Gunlake Quarry

Marulan

POELA Act 2011

Summary of Environmental Monitoring Data

Environmental Protection Licence Number 13012

Development Consent 2020/327172

Record Updated On: 20th October 2021

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1. INTRODUCTION

Gunlake Quarry holds an Environment Protection Licence (EPL) issued by the EPA under the *Protection of the Environment Operations Act 1997* (POEP Act) and operates under the conditions of Development Consent: 2017/00108663. This report has been prepared to satisfy the reporting requirements of the POEO Act as directed by the EPA, and also Condition 9, Schedule 5 of the Development Consent.

This report summarises environmental monitoring results received for the Gunlake Quarry Project.

A summary of the EPL information is provided in the following tables. Table 1 shows the licence information and Table 2 summarises the frequency and units for monitoring data for the reporting period.

Table 1 – Licence Information

Environment Protection Licence number	13012
Licensee's Name	Gunlake Quarries Pty Limited
Licensee's Address	PO Box 1665 Double Bay NSW 1360
Premises	Gunlake Quarries 715 Brayton Road Marulan NSW 2579
Link to full licence on the EPA website	http://www.epa.nsw.gov.au/prpoeoapp/ViewPOEOLicence.aspx?DOCID=38443&SYSUID=1&LICID=13012
Complaints Telephone Line	(02) 4841 1344

Table 2 – Supporting Information for EPL Monitoring Requirements

Parameter	Monitoring Site	Monitoring Frequency	Unit of Measure
Particulates – Deposited Matter (Insoluble Solids)	Point 1 – DDG 1	Monthly	$g/m^2/month$
Particulates – Deposited Matter (Insoluble Solids)	Point 2 – DDG 2	Monthly	$g/m^2/month$
Particulates – Deposited Matter (Insoluble Solids)	Point 3 – DDG 3	Monthly	$g/m^2/month$
PM10	Point 4 – R1 - HVAS	24 hour every six days	ug/m^3
PM10	Point 11 – R4 - HVAS	24 hour every six days	ug/m^3

2. AIR QUALITY MONITORING

The air quality monitoring results for Gunlake Quarry are summarised in the following sections.

2.1 Depositional Dust

Gauges 1, 2 and 3 are dust deposition gauges which measure the levels of coarse dust. Depositional dust results are shown in Table 3 – Depositional Dust (g/m2/month – Insoluble Solids)

Table 3 – Depositional Dust (g/m^2/month – Insoluble Solids)

Date Sampled	Date Results Received	DDG1 (Point 1)	DDG2 (Point 2)	DDG3 (Point 3)
18-Sep-17	1-Oct-17	0.8	3.1	7.1
16-Oct-17	29-Oct-17	1.1	2.5	3.9
17-Nov-17	27-Nov-17	1.2	1.9	2.7
15-Dec-17	22-Dec-17	0.8	3.1	6.5 [#]
15-Jan-18	29-Jan-18	1.1	3.6	5 [#1]
8-Feb-18	20-Feb-18	0.8	2.1	8.2 [#2]
21-Mar-18	5-Apr-18	4.5	1.7	6.2 [#3]
24-Apr-18	27-Apr-18	1.6	3.1	10.5 [#4]
24-May-18	31-May-18	1.5	2.6	1.8
21-Jun-18	26-Jun-18	1.0	2.5	2.6
25-Jul-18	16-Aug-18	0.8	1.7	0.8
17-Aug-18	26-Aug-18	1.1	N/A[#5]	0.9
18-Sep-18	27-Sep-18	1.1	8[#6]	1
25-Oct-18	5-Nov-18	1.2	4.4[#7]	2.4
22-Nov-18	4-Dec-18	N/A[#8]	N/A[#8]	N/A[#8]
12-Dec-18	20-Dec-18	N/A[#9]	N/A[#9]	N/A[#9]
10-Jan-19	17-Jan-18	2.1	3.9	5.4
22-Feb-19	28-Feb-19	1.4	3.8	3.8
28-Mar-19	10-Apr-19	2.4	3.6	2.0
29-Apr-19	09-May-19	0.6	2.6	1.5
16-May-19	28-May-19	1.2	3.4	1
27-Jun-19	5-Jul-19	4.3	3.8	0.7
25-Jul-19	21-Aug-19	1.2	0.8	0.8
28-Aug-19	30-Aug-19	2.0	2.1	0.6
12-Sep-19	17-Sep-19	1.6	1.7	0.4
24-Oct-19	04-Nov-19	2.0	1.7	1.6
19-Nov-19	22-Nov-19	1.3	4.8	1.1
18-Dec-19	30-Dec-19	3	3.9	1.8
17-Jan-20	7-Feb-20	9.7	9.0	0.4

Date Sampled	Date Results Received	DDG1 (Point 1)	DDG2 (Point 2)	DDG3 (Point 3)
19-Feb-20	3-Mar-20	4.2	11.4	1.3
16-Apr-20	23-Apr-20	0.5	2.3	1.9
06-May-20	08-May-20	1.9	1.6	0.8
04-Jun-20	11-Jun-20	0.6	2.3	0.4
09-Jul-20	08-May-20	0.6	1.1	4.4
04-Aug-20	11-Jun-20	4.3	2.5	0.7
01-Sep-20	07-Sep-20	2.7	0.8	0.4
06-Oct-20	13-Oct-20	1	1.2	0.6
03-Nov-20	09-Now-20	0.3	1.1	0.9
04-Dec-20	15-Dec-20	1.6	1.8	0.7
05-Jan-21	11-Jan-21	0.6	1.4	0.9
04-Feb-21	12-Feb-21	1.4	1.2	2.8
04-Mar-21	12-Mar-21	0.9	2.8	1.7
01-Apr-21	12-Apr-21	0.8	1.8	0.6
06-May-21	13-May-21	1.6	3.8	5
04-Jun-21	11-Jun-21	1.5	1.7	0.9
01-Jul-21	09-Jul-21	0.8	1.2	4.2
06-Aug-21	12-Aug-21	0.4	2.7	0.4
03-Sep-21	07-Sep-21	0.9	2.7	0.3
01-Oct-21	11-Oct-21	1.2	2.4	0.6

*Bottle broken and sample lost.

Bushfire activity/smoke northwest of the quarry approx 4km

1 Wind predominantly from the northeast with less frequent gusts from the southwest.

#2 Predominantly calmer winds from the northwest with a smaller contribution of wins from the southwest. Ash content of sample 2.56 g/m2/month

#3 dominant winds from the west and northwest, with stronger gusts from the southwest. Ash content of sample 2.64 g/m2/month

#4 Strong dominant winds from the southwest with calmer winds from the northeast. Ash content of sample 5.99 g/m2/month

#5 Broken funnel – sample compromised

#6 Pre-stripping of topsoil in pit extension area causing localised dust. DDG2 located adjacent to new extraction area.

#7 Removal of overburden in pit extension area causing localised dust. DDG2 located adjacent to new extraction area.

#8 Extraordinary event - widespread dust storms 2/11/18

#9 Extraordinary event - widespread dust storms 22/11/18

A graphical representation of depositional dust monitoring data is shown in **Figure 1**.

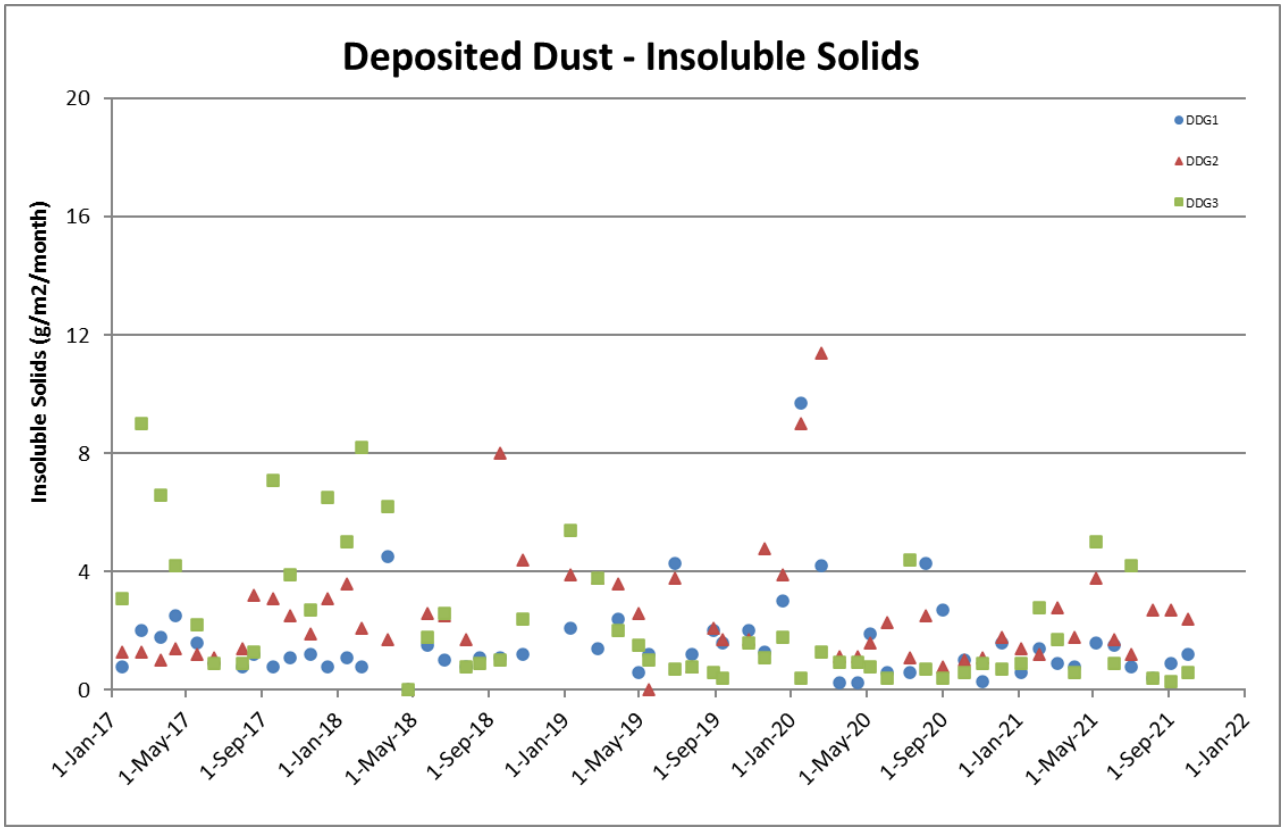

Figure 1 – Monthly Dust Deposition Gauge Results

Figure 2 shows the annual rolling average deposited dust data for compliance purposes.

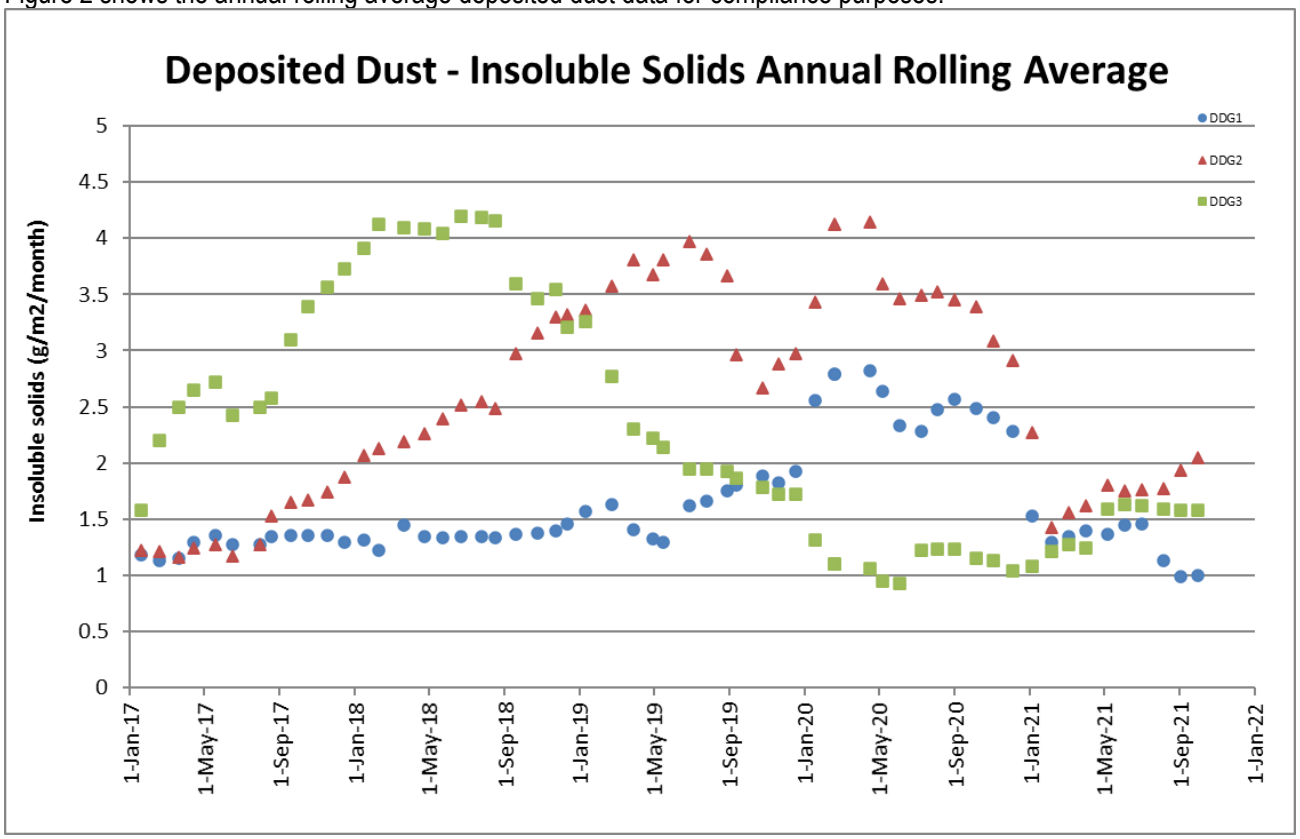

Figure 2 – Monthly Dust Annual Rolling Average – Insoluble Solids

Development consent condition limits: the limits outlined in the Development Consent are detailed in Table 4.

