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Date: May 31, 2021
Project Number: 19-009
Subject: 301 Mission Retrofit Monitoring Report 004: Results as of May 28, 2021

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.

INTERPRETATION

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 differential settlement data since the start of production pile installation (May 12, 2021; baseline readings on May 10, 2021) through May 24, 2021. Figure 04 presents current differential settlement contours (in inches) on May 24, 2021.

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 survey performed during the retrofit are included. Figure 06 presents differential 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 May 27, 2021.

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 May 28, 2021.

Figure 10 presents extensometer data from within the Tower basement since the start of production pile installation (May 12, 2021) through May 28, 2021. Figure 11 presents extensometer data from Fremont Street since the start of production pile installation (May 12, 2021) through May 28, 2021. Figure 12 presents extensometer data from Mission Street since the start of production pile installation (May 12, 2021) through May 28, 2021.

CLOSING

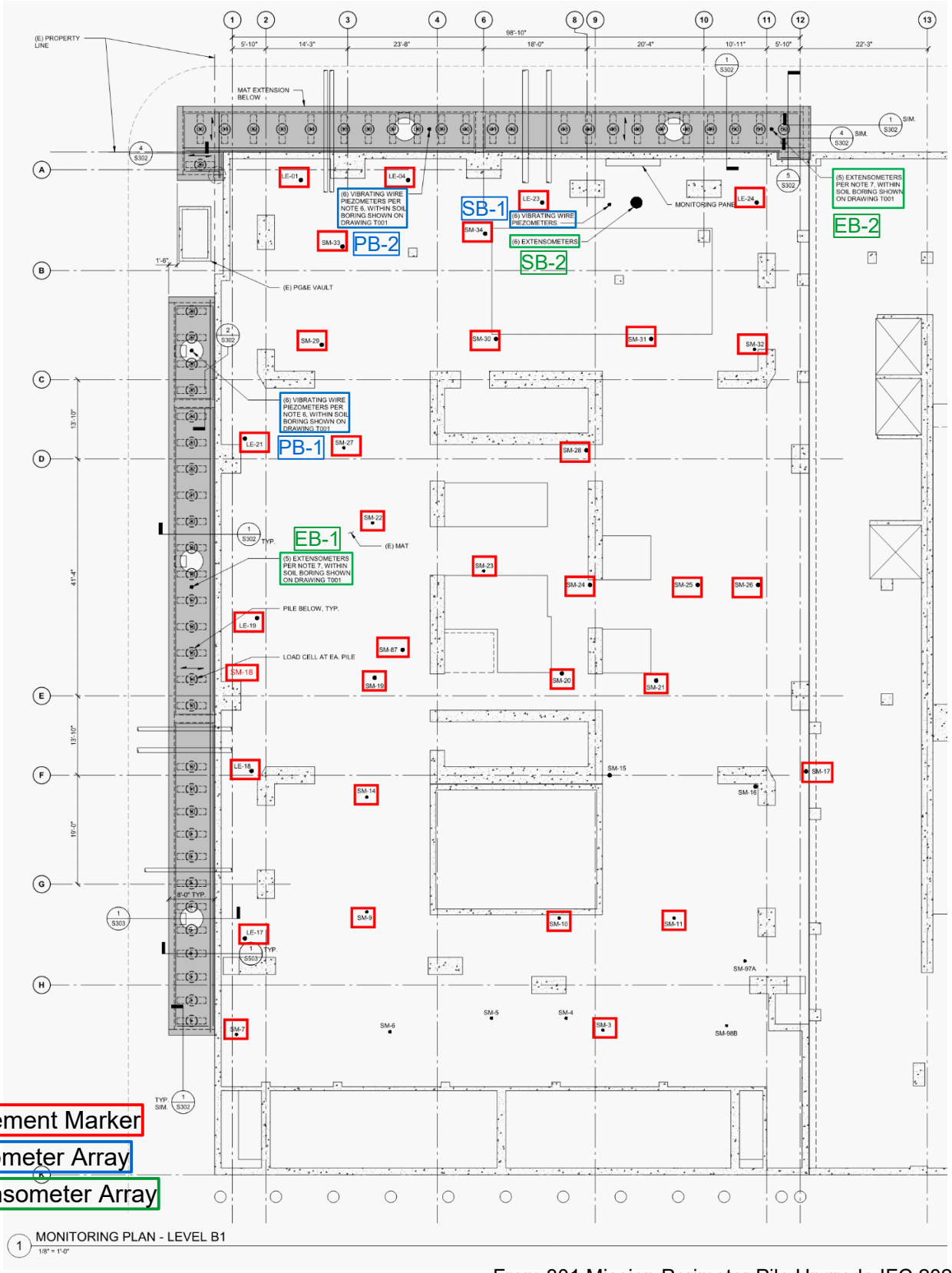
Please contact us if you have any comments or questions, or if you would like to discuss the results presented in this memorandum.

FIGURES

Figure 01A – Instrument Location Map: Settlement Markers, Piezometers, Extensometers
Figure 01B – Tower Survey Prism Location Schematic
Figure 02 – Historical Settlement Marker Data
Figure 03 – Differential Settlement Marker Data since 05/10/2021 through 05/24/2021
Figure 04 – Differential Settlement Contours since 05/10/2021 through 05/24/2021
Figure 05 – Historical Lateral Roof Deflection Data
Figure 06 – Differential Lateral Roof Deflection Data since 05/10/2021 through 05/27/2021
Figure 07 – Historical Groundwater Elevation Measurements at Locations Near 301 Mission
Figure 08 – Groundwater Elevation Measurements in Marine and Colma Sand since 1/1/2021 through 5/28/2021
Figure 09 – Groundwater Elevation Measurements in Old Bay Clay since 1/1/2021 through 5/28/2021
Figure 10 – Extensometer Data from within Tower Basement since 5/12/2021 through 5/28/2021
Figure 11 – Extensometer Data from Fremont Street since 5/12/2021 through 5/28/2021
Figure 12 – Extensometer Data from Mission Street since 5/12/2021 through 5/28/2021

