SLATE
GEOTECHNICAL CONSULTANTS

To: Millennium Tower Association

From: Debra Murphy, PE (CA 77748)
Nathaniel Wagner, PE (CA 88778), GE (CA 3237), PhD
Tamar Baumer

Date: June 17, 2024
Project Number: 23-018-01
Subject: 301 Mission Retrofit Monitoring Report 134: Results as of June 17, 2024

## REPORTABLE CONDITIONS

No reportable conditions occurred in the current time period.

## CONTEXT

This memorandum summarizes results from the monitoring plan implemented at the 301 Mission property. Instrumentation to monitor the structure prior to, during and after the retrofit was installed in January 2021, including piezometers and extensometers. Settlement markers installed in April 2009 and January 2017, survey prisms mounted on the exterior of the structure in December 2016, and crack gauges installed in April 2009 have also been monitored. Pile load cells were installed on the Mission Street piles in January 2023, and on the Fremont Street piles in June 2023. Survey points were established on the manhole covers around the Tower and a baseline reading was performed on August 8, 2023. This memorandum is for review only. It only contains ongoing monitoring information. This memorandum does not contain recommendations based upon the ongoing monitoring information.

## PRESENTATION OF DATA

Table 01 presents the Reportable Conditions as described in the "301 Mission Perimeter Pile Upgrade Post-Construction Monitoring" document developed by Simpson Gumpertz & Heger (dated September 6, 2023). Reportable Conditions that have not occurred since the last monitoring report are denoted with a "No" response and those that have occurred since the last monitoring report are denoted with a "Yes" response.

Figure 01 presents the instrument locations as referenced in later figures.

Figure 02 presents the historical settlement data interpreted from settlement markers installed on the B-1 Level of 301 Mission Tower. In addition, data from surveys performed during the retrofit are included. Figure 03 presents settlement data since the start of production pile installation (May 12, 2021; baseline readings on May 10, 2021) through June 10, 2024. Figure 04 presents current settlement contours (in inches) on April 29, 2024.

Figure 05 presents historical lateral roof deflections in the project north-south and project east-west directions interpreted from survey prisms mounted on the exterior of the Tower, from InSAR data, and from a planar fit of the settlement marker data. In addition, data from surveys performed during the retrofit are included. Figure 06A presents lateral roof deflection data from a planar fit of the settlement marker data and from survey prisms mounted on the exterior of the Tower since the start of production pile installation (May 12, 2021; baseline readings on May 10 and 13, 2021, respectively) through June 10, 2024.

Figure 07 presents the historical groundwater elevation interpreted from piezometer readings at locations near 301 Mission. In addition, data from piezometers installed to monitor groundwater elevation during the retrofit are included. Figures 08 and 09 present groundwater elevation interpreted from piezometer readings

in the Marine/Colma Sand and the Old Bay Clay, respectively, for the time period prior to the start of production pile installation (January 1, 2021) through June 17, 2024.

Figure 10 presents extensometer data from within the Tower basement since the start of production pile installation (May 12, 2021) through June 17, 2024. Figure 11 presents extensometer data from Fremont Street since the start of production pile installation (May 12, 2021) through May 16, 2023, and from the restart after fixing the extensometer (May 30, 2023) through June 7, 2024. Figure 12 presents extensometer data from Mission Street since the start of production pile installation (May 12, 2021) through June 17, 2024.

Figure 13A presents pile load cell data since the start of the First Stage Load Transfer (January 23, 2023) through June 7, 2024. Figure 13B presents the total pile load cell data since July 15, 2023, through June 7, 2024.

Figure 14 presents settlement data interpreted from survey points located on manholes around the Tower since August 8, 2023, through June 10, 2024.

**CLOSING**

Please contact us if you have any comments or questions, or if you would like to discuss the results presented in this memorandum.

**DATES**

| | |
|---|---|
| 2021/05/12: | Construction Start |
| 2023/01/23: | First Stage Load Transfer Start |
| 2023/01/27: | First Stage Load Transfer End |
| 2023/06/10: | Second Stage Load Transfer Start |
| 2023/06/14: | Second Stage Load Transfer End |
| 2023/06/15: | Third Stage Load Transfer Start |
| 2023/06/19: | Third Stage Load Transfer End |
| 2023/08/03: | Substantial Construction Completion |

## TABLES



## FIGURES

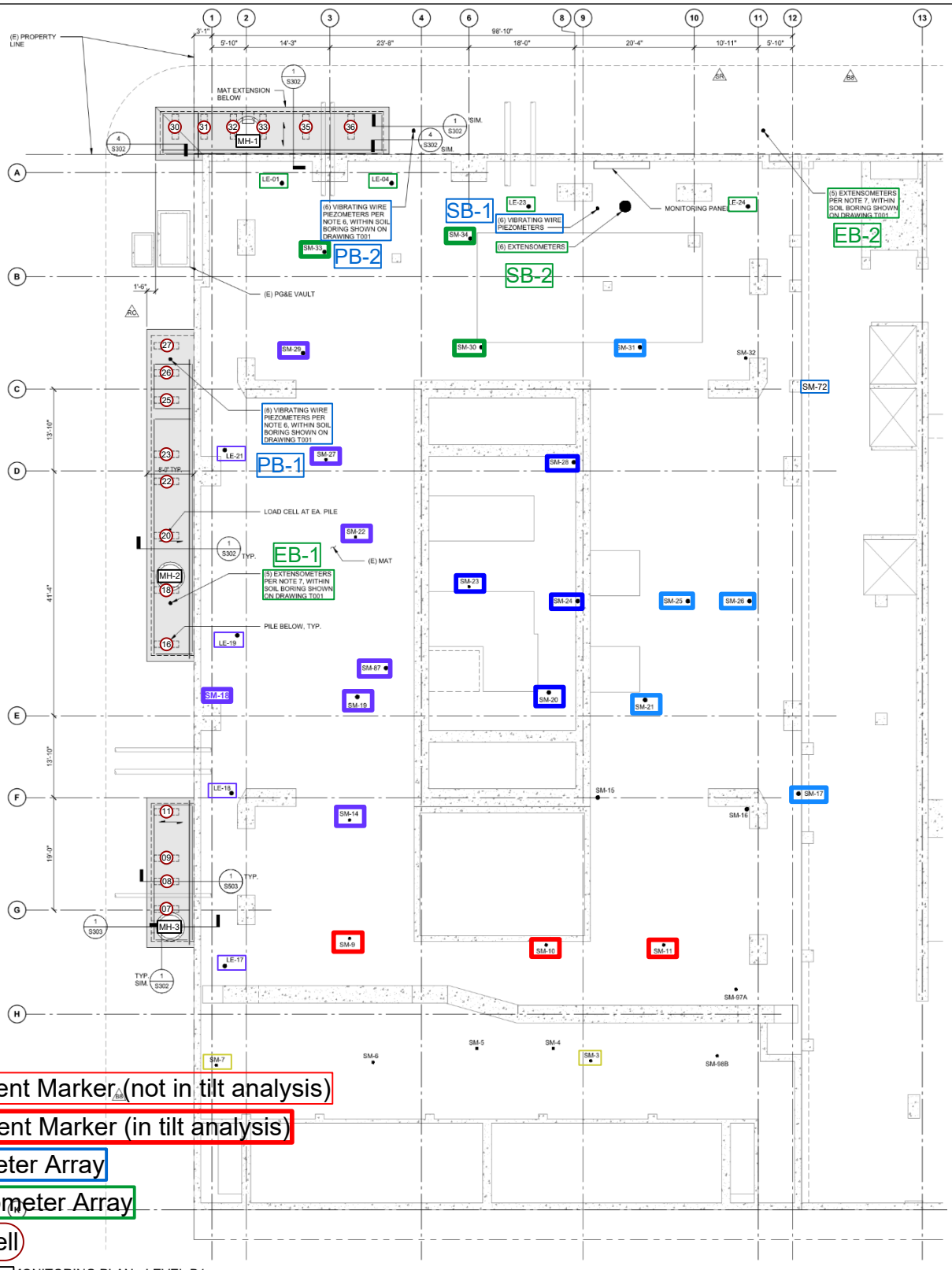


## ATTACHMENTS

**Table 01 – Reportable Conditions Checklist**
*from SGH (dated September 6, 2023)*

| Reportable Condition | Occurrence |
|---|---|
| Occurrence of an earthquake producing peak ground acceleration exceeding 0.25g; 5% damped spectral response acceleration at a period of 4 seconds exceeding 0.04g; or 5% damped spectral response acceleration at a period of 5 seconds exceeding 0.035g[1] | No |
| Occurrence of a windstorm producing estimated sustained gusts with velocity more than 93 miles per hour at a height of 30 feet above ground at the 301 Mission site[2] | No |
| A sustained decrease (i.e., more than 3 months) of piezometric head exceeding 25 feet below ground surface in soils at the building site | No |
| A reduction in sustained pile load (i.e., more than 2 weeks) on any pile below 750 kips[3] | No |
| A reduction in the sustained total load (i.e., more than 2 weeks) in all piles below 16,200 kips | No |
| An indicated sustained load (i.e., more than 2 weeks) in any pile that exceeds 1,300 kips[4] | No |
| Average building settlement, as measured by the planar average of settlement markers on the existing mat, exceeds 0.25 inches in a year[5] | No |
| Sustained horizontal displacement (i.e., more than 3 months) of the roof to the west that exceeds 29 inches, or to the north that exceeds 12 inches[6] | No |
| Sustained horizontal displacement (i.e., more than 3 months) of the roof to the west that is less than 14 inches, or the north that is less than 6 inches[6] | No |
| Growth in the width across or horizontal movement along any crack, as measured at the crack gauges relative to the value as of 8/7/2023, that exceeds 1 mm | No |
| Any instrument malfunction or inability to collect and report data for (1) more than one bi-weekly report (through 2/5/2024), and (2) any scheduled report thereafter. | No |

