

EAST SIDE COASTAL RESILIENCY

SANDRESM2 | PROJECT AREA 2

AIR QUALITY MONITORING REPORT

Q1 | 2024

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SUBCONSULTANT TO PERFETTO CONTRACTING CORPORATION



NEW YORK CITY DEPARTMENT OF DESIGN & CONSTRUCTION IN PARTNERSHIP WITH
THE CITY OF NEW YORK

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PART 1

I. Air Quality Monitoring: Introduction

The East Side Coastal Resiliency (ESCR) project is a coastal protection initiative, jointly funded by the City of New York and the federal government, aimed at reducing flood risk due to coastal storms and sea level rise on Manhattan's East Side from East 25th Street to Montgomery Street. The ESCR project will protect 110,000 New Yorkers from the impacts of climate change by increasing resiliency for communities, properties, businesses, critical infrastructure, and public open spaces. In addition to providing flood protection, the project will strengthen and enhance waterfront spaces on Manhattan's East Side by improving accessibility, increasing ecological diversity, and delivering improved recreational amenities to a vibrant and highly diverse community.

The project is divided into three project areas: Project Area 1 (from Montgomery Street to East 15th Street, including East River Park), Project Area 2 (East 15th Street to East 25th Street, including Murphy Brothers Playground, Stuyvesant Cove Park, and Asser Levy Playground), and Parallel Conveyance (work to improve inland drainage on local streets between Montgomery Street and East 25th Street).

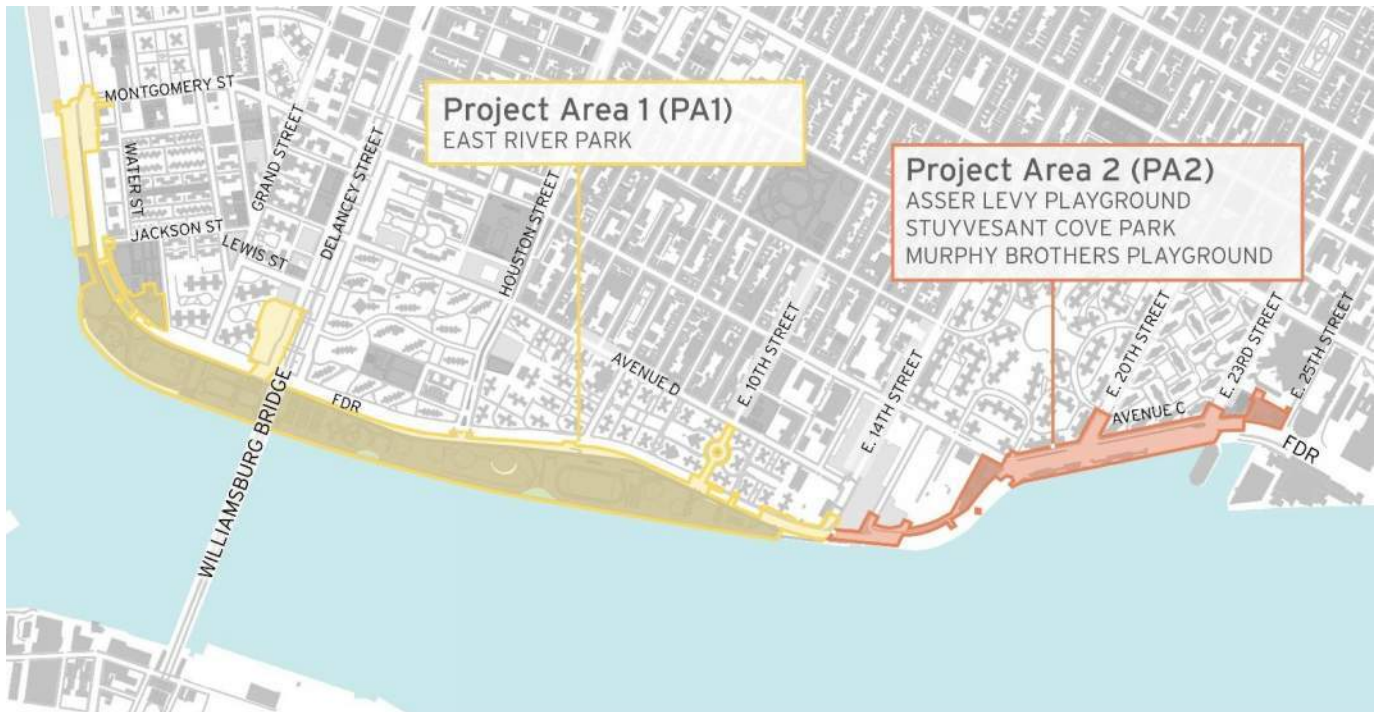


Fig.1 East Side Coastal Resiliency Project Areas

The ESCR team will be conducting air quality monitoring throughout construction in all three Project Areas to ensure the ongoing health and safety of the adjacent community. In particular, the ESCR Air Quality Monitoring (AQM) program will measure levels of Particulate Matter (PM) at two sizes: PM10 and PM2.5.

As described by the [Environmental Protection Agency \(EPA\)](#):

PM stands for **particulate matter** (also called particle pollution): the term for a mixture of solid particles and liquid droplets found in the air. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen with the naked eye. Others are so small they can only be detected using an electron microscope. Particle pollution includes:

- PM10: inhalable particles, with diameters that are generally 10 micrometers and smaller (typically from dust)
- PM2.5: fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller (typically from vehicle emissions)

The Clean Air Act (CAA) requires EPA to set national air quality standards for particulate matter, as one of the six criteria pollutants considered harmful to public health and the environment. The law also requires EPA to periodically review the standards to ensure that they provide adequate health and environmental protection, and to update those standards as necessary. National Ambient Air Quality Standards (NAAQS) for PM pollution specify a maximum amount of PM to be present in outdoor air.

The **Permissible Exposure Limit (PEL)** is a regulatory limit to protect public health/welfare set by the NAAQS in line with the requirements of the Clean Air Act on the amount or concentration of a substance in the air. The EPA has set a **24-hour time weighted average (TWA)** as standard for evaluating PM levels, meaning that they average potential PM exposure over a 24-hour period. This is also referred to as the **daily value**. In the line graphs presented in the ESCR monthly data plots, readings are averaged in 15-minute intervals and do not represent the standard TWA of 24-hrs. This more conservative approach will help the ESCR project team monitor the project’s effect on air quality more closely.

The **Action Level (AL)** is lower than the PEL and represents a level set by the ESCR AQM Plan which, when reached, will alert the contractor that there has been an increase in particulate matter so that they can assess construction activities and take necessary measures to remediate the condition. Automated alerts are dispatched to the general contractor and the construction management team whenever the AL is exceeded.

The table here illustrates the PEL and AL for net PM2.5 and PM10 concentrations over a 24-hour TWA. These levels are measured in micrograms per cubic meter air ($\mu\text{g}/\text{m}^3$):

	Action Level (AL) over a 24-hour TWA	Permissible Exposure Limit (PEL) over a 24-hour TWA
PM2.5	25 $\mu\text{g}/\text{m}^3$	35 $\mu\text{g}/\text{m}^3$
PM10	100 $\mu\text{g}/\text{m}^3$	150 $\mu\text{g}/\text{m}^3$

The ESCR Final Environmental Impact Statement (FEIS) analyzed the potential impact of the construction on community air quality and determined that **with consistent air quality monitoring and application of measures to reduce pollutant emissions and suppress dust, “construction of the Preferred Alternative would not result in any predicted concentrations above the National Ambient Air Quality Standards (NAAQS) for NO₂, CO, and PM10 or the de minimis thresholds for PM2.5 from nonroad and on-road sources. Therefore, no significant adverse air quality impacts are predicted from the construction of the Preferred Alternative.”** (ESCR FEIS, Chapter 6.10 Construction Air-Quality, 6.10-2)

Along with air quality monitoring, the contractor is required to take extensive preventative measures to control dust and limit vehicle emissions. Potential mitigation techniques include but are not limited to:

- use of water spray for roads, trucks, excavation areas and stockpiles
- use of anchored tarps to cover stockpiles
- use of truck covers during soil transport within site limits and during off-site transport
- employment of extra care during dry and/or high-wind periods

- use of gravel or recycled concrete aggregate on egress and other roadways to provide a clean and dust-free road surface
- use of a truck wheel wash at site access/egress points to prevent fugitive dust and off-site migration of dust and other particulates

How to Read the Data Plots

The PM readings that follow by month in this report are shown in data plots, as below. The data plots illustrate **Net Particulate Matter (Net PM)** levels (blue line on data plot) in a **15-minute TWA**. As mentioned above, the federal limits for PM exposure are evaluated on a **24-hour TWA**. By evaluating PM readings on the 15-minute TWA, the ESCR project can ensure that Net PM never exceeds the 24-hour TWA, or daily value.