Table 4 –Dust Limits

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
[c]Deposited dust	Annual	[b] 2 g/m^2/month	[a,d] 4 g/m^2/month

a *Cumulative impact (ie increase in concentrations due to the development plus background concentrations due to all other sources);*

b *Incremental impact (ie increase in concentrations due to the development alone, with zero allowable exceedances of the criteria over the life of the development;*

c *Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method; and*

d *Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Secretary.*

Table 5 –Background Dust Values for Gunlake Quarry

	Dust Gauge No 1	Dust Gauge No 2	Dust Gauge No 3
Individual Gauge Background Average	1.8	0.9	2.4
Overall Background Average	1.8		

Table 5 shows the average background deposited dust values recorded prior to any quarry activities taking place at Gunlake.

Compliance: The results for the reporting period comply with EPL.

2.2 Atmospheric Dust – PM10

PM10 monitoring commenced in December 2014 at site R1-HVAS which is located to the northeast of the quarry at R1. PM10 monitoring commenced in July 2018 at site R4-HVAS which is located to the northwest of the quarry at R4.

Table 6 – PM_{10} Monitoring Results R1 (ug/m^2)

Date Sampled	Report Received	PM10 (µg/m^3)
8/10/2017	31/10/2017	11.7
20/10/2017	31/10/2017	8.4
25/11/2017	19/1/2018	11.4
7/12/2017	19/1/2018	22.1
19/12/2017	19/1/2018	24.0
31/12/2017	19/1/2018	13.4
12/1/2018	19/1/2018	15.1
24/1/2018	14/2/2018	40.6
05/02/2018	26/3/2018	18.3
01/03/2018	26/3/2018	23.8
17/03/2018	26/3/2018	17.8
18/04/2018	11/5/2018	15.2
30/04/2018	11/5/2018	12.5
24/05/2018	29/6/2018	16.8
1/06/2018	29/6/2018	12.2

Date Sampled	Report Received	PM10 (µg/m^3)
7/06/2018	29/6/2018	12.4
19/06/2018	9/7/2018	3.8
25/06/2018	9/7/2018	13.5
1/07/2018	26/7/2018	2.8
7/07/2018	26/7/2018	8.6
17/07/2018	26/7/2018	30.3
24/07/2018	26/7/2018	N/A*
31/07/2018	26/8/2018	18.6
6/08/2018	26/8/2018	N/A*
12/08/2018	26/8/2018	N/A*
18/08/2018	26/8/2018	11.9
24/08/2018	27/9/2018	7.2
30/08/2018	27/9/2018	24.6
5/09/2018	27/9/2018	2.2
11/09/2018	27/9/2018	12.5
17/09/2018	27/9/2018	16.5
23/09/2018	31/10/2018	11.5
29/09/2018	31/10/2018	14.7
5/10/2018	31/10/2018	6.7
11/10/2018	31/10/2018	7.2
17/10/2018	31/10/2018	8.4
23/10/2018	27/11/2018	24.6
29/10/2018	27/11/2018	14.8
4/11/2018	27/11/2018	19.1
10/11/2018	27/11/2018	20.7
16/11/2018	27/11/2018	8.1
22/11/2018	18/12/2018	71.4#
28/11/2018	18/12/2018	7.8
4/12/2018	18/12/2018	28.1
10/12/2018	17/01/2019	20.2
16/12/2018	17/01/2019	46.4
22/12/2018	17/01/2019	8.1
28/12/2018	17/01/2019	25.7
3/01/2019	17/01/2019	23
9/01/2019	17/01/2019	12.7
15/01/2019	21/02/2019	47.4
21/01/2019	21/02/2019	6.8
27/01/2019	21/02/2019	18.0

Date Sampled	Report Received	PM10 (µg/m^3)
2/02/2019	21/02/2019	7.0
8/02/2019	06/03/2019	20.7
14/02/2019	06/03/2019	26.2
20/02/2019	12/04/2019	N/A*
26/02/2019	12/04/2019	19.2
4/03/2019	12/04/2019	N/A*
10/03/2019	12/04/2019	24.4
16/03/2019	12/04/2019	8.8
22/03/2019	10/05/2019	7.7
28/03/2019	10/05/2019	16.8
3/04/2019	10/05/2019	30.9
9/04/2019	10/05/2019	39.4
15/04/2019	10/05/2019	10.7
21/04/2019	10/05/2019	10.9
27/04/2019	1/07/2019	18.1
3/05/2019	1/07/2019	N/A*
9/05/2019	1/07/2019	36.2
15/05/2019	1/07/2019	21.4
21/05/2019	1/07/2019	36.7
27/05/2019	1/07/2019	14.6
2/06/2019	1/07/2019	7.6
8/06/2019	1/07/2019	9.3
14/06/2019	1/07/2019	25
20/06/2019	1/07/2019	24.4
26/06/2019	1/07/2019	2.9
2/07/2019	6/08/2019	50.1
8/07/2019	6/08/2019	20.2
14/07/2019	6/08/2019	4.7
20/07/2019	13/08/2019	1.9
26/07/2019	13/08/2019	18.3
1/08/2019	17/09/2019	N/A*
7/08/2019	17/09/2019	45.5
13/08/2019	17/09/2019	31.5
19/08/2019	17/09/2019	22.0
25/08/2019	17/09/2019	17.2
31/08/2019	17/09/2019	4.3
6/09/2019	26/09/2019	24.8
12/09/2019	26/09/2019	58.2

Date Sampled	Report Received	PM10 (µg/m^3)
18/09/2019	04/10/2019	7.1
24/09/2019	04/10/2019	14.2
30/09/2019	04/10/2019	10.8
6/10/2019	04/10/2019	22.4
12/10/2019	2/12/2019	3.0
18/10/2019	2/12/2019	N/A*
24/10/2019	2/12/2019	38
30/10/2019	2/12/2019	40.7
5/11/2019	2/12/2019	7.2
11/11/2019	2/12/2019	11.0
17/11/2019	13/01/2020	14.6
23/11/2019	13/01/2020	29.6
29/11/2019	14/01/2020	42.2
05/12/2019	14/01/2020	52.2#1
11/12/2019	14/01/2020	27.4
17/12/2019	10/02/2020	33.5
23/12/2019	24/03/2020	N/A#2
29/12/2019	24/03/2020	N/A#2
04/01/2020	24/03/2020	N/A#2
10/01/2020	24/03/2020	N/A#2
16/01/2020	24/03/2020	38.8
22/01/2020	24/03/2020	20.4
28/01/2020	24/03/2020	44.4
3/02/2020	24/03/2020	61
9/02/2020	24/03/2020	7.4
15/02/2020	24/03/2020	11.4
21/02/2020	24/03/2020	13.6
27/02/2020	26/03/2020	19.3
4/03/2020	26/03/2020	2.2
10/03/2020	26/03/2020	2.6
16/03/2020	21/04/2020	<1.0
22/03/2020	21/04/2020	10.8
28/03/2020	21/04/2020	7.4
3/04/2020	29/05/2020	3.4
9/04/2020	29/05/2020	3.9
15/04/2020	29/05/2020	27.4
21/04/2020	29/05/2020	14.3
27/04/2020	29/05/2020	5.9

Date Sampled	Report Received	PM10 (µg/m^3)
3/05/2020	29/05/2020	1.7
9/05/2020	29/05/2020	8.7
15/05/2020	29/05/2020	10.5
21/05/2020	11/06/2020	3.8
27/05/2020	11/06/2020	4.7
2/06/2020	20/07/2020	18.8
8/06/2020	20/07/2020	3.1
14/06/2020	20/07/2020	6.3
20/06/2020	20/07/2020	4.4
26/06/2020	20/07/2020	14.8
2/07/2020	20/07/2020	12.2
8/07/2020	13/08/2020	1.0
14/07/2020	13/08/2020	0.5
20/07/2020	13/08/2020	35.4
26/07/2020	13/08/2020	1.9
1/08/2020	08/09/2020	12.7
7/08/2020	08/09/2020	12.6
13/08/2020	08/09/2020	24.3
19/08/2020	08/09/2020	10.6
25/08/2020	08/09/2020	18.1
31/08/2020	16/10/2020	19.4
6/09/2020	16/10/2020	8.4
12/09/2020	16/10/2020	13.4
18/09/2020	16/10/2020	7.9
24/09/2020	16/10/2020	14.4
30/09/2020	11/11/2020	11.8
6/10/2020	11/11/2020	9.0
12/10/2020	11/11/2020	22.2
18/10/2020	11/11/2020	8.3
24/10/2020	11/11/2020	10.1
30/10/2020	15/12/2020	10.5
5/11/2020	15/12/2020	6.3
11/11/2020	15/12/2020	15.8
17/11/2020	15/12/2020	22.9
23/11/2020	15/12/2020	15.1
29/11/2020	15/12/2020	17.0
5/12/2020	13/01/2021	17.7
11/12/2020	13/01/2021	14

Date Sampled	Report Received	PM10 (µg/m^3)
17/12/2020	13/01/2021	6.2
23/12/2020	13/01/2021	6.0
29/12/2020	13/01/2021	<0.1
4/01/2021	17/02/2021	1.4
12/01/2021	17/02/2021	9.2
21/01/2021	17/02/2021	32.4
27/01/2021	17/02/2021	64.2
2/02/2021	17/02/2021	10.1
9/02/2021	11/03/2021	12.2
15/02/2021	11/03/2021	10.1
21/02/2021	11/03/2021	10.4
27/02/2021	11/03/2021	11.7
5/03/2021	21/04/2021	16.6
11/03/2021	21/04/2021	8.8
17/03/2021	21/04/2021	N/A*
23/03/2021	21/04/2021	1.9
29/03/2021	21/04/2021	11.9
5/04/2021	16/06/2021	10.5
11/04/2021	16/06/2021	4.2
29/04/2021	16/06/2021	16.7
4/05/2021	16/06/2021	8.3
10/05/2021	16/06/2021	10.3
16/05/2021	16/06/2021	0.1
22/05/2021	16/06/2021	14.8
28/05/2021	16/06/2021	9.4
3/06/2021	16/07/2021	5.6
9/06/2021	16/07/2021	9.2
15/06/2021	16/07/2021	8.4
21/06/2021	16/07/2021	2.8
27/06/2021	16/07/2021	2.0
3/07/2021	11/08/2021	4.6
9/07/2021	11/08/2021	9.8
15/07/2021	11/08/2021	10.5
21/07/2021	11/08/2021	9.6
27/07/2021	11/08/2021	5.0
2/08/2021	07/09/2021	5.4
8/08/2021	07/09/2021	5.9
14/08/2021	07/09/2021	5.1

Date Sampled	Report Received	PM10 (µg/m^3)
20/08/2021	07/09/2021	17.4
26/08/2021	07/09/2021	2.9
1/09/2021	07/09/2021	13.5
7/09/2021	07/10/2021	61.9
13/09/2021	07/10/2021	7.8
19/09/2021	07/10/2021	7.6
25/09/2021	07/10/2021	13.3

Extraordinary event – widespread dust storm on day of sampling

#1 High wind on day of sampling dust generation due to exposed agricultural land resulting from drought conditions

*Filter paper damaged. No result

#2 Extraordinary event – regional bushfires with heavy smoke on day of sampling

Table 7 – PM_{10} Monitoring Results R4 (ug/m^2)

Date Sampled	Report Received	PM10 (µg/m^3)
13/07/2018	26/8/2018	26.5
19/07/2018	26/8/2018	N/A*
25/07/2018	26/8/2018	31
31/07/2018	26/8/2018	7.8
6/08/2018	26/8/2018	9.2
12/08/2018	26/9/2018	4.1
18/08/2018	26/9/2018	6.8
24/08/2018	26/9/2018	7.8
30/08/2018	26/9/2018	25.9
5/09/2018	26/9/2018	6.5
11/09/2018	26/9/2018	7.2
17/09/2018	26/9/2018	12.8
23/09/2018	31/10/2018	9.2
29/09/2018	31/10/2018	3.0*
5/10/2018	31/10/2018	13.2
11/10/2018	31/10/2018	6.1
17/10/2018	31/10/2018	10.1
23/10/2018	27/11/2018	13.6
29/10/2018	27/11/2018	16.1
4/11/2018	27/11/2018	19.2
10/11/2018	27/11/2018	10.4
16/11/2018	27/11/2018	7.2
22/11/2018	18/12/2018	69#
28/11/2018	18/12/2018	9.6
4/12/2018	18/12/2018	16.4
10/12/2018	17/01/2019	18.9