ATTACHMENTS

Attachment 01 – Crack Gauge Report since 1/6/2021 through 5/20/2021



From 301 Mission Perimeter Pile Upgrade IFC 2020-02-25

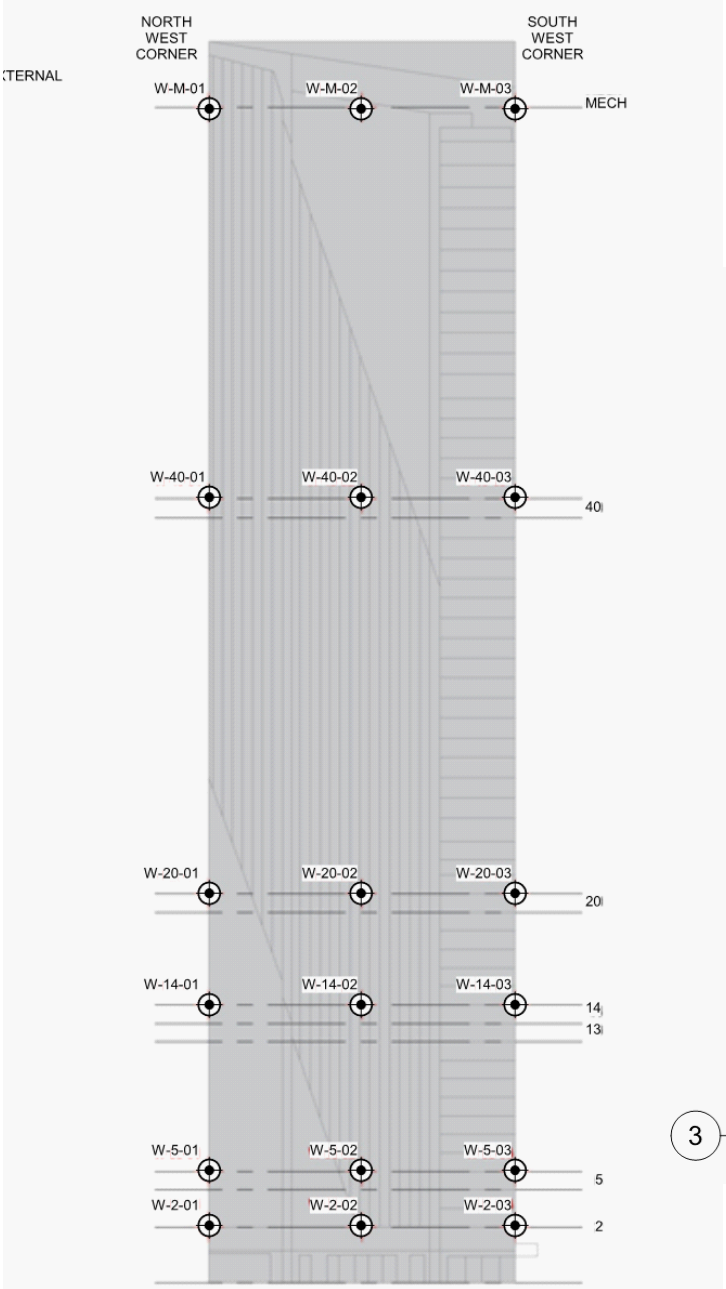
Project No: 19-009.00	Date: 5/10/2021	Created By: NBW	Checked By: DGM	Figure No: **004-01A**

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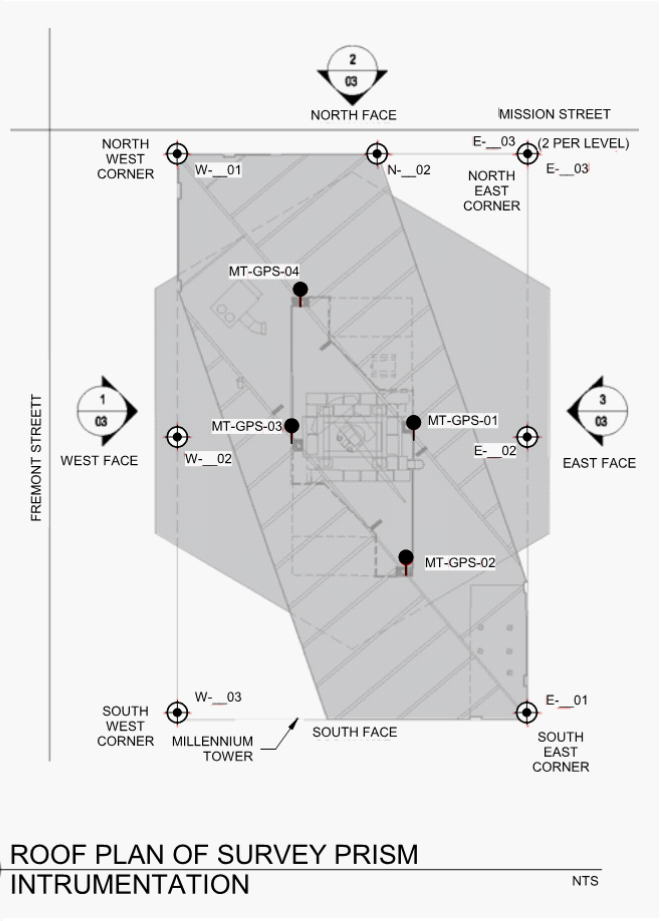
INSTRUMENT LOCATION MAP
SETTLEMENT MARKERS, PIEZOMETERS, EXTENSOMETERS

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

Filepath: S:\SlateDrive - Documents_Projects_2019\19-009.00_Millennium Tower Retrofit\10_Construction\01_Monitoring Reports\TowerSoilWater\00_Figures\Fig_004-01A_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 IFC 2020-02-25

Project No: 19-009.00	Date: 5/10/2021	Created By: NBW	Checked By: DGM	Figure No: **004-01B**

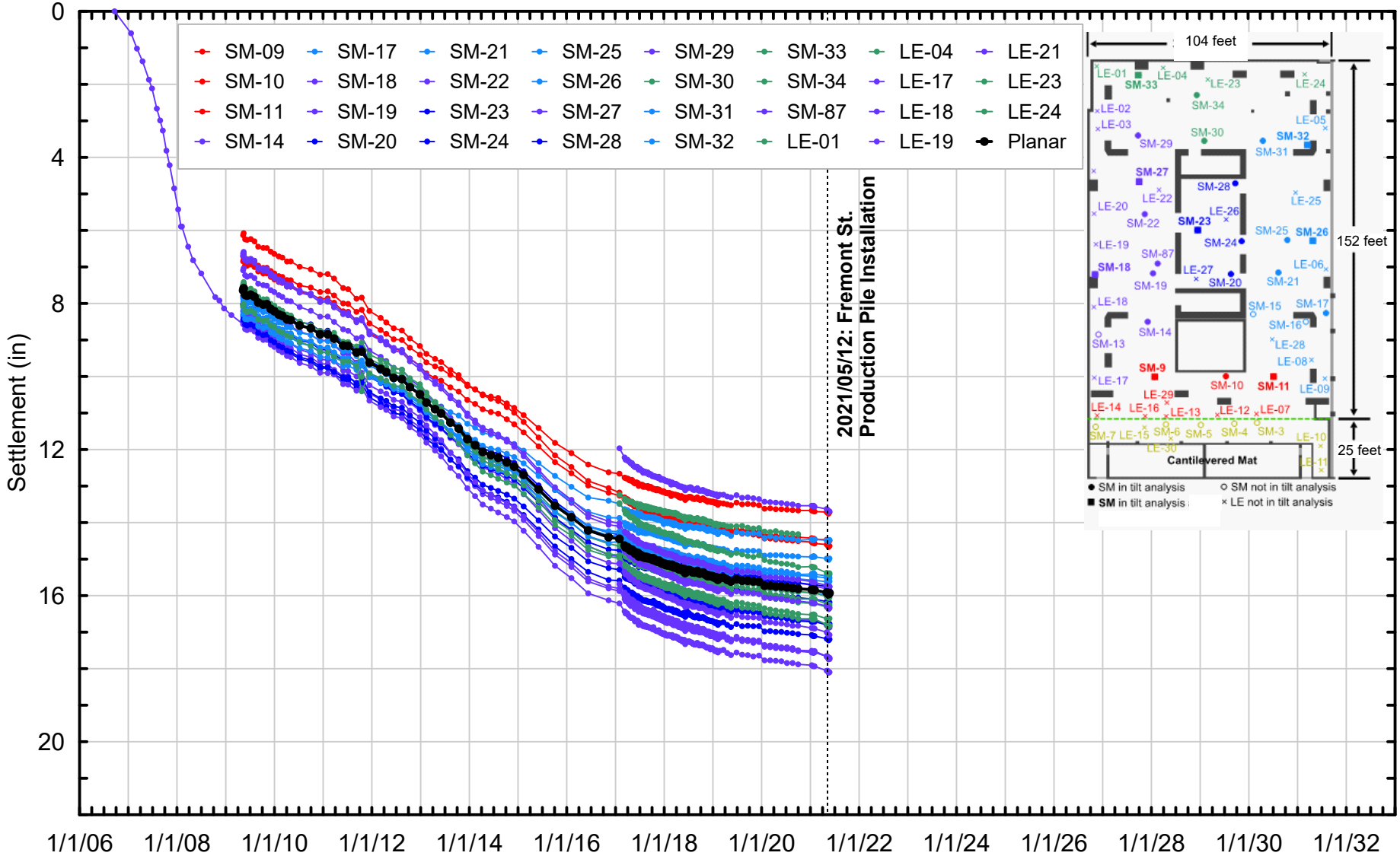
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TOWER SURVEY PRISM LOCATION SCHEMATIC

