existing Buildings\301 Mission\Monitoring Program\Settlement Markers\2010.12.09 Measurements\Differential Elevation All (2010.12.09).srf



0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on February 4, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE FIRST LEVEL BASEMENT OF THE 301 MISSION STREET STRUCTURE BETWEEN APRIL 30, 2009 AND FEBRUARY 4, 2011

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

February 2011

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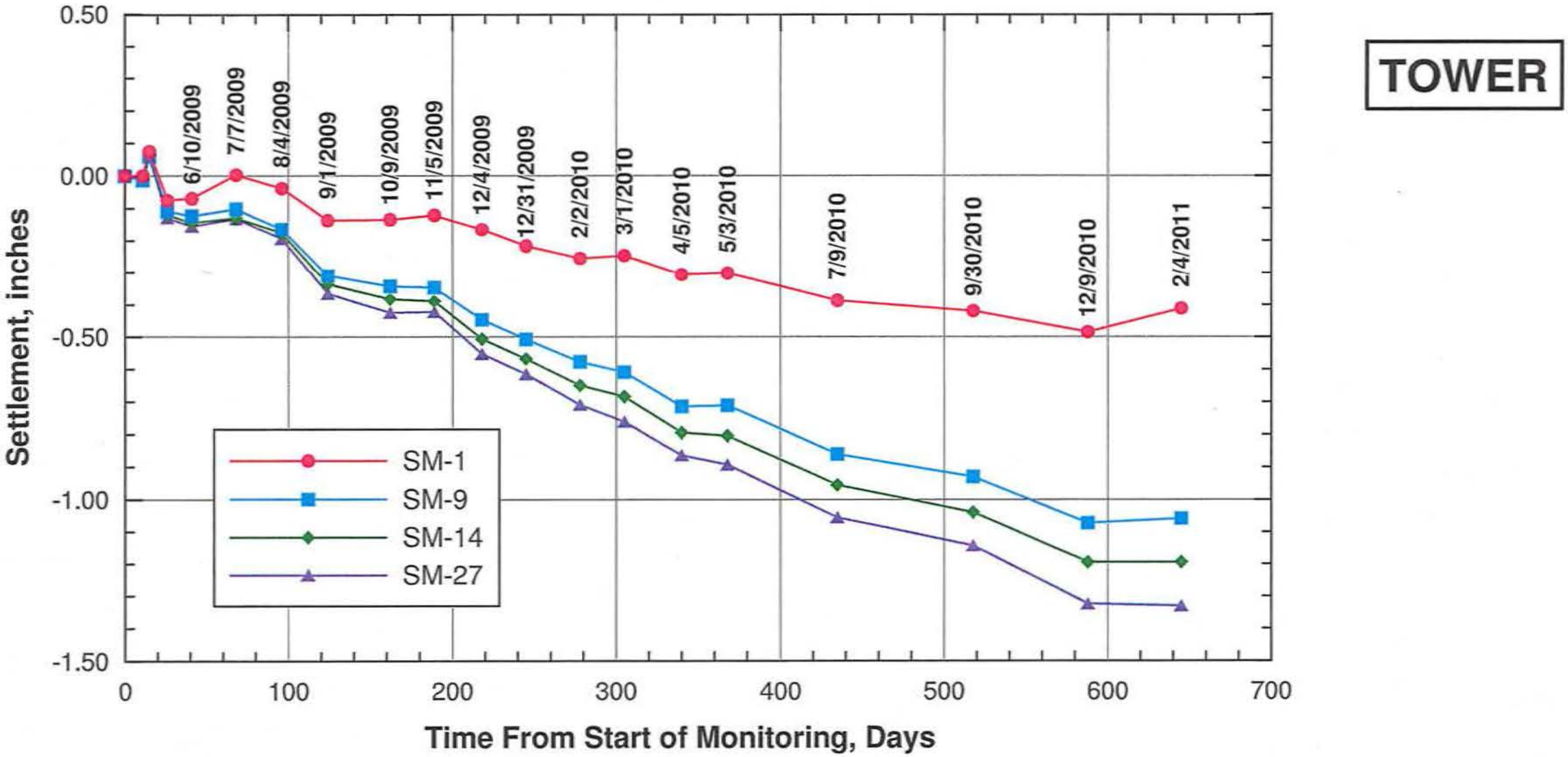
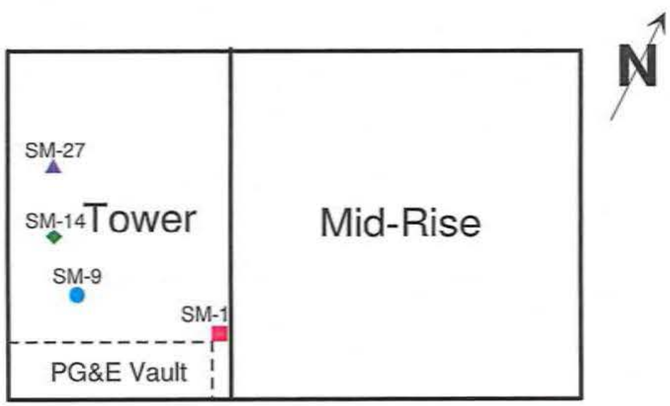
PLATE 3

Q:\132242\4 Internal Project Data\4-11 Field Work\4-11-08 Existing Building Surveys\Existing Buildings\301 Mission\Monitoring Program\Settlement Markers\2010.12.09 Measurements\Elevation changes All (2010.12.09).srf





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH FEBRUARY 4, 2011

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

February 2011

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PLATE 4

Note:
Initial (Baseline) reading taken on 04/30/09

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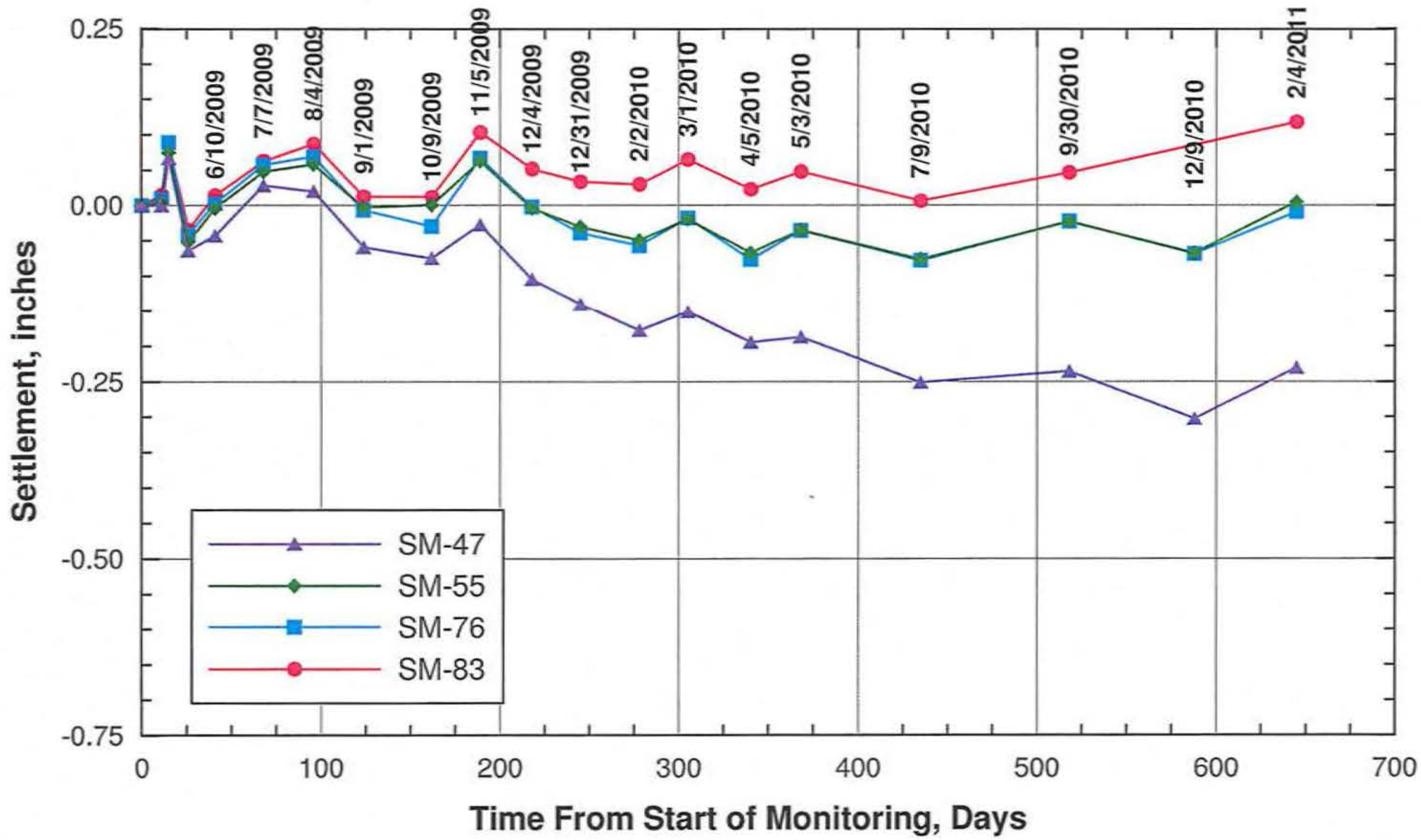
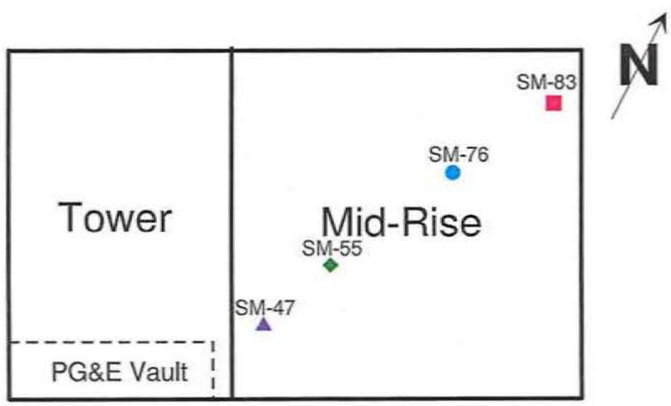


MID-RISE



SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH FEBRUARY 4, 2011

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

February 2011

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PLATE 5

Note:
Initial (Baseline) reading taken on 04/30/09

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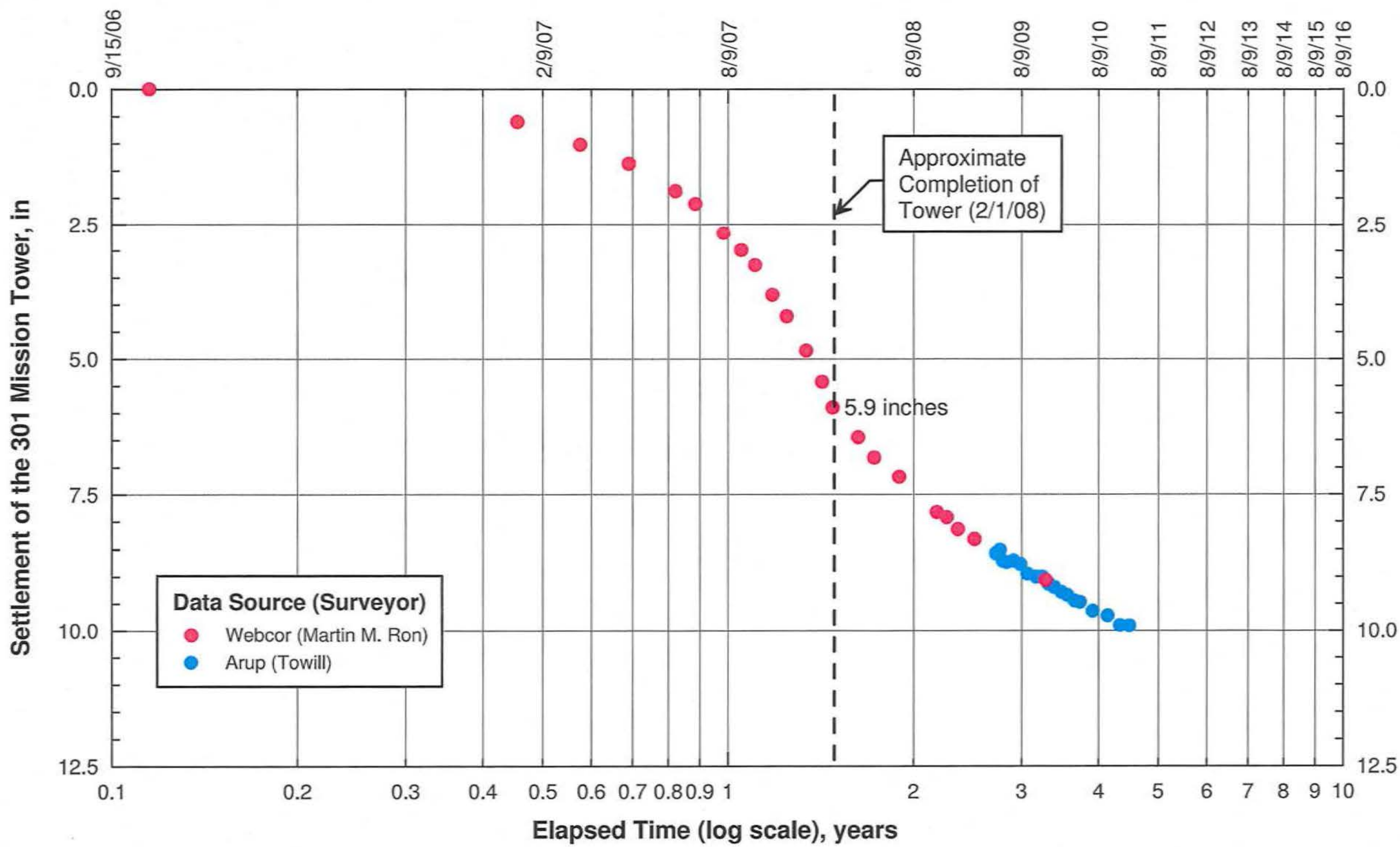

Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

February 2011

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PLATE 6

\\S-fnas01\jobsif\132242\4 Internal Project Data\4-05 Reports & Narratives\117 Memo_301 Mission Settlement - Feb 2011 Survey\Plates\Plate 6 Tower Settlements.grf

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Mr. Brian Dykes
Transbay Joint Powers Authority
201 Mission St., Suite 2100
San Francisco, CA 94105

March 28, 2011

Dear Mr. Dykes

Transbay Transit Center
Additional 301 Mission Instrumentation Installation

Previously, Arup has transmitted a letter dated October 21, 2010 which describes the instrumentation and surveying requirements at the 301 Mission property. The previous letter provided an overview of many different activities. The purpose of this letter is to describe installation details and access requirements so that these installations can be coordinated with 301 Mission representatives.

The three different type of instrumentation tools that are proposed to be installed are tiltmeters, cellular modems, and utility displacement gauges. The attached figure shows the location of these instruments. A brief description of these instruments are provided below.

<u>Tiltmeters</u>
Currently, nine tiltmeters have been installed in the B-1 basement level of 301 Mission. These tiltmeters are installed along the southern wall and the Fremont Street (western) wall. One additional tiltmeter will be installed on the Mission Street (northern) wall. This will be installed in the Garage Air Plenum. The installation will be similar to the nine installed in 2009.

<u>Cellular Modems</u>
Three cellular modems will be installed at locations indicated on the attached figure. The cellular modem installation will be a box mounted on the wall. This box mounted on the wall will look similar to the tiltmeter installation. These cellular modems will collect the data from the tiltmeters and transfer that data to an on-line server as part of the Global Analyzer. The purpose is to have real-time access to data during the excavation for the

Transbay Transit Center train box. The exact locations will be determined in the field based on radio and cellular reception.

Utility Displacement Gauges

Six utility displacement gauges will be installed at this time. UC-1 through UC-6, as shown in the attached figure, will be installed in the drop ceiling in the Parking Elevator Lobby. These instruments will be connected to a radio transmission device which will allow the data to be uploaded by the cellular modems as well. UC-7 through UC-9 require further consideration as to the method which will be utilized to monitor them. These three will not be installed at this time.

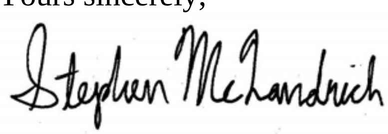
The utility displacement gauge measures relative displacement across the flexible utility connection. The digital sensors will be located inside the drop ceiling and out of sight.

The instrumentation described in this letter is only a portion of the required instrumentation and survey. Additional instrumentation and survey will be coordinated once appropriate development of instrumentation scheme is ready to be installed. All instrumentation and survey work will be completed prior to excavation in the vicinity of the 301 Mission property.

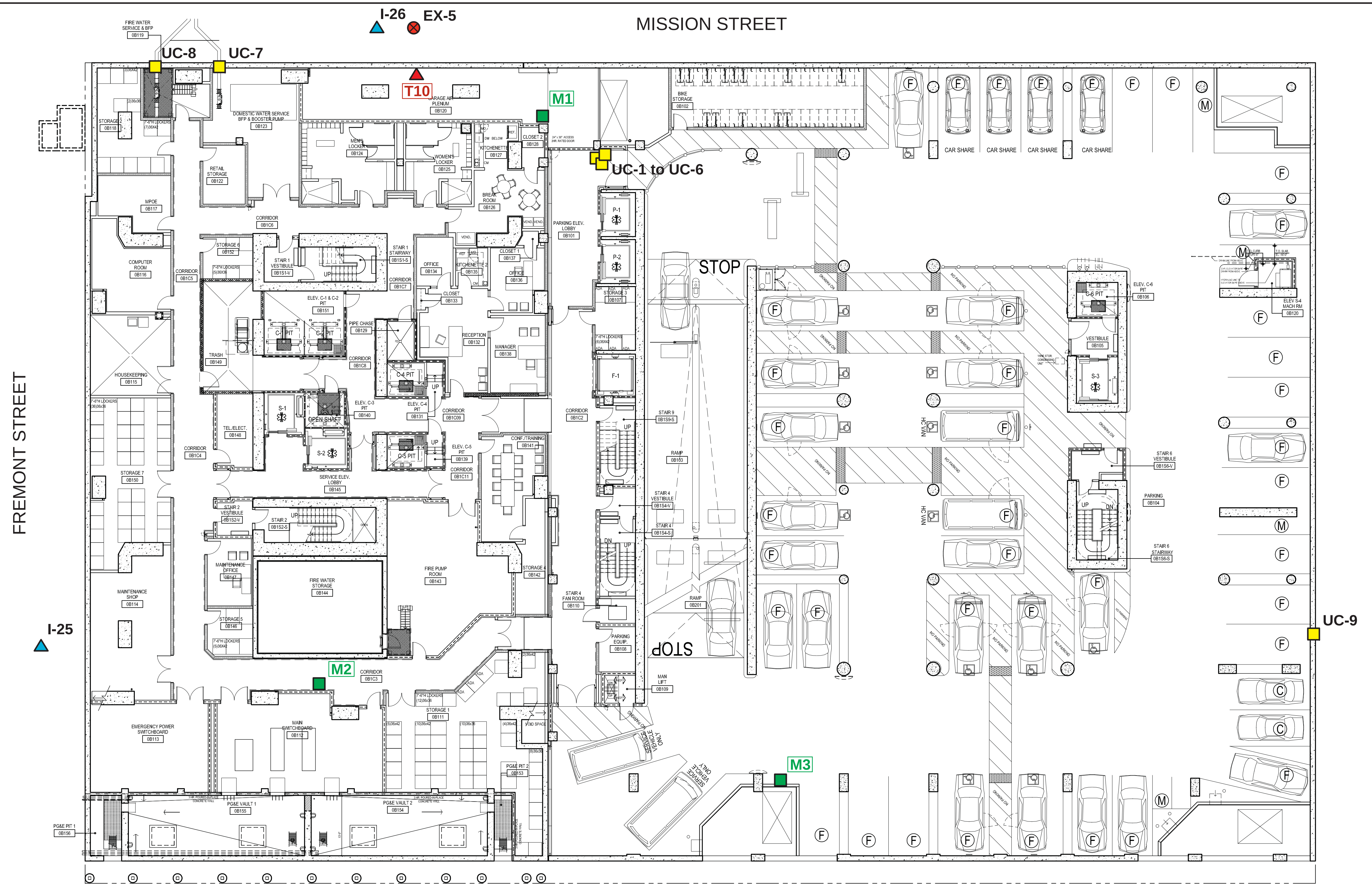
Engineers with Arup and the instrumentation subcontractor, Geo-Instruments, will require access to install these instruments. Upon review of the work described in this letter, access will be coordinated with the representatives of 301 Mission.

Please let me know if you have any questions or concerns. I can be reached by phone at (415) 946-0245 or by email at stephen.mclandrich@arup.com.

Yours sincerely,



Stephen McLandrich
Senior Engineer



LEGEND

- Tiltmeters at Data Loggers (TM)
  Mounted on walls
- Utility Displacement Gauge
  Mounted on the utility conduit
- Cellular Modem
  Mounted on walls
- Extensometer
  Installed in Mission Street
- Inclinometer
  Installed in Fremont Street and in Mission Street

ADDITIONAL INSTRUMENTATION PLAN:
301 MISSION STREET BASEMENT LEVEL B-1

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2011

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PLATE 1

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\118 Memo_301 Mission Instrumentation\Plates\Plate 1 Additional Instrumentation.ai

Memorandum

ARUP

To	Brian Dykes	Date	April 8, 2011
Copies	George Metzger Randy Volenec	Reference number	132242-60/smm
From	Stephen McLandrich x 27245 (SF)	File reference	4-05 122
Subject	Transbay Transit Center - Pile Extraction Test Program - Measured Ground Deformations to Date		

This memorandum transmits the instrumentation data collected as part of the pile extraction test program. The inclinometer data was collected by field engineers with Arup. The settlement marker and deep settlement marker data was collected by Towill, Inc. under subcontract to Arup.

After extraction of the first 14 piles, referred to as the "practice" piles, a baseline measurement was taken for all four of the inclinometers and all of the settlement markers and deep settlement markers. These baseline readings were used as the reference to which future readings were compared to in graphically presenting measurements of ground movement. The attached plates graphically display the ground movements recorded during the pile extraction test program.

Instrumentation was installed between March 7th and March 14th, 2011. Four inclinometers, four deep settlement markers, 12 settlement markers, and four piezometers were installed. These instruments were protected using a concrete slab which encased the instruments inside vault boxes. The locations of the instruments are shown in Plate 1.

The measurements from the settlement markers are presented in Table 1 and in Plate 2. The result of the deep settlement markers are presented in Table 2 and in Plates 3-1 and 3-2. The results of the inclinometers are presented in Plates 4-1 through 7-3.

Please refer to specification Section 02 41 19 – Pile Removal for information regarding the performance criteria.

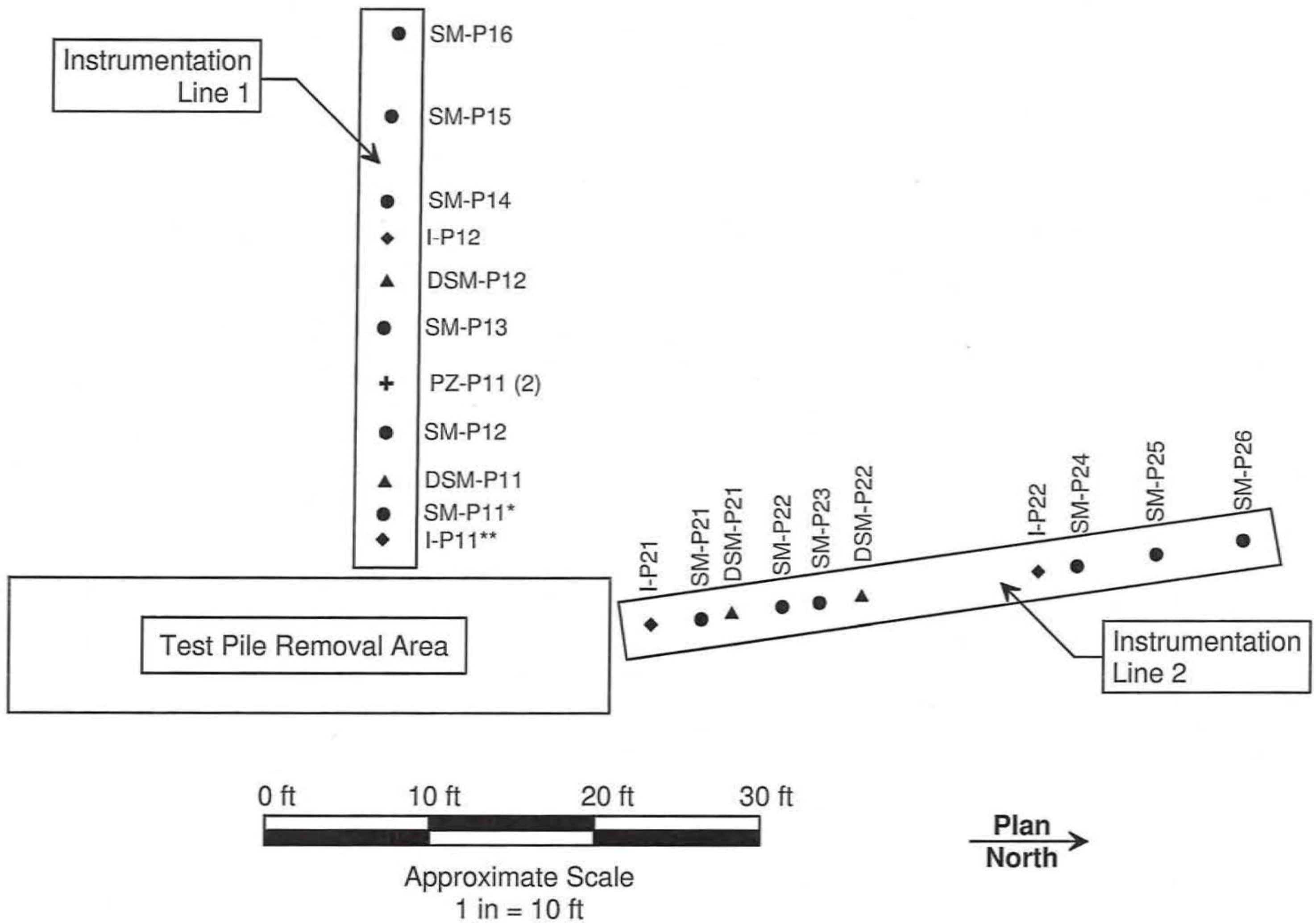
TABLES

TABLE 1 SETTLEMENT MARKERS												
	Settlement, in											
Date	LINE 1						LINE 2					
	SM-P11*	SM-P12	SM-P13	SM-P14	SM-P15	SM-P16	SM-P21	SM-P22	SM-P23	SM-P24	SM-P25	SM-P26
4/4/2011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4/6/2011	NA	0.125	0.071	-0.025	0.095	-0.058	-0.020	0.081	-0.040	0.002	-0.041	-0.080
4/7/2011	NA	0.253	0.102	0.032	0.008	0.007	0.097	0.037	0.018	-0.024	-0.018	-0.023

*SM-P11 was destroyed on 4/4/2011 after the baseline reading.

TABLE 2 RESULTS FROM DEEP SETTLEMENT MARKERS				
Date	Settlement, in			
	DSM-P11	DSM-P12	DSM-P21	DSM-P22
4/4/2011	0.000	0.000	0.000	0.000
4/6/2011	0.251	0.047	0.011	0.005
4/7/2011	0.313	0.062	0.012	0.000

PLATES



*SM-P11 was destroyed due to the excavation for the pile removal on 4/4/2011.
**I-P11 was damaged due to the excavation for the pile removal on 4/4/2011.
This inclinometer was uncovered about 6 feet below original grade and recovered.
A new baseline was recorded in the afternoon of 4/4/2011 once it was repaired.

LOCATION PLAN

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

April 2011

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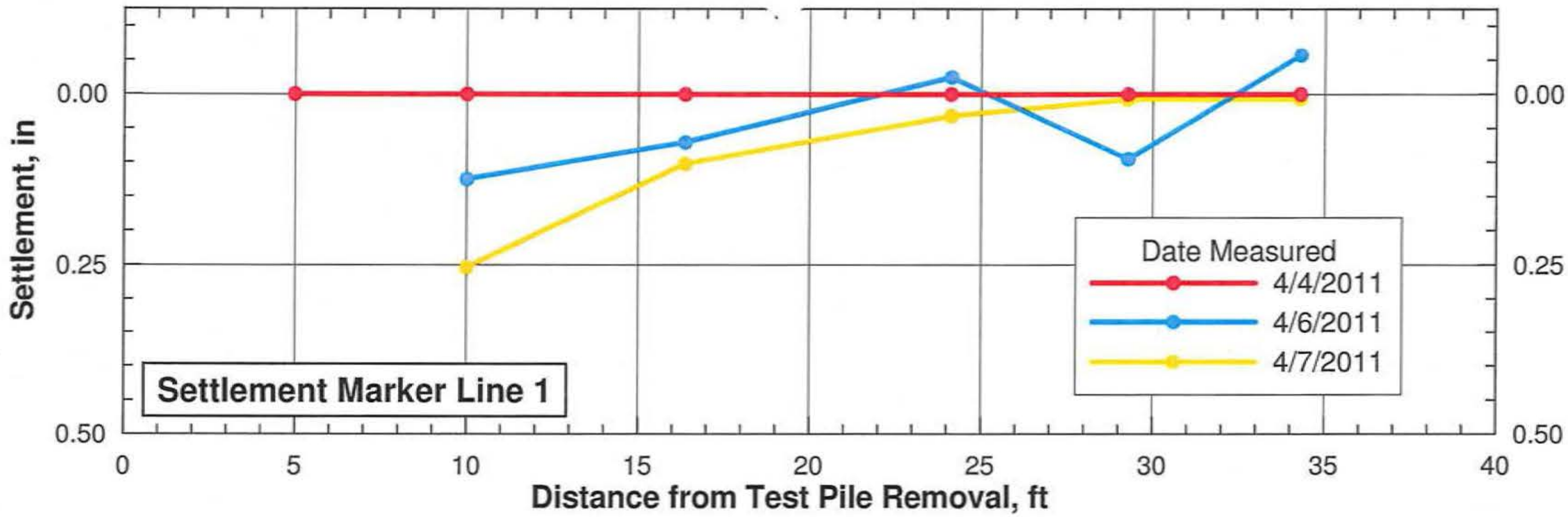
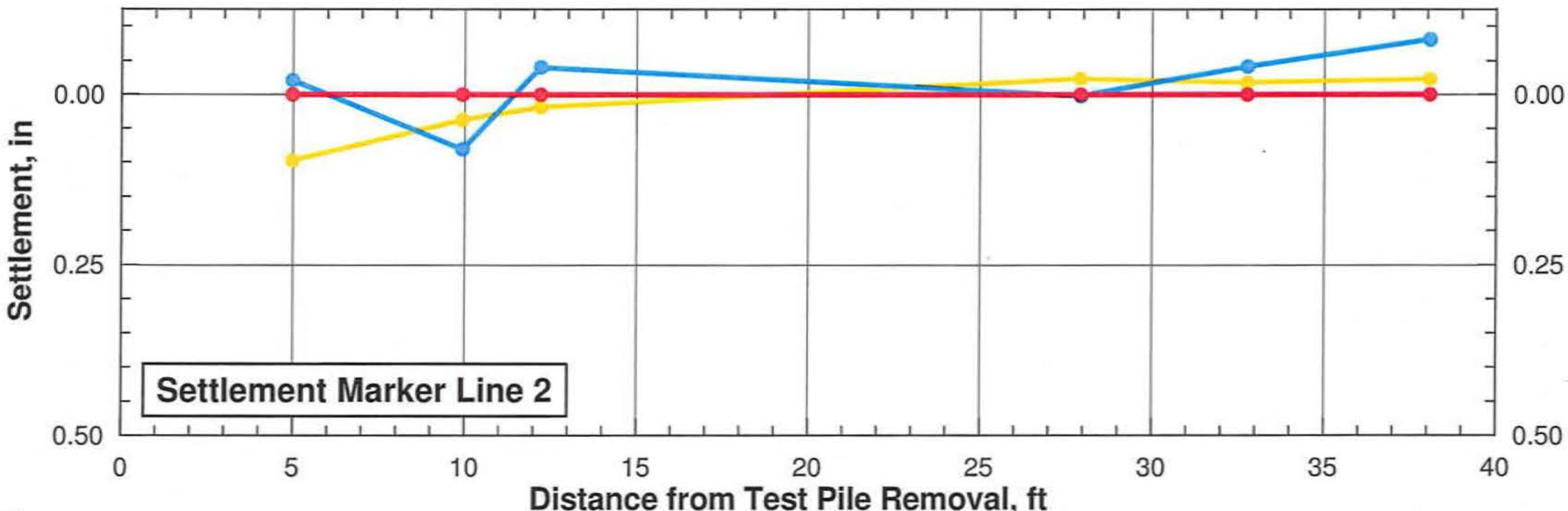
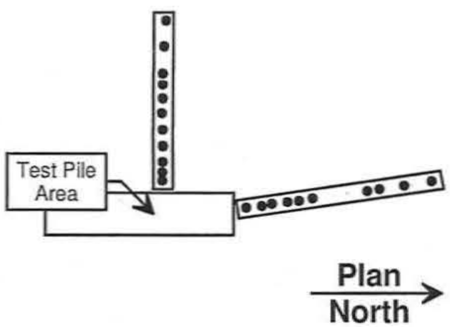
PLATE 1

\\S-fnas01\jobsif\132242\4 Internal Project Data\4-11 Field Work\4-11-11 Instrumentation\Pile Removal Site Observation\Instrumentation Layout.grf







SETTLEMENT MARKERS

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

April 2011

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PLATE 2

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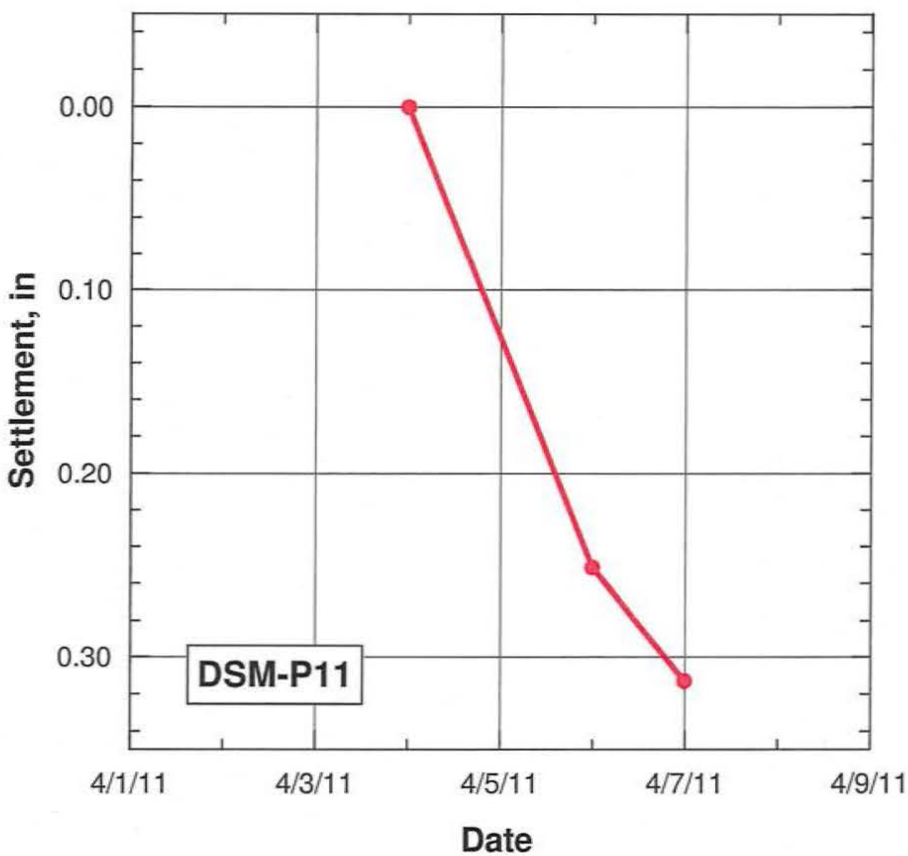

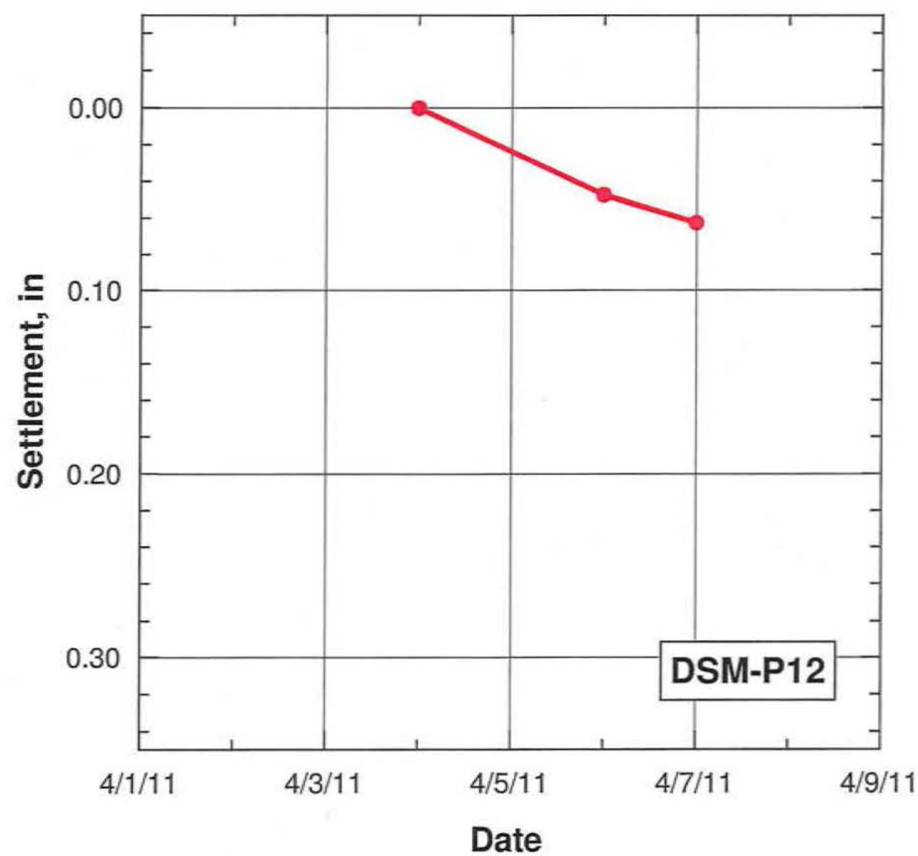

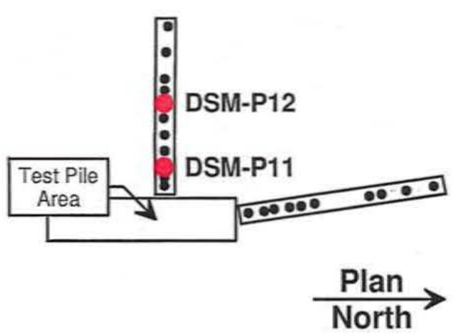

Note:
The DSM-P11 were placed in the top of Marine Sands between 30 and 35 feet
The DSM-P12 were placed in the middle of Marine Sands between 40 and 45 feet

DEEP SETTLEMENT MARKERS: LINE 1

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

April 2011

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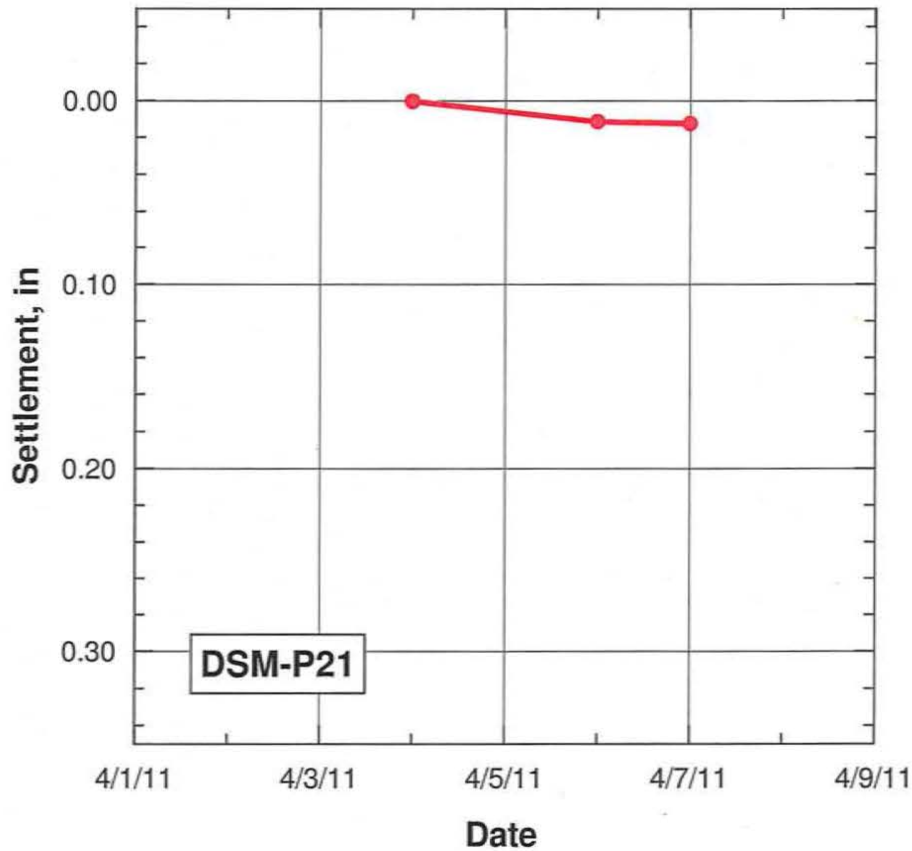
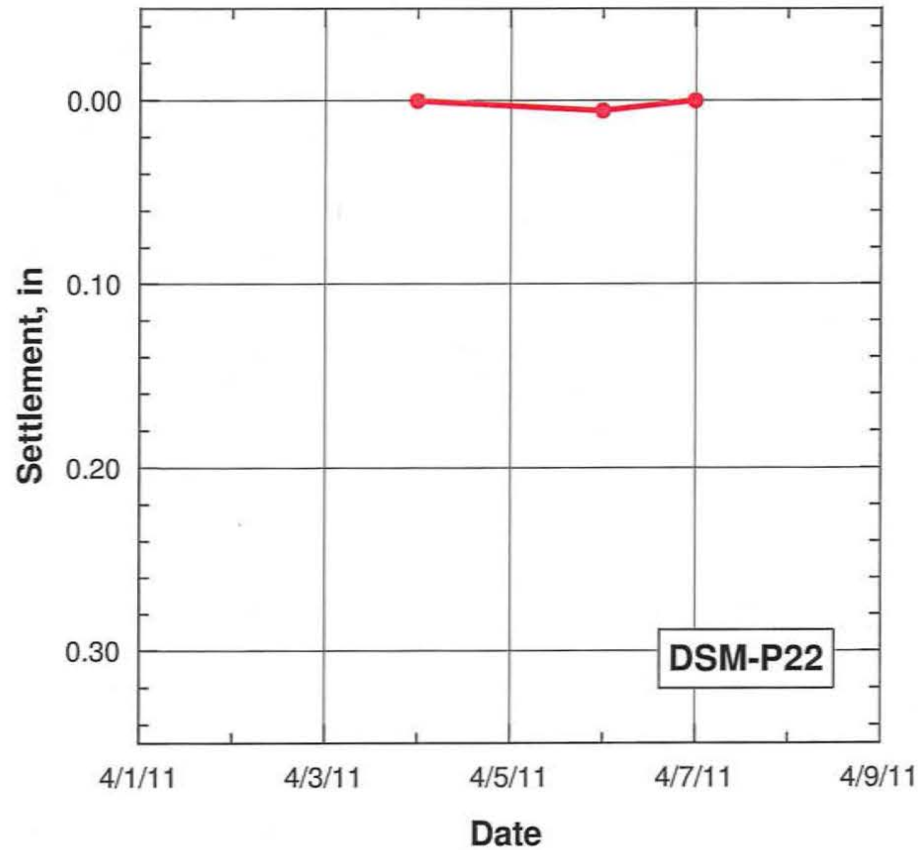
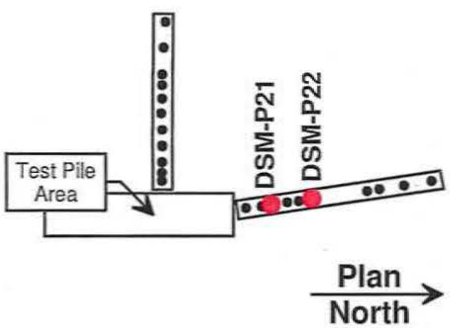
PLATE 3-1

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\122 Pile Extraction Test\Plates\Plate 3-1 DSM Line 1.grf





Note:
The DSM-P21 were placed in the bottom of
of Sandy Bay Mud between 22 and 27 feet
The DSM-P22 were placed in the top of
of Sandy Bay Mud between 12 and 17 feet



DEEP SETTLEMENT MARKERS: LINE 2

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

April 2011

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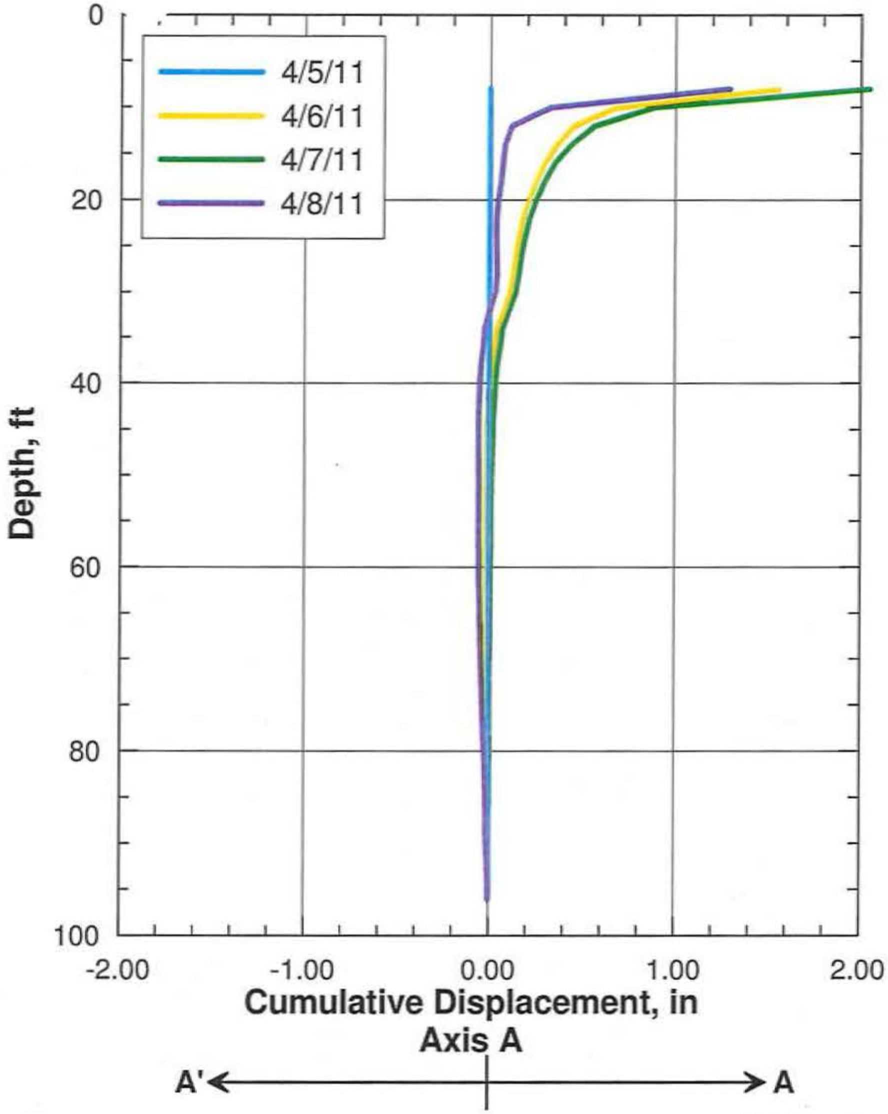
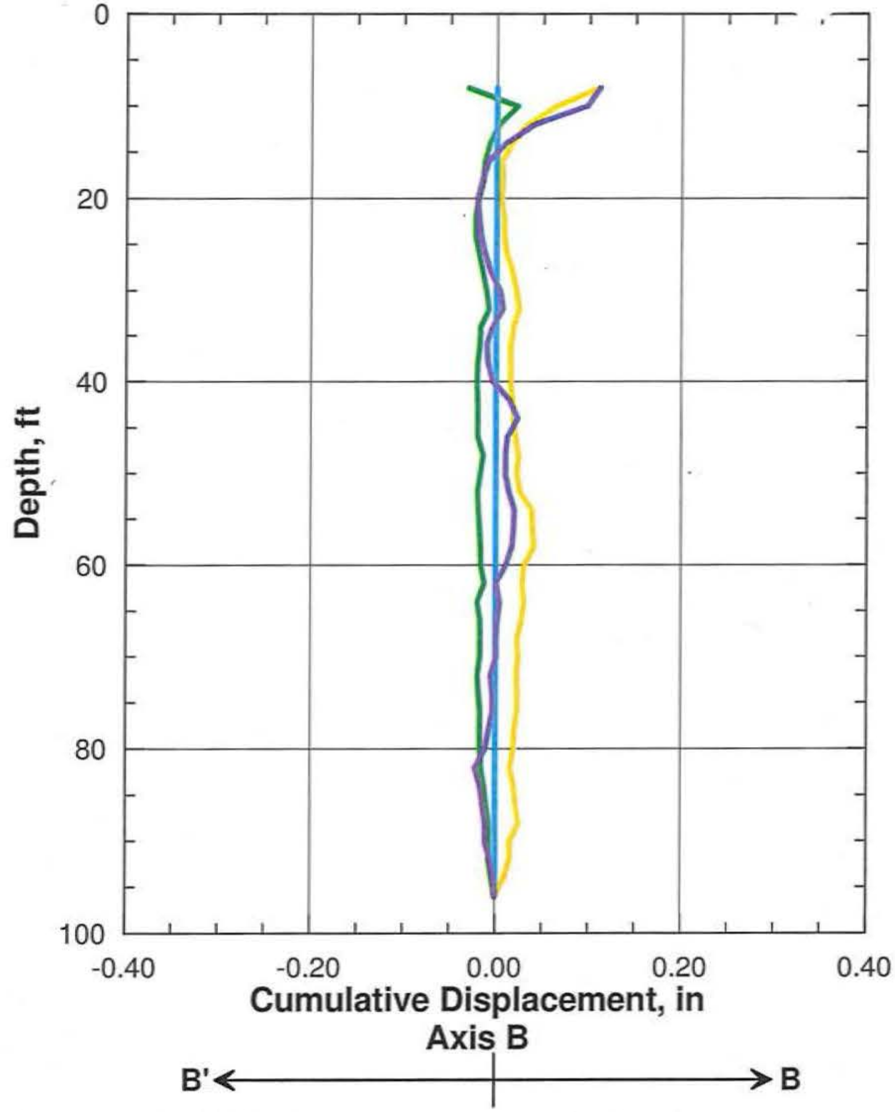
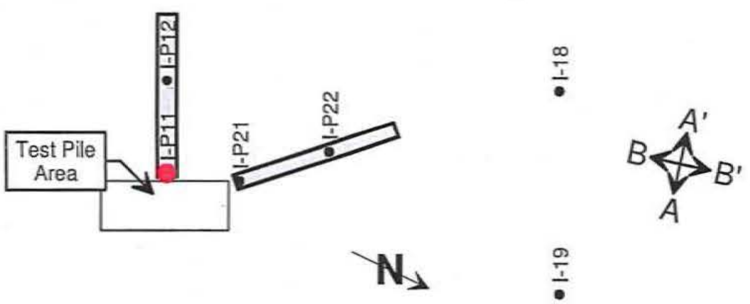
PLATE 3-2

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\122 Pile Extraction Test\Plates\Plate 3-2 DSM Line 2.grf







NOTE: Inclinometer was damaged during work on 4/5/11. It collasped about 7 feet below the surface.
The inclinometer was dug out and cut-off. A new baseline reading was taken after it was fixed on 4/5/11.
Large movements may be from it not being protected at the surface and sloughing ground due to excavation for pile removal.

INCLINOMETER DATA FOR PILE EXTRACTION
TEST SITE INCLINOMETER READING I-P11

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

April 2011

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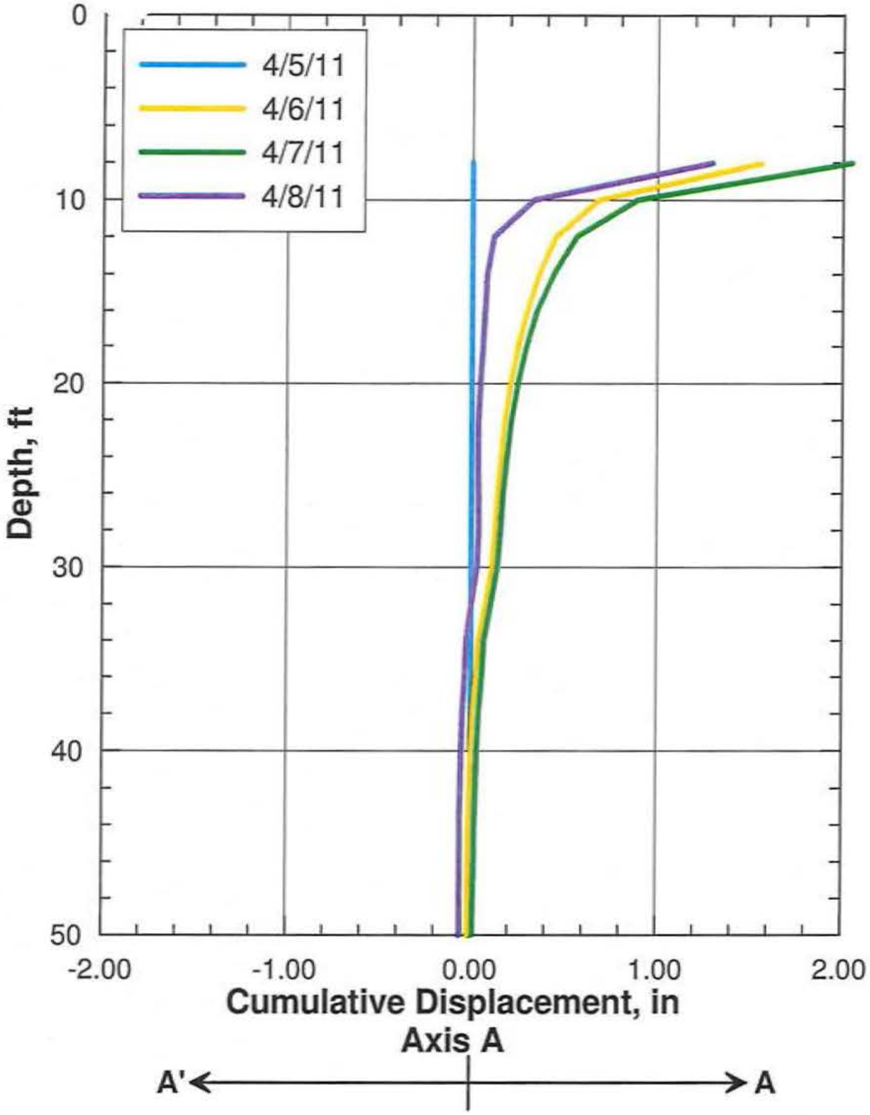
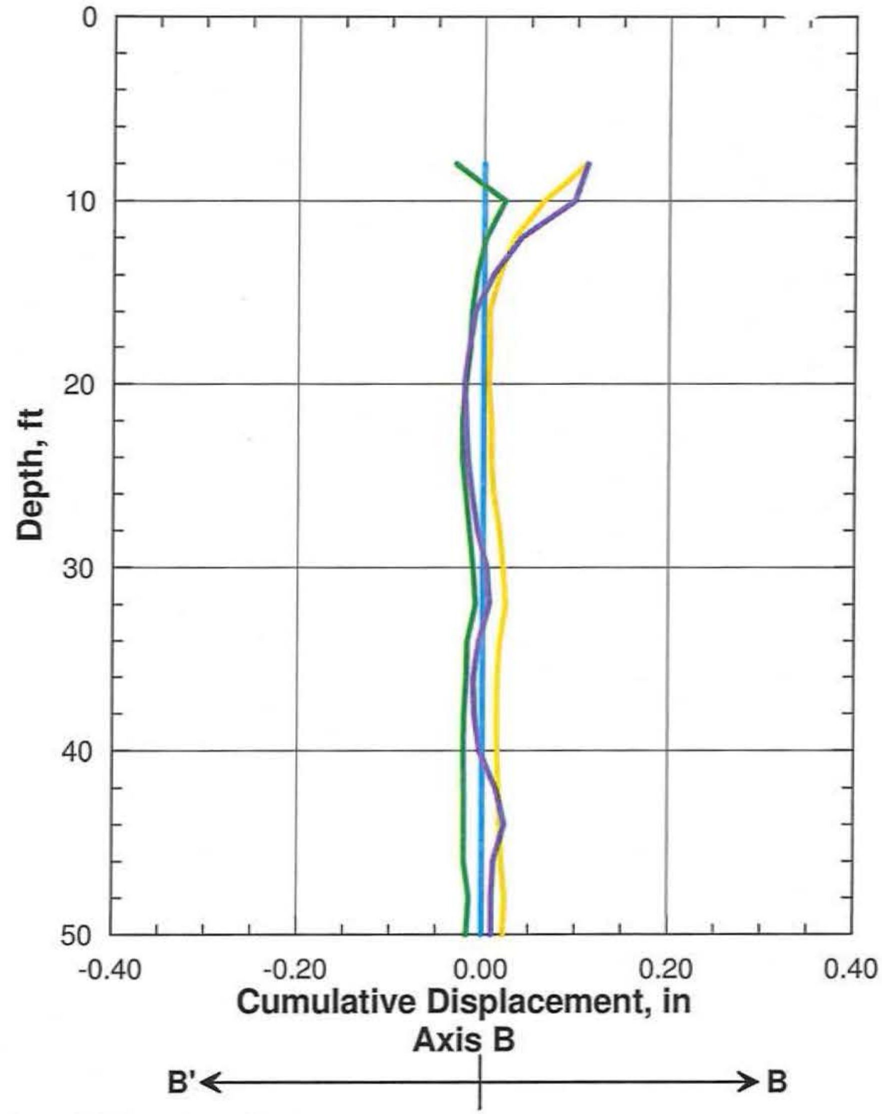
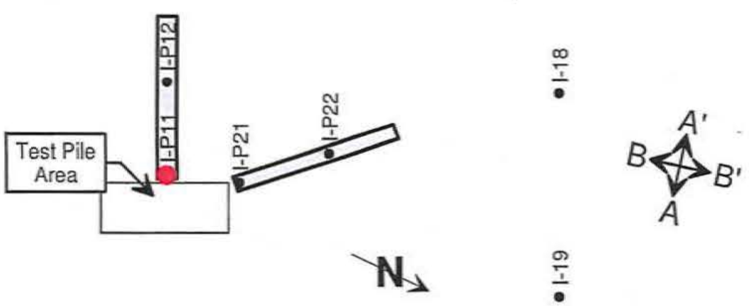
PLATE 4-1







NOTE: Inclinometer was damaged during work on 4/5/11. It collasped about 7 feet below the surface.
The inclinometer was dug out and cut-off. A new baseline reading was taken after it was fixed on 4/5/11.
Large movements may be from it not being protected at the surface and sloughing ground due to excavation for pile removal.

INCLINOMETER DATA FOR PILE EXTRACTION TEST SITE INCLINOMETER READING I-P11: TOP 50 FEET OF THE INCLINOMETER ONLY

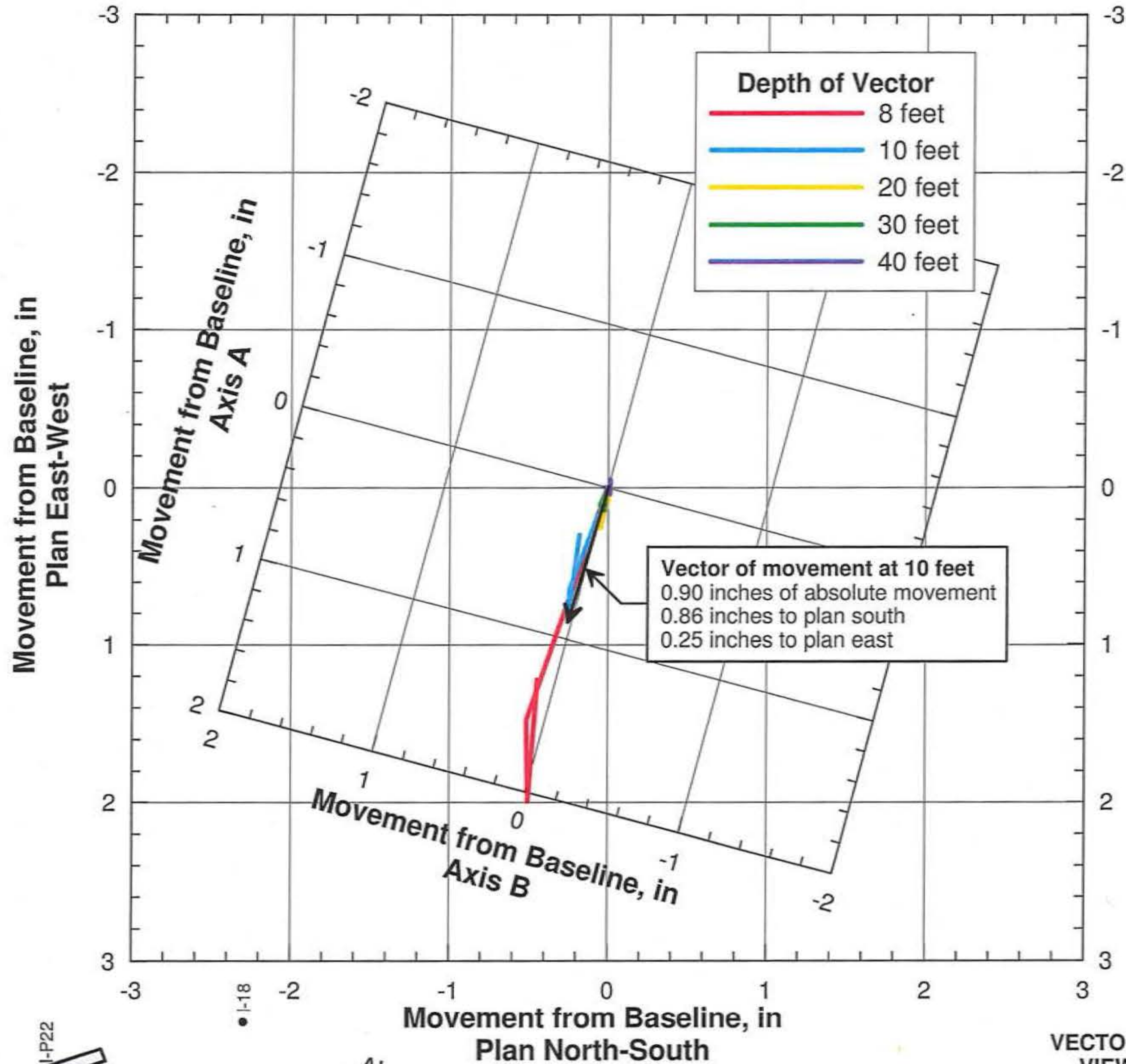
Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

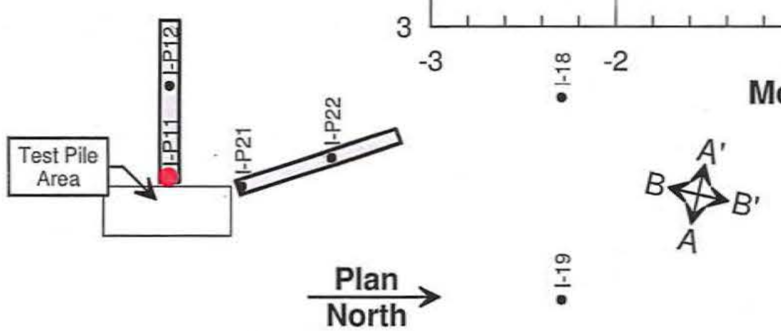
April 2011

ARUP

PLATE 4-2

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\122 Pile Extraction Test\Plates\Plate 4-2 Inclinometer IP11 - top 50 feet.grf





VECTORS OF MOVEMENT IN PLAN VIEW FOR INCLINOMETER I-P11

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

April 2011

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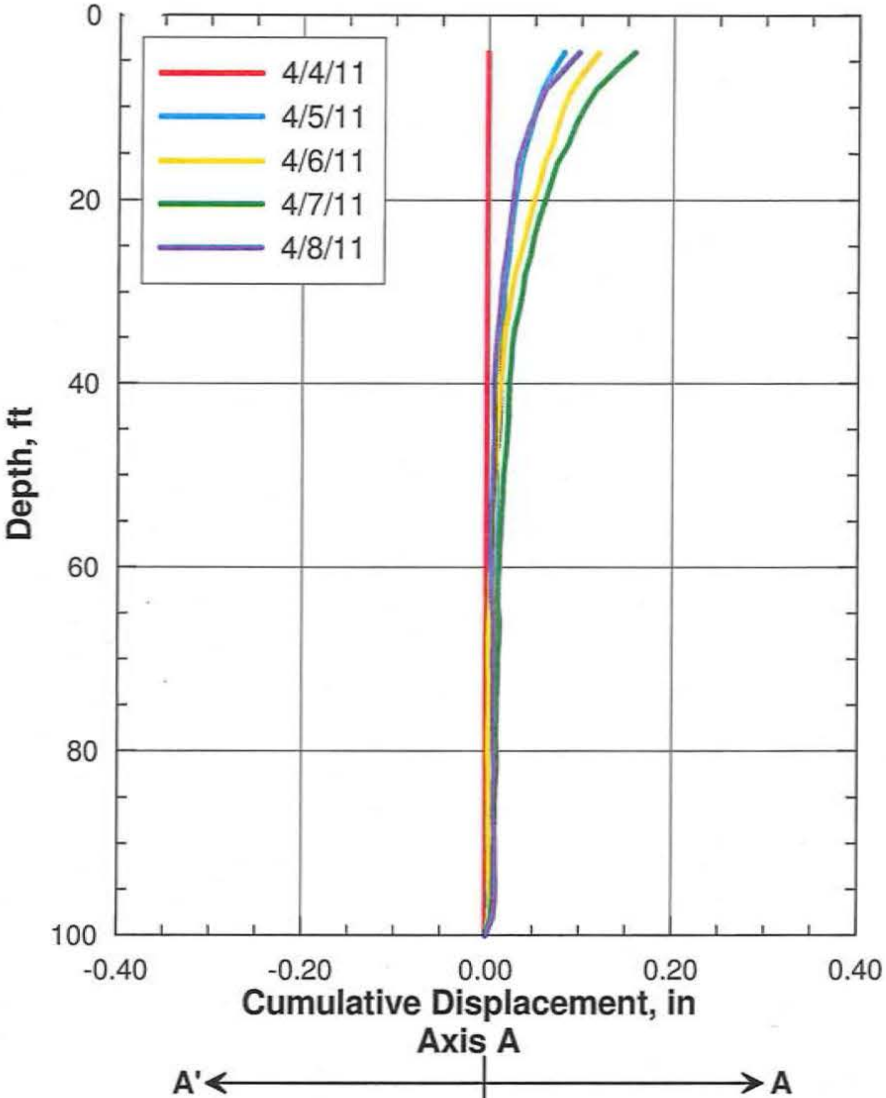
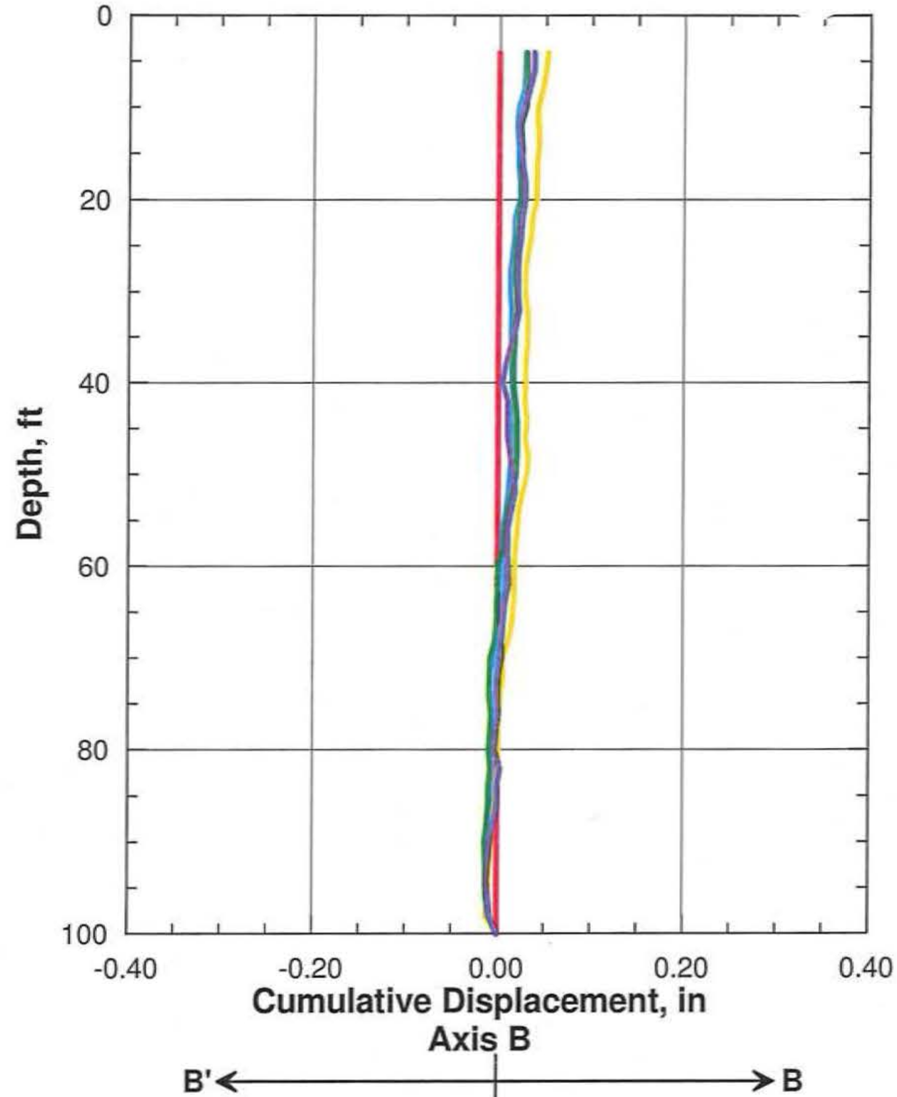
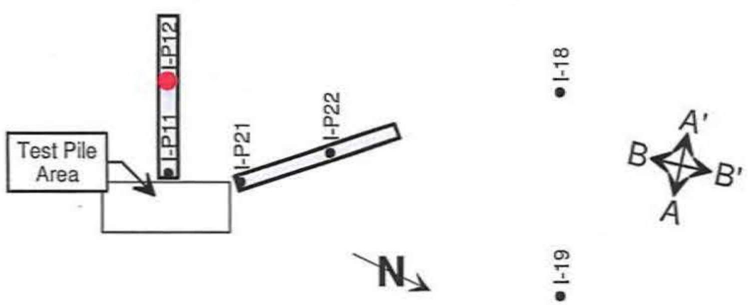
PLATE 4-3

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\122 Pile Extraction Test\Plates\Plate 4-3 Inclinometer IP11 - vectors.grf







INCLINOMETER DATA FOR PILE EXTRACTION TEST SITE INCLINOMETER READING I-P12

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

April 2011

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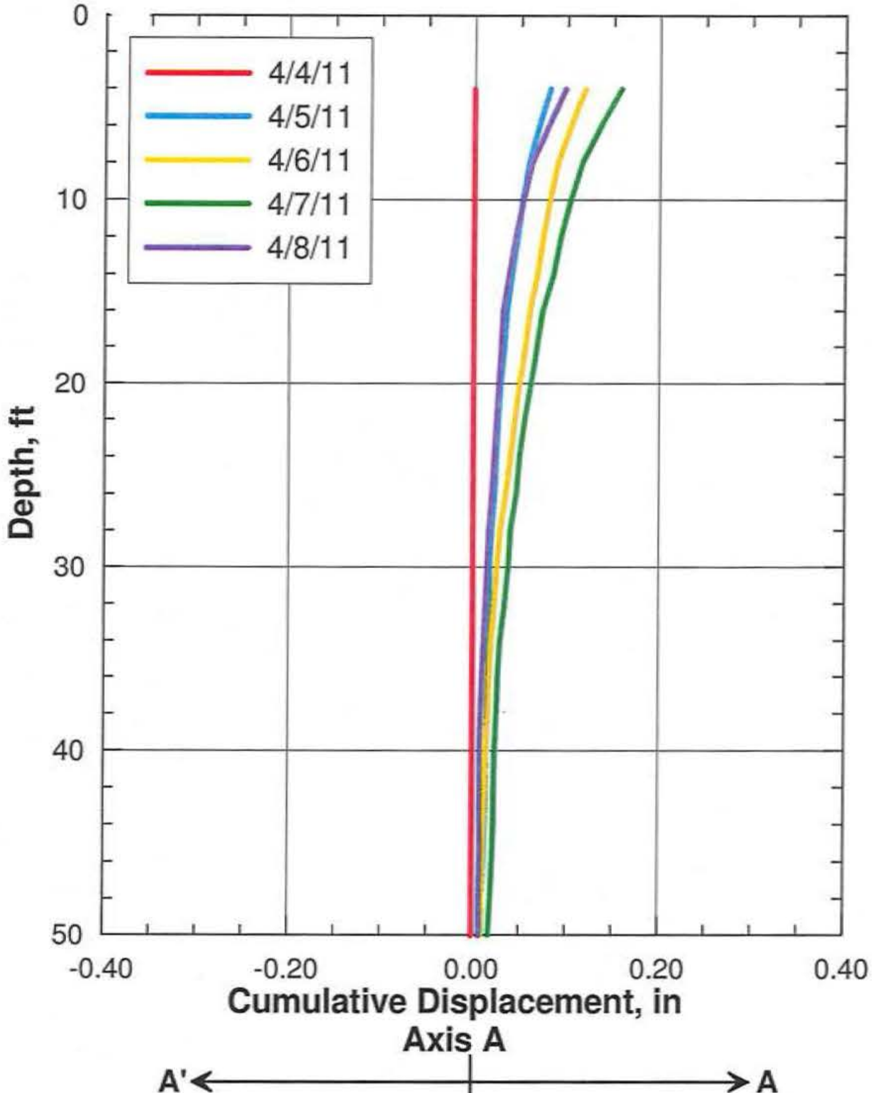
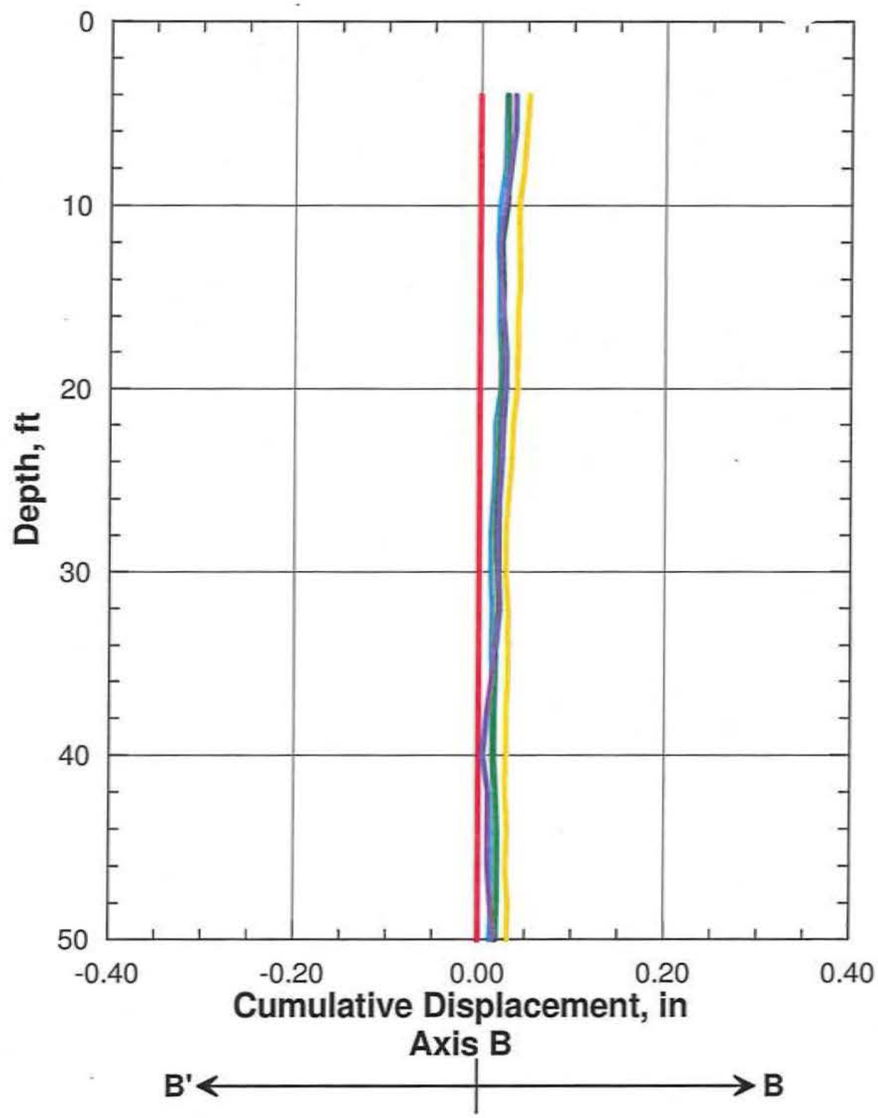
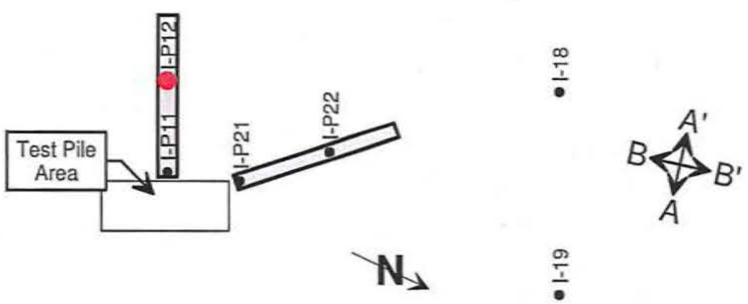
PLATE 5-1

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\122 Pile Extraction Test\Plates\Plate 5-1 Inclinometer IP12.grf







INCLINOMETER DATA FOR PILE EXTRACTION TEST SITE INCLINOMETER READING I-P12: TOP 50 FEET OF THE INCLINOMETER ONLY

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

April 2011

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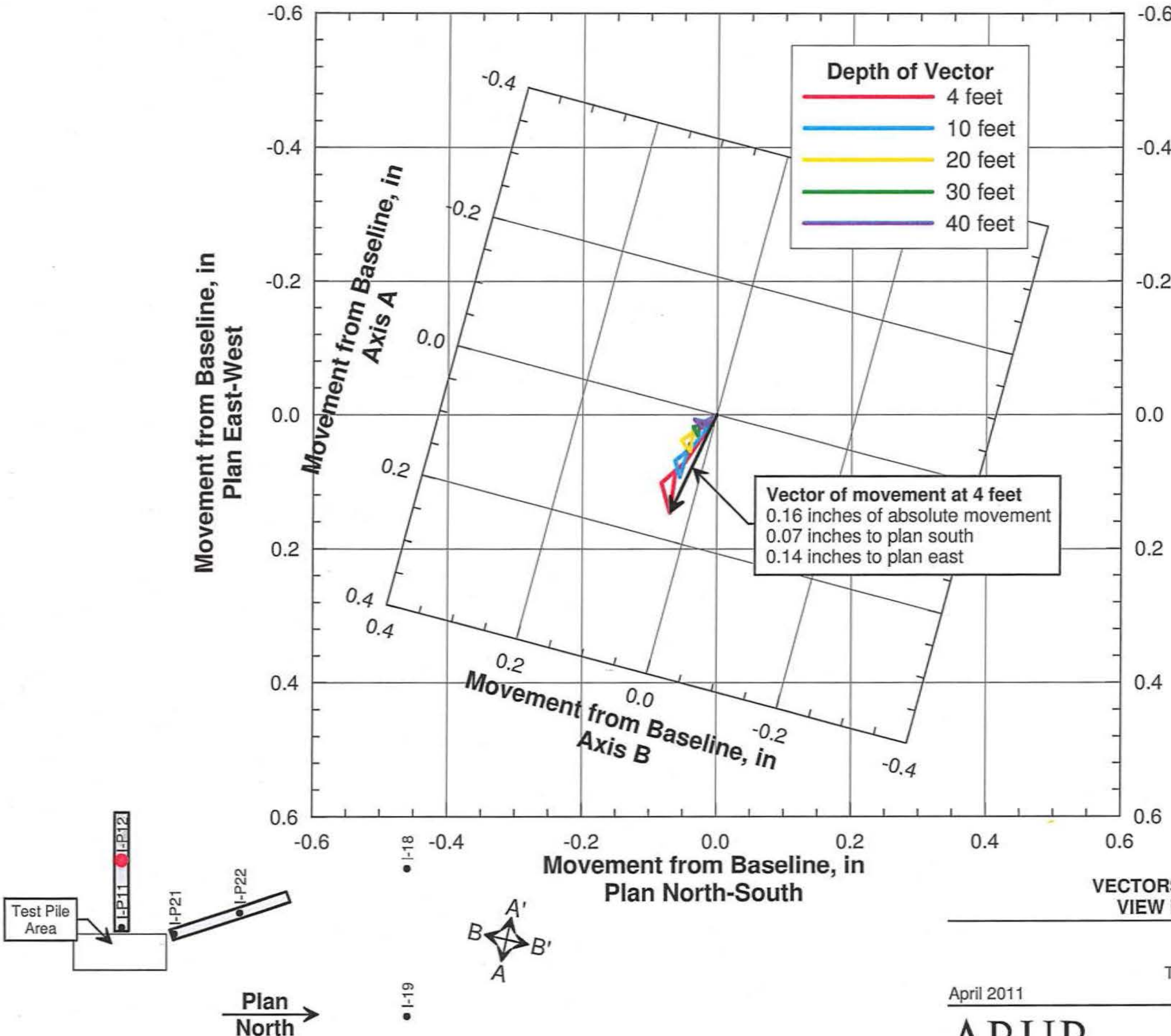
PLATE 5-2

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\122 Pile Extraction Test\Plates\Plate 5-2 Inclinometer IP12 - top 50 feet.grf



VECTORS OF MOVEMENT IN PLAN VIEW FOR INCLINOMETER I-P12

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

April 2011

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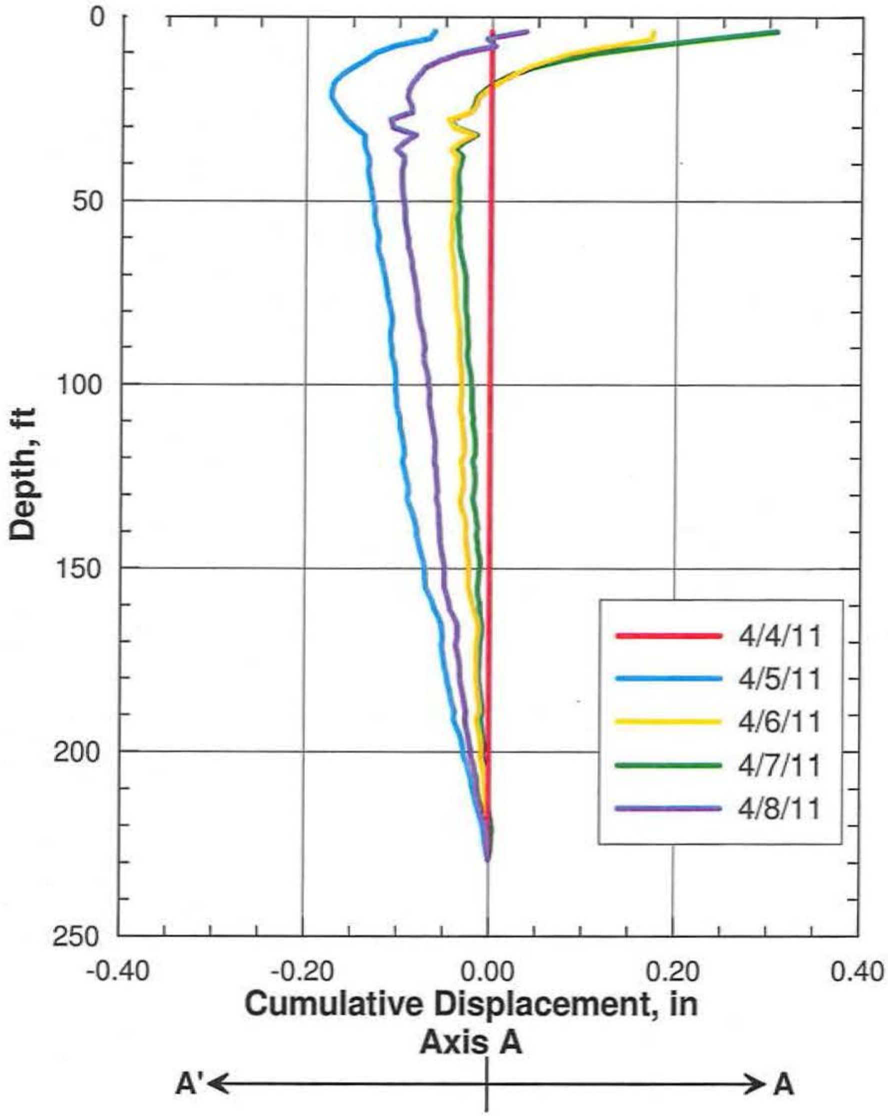
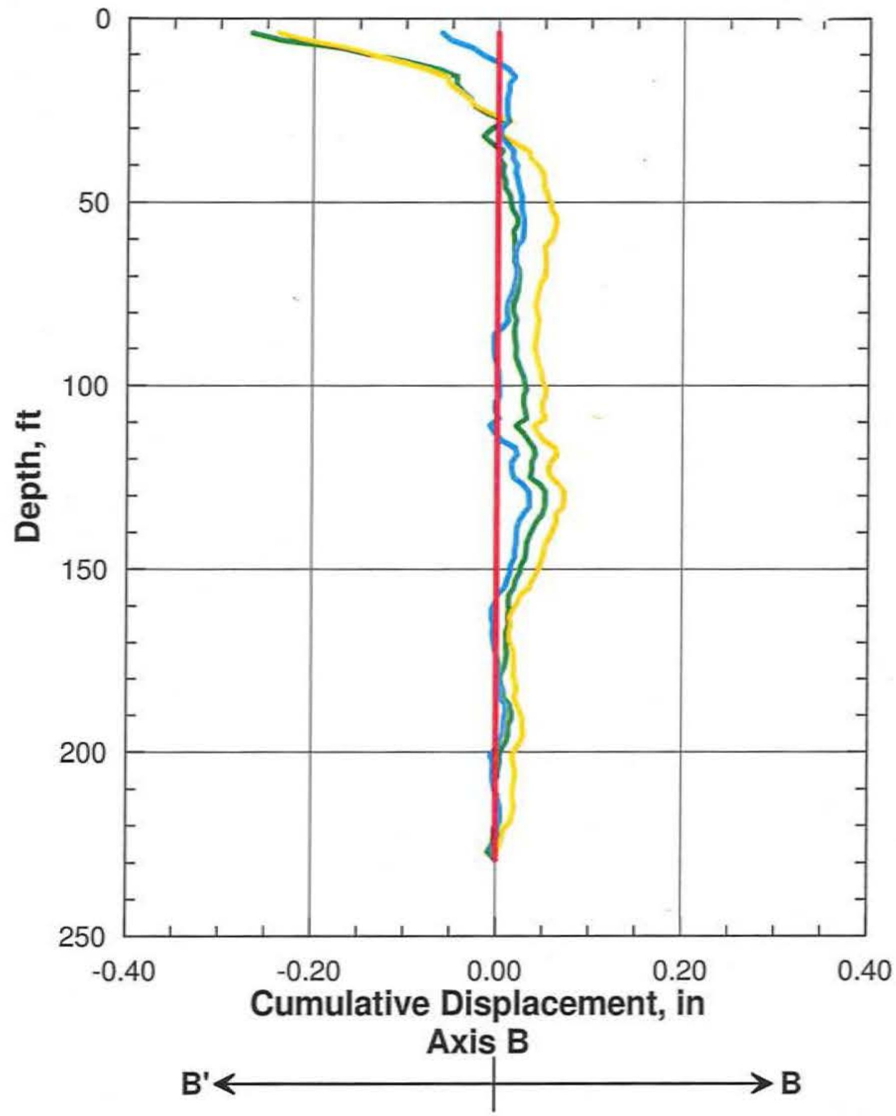
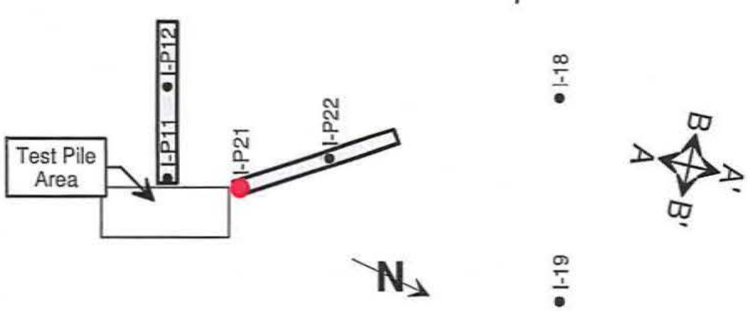
PLATE 5-3

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\122 Pile Extraction Test\Plates\Plate 5-3 Inclinometer IP12 - vectors.grf







INCLINOMETER DATA FOR PILE EXTRACTION
TEST SITE INCLINOMETER READING I-P21

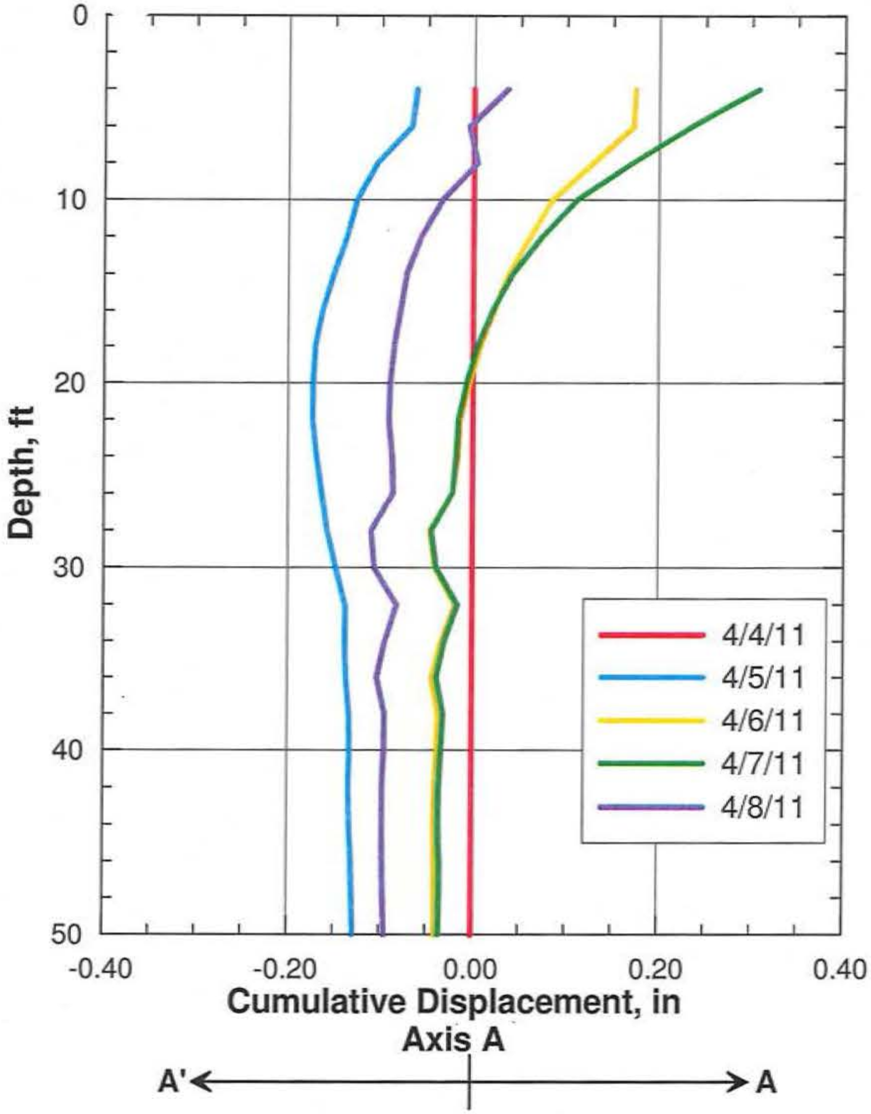
Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

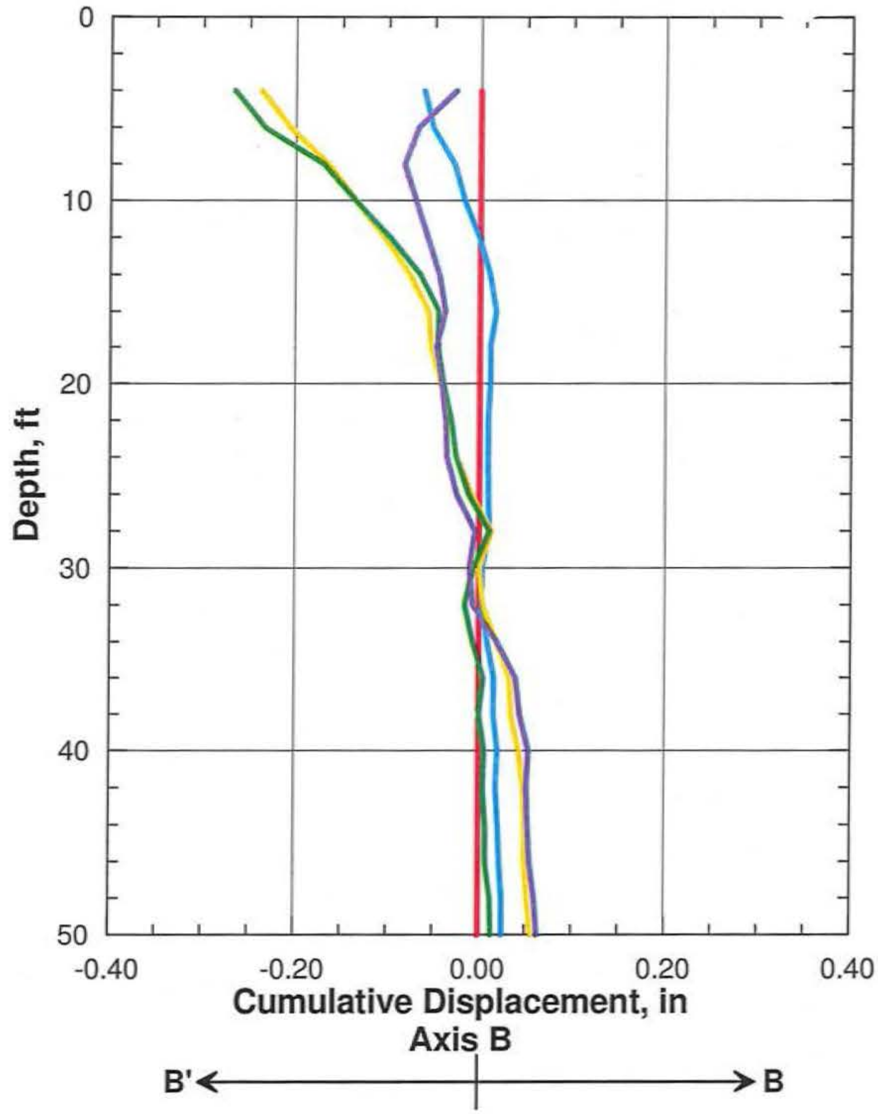
April 2011

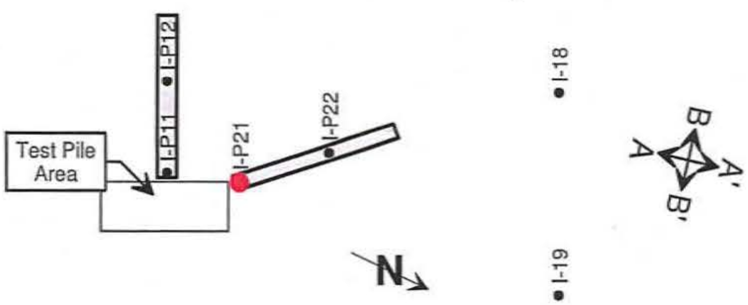
ARUP

PLATE 6-1

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\122 Pile Extraction Test\Plates\Plate 6-1 Inclinometer IP21.grf







INCLINOMETER DATA FOR PILE EXTRACTION TEST SITE INCLINOMETER READING I-P21: TOP 50 FEET OF THE INCLINOMETER ONLY

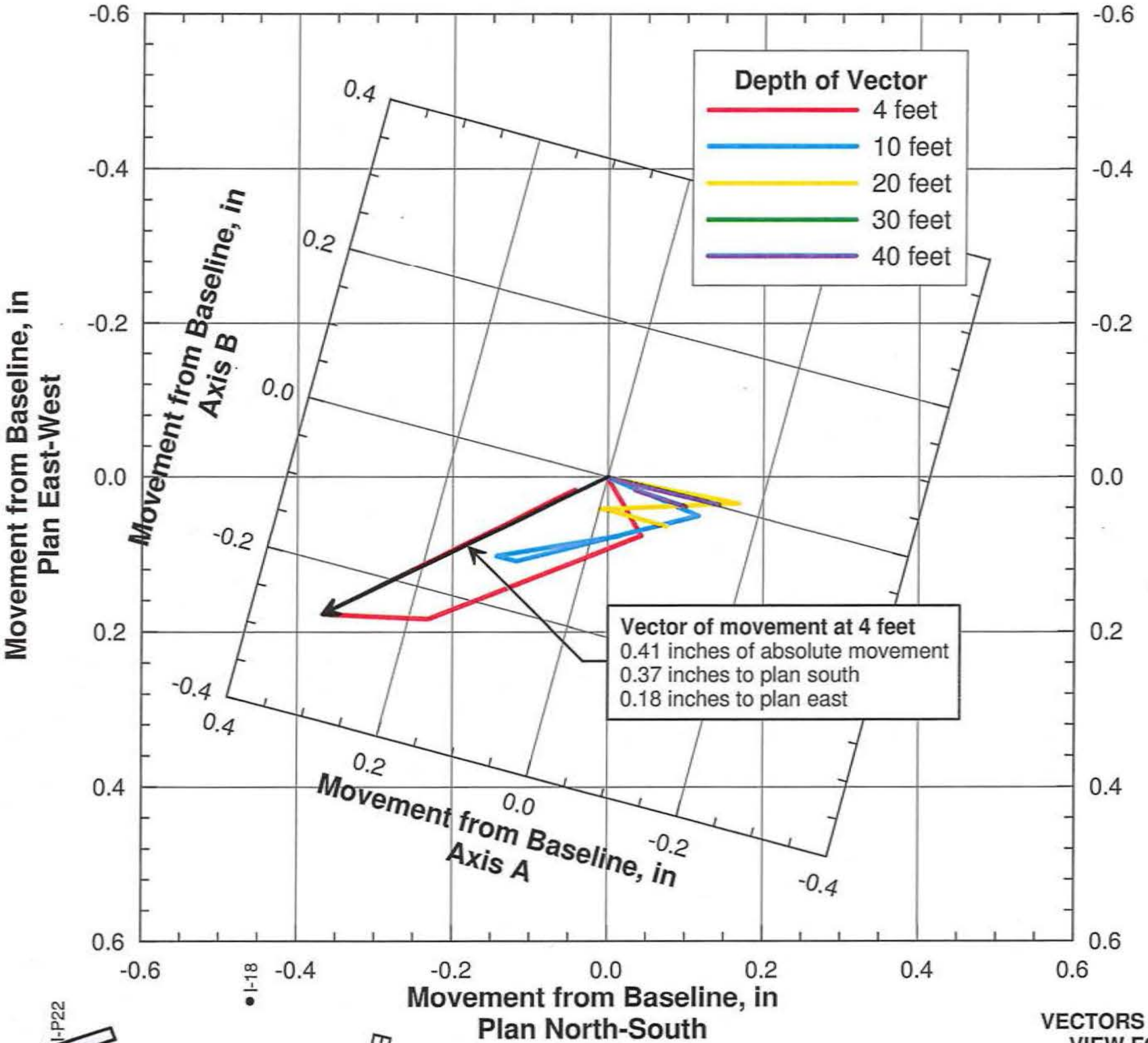
Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

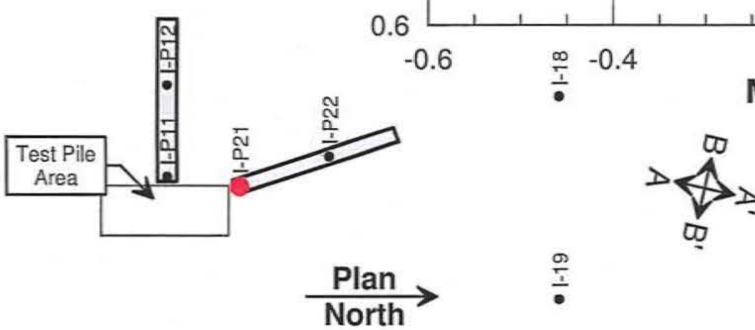
April 2011

ARUP

PLATE 6-2

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\122 Pile Extraction Test\Plates\Plate 6-2 Inclinometer IP21 - top 50 feet.grf





VECTORS OF MOVEMENT IN PLAN VIEW FOR INCLINOMETER I-P21

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

April 2011

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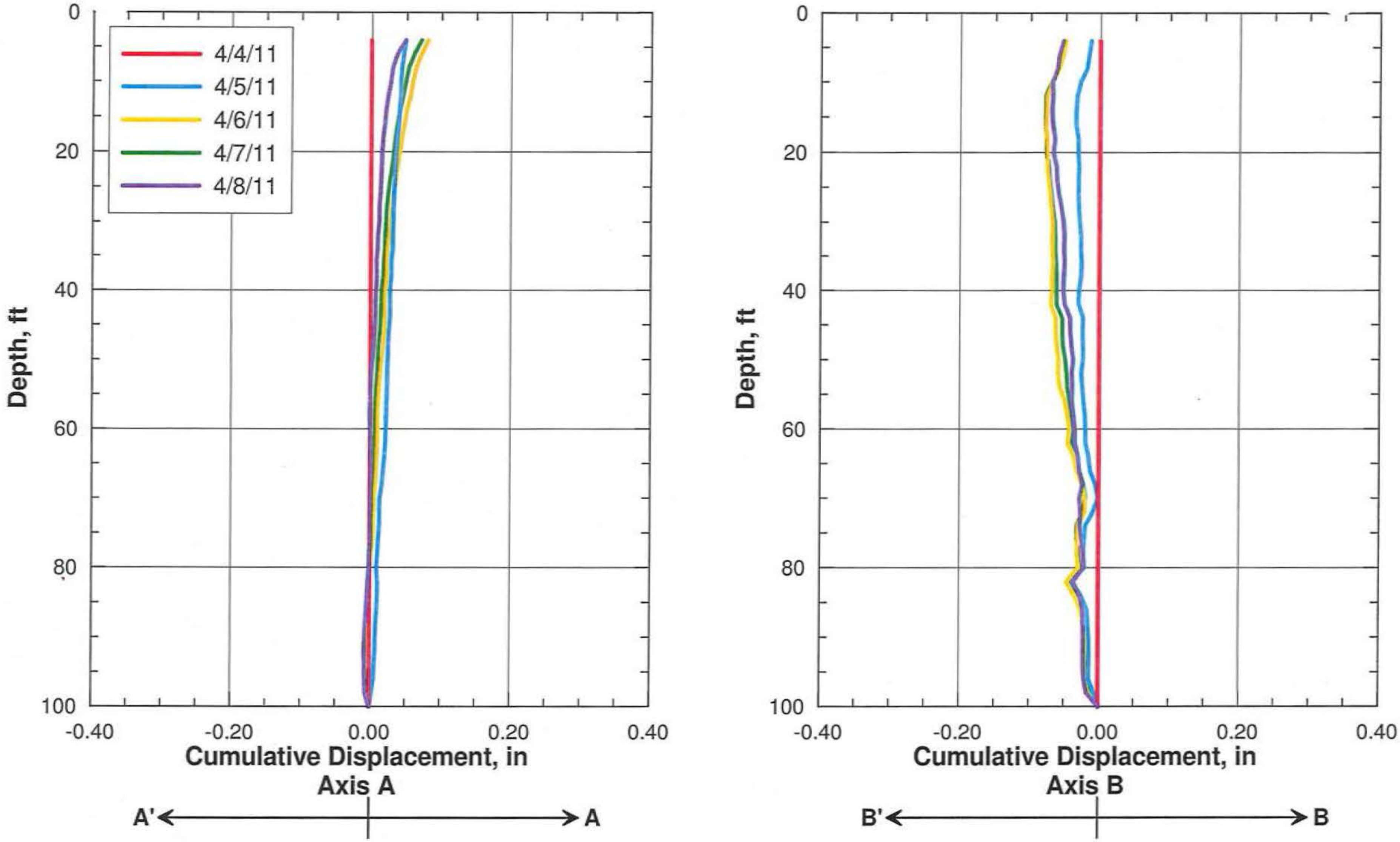
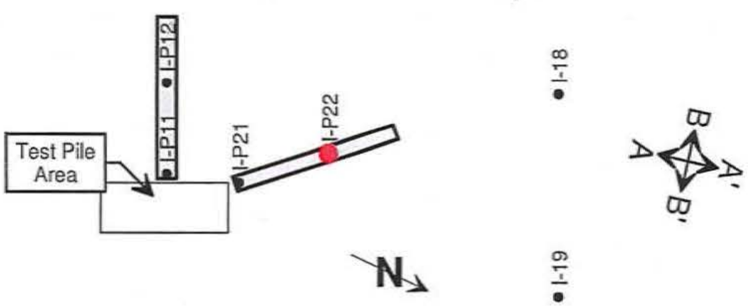
PLATE 6-3





INCLINOMETER DATA FOR PILE EXTRACTION TEST SITE INCLINOMETER READING I-P22

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

April 2011

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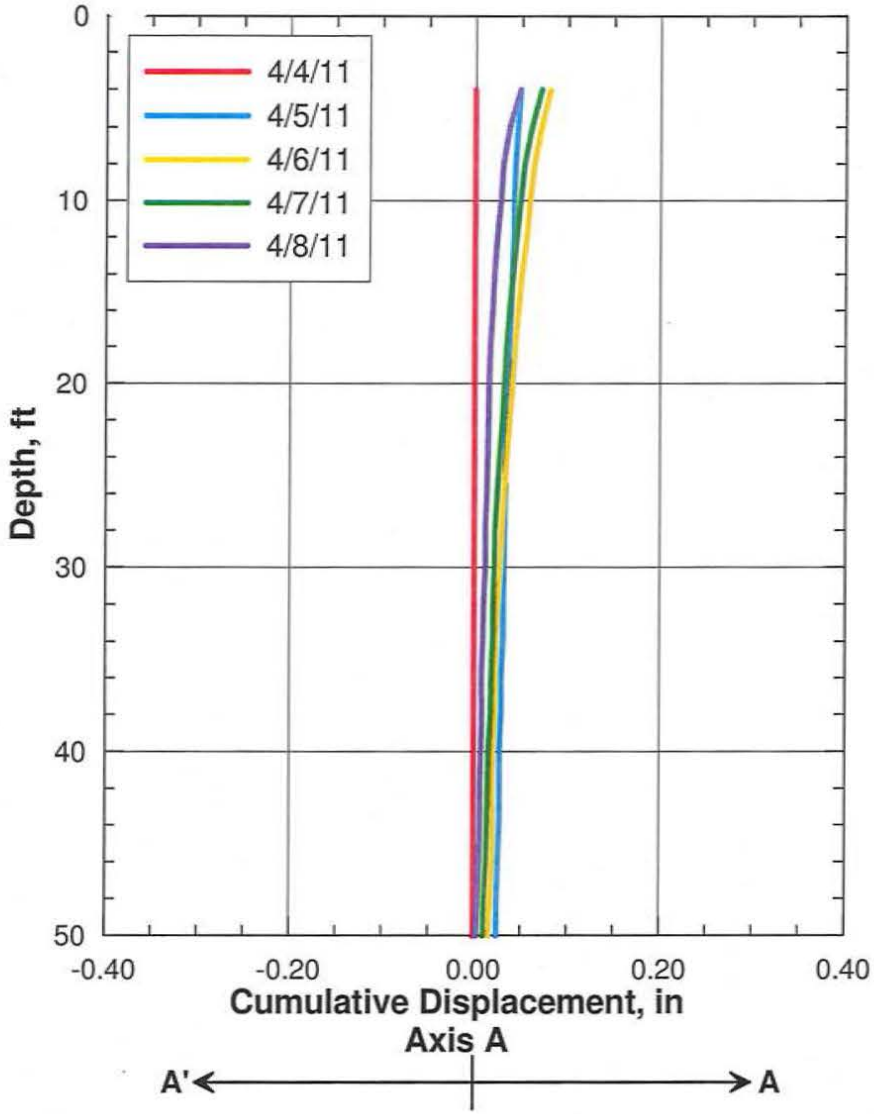
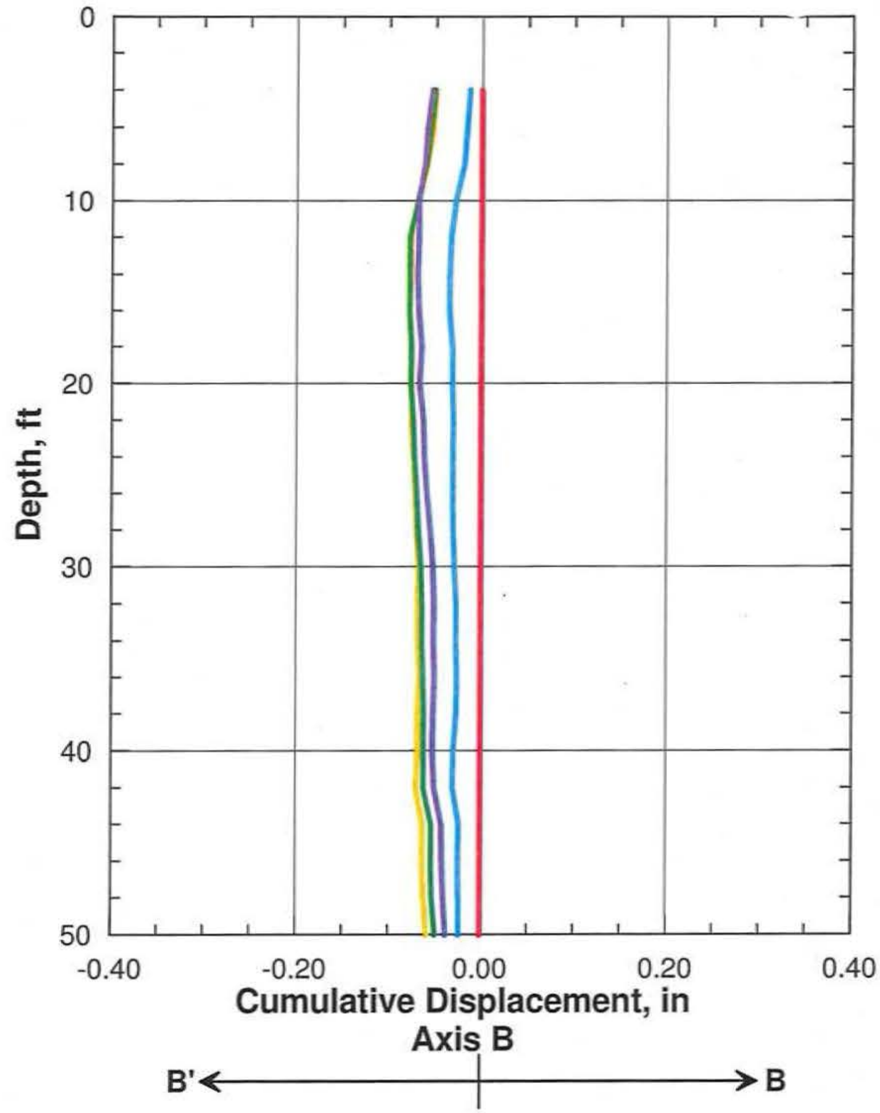
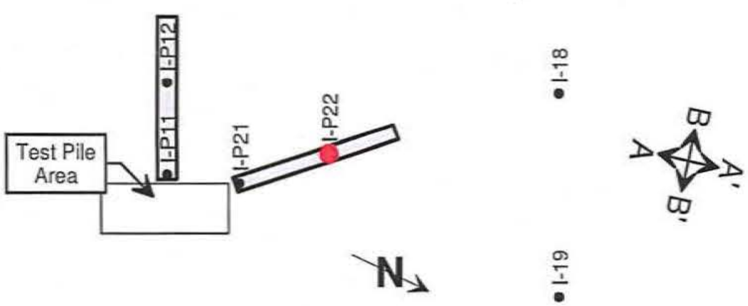
PLATE 7-1

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\122 Pile Extraction Test\Plates\Plate 7-1 Inclinometer IP22.grf







INCLINOMETER DATA FOR PILE EXTRACTION TEST SITE INCLINOMETER READING I-P22: TOP 50 FEET OF THE INCLINOMETER ONLY

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

April 2011

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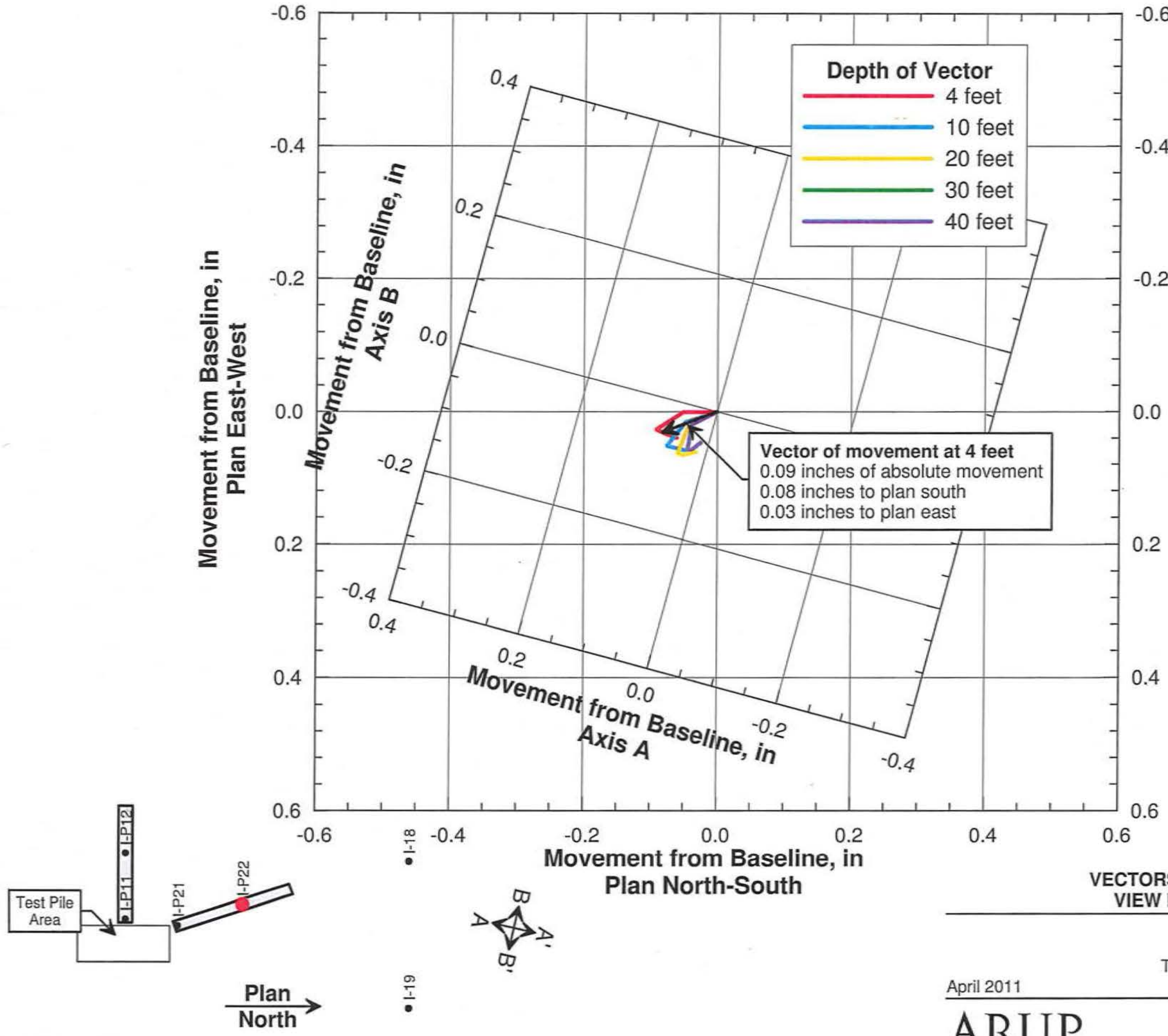
PLATE 7-2

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\122 Pile Extraction Test\Plates\Plate 7-2 Inclinometer IP22 - top 50 feet.grf



VECTORS OF MOVEMENT IN PLAN VIEW FOR INCLINOMETER I-P22

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

April 2011

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PLATE 7-3

Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date**	April 12, 2011
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/SMM
From	Stephen McLandrich (Arup) Nick O'Riordan (Arup) Kevin Clinch (Arup)	**File reference**	4-05 124
Subject	Transbay Transit Center: Results of March 2011 Settlement Survey at 301 Mission Property	**Page 1 of 1**	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated January 5, 2011 with measurements made through March 2010.

List of Plates

Plate 1 Floor Elevations at Level B-1 of 301 Mission Property: Periodic Survey – March 24, 2010

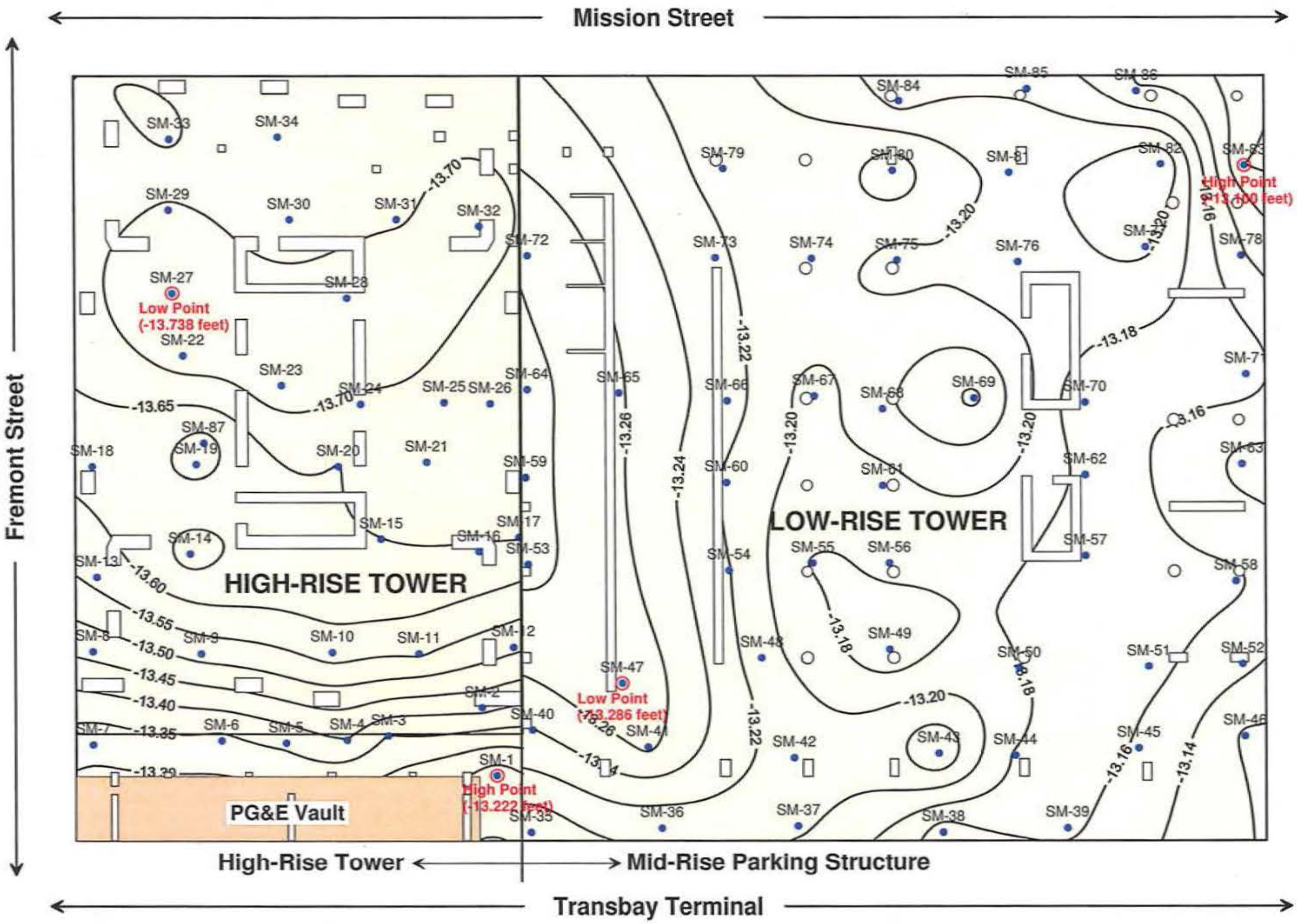
Plate 2 Differential Floor Elevation (Inches) – March 24, 2010 Survey

Plate 3 Contours of Settlements Measured at the First Level Basement of the 301 Mission Street Structure Between April 30, 2009 and March 24, 2010

Plate 4 Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Tower: April 30, 2009 through March 24, 2010.

Plate 5 Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Mid-Rise: April 30, 2009 through March 24, 2010

Plate 6 Settlements of the 301 Mission Tower Including Monitoring During Construction



Date of Survey Reading:
March 24, 2011

Legend:

SM-83 • Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	Low-Rise Tower
0.515 feet (6.185 inches)	0.186 feet (2.228 inches)

N

0 25 50 75

Approximate Scale: 1" = 25'

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on March 24, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY: PERIODIC SURVEY - MARCH 24, 2011

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

April 2011

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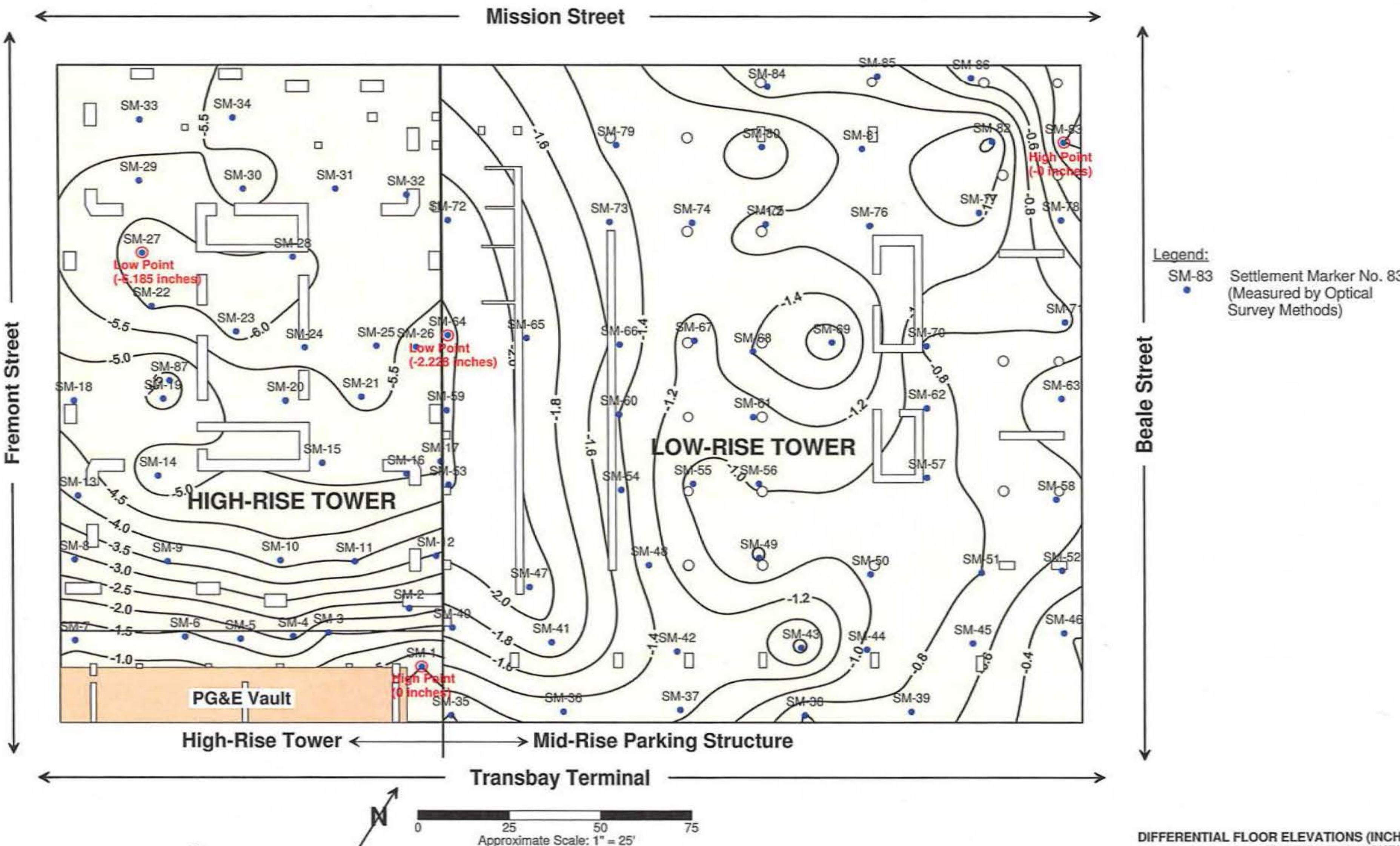
PLATE 1

Q:\132242\4 Internal Project Data\4-11 Field Work\4-11-08 Existing Building Surveys\Existing Buildings\301 Mission\Monitoring Program\Settlement Markers\2011.03.24 Measurements\Elevations All (2011.03.24).srf



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on March 24, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
MARCH 24, 2011 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

April 2011

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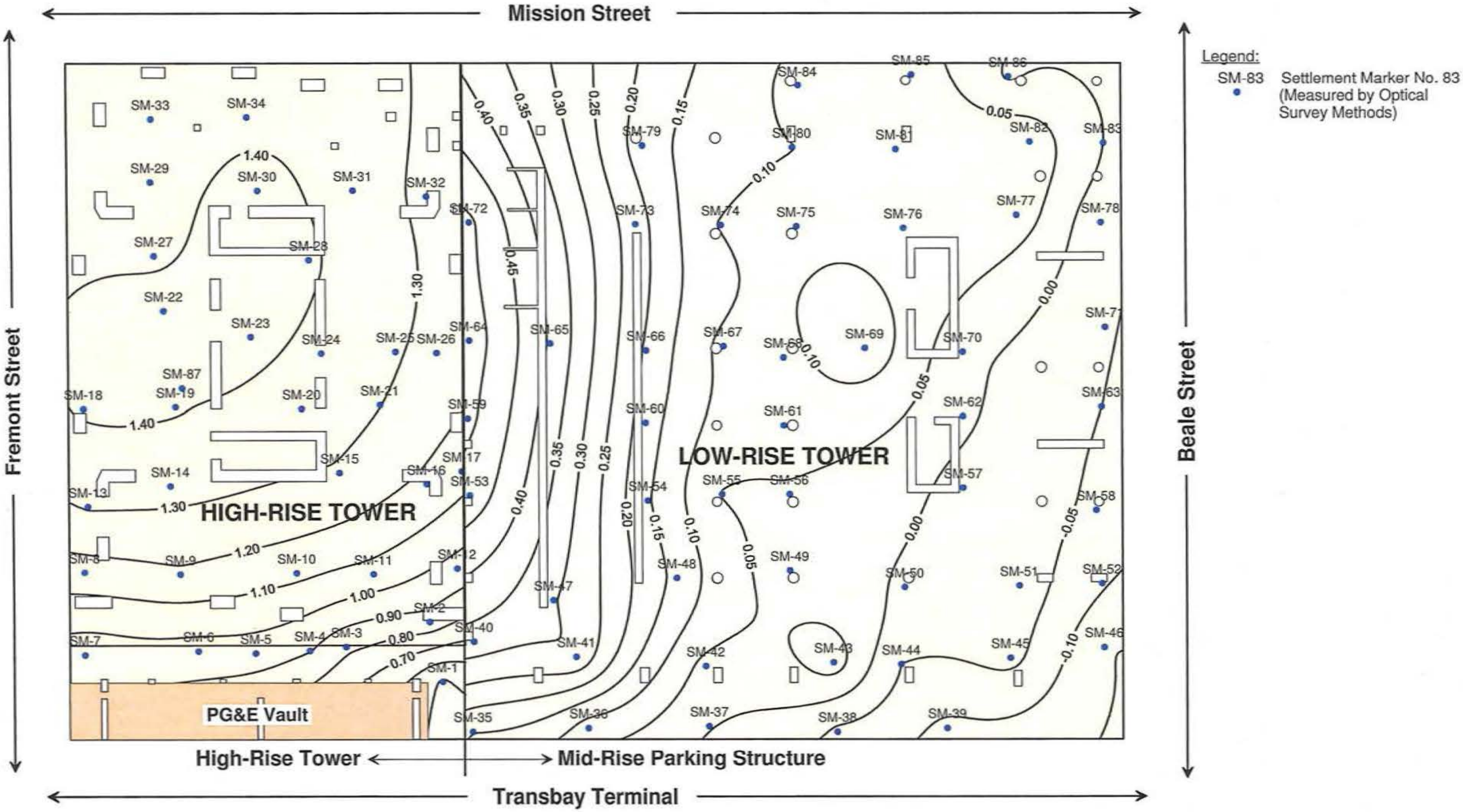
PLATE 2



N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on March 24, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE FIRST LEVEL BASEMENT OF THE 301 MISSION STREET STRUCTURE BETWEEN APRIL 30, 2009 AND MARCH 24, 2011

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

April 2011

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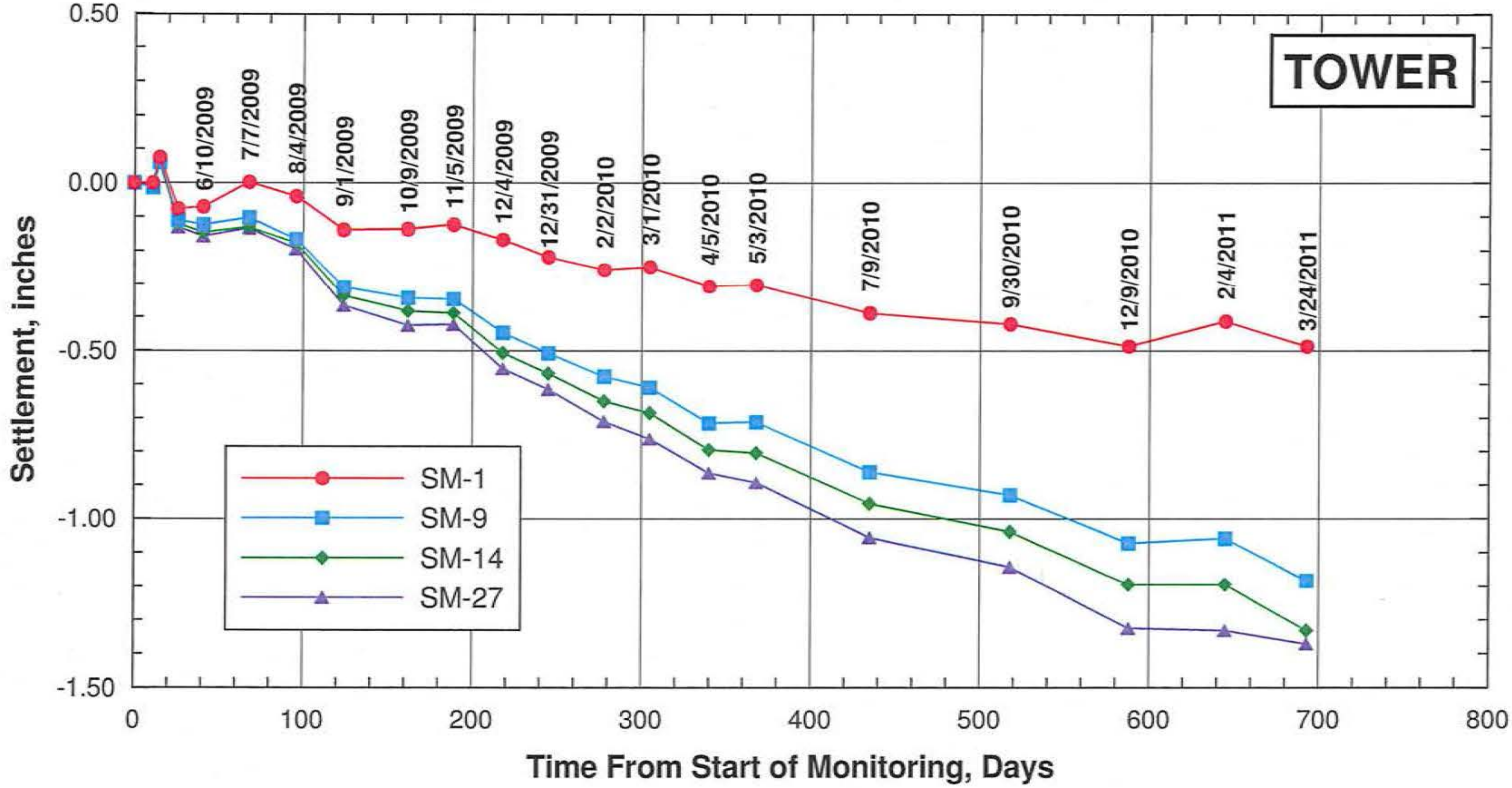
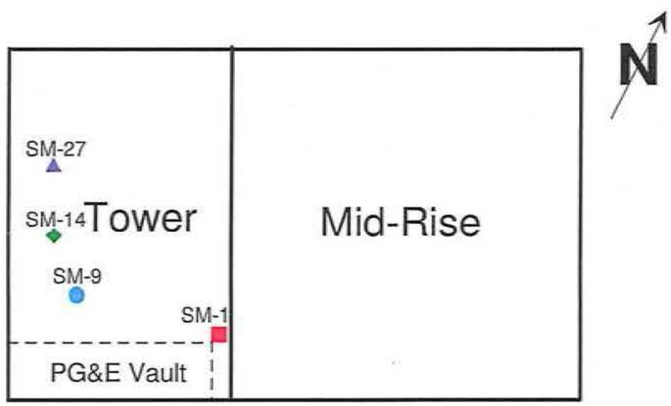
PLATE 3

Q:\132242\4 Internal Project Data\4-11 Field Work\4-11-08 Existing Building Surveys\Existing Buildings\301 Mission\Monitoring Program\Settlement Markers\2011.03.24 Measurements\Elevation changes All (2011.03.24).srf





Note:
Initial (Baseline) reading taken on 04/30/09

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\124 301 Mission - March Survey\Plates\Plate 4 Settlement Over Time - Tower.grf

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH MARCH 24, 2011

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

April 2011

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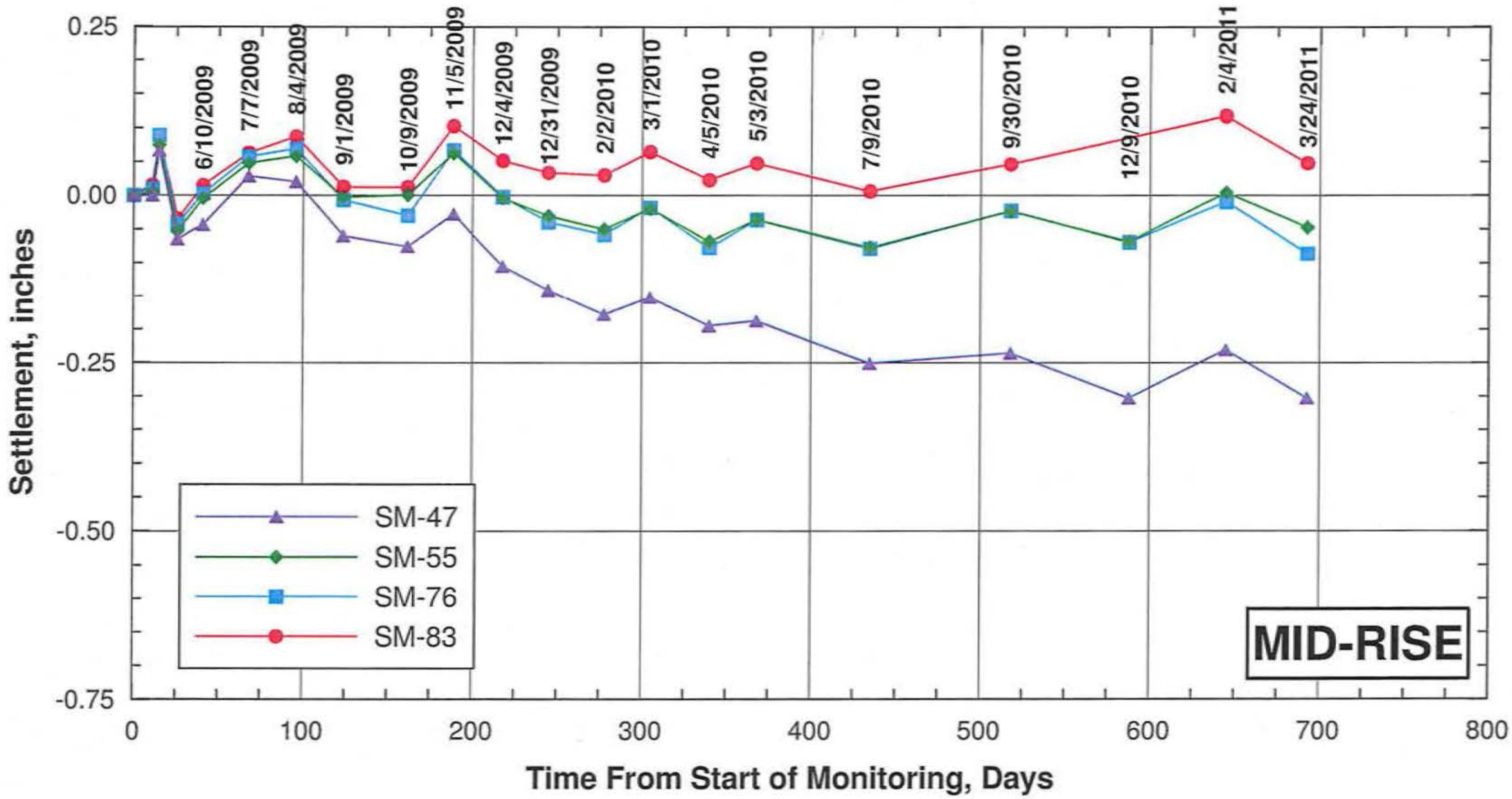
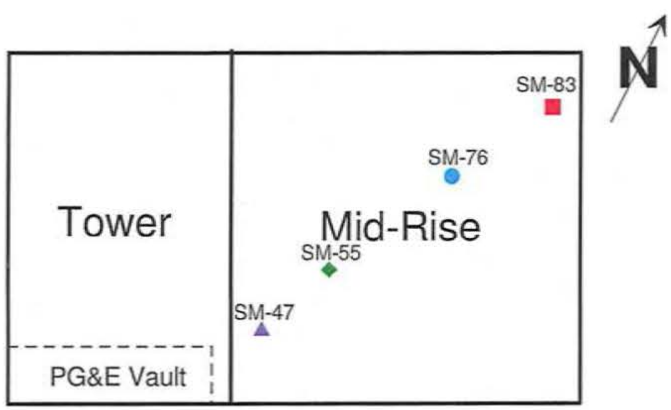
PLATE 4





Note:
Initial (Baseline) reading taken on 04/30/09

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\124 301 Mission - March Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH MARCH 24, 2011

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

April 2011

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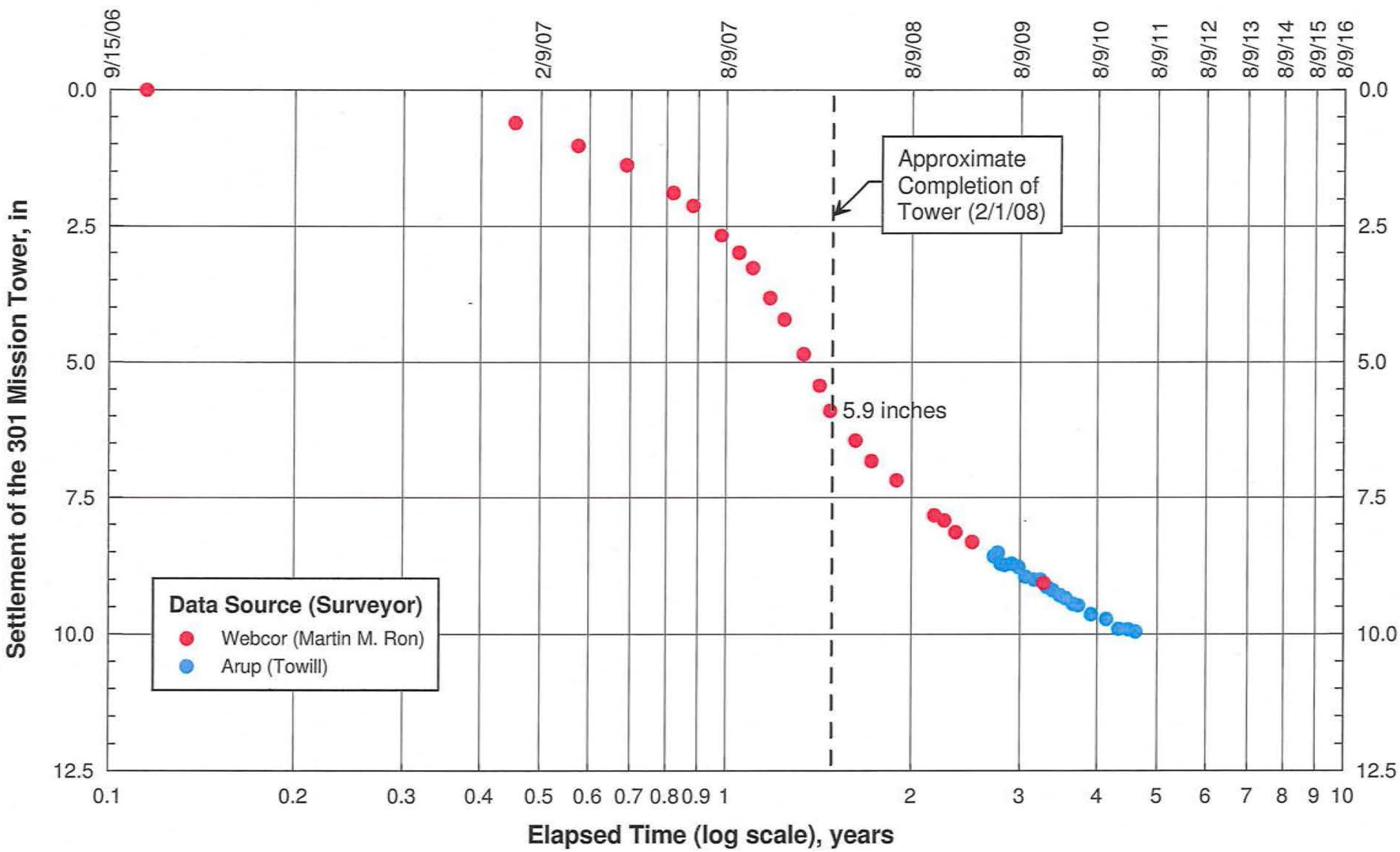
PLATE 5



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

April 2011

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PLATE 6

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\124 301 Mission - March Survey\Plates\Plate 6 Tower Settlements.grf

Memorandum

ARUP

To	Brian Dykes	Date	May 9, 2011
Copies	George Metzger Randy Volenec	Reference number	132242/smm
From	Stephen McLandrich x 27245 (San Francisco)	File reference	4-05 131
Subject	Transbay Transit Center - Inclinometer Response to Production Pile Pulling in Zone 4		

Arup has installed two inclinometers along the interface between the 301 Mission tower and the Transbay Transit Center (TTC) project. These inclinometers were installed prior to the extraction of pile foundations of the recently demolished Transbay Terminal. This memorandum transmits the measured movements to date of the two inclinometers installed.

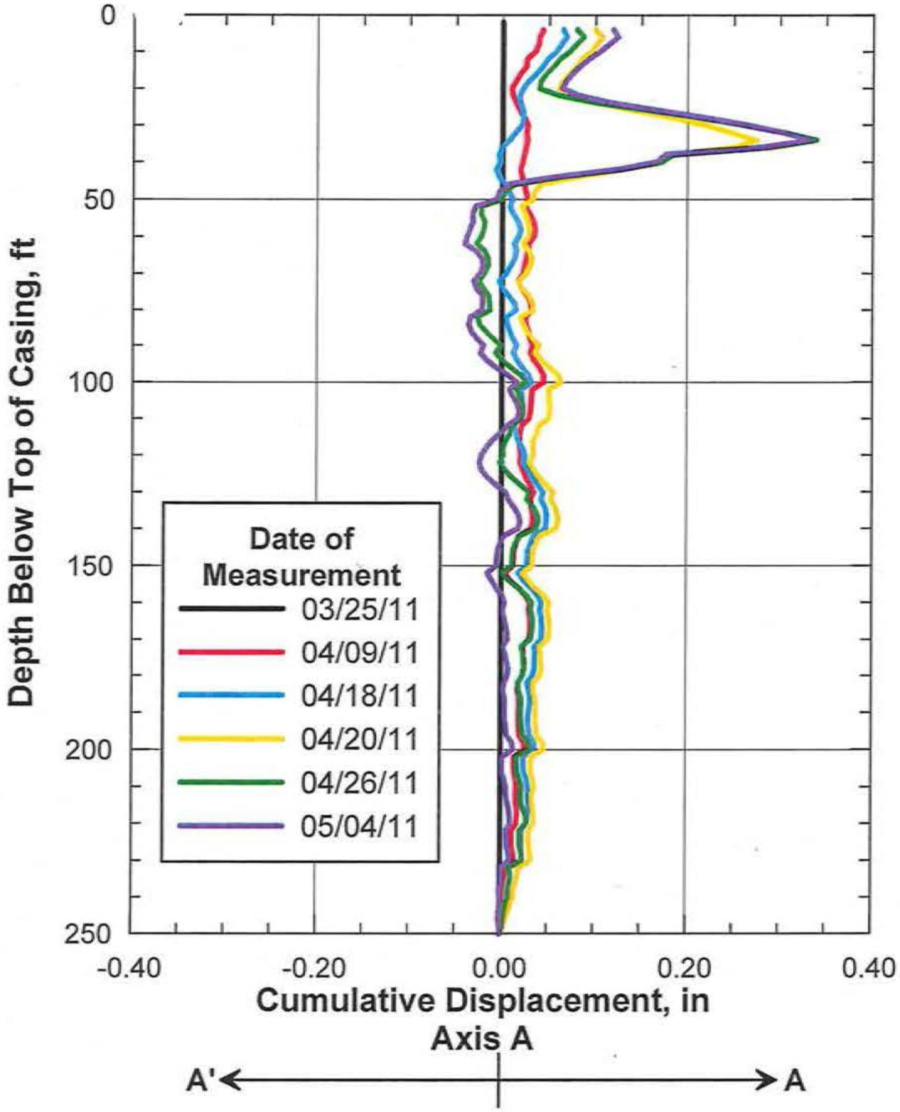
Plates 1-1 and 2-1 illustrate the lateral deflection measured in each inclinometer. The movements are measured over two axes described as A-A' and B-B'. The orientations of these axes are shown in the small figure at the bottom of the plate.

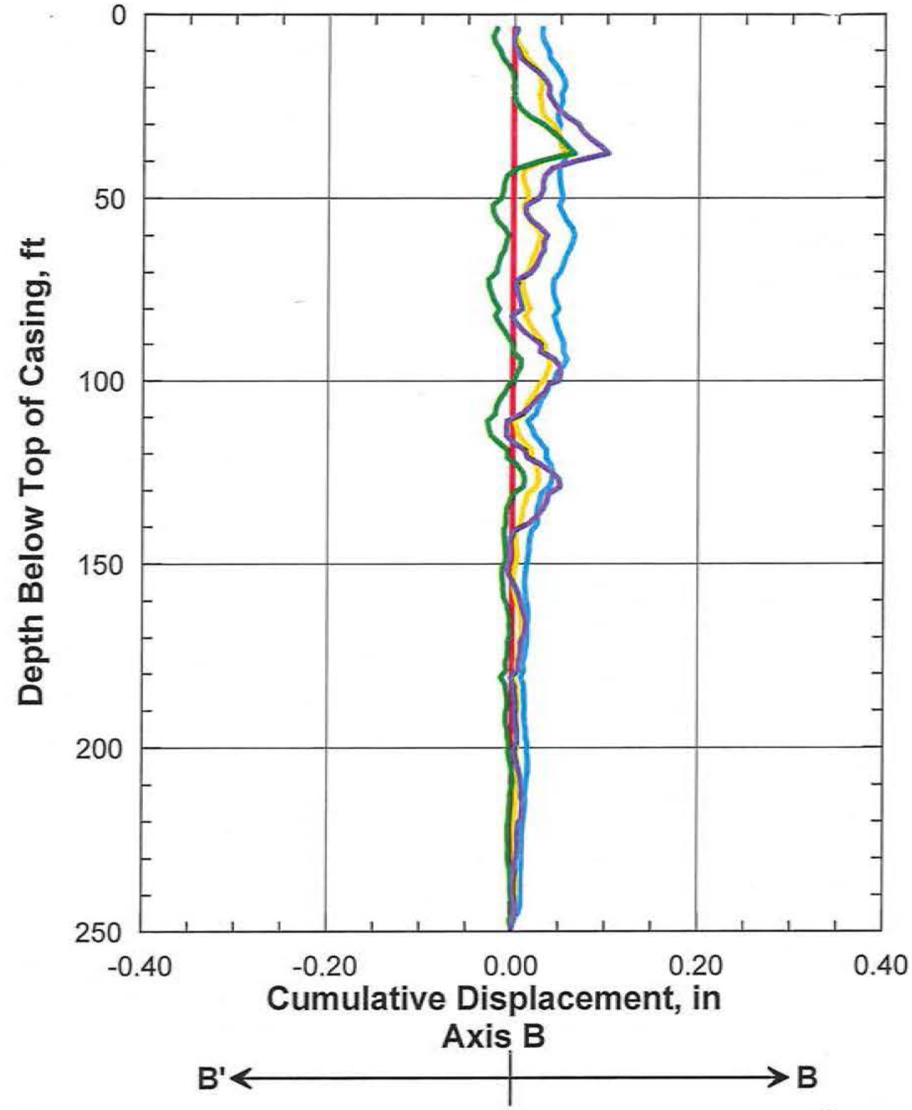
Plates 1-2 and 2-2 show two-dimensional vectors of movement at different depths. These vectors represent the movement as viewed from above over time. Each curve begins at the center or baseline reading and move along the line drawn until the final location which is represented as the end of the line.

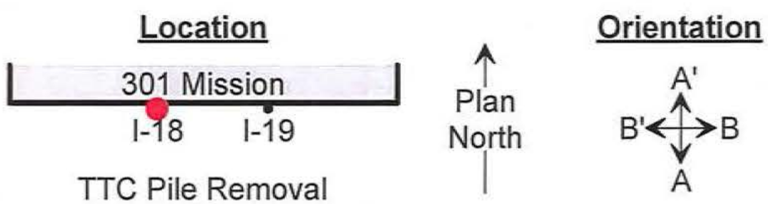
There is a readily observable change in movement at about 35 feet depth which takes place between the measurements on April 18, 2011 and April 20, 2011. Construction activities on-site over this period were the pulling of the two rows of existing timber piles directly adjacent to the 301 Mission tower.

Overall, the lateral movements recorded to date are within the tolerances prescribed in the Specification.

Additional inclinometer readings have been taken which are not shown in Plates 1-1 and 2-1. These were removed for clarity as many of the measurements show no movement from the previous measurements.







\\S-fnas01\jobsif\132242\4 Internal Project Data\4-11 Field Work\4-11-11 Instrumentation\Pile Removal Site Observation\Inclinometer\Inclinometer I-18.grf

INCLINOMETER DATA FOR PILE EXTRACTION
TEST SITE INCLINOMETER READING I-18

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

May 2011

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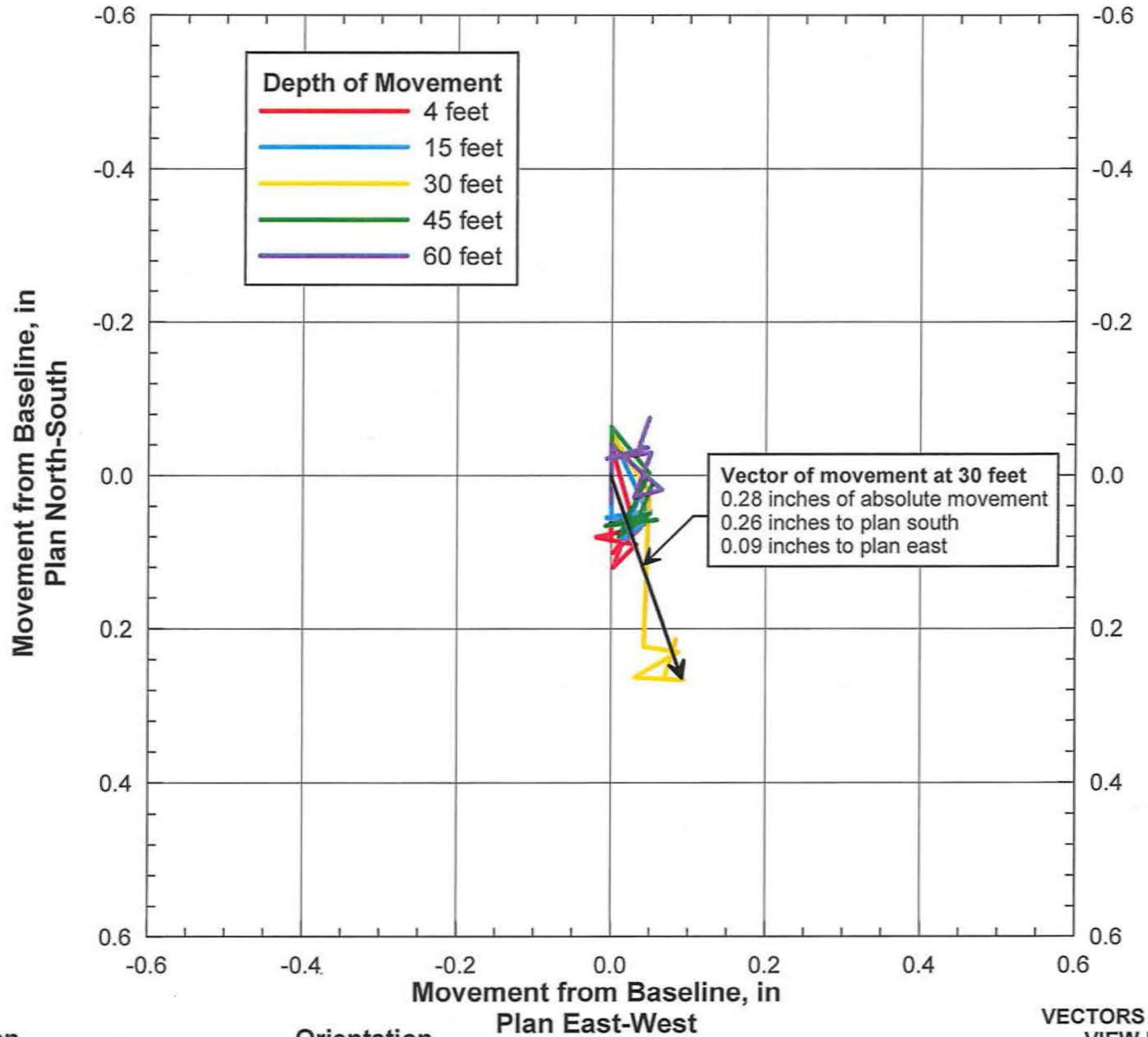
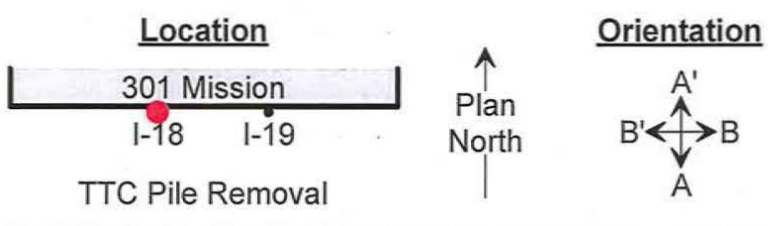
PLATE 1-1





VECTORS OF MOVEMENT IN PLAN VIEW FOR INCLINOMETER I-18

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

May 2011

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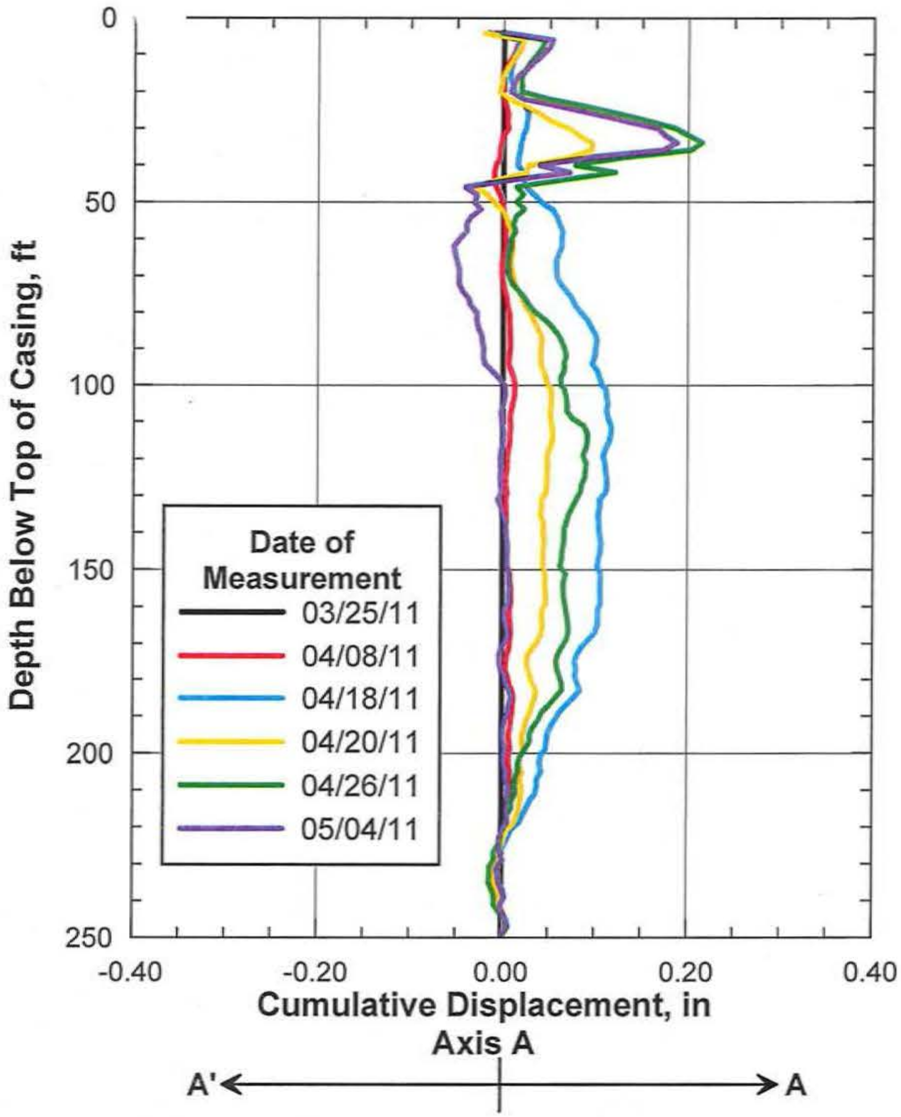
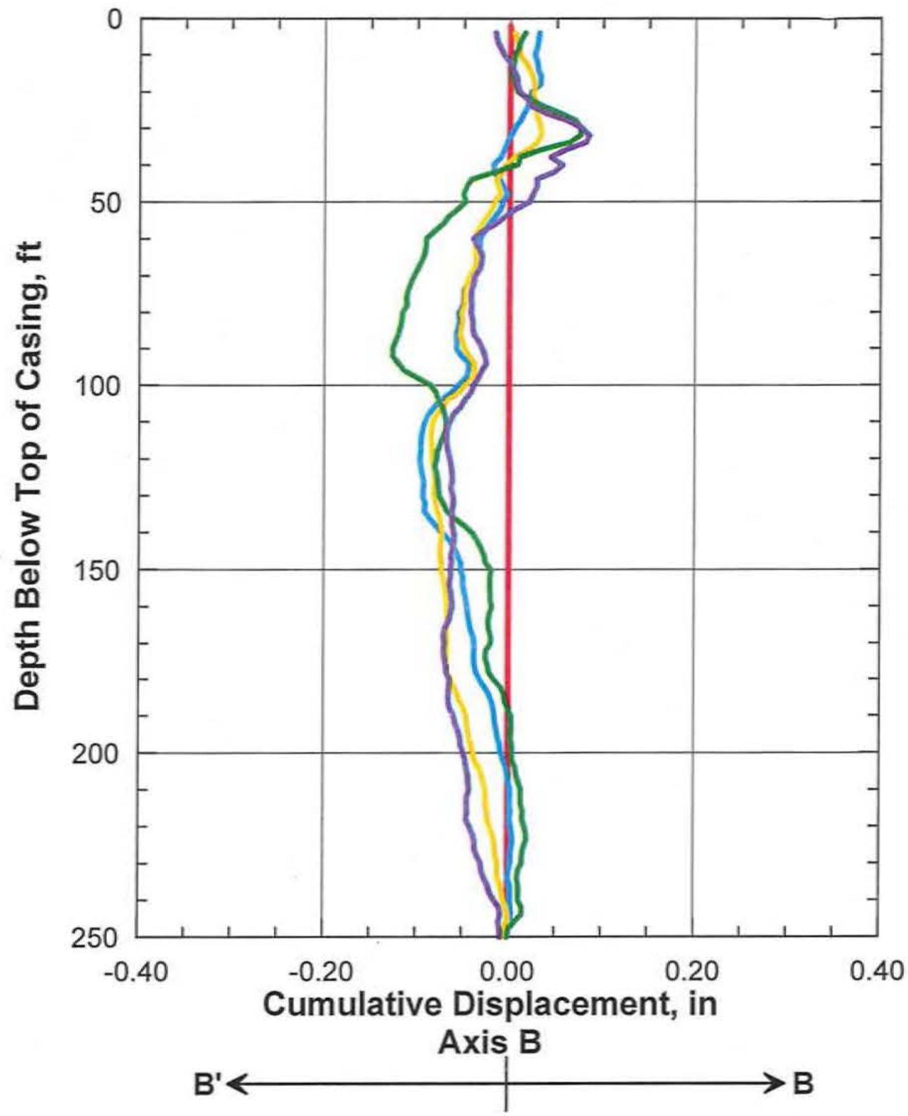
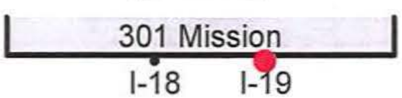
PLATE 1-2

\\S-fnas01\jobsif\132242\4 Internal Project Data\4-11 Field Work\4-11-11 Instrumentation\Pile Removal Site Observation\Inclinometer\Inclinometer I18 - vectors.grf

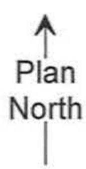




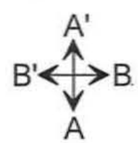
Location



TTC Pile Removal



Orientation



\\S-fnas01\jobsif\132242\4 Internal Project Data\4-11 Field Work\4-11-11 Instrumentation\Pile Removal Site Observation\Inclinometer\Inclinometer I-19.grf

INCLINOMETER DATA FOR PILE EXTRACTION TEST SITE INCLINOMETER READING I-19

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

May 2011

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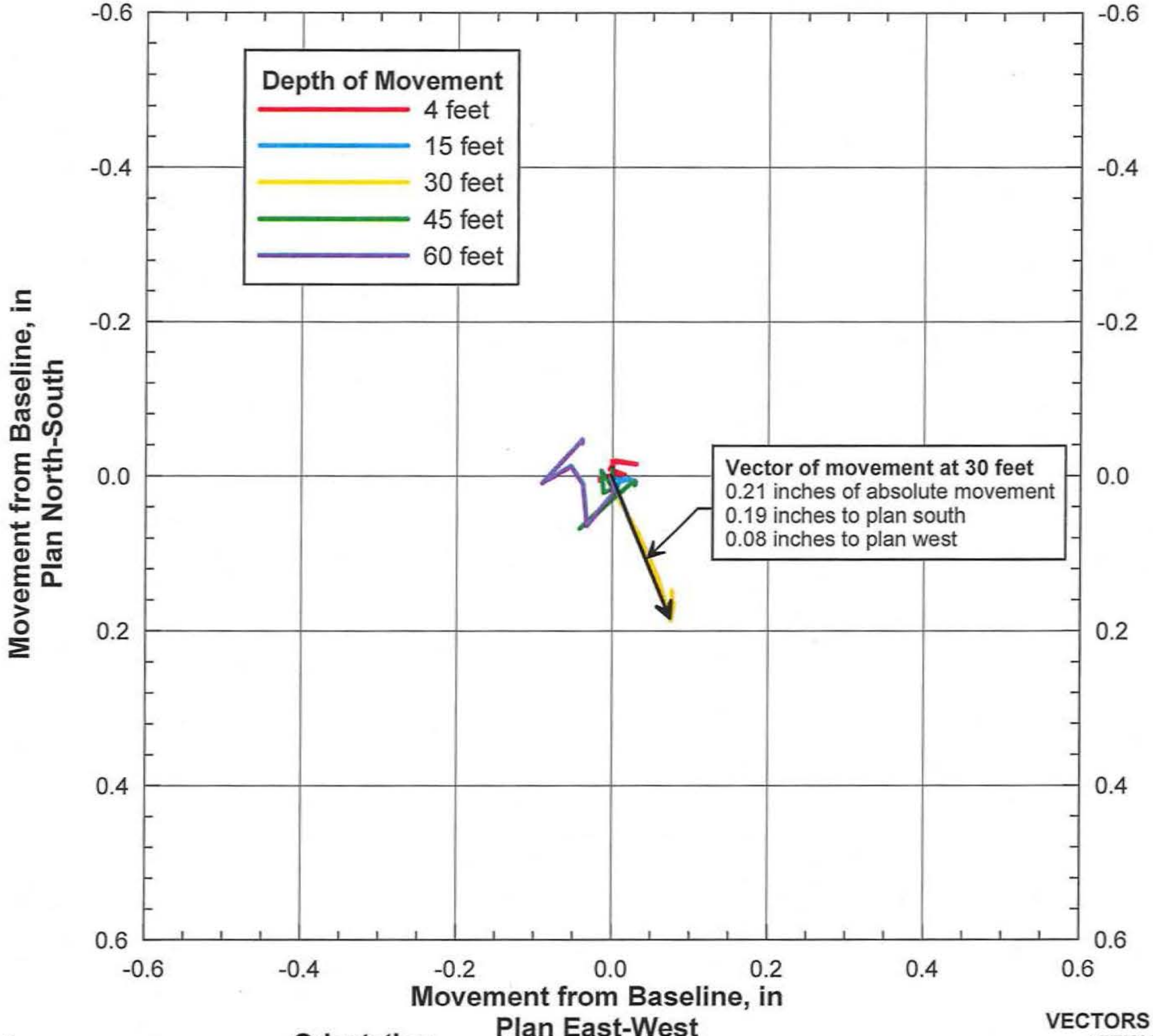
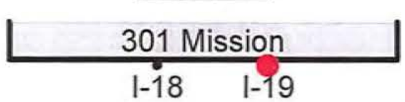
PLATE 2-1



Location



TTC Pile Removal

Plan North

Orientation

A'
B'
B
A

\\S-fnas01\jobsif\132242\4 Internal Project Data\4-11 Field Work\4-11-11 Instrumentation\Pile Removal Site Observation\Inclinometer\Inclinometer I19 - vectors.grf

VECTORS OF MOVEMENT IN PLAN VIEW FOR INCLINOMETER I-19

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

May 2011

ARUP

PLATE 2-2

Memorandum

ARUP

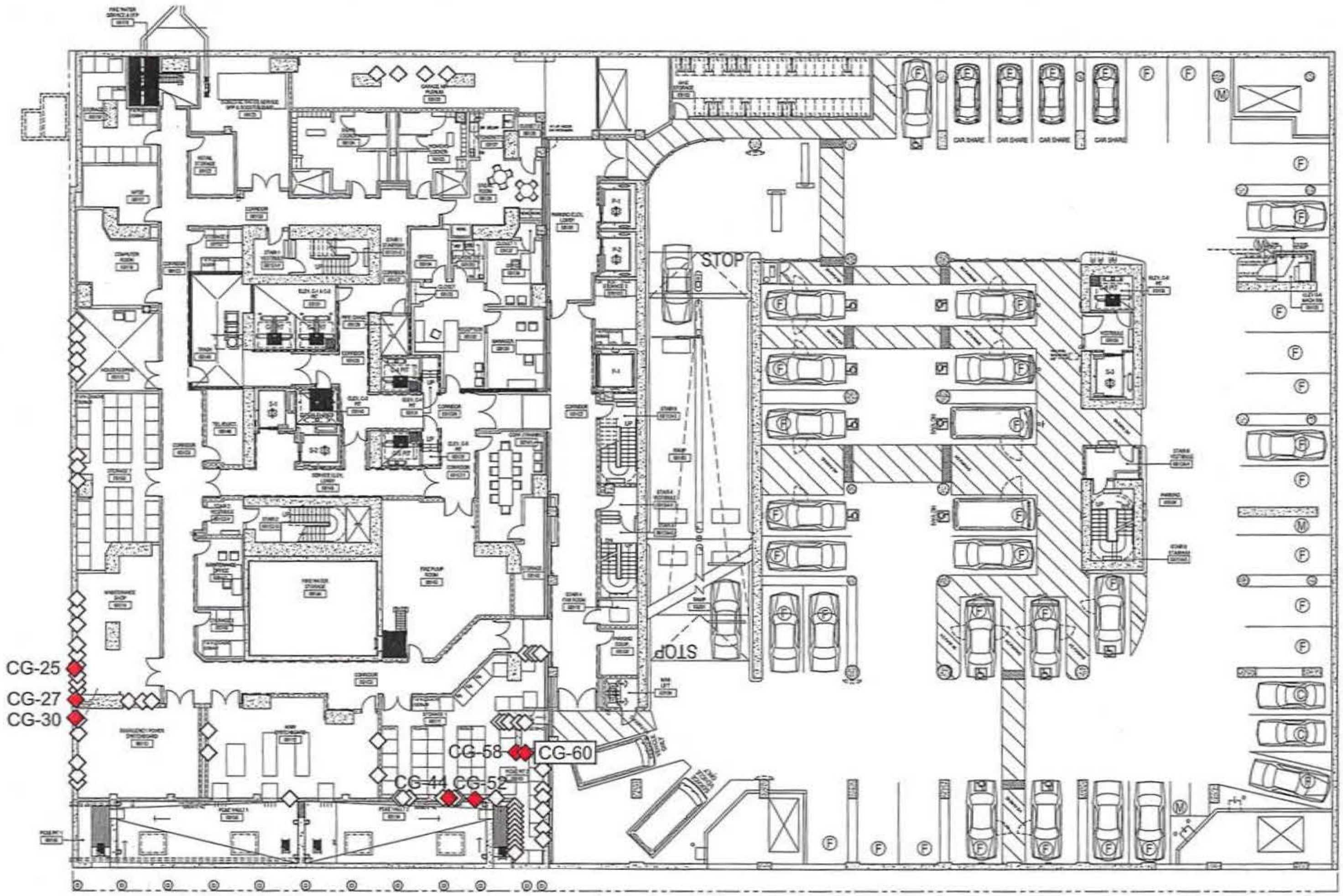
To	Brian Dykes	Date	May 16, 2011
Copies	Randy Volenec George Metzger	Reference number	132242-60/smm
From	Stephen McLandrich x 27245 (SF)	File reference	4-05 133
Subject	Transbay Transit Center - Results of Crack Gauge Survey at 301 Mission: December 9, 2010		

Arup has installed 102 crack gauges in the basement of 301 Mission building to monitor changes in the widths of cracks. These crack gauges were installed near the end of April 2009.

