



# Tollaust Pty Ltd - Lane Cove Tunnel

## Marden St and Sirius Rd Stack Air Quality Monitoring Validated Data Report

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We operate a fully compliant NATA-approved lab, and our engineers are factory-trained in the repair and maintenance of most types of gas analysers on the market, including circuit board level repairs. Our instrument technicians' training is constantly updated to stay current with the latest gas analyser market trends.



Accreditation number: 19660

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## Glossary

The following terms and abbreviations are used in this report

| Abbreviation      | Meaning                                                                                  |
|-------------------|------------------------------------------------------------------------------------------|
| °C                | Degrees Celsius                                                                          |
| %                 | Percent                                                                                  |
| CO                | Carbon monoxide                                                                          |
| eq.               | Equivalents                                                                              |
| kPa               | kiloPascal                                                                               |
| mg/m <sup>3</sup> | Milligrams per cubic meter at dry, standard temperature and pressure (0°C and 101.3 kPa) |
| NMHC              | Non-methane hydrocarbons                                                                 |
| NO                | Nitric oxide                                                                             |
| NO <sub>2</sub>   | Nitrogen dioxide                                                                         |
| NO <sub>x</sub>   | Oxides of nitrogen                                                                       |
| WST               | Parramatta Road Ventilation Facility                                                     |
| RH                | Relative Humidity                                                                        |
| TSP               | Total Suspended Particulate                                                              |
| SPI               | Underwood Road Ventilation Facility                                                      |
| VOC               | Volatile organic compounds                                                               |
| VSO               | Ventilation Stack Outlet                                                                 |

## 1. Executive Summary

The Lane Cove Tunnel runs for 3.6km between North Ryde and Artarmon, linking the M2 Motorway and the Gore Hill Freeway and forms part of Sydney's motorway network. The tunnel commenced operation in March 2007.

Two stacks provide ventilation for the tunnel, one at the western end of the tunnel (Sirius Road, Lane Cove West), and one at the eastern end of the tunnel (Marden St, Artarmon). The Sirius Road stack comprises two partitions, north and south. Sirius Road results are a combined weighted average to the two partitions.

This report presents the monthly validated stack data for February 2026 to Tollaust Pty Ltd for the Lane Cove Tunnel.

### 1.1 Compliance to limits

The Minister's Conditions of Approval (MCoA) designates limits to which pollutants being discharged from the ventilation stacks must meet. (MCoA 173).

There were nil exceedances of the prescribed limits during the reporting period.

## 2. Introduction

### 2.1 Project Background

Norditech were contracted by Tollaust Pty Ltd in December 2018 to provide continuous stack air quality monitoring and reporting services for Lane Cove Tunnel.

Norditech is a NATA accredited organisation (Accreditation Number 19660)

Addresses of relevant parties:

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This report presents the validated Marden St and Sirius Rd ventilation stack data for February 2026.

- Describe air quality measurements.
- Reports any readings above the LCT Limits.
- Compare monitoring results.
- It has been quality assured.

## 2.2 Outlet Monitor Locations

The locations of the Marden St and Sirius Rd ventilation stacks are detailed in the table and figure below.

| Location                  | Latitude    | Longitude   |
|---------------------------|-------------|-------------|
| Marden St (Eastern Stack) | -33.815025° | 151.179246° |
| Sirius Rd (Western Stack) | -33.807887° | 151.146074° |

Table 1. Lane Cove Tunnel ventilation stack GPS Coordinates

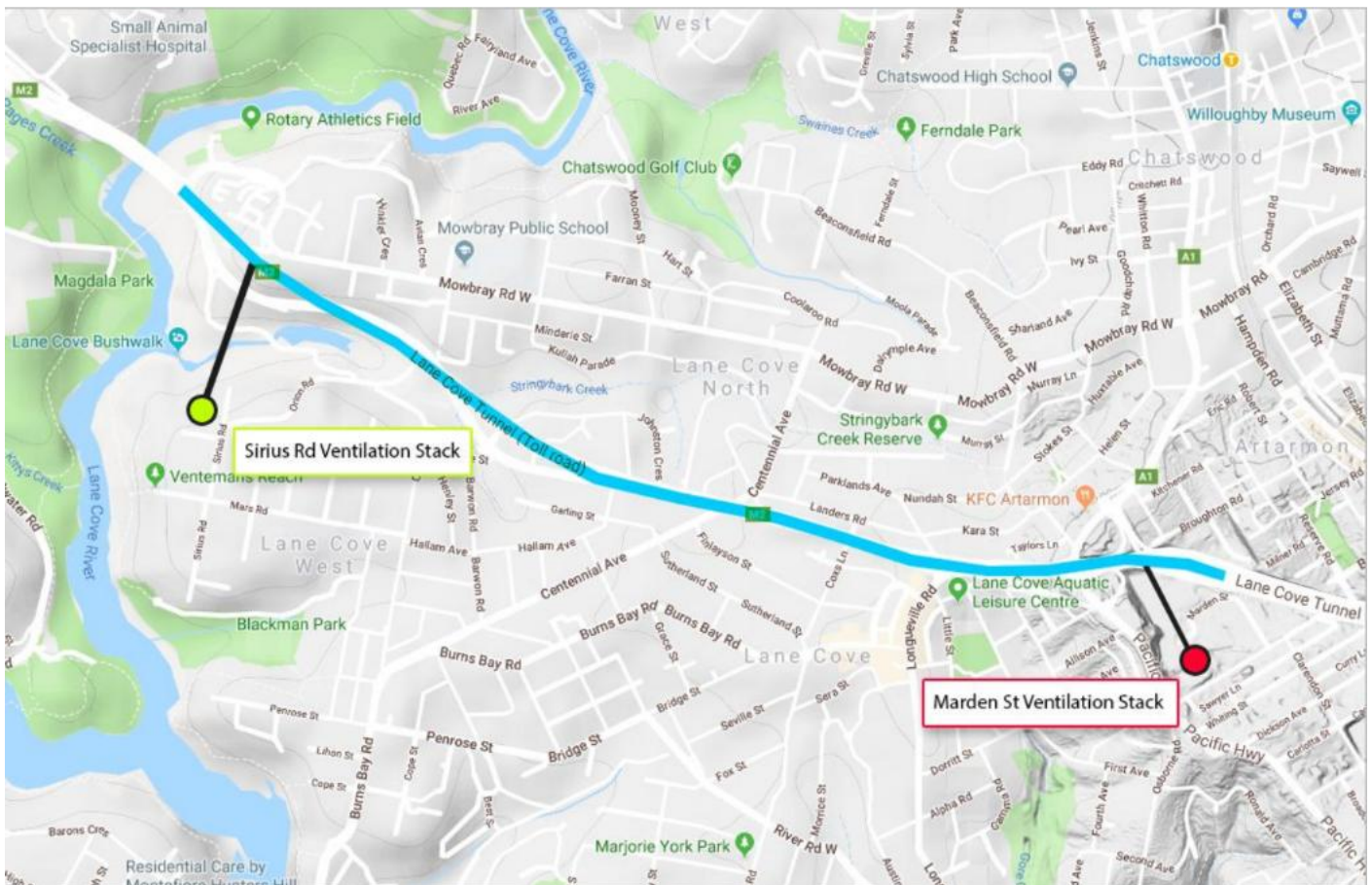


Figure 1. Lane Cove Tunnel ventilation stack locations

## 2.3 Scope

In tunnel air is discharged via two ventilation stacks – one located at Marden St, Artarmon, and one located at Sirius Rd, Lane Cove West. The Sirius Rd stack comprises of two separate partitions (North and South). For each stack, monitoring as per the requirements of MCoA 172 is undertaken. Each partition of the Sirius Rd stack is monitored by separate air quality monitoring stations.

Gaseous parameters are sampled by an extractive sampling system with automatic purging. Volatile organic compounds are measured using the flame ionization detection principle. Oxides of nitrogen are measured using chemiluminescence. Carbon monoxide is measured using non-dispersive infra-red absorption.

Particulates PM10 and PM2.5 are measured using tapered element oscillating microbalances, via an isokinetic sampling system.

Monthly routine maintenance is undertaken by Norditech. Maintenance is performed as per the relevant Australian Standard or in house method. Maintenance cycles generally involve 1, 3, 6 and 12 monthly scheduled items.

### 3. Monitoring Equipment

#### 3.1 Outlet Monitors

The Instrument of Approval requires each ventilation outlet to be continuously monitored in accordance with the requirements of Table 2.

| Pollutant / Parameter                    | Frequency  | Equivalent Reference Method | Description of the Method                                                                                              |
|------------------------------------------|------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------|
| CO                                       | Continuous | In house method TP.003      | In-house methods<br>9.5 - Extractive dilution and<br>6.3 - Carbon monoxide by gas filter correlation spectrophotometry |
| NO, NO <sub>x</sub> , NO <sub>2</sub>    | Continuous | In house method TP.001      | In-house methods<br>9.5 – Extractive dilution and<br>6.1 - Oxides of nitrogen by chemiluminescence                     |
| PM <sub>10</sub>                         | Continuous | AS/NZS 3580.9.8             | In-house method<br>7.5 – Measurement of PM10, PM2.5 and TSP using Beta Attenuation Monitor.                            |
|                                          |            | In house method TP.005      |                                                                                                                        |
|                                          |            | AS 4323.1                   |                                                                                                                        |
| PM <sub>2.5</sub>                        | Continuous | In house method TP.026      | In-house method<br>7.5 – Measurement of PM10, PM2.5 and TSP using Beta Attenuation Monitor.                            |
|                                          |            | AS 4323.1                   |                                                                                                                        |
| CH <sub>4</sub> , NMHC, VOC <sup>2</sup> | Continuous | In house method TP.006      | In-house method<br>9.5 - Monitoring of methane and non-methane hydrocarbons by direct extraction                       |
| Relative Humidity                        | Continuous | In house method TP.014      | In-house method<br>9.8 – Continuous monitoring of moisture using relative humidity and temperature probe               |
| Temperature                              | Continuous | In house method TP.012      | In-house method<br>9.3 - Temperature by instrumental techniques                                                        |
| Flow Rate                                | Continuous | TBA                         | In-house method<br>9.2 - Gas flow by ultrasonic techniques                                                             |

Table 2. Monitoring requirements

The pollutant and parameters will be continuously measured using the instruments identified in Table 3 below.

| Pollutant/<br>Parameter | Instrument                                                                                        | Units of<br>Measure | Range                      | Resolution             | Uncertainty                                                                                  |
|-------------------------|---------------------------------------------------------------------------------------------------|---------------------|----------------------------|------------------------|----------------------------------------------------------------------------------------------|
| CO                      | Ecotech Serinus S30                                                                               | mg/m <sup>3</sup>   | 0 – 123 mg/m <sup>3</sup>  | 0.01 µg/m <sup>3</sup> | ± 8.2% of reading<br>at 62.5mg/m <sup>3</sup><br>(k=1.96)                                    |
| NO                      | Ecotech Serinus S40                                                                               | mg/m <sup>3</sup>   | 0 – 31ppm                  | 0.01ppb                | ± 8.1% of reading<br>for range 25.7 –<br>32.8mg/m <sup>3</sup><br>(k=1.96)                   |
| NO <sub>x</sub>         | Ecotech Serinus S40                                                                               | mg/m <sup>3</sup>   | 0 – 33 ppm                 | 0.01 ppb               | ± 8.1% of reading<br>for range 25.7 –<br>32.8mg/m <sup>3</sup><br>(k=1.96)                   |
| NO <sub>2</sub>         | Ecotech Serinus S40                                                                               | mg/m <sup>3</sup>   | 0 – 33 ppm                 | 0.01 ppb               | ± 8.5% of reading<br>at 25.7mg/m <sup>3</sup><br>(k=1.96)                                    |
| CH <sub>4</sub>         | Baseline 9000, ENVEA<br>HC51M                                                                     | mg/m <sup>3</sup>   | 0 – 17ppm                  | 0.1 ppm                | ±12% of reading +<br>0.3mg/m <sup>3</sup> for<br>range 3.5 –<br>17mg/m <sup>3</sup> (k=2.0)  |
| NMHC (as propane)       | Baseline 9000, ENVEA<br>HC51M                                                                     | mg/m <sup>3</sup>   | 0 – 20 ppm                 | 0.01 ppm               | ±13% of reading +<br>0.56mg/m <sup>3</sup> for<br>range 3.5 –<br>20mg/m <sup>3</sup> (k=2.0) |
| PM <sub>10</sub>        | Rupprecht &<br>Patashnick TEOM with<br>Ecotech and Norditech<br>ISS isokinetic sampling<br>system | µg/m <sup>3</sup>   | 0 – 5000 µg/m <sup>3</sup> | 0.1 µg/m <sup>3</sup>  | ±5.0 µg/m <sup>3</sup> or<br>3.6% of reading,<br>whichever is the<br>greater (k=1.96)        |
| PM <sub>25</sub>        | Rupprecht &<br>Patashnick TEOM with<br>Ecotech and Norditech<br>ISS isokinetic sampling<br>system | µg/m <sup>3</sup>   | 0 – 5000 µg/m <sup>3</sup> | 0.1 µg/m <sup>3</sup>  | ±5.0 µg/m <sup>3</sup> or<br>3.6% of reading,<br>whichever is the<br>greater (k=1.96)        |
| Temperature             | Vaisala HMT330                                                                                    | °C                  | 0 - 50 °C                  | 0.1 °C                 | ± 0.6 °C, (k=2.0)                                                                            |
| Relative Humidity       | Vaisala HMT330                                                                                    | %                   | 0 - 100 %                  | 1 %                    | ± 6%, (k=2.0)                                                                                |
| Flow Rate               | Flowsic100 USD<br>55SSTI Ultrasonic flow<br>sensor                                                | m <sup>3</sup> /s   | ±40 m <sup>3</sup> /s      | 1 m <sup>3</sup> /s    | ±0.1 for velocity<br>measurement1                                                            |

