



**REPORT**

**METRO VANCOUVER QUATERLY AIR PERMIT REPORTING**

*Neptune Bulk Terminal Ltd*

Prepared for:

**Neptune Bulk Terminal Ltd.**

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North Vancouver, BC, V7L 1A7

**Envirochem Project No.: 8005-23**

**Reporting Period: 2023 – Q3**

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## TABLE OF CONTENTS

<b>1.0 BACKGROUND</b>	<b>1</b>
<b>2.0 QUARTERLY REPORTING</b>	<b>2</b>
2.1 ON-SITE PM <sub>2.5</sub> AND PM <sub>10</sub> MONITORING – 24 HR ROLLING AVERAGES	2
2.2 OFF-SITE PM <sub>2.5</sub> AND PM <sub>10</sub> MONITORING – 24 HR ROLLING EXCEEDANCES OF PM <sub>2.5</sub> AND PM <sub>10</sub> FROM AAQO	8

## TABLES

Table 1: Off-Site 24-hour rolling average PM <sub>2.5</sub> and PM <sub>10</sub> AAQO exceedances for the third calendar quarter 2023 (July 1 <sup>st</sup> to September 30 <sup>th</sup> , 2023)	9
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## FIGURES

Figure 1: 24-hour rolling averages of PM <sub>2.5</sub> data from on-site monitor for the third calendar quarter 2023	3
Figure 2: 24-hour rolling averages of PM <sub>10</sub> data from on-site monitor for the third calendar quarter 2023	4
Figure 3: Wind rose during hours contributing to PM <sub>10</sub> 24-hr rolling average AAQO exceedances (not including hours associated with Metro Vancouver Particulate Air Quality Advisories) with PM <sub>10</sub> concentrations greater than 50 µg/m <sup>3</sup> for the third calendar quarter 2023 (July 1 <sup>st</sup> to September 30 <sup>th</sup> , 2023)	6
Figure 4: Microscopic analysis of E-BAM filter tape showing an example hour with westerly wind and brown coloured particles (50x magnification)	7

## 1.0 BACKGROUND

To meet Metro Vancouver Air Permit GVA0081 (issued September 23<sup>rd</sup>, 2016) requirements, Neptune Bulk Terminals Ltd. (Neptune) has implemented a procedure for periodic permit reporting requirements to Metro Vancouver including this quarterly reporting.

Fulfilling these requirements requires processing and checking large amounts of data. The procedures in this report provide an efficient means of processing large amounts of data and ensuring that all calculations and outputs generated are completed accurately. In order to increase the efficiency of this process, Neptune has implemented a data management system which allows for uploading of data to the Neptune database and generation of outputs. Envirochem Services Inc. (Envirochem) has been retained to calculate, tabulate and report these requirements to Metro Vancouver and ensure that:

- Raw data being collected and used for generating outputs is valid,
- Correct methodologies are used to generate these outputs, and
- Any outputs being generated undergo quality assurance/quality control (QA/QC) before being submitted electronically to Metro Vancouver.

All of the procedures contained within this report detail methodologies in conformance with Section 3 Schedules A and B of the current version of the permit (September 23<sup>rd</sup>, 2016).

This report includes quarterly particulate matter monitoring reporting requirements.

## 2.0 QUARTERLY REPORTING

### 2.1 ON-SITE PM<sub>2.5</sub> AND PM<sub>10</sub> MONITORING – 24 HR ROLLING AVERAGES

#### 2.1.1 METHODOLOGY

Neptune is conducting continuous PM<sub>2.5</sub> and PM<sub>10</sub> monitoring using two Met-One E-BAM Plus monitors on-site near the northwest boundary of Neptune Terminals on the roof of the terminal's electrical substation building.

Ambient Air Monitoring data for PM<sub>2.5</sub> and PM<sub>10</sub> are stored in Neptune's database. These data are retrieved and verified by Envirochem. QA/QC is performed on the raw data and any invalid data are flagged. Neptune's data management system is then updated accordingly.

