

MANGOOLA OPEN CUT

GLENCORE

Mangoola Open Cut

2019
Annual
Review

1 January 2019 to 31 December 2019



PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
10 Kings Road
New Lambton NSW 2305 Australia
(PO Box 447 New Lambton NSW 2305)
T: +61 2 4037 3200
E: newcastleau@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Mangoola Coal (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
630.13007-R01-v1.1	29 April 2020	Samantha Hayes	Renae Gifford	Nathan Lane
630.13007-R01-v1.0	27 March 2020	Samantha Hayes	Renae Gifford	Nathan Lane

EXECUTIVE SUMMARY


Name of Operation	Mangoola Open Cut
Name of Operator	Mangoola Coal Operations Pty Ltd
Project Approval #	PA 06_0014
Name of holder of Project Approval	Mangoola Coal Operations Pty Ltd
Mining lease #	ML 1626, ML 1747, AL 9, EL 5552
Name of holder of mining lease	Mangoola Coal Operations Pty Ltd
Water licence #	Various (refer Section 3.3)
Name of holder of water licence	Mangoola Coal Operations Pty Ltd
MOP start date	1 January 2016
MOP end date	31 December 2019
Annual Review start date	1 January 2019
Annual Review end date	31 December 2019

I, Nathan Lane, certify that this audit report is a true and accurate record of the compliance status of Mangoola Open Cut for the period 1 January 2019 to 31 December 2019 and that I am authorised to make this statement on behalf of Mangoola Open Cut.

Note.

a) The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, \$1 million and for an individual, \$250,000.

b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or \$22,000, or both).

Name of authorised reporting officer	Nathan Lane
Title of authorised reporting officer	Environment and Community Manager
Signature of authorised reporting officer	
Date	29 April 2020

CONTENTS

1	STATEMENT OF COMPLIANCE	12
2	INTRODUCTION	16
2.1	Mining Operations	16
2.2	Mine Contacts	17
3	APPROVALS.....	19
3.1	Project Approval	19
3.2	Leases.....	19
3.3	Licences.....	20
3.3.1	Environment Protection Licence	20
3.3.2	Surface Water Licences	20
3.3.3	Groundwater Licences.....	22
3.3.4	Radiation Licence	23
3.3.5	Sewage Management System Licence.....	23
3.4	Other Approvals.....	23
3.4.1	Mining Operations Plan (MOP).....	23
4	OPERATIONS DURING THE REPORTING PERIOD	25
4.1	Mining Operations	25
4.1.1	Overview	25
4.1.2	Exploration	25
4.1.3	Land Preparation	25
4.1.4	Mining	25
4.2	Other Operations	27
4.2.1	Coal Processing.....	27
4.2.2	Coal Transport	27
4.2.3	Construction	27
4.2.4	Waste Management	27
4.3	Next reporting Period	28
4.3.1	Mining	28
4.3.2	Exploration	28
4.3.3	Construction	28
4.3.4	Tailings Disposal	28
5	ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW	29
6	ENVIRONMENTAL PERFORMANCE	31
6.1	Meteorology	31

CONTENTS

6.2	Air Quality	33
6.2.1	Environmental Management.....	33
6.2.2	Environmental Monitoring Results.....	36
6.2.2.1	Results from the Reporting Period	36
6.2.2.2	Comparison with Predictions	40
6.2.2.3	Long Term Trend Analysis	41
6.2.3	Key Performance and/or Management Issues	42
6.2.4	Proposed Improvements.....	43
6.3	Noise	43
6.3.1	Environmental Management.....	43
6.3.2	Environmental Monitoring Results.....	47
6.3.2.1	Results from the Reporting Period	47
6.3.2.2	Comparison with Predictions	47
6.3.2.3	Long Term Trend Analysis	50
6.3.3	Key Performance and/or Management Issues	50
6.3.4	Proposed Improvements.....	50
6.4	Blasting and Vibration.....	51
6.4.1	Environmental Management.....	51
6.4.2	Environmental Monitoring Results.....	51
6.4.2.1	Results from the Reporting Period	51
6.4.2.2	Comparison with Predictions	54
6.4.2.3	Long Term Trend Analysis	55
6.4.3	Key Performance and/or Management Issues	55
6.4.4	Proposed Improvements.....	55
6.5	Erosion and Sediment Control.....	56
6.5.1	Environmental Management.....	56
6.5.2	Environmental Monitoring Results.....	56
6.5.3	Key Performance and/or Management Issues	57
6.5.4	Proposed Improvements.....	57
6.6	Biodiversity	58
6.6.1	Environmental Management.....	58
6.6.2	Environmental Monitoring Results.....	58
6.6.2.1	Landscape Function Analysis	62
6.6.2.2	Nest Box Monitoring	62
6.6.2.3	Threatened Terrestrial Orchid Monitoring	62
6.6.2.4	Groundwater Dependent Ecosystems.....	63

CONTENTS

6.6.2.5	Grassland Monitoring	64
6.6.2.6	2019 Offset Tree Planting Program	64
6.6.3	Key Performance and/or Management Issues	65
6.6.4	Proposed Improvements	65
6.7	Weed and Pest Management	66
6.7.1	Environmental Management	66
6.7.1.1	Weed Management Activities	66
6.7.1.2	Feral and Pest Animal Management Activities	66
6.7.2	Key Performance and/or Management Issues	66
6.7.3	Proposed Improvements	66
6.8	Visual Mitigation	67
6.8.1	Environmental Management	67
6.8.2	Environmental Monitoring Results	67
6.8.3	Key Performance and/or Management Issues	67
6.8.4	Proposed Improvements	67
6.9	Aboriginal Heritage	68
6.9.1	Environmental Management	68
6.9.2	Environmental Monitoring Results	68
6.9.3	Key Performance and/or Management Issues	70
6.9.4	Proposed Improvements	70
6.10	European Heritage	70
6.10.1	Environmental Management	70
6.10.2	Environmental Monitoring Results	70
6.10.3	Key Performance and/or Management Issues	71
6.10.4	Proposed Improvements	71
6.11	Spontaneous Combustion	71
6.11.1	Environmental Management	71
6.11.2	Environmental Monitoring Results	71
6.11.3	Key Performance and/or Management Issues	71
6.11.4	Proposed Improvements	71
6.12	Bushfire	72
6.12.1	Environmental Management	72
6.12.2	Environmental Monitoring Results	72
6.12.3	Key Performance and/or Management Issues	72
6.12.4	Proposed Improvements	72
6.13	Hydrocarbon Management	73

CONTENTS

6.13.1	Environmental Management.....	73
6.13.2	Environmental Monitoring Results.....	73
6.13.3	Key Performance and/or Management Issues	73
6.13.4	Proposed Improvements.....	73
6.14	Public Safety.....	74
6.14.1	Environmental Management.....	74
6.14.2	Environmental Monitoring Results.....	74
6.14.3	Key Performance and/or Management Issues	74
6.14.4	Proposed Improvements.....	75
6.15	Greenhouse Gas Energy.....	75
6.15.1	Environmental Management.....	75
6.15.2	Environmental Monitoring Results.....	75
6.15.2.1	Results from the Reporting Period	75
6.15.2.2	Comparison with Predictions	76
6.15.3	Key Performance and/or Management Issues	77
6.15.4	Proposed Improvements.....	77
7	WATER MANAGEMENT.....	78
7.1	Water Balance.....	78
7.2	Water Take.....	79
7.2.1	Changes to Licences	80
7.2.2	Proposed improvements.....	80
7.3	Hunter River Salinity Trading Scheme Discharges	80
7.4	Surface Water Monitoring	81
7.4.1	Environmental Management.....	81
7.4.2	Environmental Monitoring Results.....	83
7.4.2.1	Results from the Reporting Period	83
7.4.2.2	Comparison with Predictions	87
7.4.2.3	Long Term Trend Analysis	88
7.4.3	Key Performance and/or Management Issues	88
7.4.4	Proposed Improvements.....	89
7.5	Groundwater Management.....	89
7.5.1	Environmental Management.....	89
7.5.2	Environmental Monitoring Results.....	91
7.5.2.1	Results from the Reporting Period	91
7.5.2.2	Comparison with Predictions	96
7.5.2.3	Long Term Trend Analysis	96

CONTENTS

7.5.3	Key Performance and/or Management Issues	97
7.5.4	Proposed Improvements	97
8	REHABILITATION	99
8.1	Rehabilitation of Disturbed Land	99
8.2	Comparison with MOP Predictions	104
8.3	Removal of Buildings	106
8.4	Key Issues Affecting Rehabilitation	107
8.4.1	Post Rehabilitation Land Use	110
8.5	Rehabilitation Trials and Research	114
8.6	Actions for the Next Reporting Period	114
9	COMMUNITY	115
9.1	Community Engagement	115
9.1.1	Face to Face Meetings	115
9.1.2	Website	116
9.1.3	Newsletters and Fact Sheets	116
9.2	Community Contributions	117
9.3	Community Complaints	119
9.3.1	2019 Complaints Summary	119
9.3.2	Analysis of Complaints	119
9.3.3	Actions in Response to Complaints	123
10	INDEPENDENT AUDIT	125
11	INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD	136
12	ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD	161
12.1	Management Plan Review	161
12.2	2020 Actions	162
13	REFERENCES	163

CONTENTS

DOCUMENT REFERENCES

TABLES

Table 1	Statement of Compliance.....	12
Table 2	Non-Compliances During 2019	12
Table 3	Compliance Status Categories.....	15
Table 4	Mine Contacts	17
Table 5	Mangoola PA 06_0014 and Modifications	19
Table 6	Mangoola Leases.....	19
Table 7	Mangoola Surface Water Licences.....	20
Table 8	Mangoola Groundwater Licences	22
Table 9	2019 Production Summary.....	25
Table 10	Actions Required From 2018 Annual Review.....	29
Table 11	PA 06_0014 Air Quality Criteria	34
Table 12	2019 Depositional Dust Gauge Results (Insoluble Matter)	36
Table 13	2019 PM ₁₀ 24-hr Average Results	37
Table 14	2019 PM ₁₀ and TSP 24-hr Average Results.....	39
Table 15	Comparison of 2018 and 2019 Dust Emissions	40
Table 16	PA 06_0014 – Noise Impact Assessment Criteria	45
Table 17	EPL 12894 – Noise Impact Assessment Criteria	45
Table 18	Attended Noise Monitoring Results and Comparison against MOD 6 Predictions (L _{Aeq} (15minute))	48
Table 19	Attended Noise Monitoring Results and Comparison against MOD 6 Predictions (L _{Amax}).....	49
Table 20	Compliance Monitoring Location Summary and Adopted Criterion.....	53
Table 21	Airblast Overpressure Summary	53
Table 22	Ground Vibration Summary	54
Table 23	2019 Annual Channel Stability Report Recommendations	57
Table 24	Aboriginal Heritage Monitoring and Inspections	68
Table 25	Proposed Energy Improvements.....	75
Table 26	Greenhouse Gas Data.....	76
Table 27	Mangoola 2019 Water Balance (Calendar Year)	78
Table 28	Mangoola 2019 Water Take (Water Year)	79
Table 29	Surface Water Monitoring Results – pH and EC.....	83
Table 30	Surface Water Monitoring Results – TDS and TSS	84
Table 31	Annual Surface Water Specification Results	86
Table 32	Comparison of 2019 Water Usage with the 2013 MOD 6 Assessment	88
Table 33	Groundwater Monitoring Results – pH, EC and Groundwater Level	92
Table 34	Annual Groundwater Speciation Results 2019	95
Table 35	Rehabilitation Status	99
Table 36	Rehabilitation Progress Compared to MOP Predictions	104
Table 37	Schedule of Building Demolitions and Removal during 2019	106
Table 38	Summary of MOP TARP actions completed in 2019	108
Table 39	Final Land Use Rehabilitation.....	110
Table 40	Comparison of the 2019 Rehabilitation Walkover Inspection Results with MOP Completion Criteria	111

CONTENTS

Table 41	Website Audit.....	116
Table 42	Summary of Complaints in 2019	119
Table 43	Independent Environmental Audit Non-Compliances	126
Table 44	Independent Environmental Audit Recommendations	130
Table 45	Non-Compliance and Exceedances	137
Table 46	Revision of Strategies, Plans and Programs	161
Table 47	2020 Actions.....	162

FIGURES

Figure 1	Regional Context	18
Figure 2	Mangoola Site Layout.....	26
Figure 3	2014-2019 Waste Streams Generated	28
Figure 4	WSN 2019 Rainfall Data	31
Figure 5	BOM Rainfall Deficiency: 12 months (2019)	32
Figure 6	WSN 2019 2m Temperature Data	33
Figure 7	Air Quality and Meteorological Monitoring Locations.....	35
Figure 8	Noise and Blast Monitoring Locations	44
Figure 9	Daily Blast Events	52
Figure 10	Flora, Fauna and GDE Monitoring Locations.....	61
Figure 11	Surface Water Monitoring Locations	82
Figure 12	Groundwater Monitoring Locations.....	90
Figure 13	Actual Rehabilitation and Disturbance Vs MOP Plan 3D.....	105
Figure 14	MOP TARP Action Areas	109
Figure 15	2019 Complaints by Time of Day	120
Figure 16	2019 Complaints by Complainant ID.....	121
Figure 17	2019 Complaints by Location	122
Figure 18	Long term Rainfall Data at WSN – 2010 to 2019.....	1
Figure 19	Long Term Annual Average Depositional Dust Monitoring Results – 2010 to 2019.....	1
Figure 20	Long Term Annual Average TSP HVAS Monitoring Results – 2010 to 2019.....	2
Figure 21	Long Term 24h PM ₁₀ HVAS Monitoring Results – 2010 to 2019.....	3
Figure 22	Long Term Annual Average PM ₁₀ TEOM Monitoring Results – 2011 to 2019.....	4
Figure 23	Long Term 24h PM ₁₀ TEOM Monitoring Results – 2011 to 2019.....	5
Figure 24	Long Term Blast Vibration Monitoring – BM01 to BM04 and BM07 to BM08	1
Figure 25	Long Term Overpressure Monitoring – BM01 to BM04 and BM07 to BM08	2
Figure 26	Long Term Blast Vibration Monitoring – Representative of Anvil Rock and Nearest Formation	3
Figure 27	Long Term Surface Water pH – 2010 to 2019.....	1
Figure 28	Long Term Surface Water EC – 2010 to 2019	2
Figure 29	Long Term Surface Water TSS – 2010 to 2019.....	3
Figure 30	Long Term Surface Water TDS – 2010 to 2019	4
Figure 31	Standing Water Level GW Bores – 2003 to 2019	5
Figure 32	Standing Water Level MP and BFC Bores – 2012 to 2019.....	6
Figure 33	GW Bores pH – 2004 to 2019.....	7
Figure 34	MP and BFC Bores pH – 2012 to 2019	8

CONTENTS

Figure 35	GW Bores EC – 2004 to 2019	9
Figure 36	MP and BFC Bores EC – 2012 to 2019	10

PHOTOS

Photo 1	South Pit Rehabilitation Woodland Area Seeded 2017	101
Photo 2	Main Pit Central Rehabilitation Frog Pond Constructed 2019	101
Photo 3	South Pit Rehabilitation Wetland Area with <i>Limnodynastes tasmaniensis</i> after March 2019 Rainfall	102
Photo 4	North Pit Rehabilitation Area Translocated <i>Xanthorrhoea's</i>	102
Photo 5	2014 Rehabilitation of Woodland and Grassland Area with Rock Habitat	103
Photo 6	Progressive Rehabilitation in Main Pit Central – Left Side of Track Seeded 2018, Right Side of Track Seeded 2019	103
Photo 7	One of Ten Invertebrate Habitat Boxes installed into the Rehabilitation during 2019.....	114
Photo 8	St Joseph's Primary School Denman – Cattle Team	118
Photo 9	Wanaruah Local Aboriginal Land Council Front Yard Blitz – Apprentice Work Bee 2019.....	118

APPENDICES

Appendix A	Annual Review Plan
Appendix B	Long Term Trend Graph – Rainfall
Appendix C	Long Term Trend Graphs – Air Quality
Appendix D	Long Term Trends Graphs – Blasting
Appendix E	Long Term Graphs – Surface and Groundwater
Appendix F	Annual Train Movements 2019

1 Statement of Compliance

A summary of compliance at Mangoola Open Cut during 2019 is provided in **Table 1**.

Table 1 Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	Yes/No
PA 06_0014	No
EPL 12894	No
ML 1626	Yes
ML 1747	Yes
AL 9	Yes
EL 5552	Yes

A summary of the non-compliances during the reporting period have been summarised in **Table 2**. The non-compliances during the 2019 reporting period are discussed further in **Section 11**. The non-compliance categories are described in **Table 3**.

Table 2 Non-Compliances During 2019

Relevant Approval	Condition #	Condition Description Summary	Compliance Status	Comment	Where Addressed
PA 06_0014	Schedule 3, Condition 14	Property investigations	Non-compliant	A property investigation was requested by Property ID 200 with results to be sent to the landholder within two months of request. As a copy of the property investigation report was not given to the landholder within two months of receiving this claim this condition is deemed non-compliant. No further action was proposed as per the 2019 Independent Environmental Audit (IEA).	Section 6.4.3 and Section 11

PA 06_0014	Schedule 3, Condition 19	24h PM ₁₀ criterion of 50µg/m ³	Non- compliant	<p>Exceedance of 50 µg/m³ 24h PM₁₀ criteria at:</p> <ul style="list-style-type: none"> 16 January 2019 – D02-DC (54.6 µg/m³) and D06-DC (57.5 µg/m³) - DPIE reviewed the information presented in the report and was satisfied Mangoola Coal undertook reasonable and feasible mitigation measures to minimise dust emissions from the site on this day. 17 January 2019 – D02-DC (54.5 µg/m³) and D06-DC (59.8 µg/m³) - DPIE reviewed the information presented in the report and was satisfied Mangoola Coal undertook reasonable and feasible mitigation measures to minimise dust emissions from the site on this day. 10 February 2019 – D03-DC (54.0 µg/m³), D04-DC (51.4 µg/m³) and D06-DC (54.7 µg/m³) - DPIE reviewed the information presented in the report and was satisfied that reasonable and feasible measures were undertaken at the site on the day of the event and that no further action was required. 11 March 2019 – D06-DC (53.5 µg/m³) - DPIE reviewed the information presented in the report and was satisfied Mangoola Coal undertook reasonable and feasible mitigation measures to minimise dust emissions from the site on this day. 9 August 2019 – D03-DC (50.4 µg/m³) - DPIE reviewed the information presented in the report and was satisfied that Mangoola Coal undertook reasonable and feasible measures to minimise dust emissions from the site on the day of the exceedance. 14 September 2019 – D03-DC (54.6 µg/m³) - DPIE reviewed the information presented in the report and was satisfied that reasonable and feasible measures were undertaken on the day. 	Section 6.2.2 and Section 11
---------------	-----------------------------	---	-------------------	--	------------------------------------

Relevant Approval	Condition #	Condition Description Summary	Compliance Status	Comment	Where Addressed
PA 06_0014	Schedule 3, Condition 44	Monitoring of coal transport	Non-compliant	Train movements 'on a daily basis' were not included in the Annual Review as required. No further action was proposed as per the 2019 IEA. The train movements on a daily basis are included as Appendix F of this document.	Section 4.2.2 and Section 11
EPL 12894	Condition P1.3	Discharge offsite	Non-compliant	Water discharged from three erosion and sediment control structures on 30 March 2019 during an 89.8 mm (Weather Station North) rainfall event in a 24-hour period. The results of the investigation showed that for the duration from 3.5 hours to 8 hours the storm exceeded a 2% Annual Exceedance Probability (AEP) event. The rainfall also exceeded the 5-day 95th percentile event. DPIE was satisfied that Mangoola Coal had complied with the requirements of the consent and approved management plans. EPA advised that 'no action' would be taken due to 'several factors including rainfall exceeding design criteria, the implementation of preventative measures and no evidence of any environmental harm'.	Section 7.4.3 and Section 11
EPL 12894	Condition M2.2	Air Monitoring Requirements	Non-compliant	PM ₁₀ monitoring is required continuously in accordance with Condition M2.2 of EPL 12894 between 25-26 February 2019, the vacuum pump failed at Monitoring Point 19 (D7-DC) as outlined in Table 4.3 of the approved AQMP. This was a non-compliance in accordance with Sampling Method – Special Method 1. The E-Sampler was replaced the following day (as soon as practicable) and daily monitoring checks were undertaken as follow up to ensure the monitor was functioning. This was reported in the EPL 12894 Annual Return in 2019.	Section 6.2.3

Relevant Approval	Condition #	Condition Description Summary	Compliance Status	Comment	Where Addressed
EPL 12894	Condition M4.1	Weather Monitoring	Non-compliant	Continuous weather monitoring is required in accordance with Condition M4.1 of EPL 12894. On Friday 11 October 2019, Weather Station North (EPL Point 5) stopped recording wind speed and direction. The issue was identified by site personnel on Monday 14 October 2019. The unit was reset remotely in an attempt to fix the issue which failed. A technician attended site on Monday 14 October 2019 and diagnosed and replaced a faulty sensor. The weather station was fully operational again at 3:45pm on Monday 14 October 2019. This will be reported in the EPL 12894 Annual Return in 2020.	Section 6.2.3

Table 3 Compliance Status Categories

Risk Level	Colour Code	Description
High	Non-Compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-Compliant	Non-compliance with potential for serious environmental consequences, but is unlikely to occur; or potential for moderate environmental consequences, but is likely to occur
Low	Non-Compliant	Non-compliance with potential for moderate environmental consequences, but is unlikely to occur; or potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-Compliant	Non-compliance which does not result in any risk of environmental harm

2 Introduction

2.1 Mining Operations

Mangoola Open Cut (Mangoola) is owned and operated by Mangoola Coal Operations Pty Ltd which is a Glencore managed operation. Mangoola is located near Wybong, New South Wales (NSW), approximately 20 kilometres (km) west of Muswellbrook and approximately 10 km north of Denman in the Muswellbrook Local Government Area (LGA). A locality plan is presented in **Figure 1**. This Annual Review has been prepared for the 12-month reporting period of 1 January 2019 to 31 December 2019 (herein referred to as the reporting period).

Project Approval 06_0014 (PA 06_0014) was granted in June 2007 for the construction of an open cut coal mine and associated infrastructure in the Wybong area. The mine, then owned by Centennial Coal and known as the Anvil Hill Project, was approved to extract up to 10.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal. Since April 2014, Mangoola has been approved to extract up to 13.5 Mtpa ROM coal under PA 06_0014. The Site also operates a Coal Handling and Preparation Plant (CHPP) and Train Loading Facility.

This Annual Review has been prepared in accordance with the following:

- Schedule 5, Condition 6 of PA 06_0014;
- The NSW Government Annual Review Guideline (October 2015);
- Mining Lease 1626 (ML 1626);
- Mining Lease 1747 (ML 1747);
- 2016-2019 Mining Operations Plan (MOP); and
- Outcomes from the 2018 Annual Review feedback and inspection.

Copies of this Annual Review will be made available to the Department of Planning, Industry and Environment (DPIE), the Department of Planning, Industry and Environment – Resources Regulator (Resources Regulator), the Biodiversity Conservation Division (BCD), the Natural Resources Access Regulator (NRAR) and the Environment Protection Authority (EPA). Copies and/or a link to the company website will also be provided to the members of the Mangoola Community Consultative Committee (CCC). A copy will also be made available on the Mangoola website in accordance with PA 06_0014 for any public person to access.

2.2 Mine Contacts

The relevant mine contacts for Mangoola are listed in **Table 4**.

Table 4 Mine Contacts

Contacts	Details
Operations Manager	Nick Slater
Environment and Community Manager	Nathan Lane
Address	PO Box 495 Muswellbrook NSW 2333
Phone Number	(02) 6549 5500
Fax Number	(02) 6549 5655
24 Hour Community Hotline	1800 014 339
Website	www.mangoolamine.com.au
General Enquiries Email	mangoolaenquiries@glencore.com.au

Figure 1 - Regional context



Legend

- Major road
- Main road
- Watercourse
- Approved Mangoola Coal EPL and Disturbance Boundary
- NPWS reserve
- State Forest

DISCLAIMER

Subject To Survey.

Glencore makes every effort to ensure the quality of the information available on this map. Before relying on the information on this map, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances. Glencore cannot guarantee and assumes no responsibility for the accuracy, currency or completeness of the information and by using this map you accept that Glencore has no liability for any loss or damage in any form whatsoever caused directly or indirectly from the use of this map.

DATA SOURCE

© NSW Department of Finance & Services (LPI) 2016
© NSW DTIRIS (Minerals & Petroleum) 2016
© Glencore 2016 © ESRI 2016

3 Approvals

Operations at Mangoola are regulated by a range of leases, licences and approvals, which are summarised in the following sections.

3.1 Project Approval

PA 06_0014 (as modified) allows for the extraction, processing and transportation of up to 13.5 Mtpa for a period of up to 21 years from the granting of a Mining Lease. Mining Lease 1626 was granted on 20 November 2008, therefore PA 06_0014 expires in 2029. Eight modifications to PA 06_0014 have been approved, as detailed in **Table 5**.

Table 5 Mangoola PA 06_0014 and Modifications

Approval	Title	Date Granted	Expiry
06_0014	Original Approval	7 June 2007	20 November 2029
06_0014 Mod 1	Change to Road Access and Water Supply	22 July 2008	20 November 2029
06_0014 Mod 2	Relocate Water Supply Pipeline	23 June 2009	20 November 2029
06_0014 Mod 3	Relocate Mine Infrastructure Area	4 November 2009	20 November 2029
06_0014 Mod 4	Modify Approved Mine Plan	22 June 2012	20 November 2029
06_0014 Mod 5	Night-time Works	23 February 2010	20 November 2029
06_0014 Mod 6	Extraction Rate Increase	28 April 2014	20 November 2029
06_0014 Mod 7	Removal of Schedule 3, Condition 3 – Traffic Noise Criteria	22 August 2016	20 November 2029
06_0014 Mod 8	Update of Project Layout Plan	14 June 2017	20 November 2029

During 2019, preparation of the Mangoola Coal Continued Operations (MCCO) Project Environmental Impact Statement (EIS) was completed. Public Exhibition was undertaken for the period 18 July 2019 to 28 August 2019 with 335 submissions received. A Response to Submission Report was furnished to DPIE in December 2019. Ongoing assessment and possible determination of the project will continue throughout 2020.

The MCCO Project proposes the continuation of the existing mine to a new mining area immediately north of the existing operation. Further details can be viewed at the Mangoola Website via the Future Mining tab.

3.2 Leases

Mangoola currently holds four active leases as shown in **Table 6**.

Table 6 Mangoola Leases

Title	Date Granted	Expiry
ML 1626	20 November 2008	20 November 2029
ML 1747	24 August 2016	5 December 2037
Exploration Lease 5552	8 May 2006	7 November 2019 (renewal lodged 4 November 2019)
Assessment Lease 9	8 November 2004	7 November 2019 (renewal lodged 4 November 2019)

3.3 Licences

3.3.1 Environment Protection Licence

Mangoola operates under Environment Protection Licence (EPL) 12894, with an anniversary date of 7 July. Monitoring results are reported to the EPA as part of the Mangoola EPL Annual Return and monitoring data is available on the Mangoola website. During the reporting period Mangoola varied its EPL twice:

- 1573948 – 8 January 2019 s.58 Licence Variation – Replace blasting monitoring point 17 with monitoring point 32 in condition M7.1 (correction); and
- 1574988 – 2 August 2019 s.58 Licence Variation – The variation replaced attended noise monitoring points 25 and 28 with new monitoring point. Monitoring point 25 was no longer required as the licensee had entered into an impact mitigation agreement with the nearest landowner to the monitoring point. For ease of access and safety and to reduce extraneous noise sources, monitoring point 28 was also proposed to be relocated. New noise monitoring point 34 was added which is representative monitoring point for the next nearest residence in the area.

The environmental reporting and monitoring activities undertaken at Mangoola as required under EPL 12894, are discussed in **Section 6**.

3.3.2 Surface Water Licences

Mangoola currently holds the following surface water licences, as detailed in **Table 7**.

Table 7 Mangoola Surface Water Licences

WAL No.	DPI Water Reference Number	Share Allocation (ML)	Water Source	WAL No.	DPI Water Reference number	Share Allocation (ML)	Water Source
503	20AL200112	159	Hunter Regulated River	6571	20AL201639	111	Hunter Regulated River
644	20AL200456	3	Hunter Regulated River	6572	20AL201640	8	Hunter Regulated River
645	20AL200457	432	Hunter Regulated River	6576	20AL201869	600	Hunter Regulated River
691	20AL200578	50	Hunter Regulated River	6577	20AL201870	8	Hunter Regulated River
692	20AL200579	8	Hunter Regulated River	7291*	20AL202589	63	Wybong Creek
735	20AL200676	72	Hunter Regulated River	7292*	20AL202610	44	Wybong Creek
822	20AL200912	3	Hunter Regulated River	9061	20AL203156	6	Hunter Regulated River
823	20AL200913	310	Hunter Regulated River	9062	20AL203157	18	Hunter Regulated River
824	20AL200915	175	Hunter Regulated River	9343*	20AL203174	25	Wybong Creek

WAL No.	DPI Water Reference Number	Share Allocation (ML)	Water Source	WAL No.	DPI Water Reference number	Share Allocation (ML)	Water Source
830	20AL200933	306	Hunter Regulated River	9344*	20AL203206	164	Wybong Creek
831	20AL200934	8	Hunter Regulated River	9986	20AL203182	5	Hunter Regulated River
895	20AL201081	8	Hunter Regulated River	9987	20AL203183	82	Hunter Regulated River
897	20AL201085	55	Hunter Regulated River	9988	20AL203184	8	Hunter Regulated River
898	20AL201086	8	Hunter Regulated River	11085*	20AL203320	128	Wybong Creek
933	20AL201156	43	Hunter Regulated River	11216	20AL203370	86	Hunter Regulated River
1000	20AL201324	3	Hunter Regulated River	13083	20AL203454	100	Hunter Regulated River
1001	20AL201325	334	Hunter Regulated River	13228	20AL202591	0	Wybong Creek
1057	20AL201469	509	Hunter Regulated River	13229	20AL202592	77	Wybong Creek
1159	20AL201722	159	Hunter Regulated River	18689	20AL209242	15	Muswellbrook
1239	20AL203080	40	Hunter Regulated River	18701	20AL209198	28	Muswellbrook
1349	20AL202949	8	Hunter Regulated River	18712	20AL209241	5	Muswellbrook
1387	20AL202878	40	Hunter Regulated River	20343	20AL204331	48	Wybong Creek
6260*	20AL202522	36	Wybong Creek	37027*	20AL213134	30	Wybong Creek
6261	20AL202524	1	Wybong Creek	37028*	20AL213135	96	Wybong Creek
6262*	20AL202525	8	Wybong Creek	6294*	20AL202631	39	Wybong Creek
6264*	20AL202531	30	Wybong Creek	6296*	20AL202639	86	Wybong Creek
6272*	20AL202554	50	Wybong Creek	6298*	20AL202643	39	Wybong Creek
6275	20AL202561	5	Wybong Creek	6300	20AL202647	5	Wybong Creek
6276*	20AL202562	12	Wybong Creek	6304	20CA202655	5	Wybong Creek
6278*	20AL202569	117	Wybong Creek	6305	20CA202656	74	Wybong Creek
6306*	20AL202658	52	Wybong Creek				

*WAL covered under water use approval 20MW065001 (Miscellaneous Works Approval for licence of harvestable rights).

3.3.3 Groundwater Licences

Mangoola currently holds the following groundwater licences shown in **Table 8**.

Table 8 Mangoola Groundwater Licences

WAL No.	Works Approval No.	Share Allocation (ML)	Type of Works	WAL No.	Works Approval No.	Share Allocation (ML)	Type of Works
6316	20CA202449	175	Well	-	20BL172827	0	Test bore
6317	20CA202451	19	Well	-	20BL171778	0	Test bore
6322	20CA202463	5	Well	-	20BL171860	0	Test bore
6327	20CA202482	30	Well	-	20BL171861	0	Test bore
18068	20CA208143	5	Bore	-	20BL171862	0	Test bore
18136	20CA208033	596	Bore	-	20BL171864	0	Test bore
18170	20CA207847	219	Well	-	20BL171865	0	Test bore
18214	20CA208151	218	Well	-	20BL171867	0	Test bore
18219	20CA208171	5	Bore	-	20BL172567	0	Test bore
18232	20CA208179	5	Bore	-	20BL172568	0	Test bore
18690	20CA209155	10	Bore/Well	-	20BL172569	0	Test bore
18695	20CA209151	131	Well	-	20BL172570	0	Test bore
18696	20CA209157	53	Well	-	20BL172573	0	Test bore
18701	20CA209199	28	Bore	-	20BL172788	0	Test bore
18718	20CA209147	151	Well/Bore	-	20BL172789	0	Test bore
30247	20CA212344	98	Well	-	20BL172790	0	Test bore
41561	20BL172598	700	Excavation	-	20BL172806	0	Test bore
6325	20CA202475	0	Well	-	20BL172807	0	Test bore
-	20WA216010	1	Bore	-	20BL172808	0	Test bore
-	20WA207550	0	Bore	-	20BL172809	0	Test bore
-	20WA214821	0	Bore	-	20BL172811	0	Test bore
-	20WA207593	0	Well	-	20BL172812	0	Test bore
-	20WA207594	0	Well	-	20BL172813	0	Test bore
-	20WA209128	0	Bore	-	20BL172814	0	Test bore
-	20WA215330	0	Bore	-	20BL168135	0	Test bore
-	20WA207651	0	Bore	-	20BL168414	0	Test bore
-	20WA215537	0	Bore	-	20BL168696	0	Test bore
-	20WA207655	0	Well	-	20BL168743	0	Test bore
-	20WA207668	0	Well	-	20WA216315	0	Bore
-	20WA209113	0	Bore	-	20WA207700	0	Well

WAL No.	Works Approval No.	Share Allocation (ML)	Type of Works	WAL No.	Works Approval No.	Share Allocation (ML)	Type of Works
-	20WA212410	0	Bore	-	20WA209139	0	Spear points
-	20WA209136	0	Bore	-	20WA207718	0	Well
-	20WA209112	0	Bore	-	20WA215573	0	Well
-	20WA215016	0	Bore	-	20WA215826	0	Well
-	20WA215082	0	Bore	-	20BL167003	0	Bore
-	20WA215502	0	Bore				

3.3.4 Radiation Licence

Mangoola holds Radiation Licence 5063445 which expires 28 April 2020. This annual licence was renewed during the reporting period.

3.3.5 Sewage Management System Licence

Mangoola Coal holds an approval to operate an onsite sewerage management system – license number WTA5/2010 which allows for the operation of a Sewage Management System in accordance with the requirements of the Muswellbrook Shire Council and the sites EPL 12894. The licence expires on 16 March 2021. All results required under EPL 12894 are published on the Mangoola Coal website.

Hansen Bailey completed the Independent Environmental Audit in 2019 and made one recommendation relating to the Sewage Management System under to PA 06_0014.

- 2019 IEA, PA 06_0014, Sch 3, Condition 57 Add sewage operation criteria to email sent to Council for easy comparison. Include criteria in the ongoing email of results to Muswellbrook Shire Council by 18 Nov 2019.

All recommendations and progress can be reviewed in **Section 10**.

3.4 Other Approvals

3.4.1 Mining Operations Plan (MOP)

The Mangoola Mining Operations Plan (MOP) was amended in 2018 (Amendment B) to shorten the MOP term to 2019 and update the rehabilitation and disturbance predictions. MOP Amendment B was approved on 26 October 2018. A comparison of 2019 rehabilitation and disturbance against the revised MOP predictions is provided in **Section 8.2**.

A new MOP was approved 20 December 2019 for the period of 2020 calendar year with revision to occur during 2020 for further years.

Hansen Bailey (2019) made one recommendation relating to the MOP as an outcome of the IEA:

- 2019 IEA, ML1626, Condition 4(b) The addition of a figure and/or discussion comparing MOP predictions with current progress should be included in the Annual Review. Update table comparing MOP predictions with current progress in the 2019 Annual Review to be submitted to DPIE by 31 Mar 2020.

All recommendations and progress can be reviewed in **Section 10**.

4 Operations During the Reporting Period

4.1 Mining Operations

4.1.1 Overview

Open cut mining continued at Mangoola during the reporting period. Truck and shovel mining methods are used to handle overburden and coal, following pre-strip and drilling and blasting activities. Product coal is loaded and transported to market via the rail loop connected to the Muswellbrook – Ulan railway. The mine operates 24 hours a day, seven days a week, and currently employs 391 full time equivalent employees (with approval for 450 employees). The general site layout is presented in **Figure 2**. Activities undertaken during the reporting period included open cut mining, coal processing and coal transport, which are detailed in the following sections.

4.1.2 Exploration

No exploration was undertaken during 2019.

4.1.3 Land Preparation

Land clearing is undertaken in accordance with the Mangoola Environmental Management System. Areas are assessed prior to clearing to minimise potential ecological, water management, sediment and erosion and cultural heritage impacts in accordance with the pre-clearing requirements.

4.1.4 Mining

Open cut mining operations continued during the reporting period, with 12.9 Million tonnes (Mt) of ROM coal being extracted. Mining operations during the reporting period continued in the Main Pit and South Pit. Approximately 37.8 million bank cubic metres (BCM) of overburden were moved. The 2019 production summary is presented in **Table 9**.

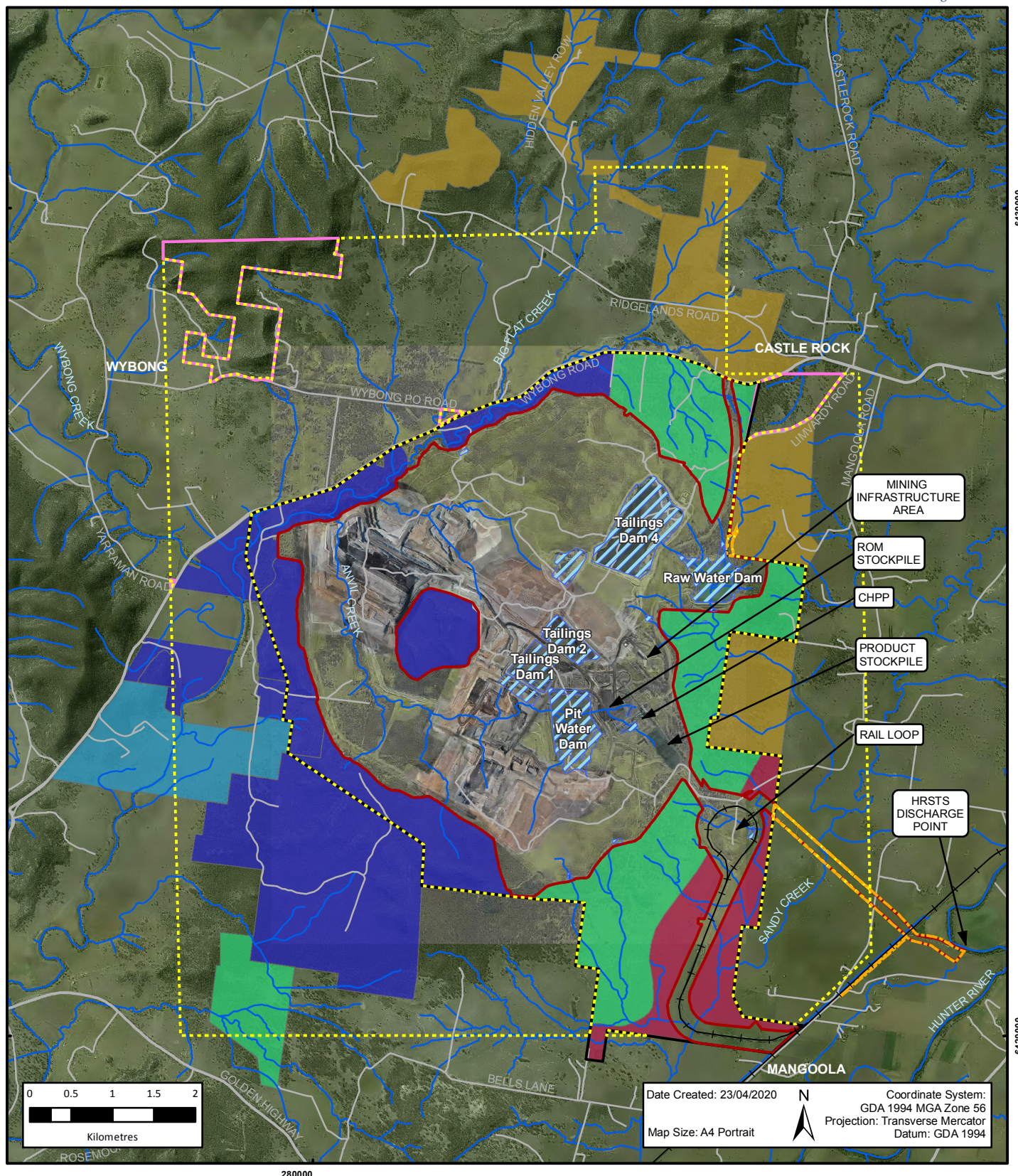
Table 9 2019 Production Summary

Material	Approved Limit (PA 06_0014)	2019 MOP Prediction	2018 reporting period (actual)	2019 reporting period (actual)	2020 reporting period (forecast)
Waste Rock/ Overburden (BCM)	No limit	37,593,604	37,268, 648	37,832,133	39,140,910
ROM Coal (t)	13,500,000	12,676,191	13,310,870	12,920,522	10,805,777
Coarse reject (t)	No limit	2,527,275*	1,231,508	1,250,014	1,007,795
Fine reject (Tailings) (t)	No limit		1,347,048	1,391,110	1,121,550
Saleable product (t)	No limit	10,148,916	10,563,220	10,163,802	8,676,432

* The MOP predicted a combined reject volume rather than separating out into coarse and fine rejects.

ROM production in 2019 exceeded MOP predictions by approximately 244,000t but was generally in line with the prediction, and was within the PA 06_0014 approval limit. During 2019, Excavator 101 (Tier 1) was converted from a face shovel configuration to a backhoe configuration to add flexibility to the mining fleet. The remainder of the mining fleet is unchanged from previous years. No gravel crushing operations occurred on site during 2019.

Figure 2 - Site Layout

Coal Assets Australia
www.glencore.com

Legend

- | | |
|--|---|
| Approved Mangoola Coal EPL and Disturbance Boundary | Biodiversity Offset Areas |
| Mining Lease 1626 | Aboriginal Cultural Heritage Offset Area |
| ML 1747 | Habitat Enhancement Offset Area |
| EL5552 | Northern Corridor |
| Assessment Lease 9 | Southern Offset Area |
| Dam locations | Western Corridor |
| — Watercourse | |
| —+— Railway | |

DISCLAIMER
Subject To Survey.

Glencore makes every effort to ensure the quality of the information available on this map. Before relying on the information on this map, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances. Glencore cannot guarantee and assumes no responsibility for the accuracy, currency or completeness of the information and by using this map you accept that Glencore has no liability for any loss or damage in any form whatsoever caused directly or indirectly from the use of this map.

DATA SOURCE

© NSW Department of Finance & Services (LPI) 2020
© NSW DTIRIS (Minerals & Petroleum) 2020
© Glencore 2020 © ESRI 2020

4.2 Other Operations

4.2.1 Coal Processing

During the reporting period approximately 10.2 Mt of product coal, 1.4 Mt of tailings, and 1.3 Mt of coarse rejects were produced from the CHPP. During the reporting period the CHPP washed or bypassed all coal produced at Mangoola. Mangoola utilised Tailings Dam 4 for fine rejects disposal.

Tailings Dam 3 (North Pit void) continued to be infilled with waste rock/overburden during 2019. Tailings Dam 4 has sufficient capacity for Life-Of-Mine. No capping took place for Tailings Dam 1 or Tailings Dam 2 during 2019.

4.2.2 Coal Transport

During the reporting period there were 2,401 train movements from the Mangoola rail loader, which transported approximately 10.2 Mt of coal. Each train consists of two movements (one movement into the loop and one movement out of the loop). This equates to an average of 6.6 train movements generated by Mangoola on a daily basis, with a maximum of 15 train movements in one day. This is within the 20 train movements per day limit stipulated in Condition 49 of PA 06_0014. No coal was transported other than by rail during the reporting period.

Annual train movements are included as **Appendix F**.

4.2.3 Construction

There were no construction works undertaken during 2019.

4.2.4 Waste Management

Waste at Mangoola is managed in accordance with the Environmental Management System (EMS) (incorporating waste reuse and recycling). The EMS has been developed in accordance with the requirements of the *Protection of the Environment Operations Act 1997* (POEO Act).

A licensed waste contractor undertakes the collection, transport and recording of waste material, with as much material as possible being recycled. During the reporting period 2,280 tonnes of waste was disposed of offsite with 1,864 tonnes of that being recycled (82% recycled). This represents an overall increase in total waste disposal compared to 2018 (1,576 tonnes). This increase was primarily a result of a major scrap steel campaign and house demolition project which was undertaken within the biodiversity offset areas in 2019. Between 2018 and 2019, the volume of scrap steel recycled increased from 250 tonnes to 404 tonnes. Asbestos disposed of increased from 0 tonnes to 100 tonnes, and concrete increased from 0 tonnes to 157 tonnes.

The major waste streams during the reporting period were waste oil (696 tonnes), scrap steel (404 tonnes), mixed solid waste (234 tonnes), asbestos (100 tonnes), concrete (157 tonnes) and effluent (432 tonnes).

A summary of waste disposal from 2015 to 2019 is presented in **Figure 3**.

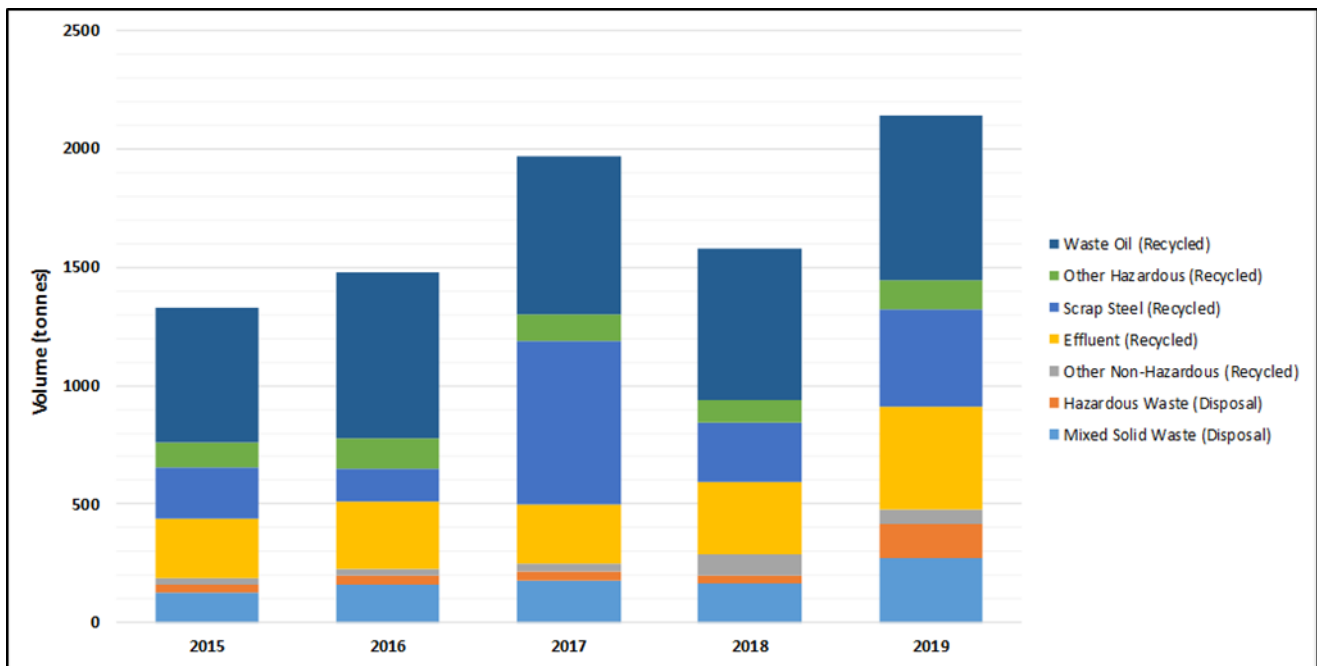


Figure 3 2014-2019 Waste Streams Generated

4.3 Next reporting Period

4.3.1 Mining

During 2020, coal extraction will continue in the Main Pit and in South Pit. Forecast production for 2020 as per the MOP is 10.8 Mt of ROM coal and 8.7 Mt of product coal. Mining in 2020 will remain the same as 2019 with the same mining equipment, personnel and mining techniques to be utilised in-pit.

Both Main and South Pit will continue progressing in line with the mine plan (and MOP) with rehabilitation expected to reach MOP predictions.

4.3.2 Exploration

No exploration activities within AL9 are currently planned for the next reporting period.

4.3.3 Construction

There is no planned construction for 2020 with regards to the existing approved operation. Should the MCCO Project be approved, construction may commence in line with the approval granted.

4.3.4 Tailings Disposal

During 2020 tailings will be disposed of in Tailings Dam 4, which has sufficient capacity for Life-Of-Mine.

5 Actions Required From Previous Annual Review

Mangoola received a letter from the DPIE on 1 May 2019, stating the Mangoola Annual Review 2018 was found to generally satisfy the requirements of Condition 6, Schedule 5 of PA 06_0014 (as modified).

A letter was also received from the Resources Regulator on 15 May 2019 requesting additional information and that an amendment to the Mangoola Annual Review 2018 be submitted. The amended report was submitted to the Resources Regulator on 14 June 2019.

The comments made by the Resources Regulator, and the response to each, are detailed in **Table 10**.

Table 10 Actions Required From 2018 Annual Review

Action Required from Previous Annual Review	Action Taken by Mangoola	Where Discussed
Resources Regulator Comments		
The attached Plans in Appendix 1 are a comparison of the expected rehabilitation and the variations circled as identified in the submitted AEMR. Provide detail where appropriate of the changes in the AEMR for the rehabilitation completed/not completed for the AEMR period. The Domains in the Plans 3C and rehabilitation/Mining Summary 2018 are also varied in that some of the Domain Infrastructure are now either Emplacement Area or Active Mine Area.	This comment was addressed in the 2018 Annual Review. As 2019 is now applicable to Plan 3D, this has been shown in Figure 13 .	Section 8.2
Minimal rehabilitation objectives and completion criteria have been reported on in this AEMR – deficiencies exist (i.e. topsoil status, rehabilitation establishment, erosion status, generation of vegetation). Review the MOP to assist in the revised AEMR.	This comment was addressed in the 2018 Annual Review.	Section 8
The photos provided are inadequate to determine location, context or progress of rehabilitation.	This comment was addressed in the 2018 Annual Review. Photos 1-6 show rehabilitation status in 2019.	Section 8
No information has been provided for “revegetation of tailings dams to assist in dewatering and strengthening of the crust through transpiration and the “water pump effect of the root system” as committed to in the MOP which expires 31 December 2019. No information regarding the testing and validation of the decommission of TD1 and TD2 was provided in this AEMR (as anticipated due to the commitment and alignment of rehabilitation).	This comment was addressed in the 2018 Annual Review and has been further addressed in Section 8.1 .	Section 8.1
Mangoola 2018 Annual Review Commitments		
Submission of the MCCO Project EIS.	The MCCO Project EIS was submitted to DPIE in July 2019.	Section 3.1

Action Required from Previous Annual Review	Action Taken by Mangoola	Where Discussed
Undertaking some of the future offset area revegetation via direct seeding rather than tubestock plantings to provide greater drought tolerance and higher survival rates.	Tree planting was undertaken in accordance with the BOMPS (Year 9). Additionally, two areas of offset revegetation were carried out via the direct seeding process. Early indicators of success are pleasing and more direct seeding is planned for 2020, in addition to the scheduled BOMPS (Year 10) works.	Section 6.6
Pending approval from OEH, Mangoola will transfer salvaged Aboriginal artefacts back to site for safe storage.	The salvaged Aboriginal artefacts were returned to Mangoola for safe storage on 27 November 2019.	Section 6.9.3
Completion of the next three-yearly energy audit as required by the ESAP.	The ESAP three-yearly energy audit was conducted during 2019 with the outcomes discussed in Table 25 .	Section 6.15.1
Continuation of the rehabilitation research and trials for threatened terrestrial orchid translocation, infill planting with additional canopy and mid-layer species, as well as achieving the rehabilitation targets as outlined in the approved MOP.	The threatened terrestrial orchid translocation trials were ongoing in 2019. Umwelt (2020a) recommended supplementary plantings of canopy and shrub species based on the BOMPS. However, due to current drought conditions, no planting works are recommended until drought conditions break.	Section 6.6.2.3 and 8.5
Completion of the three-yearly Independent Environmental Audit (IEA).	The audit was completed and submitted to DPIE in October 2019.	Section 10
Submission of a revised MOP for future approved mining areas.	A new MOP was approved 20 December 2019 for the period of 2020 calendar year with revision to occur during 2020 for further years.	Section 3.4.1

6 Environmental Performance

6.1 Meteorology

In accordance with Schedule 3, Condition 24 of PA 06_0014, and Condition P1.1 of EPL 12894, Mangoola continued to operate the Weather Station North (WSN) meteorological station throughout the reporting period. Additionally, the Weather Station South (WSS) meteorological station continued to operate, as required under EPL 12894. The WSN monitor is located to the north of the site, along Wybong Road, and the WSS monitor is located to the south of the site at the CHPP (refer **Figure 7**). Meteorological data recorded during the reporting period is available on the Mangoola website.