Table 3. Outlet Measured Parameters and Instruments

## 4. Air Quality Limits

Air quality goals provided are provided in Condition 173 of the Minister's Conditions of Approval issued by the Director-General for the Lane Cove Tunnel project. The air quality goals are shown in the table below.

| Location                  | Pollutant / Parameter | Type of Measurement  | Concentration Limit | Unit              |
|---------------------------|-----------------------|----------------------|---------------------|-------------------|
| Marden St (Eastern Stack) | CO                    | Average – 30 minutes | 62.5                | mg/m <sup>3</sup> |
|                           | NO <sub>x</sub>       | Average – 30 minutes | 25.7                | mg/m <sup>3</sup> |
|                           | PM <sub>10</sub>      | Average – 30 minutes | 1200                | µg/m <sup>3</sup> |
|                           | VOC (as propane)      | Average – 30 minutes | 6.3                 | mg/m <sup>3</sup> |
| Sirius Rd (Western Stack) | CO                    | Average – 30 minutes | 62.5                | mg/m <sup>3</sup> |
|                           | NO <sub>x</sub>       | Average – 30 minutes | 32.8                | mg/m <sup>3</sup> |
|                           | PM <sub>10</sub>      | Average – 30 minutes | 1600                | µg/m <sup>3</sup> |
|                           | VOC                   | Average – 30 minutes | 6.3                 | mg/m <sup>3</sup> |
| Combined Stacks           | CO                    | Annual               | 1530                | t/annum           |
|                           | NO <sub>x</sub>       | Annual               | 229                 | t/annum           |
|                           | PM10                  | Annual               | 14                  | t/annum           |
|                           | VOC                   | Annual               | 153                 | t/annum           |

Table 4. Ventilation Outlet Air Quality Limits

## 5. Data Validation and Reporting

### 5.1 Validation

Data validation is performed as per Norditech's data validation procedure TP.022. The data validation process identifies any data that is deemed not to be valid. This data is flagged as invalid in the database and is removed from the reported data.

Data may be deemed invalid for several reasons, including but not limited to:

- Instrument fault
- Instrument calibration out of tolerance
- Maintenance activities

For further details and explanations of reasons for invalidating data, please refer to section Data Validation Explanations.

Initial visual inspection of data is performed by inspection of graphs to identify any anomalies in the data set.

Site visit logs and maintenance and calibration certificates are cross referenced to the data set and any data affected by maintenance activities are flagged.

Instrument drift and calibration tolerances are checked and data flagged in the database as necessary as per NATA compliance requirements.

## 5.2 Reporting

The data is reported in real time at the Lane Cove Tunnel website (URL. <http://lanecovetunnel.com/>))

Summary monthly data is recorded and reported within the OMCS and is included in the attachments to this report.

- a. Carbon Monoxide
- b. Oxides of Nitrogen
- c. Nitrogen Dioxide
- d. Nitrogen Monoxide
- e. Volatile Organic Compounds
- f. PM<sub>10</sub>
- g. PM<sub>2.5</sub>
- h. Stack Temperature
- i. Stack Flow
- j. Relative Humidity

Averages are based on all readings within the averaging period.

In addition to this, the OMCS can generate ad hoc reports for specific events or periods, and these will be included in the report as required, to provide additional detail for an abnormal event or incident.

Data reported via the OMCS has not been validated. This report provides validated data for the VSO sensors.

All data within this report is reported as 'End Time'. I.e the 1hour average result for 2:00 is the average of the 1minute data from 1:00 through to 2:00.

## 5.3 Data Collection

At each Air Quality Monitoring Station, data is logged to a Congrego data logger at 5-minute average intervals. Each 5-minute average is calculated from data sampled at 10 second intervals.

Data is transferred automatically to Norditech's data collection software via a TCP/IP link, at a frequency of not greater than 1 hour. Two datasets are maintained by Norditech, one for data validation and reporting purposes, and a non-validated data set for reference purposes.

### 5.3.1 Data Availability

Data availability refers to the amount of available data for the reporting period. Data availability is calculated using the following formula:

$$\text{Data availability \%} = \frac{\text{sum of available data points}}{\text{sum of possible data points}} * 100$$

Where:

- Sum of available data points is the number of validated 1 hour average data points for the reporting period
- Sum of possible data points is the number of theoretically available data points for the reporting period

### 5.3.2 Unit Conversions

Total oxides of nitrogen (NO<sub>x</sub>) results are expressed as NO<sub>2</sub> equivalents in mg/m<sup>3</sup>. As of 1/03/2021, VOC results are expressed as non-methane hydrocarbons as propane equivalents in mg/m<sup>3</sup>. Prior to this date VOC results were expressed as total VOCs as methane equivalent.

Stack velocity readings are converted to flow rate using the following stack areas:

- Marden Street Stack area 59.8919 m<sup>2</sup>
- Sirius Road Stack – North Partition area 35.95 m<sup>2</sup>
- Sirius Road Stack – South Partition area 36.19 m<sup>2</sup>

Pollutant and flow data are reported at reference conditions: 0°C, 101.325 kPa, dry.

### 5.3.3 Combined Sirius Road South and Sirius Road North results

Data from the Sirius Road stack are combined results of the north and south partitions. Stack velocity is used to determine whether a partition is active or inactive, and this determines the calculation for the total Sirius Road ventilation stack results.

The table below shows the criteria used to determine how the total Sirius Road ventilation stack data is calculated.

| LCT Tunnel Sirius Rd Ventilation Stack Reporting Conditions |                                                                                                                                                      |
|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Partitions Active                                           | Calculation                                                                                                                                          |
| None                                                        | Combined result is based on weighted total from both partitions. Weighting is calculated as a function of the ratio of partition flows to total flow |
| One                                                         | Active partition is reported                                                                                                                         |
| Both                                                        | Combined result is based on weighted total from both partitions. Weighting is calculated as a function of the ratio of partition flows to total flow |
| Unknown in either partition                                 | No result provided as it cannot be determined whether each partition is active or not                                                                |

Table 5: Sirius Rd Reporting Condition criteria

#### 5.3.4 Accumulative Load

Accumulative loads are calculated from the monthly measured emission in tonnes for each stack for CO, NO<sub>x</sub>, PM<sub>10</sub> and VOC. The measured emissions are converted to an estimated monthly total emission by taking into account the data capture of each parameter, using the following formula:

$$\text{estimated monthly total emission} = \frac{\text{measured monthly emission}}{\text{available data \%}} * 10$$

The estimated monthly total emissions for each parameter for each stack are then added together to give the total emission per parameter per month.

The accumulative load is then calculated as the sum of the previous 12 months estimated total emission for each parameter.

If there is less than 50% data availability for any parameter, then data for the last valid previous month (i.e. above 50% data availability) is substituted.

## 6. Calibrations and Maintenance

### 6.1 Maintenance

| Device                                                   | Frequency                                   |
|----------------------------------------------------------|---------------------------------------------|
| Outlet Air Quality Sensors – CEMS Gas monitors           | 1 monthly                                   |
| Outlet Air Quality Sensors – CEMS Particulate Monitor    | 1 monthly                                   |
| Outlet Air Quality Sensors – CEMS Meteorological Sensors | 6 monthly                                   |
| Outlet Air Quality Sensors – CEMS Velocity Sensors       | Based on the Manual Stack Testing frequency |

Table 6. Indicative Maintenance requirements

### 6.2 Calibration

The table below identifies the times at which the daily gaseous parameter automatic span and zero checks are performed.

Further to the span and zero checks, the CO analysers perform nightly background reference cycles.

This data is removed from the dataset, however are not included in the data validation tables.

| Nightly span and zero times for NO, NO <sub>2</sub> , NO <sub>x</sub> , CO, CH <sub>4</sub> and NMHC |                                       |                        |                                |
|------------------------------------------------------------------------------------------------------|---------------------------------------|------------------------|--------------------------------|
| Station                                                                                              | Parameters                            | Span / Zero cycle time | Daily Calibration Checks Times |
| Marden St                                                                                            | CO                                    | 1:00 – 2:00            | 23:45 – 23:50                  |
|                                                                                                      | NO, NO <sub>2</sub> , NO <sub>x</sub> | 1:00 – 2:00            | -                              |
|                                                                                                      | VOC                                   | 1:00 – 2:00            | -                              |
| Sirius Rd South                                                                                      | CO                                    | 1:00 – 2:00            | 23:45 – 23:50                  |
|                                                                                                      | NO, NO <sub>2</sub> , NO <sub>x</sub> | 1:00 – 2:00            | -                              |
|                                                                                                      | VOC                                   | 1:00 – 2:00            | -                              |
| Sirius Rd North                                                                                      | CO                                    | 1:00 – 2:00            | 23:45 – 23:50                  |
|                                                                                                      | NO, NO <sub>2</sub> , NO <sub>x</sub> | 1:00 – 2:00            | -                              |
|                                                                                                      | VOC                                   | 1:00 – 2:00            | -                              |

Table 7. Daily Calibration Checks Times

There are no valid data available for all gaseous parameters during these times. These automatic calibration cycles are not included in the data validation tables in Section 8.

The CEMS particulate monitors are to be manually calibrated at 3 monthly intervals as described in the Operation and Maintenance manuals prepared for the project. The CEMS particulate monitors will also undergo gravimetric correlation testing at yearly intervals as described in the Operation and Maintenance manuals prepared for the project.

A list of all the devices and the latest calibration details are included in the table below, and in an excel spreadsheet.

| Lane Cove Tunnel Ventilation Stack Outlet Last Scheduled Calibration Dates – February 2026 |                                    |                  |                                    |                                  |
|--------------------------------------------------------------------------------------------|------------------------------------|------------------|------------------------------------|----------------------------------|
| Marden St                                                                                  |                                    |                  |                                    |                                  |
| Sensor                                                                                     | Date of Last Scheduled Maintenance | Maintenance Type | Date of Last Scheduled Calibration | Calibration Frequency            |
| CO                                                                                         | 18/02/2026                         | 6 Monthly        | 18/02/2026                         | 1 Monthly                        |
| NO/NO <sub>2</sub> /No <sub>x</sub>                                                        | 18/02/2026                         | 6 Monthly        | 18/02/2026                         | 1 Monthly                        |
| VOC                                                                                        | 18/02/2026                         | 6 Monthly        | 18/02/2026                         | 1 Monthly                        |
| PM10                                                                                       | 17/02/2026                         | 6 Monthly        | 17/02/2026                         | 1 Monthly                        |
| PM2.5                                                                                      | 17/02/2026                         | 6 Monthly        | 17/02/2026                         | 1 Monthly                        |
| Temperature                                                                                | 17/02/2026                         | 6 Monthly        | 17/02/2026                         | 6 Monthly                        |
| Relative Humidity                                                                          | 17/02/2026                         | 6 Monthly        | 17/02/2026                         | 6 Monthly                        |
| Flow Rate                                                                                  | N/A                                | N/A              | 09/08/2024                         | Based on stack testing frequency |

Table 8. Marden St Last Scheduled Maintenance and Calibration Dates

| Lane Cove Tunnel Ventilation Stack Outlet Last Scheduled Calibration Dates – February 2026 |                                    |                  |                                    |                                  |
|--------------------------------------------------------------------------------------------|------------------------------------|------------------|------------------------------------|----------------------------------|
| Sirius Rd South                                                                            |                                    |                  |                                    |                                  |
| Sensor                                                                                     | Date of Last Scheduled Maintenance | Maintenance Type | Date of Last Scheduled Calibration | Calibration Frequency            |
| CO                                                                                         | 12/02/2026                         | 1 Monthly        | 12/02/2026                         | 1 Monthly                        |
| NO/NO <sub>2</sub> /No <sub>x</sub>                                                        | 12/02/2026                         | 1 Monthly        | 12/02/2026                         | 1 Monthly                        |
| VOC                                                                                        | 12/02/2026                         | 1 Monthly        | 12/02/2026                         | 1 Monthly                        |
| PM10                                                                                       | 12/02/2026                         | 1 Monthly        | 12/02/2026                         | 1 Monthly                        |
| PM2.5                                                                                      | 12/02/2026                         | 1 Monthly        | 12/02/2026                         | 1 Monthly                        |
| Temperature                                                                                | 12/01/2026                         | 12 Monthly       | 12/01/2026                         | 6 Monthly                        |
| Relative Humidity                                                                          | 12/01/2026                         | 12 Monthly       | 12/01/2026                         | 6 Monthly                        |
| Flow Rate                                                                                  | N/A                                | N/A              | 09/08/2024                         | Based on stack testing frequency |