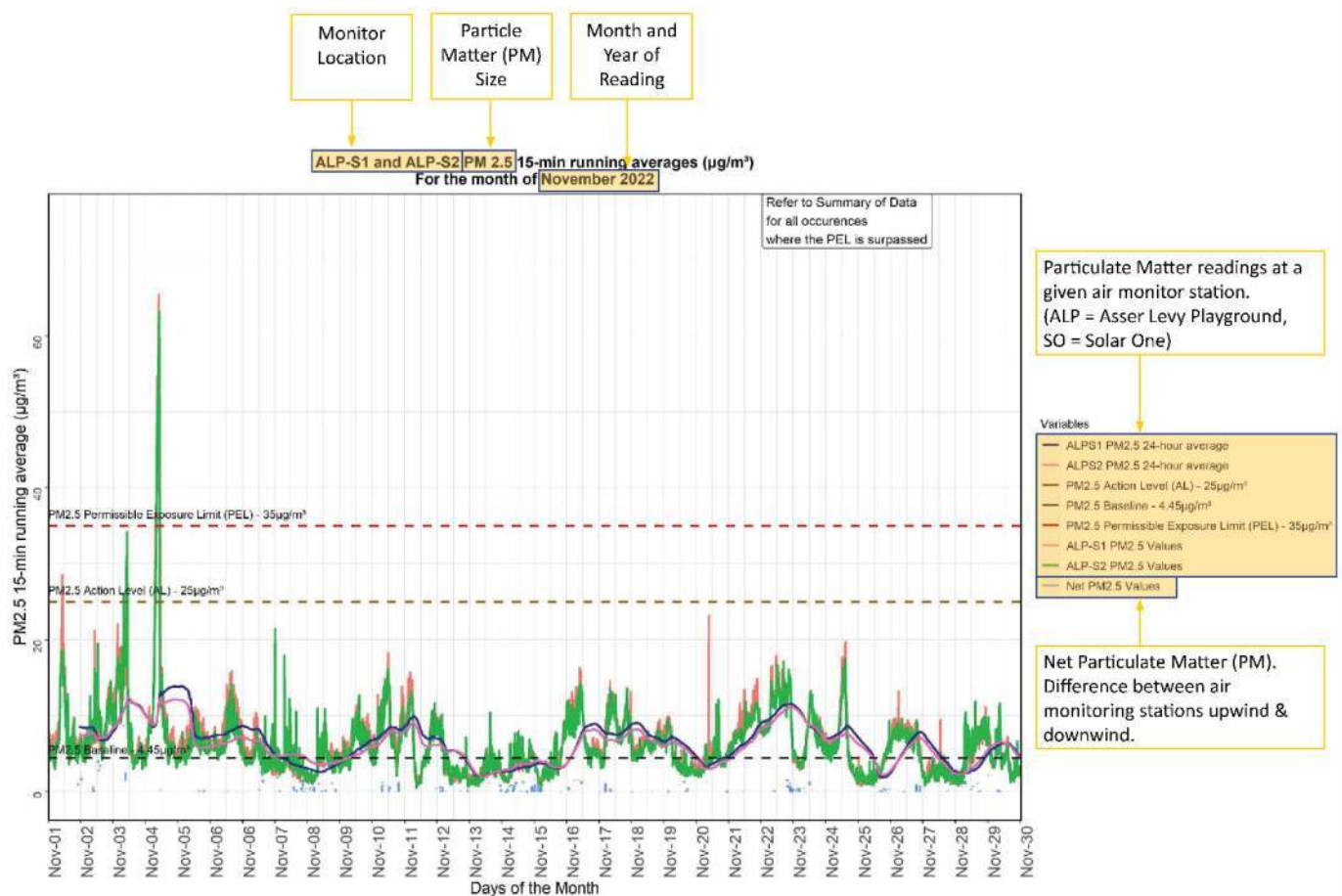


Fig.2 Sample Air Quality Data Plot

The **Net PM** readings are determined as the difference between the upwind and downwind monitoring stations as determined on any day given the wind speed and wind direction. At each construction location at least two air quality monitors are required to determine the Net PM. The Net PM value is important because it measures the **potential increase of particulate matter due to construction activities**. If the wind-speed is less than 0.5 meters per second, the downwind station is considered undetermined, and the Net PM will be absent from the data plot. In these circumstances, high readings at one or both monitoring stations will still be noted, however the increased levels in the PM readings may be due to conditions unrelated to construction.

And **exceedance** is a daily value that is above the level of the 24-hour time weighted average after rounding to the nearest $10 \mu\text{g}/\text{m}^3$ (i.e., values ending in 5 or greater are to be rounded up).

An **exceptional event** is an uncontrollable event caused by natural sources of particulate matter or an event that is not expected to recur at a given location. Inclusion of such a value in the computation of exceedances or averages could result in inappropriate estimates of their respective expected annual values.

An **outlier** is a data point on a graph or in a set of results that is very much bigger or smaller than the next nearest data point. For example, outliers among monitoring data can be due to instrument malfunctions, the influence of harsh environments, and the limitation of measuring methods.

II. Executive Summary

This report summarizes the Particulate Matter (PM) readings for ESCR Project Area 2 (PA2), collected by Distinct Environmental Group, environmental subconsultant to the PA2 contractor, Perfetto Contracting Corporation (PCC), from January through March 2023. The PA2 contract requires a minimum of four (4) air quality monitoring stations throughout construction, which will be relocated as necessary to reflect the phased construction activities. Figure 3A details the location the air quality monitoring stations from January to March 21st, 2023.



Fig.3A ESCR Project Area 2 Phase 3 Air Quality Monitoring Station Locations, January – March 21st, 2023

Due to construction activities, by March 22nd, 2023 of this period, the SO-S4 monitor was relocated from East 23rd Street to an onsite location along the FDR and installed at the location shown below; the monitor began recording upon installation. Figure 3B details the updated locations of the air quality monitoring stations.



Fig.3B ESCR Project Area 2 Phase 3 Air Quality Monitoring Station Locations, as of March 22nd, 2023

Work Activities from January to March 2024:

- Installation of steel piles and micropiles for floodwall and floodgate footings at East 15th and East 16th Street;
- Installation of single slope barrier on the FDR southbound;
- Installation of step-down wall;
- Installation of manhole on the West Service Road, north of East 23rd Street; and
- Installation of jet grout in the floodwall and floodgate footings at East 15th and East 16th Street.

Though air quality is monitored 24/7, typical work hours during the period of this report were 7:00 am – 3:30 pm.

Summary of Air Quality Monitoring Reports

For the months of January - March 2024, construction-related levels of PM at both net PM2.5 and PM10 levels did not surpass Daily Permissible Exposure Limits (PEL) as set by federal standards for the 24-hour Time Weighted Average (TWA), or daily value, and did not cause air quality concerns to the public or on-site workers. The contractor, PCC, in conjunction with the contractor's environmental specialist, has successfully implemented mitigation techniques at both Action Levels as well as PEL (15-minute TWA) to suppress construction activity effects on air quality at throughout the Project Area 2 work-zone. Air quality impacts from construction activities were observed during multiple days in January, February, and March 2024.

January 2024:

- PM2.5 levels surpassed the PEL (15-minute TWA) at ALP-S1 on January 22nd, ALP-S2 on January 22nd and January 30th, SO-S3 on January 11th, and SO-S4 on January 3rd, January 4th, January 5th, January 6th, and January 11th.
- PM10 levels surpassed the PEL (15-minute TWA) at SO-S3 on January 11th and SO-S4 on January 4th and January 11th.

February 2024:

- PM2.5 levels surpassed the PEL (15-minute TWA) at ALP-S1 on February 8th, February 9th, February 15th, February 16th, and February 27th and ALP-S2 on February 3rd, February 6th, February 9th, February 10th, and February 28th.
- PM10 levels surpassed the PEL (15-minute TWA) at ALP-S1 on February 16th and ALP-S2 on February 9th.

March 2024:

- PM2.5 levels surpassed the PEL (15-minute TWA) at ALP-S1 on March 6th, March 13th, March 14th, March 27th, and March 28th and ALP-S2 on March 14th, March 27th, and March 29th.
- PM10 levels did not surpass the PEL (15-minute TWA).

PART 2

Summary of Data January 2024

PM2.5 levels surpassed the PEL (15-minute TWA) at the following locations:

- ALP-S1 on 1/22 for 29 minutes;
- ALP-S2 on 1/22 for 29 minutes and 1/30 for 15 minutes;
- SO-S3 1/11 for 42 minutes; and
- SO-S4 on 1/3 for 7 minutes, 1/4 for 14 minutes, 1/5 for 5 minutes, 1/6 for 6 minutes, and 1/11 for 42 minutes.

PM10 levels surpassed the PEL (15-minute TWA) at the following location:

- SO-S3 on 1/11 for 42 minutes; and
- SO-S4 on 1/4 for 14 minutes and 1/11 for 42 minutes.

For the month of January 2024, PM net 2.5 and/or PM net 10 levels were exceeded on 1/3, 1/4, 1/5, 1/6, 1/11, 1/22, and 1/30.

For the month of January 2024, construction-related PM net 2.5 and 10 did not surpass Daily PEL (24-hour TWA).

PM 2.5 $\mu\text{g}/\text{m}^3$

- **ALP:** Elevated PM2.5 $\mu\text{g}/\text{m}^3$ levels were recorded on two dates (1/22 and 1/30) for between 15 and 29 minutes.
 - ALP-S1 is located at the intersection of Avenue C and East 18th Street; elevated readings on 1/22 were related to unknown causes without a specific identifiable construction operations cause. No further actions were taken.
 - ALP-S2 is located at the intersection of Avenue C and East 18th Street, by the FDR onramp; elevated readings on 1/22 and 1/30 were related to unknown causes without a specific identifiable construction operations cause. No further actions were taken.
- **SO:** Elevated PM2.5 $\mu\text{g}/\text{m}^3$ levels were recorded on five dates (1/3, 1/4, 1/5, 1/6, and 1/11) for between 5 and 42 minutes.
 - SO-S3 is located at the intersection of Avenue C and East 20th Street; elevated readings on 1/11 were related to onsite construction activities. Mitigation measures were enacted to control dust emissions.
 - SO-S4 is located along the FDR between Murphy Brothers Playground and the ConEd facility.
 - Elevated readings on 1/11 were related to onsite construction activities. Mitigation measures were enacted to control dust emissions.
 - Elevated readings on 1/3, 1/4, 1/5, and 1/6 were related to unknown causes without a specific identifiable construction operations cause. No further actions were taken.

PM 10 $\mu\text{g}/\text{m}^3$

- **SO:** Elevated PM10 $\mu\text{g}/\text{m}^3$ levels were recorded on two dates (1/4 and 1/11) for between 14 and 42 minutes.
 - SO-S3 is located at the intersection of Avenue C and East 20th Street; elevated readings on 1/11 were related to onsite construction activities. Mitigation measures were enacted to control dust emissions.