In general, 2019 was another dry year as drought conditions continued across NSW. Total annual rainfall for 2019 was 399 mm, which was comparable to 2018 rainfall (366 mm), however much less than 2016 (632mm). As shown in **Figure 4**, annual rainfall at WSN was lowest in April and highest in March 2019. Long term rainfall data is presented in **Appendix B**, which shows that rainfall at the site has been low since March 2017. This is also supported by **Figure 5**, a map produced by the Bureau of Meteorology (BOM) which shows rainfall deficiencies from 1 January 2019 to 31 December 2019.

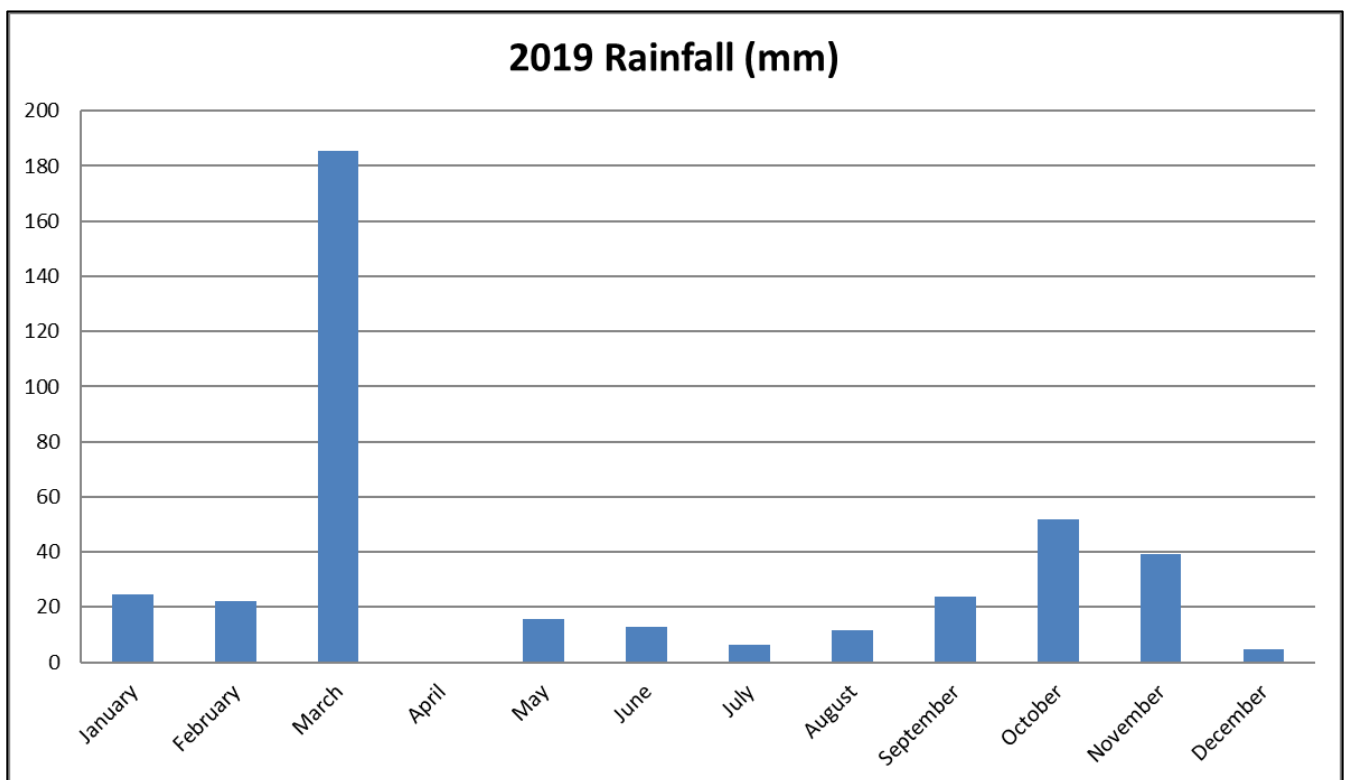


Figure 4 WSN 2019 Rainfall Data

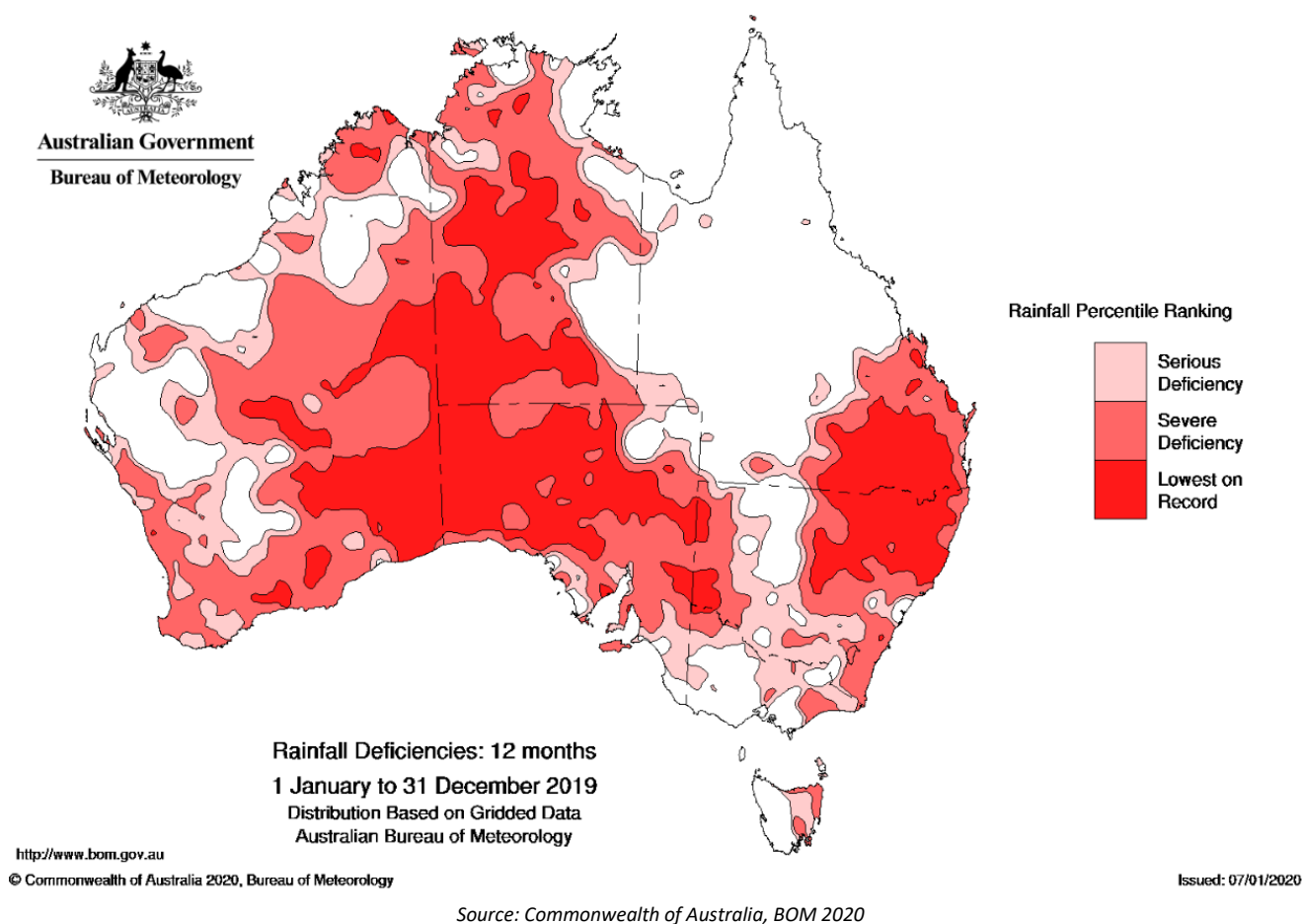


Figure 5 BOM Rainfall Deficiency: 12 months (2019)

As shown in **Figure 6**, the daily minimum and maximum 2 m temperatures ranged from -5.4°C to 44.6°C respectively, with an average daily maximum of 26.4°C, which is warmer than the 2018 daily average of 25.5°C. Average humidity during 2018 ranged from 12.9% to 94.4%.

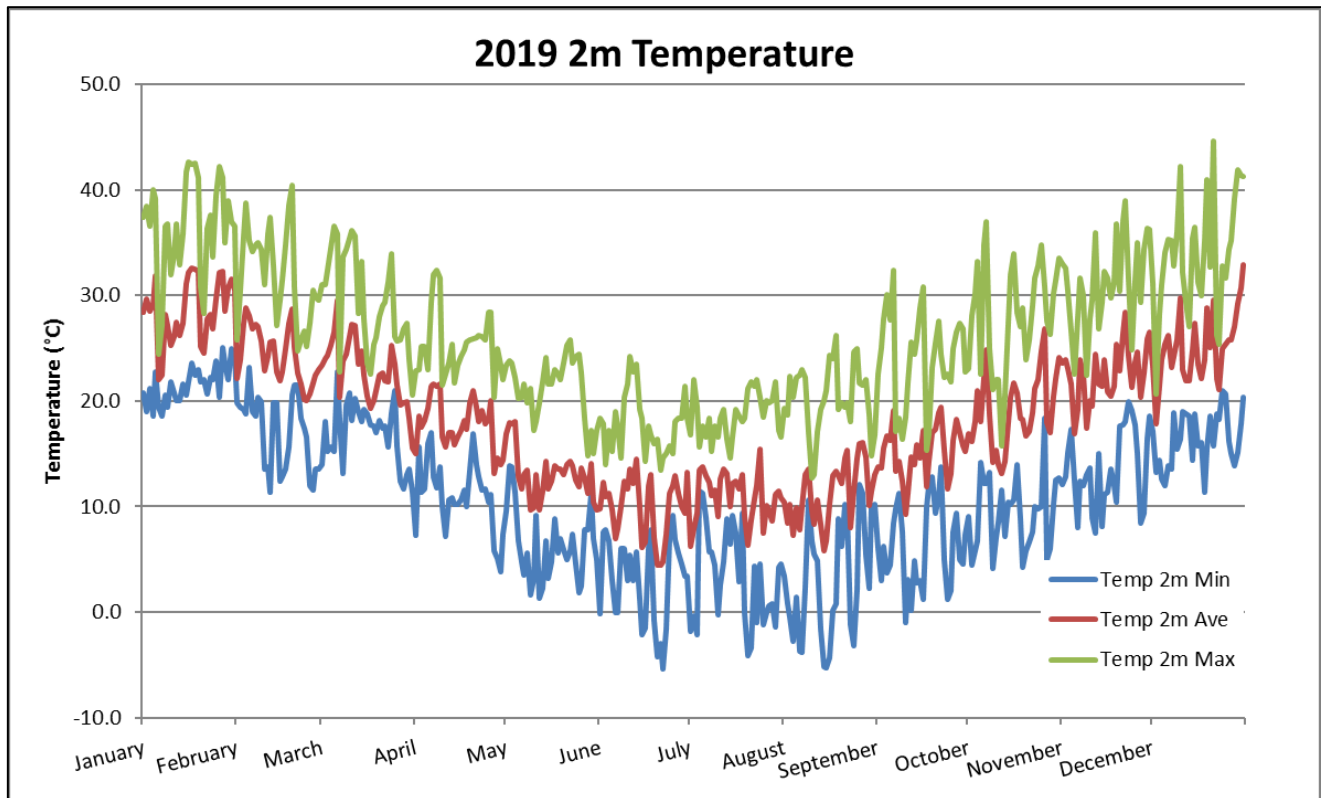


Figure 6 WSN 2019 2m Temperature Data

6.2 Air Quality

6.2.1 Environmental Management

Mangoola operates in accordance with the approved Air Quality Management Plan (AQMP), which is available on the Mangoola website. The AQMP was updated in 2018 and describes air quality management and monitoring requirements associated with operating the mine. Mangoola operated the following equipment (as shown in **Figure 7**) for the measurement of air quality in the reporting period:

- Eighteen depositional dust gauges known as DG01-DG04, DG06-DG07, DG09-DG20 which are monitored monthly;
- Five Tapered Element Oscillating Microbalance (TEOM) dust monitors continuously measuring PM₁₀ known as D02-DC to D06-DC;
- Two PM₁₀ E-Sampler Particulate Monitors continuously measuring PM₁₀ known as D7-DC and D8-DC (EPL Monitoring Points 19 and 20);
- Three High Volume Air Sampler (HVAS) dust monitors measuring Total Suspended Particulates (TSP) over one 24-hour period every six days, known as D02-TSP to D04-TSP; and
- Four HVAS dust monitors measuring PM₁₀ over one 24-hour period every six days, known as D01-PM₁₀, D05-PM₁₀, D06-PM₁₀ and D07-PM₁₀.

PA 06_0014 stipulates the criteria for PM₁₀, TSP and deposited dust, as presented in **Table 11**.

Table 11 PA 06_0014 Air Quality Criteria

Pollutant	Averaging Period	Criterion ⁴
Long Term Impact Assessment Criteria for Particulate Matter		
TSP	Annual Average	¹ 90 µg/m ³
PM ₁₀	Annual Average	¹ 30 µg/m ³
Short Term Impact Assessment Criteria for Particulate Matter		
PM ₁₀	24-hour Average	¹ 50 µg/m ³
Long Term Impact Assessment Criteria for Deposited Dust		
Deposited Dust ³	Annual Average	¹ 4 g/m ² /month (maximum total deposited dust level) ² 2 g/m ² /month (maximum increase in deposited dust level)

1 – Incremental impact (i.e. incremental increase in concentrations due to the development on its own;

2 – Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations sure to all other sources);

3 – 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

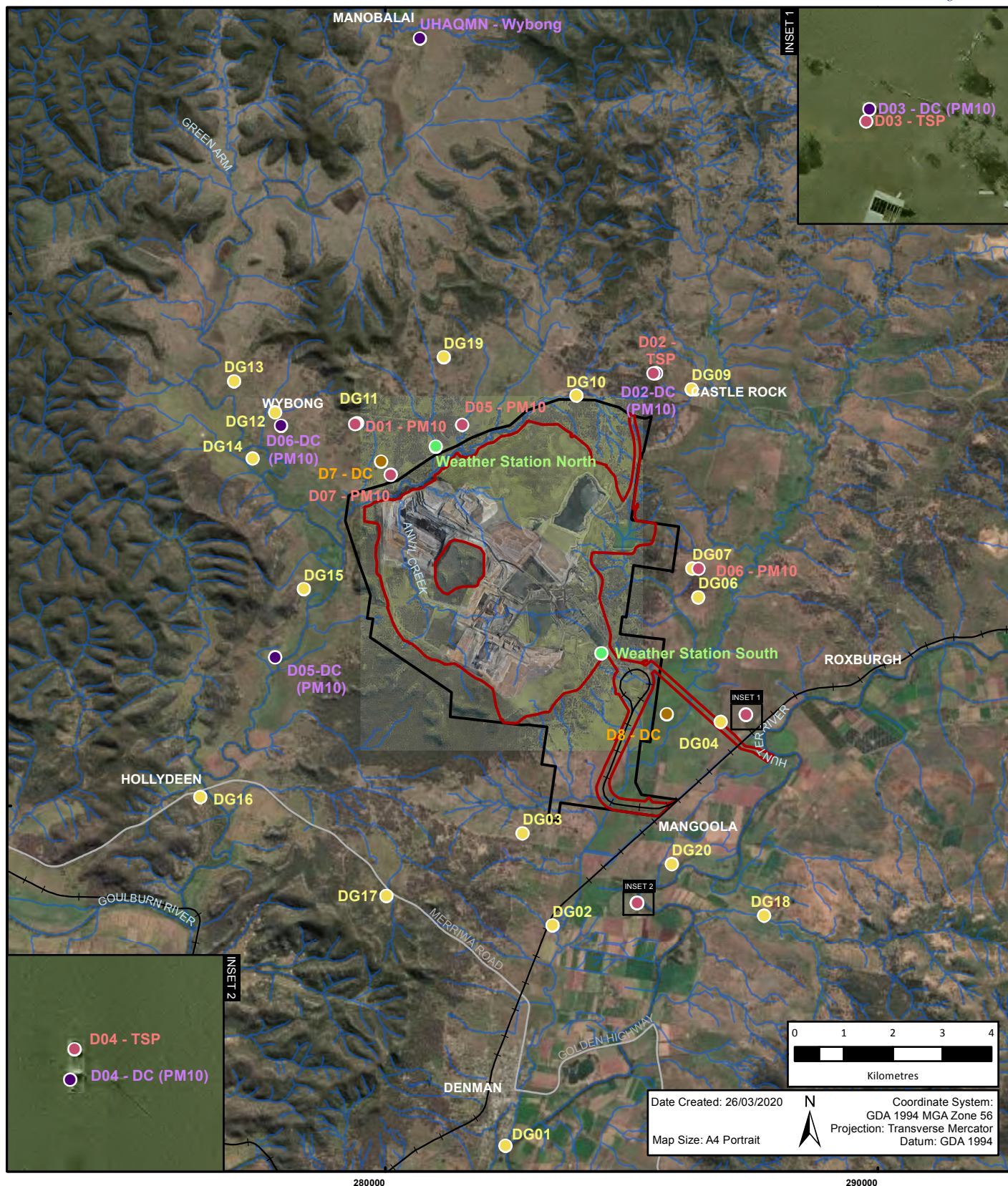
4 – Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Secretary.

Mangoola currently implements a Dust Management Trigger Action Response Plan (TARP) developed in line with the *Dust Assessment Handbook* (NSW EPA, 2019).

In addition, Mangoola also implements key operational controls as described in Section 3.2 in the AQMP. These controls include, but are not limited to, predictive meteorological forecasting, water carts, chemical dust suppressants, progressive rehabilitation and dust suppression sprays on stockpiles and conveyors.

Mangoola implements best practice for the management of air quality including the implementation of reasonable and feasible measures to minimise/mitigate offsite odours. Mangoola will continue to implement all controls in the Spontaneous Combustion Management Plan, Blast Fume Management Plan and the AQMP. There were no incidents regarding odour in the 2019 reporting period.

Figure 7 - Air Quality Monitoring Locations

Coal Assets Australia
www.glencore.com

Ref: D:\Operations\GIS\Mangoola GIS\03 MapDocuments\16 ARI\2019\2020\0120_AQ_Monitoring_V04.mxd

DISCLAIMER
Subject To Survey.

Glencore makes every effort to ensure the quality of the information available on this map.

Before relying on the information on this map, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances. Glencore cannot guarantee and assumes no responsibility for the accuracy, currency or completeness of the information and by using this map you accept that Glencore has no liability for any loss or damage in any form whatsoever caused directly or indirectly from the use of this map.

DATA SOURCE
© NSW Department of Finance & Services (LPI) 2020
© NSW DTIRIS (Minerals & Petroleum) 2020
© Glencore 2020 © ESRI 2020

6.2.2 Environmental Monitoring Results

6.2.2.1 Results from the Reporting Period

Depositional Dust Gauges

Depositional dust gauge data collected during the reporting period is available on the Mangoola website and is summarised in **Table 12**. The data presented is corrected for contamination of samples (by bird droppings or insects) and presents annual average deposition rate of insoluble solids as g/m²/month.

Table 12 2019 Depositional Dust Gauge Results (Insoluble Matter)

Gauge	Location Description	No. Of Samples Collected	No. of valid samples	Background level (g/m ² /month)	Annual Average [^] (g/m ² /month)
DG01	Cnr Babbington and Palace St	12	12	1.2	1.9
DG02	Mangoola Rd	12	9 – 3x contaminated (insects, bird droppings)	1.0	2.7
DG03	Mangoola Rd	12	12	0.9	1.6
DG04	Mangoola Rd	12	9 – 3x contaminated (insects, bird droppings, high organic matter)	1.8	2.7
DG06	Mangoola Rd	12	11 – 1x contaminated (bird droppings)	1.7	2.6
DG07	Mangoola Rd	12	10 – 2x contaminated (bird droppings, insect, high organic matter)	1.6	2.5
DG09	Castlerock Rd	12	12	1.3	1.8
DG10	Wybong Rd	12	12	1.7	1.9
DG11*	Wybong Post Office Rd	12	11 – 1x contaminated (insects, bird droppings)	1.3	1.9
DG12	Wybong Post Office Rd	12	10 – 2x contaminated (insects, vegetation)	1.4	1.7
DG13	Yarraman Rd	12	11 – 1x contaminated (insects, high organic matter)	0.9	1.6
DG14	Yarraman Rd	12	12	1.4	1.9
DG15	Wybong Rd	12	12	1.0	2.3
DG16	Golden Highway	12	12	0.9	1.7
DG17	Golden Highway	12	11 – 1x contaminated (insects, bird droppings)	0.7	1.9
DG18	Denman Rd	12	7 – 5x contaminated (insects, bird droppings)	1.6	2.8
DG19	Ridglands Rd	12	12	1.1	2.1
DG20	Bells Lane East	12	10 – 1x contaminated (insects, bird droppings)	1.2	2.1

[^] – Depositional Dust Criteria 4g/m²/month Max Annual Average; and

* – Represents management monitoring point (not used for compliance purposes).

During 2019, the annual average dust deposition did not exceed 4 g/m²/month at any monitoring locations. This is consistent with the results for 2018. Additionally, the annual average results did not exceed background levels by more than 2 g/m²/month at any monitor.

TEOM (PM₁₀)

TEOM results for PM₁₀ concentrations are available on the Mangoola website and are summarised in **Table 13**. The table excludes all 'extraordinary events' results as per Note 'd' of Schedule 3, Condition 19 of PA 06_0014.

Table 13 2019 PM₁₀ 24-hr Average Results

Gauge	Location Description	Minimum (µg/m ³)	Annual Average [#] (µg/m ³)	Maximum excluding Extraordinary Events (µg/m ³) [^]	Mangoola contribution (µg/m ³)
D02-DC	96 Ridglands Rd	1.2	17.6	54.6	2.2
D03-DC	830 Mangoola Rd	0.6	21.0	54.6	26.3
D04-DC	22 Bells Lane	4.6	20.6	51.4	5.1
D05-DC	2909 Wybong Rd	1.7	15.6	47.4	-
D06-DC	393 Wybong PO Rd	1.6	20.0	59.8	12.6
D7-DC*	Wybong Rd	0.9	13.3	58.4	-
D8-DC*	CHPP	0.1	15.6	80.6	-

* 'Early warning' unit which represents management monitoring point (not used for compliance purposes as it is not representative of private receptors);

PM₁₀ Annual Average Criteria 30 µg/m³; and

[^]PM₁₀ 24h Max Criteria 50 µg/m³.

There were no exceedances of the 30 µg/m³ annual average at any of the monitoring locations throughout the reporting period.

There were numerous reportable exceedances of the 24hr averaging period (PM₁₀ criterion) during 2019 due to ongoing bushfires and dry, dusty conditions as a result of the drought. Majority of these were determined as being 'extraordinary events' by DPIE and are discussed further in **Section 11**.

There were six reportable exceedances to the 24hr averaging period (PM₁₀ criterion) during 2019 that were not deemed 'extraordinary events' by DPIE, including:

- 16 January 2019 – D02-DC (PM₁₀) was recorded as 54.6 µg/m³ and D06-DC (PM₁₀) was recorded as 57.5 µg/m³. As per PA 06_0014, DPIE were notified of the exceedance and an internal investigation commenced. A specialist consultant was engaged to prepare an assessment for DPIE. The assessment determined that Mangoola's contribution to the DC02 and DC06 monitors would have been less than or equal to 2.2 µg/m³ and 5.8 µg/m³, respectively. The control measures and corrective actions listed in the AQMP were implemented and a report was provided to DPIE within seven days. DPIE reviewed the information presented in the report and was satisfied Mangoola Coal undertook reasonable and feasible mitigation measures to minimise dust emissions from the site on this day;

- 17 January 2019 – D02-DC (PM₁₀) was recorded as 54.5 µg/m³ and D06-DC (PM₁₀) was recorded as 59.8 µg/m³. As per PA 06_0014, DPIE were notified of the exceedance and an internal investigation commenced. A specialist consultant was engaged to prepare an assessment for DPIE. The assessment determined that Mangoola's contribution to the DC02 and DC06 monitors would have been less than or equal to 2.7 µg/m³ and 12.6 µg/m³, respectively. The control measures and corrective actions listed in the AQMP were implemented and a report was provided to DPIE within seven days. DPIE reviewed the information presented in the report and was satisfied Mangoola Coal undertook reasonable and feasible mitigation measures to minimise dust emissions from the site on this day;
- 10 February 2019 – D03-DC (PM₁₀) was recorded as 54.0 µg/m³, D04-DC was recorded as 51.4 µg/m³ and D06-DC (PM₁₀) was recorded as 54.7 µg/m³. As per PA 06_0014, DPIE were notified of the exceedance and an internal investigation commenced. A specialist consultant was engaged to prepare an assessment for DPIE. The assessment determined that Mangoola's contribution to the DC03, D04 and DC06 monitors would have been less than or equal to 7.7 µg/m³, 5.1 µg/m³ and 8.4 µg/m³, respectively. The control measures and corrective actions listed in the AQMP were implemented and a report was provided to DPIE within seven days. DPIE reviewed the information presented in the report and was satisfied that reasonable and feasible measures were undertaken at the site on the day of the event and that no further action was required;
- 11 March 2019 – D06-DC (PM₁₀) was recorded as 53.5 µg/m³. As per PA 06_0014, DPIE were notified of the exceedance and an internal investigation commenced. A specialist consultant was engaged to prepare an assessment for DPIE. The assessment determined that Mangoola's contribution to the DC06 monitor would have been less than or equal to 4.9 µg/m³. The control measures and corrective actions listed in the AQMP were implemented and a report was provided to DPIE within seven days. DPIE reviewed the information presented in the report and was satisfied Mangoola Coal undertook reasonable and feasible mitigation measures to minimise dust emissions from the site on this day;
- 9 August 2019 – D03-DC (PM₁₀) was recorded as 50.4 µg/m³. As per PA 06_0014, DPIE were notified of the exceedance and an internal investigation commenced. DPIE reviewed the information presented in the report and was satisfied that Mangoola Coal undertook reasonable and feasible measures to minimise dust emissions from the site on the day of the exceedance. No further reporting as per Schedule 5, Condition 4 of PA 06_0014 was required. DPIE stated that the adverse weather conditions were not classified as an extraordinary event, and the landowners were required to be notified. Letters to tenants and private landowners were sent on 15 August; and
- 14 September 2019 – D03-DC (PM₁₀) was recorded as 54.6 µg/m³. As per PA 06_0014, DPIE were notified of the exceedance and an internal investigation commenced. A specialist consultant was engaged to determine Mangoola's contribution to the exceedance, with the report findings stating that "the data presented indicates that Mangoola Coal's maximum contribution to the DC03-DC monitor on 14 September 2019 would have been less than or equal to 26.3 µg/m³, or 48% of the total level of 54.6 µg/m³". Letters to tenants and private landowners were sent on 16 September and the corrective actions outlined in the AQMP were enacted. DPIE reviewed the information presented in the report and was satisfied that reasonable and feasible measures were undertaken on the day.

The Department was satisfied that Mangoola completed reasonable and feasible measures to avoid and mitigate exceedances of the criteria due to emissions from the project. As such, no further action was required.

High Volume Air Sampler (HVAS) TSP and PM₁₀

HVAS results for TSP and PM₁₀ concentrations are available on the Mangoola website and are summarised in **Table 14**. The table excludes all 'extraordinary events' results as per Note 'd' of Schedule 3, Condition 19 of PA 06_0014.

Table 14 2019 PM₁₀ and TSP 24-hr Average Results

Monitoring Point	Minimum (µg/m ³)	Annual Average (µg/m ³)*	Maximum (µg/m ³)**
D02-TSP [#]	5	54.0	118
D03-TSP [#]	12	62.1	124
D04-TSP [#]	9	49.9	115
D01-PM ₁₀ [^]	1	18.3	54
D05-PM ₁₀ ^{^#}	2	18.3	47
D06-PM ₁₀ [^]	2	22.9	56
D07-PM ₁₀ [^]	1	23.3	65

* PM₁₀ Annual Average Criterion 30 µg/m³, TSP Annual Average Criterion 90 µg/m³;

** PM₁₀ 24hr Criterion 50 µg/m³, no specified 24hr Criterion for TSP under PA 06_0014;

[^] Monitor located on Mine Owned Land; and

[#] Representative of private receptors.

There were no exceedances of the TSP annual average criteria of 90 µg/m³. There were no exceedances of the PM₁₀ annual average of 30 µg/m³ during the reporting period. The PM₁₀ 24hr maximum criteria of 50µg/m³ was exceeded on four days (not determined as an extraordinary event by DPIE) during the reporting period at monitoring locations representing mine owned receptors.

These included:

- 2 January 2019 – The wind direction on the day was south-easterly with D01-PM₁₀ (54 µg/m³), D06-PM₁₀ (55 µg/m³) and D07-PM₁₀ (65 µg/m³) all located downwind of operations. There was eight consecutive days of maximum temperatures between 35-40°C in lead up to 2 January 2019. Operations had only commenced at 7:00 am (after Christmas shutdown). There was a general haze observed in valley. The Mining Supervisors were operating in accordance with the Dust TARP (responding to 8 level 1 alarms). All other results remained within compliance limits, however elevated results were observed upwind of operations at D03-DC (38.1 µg/m³);
- 14 January 2019 – The wind direction on the day was south-easterly with D01-PM₁₀ (51 µg/m³), D06-PM₁₀ (56 µg/m³) and D07-PM₁₀ (57 µg/m³) all located downwind of operations. The Mining Supervisors were operating in accordance with the Dust TARP (responding to 3 level 1 alarms). All other results remained within compliance limits, observing upwind of operations at D03-DC (38.1 µg/m³);
- 15 March 2019 – The wind direction on the day was south-easterly with D07-PM₁₀ (55 µg/m³) located downwind of operations. No dust alarms were received by the Mining Supervisors on the day. Despite this, the source appears to have been close by and localised as all other monitors remained within compliance limits; and

- 17 October 2019 – The wind direction on the day was westerly with D06-PM₁₀ (52 µg/m³) located downwind of operations. Air quality was poor throughout the valley on this day, as noted by the monitors on the Upper Hunter Air Quality Monitoring Network (UHAQMN) recording 40.3 µg/m³ at Merriwa, 45.2 µg/m³ at Wybong and 57.3 µg/m³ at Muswellbrook). The CHPP Supervisors were operating in accordance with the Dust TARP (responding to 3 level 1 alarms, including one from D8 (E-Sampler located to the south-east of site), and two from D4 (D03-DC) which is located on 830 Mangoola Road (in close proximity to D06-PM₁₀). Despite this, the source appears to have been close by and localised as all other site monitors remained within compliance limits.

It is noted that these exceedances were recorded at monitors on mine-owned tenanted properties, with the purpose of informing tenants of any elevated results. These exceedances are therefore not externally reportable non-compliances. Nonetheless, each exceedance was investigated, reported internally as an incident, and the relevant tenants notified (as required under Schedule 4, Condition 3 of PA 06_0014).

Odour

In accordance with PA 06_0014 and EPL 12894, no odour monitoring is required at Mangoola.

Odour is not an issue at Mangoola and no complaints have been received during the reporting period in relation to odour.

6.2.2.2 Comparison with Predictions

The PA 06_0014 MOD 6 Environmental Assessment (EA) Air Quality Impact Assessment (Todoroski Air Sciences, 2013) predicted dust emissions for the project in years 2, 5, and 10. As MOD 6 was approved in 2014, a comparison of 2019 dust data against Year 5 data has been made in **Table 15**.

Table 15 Comparison of 2018 and 2019 Dust Emissions

Dust Monitor	Closest Privately Owned Residence	Year 5 Prediction (MOD 6)	2018 Annual Average	2019 Annual Average
Depositional Dust (g/m²/month)				
DG01	214	1.7	2.0	1.9
DG02	200	1.7	1.8	2.7
DG03	121	1.7	1.2	1.6
DG04	125D, E and F	2.1	1.7	2.7
DG06	125B	2.3	1.4	2.6
DG07	198	2.4	2.0	2.5
DG09	111	1.9	1.5	1.8
DG10	111	1.9	2.1	1.9
DG11	81	2.0	1.8	1.9
DG12	134B	1.9	1.8	1.7
DG13	134A	1.9	1.7	1.6
DG14	130	2.0	2.8	1.9
DG15	83	2.0	2.2	2.3

Dust Monitor	Closest Privately Owned Residence	Year 5 Prediction (MOD 6)	2018 Annual Average	2019 Annual Average
DG16	265	1.7	1.4	1.7
DG17	147	1.7	1.2	1.9
DG18	201A, B and C	1.8	1.8	2.8
DG19	81	2.0	1.8	2.1
DG20	184	1.7	1.6	2.1
TEOM (PM₁₀) Monitoring Sites (µg/m³)				
D02-DC	111	13.0	17.2	17.6
D03-DC	125D, E and F	23.0	20.3	21.0
D04-DC	184	11.0	18.0	20.6
D05-DC	176	9.0	17.0	15.6
D06-DC	110	14.0	20.9	20.0
E-Samplers (PM₁₀) (µg/m³)				
D7-DC	130	15.0	16.4	13.3
D8-DC	125	23.0	23.4	15.6
HVAS (PM₁₀ and TSP) Monitors (µg/m³)				
D02-TSP	111	38.0	61.2	54.0
D03-TSP	125D, E and F	49.0	60.0	62.1
D04-TSP	184	33.0	50.4	49.9
D01-PM ₁₀	110	14.0	22.3	18.3
D05-PM ₁₀	157	10.0	20.1	18.3
D06-PM ₁₀	130	15.0	24.9	22.9
D07-PM ₁₀	190	26.0	27.4	23.3

As shown in **Table 15**, the 2019 annual averages for air quality were above the predicted levels in the Year 5 MOD 6 Assessment in ten depositional dust monitors (DG01, DG02, DG04, DG06, DG07, DG15, DG14, DG17, DG18, DG19 and DG20), all five TEOMs, both E-Samplers and all seven HVAS monitors. The exceedances of the predictions can be largely attributed to prolonged poor air quality across the greater Hunter Region due to bushfires and dusty conditions as a result of the ongoing drought.

6.2.2.3 Long Term Trend Analysis

A long term trend analysis of air quality monitoring results at Mangoola has been undertaken using data from July 2010 to December 2019 to identify any trends in the monitoring data over the life of the project. These graphs are presented in **Appendix C**. Depositional dust monitoring results have been variable since mining operations commenced in 2010, however results generally peaked in 2012 and declined to the lowest results during 2015-2016. Results have been generally increasing during 2017-2019 which correlates with low rainfall and the ongoing drought conditions (refer **Appendix B**).

The annual average HVAS TSP data has shown a gradual increase from 2010 to 2014, then declining in 2015, remaining low in 2016 and 2017, before rising again in 2018 and 2019. The results from 2018 and 2019 has seen an increase in TSP results due to prolonged period of drought and increased bushfire activity. The 24 hour maximum TEOM data show seasonal peaks in the summer months. The annual average TEOM results have remained consistent with results from 2011 through to 2017 and results have been generally increasing during 2018-2019 which correlates with low rainfall and the ongoing drought conditions. Further, as described in **Section 6.2.2.1**, a number of extraordinary events have been declared due to extreme weather and dust storms.

6.2.3 Key Performance and/or Management Issues

There were exceedances of the 24hr PM₁₀ maximum criteria during 2019. There were a number of regional dust and extreme weather events throughout the reporting period particularly attributed to the extensive bushfires in NSW through November and December, all of these have been classified as extraordinary events by DPIE. Where exceedances were recorded, DPIE was notified, and specialist consultants were engaged as required to complete an independent report. As per Schedule 4, Condition 3 of PA 06_0014, unless an extraordinary event was declared by DPIE, applicable private landowners and tenants of mine owned properties were contacted and provided with a copy of the NSW Health fact sheet "Mine Dust and You". Further detail on non-compliances is provided in **Section 11**.

PM₁₀ monitoring is required continuously in accordance with Condition M2.2 of EPL 12894 between 25-26 February 2019, the vacuum pump failed at Monitoring Point 19 (D7-DC) as outlined in Table 4.3 of the approved AQMP. This was a non-compliance in accordance with Sampling Method – Special Method 1. The E-Sampler was replaced the following day (as soon as practicable) and daily monitoring checks were undertaken as follow up to ensure the monitor was functioning. This was reported in the EPL 12894 Annual Return in 2019.

Continuous weather monitoring is required in accordance with Condition M4.1 of EPL 12894. On Friday 11 October 2019, Weather Station North (EPL Point 5) stopped recording wind speed and direction. The issue was identified by site personnel on Monday 14 October 2019. The unit was reset remotely in an attempt to fix the issue which failed. A technician attended site on Monday 14 October 2019 and diagnosed and replaced a faulty sensor. The weather station was fully operational again at 3:45pm on Monday 14 October 2019. This will be reported in the EPL 12894 Annual Return in 2020.

Weather Station North and Monitoring Point 19 are required under EPL 12895 and are outlined in the approved AQMP, these non-compliances are not reported as incidents in accordance with the footnotes on Table 4.1, 4.2 and 4.3 of the AQMP. *Units may not operate at this frequency 100% of the time due to maintenance and calibration requirements, power outages, prevention of access by landowner, no access due safety concerns of personnel and other external events outside the control of Mangoola Coal.*

There were eight community complaints received by Mangoola during the reporting period relating to dust, which is an increase from the six community complaints received in the previous reporting period. Further detail on the complaints received in 2019 is provided in **Section 9.3**.

6.2.4 Proposed Improvements

The non-compliance with Condition M4.1 of EPL 12894 will be reported in the EPL Annual Return in 2020.

Hansen Bailey (2019) made three recommendations relating to Air Quality as outcomes of the IEA, including:

- 2019 IEA, PA06_0014, Sch 4, Condition 3 Recommended the definition of 'affected landholder' is clarified with DPIE, as Hansen Bailey would suggest landholder means 'private' landholder in this context and Mangoola is assuming this is referring to 'any' landholder, including mine owned with tenants. This should exclude any property where predictions from another mine are predicted to exceed. Undertake consultation with DPIE to clarify the definition of 'affected landholder' in the context of Sch 4, Condition 3;
- 2019 IEA, PA06_0014, Sch 5, Condition 9(c) Update air quality incident letter template used to report an incident to DPIE to confirm consideration of this condition. Update the air quality incident letter template to include this reference by 18 Jan 2020; and
- 2019 IEA, PA06_0014, Sch 3, Condition 18 Annual reviews could include a discussion on odour within 'air quality' section. Further information on odour will be reported on in the 'air quality' section of the 2019 Annual Review which will be furnished to DPIE 30 March 2020.

More information is outlined in **Section 10**.

6.3 Noise

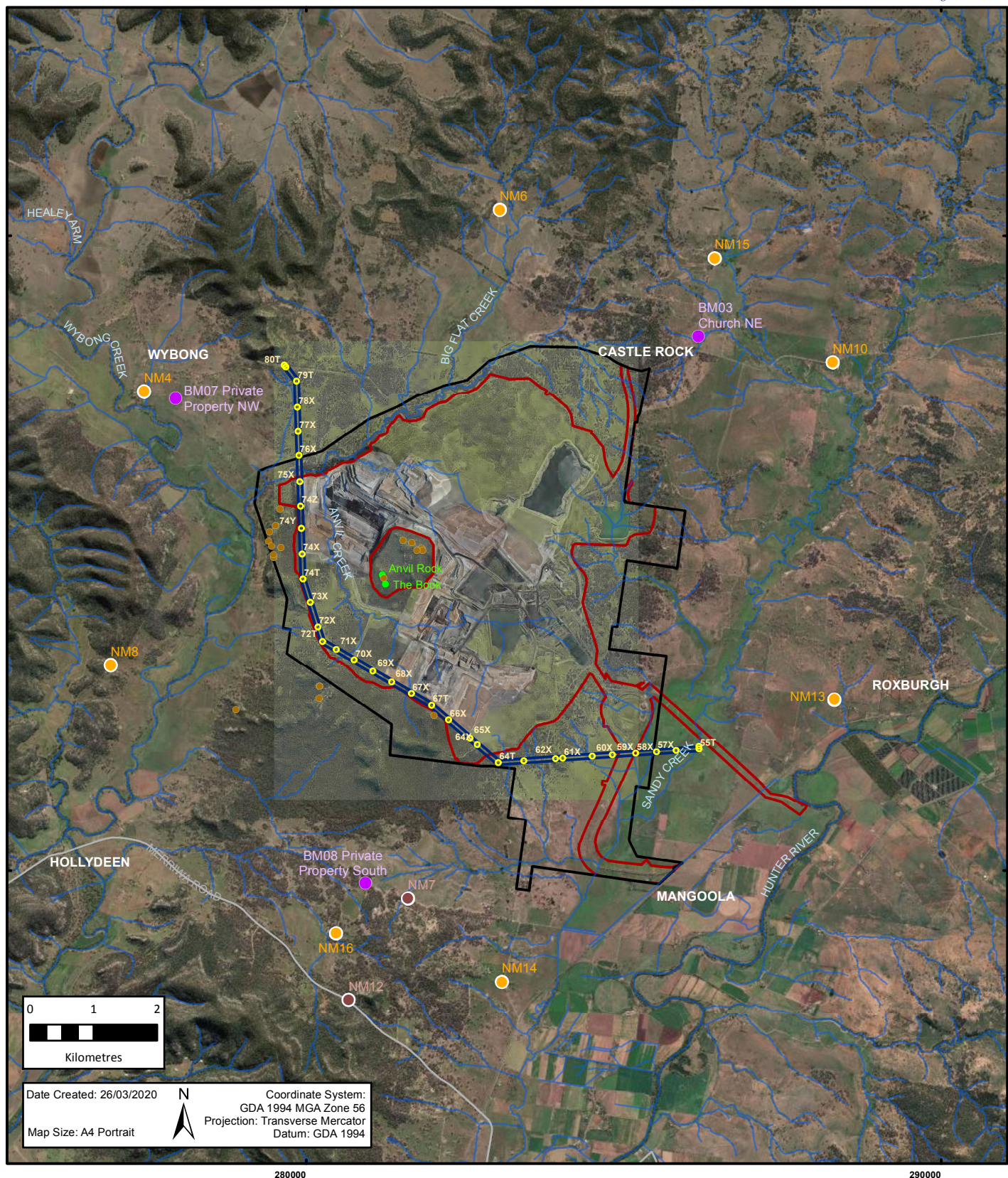
6.3.1 Environmental Management

Mangoola operates in accordance with the approved Noise Management Plan (NMP) required under PA 06_0014 which is available on the Mangoola website. Noise monitoring consists of both attended and unattended monitoring to meet the requirements of PA 06_0014 and EPL 12894. Monitoring undertaken during the reporting period is summarised as follows:

- Attended monthly monitoring occurred at ten locations representative of privately-owned residences and the Anglican Church (NM4, NM6-NM8, and NM10, NM12-15) as per the NMP; and
- Continuous unattended noise monitoring was undertaken at five permanent locations (NC02, NC03, NC05, NC06 and NC10). Three mobile units are also utilised and are relocated as needed. This monitoring is used for proactive and reactive management of day to day operations at Mangoola Open Cut, rather than a tool to monitor compliance.

The noise monitoring locations are illustrated in **Figure 8**.

Figure 8 - Noise and Blast Monitoring Locations



Legend

- | | |
|---|--|
| Approved Mangoola Coal EPL and Disturbance Boundary | ● Rock Shelters |
| Mining Lease 1626 | ● Rock Structures |
| ● Blast monitoring locations | — 500kV electricity transmission line tower location |
| ● Monthly attended noise monitoring locations | — 500kV electricity transmission line |
| ● Monthly attended noise monitoring locations (discontinued August 2019) | — Major road |
| | — Watercourse |

DISCLAIMER Subject To Survey.

Glencore makes every effort to ensure the quality of the information available on this map. Before relying on the information on this map, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances. Glencore cannot guarantee and assumes no responsibility for the accuracy, currency or completeness of the information and by using this map you accept that Glencore has no liability for any loss or damage in any form whatsoever caused directly or indirectly from the use of this map.

DATA SOURCE

© NSW Department of Finance & Services (LPI) 2020
© NSW DTIRIS (Minerals & Petroleum) 2020
© Glencore 2020 © ESRI 2020

Noise Impact Assessment Criteria

Mangoola's noise limits are provided in Table 2, Schedule 3, Condition 2 of PA 06_0014 and Condition L3.2 of the EPL and are provided in **Table 16** and **Table 17**.

Table 16 PA 06_0014 – Noise Impact Assessment Criteria

Land Number	Day LAeq(15 minute)	Evening LAeq(15 minute)	Night LAeq(15 minute)	Sleep Disturbance LA1(1minute)
132A	40	40	40	45
121, 132B	39	39	39	45
176	38	38	38	45
25, 66, 110, 130, 148, 154, 164 [#]	37	37	37	45
106C, 111, 174A, 174B, 175 [*]	36	36	36	45
109, 134A, 134B, 177, 190, 251	35	35	35	45
All other privately-owned land	35	35	35	45
Anglican Church, Castlerock Road	41	41	41	-

[#] Property ID 164 entered a negotiated agreement with Mangoola taking effect from 13 August 2018 at which time noise criteria ceased; and

^{*} Property ID 175 was purchased by Muswellbrook Coal on 29 October 2018 and by definition is no longer a privately owned property, therefore noise criteria are no longer applicable.

Table 17 EPL 12894 – Noise Impact Assessment Criteria

Monitoring Location	EPL ID Number	EA Reference	Night LAeq(15 minute)	Night LA1(1minute)
NM4	23	109, 110, 130, 148, 134A, 134B	37	45
NM6	24	66	37	45
NM7	25	164 [#]	37	45
NM8	26	176, 106C	38	45
NM10	27	251	35	45
NM12	28	177	35	45
NM13	29	190	35	45
NM14	30	200	35	45
NM15	22	154, 174A, 174B, 175 [*]	36	45
NM16 [^]	34	177	35	45

[#] Property ID 164 entered a negotiated agreement with Mangoola taking effect from 13 August 2018 at which time noise criteria ceased.

^{*} Property ID 175 was purchased by Muswellbrook Coal on 29 October 2018 and by definition is no longer a privately owned property, therefore noise criteria are no longer applicable.

[^] NM16 replaced NM7 and NM12 following EPL 12894 variation dated 2 August 2019, however NMP resubmitted to reflect EPL variation only approved 30 December 2019. In the interim, NM7, NM12 and NM16 have been monitored monthly since 2 August 2019.

The approved NMP adopts nine attended noise monitoring (NM) locations that are representative of residences outlined in the PA. Where several assessment locations are located in one NM catchment, a representative noise criteria has been adopted to ensure that the lowest (most stringent) criteria within the NM catchment can be achieved. Noise criteria only apply in specific meteorological conditions in accordance with the PA 06_0014 and EPL 12894. Additionally, in accordance with the Noise Policy for Industry (NPI) (EPA, 2017), relevant modifying factor adjustments apply when assessing the characteristics of Mangoola's mine noise emissions.

Cumulative Noise Criteria

PA 06_0014 cumulative criteria for privately owned land as outlined in Schedule 3, Condition 5 are:

- $LA_{eq(11 \text{ hour})}$ 50 dB(A) – Day;
- $LA_{eq(4 \text{ hour})}$ 45 dB(A) – Evening; and
- $LA_{eq(9 \text{ hour})}$ 40 dB(A) – Night.

Management and Mitigation Measures

In addition to conducting noise monitoring, Mangoola continues to implement a number of mitigation measures with regard to the management of noise to minimise potential noise impact on nearby receivers, and to comply with the conditions of the Project Approval. Mitigation measures are completed as per the NMP and include, but are not limited to:

- Consideration of noise impacts during mine planning;
- Controlling mine noise at the source through the use of equipment with appropriate sound attenuation fitted, where practical;
- Maintaining mining equipment in a proper and efficient manner;
- Restricting, where possible, operations on outer dump faces or elevated dumps in sensitive areas during adverse weather conditions;
- Ensuring trucks operating during the night time are restricted to operational areas below the maximum elevation of the overburden emplacement areas; and
- Using real-time noise monitors that incorporate automatic alarms so that proactive control can be implemented.

6.3.2 Environmental Monitoring Results

6.3.2.1 Results from the Reporting Period

EPL 12894 and PA 06_0014 Noise Monitoring

During the reporting period monthly attended noise surveys were undertaken at 10 representative locations in accordance with PA 06_0014, and EPL 12894 as described in **Section 6.3.1**. During 2019, Mangoola was compliant with all the noise criteria set out in PA 06_0014 and EPL 12894 (where the meteorological conditions were applicable). A summary of results is presented in **Table 18** and **Table 19**. Where the meteorological conditions did not apply, these cells have been shaded grey.

All noise monitoring results are available in full on the Mangoola website.

Cumulative Noise Monitoring

During the reporting period cumulative mining noise assessments were undertaken by assessing attended noise monitoring results at NM10, NM13 and NM15, in accordance with the NMP.

Cumulative mine noise contributions, including those from Mangoola, were below the noise limits at all monitoring locations during the reporting period.

6.3.2.2 Comparison with Predictions

The MOD 6 Noise and Vibration Assessment (EMM 2013) predicted the 10% $L_{Aeq(15minute)}$ and L_{Amax} operational noise levels at private receptors in Years 2, 5 and 10. As MOD 6 was approved in 2014, a comparison of 2019 noise data against the Year 5 data has been made in **Table 18** and **Table 19**.

Where the data exceeded the MOD 6 predictions (and where the meteorological conditions are suitable), these have been bolded.