#### 2.1.2 RESULTS

Using Neptune's data management system, Envirochem:

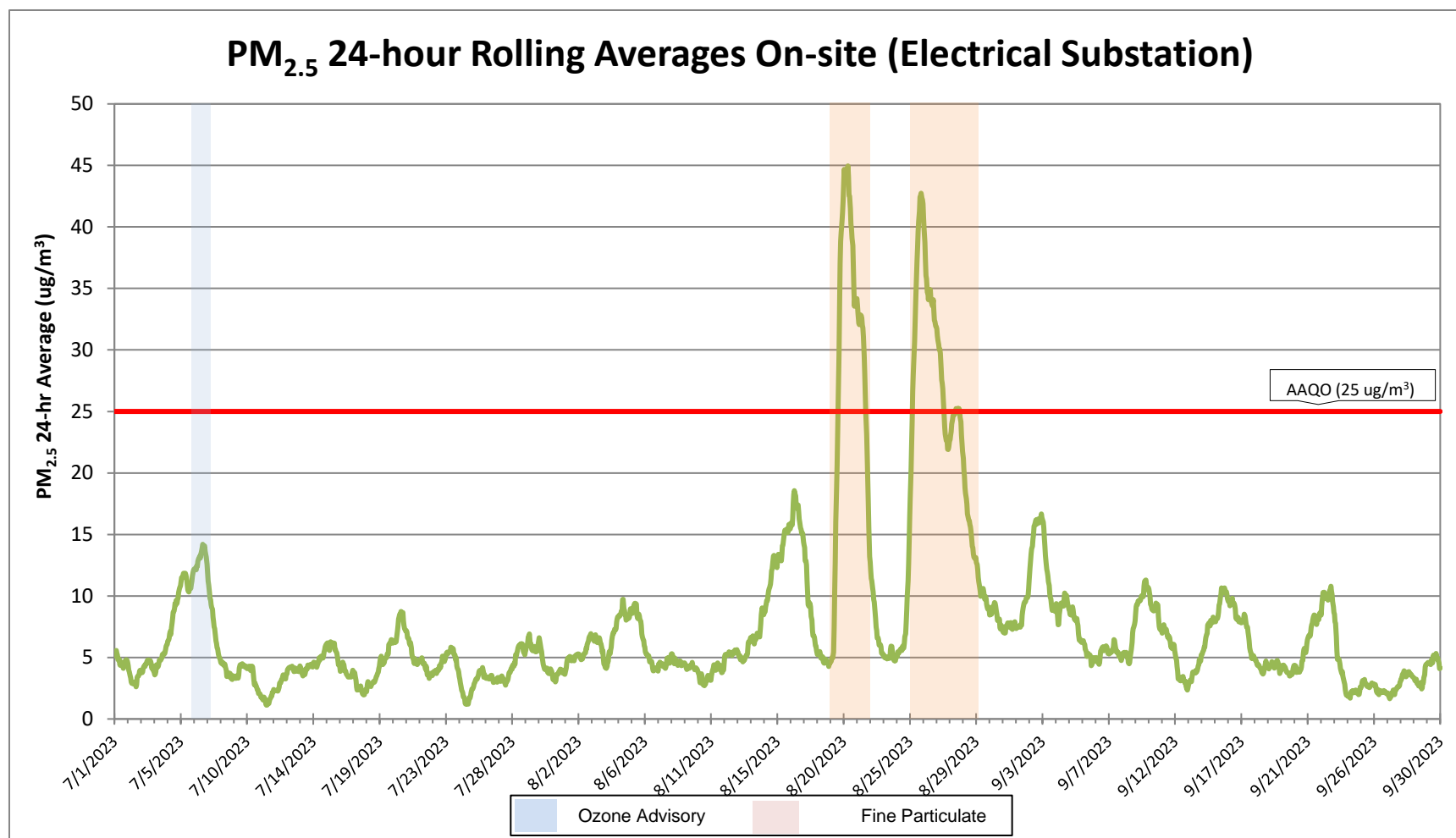
- Converts the vetted PM<sub>2.5</sub> and PM<sub>10</sub> data to 24-hour rolling averages and performs QA/QC;
- On a quarterly basis, submits the graphs (**Figure 1** and **Figure 2**) to Metro Vancouver.

