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**REPORT**

# Ambient Air Quality Monitoring (AAQM) Report December 2021

*West Gate Tunnel Project*

Submitted to:

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## Executive Summary

Air quality monitoring for the West Gate Tunnel Project has been specifically established to develop a “baseline” of data from current local conditions. This baseline will be used to measure any changes once the tunnel opens. When the project opens, air quality monitoring will continue for up to 5 years.

The results of the West Gate Tunnel Project Ambient Air Quality Monitoring (AAQM) program for the period of 1 December 2021 to 31 December 2021 are presented below.

The following tables present the maximum measured concentration for each parameter at Stations 1, 2, 3, 4, 5 and 6 during the reporting period. The maximum concentration for each parameter is compared with the respective criteria.

### Station 1 Summary December 2021

| Parameter         | Units             | Averaging period | Maximum concentration | Air quality objective <sup>A</sup> | Exceedances <sup>B</sup> |
|-------------------|-------------------|------------------|-----------------------|------------------------------------|--------------------------|
| PM <sub>2.5</sub> | ug/m <sup>3</sup> | 24 hour          | 11                    | 25                                 | Nil                      |
| PM <sub>10</sub>  | ug/m <sup>3</sup> | 24 hour          | 29                    | 50                                 | Nil                      |

Note:

A – SEPP(AAQ) objective

B - Exceedances refers to the number of individual days the criterion was exceeded at any station

### Station 2, Station 3, Station 5 and Station 6 Summary December 2021

| Parameter         | Units             | Averaging period | Maximum concentration |           |           |           | Air quality objective <sup>A</sup> | Exceedances <sup>B</sup> |
|-------------------|-------------------|------------------|-----------------------|-----------|-----------|-----------|------------------------------------|--------------------------|
|                   |                   |                  | Station 2             | Station 3 | Station 5 | Station 6 |                                    |                          |
| PM <sub>2.5</sub> | ug/m <sup>3</sup> | 24 hour          | 11                    | 9.9       | 12        | 12        | 36                                 | Nil                      |
| PM <sub>10</sub>  | ug/m <sup>3</sup> | 24 hour          | 26                    | 27        | 35        | 36        | 60                                 | Nil                      |

Note:

A - SEPP(AQM) Intervention level

B - Exceedances refers to the number of individual days the criterion was exceeded at any station

### Station 4 Summary December 2021

| Parameter            | Units             | Averaging period | Maximum concentration | Air quality objective | Exceedances <sup>C</sup> |
|----------------------|-------------------|------------------|-----------------------|-----------------------|--------------------------|
| PM <sub>2.5</sub>    | ug/m <sup>3</sup> | 24 hour          | 11                    | 36 <sup>A</sup>       | Nil                      |
| PM <sub>10</sub>     | ug/m <sup>3</sup> | 24 hour          | 35                    | 60 <sup>A</sup>       | Nil                      |
| NO <sub>2</sub>      | ppb               | 1 hour           | 33                    | 140 <sup>A</sup>      | Nil                      |
| CO                   | ppm               | 1 hour           | 0.74                  | 29 <sup>A</sup>       | Nil                      |
| Benzene              | ppb               | 24 hour          | <0.5                  | 3.0 <sup>B</sup>      | Nil                      |
| Toluene              | ppb               | 24 hour          | <0.5                  | 1000 <sup>B</sup>     | Nil                      |
| Total xylene isomers | ppb               | 24 hour          | <1                    | 250 <sup>B</sup>      | Nil                      |

Note:

A - SEPP(AQM) Intervention level

B - Air NEPM Monitoring investigation level

C - Exceedances refers to the number of individual days the criterion was exceeded at any station

December 2021 ambient air quality monitoring programme results were less than the respective air quality objectives for all parameters measured at all ambient air quality stations.

Data capture statistics for December 2021 were above 90 percent for all parameters at all stations. A diesel generator located approximately 25 metres north of Station 1 AAQMS continues to supply power to the garden lights and AAQMS.

Relative Humidity at Station 1 (Yarraville Gardens) continues to be impacted by local conditions.

A construction area (Millers Road exit ramp and noise wall relocation) is now adjacent Station 4, as a result, the measured pollutant concentrations may not be representative of traffic emissions.

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## 1.0 INTRODUCTION

Air quality monitoring for the West Gate Tunnel Project has been specifically established to develop a “baseline” of data from current local conditions. This baseline will be used to measure any changes once the tunnel opens. When the project opens, air quality monitoring will continue for up to 5 years.

The results of the West Gate Tunnel Project West Gate Tunnel Project Ambient Air Quality Monitoring (AAQM) program for the period of 1 December 2021 to 31 December 2021 are contained in the following report.

The AAQM program was conducted in accordance with the Environmental Performance Requirement (EPR) AQP4 for the Project and consists of six AAQM stations (AAQMS) monitoring the following ambient air quality indicators:

- continuous measurement of particulate matter with an equivalent aerodynamic diameter less than 10 microns (PM<sub>10</sub>)
- continuous measurement of particulate matter with an equivalent aerodynamic diameter less than 2.5 microns (PM<sub>2.5</sub>)
- continuous measurement of wind speed and wind direction.

Additionally, one of the specified AAQMS (Primula Avenue) monitors the following additional air quality indicators in combination with PM<sub>10</sub> and PM<sub>2.5</sub>:

- continuous monitoring of oxides of nitrogen ([NO<sub>x</sub>] comprising of nitrogen dioxide (NO<sub>2</sub>) and nitric oxide [NO])
- continuous monitoring of carbon monoxide (CO)
- one in six day monitoring of benzene, toluene, ethylbenzene and xylene isomers (BTEX)
- continuous measurement of atmospheric pressure.

AAQMS Station 1 to Station 6 were installed and commissioned during the period 22/08/2018 to 12/10/2018. Specific installation dates can be found below in Section 2.1.

Details of the air quality indicators monitored at each AAQMS are provided in Table 1.

**Table 1: AAQMS monitoring details**

| Site name | Location  | Coordinates                  | Monitoring parameters  |
|-----------|---|------------------------------|--|
| Station 1 | Barbara Beyer Reserve, 2 Harris Street, Yarraville    | -37.812730°S<br>144.900017°E | PM <sub>10</sub> and PM <sub>2.5</sub><br>Ambient temperature, relative humidity, wind speed and wind direction                            |
| Station 2 | 51-53 Francis Street                                  | -37.821800°S<br>144.894383°E | PM <sub>10</sub> and PM <sub>2.5</sub><br>Ambient temperature, relative humidity, wind speed and wind direction                            |
| Station 3 | Railway Lot 64, (part) 15 Goulburn Street, Yarraville | -37.814063°S<br>144.891320°E | PM <sub>10</sub> and PM <sub>2.5</sub><br>Ambient temperature, relative humidity, wind speed and wind direction                            |
| Station 4 | 44 Primula Avenue, Brooklyn                           | -37.824284°S<br>144.846425°E | PM <sub>10</sub> and PM <sub>2.5</sub><br>NO, NO <sub>2</sub> , NO <sub>x</sub> and CO<br>BTEX – one in six day sampling (24 hour average) |

| Site name | Location                         | Coordinates                  | Monitoring parameters   |
|-----------|----------------------------------|------------------------------|---|
|           |                                  |                              | Ambient temperature, relative humidity, atmospheric pressure, wind speed and wind direction   |
| Station 5 | Donald McLean Reserve, Spotswood | -37.826442°S<br>144.882133°E | PM <sub>10</sub> and PM <sub>2.5</sub><br>Ambient temperature, relative humidity, atmospheric pressure, wind speed and wind direction |
| Station 6 | 44 Millers Road Brooklyn         | -37.821252°S<br>144.848878°E | PM <sub>10</sub> and PM <sub>2.5</sub><br>Ambient temperature and relative humidity   |

## 2.0 AAQMS DETAILS

### 2.1 Site locations

AAQMS Station 1 to Station 5 were installed and commissioned during the period 22/08/2018 to 31/08/2018. AAQMS Station 6 (Millers Road) was commissioned on 12/10/2018. Meteorological sensors (wind speed and direction) were installed later due to delays in calibration from the instrument supplier. AAQMS commissioning dates are provided in Table 2. Figure 1 presents the locations of the AAQMS.

**Table 2: AAQMS commissioning dates**

| Parameter              | Station 1  | Station 2  | Station 3  | Station 4  | Station 5  | Station 6               |
|------------------------|------------|------------|------------|------------|------------|-------------------------|
| AAQMS                  | 23/08/2018 | 22/08/2018 | 22/08/2018 | 22/08/2018 | 31/08/2018 | 12/10/2018              |
| Wind speed & direction | 07/09/2018 | 20/09/2018 | 14/09/2018 | 10/09/2018 | 17/09/2018 | 23/11/2018 <sup>A</sup> |

A – wind sensor is not compliant with siting criteria specified in AS 3580.14

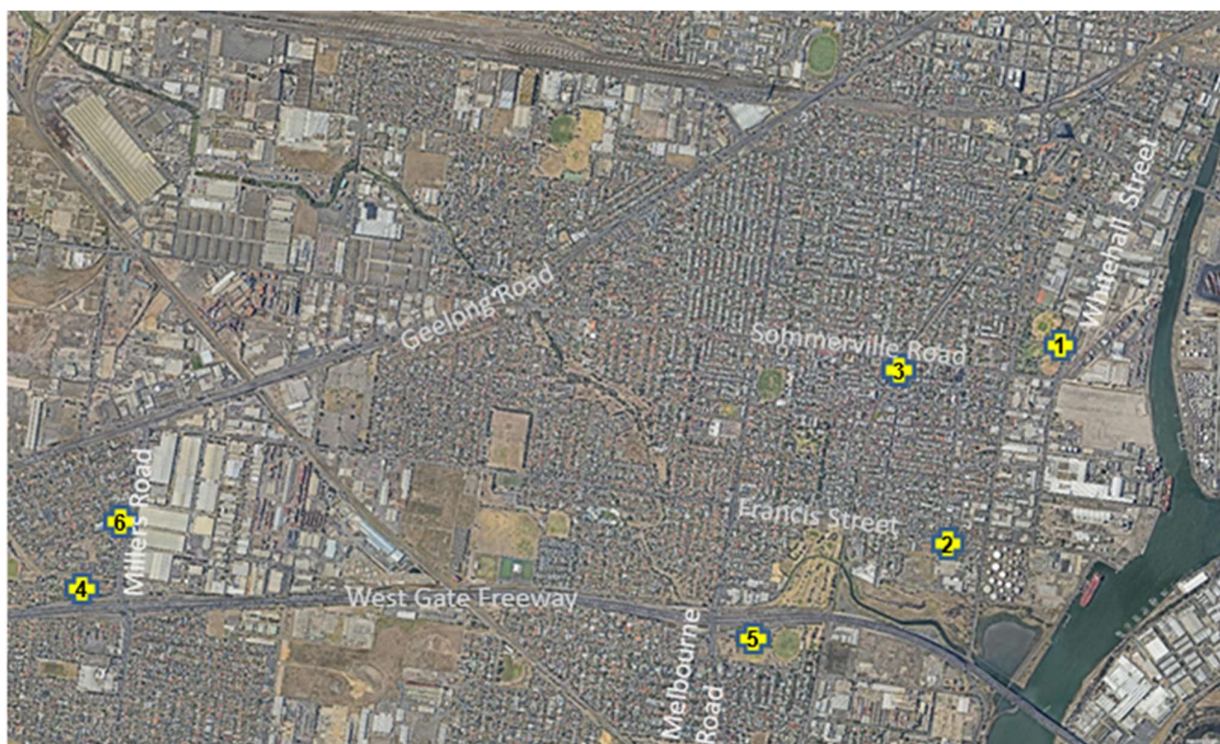


Figure 1: West Gate Tunnel AAQMS site locations

## 2.2 Siting assessment

Australian Standard AS/NZS 3580.1.1 “Methods for Sampling and Analysis of Ambient Air – Part 1.1. Guide to Siting Air Monitoring Equipment” provides general guidance for the siting of ambient air monitoring equipment and specific siting parameters for individual air pollutants. Table 3 provides a comparison between recommended criteria contained in the Standard for the parameters monitored at neighbourhood and peak monitoring stations with actual conditions at each AAQMS.

Table 3: Australian standard AAQMS siting criteria compliance

| Station  | Station 1     | Station 2 | Station 3 | Station 4 | Station 5 | Station 6 |
|--|---------------|-----------|-----------|-----------|-----------|-----------|
| Station type   | Neighbourhood | Peak      | Peak      | Peak      | Peak      | Peak      |
| Inlet height above ground level 1.0 m – 15 m           | ✓             | ✓         | ✓         | ✓         | ✓         | ✓         |
| Clear sky angle 120° (Neighbourhood)                   | ✓             | -         | -         | -         | -         | -         |
| Unrestricted 270° airflow around inlet (Neighbourhood) | ✓             | -         | -         | -         | -         | -         |
| Unrestricted 180° airflow around inlet (Peak)          | -             | ✓         | ✓         | ✓         | ✓         | ✓         |
| Distance to supporting structure ≥ 1 m                 | ✓             | ✓         | ✓         | ✓         | ✓         | ✓         |

| Station   | Station 1     | Station 2 | Station 3 | Station 4      | Station 5 | Station 6      |
|---|---------------|-----------|-----------|----------------|-----------|----------------|
| Station type  | Neighbourhood | Peak      | Peak      | Peak           | Peak      | Peak           |
| 10 m from drip line of trees                              | ✓             | ✓         | ✓         | ✓              | ✓         | ✗ <sup>A</sup> |
| No extraneous sources nearby                              | ✓             | ✓         | ✓         | ✗ <sup>B</sup> | ✓         | ✗ <sup>C</sup> |
| Greater than 50 m from road ( $\leq 10,000$ vehicles/day) | ✓             | -         | -         | -              | -         | -              |
| Greater than 2 m from road (Peak station)                 | -             | ✓         | ✓         | ✓              | ✓         | ✓              |

**Note:**

- A Tree drip line is <3 m from sampler inlets and meteorological monitoring equipment  
 B Temporary construction area for Millers Road noise wall and exit ramp relocation works  
 C Residential chimney is <5 m from the sampler inlet.

