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ANNUAL DUST MANAGEMENT REPORT FOR BIRKENHEAD WORKS

2021 Annual Report and TARP Review

Compliance date: 14/02/2022

EPA Licence 1126: Dust Management Plan (U-755)

Licensed site: **Adelaide Brighton Cement, Birkenhead Works**

62 Elder Road, Birkenhead, SA 5015

Date of Submission: **14 February 2022**

Version Number: **1**

Report Submitted by: Advisor Environment - C&L (SA/NSW/NT)

I certify that I have reviewed this report and to the best of my knowledge and ability that all the information provided in this report is a true and accurate reflection of the regulatory monitoring.

Glossary

Term	Definition
µg/m^3	micrograms per cubic metre
mg/m^3	milligrams per cubic metre
µm	micrometre
°C	degrees Celsius
m	metre
m^3	cubic metre
m^3/s	cubic metres per second
Nomenclature	**Definition**
PM_{10}	Particulate matter with a diameter less than 10 micrometres
$PM_{2.5}$	Particulate matter with a diameter less than 2.5 micrometres
24-hour average	Calendar day (midnight to midnight)
Abbreviations	**Definition**
ABC	Adelaide Brighton Cement
Air EPP	South Australian Environment Protection (Air Quality) Policy 2016
DMP	Dust Management Plan
EPA	Environment Protection Authority
GLPMRP	Ground Level Particulate Monitoring and Reporting Plan
SPMP	Stack Particulate Management Plan
TARP	Trigger Action Response Plan

Purpose	The purpose of the Dust Management Plan (DMP) is to facilitate the ongoing implementation of dust control measures to minimise offsite dust from the Facility.
Dust Management Plan	This report has been prepared in compliance with the Dust Management Plan, approved 21 June 2018, by SA EPA. The plan is available on the ABC Birkenhead Community website: https:// http://www.birkenheadcommunity.com.au
Background Information	The DMP contains a Trigger Action Response Plan (TARP) to proactively manage fugitive dust emissions. The TARP uses three levels of trigger: • Low (watch and wait) – early warning to increase awareness of potential dust issues • Medium (investigate) – there may be a potential dust issue and investigate • High (escalate) – dust concentrations are higher than normal, and action may be required Triggers and responses have been defined for: • Ambient dust monitoring from on-site monitors • Meteorological parameters (forecasts and observations (e.g., extended dry period with less than 1 mm of rain over 20 days)) • Visual observations Trigger levels and responses are documented in the EPA Approved DMP. All monitoring data, triggers, associated responses and actions are captured in the Dust Management Dashboard and control system, for reporting and analysis. This annual review of the DMP is for the reporting period 1/1/2021 to 31/12/2021.

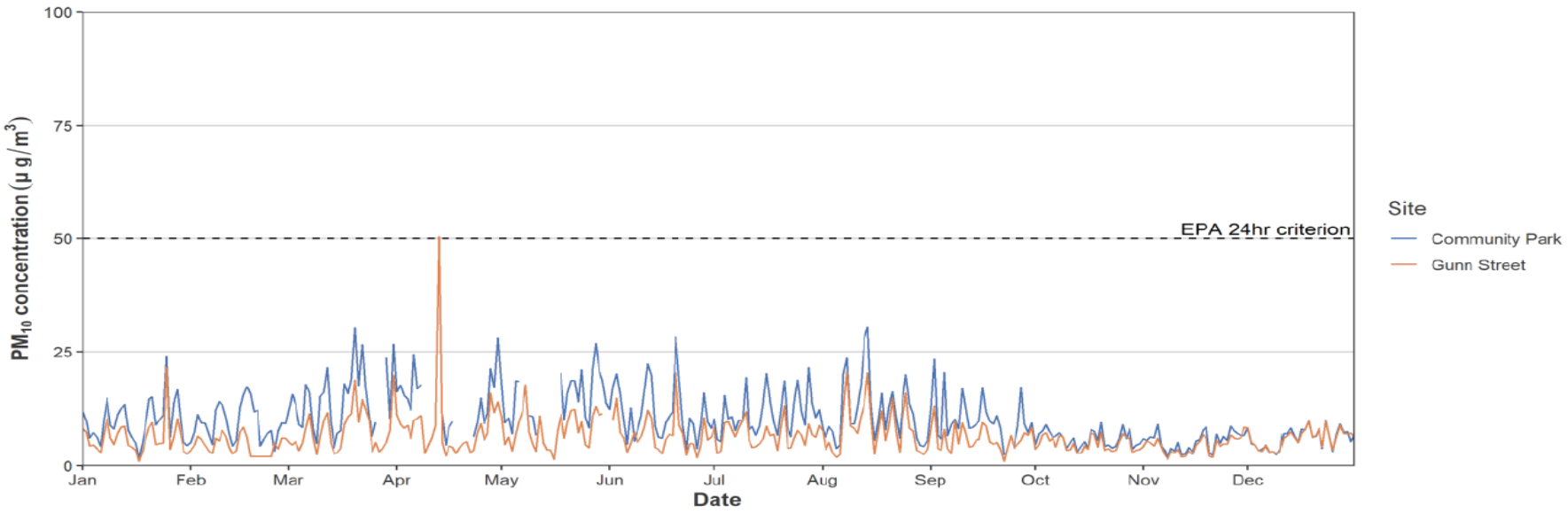
Reporting Objective	To review the effectiveness of the Trigger Action Response Plan (TARP) contained within the approved Dust Management Plan (DMP) and includes; • Review of all trigger values and frequency of occurrence • A review of the effectiveness of all action and response strategies • Correlation between triggers and measured onsite and offsite dust levels • A review and analysis of community complaints with the exceedance of trigger values and 24-hour exceedance of PM_{10} and $PM_{2.5}$ Air (EPP) criteria • A review and analysis of data collected from licence conditions U-729 and U-749 • A trend analysis of data collected • Opportunities for improvement in dust management • Revision of trigger level values as a result of improvements made in dust controls and practices
Particulate Monitor Locations	 Map showing sampling locations, major infrastructure, sensitive environmental receptors, and north arrow Sampling locations are indicated by colour-coded dots on the above map. **NB**: Four sampling points are located on the Birkenhead Works site; the other sampling points are in the community (corner of Gunn/Well streets and Community Park).

TARP – Review	A review of the Trigger Action Response Plan data, for the reporting period, 1 January 2021 – 31 December 2021, has been undertaken by Katestone Environmental Pty Ltd. (Katestone), in accordance with the requirements of the Dust Management Plan. Katestone's report is attached as an Appendix to this report.
Summary of findings from the TARP Review	**Review of trigger values and frequency of occurrence** The data analysis shows that there were 1,138 trigger alerts during the reporting period, comprising of: • 608 low trigger alerts • 408 medium trigger alerts • 122 high trigger alerts. The sites that generated the most triggers were Northern Grounds (391) and Eastern Grounds (299), followed by Meteorology – forecast (212), Southern Grounds (184) and Block 9 (48). In response to the 1,138 trigger alerts, ABC undertook 3807 actions, including 1,338 actions against low level triggers (33%), 1,605 actions against medium level triggers (42%) and 864 actions against high level triggers (23%). Sites that generated the most actions were Meteorology - forecast (1373), Northern Grounds (1,053) and Eastern Grounds (730), followed by Southern Grounds (487) and Block 9 (134) and Meteorology – observations (30). **Review and analysis of data collected from licence conditions; Ground Level Particulate Monitoring and Reporting Plan (GLPMRP) - (U-729) and Stack Particulate Management Plan (SPMP) - (U-749)** GLPMRP showed that in the reporting period there were two days when particulate monitoring on the community located monitors exceeded the EPA, 24-hour average ambient air criteria for particulates for PM_{10} and /or $PM_{2.5}$. Exceedance reports were prepared and posted on ABC's public website within 48 hrs of the event, and can be accessed on the following link https://abcmonitoring.katestone.com.au/public/compliance-reporting/ In all cases investigations of the exceedance in ambient particulate levels was attributed to regional events and stable atmospheric conditions during winter. None of the exceedances were likely to be caused by ABC operations. The following table summarises the details of the 24-hr average ambient particulate PM_{10}/$PM_{2.5}$ exceedance reports on the Community Park and Gunn Street monitors. The exceedance of the EPA criteria for PM_{10} 24-hr average (50 µg/m^3) and EPA criteria for $PM_{2.5}$ 24-hr average (25 µg/m^3) highlighted in yellow.

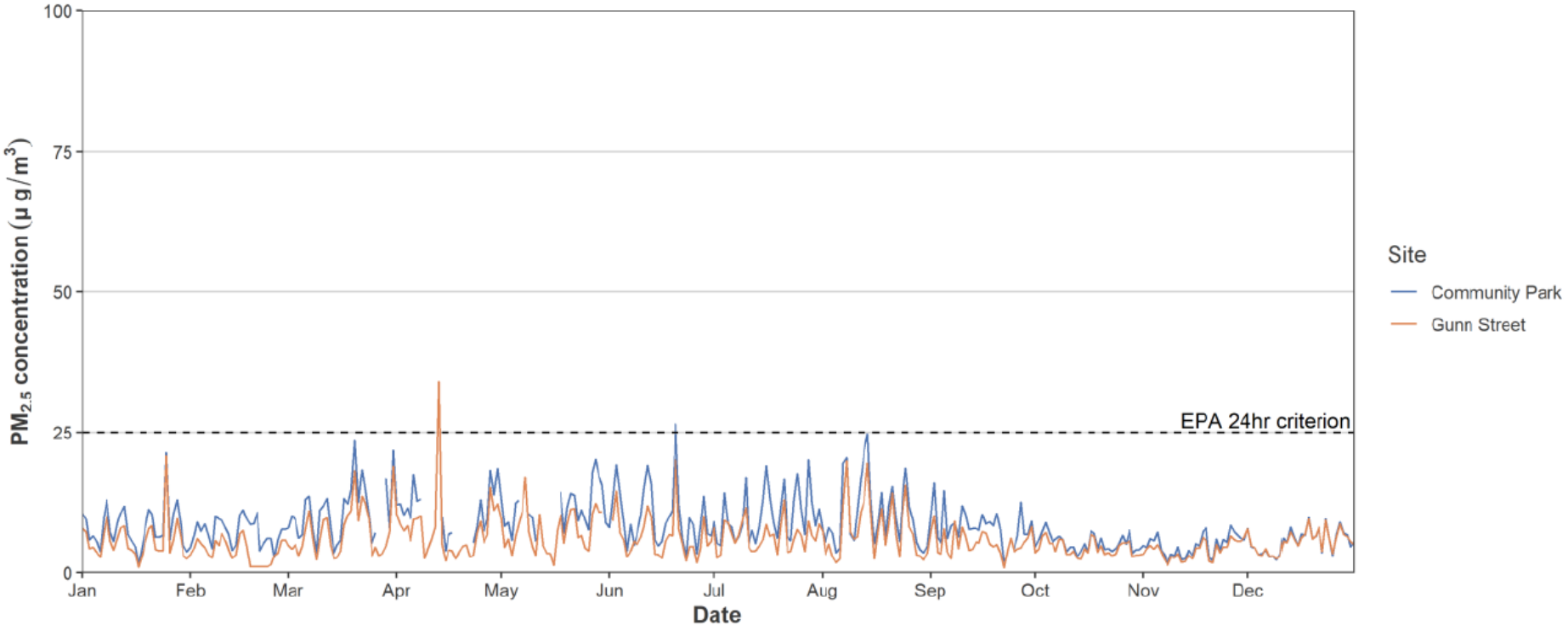
Summary details of the 24-hr average ambient particulate PM_{10}/$PM_{2.5}$ exceedance reports

Exceedance Date	Community Park (Alfred St/Hargraves St)		Gunn Street (Levi St/Gunn St)		Summary Explanation
	24-hr ave PM_{10} µg/m^3	24-hr ave $PM_{2.5}$ µg/m^3	24-hr ave PM_{10} µg/m^3	24-hr ave $PM_{2.5}$ µg/m^3	
13/04/2021	No data	No data	50.4	30.4	Adelaide experienced a widespread dust storm event on Tuesday 13 April which resulted in the elevated particulate levels on the Gunn Street Monitor, and all EPA monitors. The Community Park Monitor was undergoing maintenance to replace a faulty power supply, when the dust storm event occurred, and insufficient particulate data was collected to calculate a valid 24-hour average concentration.
20/06/2021	28.3	26.5	20.5	20.1	The 24-hour average PM2.5 concentration measured at Community Park of 26.5 ug/m3 exceeded the EPP Air criterion of 25.0 ug/m3. All ABC monitors (on site and off site) showed similar particulate levels and trends. This indicates the particulate level was from a localised airshed condition, rather than related to any specific site activity.

