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Date: May 24, 2021

Project Number: 19-009

Subject: 301 Mission Retrofit Monitoring Report 003: Results as of May 21, 2021

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## **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 17, 2021. Figure 04 presents current differential settlement contours (in inches) on May 17, 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 20, 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 21, 2021.

Figure 10 presents extensometer data from within the Tower basement since the start of production pile installation (May 12, 2021) through May 14, 2021. Figure 11 presents extensometer data from Fremont Street since the start of production pile installation (May 12, 2021) through May 21, 2021. Figure 12 presents extensometer data from Mission Street since the start of production pile installation (May 12, 2021) through May 21, 2021.

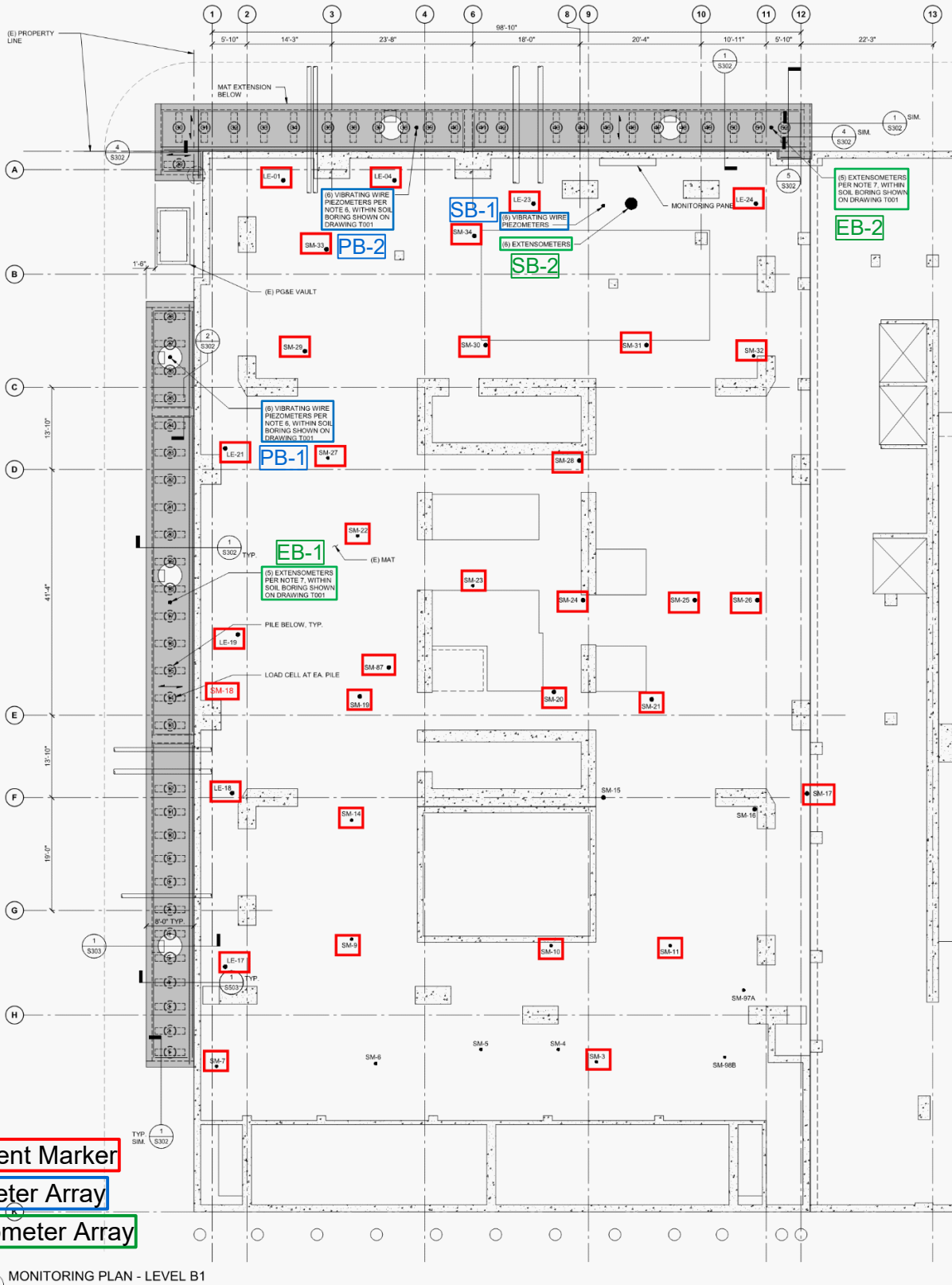


## **CLOSING**

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 05/17/2021
- Figure 04 – Differential Settlement Contours since 05/10/2021 through 05/17/2021
- Figure 05 – Historical Lateral Roof Deflection Data
- Figure 06 – Differential Lateral Roof Deflection Data since 05/10/2021 through 05/20/2021
- 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 5/21/2021
- Figure 09 – Groundwater Elevation Measurements in Old Bay Clay since 1/1/2021 through 5/21/2021
- Figure 10 – Extensometer Data from within Tower Basement since 5/12/2021 through 5/21/2021
- Figure 11 – Extensometer Data from Fremont Street since 5/12/2021 through 5/21/2021
- Figure 12 – Extensometer Data from Mission Street since 5/12/2021 through 5/21/2021