Table 18 Attended Noise Monitoring Results and Comparison against MOD 6 Predictions ($L_{Aeq(15minute)}$)

	NM4	NM6	NM7	NM8	NM10	NM12	NM13	NM14	NM15	NM16	Compliance Against Criteria
EA Property Reference	109, 110, 130, 148, 134A, 134B	66	164 ^c	176, 106C	251	177	190	200	154, 174A, 174B, 175 [~]	177	
$L_{Aeq(15\text{ minute})}$ Criteria	37	37	37	38	35	35	35	35	36	35	
$L_{Aeq(15\text{ minute})}$ Year 5 Prediction	35 ¹ , 37 ² , 37 ³ , 37 ⁴ , 35 ⁵ , 35 ⁶	32	37	34 ⁷ , N/A ⁸	31	35	33	30	31 ⁹ , 29 ¹⁰ , 29 ¹¹ , 29 ¹²	35	
January	30	IA	33	27	IA	≤34	IA	<31	IA	N/A	Yes
February	27	IA	29	25	IA	23	≤26	30	IA	N/A	Yes
March	27	<20	IA	21	23	IA	<20	IA	24	N/A	Yes
April	32	IA	27	36	IA	<20	IA	IA	IA	N/A	Yes
May	35	30	28	25	28	26	33	28	32	N/A	Yes
June	37	≤29	25	23	IA	IA	IA	<26	≤24	N/A	Yes
July	<20	28	≤23	IA	≤30	IA	<30	≤22	<35	N/A	Yes
August	28	30	IA	IA	25	IA	26	<20	22	IA	Yes
September	<20	IA	22	IA	27	IA	32	22	24	<20	Yes
October	<20	IA	26	21	IA	26	21	26	IA	25	Yes
November	IA	30	<20	IA	26	IA	24	<20	25	<20	Yes
December	IA	IA	IA	≤30	IA	IA	IA	IA	IA	IA	Yes

1. EA Reference 109

2. EA Reference 110

3. EA Reference 130

4. EA Reference 148

5. EA Reference 134A

6. EA Reference 134B

7. EA Reference 176

8. Property 106C not included in 2013 Noise Assessment

9. EA Reference 154

10. EA Reference 174A

11. EA Reference 174B

12. EA Reference 175 IA= Inaudible

* 2 dB LFN modifying factor applied

^Within 2dB therefore not an exceedance of criteria

~ID175 purchased 29/10/18 by other mining company, no longer privately owned

<ID164 has a negotiated agreement from 13/8/18, criteria does not apply from this date

Note: Grey shaded cells denote meteorological conditions not applicable.

Table 19 Attended Noise Monitoring Results and Comparison against MOD 6 Predictions (LAmax)

	NM4	NM6	NM7	NM8	NM10	NM12	NM13	NM14	NM15	NM16	Compliance Against Criteria
EA Property Reference	109, 110, 130, 148, 134A, 134B	66	164 ^c	176, 106C	251	177	190	200	154, 174A, 174B, 175 [~]	177	
L_AMax¹ Criteria	45	45	45	45	45	45	45	45	45	45	
L_AMax Year 5 Prediction	40 ² , 40 ³ , 40 ⁴ , 40 ⁵ , 38 ⁶ , 39 ⁷	38	41	<30 ⁸ , N/A ⁹	<30	38	35	38	<30 ¹⁰ , <30 ¹¹ , <30 ¹² <30 ¹³	38	
January	42	IA	37	30	IA	<35	IA	<31	IA	N/A	Yes
February	32	IA	35	30	IA	26	32	35	IA	N/A	Yes
March	32	26	IA	23	35	IA	21	IA	29	N/A	Yes
April	39	IA	33	42	IA	23	IA	IA	IA	N/A	Yes
May	40	43	40	36	44	29	45	41	45	N/A	Yes
June	<45	36	28	24	IA	IA	IA	34	≤28	N/A	Yes
July	21	33	≤25	IA	37	IA	32	24	≤35	N/A	Yes
August	35	35	IA	IA	36	IA	29	<20	30	IA	Yes
September	<20	IA	29	IA	32	IA	37	28	34	<20	Yes
October	<20	IA	29	26	IA	31	25	27	IA	31	Yes
November	IA	39	21	IA	29	IA	26	<20	31	<20	Yes
December	IA	IA	IA	30	IA	IA	IA	IA	IA	IA	Yes

1. For assessment purposes the L_Amax and the LA1(1min) are interchangeable.

2. EA Reference 109

3. EA Reference 110

4. EA Reference 130

5. EA Reference 148

6. EA Reference 134A

7. EA Reference 134B

8. EA Reference 176

9. Property 106C not included in 2013 Noise Assessment

10. EA Reference 154

11. EA Reference 174A

12. EA Reference 174B

13. EA Reference 175

IA = Inaudible

Note: Grey shaded cells denote meteorological conditions not applicable.

<ID164 has a negotiated agreement from 13/8/18, criteria does not apply from this date

~ID175 purchased 29/10/18 by other mining company, no longer privately owned

As shown in **Table 18**, the 2019 noise levels recorded at Mangoola were compared against the Year 5 noise predictions presented in the 2013 Noise and Vibration Assessment (EMM, 2013) and the PA 06_0014 criteria for $L_{Aeq}(15\text{minute})$. On two monitoring occasions (where meteorological conditions applied), results were recorded above the Year 5 $L_{Aeq}(15\text{minute})$ predictions however, these levels were well below criteria. The remaining results were lower than the predicted levels.

Table 19 compares 2019 L_{Amax} noise levels against 2013 Noise and Vibration Assessment Year 5 noise predictions and approval criteria. Two monitoring locations recorded at least one result above the Year 5 L_{Amax} predictions, with one result above predicted at NM13 and four results above predicted at NM8. All other measured L_{Amax} noise levels were below the predicted levels. The main reason for the difference between modelled noise emissions and those measured is likely due to differences in the modelling assumptions compared to the actual operational or weather scenario. This includes features such as mine topography as well as the locations and sound power levels of plant and equipment. Importantly, measured Mangoola noise emissions did not exceed the $L_{Aeq}(15\text{minute})$ or L_{Amax} noise criteria during 2019.

6.3.2.3 Long Term Trend Analysis

Exceedances of the PA 06_0014 and EPL 12984 criteria have been generally decreasing over the previous years. During 2019 there were no occasions where noise levels exceeded the PA 06_0014 or EPL 12894 criteria. These results represent a continuation of the zero exceedances reported in 2018.

6.3.3 Key Performance and/or Management Issues

During 2019, there were no new properties which triggered noise mitigation. Two properties (Property IDs 66 and 125A) with existing mitigation had further measures installed in 2019 to supplement existing mitigation as triggered under Schedule 3, Condition 4 of PA 06_0014.

A total of 172 noise related complaints were received during 2019, which is an increase from the 58 noise complaints received during the 2018 reporting period. These complaints were predominately from residences to the north-west of operations. In response to an increase in complaints in this area, weekly attended noise monitoring was conducted for a 12 week period over winter period. Monitoring results indicated that the sites were operating within noise compliance levels. Complaints are further discussed in **Section 9.3**.

During the reporting period EPL 12894 was varied on 2 August 2019 with NM16 replacing NM7 and NM12. The NMP was revised and resubmitted to reflect the change to the EPL, however was only approved 30 December 2019. Between August and December, both the updated EPL noise monitoring locations and the existing locations in the then current NMP were monitored (10 sites in total).

6.3.4 Proposed Improvements

In response to changes to property ownership around the operation, Mangoola will review the noise monitoring network to determine whether continuous noise monitoring units can be relocated to provide better coverage north-west of mining operations.

Additional attended noise monitoring will again be undertaken to the north-west of operations through the winter period to ensure noise emissions are managed appropriately.

Hansen Bailey (2019) made two recommendations relating to noise as outcomes of the IEA, including:

- 2019 IEA, PA06_0014, Sch 3, Condition 2(a) & 9 Recommend discussion with DPIE and if amenable, amend Noise Management Plan, Section 4.5.1 to remove reporting potential exceedances within 2dB in accordance with Industrial Noise Policy Section 11.1.3 Undertake consultation with DPIE regarding the removal of reporting requirement of potential exceedances within 2dB in line with INP Section 11.1.13; and
- 2019 IEA - Appendix 8, Condition 5 Noise monitoring reports do not assess "mine related tonal noise" as defined by the INP or the later NPfI as required by Section 4.1.3 of the approved Noise Management Plan. Include assessing "mine related tonal noise" within operator-attended monthly noise monitoring reports from 30 Nov 2019 onwards.

More information is outlined in **Section 10**.

6.4 Blasting and Vibration

6.4.1 Environmental Management

Blasting at Mangoola is undertaken in accordance with the approved Blast Management Plan (BMP) which was updated in 2019. The Blast Fume Management Procedure is also implemented, which defines practises to reduce the potential for fume generation and therefore reduce the impact of fume on the environment and community.

Prior to blasting and in accordance with the BMP, predictive and current meteorological data is reviewed to ensure that blasting is undertaken in appropriate weather conditions. In particular, wind speed, wind direction and the presence of temperature inversions are analysed prior to initiating blasting activities.

Blast overpressure and vibration was monitored at seven monitoring locations during 2019, known as BM03, BM04 (removed February 2019 following approval of revised BMP), BM07, BM08, Anvil Rock, the closest rock formation to the blast, and transmission line powerline pylons (where necessary). Blasting within close proximity to the powerline easement is undertaken as per a written agreement between the mining company and electricity infrastructure owner.

6.4.2 Environmental Monitoring Results

6.4.2.1 Results from the Reporting Period

During the reporting period there was an average of 2.7 blast events per week which is compliant with Schedule 3, Condition 12(b) of PA 06_0014, which allows a maximum of 6 blasts per week, averaged over a calendar year. A total of 142 blast events occurred during the reporting period and no more than 2 blast events per day which is compliant with Schedule 3, Condition 12(a) of PA 06_0014 (see **Figure 9**).

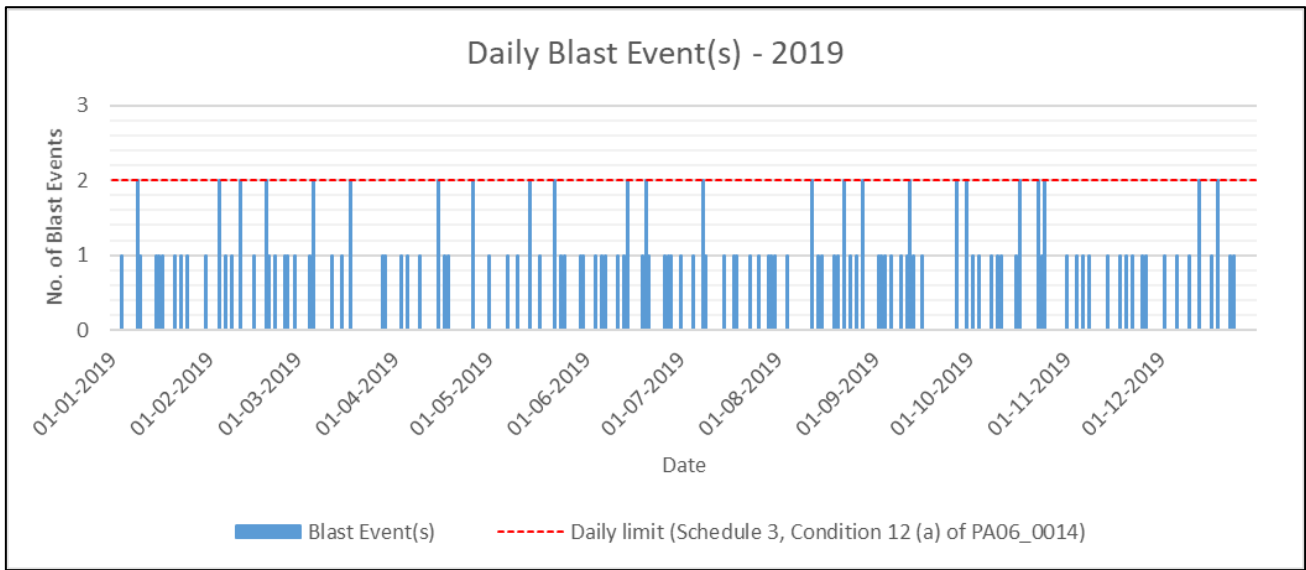


Figure 9 Daily Blast Events

Schedule 3, Condition 10 of PA 06_0014, as well as Section L4 of EPL 12894, provide the criteria for allowable airblast overpressure and ground vibration as measured at any privately owned residence. PA 06_0014 also provides ground vibration criteria for the Electricity Transmission Pylons. **Table 20** summarises the blasting criteria, as defined in the PA 06_0014 and EPL 12894, and other compliance monitoring requirements as defined in the approved BMP and Conservation Management Strategy (CMS) for Mangoola Open Cut.

Table 20 Compliance Monitoring Location Summary and Adopted Criterion

Monitoring Location Requirement	Monitoring Site Name (and PA/EPL ID)	Airblast Overpressure Limit	Ground Vibration Limit	Comments
PA ¹ : Nearest residence on privately owned land EPL ² : At monitoring points 16, 17 [#] , 21 and 32	Private Property NW (BM07/21)	115 dB (Lin Peak) (allowable exceedance of 5% over 12 months) and 120 dB (Lin Peak)	5 mm/s (peak particle velocity (PPV)) (allowable exceedance of 5% over 12 months) and 10 mm/s (PPV)	Blast monitoring is conducted at the nearest residence on privately owned land to the blast zone. Locations may change over the life of the mine as properties are acquired and the mining progresses. Criteria applies to the nearest privately owned residence (as per PA 06_0014 and EPL definition). The EPL requires blast monitoring at monitoring points 16, 17, 21 and 32 as per Condition M7.1. BM03 represents Point 16, BM04 represents Point 17, BM07 represents Point 21 and BM08 represents Point 32.
	Church NE (BM03/16)			
	Private Property S (BM04/17)			
	Private Property S (BM08/32)			
PA ¹ : 500 kV Transmission Line	Pylon 64X through to Pylon 75X	N/A (not measured)	60 mm/s ³ for tension towers	Monitoring requirements and limits apply as per agreement with the infrastructure owner (TransGrid).
			125 mm/s ³ for suspension towers	
PA ¹ : Rock Formations	Anvil Hill The Book Rockshelter sites	N/A (not measured)	<i>Safe blasting limit as determined by specialist analysis⁴</i>	Representative blast monitoring of Anvil Hill to inform vibration monitoring. The closest rock formation is monitored for every blast if not Anvil Hill.

1 PA: A requirement of Mangoola's PA 06_0014 (Schedule 3, Condition 10);

2 EPL: A requirement of Mangoola's EPL 12894 (condition L4.1, L4.2, L4.3 and L4.4 and M7.1);

3 As per TransGrid Agreement. On the 22nd September 2015, DP&E was notified that the TransGrid 500 kV transmission line should be limited to 60 mm/s for the tension pylons (PA 06_0014 limit is 50mm/s) and 125 mm/s for the suspension pylons (PA Limit is 100mm/s) following studies conducted and a letter of approval from TransGrid dated 7th September 2015;

4 For the 2019 reporting period this safe blast limit was defined as 50mm/s (PPV); and

EPL amended to remove EPL monitoring point 17, BMP revised and approved February 2019 after which monitoring at EPL monitoring point 17 ceased.

Airblast Overpressure

Airblast overpressure results at all monitoring locations for the reporting period are available on the Mangoola website, with the results recorded at the nearest privately owned residences and sensitive location summarised in **Table 21**.

Table 21 Airblast Overpressure Summary

Location	Minimum (dBL)	Average (dBL)	Maximum (dBL)	Exceedances (Y/N)
BM03	83.9	98.2	113.5	N
BM04	83.7	93.8	108.5	N
BM07	86.4	101.2	115.0	N
BM08	60.7	93.3	113.2	N

During the reporting period there were no exceedances of the 120 dB limit, or results in exceedance of the 115 dB threshold.

Ground Vibration

Ground vibration monitoring data for the reporting period is available on the Mangoola website and is summarised in **Table 22**.

Table 22 Ground Vibration Summary

Location	Minimum vibration (mm/s)	Average vibration (mm/s)	Maximum vibration (mm/s)*	Exceedances (Y/N)
Residences				
BM03	<0.1	0.1	0.5	N
BM04	<0.1	<0.1	0.3	N
BM07	<0.1	0.1	0.7	N
BM08	<0.1	0.1	0.6	N
Rock Formations				
Anvil Rock	0.2	3.8	26.9	N/A
Closest Rock Formation (where Anvil Rock is not the closest)	<0.1	3.4	10.9	N/A
Powerlines				
Transmission Line Pylon	N/A ¹	N/A ¹	N/A ¹	N/A

* Criteria for residences 5mm/s. Specialist determined safe limit for Anvil Rock and other rock formations for 2019 period is 50mm/s. Limit for powerlines as per TransGrid Agreement are 60mm/s for Tension towers and 125mm/s for Suspension towers.

¹ Monitoring at the closest powerline to the blast is required only where ground vibration limits are predicted to exceed 125mm/s peak particle velocity for suspension towers and 60mm/s for tension towers.

During 2019 there were no exceedances of the 5 mm/s threshold for residential receivers or the 50mm/s specialist determined safe limit for Anvil Rock (or other closest rock formations). Monitoring was not required at the nearest pylon as the predicted ground vibration for each blast in 2019 was below the threshold required for monitoring.

6.4.2.2 Comparison with Predictions

The PA 06_0014 MOD 6 EA included a Noise and Vibration Assessment (EMM, 2013) which assessed the impacts of blasting. This assessment determined the limiting factors to the blast design with respect to the relevant blast criteria.

The MOD 6 Noise and Vibration Assessment (EMM, 2013) determined that blast overpressure and vibration could be managed to be within PA06_0014 criteria at all times. During 2019 there were no exceedances of the blast overpressure and no exceedances of vibration criteria, therefore the results were largely consistent with predictions made in the EA (EMM, 2013).

6.4.2.3 Long Term Trend Analysis

In accordance with PA 06_0014 a long term trend analysis of blast monitoring results at Mangoola has been undertaken using data from July 2010 to December 2019, and included as **Appendix D**.

Ground vibration monitoring results have remained generally consistent since monitoring commenced, with no increasing trends developing in the data. All blast vibration monitoring results at private residences have been below the PA 06_0014 criteria since monitoring commenced. All results have been below the 10mm/s criteria, and while some results have exceeded the 5mm/s criteria between 2010 and 2019, these were within the allowable 5% frequency. BM04 has remained well below the PA 06_0014 criteria during the short period in 2019 reporting period before being decommissioned following the approval of the Blast Management Plan in February 2019 after experiencing some variability during 2015.

Airblast overpressure monitoring results at private residences (BM03, BM04, BM07 and BM08) have remained generally constant at all locations since monitoring began.

6.4.3 Key Performance and/or Management Issues

There were no exceedances of blast vibration or overpressure criteria during the 2019 reporting period.

Eight complaints were received in relation to blasting during the reporting period, which is an increase from the seven complaints received in 2018. Six complaints were relating to blast vibration/overpressure, and two complaints were relating to blast dust. Further detail on complaints is provided in **Section 9.3**.

An internal compliance review determined a property investigation was requested by Property ID 200 with results to be sent to the landholder within two months of request as required by Schedule 3, Condition 14 of PA 06_0014. As a copy of the property investigation report was not given to the landholder within two months of receiving this claim this condition is deemed non-compliant.

6.4.4 Proposed Improvements

Hansen Bailey (2019) made four recommendations relating to blasting as outcomes of the IEA, including:

- At next Modification, recommend that the condition is amended to reflect approved updated blasting hours within Condition L4.5 of EPL 12894.
- Blast monitoring in the east is currently not required, however should be reconsidered in the next audit period if required by an appropriate specialist as mining progresses south.
- 2019 IEA, PA06_0014, Sch 3, Condition 17 Blast monitoring in the east is currently not required, however should be reconsidered in the next audit period if required by an appropriate specialist as mining progresses south. If additional blast monitoring is required in the east as a result of the specialist review, a revised Blast Management Plan will be submitted to DPIE by 18 Jan 2020.
- 2019 IEA, PA06_0014, Sch 3, Condition 17 Figure 4.1 of the BMP should be extended to a 3km radius from active mining in the next audit period as mining progresses to the south to ensure that blast impacts to receivers in the south west are adequately monitored. Consideration should be given as to whether additional blast monitoring in the south-west should be installed in the vicinity of receiver 54 or 106B (approx. 4km from future active blasting). If additional blast monitoring is required in the south-west, a revised BMP will be submitted to DPIE by 18 Jan 2020.

More information is outlined in **Section 10**.

6.5 Erosion and Sediment Control

6.5.1 Environmental Management

Mangoola manages erosion and sediment on site in accordance with the approved Erosion and Sediment Control Plan (ESCP), which is included as Appendix C of the Water Management Plan (WMP). The ESCP was updated in 2018 and a copy is available on the Mangoola website.

Prior to land disturbance for any aspect of the mine, appropriate erosion and sediment controls are designed and constructed according to the ESCP as well as the guidelines *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) (the Blue Book) *Volume One and Volume 2E Mines and Quarries* (DECC, 2008).

Site erosion and sediment controls are inspected at least monthly, and within 5 days of a high rainfall event (i.e. greater than 20 mm in 24 hours). Regular maintenance is undertaken as required to replace damaged sediment control structures and maintain other temporary measures. Annual channel stability monitoring is also undertaken at Mangoola to identify any erosion and sedimentation issues on surrounding creeks and drainage lines. The outcomes are reported in the *Annual Channel Stability Report* in accordance with Schedule 3, Condition 31(e) of PA 06_0014.

6.5.2 Environmental Monitoring Results

Water discharged from three erosion and sediment control structures on 30 March 2019 during an 89.8 mm (Weather Station North) rainfall event in a 24 hour period. The results of the investigation showed that for the duration from 3.5 hours to 8 hours the storm exceeded a 2% Annual Exceedance Probability (AEP) event. The rainfall also exceeded the 5-day 95th percentile event. The Pollution Incident Response Management Plan (PIRMP) was enacted and the event was notified to the DPIE on the day with a full investigation report provided to DPIE on 8 April 2019 in accordance with Schedule 5 Condition 4. In April 2019, DPIE noted the following regarding the reported discharge event:

- The rain event exceeded the 5-day 95th percentile design capacity of sediment dams;
- Water quality monitoring results indicate that the discharge did not result in a change in water quality outside any background levels; and
- Mangoola implemented proactive and reactive actions to manage the impact of the event.

The DPIE also advised that they were 'satisfied that Mangoola has complied with the requirements of the consent and the approved management plans'. The EPA advised that 'no action' would be taken due to 'several factors including rainfall exceeding design criteria, the implementation of preventative measures and no evidence of any environmental harm'.

The 2019 Annual Channel Stability Report (HLM, 2019) recorded no observed changes in the Ephemeral Stream Assessments for Big Flat Creek and Sandy Creek which surround Mangoola. Anvil Creek was removed from the assessment in 2019 due to the stream and catchment being removed as per the mining process.

6.5.3 Key Performance and/or Management Issues

There were no issues with erosion and sediment control during the reporting period. Mangoola will review and implement if required any remedial measures as per the recommendations of the 2019 Annual Channel Stability Report, as provided in **Table 23**. Remedial actions will be implemented as required following onsite erosion and sediment control inspections completed routinely and following rainfall events.

Table 23 2019 Annual Channel Stability Report Recommendations

Recommendation	Mangoola Response
Big Flat Creek Ensure stock exclusion in the lower half of Reach 2 and revegetate. This area has a long history as a salt-affected (saline) site and due to its prominent location adjacent to Wybong Rd, would provide ample public exposure for rehabilitation.	This area is in Mangoola grazing land and is only lightly stocked due to the low carrying capacity and drought conditions. The area will continue to be monitored and further stock reductions undertaken if required. Revegetation of adjacent offset areas is undertaken in accordance with the BOMPS.
Sandy Creek Manage stock access along Sandy Creek.	Several Mangoola offset areas and grazing land surround Sandy Creek. Fencing of offset areas to exclude cattle will continue to be maintained as per the BOMPS. Grazing is restricted due to low carrying capacity and drought conditions. The area will continue to be monitored and further stock reductions undertaken if required.
Repair active erosion points.	The area identified has a low stocking rate and any erosion in this grazing land area will continue to be monitored and remediation works undertaken if necessary.
Native revegetation and continue to manage weeds.	Weed management works continue to be undertaken regularly across all buffer land and offset areas. These works are prioritised based on weed type and numbers present. Revegetation across offset areas is undertaken in accordance with the BOMPS.

6.5.4 Proposed Improvements

Hansen Bailey (2019) made one recommendation relating to erosion and sediment control as an outcome of the IEA, including:

- 2019 IEA, PA06_0014, Sch 3, Condition 30 Future version of the ESCP to include an up-to-date list of the erosion and sediment control structures at the mine, and a figure showing the locations of these structures. A reference to the site Pollution Incident Response Management Plan (updated annually) which contains the location, function and capacity of ESC structures, will be included in the ESCP to be submitted for consultation with relevant agencies by 18 Jan 2020.

More information is outlined in **Section 10**.

6.6 Biodiversity

6.6.1 Environmental Management

Flora and fauna are managed in accordance with the approved MOP and Biodiversity Offset Management Plan and Strategy (BOMPS). The BOMPS was updated in 2018. Clearing activities at Mangoola have been designed to minimise impacts to any threatened flora and fauna species and vegetation communities. Suitably qualified personnel inspect all disturbance areas as part of the Pre-Clearing Procedure to ensure that no unapproved impact on any threatened species of flora or fauna will occur. Any fauna found during clearing activities are captured (where possible) and relocated by suitably qualified persons.

Two threatened terrestrial orchids and an endangered population of epiphytic orchid are present on lands at Mangoola, being *Diuris tricolor*, *Prasophyllum sp aff petilum* (Wybong) and *Cymbidium canaliculatum*. A Translocation Management Plan is in place to salvage and relocate threatened orchid species affected by the progression of mining activities, and was updated and approved during 2018.

6.6.2 Environmental Monitoring Results

Since 2017, rainfall has been lower than average and temperatures have been hotter than average at Mangoola. These conditions worsened to “drought” in March 2018 and this has continued into 2019 – making three consecutive years of lower than average rainfall and higher than average temperatures. This has had substantial implications for local vegetation (reflected in most monitoring site results), particularly in terms of diversity of annual flora species, ground coverage and defoliation of tree vegetation.

A number of sites were monitored in 2019 (Umwelt 2020) in accordance with the BOMPS, including:

General Ecological Monitoring

- 11 fauna monitoring sites;
- 15 flora monitoring sites; and
- 1 groundwater dependent ecosystem monitoring site.

Floristic Values

- Floristic results show declining trends in highly invasive introduced species compositions which is reflective of site management actions;
- Coverage by weeds was highest in areas of derived native grassland that had been subject to revegetation (compared to remnant vegetation or rehabilitated vegetation). Weed presence remains a factor impacting recovery of revegetation and regeneration sites;
- Declines in overall flora richness are likely attributable to a combination of weed management works as well as drought conditions, which have been ongoing since 2018;
- Remnant monitoring sites are considered generally stable;
- Floristically, 13 flora monitoring sites (four rehabilitation, six remnant and three regenerating / revegetated) were on an overall positive or neutral trajectory. This is indicative that this vegetation is resilient;
- Floristically, three flora monitoring sites (two rehabilitation and one revegetated sites) were on an overall negative trajectory;

- Overall, previous grassland areas are on a positive trajectory towards becoming woodland sites;
- Substantial defoliation was recorded across numerous monitoring sites (although was not as evident in revegetation sites which had increasing canopy despite drought conditions), including areas opportunistically observed in the wider Mangoola area (particularly along Big Flat Creek);
- Substantial defoliation of the canopy was identified at GDE monitoring site RTR-SPR-17 and throughout most remnant monitoring sites (both flora and fauna) as well as in general along Big Flat Creek. Defoliation such as this has been generally observed at large tracts of riparian areas in the Central Hunter Valley over the past 24 months that correlate with drought; and
- Reduced exotic foliage cover will potentially allow for colonisation of more native groundcover species once regular rainfall patterns establish.

Fauna Values

- Habitat value provided by rehabilitated areas is rapidly increasing;
- Habitat value provided by revegetation site FA06 is increasing and this has been reflected in increases in overall fauna species diversity;
- Threatened fauna diversity in 2019 was generally consistent to previous monitoring;
- General fauna compositions across remnant sites were consistent with previous monitoring, except for mammal diversity which showed a decrease at most sites. Reductions in micro-bat detection are likely due to changed movement patterns towards water resources (most of which are now significantly reduced or absent on site);
- Bird diversity is generally higher in remnant vegetation with more dense shrubby understoreys and lots of woody debris;
- Two threatened fauna species have not been recorded during monitoring for a number of years (being diamond firetail (*Stagonopleura guttata*) and eastern cave bat (*Vespadelus troughtoni*)) and consideration should be paid to this in future monitoring. The reduced records of diamond firetail (*Stagonopleura guttata*) could be a result of drought conditions, whereby individuals are forced to move to seek food resources; and
- Threatened molluscs are mostly stable or increasing, except for one site (FA02) where declines have been identified since 2017. There was no apparent reason for this decline.

Threatened Species

Eleven threatened fauna species were recorded during monitoring in 2019, including:

- Brown treecreeper (FA13);
- Dusky wood swallow (FA02, FA07, opportunistic – 5 individuals recorded in northern rehabilitation);
- Eastern Bentwing-bat (FA01, FA06, FA07);
- Greater broad-nosed bat (FA02);
- Grey-crowned babbler (FA01, opportunistic – recorded at four locations throughout site);
- Hooded robin (FA13);
- Large-eared pied-bat (FA06);

- Little lorikeet (FA13, opportunistic – 6 individuals recorded in northern rehabilitation);
- Speckled warbler (FA01, FA02, FA03, FA07, FA08, FA09, FA11, FA12, FA13, RTR-SPR-17, opportunistic – recorded at 17 locations throughout site);
- Varied sittella (FA03); and
- Yellow-bellied sheath-tail-bat (FA13).

No targeted threatened flora species work was undertaken as part of this program during 2019 and none were identified at any of the monitoring sites. However, tiger orchids (*Cymbidium canaliculatum*) and weeping myall (*Acacia pendula*) were identified opportunistically while moving between sites. All these records are known to Mangoola.

Ecological monitoring locations are shown in **Figure 10**.

Conservation Agreement Monitoring

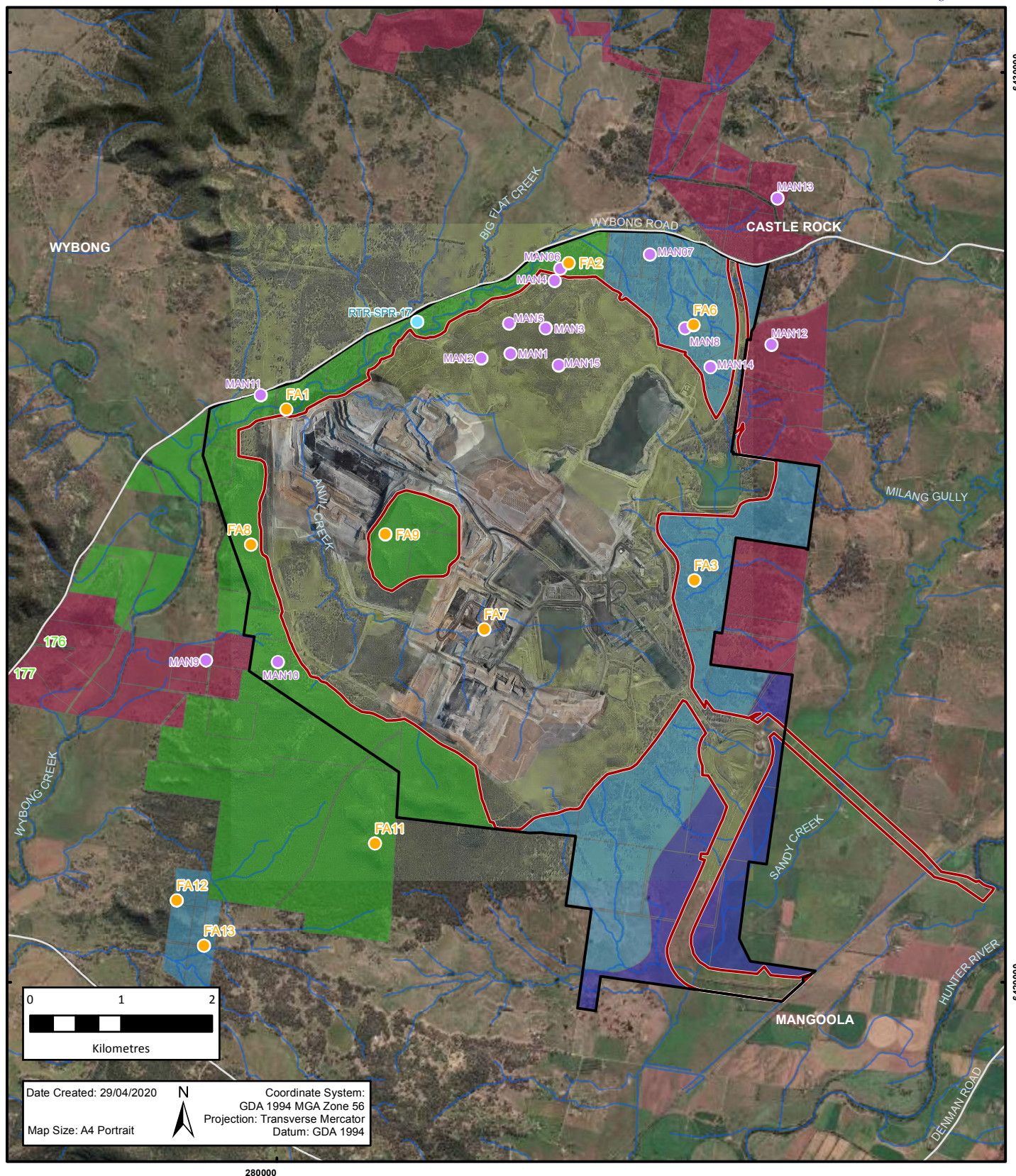
In 2019, Conservation Agreements were finalised for five areas in line with Schedule 3, Condition 37 of PA 06_0014 as long term security for the existing Biodiversity Offset Areas.

Monitoring of the Conservation Areas includes photo monitoring for comparison of baseline photos, quadrat monitoring to compare data to benchmark data and a walk-through assessment of all conservation areas. The following monitoring was undertaken:

- Big Flat Creek Conservation Area:
 - 11 photo monitoring points; and
 - 5 quadrat plots.
- Western Corridor and Anvil Hill Conservation Area:
 - 18 photo monitoring points; and
 - 11 quadrat plots.
- Southern Offset Conservation Area:
 - 8 photo monitoring points; and
 - 5 quadrat plots.
- Eastern Offset Conservation Area:
 - 10 photo monitoring points; and
 - 7 quadrat plots.
- Northern Corridor Conservation Area:
 - 12 photo monitoring points; and
 - 6 quadrat plots.

The monitoring data and reports related to the Conservation Agreements have been provided to the Biodiversity Conservation Trust as per conditions of the agreement.

Figure 10 - 2019 Ecological Monitoring Sites



Legend

- Approved Mangoola Coal EPL and Disturbance Boundary
- Mining Lease 1626
- Fauna monitoring locations
- Flora monitoring locations
- Groundwater Dependent Ecosystem (GDE) monitoring location

Approved offsets

- Biodiversity Corridor
- Conservation Offset Area (Aboriginal)
- Habitat Enhancement Offset Area
- Sustainable Agriculture Offset

DISCLAIMER
Subject To Survey.

Glencore makes every effort to ensure the quality of the information available on this map. Before relying on the information on this map, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances. Glencore cannot guarantee and assumes no responsibility for the accuracy, currency or completeness of the information and by using this map you accept that Glencore has no liability for any loss or damage in any form whatsoever caused directly or indirectly from the use of this map.

DATA SOURCE

© NSW Department of Finance & Services (LPI) 2020
© NSW DTIRIS (Minerals & Petroleum) 2020
© Glencore 2020 © ESRI 2020

6.6.2.1 Landscape Function Analysis

Landscape Function Analysis (LFA) is conducted every two years at Mangoola. No LFA sampling was undertaken in 2019, with the next monitoring survey due to occur in 2020.

6.6.2.2 Nest Box Monitoring

Nest boxes at Mangoola are monitored every two years for the presence of fauna and the condition of each box monitored every four years. A total of 902 nest boxes were monitored as part of the standard program during 2019, comprising 419 boxes monitored for content and condition and 483 for condition only. In addition, 93 nest boxes and 37 stags in the Northern, Main Pit and Southern Rehabilitation areas were also content monitored at the request of Mangoola (Umwelt 2020b).

Results are summarised below:

- Approximately half of the boxes monitored for content during 2019 showed some signs of use (both external and internal);
- 33 of the boxes monitored for content (6%) contained an animal at the time of monitoring. These included mammals, marsupials, reptiles, birds and their eggs;
- No threatened species were recorded in the boxes in the BOAs, Corridors or Northern Rehabilitation in 2019; and
- Of the rehabilitation nest boxes monitored in 2019, two species were identified, being the Australian owllet nightjar (*Aegotheles cristatus*) and Gould's wattled bat (*Chalinolobus gouldii*). Nest box occupation was marginally lower in the rehabilitation areas at 4.3%, however signs of presence were relatively high at 28 boxes (40.5%). The most common signs of presence included mammal scats most likely a result of usage by micro-bats.

6.6.2.3 Threatened Terrestrial Orchid Monitoring

Orchid detection results obtained during the 2019 monitoring program at Mangoola continued the downward trend observed since the commencement of drought conditions in 2017. The 2019 flowering season followed 23 months of below average rainfall at Mangoola, and under these conditions poor flowering is to be expected. Dry conditions also exacerbate impacts from vertebrate and invertebrate grazing, as potential forage areas outside of recipient plots fail to produce sufficient feed. In these circumstances, low detection rates most likely reflect ongoing impacts from environmental stressors rather than mortality brought about by the translocation process itself.

Over the course of nine years, improvements in monitoring methods have dramatically improved orchid detection rates with successive monitoring events. Considered together, detectability for most recipient plots in 2019 dropped to 2-20%, with no orchids detected at Translocation #6 (R3a), #6 (ON) and the tuber translocations (TR, TN, TS). Individually however, two different scenarios are presented. For *Diuris*, most plots returned rates of up to 23%, more-or-less consistently with time in the ground. Unmined plots (i.e. offsets) recorded rates of 1-23% over 5-9 years, while in mine rehabilitation detection was 2-20% after 4-5 years. *Prasophyllum* was detected at only one translocation plot in 2019, Translocation #7 (O). Translocation of both *Diuris* and *Prasophyllum* as salvaged tubers showed a poor result (all nil detection in 2019), although sample size was small. While all of these detection rates are variable, the influence of external environmental factors experienced from year to year combined with changing monitoring techniques suggest caution in assessing success from a single point in time.

Permanently marked naturally occurring orchids within the four control plots were censused for the third time in 2019. In 2017, 38% of the 74 tagged orchids were flowering, but an additional nine orchids newly emerged in Control #4 were added to the tagged number in 2017. Since installation, numbered individuals of *Diuris* and *Prasophyllum* have declined in detection following dry winter rainfall trends and mirrored results from recipient sites. Although the monitoring process is still in its infancy, the downward trends in detection relative to winter rainfall is expected to continue, and it will be of interest to see how these orchids respond when good rains return.

Some minor issues relating to management of translocation recipient sites became apparent during the 2019 monitoring period and are outlined, while some previous management suggestions are yet to be implemented. Likely tuber predation by White-winged Choughs was observed within one recipient plot, but such a threat cannot be managed for. Suggestions for continuing research questions into the ecology of these two orchid species are also provided.

Since the completion of previous monitoring events at Mangoola, some recommendations suggested in annual reports have now been implemented by Mangoola Coal and have aided ongoing monitoring. These include:

- All recipient sites have had competing grasses cut to ankle height annually, prior to orchid emergence (generally around March or April in each year), and cut thatch removed;
- Stronger mammal exclusion fencing of recipient plots has been erected, to combat occasional breaches by macropods and wombats;
- Completion of a pilot study on fruit: flower ratios to assess pollinator presence, which has been investigated further by Vizer (2013) as part of post-graduate studies;
- Repeated monitoring of recipient plots within the one season, to increase detection rates of translocated orchids;
- Cessation of monitoring of the initial translocation site (Translocation #1) due to the absence of baseline data for annual comparisons;
- Installation of motion detection cameras at Control Plot #4 off Yarrawa Road in 2018, to monitor the impact of native herbivore grazing;
- Removal of *Galenia pubescens* from recipient plots within mine rehabilitation (plots Rehab 3A, 3B, 4A, and 4B from Translocation #6 and the Translocation #7 rehabilitation plot); and
- Publication of progressive results of the monitoring program (see Bell 2019, Bell submitted).

6.6.2.4 Groundwater Dependent Ecosystems

Groundwater Dependent Ecosystem (GDE) monitoring was undertaken along Big Flat Creek to identify if floristic data reflects any substantial negative changes that may have resulted from groundwater depressurisation associated with groundwater inflows.

The GDE monitoring site (RTR-SPR-17) has experienced extensive dieback since 2017 with over-storey and mid-storey cover both reducing by over 50%. This dieback was prevalent throughout this area in both the mature and regenerating Swamp Oak (*Casuarina glauca*). Swamp Oak dieback has been widely observed across the Hunter Valley over the past 18 months and correlates with the area being under drought since March 2018 (Umwelt, 2020a).

Observations throughout the Hunter Valley outside of Mangoola has identified riparian vegetation, particularly swamp oak (*Casuarina glauca*) and river oak (*Casuarina cunninghamiana*) that is experiencing similar declines in condition (Umwelt, 2020a).

Groundwater quantitative data is collected at two sites along Big Flat Creek and in proximity to RTR-SPR-17, being MP17-B and MP8-B (in alluvium and weathered conglomerate), these flows move in a south-westerly direction. In 2012, baseline depth to water (DtW) levels for MP17-B and MP8-B was recorded at 2.96 m and 3.35 m, respectively. These levels are likely to be within the root zones of treed vegetation or at least within a zone where soil capillary action allows groundwater to influence soil moisture and thus be available to surface vegetation.

It is probable that the Swamp Oak Riparian Forest vegetation (canopy species) above RTR-SPR-17 is at least partially groundwater dependent. This dependence may be more pronounced during extended periods of drought where surface water availability is reduced or absent (such as was experienced during 2018).

Umwelt (2020a) concluded by stating most likely the changes to this vegetation are a result of low levels of rainfall as opposed to groundwater depressurisation.

6.6.2.5 Grassland Monitoring

In line with the Conservation Agreement, the Southern Offset Area (previously Sustainable Offset Area) is no longer being grazed or required to be monitored for grazing purposes. The area is now monitored under the Conservation Agreement monitoring program.

6.6.2.6 2019 Offset Tree Planting Program

Tree planting activities are undertaken in the biodiversity offset areas in accordance with the BOMPS to extend and enhance existing woodland areas and create vegetation corridors to link the offset areas and rehabilitation with remnant vegetation to the north and west of Mangoola mine.

As outlined in the BOMPS, the tree planting for Year 9 (2019) covered an area of approximately 39.8 ha, including:

- 1.0 ha of Slaty Box Woodland in HEO-2;
- 18.6 ha of Slaty Box Woodland in HEO-3;
- 15.5 ha of Slaty Box Woodland in NC-06; and
- 4.7 ha of Slaty Box Woodland in SO-2.

6.6.3 Key Performance and/or Management Issues

During the reporting period there were no reportable incidents, performance or management issues relating to flora and fauna. Management issue recommendations related to biodiversity monitoring are:

- Recommendations from the 2019 Ecological Monitoring Report (Umwelt 2020a) are listed below:
 - Continue to undertake ongoing maintenance and monitoring of weed species in line with the 2020 Weed Action Plan;
 - Continue targeted control works for feral animal species identified during 2019 monitoring, particularly rabbit (*Oryctolagus cuniculus*) and fallow deer (*Dama dama*);
 - Continue to assess erosion at site FA3 and FA7; and
 - The number of rehabilitation monitoring sites should be increased in order to provide adequate spatial coverage and to provide adequate data for statistical robustness of monitoring results.
- Recommendations for future nest box activities (Umwelt 2020b) include:
 - Large boxes (owl, cockatoo, deep king parrots in particular) should be considered to be installed with heavy duty wire as the green 3.5mm half-hard wire will stretch over time on mature trees;
 - As rehabilitation area trees mature, continue installation of small nest box types catering for micro-bats and small birds may be incorporated where trees are suitable;
 - Nest boxes should ideally be installed at or above 3m in height: and no less than 2m;
 - Boxes need to be species-specific and clustered such that competing, or highly territorial species are not installed on the same tree (e.g. gliders/possums or parrots/cockatoos); and
 - Results of stag installation activities are currently promising. These works should be continued, with records made of installation locations and unique ID's given to individual trees for future comparison.

Mangoola will review and implement these recommendations where appropriate as part of the 2020 ecological monitoring program. Some projects such as supplementary/infill planting will not be undertaken until drought conditions ease.

6.6.4 Proposed Improvements

Proposed improvements recommended in the ecological monitoring report (Umwelt 2020a) are:

- Undertake supplementary/infill plantings of canopy and shrub species based on the BOMPS at the locations identified, after drought conditions break; and
- Some species have been proving to be more dominant in species mixes in rehabilitation and revegetation areas, it is recommended that seeding/planting ratios be modified for these species (increasing or decreasing them from their current rates).

6.7 Weed and Pest Management

6.7.1 Environmental Management

6.7.1.1 Weed Management Activities

During the reporting period contractors were engaged to undertake weed management works at the mine, within rehabilitation and offset areas. Noxious and highly populated weeds were prioritised with environmental weeds treated opportunistically when encountered. A summary of the weed management and control activities undertaken during the reporting period is listed below:

- Low volume spraying was conducted targeting *Lycium ferocissimum* (African Boxthorn), *Galenia pubescens* (Galenia) and *Opuntia stricta* (Prickly Pear);
- Cut-and-paint works with chainsaws and handsaws were conducted throughout site using neat Roundup Biactive® targeting *Lycium ferocissimum*; and
- Widespread high and low volume weed control throughout all mine rehabilitation areas, primarily targeting African Boxthorn (*Lycium ferocissimum*), Galenia (*Galenia pubescens*), Inkweed (*Phytolacca octandra*), Narrow-leaved Cotton Bush (*Gomphocarpus fruticosus*), African Love Grass (*Eragrostis curvula*), Fireweed (*Senecio madagascariensis*), Purpletop (*Verbena bonariensis*), Mustard Weed (*Sisymbrium officinale*), Scotch Thistle (*Onopordum acanthium*), Blackberry Nightshade (*Solanum nigrum*), Sow Thistle (*Sonchus oleraceus*), Mexican Poppy (*Argemone mexicana*), Saffron Thistle (*Carthamus lanatus*), Noogoora Burr (*Xanthium strumarium*) and Blue Heliotrope (*Heliotropium amplexicaule*).

The weed management across 2019 has resulted in a considerable reduction in numbers of weeds present across offset areas and buffer lands.

6.7.1.2 Feral and Pest Animal Management Activities

Mangoola completed winter and spring 1080 baiting programs during 2019 which resulted in 64 fox takes, and 3 wild dog takes.

Additional culling programs also resulted in 123 deer, 25 pigs, 2 wild dogs and 55 foxes being culled. Mangoola is a member of the Wybong Wild Dog Association and co-ordinates vertebrate pest control activities with regional neighbours to ensure maximum program efficiency.

6.7.2 Key Performance and/or Management Issues

No reportable incidents, performance or management issues regarding weeds and feral animal management occurred during the reporting period.

6.7.3 Proposed Improvements

Hansen Bailey (2019) made one recommendation relating to the BOMP as an outcome of the IEA, including:

- 2019 IEA, PA 06_0014, Sch 3, Condition 34 In the next update of the Biodiversity Offset Management Plan and Strategy, a statement should be made clarifying that no areas of Bulloak Woodland are proposed to be re-established but existing areas will be managed and enhanced. Clarification to be included in the next periodic update of the BOMPS regarding the management of Bulloak Woodland which will be updated and submitted to relevant Departments for consultation by 30 Sep 2021.

More information is outlined in **Section 10**.

6.8 Visual Mitigation

6.8.1 Environmental Management

All works occurring onsite are undertaken in a manner which ensures that there is minimal impact on visual amenity in accordance with *AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting*. Mangoola is committed to minimising ongoing visual impacts as a result of its operations. In order to ensure visual impacts are minimised a variety of methods are implemented, including tree screen planting, visual bunds, building placement, light shielding, and lighting direction to prevent light spillage.

6.8.2 Environmental Monitoring Results

Lighting inspections were undertaken by Mining Supervisors to monitor mobile lighting impacts from external viewing points.

Visual tree screening was established via direct seeding of appropriate local flora species along sections of Yarraman Road and Ridglands Road during 2018 to reduce visual exposure as the mine progresses to the north-west. As a result of the ongoing drought conditions in 2019, the direct seeding campaign undertaken in 2018 resulted in no germination. There was also no additional seeding undertaken in 2019 due to ongoing weather conditions. The re-seeding on Yarraman Road and Ridglands Road has been budgeted and will be scheduled when the weather conditions are more appropriate to ensure that the seeding campaign is successful.

6.8.3 Key Performance and/or Management Issues

In July 2018, receptor 192 was offered visual mitigation in the form of tree screening in accordance with Schedule 3, Condition 52 of PA 06_0014. In December 2018, Mangoola received a signed letter from receptor 192 to advise the trees were received.

Mangoola notified DPIE of the completion of tree screen works at receptor 192 in April 2019. In May 2019, DPIE contacted Mangoola for further information regarding the agreement of completion of works following a phone call they received from receptor 194. Mangoola provided additional information in May 2019 confirming that receptor 192 was satisfied with the outcome in accordance with Schedule 3, Condition 52 of PA 06_0014. DPIE reviewed the provided information and advised they were satisfied with the outcome in June 2019.

There were no other performance or management issues regarding visual mitigation or lighting during the reporting period. One complaint was received in 2019 in relation to lighting which is a decrease from the three lighting complaints received in 2018.

6.8.4 Proposed Improvements

Hansen Bailey (2019) made one recommendation relating to visual mitigation as an outcome of the IEA, including:

- 2019 IEA, PA06_0014, Sch 3, Condition 54. Add residence location to Appendix A of Lighting Plants Procedure to confirm which properties have residences and which are vacant. Update Appendix A of Lighting Plants Procedure to include residence locations to show which are vacant/occupied.

More information is outlined in **Section 10**.

6.9 Aboriginal Heritage

6.9.1 Environmental Management

The management of activities relating to Aboriginal cultural heritage at Mangoola is undertaken in accordance with the Aboriginal Cultural Heritage Management Plan (ACHMP) and relevant other guidelines and legislation. The ACHMP was updated in 2018 and a copy is available on the Mangoola website.

A number of Aboriginal archaeological sites are recorded within or adjacent to the Mangoola project area. In order to assist with the management of Aboriginal cultural heritage, Mangoola maintains spatial information on all identified Aboriginal archaeological sites within the operational geographical information system. The GIS information is utilised to inform the GDP process.

6.9.2 Environmental Monitoring Results

Aboriginal heritage monitoring and inspections undertaken in 2019 have been summarised in **Table 24**.