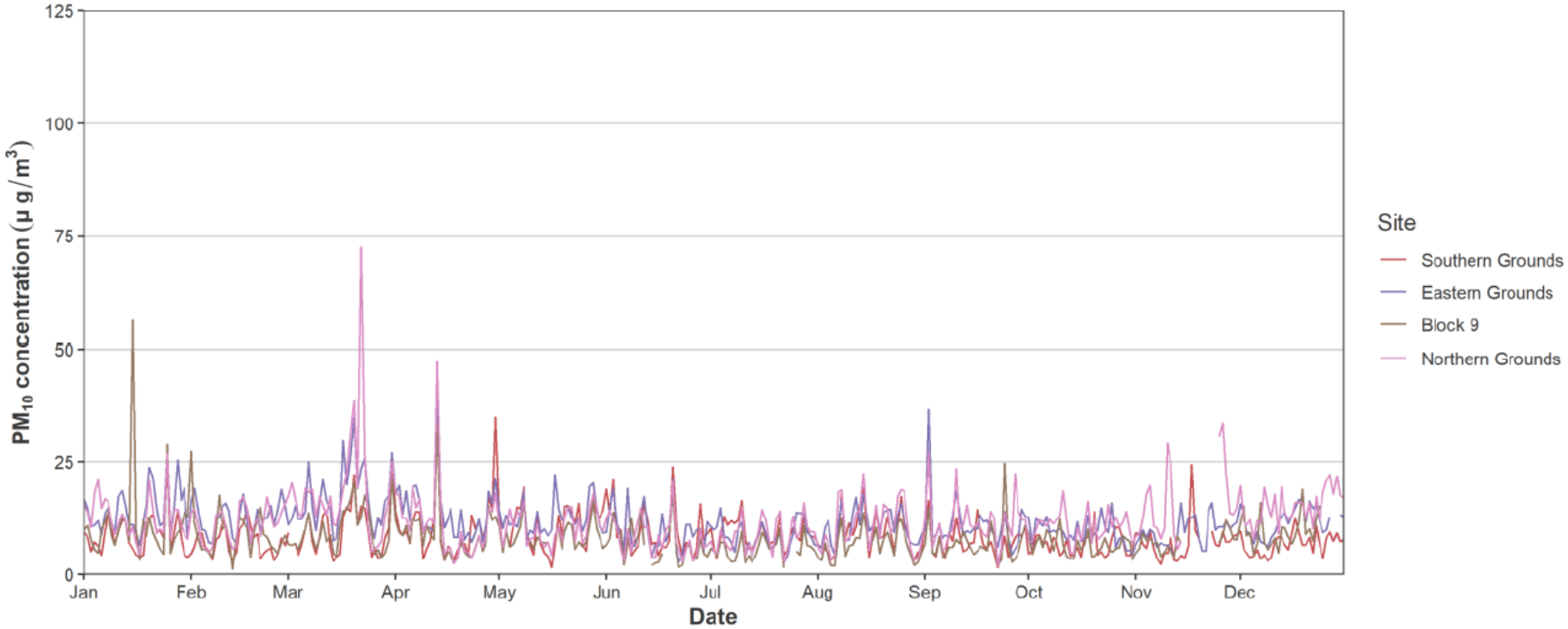
The following graph shows the 24-hr average concentrations for PM_{10} on the community monitors 1/1/2021 – 31/12/2021



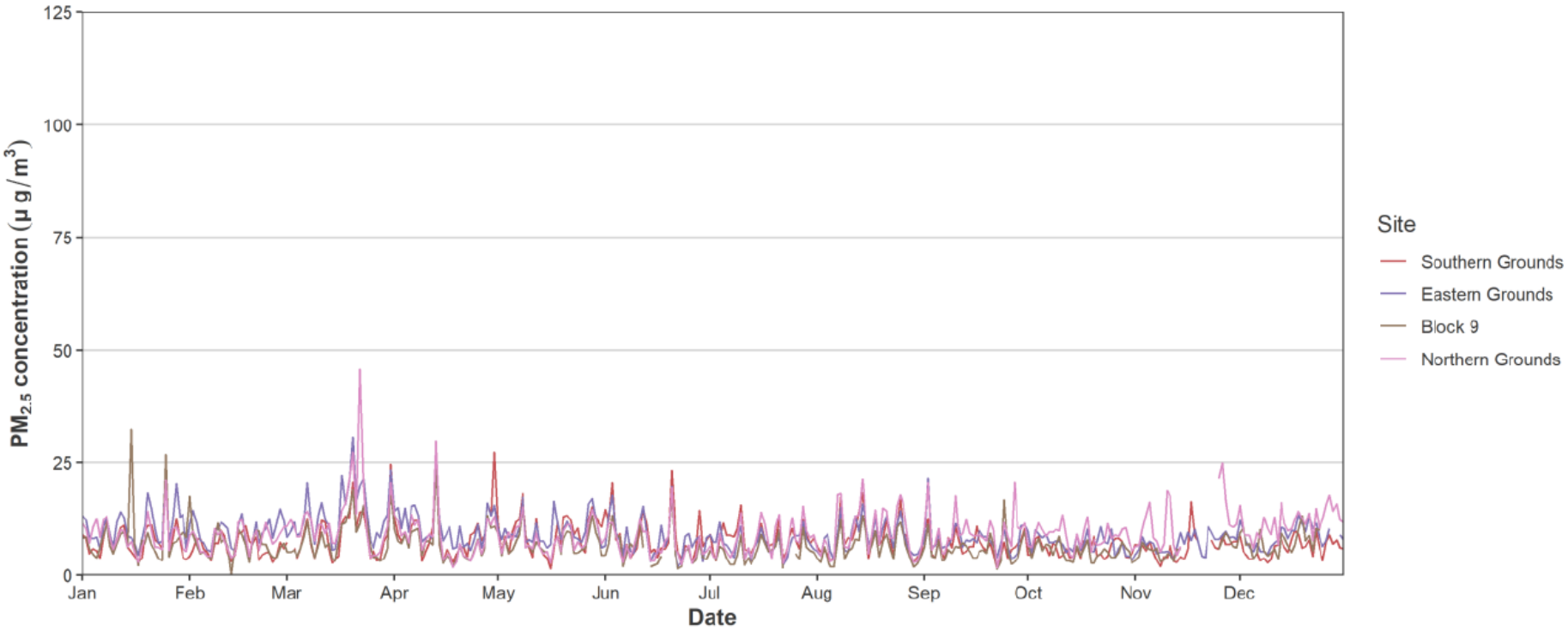
The following graph shows the 24-hr average concentrations for $PM_{2.5}$ on the community monitors 1/1/2021 – 31/12/2021



The following graph shows the 24-hr average concentrations for PM_{10} from the on-site monitors 1/1/2021 – 31/12/2021



The following graph shows the 24-hr average concentrations for $PM_{2.5}$ from the on-site monitors 1/1/2021 – 31/12/2021



Review and analysis of community complaints, trigger values, 24-hour PM_{10} and $PM_{2.5}$ ambient air exceedance criteria and stack reporting events

The table below captures community complaints by type, 1-hr stack reporting events and 24-hr ambient PM_{10} and $PM_{2.5}$ exceedance events for reporting period.

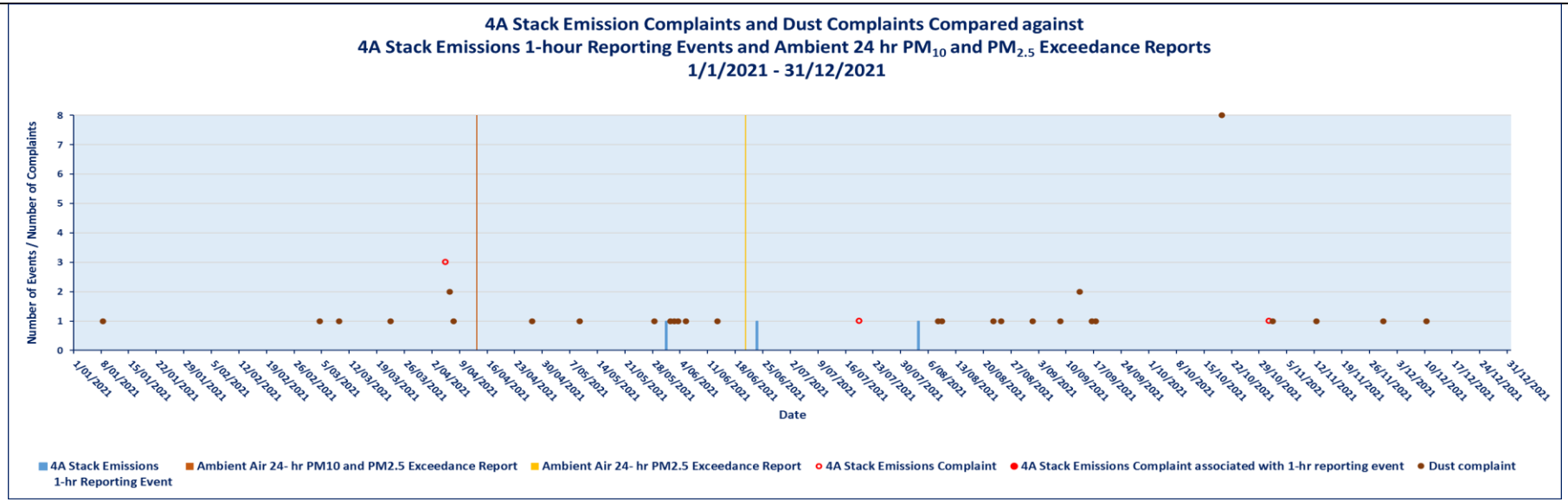
Table Legend
4A Stack 1-hr reporting event
4B Stack 1-hr reporting event
4A Stack Emissions complaint
4B Stack Emissions complaint
Ambient Air 24-hr $PM_{2.5}$ exceedance
Ambient Air 24-hr PM_{10} & $PM_{2.5}$ exceedance
Dust complaint

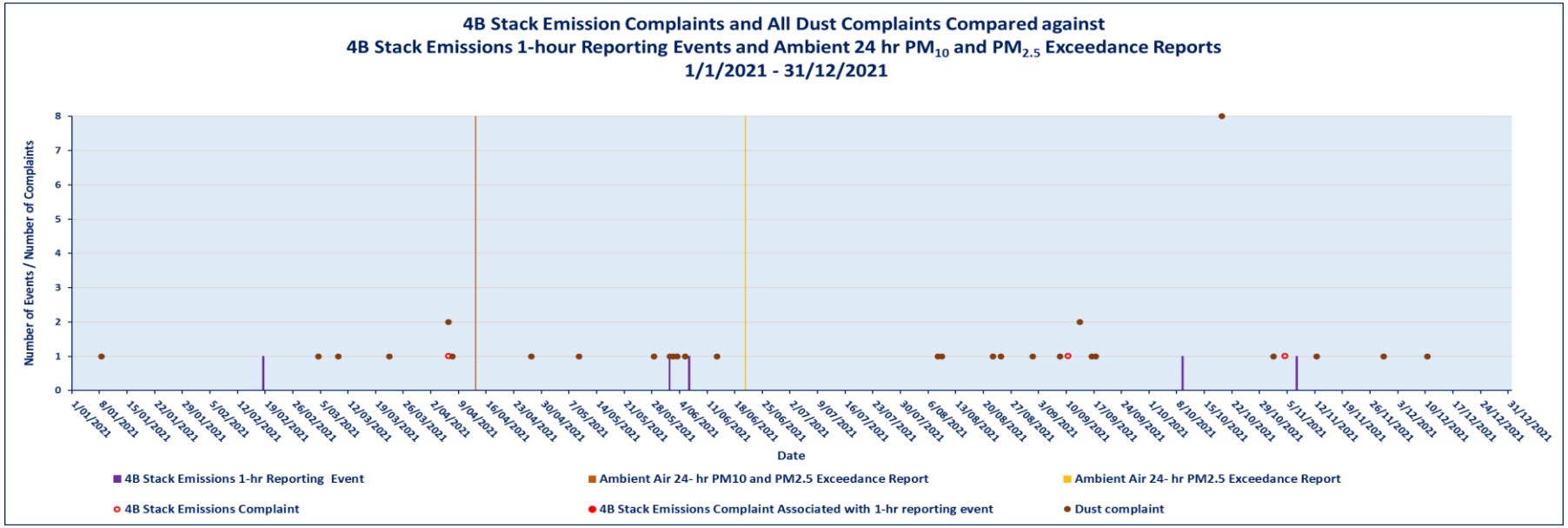
Date	Finish Time	4A Stack Emissions 1-hr Reporting Event	4B Stack Emissions 1-hr Reporting Event	4A Stack Emissions Complaint	4B Stack Emissions Complaint	4A Stack Emissions Complaint Associated with 1-hr reporting event	4B Stack Emissions Complaint Associated with 1-hr reporting event	Dust complaint	Ambient Air 24- hr PM_{10} and $PM_{2.5}$ Exceedance Report	Ambient Air 24- hr $PM_{2.5}$ Exceedance Report
8/01/2021	10:00							1		
18/02/2021	02:05		1							
4/03/2021	09:54							1		
9/03/2021	16:45							1		
22/03/2021	22:00							1		
5/04/2021	11:27			1						
5/04/2021	20:15			1						
5/04/2021	21:20			1						
6/04/2021	11:26							1		

Date	Finish Time	4A Stack Emissions 1-hr Reporting Event	4B Stack Emissions 1-hr Reporting Event	4A Stack Emissions Complaint	4B Stack Emissions Complaint	4A Stack Emissions Complaint Associated with 1-hr reporting event	4B Stack Emissions Complaint Associated with 1-hr reporting event	Dust complaint	Ambient Air 24- hr PM_{10} and $PM_{2.5}$ Exceedance Report	Ambient Air 24- hr $PM_{2.5}$ Exceedance Report
6/04/2021	14:52							1		
6/04/2021	21:48				1					
7/04/2021	11:00							1		
13/04/2021	23:59								1	
27/04/2021	10:30							1		
9/05/2021	11:09							1		
28/05/2021	07:55							1		
31/05/2021	21:26	1								
1/06/2021	06:35		1							
1/06/2021	15:23							1		
2/06/2021	17:12							1		
3/06/2021	15:00							1		
5/06/2021	14:19							1		
6/06/2021	13:01		1							
13/06/2021	07:00							1		
20/06/2021	23:59									1
23/06/2021	14:16	1								
19/07/2021	00:08			1						
3/08/2021	15:17	1								
8/08/2021	12:43							1		
9/08/2021	13:48							1		
22/08/2021	10:30							1		
24/08/2021	13:28							1		
1/09/2021	10:00							1		
8/09/2021	14:30							1		

Date	Finish Time	4A Stack Emissions 1-hr Reporting Event	4B Stack Emissions 1-hr Reporting Event	4A Stack Emissions Complaint	4B Stack Emissions Complaint	4A Stack Emissions Complaint Associated with 1-hr reporting event	4B Stack Emissions Complaint Associated with 1-hr reporting event	Dust complaint	Ambient Air 24- hr PM_{10} and $PM_{2.5}$ Exceedance Report	Ambient Air 24- hr $PM_{2.5}$ Exceedance Report
10/09/2021	09:21				1					
13/09/2021	08:00							1		
13/09/2021	10:00							1		
16/09/2021	08:06							1		
17/09/2021	10:28							1		
9/10/2021	17:07		1							
19/10/2021	05:30							1		
19/10/2021	05:30							1		
19/10/2021	05:30							1		
19/10/2021	05:30							1		
19/10/2021	05:30							1		
19/10/2021	05:30							1		
19/10/2021	05:30							1		
19/10/2021	05:30							1		
31/10/2021	14.30			1						
1/11/2021	17:30							1		
4/11/2021	10:50				1					
7/11/2021	09:10		1							
12/11/2021	15:00							1		
29/11/2021	10:00							1		
10/12/2021	11:14							1		