## 2.3 Equipment specifications

Table 4 provides a list of the monitoring equipment installed at the AAQMS.

**Table 4: AAQMS instrumentation**

| Parameter                     | Equipment item                   | Manufacturer                  | Model       |
|-------------------------------|----------------------------------|-------------------------------|-------------|
| PM <sub>2.5</sub>             | Beta Attenuation Monitor (BAM)   | Thermo Fisher Scientific Inc. | 5014i       |
| PM <sub>10</sub>              | Beta Attenuation Monitor (BAM)   | Thermo Fisher Scientific Inc. | 5014i       |
| Oxides of Nitrogen            | Chemiluminescence                | Thermo Fisher Scientific Inc. | 42i         |
| Carbon Monoxide               | Infra-red gas filter correlation | Thermo Fisher Scientific Inc. | 48i         |
| Temperature                   | Pt100 resistive platinum sensor  | Thermo Fisher Scientific Inc. | 5014i       |
| BTEX                          | Summa canister                   | Restek                        | 6 litre     |
| Relative humidity             | Capacitive thin film sensor      | Thermo Fisher Scientific Inc. | 5014i       |
| Atmospheric Pressure          | Beta Attenuation Monitor (BAM)   | Thermo Fisher Scientific Inc. | 5014i       |
| Wind speed and wind direction | Ultrasonic anemometer            | RM Young                      | Model 86000 |

## 3.0 AIR QUALITY CRITERIA

The ambient air quality criteria applicable to the West Gate Tunnel Project were derived from the State Environment Protection Policies (SEPPs); Ambient Air Quality (SEPP(AAQ)), Air Quality Management (SEPP(AQM)) and the National Environment Protection (Air Toxics) Measure Monitoring Investigation Levels (MILs).

As part of the implementation of the Environment Protection Act 2017 (Act) which came into effect on 1 July 2021, the SEPP(AAQ) and SEPP(AQM) have been discontinued and some of their content has been replaced

by the “Environment Reference Standard” (ERS), publication S245. In addition, some elements of the SEPP’s will ultimately be replaced by proposed guidelines.

EPA publication 1998 - June 2021 “Compliance Code for Victoria’s Big Build Projects” states for the West Gate Tunnel Project, the obligations under Section 25(1) of the Act for General Environmental Duty (GED) are met during design and construction by complying with the West Gate Tunnel Project Environmental Performance Requirements (EPRs), which include undertaking ambient air quality monitoring in accordance with SEPP(AAQ) and SEPP(AQM). This report therefore continues to make reference to the SEPP(AAQ) and SEPP(AQM).

### SEPP (AAQ)

The SEPP(AAQ) sets out the environmental indicators and objectives for ambient air quality that seek to achieve or maintain environmental values in Victoria. The SEPP(AAQ) adopts the requirements of the *National Environment Protection (Ambient Air Quality) Measure* (Air NEPM) and its environmental quality objectives (EQOs) for CO, NO<sub>2</sub>, and particles (as PM<sub>10</sub> and PM<sub>2.5</sub>). The SEPP(AAQ) EQOs apply to air quality within a region or sub-region considered to be representative of exposure of the general population in Victoria. These objectives have been adopted for the purposes of comparison with results from background/ neighbourhood monitoring stations for the West Gate Tunnel Project and are relevant to Station 1 (Yarraville Gardens).

### SEPP(AQM)

The SEPP(AQM) sets out legislative requirements for managing and assessing air emissions in Victoria. The aim of the SEPP(AQM) is to ensure that prescribed air quality objectives are met and protect the beneficial uses of the air environment. Schedule B lists intervention levels which are used in the assessment of local or neighbourhood air monitoring data. Consistent with assessment of impacts described in the Environment Effects Statement for the West Gate Tunnel Project, the SEPP(AQM) intervention levels will continue to be adopted for purposes of comparison with results from peak monitoring stations for the West Gate Tunnel Project. These AQO are applicable to Station 2 (Francis Street), Station 3 (Railway Reserve), Station 4 (Primula Avenue), Station 5 (Donald McLean Reserve) and Station 6 (Millers Road).

### NEPM (Air Toxics)

The aim of the Air Toxics NEPM is to gain a greater understanding of the levels of air toxics at specific locations where elevated concentrations are likely to occur and where the potential for significant human exposure exists. The Air Toxics NEPM established monitoring investigation levels (MILs) relevant for the West Gate Tunnel Project for benzene, toluene and xylene isomers. The MILs are used purposes of comparison with results from the air toxics monitored at Station 4 (Primula Avenue). Table 5 presents the air quality indicators and objectives for each AAQMS for the West Gate Tunnel Project.

**Table 5: Air quality indicators and objectives**

| Location  | Pollutant         | Units             | Air Quality Objective | Averaging period |
|-----------|-------------------|-------------------|-----------------------|------------------|
| Station 1 | PM <sub>10</sub>  | µg/m <sup>3</sup> | 50                    | 24 hour          |
|           |                   |                   | 20                    | Annual           |
|           | PM <sub>2.5</sub> |                   | 25                    | 24 hour          |
|           |                   |                   | 8                     | Annual           |

| Location  | Pollutant         | Units             | Air Quality Objective | Averaging period |
|---|-------------------|-------------------|-----------------------|------------------|
| Station 2<br>Station 3<br>Station 4<br>Station 5<br>Station 6 | PM <sub>10</sub>  | µg/m <sup>3</sup> | 60                    | 24 hour          |
|   | PM <sub>2.5</sub> |                   | 36                    |                  |
| Station 4   | CO                | ppm               | 29                    | 1 hour           |
|   | NO <sub>2</sub>   | ppb               | 140                   | 1 hour           |
|   | Benzene           | ppb               | 3                     | Annual           |
|   | Toluene           | ppb               | 1000                  | 24 hour          |
|   |                   |                   | 100                   | Annual           |
|   | Ethylbenzene      | ppb               | NA                    | 24 hour          |
|   | Xylene isomers    | ppb               | 250                   | 24 hour          |
|   |                   |                   | 200                   | Annual           |

## 4.0 TEST METHODS

### 4.1 Particulate matter (PM<sub>2.5</sub>)

PM<sub>2.5</sub> concentrations are determined using a Beta Attenuation Monitor (BAM).

Suspended particulate matter in ambient air is measured using the attenuation of beta rays as a surrogate for continuous mass determination. Beta rays are high energy electrons generated from the radioactive decay of the radon isotope Rn-222. When contacting particulate matter beta rays are either absorbed or their energy level is diminished. The relationship between the attenuation of beta rays between the source and detector is used to determine the mass density.

The BAM is equipped with a flow control and measurement system. The flow control system volumetrically controls the flowrate to 16.7 l/min. The flowrate is used with the mass density to calculate the particulate matter concentration.

The sampler is fitted with a size selective inlet, which separates particles with an equivalent aerodynamic diameter greater than 10 microns from the sample stream. An in-line PM<sub>2.5</sub> particle size separator is also fitted to further separate particles; only those with an equivalent aerodynamic diameter less than 2.5 microns can pass through the particle size separator to the filter for mass determination.

The PM<sub>2.5</sub> monitoring method is based on the requirements contained within Australian Standard AS/NZS 3580.9.12 “*Methods for Sampling and Analysis of Ambient Air – Method 9.12: Determination of Suspended Particulate Matter – PM<sub>2.5</sub> Beta Attenuation Monitors*” (NATA Laboratory Accreditation No. 1910).

### 4.2 Particulate matter (PM<sub>10</sub>)

PM<sub>10</sub> concentrations are determined using a continuous BAM without an in-line PM<sub>2.5</sub> particle size separator. All other measurement processes remain the same as for the PM<sub>2.5</sub> test method.



The PM<sub>10</sub> monitoring method is based on the requirements contained within Australian Standard AS/NZS 3580.9.11:2016 “*Methods for Sampling and Analysis of Ambient Air – Method 9.11: Determination of Suspended Particulate Matter – PM<sub>10</sub> Beta Attenuation Monitors*” (NATA Laboratory Accreditation No. 1910).

### 4.3 Nitrogen dioxide (NO<sub>2</sub>)

Oxides of nitrogen concentrations were determined using a 42i Thermo Scientific chemiluminescence gas analyser.

Automatic calibrations are carried out daily against a NATA certified reference gas mixture. Manual calibrations are conducted at one month intervals.

The oxides of nitrogen (NO, NO<sub>2</sub> and NO<sub>x</sub>) monitoring method is based on the requirements of Australian Standard AS 3580.5.1, “*Determination of Oxides of Nitrogen – Chemiluminescence Method*”.

### 4.4 Carbon monoxide (CO)

Carbon monoxide concentrations are determined using a 48i Thermo Scientific infra-red gas filter correlation analyser.

Automatic calibrations are carried out daily against a NATA certified reference gas mixture. Manual calibrations are conducted at one month intervals.

The carbon monoxide monitoring method is based on the requirements of Australian Standard AS 3580.7.1, “*Determination of Carbon Monoxide – Direct Reading Instrumental Method*”.

### 4.5 Volatile organic compounds (BTEX)

A sample is collected in an evacuated electro-polished and passivated stainless steel canister. Analysis involves separation by gas chromatography (GC) and measurement by mass selective (MS) detector.

The procedure for sampling Volatile Organic Compounds (VOCs) using evacuated canisters, and for the subsequent analysis, is described in USEPA Method TO-15 “*Determination of Volatile Organic Compounds (VOCs) in air collected in specially-prepared canisters and analysed by Gas Chromatography/Mass Spectrometry (GC/MS)*”.

Samples were analysed by Queensland Health (NATA Laboratory Accreditation No. 41) based on USEPA method TO-15. The test method used was in accordance with Golder Source Test Method C9, “*Canister (Evacuated) Sampling for VOC: In Ambient Air and Source Emissions*”.

### 4.6 Meteorological parameters

Monitoring of meteorological parameters; wind speed/direction, temperature, relative humidity, solar radiation and rainfall was conducted in accordance with Australian Standard AS 3580.14 “*Methods for Sampling and Analysis of Ambient Air – Part 14: Meteorological Monitoring for Ambient Air Quality Monitoring Applications*” (NATA Laboratory Accreditation No. 1910).

## 5.0 MEASUREMENT UNCERTAINTY

### 5.1 PM<sub>2.5</sub>

The measurement uncertainty for PM<sub>2.5</sub> by BAM is published by Thermo-Fisher as  $\pm 2 \mu\text{g}/\text{m}^3$  (24 hour average).

### 5.2 PM<sub>10</sub>

The measurement uncertainty for PM<sub>2.5</sub> by BAM is published by Thermo-Fisher as  $\pm 2 \mu\text{g}/\text{m}^3$  (24 hour average).

### 5.3 NO<sub>2</sub>

The measurement uncertainty for NO, NO<sub>2</sub> and NO<sub>x</sub> by Chemiluminescence is published in AS3580.5.1 as  $\pm 10\%$  (24 hour average).

### 5.4 CO

The measurement uncertainty for CO by Infra-red gas filter correlation is published in AS3580.7.1 as  $\pm 10\%$  (24 hour average).

### 5.5 Benzene

USEPA Method TO-15 cites the accuracy and precision for two ambient air quality studies conducted in the United States of America. The average replicate precision for a range of 16 compounds in both studies was 15%. Replicate precision was defined as the ratio of the average difference between replicates to the average value of replicates.

The reported accuracies for both studies ranged between  $\pm 4\%$  and  $\pm 31\%$ . The average accuracy for both studies for the range of 16 compounds was  $\pm 11\%$ . Accuracy is defined as the ratio of the difference between expected and observed audit results to the expected audit result.

### 5.6 Meteorological parameters

The estimated measurement uncertainty for each of the parameters is presented in Table 6.

**Table 6: Meteorological parameters measurement uncertainty**

| Parameter           | Measurement uncertainty <sup>A</sup> |
|---------------------|--------------------------------------|
| Wind speed          | Greater of $\pm 0.6$ m/s or 5%       |
| Wind direction      | $\pm 5^\circ$                        |
| Barometric pressure | $\pm 3$ hPa                          |
| Temperature         | $\pm 6\%$                            |
| Relative humidity   | $\pm 5 - 7\%$ RH                     |

**Note:**

<sup>A</sup> Measurement uncertainty estimates are as published in AS3580.14 "Methods for Sampling and Analysis of Ambient Air – Part 14 Meteorological Monitoring for Ambient Air Quality Monitoring Applications".

