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Stack Particulate Management Plan
Annual Stack Particulate Report

Period: 1 July 2020 – 30 June 2021

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

62 Elder Road, Birkenhead, SA 5015

EPA Licence number: **1126**

Date of Submission: **29 October 2021**

Version Number: **1**

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

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

Glossary

Term	Definition
µg/m3	micrograms per cubic metre
mg/m3	milligrams per cubic metre
m	metre
m^3	cubic metres
m^3/s	cubic metres per second
Nm^3	Gas volume in cubic metres at STP dry basis
Abbreviations	**Definition**
Air EPP	Environment Protection (Air Quality) Policy 2016
SA EPA	South Australian Environment Protection Authority
STP	Standard Temperature and Pressure (zero degrees Celsius and 101.3 kilo Pascals absolute)
TSP	Total Suspended Particulates
SPMP	Stack Particulate Management Plan

Monitoring Objective	All stack particulate emissions events for the reporting period, where levels have exceeded the reporting thresholds: • 100mg/Nm^3 (1 hour averaging period) on Kiln Stack 4A • 60 mg/Nm^3 (1 hour averaging period) on Precalciner Stack 4B An annual report will be prepared and submitted by the last day of October of each year that provides an analysis of the 1-hour particulate reporting events including: • A table detailing the number and cause of reporting events for Kiln Stack 4A and Precalciner Stack 4B • A trend analysis of magnitude and duration of 1-hour notifications on a time series graph for each stack • A trend analysis of community complaints by type against 1-hour reporting events by cause on a time series graph for each stack • A table comparing the number of 1-hour reporting events by cause for the current and previous year • Identification of opportunities for improvement to decrease the frequency, duration and magnitude of 1-hour reporting events
Monitoring Plan	This monitoring report has been prepared in line with the objectives of the Stack Particulate Management Plan approved on 18 June 2018 by the South Australian EPA. The Plan is available on the ABC Birkenhead Community Website: http://www.birkenheadcommunity.com.au

4A Stack - Summary of 1-hr Reporting Events for the period 1/7/2020 to 30/06/2021

The table below provides a summary of 1-hr reporting events (stack particulates levels exceeding 100 mg/Nm^3 (1 hour averaging period))

Date	Time start	Time finish	Duration (min)	Magnitude mg/Nm3	Cause	Immediate Actions Taken	Actions Taken to Prevent a Reoccurence
15/11/2020	15:54	16:34	40	137	4A conditioning tower spray pump failed, during 4A Mill outage for maintenance, resulting in higher than desirable temperatures into the electrostatic precipitator resulting in elevated emissions.	Restarted 4A Mill, to reduce emissions. Repaired the pump impellor.	This issue has not occurred before Maintain existing maintenance and inspection program
31/05/2021	21:16	21:26	10	100.1	Automatic safety trip on the kiln, in response to a failure of the inlet temperature sensor on the Bypass ESP.	Replaced temperature sensor and restarted kiln	Maintain existing maintenance and inspection program
23/06/2021	11:16	14:16	180	232	Blockage in bypass system occurred during 4A Mill shutdown resulting in reduced flow, temperature and performance in the Bypass ESP.	Cleared Bypass system blockage	This was a rare event. Maintain existing cleaning program

4B Stack - Summary of 1-hr Reporting Events for the period 1/7/2020 to 30/6/2021

The table below provides a summary of 1-hr reporting events (stack particulates levels exceeding 60 mg/Nm^3 (1 hour averaging period))

Date	Time start	Time finish	Duration (min)	Magnitude mg/Nm3	Cause	Immediate Actions Taken	Actions Taken to Prevent a Reoccurence
27/10/2020	17:35	17:48	13	65.1	4B Mill off for extended period for maintenance which resulted in higher than desirable temperatures into the electrostatic precipitator resulting in elevated emissions	Maximised conditioning tower cooling sprays and reduced process feed rates to reduce temperatures until 4B Mill could be restarted	Operate to Process control Standards
10/11/2020	14:30	14:56	26	68.4	4B Mill off for extended period which resulted in higher than desirable temperatures into the electrostatic precipitator resulting in elevated emissions	Restarted 4B mill to reduce emissions	Operate to Process control Standards
13/11/2020	11:36	12:02	26	72.8	4B Mill off for extended period which resulted in higher than desirable temperatures into the electrostatic precipitator resulting in elevated emissions	Restarted 4B mill to reduce emissions	Operate to Process control Standards
14/11/2020	11:29	12:20	51	84	4B Mill off for extended period which resulted in higher than desirable temperatures into the electrostatic precipitator resulting in elevated emissions	Restarted 4B mill to reduce emissions	Operate to Process control Standards
18/02/2021	0:28	1:12	0:00	19:12	Kiln and Calciner - Emergency stop activated in response to a Kiln shell hot spot	Hot spot inspection indicated refractory failure in a small section of the Kiln. Cool down of Kiln and annual plant shutdown commenced.	Refractory replacement on annual plant shutdown.
01/06/2021	6:18	6.35	17	65.1	Short term electrical instability in 4B ESP fields on start-up of the calciner following a kiln trip.	ESP field stabilised	Cause of Instability unknown
06/06/2021	12:16	13:01	45	73.2	4B Mill tripped (unforeseen sudden stop), upsetting 4B draft, resulting in a Calciner trip.	Trip required purge and restart of the Calciner.	Operate to Process Control Standards