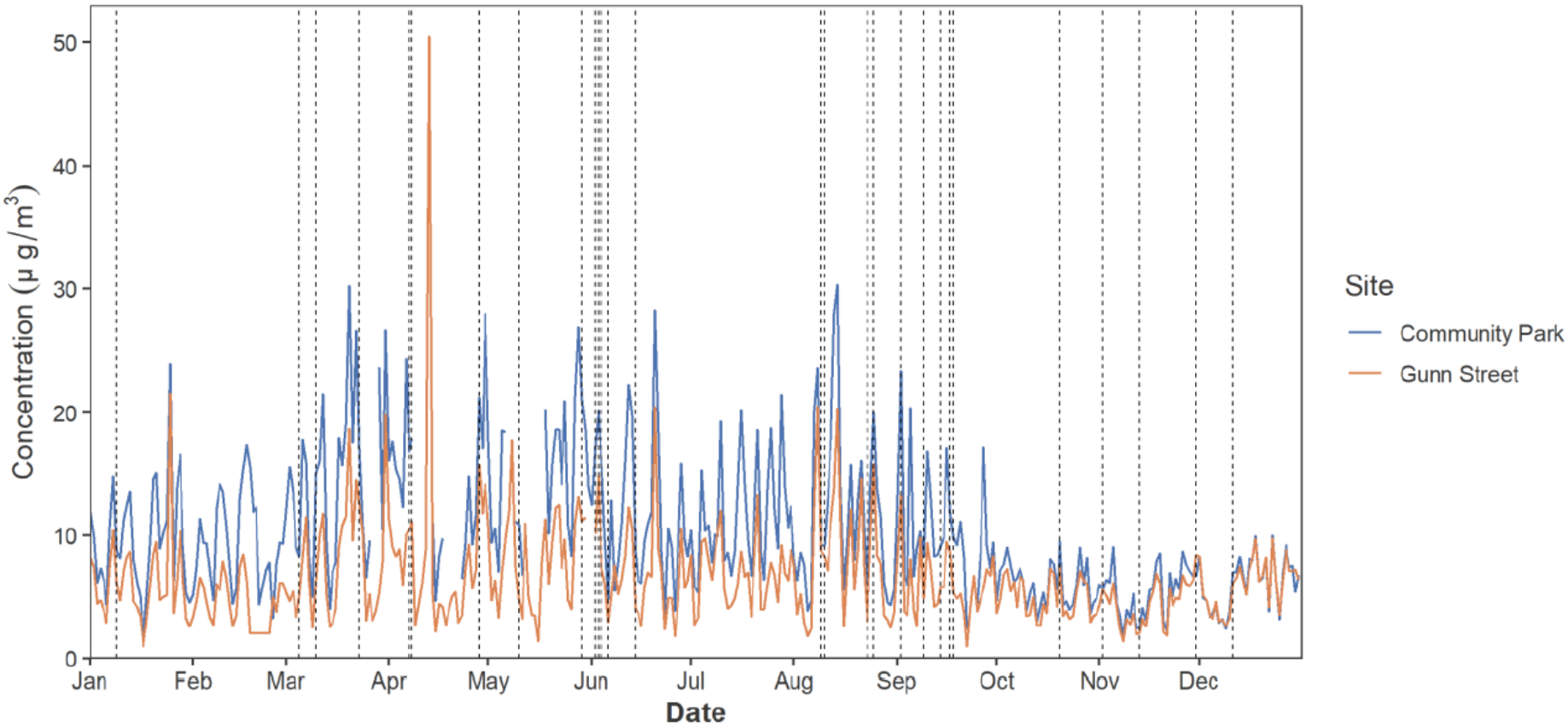
The above data is plotted on the following time series graphs for each stack





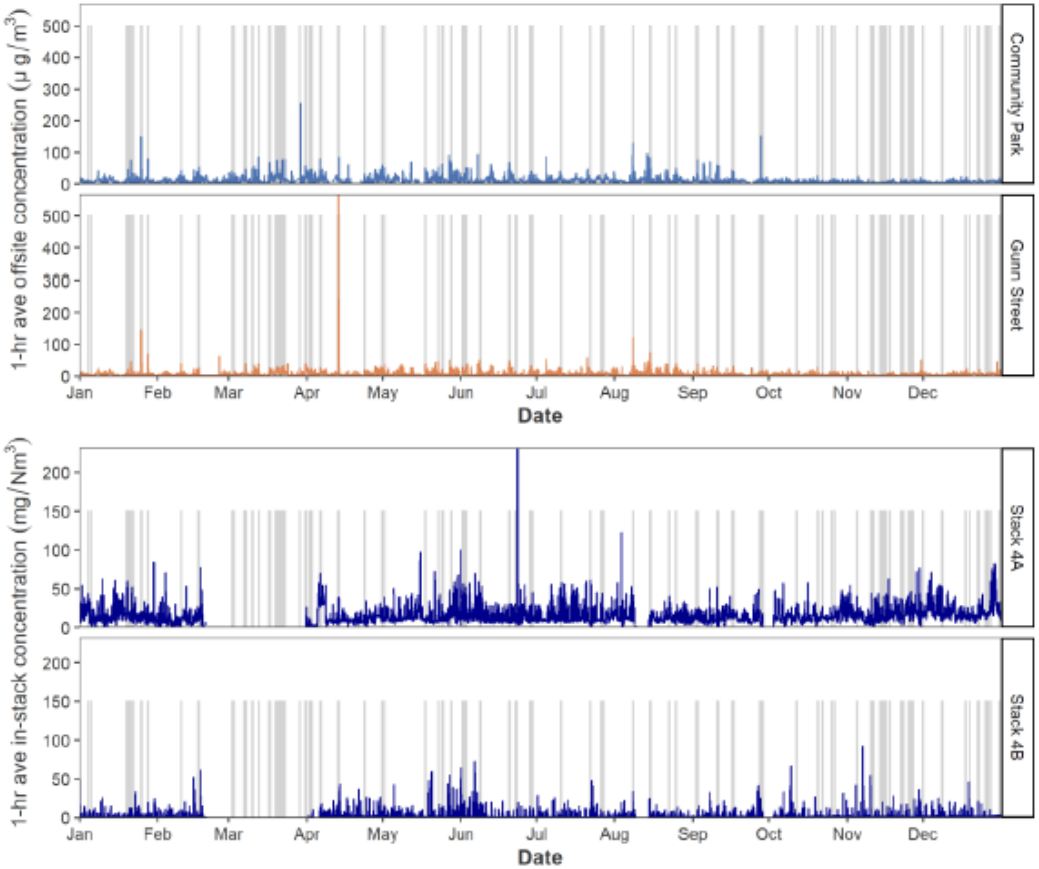
The data shows there is no relationship between 1-hour stack emission reporting events and 24-hour ambient particulate PM_{10} and $PM_{2.5}$ exceedance reports, dust complaints and stack emission complaints.

The following graph shows a time series of the 24-hr average concentrations of PM_{10} at the offsite monitors during the reporting period with dust complaint reporting dates marked as vertical dashed lines.



The graph shows that the highest measured concentrations did not tend to correlate with complaints being generated. It is relevant to note that complaints may not reflect specific elevated dust events, instead reflecting extended periods of low levels of dust accumulating over time. This possibility may indicate a cumulative combination of broader dust sources, as measured by the EPA monitoring network in combination with on-site operations.

The following graph shows the 1-hr average concentration of PM_{10} at the Community Park and Gunn Street monitoring locations during the reporting period and rolling 1-hr average in stack particulates (mg/m^3) from stacks 4A and 4B with periods of high trigger alerts identified with a grey vertical marker.



This graph shows the following:

- The majority of actual elevated PM10 events were also covered by a high trigger alert.
- The highest PM10 levels recorded at both Community Park and Gunn Street did not coincide with high in-stack concentrations.
- The highest in-stack PM10 level recorded in June 2021 at Stack 4A does not coincide with high off-site concentrations at Community Park or Gunn Street.
- The lack of a positive relationship between stack particulate emissions concentrations and ambient concentrations suggests that the stack emissions have little influence on local particulate concentrations.

TARP Effectiveness	The above information demonstrates that the TARP is working effectively. Katestone's review of the TARP (attached in the Appendix) determines the TARP is working effectively to minimise off-site exceedances. The report recommends maintaining the current trigger levels considering the low number of off-site exceedances observed throughout this reporting period and the risk of increased off-site impacts if trigger levels were increased.
Opportunities For Improvement in Dust Management	ABC's "Assessment of Options Report"– August 2018 approved by the EPA on 16 August 2018 identifies further opportunities to reduce particulate emissions from the site. The recommended improvement options from this report have been incorporated into an Environment Improvement Programme (EIP), approved by the EPA on 28/2/2019. The improvements are now being implemented and reported separately in accordance with the EIP.
Dust Management Plan Effectiveness	The DMP has raised the awareness of operations personnel to monitored dust levels. This has been achieved through the implementation of the Dust Management Dashboard, which provides • improved visibility and employee understanding of ambient particulate monitoring data • improved responsiveness to monitored dust levels, driven by dust trigger alerts This has resulted in • pro-active action taken to minimise dust in response to high trigger alerts, including meteorological forecasts • more timely response to plant issues
Appendix	Katestone report "Trigger Action Response Plan Annual Review", February 2022

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Trigger Action Response Plan Annual Review

Prepared for:

Adelaide Brighton Cement Ltd

February 2022

FINAL

Prepared by:

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Glossary

Term	Definition
µg/m^3	micrograms per cubic metre
µm	microns
°C	degrees Celsius
km	kilometre
km/h	kilometre per hour
m	metre
m/s	metres per second
m^2	square metres
m^3	cubic metres
m^3/s	cubic metres per second
Nomenclature	**Definition**
PM_{10}	particulate matter with a diameter less than 10 micrometres
$PM_{2.5}$	particulate matter with a diameter less than 2.5 micrometres
Abbreviations	**Definition**
ABC	Adelaide Brighton Cement
DMP	Dust management plan
EPA	Environmental Protection Authority South Australia
GLPMRP	Ground Level Particulate Monitoring and Reporting Plan
SPMP	Stack Particulate Management Plan
TARP	Trigger Action Response Plan

EXECUTIVE SUMMARY

Katestone Environmental Pty Ltd (Katestone) was commissioned by Adelaide Brighton Cement Ltd (ABC) to complete a review of the Trigger Action Response Plan (TARP) data collected for the period 1 January 2021 to 31 December 2021 inclusive (the reporting period).

The TARP is implemented and managed at ABC's Birkenhead facility through a Dust Management Dashboard operated in the Birkenhead Control Room. This includes receiving alerts that are triggered by monitoring data or observations of visible dust, analysis of air quality monitoring data, logging responses/actions and closing alerts. Analysis of the TARP data during the reporting period shows the following:

- A total of 1,138 triggers were recorded, including 608 low level triggers (53%), 408 medium level triggers (36%) and 122 high level triggers (11%).
- Low, medium and high-level triggers occurred with decreasing frequency at all sites.
- The sites that generated the most triggers were Northern Grounds (391) and Eastern Grounds (299), followed by Meteorology – forecast (212), Southern Grounds (184) and Block 9 (48).
- No triggers were generated by visual observations and only four triggers were generated by meteorological observations during the reporting period.
- A total of 3,807 actions were taken, including 1,338 actions against low level triggers (35%), 1,605 actions against medium level triggers (42%) and 864 actions against high level triggers (23%).
- The most actions were generated by Meteorology - forecast (1,373), Northern Grounds (1,053) and Eastern Grounds (730), followed by Southern Grounds (487), Block 9 (134) and Meteorology - observations (30).
- On average, approximately 4 separate actions were performed for every trigger. This is a reduction in the number of actions per trigger compared to the previous reporting period (1 January 2020 to 31 December 2020).
- Although high trigger alerts regularly do not correspond with elevated PM_{10} concentrations at the off-site monitoring locations the majority of actual elevated PM_{10} events were also covered by a high trigger alert.
- The highest PM_{10} levels recorded at both Community Park and Gunn Street did not coincide with high in-stack concentrations, and the highest in-stack PM_{10} level recorded in June 2021 at Stack 4A did not coincide with high off-site concentrations at Community Park or Gunn Street.
- The lack of a positive relationship between stack particulate emissions concentrations and ambient concentrations suggests that the stack emissions have little influence on local particulate concentrations.

Ambient concentrations of PM_{10} and $PM_{2.5}$ are measured through the Dust Management Dashboard. Analysis of the Ground Level Particulate Monitoring Program data collected during the monitoring period shows the following:

- The 24-hour average concentrations of $PM_{2.5}$ exceeded the relevant EPA criterion at Community Park monitoring site on one day (20-June-2021) during the reporting period, with a concentration of 26.5 µg/m³. Concentrations were elevated at all monitors on this day as a result of a regional dust event and any contribution from the Facility would have been very small.
- The 24-hour average concentrations of PM_{10} and $PM_{2.5}$ exceeded the EPA criteria at the Gunn Street monitoring site on one day (13-April-2021) during the reporting period with respective concentrations

of 50.4 µg/m³ and 34.0 µg/m³. Concentrations on this day were elevated at all sites suggesting a regional dust episode to be the cause of this exceedance rather than emissions from the Facility. Adelaide and most of South Australia recorded wide ranging dust storms due to northerly winds on the 13 April 2021.

- The highest on-site 24-hour average concentrations of PM_{10} and $PM_{2.5}$ were both recorded at Northern Grounds (72.4 µg/m³ and 45.7 µg/m³, respectively).
- It does not appear that on-site operations are significantly contributing to off-site particulate monitoring concentrations at Community Park or Gunn Street.

The analysis demonstrates that the TARP is working effectively to reduce off-site exceedances of particulates, despite persistence of dust complaints within an average proximity of 380 m. Compared to the number of off-site exceedances recorded for the previous reporting period (January 2020 – December 2020) which showed four PM_{10} and 22 $PM_{2.5}$ exceedances at Community Park and one PM_{10} and 14 $PM_{2.5}$ exceedances at Gunn Street, this report indicates a significant decrease. Although exceedances during the previous reporting period were likely largely attributable to bush fires, this reporting period shows in the absence of such events that very few exceedances occur off-site.

It is recommended to maintain the current trigger levels considering the low number of off-site exceedances observed throughout this reporting period and the risk of increased off-site impacts if trigger levels were increased.

1. INTRODUCTION

Katestone Environmental Pty Ltd (Katestone) was commissioned by Adelaide Brighton Cement Ltd (ABC) to complete a review of the Trigger Action Response Plan (TARP) data collected for the period 1 January 2021 to 31 December 2021 inclusive (the reporting period).