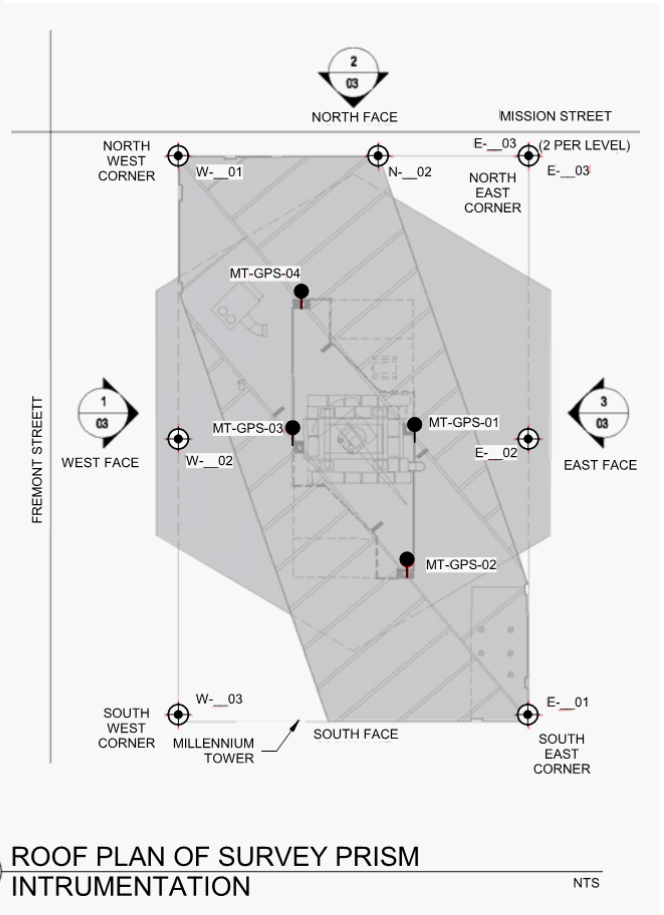
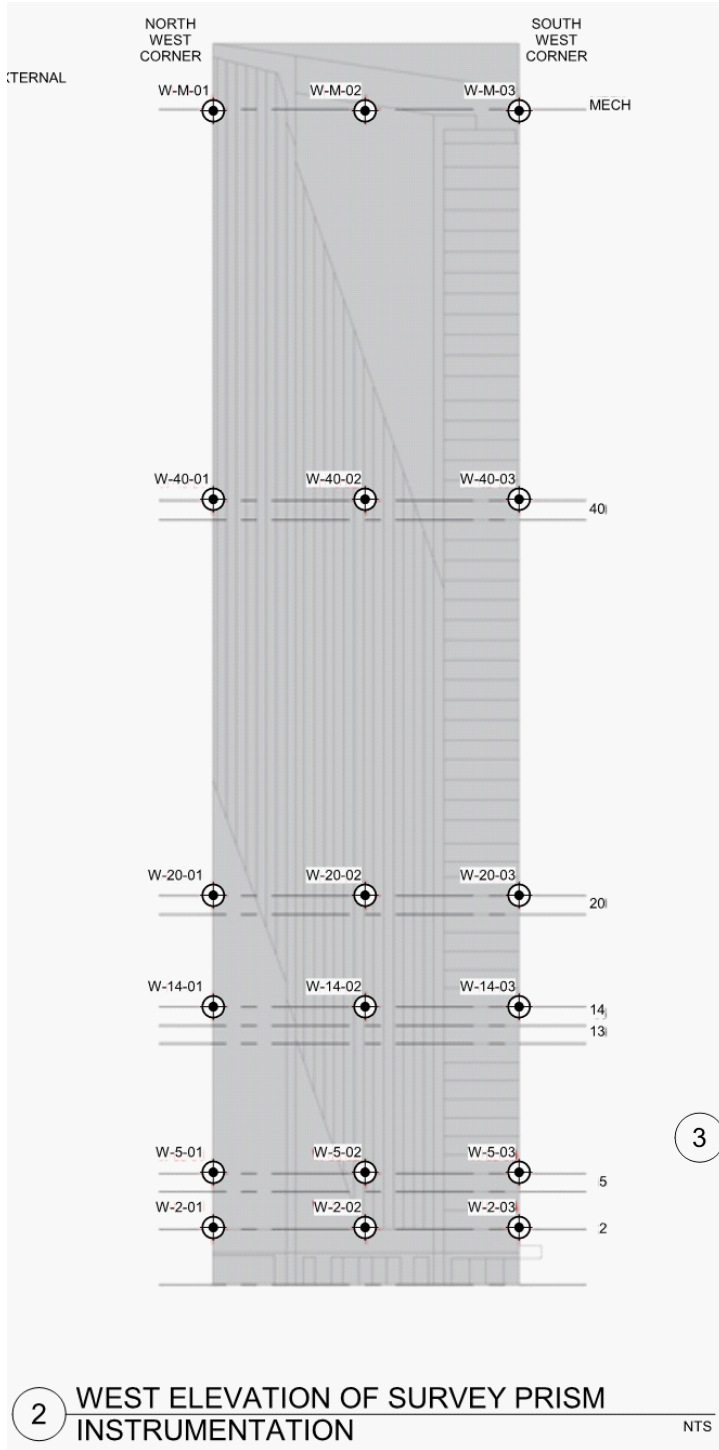
From 301 Mission Perimeter Pile Upgrade IFC 2020-02-25

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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