Table 9. Sirius Rd South Last Scheduled Maintenance and Calibration Dates

| Lane Cove Tunnel Ventilation Stack Outlet Last Scheduled Calibration Dates – February 2026 |                                    |                  |                                    |                                  |
|--------------------------------------------------------------------------------------------|------------------------------------|------------------|------------------------------------|----------------------------------|
| Sirius Rd North                                                                            |                                    |                  |                                    |                                  |
| Sensor                                                                                     | Date of Last Scheduled Maintenance | Maintenance Type | Date of Last Scheduled Calibration | Calibration Type                 |
| CO                                                                                         | 09/02/2026                         | 12 Monthly       | 09/02/2026                         | 1 Monthly                        |
| NO/NO <sub>2</sub> /No <sub>x</sub>                                                        | 09/02/2026                         | 12 Monthly       | 09/02/2026                         | 1 Monthly                        |
| VOC                                                                                        | 09/02/2026                         | 12 Monthly       | 09/02/2026                         | 1 Monthly                        |
| PM10                                                                                       | 10/02/2026                         | 12 Monthly       | 10/02/2026                         | 1 Monthly                        |
| PM2.5                                                                                      | 10/02/2026                         | 12 Monthly       | 10/02/2026                         | 1 Monthly                        |
| Temperature                                                                                | 09/02/2026                         | 12 Monthly       | 09/02/2026                         | 6 Monthly                        |
| Relative Humidity                                                                          | 09/02/2026                         | 12 Monthly       | 09/02/2026                         | 6 Monthly                        |
| Flow Rate                                                                                  | N/A                                | N/A              | 09/08/2024                         | Based on stack testing frequency |

Table 10. Sirius Rd North Last Scheduled Maintenance and Calibration Dates

## 7. Above Goal Readings

Instances of the ventilation stack pollutants exceeding the MCoA goals during the reporting period are presented in the table below.

There were nil exceedances of the prescribed limits during the reporting period.

| Lane Cove Tunnel – Marden St Above Goal Readings – February 2026 |                     |                   |                  |                               |                                 |                    |
|------------------------------------------------------------------|---------------------|-------------------|------------------|-------------------------------|---------------------------------|--------------------|
| Pollutant                                                        | Concentration Limit | Units             | Averaging Period | Number of Above Goal Readings | Date Time of Above Goal Reading | Above Goal Reading |
| CO                                                               | 62.5                | mg/m <sup>3</sup> | 30 minutes       | 0                             | -                               | -                  |
| NO <sub>x</sub>                                                  | 25.7                | mg/m <sup>3</sup> | 30 minutes       | 0                             | -                               | -                  |
| PM <sub>10</sub>                                                 | 1200                | µg/m <sup>3</sup> | 30 minutes       | 0                             | -                               | -                  |
| VOC                                                              | 6.3                 | mg/m <sup>3</sup> | 30 minutes       | 0                             | -                               | -                  |

Table 11. Marden St Above Goal Readings

| Lane Cove Tunnel – Sirius Rd Above Goal Readings – February 2026 |                     |                   |                  |                               |                                 |                    |
|------------------------------------------------------------------|---------------------|-------------------|------------------|-------------------------------|---------------------------------|--------------------|
| Pollutant                                                        | Concentration Limit | Units             | Averaging Period | Number of Above Goal Readings | Date Time of Above Goal Reading | Above Goal Reading |
| CO                                                               | 62.5                | mg/m <sup>3</sup> | 30 minutes       | 0                             | -                               | -                  |
| NO <sub>x</sub>                                                  | 32.8                | mg/m <sup>3</sup> | 30 minutes       | 0                             | -                               | -                  |
| PM <sub>10</sub>                                                 | 1600                | µg/m <sup>3</sup> | 30 minutes       | 0                             | -                               | -                  |
| VOC                                                              | 6.3                 | mg/m <sup>3</sup> | 30 minutes       | 0                             | -                               | -                  |

Table 12. Sirius Rd Above Goal Readings

| Lane Cove Tunnel – Combined Stacks Above Goal Readings – February 2026 |                     |         |                  |                               |                                 |                    |
|------------------------------------------------------------------------|---------------------|---------|------------------|-------------------------------|---------------------------------|--------------------|
| Pollutant                                                              | Concentration Limit | Units   | Averaging Period | Number of Above Goal Readings | Date Time of Above Goal Reading | Above Goal Reading |
| CO                                                                     | 1530                | t/annum | Annual           | 0                             | -                               | -                  |
| NO <sub>x</sub>                                                        | 229                 | t/annum | Annual           | 0                             | -                               | -                  |
| PM <sub>10</sub>                                                       | 14                  | t/annum | Annual           | 0                             | -                               | -                  |
| VOC                                                                    | 153                 | t/annum | Annual           | 0                             | -                               | -                  |

Table 13. Combined Stacks Annual Above Goal Readings

## 8. Documentation

Validated data for Marden St Stack is presented in the Excel workbook named “202602 LCT Marden St Stack Validated data.xlsx”. The workbook consists of the following sheets:

1. Cover
2. Marden St 5m Avg
3. Marden St Span Zero Data
4. Marden St Data Validation

Validated data for Sirius Rd Stack is presented in the Excel workbook named “202602 LCT Sirius Rd Stack Validated data.xlsx”. The workbook consists of the following sheets:

1. Cover
2. Sirius Rd Combined 5m Avg
3. Flow Temp RH Individual 5m Avg
4. Sirius Rd South Span Zero Data
5. Sirius Rd North Span Zero Data
6. Sirius Rd South Data Validation
7. Sirius Rd North Data Validation

## 9. Results

### 9.1 Data Availability

Data availability for the ventilation stack outlet sensors is provided in the table below.

| LCT Tunnel – Ventilation Stack Data Availability – February 2026 |        |        |                     |                     |                      |                       |         |          |
|------------------------------------------------------------------|--------|--------|---------------------|---------------------|----------------------|-----------------------|---------|----------|
| Location                                                         | CO (%) | NO (%) | NO <sub>2</sub> (%) | NO <sub>x</sub> (%) | PM <sub>10</sub> (%) | PM <sub>2.5</sub> (%) | VOC (%) | Flow (%) |
| Marden St Stack                                                  | 91.6%  | 92.0%  | 92.0%               | 92.0%               | 96.1%                | 92.0%                 | 92.0%   | 97.2%    |
| Sirius Rd Stack                                                  | 91.9%  | 88.9%  | 88.9%               | 88.9%               | 96.9%                | 97.1%                 | 85.5%   | 98.3%    |

Table 14. LCT data availability

### 9.2 Tabulated Results

#### 9.2.1 Summary of 30 minute Average Ventilation Outlet Data

The following table presents 30 minute average minimum, maximum and daily average data for the Marden St Stack, and Sirius Rd combined stack.

30 minute averages are calculated from 5 minute average data. The daily average is calculated from 30 minute average data.

| LCT Tunnel – Marden St Stack Summary – February 2026 |                   |                   |                   |                   |                   |                   |                   |                   |
|------------------------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|                                                      | CO                | NO                | NO <sub>2</sub>   | NO <sub>x</sub>   | PM <sub>10</sub>  | PM <sub>2.5</sub> | VOC               | Flow              |
|                                                      | mg/m <sup>3</sup> | mg/m <sup>3</sup> | mg/m <sup>3</sup> | mg/m <sup>3</sup> | µg/m <sup>3</sup> | µg/m <sup>3</sup> | mg/m <sup>3</sup> | m <sup>3</sup> /s |
|                                                      | 30 minute average | 30 minute average | 30 minute average | 30 minute average | 30 minute average | 30 minute average | 30 minute average | 30 minute average |
| Minimum                                              | 0.47              | 0.00              | 0.02              | 0.03              | -8.90             | -10.23            | 0.00              | 9.40              |
| Maximum                                              | 6.11              | 3.51              | 0.62              | 6.00              | 258.19            | 158.43            | 0.93              | 477.43            |
| Average                                              | 2.06              | 0.79              | 0.18              | 1.40              | 55.06             | 21.45             | 0.14              | 460.15            |
| Limit                                                | 62.50             | N/A               | N/A               | 25.70             | 1200.00           | N/A               | 6.30              | N/A               |

Table 15. Summary of 30-minute average data Marden St

**LCT Tunnel – Sirius Rd Stack Summary – February 2026**

|         | CO                | NO                | NO <sub>2</sub>   | NO <sub>x</sub>   | PM <sub>10</sub>  | PM <sub>2.5</sub> | VOC               | Flow              |
|---------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|         | mg/m <sup>3</sup> | mg/m <sup>3</sup> | mg/m <sup>3</sup> | mg/m <sup>3</sup> | µg/m <sup>3</sup> | µg/m <sup>3</sup> | mg/m <sup>3</sup> | m <sup>3</sup> /s |
|         | 30 minute average | 30 minute average | 30 minute average | 30 minute average | 30 minute average | 30 minute average | 30 minute average | 30 minute average |
| Minimum | 0.10              | -0.01             | 0.02              | 0.01              | -4.96             | -4.84             | 0.00              | 13.24             |
| Maximum | 2.03              | 0.51              | 0.21              | 0.91              | 138.74            | 91.76             | 0.38              | 523.46            |
| Average | 0.54              | 0.11              | 0.06              | 0.23              | 33.71             | 18.82             | 0.13              | 459.02            |
| Limit   | 62.50             | N/A               | N/A               | 32.80             | 1600.00           | N/A               | 6.30              | N/A               |

Table 16. Summary of 30-minute average data Sirius Rd

### 9.2.2 Summary of 30 minute Average Flow, Relative Humidity and Temperature

The following table presents 30 minute average minimum, maximum and daily average flow, relative humidity, and temperature data for the Marden St Stack, and Sirius Rd North and South partitions.

30 minute averages are calculated from 5 minute average data. The daily average is calculated from 30 minute average data.

**LCT Tunnel Ventilation Stack Flow, RH, Temperature Summary– February 2026**

|           | Marden St (Eastern Stack) |                   |                   | Sirius Rd – South Partition |                   |                   | Sirius Rd – North Partition |                   |                   |
|-----------|---------------------------|-------------------|-------------------|-----------------------------|-------------------|-------------------|-----------------------------|-------------------|-------------------|
| Parameter | Flow                      | RH                | Temperature       | Flow                        | RH                | Temperature       | Flow                        | RH                | Temperature       |
|           | m <sup>3</sup> /s         | %                 | °C                | m <sup>3</sup> /s           | %                 | °C                | m <sup>3</sup> /s           | %                 | °C                |
|           | 30 minute average         | 30 minute average | 30 minute average | 30 minute average           | 30 minute average | 30 minute average | 30 minute average           | 30 minute average | 30 minute average |
| Minimum   | 9.40                      | 32.51             | 21.93             | 5.79                        | 32.28             | 18.86             | 4.28                        | 16.33             | 17.17             |
| Maximum   | 477.43                    | 81.40             | 32.01             | 488.79                      | 95.28             | 30.83             | 523.46                      | 105.78            | 34.52             |
| Average   | 460.15                    | 60.58             | 27.18             | 360.15                      | 62.64             | 25.64             | 115.19                      | 64.11             | 25.08             |

Table 17. Summary of 30-minute average data Sirius Rd

### 9.2.3 Summary of Accumulated Load for Combined Stacks

| Lane Cove Tunnel Ventilation Stack Outlet Accumulative Load<br>January 2025 – February 2026 |                 |                    |                  |        |
|---------------------------------------------------------------------------------------------|-----------------|--------------------|------------------|--------|
| Location                                                                                    | Carbon Monoxide | Oxides of Nitrogen | PM <sub>10</sub> | VOC    |
|                                                                                             | Tonnes          | Tonnes             | Tonnes           | Tonnes |
| Accumulative Load for past 12 months                                                        | 37.96           | 28.21              | 1.28             | 3.46   |
| Annual Limit (Tonnes)                                                                       | 1530            | 229                | 14               | 153    |

Table 18. Summary of Accumulated Load for Combined Stacks

## 9.3 Graphical Representations

### 9.3.1 Marden St Stack - Monthly Charts

The following charts present 30-minute average minimum, maximum and daily average data CO, NOx, PM10 and VOC for the Marden St Stack.

30-minute averages are calculated from 5-minute average data. The daily average is calculated from 30-minute average data.