During Quarter 3 of 2023, there were some exceedances of the 24-hour PM<sub>2.5</sub> and PM<sub>10</sub> AAQO at Neptune's on-site monitor (electrical substation, presented in **Figure 2**). Some of the exceedances corresponded to elevated ambient particulate levels in the entire region. It should be noted that Metro Vancouver Air Quality Advisories were in place from July 6<sup>th</sup> to July 7<sup>th</sup> for high concentrations of ground-level ozone and from August 19<sup>th</sup> to August 22<sup>nd</sup> and from August 25<sup>th</sup> to August 29<sup>th</sup> for high concentrations of fine particulate matter in the region.

There were also a few 24-hour PM<sub>10</sub> AAQO exceedances at Neptune's on-site monitor (electrical substation) outside of Metro Vancouver Air Quality Advisory periods. To investigate the attributable particulate for exceedances of the 24-hour PM<sub>10</sub> AAQO outside of Metro Vancouver Air Quality Advisory periods:

- Wind speed and direction during hours with PM<sub>10</sub> concentrations where the hourly average concentration was at or above the 24-hour AAQO level of 50 µg/m<sup>3</sup> were analyzed (**Figure 3**); and
- Optical (microscopic) analysis of the E-BAM filter tape was performed (**Figure 4**).

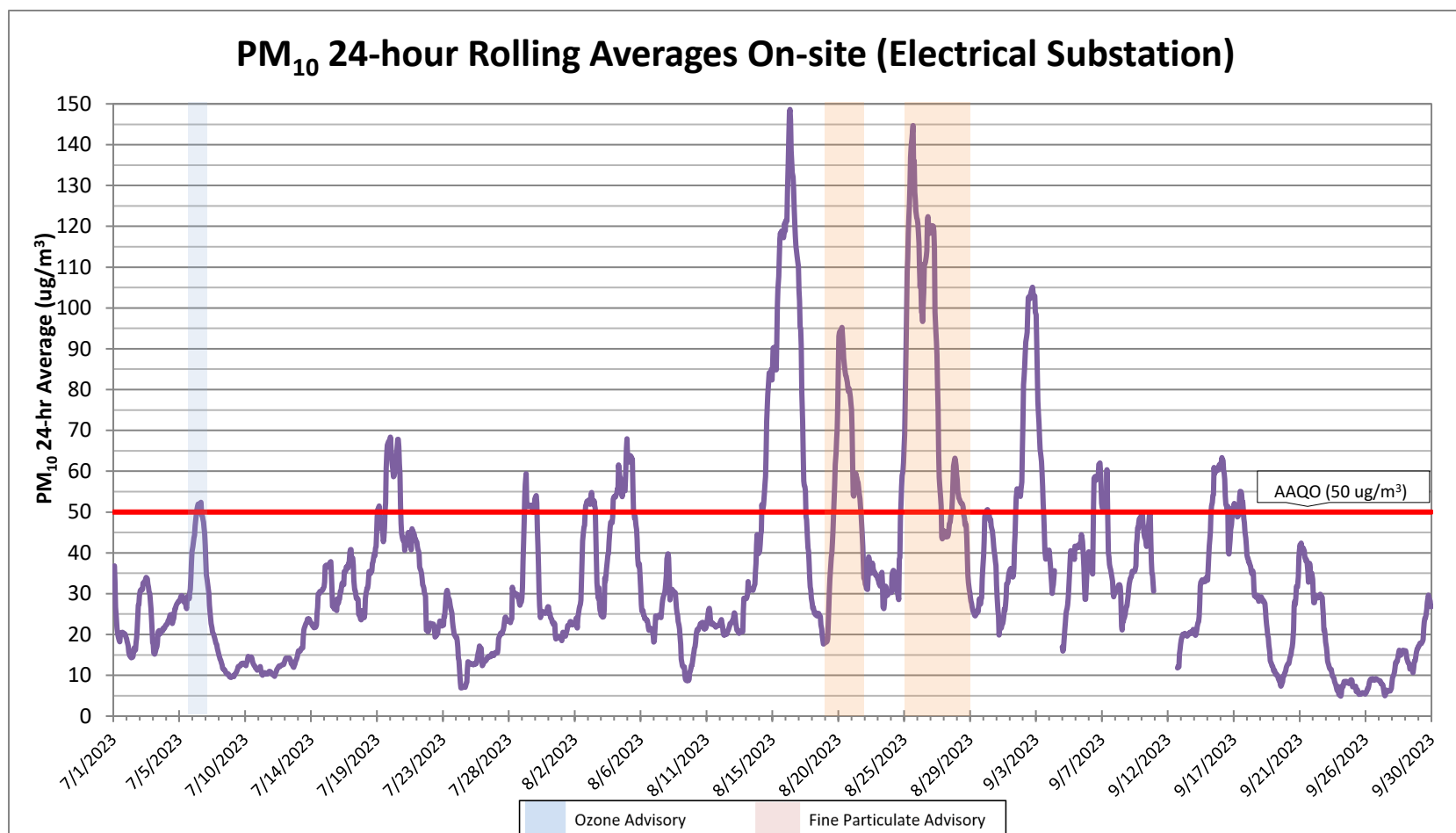
Results and findings are summarized below.