The purpose of this report is to review and evaluate the effectiveness of the TARP and make any recommendations for improvement. The review has been prepared to satisfy the following annual reporting requirements in ABC's licence (Licence number 1126):

> *"1.1.2e a methodology and framework for the provision of an annual report to the EPA which includes the following but is not limited to:*
>
> *i a review of all the trigger values identified in sub paragraph 2(a) of this condition*
>
> *ii a review of the effectiveness of all action and response strategies identified in sub paragraph 2(c) of this condition*
>
> *iii a trend analysis of data collected*
>
> *iv a review and analysis of community complaints recorded in condition 300-9 with the exceedance of trigger values reported under sub paragraph 2(d) of this condition; and*
>
> *v opportunities for improvement in dust management*"

Accordingly, this report details the following:

- Description of ABC's TARP (Section 2)
- Reporting Period Data Summary (Section 3), including:
  - TARP data collected during the reporting period (Section 3.1)
  - An analysis of data collected by ABC's other environmental monitoring programs during the monitoring period, including:
    - Ground Level Particulate Monitoring and Reporting Plan (GLPMRP) - required under Licence Conditions U-729 (Section 3.2)
    - Stack Particulate Management Plan (SPMP) - required under Licence Conditions U-749 (Section 3.3)
- Analysis of community complaints and TARP data during the reporting period (Section 4)
- Review of the effectiveness of the TARP data collection during the reporting period (Section 5)
- Conclusion (Section 6).

Figure 1 shows the location and layout of the site, along with the specific locations of the air quality monitors and stacks referenced in this report.

Figure 1 **Site layout and ambient air quality monitors**

2. TRIGGER ACTION RESPONSE PLAN

The Trigger Action Response Plan (TARP) forms part of ABC's overall Dust Management Plan (DMP) at its Birkenhead Site. The DMP defines a range of triggers to assist ABC to meet its dust management obligations by identifying circumstances when:

- Ground-level concentrations at off-site receptors are likely to be elevated due to activities on-site
- Activities on-site are generating dust outside of the normal range.

Three levels of triggers are defined within the TARP:

1. Low trigger (Watch and wait). This is an early warning level put in place to increase awareness of potential dust issues before they arise.
2. Medium trigger (Investigate). A medium trigger indicates that there may be a potential dust issue and specific investigation is warranted.
3. High trigger (Escalate). A high trigger indicates that dust concentrations are outside of the normal range and that an action is warranted.

The TARP has been designed to provide as much warning as possible to allow proactive management of fugitive dust. Therefore, a trigger, particularly a low or medium trigger, does not indicate the presence of a dust impact.

The triggers and associated responses defined in ABC's DMP are reproduced in the following sections.

2.1 TARP for ambient dust monitoring

Certain responses are implemented when ABC's ambient dust monitoring network measures concentrations of PM_{10} that exceed the trigger values presented in Table 1. The responses that are triggered are presented in Table 2.

Table 1 Trigger values for 1-hour average concentrations of PM_{10}

Parameter	Block 9	North Grounds	East Grounds	South Grounds
Location	On-site	On-site	On-site	On-site
Low	35	20	22	19
Medium	41	27	28	26
High	66	47	48	44

Table 2 Actions and responses for ambient monitoring data triggers – on-site, 1-hour average

Trigger Level	Action required	Responsibility
Low	• Alert relevant operators that dust levels are elevated therefore heightened awareness to sources of dust may be required.	Shift supervisor
Medium	As for low, in addition: • Ensure all routine dust management practices have been implemented. • Visual observations on site to check if there are any significant visible dust emissions in the region of the exceeding monitor.	Shift supervisor
High	As for medium, in addition: • Ensure all routine dust management practices have been implemented. If not, correct this immediately. • Slow activities or reschedule to more suitable meteorological conditions. • If dust mitigation equipment is unavailable, or at fault, investigate temporary alternative management practices. • Mobilise water cart or apply additional water sprays	Shift supervisor

2.2 Trigger values for meteorological parameters

Certain responses are implemented when ABC's meteorological monitoring indicates that meteorological parameters correspond to the trigger values presented in Table 3. The responses that are triggered are presented in Table 4.

Table 3 Trigger values for meteorological parameters

Trigger level	Trigger
Low	Forecast of high temperatures (30 ºC) and north-easterly winds (0° – 90°)
Low	Forecast of strong winds (> 6 m/s as a 3-hour average) from the Facility towards receptor areas (wind direction between 0° and 180°)
Medium	Forecast of strong winds (> 7 m/s as a 3-hour average) from the Facility towards receptor areas (wind direction between 0° and 180°)
Medium	Extended dry period indicated by less than 1 mm of rain over a 20-day period
High	Forecast of strong winds (> 8 m/s as a 3-hour average) from the Facility towards receptor areas (wind direction between 0° and 180°)

Table 4 Actions and responses for meteorological data triggers

Trigger Level	Action required	Responsibility
Low	• Alert shift employees that dust potential is elevated. • Pre-emptive watering of stockpiles before handling. • Assess potential for shifting operations to more favourable conditions. • Ensure water truck is on standby to apply water. • Visual observations of site every 2 hours. • Application of water.	Shift supervisor
Medium	As for low, in addition: • Visual observations of major stockpiles. • Additional watering if warranted.	Shift supervisor
High	As for medium, in addition: • Minimise activity rate • Apply water/suppressant immediately	Shift supervisor

2.3 Trigger values for visual observations

Certain responses are triggered if visual observations of dust occur as detailed in Table 5. The responses that are triggered are presented in Table 6.

Table 5 Trigger values for visual observations

Trigger level	Trigger
Low	General build-up of deposited dust on non-worked areas at the Facility, e.g. carparks, alongside buildings etc.
Medium	Visible dust plume generated by Facility activity above normal/acceptable levels
High	Visible dust plume crossing the Facility boundary

Table 6 Trigger Action Response Plan – Visual Observations

Trigger Level	Action required	Responsibility
Low	• Inspect site to determine source of dust. • Check whether routine (baseline) dust management practices have been applied to that source	Shift supervisor
Medium	As for low, in addition: • Apply dust management. • If relevant, apply water and/or chemical suppressant to source of dust. • If dust mitigation equipment is unavailable, or at fault, investigate temporary alternative management practices. • Repair any faulty dust mitigation equipment.	Shift supervisor
High	As for medium, in addition: • Minimise activity rate • Apply water/suppressant immediately	Shift supervisor

2.4 TARP Implementation

The TARP is implemented and managed at ABC's Birkenhead facility through a Dust Management Dashboard operated in the Birkenhead Control Room. This includes analysis of monitoring data, logging responses/actions, closing alerts, and raising visual observation alerts.

Live, 1-minute average air quality monitoring data is collected from two off-site monitors (Community Park and Gunn Street) and four on-site monitors (Northern Grounds, Southern Grounds, Eastern Grounds and Block 9). The data are analysed hourly and compared with the site-specific trigger conditions (as detailed in the previous tables) to generate trigger alerts.

The Dust Management Dashboard also incorporates meteorological data (forecast and observational), which are updated at 3-hour intervals and analysed daily between 5am-6am and 5pm-6pm. Trigger alerts are generated if meteorological data (observations and forecast) satisfy the relevant trigger level criteria (as detailed in the previous tables).

Staff in the Birkenhead Control Room are notified of any new or escalated alerts.

3. REPORTING PERIOD DATA SUMMARY

3.1 TARP

3.1.1 Triggers

TARP triggers generated during the reporting period (1 January 2021 to 31 December 2021) are summarised in Table 7 and Table 8. Triggers generated over consecutive hours at a particular site are recorded as a single trigger of the highest level during the alert period.

The data shows that:

- A total of 1,138 triggers were recorded, including 608 low level triggers (53%), 408 medium level triggers (36%) and 122 high level triggers (11%)
- Low, medium and high-level triggers occurred with decreasing frequency at all sites.
- The sites that generated the most triggers were Northern Grounds (391) and Eastern Grounds (299), followed by Meteorology – forecast (212), Southern Grounds (184) and Block 9 (48)
- No triggers were generated by on-site observations and only four triggers were generated by meteorological observations during the reporting period.

Table 7 Number of triggers during the reporting period

Site	Trigger level			Total (% of all alerts)
	Low	Medium	High	
Southern Grounds	107	60	17	184 (16%)
Eastern Grounds	158	104	37	299 (26%)
Block 9	23	22	3	48 (4%)
Northern Grounds	194	159	38	391 (34%)
Meteorology - forecast	126	59	27	212 (19%)
Meteorology - observations	-	4	-	4 (0.4%)
On-site visual observations	-	-	-	-
All sites	**608**	**408**	**122**	**1138 (100%)**

Table 8 Frequency of triggers during the reporting period

Site	Trigger level		
	Low	Medium	High
Southern Grounds	58%	33%	9%
Eastern Grounds	53%	35%	12%
Block 9	48%	46%	6%
Northern Grounds	50%	41%	10%
Meteorology - forecast	59%	28%	13%
Meteorology – observations	-	100%	-
All sites	**53%**	**36%**	**11%**

3.1.2 Actions

Actions recorded in response to TARP triggers during the reporting period are summarised in Table 9 and Table 10. These actions include but are not limited to: alerting operators, checking for dust emissions, checking dust controls are in place and working, implementing temporary mitigation, reducing activity rates and rescheduling activities. Note that percentages may not sum to 100% due to rounding.

The data shows that:

- A total of 3,807 actions were taken, including 1,338 actions against low level triggers (35%), 1,605 actions against medium level triggers (42%) and 864 actions against high level triggers (23%).
- The most actions were generated by Meteorology - forecast (1,373), Northern Grounds (1,053) and Eastern Grounds (730), followed by Southern Grounds (487), Block 9 (134) and Meteorology - observations (30).

Table 9 Number of actions taken during the reporting period

Site	Actions			Total number of Actions
	Low trigger	Medium trigger	High trigger	
Southern Grounds	136	237	114	487 (13%)
Eastern Grounds	182	358	190	730 (19%)
Block 9	29	93	12	134 (4%)
Northern Grounds	228	485	340	1053 (28%)
Meteorology - forecast	763	402	208	1373 (36%)
Meteorology – observations	-	30	-	30 (1%)
All sites	**1338**	**1605**	**864**	**3807**

Table 10 Frequency of actions taken during the reporting period

Site	Actions		
	Low trigger	Medium trigger	High trigger
Southern Grounds	28%	49%	23%
Eastern Grounds	25%	49%	26%
Block 9	22%	69%	9%
Northern Grounds	22%	46%	32%
Meteorology - forecast	56%	29%	15%
Meteorology – observations	-	100%	-
All sites	**35%**	**42%**	**23%**

3.1.3 TARP Implementation Summary

Table 11 summarises the TARP triggers and actions during the reporting period. On average, 4 separate actions were performed for every trigger.

Table 11 Summary of TARP implementation during the reporting period

Site	Triggers	Actions	Average Actions/Trigger
Southern Grounds	184	487	2.6
Eastern Grounds	299	730	2.4
Block 9	48	134	2.8
Northern Grounds	391	1053	2.7
Meteorology - forecast	212	1373	6.5
Meteorology - observation	4	30	7.5
All sites	**1138**	**3807**	**4.1**

3.2 Ground Level Particulate Monitoring and Reporting Plan

PM_{10} and $PM_{2.5}$ data collected during the reporting period in accordance with the GLPMRP are summarised in Table 12. Concentrations measured at the off-site monitoring locations (Community Park and Gunn Street) are compared with the EPA 24-hour average criteria for PM_{10} (50 µg/m³) and $PM_{2.5}$ (25 µg/m³) in Table 13 for reference; however, these monitors are not compliance monitors. Table 14 provides the measured concentrations at all sites on days when there was an exceedance at either Community Park or Gunn Street. Timeseries of 24-hour average particulate concentrations measured during the reporting period are presented for the off-site monitors in Figure 2 and Figure 3, and for the on-site monitors in Figure 4 and Figure 5.

The data show that:

- Data capture during the reporting period was greater than 93% at all sites.
- The 24-hour average concentrations of $PM_{2.5}$ exceeded the EPA criterion at the Community Park monitoring site on one day (20-June-2021) during the reporting period (Figure 2 and Table 13), with a concentration of 26.5 µg/m³. Concentrations on this day were elevated at all sites (Table 14), suggesting a regional dust episode to be the cause of this exceedance rather than emissions from the Facility. It is possible that the facility made some contribution, but analysis of wind direction data measured at the Community Park monitoring site on this day suggests that the monitor was not downwind of the Facility for most of the day.
- The 24-hour average concentrations of PM_{10} and $PM_{2.5}$ exceeded the EPA criteria at the Gunn Street monitoring site on one day (13-April-2021) during the reporting period (Figure 3 and Table 13), with respective concentrations of 50.4 µg/m³ and 34.0 µg/m³. Again, concentrations on this day were elevated at all sites (Table 14), suggesting a regional dust episode to be the cause of this exceedance rather than emissions from emissions from the Facility. Adelaide and most of South Australia recorded wide ranging dust storms due to northern winds on the 13 April 2021.
- This is a significant decrease compared to the previous reporting period (January 2020 – December 2020) which showed four PM_{10} and 22 $PM_{2.5}$ exceedances at Community Park and one PM_{10} and 14 $PM_{2.5}$ exceedances at Gunn Street. Although these were likely largely attributable to bush fires, this reporting period shows, through the absence of such events, that very few exceedances occur off-site.

- The highest on-site 24-hour average concentrations of PM_{10} and $PM_{2.5}$ were both recorded at Northern Grounds (72.4 µg/m³ and 45.7 µg/m³, respectively). These high records did not correlate with exceedances at the off-site monitors.
- It does not appear that on-site operations are significantly contributing to off-site particulate monitoring concentrations at Community Park or Gunn Street.

Ground Level Particulate Notification Reports were issued for each exceedance day and are publicly accessible at https://abcmonitoring.katestone.com.au/public/compliance-reporting/. In these, the exceedance on 13 April 2021 was attributable to a widespread dust storm event resulting in elevated particulate levels at Gunn Street and all EPA monitors. The 20 June 2021 exceedance has been attributed to stable atmospheric conditions during winter. None of the exceedances were likely to be caused by operations at the Facility.

