Suburban Rail Loop East
Early Works
Air Quality Monthly Report

18 September – 17 October 2023

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Contents

Executive Summary

Key Outcomes

Key outcomes arising from the monthly air quality monitoring program:

- The concentration of small dust particles measured in proximity to construction activities exceeded the Environment Reference Standard (ERS) on several occasions. The ERS sets out the air quality objectives for PM_{10} dust concentrations measured over a 24-hour averaging period.
- Visible dust was not observed to pass site boundaries, indicating dust impacts were contained to the construction site.
- No community complaints or enquiries were received regarding outdoor air quality related to the dates of exceedances.

This report presents the results of the monthly review of the air quality monitoring data for each Suburban Rail Loop (SRL) East Early Works construction site for the period between 18 September 2023 and 17 October 2023 in accordance with SRL East Environmental Management Framework (EMF) and Environmental Performance Requirements (EPRs) AQ1 and AQ2.

This report does not include works delivered as SRL Initial Works. The SRL Initial Works which include investigative works, protective works, utility relocations and installations, ground improvement works (such as at the Heatherton Stabling Facility) and minor road modifications were subject to a separate approval process under Clause 52.30 of the Victoria Planning Provisions (VPP) and were approved by the Minister for Planning on 19 December 2021. These works are required to comply with Clause 52.30 of the VPP and are not subject to the EMF and EPRs.

No works requiring monitoring (i.e Early Works) occurred at the following locations during this period:

- Glen Waverley
- Monash
- Clayton
- Heatherton
- Cheltenham.

This report presents the results of the air quality monitoring program and measures the concentration of small dust particles in the air near construction sites. These particles, known as PM_{10} have the potential to impact human health. PM_{10} refers to particles with an aerodynamic diameter of 10 µm or less. This report compares the measured concentrations to air quality objectives that are defined in the Environment Reference Standard (ERS) which is a tool under the Environment Protection Act 2017. The ERS sets out the air quality objectives for PM10 which are measured over a 24-hour averaging period and are shown in Table 1 below. The objectives are risk-based concentrations that are not intended to be compliance levels, but they assist the MC to understand the risk to human health. When the monitor measures exceedances and/or visual observations identify a change in site conditions this triggers the MC to prompt actions on site to reduce dust impacts, and review mitigation measures applied.

The key findings are summarised in Table 1 and an analysis of these findings is provided below.

Table 1: Summary of air quality monitoring results for reporting period.

Location	Parameter	Averaging Period	Max concentration (µg/m^3)	EPA Air Quality Objective (µg/m^3)	Total exceedances in period	Exceedances due to Project Activities*
Representative Background[1]	PM_{10}	24-hour	31.6	50	-	-
Box Hill – Site Office	PM_{10}	24-hour	214.6	50	6	5
Box Hill – East of Market St	PM_{10}	24-hour	227.9	50	6	5
Burwood – 16 McComas Gr	PM_{10}	24-hour	36.9	50	0	0

[1] The EPA monitoring station at Dandenong is used as the representative control site for Heatherton and Cheltenham, and the EPA monitoring station at Box Hill is used as the representative control site for all other SRL work sites.

Location	Parameter	Averaging Period	Max concentration (µg/m^3)	EPA Air Quality Objective (µg/m^3)	Total exceedances in period	Exceedances due to Project Activities*
Burwood – Cnr McComas Gr and Sinnott St	PM_{10}	24-hour	117.1	50	1	0

*Visible dust was not observed to pass the site boundaries

In Burwood, the EPA air quality objective was consistently met during construction working hours throughout the September – October reporting period. Heavy fog between 4:00am and 8:00am on 24 September 2023 resulted in a 24-hour level of 117.1 µg/m^3. The highest 24-hour level recorded during construction working hours was 36.9 µg/m^3.

In Box Hill on 24 September 2023, PM_{10} concentrations of 214.6 µg/m^3 at the Box Hill Site Office and 227.9 µg/m^3 at the east of Market Street were recorded. These events were caused by heavy fog conditions between 4:00am and 8:00am and were not related to construction works. The highest levels during the monitoring period for project-related activity were 59.6 µg/m^3 at the site office and 73.6 µg/m^3 east of Market Street.