Table 24 Aboriginal Heritage Monitoring and Inspections

Monitoring / Inspection	Dates	Attendees	Notes
2019 Offset Tree Planting due diligence	17 April 2019	Philippa Sokol (OzArk - Archaeologist), Cameron Eckersley (Mangoola Environment and Community Officer), and two representatives from registered Aboriginal parties.	<p>During the inspection, fourteen new Aboriginal sites were recorded:</p> <ul style="list-style-type: none"> • AHIMS #37-2-5906 • AHIMS #37-2-5907 • AHIMS #37-2-5908 • AHIMS #37-2-5909 • AHIMS #37-2-5910 • AHIMS #37-2-5911 • AHIMS #37-2-5912 • AHIMS #37-2-5913 • AHIMS #37-2-5914 • AHIMS #37-2-5915 • AHIMS #37-2-5916 • AHIMS #37-2-5917 • AHIMS #37-2-5918 • AHIMS #37-2-5919 <p>It is noted that the visual inspection located three previously recorded AHIMS sites which exist in the study area:</p> <ul style="list-style-type: none"> • AHIMS #37-2-2689 • AHIMS #37-2-4497 • AHIMS #37-2-4498 <p>Due to the scope of the proposed works and the ability to avoid impacts by excluding the sites areas from disturbance through demarcation with highly visible flagging, an AHIP application was not necessary. The works proceeded with caution.</p>

Monitoring / Inspection	Dates	Attendees	Notes
AC58 baseline recording	9 August 2019	Nicola Roche (Umwelt - Senior Archaeologist), Cameron Eckersley (Mangoola Environment and Community Officer) and two representatives from registered Aboriginal parties.	During the annual offset monitoring and inspection in 2019, a one new Aboriginal (rock shelter) site was recorded: <ul style="list-style-type: none"> • AHIMS #37-2-5839 (AC58) The baseline monitoring of this Rockshelter was undertaken in 2019 with no new additional Aboriginal sites noted or recorded.
2019 Demolition Program	17 August 2019	Ben Churcher (OzArk - Archaeologist), Cameron Eckersley (Mangoola Environment and Community Officer), and one representative from a registered Aboriginal party.	During the inspection, one new Aboriginal sites was recorded: <ul style="list-style-type: none"> • BFC 156 AHIMS #37-2-5935 Due to the scope of the proposed works and the ability to avoid impacts by excluding the site area from disturbance through demarcation with highly visible flagging, an AHIP application was not necessary. The works proceeded with caution.
Construction of Spillway at Sandy Creek Farm Dam 2	21 November 2019	Jodie Benton (OzArk - Director), Mitchell Green (Mangoola Environment and Community Coordinator), and two representatives from registered Aboriginal parties.	During the inspection, three new Aboriginal sites were recorded: <ul style="list-style-type: none"> • SC124 AHIMS #37-2-5968 • SC125 AHIMS #33-2-0030 • SC126 AHIMS #37-2-5967 It is noted that the visual inspection located two previously recorded AHIMS sites which exist in the study area: <ul style="list-style-type: none"> • AHIMS #37-2-5427 • AHIMS #37-2-4504 Due to the scope of the proposed works and the ability to avoid impacts by excluding the site area from disturbance through demarcation with highly visible flagging, an AHIP application was not necessary. The works proceeded with caution.
Annual offset monitoring	28-31 November 2019	Stephanie Rusden (OzArk - Archaeologist), Cameron Eckersley (Mangoola Environment and Community Officer) and two representatives from registered Aboriginal parties.	Throughout 2019, Mangoola ensured that visitation to rock shelters was kept to a minimum. Visitation was undertaken to conduct required monitoring and measurements in line with approved management plans and statutory approvals, as well as at the request of registered Aboriginal parties. Continued fencing and signage maintenance has been recommended, as required.

On 28 November 2019, an Aboriginal stakeholder consultation meeting was held to review previous meeting minutes and actions, and provide an update on project progress, outcomes of monitoring activities, cultural heritage inspections/surveys and any salvage activities conducted in accordance with ACHMP requirements.

6.9.3 Key Performance and/or Management Issues

There were no reportable incidents, performance or management issues relating to Aboriginal heritage during the reporting period. However, actions captured in the 2019 Annual Stakeholder review meeting have been enacted.

On 18 June 2018, an application was made to the BCD for the Care and Control of the Aboriginal Artefacts salvaged as part of the PA 06_0014 approval (stored securely at Umwelt Pty Ltd offices in Teralba) to be relocated back to Mangoola for secure storage on site. This Care and Control Agreement was executed on 19 July 2019 (Mangoola Care Agreement C0003885) and notification was made to BCD and registered Aboriginal groups, as required. The artefacts were returned to Mangoola on 27 November 2019 and are stored in a locked container as outlined in Item 5, Schedule A of the Care Agreement. During the 2019 Annual Stakeholder Review Meeting the Care Agreement was discussed and the artefact storage container was visited.

6.9.4 Proposed Improvements

Hansen Bailey (2019) made one recommendation relating to Aboriginal heritage as an outcome of the IEA, including:

- 2019 IEA, PA06_0014, Sch 3, Condition 41 Include the newly identified rock shelter (AC58) in the next revision of the ACHMP. Update the ACHMP to include AC58 and send to the registered Aboriginal Parties for consultation by 31 Dec 2019.

More information is outlined in **Section 10**.

6.10 European Heritage

6.10.1 Environmental Management

European heritage is managed at Mangoola in accordance with the Conservation Management Strategy (CMS). A copy of the CMS is available on the Mangoola website. Specifically, the CMS identifies known European Heritage sites at Mangoola and any relevant monitoring required to be completed to assess the potential impact primarily from blasting or clearing activities.

6.10.2 Environmental Monitoring Results

During the reporting period ground vibration monitoring at key heritage sites, such as Anvil Rock, was maintained. The results from the blast monitors and monitoring undertaken to date has demonstrated that no damage has occurred.

To date no monitoring has occurred at the Castle Hill Homestead as the site is on private property and Mangoola does not have approval to access the site from the landholders. A representative blast monitor is in place between mining operations and the Castle Hill site and has not exceeded vibration limits for any blasts in 2019.

6.10.3 Key Performance and/or Management Issues

No reportable incidents regarding European Heritage occurred during the reporting period.

Mangoola will continue to carry out ground vibration and physical monitoring in 2020 on Anvil Rock and The Book Rock Formations to inform the adequacy of blasting controls and management of these structures.

An annual review of safe blasting limits has been undertaken to inform blasting design to ensure there are no blasting impacts on Anvil Rock, The Book Rock Formations or Castle Hill heritage sites.

6.10.4 Proposed Improvements

Two additional blast monitors on Anvil Rock were installed in January 2020. As the mine progresses around Anvil Hill, the additional blast monitoring results will inform accuracy in blast modelling and predictions. This install was done in consultation with the DPIE and the CCC. As a result the Blast Management Plan (BMP) was updated and submitted to the DPIE for approval.

Hansen Bailey (2019) made one recommendation relating to European heritage as an outcome of the IEA, including:

- 2019 IEA, PA06_0014, Sch 3, Condition 43 Remove demolished sites from the main table of the CMS (Figure 2 and Table 2) to avoid confusion. Update CMS to removed demolished sites from Figure 2 and Table 2 to avoid confusion and submit to relevant departments for consultation by 31 Dec 2020.

More information is outlined in **Section 10**.

6.11 Spontaneous Combustion

6.11.1 Environmental Management

Management of spontaneous combustion is undertaken in accordance with the Mangoola Spontaneous Combustion Management Plan (SCMP). This management plan details the monitoring and control measures implemented by Mangoola to reduce the incidence and impacts of spontaneous combustion, including stockpile inspections, staff training, priority processing of areas that are heating, and track rolling/battering down stockpiles that will be stored for greater than three months.

6.11.2 Environmental Monitoring Results

No significant instances of spontaneous combustion were detected at Mangoola during the reporting period. Implementation of the SCMP has been effective in preventing spontaneous combustion on site to date.

6.11.3 Key Performance and/or Management Issues

There were no reportable incidents, or performance or management issues involving spontaneous combustion during the reporting period.

6.11.4 Proposed Improvements

There are no proposed improvements in this area in 2020.

6.12 Bushfire

6.12.1 Environmental Management

Potential risks associated with bushfire are managed through the implementation of monitoring and control strategies as documented in the Mangoola Bushfire Management Plan. This management plan was originally developed in consultation with the NSW Rural Fire Service, the Muswellbrook Shire Council and both the Mangoola and Wybong Rural Fire Brigades.

6.12.2 Environmental Monitoring Results

There were no bushfires at Mangoola during 2019.

A bushfire hazard inspection was undertaken in September 2019. The inspection identified any non-conformances with criteria at the time of the inspection.

A bushfire hazard reduction program was implemented following the outcomes of the September 2019 bushfire hazard inspection and included:

- **Item 1** – Vegetation maintenance around the gas storage area near the workshop. Foliage was pruned 1m back from the mesh fence and to 1m above ground level;
- **Item 3** – Building Asset Protection Zone (APZ) to be maintained at the rear of administration building to Bushfire Management Plan Asset Protection Zone standards (30m width, 10cm grass height);
- **Item 5** – Vegetation trimming on essential access roads to the south. Roads to meet RFS fire trail standards (suitable open access, no obstructions, clearance to 6m width and 4m height); and
- **Item 9** – Hunter River pump station APZ to be maintained as per APZ standards (10m APZ, 10cm grass height).

6.12.3 Key Performance and/or Management Issues

There were no performance or management issues relating to bushfires during the reporting period.

6.12.4 Proposed Improvements

There are no proposed improvements in this area in 2020.

6.13 Hydrocarbon Management

6.13.1 Environmental Management

Bulk fuel facilities are managed in accordance with *AS1940-2017 The Storage and Handling of Flammable and Combustible Liquids*. All permanent fuel facilities are fully bunded, with emergency measures in place to manage spills.

All hydrocarbon spills which occur are reported via the sites incident reporting system, and investigations carried out as required. When spills occur, they are managed with one of the spill kits available onsite or treated through oily-water separators.

There is also an active bioremediation area which was constructed within the mining area in 2018 and utilised as required in 2019.

6.13.2 Environmental Monitoring Results

During the reporting period, seven hydrocarbon spills occurred and were all reported internally. Five of these spills were less than 20L, with one 50L hydraulic oil/transmission oil spill and one 800L power steering oil spill. These spills were all contained on site within the active mining area and no offsite pollution or environmental harm occurred as a result of these spills. Consequently, none of these incidents required external reporting to any government agencies.

In response to each spill, the following tasks were generally implemented:

- Source of the spill controlled (pumping/machinery stopped);
- Spill contained and cleaned up with absorbent material;
- Contaminated material taken to bioremediation area, where appropriate (improvement in 2018);
- Incident reported an investigation commenced where required;
- Machinery repaired, where required; and
- Where required, procedures were updated, and staff and contractors received additional training on adequate management of hydrocarbons or spills.

6.13.3 Key Performance and/or Management Issues

There were no key performance and/or management issues relating to hydrocarbon management in 2019 with only the minor leaks contained at site and outlined in **Section 6.12.2**.

6.13.4 Proposed Improvements

There are no proposed improvements in this area in 2020.

6.14 Public Safety

6.14.1 Environmental Management

Mangoola is committed to preventing risks to public safety as a result of operations at the mine. Ongoing reviews of potential public safety issues are undertaken on a regular basis around the mine area and associated public roads.

Day-to-day monitoring of public safety at Mangoola is undertaken through the use of a variety of methods, including:

- All site visitors are directed to the main office and are required to report and log on to an electronic visitors book;
- Implementation of a security system to ensure public and employee safety is maintained in accordance with the relevant requirements under the *Coal Work Health and Safety Act 2011*, *Mining Act 1992* and the Mining Leases;
- During hazardous activities such as blasting, sentries are posted throughout the site to prevent unauthorised entry into the blasting zone;
- Site boundary fencing surround the perimeter of the site;
- Security patrols;
- Upgrade of local roads in accordance with Schedule 4, Conditions 46 – 47 of PA 06_0014;
- Restrictions of local road use in accordance with Schedule 4, Condition 48 of PA 06_0014 ; and
- Employee and contractor inductions regarding mine safety and environmental management issues prior to commencement of work at the site.

6.14.2 Environmental Monitoring Results

As required by Condition 45 of PA 06_0014, Mangoola was required to contribute funding to the upgrade of the Thomas Mitchell Drive and Denman Road intersection which was to be completed by 31 December 2017.

On the 4 May 2016, Mangoola received an extension from the DPIE to complete the upgrade works by the end of 2019. In 2019, further discussions were held between Mount Arthur Coal (who are completing the upgrade), Muswellbrook Shire Council and DPIE regarding the timing of works to be completed. As of the end of 2019, assessments had been undertaken of the safety and pavement performance of the intersection and a decision on the timing of the upgrade and the Mangoola contribution were pending following DPIE review.

Condition 46 and 47 were satisfied during 2016 and practical completion was received from Muswellbrook Shire Council on the 14 September 2016.

One traffic related complaint was received in 2019.

6.14.3 Key Performance and/or Management Issues

There were no public safety incidents, performance or management issues in 2019.

6.14.4 Proposed Improvements

There are no proposed improvements in this area in 2020.

6.15 Greenhouse Gas Energy

6.15.1 Environmental Management

Energy consumption (electricity, diesel and liquefied petroleum gas) at Mangoola is monitored and reported in accordance with Glencore requirements and the *National Greenhouse and Energy Reporting Act 2007* (NGER Act).

Mangoola operates in accordance with the approved *Energy Savings Action Plan* (ESAP). The ESAP has been produced to comply with Schedule 3, Condition 55 of PA 06_0014. Mangoola continually assesses the viability of initiatives to improve energy efficiency and reduce greenhouse emissions from proposed operations.

The ESAP identifies opportunities at Mangoola to reduce greenhouse gas emissions and energy consumption, as well as specifying actions to realise these opportunities.

The three-yearly energy audit was conducted in 2019 as required by the ESAP and energy efficiency improvement opportunities were investigated as a result. **Table 25** details the outcomes of these investigations.

Table 25 Proposed Energy Improvements

Opportunity Area	Improvement Under Investigation	Action
Dozer Push	Dozer push can be one of the most cost-effective methods of moving overburden. Depending on geotechnical conditions and pit configuration, dozer bulk push can replace some of the truck-shovel operations. Mangoola Coal is currently investigating the operational efficiency improvement and future diesel saving associated with dozer push.	To be analysed in 2020 to determine energy saving.

6.15.2 Environmental Monitoring Results

6.15.2.1 Results from the Reporting Period

Data relating to electricity consumption, diesel usage and liquefied petroleum gas, and the associated greenhouse gas emissions, during the 2019 reporting period is presented in **Table 26**. In 2019, the total emissions produced by Mangoola were 179,724 t CO₂-e which represents a ~4% increase from 2018 (172,097 t CO₂-e).

Table 26 Greenhouse Gas Data

Emissions Source	2018 T CO ₂ -e	2019 T CO ₂ -e	Year 2-9 Scope Total T CO ₂ -e
Scope 1 Emissions (Direct)			
Biodiesel (non-transport)	0	0	136,358 ²
Diesel Oil (non-transport) *off road*	104,798	113,301	
Diesel Oil (transport) *on road*	220	206	
Gasoline (transport) *on road*	27	18	
Liquefied Petroleum Gas (non-transport)	16	13	
Oils & grease (non-transport)	N/A ¹	467	
Industrial processes (SF6)	N/A ¹	1613	
Fugitive Emissions ROM	9,324	11,053	
Scope 2 Emissions (Indirect)			
Electricity	57,711	53,053	63,962
TOTAL EMISSIONS (SCOPE 1 & 2)	172,096	179,724	200,320
Scope 3 Emissions (Indirect) – MOD 6 GHG emissions assessment			
Associated with energy extraction and distribution			9,759
Product transport			1,713,926
Product use			23,529,897
TOTAL EMISSIONS (SCOPE 3 only)			25,253,582
TOTAL EMISSIONS (SCOPE 1, 2 & 3)			25,453,902

¹ Not previously reported in 2018.

² Scope total made up of diesel use, explosive use and fugitive emissions – MOD 6 greenhouse gas assessment breakdown, current annual broken down more accurately than initial assessment.

6.15.2.2 Comparison with Predictions

The MOD 6 EA included an Air Quality Impact Assessment (Todoroski Air Sciences, 2013) which predicted greenhouse gas emissions for years 1, 2-9, and 10 of the project. As MOD 6 was approved in 2014, 2019 can be considered Year 6 of the modified operations. The Year 2-9 greenhouse gas emissions predictions are presented in **Table 26**.

The data shown in **Table 26** represents the average annual predicted CO₂-e emissions for Years 2-9 of the modified operations. As shown in **Table 26**, the total emissions for 2019 were 179,724 t CO₂-e. This is 11% less than the 200,320 t CO₂-e predicted in the EA for Years 2-9 (Todoroski Air Sciences, 2013) for Scope 1 (Direct) and 2 (Indirect) emissions. Scope 3 emissions are unable to be quantified and therefore have not been included here.

No reportable incidents regarding greenhouse gas and energy occurred during the reporting period.

6.15.3 Key Performance and/or Management Issues

The three-yearly energy audit required under the ESAP was carried out in 2019 with the findings discussed in **Section 6.15.1**.

6.15.4 Proposed Improvements

Hansen Bailey (2019) made one recommendation relating to greenhouse gas emissions as an outcome of the IEA, including:

- 2019 IEA, PA06_0014, Sch 3, Condition 56 Tables in Annual Review (Table 26 and 27) relating to greenhouse gas emissions should be combined to easily compare predictions to totals. Update greenhouse gas emissions table in the 2019 Annual Review due for submission by 31 March 2020 (see **Table 26**).

More information is outlined in **Section 10**.

The next three-yearly energy audit is due to be conducted in 2022 as required by the ESAP.

7 Water Management

Mangoola manages water on site in accordance with the approved Mangoola WMP which is available on the Mangoola website. The WMP was approved in 2018. Mangoola implements the following hierarchy of water supply to meet demand and reduce water take:

1. On-site runoff from within the saline water system for preferential use for dust suppression and CHPP process water within the saline water system;
2. On-site runoff from within the dirty water system used for dust suppression and CHPP process water (entire site);
3. Groundwater inflows into the open cut pits for use for dust suppression and CHPP process water within the saline water system;
4. Clean water incidentally collected from undisturbed areas of the site for use for dust suppression and CHPP process water within the entire site under Harvestable Rights provisions; and
5. Water from the Hunter River using existing water access licences or purchased on the open market.

7.1 Water Balance

Mangoola operates a comprehensive and calibrated site water balance to inform water management at the site. Water held and captured onsite at Mangoola by the water management system during the calendar year reporting period is shown in **Table 27**. The Mangoola Water balance is generated from a calibrated model, with an error margin of 2.8%.

Table 27 Mangoola 2019 Water Balance (Calendar Year)

Aspect	Volume (ML)
INFLOWS	
Runoff	784
Hunter River Raw Water Supply	2,935
Groundwater Inflow	136
Spoil Seepage	560
Tailings Bleed Water	2,467
Total	6,883
OUTFLOWS	
Evaporation	1,361
CHPP Supply	4,039
Water Cart Usage	935
Wash Bay	10
Hunter Release	0
Spill	0
Total	6,345
Inflow – Outflow	538

Aspect	Volume (ML)
Recorded Volume Stored on Site at start of Annual Review period	1,742
Recorded Volume Stored on Site at end of Annual Review period	1,909
Recorded Change in Storage	167
Error	2.8%

7.2 Water Take

Mangoola currently operates two water extraction pumps within one pump station (20WA211008) to provide additional water for its operations, as required, from the Hunter River in accordance with its water extraction permits. The extraction limit for the Mangoola Hunter River Licences is 2,758 ML. The total Hunter River water used by Mangoola during the 2018-2019 water year was approximately 2,752 ML, which was within the extraction limit. This represents an increase from the 2,452 ML extracted from the Hunter River during the 2017-2018 water year.

Water taken by the operation during the previous water year (1 July 2018 to 30 June 2019) has been summarised in **Table 28**.

Table 28 Mangoola 2019 Water Take (Water Year)

Water Licence #	Water sharing plan, source and management zone (as applicable)	Entitlement (ML)	Allocation Used (ML) (Previous Water Year)
Mangoola Licences			
503	Hunter Regulated River (zone 1A)	159	159
645	Hunter Regulated River (zone 1A)	432	432
691	Hunter Regulated River (zone 1A)	50	50
735	Hunter Regulated River (zone 1A)	72	72
823	Hunter Regulated River (zone 1A)	310	310
824	Hunter Regulated River (zone 1A)	175	175
830	Hunter Regulated River (zone 1A)	306	300
897	Hunter Regulated River (zone 1A)	55	55
933	Hunter Regulated River (zone 1A)	43	43
1159	Hunter Regulated River (zone 1A)	159	159
6571	Hunter Regulated River (zone 1A)	111	111
6576	Hunter Regulated River (zone 1A)	600	600
9062	Hunter Regulated River (zone 1A)	18	18
9987	Hunter Regulated River (zone 1A)	82	82
11216	Hunter Regulated River (zone 1A)	86	86
13083	Hunter Regulated River (zone 1A)	100	100
Hunter River Licenses Sub-Total		2,758	2,752
Colinta Licences*			

Water Licence #	Water sharing plan, source and management zone (as applicable)	Entitlement (ML)	Allocation Used (ML) (Previous Water Year)
1001	Hunter Regulated River (zone 1A)	334	334
1057	Hunter Regulated River (zone 1A)	509	507
Colinta Licenses Sub-Total		843	841
Groundwater Inflows			
20BL172598	Excavation Groundwater	700	136
6308	Wybong Creek Water Source	96	0
6270	Wybong Creek Water Source	30	0
11085	Wybong Creek Water Source	128	0
Groundwater Licenses Sub-Total		954	136
TOTAL		4,154	3,729

7.2.1 Changes to Licences

During 2019 a review of the harvestable rights for Mangoola was conducted and the 14 supply works approvals that were transferred to Miscellaneous Works Approvals in the Wybong catchment are sufficient. The 2019 analysis confirms the modelled reduction in the capture of clean water from 2018 to 2019. As the clean catchment is reducing in accordance with the approved mine designs, no further action is required.

7.2.2 Proposed improvements

Hansen Bailey (2019) made four recommendations relating to water management as outcomes of the IEA, including:

- 2019 IEA, PA06_0014, Sch 3, Condition 28. Future version of the WMP to include evidence of relevant consultation as an Appendix. Include consultation records and DPIE approval as an Appendix of the WMP to be submitted for consultation with relevant agencies by 18 Jan 2020.
- 2019 IEA, PA06_0014, Sch 3, Condition 24 (note). Future version of the site WMP should remove stock and domestic Water Access Licences. Update WMP to provided clear clarification around licences required for the project and submit for consultation to relevant agencies by 18 Jan 2020.
- 2019 IEA, PA06_0014, Sch 3, Condition 29. Future version of the WMP should include a cross-reference in Section 4 to any site water balance reporting requirements. Include a reference in Section 4 to reflect site Water Balance reporting requirements in the WMP to be submitted for consultation with relevant agencies by 18 Jan 2020.
- 2019 IEA, PA06_0014, Sch 3, Condition 55. DPI Water should be updated in this condition and/or relevant regulator which is actually responsible for energy in NSW added at next modification.

Further information can be found in **Section 10**.

7.3 Hunter River Salinity Trading Scheme Discharges

There were no water Hunter River Salinity Trading Scheme (HRSTS) discharges offsite from Mangoola during the 2019 reporting period.

7.4 Surface Water Monitoring

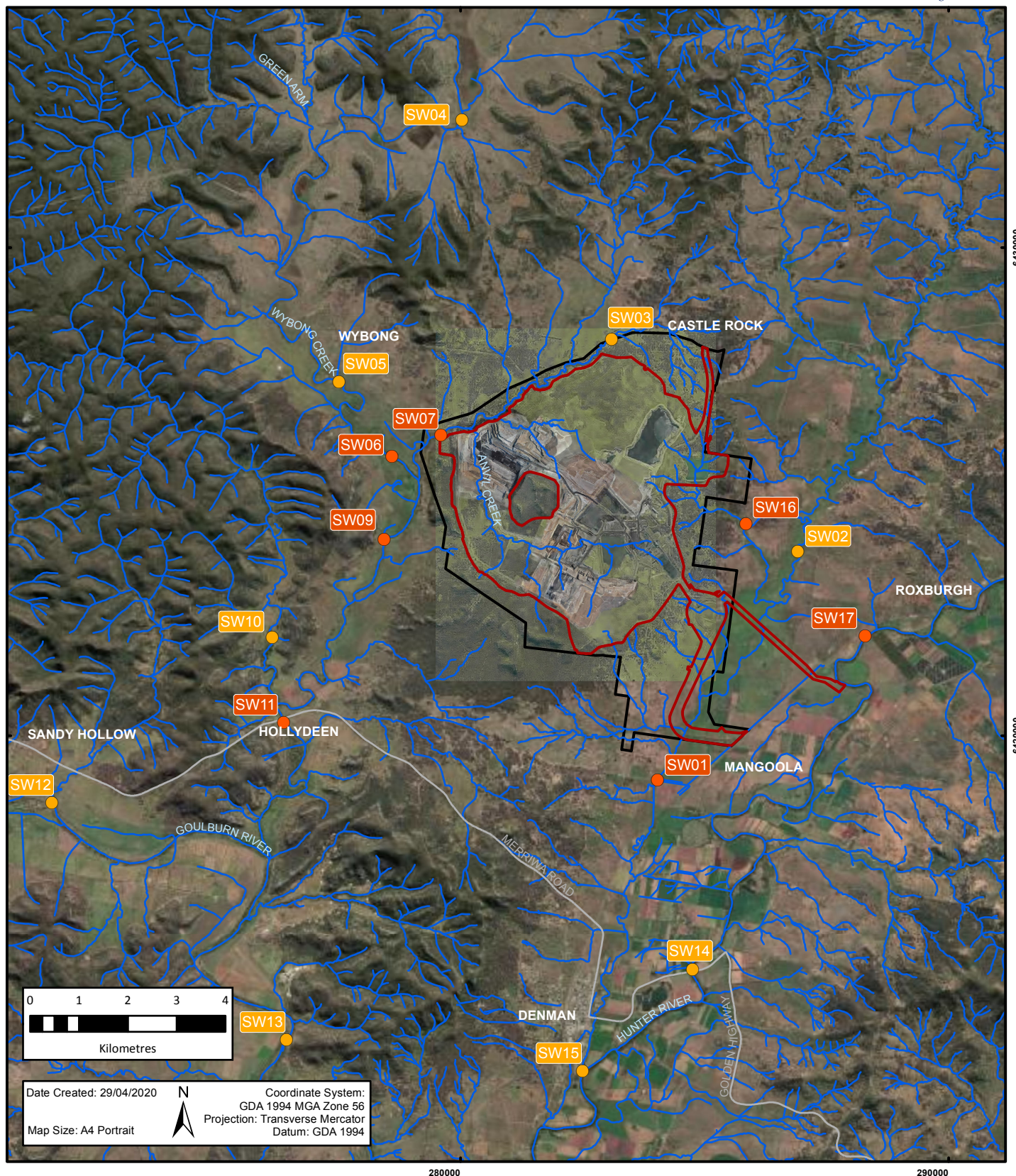
7.4.1 Environmental Management

Surface water quality continued to be monitored onsite at Mangoola and in the surrounding waterways during the reporting period in accordance with the Surface Water Monitoring Plan, which was updated in 2018. Surface water monitoring locations are shown on **Figure 11** and comprise of 16 sites (SW01-07 and SW09-17) which are sampled monthly for pH, Electrical Conductivity (EC), Total Suspended Solids (TSS), Total Dissolved Solids (TDS) and flow conditions by observation.

Water monitoring is also undertaken monthly as a requirement of EPL 12894. Monitoring is completed at surface water monitoring points SW16, SW03, SW04 and SW07 representing EPL monitoring point number 7, 8, 9 and 31 respectively.

There is no surface water monitoring criteria limit listed in EPL 12894 or PA 06_0014.

Figure 11 - Surface Water Monitoring Locations

Coal Assets Australia
www.glencore.com

Legend

- Approved Mangoola Coal EPL and Disturbance Boundary
- Mining Lease 1626
- Surface Water Monitoring
- Background Surface Water Monitoring
- Major road
- Watercourse

DISCLAIMER
Subject To Survey.

Glencore makes every effort to ensure the quality of the information available on this map. Before relying on the information on this map, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances. Glencore cannot guarantee and assumes no responsibility for the accuracy, currency or completeness of the information and by using this map you accept that Glencore has no liability for any loss or damage in any form whatsoever caused directly or indirectly from the use of this map.

DATA SOURCE

© NSW Department of Finance & Services (LPI) 2020
© NSW DTIRIS (Minerals & Petroleum) 2020
© Glencore 2020 © ESRI 2020

7.4.2 Environmental Monitoring Results

7.4.2.1 Results from the Reporting Period

The pH and EC monitoring results for the reporting period have been summarised in **Table 29**. In accordance with the Surface Water Monitoring Plan (which was updated and approved during 2018), exceedances of surface water monitoring criteria are not reported to DPIE unless three consecutive elevated results are recorded (and an incident is deemed to have occurred (e.g. mining impacts have impacted results)). Detailed results of surface water quality monitoring collected during the reporting period are available on the Mangoola website.

Table 29 Surface Water Monitoring Results – pH and EC

Monitoring Location	pH Results					EC Results (µS/cm)				No. of Samples and Flow Conditions
	Min	Ave	Max	Lower Criteria*	Upper Criteria*	Min	Ave	Max	Criteria*	
SW01	6.9	7.9	8.4	6.5	9.0/ 8.9	411	756	1,031	3,325/ 3,757	5 – no flow
SW02	-	-	-	6.5	8.2/ 8.2	-	-	-	5,569/ 5,654	0 – no flow
SW03	7.0	7.0	7.0	6.5	8.2/ 8.8	380	380	380	10,774/ 31,805	1 – no flow
SW04	7.3	7.5	7.7	6.5	8.7 /8.5	2,040	2,733	3,280	1,939 /1,947	12 – flow
SW05	8.1	8.4	9.1	6.5	8.5 / 8.6	1,376	2,714	5,750	2,049 / 2,049	12 – no flow (11), flow (1)
SW06	7.5	7.7	8.1	6.5	8.5 / 8.5	1,938	3,476	4,460	2,540 / 2,422	12 – no flow (10), flow (2)
SW07	7.1	7.3	7.4	6.5	8.4/ 8.9	1,018	1,148	1,278	10,710/ 12,780	2 – no flow
SW09	7.4	7.6	7.8	6.5	8.4 / 8.6	1,726	4,101	4,880	3,130 / 3,365	12 – no flow (10), flow (2)
SW10	-	-	-	5.6/ 6.2	7.1/ 7.2	-	-	-	950/ 1,004	0 – no flow
SW11	7.4	7.6	7.8	6.5	8.4 / 8.5	2,100	3,259	4,280	2,400 / 2,465	12 – flow (7), no flow (5)
SW12	7.9	8.1	8.3	6.5	8.4 / 8.6	998	1,401	2,250	1,677 / 1,980	10 – flow (9), no flow (1)
SW13	7.8	8.1	8.5	6.5	8.4 / 8.6	1,026	1,389	1,685	1,425 / 1,545	10 – no flow (2), flow (8)
SW14	7.7	8.0	8.3	6.5	8.2 /8.5	364	468	618	753 /835	12 – flow
SW15	7.7	7.9	8.2	6.5	8.2 /8.3	358	473	628	802 /878	12 – flow
SW16	6.0	7.0	8.4	6.2/ 6.5	7.8/ 8.0	223	289	399	683/ 809	7 – no flow
SW17	7.7	7.9	8.2	6.5	8.2 / 8.3	354	440	643	761 / 796	12 – flow (11), no flow (1)

* Criteria with two values denotes criteria for flow/no flow monitoring events (taken from May 2018 SWMP). Bold indicates this criterion was applicable at times in 2019.

Note that shaded sites are monitored to establish background conditions upstream or separate of mining operations and used in the investigation of exceedance of impact assessment criteria at locations directly downstream of mining operations

Surface water pH levels were slightly alkaline across the site, ranging from 6.0 to 9.1, with an average pH of 7.8 which is slightly lower than the 7.9 average for 2018. EC results across the site ranged from 223 $\mu\text{S}/\text{cm}$ to 5,750 $\mu\text{S}/\text{cm}$, with an average of 1,894 $\mu\text{S}/\text{cm}$ which was slightly lower than the 2018 average of 2,044 $\mu\text{S}/\text{cm}$.

There were no reportable incidents associated with pH or EC levels during 2019.

The TDS and TSS monitoring results for the reporting period have been summarised in **Table 30**. Detailed results of surface water quality monitoring collected during the reporting period are available on the Mangoola website.

Table 30 Surface Water Monitoring Results – TDS and TSS

Location	Total Suspended Solids (mg/L)				Total Dissolved Solids (mg/L)				No. of Samples and Flow Conditions
	Min	Ave	Max	Criteria*	Min	Ave	Max	Criteria*	
SW01	24	37	58	189.8/ 246	323	588	932	1,888/ 2,128	5 – no flow (5)
SW02	-	-	-	291/ 89	-	-	-	3,119/ 3,248	0 – no flow
SW03	268	268	268	1,335/ 367	390	390	390	6,243/ 20,410	1 – no flow
SW04	1	7	19	496.2 /50	1,140	1,598	1,930	1,117 /1,147	12 – flow
SW05	5	67	198	629 /50	894	1,719	3,640	1,180 /1,299	12 – no flow (11), flow (1)
SW06	4	16	37	539 /50	1,280	2,061	2,600	1,470 /1,453	12 – no flow (10), flow (2)
SW07	6	7	7	129/ 75	689	756	823	5,775/ 7,494	2 – no flow
SW09	5	17	31	338 /50	1,090	2,492	3,080	1,720 /1,917	12 – no flow (10), flow (2)
SW10	-	-	-	43.9/ 77	-	-	-	574/ 758	0 – no flow
SW11	1	10	28	619 /50	1,210	1,900	2,620	1,370 /1,463	12 – flow (7), no flow (5)
SW12	9	21	62	482 /50	610	842	1,360	971 /1,205	10 – flow (9), no flow (1)
SW13	22	58	182	922 /50	604	836	998	839 /924	10 – no flow (2), flow (8)
SW14	6	12	36	183 /50	205	282	470	455 /514	12 – flow
SW15	5	14	29	139 /50	222	286	408	454 /527	12 – flow
SW16	32	323	1,650	438/ 449	202	244	328	882/ 976	7 – no flow
SW17	5	14	31	123 /50	218	276	449	488 /518	12 – flow (11), no flow (1)

* Criteria with two values denotes criteria for flow/no flow monitoring events (taken from May 2018 SWMP). Bold indicates this criterion was applicable at times in 2019.

Note that shaded sites are monitored to establish background conditions upstream or separate of mining operations and used in the investigation of exceedance of impact assessment criteria at locations directly downstream of mining operations.

TSS levels during the reporting period ranged from 1 mg/L to 1,650 mg/L, with an average of 41 mg/L which was higher than the 2018 average of 15 mg/L. TDS levels during the reporting period ranged from 202 mg/L to 3,640 mg/L, with an average of 1,145 mg/L which was slightly lower than the 2018 average of 1,220 mg/L.

There were no reportable incidents associated with TSS or TDS levels during 2019.

Assessment of Surface Water Quality

In accordance with the Surface Water Monitoring Plan, speciation monitoring is undertaken annually at Mangoola surface water monitoring locations in June. There is no speciation monitoring criteria in the Surface Water Monitoring Plan. A summary of the surface water results for 2019 are presented in **Table 31**. It is noted that monitoring points SW02, SW03, SW07 and SW10 were not able to be sampled during June 2019 as the monitoring locations were dry. SW01, SW05, SW06, SW09 and SW16 had no flow conditions and SW04, SW11, SW12, SW13, SW14 and SW15 had low flow conditions at the time of sampling.

Table 31 Annual Surface Water Specification Results

Site	Flow	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	Nitrite + Nitrate as N (mg/L)	TKN (mg/L)	Total Nitrogen as N (mg/L)	Total Phosphorus as P (mg/L)	Sulphate (mg/L)
SW01	Flow	8.0	754	24	442	<0.01	2.8	2.8	0.2	<1
SW02	No Flow									
SW03	No Flow									
SW04	Flow	7.7	2,450	<5	1,470	0.05	0.2	0.2	0.1	26
SW05	No Flow	8.2	2,000	<5	1,160	<0.01	6.8	6.8	<0.1	29
SW06	No Flow	7.9	2,670	37	1,680	<0.01	0.4	0.4	0.6	48
SW07	No Flow									
SW09	No Flow	7.7	3,910	19	2,510	<0.01	0.6	0.6	0.1	80
SW10	No Flow									
SW11	Flow	7.8	2,890	8	1,760	<0.01	0.4	0.4	0.3	7
SW12	Flow	8.1	1,230	14	685	<0.01	0.2	0.2	0.1	43
SW13	Flow	8.1	1,360	70	762	0.11	3.0	3.1	0.1	44
SW15	Flow	7.8	588	6	308	<0.01	0.2	0.2	<0.1	25
SW16	No Flow	7.2	247	43	202	<0.01	2.4	2.4	0.4	4

Stream Health Monitoring

Biosis (2020) undertook stream health monitoring surveys during autumn and spring in 2019. The stream health monitoring program encompasses eight potential impact sites (monitoring sites) across four major waterways that traverse the Mangoola Open Cut site – Big Flat Creek, Wybong Creek, Anvil Creek and Sandy Creek. The program also established eight control sites in 2013 with catchments similar to the monitoring sites to differentiate potential mining impacts from environmentally driven variations due to natural processes. The control sites are located across four waterways – Cuan Creek, Wybong Creek (upstream of the mine site), Unnamed Creek 1 and Unnamed Creek 2.

The monitoring program assesses macroinvertebrate community structures, water quality and overall catchment-riparian health using NSW AUSRIVAS and Signal2 sampling and analyses, HABSCORE assessments, and physicochemical surface water quality testing.

Stream health criteria have been established for major waterways identified as being potentially subject to impacts associated with mining activities. One site was identified as not conforming with the stream health criteria, however these results were not considered indicative of impacts associated with mining. These results were identified as being caused by broader catchment conditions following an extended low rainfall period, with a sustained drought period experienced throughout the region during the 2019 survey period.

Monitoring sites and control sites overall have remained in a relatively stable but poor condition since the stream health monitoring project commenced in 2009, and no significant difference has been observed between monitoring sites and the control sites. A number of sites were dry at the time of survey, a result of the prolonged dry conditions within the region. Water was found only at the larger waterways, such as Wybong Creek and Cuan Creek where water levels and flows were still highly reduced.

HABSCORE assessments during 2019 surveys indicated broad consistency with the 2017 and 2018 years of monitoring, which are relatively poor in comparison to previous years of the monitoring program, a result of dry conditions continuing through the 2017 to 2019 period. The HABSCORE results were typically higher in autumn, following above average rainfall in March. The AUSRIVAS and Signal2 analyses showed that while sites have been in poor condition since the commencement of baseline monitoring, the macroinvertebrate assemblages are relatively stable. Year to year fluctuations in these metrics are observed across both monitoring and control sites and therefore likely associated with changes in water availability and environmental conditions, specifically the period of drought between 2017 to 2019.

7.4.2.2 Comparison with Predictions

The PA 06_0014 MOD 6 EA included a Surface Water Assessment (WRM Water & Environment, 2013) which predicted water usage for the project in years 2, 5, and 10, for a high water demand scenario, and a low water demand scenario.

The high water demand scenario was based on 13.5 Mtpa of ROM coal washed through the CHPP, and the low water demand scenario was based on 8.0 Mtpa of ROM coal washed through the CHPP and 5.5 Mtpa of ROM coal processed as bypass coal (i.e. unwashed). During the 2019 reporting period, approximately 630,000 tonnes of coal was bypassed through the CHPP.

As MOD 6 was approved in 2014, 2019 constitutes Year 5 of the modified operations, therefore, the water usage data is compared against the Year 5 high water demand scenario predictions from the MOD 6 EA, as shown in **Table 32**.

Table 32 Comparison of 2019 Water Usage with the 2013 MOD 6 Assessment

Aspect of Water Management System	2019 Data (ML)	EA Prediction (Year 5) High water demand
CHPP water use	4,039	3,970 ML/annum
Haul Road Dust Suppression	935	480 ML/annum
Pipeline Water (Hunter River)	2,752	889 ML/annum
Hunter River Salinity Trading Scheme Offsite Release	0	16 ML/annum

As shown in **Table 32**, the 2019 CHPP, haul road dust suppression and pipeline water (Hunter River) usage was greater than predictions made in the 2013 Surface Water Assessment. This increase in pipeline water (Hunter River) was primarily due to the low rainfall received on-site during 2019 and an increase in water storage onsite for water security and continuity of operations. The increase in the dust suppression is from an additional water cart being operational over the summer period to maintain dust suppression. Conversely, the Hunter River offsite release was less than the predictions in the 2013 Surface Water Assessment.

7.4.2.3 Long Term Trend Analysis

In accordance with PA 06_0014 a long term trend analysis of surface water monitoring results at Mangoola has been undertaken using data from 2010 to 2019 to identify any trends in the monitoring data over the life of the project. Long term monitoring results for pH, EC, TDS and TSS are presented in **Appendix E**.

The results indicate the following:

- The pH of surface water monitoring locations has generally remained relatively stable since mining operations commenced in 2010;
- EC has generally remained stable from 2010-2017 with the exception of monitoring locations SW01, SW02, SW03, and SW07, which have been periodically elevated. As noted previously, SW02 and SW03 are located upstream of the Mangoola Mining Lease boundary, and therefore the elevated salinity cannot be attributed to operations at Mangoola. Similarly SW07, and SW01, while located within the Mangoola Mining Lease boundary, are downstream of SW03 and SW02 respectively. Monitoring locations SW01, SW02, SW03, and SW07 have been dry for most of 2017-2019 due to drought conditions. At the sites with sufficient water for consistent sampling, results have shown an increase in EC during 2017-2019 due to the drought's impact on flow conditions; and
- TSS and TDS have also generally remained stable from 2010-2019, with a few elevated readings, however no discernible trends. At the sites with sufficient water for consistent sampling, results have shown an increase in TDS during 2017-2019 due to the drought's impact on flow conditions.

7.4.3 Key Performance and/or Management Issues

There were no specific key performance or management issues related surface water.

7.4.4 Proposed Improvements

Hansen Bailey (2019) made two recommendations relating to surface water as outcomes of the IEA, including:

- 2019 IEA, PA06_0014, Sch 3, Condition 33 Recommend the next revision of the Surface Water and Groundwater Response Plan include a clear protocol specifically for the identification, investigation and mitigation of creek flow loss. Update Figure 2.7 of the Surface Water and Groundwater Response Plan to acknowledge and clarify loss of creek flow as a trigger in the TARP and submit for consultation with relevant agencies by 18 Jan 2020.
- 2019 IEA, PA06_0014, Sch 3, Condition 31 Future version of the SWMP to include baseline flow data for relevant creeks. Update the SWMP to include baseline flow data for relevant creeks and submit for consultation with relevant agencies by 18 Jan 2020.

Further information can be found in **Section 10**.

7.5 Groundwater Management

7.5.1 Environmental Management

Mangoola monitors groundwater quality and levels within and surrounding the site in accordance with the approved Groundwater Monitoring Plan (GWMP) which is available on the Mangoola website. The GWMP was updated in 2017 and submitted for comment to the EPA, Natural Resources Access Regulator (NRAR) and DPIE. Consultation continued in 2019. This later version of the GWMP has not yet been approved.

Active groundwater monitoring locations are shown on **Figure 12** and comprise:

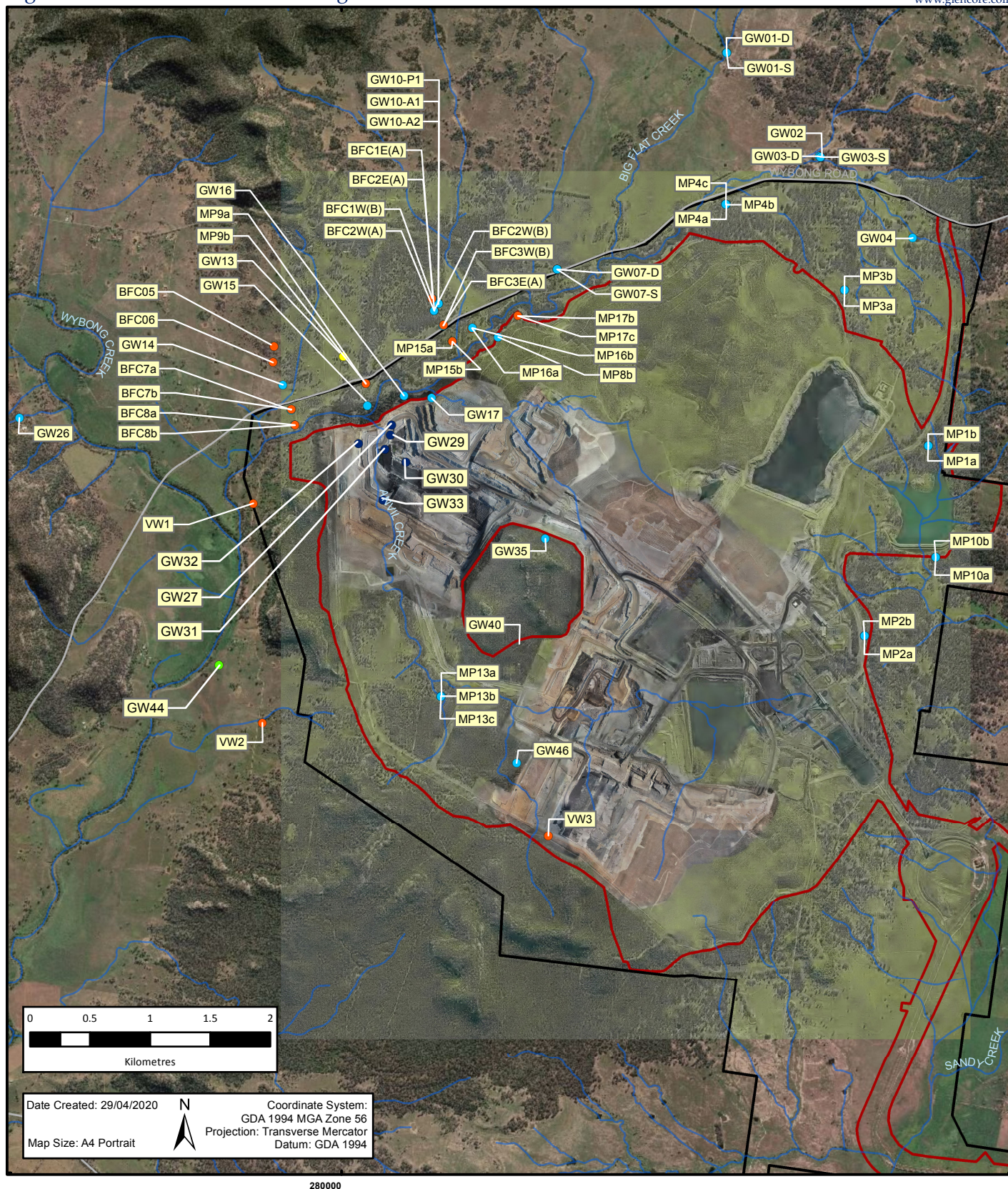
- Six continuous data loggers (VW) to continuously monitor groundwater levels at regular intervals and vibration wires;
- 35 groundwater monitoring bores (GW) sampled bi-monthly for groundwater level, pH, and EC. Due to the progression of mining, and one instance where the landowner has not granted permission to monitor, there are currently 25 groundwater monitoring locations sampled bi-monthly in line with the GWMP defined parameters;
- 15 Monitoring Program (MP) bores sampled quarterly for groundwater level, pH and EC; and
- 5 Big Flat Creek (BFC) bores sampled quarterly for groundwater level, pH and EC.

Mangoola also undertakes an annual comprehensive analysis of eight representative boreholes, being GW02 (coal measures), GW04 (coal measures), GW07 (alluvial), GW14 (Fassifern), GW18 (Fassifern), GW33 (deep alluvium), GW34 (Fassifern) and GW46 (alluvial).

Due to the progression of mining there are currently five groundwater monitoring locations sampled annually in line with the GWMP (GW02, GW04, GW07-S, GW14 and GW46).

Groundwater monitoring points GW04 and GW26 represents the EPL monitoring points 10 and 11.

Figure 12 - Groundwater Monitoring Locations

Coal Assets Australia
www.glencore.com

Legend

- Well
- Vibrating Wire Piezometer
- Bore / Stand Pipe
- Bore / Standpipe - No access from landowner
- Bore / Stand Pipe - Decommissioned
- Main road
- Watercourse
- Mining Lease 1626
- Approved Mangoola Coal EPL and Disturbance Boundary

DISCLAIMER

Subject To Survey.

Glencore makes every effort to ensure the quality of the information available on this map. Before relying on the information on this map, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances. Glencore cannot guarantee and assumes no responsibility for the accuracy, currency or completeness of the information and by using this map you accept that Glencore has no liability for any loss or damage in any form whatsoever caused directly or indirectly from the use of this map.

DATA SOURCE

© NSW Department of Finance & Services (LPI) 2020
© NSW DTIRIS (Minerals & Petroleum) 2020
© Glencore 2020 © ESRI 2020

7.5.2 Environmental Monitoring Results

7.5.2.1 Results from the Reporting Period

The results of the groundwater monitoring undertaken during the reporting period are available in full on the Mangoola website. A summary of the groundwater results for 2019 are presented in **Table 33**. Where these results exceed criteria outlined in the approved Mangoola GWMP they have been bolded.

In accordance with the approved Mangoola Groundwater Monitoring Plan when three consecutive monitoring results are outside the adopted impact assessment criteria Mangoola investigates as per the approved Surface Water and Groundwater Response Plan.

- GW02, GW10-P2 and GW15 exceeded the EC criterion during the January, March, May, July, September and November 2019 monitoring rounds; and
- GW14 exceeded the EC values on only the July, September and November 2019 monitoring rounds.

These elevated results were investigated as per the SWGWRP as outlined in the GWMP. An independent consultants investigations determined that the results were due to below average rainfall and were not attributable to Mangoola. These elevated results are anticipated to persist while drought conditions continue. As a result, none of the exceedances were externally reportable to DPIE.