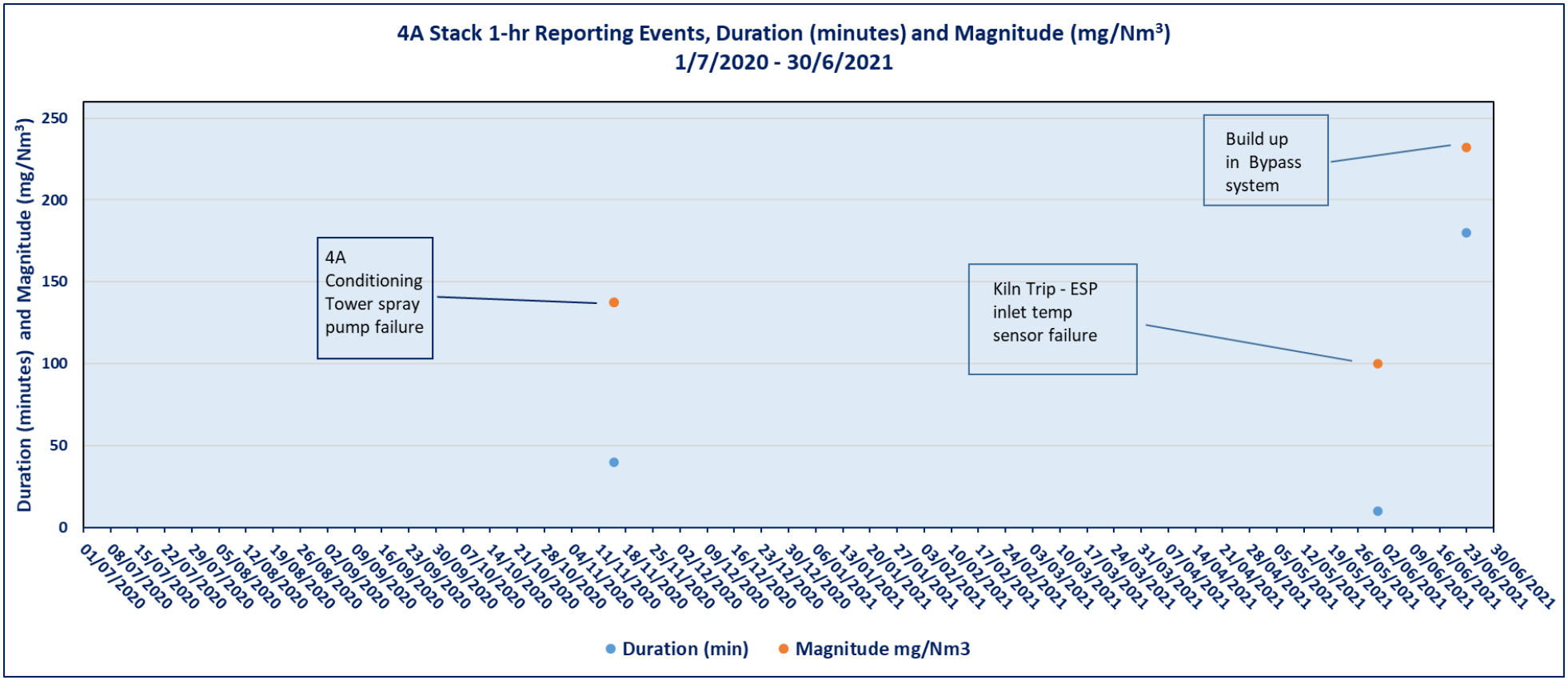
Stacks 4A and 4B - Number and Cause of 1- hour Reporting Events - 1/7/2019 – 30/6/2020

The number of reporting events by cause for each stack is summarised in the table below.