### 5.7 Calibration and maintenance

Sample flow rate calibration was conducted on a monthly basis using a NATA calibrated primary standard flowmeter. Calibration details for the reporting period are presented in Table 7.

**Table 7: Calibrations**

| Location  | Parameter                | Last Calibration Date | Calibration Type |
|-----------|--------------------------|-----------------------|------------------|
| Station 1 | PM <sub>10</sub>         | 21/12/2021            | 3 monthly        |
|           | PM <sub>2.5</sub>        | 21/12/2021            | 3 monthly        |
|           | Wind speed and direction | 17/08/2020            | Two yearly       |
| Station 2 | PM <sub>10</sub>         | 21/12/2021            | 3 monthly        |
|           | PM <sub>2.5</sub>        | 21/12/2021            | 3 monthly        |



| Location  | Parameter                             | Last Calibration Date | Calibration Type                                |
|-----------|---------------------------------------|-----------------------|---|
|           | Wind speed and direction              | 30/07/2020            | Two yearly                                      |
| Station 3 | PM <sub>10</sub>                      | 21/12/2021            | 3 monthly                                       |
|           | PM <sub>2.5</sub>                     | 21/12/2021            | 3 monthly                                       |
|           | Wind speed and direction              | 15/09/2020            | Two yearly                                      |
| Station 4 | PM <sub>10</sub>                      | 22/12/2021            | 3 monthly                                       |
|           | PM <sub>2.5</sub>                     | 22/12/2021            | 3 monthly                                       |
|           | NO/ NO <sub>2</sub> / NO <sub>x</sub> | 22/12/2021            | 3 monthly                                       |
|           | CO                                    | 22/12/2021            | 3 monthly                                       |
|           | BTEX                                  | NA                    | Flow-controllers and canisters certified by lab |
|           | Wind speed and direction              | 24/08/2020            | Two yearly                                      |
| Station 5 | PM <sub>10</sub>                      | 22/12/2021            | 3 monthly                                       |
|           | PM <sub>2.5</sub>                     | 22/12/2021            | 3 monthly                                       |
|           | Wind speed and direction              | 05/09/2020            | Two yearly                                      |
| Station 6 | PM <sub>10</sub>                      | 22/12/2021            | 3 monthly                                       |
|           | PM <sub>2.5</sub>                     | 22/12/2021            | 3 monthly                                       |

## 6.0 RESULTS

The monitoring results for 1 December 2021 to 31 December 2021 are presented in the following sections.

### 6.1 Particulate matter (BAM PM<sub>2.5</sub> & PM<sub>10</sub>)

PM<sub>2.5</sub> and PM<sub>10</sub> were continuously monitored and 5-minute averages logged. The 5-minute average data was transformed to 24 hour averages for reporting.

PM<sub>2.5</sub> and PM<sub>10</sub> concentration statistics from the reporting period for Station 1 to Station 6 are presented in Table 8 to Table 13. The 24 hour average plots for Station 1 to Station 6 are presented in Figure 2 to Figure 7.

### 6.1.1 Station 1 – Yarraville Gardens

Table 8: Station 1 (Yarraville Gardens AAQMS) PM<sub>2.5</sub> and PM<sub>10</sub> percentiles (24 hour average)

| Parameter         | Concentration (µg/m <sup>3</sup> ) <sup>A</sup> |                  |                  |                  |                  |                  |                  | Air quality objective <sup>B</sup><br>(µg/m <sup>3</sup> ) |
|-------------------|---|------------------|------------------|------------------|------------------|------------------|------------------|--|
|                   | Maximum   | 99 <sup>th</sup> | 98 <sup>th</sup> | 95 <sup>th</sup> | 90 <sup>th</sup> | 75 <sup>th</sup> | 50 <sup>th</sup> |  |
| PM <sub>2.5</sub> | 11  | 11               | 11               | 10               | 9.0              | 8.2              | 6.7              | 25   |
| PM <sub>10</sub>  | 29  | 28               | 28               | 26               | 24               | 20               | 18               | 50   |

**Note:**

A Micrograms per cubic metre at 0°C and 101.3 kPa

B SEPP(AAQ) Objective

Values rounded to two significant figures.

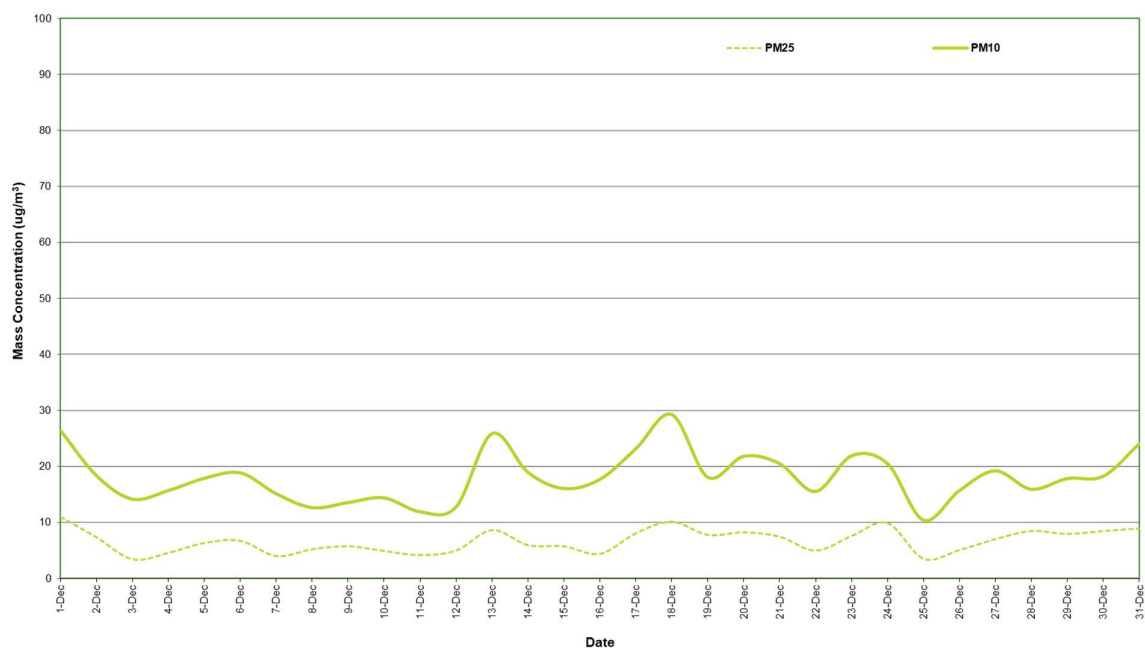


Figure 2: Station 1 PM<sub>2.5</sub> and PM<sub>10</sub> concentration (24 hour average) – December 2021

### 6.1.2 Station 2 – Francis Street

**Table 9: Station 2 (Francis Street AAQMS) PM<sub>2.5</sub> and PM<sub>10</sub> percentiles (24 hour average)**

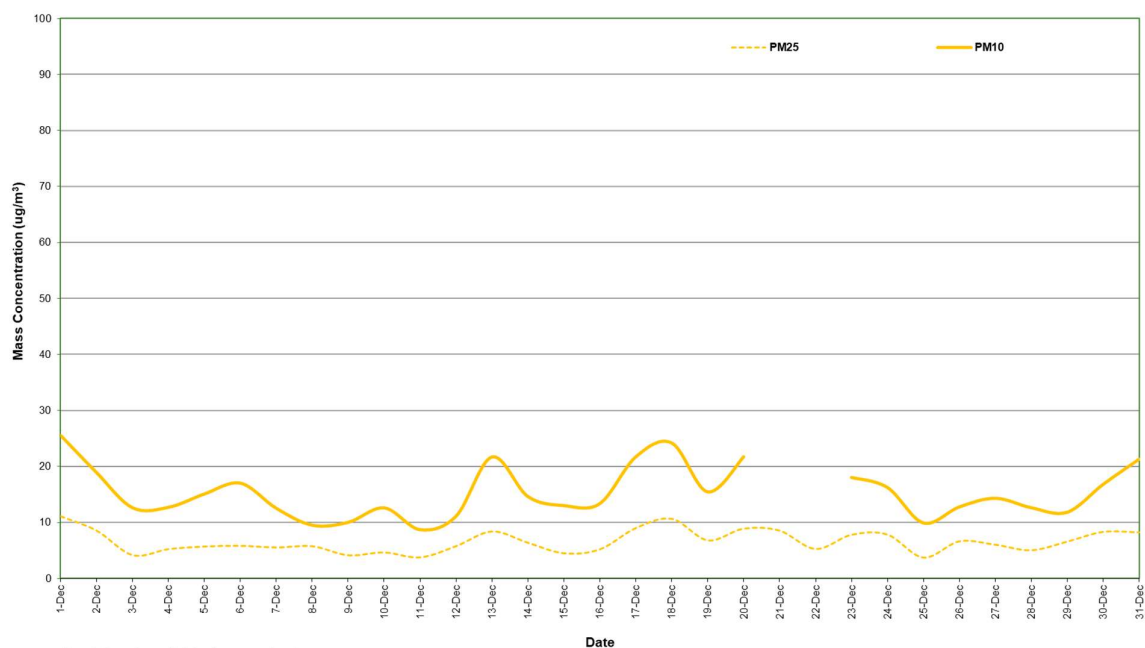
| Parameter         | Concentration (µg/m <sup>3</sup> ) <sup>A</sup> |                  |                  |                  |                  |                  |                  | Air quality objective <sup>B</sup> |
|-------------------|---|------------------|------------------|------------------|------------------|------------------|------------------|------------------------------------|
|                   | Maximum   | 99 <sup>th</sup> | 98 <sup>th</sup> | 95 <sup>th</sup> | 90 <sup>th</sup> | 75 <sup>th</sup> | 50 <sup>th</sup> | (µg/m <sup>3</sup> )               |
| PM <sub>2.5</sub> | 11  | 11               | 11               | 9.8              | 8.9              | 8.3              | 6.0              | 36                                 |
| PM <sub>10</sub>  | 26  | 25               | 25               | 23               | 22               | 18               | 14               | 60                                 |

**Note:**

A Micrograms per cubic metre at 0°C and 101.3 kPa

B SEPP(AQM) Intervention level

Values rounded to two significant figures.



**Figure 3: Station 2 PM<sub>2.5</sub> and PM<sub>10</sub> concentration (24 Hour Average) – December 2021**

### 6.1.3 Station 3 – Railway Reserve

Table 10: Station 3 (Railway Reserve AAQMS) PM<sub>2.5</sub> and PM<sub>10</sub> percentiles (24 hour average)

| Parameter         | Concentration (µg/m <sup>3</sup> ) <sup>A</sup> |                  |                  |                  |                  |                  |                  | Air quality objective <sup>B</sup> |
|-------------------|---|------------------|------------------|------------------|------------------|------------------|------------------|------------------------------------|
|                   | Maximum   | 99 <sup>th</sup> | 98 <sup>th</sup> | 95 <sup>th</sup> | 90 <sup>th</sup> | 75 <sup>th</sup> | 50 <sup>th</sup> | (µg/m <sup>3</sup> )               |
| PM <sub>2.5</sub> | 9.9   | 9.7              | 9.5              | 9.1              | 8.9              | 7.3              | 6.1              | 36                                 |
| PM <sub>10</sub>  | 27  | 26               | 24               | 22               | 21               | 20               | 15               | 60                                 |

**Note:**

A Micrograms per cubic metre at 0°C and 101.3 kPa

B SEPP(AQM) Intervention level

Values rounded to two significant figures.