[1] These acceleration parameters are approximately 50% of the parameters for the site-specific design earthquake ground motions used as a basis for design of the PPU. Actual values produced by an earthquake shall be based on spectra derived from instrument CSMIP 58411 located at the building base. In the event data from this instrument is unavailable, spectra shall be derived from available instruments in buildings at sites similar to and within 1 kilometer of the 301 Mission site.
[2] Wind speeds may be as determined at San Francisco International Airport.
[3] This corresponds to conditions included in the negative declaration on the EIR for the project.
[4] The load transfer rods have a maximum safe loading of 375 kips per rod, or 1,500 kips per pile. The 1,300-kip threshold is set to allow sufficient time to evaluate building behavior, should excessive load develop in one or more piles.
[5] As plotted on Figure 03. The annual rate is calculated starting on the settlement monitoring date closest to one year prior to the current date or on June 19, 2023 (the settlement monitoring date corresponding to the last day of jacking load application), whichever is later, and ending on the current date.
[6] As plotted on Figure 05, relative to a plumb condition.




Settlement Marker (not in tilt analysis)

Settlement Marker (in tilt analysis)

Piezometer Array

Extensometer Array

Load Cell

Manhole

From 301 Mission Perimeter Pile Upgrade Sheet S 207 2022-06-06

| Project No: 23-018-01 | Date: 8/22/2023 | Created By: NBW | Checked By: DGM | Figure No: **134-01A** |
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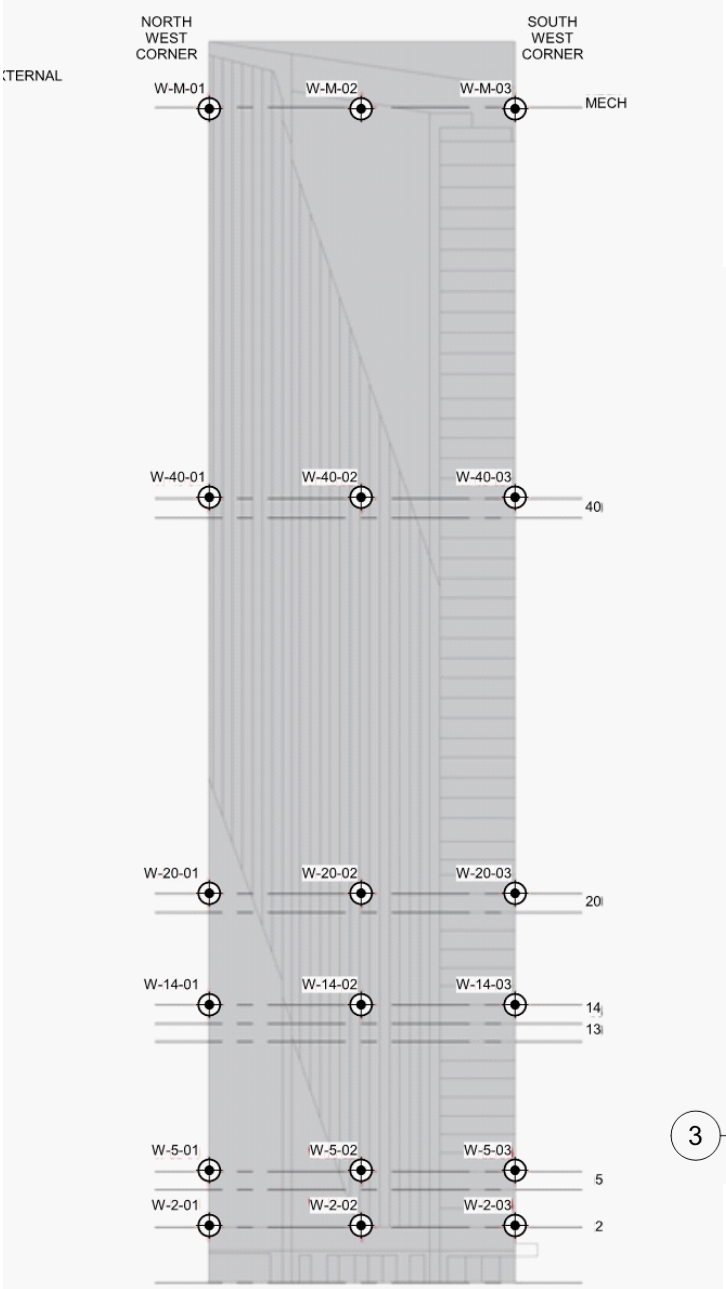
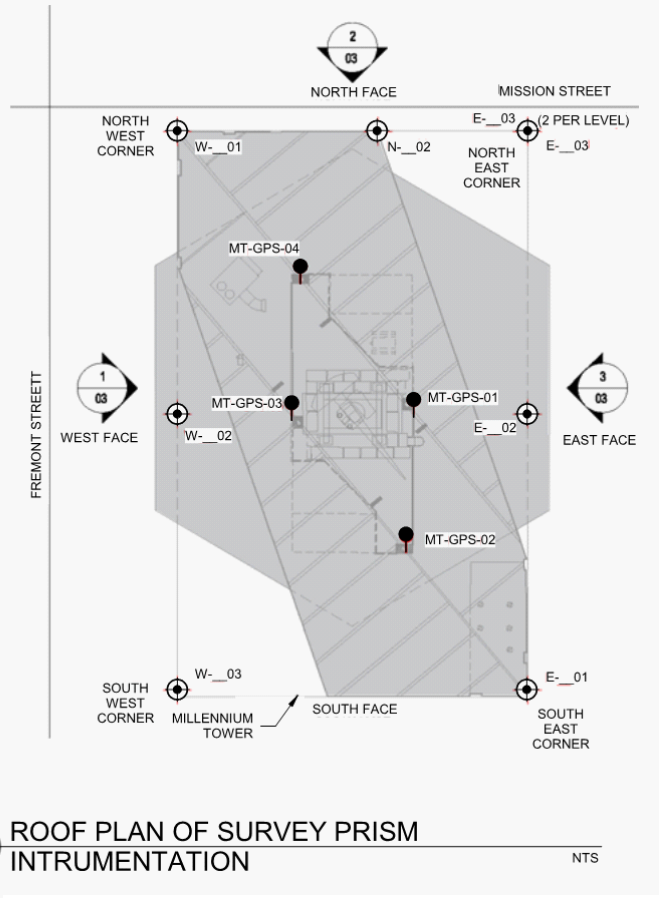
INSTRUMENT LOCATION MAP
SETTLEMENT MARKERS, PIEZOMETERS, EXTENSOMETERS, LOAD CELLS

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California

Filepath: S:\SlateDrive - Documents_Projects_2023\23-018-01 On-going Millennium Tower Monitoring\04_Eval_Analysis\00_Figures\Fig_134-01A_Instrument_Map.grf