Table 33 Groundwater Monitoring Results – pH, EC and Groundwater Level

Monitoring Bores	Depth to Groundwater Results (m)			pH Results				EC Results (µS/cm)			
	Max	Min	Ave	Max	Min	Ave	Criteria	Max	Min	Ave	Criteria
BFC01A*	11.8	11.4	11.6	7.0	6.8	6.9	6.5-8.5	15,480	13,300	13,898	125-2,200
BFC02A*	12.0	11.8	11.9	7.3	7.0	7.1	6.5-8.5	15,900	13,860	14,460	125-2,200
BFC03A*	12.6	12.5	12.6	6.6	6.3	6.5	6.5-8.5	21,360	18,770	19,420	125-2,200
BFC07A*	12.9	12.9	12.9	dry	dry	dry	6.5-8.5	dry	dry	dry	125-2,200
BFC08A*	11.6	11.5	11.5	dry	dry	dry	6.5-8.5	dry	dry	dry	125-2,200
GW01-D*	2.7	2.3	2.6	7.2	6.8	7.0	6.5-8.5	17,220	13,610	15,173	125-2,200
GW01-S*	2.7	2.4	2.5	7.3	6.8	7.1	6.5-8.5	16,520	8,360	13,767	125-2,200
GW02	5.4	4.8	5.1	8.2	6.7	7.4	6.5-9.3	24,480	20,750	23,033	16,039
GW03-D	dry	dry	dry	dry	dry	dry	6.5-7.5	dry	dry	dry	29,535
GW03-S	dry	dry	dry	dry	dry	dry	6.5-7.5	dry	dry	dry	29,535
GW04*^	13.1	12.0	12.3	7.5	7.0	7.2	6.5-7.3	9,000	410	6,722	8,174
GW06	dry	dry	dry	dry	dry	dry	-	dry	dry	dry	-
GW07-D	dry	dry	dry	dry	dry	dry	6.5-8.3	dry	dry	dry	18,547
GW07-S	dry	dry	dry	dry	dry	dry	6.5-8.1	Dry	dry	dry	20,301
GW10-A2	11.9	11.6	11.8	7.8	6.6	7.1	6.5-7.9	4,900	592	2,354	12,864
GW10-P1	13.4	12.8	13.2	7.1	6.9	7.0	6.5-7.9	13,540	10,580	12,227	15,590
GW10-P2	16.3	16.1	16.2	7.3	7.1	7.2	6.5-8.1	11,370	970	8,573	8,034
GW13*	11.5	9.6	10.9	8.1	7.8	7.9	6.5-8.5	644	450	564	125-2,200
GW14	26.2	22.2	23.9	7.6	6.3	7.1	6.5-8.0	6,320	5,060	5,538	5,096

Monitoring Bores	Depth to Groundwater Results (m)			pH Results				EC Results (µS/cm)			
	Max	Min	Ave	Max	Min	Ave	Criteria	Max	Min	Ave	Criteria
GW15	20.6	20.5	20.5	7.1	6.9	7.0	6.5-7.3	16,770	12,770	14,230	11,483
GW16	dry	dry	dry	dry	dry	dry	6.5-7.1	dry	dry	dry	21,584
GW17	dry	dry	dry	dry	dry	dry	6.5-7.4	dry	dry	dry	17,997
GW26*^	16.6	16.3	16.4	7.5	6.8	7.2	6.5-8.5	2,813	218	2,066	125-2,200
GW35*	dry	dry	dry	dry	dry	dry	6.5-8.5	dry	dry	dry	125-2,200
GW40	dry	dry	dry	dry	dry	dry	6.5-7.1	dry	dry	dry	4,311
GW44	No access	No access	No access	No access	No access	No access	6.5-7.0	No access	No access	No access	7,878
GW46	21.5	21.0	21.2	7.0	6.2	6.7	6.5-7.2	9,210[#]	7,320	7,975	8,053
MP1-A*	11.8	11.7	11.8	8.1	7.6	7.9	6.5-8.5	6,630	5,650	6,088	125-2,200
MP1-B*	14.4	13.5	13.7	8.6	8.1	8.4	6.5-8.5	7,590	6,140	6,915	125-2,200
MP2-A*	39.8	4.5	28.0	7.8	6.9	7.4	6.5-8.5	18,320	11,090	14,705	125-2,200
MP2-B*	23.2	23.1	23.1	7.9	6.7	7.1	6.5-8.5	22,220	12,860	18,975	125-2,200
MP3-A*	28.9	28.7	28.8	7.8	7.3	7.6	6.5-8.5	10,190	8,510	9,268	125-2,200
MP3-B*	26.2	25.9	26.1	7.3	6.8	7.1	6.5-8.5	13,250	11,100	12,170	125-2,200
MP4-A*	2.8	2.6	2.7	7.8	7.3	7.6	6.5-8.5	10,840	8,890	9,649	125-2,200
MP4-B*	3.4	3.1	3.2	8.0	7.6	7.8	6.5-8.5	7,810	6,360	6,910	125-2,200
MP4-C*	5.4	5.0	5.1	7.1	6.4	6.8	6.5-8.5	28,080	22,830	25,005	125-2,200
MP8-B*	dry	dry	dry	dry	dry	dry	6.5-8.5	dry	dry	dry	125-2,200
MP9-A*	12.9	11.8	12.4	6.9	6.1	6.6	6.5-8.5	16,210	13,550	14,830	125-2,200
MP10-A*	18.1	17.8	17.9	7.5	7.1	7.3	6.5-8.5	9,840	7,980	8,970	125-2,200
MP10-B*	11.7	10.8	11.1	6.4	6.2	6.3	6.5-8.5	16,370	13,690	14,973	125-2,200

Monitoring Bores	Depth to Groundwater Results (m)			pH Results				EC Results (µS/cm)			
	Max	Min	Ave	Max	Min	Ave	Criteria	Max	Min	Ave	Criteria
MP13-A*	18.3	18.3	18.3	dry	dry	dry	6.5-8.5	dry	dry	dry	125-2,200
MP13-B*	45.7	43.5	44.4	7.0	6.5	6.8	6.5-8.5	10,550	8,970	9,508	125-2,200
MP13-C*	41.0	41.0	41.0	dry	dry	dry	6.5-8.5	dry	dry	dry	125-2,200
MP15-B*	dry	dry	dry	dry	dry	dry	6.5-8.5	dry	dry	dry	125-2,200
MP16-B*	12.0	11.6	11.8	7.0	6.8	6.9	6.5-8.5	17,290	13,650	15,216	125-2,200
MP17-B*	dry	dry	dry	dry	dry	dry	6.5-8.5	dry	dry	dry	125-2,200

* Locations where insufficient groundwater monitoring data exists for site specific triggers as outlined in the Groundwater Monitoring Plan. These are currently being updated in a revision to the Groundwater Monitoring Plan.

^ EPL monitoring points, assessed against ANZECC criteria and investigated as per EPL12984.

EC results did not record three consecutive results above the Upper Cut-off Limit to trigger investigation.

Annual Speciation Assessment

In accordance with the Groundwater Monitoring Plan, speciation monitoring is undertaken annually at Mangoola groundwater monitoring locations (GW02, GW04, GW07-S, GW14 and GW46) in September. Until site specific values are available, the GWMP states the impact assessment criteria for speciation data at all monitoring locations is based on the ANZECC (2000) guidelines for recreational water use. The groundwater results for 2019 are presented in **Table 34**.

Table 34 Annual Groundwater Speciation Results 2019

Parameter	GW02	GW04	GW07-S	GW14	GW46	Criteria (mg/L)
TDS (mg/L)	14,000	4,430	-	2,970	4,360	1,000
Dissolved Calcium (mg/L)	30.0	40.0	-	73.0	105.0	N/A
Dissolved Magnesium (mg/L)	385.0	15.00	-	72.0	421.0	N/A
Dissolved Sodium (mg/L)	4,340	1,700	-	949.0	807.0	300
Dissolved Potassium (mg/L)	50.0	10.0	-	18.0	48.0	N/A
Carbonate (mg/L)	<1	<1	-	<1	<1	N/A
Bicarbonate (mg/L)	228.0	1,280	-	739	824	N/A
Dissolved Chloride (mg/L)	8,500	1,740	-	1,380	2,000	400
Sulfate (mg/L)	<10.0	166.0	-	4.0	176.0	400
Dissolved Aluminium (µg/L)	10.0	<10.0	-	10.0	10.0	0.2
Dissolved Arsenic (µg/L)	<1.0	<1.0	-	<1.0	<1.0	0.005
Dissolved Boron(µg/L)	<50.0	350.0	-	160.0	60.0	1
Dissolved Barium(µg/L)	29.0	288.0	-	941.0	277.0	1
Dissolved Iron (µg/L)	51,700	120.0	-	2,130	11,200	0.3
Dissolved Lithium (µg/L)	47.0	79.0	-	52.0	120.0	N/A
Dissolved Manganese (µg/L)	1,120	79.0	-	371.0	604.0	0.1
Dissolved Rubidium (µg/L)	53.0	30.0	-	36.0	50.0	N/A
Total Phosphorus (mg/L)	<0.05	0.7	-	0.33	2.27	N/A
Dissolved Selenium (µg/L)	<10.0	<10.0	-	<10.0	<10.0	0.01
Dissolved Silicon (µg/L)	<250.0	6,930	-	7,160.0	8,370	N/A
Dissolved Strontium (µg/L)	4,270	3,400	-	3,000	3,340	N/A
Dissolved Zinc (µg/L)	<5.0	<5.0	-	5.0	16.0	5

It is noted that GW07-S was dry during September therefore no results were available. The results of the 2019 annual groundwater speciation sampling found that at all remaining sites, the ANZECC criteria were exceeded for TDS, Sodium, Chloride, Iron, and Manganese. The exceedances were investigated by AGE (2019) who determined that the water quality exceedances are primarily occurring due to inappropriate interim trigger values which are not representative of natural baseline conditions at Mangoola. Where results have been temporarily stable since the start of monitoring, AGE states that it is therefore unlikely that the exceedances will result in environmental harm.

7.5.2.2 Comparison with Predictions

Groundwater modelling for the original EA was undertaken by Mackie Environmental Research (MER) in 2006. Since then, the progressive three yearly updates to the numerical groundwater model completed by MER in 2010 and 2013, and AGE in 2016. The numerical groundwater model was further updated and recalibrated in 2018 as part of the EIS for the MCCO Project. The latest three yearly update to the groundwater model was completed by AGE in 2019 (AGE 2019b). The predictions from this model were calibrated with 2018/2019 water level monitoring data to validate the model calibration. The observed monitoring bore water level data was compared to the modelled water level data from the 2019. Despite slight divergences between the observed and modelled datasets, the majority of the hydrographs showed similar trends in the 2019 reporting period.

The observed groundwater level trends can be generally categorised into stable or declining groundwater levels. The monitoring bores located beyond the boundary of the Approved Mangoola Coal Mine Disturbance Area, displayed stable water levels, matching the simulated levels. The greatest groundwater level drawdown was measured on the western boundary of the mine, which is consistent with the model simulations and with the mining activities progressing below the groundwater table in this area. The effects of drawdown are most prominent in greater depths, decreasing with distance, both vertically and laterally, from the mining area. Groundwater levels in shallow bores screened within the alluvium of Wybong Creek began declining in 2016, suggesting climate rather than mining influences on groundwater levels in this area.

Engeny (2020) completed quarterly reviews of groundwater take associated with groundwater ingress into Main Pit to track compliance with the licence conditions to take under Water Licence 20BL172598. Engeny concluded that the groundwater inflow volumes estimated by AGE were typically in accordance with the groundwater inflows from quarterly reviews. Subsequently, Engeny adopted a groundwater inflow estimate of 136 ML/year based on the AGE numerical groundwater model in the water balance report. The revised groundwater model predicted groundwater inflow of 144 ML/year for the year 2019.

7.5.2.3 Long Term Trend Analysis

In accordance with PA 06_0014 a long-term trend analysis of groundwater monitoring results at Mangoola has been undertaken using data since monitoring commenced to identify any trends in water quality over the life of the project.

Long term groundwater water level, pH and EC results are presented in **Appendix E**. A summary of long-term trends identified for each monitoring dataset is provided below:

- Groundwater levels from monitoring bores in general show fluctuations reflecting climatic conditions and rainfall particularly in the shallow strata. Groundwater levels in deeper Permian strata fluctuate less with rainfall and have recorded declining levels since 2014 when mining of the coal seams progressed below the water table. This has resulted in groundwater levels declining in the order of 30 metres at some sites;

- The majority of the monitoring sites have relatively stable long-term EC. The exceptions are bores located close to the active mine along Big Flat Creek (e.g. GW02, GW14, GW30, GW31, most BFC and MP bores), where changes in water levels/water pressure in the deeper Permian strata have drawn in more saline water to the bores (AGE 2019a). Consequently, groundwater in bores affected by the mobilisation of more saline groundwater show increasing EC levels since 2014; and
- The pH of groundwater has generally recorded only limited fluctuations with most monitoring sites having no discernible trends. Similar to the observed EC trends, the BFC and MP-series close to the active mine along Big Flat Creek have recorded minor downward trends in pH since 2014-15. The magnitude of observed pH decline is typically within half a pH unit magnitude and is still within the neutral range (6.6 to 7.5), since commencement of monitoring in 2012.

7.5.3 Key Performance and/or Management Issues

The Mangoola GWMP (Umwelt 2014) establishes groundwater impact criteria and conditions (groundwater level and quality) for site monitoring bores. Water level responses in the monitoring bores are in line with either predicted drawdowns or changes expected due to the below average rainfall-recharge since early 2017. There are no sites where changing water levels are unexpected and require further investigation.

Bi-monthly exceedances were reported by Mangoola for EC at three monitoring bores (GW02, GW10-P2 and GW15) following January, March, May, July, September and November 2019 sampling rounds, and an additional monitoring bore (GW14) following July, September and November 2019 monitoring rounds. The annual groundwater chemistry speciation sampling (AGE 2019c) also identified exceedances in TDS, sodium and chloride in four bores (GW02, GW04, GW14 and GW46) as well as manganese and iron exceedances in three of the four bores.

Where the criteria were exceeded for three consecutive monitoring events, the response protocol was enacted as per measures prescribed in the Mangoola Surface Water and Groundwater Response Plan (Glencore 2018). Following an exceedance, initial steps of the protocol require review of the results and an investigation to determine if an incident has occurred that could cause environmental harm. AGE was engaged to investigate the exceedances and report on findings. As per the Surface Water and Groundwater Response Plan, exceedances of trigger values are only reportable if an investigation determined that an incident had occurred. The AGE trigger level exceedance review reports concluded that the EC exceedances posed low potential for material environmental harm, and therefore no incidents were considered to have occurred.

7.5.4 Proposed Improvements

As noted above the three-yearly review of the numerical groundwater model (AGE 2019b) for Mangoola was completed during 2019. The updated model has been calibrated with available groundwater monitoring data, in line with the GWMP. The revised findings on the magnitude and timing of groundwater impacts have been subsequently incorporated into the GWMP in October 2019. The next validation and review of the groundwater model will be in 2021, including revision of the GWMP.

The water quality exceedances reported in 2019 have been triggered mainly due to application of inappropriate interim trigger values, which are not representative of natural baseline conditions at Mangoola. It is likely that all bores sampled will continue to trigger for the same parameters if the trigger values are not adjusted to fit site conditions. Mangoola has submitted a GWMP containing revised water quality to DPIE (NRAR) and have been in consultation with them since 2017.

Hansen Bailey (2019) made one recommendation relating to groundwater as outcomes of the IEA, including:

- 2019 IEA, PA06_0014, Sch 3, Condition 32 Future version of the GWMP to include, baseline data tables that clearly state the parameter and unit of measure, baseline yield for relevant bores, and a program for accurately delineating the boundary of the Big Flat Creek alluvial aquifer. Submit an updated GWMP addressing the audit findings to NRAR by 13 Nov 2019.

Further information can be found in **Section 10**.

8 Rehabilitation

Mangoola aims to develop rehabilitation of mined land that returns the site to a condition where the landforms, soils, hydrology, flora and fauna are self-sustaining and compatible with the surrounding land uses. Rehabilitation of the overburden emplacement areas is conducted progressively over the life of mine, as an integral component of mining operations.

8.1 Rehabilitation of Disturbed Land

Rehabilitation at Mangoola was undertaken in accordance with the approved 2016-2019 MOP. A copy of the current approved MOP is available on the Mangoola website. A total of 654.79 ha of rehabilitation has been undertaken to date. All rehabilitation areas are classified as being in the Ecosystem and Land Use Establishment Phase. A summary of rehabilitation during 2018 and 2019, and the projected rehabilitation for 2020, is provided in **Table 35**.

Table 35 Rehabilitation Status

Mine Area Type	Previous Reporting Period (Actual) (Ha)	This Reporting Period (Actual) (Ha)	Next Reporting Period (Forecast) (Ha)
A. Total mine footprint ¹	1,822.85	2112.82	2208.51
B. Total active disturbance ²	1,279.86	1475.00	1470.69
Infrastructure Areas	453.84	716.576	697.78
Topsoil Stockpile	20.19	26.03	26.03
Active Mining Areas	374.30	274.01	300.3
Waste Emplacements	318.23	324.42	322.79
Tailings Dams	96.33	117	106.82
Temporary Rehab	16.97	16.97	16.97
C. Land being prepared for Rehabilitation ³	10.85	0	0
D. Land under active Rehabilitation ⁴	532.14	637.82	737.82
E. Completed rehabilitation ⁵	0	0	0

¹ Total mine footprint includes all areas within a mining lease that either have at some point in time or continue to pose a rehabilitation liability due to mining and associated activities. Total mine footprint differs from MOP disturbance figure due to broader scale of disturbance interpretation in MOP figures.

² Total active disturbance includes all areas ultimately requiring rehabilitation.

³ Land being prepared for rehabilitation – includes the sum of mine disturbed land that is under the following rehabilitation phases – decommissioning, landform establishment and growth medium development (as defined in DRE MOP/RMP Guidelines).

⁴ Land under active rehabilitation - includes areas under rehabilitation and being managed to achieve relinquishment.

⁵ Completed rehabilitation – requires formal sign-off by DRE that the area has successfully met the rehabilitation land use objectives and completion criteria.

⁶ Note that there has been no major change to the physical infrastructure area. This change from 2018 is due to a mapping correction to ensure that the infrastructure area reported in the AR now aligns with the broader interpretation of infrastructure area under the MOP and RCE.

Topsoil is being managed to maximise the viability of soil biota. Topsoil management measures on site include varying stripping depths for different soil types, incorporation of mulched vegetation material into the topsoil resource, limiting topsoil storage stockpiles to a maximum of three metres in height, minimising any compaction of stockpiles, and seeding topsoil stockpiles with a cover crop.

Mangoola has continued with the natural landform design project and will implement this design in all final rehabilitation. The natural landform design has been integrated into the MOP. All rehabilitation undertaken is guided by the completion criteria outlined in the MOP. Current examples of site rehabilitation progress are shown in **Photos 1-6**.

A general overview of the 2019 rehabilitation process is presented below:

- After bulk shaping is completed, topsoil is applied at a nominal depth of 100-150mm in thickness. Direct topsoil placement from recently mulched and stripped areas is prioritised where possible;
- Gypsum is applied as a soil ameliorant for incorporation into the topsoil;
- Ground timber and stag trees are placed, with the density depending on available resources;
- Frog ponds and aquatic habitat areas are shaped with habitat structures added;
- Topsoiled rehabilitation areas are double pass ripped, across the contour, to a depth ranging from 200 mm (level areas), 400 mm (gradual slopes) to 600 mm (steep slopes); and
- Rehabilitation areas are seeded by hand. This provides more detail for targeted vegetation communities, such as riparian areas and eco-tonal changes based on soil type and aspect. Seed mixes are comprised of endemic Ironbark woodland complex species sourced from adjoining offset and buffer lands.

In addition to the natural landform created at Mangoola, plant species compositions have been selected based on vegetation types of the surrounding natural landforms, e.g. Forest Gum woodland or Rough-barked Apple woodland in the drainage lines or Ironbark woodland along the ridges and Spotted Gum forest on the peaks. An example of seed mixes used at Mangoola is provided in the MOP. During 2019 there was a focus on:

- The continued increase in flora species diversity into the rehabilitation seed mixes;
- The creation of aquatic habitat resources across rehabilitated areas; and
- Translocation of salvaged *Xanthorrhoea*'s and *Macrozamia* species

During the reporting period, no rehabilitation areas received sign-off from the Resources Regulator as not all of the rehabilitation criteria have been met. Mangoola does not anticipate rehabilitation to receive sign-off from the Resources Regulator during this MOP period.

Closure planning for the Tailings Dam 1 and Tailings Dam 2 commenced during mid-2019. The program includes shear vein testing (SVT) investigation within Tailings Dam 1. Following this a laboratory evaluation of the possible capping materials will occur. Once stability analyses are conducted using updated strength profiles derived from the detailed SVT investigation and it is confirmed the strength profiles are adequate, drawings and work methods will be prepared, together with the necessary High Risk Area (HRA) application.

Once approvals are in place, construction of the capping layer may then commence progressively, from the upper beach of Tailings Dam 1 in the north east of the dam. In regards to Tailing Dams 2, the tailings strength will continue to be routinely monitored by use of the shear vane apparatus, until tailings strengths develop to those similar to Tailings Dam 1, when construction of the capping layer commences. Throughout this process any surface water will be kept to a minimum on Tailing Dam 1 and 2 to maximise the effect of solar desiccation.

Photo 1 South Pit Rehabilitation Woodland Area Seeded 2017



Photo 2 Main Pit Central Rehabilitation Frog Pond Constructed 2019



Photo 3 South Pit Rehabilitation Wetland Area with *Limnodynastes tasmaniensis* after March 2019 Rainfall



Photo 4 North Pit Rehabilitation Area Translocated *Xanthorrhoea's*



Photo 5 2014 Rehabilitation of Woodland and Grassland Area with Rock Habitat



Photo 6 Progressive Rehabilitation in Main Pit Central – Left Side of Track Seeded 2018, Right Side of Track Seeded 2019



8.2 Comparison with MOP Predictions

During 2019 Mangoola generally operated in accordance with the approved MOP. A comparison of 2019 rehabilitation against the predictions made in the MOP have been presented in **Table 36** and shown in the Annual Review Plan included as **Appendix A**.

Table 36 Rehabilitation Progress Compared to MOP Predictions

Predicted/Actual	Total Disturbance Area (ha)	Total Rehabilitation Area (ha) (per MOP Year)	Cumulative Rehabilitation Area (During MOP Term)
2019 Data (Actual)	1,900.32	105.68	654.79 (includes 16.97 temporary rehabilitation)
MOP Year 4 Predictions	1,908.00	100.00	648.00

As seen in **Table 36**, Mangoola disturbed less area than the forecast for the MOP year. Disturbance was actually in accordance with the MOP disturbance polygons for 2019, however a calculation error resulted in an overstatement of the predicted disturbance for 2019 in MOP Table 7.3. There was no impact on the rehabilitation cost estimate (RCE) as it was calculated based on the disturbance polygon area, not the incorrect figure in MOP Table 7.3.

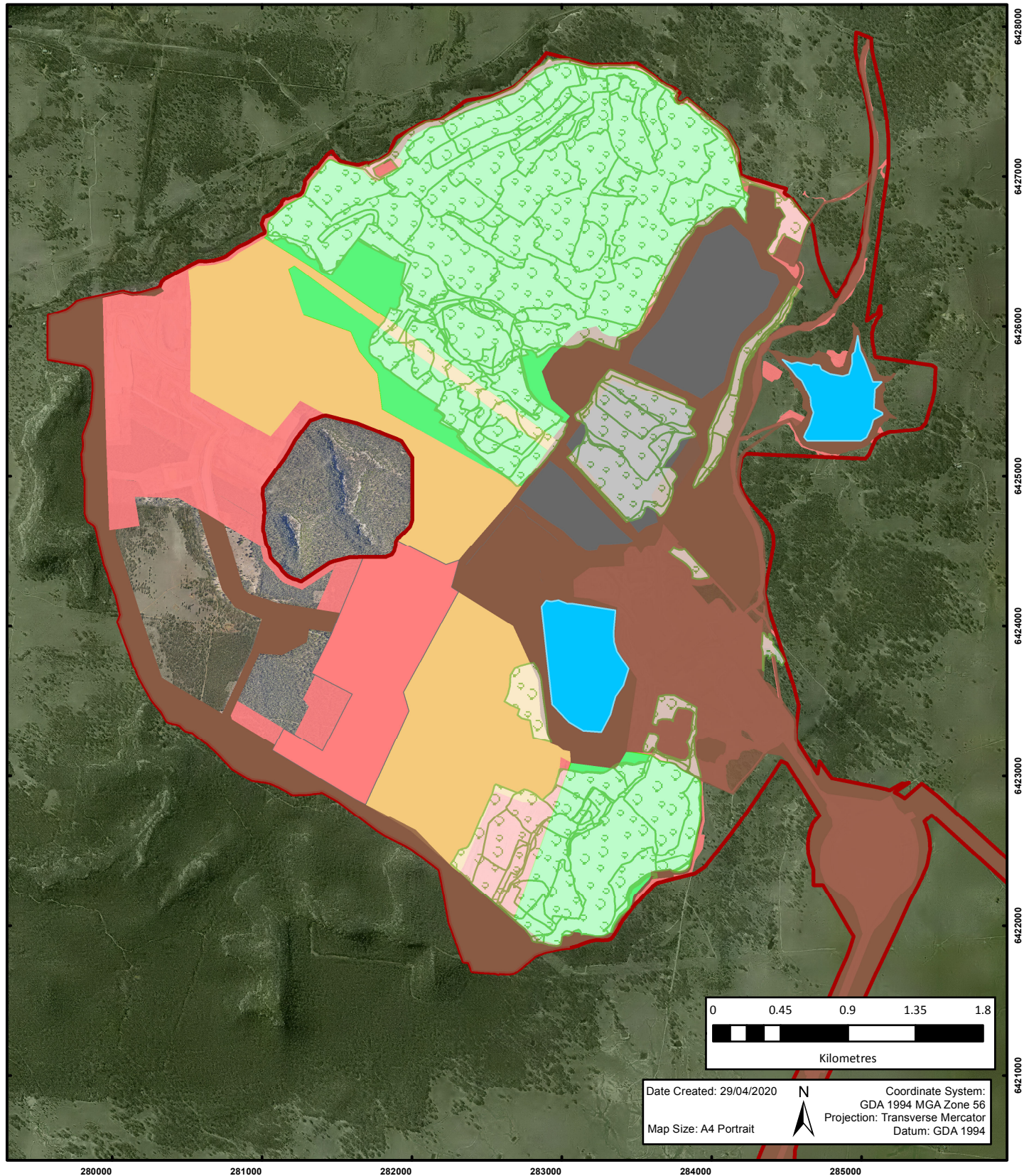
As part of the Annual Review a comparison of actual disturbance and rehabilitation with MOP Plan 3D was undertaken as per **Figure 13**. MOP Plan 3D reflects an ideal state schedule whereby mining generally advances strip by strip and the dumps/rehabilitation follows sequentially. In reality this does not always occur as planned due to factors such as:

- Breakdowns;
- Weather;
- Truck availability;
- Labour shortages;
- Market conditions;
- Blasting capacity; and/or
- Prevailing weather impacting blasting.

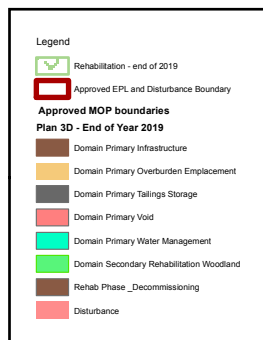
As a result, both the North Pit, Main Pit Central and South Pit rehabilitation areas have differed from Plan 3D. The net effect is an increase in rehabilitation in the South Pit area of 33 ha, an increase in North Pit of 16.5 ha and a decrease in Main Pit Central area of 42 ha. A major contributing factor in the Main Pit Central area is the realignment of the LOM haul road for the proposed MCCO project, in order to both shorten and lower the haul route to reduce noise impacts. Overall, the operation still achieved its rehabilitation target of over 100 ha. Disturbance for the year was consistent with MOP Plan 3D.

Figure 13 - Actual rehabilitation and disturbance compared with MOP Plan 3D

GLENCORE



Ref: \\AUSYDSRVC5590\Operations\GIS\MapDocuments\16 AR2019\20200204_MOP_rehab_v1.mxd



Date Created: 29/04/2020
Map Size: A4 Portrait

Coordinate System:
GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994

DISCLAIMER
Subject To Survey.

Glencore makes every effort to ensure the quality of the information available on this map. Before relying on the information on this map, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances. Glencore cannot guarantee and assumes no responsibility for the accuracy, currency or completeness of the information and by using this map you accept that Glencore has no liability for any loss or damage in any form whatsoever caused directly or indirectly from the use of this map.

DATA SOURCE
© NSW Department of Finance, Services & Innovation 2020
© NSW DTIRIS (Minerals & Petroleum) 2020
© Glencore 2020 © ESRI 2020

8.3 Removal of Buildings

Buildings and associated infrastructure were removed from ten Mangoola owned properties during 2019. **Table 37** below provides details of the demolitions and removals. The buildings were all demolished due to their poor or deteriorating condition making them unsuitable for habitation. Complying Development Certificates (CDC) authority was provided by Muswellbrook Shire Council prior to any demolition work being undertaken. All work was undertaken by a licenced demolition and asbestos removal contractor, with waste recorded and disposed of at a licenced waste receival facility. There were no heritage issues associated with any of the demolitions.

Table 37 Schedule of Building Demolitions and Removal during 2019

Address	Description	Muswellbrook Council Approval	Health and Safety Issues
2 Mulgowrie Access Road, Muswellbrook	Demolition and removal of house, water tank, five sheds, carport and two stock yards	CDC 66/2019	Asbestos material on site
150 Wybong PO Road, Muswellbrook	Demolition and removal of house, two water tanks, machinery shed, two chicken coops and cattle ramp	CDC 58/2019	No asbestos on site
363 Wybong PO Road, Muswellbrook	Demolition and removal of dwelling, garage, old dairy slab, water tanks, sheds and cactus plants	CDC 57/2019	Asbestos material on site
853 Yarraman Road, Muswellbrook	Demolition and removal of house, four sheds, carport, stock yards and scattered rubbish	CDC 61/2019	Asbestos material on site
2039 Wybong Road, Muswellbrook	Demolition and removal of house, water tanks, two sheds, concrete slab, five structures, chicken coop and animal compound	CDC 64/2019	Asbestos material on site
2121 Wybong Road, Muswellbrook	Demolition and removal of house, water tank, two sheds, animal pens, asbestos debris, asbestos pipes and waste	CDC 63/2019	Asbestos material on site
2431 Wybong Road, Muswellbrook	Demolition and removal of dwelling, one ancillary structure, water tank and corrugated iron sheets	CDC 62/2019	Asbestos material on site
2569 Wybong Road, Muswellbrook	Demolition and removal of house, two water tanks, green house, six sheds, chicken coop with run, stock yards, silos, rubbish, pump slab and tank	CDC 65/2019	Asbestos material on site
2652 Lot 24 Wybong Road, Muswellbrook	Demolition and removal of shed, animal shelters and concrete slab	CDC 59/2019	No asbestos on site
2652 Lot 25 Wybong Road, Muswellbrook	Demolition and removal of dwelling, five water tanks, three sheds, stable, stock yards and animal shelters	CDC 60/2019	Asbestos material on site

8.4 Key Issues Affecting Rehabilitation

In September 2019, a walkthrough rehabilitation inspection audit and subsequent report was completed by a specialist consultant to provide a snapshot of the condition of mine rehabilitation and highlight areas where remedial (maintenance) action is required.

The report stated that overall the rehabilitation works to date remain highly successful and are generally progressing towards the completion criteria listed in the MOP. Native diversity across both rehabilitation areas was considered to be generally high. Most areas exhibited appropriate species for the target vegetation community in all layers. Mangoola continued to implement innovative programmes and the continued installation of stag trees, log and boulder emplacement; installation of dams, and installation of nest boxes within rehabilitation areas demonstrates a commitment to establishing diverse and functional fauna habitat that should be commended.

Adaptive management was evident across the Mangoola rehabilitation areas. This included improvements in plant densities between older and newer areas of rehabilitation, improved ground cover diversity and the implementation of recommendations from previous monitoring events such as thinning of mid layer species and installation of habitat structures. The report noted that the Mangoola rehabilitation areas contained some erosion sites however overall erosion control was successful. The establishment of vegetation and stabilisation of previous erosion gullies was noted as being successful in limiting erosion potential across the site. Two areas of erosion were highlighted for ongoing monitoring, one area in the south pit rehabilitation most likely requiring remedial works.

The report noted the presence of two Eucalypt and one Acacia species that are inconsistent with the target vegetation communities which were likely to pose a threat to the success of rehabilitation areas if they were allowed to develop a viable seed bank. The control of these species was highlighted as a high priority requirement. Recommendations were also made to undertake weed control in specific areas where some invasive perennial grasses and noxious weeds had been identified.

The report also noted that while the structure and diversity of vegetation across the site was generally good, improvements could be made in the mid storey by increasing the number of longer-lived shrub species; and on the ground layer by increasing the cover and diversity of species and growth forms.

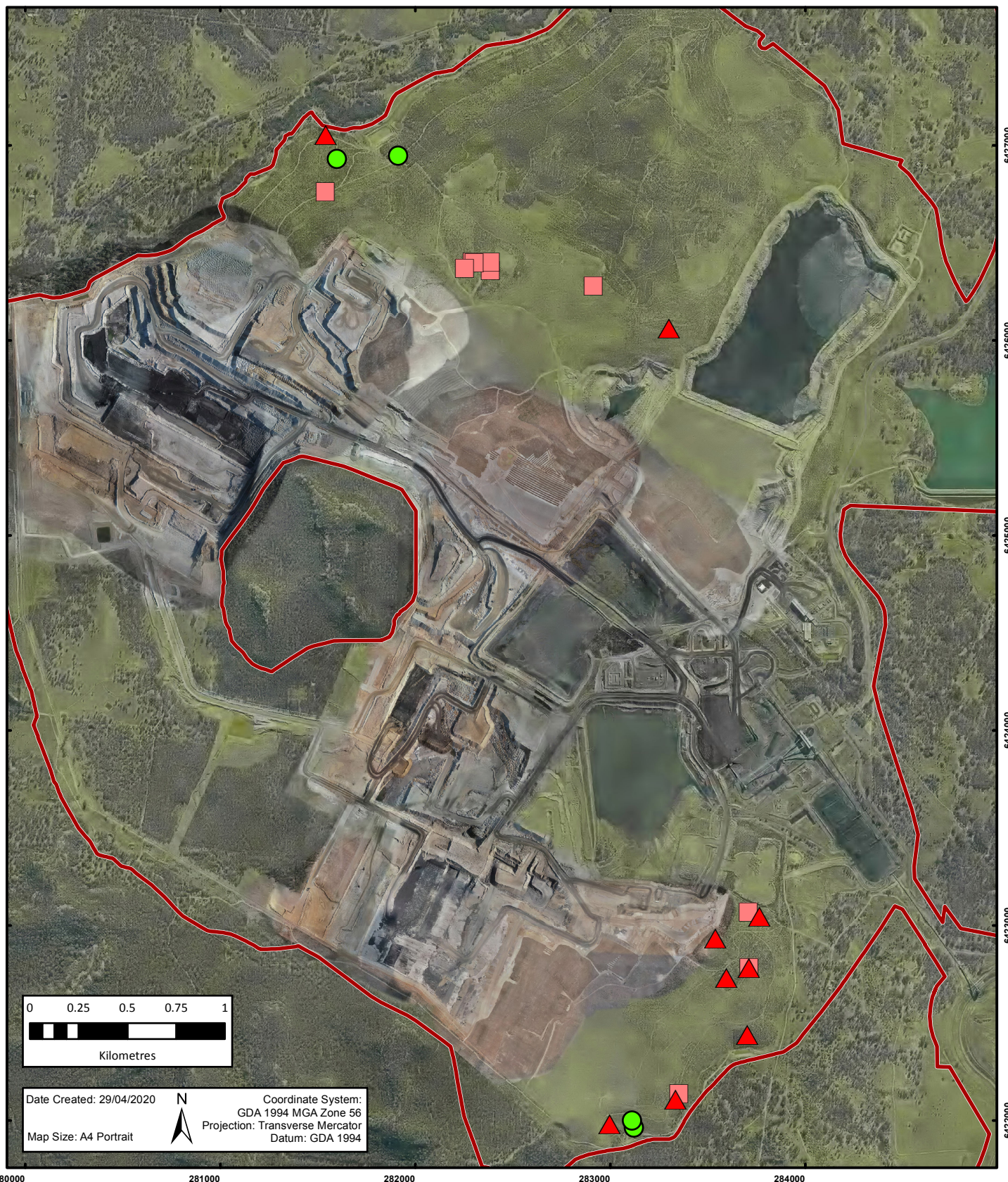
The report concluded by stating that Mangoola remains an industry leader in rehabilitation within the Hunter Valley and the coal mining sector as a whole, and commended the continuous improvements and development within the rehabilitation on site.

During the reporting period the TARP as contained in the approved MOP was enacted. Triggers and corresponding actions are summarised in **Table 38** and shown in **Figure 14**.

Table 38 Summary of MOP TARP actions completed in 2019

Aspect/ Category	Key Element	Trigger Condition (Amber / Red)	Response
Landform Stability	Erosion Control	Significant gully or tunnel erosion present and/or rilling >200 mm deep. (Southern rehabilitation area), after March 2019 heavy rainfall event.	Contractors were engaged to re-shape erosion rills, install new topsoil and rip lines then re-seed with appropriate native vegetation community seed mix.
		Significant gully or tunnel erosion present and/or rilling >200 mm deep. (Main Pit central rehabilitation area), after March 2019 heavy rainfall event.	Contractors were engaged to re-shape erosion rills, install new topsoil and rip lines then re-seed with appropriate native vegetation community seed mix.
		Significant gully or tunnel erosion present and/or rilling >200 mm deep. (Main Pit west rehabilitation area), after March 2019 heavy rainfall event.	Contractors were engaged to re-shape erosion rills, install new topsoil and rip lines then re-seed with appropriate native vegetation community seed mix.
	Weed Presence	Twelve months following revegetation, >10% but <25% cover of undesirable species present. (Weeds in northern and southern rehabilitation areas).	Continue the ongoing site weed management program with a focus on the specific areas identified in the annual rehabilitation walkover report to ensure newly identified weed outbreaks are controlled.
		Twelve months following revegetation, >10% but <25% cover of undesirable species present. (Identification of native species inconsistent with the desired vegetation communities in the northern and southern rehabilitation areas).	Weed management contractor to continue to remove introduced species from the site during weed control activities.

Figure 14 - MOP rehabilitation TARP areas 2019



Legend

- Approved EPL and Disturbance Boundary
- ▲ Inconsistent canopy species
- Weed locations
- Erosion Locations

DISCLAIMER

Subject To Survey.
Glencore makes every effort to ensure the quality of the information available on this map. Before relying on the information on this map, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances. Glencore cannot guarantee and assumes no responsibility for the accuracy, currency or completeness of the information and by using this map you accept that Glencore has no liability for any loss or damage in any form whatsoever caused directly or indirectly from the use of this map.

DATA SOURCE

© NSW Department of Finance, Services & Innovation 2020
© NSW Resources & Geoscience (DRG) 2020
© Glencore 2020

8.4.1 Post Rehabilitation Land Use

As outlined in the MOP, the post-rehabilitation land use will be self-sustaining locally occurring vegetation communities, which emulate the pre-mining environment, enhance local and regional ecological linkages and provide for a sustainable final land use option. It has been developed with consideration of the inherently low land capability of the existing land (Class VI) across the majority of the site. The final void will remain onsite and will be appropriately rehabilitated and fenced to prevent access. Rehabilitation will establish a range of grassland, woodland and forest communities in addition to the offset area which surrounds the site.

Mangoola will establish native woodland and approximately 700 ha of native grassland across the site at closure.

Vegetation communities within the native woodland areas include:

- Forest Redgum Riparian Woodland;
- Ironbark Woodland Complex;
- Paperbark Woodland;
- Sheltered Grey gum Woodland;
- Slaty Box Woodland;
- Spotted Gum Open Forest; and
- Weeping Myall Woodland.

Table 39 compares the area of rehabilitation established for each final land use type during the 2019 reporting period and to date, against the MOP forecast.

Table 39 Final Land Use Rehabilitation

Secondary Domain Type	2019 reporting period (Actual)	Cumulative to date (Actual)	Area at end of MOP period (Forecast)
Ecosystem and Land Use Establishment			
Grassland	25.50	144.14	130.34
Woodland	80.18	510.65	517.66

In addition to the above Mangoola has commenced monitoring overburden emplacement area rehabilitation against relevant completion criteria. **Table 40** provides a summary of progress to date against relevant criteria for the stage of rehabilitation onsite, which has only been undertaken on rehabilitated waste emplacements areas to date. Further updates against criteria will be provided in future Annual Reviews as relevant criteria are triggered.

Many of the completion criteria listed in the MOP are not yet relevant, as they relate to stages of rehabilitation that have not yet been reached or triggered. The annual ecological monitoring program, rehabilitation walkover inspection and annual bushfire hazard inspection have assessed the relevant criteria, specifically landform stability, floristic diversity, vegetation health, weed presence, structural fauna habitat, management of pest species and bushfire management. Topsoil chemistry and structure monitoring was delayed in 2019 due to the ongoing drought conditions but will be undertaken and reported on in the 2020 Annual Review.

Table 40 Comparison of the 2019 Rehabilitation Walkover Inspection Results with MOP Completion Criteria

Objective	Performance Indicator	Completion Criteria	2019 Status North Pit Rehabilitation Area	2019 Status South Pit Rehabilitation Area
Floristic diversity is progressing towards the ecosystems planned in the final land use	Development of native ecosystems as per the final land use	<p><u>For Grassland areas:</u></p> <p>-0-20% canopy</p> <p>-60-90% Groundcover</p> <p><u>For Woodland Areas:</u></p> <p>-20-60% canopy for Woodland areas.</p> <p>-10-60% Understorey</p> <p>- 40-80% Groundcover</p>	<p>Not complete.</p> <p>Native diversity across the Northern Rehabilitation area was generally high. Most areas exhibited appropriate species for the target vegetation community in all layers.</p> <p>Infill planting of canopy species is unlikely to be required but may be beneficial in a few small areas where Eucalypt establishment has been low.</p>	<p>Not complete.</p> <p>Native diversity across the South Pit Rehabilitation Area was generally high. Most areas exhibited appropriate species for the target vegetation community in all layers.</p> <p>Infill planting is not required in the South Pit Rehabilitation area at this stage.</p>
		Signs of seeding occurring in woodland and grassland	<p>Yes in older rehabilitation areas.</p> <p>Canopy species in the oldest parts of Northern Rehabilitation Area are starting to reach reproductive age and fruit has been observed on slaty gum (<i>Eucalyptus dawsonii</i>), Narrow leaved ironbark (<i>Eucalyptus crebra</i>) and grey box (<i>Eucalyptus moluccana</i>)</p> <p>Seeding of shrub species was generally observed in rehabilitation areas greater than 2 years of age. Recruitment of shrub species was low at this stage.</p> <p>Seeding of ground cover species was generally low. This is likely related to the drought conditions leading into the survey as seeding of ground layer species has been observed in previous years especially native grass species (<i>family Poaceae</i>).</p>	<p>Canopy species in the Southern Rehabilitation Area were not of sufficient age for reproduction. Seeding of shrub species was generally observed in rehabilitation areas greater than 2 years of age. Recruitment of shrub species was low at this stage.</p> <p>Seeding of ground cover species was generally low. This is likely related to the drought conditions leading into the survey and seeding of ground layer species has been observed in previous years especially native grass species (<i>family Poaceae</i>), and species of the family Chenopodiaceae.</p>

Objective	Performance Indicator	Completion Criteria	2019 Status North Pit Rehabilitation Area	2019 Status South Pit Rehabilitation Area
		More than 75% of trees are healthy and growing as indicated by long term monitoring	At this stage in excess of 75% of trees are healthy and growing in the Northern Rehabilitation Area. Long term monitoring is required to further assess against these criteria. No evidence of significant plant mortality or dieback observed.	At this stage in excess of 75% of trees are healthy and growing in the South Pit Rehabilitation Area. Long term monitoring is required to further assess against these criteria. No evidence of significant plant mortality or dieback observed.
		Less than 30% weeds based on monitoring	Most areas had less than 30% weed cover. Some areas of high weed cover are identified in the MOP TARP.	Most areas had less than 30% weed cover. Some areas of high weed cover are identified in the MOP TARP.
Fauna diversity is progressing towards the ecosystems planned in the final land use	Rehabilitation areas provide a range of structural habitats similar to pre-mining fauna communities.	Monitoring data provides evidence of a range of structural habitats similar to pre-mining fauna communities are evident in rehabilitation areas	More mature areas were identified as having a range of mostly small woodland birds. The presence of the habitat augmentation features here (such as stags, dams, nest boxes, logs and rock piles) are likely to have assisted in this colonisation and will make colonisation by all fauna groups easier. This should be tracked as part of general ecological works. The densities of hollows across rehabilitation area remains significantly lower than the likely density of hollows prior to mining.	More mature areas were identified as having a range of mostly small woodland birds. The presence of the habitat augmentation features here (such as stags, dams, nest boxes, logs and rock piles) are likely to have assisted in this colonisation and will make colonisation by all fauna groups easier. This should be tracked as part of general ecological works. The densities of hollows across rehabilitation area remains significantly lower than the likely density of hollows prior to mining.

Objective	Performance Indicator	Completion Criteria	2019 Status North Pit Rehabilitation Area	2019 Status South Pit Rehabilitation Area
	Fauna pest species are managed and controlled (where possible)	Pest monitoring will be undertaken annually. The control of pest species is undertaken in accordance with the annual pest management action plan. Pest control activities occur on an ongoing basis throughout the year. Specific control techniques will be determined from monitoring prior to the commencement of control activities.	Pest monitoring undertaken as part of separate program however observed levels were low.	Pest monitoring undertaken as part of separate program however observed levels were low.

8.5 Rehabilitation Trials and Research

Mangoola is undertaking an orchid translocation trial for the threatened species *Diuris tricolor* and *Prasophyllum petilum*. Orchids were translocated to new areas and the survival rates have been monitored annually since 2010. The results of the 2019 orchid translocation monitoring are presented in **Section 6.6.2.3**.

Invertebrate habitat “bee and bug hotels” were introduced into the rehabilitation during 2019 (refer **Photo 7**). These will be monitored over time to assess usage by pollinators and if successful will be installed in other areas of rehabilitation across the site.

Photo 7 One of Ten Invertebrate Habitat Boxes installed into the Rehabilitation during 2019.



8.6 Actions for the Next Reporting Period

Rehabilitation activities proposed for the 2020 reporting period include the continuation of the rehabilitation research and trials for threatened terrestrial orchid translocation, continued development to increase the seed mix species diversity, particularly in the ground cover and shrub layer, the establishment of additional aquatic habitat features, and a focus on achieving the rehabilitation targets as outlined in the approved MOP.

9 Community

9.1 Community Engagement

9.1.1 Face to Face Meetings

Mangoola has developed a comprehensive Stakeholder Engagement Strategy and Plan to identify and understand stakeholder views and concerns.

During the reporting period, the majority of consultation was associated with the MCCO Project which is contained within Assessment Lease (AL9). In 2019, the EIS was finalised for public exhibition from 18 July to 28 August 2019, with submissions received and a Response to Submissions report lodged. Community consultation continued throughout this process to keep the community informed of the EIS findings and how they could view the full report and lodge a submission. Documents associated with this project can be found on the company website: www.mangoolamine.com.au (link under “Future Mining”).

During the reporting period, there was no exploration activity within AL9 therefore, consultation under the Community Consultation Strategy (CCS) for AL9, developed in accordance with Conditions 4 and 5 of AL9, was limited to general Mangoola and MCCO Project updates. An Annual Community Consultation report was lodged with the Department of Trade and Investment Regional Infrastructure and Services (DTIRIS) in November 2019. Likewise, there was no exploration activity conducted in EL5552 during the reporting period. A limited Annual Community Consultation report was lodged with DTIRIS in February 2019 (with the next report due February 2020).

In 2019, there were no acquisitions under the Landholder Liaison Program and Property Acquisition Strategy (LLPPAS) that was developed in accordance with Condition 54 of AL9.

The Mangoola CCC met four times during the reporting period. The CCC meetings include an update on mining and exploration operations, environmental monitoring, rehabilitation, weed control and complaints. Two site tours were undertaken with the CCC in May and November 2019 which focused on the North Pit rehabilitation area (May), and the Hunter River pumping station and South Pit rehabilitation (November). CCC meetings in 2019 also included MCCO Project updates including upcoming community information sessions, progress on approvals pathway, summary of EIS findings, and how to lodge a submission and other general updates/consultation. Copies of the meeting minutes are provided on the Mangoola website.

Face to face meetings continued with landholders within 4 km of the project area, including those identified as being impacted by the Project. Meetings also continued with other key stakeholders identified during the development of the MCCO Project Consultation Strategy and outlined in the Secretary’s Environmental Assessment Requirements (SEARs).

In 2019, approximately 270 people toured the mine to view operations and the natural landform rehabilitation. This included government departments, politicians, industry peers, various students and teachers/scholars (local school, university, Aussie Ark personnel and international students), the CCC and the general community. Mangoola continues to offer tours when requested and advertises this in the Community Newsletter (as well as offering tours during face to face meetings).

9.1.2 Website

Mangoola operates a website (www.mangoolamine.com.au) where members of the community can access information about the site, including the latest reports, management plans and environmental monitoring data, including previous Annual Reviews.

An Audit of the website was undertaken by SLR in February 2020 in accordance with Schedule 5, Condition 11 of PA 06_0014. The findings of the audit are outlined in **Table 41** below.

Table 41 Website Audit

Condition	Comment
The Proponent must: (a) make the following information publicly available on its website:	-
The documents listed in condition 2 of Schedule 2;	Compliant.
Current statutory approvals for the project	Compliant – Approvals tab on website.
Approved strategies, plans or programs required under the conditions of this approval	Compliant – Management Plan tab on website.
A comprehensive summary of the compliance monitoring results of the project, which have been reported in accordance with the various plans and programs approved under the conditions of this approval	Compliant – Detailed monitoring reports. Includes EPL monitoring. Copies of past Annual Reviews
A complaints register, which is to be updated on a monthly basis	Compliant.
Minutes of CCC meetings	Compliant.
The last five annual reviews	Compliant - Annual Reviews / AEMR since 2008.
Any independent environmental audit; and the Proponent's response to the recommendations in any audit	Compliant. Link to audits.

9.1.3 Newsletters and Fact Sheets

Mangoola published and distributed three community newsletters during 2019 (with the Q4 newsletter under development for distribution in January 2020). The newsletters provided information on the MCCO Project (including consultation and approvals pathway updates, EIS exhibition details and EIS submission summary), mine rehabilitation, vertebrate pest animal control, various environmental management topics and community site tours and support. MCCO Project specific material was also distributed/communicated to key stakeholders including one Community Information Sheet and an EIS Summary Booklet. Copies are available on the Mangoola website.

9.2 Community Contributions

Mangoola is committed to supporting the local community in which it operates. To reflect this commitment, Mangoola was involved with, and supported a diverse range of innovative local community activities in 2019, with contributions of approximately \$85,000 made. Some of the recipients that received 2019 sponsorship/donations from Mangoola, or Glencore Coal Assets Australia in partnership with Mangoola, during the reporting period are presented below:

- Upper Hunter Education Fund;
- The Upper Hunter Show;
- Wybong RFS (electronic bushfire hazard board, pump and water bottles) ;
- Wybong Community Hall and Wybong Cemetery (mowing and hall insurance);
- National Tree Day;
- Muswellbrook Chamber of Commerce and Industry Business Awards;
- St Josephs Public School Denman – Cattle Team;
- Mangoola RFS – Open Day;
- Hunter Life Education – Soap Box Derby;
- Muswellbrook High School Year 7 Camp;
- Hunter Sustainability Landcare – gazebo for Denman Community Garden/other events;
- Hunter Valley Group 21 under 16's Rugby Trip;
- Upper Hunter Drought Buster Charity Rodeo (through Glencore Coal Asset Australia Grants);
- Wildlife Aid – Denman Schools Program;
- Muswellbrook South Primary School Fete;
- Westpac Helicopter Service Upper Hunter Charity Golf Day;
- Various Denman and Sandy Hollow schools – Annual Awards;
- Denman Children's Centre – sand pit play equipment;
- Denman Little Athletics – sports equipment via Glencore Coal Asset Australia Junior Sports Grants ;
- Hunter Valley Mining Charity Rugby League (Westpac Helicopter Service); and
- Zone 7 Pony Club camp (safety focus) - Glencore Coal Asset Australia Junior Sports Grants.

A key component of the Stakeholder Engagement Strategy is to ensure Mangoola supports the local community. Mangoola has implemented the Voluntary Planning Agreement (VPA) required under Schedule 2, Condition 12 of PA 06_0014 with Muswellbrook Shire Council. The VPA is designed to provide financial contributions commensurate with the terms set out in PA 06_0014. Mangoola is committed to meeting its obligations under the VPA.

Photo 8 St Joseph's Primary School Denman – Cattle Team



In addition to the above, Mangoola also completed an Apprentice Community Working Bee which resulted in further upgrades to the local Wannaruah Local Aboriginal Land Council (WLALC) garden including fire pit, car park, vegetable gardens, reflections garden and more. The WLALC is a key community hub in Muswellbrook.

Photo 9 Wanaruah Local Aboriginal Land Council Front Yard Blitz – Apprentice Work Bee 2019



9.3 Community Complaints

Mangoola manages all complaints in accordance with the Mangoola Complaints Management Procedure, which details the process for receiving and responding to complaints. Complaints are received via a dedicated Community Response Line, in person, facsimile, email, letter or general telephone.

9.3.1 2019 Complaints Summary

A total of 191 community complaints were received by Mangoola during the reporting period. A summary of the time of year and subject of the complaints are provided in **Table 42**.

Table 42 Summary of Complaints in 2019

Month	Noise	Dust	Lighting	Blasting	Traffic	Other	Total
January	8	2					10
February	15	1					16
March	12	1				1 (bus shelter use)	14
April	27						27
May	12			2	1		15
June	32			1			33
July	17			1			18
August	20	2					22
September	14			2			16
October	12	1	1				14
November	2			1			3
December	1	1		1			3
Total	172	8	1	8	1	1	191

9.3.2 Analysis of Complaints

Complaint Subject and Quantity

As shown in **Table 42**, the majority of complaints received in the reporting period were in relation to noise (90%). This percentage has increased from 2018 (77%) but consistent with 2017 (90%). Further details on management and mitigation measures regarding noise that were implemented during the reporting period are provided in **Section 6.3**. Additional attended noise monitoring was conducted from June to September 2019 due to the increase in complaints from the area north west of the mine. The results of this monitoring has also been included in **Section 6.3**.