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

Filepath: S:\SlateDrive - Documents_Projects_2019\19-009.00_Millennium Tower Retrofit\10_Construction\01_Monitoring Reports\TowerSoilWater\00_Figures\Fig_004-01B_Prism_Map.grf

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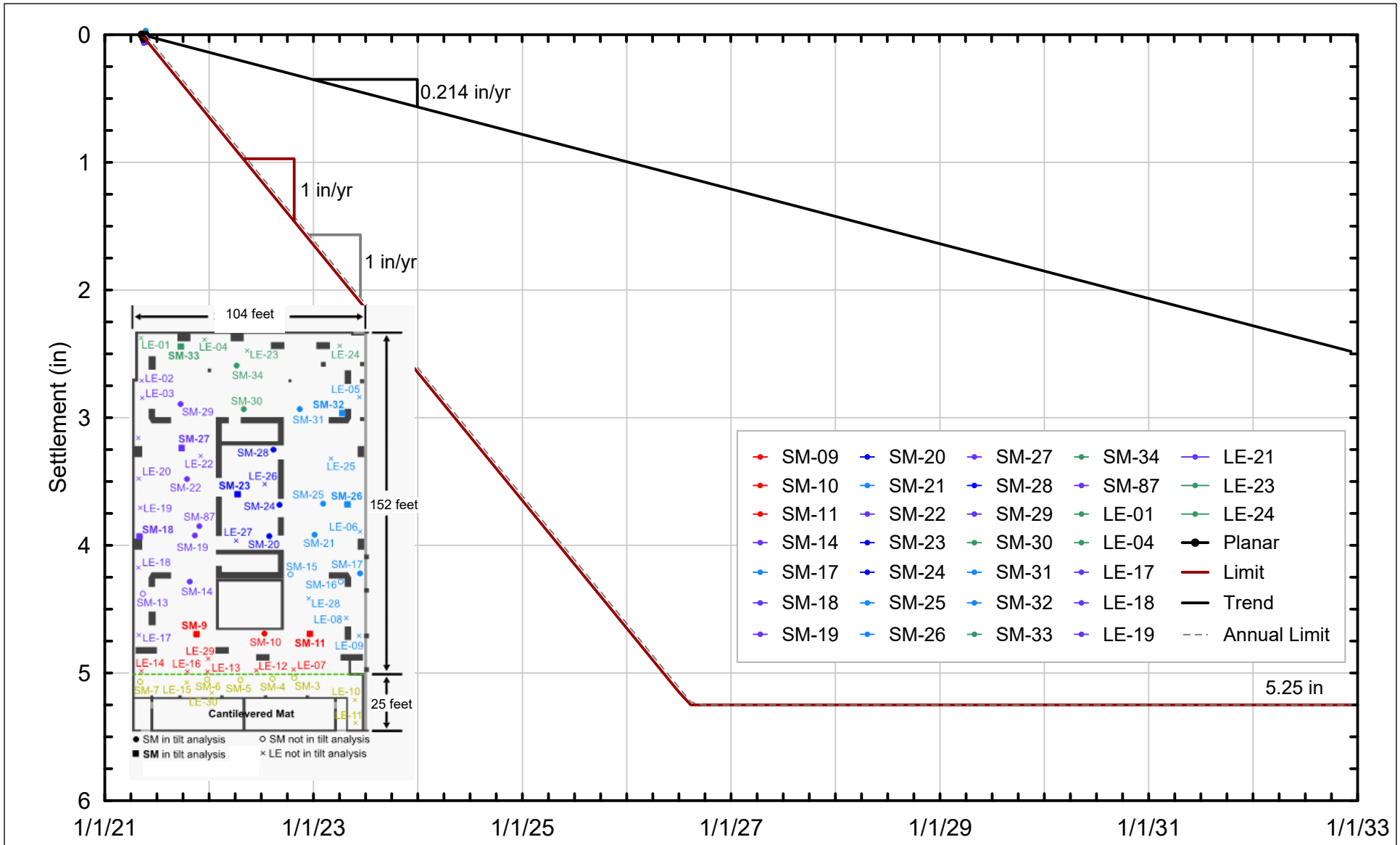
Project No: 19-009.00	Date: 5/31/2021	Created By: NBW	Checked By: DGM	Figure No: **004-02**

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HISTORICAL SETTLEMENT MARKER DATA

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

Filepath: S:\SlateDrive - Documents_Projects_2019\19-009.00_Millennium Tower Retrofit\10_Construction\01_Monitoring Reports\TowerSoilWater\00_Figures\Fig_004-03_SM_Data_Diff.grf