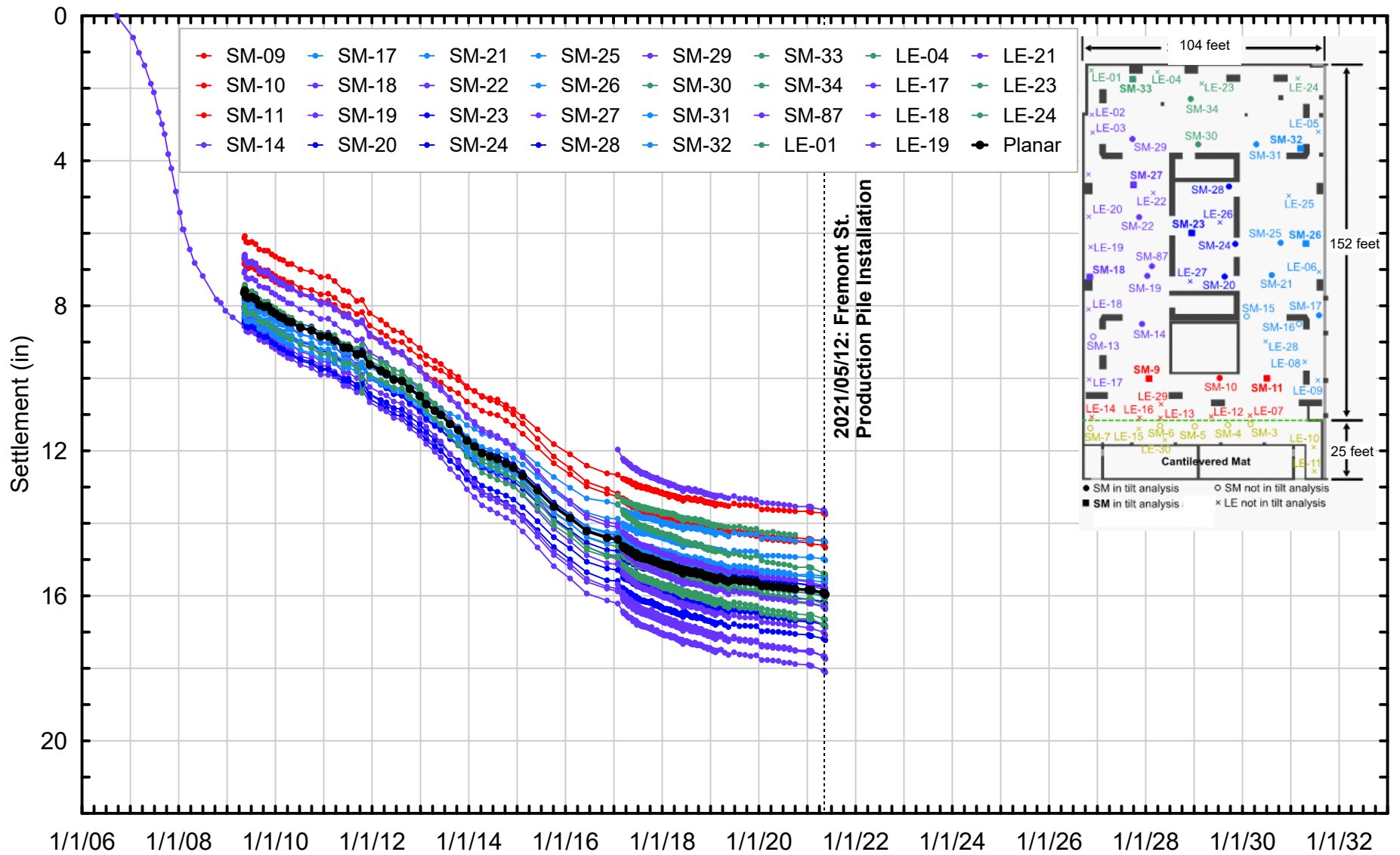
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Project No: 19-009.00	Date: 5/10/2021	Created By: NBW	Checked By: DGM	Figure No: <b>003-01B</b>
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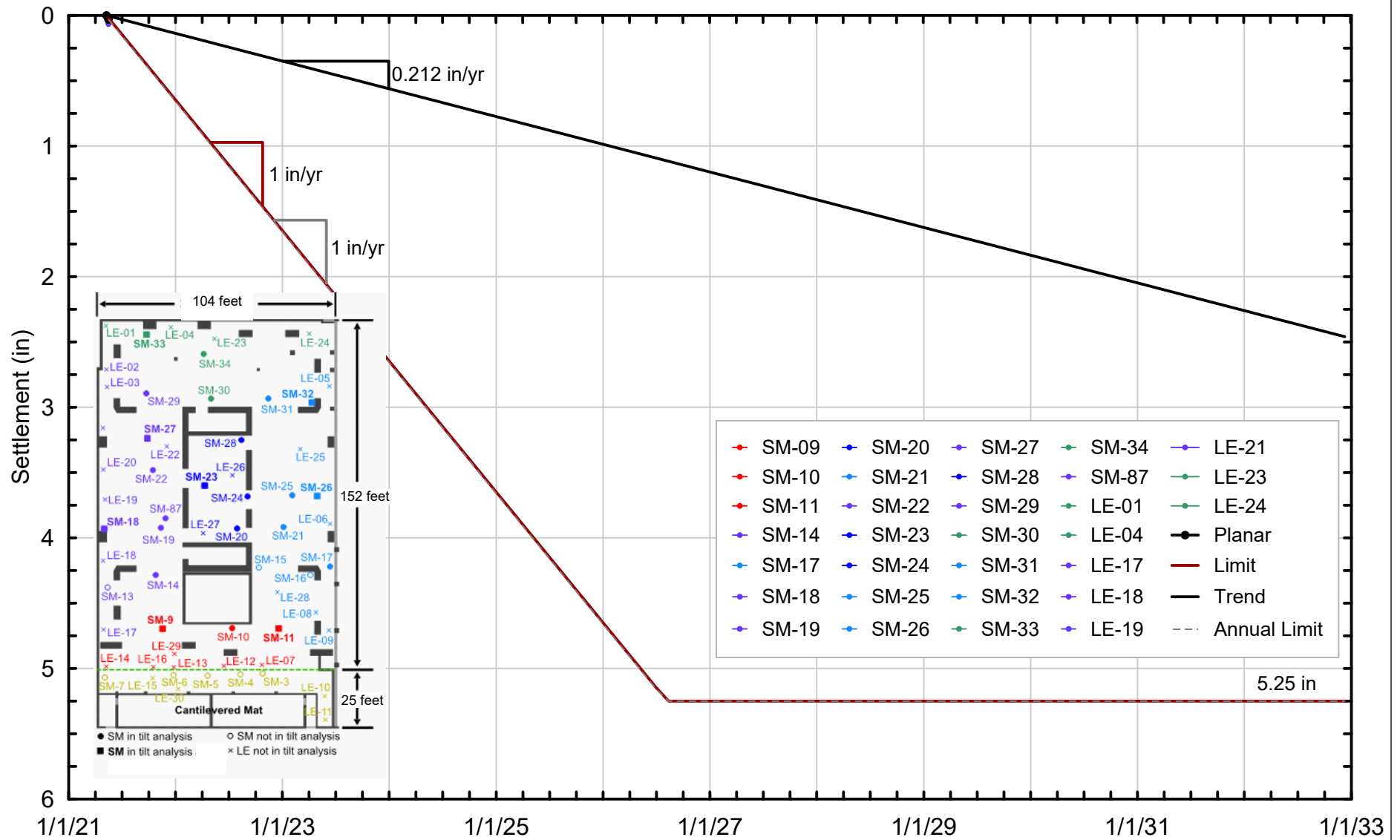


TOWER SURVEY PRISM LOCATION SCHEMATIC

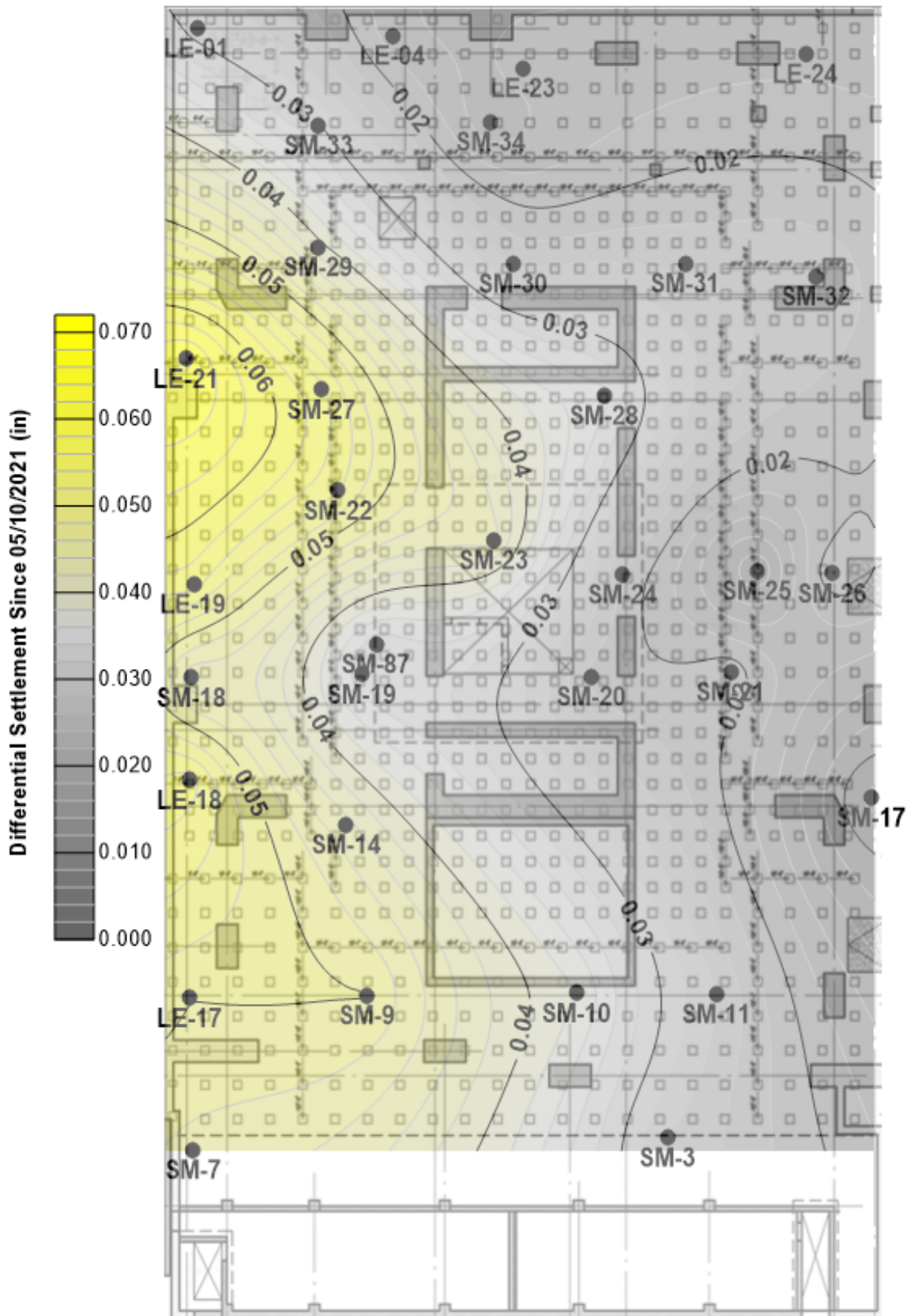
Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data  
City and County of San Francisco, California