The 191 complaints received in 2019 represent a 255% increase from the 75 environmental complaints received in 2018. A review of complaints from 2007 to 2019 found that complaints peaked in 2011 (717 complaints) which represented the first full calendar year of operations, and have generally been decreasing each year since with increasing peaks in 2013 and 2018/2019.

Complaint Timing

Figure 15 shows the time of day that complaints were made during 2019. Analysis of this data shows that noise and lighting complaints are generally made in the early morning and late evening, whereas dust and blast related complaints are generally made in the middle of the day.

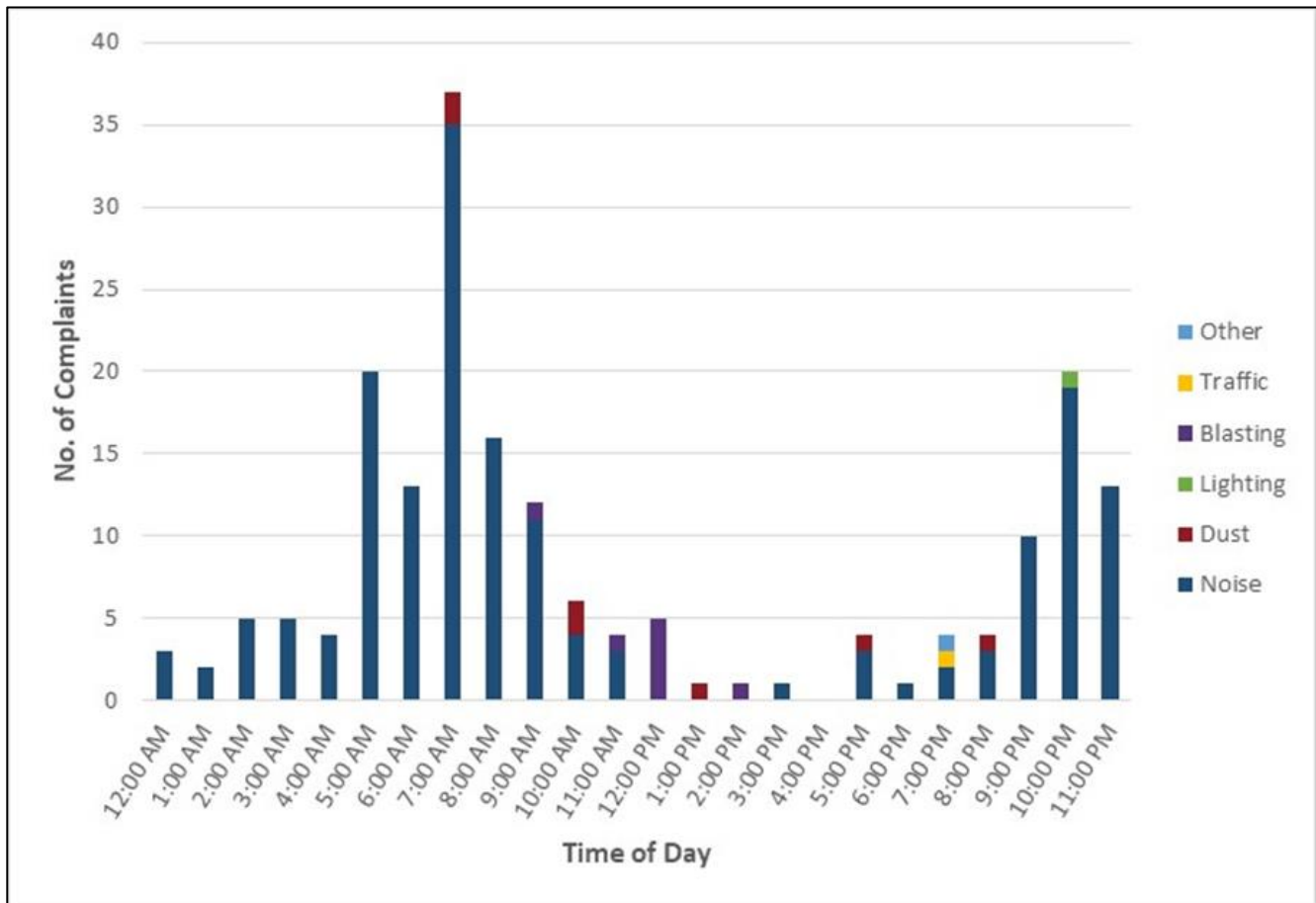


Figure 15 2019 Complaints by Time of Day

Complainants

Figure 16 shows the number of complaints made by each complainant during 2019. The 191 complaints were made by 28 individuals during 2019, in addition to two anonymous complaints, and approximately a third of all complaints (65) were made by one complainant. These were predominantly in relation to noise.

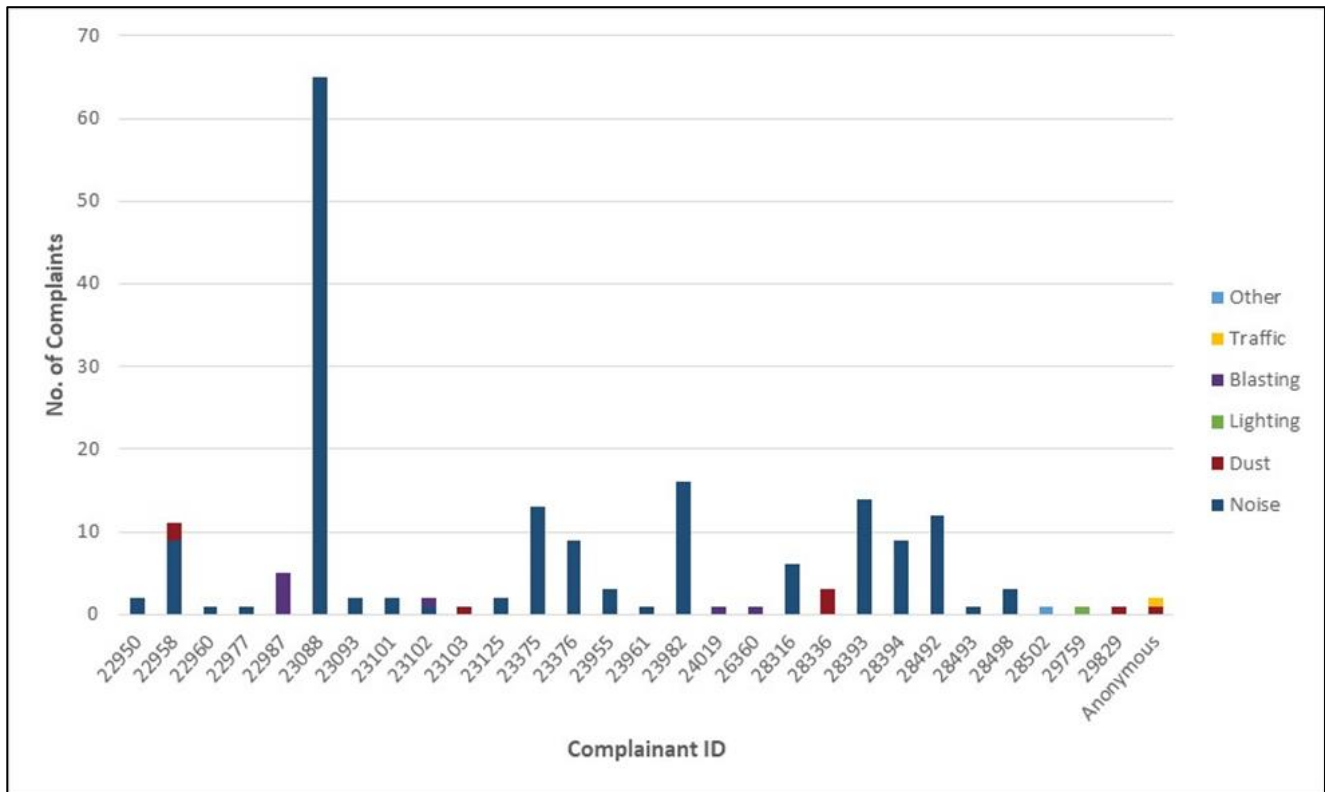


Figure 16 2019 Complaints by Complainant ID

Complaint Location

Figure 17 shows complaint location during 2019. There were 191 complaints received during the reporting period from 28 complainants and 2 anonymous complainants.

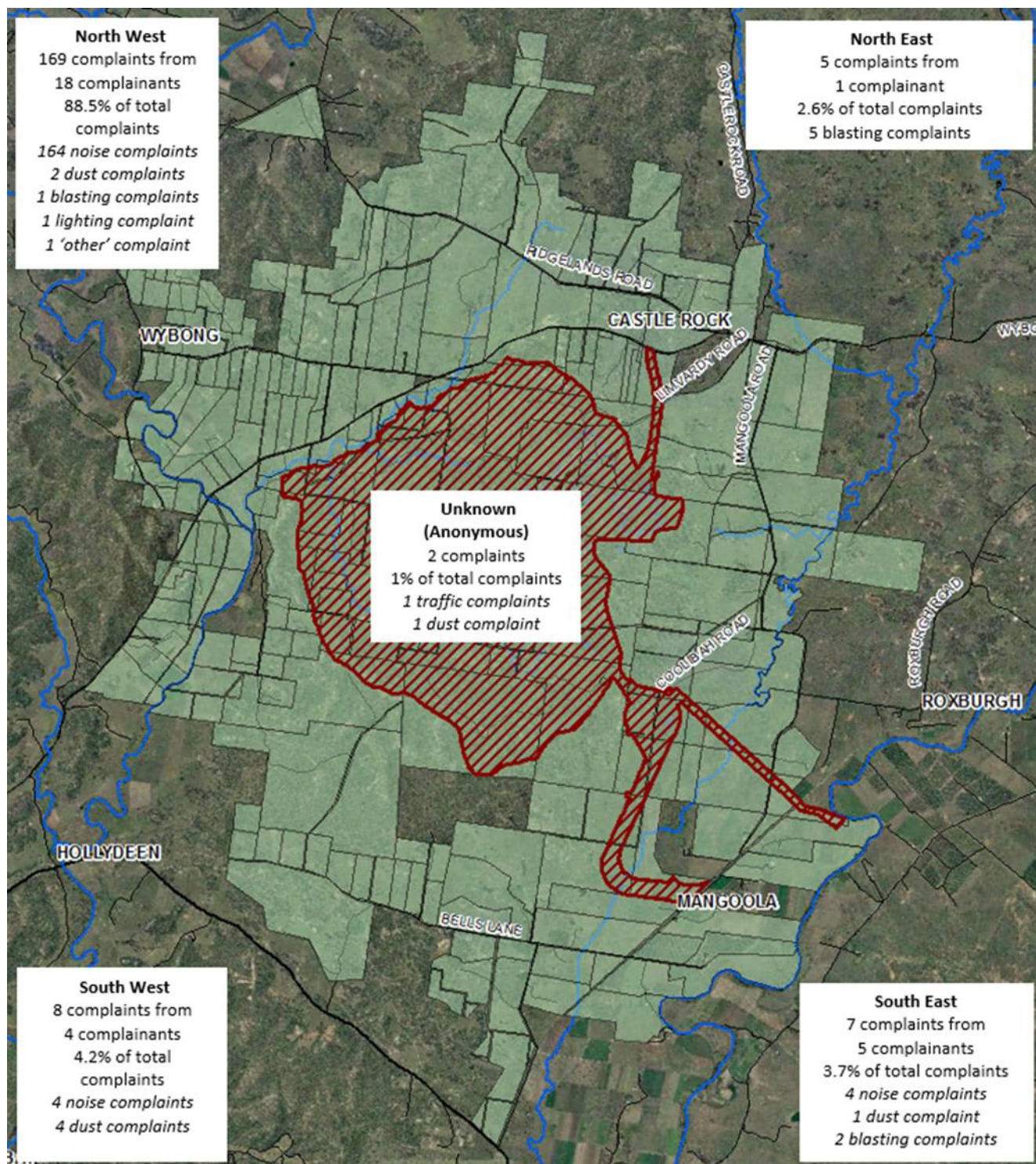


Figure 17 2019 Complaints by Location

9.3.3 Actions in Response to Complaints

In response to complaints received in 2019, the following responses were undertaken, depending on the nature of the complaint.

Noise

- Following receipt of a noise complaint, the real time noise monitors were reviewed, and noise alarms were reviewed to see if any were received prior to the complaint;
- Operational noise management controls were reviewed by the Mining Supervisor or CHPP Supervisor;
- Where noise alarms were received, and the Mining/CHPP Supervisor verified activities from our operation to be the source, the operation was reviewed with changes made as required to reduce noise levels, e.g. parking up equipment; and
- Supplementary weekly attended noise monitoring was undertaken at an additional four locations at a further distance north west of site in response to complaints. This was completed weekly during the winter period. No non compliances were measured during this monitoring.

Blast

- Depending on the nature of the blast complaint, the following were reviewed:
 - blast monitoring results;
 - the blast video;
 - pre-blast assessment to confirm meteorological conditions at time of blasting;
 - air quality monitoring results; and/or
 - other blasting activity in region (where blast time did not correlate with a Mangoola blast);
- All blast overpressure and ground vibration results confirmed to be within compliance limits and discussed with complainant where relevant; and
- Details of one complaint investigation were provided from the EPA (for a complaint lodged via the EPA hotline).

Dust

- Following receipt of a dust complaint, a review of alarms and the operational air quality management controls was undertaken by the Mining or CHPP Supervisor;
- Modifications to operations were made as required (e.g. pulling up circuit, relocating to lower dump – typically undertaken in response to alarms prior to or around time of complaint);
- Meteorological conditions and other relevant monitoring systems (such as the Upper Hunter Air Quality Monitoring Network) were also reviewed;
- Complainants contacted to discuss complaint detail, outcomes of investigation and any additional actions implemented in response to alarms; and
- One complaint was lodged anonymously through DPIE. The investigation outcomes were provided to the DPIE who were satisfied with the controls in place.

Lighting

- Following receipt of a lighting complaint, the Mining Supervisor reviewed lighting including a lighting inspection along public roads (no address was provided and there was no answer to phone call). No visible or offensive light identified. Complainant unable to be contacted, messages left.

Other

- One 'other' complaint received stating that employees were observed to be drinking at a bus shelter. The Mining Supervisor visited location however people had left by the time of inspection - no rubbish was left in area. A training presentation was presented to all Mangoola staff at the March Training day regarding the use of the bus stop and local roads in accordance with the requirements of PA 06_0014; and
- Following receipt of any complaint, a follow up response was made with the complainant if requested.

10 Independent Audit

In accordance with Condition 7, Schedule 5 of PA06_0014, an IEA is required every three years. An IEA was undertaken in 2019, occurring between 29 July 2019 to 1 August 2019.

This audit had a result of six non-compliances, which were risk ranked. There were no high or medium risks identified. Three issues were identified as 'low risk' and three issues were classified as 'administrative' in nature. These non-compliances and Mangoola's response/action plan and status as at 31 March 2020 are noted in **Table 43**.

In addition, Hanson Bailey (2019) provided 32 recommendations which are outlined in **Table 44**.

Table 43 Independent Environmental Audit Non-Compliances

Reference	Requirement	Audit Finding	Mangoola Coal Response/ Action Required/ Timeline	Status as at 31 March 2020
PA 06_0014 (as modified)				
Sch. 2, C. 2(a)	2A. The proponent must carry out the project in accordance with the conditions of this approval.	Although a high level of compliance was identified, some noncompliance's were identified with the conditions of this approval. Not Compliant Administrative	Noted.	N/A
Sch. 2, C. 2(a)	2A. The proponent must carry out the project in accordance with the conditions of this approval.	The 2017 Annual Review indicates noise criteria exceedances in March (by 2 dBA) and May (by 1 dBA) at Location NM4. Follow-up monitoring after adjustments to mine operations indicated compliance with criteria in both cases. Although these results are within the 2-dBA allowed under the INP and were promptly managed, these minor exceedances are a noncompliance against the specific criteria in Table 2. Not Compliant Low Risk	Noted and previously reported.	N/A

Reference	Requirement	Audit Finding	Mangoola Coal Response/ Action Required/ Timeline	Status as at 31 March 2020
Sch.3. C 14(b)	<p>If the owner of any privately-owned land within 2km of the site (or on any other land where the Secretary agrees that a property investigation is warranted) claims that buildings and/or structures on his/her land have been damaged as a result of blasting on the site, then within 2 months of receiving this claim the Proponent must:</p> <p>(a) commission a suitably qualified, experienced and independent person, whose appointment is acceptable to both parties to investigate the claim; and</p> <p>(b) give the landowner a copy of the property investigation report.</p>	<p>A property investigation was requested by Property ID 200 with results to be sent to the landholder within two months of request. As a copy of the property investigation report was not given to the landholder within two months of receiving this claim this condition is deemed non-compliant.</p> <p>Not Compliant Administrative</p>	<p>As reported to DPIE 11 June 2019, no further action is proposed for this matter. A further process has been put in place where by actions are generated in the sites compliance database when claims are received to avoid this reoccurring.</p>	N/A
Sch. 3, Cond. 19	<p>The Proponent must ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the project do not cause exceedances of the criteria listed in Tables 5, 6 and 7 at any residence on privately-owned land (excluding the dust</p>	<p>DG21 was sampled only 4 times (out of 12) due to being on private property and the landholder refusing entry. Due to this ongoing issue, the AQMP was revised and DG21 was removed. Strictly a non-compliance as monitoring was not conducted in a representative location for 8 months (although out of Mangoola's control).</p> <p>Not Compliant Low Risk</p>	<p>The site AQMP was updated at the time of the non compliance and approved by DPIE in December 2017. No further action required.</p>	N/A

Reference	Requirement	Audit Finding	Mangoola Coal Response/ Action Required/ Timeline	Status as at 31 March 2020
Sch. 3, Cond 44	<p>The Proponent must:</p> <p>(a) keep records of the:</p> <ul style="list-style-type: none"> • amount of coal transported from the site each year; and • number of coal haulage train movements generated by the project (on a daily basis); and <p>(b) include these records in the Annual Review.</p>	<p>Reported 11/6/19 of missing 'on a daily basis' information. The train movements have since been added to the Appendix of each annual review.</p> <p>Not Compliant</p> <p>Administrative</p>	<p>As reported to DPIE 11 June 2019, Mangoola Coal has now amended and included train records with Annual Review. These are available on the company website. No further action required.</p>	N/A

Reference	Requirement	Audit Finding	Mangoola Coal Response/ Action Required/ Timeline	Status as at 31 March 2020
Appendix 8, Condition 5	<p>Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:</p> <p>(a) monitoring locations for the collection of representative noise data;</p> <p>(b) meteorological conditions during which collection of noise data is not appropriate;</p> <p>(c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and</p> <p>(d) modifications to noise data collected including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.</p>	<p>Noise monitoring reports do not assess “mine-related tonal noise” as defined by the INP or the later Noise Policy for Industry as required by Section 4.1.3 of the Noise Management Plan.</p> <p>Audit Recommendation</p> <p>Recommend noise monitoring reports assess mine-related tonal noise as defined by the INP.</p>	<p>Mangoola Coal has consulted with its Independent Acoustic Consultant regarding tonal noise. The consultant confirmed that tonal noise has not been detected during operator-attended noise monitoring at Mangoola. This will be acknowledged and considered future monthly noise monitoring reports from 30 November 2019 onwards for clarification.</p>	Action completed.

Table 44 Independent Environmental Audit Recommendations

Reference	Audit Finding	Mangoola Coal Response/ Action Required/ Timeline	Status as at 31 March 2020
PA 06_0014 (as modified)			
PA 06_0014, Sch. 3, Cond. 1	Recommend updating acquisition table at next scheduled modification to only show relevant properties.	Mangoola Coal is currently seeking approval for the MCCO Project SSD-8642 and is seeking a new approval which will reflect current land ownership, should this be granted approval.	N/A
PA 06_0014, Sch 3, Condition 2(a) and 9	Report all noise exceedances of criteria specified in consent (including those within the 2 dBA allowed under the INP) in Annual Review's. Recommend that discussion with DPIE occur and if amendable, an amendment to Noise Management Plan be undertaken at Section 4.5.1 that reporting of potential exceedances within 2 dB not be reported in accordance with INP Section 11.1.3	Mangoola will continue to report as per the approved NMP. Section 11.1.3 of the INP states the following: "A development will be deemed to be in non-compliance with a noise consent or licence condition if the monitored noise level is more than 2 dB above the statutory noise limit specified in the consent or licence condition." This methodology continues are per Point 8 of the Implementation and Transitional Arrangements for the Noise Policy for Industry 2017. Consultation will be undertaken with DPIE regarding section 4.5.3 of the approved NMP and if required, A revised NMP will be submitted to DPIE by 18 January 2020.	Action completed.
PA 06_0014, Sch. 3, Cond. 11	At next Modification, recommend that the condition is amended to reflect approved updated blasting hours within Condition L4.5 of EPL 12894.	Mangoola Coal is currently seeking approval for the MCCO Project SSD-8642. Current approved blasting hours have been included in the EIS which will be considered within conditioning, should approval be granted.	N/A
PA 06_0014 Sch.3, C.14	At next Modification, recommend making wording consistent with Condition 13.	Mangoola Coal is currently seeking approval for the MCCO Project SSD-8642. Consistent wording between property inspection and property investigation will likely be included consistent with current conditioning, should the project be approved.	N/A

Reference	Audit Finding	Mangoola Coal Response/ Action Required/ Timeline	Status as at 31 March 2020
PA 06_0014, Sch. 3, Cond. 16	At next modification, recommend the Appendix 1 of PA 06_0014 be updated to reflect recent landownership data.	Mangoola Coal is currently seeking approval for the MCCO SSD-8642 and is seeking a new approval which will reflect current land ownership.	N/A
PA 06_0014, Sch. 3, Cond. 18	Annual Reviews could include a discussion on odour within 'air quality' section.	Further information on odour will be reported in the air quality section of the Annual Review which will be furnished to DPIE 30 March 2020.	Action completed.
PA 06_0014, Sch.3, C. 19	Update to be consistent with the industry by referencing Note (b) with the Criterion to allow for any exceedances be based of mine related activities and not include background concentrations.	Mangoola Coal is currently seeking approval for the MCCO Project SSD-8642. Mangoola Coal will comply with any changes to conditions, should the proposed project be granted approval.	N/A
PA 06_0014, Sch. 3, Cond. 20	Update to be consistent with the industry by referencing Note (b) with the Criterion to allow for any exceedances be based of mine related activities and not include background concentrations.	Mangoola Coal is currently seeking approval for the MCCO SSD-8642. Mangoola Coal will comply with any changes to conditions, should the proposed project be granted approval.	N/A
PA 06_0014, Sch. 3, Cond. 24 NOTE	Future versions of the WMP should remove stock and domestic Water Access Licenses.	Mangoola Coal will update the WMP to provide clear clarification around licence required for the project and submit for consultation with relevant agencies by 18 January 2020.	Action completed.
PA 06_0014, Sch. 3, Cond. 28	Future versions of the WMP include relevant consultation in an appendix.	Mangoola Coal will include consultation and DPIE approval as an Appendix of the WMP to be submitted for consultation with relevant agencies by 18 January 2020.	Action completed.
PA 06_0014, Sch. 3, Cond. 29	Future versions of the WMP should include a cross-reference in Section 4 to any site water balance reporting requirements.	Mangoola Coal include a reference in Section 4 to reflect Water Balance Reporting in the WMP to be submitted for consultation with relevant agencies by 18 January 2020.	Action completed.
PA 06_0014, Sch. 3, Cond. 31	Future versions of the SWMP include baseline flow data for relevant creeks.	Mangoola Coal will update the SWMP to include baseline flow data and submit for consultation with relevant agencies by 18 January 2020.	Action completed.

Reference	Audit Finding	Mangoola Coal Response/ Action Required/ Timeline	Status as at 31 March 2020
PA 06_0014, Sch. 3, Cond. 32	<p>Future version of the Groundwater Monitoring Program to include:</p> <ul style="list-style-type: none"> • Baseline data tables that clearly state the parameter and measurement unit; • Baseline yield for relevant bores; and • A program for accurately delineating the boundary of the Big Flat Creek alluvial aquifer. 	Mangoola Coal is currently revising the sites GWMP and is responding to comments from the NRAR dated 13 August 2019. Further details have been included in the updated GWMP to address the audit recommendation. Mangoola Coal will provide an updated GWMP to NRAR by 13 November 2019. GWMP approval is required by NRAR under 20BL 172598. Following this approved the GWMP will be submitted to DPIE for approval.	Action completed.
PA 06_0014, Sch. 3, Cond. 33	Recommend the SWGWRP at next revision include a clear protocol specifically for the identification, investigation and mitigation of creek flow loss. It is recommended that SWGWRP Figure 2.7 is updated (or a new SWGWRP figure is added to the SWGWRP). This would need to clearly address the loss of creek flows and specifically provide a reliable means of identifying and investigating the potential loss of flows due to mining, taking into account the alternatives discussed above.	Figure 2.7 of the SWGWRP will be updated and sent for consultation with relevant agencies by 18 January 2020 to acknowledge and clarify loss of creek flow as a Trigger in the TARP.	Action completed.
PA 06_0014, Sch. 3, Cond. 33	In the next update of the Biodiversity Offset Strategy, a statement should be made clarifying that no areas of Bull Oak Woodland are proposed to be re-established but existing areas will be managed and enhanced.	Section 4.4.1 of the approved BOMPS refers to the monitoring of passive regeneration. Observations to date has shown that Bulloak Woodland passive regeneration has been successful. Mangoola Coal will continue to apply the processes contained in Section 4.4.1 of the BOMPS which may include the active regeneration of Bulloak woodland if required. Clarification will be made in the periodic update of the BOMPS which will be updated and submitted to relevant Departments for consultation by 30 September 2021.	Action to be completed as part of the period update to the BOMPS which will be updated and submitted for consultation by 30 September 2021.

Reference	Audit Finding	Mangoola Coal Response/ Action Required/ Timeline	Status as at 31 March 2020
PA 06_0014, Sch. 3, Cond. 41	Include the newly identified rock shelter (AC58) in the next revision of the ACHMP.	Mangoola Coal will be revising the ACHMP to include this AC 58 and will send out registered Aboriginal Parties from consultation by 31 December 2019. Submission to DPIE will follow consultation feedback.	Action completed.
PA 06_0014, Sch. 3, Cond. 43	Remove demolished sites from the main document (Figure 2 and Table 2) to avoid confusion at next review.	Mangoola Coal will make this administrative update in the next periodic review of the Conservation Management Strategy which is due by 31 December 2020.	Action is to be completed as part of the periodic review of the Conservation Management Strategy which will be updated and submitted for consultation by 30 June 2020.
PA 06_0014, Sch. 3, Cond. 43	Add residence locations to Appendix A to confirm which properties have residences and which are vacant.	Mangoola Coal will update Appendix A of the MANOC-1772150304-138 Lighting Plants Procedure by 31 December 2019 to show locations of residences.	Action completed.
PA 06_0014, Sch. 3, Cond. 54	DPI Water should be updated in this condition and/or relevant regulator which is actually responsible for energy in NSW added at next modification.	Mangoola Coal is currently seeking approval for the MCCO Project SSD-8642. Should approval be granted, current names of relevant agencies would be referenced.	N/A
PA 06_0014, Sch. 3, Cond. 56	Tables in Annual Review (Table 26, 27) relating to greenhouse gas emissions be combined to easily compare predictions to totals.	Mangoola will update this table in the 2019 Annual Review, due for submission by 30 March 2020.	Action completed.
PA 06_0014, Sch. 3, Cond. 57	Add sewage operation criteria to email sent to council in future for easy comparison.	Mangoola will include criteria in the ongoing email of results to Muswellbrook Shire Council by 18 November 2019.	Action completed.
PA 06_0014, Sch. 3, Cond. 59	Minesoils recommend continuing current practices as they appear to be providing successful results.	Noted.	N/A

Reference	Audit Finding	Mangoola Coal Response/ Action Required/ Timeline	Status as at 31 March 2020
PA 06_0014, Sch. 4, Cond. 3	Definition of 'affected landholder' is clarified with DPIE as HB would suggest landholder means "private" landholder in this context and Mangoola is assuming this is referring to any landholder, including mine owned with tenants. This should exclude any property where predictions from another mine are predicted to exceed.	Consultation will be undertaken with DPIE regarding the definition of affected landholder and if required, A revised Air Quality Management Plan will be submitted to DPIE by 18 January 2020.	Action completed.
PA 06_0014, Sch. 5, Cond. 9 (c)	Update air quality incident letter template used to report an incident to DPIE to confirm consideration of this condition.	Mangoola Coal will update the template to include this reference by 18 January 2020.	Action completed.
EPL 12894			
EPL 12894, Cond. A2.1	Update condition for most recent figure version.	Mangoola Coal will consult with the EPA regarding the administrative update of this reference by 18 January 2020 to determine if an update of the Figure reference is required.	Action completed.
EPL 12894, Cond. P1	Include location 33 (STP discharge point) on figure. As the EPL IDs and site IDs of required monitoring points, it is recommend including site ID location in table to easily identify the correlation with EPL monitoring points.	Mangoola Coal will consult with the EPA regarding the administrative update of this reference by 18 January 2020 to determine if an update of the Figure reference is required.	Action completed.
EPL 12894, Cond. L3	As the EPL IDs and site IDs of required monitoring points, it is recommend including site ID location in table to easily identify the correlation with EPL monitoring points.	Mangoola Coal will consult with the EPA regarding the administrative update of this reference by 18 January 2020 to determine if an update of the Figure reference is required.	Action completed.
EPL 12894, Cond. E1	Update condition to correct reference R4.5 rather than R4.4.	Mangoola Coal will consult with the EPA regarding the administrative update of this reference by 18 January 2020 to determine if an update of the Figure reference is required.	Action completed.
ML 1626			
ML1626 Cond. 4(b)	The addition of a figure and/or discussion comparing MOP predictions with current progress in Annual Review 2019.	Mangoola will update this table in the 2019 Annual Review, due for submission to DPIE by 30 March 2020.	Action completed.

Reference	Audit Finding	Mangoola Coal Response/ Action Required/ Timeline	Status as at 31 March 2020
Monitoring Locations			
Sch 3., C 17.	Blast monitoring in the east is currently not required, however should be reconsidered in the next audit period if required by an appropriate specialist as mining progresses south.	Mangoola Coal will undertake a review with an appropriate specialist and if required, A revised BMP will be submitted to DPIE by 18 January 2020.	Action completed.
Sch 3., C 17.	Figure 4.1 of the Blast MP should be extended to a 3 km radius from active mining in the next audit period as mining progresses to the south to ensure that blast impacts to receivers in the SW are adequately monitored. Consideration as to whether an additional blast monitoring in the SW should be installed in the vicinity of receiver 54 or 106B (approximately 4 km from future active blasting).	Mangoola Coal will undertake a review with an appropriate specialist and if required, A revised BMP will be submitted to DPIE by 18 January 2020.	Action completed.

11 Incidents and Non-Compliances during the Reporting Period

All 2019 incidents, non-compliances and exceedances related to PA 06_0014, EPL 12894 and relevant management plans are summarised in **Table 45**.

Table 45 Non-Compliance and Exceedances

Date	Summary	Non-Compliance	Details/Response
16 January 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. This occurred on Wednesday 16 January and Thursday 17 January 2019.</p> <p>The results were as follows:</p> <p>WEDNESDAY (16 January 2019)</p> <ul style="list-style-type: none"> • D02-DC (PM10) – 54.6 µg/m³ • D06-DC (PM10) – 57.5 µg/m³
17 January 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>THURSDAY (17 January 2019)</p> <ul style="list-style-type: none"> • D02-DC (PM10) – 54.5 µg/m³ • D06-DC (PM10) – 59.8 µg/m³ <p>As per PA06_0014, the Department were notified of the exceedances and an internal investigation commenced. The control measures and corrective actions listed in the AQMP were implemented and a report was provided to DPIE within seven days.</p>
10 February 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀), D04-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. The results were as follows:</p> <ul style="list-style-type: none"> • D03-DC (PM10) – 54.0µg/m³ • D04-DC (PM10) – 51.4µg/m³ • D06-DC (PM10) – 54.7 µg/m³ <p>As per PA06_0014 the Department were notified of the exceedances and an internal investigation commenced. The control measures and corrective actions listed in the AQMP were implemented and a report was provided to DPIE within seven days.</p>

Date	Summary	Non-Compliance	Details/Response
13 February 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. The results were as follows:</p> <ul style="list-style-type: none"> • D02-DC (PM10) – 74.5 µg/m³ • D03-DC (PM10) – 75.0 µg/ m³ • D04-DC (PM10) – 76.1 µg/ m³ • D05-DC (PM10) – 68.8 µg/ m³ • D06-DC (PM10) – 92.8 µg/ m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. This was classified as extraordinary event by DPIE.</p>
19 February 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀), D04-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. The results were as follows:</p> <ul style="list-style-type: none"> • D03-DC (PM10) – 56.3 µg/m³ • D04-DC (PM10) – 60.3 µg/m³ • D06-DC (PM10) – 55.2 µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. This was classified as extraordinary event by DPIE.</p>

Date	Summary	Non-Compliance	Details/Response
6 March 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. The results were as follows:</p> <ul style="list-style-type: none"> • D02-DC (PM10) – 71.9 µg/m³ • D03-DC (PM10) – 82.6 µg/m³ • D04-DC (PM10) – 90.3 µg/m³ • D05-DC (PM10) – 82.6 µg/m³ • D06-DC (PM10) – 89.7 µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. This was classified as extraordinary event by DPIE.</p>
11 March 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from one of Mangoola Open Cut's TEOM's was over the 24 hour averaging PM₁₀ criterion of 50ug/m³. The result was as follows:</p> <ul style="list-style-type: none"> • D06-DC (PM10) – 53.5µg/m³ <p>As per PA06_0014 the Department were notified of the exceedances and an internal investigation commenced. The control measures and corrective actions listed in the AQMP were implemented and a report was provided to DPIE within seven days.</p>

Date	Summary	Non-Compliance	Details/Response
30 March 2019	Rainfall event caused exceedance of dam design capacity	Water Management Plan EPL 12894	<p>On Saturday 30 March 2019, 88.4mm of rain fell which was above the design capacity of the following dams:</p> <ul style="list-style-type: none"> • South Pit South Sediment Dam • South Pit North Sediment Dam • Sandy Creek Farm Dam 2 <p>Due to the runoff exceeding the pumping and freeboard of the dams, dirty water was discharged from site.</p> <p>Follow up actions included:</p> <ul style="list-style-type: none"> • PIRMP was triggered and notifications made. • Pumps were checked and remained operational throughout period to limit the water spilt. • Water samples were collected as per the approved Surface Water Response Plan. <p>As required, relevant Departments were notified and a report was provided within seven days. DPIE was satisfied that Mangoola Coal had complied with the requirements of the consent and approved management plans. EPA advised that 'no action' would be taken due to 'several factors including rainfall exceeding design criteria, the implementation of preventative measures and no evidence of any environmental harm'.</p>
31 March 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. The result was as follows:</p> <ul style="list-style-type: none"> • D02-DC (PM10) – 58.3 µg/m³ • D03-DC (PM10) – 64.5 µg/m³ • D04-DC (PM10) – 73.3 µg/m³ • D05-DC (PM10) – 63.1 µg/m³ • D06-DC (PM10) – 72.6 µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. This was classified as extraordinary event by DPIE.</p>

Date	Summary	Non-Compliance	Details/Response
4 June 2019	Internal compliance review identified non-compliance with Schedule 3, Condition 14 and Schedule 3, Condition 44 of PA 06_0014.	PA 06_0014	On 4 June 2019, Mangoola received the findings from the Mangoola internal compliance review completed 8-12th April 2019. The findings identified a non-compliance with Schedule 3, Condition 14 and Schedule 3, Condition 44 of PA 06_0014 and therefore constituted an incident under Schedule 5, Condition 4 of PA06_0014. As such, DPIE was notified of this non-compliance and an incident report was provided within 7 days as required.
9 August 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from one of Mangoola Open Cut's TEOM's was over the 24 hour averaging PM₁₀ criterion of 50ug/m³.</p> <p>The result was as follows:</p> <ul style="list-style-type: none"> D03-DC (PM10) – 50.4 µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. The event was not classified as extraordinary event by DPIE, therefore, private landowners and tenants were notified by letter. Confirmation from DPIE was received on 15 August stating that DPIE was satisfied that Mangoola Coal undertook reasonable and feasible measures to minimise dust emissions from the site on the day of the exceedance</p>

Date	Summary	Non-Compliance	Details/Response
6 September 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. The results were as follows:</p> <ul style="list-style-type: none"> • D02-DC (PM10) – 71.8 µg/m³ • D03-DC (PM10) – 89.2 µg/m³ • D04-DC (PM10) – 79.5 µg/m³ • D05-DC (PM10) – 65.4 µg/m³ • D06-DC (PM10) – 78.9 µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. This was classified as extraordinary event by DPIE.</p>
14 September 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from one of Mangoola Open Cut's TEOM's was over the 24 hour averaging PM₁₀ criterion of 50ug/m³. The result was as follows:</p> <ul style="list-style-type: none"> • D03-DC (PM10) – 54.6 µg/m³ <p>A specialist consultant was engaged to investigate. Letters were sent to neighbouring private landowners and tenants, and DPIE were notified as per PA 06_0014. On the 2 October the Department notified Mangoola that they were satisfied that reasonable and feasible measures were undertaken on the day</p>

Date	Summary	Non-Compliance	Details/Response
7 October 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. The results were as follows:</p> <ul style="list-style-type: none"> D02-DC (PM10) – 54.7 µg/m³ D03-DC (PM10) – 51.8 µg/m³ D06-DC (PM10) – 55.7 µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. This was classified as extraordinary event by DPIE.</p>
26 October 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. This occurred on Saturday 26 October, Sunday 27 October and Monday 28 October 2019. The results were as follows:</p> <p>SATURDAY (26 October 2019)</p> <ul style="list-style-type: none"> D02-DC (PM10) – 68.2 µg/m³ D03-DC (PM10) – 72.6 µg/m³ D04-DC (PM10) – 75.6 µg/m³ D05-DC (PM10) – 55.1 µg/m³ D06-DC (PM10) – 80.1 µg/m³ <p>SUNDAY (27 October 2019)</p> <ul style="list-style-type: none"> D03-DC (PM10) – 54.7 µg/m³
27 October 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) D03-DC(PM ₁₀), (refer Figure 7)		

Date	Summary	Non-Compliance	Details/Response
28 October 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>MONDAY (28 October 2019)</p> <ul style="list-style-type: none"> D02-DC (PM₁₀) – 57.9 µg/m³ D03-DC (PM₁₀) – 62.1 µg/m³ D04-DC (PM₁₀) – 54.3 µg/m³ D06-DC (PM₁₀) – 58.3 µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. These days were classified as extraordinary event by DPIE.</p>
30 October 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀) and D04-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. This occurred on Wednesday 30 October, Thursday 31 October and Friday 1 November 2019.</p> <p>The results were as follows:</p> <p>WEDNESDAY (30 October 2019)</p> <ul style="list-style-type: none"> D03-DC (PM₁₀) – 59.5 µg/m³ D04-DC (PM₁₀) – 53.9 µg/m³
31 October 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀), D04-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>THURSDAY (31 October 2019)</p> <ul style="list-style-type: none"> D03-DC (PM₁₀) – 79.4 µg/m³ D04-DC (PM₁₀) – 60.1 µg/m³

Date	Summary	Non-Compliance	Details/Response
1 November 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<ul style="list-style-type: none"> D06-DC (PM₁₀) – 56.5 µg/m³ <p>FRIDAY (1 November 2019)</p> <ul style="list-style-type: none"> D02-DC (PM₁₀) – 78.5 µg/m³ D03-DC (PM₁₀) – 83.9 µg/m³ D04-DC (PM₁₀) – 79.6 µg/m³ D05-DC (PM₁₀) – 69.9 µg/m³ D06-DC (PM₁₀) – 78.8 µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. These days were classified as extraordinary event by DPIE.</p>
7 November 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. This occurred on Thursday 7 November and Friday 8 November 2019.</p> <p>The results were as follows:</p> <p>THURSDAY (7 November 2019)</p> <ul style="list-style-type: none"> D02-DC (PM₁₀) – 116.3 µg/m³ D03-DC (PM₁₀) – 77.8 µg/m³

Date	Summary	Non-Compliance	Details/Response
8 November 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<ul style="list-style-type: none"> D04-DC (PM₁₀) – 74.7 µg/m³ D05-DC (PM₁₀) – 57.6 µg/m³ D06-DC (PM₁₀) – 71.0 µg/m³ <p>FRIDAY (8 November 2019)</p> <ul style="list-style-type: none"> D02-DC (PM₁₀) – 164.6 µg/m³ D03-DC (PM₁₀) – 75.0 µg/m³ D04-DC (PM₁₀) – 74.6 µg/m³ D05-DC (PM₁₀) – 61.4.6 µg/m³ D06-DC (PM₁₀) – 74.9 µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. These days were classified as extraordinary event by DPIE.</p>
12 November 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. The results are as follows:</p> <ul style="list-style-type: none"> D02-DC (PM₁₀) – 60.3µg/m³ D03-DC (PM₁₀) – 108.2µg/m³ D04-DC (PM₁₀) – 117.4µg/m³ D05-DC (PM₁₀) – 85.6 µg/m³ D06-DC (PM₁₀) – 103.6µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. This was classified as extraordinary event by DPIE.</p>

Date	Summary	Non-Compliance	Details/Response
16 November 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀), and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. This occurred on Saturday 16 November and Sunday 17 November 2019.</p> <p>The results were as follows:</p> <p>SATURDAY (16 November 2019)</p> <ul style="list-style-type: none"> • D03-DC (PM10) – 62.5 µg/m³ • D06-DC (PM10) – 51.3 µg/m³
17 November 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀), D04-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>SUNDAY (17 November 2019)</p> <ul style="list-style-type: none"> • D03-DC (PM10) – 63.5 µg/m³ • D04-DC (PM10) – 58.7 µg/m³ • D06-DC (PM10) – 53.0 µg/m³ <p>As per PA 06_0014, the Department were notified of exceedances and an internal investigation commenced. These days were classified as extraordinary event by DPIE.</p>
19 November 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. This occurred between Tuesday 19 November and Saturday 23 November 2019.</p> <p>The results were as follows:</p>

Date	Summary	Non-Compliance	Details/Response
20 November 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>TUESDAY (19 November 2019)</p> <ul style="list-style-type: none"> D03-DC (PM₁₀) – 52.7 µg/m³ <p>WEDNESDAY (20 November 2019)</p> <ul style="list-style-type: none"> D02-DC (PM₁₀) – 69.6 µg/m³ D03-DC (PM₁₀) – 86.1 µg/m³ D04-DC (PM₁₀) – 77.9 µg/m³ D05-DC (PM₁₀) – 66.1 µg/m³ D06-DC (PM₁₀) – 86.2 µg/m³
21 November 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>THURSDAY (21 November 2019)</p> <ul style="list-style-type: none"> D02-DC (PM₁₀) – 74.4 µg/m³ D03-DC (PM₁₀) – 95.7 µg/m³ D04-DC (PM₁₀) – 94.3 µg/m³ D05-DC (PM₁₀) – 75.0 µg/m³ D06-DC (PM₁₀) – 87.5 µg/m³
22 November 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>FRIDAY (22 November 2019)</p> <ul style="list-style-type: none"> D02-DC (PM₁₀) – 81.9 µg/m³ D03-DC (PM₁₀) – 111.4 µg/m³ D04-DC (PM₁₀) – 109.0 µg/m³ D05-DC (PM₁₀) – 75.7 µg/m³ D06-DC (PM₁₀) – 103.5 µg/m³

Date	Summary	Non-Compliance	Details/Response
23 November 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>SATURDAY (23 November 2019)</p> <ul style="list-style-type: none"> D02-DC (PM10) – 56.5 µg/m³ D03-DC (PM10) – 73.8 µg/m³ D04-DC (PM10) – 61.4 µg/m³ D06-DC (PM10) – 71.5 µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. These days were classified as extraordinary event by DPIE.</p>
26 November 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. This occurred between Tuesday 26 November and Saturday 23 November 2019.</p> <p>The results were as follows:</p> <p>TUESDAY (26 November 2019)</p> <ul style="list-style-type: none"> D02-DC (PM10) – 134.2µg/m³ D03-DC (PM10) – 193.3µg/m³ D04-DC (PM10) – 215.2µg/m³ D05-DC (PM10) – 189.3µg/m³ D06-DC (PM10) – 235.9µg/m³
27 November 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<ul style="list-style-type: none"> D06-DC (PM10) – 235.9µg/m³

Date	Summary	Non-Compliance	Details/Response
28 November 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>WEDNESDAY (27 November 2019)</p> <ul style="list-style-type: none"> D06-DC (PM₁₀) – 67.5µg/m³ <p>THURSDAY (28 November 2019)</p> <ul style="list-style-type: none"> D02-DC (PM₁₀) – 81.5µg/m³ D03-DC (PM₁₀) – 96.3µg/m³ D04-DC (PM₁₀) – 86.9µg/m³ D05-DC (PM₁₀) – 65.7µg/m³ D06-DC (PM₁₀) – 89.6µg/m³
29 November 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>FRIDAY (29 November 2019)</p> <ul style="list-style-type: none"> D02-DC (PM₁₀) – 59.9µg/m³ D03-DC (PM₁₀) – 91.0µg/m³ D04-DC (PM₁₀) – 81.9µg/m³ D05-DC (PM₁₀) – 83.8µg/m³ D06-DC (PM₁₀) – 106.0µg/m³
30 November 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀), D04-DC(PM ₁₀), and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>SATURDAY (30 November 2019)</p> <ul style="list-style-type: none"> D03-DC (PM₁₀) – 69.2µg/m³ D04-DC (PM₁₀) – 66.2µg/m³ D06-DC (PM₁₀) – 73.0µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. These days were classified as extraordinary event by DPIE.</p>

Date	Summary	Non-Compliance	Details/Response
1 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. This occurred between Sunday 1 December and Thursday 5 December 2019.</p> <p>The results were as follows:</p> <p>SUNDAY (1 December 2019)</p> <ul style="list-style-type: none"> • D03-DC (PM10) – 66.6µg/m³ • D04-DC (PM10) – 63.6µg/m³ • D06-DC (PM10) – 60.4µg/m³
2 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>MONDAY (2 December 2019)</p> <ul style="list-style-type: none"> • D02-DC (PM10) – 53.5µg/m³ • D03-DC (PM10) – 92.8µg/m³ • D04-DC (PM10) – 84.0µg/m³ • D05-DC (PM10) – 66.1µg/m³ • D06-DC (PM10) – 95.0µg/m³
3 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>TUESDAY (3 December 2019)</p> <ul style="list-style-type: none"> • D03-DC (PM10) – 55.7µg/m³ <p>WEDNESDAY (4 December 2019)</p> <ul style="list-style-type: none"> • D06-DC (PM10) – 50.8µg/m³.
4 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>THURSDAY (5 December)</p> <ul style="list-style-type: none"> • D03-DC (PM10) – 60.3µg/m³

Date	Summary	Non-Compliance	Details/Response
5 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. These days were classified as extraordinary event by DPIE.
6 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. This occurred between Friday 6 December and Monday 9 December 2019.</p> <p>The results were as follows:</p> <p>FRIDAY (6 December 2019)</p> <ul style="list-style-type: none"> • D03-DC (PM10) – 77.5µg/m³ • D04-DC (PM10) – 60.5µg/m³ • D05-DC (PM10) – 53.4µg/m³ • D06-DC (PM10) – 64.2µg/m³
7 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>SATURDAY (7 December 2019)</p> <ul style="list-style-type: none"> • D02-DC (PM10) – 139.1µg/m³ • D03-DC (PM10) – 188.0µg/m³ • D04-DC (PM10) – 203.7µg/m³

Date	Summary	Non-Compliance	Details/Response
8 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<ul style="list-style-type: none"> D05-DC (PM₁₀) – 231.3µg/m³ D06-DC (PM₁₀) – 189.9µg/m³ <p>SUNDAY (8 December 2019)</p> <ul style="list-style-type: none"> D02-DC (PM₁₀) – 52.0µg/m³ D03-DC (PM₁₀) – 71.9µg/m³ D04-DC (PM₁₀) – 65.2µg/m³ D05-DC (PM₁₀) – 108.9µg/m³ D06-DC (PM₁₀) – 77.8µg/m³
9 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>MONDAY (9 December 2019)</p> <ul style="list-style-type: none"> D02-DC (PM₁₀) – 81.1µg/m³ D03-DC (PM₁₀) – 92.8µg/m³ D05-DC (PM₁₀) – 157.4µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. These days were classified as extraordinary event by DPIE.</p>
10 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. This occurred on Tuesday 10 December and Wednesday 11 December 2019.</p> <p>The results were as follows:</p> <p>TUESDAY (10 December 2019)</p> <ul style="list-style-type: none"> D02-DC (PM₁₀) – 95.8µg/m³ D03-DC (PM₁₀) – 126.7µg/m³

Date	Summary	Non-Compliance	Details/Response
11 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<ul style="list-style-type: none"> D05-DC (PM₁₀) – 158.3µg/m³ D06-DC (PM₁₀) – invalid result <p>WEDNESDAY (11 December 2019)</p> <ul style="list-style-type: none"> D02-DC (PM₁₀) – 135.5µg/m³ D03-DC (PM₁₀) – 178.7µg/m³ D05-DC (PM₁₀) – 215.9µg/m³ D06-DC (PM₁₀) – 181.3µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. These days were classified as extraordinary event by DPIE.</p>
12 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. This occurred on Thursday 12 December and Friday 13 December 2019.</p> <p>The results were as follows:</p> <p>THURSDAY (12 December 2019)</p> <ul style="list-style-type: none"> D02-DC (PM₁₀) – 63.8µg/m³ D03-DC (PM₁₀) – 106.9µg/m³

Date	Summary	Non-Compliance	Details/Response
13 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D05-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<ul style="list-style-type: none"> D04-DC (PM₁₀) – 71.5 µg/m³ D05-DC (PM₁₀) – 156.1µg/m³ D06-DC (PM₁₀) – 93.9µg/m³ <p>FRIDAY (13 December 2019)</p> <ul style="list-style-type: none"> D05-DC (PM₁₀) – 85.8µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. These days were classified as extraordinary event by DPIE.</p>
14 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. This occurred on Saturday 14 December and Sunday 15 December 2019.</p> <p>The results were as follows:</p> <p>SATURDAY (14 December 2019)</p> <ul style="list-style-type: none"> D03-DC (PM₁₀) – 66.2µg/m³ D05-DC (PM₁₀) – 77.5µg/m³ D06-DC (PM₁₀) – 55.8µg/m³
15 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>SUNDAY (15 December 2019)</p> <ul style="list-style-type: none"> D03-DC (PM₁₀) – 50.0µg/m³ D05-DC (PM₁₀) – 83.6µg/m³ D06-DC (PM₁₀) – 52.1µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. These days were classified as extraordinary event by DPIE.</p>

Date	Summary	Non-Compliance	Details/Response
16 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. This occurred between Monday 16 December and Wednesday 18 December 2019.</p> <p>The results were as follows:</p> <p>MONDAY (16 December 2019)</p> <ul style="list-style-type: none"> • D02-DC (PM10) – 69.0µg/m³ • D03-DC (PM10) – 105.5µg/m³ • D04-DC (PM10) – 66.9 µg/m³ • D05-DC (PM10) – 110.3µg/m³ • D06-DC (PM10) – 104.9µg/m³
17 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D05-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>TUESDAY (17 December 2019)</p> <ul style="list-style-type: none"> • D05-DC (PM10) – 54.7µg/m³
18 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>WEDNESDAY (18 December 2019)</p> <ul style="list-style-type: none"> • D03-DC (PM10) – 55.6µg/m³ • D06-DC (PM10) – 56.9µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. These days were classified as extraordinary event by DPIE.</p>

Date	Summary	Non-Compliance	Details/Response
19 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. This occurred between Thursday 19 December and Friday 20 December 2019.</p> <p>The results were as follows:</p> <p>THURSDAY (19 December 2019)</p> <ul style="list-style-type: none"> • D02-DC (PM10) – 70.0µg/m³ • D03-DC (PM10) – 97.4µg/m³ • D04-DC (PM10) – 81.3µg/m³ • D05-DC (PM10) – 111.3µg/m³ • D06-DC (PM10) – 114.7µg/m³
20 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>FRIDAY (20 December 2019)</p> <ul style="list-style-type: none"> • D03-DC (PM10) – 67µg/m³ • D05-DC (PM10) – 50.6µg/m³ • D06-DC (PM10) – 64.7µg/m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. These days were classified as extraordinary event by DPIE.</p>

Date	Summary	Non-Compliance	Details/Response
21 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. This occurred between Saturday 21 December and Sunday 22 December 2019.</p> <p>The results were as follows:</p> <p>SATURDAY (21 December 2019)</p> <ul style="list-style-type: none"> • D02-DC (PM10) – 99µg/m³ • D04-DC (PM10) – 104.5µg/m³ • D06-DC (PM10) – 96.5µg/m³ • D03-DC (PM10) – 130µg/m³ • D05-DC (PM10) – 90.6µg/m³
22 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>SUNDAY (22 December 2019)</p> <ul style="list-style-type: none"> • D06-DC (PM10): 71.9µg/ m³ • D03-DC (PM10): 60.5µg/ m³ • D05-DC (PM10): 59.2µg/ m³ <p>As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. These days were classified as extraordinary event by DPIE.</p>
27 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>The 24 hour averaging results from Mangoola Open Cut's TEOM's were over the 24 hour averaging PM₁₀ criterion of 50ug/m³. This occurred between Friday 27 December and Tuesday 31 December 2019.</p> <p>The results were as follows:</p>

Date	Summary	Non-Compliance	Details/Response
28 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>FRIDAY (27 December 2019)</p> <ul style="list-style-type: none"> D03-DC (PM10) – 50.9µg/m³ D06-DC (PM10) – 61.0µg/m³ <p>SATURDAY (28 December 2019)</p> <ul style="list-style-type: none"> D03-DC (PM10) – 51.3µg/m³ D06-DC (PM10) – 56.6µg/m³
29 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀), (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>SUNDAY (29 December 2019) –</p> <ul style="list-style-type: none"> D03-DC (PM10) – 67.9µg/ m³ <p>MONDAY (30 December 2019)</p> <ul style="list-style-type: none"> D02-DC (PM10) – 56.3µg/m³ D03-DC (PM10) – 83.1µg/m³ D04-DC (PM10) – 65.5µg/m³ D05-DC (PM10) – 65.5µg/m³ D06-DC (PM10) – 68.3µg/m³
30 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D02-DC(PM ₁₀), D03-DC(PM ₁₀), D04-DC(PM ₁₀), D05-DC(PM ₁₀) and D06-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	<p>TUESDAY (31 December 2019)</p> <ul style="list-style-type: none"> D03-DC (PM10) – 56.8µg/m³ D04-DC (PM10) – 56.3µg/m³

Date	Summary	Non-Compliance	Details/Response
31 December 2019	Exceedance of 24hr averaging period (PM ₁₀ criterion) at D03-DC(PM ₁₀) and D04-DC(PM ₁₀) (refer Figure 7)	PA 06_0014 Air Quality Management Plan	As per PA 06_0014, the Department were notified of the exceedances and an internal investigation commenced. These days were classified as extraordinary event by DPIE.