Stack	Cause of 1-hr Reporting Event	Number of 1-hr reporting events current year 1/7/2020 to 30/6/2021
4A	Excess build-up within the Bypass process	1
	Erratic ESP Performance - unknown cause	1
	4A Conditioning Tower spray pump failed	1
	Total Number of Reporting Events	**3**
4B	4B Mill off for extended period	4
	Kiln and Calciner - Emergency stop activated in response to a Kiln shell hot spot	1
	4B Mill tripped (unforeseen sudden stop), upsetting 4B draft, resulting in a Calciner trip.	1
	Short term electrical instability in 4B ESP fields on start-up of the calciner following a kiln trip.	1
	Total Number of Reporting Events	**7**

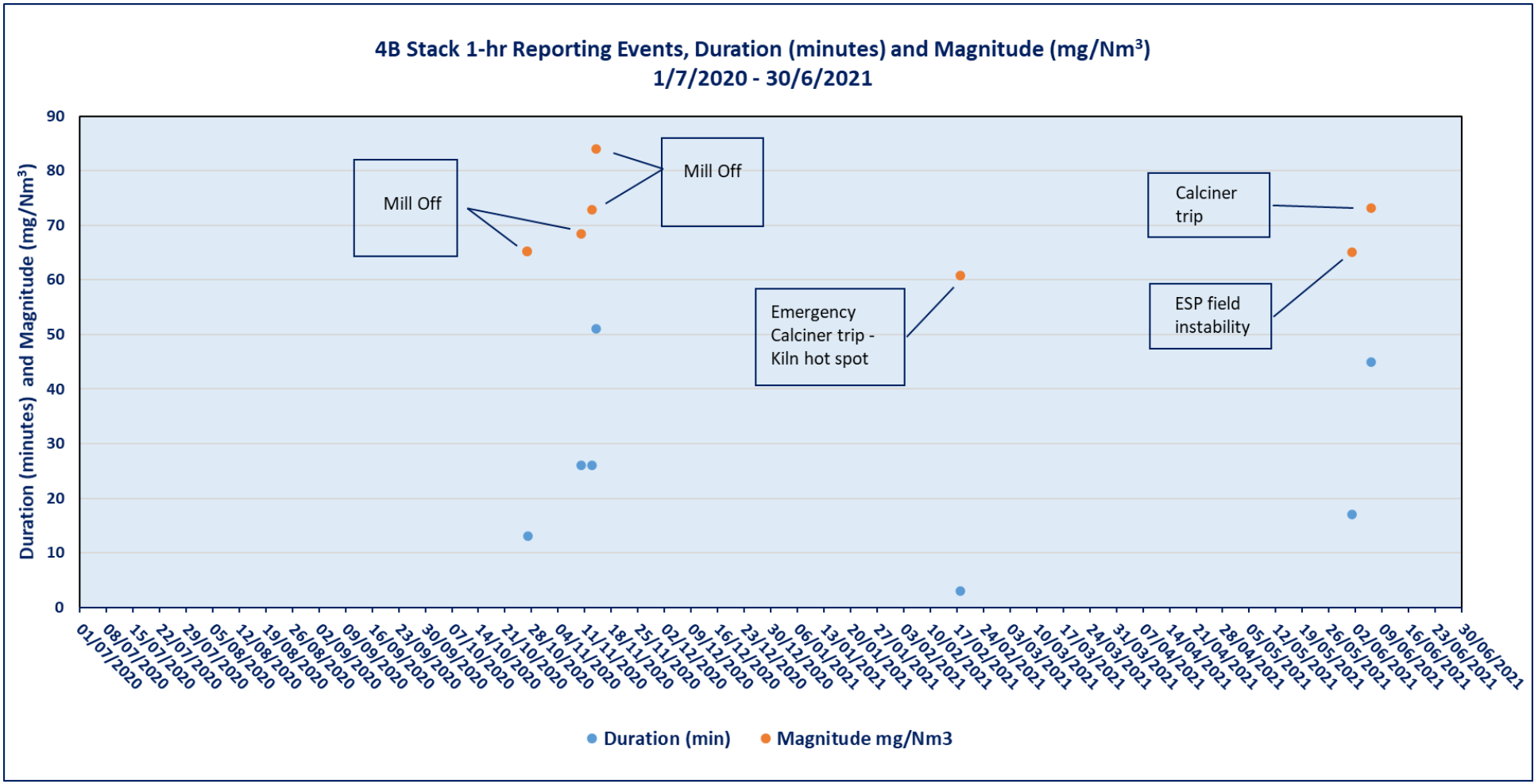
Trend Analysis of Magnitude and Duration of 1-hr Reporting Events between 1/7/2020 to 30/6/2020

4A Stack:



There were 3, 1-hr reporting events for the year.