Project No: 19-009.00	Date: 5/24/2021	Created By: NBW	Checked By: DGM	Figure No: <b>003-02</b>
		HISTORICAL SETTLEMENT MARKER DATA Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data City and County of San Francisco, California		



Project No: 19-009.00	Date: 5/24/2021	Created By: NBW	Checked By: DGM	Figure No: <b>003-03</b>
		DIFFERENTIAL SETTLEMENT MARKER DATA SINCE 05/10/2021 THROUGH 05/17/2021		
		Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data City and County of San Francisco, California		



Project No: 19-009.00

Date: 5/24/2021

Created By: NBW

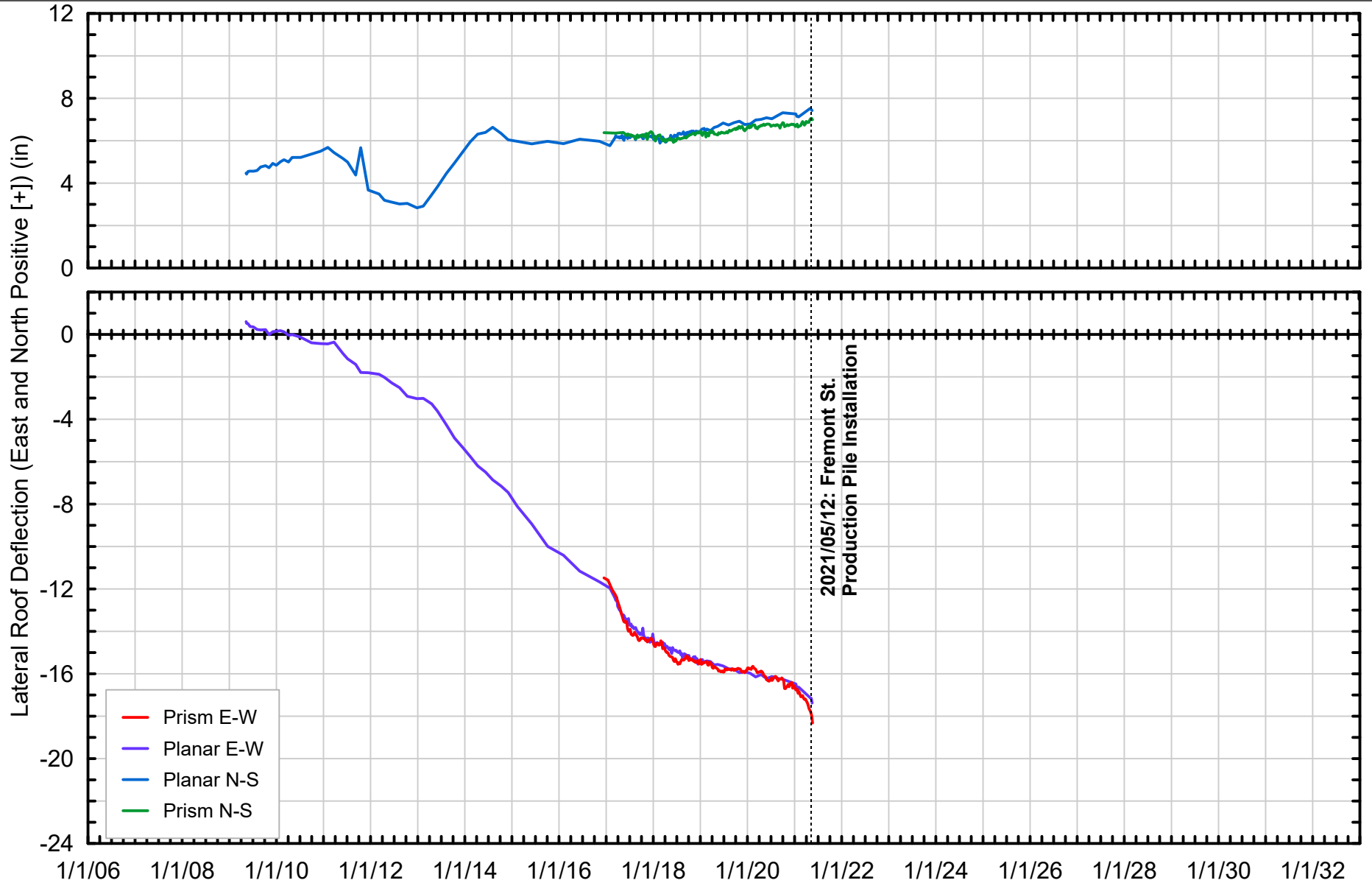
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Figure No: **003-04**