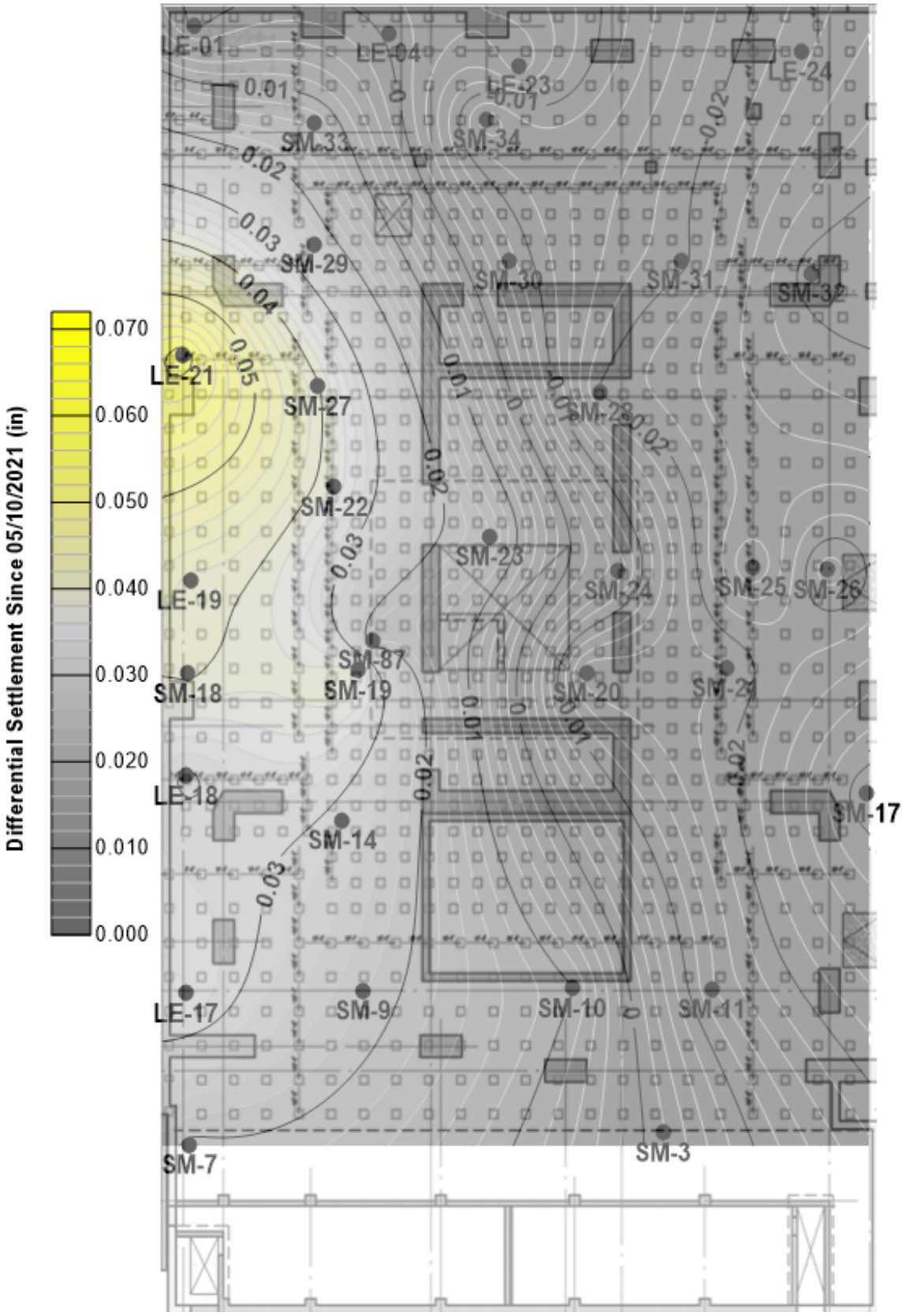


Project No: 19-009.00	Date: 5/31/2021	Created By: NBW	Checked By: DGM	Figure No: **004-03**

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DIFFERENTIAL SETTLEMENT MARKER DATA
SINCE 05/10/2021 THROUGH 05/24/2021

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



Project No: 19-009.00	Date: 5/31/2021	Created By: NBW	Checked By: DGM	Figure No: **004-04**

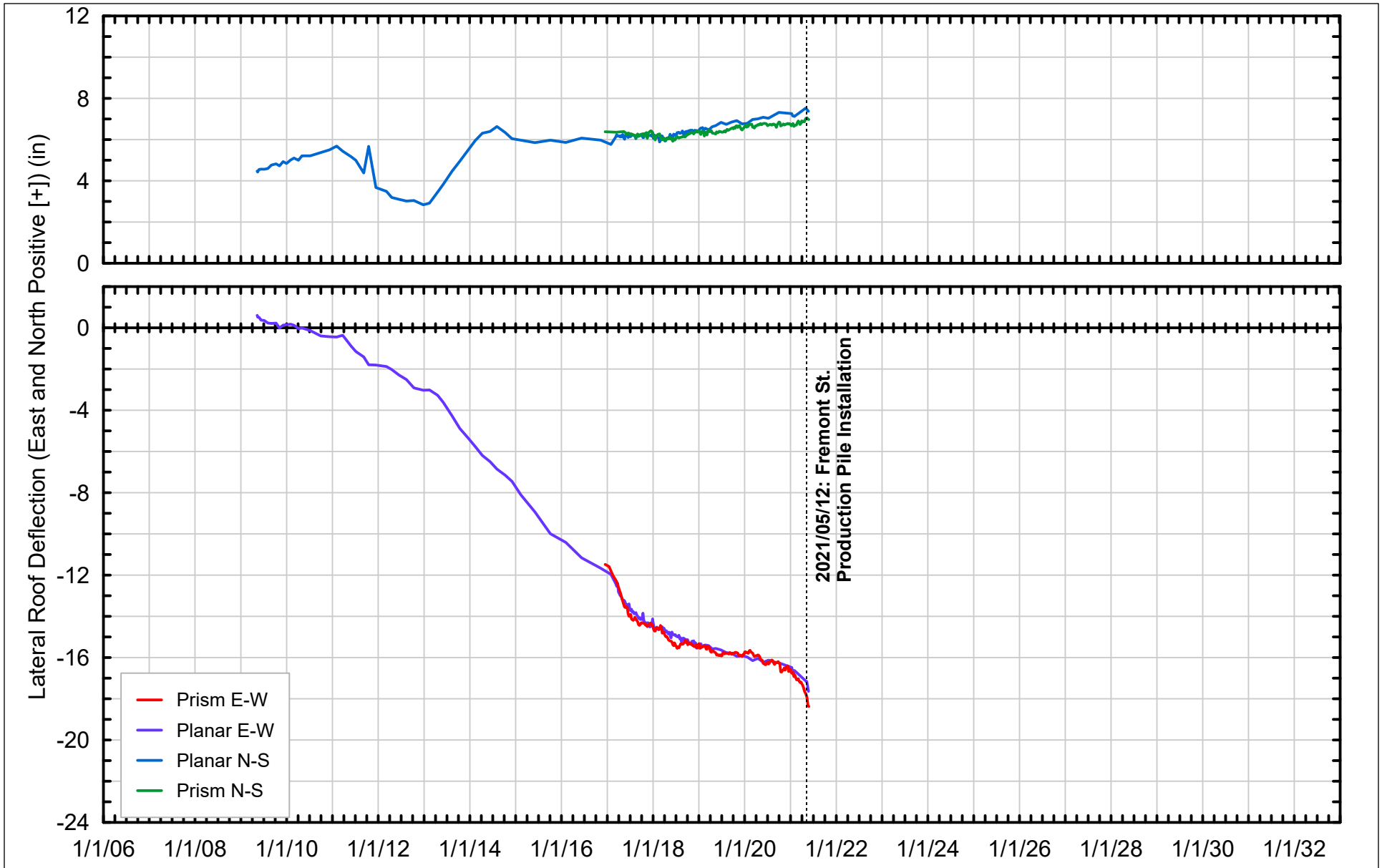
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DIFFERENTIAL SETTLEMENT CONTOURS
SINCE 05/10/2021 THROUGH 05/24/2021

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

Filepath: S:\SlateDrive - Documents_Projects_2019\19-009.00_Millennium Tower Retrofit\10_Construction\01_Monitoring Reports\TowerSoilWater\00_Figures\Fig_004-04_SM_Data_Diff_Contours.grf