4B Stack:



There were 7, 1-hr reporting events for the year.

Trend Analysis of Community Complaints by Type against 1-hr Reporting Events

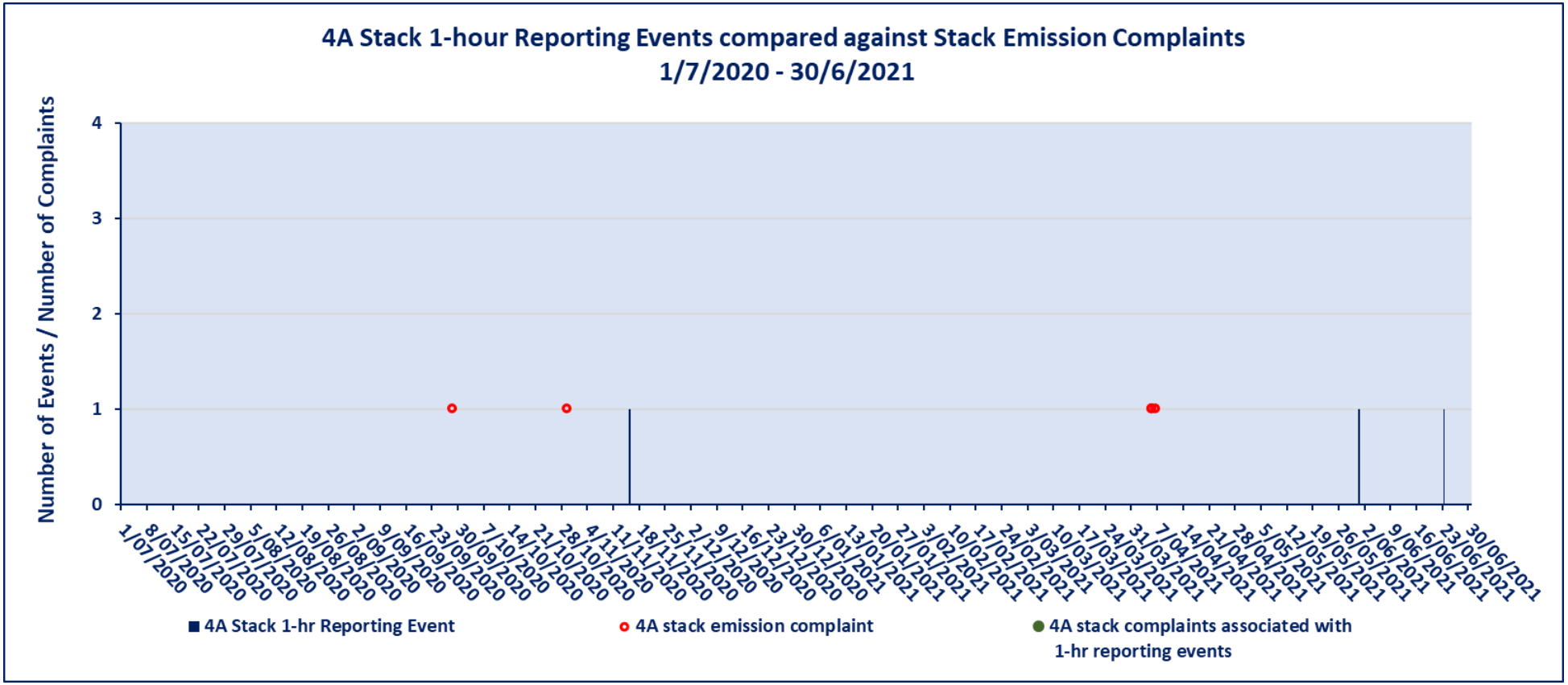
The table below captures community complaints by type and stack 1-hr reporting events for the period 1/7/2020 to 30/06/2021

Date	Time	4A Stack 1-hr Reporting Event	4B Stack 1-hr Reporting Event	4A stack emission complaint	4B stack emission complaint	4A stack complaints associated with 1-hr reporting events	4B stack complaints associated with 1-hr reporting events	Dust Complaint
2/07/2020	17:43							1
17/07/2020	09:50							1
17/07/2020	11:00							1
27/07/2020	11:00							1
27/07/2020	14:20							1
31/07/2020	10:06							1
14/08/2020	12:28							1
17/08/2020	15:18							1
21/08/2020	13:30							1
28/08/2020	15:00							1
28/09/2020	12:30			1				
27/10/2020	5:48		1					
29/10/2020	18:15			1				1
10/11/2020	14:56		1					
13/11/2020	12:02		1					
14/11/2020	12:20		1					
15/11/2020	16:34	1						
8/01/2021	10:00							
18/02/2021	2:05		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				1
5/04/2021	21:20			1				
6/04/2021	21:48				1			
6/04/2021	11:26							1
6/04/2021	14:52							1
7/04/2021	11:00							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	6:35		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
23/06/2021	14:16	1						