Date Sampled	Report Received	PM10 (µg/m^3)
16/12/2018	17/01/2019	49.5
22/12/2018	17/01/2019	8.9
28/12/2018	17/01/2019	27.9
3/01/2019	17/01/2019	18.6
9/01/2019	21/02/2019	8.1
15/01/2019	21/02/2019	8.8
21/01/2019	21/02/2019	19.1
27/01/2019	21/02/2019	7.8
2/02/2019	21/02/2019	31.0
8/02/2019	10/05/2019	13.4
14/02/2019	06/03/2019	64.9#1
20/02/2019	12/04/2019	N/A*
26/02/2019	12/04/2019	20.7
4/03/2019	12/04/2019	N/A*
10/03/2019	12/04/2019	26.8
16/03/2019	12/04/2019	10.2
22/03/2019	12/04/2019	7.8
28/03/2019	10/05/2019	16.1
3/04/2019	10/05/2019	14.5
9/04/2019	10/05/2019	19.9
15/04/2019	10/05/2019	10.8
21/04/2019	10/05/2019	13.2
27/04/2019	1/07/2019	13.5
3/05/2019	1/07/2019	17.4
9/05/2019	1/07/2019	5.7
15/05/2019	1/07/2019	15.5
21/05/2019	1/07/2019	12.3
27/05/2019	1/07/2019	6.3
2/06/2019	1/07/2019	8.5
8/06/2019	1/07/2019	7
14/06/2019	1/07/2019	4.1
20/06/2019	1/07/2019	5.6
26/06/2019	1/07/2019	7.1
2/07/2019	6/08/2019	5.2
8/07/2019	6/08/2019	2.7
14/07/2019	6/08/2019	2.2
20/07/2019	13/08/2019	1.9
26/07/2019	13/08/2019	6.0

Date Sampled	Report Received	PM10 (µg/m^3)
1/08/2019	17/09/2019	5.6
7/08/2019	17/09/2019	10.6
13/08/2019	17/09/2019	4.6
19/08/2019	17/09/2019	22.0
25/08/2019	17/09/2019	26.4
31/08/2019	17/09/2019	4.4
6/09/2019	26/09/2019	17.8
12/09/2019	26/09/2019	16.1
18/09/2019	04/10/2019	8.4
24/09/2019	04/10/2019	5.0
30/09/2019	04/10/2019	11.3
6/10/2019	04/10/2019	26.4
12/10/2019	2/12/2019	3.8
18/10/2019	2/12/2019	N/A*
24/10/2019	2/12/2019	21.6
30/10/2019	2/12/2019	33.8
5/11/2019	2/12/2019	6.8
11/11/2019	2/12/2019	6.0
17/11/2019	13/01/2020	14.6
23/11/2019	14/01/2020	51.3#2
29/11/2019	14/01/2020	35.9
05/12/2019	14/01/2020	37.6
11/12/2019	Lab Lost paper	Lab Lost Paper
17/12/2019	10/02/2020	39.1
23/12/2019	24/03/2020	N/A#3
29/12/2019	24/03/2020	N/A#3
04/01/2020	24/03/2020	N/A#3
10/01/2020	24/03/2020	N/A#3
16/01/2020	24/03/2020	36.6
22/01/2020	24/03/2020	19.8
28/01/2020	24/03/2020	23.4
3/02/2020	24/03/2020	40.8
9/02/2020	24/03/2020	6.2
15/02/2020	24/03/2020	13.8
21/02/2020	24/03/2020	12.0
27/02/2020	26/03/2020	18.5
4/03/2020	26/03/2020	2.5
10/03/2020	26/03/2020	6.6

Date Sampled	Report Received	PM10 (µg/m^3)
16/03/2020	21/04/2020	7.1
22/03/2020	21/04/2020	11.9
28/03/2020	21/04/2020	6.7
3/04/2020	29/05/2020	2.8
9/04/2020	29/05/2020	3
15/04/2020	29/05/2020	8.2
21/04/2020	29/05/2020	13.5
27/04/2020	29/05/2020	8.1
3/05/2020	29/05/2020	<0.1
9/05/2020	29/05/2020	9.5
15/05/2020	29/05/2020	7.4
21/05/2020	11/06/2020	3.1
27/05/2020	11/06/2020	2.7
2/06/2020	20/07/2020	0.1
8/06/2020	20/07/2020	3.2
14/06/2020	20/07/2020	2.5
20/06/2020	20/07/2020	5.8
26/06/2020	20/07/2020	1.1
2/07/2020	20/07/2020	5.1
8/07/2020	13/08/2020	13.5
14/07/2020	13/08/2020	1.0
20/07/2020	13/08/2020	3.5
26/07/2020	13/08/2020	0.5
1/08/2020	08/09/2020	8.7
7/08/2020	08/09/2020	9.1
13/08/2020	08/09/2020	7.6
19/08/2020	08/09/2020	4.8
25/08/2020	08/09/2020	5.4
6/09/2020	16/10/2020	9.1
12/09/2020	16/10/2020	10.4
18/09/2020	16/10/2020	9.5
24/09/2020	16/10/2020	6.2
30/09/2020	11/11/2020	14.9
6/10/2020	11/11/2020	10.4
12/10/2020	11/11/2020	12
18/10/2020	11/11/2020	10.6
24/10/2020	11/11/2020	11.3
30/10/2020	15/12/2020	7.5

Date Sampled	Report Received	PM10 (µg/m^3)
5/11/2020	15/12/2020	4.2
11/11/2020	15/12/2020	14.3
17/11/2020	15/12/2020	22.4
23/11/2020	15/12/2020	10.5
29/11/2020	15/12/2020	17.6
5/12/2020	13/01/2021	18.8
11/12/2020	13/01/2021	16.6
17/12/2020	13/01/2021	1.8
23/12/2020	13/01/2021	<0.1
29/12/2020	17/02/2021	N/A*
4/01/2021	17/02/2021	2.4
10/01/2021	17/02/2021	7.8
16/01/2021	17/02/2021	14.8
22/01/2021	17/02/2021	21
28/01/2021	17/02/2021	11.4
3/02/2021	11/03/2021	13.8
9/02/2021	17/02/2021	9.6
15/02/2021	11/03/2021	12.6
21/02/2021	11/03/2021	10.1
27/02/2021	21/04/2021	8.9
5/03/2021	21/04/2021	13.6
11/03/2021	21/04/2021	8.3
17/03/2021	21/04/2021	6.6
23/03/2021	21/04/2021	5.2
29/03/2021	21/04/2021	8.2
5/04/2021	16/06/2021	10.6
11/04/2021	16/06/2021	10.6
17/04/2021	16/06/2021	16
23/04/2021	16/06/2021	11
29/04/2021	16/06/2021	24.3
4/05/2021	16/06/2021	6.2
10/05/2021	16/06/2021	2.1
16/05/2021	16/06/2021	0.9
22/05/2021	16/06/2021	11.4
28/05/2021	16/06/2021	6.4
3/06/2021	16/07/2021	3.8
9/06/2021	16/07/2021	5.4
15/06/2021	16/07/2021	9.7

Date Sampled	Report Received	PM10 (µg/m^3)
21/06/2021	16/07/2021	3.6
27/06/2021	11/08/2021	5.3
3/07/2021	11/08/2021	3.7
9/07/2021	11/08/2021	10.7
15/07/2021	11/08/2021	8.1
21/07/2021	11/08/2021	12.1
27/07/2021	11/08/2021	5.3
2/08/2021	07/09/2021	6.2
8/08/2021	07/09/2021	6.2
14/08/2021	07/09/2021	6.2
20/08/2021	07/09/2021	3.7
26/08/2021	07/09/2021	2.6
1/09/2021	7/10/2021	5.2
7/09/2021	7/10/2021	5.6
13/09/2021	7/10/2021	4.7
19/09/2021	7/10/2021	7.2
25/09/2021	7/10/2021	9.9

*Filter paper damaged.

Extraordinary event – widespread dust storm on day of sampling

#1 High reading at background monitoring site R4 not attributable to quarry – prevailing winds from the N to NNE on day of sampling and quarry located to the SE of R4. Corresponding levels at R1 on day of sampling 26.2 µg/m3.

#2 High reading at background monitoring site R4 not attributable to quarry – prevailing westerly winds on day of sampling and quarry located to the SE of R4. Corresponding levels at R1 on day of sampling 29.6 µg/m3.

#2 Extraordinary event – regional bushfires with heavy smoke on day of sampling

Development consent condition limits: the limits outlined in the Development Consent are detailed in Table 8.

Table 8 – Development Consent Conditions PM_{10} and $PM_{2.5}$ Limits

Pollutant	Averaging period	Criterion
Particulate matter < 10 µm (PM_{10})	24 hour	[b] 50 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	[a, d] 25 µg/m^3
Particulate matter < 2.5 µm ($PM_{2.5}$)	24 hour	[b] 25 µg/m^3
Particulate matter < 2.5 µm ($PM_{2.5}$)	Annual	[a, d] 8 µg/m^3

a Cumulative impact (ie increase in concentrations due to the development plus background concentrations due to all other sources).

b Incremental impact (ie increase in concentrations due to the development alone, with zero allowable exceedances of the criteria over the life of the development.

c Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.

d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Secretary.

Compliance: the 24 hour average criteria was exceeded at R1 on 7/9/2021.