A reading of the crack gauges was conducted on December 9, 2010. During this survey, some of the crack gauges were missing or inaccessible. Most of the gauges were available. For these, a picture was taken of the gauge.

The movement recorded was less than 0.1 millimeters on all of the gauges except for seven of the gauges. For these seven gauges, the attached plate and table describe their location and the recorded movements.

The crack gauges monitored were photographed. These photographs are transmitted along with this memorandum.



LEGEND

◇ Crack Gauge
Mounted across a crack in concrete

Crack Gauge	Distance of Movement	Direction of movement, relative to the Crack
CG-25	0.2 mm 0.4 mm	Perpendicular Parallel
CG-27	0.4 mm	Parallel
CG-30	0.4 mm	Parallel
CG-44	0.2 mm	Perpendicular
CG-52	0.4 mm	Parallel
CG-58	0.2 mm	Perpendicular
CG-60	0.1 mm	Perpendicular

CRACK GAUGES SHOWING MOVEMENT:
301 MISSION STREET BASEMENT LEVEL B-1

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

December 2010

ARUP

PLATE 1

Q:\132242\4 Internal Project Data\4-03 Drawings\Geotech\Instrumentation Plan\301 Mission Instrumentation Plan B-1.ai

TABLE 1
SUMMARY OF CRACK GAUGES
SHOWING MOVEMENT: DECEMBER 9, 2010

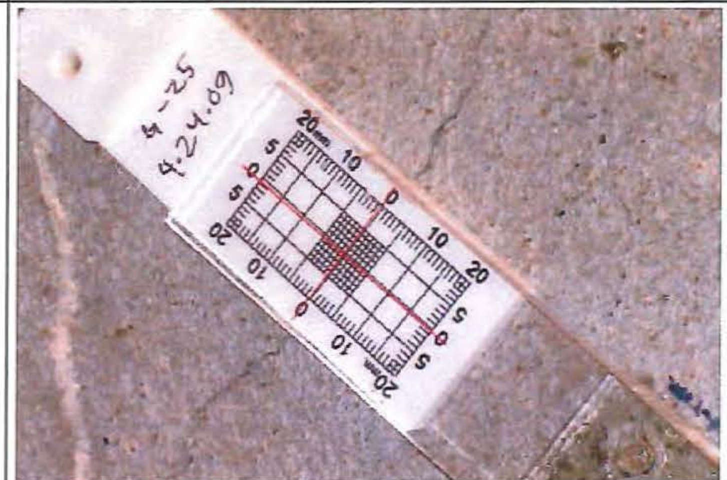
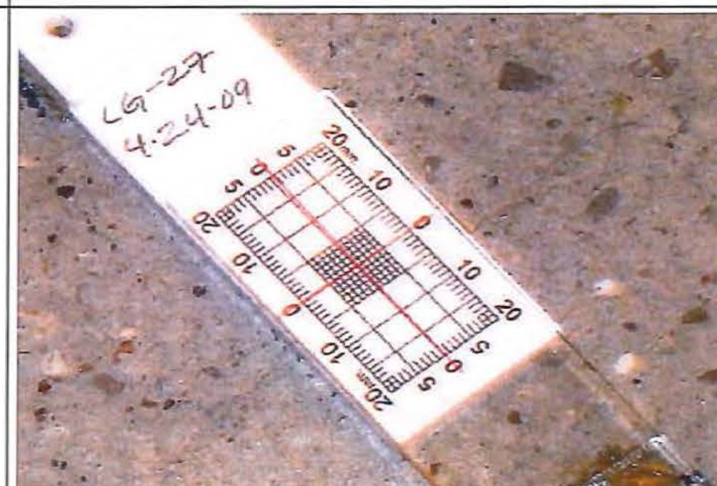
Crack Gauge	Distance of Movement	Direction of movement, relative to the Crack	Picture of Movement
CG-25	0.2 mm 0.4 mm	Perpendicular Parallel	
CG-27	0.4 mm	Parallel	

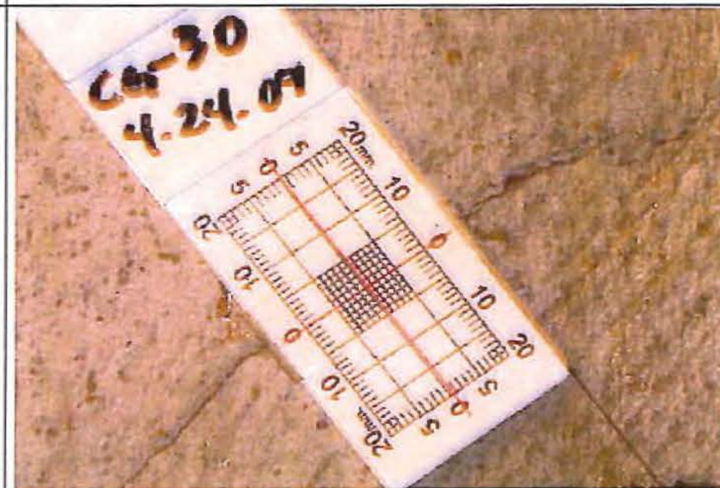
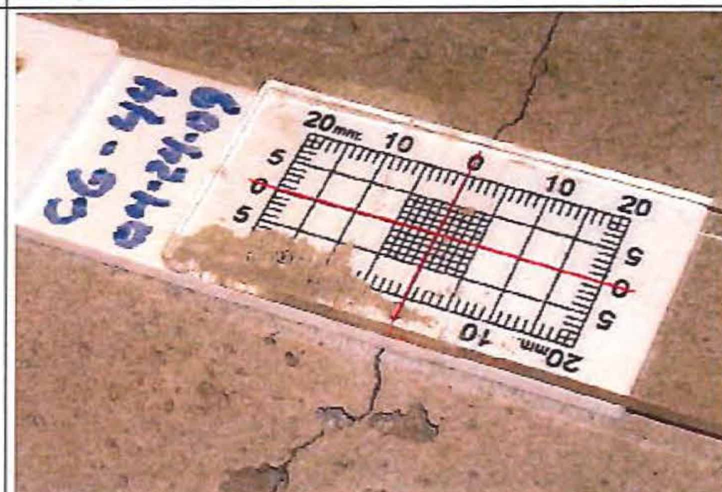
TABLE 1 SUMMARY OF CRACK GAUGES SHOWING MOVEMENT: DECEMBER 9, 2010			
Crack Gauge	**Distance of Movement**	**Direction of movement, relative to the Crack**	**Picture of Movement**
CG-30	0.4 mm	Parallel	
CG-44	0.2 mm	Perpendicular	

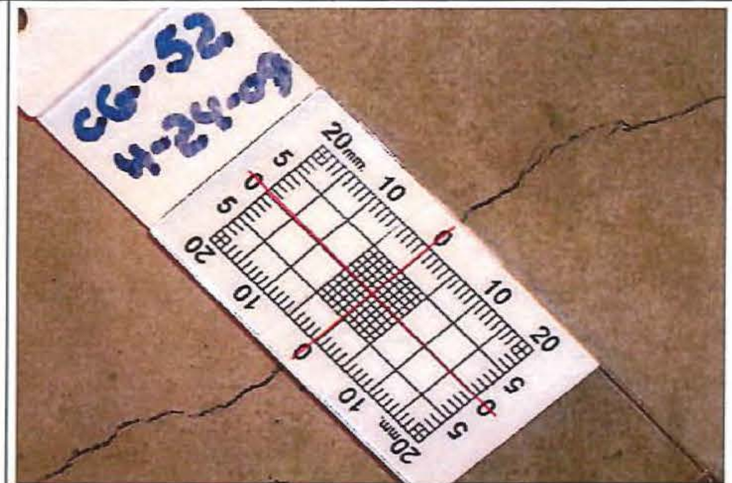
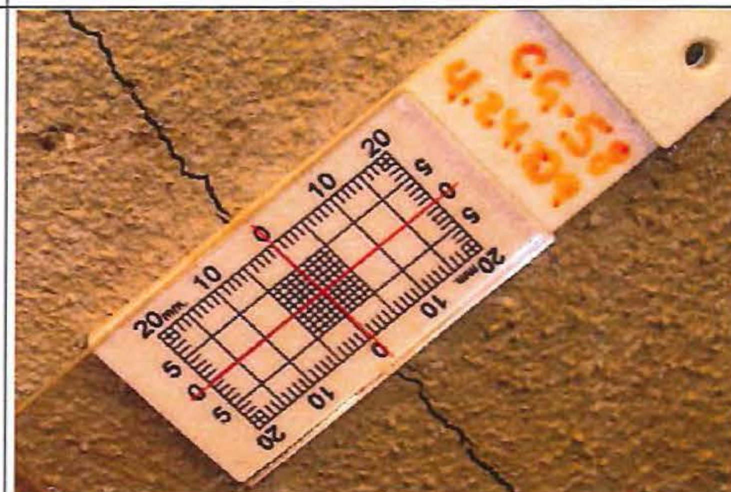
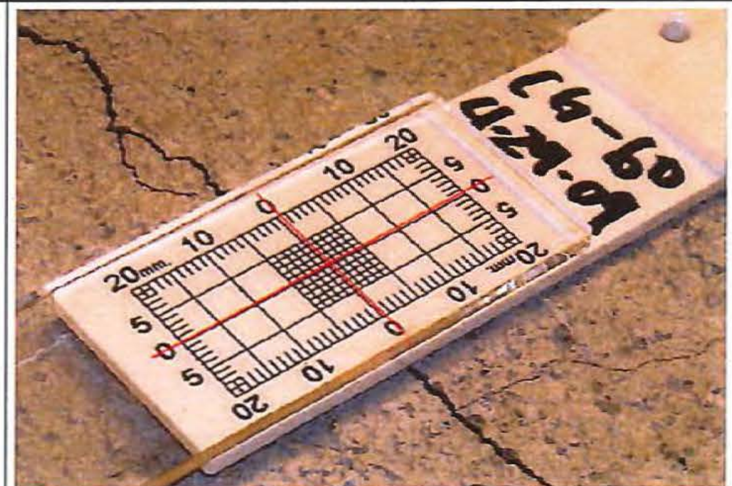
TABLE 1 SUMMARY OF CRACK GAUGES SHOWING MOVEMENT: DECEMBER 9, 2010			
Crack Gauge	**Distance of Movement**	**Direction of movement, relative to the Crack**	**Picture of Movement**
CG-52	0.4 mm	Parallel	
CG-58	0.2 mm	Perpendicular	

TABLE 1
SUMMARY OF CRACK GAUGES
SHOWING MOVEMENT: DECEMBER 9, 2010

Crack Gauge	Distance of Movement	Direction of movement, relative to the Crack	Picture of Movement
CG-60	0.1 mm	Perpendicular	 Head on photograph was not available.

Memorandum

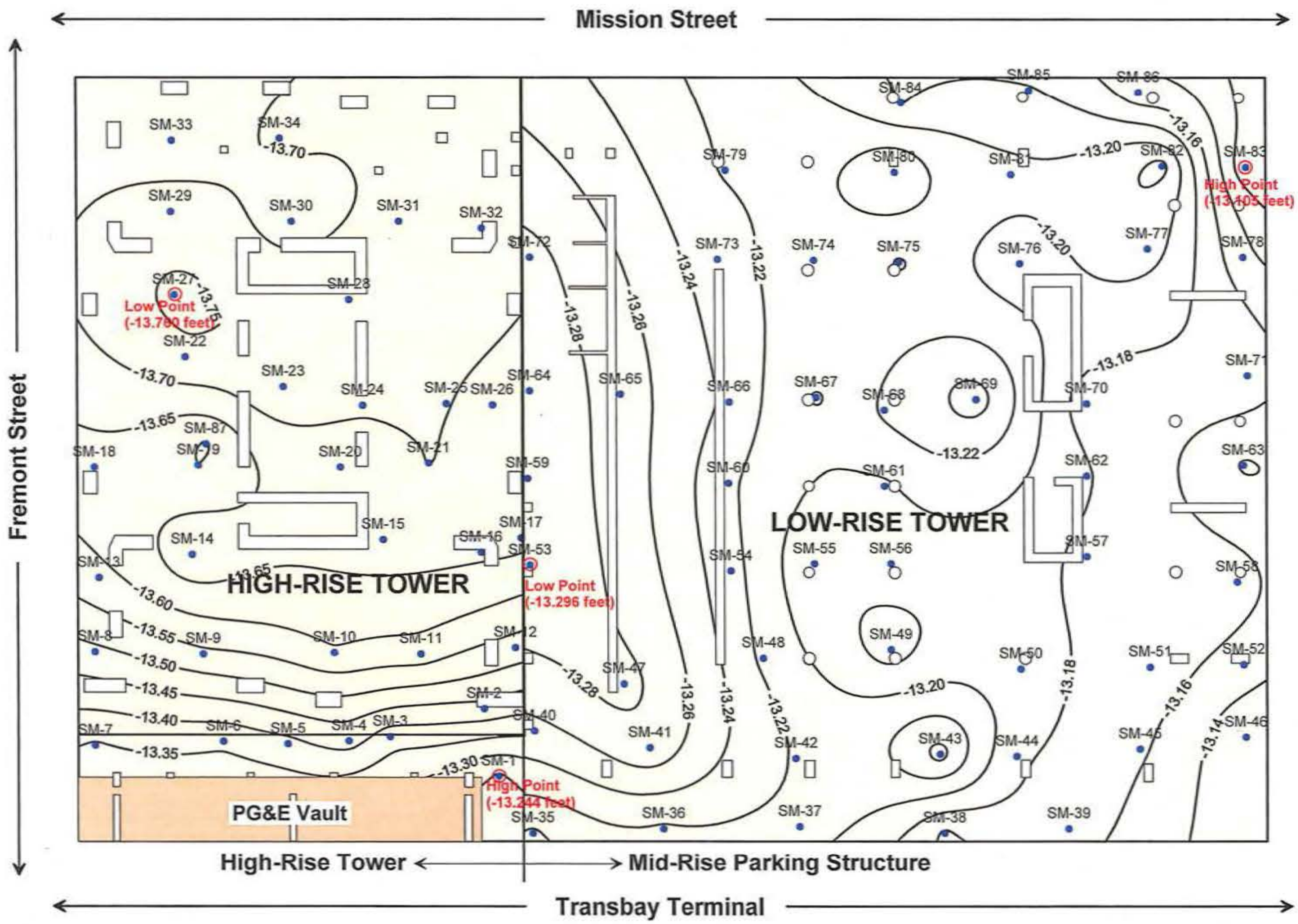
ARUP

To	Brian Dykes (TJPA)	**Date**	June 24, 2011
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/SMM
From	Stephen McLandrich (Arup) Nick O'Riordan (Arup) Kevin Clinch (Arup)	**File reference**	4-05 136
Subject	Transbay Transit Center: Results of May 2011 Settlement Survey at 301 Mission Property	**Page 1 of 1**	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated April 12, 2011 with measurements made through May 2010.

List of Plates

Plate 1	Floor Elevations at Level B-1 of 301 Mission Property: Periodic Survey – May 31, 2010
Plate 2	Differential Floor Elevation (Inches) – May 31, 2010 Survey
Plate 3	Contours of Settlements Measured at the First Level Basement of the 301 Mission Street Structure Between April 30, 2009 and May 31, 2010
Plate 4	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Tower: April 30, 2009 through May 31, 2010.
Plate 5	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Mid-Rise: April 30, 2009 through May 31, 2010
Plate 6	Settlements of the 301 Mission Tower Including Monitoring During Construction



Date of Survey Reading:
May 31, 2011

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	Low-Rise Tower
0.516 feet (6.192 inches)	0.191 feet (2.292 inches)

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on May 31, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

0 25 50 75
Approximate Scale: 1" = 25'

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\136 301 Mission - May Survey\Plates\Differential Elevation All (2001.05.31).srf

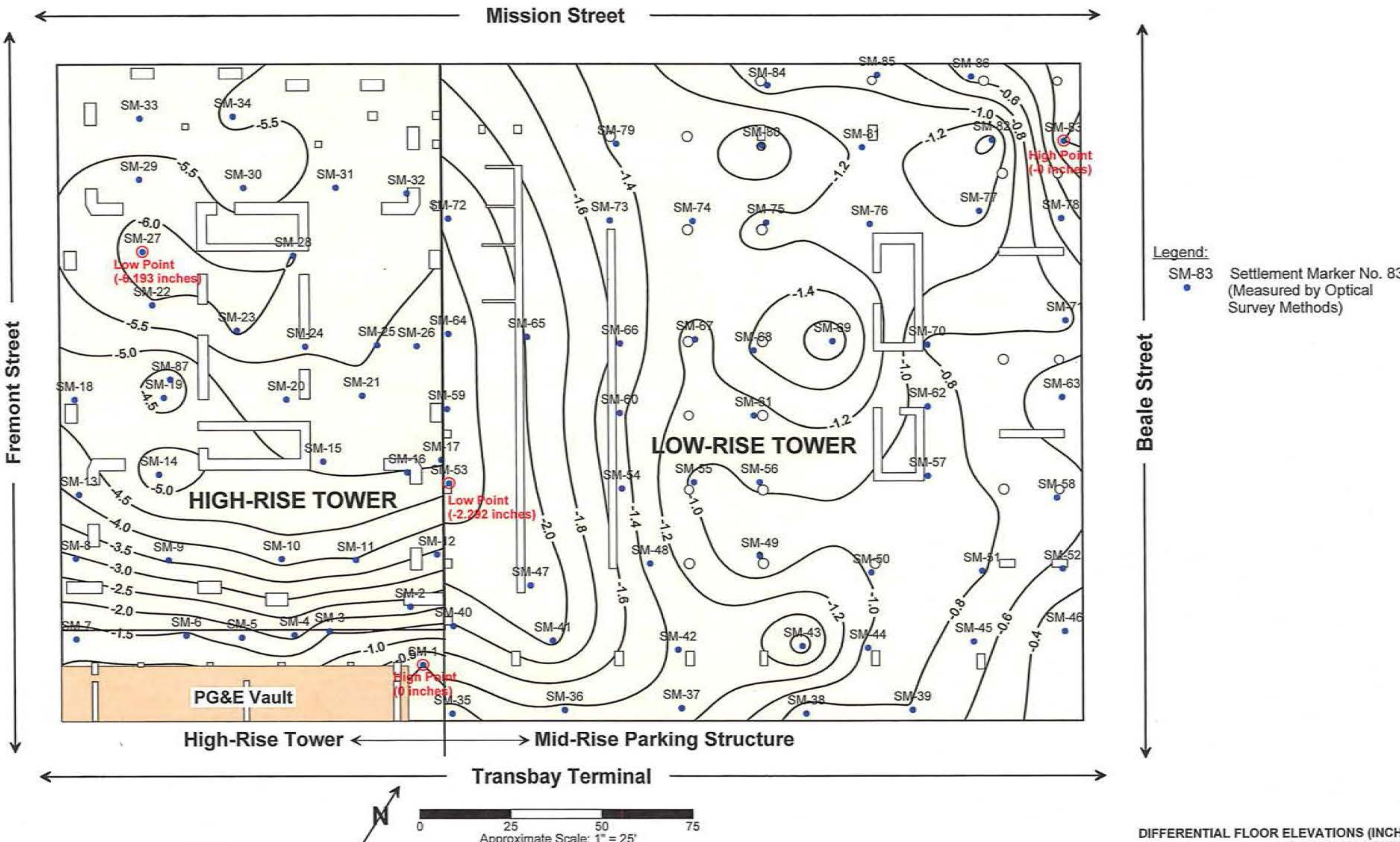
FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY: PERIODIC SURVEY - MAY 31, 2011

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2011

ARUP

PLATE 1



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on May 31, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
MAY 31, 2011 SURVEY

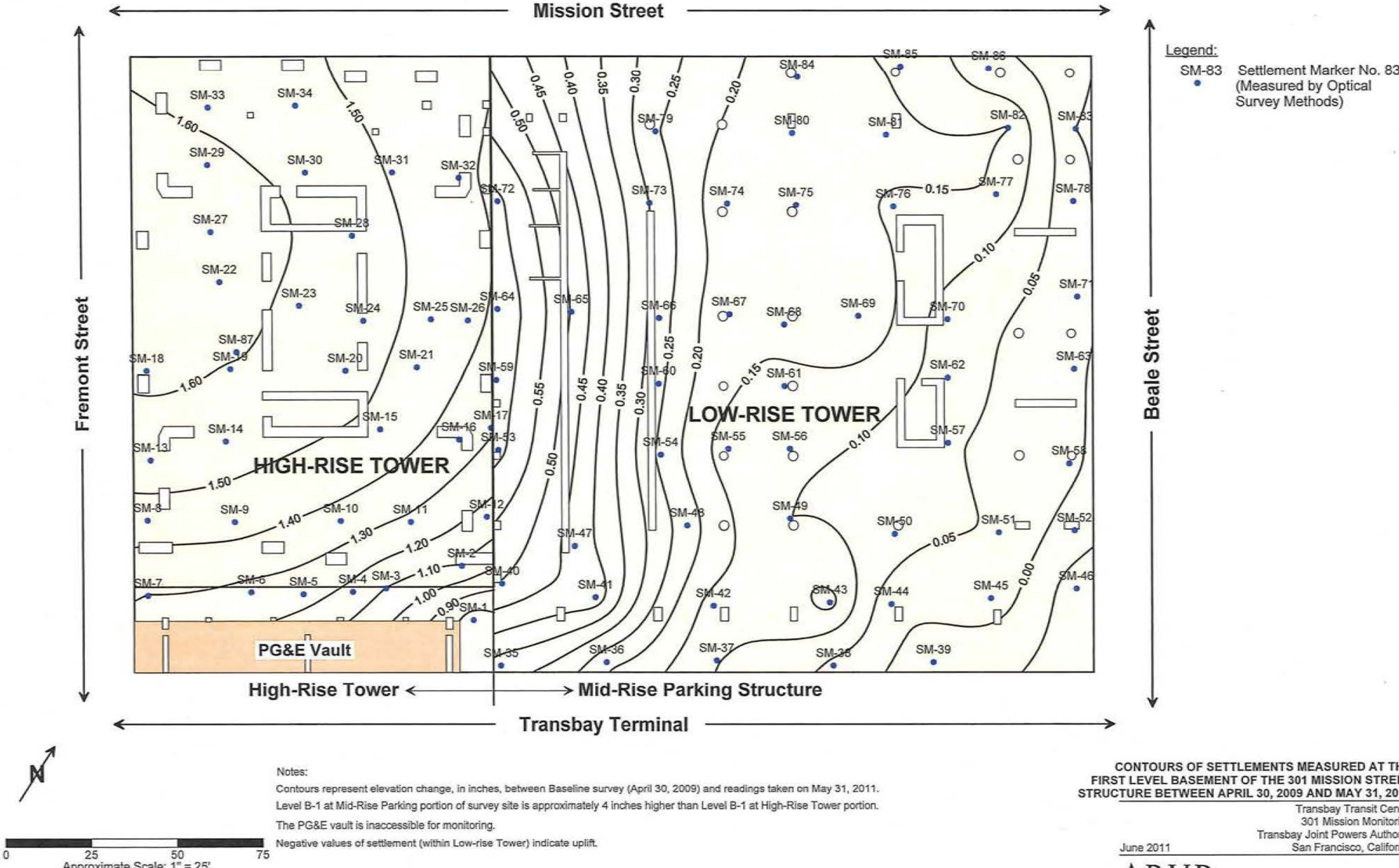
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2011

ARUP

PLATE 2

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\136 301 Mission - May Survey\Plates\Elevation changes All (2011.05.31).srf



Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on May 31, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\136 301 Mission - May Survey\Plates\Elevations All (2011.05.31).srf

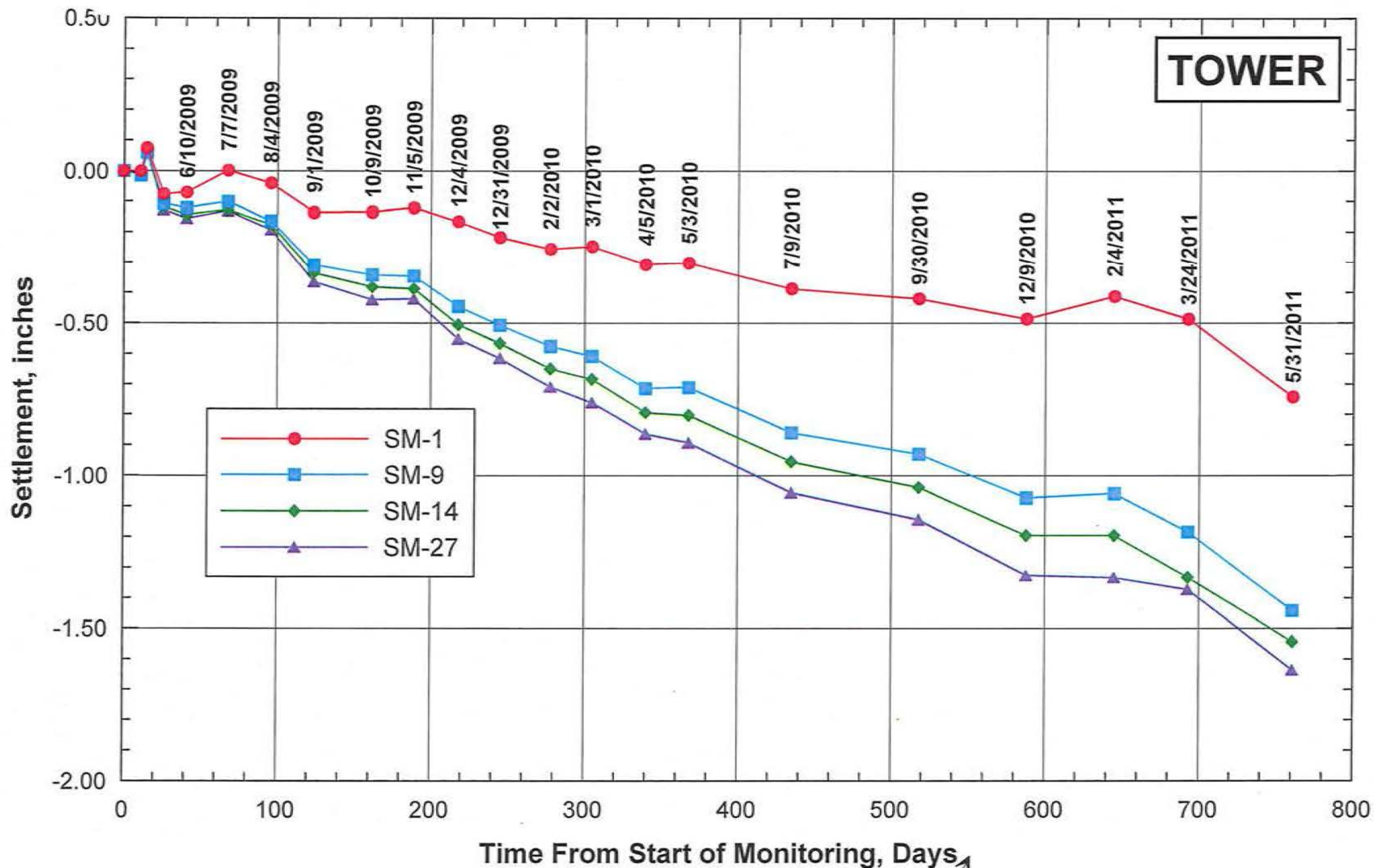
CONTOURS OF SETTLEMENTS MEASURED AT THE FIRST LEVEL BASEMENT OF THE 301 MISSION STREET STRUCTURE BETWEEN APRIL 30, 2009 AND MAY 31, 2011

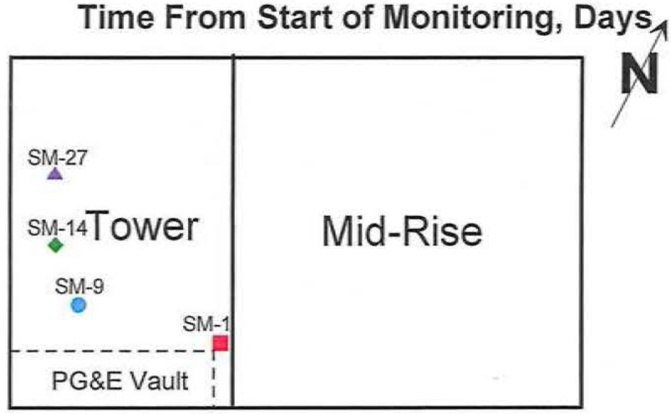
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2011

ARUP

PLATE 3





Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH MAY 31, 2011

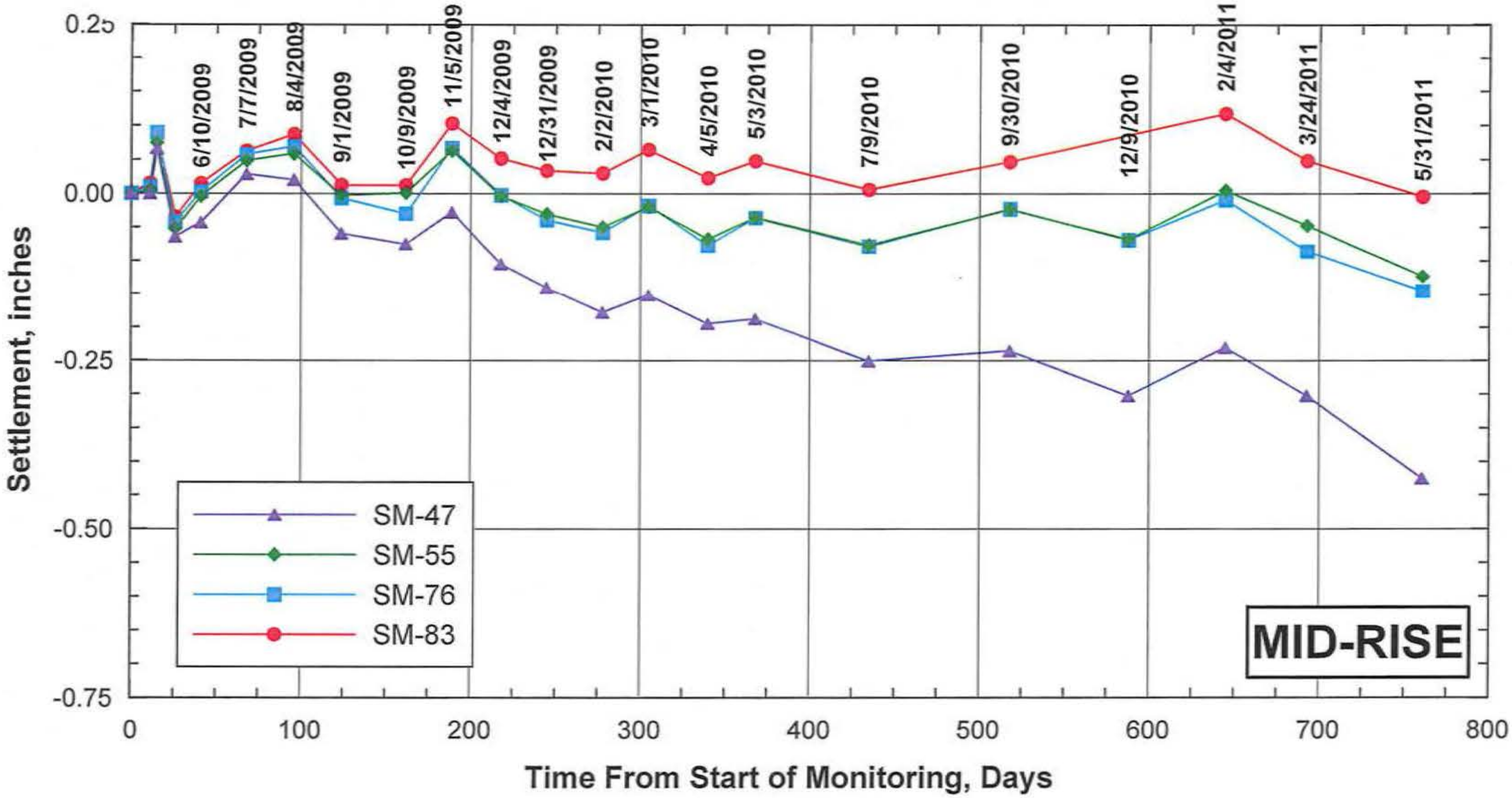
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

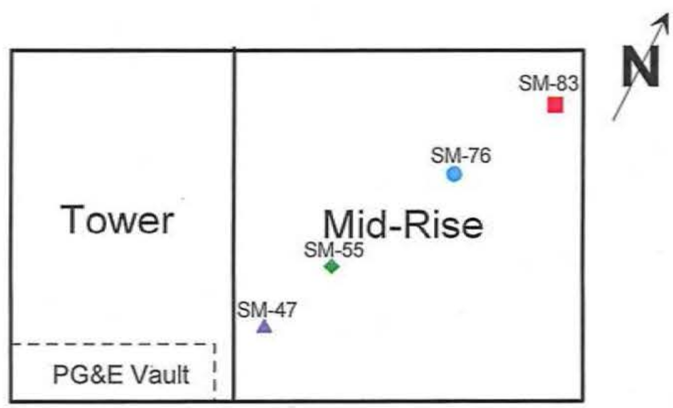
June 2011

ARUP

PLATE 4

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\136 301 Mission - May Survey\Plates\Plate 4 Settlement Over Time - Tower.grf





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH MAY 31, 2011

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

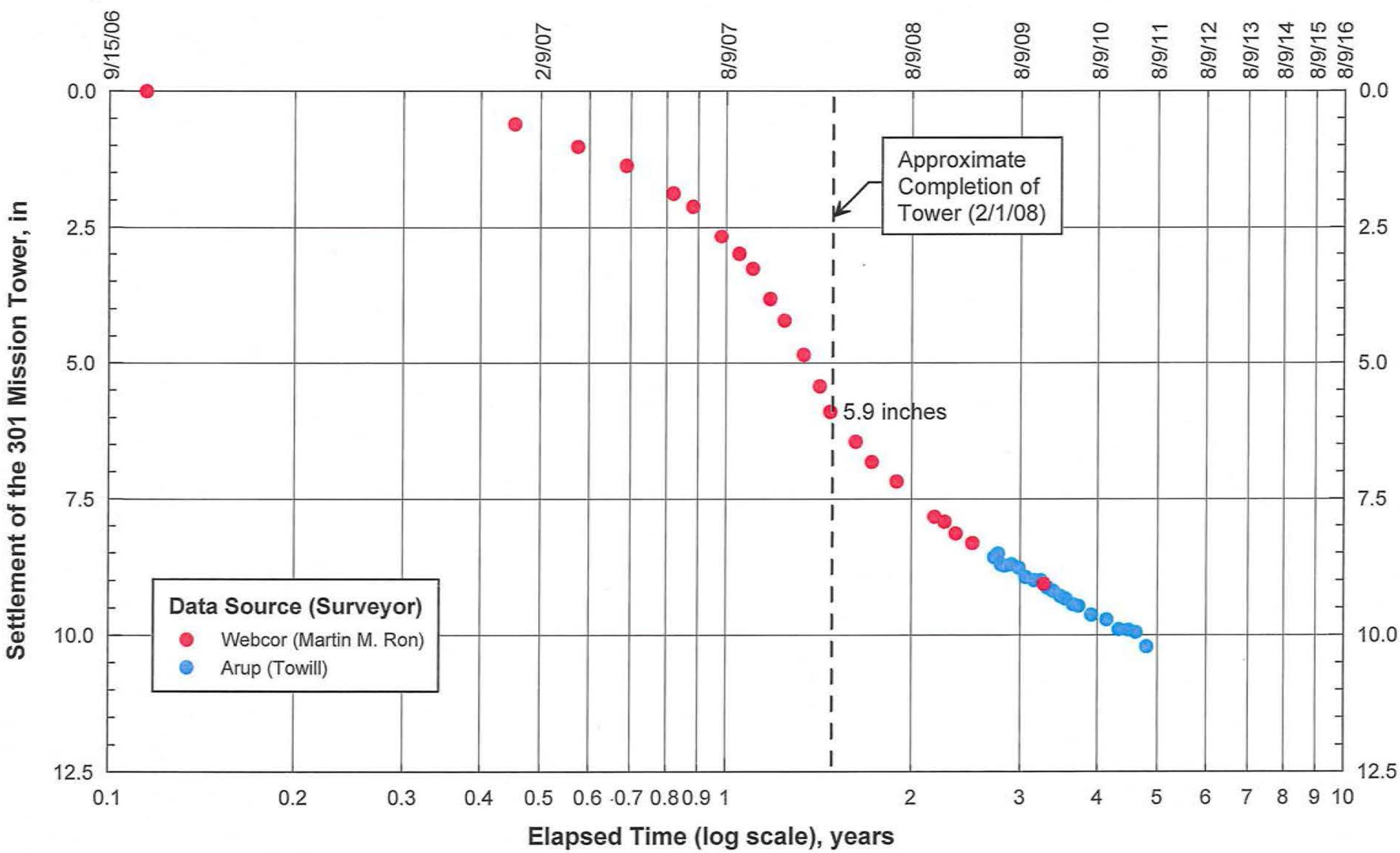
June 2011

ARUP

PLATE 5

Note:
Initial (Baseline) reading taken on 04/30/09

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\136 301 Mission - May Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2011

ARUP

PLATE 6

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\136 301 Mission - May Survey\Plates\Plate 6 Tower Settlements.grf

Memorandum

ARUP

To	Brian Dykes	Date	June 29, 2011
Copies	George Metzger Randy Volenec	Reference number	132242/smm
From	Stephen McLandrich x 27245 (San Francisco)	File reference	4-05 131
Subject	Transbay Transit Center - Final Inclinometer Response to Production Pile Pulling in Zone 4		

Arup has installed two inclinometers along the interface between the 301 Mission tower and the Transbay Transit Center (TTC) project. These inclinometers were installed prior to the extraction of pile foundations of the recently demolished Transbay Terminal. This memorandum transmits an update to May 9, 2011 memorandum which presented the measured movements of the two inclinometers installed. The final reading of these inclinometers was performed on May 16, 2011.

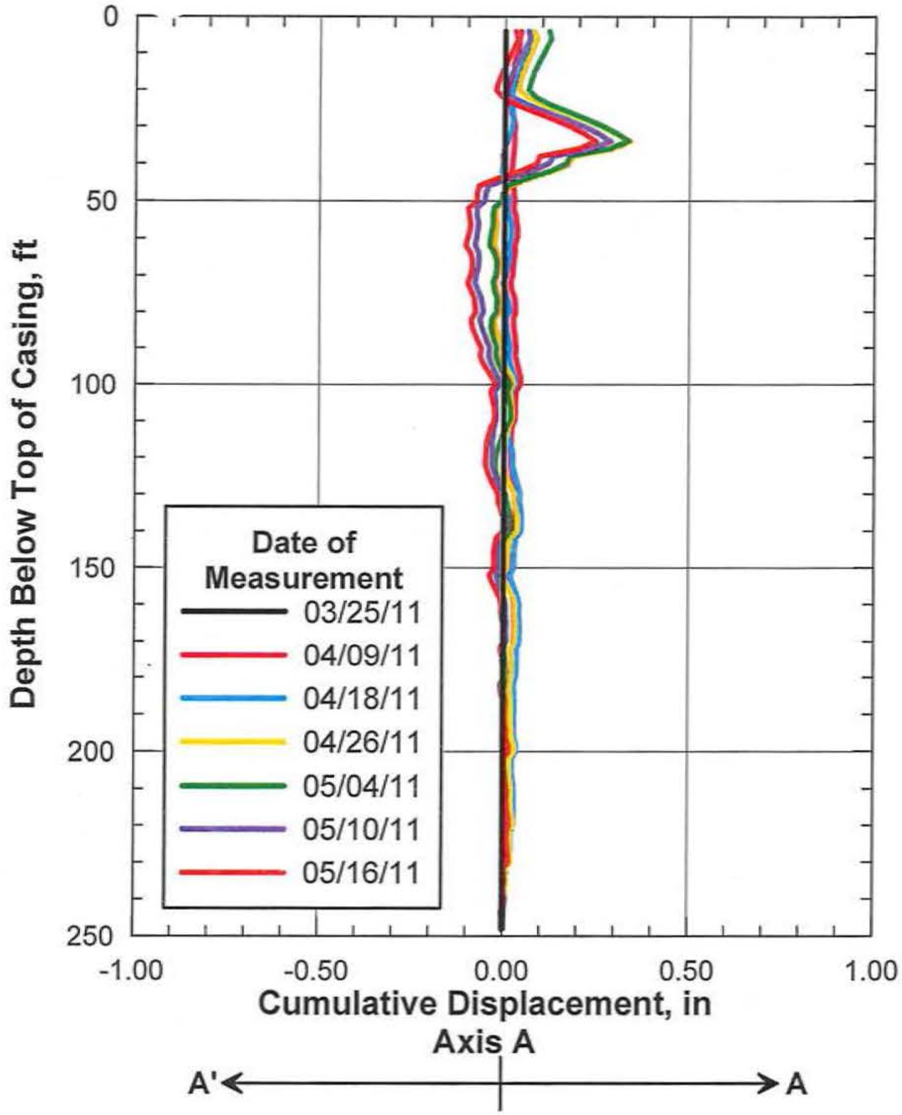
Plates 1 and 3 illustrate the lateral deflection measured in each inclinometer. The movements are measured over two axes described as A-A' and B-B'. The orientations of these axes are shown in the small figure at the bottom of the plate.

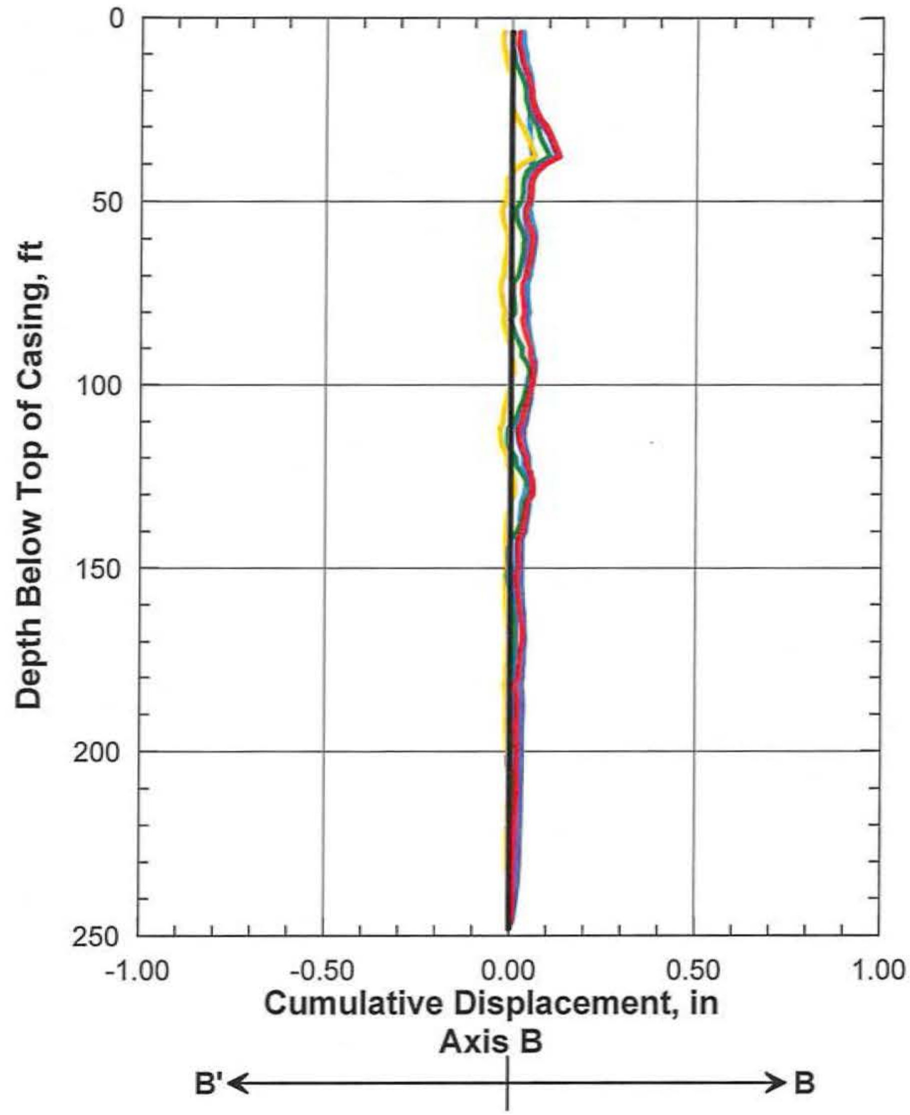
Plates 2 and 4 show two-dimensional vectors of movement at different depths. These vectors represent the movement as viewed from above over time. Each curve begins at the center or baseline reading and move along the line drawn until the final location which is represented as the end of the line.

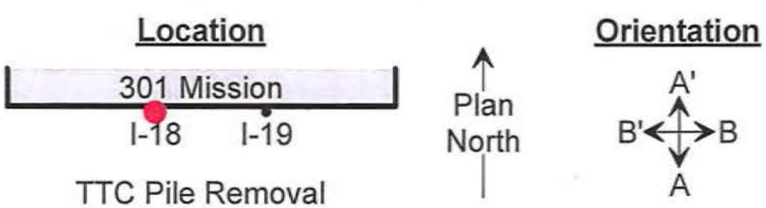
There is a readily observable change in movement at about 35 feet depth which takes place between the measurements on April 18, 2011 and April 20, 2011. Construction activities on-site over this period were the pulling of the two rows of existing timber piles directly adjacent to the 301 Mission tower.

Overall, the lateral movements recorded to date are within the tolerances prescribed in the Specification.

Additional inclinometer readings have been taken which are not shown in Plates 1 and 3. These were removed for clarity as many of the measurements show no movement from the previous measurements.







Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\140 Inclinometers at 301 Rev\Plates\Plate 1 Inclinometer I-18.grf

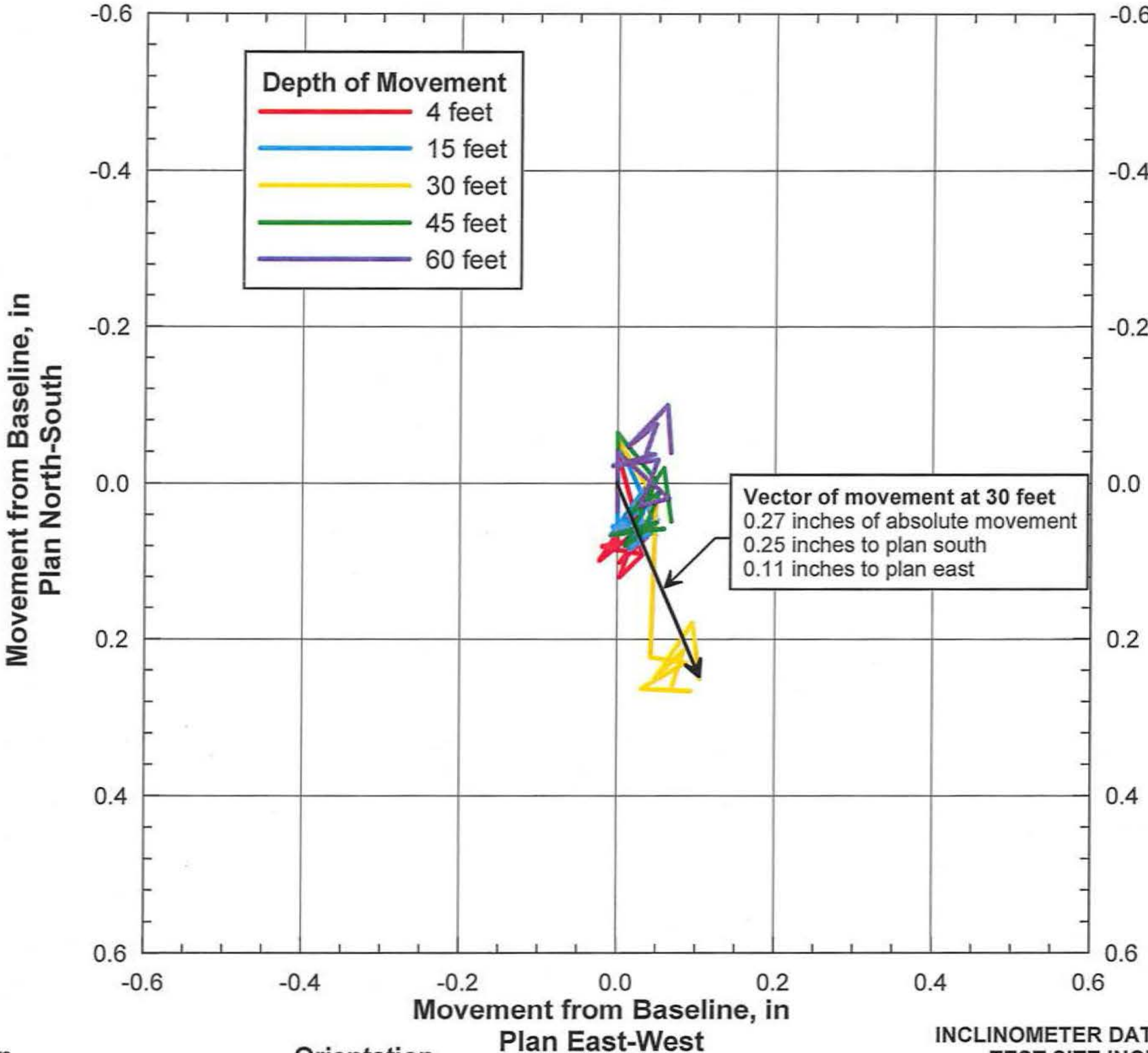
INCLINOMETER DATA FOR PILE EXTRACTION
TEST SITE INCLINOMETER READING I-18

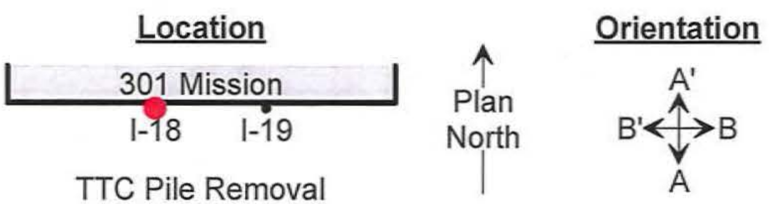
Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

June 2011

ARUP

PLATE 1





INCLINOMETER DATA FOR PILE EXTRACTION TEST SITE INCLINOMETER READING I-19

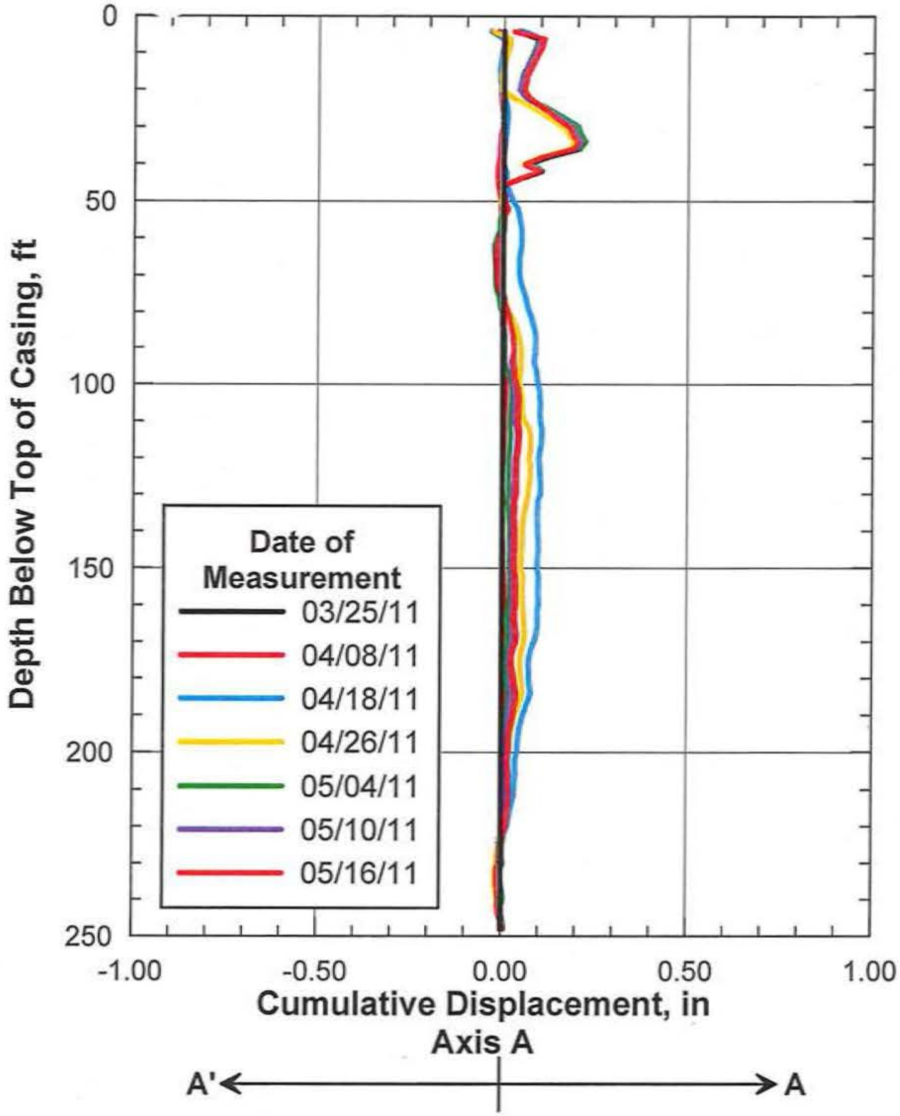
Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

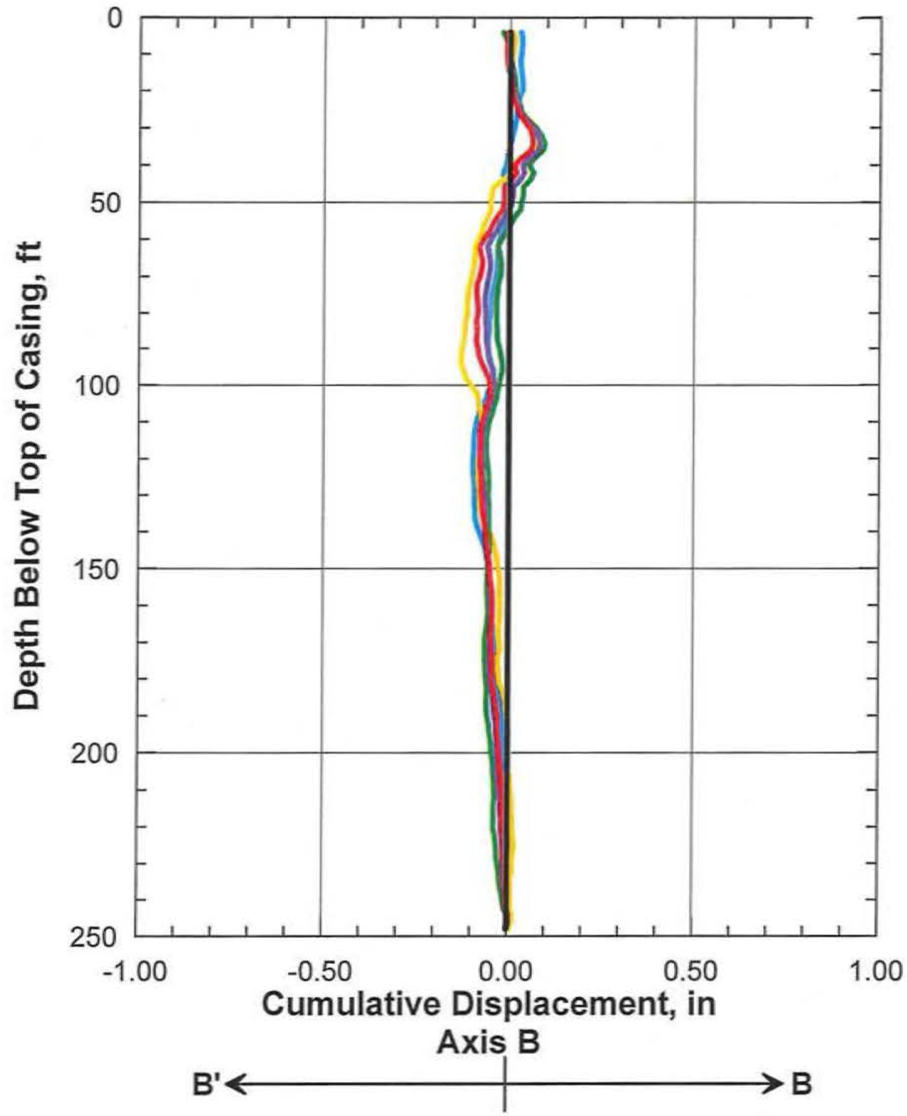
June 2011

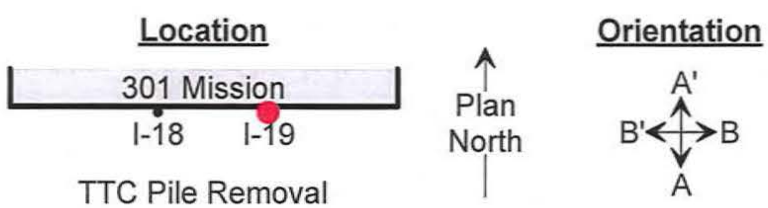
ARUP

PLATE 2

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\140 Inclinometers at 301 Rev\Plates\Plate 2 Inclinometer I18 - vectors.grf







Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\140 Inclinometers at 301 Rev\Plates\Plate 3 Inclinometer I-19.grf

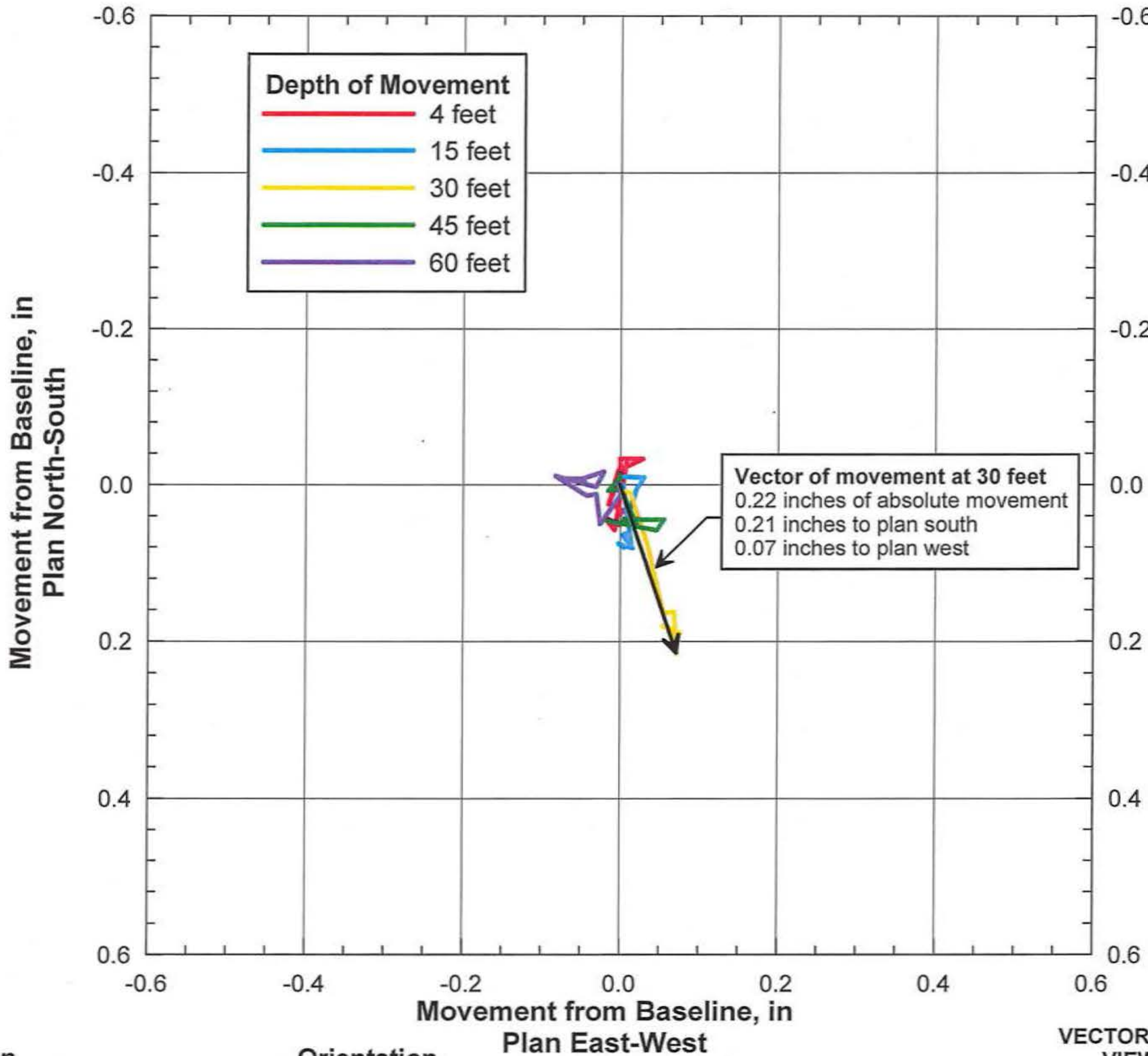
VECTORS OF MOVEMENT IN PLAN VIEW FOR INCLINOMETER I-18

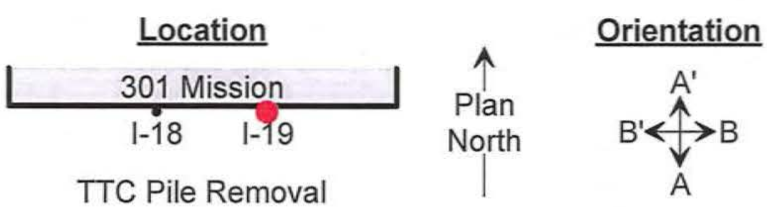
Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

June 2011

ARUP

PLATE 3





VECTORS OF MOVEMENT IN PLAN VIEW FOR INCLINOMETER I-19

Transbay Transit Center
Pile Extraction Test Results
Transbay Joint Powers Authority
San Francisco, California

June 2011

ARUP

PLATE 4

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\140 Inclinometers at 301 Rev\Plates\Plate 4 Inclinometer I19 - vectors.grf

Memorandum

ARUP

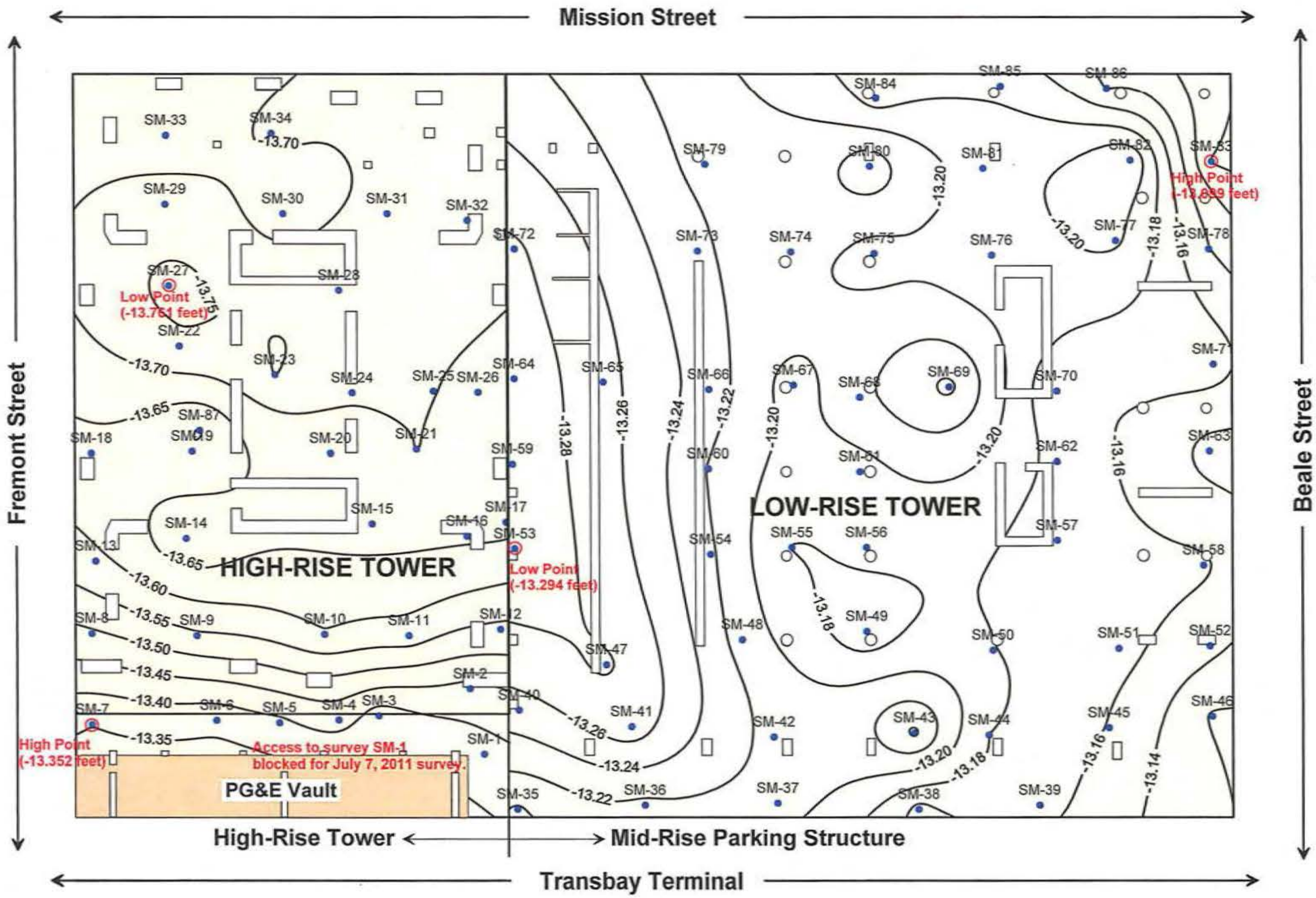
To	Brian Dykes (TJPA)	Date	August 26, 2011
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	Reference number	132242-60/SMM
From	Stephen McLandrich (Arup) Nick O'Riordan (Arup) Kevin Clinch (Arup)	File reference	4-05 142
Subject	Transbay Transit Center: Results of July 2011 Settlement Survey at 301 Mission Property	Page 1 of 1	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated June 24, 2011 with measurements made through July 2011.

Arup has installed an additional nine settlement markers in the floor at basement level B-5. These settlement markers were surveyed three separate times in order to establish a baseline reading. The results of this monitoring are presented in Plates 7 and 8 of this memorandum.

List of Plates

Plate 1	Floor Elevations at Level B-1 of 301 Mission Property: Periodic Survey – July 7, 2010
Plate 2	Differential Floor Elevation (Inches) – July 7, 2010 Survey
Plate 3	Contours of Settlements Measured at the First Level Basement of the 301 Mission Street Structure Between April 30, 2009 and July 7, 2010
Plate 4	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Tower: April 30, 2009 through July 7, 2010.
Plate 5	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Mid-Rise: April 30, 2009 through July 7, 2010
Plate 6	Settlements of the 301 Mission Tower Including Monitoring During Construction
Plate 7	Floor Elevation at Basement Level B-5 of 301 Mission Property: July 7, Survey
Plate 8	Differential Floor Elevations (Inches) at Basement Level B-5: July 7, 2011 Survey



Date of Survey Reading:
July 7, 2011

Legend:
SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	**Low-Rise Tower**
0.409 feet (4.908 inches)	**0.195 feet (2.340 inches)**

N

Notes:
Contours represent elevation, in feet (CCSF Datum), from survey readings taken on July 7, 2011.
Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.
The PG&E vault is inaccessible for monitoring.

0 25 50 75
Approximate Scale: 1" = 25'

FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY: PERIODIC SURVEY - JULY 7, 2011

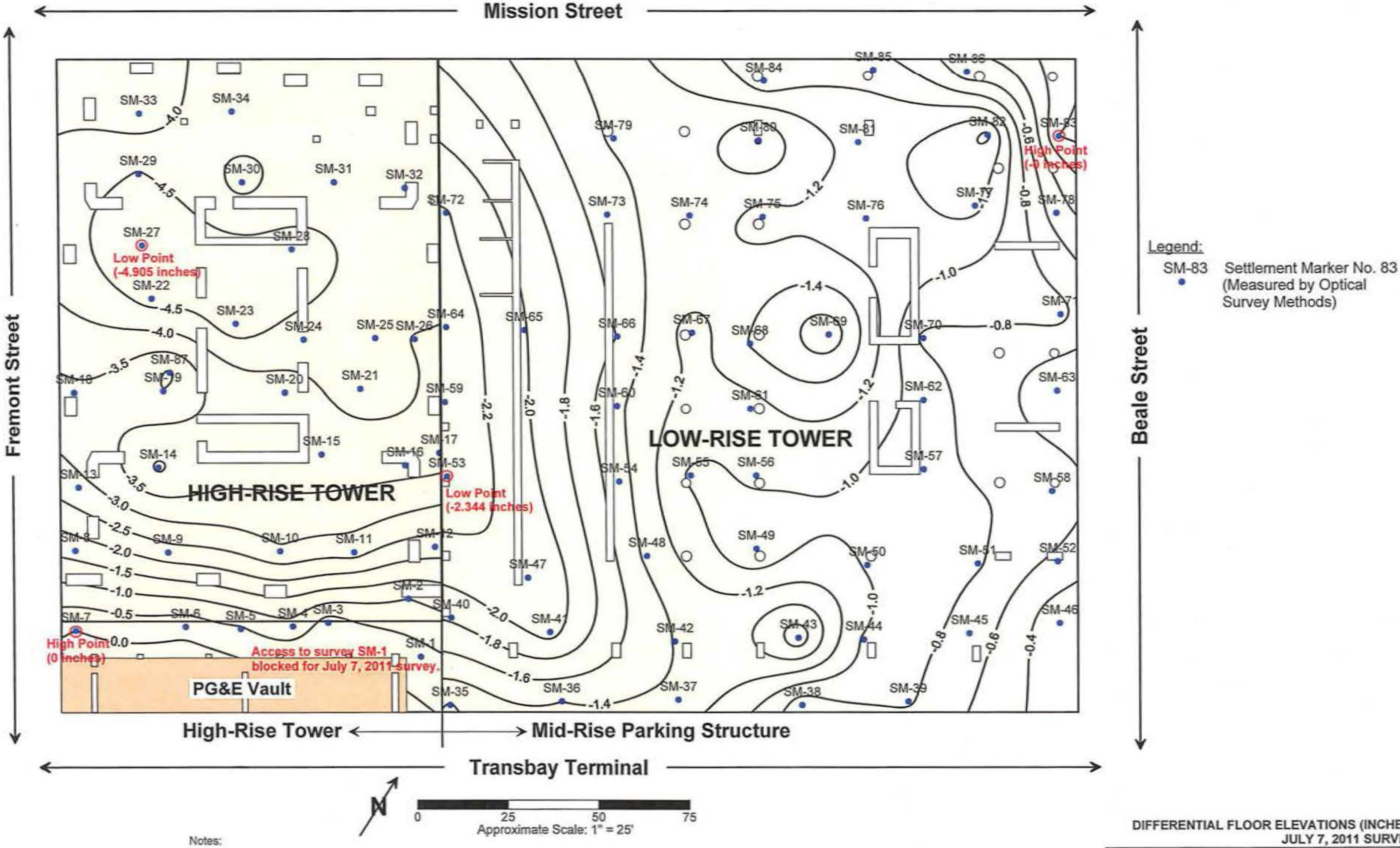
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

August 2011

ARUP

PLATE 1

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\142 301 Mission - July Survey\Plates\Elevations All (2011.07.07).srf



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on July 7, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
JULY 7, 2011 SURVEY

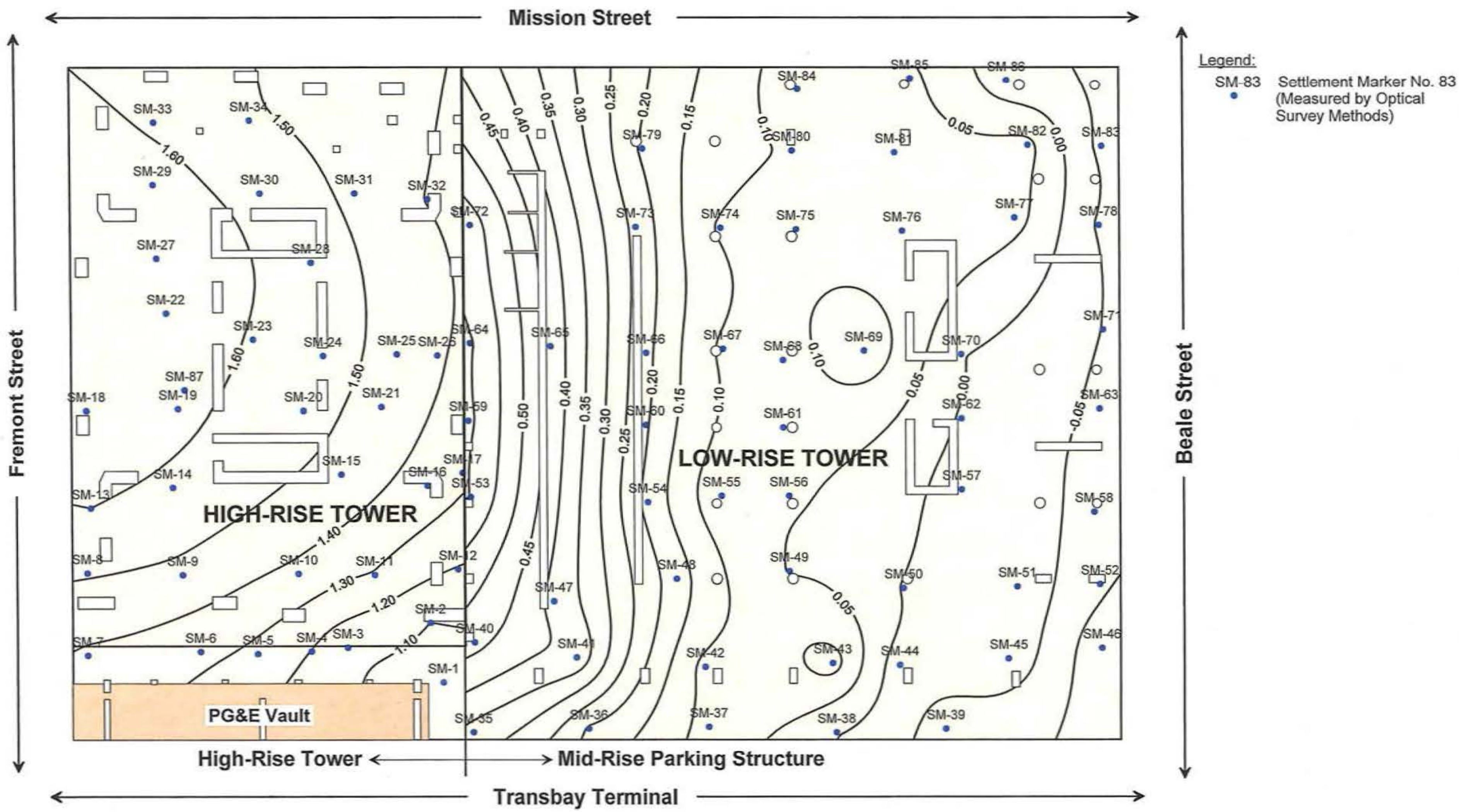
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

August 2011

ARUP

PLATE 2

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\142 301 Mission - July Survey\Plates\Differential Elevation All (2011.07.07).srf



N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on July 7, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

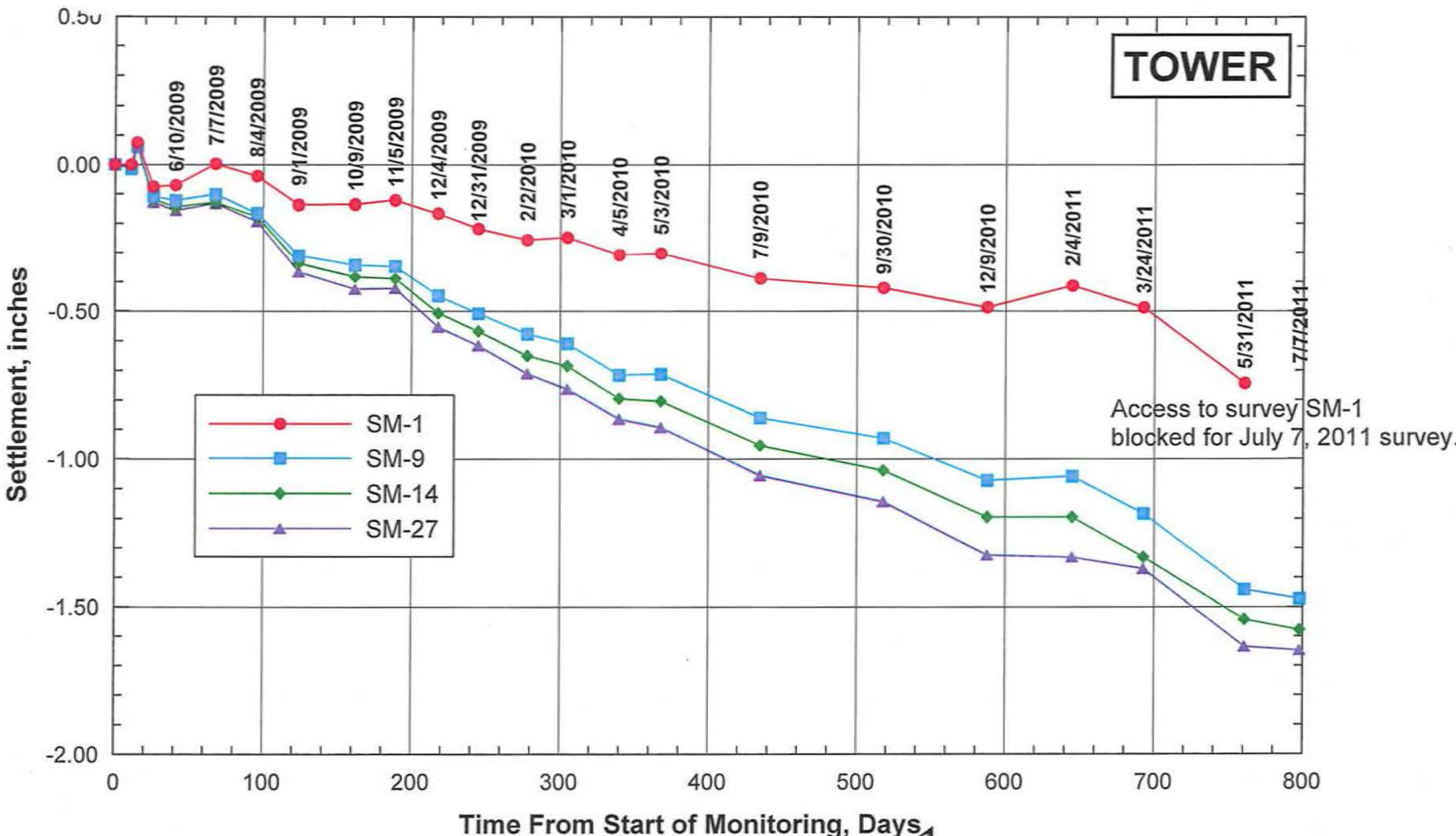
CONTOURS OF SETTLEMENTS MEASURED AT THE FIRST LEVEL BASEMENT OF THE 301 MISSION STREET STRUCTURE BETWEEN APRIL 30, 2009 AND JULY 7, 2011

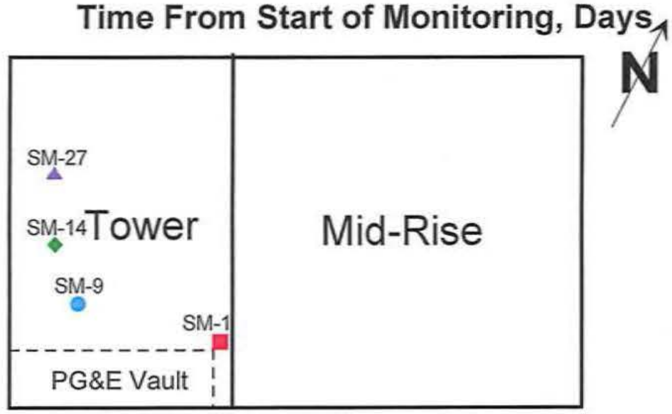
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

August 2011

ARUP

PLATE 3





Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH JULY 7, 2011

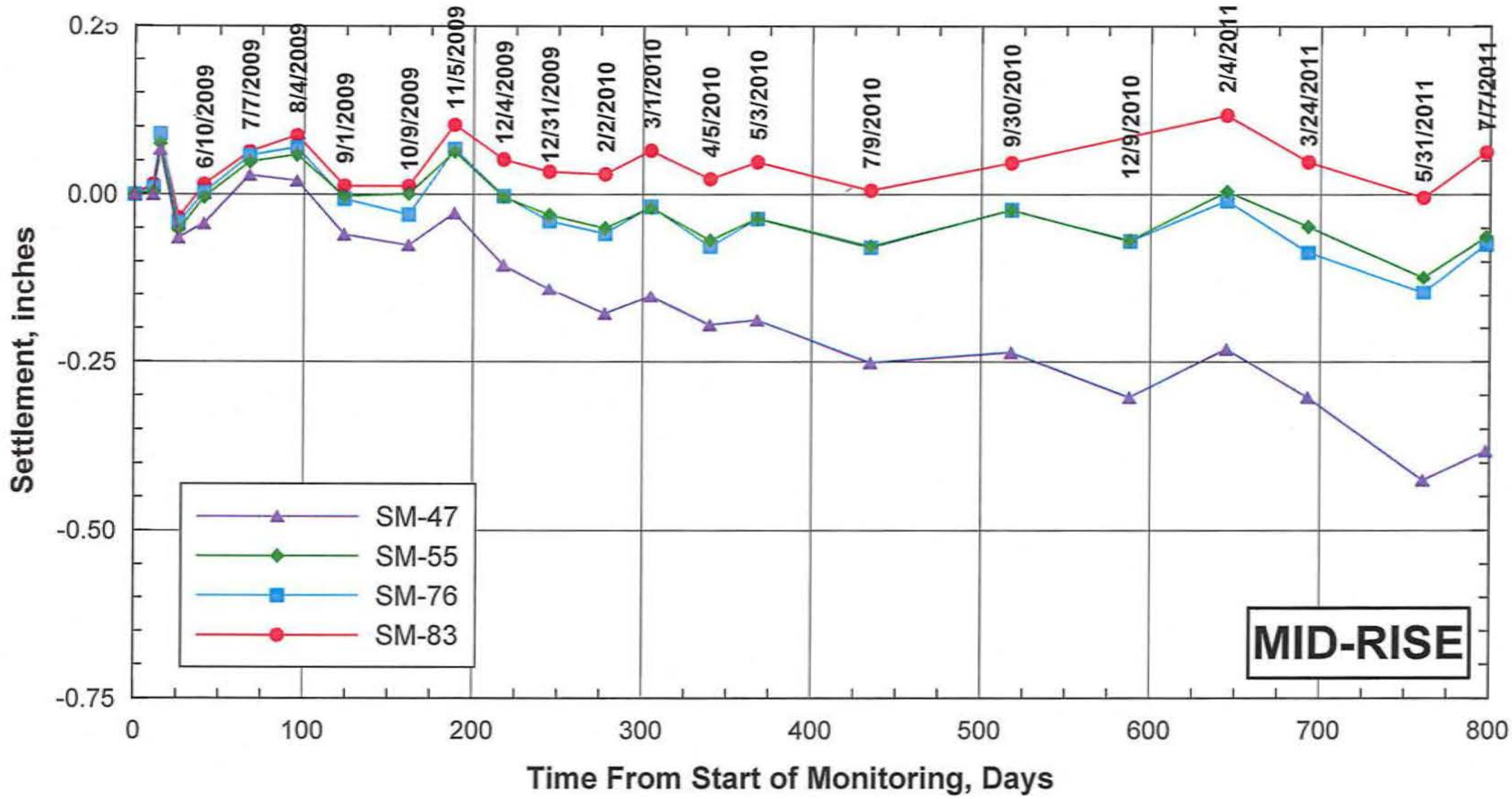
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

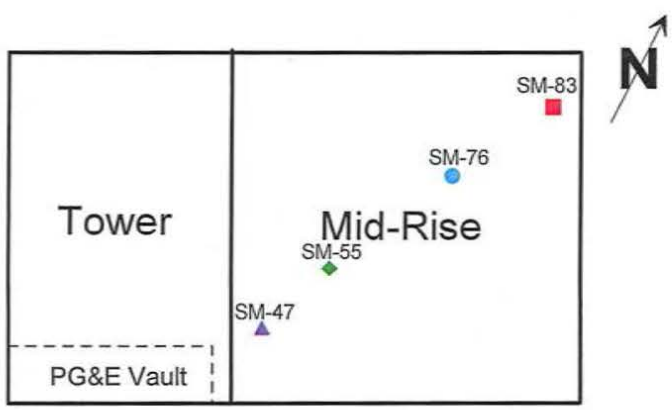
August 2011

ARUP

PLATE 4

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\142 301 Mission - July Survey\Plates\Plate 4 Settlement Over Time - Tower.grf





Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH JULY 7, 2011

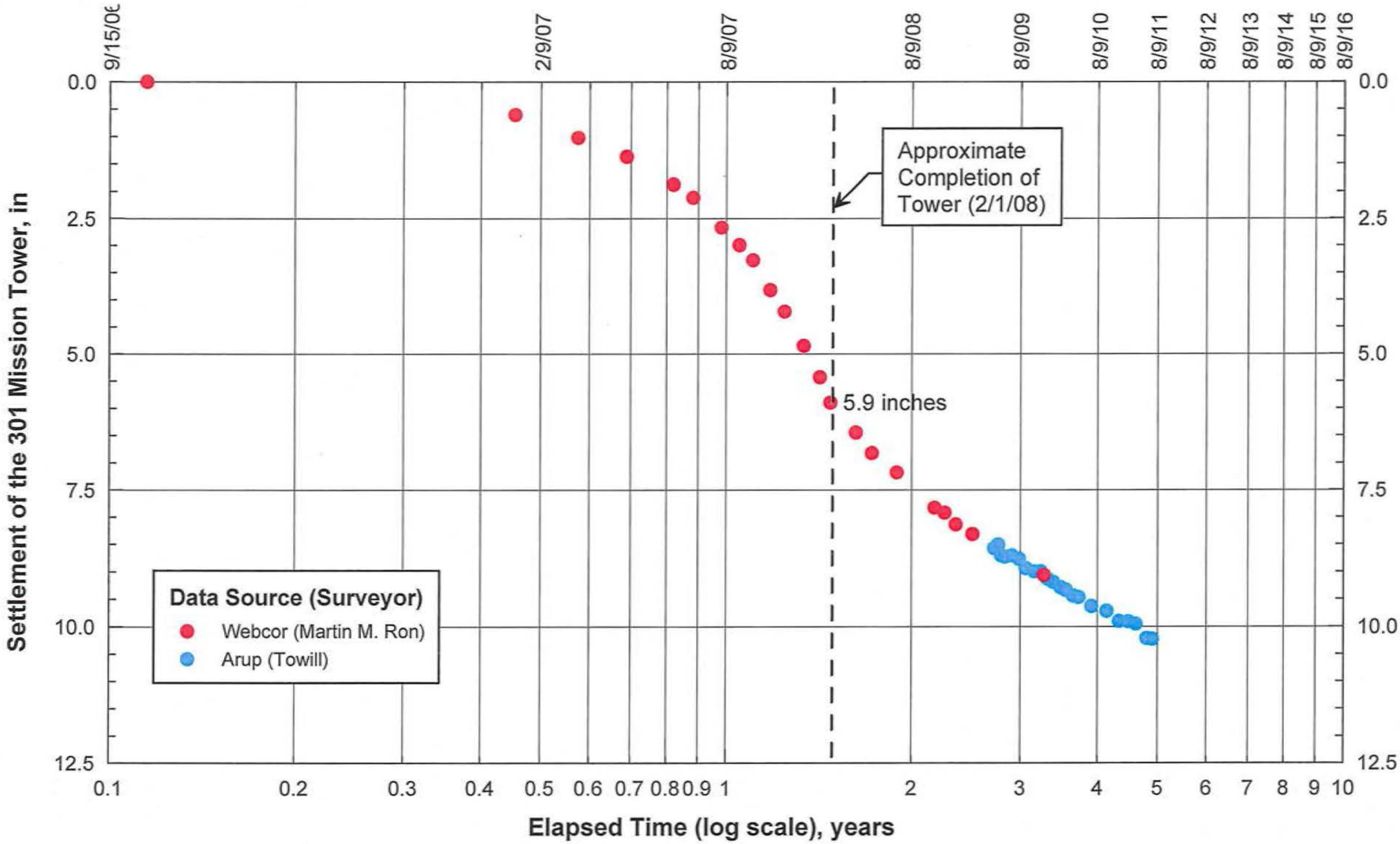
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

August 2011

ARUP

PLATE 5

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\142 301 Mission - July Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

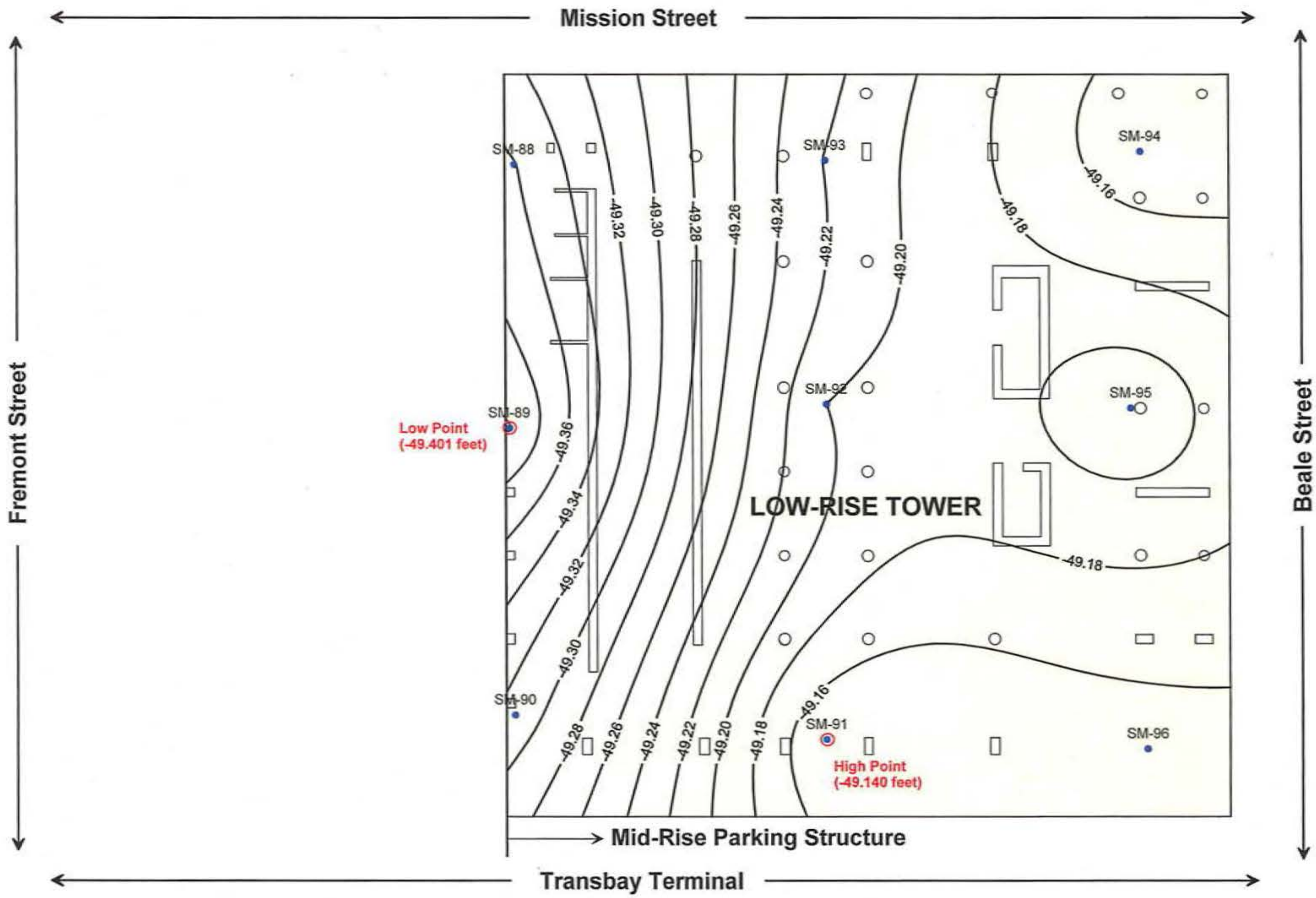
SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

August 2011

ARUP

PLATE 6



Date of Survey Reading: July 7, 2011

Legend:

SM-88 • Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.261 feet (3.132 inches)

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on July 7, 2011.

0 25 50 75

Approximate Scale: 1" = 25'

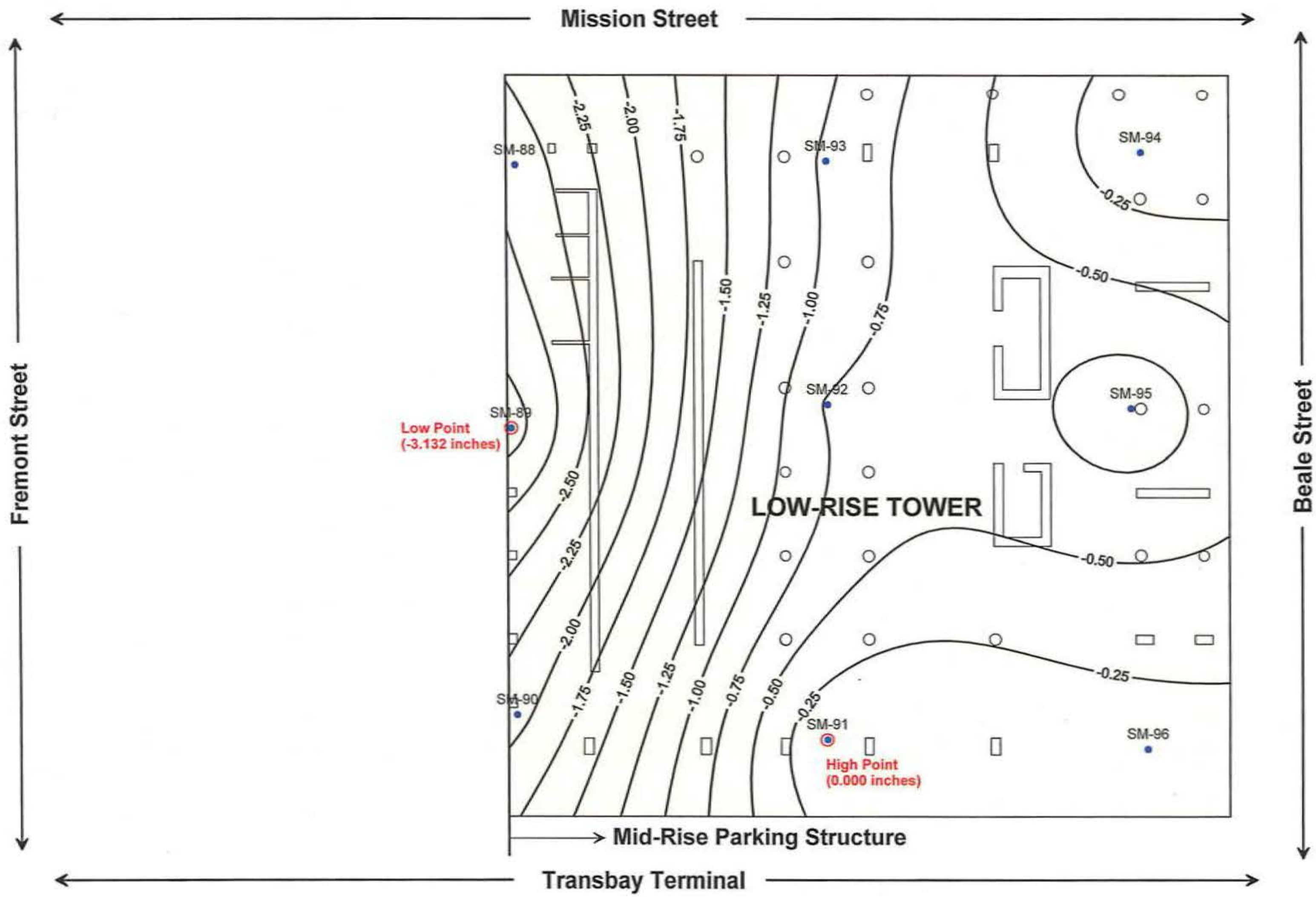
FLOOR ELEVATION AT BASEMENT LEVEL B-5 OF 301 MISSION PROPERTY: JULY 7, 2011 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

August 2011

ARUP

PLATE 7



Date of Survey Reading:
July 7, 2011

Legend:
SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.261 feet (3.132 inches)

N

Notes:
Contours represent elevation, in feet (CCSF Datum), from survey readings taken on July 7, 2011.

0 25 50 75
Approximate Scale: 1" = 25'

DIFFERENTIAL FLOOR ELEVATIONS (INCHES) AT BASEMENT LEVEL B-5: JULY 7, 2011 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

August 2011

ARUP

PLATE 8

Q:\132242\4 Internal Project Data\4-05 Reports & Narratives\142 301 Mission - July Survey\Plates\B-5 Differential Elevations (2011.07.07).srf

Memorandum

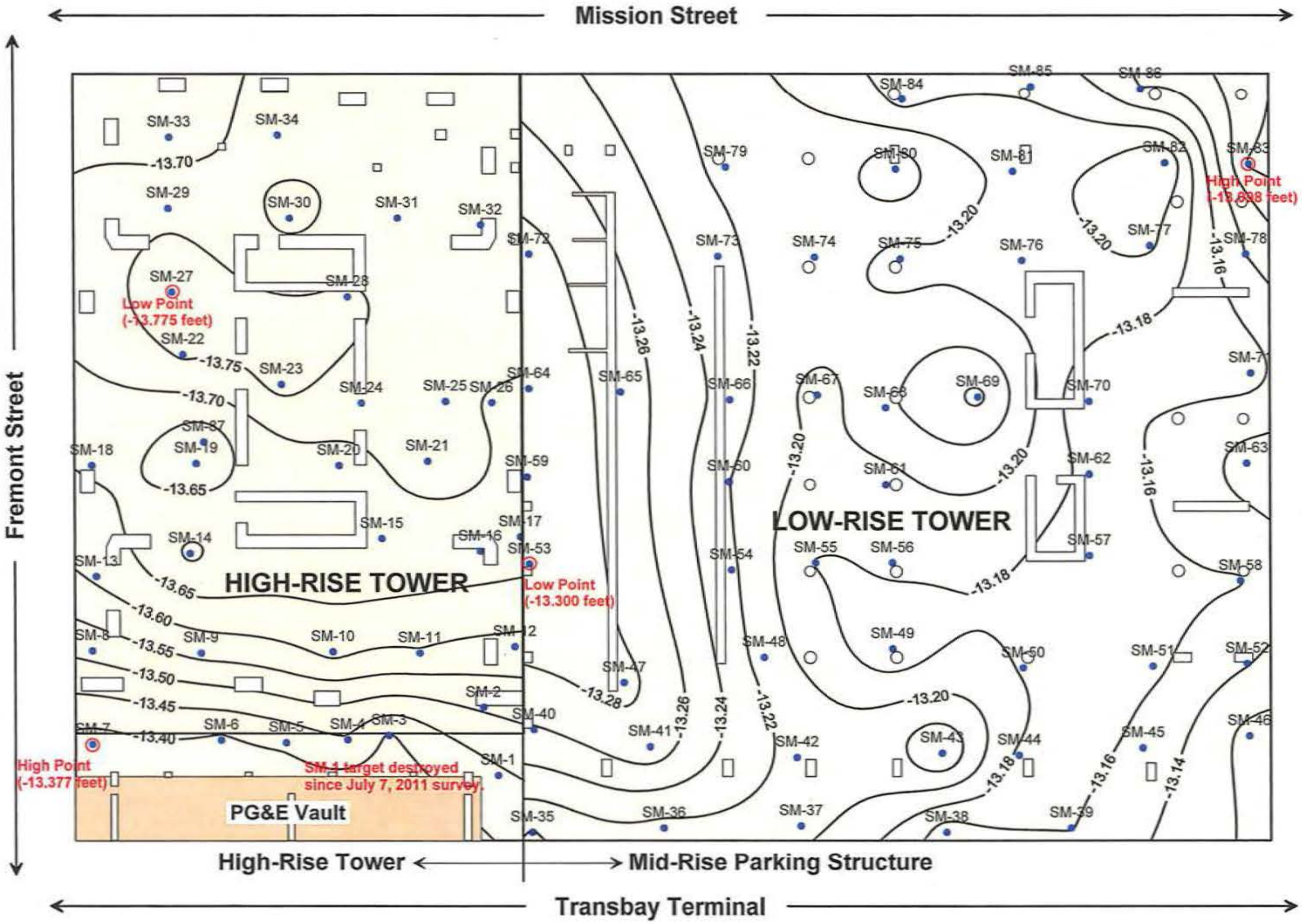
ARUP

To	Brian Dykes (TJPA)	**Date** 10 October 2011	
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number** 132242-60/SMM	
From	Stephen McLandrich (Arup) Nick O'Riordan (Arup) Kevin Clinch (Arup)	**File reference** 4-05 145	
Subject	Transbay Transit Center: Results of September 2011 Settlement Survey at 301 Mission Property	**Page 1 of 1**	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated August 26, 2011 with measurements made through September 2011.

List of Plates

Plate 1	Floor Elevations at Level B-1 of 301 Mission Property: Periodic Survey – September 8, 2010
Plate 2	Differential Floor Elevation (Inches) – September 8, 2010 Survey
Plate 3	Contours of Settlements Measured at the First Level Basement of the 301 Mission Street Structure Between April 30, 2009 and September 8, 2010
Plate 4	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Tower: April 30, 2009 through September 8, 2010.
Plate 5	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Mid-Rise: April 30, 2009 through September 8, 2010
Plate 6	Settlements of the 301 Mission Tower Including Monitoring During Construction
Plate 7	Floor Elevation at Basement Level B-5 of 301 Mission Property: September 8, 2011 Survey
Plate 8	Differential Floor Elevations (Inches) at Basement Level B-5: September 8, 2011 Survey



Date of Survey Reading:
September 8, 2011

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	Low-Rise Tower
0.398 feet (4.774 inches)	0.202 feet (2.422 inches)

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on September 8, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

0 25 50 75
Approximate Scale: 1" = 25'

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\145 301 Mission - September Survey\Plates\Elevations All (2011.09.08).srf

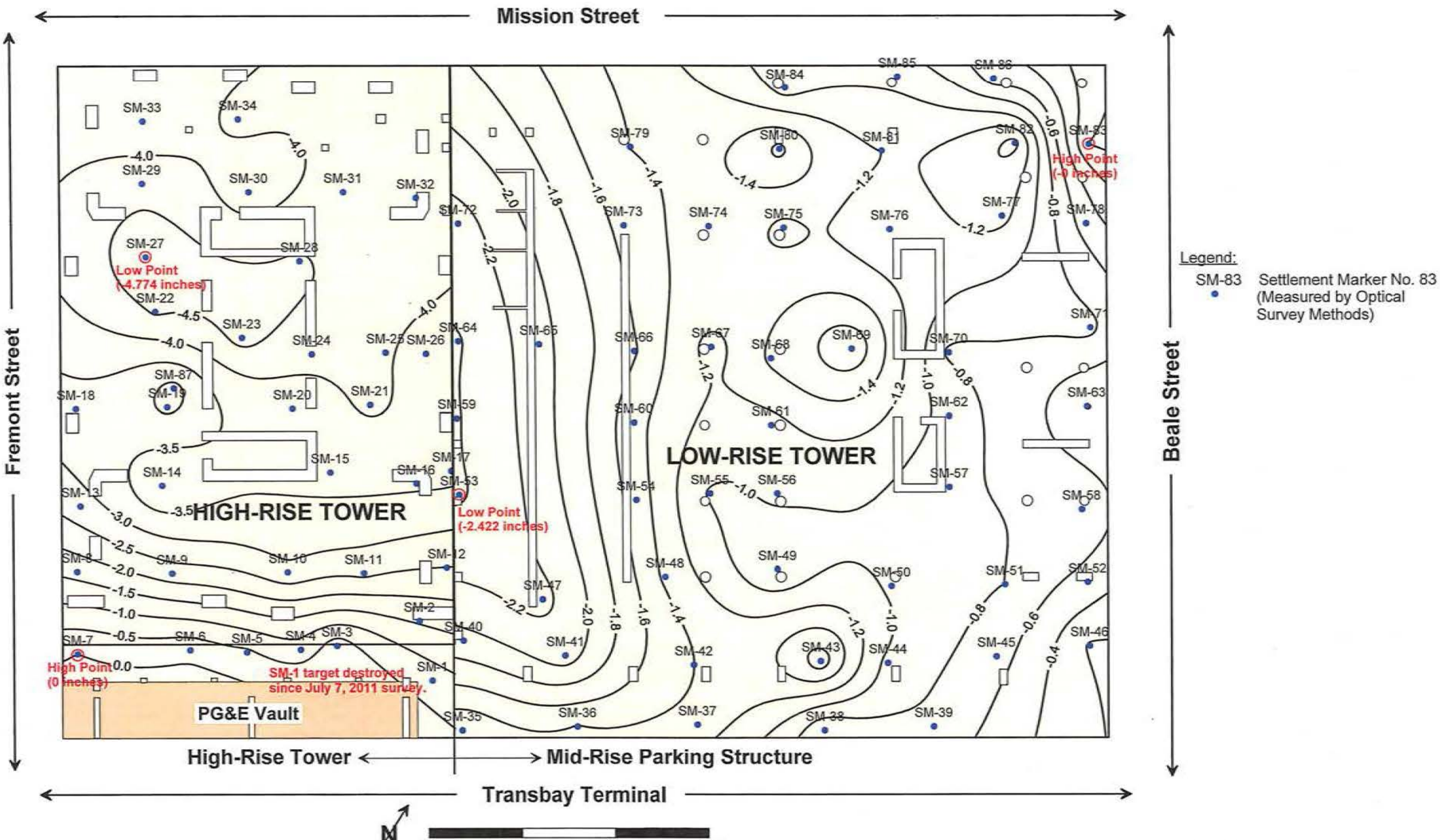
FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY: PERIODIC SURVEY - SEPTEMBER 8, 2011

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

October 2011

ARUP

PLATE 1



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on September 8, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
SEPTEMBER 8, 2011 SURVEY

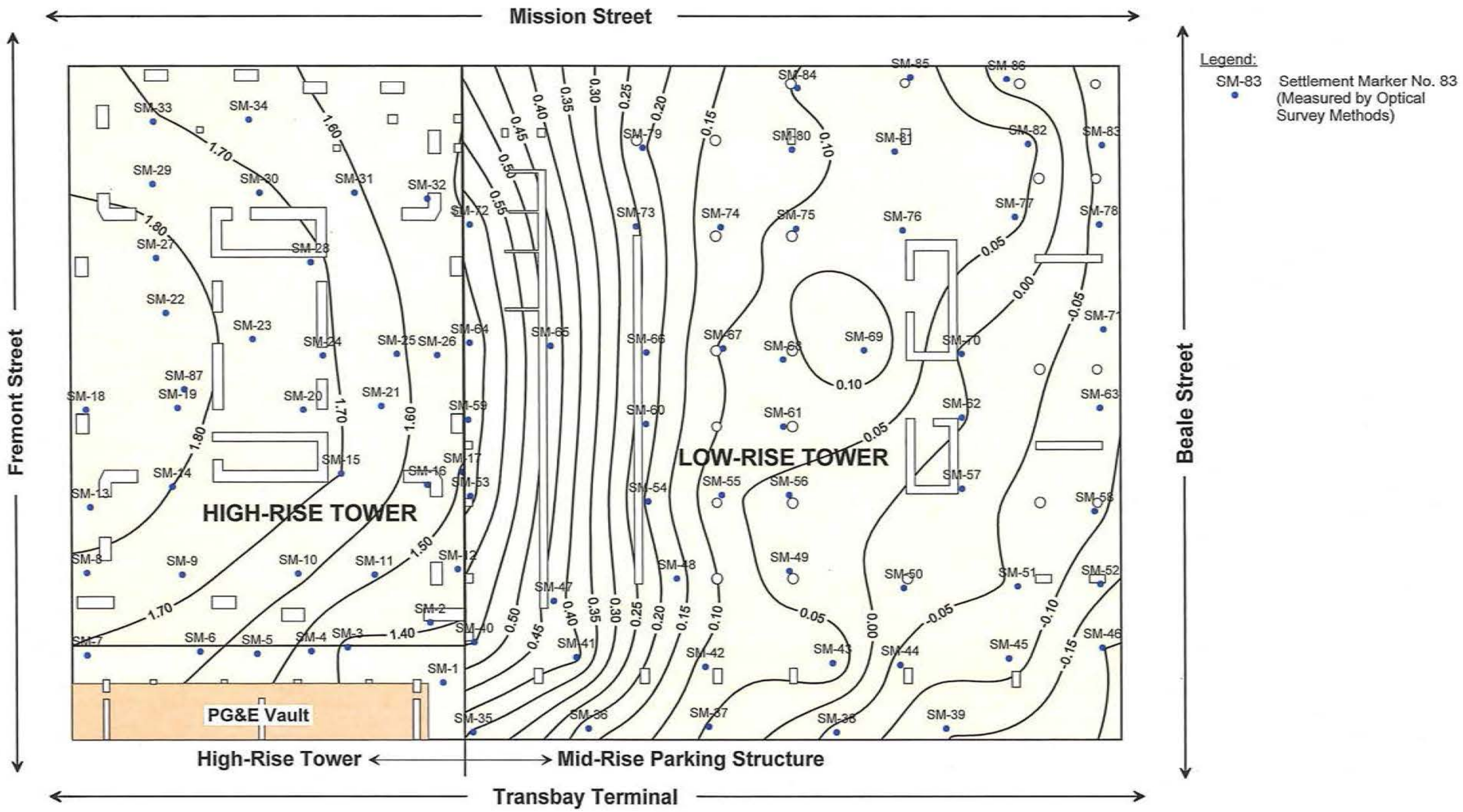
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

October 2011

ARUP

PLATE 2

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\145 301 Mission - September Survey\Plates\Differential Elevation All (2011.09.08).srf



N

Approximate Scale: 1" = 25'

0 25 50 75

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on September 8, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE FIRST LEVEL BASEMENT OF THE 301 MISSION STREET STRUCTURE BETWEEN APRIL 30, 2009 AND SEPTEMBER 8, 2011

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

October 2011

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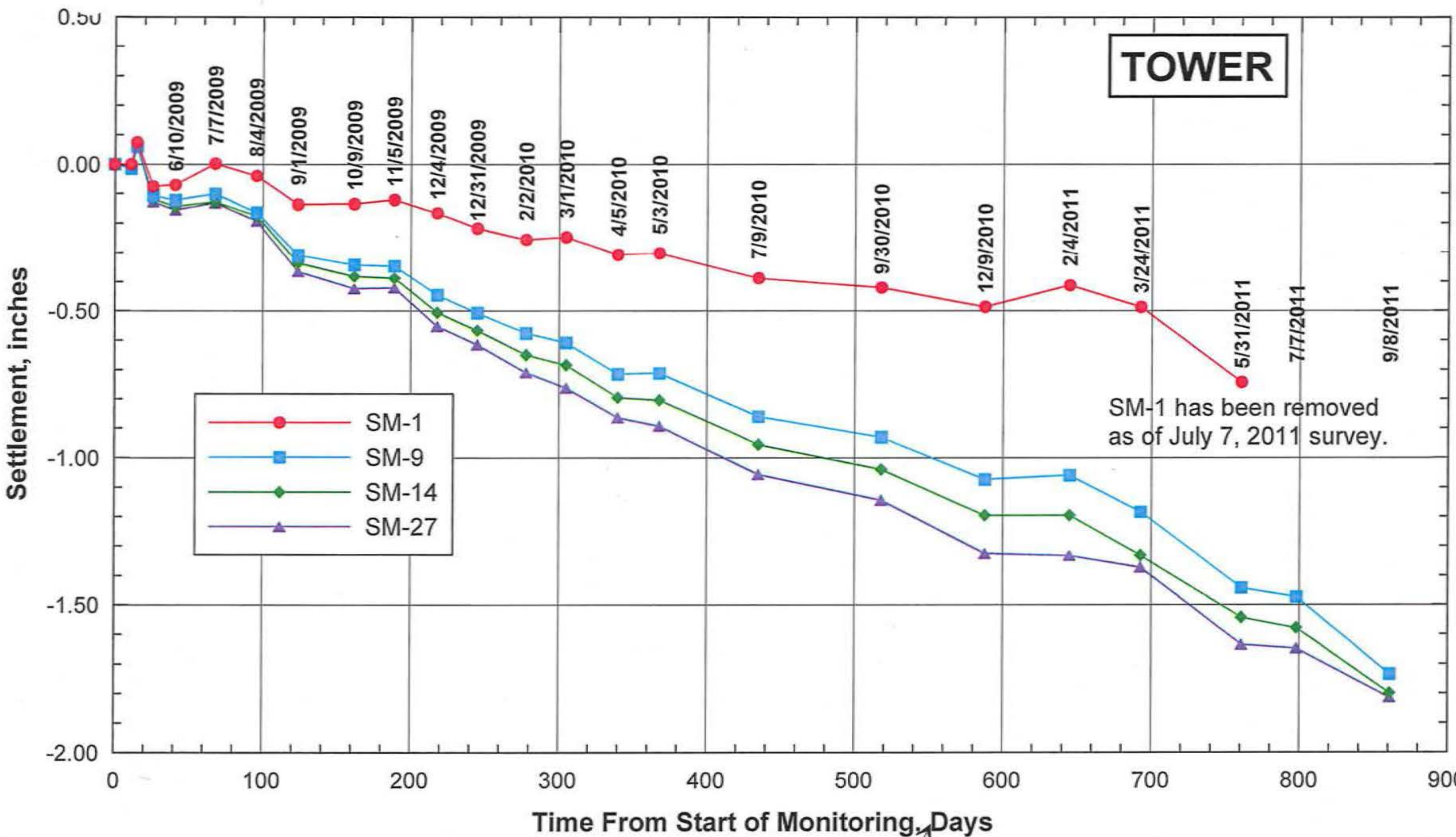
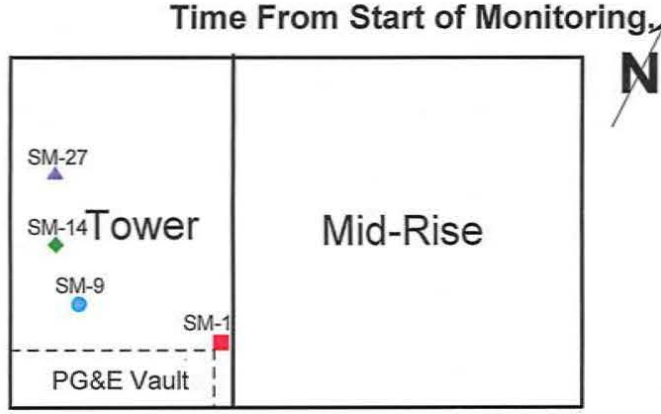
PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\145 301 Mission - September Survey\Plates\Elevation changes All (2011.09.08).srf





Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\145 301 Mission - September Survey\Plates\Plate 4 Settlement Over Time - Tower.grf

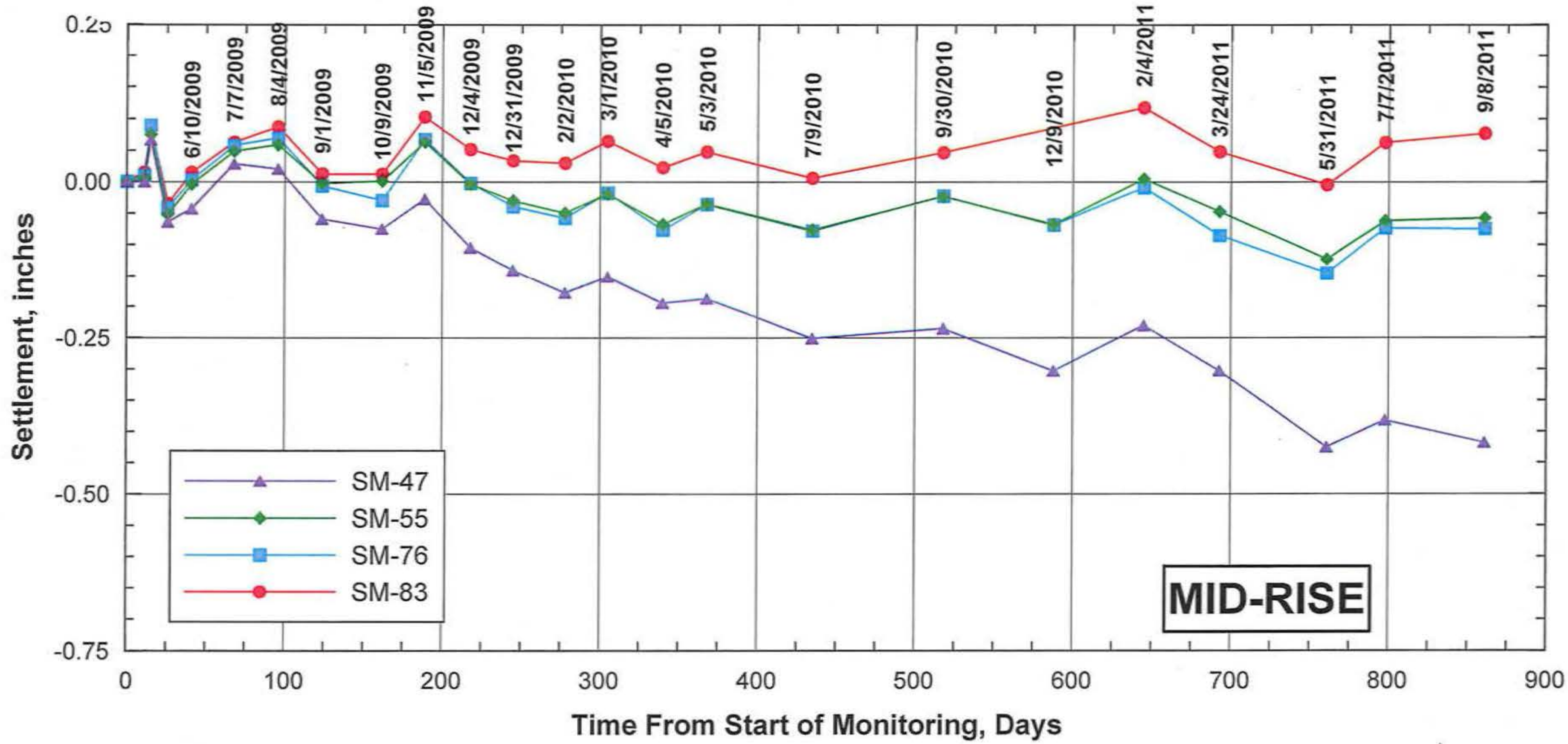
SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH SEPTEMBER 8, 2011

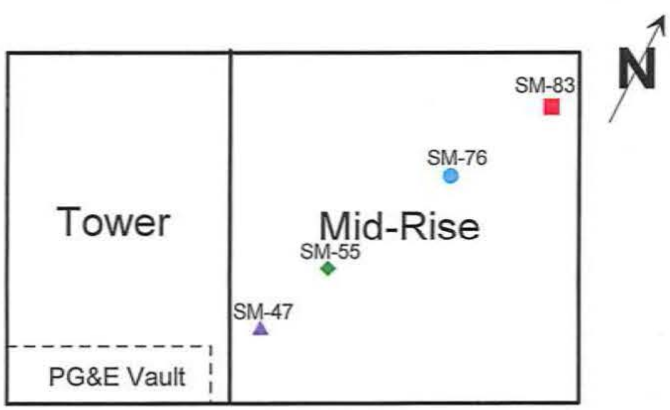
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

October 2011

ARUP

PLATE 4





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH SEPTEMBER 8, 2011

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

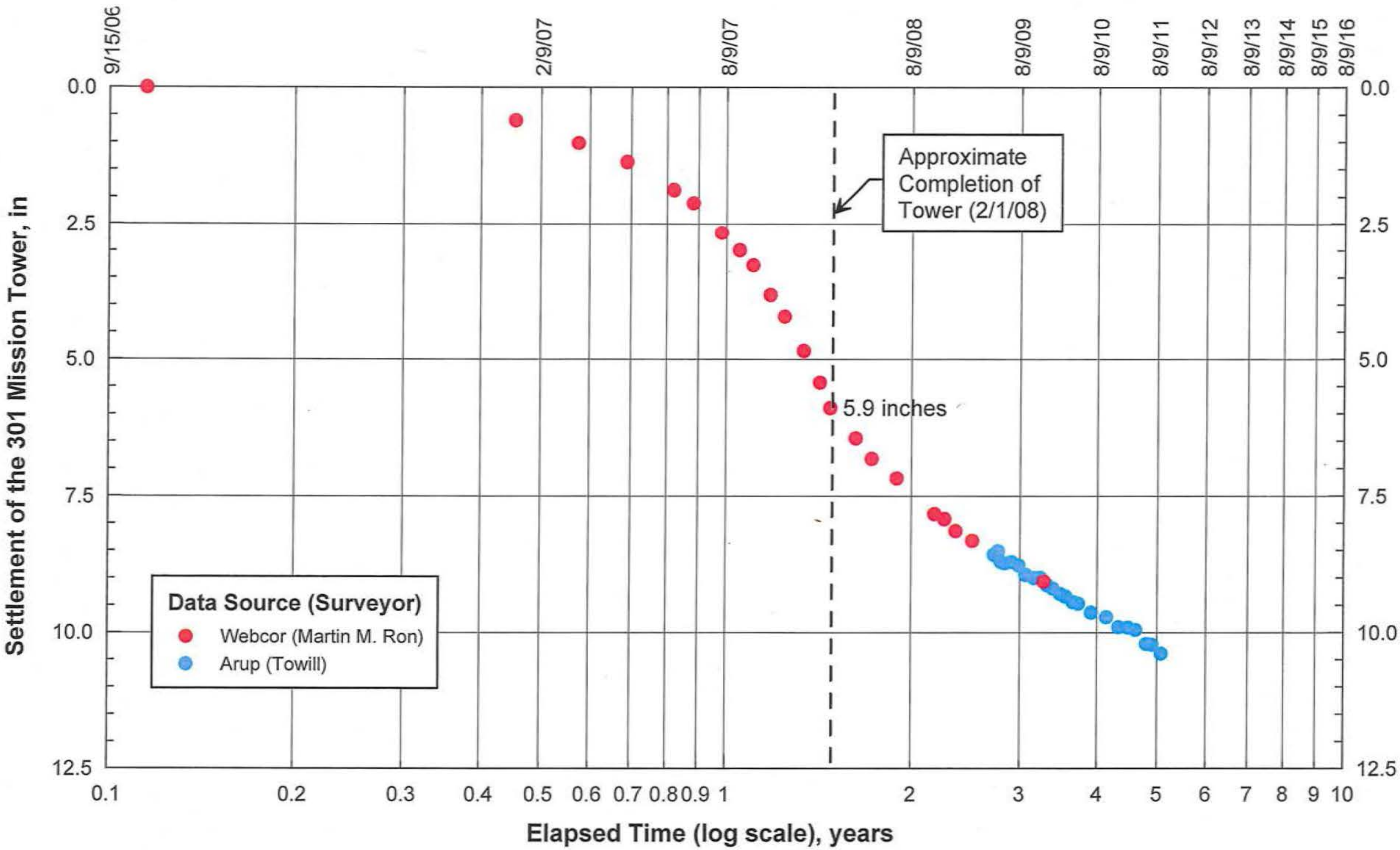
October 2011

ARUP

PLATE 5

Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\145 301 Mission - September Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

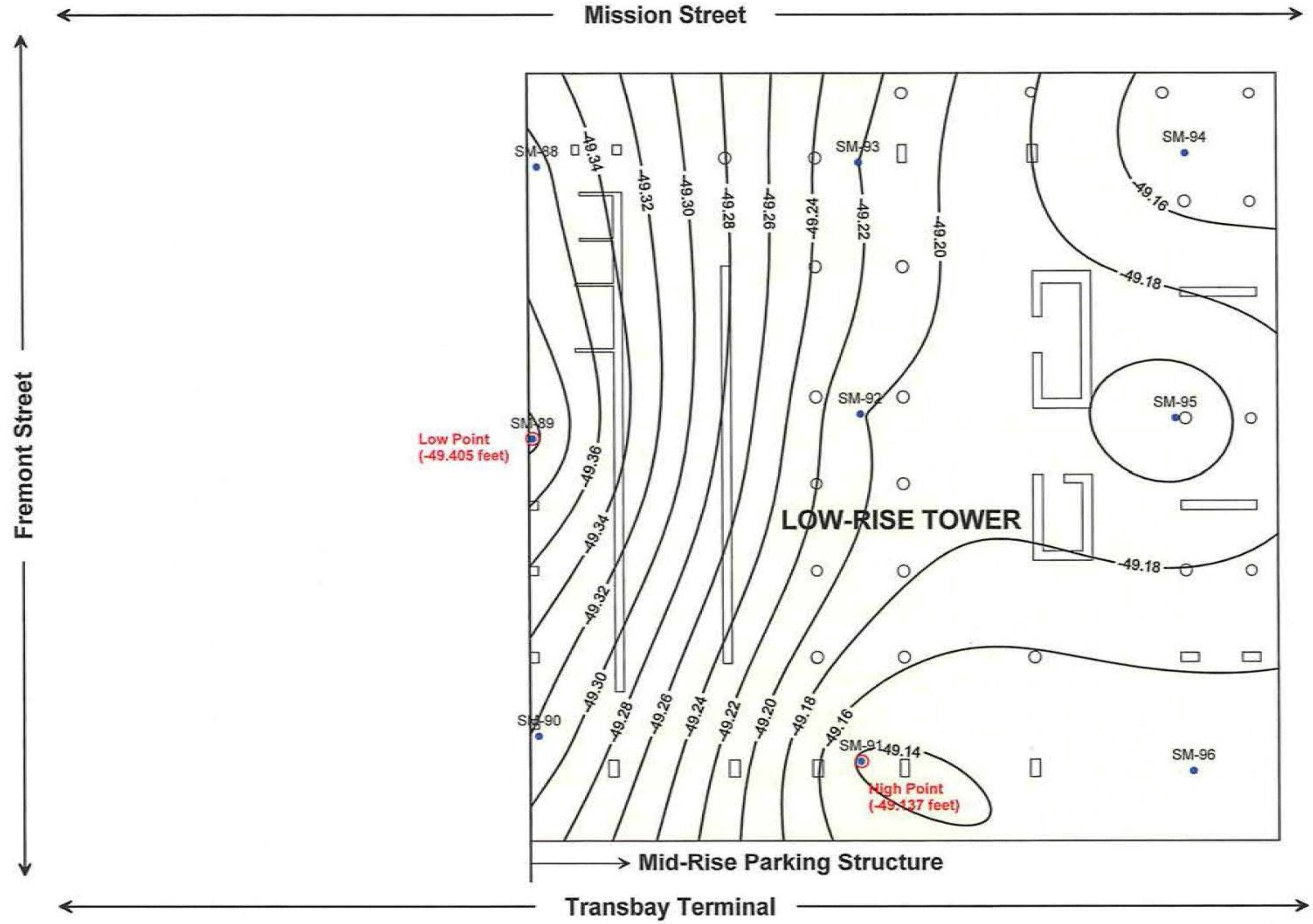
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

October 2011

ARUP

PLATE 6

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\145 301 Mission - September Survey\Plates\Plate 6 Tower Settlements.grf



Date of Survey Reading:
September 8, 2011

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.268 feet (3.218 inches)

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on September 8, 2011.

0 25 50 75
Approximate Scale: 1" = 25'

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\145 301 Mission - September Survey\Plates\B-5 Elevations (2011.09.08).srf

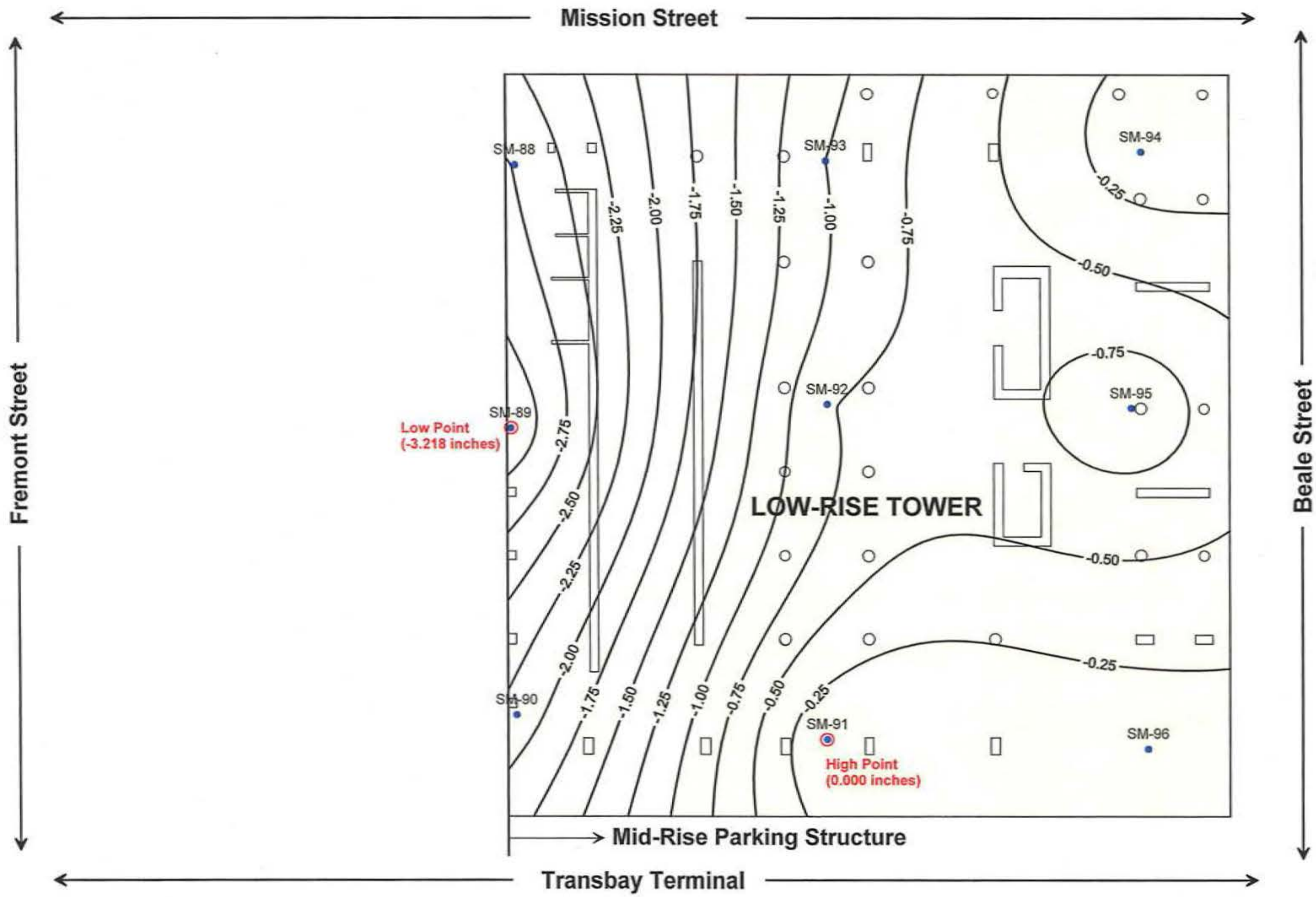
FLOOR ELEVATION AT BASEMENT LEVEL B-5 OF 301 MISSION PROPERTY: SEPTEMBER 8, 2011 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

October 2011

ARUP

PLATE 7



Date of Survey Reading:
September 8, 2011

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.268 feet (3.218 inches)

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on September 8, 2011.

Approximate Scale: 1" = 25'

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\145 301 Mission - September Survey\Plates\B-5 Differential Elevations (2011.09.08).srf

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
AT BASEMENT LEVEL B-5: SEPTEMBER 8, 2011 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

October 2011

ARUP

PLATE 8

Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date** 25 October 2011
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number** 132242-60/SMM
From	Stephen McLandrich (Arup) Nick O'Riordan (Arup) Kevin Clinch (Arup)	**File reference** 4-05 146
Subject	Transbay Transit Center: Results of October 2011 Settlement Survey at 301 Mission Property	**Page 1 of 1**

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated October 25, 2011 with measurements made through October 2011.

List of Plates

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Plate 5	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Mid-Rise: April 30, 2009 through October 20, 2010
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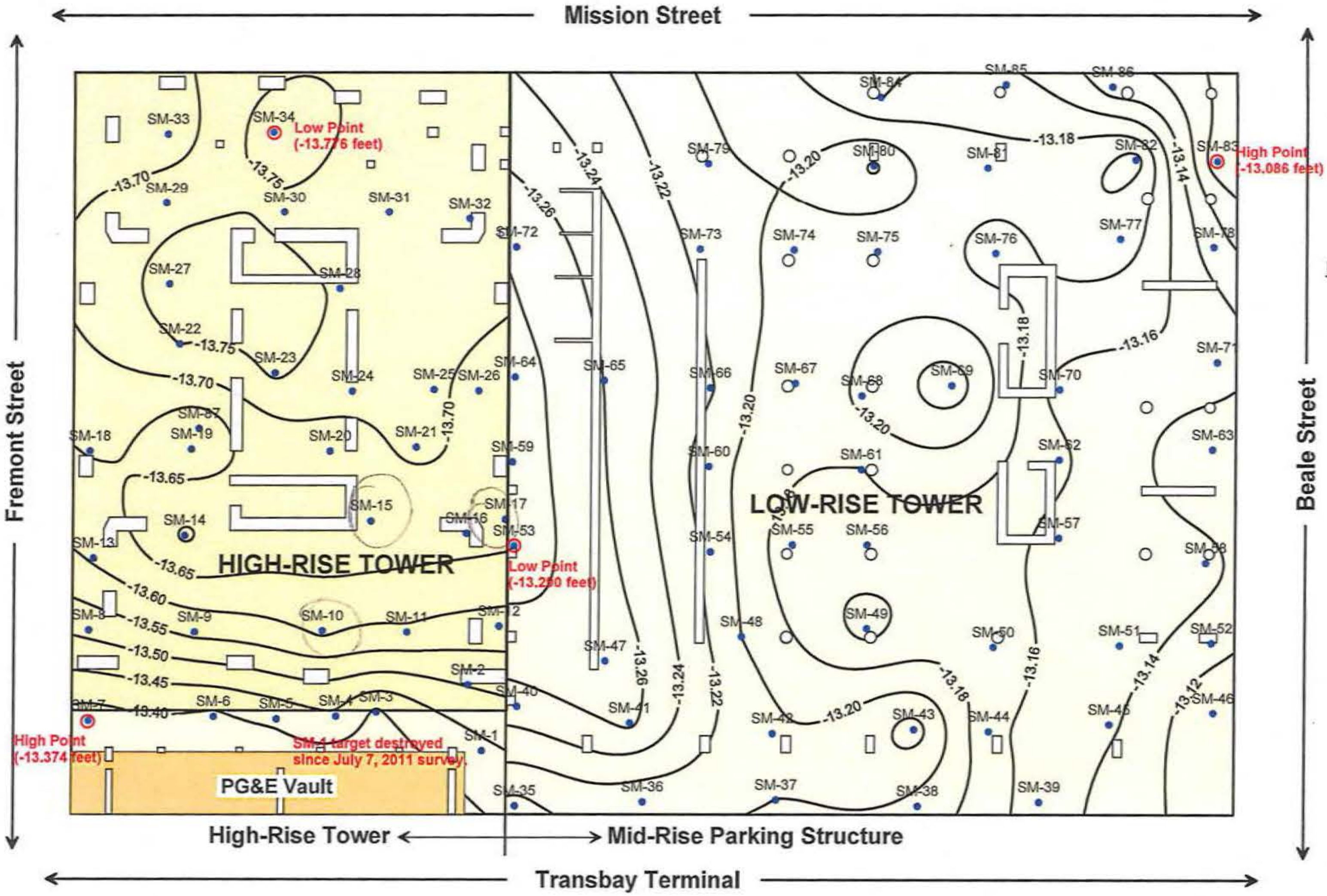
Plate 8	Differential Floor Elevations (Inches) at Basement Level B-5: October 20, 2011 Survey



Date of Survey Reading:
October 20, 2011

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	Low-Rise Tower
0.402 feet (4.824 inches)	0.204 feet (2.447 inches)

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on October 20, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

0 25 50 75
Approximate Scale: 1" = 25'

FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY: PERIODIC SURVEY - OCTOBER 20, 2011

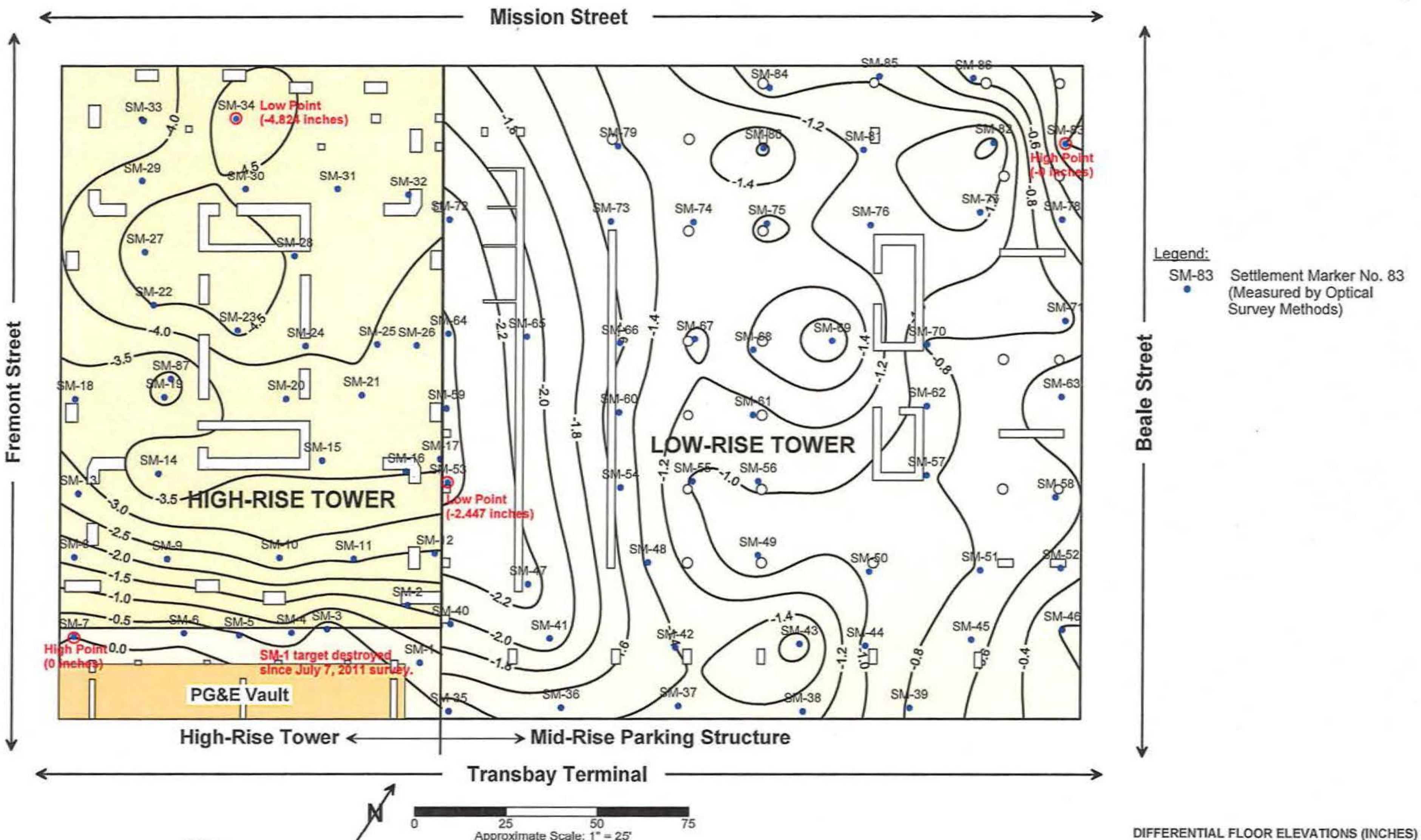
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

October 2011

ARUP

PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\146 301 Mission - Oct 2011 Survey\Plates\Elevations All (2011.10.20).srf



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on October 20, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
OCTOBER 20, 2011 SURVEY

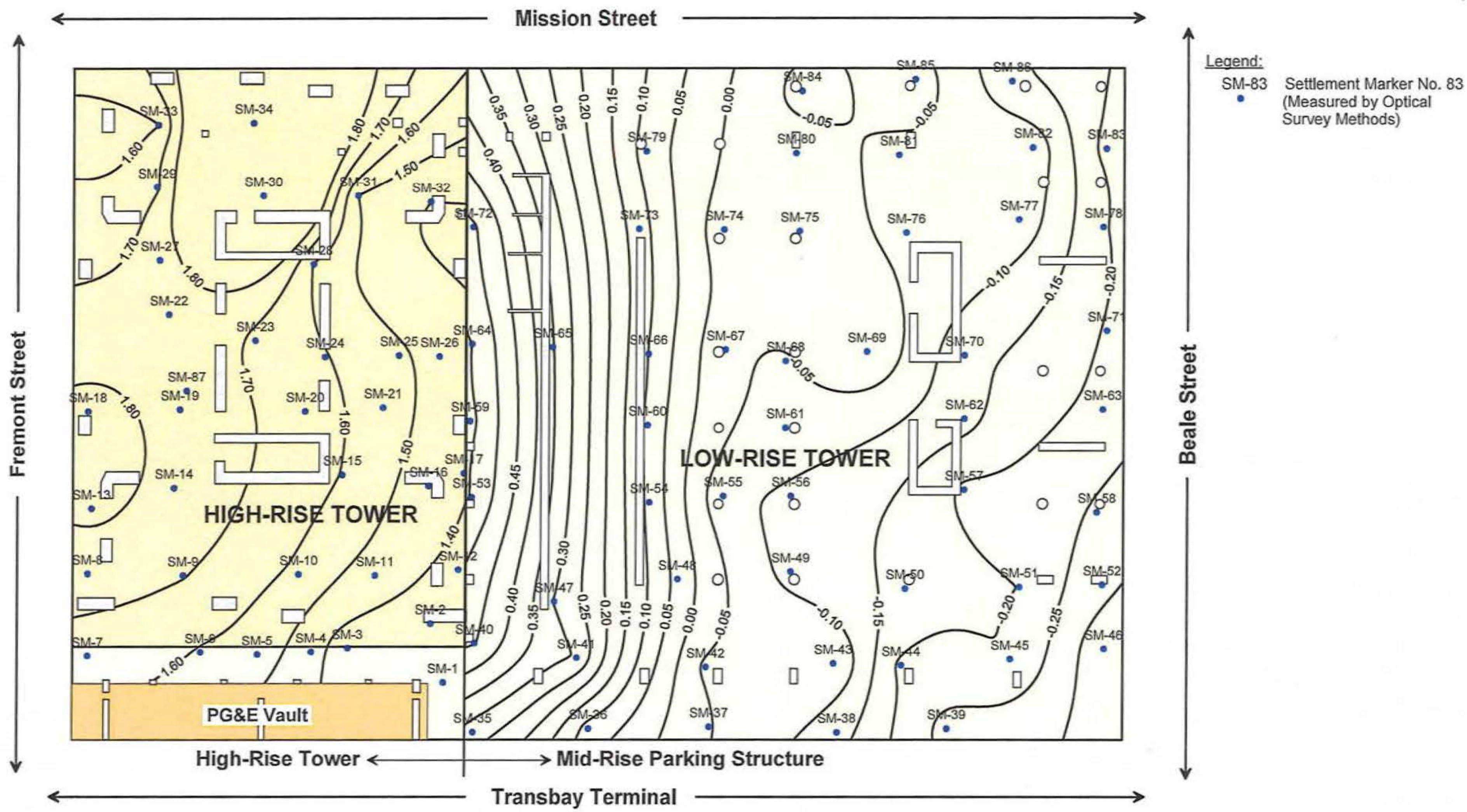
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

October 2011

ARUP

PLATE 2

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\146 301 Mission - Oct 2011 Survey\Plates\Differential Elevation All (2011.10.20).srf



N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on October 20, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE FIRST LEVEL BASEMENT OF THE 301 MISSION STREET STRUCTURE BETWEEN APRIL 30, 2009 AND OCTOBER 20, 2011

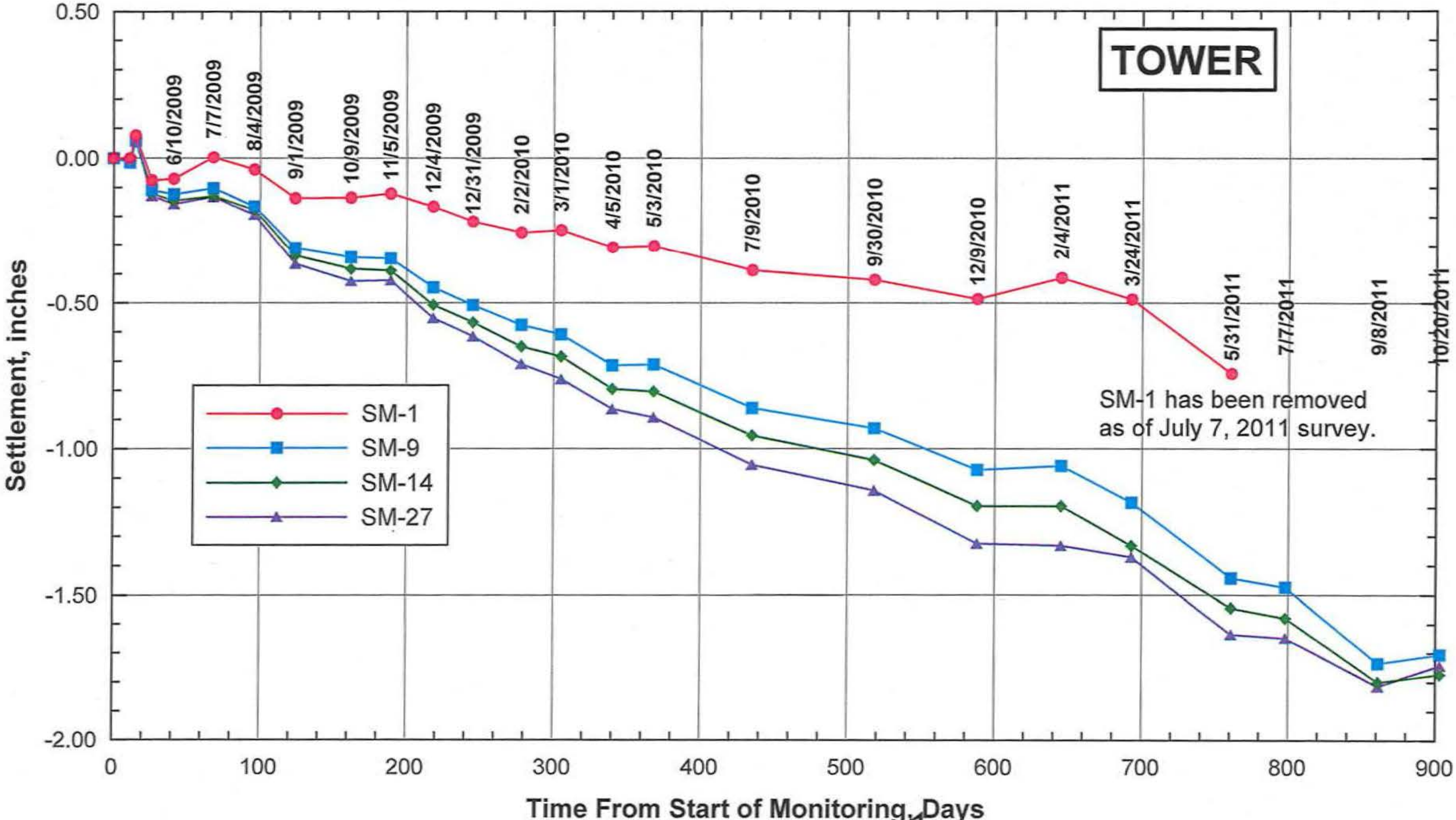
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

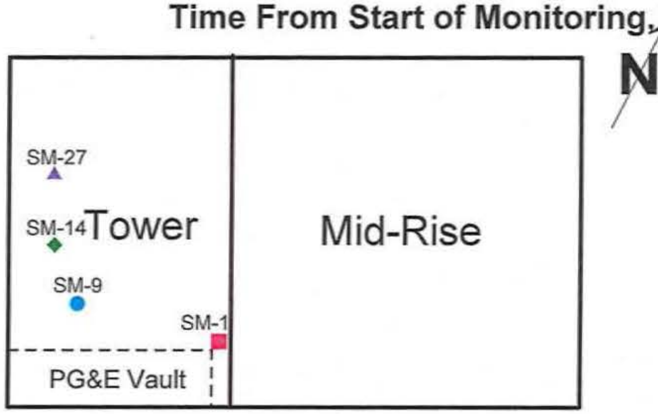
October 2011

ARUP

PLATE 3

J:\S-F\132000\132424\4 Internal Project Data\4-05 Reports & Narratives\145 301 Mission - Oct 2011 Survey\Plates\Elevation changes All (2011.10.20).srf





Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\146 301 Mission - Oct 2011 Survey\Plates\Plate 4 Settlement Over Time - Tower.grf

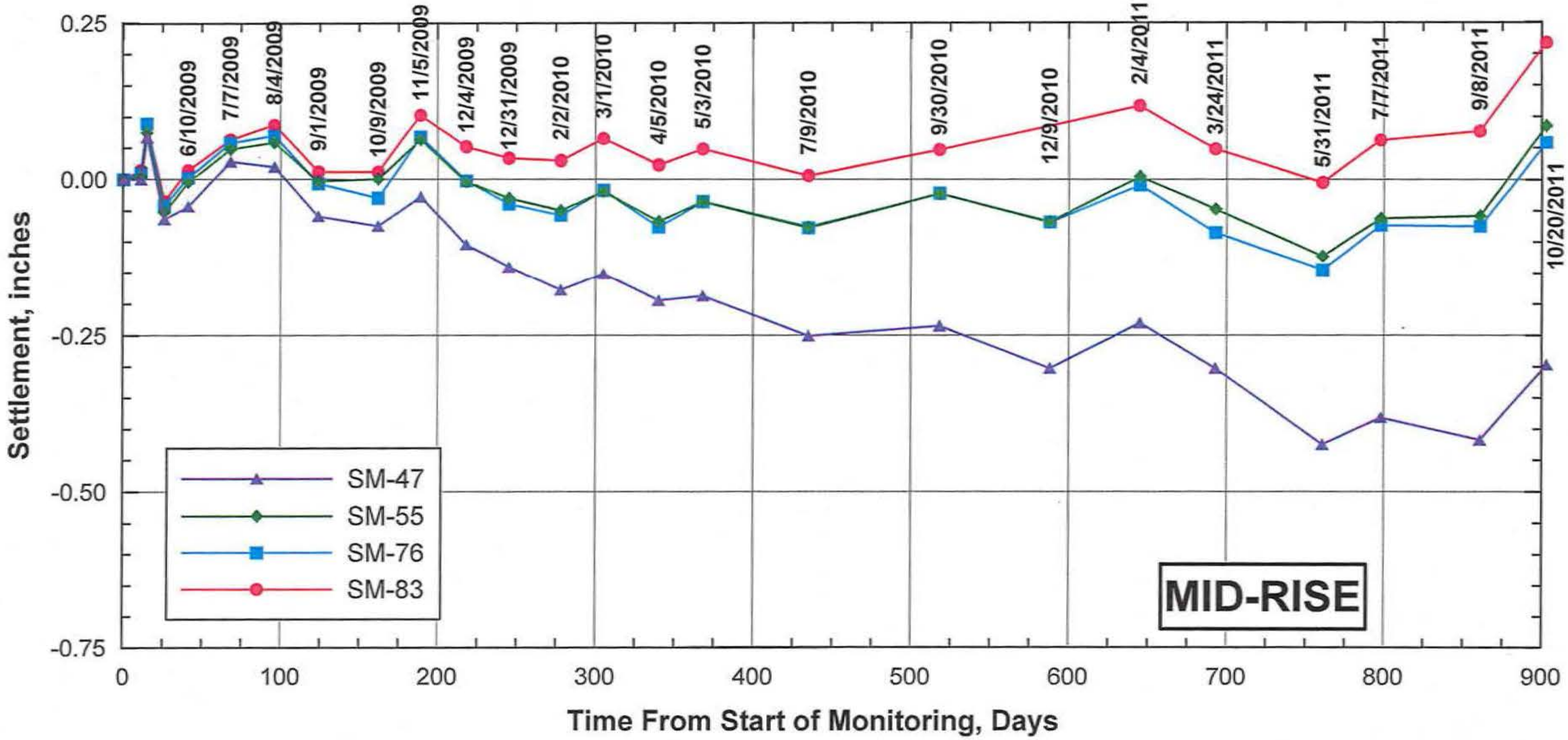
SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH OCTOBER 20, 2011

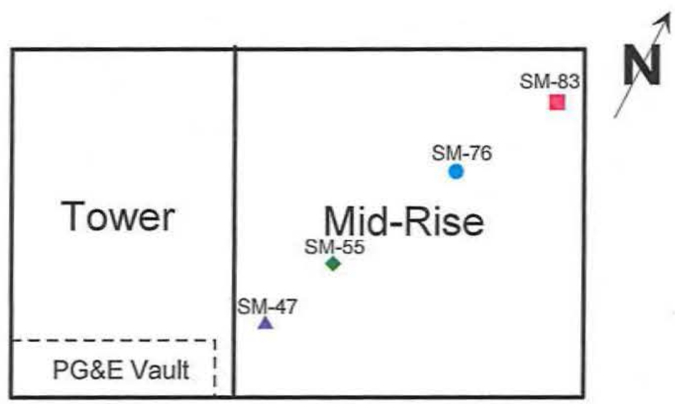
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

October 2011

ARUP

PLATE 4





Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\146 301 Mission - Oct 2011 Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf

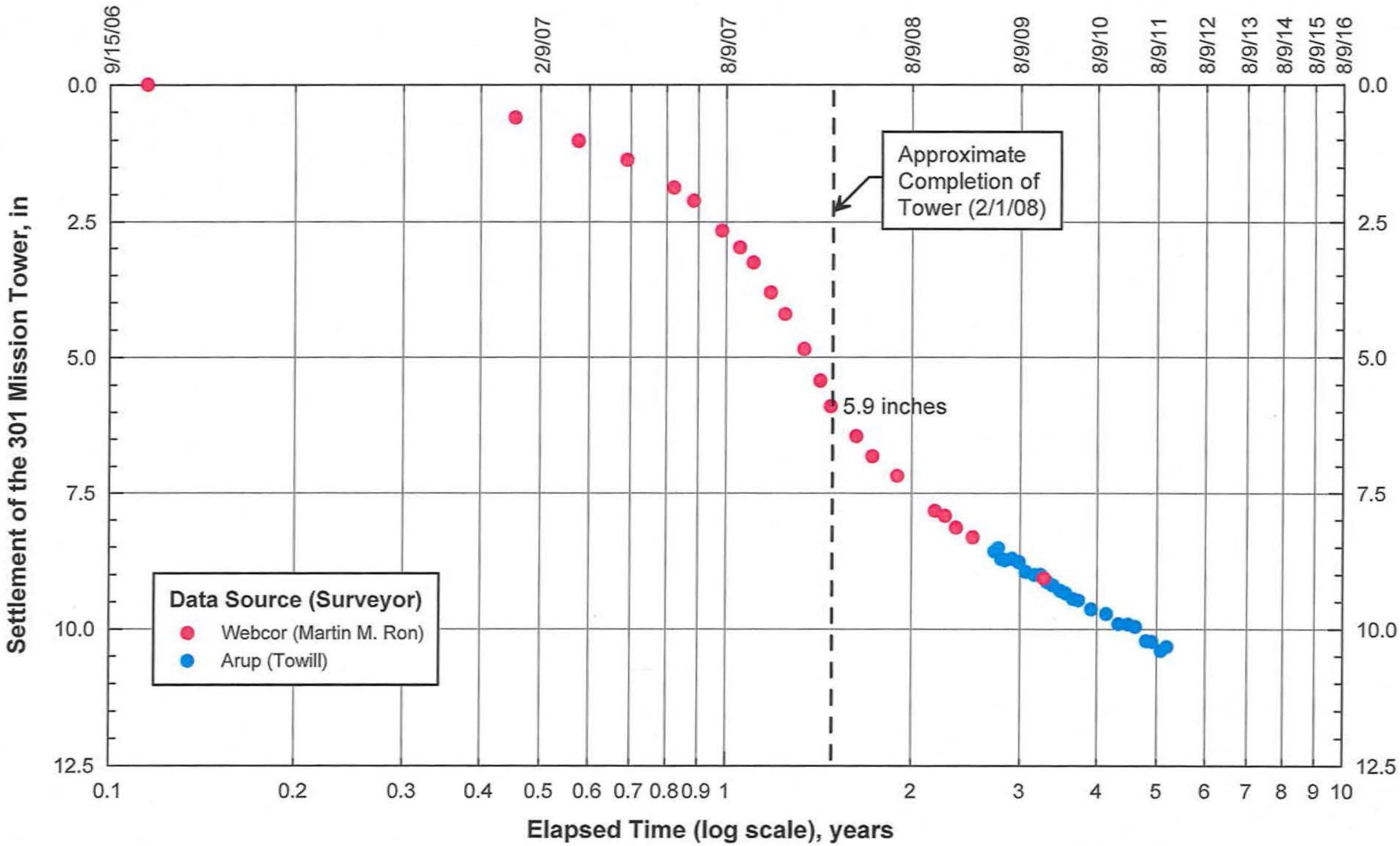
SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH OCTOBER 20, 2011

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

October 2011

ARUP

PLATE 5



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

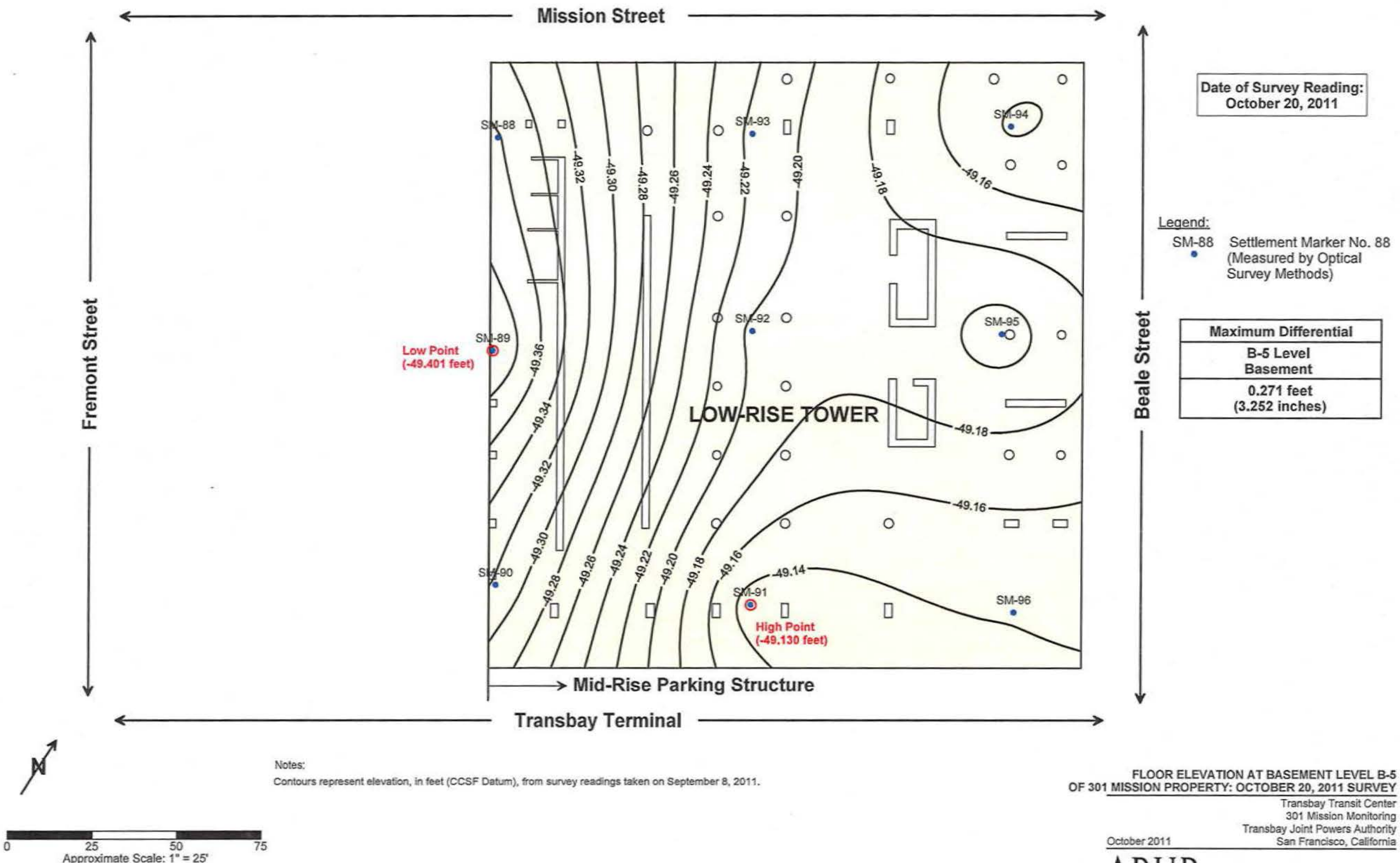
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

October 2011

ARUP

PLATE 6

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\146 301 Mission - Oct 2011 Survey\Plates\Plate 6 Tower Settlements.grf



Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on September 8, 2011.