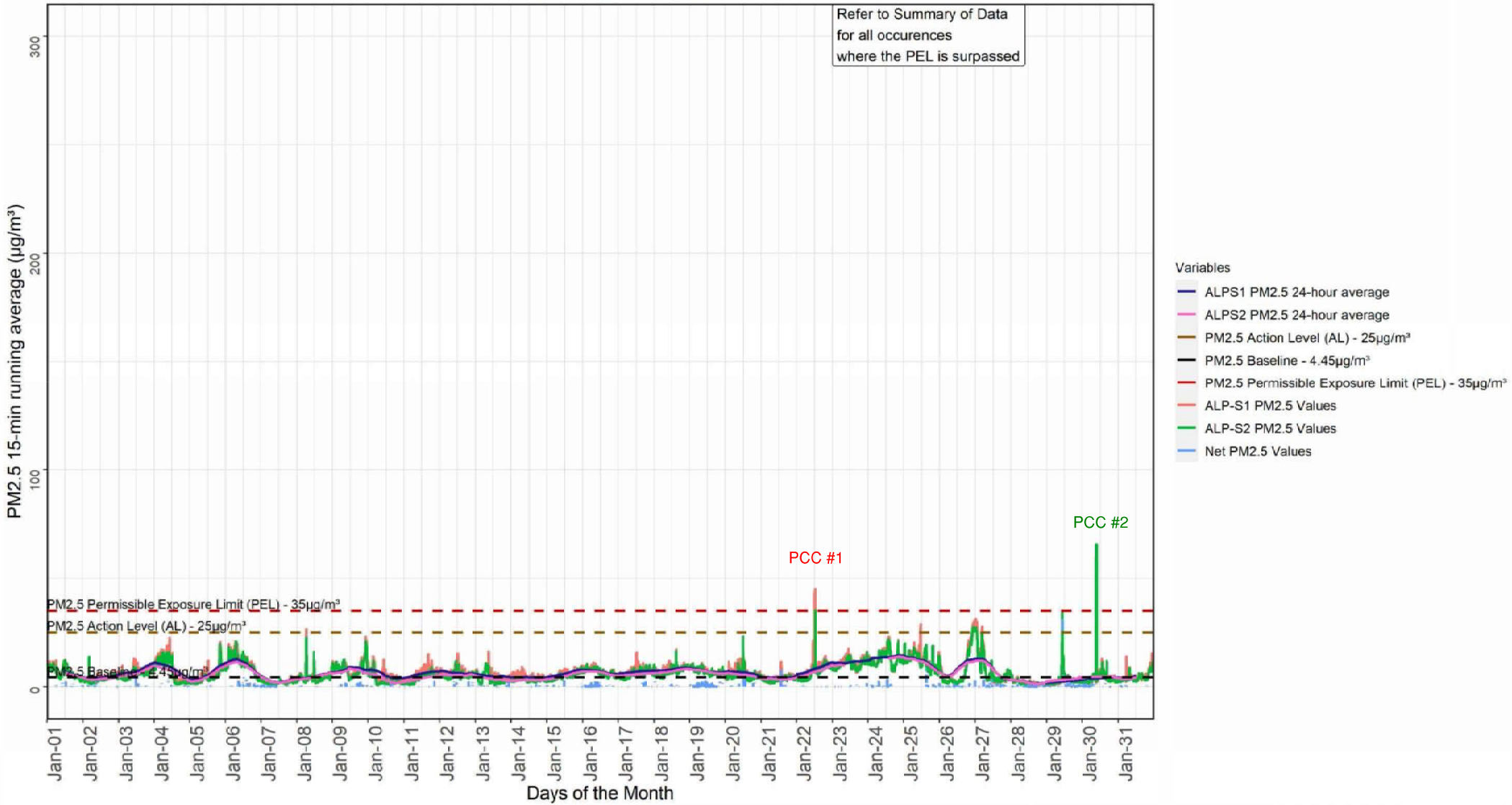
- SO-S4 is located along the FDR between Murphy Brothers Playground and the ConEd facility.
 - Elevated readings on 1/11 were related to onsite construction activities. Mitigation measures were enacted to control dust emissions.
 - Elevated readings on 1/4 were related to unknown causes without a specific identifiable construction operations cause. No further actions were taken.

Mitigation Measures

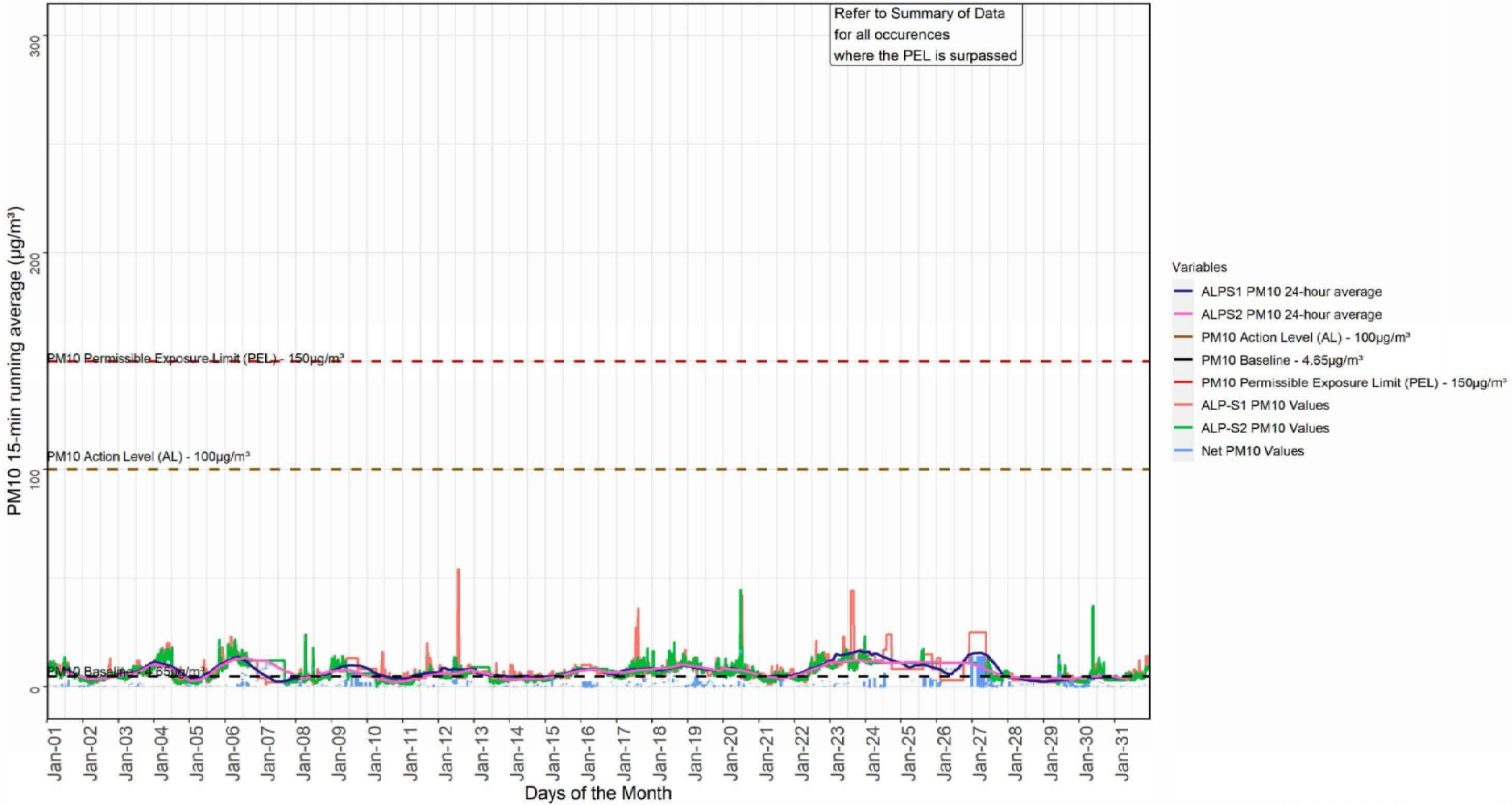
- Throughout the month, construction activity was closely monitored, and dust mitigation techniques were continuously implemented to successfully contain any airborne particulates created due to construction activity.

JANUARY 2024 DATA PLOTS

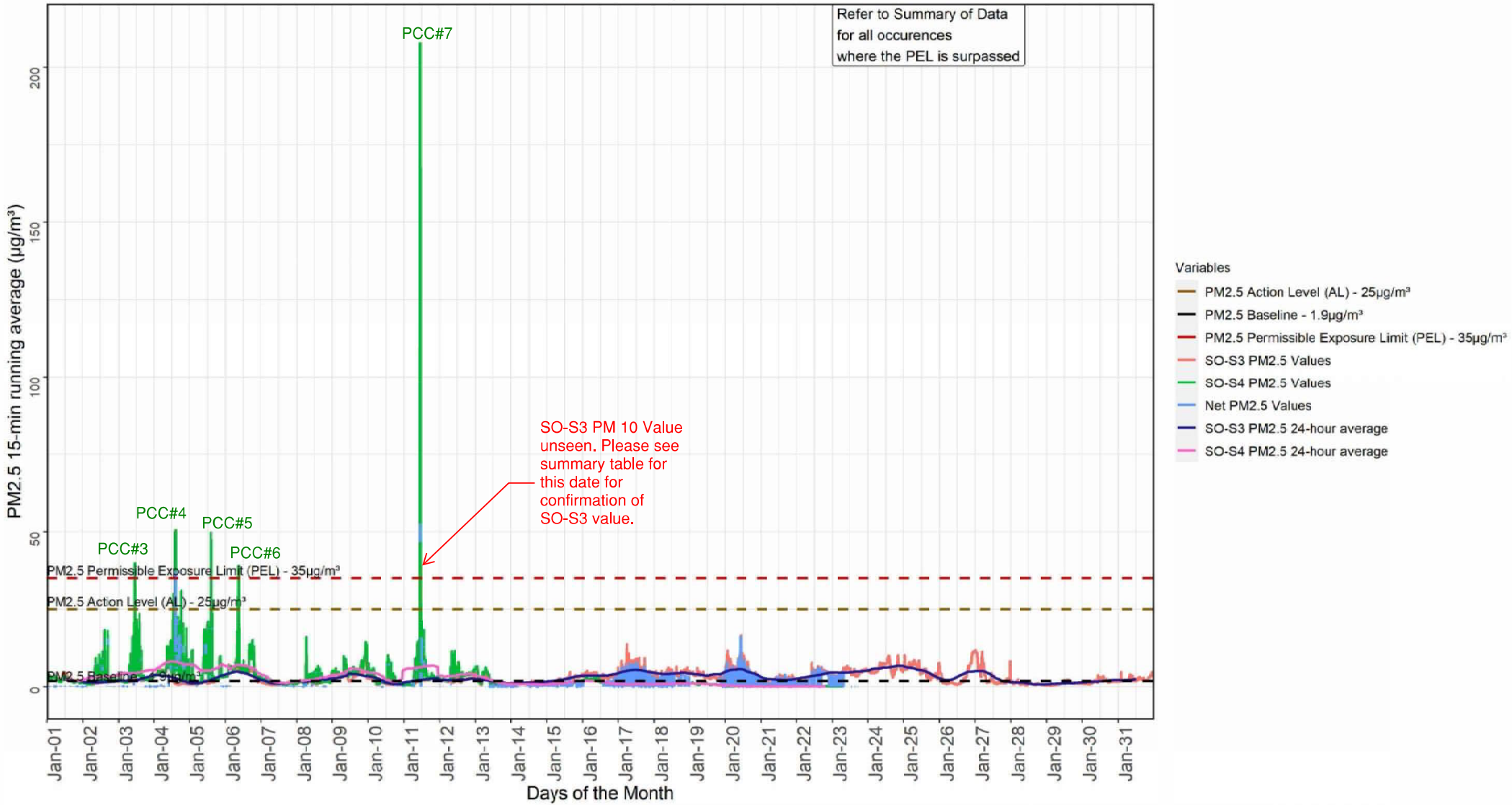
ALP-S1 and ALP-S2 PM 2.5 15-min running averages ($\mu\text{g}/\text{m}^3$)
For the month of January 2024