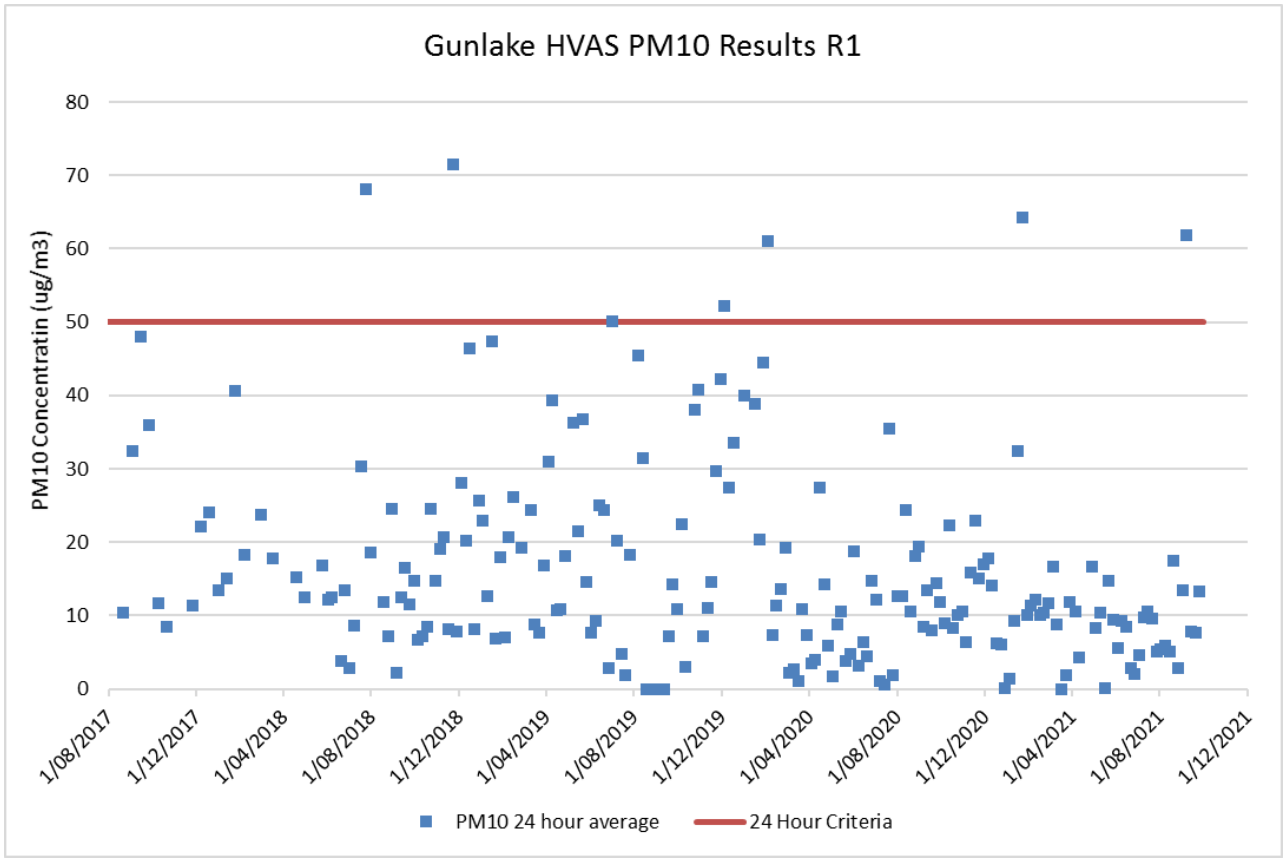

Figure 3 – HVAS PM10 Monitoring Results for R1

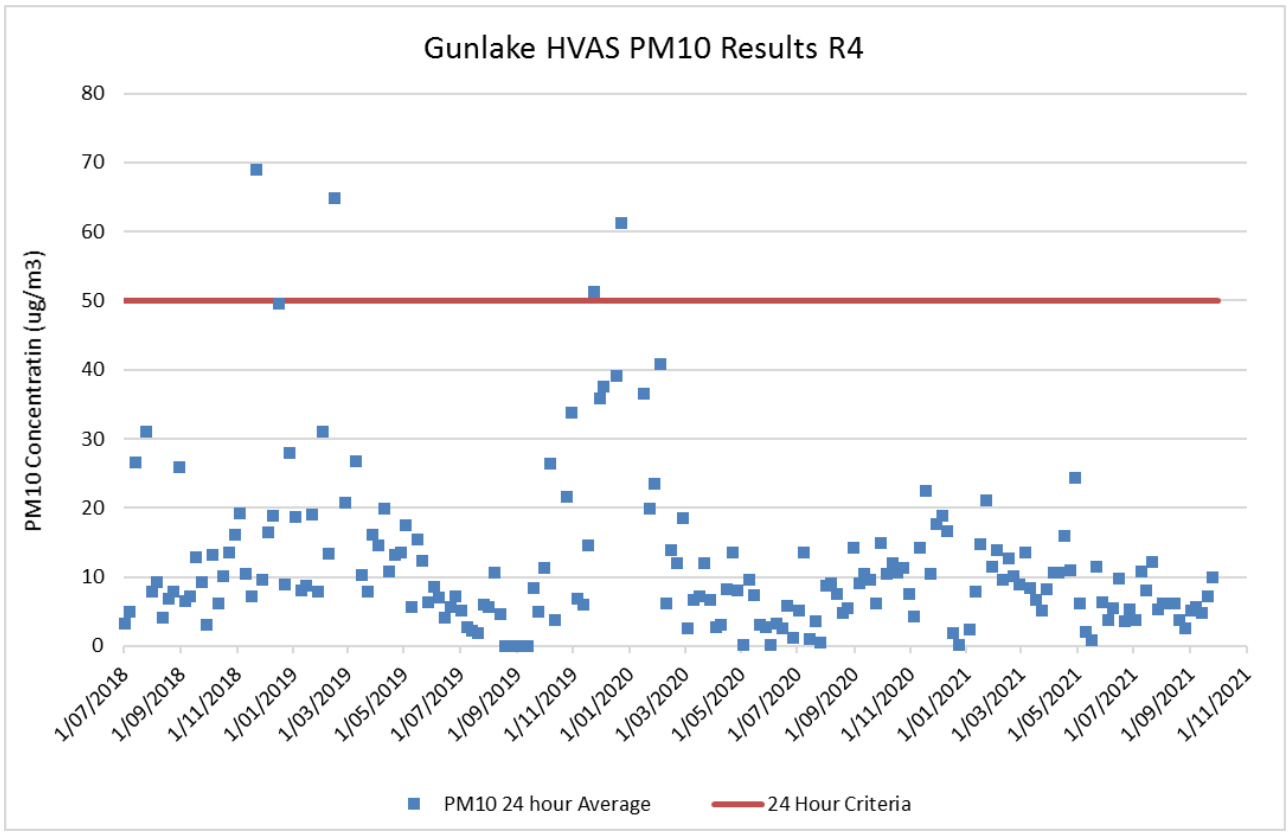

Figure 4 – HVAS PM10 Monitoring Results for R4

2.3 Atmospheric Dust – PM2.5

PM2.5 monitoring commenced at R1 on 13th September 2021, the results of which are provided in Table 9 and shown graphically in Figure 5.

Table 9 – $PM_{2.5}$ Monitoring Results (ug/m²)

Date Sampled	Report Received	PM10 (µg/m³)
13/09/2021	7/10/2021	5.5
19/09/2021	7/10/2021	5.8
25/09/2021	7/10/2021	11.1

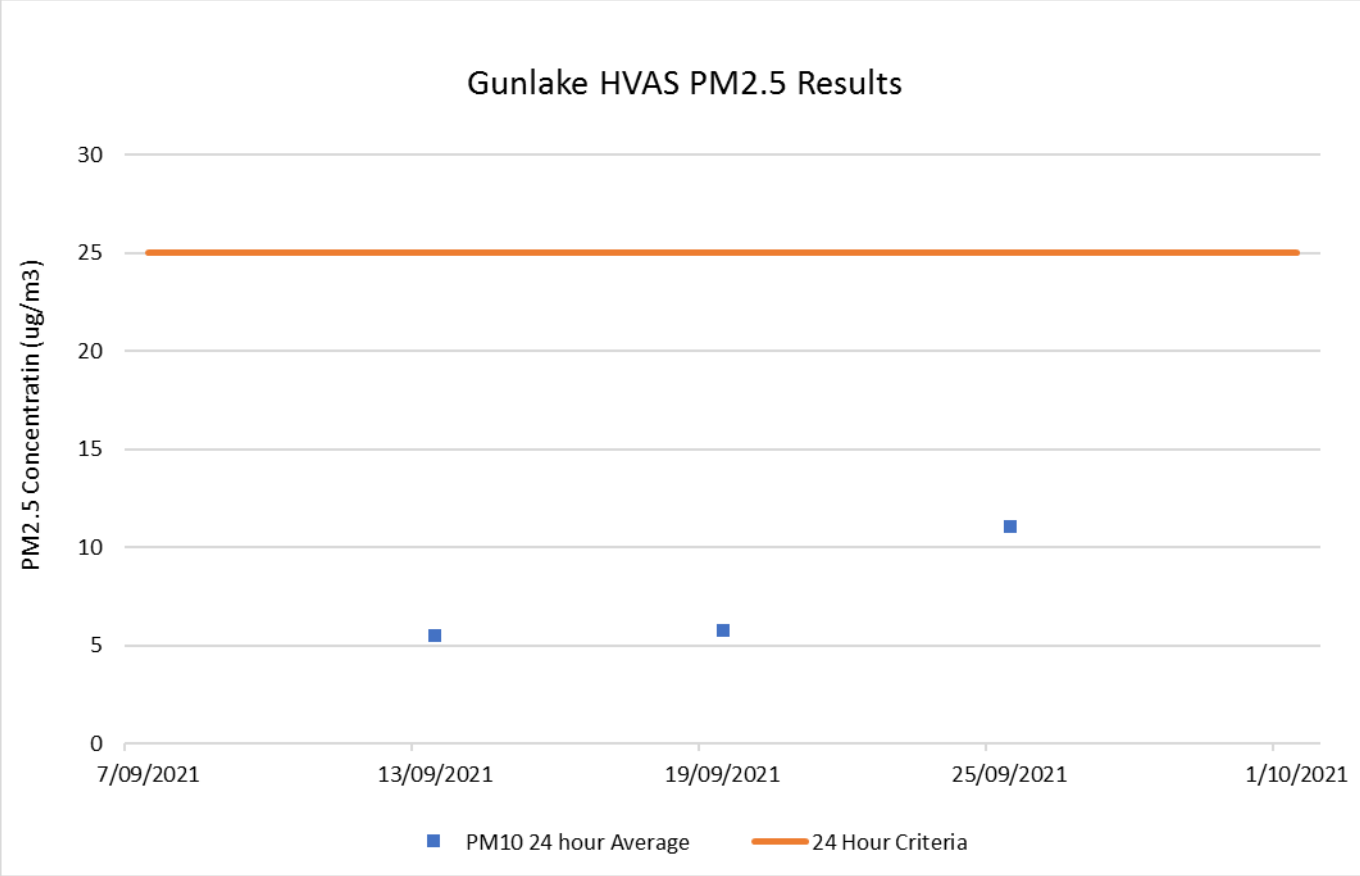

Figure 5 – HVAS PM2.5 Monitoring Results

Compliance: monitoring results comply with the criteria in Table 8.

3. BLAST MONITORING

Airblast Overpressure and the Ground Vibration level are required to be monitored for all blasts undertaken at the quarry.

Levels are recorded at the nearest sensitive receptor Lot 575 Brayton Rd, and at Lot 529 Brayton Rd and the boundary corner as required. The results recorded for the blast monitoring are included in Table 10.

Table 10 –Blast Monitoring Results

Date	Time	Location	Airblast Overpressure (dB (Lin Peak))	Ground Vibration Level (mm/s)
4/10/2017	14.12	Lot 575 Brayton Rd	110.90	0.63
18/10/2017	13.12	Lot 575 Brayton Rd	101.00	0.52
25/10/2017	14.22	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
13/11/2017	14.18	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
27/11/2017	12.10	Lot 575 Brayton Rd	0.00	0.00
4/12/2017	15.00	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
16/1/2018	14.03	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
5/2/2018	13.10	Lot 575 Brayton Rd	104.90	0.89
19/2/2018	14.31	Lot 575 Brayton Rd	110.20	0.64
13/3/2018	13.11	Lot 575 Brayton Rd	108.0	0.76
20/3/2018	12.39	Lot 575 Brayton Rd	100.00	0.51
3/4/2018	12.10	Lot 575 Brayton Rd	98.8	1.89
16/4/2018	12.38	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
23/4/2018	16.02	Lot 575 Brayton Rd	111.50	0.88
8/5/2018	13.16	Lot 575 Brayton Rd	103.50	1.14
21/5/2018	14.17	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
29/5/2018	13.56	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
15/6/2018	13.59	Lot 575 Brayton Rd	0.00	0.00
25/6/2018	14.29	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
6/7/2018	12:00	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
17/7/2018	12.42	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
23/7/2018	13.51	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
8/8/2018	13.35	Lot 575 Brayton Rd	116.30	1.80
17/8/2018	13.03	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
27/8/2018	12.35	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
3/9/2018	13.36	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
3/9/2018	13.43	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
17/9/2018	14.58	Lot 575 Brayton Rd	112.0	0.86
25/9/2018	13.43	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
28/9/2018	12.02	Lot 575 Brayton Rd	101.0	1.02
5/10/2018	14.19	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
12/10/2018	12.00	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
19/10/2018	11.23	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger

Date	Time	Location	Airblast Overpressure (dB (Lin Peak))	Ground Vibration Level (mm/s)
26/10/2018	13.08	Lot 575 Brayton Rd	111.8	0.95
2/11/2018	11.55	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
9/11/2018	11.32	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
26/11/2018	12.00	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
30/11/2018	12.22	Lot 575 Brayton Rd	107	1.5
11/12/2018	14.49	Lot 575 Brayton Rd	105.5	0.751
29/01/2019	12.08	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
1/02/2019	12.49	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
15/02/2019	12.53	Lot 575 Brayton Rd	109.5	0.696
22/02/2019	9.58	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
1/03/2019	10.40	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
15/03/2019	12.41	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
29/03/2019	13.58	Lot 575 Brayton Rd	111.5	0.925
12/04/2019	12.45	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
26/04/2019	11.01	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
10/05/2019	14.05	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
20/05/2019	12.19	Lot 575 Brayton Rd	111.2	0.751
31/05/2019	14.04	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
7/06/2019	9.26	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
14/06/2019	12.12	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
14/06/2019	12.12	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
21/06/2019	14.18	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
5/07/2019	12.34	Lot 575 Brayton Rd	104.2	0.582
18/07/2019	14.02	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
26/07/2019	11.07	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
2/08/2019	11.09	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
13/08/2019	12.05	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
19/08/2019	14.08	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
20/08/2019	2.08	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
30/08/2019	3.08	Lot 575 Brayton Rd	112.6	1.264
6/09/2019	11.06	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
13/09/2019	11.59	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
20/09/2019	13.04	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
4/10/2019	13.26	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
18/10/2019	11:58	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
25/10/2019	11:58	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
1/11/2019	10:32	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
11/11/2019	12:03	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
18/11/2019	10:32	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger

Date	Time	Location	Airblast Overpressure (dB (Lin Peak))	Ground Vibration Level (mm/s)
22/11/2019	12:39	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
6/12/2019	12:41	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
17/1/2020	11:25	Lot 575 Brayton Rd	109.9	0.933
31/1/2020	10:41	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
25/2/2020	12:56	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
6/3/2020	13:47	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
13/3/2020	13:41	Lot 575 Brayton Rd	107.5	0.568
20/4/2020	12:07	Lot 575 Brayton Rd	114.8	1.442
8/5/2020	13:18	Lot 575 Brayton Rd	114.8	0.950
22/5/2020	11:03	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
29/5/2020	14:01	Lot 575 Brayton Rd	114.4	1.164
9/6/2020	14:07	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
12/6/2020	13:30	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
26/6/2020	10:57	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
3/7/2020	10:57	Lot 575 Brayton Rd	113.3.	0.852
24/7/2020	14.02	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
7/8/2020	15.33	Lot 575 Brayton Rd	100.0	0.539
21/8/2020	12.18	Lot 575 Brayton Rd	108	0.730
28/8/2020	14.02	Lot 575 Brayton Rd	101.9	0.741
4/9/2020	14.35	Lot 575 Brayton Rd	110.0	0.524
11/9/2020	11.59	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
29/9/2020	14.11	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
9/10/2020	12.10	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
16/10/2020	11.44	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
20/10/2020	11.47	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
23/10/2020	12.04	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
6/11/2020	12.10	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
13/11/2020	14.24	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
20/11/2020	12.11	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
27/11/2020	12.12	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
4/12/2020	13.51	Lot 575 Brayton Rd	111.2	1.164
18/12/2020	14.24	Lot 575 Brayton Rd	113.3	0.696
15/1/2021	12.05	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
22/1/2021	14.23	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
5/2/2021	12.05	Lot 575 Brayton Rd	97.5	0.852
12/2/2021	10.26	Lot 575 Brayton Rd	108.4	0.568
19/2/2021	11.59	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
26/2/2021	15.23	Lot 575 Brayton Rd	98.8	0.508
5/3/2021	9.56	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger

Date	Time	Location	Airblast Overpressure (dB (Lin Peak))	Ground Vibration Level (mm/s)
12/3/2021	13.10	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
24/3/2021	14.38	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
9/4/2021	13.33	Lot 575 Brayton Rd	114.8	1.4
21/4/2021	14.29	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
28/4/2021	11.51	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
30/4/2021	14.12	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
30/4/2021	14.36	Lot 575 Brayton Rd	98.8	0.539
12/5/2021	12.40	Lot 575 Brayton Rd	101.9	0.582
14/5/2021	13.56	Lot 575 Brayton Rd	105.5	0.635
21/5/2021	12.21	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
28/5/2021	12.54	Lot 575 Brayton Rd	107	0.524
9/6/2021	14.02	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
18/6/2021	11.58	Lot 575 Brayton Rd	106.5	0.582
25/6/2021	12.18	Lot 575 Brayton Rd	113.1	1.212
7/7/2021	14.28	Lot 575 Brayton Rd	103.5	0.524
16/7/2021	11.30	Lot 575 Brayton Rd	108.0	0.813
23/7/2021	9.57	Lot 575 Brayton Rd	94.0	0.539
30/7/2021	11.38	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
13/8/2021	13.07	Lot 575 Brayton Rd	107.5	0.861
10/9/2021	12.05	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger
22/9/2021	12.21	Lot 575 Brayton Rd	Nil Trigger	Nil Trigger

EPL13012 and Development Consent condition limits: Tables 11 and 12 outline the limits for Airblast Overpressure and Ground Vibration level.