#### 9.3.1.1 Marden St Monthly CO Averages

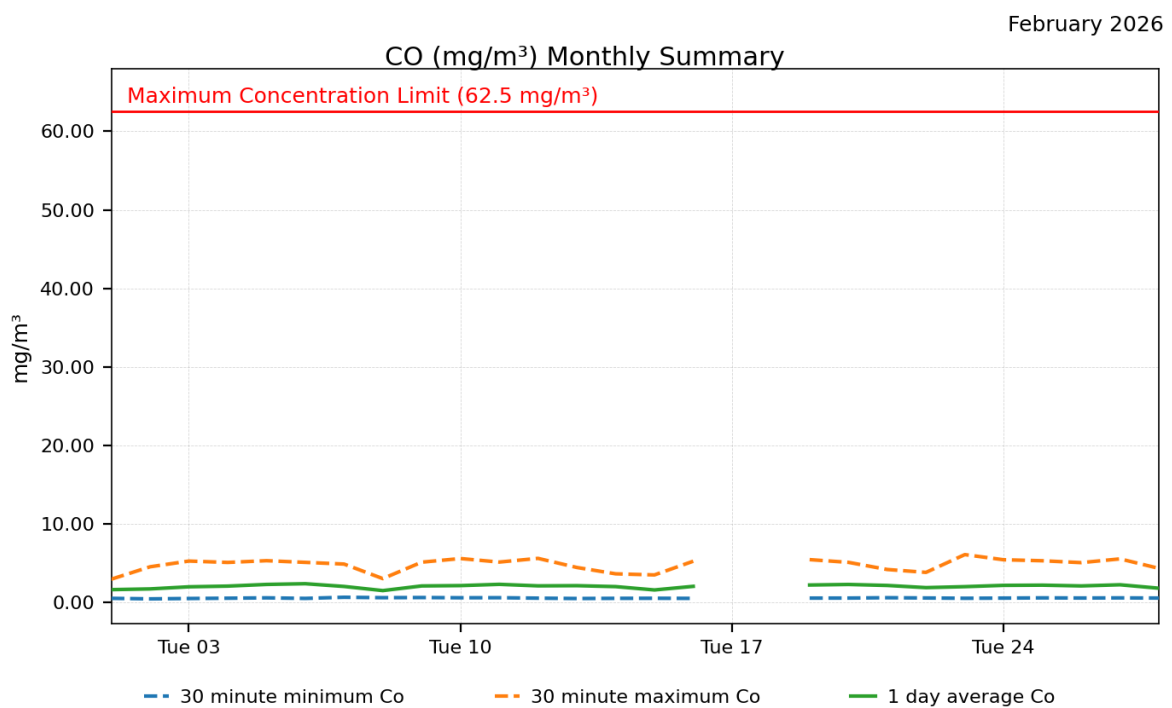


Figure 2. Marden St CO Averages

### 9.3.1.2 Marden St Monthly VOC Averages

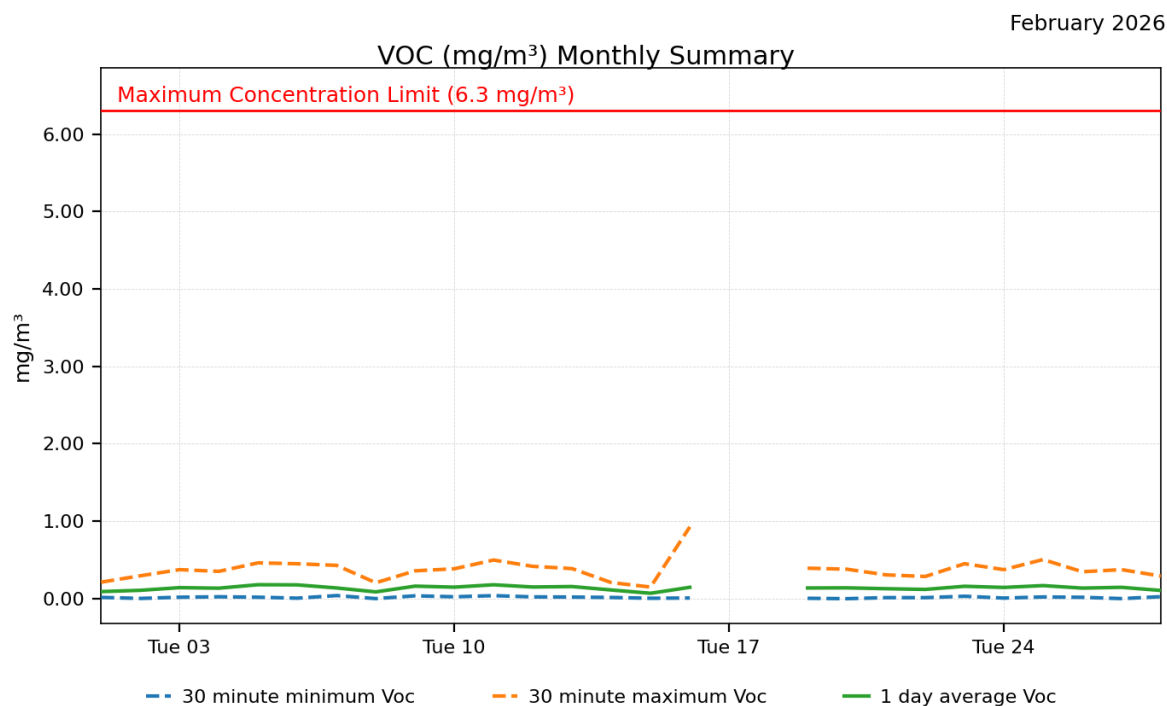


Figure 3. Marden St VOC Averages

### 9.3.1.3 Marden St Monthly NO<sub>x</sub>, NO<sub>2</sub> Averages

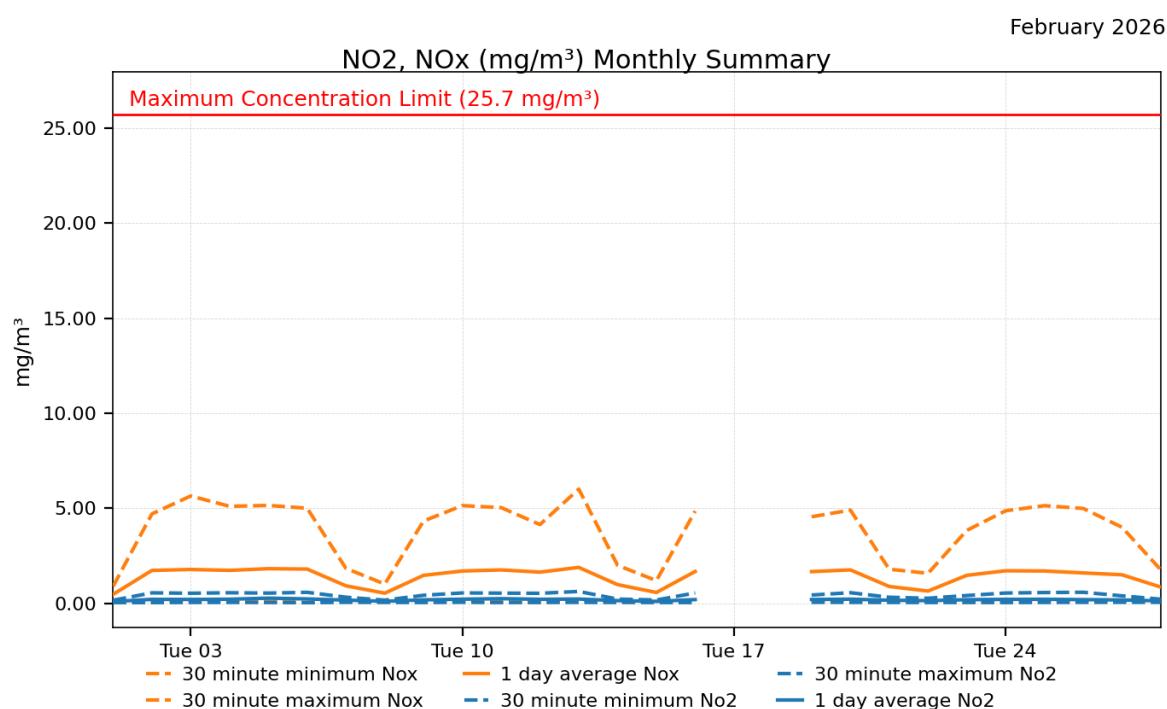


Figure 4. Marden St NO<sub>x</sub>, NO<sub>2</sub> Averages

### 9.3.1.4 Marden St Monthly PM<sub>10</sub> Averages

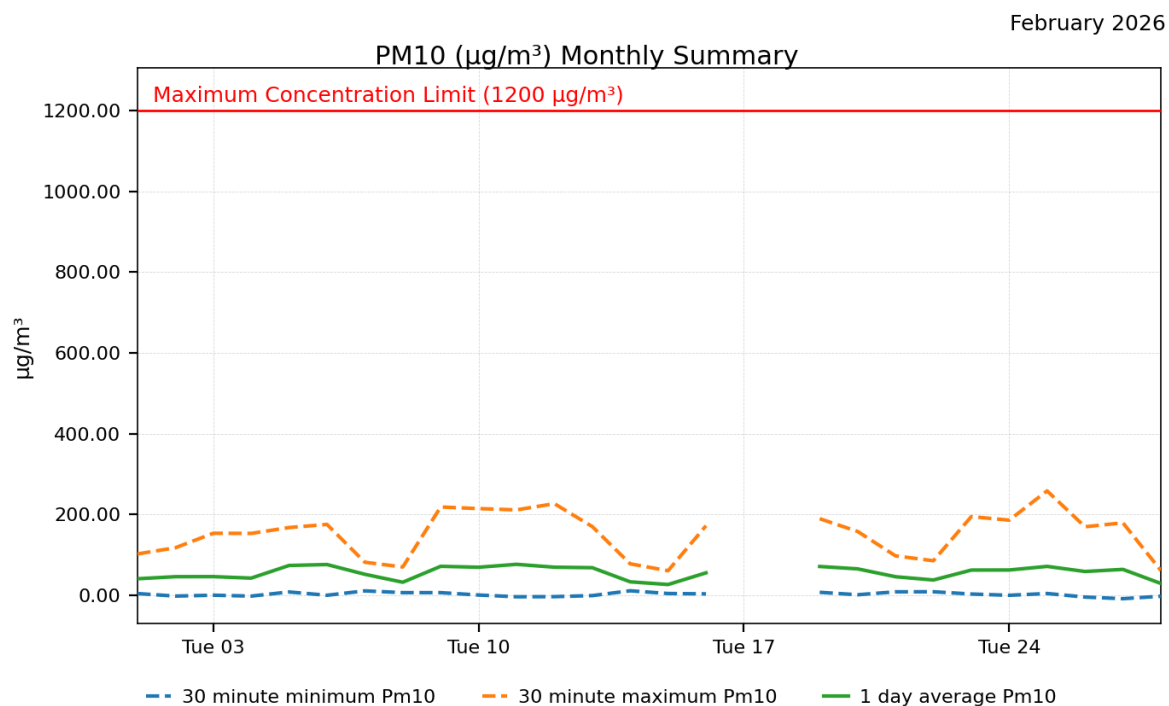


Figure 5. Marden St PM<sub>10</sub> Averages

### 9.3.2 Sirius Rd Stack - Monthly Charts

The following charts present 30-minute average minimum, maximum and daily average data CO, NOx, PM10 and VOC for the Marden St Stack, and Sirius Rd combined stack.

30-minute averages are calculated from 5-minute average data. The daily average is calculated from 30-minute average data.