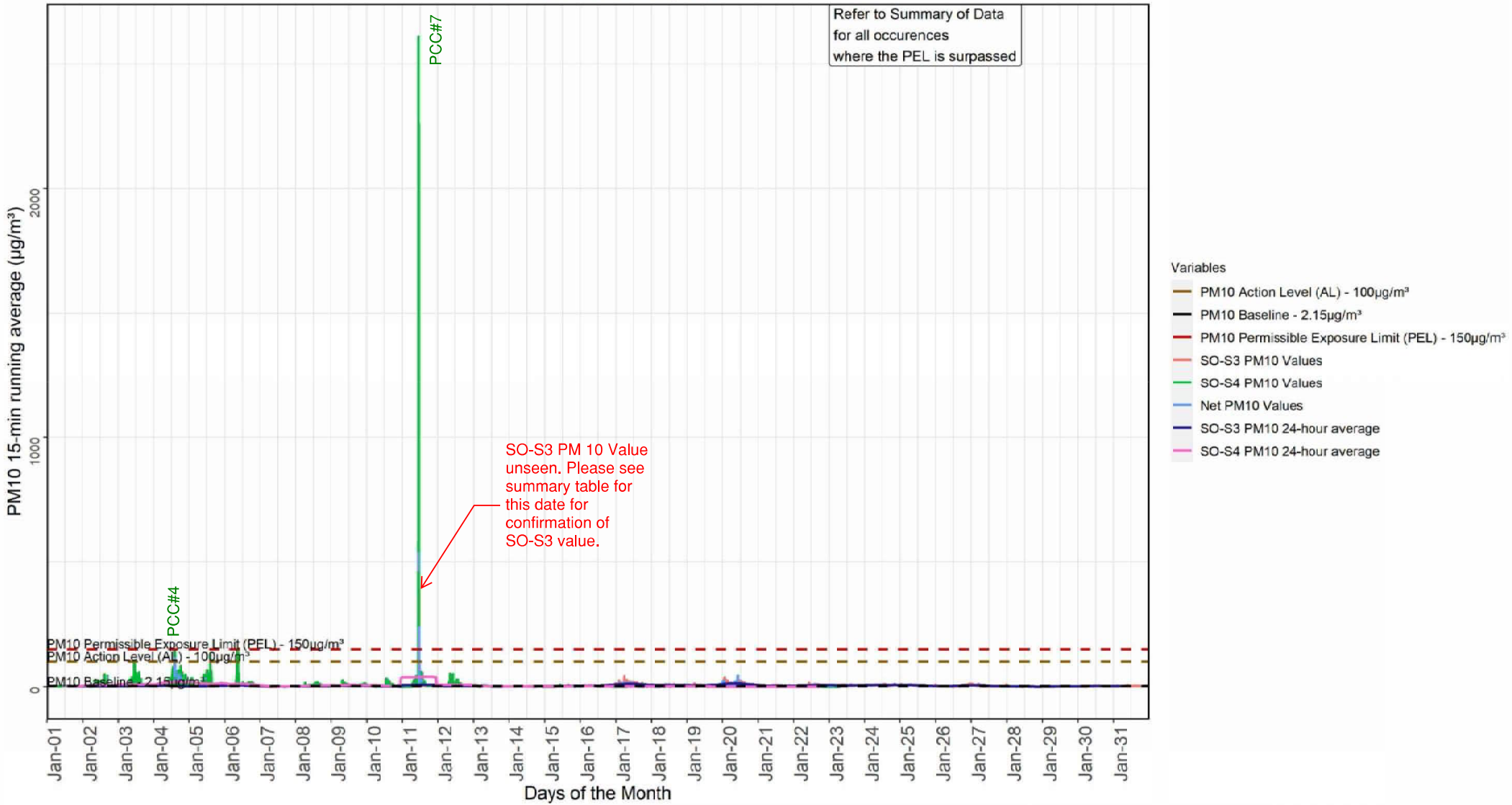
ALP-S1 and ALP-S2 PM 10 15-min running averages ($\mu\text{g}/\text{m}^3$)
For the month of January 2024



SO-S3 and SO-S4 PM2.5 15-min running averages ($\mu\text{g}/\text{m}^3$)
For the month of January 2024



**SO-S3 and SO-S4 PM10 15-min running averages ($\mu\text{g}/\text{m}^3$)
For the month of January 2024**



Summary of Data February 2024

PM2.5 levels surpassed the PEL (15-minute TWA) at the following locations:

- ALP-S1 on 2/8 for 22 minutes, 2/9 for 137 minutes, 2/15 for 14 minutes, 2/16 for 18 minutes, and 2/27 for 8 minutes; and
- ALP-S2 on 2/3 for 7 minutes, 2/6 for 15 minutes, 2/9 for 137 minutes, 2/10 for 16 minutes, and 2/28 for 5 minutes.

PM10 levels surpassed the PEL (15-minute TWA) at the following location:

- ALP-S1 on 2/16 for 18 minutes; and
- ALP-S2 on 2/9 for 137 minutes.

For the month of January 2024, PM net 2.5 and/or PM net 10 levels were exceeded on 2/3, 2/6, 2/7, 2/8, 2/9, 2/10, 2/15, 2/27, and 2/28.

For the month of January 2024, construction-related PM net 2.5 and 10 did not surpass Daily PEL (24-hour TWA).

PM 2.5 $\mu\text{g}/\text{m}^3$

- **ALP:** Elevated PM2.5 $\mu\text{g}/\text{m}^3$ levels were recorded on nine dates (2/3, 2/6, 2/8, 2/9, 2/10, 2/15, 2/16, 2/27, and 2/28) for between 5 and 137 minutes.
 - ALP-S1 is located at the intersection of Avenue C and East 18th Street.
 - Elevated readings on 2/9 and 2/16 were related to onsite construction activities. Mitigation measures were enacted to control dust emissions.
 - Elevated readings on 2/8, 2/15, and 2/27 were related to unknown causes without a specific identifiable construction operations cause. No further actions were taken.
 - ALP-S2 is located at the intersection of Avenue C and East 18th Street, by the FDR onramp.
 - Elevated readings on 2/9 were related to onsite construction activities. Mitigation measures were enacted to control dust emissions.
 - Elevated readings on 2/3, 2/6, 2/10, and 2/28 were related to unknown causes without a specific identifiable construction operations cause. No further actions were taken.

PM 10 $\mu\text{g}/\text{m}^3$

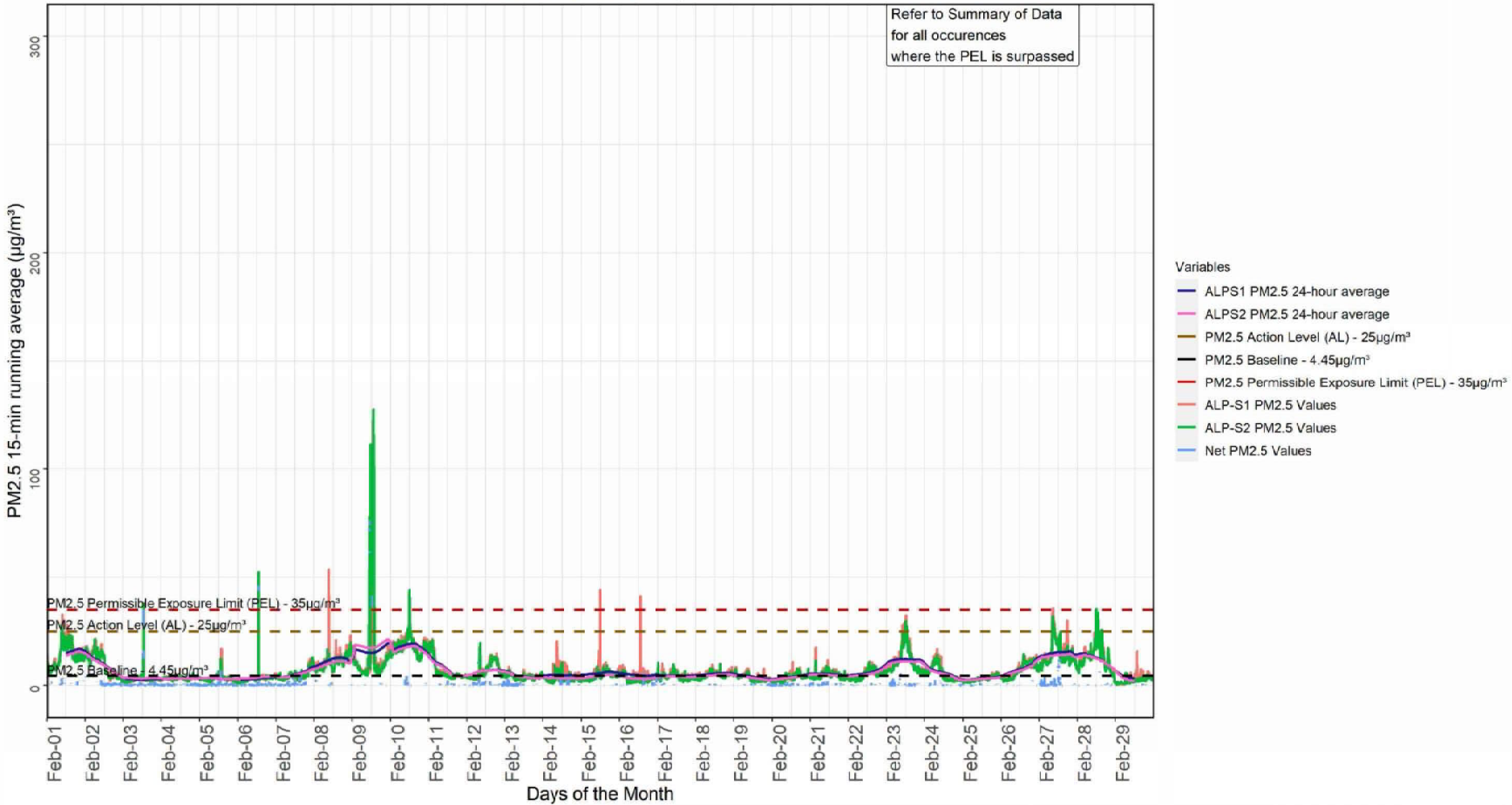
- **ALP:** Elevated PM10 $\mu\text{g}/\text{m}^3$ levels were recorded on two dates (2/9 and 2/16) for between 18 and 137 minutes.
 - ALP-S1 is located at the intersection of Avenue C and East 18th Street; elevated readings on 2/16 were related to onsite construction activities. Mitigation measures were enacted to control dust emissions.
 - ALP-S2 is located at the intersection of Avenue C and East 18th Street, by the FDR onramp; elevated readings on 2/9 were related to onsite construction activities. Mitigation measures were enacted to control dust emissions.