FLOOR ELEVATION AT BASEMENT LEVEL B-5 OF 301 MISSION PROPERTY: OCTOBER 20, 2011 SURVEY

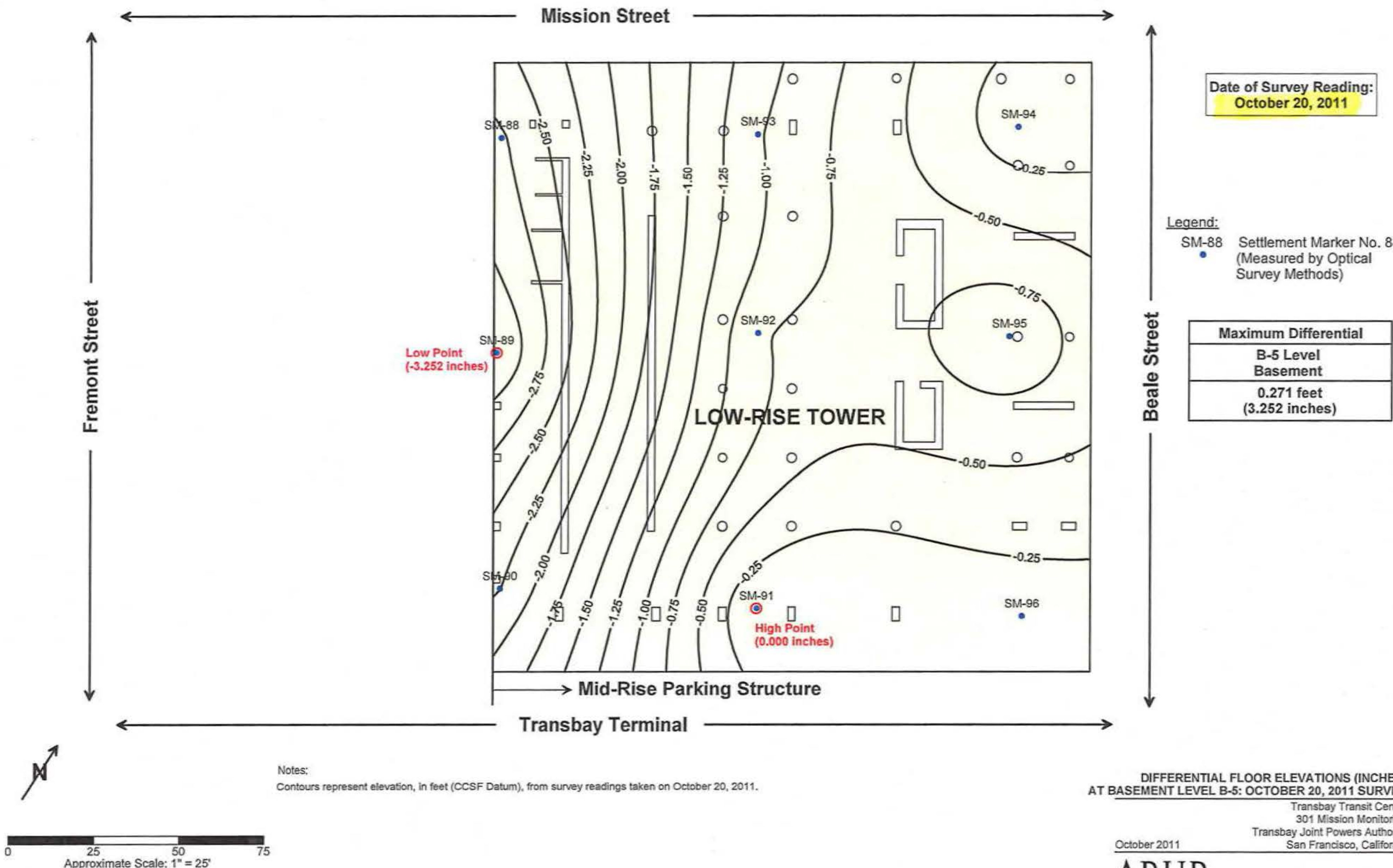
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

October 2011

ARUP

PLATE 7

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\1.46 301 Mission - Oct 2011 Survey\Plates\B-5 Elevations (2011.10.20).srf



Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on October 20, 2011.

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\146 301 Mission - Oct 2011 Survey\Plates\B-5 Differential Elevations (2011.10.20).srf

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
AT BASEMENT LEVEL B-5: OCTOBER 20, 2011 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

October 2011

ARUP

PLATE 8

Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date**	23 December 2011
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/SMM
From	Stephen McLandrich (Arup) Nick O'Riordan (Arup) Kevin Clinch (Arup)	**File reference**	4-05 150
Subject	Transbay Transit Center: Results of December 2011 Settlement Survey at 301 Mission Property	**Page** 1 **of** 1	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated October 25, 2011 with measurements made through December 2011.

Settlement Markers SM-01 and SM-02 were destroyed during patching of the floor in their locations. These two points will be replaced by four additional settlement markers, SM-97 through SM-100. Currently, only SM-97 and SM-98 have been installed due to additional floor patching work. Their locations can be seen in the floor plan in Plate 1.

List of Plates

Plate 1 Floor Elevations at Level B-1 of 301 Mission Property: Periodic Survey – December 14, 2010
Plate 2 Differential Floor Elevation (Inches) – December 14, 2010 Survey
Plate 3 Contours of Settlements Measured at the First Level Basement of the 301 Mission Street Structure Between April 30, 2009 and December 14, 2010
Plate 4 Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Tower: April 30, 2009 through December 14, 2010.
Plate 5 Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Mid-Rise: April 30, 2009 through December 14, 2010
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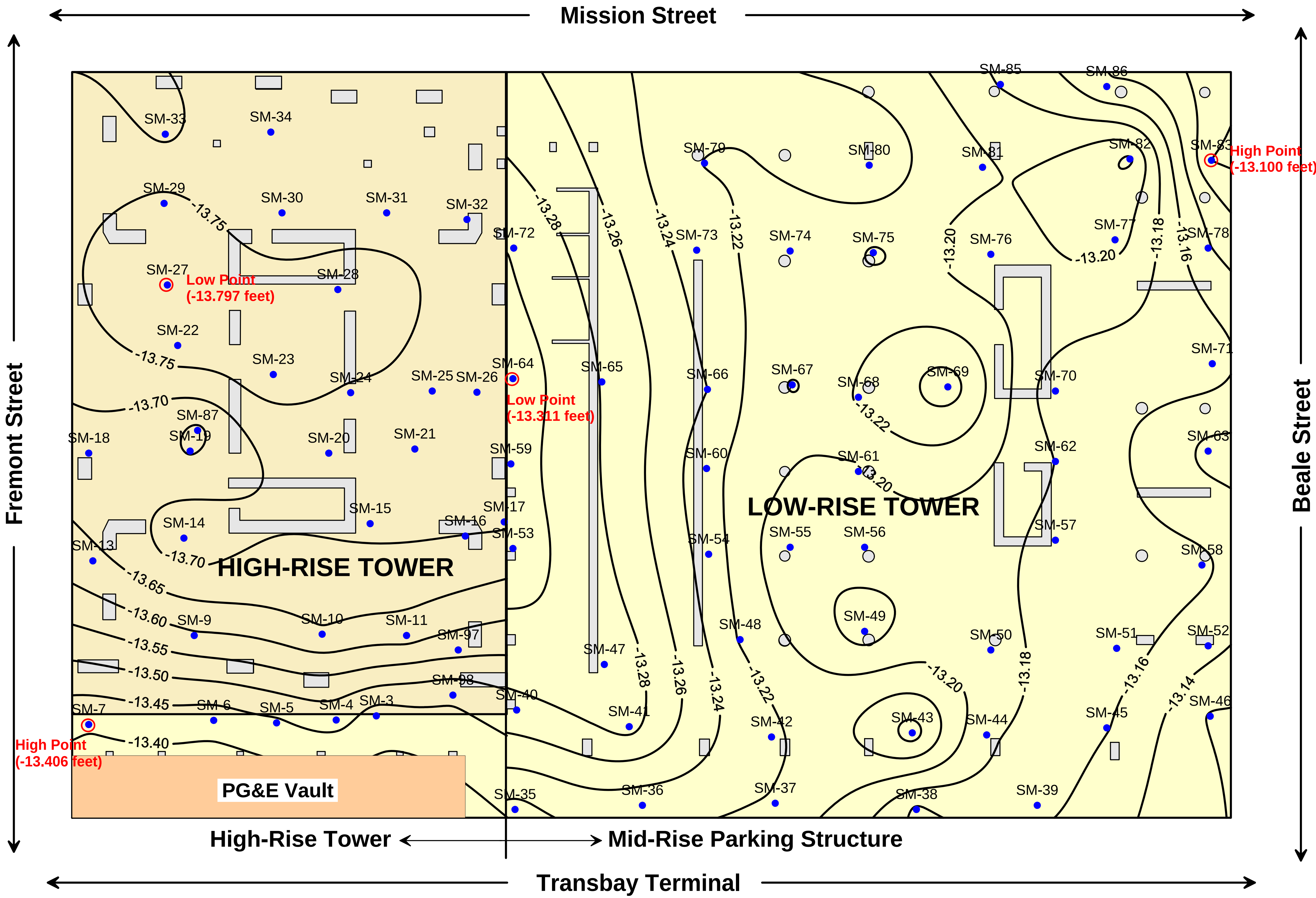
Plate 7 Floor Elevation at Basement Level B-5 of 301 Mission Property: December 14, 2011 Survey
Plate 8 Differential Floor Elevations (Inches) at Basement Level B-5: December 14, 2011 Survey



Date of Survey Reading:
December 14, 2011

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	Low-Rise Tower
0.392 feet (4.700 inches)	0.211 feet (2.533 inches)

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on December 14, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

0 25 50 75

Approximate Scale: 1" = 25'

FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY:
PERIODIC SURVEY - DECEMBER 14, 2011

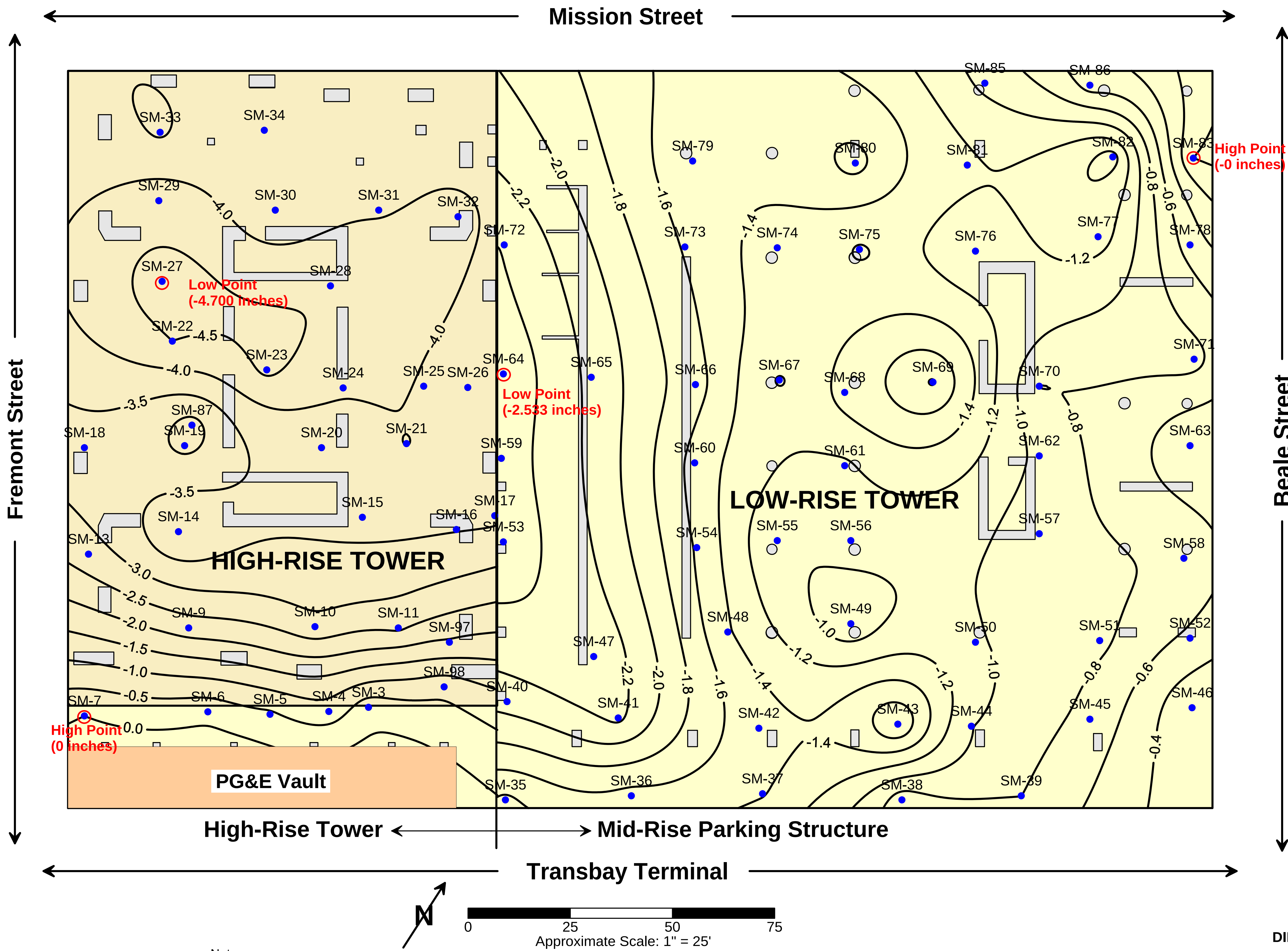
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

December 2011

ARUP

PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\150 301 Mission - Dec 2011 Survey\Plates\Elevations All (2011.12.14).srf



Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on December 14, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
DECEMBER 14, 2011 SURVEY

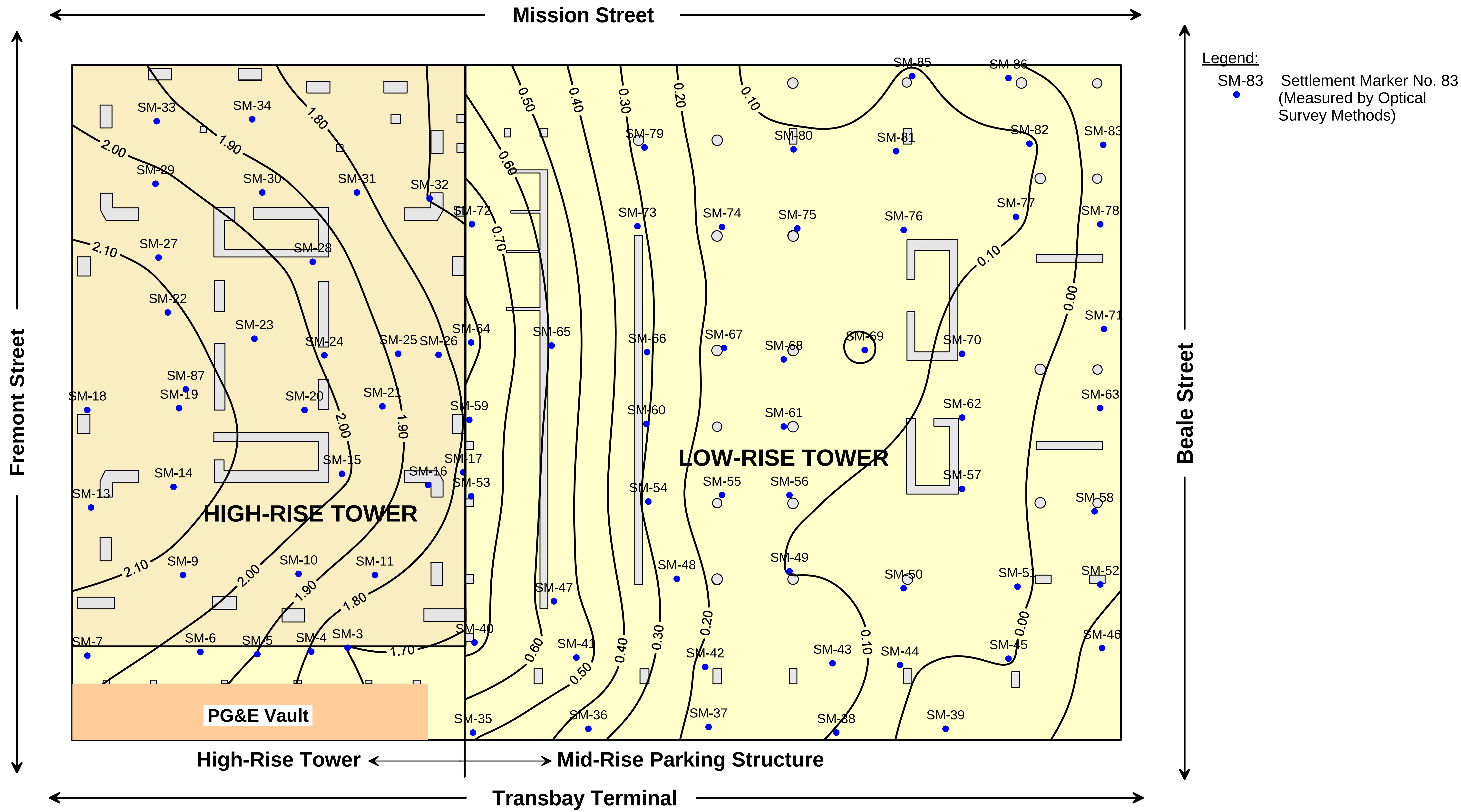
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

December 2011

ARUP

PLATE 2

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\150 301 Mission - Dec 2011 Survey\Plates\Differential Elevation All (2011.12.14).srf



N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on December 14, 2011.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE FIRST LEVEL BASEMENT OF THE 301 MISSION STREET STRUCTURE BETWEEN APRIL 30, 2009 AND DECEMBER 14, 2011

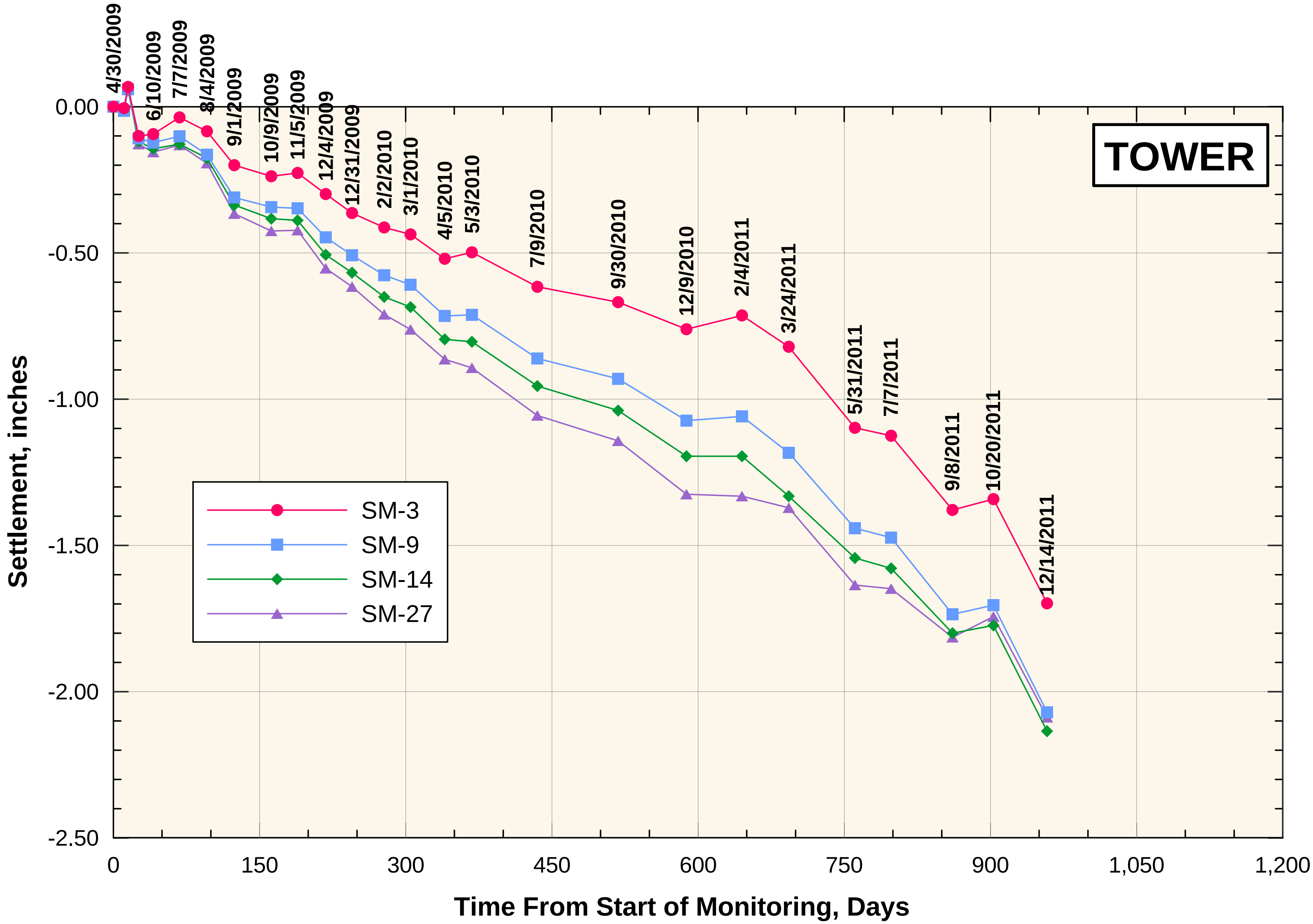
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

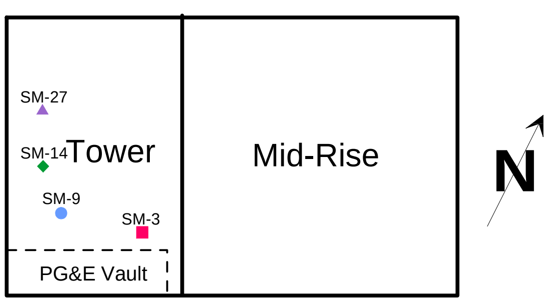
December 2011

ARUP

PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\150 301 Mission - Dec 2011 Survey\Plates\Elevation changes All (2011.12.14).srf





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH DECEMBER 14, 2011

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

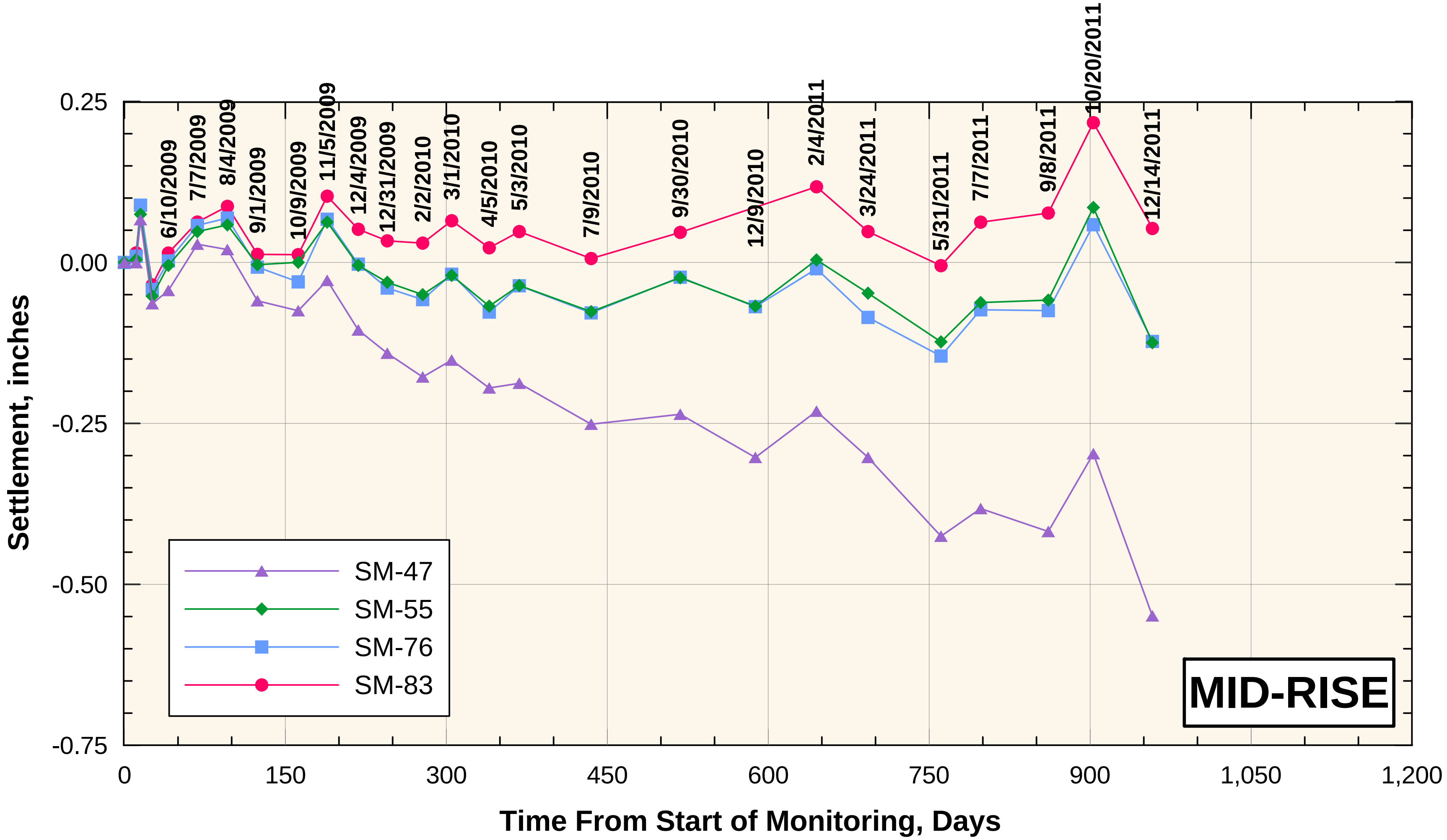
December 2011

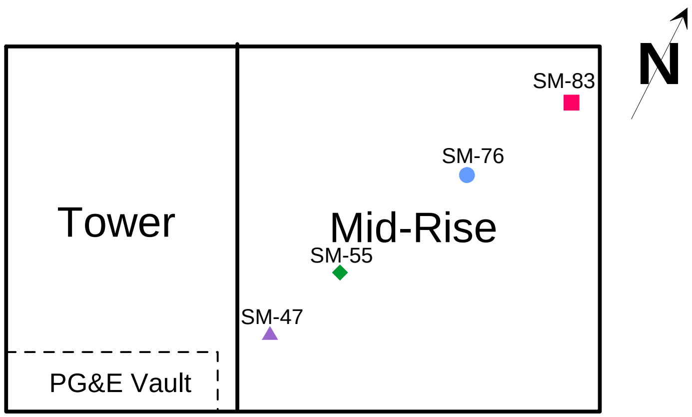
ARUP

PLATE 4

Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\150 301 Mission - Dec 2011 Survey\Plates\Plate 4 Settlement Over Time - Tower.grf





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH DECEMBER 14, 2011

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

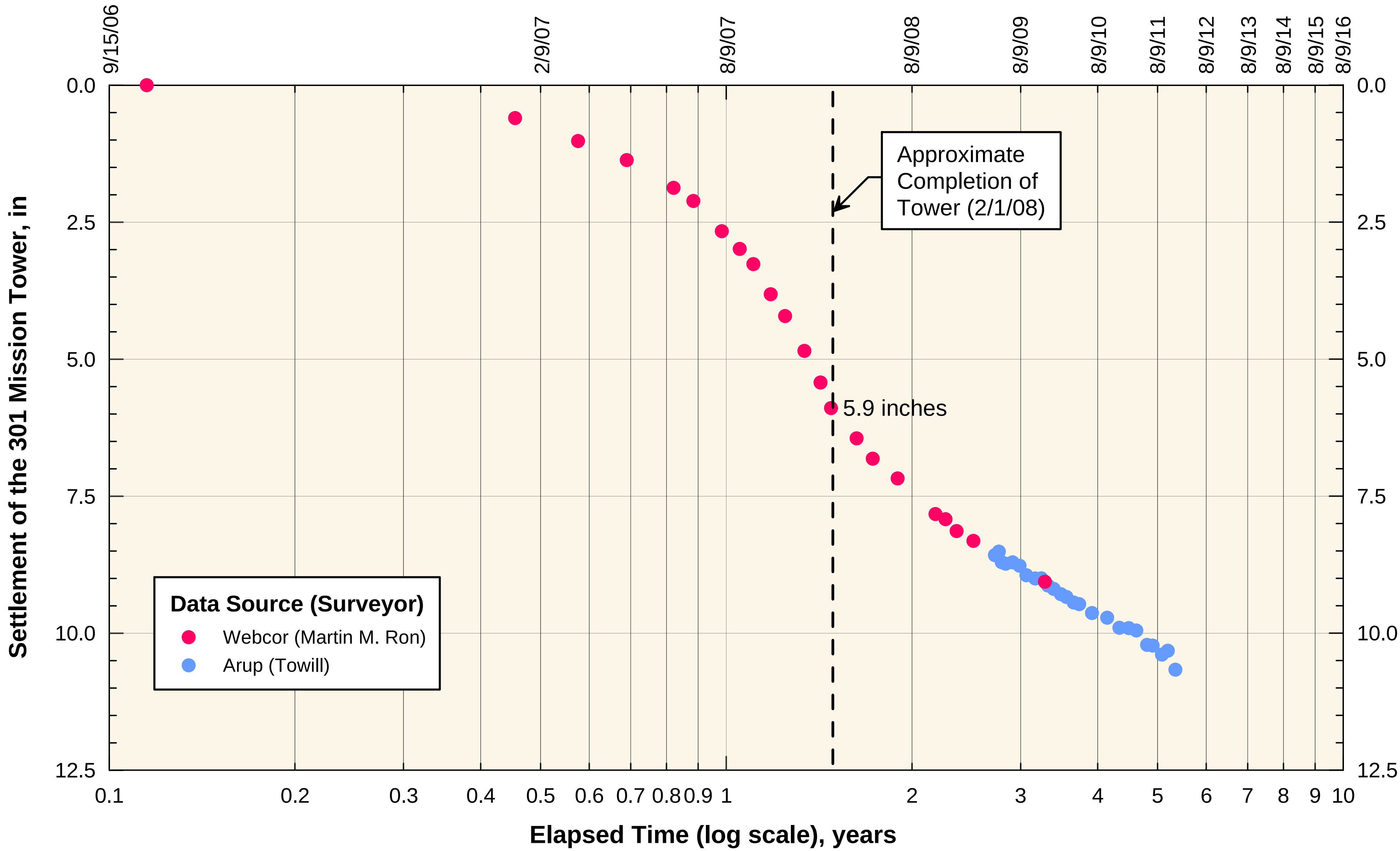
December 2011

ARUP

PLATE 5

Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\150 301 Mission - Dec 2011 Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

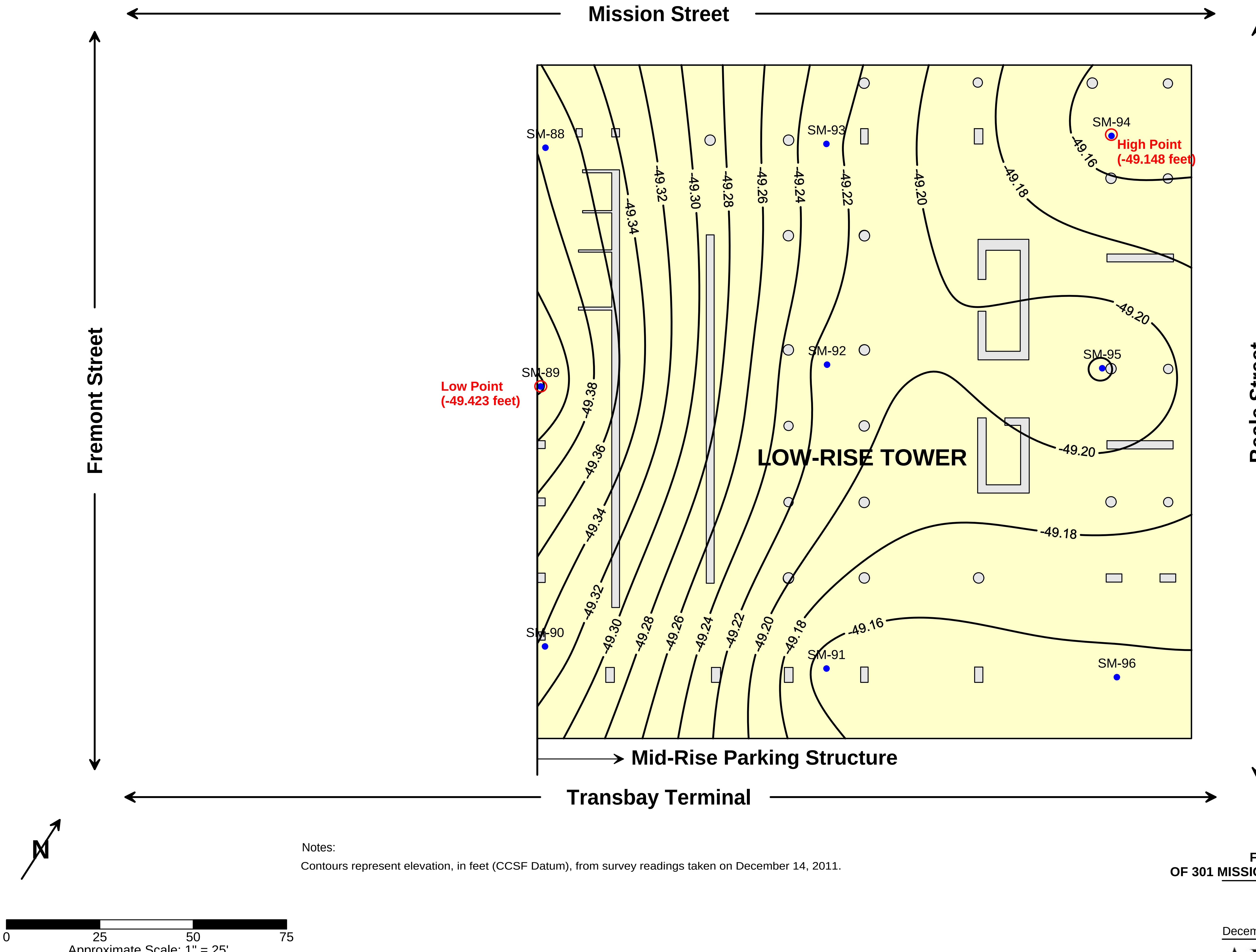
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

December 2011

ARUP

PLATE 6

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\150 301 Mission - Dec 2011 Survey\Plates\Plate 6 Tower Settlements.grf



Date of Survey Reading:
December 14, 2011

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.275 feet (3.298 inches)

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on December 14, 2011.

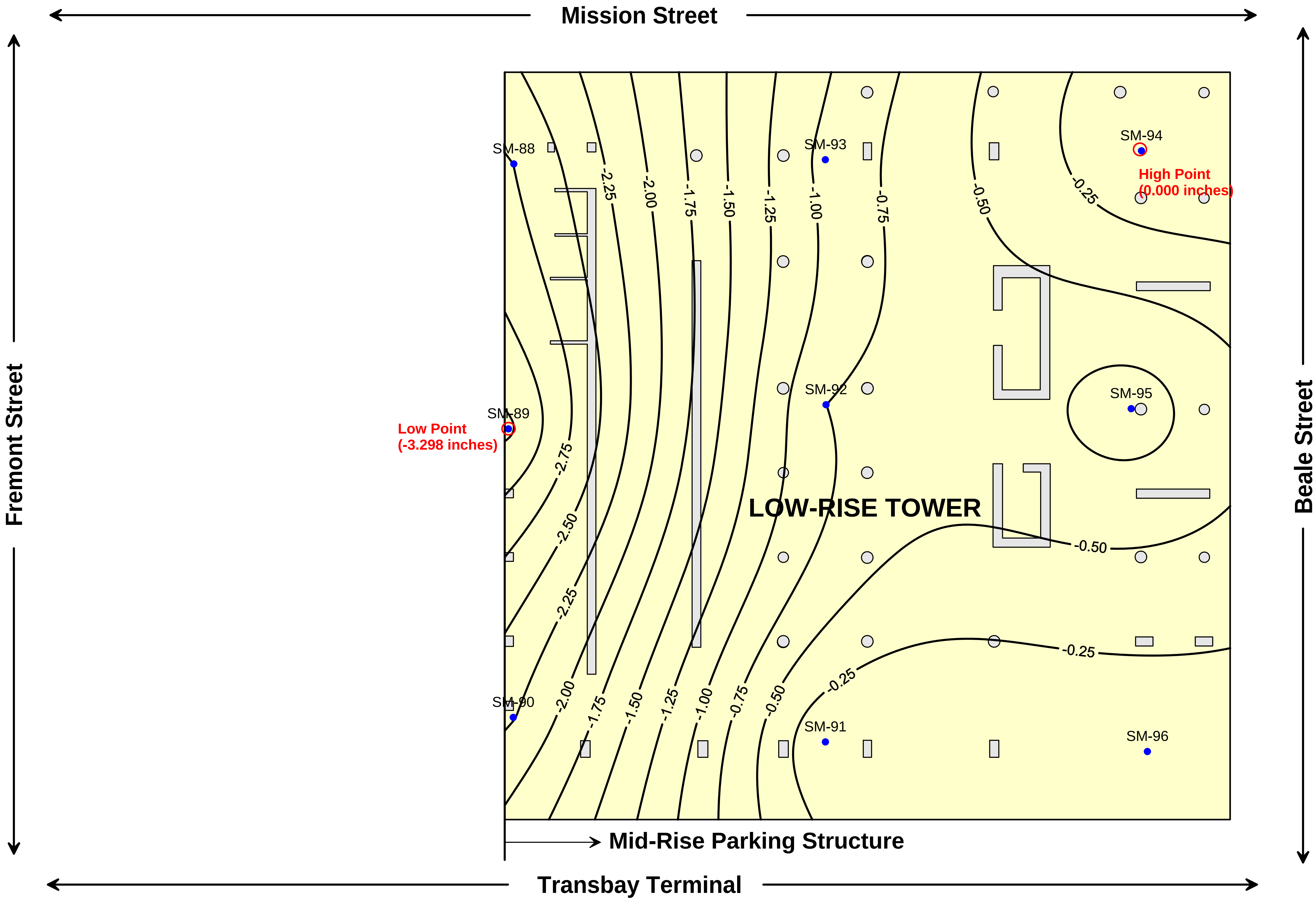
FLOOR ELEVATION AT BASEMENT LEVEL B-5 OF 301 MISSION PROPERTY: DECEMBER 14, 2011 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

December 2011

ARUP

PLATE 7



Date of Survey Reading:
December 14, 2011

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.275 feet (3.298 inches)

N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on December 14, 2011.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
AT BASEMENT LEVEL B-5: DECEMBER 14, 2011 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

December 2011

ARUP

PLATE 8

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\150 301 Mission - Dec 2011 Survey\Plates\B-5 Differential Elevations (2011.12.14).srf

Memorandum

ARUP

To	Brian Dykes (TJPA)	Date	January 20, 2012
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	Reference number	132242/sm
From	Stephen McLandrich (Arup) x 27245 (SF) Marlene Wong (Arup) Lorenzo Allievi (Arup)	File reference	4-05 151
Subject	Transbay Transit Center - Results of Crack Gauge Survey at 301 Mission: December 2011 - January 2012		

Arup has installed 119 crack gauges in the basement of the 301 Mission building to monitor changes in the widths of cracks. 103 of them were installed near the end of April 2009, 15 in May 2011 and 1 in December 2011. Four additional crack gauges were installed by Geo Instruments in June 2011.

A reading of the crack gauges was conducted from December 2011 to January 2012. During this survey, some of the crack gauges were damaged, inaccessible, or missing. Most of the gauges were in working condition. For all the accessible crack gauges, a picture of the gauge was taken. Photographs of crack gauges showing movement are included in Table 1 of this memorandum.

Crack gauge Nos. 94 through 102, located on level B1, may possibly be cemented together. This is likely from the wall re-surfacing which was performed in the area of these gauges. Additionally, crack gauge Nos. 2, 8, 13, 16 and 18 are covered in water-proofing epoxy.

The movement recorded was less than 0.1 millimeters for most of the gauges. 25 of them showed more than 0.1 mm of movement. 8 of the 25 which show movement, do not show movement when compared to the previous reading, in December 2010 or after the installation for those installed in 2011. For these gauges, the attached plate and table describe their locations and the recorded movements.

List of Tables

List of Plates

TABLE 1
SUMMARY OF CRACK GAUGES
SHOWING MOVEMENT: DECEMBER 2011 - JANUARY 2012

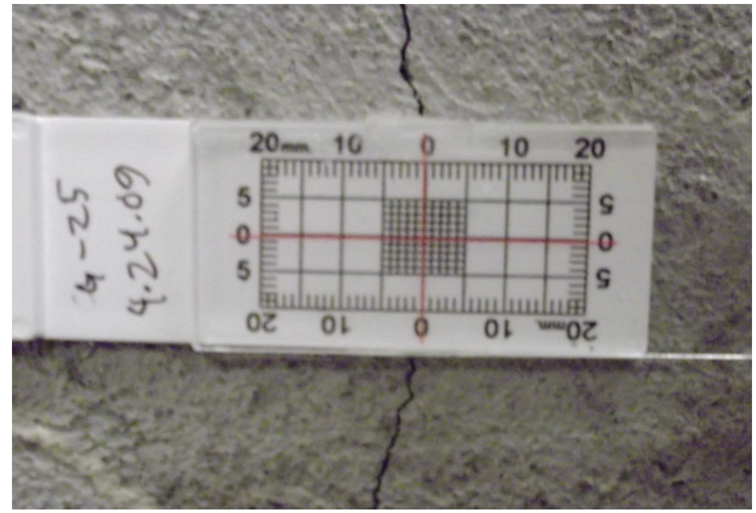
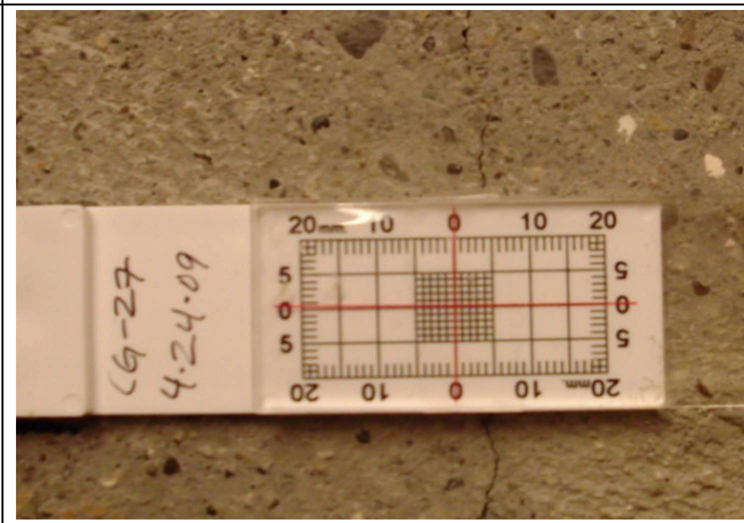
Crack Gauge	Distance of Movement	Direction of movement, relative to the Crack	Variation from previous reading	Picture of Movement
CG-25	0.5 mm	Parallel	+0.1 mm	
CG-27	0.5 mm	Parallel	Same as previous reading	

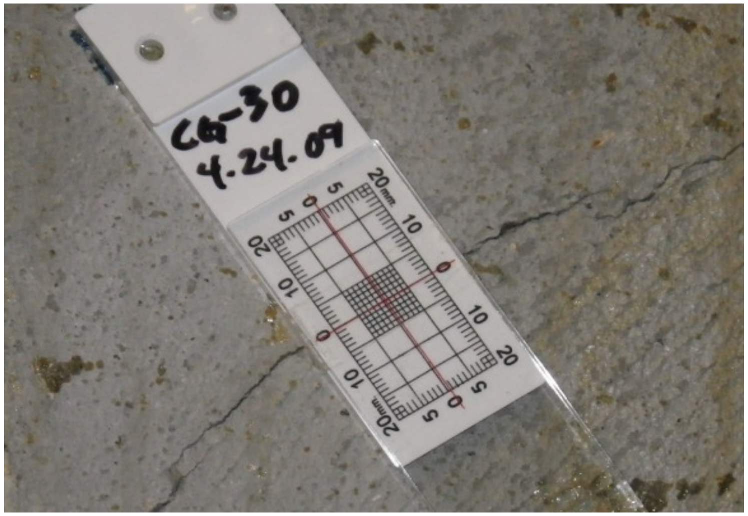
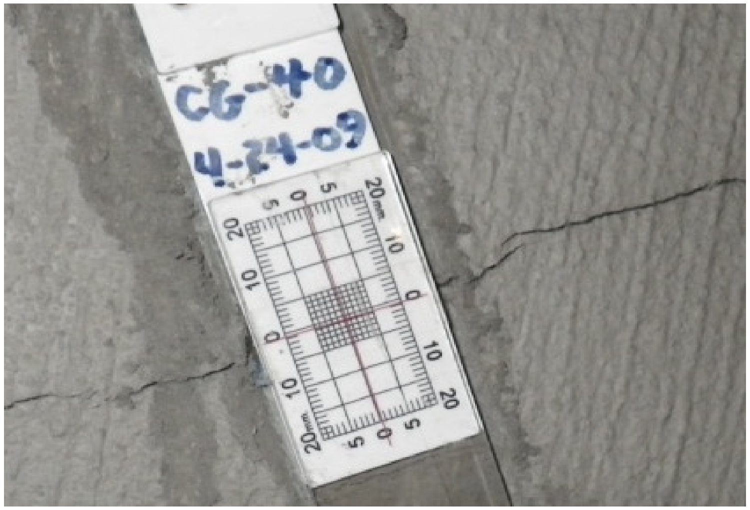
TABLE 1 SUMMARY OF CRACK GAUGES SHOWING MOVEMENT: DECEMBER 2011 - JANUARY 2012				
Crack Gauge	**Distance of Movement**	**Direction of movement, relative to the Crack**	**Variation from previous reading**	**Picture of Movement**
CG-30	0.5 mm	Parallel	+0.1 mm	
CG-40	0.9 mm 0.7 to 0.2 mm	Parallel Perpendicular	+0.9 mm +0.7 to +0.1 mm	

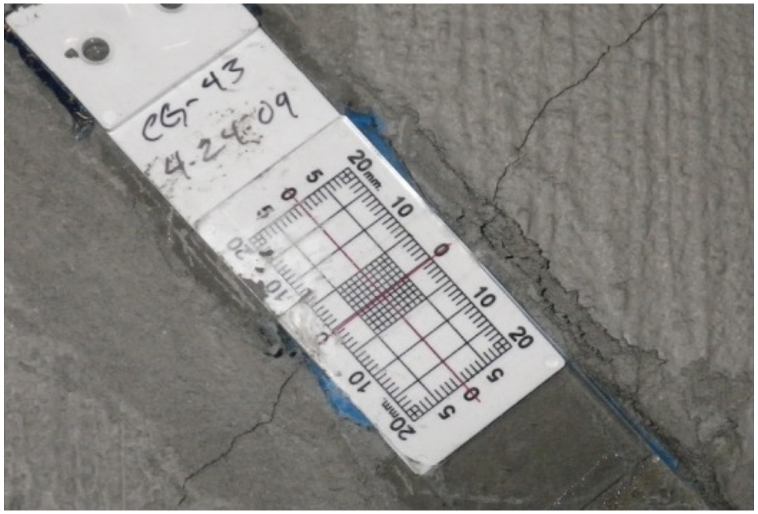
TABLE 1 SUMMARY OF CRACK GAUGES SHOWING MOVEMENT: DECEMBER 2011 - JANUARY 2012				
Crack Gauge	**Distance of Movement**	**Direction of movement, relative to the Crack**	**Variation from previous reading**	**Picture of Movement**
CG-41	0.5 mm	Parallel	+0.5 mm	
CG-43	0.3 mm	Perpendicular	Same as previous reading	

TABLE 1
SUMMARY OF CRACK GAUGES
SHOWING MOVEMENT: DECEMBER 2011 - JANUARY 2012

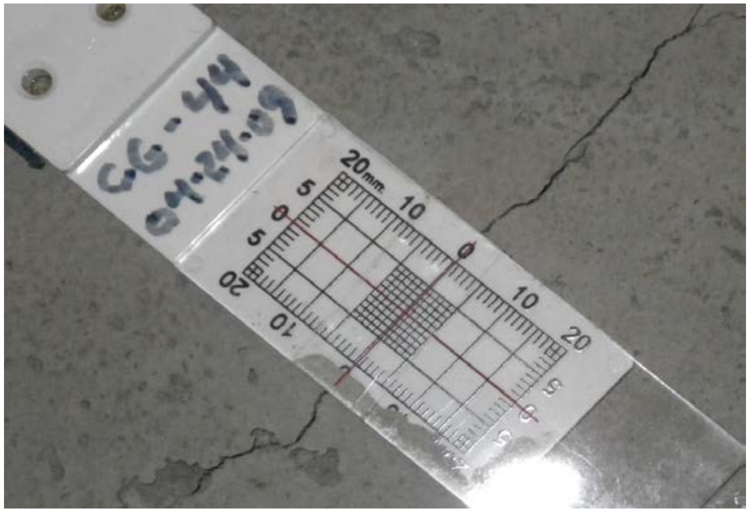
Crack Gauge	Distance of Movement	Direction of movement, relative to the Crack	Variation from previous reading	Picture of Movement
CG-44	0.3 mm	Perpendicular	+0.3 mm	
CG-45	0.4 mm	Perpendicular	+0.4 mm	

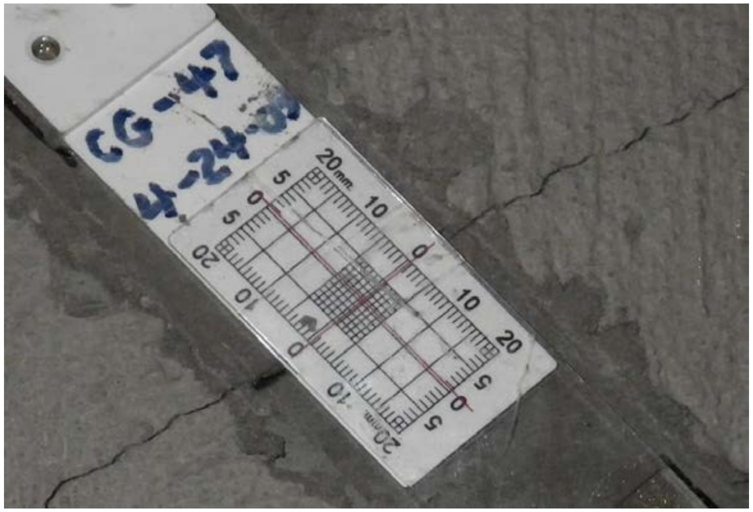
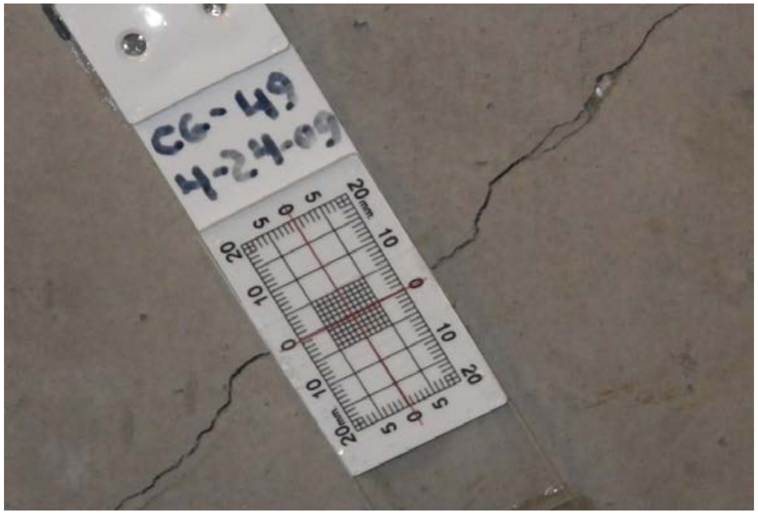
TABLE 1 SUMMARY OF CRACK GAUGES SHOWING MOVEMENT: DECEMBER 2011 - JANUARY 2012				
Crack Gauge	**Distance of Movement**	**Direction of movement, relative to the Crack**	**Variation from previous reading**	**Picture of Movement**
CG-47	0.5 to 0.8 mm 0.5 to 0.8 mm	Parallel Perpendicular	+0.5 to +0.8 mm +0.5 to +0.8 mm	
CG-49	0.4 mm	Perpendicular	+0.4 mm	

TABLE 1
SUMMARY OF CRACK GAUGES
SHOWING MOVEMENT: DECEMBER 2011 - JANUARY 2012

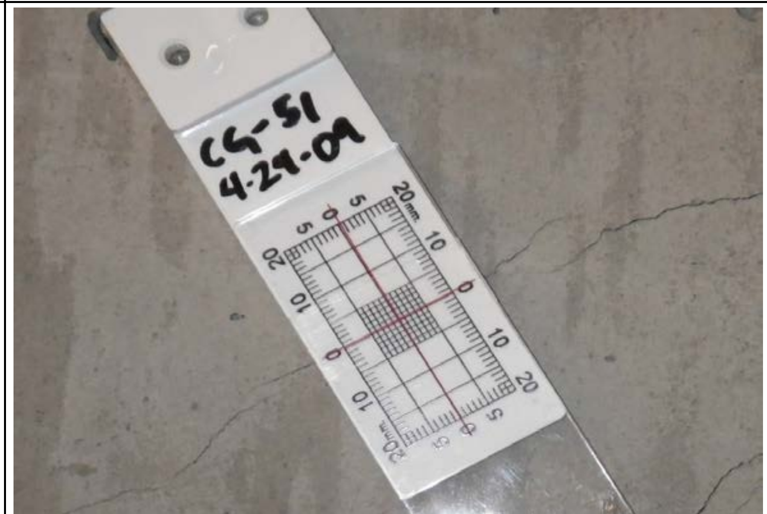
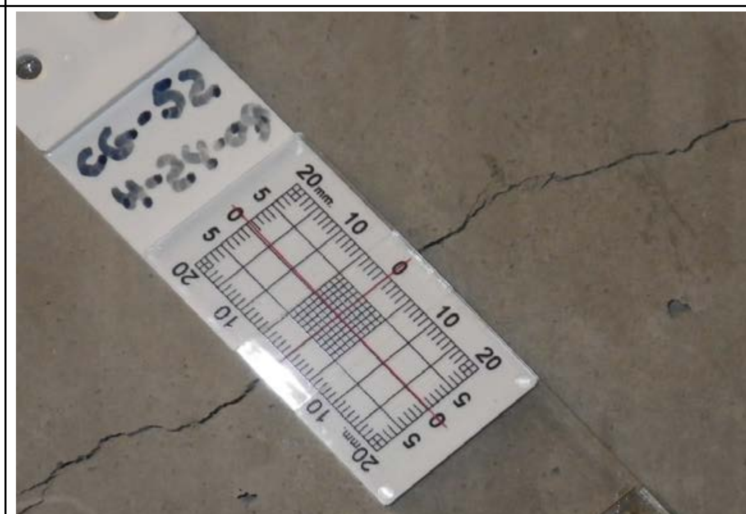
Crack Gauge	Distance of Movement	Direction of movement, relative to the Crack	Variation from previous reading	Picture of Movement
CG-51	0.5 mm	Parallel	Same as previous reading	
CG-52	0.5 mm	Parallel	Same as previous reading	

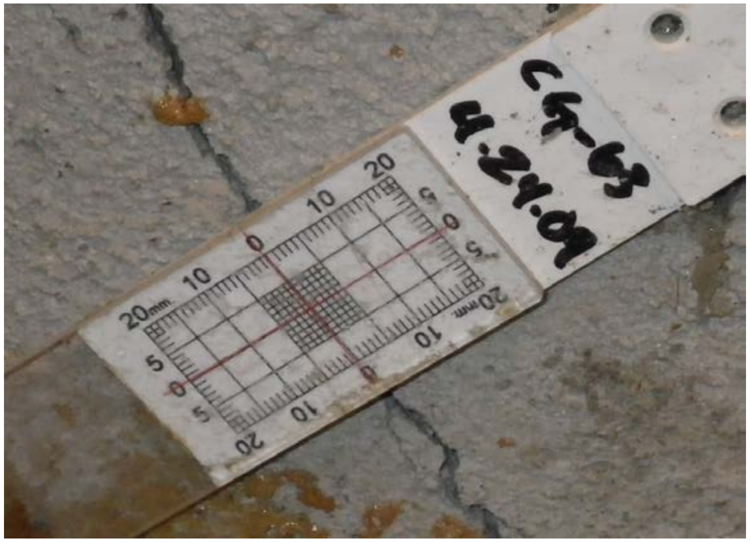
TABLE 1 SUMMARY OF CRACK GAUGES SHOWING MOVEMENT: DECEMBER 2011 - JANUARY 2012				
Crack Gauge	**Distance of Movement**	**Direction of movement, relative to the Crack**	**Variation from previous reading**	**Picture of Movement**
CG-59	0.5 mm	Perpendicular	+0.5 mm	
CG-63	0.4 mm	Perpendicular	+0.3 mm	

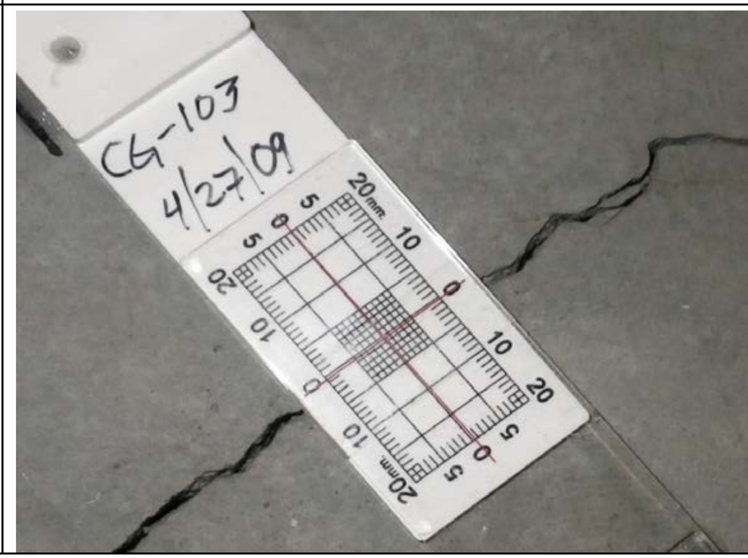
TABLE 1 SUMMARY OF CRACK GAUGES SHOWING MOVEMENT: DECEMBER 2011 - JANUARY 2012				
Crack Gauge	**Distance of Movement**	**Direction of movement, relative to the Crack**	**Variation from previous reading**	**Picture of Movement**
CG-76	0.5 mm	Perpendicular	+0.5 mm	
CG-103	0.5 mm 0.1 to 0.4 mm	Perpendicular Parallel	+0.5 mm +0.1 to +0.4 mm	

TABLE 1
SUMMARY OF CRACK GAUGES
SHOWING MOVEMENT: DECEMBER 2011 - JANUARY 2012

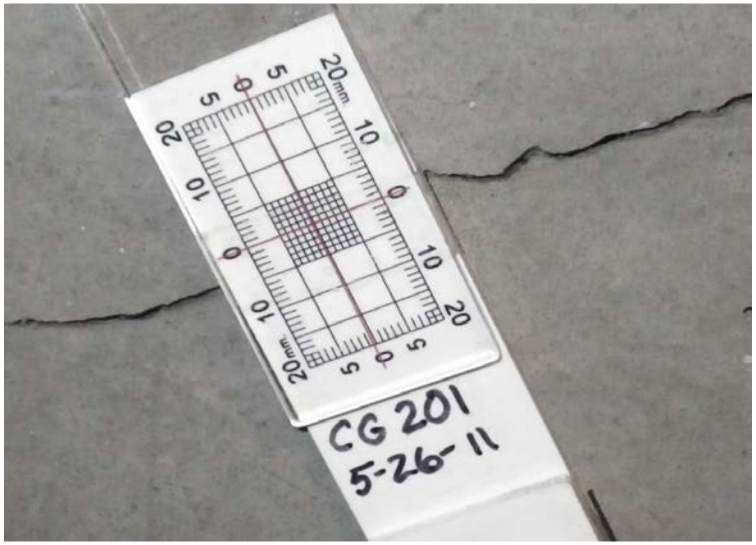
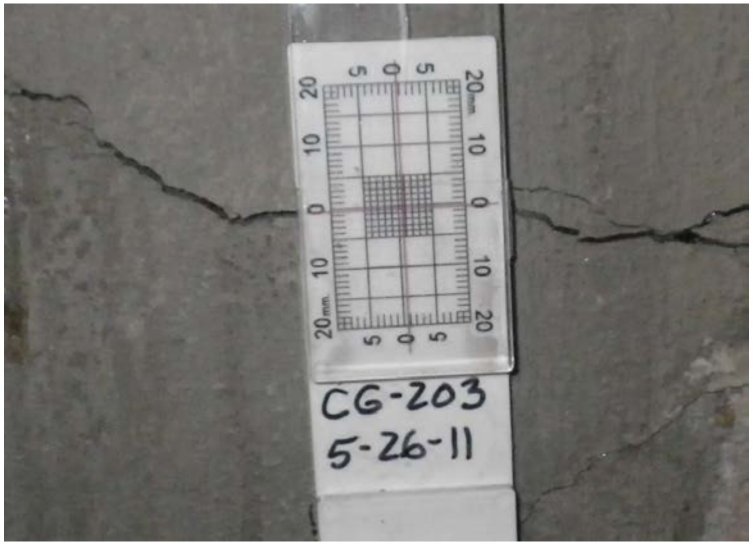
Crack Gauge	Distance of Movement	Direction of movement, relative to the Crack	Variation from previous reading	Picture of Movement
CG-201	0.4 mm	Parallel	+0.4 mm (from installation reading)	
CG-203	0.3 mm 0.8 mm	Perpendicular Parallel	+0.3 mm +0.8 mm (from installation reading)	

TABLE 1
SUMMARY OF CRACK GAUGES
SHOWING MOVEMENT: DECEMBER 2011 - JANUARY 2012

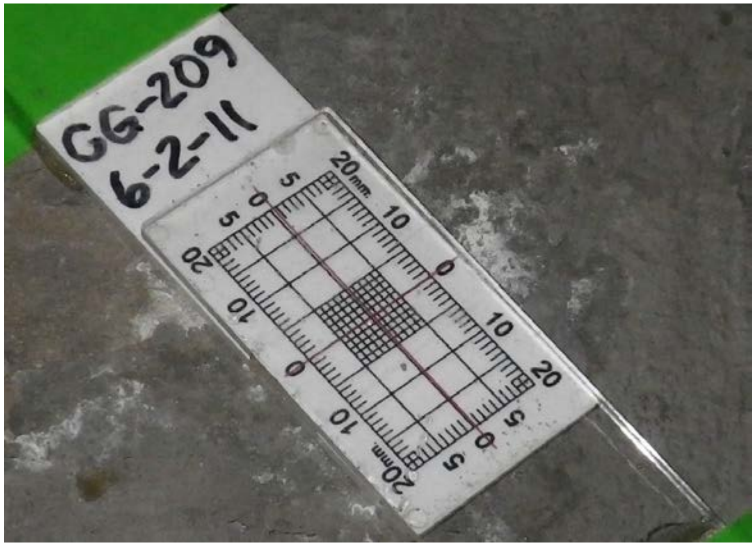
Crack Gauge	Distance of Movement	Direction of movement, relative to the Crack	Variation from previous reading	Picture of Movement
CG-209	0.5 mm	Parallel	+0.5 mm (from installation reading)	
CG-211	0.5 mm	Parallel	+0.5 mm (from installation reading)	

TABLE 1
SUMMARY OF CRACK GAUGES
SHOWING MOVEMENT: DECEMBER 2011 - JANUARY 2012

Crack Gauge	Distance of Movement	Direction of movement, relative to the Crack	Variation from previous reading	Picture of Movement
CG-213	0.5 to 1.0 mm 0.5 mm	Parallel Perpendicular	+0.5 to +1.0 mm +0.5 mm (from installation reading)	
CG-214	0.5 mm	Parallel	+0.5 mm (from installation reading)	

TABLE 1
SUMMARY OF CRACK GAUGES
SHOWING MOVEMENT: DECEMBER 2011 - JANUARY 2012

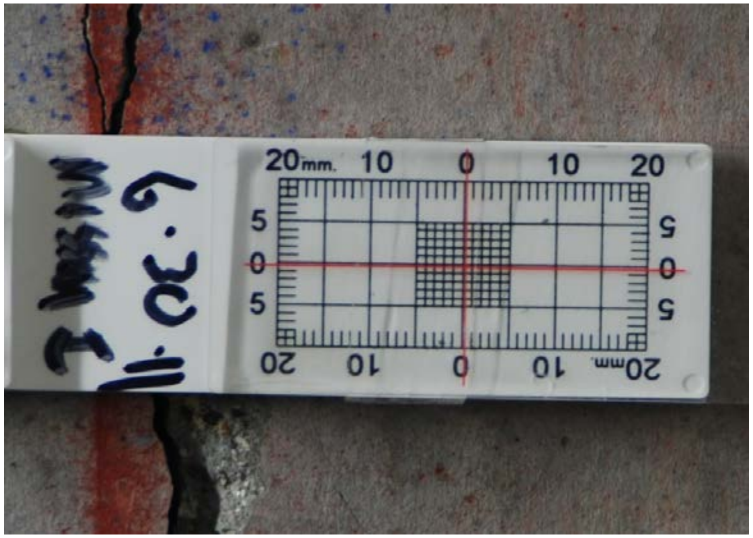
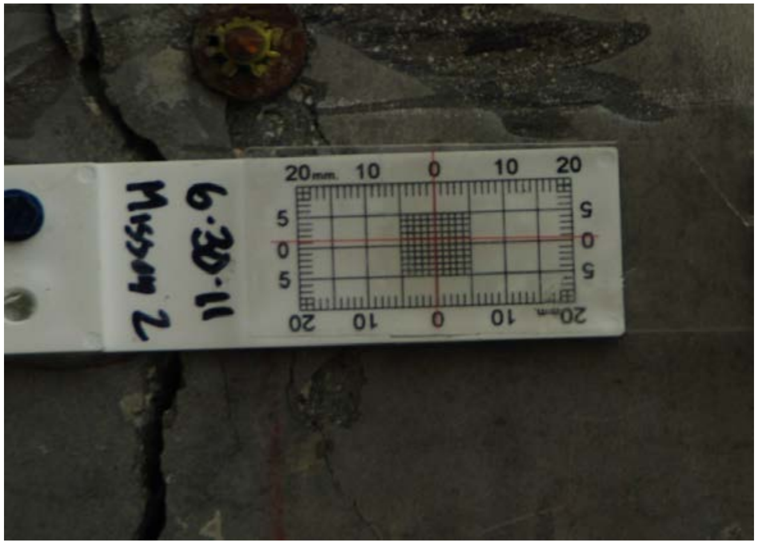
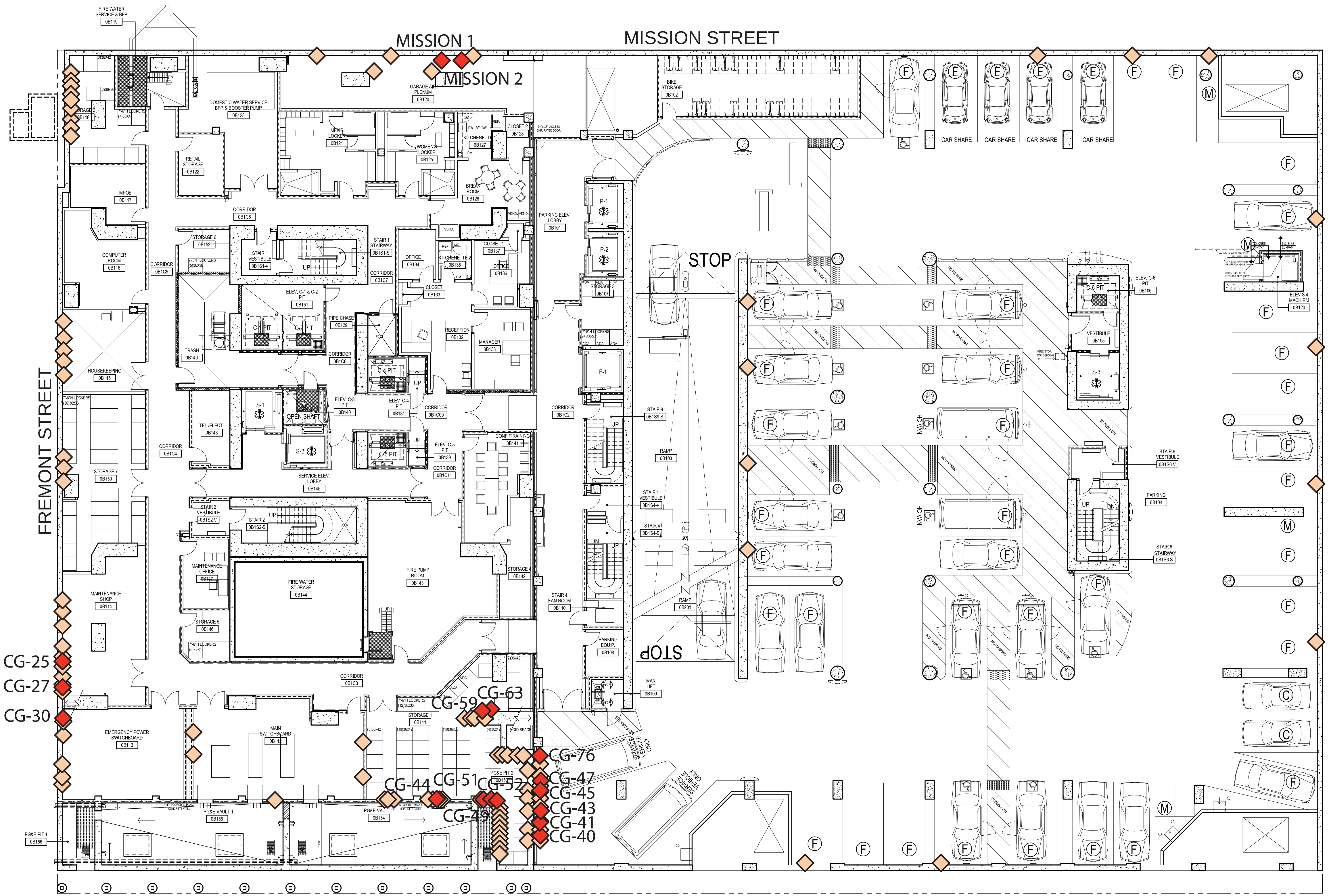
Crack Gauge	Distance of Movement	Direction of movement, relative to the Crack	Variation from previous reading	Picture of Movement
CG-215	0.1 to 0.5mm 0.5 mm	Parallel Perpendicular	+0.1 to +0.5 mm +0.5 mm (from installation reading)	
MISSION 1	0.1 to 0.4 mm	Parallel	Same as installation reading	

TABLE 1 SUMMARY OF CRACK GAUGES SHOWING MOVEMENT: DECEMBER 2011 - JANUARY 2012				
Crack Gauge	**Distance of Movement**	**Direction of movement, relative to the Crack**	**Variation from previous reading**	**Picture of Movement**
MISSION 2	0.7 to 1.1 mm	Parallel	+0.7 to 1.1 mm (from installation reading)	



LEGEND

Crack Gauge
Mounted across a crack in concrete

Crack Gauge showing movements

CRACK GAUGES SOWING MOVEMENT:
301 MISSION STREET BASEMENT LEVEL B-1

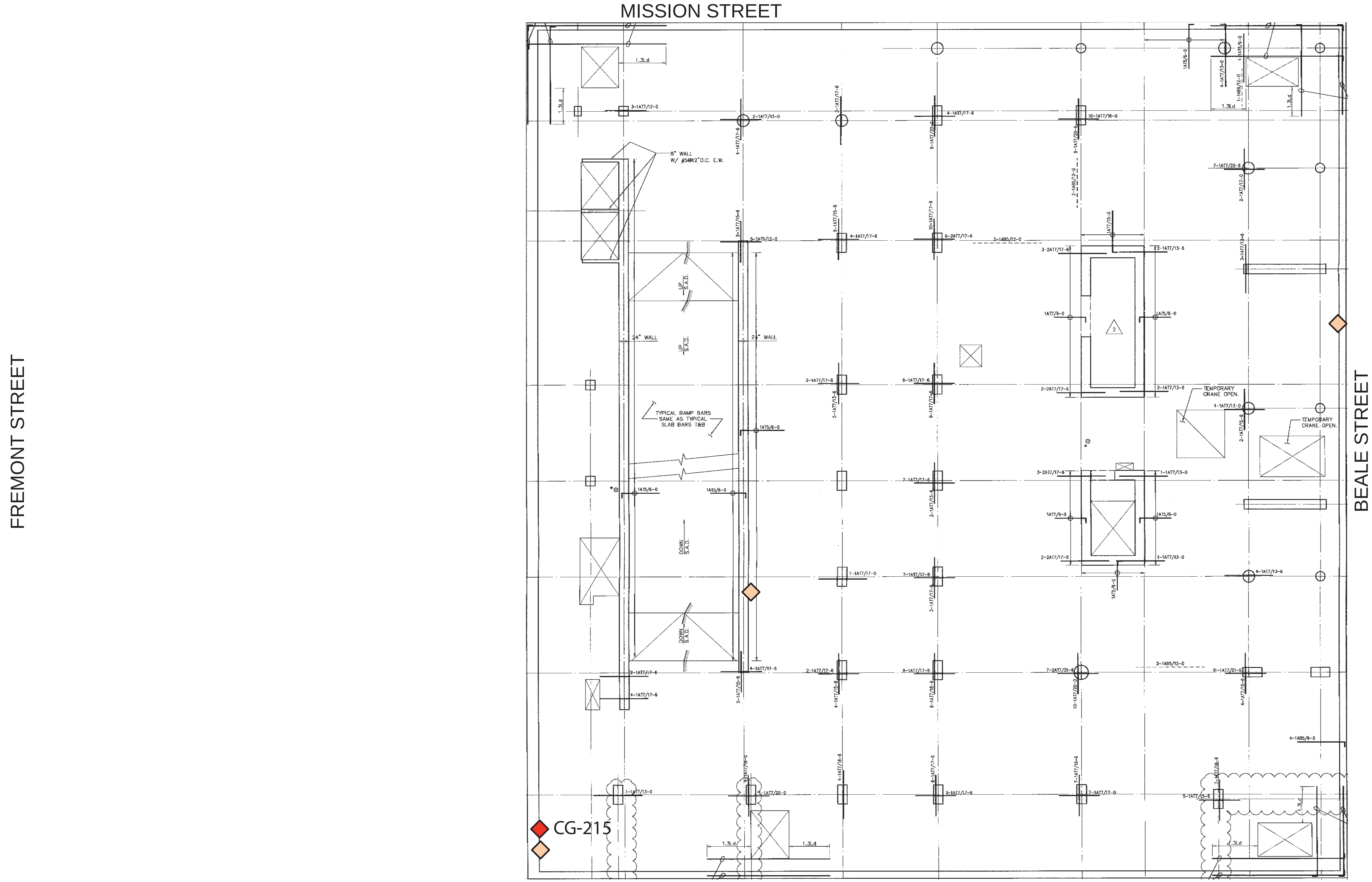
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2012

ARUP

PLATE 1

Q:\132242\4 Internal Project Data\4-03 Drawings\Geotech\Instrumentation Plan\301 Mission Instrumentation Plan B-1.ai



LEGEND

- Crack Gauge
  Mounted across a crack in concrete
- Crack Gauge showing movements

CRACK GAUGES SHOWING MOVEMENT: 301 MISSION STREET BASEMENT LEVEL B-3

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2012

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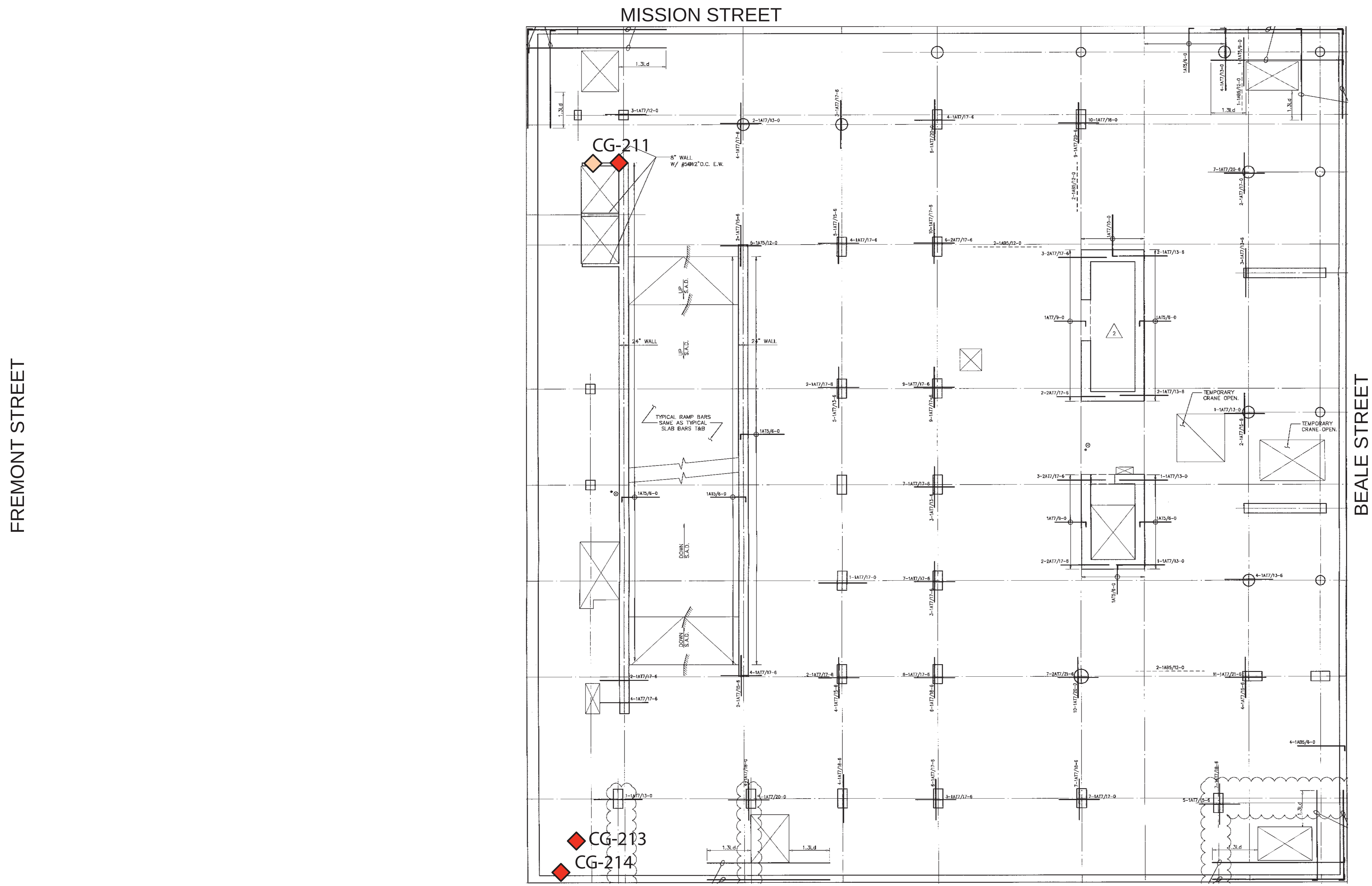
PLATE 2



LEGEND

- Crack Gauge
  Mounted across a crack in concrete
- Crack Gauges showing movements

CRACK GAUGES SHOWING MOVEMENTS:
301 MISSION STREET BASEMENT LEVEL B-4

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2012

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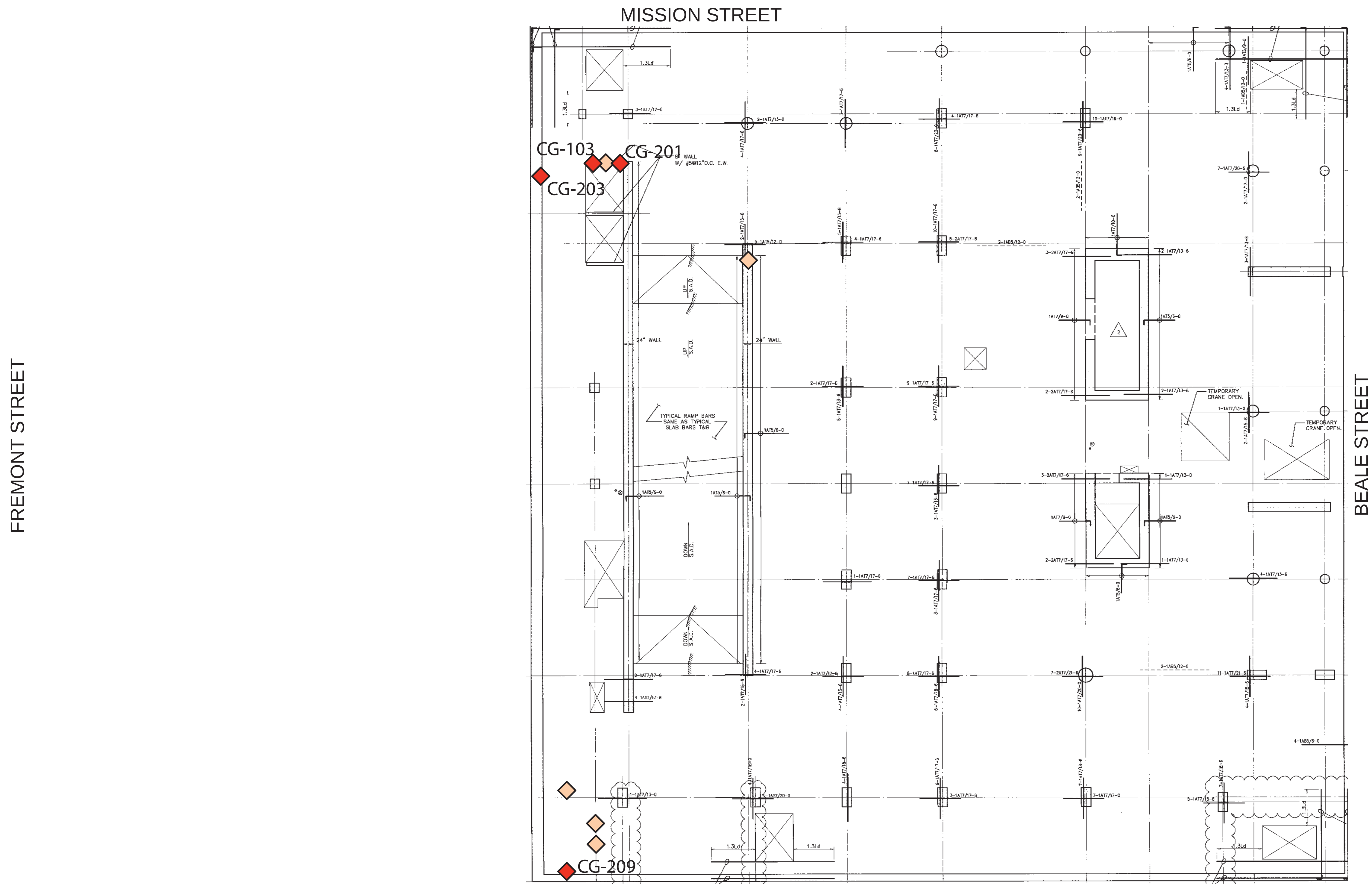
PLATE 3

Q:\132242\4 Internal Project Data\4-03 Drawings\Geotech\Instrumentation Plan\301 Mission Instrumentation Plan B-4.ai



LEGEND

- Crack Gauge
  Mounted across a crack in concrete
- Crack Gauge showing movement

CRACK GAUGES SHOWING MOVEMENTS:
301 MISSION STREET BASEMENT LEVEL B-5

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2012

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PLATE 4

Memorandum

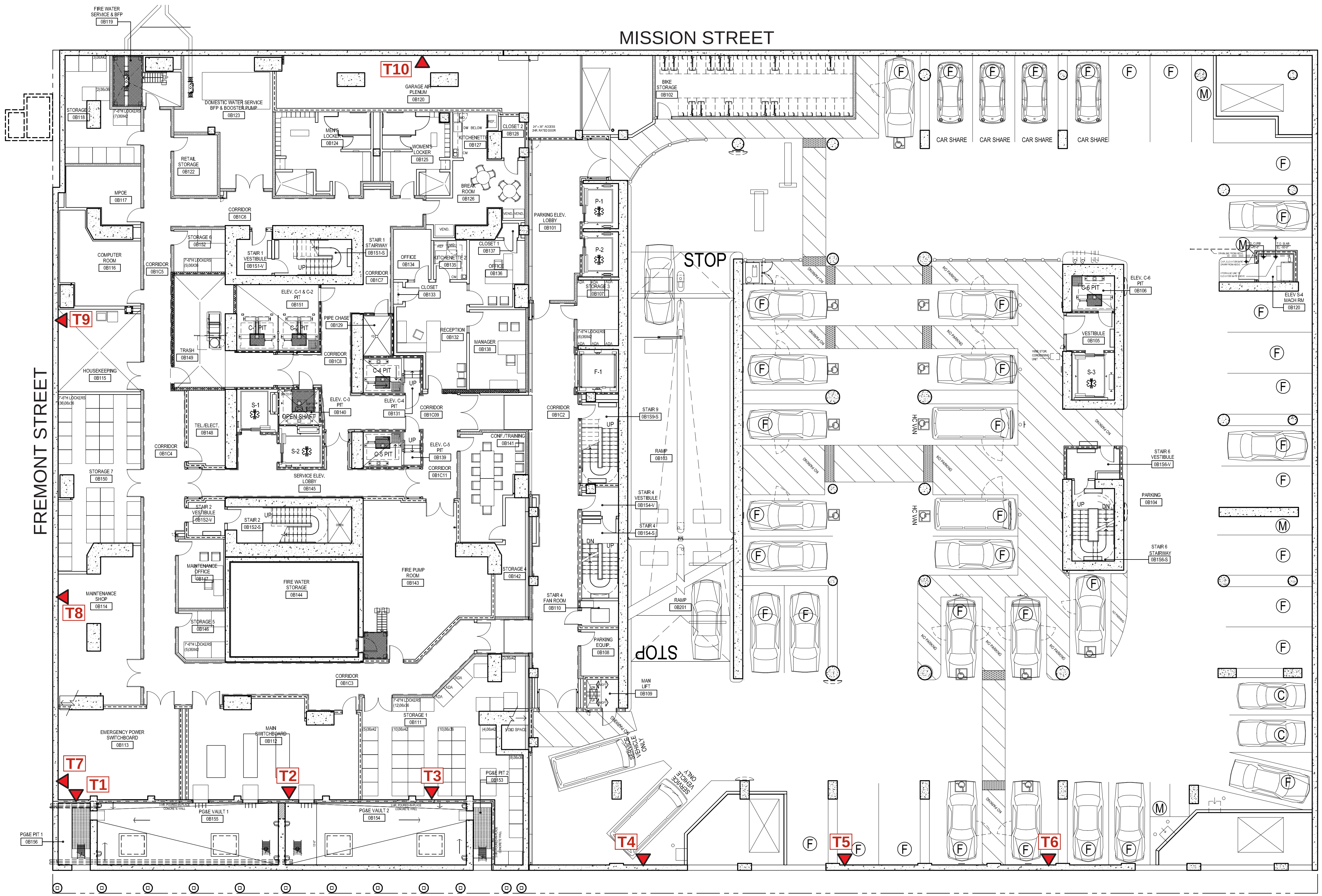
ARUP

To	Brian Dykes (TJPA)	**Date**	10 February 2012
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/SMM
From	Stephen McLandrich (Arup) Nick O'Riordan (Arup) Kevin Clinch (Arup)	**File reference**	4-05 154
Subject	Transbay Transit Center: Results of Tiltmeter Readings	**Page** 1 **of** 1	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum presents the tiltmeters readings collected to date. TL-01 through TL-09 were installed in March 2010 while TL-10 was installed in August 2011. The gaps in the data are a result of dead battery or data malfunctioning. TL-05 is currently reporting erroneous data and it is being evaluated to see if it can be restored or whether it should be replaced.

TL-02 and TL-07 show a one-time change in tilt around the beginning of November. These two tiltmeters were serviced at this time and it is likely that a permanent tilt was introduced which could be corrected. The correction was not applied to the attached plates which show only the recorded tilt versus time.

List of Plates



LEGEND

▼ Tiltmeters at Data Loggers (TM)
Mounted on walls

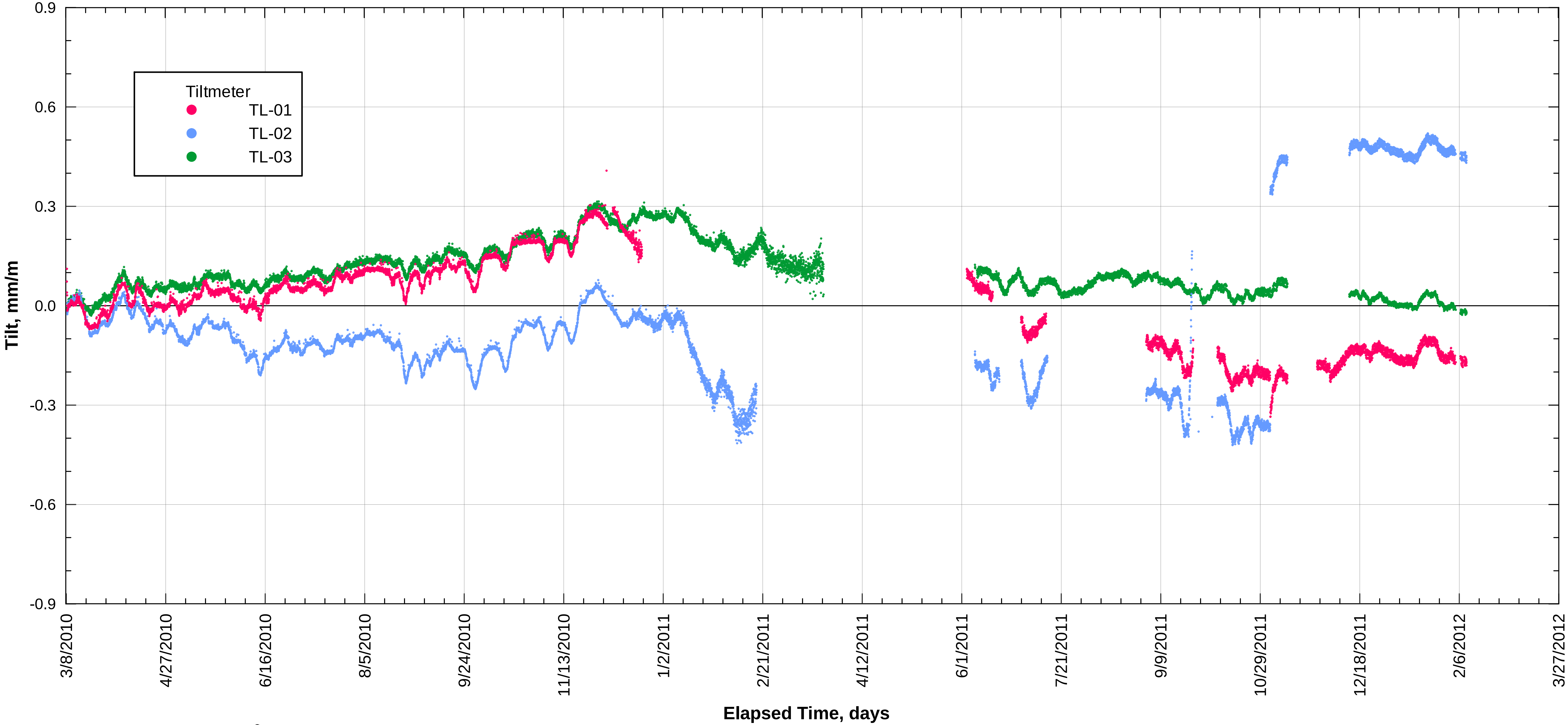
LOCATION OF TILTMETERS:
301 MISSION STREET BASEMENT LEVEL B-1

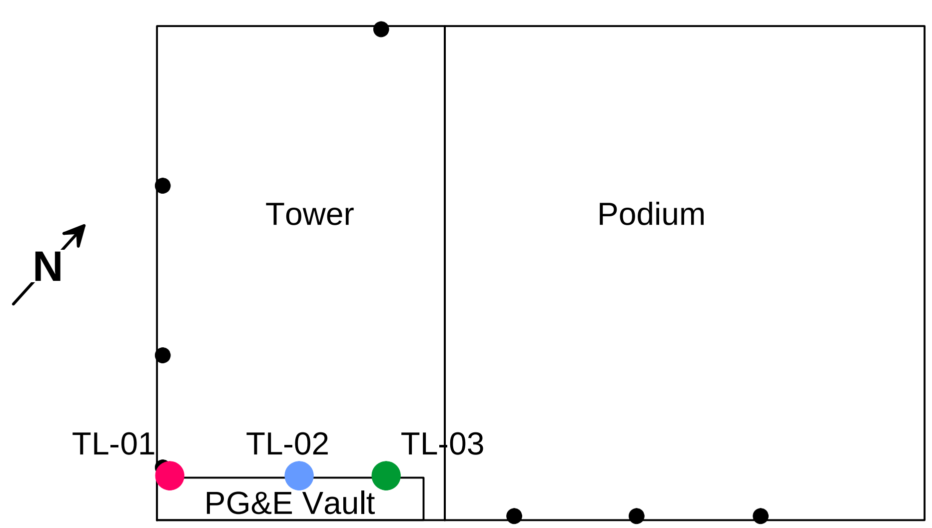
Transbay Transit Center
301 Mission Monitoring - Tiltmeters
Transbay Joint Powers Authority
San Francisco, California

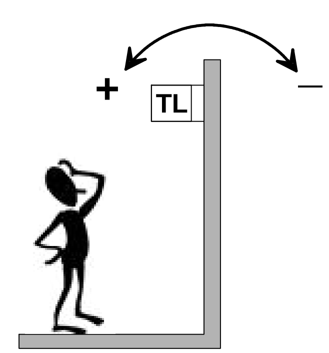
February 2012

ARUP

PLATE 1







Positive tilt represents movement of the top of the wall towards the inside of the room.

TILT RECORDED IN TILTMETERS TL-01, TL-02, AND TL-03: BASEMENT LEVEL B-1

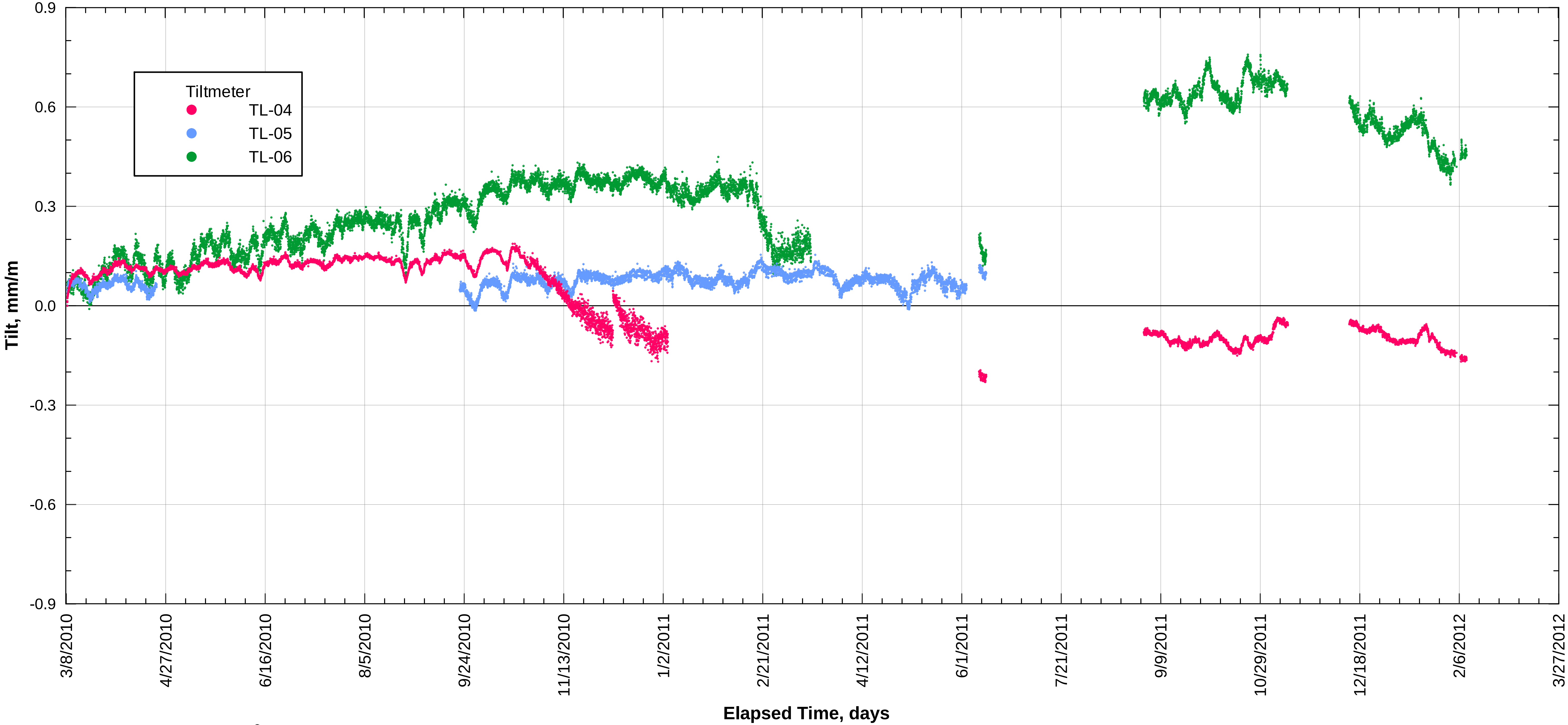
Transbay Transit Center
301 Mission Monitoring - Tiltmeters
Transbay Joint Powers Authority
San Francisco, California

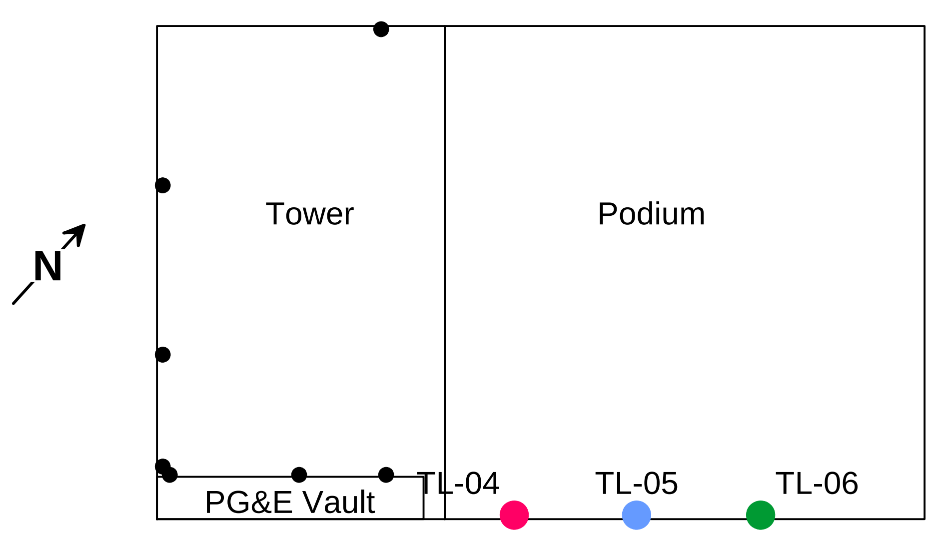
February 2012

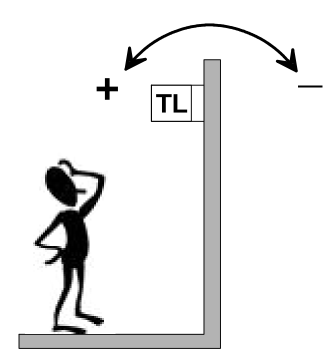
ARUP

PLATE 2

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\154 301 Mission Tiltmeters Feb 2012\Plates\Plate 2.grf







Positive tilt represents movement of the top of the wall towards the inside of the room.

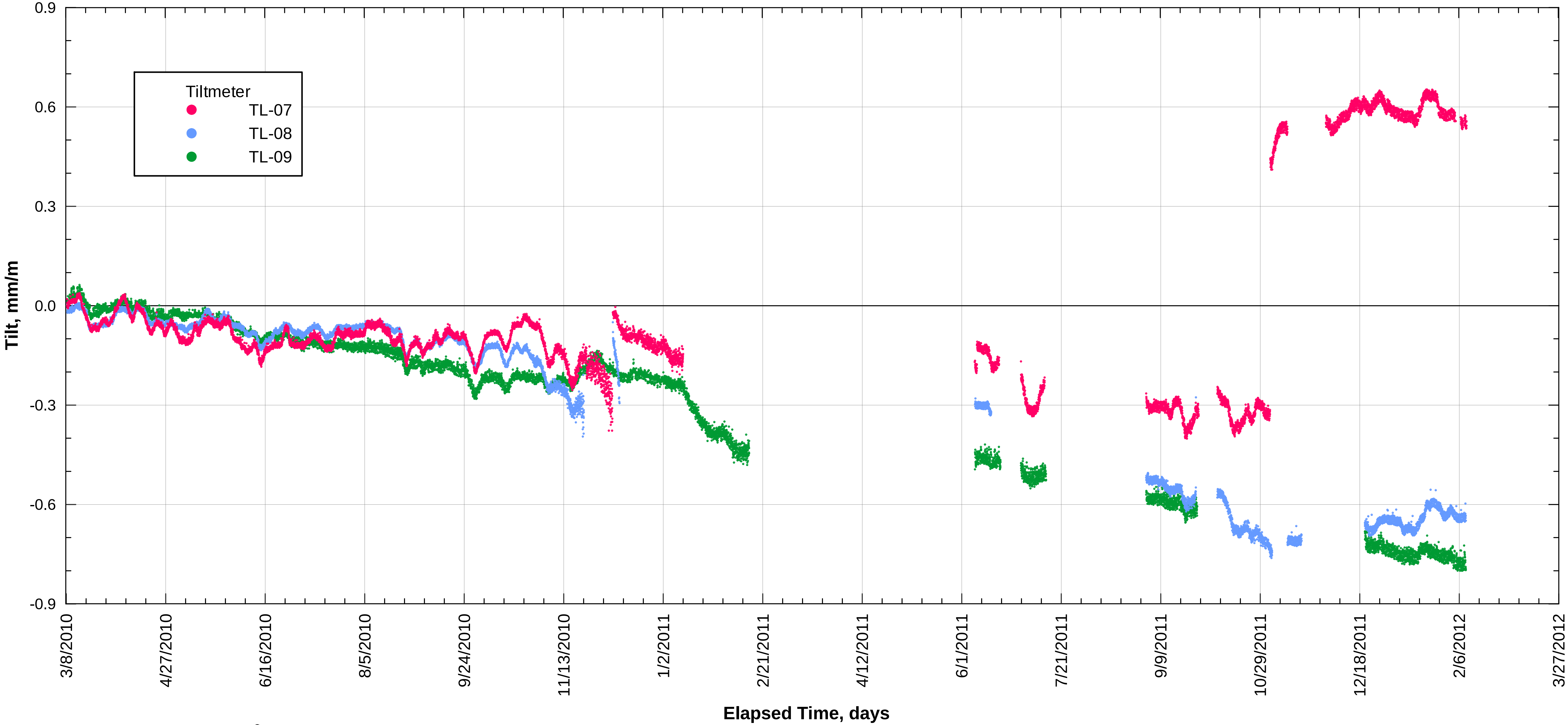
TILT RECORDED IN TILTMETERS TL-04, TL-05, AND TL-06: BASEMENT LEVEL B-1

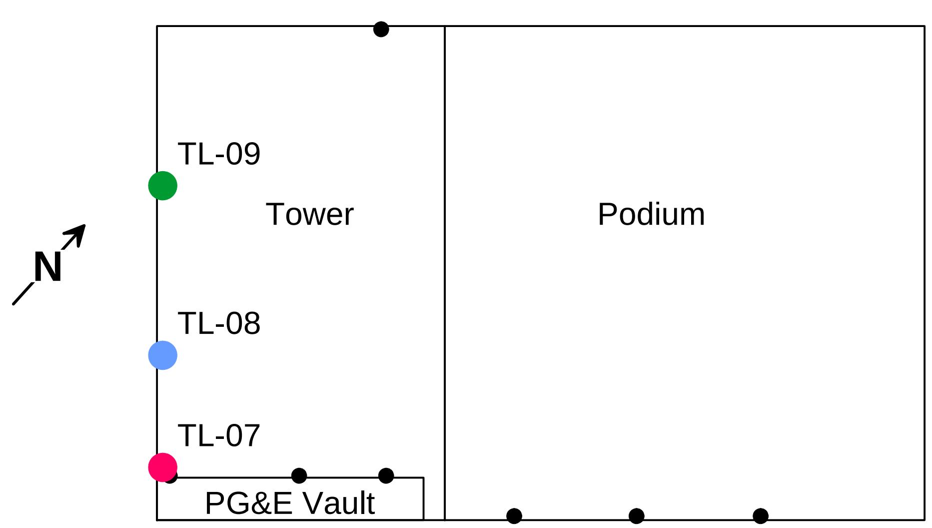
Transbay Transit Center
301 Mission Monitoring - Tiltmeters
Transbay Joint Powers Authority
San Francisco, California

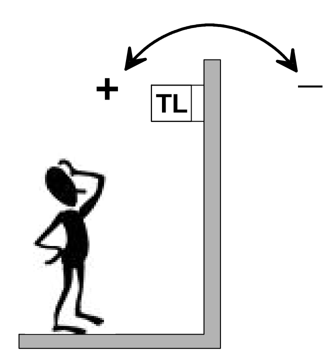
February 2012

ARUP

PLATE 3







Positive tilt represents movement of the top of the wall towards the inside of the room.

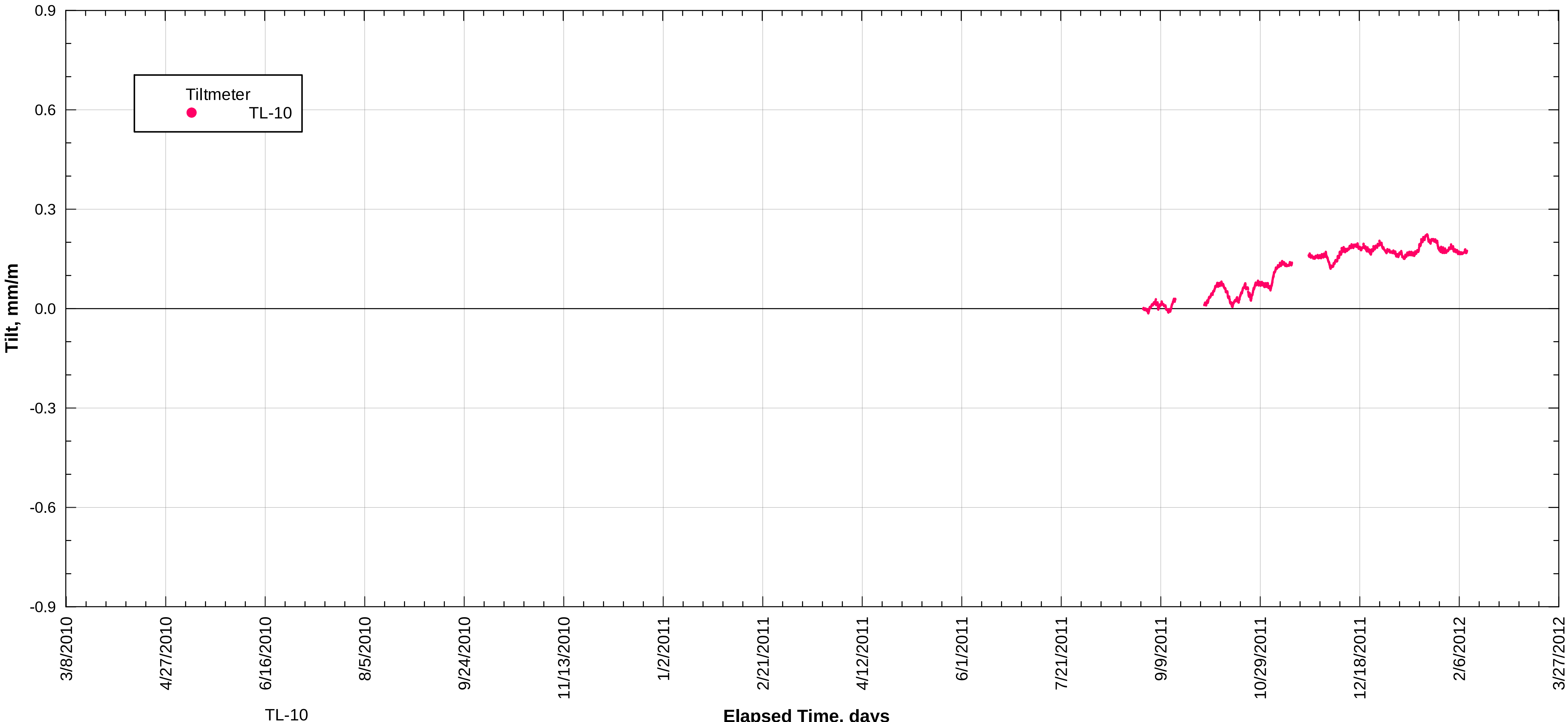
TILT RECORDED IN TILTMETERS TL-07, TL-08, AND TL-09: BASEMENT LEVEL B-1

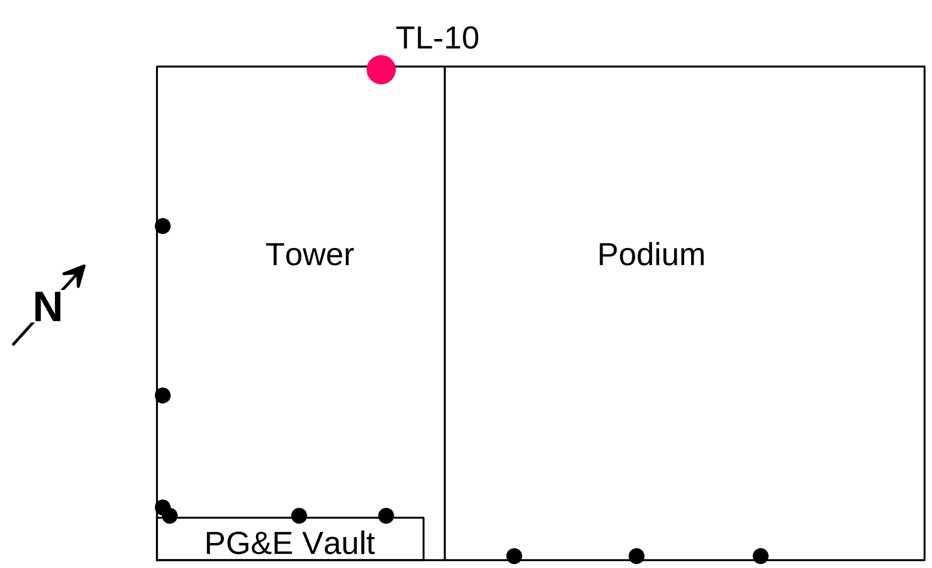
Transbay Transit Center
301 Mission Monitoring - Tiltmeters
Transbay Joint Powers Authority
San Francisco, California

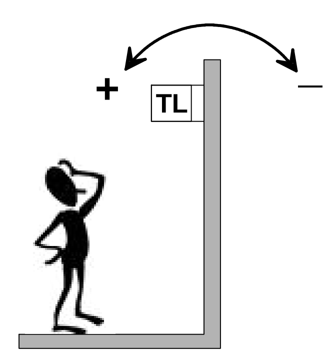
February 2012

ARUP

PLATE 4







Positive tilt represents movement of the top of the wall towards the inside of the room.

TILT RECORDED IN TILTMETER TL-10: BASEMENT LEVEL B-1

Transbay Transit Center
301 Mission Monitoring - Tiltmeters
Transbay Joint Powers Authority
San Francisco, California

February 2012

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PLATE 5

Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date**	March 7 2012
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/SMM
From	Stephen McLandrich (Arup)	**File reference**	4-05/157
Subject	Transbay Transit Center Results of External Instruments Adjacent to 301 Mission Street		

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the buildings adjacent to the Transbay Transit Center prior to and during construction. This memorandum presents the current readings from external instrumentation adjacent to the 301 Mission buildings. Plates 1 through 3 show the as-built locations of the nine inclinometers, four piezometers, four deep settlement markers, and one extensometer installed in the vicinity of the 301 Mission buildings. The quantity and location of the instruments vary from the as-planned due to installation limitations. The best effort has been made to install as many instruments as possible. The locations of the inclinometers are shown on Plate 1. The locations of the piezometers are shown on Plate 2. The location of the deep settlement markers and the extensometer (EX-01) are shown on Plate 3.

Inclinometers

Currently, inclinometers I-18M (formerly known as I-18) and I-19 are being currently read using a standard manual method. Inclinometers I-16, I-17A, I-17B, I-18, I-19, I-20, I-21, and I-22 will be receiving in-place-inclinometers which will allow automated digital reading. These inclinometers will report to the Global Analyzer, a data reporting website. Inclinometer I-18M will be manually read throughout the Transbay project. Plates 4 and 5 show the readings at I-18M and I-19. There appear to be two movement occasions for these instruments. The first movement happened during pile extraction, shown as the difference between the baseline reading in March 2011 and the reading in May 2011. The second movement event is between March 2011 and October 2011 (December 2011 in the case of I-19). The movement is likely caused by the installation of the Transbay shoring wall. Installation of the buttress shafts do not appear to cause movements in the inclinometers based on the relatively consistent readings after the shoring wall was installed.

Piezometers

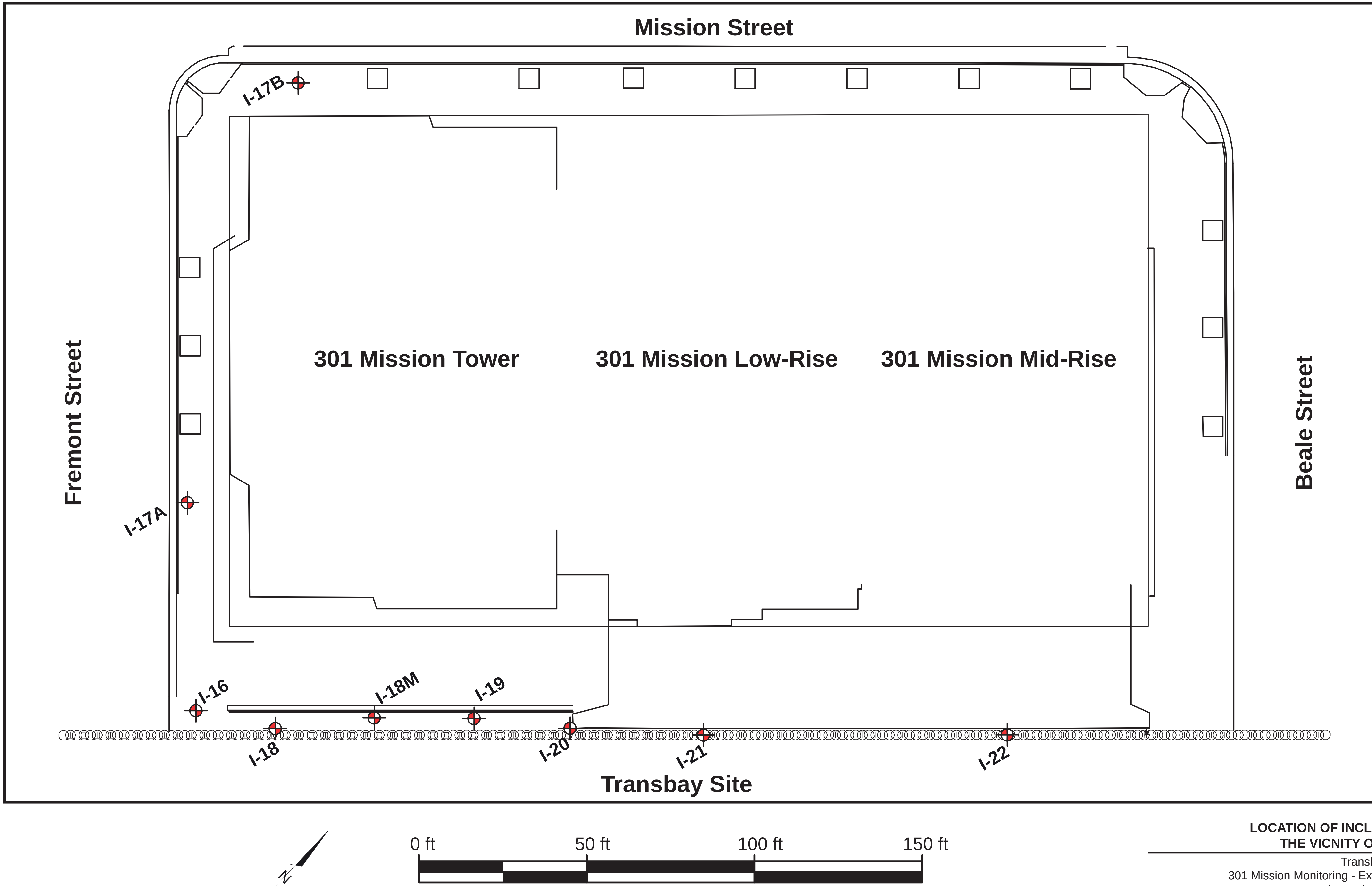
The piezometric elevations recorded in the four vibrating wire piezometers are shown on Plate 6. The suffix in the piezometer name represents the geologic unit in which this instrument is placed.

Piezometer P-06F is located in the fill layer at approximately 18 feet deep. Piezometer P-06MS is located in the same borehole as piezometer P-06F but installed in the marine sand layer at approximately 45 feet deep. Piezometer P-07MS is located in the marine sand at approximately 45 feet and piezometer P-08MS is located in the marine sand layer at approximately 58 feet.

Deep Settlement Markers and Extensometer

The deep settlement markers and the extensometer have been installed to allow digital data acquisition. These instruments are currently not reporting data. Deep settlement marker DSM-07 has already been damaged and is likely not able to collect data. It is not feasible to reinstall this instrument at this time.

List of Plates



LOCATION OF INCLINOMETERS IN THE VICINITY OF 301 MISSION

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

March 2012

ARUP

PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\157 301 Mission External Instrumentation - Mar 2012\Plates\Plate 1 External Instrumentation.ai

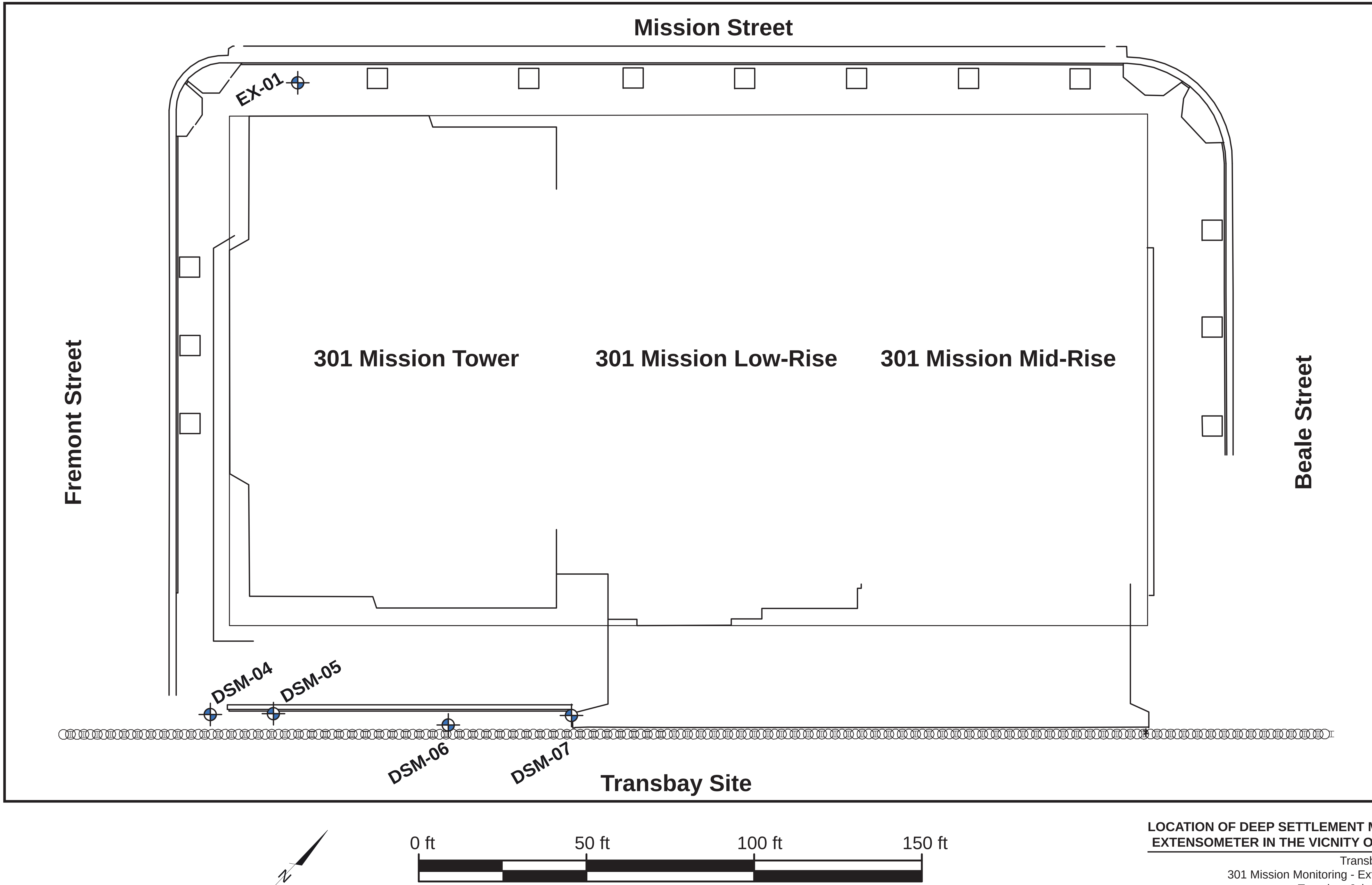
LOCATION OF PIEZOMETERS IN THE VICINITY OF 301 MISSION

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

March 2012

ARUP

PLATE 2



LOCATION OF DEEP SETTLEMENT MARKERS AND EXTENSOMETER IN THE VICINITY OF 301 MISSION

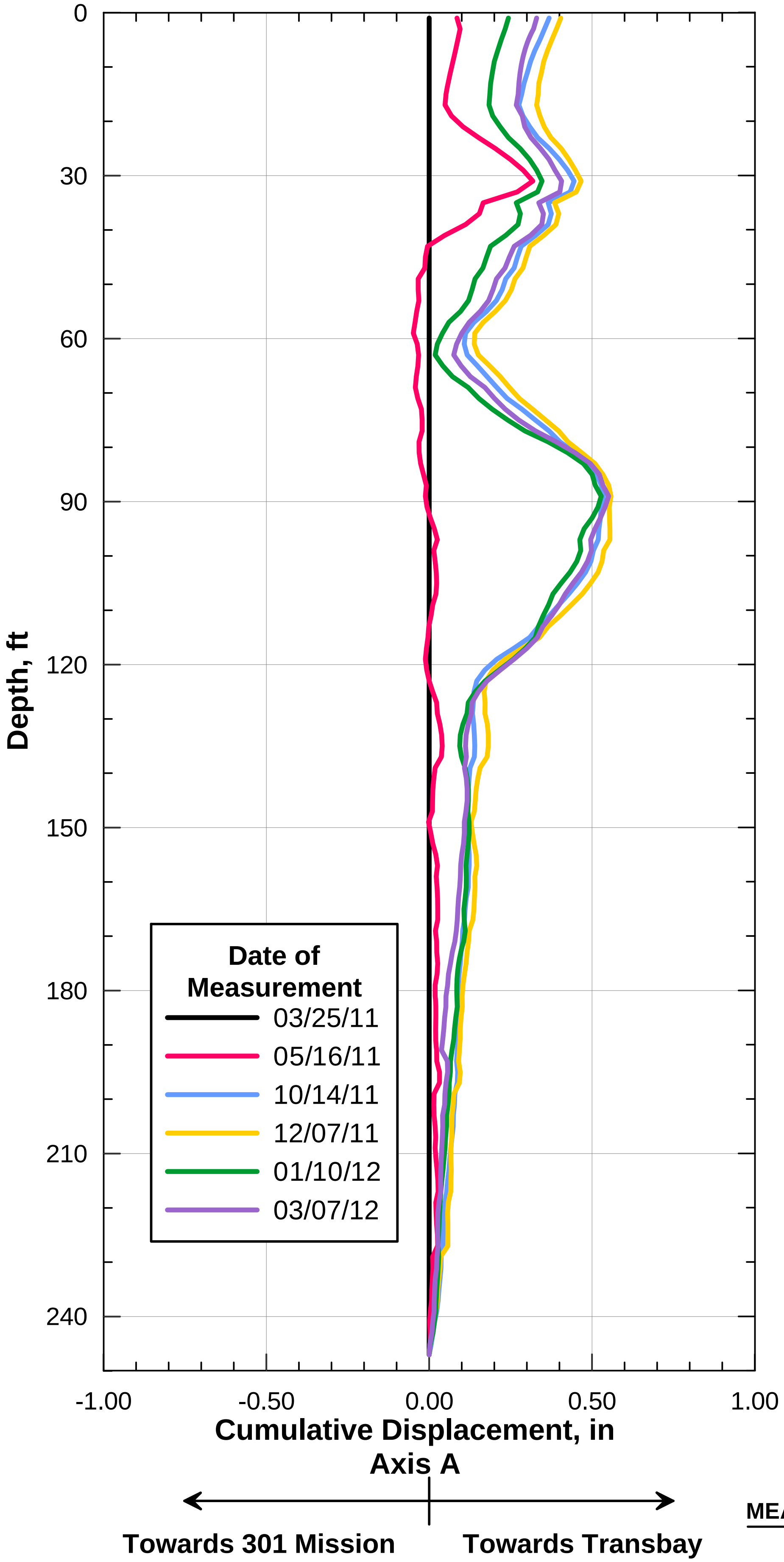
Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

March 2012

ARUP

PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\157 301 Mission External Instrumentation - Mar 2012\Plates\Plate 1 External Instrumentation.ai



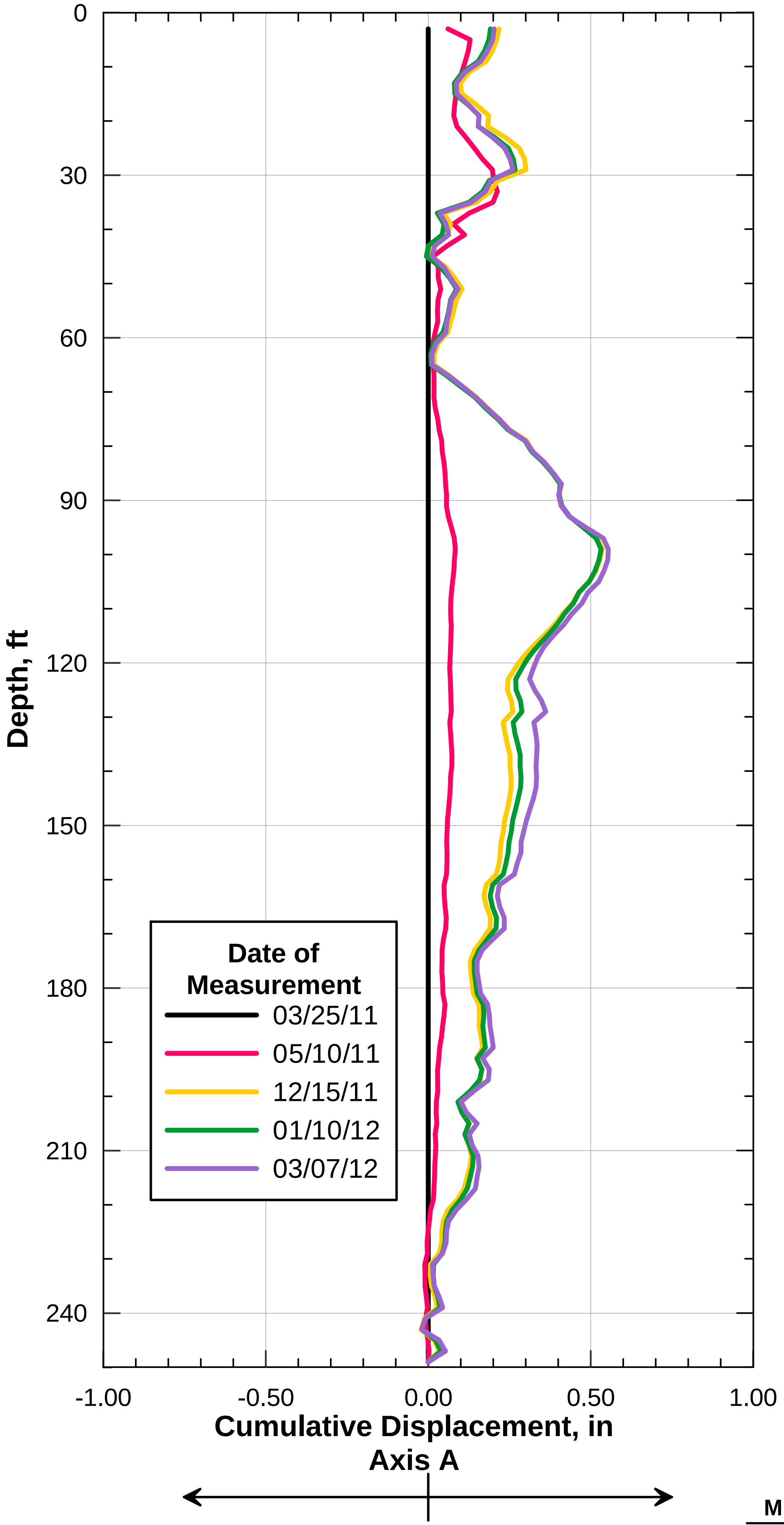
MEASUREMENTS TAKEN AT INCLINOMETER I-18M

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

March 2012

ARUP

PLATE 4

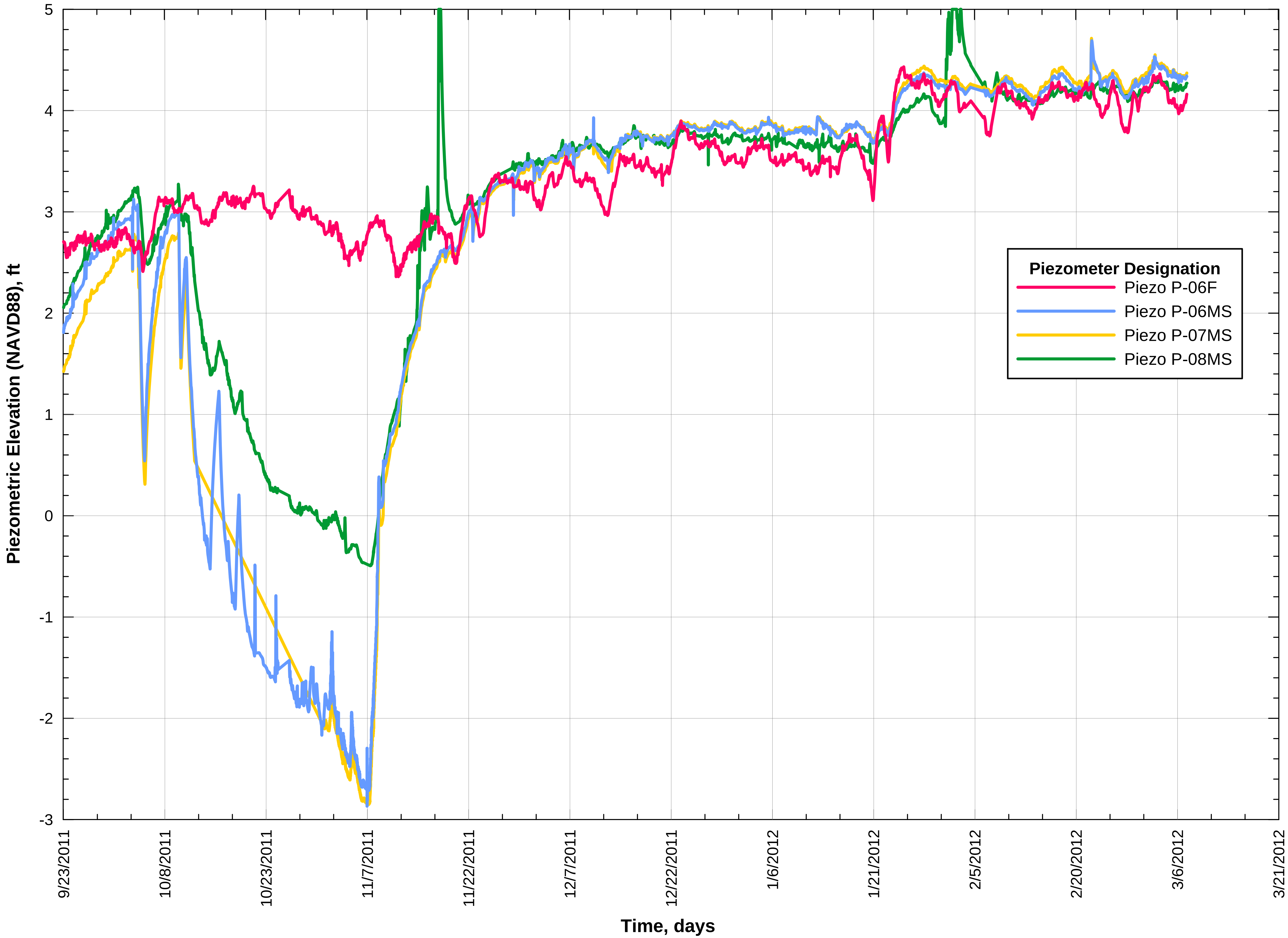


MEASUREMENTS TAKEN AT INCLINOMETER I-19

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
March 2012 San Francisco, California

ARUP

PLATE 5



NOTE: Ground surface is approximately +14.0 ft NAVD88 in the vicinity of the 301 Mission/Transbay interface.

PIEZOMETER READINGS ADJACENT TO 301 MISSION

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

March 2012

ARUP

PLATE 6

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\157 301 Mission External Instrumentation - Mar 2012\Plates\Plate 6 Piezo Data.grf

Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date** March 7 2012
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number** 132242-60/SMM
From	Stephen McLandrich (Arup)	**File reference** 4-05/157
Subject	Transbay Transit Center Results of External Instruments Adjacent to 301 Mission Street	**Page** 1 **of** 2

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the buildings adjacent to the Transbay Transit Center prior to and during construction. This memorandum presents the current readings from external instrumentation adjacent to the 301 Mission buildings. Plates 1 through 3 show the as-built locations of the nine inclinometers, four piezometers, four deep settlement markers, and one extensometer installed in the vicinity of the 301 Mission buildings. The quantity and location of the instruments vary from the as-planned due to installation limitations. The best effort has been made to install as many instruments as possible. The locations of the inclinometers are shown on Plate 1. The locations of the piezometers are shown on Plate 2. The location of the deep settlement markers and the extensometer (EX-01) are shown on Plate 3.

Inclinometers

Currently, inclinometers I-18M (formerly known as I-18) and I-19 are being currently read using a standard manual method. Inclinometers I-16, I-17A, I-17B, I-18, I-19, I-20, I-21, and I-22 will be receiving in-place-inclinometers which will allow automated digital reading. These inclinometers will report to the Global Analyzer, a data reporting website. Inclinometer I-18M will be manually read throughout the Transbay project. Plates 4 and 5 show the readings at I-18M and I-19. There appear to be two movement occasions for these instruments. The first movement happened during pile extraction, shown as the difference between the baseline reading in March 2011 and the reading in May 2011. The second movement event is between March 2011 and October 2011 (December 2011 in the case of I-19). The movement is likely caused by the installation of the Transbay shoring wall. Installation of the buttress shafts do not appear to cause movements in the inclinometers based on the relatively consistent readings after the shoring wall was installed.

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Deep Settlement Markers and Extensometer

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List of Plates

LOCATION OF INCLINOMETERS IN THE VICNITY OF 301 MISSION

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

March 2012

ARUP

PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\157 301 Mission External Instrumentation - Mar 2012\Plates\Plate 1 External Instrumentation.ai

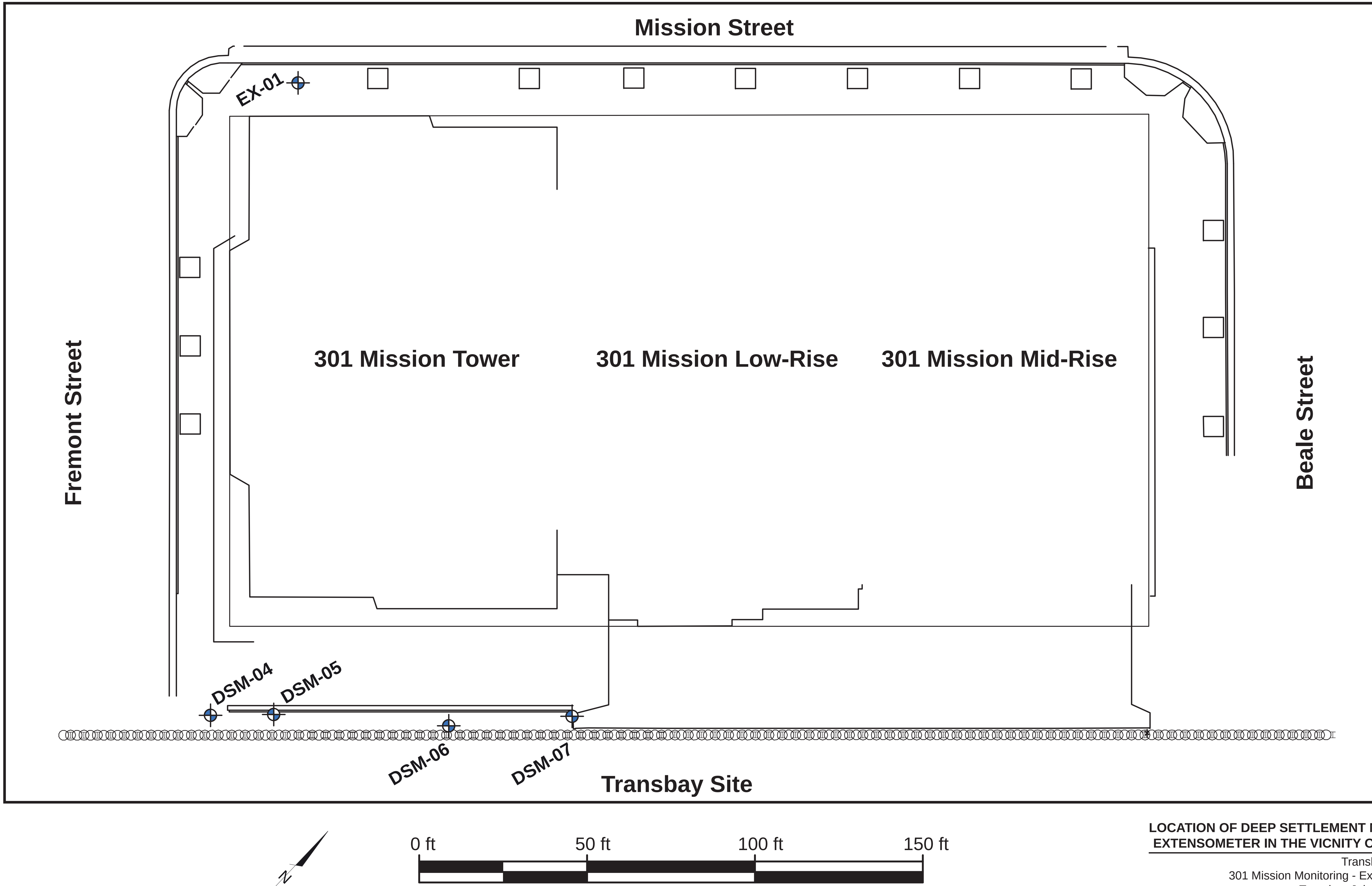
LOCATION OF PIEZOMETERS IN THE VICINITY OF 301 MISSION

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

March 2012

ARUP

PLATE 2



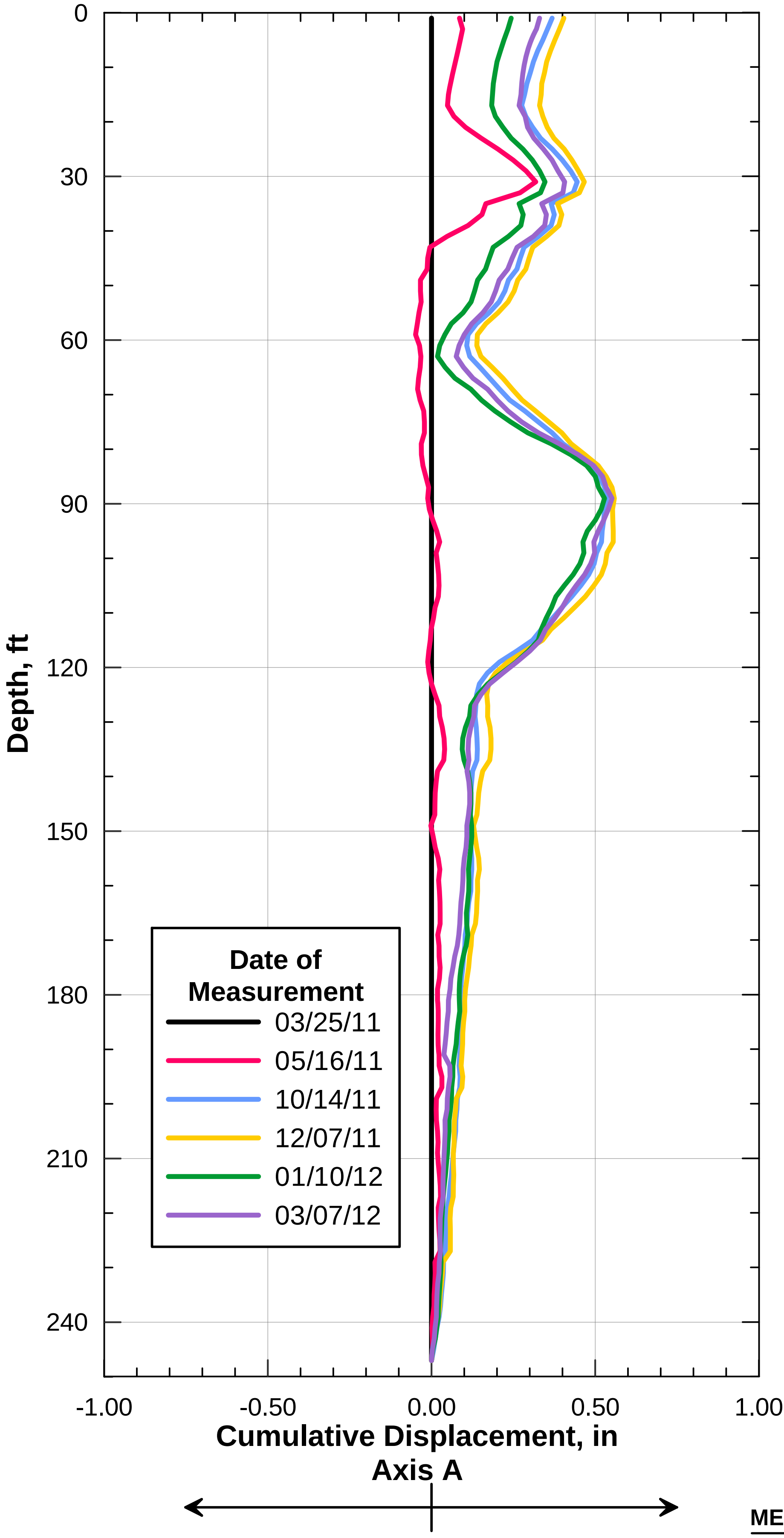
LOCATION OF DEEP SETTLEMENT MARKERS AND EXTENSOMETER IN THE VICINITY OF 301 MISSION

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

March 2012

ARUP

PLATE 3



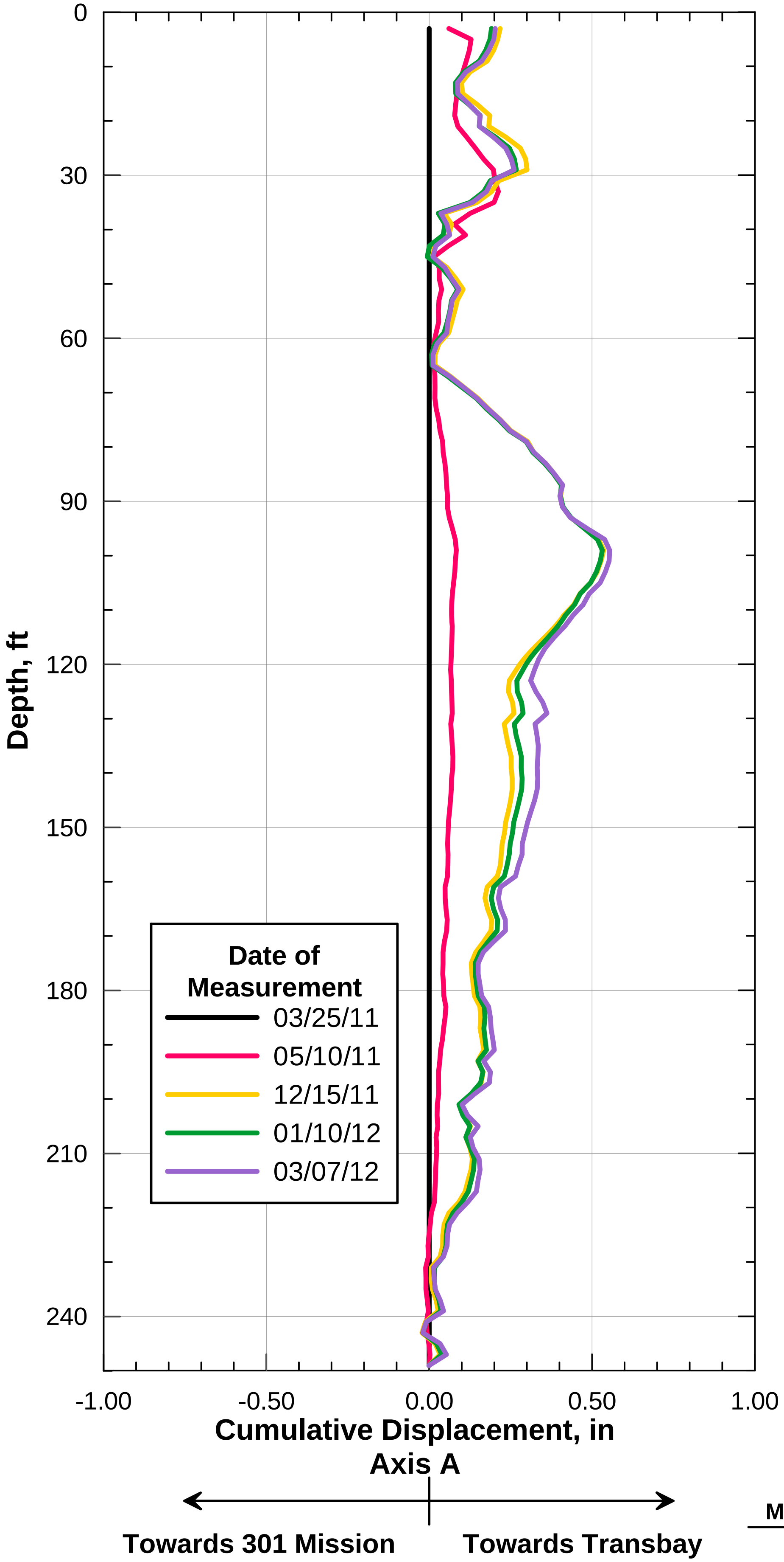
MEASUREMENTS TAKEN AT INCLINOMETER I-18M

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
March 2012 San Francisco, California

ARUP

PLATE 4

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\157 301 Mission External Instrumentation - Mar 2012\Plates\Plate 4 Inclinometer I-18M.grf



MEASUREMENTS TAKEN AT INCLINOMETER I-19

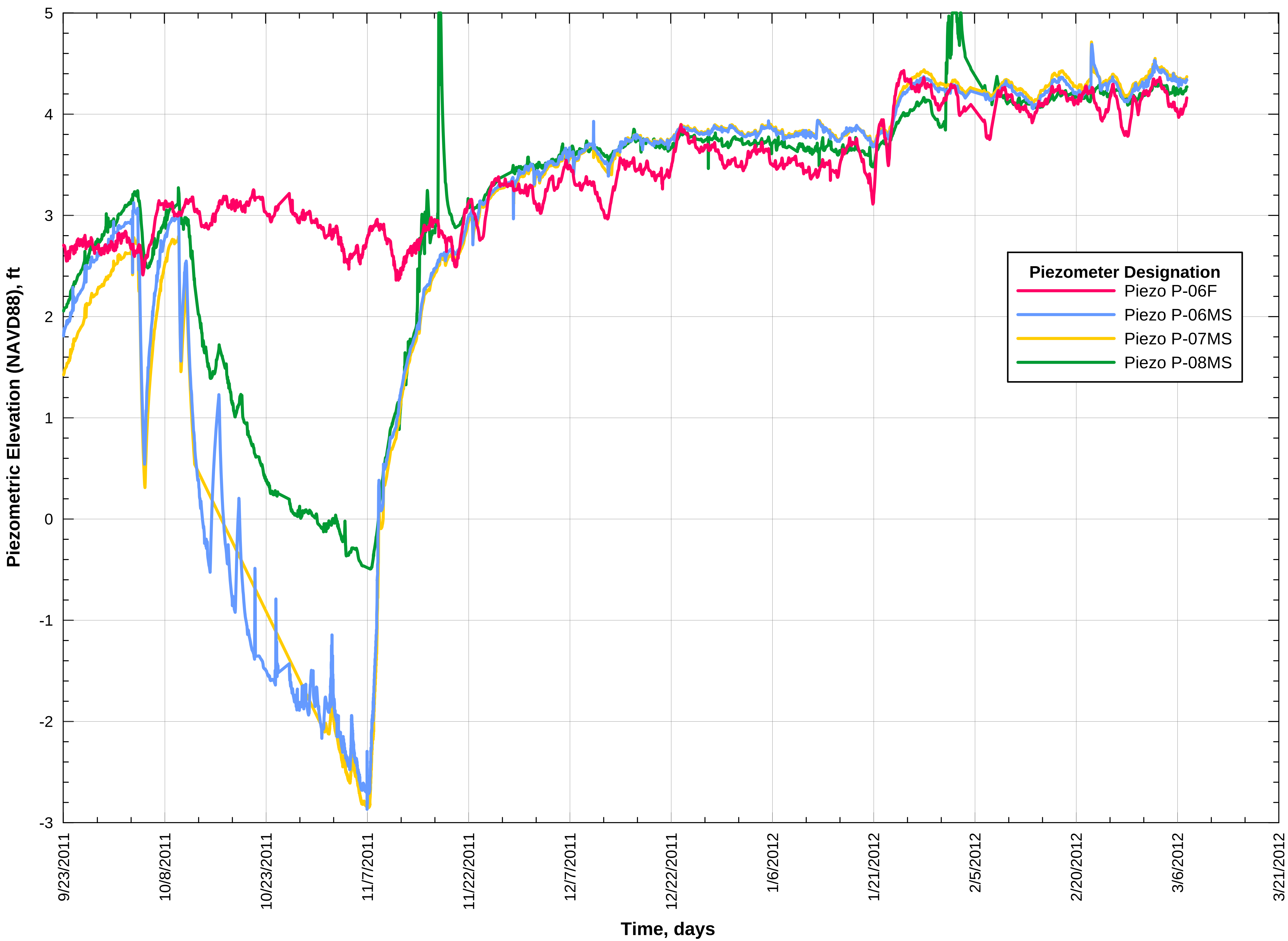
Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

March 2012

ARUP

PLATE 5

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\157 301 Mission External Instrumentation - Mar 2012\Plates\Plate 5 Inclinometer I-19.grf



NOTE: Ground surface is approximately +14.0 ft NAVD88 in the vicinity of the 301 Mission/Transbay interface.

PIEZOMETER READINGS ADJACENT TO 301 MISSION

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

March 2012

ARUP

PLATE 6

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\157 301 Mission External Instrumentation - Mar 2012\Plates\Plate 6 Piezo Data.grf

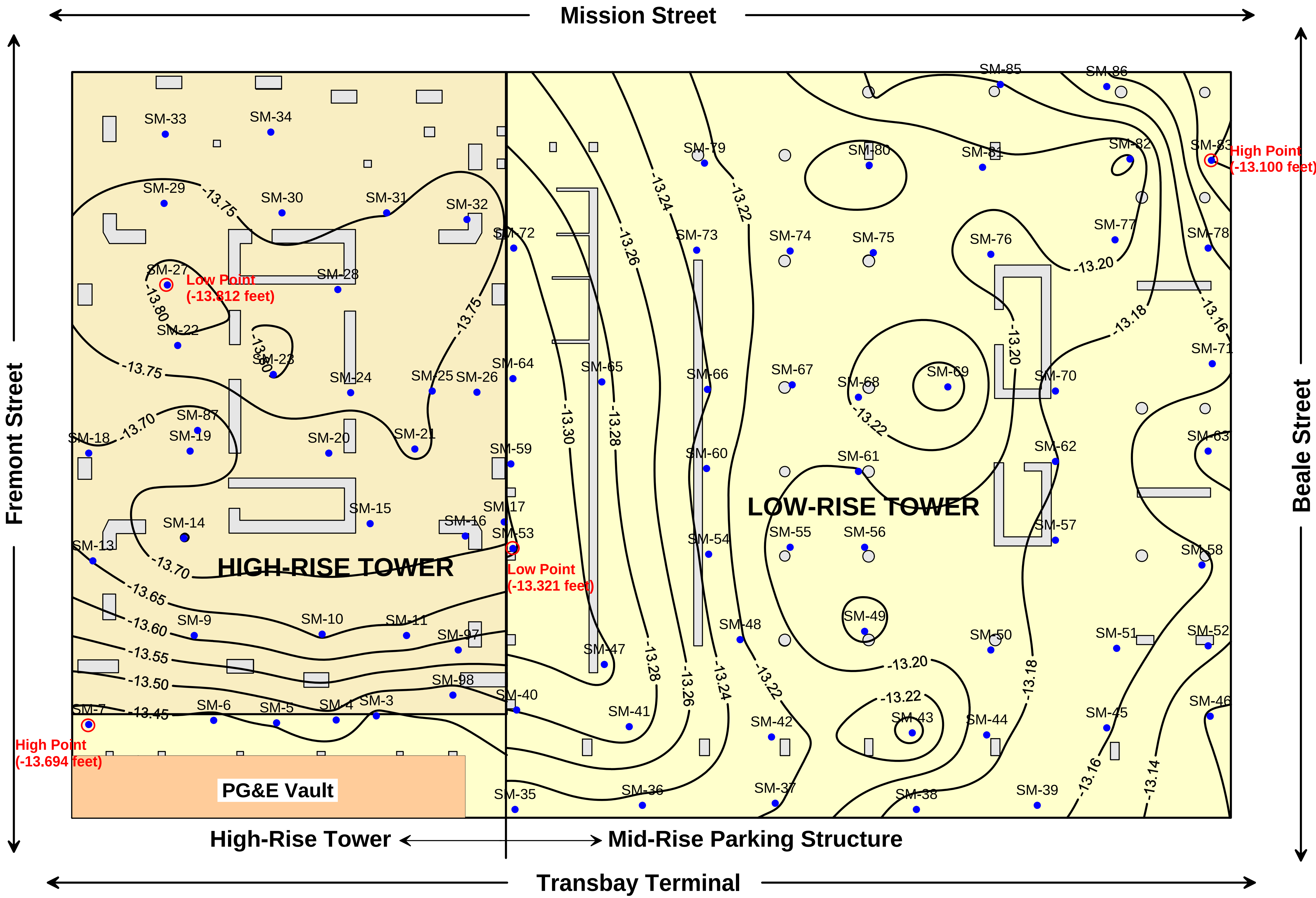
Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date**	19 March 2012
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/SMM
From	Stephen McLandrich (Arup) Nick O'Riordan (Arup) Kevin Clinch (Arup)	**File reference**	4-05 160
Subject	Transbay Transit Center: Results of March 2012 Settlement Survey at 301 Mission Property	**Page** 1 **of** 1	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated December 23, 2011 with measurements made through March 2012.