12 Activities to be Completed in the Next Reporting Period

12.1 Management Plan Review

In accordance with Schedule 5, Condition 9 of PA06_0014 the following strategies, plans and programs will be reviewed and/or revised in 2020 as necessary, as listed in **Table 46**.

Table 46 Revision of Strategies, Plans and Programs

Document	2020 Review	Comment
Air Quality Management Plan	Reviewed	No change required.
Noise Management Plan	Reviewed	No change required.
Environmental Management Strategy	Reviewed	No change required.
Conservation Management Strategy	Reviewed	No change required.
Blast Management Plan	Revise and Update	No change required.
Blast Fume Management Procedure	Reviewed	No change required.
Water Management Plan	Reviewed	No change required.
Surface Water Monitoring Plan	Reviewed	No change required.
Groundwater Monitoring Plan	Reviewed	NOTE: Seeking approval from Natural Resource Access Regulator as per 20BL172598 prior to submitting to DPIE.
Surface and Groundwater Response Plan	Reviewed	No change required.
Erosion and Sediment Control Plan	Reviewed	No change required.
Site Water Balance	Update	No change required.
Aboriginal Cultural Heritage Management Plan	Reviewed	No change required.
Biodiversity Offset Management Plan and Strategy	Reviewed	No change required.
Translocation Management Plan	Reviewed	No change required.
Energy Savings Action Plan	Reviewed	No change required.
MOP 2016-2019	Reviewed	No change required.
AL9 and EL 5552 Groundwater Monitoring and Modelling Plan	Reviewed	No change required.
AL9 Community Consultation Strategy	Reviewed	No change required.

12.2 2020 Actions

Table 47 outlines the actions to be implemented during the 2020 reporting period.

Table 47 2020 Actions

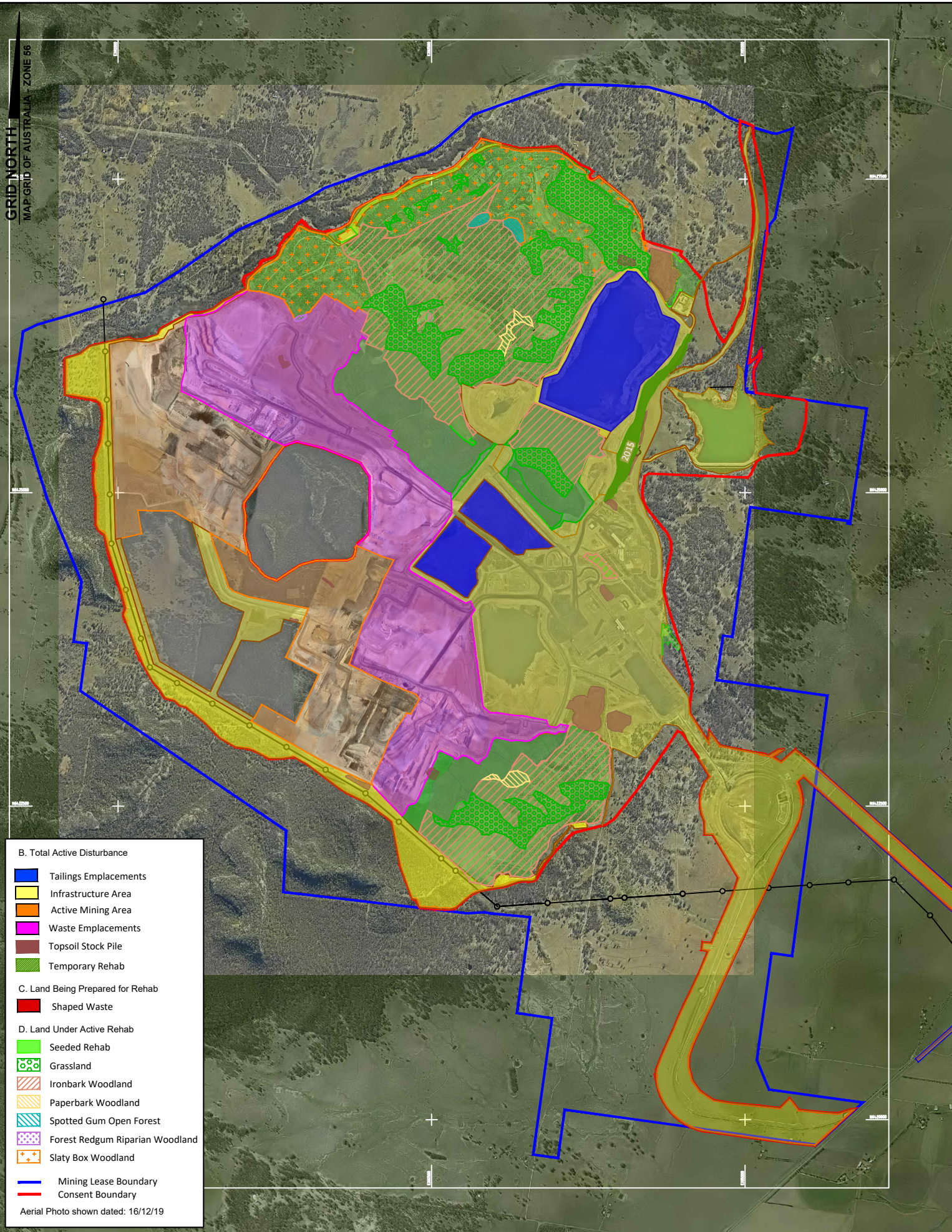
Action	Due Date
A new MOP was approved on the 20 December 2019 for the period of 2020 calendar year with revision to occur during 2020 for further years.	September 2020
Complete actions required from IEA undertaken 2019 that are required to be completed in 2020.	Various – As per audit action plan available on company website
In response to high levels of complaints in 2019, additional attended noise monitoring will again be undertaken to the north-west of operations through the winter period 2020 to ensure site operates within approved noise criteria.	June to August 2020
In response to changes to increasing noise complaints north west the operation, review the continuous noise monitoring network to determine whether continuous noise monitoring units can be relocated to provide better coverage north west of mining operations.	June 2020
Supplementary plantings of canopy and shrub species will be undertaken based on the BOMP.	When the drought has broken.
Continuation of the rehabilitation research and trials for threatened terrestrial orchid translocation, continued development to increase the seed mix species diversity, particularly in the ground cover and shrub layer, the establishment of additional aquatic habitat features, and a focus on achieving the rehabilitation targets as outlined in the approved MOP.	31 December 2020

13 References

- AGE (2019a) *Mangoola Coal Continued Operations Groundwater Impact Assessment (G1839F)*.
- AGE (2019b) *Mangoola Coal Mine – Groundwater Model Three-Year Inflow And Impact Prediction Validation (G1839S)*.
- AGE (2019c) *Mangoola Coal Mine – Review of Annual Monitoring Bore Exceedances (G1839Y)*.
- Australian and New Zealand Environment Conservation Council (ANZECC) (2000) *National Water Quality Management Strategy: Australia Guidelines for Fresh and Marine Water Quality*.
- Biosis (2020) *Mangoola Coal Stream Health Monitoring Program: Autumn and Spring 2019*.
- Department of Environment and Climate Change NSW (DECC) (2008) *Managing Urban Stormwater: Soils and Construction Volume 2E Mines and Quarries, DECC, Sydney NSW*.
- Eastcoast Flora Survey (2020) *Monitoring of Translocated Threatened Orchids (Diuris tricolor, Prasophyllum petilum) at Mangoola Coal: 2019 Results*.
- EMM (2013) *Mangoola Coal Modification 6 Noise and Vibration Assessment*.
- Engeny (2020) *Mangoola Open Cut 2019 Water Balance Summary – Letter Report to Mangoola Open Cut*.
- Environment Protection Authority (2017) *Noise Policy for Industry*.
- Glencore (2018) *Mangoola Coal Operations – Plan for Surface Water and Groundwater Response*
- HLM (2019) *Annual Channel Stability Report (Year 12)*.
- Landcom (2004) *Managing Urban Stormwater: Soils and Construction Volume 1, 4th Edition*.
- Mackie Environmental Research (2006) *Anvil Hill Project: Groundwater Management Studies*.
- Mangoola Open Cut (2018) *Mangoola Open Cut Mining Operations Plan 2016 to 2019 Amendment B*.
- NSW Government (2015) *Annual Review Guideline*.
- Todoroski Air Sciences (2013) *Air Quality and Greenhouse Gas Assessment Mangoola Coal*.
- Umwelt (2014) *Mangoola Coal Groundwater Monitoring Plan*
- Umwelt (2019) *Mangoola Coal 2019 – Conservation Agreement Monitoring Report*.
- Umwelt (2020a) *Mangoola Open Cut – 2019 Ecological Monitoring Report*.
- Umwelt (2020b) *Outcomes of Nest Box Monitoring in Biodiversity Offset Areas, Corridors and Rehabilitation Areas of Mangoola Open Cut – 2019*.
- WRM (2013) *Mangoola Coal Modification to Project Approval Surface Water Assessment*.

APPENDIX A

Annual Review Plan



B. Total Active Disturbance

- Tailing Emplacements
- Infrastructure Area
- Active Mining Area
- Waste Emplacements
- Topsoil Stock Pile
- Temporary Rehab

C. Land Being Prepared for Rehab

- Shaped Waste

D. Land Under Active Rehab

- Seeded Rehab
- Grassland
- Ironbark Woodland
- Paperbark Woodland
- Spotted Gum Open Forest
- Forest Redgum Riparian Woodland
- Slaty Box Woodland

- Mining Lease Boundary
- Consent Boundary

Aerial Photo shown dated: 16/12/19

SITE :
MANGOOLA

DEPARTMENT :
SURVEY

DATUM:
A.H.D.

DRAWN :
MPN

DATE :
24/01/20

SIGN:

SCALE :
NTS

GLENCORE

Mangoola Coal Operations Pty Ltd
Wybong Road, Muswellbrook NSW 2333 Australia
P.O. Box 495 Muswellbrook NSW 2333 Australia

TITLE:

Rehabilitation / Mining Summary 2019

DRAWING No. : 200120-GEN-EN-417-MN-R0

File No. :

REV. SHEET

0 A4

APPENDIX B

Long Term Trend Graph – Rainfall

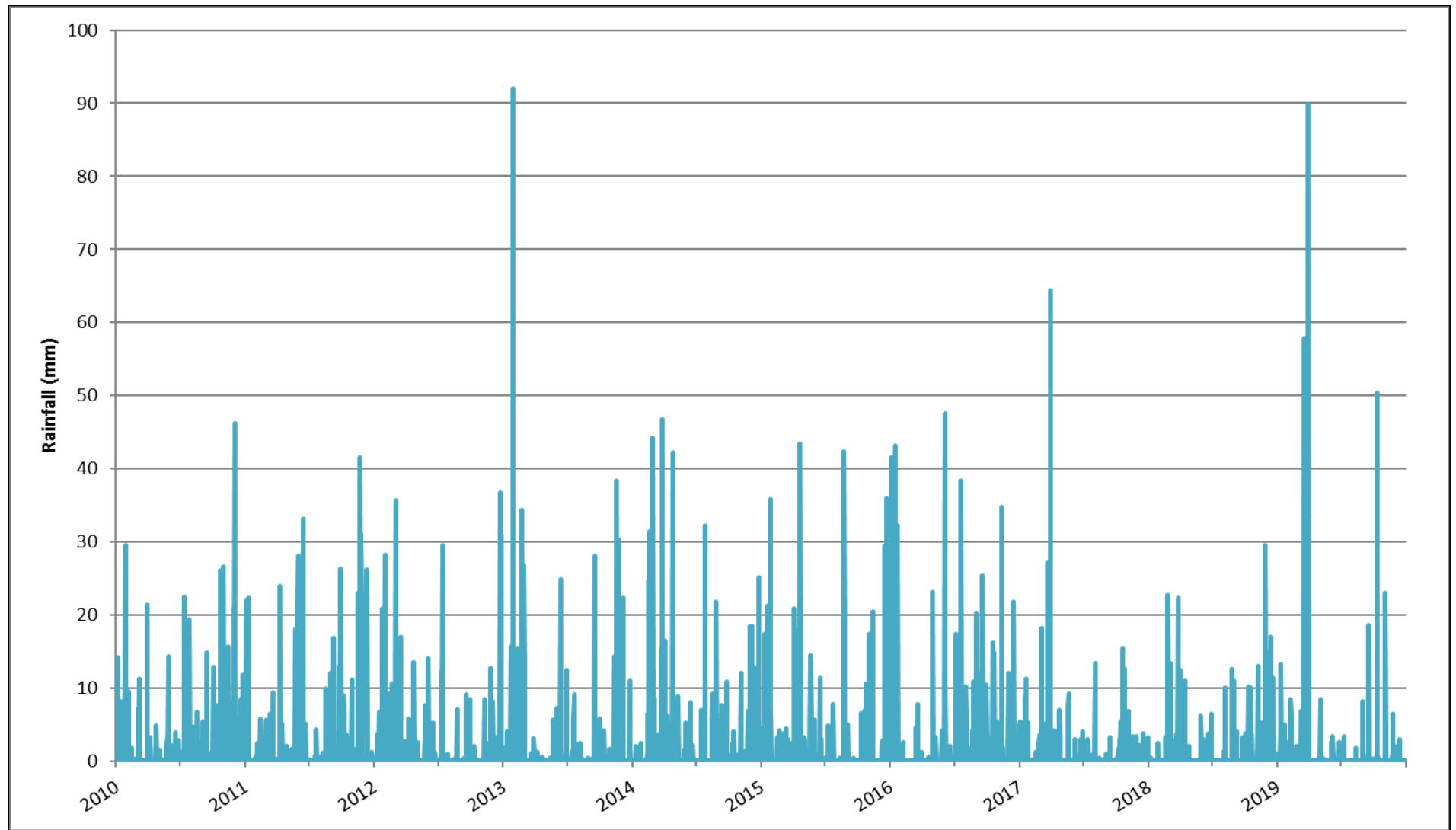


Figure 18 Long term Rainfall Data at WSN – 2010 to 2019

APPENDIX C

Long Term Trend Graphs – Air Quality

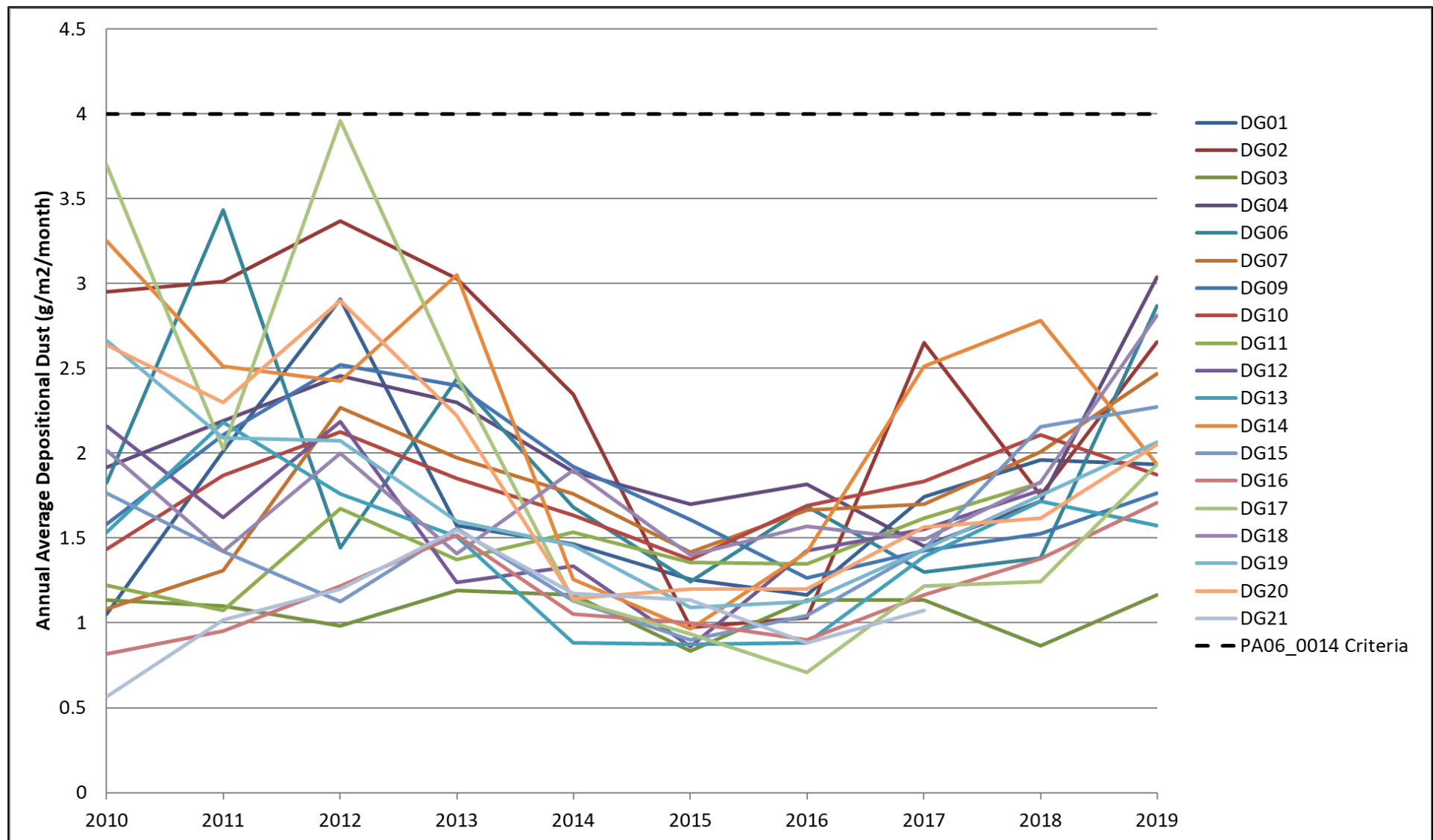


Figure 19 Long Term Annual Average Depositional Dust Monitoring Results – 2010 to 2019

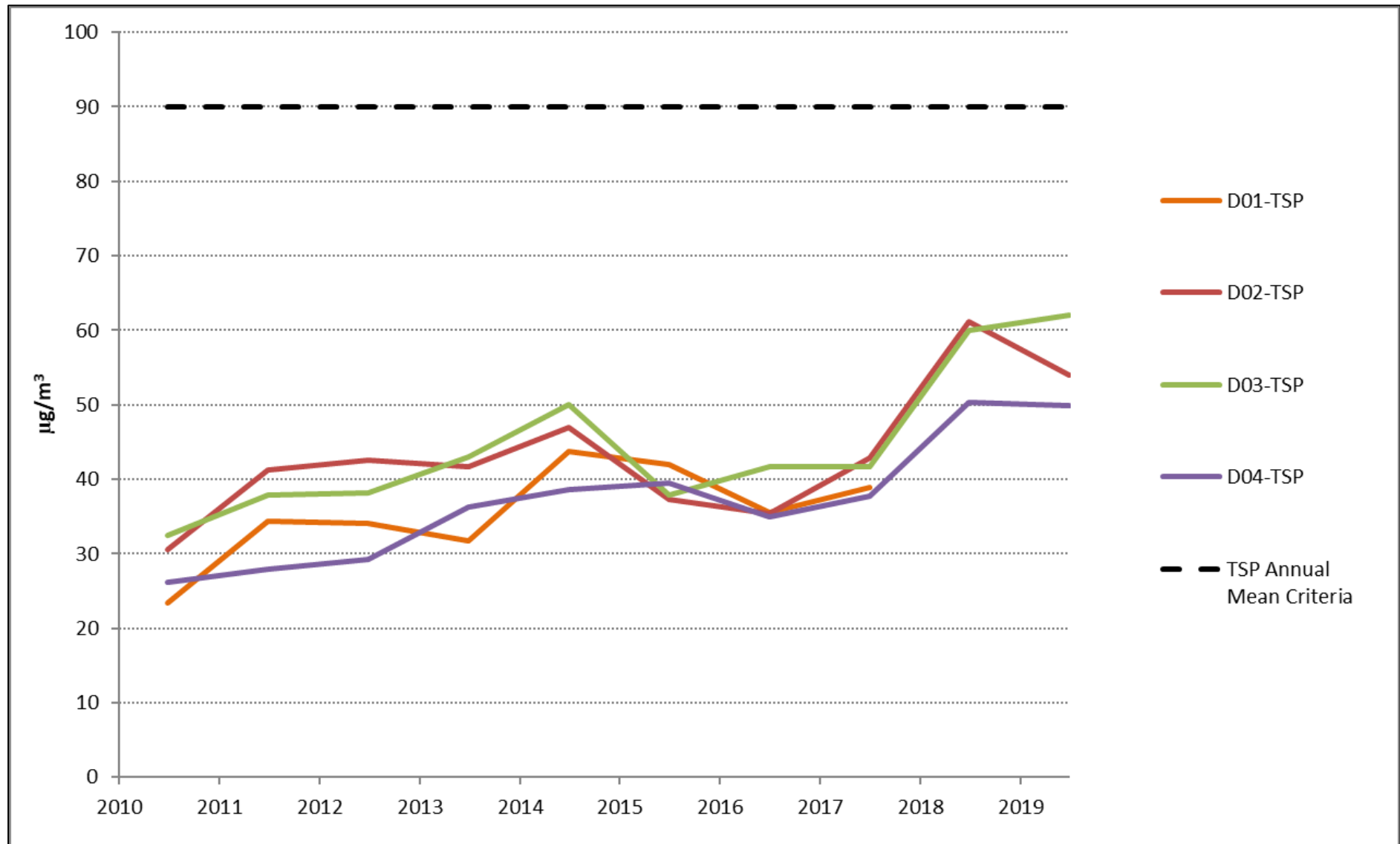


Figure 20 Long Term Annual Average TSP HVAS Monitoring Results – 2010 to 2019

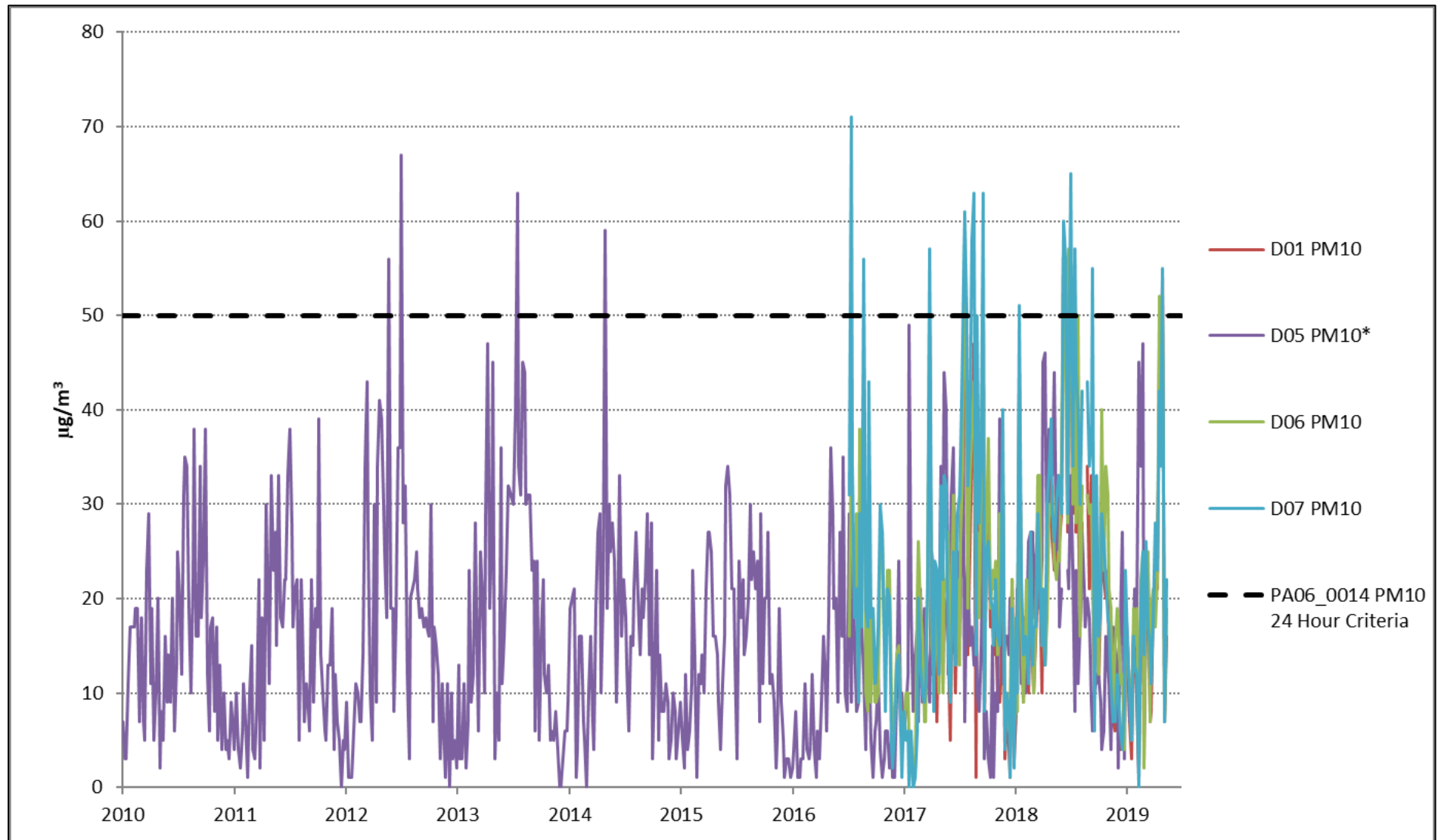


Figure 21 Long Term 24h PM₁₀ HVAS Monitoring Results – 2010 to 2019

* Note that D05-PM₁₀ is the only monitor representative of a private receptor.

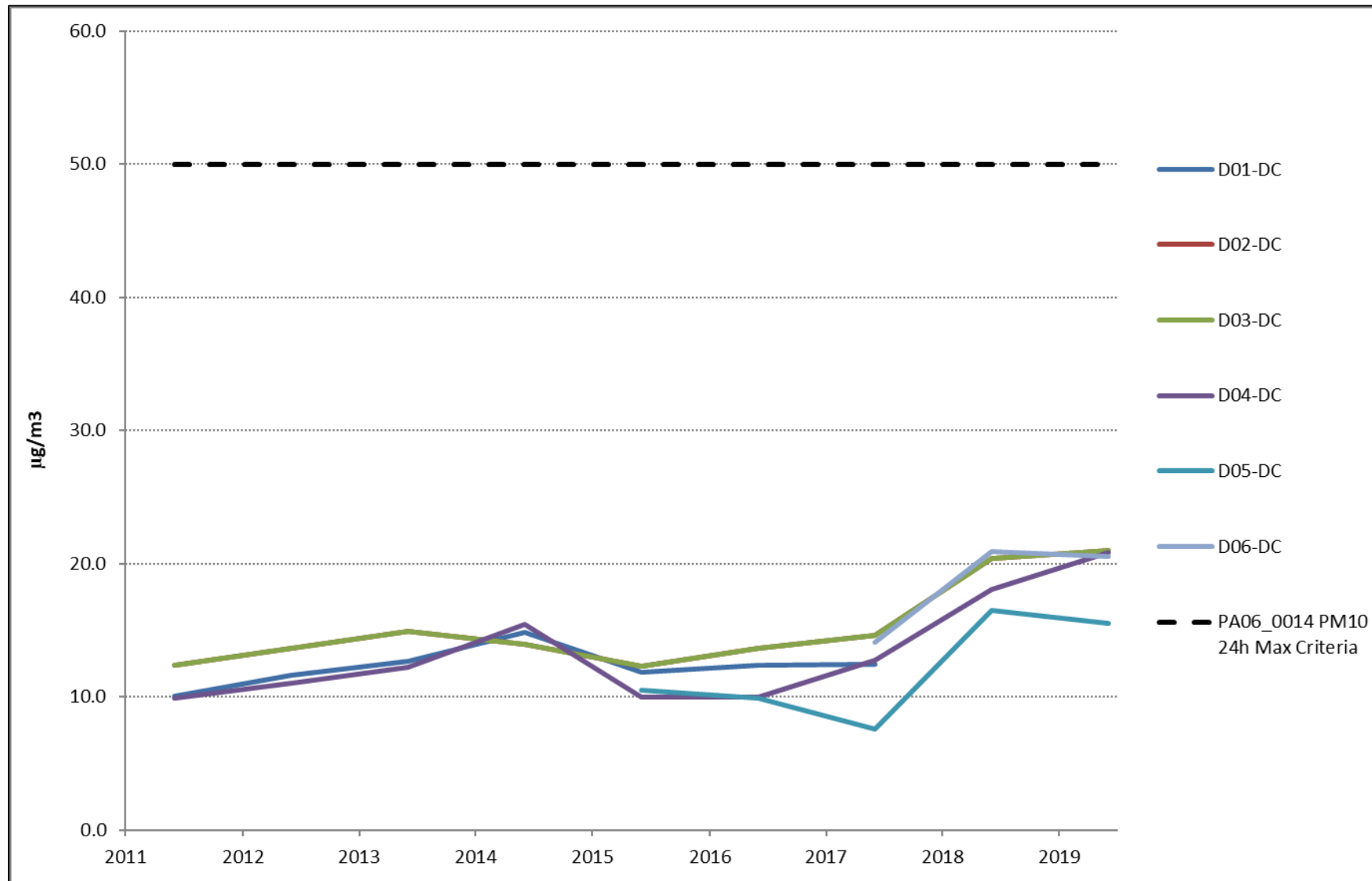


Figure 22 Long Term Annual Average PM₁₀ TEOM Monitoring Results – 2011 to 2019

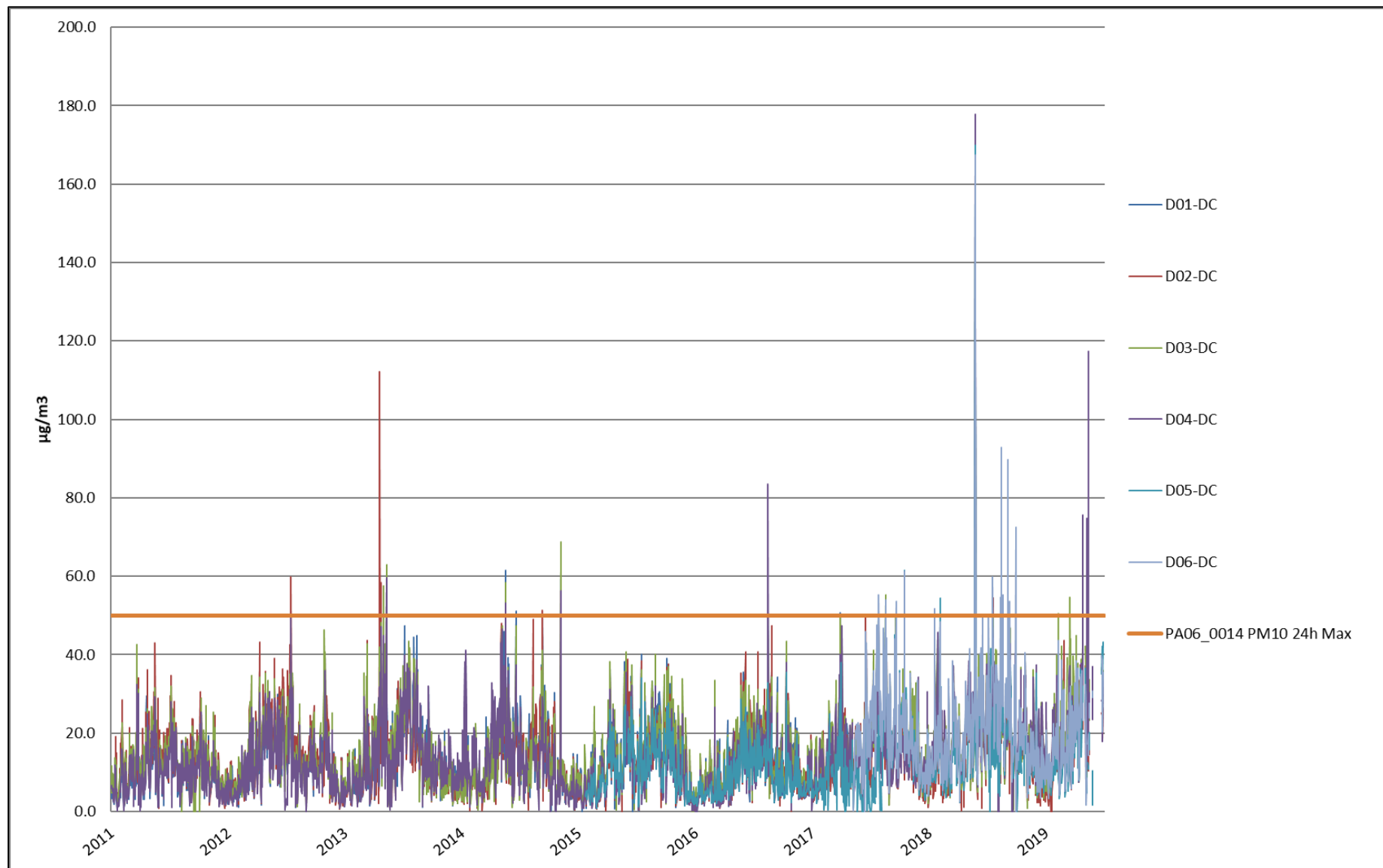


Figure 23 Long Term 24h PM₁₀ TEOM Monitoring Results – 2011 to 2019

APPENDIX D

Long Term Trends Graphs – Blasting

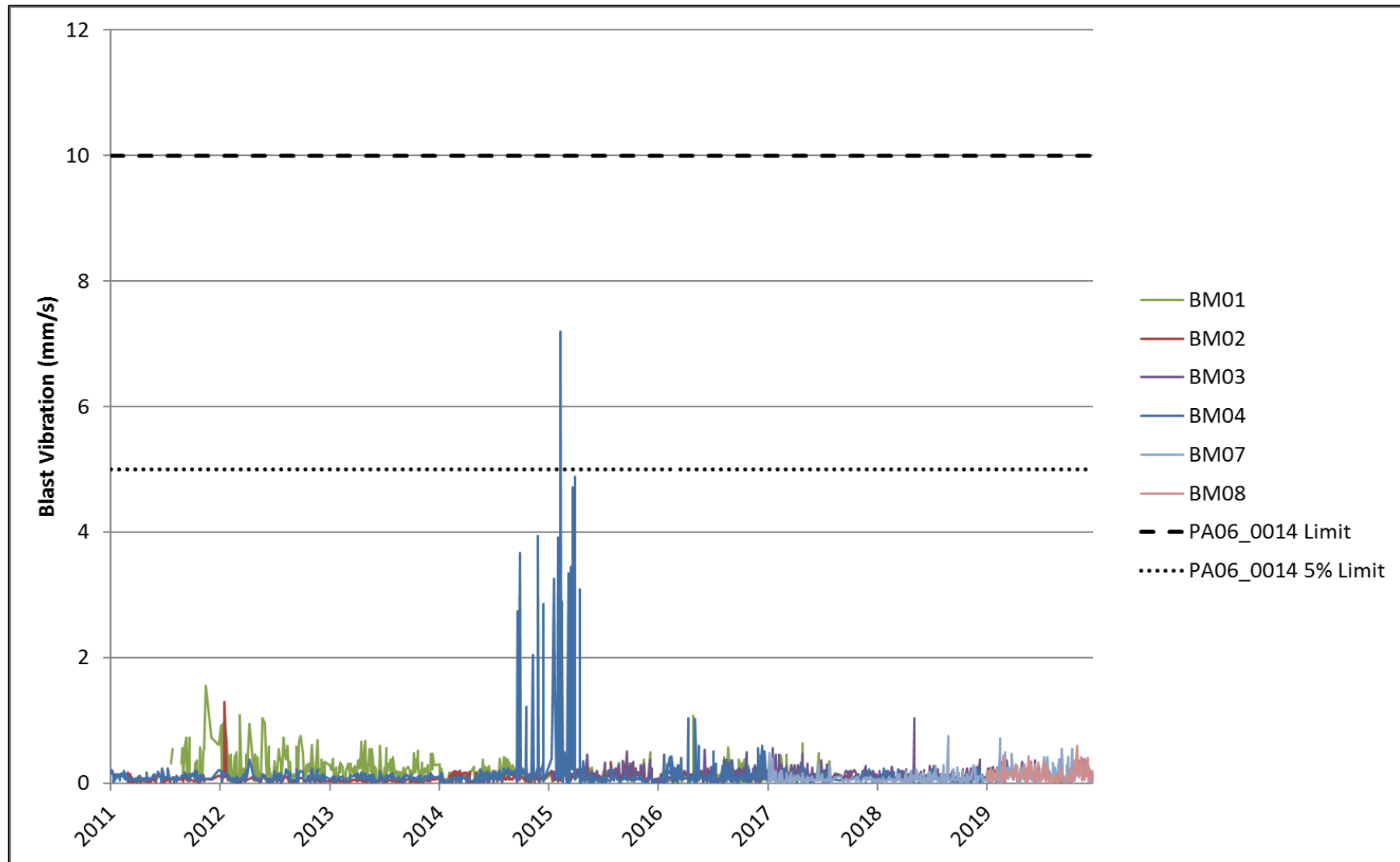


Figure 24 Long Term Blast Vibration Monitoring – BM01 to BM04 and BM07 to BM08

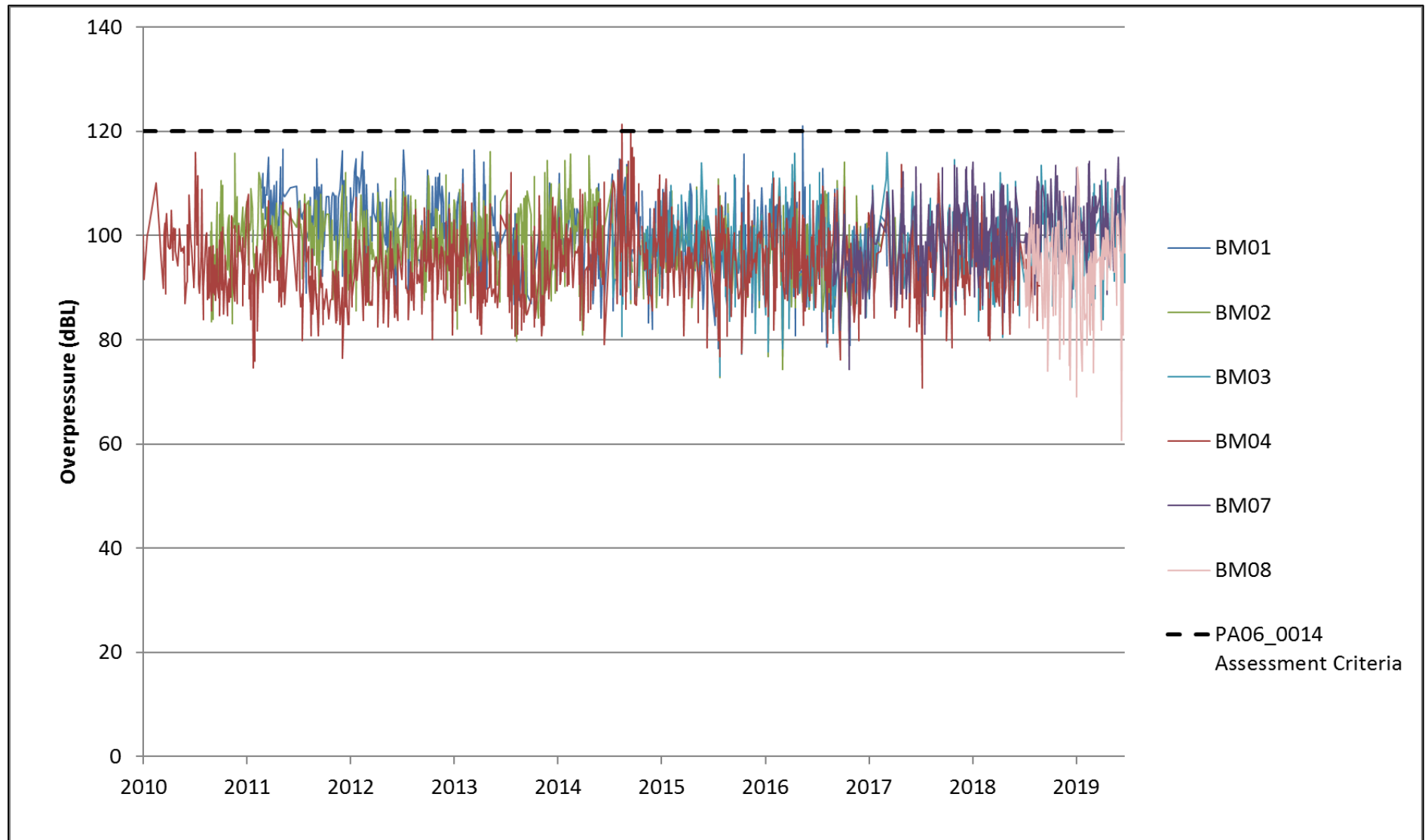


Figure 25 Long Term Overpressure Monitoring – BM01 to BM04 and BM07 to BM08

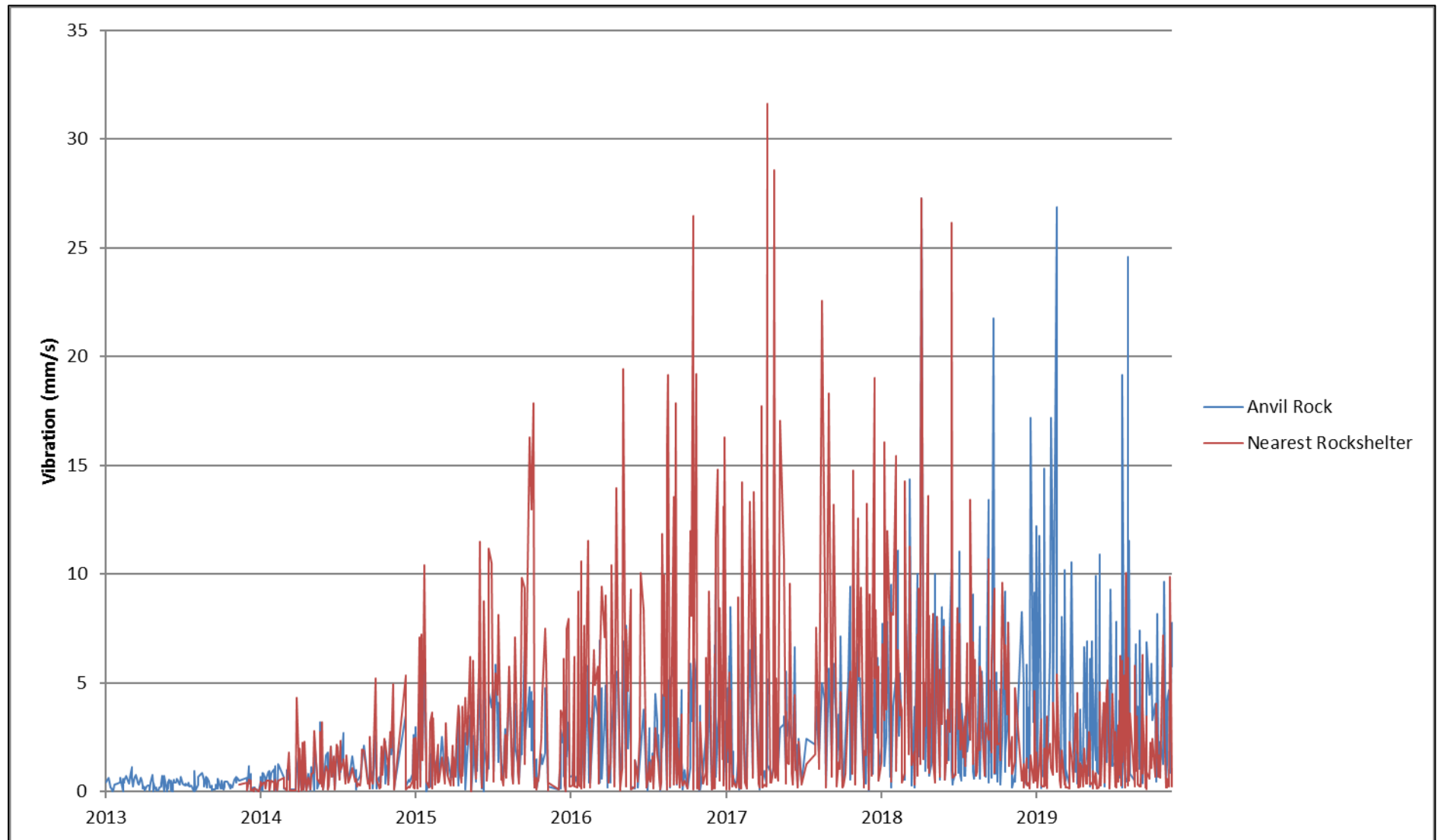


Figure 26 Long Term Blast Vibration Monitoring – Representative of Anvil Rock and Nearest Formation