Legend
Stack 1-hr reporting event
Stack emissions complaint
Dust complaint

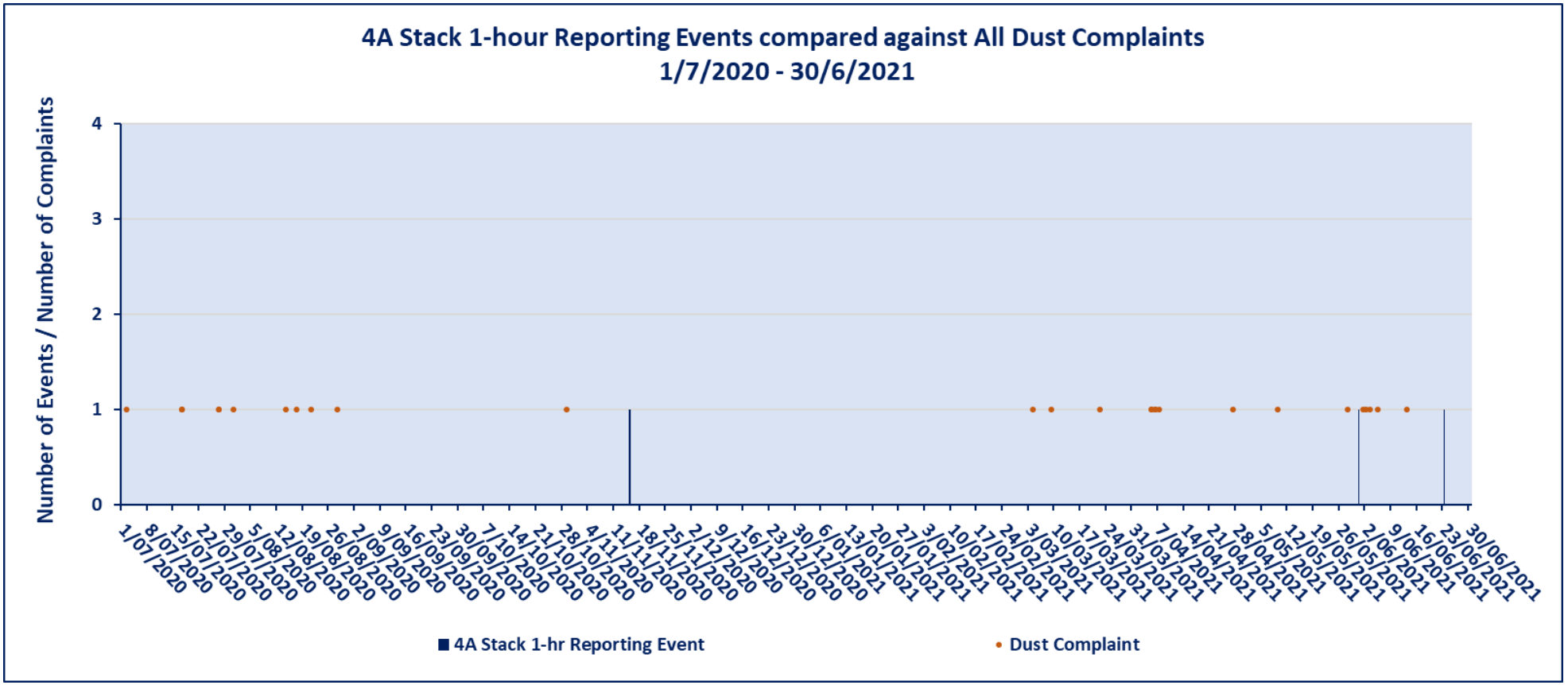
The above data is plotted on the following time series graphs for each stack.