**Figure 1: 24-hour rolling averages of PM<sub>2.5</sub> data from on-site monitor for the third calendar quarter 2023 (July 1<sup>st</sup> to September 30<sup>th</sup>, 2023)**

**Note 1:** Blank space indicates that no data is available due to power failure or instrument maintenance.

**Note 2:** Highlighted periods indicate dates where Metro Vancouver Air Quality Advisories were in effect.



**Figure 2: 24-hour rolling averages of PM<sub>10</sub> data from on-site monitor for the third calendar quarter 2023  
(July 1<sup>st</sup> to September 30<sup>th</sup>, 2023)**

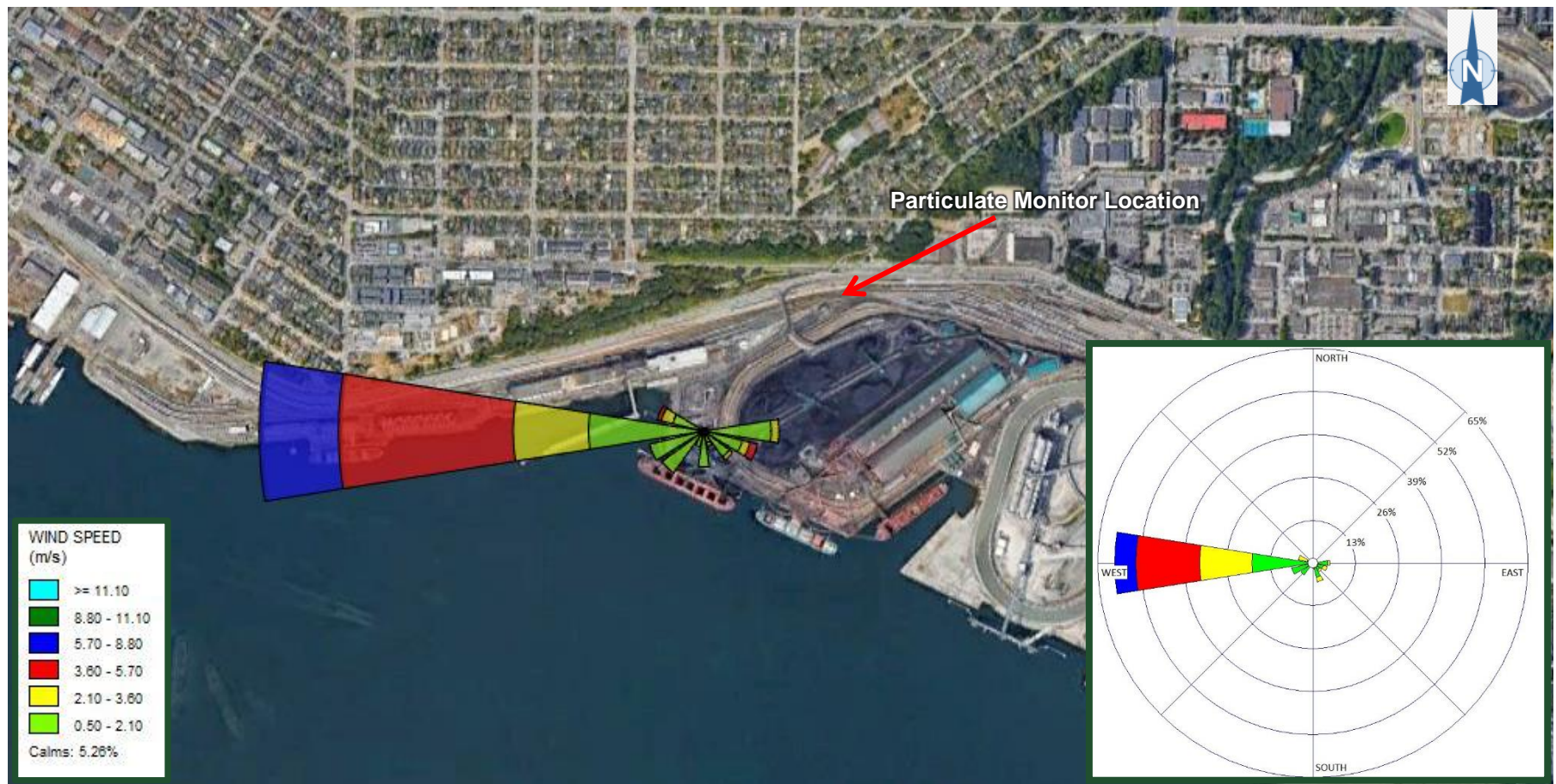
**Note 1:** Blank space indicates that no data is available due to power failure or instrument maintenance.