Table 12 Summary of GLPMRP data collected during the reporting period (µg/m³)

Location	Site	Avg period	Size	Max	Min	Mean	99th %ile	95th %ile	Data capture
Off-site	Community Park	1-hour	PM_{10}	254.4	-4.6	10.3	50.9	28.1	96%
			$PM_{2.5}$	185.5	-4.6	8.5	40.5	21.7	96%
		24-hour	PM_{10}	30.3	1.6	10.3	28.0	21.2	94%
			$PM_{2.5}$	26.5	1.5	8.5	21.7	17.9	94%
	Gunn Street	1-hour	PM_{10}	568.2	-4.1	6.6	30.6	17.3	99%
			$PM_{2.5}$	345.7	-4.2	6.0	28.4	16.0	99%
		24-hour	PM_{10}	50.4	0.9	6.6	20.4	12.6	99%
			$PM_{2.5}$	34.0	0.9	6.0	19.7	12.2	99%
On-site	Southern Grounds	1-hour	PM_{10}	318.6	-7.1	8.5	36.1	21.1	99%
			$PM_{2.5}$	229.6	-7.9	7.6	32.5	18.6	99%
		24-hour	PM_{10}	35.3	1.5	8.6	24.7	15.8	99%
			$PM_{2.5}$	27.2	1.4	7.6	23.5	14.1	99%
	Eastern Grounds	1-hour	PM_{10}	360.1	-7.0	11.8	44.6	25.3	99%
			$PM_{2.5}$	241.7	-8.3	9.1	35.0	19.8	99%
		24-hour	PM_{10}	36.9	2.5	11.8	28.5	19.9	99%
			$PM_{2.5}$	30.7	1.8	9.1	22.7	16.1	99%
	Northern Grounds	1-hour	PM_{10}	725.8	-7.8	12.0	49.6	29.0	97%
			$PM_{2.5}$	435.3	-10.2	9.3	36.7	22.3	97%
		24-hour	PM_{10}	72.4	1.9	12.0	32.4	22.0	97%
			$PM_{2.5}$	45.7	1.5	9.3	23.1	17.7	97%
	Block 9	1-hour	PM_{10}	316.4	-74.2	8.1	37.9	19.8	94%
			$PM_{2.5}$	225.7	-77.4	6.6	29.5	16.0	94%
		24-hour	PM_{10}	56.2	1.2	8.1	26.2	15.2	93%
			$PM_{2.5}$	32.4	0.2	6.6	19.1	12.0	93%

Table 13 Exceedances of EPA criteria during the reporting period

Site	Averaging period	Pollutant	Date	Concentration (µg/m³)
Community Park	24-hour	$PM_{2.5}$	20-June-2021	26.5
Gunn Street	24-hour	PM_{10}	13-April-2021	50.4
	24-hour	$PM_{2.5}$	13-April-2021	34.0

Table 14 Concentrations at all sites at times of exceedance at Community Park and Gunn Street

Date	Pollutant	Concentration (µg/m³)					
		Community Park	Gunn Street	Southern Grounds	Eastern Grounds	Northern Grounds	Block 9
20-June-2021	$PM_{2.5}$	26.5	20.1	23.3	19.6	19.5	17.9
13-April-2021	PM_{10}	-	50.4	35.3	36.9	47.3	33.5
13-April-2021	$PM_{2.5}$	-	34.0	25.4	24.0	29.6	24.1

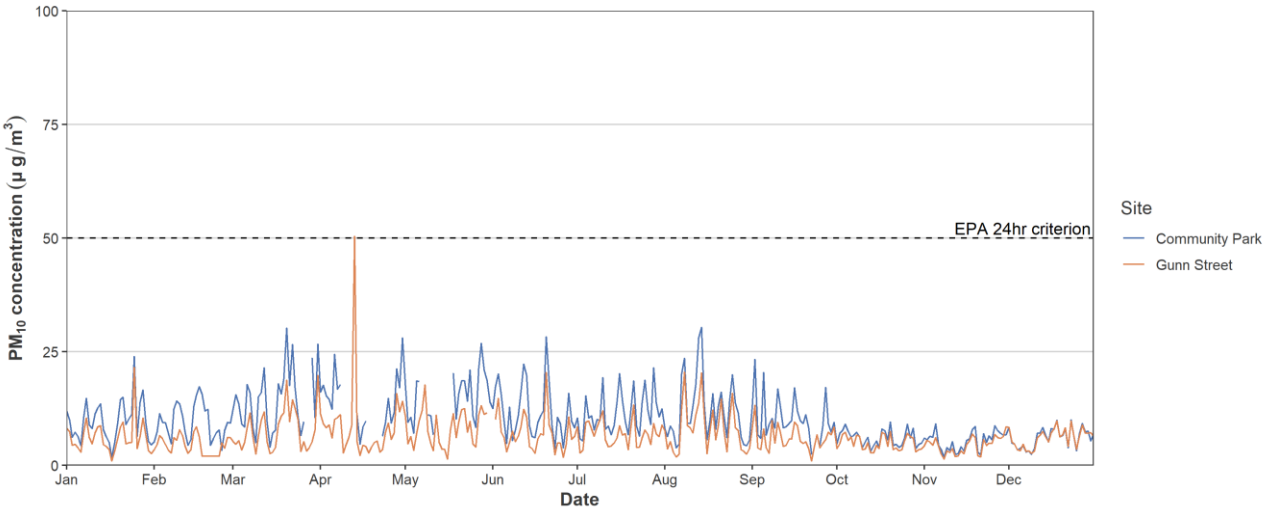

Figure 2 24-hour average concentrations of PM_{10} measured off-site during the reporting period

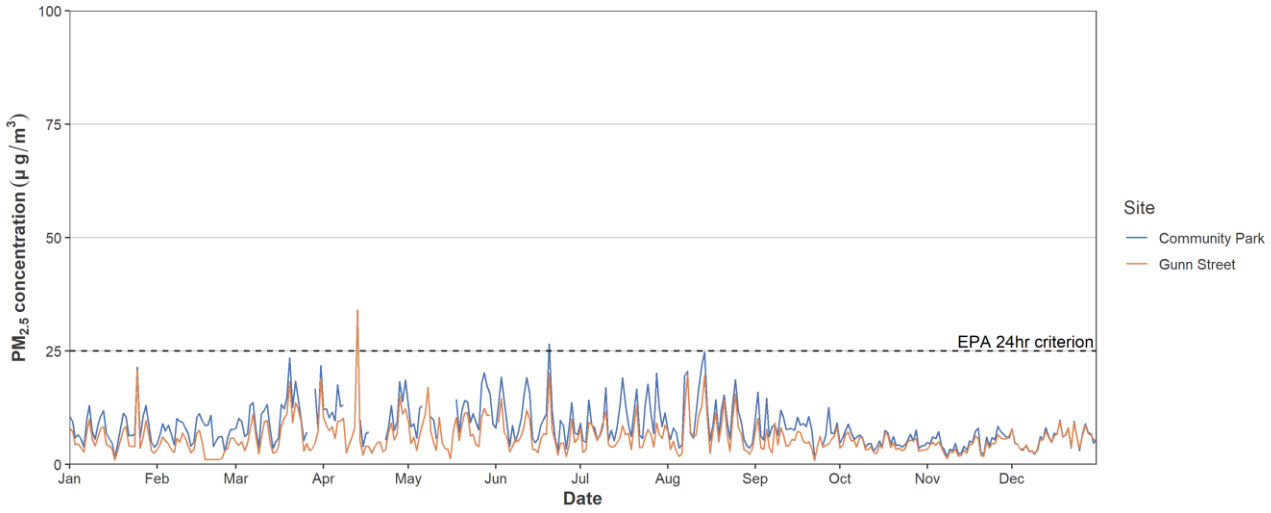

Figure 3 **24-hour average concentrations of $PM_{2.5}$ measured off-site during the reporting period**

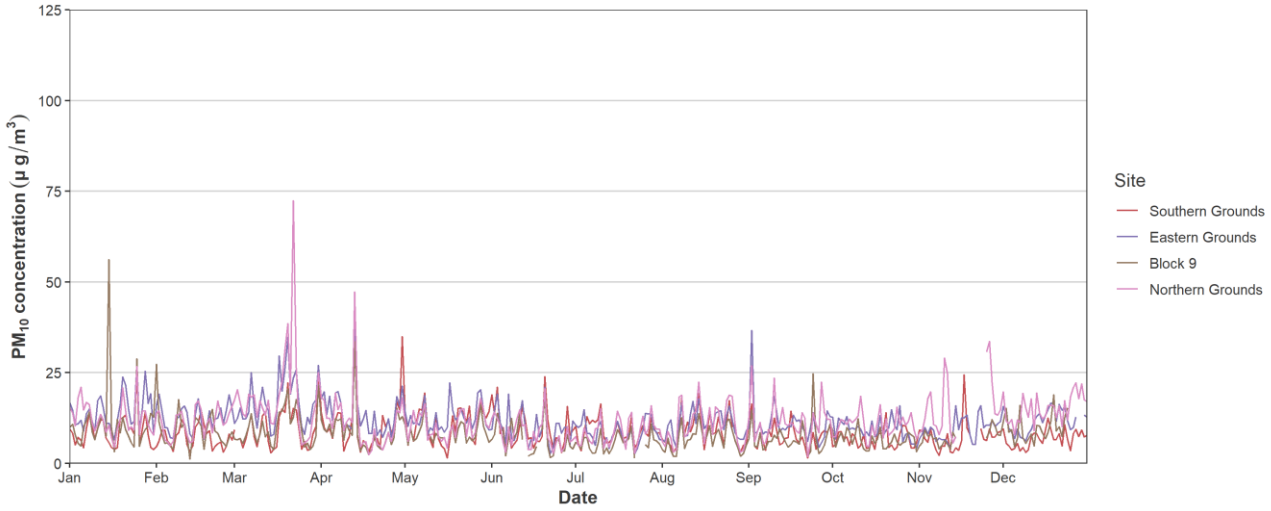

Figure 4 **24-hour average concentrations of PM_{10} measured on-site during the reporting period**

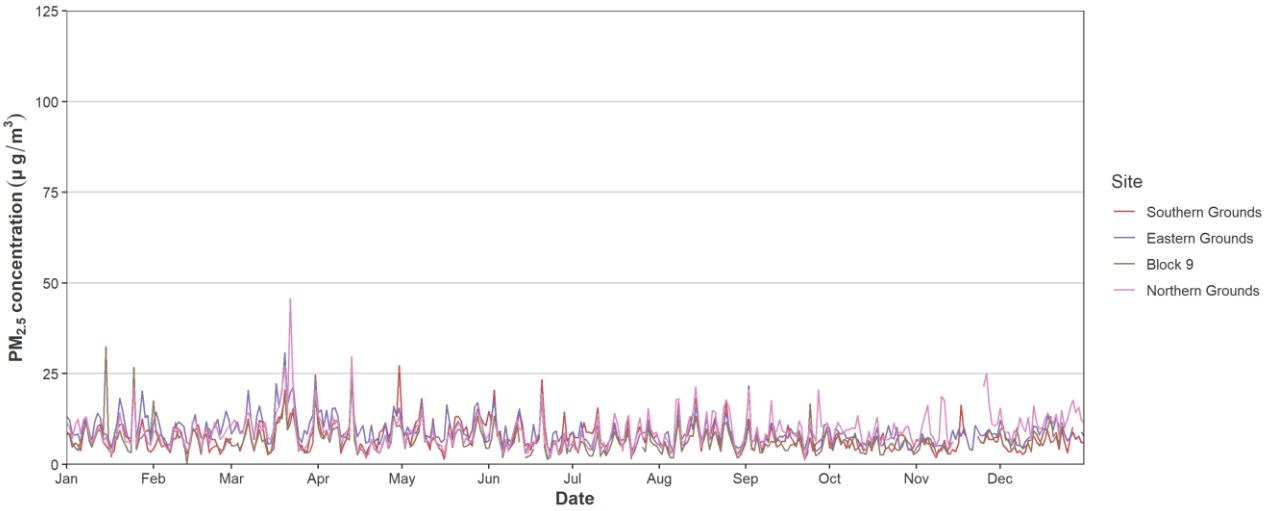

Figure 5 **24-hour average concentrations of $PM_{2.5}$ measured on-site during the reporting period**

3.3 Stack Particulate Management Plan

The data collected during the reporting period in accordance with the SPMP is summarised in Table 15. Timeseries of 1-hour rolling average and 24-hour average in-stack concentrations are presented Figure 6 and Figure 7, respectively.

The SPMP data shows the following:

- Data capture during the reporting period was above 97% for Stack 4A and 99% for Stack 4B. The data flatline from 18 February 2021 to 5 April 2021 observed in Figure 6 and Figure 7 correlates with the annual kiln shutdown period for maintenance. There were two other notable kiln shutdown periods, these being between 8 and 15 August and 26 September to 3 October, Most obvious in the plot for Stack 4A.
- The average particle concentration in Stack 4A (13 mg/Nm³) was considerably higher than Stack 4B (2 mg/Nm³). The maximum 1-hour rolling average concentration of particles of 231.8 mg/Nm³ was measured in Stack 4A.
- The 1-hour rolling average concentrations were relatively consistent throughout the reporting period. Exceptions include two large peaks above 100 mg/Nm³ for Stack 4A in June and August 2021, and some scattered peaks for Stack 4B in February, June, August, and later in the year between October and November 2021.