2 WEST ELEVATION OF SURVEY PRISM INSTRUMENTATION NTS




3 ROOF PLAN OF SURVEY PRISM INTRUMENTATION NTS

From 301 Mission Perimeter Pile Upgrade Bulletin 8 Set S 207 2021-06-15

| Project No: 23-018-01 | Date: 7/26/2021 | Created By: NBW | Checked By: DGM | Figure No: **134-01B** |
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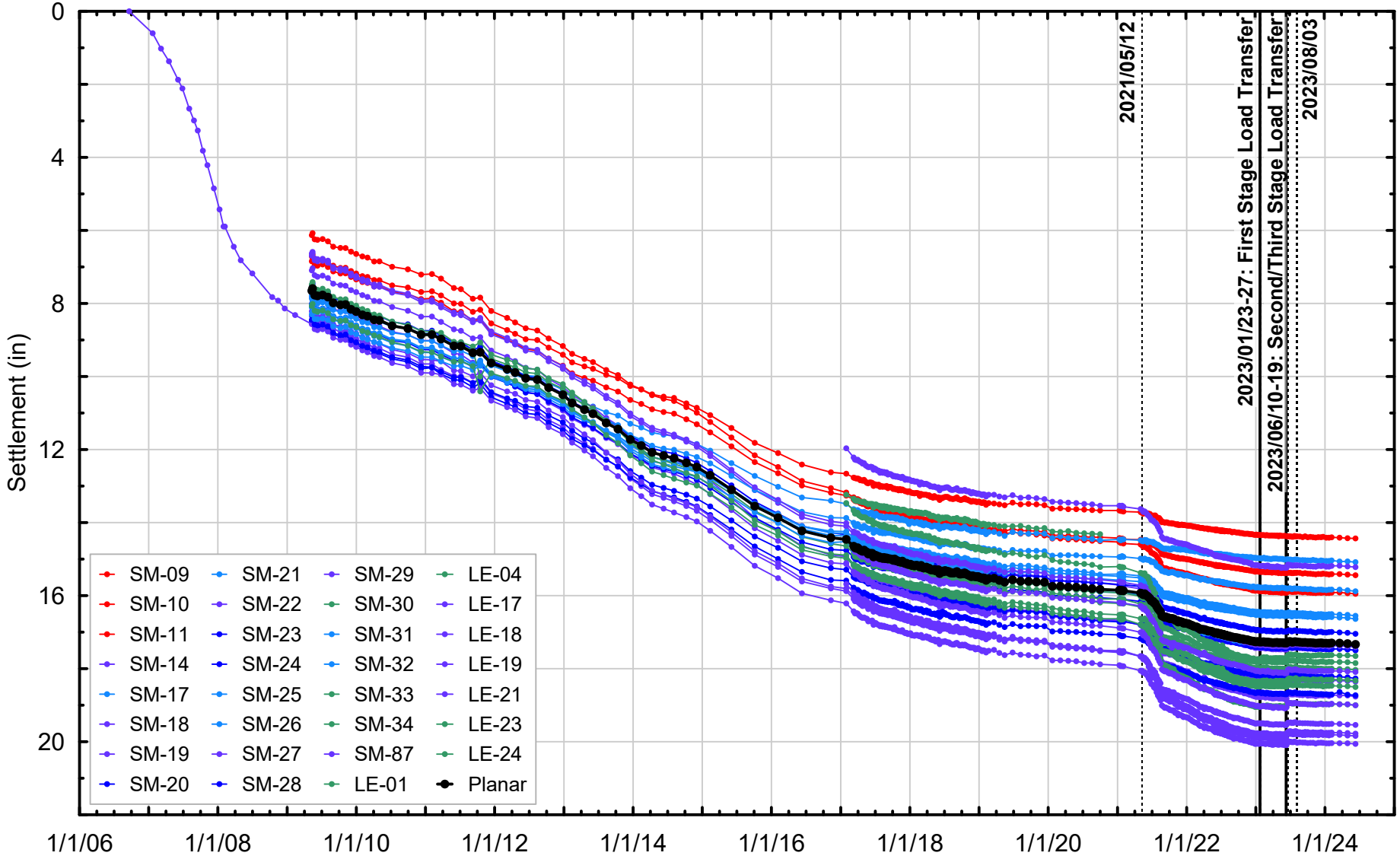
TOWER SURVEY PRISM LOCATION SCHEMATIC

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California

Filepath: S:\SlateDrive - Documents_Projects_2023\23-018-01 On-going Millennium Tower Monitoring\04_Eval_Analysis\00_Figures\Fig_134-01B_Prism_Map.grf

Filepath: S:\SlateDrive - Documents_Projects_2023\23-018-01 On-going Millennium Tower Monitoring\04_Eval_Analysis\00_Figures\Fig_134-02_SM_Data.grf




| Project No: 23-018-01 | Date: 6/17/2024 | Created By: TB | Checked By: DGM | Figure No: **134-02** |
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HISTORICAL SETTLEMENT MARKER DATA

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California

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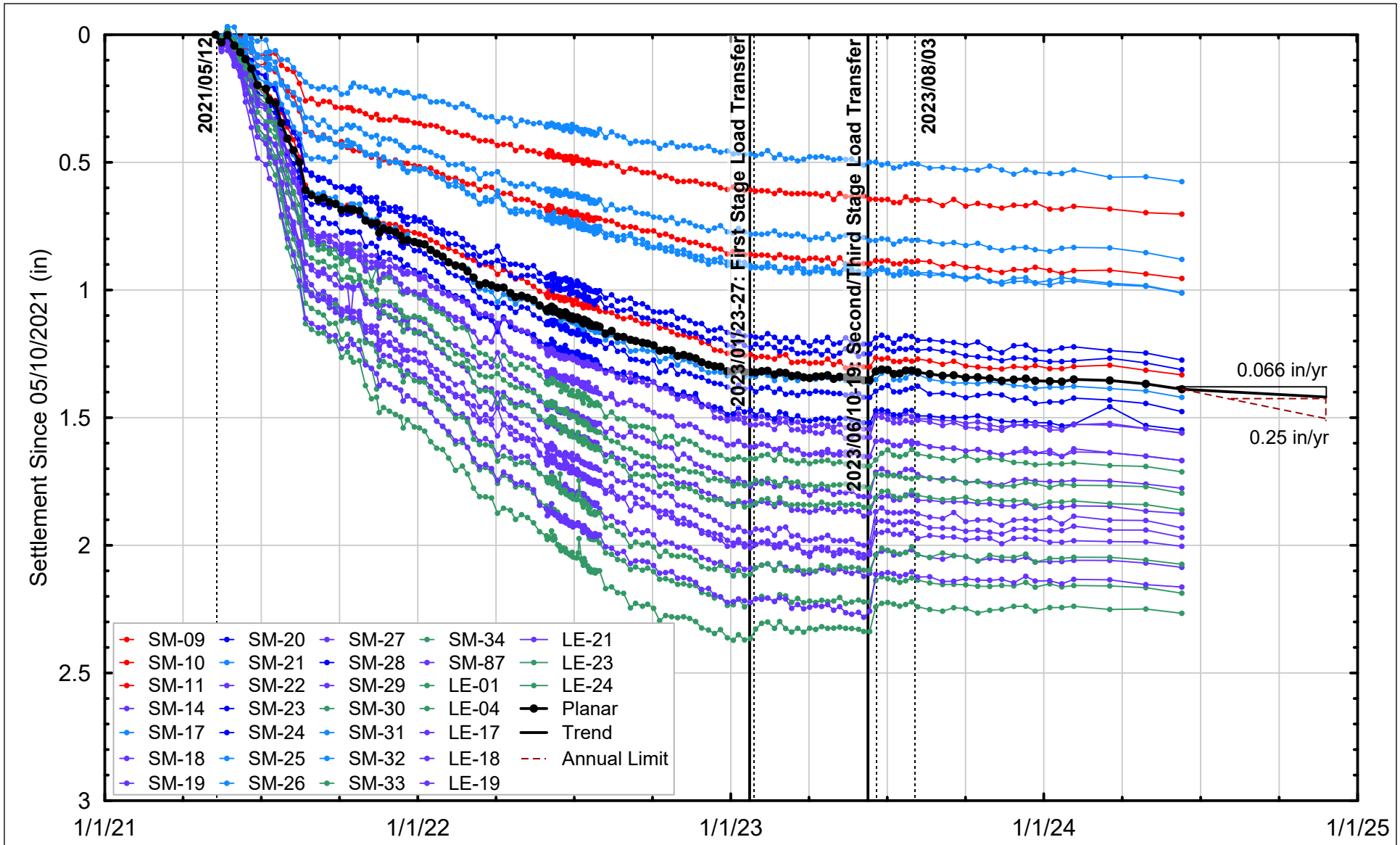


| Project No: 23-018-01 | Date: 6/17/2024 | Created By: TB | Checked By: DGM | Figure No: **134-03** |
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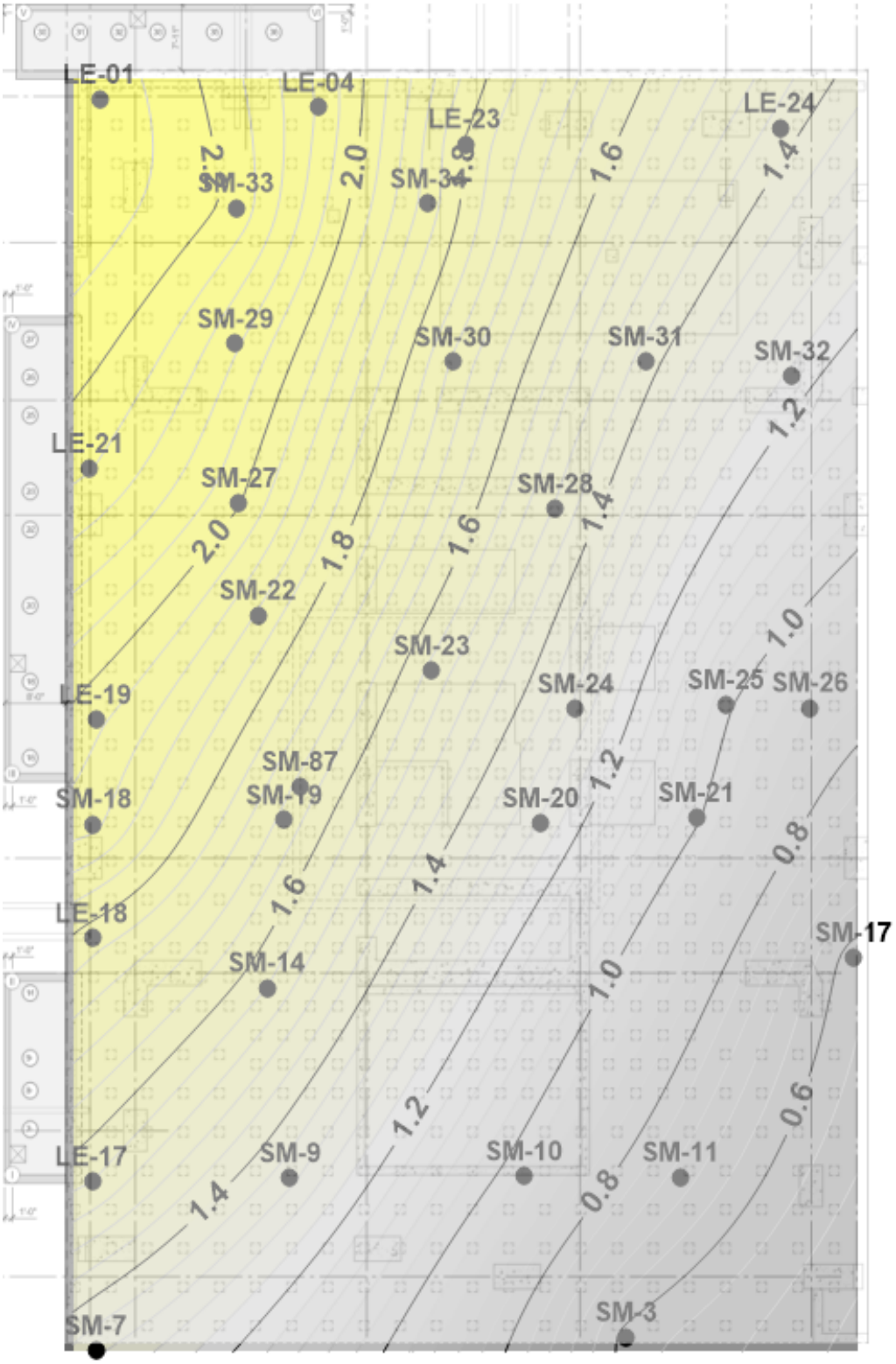
SETTLEMENT MARKER DATA
SINCE 05/10/2021 THROUGH 06/10/2024