List of Plates



Date of Survey Reading: March 7, 2012

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	**Low-Rise Tower**
0.391 feet (4.694 inches)	**0.221 feet (2.654 inches)**

N

0 25 50 75

Approximate Scale: 1" = 25'

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on March 7, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY: PERIODIC SURVEY - MARCH 7, 2012

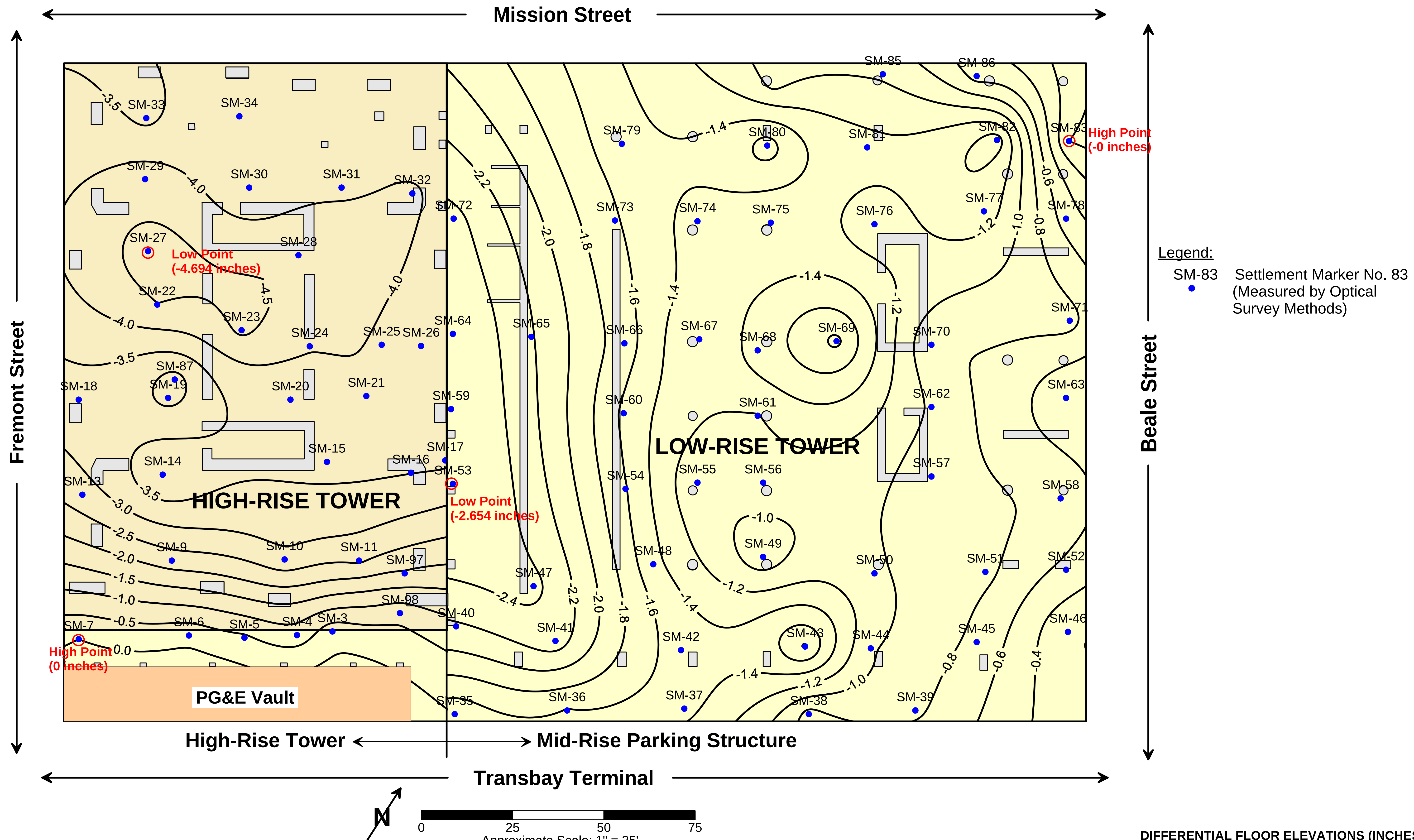
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2012

ARUP

PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\160 301 Mission - Mar 2011 Survey\Plates\Elevations All (2012.03.07).srf



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on March 7, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
MARCH 7, 2012 SURVEY

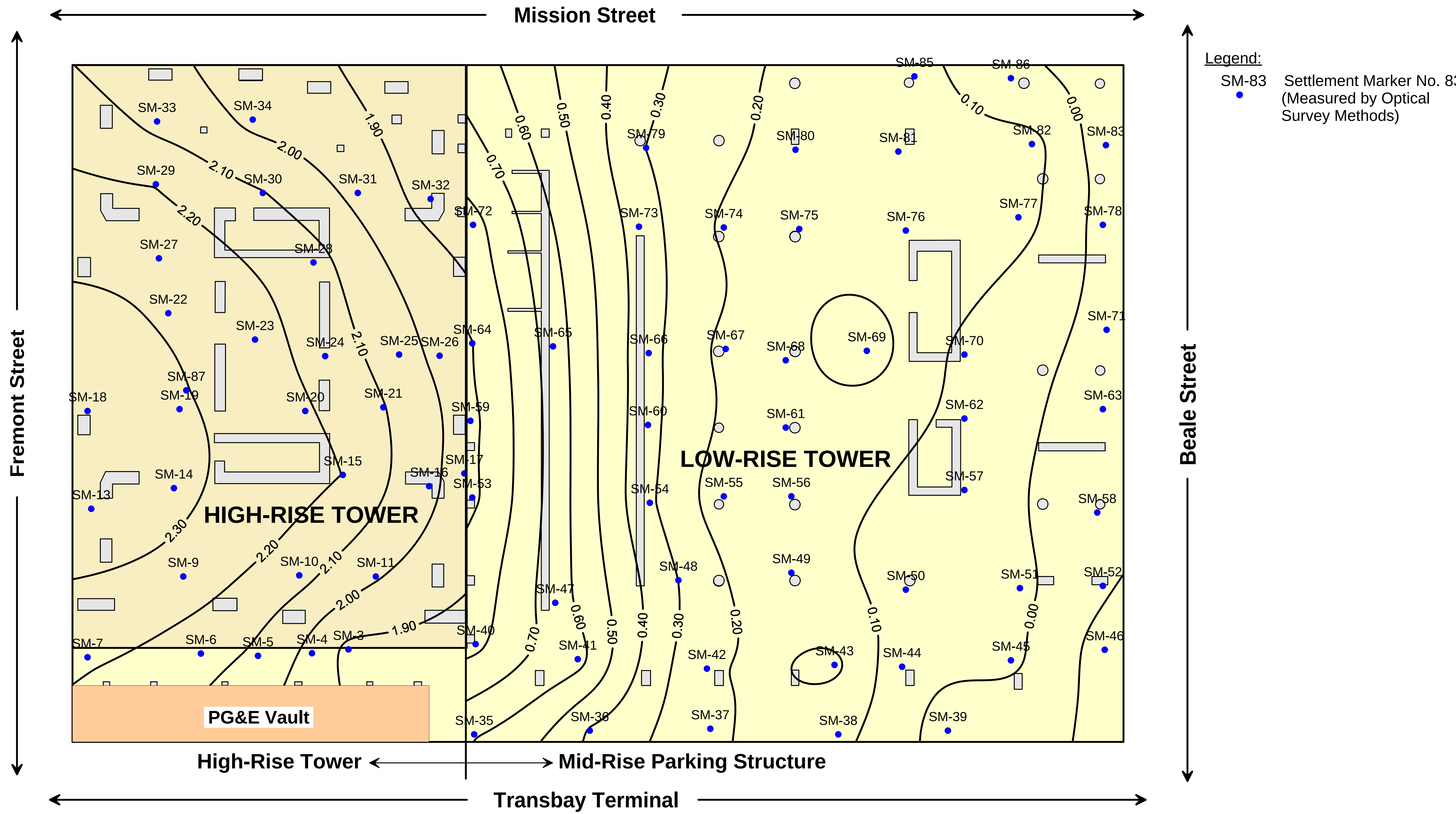
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2012

ARUP

PLATE 2

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\160 301 Mission - Mar 2011 Survey\Plates\Differential Elevation All (2012.03.07).srf



N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on March 7, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE FIRST LEVEL BASEMENT OF THE 301 MISSION STREET STRUCTURE BETWEEN APRIL 30, 2009 AND MARCH 7, 2012

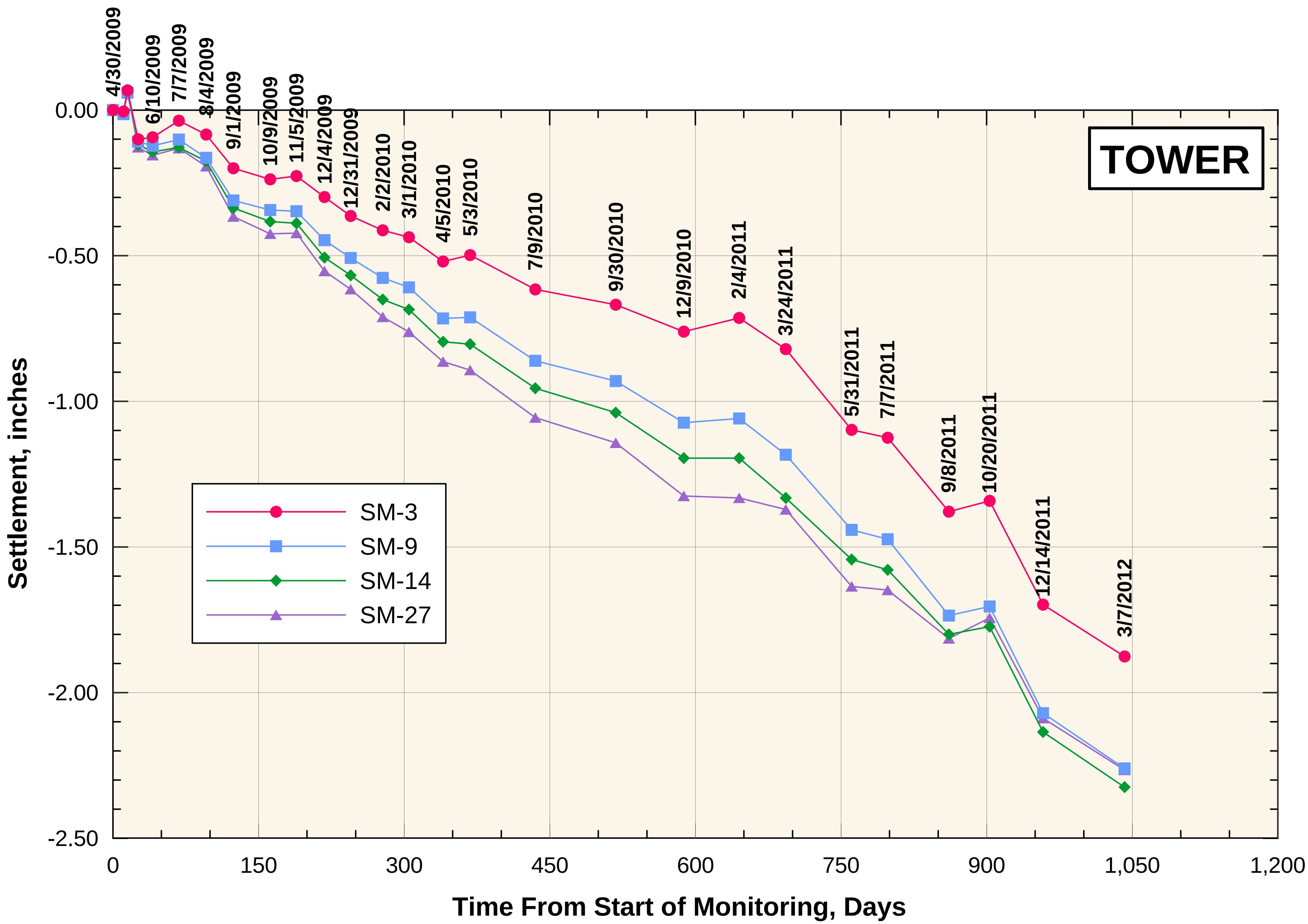
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

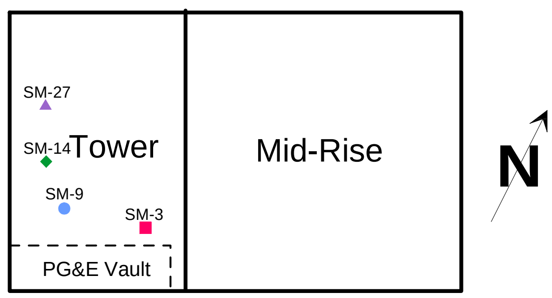
March 2012

ARUP

PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\160 301 Mission - Mar 2011 Survey\Plates\Elevation changes All (2012.03.07).srf





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH MARCH 7, 2012

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

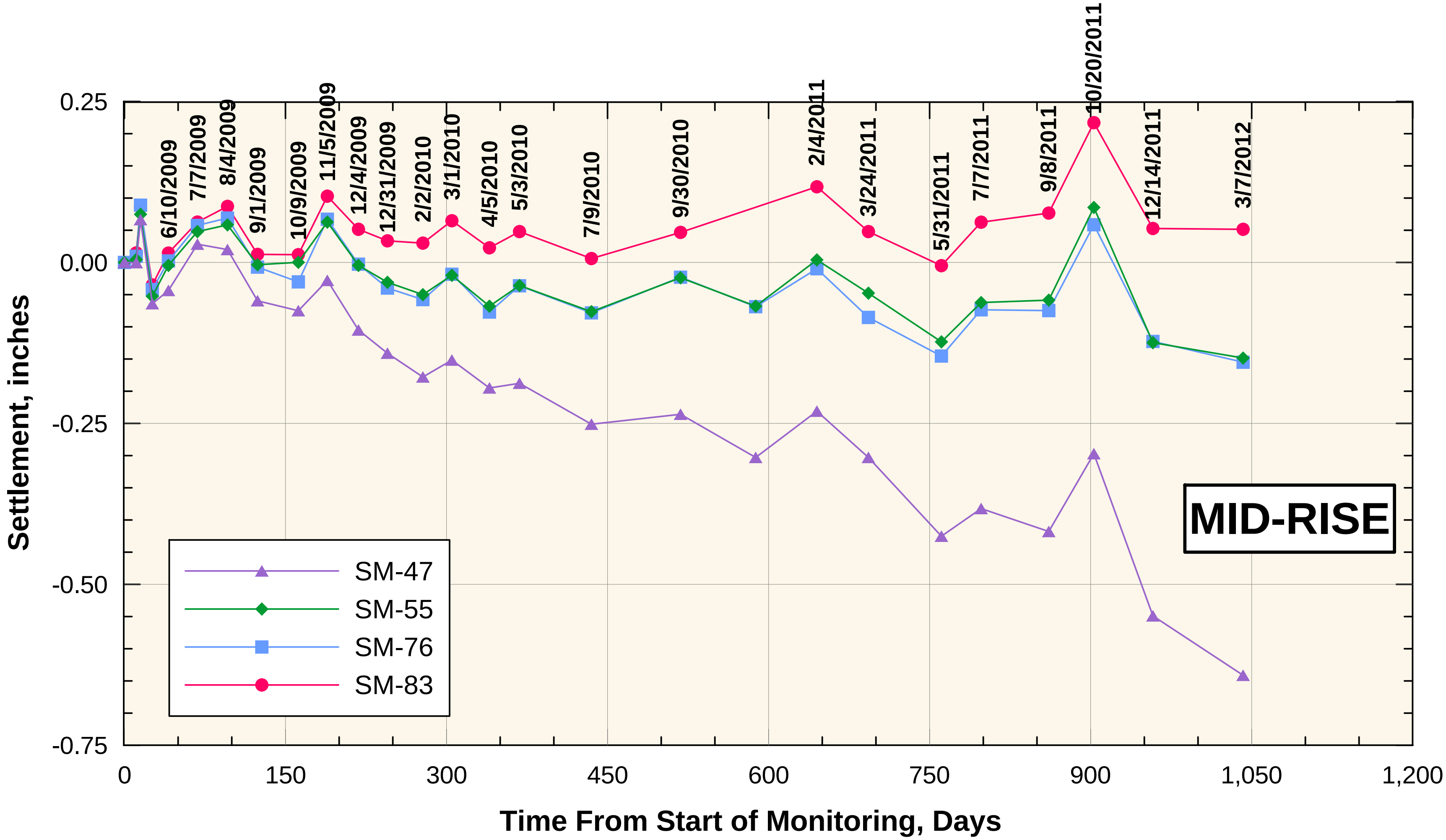
March 2012

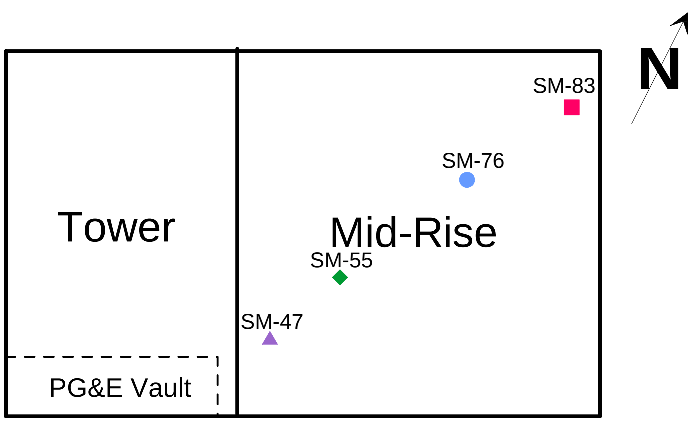
ARUP

PLATE 4

Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\160 301 Mission - Mar 2011 Survey\Plates\Plate 4 Settlement Over Time - Tower.grf





Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\160 301 Mission - Mar 2011 Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf

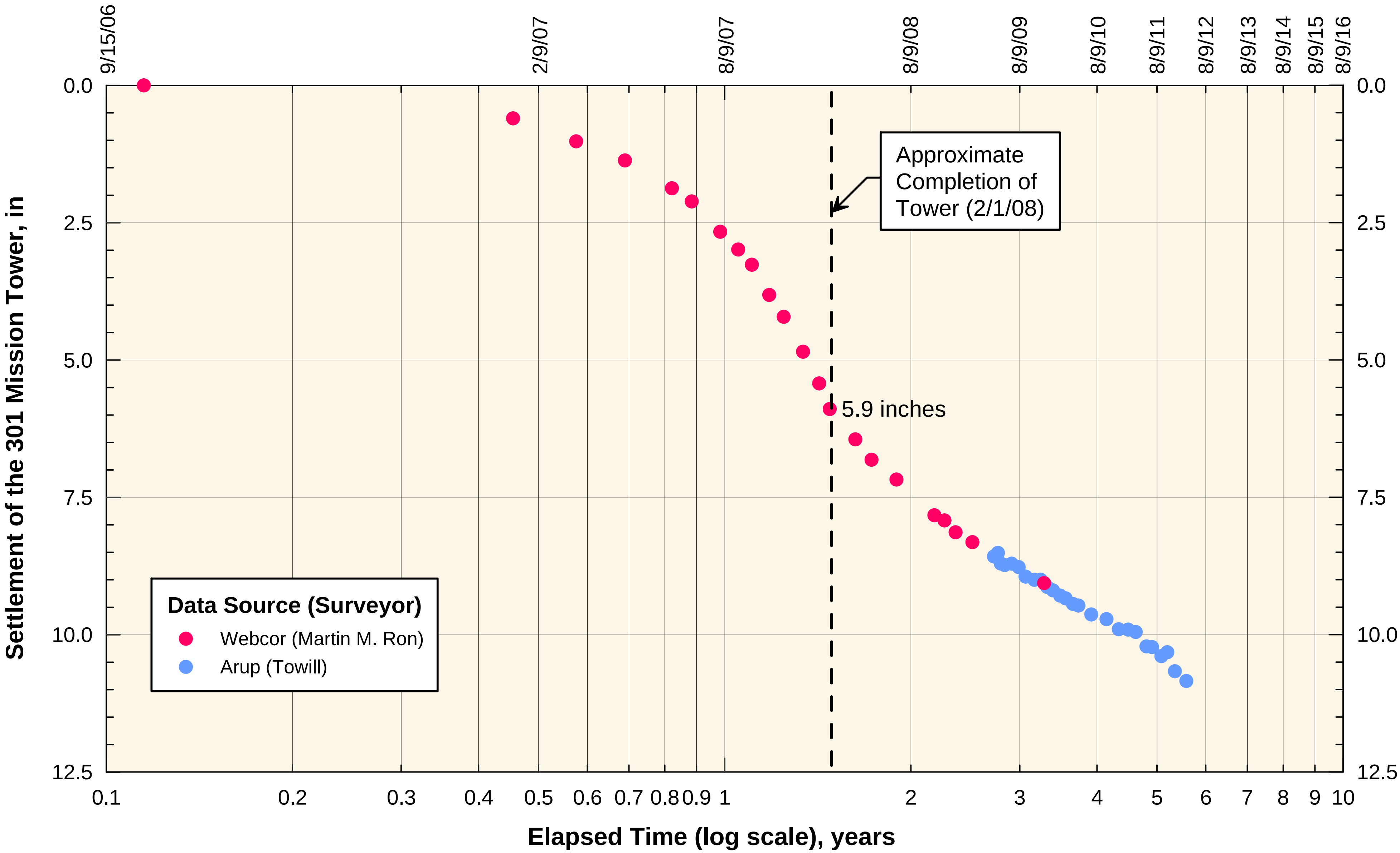
SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH MARCH 7, 2012

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2012

ARUP

PLATE 5



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

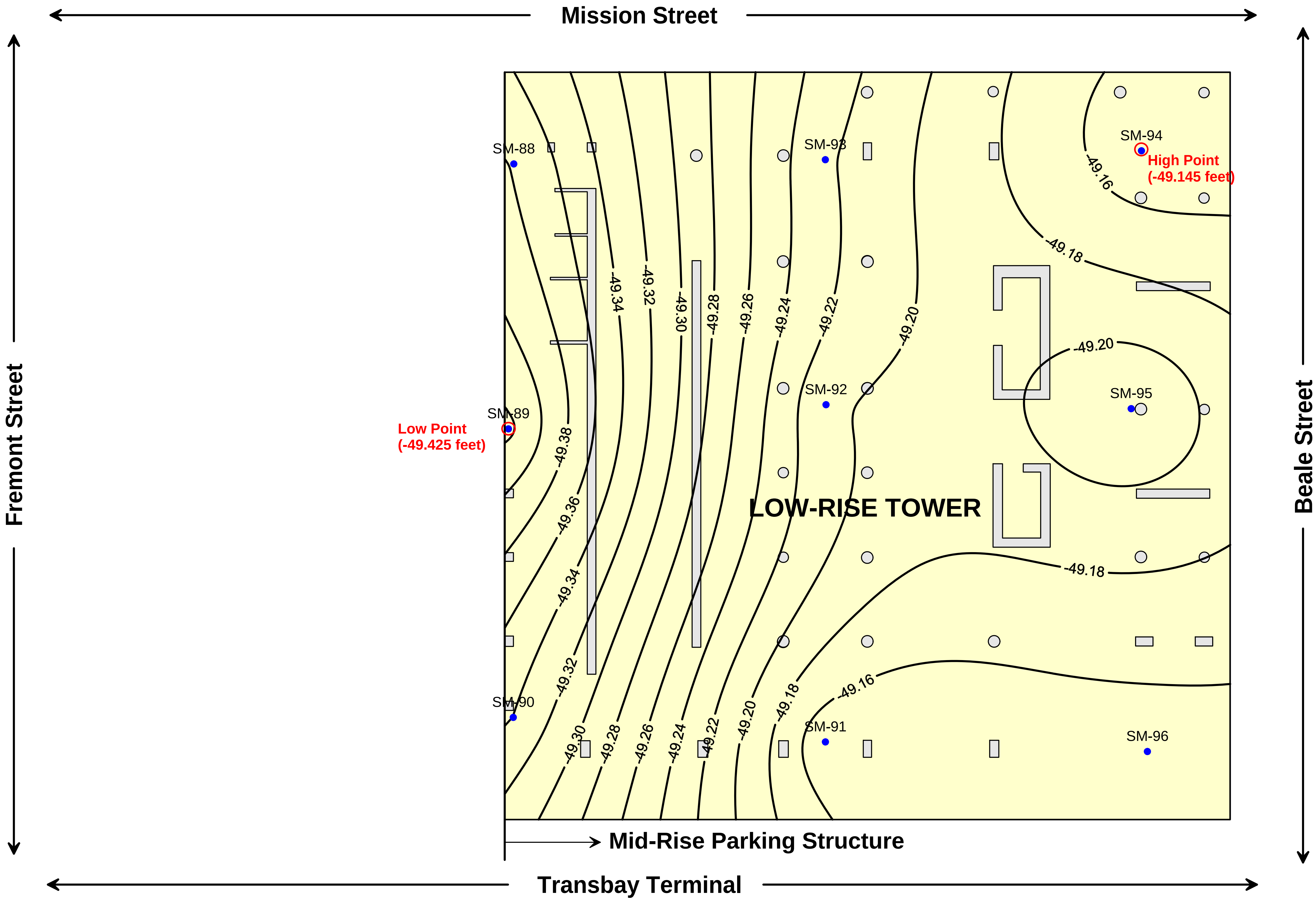
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2012

ARUP

PLATE 6

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\160 301 Mission - Mar 2011 Survey\Plates\Plate 6 Tower Settlements.grf

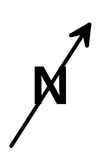


Date of Survey Reading:
March 7, 2012

Legend:

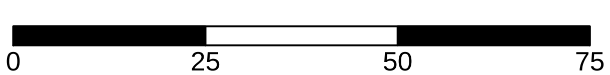
SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.280 feet (3.358 inches)



Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on March 7, 2012.



Approximate Scale: 1" = 25'

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\160 301 Mission - Mar 2011 Survey\Plates\B-5 Elevations (2012.03.07).srf

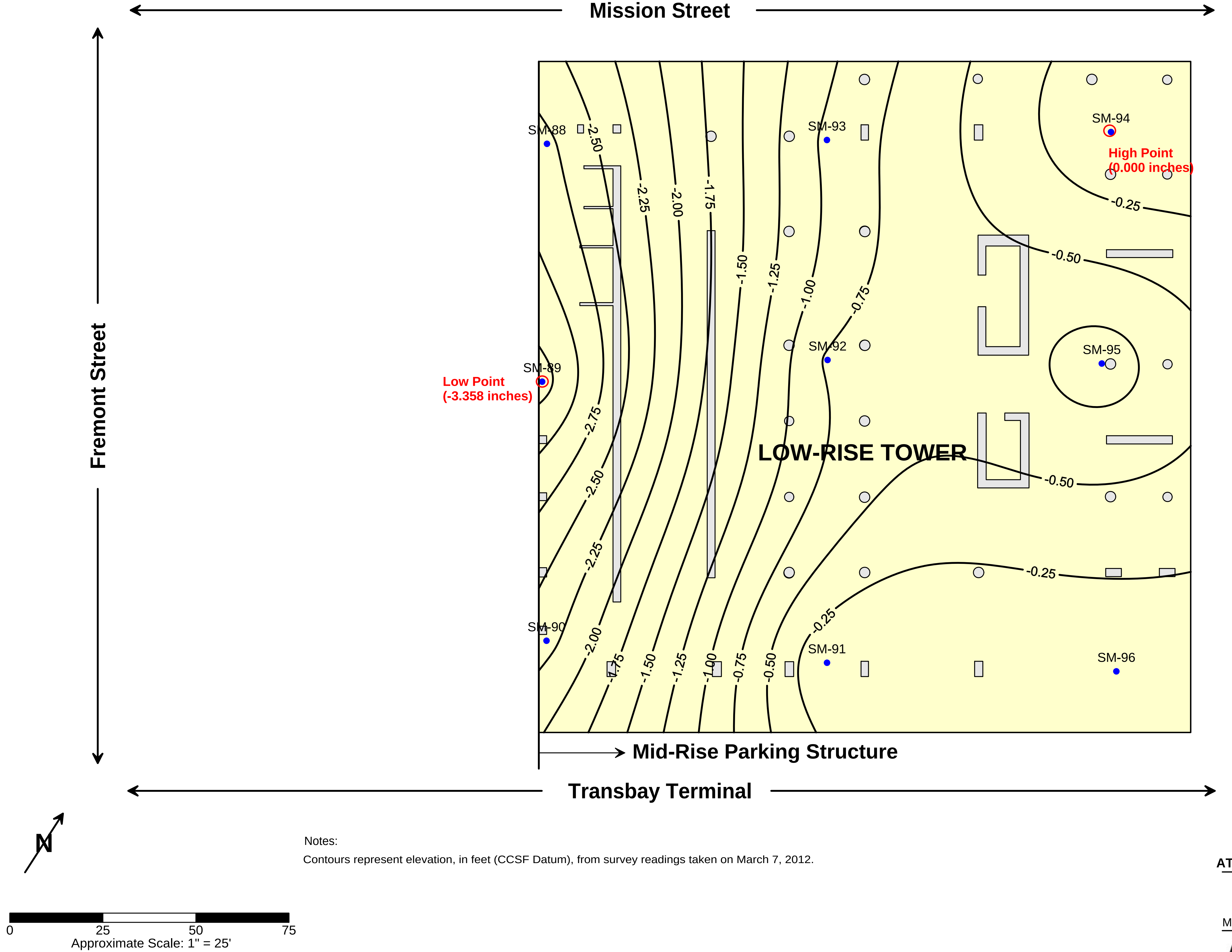
FLOOR ELEVATION AT BASEMENT LEVEL B-5
OF 301 MISSION PROPERTY: MARCH 7, 2012 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2012

ARUP

PLATE 7



Date of Survey Reading:
March 7, 2012

Legend:

SM-88 ● Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.280 feet (3.358 inches)

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on March 7, 2012.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
AT BASEMENT LEVEL B-5: MARCH 7, 2012 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2012

ARUP

PLATE 8

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\160 301 Mission - Mar 2011 Survey\Plates\B-5 Differential Elevations (2012.03.07).srf

Memorandum

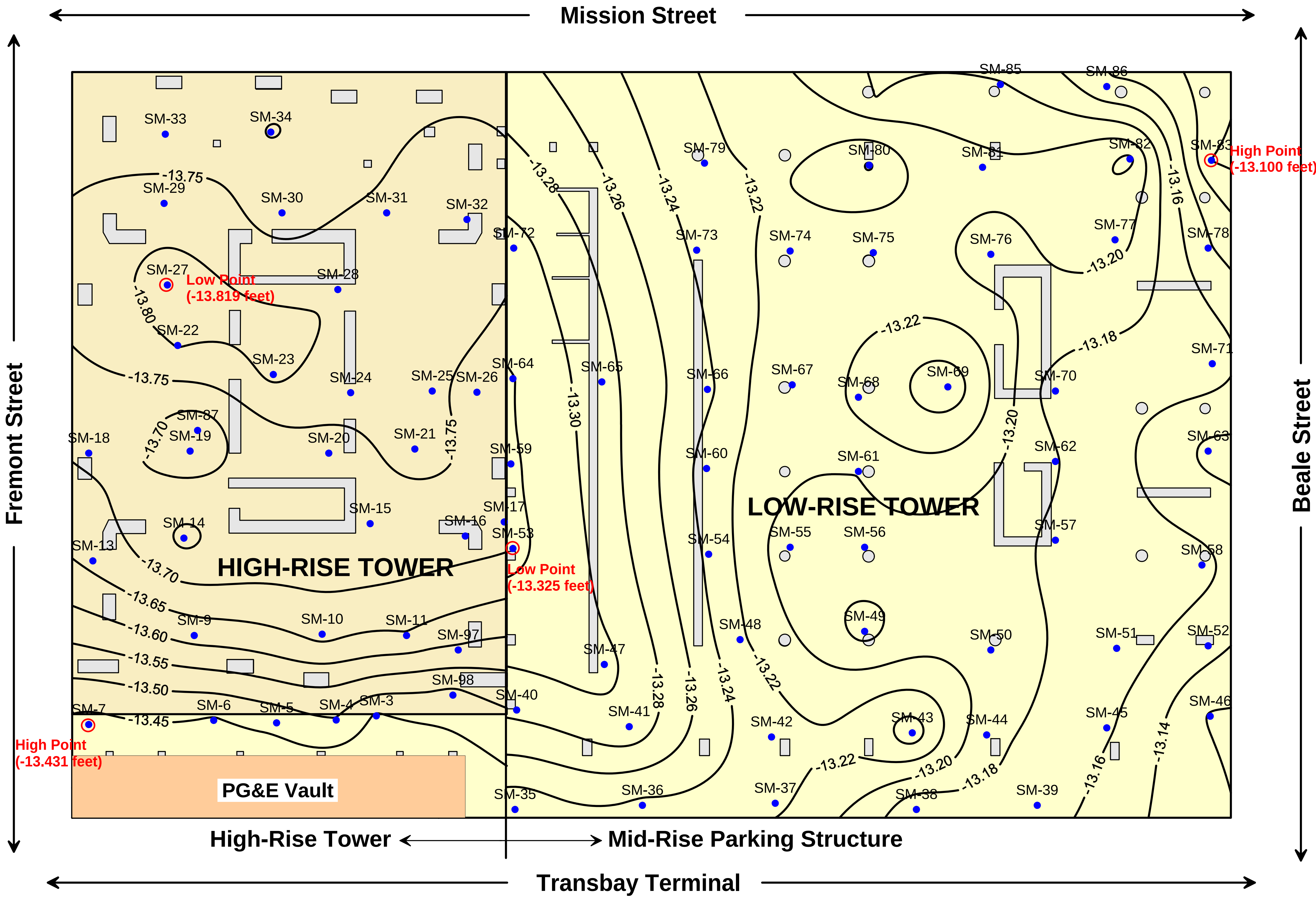
ARUP

To	Brian Dykes (TJPA)	**Date**	27 April 2012
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/SMM
From	Stephen McLandrich (Arup) Nick O'Riordan (Arup) Kevin Clinch (Arup)	**File reference**	4-05 165
Subject	Transbay Transit Center: Results of April 2012 Settlement Survey at 301 Mission Property	**Page** 1 **of** 1	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated March 7, 2011 with measurements made through April 2012.

List of Plates

Plate 1 Floor Elevations at Level B-1 of 301 Mission Property: Periodic Survey – April 18, 2012
Plate 2 Differential Floor Elevation (Inches) – April 18, 2012 Survey
Plate 3 Contours of Settlements Measured at the First Level Basement of the 301 Mission Street Structure Between April 30, 2009 and April 18, 2012
Plate 4 Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Tower: April 30, 2009 through April 18, 2012.
Plate 5 Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Mid-Rise: April 30, 2009 through April 18, 2012
Plate 6 Settlements of the 301 Mission Tower Including Monitoring During Construction
Plate 7 Floor Elevation at Basement Level B-5 of 301 Mission Property: April 18, 2012 Survey
Plate 8 Differential Floor Elevations (Inches) at Basement Level B-5: April 18, 2012 Survey



Date of Survey Reading:
April 18, 2012

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	**Low-Rise Tower**
0.388 feet (4.652 inches)	**0.225 feet (2.700 inches)**

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on April 18, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

0 25 50 75

Approximate Scale: 1" = 25'

FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY
PERIODIC SURVEY - APRIL 18, 201

Transbay Transit Cente
301 Mission Monitorin
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April 2012

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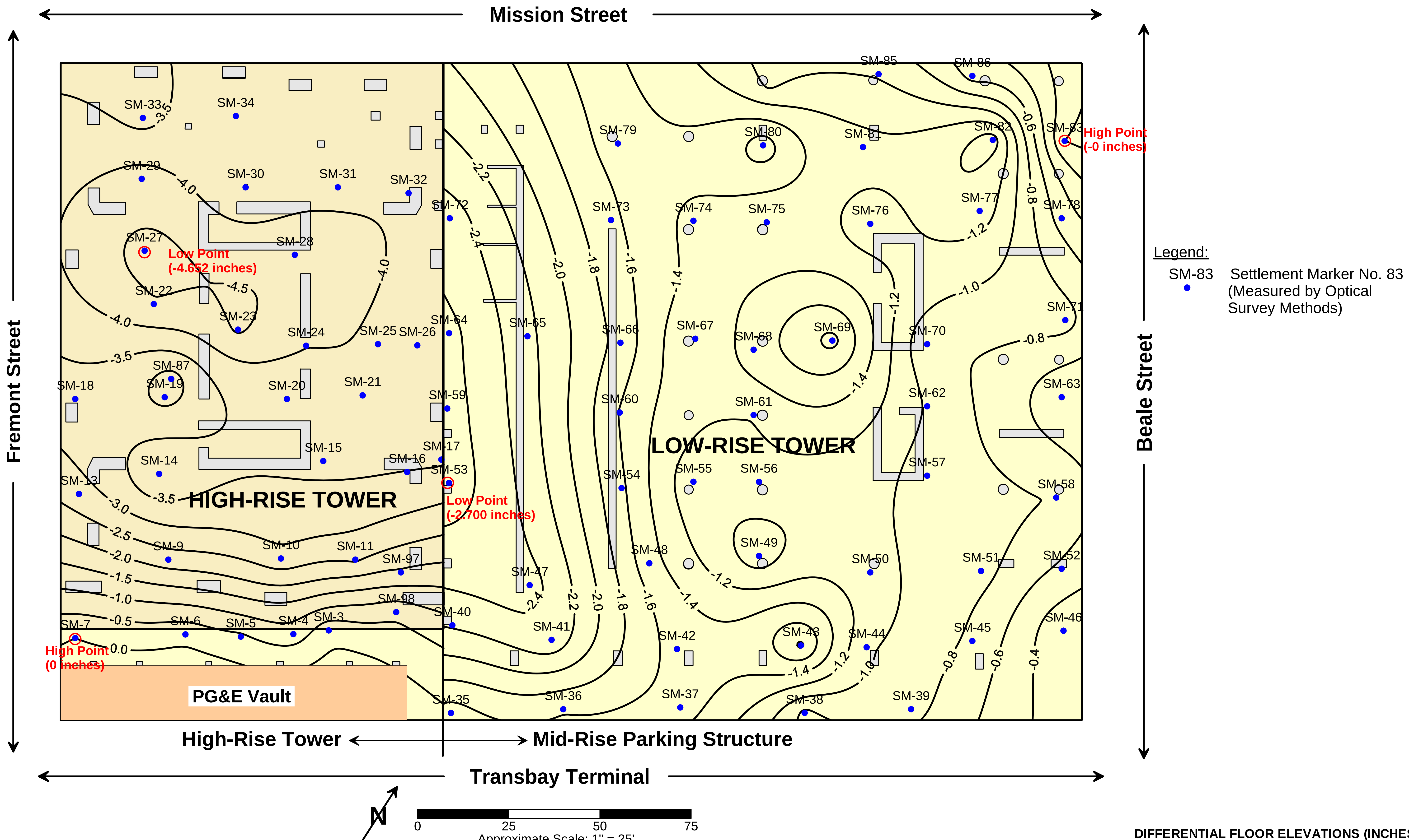
PLATE 1

J:Internal Project DataReports & Narratives301 Mission - Apr 2012 Survey\Plates\Elevations All (2012.04.18).srf



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on April 18, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
APRIL 18, 2012 SURVEY

Transbay Transit Cente
301 Mission Monitoring
Transbay Joint Powers Authorit
San Francisco, Californi

April 2012

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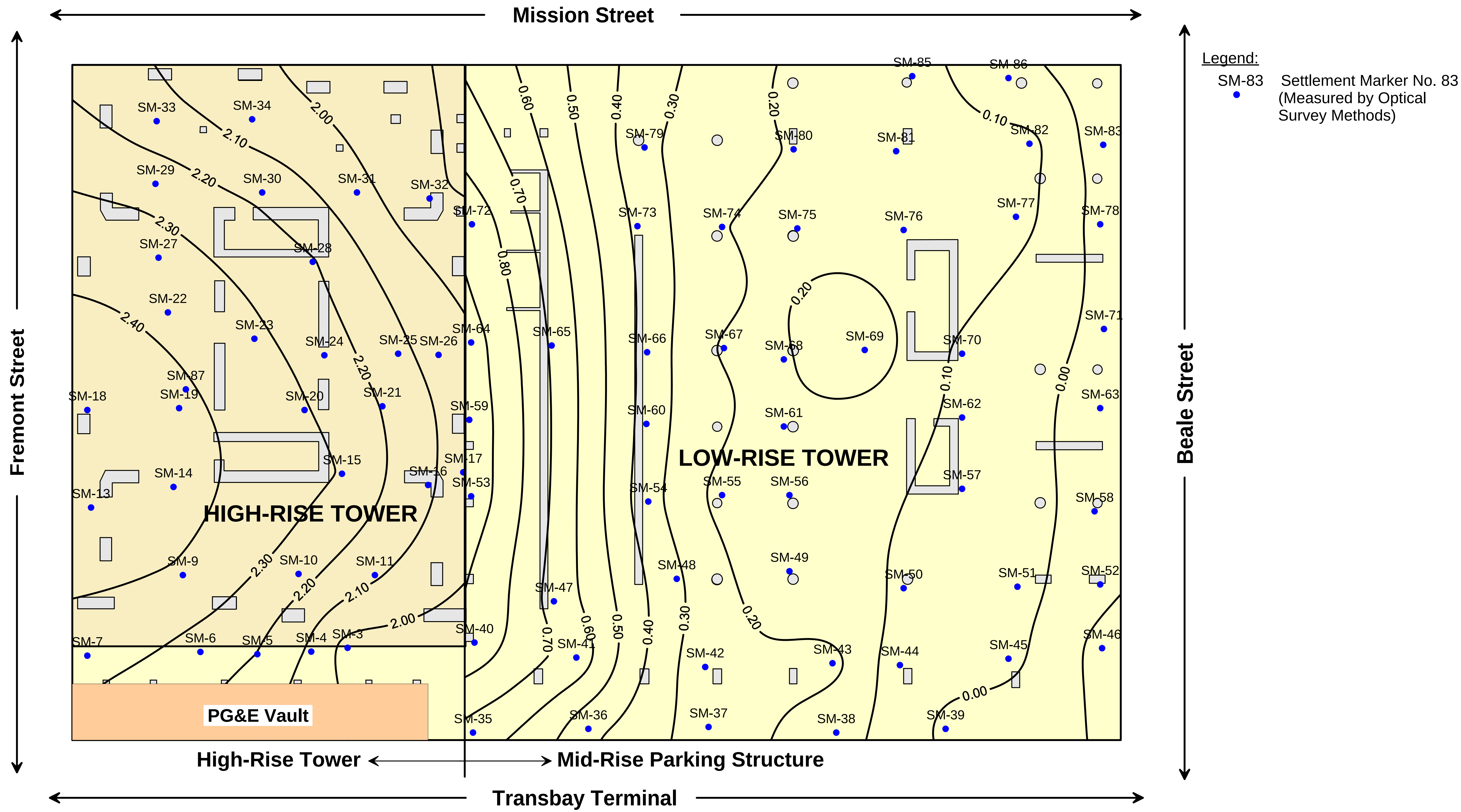
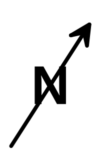
PLATE 2

J:Internal Project DataReports & Narratives301 Mission - Apr 2012 Survey\Plates\Differential Elevation All (2012.04.18).srf





0 25 50 75

Approximate Scale: 1" = 25'

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on April 18, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE FIRST LEVEL BASEMENT OF THE 301 MISSION STREE STRUCTURE BETWEEN APRIL 30, 2009 AND APR

Transbay Transit Cente
301 Mission Monitorin
Transbay Joint Powers Authorit
San Francisco, Californi

April 2012

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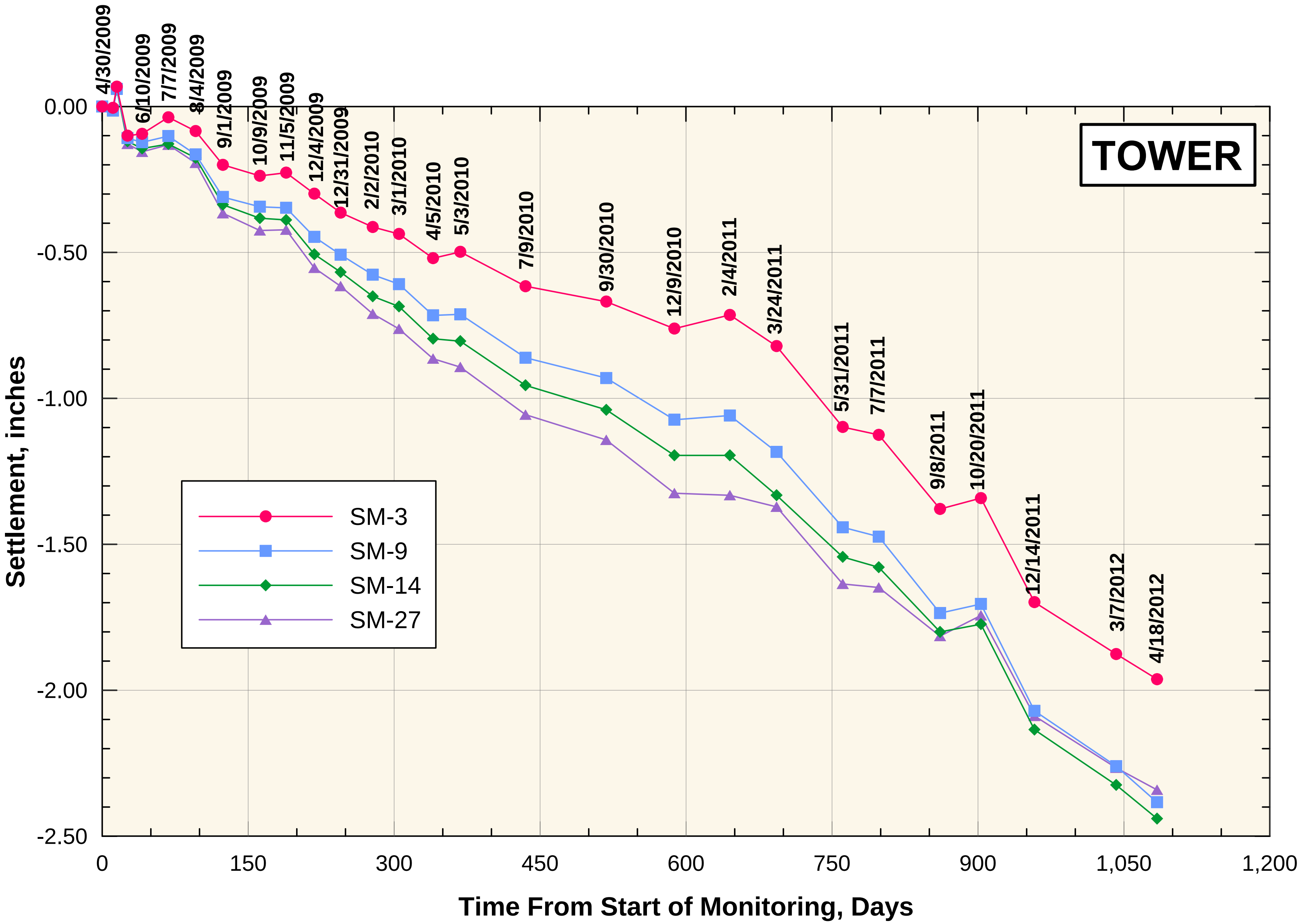
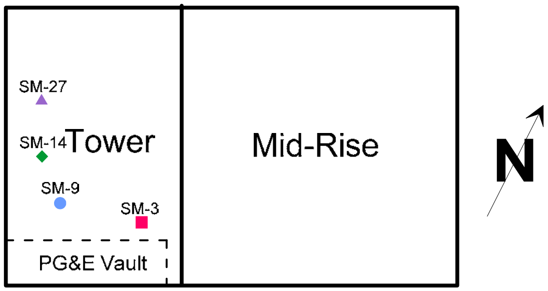
PLATE 3

J:Internal Project DataReports & Narratives301 Mission - Apr 2012 Survey\Plates\Elevation changes All (2012.04.18).srf





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH APRIL 18, 2012

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

April 2012

Note:
Initial (Baseline) reading taken on 04/30/09

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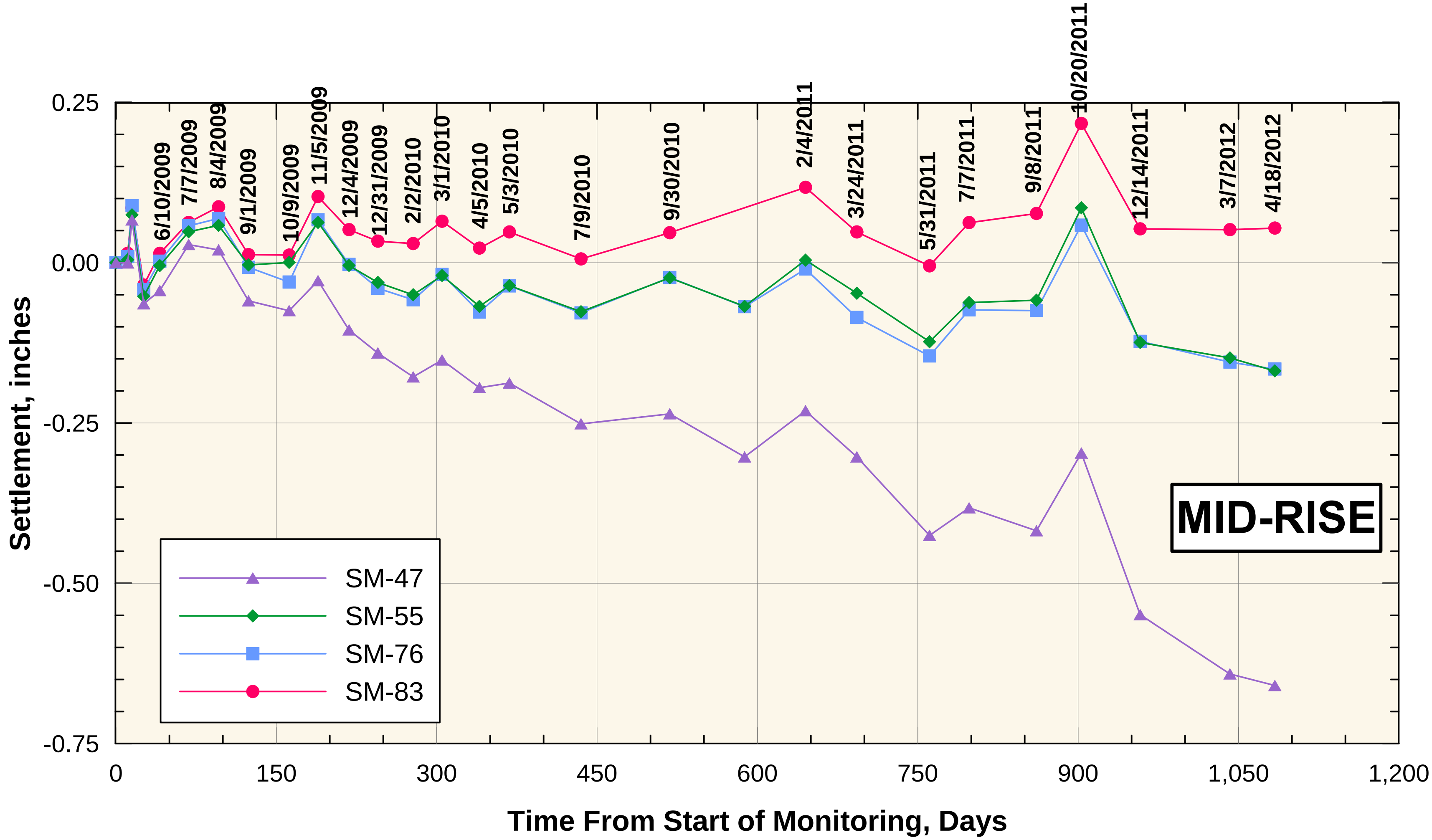
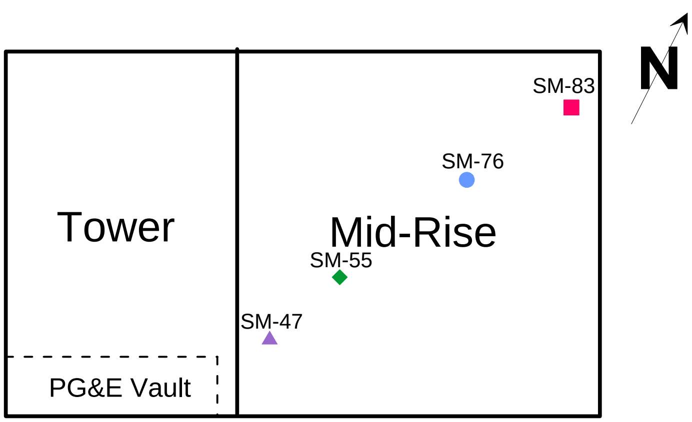
PLATE 4

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\165 301 Mission - Apr 2012 Survey\Plates\Plate 4 Settlement Over Time - Tower.grf





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH APRIL 18, 2012

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
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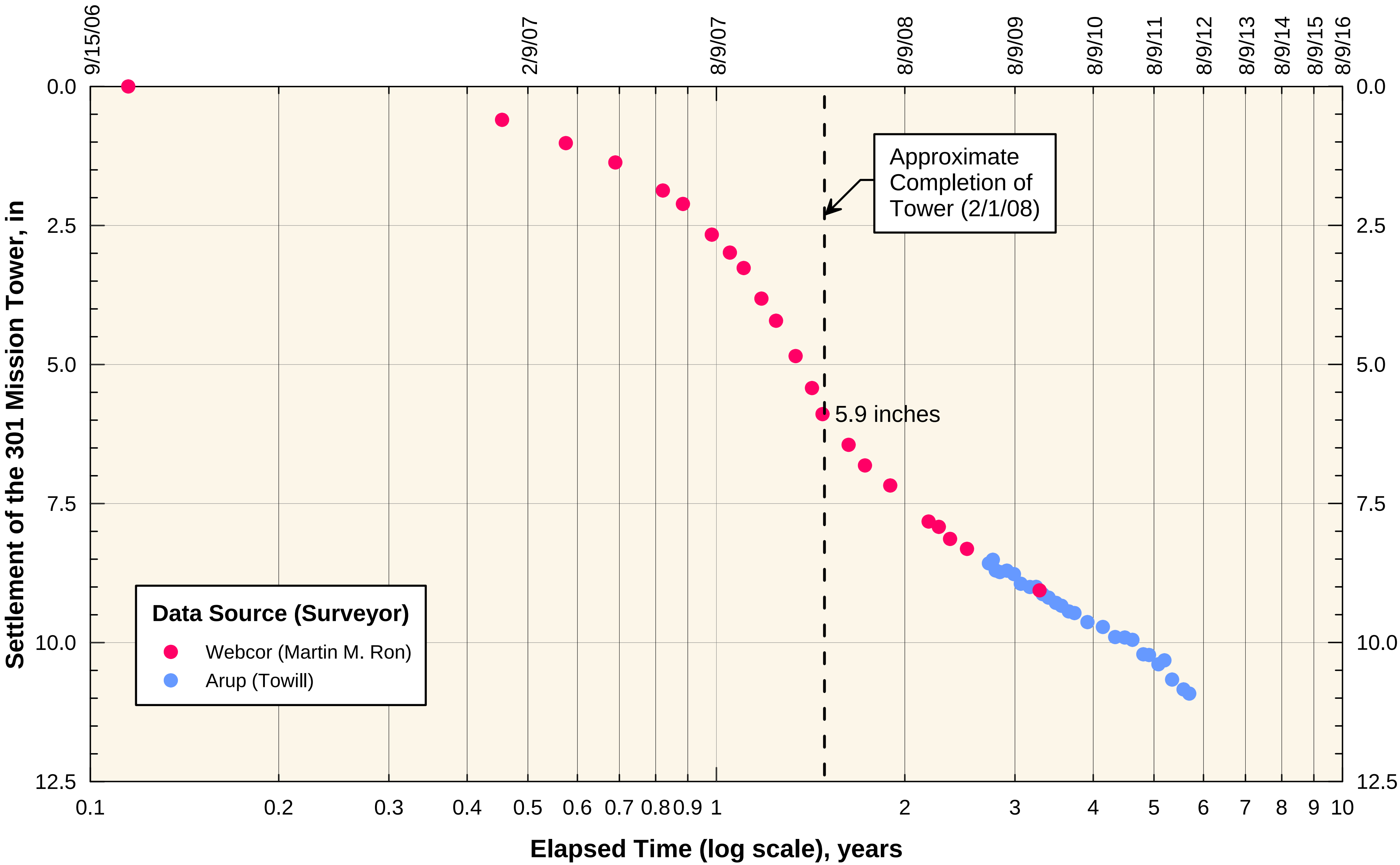
PLATE 5

Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\165 301 Mission - Apr 2012 Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER
INCLUDING MONITORING DURING CONSTRUCTION

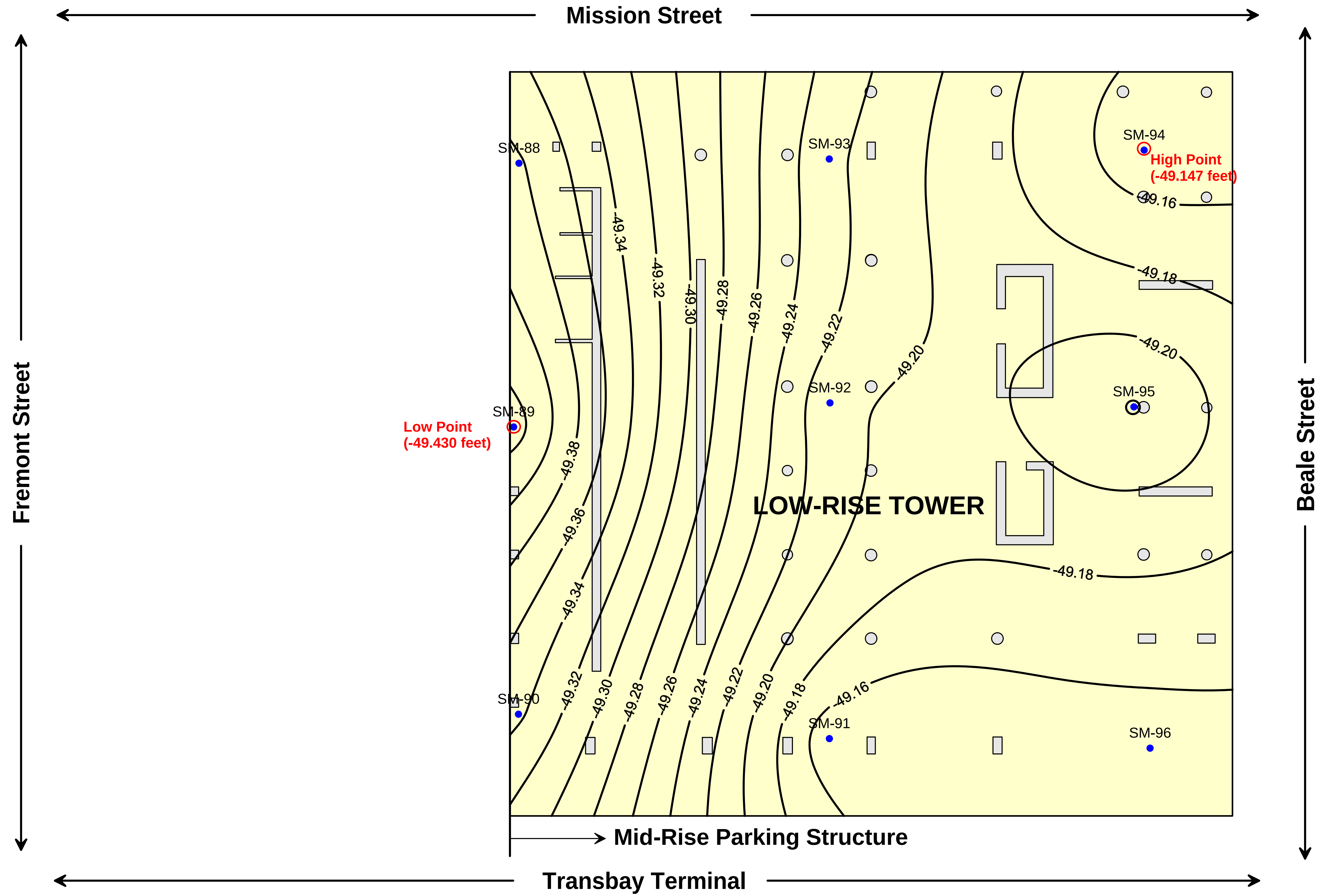
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

April 2012

ARUP

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\165 301 Mission - Apr 2012 Survey\Plates\Plate 6 Tower Settlements.grf

PLATE 6



Date of Survey Reading:
April 18, 2012

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.283 feet (3.394 inches)

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on April 18, 2012.

0 25 50 75

Approximate Scale: 1" = 25'

FLOOR ELEVATION AT BASEMENT LEVEL B-5 OF 301 MISSION PROPERTY: APRIL 18, 2012 SURVE

Transbay Transit Cente
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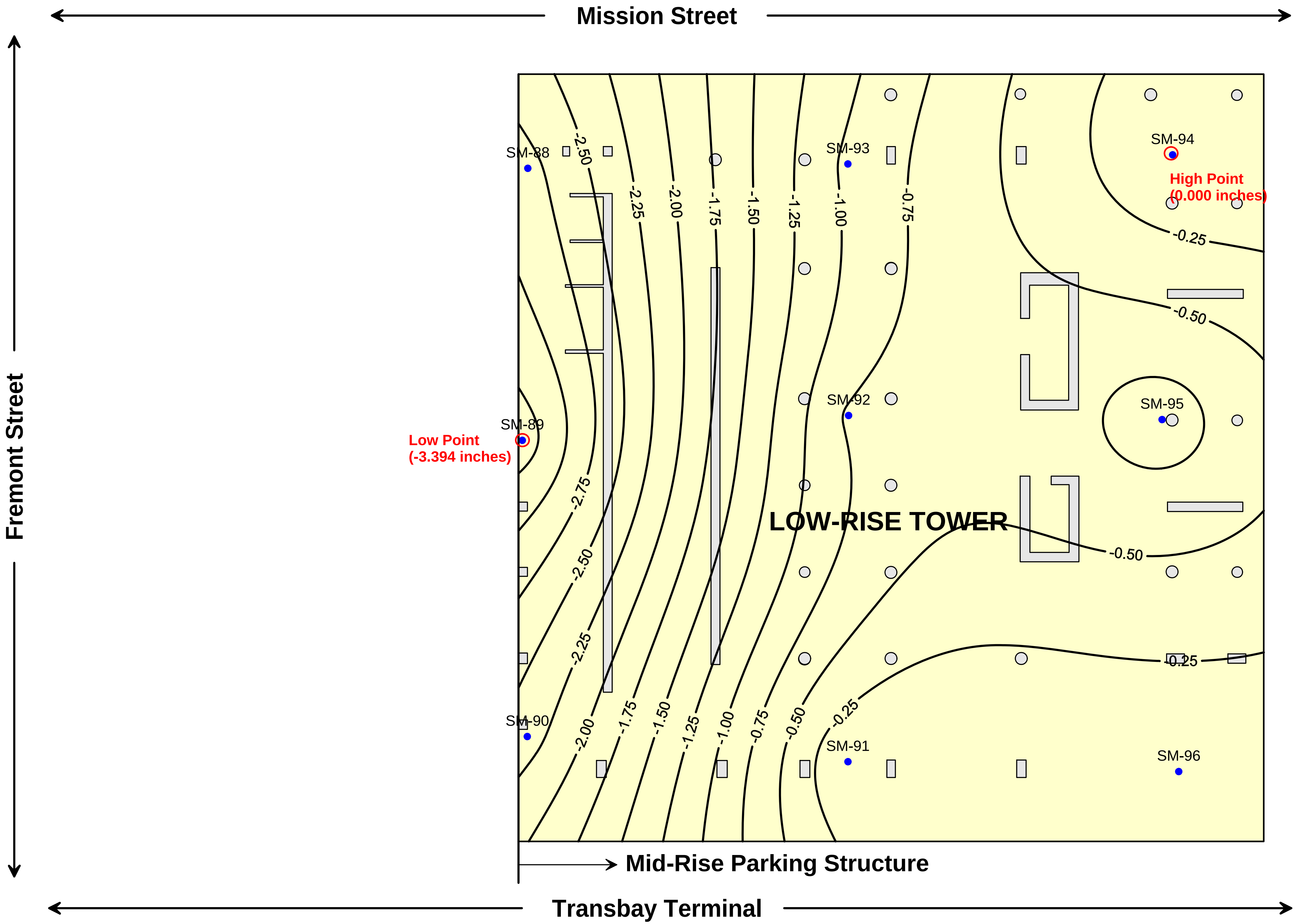
PLATE 7

J:Internal Project DataReports & Narratives301 Mission - Apr 2012 Survey\Plates\B-5 Elevations (2012.04.18).srf

Date of Survey Reading:
April 18, 2012



Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.283 feet (3.394 inches)

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on April 18, 2012.

N

0 25 50 75
Approximate Scale: 1" = 25'

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
AT BASEMENT LEVEL B-5: APRIL 18, 2012 SURVEY

Transbay Transit Cente
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PLATE 8

J:Internal Project DataReports & Narratives301 Mission - Apr 2012 Survey\Plates\B-5 Differential Elevations (2012.04.18).srf

Memorandum

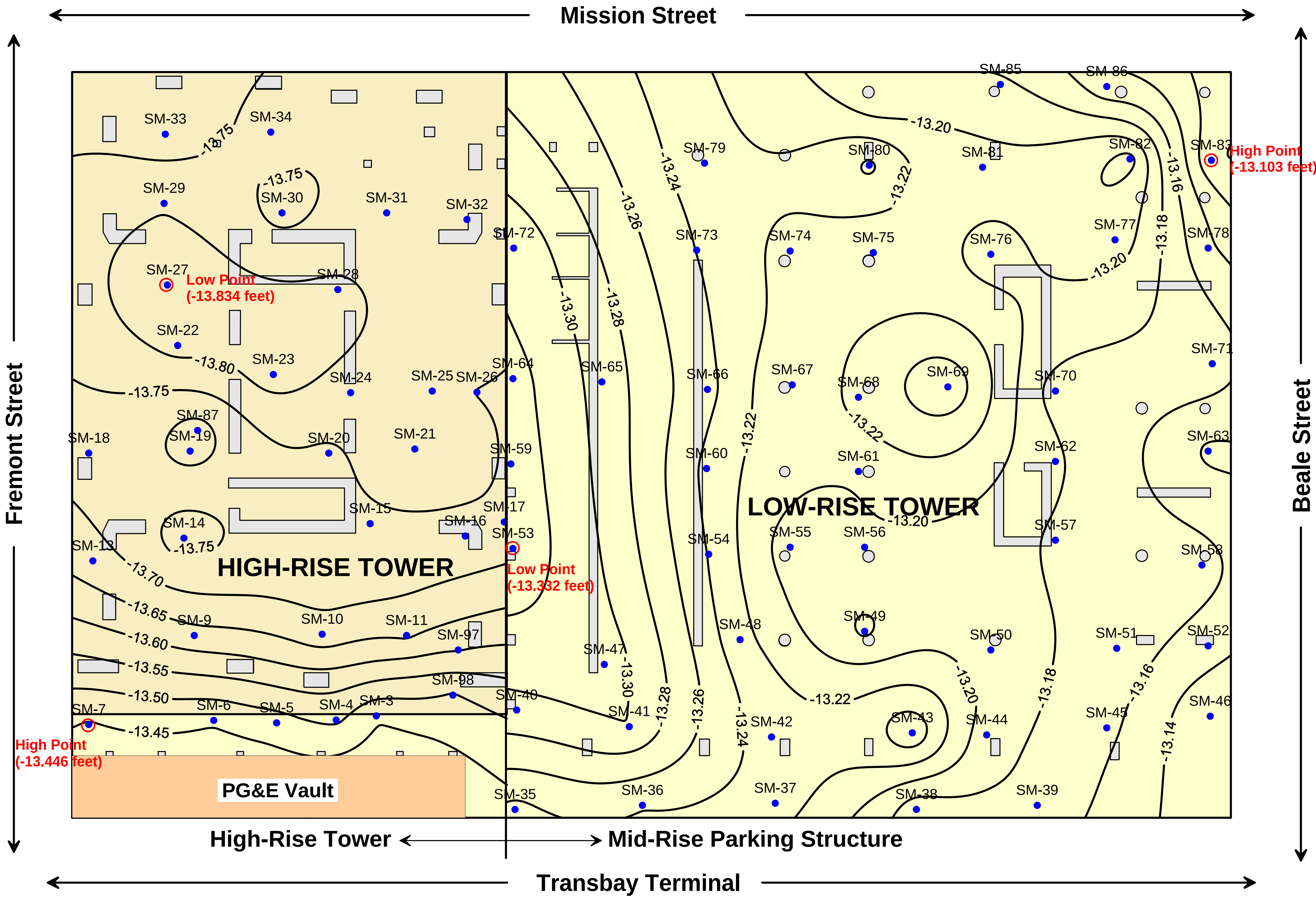
ARUP

To	Brian Dykes (TJPA)	**Date** 6 July 2012
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number** 132242-60/SMM
From	Stephen McLandrich (Arup) Nick O'Riordan (Arup) Kevin Clinch (Arup)	**File reference** 4-05 174
Subject	Transbay Transit Center: Results of June 2012 Settlement Survey at 301 Mission Property	**Page** 1 **of** 1

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated April 27, 2011 with measurements made through June 2012.

List of Plates

Plate 1 Floor Elevations at Level B-1 of 301 Mission Property: Periodic Survey – June 13, 2012
Plate 2 Differential Floor Elevation (Inches) – June 13, 2012 Survey
Plate 3 Contours of Settlements Measured at the First Level Basement of the 301 Mission Street Structure Between April 30, 2009 and June 13, 2012
Plate 4 Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Tower: April 30, 2009 through June 13, 2012.
Plate 5 Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Mid-Rise: April 30, 2009 through June 13, 2012
Plate 6 Settlements of the 301 Mission Tower Including Monitoring During Construction
Plate 7 Floor Elevation at Basement Level B-5 of 301 Mission Property: June 13, 2012 Survey
Plate 8 Differential Floor Elevations (Inches) at Basement Level B-5: June 13, 2012 Survey



Date of Survey Reading: June 13, 2012

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	Low-Rise Tower
0.388 feet (4.654 inches)	0.229 feet (2.751 inches)

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on June 13, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

0 25 50 75

Approximate Scale: 1" = 25'

J:Internal Project DataReports & Narratives301 Mission - Jun 2012 Survey\Elevations All (2012.06.13).srf

FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY PERIODIC SURVEY - JUNE 13, 2012

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

July 2012

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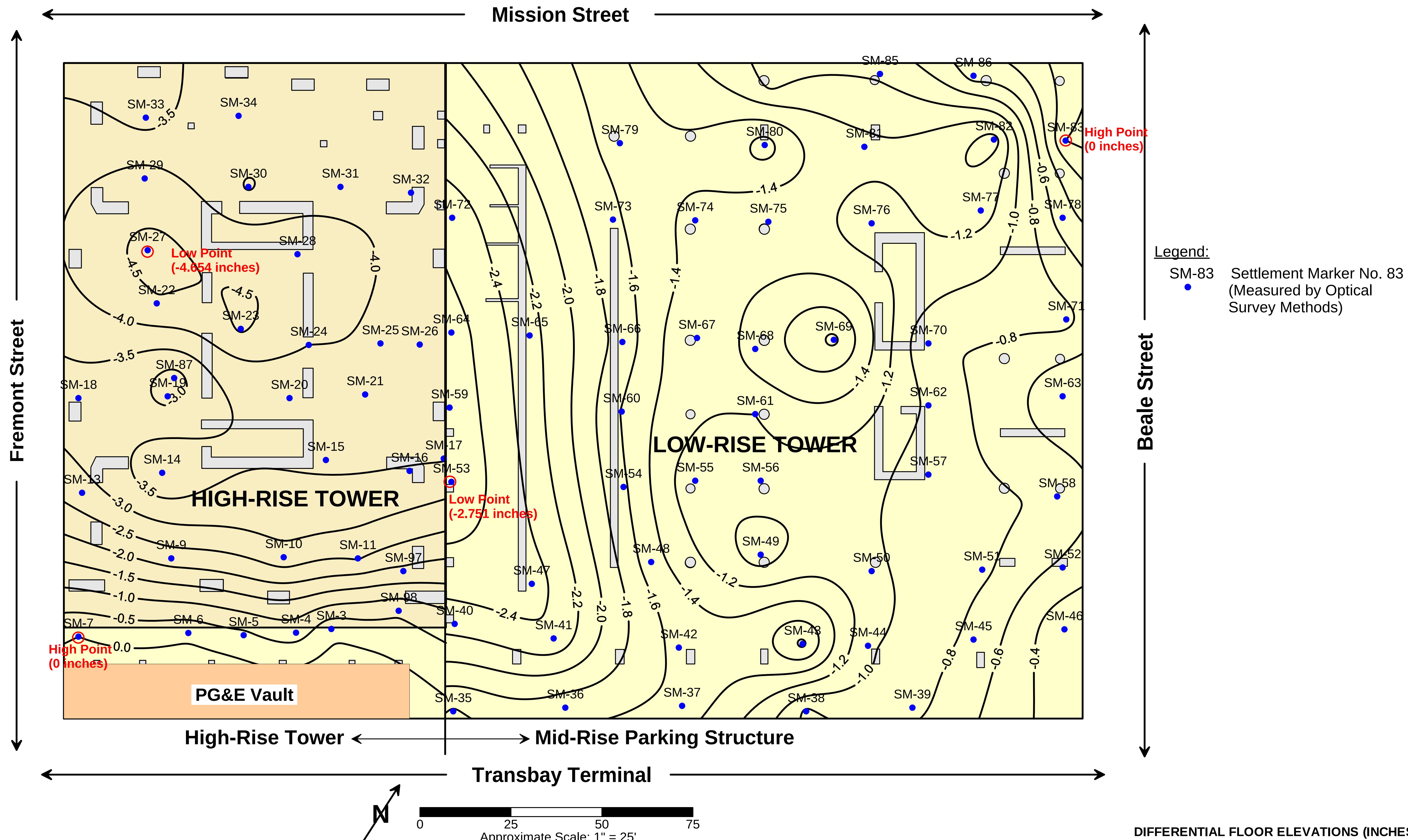
PLATE 1



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on June 13, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
JUNE 13, 2012 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

July 2012

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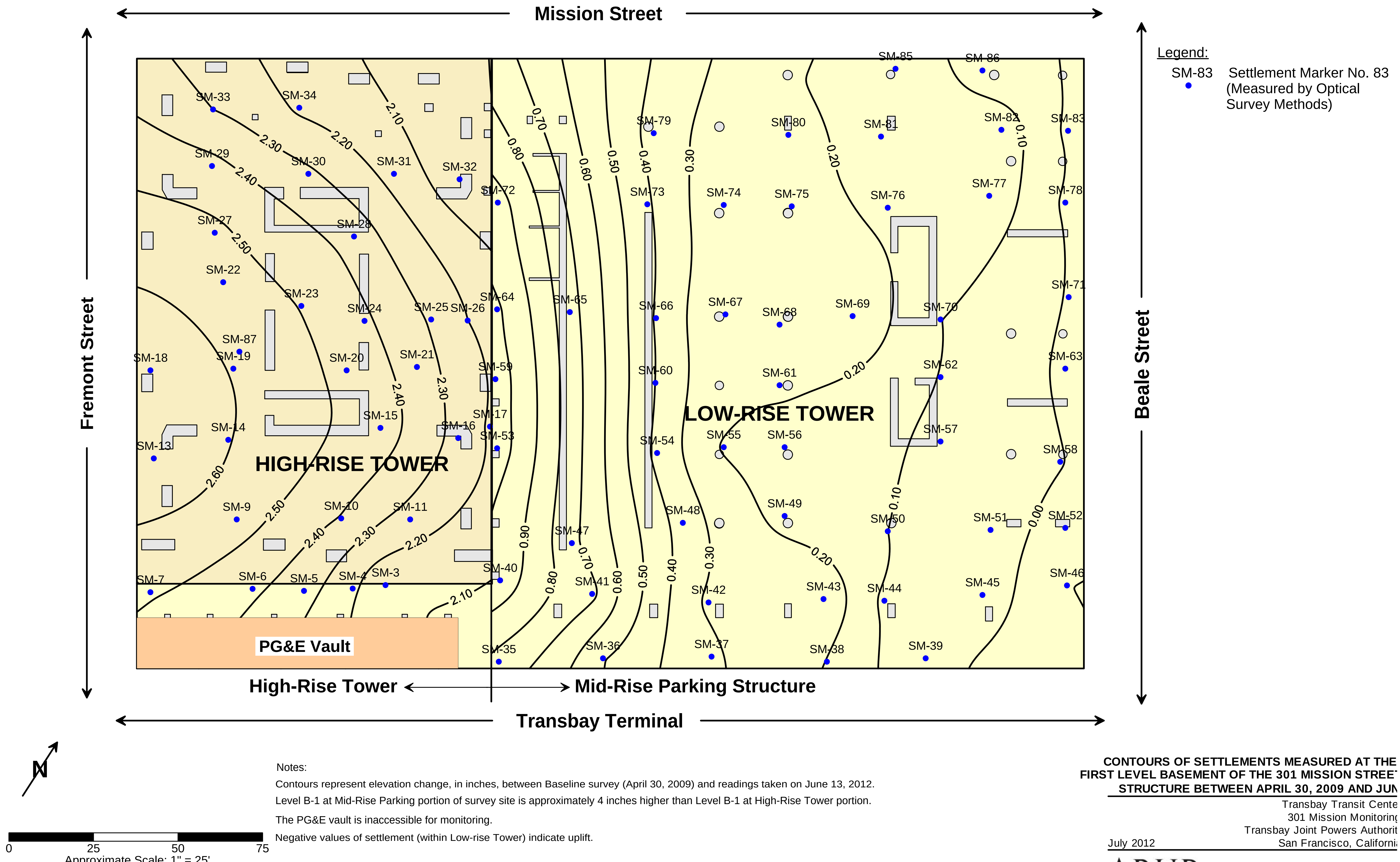
PLATE 2

J:Internal Project DataReports & Narratives301 Mission - Jun 2012 Survey\Differential Elevation All (2012.06.13).srf



Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on June 13, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE FIRST LEVEL BASEMENT OF THE 301 MISSION STREET STRUCTURE BETWEEN APRIL 30, 2009 AND JUN

Transbay Transit Cente
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Transbay Joint Powers Authorit
San Francisco, Californi

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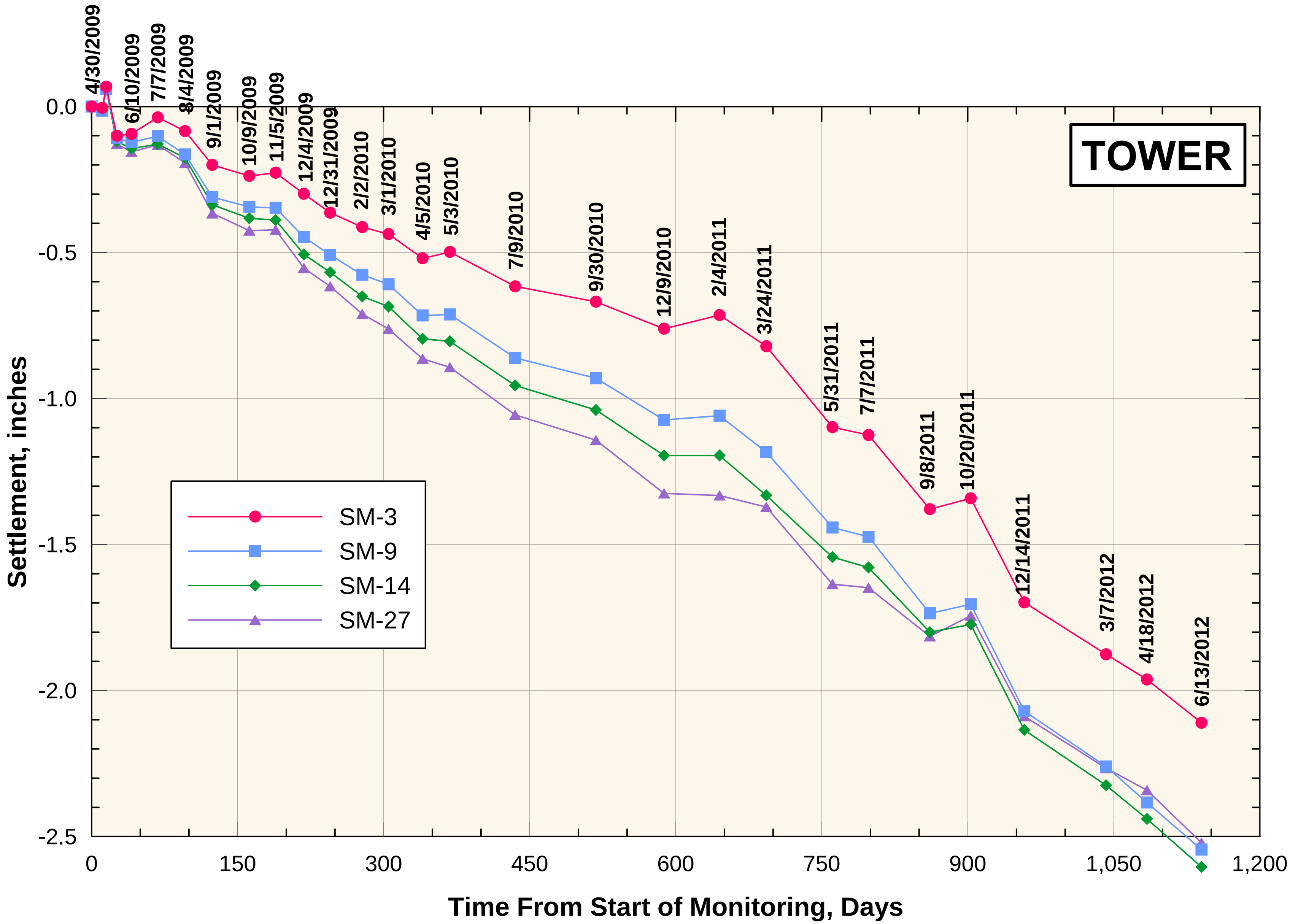
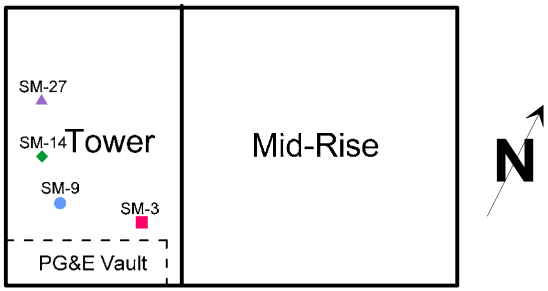
PLATE 3

J:Internal Project DataReports & Narratives301 Mission - Jun 2012 Survey\Elevation changes All (2012.06.13).srf





Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH JUNE 13, 2012

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

July 2012

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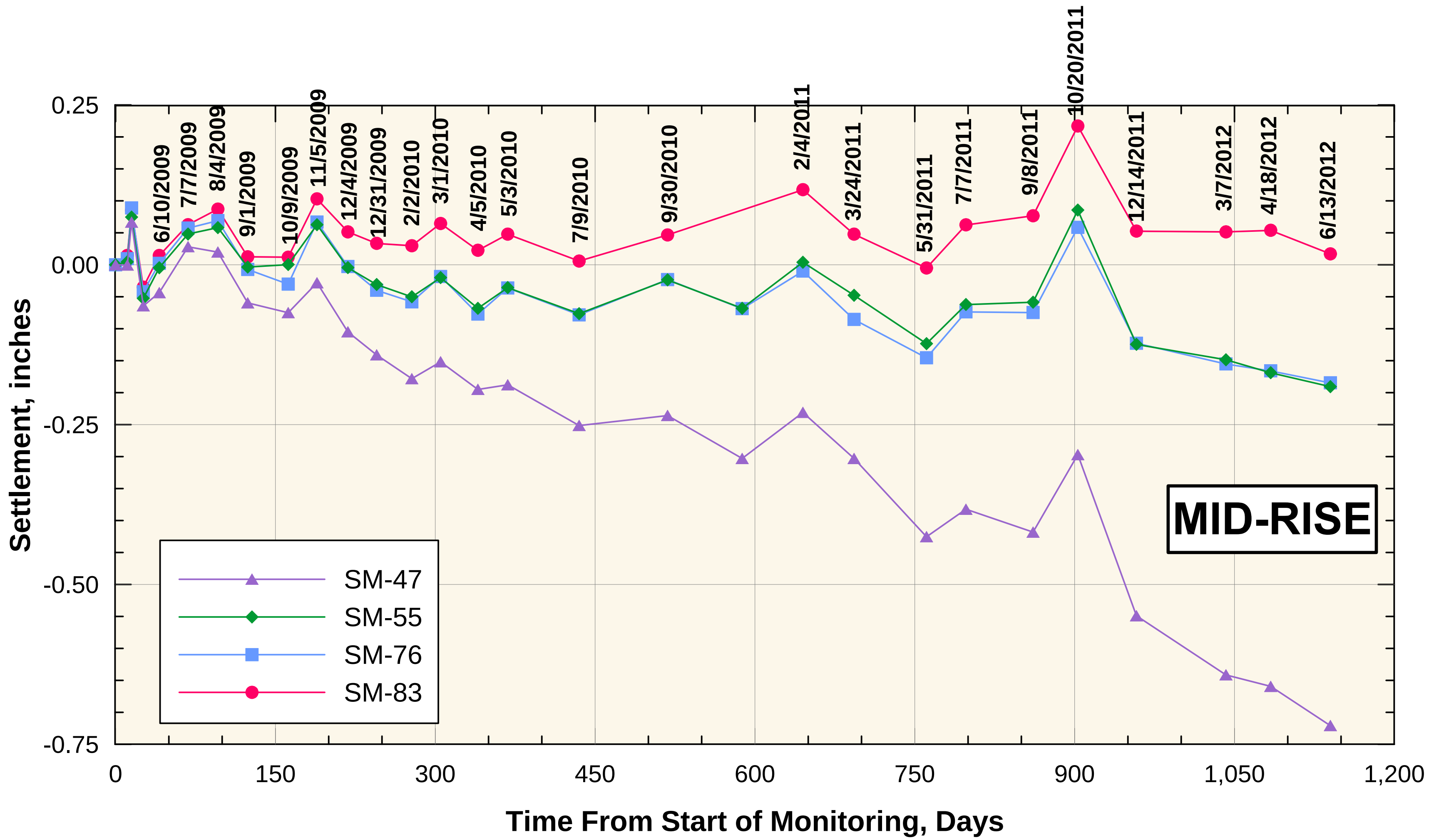
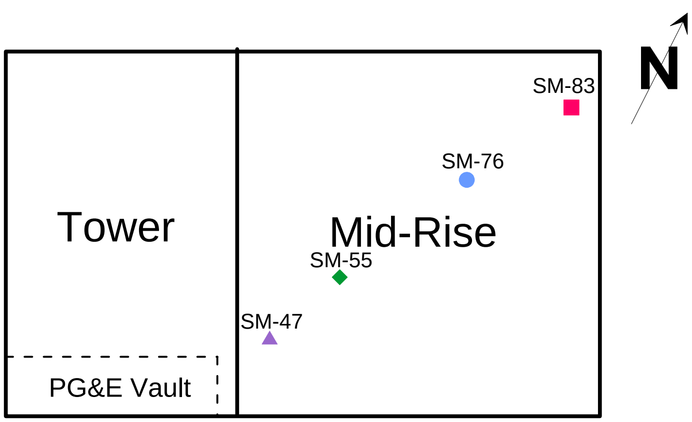
PLATE 4

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\174 301 Mission - Jun 2012 Survey\Plates\Plate 4 Settlement Over Time - Tower.grf





Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\174 301 Mission - Jun 2012 Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH JUNE 13, 2012

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

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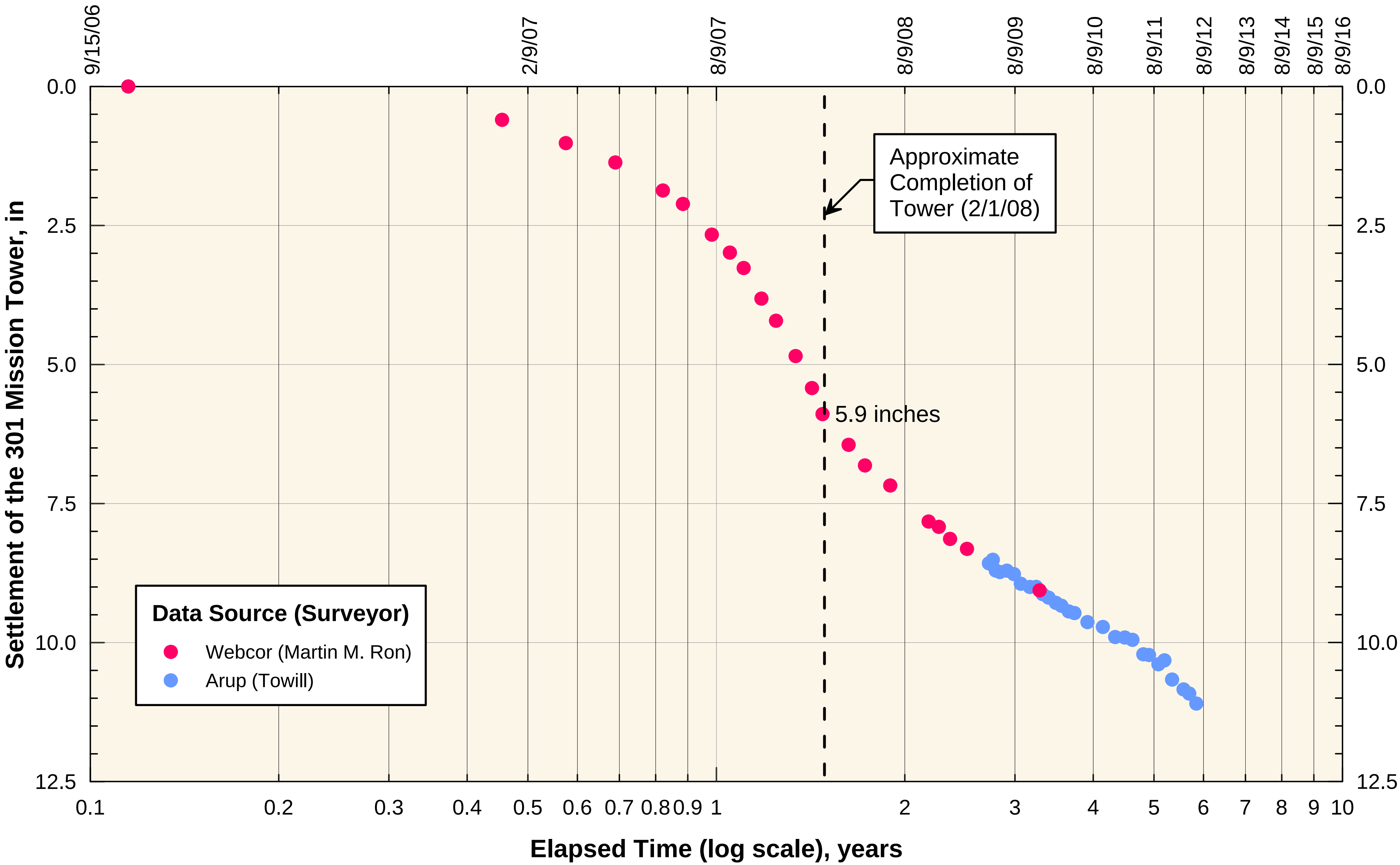
PLATE 5



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

July 2012

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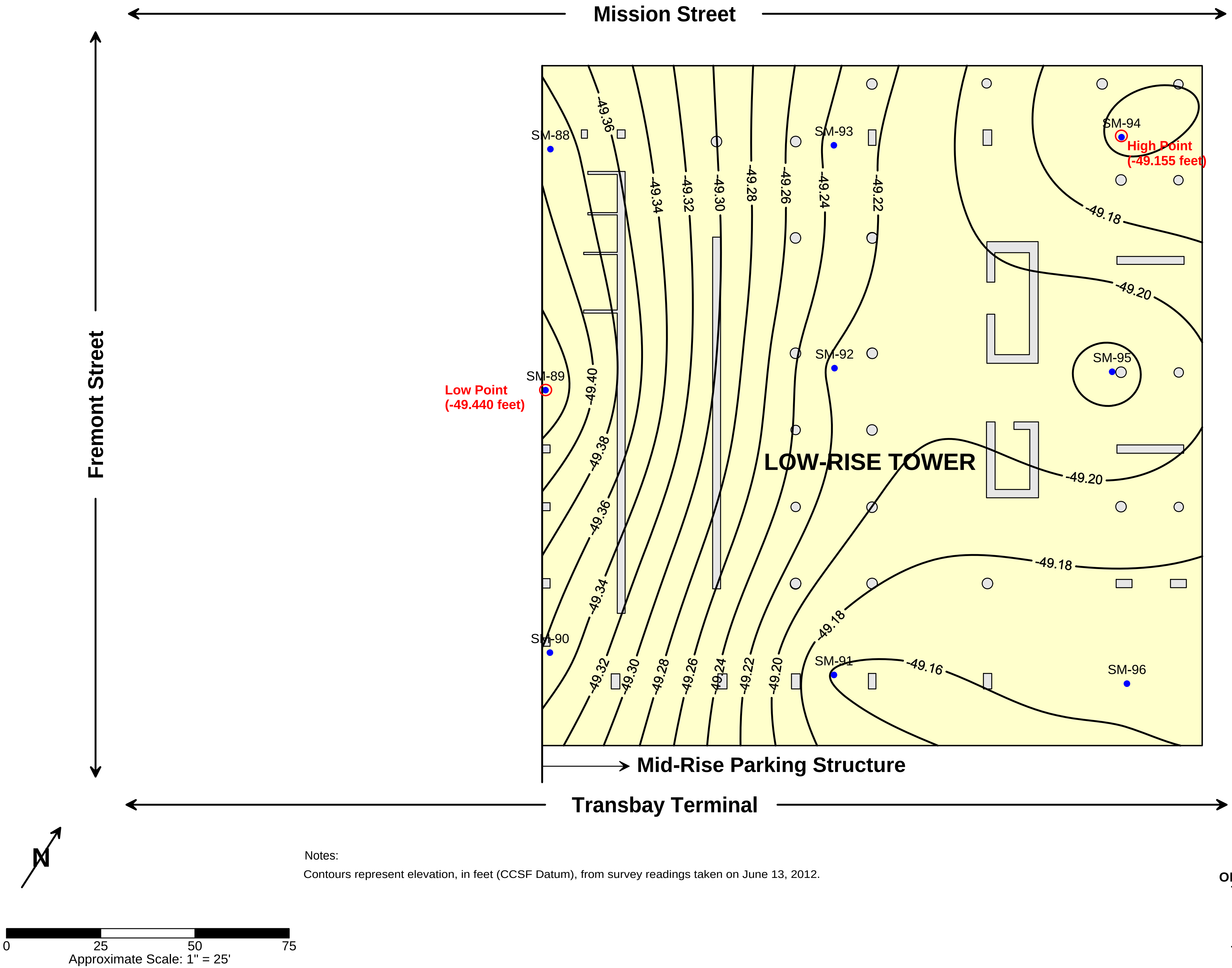
PLATE 6



Date of Survey Reading:
June 13, 2012

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.285 feet (3.421 inches)

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on June 13, 2012.

FLOOR ELEVATION AT BASEMENT LEVEL B-5 OF 301 MISSION PROPERTY: JUNE 13, 2012 SURVE

Transbay Transit Cente
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July 2012

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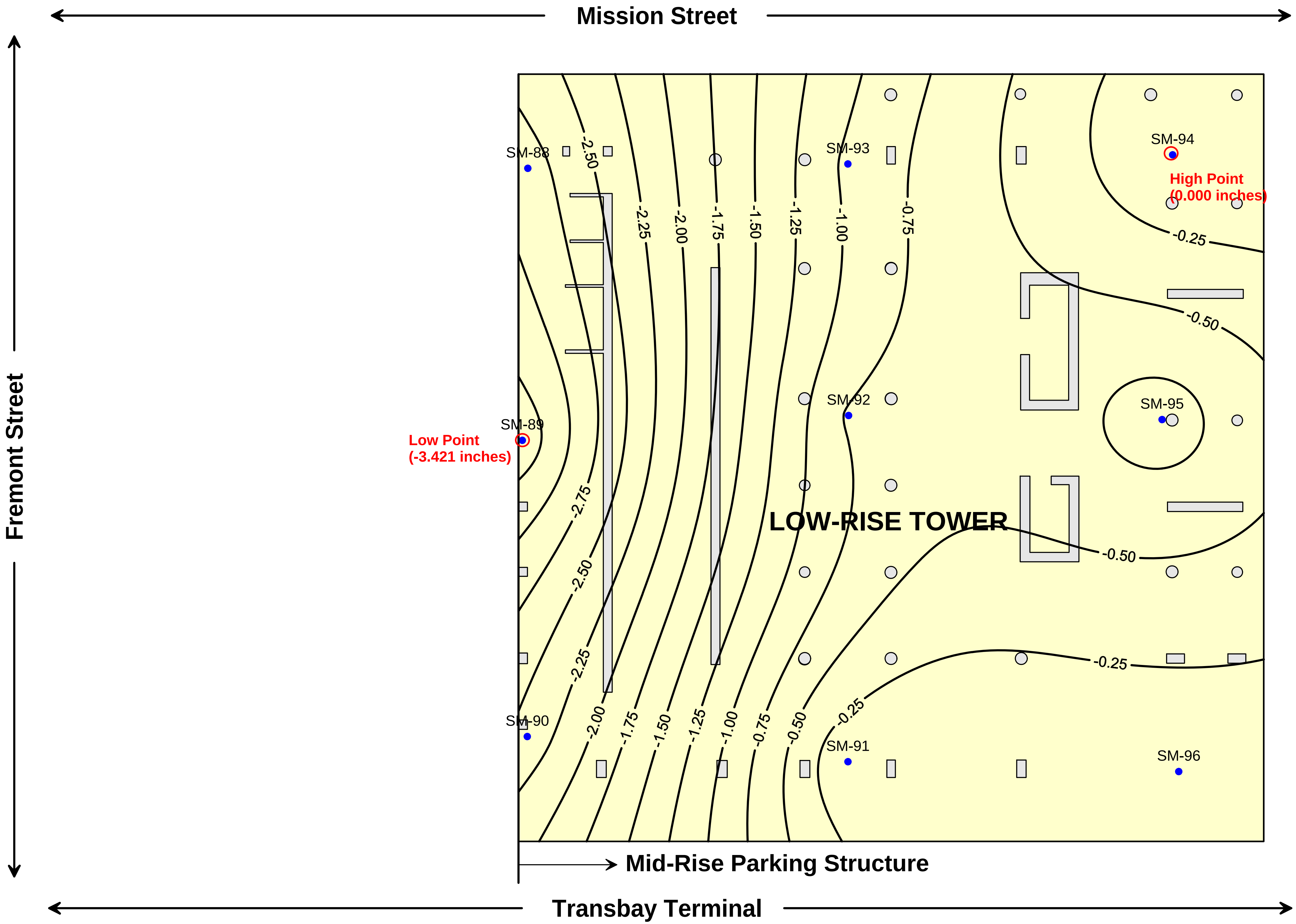
PLATE 7

J:Internal Project DataReports & Narratives301 Mission - Jun 2012 Survey\B-5 Elevations (2012.06.13).srf



Date of Survey Reading:
June 13, 2012

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.285 feet (3.421 inches)

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on June 13, 2012.

0 25 50 75

Approximate Scale: 1" = 25'

J:Internal Project DataReports & Narratives301 Mission - Jun 2012 Survey\B-5 Differential Elevations (2012.06.13).srf

DIFFERENTIAL FLOOR ELEVATIONS (INCHES) AT BASEMENT LEVEL B-5: JUNE 13, 2012 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

July 2012

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PLATE 8

Memorandum

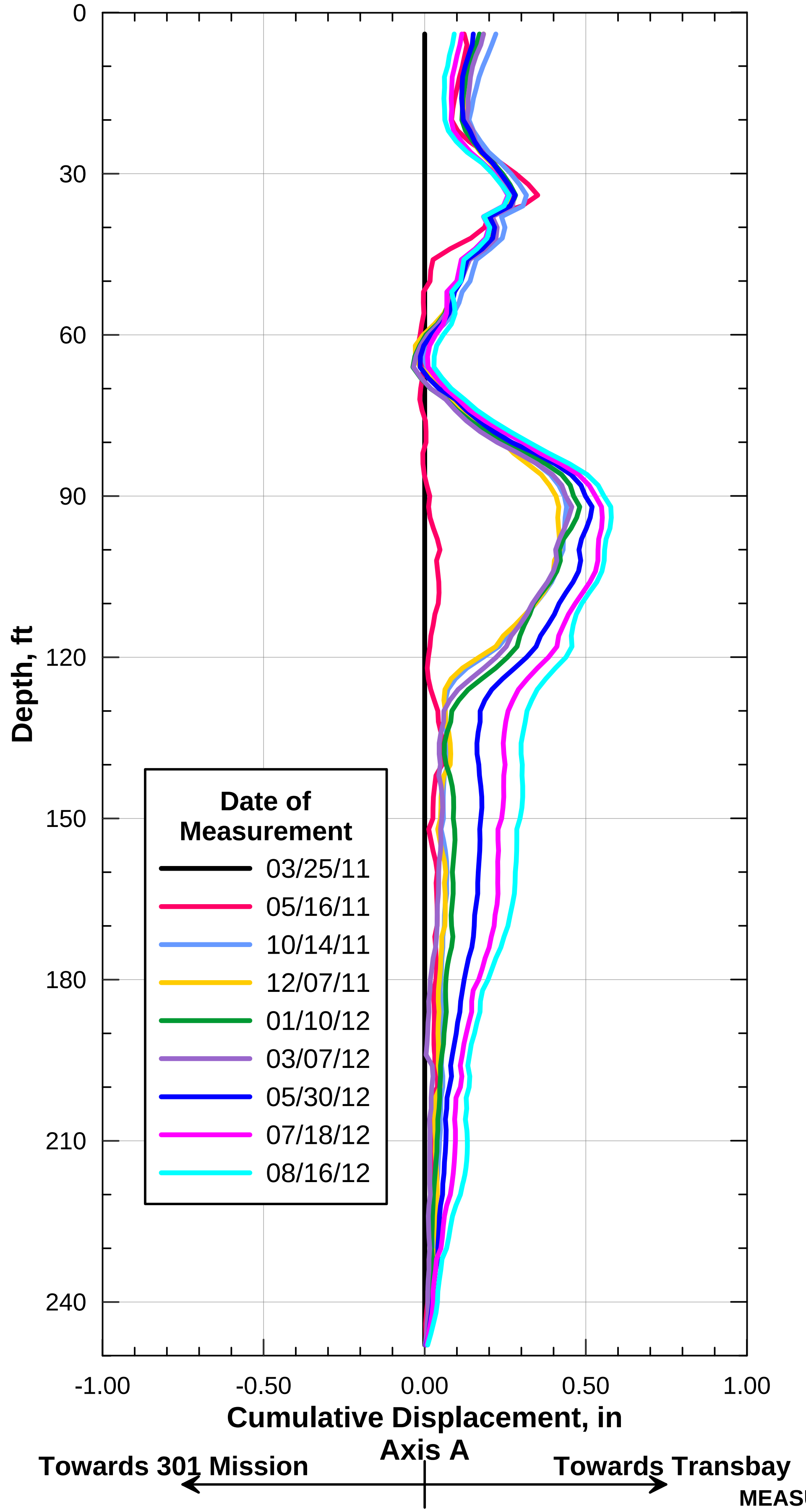
ARUP

To	Brian Dykes (TJPA)	**Date** 22 August 2012
Copies		**Reference number** 132242-60/SMM
From	Stephen McLandrich (Arup)	**File reference** 4-05/182
Subject	Transbay Transit Center Recent Manually Inclinometer Readings	**Page** 1 **of** 1

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the buildings adjacent to the Transbay Transit Center prior to and during construction. This memorandum presents the current readings from the manual inclinometer adjacent to the 301 Mission buildings. Plate 1 shows the recent readings taken at this inclinometer.

<u>List of Plates</u>

Plate 1 Measurements Taken at Inclinometer I-18M



MEASUREMENTS TAKEN AT INCLINOMETER I-18M

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

August 2012

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PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\182 301 Inclinometer Aug 2012\Plates\Plate 1 Inclinometer I-18M.grf

Memorandum

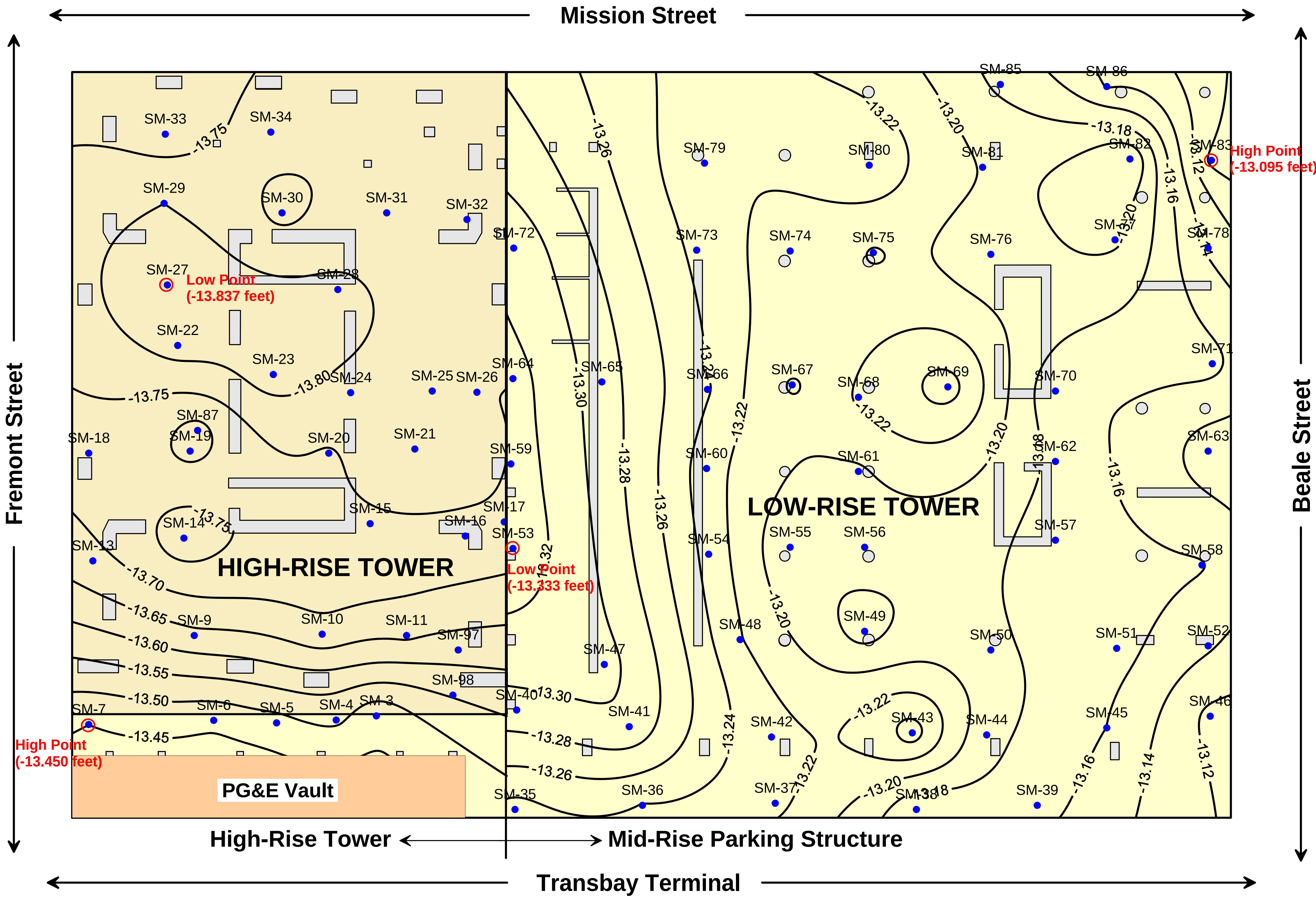
ARUP

To	Brian Dykes (TJPA)	**Date** 22 August 2012
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number** 132242-60/SMM
From	Stephen McLandrich (Arup) Nick O'Riordan (Arup) Kevin Clinch (Arup)	**File reference** 4-05 181
Subject	Transbay Transit Center: Results of August 2012 Settlement Survey at 301 Mission Property	**Page** 1 **of** 1

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated July 6, 2012 with measurements made through August 2012.

List of Plates

Plate 1 Floor Elevations at Level B-1 of 301 Mission Property: Periodic Survey – August 13, 2012
Plate 2 Differential Floor Elevation (Inches) – August 13, 2012 Survey
Plate 3 Contours of Settlements Measured at the First Level Basement of the 301 Mission Street Structure Between April 30, 2009 and August 13, 2012
Plate 4 Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Tower: April 30, 2009 through August 13, 2012.
Plate 5 Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Mid-Rise: April 30, 2009 through August 13, 2012
Plate 6 Settlements of the 301 Mission Tower Including Monitoring During Construction
Plate 7 Floor Elevation at Basement Level B-5 of 301 Mission Property: August 13, 2012 Survey
Plate 8 Differential Floor Elevations (Inches) at Basement Level B-5: August 13, 2012 Survey



Date of Survey Reading:
August 13, 2012

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	Low-Rise Tower
0.387 feet (4.640 inches)	0.238 feet (2.852 inches)

N

0 25 50 75

Approximate Scale: 1" = 25'

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on August 13, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY PERIODIC SURVEY - AUGUST 13, 2012

Transbay Transit Cente
301 Mission Monitoring
Transbay Joint Powers Authorit
San Francisco, California

August 2012

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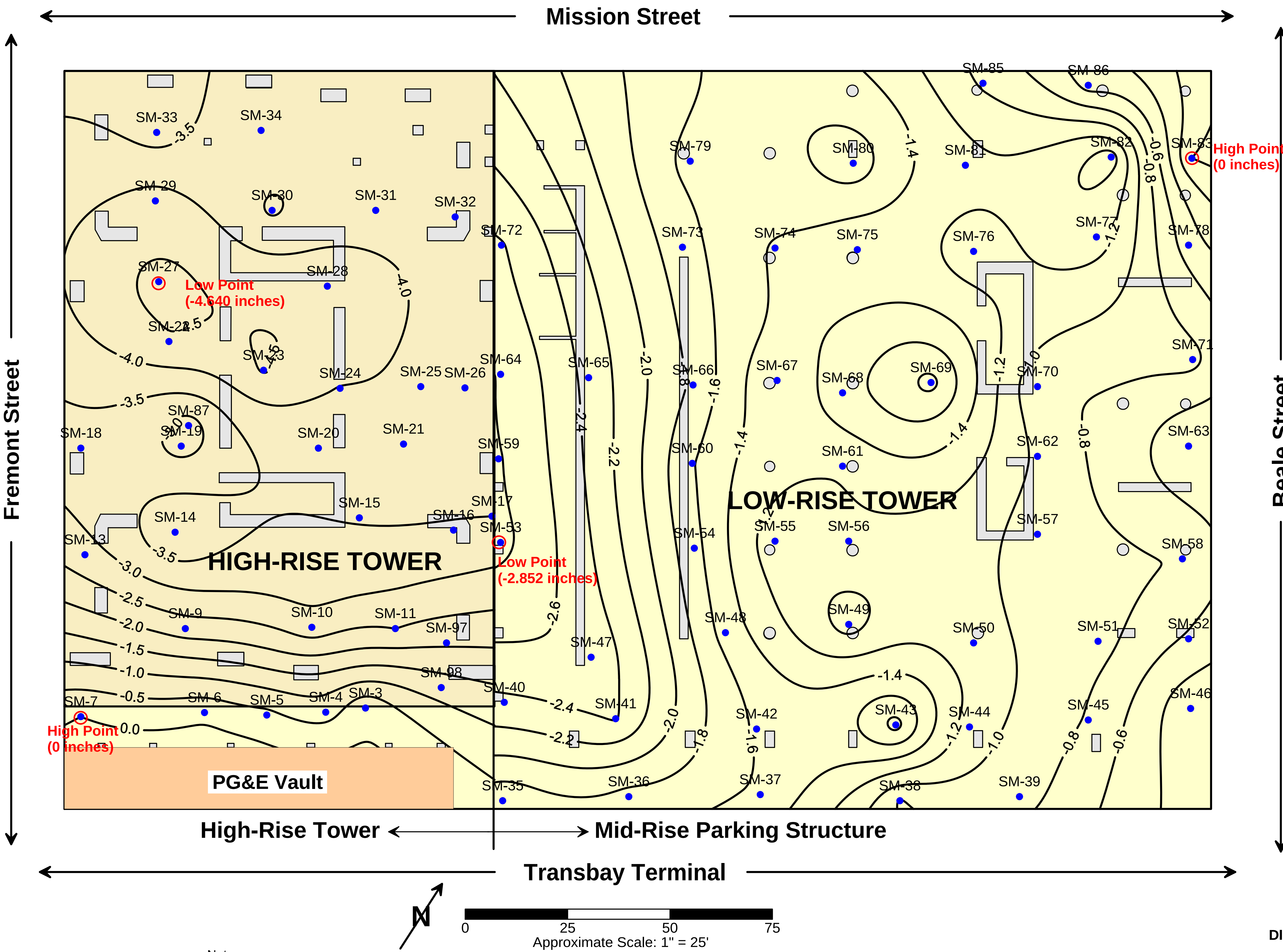
PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\181 301 Mission - Aug 2012 Survey\Plates\Elevations All (2012.08.13).srf



Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on August 13, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
AUGUST 13, 2012 SURVEY

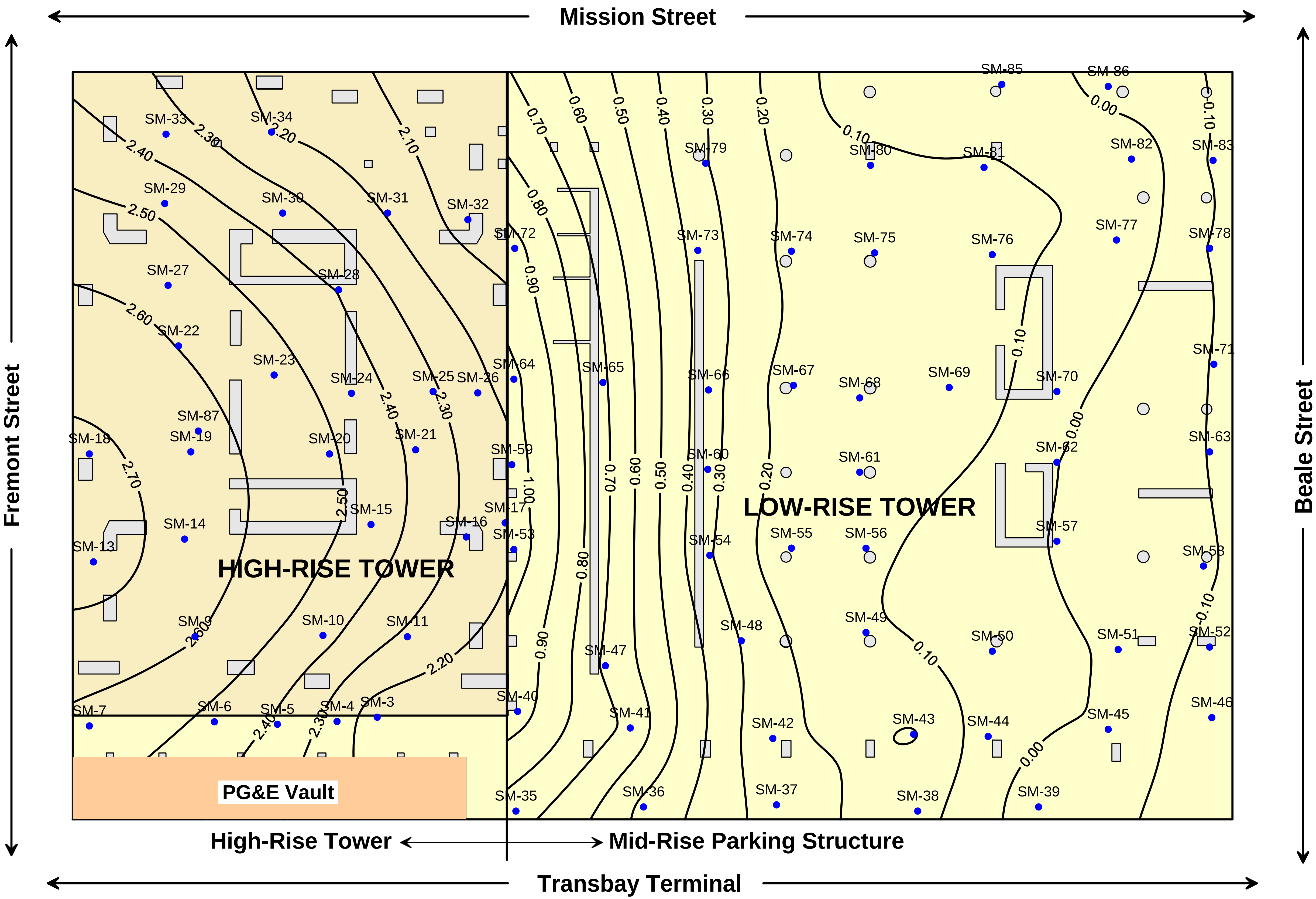
Transbay Transit Cente
301 Mission Monitoring
Transbay Joint Powers Authorit
San Francisco, California

August 2012

ARUP

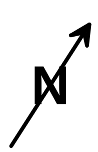
PLATE 2

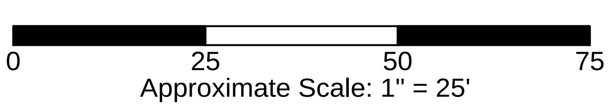
J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\181 301 Mission - Aug 2012 Survey\Plates\Differential Elevation All (2012.08.13).srf



Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)





Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on August 13, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE FIRST LEVEL BASEMENT OF THE 301 MISSION STREE STRUCTURE BETWEEN APRIL 30, 2009 AND AUG

Transbay Transit Cente
301 Mission Monitorin
Transbay Joint Powers Authorit
San Francisco, Californi

August 2012

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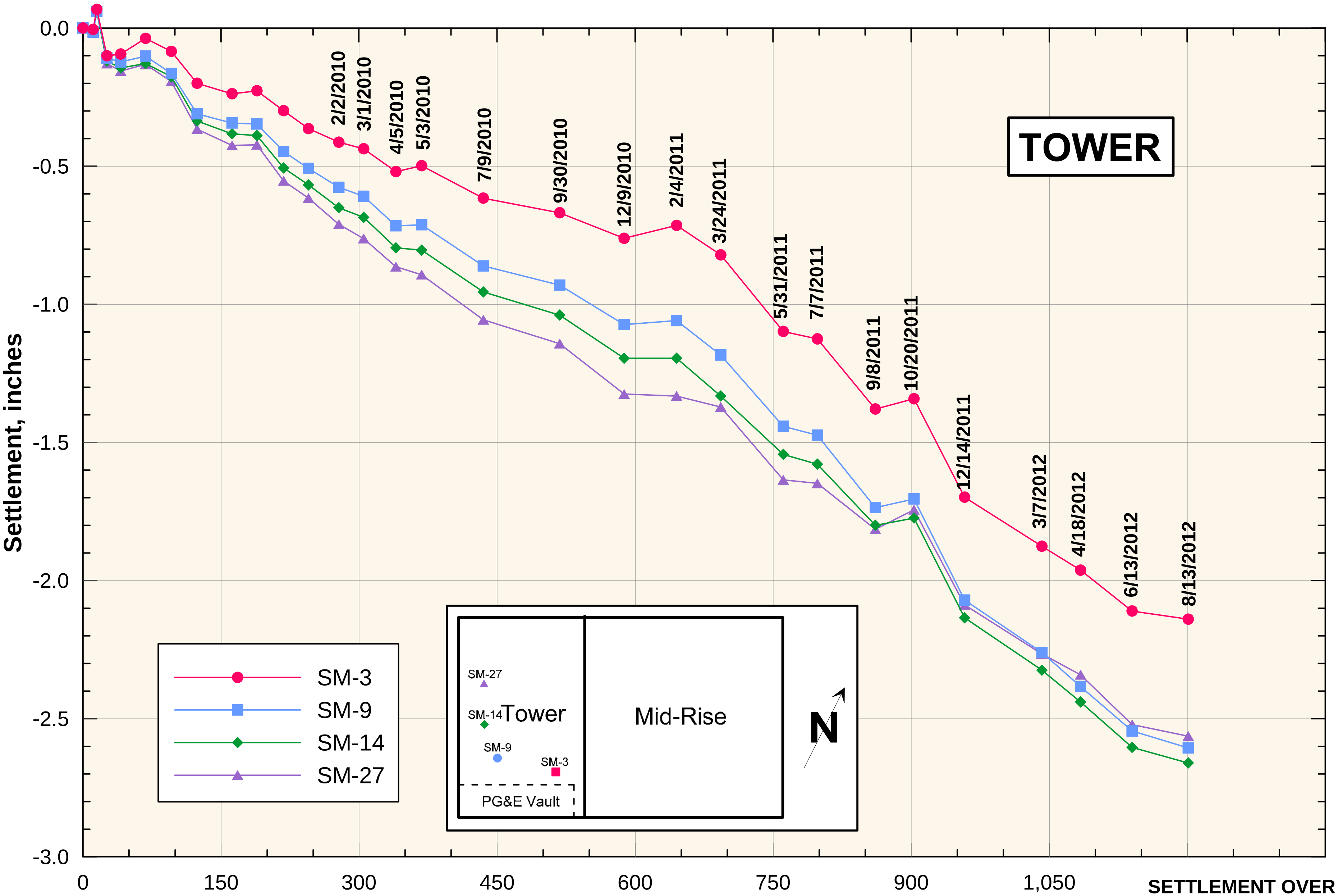
PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\181 301 Mission - Aug 2012 Survey\Plates\Elevation changes All (2012.08.13).srf



SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH AUGUST 13, 2012

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

August 2012

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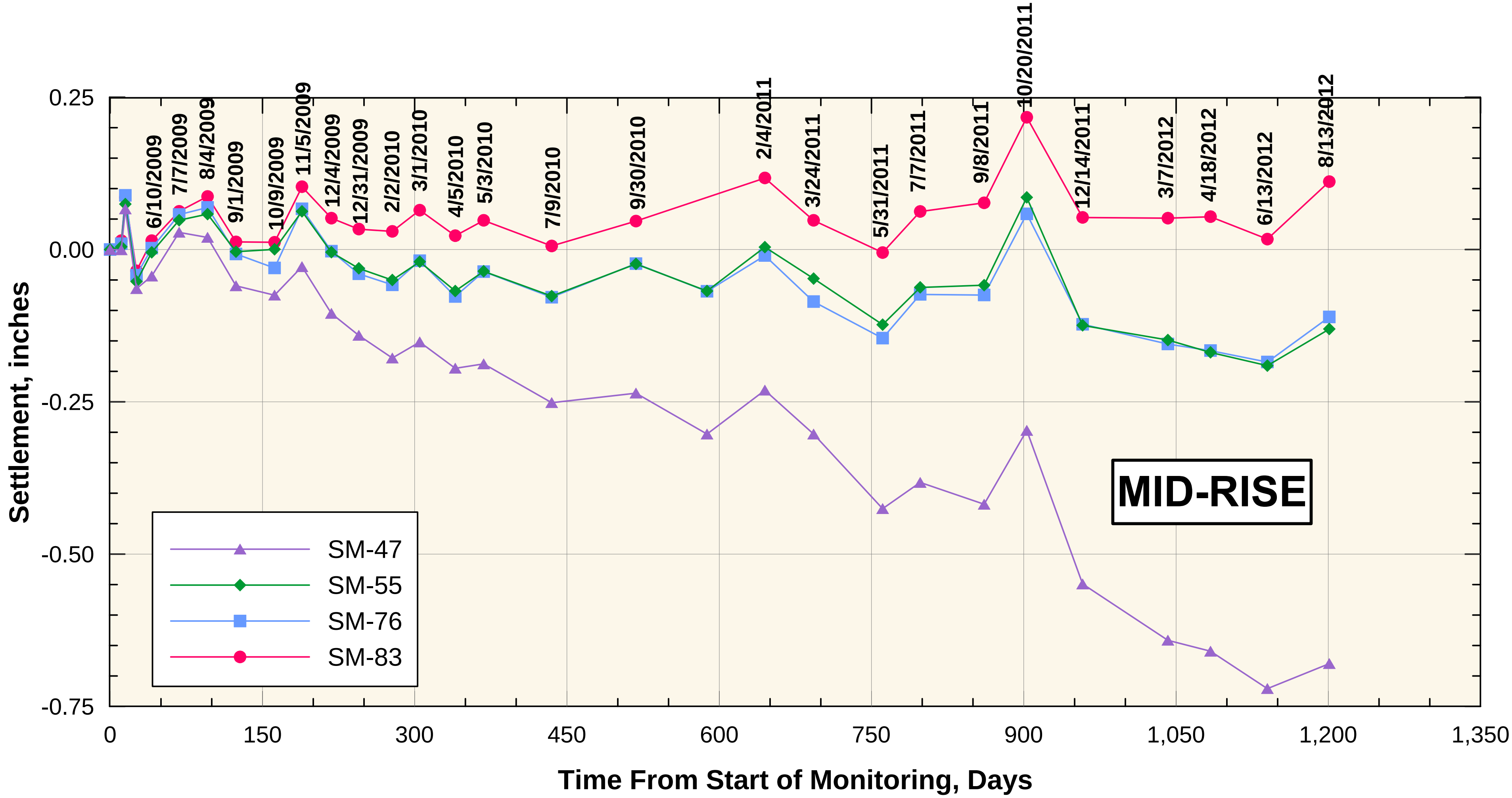
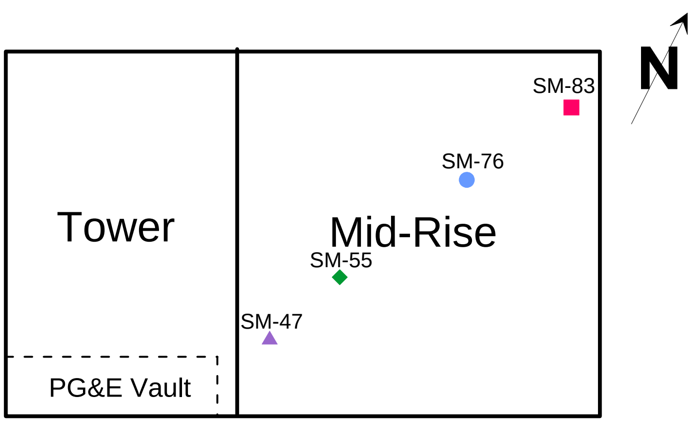
PLATE 4

Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\181 301 Mission - Aug 2012 Survey\Plates\Plate 4 Settlement Over Time - Tower.grf





Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH AUGUST 13, 2012

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

August 2012

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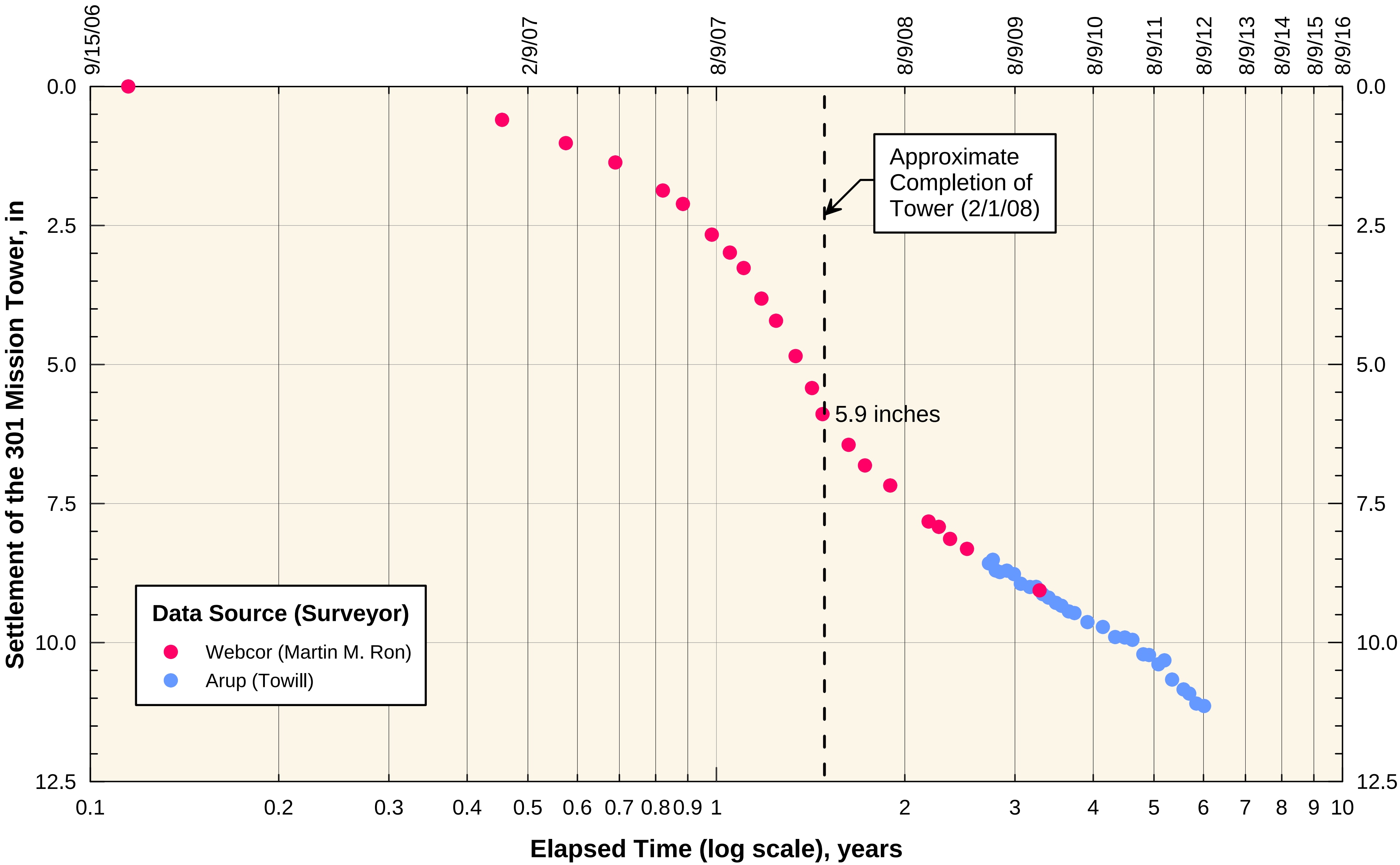
PLATE 5

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\181 301 Mission - Aug 2012 Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER
INCLUDING MONITORING DURING CONSTRUCTION

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

August 2012

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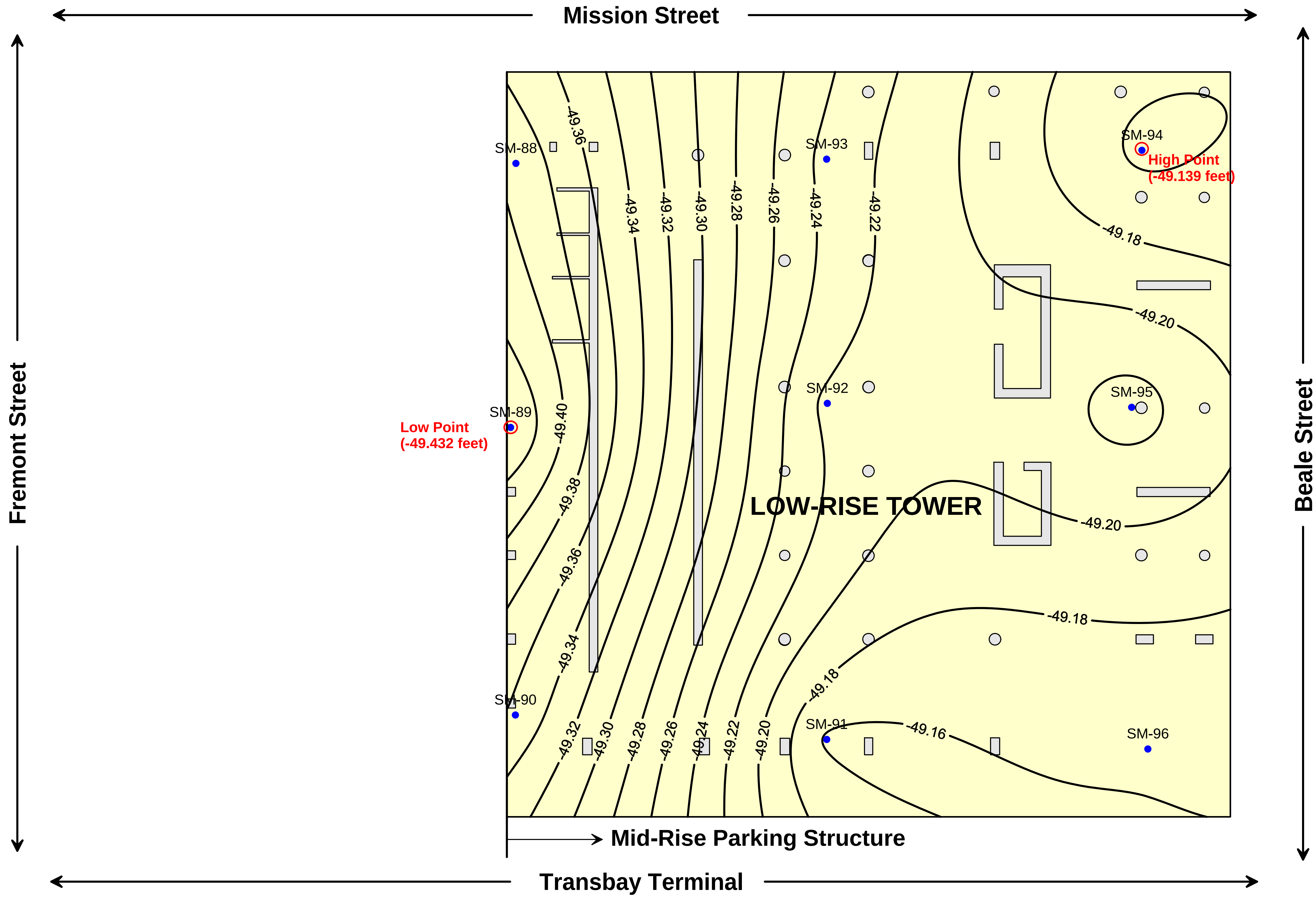
J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\181 301 Mission - Aug 2012 Survey\Plates\Plate 6 Tower Settlements.grf

PLATE 6



Date of Survey Reading:
August 13, 2012

Legend:
SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.293 feet (3.516 inches)

N

Notes:
Contours represent elevation, in feet (CCSF Datum), from survey readings taken on August 13, 2012.

0 25 50 75
Approximate Scale: 1" = 25'

FLOOR ELEVATION AT BASEMENT LEVEL B-5 OF 301 MISSION PROPERTY: AUGUST 13, 2012 SURVE

Transbay Transit Cente
301 Mission Monitorinç
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August 2012

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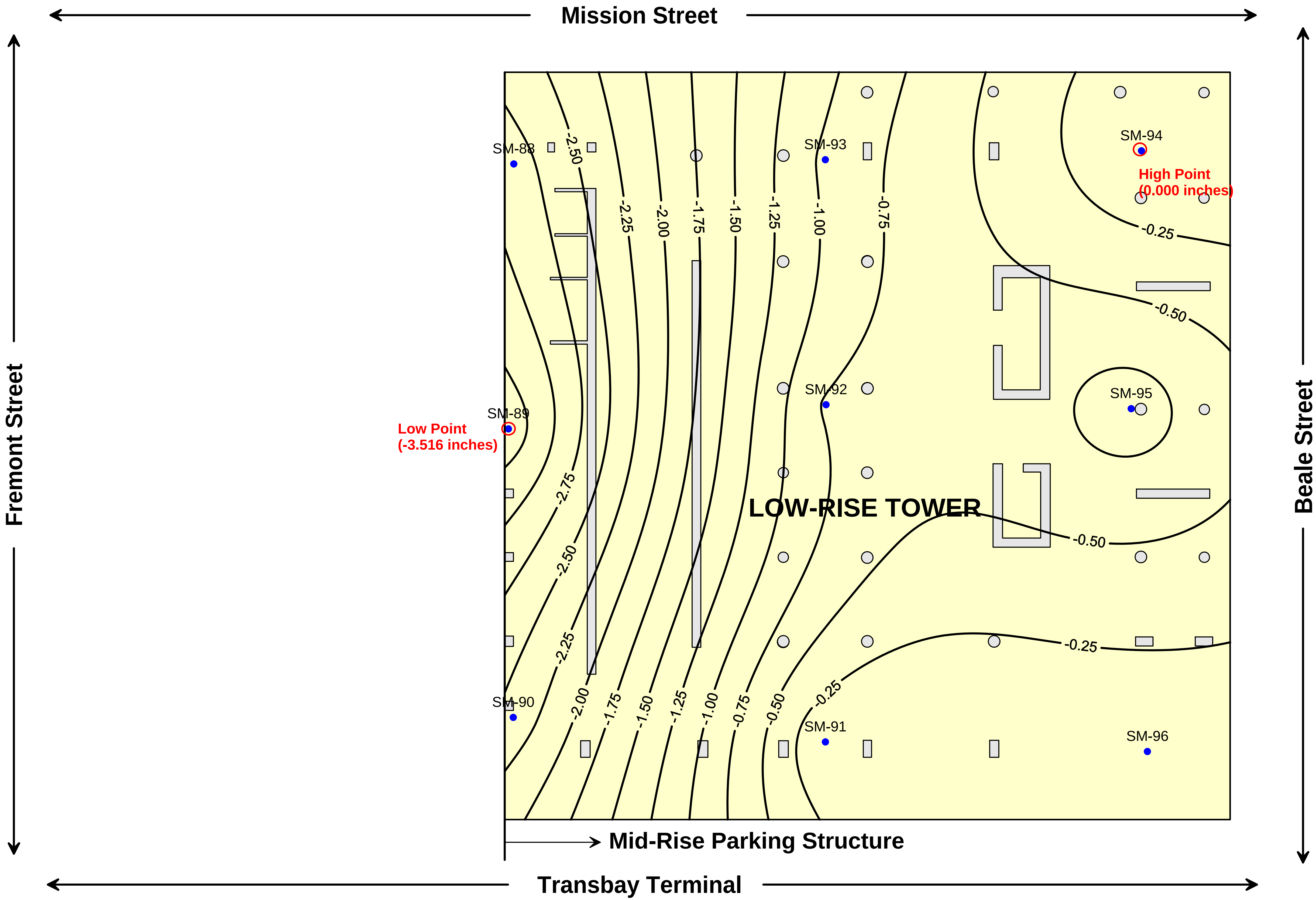
PLATE 7

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\181 301 Mission - Aug 2012 Survey\Plates\B-5 Elevations (2012.08.13).srf



Date of Survey Reading:
August 13, 2012

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.293 feet (3.516 inches)

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on August 13, 2012.

0 25 50 75

Approximate Scale: 1" = 25'

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\181 301 Mission - Aug 2012 Survey\Plates\B-5 Differential Elevations (2012.08.13).srf

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
AT BASEMENT LEVEL B-5: AUGUST 13, 2012 SURVEY

Transbay Transit Cente
301 Mission Monitorin
Transbay Joint Powers Authorit
San Francisco, Californi

August 2012

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PLATE 8

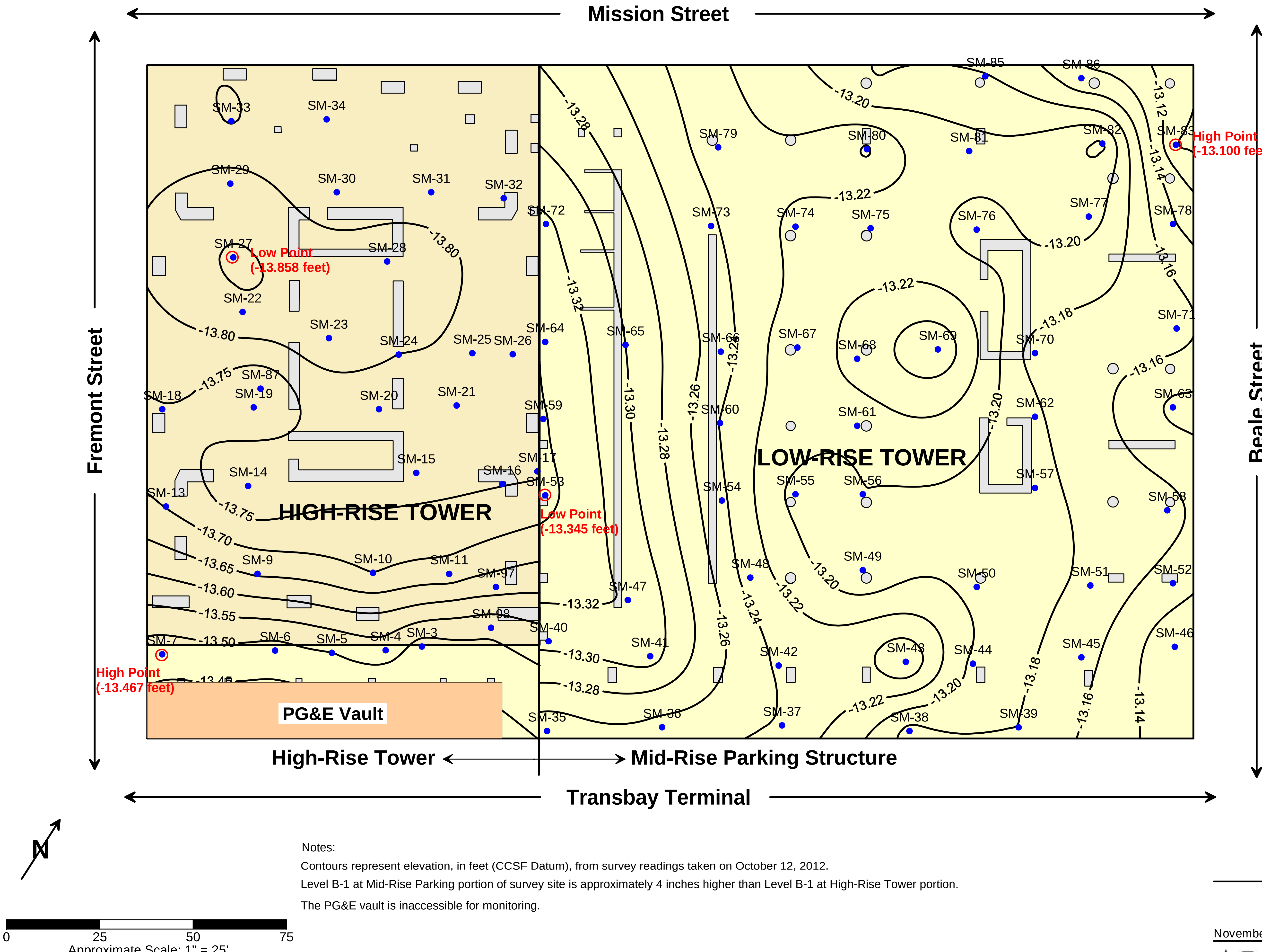
Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date**	06 November 2012
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/SMM
From	Michael Gardner (Arup) Stephen McLandrich (Arup)	**File reference**	4-05 187
Subject	Transbay Transit Center: Results of October 2012 Settlement Survey at 301 Mission Property	**Page** 1 **of** 1	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated August 22, 2012 with measurements made through October 2012.

List of Plates



Date of Survey Reading:
October 12, 2012

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	**Low-Rise Tower**
0.390 feet (4.685 inches)	**0.246 feet (2.946 inches)**

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on October 12, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY: PERIODIC SURVEY - OCTOBER 12, 2012

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

November 2012

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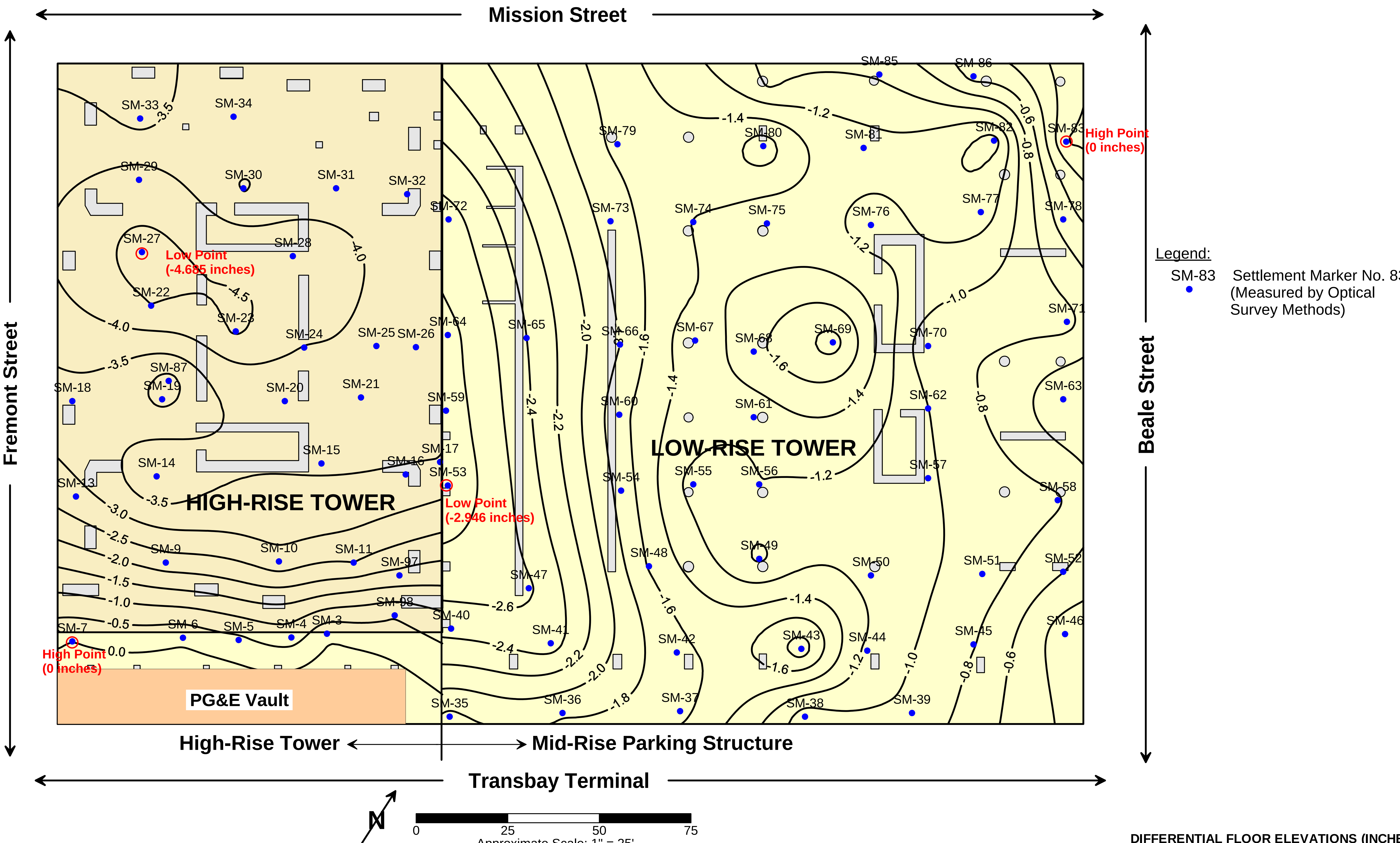
PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\181 301 Mission - Aug 2012 Survey\Plates\Elevations All (2012.08.13).srf



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on October 12, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour inervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
OCTOBER 12, 2012 SURVEY

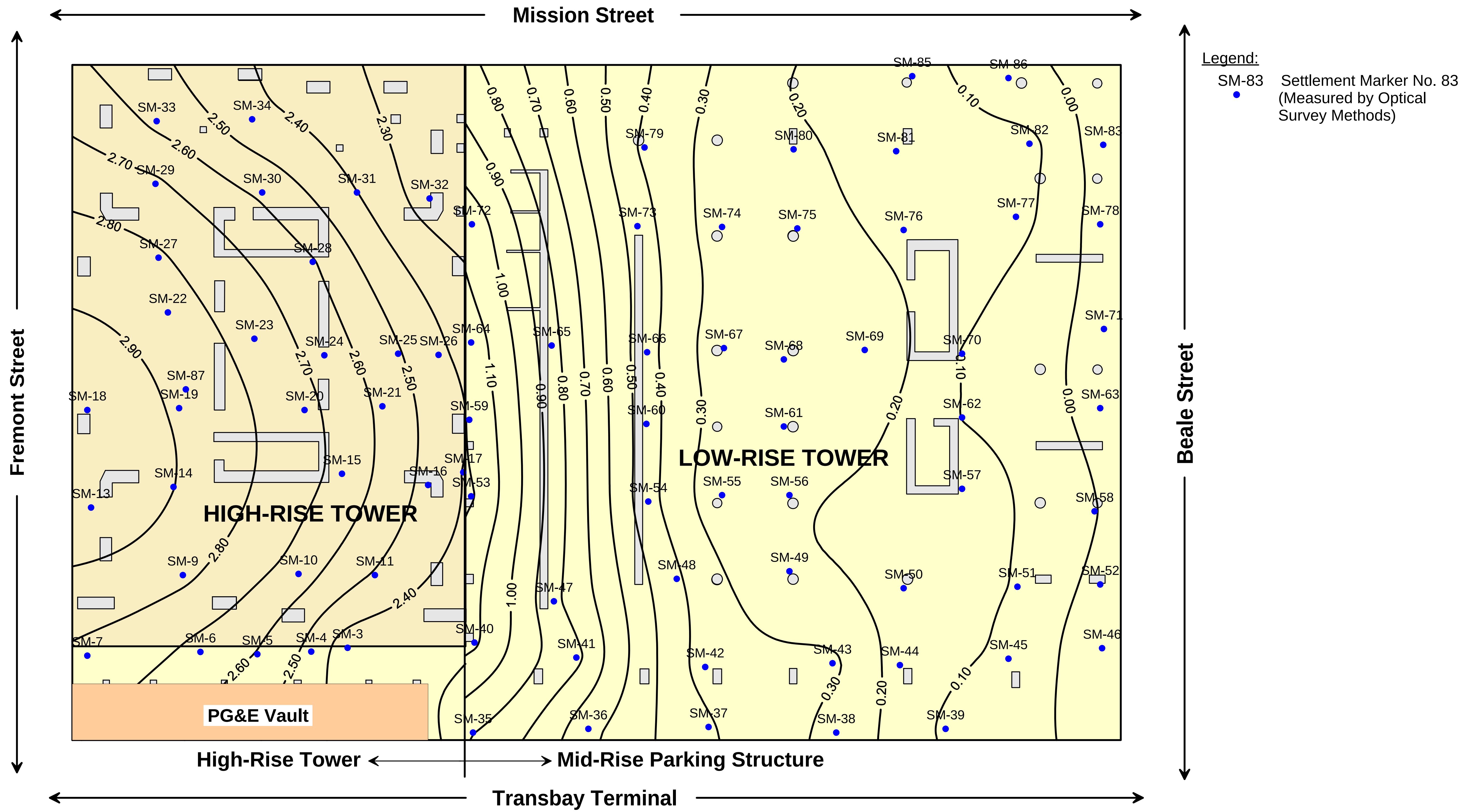
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

November 2012

ARUP

PLATE 2

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\181 301 Mission - Aug 2012 Survey\Plates\Differential Elevation All (2012.08.13).srf



Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on October 12, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

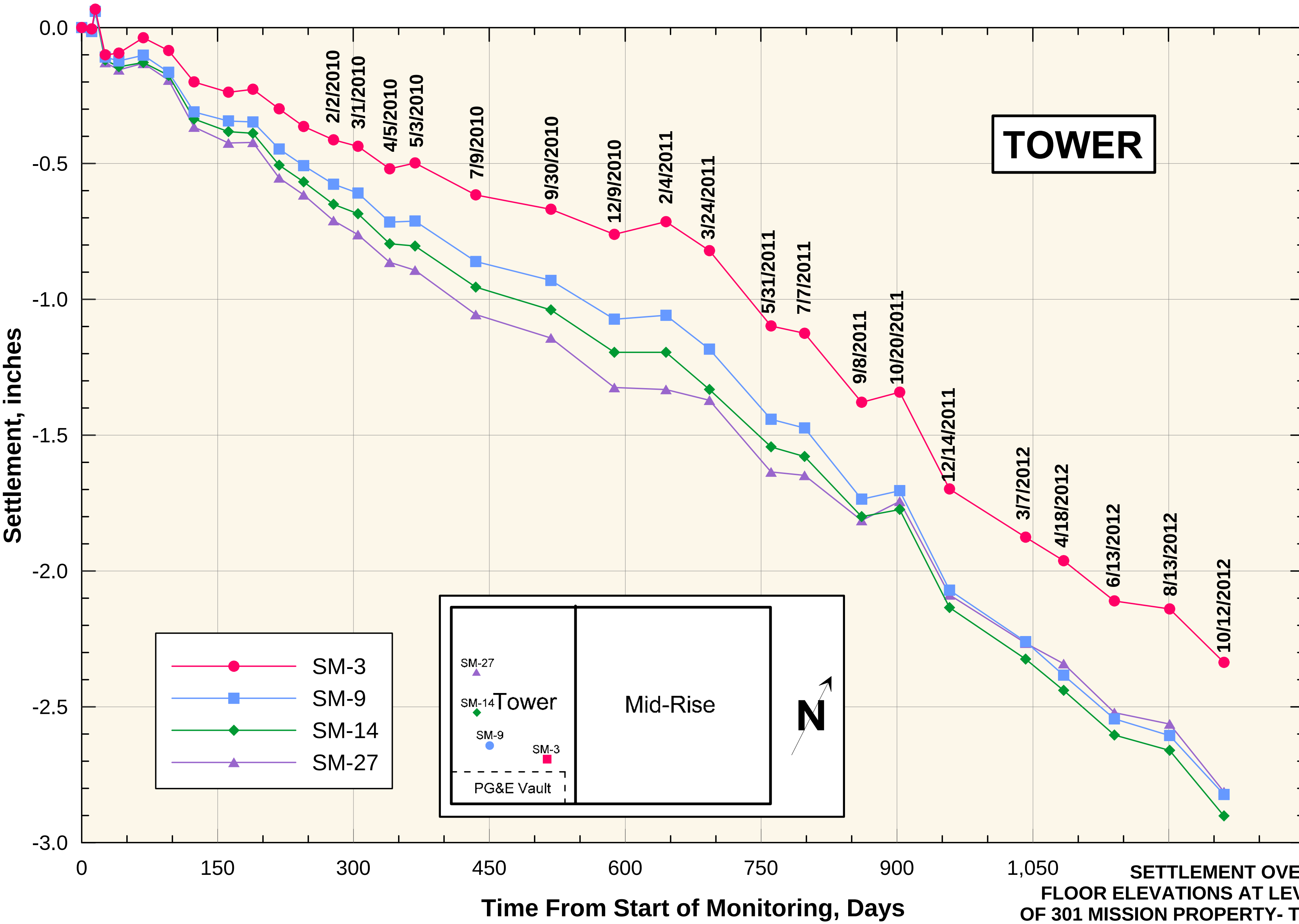
CONTOURS OF SETTLEMENTS MEASURED AT THE FIRST LEVEL BASEMENT OF THE 301 MISSION STREET STRUCTURE BETWEEN APRIL 30, 2009 AND OCT

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

November 2012

ARUP

PLATE 3



SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH OCTOBER 12, 2012

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

November 2012

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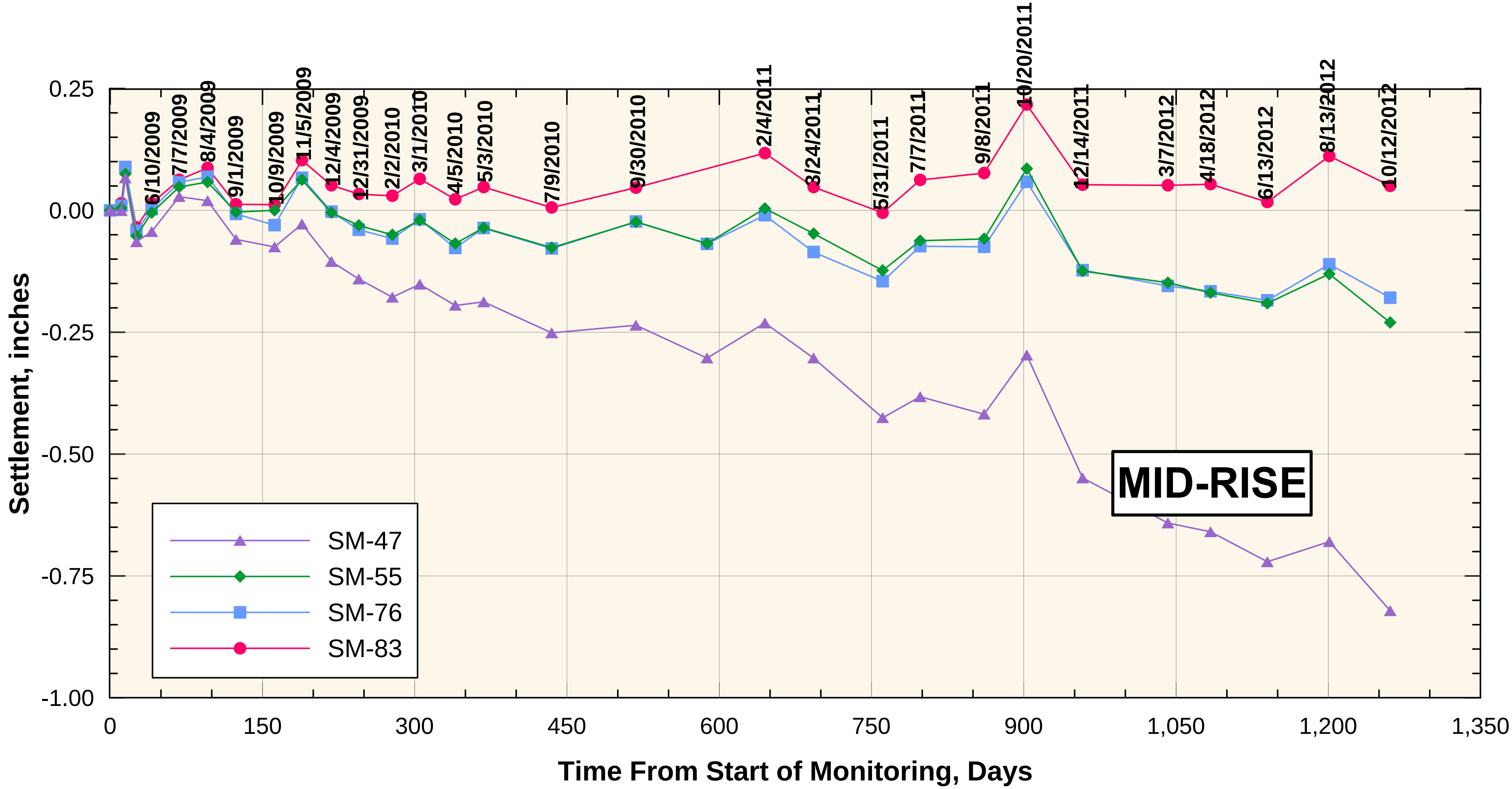
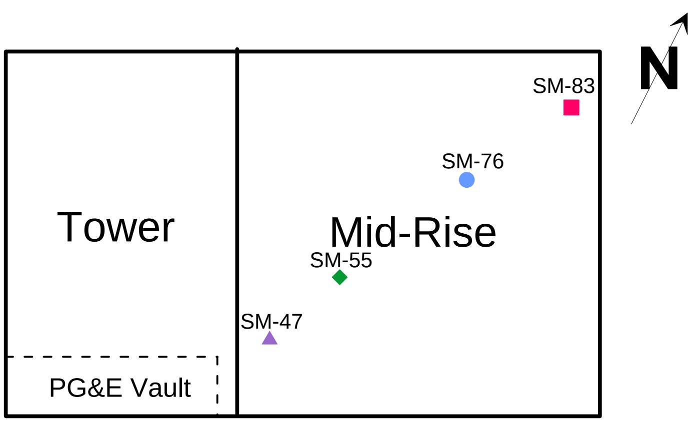
PLATE 4

Note:
Initial (Baseline) reading taken on 04/30/09

\\global.arup.com\americas\Jobs\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\187 301 Mission - Oct 2012 Survey\Plates\Plate 4 Settlement Over Time - Tower.grf





Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH OCTOBER 12, 2012

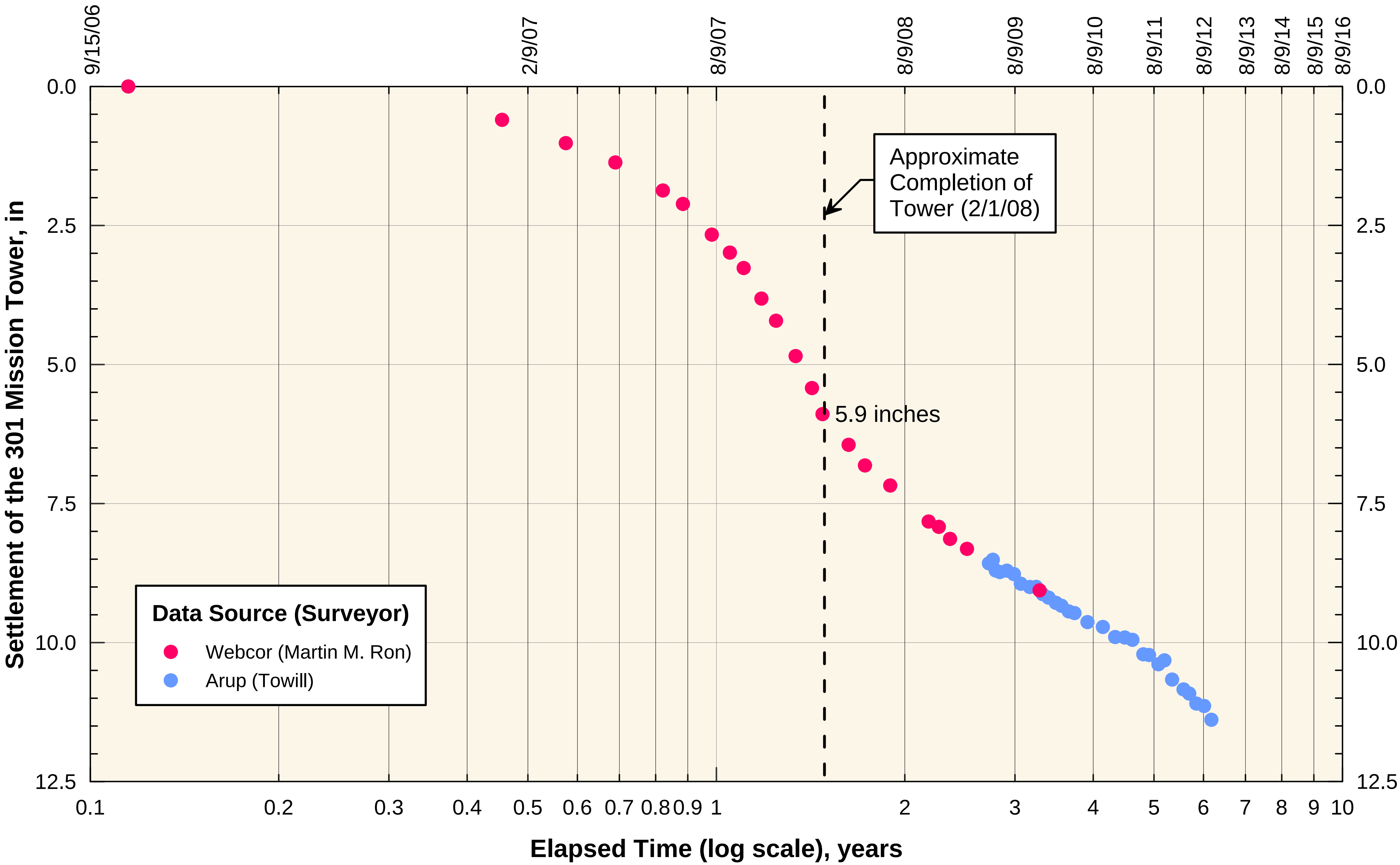
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

November 2012

ARUP

PLATE 5

\\global.arup.com\americas\Jobs\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\187 301 Mission - Oct 2012 Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

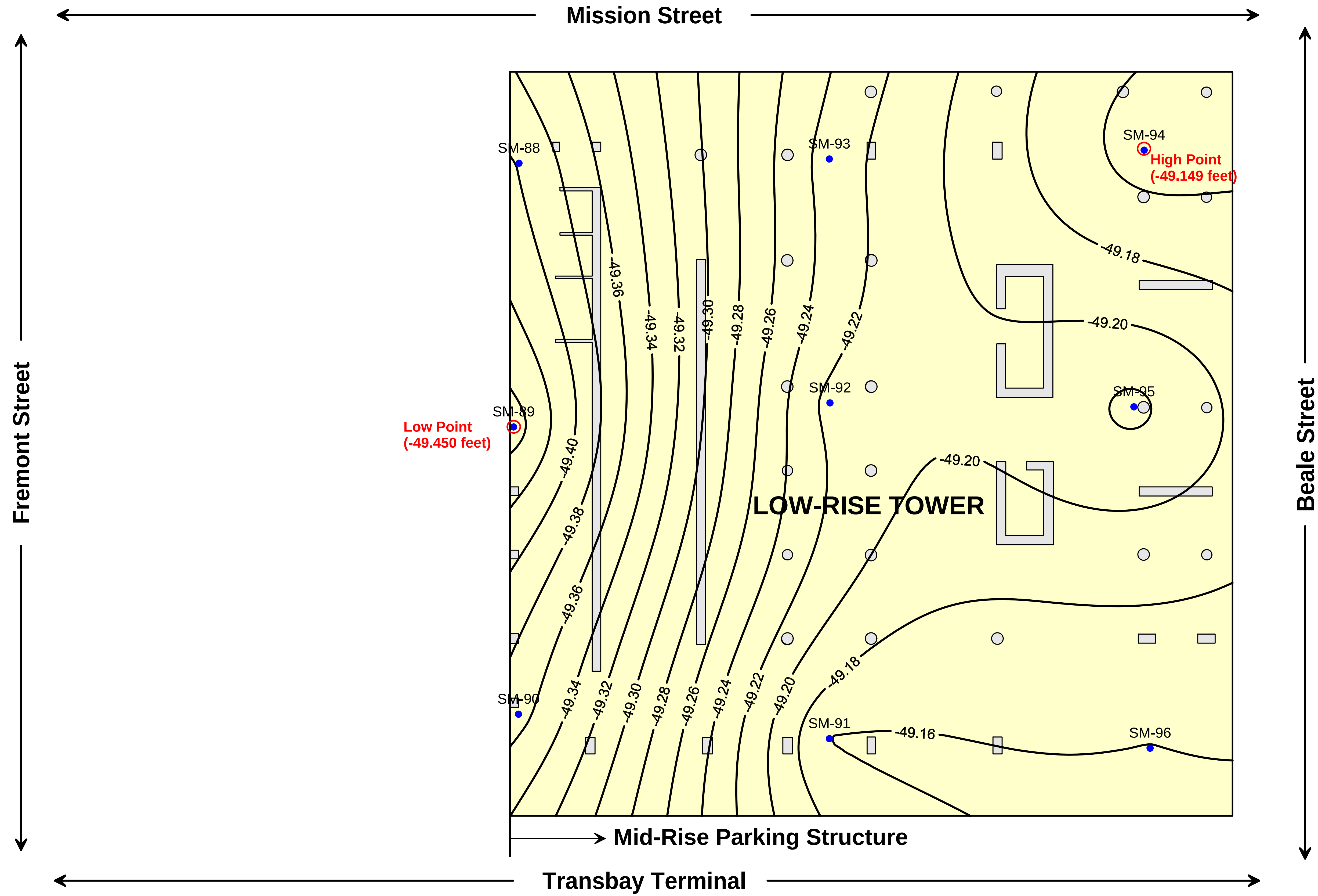
SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

August 2012

ARUP

PLATE 6



Date of Survey Reading:
October 12, 2012

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.301 feet (3.611 inches)

N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on October 12, 2012.

FLOOR ELEVATION AT BASEMENT LEVEL B-5
OF 301 MISSION PROPERTY: OCTOBER 12, 2012 SURVEY

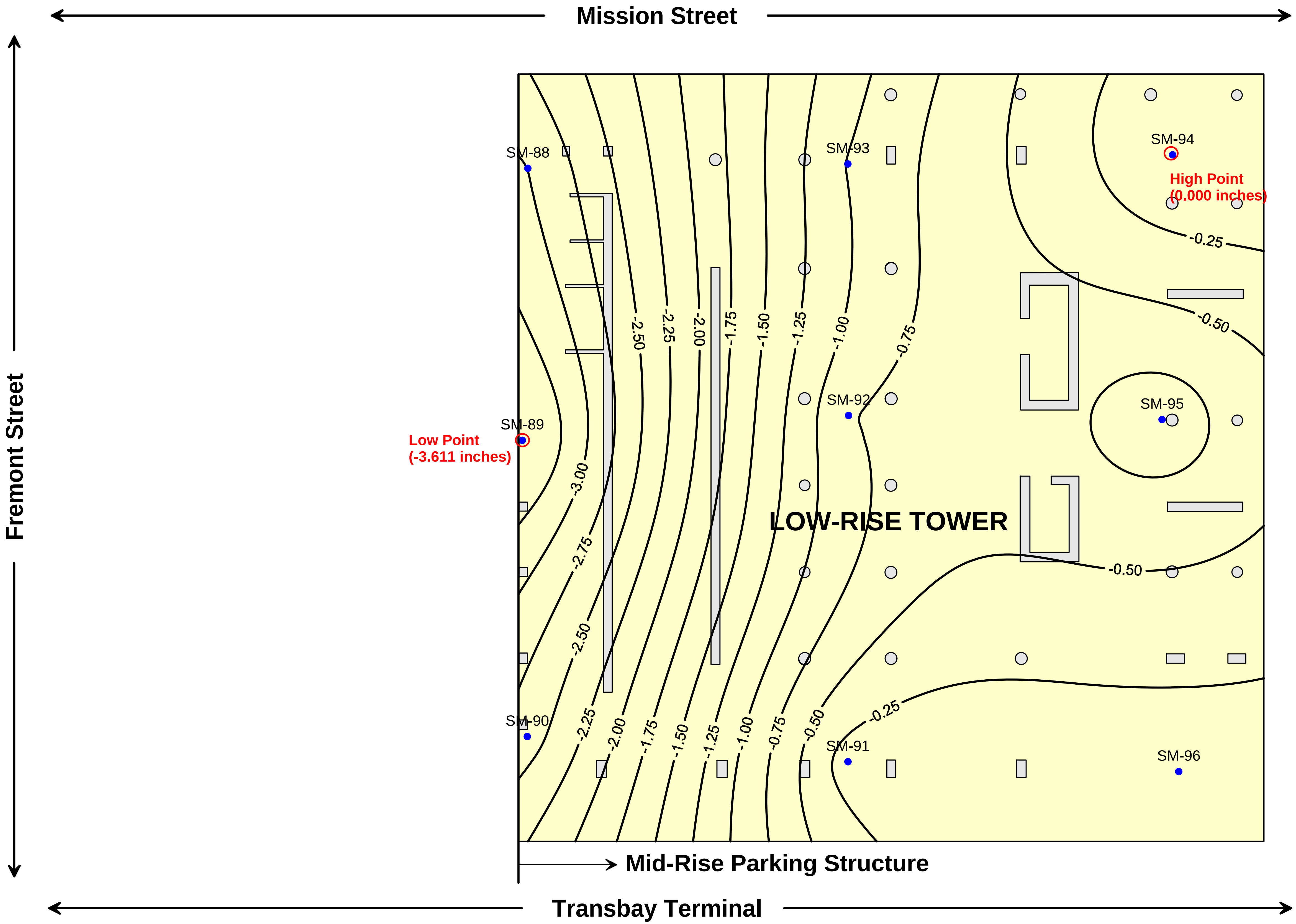
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

November 2012

ARUP

PLATE 7

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\181 301 Mission - Aug 2012 Survey\Plates\B-5 Elevations (2012.08.13).srf



Date of Survey Reading:
October 12, 2012

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.301 feet (3.611 inches)

N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on October 12, 2012.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
AT BASEMENT LEVEL B-5: OCTOBER 12, 2012 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

November 2012

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PLATE 8

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\181 301 Mission - Aug 2012 Survey\Plates\B-5 Differential Elevations (2012.08.13).srf

Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date**	9 November 2012
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/SMM
From	Stephen McLandrich (Arup) Michael Gardner (Arup)	**File reference**	4-05 189
Subject	Transbay Transit Center: Results of September 2012 Tape Extensometer Reading	**Page** 1 **of** 1	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum presents the tape extensometer readings collected from the first readings in May 2009 through readings conducted through September 2012.

List of Plates

List of Plates

TABLE 1

SUMMARY OF TAPE EXTENSOMETER READINGS

Date of Reading	Average Reading, ft				
	TE-1 to TE-2	TE-2 to TE-3	TE-3 to TE-4	TE-5 to TE-6	TE-7 to TE-8
5/21/2009	38.3877	47.4730	41.3607	16.5926	24.2707
7/29/2009	38.3879	47.4718	41.3594	16.5916	24.2691
8/28/2009	38.3862	47.4712	41.3599	16.5911	24.2682
9/14/2009	38.3870	47.4714	41.3604	16.5909	24.2684
12/10/2010	38.3840	47.4683	41.3570	16.5894	24.2654
5/26/2011	38.3855	47.4681	41.3577	16.5890	24.2615
12/13/2011*	38.3860	47.4679	41.3593	16.5890	24.2614
4/2/2012	38.3846	47.4660	41.3551	16.5890	24.2605
7/30/2012	38.3837	47.4653	41.3568	16.5873	24.2608
9/18/2012	38.3832	47.4659	41.3579	16.5882	24.2609

* The reading for TE-2 to TE-3 was conducted on 1/26/2012

TABLE 2

SUMMARY OF RELATIVE MOVEMENT: TAPE EXTENSOMETER READINGS

Date of Reading	Relative Movement**, in				
	TE-1 to TE-2	TE-2 to TE-3	TE-3 to TE-4	TE-5 to TE-6	TE-7 to TE-8
5/21/2009	0.000	0.000	0.000	0.000	0.000
7/29/2009	0.002	-0.015	-0.015	-0.012	-0.019
8/28/2009	-0.019	-0.021	-0.009	-0.018	-0.030
9/14/2009	-0.008	-0.019	-0.003	-0.021	-0.027
12/10/2010	-0.045	-0.056	-0.045	-0.038	-0.063
5/26/2011	-0.027	-0.059	-0.036	-0.044	-0.110
12/13/2011*	-0.021	-0.061	-0.017	-0.044	-0.111
4/2/2012	-0.037	-0.084	-0.067	-0.044	-0.122
7/30/2012	-0.049	-0.093	-0.047	-0.063	-0.118
9/18/2012	-0.054	-0.085	-0.033	-0.053	-0.117

* The reading for TE-2 to TE-3 was conducted on 1/26/2012

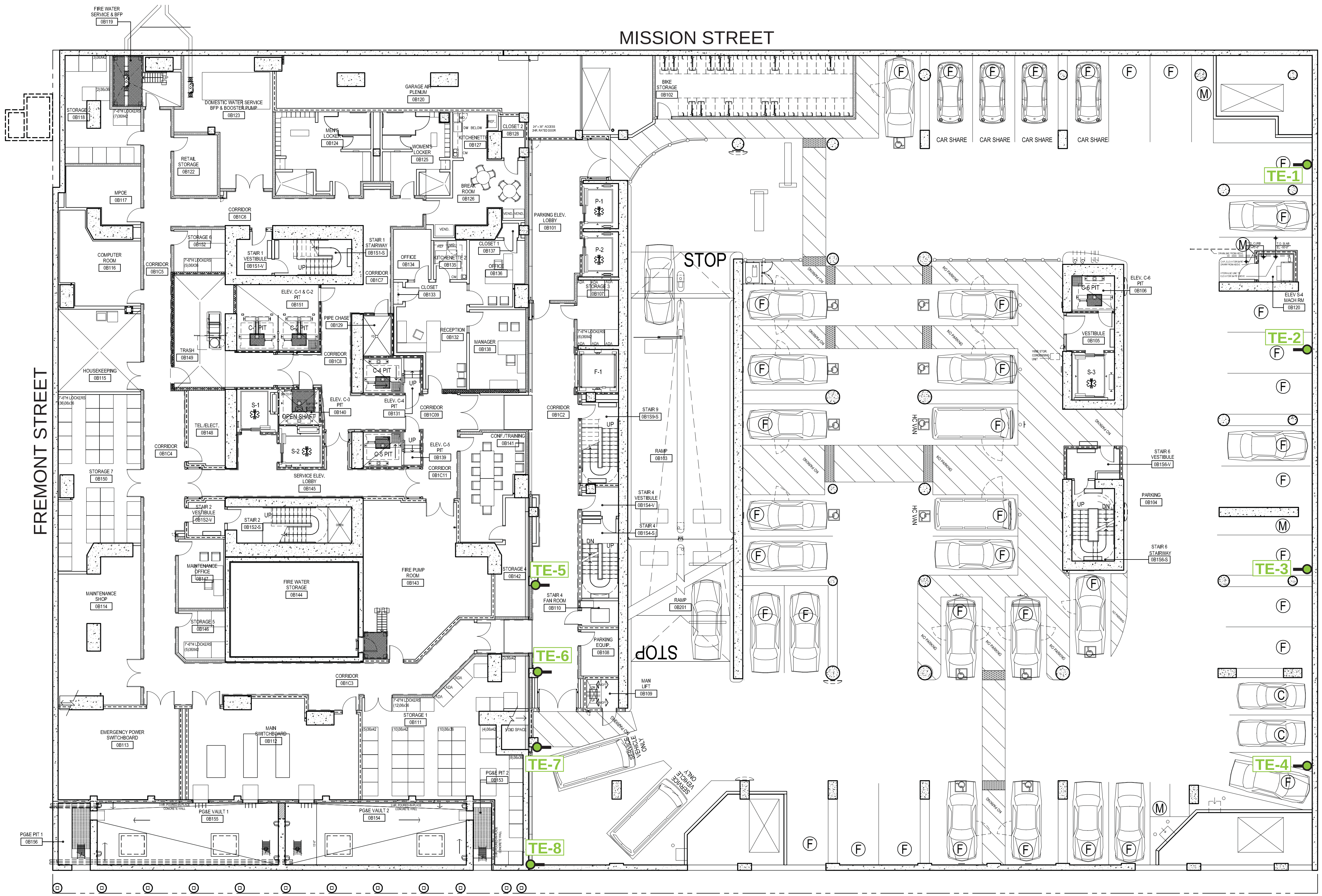
** Positive Relative Movement represents the two points becoming further apart.