4A Stack:



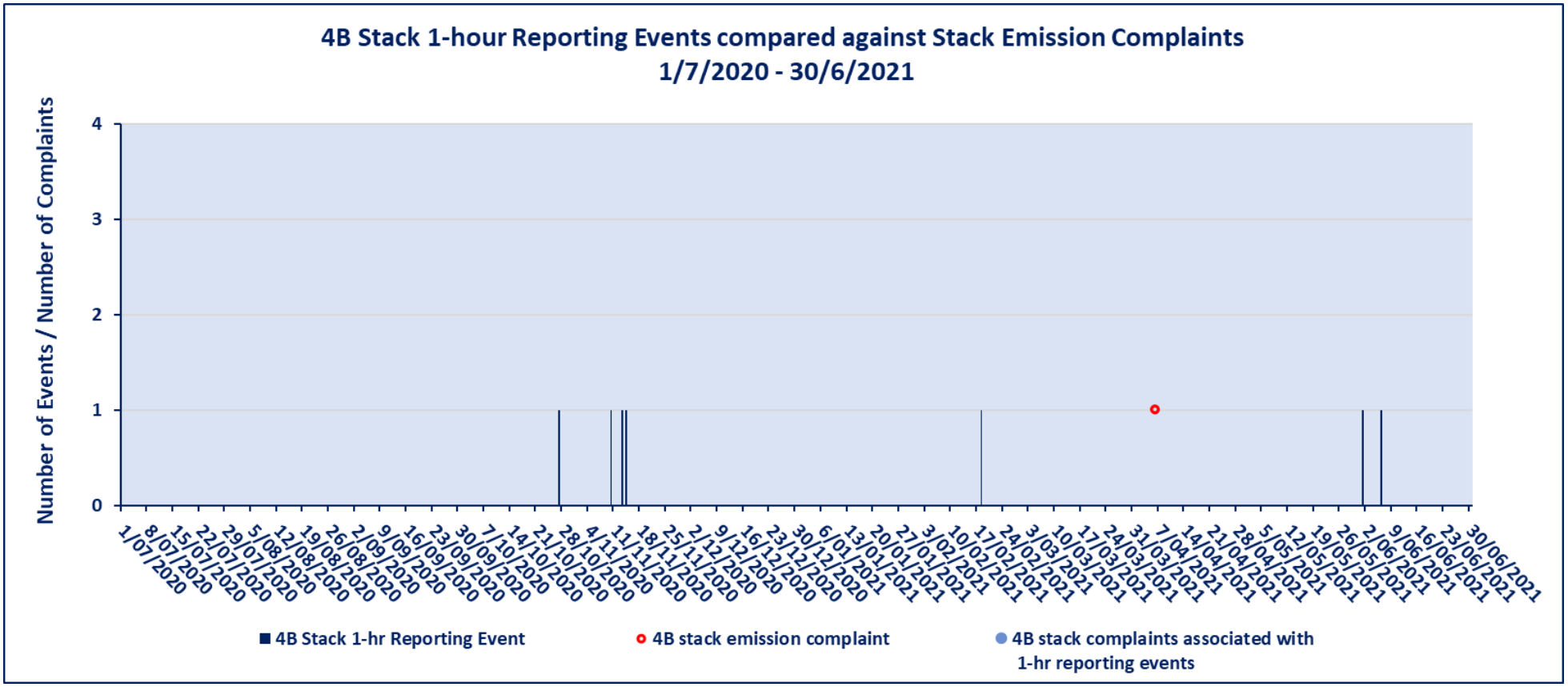
Stack emission complaints did not coincide with 4A stack 1-hr reporting events.

4A Stack:



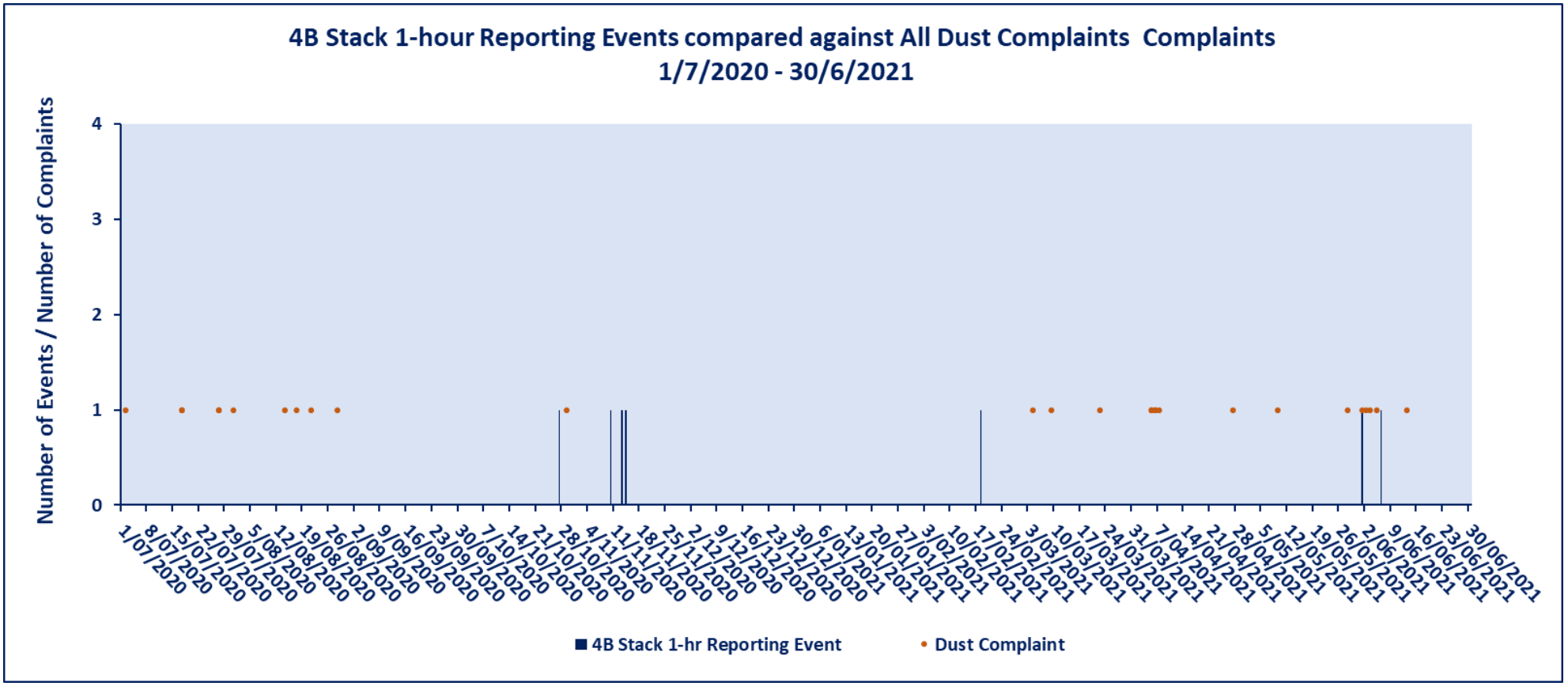
Dust complaints did not coincide with 4A stack 1-hr reporting events, indicating dust complaints are not related to stack emissions.

4B Stack:



Stack emission complaints did not coincide with 4B stack 1-hr reporting events.

4B Stack:



Dust complaints did not coincide with 4B stack 1-hr reporting events, indicating dust complaints are not related to stack emissions.

Stacks 4A and 4B - Comparison of current and previous year 1-hr reporting events - by cause and number

The table below details the number and cause of 1-hr reporting events for both stacks, for the current and previous reporting year.

Stack	Cause of 1-hr Reporting Event	Type of 1-hr Reporting Event	Number of 1-hr reporting events 1/7/2019 - 30/6/2020	Number of 1-hr reporting events current year 1/7/2020 - 30/6/2021
4A	Excess build-up within the Bypass process	Process related	2	1
	Erratic ESP Performance - unknown cause	Process related	1	0
	Automatic safety trip on the kiln, in response to a failure of the inlet temperature sensor on the Bypass ESP.	Equipment related	0	1
	4A conditioning tower spray pump failed	Equipment related	0	1
	Total Number of Reporting Events		**3**	**3**
4B	4B Mill off for extended period	Process related	2	4
	4B Mill tripped (unforeseen sudden stop causing upset process conditions)	Process related	0	1
	VVF drive fault occurred on 4B Raw feed conveyor during 4B mill start up sequence, preventing 4B conditioning tower sprays to come on.	Equipment related	1	0
	The event occurred after the calciner tripped on high exit pressure. The increase in particulate emissions occurred as a result of increased flow required to safely perform fault finding and remove a metal pole, that was found lodged in the dust flap below 4B cyclone.	Process related	1	0
	The event occurred as a result of an electrical fault on 4B ESP field 3, which resulted in loss of that field, with resulting increase in particulate emission. The root cause of the problem was a failed cartridge fuse switch and associated cabling on the ESP switchboard.	Equipment related	1	0
	Erratic ESP Performance - unknown cause	Process related	1	0
	Kiln and Calciner trip- Emergency stop activated in response to a Kiln shell hot spot	Equipment related	0	1
	Short term electrical instability in 4B ESP fields on start-up of the calciner following a kiln trip.	Process related	0	1
	Total Number of Reporting Events		**6**	**7**

The data above shows similar levels in 1-hr reporting events between the two reporting years

Identification of opportunities to reduce the frequency, duration and magnitude of 1-hr reporting events

Actions taken to prevent reocurrence of 1-hr reporting events has been doucmented for each reporting each event.
Equipment related failures are one off events and don't suggest an underlying condition that that requires any further action.