Table 15 **Summary of SPMP data collected during the reporting period (mg/Nm³)**

Stack	Avg period	Max	Min	Mean	99th %ile	95th %ile	Data capture
4A	1-hour	231.8	0.0	12.9	50.0	32.4	97%
	24-hour	53.6	0.0	13.0	34.1	24.7	97%
4B	1-hour	92.3	0.0	2.0	20.3	7.8	100%
	24-hour	10.3	0.0	2.0	8.5	5.7	99%

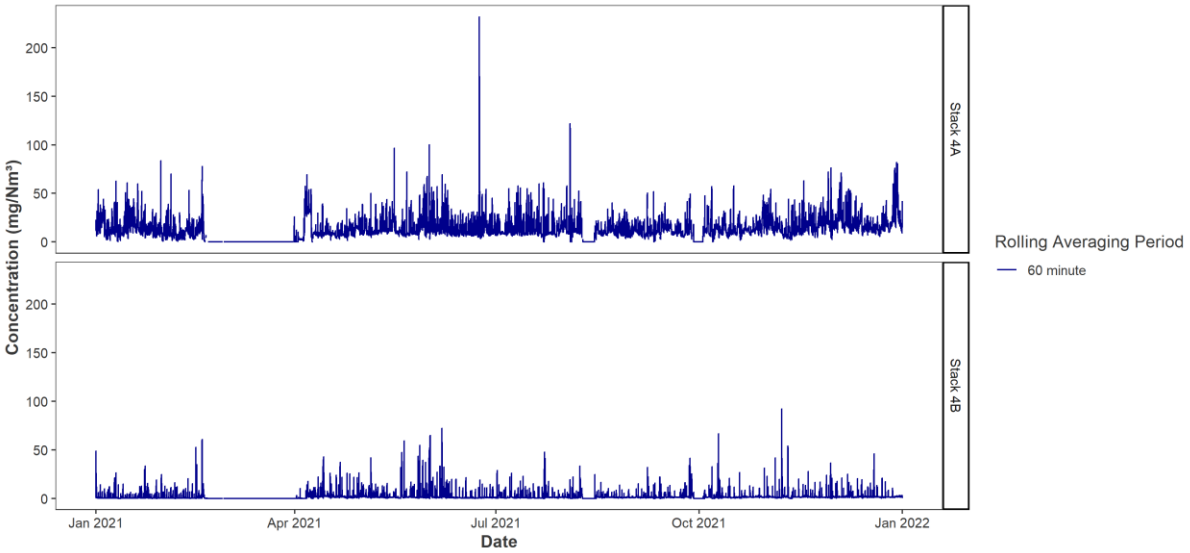

Figure 6 **Rolling 1-hour average in-stack particulate matter concentrations (mg/Nm³) measured at Stacks 4A and 4B during the reporting period**

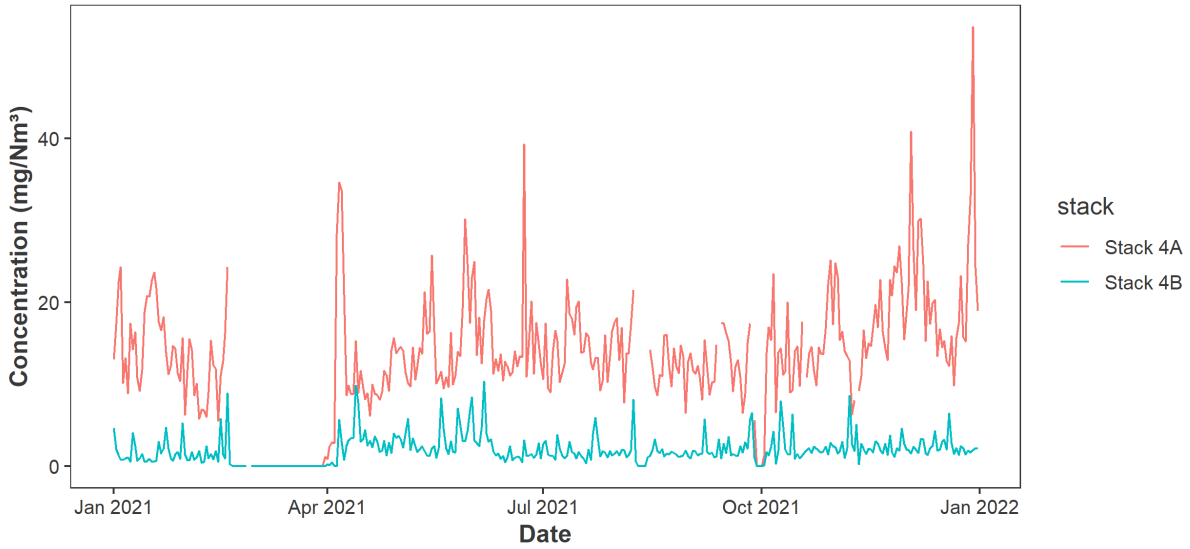

Figure 7 **24-hour average in-stack particulate matter concentrations (mg/Nm³) measured at Stacks 4A and 4B during the reporting period**

3.4 Meteorology

Forecast and observed meteorological data is provided by the Dark Sky data service. A timeseries of hourly average meteorological observations for the reporting period is presented in Figure 8. A review of the Dark Sky data service was undertaken in July 2019 and it was recommended for continued use.

Meteorological data is also collected at each of the dust monitoring locations. The distribution of wind speed and wind direction measured at each monitor is presented as a wind rose in Figure 9.

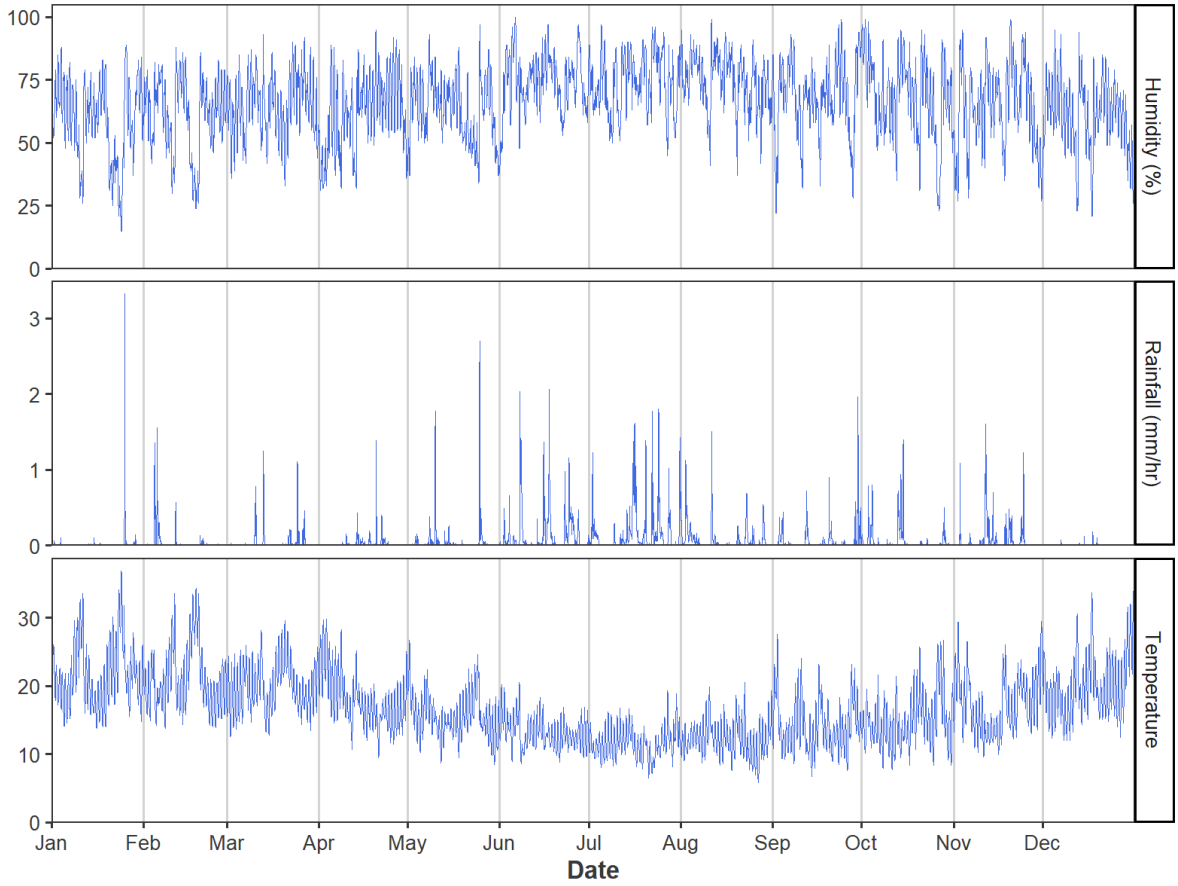

Figure 8 Meteorological observations for Birkenhead during the reporting period

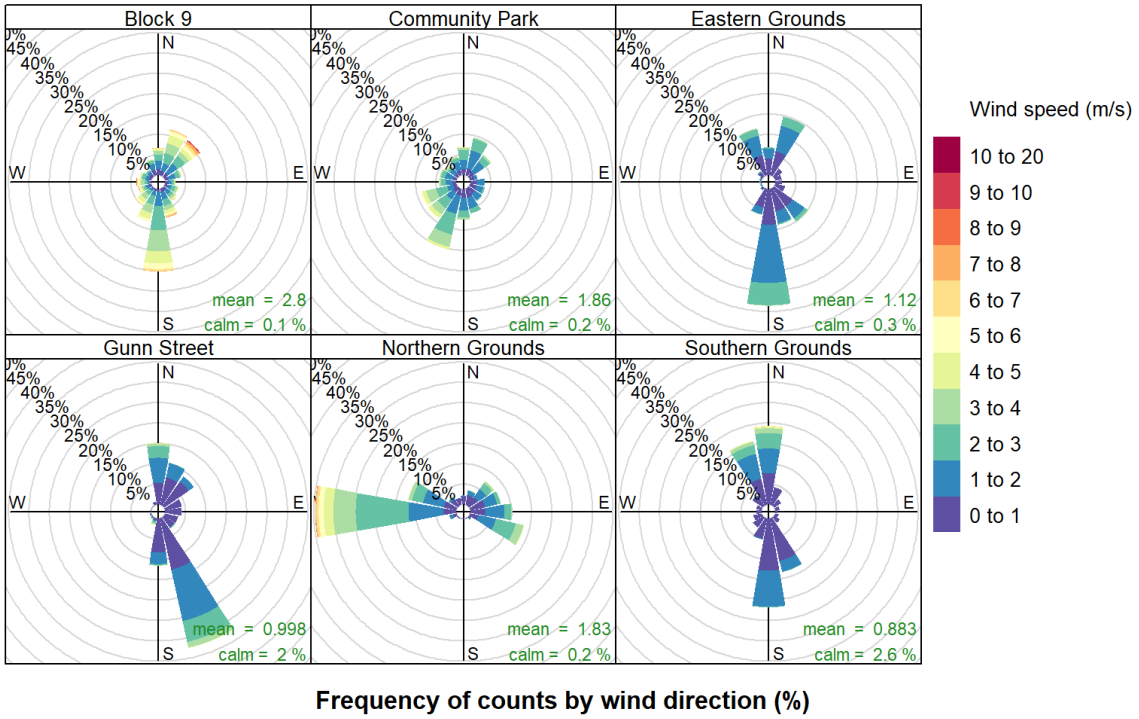

Figure 9 **Distribution of wind speed and direction measured at ABC monitoring sites during the reporting period**

3.5 EPA monitoring

The closest EPA monitoring site to ABC's Birkenhead facility is Le Fevre 1. The 24-hour average concentrations of PM_{10} and $PM_{2.5}$ collected at Le Fevre 1 during the reporting period are shown in Figure 10 and Figure 11, respectively. Concentrations of PM_{10} and $PM_{2.5}$ measured at the other monitors within the EPA network are also shown in the figures as grey lines to provide the context of regional dust levels.

The data shows that:

- 24-hour average concentrations of PM_{10} at Le Fevre 1 exceeded the EPA criterion of 50 µg/m³ on several occasions during the reporting period. These occasions appear to be regional events, as there are corresponding spikes at other sites in the EPA network at these times. Exceedances occurred in February, April, May, and September 2021.
- Recorded exceedances on 13 April 2021 and 24-25 May 2021 were the result of dust storms, while intense bushfires and high-speed winds affected the Adelaide area on 2 September 2021. The cause of the February exceedance is unknown but does not correspond to any exceedances or elevated readings from the onsite or offsite monitors (Section 3.2).

24-hour average concentrations of $PM_{2.5}$ at Le Fevre 1 did not exceed the EPA criterion of 25 µg/m³ during the reporting period.

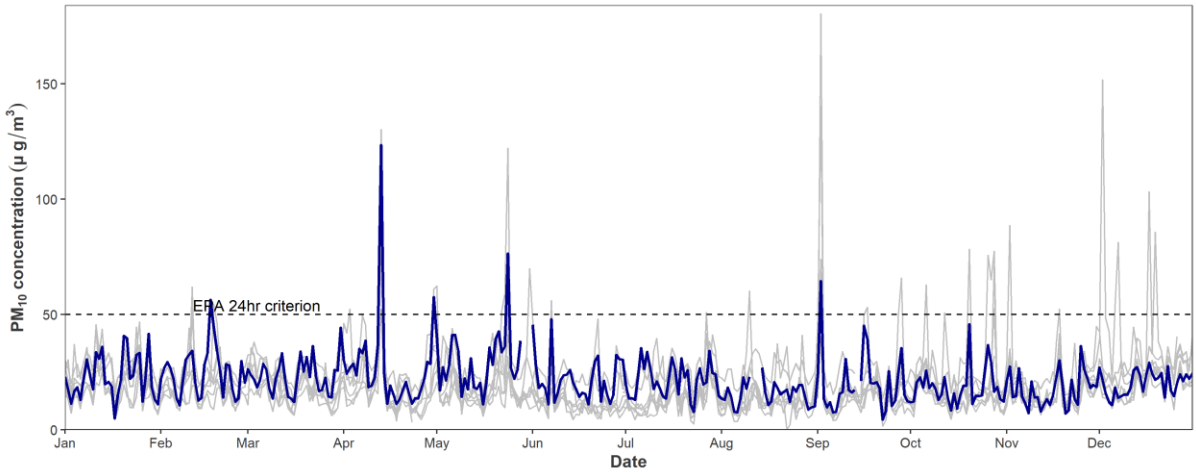

Figure 10 **24-hour average concentrations of PM_{10} recorded at Le Fevre 1 (blue) and other EPA monitoring sites (grey) during the reporting period**

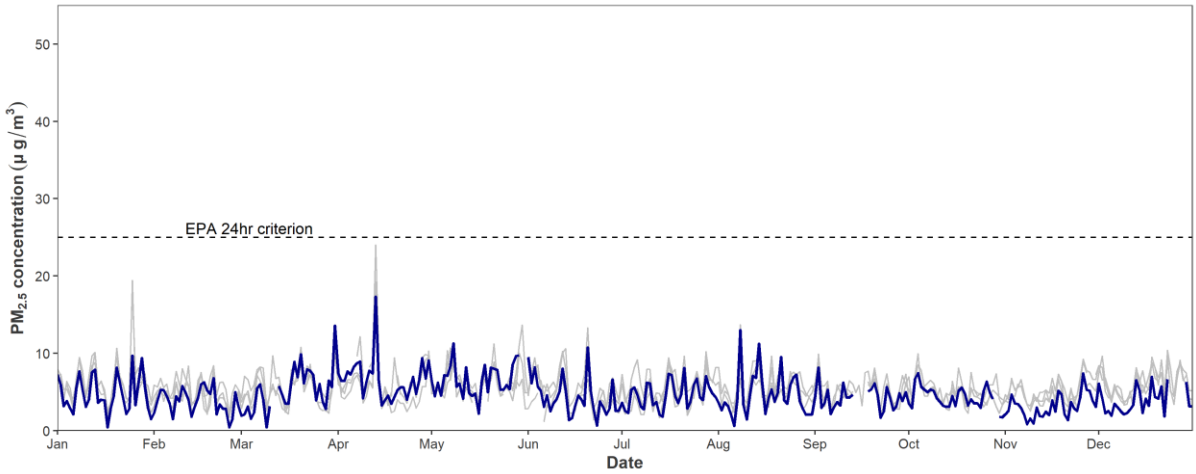

Figure 11 **24-hour average concentrations of $PM_{2.5}$ recorded at Le Fevre 1 (blue) and other EPA monitoring sites (grey) during the reporting period**

4. COMPLAINTS

There were 37 complaints relating to dust made during the reporting period; these are detailed in Table 16. This is an increase in comparison to the 22 dust-related complaints generated in 2020.