**DIFFERENTIAL SETTLEMENT CONTOURS  
SINCE 05/10/2021 THROUGH 05/17/2021**

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



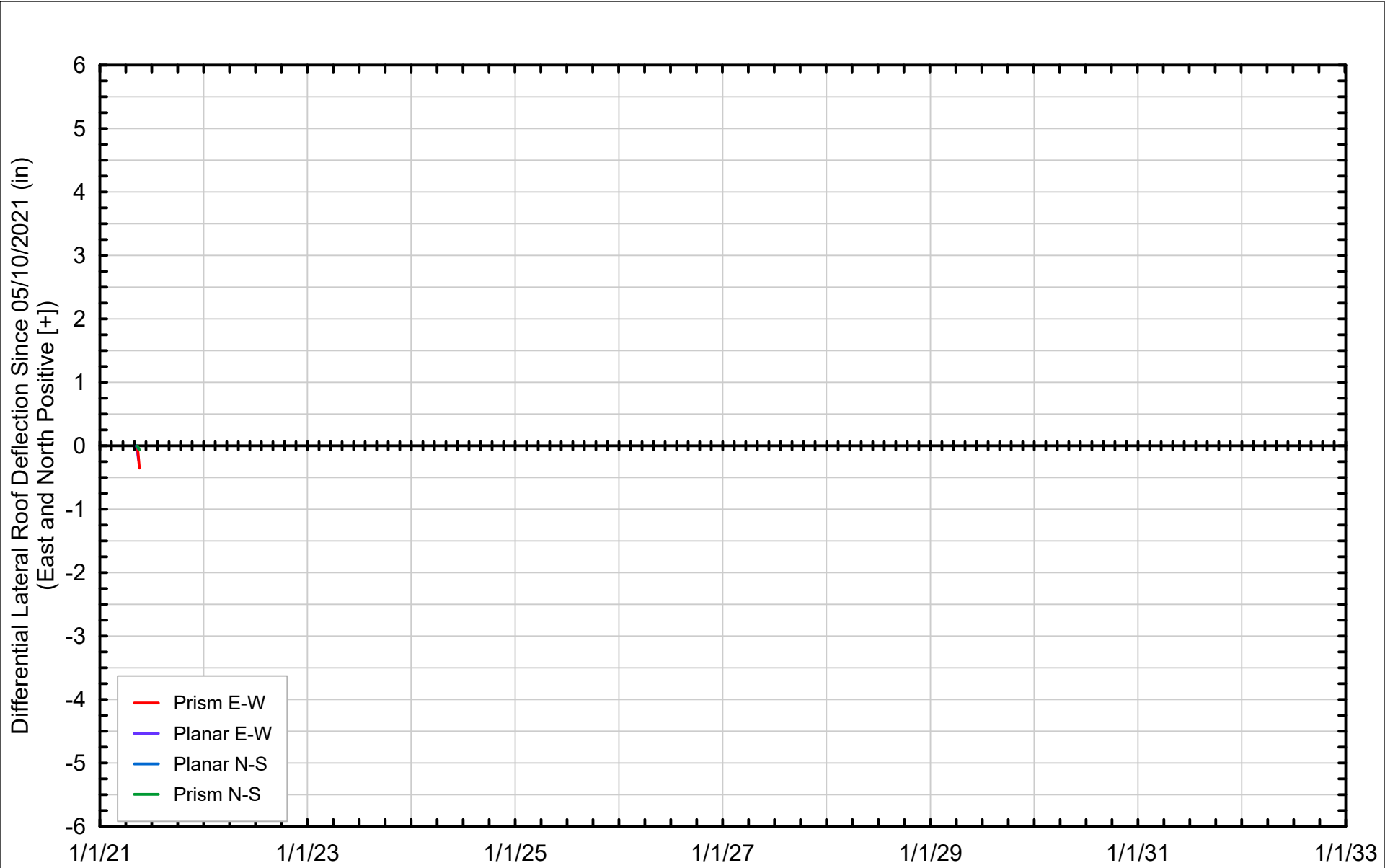
Project No: 19-009.00	Date: 5/24/2021	Created By: NBW	Checked By: DGM	Figure No: <b>003-05</b>
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HISTORICAL LATERAL ROOF DEFLECTION DATA