TABLE 3

SUMMARY OF RELATIVE MOVEMENT: TAPE EXTENSOMETER READINGS

Date of Reading	Strains, %				
	TE-1 to TE-2	TE-2 to TE-3	TE-3 to TE-4	TE-5 to TE-6	TE-7 to TE-8
5/21/2009	0.000	0.000	0.000	0.000	0.000
7/29/2009	0.004	-0.031	-0.036	-0.071	-0.080
8/28/2009	-0.049	-0.044	-0.023	-0.108	-0.125
9/14/2009	-0.022	-0.040	-0.007	-0.125	-0.113
12/10/2010	-0.117	-0.117	-0.108	-0.231	-0.261
5/26/2011	-0.069	-0.124	-0.086	-0.262	-0.455
12/13/2011*	-0.054	-0.128	-0.041	-0.264	-0.457
4/2/2012	-0.097	-0.176	-0.162	-0.263	-0.504
7/30/2012	-0.127	-0.195	-0.114	-0.382	-0.487
9/18/2012	-0.141	-0.179	-0.080	-0.317	-0.484

* The reading for TE-2 to TE-3 was conducted on 1/26/2012



LEGEND

- Tape Extensometer
  Hooks installed on columns, or walls

LOCATION OF TAPE EXTENSOMETERS:
B-1 BASEMENT LEVEL, 301 MISSION STREET

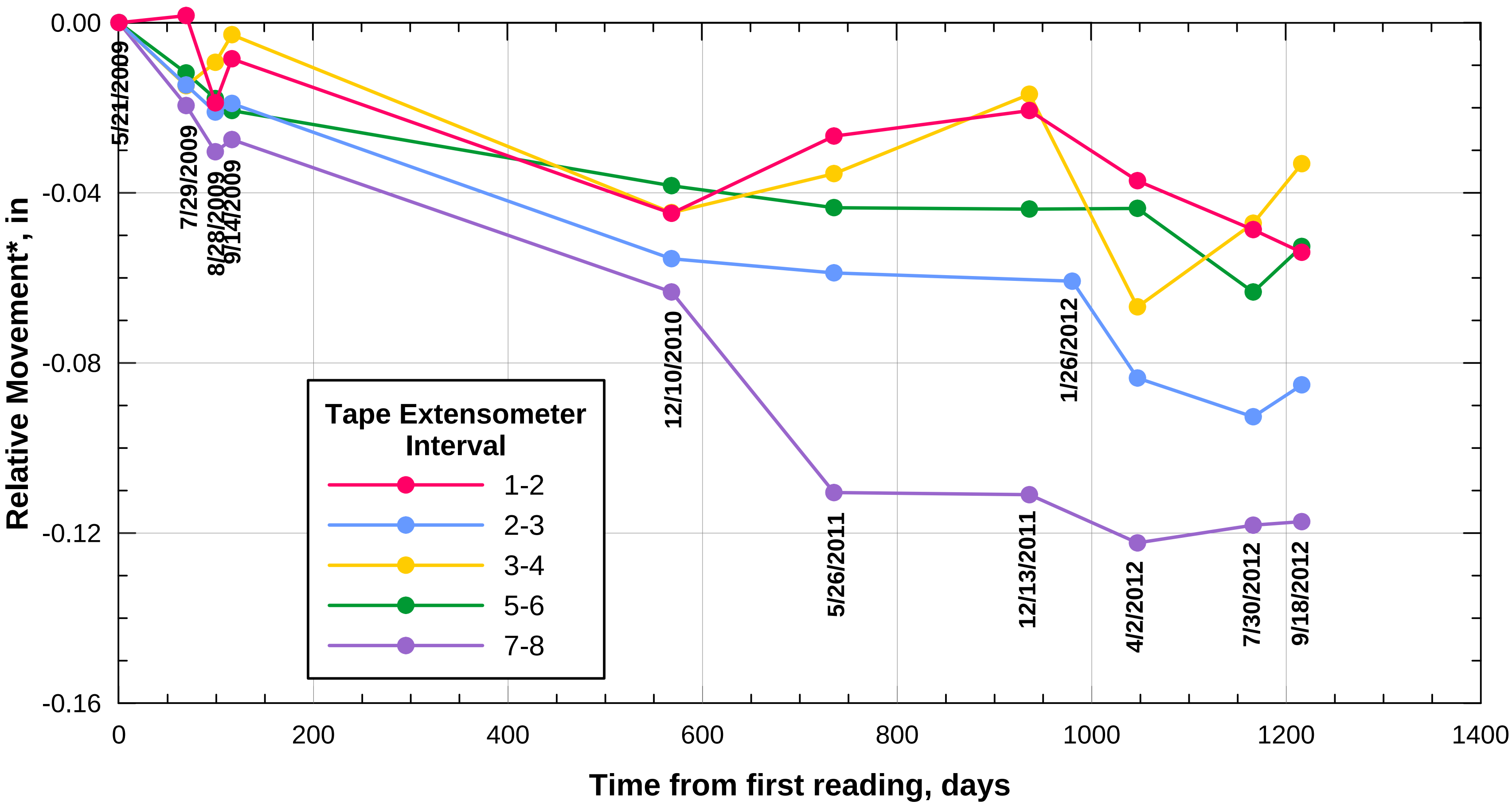
Transbay Transit Center
301 Mission Monitoring - Tape Extensometers
Transbay Joint Powers Authority
San Francisco, California

November 2012

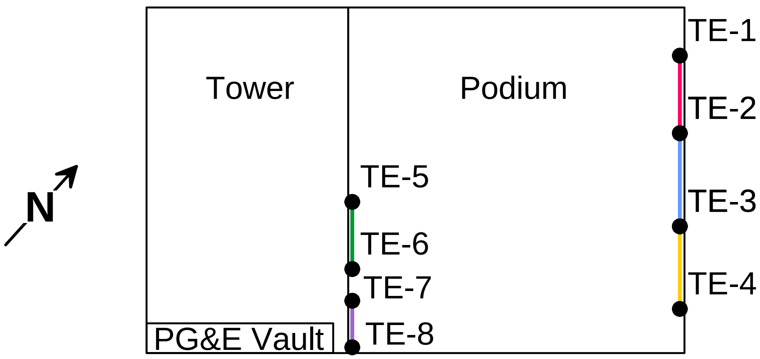
ARUP

PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\189 301 Mission Tape Extensometer - Nov 2012\Plates\Plate 1 - Tape Extensometer.ai



* Positive Relative Movement represents the two points becoming further apart.



RELATIVE MOVEMENT OF TAPE EXTENSOMETER INTERVALS

Transbay Transit Center
301 Mission Monitoring - Tape Extensometers
Transbay Joint Powers Authority
San Francisco, California

November 2012

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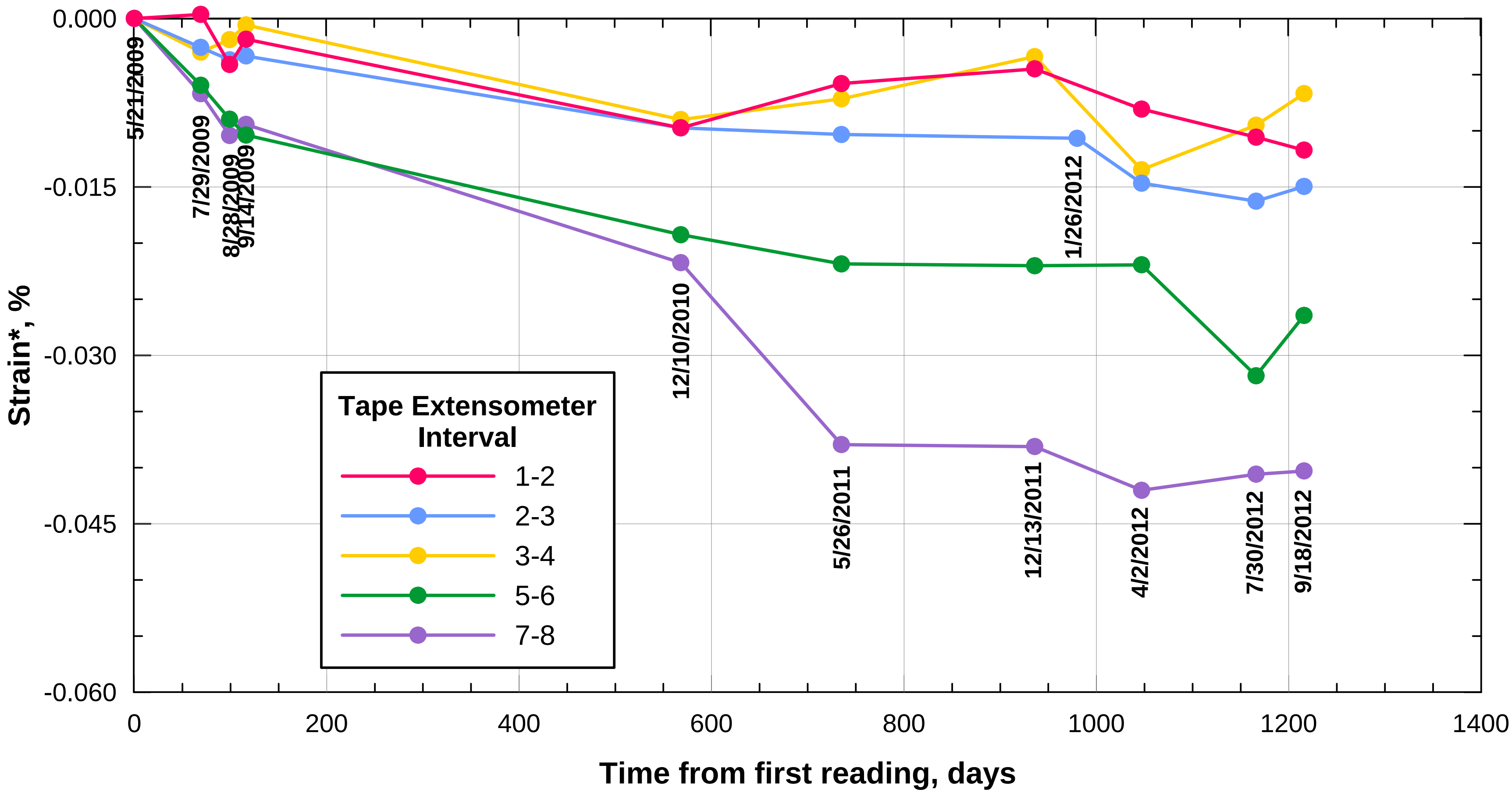
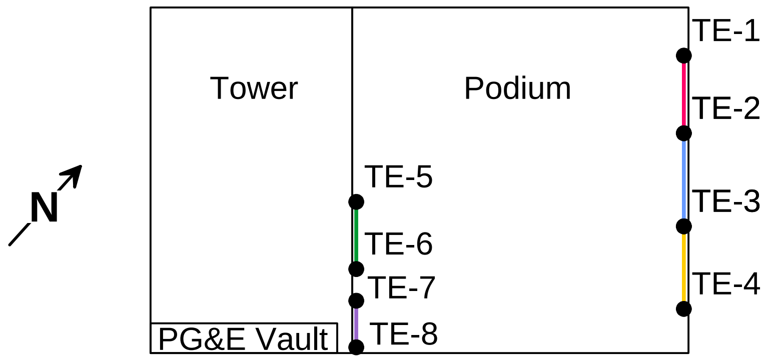
PLATE 2

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\189 301 Mission Tape Extensometer - Nov 2012\Plates\Plate 2 - Relative Movement.grf



* Positive strain represents extension.



STRAIN BETWEEN TAPE EXTENSOMETER INTERVALS

Transbay Transit Center
301 Mission Monitoring - Tape Extensometers
Transbay Joint Powers Authority
San Francisco, California

November 2012

ARUP

PLATE 3

Memorandum

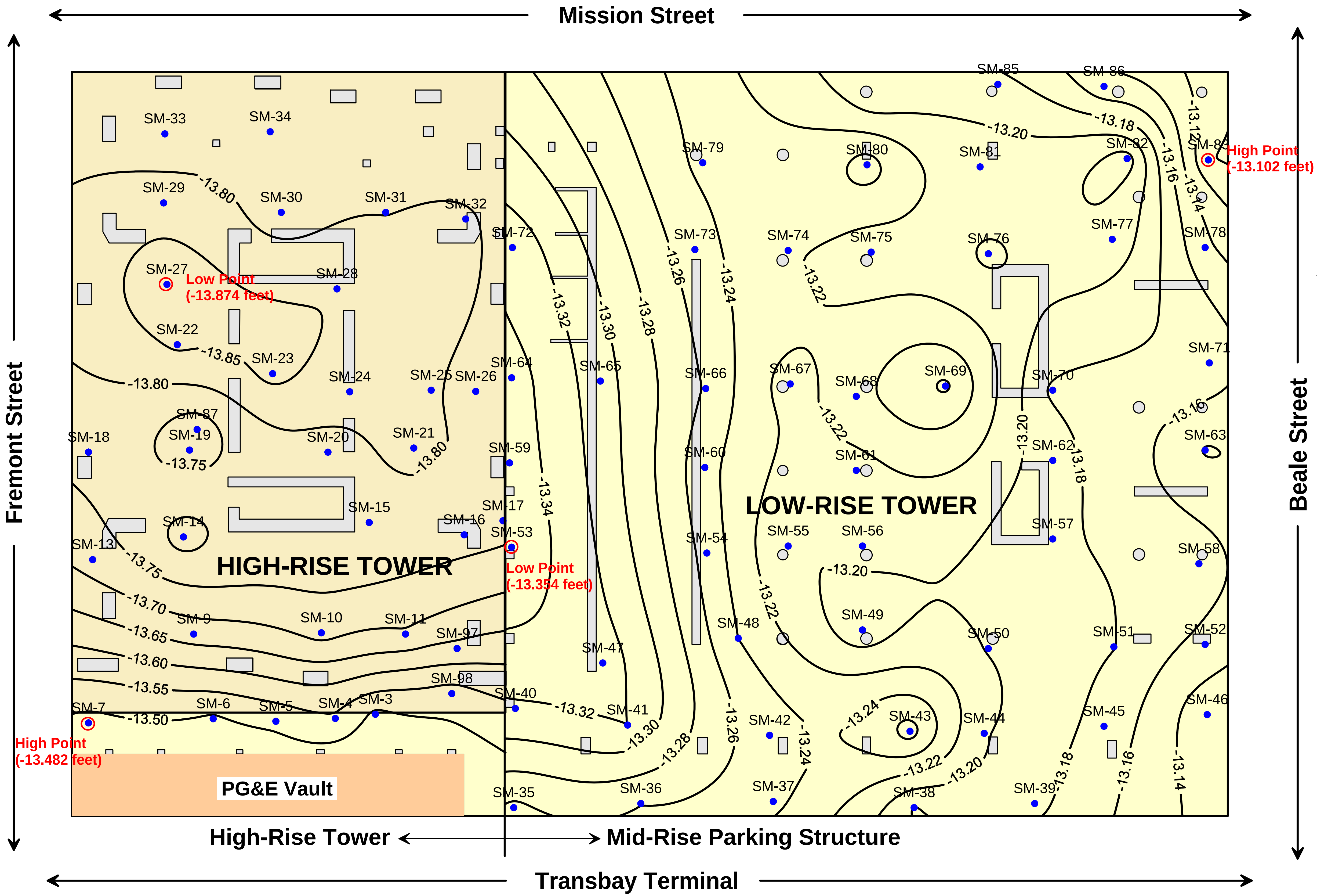
ARUP

To	Brian Dykes (TJPA)	**Date** 17 January 2013
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number** 132242-60/SMM
From	Stephen McLandrich (Arup)	**File reference** 4-05 195
Subject	Transbay Transit Center: Results of December 2012 Settlement Survey at 301 Mission Property	**Page** 1 **of** 1

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated November 6, 2012 with measurements made through December 2012.

List of Plates

Plate 1	Floor Elevations at Level B-1 of 301 Mission Property: Periodic Survey – December 26, 2012
Plate 2	Differential Floor Elevation (Inches) – December 26, 2012 Survey
Plate 3	Contours of Settlements Measured at the First Level Basement of the 301 Mission Street Structure Between April 30, 2009 and December 26, 2012
Plate 4	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Tower: April 30, 2009 through December 26, 2012.
Plate 5	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Mid-Rise: April 30, 2009 through December 26, 2012
Plate 6	Settlements of the 301 Mission Tower Including Monitoring During Construction
Plate 7	Floor Elevation at Basement Level B-5 of 301 Mission Property: December 26, 2012 Survey
Plate 8	Differential Floor Elevations (Inches) at Basement Level B-5: December 26, 2012 Survey



Date of Survey Reading:
December 26, 2012

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	**Low-Rise Tower**
0.392 feet (4.700 inches)	**0.253 feet (3.034 inches)**

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on December 26, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

0 25 50 75
Approximate Scale: 1" = 25'

FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY:
PERIODIC SURVEY - DECEMBER 26, 2012

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2013

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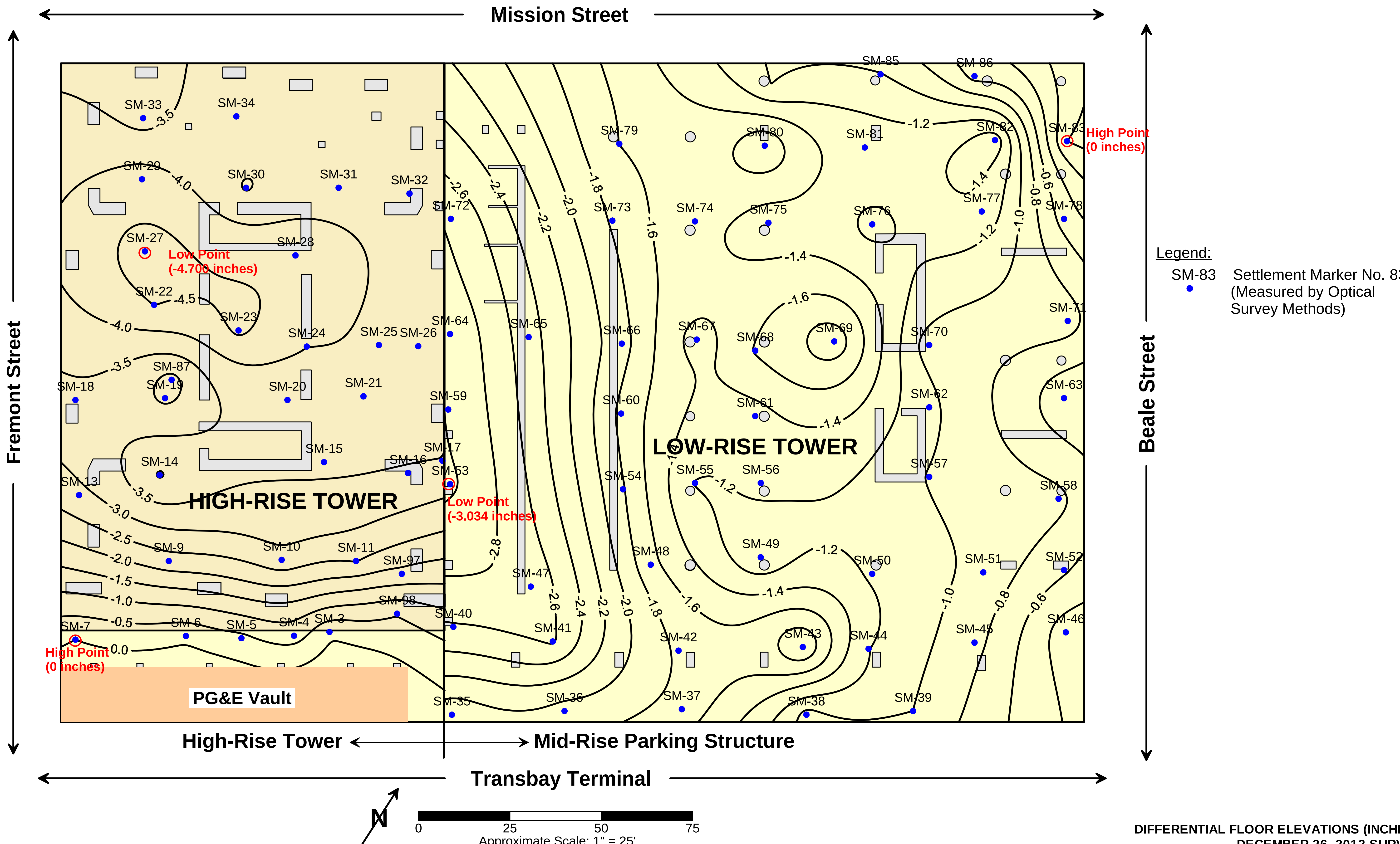
PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\195 301 Mission - Dec 2012 Survey\Plates\Elevations All (2012.12.26).srf



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on December 26, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
DECEMBER 26, 2012 SURVEY

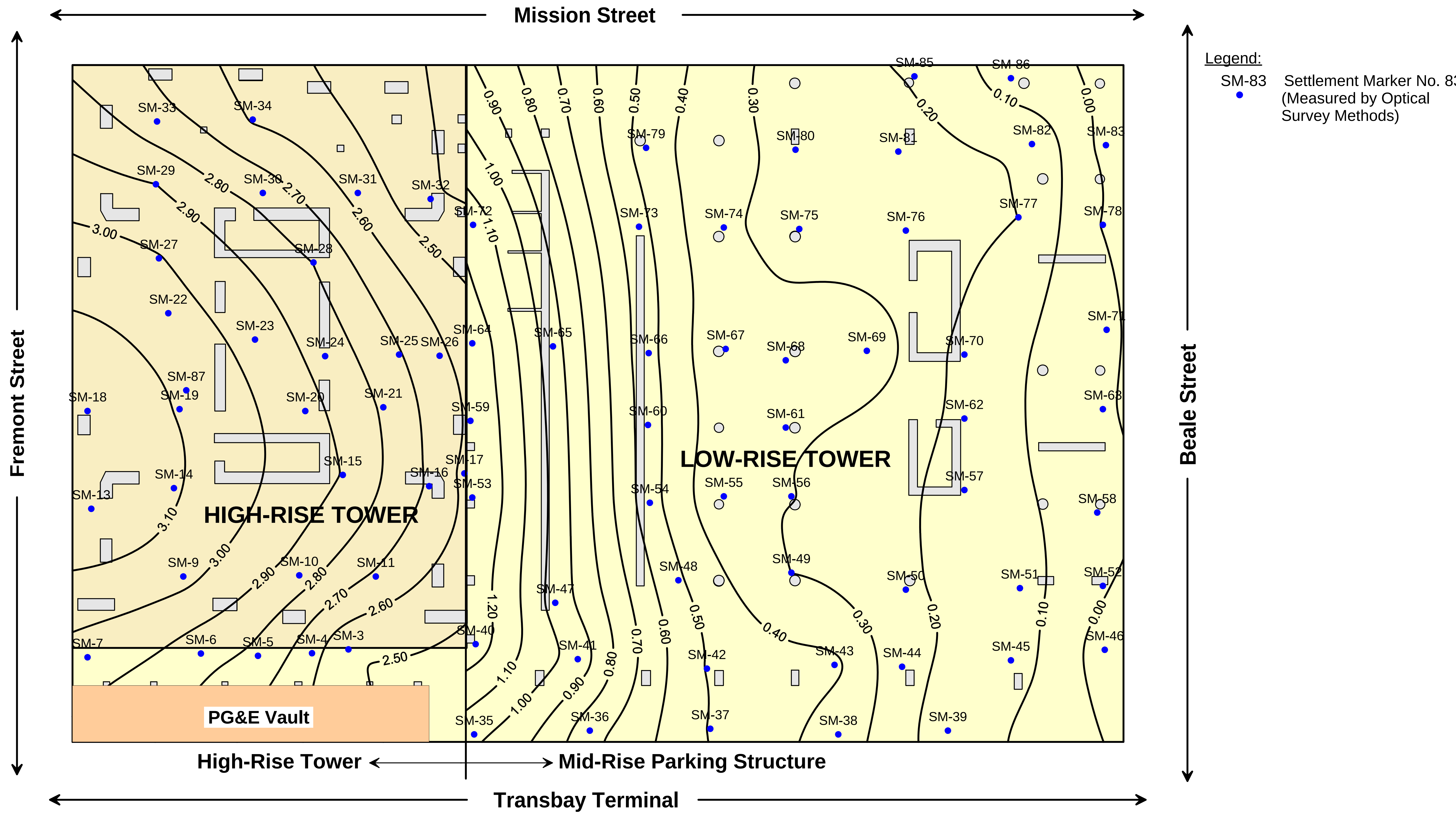
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

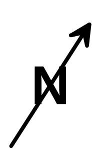
January 2013

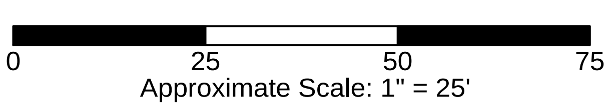
ARUP

PLATE 2

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\195 301 Mission - Dec 2012 Survey\Plates\Differential Elevation All (2012.12.26).srf







Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on December 26, 2012.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE FIRST LEVEL BASEMENT OF THE 301 MISSION STREET STRUCTURE BETWEEN APRIL 30, 2009 AND DEC

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2013

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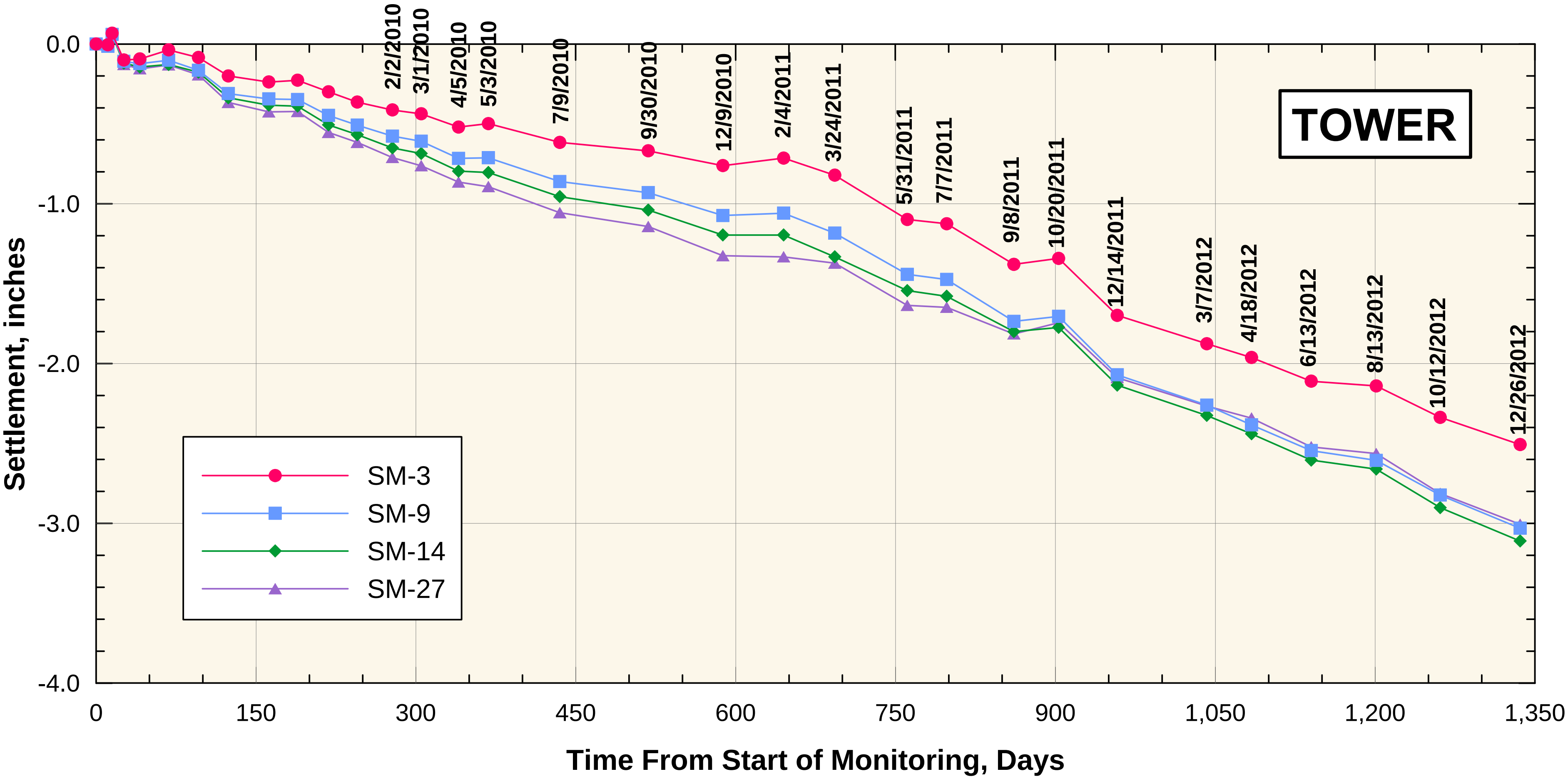
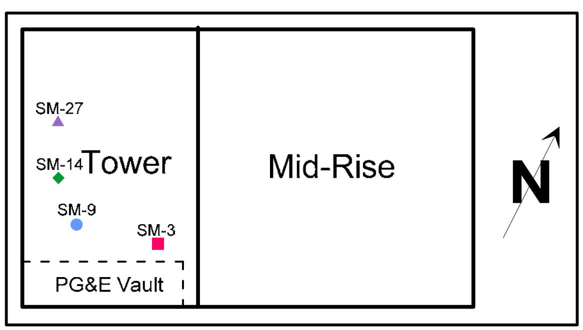
PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\195 301 Mission - Dec 2012 Survey\Plates\Elevation changes All (2012.12.26).srf





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH DECEMBER 26, 2012

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2013

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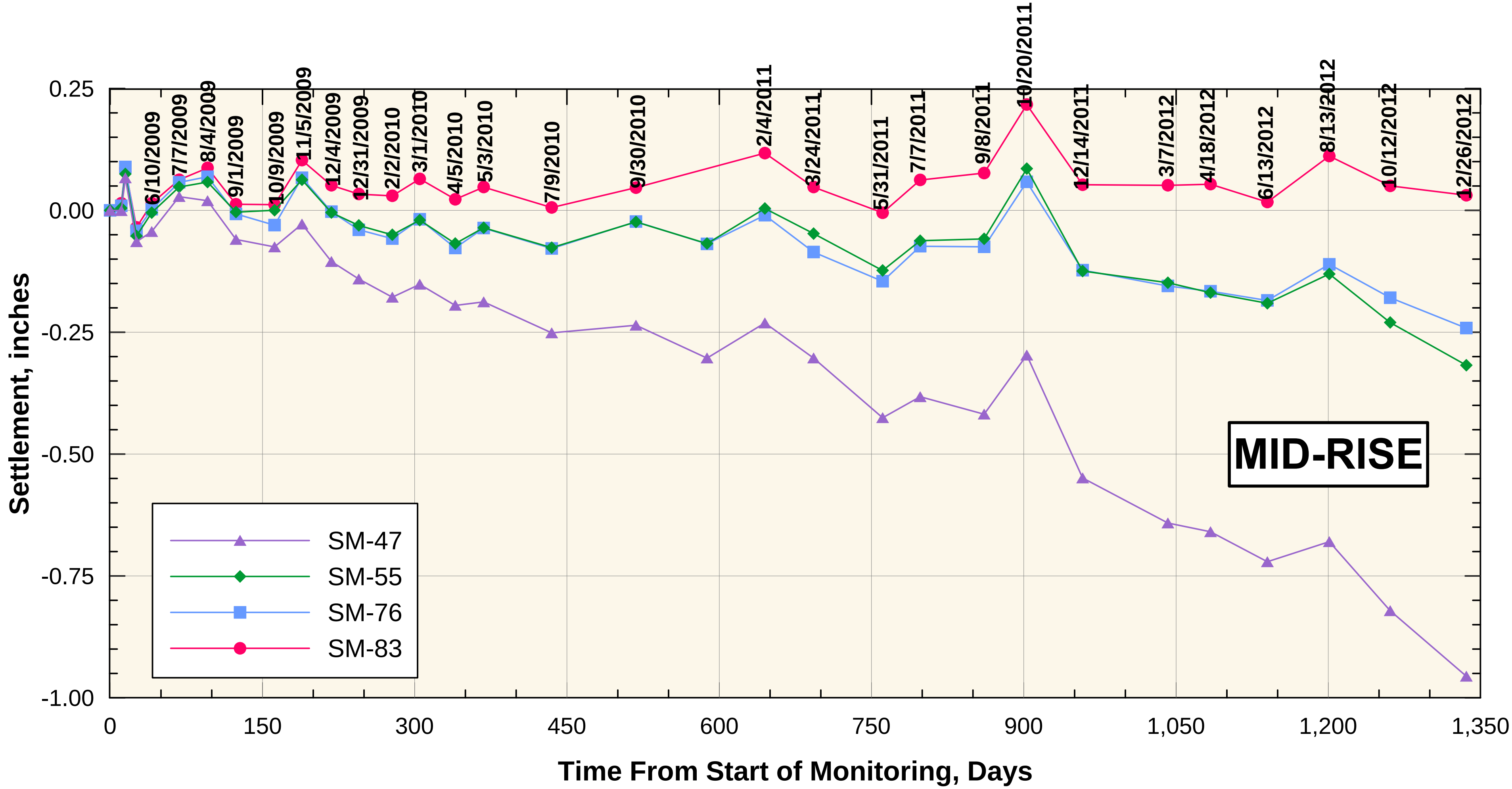
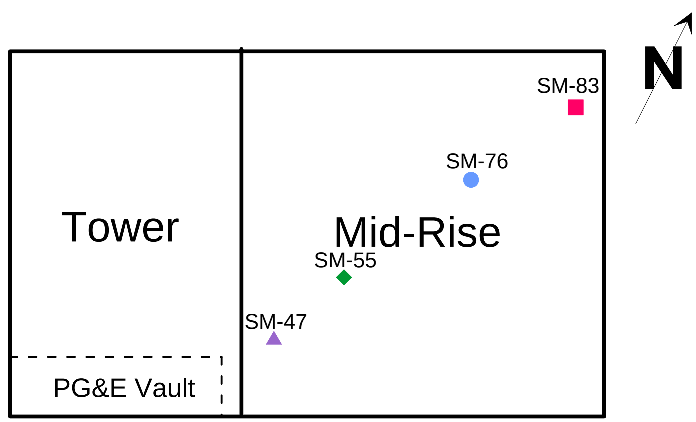
PLATE 4

Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\195 301 Mission - Dec 2012 Survey\Plates\Plate 4 Settlement Over Time - Tower.grf





Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH DECEMBER 26, 2012

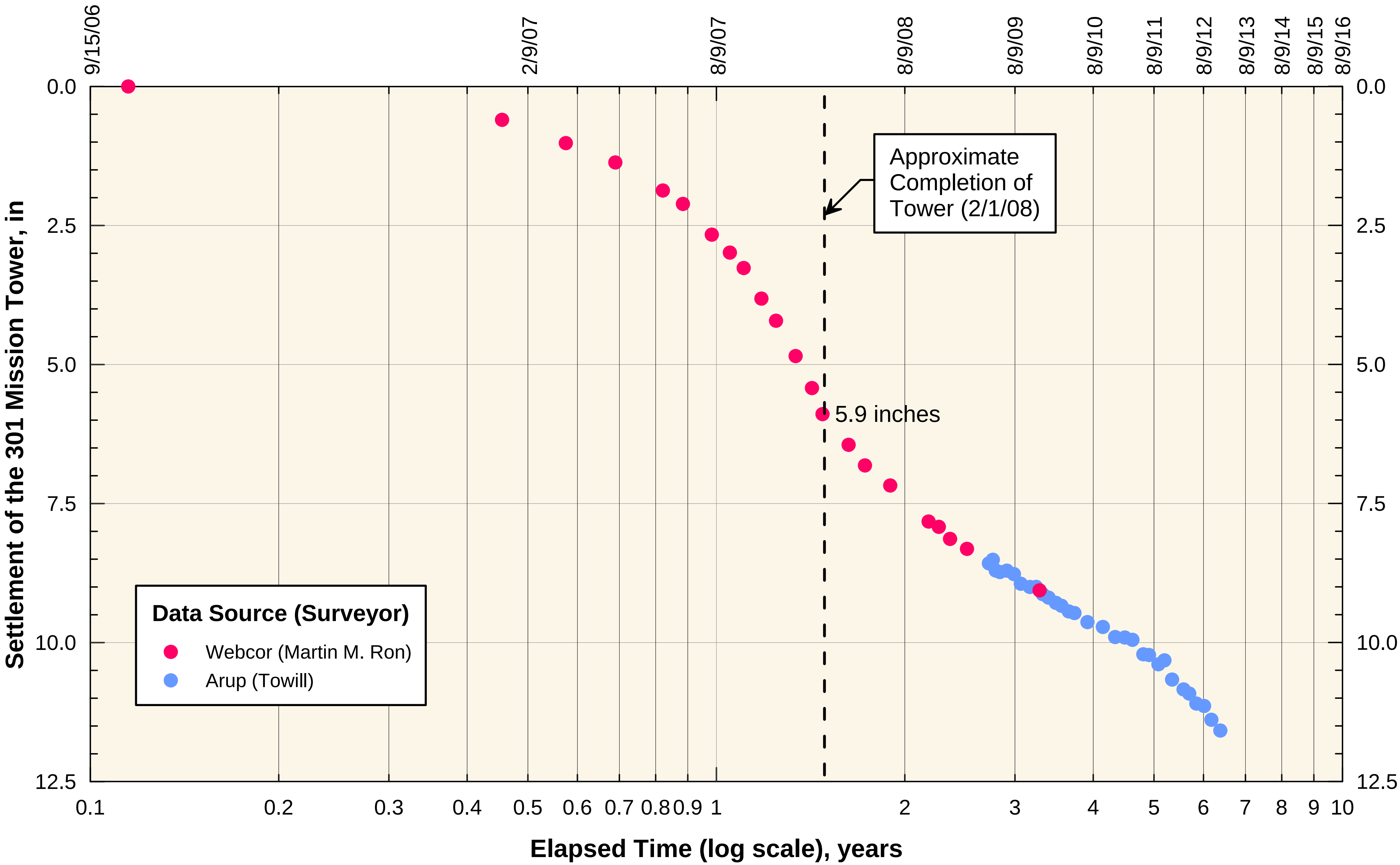
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2013

ARUP

PLATE 5

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\195 301 Mission - Dec 2012 Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

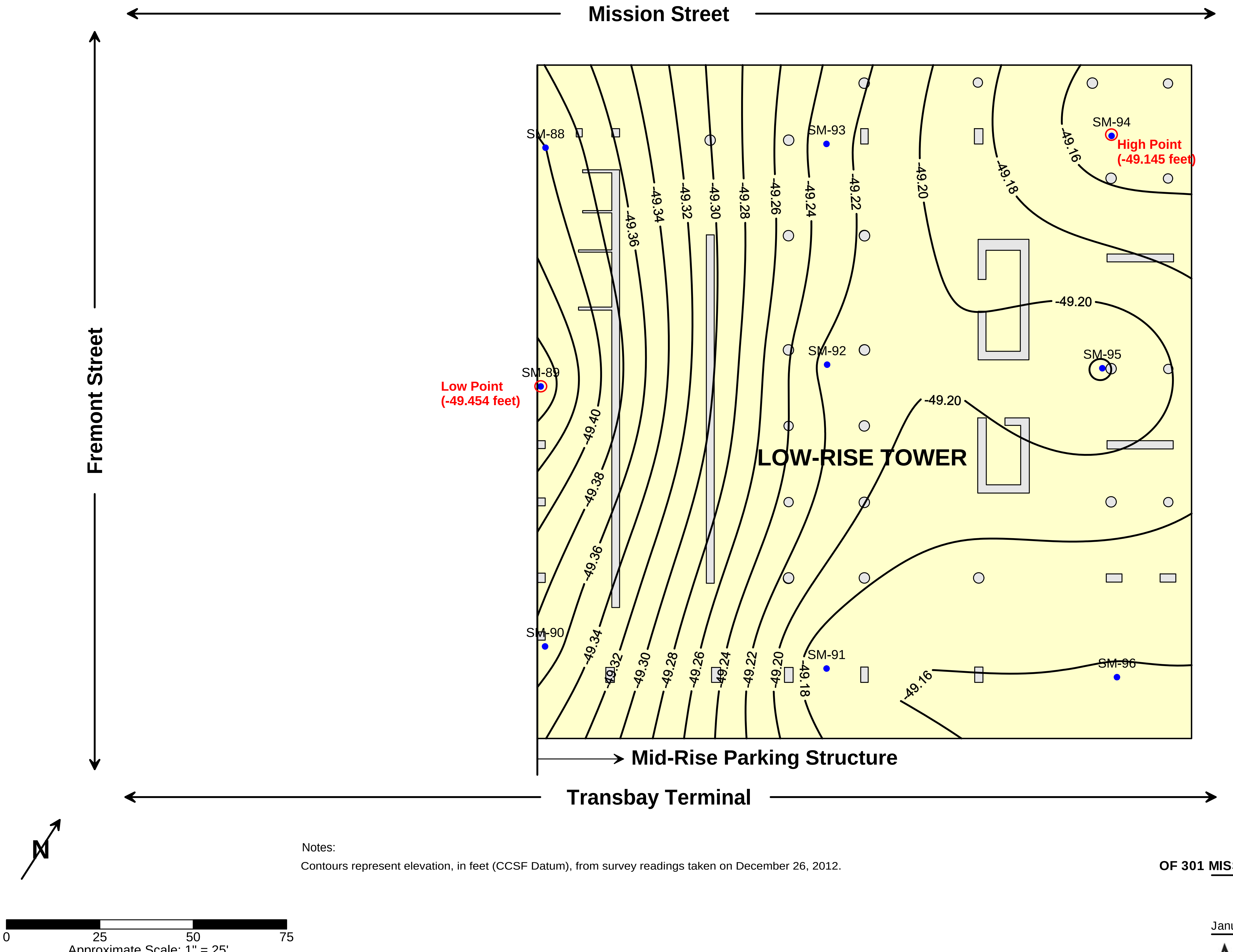
SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2013

ARUP

PLATE 6



Date of Survey Reading:
December 26, 2012

Legend:

SM-88 • Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.310 feet (3.718 inches)

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on December 26, 2012.

FLOOR ELEVATION AT BASEMENT LEVEL B-5 OF 301 MISSION PROPERTY: DECEMBER 26, 2012 SURVEY

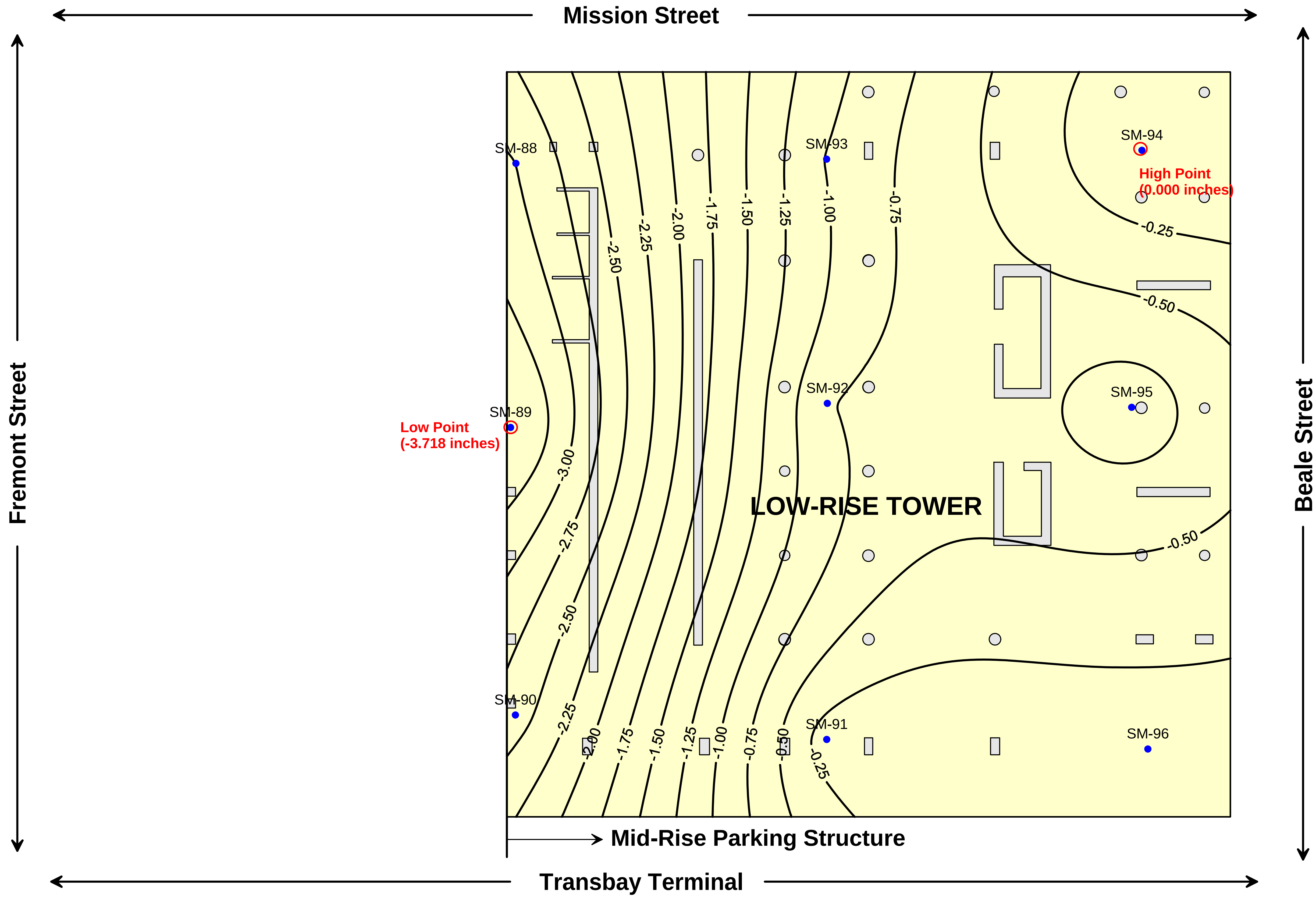
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2013

ARUP

PLATE 7

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\195 301 Mission - Dec 2012 Survey\Plates\B-5 Elevations (2012.12.26).srf



Date of Survey Reading:
December 26, 2012

Legend:

SM-88 • Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.310 feet (3.718 inches)

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on December 26, 2012.

0 25 50 75

Approximate Scale: 1" = 25'

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
AT BASEMENT LEVEL B-5: DECEMBER 26, 2012 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2013

ARUP

PLATE 8

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\195 301 Mission - Dec 2012 Survey\Plates\B-5 Differential Elevations (2012.12.26).srf

Memorandum

ARUP

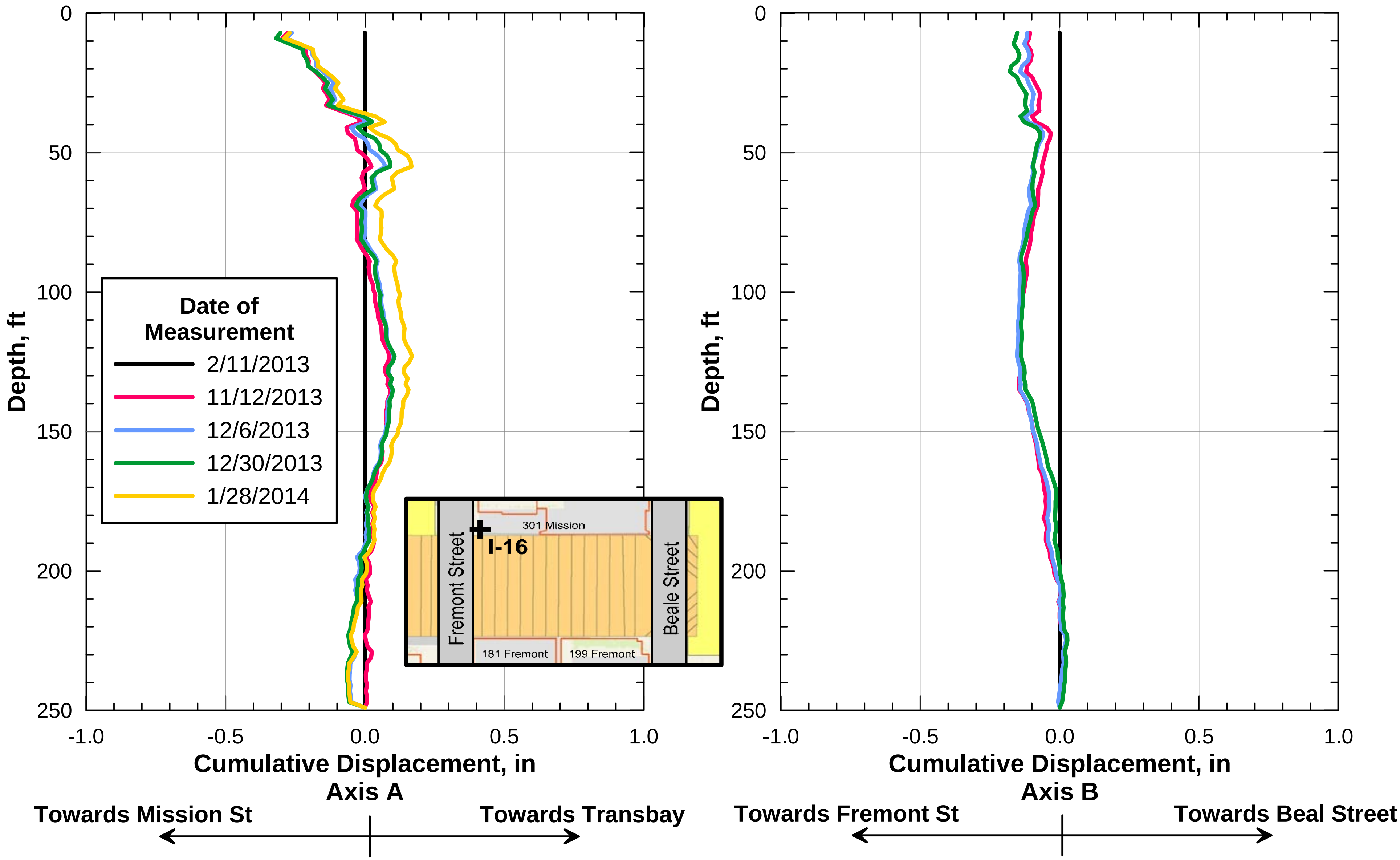
To	Brian Dykes (TJPA)	**Date** 14 February 2014
Copies	Randy Volenec (PCPA) George Metzger (AAI)	**Reference number** 132242-60
From	Stephen McLandrich (Arup)	**File reference** 4-05/227
Subject	Transbay Transit Center Manually Read Inclinometer Update	**Page** 1 **of** 1

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the buildings adjacent to the Transbay Transit Center prior to and during construction. This memorandum presents the current readings from the inclinometers adjacent to the 301 Mission buildings.

Currently, inclinometers I-16, I-17A, I-17B, I-18, I-18M I-19, I-21 and I-22 are being read using a standard manual method. Inclinometer I-20 was destroyed in the course of construction activity in early 2013. Plates 1 through 8 show the readings taken on the inclinometers surrounding the 301 Mission buildings. These inclinometers will continue to be read manually throughout the Transbay project.

List of Plates

Plate 1 Measurements Taken at Inclinometer I-16
Plate 2 Measurements Taken at Inclinometer I-17A
Plate 3 Measurements Taken at Inclinometer I-17B
Plate 4 Measurements Taken at Inclinometer I-18
Plate 5 Measurements Taken at Inclinometer I-18M
Plate 6 Measurements Taken at Inclinometer I-19
Plate 7 Measurements Taken at Inclinometer I-21
Plate 8 Measurements Taken at Inclinometer I-22



MEASUREMENTS TAKEN AT INCLINOMETER I-16

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

February 2014

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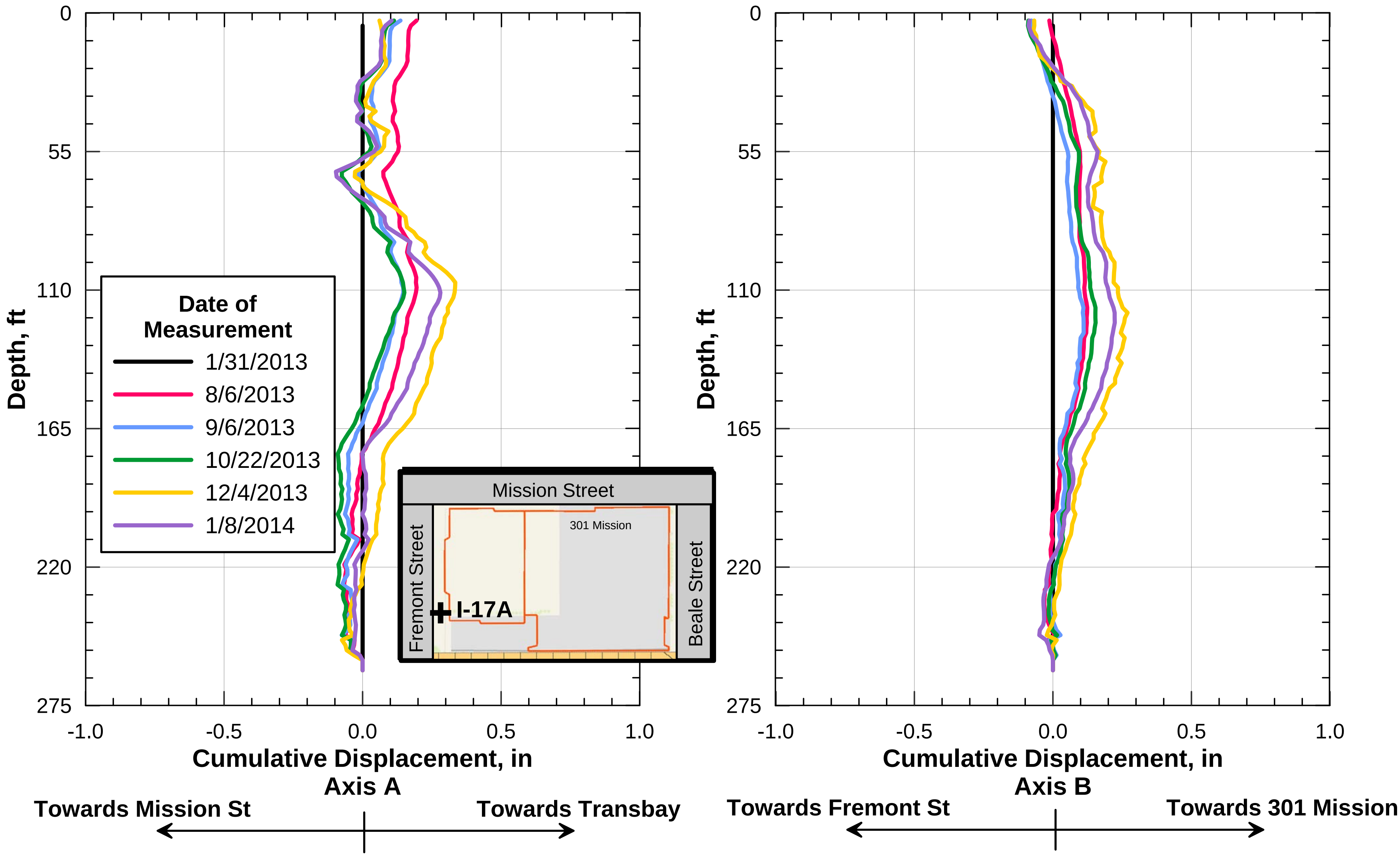
PLATE 1

J:\S-F\132000\132242\12 Construction Monitoring\12-04 Manual Readings\Inclinometers\Manual Inclinometers\Inclinometer I-16_formatted.grf



Note: The axes were rotated 30 degrees in order to reflect the directions orthogonal to the excavation

MEASUREMENTS TAKEN AT INCLINOMETER I-17A

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

February 2014

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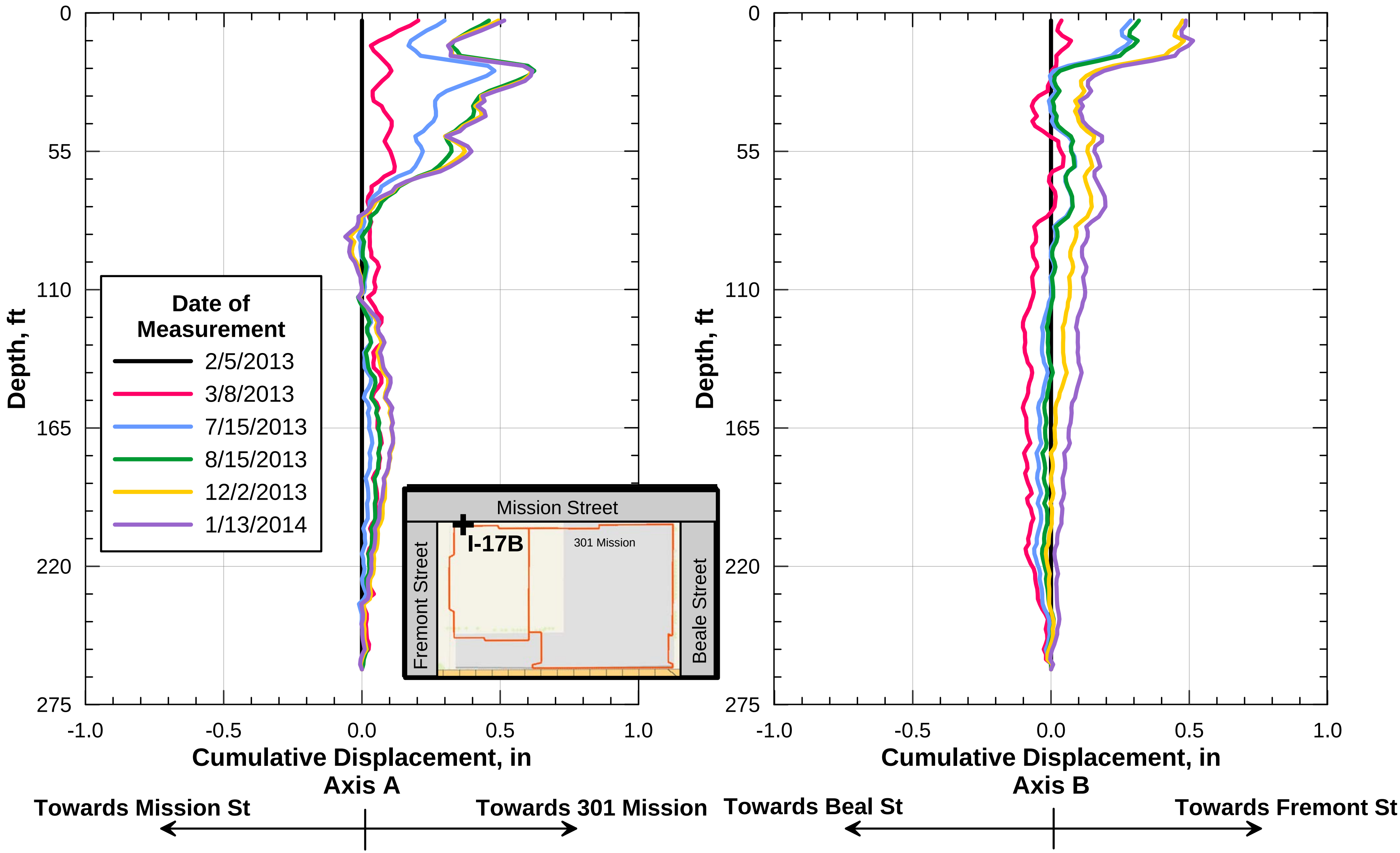
PLATE 2

J:\S-F\132000\132242\12 Construction Monitoring\12-04 Manual Readings\Inclinometers\Manual Inclinometers\Inclinometer I-17A_formatted.grf



Note: The axes were rotated 30 degrees in order to reflect the directions orthogonal to the excavation

MEASUREMENTS TAKEN AT INCLINOMETER I-17B

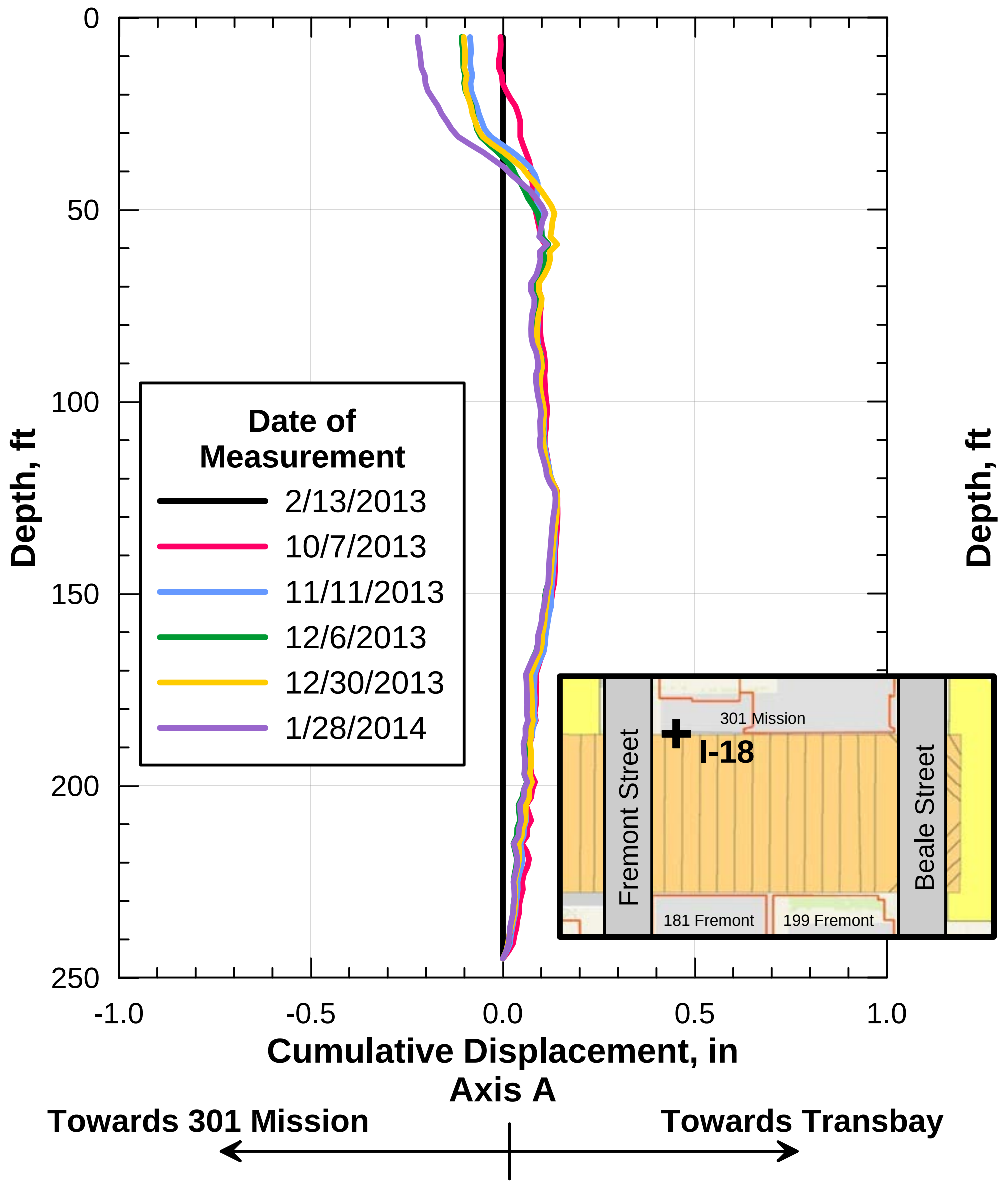
Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

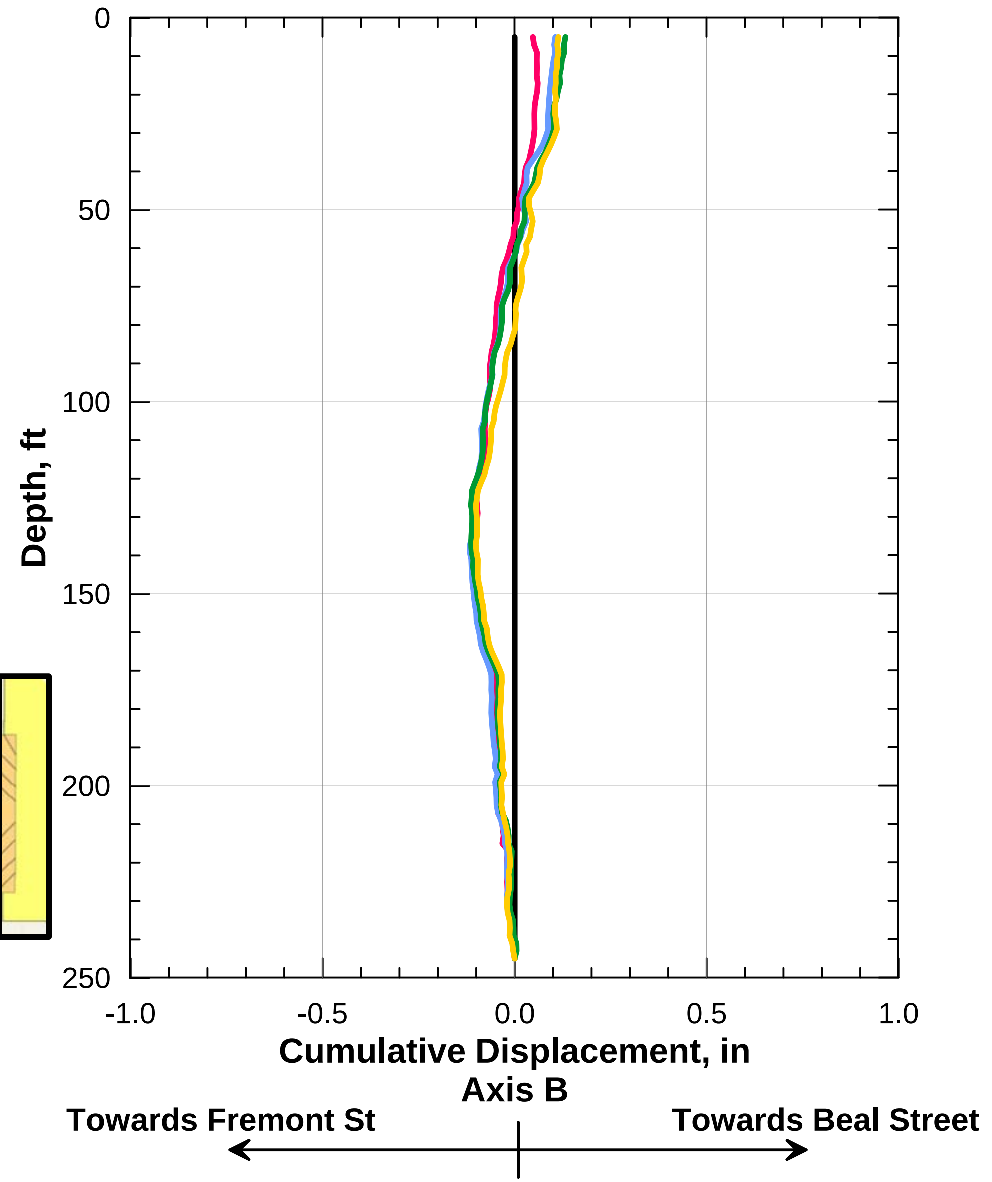
February 2014

ARUP

PLATE 3

J:\S-F\132000\132242\12 Construction Monitoring\12-04 Manual Readings\Inclinometers\Manual Inclinometers\Inclinometer I-17B_formatted.grf





MEASUREMENTS TAKEN AT INCLINOMETER I-18

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

February 2014

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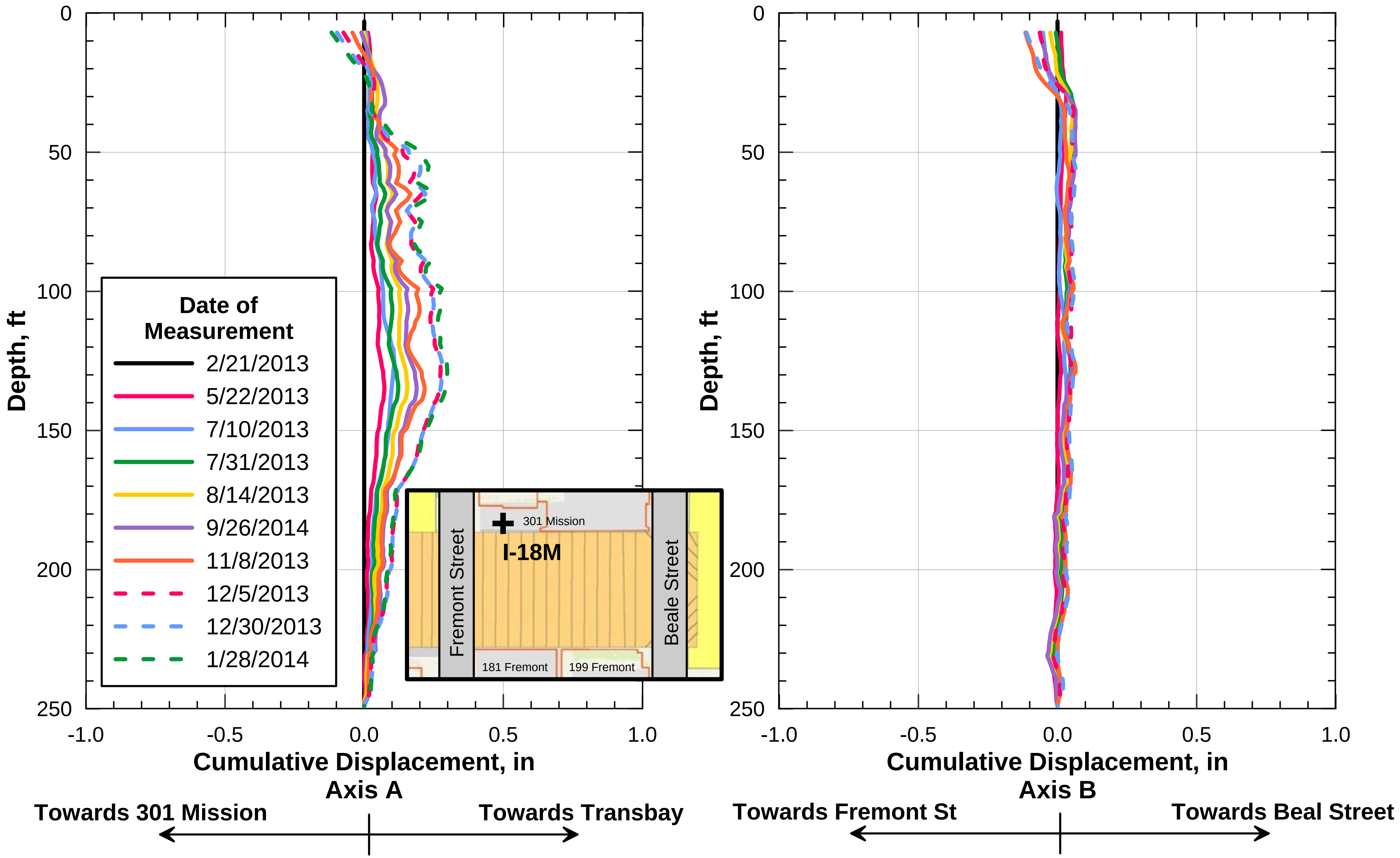
PLATE 4



MEASUREMENTS TAKEN AT INCLINOMETER I-18M

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

February 2014

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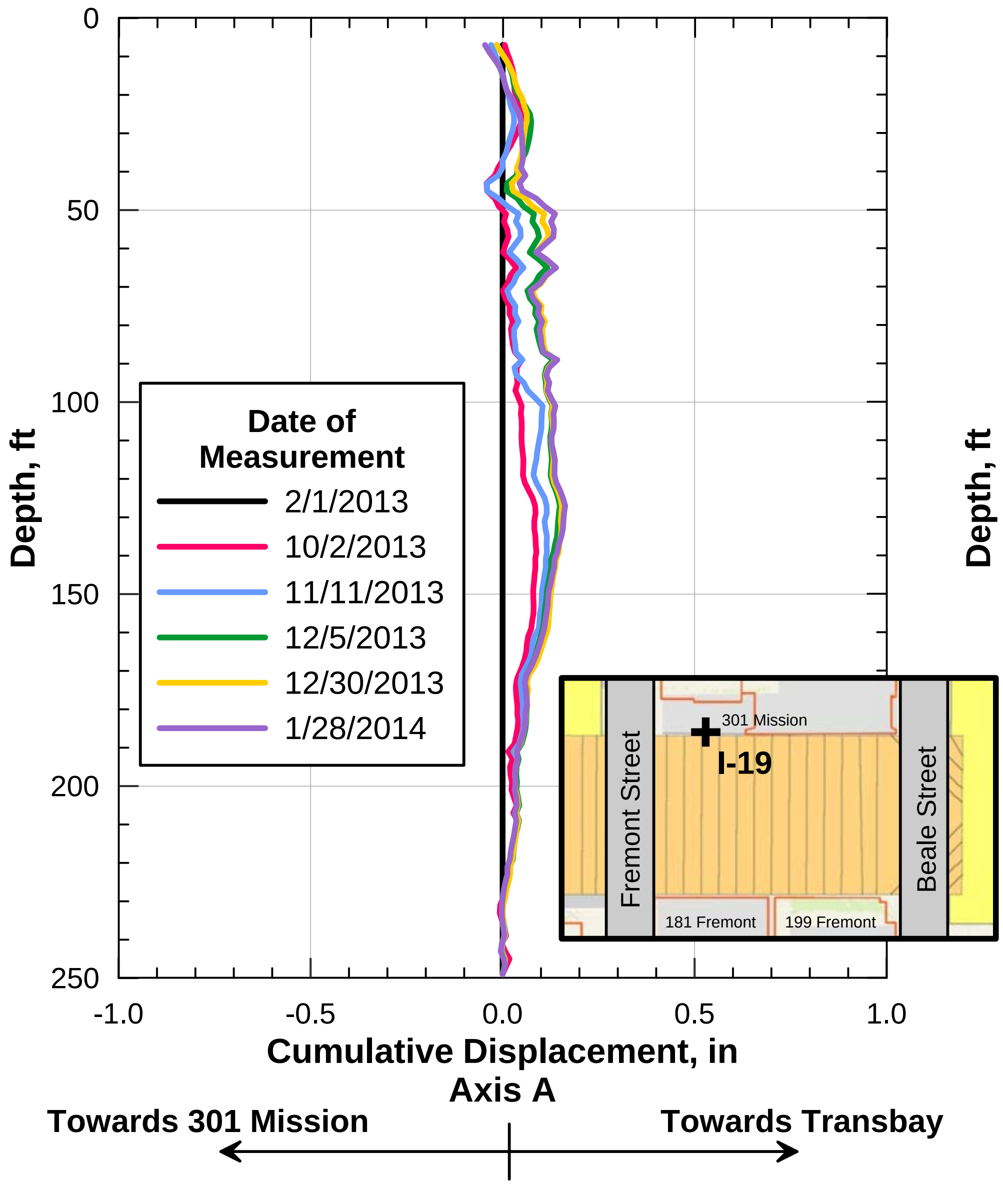
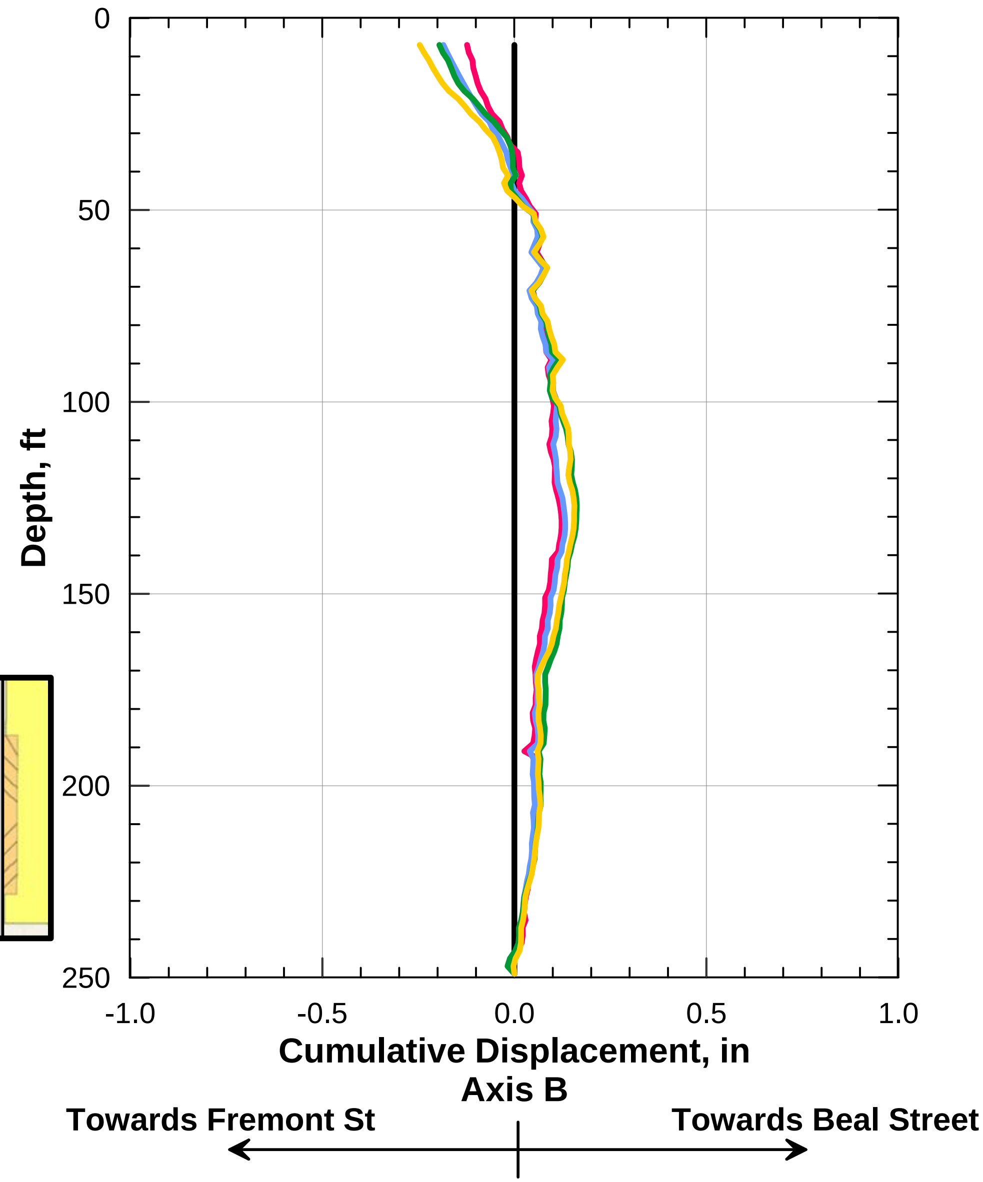
PLATE 5

J:\S-F\132000\132242\12 Construction Monitoring\12-04 Manual Readings\Inclinometers\Manual Inclinometers\Inclinometer I-18M_formatted.grf





MEASUREMENTS TAKEN AT INCLINOMETER I-19

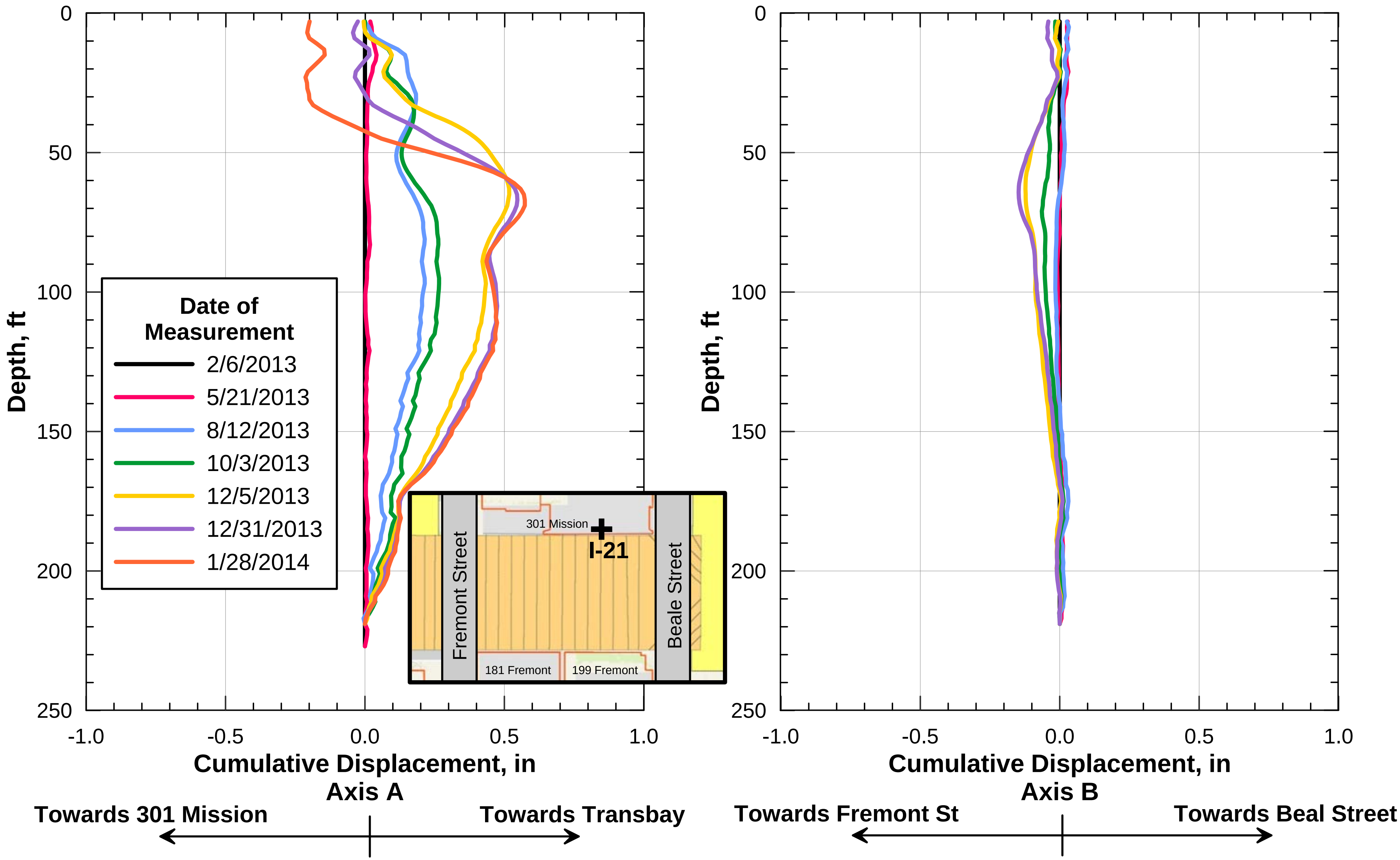
Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

February 2014

ARUP

PLATE 6

J:\S-F\132000\132242\12 Construction Monitoring\12-04 Manual Readings\Inclinometers\Manual Inclinometers\Inclinometer I-19_formatted.grf



MEASUREMENTS TAKEN AT INCLINOMETER I-21

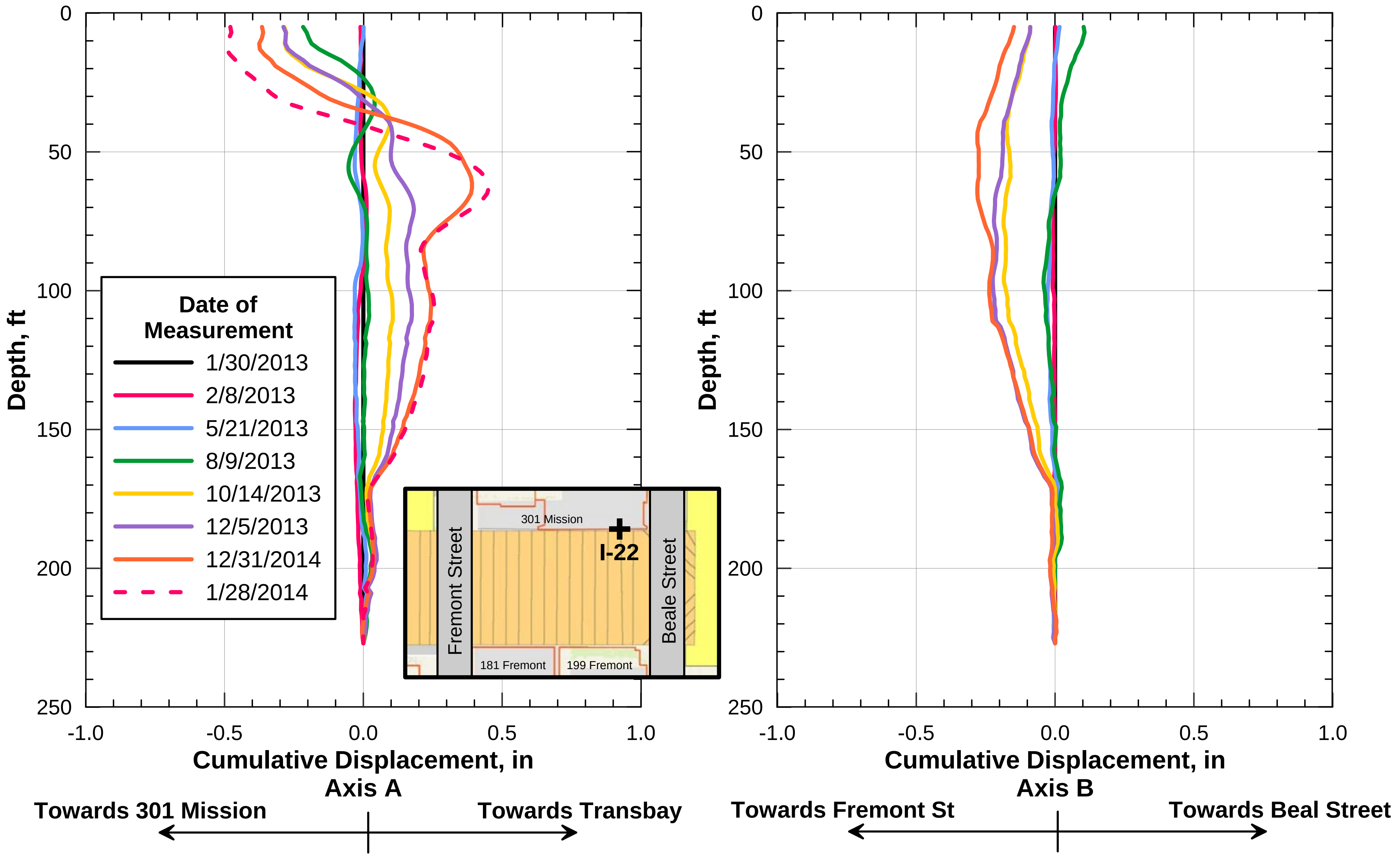
Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

February 2014

ARUP

PLATE 7

J:\S-F\132000\132242\12 Construction Monitoring\12-04 Manual Readings\Inclinometers\Manual Inclinometers\Inclinometer I-21_formatted.grf



MEASUREMENTS TAKEN AT INCLINOMETER I-22

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

February 2014

ARUP

PLATE 8

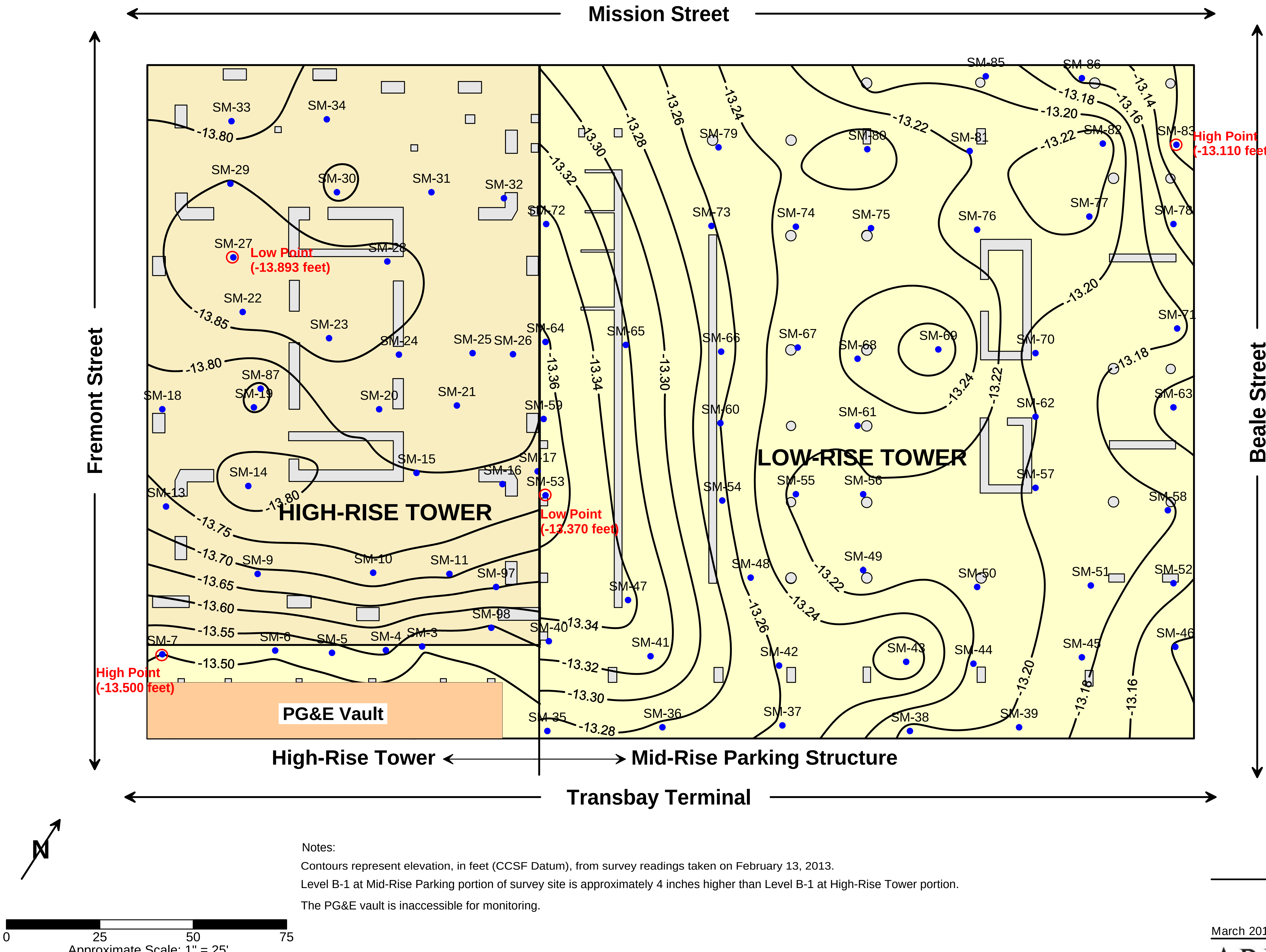
Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date**	27 March 2013
Copies	Robert Beck (TJPA) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/SMM
From	Stephen McLandrich (Arup)	**File reference**	4-05 204
Subject	Transbay Transit Center: Results of February 2013 Settlement Survey at 301 Mission Property	**Page** 1 **of** 1	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated January 17, 2013 with measurements made through February 2013.

List of Plates



Date of Survey Reading:
February 13, 2013

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	**Low-Rise Tower**
0.394 feet (4.723 inches)	**0.259 feet (3.114 inches)**

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on February 13, 2013.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY: PERIODIC SURVEY - FEBRUARY 13, 2013

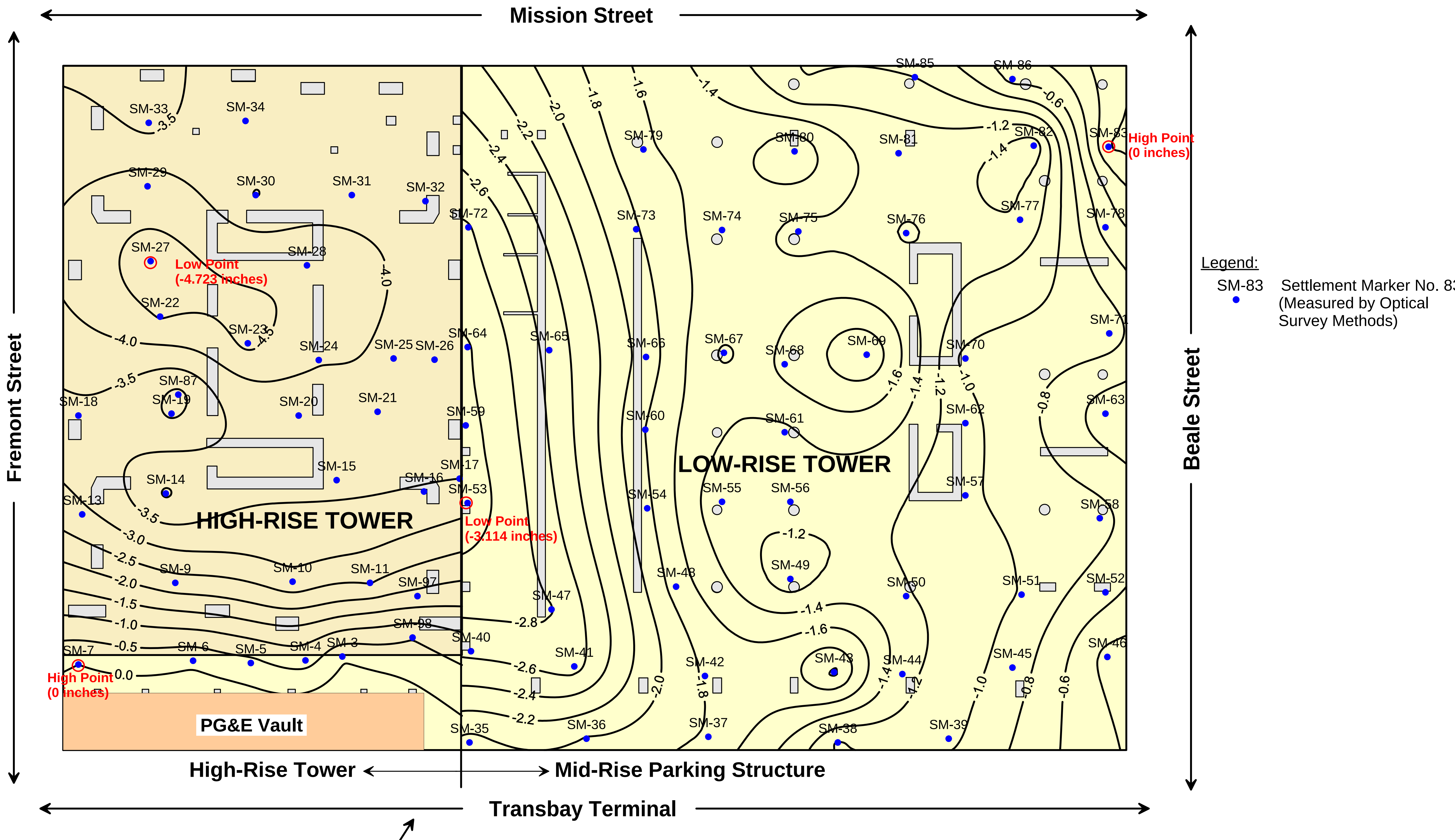
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2013

ARUP

PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\204 301 Mission - Feb 2013 Survey\Plates\Elevations All (2013.02.13).srf



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on February 13, 2013.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
FEBRUARY 13, 2013 SURVEY

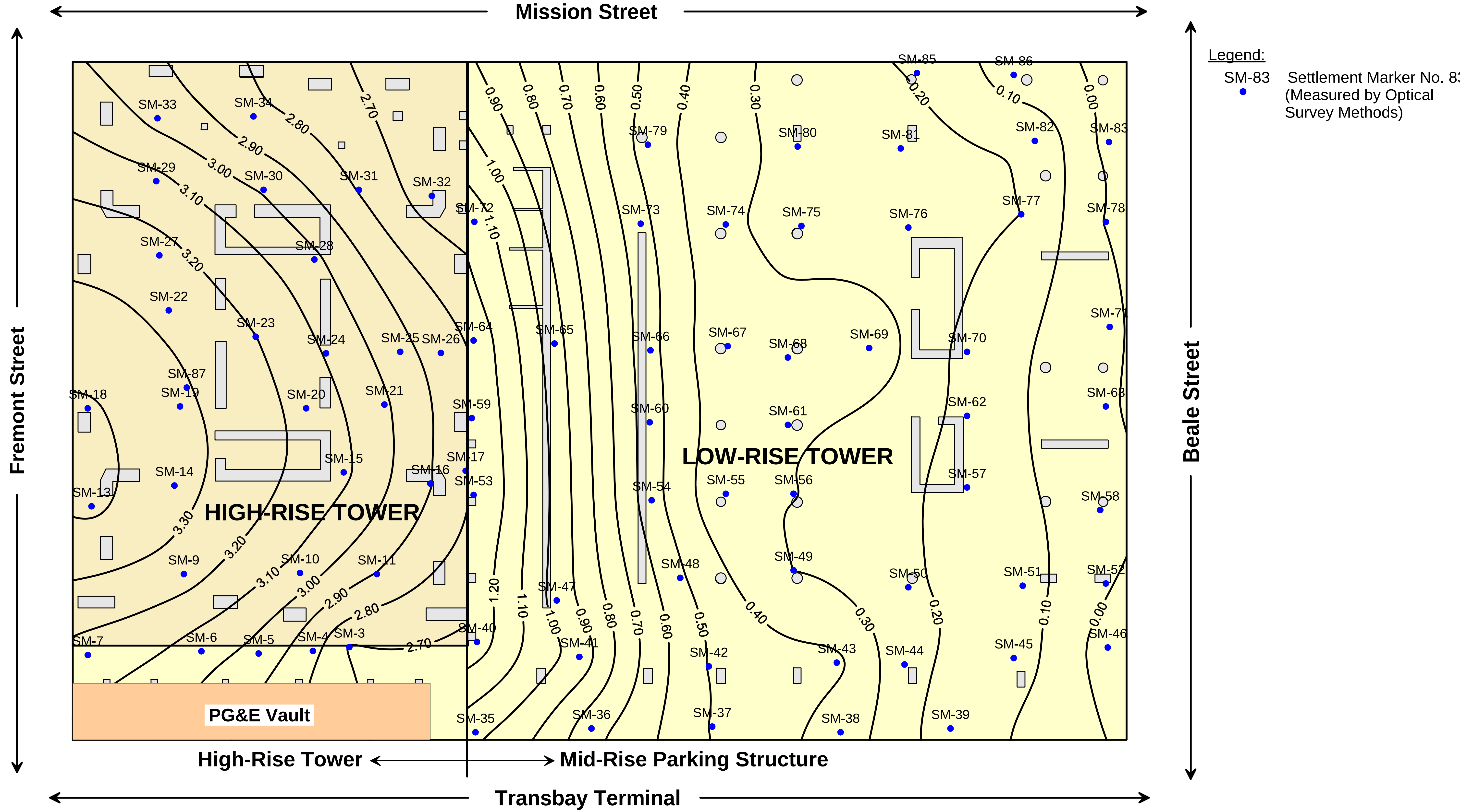
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2013

ARUP

PLATE 2

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\204 301 Mission - Feb 2013 Survey\Plates\Differential Elevation All (2013.02.13).srf



N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on February 13, 2013.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE FIRST LEVEL BASEMENT OF THE 301 MISSION STREET STRUCTURE BETWEEN APRIL 30, 2009 AND FEB

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2013

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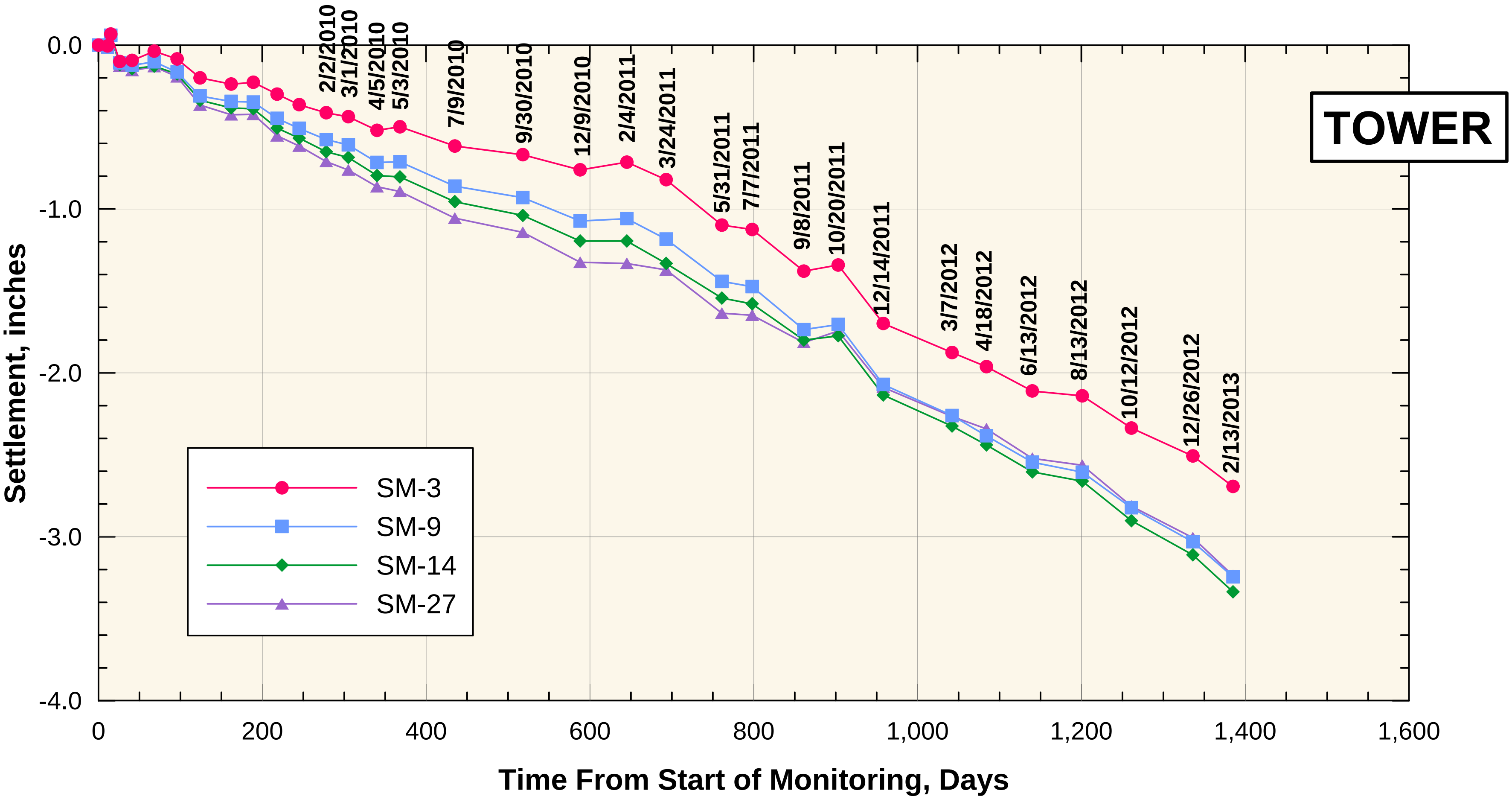
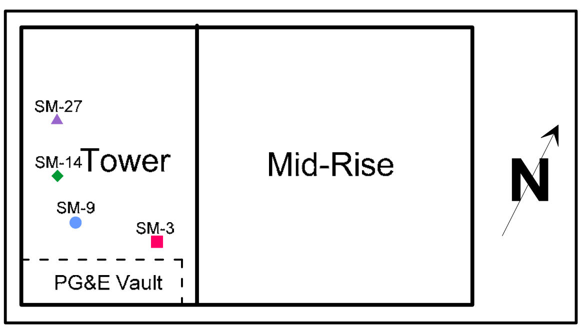
PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\204 301 Mission - Feb 2013 Survey\Plates\Elevation changes All (2013.02.13).srf





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH FEBRUARY 13, 2013

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2013

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PLATE 4

Note:
Initial (Baseline) reading taken on 04/30/09

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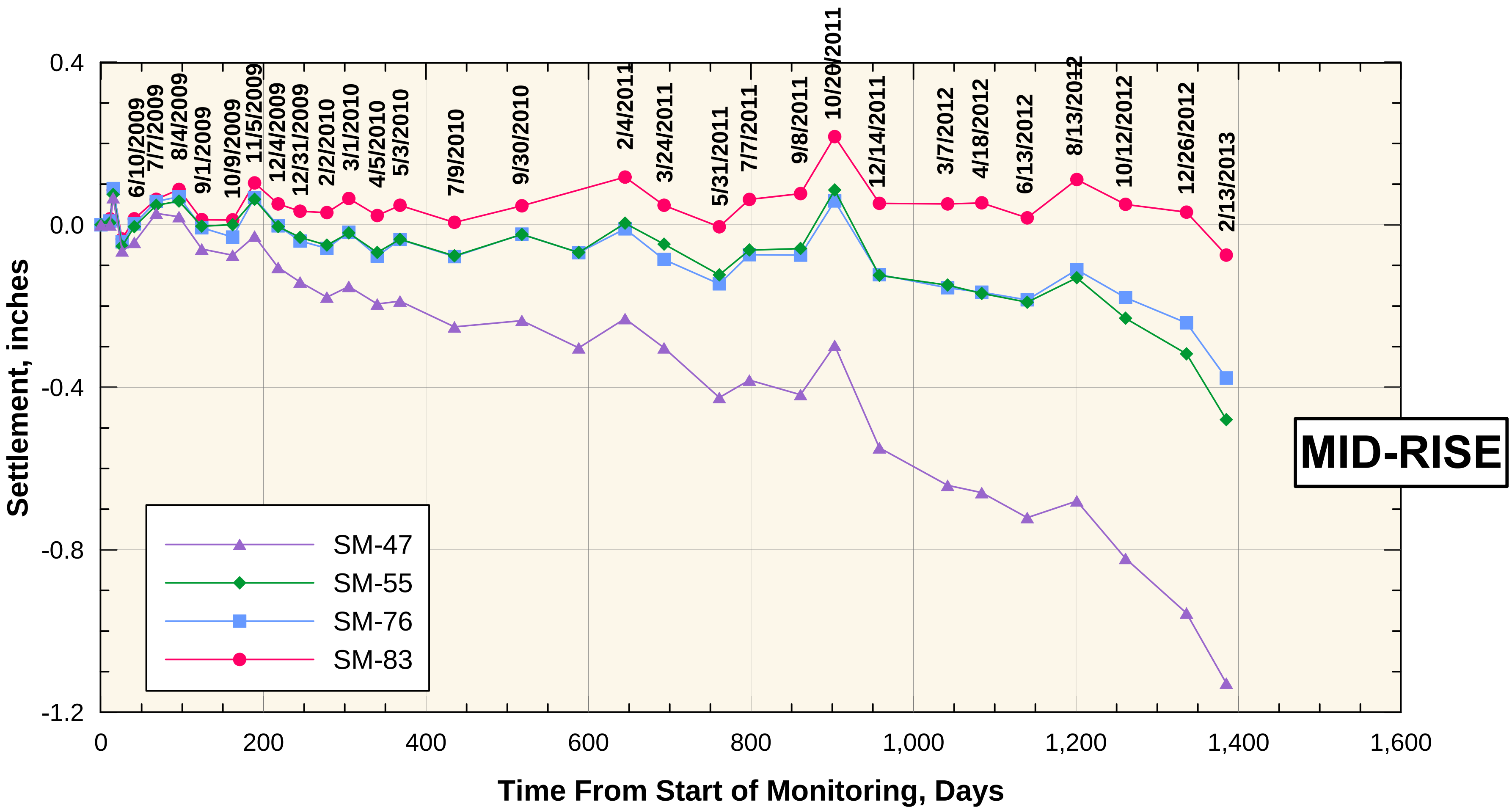
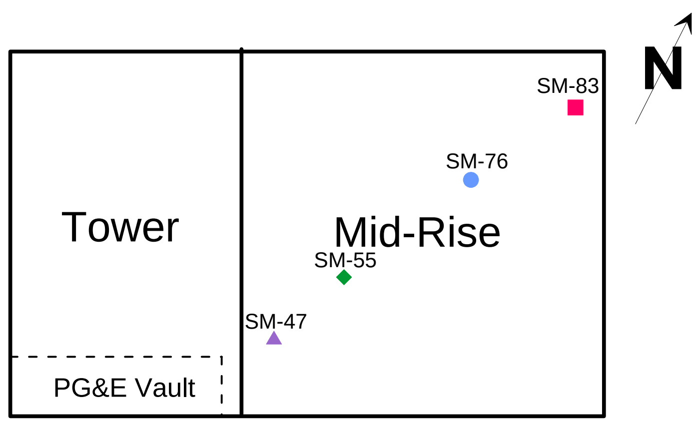




Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH FEBRUARY 13, 2013

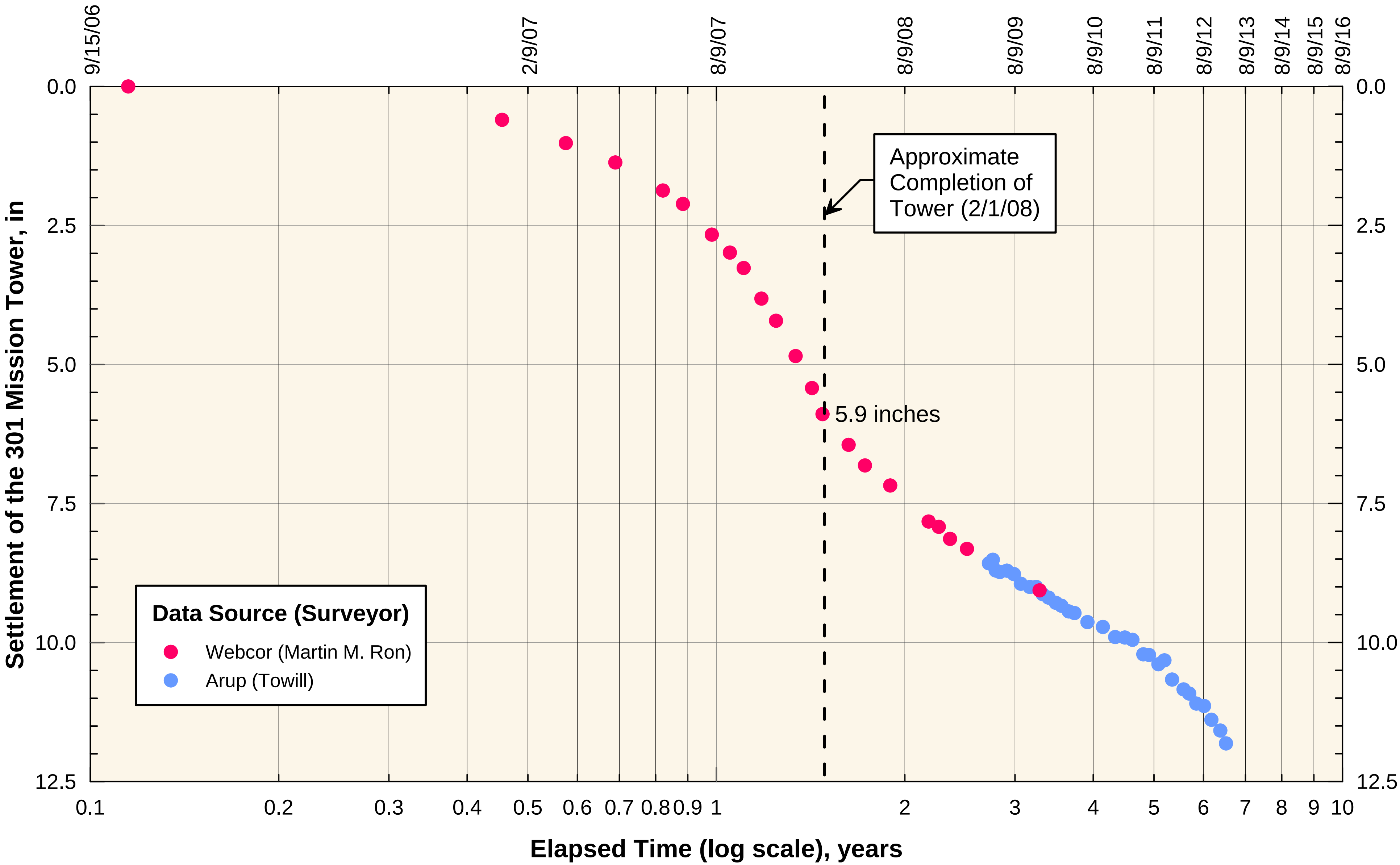
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2013

ARUP

PLATE 5

\\global.arup.com\americas\Jobs\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\204 301 Mission - Feb 2013 Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2013

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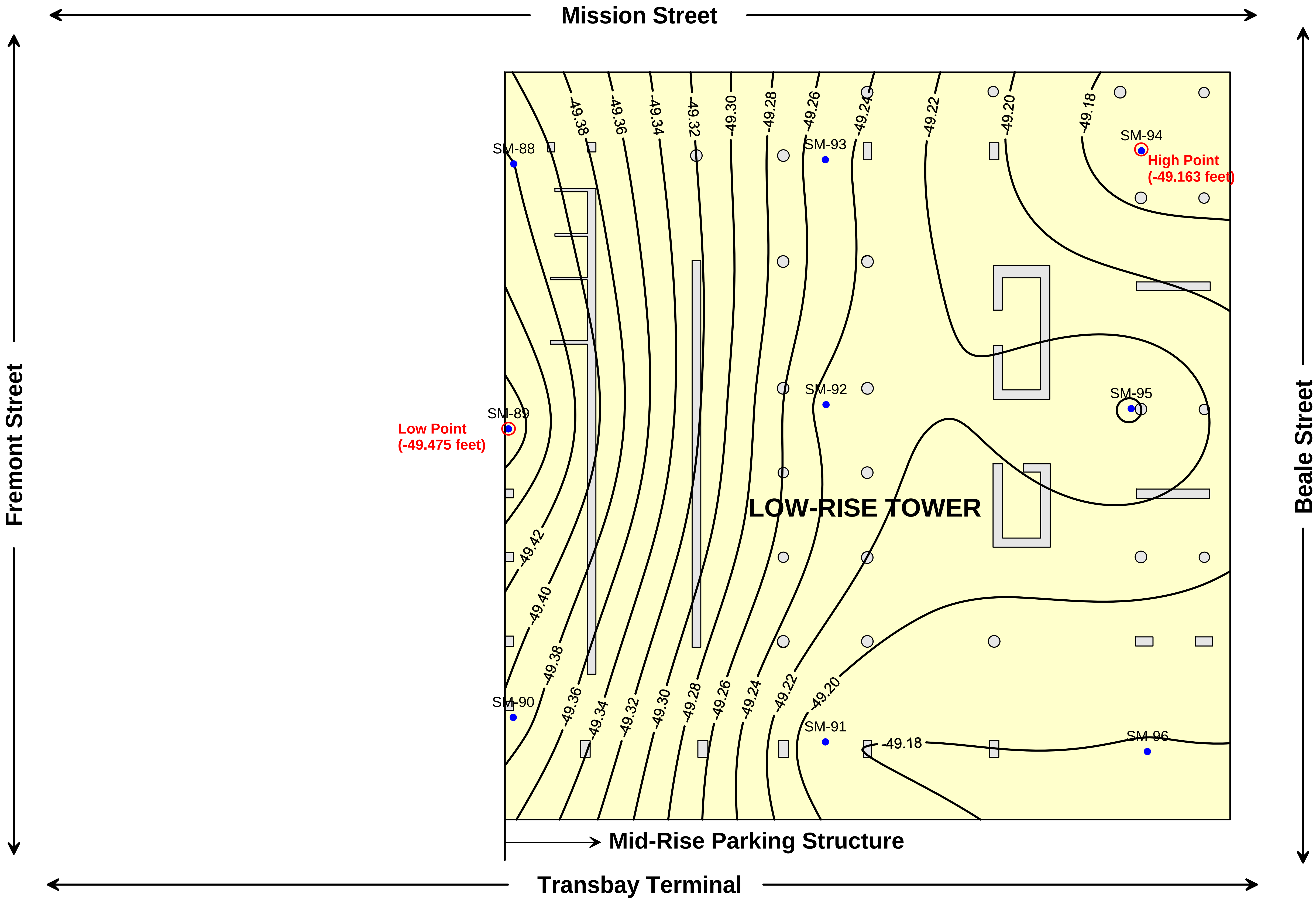
PLATE 6

\\global.arup.com\americas\Jobs\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\204 301 Mission - Feb 2013 Survey\Plates\Plate 6 Tower Settlements.grf



Date of Survey Reading:
February 13, 2013

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.311 feet (3.734 inches)

N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on February 13, 2013.

FLOOR ELEVATION AT BASEMENT LEVEL B-5 OF 301 MISSION PROPERTY: FEBRUARY 13, 2013 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2013

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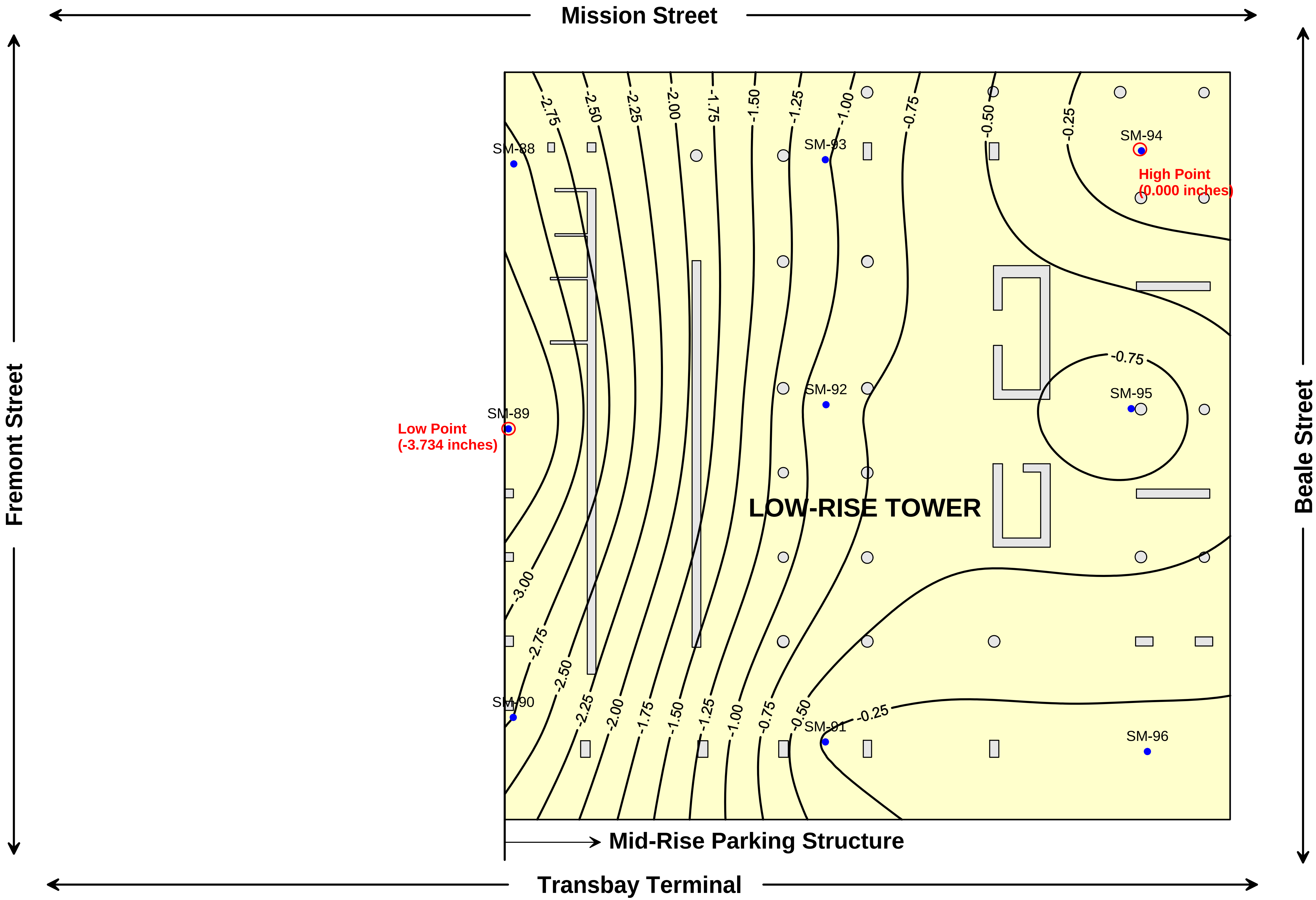
PLATE 7

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\204 301 Mission - Feb 2013 Survey\Plates\B-5 Elevations (2013.02.13).srf



Date of Survey Reading:
February 13, 2013

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.311 feet (3.734 inches)

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on February 13, 2013.

0 25 50 75
Approximate Scale: 1" = 25'

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
AT BASEMENT LEVEL B-5: FEBRUARY 13, 2013 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

March 2013

ARUP

PLATE 8

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\204 301 Mission - Feb 2013 Survey\Plates\B-5 Differential Elevations (2013.02.13).srf

Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date**	April 15, 2013
Copies	Robert Beck (TJPA) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/SMM
From	Stephen McLandrich (Arup) Andrew Yeskoo (Arup)	**File reference**	4-05 205
Subject	Transbay Transit CenterInternal 301 Mission Readings	**Page** 1 **of** 2	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum presents the utility crossing and tiltmeter readings collected to date. Arup has installed digital monitoring devices on utilities which may be affected by differential building settlements. This monitoring uses tiltmeters and linear potentiometers on a rigid rod that spans between two fixed points, monitoring the movement with respect to each other. These devices allow empirical interpretation of the movement. In addition to these utility crossing monitor points, an additional ten (10) tiltmeters were installed directly onto the interior face of the exterior walls to measure tilt of the walls.

Ten utility crossing monitoring devices (UC-01 through UC-05, and UC-07 through UC-11) are installed in the 301 Mission basement on the Mission Street side of the building. Tables 1 and 2 present a summary of both the 2-dimensional and 3-dimensional utility crossing devices. Plate 1 is an illustration which shows the location of the utility crossing devices. Plates 2 through 7 show the movement convention and data for the 2-dimensional utility crossing devices. Plates 8 through 12 show the movement convention and data for the 3-dimensional utility crossing devices. The tilt values shown in this memo are relative tilt based on the initial tilt readings. Please note: UC-11 was damaged during maintenance unrelated to our instrumentation monitoring and has been removed from this memo. Baseline corrections were performed in the data sets of UC-01, UC-03, UC-07 and UC-09 to remove erroneous jumps in the readings, the dates of which are recorded on the plots.

Ten tiltmeters are installed in the 301 Mission basement on the Mission Street, Freemont Street, and Transbay Transit Center sides of the building. The locations of the tiltmeters is presented on Plate 13. Plates 14 through 17 show the data for the installed tiltmeters.

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Table 2 Summary of 3-Dimensional Utility Crossing Devices

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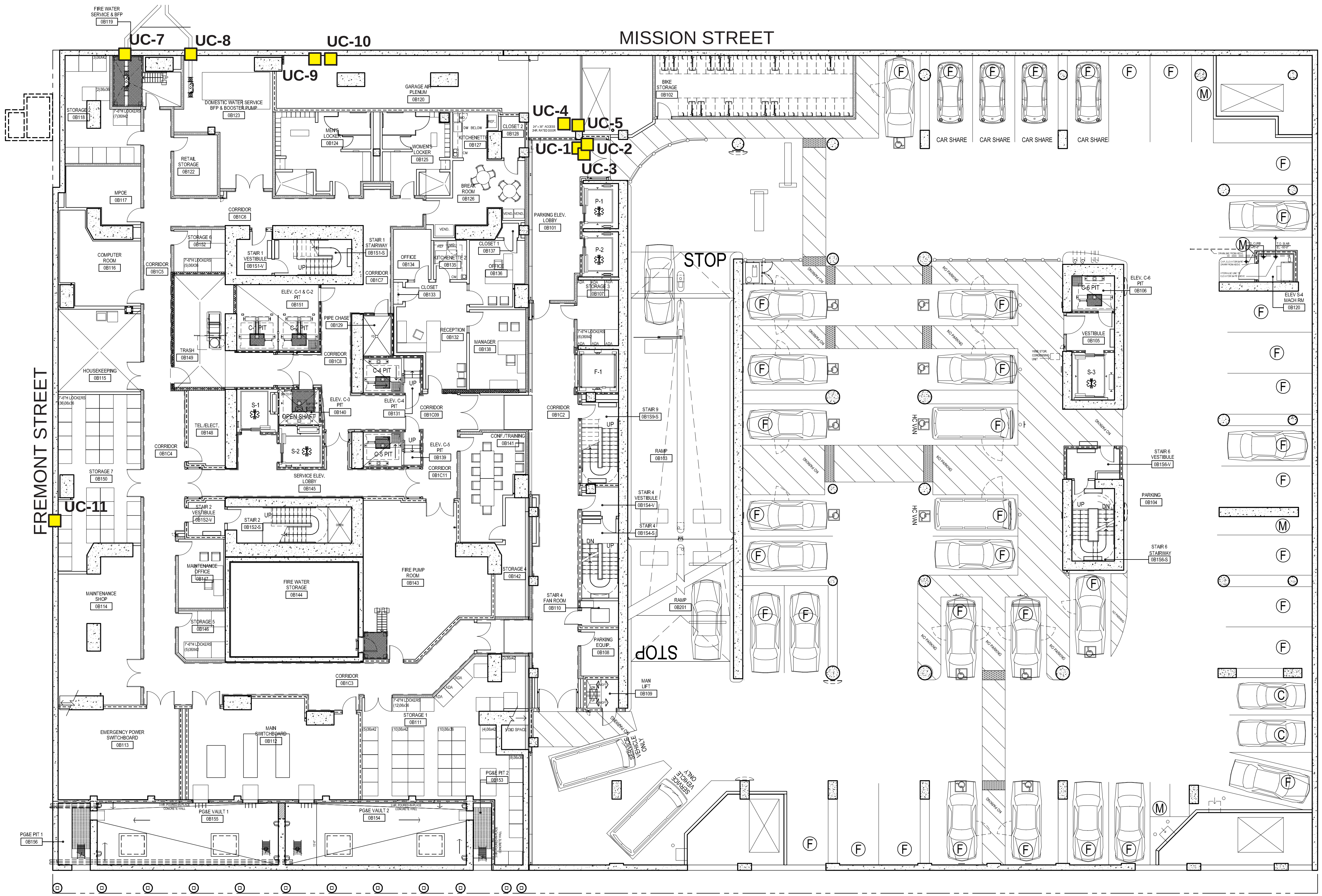
TABLE 1 SUMMARY OF 2-DIMENSIONAL UTILITY CROSSING DEVICES							
Gauge	Type	Location	Gauge Length (in)	X-axis		Y-axis	
				Linear Potentiometer ID	Type	Tiltmeter ID	Serial Number
UC-1	2-D	4" Gas (westen flexible joint)	31.5	LP-301-UX01	2inch/2.5v	TL-301-UY-01	003735RC
UC-2	2-D	4" Gas (eastern flexible joint)	32.1	LP-301-UX02	2inch/2.5v	TL-301-UY-02	913305RC
UC-3	2-D	Water	28.0	LP-301-UX03	2inch/2.5v	TL-301-UY-03	913207RC
UC-4	2-D	Fire	71.0	LP-301-UX04	2inch/2.5v	TL-301-UY-04	1005002RC
UC-5	2-D	Fire	71.0	LP-301-UX05	2inch/2.5v	TL-301-UY-05	1005006RC

TABLE 2
SUMMARY OF 3-DIMENSIONAL UTILITY CROSSING DEVICES

Gauge	Type	Location	Gauge Length (in)	X-axis		Y-axis		Z-axis	
				Tiltmeter ID	Serial Number	Linear Potentiometer ID	Type	Tiltmeter ID	Serial Number
UC-7	3-D	Fire	41.3	TL-301-UX-07	003733RC	LP-301-UY07	2inch/2.5v	TL-301-UZ-07	913312RC
UC-8	3-D	Domestic	109.5	TL-301-UX-08	1005008RC	LP-301-UY08	2inch/2.5v	TL-301-UZ-08	913203RC
UC-9	3-D	Storm	96.0	TL-301-UX-09	913302RC	LP-301-UY09	2inch/2.5v	TL-301-UZ-09	1005001RC
UC-10	3-D	Storm	94.4	TL-301-UX-10	003727RC	LP-301-UY10	2inch/2.5v	TL-301-UZ-10	1005005RC
UC-11*	3-D	Storm	35.4	TL-301-UX-11	913208RC	LP-301-UY11	2inch/2.5v	TL-301-UZ-11	913307RC

* UC-11 was damaged during utility maintenance and is not included in this memo



LEGEND

Utility Displacement Gauge
Mounted on the utility conduit

LOCATION OF UTILITY CROSSING MONITORING:
301 MISSION STREET BASEMENT LEVEL B-1

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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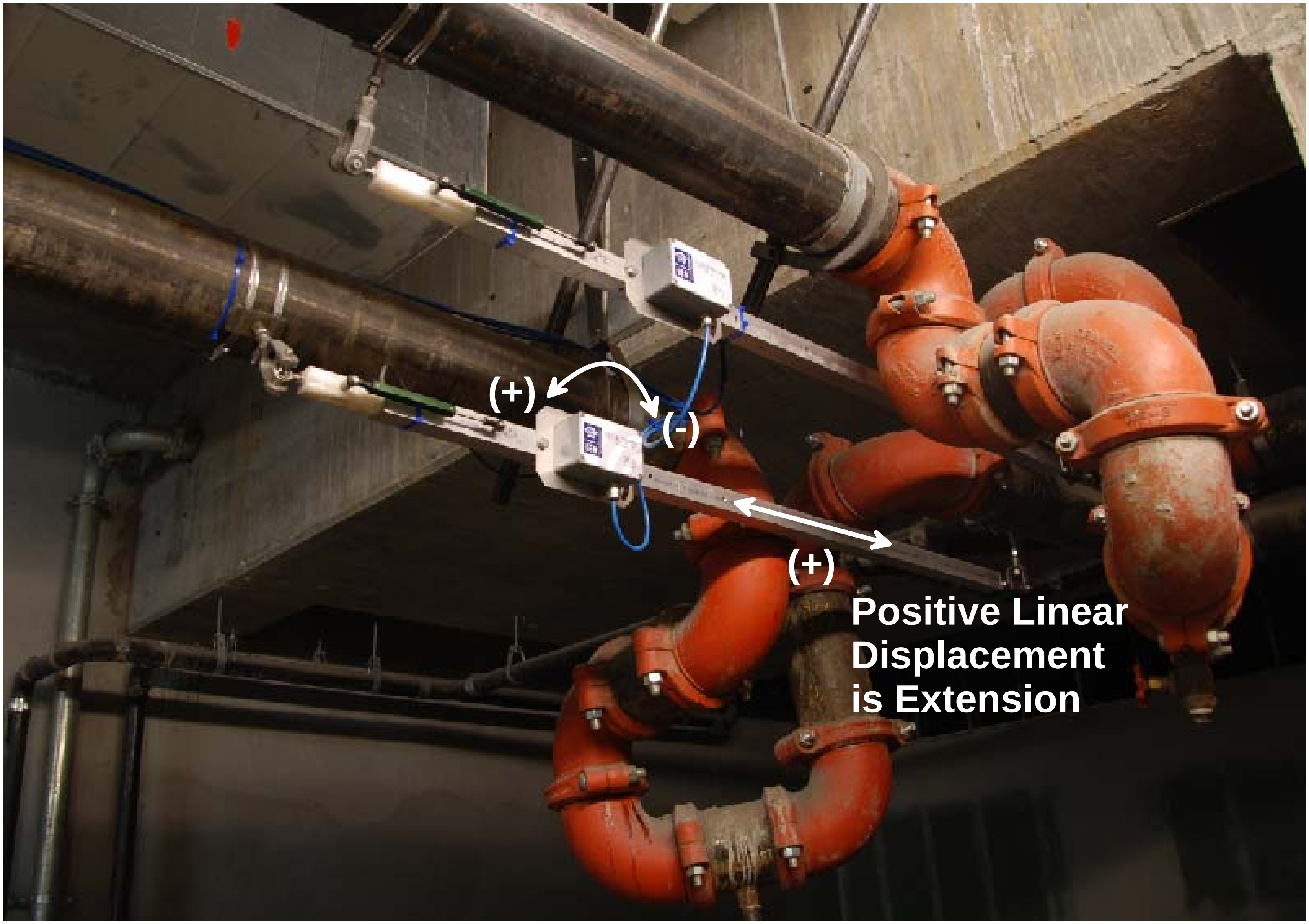
PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Utility Crossing\Plates\Plate 1 Utility Crossings.ai



Positive Tilt represents rotation of the utility crossing device counter-clockwise as the instrument face is observed.

Positive Linear Displacement represents extension between the two fixed points.

MOVEMENT CONVENTION FOR 2-DIMENSIONAL UTILITY CROSSING MONITORING DEVICE

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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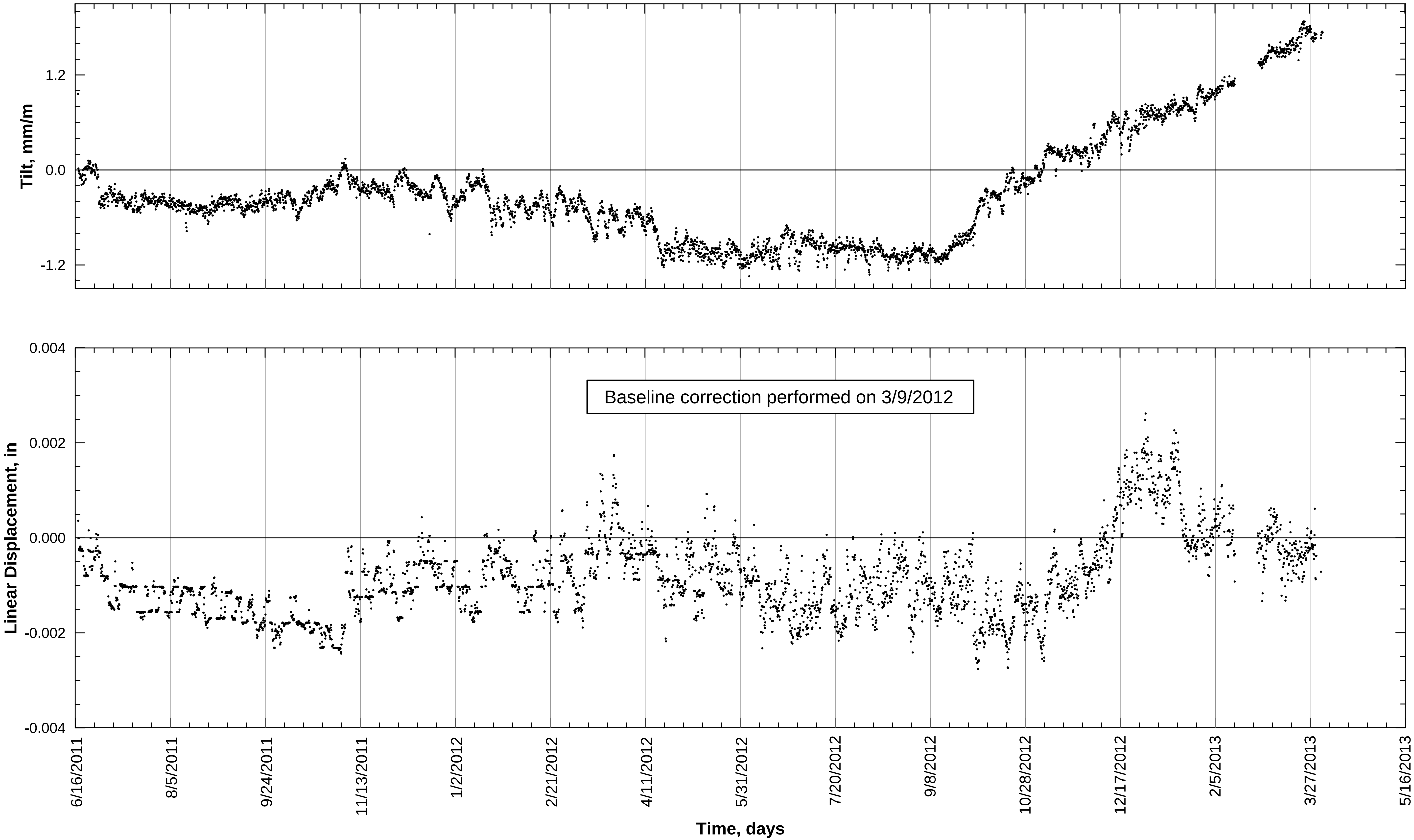

UTILITY CROSSING MONITORING DATA: UC-01

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
April 2013 San Francisco, California

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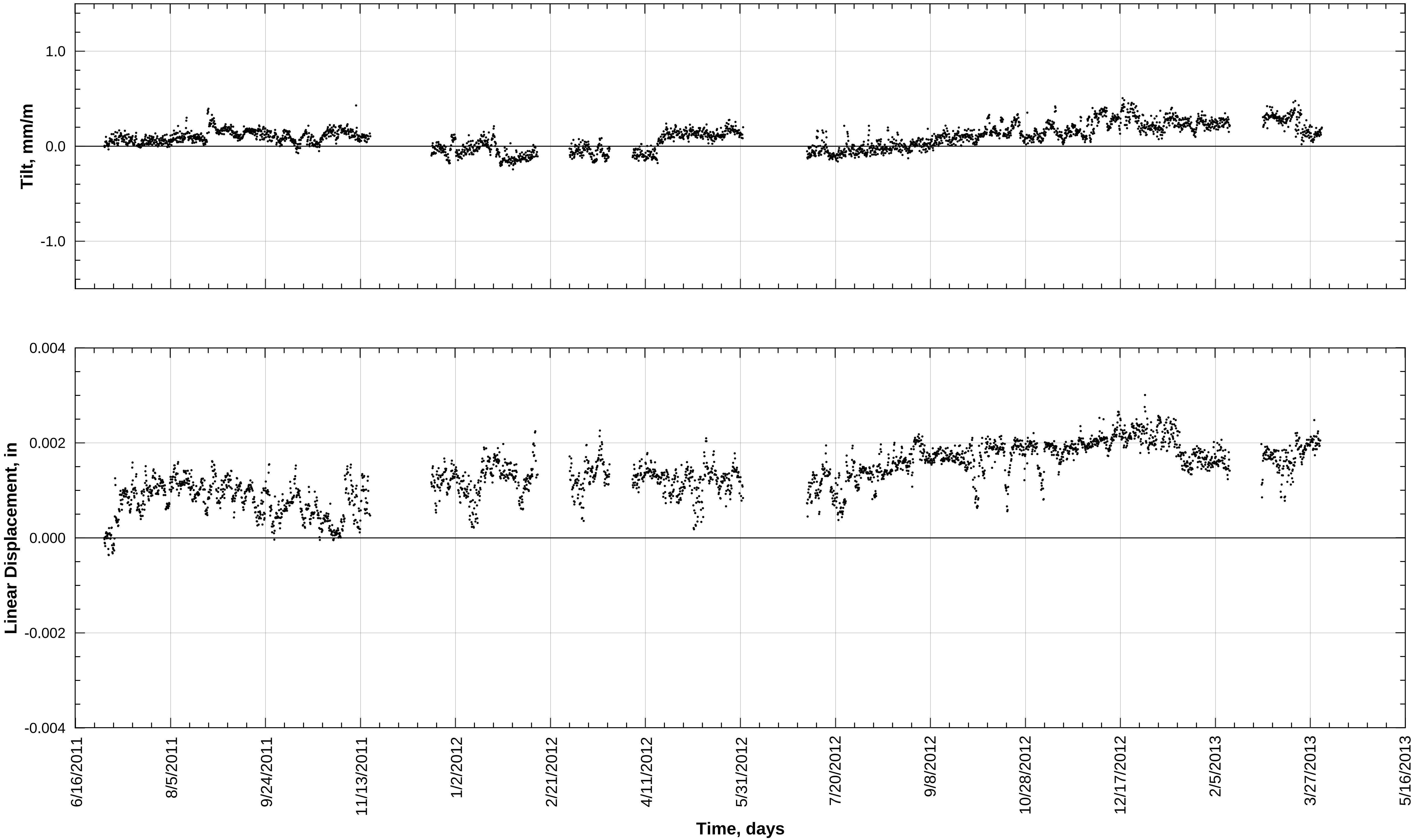
PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Utility Crossing\Plates\Plate 3 UC-01.grf



UTILITY CROSSING MONITORING DATA: UC-02

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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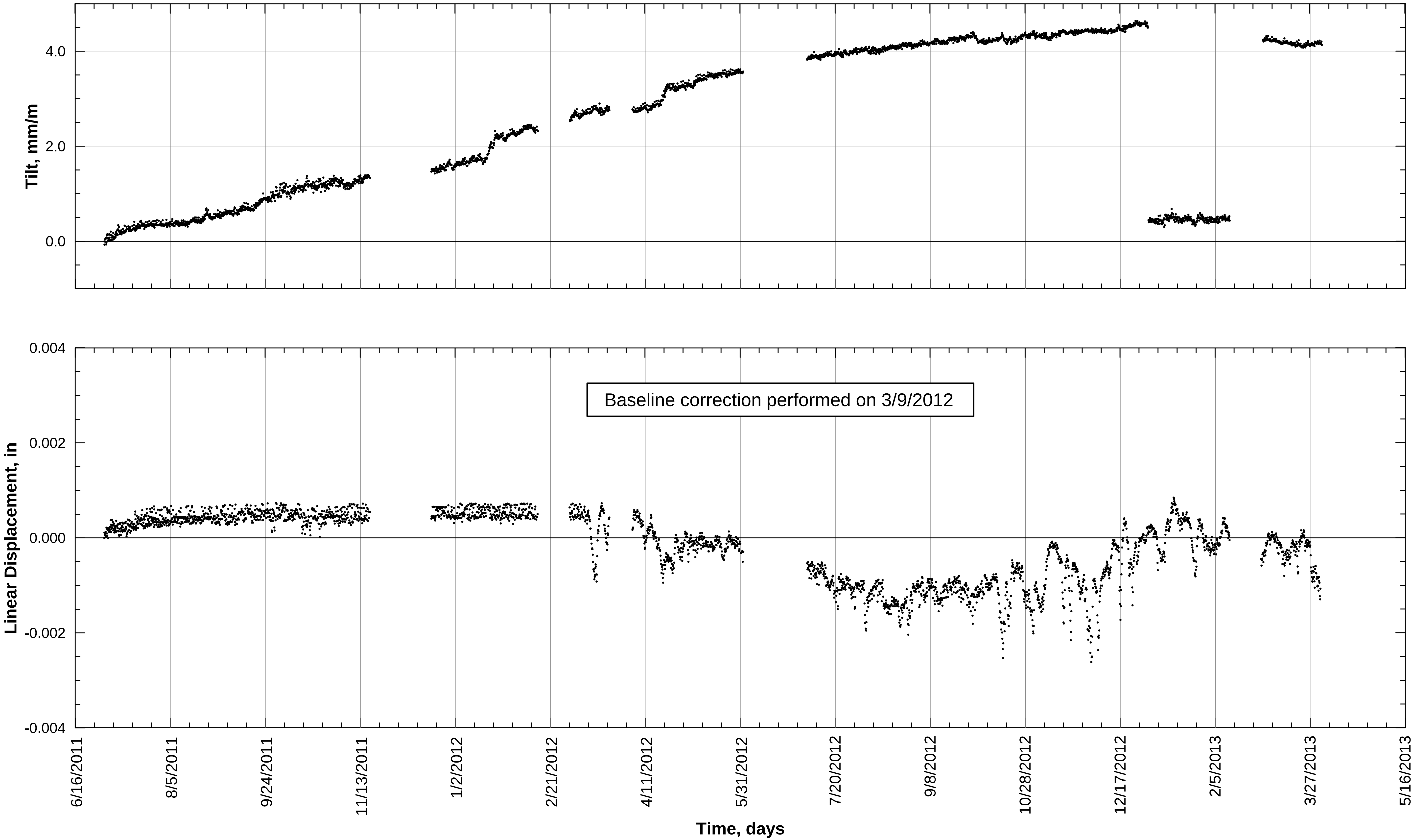
PLATE 4



UTILITY CROSSING MONITORING DATA: UC-03

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
April 2013 San Francisco, California

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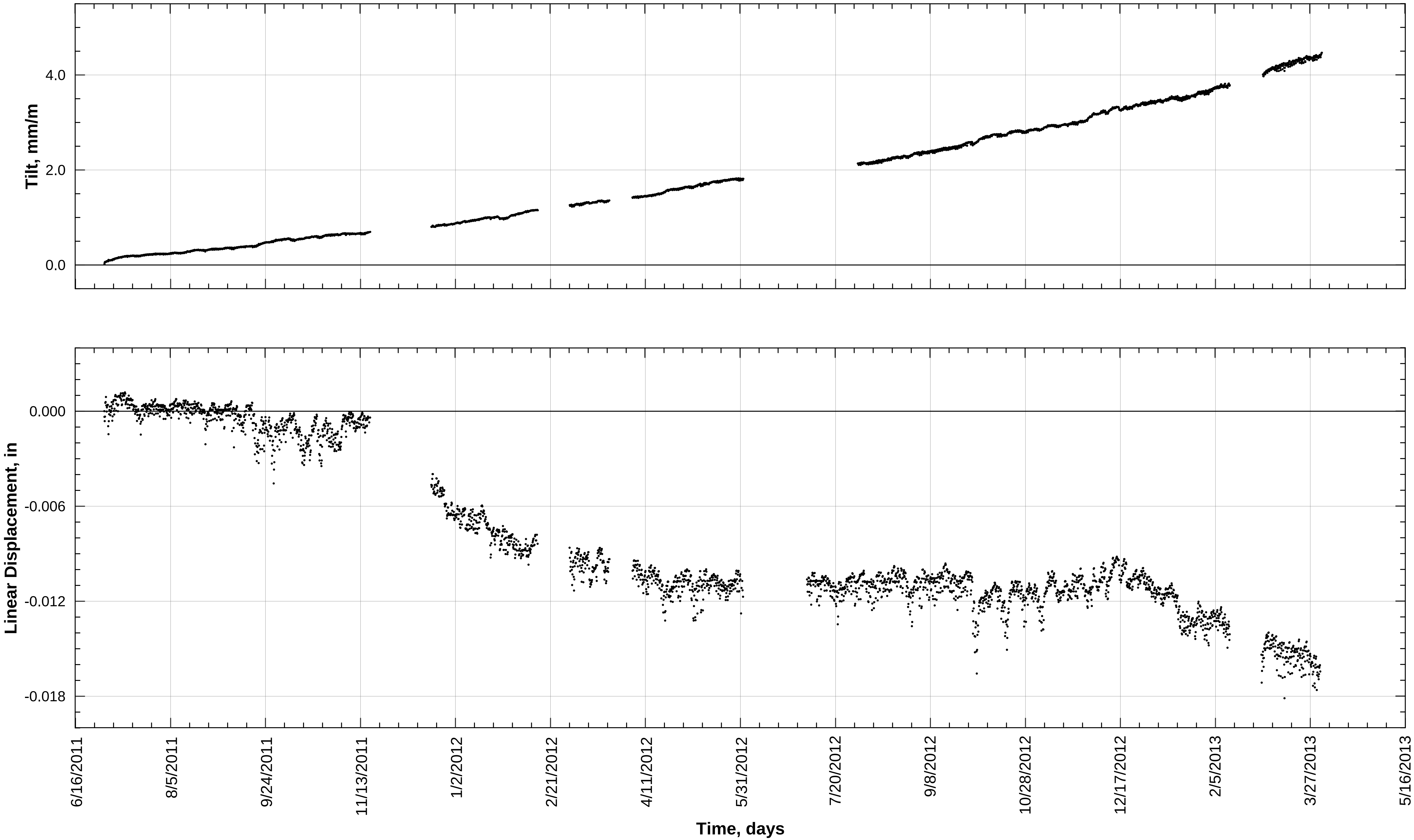
PLATE 5



UTILITY CROSSING MONITORING DATA: UC-04

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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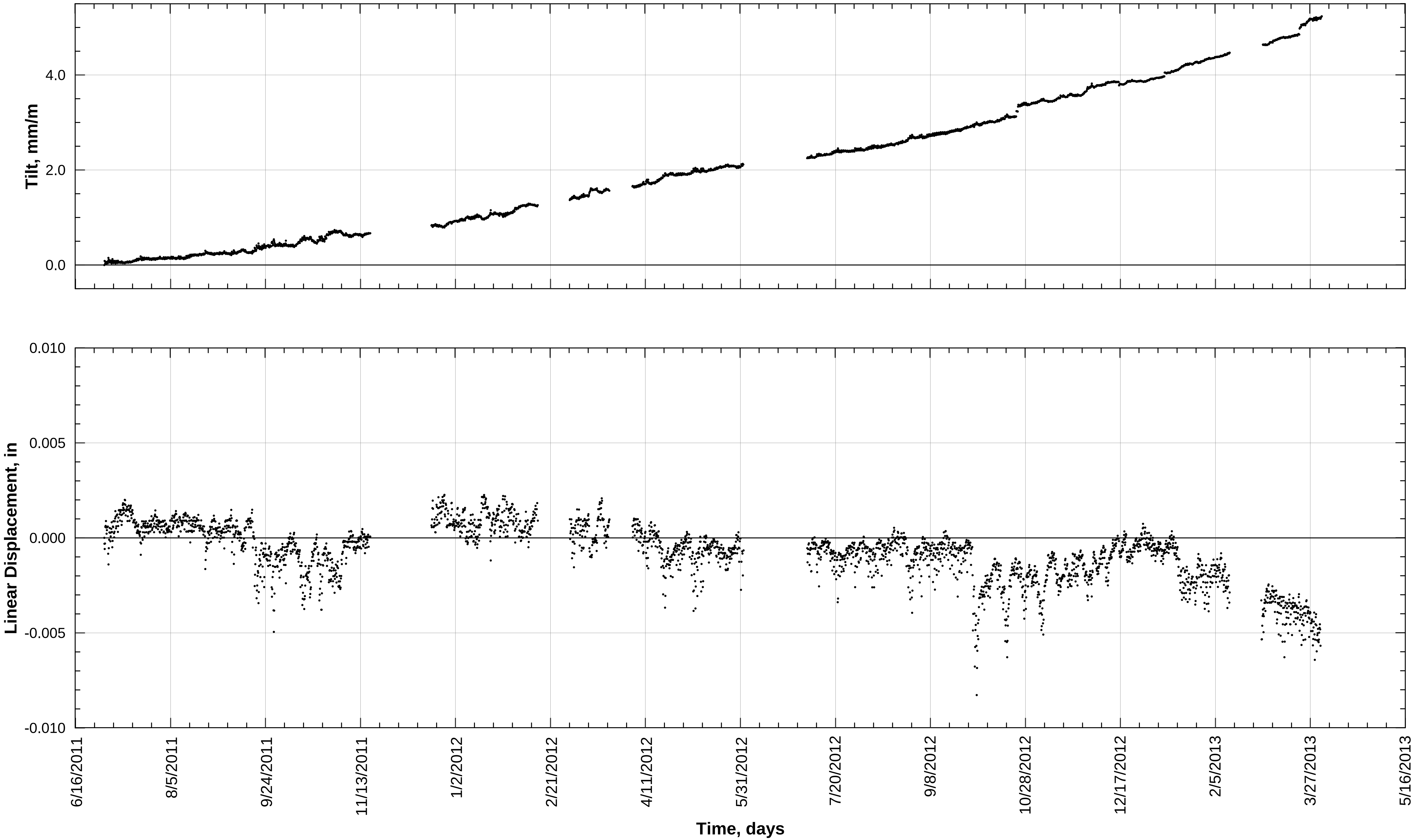
PLATE 6

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Utility Crossing\Plates\Plate 6 UC-04.grf



UTILITY CROSSING MONITORING DATA: UC-05

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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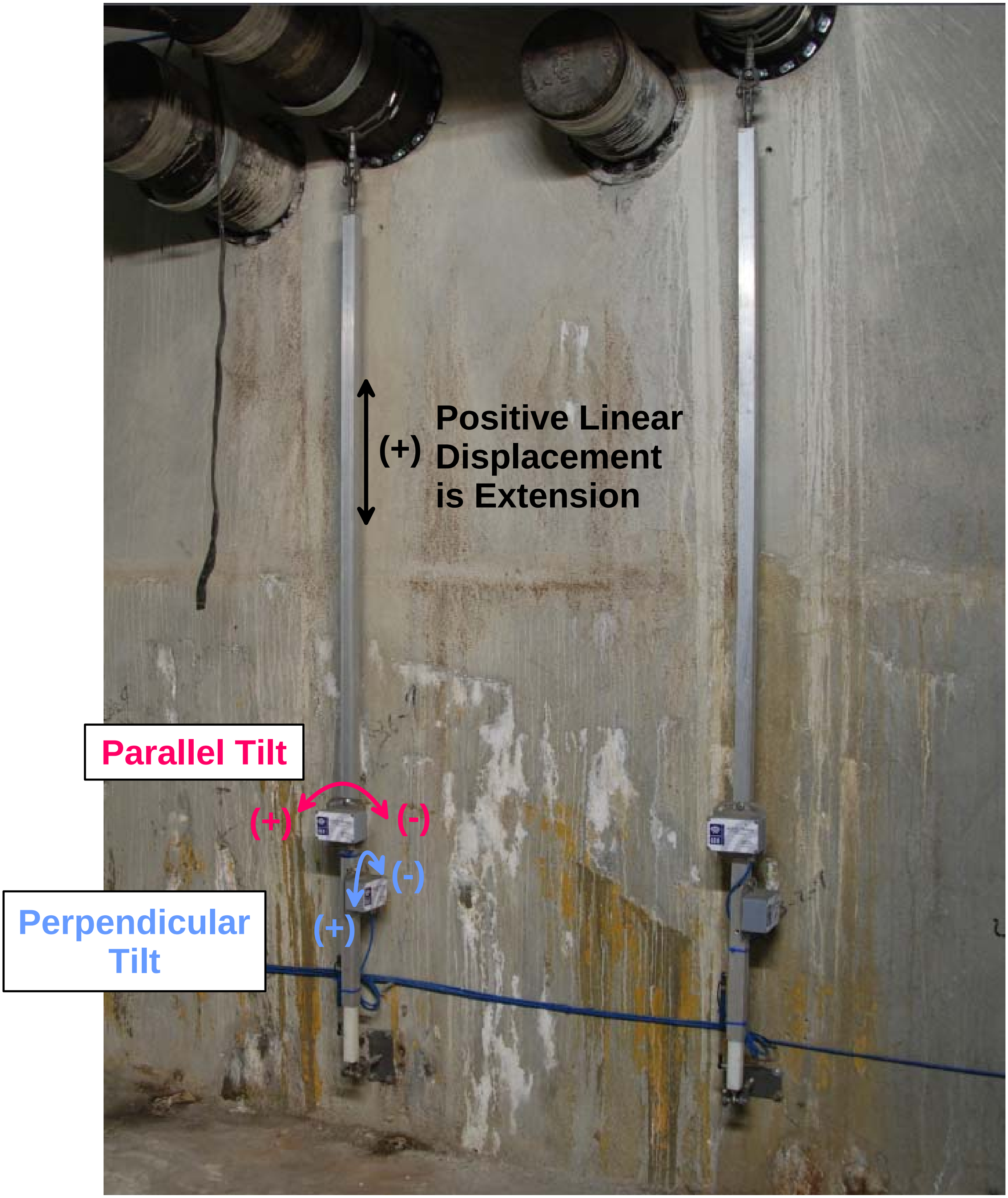
PLATE 7



Parallel Tilt is in the direction of the wall.

Perpendicular Tilt is perpendicular to the plan of the wall.

Positive Linear Displacement represents extension between the two fixed points.