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California




| Project No: 23-018-01 | Date: 6/17/2024 | Created By: TB | Checked By: DGM | Figure No: **134-04** |
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SETTLEMENT CONTOURS
SINCE 05/10/2021 THROUGH 06/10/2024

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California

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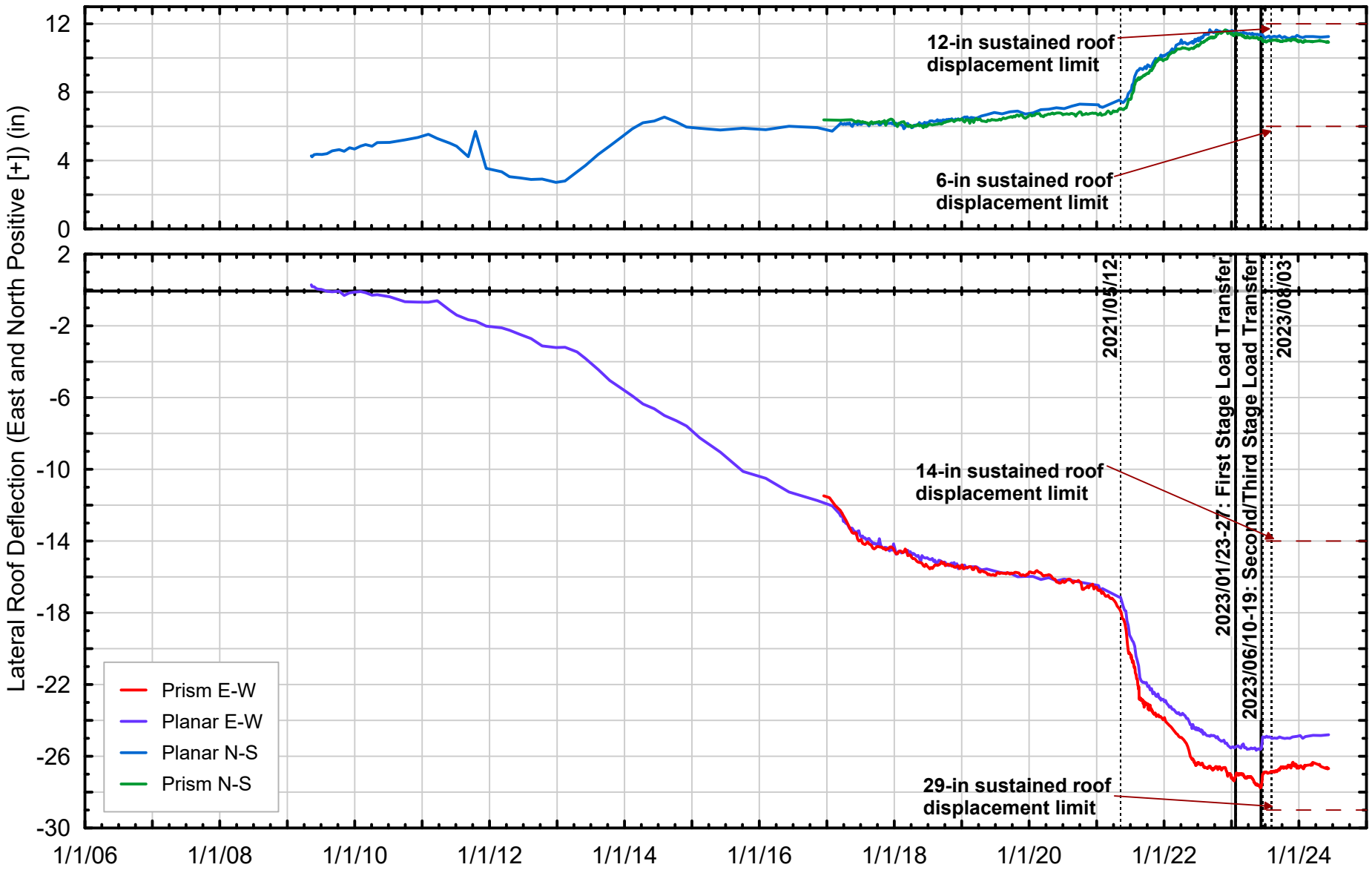


| Project No: 23-018-01 | Date: 6/17/2024 | Created By: TB | Checked By: DGM | Figure No: **134-05** |
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HISTORICAL LATERAL ROOF DEFLECTION DATA

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California

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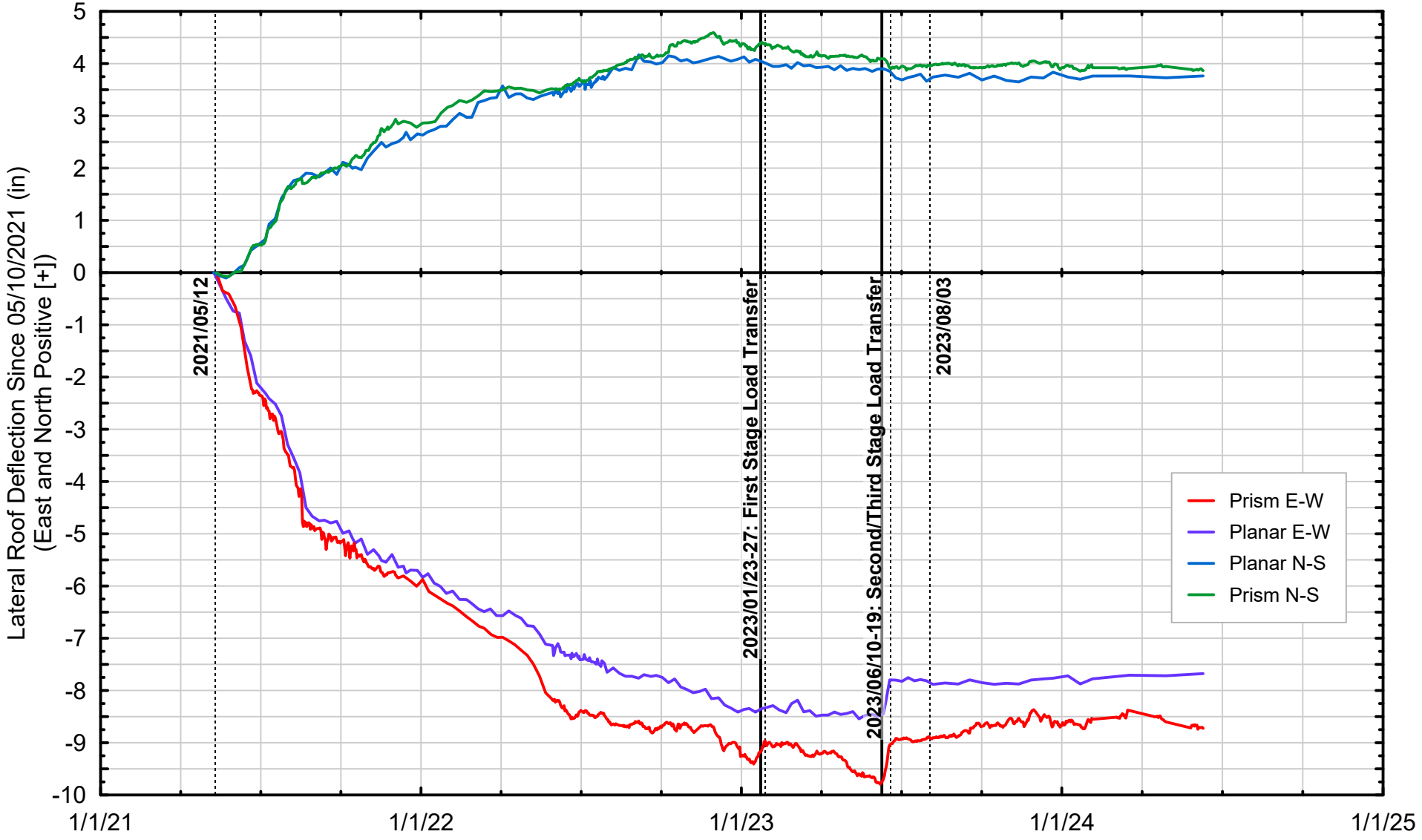


| Project No: 23-018-01 | Date: 6/17/2024 | Created By: TB | Checked By: DGM | Figure No: **134-06** |
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LATERAL ROOF DEFLECTION DATA
SINCE 05/10/2021 THROUGH 06/10/2024