Mitigation Measures

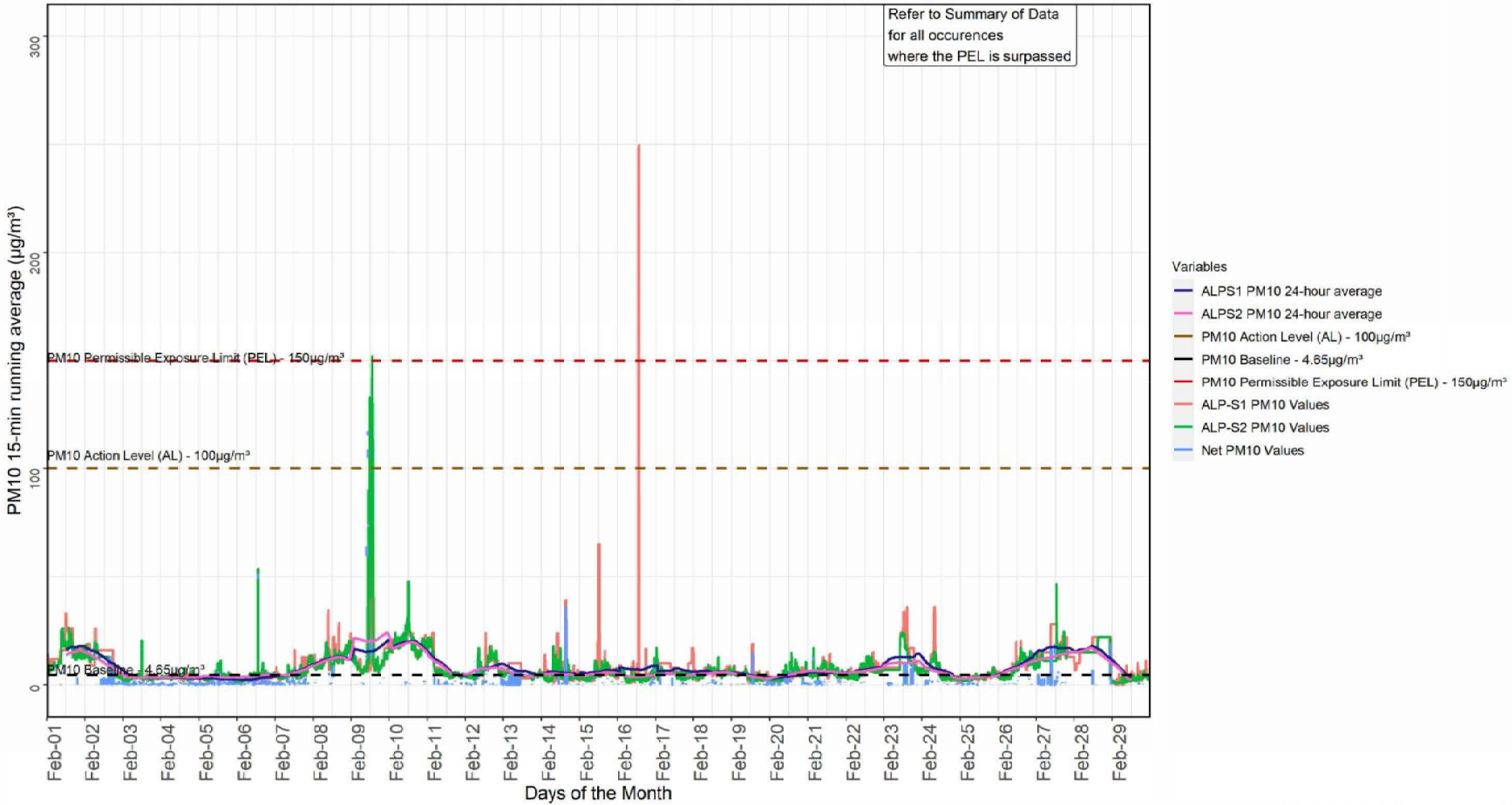
- Throughout the month, construction activity was closely monitored, and dust mitigation techniques were continuously implemented to successfully contain any airborne particulates created due to construction activity.

FEBRUARY 2024 DATA PLOTS

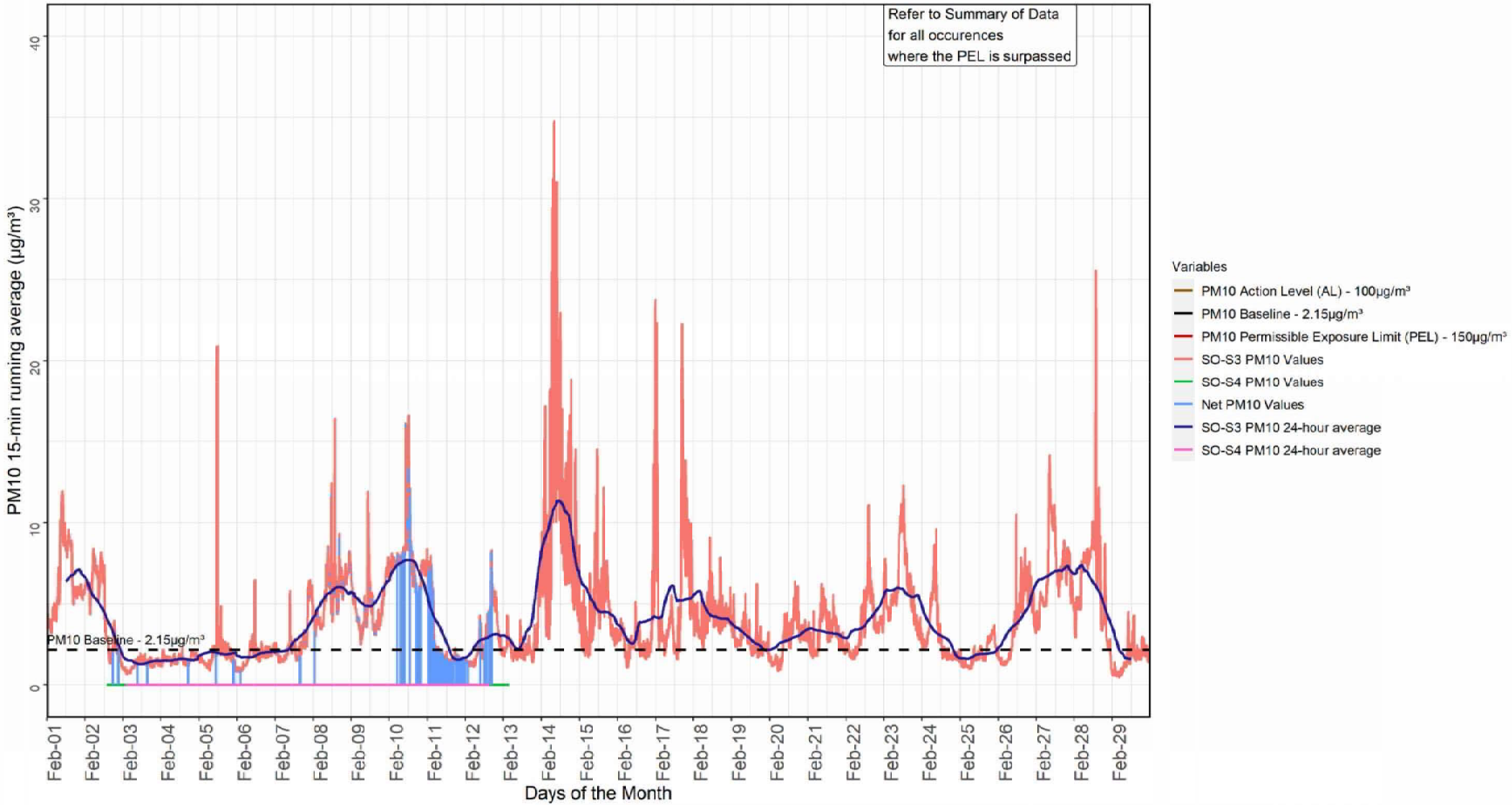
ALP-S1 and ALP-S2 PM 2.5 15-min running averages ($\mu\text{g}/\text{m}^3$)
For the month of February 2024