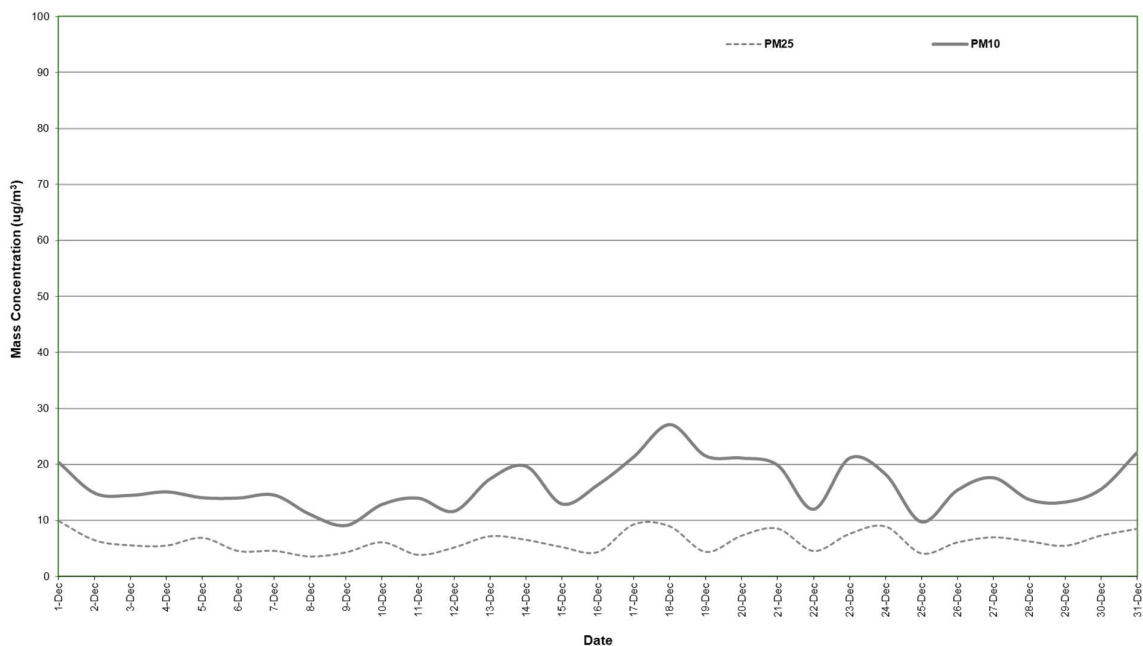


Figure 4: Station 3 PM<sub>2.5</sub> and PM<sub>10</sub> concentration (24 hour average) – December 2021

### 6.1.4 Station 4 – Primula Avenue

Table 11: Station 4 (Primula Avenue AAQMS) PM<sub>2.5</sub> and PM<sub>10</sub> percentiles (24 hour average)

| Parameter         | Concentration (µg/m <sup>3</sup> ) <sup>A</sup> |                  |                  |                  |                  |                  |                  | Air quality objective <sup>B</sup> |
|-------------------|---|------------------|------------------|------------------|------------------|------------------|------------------|------------------------------------|
|                   | Maximum   | 99 <sup>th</sup> | 98 <sup>th</sup> | 95 <sup>th</sup> | 90 <sup>th</sup> | 75 <sup>th</sup> | 50 <sup>th</sup> | (µg/m <sup>3</sup> )               |
| PM <sub>2.5</sub> | 11  | 11               | 10               | 10               | 9.7              | 7.8              | 5.8              | 36                                 |
| PM <sub>10</sub>  | 35  | 35               | 35               | 34               | 31               | 25               | 18               | 60                                 |

Note:

A Micrograms per cubic metre at 0°C and 101.3 kPa

B SEPP(AQM) Intervention level

Values are rounded to two significant figures.

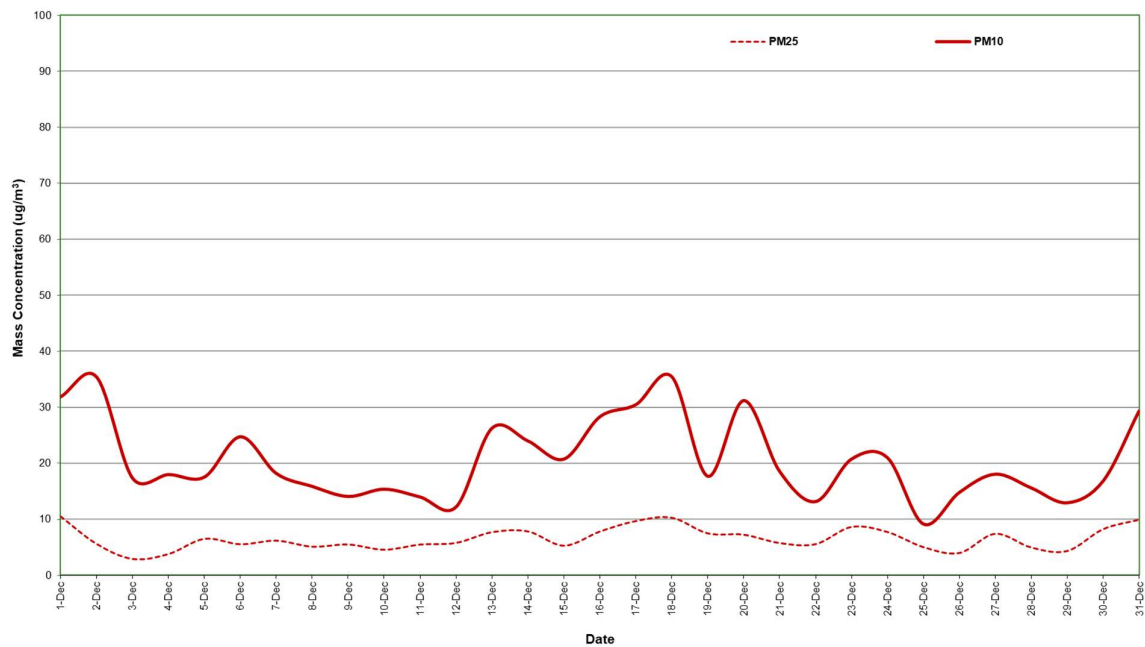


Figure 5: Station 4 PM<sub>2.5</sub> and PM<sub>10</sub> concentration (24 hour average) – December 2021

### 6.1.5 Station 5 – Donald McLean Reserve

Table 12: Station 5 (Donald McLean Reserve AAQMS) PM<sub>2.5</sub> and PM<sub>10</sub> percentiles (24 hour average)

| Parameter         | Concentration (µg/m <sup>3</sup> ) <sup>A</sup> |                  |                  |                  |                  |                  |                  | Air quality objective <sup>B</sup> |
|-------------------|---|------------------|------------------|------------------|------------------|------------------|------------------|------------------------------------|
|                   | Maximum   | 99 <sup>th</sup> | 98 <sup>th</sup> | 95 <sup>th</sup> | 90 <sup>th</sup> | 75 <sup>th</sup> | 50 <sup>th</sup> | (µg/m <sup>3</sup> )               |
| PM <sub>2.5</sub> | 12  | 11               | 10               | 9.2              | 8.8              | 6.9              | 5.6              | 36                                 |
| PM <sub>10</sub>  | 35  | 34               | 34               | 30               | 27               | 19               | 16               | 60                                 |

**Note:**

A Micrograms per cubic metre at 0°C and 101.3 kPa

B SEPP(AQM) Intervention level

Values rounded to two significant figures.

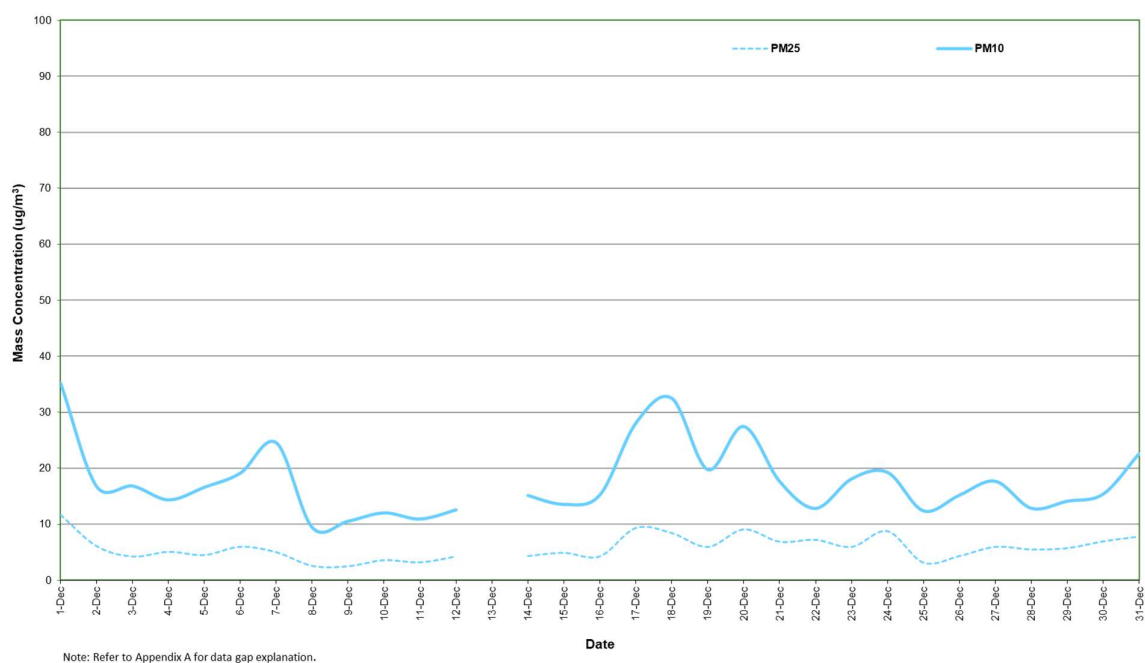


Figure 6: Station 5 PM<sub>2.5</sub> and PM<sub>10</sub> concentration (24 hour average) – December 2021

### 6.1.6 Station 6 – Millers Road

Table 13: Station 6 (Millers Road AAQMS) PM<sub>2.5</sub> and PM<sub>10</sub> percentiles (24 hour average)

| Parameter         | Concentration (µg/m <sup>3</sup> ) <sup>A</sup> |                  |                  |                  |                  |                  |                  | Air quality objective <sup>B</sup> |
|-------------------|---|------------------|------------------|------------------|------------------|------------------|------------------|------------------------------------|
|                   | Maximum   | 99 <sup>th</sup> | 98 <sup>th</sup> | 95 <sup>th</sup> | 90 <sup>th</sup> | 75 <sup>th</sup> | 50 <sup>th</sup> | (µg/m <sup>3</sup> )               |
| PM <sub>2.5</sub> | 12  | 11               | 11               | 9.9              | 8.6              | 7.4              | 6.1              | 36                                 |
| PM <sub>10</sub>  | 36  | 34               | 31               | 27               | 27               | 19               | 15               | 60                                 |

**Note:**

A Micrograms per cubic metre at 0°C and 101.3 kPa

B SEPP(AQM) Intervention level

Values rounded to two significant figures.

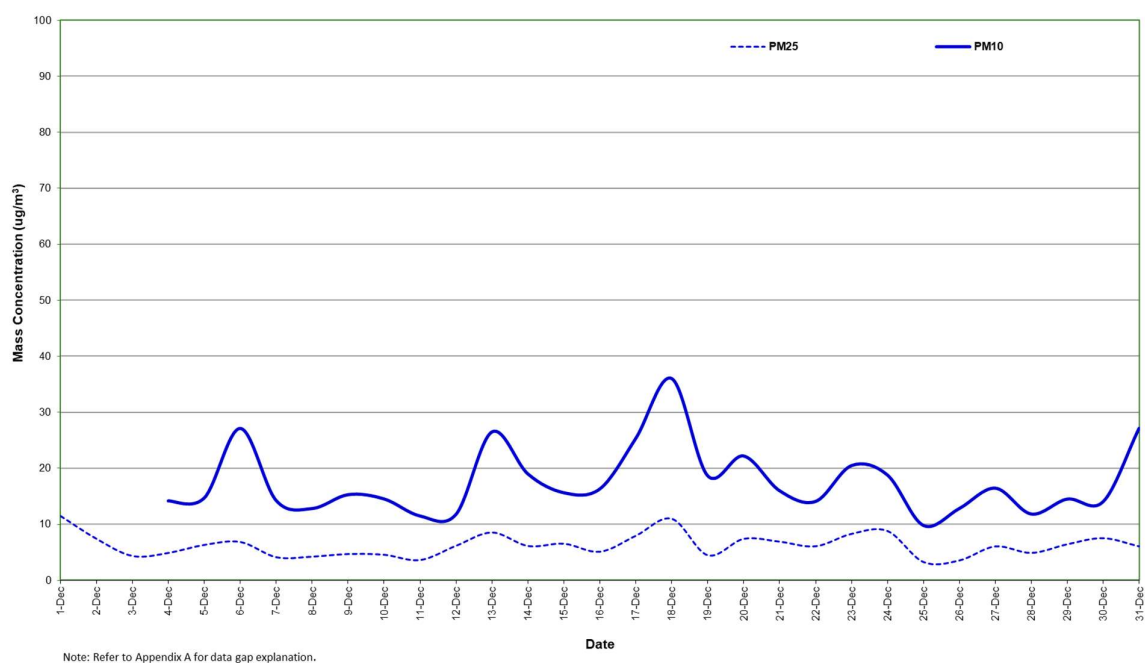


Figure 7: Station 6 PM<sub>2.5</sub> and PM<sub>10</sub> concentration (24 hour average) – December 2021

### 6.1.7 Combined PM<sub>2.5</sub> mass concentrations

Combined plots of the AAQMS PM<sub>2.5</sub> and PM<sub>10</sub> are presented in Figure 8 and Figure 9 respectively.