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California

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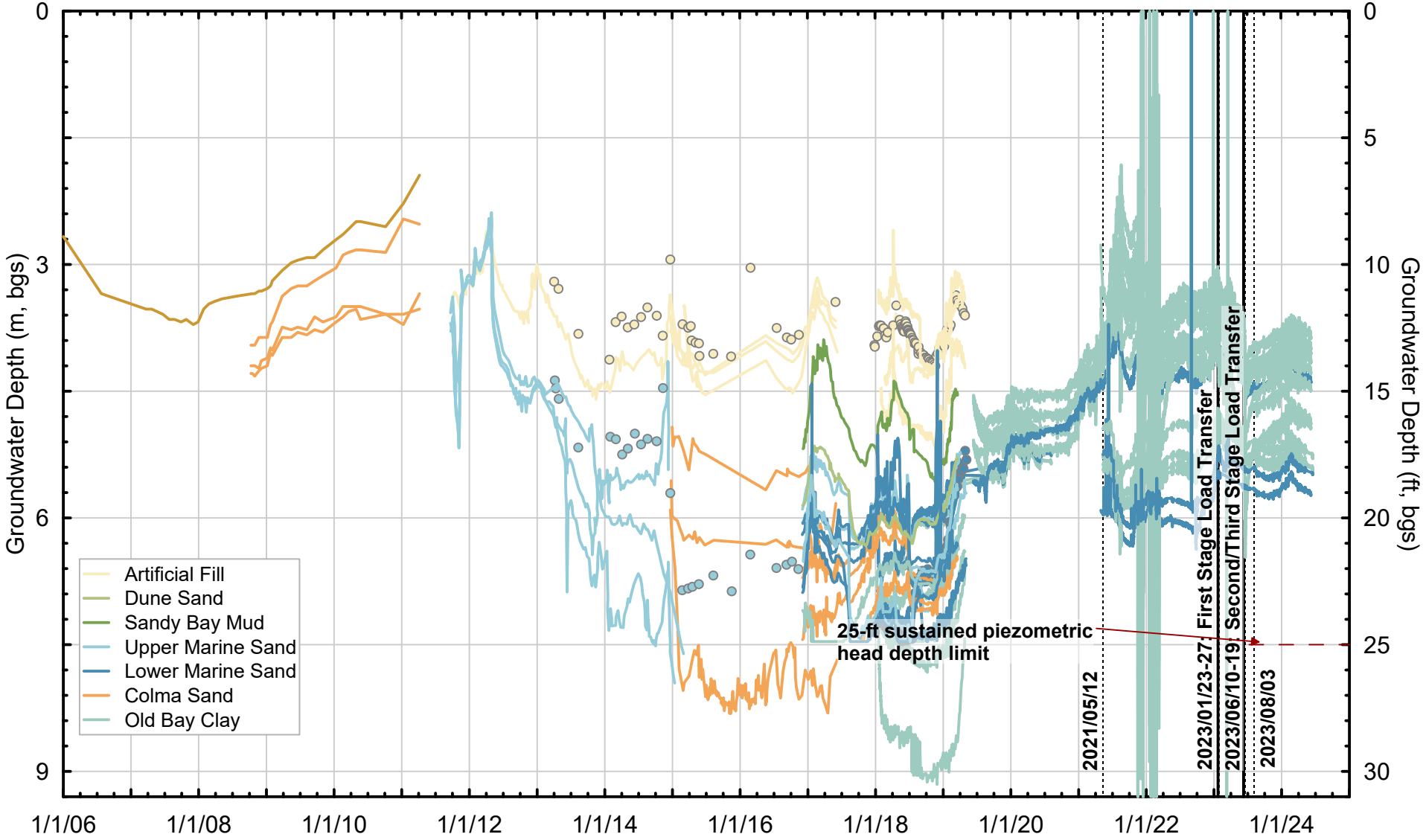


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HISTORICAL GROUNDWATER ELEVATION MEASUREMENTS
AT LOCATIONS NEAR 301 MISSION

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California

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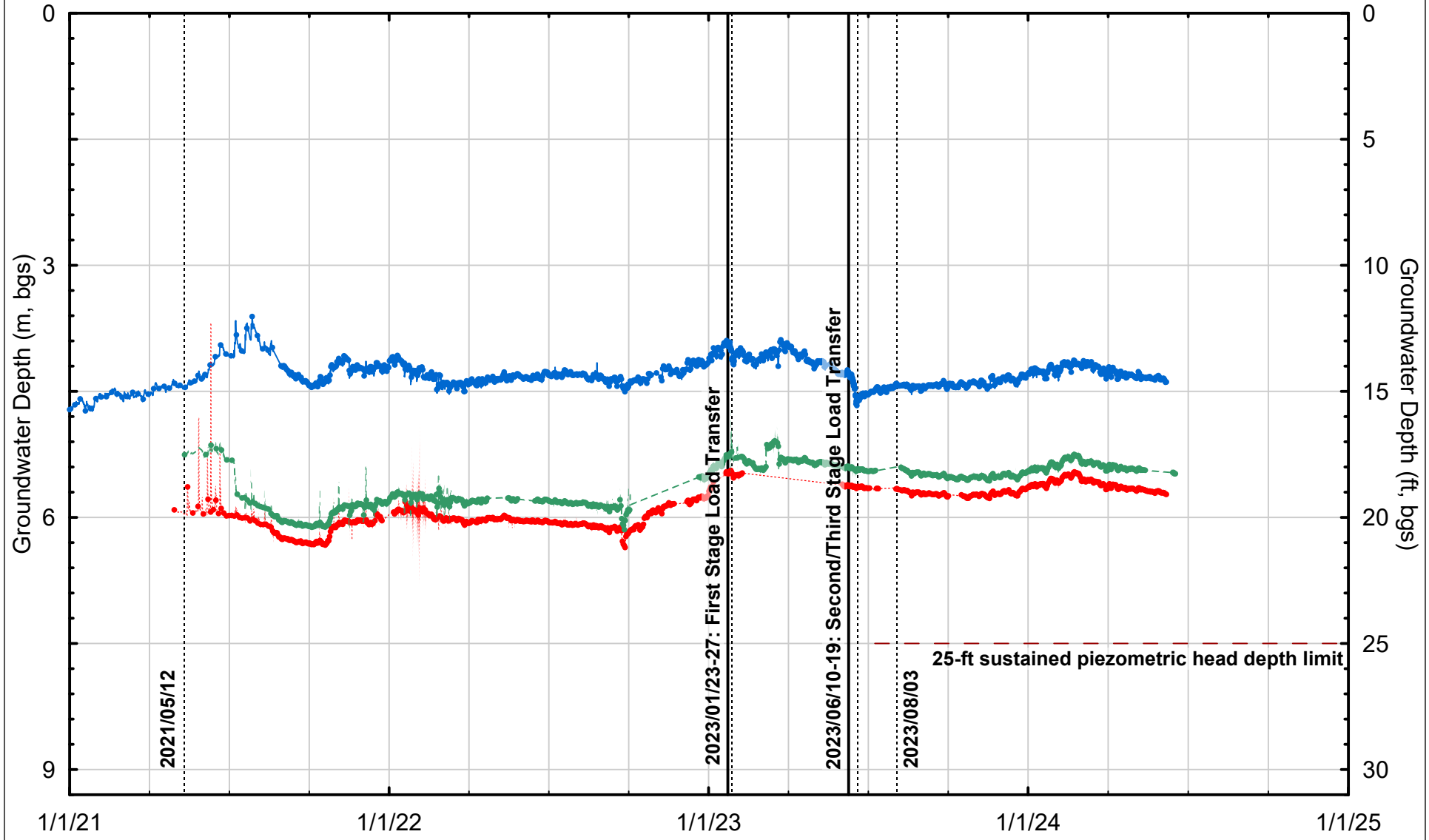


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GROUNDWATER ELEVATION MEASUREMENTS IN MARINE AND COLMA SAND
SINCE 01/01/2021 THROUGH 06/17/2024