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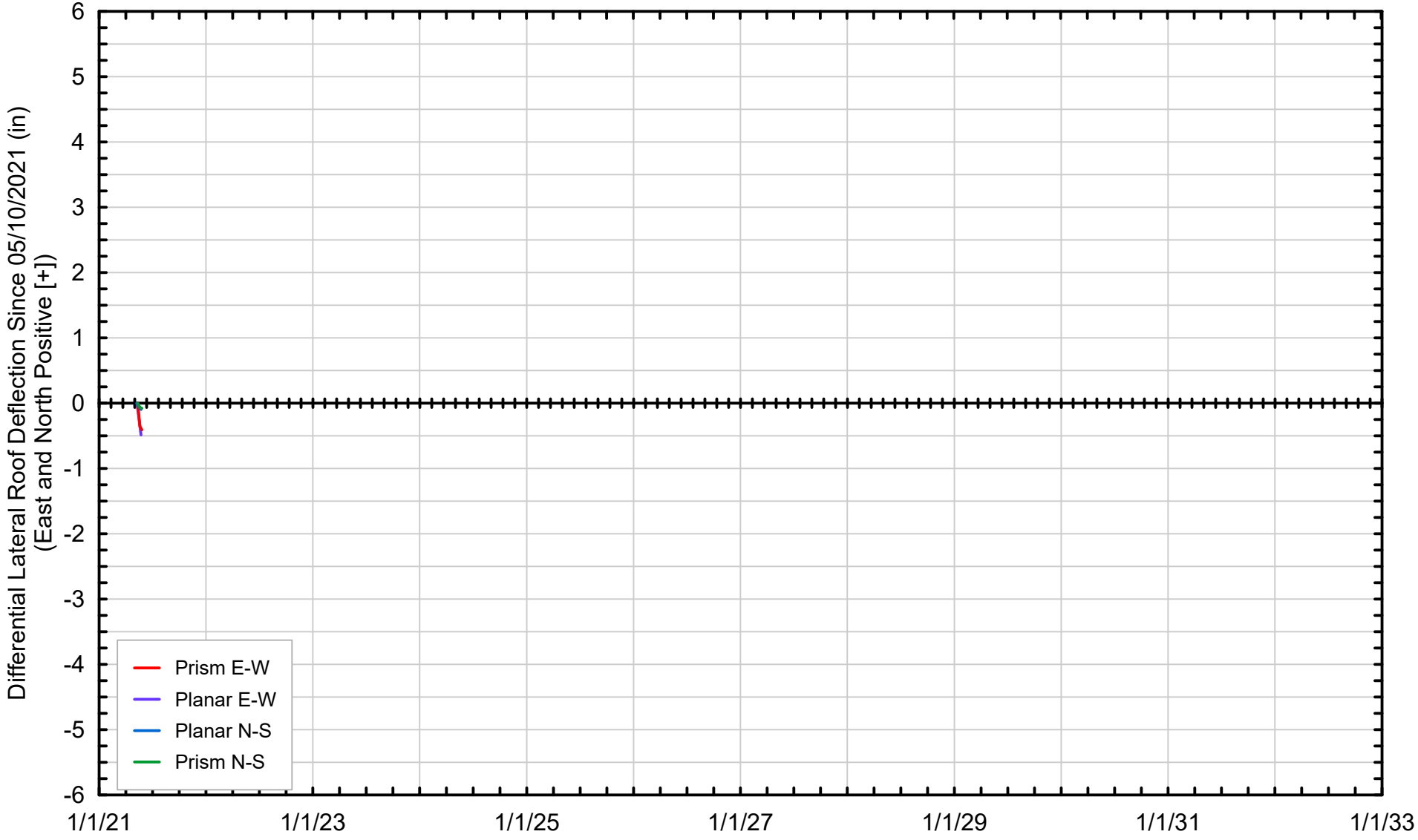
Project No: 19-009.00	Date: 5/31/2021	Created By: NBW	Checked By: DGM	Figure No: **004-05**

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HISTORICAL LATERAL ROOF DEFLECTION DATA

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

Filepath: S:\SlateDrive - Documents_Projects_2019\19-009.00_Millennium Tower Retrofit\10_Construction\01_Monitoring Reports\TowerSoilWater\00_Figures\Fig_004-06_LatDef_Data_Diff.grf



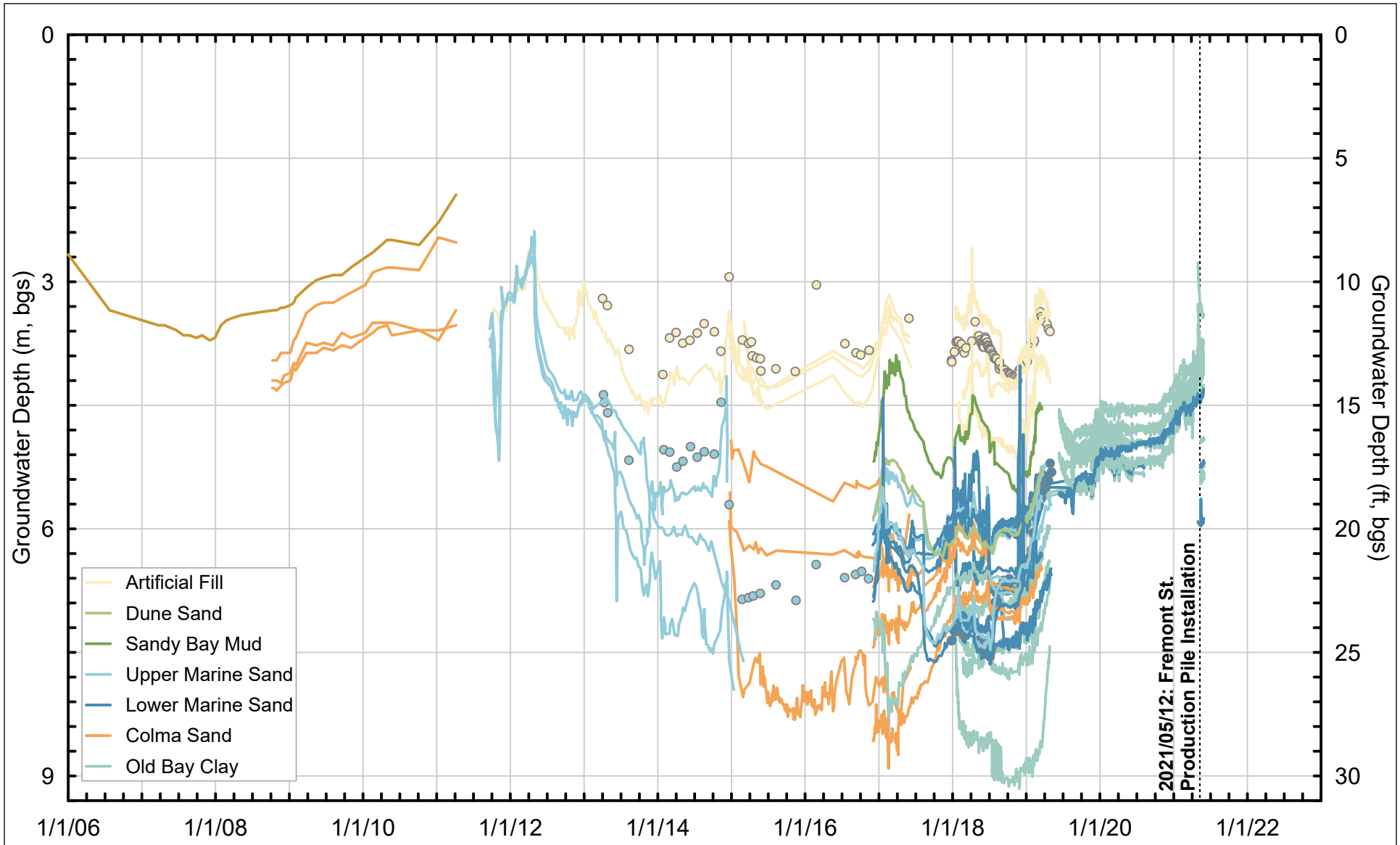
Project No: 19-009.00	Date: 5/31/2021	Created By: NBW	Checked By: DGM	Figure No: **004-06**