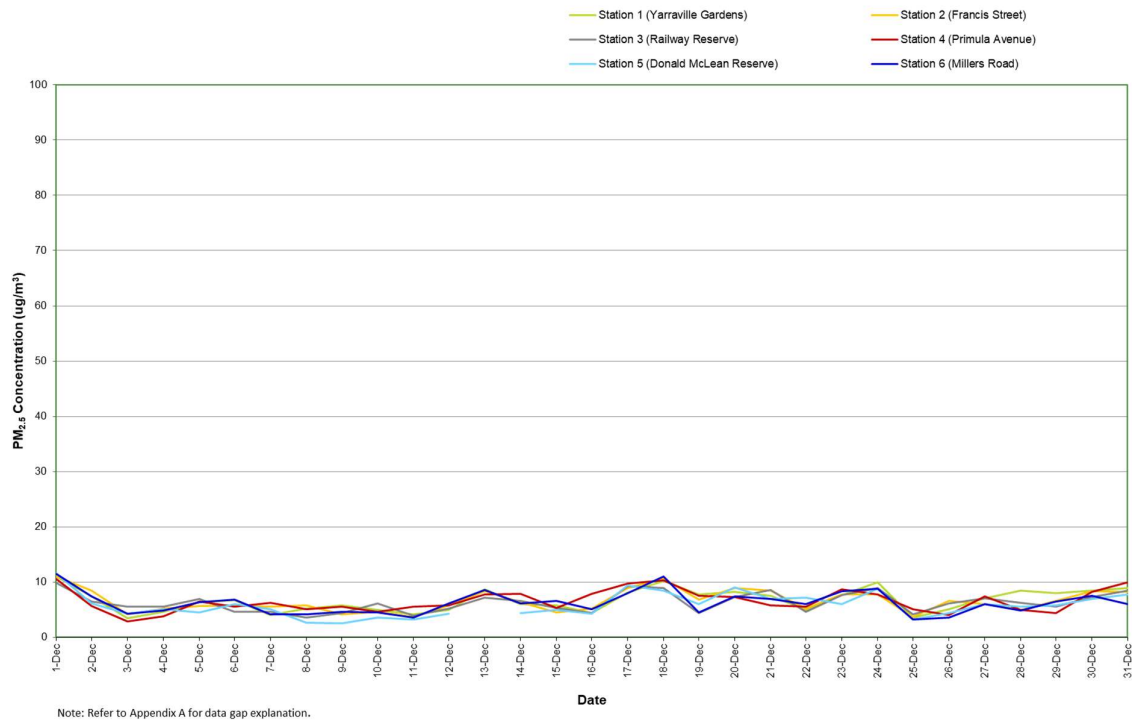


Figure 8: Combined PM<sub>2.5</sub> concentration (24 hour average) – December 2021

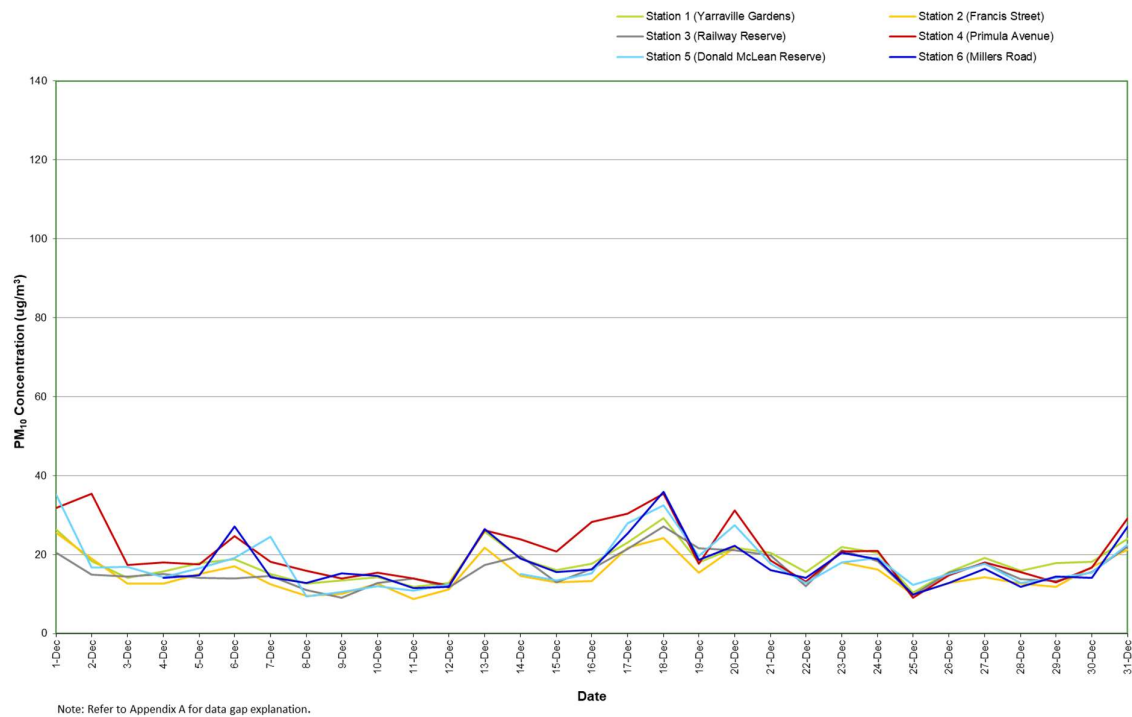


Figure 9: Combined PM<sub>10</sub> concentration (24 hour average) – December 2021



## 6.2 Nitrogen dioxide (NO<sub>2</sub>)

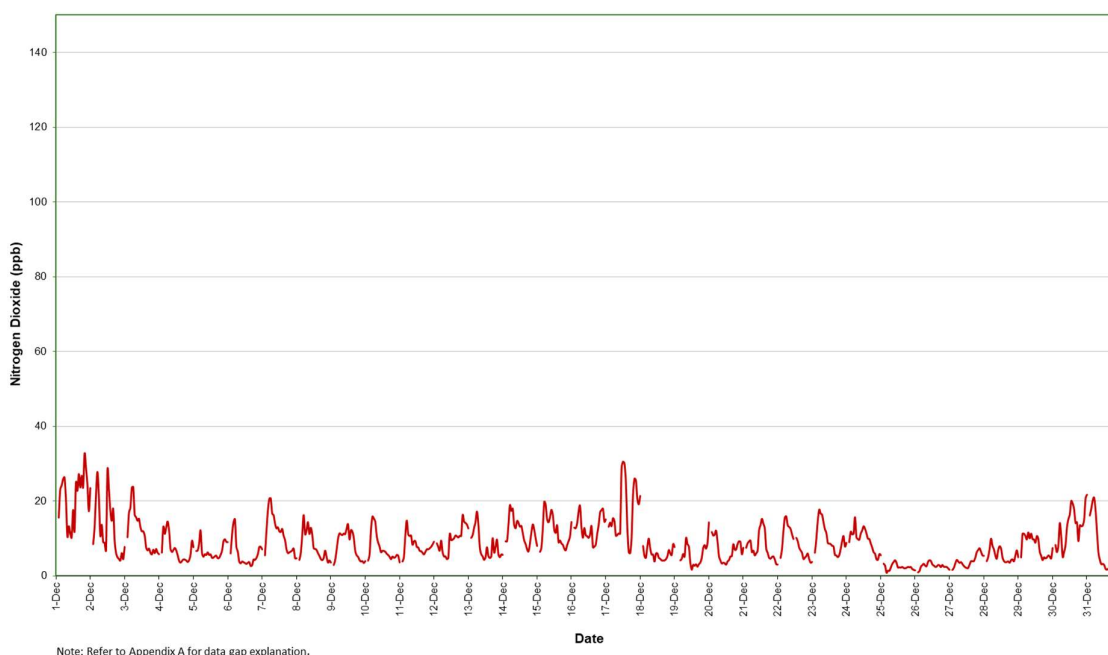
NO<sub>2</sub> (1 hour average) mass concentration statistics for the reporting period are given in Table 14. A plot of NO<sub>2</sub> (1 hour average) mass concentration for the reporting period is presented in Figure 10.

**Table 14: Station 4 (Primula Avenue AAQMS) NO<sub>2</sub> percentiles (1 hour average)**

| Parameter       | Concentration (ppb) <sup>A</sup> |                  |                  |                  |                  |                  |                  | SEPP (AQM)<br>intervention level |
|-----------------|----------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|----------------------------------|
|                 | Maximum                          | 99 <sup>th</sup> | 98 <sup>th</sup> | 95 <sup>th</sup> | 90 <sup>th</sup> | 75 <sup>th</sup> | 50 <sup>th</sup> | (ppb)                            |
| NO <sub>2</sub> | 33                               | 27               | 25               | 20               | 16               | 12               | 7.7              | 140                              |

**Note:**

A Parts per billion



Note: Refer to Appendix A for data gap explanation.

**Figure 10: Station 4 NO<sub>2</sub> concentration (1 hour average) – December 2021**

### 6.3 Carbon monoxide (CO)

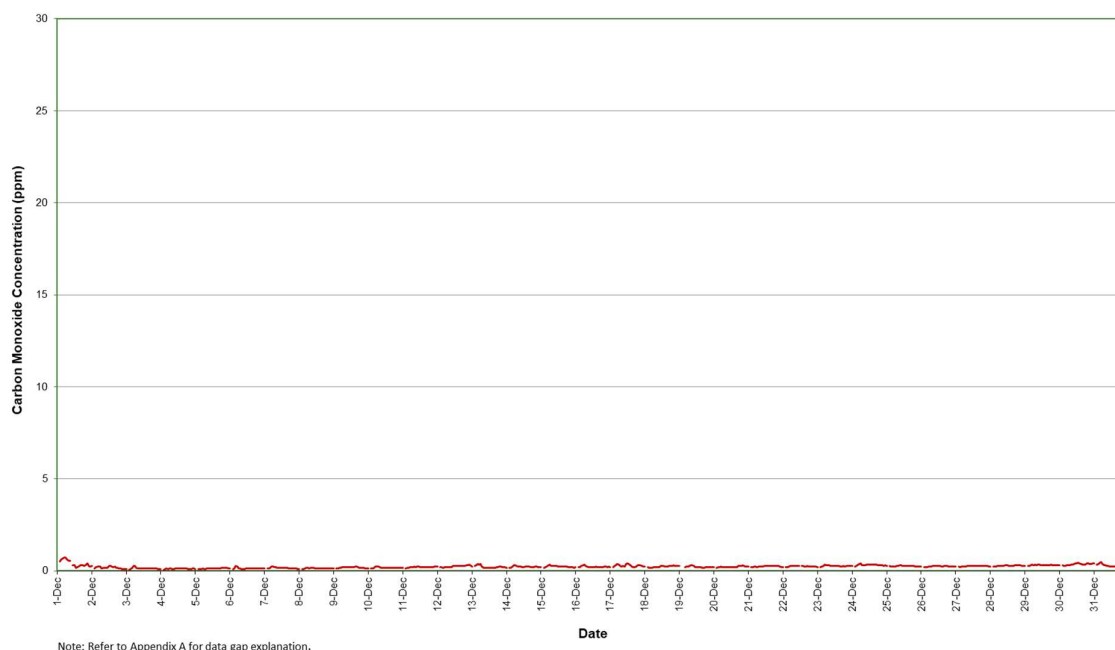
CO (1 hour average) mass concentration statistics for the reporting period are given in Table 15. A plot of CO (1 hour average) concentration for the reporting period is presented in Figure 11.

**Table 15: Station 4 (Primula Avenue AAQMS) CO percentiles (1 hour average)**

| Parameter | Concentration (ppm) <sup>A</sup> |                  |                  |                  |                  |                  |                  | SEPP (AQM)<br>intervention level |
|-----------|----------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|----------------------------------|
|           | Maximum                          | 99 <sup>th</sup> | 98 <sup>th</sup> | 95 <sup>th</sup> | 90 <sup>th</sup> | 75 <sup>th</sup> | 50 <sup>th</sup> | (ppm)                            |
| CO        | 0.74                             | 0.56             | 0.41             | 0.36             | 0.32             | 0.27             | 0.23             | 29                               |

**Note:**

A Parts per million



**Figure 11: Station 4 CO concentration (1 hour average) – December 2021**

## 6.4 Volatile organic compounds (BTEX)

VOC samples were collected from Station 4 (Primula Avenue), in an evacuated electro-polished and passivated stainless steel canister. Analysis involves separation by gas chromatography (GC) and measurement by mass selective (MS) detector.

The procedure for sampling Volatile Organic Compounds (VOCs) using evacuated canisters, and for the subsequent analysis, is described in USEPA Method TO-15 "Determination of Volatile Organic Compounds (VOCs) in air collected in specially-prepared canisters and analysed by Gas Chromatography/Mass Spectrometry (GC/MS)".

Samples were analysed by Queensland Health (NATA Laboratory Accreditation No. 41) based on USEPA method TO-15 (Laboratory Report Nos. SSP77297 and SSP77500).

The test method used was in accordance with Golder Source Test Method C9, "Canister (Evacuated) Sampling for VOC: In Ambient Air and Source Emissions".

BTEX (24 hour average) mass concentration statistics for the reporting period are given in Table 16. Laboratory certificates are presented in APPENDIX B.

**Table 16: Station 4 - Primula Avenue AAQMS BTEX concentrations (24 hour average)**

| Date                  | Sample no. | Benzene (ppb)    | Toluene (ppb) | Ethylbenzene (ppb) | Total xylene isomers (ppb) |
|-----------------------|------------|------------------|---------------|--------------------|----------------------------|
| 6/12/2021             | 21-2471    | <0.5             | <0.5          | <0.5               | <1                         |
| 12/12/2021            | 21-2472    | <0.5             | <0.5          | <0.5               | <1                         |
| 18/12/2021            | 21-2594    | <0.5             | <0.5          | <0.5               | <1                         |
| 24/12/2021            | 21-2595    | <0.5             | <0.5          | <0.5               | <1                         |
| 30/12/2021            | 21-2596    | <0.5             | <0.5          | <0.5               | <1                         |
| NEPM MIL <sup>A</sup> |            | 3.0 <sup>B</sup> | 1000          | NA                 | 250                        |

**Note:**

A National Environment Protection Measure (Air Toxics) Monitoring Investigation Level

B Annual average

Sample analysis conducted by Queensland Health, NATA Accreditation No. 41/ Eurofins Pty Ltd, NATA Accreditation No. 1261.