#### 9.3.2.1 Sirius Rd Monthly CO Averages

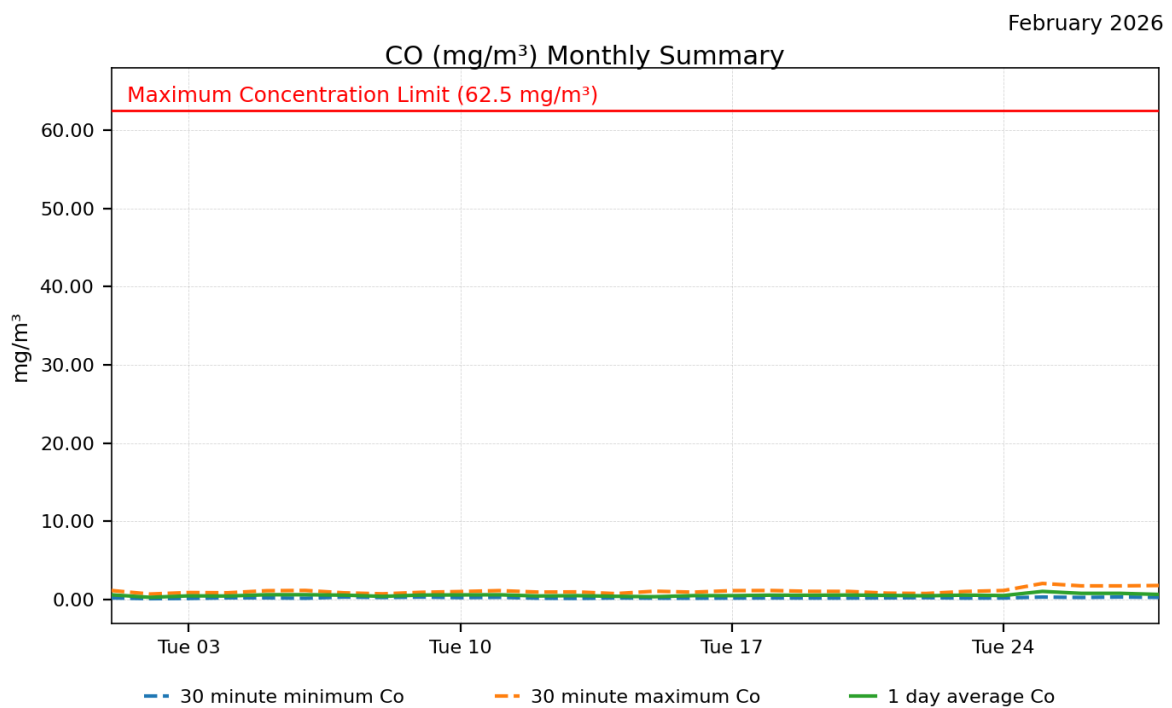


Figure 6. Sirius Rd CO Averages

### 9.3.2.2 Sirius Rd Monthly VOC Averages

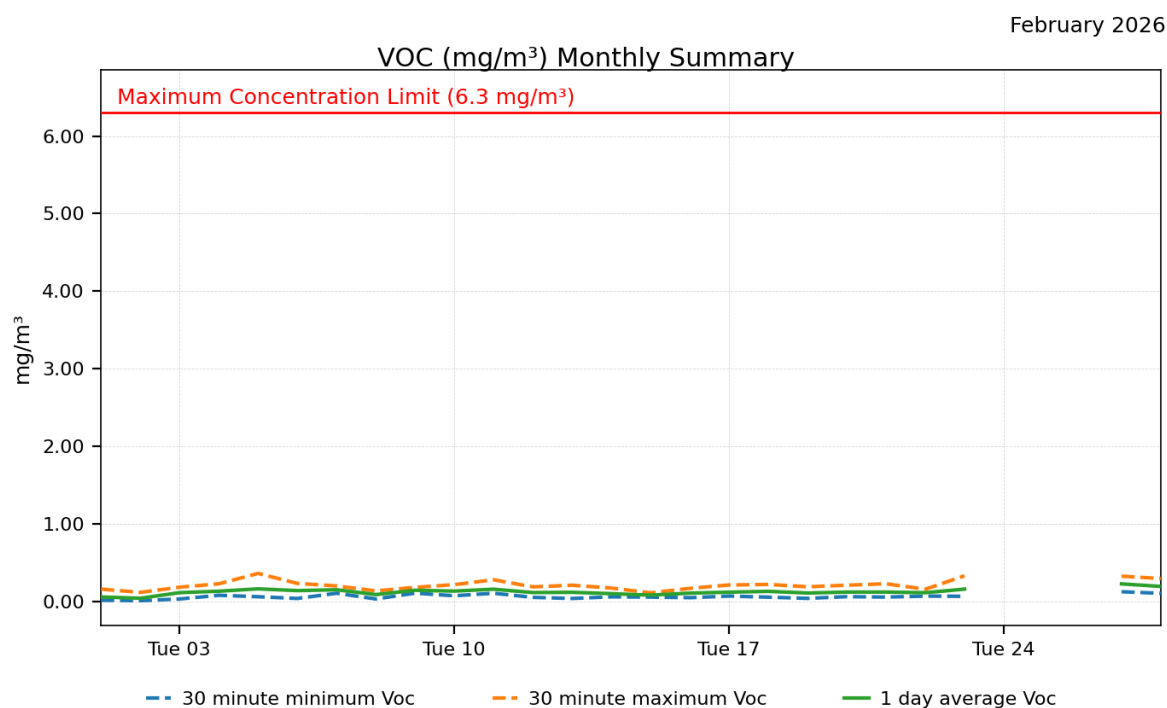


Figure 7. Sirius Rd VOC Averages

### 9.3.2.3 Sirius Rd Monthly NO<sub>x</sub>, NO<sub>2</sub> Averages

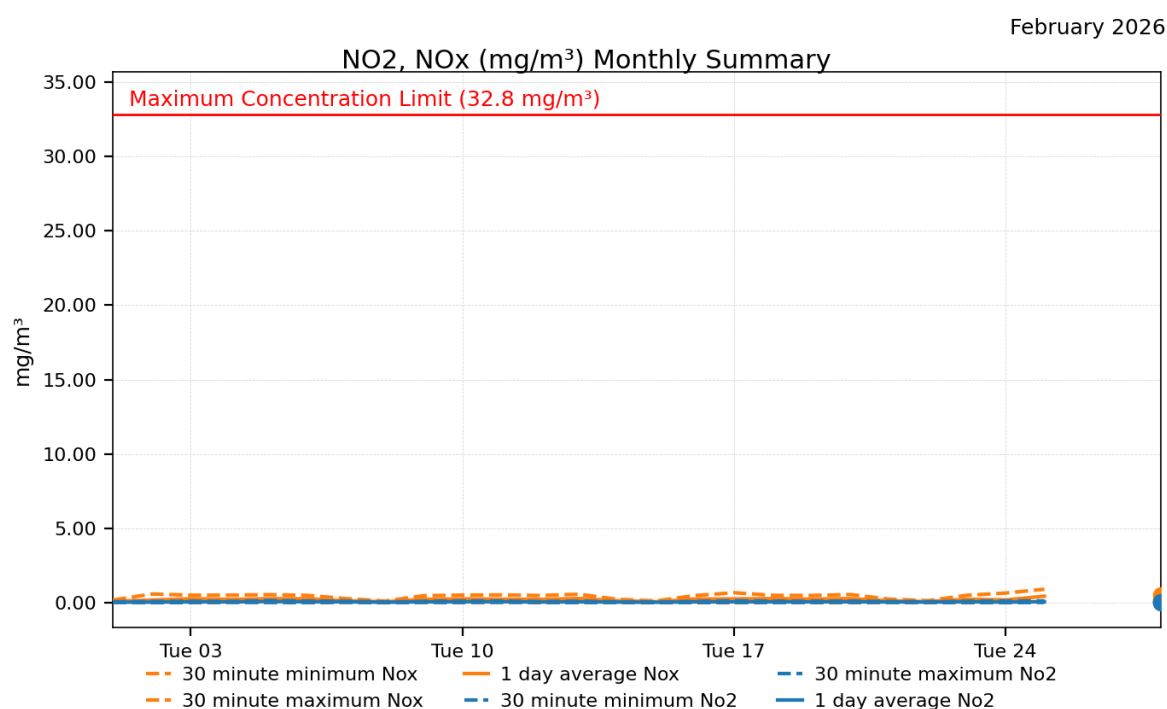


Figure 8. Sirius Rd NO<sub>x</sub>, NO<sub>2</sub> Averages

### 9.3.2.4 Sirius Rd Monthly PM<sub>10</sub> Averages

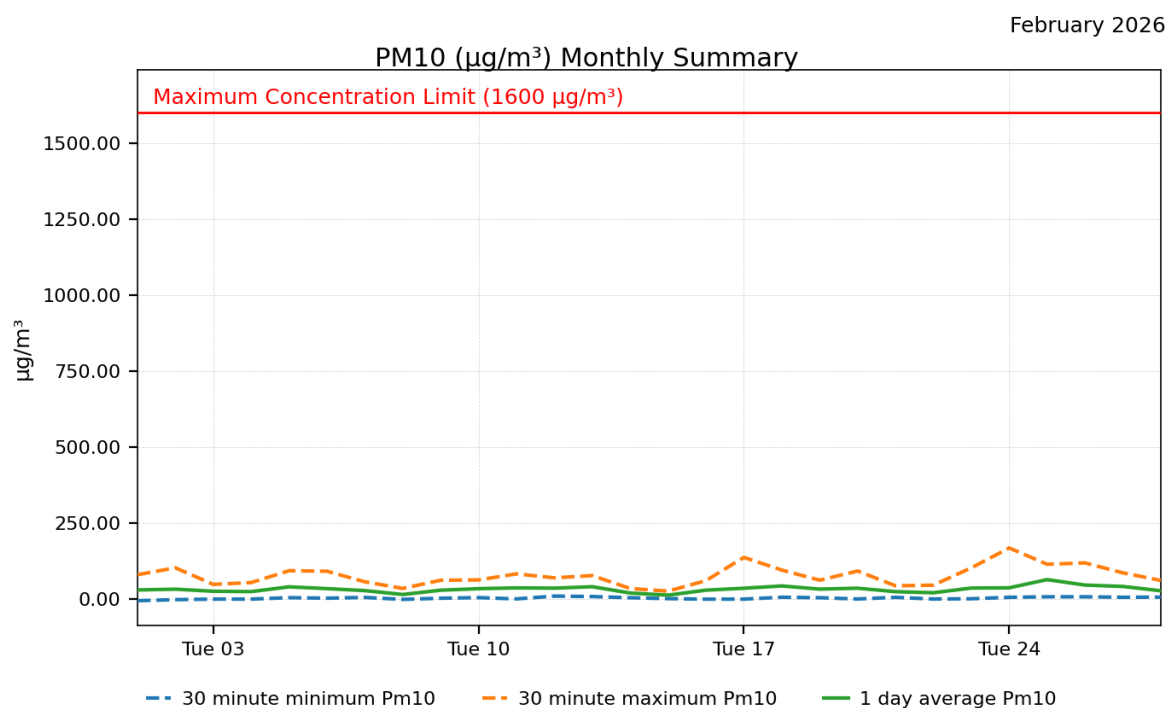


Figure 9. Sirius Rd PM<sub>10</sub> Averages

### 9.3.3 Accumulative Loads

The following charts present annual accumulative total loads CO, NO<sub>x</sub>, PM<sub>10</sub> and VOC for the Lane Cove Tunnel ventilation stacks