It should be noted that dust complaints often relate to a gradual build-up of dust, so the day of the complaint does not necessarily relate to the day of the dust emissions that led to the complaint. This is acknowledged as a limitation to some of the analysis presented in Section 5. However, there were 8 complaints on 19 October 2021, which were related to emissions from a hole in an elevated piece of equipment at the Facility that was discovered on this day. Measured 24-hour average PM_{10} and $PM_{2.5}$ concentrations at all on-site and off-site monitors were low on this day, at no more than 40% of the respective objectives.

Table 16 Dust complaints made during the reporting period

Date	Complaint description	Direction from Site	Distance from Site (km)
8/01/2021	Resident called reporting cementitious deposits on pergola relating to a filter bag failure in 2017 – only just discovered these deposits	WNW	1.39
4/03/2021	Build up of cement dust on vehicles	WNW	0.41
9/03/2021	Dust on car - looking for car wash voucher.	WNW	0.46
22/03/2021	Worker observed dust emissions from ABC site on arrival for night shift at Viva Energy	N	0.00
6/04/2021	Dust on car	WNW	0.35
6/04/2021	Dust on windows and solar panels	Undefined	0.00
7/04/2021	Resident complained about dust on vehicle - in the last few days can't remove it	WNW	0.50
27/04/2021	Car covered in dust on weekend	Undefined	0.00
9/05/2021	Dust fall out on her car on the weekend and dust on son's car which has not been washed for a while	W	0.38
28/05/2021	Gritty dark clinker like dust on vehicle	W	0.39
1/06/2021	Complaint of cement dust on cars	WNW	0.41
2/06/2021	Dust on car would not come off in brush wash	W	0.31
3/06/2021	Resident rang to say he had dust on air conditioner	W	0.37
5/06/2021	Dust on car	W	0.38
13/06/2021	Dust on car	W	0.63
8/08/2021	ESCL#1506 dust on car again	Undefined	0.00
9/08/2021	Dust landing on her car and washing every day	WSW	0.42
22/08/2021	Concrete dust on car	SW	0.52
24/08/2021	Resident rang re dust fall out on her car	WSW	0.42
1/09/2021	Dust on car	Undefined	0.00
8/09/2021	Dust on car - can't clean off	WSW	0.55
13/09/2021	Resident is sick of grey dust landing on her front porch and windows each day	Undefined	0.00
13/09/2021	Dust on car	Undefined	0.00
16/09/2021	Dust on car.	NW	0.64
17/09/2021	Has noticed fine white dust in the last 2 weeks, last night there was a reasonable deposit on car	WSW	0.55
19/10/2021	White dust on car	Undefined	0.00
19/10/2021	ESCL#1531 white powder dust on cars this morning	WNW	0.92
19/10/2021	ESCL#1530 dust on car	WNW	1.11

Date	Complaint description	Direction from Site	Distance from Site (km)
19/10/2021	ESCL#1529 dust on vehicles immediate callback	Undefined	0.00
19/10/2021	ESCL#1528, Car covered in soot was there an incident last night?	W	0.77
19/10/2021	ESCL# 1527 Ash on cars caused damage	Undefined	0.00
19/10/2021	ESCL# 1526 dust on car, covered in dust this morning	WNW	1.07
19/10/2021	ESCL# 1525 Dust on car	Undefined	0.00
1/11/2021	Dust on car	WNW	0.46
12/11/2021	Dust on verandah - has been an issue over the last few weeks	W	0.37
29/11/2021	Resident rang about dust on car	WNW	0.35
10/12/2021	ESC # 1551 Dust on resident's car	Undefined	0.00

5. TARP EFFECTIVENESS

The data analysis detailed in Section 3 shows that there were 1,138 trigger alerts during the reporting period of 365 days, comprised of:

- 608 low trigger alerts
- 408 medium trigger alerts
- 122 high trigger alerts.

The majority of trigger alerts (60%) were generated from Northern Grounds and Eastern Grounds with the remaining trigger alerts (40%) from Southern Grounds, Block 9, forecast meteorology and on-site meteorological observations. It must be remembered that trigger alerts are not necessarily a result of emissions from the Facility; they can be caused by a variety of factors, including meteorological forecasts and regional dust episodes.

In response to the 1,138 trigger alerts, ABC undertook 3,807 actions, or, on average, approximately 4 actions per trigger alert. This is a reduction in the number of actions per trigger compared to the previous reporting period (1 January 2020 to 31 December 2020).

The relationship between daily trigger alert numbers (the coloured boxes) and complaints (dashed lines) is investigated in Figure 12. Some complaints occur at times when no, or few, trigger alerts have been generated, suggesting that it is unlikely that these complaints are associated with emissions from the Facility. However, some complaints, such as those in April, June, August and September, do appear to coincide with periods of frequent trigger level exceedances. As has been mentioned previously, these triggers could relate to regional dust episodes or other factors, and do not necessarily indicate that the Facility is the source of the dust emissions that have led to the complaints. What this does suggest is that the triggers are likely effective in identifying certain conditions that could lead to dust complaints, and should in turn through the actions and responses taken by ABC staff reduce the likelihood of the Facility contributing to the causes of the complaints. There tend to be more low and medium triggers on days with complaints than high triggers, which could be taken to mean that actions taken to address these triggers are preventing escalation to the point where high triggers occur.

The GLPMRP data for off-site monitors presented in Section 3.2 shows that, during the reporting period, there was one exceedance of the 24-hour average $PM_{2.5}$ criterion at Community Park, and one of the 24-hour average PM_{10} and $PM_{2.5}$ criteria at Gunn Street. Timeseries of 24-hour average concentrations of PM_{10} at the off-site monitors are shown in Figure 13, with the dust complaint dates marked as vertical dashed lines. Figure 13 shows that the highest measured concentrations did not tend to correlate with complaints being generated. However, some complaints were generated at times of elevated measured concentrations, specifically one in March, two in April and several in June, August and September.

It is relevant to note that complaints may not reflect specific elevated dust events, instead reflecting extended periods of low levels of dust accumulating over time. This possibility may indicate a cumulative combination of broader dust sources, as measured by the EPA monitoring network (Figure 10 and Figure 11), in combination with on-site operations. However, given that many of the elevated particulate concentrations recorded by the EPA monitoring network are not observed at the Community Park, Gunn St or on-site monitors, and considering the proximity of complaints to the site being largely less than 1 km and the prevalence of their concerns pertaining to white dusts which are difficult to remove, a local dust source being at least a contributor to the cause of these complaints is likely.

Figure 14 provides the 1-hour average concentration of PM_{10} at the Community Park and Gunn St off-site monitoring sites during the reporting period, along with the rolling 1-hour average in-stack concentrations of particulate matter (mg/m³) from Stacks 4A and 4B. High trigger alerts are identified with a grey vertical marker in Figure 14 and their density is shown in Figure 15. Figure 16 plots measured concentrations in the stack against measured concentrations at the nearby ambient air quality monitors, to see if there is a relationship between the two (i.e. whether the stack emissions appear to influence ambient concentrations).

The figures show that:

- Although high trigger alerts regularly do not correspond with elevated PM_{10} concentrations at the off-site monitoring locations, the majority of actual elevated PM_{10} events were also covered by a high trigger alert.
- The highest PM_{10} levels recorded at both Community Park and Gunn Street did not coincide with high in-stack concentrations.
- The highest in-stack PM_{10} level recorded in June 2021 at Stack 4A does not coincide with high off-site concentrations at Community Park or Gunn Street.
- The lack of a positive relationship between stack particulate emissions concentrations and ambient concentrations in Figure 16 suggests that the stack emissions have little influence on local particulate concentrations.

Taken as a whole, these results indicate that the TARP is working effectively in maintaining dust levels off-site within guideline values. The large number of alerts, particularly high alerts, not correlated with elevated off-site concentrations or complaints indicates that dust controls are being applied effectively, but also suggests that the trigger levels may be too low, generating alerts and actions when none are required. Revision of the trigger levels could be investigated, but this would risk increasing off-site impacts and thus would not be worthwhile unless the current TARP is overly onerous.

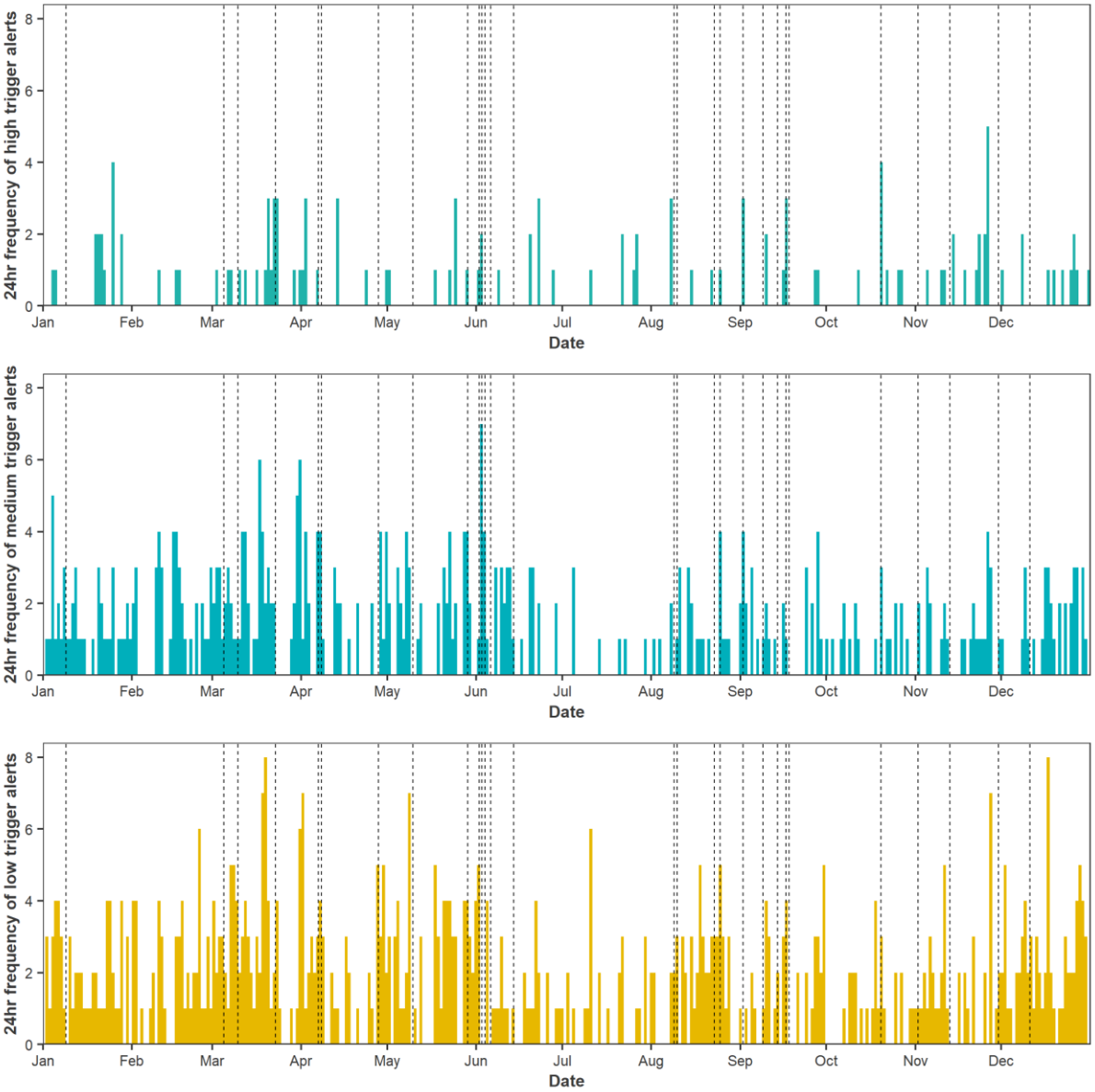

Figure 12 Trigger alerts and complaints during the reporting period

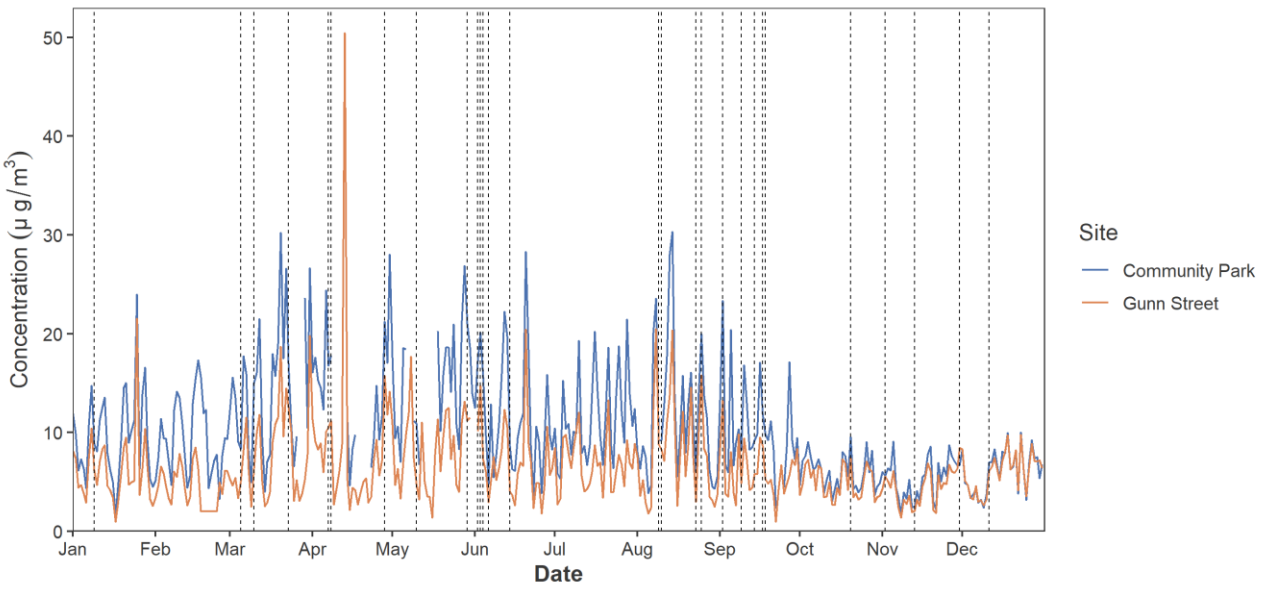

Figure 13 **Dust complaints reported (vertical dashed lines) and corresponding 24-hour average concentration of PM_{10} (µg/m³) at the off-site monitoring stations**