Table 11 – Airblast Overpressure Impact Assessment Criteria for Residences on Privately Owned Land

Receiver	***Airblast Overpressure Level (dB(Lin Peak))***	***Allowable Exceedance***
Any residence on privately-owned land	115	5% of the total number of blasts over a period of 12 months
	120	0%

Table 12 –Vibration Impact Assessment Criteria for Residences on Privately Owned Land

Receiver	***Ground Vibration Level (mm/s)***	***Allowable Exceedance***
Any residence on privately-owned land	5	5% of the total number of blasts over a period of 12 months
	10	0%

Compliance: The results from the blast monitoring show that there have been no exceedances of the limits outlined in the above tables in the reporting period.

4. GROUNDWATER MONITORING

Groundwater monitoring us currently undertaken on a monthly basis at Gunlake, from four monitoring bores located around the quarry. These are referred to as GM 6 (point 7), GM 13 (point 8), GM 24 (point 9), and GM 36 (point 10). Tables 13 to 20 show the results of the water quality monitoring undertaken.

Table 13 –Groundwater Quality Monitoring Results GM 6 (Point 7)

Parameter	Unit of Measure	Sample Date:29/6/17	Sample Date:22/1/18	Sample Date: 21/6/18	Sample Date: 25/9/18	Sample Date: 20/12/18	Sample Date:02/4/19
pH	pH units	6.68	7	6.62	6.84	6.97	7.21
Electrical Conductivity	µS/cm	285	254	205	254	176	201
Total Dissolved Solids	mg/L	185	165	133	165	114	131
Hardness	mg/L	60	58	42	58	49	55
Chloride	mg/L	32	30	18	24	20	20
Sulfate	mg/L	4	8	13	<5	<1	1
Bicarbonate alkalinity	mg/L	63	81	67	90	60	66
Carbonate alkalinity	mg/L	<1	<1	<1	<1	<1	<1
Hydroxide alkalinity	Mg/L	<1	<1	<1	<1	<1	<1
Total alkalinity	mg/L	63	81	67	90	60	66
Calcium	mg/L	9	10	7	10	8	9
Iron (dissolved)	mg/L	0.11	1.34	1.01	1.09	0.26	1.94
Magnesium	mg/L	9	9	6	8	7	8
Potassium	mg/L	5	4	3	3	5	4
Sodium	mg/L	26	24	21	24	21	22
Iron (total)	mg/L	0.11	5.88	6.20	3.85	1.79	4.55
Arsenic	mg/L	0.001	0.003	0.002	0.003	0.002	0.002
Cadmium	mg/L	0.0001	0.0003	0.0002	<0.0001	0.0001	<0.0001
Chromium	mg/L	0.004	0.006	0.010	0.003	0.002	0.003
Copper	mg/L	0.011	0.007	0.016	0.007	0.011	0.006
Lead	mg/L	0.006	0.03	0.037	0.012	0.007	0.009
Mercury	mg/L	<0.0001	<0.0001	< 0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.017	0.019	0.019	0.022	0.012	0.015
Zinc	mg/L	0.029	0.046	0.046	0.006	0.047	0.029
Ammonia as N	mg/L	0.02	0.12	0.21	0.17	0.6	0.67
Nitrite as N	mg/L	2.26	0.02	0.02	<0.01	0.01	0.02
Nitrate as N	mg/L	2.26	0.36	0.62	0.33	0.57	0.13
Total Phosphorus as P	mg/L	0.06	0.25	0.32	0.11	0.21	0.25
Reactive Phosphorus	mg/L	0.02	0.01	<0.01	<0.01	0.09	0.07

Table 14 –Groundwater Quality Monitoring Results GM 6 (Point 7) (continued)

Parameter	Unit of Measure	Sample Date:02/7/19	Sample Date:26/9/19	Sample Date:10/12/19	Sample Date:10/03/2020	Sample Date: 9/06/2020	Sample Date: 01/09/20
pH	pH units	6.83	6.99	7.01	6.43	6.75	6.98
Electrical Conductivity	µS/cm	230	281	294	289	280	206
Total Dissolved Solids	mg/L	150	183		188	182	134
Hardness	mg/L	62	71	80	55	62	40
Chloride	mg/L	24	30	35	32	34	42
Sulfate	mg/L	2	<1	<1	6	6	3
Bicarbonate alkalinity	mg/L	79	88	93	42	67	33
Carbonate alkalinity	mg/L	<1	<1	<1	<1	<1	<1
Hydroxide alkalinity	Mg/L	<1	<1	<1	<1	<1	<1
Total alkalinity	mg/L	79	88	93	42	67	33
Calcium	mg/L	10	12	14	9	10	6
Iron (dissolved)	mg/L	2.61	0.58	2.0	0.1	0.07	<0.05
Magnesium	mg/L	9	10	11	8	9	6
Potassium	mg/L	4	4	4	5	29	4
Sodium	mg/L	24	25	28	28	5	30
Iron (total)	mg/L	4.91	2.65	5.28	3.72	1.64	0.51
Arsenic	mg/L	0.002	0.001	0.002	0.001	<0.001	<0.001
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	0.0003	0.0001	<0.0001
Chromium	mg/L	0.003	0.003	0.003	0.007	0.003	0.003
Copper	mg/L	0.007	0.005	0.004	0.023	0.006	0.006
Lead	mg/L	0.008	0.004	0.005	0.023	0.011	0.002
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.016	0.014	0.014	0.011	0.012	0.032
Zinc	mg/L	0.038	0.012	0.012	0.047	0.017	0.03
Ammonia as N	mg/L	0.61	0.45	0.38	0.11	<0.01	<0.01
Nitrite as N	mg/L	<0.01	<0.01	0.15	<0.01	0.03	<0.01
Nitrate as N	mg/L	0.3	0.11	0.15	7.27	2.07	0.16
Total Phosphorus as P	mg/L	0.08	0.04	0.04	0.09	0.1	0.06
Reactive Phosphorus	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Table 15 –Groundwater Quality Monitoring Results GM 6 (Point 7) (continued)

Parameter	Unit of Measure	Sample Date: 15/12/20	Sample Date: 16/03/2021	Sample Date: 15/06/2021	Sample Date: 01/09/2021
pH	pH units	6.47	7.03	6.34	6.24
Electrical Conductivity	µS/cm	224	239	165	177
Total Dissolved Solids	mg/L	146	155	107	115
Hardness	mg/L	36	49	33	29
Chloride	mg/L	39	37	23	23
Sulfate	mg/L	7	3	5	7
Bicarbonate alkalinity	mg/L	47	56	38	54
Carbonate alkalinity	mg/L	<1	<1	<1	<1
Hydroxide alkalinity	Mg/L	<1	<1	<1	<1
Total alkalinity	mg/L	47	56	38	54
Calcium	mg/L	6	8	5	5
Iron (dissolved)	mg/L	0.15	1.73	0.12	0.14
Magnesium	mg/L	5	7	5	4
Potassium	mg/L	3	4	4	3
Sodium	mg/L	26	27	22	21
Iron (total)	mg/L	3.71	4.24	0.54	0.53
Arsenic	mg/L	0.002	0.002	<0.0001	0.001
Cadmium	mg/L	0.0001	0.0004	0.0001	<0.0001
Chromium	mg/L	0.007	0.005	0.002	0.002
Copper	mg/L	0.005	0.005	0.009	0.010
Lead	mg/L	0.025	0.024	0.006	0.002
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.01	0.019	0.008	0.007
Zinc	mg/L	0.026	0.03	0.013	0.014
Ammonia as N	mg/L	0.02	0.06	<0.01	0.01
Nitrite as N	mg/L	<0.01	<0.01	<0.01	<0.01
Nitrate as N	mg/L	0.2	0.14	0.5	0.18
Total Phosphorus as P	mg/L	0.18	0.2	0.09	0.06
Reactive Phosphorus	mg/L	<0.01	<0.01	<0.01	<0.01

Table 16 – Groundwater Quality Monitoring Results GM 13 (Point 8)

Parameter	Unit of Measure	Sample Date:29/6/17	Sample Date:22/1/18	Sample Date: 21/6/18	Sample Date: 25/9/18	Sample Date: 20/12/18	Sample Date: 02/4/19
pH	pH units	7.37	7.72	7.06	7.29	7.33	7.64
Electrical Conductivity	µS/cm	665	912	3230	1640	2380	2340
Total Dissolved Solids	mg/L	432	593	2100	1070	1550	1520
Hardness	mg/L	218	257	962	548	763	672
Chloride	mg/L	68	132	800	384	582	545
Sulfate	mg/L	7	8	13	11	10	11
Bicarbonate alkalinity	mg/L	224	257	383	282	292	235
Carbonate alkalinity	mg/L	<1	<1	<1	<1	<1	<1
Hydroxide alkalinity	Mg/L	<1	<1	<1	<1	<1	<1
Total alkalinity	mg/L	224	257	383	282	292	235
Calcium	mg/L	43	45	174	104	144	124
Iron (dissolved)	mg/L	0.05	0.19	0.22	0.05	0.06	0.11
Magnesium	mg/L	27	33	128	70	98	88
Potassium	mg/L	5	6	10	9	12	10
Sodium	mg/L	53	59	186	120	165	149
Iron (total)	mg/L	0.05	0.22	0.62	0.1	0.06	0.2
Arsenic	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	0.002	0.002	0.001	<0.001	0.001	0.001
Copper	mg/L	0.018	0.005	0.008	0.008	0.015	0.011
Lead	mg/L	<0.001	<0.001	0.002	<0.001	<0.001	<0.001
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.009	0.019	0.016	0.037	0.013	0.014
Zinc	mg/L	0.028	0.008	0.020	0.006	0.093	0.033
Ammonia as N	mg/L	0.03	0.09	0.06	0.06	0.1	0.04
Nitrite as N	mg/L	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
Nitrate as N	mg/L	0.56	1	0.58	0.2	0.16	0.26
Total Phosphorus as P	mg/L	0.01	0.02	<0.01	0.01	<0.01	<0.01
Reactive Phosphorus	mg/L	<0.01	0.02	<0.01	<0.01	<0.01	<0.01

Table 17 – Groundwater Quality Monitoring Results GM 13 (Point 8) (continued)

Parameter	Unit of Measure	Sample Date: 02/7/19	Sample Date: 26/9/19	Sample Date: 10/12/19	Sample Date: 10/03/20	Sample Date: 9/06/2020	Sample Date: 01/09/20
pH	pH units	7.07	7.52	7.32	7.11	7.08	7.54
Electrical Conductivity	µS/cm	3700	2840	5040	1230	2400	618
Total Dissolved Solids	mg/L	2400	1850	3280	800	1560	402
Hardness	mg/L	1180	994	1770	371	763	175
Chloride	mg/L	937	844	1440	280	636	154
Sulfate	mg/L	12	10	15	7	8	6
Bicarbonate alkalinity	mg/L	325	283	409	174	194	90
Carbonate alkalinity	mg/L	<1	<1	<1	<1	<1	<1
Hydroxide alkalinity	Mg/L	<1	<1	<1	<1	<1	<1
Total alkalinity	mg/L	325	283	409	174	194	90
Calcium	mg/L	206	177	308	63	134	32
Iron (dissolved)	mg/L	0.54	0.33	0.32	<0.05	<0.05	<0.05
Magnesium	mg/L	163	134	244	52	104	23
Potassium	mg/L	14	12	17	7	152	4
Sodium	mg/L	243	208	338	102	9	52
Iron (total)	mg/L	1.13	0.47	0.71	0.64	0.23	0.3
Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	0.0002	0.0003	<0.0001
Chromium	mg/L	0.008	0.003	0.003	0.002	0.001	0.001
Copper	mg/L	0.027	0.013	0.015	0.009	0.006	0.007
Lead	mg/L	0.001	<0.001	<0.001	0.001	<0.001	<0.001
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.0001
Nickel	mg/L	0.032	0.018	0.013	0.004	0.005	0.003
Zinc	mg/L	0.156	0.033	0.052	0.014	0.015	0.011
Ammonia as N	mg/L	0.25	0.17	0.22	0.1	0.98	<0.01
Nitrite as N	mg/L	<0.01	<0.01	<0.01	0.5	0.03	<0.01
Nitrate as N	mg/L	0.06	0.14	0.15	14.2	15.2	1.46
Total Phosphorus as P	mg/L	0.03	0.01	0.01	0.01	<0.01	0.01
Reactive Phosphorus	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Table 18 – Groundwater Quality Monitoring Results GM 13 (Point 8) (continued)