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California

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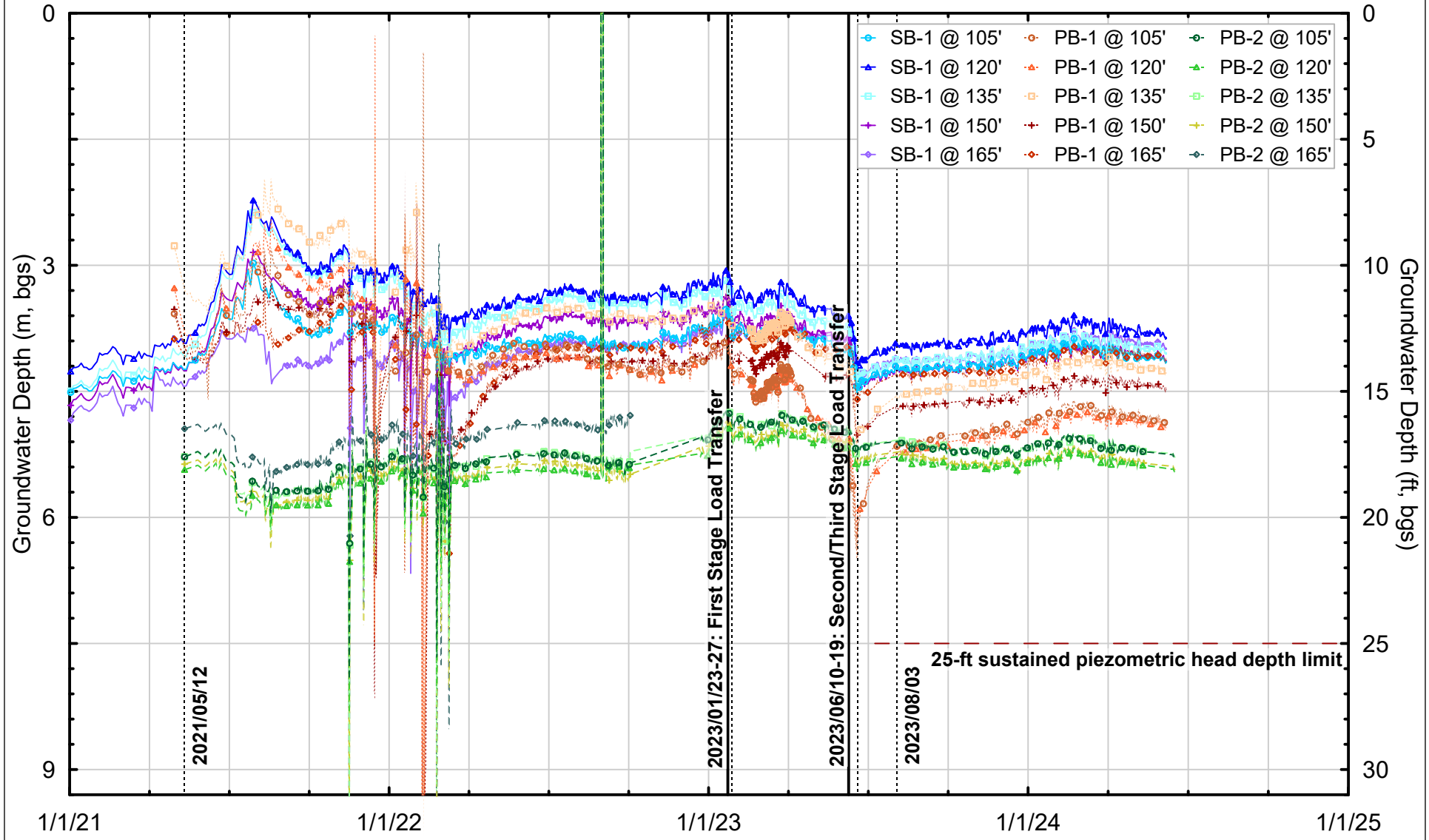


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GROUNDWATER ELEVATION MEASUREMENTS IN OLD BAY CLAY
SINCE 01/01/2021 THROUGH 06/17/2024

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California

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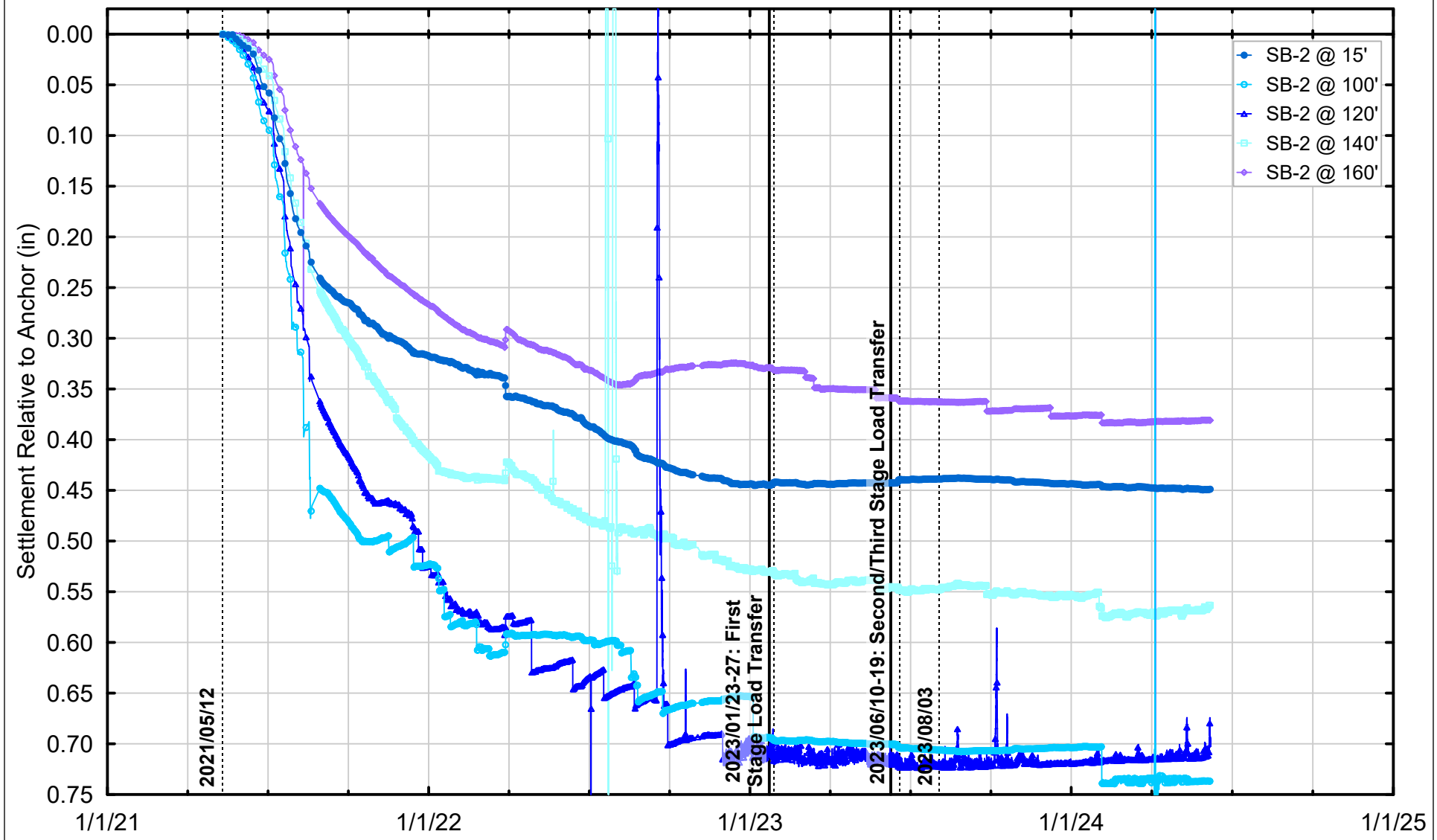


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EXTENSOMETER DATA FROM WITHIN TOWER BASEMENT
SINCE 01/01/2021 THROUGH 06/07/2024

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California

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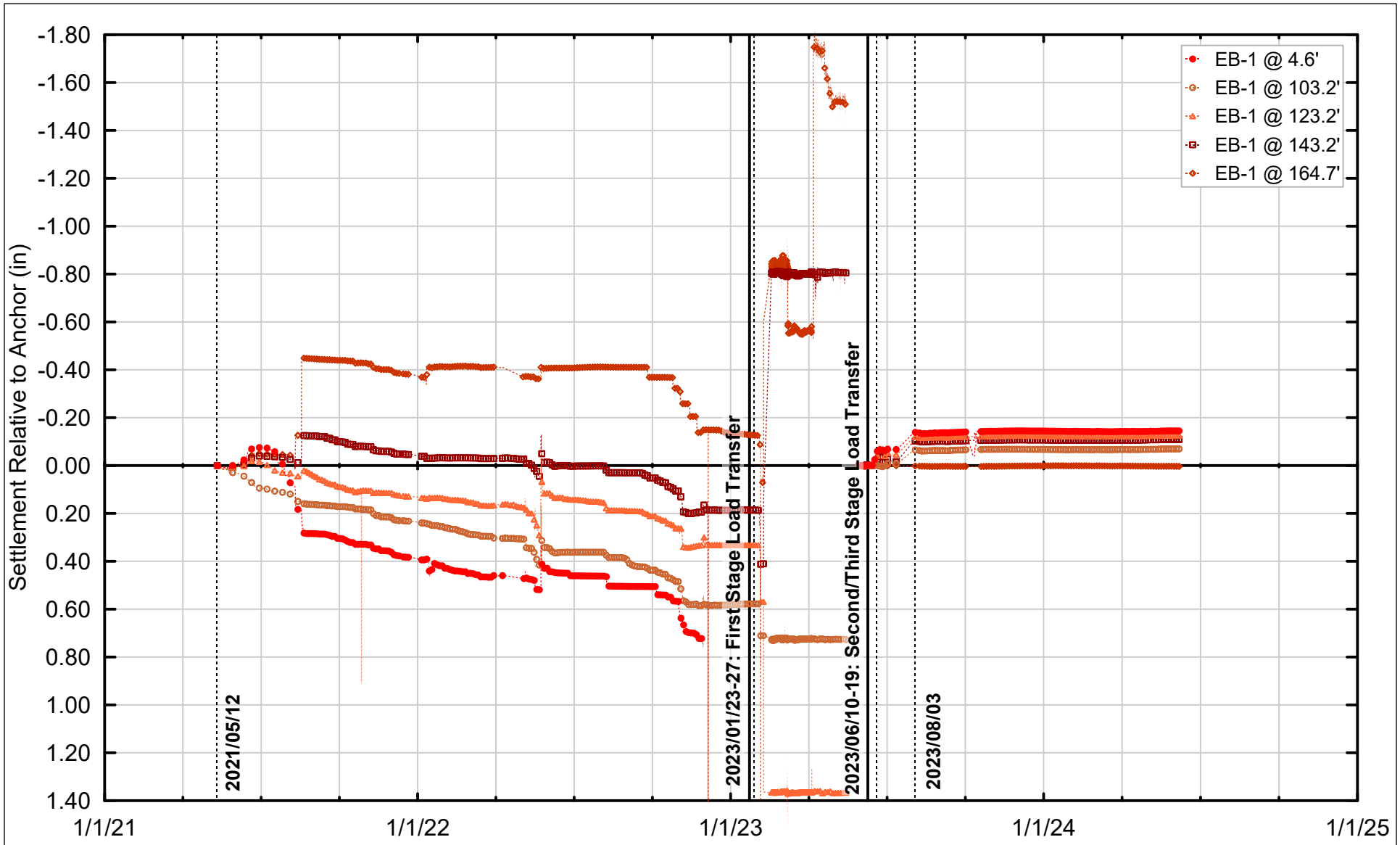