MOVEMENT CONVENTION FOR 3-DIMENSIONAL UTILITY CROSSING MONITORING DEVICE

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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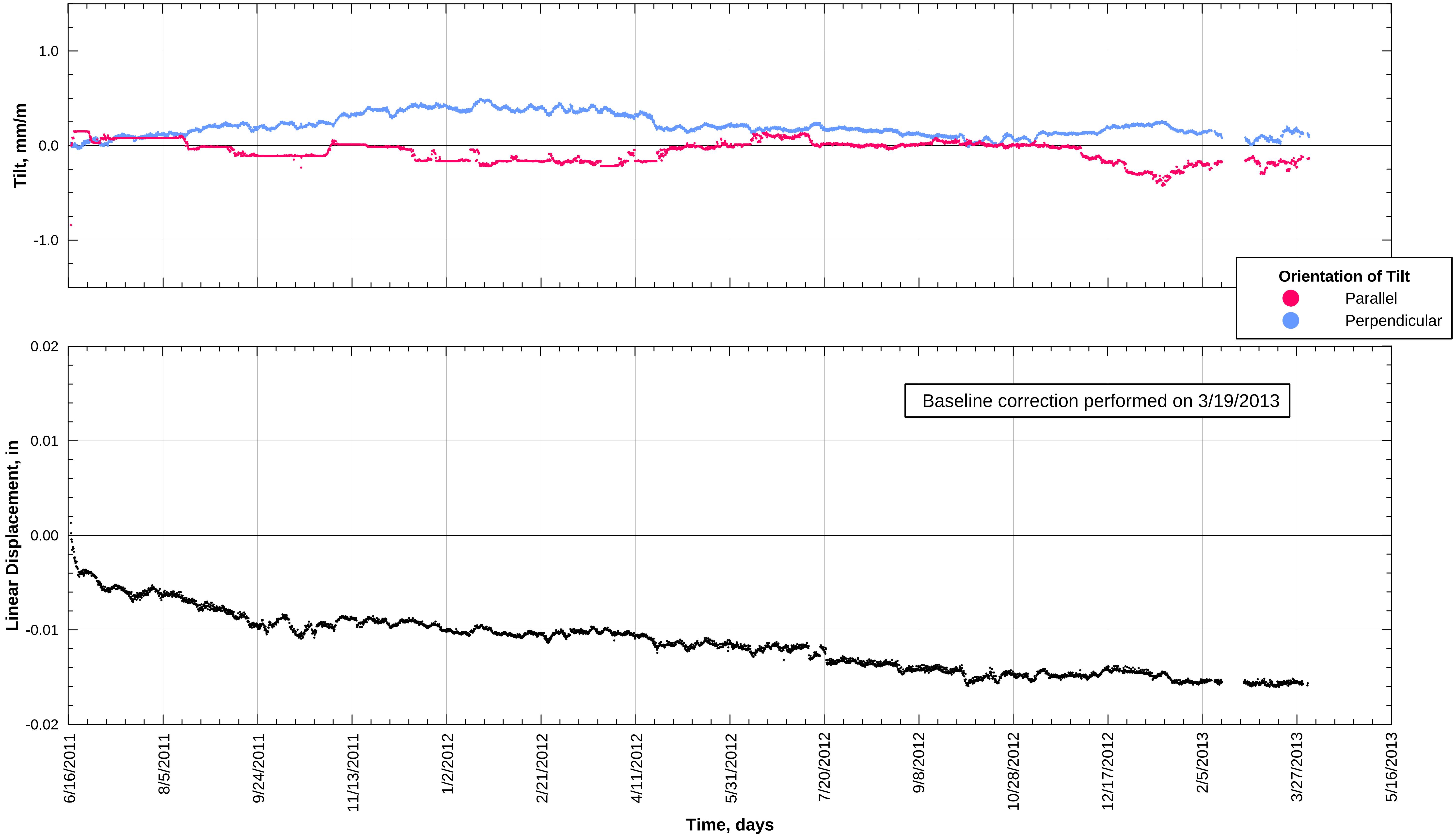
PLATE 8

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Plates\Plate 8 3-D Convention.grf



UTILITY CROSSING MONITORING DATA: UC-07

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
April 2013 San Francisco, California

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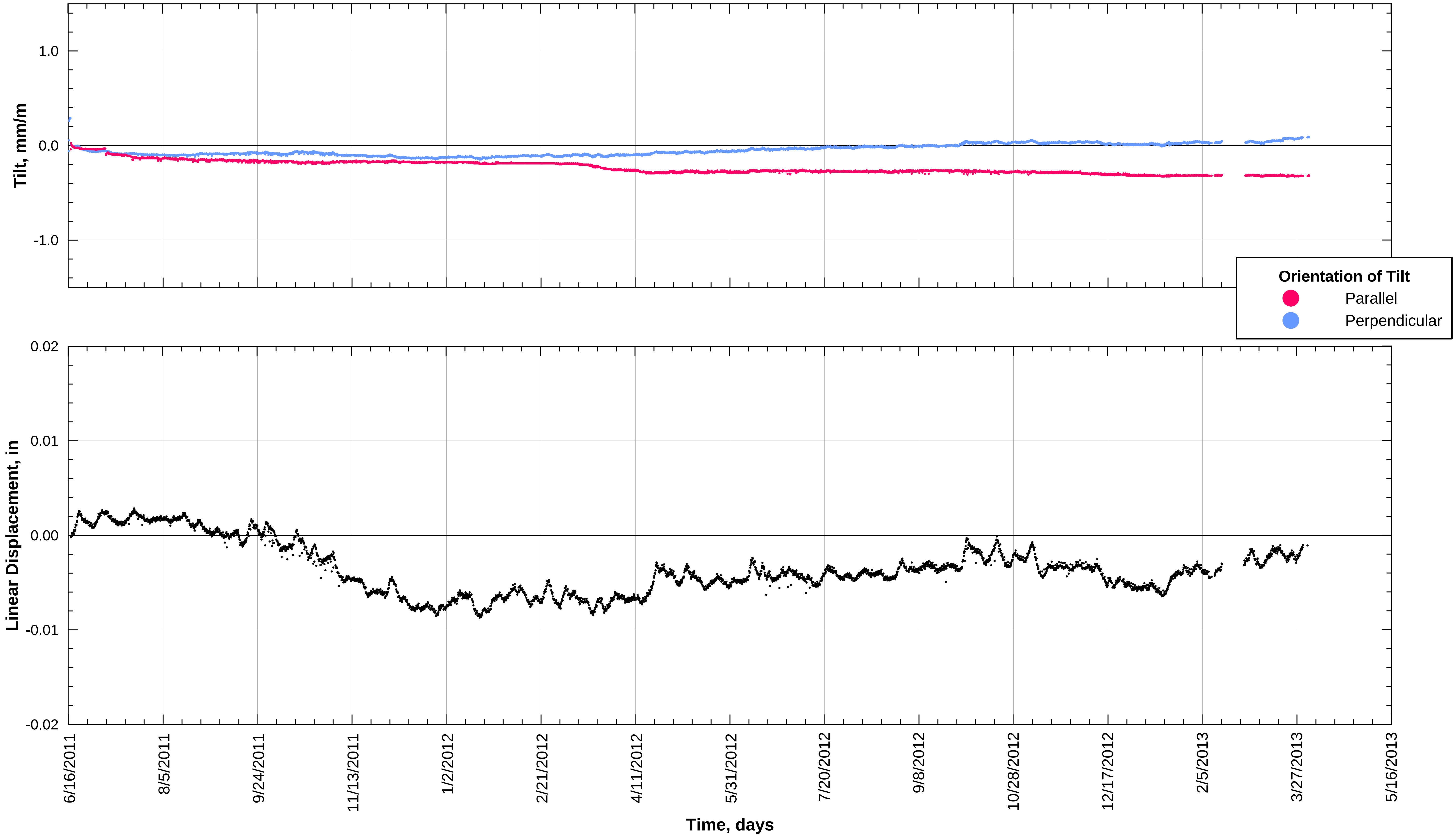
PLATE 9



UTILITY CROSSING MONITORING DATA: UC-08

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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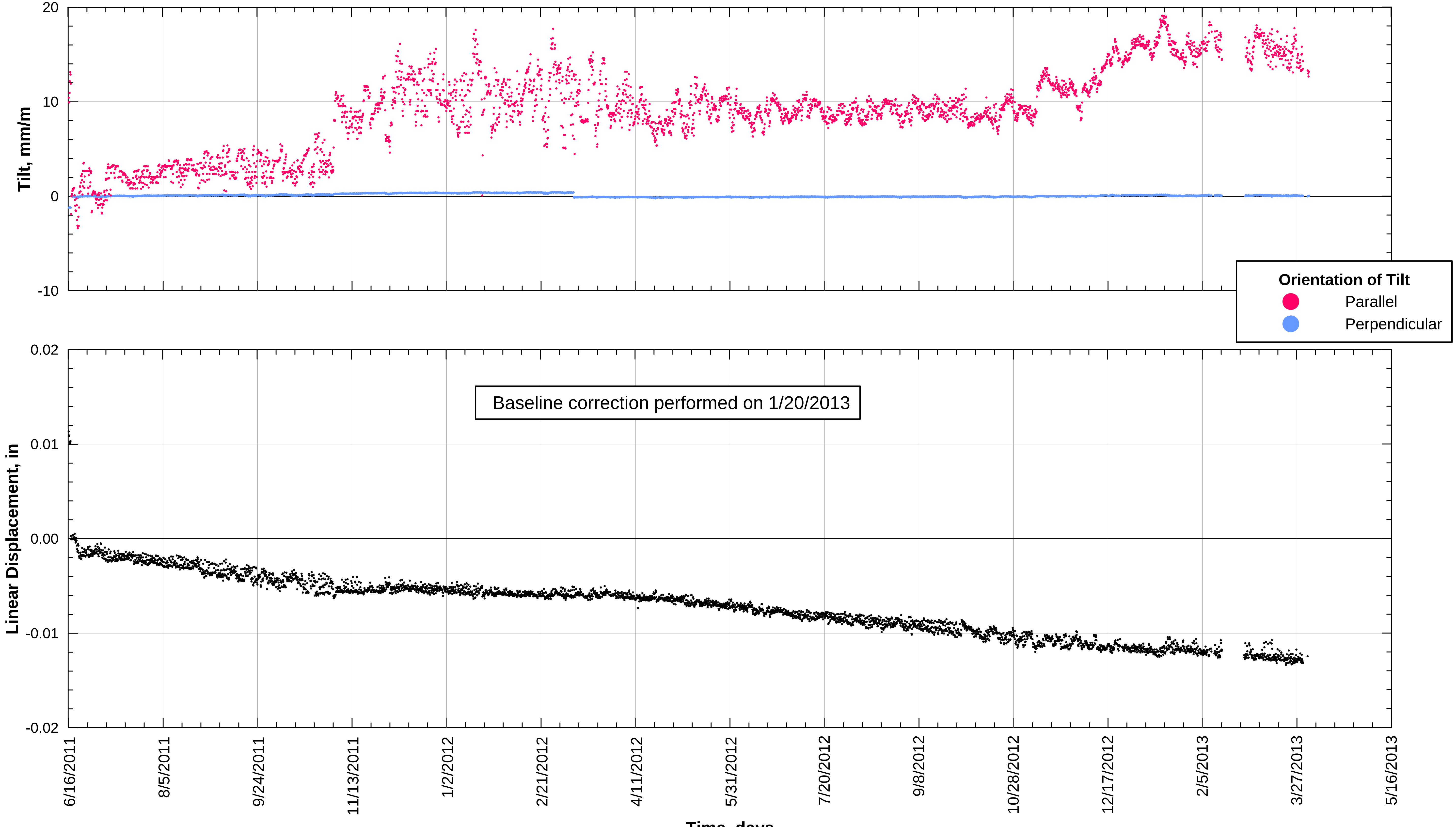
PLATE 10

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Utility Crossing\Plates\Plate 10 UC-08.grf



UTILITY CROSSING MONITORING DATA: UC-09

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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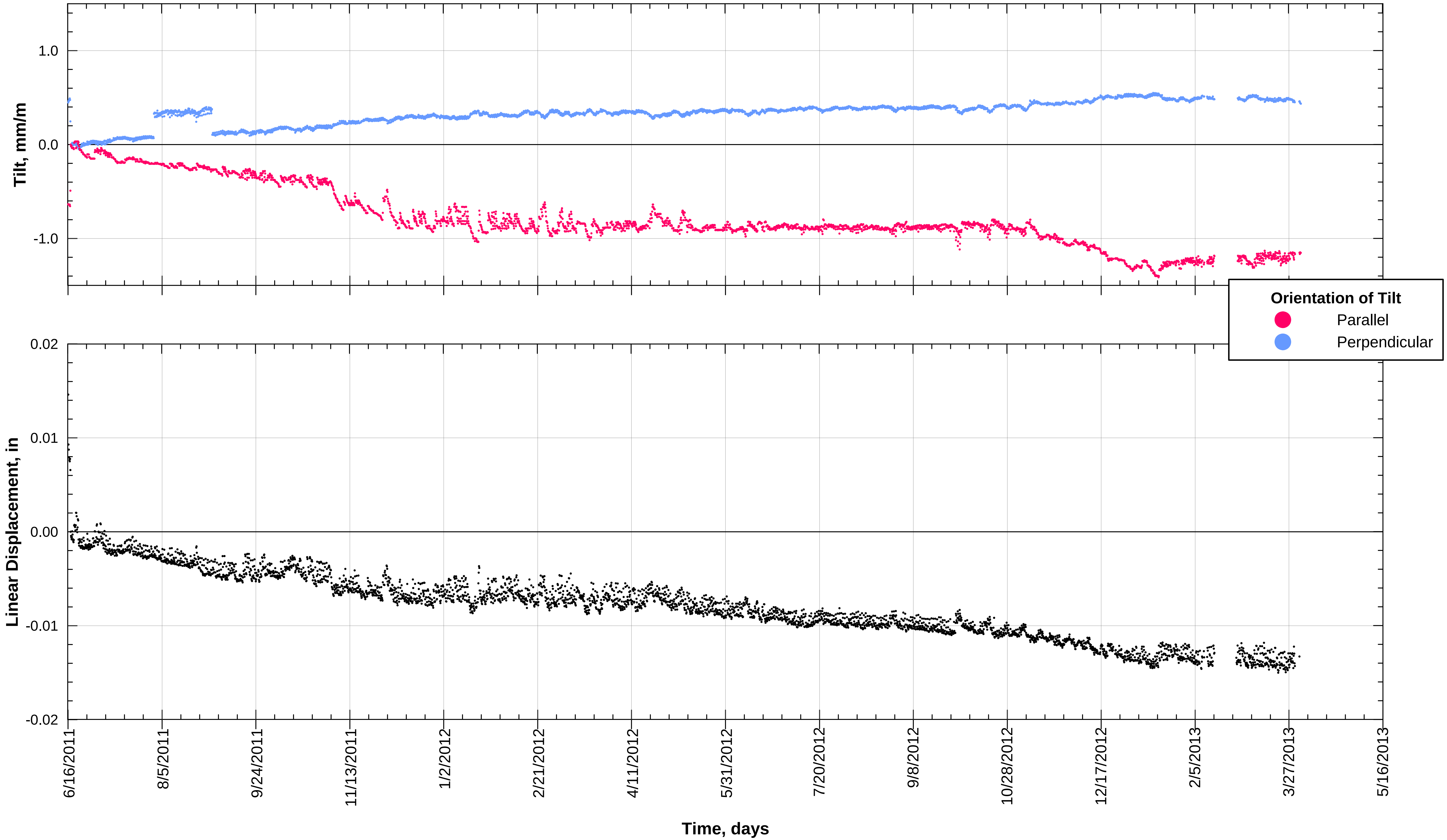
PLATE 11

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Utility Crossing\Plates\Plate 11 UC-09.grf



UTILITY CROSSING MONITORING DATA: UC-10

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
April 2013 San Francisco, California

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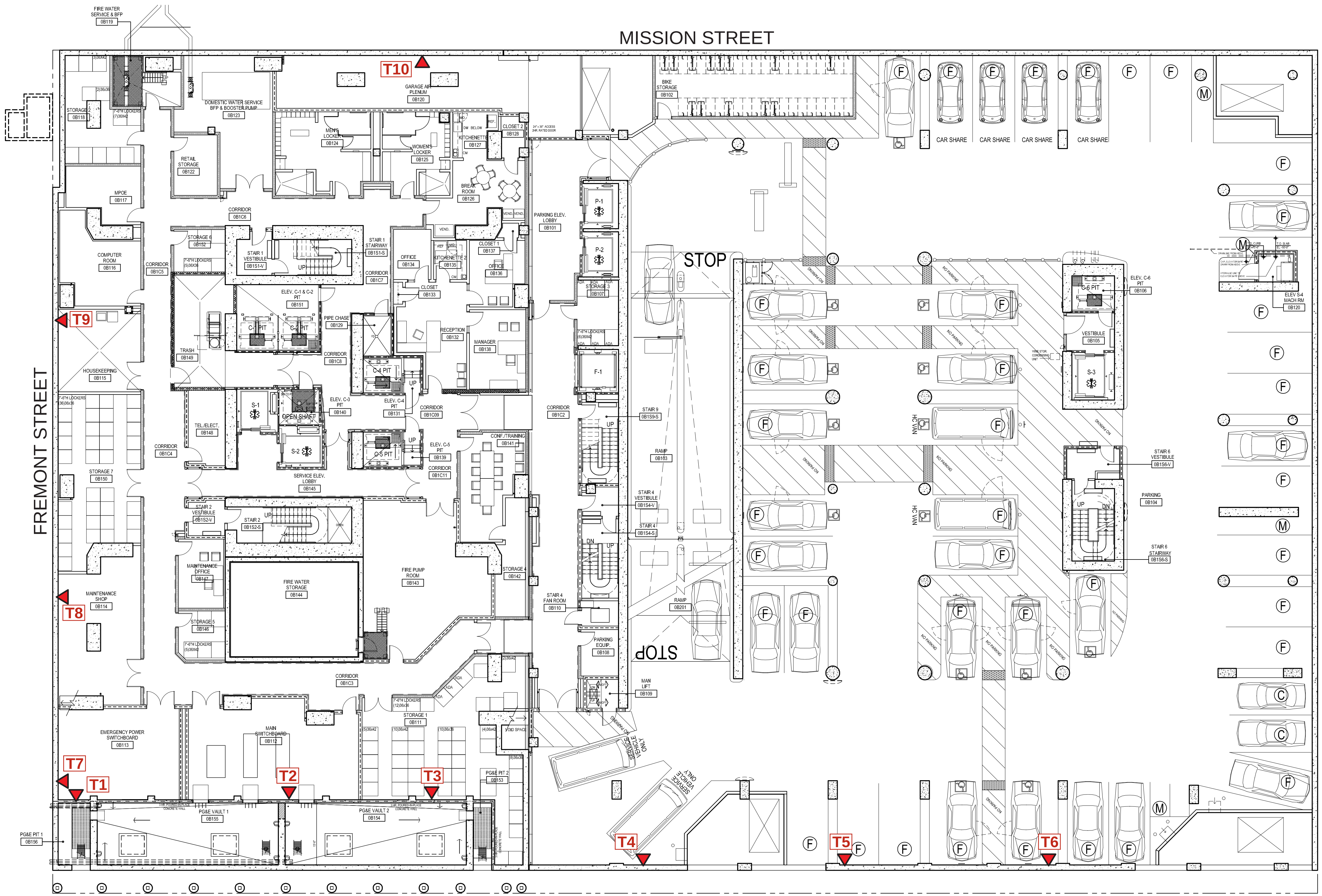
PLATE 12

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Utility Crossing\Plates\Plate 12 UC-10.grf



LEGEND

- Tiltmeters at Data Loggers (TM)
  Mounted on walls

LOCATION OF TILTMETERS:
301 MISSION STREET BASEMENT LEVEL B-1

Transbay Transit Center
301 Mission Monitoring - Tiltmeters
Transbay Joint Powers Authority
San Francisco, California

April 2013

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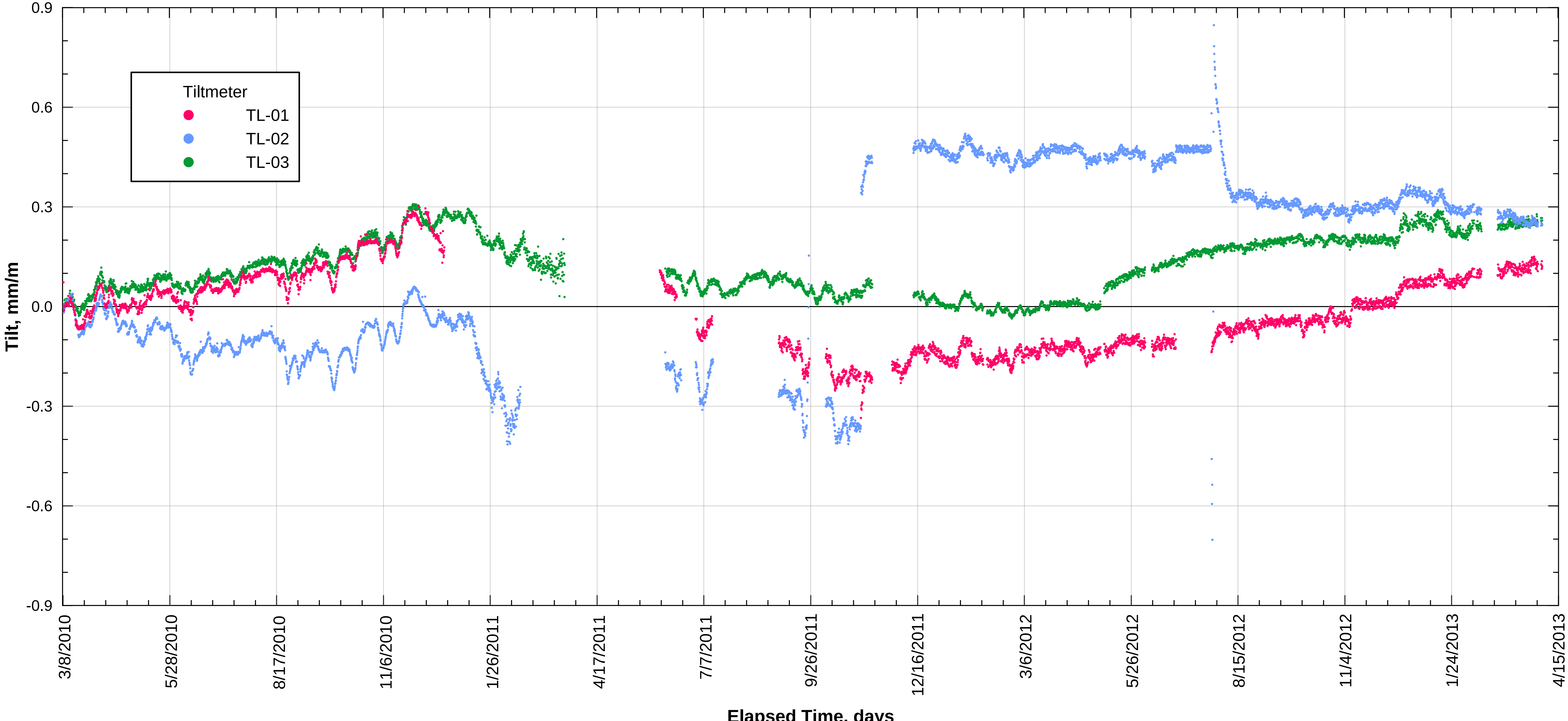
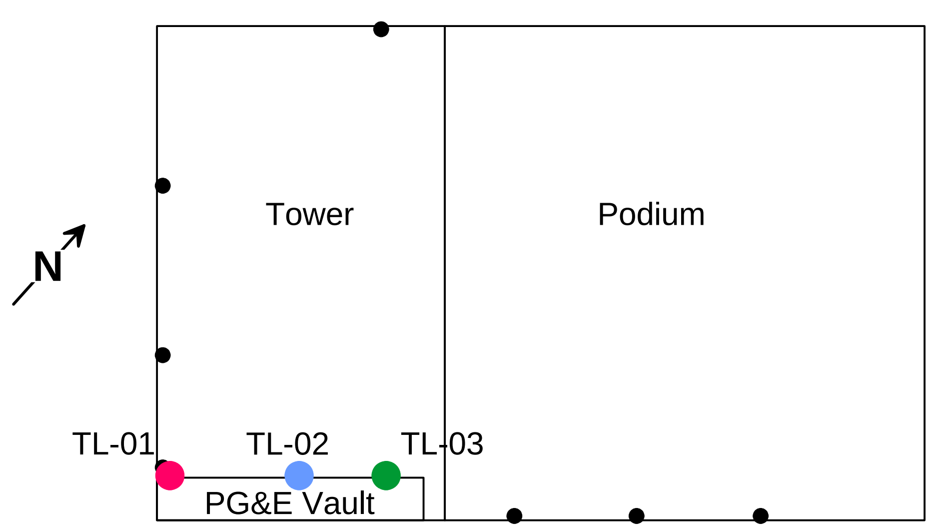
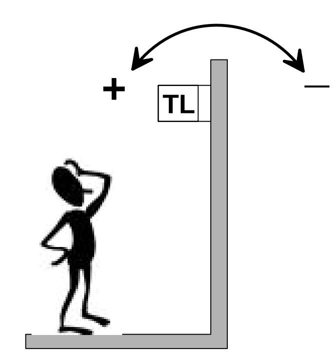
PLATE 13

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Tiltmeters\Plates\Plate 14 Tiltmeter Locations.ai







Positive tilt represents movement of the top of the wall towards the inside of the room.

TILT RECORDED IN TILTMETERS TL-01, TL-02, AND TL-03: BASEMENT LEVEL B-1

Transbay Transit Center
301 Mission Monitoring - Tiltmeters
Transbay Joint Powers Authority
San Francisco, California

April 2013

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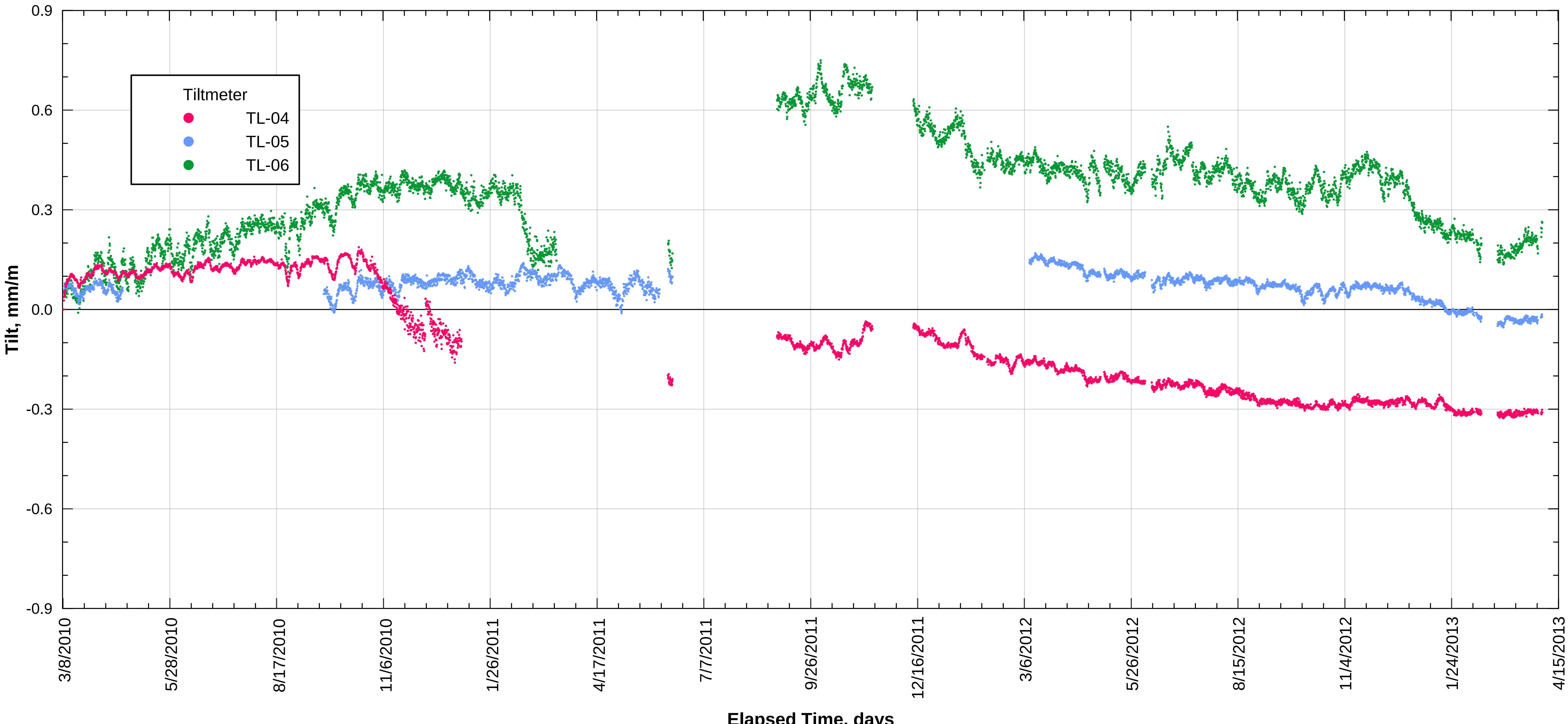
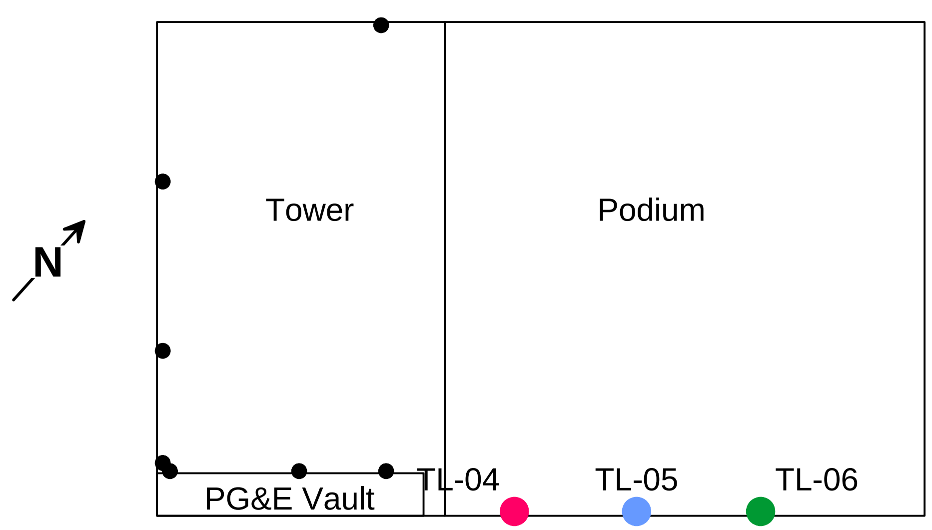
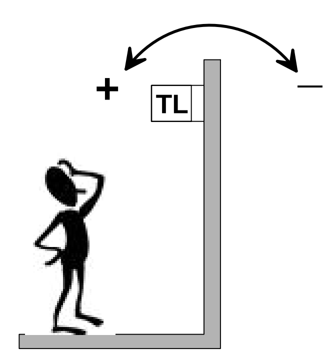
PLATE 14

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Utility Crossing\Plates\Plate 14.grf







Positive tilt represents movement of the top of the wall towards the inside of the room.

TILT RECORDED IN TILTMETERS TL-04, TL-05, AND TL-06: BASEMENT LEVEL B-1

Transbay Transit Center
301 Mission Monitoring - Tiltmeters
Transbay Joint Powers Authority
San Francisco, California

April 2013

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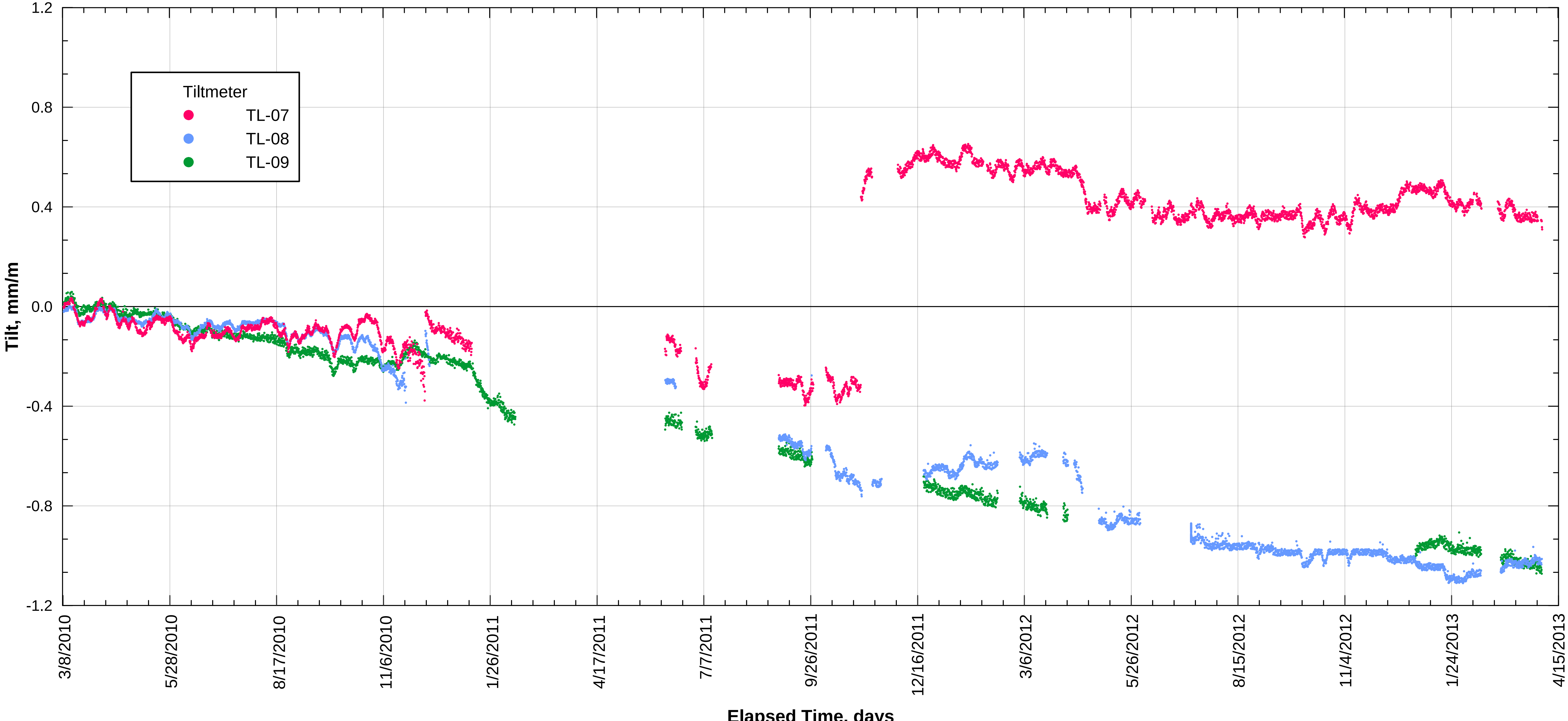
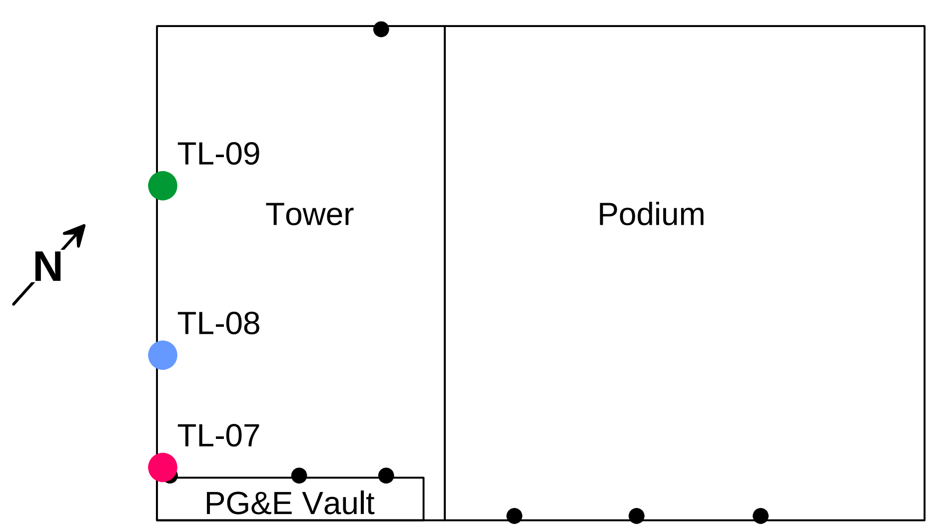
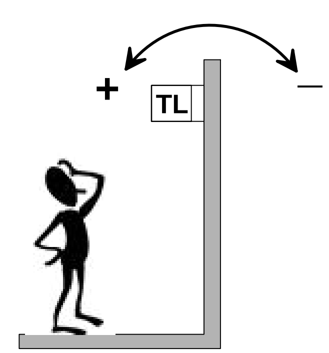
PLATE 15

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Tiltmeters\Plates\Plate 15.grf







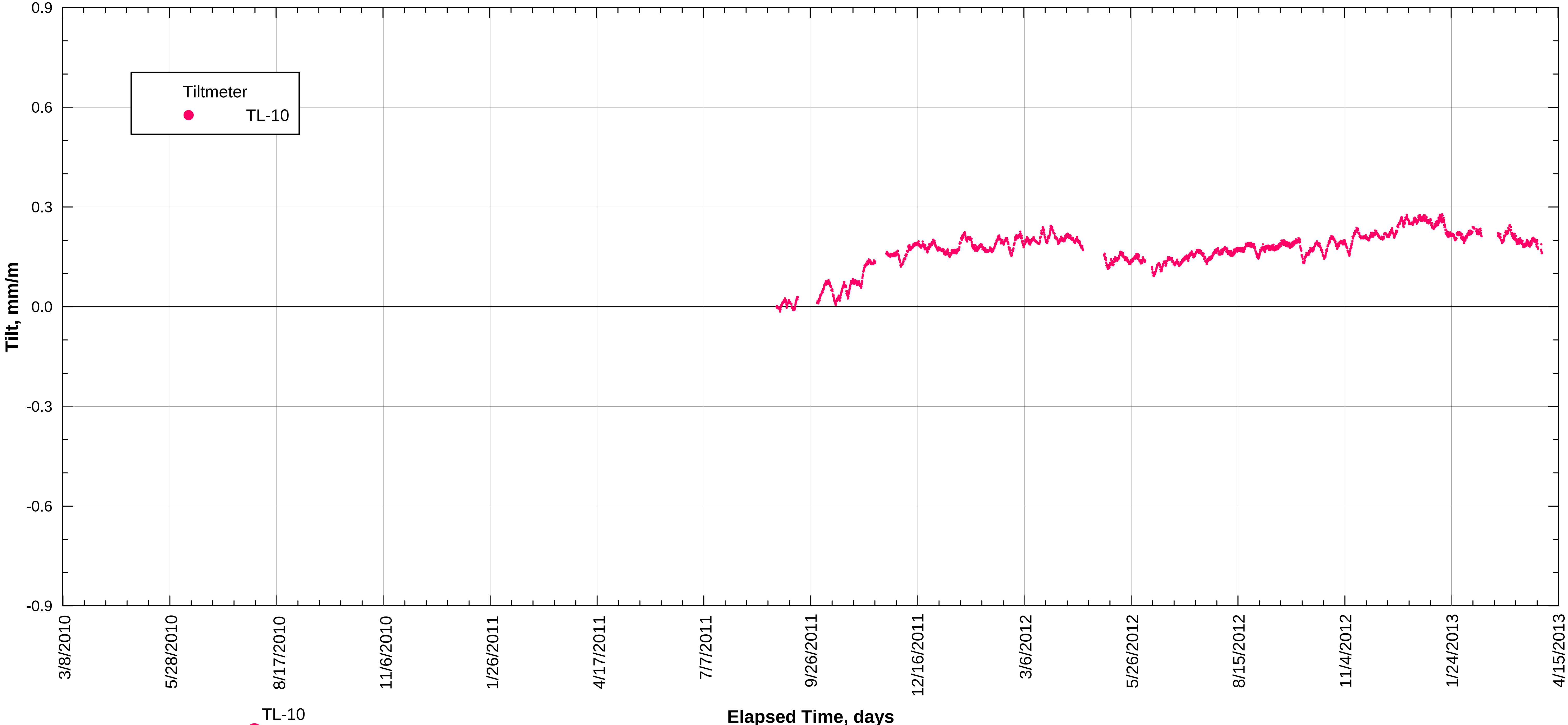
Positive tilt represents movement of the top
of the wall towards the inside of the room.

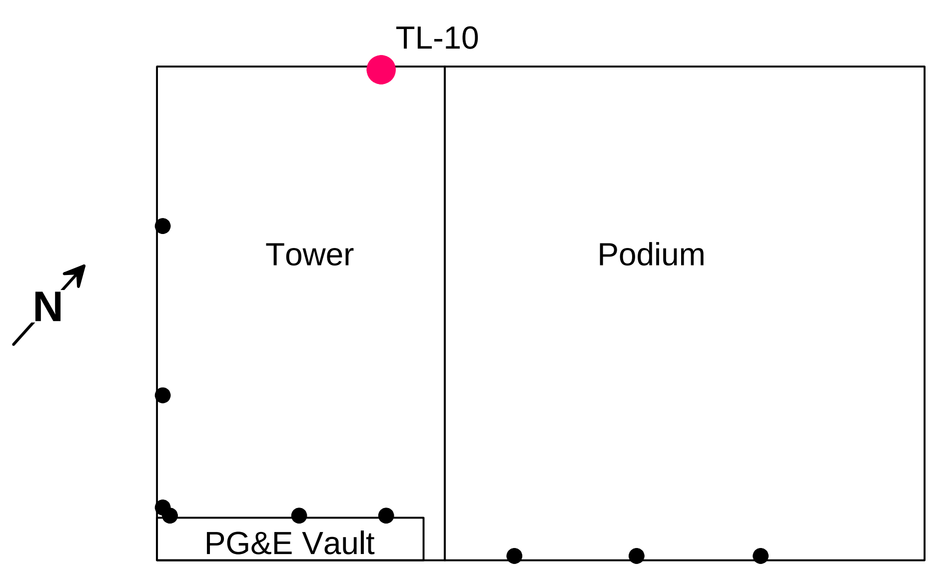
TILT RECORDED IN TILTMETERS TL-07, TL-08, AND TL-09: BASEMENT LEVEL B-1

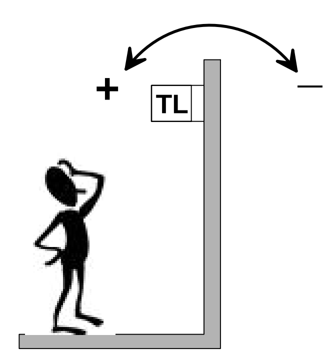
Transbay Transit Center
301 Mission Monitoring - Tiltmeters
Transbay Joint Powers Authority
San Francisco, California

April 2013

PLATE 16







Positive tilt represents movement of the top of the wall towards the inside of the room.

TILT RECORDED IN TILTMETER TL-10: BASEMENT LEVEL B-1

Transbay Transit Center
301 Mission Monitoring - Tiltmeters
Transbay Joint Powers Authority
San Francisco, California

April 2013

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PLATE 17

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Tiltmeters\Plates\Plate 17.grf

Memorandum

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To	Brian Dykes (TJPA)	**Date**	April 16, 2013
Copies	Robert Beck (TJPA) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/SMM
From	Stephen McLandrich (Arup) Andrew Yeskoo (Arup)	**File reference**	4-05 205
Subject	Transbay Transit Center: Internal 301 Mission Readings	**Page** 1 **of** 2	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum presents the utility crossing and tiltmeter readings collected to date. Arup has installed digital monitoring devices on utilities which may be affected by differential building settlements. This monitoring uses tiltmeters and linear potentiometers on a rigid rod that spans between two fixed points, monitoring the movement with respect to each other. These devices allow empirical interpretation of the movement. In addition to these utility crossing monitor points, an additional ten (10) tiltmeters were installed directly onto the interior face of the exterior walls to measure tilt of the walls.

Ten utility crossing monitoring devices (UC-01 through UC-05, and UC-07 through UC-11) are installed in the 301 Mission basement on the Mission Street side of the building. Tables 1 and 2 present a summary of both the 2-dimensional and 3-dimensional utility crossing devices. Plate 1 is an illustration which shows the location of the utility crossing devices. Plates 2 through 7 show the movement convention and data for the 2-dimensional utility crossing devices. Plates 8 through 12 show the movement convention and data for the 3-dimensional utility crossing devices. The tilt values shown in this memo are relative tilt based on the initial tilt readings. Please note: UC-11 was damaged during maintenance unrelated to our instrumentation monitoring and has been removed from this memo.

Baseline corrections were performed in the data sets of UC-01, UC-03, UC-07 and UC-09 to remove erroneous jumps in the readings, the dates of which are recorded on the plots. The instruments in these utility crossings exhibited a one-time jump of a magnitude several times greater than the movement recorded before or after. Before adjusting the baseline for the data following the jump, physical measurements of the gauge length of the instruments were taken on 3/19/2013 to compare to the indicated movement. Comparing these measurements to the original gauge length for the instruments, the four instruments listed above were identified as having jumps in their data files that did not reflect actual movement at the utility crossing. Based on this information, the value of the jump was subtracted from all readings following the jump time to adjust the subsequent readings back to the original baseline. An example of the baseline correction for UC-01 is presented on Plate 13 which displays the raw and corrected data as well as the magnitude of the jump. The jump on UC-01 and UC-03 occurred on the same day and was likely caused by the same event given their proximity. The jump on UC-07 occurred during the manual gauge length measurements on 3/19/2013 and was likely inadvertently bumped while the measurement was taken.

Ten tiltmeters are installed in the 301 Mission basement on the Mission Street, Freemont Street, and Transbay Transit Center sides of the building. The locations of the tiltmeters is presented on Plate 13. Plates 14 through 17 show the data for the installed tiltmeters.

List of Tables

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UC-3	2-D	Water	28.0	LP-301-UX03	2inch/2.5v	TL-301-UY-03	913207RC
UC-4	2-D	Fire	71.0	LP-301-UX04	2inch/2.5v	TL-301-UY-04	1005002RC
UC-5	2-D	Fire	71.0	LP-301-UX05	2inch/2.5v	TL-301-UY-05	1005006RC

TABLE 2 SUMMARY OF 3-DIMENSIONAL UTILITY CROSSING DEVICES									
Gauge	Type	Location	Gauge Length (in)	X-axis		Y-axis		Z-axis	
				Tiltmeter ID	Serial Number	Linear Potentiometer ID	Type	Tiltmeter ID	Serial Number
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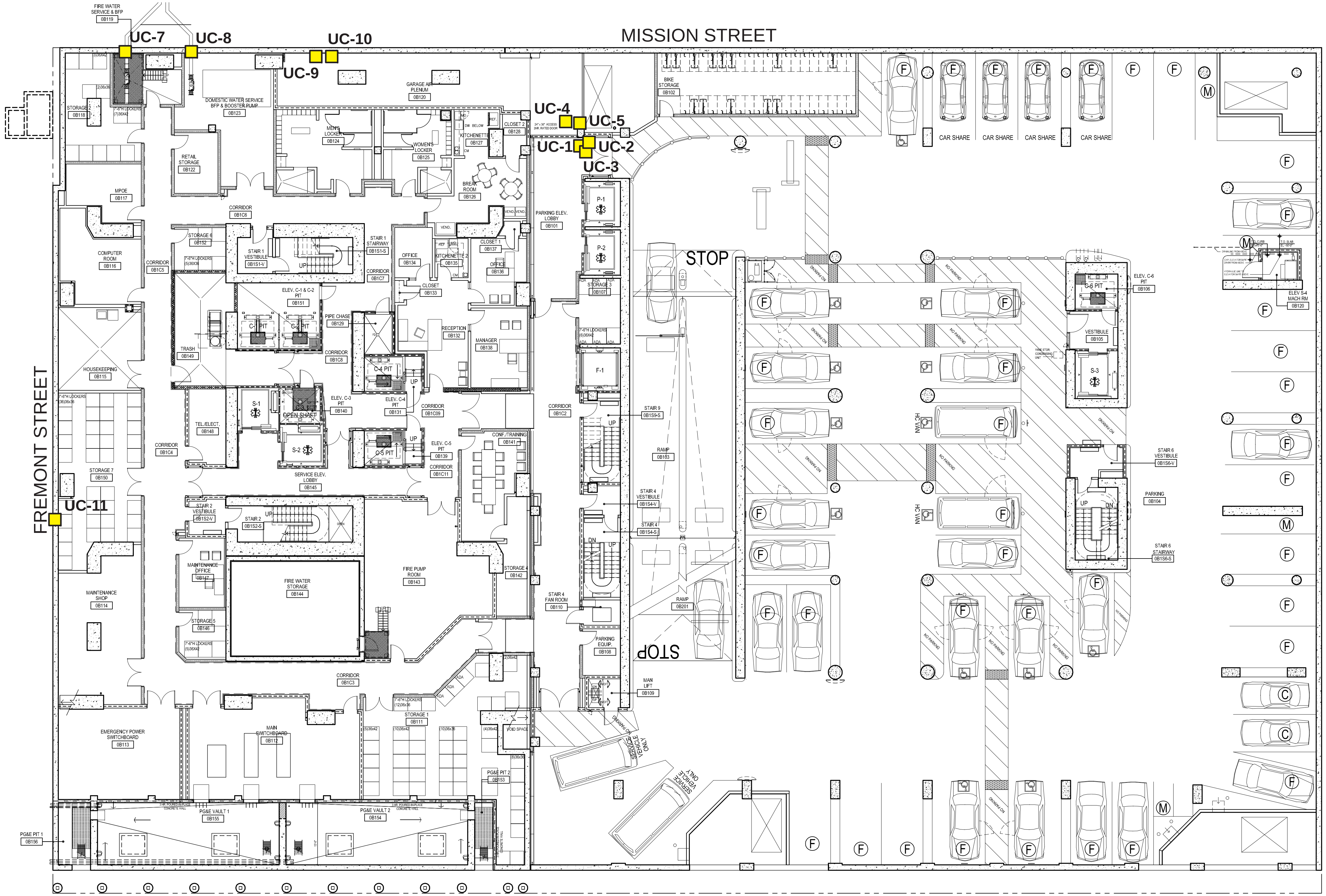
UC-8	3-D	Domestic	109.5	TL-301-UX-08	1005008RC	LP-301-UY08	2inch/2.5v	TL-301-UZ-08	913203RC
UC-9	3-D	Storm	96.0	TL-301-UX-09	913302RC	LP-301-UY09	2inch/2.5v	TL-301-UZ-09	1005001RC
UC-10	3-D	Storm	94.4	TL-301-UX-10	003727RC	LP-301-UY10	2inch/2.5v	TL-301-UZ-10	1005005RC
UC-11*	3-D	Storm	35.4	TL-301-UX-11	913208RC	LP-301-UY11	2inch/2.5v	TL-301-UZ-11	913307RC

* UC-11 was damaged during utility maintenance and is not included in this memo



LEGEND

- Utility Displacement Gauge
  Mounted on the utility conduit

LOCATION OF UTILITY CROSSING MONITORING:
301 MISSION STREET BASEMENT LEVEL B-1

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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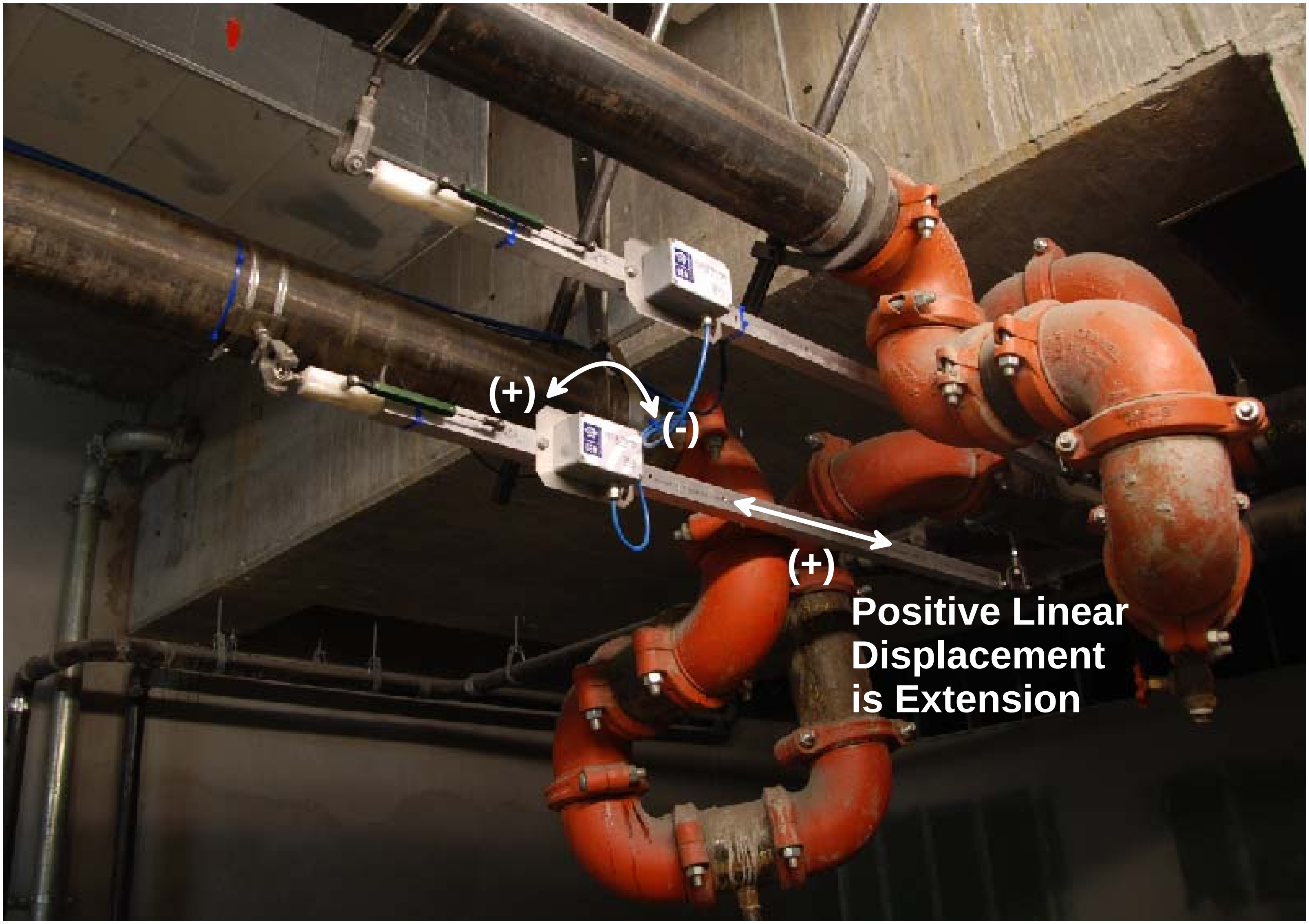
PLATE 1



Positive Tilt represents rotation of the utility crossing device counter-clockwise as the instrument face is observed.

Positive Linear Displacement represents extension between the two fixed points.

MOVEMENT CONVENTION FOR 2-DIMENSIONAL UTILITY CROSSING MONITORING DEVICE

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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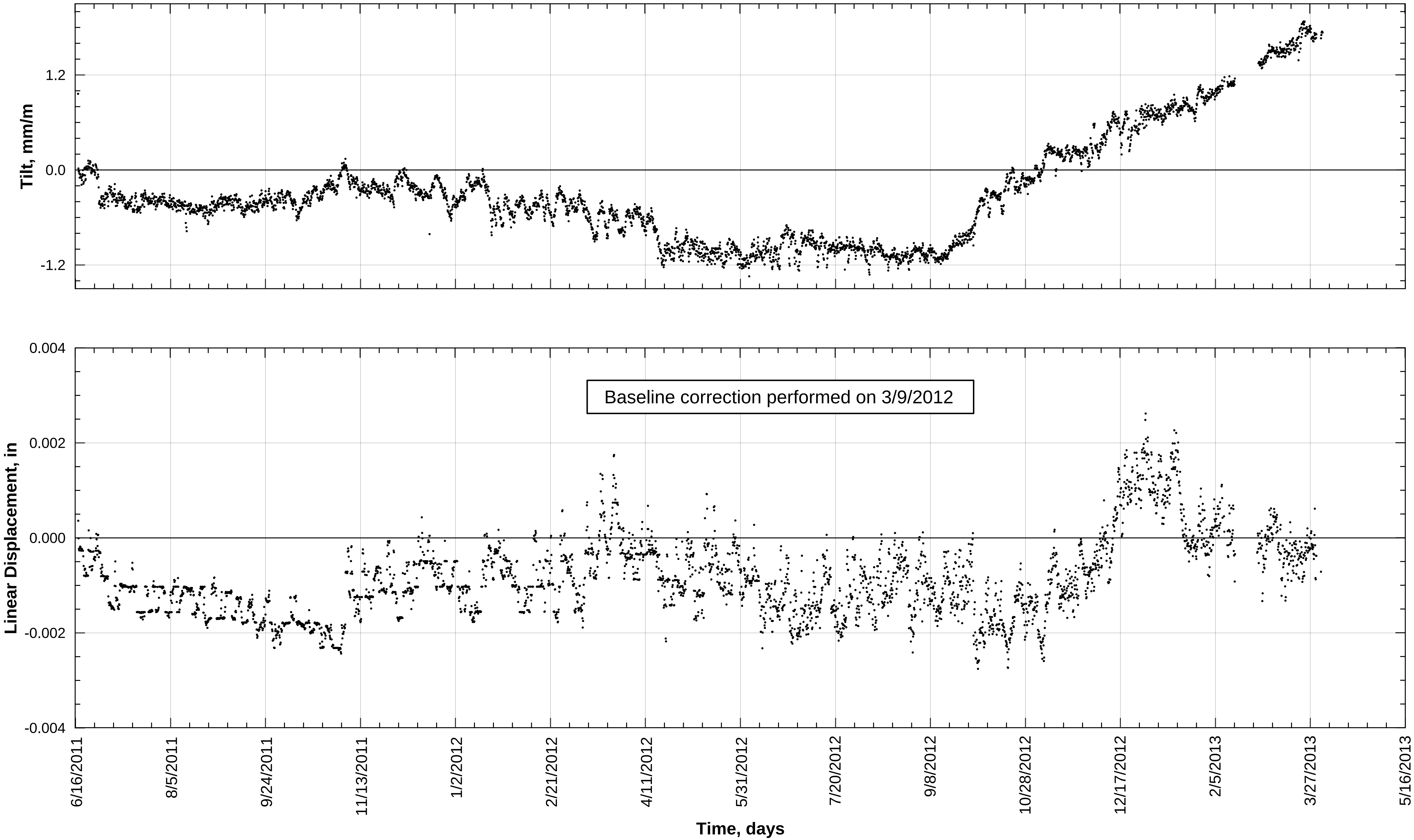
PLATE 2



UTILITY CROSSING MONITORING DATA: UC-01

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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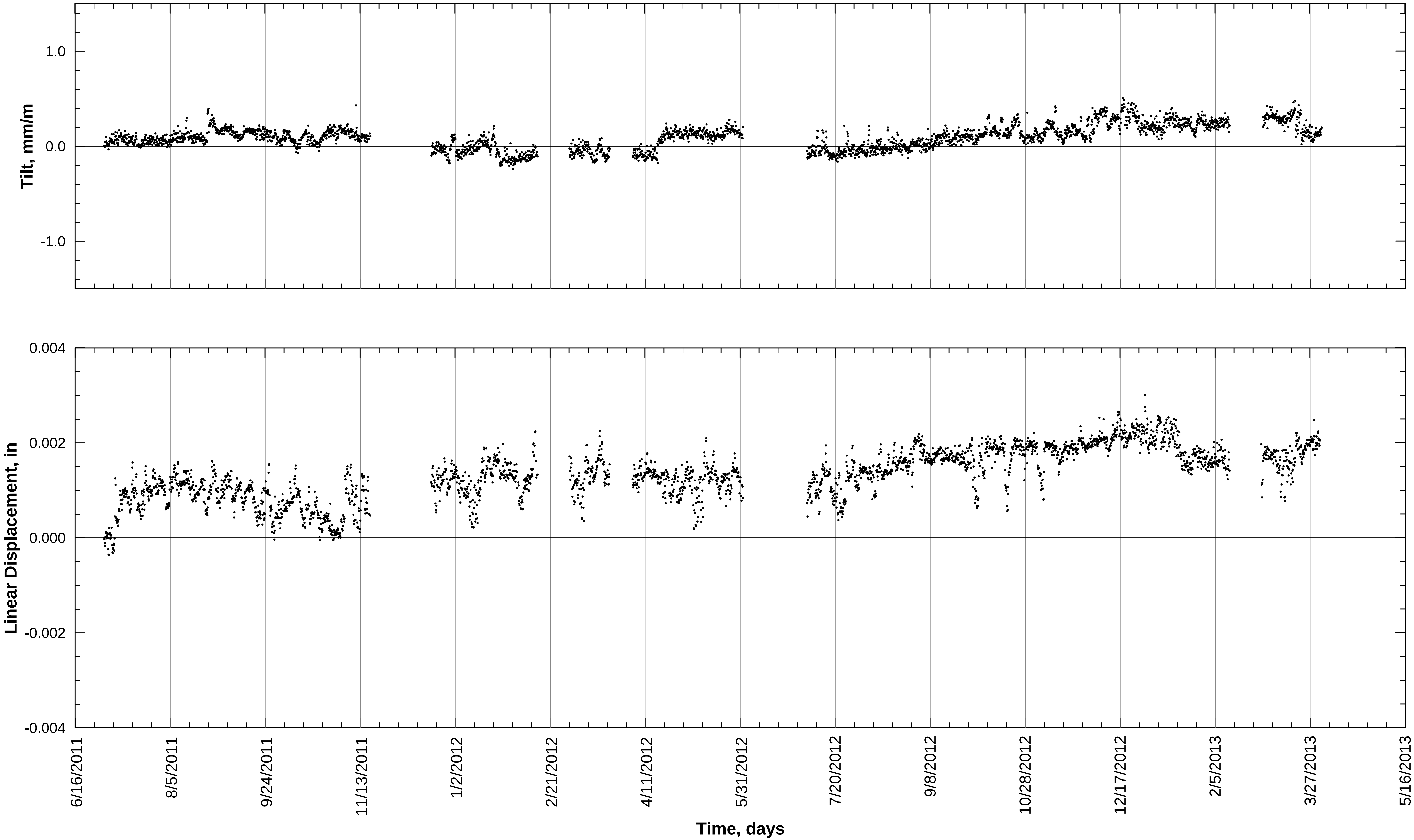
PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Utility Crossing\Plates\Plate 3 UC-01.grf



UTILITY CROSSING MONITORING DATA: UC-02

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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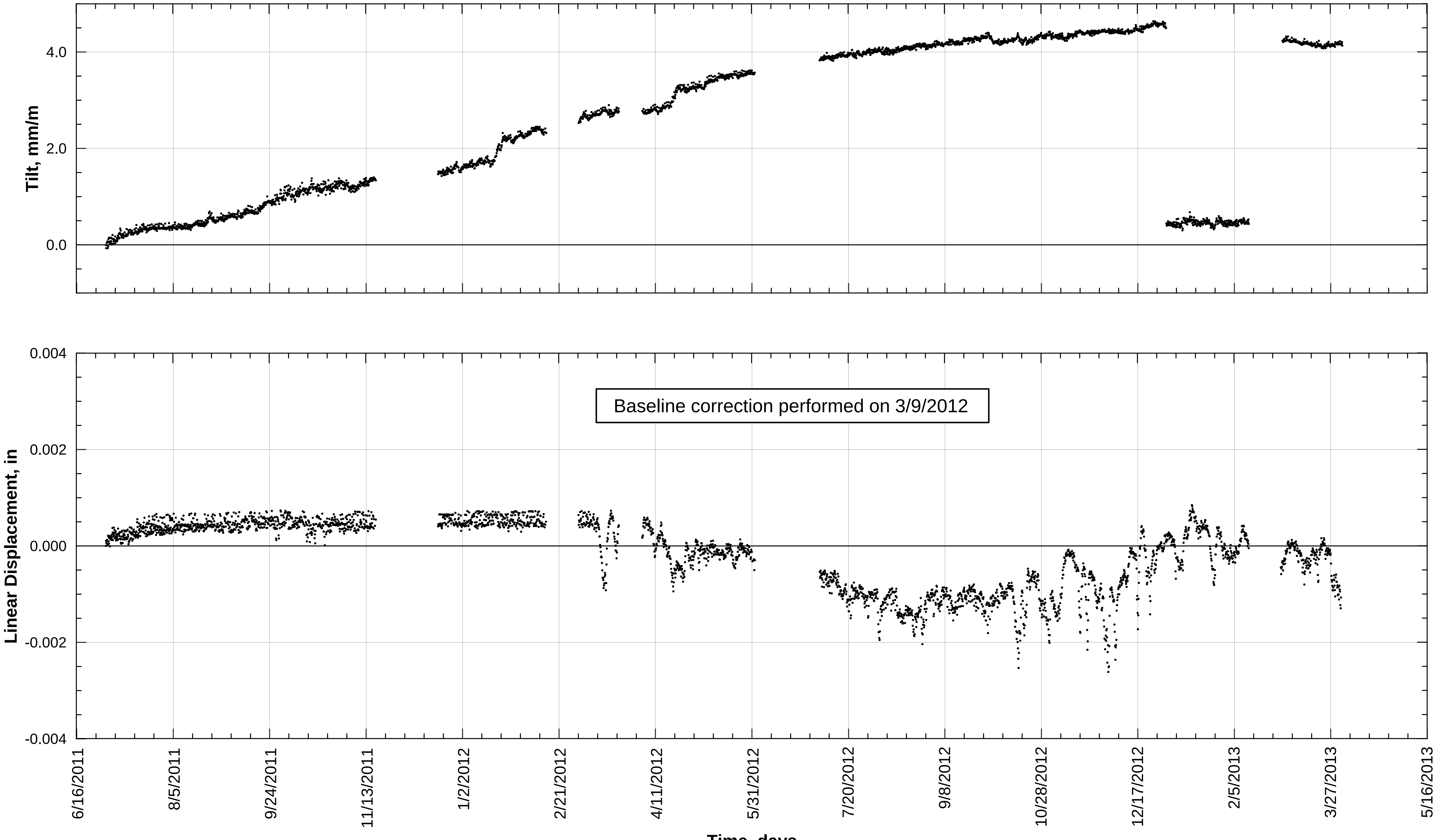
PLATE 4

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Utility Crossing\Plates\Plate 4 UC-02.grf



UTILITY CROSSING MONITORING DATA: UC-03

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
April 2013 San Francisco, California

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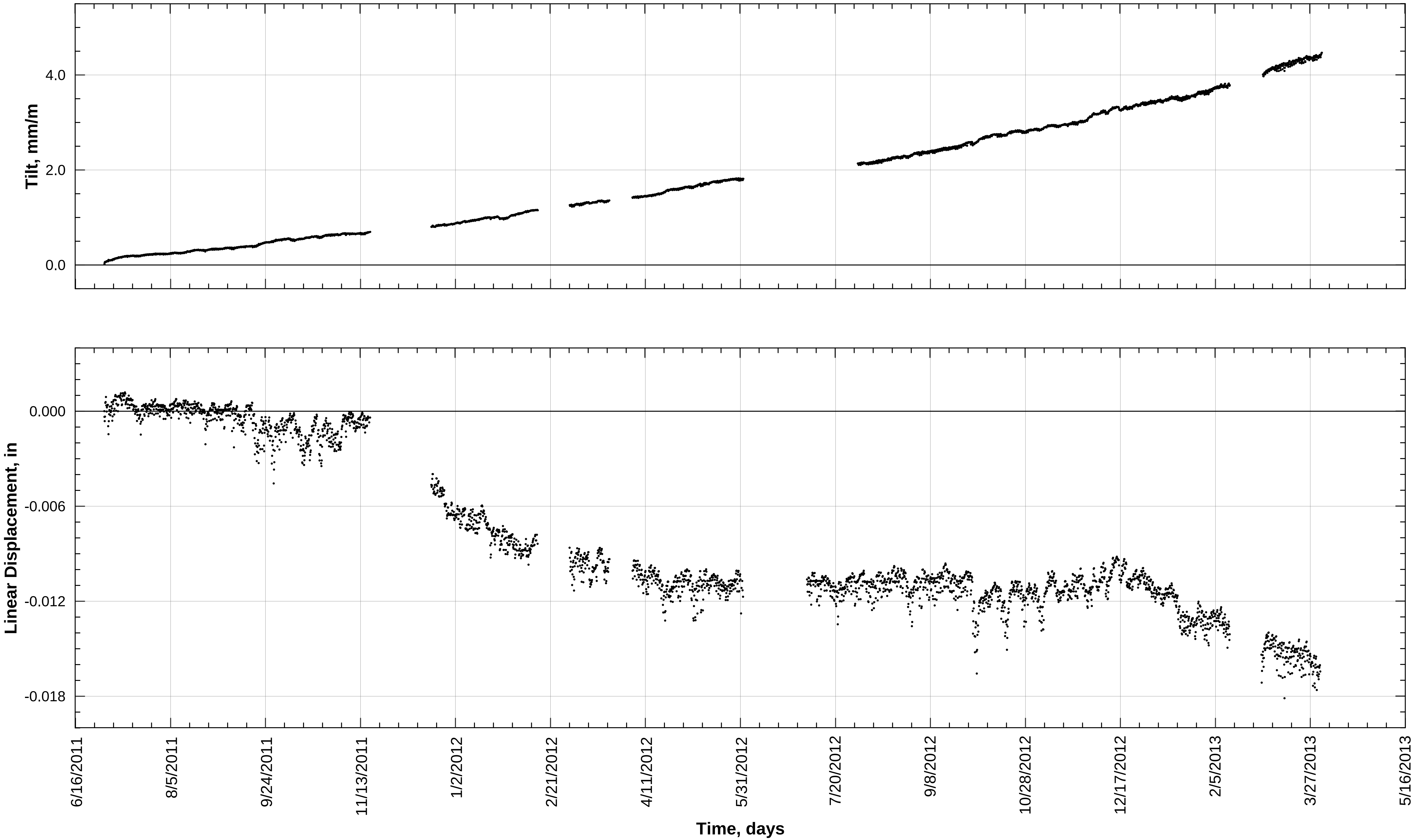
PLATE 5



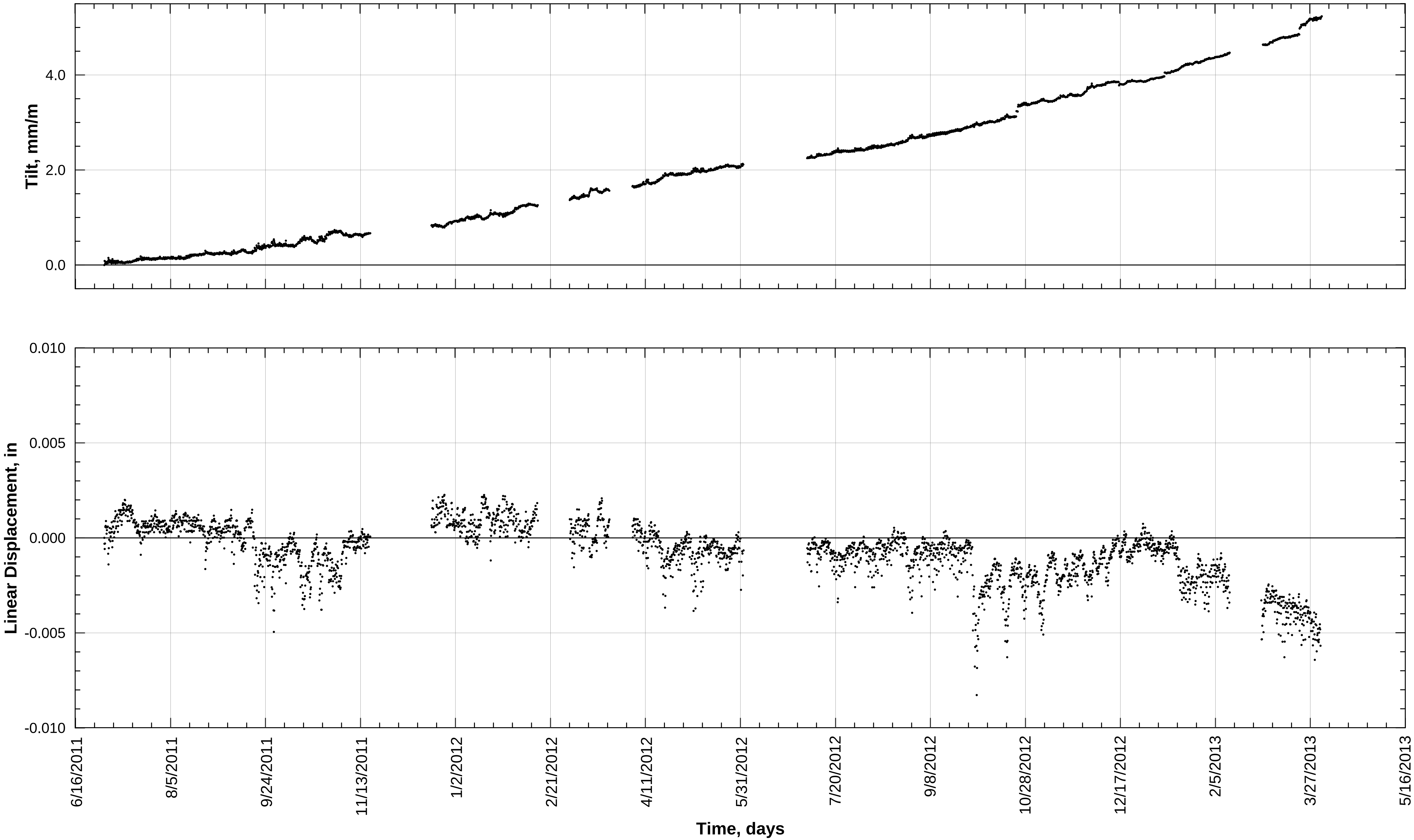
UTILITY CROSSING MONITORING DATA: UC-04

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

ARUP

PLATE 6



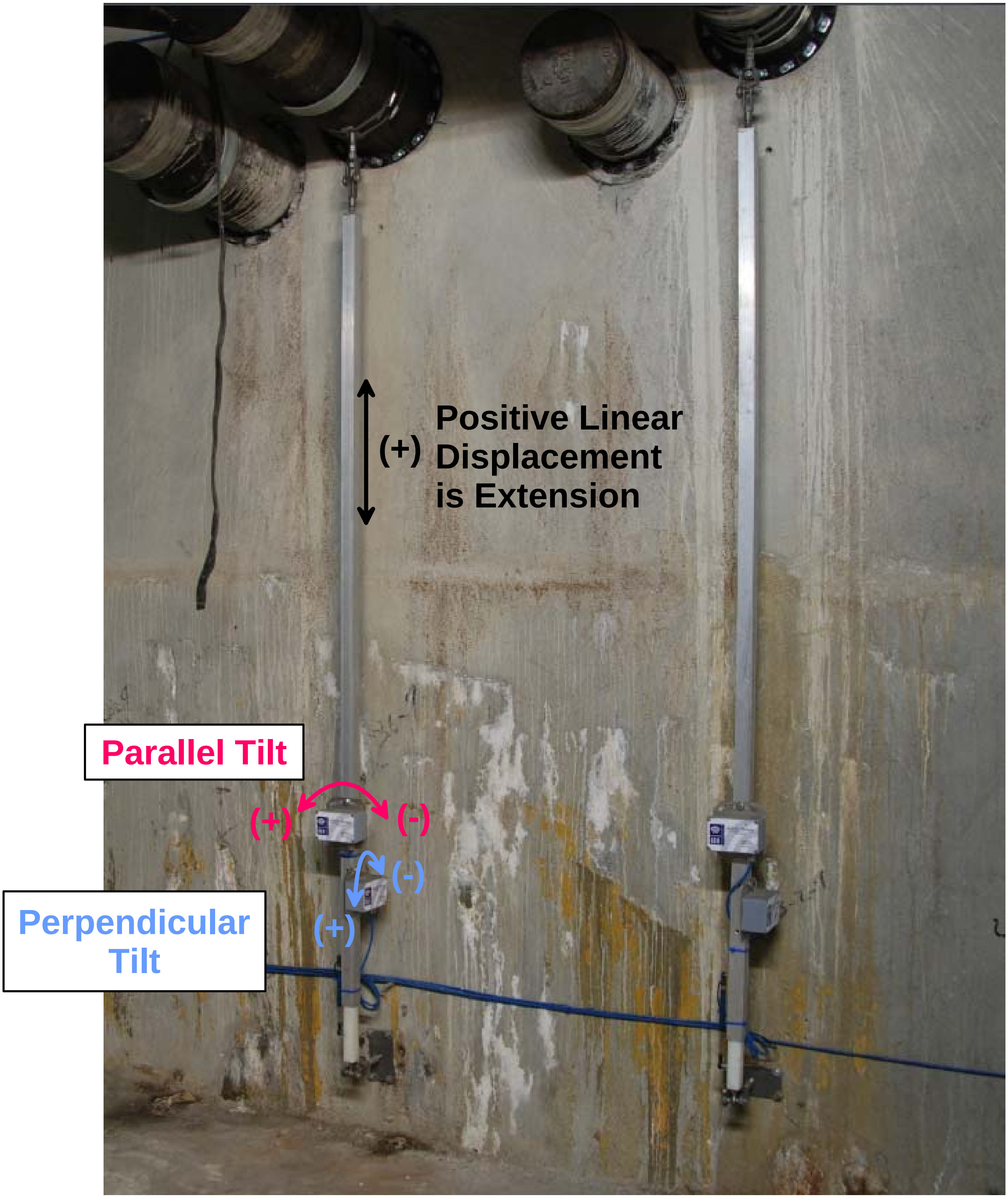
UTILITY CROSSING MONITORING DATA: UC-05

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
April 2013 San Francisco, California

ARUP

PLATE 7

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Utility Crossing\Plates\Plate 7 UC-05.grf



Parallel Tilt is in the direction of the wall.

Perpendicular Tilt is perpendicular to the plan of the wall.

Positive Linear Displacement represents extension between the two fixed points.

MOVEMENT CONVENTION FOR 3-DIMENSIONAL UTILITY CROSSING MONITORING DEVICE

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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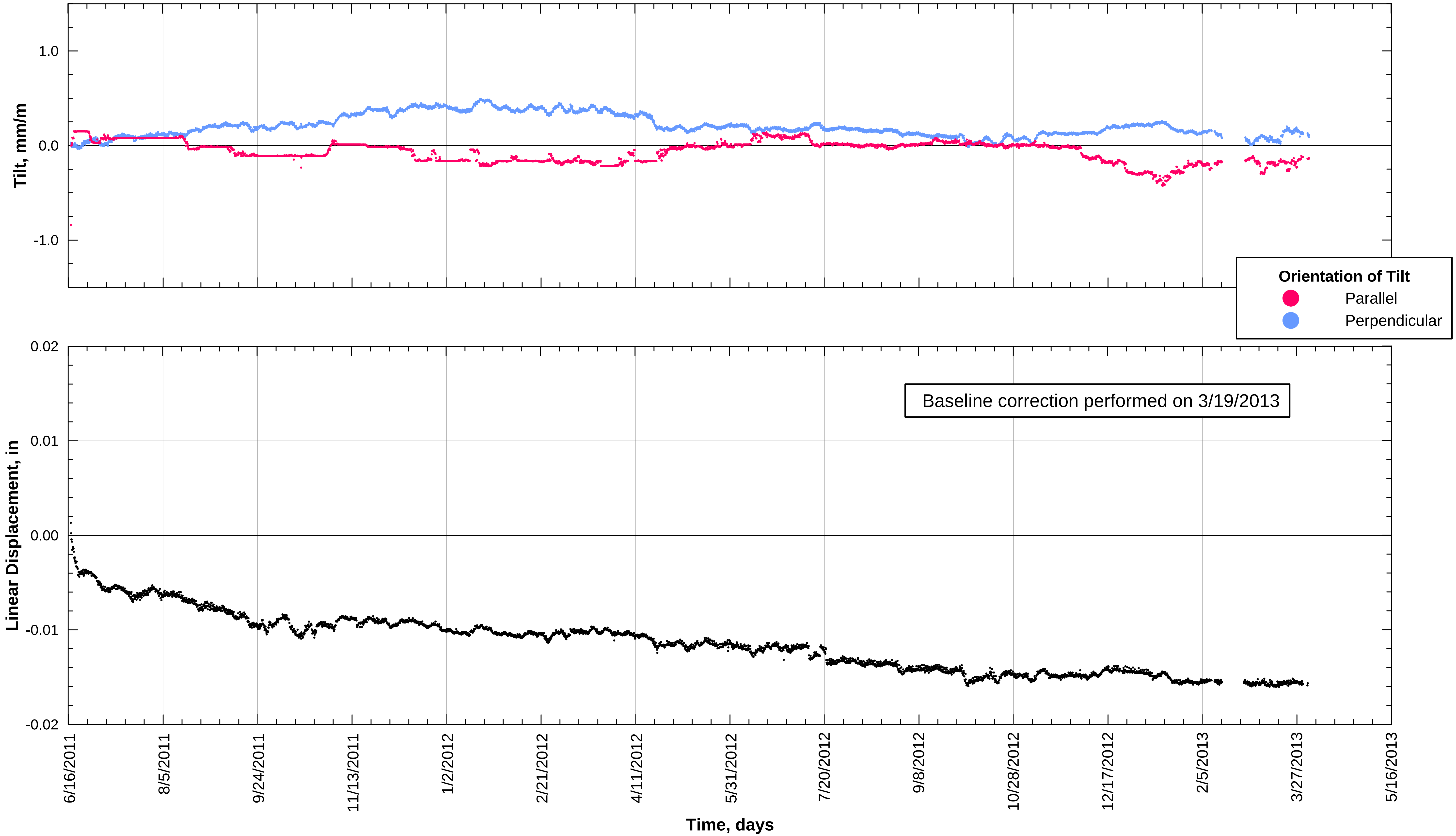
PLATE 8

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Plates\Plate 8 3-D Convention.grf



UTILITY CROSSING MONITORING DATA: UC-07

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
April 2013 San Francisco, California

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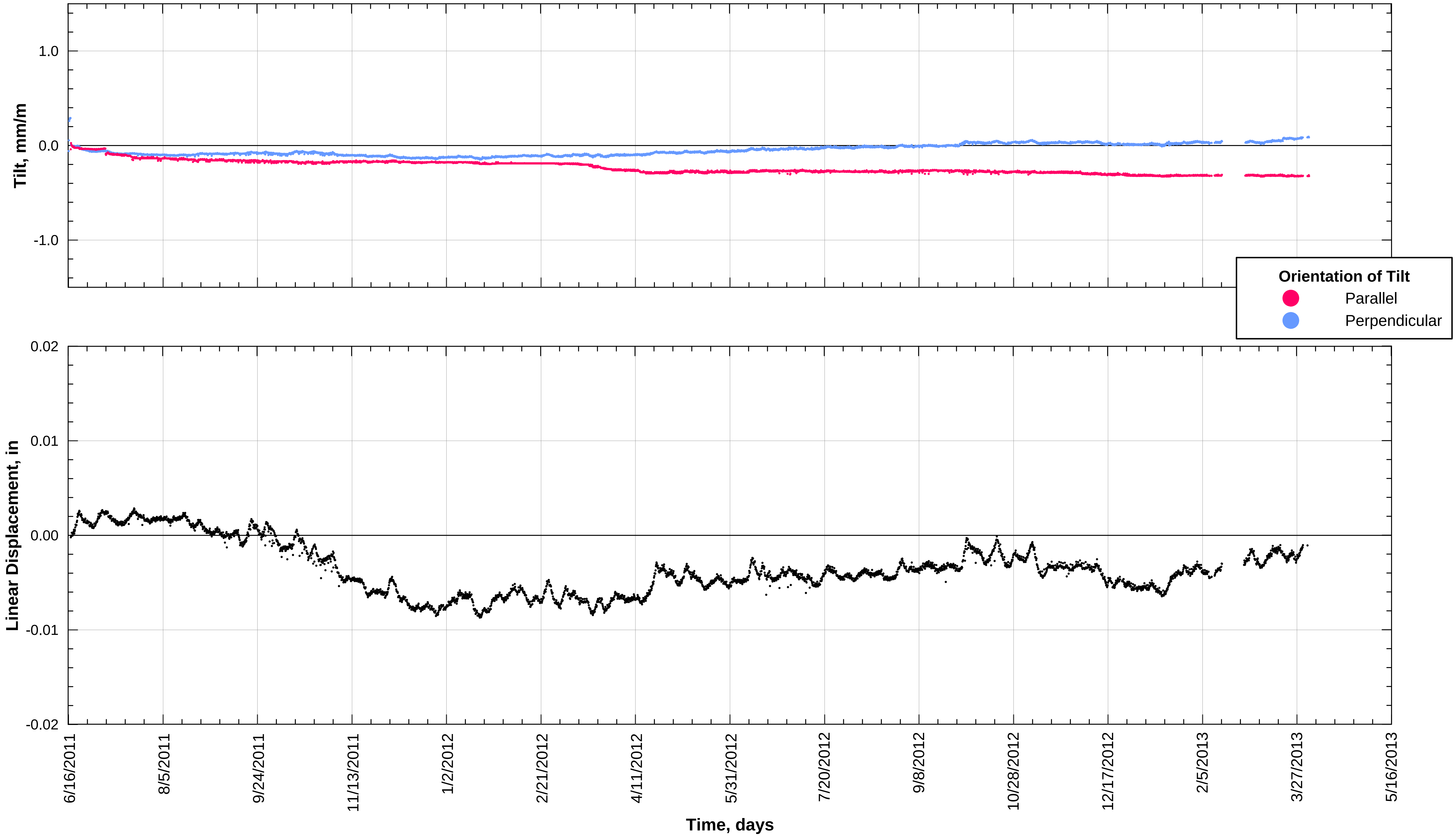
PLATE 9

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Utility Crossing\Plates\Plate 9 UC-07.grf



UTILITY CROSSING MONITORING DATA: UC-08

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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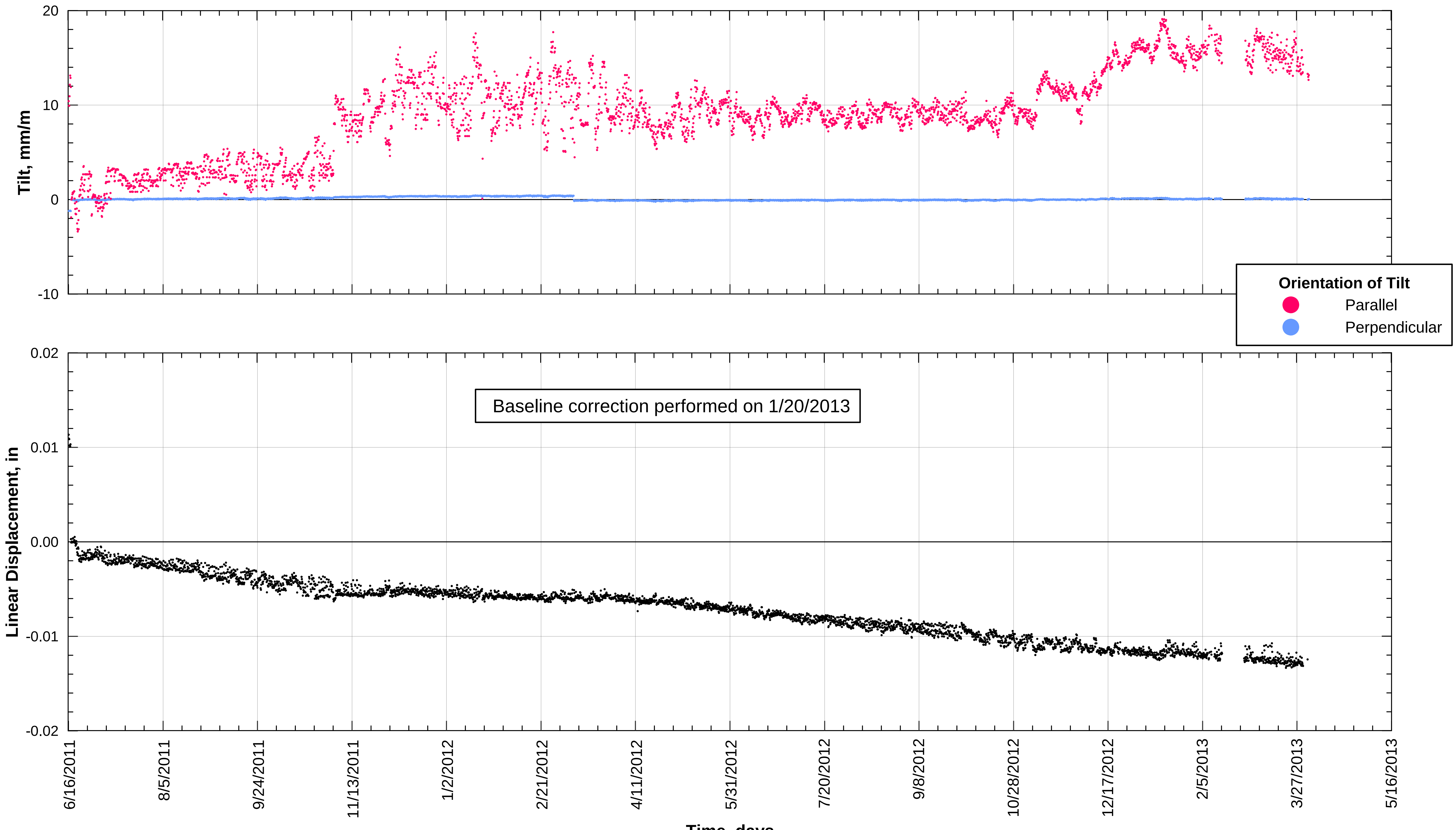
PLATE 10

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Utility Crossing\Plates\Plate 10 UC-08.grf



UTILITY CROSSING MONITORING DATA: UC-09

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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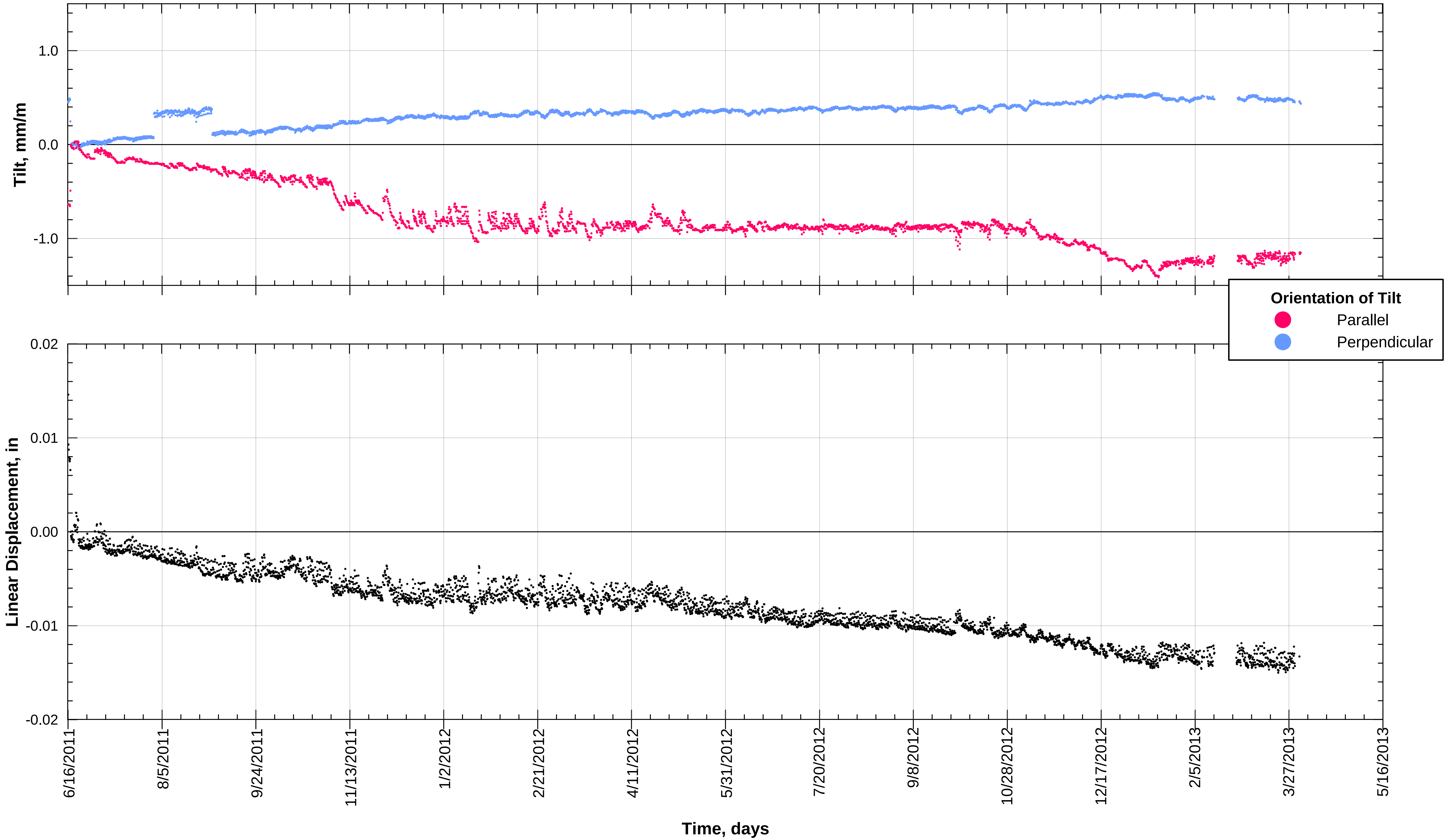
PLATE 11

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Utility Crossing\Plates\Plate 11 UC-09.grf



UTILITY CROSSING MONITORING DATA: UC-10

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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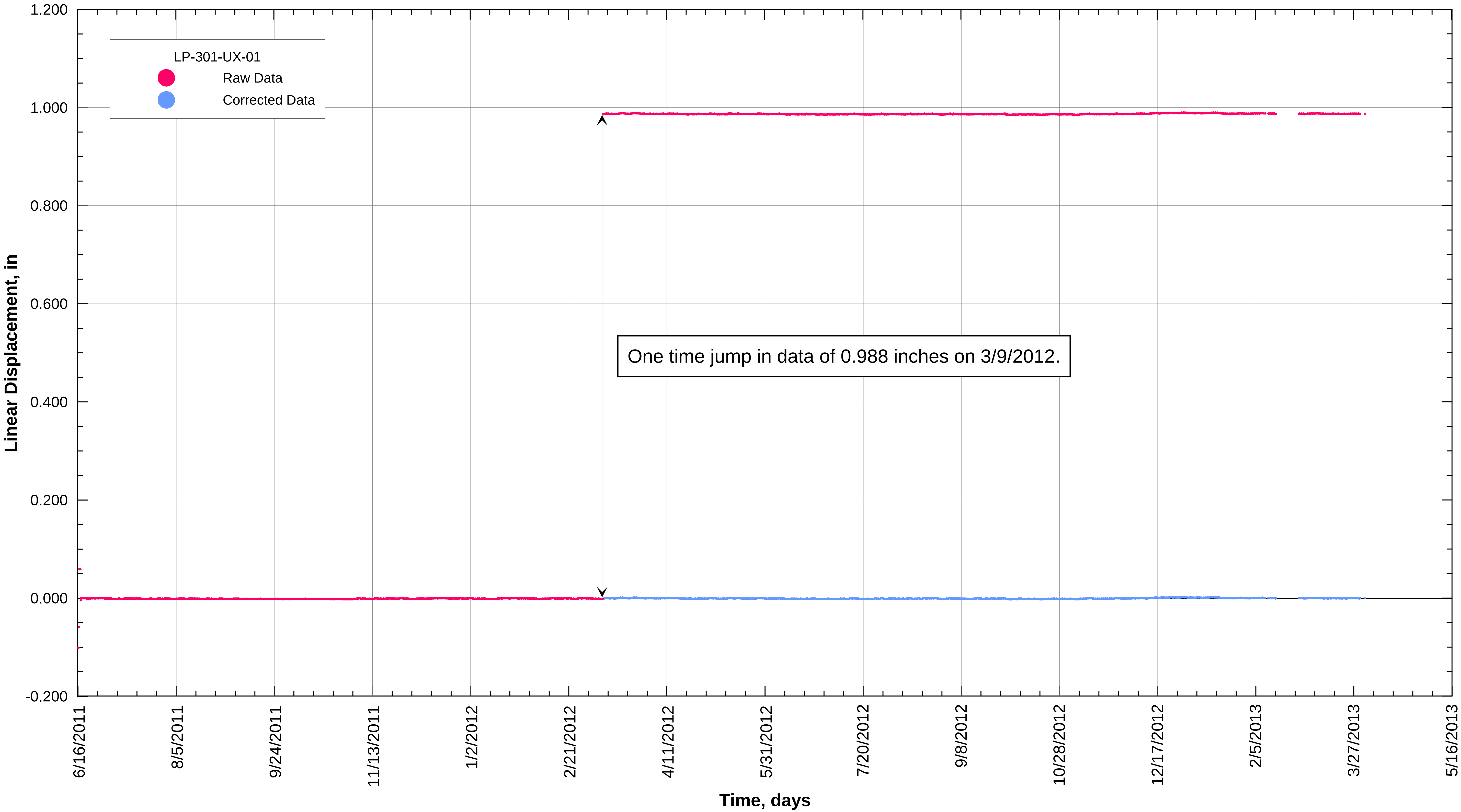
PLATE 12



BASELINE CORRECTION EXAMPLE: UC-01

Transbay Transit Center
301 Mission Monitoring - Utility Crossings
Transbay Joint Powers Authority
San Francisco, California

April 2013

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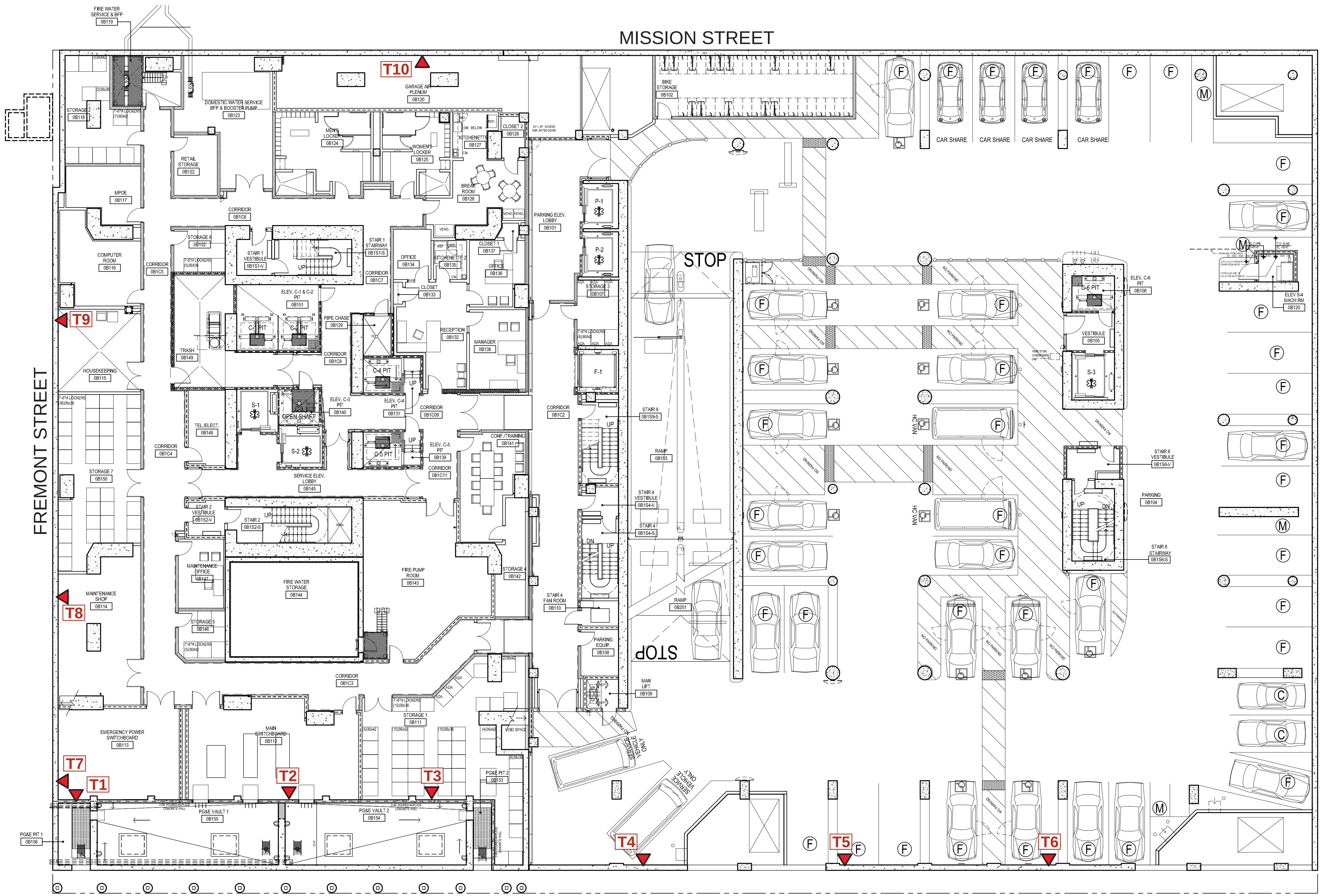
PLATE 13

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Utility Crossing\Plates\Plate 3 UC-01 Baseline Correction.grf



LEGEND

▼ Tiltmeters at Data Loggers (TM)
Mounted on walls

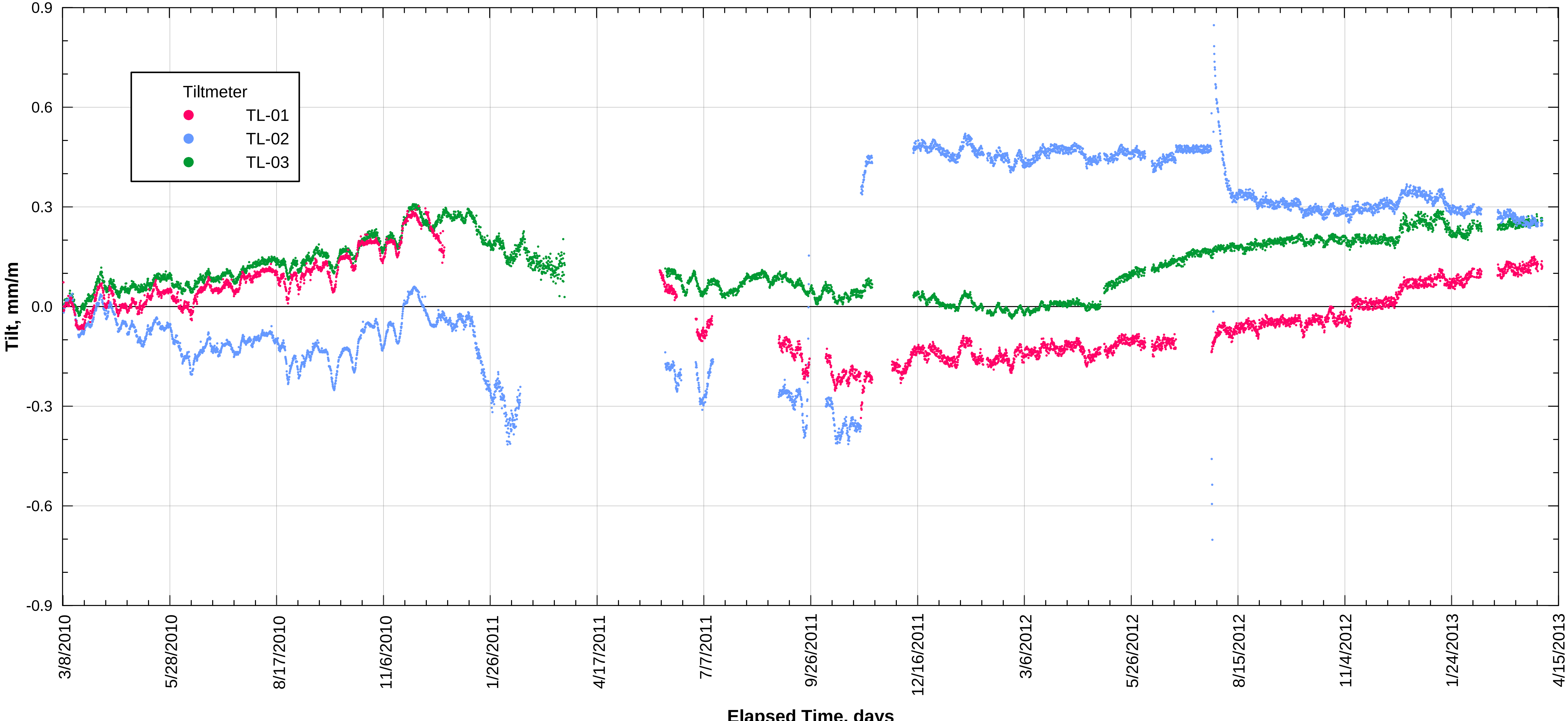
LOCATION OF TILTMETERS:
301 MISSION STREET BASEMENT LEVEL B-1

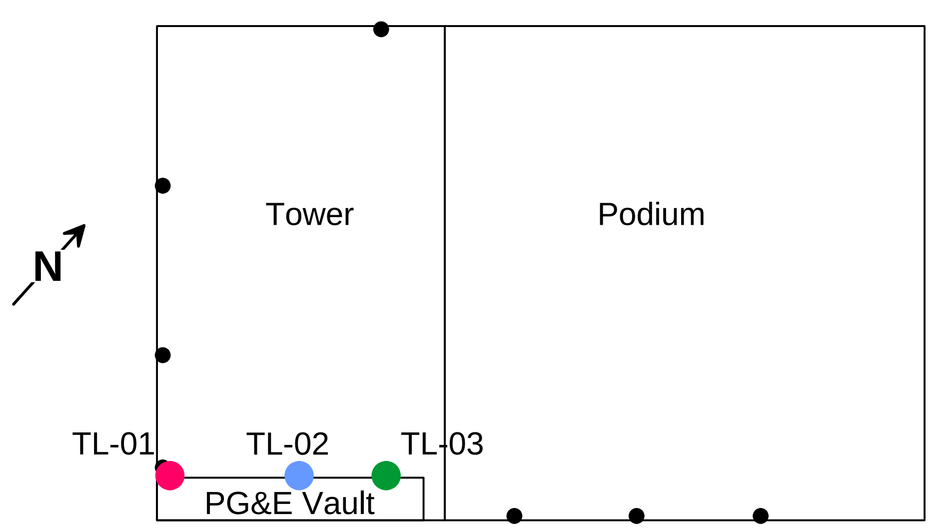
Transbay Transit Center
301 Mission Monitoring - Tiltmeters
Transbay Joint Powers Authority
San Francisco, California

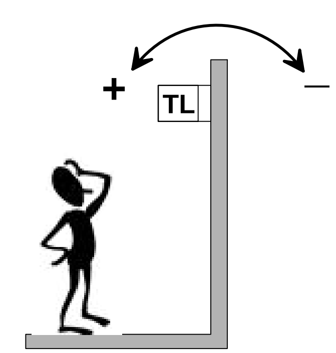
April 2013

ARUP

PLATE 14







Positive tilt represents movement of the top of the wall towards the inside of the room.

TILT RECORDED IN TILTMETERS TL-01, TL-02, AND TL-03: BASEMENT LEVEL B-1

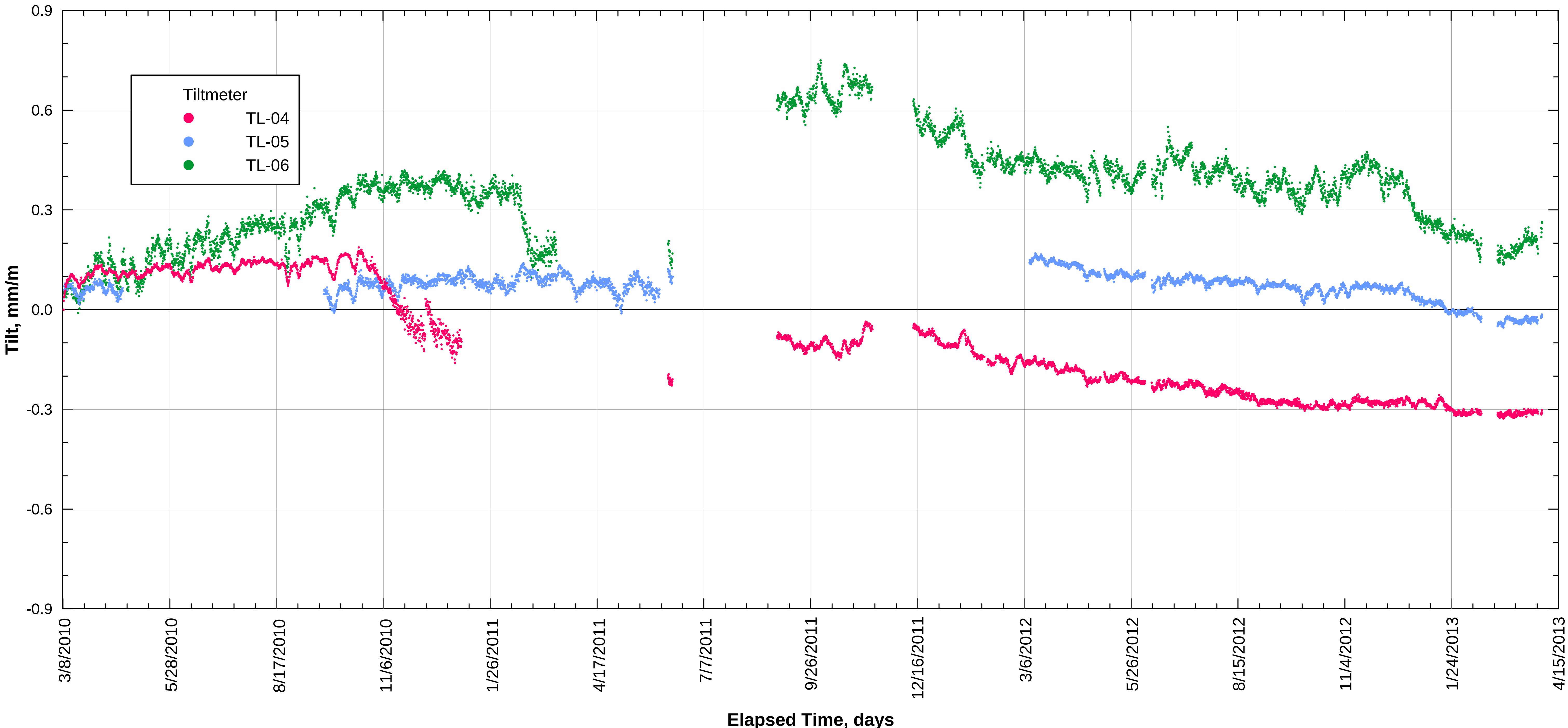
Transbay Transit Center
301 Mission Monitoring - Tiltmeters
Transbay Joint Powers Authority
San Francisco, California

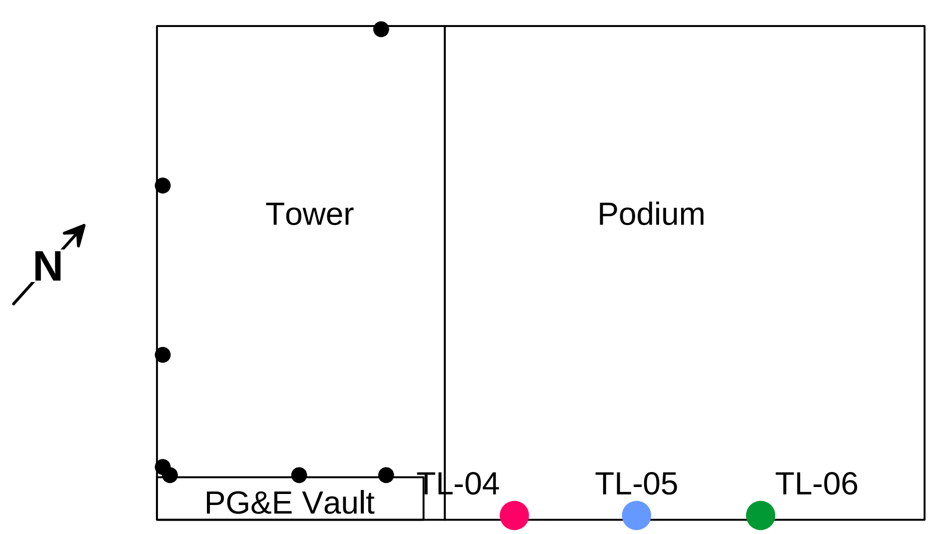
April 2013

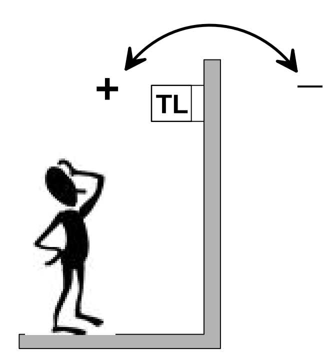
ARUP

PLATE 15

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Tiltmeters\Plates\Plate 15.grf







Positive tilt represents movement of the top of the wall towards the inside of the room.

TILT RECORDED IN TILTMETERS TL-04, TL-05, AND TL-06: BASEMENT LEVEL B-1

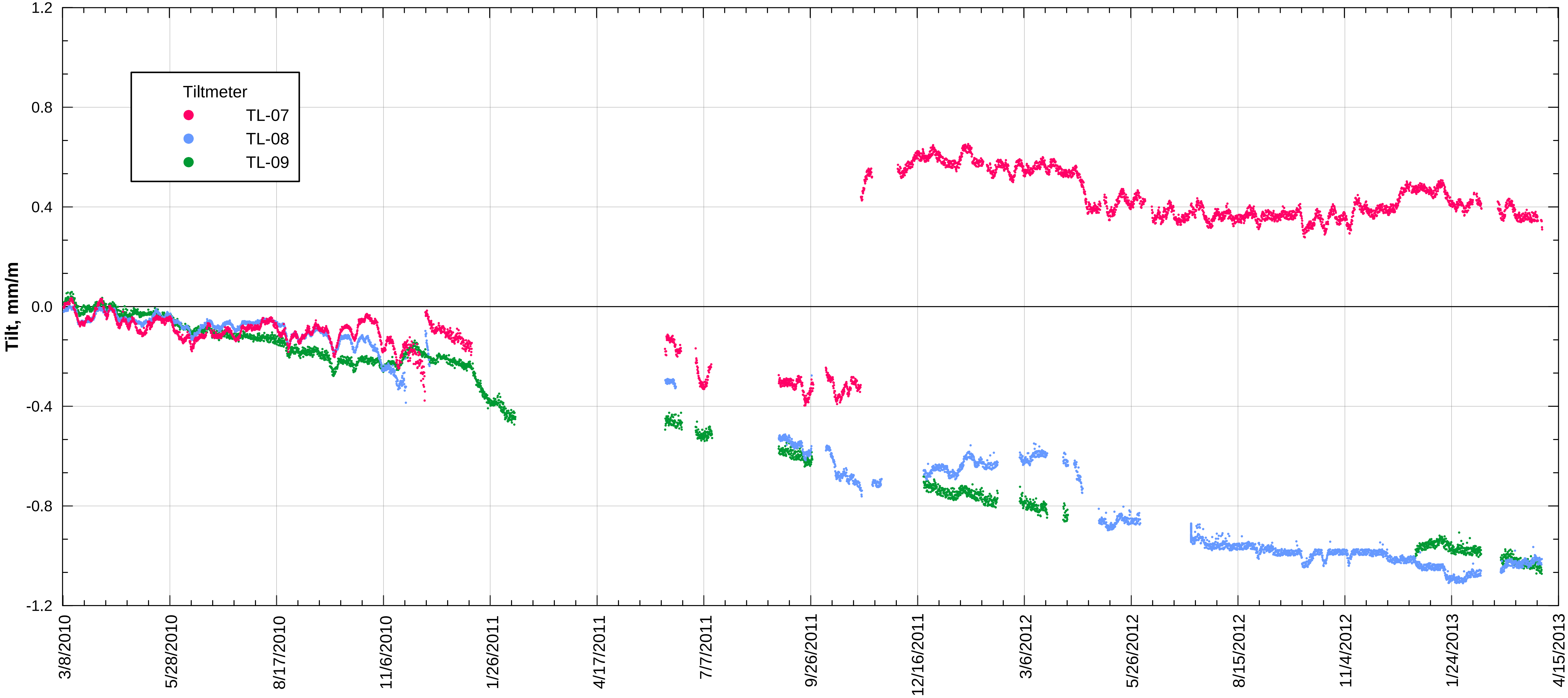
Transbay Transit Center
301 Mission Monitoring - Tiltmeters
Transbay Joint Powers Authority
San Francisco, California

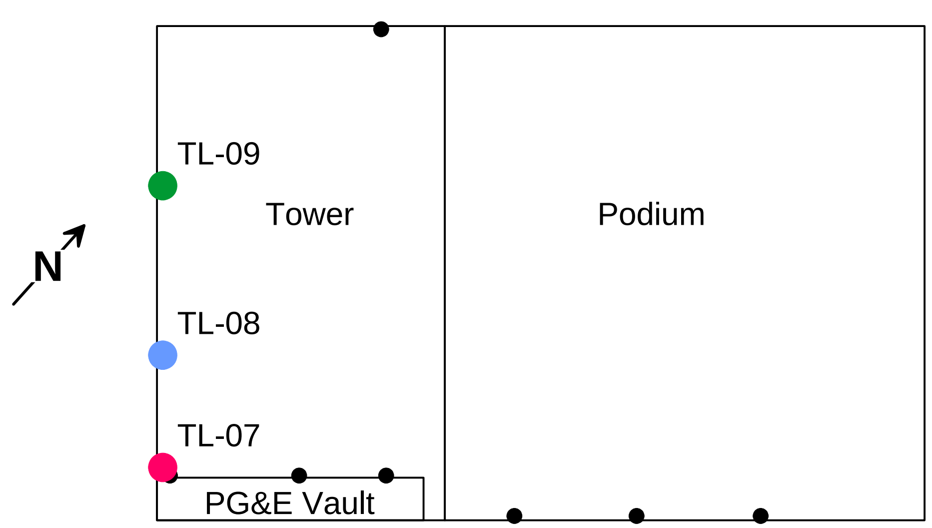
April 2013

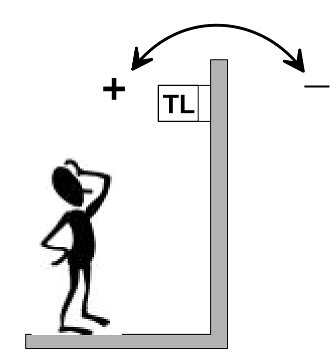
ARUP

PLATE 16

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Tiltmeters\Plates\Plate 16.grf







Positive tilt represents movement of the top of the wall towards the inside of the room.

TILT RECORDED IN TILTMETERS TL-07, TL-08, AND TL-09: BASEMENT LEVEL B-1

Transbay Transit Center
301 Mission Monitoring - Tiltmeters
Transbay Joint Powers Authority
San Francisco, California

April 2013

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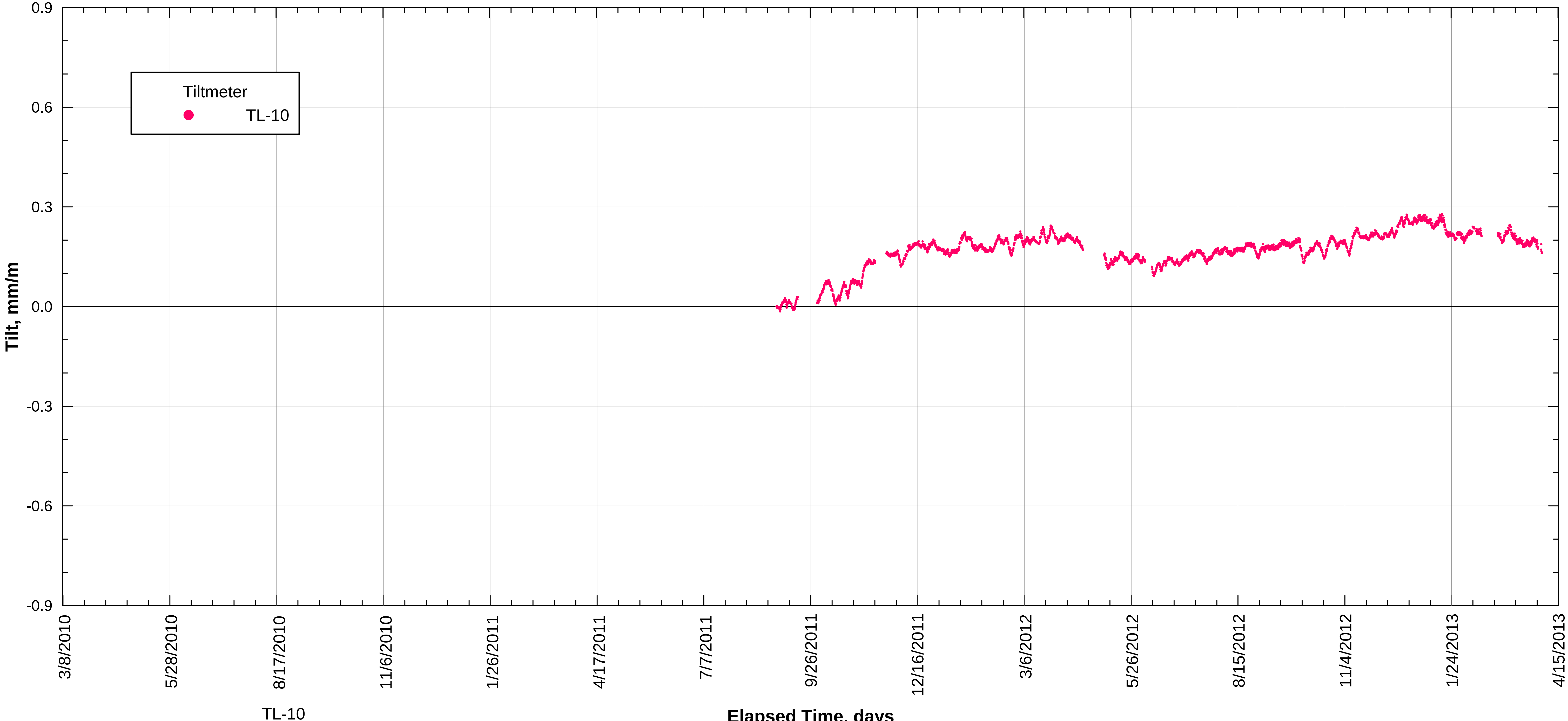
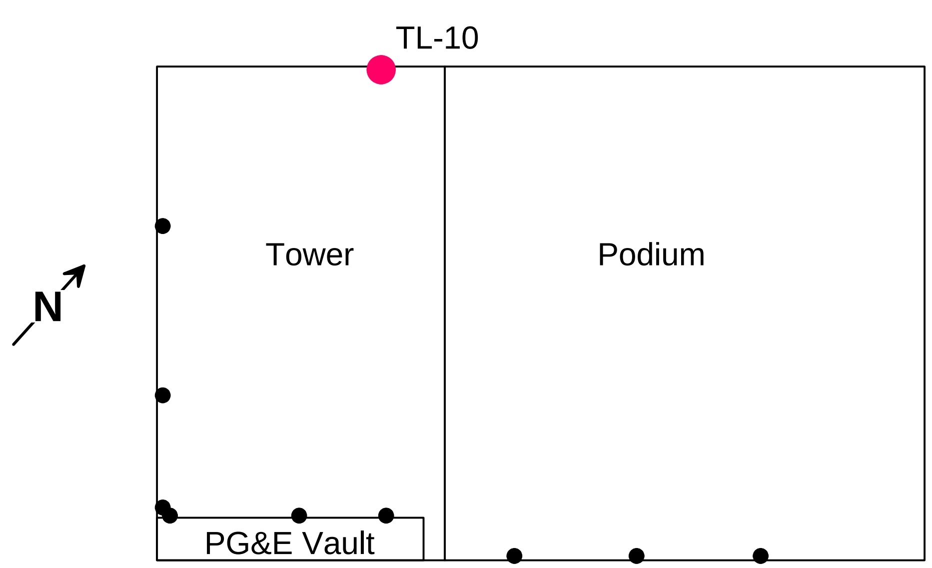
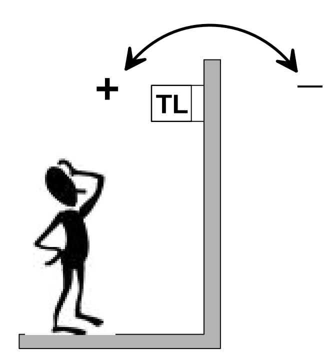
PLATE 17







Positive tilt represents movement of the top of the wall towards the inside of the room.

TILT RECORDED IN TILTMETER TL-10: BASEMENT LEVEL B-1

Transbay Transit Center
301 Mission Monitoring - Tiltmeters
Transbay Joint Powers Authority
San Francisco, California

April 2013

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PLATE 18

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\205 301 Mission Internal Instrumentation Apr 2013\Utility Crossing\Plates\Plate 18.grf

Memorandum

ARUP

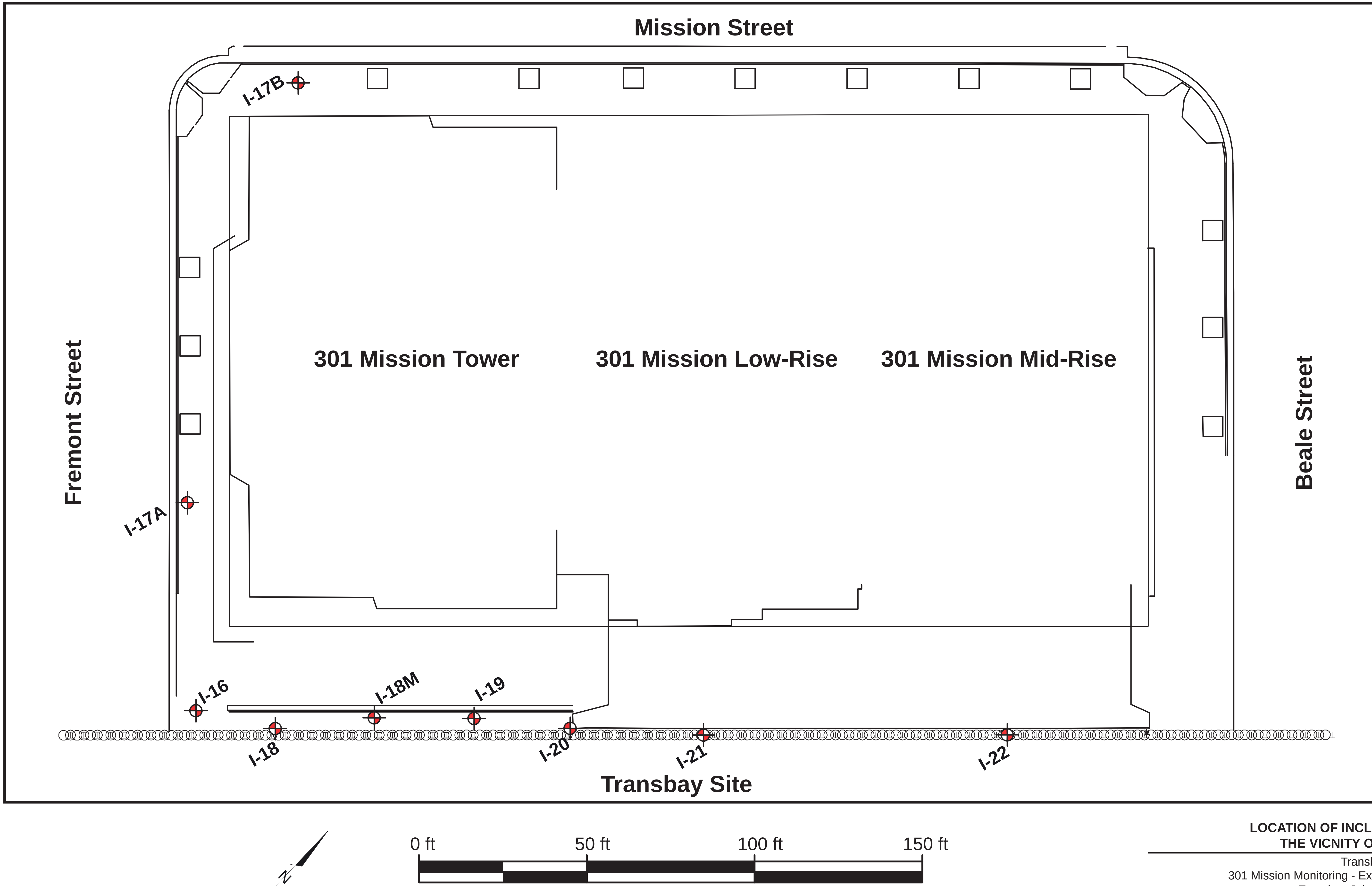
To	Brian Dykes (TJPA)	**Date**	28 June 2013
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/MHG
From	Michael Gardner (Arup)	**File reference**	4-05/214
Subject	Transbay Transit Center Manually Read Inclinometer Update	**Page** 1 **of** 1	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the buildings adjacent to the Transbay Transit Center prior to and during construction. This memorandum presents the current readings from the inclinometers adjacent to the 301 Mission buildings. Plate 1 shows the as-built locations of the nine inclinometers installed in the vicinity of the 301 Mission buildings. The quantity and location of the instruments vary from the as-planned due to installation limitations. Our best effort has been made to install as many instruments as possible.

Currently, inclinometer I-18M (formerly known as I-18) is being read using a standard manual method. Additionally, inclinometers I-21 and I-22 were read manually during maintenance on the in-place-inclinometers. Plates 2 through 4 show the readings taken on I-18M, I-21 and I-22, respectively. Inclinometer I-18M will continue to be read manually throughout the Transbay project.

List of Plates

Plate 1 Location of Inclinometers in the Vicinity of 301 Mission
Plate 2 Measurements Taken at Inclinometer I-18M
Plate 3 Measurements Taken at Inclinometer I-21
Plate 4 Measurements Taken at Inclinometer I-22



LOCATION OF INCLINOMETERS IN THE VICINITY OF 301 MISSION

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

June 2013

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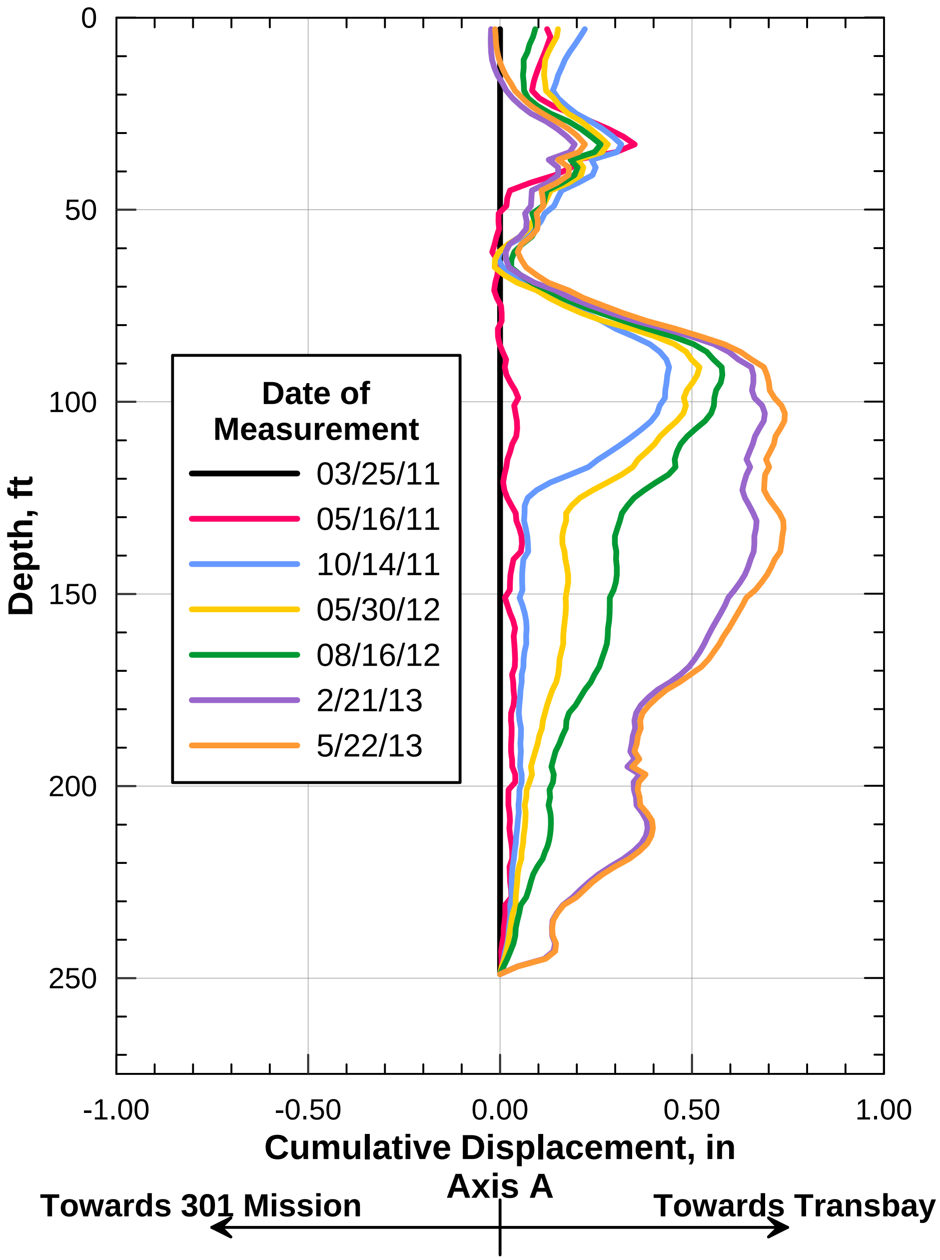
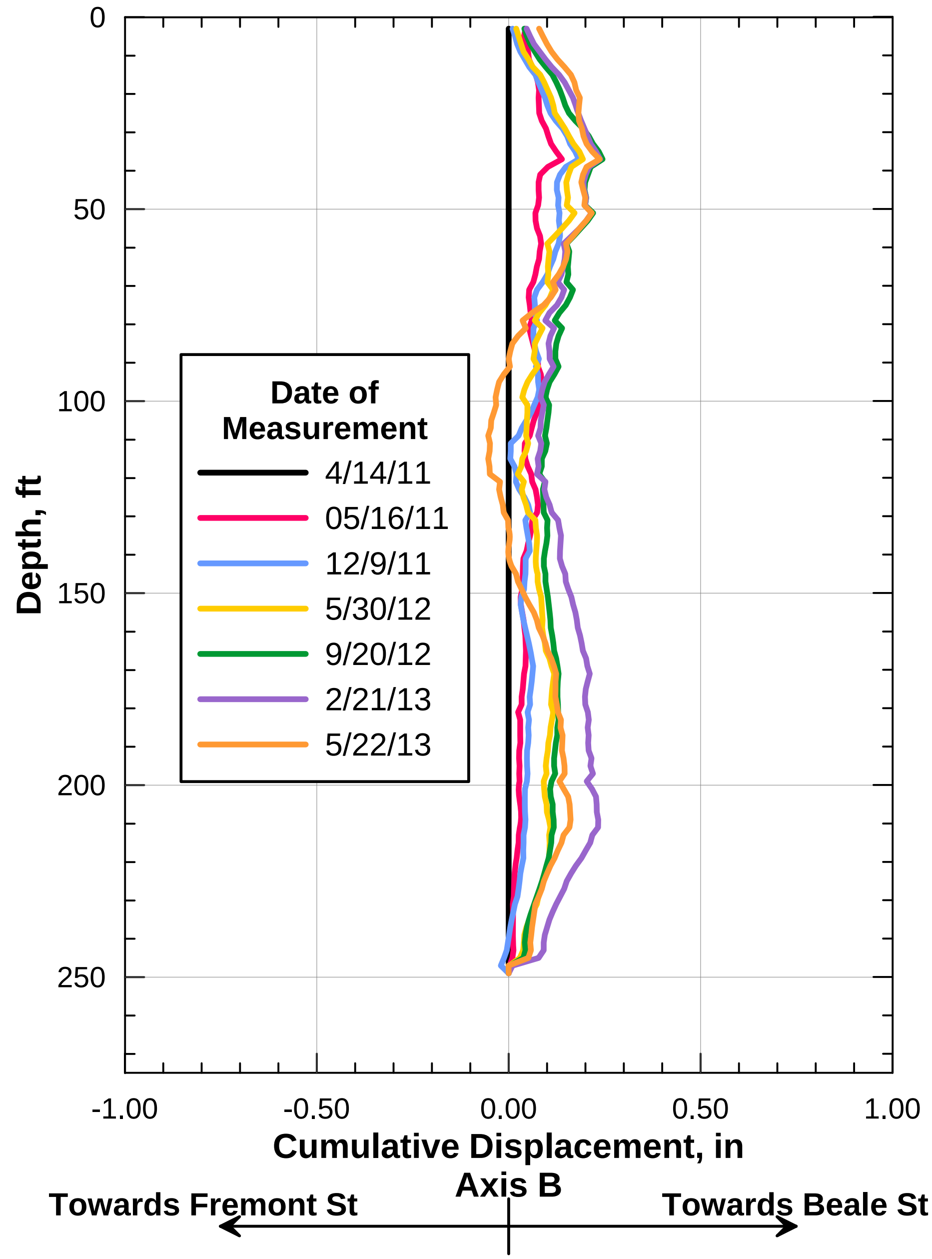
PLATE 1





MEASUREMENTS TAKEN AT INCLINOMETER I-18M

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

June 2013

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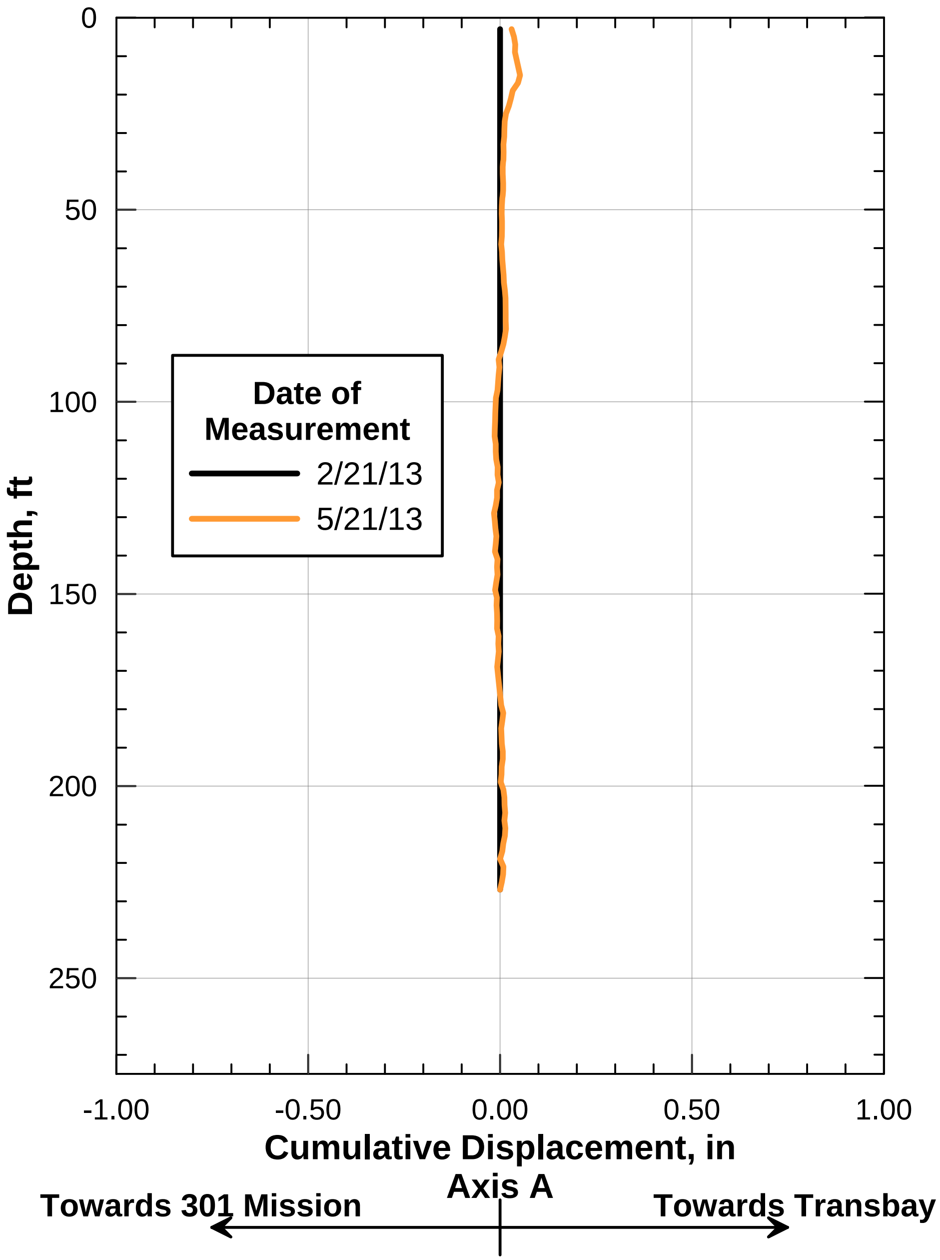
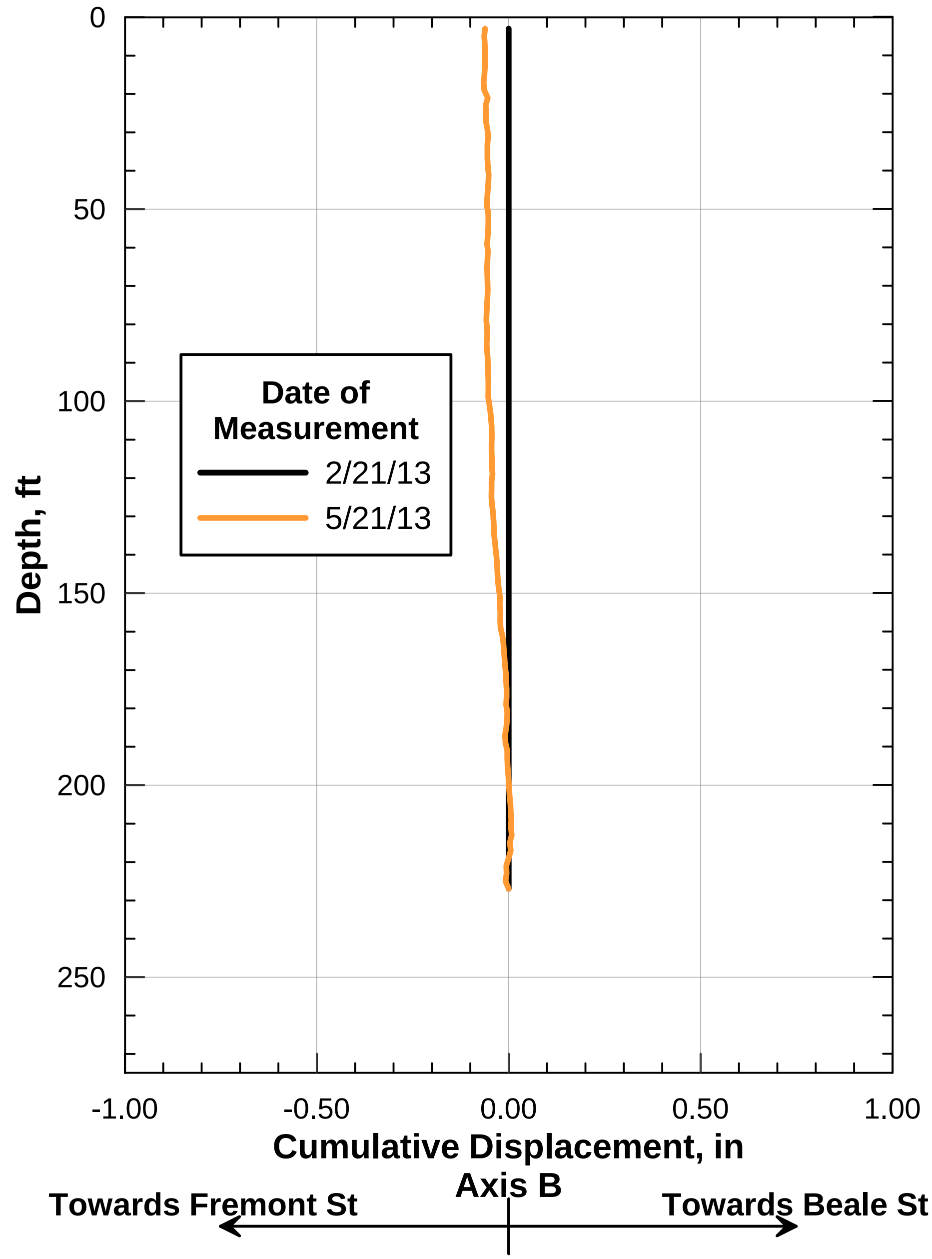
PLATE 2





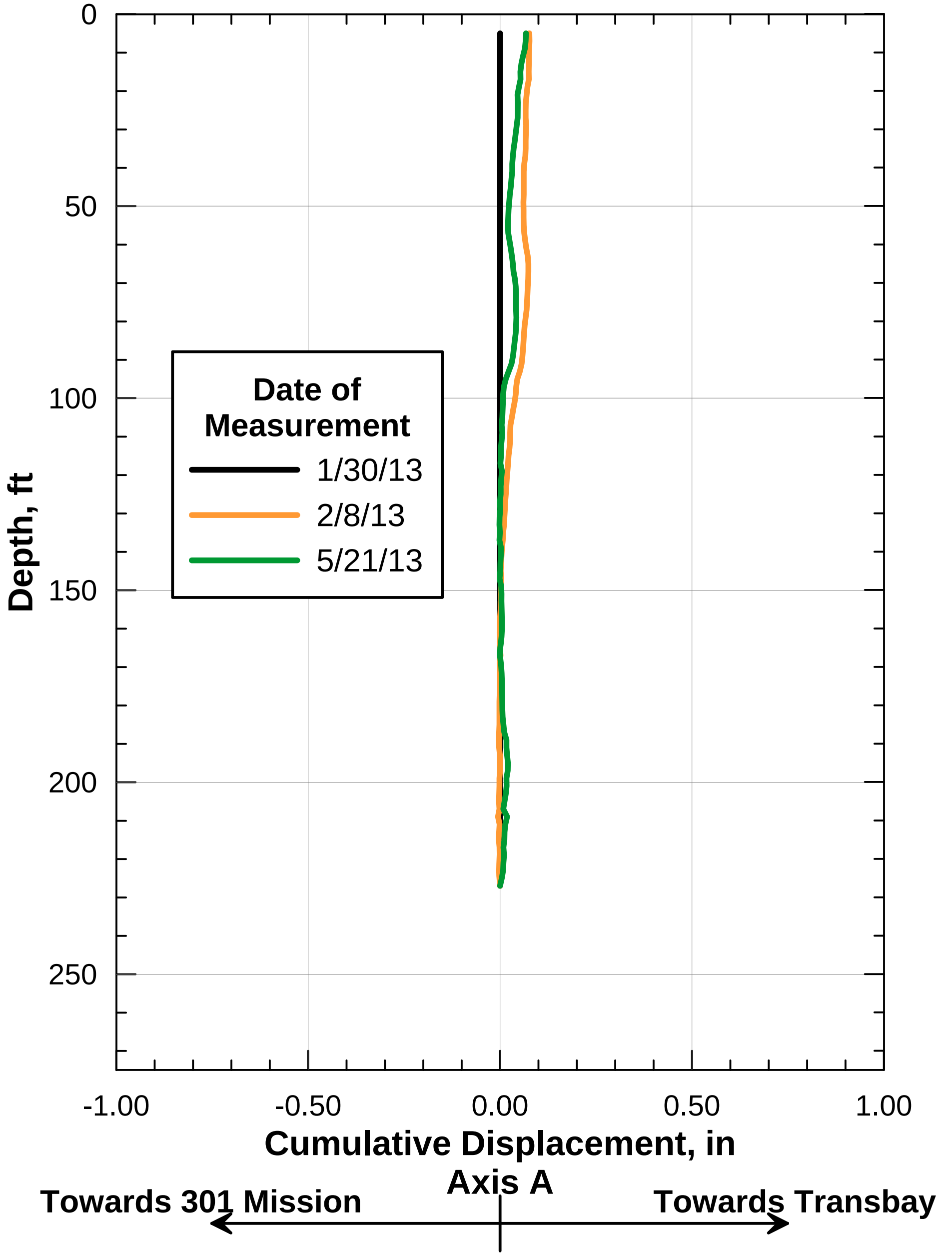
MEASUREMENTS TAKEN AT INCLINOMETER I-21

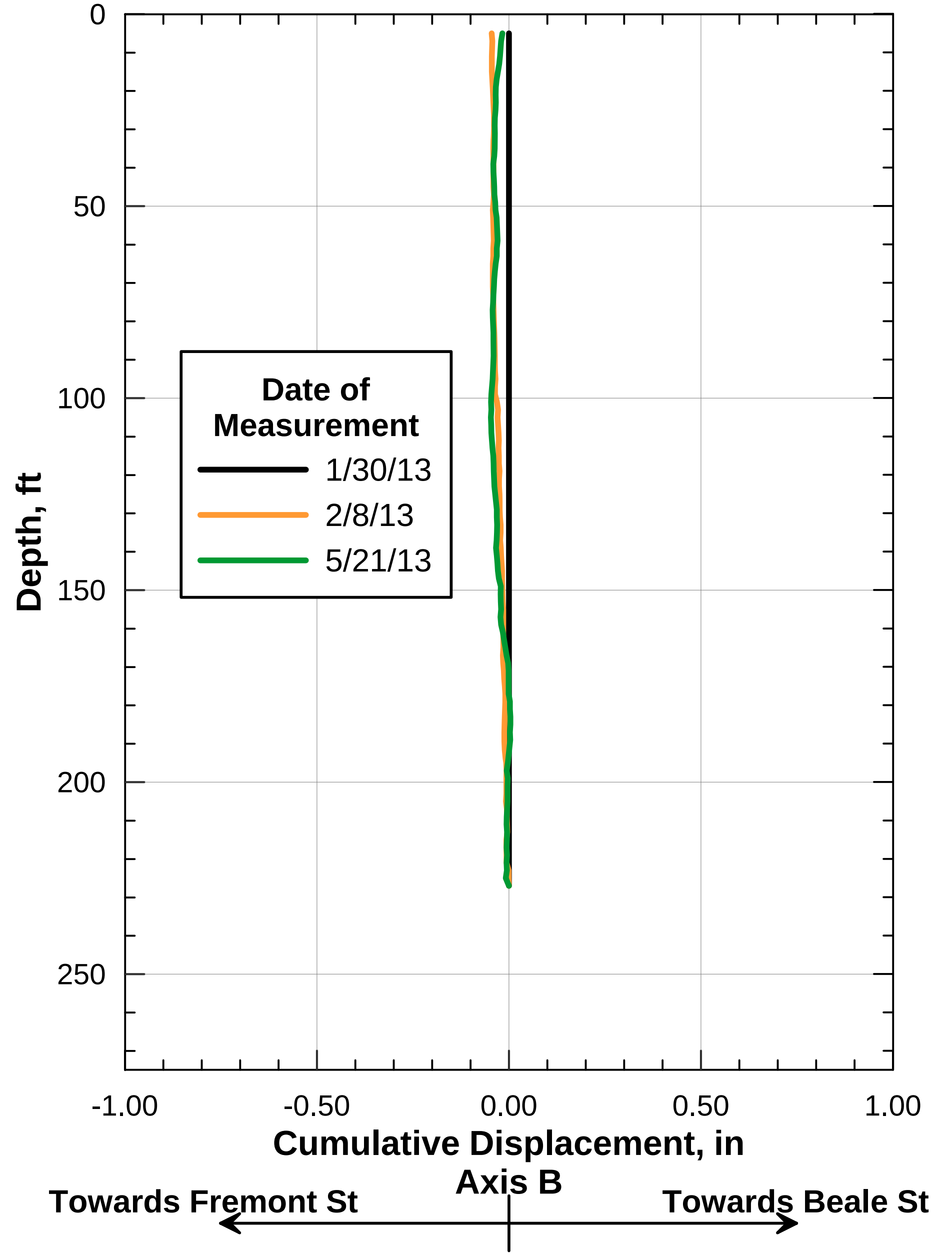
Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
June 2013 San Francisco, California

ARUP

PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\214 301 Mission Inclinometer Update - June 2013\Plates\Plate 3 Inclinometer I-21.grf





MEASUREMENTS TAKEN AT INCLINOMETER I-22

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
June 2013 San Francisco, California

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\\global.arup.com\americas\Jobs\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\214 301 Mission Inclinometer Update - June 2013\Plates\Plate 4 Inclinometer I-22.grf

PLATE 4

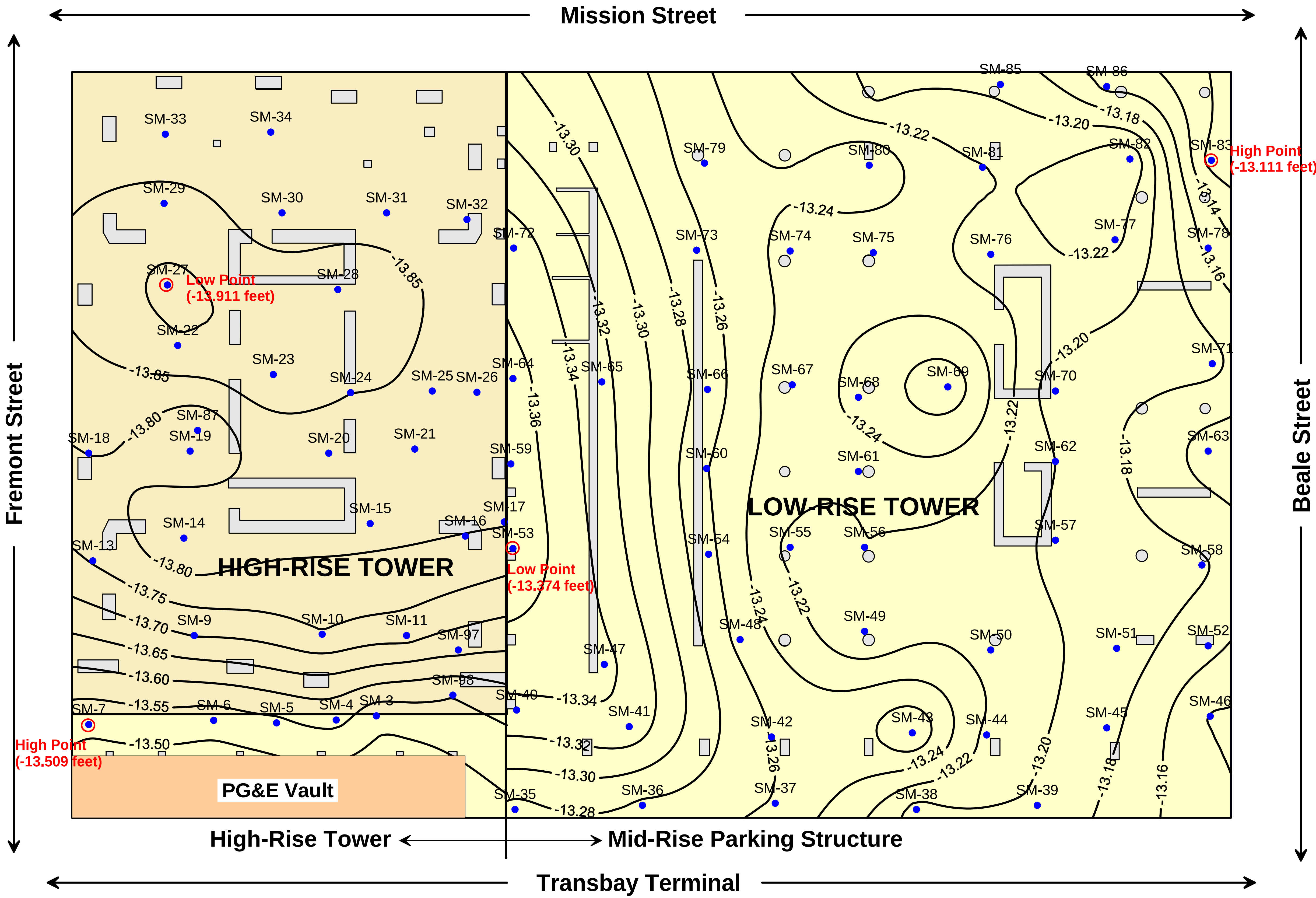
Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date**	28 June 2013
Copies	Robert Beck (TJPA) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/MHG
From	Michael Gardner (Arup)	**File reference**	4-05 212
Subject	Transbay Transit Center: Results of April 2013 Settlement Survey at 301 Mission Property	**Page** 1 **of** 1	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated March 27, 2013 with measurements made through April 2013.

List of Plates



Date of Survey Reading: April 19, 2013

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	**Low-Rise Tower**
0.402 feet (4.824 inches)	**0.263 feet (3.156 inches)**

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on April 19, 2013.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

N

0 25 50 75

Approximate Scale: 1" = 25'

FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY PERIODIC SURVEY - APRIL 19, 2013

Transbay Transit Cente
301 Mission Monitorin
Transbay Joint Powers Authorit
San Francisco, Californi

June 2013

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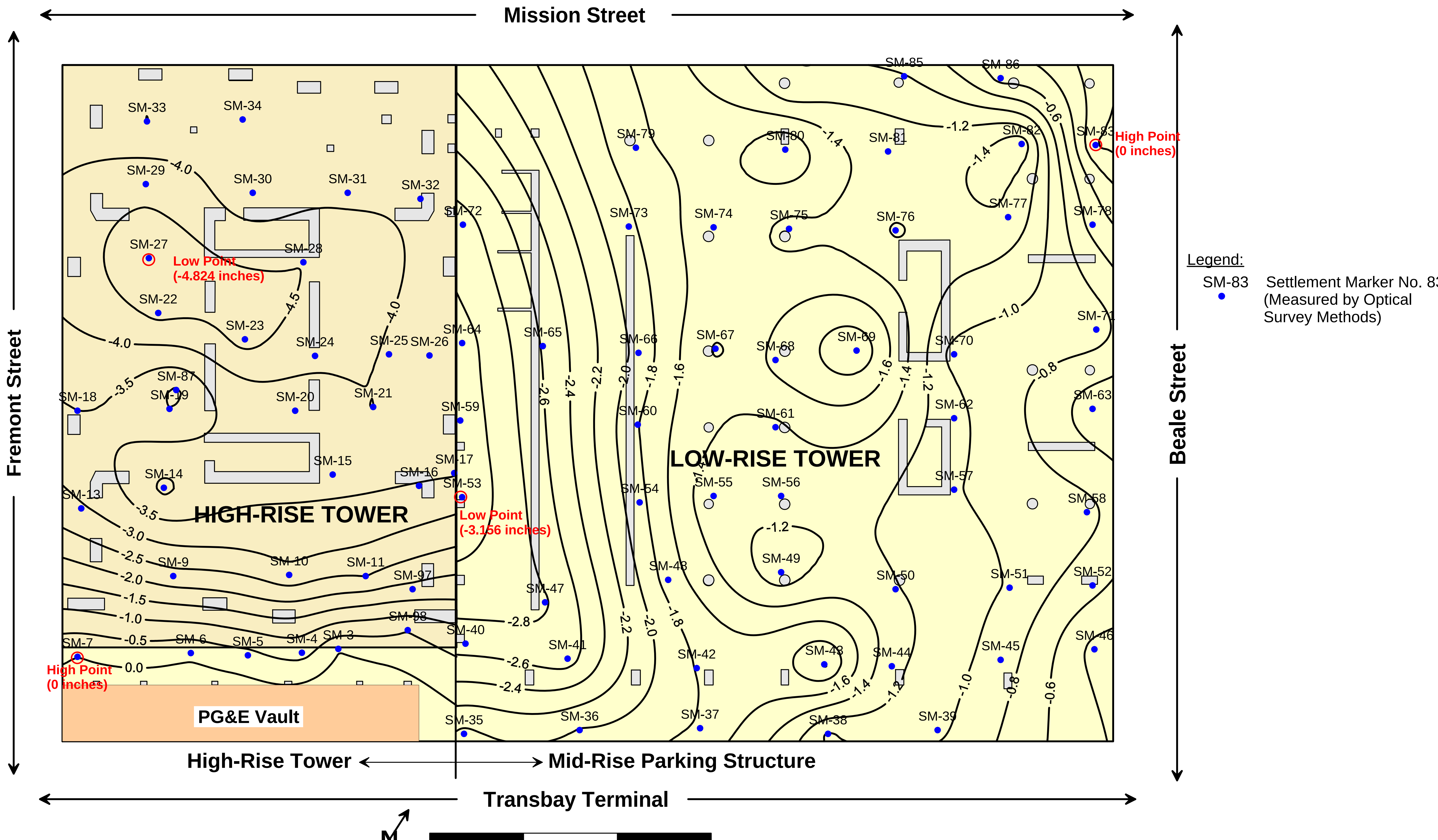
PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\212 301 Mission - April 2013 Survey\Plates\Elevations All (2013.04.19).srf



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on April 19, 2013.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
APRIL 19, 2013 SURVEY

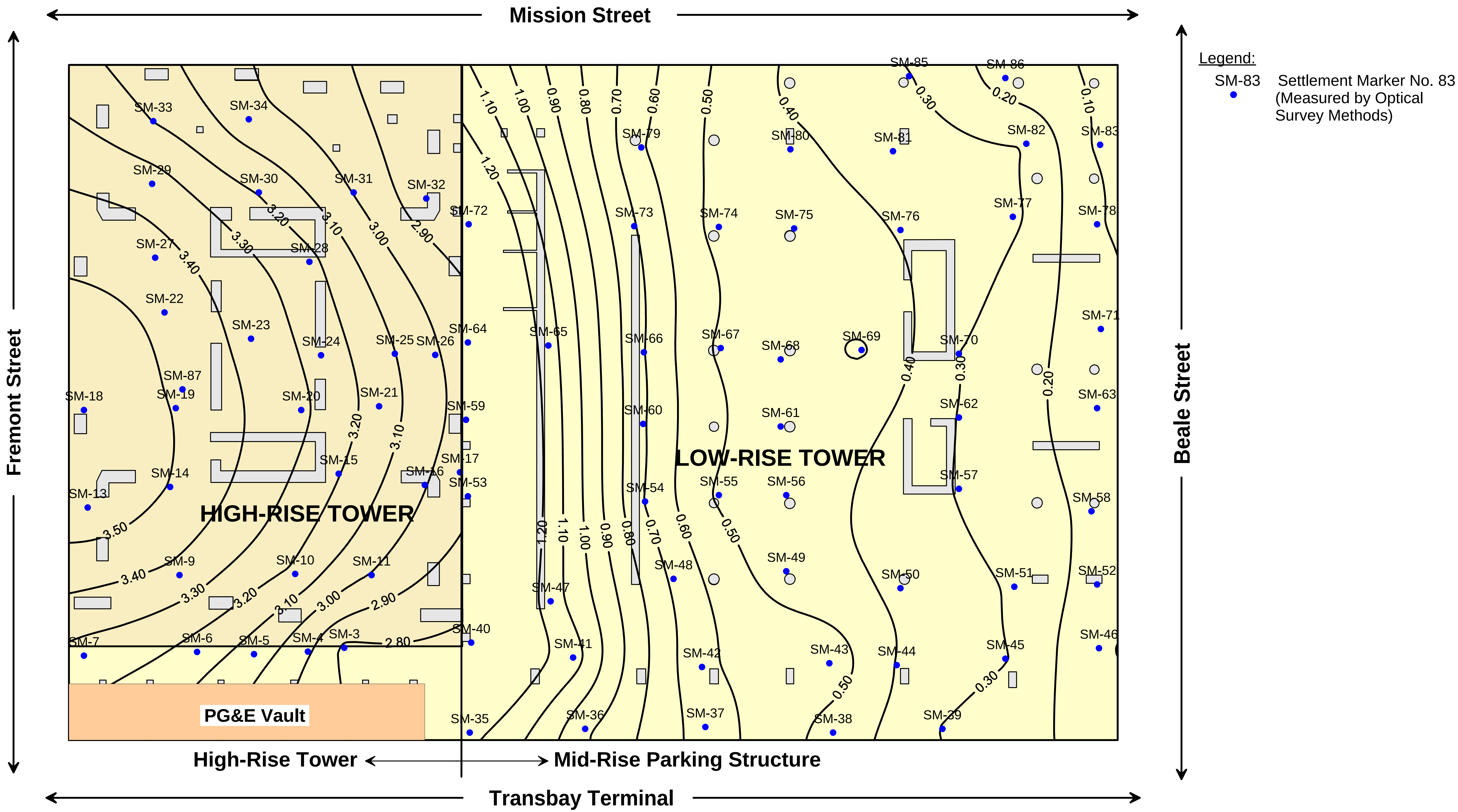
Transbay Transit Cente
301 Mission Monitorin
Transbay Joint Powers Authorit
San Francisco, Californi

June 2013

ARUP

PLATE 2

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\212 301 Mission - April 2013 Survey\Plates\Differential Elevation All (2013.04.19).srf



N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on April 19, 2013.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE 1ST LEVEL BASEMENT OF THE 301 MISSION ST STRUCTURE BETWEEN 04/30/2009 AND 04/19/2013

Transbay Transit Cente
301 Mission Monitoring
Transbay Joint Powers Authorit
San Francisco, Californi

June 2013

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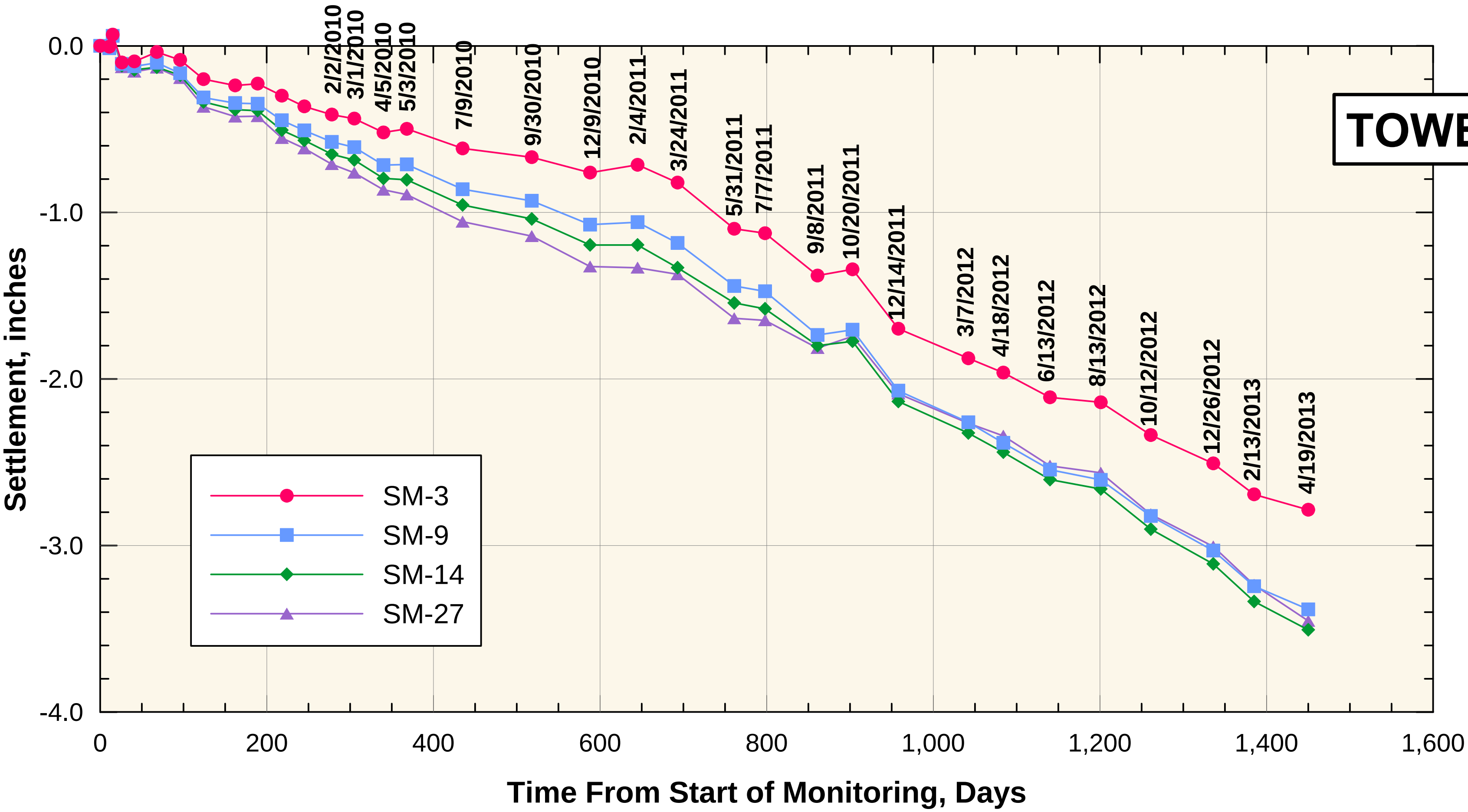
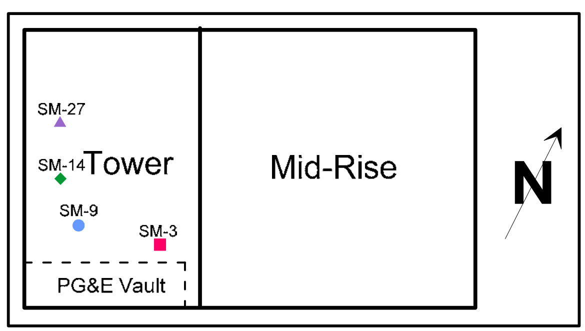
PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\212 301 Mission - April 2013 Survey\Plates\Elevation changes All (2013.04.19).srf





Note:
Initial (Baseline) reading taken on 04/30/09

\\global.arup.com\americas\Jobs\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\212 301 Mission - April Survey\Plates\Plate 4 Settlement Over Time - Tower.grf

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH APRIL 19, 2013

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2013

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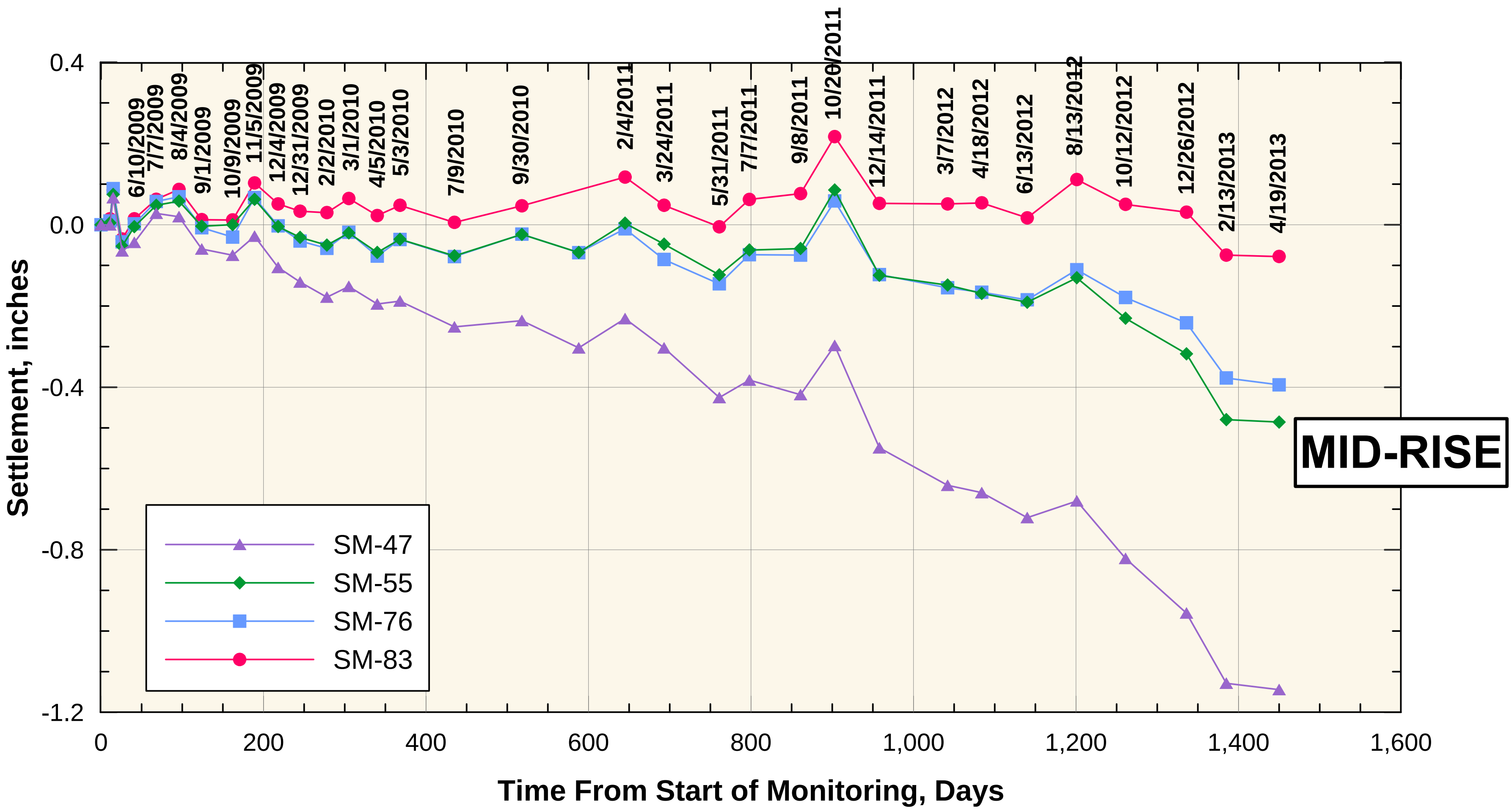
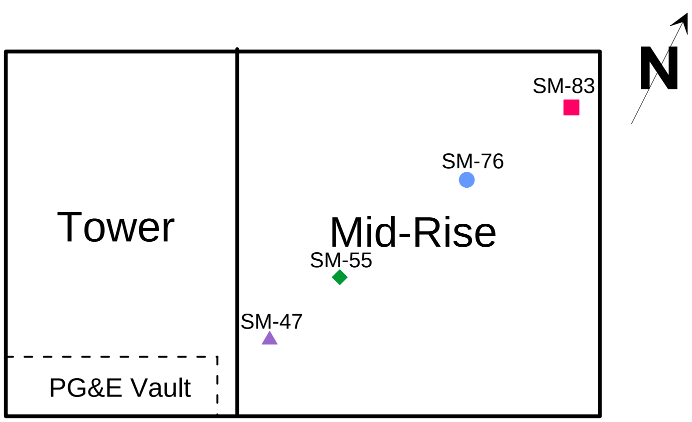
PLATE 4





Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH APRIL 19, 2013

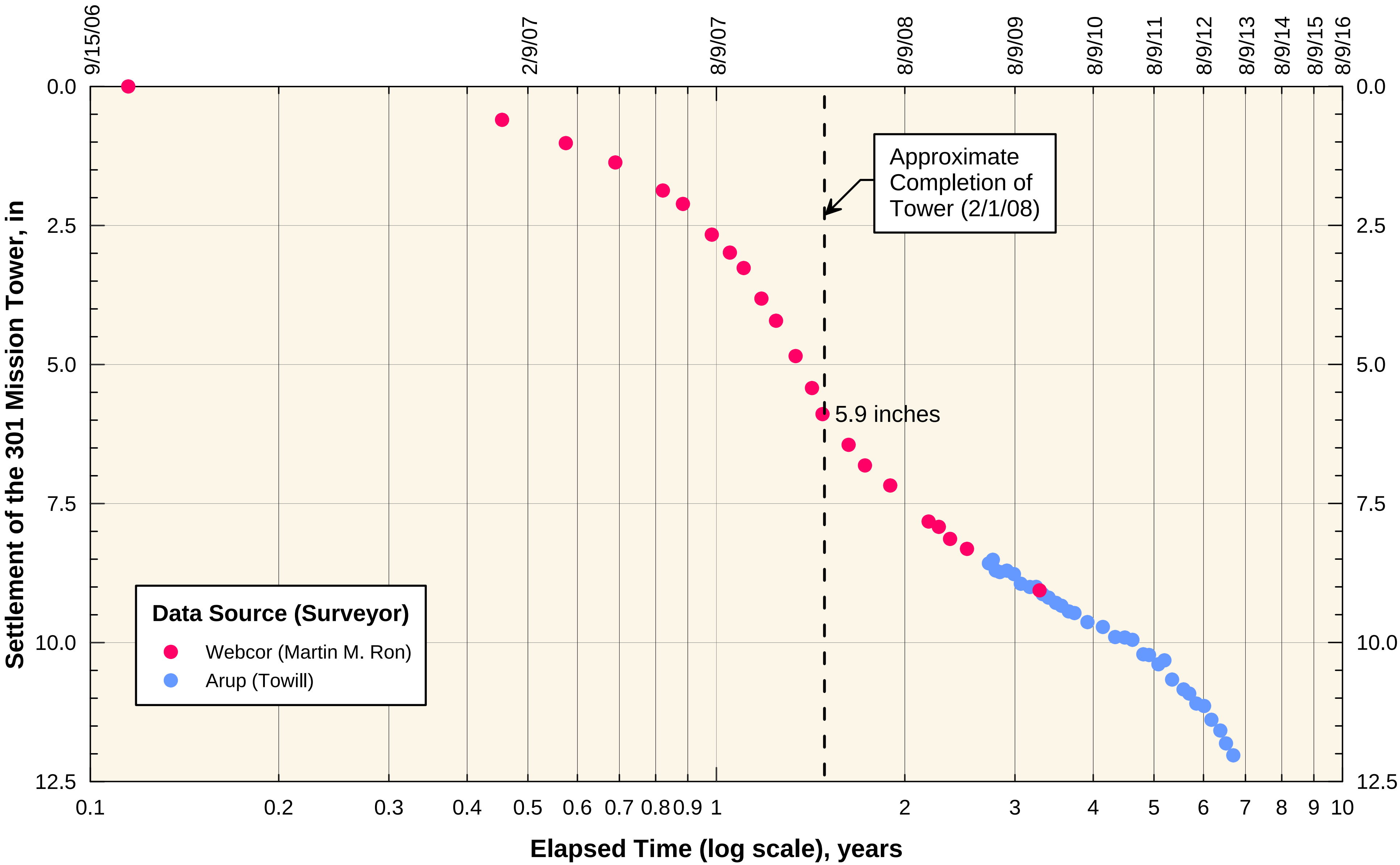
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2013

ARUP

PLATE 5

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\212 301 Mission - April Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER
INCLUDING MONITORING DURING CONSTRUCTION

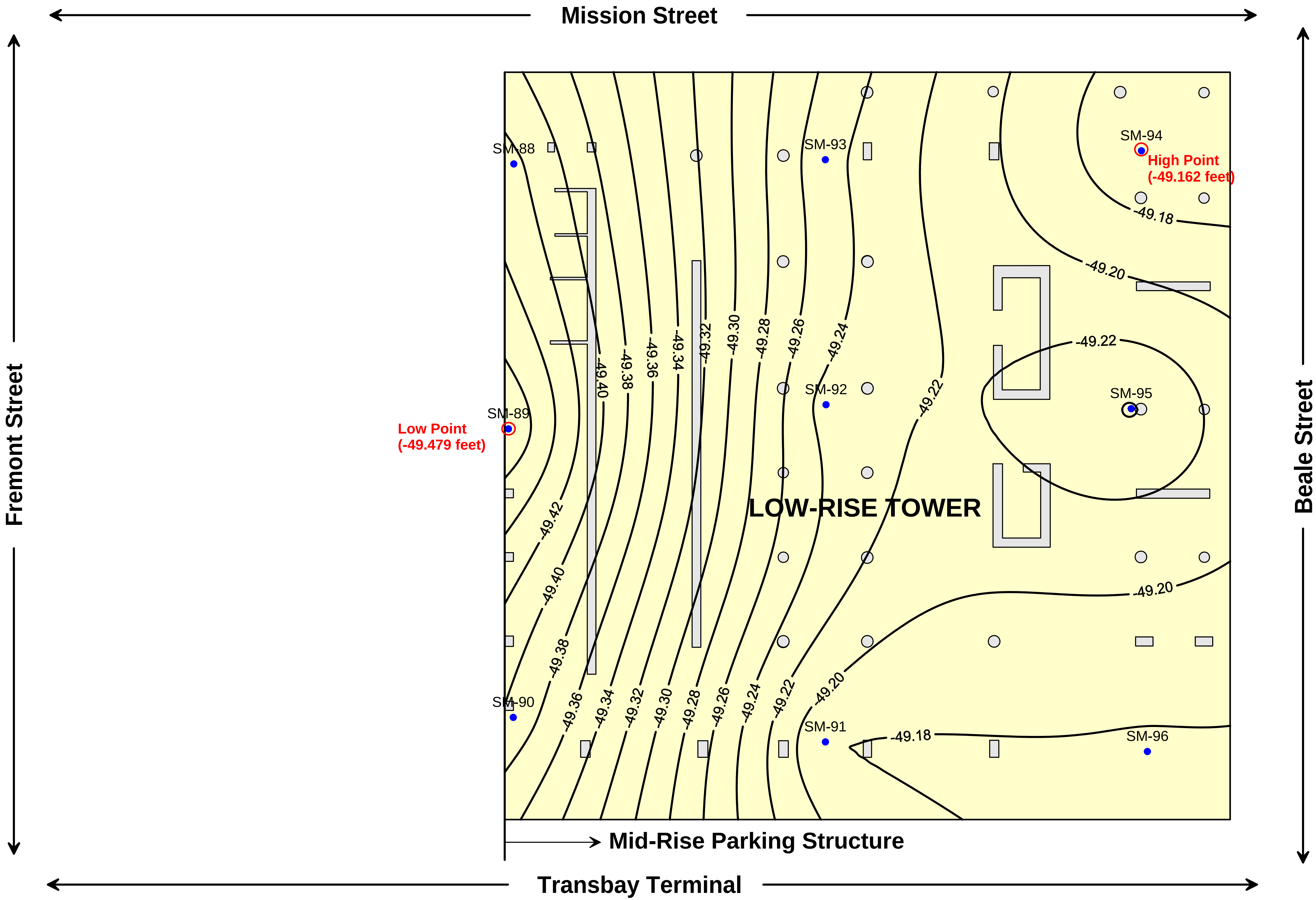
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2013

ARUP

PLATE 6

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\212 301 Mission - April Survey\Plates\Plate 6 Tower Settlements.grf



Date of Survey Reading:
April 19, 2013

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.317 feet (3.799 inches)

N

0 25 50 75

Approximate Scale: 1" = 25'

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on April 19, 2013.