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



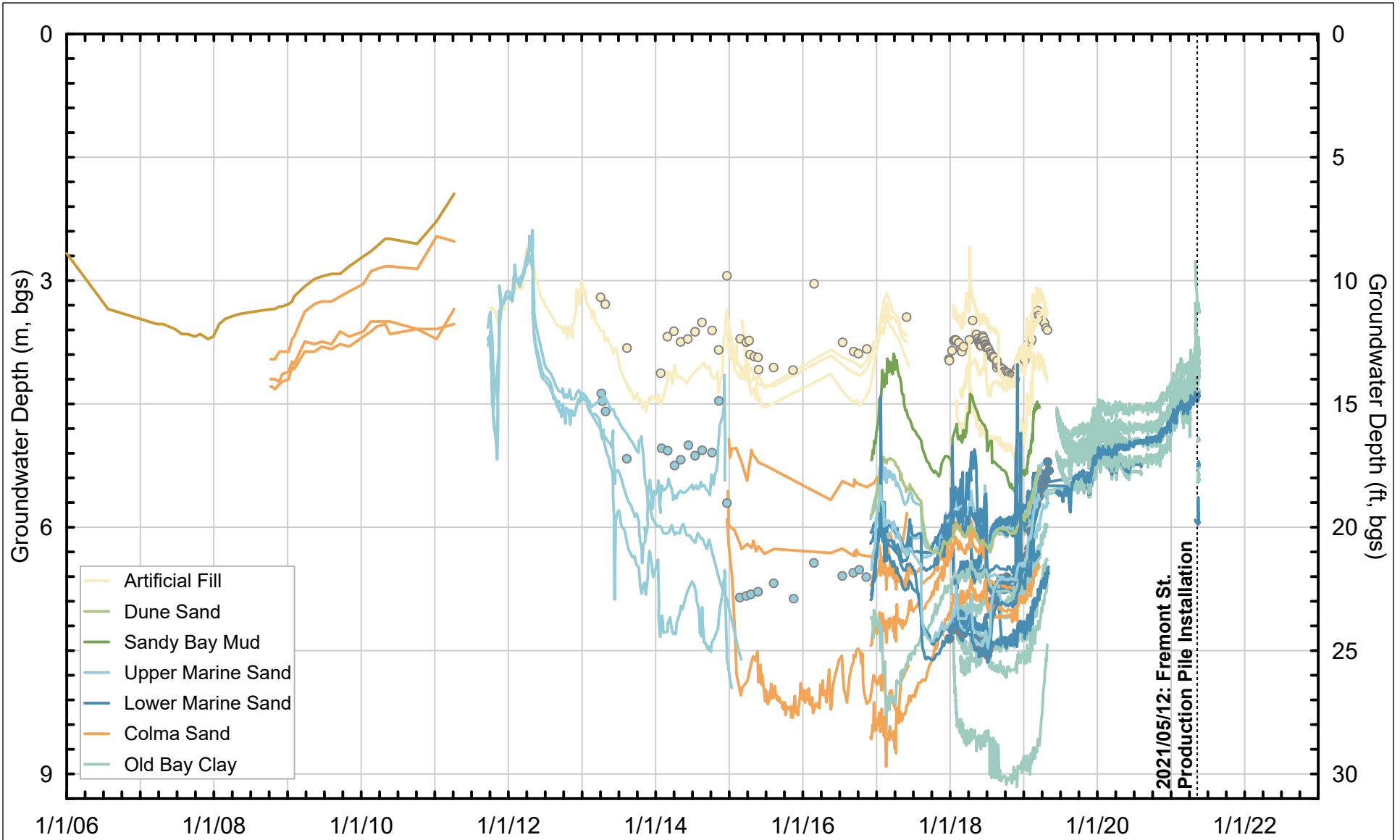


- Prism E-W
- Planar E-W
- Planar N-S
- Prism N-S

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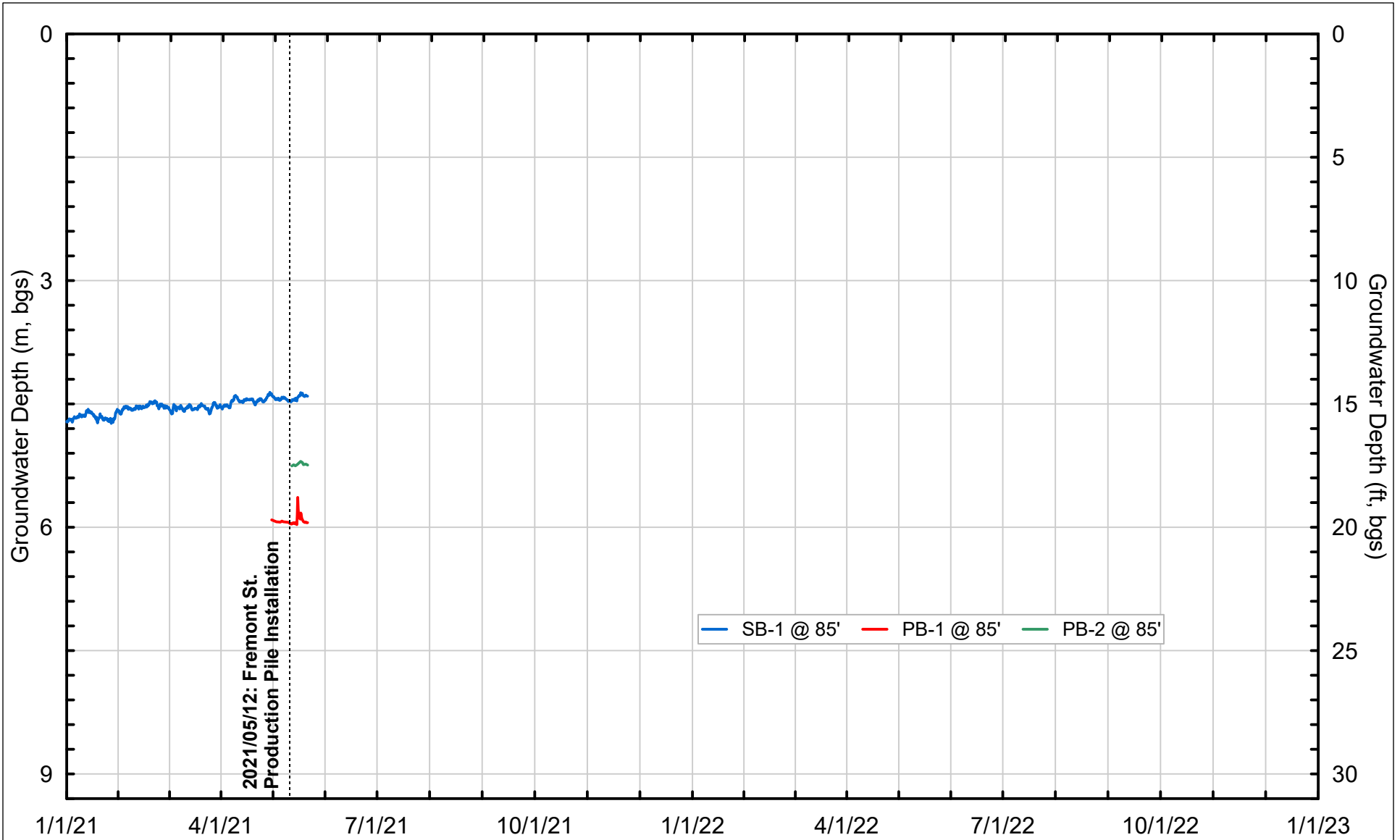
DIFFERENTIAL LATERAL ROOF DEFLECTION DATA  
SINCE 05/10/2021 THROUGH 05/20/2021  
Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data  
City and County of San Francisco, California