**Note 2:** Highlighted periods indicate dates where Metro Vancouver Air Quality Advisories were in effect.

### 2.1.3 WIND ANALYSIS

To investigate the attributable particulate to the observed PM<sub>10</sub> exceedances, wind speed and direction during hours of those events with hourly average PM<sub>10</sub> concentrations of 50 µg/m<sup>3</sup> or greater were analyzed. 50 µg/m<sup>3</sup> was conservatively chosen as it is the 24-hour AAQO for PM<sub>10</sub>. Hence, hours with 50 µg/m<sup>3</sup> PM<sub>10</sub> or above were considered to have a possible contribution to the AAQO exceedances. Hours during periods impacted by Metro Vancouver Air Quality Advisories for fine particulate were not considered. As can be seen in **Figure 3**, during hours with 50 µg/m<sup>3</sup> of PM<sub>10</sub> or higher, the most frequent wind direction was blowing from the west.





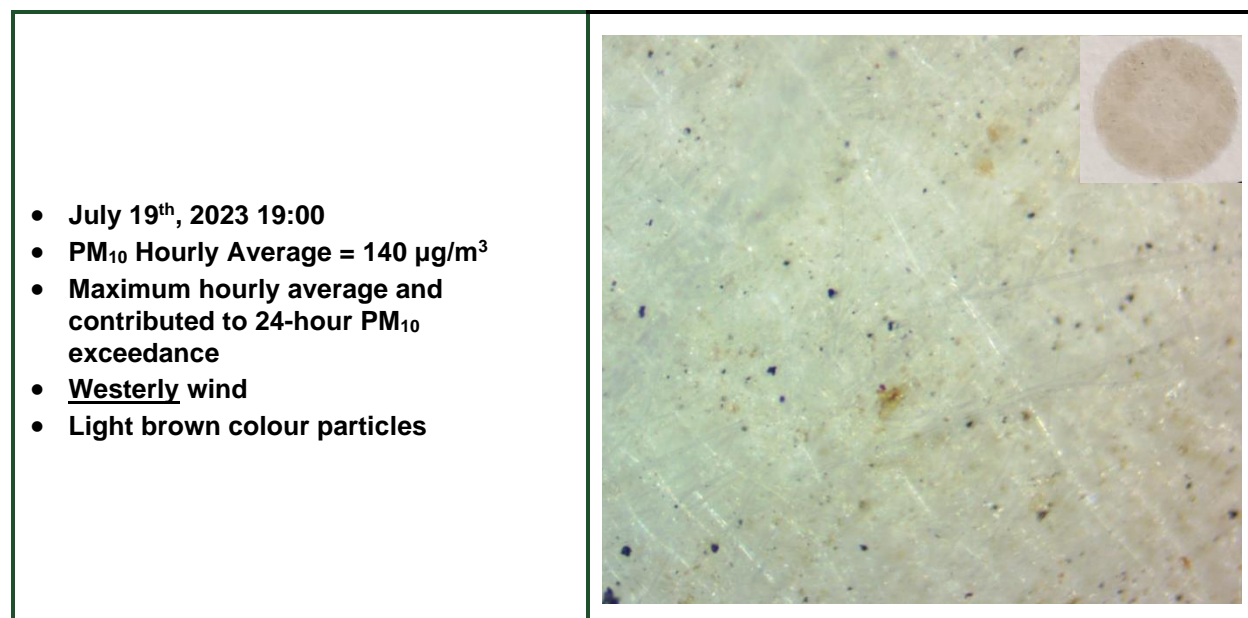
**Figure 3: Wind rose during hours contributing to PM<sub>10</sub> 24-hr rolling average AAQO exceedances (not including hours associated with Metro Vancouver Particulate Air Quality Advisories) with PM<sub>10</sub> concentrations greater than 50 µg/m<sup>3</sup> for the third calendar quarter 2023 (July 1<sup>st</sup> to September 30<sup>th</sup>, 2023).**