APPENDIX E

Long Term Graphs – Surface and Groundwater

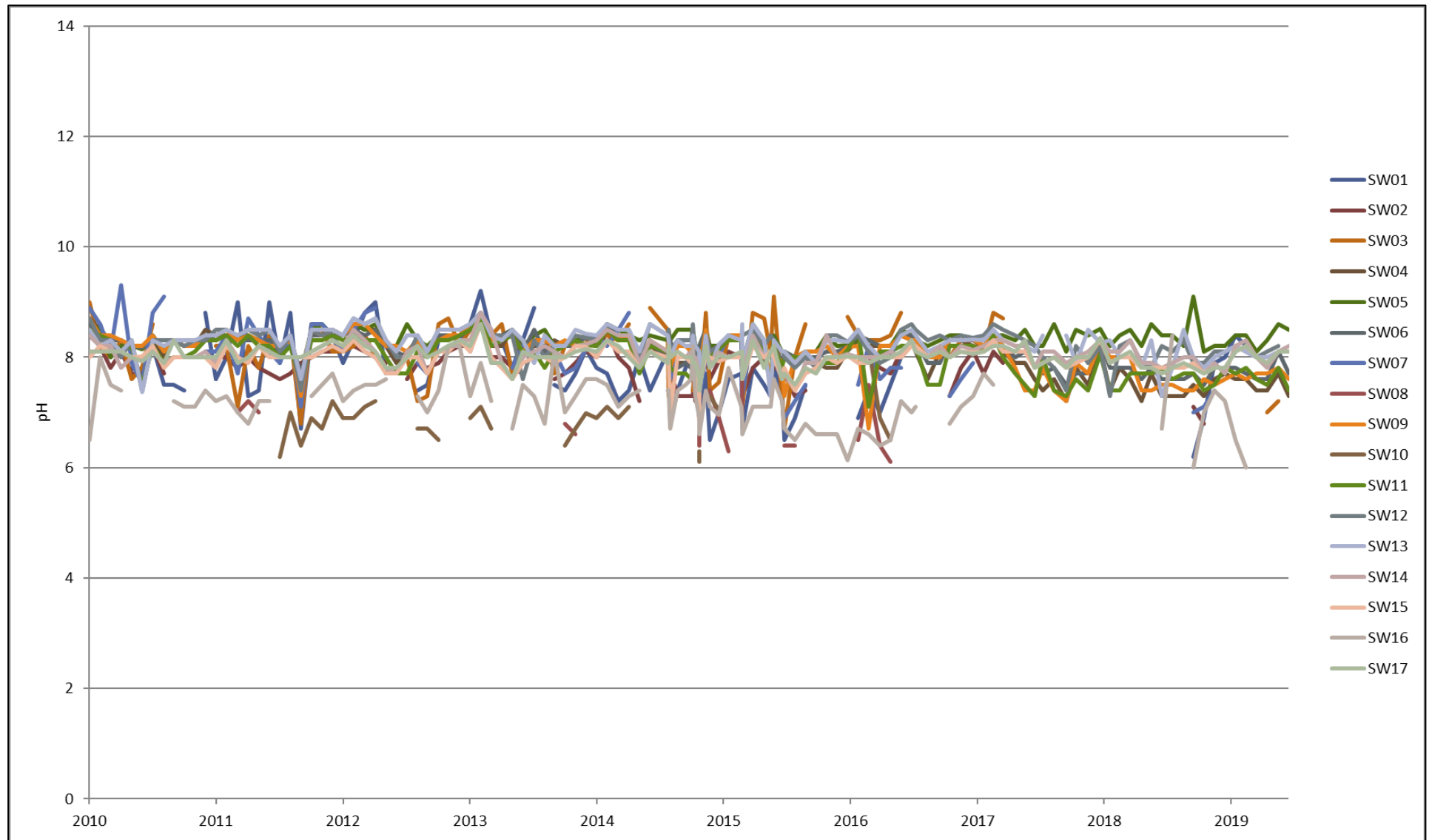


Figure 27 Long Term Surface Water pH – 2010 to 2019

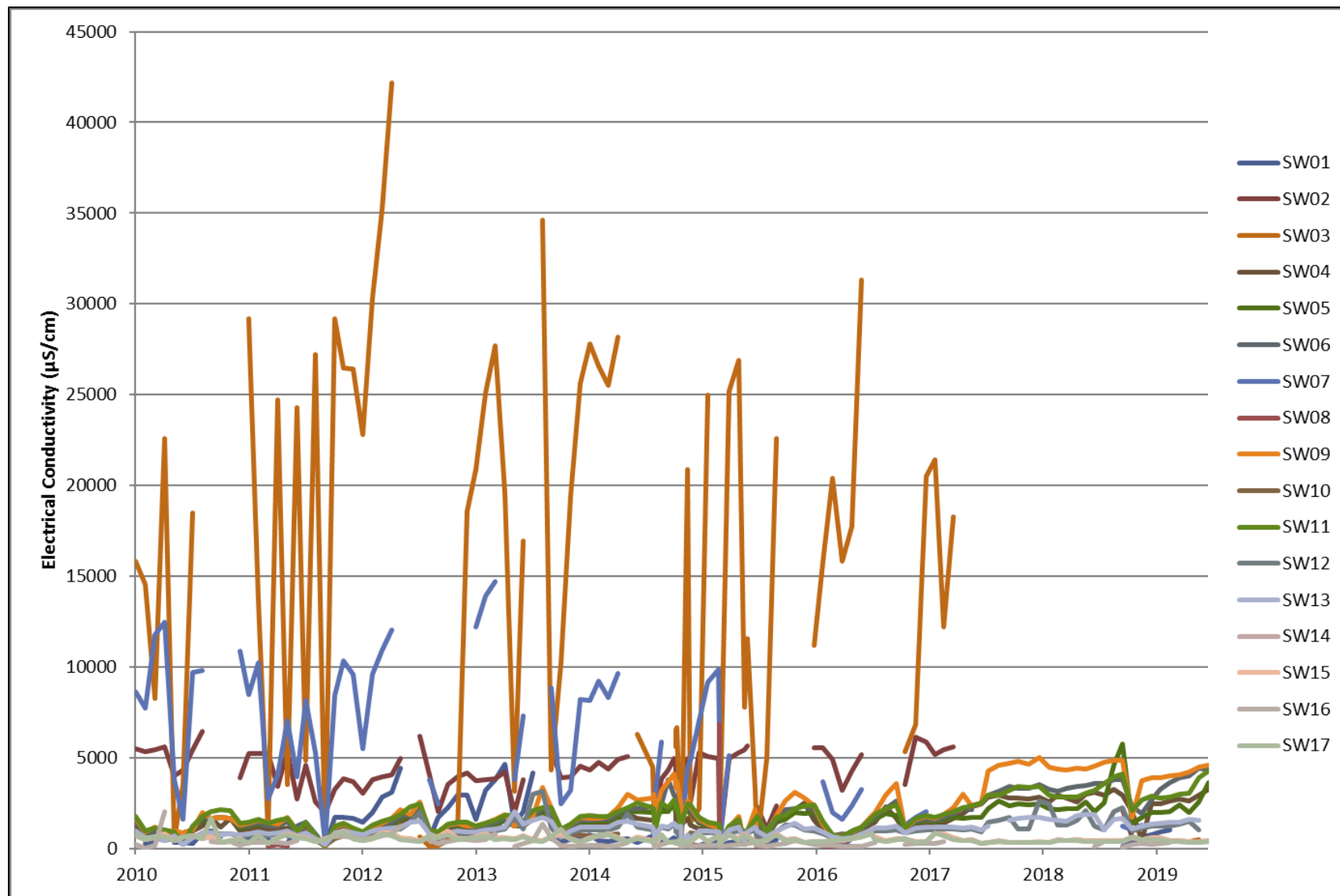


Figure 28 Long Term Surface Water EC – 2010 to 2019

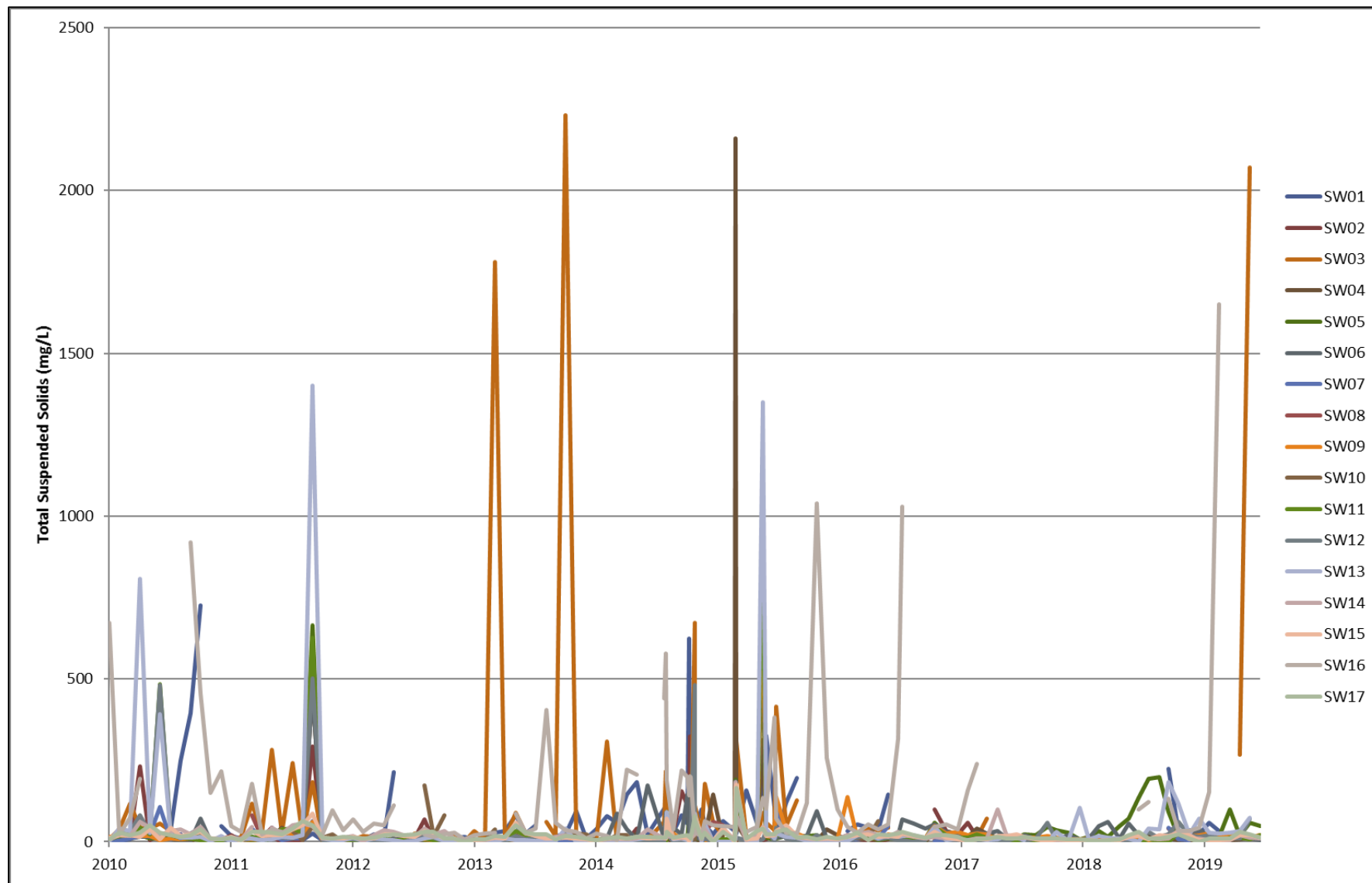


Figure 29 Long Term Surface Water TSS – 2010 to 2019

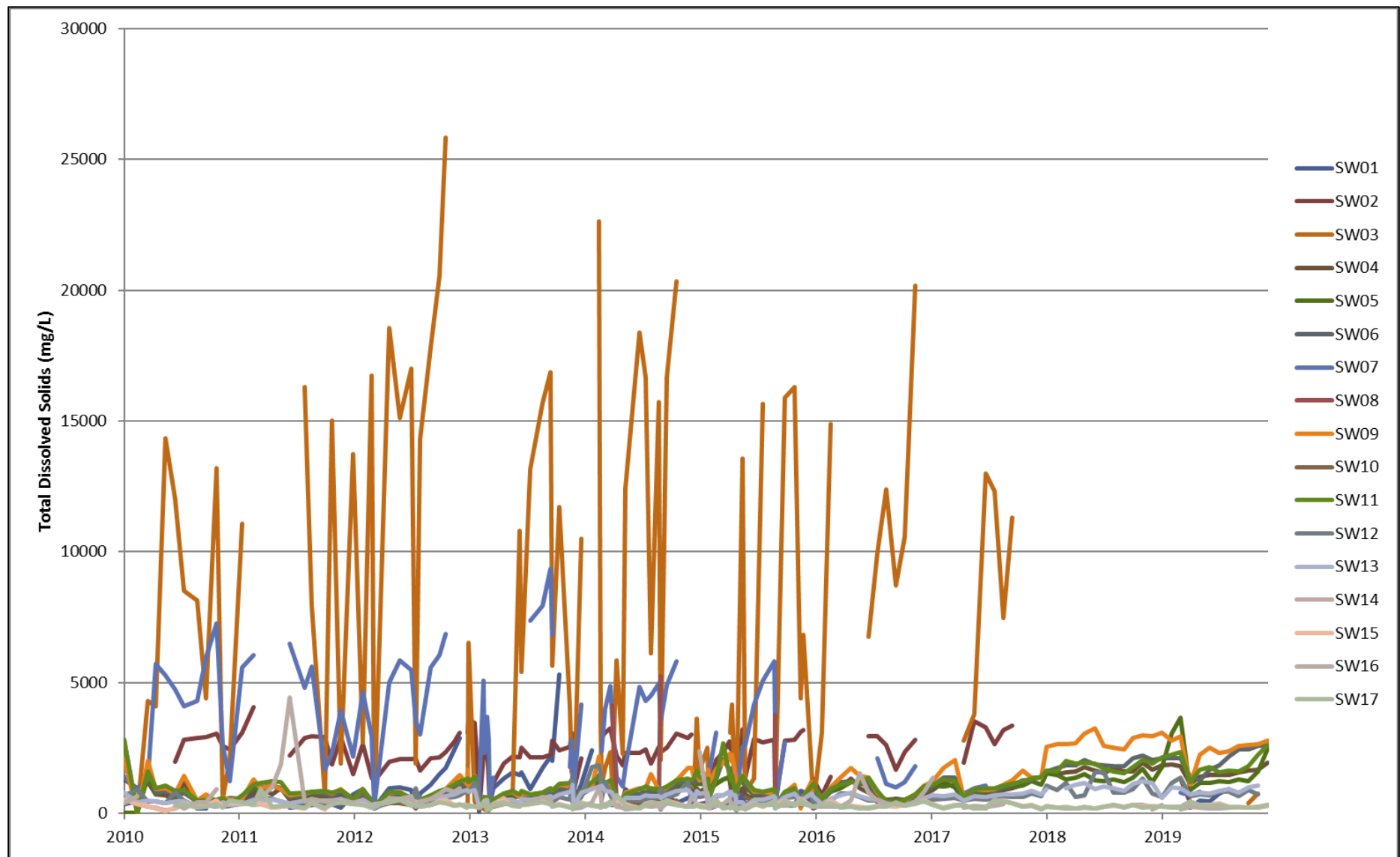


Figure 30 Long Term Surface Water TDS – 2010 to 2019

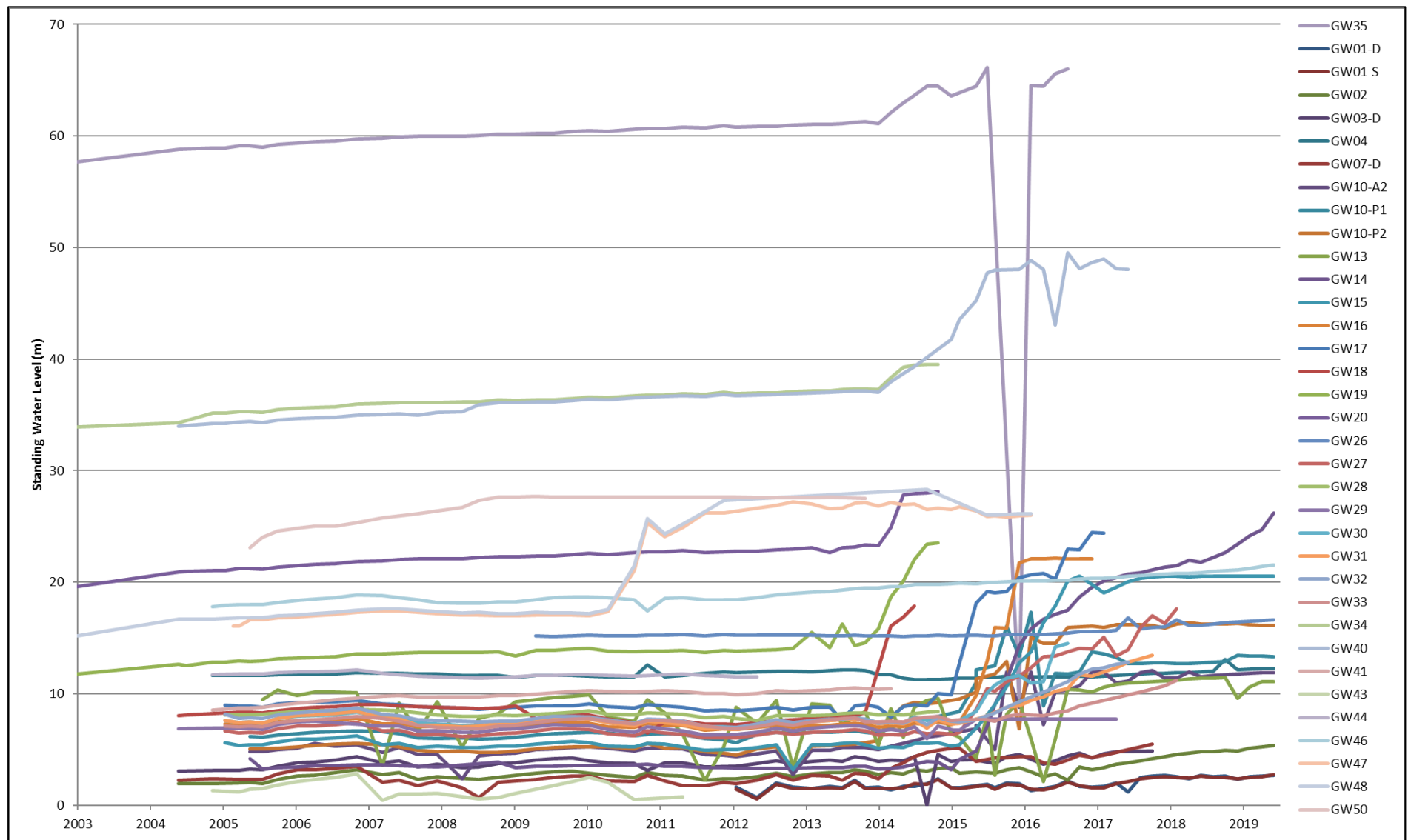


Figure 31 Standing Water Level GW Bores – 2003 to 2019

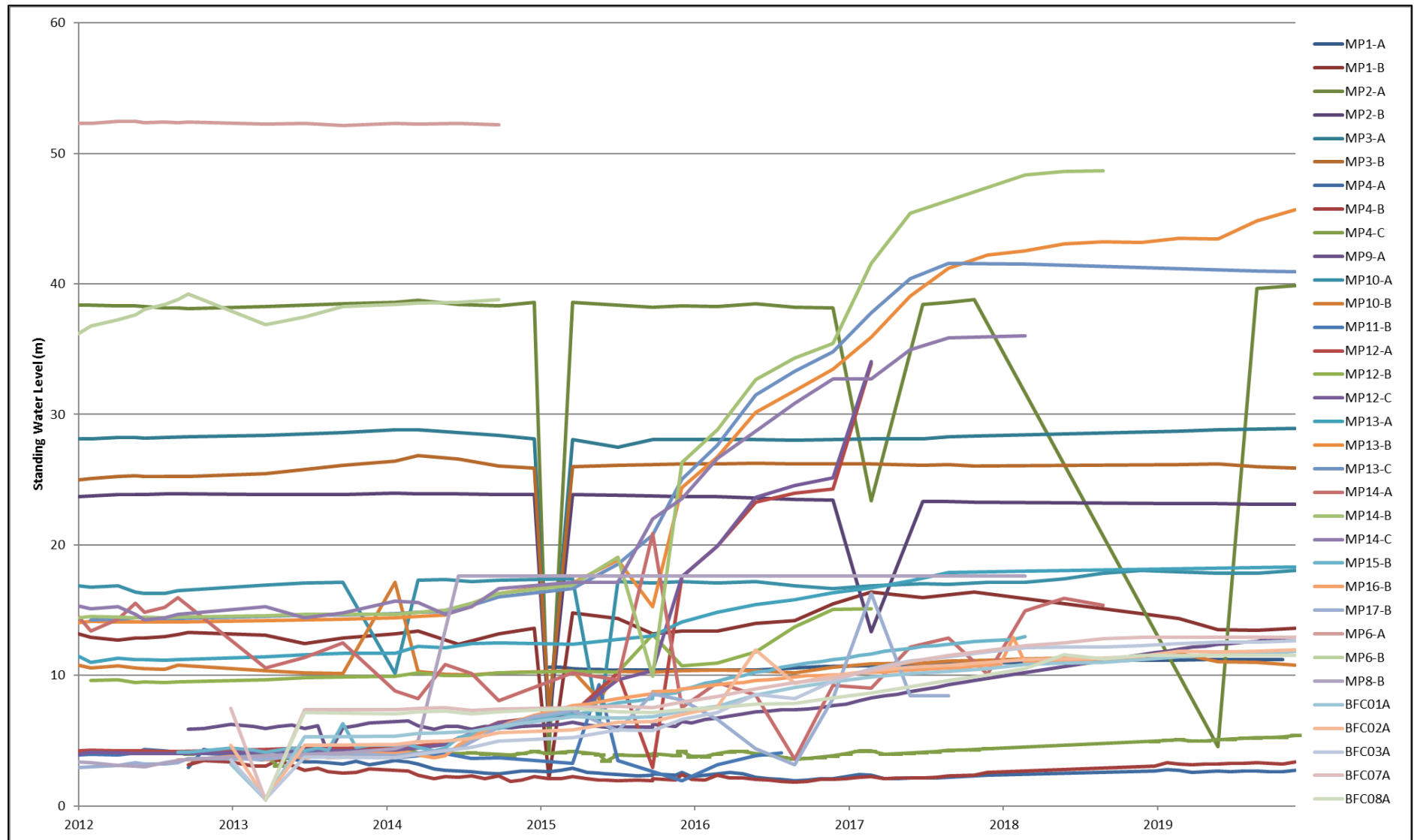


Figure 32 Standing Water Level MP and BFC Bores – 2012 to 2019

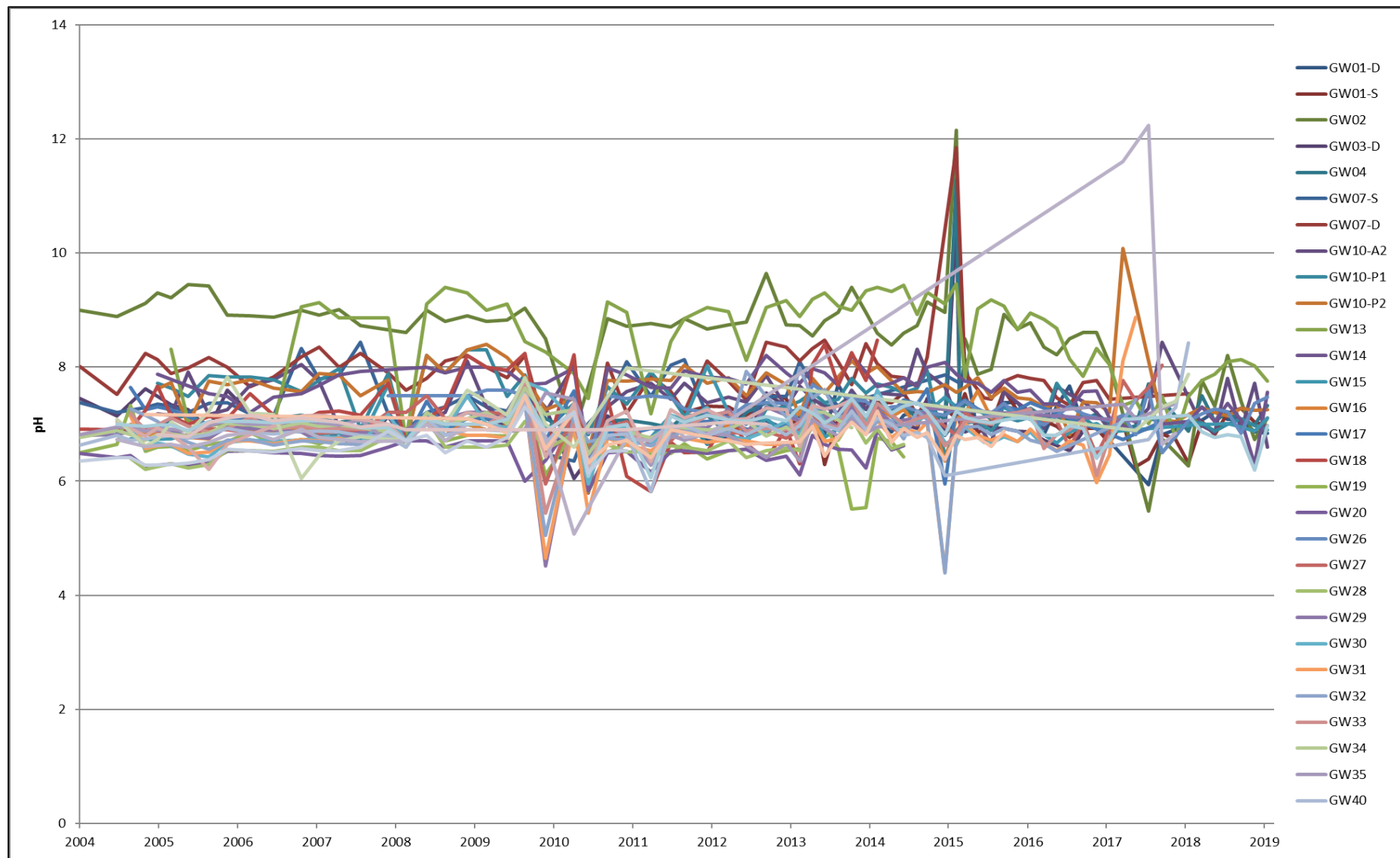


Figure 33 GW Bores pH – 2004 to 2019

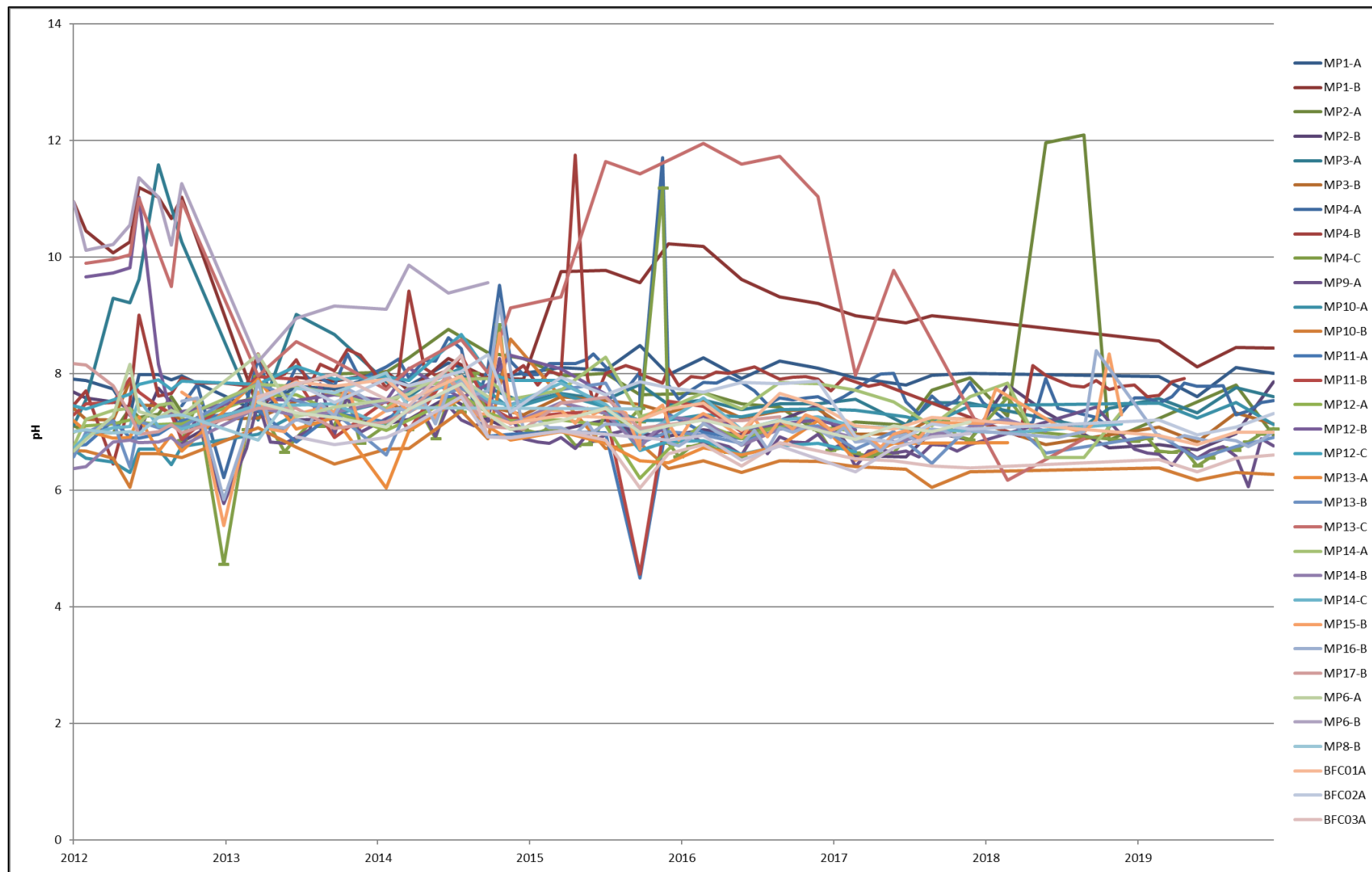


Figure 34 MP and BFC Bores pH – 2012 to 2019

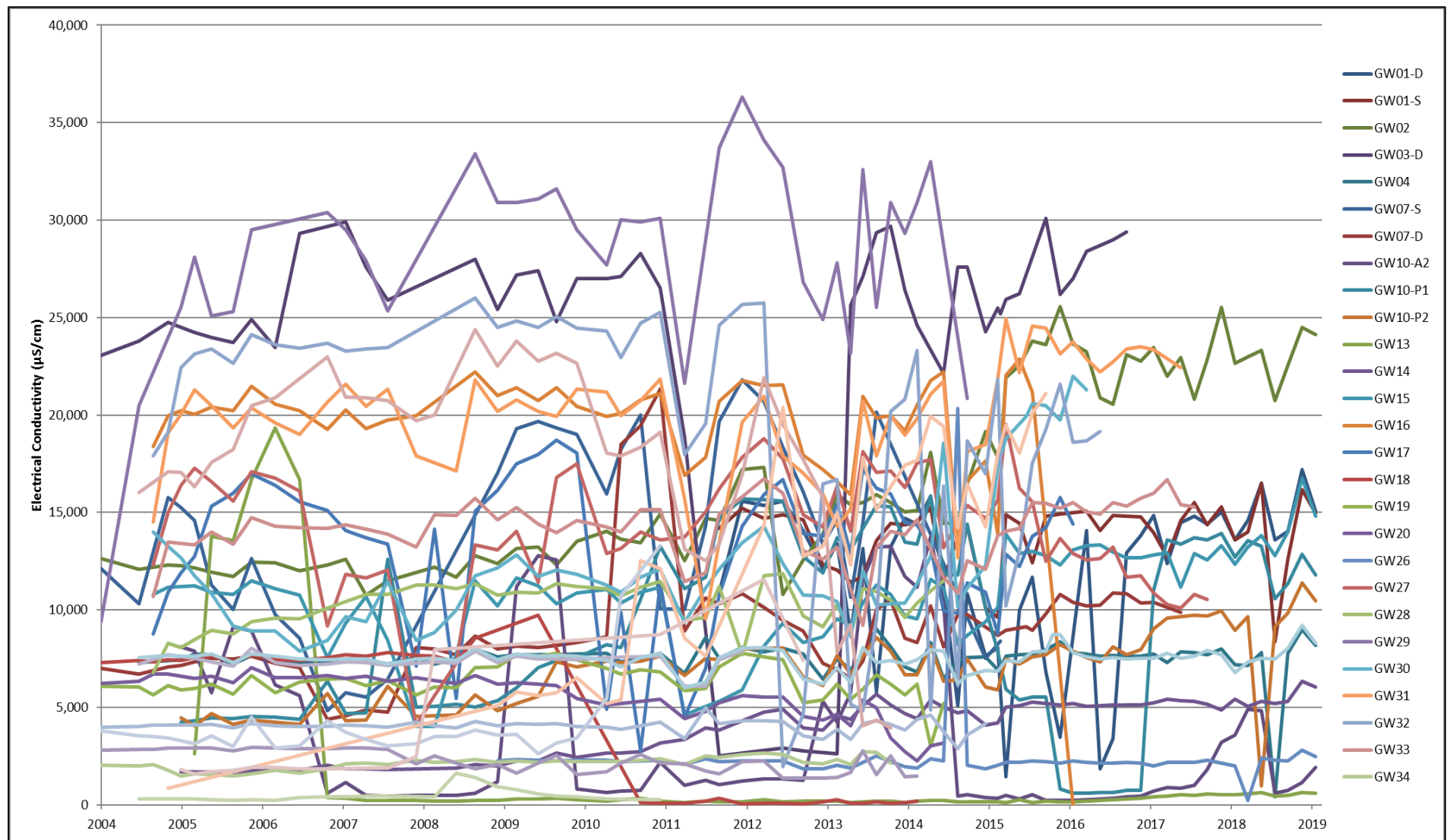


Figure 35 GW Bores EC – 2004 to 2019

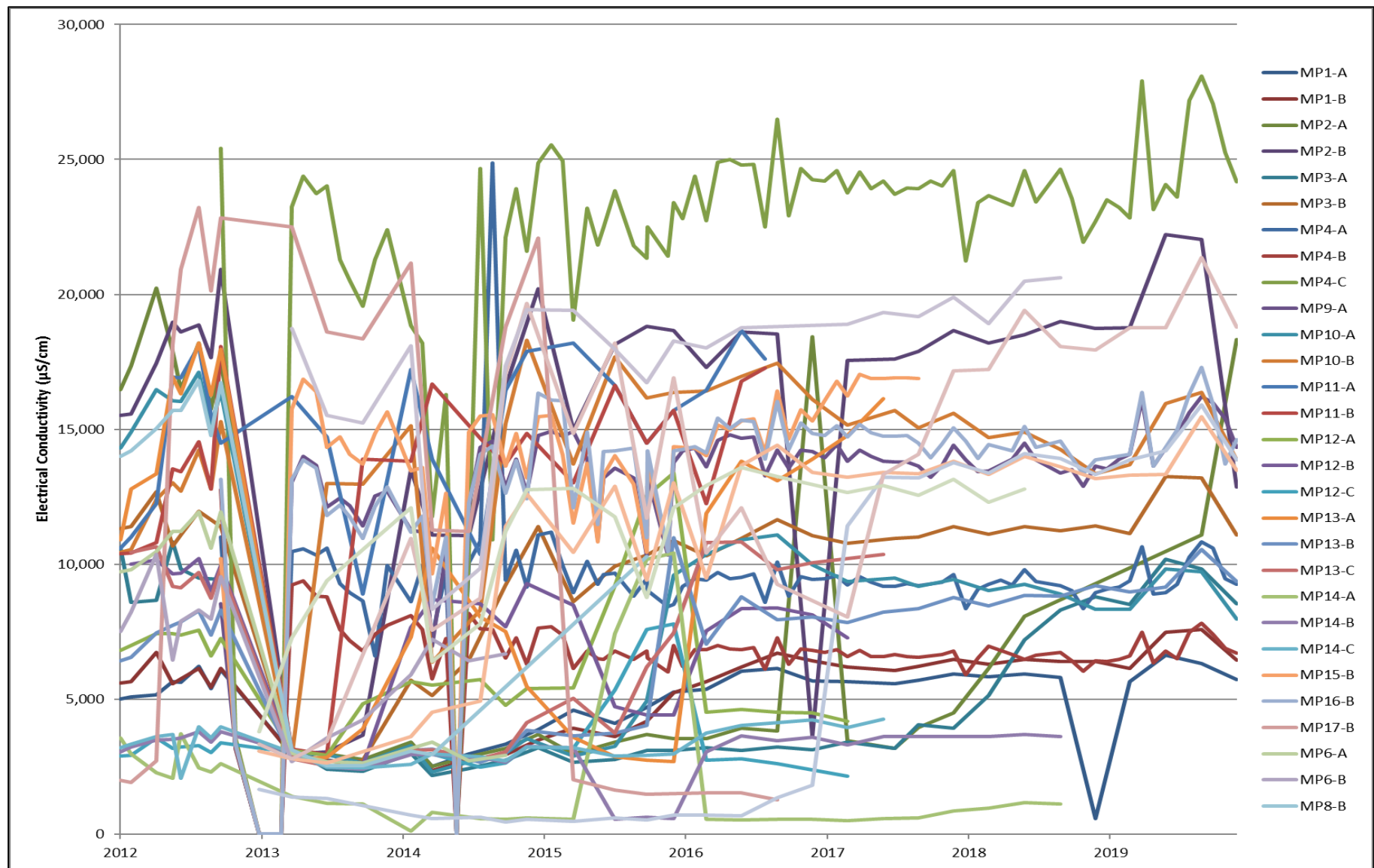


Figure 36 MP and BFC Bores EC – 2012 to 2019

APPENDIX F

Annual Train Movements 2019

Start Date	Incoming	Outgoing	Total Movements	Tonnes
01-Jan-19	2	2	4	17800.1
02-Jan-19	3	3	6	27095.2
03-Jan-19	5	5	10	45720.2
04-Jan-19	5	4	9	36008.3
05-Jan-19	3	3	6	27114.7
06-Jan-19	3	4	7	36483.1
07-Jan-19	6	6	12	54227.2
08-Jan-19	6	5	11	45750.9
09-Jan-19	4	4	8	36421.3
10-Jan-19	2	2	4	18220.4
11-Jan-19	4	4	8	36273.0
12-Jan-19	6	6	12	55706.3
13-Jan-19	4	4	8	37074.9
14-Jan-19	2	3	5	27572.7
15-Jan-19	3	3	6	27514.9
16-Jan-19	4	4	8	37258.5
17-Jan-19	6	4	10	37046.4
18-Jan-19	3	4	7	37227.1
19-Jan-19	5	5	10	45726.2
20-Jan-19	4	5	9	46534.4
21-Jan-19	4	3	7	27951.1
22-Jan-19	1	2	3	18451.2
23-Jan-19	3	3	6	27913.7
24-Jan-19	3	3	6	26273.2
25-Jan-19	5	5	10	44929.9
26-Jan-19	3	2	5	18603.5
27-Jan-19	2	3	5	27094.0
28-Jan-19	1	1	2	9318.4
29-Jan-19	3	3	6	27939.1
30-Jan-19	2	2	4	18596.2
31-Jan-19	3	3	6	26283.7
01-Feb-19	2	2	4	18658.8
02-Feb-19	4	3	7	26316.9
03-Feb-19	5	6	11	55725.7
04-Feb-19	3	3	6	27096.8
05-Feb-19	4	3	7	27785.4
06-Feb-19	5	5	10	46280.5

Start Date	Incoming	Outgoing	Total Movements	Tonnes
07-Feb-19	4	4	8	36466.8
08-Feb-19	3	3	6	27061.6
09-Feb-19	7	7	14	64508.2
10-Feb-19	5	5	10	46644.8
11-Feb-19	5	5	10	45060.0
12-Feb-19	4	5	9	45713.2
13-Feb-19	2	2	4	18698.9
14-Feb-19	3	3	6	28020.3
15-Feb-19	6	5	11	46519.6
16-Feb-19	4	4	8	36999.7
17-Feb-19	5	6	11	55803.0
18-Feb-19	7	7	14	64296.1
19-Feb-19	1	1	2	9318.1
20-Feb-19	0	0	0	0.0
21-Feb-19	0	0	0	0.0
22-Feb-19	3	3	6	27593.0
23-Feb-19	4	3	7	27188.2
24-Feb-19	2	2	4	18658.6
25-Feb-19	1	2	3	17662.0
26-Feb-19	3	3	6	27192.0
27-Feb-19	2	2	4	17783.9
28-Feb-19	2	2	4	17864.7
01-Mar-19	1	1	2	9330.1
02-Mar-19	1	1	2	9353.2
03-Mar-19	0	0	0	0.0
04-Mar-19	3	2	5	17870.7
05-Mar-19	2	3	5	28041.9
06-Mar-19	6	6	12	54325.2
07-Mar-19	1	1	2	9352.0
08-Mar-19	7	6	13	55237.5
09-Mar-19	3	3	6	27821.1
10-Mar-19	2	3	5	28008.4
11-Mar-19	3	3	6	27184.6
12-Mar-19	3	3	6	27209.6
13-Mar-19	6	5	11	46525.5
14-Mar-19	4	4	8	37199.4
15-Mar-19	4	5	9	45481.2
16-Mar-19	4	4	8	37208.4

Start Date	Incoming	Outgoing	Total Movements	Tonnes
17-Mar-19	3	2	5	18721.8
18-Mar-19	3	4	7	37288.9
19-Mar-19	0	0	0	0.0
20-Mar-19	1	1	2	9294.4
21-Mar-19	1	1	2	8468.6
22-Mar-19	3	2	5	17755.7
23-Mar-19	3	3	6	26001.3
24-Mar-19	2	3	5	26836.0
25-Mar-19	2	2	4	17773.9
26-Mar-19	3	3	6	22019.2
27-Mar-19	3	2	5	17751.5
28-Mar-19	3	3	6	22590.5
29-Mar-19	4	4	8	26070.3
30-Mar-19	2	3	5	22021.0
31-Mar-19	3	3	6	17816.2
01-Apr-19	3	3	6	21797.6
02-Apr-19	2	2	4	13560.2
03-Apr-19	4	3	7	17782.0
04-Apr-19	4	4	8	36161.0
05-Apr-19	4	5	9	35328.5
06-Apr-19	6	6	12	49863.5
07-Apr-19	3	3	6	27865.6
08-Apr-19	0	0	0	0.0
09-Apr-19	0	0	0	0.0
10-Apr-19	0	0	0	0.0
11-Apr-19	0	0	0	0.0
12-Apr-19	0	0	0	0.0
13-Apr-19	2	1	3	9285.2
14-Apr-19	6	6	12	55570.4
15-Apr-19	2	3	5	24797.3
16-Apr-19	0	0	0	0.0
17-Apr-19	0	0	0	0.0
18-Apr-19	0	0	0	0.0
19-Apr-19	0	0	0	0.0
20-Apr-19	0	0	0	0.0
21-Apr-19	1	0	1	0.0
22-Apr-19	2	2	4	18592.7
23-Apr-19	0	0	0	0.0

Start Date	Incoming	Outgoing	Total Movements	Tonnes
24-Apr-19	2	2	4	18462.7
25-Apr-19	6	6	12	55359.6
26-Apr-19	6	6	12	55510.1
27-Apr-19	6	6	12	55192.8
28-Apr-19	6	6	12	55752.0
29-Apr-19	5	5	10	46477.2
30-Apr-19	5	5	10	46504.5
01-May-19	6	6	12	55378.6
02-May-19	1	2	3	18584.3
03-May-19	2	1	3	9296.4
04-May-19	5	5	10	45649.9
05-May-19	5	6	11	44527.0
06-May-19	5	5	10	41471.1
07-May-19	4	4	8	32182.6
08-May-19	3	2	5	13560.4
09-May-19	4	5	9	40617.2
10-May-19	3	3	6	22094.3
11-May-19	2	2	4	13377.7
12-May-19	4	4	8	31347.9
13-May-19	3	3	6	22878.3
14-May-19	5	5	10	41245.9
15-May-19	3	3	6	22846.1
16-May-19	5	5	10	39612.1
17-May-19	4	4	8	36183.9
18-May-19	4	3	7	27032.8
19-May-19	6	6	12	53063.4
20-May-19	2	3	5	26863.8
21-May-19	0	0	0	0.0
22-May-19	0	0	0	0.0
23-May-19	1	0	1	0.0
24-May-19	3	4	7	36406.4
25-May-19	4	4	8	35970.7
26-May-19	4	4	8	36966.8
27-May-19	4	3	7	27077.8
28-May-19	4	5	9	45545.6
29-May-19	4	4	8	34496.1
30-May-19	2	1	3	8472.2
31-May-19	6	7	13	58439.2

Start Date	Incoming	Outgoing	Total Movements	Tonnes
01-Jun-19	5	5	10	40454.2
02-Jun-19	3	3	6	16965.1
03-Jun-19	5	5	10	35404.0
04-Jun-19	4	3	7	22696.3
05-Jun-19	4	4	8	35561.3
06-Jun-19	4	5	9	40675.7
07-Jun-19	5	4	9	31144.4
08-Jun-19	3	4	7	37038.4
09-Jun-19	4	4	8	35382.9
10-Jun-19	5	4	9	36160.1
11-Jun-19	3	4	7	36411.2
12-Jun-19	0	0	0	0.0
13-Jun-19	3	2	5	18587.5
14-Jun-19	4	5	9	40563.2
15-Jun-19	3	3	6	22847.6
16-Jun-19	6	5	11	40476.8
17-Jun-19	7	7	14	60089.9
18-Jun-19	4	5	9	40423.3
19-Jun-19	5	5	10	41472.4
20-Jun-19	4	4	8	31972.6
21-Jun-19	5	5	10	40264.3
22-Jun-19	4	3	7	22056.9
23-Jun-19	5	5	10	39838.7
24-Jun-19	2	2	4	13372.4
25-Jun-19	4	4	8	30495.6
26-Jun-19	3	3	6	22895.1
27-Jun-19	0	1	1	9312.9
28-Jun-19	3	2	5	8516.2
29-Jun-19	2	3	5	22854.9
30-Jun-19	4	4	8	31589.1
01-Jul-19	4	4	8	31962.5
02-Jul-19	5	3	8	22666.3
03-Jul-19	3	5	8	35607.2
04-Jul-19	3	3	6	22674.9
05-Jul-19	4	3	7	22845.6
06-Jul-19	4	5	9	35404.7
07-Jul-19	3	3	6	22629.3
08-Jul-19	4	3	7	21821.7

Start Date	Incoming	Outgoing	Total Movements	Tonnes
09-Jul-19	5	6	11	50371.2
10-Jul-19	5	5	10	31371.8
11-Jul-19	4	3	7	17795.6
12-Jul-19	4	4	8	35565.2
13-Jul-19	3	4	7	36180.7
14-Jul-19	4	4	8	36774.8
15-Jul-19	5	4	9	36378.4
16-Jul-19	3	4	7	37016.6
17-Jul-19	4	3	7	27071.9
18-Jul-19	6	7	13	64729.8
19-Jul-19	5	4	9	31333.6
20-Jul-19	3	4	7	26721.3
21-Jul-19	5	5	10	40373.9
22-Jul-19	6	6	12	45619.4
23-Jul-19	6	6	12	50564.3
24-Jul-19	5	4	9	31304.7
25-Jul-19	1	1	2	9248.4
26-Jul-19	2	1	3	9309.5
27-Jul-19	2	4	6	27143.3
28-Jul-19	4	4	8	31973.8
29-Jul-19	2	2	4	13388.0
30-Jul-19	5	5	10	41082.0
31-Jul-19	3	2	5	13584.2
01-Aug-19	3	3	6	27738.2
02-Aug-19	2	3	5	27676.5
03-Aug-19	1	1	2	9288.9
04-Aug-19	3	3	6	27679.2
05-Aug-19	2	2	4	18618.1
06-Aug-19	0	0	0	0.0
07-Aug-19	0	0	0	0.0
08-Aug-19	0	0	0	0.0
09-Aug-19	3	3	6	27904.9
10-Aug-19	5	5	10	44823.0
11-Aug-19	1	1	2	9313.3
12-Aug-19	4	3	7	27938.6
13-Aug-19	3	4	7	36849.1
14-Aug-19	3	3	6	27099.4
15-Aug-19	4	4	8	36601.9

Start Date	Incoming	Outgoing	Total Movements	Tonnes
16-Aug-19	5	5	10	44056.1
17-Aug-19	3	3	6	26248.9
18-Aug-19	3	3	6	27054.1
19-Aug-19	6	6	12	48918.6
20-Aug-19	7	6	13	44857.1
21-Aug-19	7	7	14	62169.1
22-Aug-19	1	2	3	13541.2
23-Aug-19	7	6	13	54164.9
24-Aug-19	4	5	9	45489.6
25-Aug-19	7	6	13	53926.7
26-Aug-19	6	6	12	54122.9
27-Aug-19	5	6	11	54056.8
28-Aug-19	4	3	7	26880.9
29-Aug-19	3	4	7	36153.5
30-Aug-19	3	3	6	27118.2
31-Aug-19	4	4	8	36373.7
01-Sep-19	4	3	7	27071.6
02-Sep-19	5	5	10	45445.3
03-Sep-19	2	3	5	27061.1
04-Sep-19	3	3	6	27863.0
05-Sep-19	4	4	8	37208.7
06-Sep-19	5	5	10	46466.1
07-Sep-19	3	3	6	27054.5
08-Sep-19	3	2	5	17751.2
09-Sep-19	1	2	3	18402.2
10-Sep-19	3	2	5	18615.8
11-Sep-19	2	2	4	17792.9
12-Sep-19	6	7	13	64006.2
13-Sep-19	2	1	3	9310.3
14-Sep-19	2	3	5	27067.4
15-Sep-19	2	1	3	8471.2
16-Sep-19	5	5	10	36445.0
17-Sep-19	2	3	5	22884.5
18-Sep-19	2	2	4	13450.2
19-Sep-19	4	3	7	27908.2
20-Sep-19	3	4	7	27149.0
21-Sep-19	1	1	2	9328.1
22-Sep-19	4	4	8	27169.1

Start Date	Incoming	Outgoing	Total Movements	Tonnes
23-Sep-19	3	3	6	22722.2
24-Sep-19	0	0	0	0.0
25-Sep-19	0	0	0	0.0
26-Sep-19	0	0	0	0.0
27-Sep-19	3	3	6	22824.9
28-Sep-19	4	4	8	27182.0
29-Sep-19	4	4	8	31955.6
30-Sep-19	4	3	7	17651.1
01-Oct-19	2	3	5	22660.4
02-Oct-19	3	3	6	27896.3
03-Oct-19	1	1	2	9281.8
04-Oct-19	3	3	6	27695.6
05-Oct-19	1	1	2	9106.6
06-Oct-19	6	5	11	41061.2
07-Oct-19	6	7	13	55014.7
08-Oct-19	5	4	9	32165.8
09-Oct-19	4	5	9	36478.2
10-Oct-19	4	3	7	27495.4
11-Oct-19	4	4	8	36384.8
12-Oct-19	2	3	5	22680.8
13-Oct-19	3	2	5	13376.9
14-Oct-19	5	5	10	41446.8
15-Oct-19	5	5	10	40320.5
16-Oct-19	5	5	10	35570.6
17-Oct-19	3	3	6	22871.6
18-Oct-19	4	4	8	31935.0
19-Oct-19	7	8	15	62641.4
20-Oct-19	4	4	8	35337.5
21-Oct-19	3	3	6	27094.8
22-Oct-19	3	3	6	26851.8
23-Oct-19	3	2	5	17579.5
24-Oct-19	1	2	3	17778.9
25-Oct-19	1	1	2	8447.4
26-Oct-19	5	5	10	45455.3
27-Oct-19	4	3	7	27059.7
28-Oct-19	2	3	5	27088.1
29-Oct-19	5	4	9	36166.4
30-Oct-19	4	4	8	33705.2

Start Date	Incoming	Outgoing	Total Movements	Tonnes
31-Oct-19	2	2	4	18571.2
01-Nov-19	0	1	1	8474.3
02-Nov-19	4	4	8	36310.3
03-Nov-19	2	2	4	18358.1
04-Nov-19	4	4	8	36331.9
05-Nov-19	5	4	9	36352.9
06-Nov-19	4	5	9	45674.9
07-Nov-19	5	5	10	45244.9
08-Nov-19	5	4	9	37000.4
09-Nov-19	3	4	7	36964.2
10-Nov-19	3	3	6	27047.0
11-Nov-19	1	1	2	8438.5
12-Nov-19	3	3	6	27868.4
13-Nov-19	4	3	7	26255.0
14-Nov-19	2	2	4	17805.4
15-Nov-19	3	4	7	36343.1
16-Nov-19	3	3	6	27096.0
17-Nov-19	3	3	6	26865.1
18-Nov-19	2	2	4	18637.5
19-Nov-19	0	0	0	0.0
20-Nov-19	0	0	0	0.0
21-Nov-19	0	0	0	0.0
22-Nov-19	2	2	4	17750.1
23-Nov-19	1	0	1	0.0
24-Nov-19	2	3	5	26482.7
25-Nov-19	3	3	6	27053.2
26-Nov-19	2	1	3	8459.8
27-Nov-19	0	1	1	9325.6
28-Nov-19	2	2	4	17729.3
29-Nov-19	3	3	6	27486.8
30-Nov-19	2	2	4	17747.2
01-Dec-19	3	3	6	27853.4
02-Dec-19	5	4	9	36180.2
03-Dec-19	3	3	6	25376.7
04-Dec-19	3	3	6	27697.8
05-Dec-19	2	3	5	27696.2
06-Dec-19	4	3	7	26857.3
07-Dec-19	4	4	8	35344.8

Start Date	Incoming	Outgoing	Total Movements	Tonnes
08-Dec-19	2	2	4	17777.5
09-Dec-19	3	4	7	36066.8
10-Dec-19	5	4	9	36366.2
11-Dec-19	3	4	7	36354.0
12-Dec-19	1	1	2	9118.0
13-Dec-19	6	6	12	54870.7
14-Dec-19	5	5	10	45005.8
15-Dec-19	6	5	11	45429.4
16-Dec-19	5	6	11	54757.3
17-Dec-19	5	5	10	44629.4
18-Dec-19	4	3	7	27884.4
19-Dec-19	6	6	12	55563.6
20-Dec-19	4	5	9	43967.7
21-Dec-19	2	2	4	17741.9
22-Dec-19	5	5	10	46287.6
23-Dec-19	3	3	6	26048.5
24-Dec-19	2	1	3	9100.3
25-Dec-19	0	0	0	0.0
26-Dec-19	1	0	1	0.0
27-Dec-19	3	5	8	46277.5
28-Dec-19	5	4	9	36314.9
29-Dec-19	4	5	9	46349.9
30-Dec-19	5	4	9	36114.5
31-Dec-19	4	4	8	36782.9

ASIA PACIFIC OFFICES

BRISBANE

Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA

GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN

Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST

Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY

21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE

Suite 2, 2 Domville Avenue
Hawthorn VIC 3122
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE

10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH

Ground Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SYDNEY

2 Lincoln Street
Lane Cove NSW 2066
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE

Level 1, 514 Sturt Street
Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

TOWNSVILLE SOUTH

12 Cannan Street
Townsville South QLD 4810
Australia
T: +61 7 4772 6500

WOLLONGONG

Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 404 939 922

AUCKLAND

68 Beach Road
Auckland 1010
New Zealand
T: +64 27 441 7849

NELSON

6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628