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DIFFERENTIAL LATERAL ROOF DEFLECTION DATA
SINCE 05/10/2021 THROUGH 05/27/2021

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

Filepath: S:\SlateDrive - Documents_Projects_2019\19-009.00_Millennium Tower Retrofit\10_Construction\01_Monitoring Reports\TowerSoilWater\00_Figures\Fig_004-07_GWT_Data.grf



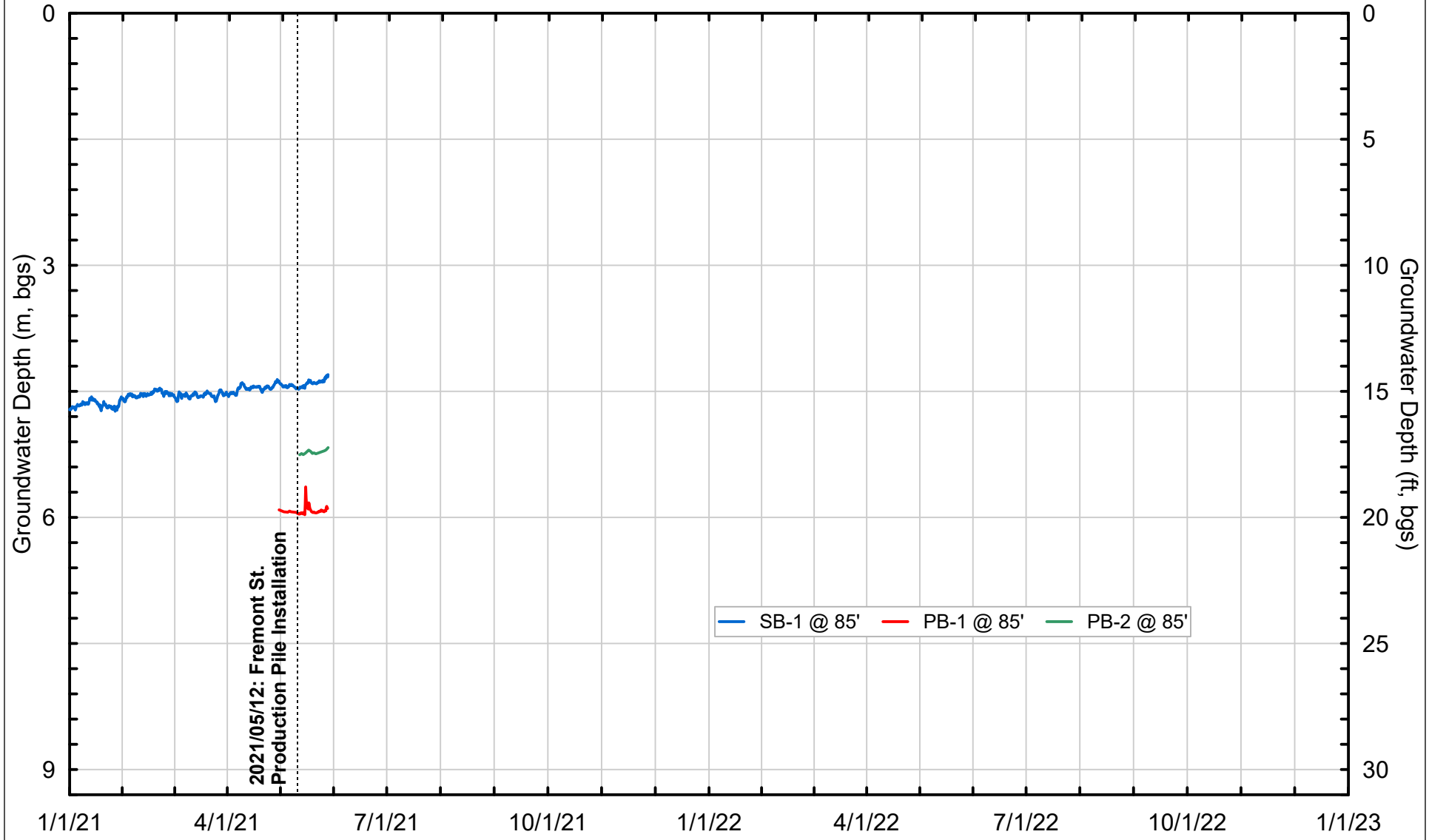
Project No: 19-009.00	Date: 5/31/2021	Created By: NBW	Checked By: DGM	Figure No: **004-07**

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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

Filepath: S:\SlateDrive - Documents_Projects_2019\19-009.00_Millennium Tower Retrofit\10_Construction\01_Monitoring Reports\TowerSoilWater\00_Figures\Fig_004-08_GWT_Data_Sand.grf



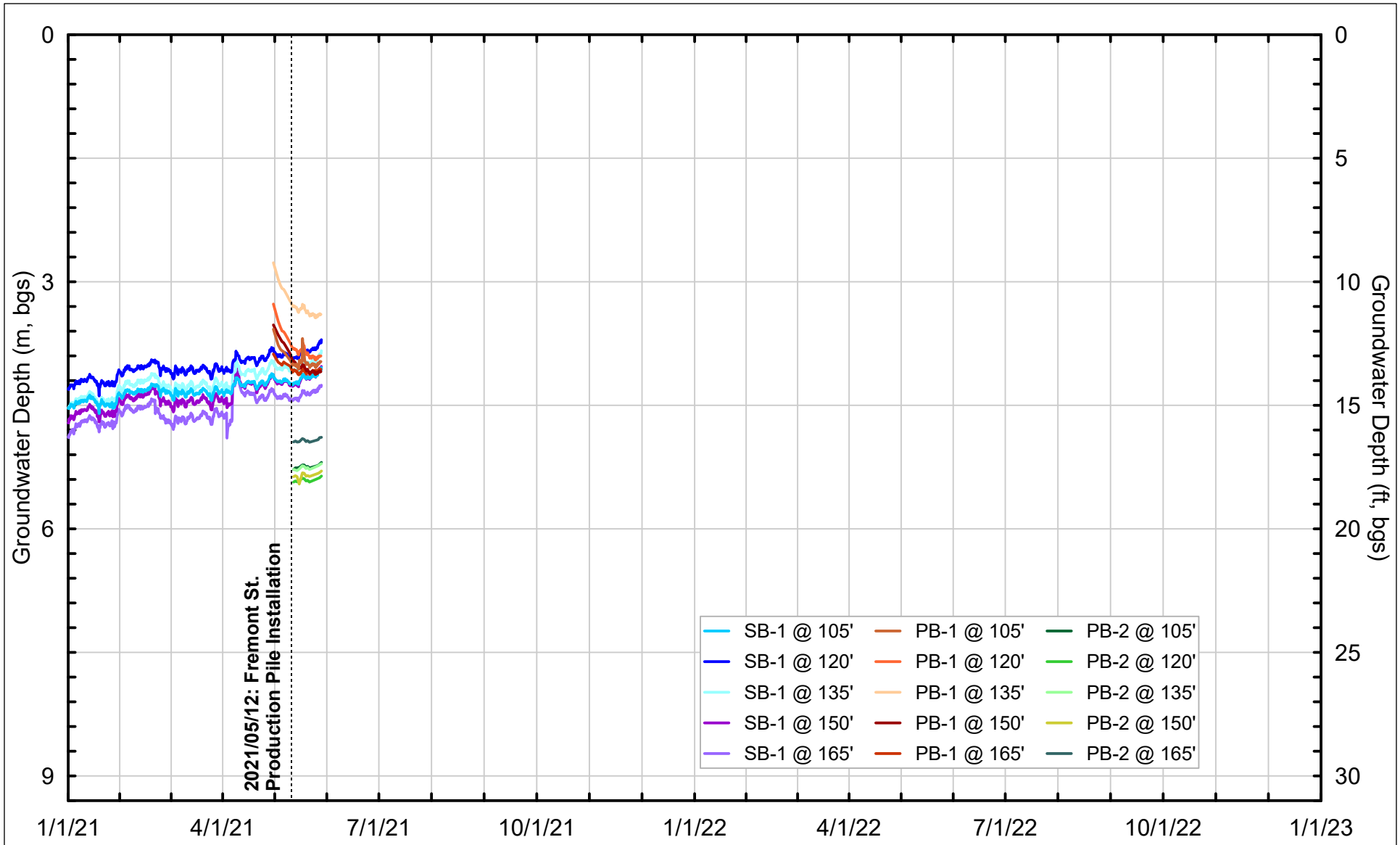
Project No: 19-009.00	Date: 5/31/2021	Created By: NBW	Checked By: DGM	Figure No: **004-08**