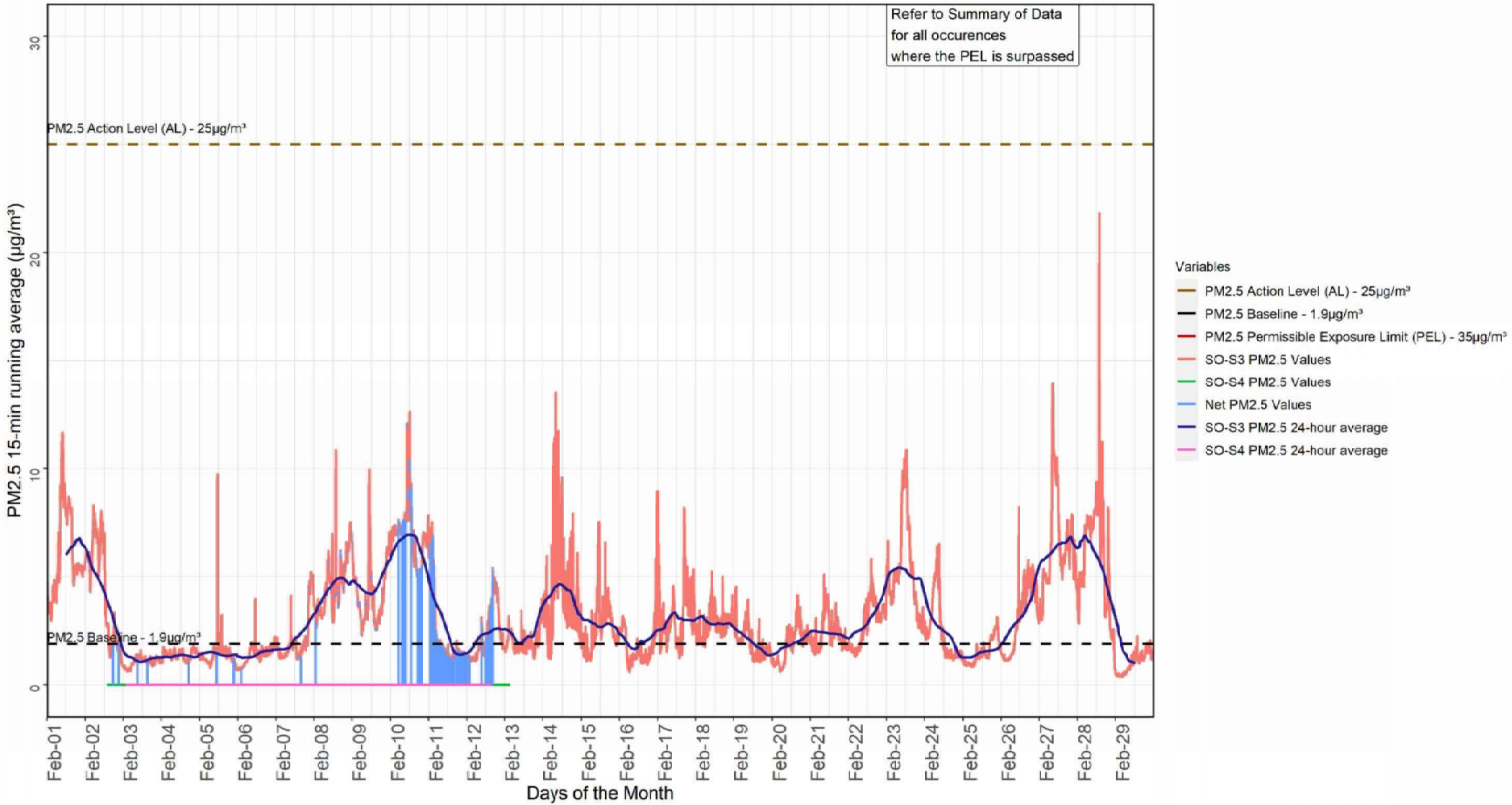
ALP-S1 and ALP-S2 PM 10 15-min running averages ($\mu\text{g}/\text{m}^3$)
For the month of February 2024



SO-S3 and SO-S4 PM10 15-min running averages ($\mu\text{g}/\text{m}^3$)
For the month of February 2024



SO-S3 and SO-S4 PM2.5 15-min running averages ($\mu\text{g}/\text{m}^3$)
For the month of February 2024



Summary of Data March 2024

PM2.5 levels surpassed the PEL (15-minute TWA) at the following locations:

- ALP-S1 on 3/6 for 77 minutes, 3/13 for 2 minutes, 3/14 for 21 and 11 minutes, 3/27 for 38 minutes, and 3/28 for 2 minutes; and
- ALP-S2 on 3/14 for 19 and 15 minutes, 3/27 for 173 minutes, and 3/29 for 15 minutes.

PM10 levels did not surpass the PEL (15-minute TWA).

For the month of March 2024, PM net 2.5 and/or PM net 10 levels were exceeded on 3/6, 3/14, 3/27, 3/28, and 3/29.

For the month of March 2024, construction-related PM net 2.5 and 10 did not surpass Daily PEL (24-hour TWA).

PM 2.5 $\mu\text{g}/\text{m}^3$

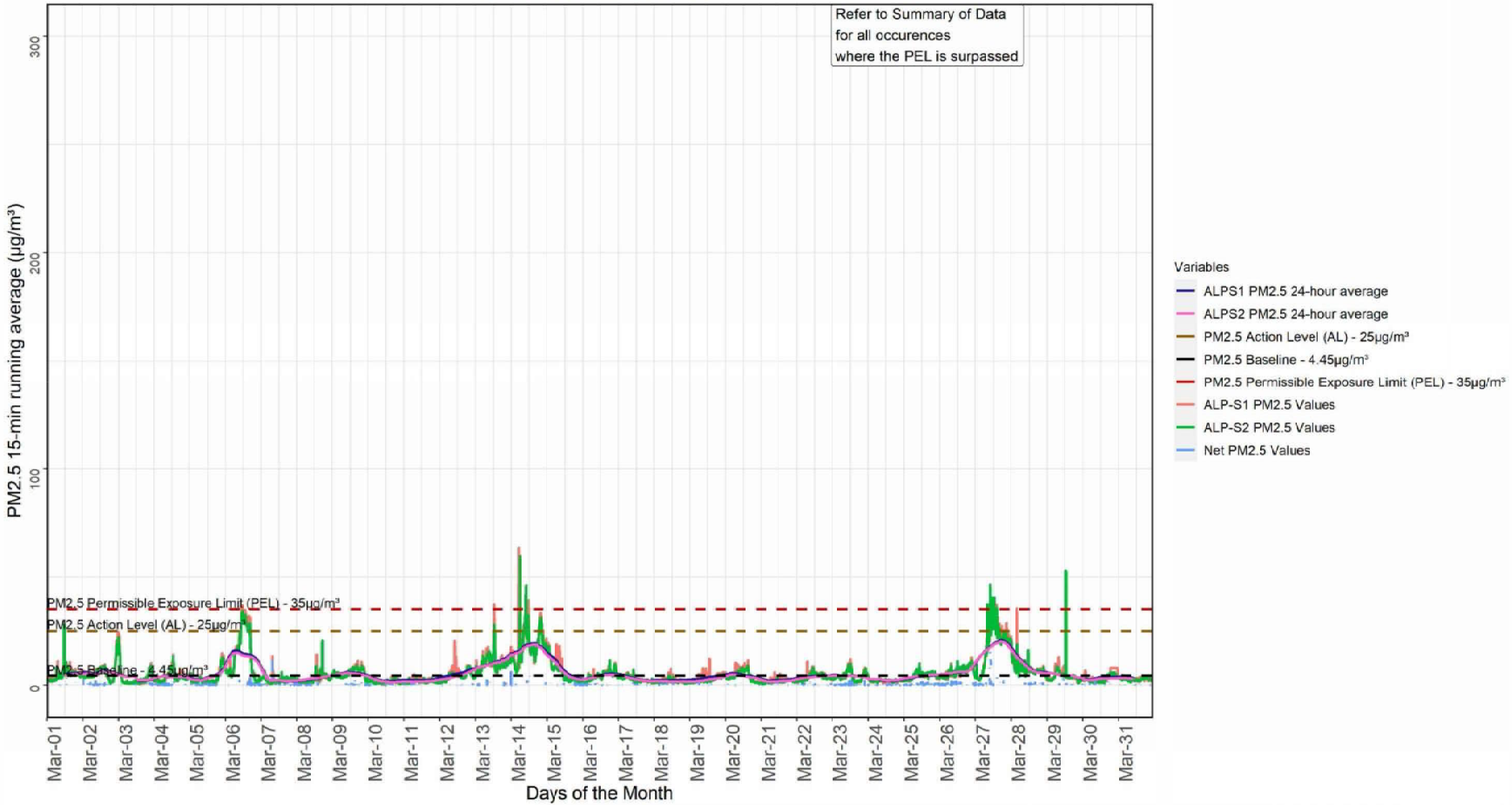
- **ALP:** Elevated PM2.5 $\mu\text{g}/\text{m}^3$ levels were recorded on five dates (3/6, 3/13, 3/14, 3/27, and 3/28) for between 2 and 77 minutes.
 - ALP-S1 is located at the intersection of Avenue C and East 18th Street.
 - Elevated readings on 3/14, 3/14, and 3/28 were related to unknown causes without a specific identifiable construction operations cause. No further actions were taken.
 - Elevated readings on 3/6 and 3/27 were related to onsite construction activities. Mitigation measures were enacted to control dust emissions.
 - ALP-S2 is located at the intersection of Avenue C and East 18th Street, by the FDR onramp.
 - Elevated readings on 3/14 were related to unknown causes without a specific identifiable construction operations cause. No further actions were taken.
 - Elevated readings on 3/14, 3/27, and 3/29 were related to onsite construction activities. Mitigation measures were enacted to control dust emissions.

Mitigation Measures

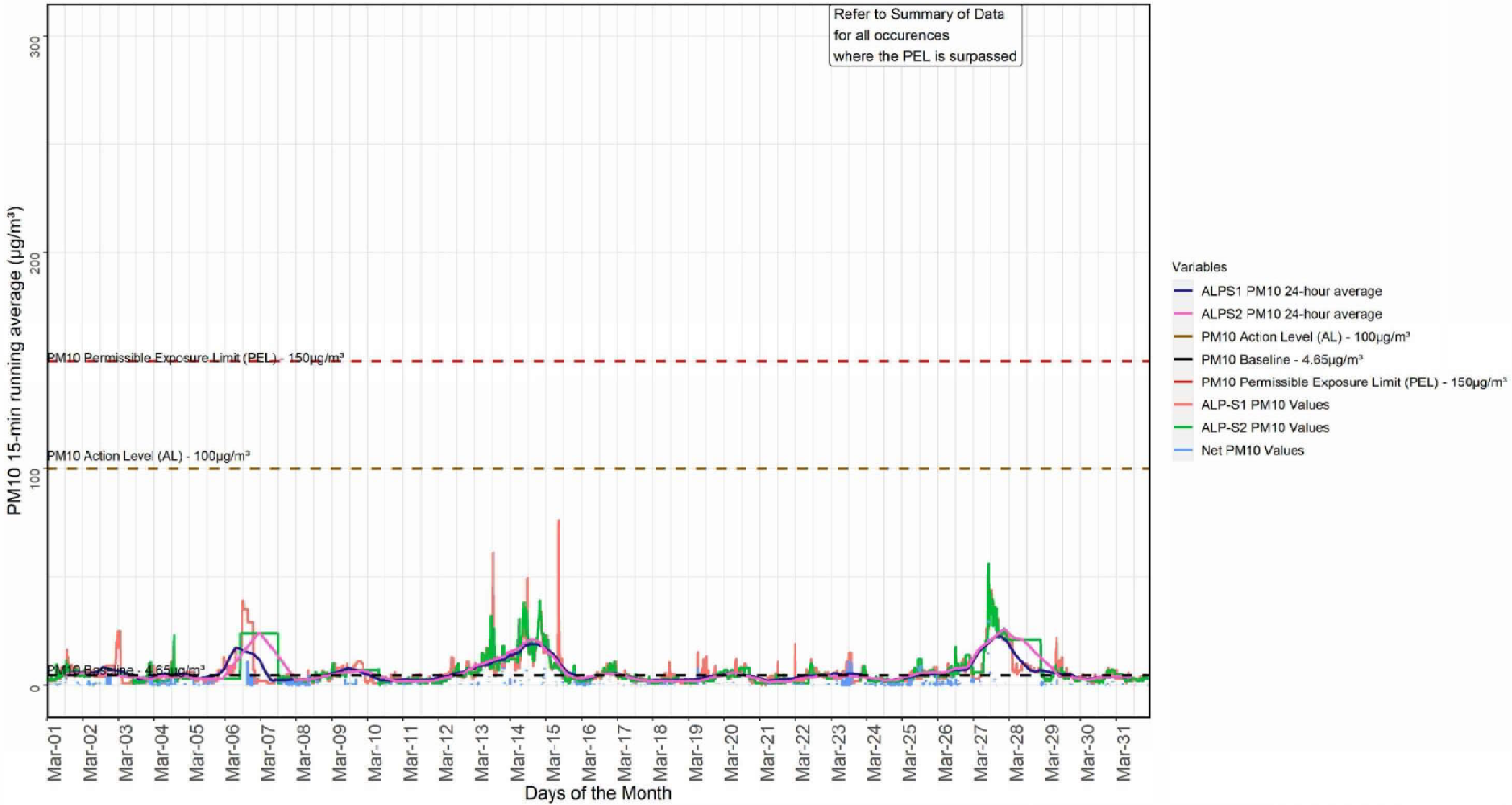
- Throughout the month, construction activity was closely monitored, and dust mitigation techniques were continuously implemented to successfully contain any airborne particulates created due to construction activity.