Analysis dates: 20/12/2021 (21-2471 and 21-2472) and 16/01/2022 (21-2594, 21-2595 and 21-2596)

## 6.5 Meteorological parameters

### 6.5.1 Ambient temperature

Ambient Temperature data for all AAQMS sites are presented in Figure 12 for the reporting period.

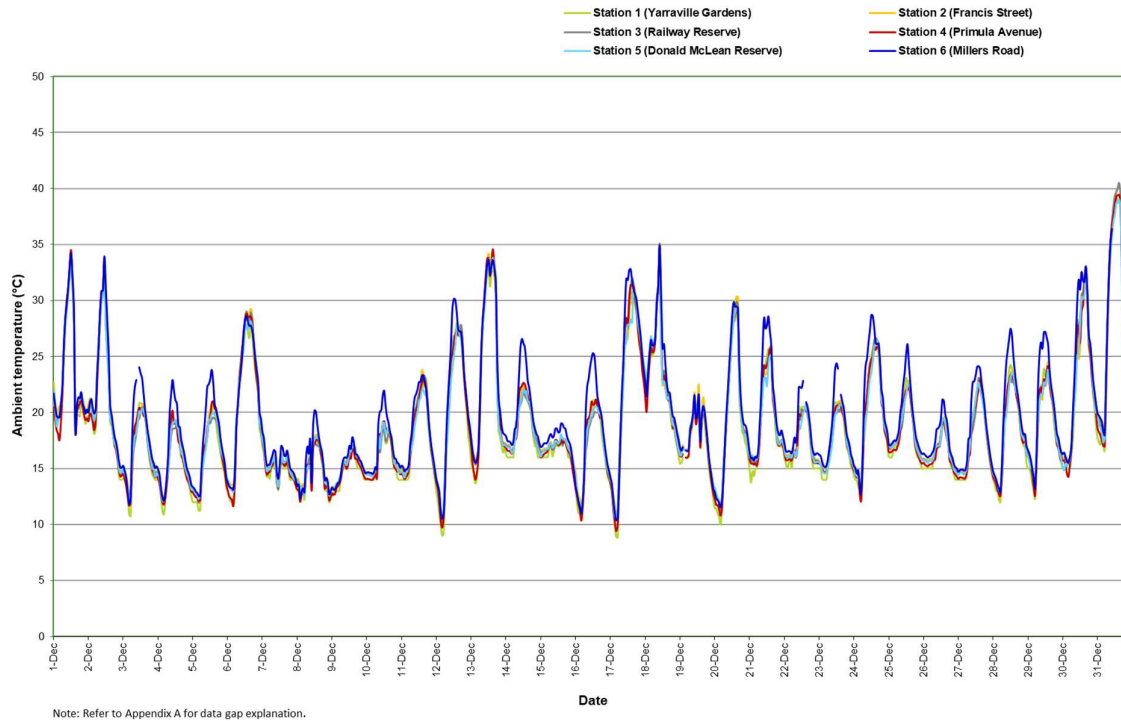


Figure 12: Ambient temperature (1 hour average) All AAQMS – December 2021

### 6.5.2 Relative humidity

Relative Humidity data for all AAQMS sites are presented in Figure 13 for the reporting period.

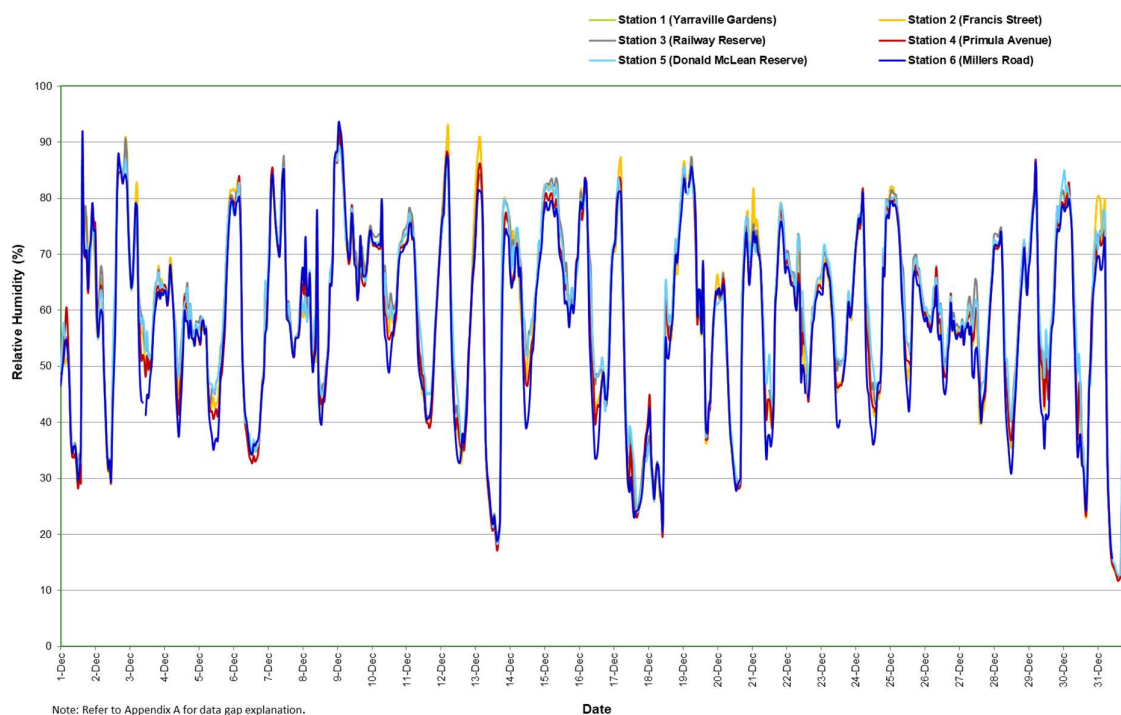


Figure 13: Relative humidity (1 hour average) All AAQMs – December 2021

### 6.5.3 Atmospheric pressure

Atmospheric pressure data for Station 4 (Primula Avenue AAQMS) is presented in Figure 14 for the reporting period.



Figure 14: Atmospheric pressure (1 hour average) Station 4 Primula Avenue – December 2021

### 6.5.4 Wind speed

Wind Speed data for all AAQMS sites are presented in Figure 15 for the reporting period.

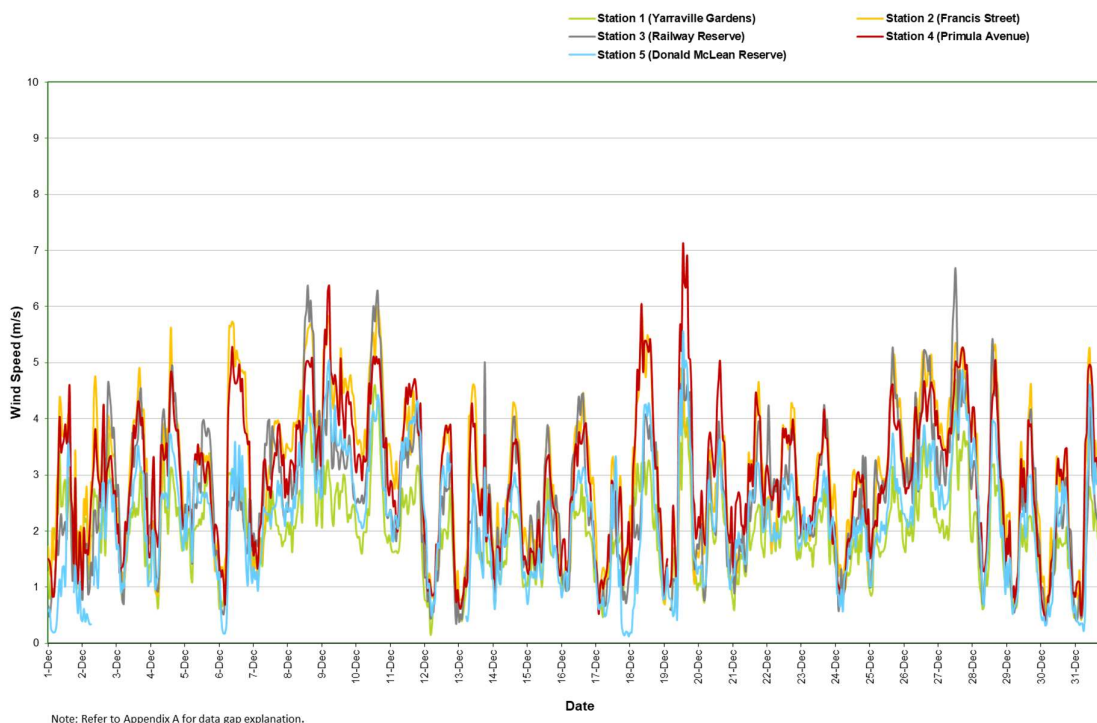


Figure 15: Wind speed (1 hour average) All AAQMs – December 2021

### 6.5.5 Wind rose – Station 1 (Yarraville Gardens)

A wind rose (1 hour average) for Yarraville Gardens AAQMS is presented in Figure 16.

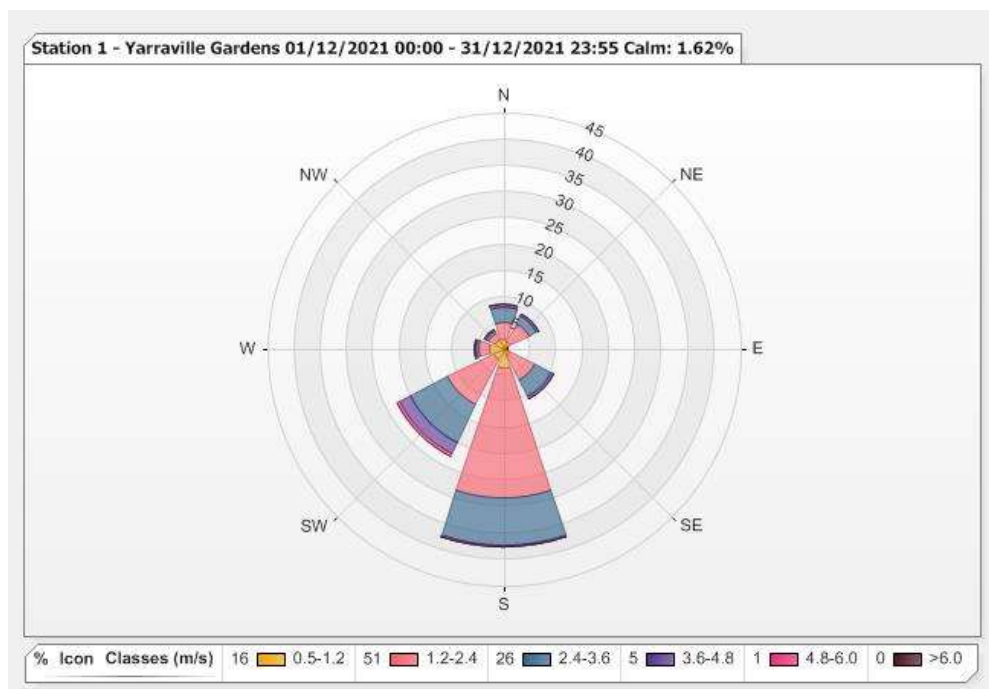


Figure 16: Wind speed (1 hour average) Station 1 - Yarraville Gardens

6.5.6 Wind rose – Station 2 (Francis Street)

A wind rose (1 hour average) for Station 2 (Francis Street AAQMS) is presented in Figure 17.

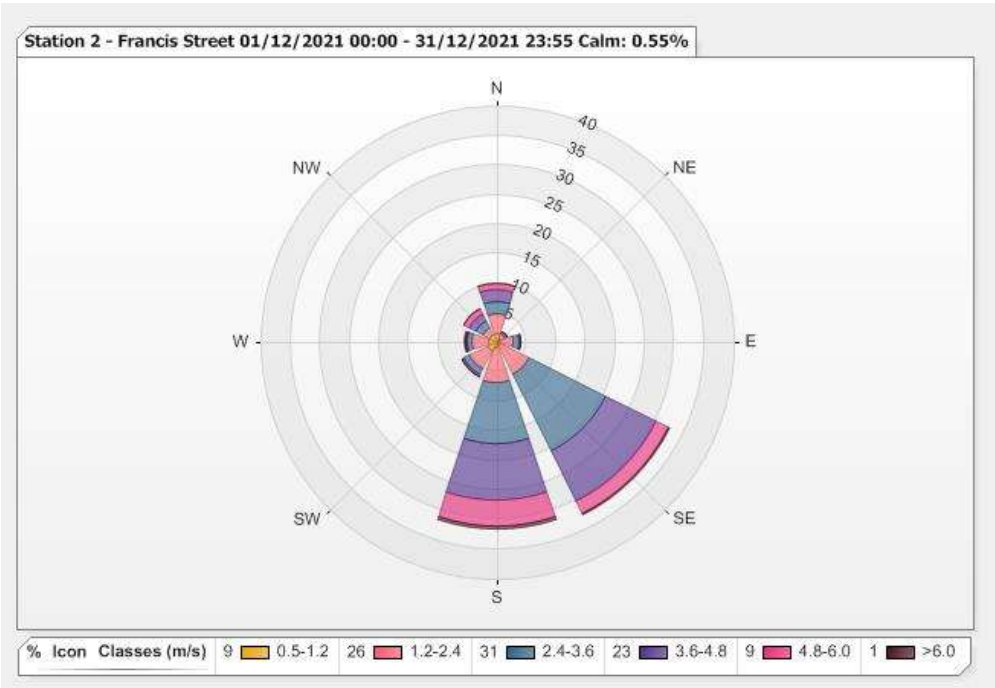


Figure 17: Wind speed (1 hour average) Station 2 - Francis Street

6.5.7 Wind rose – Station 3 (Railway Reserve)

A wind rose (1 hour average) for Station 3 (Railway Reserve AAQMS) is presented in Figure 18.