#### 9.3.3.1 Combined Stacks CO Accumulative Load

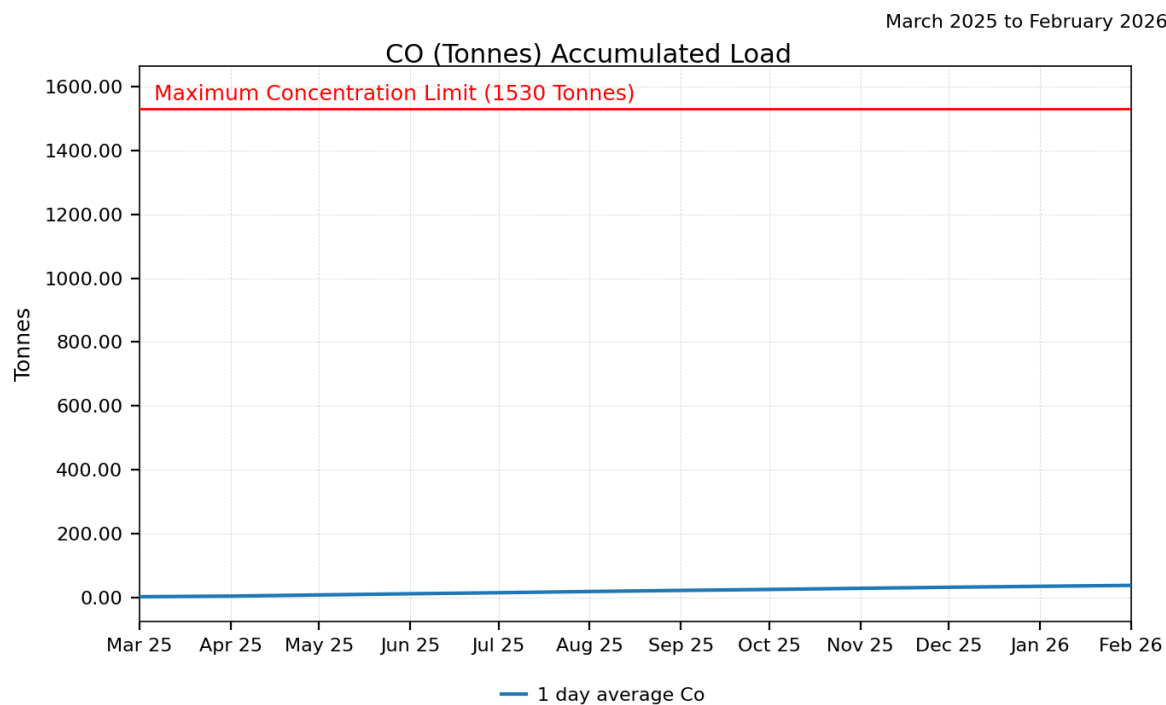


Figure 10. Combined Stacks CO Accumulative Load

### 9.3.3.2 Combined Stacks VOC Accumulative Load

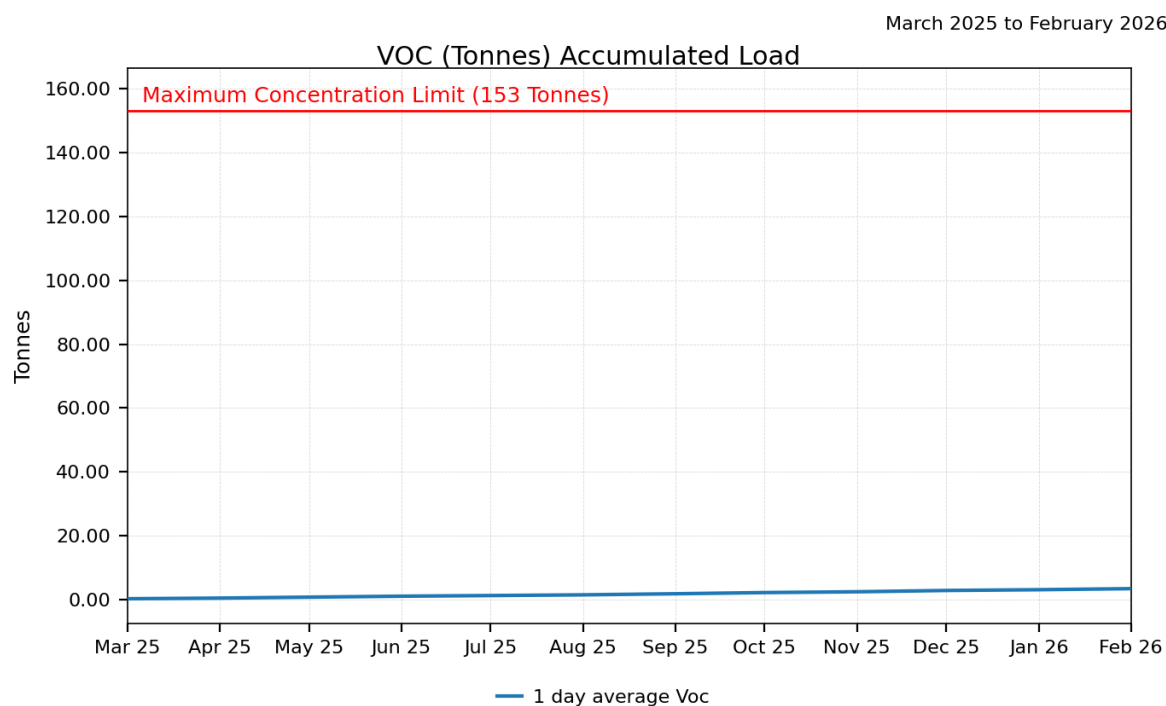


Figure 11. Combined Stacks VOC Accumulative Load

### 9.3.3.3 Combined Stacks NO<sub>x</sub> Accumulative Load

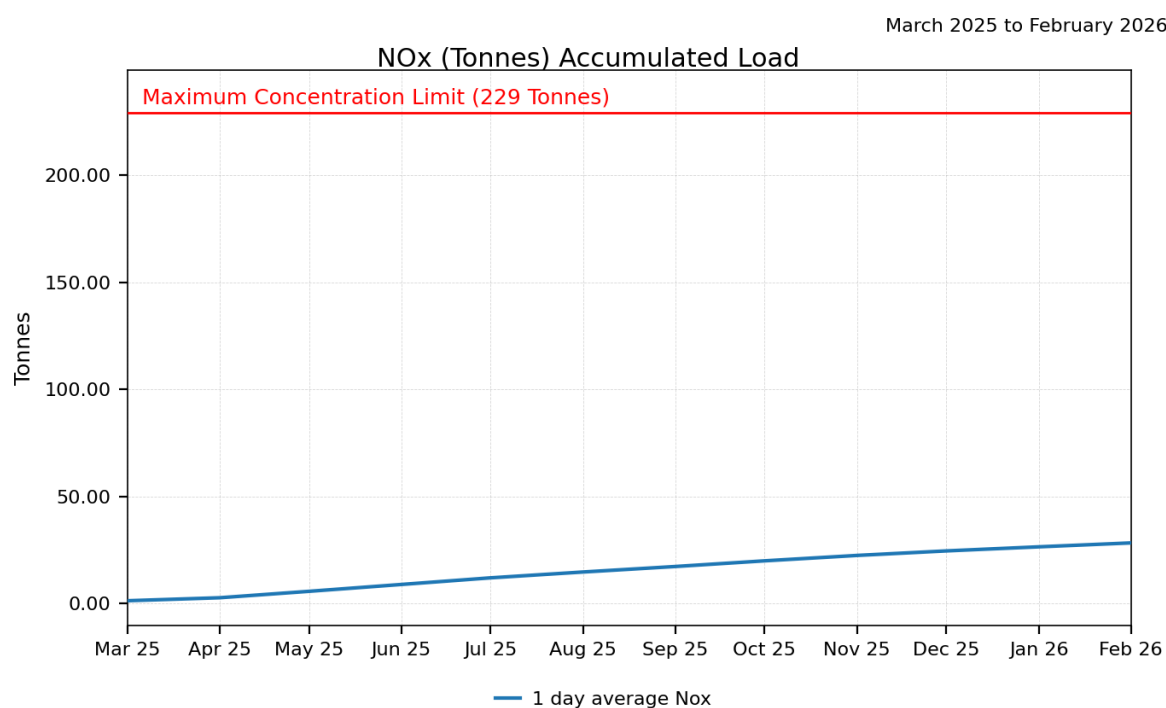


Figure 12. Combined Stacks NO<sub>x</sub> Accumulative Load

### 9.3.3.4 Combined Stacks PM<sub>10</sub> Accumulative Load

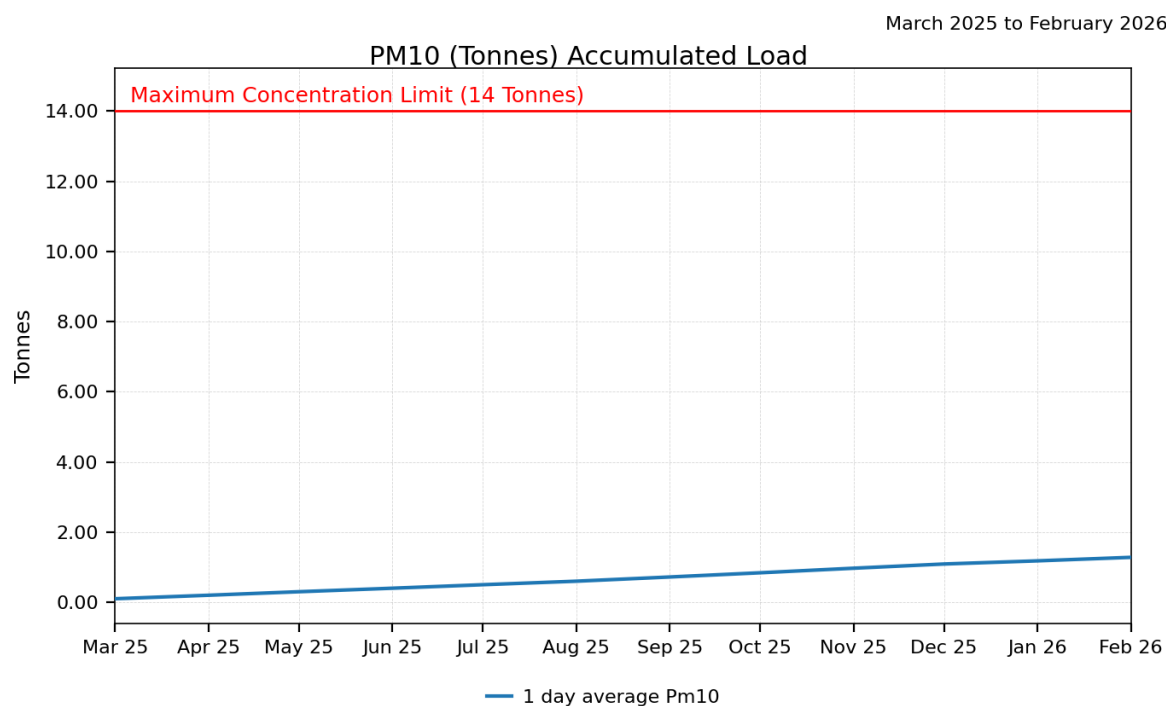


Figure 13. Combined Stacks NO<sub>x</sub> Accumulative Load

### 9.3.4 Marden St Stack - Three Monthly Trends

The following charts present 1 day average CO, NOx, PM10 and VOC for the Marden St Stack in three months.

The daily average is calculated from 30-minute average data.