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GROUNDWATER ELEVATION MEASUREMENTS IN MARINE AND COLMA SAND
SINCE 01/01/2021 THROUGH 05/28/2021

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

Filepath: S:\SlateDrive - Documents_Projects_2019\19-009.00_Millennium Tower Retrofit\10_Construction\01_Monitoring Reports\TowerSoilWater\00_Figures\Fig_004-09_GWT_Data_OBC.grf



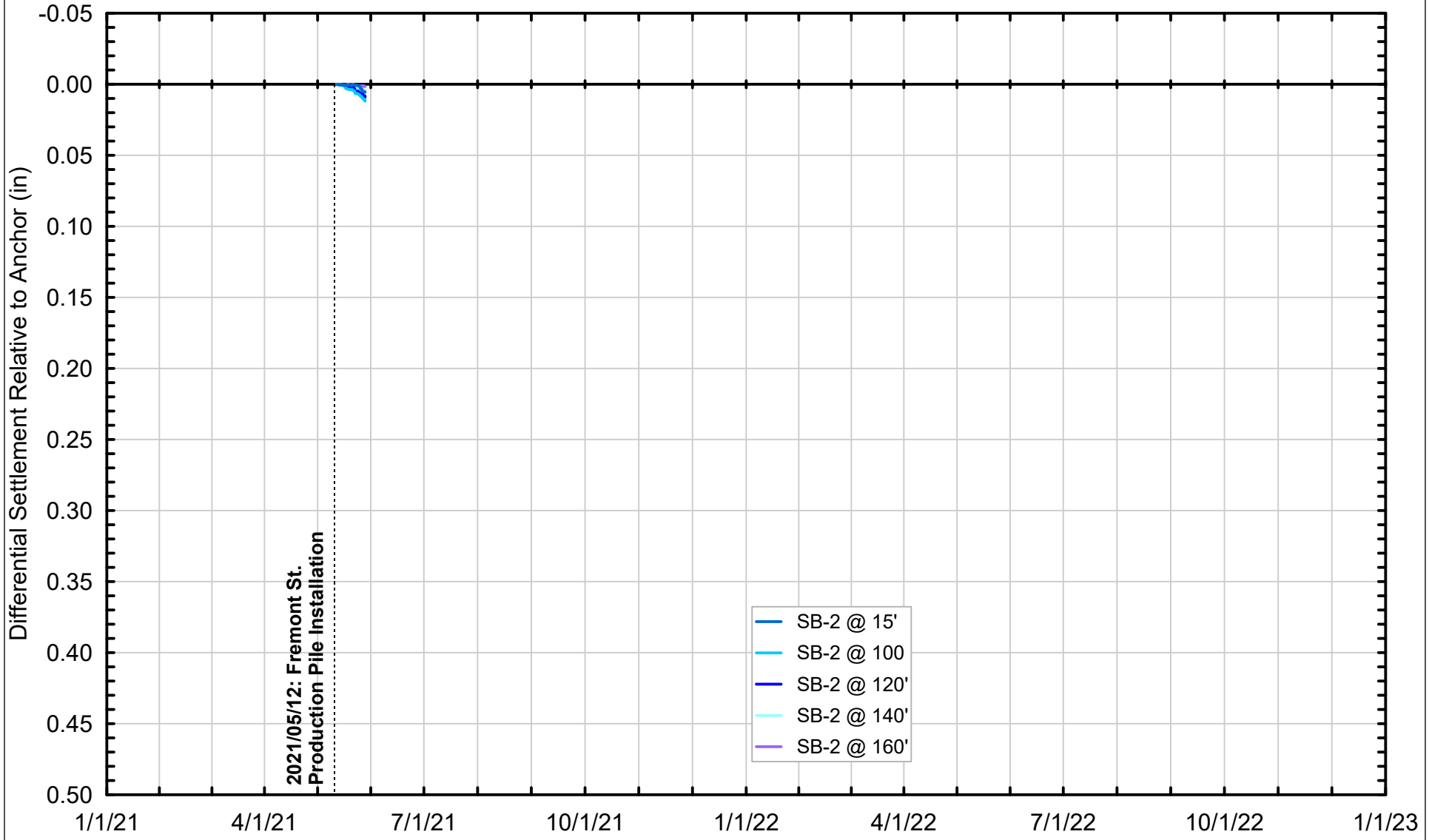
Project No: 19-009.00	Date: 5/31/2021	Created By: NBW	Checked By: DGM	Figure No: **004-09**

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GROUNDWATER ELEVATION MEASUREMENTS IN OLD BAY CLAY
SINCE 01/01/2021 THROUGH 05/28/2021