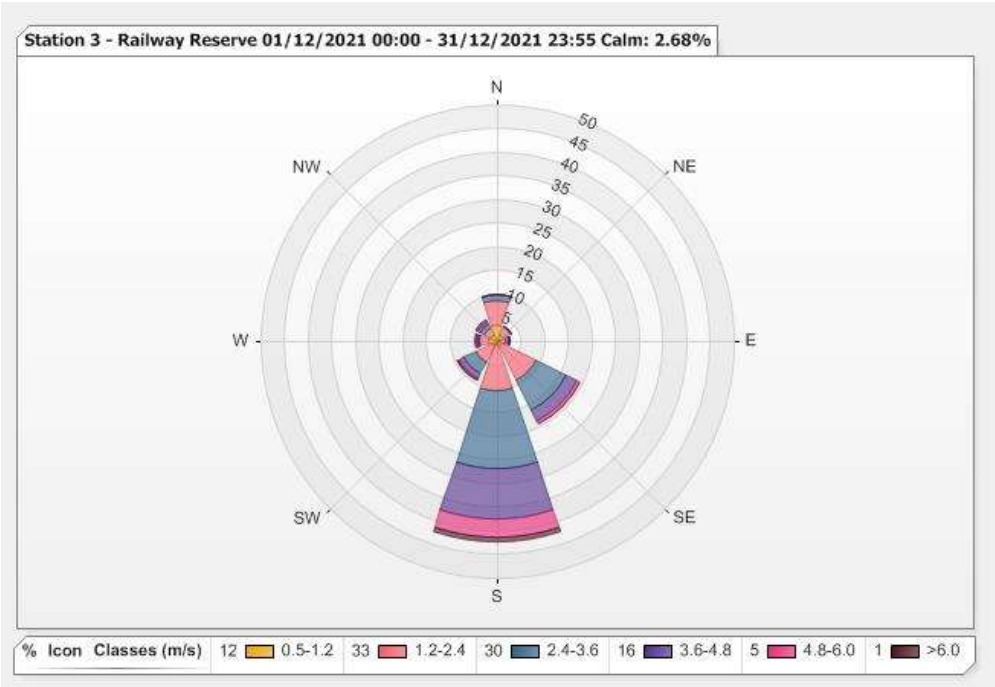


Figure 18: Wind speed (1 hour average) Station 3 - Railway Reserve

6.5.8 Wind rose – Station 4 (Primula Avenue)

A wind rose (1 hour average) for Station 4 (Primula Avenue AAQMS) is presented in Figure 19.

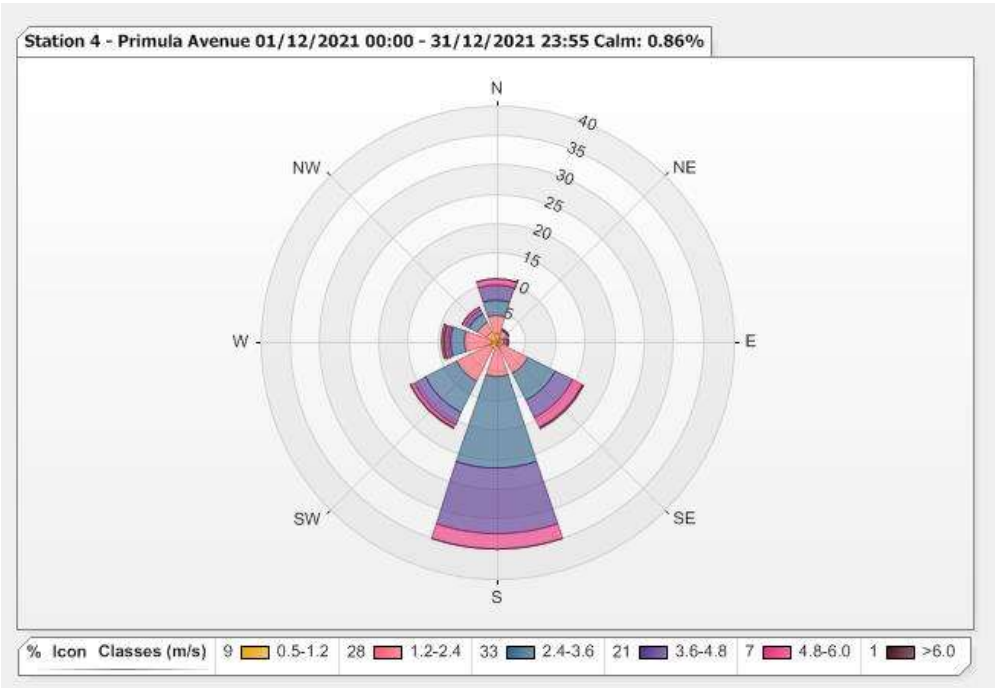


Figure 19: Wind speed (1 hour average) Station 4 - Primula Avenue

6.5.9 Wind rose – Station 5 (Donald McLean Reserve)

A wind rose (1 hour average) for Station 5 (Donald McLean Reserve AAQMS) is presented in Figure 20.

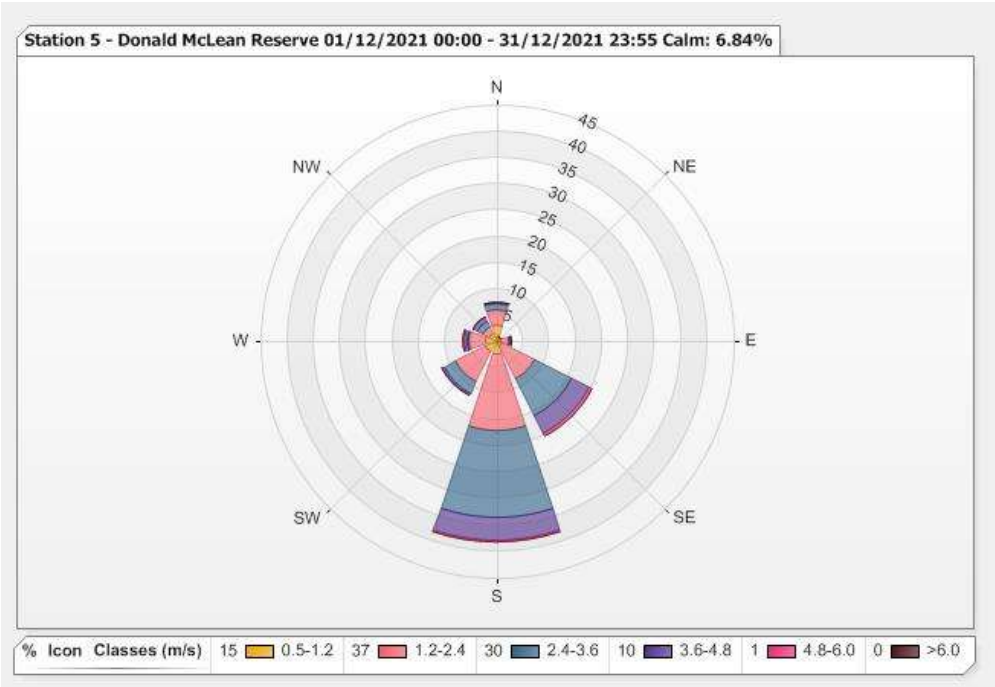


Figure 20: Wind speed (1 hour average) Station 5 - Donald McLean Reserve



## 7.0 QUALITY ASSURANCE

### 7.1 Data capture

Data capture is defined as the number of valid data periods collected divided by the number of available data periods. Valid data excludes periods where the instrument is unavailable due to calibration and maintenance and excludes periods where the data has been rejected due to quality assurance/data validation procedures.

Automatic calibrations are conducted for NO<sub>2</sub> and CO daily to monitor and correct instrument drift where necessary. NO<sub>2</sub> and CO automatic calibrations are conducted once per day between 01:00 and 01:45 hours.

Data capture statistics for the reporting period 1 December to 31 December 2021 are shown in Table 17. Averages were only collected for those periods where the 5 minute data constituted 75% data capture. Data capture statistics for December 2021 were above 90 percent for all parameters.

**Table 17: Data Capture**

| Parameter                               | Averaging period | Station                   | Collected periods | Available periods | Data capture <sup>1</sup> |
|---|------------------|---------------------------|-------------------|-------------------|---------------------------|
| PM <sub>2.5</sub>                       | 24 hour          | 1 – Yarraville Gardens    | 31                | 31                | 100%                      |
|   | 24 hour          | 2 – Francis Street        | 31                | 31                | 100%                      |
|   | 24 hour          | 3 – Railway Reserve       | 31                | 31                | 100%                      |
|   | 24 hour          | 4 – Primula Avenue        | 31                | 31                | 100%                      |
|   | 24 hour          | 5 – Donald McLean Reserve | 30                | 31                | 97%                       |
|   | 24 hour          | 6 – Millers Road          | 31                | 31                | 100%                      |
| PM <sub>10</sub>                        | 24 hour          | 1 – Yarraville Gardens    | 31                | 31                | 100%                      |
|   | 24 hour          | 2 – Francis Street        | 29                | 31                | 94%                       |
|   | 24 hour          | 3 – Railway Reserve       | 31                | 31                | 100%                      |
|   | 24 hour          | 4 – Primula Avenue        | 31                | 31                | 100%                      |
|   | 24 hour          | 5 – Donald McLean Reserve | 30                | 31                | 97%                       |
|   | 24 hour          | 6 – Millers Road          | 29                | 31                | 94%                       |
| NO <sub>2</sub>                         | 1 hour           | 4 – Primula Avenue        | 711               | 744               | 96%                       |
| CO                                      | 1 hour           | 4 – Primula Avenue        | 710               | 744               | 95%                       |
| Ambient temperature & relative humidity | 1 hour           | 1 – Yarraville Gardens    | 741               | 744               | 100%                      |
|   | 1 hour           | 2 – Francis Street        | 741               | 744               | 100%                      |
|   | 1 hour           | 3 – Railway Reserve       | 741               | 744               | 100%                      |
|   | 1 hour           | 4 – Primula Avenue        | 742               | 744               | 100%                      |
|   | 1 hour           | 5 – Donald McLean Reserve | 730               | 744               | 98%                       |
|   | 1 hour           | 6 – Millers Road          | 737               | 744               | 99%                       |
| Atmospheric pressure                    | 1 hour           | 4 – Primula Avenue        | 742               | 744               | 100%                      |

|                          |        |                           |     |     |      |
|--------------------------|--------|---------------------------|-----|-----|------|
| Wind speed and direction | 1 hour | 1 – Yarraville Gardens    | 743 | 744 | 100% |
|                          | 1 hour | 2 – Francis Street        | 743 | 744 | 100% |
|                          | 1 hour | 3 – Railway Reserve       | 743 | 744 | 100% |
|                          | 1 hour | 4 – Primula Avenue        | 743 | 744 | 100% |
|                          | 1 hour | 5 – Donald McLean Reserve | 732 | 744 | 98%  |

Note:

1 Rounded to two significant figures

## 7.2 Data validation

Data contained in this report has been validated against performance and calibration requirements for each instrument. Data during commissioning, maintenance and calibration periods has been removed from the validated data sets. APPENDIX A lists the data exceptions for all AAQMS. Missing data periods during automatic calibrations of the gaseous atmospheric contaminants NO<sub>2</sub> and CO are not shown.

## 8.0 DISCUSSION

Table 18 presents the maximum measured concentration during the reporting period at Station 1 for PM<sub>2.5</sub> and PM<sub>10</sub> compared with the respective criteria.

**Table 18: Station 1 Summary – December 2021**

| Parameter         | Units             | Averaging period | Maximum concentration | Air quality objective <sup>A</sup> | Exceedances <sup>B</sup> |
|-------------------|-------------------|------------------|-----------------------|------------------------------------|--------------------------|
| PM <sub>2.5</sub> | ug/m <sup>3</sup> | 24 hour          | 11                    | 25                                 | Nil                      |
| PM <sub>10</sub>  | ug/m <sup>3</sup> | 24 hour          | 29                    | 50                                 | Nil                      |

Notes:

A – SEPP(AAQ) objective

B - Exceedances refers to the number of individual days the criterion was exceeded at any station.

Table 19 presents the maximum measured concentration during the reporting period at Station 2, Station 3, Station 5 and Station 6 for PM<sub>2.5</sub> and PM<sub>10</sub> compared with the respective criteria.