Parameter	Unit of Measure	Sample Date: 15/12/20	Sample Date: 16/03/21	Sample Date: 15/06/21	Sample Date: 01/09/21
pH	pH units	7.44	7.55	7.22	6.83
Electrical Conductivity	µS/cm	4100	1700	454	823
Total Dissolved Solids	mg/L	2660	1100	295	535
Hardness	mg/L	1350	517	149	255
Chloride	mg/L	1040	424	43	164
Sulfate	mg/L	15	9	10	16
Bicarbonate alkalinity	mg/L	370	168	156	174
Carbonate alkalinity	mg/L	<1	<1	<1	<1
Hydroxide alkalinity	Mg/L	<1	<1	<1	<1
Total alkalinity	mg/L	370	168	156	174
Calcium	mg/L	243	90	30	51
Iron (dissolved)	mg/L	<0.05	<0.05	0.08	<0.05
Magnesium	mg/L	181	71	18	31
Potassium	mg/L	11	6	7	6
Sodium	mg/L	252	110	38	55
Iron (total)	mg/L	0.81	1.08	1.74	0.94
Arsenic	mg/L	<0.001	<0.001	0.001	<0.001
Cadmium	mg/L	0.0005	0.0004	<0.0001	<0.0001
Chromium	mg/L	0.002	0.003	0.003	0.002
Copper	mg/L	0.005	0.014	0.012	0.007
Lead	mg/L	0.002	0.002	0.005	0.002
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.038	0.011	0.006	0.007
Zinc	mg/L	0.013	0.018	0.019	0.011
Ammonia as N	mg/L	<0.01	0.02	0.01	<0.01
Nitrite as N	mg/L	0.05	0.02	<0.01	<0.01
Nitrate as N	mg/L	0.99	1.39	0.05	0.11
Total Phosphorus as P	mg/L	0.01	0.04	0.07	0.02
Reactive Phosphorus	mg/L	<0.01	<0.01	<0.01	<0.01

Table 19 – Groundwater Quality Monitoring Results GM 24 (Point 9)

Parameter	Unit of Measure	Sample Date: 29/6/17	Sample Date: 22/1/18	Sample Date: 21/6/18	Sample Date: 25/9/18
pH	pH units	7.17	7.58	7.15	7.41
Electrical Conductivity	µS/cm	1230	1300	1240	1220
Total Dissolved Solids	mg/L	800	845	806	793
Hardness	mg/L	356	314	329	351
Chloride	mg/L	275	300	272	296
Sulfate	mg/L	<1	<10	10	1
Bicarbonate alkalinity	mg/L	204	217	213	192
Carbonate alkalinity	mg/L	<1	<1	<1	<1
Hydroxide alkalinity	Mg/L	<1	<1	<1	<1
Total alkalinity	mg/L	204	217	213	192
Calcium	mg/L	60	57	56	58
Iron (dissolved)	mg/L	2.66	0.19	0.36	0.82
Magnesium	mg/L	50	51	46	50
Potassium	mg/L	8	8	7	8
Sodium	mg/L	106	108	100	108
Iron (total)	mg/L	2.66	1.93	0.92	1.18
Arsenic	mg/L	0.001	<0.001	<0.001	<0.001
Cadmium	mg/L	<0.0001	<0.0001	0.0002	0.0003
Chromium	mg/L	0.005	0.003	0.001	0.001
Copper	mg/L	0.012	0.03	0.004	0.007
Lead	mg/L	<0.001	<0.001	<0.001	<0.001
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.01	0.02	0.030	0.048
Zinc	mg/L	0.092	0.034	0.022	0.008
Ammonia as N	mg/L	0.09	0.02	0.02	0.07
Nitrite as N	mg/L	<0.01	0.01	<0.01	<0.01
Nitrate as N	mg/L	0.07	0.06	0.03	0.07
Total Phosphorus as P	mg/L	0.02	0.03	<0.01	<0.01
Reactive Phosphorus	mg/L	0.01	<0.01	<0.01	<0.01

Table 20 – Groundwater Quality Monitoring Results GM 36 (Point 10) (continued)

Parameter	Unit of Measure	Sample Date: 29/6/17	Sample Date: 22/1/18	Sample Date: 21/6/18	Sample Date: 5/9/18
pH	pH units	6.6	6.88	6.56	6.65
Electrical Conductivity	µS/cm	282	298	300	310
Total Dissolved Solids	mg/L	183	194	195	202
Hardness	mg/L	69	65	69	67
Chloride	mg/L	25	32	31	34
Sulfate	mg/L	<1	<10	<10	<5
Bicarbonate alkalinity	mg/L	97	103	101	92
Carbonate alkalinity	mg/L	<1	<1	<1	<1
Hydroxide alkalinity	Mg/L	<1	<1	<1	<1
Total alkalinity	mg/L	97	103	101	92
Calcium	mg/L	16	16	16	17
Iron (dissolved)	mg/L	2.56	1.26	1.63	1.39
Magnesium	mg/L	7	7	7	6
Potassium	mg/L	4	4	4	4
Sodium	mg/L	31	31	30	32
Iron (total)	mg/L	2.56	2.2	1.95	1.65
Arsenic	mg/L	0.001	0.001	0.001	0.001
Cadmium	mg/L	<0.0001	<0.0001	0.0002	0.0001
Chromium	mg/L	0.002	0.002	0.002	0.002
Copper	mg/L	0.01	0.005	0.006	0.006
Lead	mg/L	<0.001	<0.001	0.001	<0.001
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.005	0.003	0.007	0.007
Zinc	mg/L	0.018	0.033	0.018	0.012
Ammonia as N	mg/L	0.14	0.24	0.28	0.35
Nitrite as N	mg/L	<0.01	<0.01	<0.01	<0.01
Nitrate as N	mg/L	0.02	<0.01	0.10	0.09
Total Phosphorus as P	mg/L	0.04	0.04	<0.01	<0.01
Reactive Phosphorus	mg/L	<0.01	<0.01	<0.01	<0.01

5. SURFACE WATER MONITORING

Gunlake Quarry undertakes regular monitoring of surface water quality within Chapman's Creek. Under the original Project Approval monitoring was undertaken at three sites within the project boundary. The Figure in **Appendix 1** shows the location of these surface water monitoring sites, which are identified as Sites D, O and I. Monitoring of surface water sites PWD, PDD, RW1 (formerly Site 0) and RW2 commenced in June 2018. These sites comprise the surface water monitoring network as required by the Gunlake Extension Project SSD Development Consent (2017/00108663). PDD is the pit dewatering dam which has not been constructed as yet and hence no monitoring at this site is currently undertaken.

The results from surface water monitoring are shown in Tables 21 to 37. Chapman's Creek flows intermittently and for the majority of the time in the upper reaches of the Gunlake property it is dry (site I). It is only in the lower sections of the creek within the project boundary that pools appear, which tend to dry rapidly in periods of dry weather. Chapman's Creek flows into Joaramin Creek approximately 1.4 km downstream from the Gunlake project boundary, and Joaramin Creek eventually flows into the Wollondilly River.

Table 21 – Monitoring Results for Site I Chapmans Creek

	pH (pH units)	Electrical Conductivity (uS/cm).	Total Suspended Solids (mg/L)	Phosphate as P (mg/L)	Total Nitrogen (mg/L)
17-Feb-2017	Site dry				
19-May-2017	Site dry				
17-Nov-2017	Site dry				
8-Feb-2018	Site dry				
24-May-2018	Site dry				

Table 22 – Monitoring Results for Site D Chapmans Creek

	pH (pH units)	Electrical Conductivity (uS/cm).	Suspended solids (mg/L)	Phosphate as P (mg/L)	Total Nitrogen (mg/L)
17-Feb-2017	9.11	754	5	0.02	1.21
19-May-2017	8.91	990	2	<0.01	6.65
17-Nov-2017	9.05	964	16	0.02	1.14
8-Feb-2017	9.18	1530	56	0.28	3.13
24-May-2018	8.29	1270	12	0.05	1.79

Table 23 – Monitoring Results for Site O Chapmans Creek

	pH (pH units)	Electrical Conductivity (uS/cm).	Suspended solids (mg/L)	Phosphate as P (mg/L)	Total Nitrogen (mg/L)
17-Feb-2017	Site Dry – no over flow of weir into site				
19-May-2017	8.59	1410	3	<0.01	8.12
17-Nov-2017	8.11	2990	5	0.02	1.39
8-Feb-2018	Site Dry – no over flow of weir into site				
24-May-2018	Site Dry – no over flow of weir into site				

Table 24 – Monitoring Results for Sites for, RW1, RW2 and PWD (Sample Date 21/06/2018)

Analyte	Units	RW1	RW2 (DRY)	PWD
pH	pH units	7.52		7.86
Electrical Conductivity	uS/cm	787		563
Total Suspended Soilds (TSS)	mg/L	53		50
Total Dissolved Solids (TDS)	mg/L	512		366
Total Phosphorus as P (TP)	mg/L	<0.01		<0.01
Total Nitrogen as N (TN)	mg/L	1.1		3.5
Dissolved Oxygen (DO)	mg/L	9.6		10.3
Turbidity	NTU	76.1		72.5
Chloride	mg/L	180		70
Calcium	mg/L	27		16
Magnesium	mg/L	27		15
Sodium	mg/L	72		67
Potassium	mg/L	4		5
Total Aluminium	mg/L	----		----
Total Arsenic	mg/L	<0.001		<0.001
Total Cobalt	mg/L	<0.001		0.002
Total Copper	mg/L	0.002		0.003
Total Manganese	mg/L	0.058		0.115
Total Nickel	mg/L	0.002		0.002
Total Zinc	mg/L	0.014		0.009
Total Iron	mg/L	1.92		2.77
Oil and Grease	visual inspection	None visible		None visible

Table 25 – Monitoring Results for Sites for, RW1, RW2 and PWD (Sample Date 27/09/2018)

Analyte	Units	RW1	RW2 (DRY)	PWD
pH	pH units	7.81		9.17
Electrical Conductivity	uS/cm	537		856
Total Suspended Soilds (TSS)	mg/L	68		32
Total Dissolved Solids (TDS)	mg/L	349		556
Total Phosphorus as P (TP)	mg/L	<0.01		<0.01
Total Nitrogen as N (TN)	mg/L	1.1		3.8
Dissolved Oxygen (DO)	mg/L	7.7		9.3
Turbidity	NTU	74.2		29.3
Chloride	mg/L	92		154
Calcium	mg/L	22		18
Magnesium	mg/L	17		25
Sodium	mg/L	44		106
Potassium	mg/L	4		7
Total Aluminium	mg/L	1.79		1.31

Total Arsenic	mg/L	<0.001		<0.001
Total Cobalt	mg/L	<0.001		<0.001
Total Copper	mg/L	0.003		0.004
Total Manganese	mg/L	0.116		0.083
Total Nickel	mg/L	<0.001		<0.001
Total Zinc	mg/L	0.01		<0.005
Total Iron	mg/L	1.28		10.5
Oil and Grease	visual inspection	None visible		None visible

Table 26 – Monitoring Results for Sites for, RW1, RW2 and PWD (Sample Date 29/11/2018)

Analyte	Units	RW1	RW2	PWD	Drop Cut
pH	pH units	7.53	7.79	8.39	8.09
Electrical Conductivity	uS/cm	850	1530	374	1260
Total Suspended Soilds (TSS)	mg/L	194	30	150	14
Total Dissolved Solids (TDS)	mg/L	552	994	243	819
Total Phosphorus as P (TP)	mg/L	0.14	0.07	0.08	0.01
Total Nitrogen as N (TN)	mg/L	1.8	2.2	4.3	11.1
Dissolved Oxygen (DO)	mg/L	9.2	9.4	9.3	9.4
Turbidity	NTU	312	59.5	347	24.3
Chloride	mg/L	259	480	54	349
Calcium	mg/L	23	39	9	42
Magnesium	mg/L	33	64	8	47
Sodium	mg/L	84	156	53	128
Potassium	mg/L	5	5	3	6
Total Aluminium	mg/L	14.8	3.15	12.6	1.12
Total Arsenic	mg/L	0.002	<0.001	0.002	<0.001
Total Cobalt	mg/L	0.005	0.001	0.005	<0.001
Total Copper	mg/L	0.01	0.003	0.007	0.003
Total Manganese	mg/L	0.224	0.115	0.232	0.032
Total Nickel	mg/L	0.007	0.002	0.005	0.001
Total Zinc	mg/L	0.027	0.006	0.034	<0.005
Total Iron	mg/L	11.3	2.26	10.7	0.88
Oil and Grease	visual inspection	None visible	None visible	None visible	None visible

Table 27 – Monitoring Results for Sites for, RW1, RW2 and PWD (Sample Date 02/4/2019)

Analyte	Units	RW1	RW2	PWD	Drop Cut
pH	pH units	7.73	7.95	8.21	7.94
Electrical Conductivity	uS/cm	248	4730	518	882
Total Suspended Soilds (TSS)	mg/L	20	10	91	16
Total Dissolved Solids (TDS)	mg/L	161	3070	337	573
Total Phosphorus as P (TP)	mg/L	0.09	<0.01	0.09	0.04