#### 9.3.4.1 Marden St Three Monthly CO 1day Averages

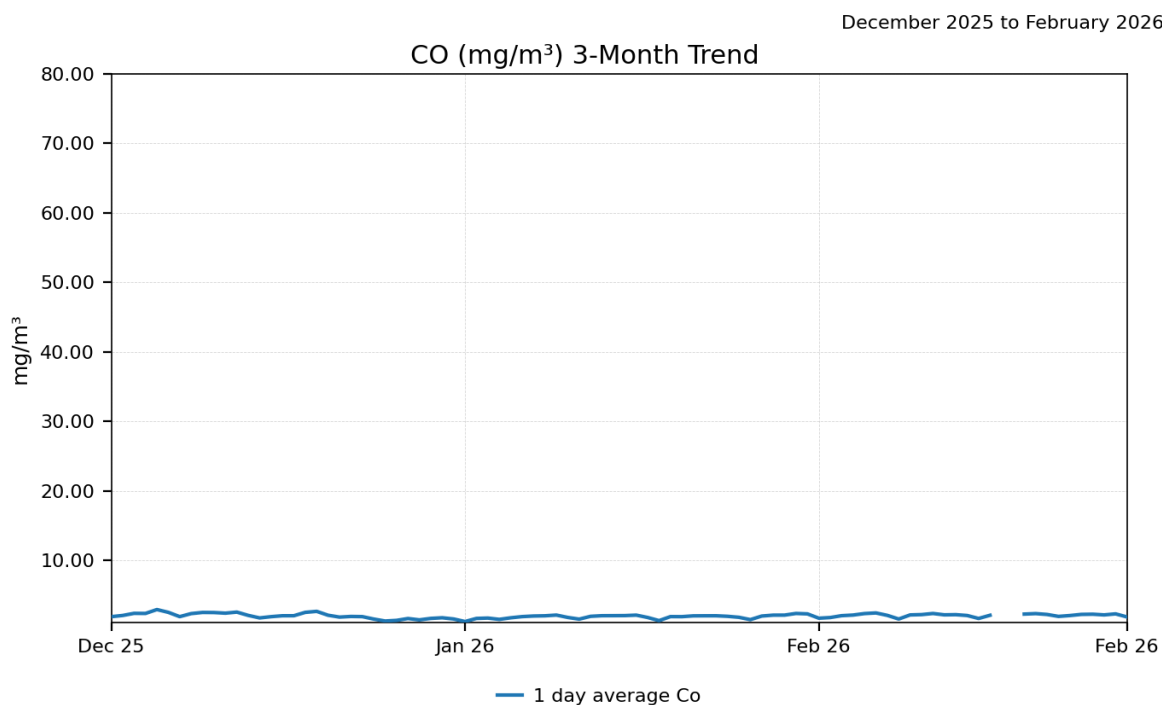


Figure 14. Marden St Three Monthly CO 1day Averages

### 9.3.4.2 Marden St Three Monthly VOC 1day Averages

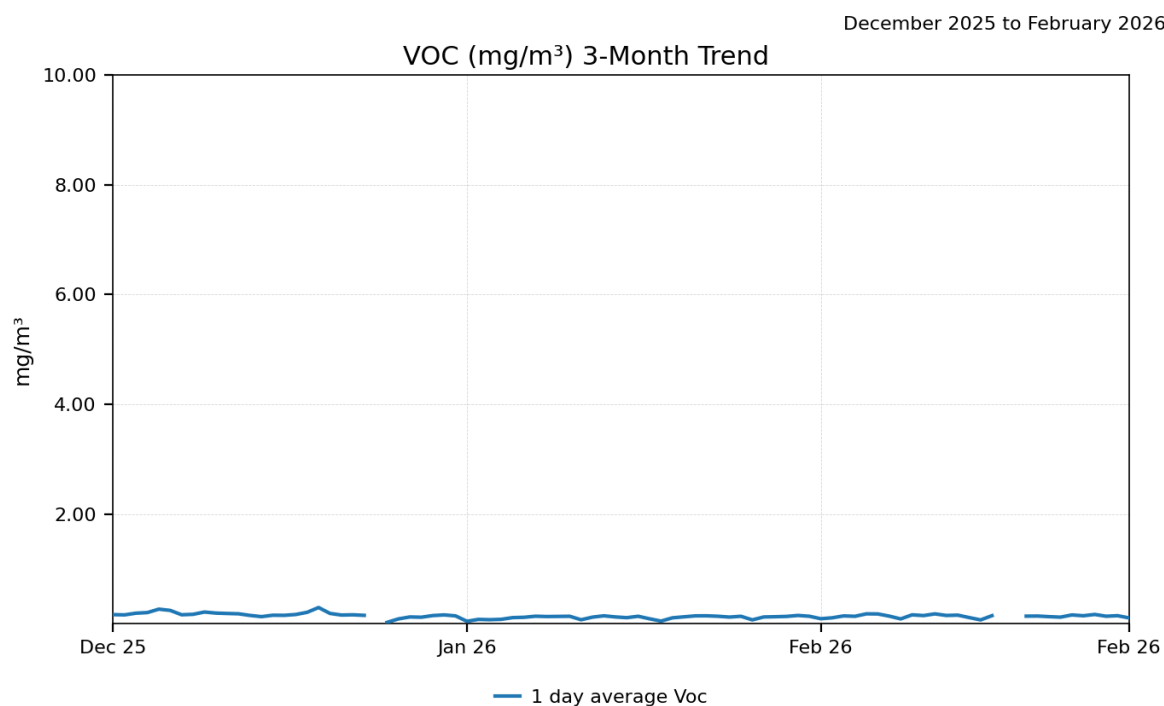


Figure 15. Marden St Three Monthly VOC 1day Averages

### 9.3.4.3 Marden St Three Monthly NO<sub>x</sub>, NO<sub>2</sub> 1day Averages

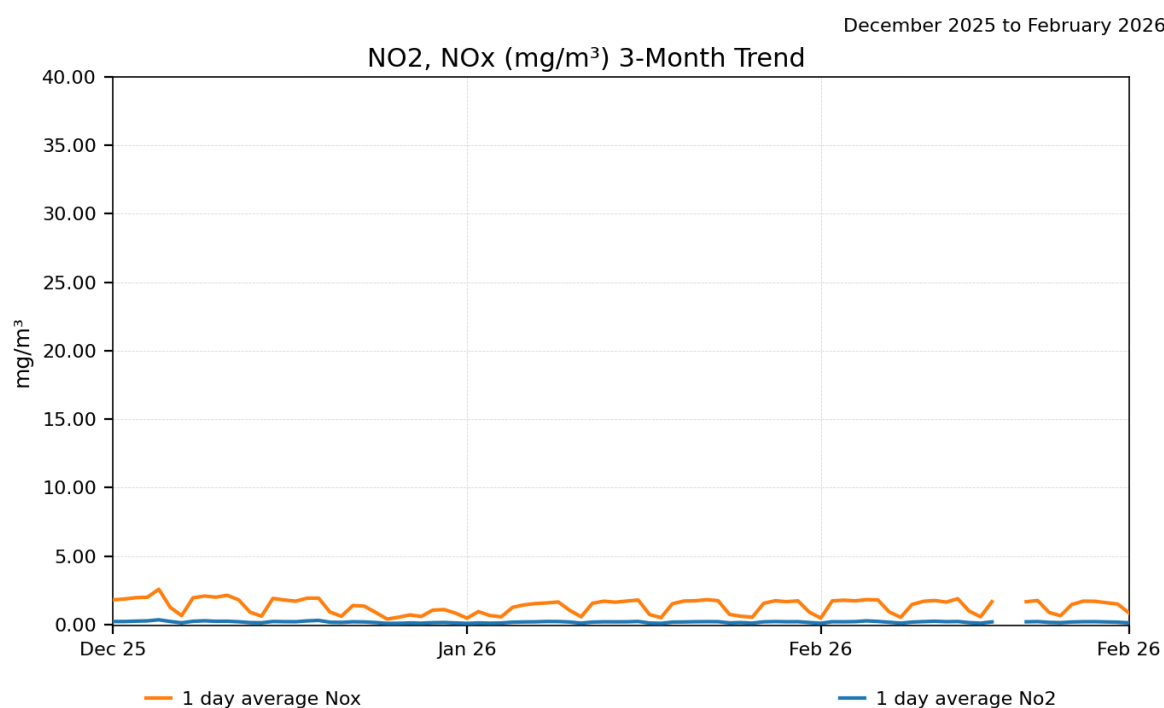


Figure 16. Marden St Three Monthly NO<sub>x</sub>, NO<sub>2</sub> 1day Averages

#### 9.3.4.4 Marden St Three Monthly PM<sub>10</sub> 1day Averages

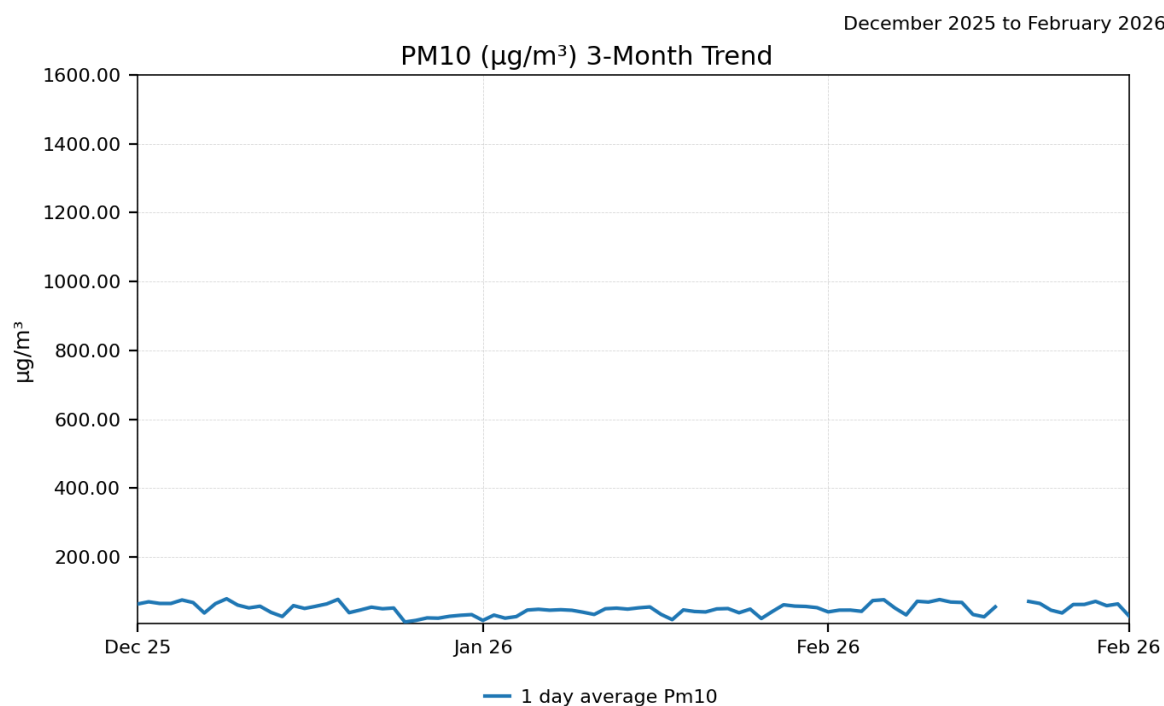


Figure 17. Marden St Three Monthly PM<sub>10</sub> 1day Averages

### 9.3.5 Sirius Rd Stack - Three Monthly Trends

The following charts present 1-day average CO, NO<sub>x</sub>, PM<sub>10</sub> and VOC for the Sirius Rd Stack in three months.

The daily average is calculated from 30-minute average data.