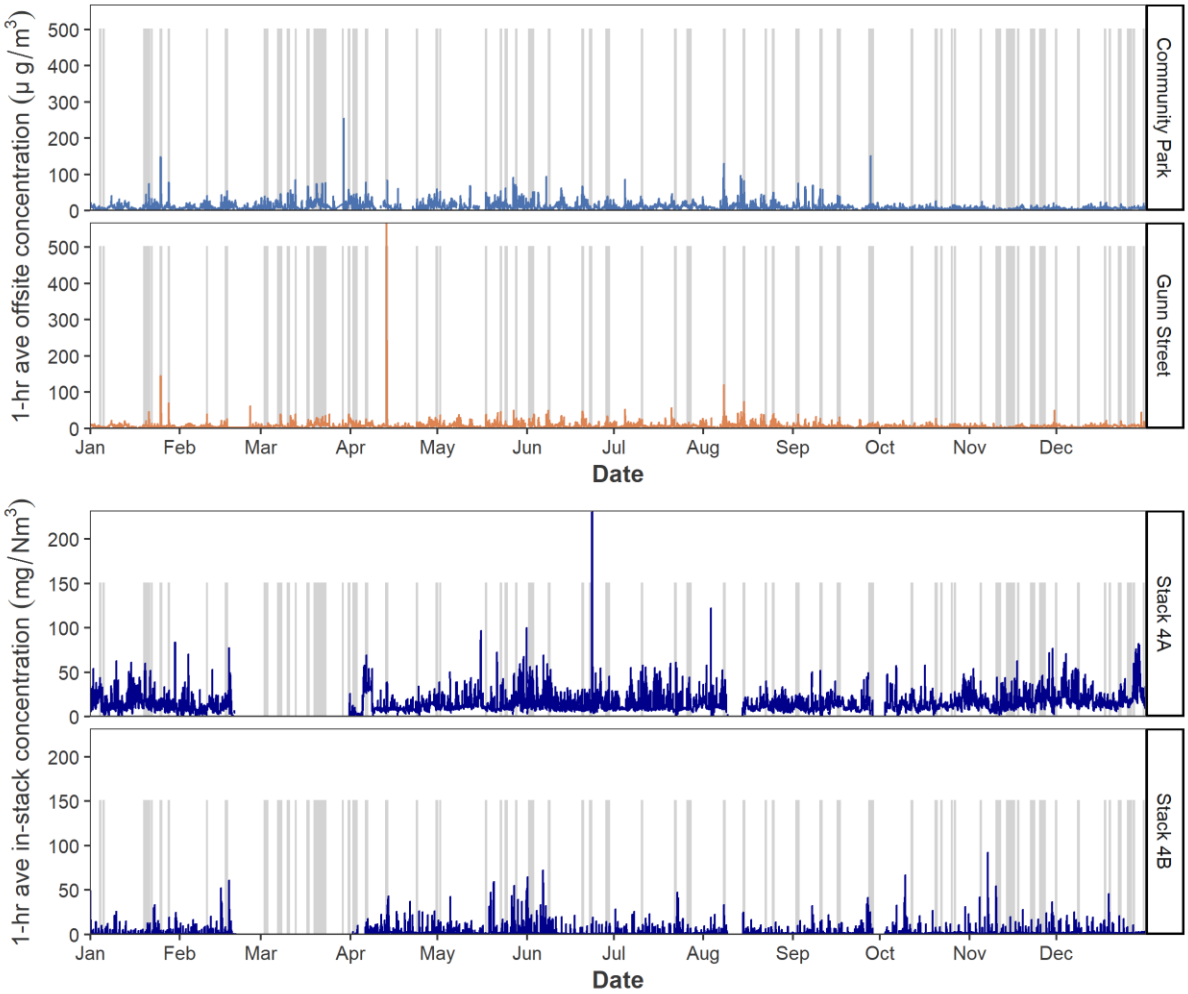

Figure 14 **1-hour average concentration of PM_{10} (µg/m³) at off-site monitoring sites and rolling 1-hour average in-stack particulate matter concentrations (mg/Nm³) from Stacks 4A and 4B with periods of 'high' triggers marked in grey**

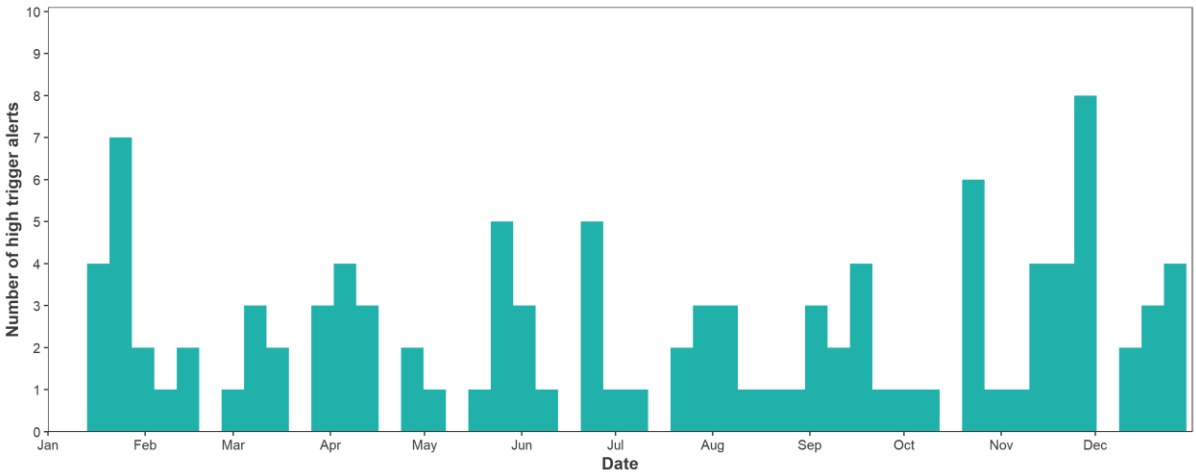

Figure 15 **Frequency of high trigger alerts during the reporting period**

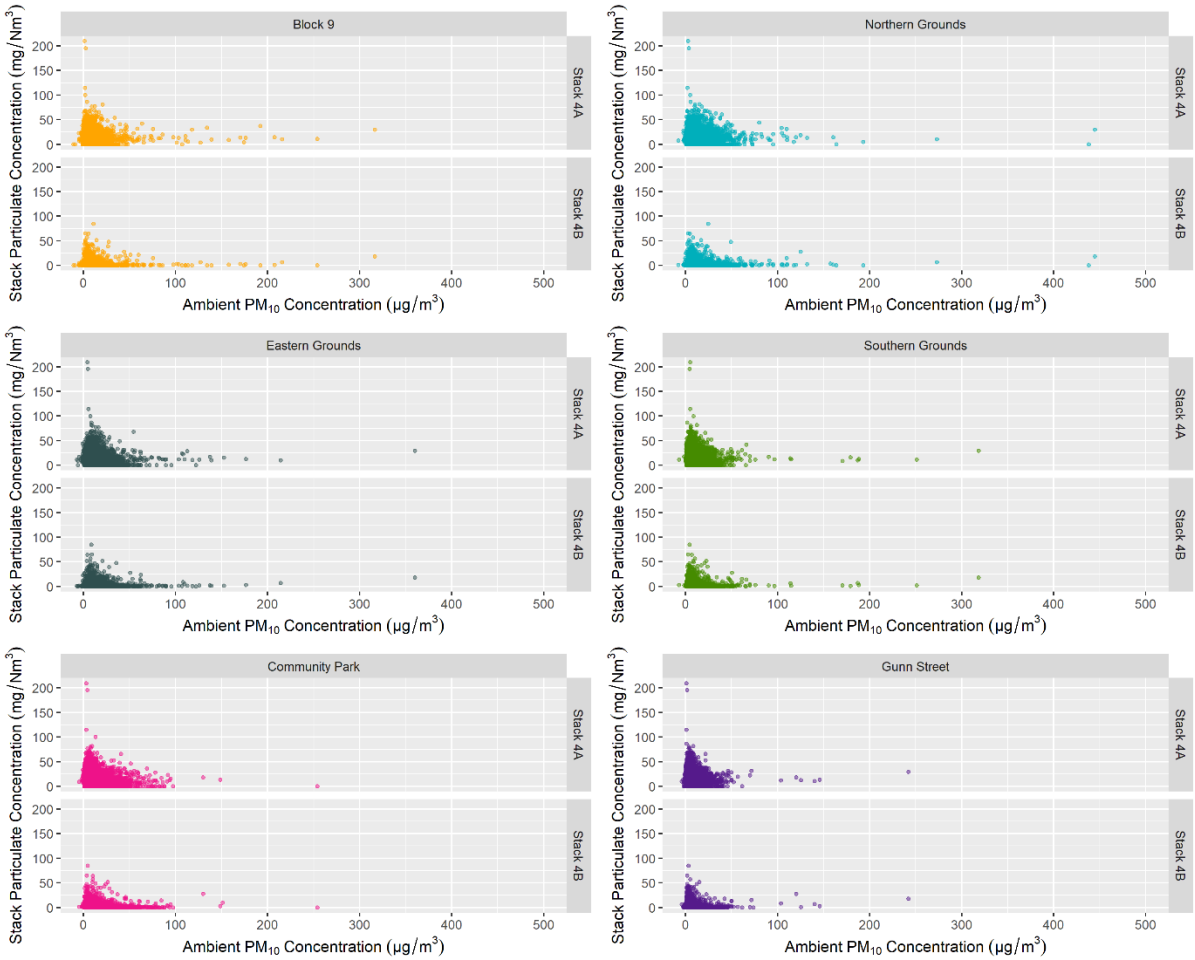

Figure 16 **Scatter plot of 1-hour average in-stack particulate matter concentrations (mg/Nm³) measured at Stacks 4A and 4B compared to 1-hour average ambient measurements at all on-site and off-site monitors for the reporting period**

6. CONCLUSIONS

Katestone Environmental Pty Ltd (Katestone) was commissioned by Adelaide Brighton Cement Ltd (ABC) to complete a review of the Trigger Action Response Plan (TARP) data collected for the period 1 January 2021 to 31 December 2021 inclusive (the reporting period).

The TARP is implemented and managed at ABC's Birkenhead facility through a Dust Management Dashboard operated in the Birkenhead Control Room. This includes receiving alerts that are triggered by monitoring data or observations of visible dust, analysis of air quality monitoring data, logging responses/actions and closing alerts. Analysis of the TARP data during the reporting period shows the following:

- A total of 1,138 triggers were recorded, including 608 low level triggers (53%), 408 medium level triggers (36%) and 122 high level triggers (11%).
- Low, medium and high level triggers occurred with decreasing frequency at all sites.
- The sites that generated the most triggers were Northern Grounds (391) and Eastern Grounds (299), followed by Meteorology – forecast (212), Southern Grounds (184) and Block 9 (48).
- No triggers were generated by visual observations and only four triggers were generated by meteorological observations during the reporting period.
- A total of 3,807 actions were taken, including 1,338 actions against low level triggers (35%), 1,605 actions against medium level triggers (42%) and 864 actions against high level triggers (23%).
- The most actions were generated by Meteorology - forecast (1,373), Northern Grounds (1,053) and Eastern Grounds (730), followed by Southern Grounds (487), Block 9 (134) and Meteorology - observations (30).
- On average, approximately 4 separate actions were performed for every trigger. This is a reduction in the number of actions per trigger compared to the previous reporting period (1 January 2020 to 31 December 2020).
- Although high trigger alerts regularly do not correspond with elevated PM_{10} concentrations at the off-site monitoring locations the majority of actual elevated PM_{10} events were also covered by a high trigger alert.
- The highest PM_{10} levels recorded at both Community Park and Gunn Street did not coincide with high in-stack concentrations, and the highest in-stack PM_{10} level recorded in June 2021 at Stack 4A did not coincide with high off-site concentrations at Community Park or Gunn Street.
- The lack of a positive relationship between stack particulate emissions concentrations and ambient concentrations suggests that the stack emissions have little influence on local particulate concentrations.

Ambient concentrations of PM_{10} and $PM_{2.5}$ are measured through the Dust Management Dashboard. Analysis of the Ground Level Particulate Monitoring Program data collected during the monitoring period shows the following:

- The 24-hour average concentrations of $PM_{2.5}$ exceeded the relevant EPA criterion at Community Park monitoring site on one day (20-June-2021) during the reporting period, with a concentration of 26.5 µg/m³. Concentrations were elevated at all monitors on this day as a result of a regional dust event and any contribution from the Facility would have been very small.
- The 24-hour average concentrations of PM_{10} and $PM_{2.5}$ exceeded the EPA criteria at the Gunn Street monitoring site on one day (13-April-2021) during the reporting period, with respective concentrations of 50.4 µg/m³ and 34.0 µg/m³. Again, concentrations on this day were elevated at all sites, suggesting a regional dust episode to be the cause of this exceedance rather than emissions from emissions from the Facility. Adelaide and most of South Australia recorded wide ranging dust storms due to northern winds on the 13 April 2021.

- The highest on-site 24-hour average concentrations of PM_{10} and $PM_{2.5}$ were both recorded at Northern Grounds (72.4 µg/m³ and 45.7 µg/m³, respectively).
- It does not appear that on-site operations are significantly contributing to off-site particulate monitoring concentrations at Community Park or Gunn Street.

The analysis demonstrates that the TARP is working effectively to reduce off-site exceedances of particulates, despite persistence of dust complaints within an average proximity of 380 m. Compared to the number of off-site exceedances recorded for the previous reporting period (January 2020 – December 2020) which showed four PM_{10} and 22 $PM_{2.5}$ exceedances at Community Park and one PM_{10} and 14 $PM_{2.5}$ exceedances at Gunn Street, this report indicates a significant decrease. Although exceedances during the previous reporting period were likely largely attributable to bush fires, this reporting period shows in the absence of such events that very few exceedances occur off-site.

It is recommended to maintain the current trigger levels considering the low number of off-site exceedances observed throughout this reporting period and the risk of increased off-site impacts if trigger levels were increased.