MARCH 2024 DATA PLOTS

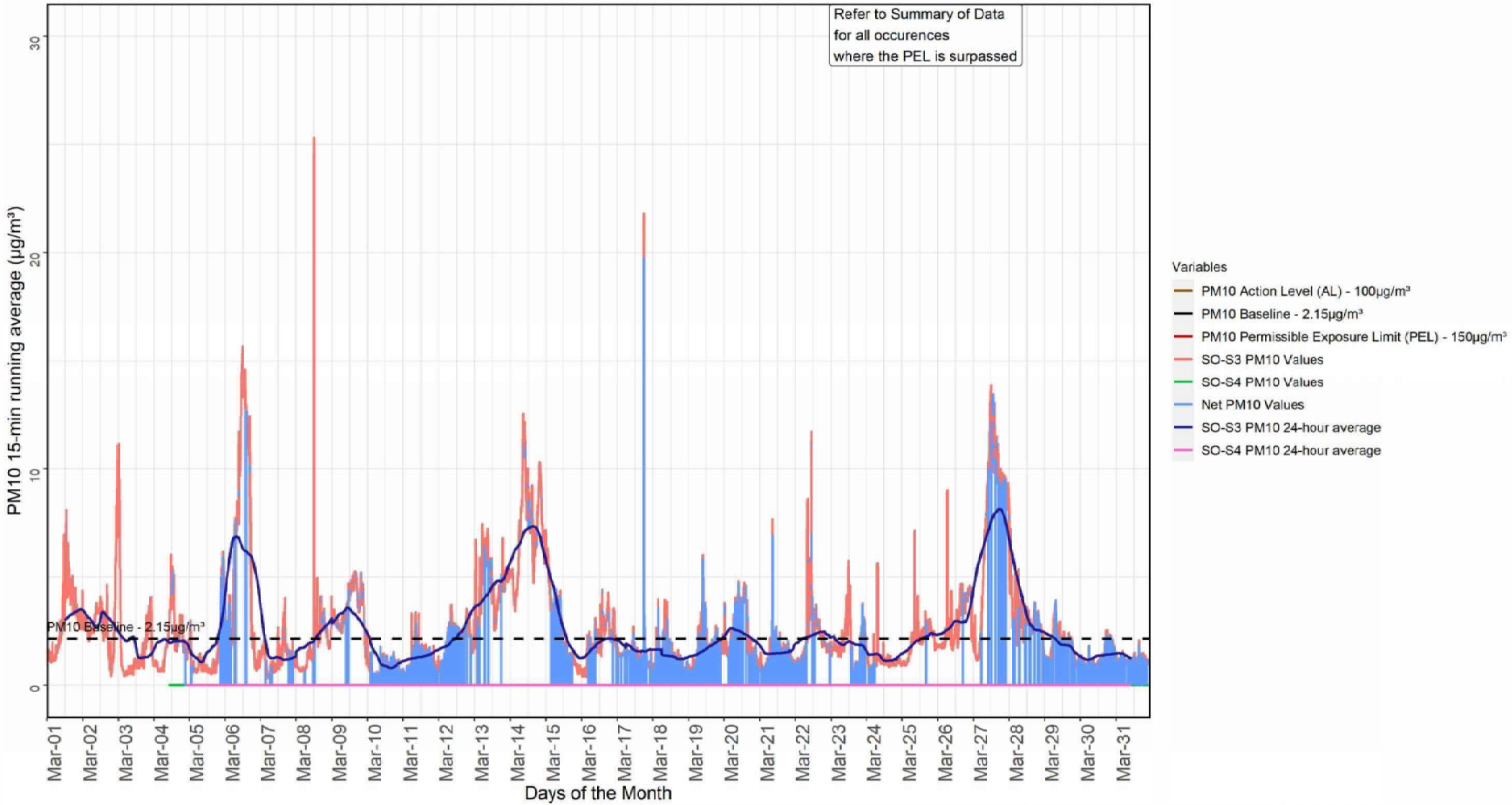
**ALP-S1 and ALP-S2 PM 2.5 15-min running averages ($\mu\text{g}/\text{m}^3$)
For the month of March 2024**



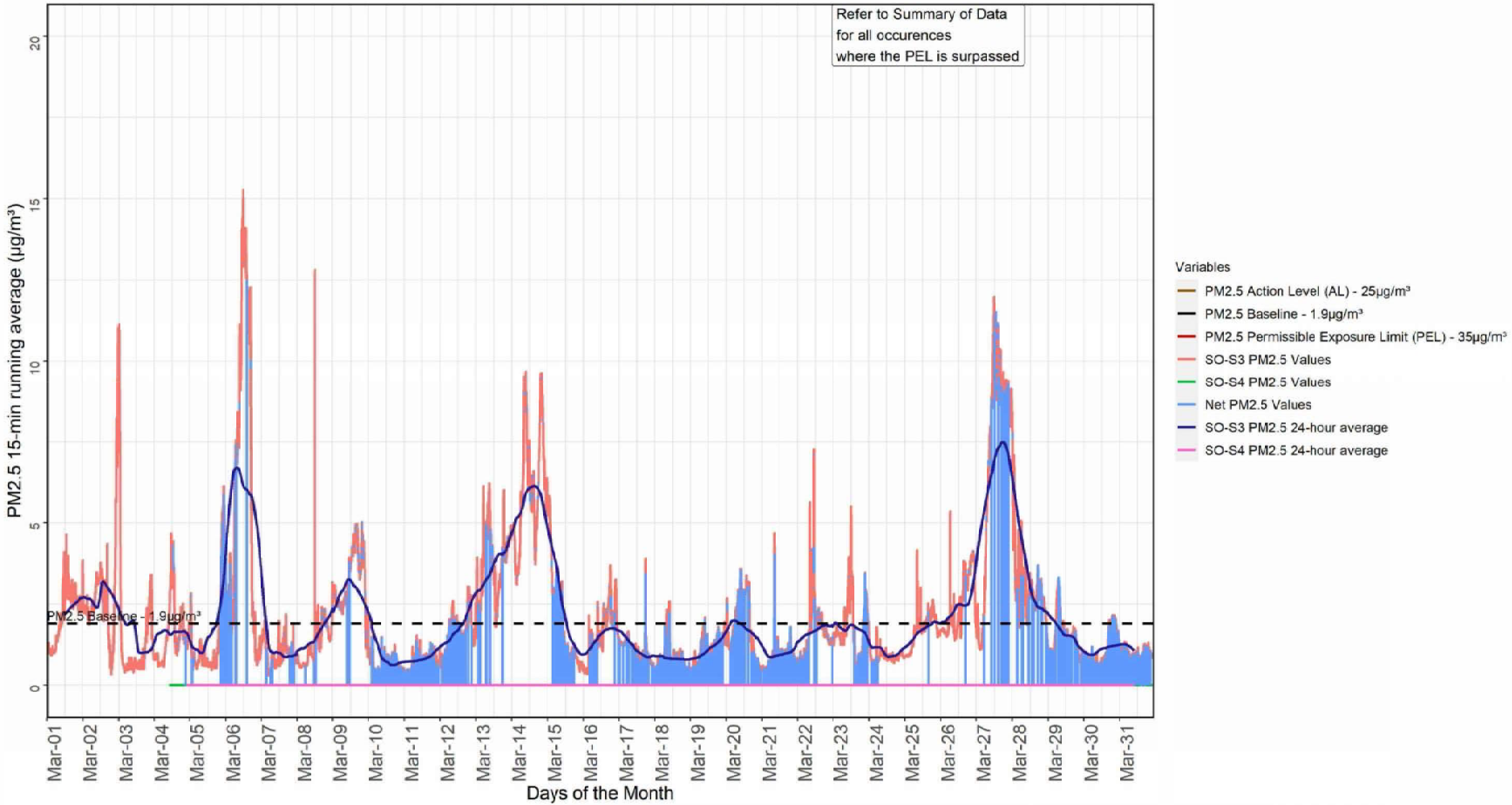
ALP-S1 and ALP-S2 PM 10 15-min running averages ($\mu\text{g}/\text{m}^3$)
For the month of March 2024



SO-S3 and SO-S4 PM10 15-min running averages ($\mu\text{g}/\text{m}^3$)
For the month of March 2024



SO-S3 and SO-S4 PM2.5 15-min running averages ($\mu\text{g}/\text{m}^3$)
For the month of March 2024



APPENDIX

I. Project Area 2 Phasing

Project Area 2

The construction in Project Area 2 will occur in three main phases from north to south and will be staggered to minimize open space impacts. The construction timeline will be broken down as follows by area (subject to change):