Analyte	Units	RW1	RW2	PWD	Drop Cut
Total Nitrogen as N (TN)	mg/L	0.9	0.6	6.1	5.4
Dissolved Oxygen (DO)	mg/L	6.3	7.4	8.6	8.8
Turbidity	NTU	32.7	1.1	118	7.3
Chloride	mg/L	39	1200	56	162
Calcium	mg/L	13	107	13	29
Magnesium	mg/L	9	172	12	27
Sodium	mg/L	24	428	75	75
Potassium	mg/L	5	8	4	5
Total Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001
Total Cobalt	mg/L	<0.001	<0.001	0.001	<0.001
Total Copper	mg/L	<0.001	<0.001	<0.001	<0.001
Total Manganese	mg/L	0.051	0.136	0.071	0.01
Total Nickel	mg/L	0.001	0.001	0.002	<0.001
Total Zinc	mg/L	0.007	<0.005	0.014	<0.005
Total Iron	mg/L	1.26	0.17	4.66	0.18
Oil and Grease	visual inspection	None visible	None visible	None visible	None visible

Table 28 – Monitoring Results for Sites for, RW1, RW2 and PWD (Sample Date 02/7/2019)

Analyte	Units	RW1	RW2	PWD	Drop Cut
pH	pH units	8.34	7.98	8.01	8.56
Electrical Conductivity	uS/cm	1760	2860	360	933
Total Suspended Soilds (TSS)	mg/L	14	15	98	5
Total Dissolved Solids (TDS)	mg/L	1140	1860	234	606
Total Phosphorus as P (TP)	mg/L	0.01	<0.01	0.09	<0.01
Total Nitrogen as N (TN)	mg/L	0.8	6.6	3.6	5.8
Dissolved Oxygen (DO)	mg/L	12	11.3	11.3	11.6
Turbidity	NTU	3.9	0.9	218	0.9
Chloride	mg/L	481	733	44	216
Calcium	mg/L	50	67	9	34
Magnesium	mg/L	68	112	8	34
Sodium	mg/L	185	315	54	90
Potassium	mg/L	5	6	3	5
Total Arsenic	mg/L	<0.001	<0.001	0.001	<0.001
Total Cobalt	mg/L	<0.001	0.001	0.004	<0.001
Total Copper	mg/L	0.002	0.005	0.006	<0.001
Total Manganese	mg/L	0.011	0.006	0.202	0.006
Total Nickel	mg/L	<0.001	<0.001	0.003	<0.001
Total Zinc	mg/L	<0.005	<0.005	0.03	<0.005
Total Iron	mg/L	0.16	0.05	8.01	0.12
Oil and Grease	visual inspection	None visible	None visible	None visible	None visible

Table 29 – Monitoring Results for Sites for, RW1, RW2 and PWD (Sample Date 26/9/2019)

Analyte	Units	RW1	RW2	PWD	Drop Cut
pH	pH units	7.31	7.91	7.83	7.54
Electrical Conductivity	uS/cm	1170	1010	2220	1440
Total Suspended Soilds (TSS)	mg/L	<5	20	11	17
Total Dissolved Solids (TDS)	mg/L	760	656	1440	936
Total Phosphorus as P (TP)	mg/L	0.01	0.03	0.04	0.02
Total Nitrogen as N (TN)	mg/L	7	15	0.7	0.8
Dissolved Oxygen (DO)	mg/L	9.6	9.9	8.7	9.8
Turbidity	NTU	1.1	9	3.1	20.5
Chloride	mg/L	304	208	683	434
Calcium	mg/L	39	27	49	32
Magnesium	mg/L	41	37	85	55
Sodium	mg/L	101	133	215	130
Potassium	mg/L	5	6	5	4
Total Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001
Total Cobalt	mg/L	<0.001	0.002	<0.001	<0.001
Total Copper	mg/L	<0.001	0.001	0.002	0.002
Total Manganese	mg/L	0.004	0.024	0.051	0.035
Total Nickel	mg/L	<0.001	<0.001	0.002	0.002
Total Zinc	mg/L	<0.005	<0.005	<0.005	<0.005
Total Iron	mg/L	<0.05	0.24	0.08	0.77
Oil and Grease	visual inspection	None visible	None visible	None visible	None visible

Table 30 – Monitoring Results for Sites for, RW1, RW2 and PWD (Sample Date 10/12/2019)

Analyte	Units	RW1	RW2 (DRY)	PWD	Drop Cut
pH	pH units	7.94		8.18	8.26
Electrical Conductivity	uS/cm	2160		1360	1250
Total Suspended Soilds (TSS)	mg/L	18		10	6
Total Dissolved Solids (TDS)	mg/L	1400		884	812
Total Phosphorus as P (TP)	mg/L	0.01		<0.01	<0.01
Total Nitrogen as N (TN)	mg/L	1		2.1	3.5
Dissolved Oxygen (DO)	mg/L	8.7		9.5	9.8
Turbidity	NTU	14.1		6	4.8
Chloride	mg/L	638		368	318
Calcium	mg/L	56		39	45
Magnesium	mg/L	88		55	51
Sodium	mg/L	226		144	120
Potassium	mg/L	9		7	7
Total Arsenic	mg/L	0.002		0.001	<0.001
Total Cobalt	mg/L	<0.001		<0.001	<0.001

Analyte	Units	RW1	RW2 (DRY)	PWD	Drop Cut
Total Copper	mg/L	0.002		0.002	0.001
Total Manganese	mg/L	0.13		0.025	0.026
Total Nickel	mg/L	0.001		<0.001	<0.001
Total Zinc	mg/L	<0.005		0.013	<0.005
Total Iron	mg/L	0.07		<0.05	<0.05
Oil and Grease	visual inspection	None visible		None visible	None visible

Table 31 – Monitoring Results for Sites for, RW1, RW2 and PWD (Sample Date 10/03/2020)

Analyte	Units	RW1	RW2	PWD	Drop Cut
pH	pH units	8.03	7.76	7.67	7.24
Electrical Conductivity	uS/cm	1520	1200	659	415
Total Suspended Soilds (TSS)	mg/L	6	7	46	30
Total Dissolved Solids (TDS)	mg/L	988	780	428	270
Total Phosphorus as P (TP)	mg/L	0.01	0.04	0.02	0.05
Total Nitrogen as N (TN)	mg/L	4.2	2.2	13	6.7
Dissolved Oxygen (DO)	mg/L	8.6	8.5	8	7
Turbidity	NTU	4.3	11.3	78.6	171
Chloride	mg/L	405	289	61	54
Calcium	mg/L	40	28	11	11
Magnesium	mg/L	59	42	14	10
Sodium	mg/L	192	148	97	46
Potassium	mg/L	5	4	5	4
Total Arsenic	mg/L	<0.001	<0.001	0.002	0.001
Total Cobalt	mg/L	0.001	0.002	0.002	0.004
Total Copper	mg/L	<0.001	<0.001	0.005	0.009
Total Manganese	mg/L	0.029	0.075	0.07	0.078
Total Nickel	mg/L	0.001	0.001	0.002	0.001
Total Zinc	mg/L	<0.005	0.006	0.012	0.014
Total Iron	mg/L	0.17	0.34	2.44	6.8
Oil and Grease	visual inspection	None visible	None visible	None visible	None visible

Table 32 – Monitoring Results for Sites for, RW1, RW2 and PWD (Sample Date 09/06/2020)

Analyte	Units	RW1	RW2	PWD	Drop Cut
pH	pH units	8.03	7.88	8.09	7.62
Electrical Conductivity	uS/cm	2990	2620	752	552
Total Suspended Soilds (TSS)	mg/L	<5	6	19	34
Total Dissolved Solids (TDS)	mg/L	1940	1700	489	359
Total Phosphorus as P (TP)	mg/L	<0.01	<0.01	0.01	0.05
Total Nitrogen as N (TN)	mg/L	0.6	0.3	11.4	8.6
Dissolved Oxygen (DO)	mg/L	11.5	11.1	11.4	11.7

Analyte	Units	RW1	RW2	PWD	Drop Cut
Turbidity	NTU	1.3	0.9	26.2	29.7
Chloride	mg/L	801	698	74	72
Calcium	mg/L	80	67	17	18
Magnesium	mg/L	128	113	19	16
Sodium	mg/L	300	266	107	58
Potassium	mg/L	5	5	6	4
Total Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001
Total Cobalt	mg/L	<0.001	<0.001	0.002	0.001
Total Copper	mg/L	<0.001	<0.001	<0.001	<0.001
Total Manganese	mg/L	0.026	0.032	0.022	0.016
Total Nickel	mg/L	<0.001	<0.001	<0.001	<0.001
Total Zinc	mg/L	<0.005	<0.005	<0.005	<0.005
Total Iron	mg/L	<0.05	0.06	0.76	1.68
Oil and Grease	visual inspection	None visible	None visible	None visible	None visible

Table 33 – Monitoring Results for Sites for, RW1, RW2 and PWD (Sample Date 01/09/2020)

Analyte	Units	RW1	RW2	PWD	Drop Cut
pH	pH units	8.16	8.26	8.26	7.88
Electrical Conductivity	uS/cm	967	884	586	481
Total Suspended Soilds (TSS)	mg/L	17	17	33	75
Total Dissolved Solids (TDS)	mg/L	628	575	381	313
Total Phosphorus as P (TP)	mg/L	0.03	0.02	0.02	0.02
Total Nitrogen as N (TN)	mg/L	4.6	5.8	9.1	8.2
Dissolved Oxygen (DO)	mg/L	9.8	10.4	10.4	9.4
Turbidity	NTU	10.7	9.5	27.5	92.7
Chloride	mg/L	212	179	73	68
Calcium	mg/L	29	22	11	16
Magnesium	mg/L	35	32	17	15
Sodium	mg/L	112	107	83	62
Potassium	mg/L	6	6	8	4
Total Arsenic	mg/L	<0.001	<0.001	0.001	<0.001
Total Cobalt	mg/L	0.001	0.001	0.002	0.002
Total Copper	mg/L	0.003	0.002	0.003	0.004
Total Manganese	mg/L	0.026	0.034	0.051	0.04
Total Nickel	mg/L	0.001	<0.001	<0.001	0.001
Total Zinc	mg/L	0.005	0.006	0.006	0.011
Total Iron	mg/L	0.46	0.38	1.06	2.49
Oil and Grease	visual inspection	None visible	None visible	None visible	None visible

Table 34 – Monitoring Results for Sites for, RW1, RW2 and PWD (Sample Date 15/12/2020)

Analyte	Units	RW1	RW2	PWD	Drop Cut
pH	pH units	8.37	8.48	8	7.61
Electrical Conductivity	uS/cm	1340	1310	634	668
Total Suspended Soilds (TSS)	mg/L	7	6	28	24
Total Dissolved Solids (TDS)	mg/L	871	852	412	434
Total Phosphorus as P (TP)	mg/L	<0.01	<0.01	<0.01	<0.01
Total Nitrogen as N (TN)	mg/L	1.2	0.8	7.2	9.1
Dissolved Oxygen (DO)	mg/L	8.9	8.9	8.4	8.6
Turbidity	NTU	2.7	2.6	28.5	18.5
Chloride	mg/L	297	266	76	117
Calcium	mg/L	33	28	14	23
Magnesium	mg/L	49	51	16	19
Sodium	mg/L	151	157	83	76
Potassium	mg/L	6	6	7	12
Total Arsenic	mg/L	<0.001	<0.001	0.001	<0.001
Total Cobalt	mg/L	<0.001	<0.001	0.001	0.001
Total Copper	mg/L	<0.001	<0.001	0.002	0.002
Total Manganese	mg/L	0.048	0.053	0.028	0.016
Total Nickel	mg/L	<0.001	<0.001	<0.001	<0.001
Total Zinc	mg/L	<0.005	<0.005	<0.005	<0.005
Total Iron	mg/L	0.16	0.16	1.07	0.94
Oil and Grease	visual inspection	None visible	None visible	None visible	None visible

Table 35 – Monitoring Results for Sites for, RW1, RW2 and PWD (Sample Date 16/03/2021)

Analyte	Units	RW1	RW2	PWD	Drop Cut
pH	pH units	8.28	8.15	8.47	7.99
Electrical Conductivity	uS/cm	1360	1670	707	768
Total Suspended Soilds (TSS)	mg/L	10	9	10	<5
Total Dissolved Solids (TDS)	mg/L	884	1080	460	499
Total Phosphorus as P (TP)	mg/L	0.05	0.02	0.02	<0.01
Total Nitrogen as N (TN)	mg/L	0.6	2.3	6.6	8
Dissolved Oxygen (DO)	mg/L	8.6	8.7	8.6	7.6
Turbidity	NTU	9.6	7.3	19	6.1
Chloride	mg/L	294	380	101	131
Calcium	mg/L	36	43	16	26
Magnesium	mg/L	53	65	21	24
Sodium	mg/L	161	197	95	87
Potassium	mg/L	6	7	8	5
Total Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001

Analyte	Units	RW1	RW2	PWD	Drop Cut
Total Cobalt	mg/L	<0.001	<0.001	<0.001	0.001
Total Copper	mg/L	<0.001	<0.001	<0.001	0.002
Total Manganese	mg/L	0.046	0.109	0.024	0.008
Total Nickel	mg/L	0.001	0.001	<0.001	<0.001
Total Zinc	mg/L	<0.005	<0.005	<0.005	<0.005
Total Iron	mg/L	0.61	0.47	0.63	0.21
Oil and Grease	visual inspection	None visible	None visible	None visible	None visible