*Note: The presented wind rose is based on "winds blowing from"*



#### 2.1.4 OPTICAL (MICROSCOPIC) ANALYSIS

To support the findings from the wind data, optical analysis was performed for some E-BAM Plus filter tape spots during hours with  $\text{PM}_{10}$  concentrations greater than  $50 \mu\text{g}/\text{m}^3$  that contributed to  $\text{PM}_{10}$  24-hr rolling average AAQO exceedances that were not associated with a Metro Vancouver Air Quality Advisory. An example spot is shown in **Figure 4**.



**Figure 4: Microscopic analysis of E-BAM filter tape showing an example hour with westerly wind and brown coloured particles (50x magnification)**

The optical analysis was conducted to elucidate the major components of the particulate on the E-BAM filter tape with respect to coal dust and other particles. For this analysis, a light microscope (OMAX 40x-2500x) with a 10x ocular lens, 4x/10x/40x objective lenses, and a 0.5x mountable camera (OMAX A3RDF50) was used. E-BAM filter tape is made of glass fibres that are visible in the microscopic pictures.

The microscopic analyses indicated that hours with westerly winds often show a majority of grain particles (chaff and flake with a brown color) associated with offsite sources from the west of the site boundary. The microscopic analysis therefore supports the wind analysis and suggests that there are significant sources of dust in the area that contribute to monitored particulate concentrations that are not coal (e.g. grain dust etc.).

## 2.2 OFF-SITE PM<sub>2.5</sub> AND PM<sub>10</sub> MONITORING – 24 HR ROLLING EXCEEDANCES OF PM<sub>2.5</sub> AND PM<sub>10</sub> FROM AAQO

### 2.2.1 METHODOLOGY

Neptune is conducting continuous PM<sub>2.5</sub> and PM<sub>10</sub> monitoring off-site from the terminal at these two locations (in the neighbouring areas):

- To the northeast of the Neptune Terminals, on the roof of 340 Brooksbank Avenue (Neptune's office) equipped with a PM<sub>10</sub> monitor (Met One E-BAM Plus) and a PM<sub>2.5</sub> monitor (SHARP 5030i).
- To the northwest of the Neptune Terminals in the residential area at 618 2<sup>nd</sup> Street East using two pole mounted PM<sub>2.5</sub> and PM<sub>10</sub> monitors (Met One E-BAM Plus).

Ambient Air Monitoring data for PM<sub>2.5</sub> and PM<sub>10</sub> is stored in Neptune's database. These data are retrieved and verified by Envirochem. QA/QC is performed on the raw data and any invalid data are flagged. Neptune's data management system is then updated accordingly.