- **Phase I:** ALP Flood Wall/Gates and Park Restoration: **Early 2021 to Mid-2022**
- **Phase I:** Stuyvesant Cove Park: SO Flood Wall and Gate: **Early 2021 to Mid-2023**
- **Phase II & III:** Stuyvesant Cove Park Flood Wall and Restoration: **Mid-2021 to Mid-2024**
*Construction of Stuyvesant Cove Park will occur in phases, starting with closures from East 20th Street northwards and moving to the southern end of the park upon completion of the northern side.
- **Phase IV:** Murphy Brothers Playground Flood Wall and Restoration: **Late 2022 to Late 2024**

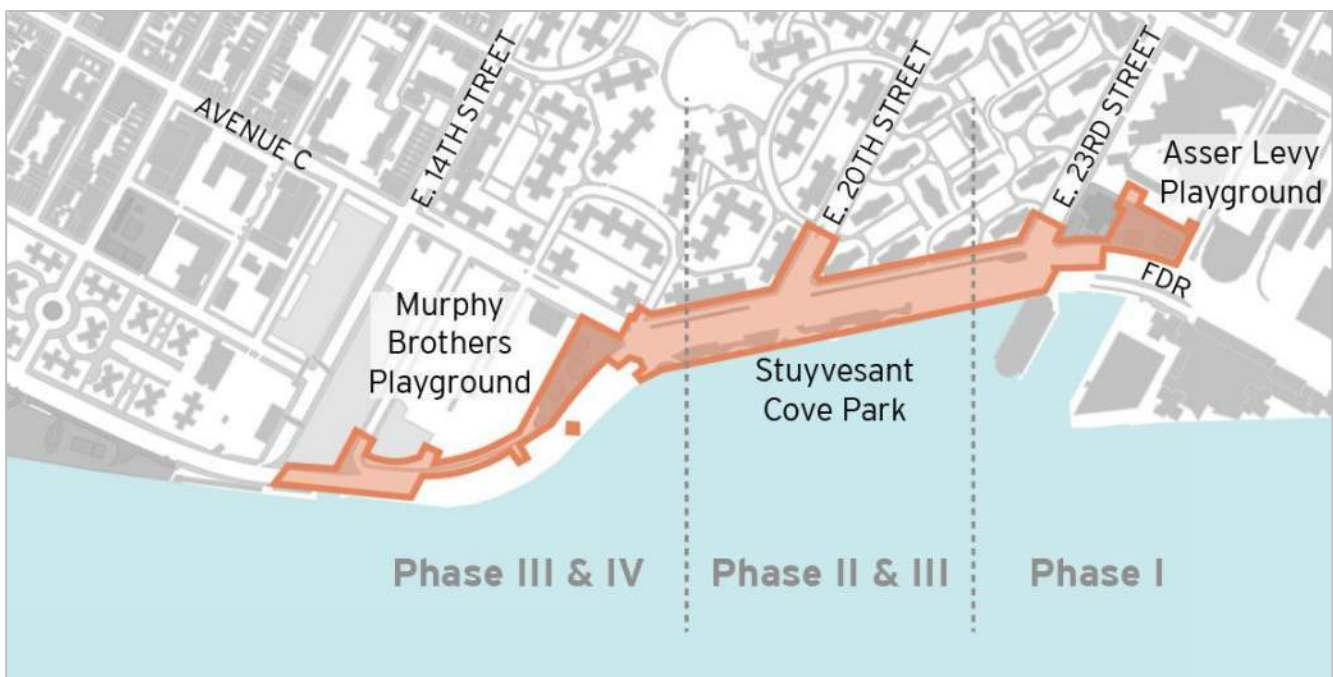


Fig.4 East Side Coastal Resiliency **Project Area 2** Proposed Phasing (subject to change)

II. ESCR Air Quality Management Program

Community health and safety is of utmost importance to the City of New York, NYC Department of Design and Construction (DDC), and the ESCR Team. The ESCR Team is implementing a multi-level approach to Air Quality Management with includes:

- Step 1: Air Quality Management Plan
- Step 2: Daily Air Quality Mitigation Techniques
- Step 3: Daily AQM
- Step 4: Air Quality oversight by environmental specialists

Step 1: The Air Quality Management Plan

The Air Quality Management Plan is submitted at the start of the project to outline the management of air quality for the project. It includes contractor roles and responsibilities, mitigation techniques, and action plans. This Plan is reviewed and approved by the Program Management / Construction Management (PMCM) Team HNTB-LiRo-Joint Venture, and DDC.

Step 2: Daily Air Quality Mitigation Techniques

As mentioned in Chapter 6.6 of the FEIS, Construction-Hazardous Materials Section “Dust management during soil-disturbing work would include the following: (1) use of water spray for roads, trucks, excavation areas and stockpiles; (2) use of anchored tarps to cover stockpiles; (3) use of truck covers during soil transport within site limits and during off-site transport; (4) employment of extra care during dry and/or high-wind periods; (5) use of gravel or recycled concrete aggregate on egress and other roadways to provide a clean and dust-free road surface; and (6) use of a truck wheel wash at site access/egress points to prevent fugitive dust and off-site migration of dust and other particulates. The source(s) of any dust emissions would be identified and addressed immediately and appropriately.

Step 3: Daily Air Quality Monitoring

The air quality monitoring confirms the daily mitigation techniques in place are being implemented and are effective. Action levels are set to alert the contractor when a technique is not working, and adjustments are required to maintain the levels as set by the NAAQS for PM pollution as mentioned above. Step 3 is implemented daily and mitigation techniques will vary depending on work activities. The EPA Standard TWA for analyzing PM levels is 24hours, the ESCR project is analyzing levels more frequently at 15min TWA.

Step 4: Air Quality Oversight by Environmental Specialists

The oversight for environmental monitoring for the ESCR project is multi-tiered and includes relationships between several agencies and entities. As shown in the exhibit on the following page, a series of checks and balances have been implemented to assure compliance with environmental regulations. See [Fig. 5 East Side Coastal Resiliency Air Quality Monitoring Flow Chart](#)

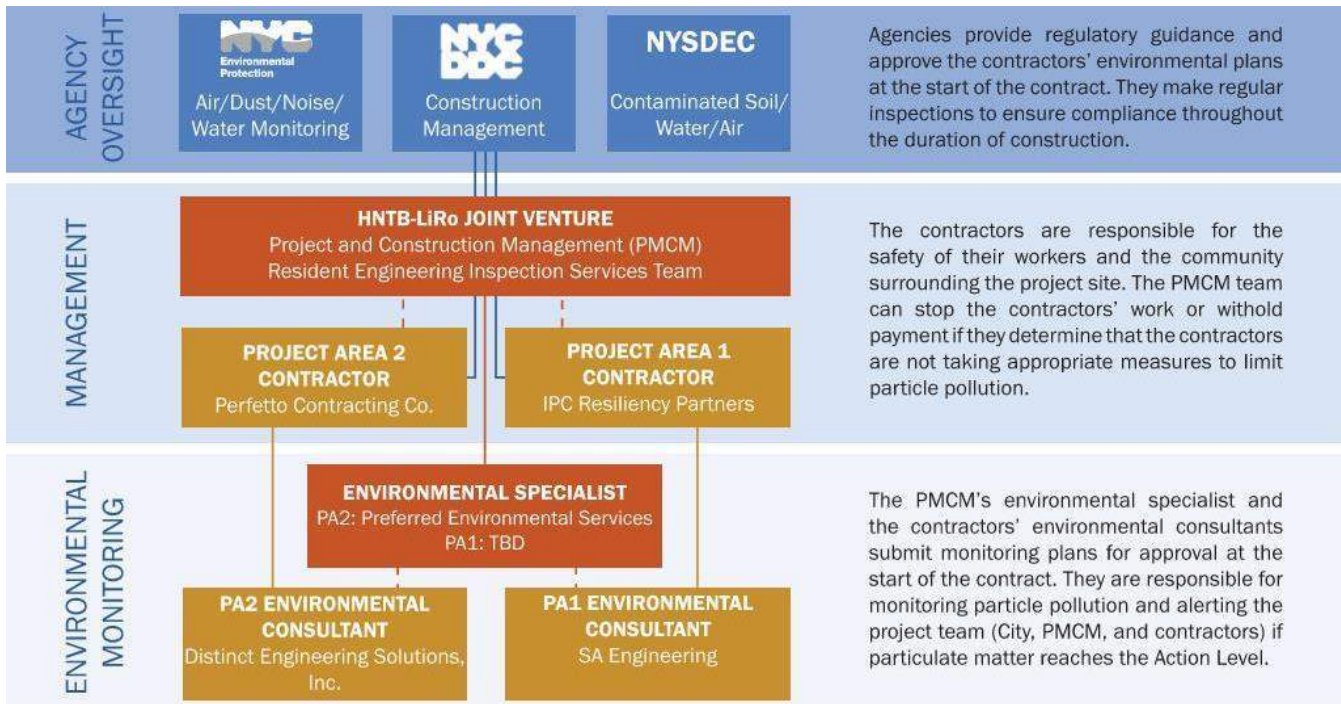


Fig.5 East Side Coastal Resiliency Air Quality Monitoring Flow Chart

III. RESOURCES

- ESCR Website: <https://www1.nyc.gov/site/escr/index.page>
- ESCR Environmental Review Process web page: <https://www1.nyc.gov/site/escr/about/environmental-review.page>
- FEIS Chapter 5.7 Hazardous Materials: <https://www1.nyc.gov/assets/escr/downloads/pdf/FEIS/ESCR-EIS-Chapter-5.7-Hazardous-Materials.pdf>
- FEIS Chapter 6.6 Construction Hazardous Materials: <https://www1.nyc.gov/assets/escr/downloads/pdf/FEIS/ESCR-EIS-Chapter-6.6-Construction-Hazardous-Materials.pdf>
- EPA Particulate Matter (PM) Pollution - Particulate Matter (PM) Basics: <https://www.epa.gov/pm-pollution/particulate-matter-pm-basics#PM>
- EPA Particulate Matter (PM) Pollution - Setting and Reviewing Standards to Control Particulate Matter (PM) Pollution: <https://www.epa.gov/pm-pollution/setting-and-reviewing-standards-control-particulate-matter-pm-pollution>
- EPA Particulate Matter (PM) Pollution - National Ambient Air Quality Standards (NAAQS) for PM: <https://www.epa.gov/pm-pollution/national-ambient-air-quality-standards-naaqs-pm>
- EPA Particulate Matter (PM) Pollution - Applying or Implementing Particulate Matter (PM) Standards: <https://www.epa.gov/pm-pollution/applying-or-implementing-particulate-matter-pm-standards>