Table 36 – Monitoring Results for Sites for, RW1, RW2 and PWD (Sample Date 15/06/2021)

Analyte	Units	RW1	RW2	PWD	Drop Cut
pH	pH units	7.98	7.97	8.29	7.7
Electrical Conductivity	uS/cm	1370	1280	722	646
Total Suspended Soilds (TSS)	mg/L	<5	<5	8	5
Total Dissolved Solids (TDS)	mg/L	890	832	469	420
Total Phosphorus as P (TP)	mg/L	0.02	<0.01	<0.01	<0.01
Total Nitrogen as N (TN)	mg/L	2.3	4.6	9.3	8.3
Dissolved Oxygen (DO)	mg/L	10.2	10.3	11.2	9.6
Turbidity	NTU	6.7	7.3	14.4	10.7
Chloride	mg/L	302	268	96	99
Calcium	mg/L	43	37	16	24
Magnesium	mg/L	58	55	23	21
Sodium	mg/L	144	142	96	74
Potassium	mg/L	5	6	8	5
Total Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001
Total Cobalt	mg/L	<0.001	<0.001	<0.001	<0.001
Total Copper	mg/L	<0.001	<0.001	<0.001	0.001
Total Manganese	mg/L	0.038	0.03	<0.001	0.011
Total Nickel	mg/L	<0.001	0.001	<0.001	<0.001
Total Zinc	mg/L	0.007	0.006	0.006	<0.005
Total Iron	mg/L	0.06	0.06	<0.05	<0.05
Oil and Grease	visual inspection	None visible	None visible	None visible	None visible

Table 37 – Monitoring Results for Sites for, RW1, RW2 and PWD (Sample Date 1/09/2021)

Analyte	Units	RW1	RW2	PWD	Drop Cut
pH	pH units	7.18	7.31	7.33	6.88
Electrical Conductivity	uS/cm	984	961	689	732
Total Suspended Solids (TSS)	mg/L	8	11	<5	<5
Total Dissolved Solids (TDS)	mg/L	640	625	448	476
Total Phosphorus as P (TP)	mg/L	0.08	0.03	0.01	<0.01
Total Nitrogen as N (TN)	mg/L	2.0	2.8	7.1	8.1

Analyte	Units	RW1	RW2	PWD	Drop Cut
Dissolved Oxygen (DO)	mg/L	11.7	11.7	11.6	11.2
Turbidity	NTU	21.6	26.6	6.4	4.8
Chloride	mg/L	236	221	101	128
Calcium	mg/L	30	26	16	26
Magnesium	mg/L	37	36	21	22
Sodium	mg/L	97	96	80	72
Potassium	mg/L	4	4	7	4
Total Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001
Total Cobalt	mg/L	<0.001	<0.001	<0.001	<0.001
Total Copper	mg/L	<0.001	0.001	<0.001	0.001
Total Manganese	mg/L	0.038	0.036	0.004	0.005
Total Nickel	mg/L	0.001	0.001	<0.001	<0.001
Total Zinc	mg/L	<0.005	<0.005	<0.005	<0.005
Total Iron	mg/L	0.19	0.13	<0.05	<0.05
Oil and Grease	visual inspection	None visible	None visible	None visible	None visible

6. TRUCK MOVEMENTS

Condition 23 of Schedule 3 of the Consent requires a summary of truck movements to and from the quarry to be published on the website. This summary is contained in Table 38.

Table 38 – Truck Movement Summary

Gunlake Marulan Quarry **Truck Movement Summary**
January 2021 Average Movements – 188 Max movements - 356
February 2021 Average Movements – 260 Max movements - 408
March 2021 Average Movements – 230 Max movements - 376
April 2021 Average Movements – 248 Max movements - 392
May 2021 Average Movements – 240 Max movements - 380
June 2021 Average Movements – 246 Max movements - 364

7. INCIDENTS

No incidents occurred during the reporting period.

8. COMPLAINTS

Table 39 – Complaints Register

Date and Time	Complainant	Nature of Complaint	Recorded By	Corrective Action	Date Closed
30/08/2019	Anthony Deprille	Complainant reported that his house shook from blast vibration and that the blast was not monitored.	Mel White / Vince Matthews	The blast contractor was contacted by the quarry manager and it was confirmed that the blast was monitored as required and that the blast criteria were not exceeded. The complainant was then contacted and advised of the findings.	5/09/2019

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Appendix 1

Monitoring Site Locations

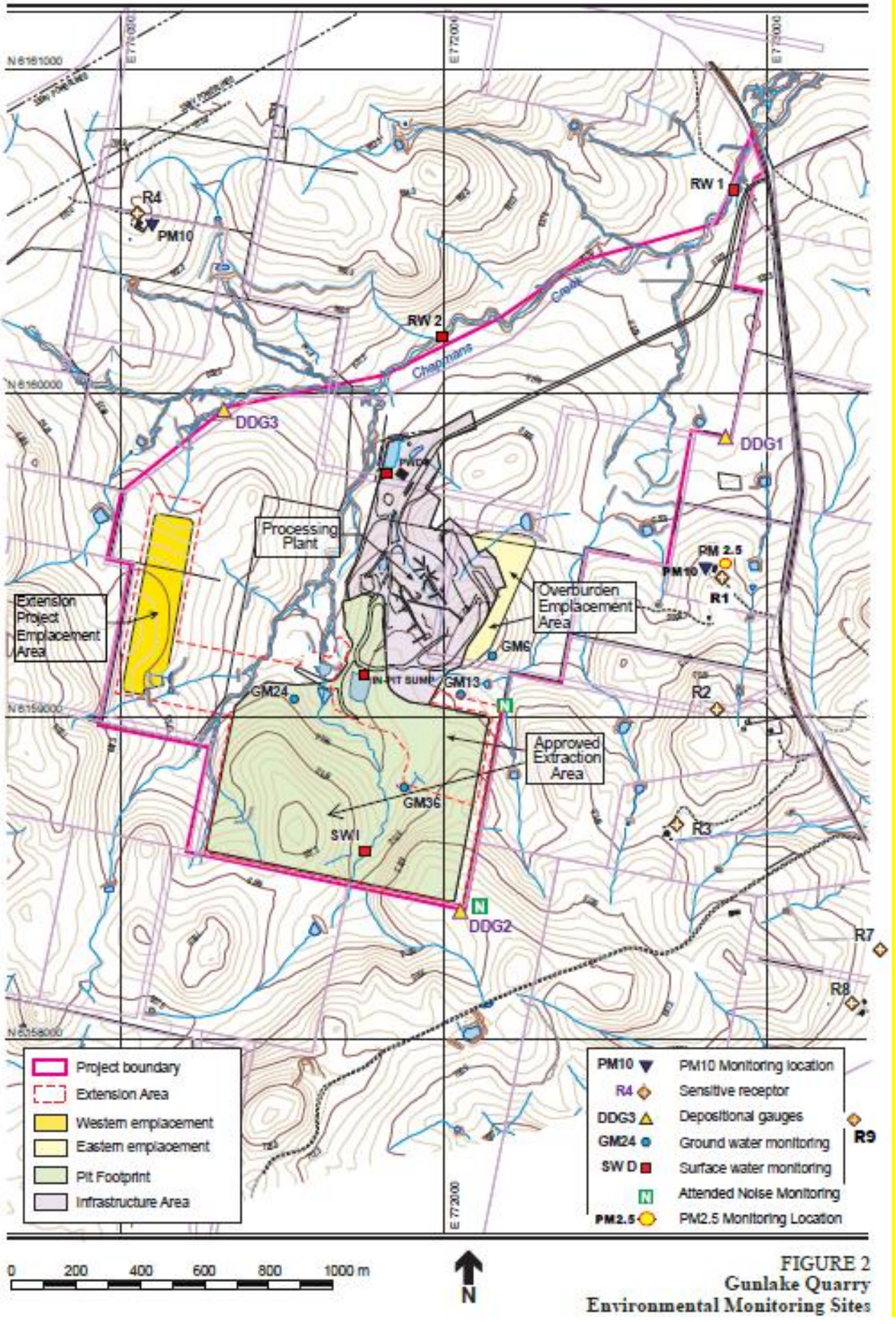
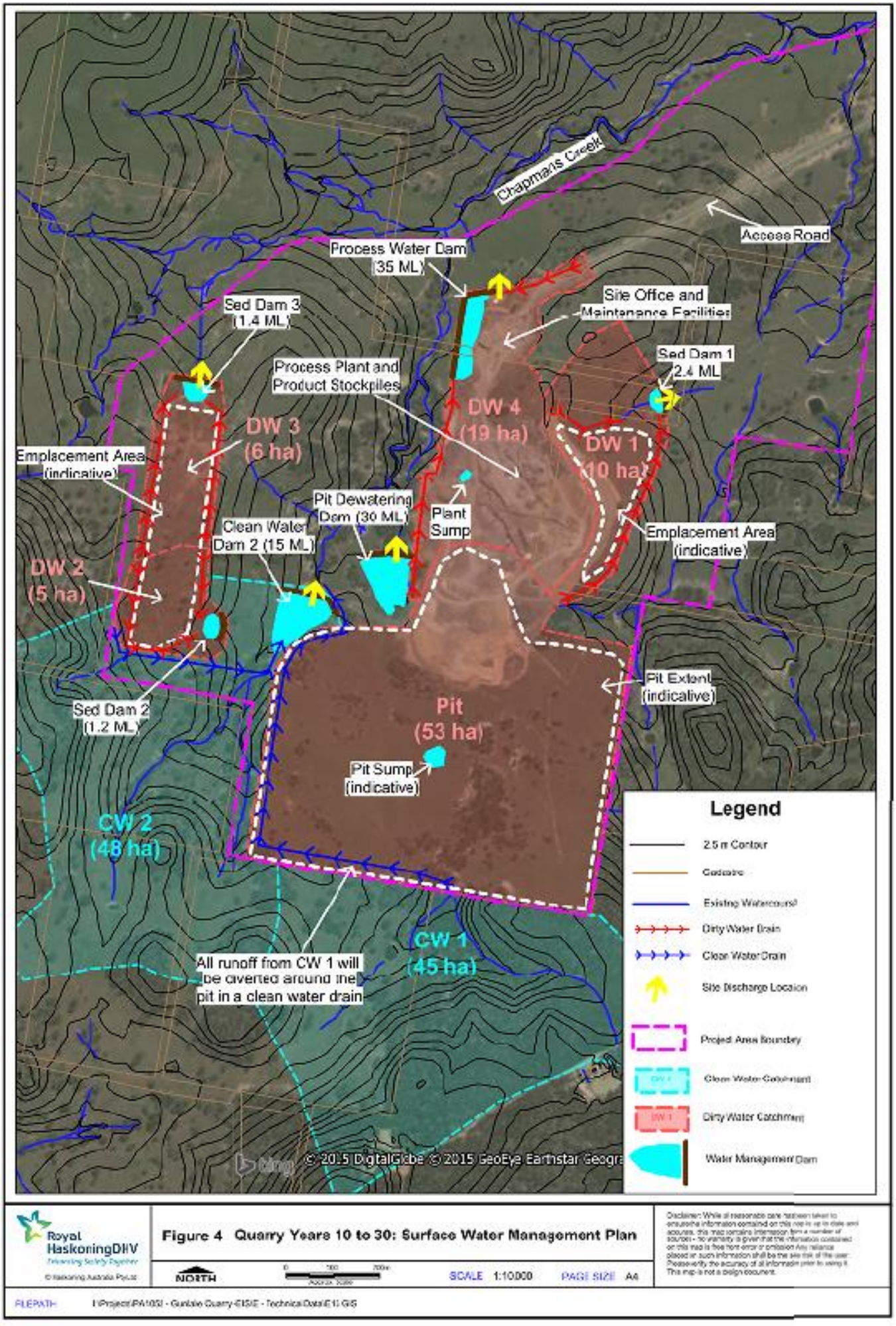


FIGURE 2
Gunlake Quarry
Environmental Monitoring Sites


Chapmans Creek
Access Road
Process Water Dam (35 ML)
Site Office and Maintenance Facilities
Sed Dam 3 (1.4 ML)
Sed Dam 1 2.4 ML
Process Plant and Product Stockpiles
DW 4 (19 ha)
DW 3 (6 ha)
DW 1 (10 ha)
Emplacement Area (indicative)
Pit Dewatering Dam (30 ML)
Plant Sump
Clean Water Dam 2 (15 ML)
Emplacement Area (indicative)
DW 2 (5 ha)
Pit Extent (indicative)
Sed Dam 2 (1.2 ML)
Pit (53 ha)
Pit Sump (indicative)
CW 2 (48 ha)
CW 1 (45 ha)
All runoff from CW 1 will be diverted around the pit in a clean water drain
© 2015 DigitalGlobe © 2015 GeoEye Earthstar Geogra
Legend
2.5 m Contour
Cadastre
Existing Watercourse
Dirty Water Drain
Clean Water Drain
Site Discharge Location
Project Area Boundary
Clean Water Catchment
Dirty Water Catchment
Water Management Dam
Royal HaskoningDHV
Figure 4 Quarry Years 10 to 30: Surface Water Management Plan
NORTH
SCALE 1:10000
PAGE SIZE A4
FILEPATH: I:\Projects\PA1053 - Gunlake Quarry-EISE - Technical Data\E1\GIS