**Table 19: Station 2, Station 3, Station 5 and Station 6 Summary – December 2021**

| Parameter         | Units             | Averaging period | Maximum concentration |           |           |           | Air quality objective <sup>A</sup> | Exceedances <sup>B</sup> |
|-------------------|-------------------|------------------|-----------------------|-----------|-----------|-----------|------------------------------------|--------------------------|
|                   |                   |                  | Station 2             | Station 3 | Station 5 | Station 6 |                                    |                          |
| PM <sub>2.5</sub> | ug/m <sup>3</sup> | 24 hour          | 11                    | 9.9       | 12        | 12        | 36                                 | Nil                      |
| PM <sub>10</sub>  | ug/m <sup>3</sup> | 24 hour          | 26                    | 27        | 35        | 36        | 60                                 | Nil                      |

Notes:

A - SEPP(AQM) Intervention level

B - Exceedances refers to the number of individual days the criterion was exceeded at any station.

Table 20 presents maximum measured concentration during the reporting period at Station 4 for PM<sub>2.5</sub>, PM<sub>10</sub>, NO<sub>2</sub>, CO and BTEX compared with the respective criteria.

**Table 20: Station 4 Summary – December 2021**

| Parameter            | Units             | Averaging period | Maximum concentration | Air quality objective | Exceedances <sup>C</sup> |
|----------------------|-------------------|------------------|-----------------------|-----------------------|--------------------------|
| PM <sub>2.5</sub>    | ug/m <sup>3</sup> | 24 hour          | 11                    | 36 <sup>A</sup>       | Nil                      |
| PM <sub>10</sub>     | ug/m <sup>3</sup> | 24 hour          | 35                    | 60 <sup>A</sup>       | Nil                      |
| NO <sub>2</sub>      | ppb               | 1 hour           | 33                    | 140 <sup>A</sup>      | Nil                      |
| CO                   | ppm               | 1 hour           | 0.74                  | 29 <sup>A</sup>       | Nil                      |
| Benzene              | ppb               | 24 hour          | <0.5                  | 3.0 <sup>B</sup>      | Nil                      |
| Toluene              | ppb               | 24 hour          | <0.5                  | 1000 <sup>B</sup>     | Nil                      |
| Total xylene isomers | ppb               | 24 hour          | <1                    | 250 <sup>B</sup>      | Nil                      |

Notes:

A - SEPP(AQM) Intervention level

B - Air NEPM Monitoring investigation level

C - Exceedances refers to the number of individual days the criterion was exceeded at any station.

December 2021 ambient air quality monitoring programme results were less than the respective air quality objectives for all parameters measured at all ambient air quality stations.

Data capture statistics for December 2021 were above 90 percent for all parameters at all stations. A diesel generator located approximately 25 metres north of Station 1 AAQMS continues to supply power to the garden lights and AAQMS.

Relative Humidity at Station 1 (Yarraville Gardens) continues to be impacted by local conditions.

A construction area (Millers Road exit ramp and noise wall relocation) is now adjacent Station 4, as a result, the measured pollutant concentrations may not be representative of traffic emissions.

## 9.0 IMPORTANT INFORMATION RELATING TO THIS REPORT

Your attention is drawn to the document titled - "Important Information Relating to this Report", which is included in APPENDIX C of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The Important Information document does not alter the obligations Golder Associates has under the contract between it and its client.

## Signature Page

Golder Associates Pty Ltd



Anthony Myszka  
*Environmental Technician*



Mark Tulau  
*Senior Environmental Scientist*

AM/MDT/am

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**APPENDIX A**

# Data Exceptions

| Date from        | Date to          | Station         | Parameters                                | Reason                            |
|------------------|------------------|-----------------|---|-----------------------------------|
| 1/12/2021 10:05  | 1/12/2021 10:40  | 4               | CO  | Maintenance / calibration         |
| 1/12/2021 14:45  | 1/12/2021 14:55  | 4               | PM <sub>2.5</sub> / PM <sub>10</sub>      | Maintenance / calibration         |
| 1/12/2021 16:45  | 1/12/2021 17:20  | 5               | All Parameters                            | Power failure                     |
| 1/12/2021 16:50  | 3/12/2021 20:40  | 6               | PM <sub>10</sub>                          | Power failure                     |
| 1/12/2021 17:25  | 1/12/2021 21:00  | 5               | PM <sub>2.5</sub> / PM <sub>10</sub>      | Maintenance / calibration         |
| 3/12/2021 02:45  | 3/12/2021 06:00  | 4               | PM <sub>2.5</sub>                         | Invalid <sup>1</sup>              |
| 12/12/2021 19:45 | 13/12/2021 04:40 | 5               | All Parameters                            | Power failure                     |
| 13/12/2021 04:45 | 13/12/2021 15:00 | 5               | PM <sub>2.5</sub> / PM <sub>10</sub>      | Stabilisation after power failure |
| 19/12/2021 03:00 | 19/12/2021 03:45 | 1, 2, 3, 4, & 6 | All Parameters                            | Sever error                       |
| 20/12/2021 02:55 | 20/12/2021 06:00 | 4               | PM <sub>2.5</sub>                         | Invalid <sup>1</sup>              |
| 21/12/2021 07:55 | 21/12/2021 08:45 | 1               | PM <sub>2.5</sub> / PM <sub>10</sub>      | Maintenance / calibration         |
| 21/12/2021 09:15 | 21/12/2021 09:50 | 2               | PM <sub>2.5</sub>                         | Maintenance / calibration         |
| 21/12/2021 09:55 | 22/12/2021 14:40 | 2               | PM <sub>10</sub>                          | Maintenance / calibration         |
| 21/12/2021 10:15 | 21/12/2021 11:15 | 3               | PM <sub>2.5</sub> / PM <sub>10</sub>      | Maintenance / calibration         |
| 22/12/2021 12:00 | 22/12/2021 13:10 | 4               | CO, NO, NO <sub>2</sub> , NO <sub>x</sub> | Maintenance / calibration         |
| 22/12/2021 13:20 | 22/12/2021 13:35 | 4               | PM <sub>2.5</sub>                         | Maintenance / calibration         |
| 22/12/2021 13:20 | 22/12/2021 17:55 | 4               | PM <sub>10</sub>                          | Maintenance / calibration         |
| 22/12/2021 14:00 | 22/12/2021 14:25 | 3               | PM <sub>2.5</sub> / PM <sub>10</sub>      | Maintenance / calibration         |

Note: 1 – In the opinion of the data reviewer

**APPENDIX B**

# Laboratory Certificates

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**CERTIFICATE OF ANALYSIS**

---

**CLIENT:** Golder Associates  
Building 7, Botanicca Corporate Park  
570 - 588 Swan Street  
Richmond VIC 3121  
  
ATTN: Laurent Campbell

Laboratory Reference : SSP77297  
Client Order Number : PO24154  
Quote Number : n/a  
Client Project : 1789878  
Client Batch Reference : n/a  
Date Received : 20-Dec-2021  
Date Commenced : 20-Dec-2021  
Laboratory Number/s : 21KS2331-2332

**CC:** Anthony Myszk

---


Submitting Authority : Golder Associates

Number of Samples : Two (2) Summa canisters

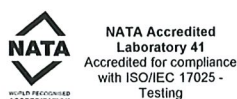
Reason for Analysis : Analysis of Volatile Organic Compounds (VOCs) in air

Method/s of Analysis : QIS28237 – Identification, confirmation and quantitation of Volatile Organic Compounds (VOCs) by GCMS using an in-house method as per EPA method TO15

Remarks : Sample details and results are summarised in Table 1.



.....  
David Pass  
Senior Chemist, Organics Laboratory  
21st December 2021

**SSP77297**

This report overrides all previous reports. The results relate solely to the sample/s as received and are limited to the specific tests undertaken as listed on the report. The results of this report are confidential and are not to be used or disclosed to any other person or used for any other purpose, whether directly or indirectly, unless that use is disclosed or the purpose is expressly authorised in writing by Queensland Health and the named recipient on this report. To the fullest extent permitted by law, Queensland Health will not be liable for any loss or claim (including legal costs calculated on an indemnity basis) which arise because of (a) problems related to the merchantability, fitness or quality of the sample/s, or (b) any negligent or unlawful act or omissions by Queensland Health that is connected with any activities or services provided by Queensland Health under this agreement (including the timing and/or method under which the sample/s were taken, stored or transported).

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Email FSS@health.qld.gov.au



# CERTIFICATE OF ANALYSIS

Laboratory Reference: SSP77297  
Laboratory Number: 21KS2331-2332

Table 1: Results for Summa canister analysis

| Client Reference     |   |       |                 | 21-2471              | 21-2472              |
|----------------------|---|-------|-----------------|----------------------|----------------------|
| Sample Type          |   |       |                 | Silco Canister #1932 | Silco Canister #1990 |
| Sampling Time / Date |   |       |                 | n/a                  | n/a                  |
| Sample Description   |   |       |                 | ambient air          | ambient air          |
| Method               | Volatile Organic Compounds (VOCs) by GCMS | Units | Reporting Limit | 21KS2331             | 21KS2332             |
| 28237                | Benzene                                   | ppbv  | 0.5             | < LOR                | < LOR                |
| 28237                | Toluene                                   | ppbv  | 0.5             | < LOR                | < LOR                |
| 28237                | Ethylbenzene                              | ppbv  | 0.5             | < LOR                | < LOR                |
| 28237                | m- & p-Xylene                             | ppbv  | 0.5             | < LOR                | < LOR                |
| 28237                | o-Xylene                                  | ppbv  | 0.5             | < LOR                | < LOR                |

Temperature and atmospheric pressure at time of sampling unavailable

This report overrides all previous reports. The results relate solely to the sample/s as received and are limited to the specific tests undertaken as listed on the report. The results of this report are confidential and are not to be used or disclosed to any other person or used for any other purpose, whether directly or indirectly, unless that use is disclosed or the purpose is expressly authorised in writing by Queensland Health and the named recipient on this report. To the fullest extent permitted by law, Queensland Health will not be liable for any loss or claim (including legal costs calculated on an indemnity basis) which arise because of (a) problems related to the merchantability, fitness or quality of the sample/s, or (b) any negligent or unlawful act or omissions by Queensland Health that is connected with any activities or services provided by Queensland Health under this agreement (including the timing and/or method under which the sample/s were taken, stored or transported).

---

## CERTIFICATE OF ANALYSIS

---

**CLIENT:** Golder Associates  
Building 7, Botanicca Corporate Park  
570 - 588 Swan Street  
Richmond VIC 3121

ATTN: Laurent Campbell

Laboratory Reference : SSP77500  
Client Order Number : PO24154  
Quote Number : n/a  
Client Project : 1789878  
Client Batch Reference : n/a  
Date Received : 14-Jan-2022  
Date Commenced : 16-Jan-2022  
Laboratory Number/s : 22KS54-57

**CC:** Anthony Myszk

---

Submitting Authority : Golder Associates

Number of Samples : Four (4) Summa canisters

Reason for Analysis : Analysis of Volatile Organic Compounds (VOCs) in air

Method/s of Analysis : QIS28237 – Identification, confirmation and quantitation of Volatile Organic Compounds (VOCs) by GCMS using an in-house method as per EPA method TO15

Remarks : Sample details and results are summarised in Table 1.



.....  
David Pass  
Senior Chemist, Organics Laboratory  
18th January 2022



NATA Accredited  
Laboratory 41  
Accredited for compliance  
with ISO/IEC 17025 -  
Testing

### SSP77500

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CERTIFICATE OF ANALYSIS

Laboratory Reference: SSP77500  
Laboratory Number: 22KS54-57

Table 1: Results for Summa canister analysis

| Client Reference     |   | 21-2594              | 21-2595              | 21-2596              | 21-2663              |
|----------------------|---|----------------------|----------------------|----------------------|----------------------|
| Sample Type          |   | Silco Canister #2389 | Silco Canister #5406 | Silco Canister #1737 | Silco Canister #1738 |
| Sampling Time / Date |   | n/a                  | n/a                  | n/a                  | n/a                  |
| Sample Description   |   | ambient air          | ambient air          | ambient air          | ambient air          |
| Method               | Volatile Organic Compounds (VOCs) by GCMS | Units                | Reporting Limit      |                      |                      |
| 28237                | Benzene                                   | ppbv                 | 0.5                  |                      |                      |
| 28237                | Toluene                                   | ppbv                 | 0.5                  |                      |                      |
| 28237                | Ethylbenzene                              | ppbv                 | 0.5                  |                      |                      |
| 28237                | m- & p-Xylene                             | ppbv                 | 0.5                  |                      |                      |
| 28237                | o-Xylene                                  | ppbv                 | 0.5                  |                      |                      |

Temperature and atmospheric pressure at time of sampling unavailable

This report overrides all previous reports. The results relate solely to the sample/s as received and are limited to the specific tests undertaken as listed on the report. The results of this report are confidential and are not to be used or disclosed to any other person or used for any other purpose, whether directly or indirectly, unless that use is disclosed or the purpose is expressly authorised in writing by Queensland Health and the named recipient on this report. To the fullest extent permitted by law, Queensland Health will not be liable for any loss or claim (including legal costs calculated on an indemnity basis) which arise because of (a) problems related to the merchantability, fitness or quality of the sample/s, or (b) any negligent or unlawful act or omissions by Queensland Health that is connected with any activities or services provided by Queensland Health under this agreement (including the timing and/or method under which the sample/s were taken, stored or transported).

**APPENDIX C**

**Important Information Relating to  
this Report**

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