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

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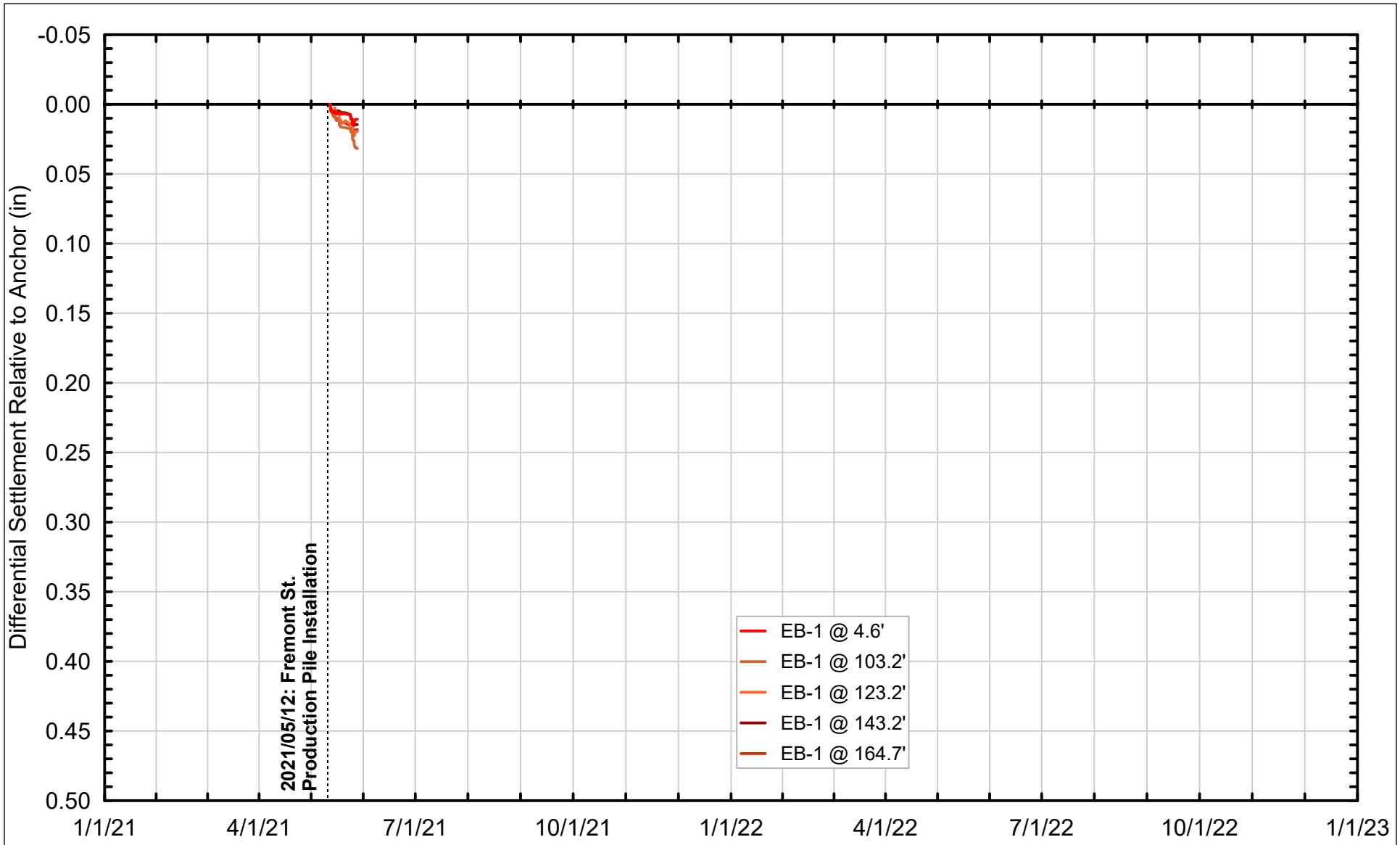
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DIFFERENTIAL EXTENSOMETER DATA FROM WITHIN TOWER BASEMENT
SINCE 05/12/2021 THROUGH 05/28/2021

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

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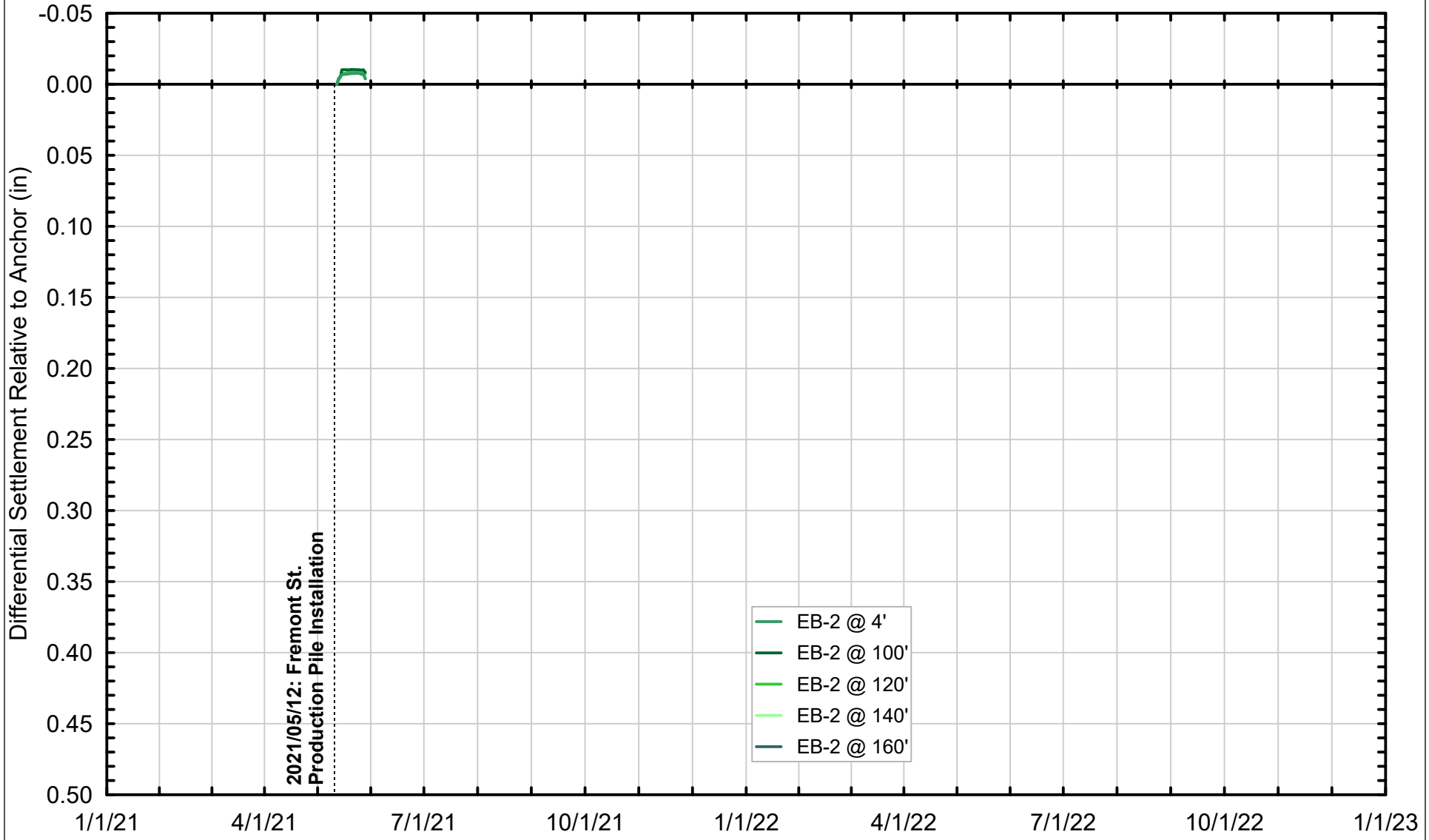
Project No: 19-009.00	Date: 5/31/2021	Created By: NBW	Checked By: DGM	Figure No: **004-11**

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DIFFERENTIAL EXTENSOMETER DATA FROM FREMONT STREET
SINCE 05/12/2021 THROUGH 05/28/2021

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

Filepath: S:\SlateDrive - Documents_Projects_2019\19-009.00_Millennium Tower Retrofit\10_Construction\01_Monitoring Reports\TowerSoilWater\00_Figures\Fig_004-12_Ext_Data_Mission.grf



Project No: 19-009.00	Date: 5/31/2021	Created By: NBW	Checked By: DGM	Figure No: **004-12**

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DIFFERENTIAL EXTENSOMETER DATA FROM MISSION STREET
SINCE 05/12/2021 THROUGH 05/28/2021

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