Outside of the fog event in Box Hill, air quality exceeded the EPA objective of 50 µg/m^3 over a 24-hour period on seven days during the reporting period (18, 19, 26, 27, 28 September 2023 and 11 and 17 October 2023) across two monitors. Four out of these seven days required a Level 3 response, as defined in the Managing Contractor's (MC) Trigger Action Response Protocol (TARP) and were caused by dust from earthworks carried out on 19, 26, 27 September and 17 October 2023. On these occasions, key areas were swept and dampened using water to reduce dust levels. Dust suppression was also carried out in response to visual monitoring undertaken on site. Visible dust was not observed to pass the site boundaries indicating dust impacts were contained to the site. No community complaints were received regarding outdoor air quality related to the dates of exceedance. A water cart and street sweeper were deployed to mitigate dust impacts outside of dust events.

Glossary

µg/m^3 – micrograms per cubic metre is a unit of measurement used to measure the mass of air pollutants (micrograms) per volume of air (cubic metre) as a concentration.

Environment Effects Statement (EES) – In Victoria, environment assessment of the potential environmental impacts or effects of a proposed development under the *Environment Effects Act 1978*.

Environmental Air Quality and Dust Management Plan (EAQDMP) – The EAQDMP is environmental management documentation prepared by the MC to manage and monitor air quality impacts during construction of SRL East. It includes the RMMP and TARP and is verified by the IEA.

Environmental Management Framework (EMF) – The purpose of the EMF is to provide a transparent and integrated framework to manage environmental effects of the SRL East Project during construction and operation to achieve acceptable environmental outcomes.

Environmental Performance Requirements (EPRs) – The EPRs define the environmental outcomes that must be achieved during the design, construction and operation of SRL East and are included within the EMF.

Environment Protection Authority (EPA) - Victorian regulator established under the *Environment Protection Act 2017* and which has the statutory objective to protect human health and the environment from the harmful effects of pollution and waste.

Environmental Reference Standard (ERS) – The ERS is a tool made under the *Environment Protection Act 2017* to identify and assess environmental values, including air quality, in Victoria.

Exceedance – An air quality measurement result caused by the Early Works which exceeds the ambient air quality objectives (as defined in the Environment Reference Standard).

Independent Environmental Auditor (IEA) – The IEA is appointed by the Victorian Government to undertake independent environmental reviews and audits of project activities including assessing compliance with the EMF and EPRs.

PM_{10} – Particulate matter with an aerodynamic diameter of 10 micrometres (µm) or less. PM_{10} particles are small enough to have a potential impact on human health.

Risk Management and Monitoring Program (RMMP) – this plan outlines the approach to air quality monitoring and includes instrumental, visual monitoring, TARP and public reporting processes. The RMMP forms part of the EAQDMP.

Trigger Action Response Protocol (TARP) – The TARP defines a series of adaptive management measures that are implemented to avoid or mitigate impacts from dust emissions for nearby sensitive receptors in response to the results from monitoring. The TARP forms part of the EAQDMP.

1.Introduction

1.1. Suburban Rail Loop East

Suburban Rail Loop (SRL) will deliver a 90km rail line linking every major suburban line from the Frankston Line to the Werribee Line via Melbourne Airport, better connecting Victorians to jobs, retail, education, health services and each other. SRL East from Cheltenham to Box Hill will connect major employment, health, education and retail destinations in Melbourne's east and south-east. The new underground train line will reduce travel times, connect people travelling on the Gippsland corridor and building it will create up to 8000 direct local jobs. Trains will be running by 2035.

Early Works for SRL East commenced at Burwood in May 2023 and Box Hill in June 2023. Laing O'Rourke is delivering the Early Works as Managing Contractor (MC). Early Works include:

- road modifications
- utility relocations
- ground improvement works
- tram terminus works, and
- site preparations for tunnel boring machines.

This report does not include works delivered as SRL Initial Works. The SRL Initial Works which include investigative works, protective works, utility relocations and installations, ground improvement works (such as at the Heatherton Stabling Facility) and minor road modifications were subject to a separate approval process under Clause 52.30 of the Victoria Planning Provisions (VPP) and were approved by the Minister for Planning on 19 December 2021. These works are required to comply with Clause 52.30 of the VPP and are not subject to the EMF and EPRs.

1.2. Environmental Management Framework

The Environmental Management Framework (EMF) for SRL East (the Project) provides a transparent and integrated framework to manage environmental effects of the Project and includes EPRs that define environmental outcomes that must be achieved during the design, construction, and operation phases of the Project. The EMF is available on the SRL east website at https://bigbuild.vic.gov.au/library/suburban-rail-loop/planning/srl-east-environmental-management-framework.

The development of the EMF has been informed by relevant legislation, policy and guidelines, and the specialist impact assessment studies completed for the SRL East Environment Effects Statement (EES) and the Minister's Assessment, dated 5 August 2022.