### 2.2.2 RESULTS

Using Neptune's data management system, Envirochem:

- Converts the vetted PM<sub>2.5</sub> and PM<sub>10</sub> data to 24-hour rolling averages;
- Retrieves the quarterly 24-hour rolling averages from Neptune's database;
- Identifies and flags any 24-hour rolling averages which exceed Metro Vancouver Ambient Air Quality Objectives (AAQOs) for PM<sub>2.5</sub> and PM<sub>10</sub>;
- On a quarterly basis, tabulates all exceedances (**Table 1**) and submits them to Metro Vancouver.

**Table 1: Off-Site 24-hour rolling average PM<sub>2.5</sub> and PM<sub>10</sub> AAQO exceedances for the third calendar quarter 2023 (July 1<sup>st</sup> to September 30<sup>th</sup>, 2023)**

METRO VANCOUVER PERMIT GVA 0081	
Neptune Bulk Terminals (Canada) Ltd.	
OFF-SITE 24-HR ROLLING AVERAGE PM <sub>2.5</sub> AND PM <sub>10</sub> AAQO EXCEEDANCES	
Reporting Period:	July 1 <sup>st</sup> - September 30 <sup>th</sup> , 2023

Exceedance Event	MV AAQO		Neptune Office (340 Brooksbank Ave)	Neighbourhood Pole (618 E 2 <sup>nd</sup> St.)	Comment
	Contaminant	µg/m³	Period of Exceedance		
1	PM <sub>2.5</sub>	25	No exceedances	No exceedances	-
	PM <sub>10</sub>	50	14:00 August 15 <sup>th</sup> – 13:00 August 16 <sup>th</sup> 20:00 August 16 <sup>th</sup> – 17:00 August 17 <sup>th</sup>	02:00 August 17 <sup>th</sup> – 23:00 August 17 <sup>th</sup>	Stagnation conditions  Construction in area around offsite monitors.
2	PM <sub>2.5</sub>	25	04:00 August 20 <sup>th</sup> – 05:00 August 22 <sup>nd</sup>	16:00 August 20 <sup>th</sup> – 00:00 August 22 <sup>nd</sup>	Wildfire Smoke (MV Air Quality Advisory)
	PM <sub>10</sub>	50	03:00 August 20 <sup>th</sup> – 22:00 August 21 <sup>st</sup>	12:00 August 21 <sup>st</sup> – 23:00 August 21 <sup>st</sup>	Wildfire Smoke (MV Air Quality Advisory).
3	PM <sub>2.5</sub>	25	09:00 August 25 <sup>th</sup> – 12:00 August 27 <sup>th</sup>	10:00 August 25 <sup>th</sup> – 04:00 August 27 <sup>th</sup>	Wildfire Smoke (MV Air Quality Advisory)
	PM <sub>10</sub>	50	06:00 August 25 <sup>th</sup> – 15:00 August 26 <sup>th</sup>	05:00 August 25 <sup>th</sup> – 15:00 August 26 <sup>th</sup>	Wildfire Smoke (MV Air Quality Advisory)
4	PM <sub>2.5</sub>	25	04:00 August 28 <sup>th</sup> – 15:00 August 28 <sup>th</sup>	08:00 August 28 <sup>th</sup> – 15:00 August 28 <sup>th</sup>	Wildfire Smoke (MV Air Quality Advisory)
	PM <sub>10</sub>	50	No exceedances	No exceedances	-
5	PM <sub>2.5</sub>	25	No exceedances	No exceedances	-
	PM <sub>10</sub>	50	No exceedances	07:00 September 7 <sup>th</sup> – 08:00 September 7 <sup>th</sup>	Stagnation conditions  Construction in area around offsite monitors.
6	PM <sub>2.5</sub>	25	No exceedances	No exceedances	-
	PM <sub>10</sub>	50	No exceedances	17:00 September 10 <sup>th</sup> – 21:00 September 10 <sup>th</sup>  05:00 September 11 <sup>th</sup> – 09:00 September 11 <sup>th</sup>	Stagnation conditions  Construction in area around offsite monitors.

**Note:** AAQOs are based on 24-hour rolling averages. For hours presented above, periods are representative of the previous 24 hours.