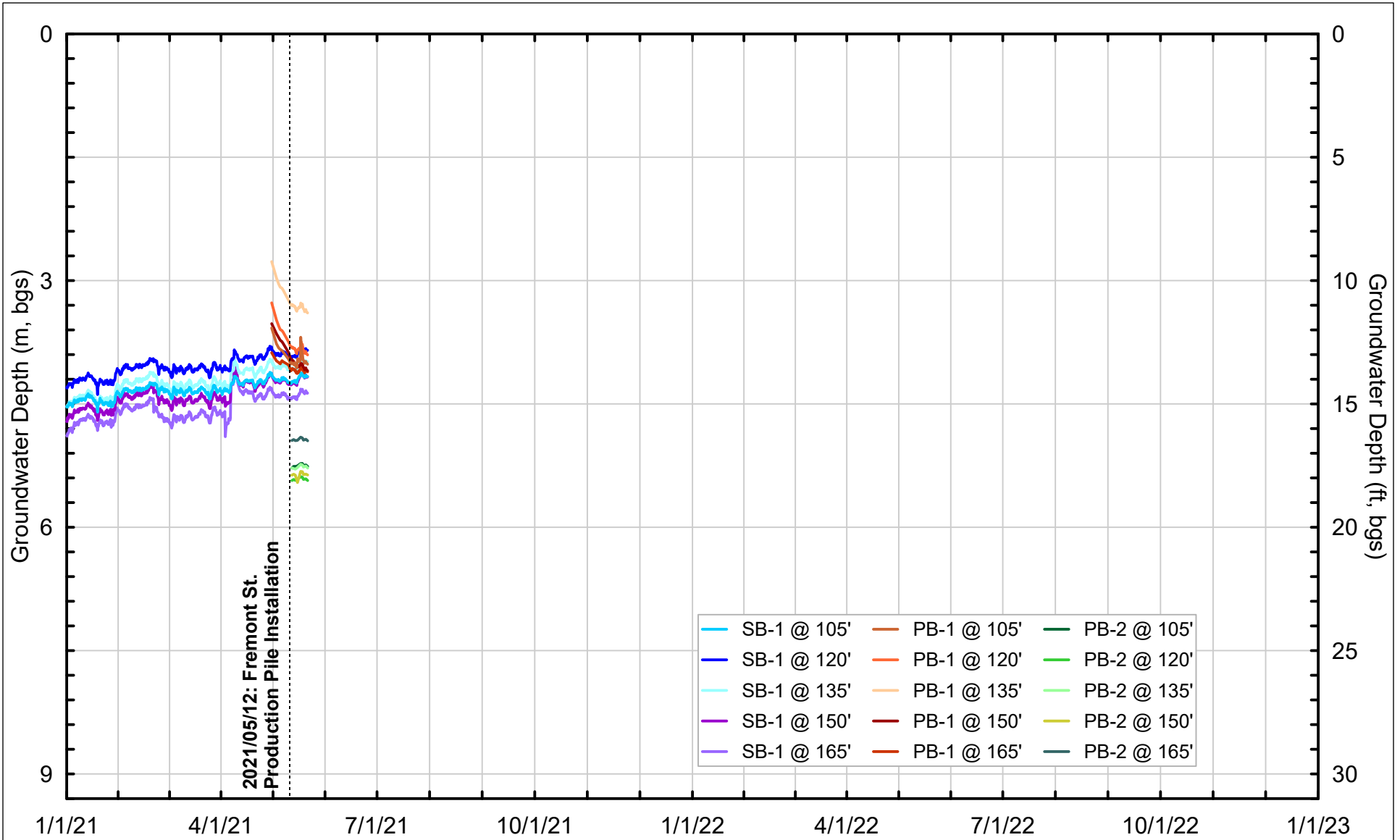
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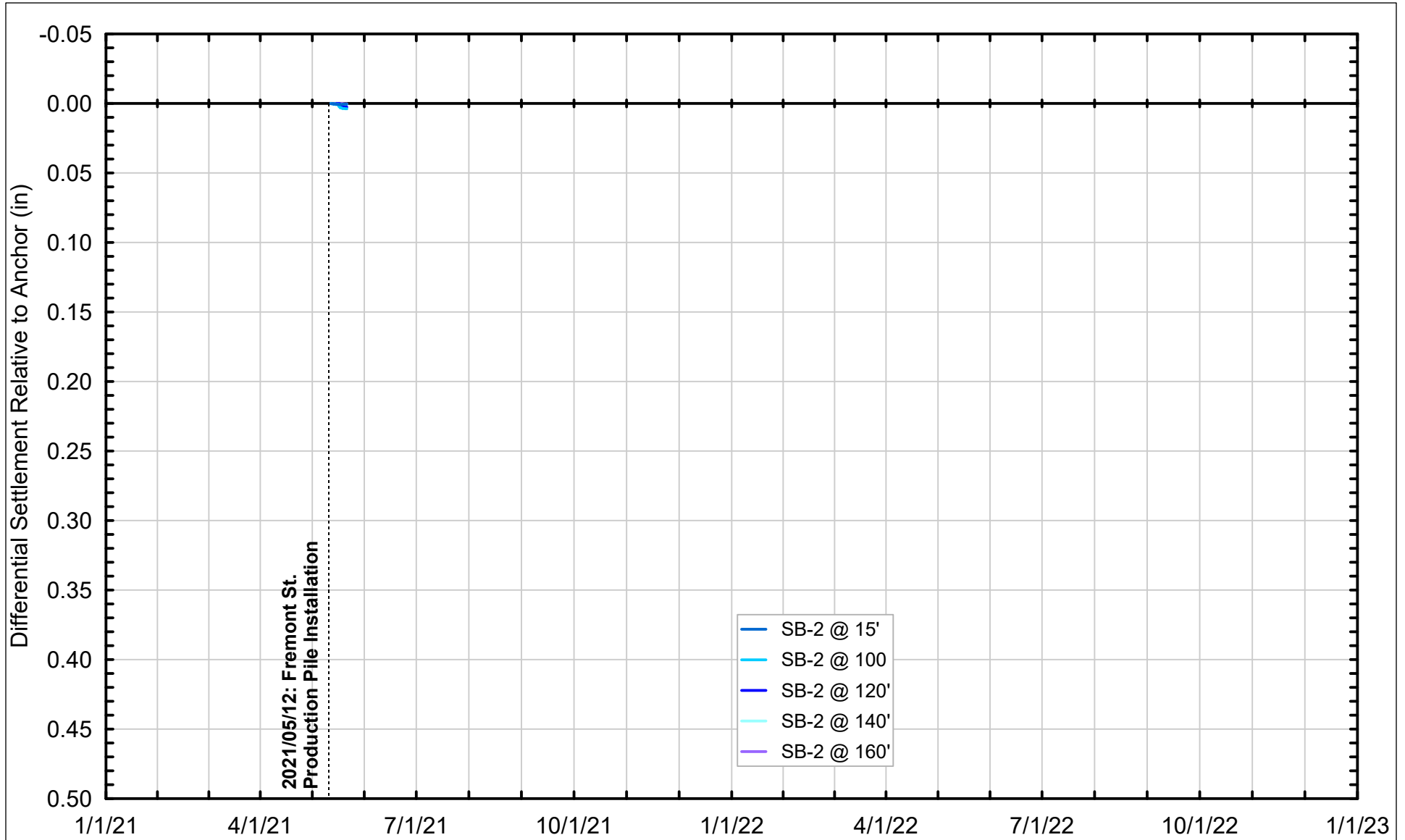
**HISTORICAL GROUNDWATER ELEVATION MEASUREMENTS  
 AT LOCATIONS NEAR 301 MISSION**  
  
 Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data  
 City and County of San Francisco, California



Project No: 19-009.00	Date: 5/24/2021	Created By: NBW	Checked By: DGM	Figure No: <b>003-08</b>
		<p>GROUNDWATER ELEVATION MEASUREMENTS IN MARINE AND COLMA SAND SINCE 01/01/2021 THROUGH 05/21/2021</p> <p>Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data City and County of San Francisco, California</p>		



Project No: 19-009.00	Date: 5/24/2021	Created By: NBW	Checked By: DGM	Figure No: <b>003-09</b>
		<p>GROUNDWATER ELEVATION MEASUREMENTS IN OLD BAY CLAY SINCE 01/01/2021 THROUGH 05/21/2021</p> <p>Millennium Tower Perimeter Pile Upgrade: Instrumentation Monitoring Data City and County of San Francisco, California</p>		