The EMF requires the MC to develop and implement an Environmental Air Quality and Dust Management Plan (EAQDMP). As part of implementing this document the MC is required to conduct monitoring of PM_{10} concentrations and measure wind speed and direction at each Early Works construction site and at a representative control site. The EAQDMP also includes a Trigger Action Response Protocol (TARP) which defines a set of triggers that prompt actions on site to reduce dust impacts, and review mitigation measures applied. The EMF, and therefore this report, is not applicable to SRL Initial Works activities.

The MC regularly reviews the monitoring data at each site, for the purpose of assessing the effectiveness of EAQDMP implementation. The results of the PM_{10} monitoring for the applicable monthly period are contained in this report, which will be available to the public, in accordance with the requirements of the EMF.

2. Air Quality Monitoring

2.1. Context

Maintaining air quality is important for public health, the liveability of our cities and our environment. Overall air quality conditions in Melbourne are good, however like all major cities, there are days where the background concentrations of air pollutants are very high on a regional basis. Sometimes these elevated concentrations are due to regional influences such as windblown continental dust, bushfires or hazard reduction burns. Emissions from traffic, home heating, and industrial emissions across Melbourne can also cause high background concentrations, especially when the weather is calm. Environment Protection Authority (EPA) monitoring stations measure these background levels of pollution that already exist in the air within the surrounding area. The EPA monitoring station at Dandenong is used as the representative

control site for Heatherton and Cheltenham, and the EPA monitoring station at Box Hill is used as the representative control site for all other SRL work sites.

Without effective management, construction of the Project has the potential to contribute to these background concentrations which may impact public health. Comparison of SRL East monitoring results with publicly available EPA monitoring data is used by the MC to identify when construction-related activities are impacting local air quality, and conversely when the local air quality results may be influenced by background conditions outside of the influence of the construction site.

Meteorological conditions such as wind direction and speed can impact on the dispersion of particulates in the air and by monitoring these, the MC can respond when conditions on site change. Having records of wind conditions is also helpful for retrospectively identifying the activity that is causing any elevated dust concentrations.

2.2. Purpose

The purpose of the air quality monitors is to measure the concentration of small dust particles in the air near the construction site. These particles, known as PM_{10} have the potential to impact human health. PM_{10} refers to particles with an aerodynamic diameter of 10 µm or less.

The measured concentrations are compared to air quality objectives that are defined in the Environment Reference Standard (ERS) which is a tool under the *Environment Protection Act 2017*. The objectives are risk-based concentrations that are not intended to be compliance levels, but they assist the MC to understand the risk to human health. The ERS sets out the air quality objectives for PM_{10} which are measured over a 24-hour averaging period, as reproduced below in Table 2.

Table 2: Ambient air quality objectives for PM_{10}.

Indicator	Air Quality Objective (µg/m^3)	Averaging Period
Particles as PM_{10} (maximum concentration)	50	24-hour

The measured concentrations (which include both existing background concentrations and the Project's incremental contribution over a 24-hour period) are presented in Section 3 and compared against the air quality objective. Monitoring is continuous, even when there are no construction-related activities occurring on the site. Periods of time where there are no site activities are classified as 'Out of Hours'. The potential for dust generation from the work sites is much lower when there are no site activities occurring, however dust can still be generated at the work site during "Out of Hours" periods due to wind erosion.

2.3. Monitoring Locations

Air quality monitors are located on or adjacent to the Early Works construction sites, to represent local air quality conditions, in positions that enable the MC to adequately measure potential impact of works on local sensitive receivers including residents. This does not include monitoring undertaken as part of the SRL Initial Works as outlined in Section 1.1.

The air quality monitors were installed on the following dates at each of the following locations. The location of these monitors is shown on maps in Section 3 of this Report.

Table 3: Air quality monitoring locations active during reporting period.

Monitoring Location	Date Commissioned	Coordinates	Monitoring Parameters	Representative Control Site
Box Hill – Site Office	07 Jul 2023	Latitude: -37.817863° Longitude: 145.12187°	PM_{10}	Box Hill EPA monitoring station
Box Hill – East of Market St	13 Jul 2023	Latitude -37.818073° Longitude: 145.1232°	PM_{10}	Box Hill EPA monitoring station
Burwood – 16 McComas Grove	18 May 2023	Latitude: -37.851494° Longitude: 145.1116°	PM_{10}	Box Hill EPA monitoring station
Burwood – Cnr of McComas Gr and Sinnott St	18 May 2023	Latitude: - 37.852413° Longitude: 145.11163°	PM_{10}	Box Hill EPA monitoring station

2.4 Data Limitations and Verification

The following limitations apply to this data:

- Meteorological conditions on site can affect measurements made by monitoring devices. For instance, dust measurements can be impacted by rainfall and/or humidity (with water droplets in the air being mistaken as dust particles). Displaying periods of inclement weather allows reviewers to identify measurements that may have been impacted.

Data are provided in tabular and graphical form in Section 3 to visually present 24-hour averages of PM_{10} over the monthly period. The data included in this report have been verified by the Managing Contractor and relevant subject matter expert.

3. Results

Data are provided in graphical form below to visually present 24-hour averages of PM_{10} dust concentration over the monthly period for each active construction site. Where results exceed the ambient air quality objectives as presented in Table 2 due to works occurring on the construction sites, they are identified below as "Exceedances" and an analysis is presented for discussion.

3.1. Box Hill

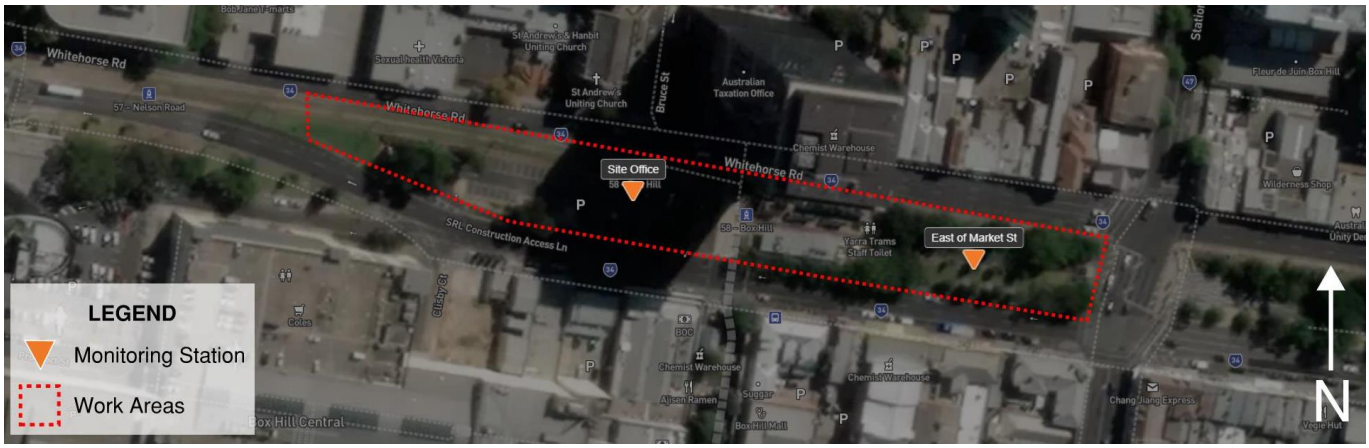

Figure 1: Box Hill air quality monitoring stations.

3.1.1. Results

Table 4: Box Hill PM_{10} results.

Monitor Number	Monitoring Location	Max Daily PM_{10} Concentration (µg/m^3)	EPA Air Quality Objective (µg/m^3)	Total exceedances in period	Exceedances due to Project Activities*
-	Representative Background	31.6	50	N/A	N/A
1	Site Office	214.6	50	6	5
2	East of Market St	227.9	50	6	5

*Visible dust was not observed to pass the site boundaries

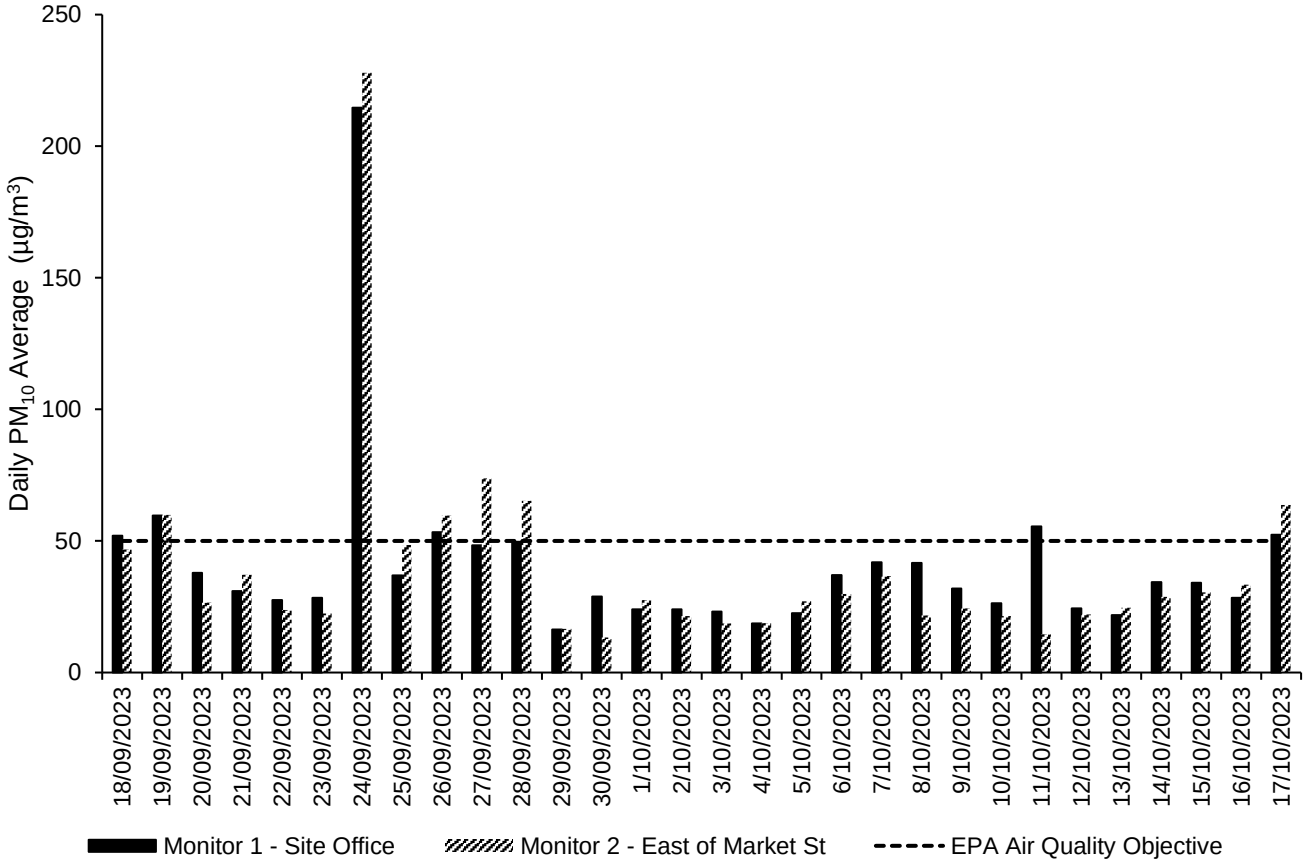

Figure 2: Box Hill PM_{10} daily averages

3.1.2. Analysis

The September – October monitoring period coincided with a period of intense work to move the 109 tram terminus on Whitehorse Road in Box Hill. The air quality SiteHive Hexanode monitoring stations recorded a maximum PM_{10} at Box Hill on 24 September 2023 for Monitor 1 at 214.6 µg/m^3 and Monitor 2 at 227.9 µg/m^3. Fog was observed in the morning between 4:00am and 8:00am, with the relative humidity at 9:00am recorded as 73 per cent (see Figure 3). As detailed in Section 2.4, water droplets in the air from fog can be recorded as particulate matter (dust). As such, the daily average values for 24 September 2023 are not considered to be indicative of poor air quality conditions at the site due to project works, which were 19.9 µg/m^3 at Monitor 1 and 16.2 µg/m^3 at Monitor 2, excluding fog. There was no requirement to implement the TARP. This event is not a construction related exceedance.

The maximum daily average PM_{10} concentrations excluding fog and due to site works were 59.6 µg/m^3 (n = 30)[2] and 73.8 µg/m^3 (n = 30) at the monitoring stations at the Box Hill Site Office (Monitor 1) and east of Market Street (Monitor 2), respectively.

Exceedances of the EPA air quality objective (50 µg/m^3 over a 24-hour period) were recorded for the dates of 18, 19, 26 September, and 11 and 17 of October 2023 for Monitor 1, and on 19, 26, 27, 28 September and 17 October 2023 for Monitor 2. On these days, construction workers were undertaking earthworks such as piling, overhead pole installation, and delivery and movement of fine materials.

Several consecutive hours of PM_{10} measurements above 80 µg/m^3 on 19, 26, 27 September and 17 October met the criteria for a Level 3 response, as defined by the MC's TARP. Due to time-sensitive 24-hour tram terminus relocation works, works were not suspended as required by the TARP measures for Level 3 events, however key areas of the site were swept and dampened using water to reduce dust levels. Dust suppression measures were also instigated where visual monitoring indicated deteriorating air quality conditions. On these dates, wind speeds were monitored and were generally low to moderate (max. 43, 39, 30, 35, 31 km/h gusts). Visible dust was not observed to pass the site boundaries indicating dust impacts were contained to the site. No community complaints were received regarding outdoor air quality related to the dates of exceedance. A water cart and street sweeper were deployed to mitigate dust impacts outside of dust events.

[2] n = the number of days of monitoring data captured in the monitoring period

3.1.3. Meteorological conditions

Table 5: Daily weather observations for Melbourne (Olympic Park), Victoria September 18 – October 17 2023. Data Source BOM.

	Temperature		Daily Rain Total	Maximum Wind Gust		Relative Humidity @ 9:00 AM
	Min (°C)	Max (°C)	mm	Dir	Speed (km/h)	%
Mean	10.3	19.2				66.6
Lowest	5.2	16.4	0	N	48	29
Highest	15.4	29.7	22.8	SSW	50	100
Total			63			

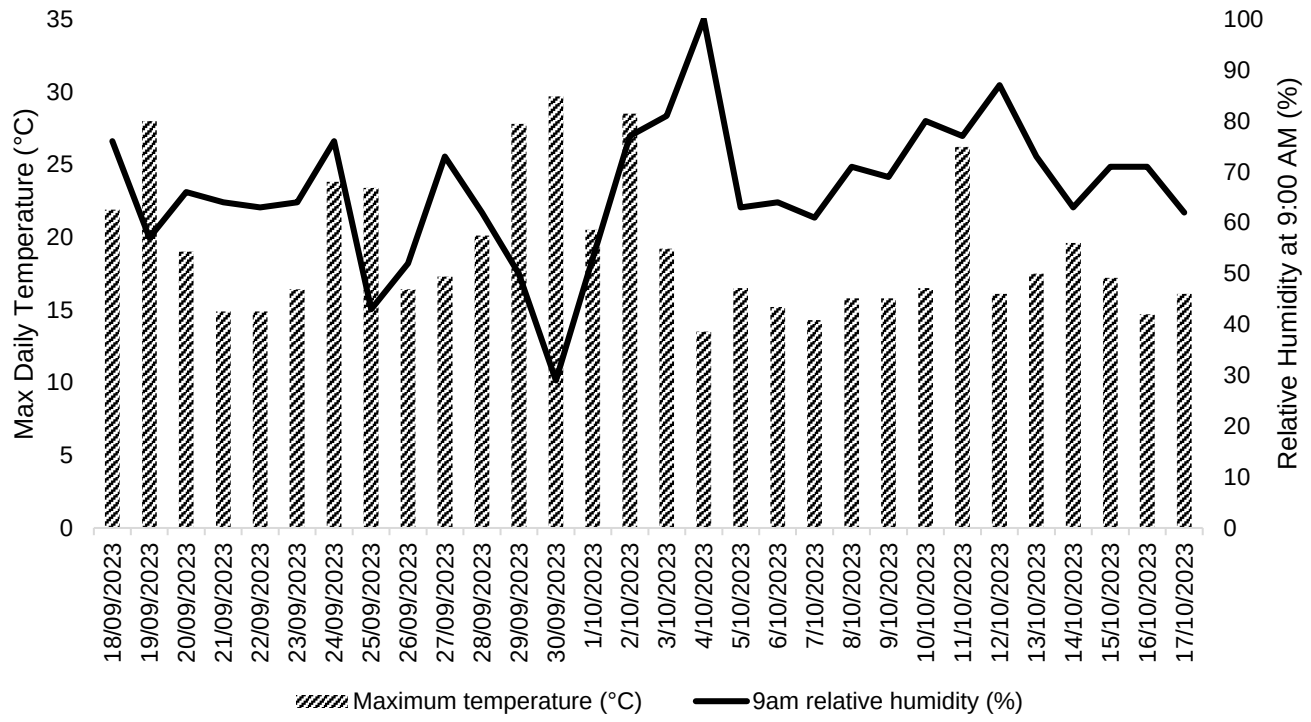

Figure 3: Daily relative humidity and temperature observations for Melbourne (Olympic Park), Victoria September 18 – October 17 2023. Data Source BOM.