FLOOR ELEVATION AT BASEMENT LEVEL B-5 OF 301 MISSION PROPERTY: APRIL 19, 2013 SURVEY

Transbay Transit Cente
301 Mission Monitorin
Transbay Joint Powers Authorit
San Francisco, Californi

June 2013

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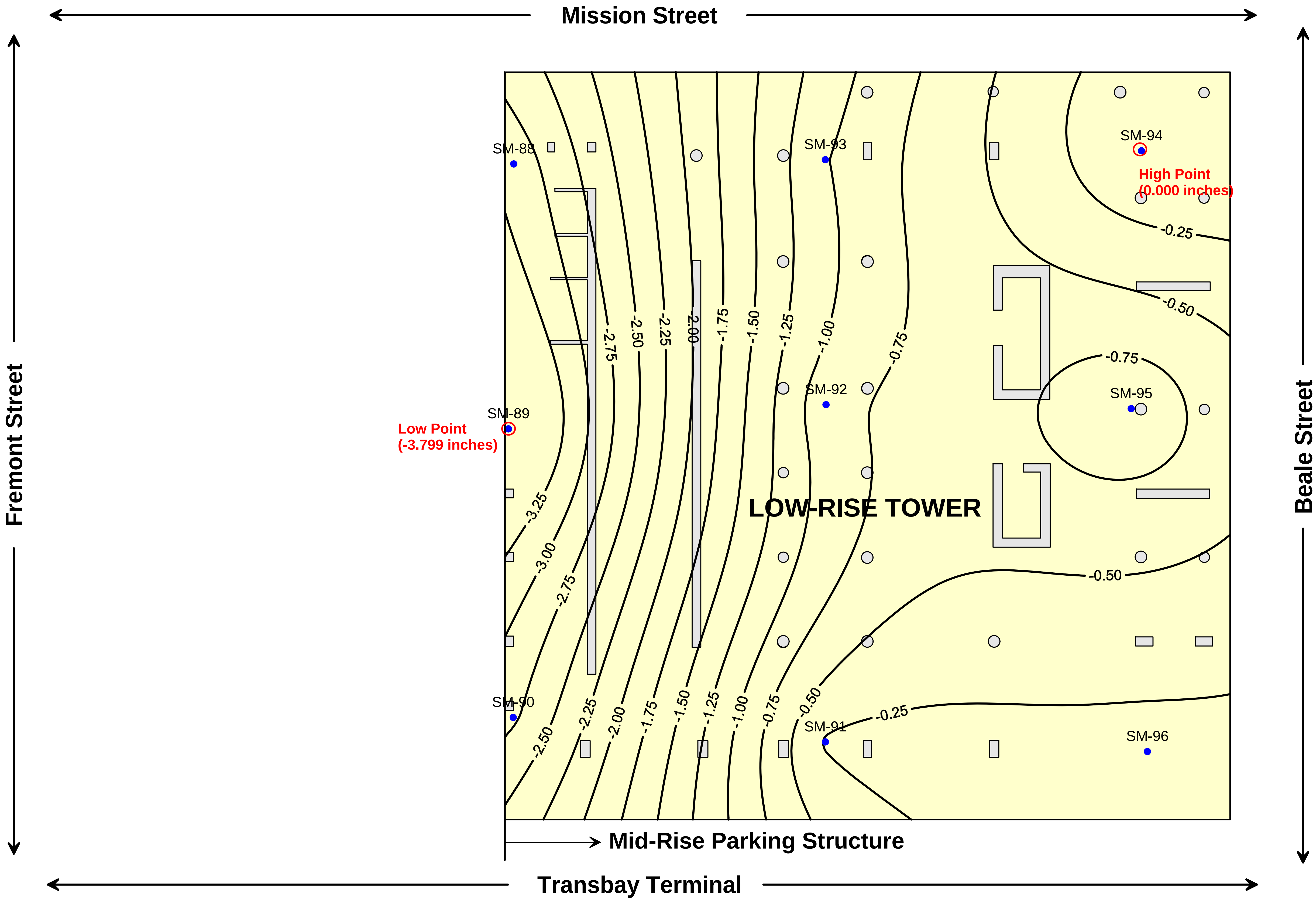
PLATE 7

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\212 301 Mission - April 2013 Survey\Plates\B-5 Elevations (2013.04.19).srf



Date of Survey Reading:
April 19, 2013

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.317 feet (3.799 inches)

N

0 25 50 75

Approximate Scale: 1" = 25'

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on April 19, 2013.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES) AT BASEMENT LEVEL B-5: APRIL 19, 2013 SURVE

Transbay Transit Cente
301 Mission Monitorin
Transbay Joint Powers Authorit
San Francisco, Californi

June 2013

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PLATE 8

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\212 301 Mission - April 2013 Survey\Plates\B-5 Differential Elevations (2013.04.19).srf

Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date** 28 June 2013
Copies	Robert Beck (TJPA) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number** 132242-60/MHG
From	Michael Gardner (Arup)	**File reference** 4-05 213
Subject	Transbay Transit Center: Results of June 2013 Settlement Survey at 301 Mission Property	**Page** 1 **of** 1

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated June 28, 2013 with measurements made through June 2013.

List of Plates

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Plate 3	Contours of Settlements Measured at the 1st Level Basement of the 301 Mission St. Structure Between 04/30/2009 & 06/03/2013
Plate 4	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Tower: April 30, 2009 through June 3, 2013
Plate 5	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Mid-Rise: April 30, 2009 through June 3, 2013
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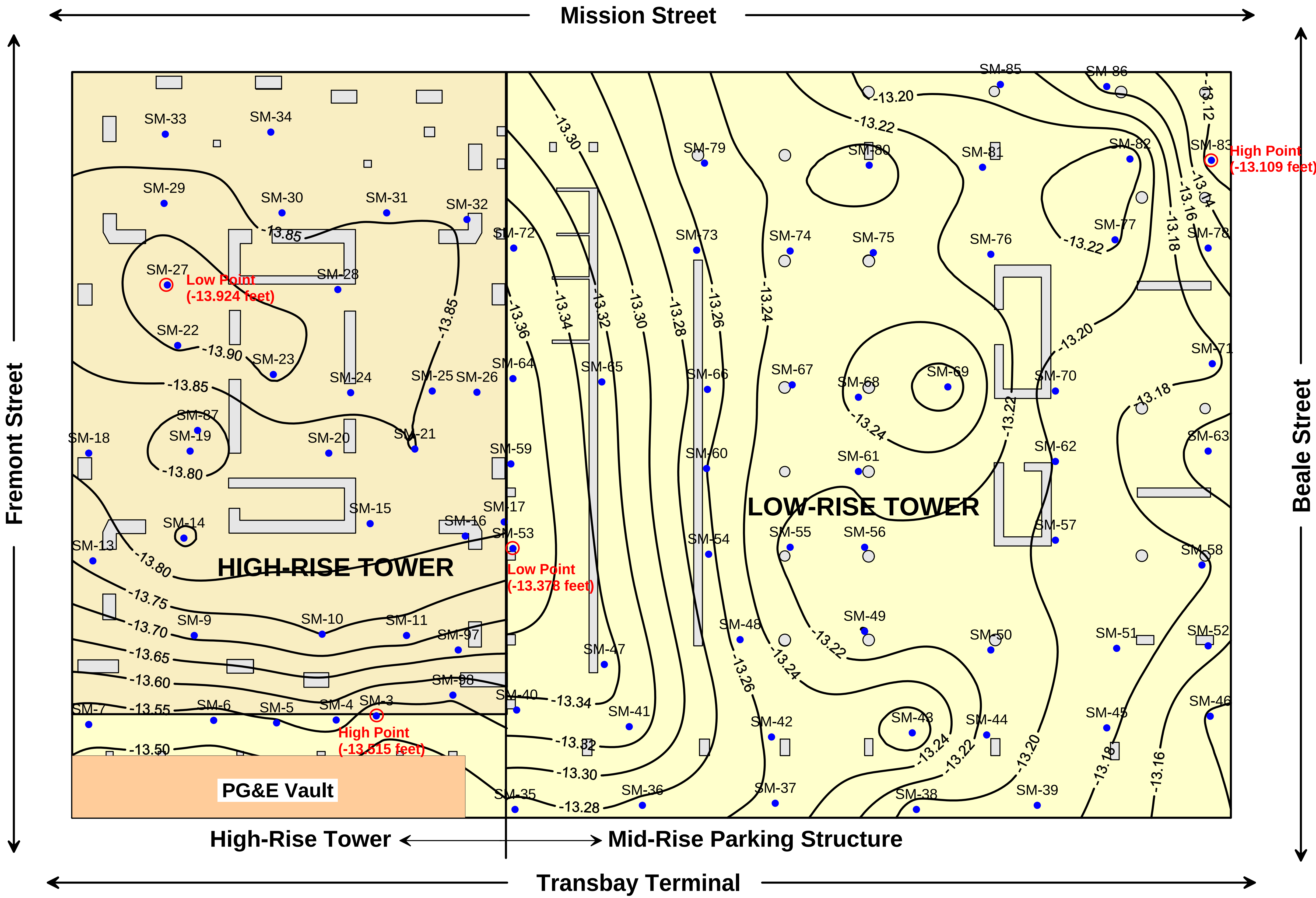
Plate 7	Floor Elevation at Basement Level B-5 of 301 Mission Property: June 3, 2013 Survey
Plate 8	Differential Floor Elevations (Inches) at Basement Level B-5: June 3, 2013 Survey



Date of Survey Reading:
June 3, 2013

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	**Low-Rise Tower**
0.409 feet (4.912 inches)	**0.269 feet (3.228 inches)**

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on June 3, 2013.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

0 25 50 75
Approximate Scale: 1" = 25'

FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY
PERIODIC SURVEY - JUNE 03, 2013

Transbay Transit Cente
301 Mission Monitorin
Transbay Joint Powers Authorit
San Francisco, Californi

June 2013

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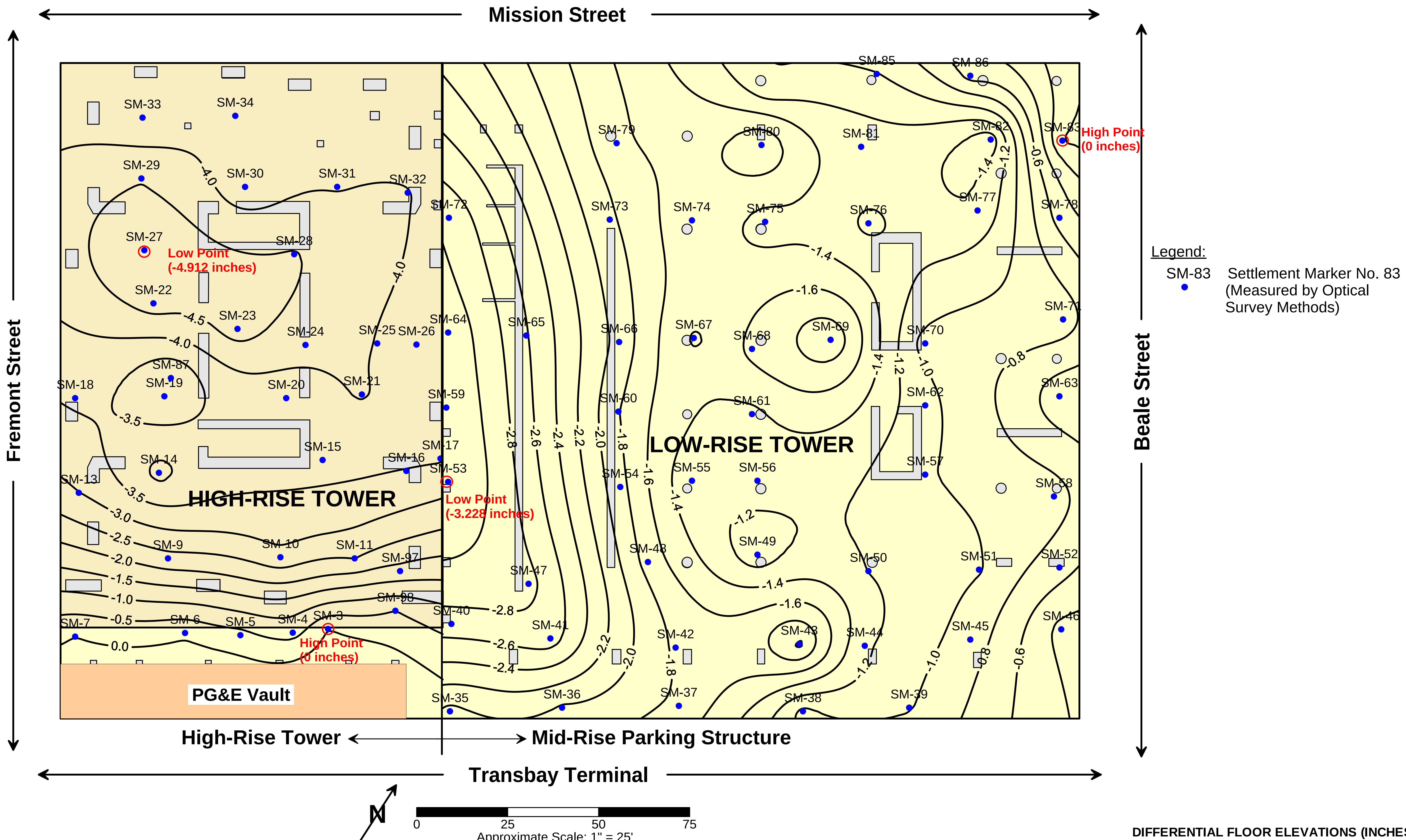
PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\213 301 Mission - June 2013 Survey\Plates\Elevations All (2013.06.03).srf



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on June 3, 2013.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
JUNE 03, 2013 SURVEY

Transbay Transit Cente
301 Mission Monitorin
Transbay Joint Powers Authorit
San Francisco, Californi

June 2013

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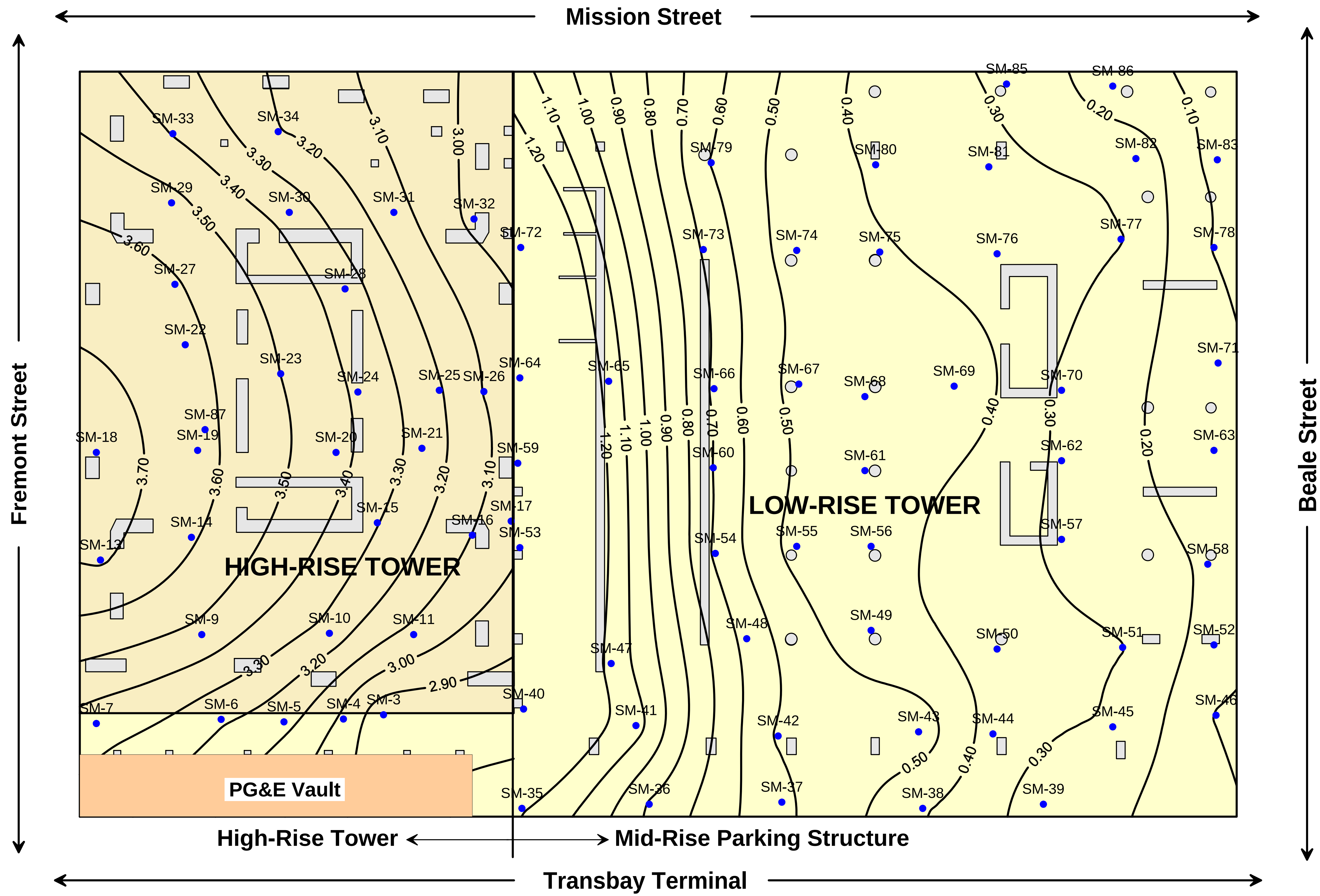
PLATE 2

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\212 301 Mission - June 2013 Survey\Plates\Differential Elevation All (2013.06.03).srf



Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

N

0 25 50 75

Approximate Scale: 1" = 25'

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on June 3, 2013.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE 1ST LEVEL BASEMENT OF THE 301 MISSION ST STRUCTURE BETWEEN 04/30/2009 & 06/03/2013

Transbay Transit Cente
301 Mission Monitorinç
Transbay Joint Powers Authorit
San Francisco, Californi

June 2013

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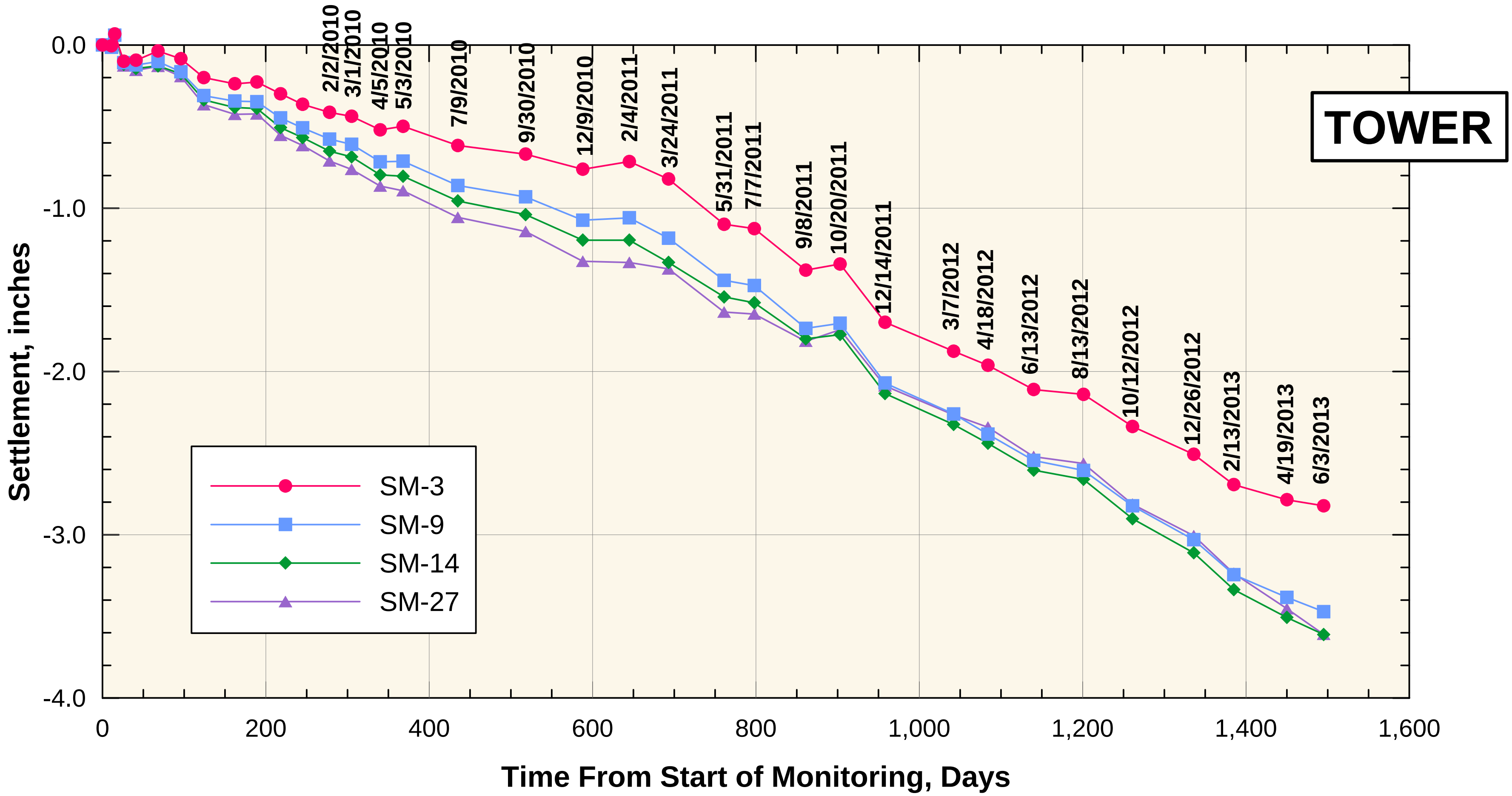
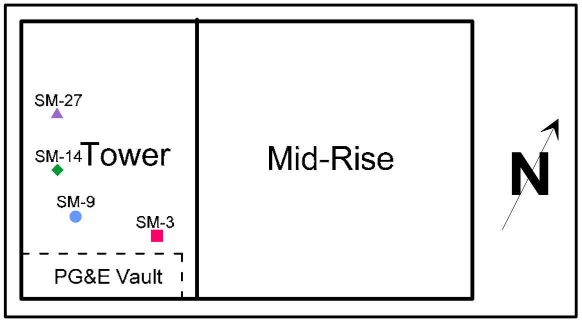
PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\213 301 Mission - June 2013 Survey\Plates\Elevation changes All (2013.06.03).srf





Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH JUNE 03, 2013

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2013

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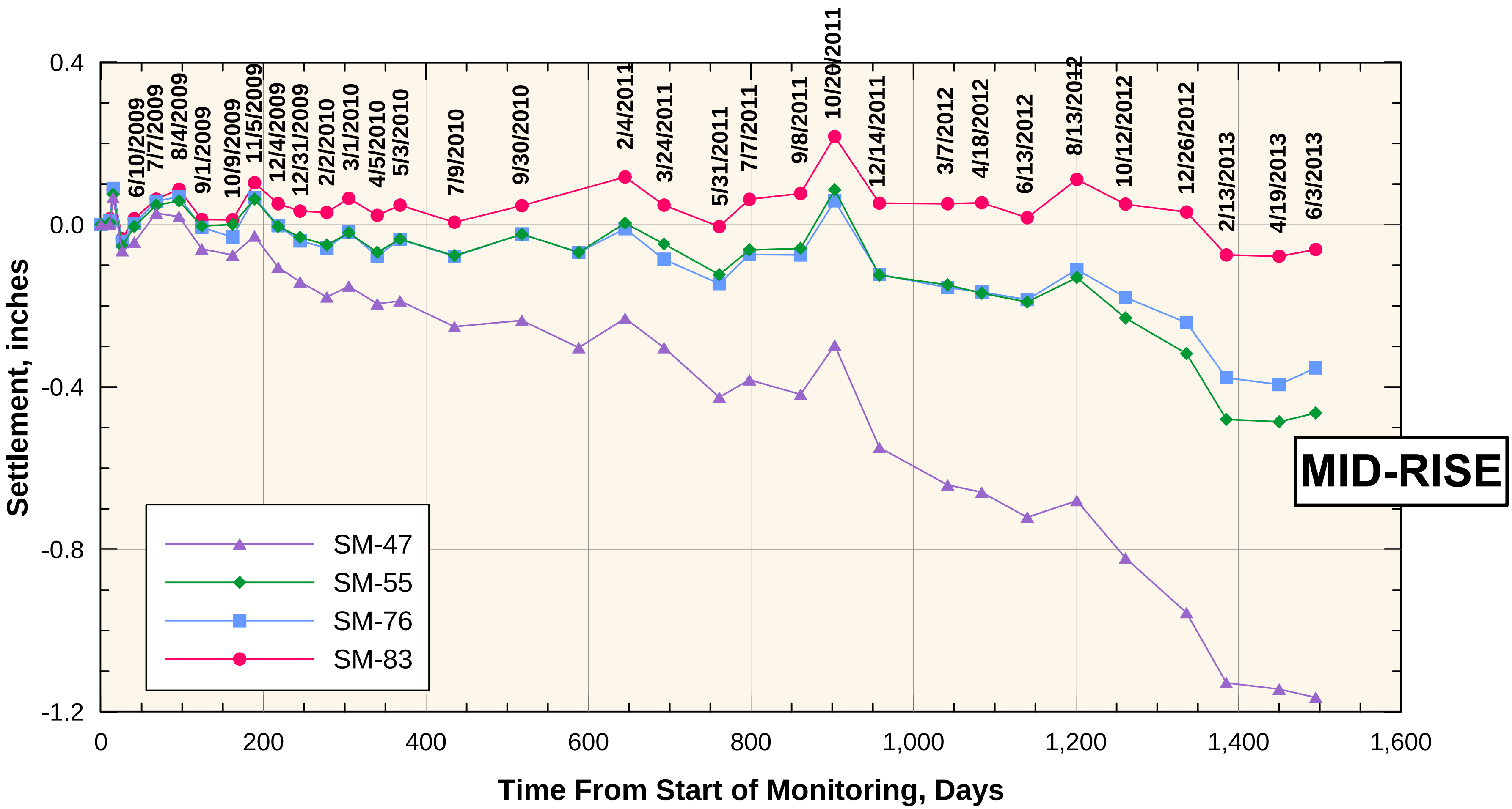
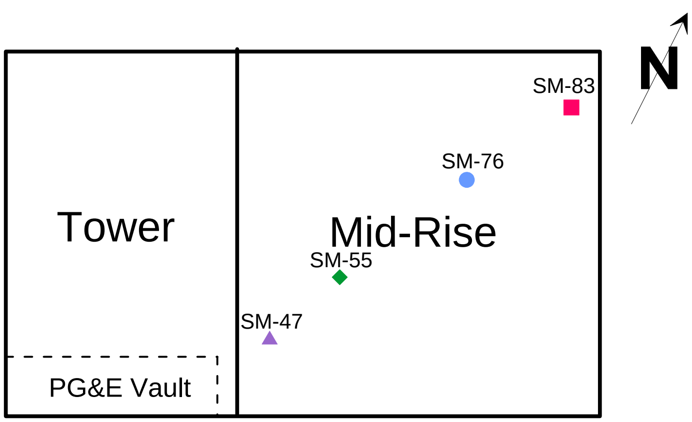
PLATE 4

\\global.arup.com\americas\Jobs\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\213 301 Mission - June Survey\Plates\Plate 4 Settlement Over Time - Tower.grf





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH JUNE 03, 2013

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2013

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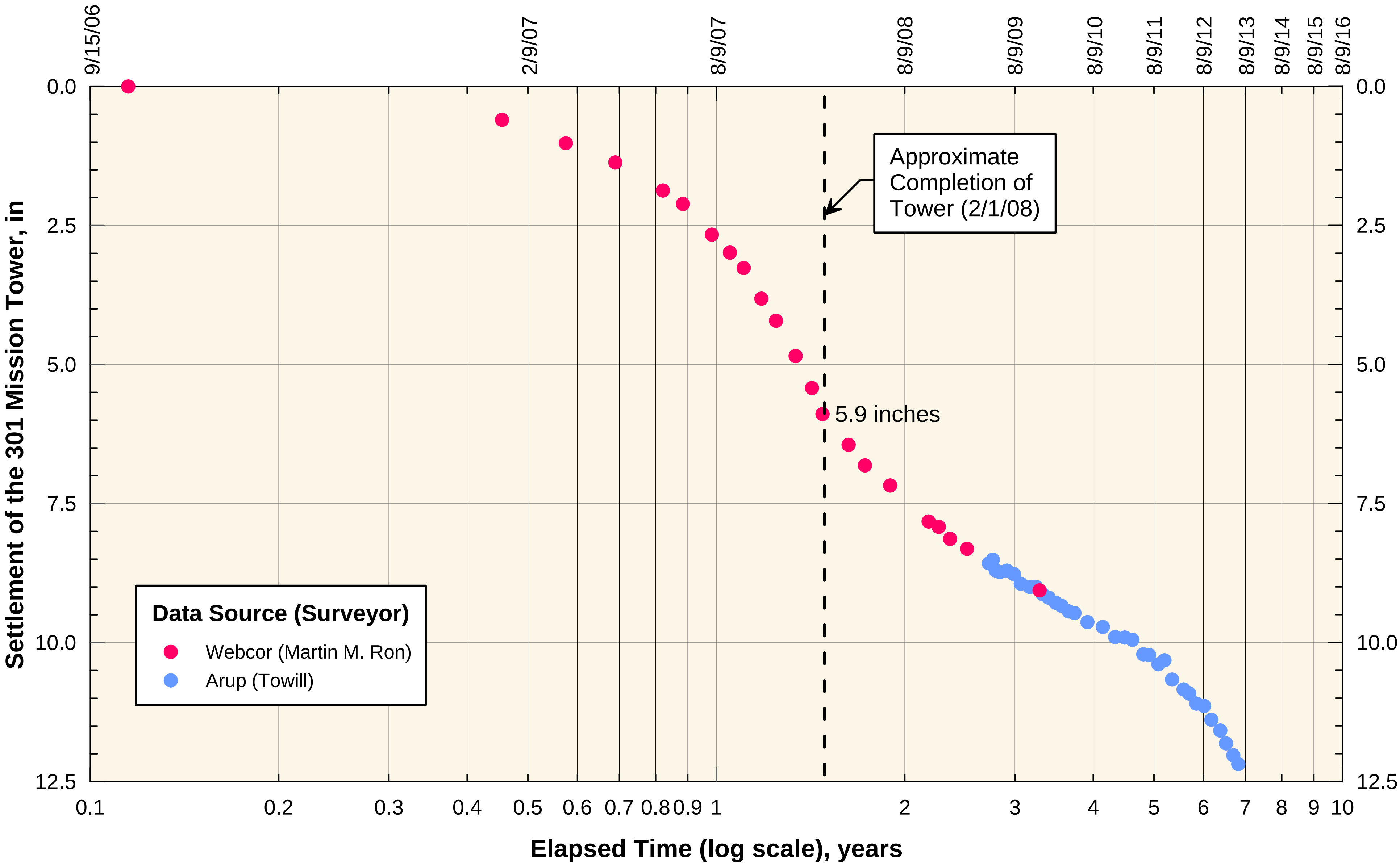
PLATE 5

Note:
Initial (Baseline) reading taken on 04/30/09

\\global.arup.com\americas\Jobs\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\213 301 Mission - June Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER
INCLUDING MONITORING DURING CONSTRUCTION

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2013

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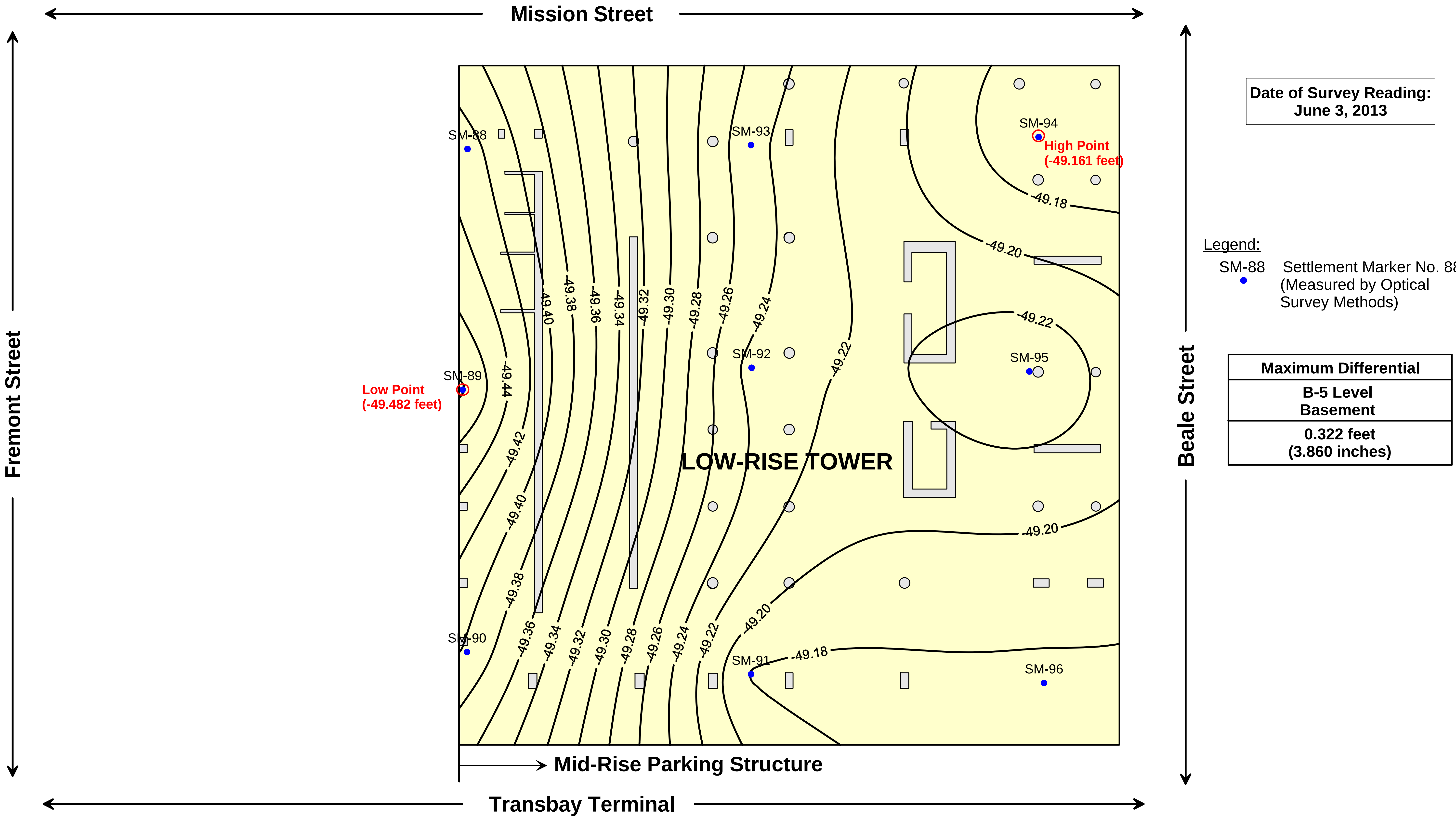
PLATE 6

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\213 301 Mission - June Survey\Plates\Plate 6 Tower Settlements.grf



N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on June 3, 2013.

0 25 50 75
Approximate Scale: 1" = 25'

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\213 301 Mission - June 2013 Survey\Plates\B-5 Elevations (2013.06.03).srf

FLOOR ELEVATION AT BASEMENT LEVEL B-5 OF 301 MISSION PROPERTY: JUNE 03, 2013 SURVEY

Transbay Transit Cente
301 Mission Monitoring
Transbay Joint Powers Authorit
San Francisco, Californi

June 2013

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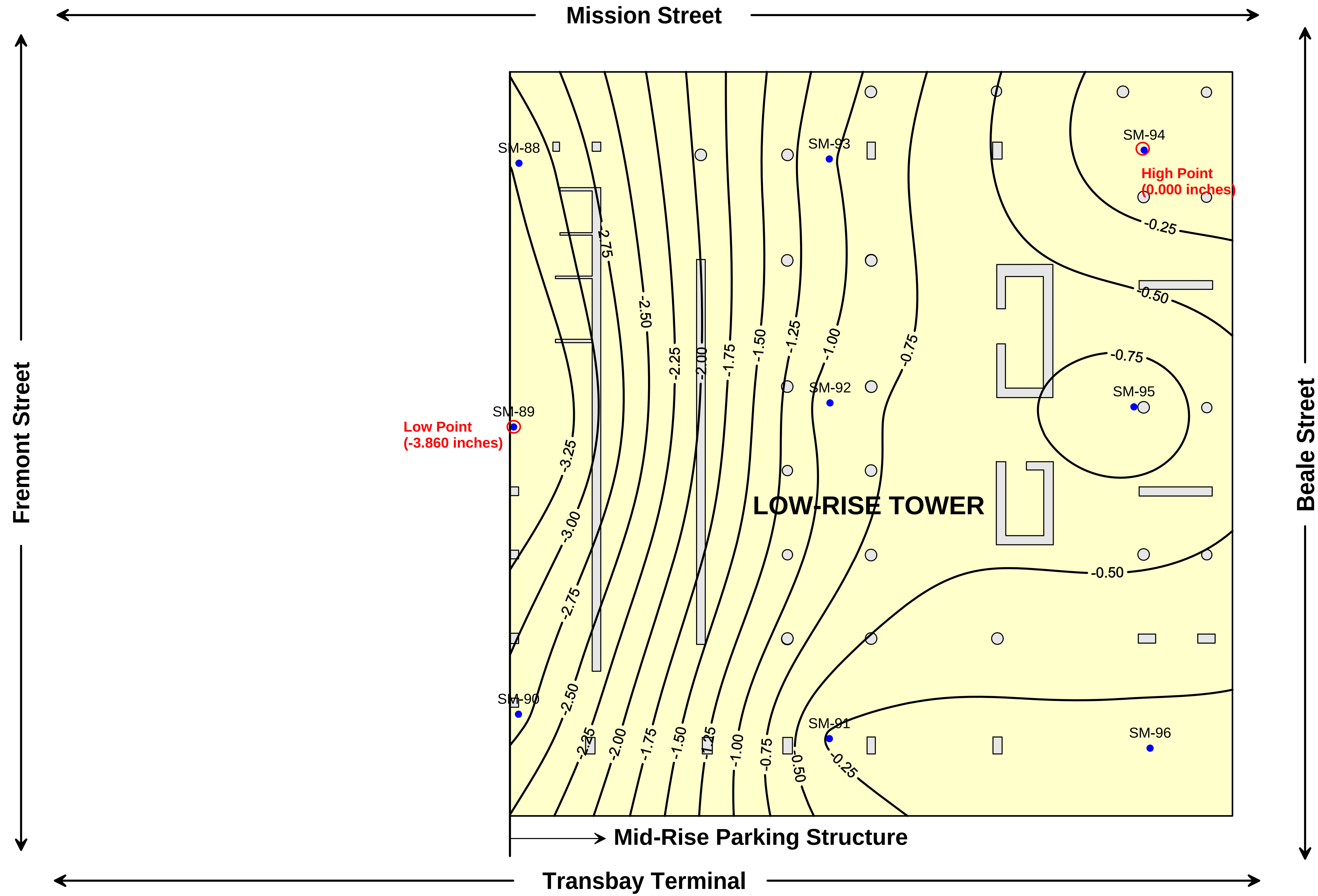
PLATE 7

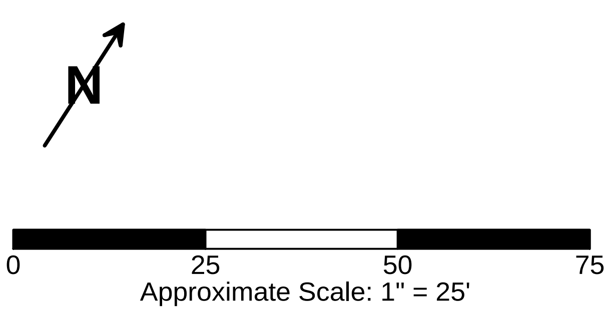


Date of Survey Reading:
June 3, 2013

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.322 feet (3.860 inches)



Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on June 3, 2013.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
AT BASEMENT LEVEL B-5: JUNE 03, 2013 SURVEY

Transbay Transit Cente
301 Mission Monitorin
Transbay Joint Powers Authorit
San Francisco, Californi

June 2013

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PLATE 8

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\213 301 Mission - June 2013 Survey\Plates\B-5 Differential Elevations (2013.06.03).srf

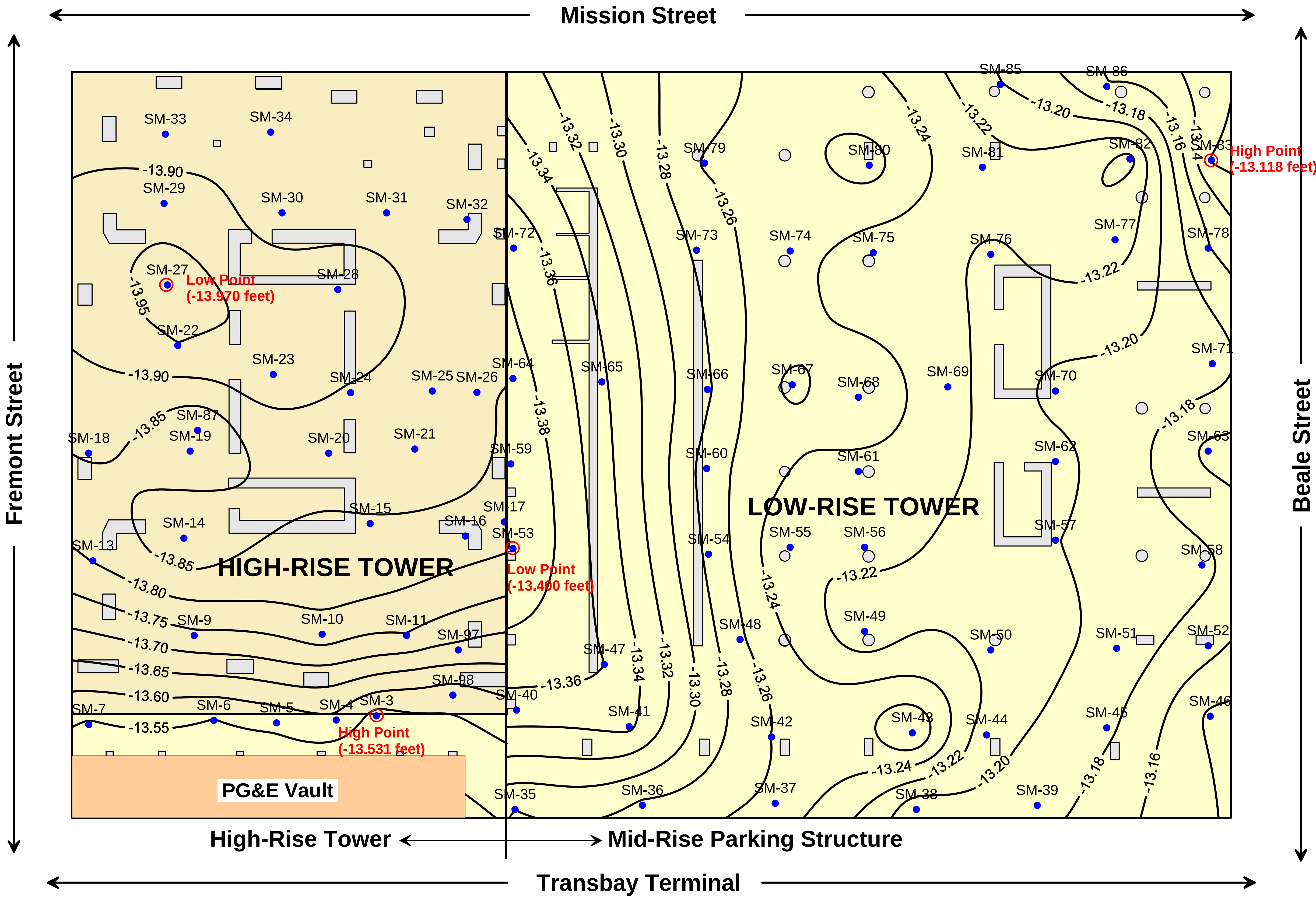
Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date**	13 November 2013
Copies	Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/MHG
From	Stephen McLandrich (Arup)	**File reference**	4-05 213
Subject	Transbay Transit Center: Results of October 2013 Settlement Survey at 301 Mission Property	**Page** 1 **of** 1	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated June 28, 2013 with measurements made through October 2013.

List of Plates



Date of Survey Reading:
October 9, 2013

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	**Low-Rise Tower**
0.439 feet (5.268 inches)	**0.281 feet (3.384 inches)**

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on October 9, 2013.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

0 25 50 75

Approximate Scale: 1" = 25'

FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY: PERIODIC SURVEY - OCTOBER 9, 2013

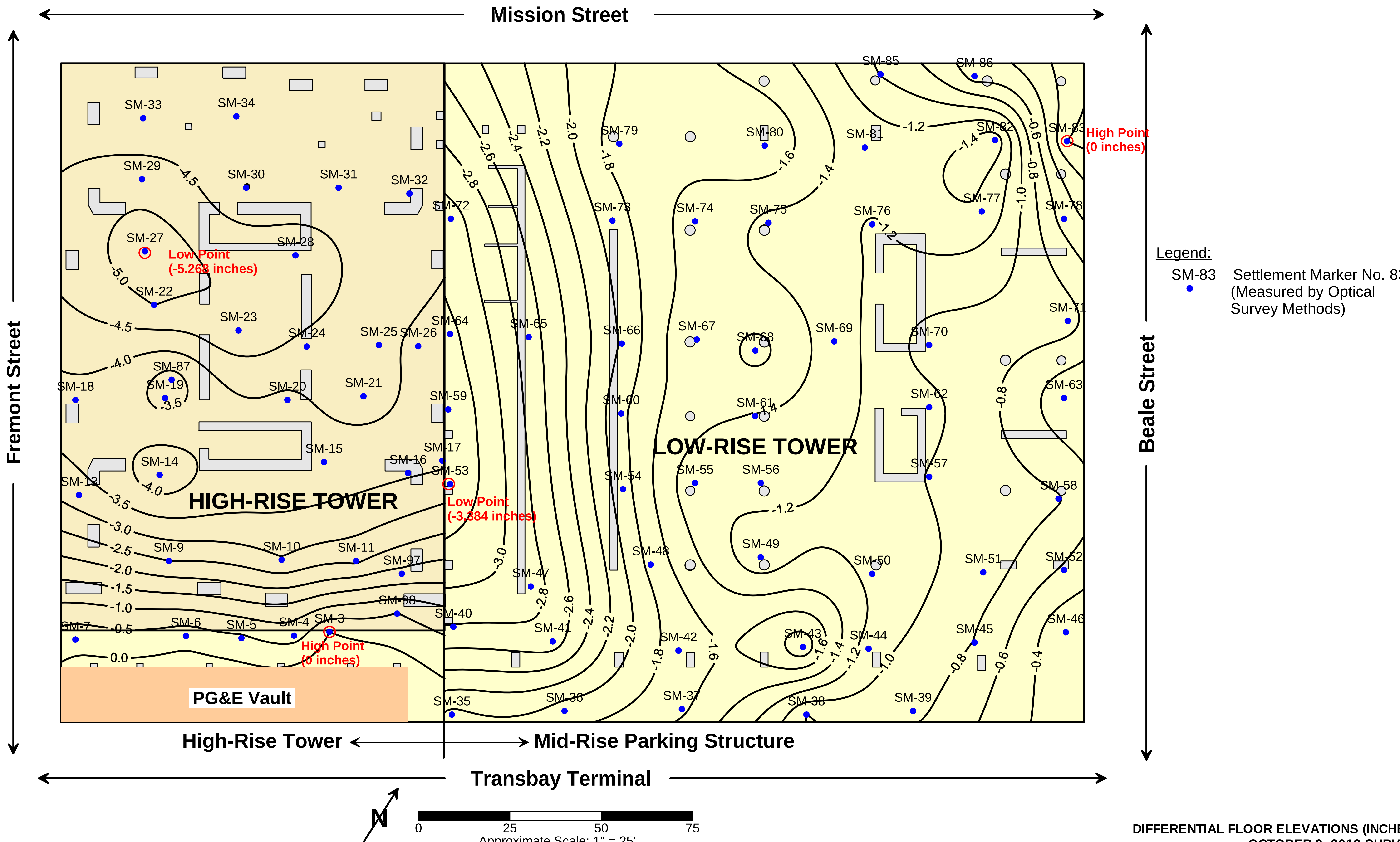
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

November 2013

ARUP

PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\221 301 Mission - October 2013 Survey\Plates\Elevations All (2013.10.09).srf



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on October 9, 2013.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
OCTOBER 9, 2013 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

November 2013

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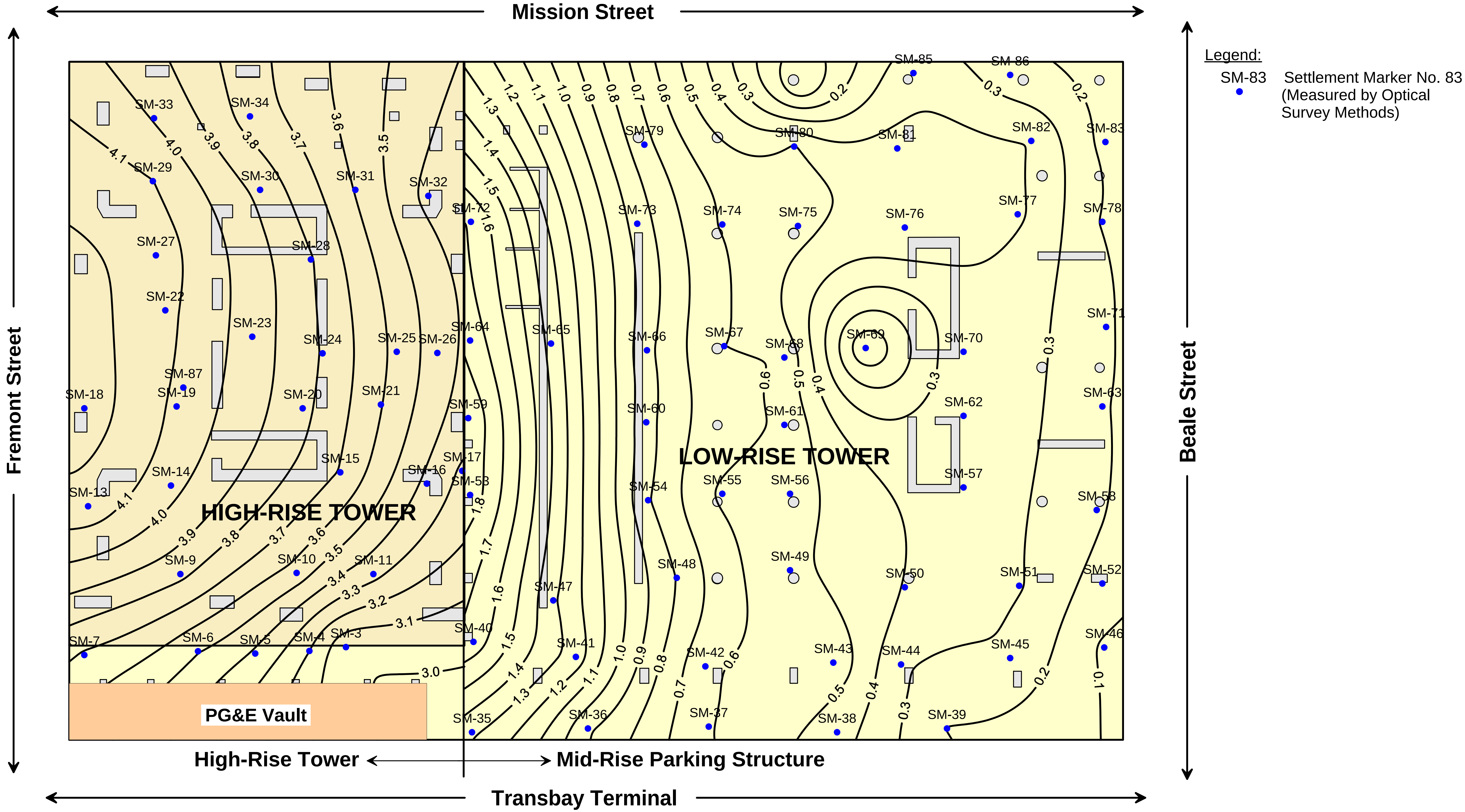
PLATE 2

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\221 301 Mission - October 2013 Survey\Plates\Differential Elevation All (2013.10.09).srf



N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on October 9, 2013.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE 1ST LEVEL BASEMENT OF THE 301 MISSION ST STRUCTURE BETWEEN 04/30/2009 & 10/09/2013

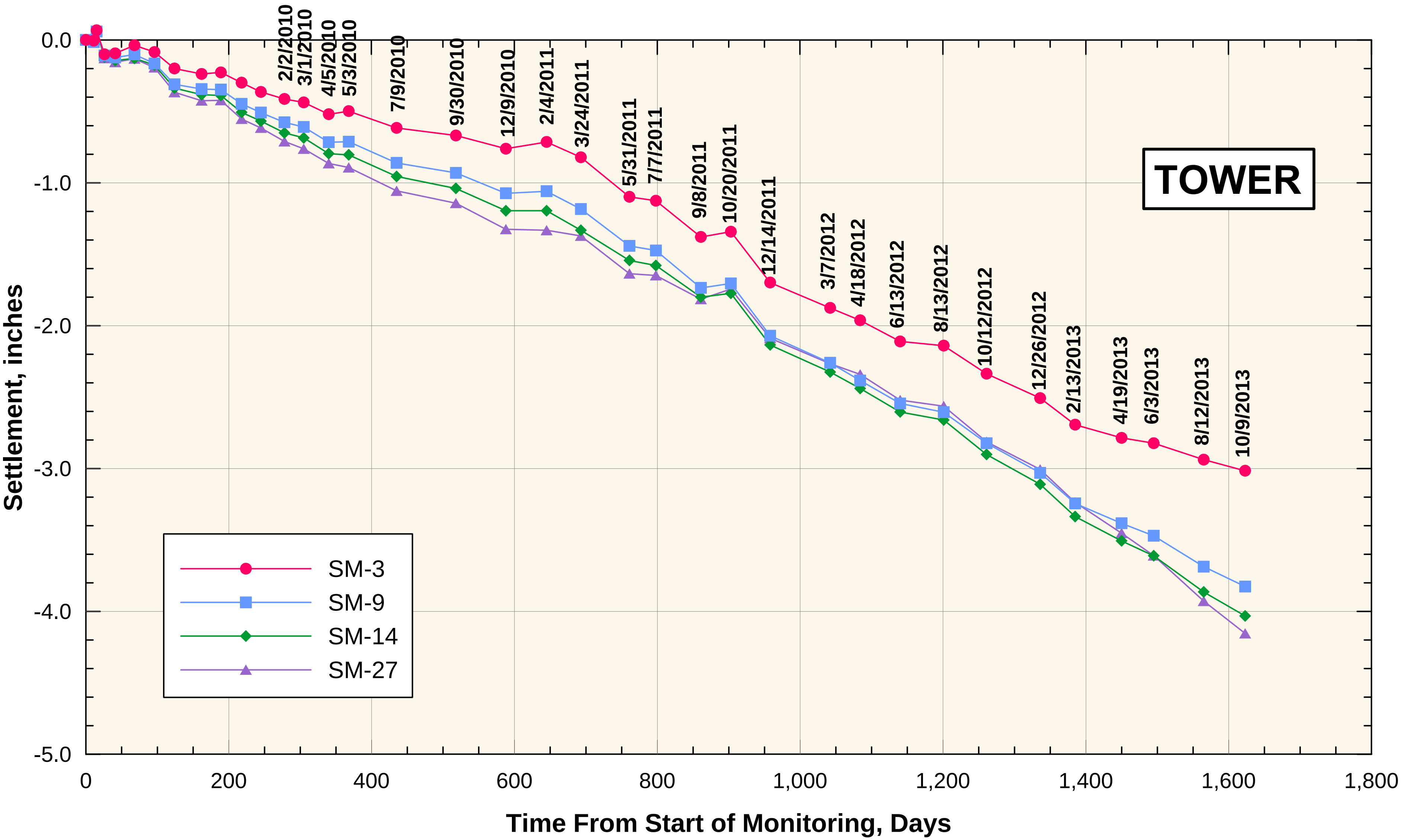
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

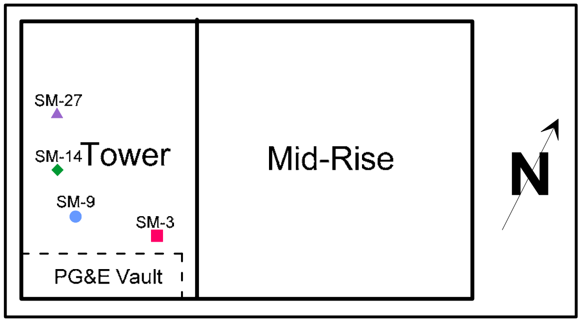
November 2013

ARUP

PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\221 301 Mission - October 2013 Survey\Plates\Elevation changes All (2013.10.09).srf





Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH OCTOBER 9, 2013

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

November 2013

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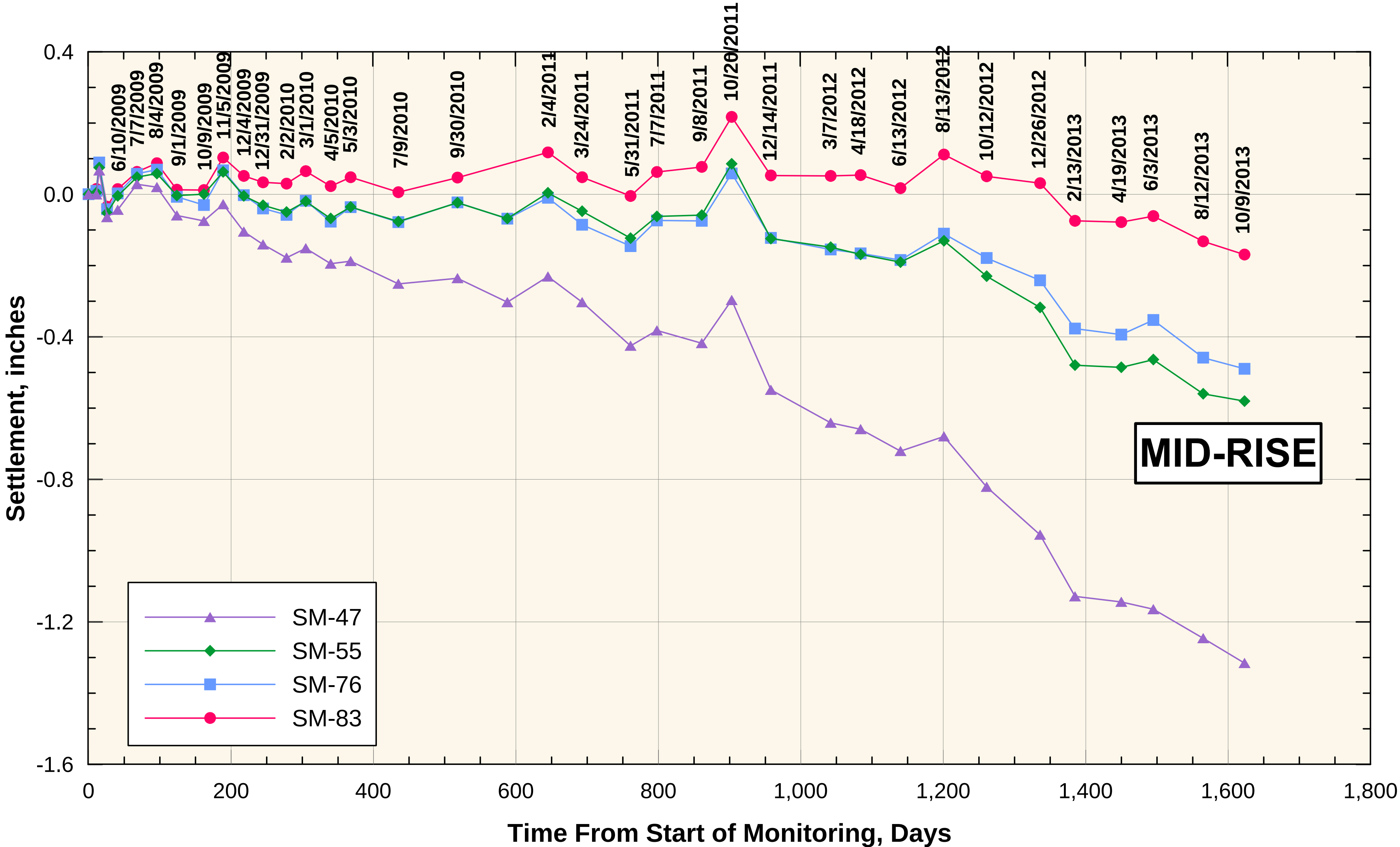
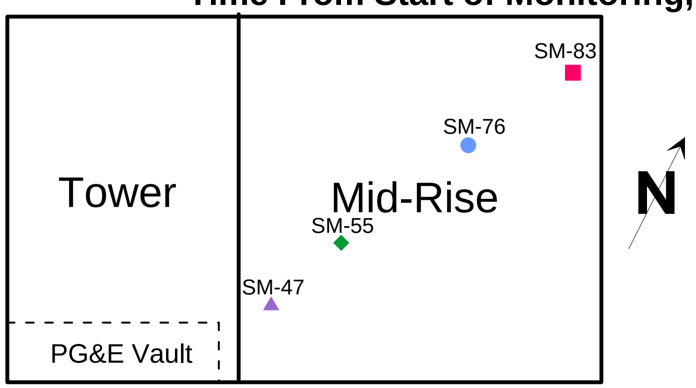
PLATE 4

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\221 301 Mission - October 2013 Survey\Plates\Plate 4 Settlement Over Time - Tower.grf





Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH OCTOBER 9, 2013

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

November 2013

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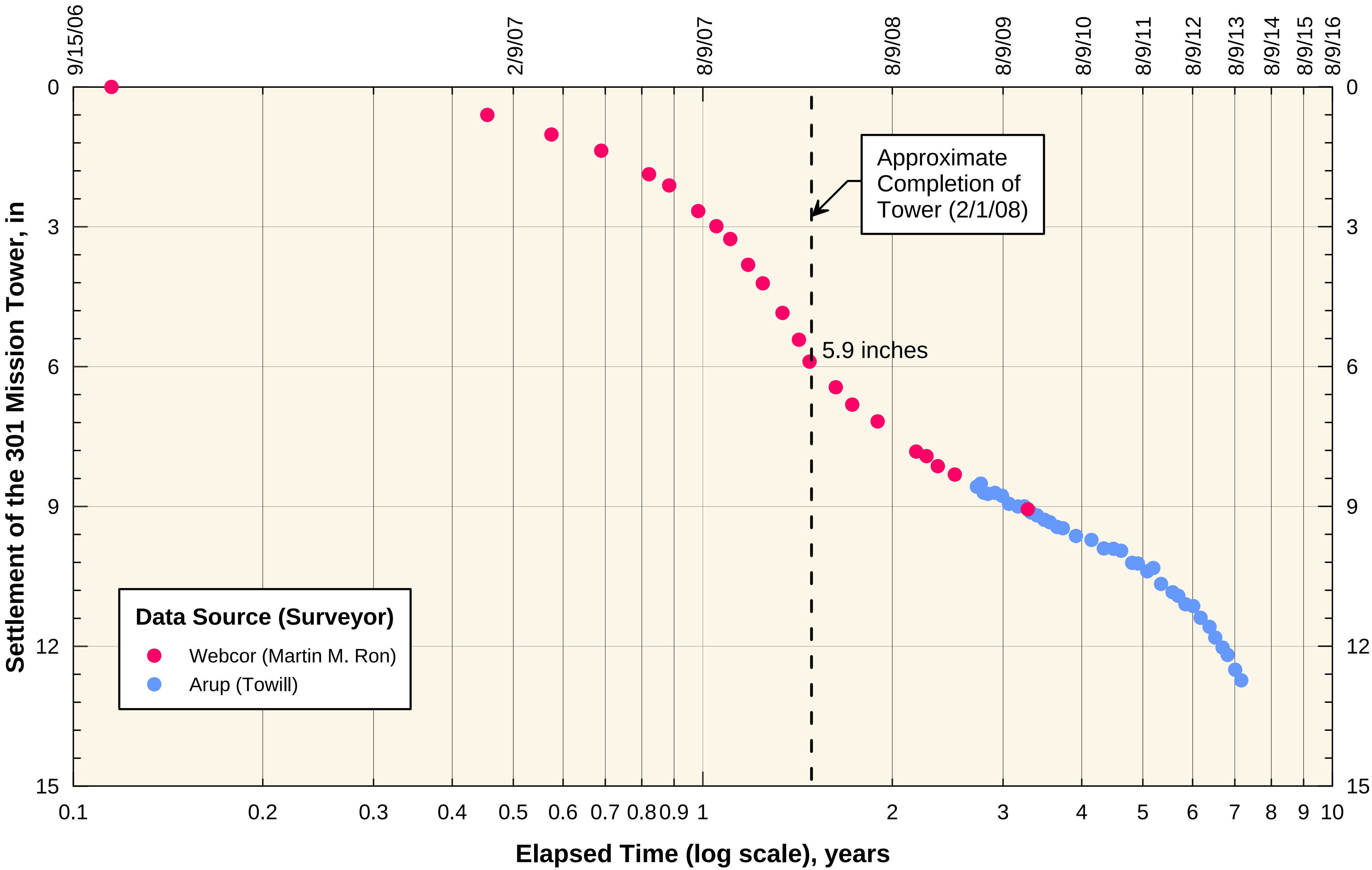
PLATE 5

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\221 301 Mission - October 2013 Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

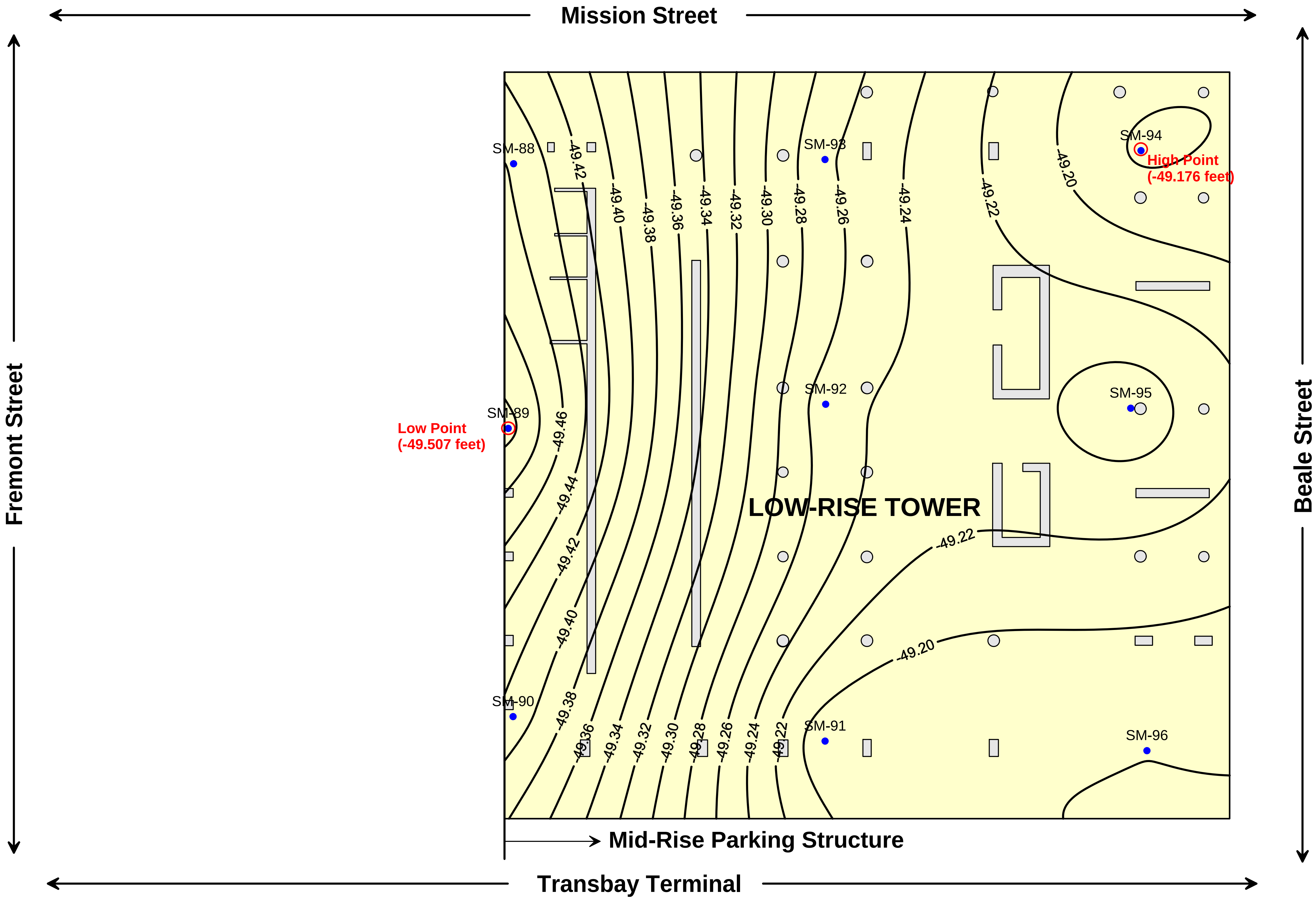
SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

November 2013

ARUP

PLATE 6



Date of Survey Reading:
October 9, 2013

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.331 feet (3.972 inches)

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on October 9, 2013.

0 25 50 75

Approximate Scale: 1" = 25'

FLOOR ELEVATION AT BASEMENT LEVEL B-5
OF 301 MISSION PROPERTY: OCTOBER 9, 2013 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

November 2013

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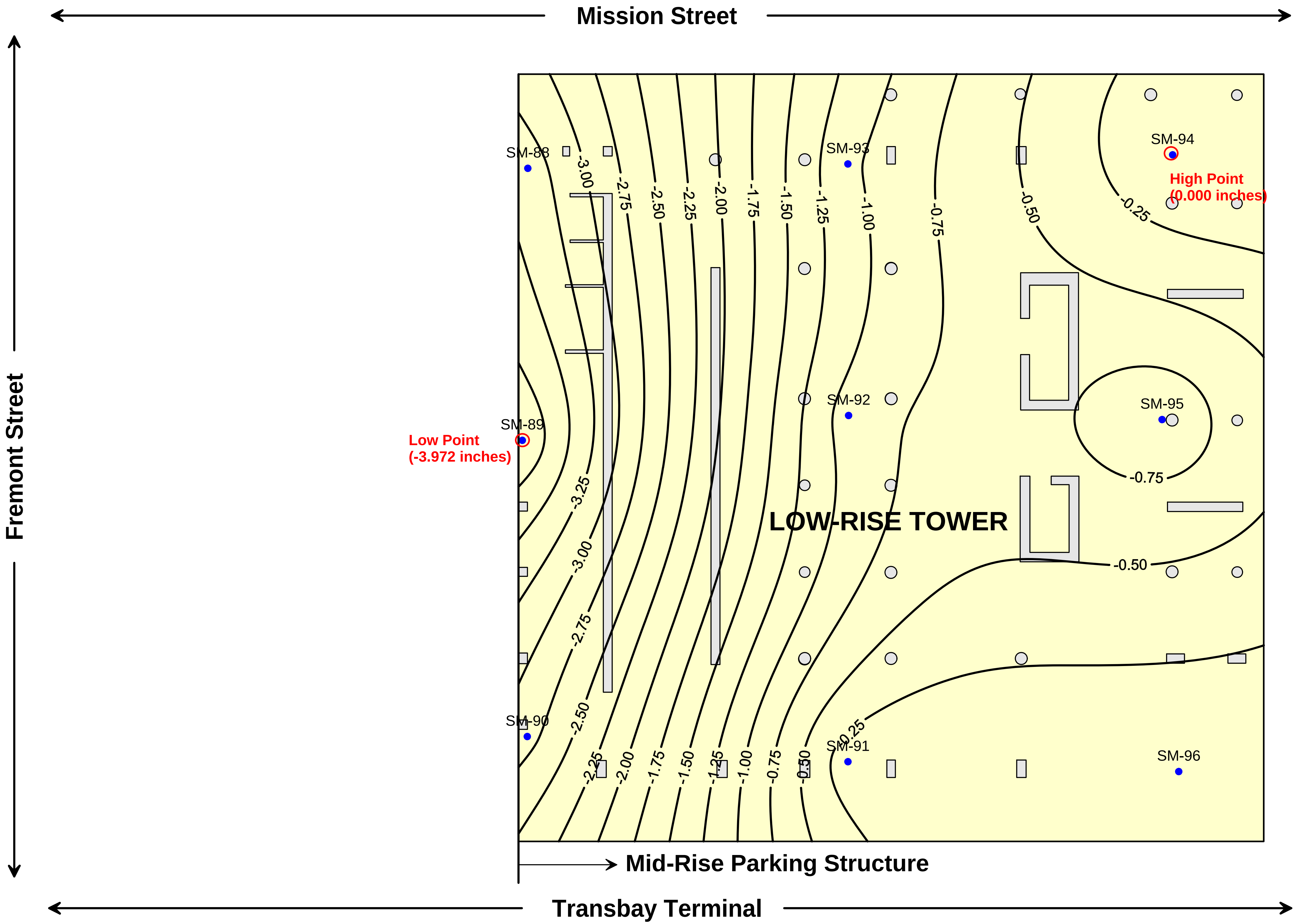
PLATE 7

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\221 301 Mission - October 2013 Survey\Plates\B-5 Elevations (2013.10.09).srf



Date of Survey Reading:
October 9, 2013

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.331 feet (3.972 inches)

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on October 9, 2013.

0 25 50 75
Approximate Scale: 1" = 25'

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\221 301 Mission - October 2013 Survey\Plates\B-5 Differential Elevations (2013.10.09).srf

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
AT BASEMENT LEVEL B-5: OCTOBER 9, 2013 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

November 2013

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PLATE 8

Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date** 10 December 2013
Copies	Robert Beck (TJPA) Emilio Cruz (PMPC) Randy Volenec (PCPA) George Metzger (AAI)	**Reference number** 132242-60
From	Andrew Yeskoo (Arup)	**File reference** 4-05/223
Subject	Transbay Transit Center Manually Read Inclinometer Update	**Page** 1 **of** 1

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the buildings adjacent to the Transbay Transit Center prior to and during construction. This memorandum presents the current readings from the inclinometers adjacent to the 301 Mission buildings. Plate 1 shows the as-built locations of the nine inclinometers installed in the vicinity of the 301 Mission buildings. The quantity and location of the instruments vary from the as-planned due to installation limitations. Efforts have been made to install as many instruments as reasonably possible.

Currently, inclinometers I-16, I-17A, I-17B, I-18, I-18M I-19, I-21 and I-22 are being read using a standard manual method. Inclinometer I-20 was destroyed in the course of construction activity in early 2013. Plates 2 through 9 show the readings taken on the inclinometers surrounding the 301 Mission buildings. These inclinometers will continue to be read manually throughout the Transbay project.

<u>List of Plates</u>

Plate 1 Location of Inclinometers in the Vicinity of 301 Mission
Plate 2 Measurements Taken at Inclinometer I-16
Plate 3 Measurements Taken at Inclinometer I-17A
Plate 4 Measurements Taken at Inclinometer I-17B
Plate 5 Measurements Taken at Inclinometer I-18
Plate 6 Measurements Taken at Inclinometer I-18M
Plate 7 Measurements Taken at Inclinometer I-19
Plate 8 Measurements Taken at Inclinometer I-21
Plate 9 Measurements Taken at Inclinometer I-22

LOCATION OF INCLINOMETERS IN THE VICNITY OF 301 MISSION

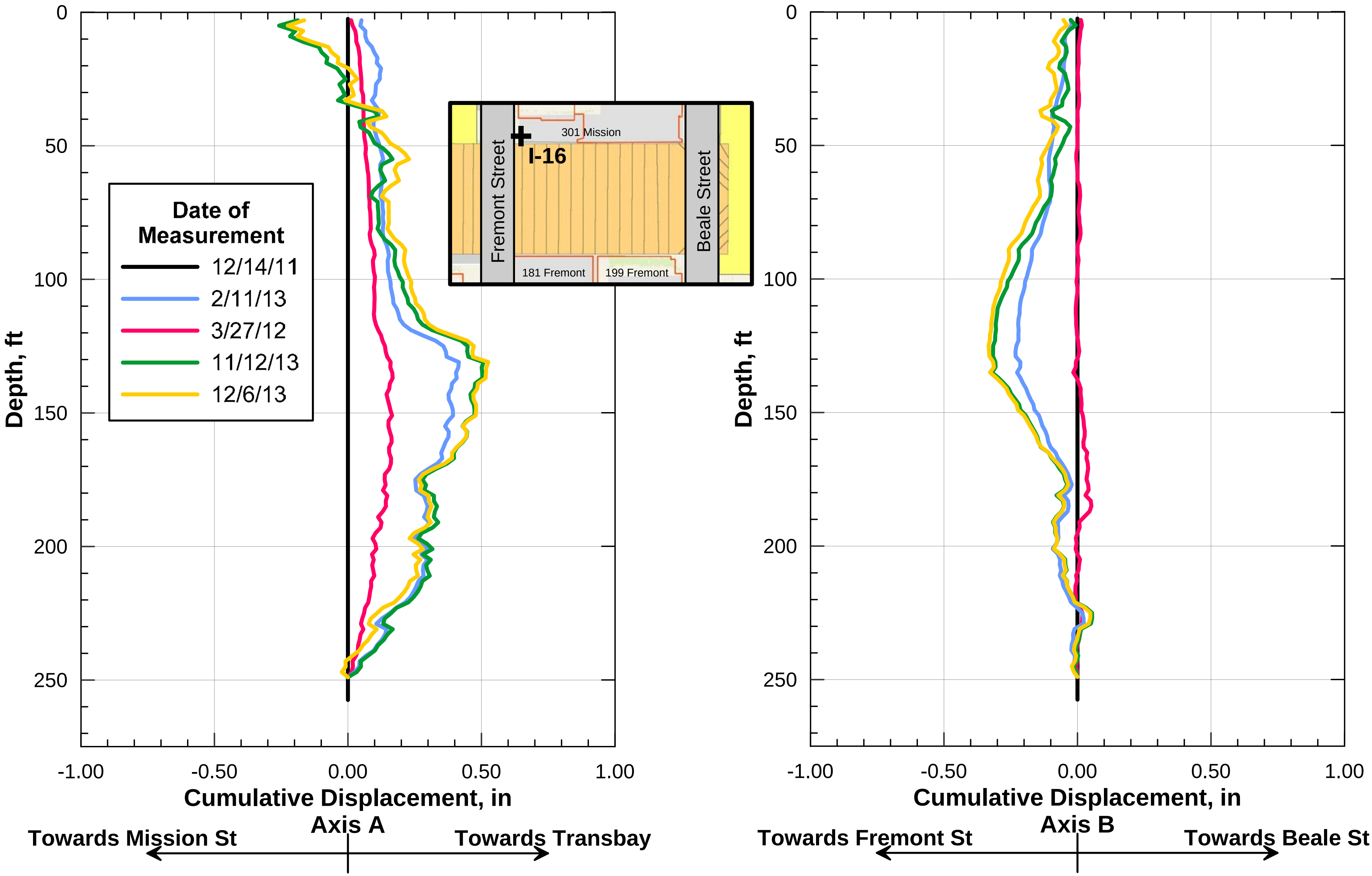
Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

December 2013

ARUP

PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\214 301 Mission External Instrumentation - June 2013\Plates\Plate 1 External Instrumentation.ai



MEASUREMENTS TAKEN AT INCLINOMETER I-16

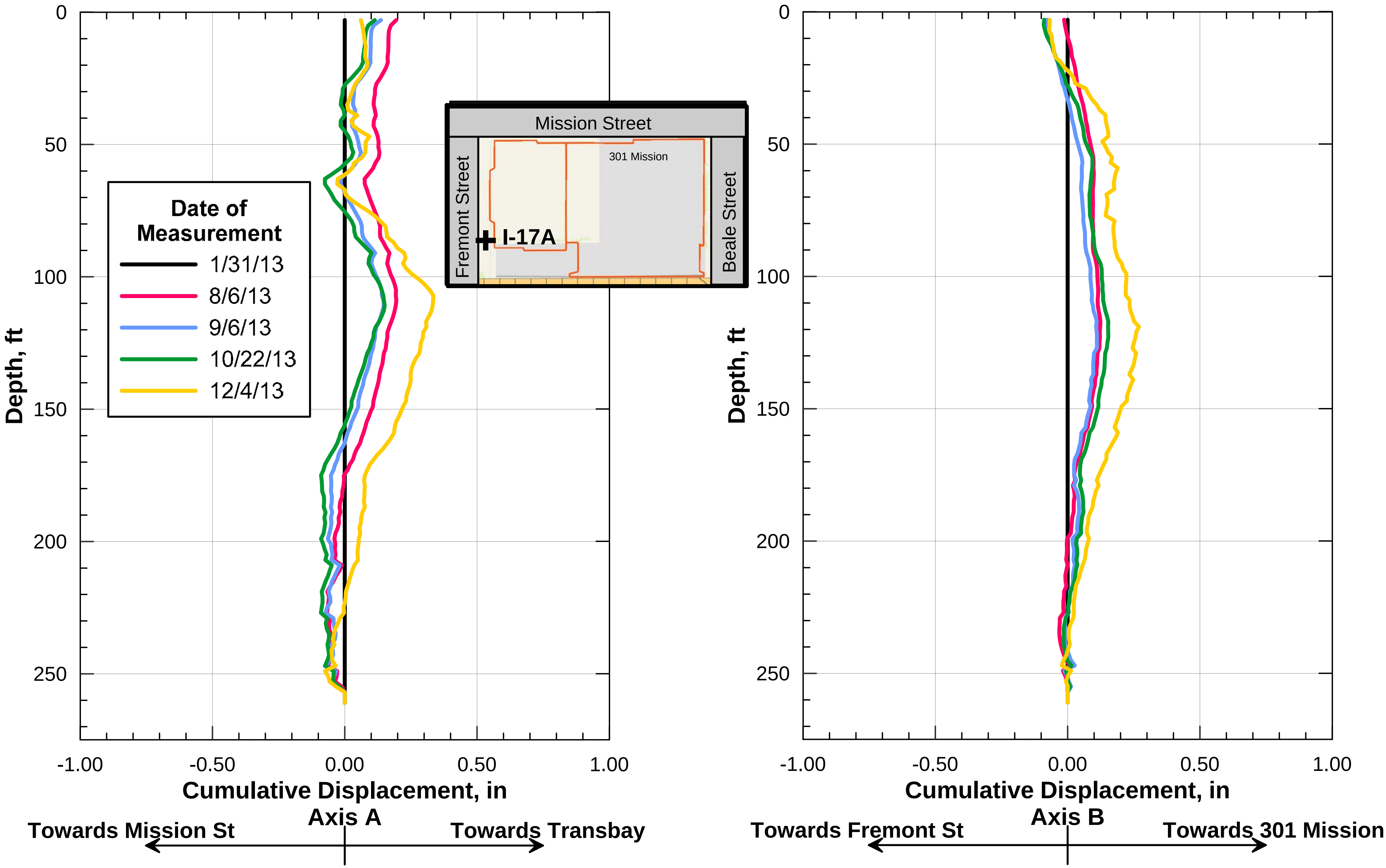
Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

December 2013

ARUP

PLATE 2

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\223 301 Mission Inclinometer Update - Dec 2013\Plates\Plate 2 Inclinometer I-16.grf



Note - The axes were rotated 30 degrees in order to reflect the directions orthogonal to the excavation.

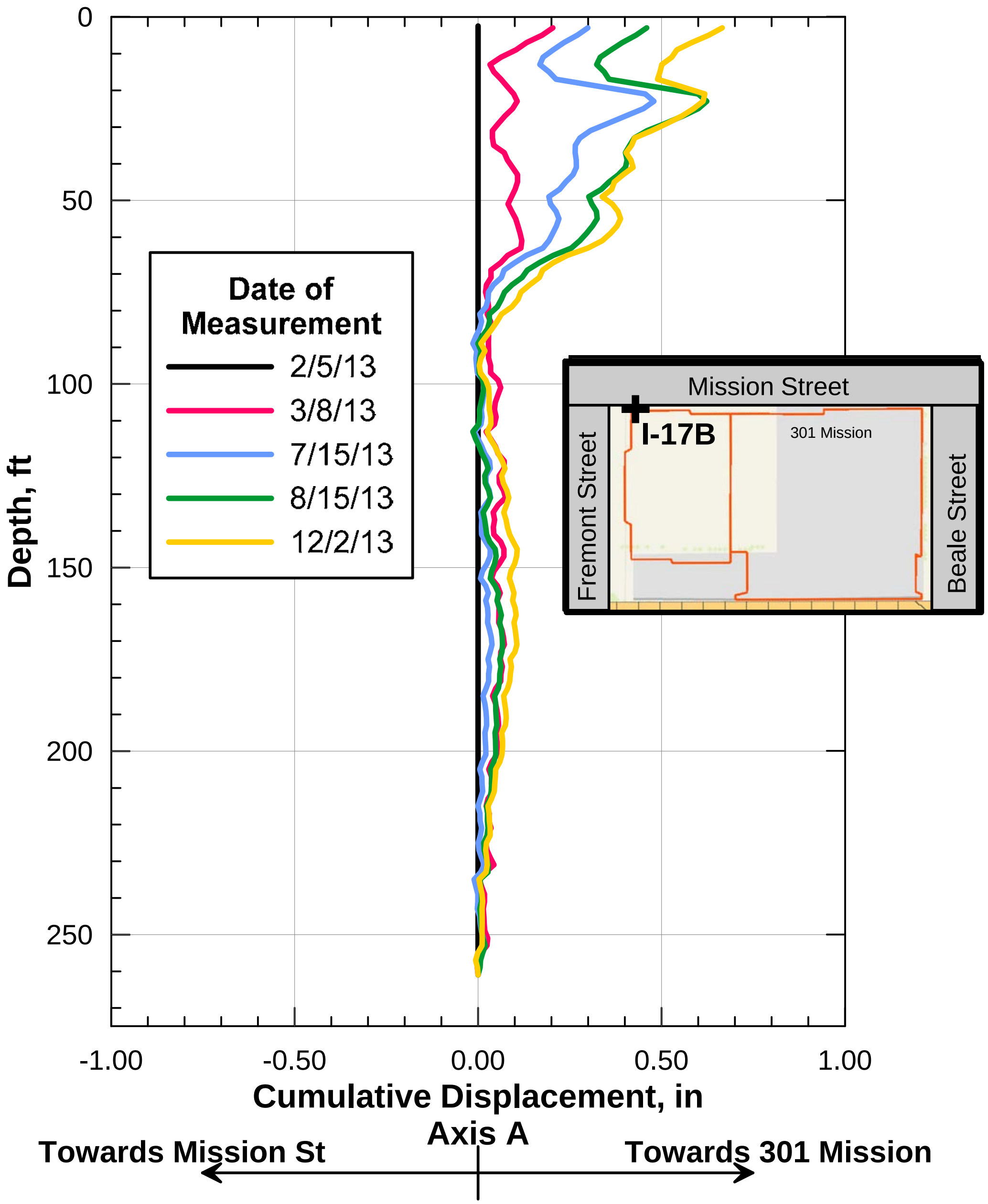
MEASUREMENTS TAKEN AT INCLINOMETER I-17A

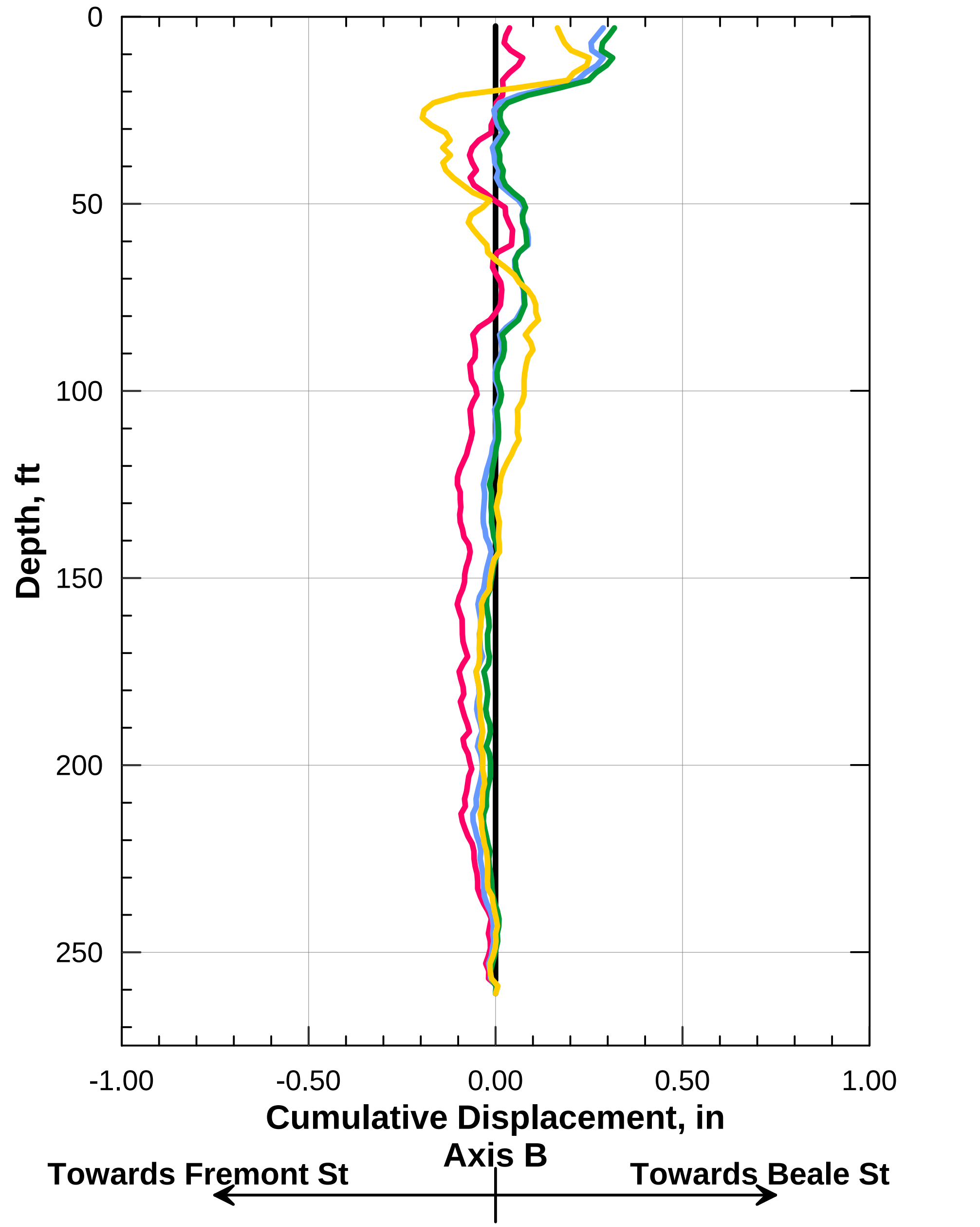
Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
December 2013 San Francisco, California

ARUP

PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\223 301 Mission Inclinometer Update - Dec 2013\Plates\Plate 3 Inclinometer I-17A (2 ft).grf





Note - The axes were rotated 30 degrees in order to reflect the directions orthogonal to the excavation.

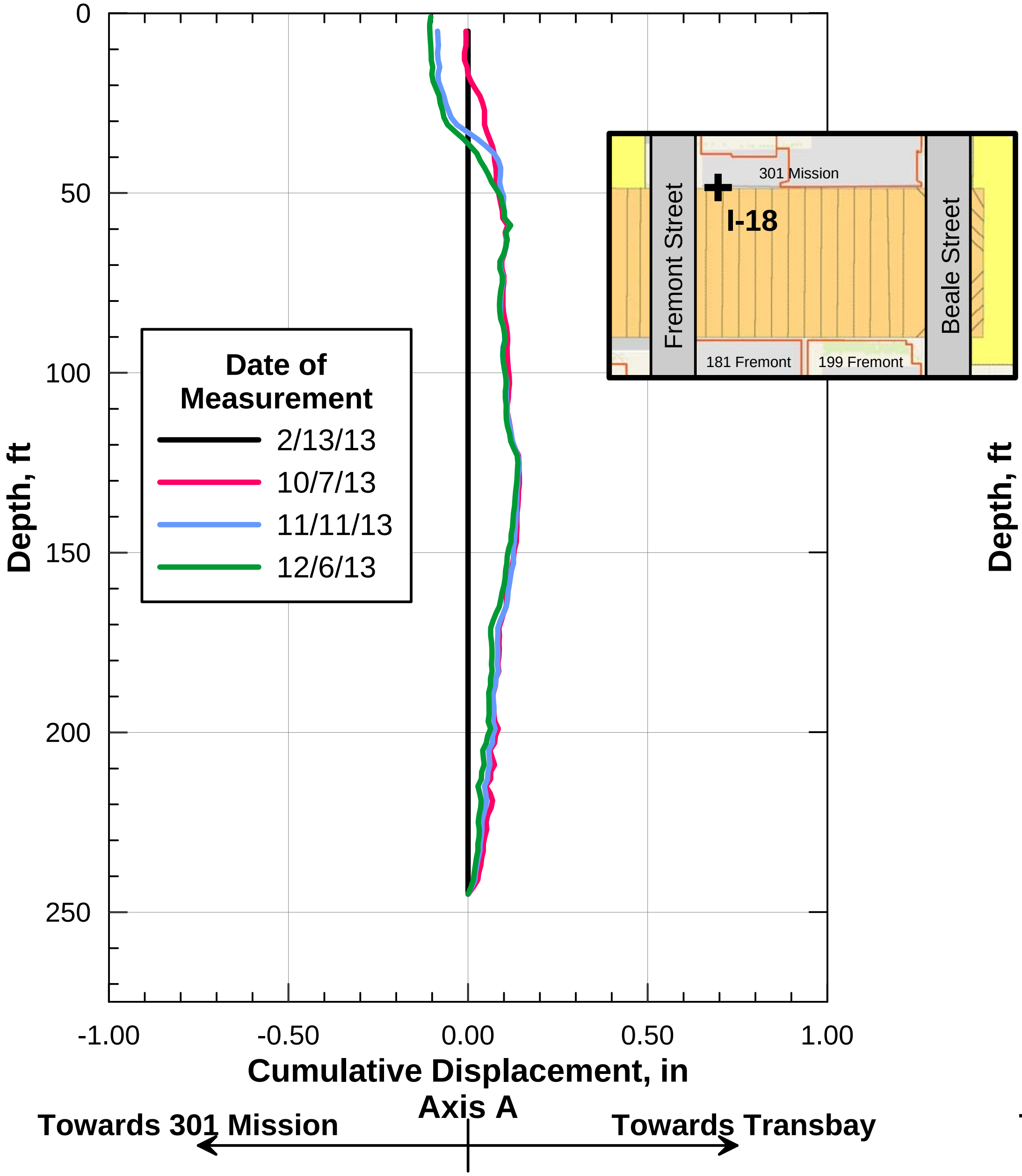
MEASUREMENTS TAKEN AT INCLINOMETER I-17B

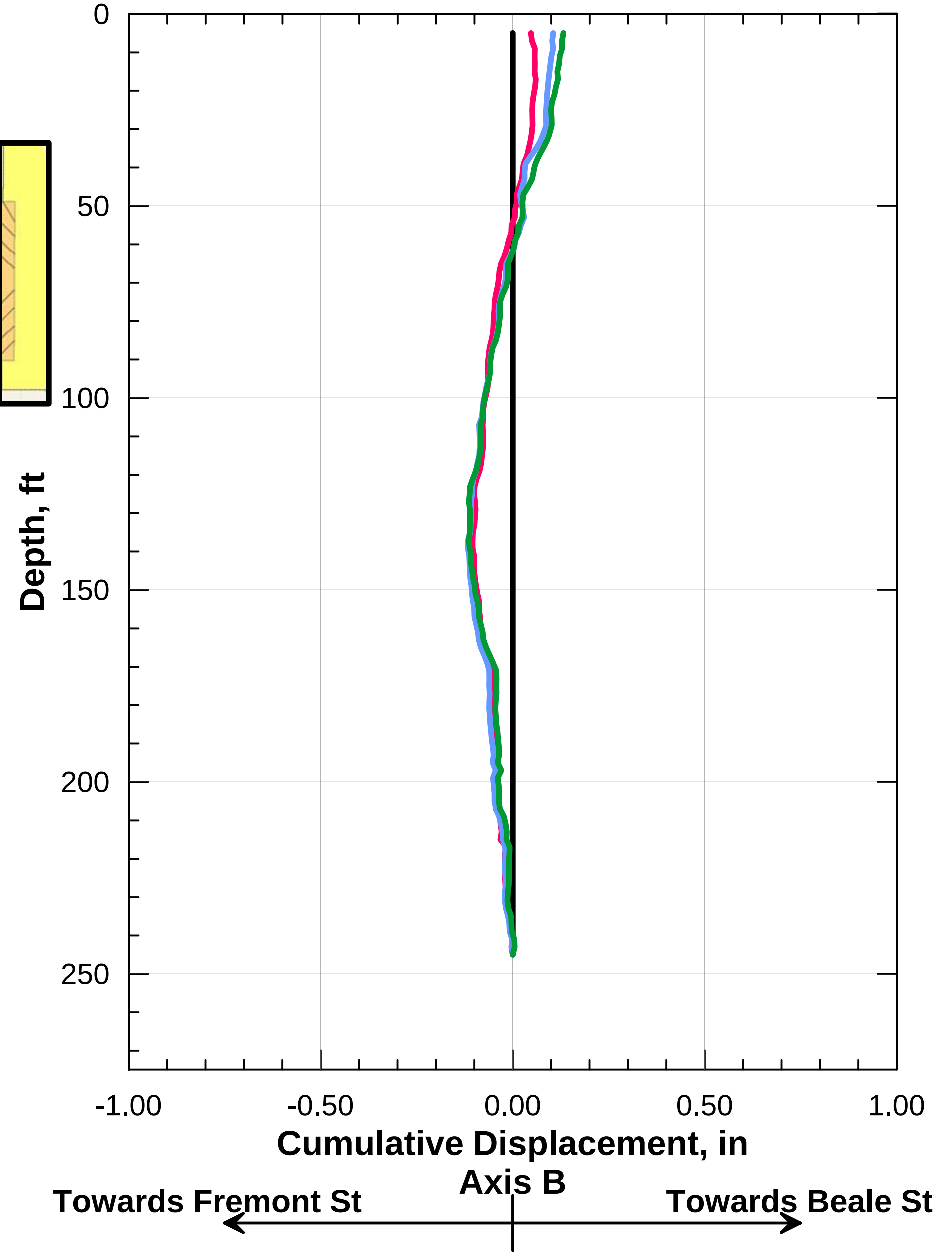
Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California
December 2013

ARUP

PLATE 4

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\223 301 Mission Inclinometer Update - Dec 2013\Plates\Plate 4 Inclinometer I-17B.grf





MEASUREMENTS TAKEN AT INCLINOMETER I-18

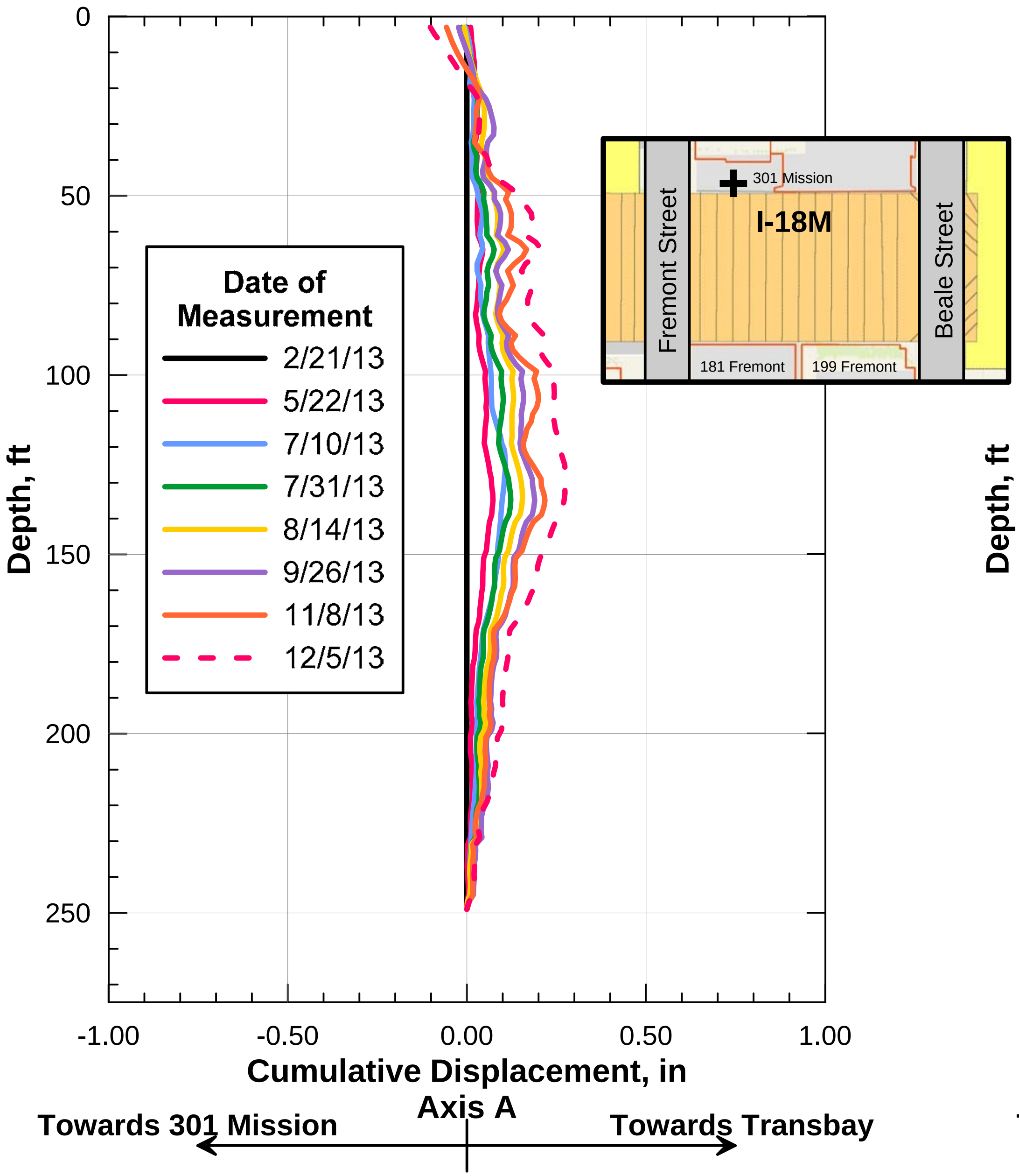
Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

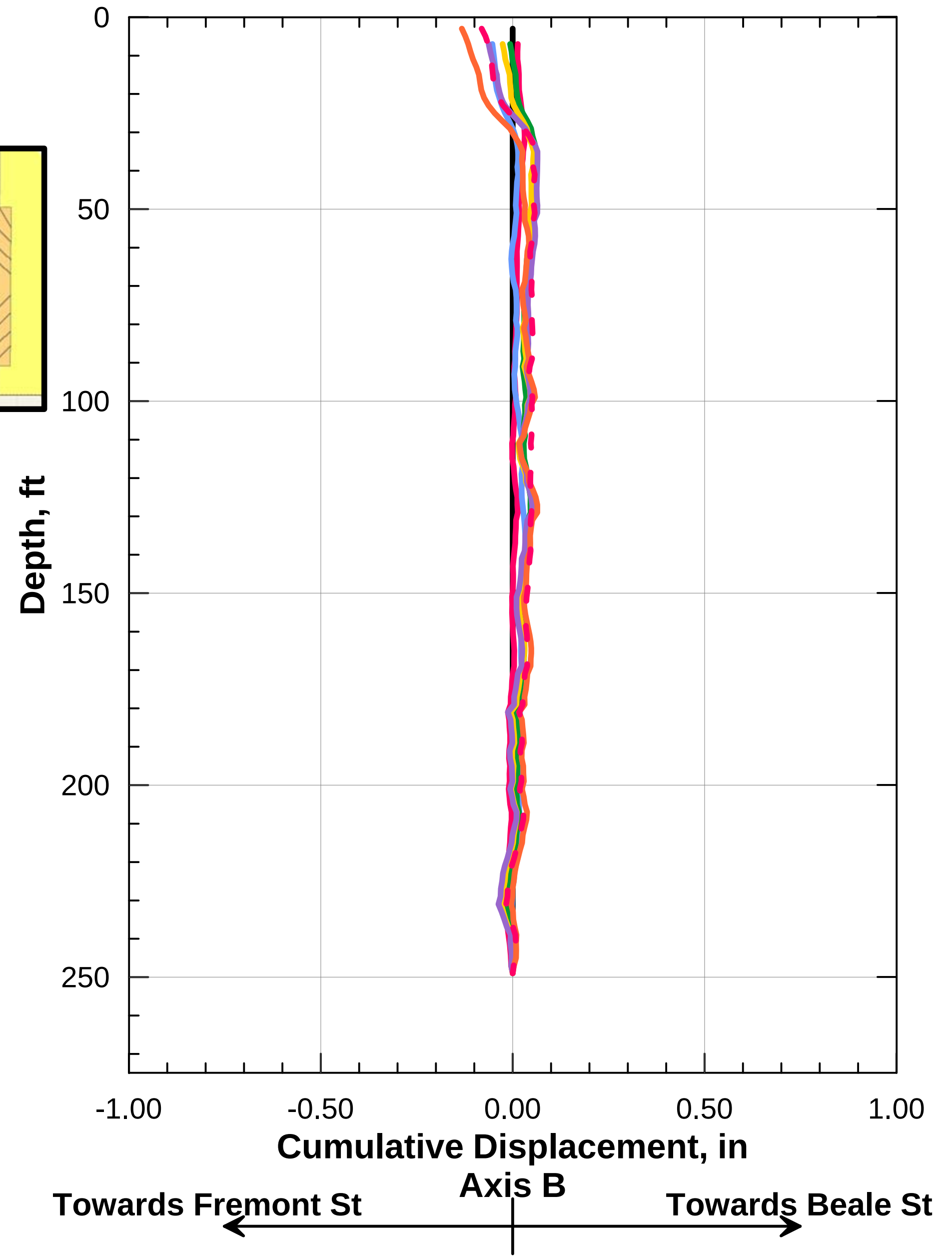
December 2013

ARUP

PLATE 5

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\223 301 Mission Inclinometer Update - Dec 2013\Plates\Plate 5 Inclinometer I-18.grf





MEASUREMENTS TAKEN AT INCLINOMETER I-18M

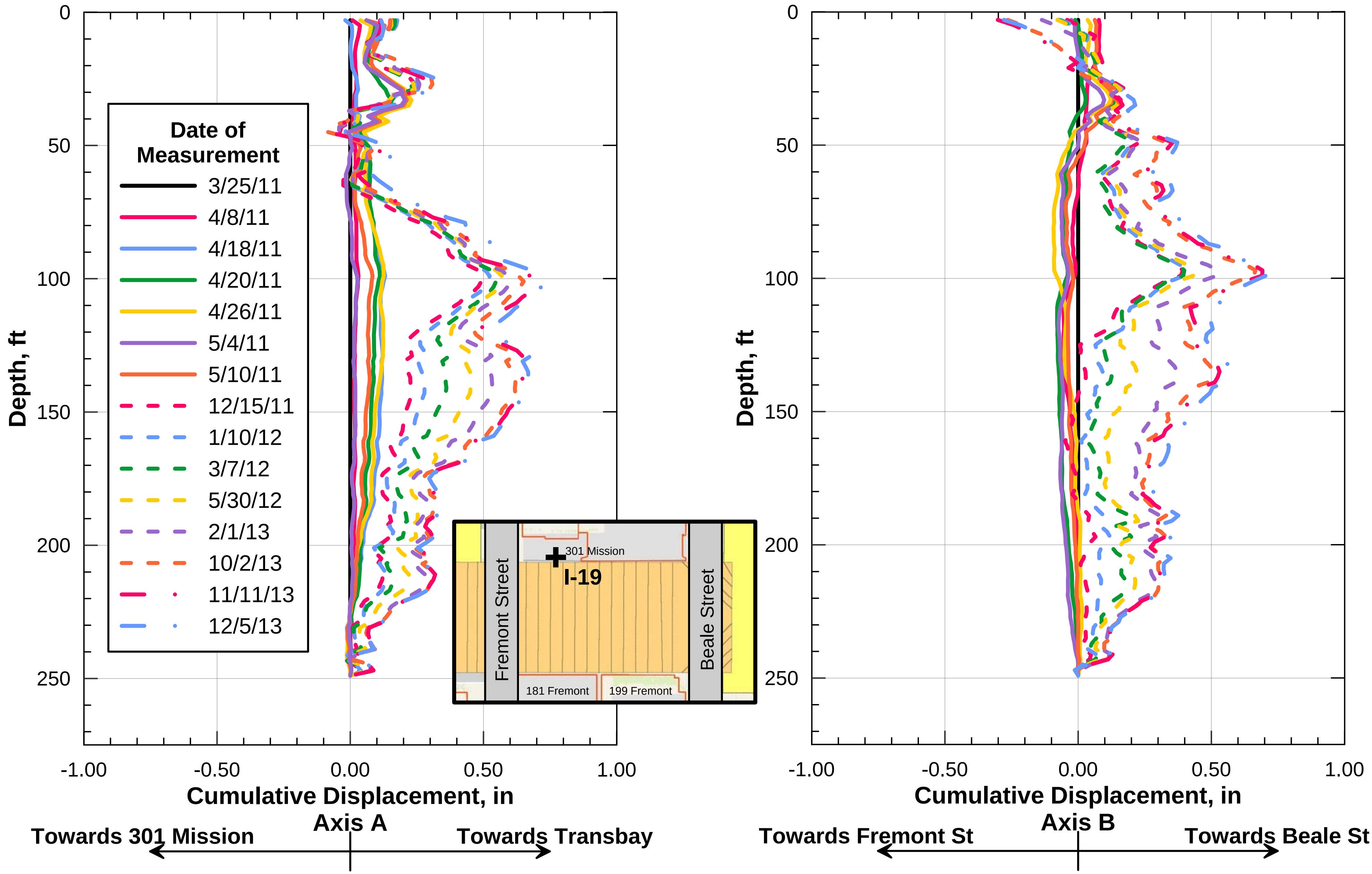
Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
San Francisco, California

December 2013

ARUP

PLATE 6

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\223 301 Mission Inclinometer Update - Dec 2013\Plates\Plate 6 Inclinometer I-18M (revised baseline).grf



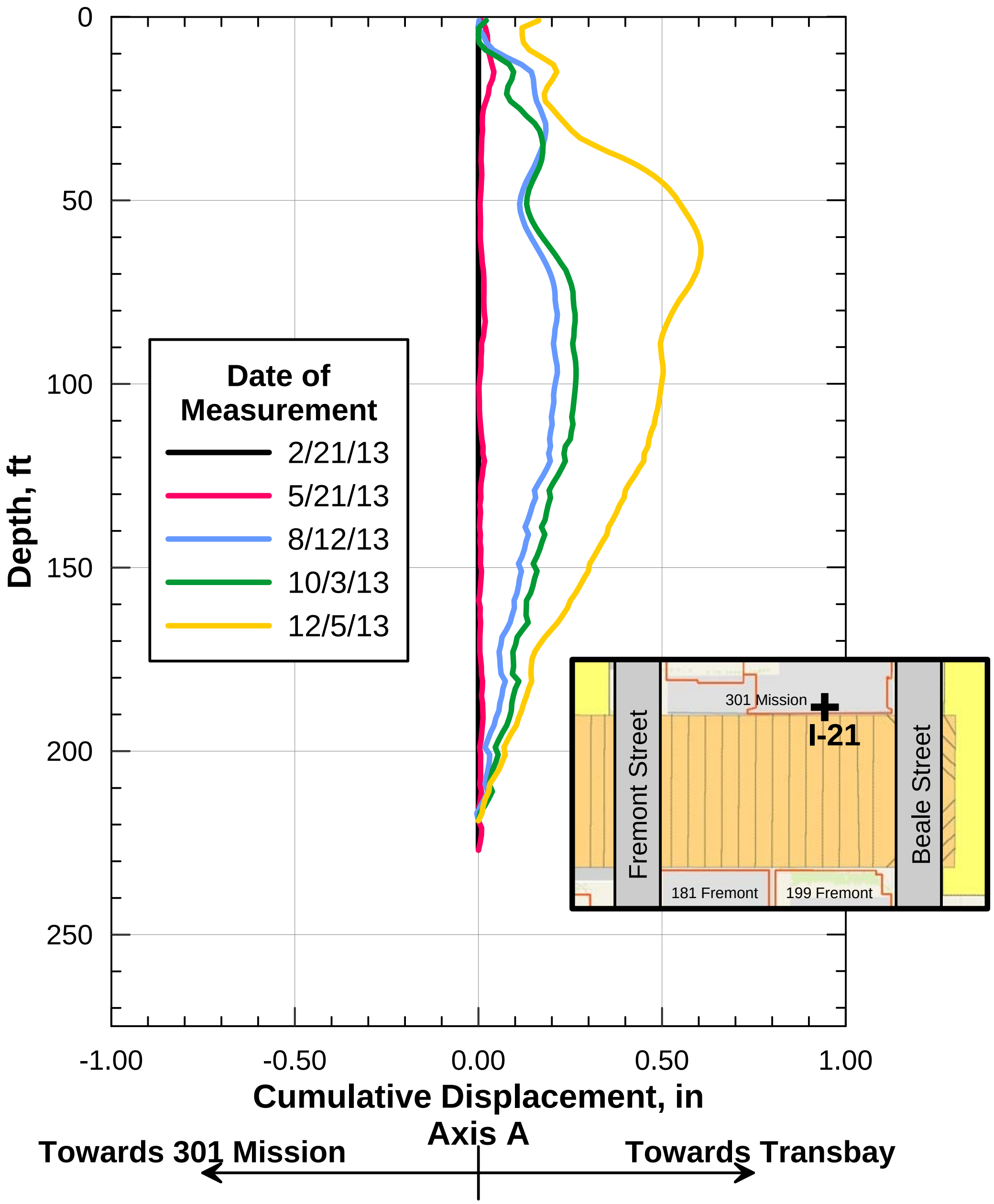
MEASUREMENTS TAKEN AT INCLINOMETER I-19

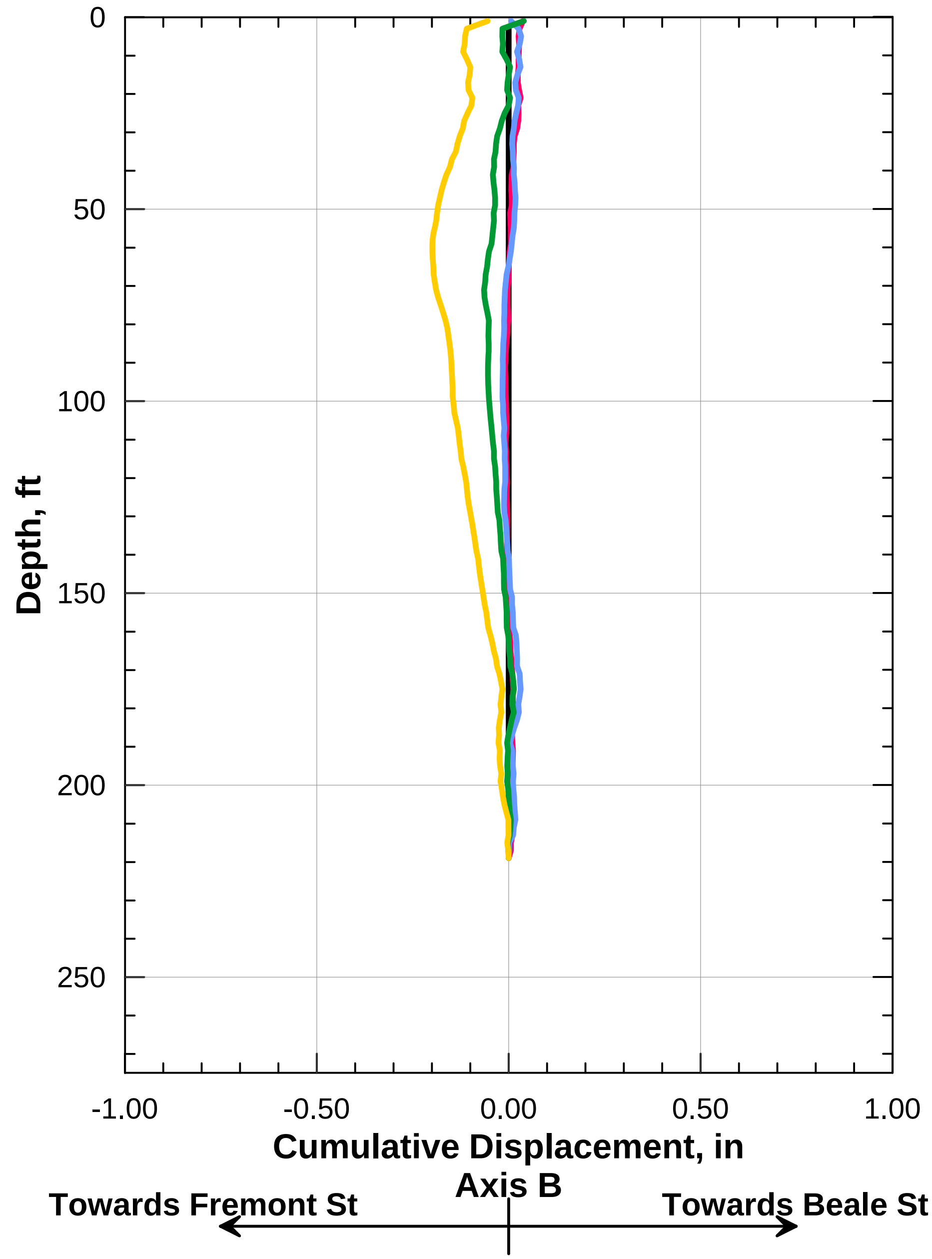
Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
December 2013 San Francisco, California

ARUP

PLATE 7

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\223 301 Mission Inclinometer Update - Dec 2013\Plates\Plate 7 Inclinometer I-19.grf





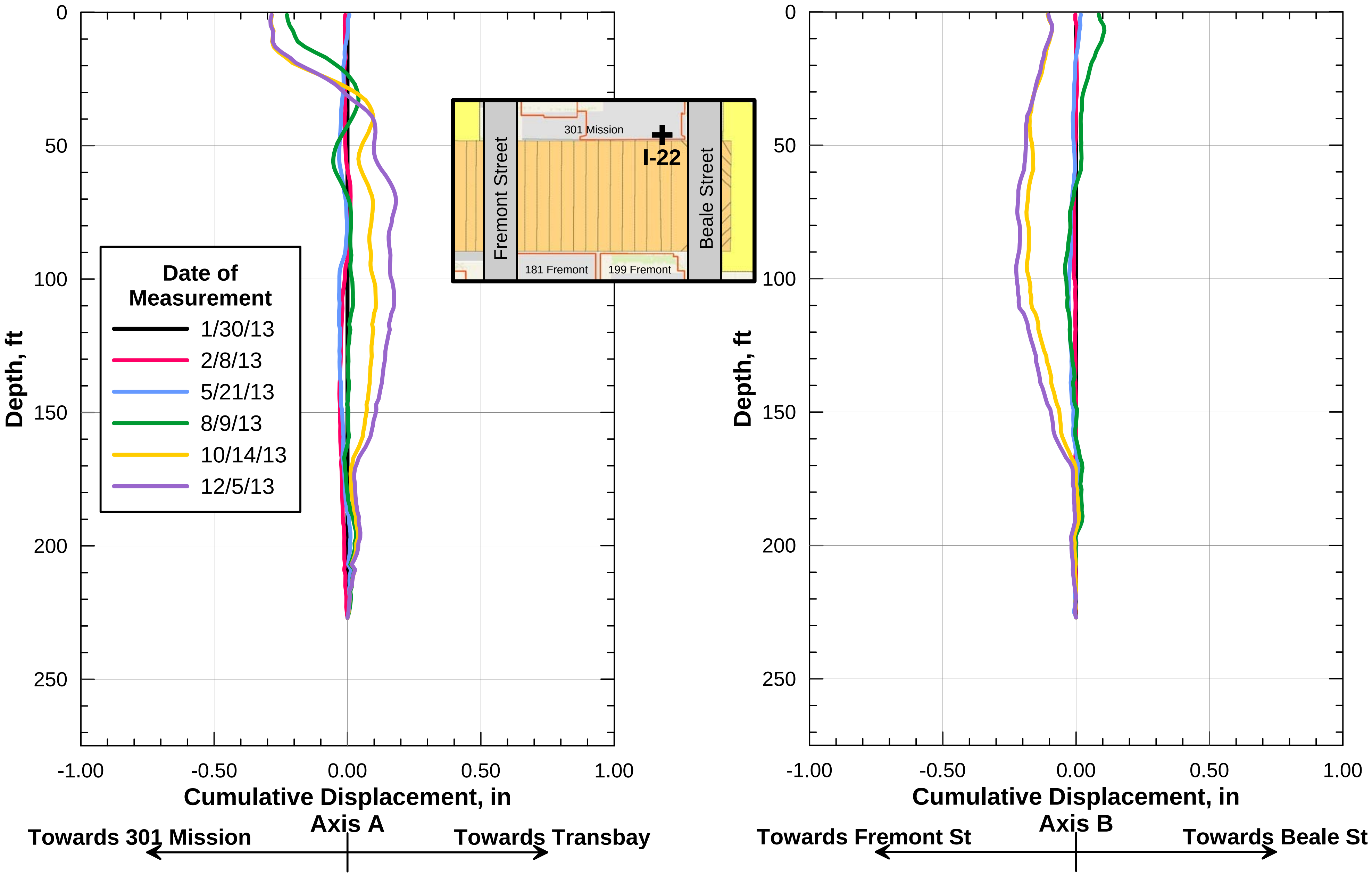
MEASUREMENTS TAKEN AT INCLINOMETER I-21

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
December 2013 San Francisco, California

ARUP

PLATE 8

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\223 301 Mission Inclinometer Update - Dec 2013\Plates\Plate 8 Inclinometer I-21.grf



MEASUREMENTS TAKEN AT INCLINOMETER I-22

Transbay Transit Center
301 Mission Monitoring - External Instruments
Transbay Joint Powers Authority
December 2013 San Francisco, California

ARUP

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\223 301 Mission Inclinometer Update - Dec 2013\Plates\Plate 9 Inclinometer I-22.grf

PLATE 9

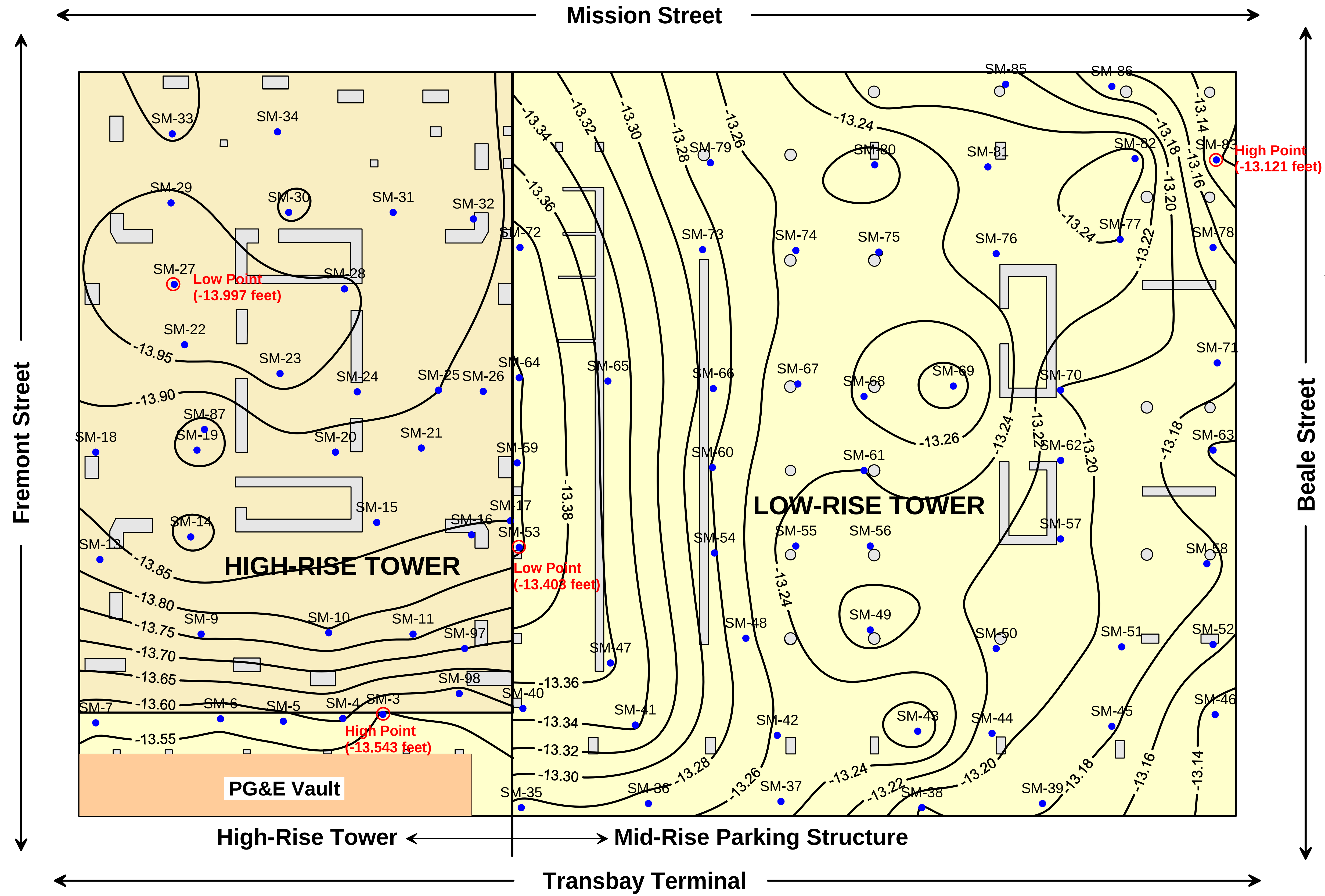
Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date**	9 January 2014
Copies	Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/MHG
From	Stephen McLandrich (Arup)	**File reference**	4-05 224
Subject	Transbay Transit Center: Results of December 2013 Settlement Survey at 301 Mission Property	**Page** 1 **of** 1	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated November 13, 2013 with measurements made through December 2013.

List of Plates



Date of Survey Reading:
December 17, 2013

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	**Low-Rise Tower**
0.454 feet (5.446 inches)	**0.281 feet (3.374 inches)**

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on December 17, 2013.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

0 25 50 75
Approximate Scale: 1" = 25'

FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY:
PERIODIC SURVEY - DECEMBER 17, 2013

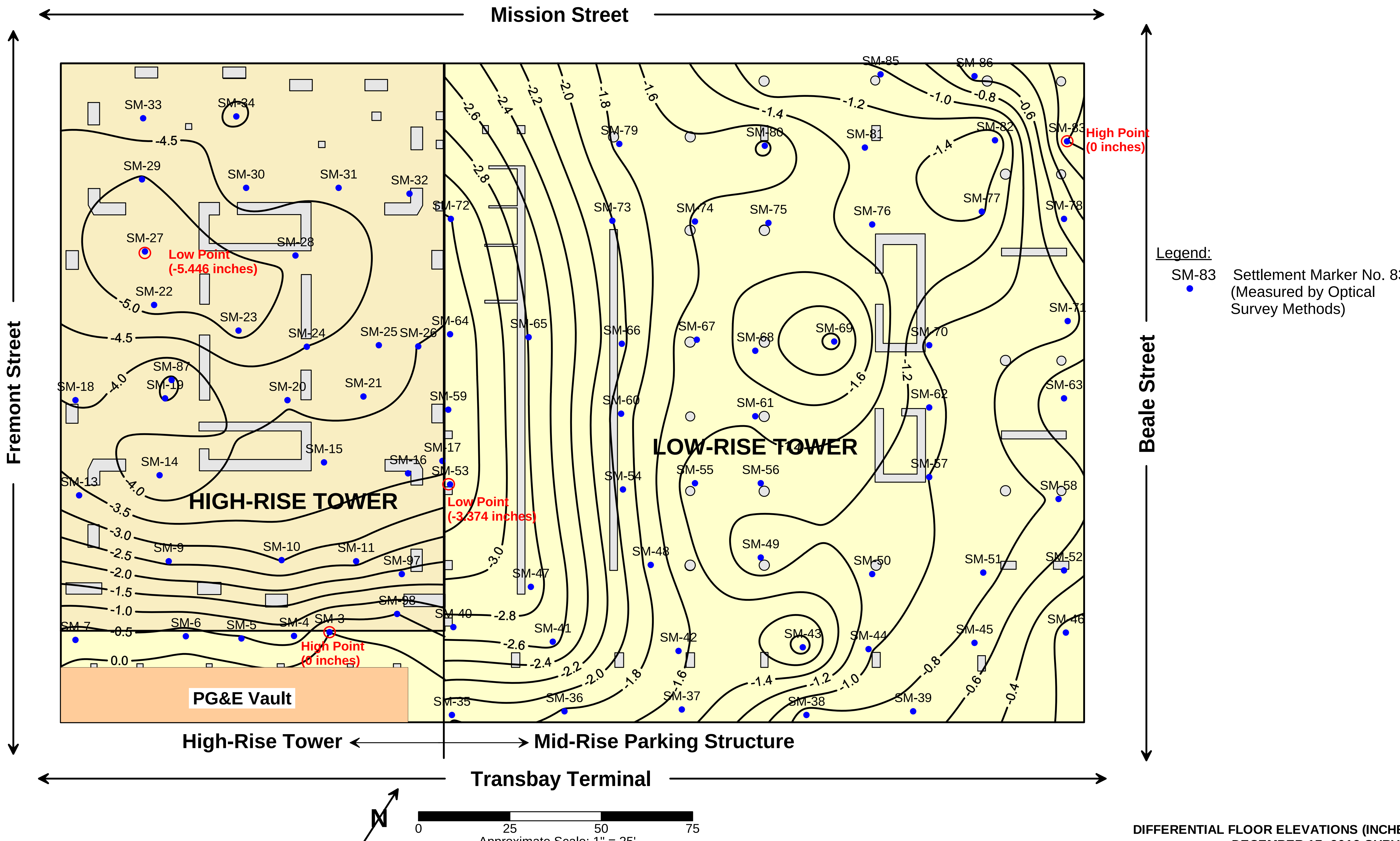
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2014

ARUP

PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\224 301 Mission - December 2013 Survey\Plates\Elevations All (2013.12.17).srf



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on December 17, 2013.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
DECEMBER 17, 2013 SURVEY

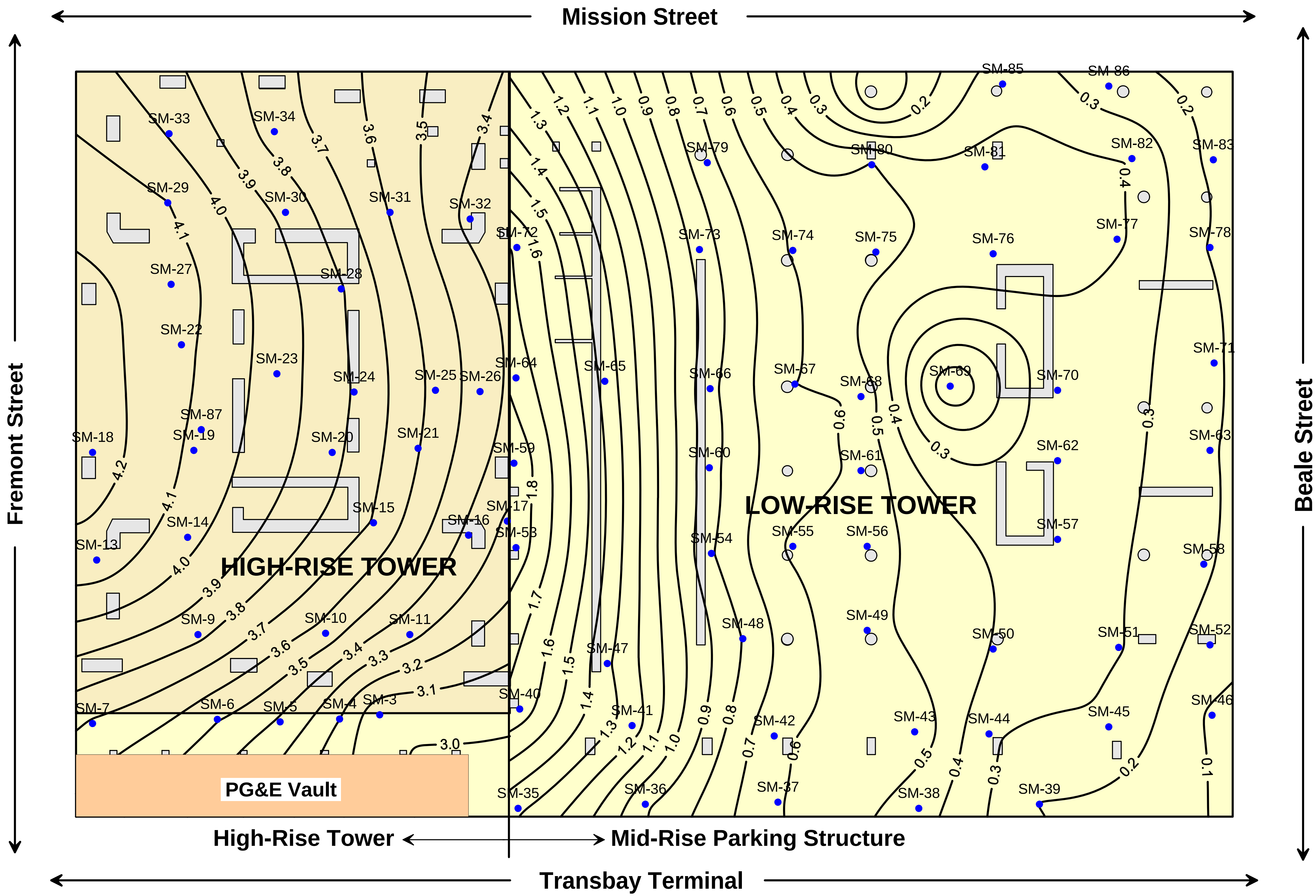
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2014

ARUP

PLATE 2

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\224 301 Mission - December 2013 Survey\Plates\Differential Elevation All (2013.12.17).srf



Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

N

0 25 50 75

Approximate Scale: 1" = 25'

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on December 17, 2013.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

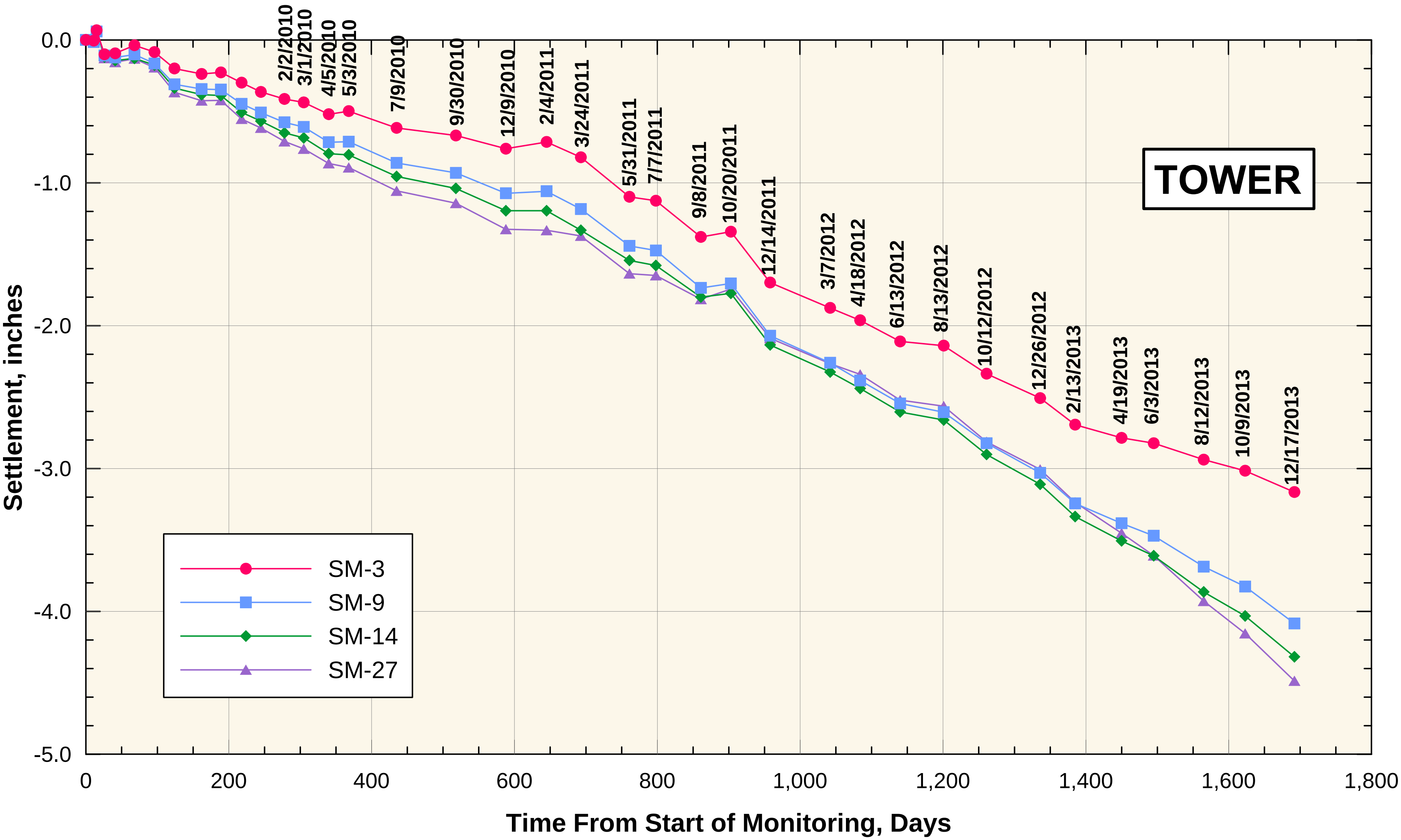
CONTOURS OF SETTLEMENTS MEASURED AT THE 1ST LEVEL BASEMENT OF THE 301 MISSION ST STRUCTURE BETWEEN 04/30/2009 & 12/17/2013

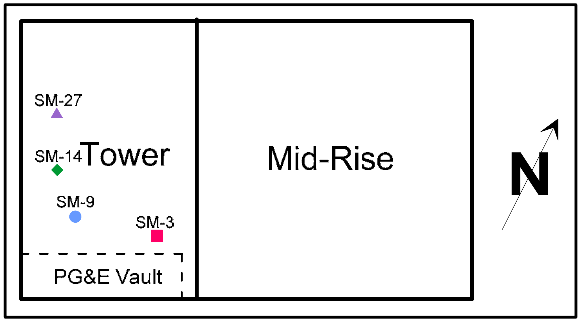
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2014

ARUP

PLATE 3





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH DECEMBER 17, 2013

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

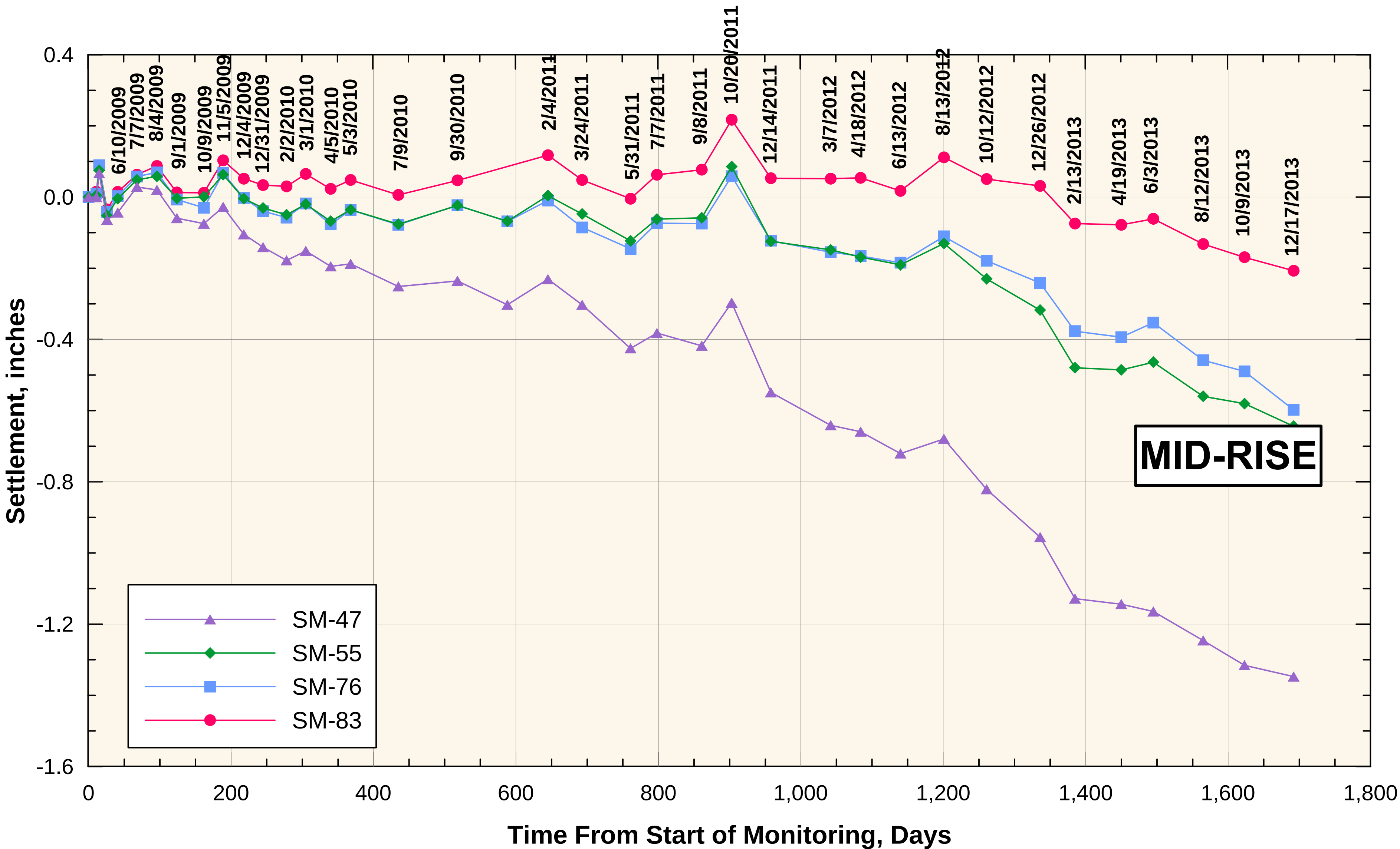
January 2014

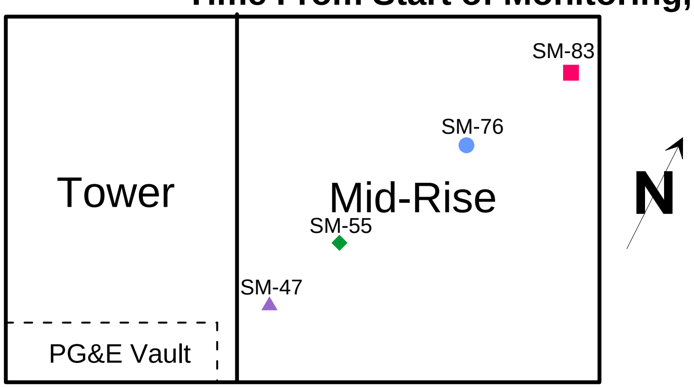
ARUP

PLATE 4

Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\224 301 Mission - December 2013 Survey\Plates\Plate 4 Settlement Over Time - Tower.grf





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH DECEMBER 17, 2013

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

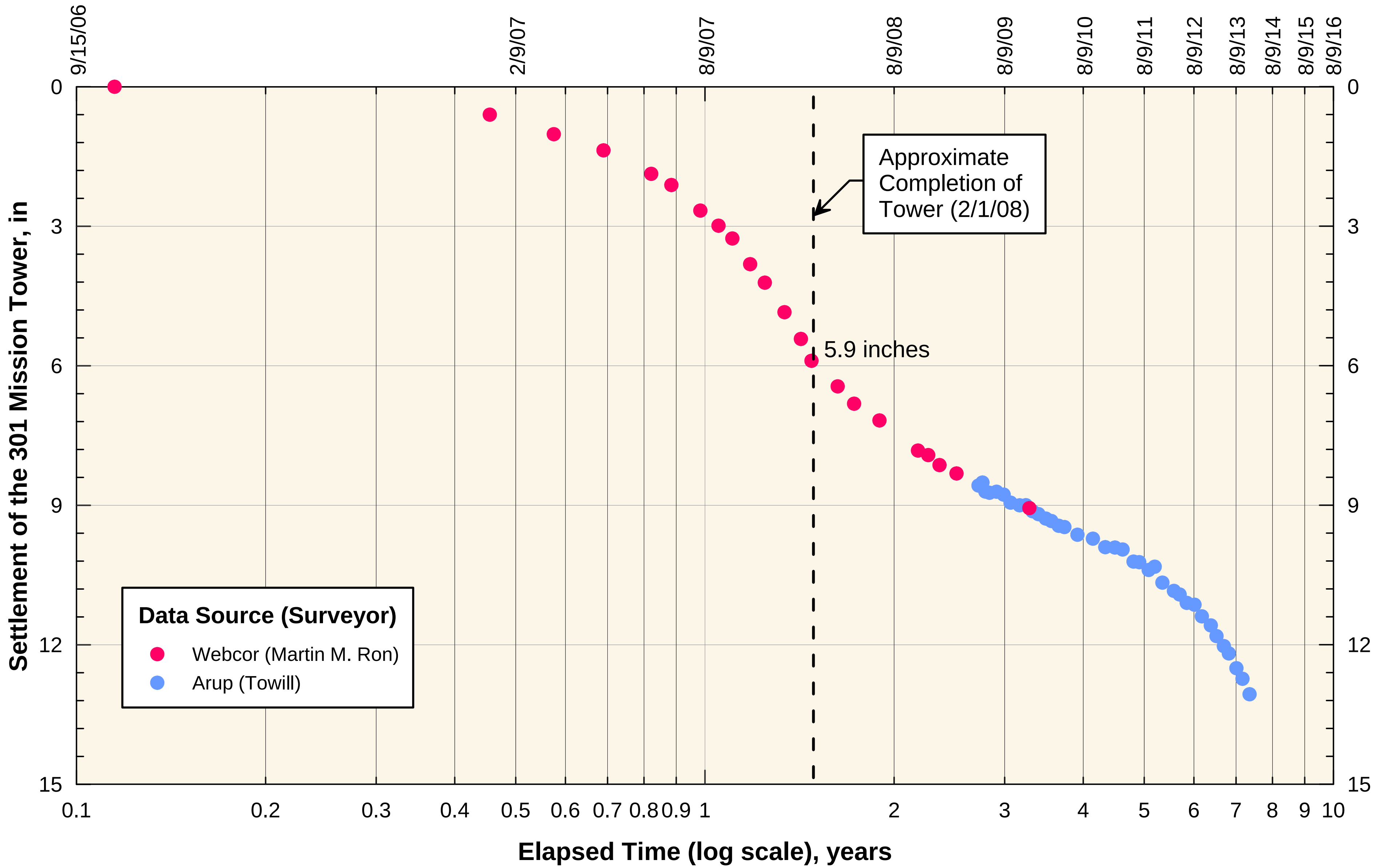
January 2014

ARUP

PLATE 5

Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\224 301 Mission - December 2013 Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

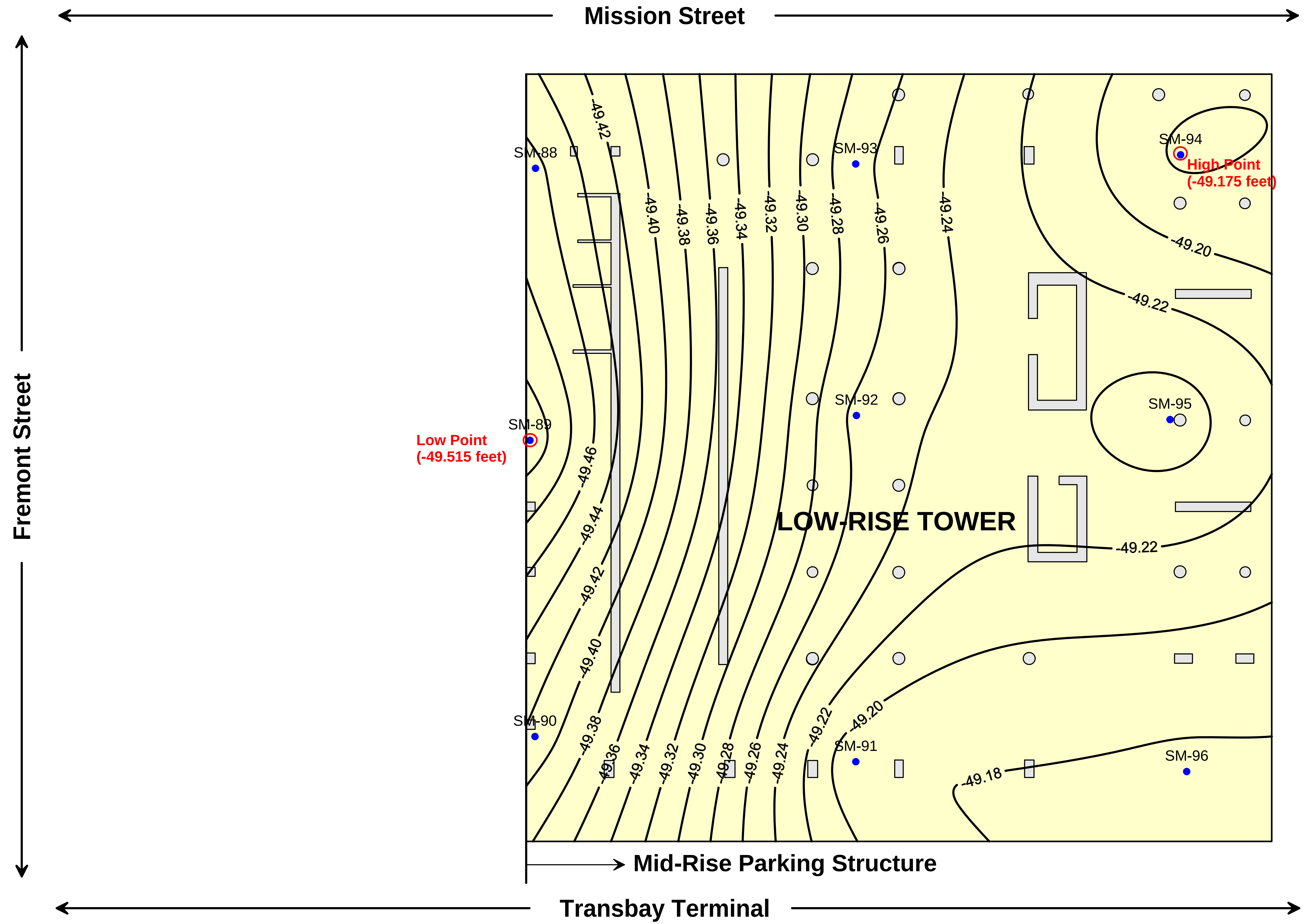
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2014

ARUP

PLATE 6

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\224 301 Mission - December 2013 Survey\Plates\Plate 6 Tower Settlements.grf



Date of Survey Reading:
December 17, 2013

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.340 feet (4.076 inches)

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on December 17, 2013.

0 25 50 75
Approximate Scale: 1" = 25'

FLOOR ELEVATION AT BASEMENT LEVEL B-5 OF 301 MISSION PROPERTY: DECEMBER 17, 2013 SURVEY

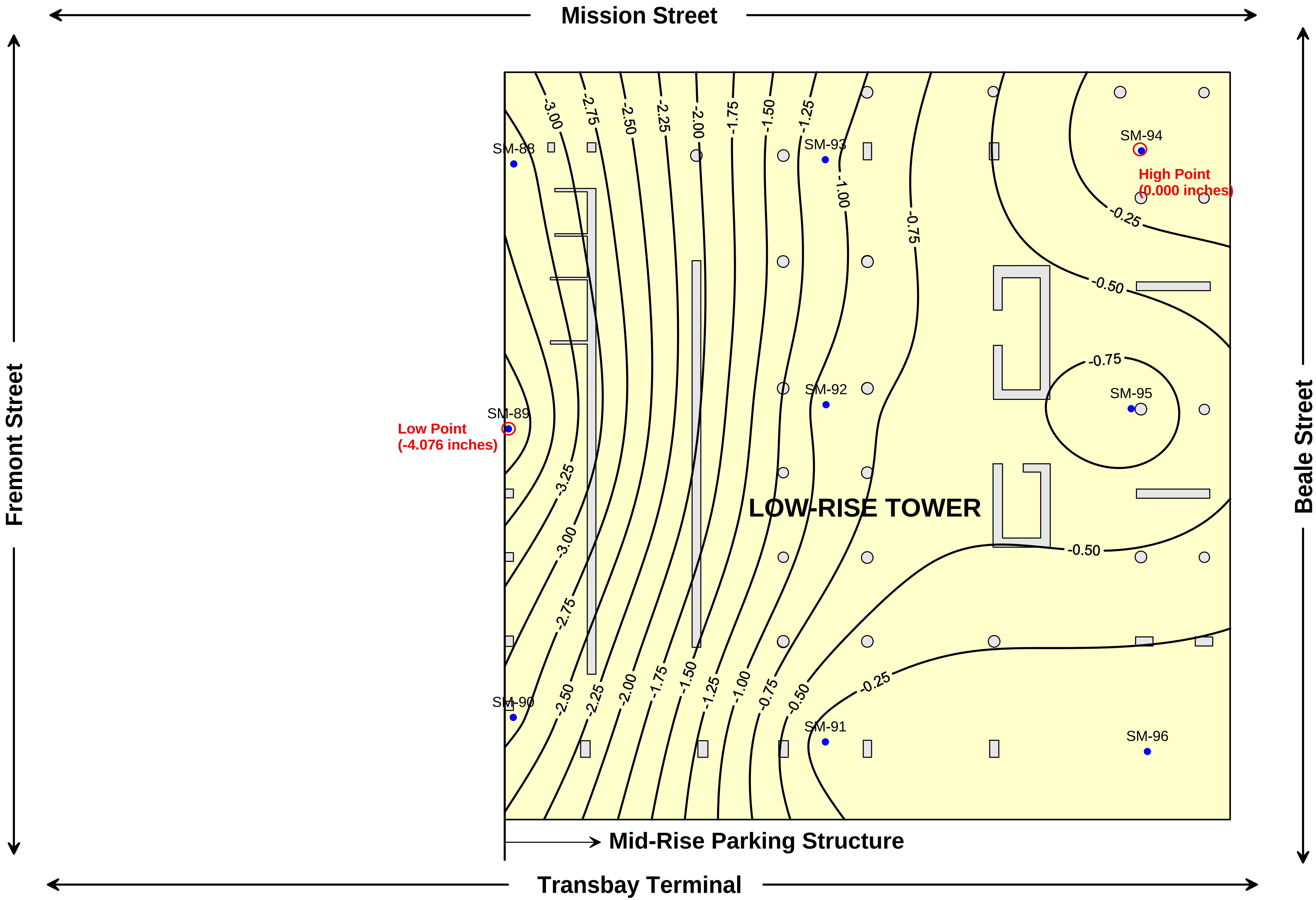
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2014

ARUP

PLATE 7

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\224 301 Mission - December 2013 Survey\Plates\B-5 Elevations (2013.12.17).srf

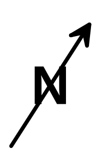


Date of Survey Reading:
December 17, 2013

Legend:

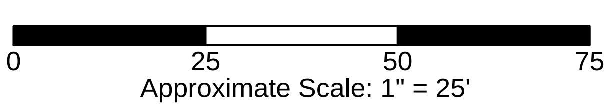
SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.340 feet (4.076 inches)



Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on December 17, 2013.



DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
AT BASEMENT LEVEL B-5: DECEMBER 17, 2013 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

January 2014

ARUP

PLATE 8

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\224 301 Mission - December 2013 Survey\Plates\B-5 Differential Elevations (2013.12.17).srf

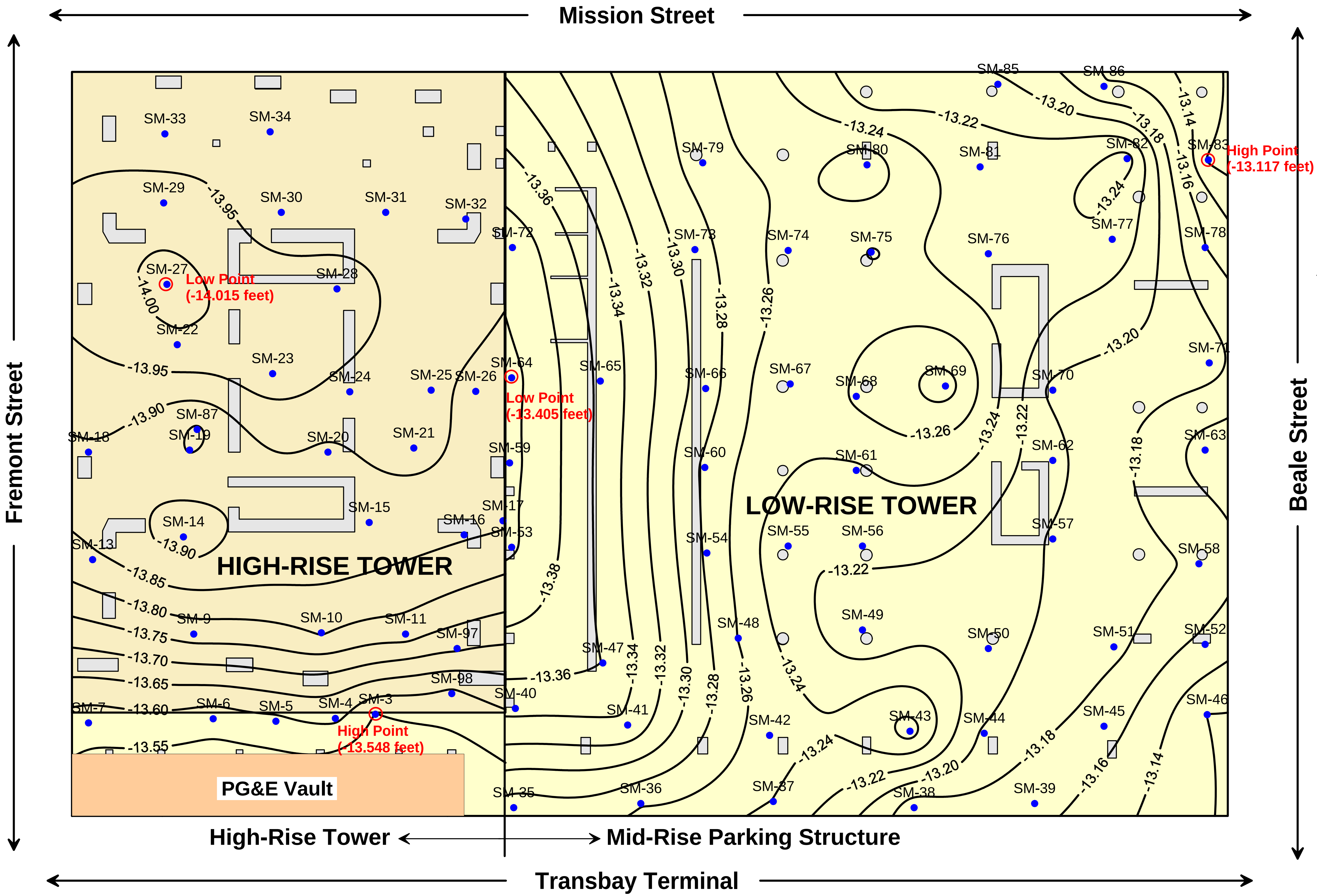
Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date**	28 February 2014
Copies	Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242-60/MHG
From	Stephen McLandrich (Arup)	**File reference**	4-05 224
Subject	Transbay Transit Center: Results of February 2014 Settlement Survey at 301 Mission Property	**Page** 1 **of** 1	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated January 9, 2014 with measurements made through February 2014.