#### 9.3.5.1 Sirius Rd Three Monthly CO 1day Averages

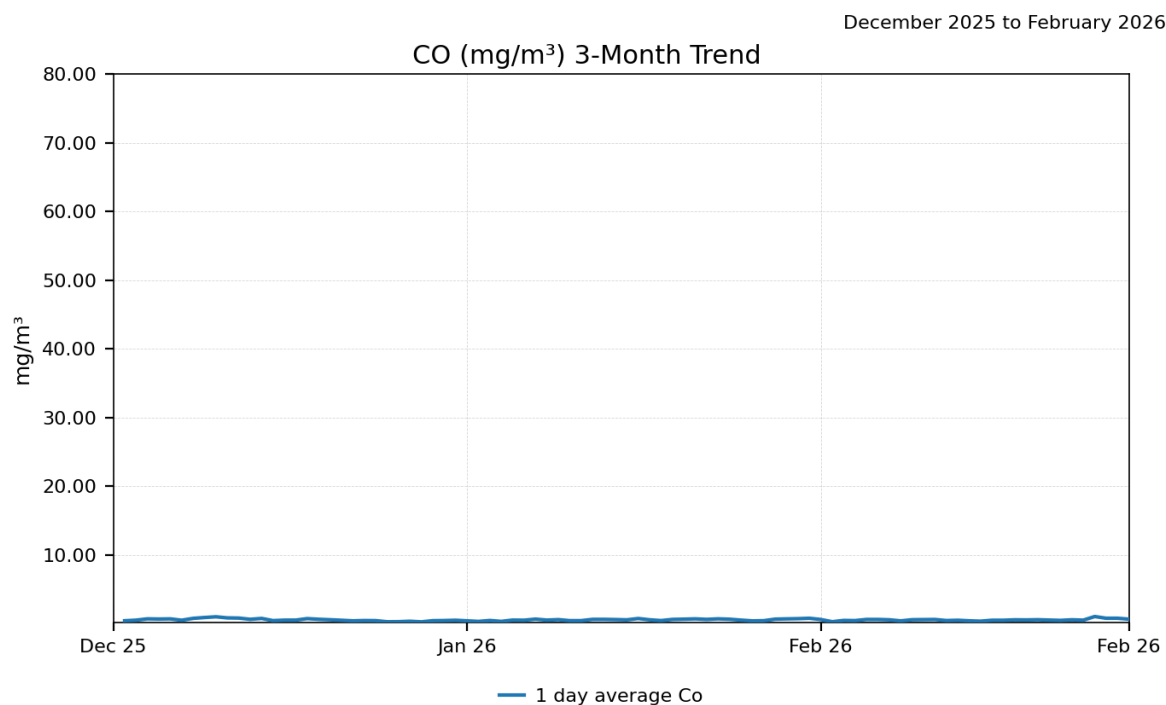


Figure 18. Sirius Rd Three Monthly CO 1day Averages

### 9.3.5.2 Sirius Rd Three Monthly VOC 1day Averages

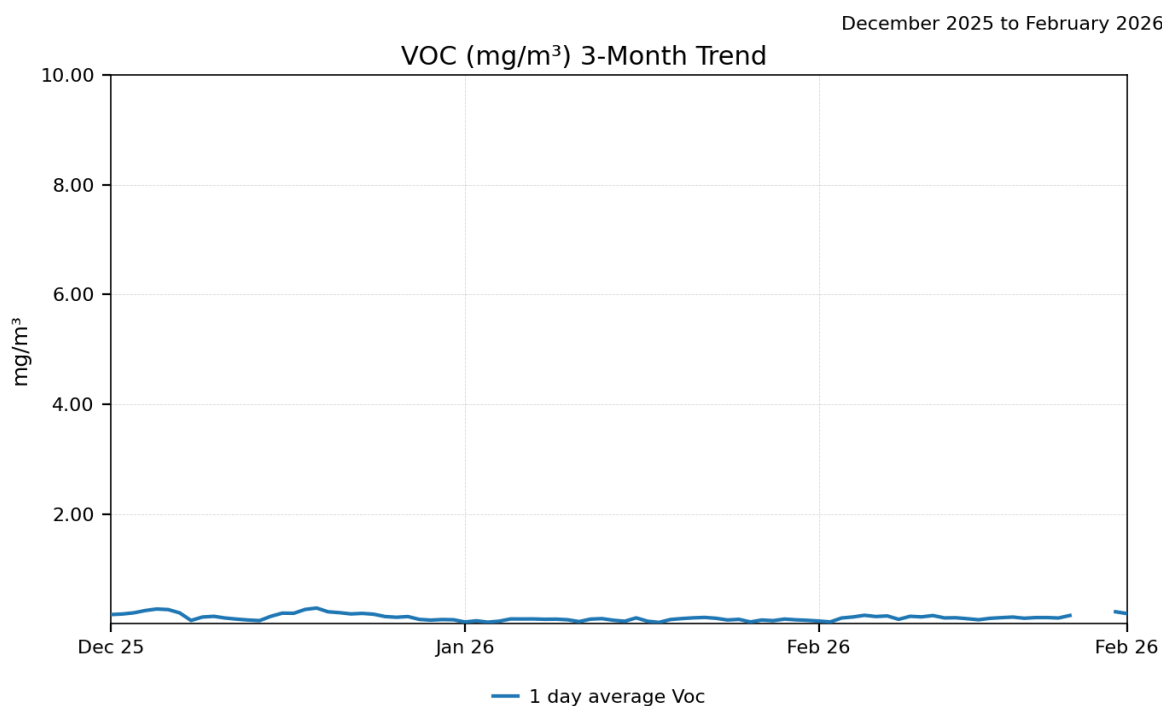


Figure 19. Sirius Rd Three Monthly VOC 1day Averages

### 9.3.5.3 Sirius Rd Three Monthly NO<sub>x</sub>, NO<sub>2</sub> 1day Averages

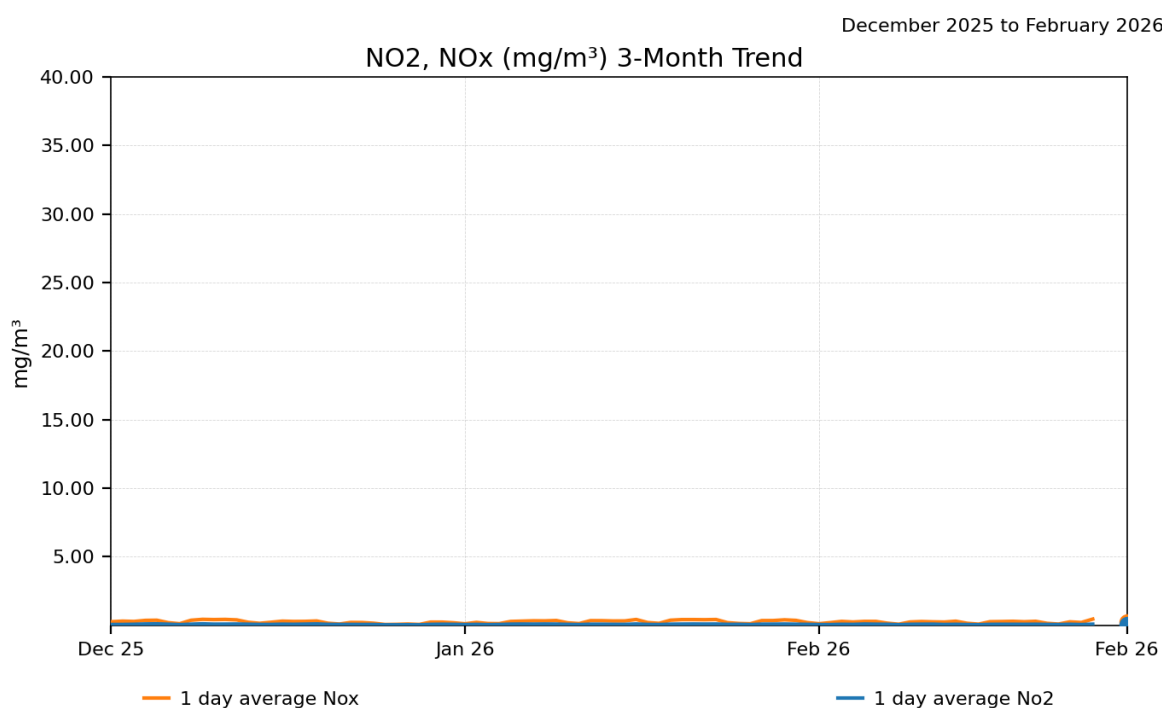


Figure 20. Sirius Rd Three Monthly NO<sub>x</sub>, NO<sub>2</sub> 1day Averages

#### 9.3.5.4 Sirius Rd Three Monthly PM<sub>10</sub> 1day Averages

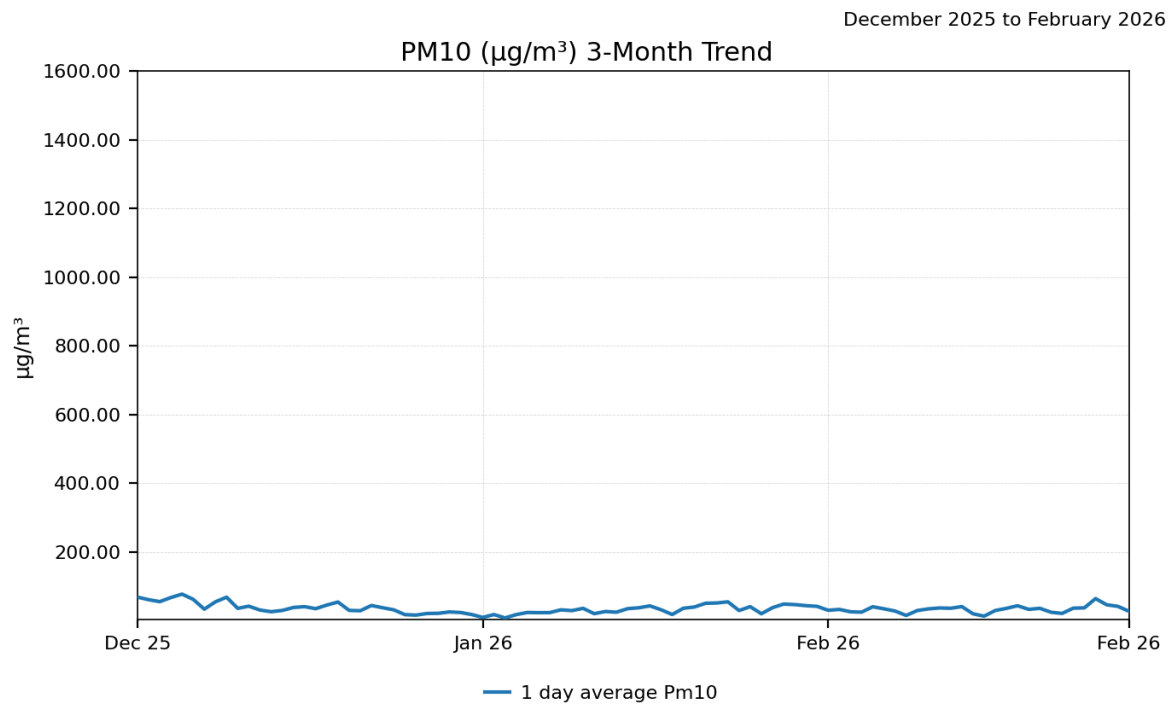


Figure 21. Sirius Rd Three Monthly PM<sub>10</sub> 1day Averages

## 10. Data Exceptions

This section outlines any issues noted with the monitoring equipment during the reporting period.

| Lane Cove Tunnel – Marden St Data Validation Table – February 2026 |                  |                     |                                                                                 |                |              |           |
|--------------------------------------------------------------------|------------------|---------------------|---------------------------------------------------------------------------------|----------------|--------------|-----------|
| Date from                                                          | Date to          | Parameters affected | Reason                                                                          | Hours Affected | Validated By | Date      |
| 1/02/2026 0:00                                                     | 28/02/2026 23:55 | NMHC                | Offset applied to data:<br>Offset A: -0.1<br>Offset B: -0.1                     | 671.92         | TA           | 2/03/2026 |
| 1/02/2026 2:20                                                     | 27/02/2026 22:40 | PM10, PM2.5         | Intermittent unrealistic data - negative                                        | N/A            | TA           | 2/03/2026 |
| 17/02/2026 9:30                                                    | 17/02/2026 15:35 | All parameters      | Maintenance                                                                     | 6.08           | TA           | 2/03/2026 |
| 18/02/2026 10:10                                                   | 18/02/2026 12:00 | All parameters      | Maintenance                                                                     | 1.83           | TA           | 2/03/2026 |
| 18/02/2026 12:05                                                   | 20/02/2026 10:55 | NMHC                | Multiplier applied to data:<br>Multiplier A: 0.910931<br>Multiplier B: 0.910931 | N/A            | TA           | 2/03/2026 |
| 18/02/2026 12:05                                                   | 20/02/2026 10:55 | CH4                 | Multiplier applied to data:<br>Multiplier A: 0.921659<br>Multiplier B: 0.921659 | N/A            | TA           | 2/03/2026 |
| 20/02/2026 11:00                                                   | 20/02/2026 11:35 | All parameters      | Maintenance                                                                     | 0.58           | TA           | 2/03/2026 |

Table 19. Marden St Data Validation Table

| Lane Cove Tunnel – Sirius Rd South Data Validation Table – February 2026 |                  |                                   |                                                             |                |              |           |
|--------------------------------------------------------------------------|------------------|-----------------------------------|-------------------------------------------------------------|----------------|--------------|-----------|
| Date from                                                                | Date to          | Parameters affected               | Reason                                                      | Hours Affected | Validated By | Date      |
| 1/02/2026 0:00                                                           | 28/02/2026 23:55 | NMHC                              | Offset applied to data:<br>Offset A: -0.2<br>Offset B: -0.2 | N/A            | TA           | 2/03/2026 |
| 1/02/2026 16:35                                                          | 28/02/2026 12:15 | PM10, PM2.5                       | Intermittent unrealistic data - negative                    | N/A            | TA           | 2/03/2026 |
| 11/02/2026 13:45                                                         | 11/02/2026 14:40 | All parameters                    | Maintenance                                                 | 0.9            | TA           | 2/03/2026 |
| 12/02/2026 8:55                                                          | 12/02/2026 11:50 | All parameters                    | Maintenance                                                 | 2.9            | TA           | 2/03/2026 |
| 12/02/2026 19:50                                                         | 12/02/2026 19:50 | All parameters                    | Missing data                                                | 0.0            | TA           | 2/03/2026 |
| 24/02/2026 2:45                                                          | 24/02/2026 2:45  | All parameters                    | Missing data due to power interruption                      | 0.0            | TA           | 2/03/2026 |
| 24/02/2026 2:50                                                          | 24/02/2026 4:05  | CO, NO, NO2, NOx, VOC PM2.5, PM10 | Instrument stabilisation following power interruption       | 1.3            | TA           | 2/03/2026 |
| 25/02/2026 21:05                                                         | 25/02/2026 21:05 | All parameters                    | Missing data due to power interruption                      | 0.0            | TA           | 2/03/2026 |
| 25/02/2026 21:10                                                         | 25/02/2026 21:45 | CO, NO, NO2, NOx, VOC PM2.5, PM10 | Instrument stabilisation following power interruption       | 0.6            | TA           | 2/03/2026 |
| 26/02/2026 2:25                                                          | 26/02/2026 2:55  | CO, NO, NO2, NOx, VOC PM2.5, PM10 | Instrument stabilisation following power interruption       | 0.5            | TA           | 2/03/2026 |
| 26/02/2026 13:35                                                         | 27/02/2026 15:30 | PM10                              | Unrealistic data - noisy                                    | 25.9           | TA           | 2/03/2026 |

Table 20. Sirius Rd South Data Validation Table

**Lane Cove Tunnel – Sirius Rd North Data Validation Table – February 2026**

| Date from        | Date to          | Parameters affected           | Reason                                                | Hours Affected | Validated By | Date      |
|------------------|------------------|-------------------------------|-------------------------------------------------------|----------------|--------------|-----------|
| 1/02/2026 19:15  | 27/02/2026 14:40 | PM10                          | Intermittent unrealistic data - negative              | N/A            | TA           | 2/03/2026 |
| 9/02/2026 2:05   | 11/02/2026 0:55  | CH4                           | Calibration out of tolerance                          | 46.8           | TA           | 2/03/2026 |
| 9/02/2026 9:50   | 9/02/2026 14:15  | All parameters                | Maintenance                                           | 4.4            | TA           | 2/03/2026 |
| 9/02/2026 14:20  | 10/02/2026 13:20 | Stack RH                      | Instrument fault                                      | 23.0           | TA           | 2/03/2026 |
| 10/02/2026 10:00 | 11/02/2026 10:25 | PM2.5, PM10                   | Maintenance                                           | 24.4           | TA           | 2/03/2026 |
| 11/02/2026 10:30 | 11/02/2026 13:25 | All parameters                | Maintenance                                           | 2.9            | TA           | 2/03/2026 |
| 16/02/2026 13:30 | 26/02/2026 9:40  | VOC                           | Instrument fault                                      | 236.2          | TA           | 2/03/2026 |
| 25/02/2026 1:40  | 25/02/2026 1:45  | All parameters                | Power Interruption                                    | 0.1            | TA           | 2/03/2026 |
| 25/02/2026 1:50  | 25/02/2026 3:00  | CO, NO, NO2, NOx, PM2.5, PM10 | Instrument stabilisation following power interruption | 1.2            | TA           | 2/03/2026 |
| 26/02/2026 9:45  | 26/02/2026 11:50 | All parameters                | Maintenance                                           | 2.1            | TA           | 2/03/2026 |
| 26/02/2026 11:55 | 27/02/2026 13:15 | NO, NO2, NOx                  | Instrument fault                                      | 25.3           | TA           | 2/03/2026 |

Table 21. Sirius Rd North Data Validation Table

## 11. Report Summary

There was nil above goal readings recorded during the reporting period.

## 12. Data validation explanations

**Automatic background check** refers to when analyser samples zero air and measures the level of the concentration voltage. This voltage is taken as the zero signal level and this value is subtracted from any subsequent readings as an active zero compensation. This is the analyser's fine zero measurement.

**Calibration check outside tolerance** refers to when the calibration values are outside the tolerance limits set for the precision check.

**Offset or Multiplier Applied to data** refers to an offset or multiplier applied to the data. This operation may be performed for a number of reasons including: (a) when a clear trend / drift outside the tolerance limit can be demonstrated by repeated operation precision checks, (b) when a correction is required on previously logged data due to a calibration check being outside the allowable tolerance

**Data transmission error** refers to a period of time when the instrument could not transmit data. This may be due to a communication fault between the logger and the instrument.

**Equipment malfunction/instrument fault** refers to a period of time when the instrument was not in the normal operating mode and did not measure a representative value of the existing conditions.

**Missing data/data not available** refers to a period of time when either data has been lost or could not be collected.

**Instrument Alarm** refers to an alarm produced by the instrument. A range of alarms can be produced depending on how the operation of the instrument is being affected.

**Instrument out of service** refers to an unavailability of data due to an instrument being shut down for repair, maintenance, or factory calibration.

**Logger error** refers to when an error occurs and instrument readings are not correctly recorded by the logger.

**Maintenance** refers to a period of time when the logger / instrument was unavailable due to maintenance.

**Overnight span/zero out of tolerance** refers to when the span/zero reading measured by the analyser during an automatic precision check falls outside of the expected concentration limits.

**Power Interruption** refers to no power to the station therefore no data was collected at this time.

**Remote Calibration** refers to when a technician remotely connects to the station and manually performs a span check.

**Warm up after power interruption** refers to the start up period of an instrument after power has been restored.