Stack Particulate Management Plan / TARP Review:

The Stack Particulate Management Plan (SPMP), approved on the 18 June 2018, incorporates the use of stack particulate emissions Trigger Action Reporting Plans (TARP's). The purpose of the stack TARP's is to enable early action to be taken to prevent or minimise the number of occasions where stack emissions reach the 1-hr reporting threshold. The plant initiates early action when particulate emissions reach the 10-minute trigger threshold.
The following table details the number of 10-minute triggers that were activated for each stack for the reporting period 1/7/2020 to 30/6/2021.

TARP trigger events for the period 1/7/2020 to 30/6/2021

Stack	Number of 10-minute trigger events	Number of 1-hr Reporting events
4A	14	3
4B	52	6

The data in the table shows the current 10-minute triggers are providing sufficient early warning needed to reduce the number of 1-hr reporting events.
The following table shows the 1-hr reporting events by type for the last four reporting years.

Stack	Cause of 1-hr Reporting Event	Type of 1-hr Reporting Event	Number of 1-hr reporting events			
			1/11/2017 - 30/6/2018	1/7/2018 - 30/6/2019	1/7/2019 - 30/6/2020	1/7/2020 - 30/6/2021
4A	Excess build-up within the Bypass process	Process related	5	1	2	1
	Ruptured airline hose to valve that controls water flow to the conditioning tower cooling spray system	Equipment related	1	0	0	0
	Erratic ESP Performance - unknown cause	Process related	0	0	1	0
	Automatic safety trip on the kiln, in response to a failure of the inlet temperature sensor on the Bypass ESP.	Equipment related	0	0	0	1
	4A conditioning tower spray pump failed	Equipment related	0	0	0	1
	Total Number of Reporting Events		**6**	**1**	**3**	**3**
4B	4B Mill off for extended period	Process related	7	0	2	4
	Equipment failure of 4B Elevator drag chain transport system	Equipment related	1	0	0	0
	Dislodged baffle plates at the entrance to the Electrostatic Precipitator were found to be the root cause	Equipment related	0	2	0	0
	4B Mill tripped (unforeseen sudden stop causing upset process conditions)	Process related	0	1	0	1
	Rare failure of a pump level protection sensor on the 4B conditioning tower header tank, tripping the pumps providing water to the conditioning tower sprays during a 4B mill stoppage	Equipment related	0	1	0	0
	Failure of the pump on the conditioning spray system to turn on, when the 4B Mill was turned off	Equipment related	0	1	0	0
	The 4B Electrostatic Precipitator (emission filtering equipment) efficiency was reduced as a result of water ingress from a cracked plastic casing on an electrical control unit.	Equipment related	0	1	0	0
	VVF drive fault occurred on 4B Raw feed conveyor during 4B mill start up sequence, preventing 4B conditioning tower sprays to come on.	Equipment related	0	0	1	0
	The event occurred after the calciner tripped on high exit pressure. The increase in particulate emissions occurred as a result of increased flow required to safely perform fault finding and remove a metal pole, that was found lodged in the dust flap below 4B cyclone.	Process related	0	0	1	0
	The event occurred as a result of an electrical fault on 4B ESP field 3, which resulted in loss of that field, with resulting increase in particulate emission. The root cause of the problem was a failed cartridge fuse switch and associated cabling on the ESP switchboard.	Equipment related	0	0	1	0
	Erratic ESP Performance - unknown cause	Process related	0	0	1	0
	Kiln and Calciner trip- Emergency stop activated in response to a Kiln shell hot spot	Equipment related	0	0	0	1
	Short term electrical instability in 4B ESP fields on start-up of the calciner following a kiln trip.	Process related	0	0	0	1
	Total Number of Reporting Events		**8**	**6**	**6**	**7**

The data in the table above shows that the introduction of the stack TARP's in July 2018, have been effective in reducing the number of process related 1-hr reporting events. Equipment performance related events that result in a 1-hr reporting event, are often unique in nature and require the plant to remain operational long enough to be able to determine the root cause of the problem, so that corrective action can be taken. The current 10-minute triggers however do provide the plant with the early warning needed to start trouble shooting for equipment related issues.

The current Trigger Action Reporting Plans have been effective in improving operation response times to conditions that have the potential for stack emissions to reach1-hr reporting levels.

There have been no identified improvements required in the existing TARP's.

Summary:

- The existing TARP's have been effective, in reducing the number of 1-hr reporting events.
- Opportunities to reduce the frequency, number and magnitude of 1-hr reporting events have been identified and implemented.
- It is recommended that the performance of the existing TARP's, continue to be monitored for improvement over the next 12 months.