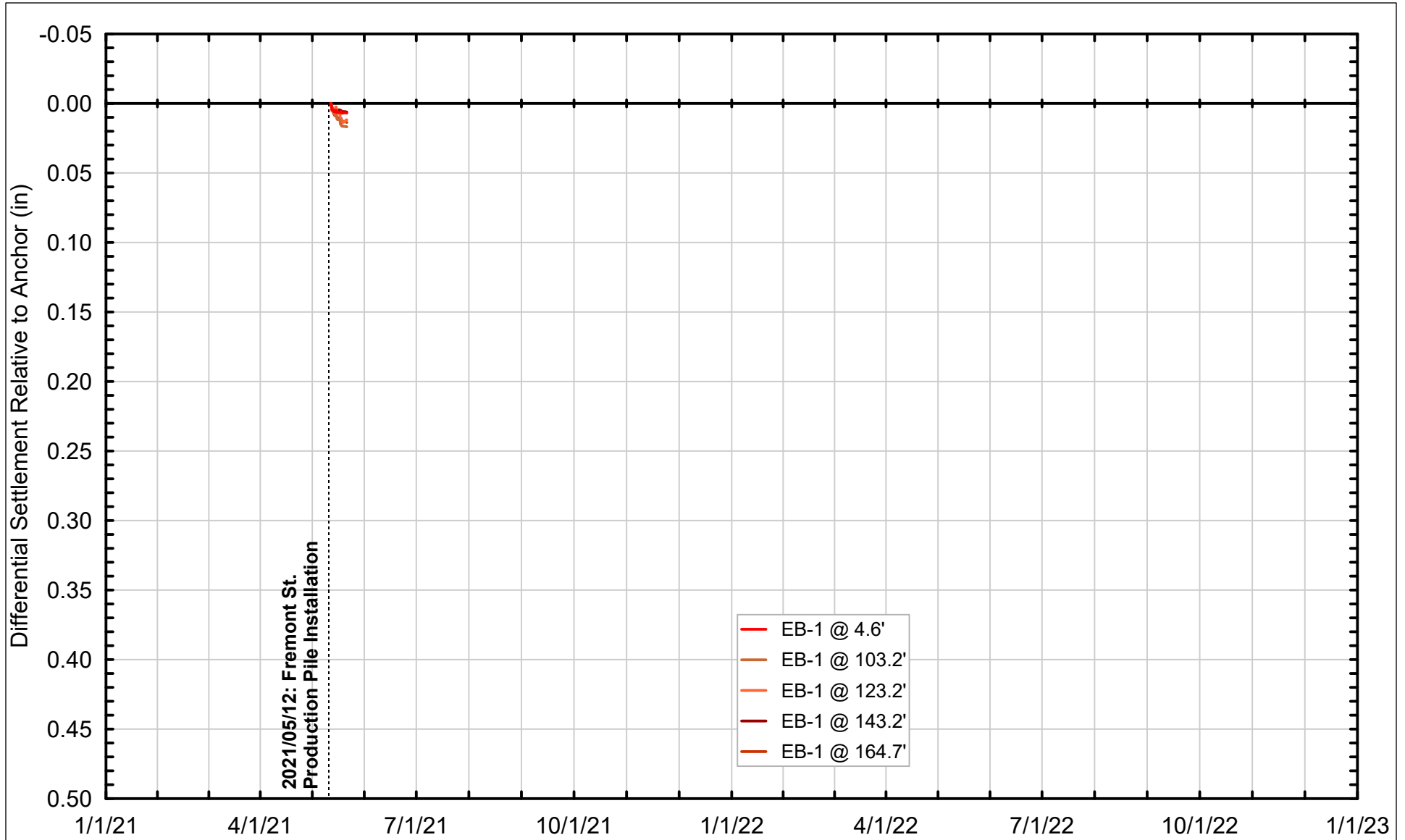


Project No: 19-009.00	Date: 5/24/2021	Created By: NBW	Checked By: DGM	Figure No: <b>003-10</b>
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DIFFERENTIAL EXTENSOMETER DATA FROM WITHIN TOWER BASEMENT  
SINCE 05/12/2021 THROUGH 05/21/2021

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

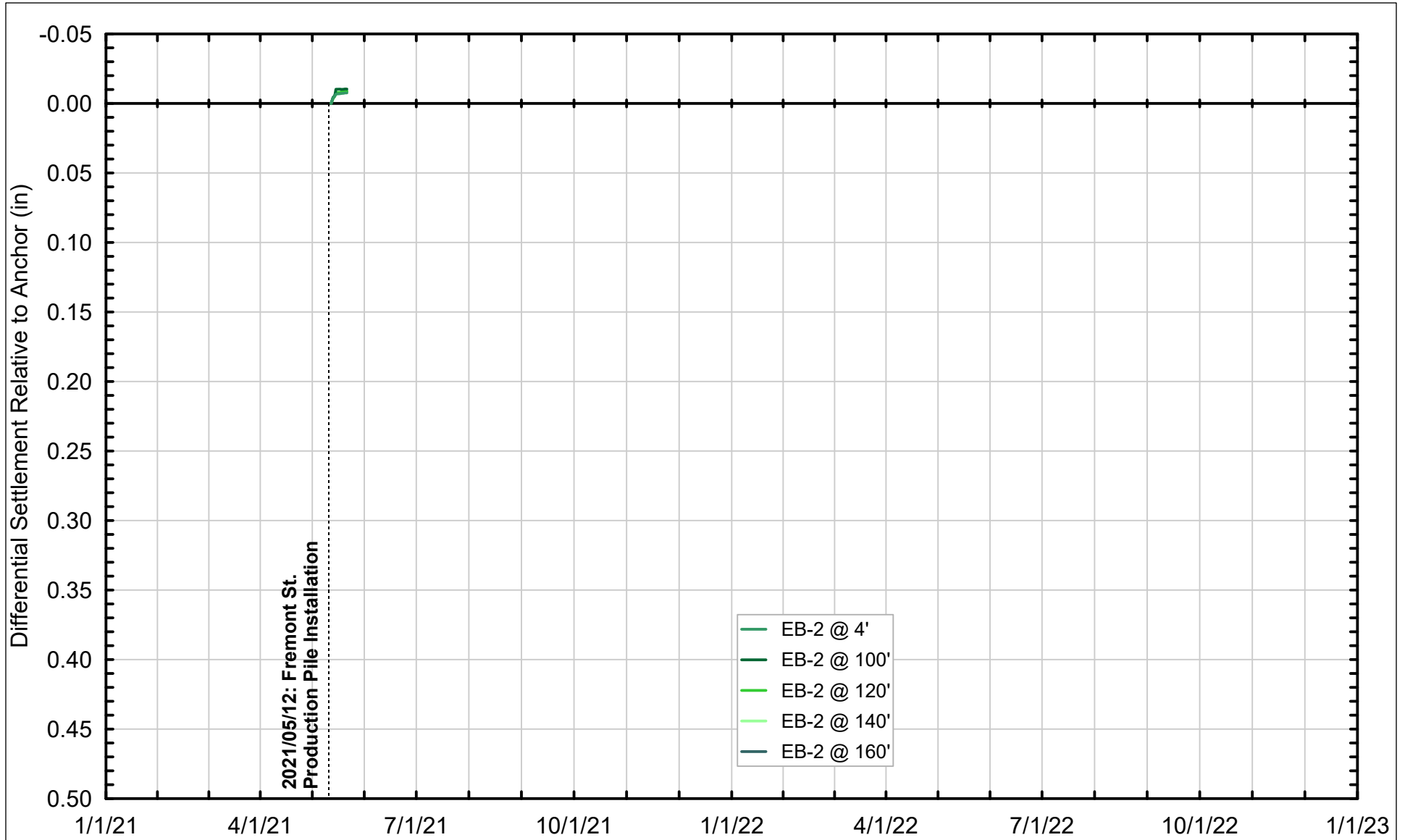


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DIFFERENTIAL EXTENSOMETER DATA FROM FREMONT STREET  
SINCE 05/12/2021 THROUGH 05/21/2021

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



Project No: 19-009.00	Date: 5/24/2021	Created By: NBW	Checked By: DGM	Figure No: <b>003-12</b>
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DIFFERENTIAL EXTENSOMETER DATA FROM MISSION STREET  
SINCE 05/12/2021 THROUGH 05/21/2021

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