List of Plates



Date of Survey Reading:
February 13, 2014

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	**Low-Rise Tower**
0.467 feet (5.603 inches)	**0.288 feet (3.455 inches)**

N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on February 13, 2014.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY:
PERIODIC SURVEY - FEBRUARY 13, 2014

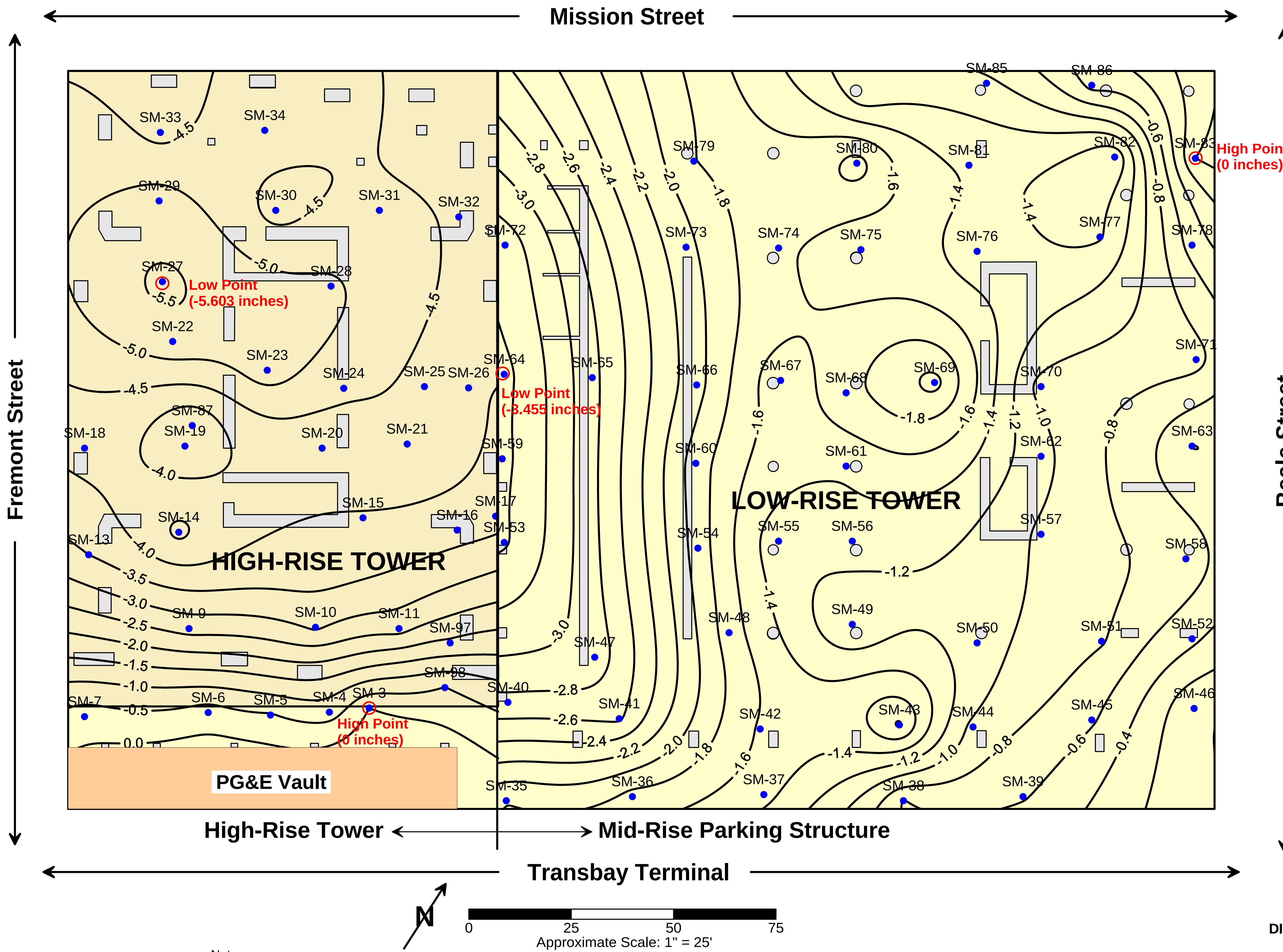
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

February 2014

ARUP

PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\229 301 Mission - February 2014 Survey\Plates\Elevations All (2014.02.13).srf



Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on February 13, 2014.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

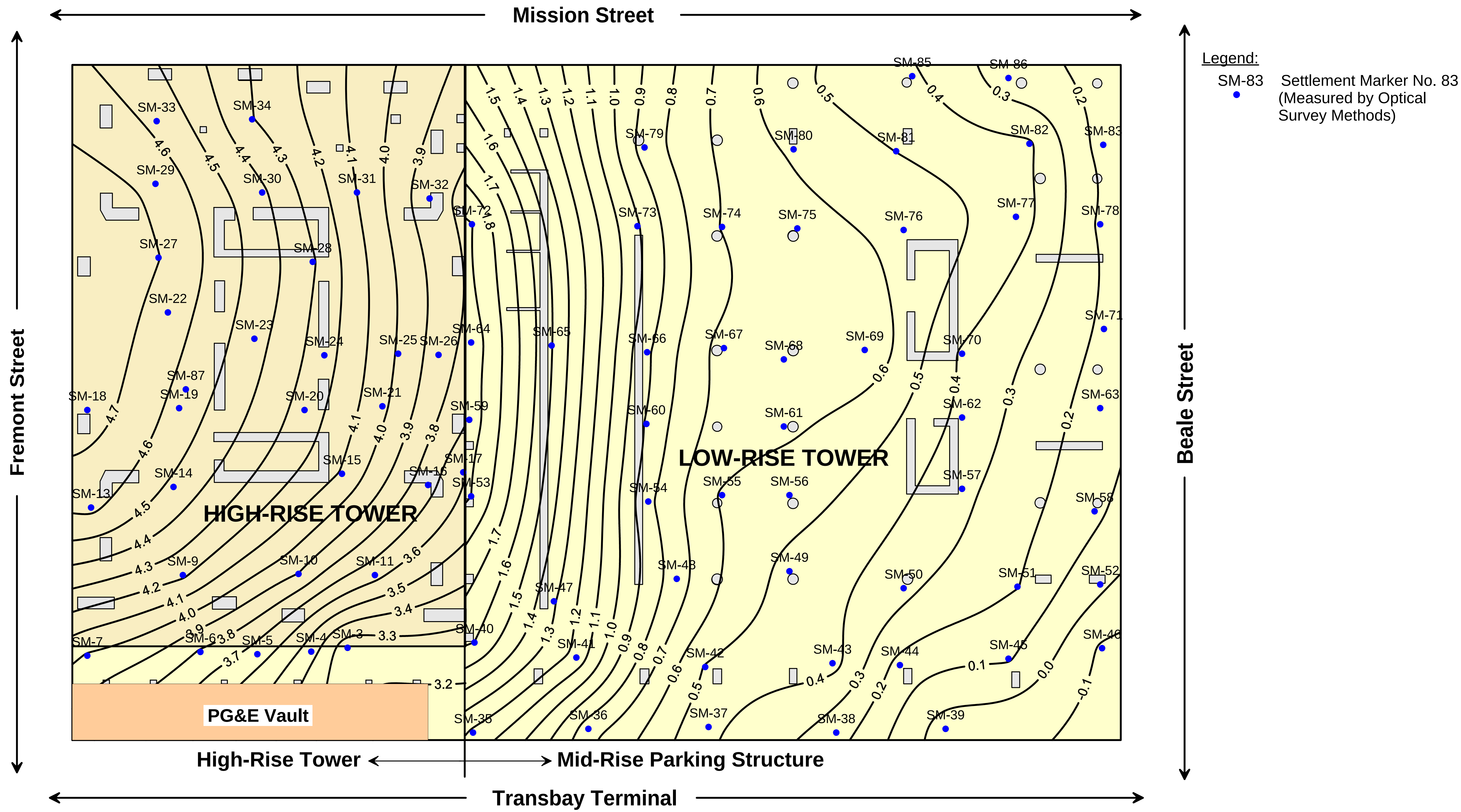
DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
FEBRUARY 13, 2014 SURVEY

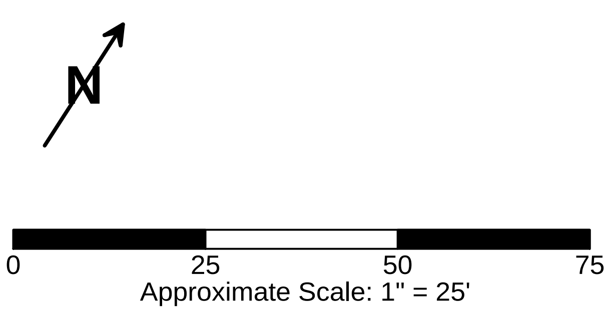
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

February 2014

ARUP

PLATE 2





Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on February 13, 2014.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE 1ST LEVEL BASEMENT OF THE 301 MISSION ST STRUCTURE BETWEEN 04/30/2009 & 12/17/2013

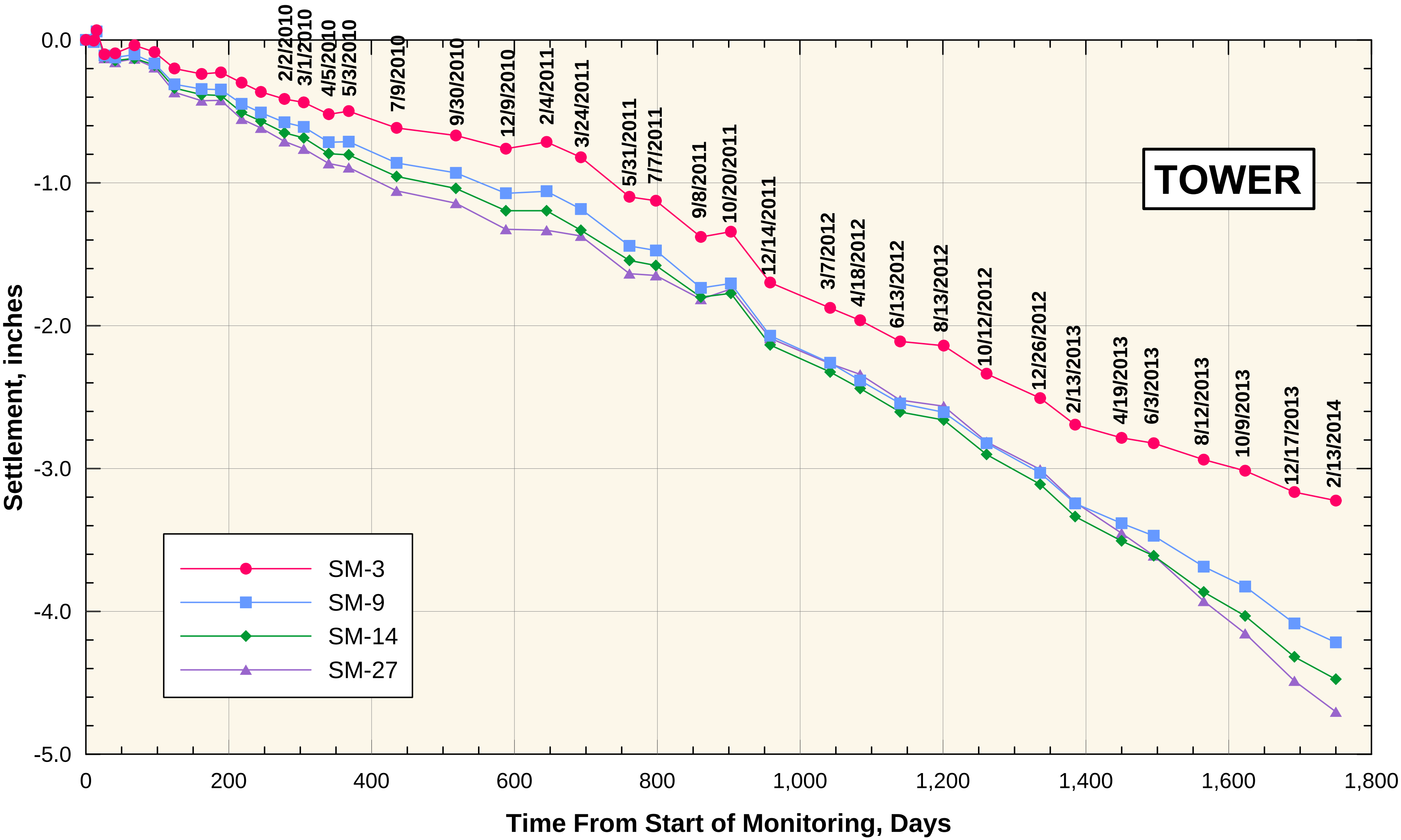
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

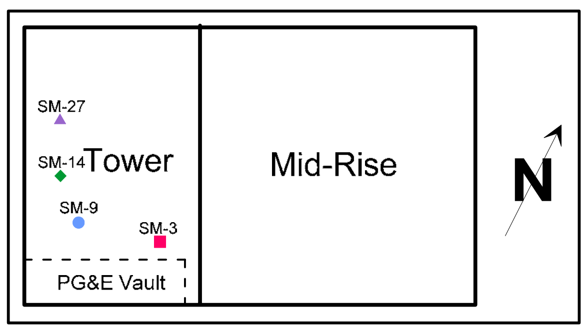
February 2014

ARUP

PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\229 301 Mission - February 2014 Survey\Plates\Elevation changes All (2014.02.13).srf





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH FEBRUARY 13, 2014

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

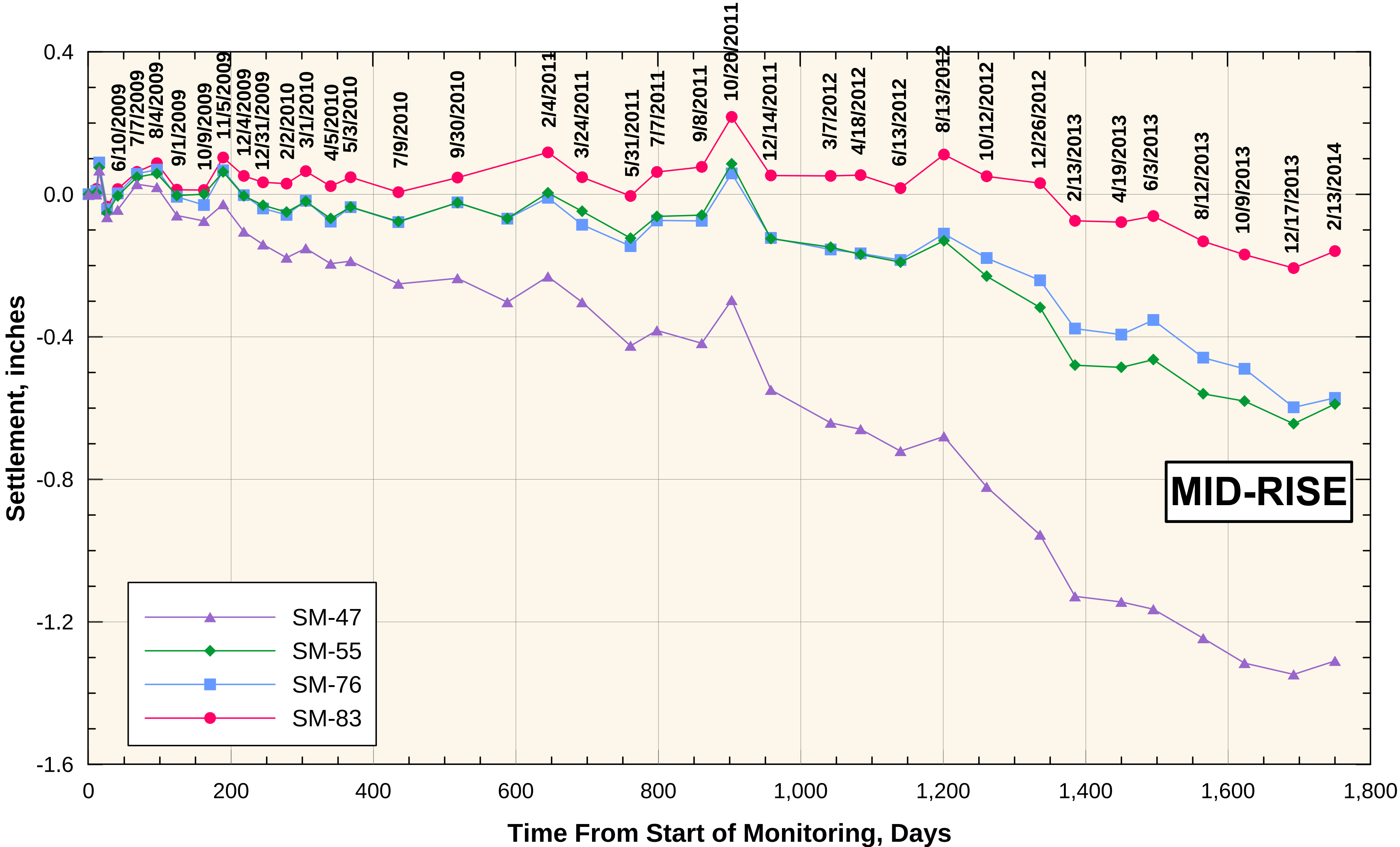
February 2014

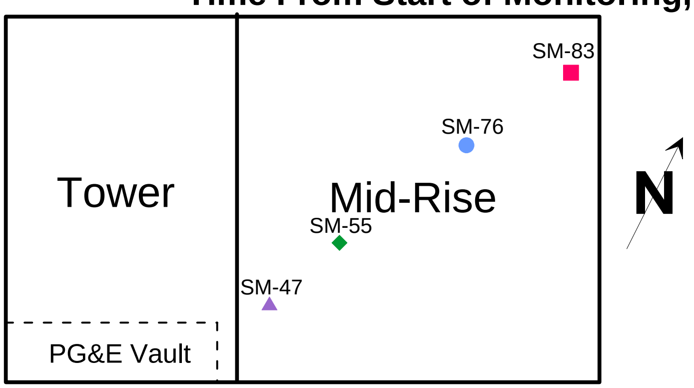
ARUP

PLATE 4

Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\229 301 Mission - February 2014 Survey\Plates\Plate 4 Settlement Over Time - Tower.grf





Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH FEBRUARY 13, 2014

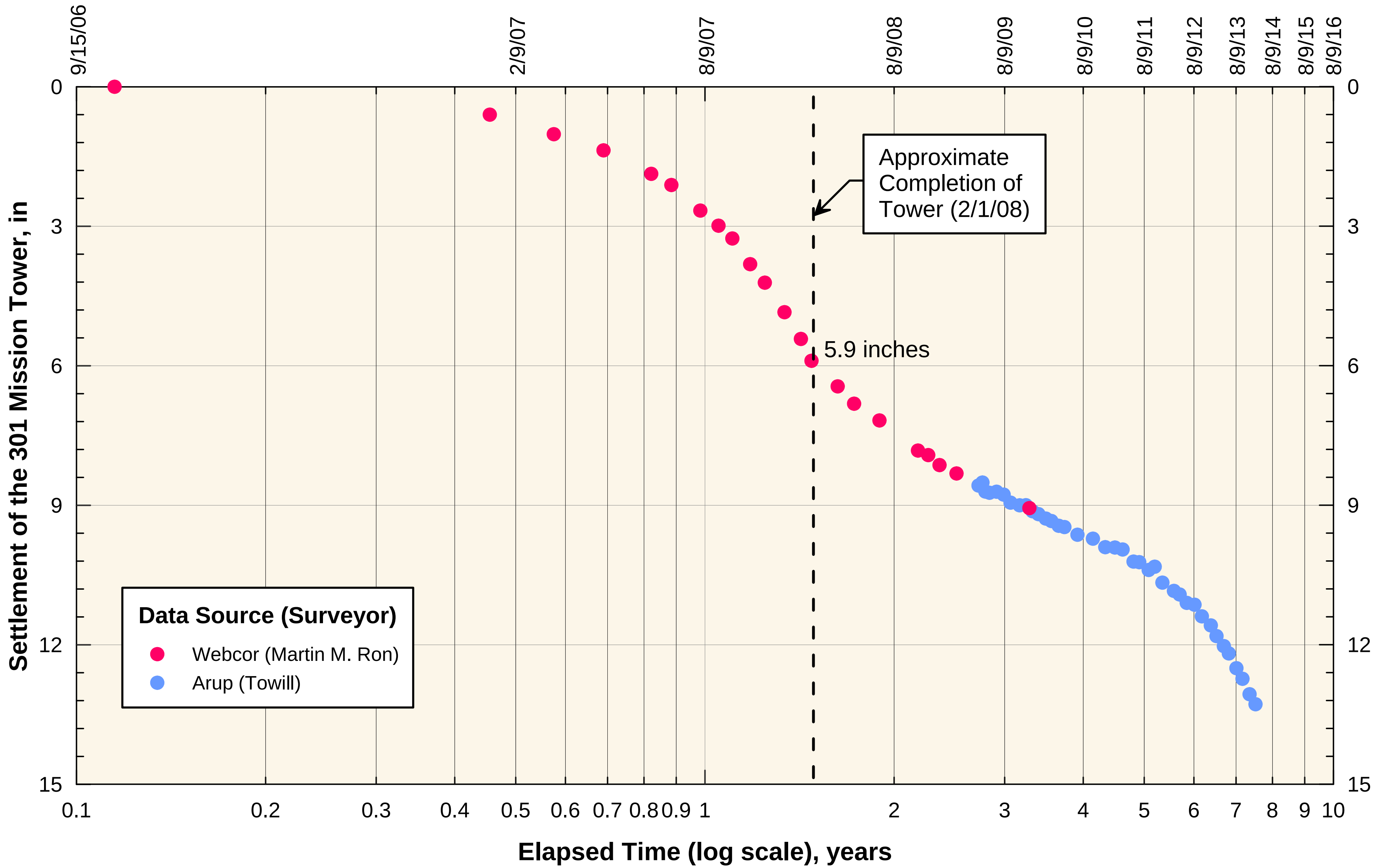
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

February 2014

ARUP

PLATE 5

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\229 301 Mission - February 2014 Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

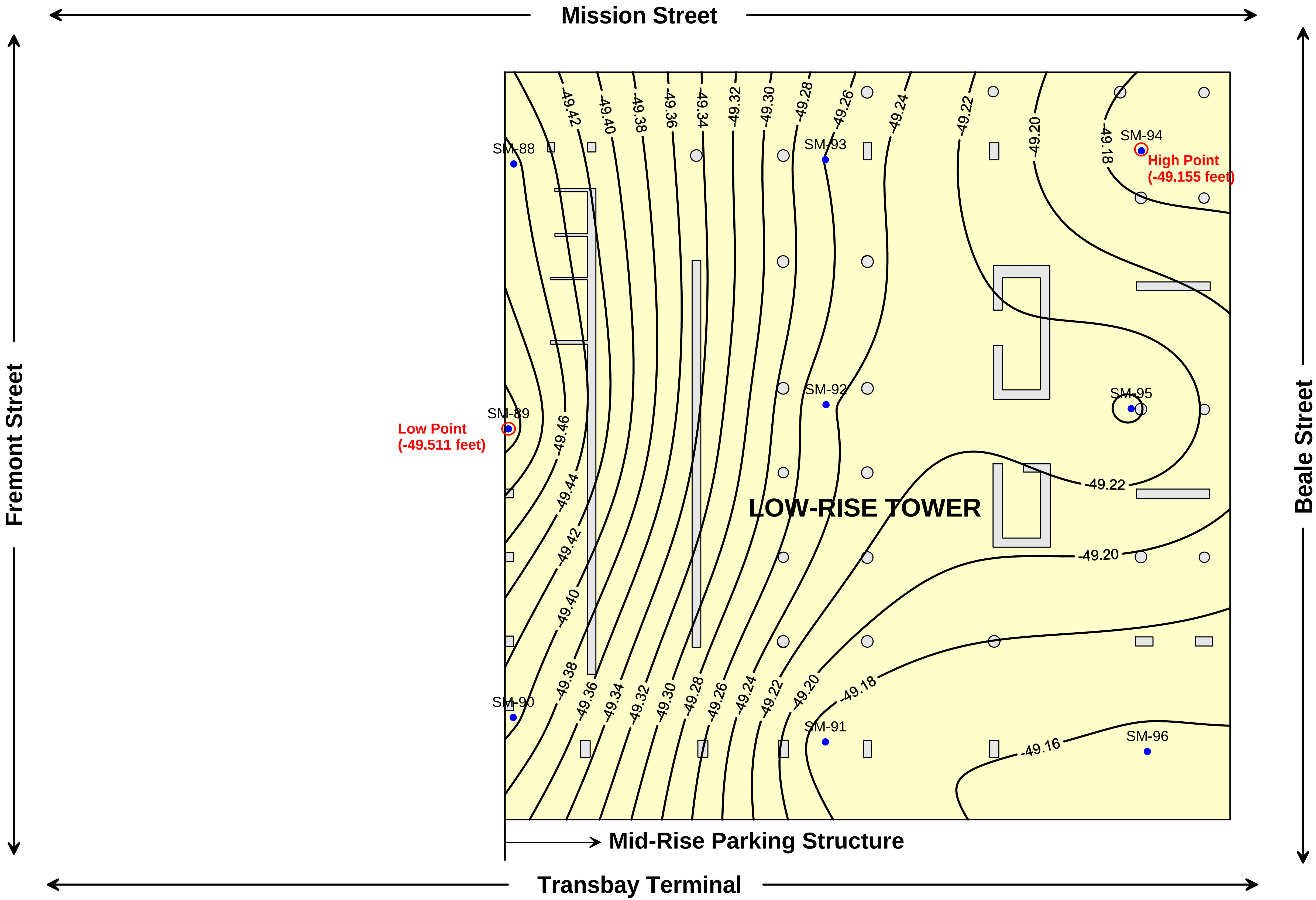
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

February 2014

ARUP

PLATE 6

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\229 301 Mission - February 2014 Survey\Plates\Plate 6 Tower Settlements.grf



Date of Survey Reading:
February 13, 2014

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.356 feet (4.270 inches)

N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on February 13, 2014.

FLOOR ELEVATION AT BASEMENT LEVEL B-5
OF 301 MISSION PROPERTY: FEBRUARY 13, 2014 SURVEY

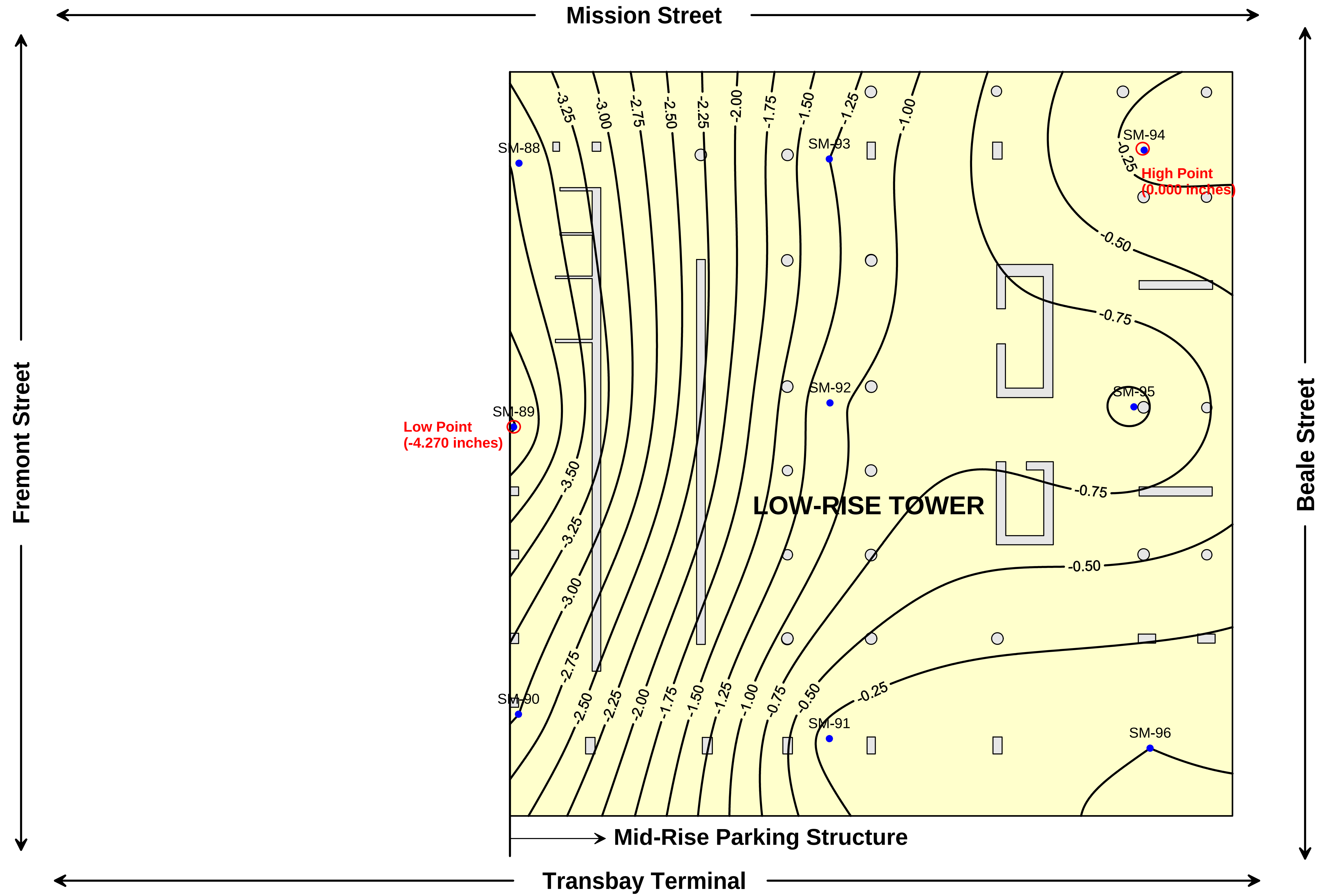
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

February 2014

ARUP

PLATE 7

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\229 301 Mission - February 2014 Survey\Plates\B-5 Elevations (2014.02.13).srf



Date of Survey Reading: February 13, 2014

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.356 feet (4.270 inches)

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on February 13, 2014.

0 25 50 75

Approximate Scale: 1" = 25'

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\229 301 Mission - February 2014 Survey\Plates\B-5 Differential Elevations (2014.02.13).srf

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
AT BASEMENT LEVEL B-5: FEBRUARY 13, 2014 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

February 2014

ARUP

PLATE 8

Memorandum

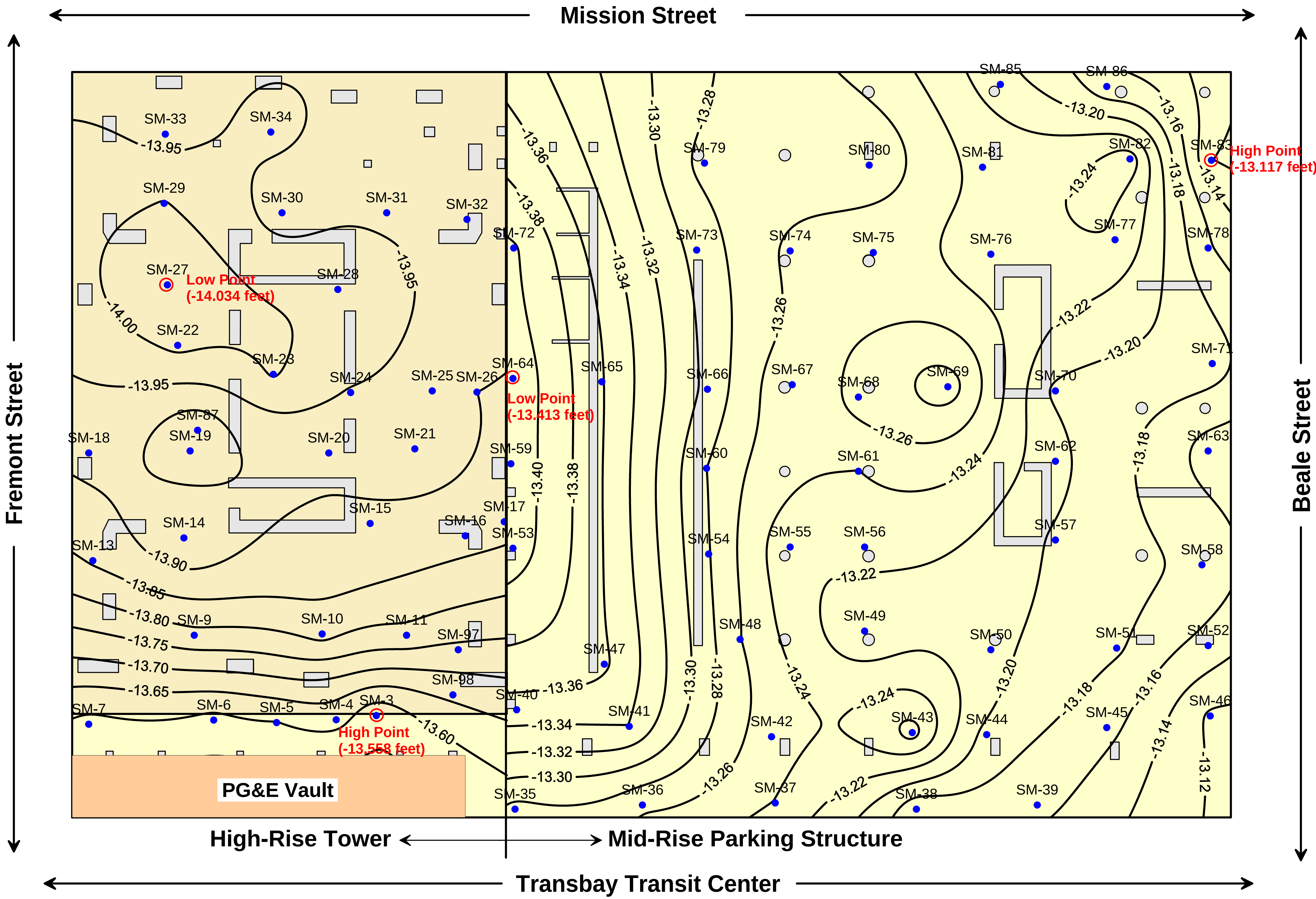
ARUP

To	Brian Dykes (TJPA)	**Date** May 7, 2014
Copies	Randy Volenec (PCPA) George Metzger (AAI)	**Reference number** 132242
From	Stephen McLandrich (Arup)	**File reference** 4-05 236
Subject	Transbay Transit Center: Results of April 2014 Settlement Survey at 301 Mission Property	**Page** 1 **of** 1

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated February 28, 2014 with measurements made through April 2014.

List of Plates

Plate 1 Floor Elevations at Level B-1 of 301 Mission Property: Periodic Survey – April 11, 2014
Plate 2 Differential Floor Elevation (Inches) April 11, 2014 Survey
Plate 3 Contours of Settlements Measured at the 1st Level Basement of the 301 Mission St. Structure Between 04/30/2009 & 4/11/2014
Plate 4 Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Tower: April 30, 2009 through April 11, 2014
Plate 5 Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Mid-Rise: April 30, 2009 through April 11, 2014
Plate 6 Settlements of the 301 Mission Tower Including Monitoring During Construction
Plate 7 Floor Elevation at Basement Level B-5 of 301 Mission Property: April 11, 2014 Survey
Plate 8 Differential Floor Elevations (Inches) at Basement Level B-5: April 11, 2014 Survey



Date of Survey Reading:
April 11, 2014

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	**Mid-Rise Parking**
0.476 feet (5.714 inches)	**0.296 feet (3.552 inches)**

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on April 11, 2014.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

0 25 50 75

Approximate Scale: 1" = 25'

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\236 301 Mission - April 2014 Survey\Plates\Elevations All (2014.04.11).srf

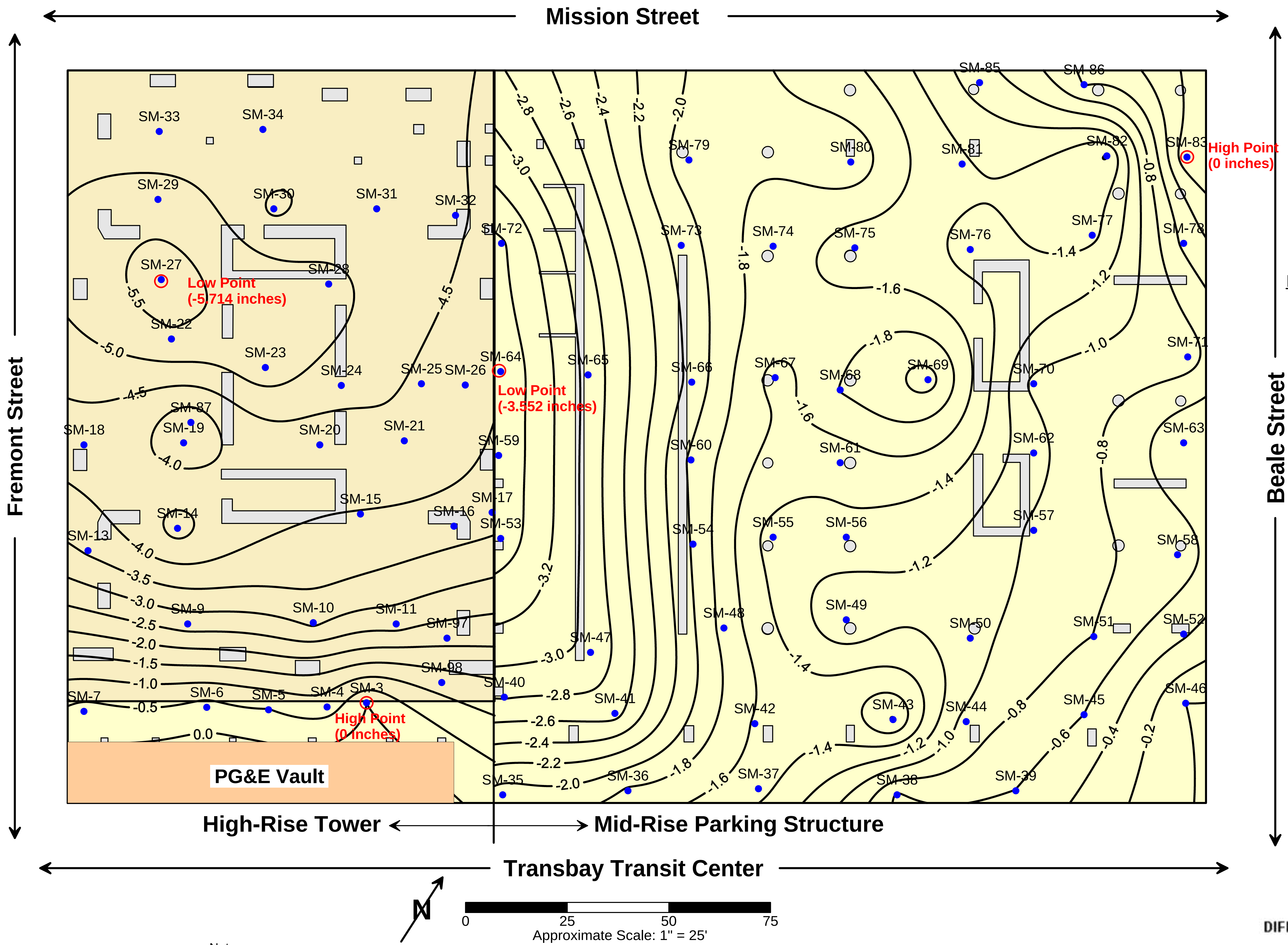
FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY: PERIODIC SURVEY - APRIL 11, 2014

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

May 2014

ARUP

PLATE 1



Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on April 11, 2014.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
APRIL 11, 2014 SURVEY

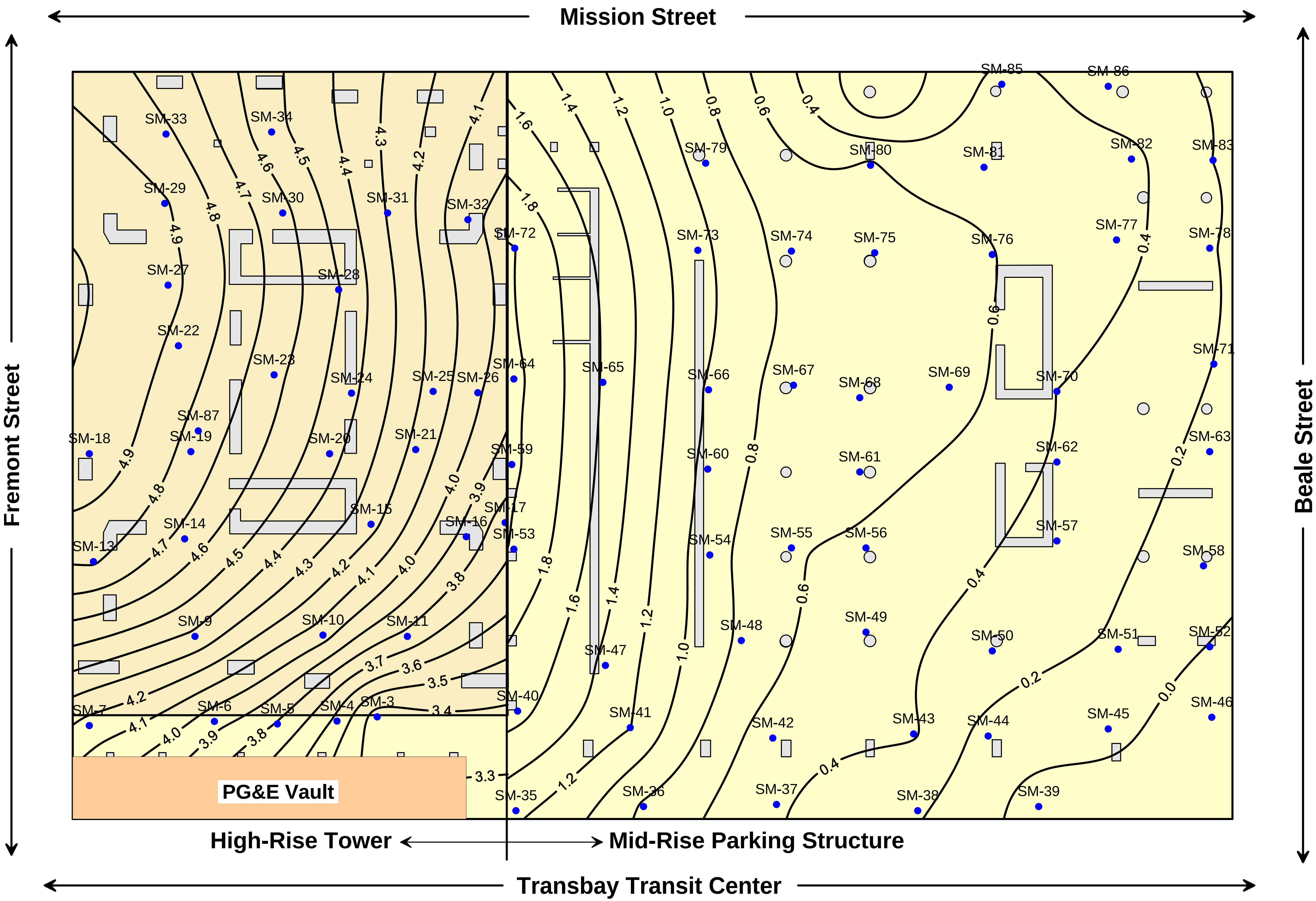
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

May 2014

ARUP

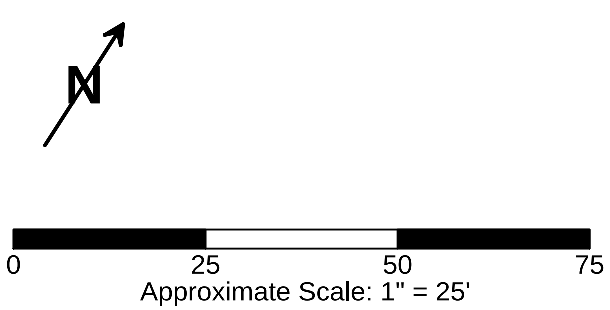
PLATE 2

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\236 301 Mission - April 2014 Survey\Plates\Differential Elevation All (2014.04.11).srf



Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)



Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on April 11, 2014.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE 1ST LEVEL BASEMENT OF THE 301 MISSION ST STRUCTURE BETWEEN 04/30/2009 & 4/11/2014

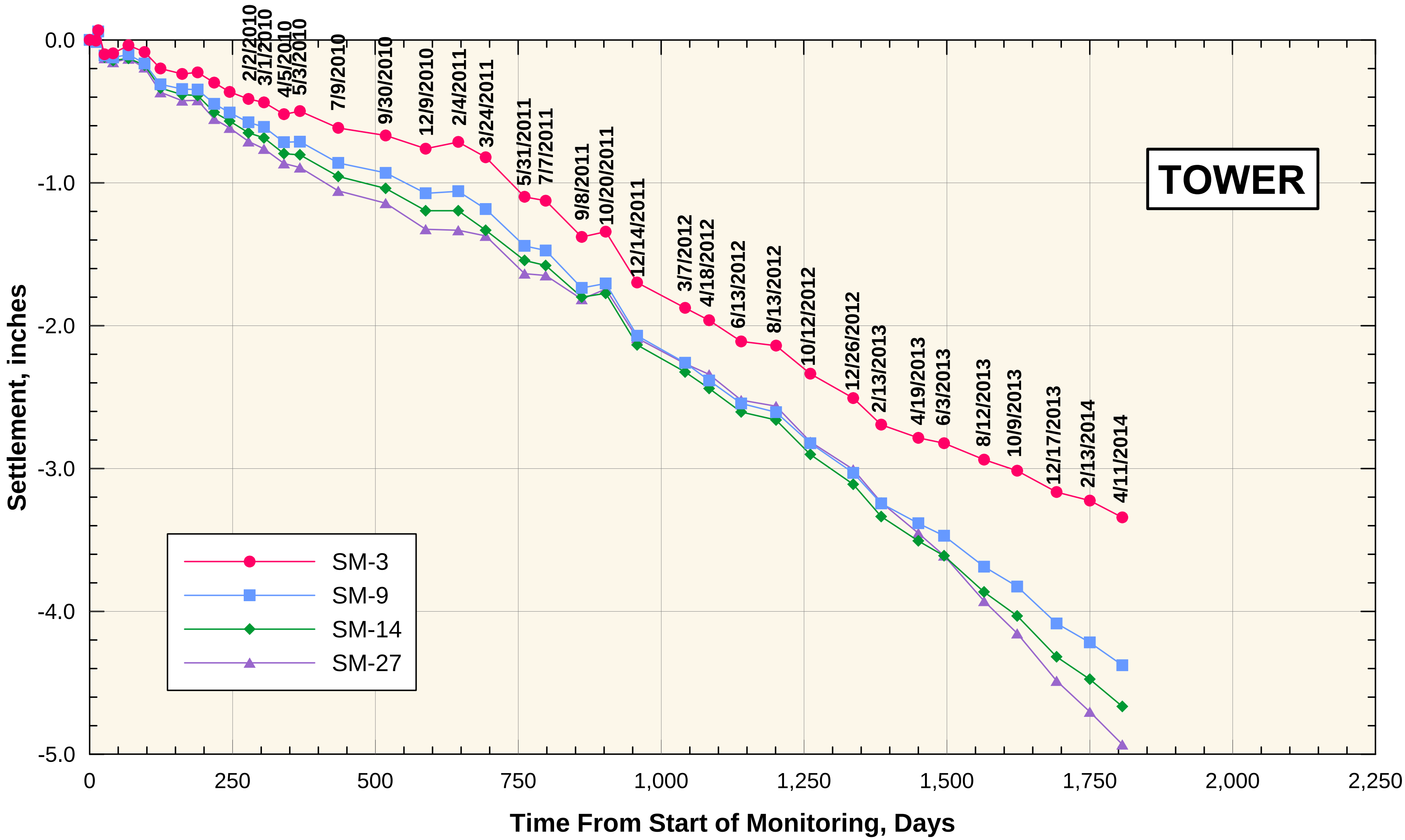
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

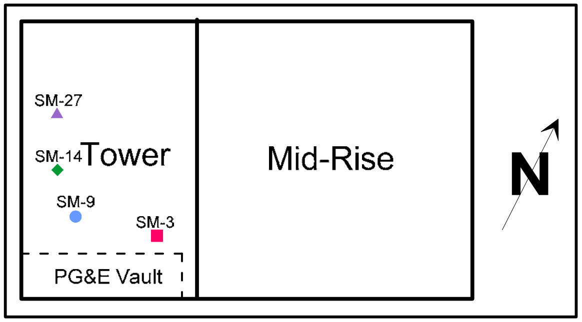
May 2014

ARUP

PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\236 301 Mission - April 2014 Survey\Plates\Elevation changes All (2014.04.11).srf





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH APRIL 11, 2014

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

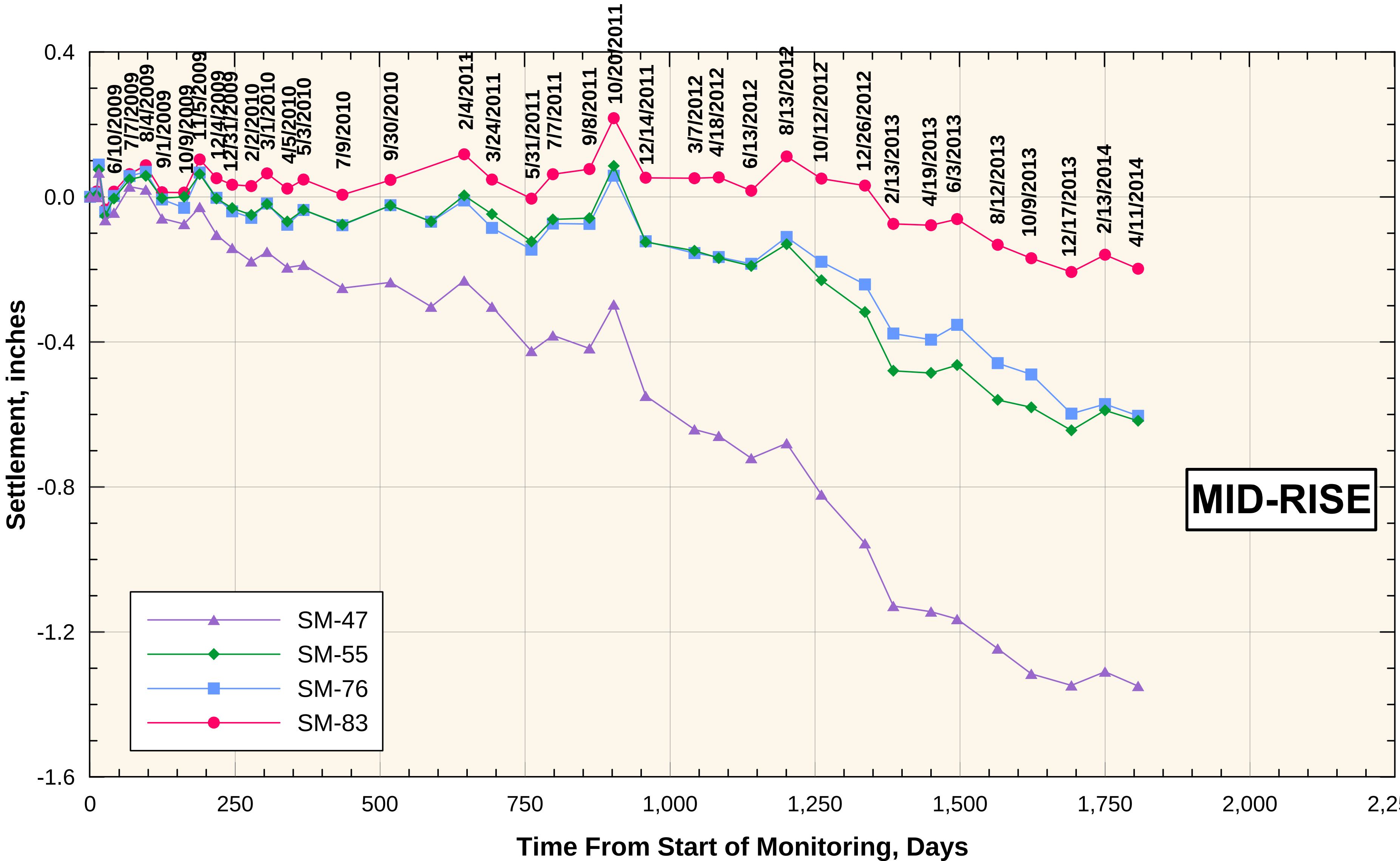
May 2014

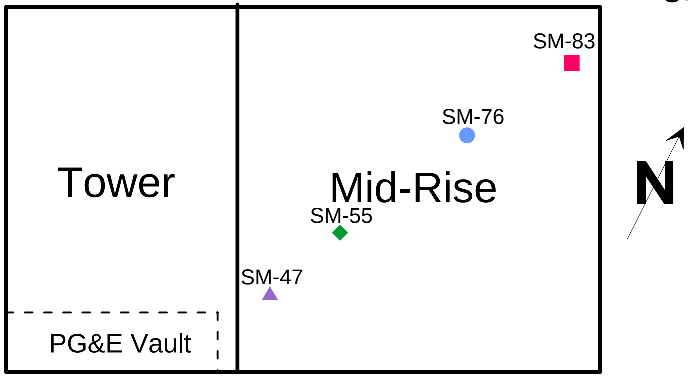
ARUP

PLATE 4

Note:
Initial (Baseline) reading taken on 04/30/09

\\global.arup.com\americas\Jobs\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\236 301 Mission - April 2014 Survey\Plates\Plate 4 Settlement Over Time - Tower.grf





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH APRIL 11, 2014

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

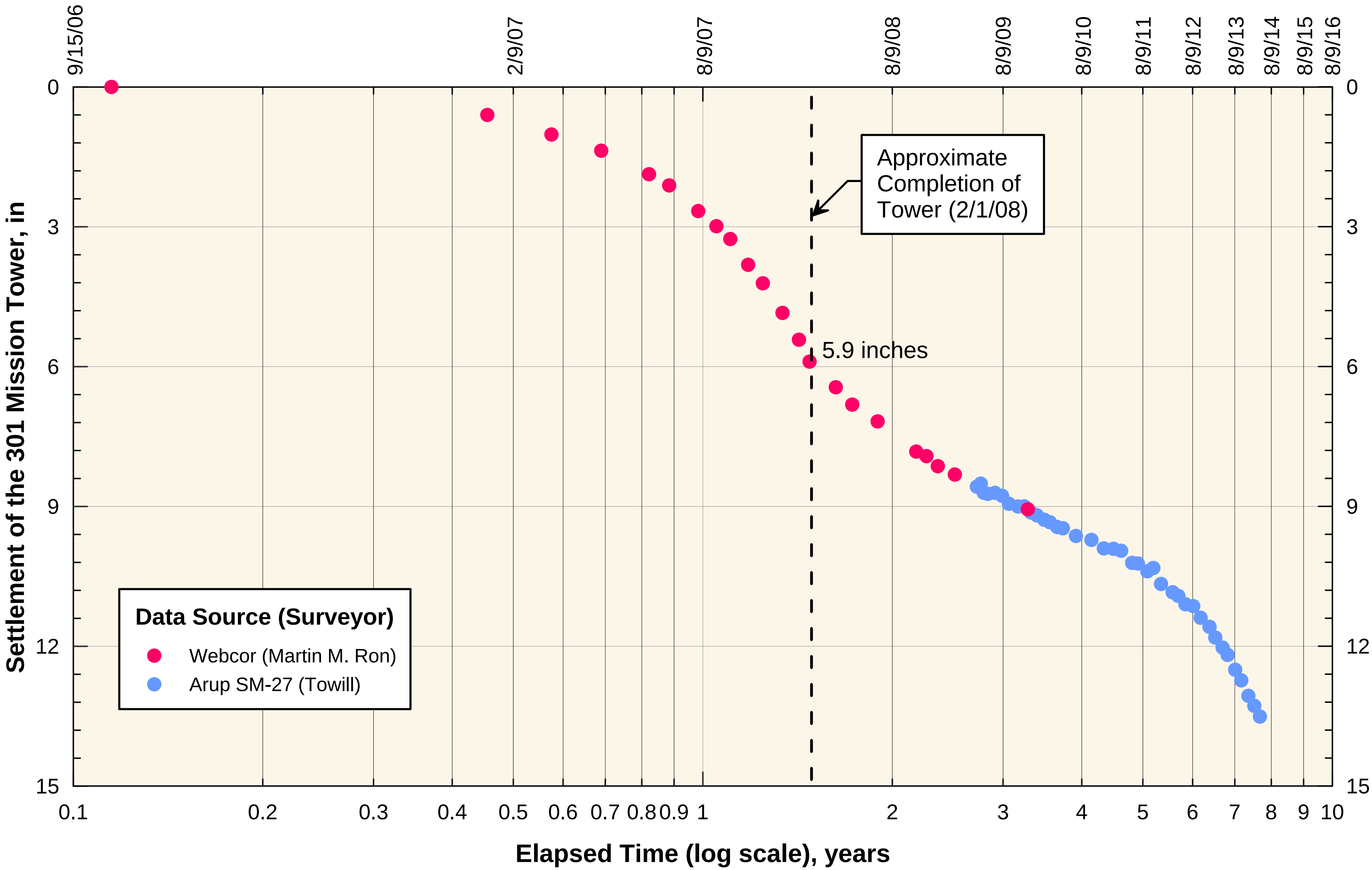
May 2014

ARUP

PLATE 5

Note:
Initial (Baseline) reading taken on 04/30/09

\\global.arup.com\americas\Jobs\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\236 301 Mission - April 2014 Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

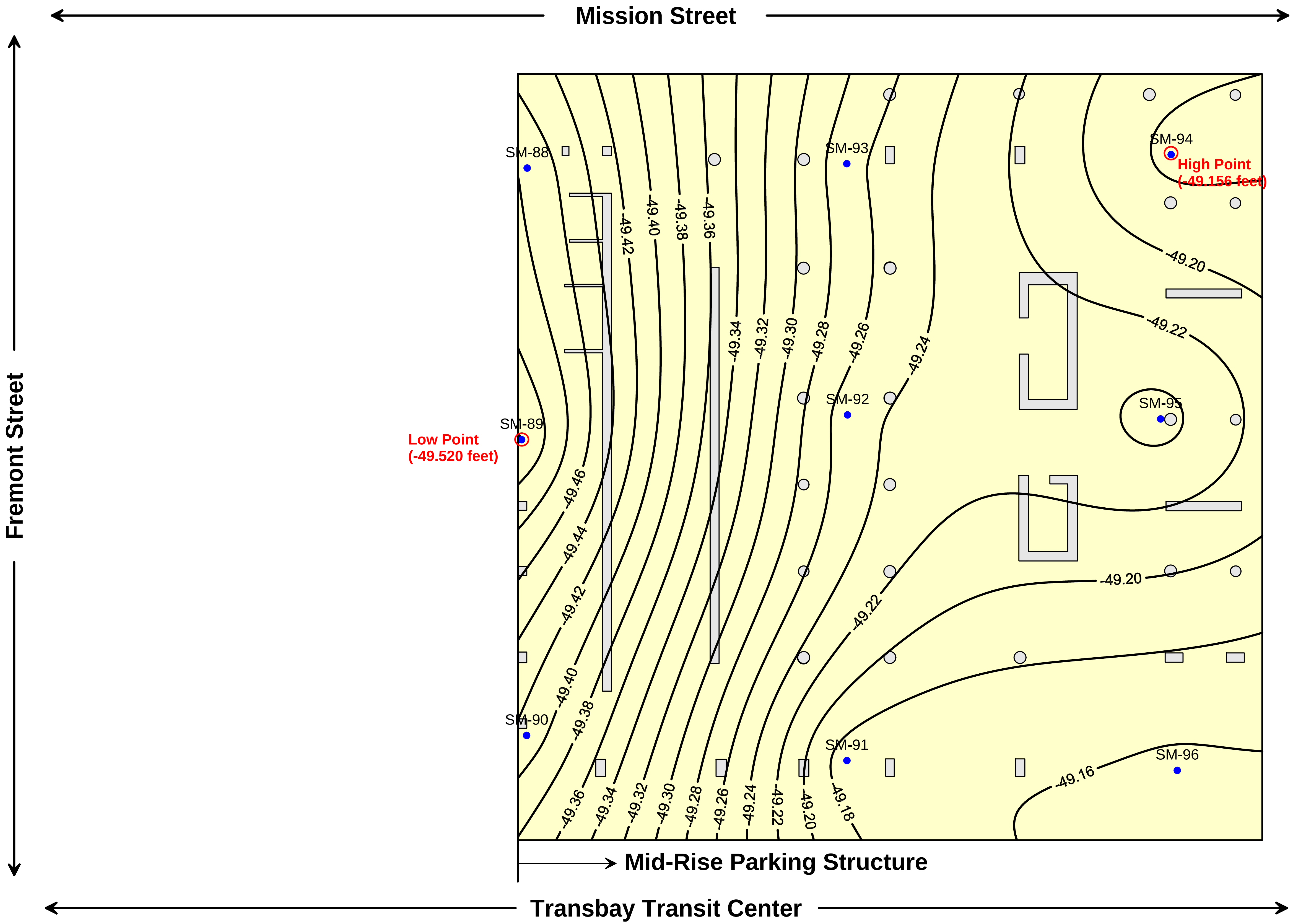
SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

May 2014

ARUP

PLATE 6

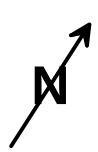


Date of Survey Reading:
April 11, 2014

Legend:

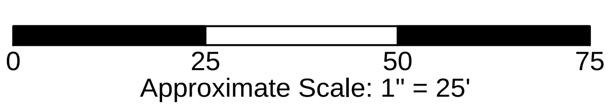
SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.365 feet (4.379 inches)



Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on April 11, 2014.



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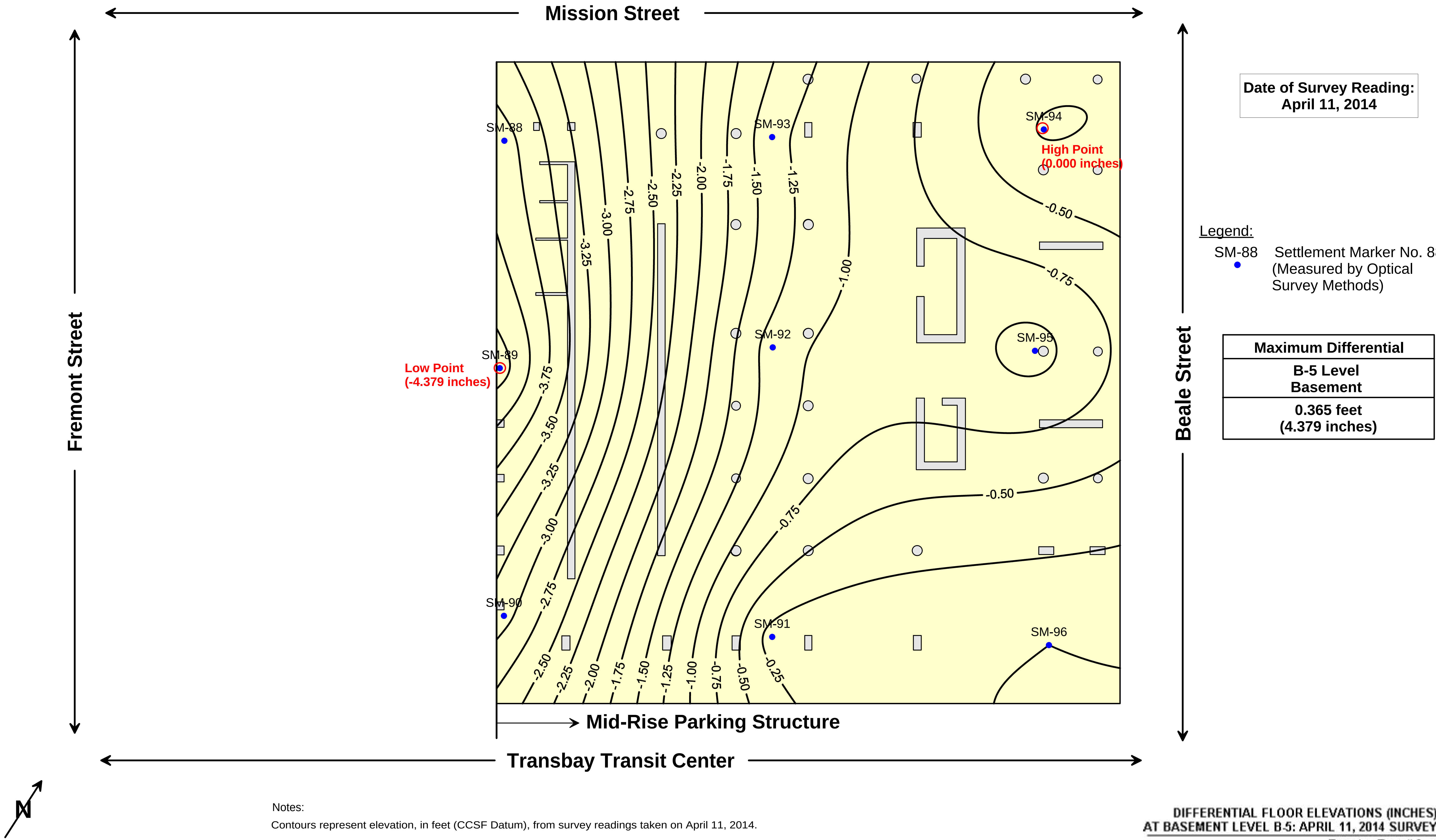
FLOOR ELEVATION AT BASEMENT LEVEL B-5 OF 301 MISSION PROPERTY: APRIL 11, 2014 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

May 2014

ARUP

PLATE 7



Maximum Differential
B-5 Level Basement
0.365 feet (4.379 inches)

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on April 11, 2014.

0 25 50 75

Approximate Scale: 1" = 25'

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\236 301 Mission - April 2014 Survey\Plates\B-5 Differential Elevations (2014.04.11).srf

DIFFERENTIAL FLOOR ELEVATIONS (INCHES) AT BASEMENT LEVEL B-5: APRIL 11, 2014 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

May 2014

ARUP

PLATE 8

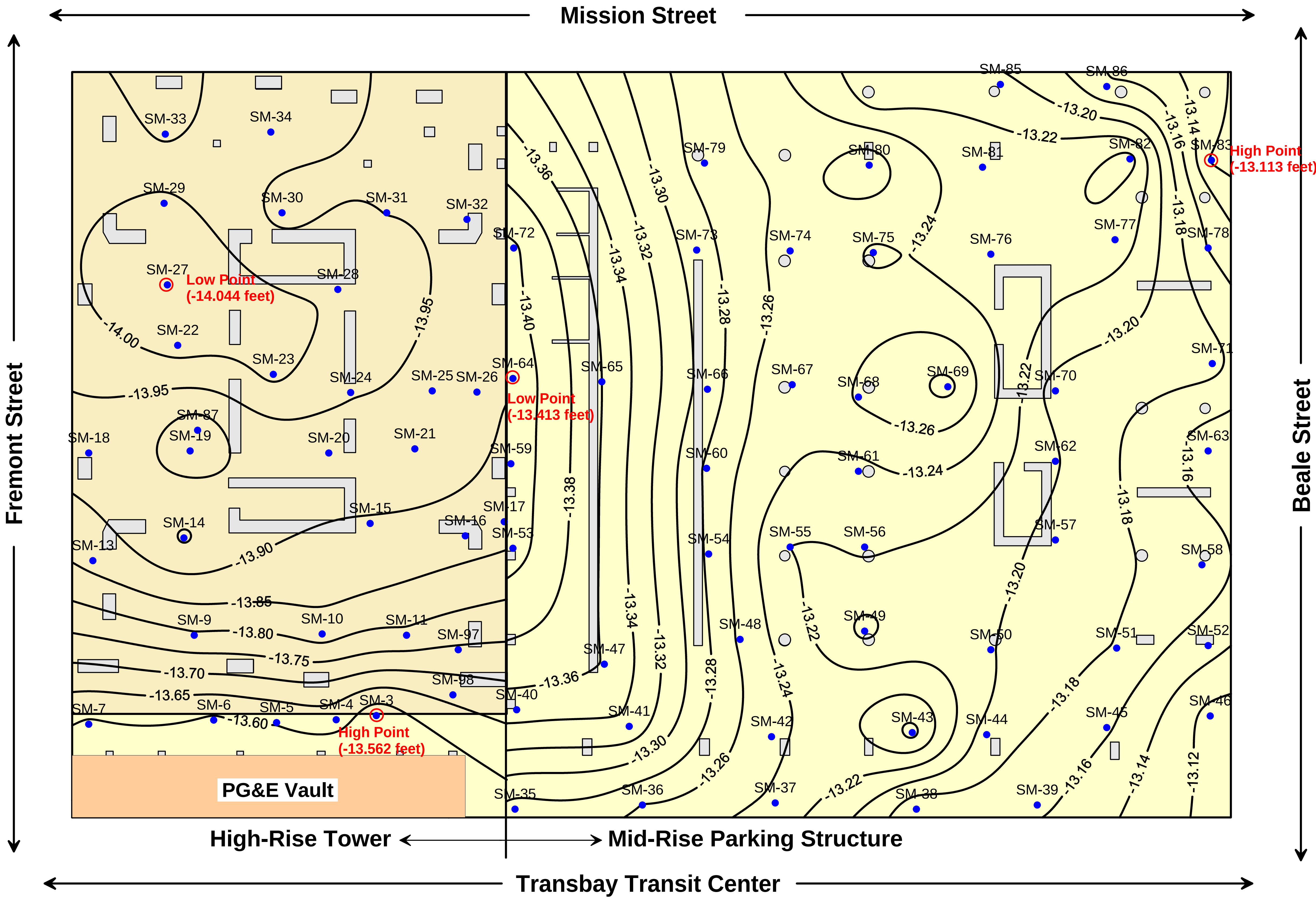
Memorandum

ARUP

To	Brian Dykes (TJPA)	**Date** June 27, 2014
Copies	Randy Volenec (PCPA) George Metzger (AAI)	**Reference number** 132242
From	Stephen McLandrich (Arup)	**File reference** 4-05 238
Subject	Transbay Transit Center: Results of June 2014 Settlement Survey at 301 Mission Property	**Page** 1 **of** 1

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated May 7, 2014 with measurements made through June 2014.

List of Plates



Date of Survey Reading:
June 11, 2014

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	**Mid-Rise Parking**
0.482 feet (5.786 inches)	**0.300 feet (3.599 inches)**

N

0 25 50 75

Approximate Scale: 1" = 25'

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on June 11, 2014.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

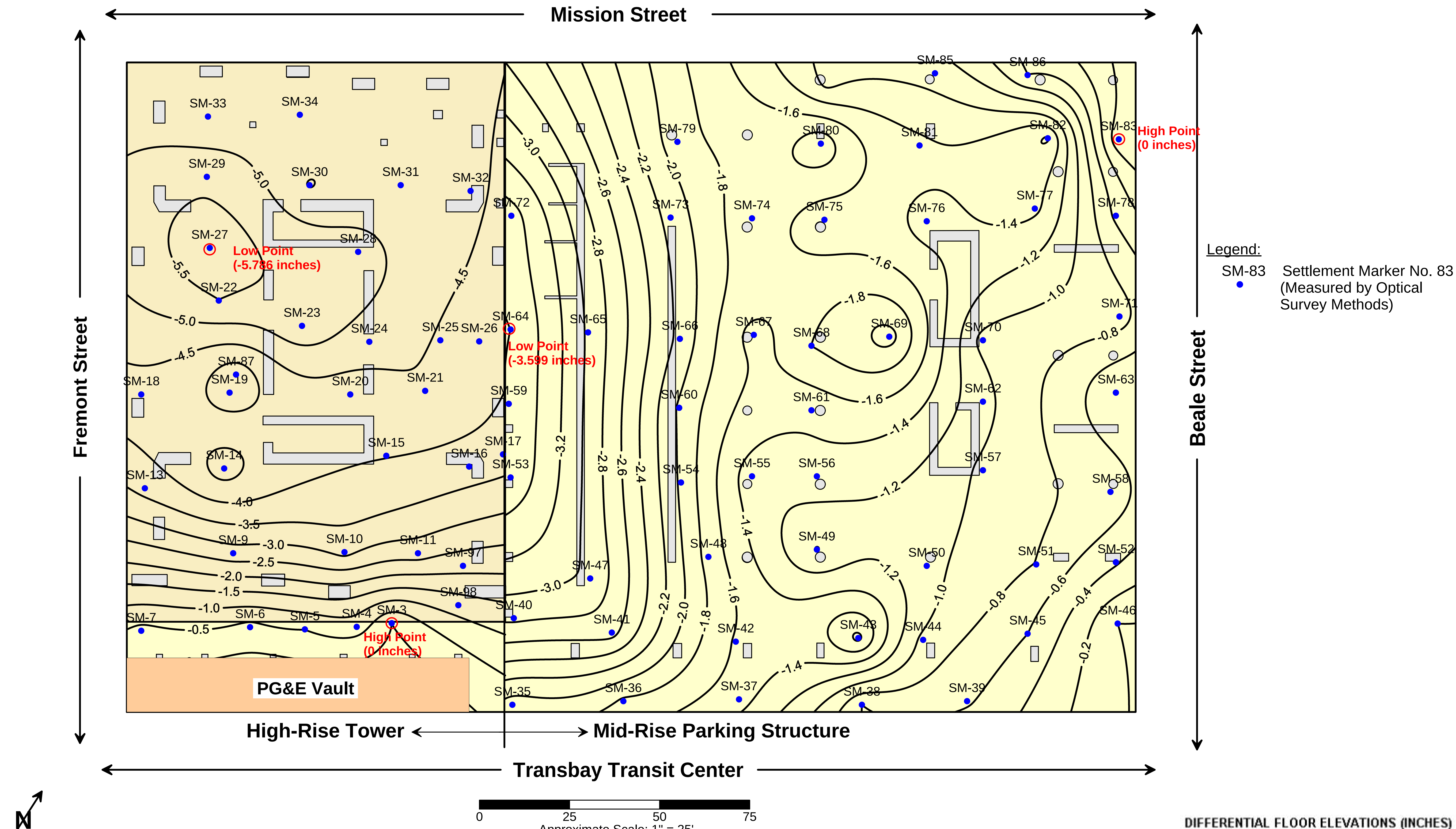
FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY: PERIODIC SURVEY - JUNE 11, 2014

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2014

ARUP

PLATE 1



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on June 11, 2014.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
JUNE 11, 2014 SURVEY

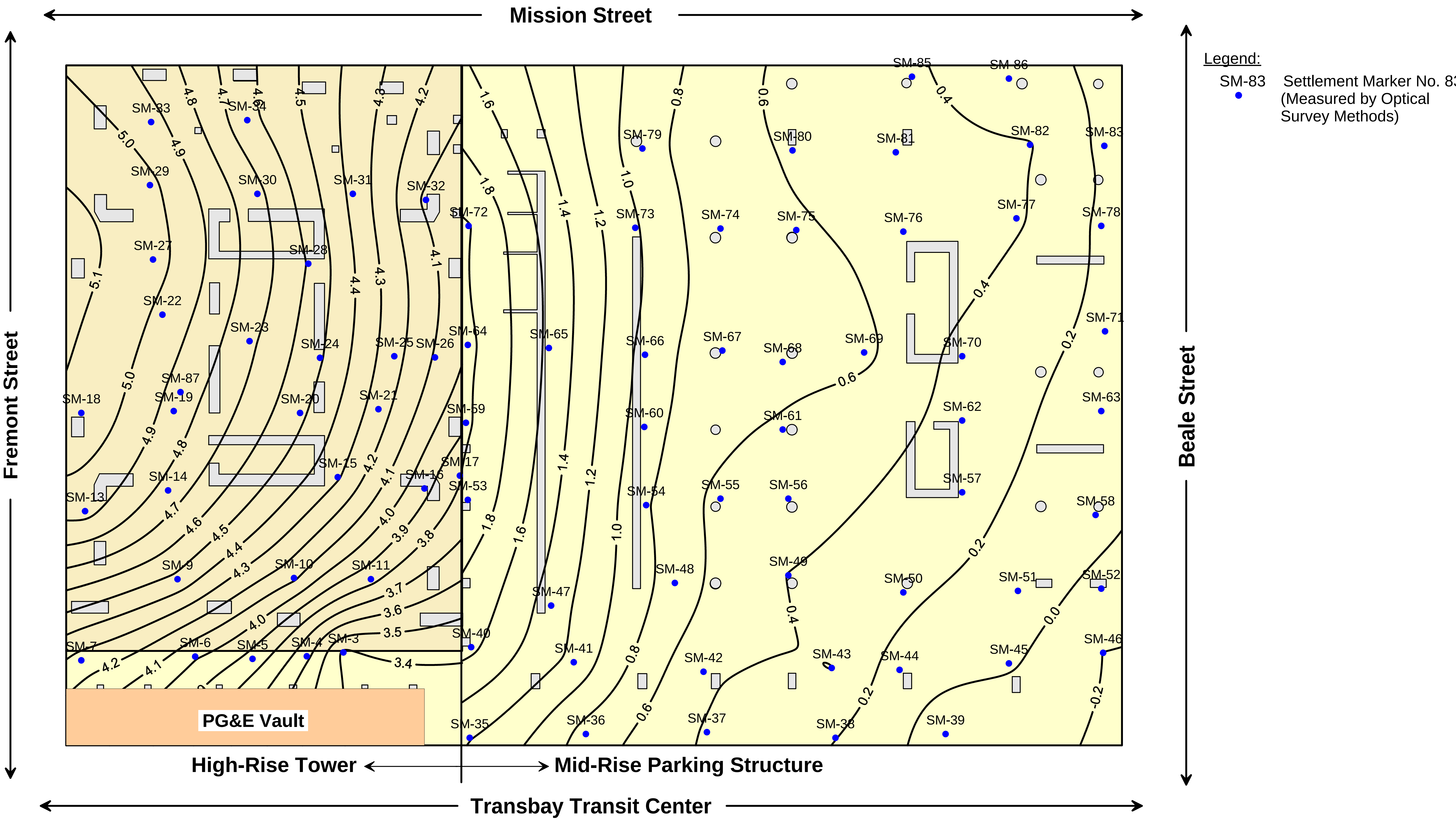
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2014

ARUP

PLATE 2

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\238 301 Mission - June 2014 Survey\Plates\Differential Elevation All (2014.06.11).srf



N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on June 11, 2014.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE 1ST LEVEL BASEMENT OF THE 301 MISSION ST STRUCTURE BETWEEN 04/30/2009 & 6/11/2014

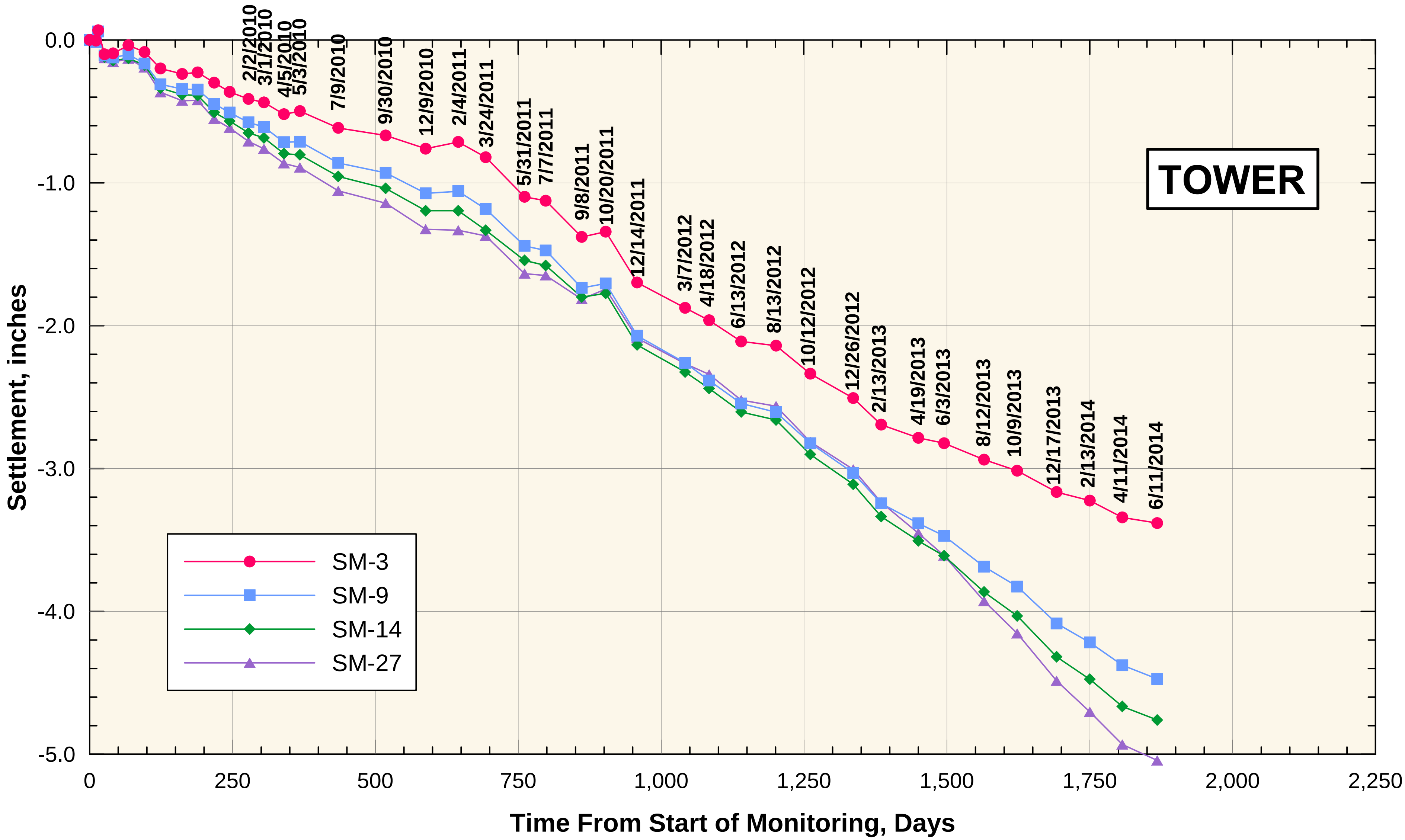
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

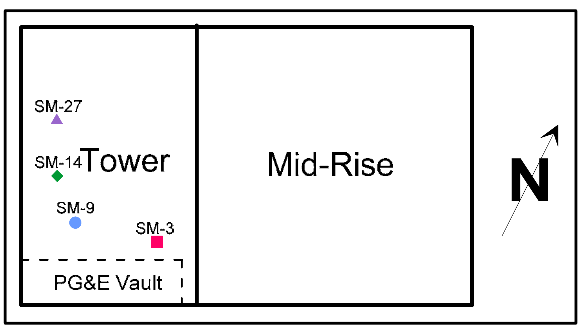
June 2014

ARUP

PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\238 301 Mission - June 2014 Survey\Plates\Elevation changes All (2014.06.11).srf





Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH JUNE 11, 2014

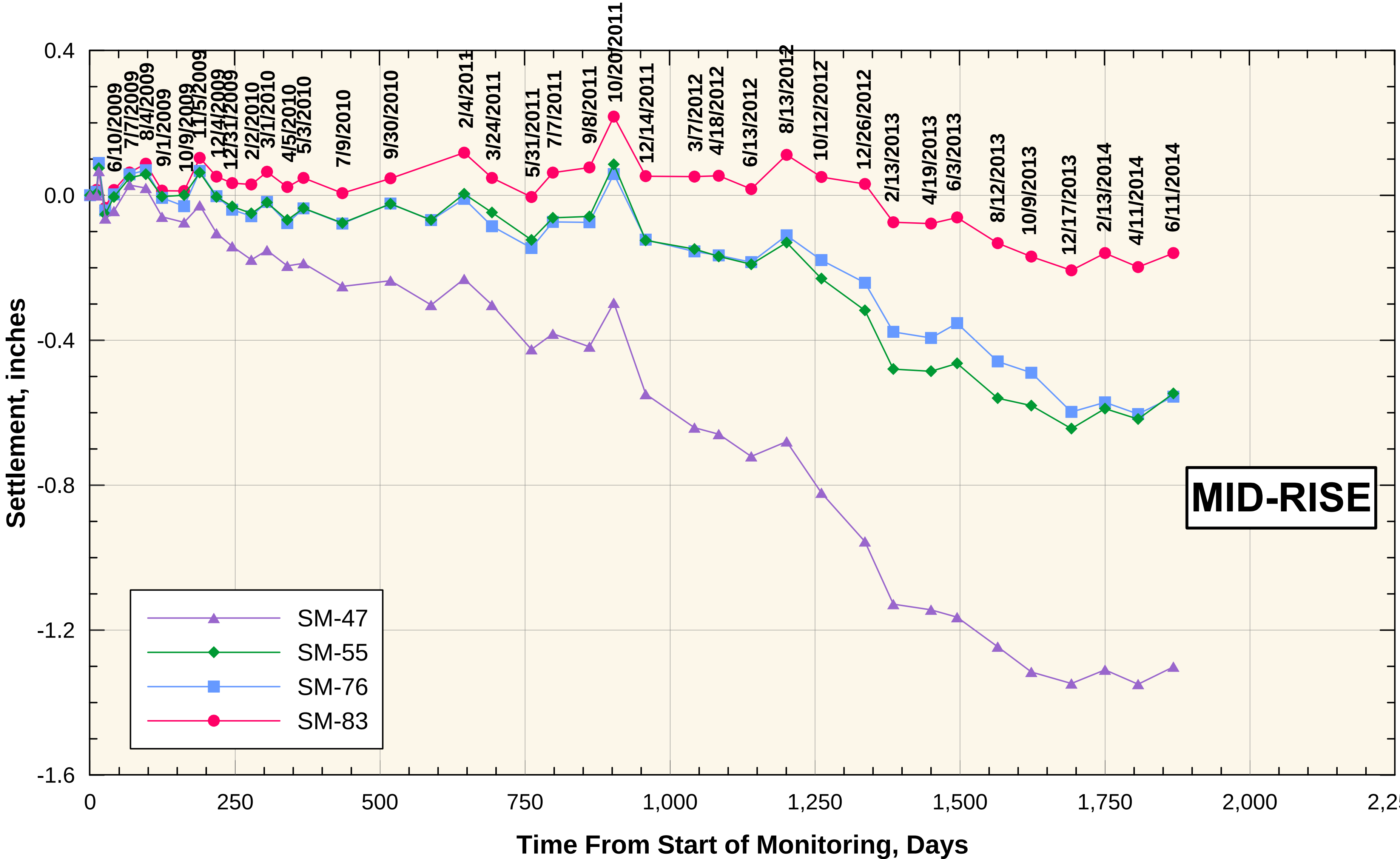
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

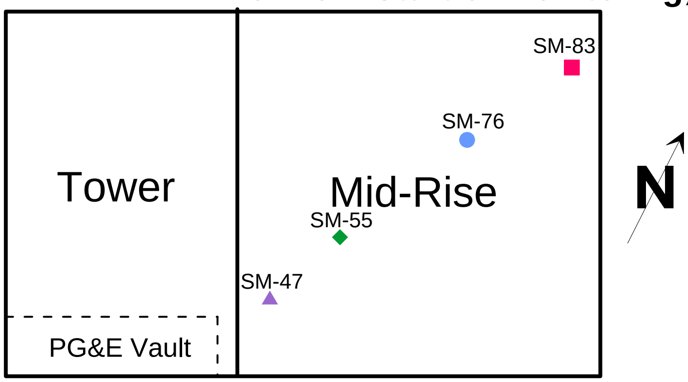
June 2014

ARUP

PLATE 4

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\238 301 Mission - June 2014 Survey\Plates\Plate 4 Settlement Over Time - Tower.grf





Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH JUNE 11, 2014

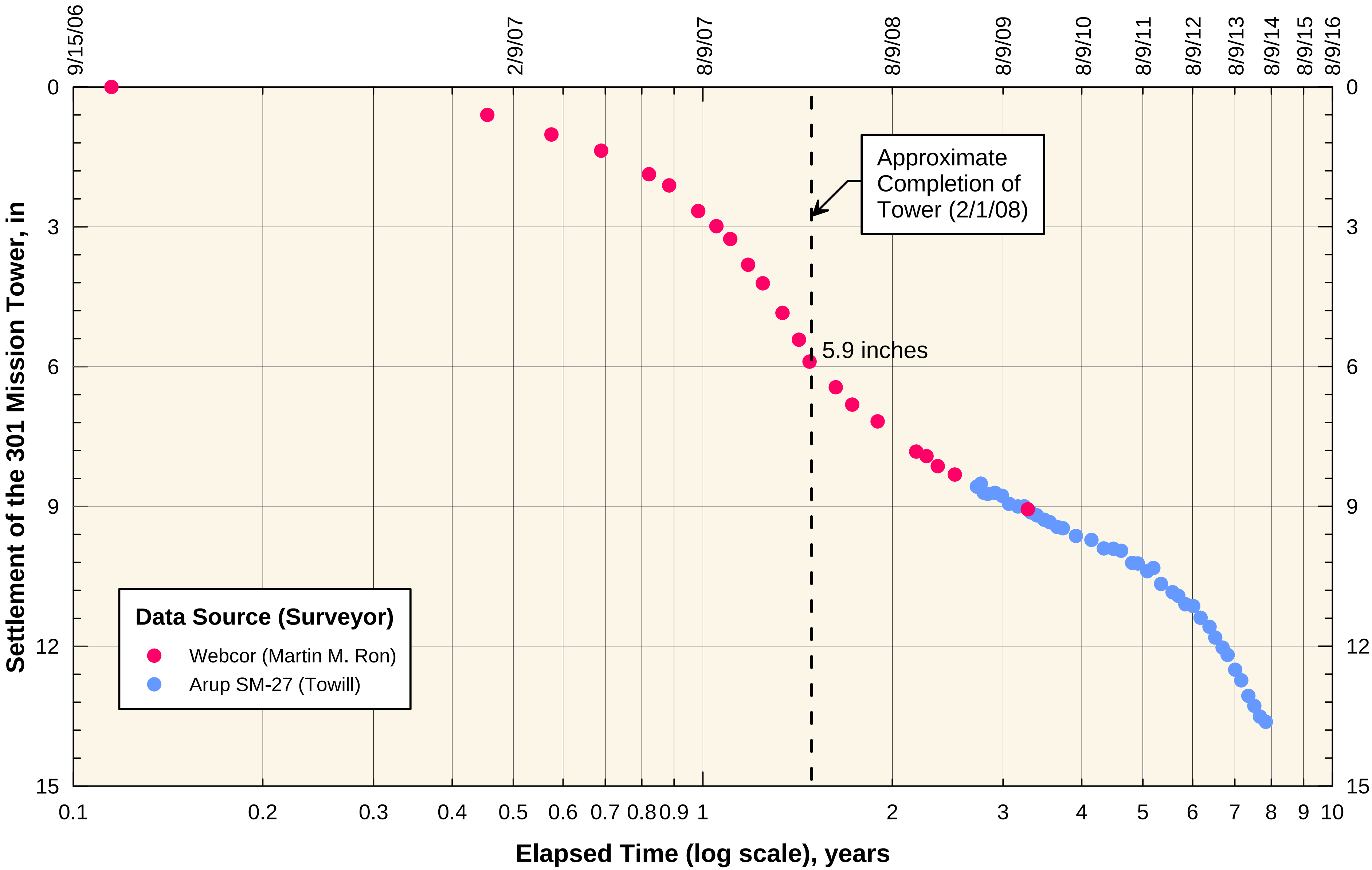
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2014

ARUP

PLATE 5

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\238 301 Mission - June 2014 Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER
INCLUDING MONITORING DURING CONSTRUCTION

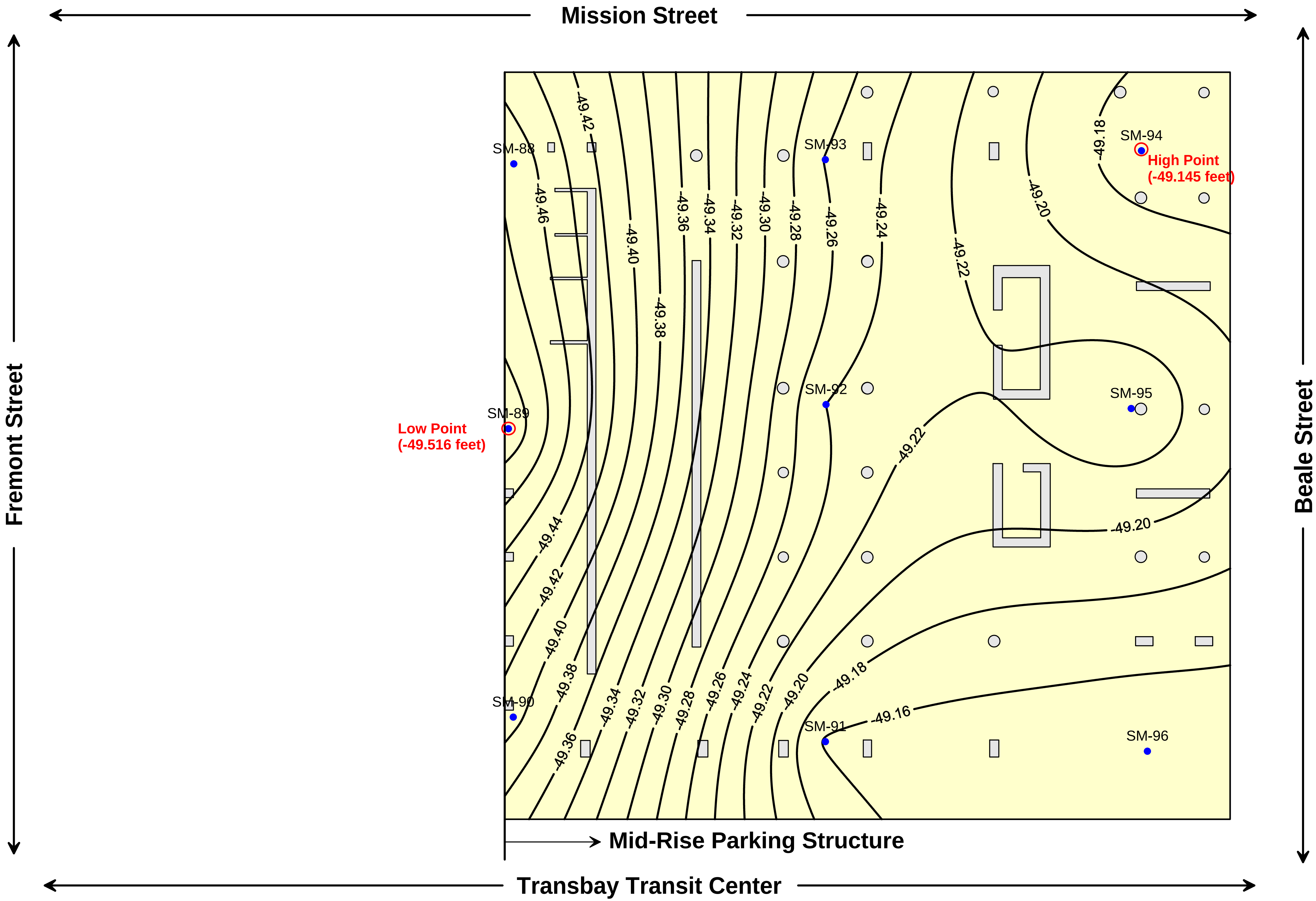
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2014

ARUP

PLATE 6

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\238 301 Mission - June 2014 Survey\Plates\Plate 6 Tower Settlements.grf



Date of Survey Reading:
June 11, 2014

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.371 feet (4.457 inches)

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on June 11, 2014.

0 25 50 75

Approximate Scale: 1" = 25'

FLOOR ELEVATION AT BASEMENT LEVEL B-5 OF 301 MISSION PROPERTY: JUNE 11, 2014 SURVEY

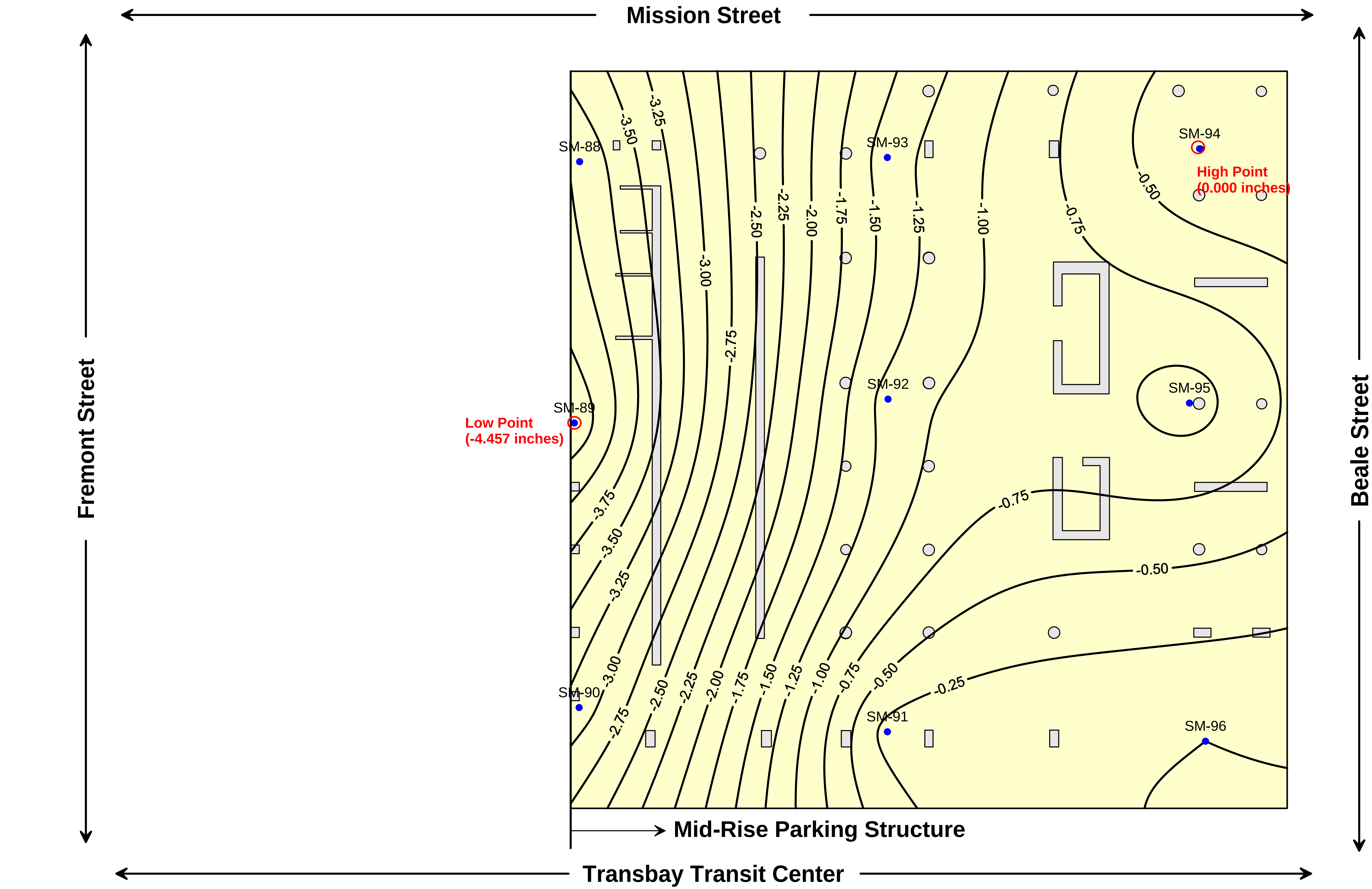
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2014

ARUP

PLATE 7

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\238 301 Mission - June 2014 Survey\Plates\B-5 Elevations (2014.06.11).srf



Date of Survey Reading:
June 11, 2014

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.371 feet (4.457 inches)

N

0 25 50 75

Approximate Scale: 1" = 25'

Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on June 11, 2014.

DIFFERENTIAL FLOOR ELEVATIONS (INCHES) AT BASEMENT LEVEL B-5: JUNE 11, 2014 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2014

ARUP

PLATE 8

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\238 301 Mission - June 2014 Survey\Plates\B-5 Differential Elevations (2014.06.11).srf

Memorandum

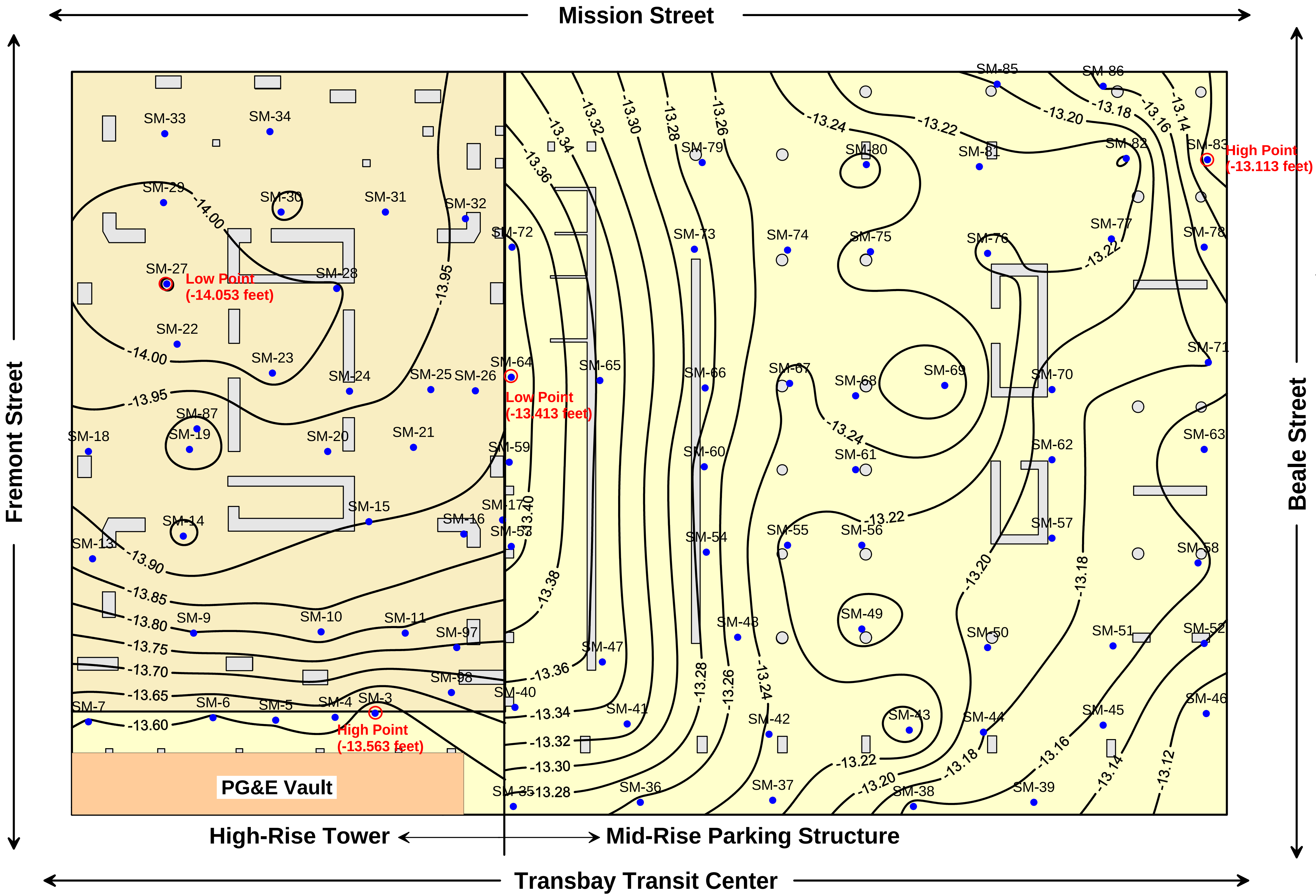
ARUP

To	Brian Dykes (TJPA)	**Date**	September 4, 2014
Copies	Randy Volenec (PCPA) George Metzger (AAI)	**Reference number**	132242
From	Stephen McLandrich (Arup)	**File reference**	4-05 240
Subject	Transbay Transit Center: Results of August 2014 Settlement Survey at 301 Mission Property	**Page** 1 **of** 1	

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated June 27, 2014 with measurements made through August 2014.

List of Plates

Plate 1 Floor Elevations at Level B-1 of 301 Mission Property: Periodic Survey – August 5, 2014
Plate 2 Differential Floor Elevation (Inches) August 5, 2014 Survey
Plate 3 Contours of Settlements Measured at the 1st Level Basement of the 301 Mission St. Structure Between 04/30/2009 & 8/5/2014
Plate 4 Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Tower: April 30, 2009 through August 5, 2014
Plate 5 Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Mid-Rise: April 30, 2009 through August 5, 2014
Plate 6 Settlements of the 301 Mission Tower Including Monitoring During Construction
Plate 7 Floor Elevation at Basement Level B-5 of 301 Mission Property: August 5, 2014 Survey
Plate 8 Differential Floor Elevations (Inches) at Basement Level B-5: August 5, 2014 Survey



Date of Survey Reading:
August 5, 2014

Legend:

SM-83 Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	**Mid-Rise Parking**
0.489 feet (5.869 inches)	**0.307 feet (3.689 inches)**

N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on August 5, 2014.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY: PERIODIC SURVEY - AUGUST 5, 2014

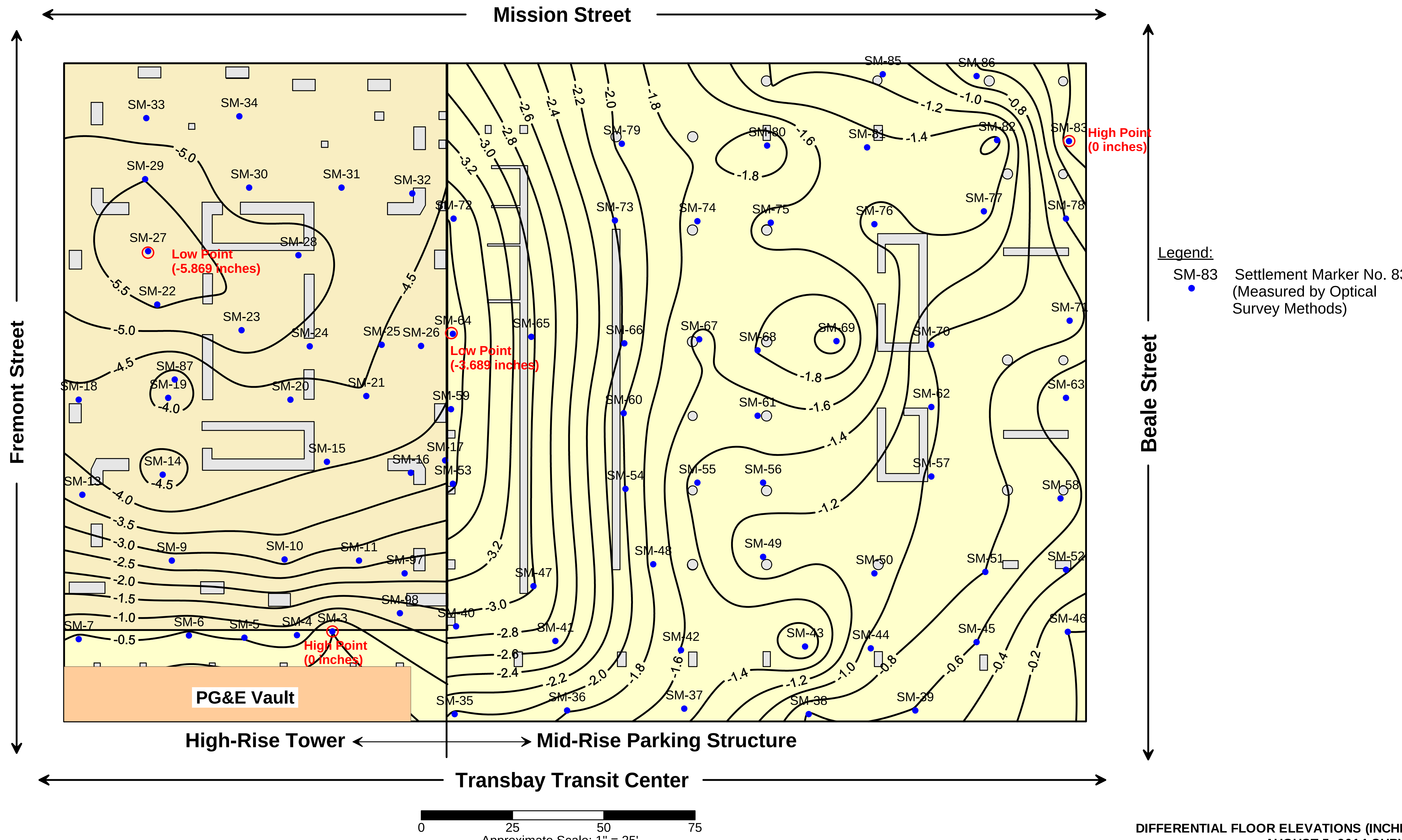
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

September 2014

ARUP

PLATE 1

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\240 301 Mission - August 2014 Survey\Plates\Elevations All (2014.08.05).srf



Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on August 5, 2014.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\240 301 Mission - August 2014 Survey\Plates\Differential Elevation All (2014.08.05).srf

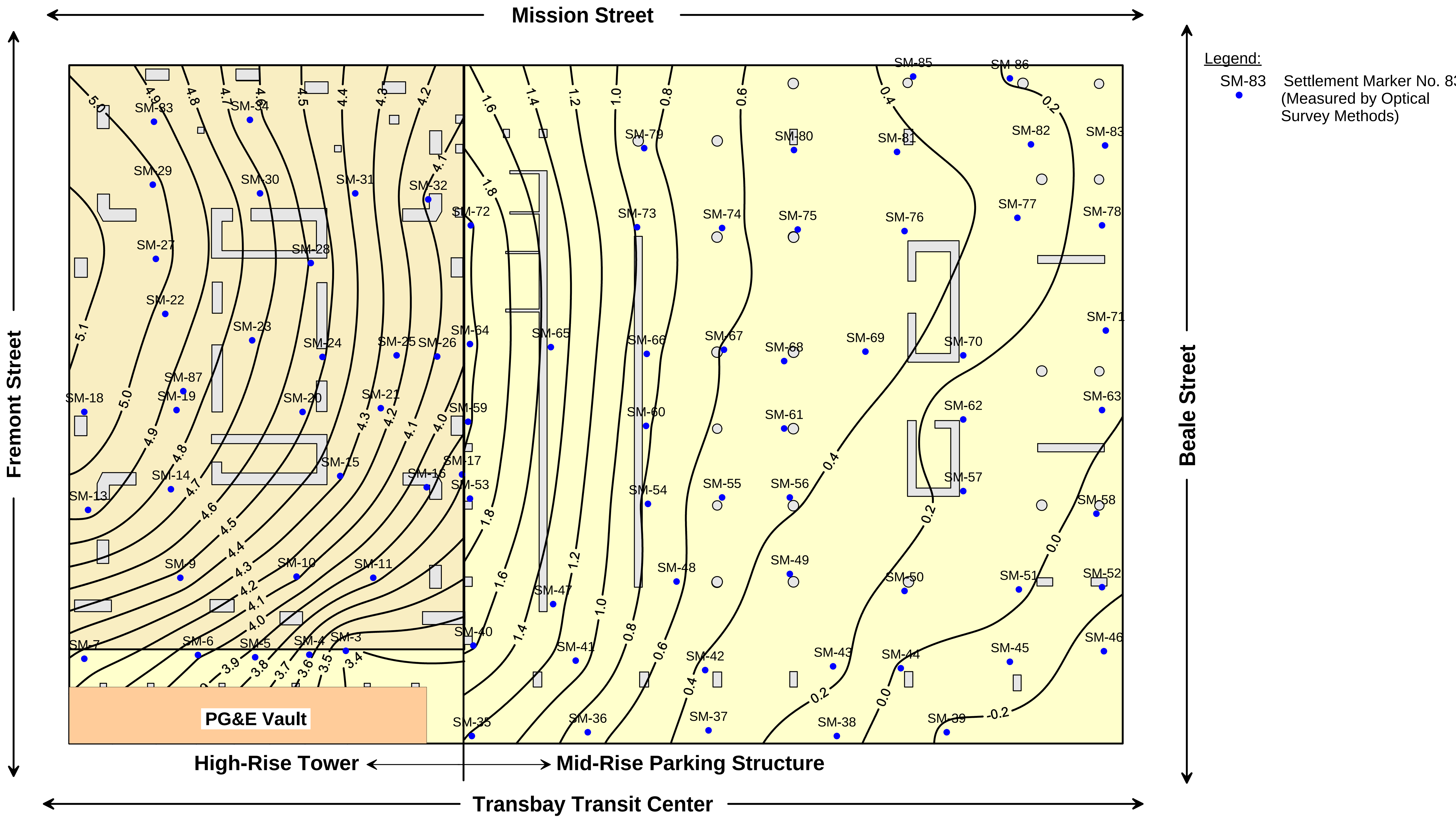
DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
AUGUST 5, 2014 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

September 2014

ARUP

PLATE 2



N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on August 5, 2014.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

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Negative values of settlement (within Low-rise Tower) indicate uplift.

CONTOURS OF SETTLEMENTS MEASURED AT THE 1ST LEVEL BASEMENT OF THE 301 MISSION ST STRUCTURE BETWEEN 04/30/2009 & 8/5/2014

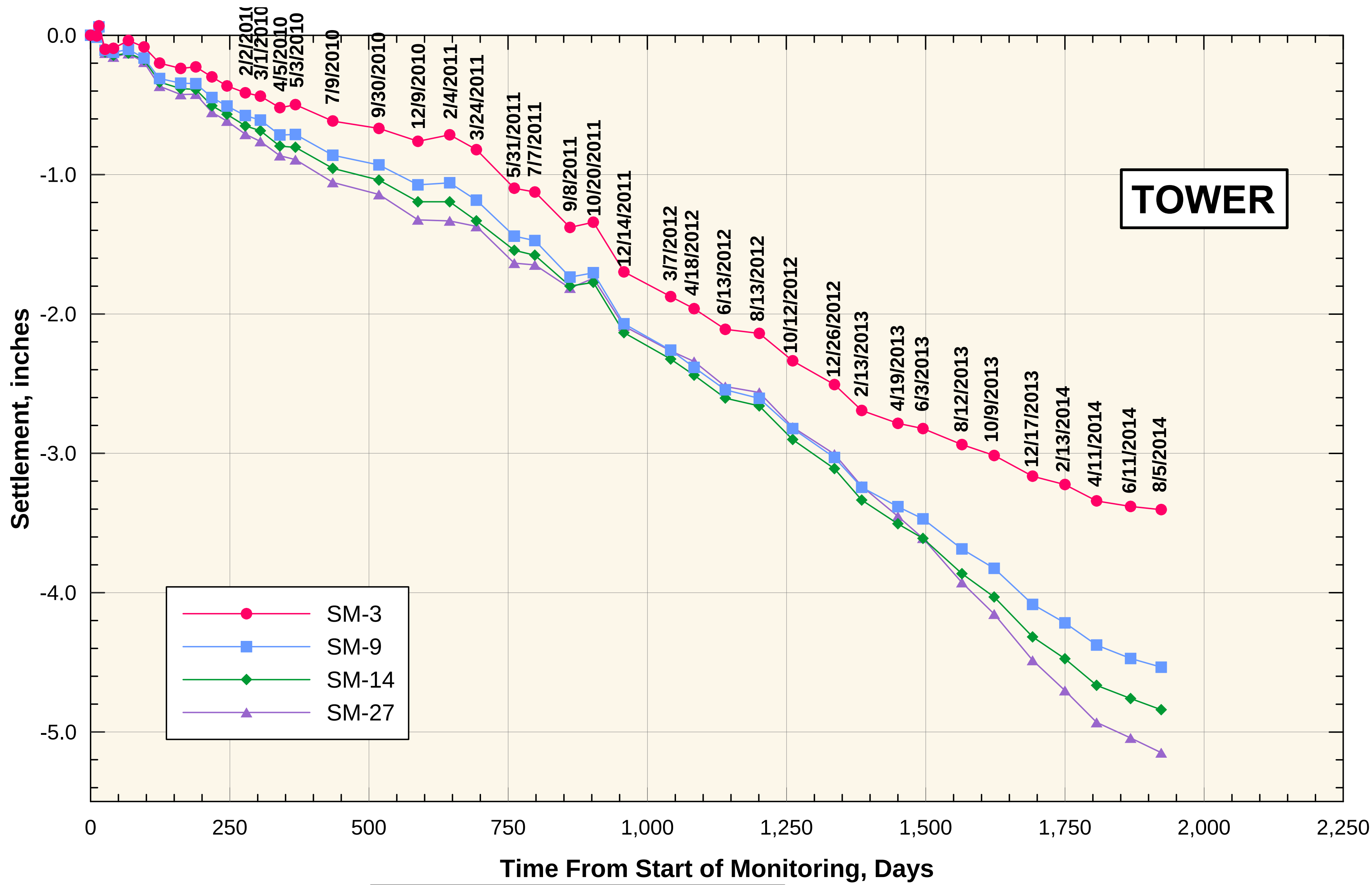
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

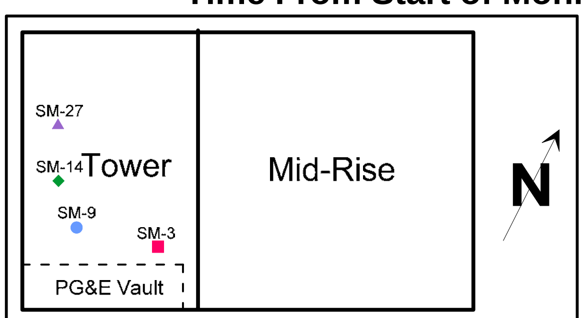
September 2014

ARUP

PLATE 3

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\240 301 Mission - August 2014 Survey\Plates\Elevation changes All (2014.08.05).srf





SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH AUGUST 5, 2014

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

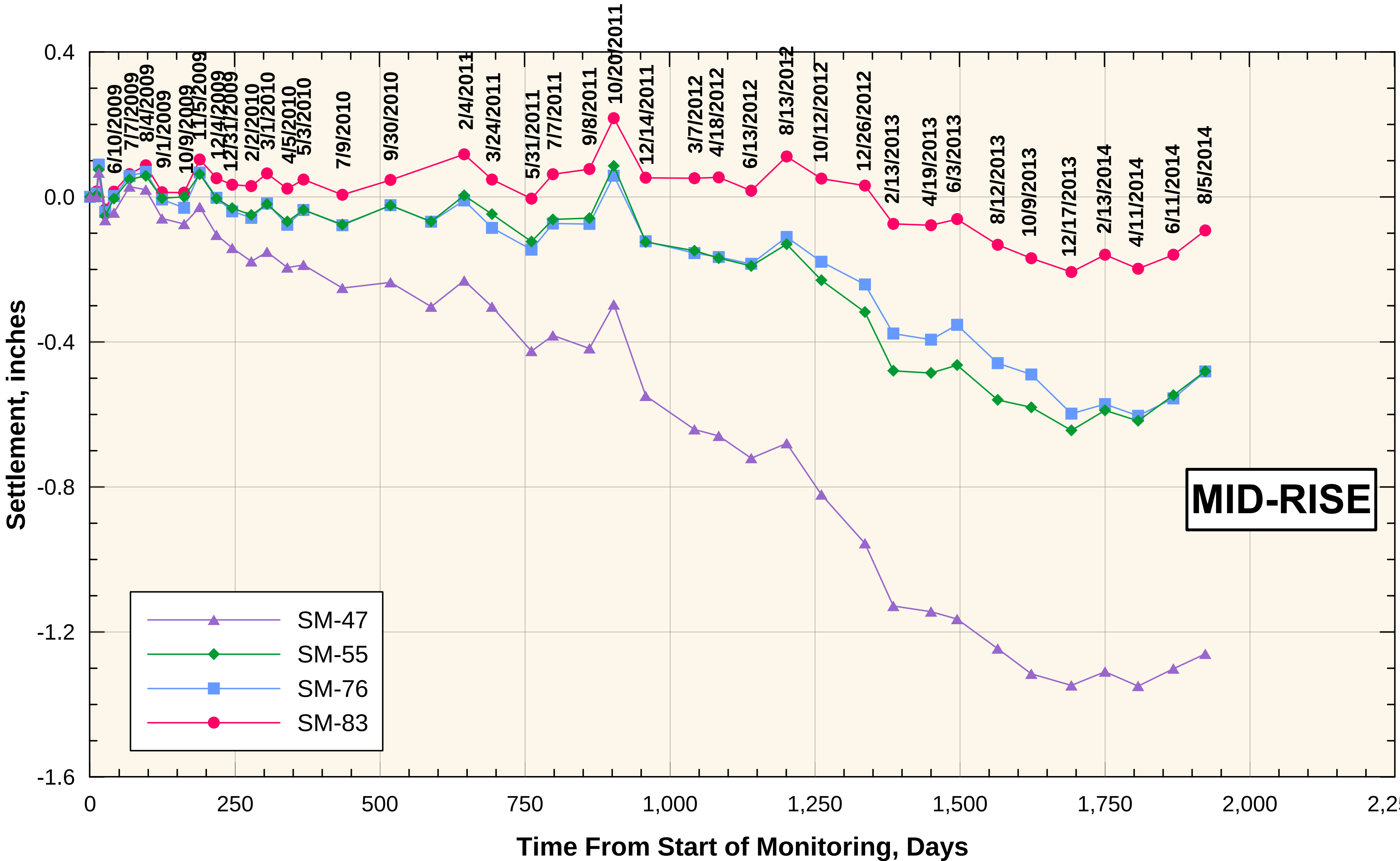
September 2014

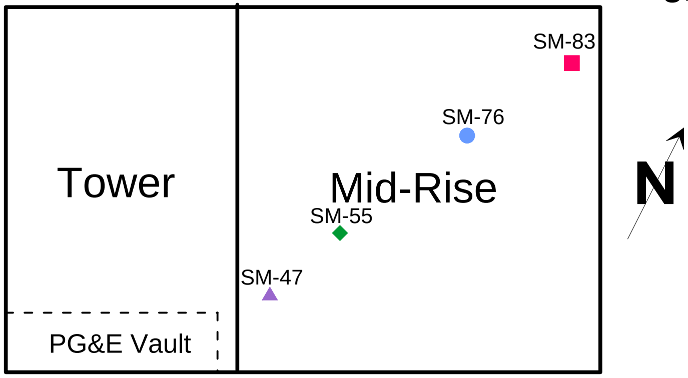
ARUP

PLATE 4

Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\240 301 Mission - August 2014 Survey\Plates\Plate 4 Settlement Over Time - Tower.grf





Note:
Initial (Baseline) reading taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\240 301 Mission - August 2014 Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf

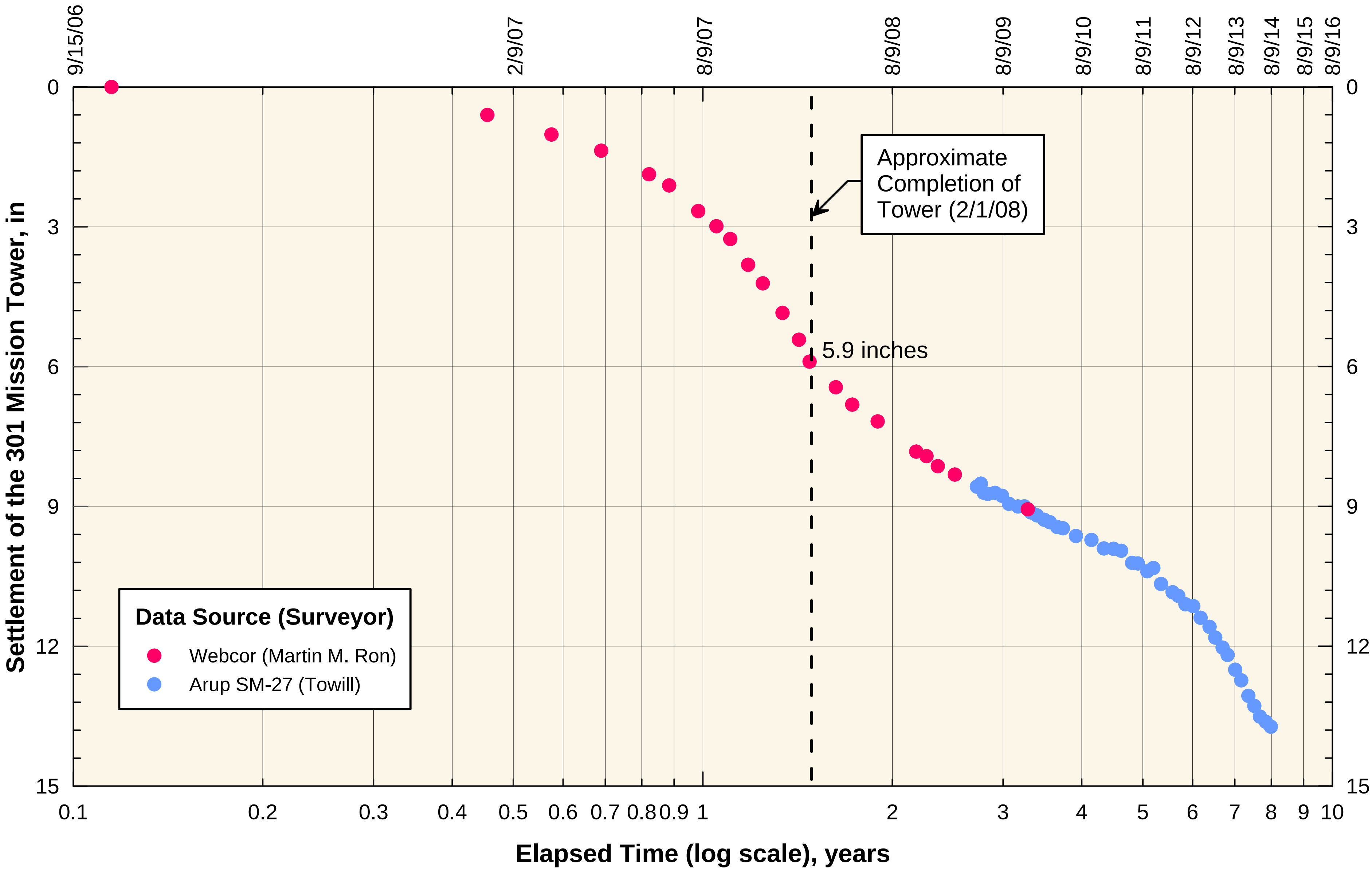
SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH AUGUST 5, 2014

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

September 2014

ARUP

PLATE 5



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

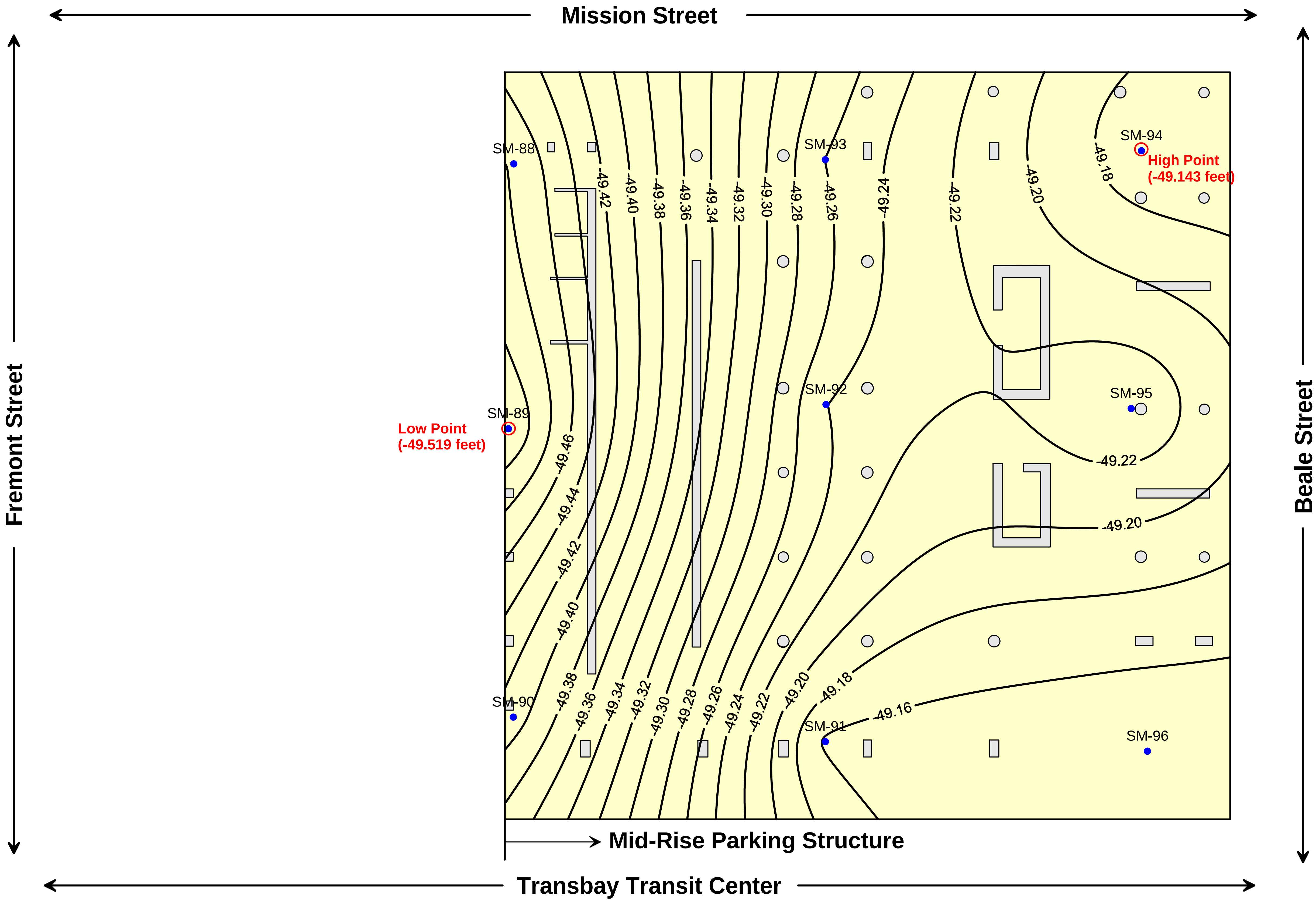
SETTLEMENTS OF THE 301 MISSION TOWER
INCLUDING MONITORING DURING CONSTRUCTION

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
September 2014 San Francisco, California

ARUP

PLATE 6

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\240 301 Mission - August 2014 Survey\Plates\Plate 6 Tower Settlements.grf



Date of Survey Reading:
June 11, 2014

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.376 feet (4.513 inches)

N

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on June 11, 2014.

0 25 50 75
Approximate Scale: 1" = 25'

FLOOR ELEVATION AT BASEMENT LEVEL B-5
OF 301 MISSION PROPERTY: AUGUST 5, 2014 SURVEY

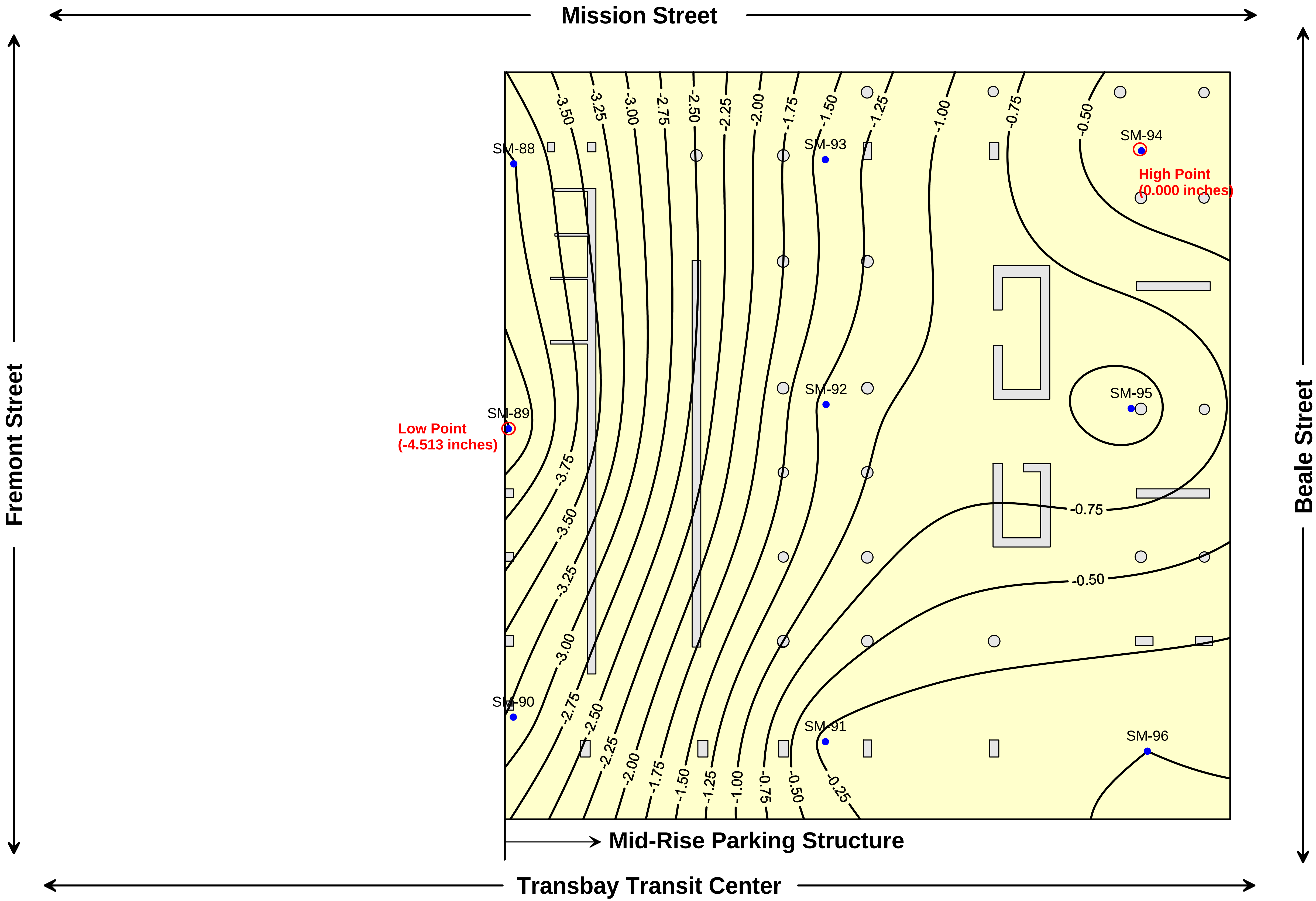
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

September 2014

ARUP

PLATE 7

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\240 301 Mission - August 2014 Survey\Plates\B-5 Elevations (2014.08.05).srf



Date of Survey Reading:
August 5, 2014

Legend:

SM-88 Settlement Marker No. 88 (Measured by Optical Survey Methods)

Maximum Differential
B-5 Level Basement
0.376 feet (4.513 inches)

N

Notes:

Contours represent differential elevation, in inches, between the highest point and all other points taken on August 5, 2014.

0 25 50 75

Approximate Scale: 1" = 25'

DIFFERENTIAL FLOOR ELEVATIONS (INCHES) AT BASEMENT LEVEL B-5: AUGUST 5, 2014 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

September 2014

ARUP

PLATE 8

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\240 301 Mission - August 2014 Survey\Plates\B-5 Differential Elevations (2014.08.05).srf

Memorandum

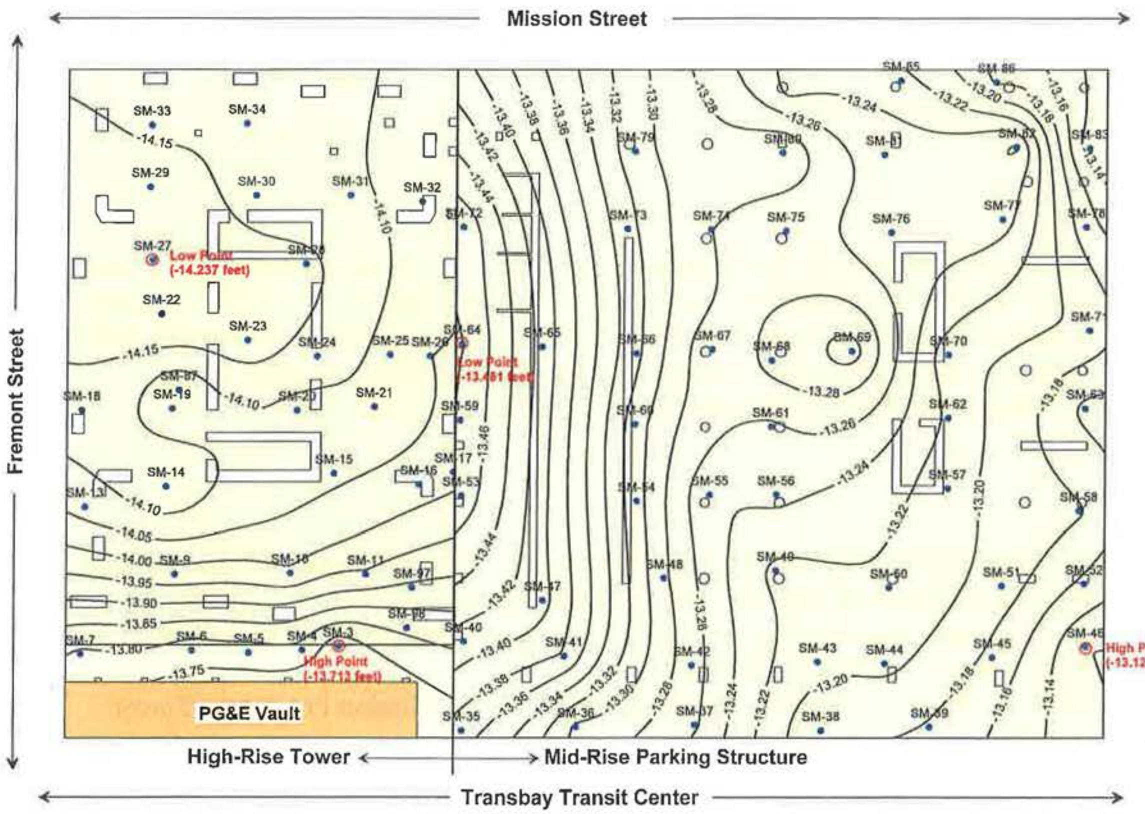
ARUP

To	Brian Dykes (TJPA)	**Date** June 16, 2016
Copies		**Reference number** 132242
From	Andrew Yeskoo (Arup)	**File reference** 4-05 260
Subject	Transbay Transit Center: Results of June 2016 Settlement Survey at 301 Mission Property	**Page 1 of 1**

Under Arup's Geotechnical Contract with the Transbay Joint Powers Authority through Pelli Clark Pelli Architects, Arup is required to monitor the settlements of the buildings adjacent to the Transbay Transit Center prior to and during construction. We began the monitoring program for the 301 Mission property in April of 2009. This memorandum and the attached plates present an update to our memorandum dated February 19, 2016 with measurements made through June 2016.

List of Plates

Plate 1	Floor Elevations at Level B-1 of 301 Mission Property: Periodic Survey – June 10, 2016
Plate 2	Differential Floor Elevation (Inches) June 10, 2016 Survey
Plate 3	Contours of Settlements Measured at the 1st Level Basement of the 301 Mission St. Structure Between 4/30/2009 & 6/10/2016
Plate 4	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Tower: April 30, 2009 through June 10, 2016
Plate 5	Settlement Over Time Floor Elevations at Level B-1 of 301 Mission Property – Mid-Rise: April 30, 2009 through June 10, 2016
Plate 6	Settlements of the 301 Mission Tower Including Monitoring During Construction
Plate 7	Floor Elevation at Basement Level B-5 of 301 Mission Property: June 10, 2016 Survey
Plate 8	Differential Floor Elevations (Inches) at Basement Level B-5: June 10, 2016 Survey



Date of Survey Reading: June 10, 2016

Legend:

SM-83 • Settlement Marker No. 83 (Measured by Optical Survey Methods)

Maximum Differential	
High-Rise Tower	Mid-Rise Parking
0.524 feet (6.283 inches)	0.361 feet (4.326 inches)

Notes:

Contours represent elevation, in feet (CCSF Datum), from survey readings taken on June 10, 2016.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

0 25 50 75

Approximate Scale: 1" = 25'

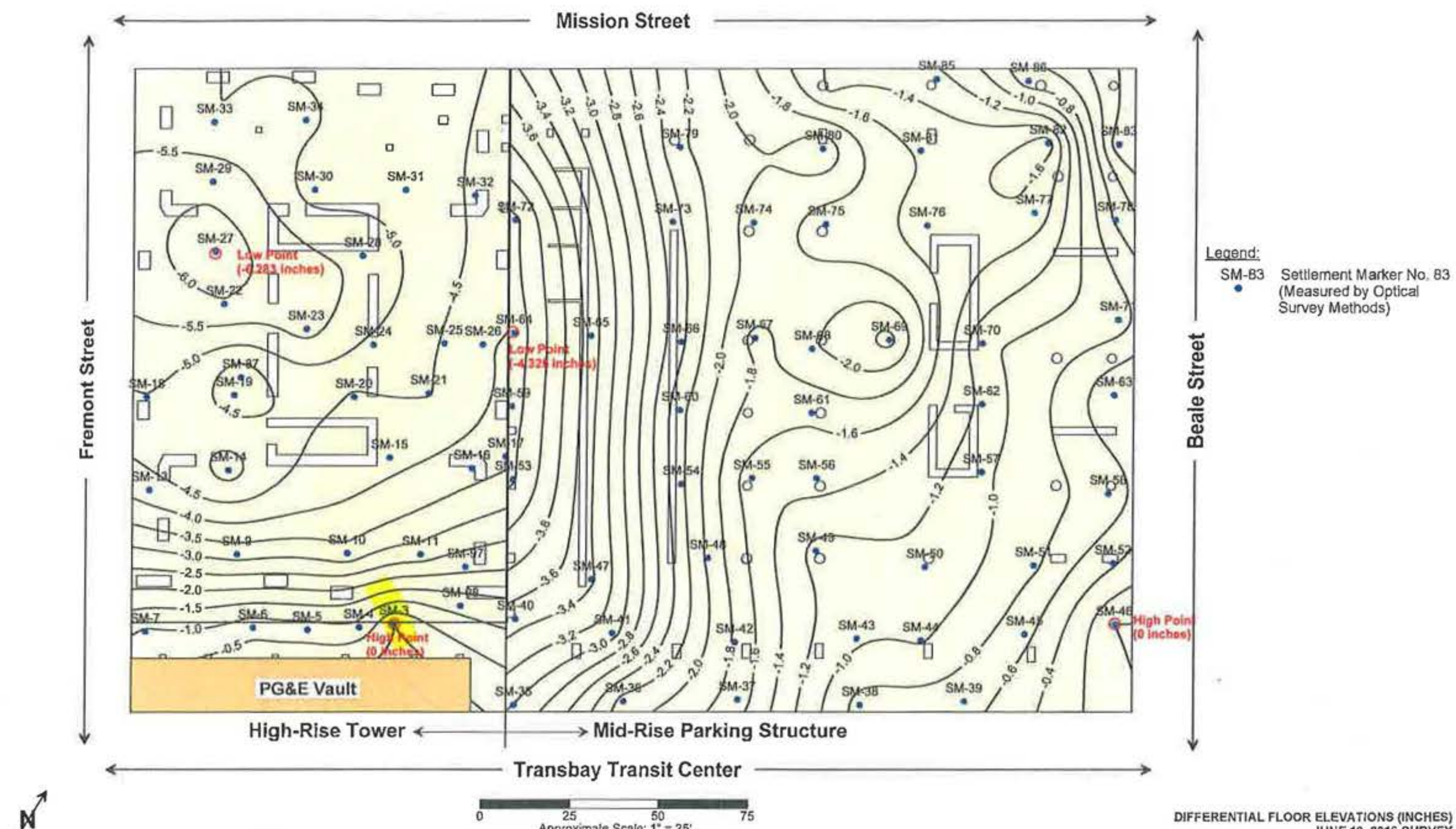
FLOOR ELEVATIONS AT LEVEL B-1 OF 301 MISSION PROPERTY: PERIODIC SURVEY - JUNE 10, 2016

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2016

ARUP

PLATE 1



Notes:

Contours represent differential elevation, in inches, betwen the highest point and all other points taken on June 10, 2016.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Contour invervals are different between the High-Rise Tower and the Low-Rise Tower.

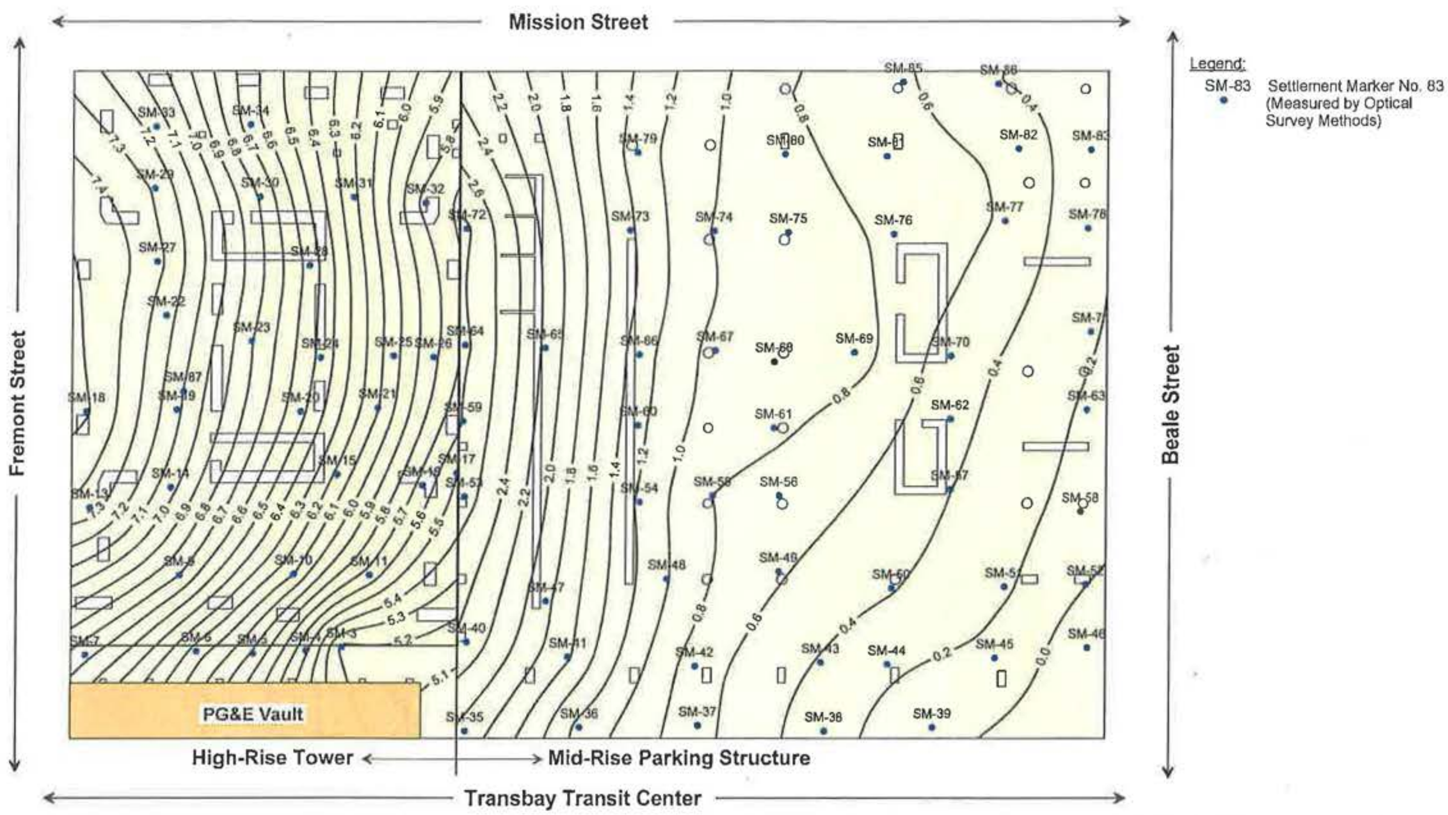
DIFFERENTIAL FLOOR ELEVATIONS (INCHES)
JUNE 10, 2016 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2016

ARUP

PLATE 2



N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:

Contours represent elevation change, in inches, between Baseline survey (April 30, 2009) and readings taken on June 10, 2016.

Level B-1 at Mid-Rise Parking portion of survey site is approximately 4 inches higher than Level B-1 at High-Rise Tower portion.

The PG&E vault is inaccessible for monitoring.

Negative values of settlement (within Low-rise Tower) indicate uplift.

J:\S-F\132000\132424\4 Internal Project Data\4-05 Reports & Narratives\260 301 Mission - June 2016 Survey\Plates\Plate 3 Elevation changes All.vf

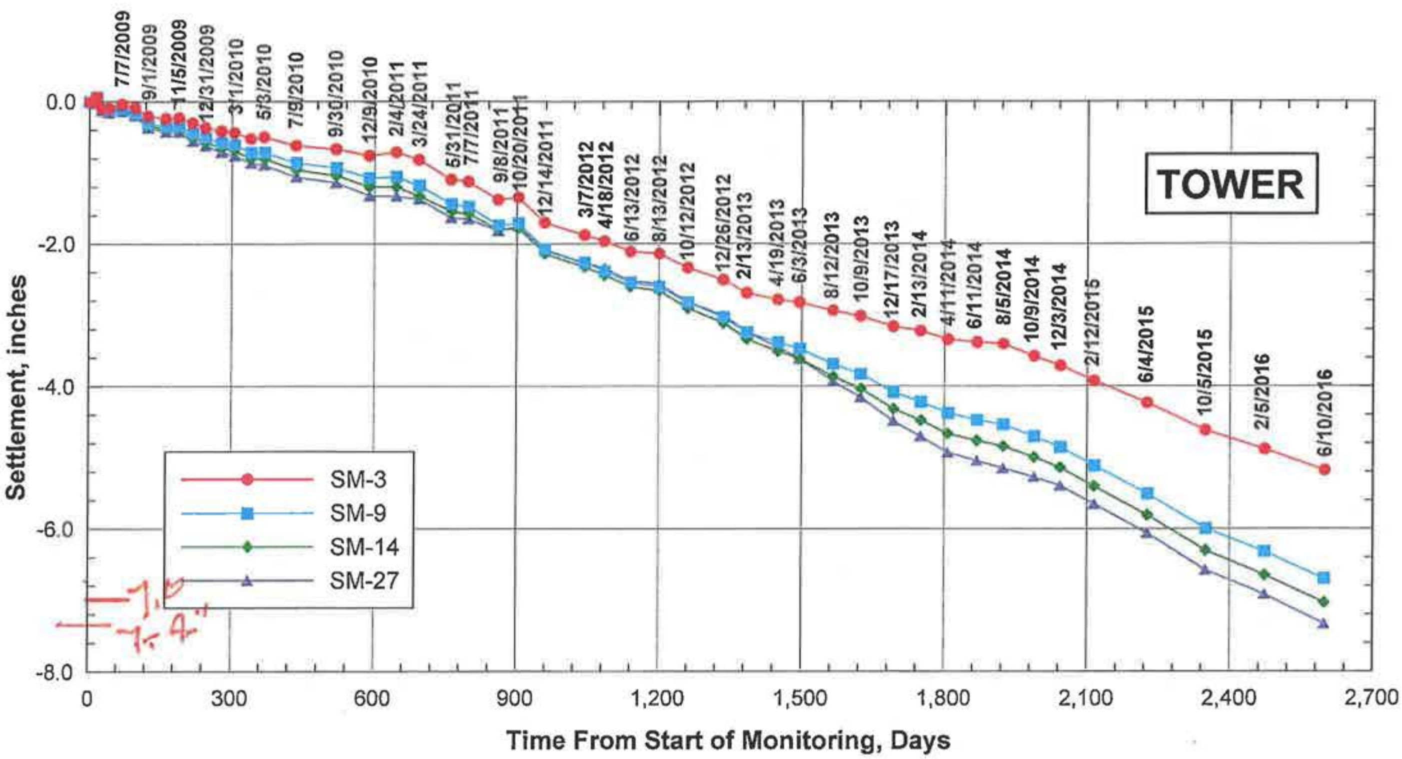
CONTOURS OF SETTLEMENTS MEASURED AT THE 1ST LEVEL BASEMENT OF THE 301 MISSION ST STRUCTURE BETWEEN 4/30/2009 & 6/10/2016

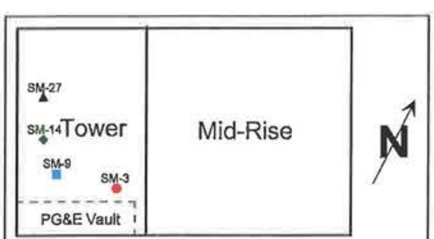
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2016

ARUP

PLATE 3





Note:
Initial (Baseline) reading
taken on 04/30/09

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\260 301 Mission - June 2016 Survey\Plates\Plate 4 Settlement Over Time - Tower.grf

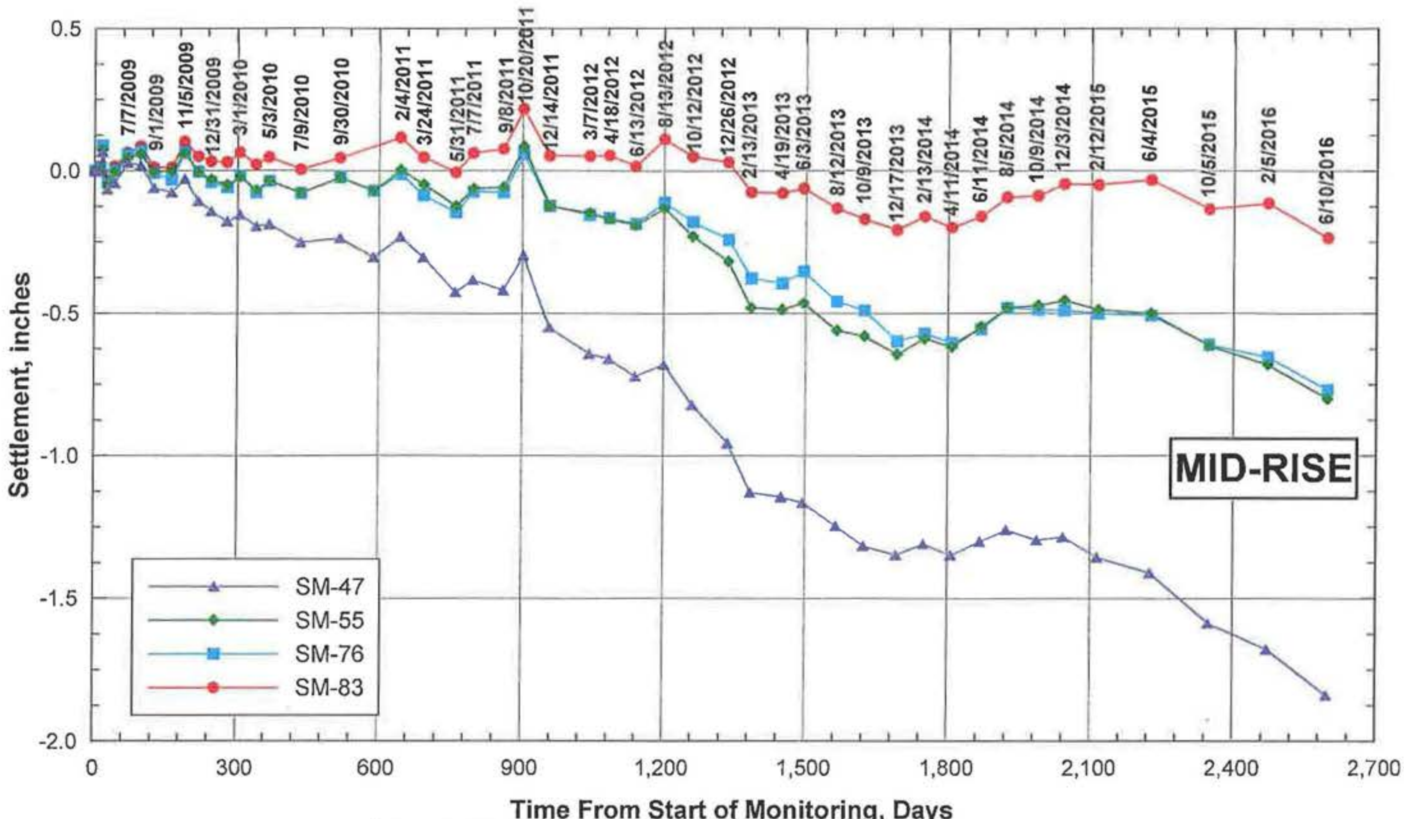
SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- TOWER:
APRIL 30, 2009 THROUGH JUNE 10, 2016

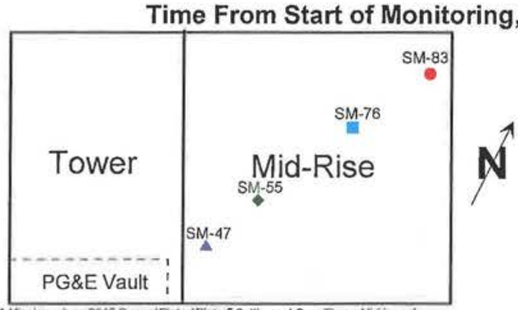
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2016

ARUP

PLATE 4





Note:
Initial (Baseline) reading taken on 04/30/09

SETTLEMENT OVER TIME
FLOOR ELEVATIONS AT LEVEL B-1
OF 301 MISSION PROPERTY- MID-RISE:
APRIL 30, 2009 THROUGH JUNE 10, 2016

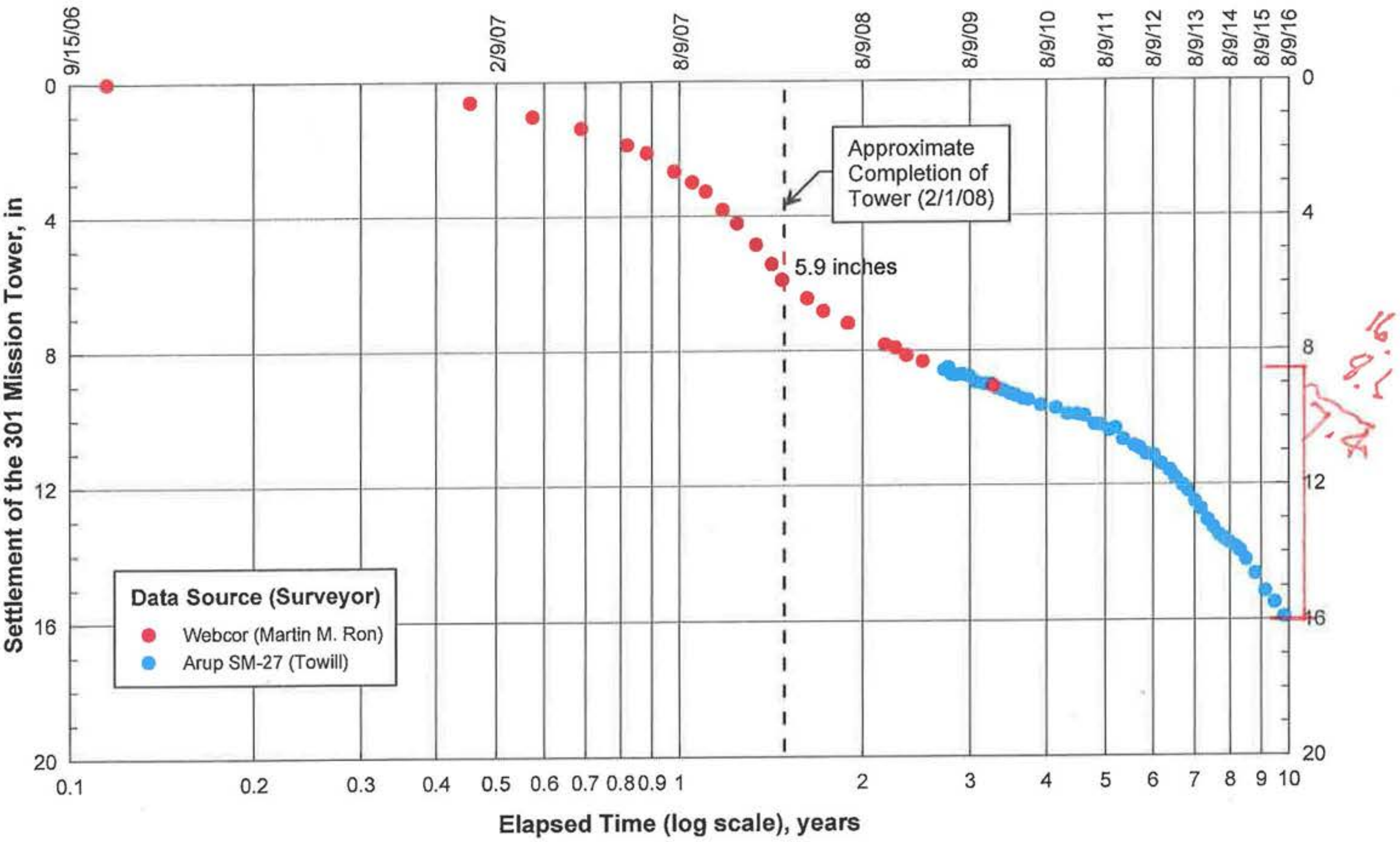
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2016

ARUP

PLATE 5

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\260 301 Mission - June 2016 Survey\Plates\Plate 5 Settlement Over Time - Midrise.grf



Begining of Tower Construction: 8/9/06
End of Tower Construction: 2/1/08
Construction Duration: 542 days (1.5 years)

SETTLEMENTS OF THE 301 MISSION TOWER INCLUDING MONITORING DURING CONSTRUCTION

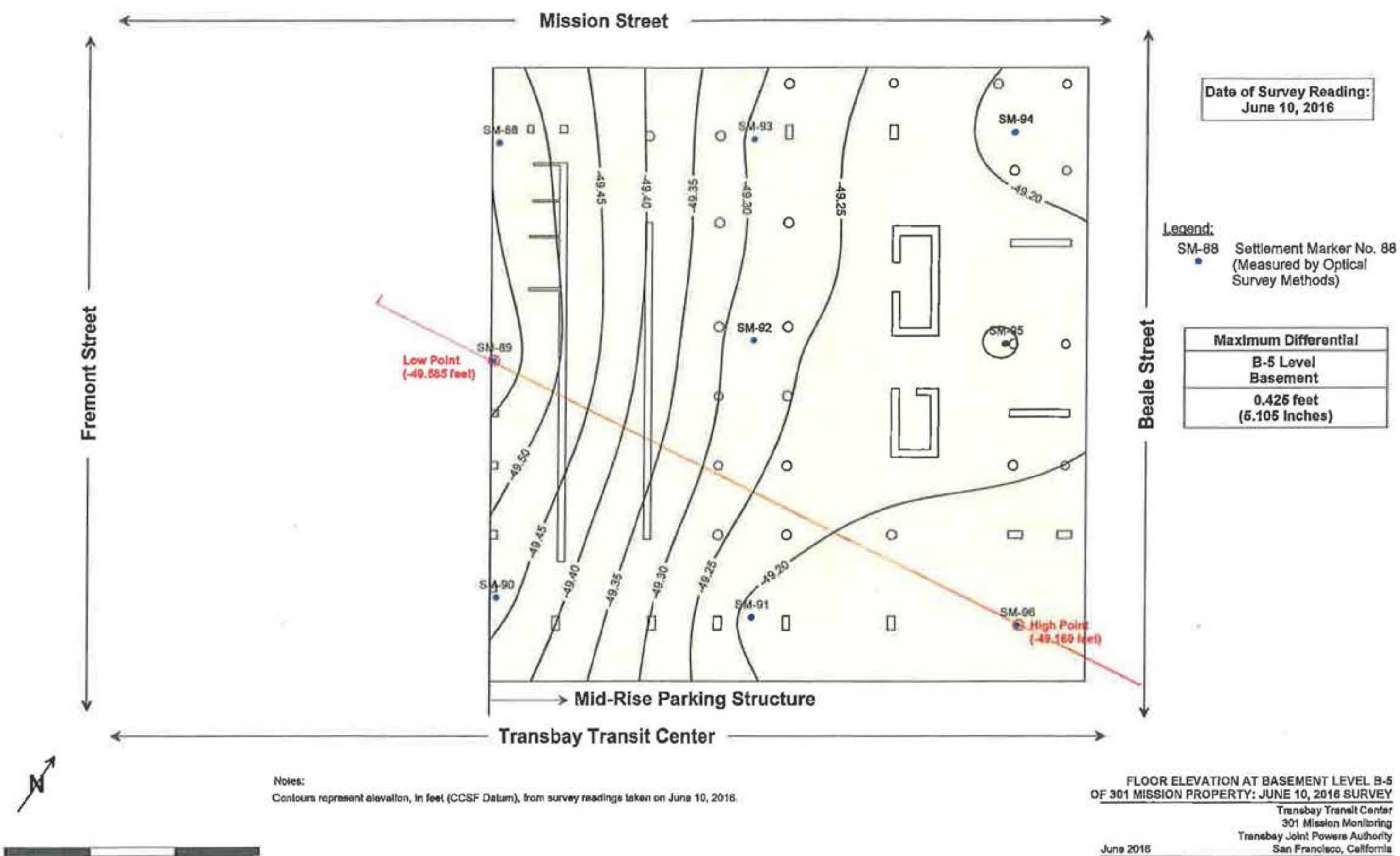
Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2016

ARUP

PLATE 6

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\260 301 Mission - June 2016 Survey\Plates\Plate 6 Tower Settlements.grf



Notes:
Contours represent elevation, in feet (CCSF Datum), from survey readings taken on June 10, 2016.

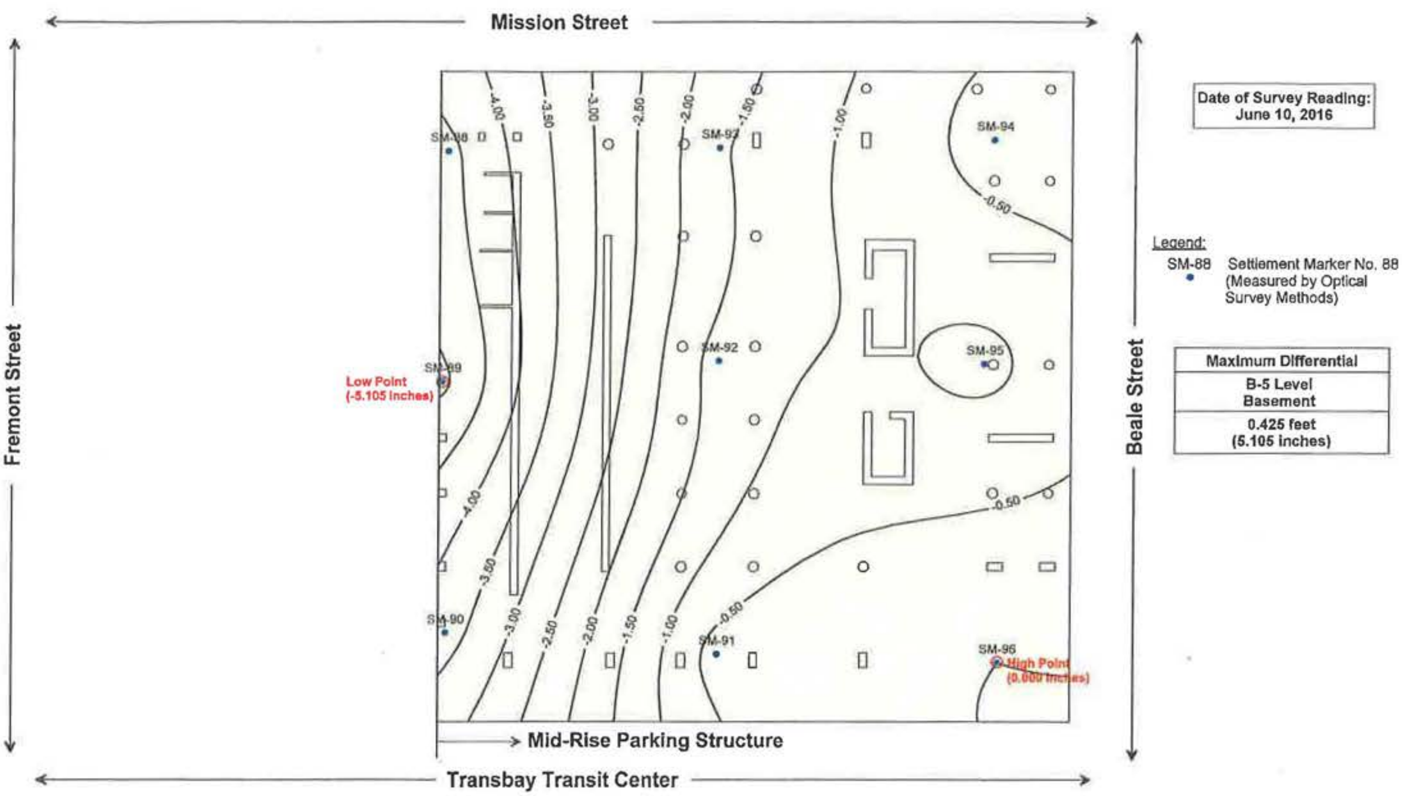
FLOOR ELEVATION AT BASEMENT LEVEL B-5 OF 301 MISSION PROPERTY: JUNE 10, 2016 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2016

ARUP

PLATE 7



N

0 25 50 75
Approximate Scale: 1" = 25'

Notes:
Contours represent differential elevation, in inches, between the highest point and all other points taken on June 10, 2016.

J:\S-F\132000\132242\4 Internal Project Data\4-05 Reports & Narratives\260 301 Mission - June 2016 Survey\Plates\Plate 8 B-5 Differential Elevations.srf

DIFFERENTIAL FLOOR ELEVATIONS (INCHES) AT BASEMENT LEVEL B-5: JUNE 10, 2016 SURVEY

Transbay Transit Center
301 Mission Monitoring
Transbay Joint Powers Authority
San Francisco, California

June 2016

ARUP

PLATE 8

BOARD of SUPERVISORS

City Hall
1 Dr. Carlton B. Goodlett Place, Room 244
San Francisco 94102-4689
Tel. No. 554-5184
Fax No. 554-5163
TDD/TTY No. 554-5227

MEMORANDUM

TO: Tom Hui, Director, Department of Building Inspection

FROM: Erica Major, Assistant Clerk, Government Audit and Oversight Committee, Board of Supervisors

DATE: September 12, 2016

SUBJECT: HEARING MATTER INTRODUCED

The Board of Supervisors' Government Audit and Oversight Committee has received the following hearing request, introduced by Supervisor Peskin on September 6, 2016:

File No. 160975

Hearing on existing building standards in seismic safety zones, including infill and waterfront neighborhoods; and requesting the Department of Building Inspection to report.

If you have any comments or reports to be included with the file, please forward them to me at the Board of Supervisors, City Hall, Room 244, 1 Dr. Carlton B. Goodlett Place, San Francisco, CA 94102.

cc:
William Strawn, Department of Building Inspection
Carolyn Jayin, Department of Building Inspection

Print Form

Introduction Form

By a Member of the Board of Supervisors or the Mayor

RECEIVED
BOARD OF SUPERVISORS
SAN FRANCISCO
2016 SEP -6 PM 3:53
BY

Time stamp
or meeting date

I hereby submit the following item for introduction (select only one):

☐ 1. For reference to Committee. (An Ordinance, Resolution, Motion, or Charter Amendment)

☐ 2. Request for next printed agenda Without Reference to Committee.

☒ 3. Request for hearing on a subject matter at Committee.

☐ 4. Request for letter beginning "Supervisor [ ] inquires"

☐ 5. City Attorney request.

☐ 6. Call File No. [ ] from Committee.

☐ 7. Budget Analyst request (attach written motion).

☐ 8. Substitute Legislation File No. [ ]

☐ 9. Reactivate File No. [ ]

☐ 10. Question(s) submitted for Mayoral Appearance before the BOS on [ ]

Please check the appropriate boxes. The proposed legislation should be forwarded to the following:

☐ Small Business Commission ☐ Youth Commission ☐ Ethics Commission

☐ Planning Commission ☐ Building Inspection Commission

Note: For the Imperative Agenda (a resolution not on the printed agenda), use a Imperative Form.

Sponsor(s):

Aaron Peskin

Subject:

Hearing on Building Standards in Seismic Safety Zones

The text is listed below or attached:

Hearing at the Government Audit and Oversight Committee to receive presentations by the Department of Building Inspections on existing building standards in seismic safety zones, including infill and waterfront neighborhoods.

Signature of Sponsoring Supervisor: [signature]

For Clerk's Use Only: