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CLIENT

Growth and Infrastructure
Coordination Unit

PROJECT

Sellicks Beach Growth Area –
Air Quality Assessment

PROJECT

0159.2409

REPORT

Interim Summary of Findings and
Recommendations

04 August 2025

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Glossary

Term	Definition
Units of measurement	
s	second
min	minute
h	hour
d	day
yr	year
µm	micrometre
m	metre
km	kilometre
m ²	square metres
m ³	cubic metres
m/s	metres per second
km/h	kilometres per hour
µg/m ³	microgram per cubic metre
Atm	atmosphere (unit of air pressure)
°C	degrees Celsius
K	Kelvin (unit of temperature)
%	percentage

Scientific abbreviations and chemical nomenclature

TSP	Total Suspended Particle
RCS	Respirable Crystalline Silica
PM ₁₀	Particulate matter with an aerodynamic diameter less than 10 microns
PM _{2.5}	Particulate matter with an aerodynamic diameter less than 2.5 microns
RH	relative humidity
T	temperature

Other abbreviations

AQM	air quality monitor
AQMS	air quality monitoring station
CBD	Central Business District
DHUD	Department for Housing and Urban Development
EPA	Environment Protection Authority
DEM	Department for Energy and Mining
GLC	Ground level concentration
SBGA	Sellicks Beach Growth Area



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Executive Summary

Air Environment conducted a comprehensive six-month ambient air quality monitoring assessment in the Sellicks Beach Growth Area (SBGA) between November 2024 and April 2025 to understand the potential impacts for the area considered for future residential development to inform the Sellick Beach Code Amendment (the Code Amendment). The study focused on particulate matter concentrations (PM_{10} , $PM_{2.5}$, TSP) and respirable crystalline silica (RCS) at three strategically located monitoring sites.

The assessment revealed several exceedances of particulate matter concentrations in the SBGA. Site A experienced the highest number of exceedances of the PM_{10} criterion ($50 \mu\text{g}/\text{m}^3$ for a 24-hour average) with 10 exceedances recorded over the monitoring period, with the highest daily concentration of $78.9 \mu\text{g}/\text{m}^3$ observed at Site A in February 2025. Similarly, $PM_{2.5}$ levels, which generally remained below the GLC criterion ($25 \mu\text{g}/\text{m}^3$ for a 24-hour average), also showed a notable exceedance at Site A in February 2025. However, both of these February 2025 exceedances were attributed to a bushfire smoke event originating from Victoria. In the context of this assessment, this particular exceedance event was classified as an exceptional event i.e. a fire or dust occurrence that adversely affects air quality at a particular location that is directly related to bushfire, jurisdiction authorised hazard reduction burning or continental scale windblown dust that causes an exceedance.

Analysis of wind patterns and particulate concentrations identified southeasterly winds, originating from the direction of Sellicks Hill Quarry, as consistently associated with elevated particulate concentrations at all sites. This correlation suggests that the quarry may be a contributor to particulate matter in the SBGA, particularly during south-easterly wind conditions. However, additional influence from westerly winds suggest multiple sources including potential contributions from the direction of Sellicks Beach. This highlights the complex nature of air quality in the area, with both inland and coastal sources potentially contributing to particulate levels.

Seasonal trends indicated higher particulate concentrations during summer months, likely due to a combination of drier conditions and increased dust generation. Rainfall analysis revealed significantly below-average precipitation in early 2025, which likely contributed to the higher frequency of PM_{10} exceedances observed during the monitoring period.

The report includes a discussion of the WHO Air Quality Guidelines 2021, which provide more stringent standards for particulate matter than current South Australian criteria and national standards.

Respirable Crystalline Silica (RCS) sampling, conducted every sixth day, revealed a mean concentration of $0.86 \mu\text{g}/\text{m}^3$ over the six-month period, which is well below the interim annual criterion of $3 \mu\text{g}/\text{m}^3$. The ongoing sampling program is expected to provide a more comprehensive dataset for assessing long-term RCS exposure in the SBGA.

Based on these findings, Air Environment recommends conducting additional monitoring, including the next summer period (December 2025 - February 2026), to confirm the consistency of observed patterns and provide a larger dataset for more robust statistical analysis. Additionally, the development of a high-resolution wind field model for the SBGA is suggested to simulate PM_{10} transport from identified sources and further investigate the potential source-receptor pathways identified in the observed data.



1 Introduction

Air Environment was commissioned by the Department for Housing and Urban Development (DHUD) to conduct a six-month ambient air quality monitoring assessment in the SBGA from November 2024 to April 2025. This assessment, focusing on airborne particulate matter concentrations (PM₁₀, PM_{2.5}, TSP) and respirable crystalline silica (RCS), aims to evaluate potential impacts on an area being considered for future residential development.

The findings presented in this summary report, including key trends and recommendations for future actions, will inform the Sellicks Beach Code Amendment.

The Sellicks Beach Growth Area air quality assessment is a critical component of the proposed Code Amendment investigation, aimed at ensuring the health and well-being of future residents while the existing industries and businesses can continue operating under the relevant approvals. This assessment is particularly significant given the proximity of the area proposed for the Code Amendment to the Sellicks Hill Quarry and the history of community concerns regarding dust impacts in the region.

The scope of the assessment includes:

- Monitoring program to collect data and assess against relevant air quality criteria
- Correlation of dust monitoring data with wind patterns to identify potential dust sources, such as:
 - Sellicks Hill Quarry
 - Sea salt
 - Other local dust sources
- Comparison of results with other regional monitoring stations (Christies and Adelaide CBD) operated by EPA.

This approach aims to provide a thorough understanding of air quality in the SBGA, considering various factors that may influence particulate matter concentrations.



2 Monitoring Program Design

The air quality monitoring program for the SBGA measures three main categories of particulate matter: nuisance dust/Total Suspended Particles (TSP), PM₁₀ and PM_{2.5}, and Respirable Crystalline Silica (RCS). This section describes the design of this monitoring program including monitoring stations, types of instruments used and their locations relative to the area proposed for the Code Amendment.

2.1 Dust fractions measured

2.1.1 Nuisance dust/TSP

TSP is a size-based classification of particles with an equivalent aerodynamic diameter (EAD) of less than 50 µm, encompassing both large and fine particles. While larger particles with EADs greater than 10 µm are generally trapped in the nose and throat and don't reach the lungs, they can cause irritation, nuisance, and the soiling of surfaces when settled out of the atmosphere. These larger particles are often referred to as “nuisance dust” due to their visible nature and potential to cause annoyance, rather than any direct health effects.

TSP is an important measure in areas like Sellicks Beach, where community concerns about dust from local quarry operations have been raised. Unlike particles in the PM₁₀ and PM_{2.5} size fractions, which have specific health-based criteria, there are no South Australian criteria for nuisance dust measured as TSP. However, TSP measurements are valuable for understanding overall dust levels, potential sources, and seasonal variations in particulate matter concentrations. TSP data alongside PM₁₀ data can provide a comprehensive assessment of dust impacts and sources in the area.

2.1.2 PM₁₀ and PM_{2.5}

Particles are defined by their diameter (EAD) for air quality regulatory purposes. PM₁₀ refers to particulate matter with an aerodynamic diameter of 10 micrometres or less. These particles are small enough to be inhaled into the lungs and can cause or exacerbate respiratory issues. PM_{2.5}, consisting of even finer particles with an aerodynamic diameter of 2.5 micrometres or less, poses an even greater health risk as these particles can penetrate deep into the lungs and even enter the bloodstream.

PM₁₀ and PM_{2.5} often derive from different emission sources and have different chemical compositions. Emissions from combustion of solid or liquid fuel produce much of the PM_{2.5} particles found in outdoor air, as well as a significant proportion of PM₁₀. PM₁₀ also includes dust from construction sites, industrial sources, wind-blown dust from exposed land, pollen and fragments of bacteria.

In the SBGA, monitoring PM₁₀ levels is important for assessing the impact of local dust sources, especially given the area's susceptibility to dust generation during dry periods and the influence of wind patterns on particulate dispersion. Monitoring PM_{2.5} concentrations is equally important for understanding both local pollution sources and the influence of regional events, such as bushfire smoke.

2.1.3 Respirable Crystalline Silica (RCS)

RCS is a specific type of particulate matter that poses significant health risks, particularly in areas with quarrying activities like the Sellicks Hill Quarry near the SBGA. These extremely fine particles, typically less than 10 micrometers in diameter (PM₁₀ RCS), can penetrate deep into the lungs when inhaled, potentially leading to severe respiratory diseases such as silicosis and lung cancer after prolonged exposure.



2.2 Monitoring site configuration

Three monitoring sites were established on 1 November 2024 to assess ambient ground-level concentrations of TSP, PM₁₀, PM_{2.5}, and RCS PM₁₀, as well as key meteorological parameters. The locations of the SBGA monitoring stations are illustrated in Figure 2-1.



Figure 2-1 Location of air quality monitoring stations in Sellicks Beach Growth Area



Details of the SBGA monitoring stations are presented in Table 2-1.

Table 2-1 Monitoring sites and parameters measured

AQMS	Pollutants	Meteorology	Instruments/monitors used
Site A	PM ₁₀ , PM _{2.5} , TSP, RCS*	- Wind speed and direction (at 10 m above the ground), - Ambient temperature (at 10 m above the ground), - Ambient air pressure, - Relative humidity (at 2 m above the ground), - Wet bulb temperature, - Rainfall (at <2 m above the ground)	- PM Mass Monitor - T640, - Australian Standard Weather Station (ASNZ3580.14(2014), - FH 62 C14 continuous particulate monitor, - HiVol 3000 High volume air sampler
Site 2	PM ₁₀ , PM _{2.5} , TSP	None	- QAMS Dust Master Pro 7000 real-time particulate monitor, - BGI PQ200 ambient air particulate sampler
Site 3	PM ₁₀ , PM _{2.5} , TSP	None	- QAMS Dust Master Pro 7000 real-time particulate monitor, - BGI PQ200 ambient air particulate sampler

Situated approximately 330 metres from Sellicks Hill Quarry's tenement boundary and approximately 280 metres outside the boundary of the Sellicks Beach Growth Area (SBGA), Site A occupies a strategic position for air quality assessment. Its location in the prevailing wind direction of the area makes it particularly well-suited for evaluating air quality conditions relevant to the SBGA. This positioning allows Site A to capture potential emissions from the quarry given its proximity and therefore capturing the worst case conditions for assessing the air quality impacts on future residential developments within the SBGA.

The locations were selected to provide representative coverage of the SBGA, considering proximity to potential sources (such as Sellicks Hill Quarry) and sensitive receptors. Site A was positioned centrally to capture worst case air quality trends, while Sites 2 and 3 were placed to assess spatial variations across the area. Sites 2 and 3 are located inside the SBGA boundary by 160 and 90 metres respectively.

In air quality monitoring, a correction factor (known as a k-factor) is often used to adjust measurements from continuous optical particle monitors to align them with reference gravimetric methods. It is derived through linear regression analysis comparing data from optical instruments (like the QAMS Dust Master Pro) with filter-based gravimetric samplers (such as the BGI PQ200). The k-factor accounts for differences in measurement techniques, helping to ensure consistency across different monitoring methods.

The PM₁₀ concentrations at sites 2 and 3 were measured using DMP7000 real-time optical-technique particulate monitors. To obtain reference measurements, filter-based gravimetric analyses for PM₁₀ were conducted at a 1-in-6-day sampling frequency.

This monitoring station setup is designed to provide a comprehensive understanding of particulate matter concentrations and dust impacts in the SBGA. The combination of continuous real-time monitoring and



filter-based sampling methods allows the development of a correction factor for PM₁₀ data measured by optical instruments.

The selected monitoring approach and methodologies aligned with EPA regulatory requirements. DHUD established an inter-agency working group with representatives from EPA, DEM, and SA Health, which received monthly monitoring data updates to ensure multi-disciplinary expertise informed the air quality evaluation for the SBGA.

2.3 Data availability requirements

The EPA typically requires a minimum data capture rate of 75% for air quality monitoring. The rate of data capture for the SBGA air quality monitoring network between November 2024 and April 2025 is summarised in Table 2-2. These high data capture rates ensured the reliability and representativeness of the air quality assessment presented in this report.

Table 2-2 AQMS data availability between 1 November 2024 and 30 April 2025

AQMS	24-hour average data capture rate (%)		
	TSP	PM ₁₀	PM _{2.5}
Site A	99.4	100	100
Site 2	100	100	100
Site 3	96.1	96.1	96.1



3 Legislation and Relevant Air Quality Guidelines

3.1 Air quality criteria in South Australia

The air quality assessment for the SBGA was conducted in accordance with the Environment Protection (Air Quality) Policy 2016 (Air EPP), which is part of the Environment Protection Act 1993 in South Australia. This policy sets out the ground-level concentration (GLC) criteria for various air pollutants, including PM₁₀ and PM_{2.5}. The assessment criteria used were:

- PM₁₀: 24-hour average of 50 µg/m³
- PM_{2.5}: 24-hour average of 25 µg/m³ and annual average of 8 µg/m³
- RCS: Annual average of 3 µg/m³ (interim criterion).

3.2 Ambient Air Quality NEPM

The Ambient Air Quality National Environment Protection Measure (AAQ NEPM) sets national standards for six key air pollutants in Australia, including particulate matter PM₁₀ and PM_{2.5}. These standards are designed to protect human health and well-being.

- For PM₁₀:
 - 24-hour average of 50 µg/m³
 - There is no allowable number of exceedances per year (except for exceptional events¹)
 - The annual average standard is 25 µg/m³
- For PM_{2.5}:
 - 24-hour average of 25 µg/m³
 - There is no allowable number of exceedances per year (except for exceptional events)
 - The annual average standard is 8 µg/m³.

These standards were last updated in 2021, reflecting the most recent scientific evidence on the health impacts of particulate matter. It is important to note that while these are national standards, state and territory governments are responsible for implementing measures to meet these standards in their jurisdictions.

South Australia's air quality standards align with the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM), with one notable exception: the state's Environment Protection Policy (Air Quality) does not establish a numerical threshold for annual average PM₁₀ concentration. In circumstances where South Australia's Air EPP lacks specific criteria, reference is made to the AAQ NEPM standards or air quality criteria from other Australian jurisdictions.

3.3 WHO Air Quality Guidelines 2021

The World Health Organisation (WHO) released updated Air Quality Guidelines in 2021, setting more stringent standards for particulate matter.

24-hour average guidelines:

- PM₁₀: 45 µg/m³ (allowable exceedances: three to four exceedance days per year)
- PM_{2.5}: 15 µg/m³ (allowable exceedances: three to four exceedance days per year)

¹ Means a fire or dust occurrence that adversely affects air quality at a particular location that is directly related to bushfire, jurisdiction authorised hazard reduction burning or continental scale windblown dust that causes an exceedance.



Annual average guidelines:

- PM₁₀: 15 µg/m³
- PM_{2.5}: 5 µg/m³.

WHO emphasises that its air quality guidelines are not legally binding standards, but rather recommendations to help reduce the health impacts of air pollution. WHO acknowledges that governments should consider their unique local conditions when deciding how to apply these guidelines.

In Australia, while WHO guidelines are taken into account during air quality standard-setting processes, they are not adopted verbatim. The development of Australian air quality standards involves input from various stakeholders, including state and territory governments, as well as consideration of multiple factors and data sources. This approach has resulted in the Australian Ambient Air Quality National Environment Protection Measure (AAQ NEPM) standards and, therefore, South Australian criteria differ from the WHO guidelines in both magnitude and form.

The Australian approach recognises the need to balance health protection with practical implementation, taking into account local environmental, social, and economic factors. This process ensures that air quality standards are tailored to the Australian context while still striving to minimise adverse health effects from air pollution.



4 Monitoring Results

4.1 PM₁₀ concentrations

The variability of 24-hour average PM₁₀ concentrations during the six month monitoring period from November 2024 to April 2025 is illustrated graphically as a time series chart in Figure 4-1.

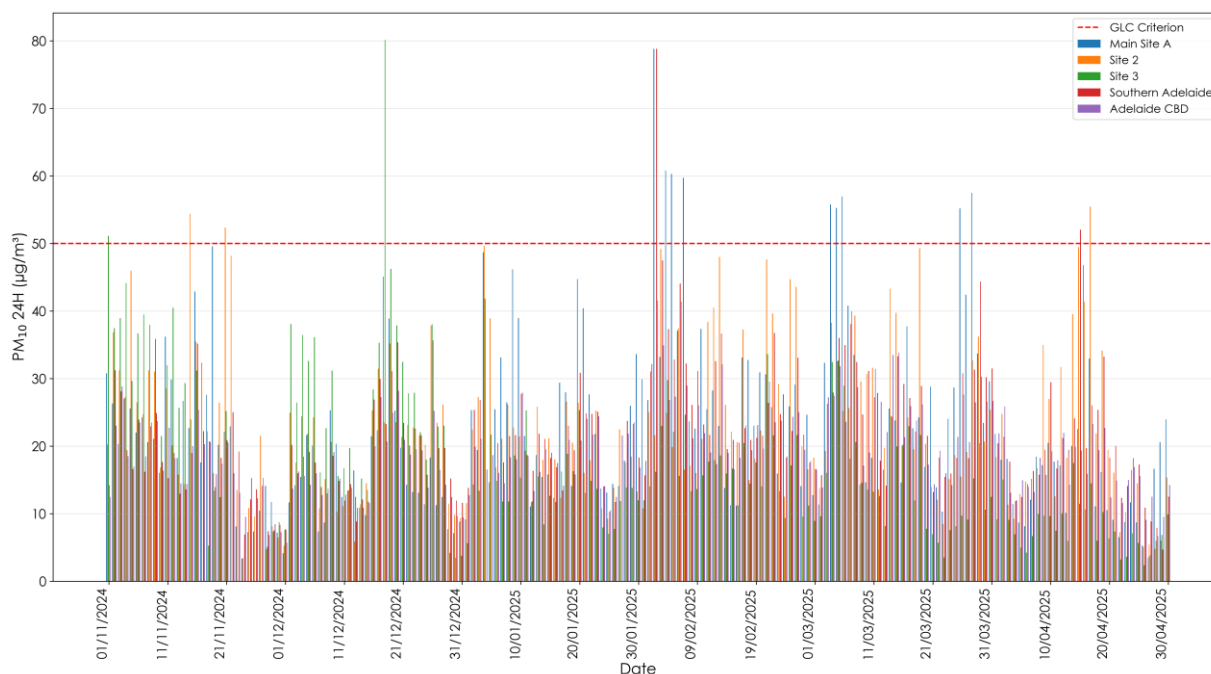


Figure 4-1 Time series chart for 24-hour average PM₁₀ (November 2024 to April 2025)

In summary, the monitoring study determined the following results:

- Site A:
 - Total exceedances: 10
 - Breakdown: 1 in November, 4 in February, 5 in March
 - Highest 24-hour average: 78.9 µg/m³ (February 2025)
 - Monthly averages ranged from 15.7 µg/m³ (April) to 30.9 µg/m³ (February)
- Site 2:
 - Total exceedances: 3
 - Breakdown: 1 in November (52.7 µg/m³), 1 in March (50.1 µg/m³), 1 in April (55.4 µg/m³)
 - Highest 24-hour average: 55.4 µg/m³ (April 2025)
 - Monthly averages ranged from 19.3 µg/m³ (December) to 28.1 µg/m³ (February)
- Site 3:
 - Total exceedances: 2
 - Breakdown: 1 in November (51.1 µg/m³) and 1 in December (80.1 µg/m³)
 - Highest 24-hour average: 80.1 µg/m³ (December 2024)
 - Monthly averages ranged from 8.0 µg/m³ (April) to 18.4 µg/m³ (November)



- Six-month average for PM₁₀ (November 2024 to April 2025) tracked in compliance with NEPM PM₁₀ standard of 25 µg/m³
 - PM₁₀ at Site A: 22.8 µg/m³
 - PM₁₀ at Site 2: 22.9 µg/m³
 - PM₁₀ at Site 3: 17.7 µg/m³.

The 24-hour PM₁₀ GLC criterion of 50 µg/m³ was exceeded multiple times across all sites with the most exceedances occurring at Site A. This pattern suggests that Site A may be more directly impacted by local emission sources or may be situated in an area where particulate matter tends to accumulate due to topographical or meteorological factors. The variation in exceedances across the three sites also indicates that air quality issues in the SBGA are not uniformly distributed, highlighting the need to better understand the dust dispersion pattern in the area.

The PM₁₀ concentrations at site 2 and site 3 were measured using DMP7000 instruments, which employs an optical measurement technique. To obtain reference measurements, filter-based gravimetric analyses for PM₁₀ were conducted at a 1-in-6-day sampling frequency.

The gravimetric results were used to calibrate and correct the continuous monitoring data at sites 2 and 3. Linear regression analyses were performed to estimate and correct the PM₁₀ concentrations at these sites based on the reference measurements obtained from the PQ200. The linear regression analyses used to determine the k-factor corrections for sites 2 and 3 are presented in Figure 4-2 and Figure 4-3 respectively.

The linear regression analysis for site 2 (Figure 4-2) showed a better correlation with a correlation coefficient of 0.8 and a k-factor of 0.61. For site 3, the analysis indicated a k-factor correction value of 1.48 and a correlation coefficient of 0.62. The regression analyses revealed that DMP7000 instrument measurements at site 2 were consistently higher than PQ200 measurements, while the opposite was true for site 3.

During the monitoring period, data availability from the PQ200 at site 2 was comparatively lower than at site 3. The k-factor analysis for PM₁₀ measurements at Sites 2 and 3 has yielded some unexpected results that warrant further investigation. Typically, we expect k-factors to be above 1, as optical instruments like the QAMS Dust Master Pro (DMP) generally tend to underestimate PM₁₀ concentrations (coarser particles) compared to reference gravimetric methods. However, for Site 2, we obtained a k-factor of 0.61, which is contrary to this expectation.

Consequently, the correction factor was only applied to site 3. The corrected PM₁₀ concentration data presented in this report for site 3 is adjusted using the k-factor correction. Further data collection and investigation is required for the development of a k-factor at Site 2. The monitoring program has been extended for a further 12-month period. Consequently, at the conclusion of the 18-month monitoring program (from November 2024 to April 2026), the final k-factor relationships for Sites 2 and 3 will be calculated.

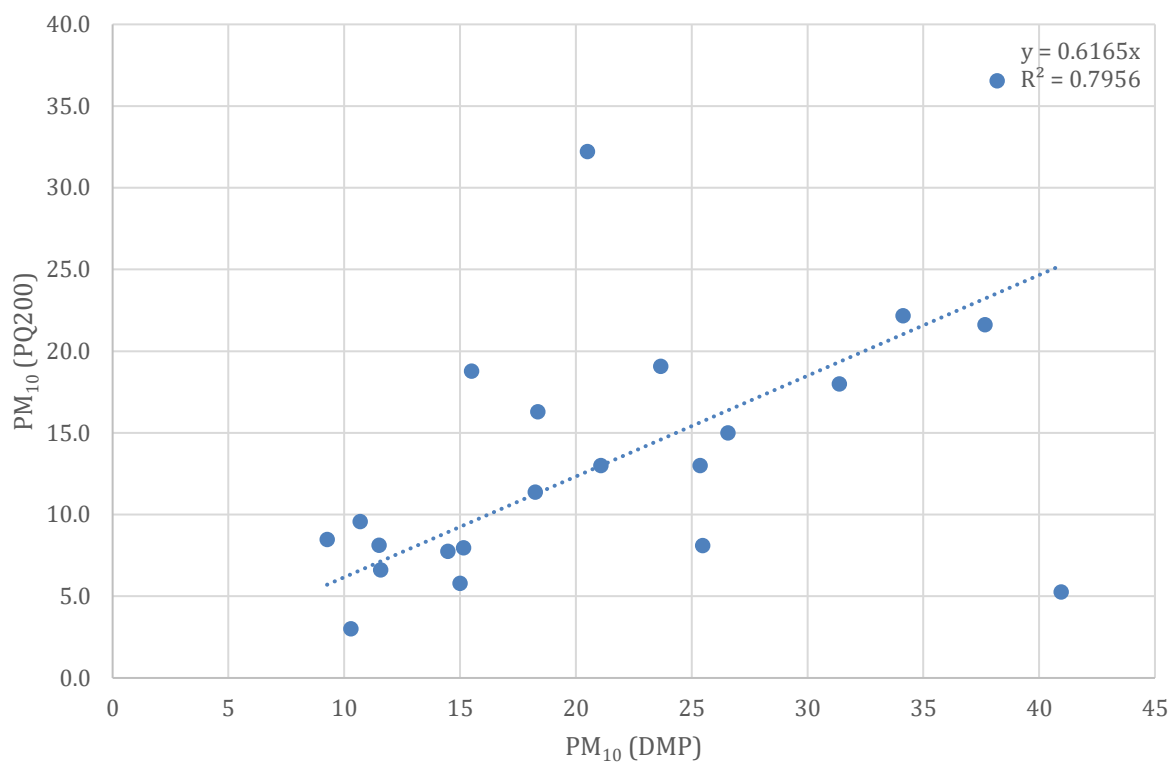


Figure 4-2 Linear regression for DMP7000 vs PQ200 measured PM₁₀ concentrations at site 2

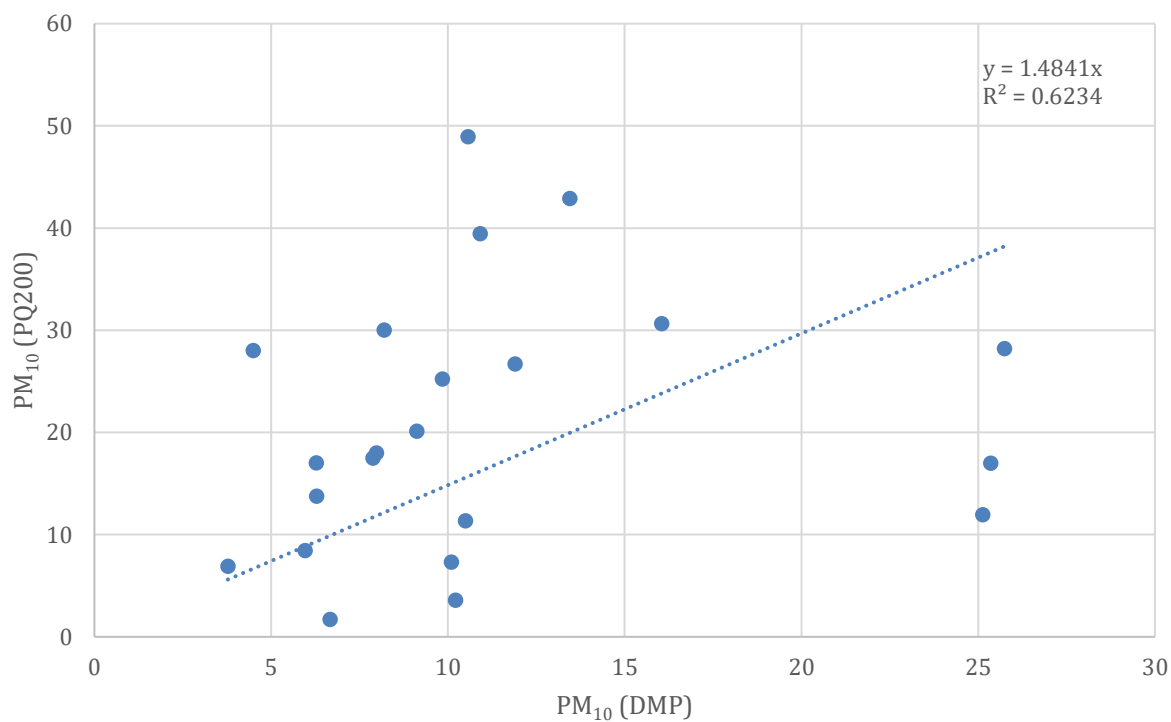


Figure 4-3 Linear regression for DMP7000 vs PQ200 measured PM₁₀ concentrations at site 3



4.2 PM_{2.5} concentrations

The variability of 24-hour average PM_{2.5} concentrations during the six month monitoring period from November 2024 to April 2025 is illustrated graphically as a time series chart in Figure 4-4.

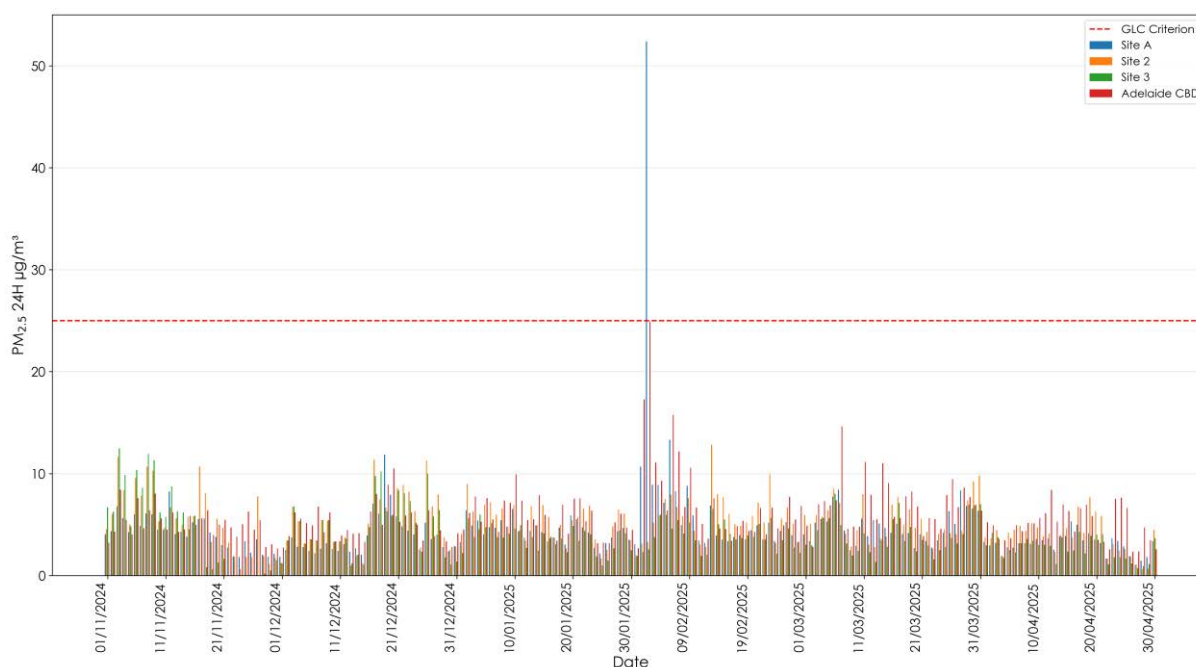


Figure 4-4 Time series chart for 24-hour average PM_{2.5} (November 2024 to April 2025)

In summary, the monitoring study determined the following results:

1. Site A:
 - Total exceedances: 1
 - Highest 24-hour average: 52.8 µg/m³ (February 2025)
 - Monthly averages ranged from 3.1 µg/m³ (April) to 7.2 µg/m³ (February)
- Site 2 and Site 3:
 - No exceedances recorded
 - Highest 24-hour averages: 12.7 µg/m³ (Site 2, February 2025) and 12.5 µg/m³ (Site 3, November 2024).
- Six-month average for PM_{2.5} (November 2024 to April 2025) tracked in compliance with NEPM PM_{2.5} standard of 8 µg/m³
 - PM₁₀ at Site A: 4.6 µg/m³
 - PM₁₀ at Site 2: 5.1 µg/m³
 - PM₁₀ at Site 3: 4.0 µg/m³.

PM_{2.5} levels generally remained below the 24-hour GLC criterion of 25 µg/m³, with one significant exceedance at Site A in February 2025, attributed to bushfire smoke from Victoria. This event likely qualifies as an exceptional event.



4.3 Total Suspended Particles (TSP)

The variability of 24-hour average TSP concentrations during the six month monitoring period from November 2024 to April 2025 is illustrated graphically as a time series chart in Figure 4-5.

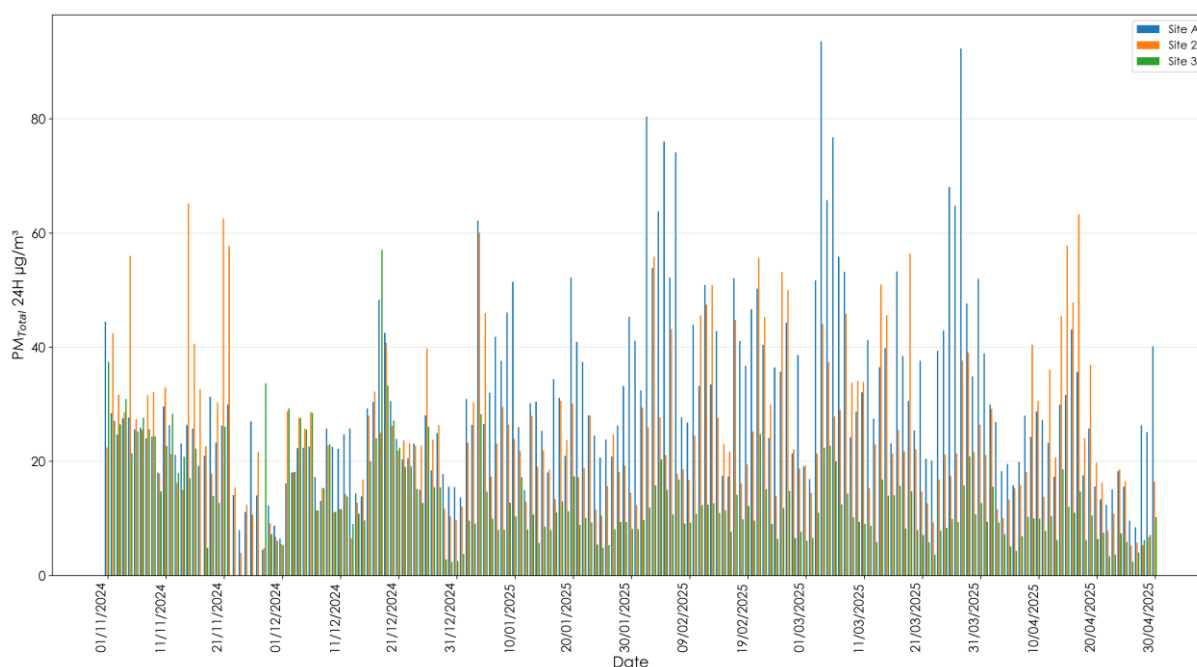


Figure 4-5 Time series chart for 24-hour average TSP (November 2024 to April 2025)

While no specific GLC criteria exist for TSP in South Australia, the peak values registered were consistent with those recorded for PM₁₀.

- Site A: Peak 24-hour average of 93.5 µg/m³ (February 2025)
- Site 2: Peak 24-hour average of 91.8 µg/m³ (February 2025)
- Site 3: Peak 24-hour average of 76.0 µg/m³ (November 2024).

The high TSP levels, particularly at Site A, indicate a significant presence of larger particles in the area. While these particles may not pose the same health risks as finer particulate matter, they can contribute to nuisance dust issues and reduced visibility. The variation in TSP levels across the three sites suggests that local sources and topography play a significant role in the distribution of larger particles in the SBGA.

TSP mean values for six months (Nov 2024 to April 2025) have tracked much lower when compared to annual average criteria of 90 µg/m³ used in other states such as Queensland² or NSW³:

- Site A: 31.0 µg/m³
- Site 2: 25.4 µg/m³
- Site 3: 13.3 µg/m³.

² The Environmental Protection (Air) Policy 2019 in Queensland sets out air quality objectives for the state, including those related to TSP. The policy sets an annual average objective for TSP of 90 µg/m³.

³ In NSW, the Approved Methods for the Modelling and Assessment of Air Pollutants sets the annual criterion for TSP matter at 90 µg/m³.



4.4 Respirable Crystalline Silica

Respirable Crystalline Silica (RCS) analysis was conducted during the six month monitoring period from November 2024 to April 2025. Filters were collected from a High Volume (HiVol) sampler equipped with a PM₁₀ inlet at a frequency of once every 6 days. These filters were subsequently analysed for RCS content by a NATA accredited laboratory.

The variability of RCS data collected during the six-month air quality monitoring period was investigated through a time series analysis presented in Figure 4-4.

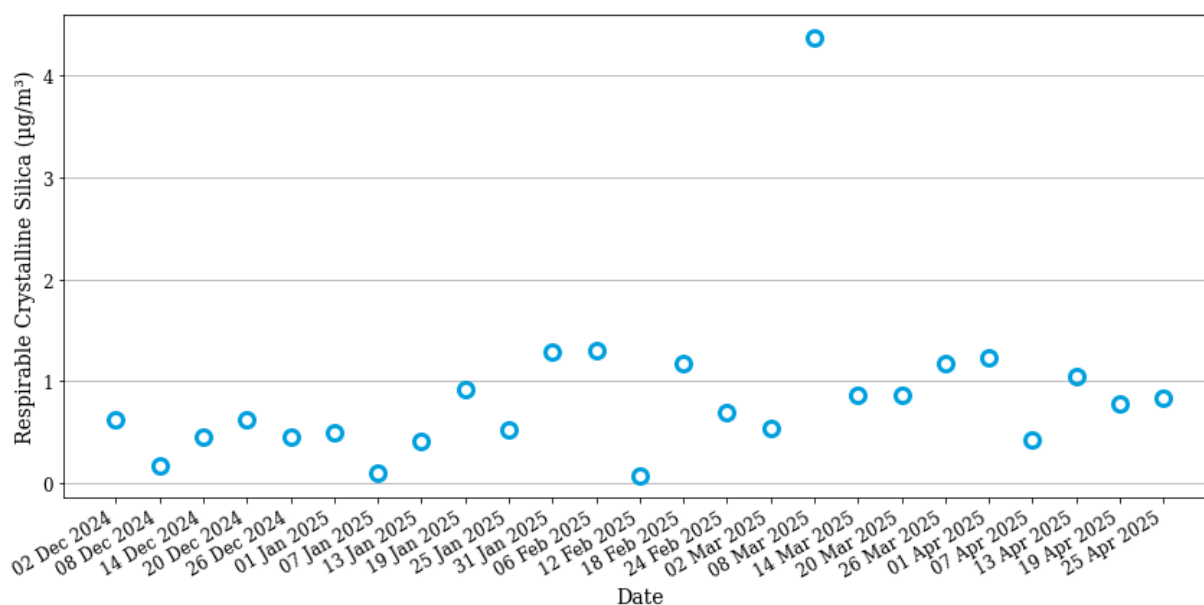


Figure 4-6 Time series of RCS during the air quality monitoring period based on the filter samples

Figure note: Interim air quality criteria for RCS: 3 µg/m³ (annual average).

- The RCS monitoring program has revealed a mean concentration of 0.86 µg/m³ over the initial six-month period, which has tracked well below the interim annual criterion of 3 µg/m³.
- A notable RCS value of 4.38 µg/m³ was recorded on 8 March 2025, significantly higher than the mean concentration of 0.86 µg/m³. While the 24-hour average PM₁₀ concentration on this day remained below the 50 µg/m³ criterion, it is important to note that this single data point, based on a 24-hour average, cannot be directly compared to the interim annual average criterion of 3 µg/m³ for RCS.
- Further, the sample from 8 March 2025 was reanalysed by an analytical laboratory to confirm no laboratory error in the original measurement.
- Importantly, the sampling program is ongoing, with additional results expected to provide a more comprehensive dataset.

4.5 Wind direction influence and source attribution

The wind distribution observed at Site A during the six-month air quality monitoring period (November 2024 to April 2025) is presented as a wind rose diagram in Figure 4-7. Analysis of this data reveals that higher wind speeds (>6 m/s) predominantly originate from the southeast and westerly directions. Winds from other cardinal directions are less significant compared to the southeast and westerly winds at the site.

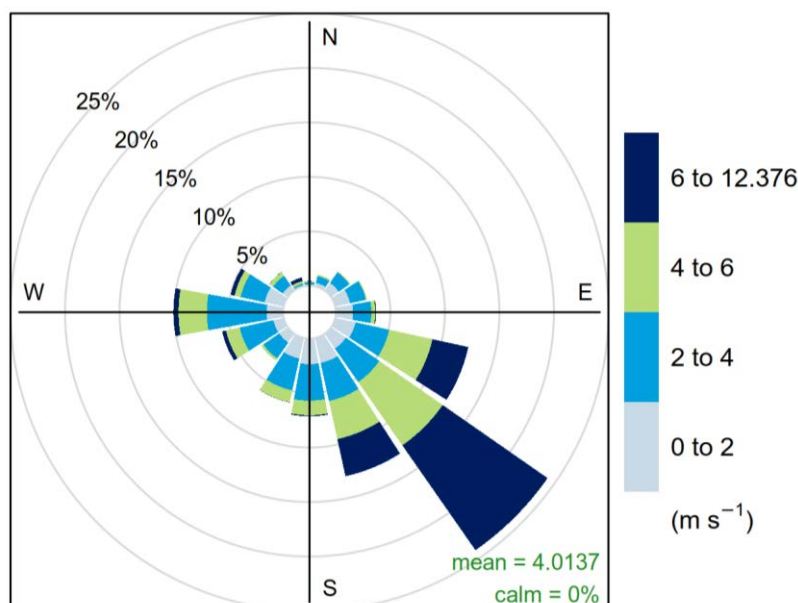


Figure 4-7 Wind rose analysis of Site A during six months (November 2024 to April 2025) of air quality monitoring period.

In the context of air quality monitoring and analysis for the SBGA, it is important to clearly state and understand the assumptions made regarding wind data representation across the monitoring sites. The report assumes that the winds recorded at Site A are representative of the wind conditions influencing particulate concentrations and transport at all three monitoring sites (Site A, Site 2, and Site 3).

This assumption is based on the central location of Site A near the SBGA and its instrumentation, which includes an Australian Standard Weather Station that measures wind speed and direction at 10 metres above ground level. While this assumption allows for a consistent interpretation of wind-related effects across the study area, it is important to acknowledge its potential limitation.

The directional analysis of PM₁₀ source contributions at Site A, Site 2 and Site 3 for the six months of monitoring (November 2024 to April 2025) was conducted using polar plots. These plots, presented in Figure 4-8, combine observed wind speed and direction with PM₁₀ concentrations to assess particle concentrations under different wind conditions.

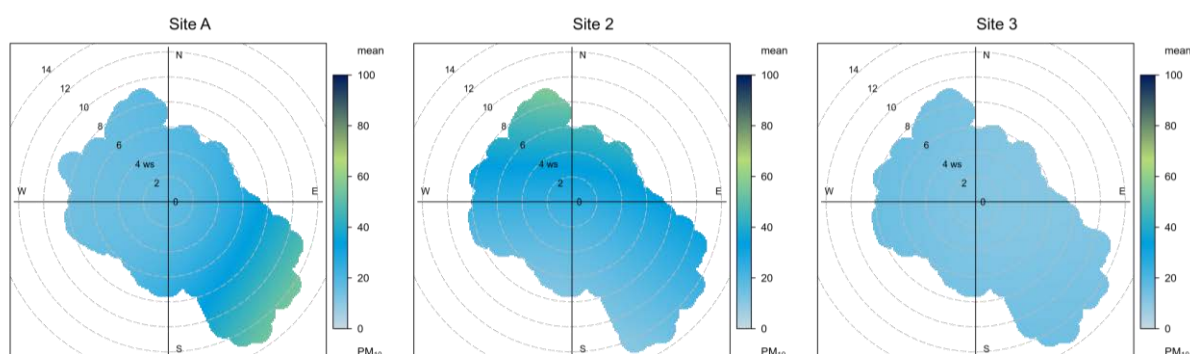


Figure 4-8 Polar plot analyses of cumulative PM₁₀ at Site A, Site 2 and Site 3 during six months (November 2024 to April 2025) monitoring.



Cumulative polar plots of the six-month air quality monitoring period (Figure 4-8) provides a better understanding of the elevated PM₁₀ levels and the associated winds at each of the three sites. Site A is mainly dominated by the higher PM₁₀ concentration associated with southeasterly winds, whereas site 2 is associated with increased PM₁₀ due to the northwesterly winds. In contrast, site 3 showed relatively low PM₁₀ values (<20 µg/m³) during the monitoring period.

To better understand PM₁₀ concentrations in relation to wind speed and direction at each monitoring site, pollution rose analyses were conducted. It is important to note that polar plots do not typically display arithmetic means of the data, but rather present smoothed data based on wind speed and direction.

The pollution rose analyses of hourly averaged PM₁₀ concentrations at Site A for November 2024 to April 2025 are presented in Figure 4-9. Cumulative pollution rose analyses of the monitoring period clearly indicated the significant contribution (25%) of southeasterly winds associated with elevated PM₁₀ concentration and relatively less contribution from westerly winds associated with lower PM₁₀ levels at Site A (Figure 4-9).

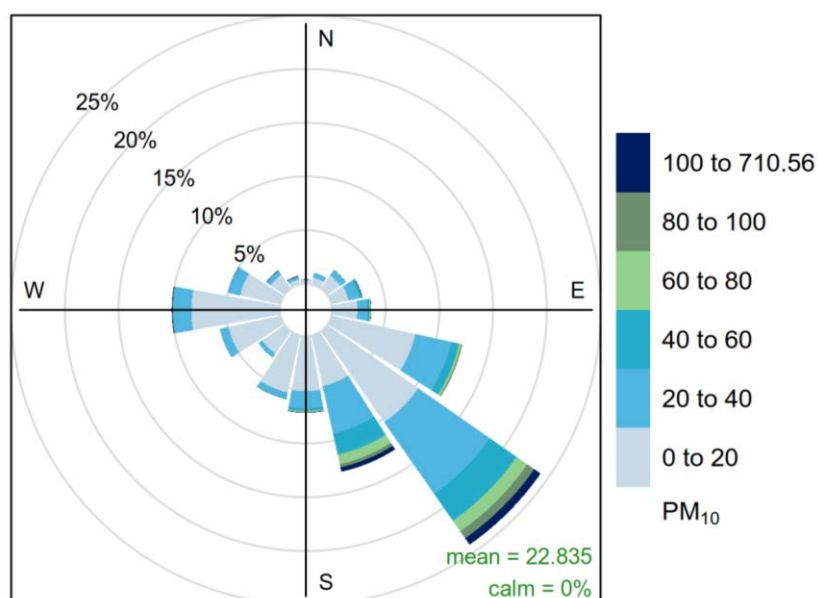


Figure 4-9 Pollution rose analyses of the hourly averaged PM₁₀ at Site A between November 2024 and April 2025

The analysis of wind patterns and particulate concentrations revealed:

- Southeasterly winds, originating from the direction of Sellicks Hill Quarry, were consistently associated with elevated particulate concentrations at all sites. This strong correlation suggests that the quarry may be a significant contributor to particulate matter in the SBGA, particularly during southeasterly wind conditions.
- Site 2 showed additional influence from westerly winds, suggesting multiple sources including potential sea salt contributions from Sellicks Beach. This highlights the complex nature of air quality in the area, with both inland and coastal sources potentially contributing to particulate levels.
- One PM₁₀ exceedance in March 2025 coincided with known quarry blast events. This temporal correlation provides further evidence of the quarry's impact on local air quality and suggests that specific operational activities at the quarry may have disproportionate effects on particulate levels.



- The Sellicks Hill Quarry was identified as a likely major contributor to elevated particulate levels, especially during southeasterly wind conditions. While other sources are likely present, the consistent association between wind direction and particulate levels points to the quarry as a primary concern for air quality management in the SBGA.

4.6 Seasonal trends and rainfall analysis

Particulate matter concentrations tended to be higher during summer months (December-February). This seasonal pattern is likely due to a combination of factors including drier conditions, increased dust generation, and potentially higher activity levels at local emission sources.

Rainfall data analysis (based on BoM statistics for Adelaide Airport):

- Historical annual mean rainfall (1955-2025): 437.2 mm
- 2025 rainfall (January-April): Significantly below average
 - January: 4.4 mm (76% below average)
 - February: 0.8 mm (96% below average)
 - March: 3.6 mm (83% below average)
 - April: 5.0 mm (85% below average)
- Total rainfall for January-April 2025: 13.8 mm (85% below the long-term average of 90.8 mm).

The extremely low rainfall in early 2025 likely contributed to drier soil conditions and increased potential for dust generation, explaining the higher frequency of PM₁₀ exceedances observed during the monitoring period, especially at Site A.

4.7 Comparison with regional EPA monitoring stations

1. Adelaide CBD:

- PM₁₀: No exceedances; highest 24-hour average of 41.5 µg/m³ (February 2025)

2. Southern Adelaide (Christies):

- PM₁₀: Two exceedances; highest 24-hour average of 78.8 µg/m³ (February 2025).

The SBGA monitoring sites generally showed higher particulate concentrations and more frequent exceedances compared to the regional EPA stations, indicating localised air quality issues.



5 Summary of Findings and Recommendations

Ambient air particulate monitoring of PM₁₀, PM_{2.5}, TSP and PM₁₀ RCS, conducted in the SBGA from November 2024 to April 2025, revealed multiple exceedances of the 24-hour average PM₁₀ GLC criterion of 50 µg/m³ across all monitoring sites. Site A experienced the most exceedances of the criteria out of the three sites. PM_{2.5} levels generally remained below the 24-hour GLC criterion of 25 µg/m³, with one significant exceedance at Site A in February 2025 attributed to bushfire smoke from Victoria.

Analysis of wind patterns and particulate concentrations identified southeasterly winds, originating from the direction of Sellicks Hill Quarry, as consistently associated with elevated particulate concentrations. The monitoring data revealed that westerly winds also played a role in particulate matter distribution, particularly at Site 2. These westerly winds potentially carried sea salt and other coastal particulates from the direction of Sellicks Beach, contributing to the complex air quality profile of the area.

Rainfall analysis revealed significantly below average precipitation in early 2025, which likely contributed to the higher frequency of PM₁₀ exceedances observed during the monitoring period.

The following recommendations are proposed to address the identified air quality issues and inform future decision-making processes:

1. Further Monitoring: Conduct additional monitoring including the next summer period (December 2025 - February 2026) to:
 - a. Confirm if the observed patterns are consistent year-to-year.
 - b. Provide a larger dataset for more robust statistical analysis.
 - c. Capture any potential changes in local emission sources or meteorological conditions.
2. Wind Condition Modelling: Develop a high-resolution wind field model for the SBGA, incorporating local topography and land use. Integrate this with a dispersion model to simulate PM₁₀ transport from identified sources and validate using the collected monitoring data.