3.2. Burwood

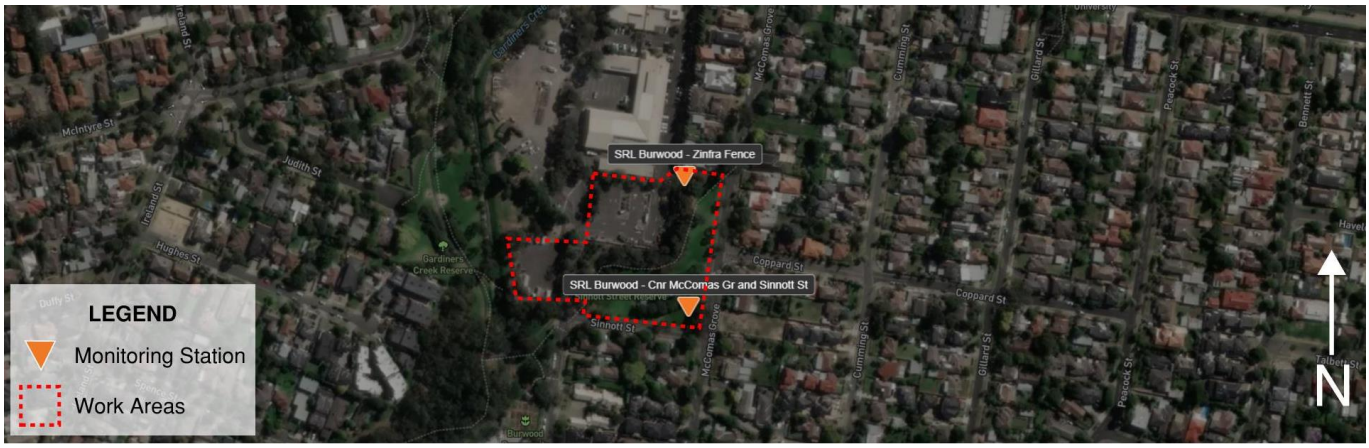

Figure 4: Burwood air quality monitoring stations.

3.2.1. Results

Table 6: Burwood air quality monitor PM10 percentiles

Monitor Number	Monitoring Location	Max Daily PM_{10} Concentration ($\mu g/m^3$)	EPA Air Quality Objective ($\mu g/m^3$)	Total exceedances in period	Exceedances due to Project Activities*
-	Representative Background	31.6	50	N/A	N/A
1	Cnr of McComas Gr and Sinnott St	117.1	50	1	0
2	16 McComas Grove	36.9	50	0	0