Note: EB-1 was repaired and reset on 2023/05/30

| Project No: 23-018-01 | Date: 6/17/2024 | Created By: TB | Checked By: DGM | Figure No: **134-11** |
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EXTENSOMETER DATA FROM FREMONT STREET
SINCE 05/10/2021 THROUGH 05/16/2023
SINCE 05/30/2023 THROUGH 06/07/2024
Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California

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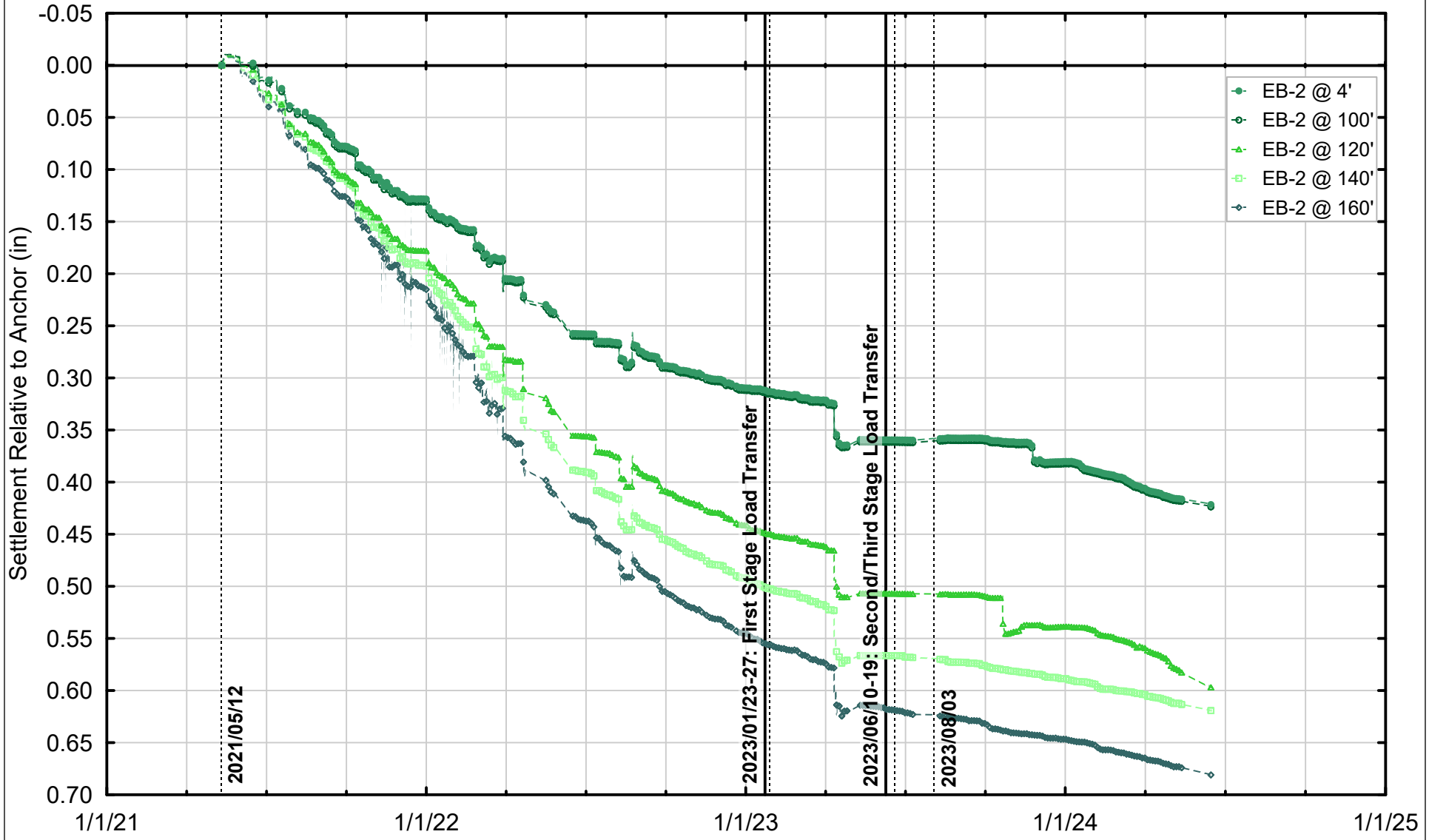


| Project No: 23-018-01 | Date: 6/17/2024 | Created By: TB | Checked By: DGM | Figure No: **134-12** |
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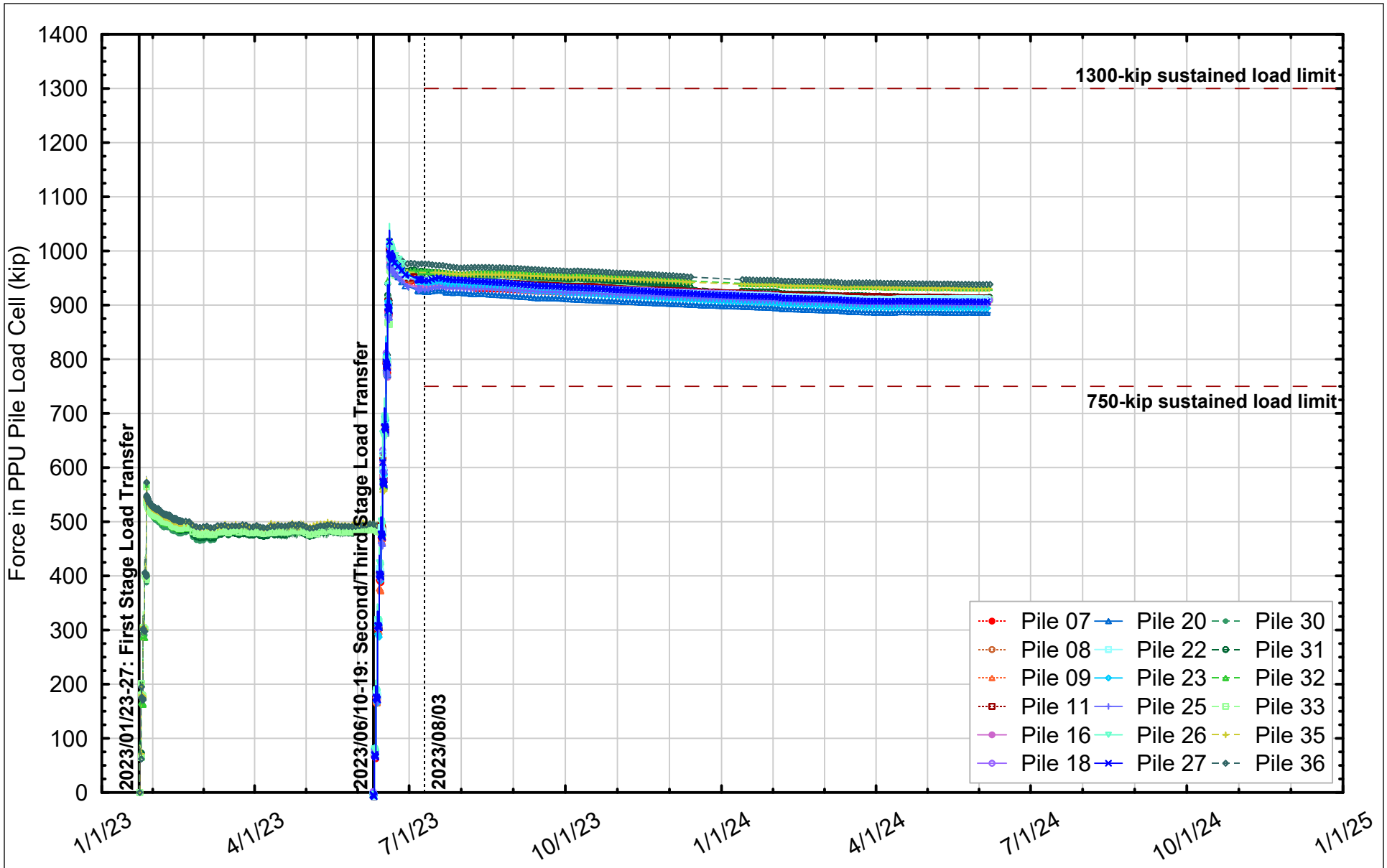
EXTENSOMETER DATA FROM MISSION STREET
SINCE 01/01/2021 THROUGH 06/17/2024