*Visible dust was not observed to pass the site boundaries

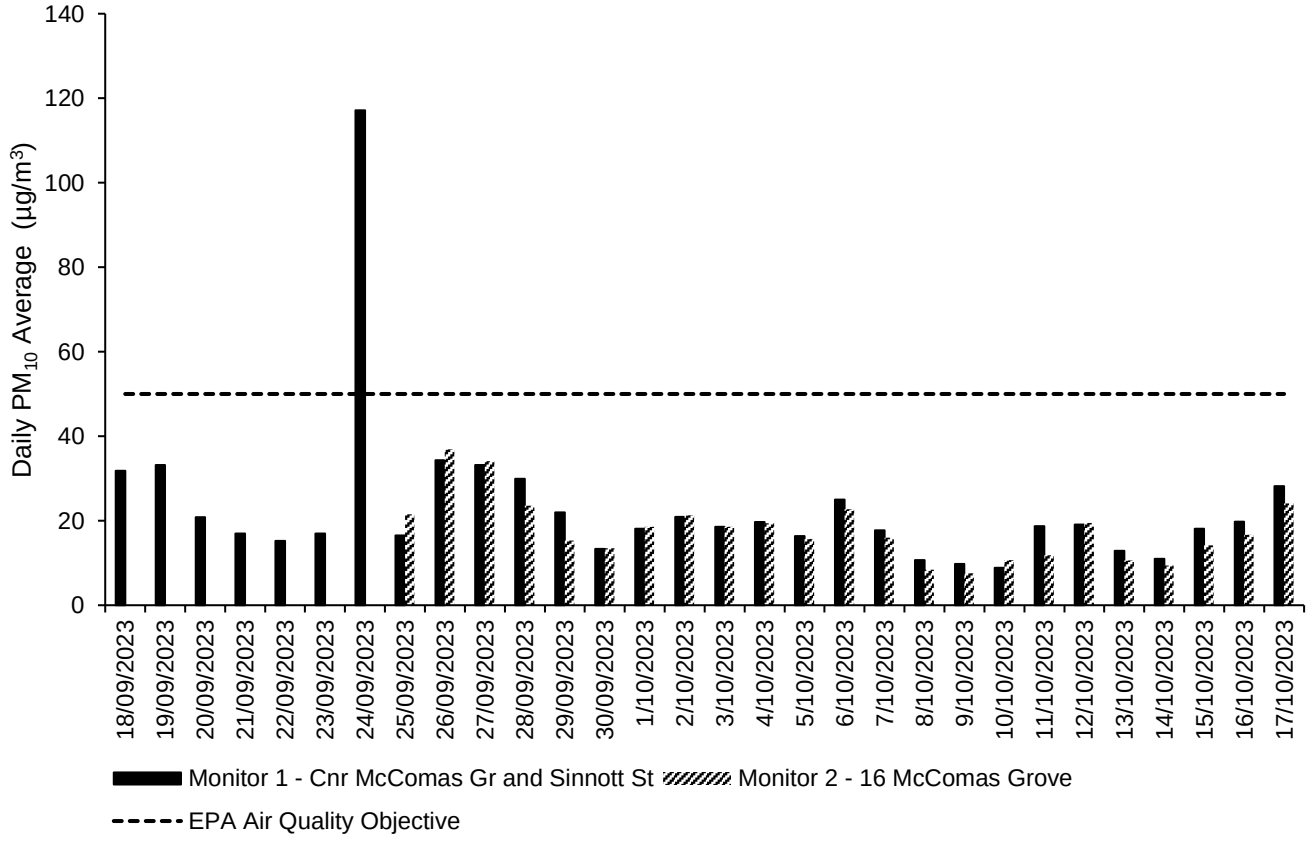

Figure 5: Burwood PM_{10} daily averages

3.2.2. Analysis

During the September – October the monitoring period, the Burwood air quality SiteHive Hexanode monitoring stations recorded maximum daily (24 hr) average PM_{10} concentrations of 117.2 µg/m^3 (n = 30)[3] and 36.9 µg/m^3 (n = 23) at the monitoring stations at the corner of Sinnott Street and McComas Grove, and at the north-eastern corner of the site at 16 McComas Grove, respectively. The results show dust levels didn't exceed the EPA air quality objective.

The maximum PM_{10} measurement of 117.2 µg/m^3 was recorded on 24 September 2023 at Monitor 1. On this day fog was observed between 4:00am and 8:00am, with the relative humidity at 9:00am recorded as 73 per cent (see Figure 3). As detailed in Section 2.4, water droplets in the air from fog can be recorded as particulate matter (dust). As such, the daily average value for 24 September 2023 is not considered to be indicative of air quality conditions at the site due to project works which were 11.2 µg/m^3 excluding fog and there was no requirement to implement the TARP. This event is not a construction-related exceedance.

3.2.3. Meteorological conditions

Background air quality was captured from the Melbourne (Olympic Park) BOM weather station. See Section 3.1.3 for tabulated meteorological data for this reporting period.

4.Quality assurance

4.1. 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 period 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.

Data capture statistics for the reporting period 18 September 2023 to 17 October 2023 are shown in Table 7, below.

Data capture statistics were 100% for all parameters at all stations for the reporting period, with the exception of the following:

- Burwood Monitor 1 (16 McComas Grove) – This monitor was stolen on 21 August 2023. A replacement monitor was installed on 25 September 2023.

Table 7: Air quality monitoring, data capture summary

Location	Parameter	Averaging Period	Collected Periods	Available Periods	Data Capture
Box Hill – Site Office	PM_{10}	24-hours	30	30	100%
Box Hill – East of Market St	PM_{10}	24-hours	30	30	100%
Burwood – 16 McComas Gr	PM_{10}	24-hours	23	30	77%
Burwood – Cnr McComas Gr and Sinnott St	PM_{10}	24-hours	30	30	100%

[3] n = the number of days of monitoring data captured in the monitoring period

4.2. 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.

Table 8: Monitoring device calibration information.

Location	Device Serial Number	Calibration Date	Calibration Due
Box Hill – Site Office (07/07/2023 – 05/10/2023)	HEX-000248	01 Jun 2023	01 Jun 2025
Box Hill – Site Office (06/10/23 – ongoing)	HEX-000407	29 Aug 2023	29 Aug 2025
Box Hill – East of Market St	HEX-000339	19 Apr 2023	19 Apr 2025
Burwood – 16 McComas Grove	HEX-000385	29 Aug 2023	29 Aug 2025
Burwood – Cnr McComas Gr and Sinnott St	HEX-000308	03 Apr 2023	03 Apr 2025