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California

Filepath: S:\SlateDrive - Documents_Projects_2023\23-018-01 On-going Millennium Tower Monitoring\04_Eval_Analysis\00_Figures\Fig_134-13A_PPU_Pile_Load.grf




| Project No: 23-018-01 | Date: 6/17/2024 | Created By: TB | Checked By: DGM | Figure No: **134-13A** |
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PILE LOAD CELL DATA
SINCE 01/23/2023 THROUGH 06/07/2024

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California

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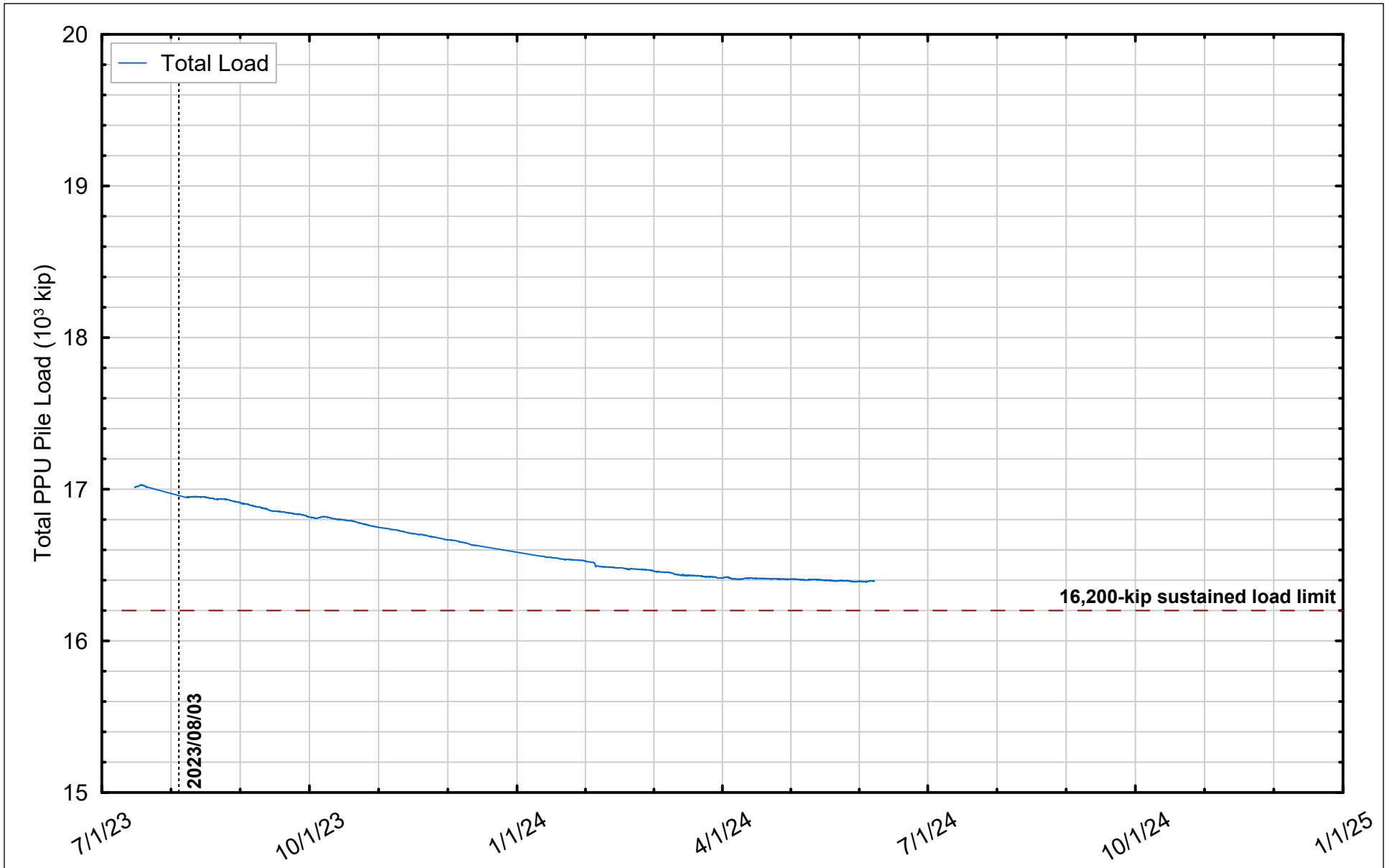


| Project No: 23-018-01 | Date: 6/17/2024 | Created By: TB | Checked By: DGM | Figure No: **134-13B** |
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TOTAL PILE LOAD CELL DATA
SINCE 07/15/2023 THROUGH 06/07/2024

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California

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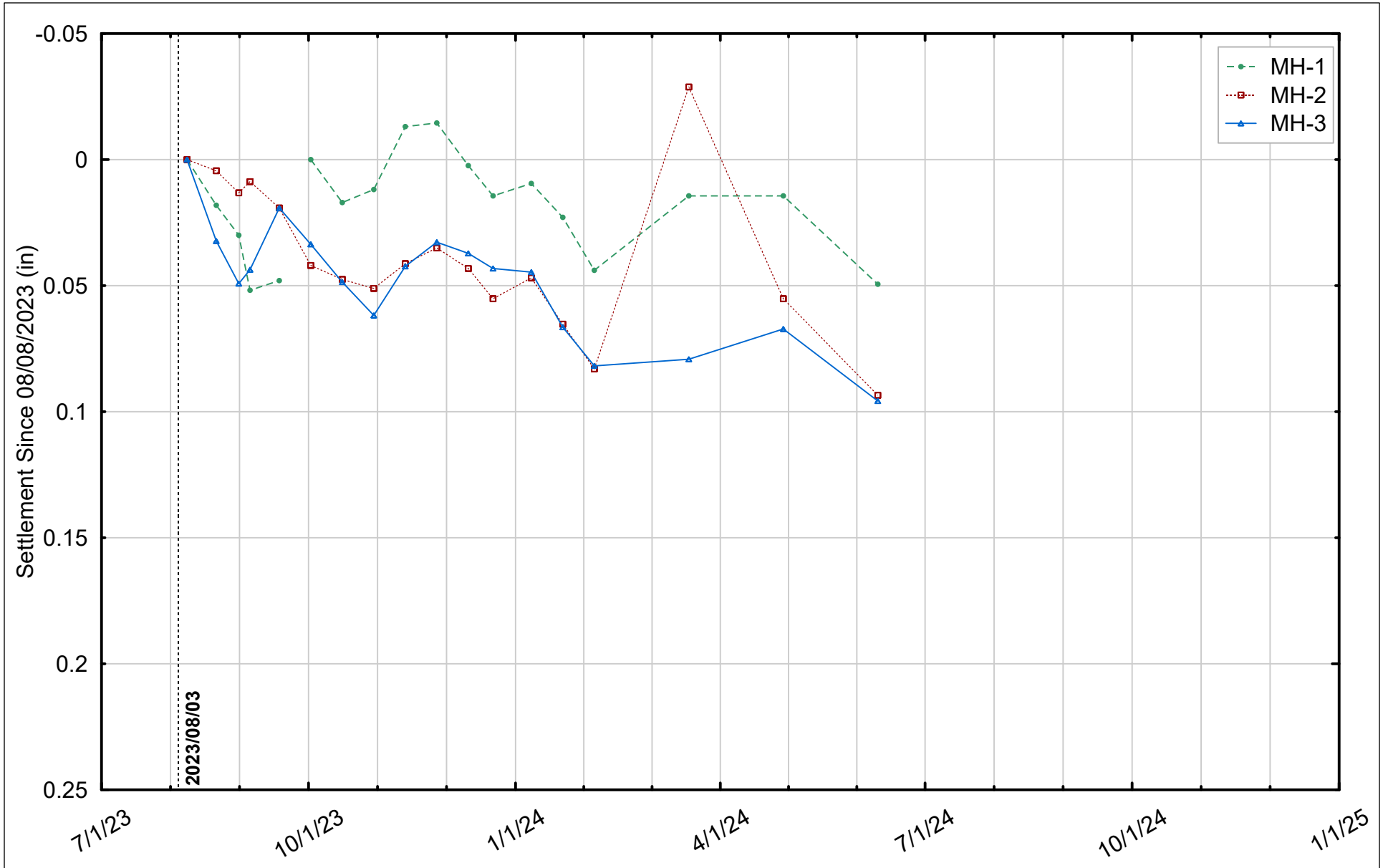


| Project No: 23-018-01 | Date: 6/17/2024 | Created By: TB | Checked By: DGM | Figure No: **134-14** |
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Note: MH-1 was reset on 10/02/2023

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MANHOLE SETTLEMENT DATA
SINCE 08/08/2023 THROUGH 06/10/2024

Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data
City and County of San Francisco, California