MOOLARBEN COAL COMPLEX ANNUAL REVIEW 2020

Document	Version	Issue	Author	Approved
MCO_RPT_ANNUAL REVIEW 2020	1	Mar 2021	MCO	GC

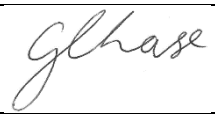
Name of operation	Moolarben Coal Complex
Name of operator	Moolarben Coal Operations Pty Ltd
Development consent / project approval #	05_0117 and 08_0135
Name of holder of development consent / project approval	Moolarben Coal Mines Pty Limited
Mining lease #	ML 1605, 1606, 1628, 1691, 1715
Name of holder of mining leases	Moolarben Coal Mines Pty Ltd, Yancoal Moolarben Pty Ltd and Kores Australia Moolarben Resources Pty Ltd
Water licence #	Refer Table 6
Name of holder of water licence	Moolarben Coal Operations Pty Ltd
MOP/RMP start date	1 January 2020
MOP/RMP end date	31 December 2022
Annual Review start date	1 January 2020
Annual Review end date	31 December 2020

I, Graham Chase, certify that this audit report is a true and accurate record of the compliance status of Moolarben Coal Complex for the period January 1st 2020 to December 31 2020 and that I am authorised to make this statement on behalf of Moolarben Coal Operations.

Note.

a) The Annual Review is an 'environmental audit' for the purposes of section 9.39 of the Environmental Planning and Assessment Act 1979. Section 9.42 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	Graham Chase
Title of authorised reporting officer	Graham Chase
Signature of authorised reporting officer	
Date	31 March 2021

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1.0 STATEMENT OF COMPLIANCE

A summary of compliance with relevant approval conditions from 01 January 2020 to 31 December 2020 (the reporting period) is provided in **Table 1** and **Table 2**. A compliance table key is provided in **Table 3**.

Table 1: Statement of compliance

Approval	Compliance Status (Including Administrative Non-compliances)	Approval	Compliance Status (Including Administrative Non-compliances)
PA 05_0117	No	WAL36340	Yes
PA 08_0135	No	WAL37582	Yes
ML 1605	Yes	WAL37583	Yes
ML 1606	Yes	WAL39799	Yes
ML 1628	Yes	WAL41888	Yes
ML 1691	No	20BL173935	Yes
ML 1715	Yes	-	-

Table 2: Non-compliances

Approval	Condition Number	Condition description (summary)	Compliance status	Comment	Where addressed
PA05-0117	Sch. 3 C. 20A	Air Quality Management Plan	Non-Compliant	Non-continuous TEOM monitoring.	6.4 and 12.0
PA 08_0135	Sch. 3 C. 22				
PA05-0117	Sch. 3 C. 33	Surface Water Management Plan	Non-Compliant	Discharge Monitoring, Oil & Grease sample not collected on one occasion.	7.3 and 12.0
PA 08_0135	Sch. 3 C. 29				
PA05-0117	Sch. 3 C. 33	Surface Water Management Plan	Non-Compliant	Effluent Monitoring was not completed at EPL ID 22 on one occasion.	7.3 and 12.0
PA 08_0135	Sch. 3 C. 29				
PA05-0117	Sch. 3 C. 31	Water Release as per S120 POEO Act	Non-Compliant	Storm water entered Creek crossing construction works	7.3 and 12.0
PA 08_0135	Sch. 3 C. 27				
ML1691	C12	Prevention of soil erosion and Pollution			
PA05-0117	Sch. 3 C. 31	Water release as per S120 POEO Act	Non-Compliant	Sediment water released from drain to Sediment Dam 304.	7.3 and 12.0
PA 08_0135	Sch. 3 C. 27				
ML1691	C12	Prevention of soil erosion and Pollution			

Table 3: Compliance Table Key

Risk	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-Compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

2.0 INTRODUCTION

The Moolarben Coal Complex (MCC) is located approximately 40 kilometres north of Mudgee in the Western Coalfield of New South Wales **(Figure 1)** within the Mid-Western Regional Local Government Area. Local relevant land ownership within the immediate vicinity of the MCC is provided in **Appendix 1**.

Moolarben Coal Operations Pty Ltd (MCO) is the operator of the Moolarben Coal Complex (MCC) on behalf of the Moolarben Joint Venture (Moolarben Coal Mines Pty Ltd [MCM], Yancoal Moolarben Pty Ltd (YM) and a consortium of Korean power companies). MCO, MCM and YM are wholly owned subsidiaries of Yancoal Australia Limited (Yancoal).

Current mining operations undertaken across the MCC have approval until 31 December 2038. All mining operations are conducted in accordance with NSW Project Approval (05_0117) (Moolarben Coal Project Stage 1) as modified, and NSW Project Approval (08_0135) (Moolarben Coal Project Stage 2) as modified.

The current mining operations are undertaken in accordance with Approval Decisions (EPBC 2007/3297), (EPBC 2013/6926), (EPBC 2008/4444) and (EPBC 2017/7974) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Mining operations and exploration activities at the MCC are also conducted in accordance with the requirements of the conditions of Mining Lease (ML) 1605, ML 1606, ML 1628, ML 1691, and ML1715 and Exploration Licences (EL) EL6288, EL7073 and EL7074 granted under the *Mining Act 1992*.

2.1 SCOPE

This Annual Review (AR) has been prepared by MCO (with input from experienced and qualified experts) to satisfy the reporting requirements of NSW Project Approval (05_0117) (as modified), NSW Project Approval (08_0135) (as modified), mining leases ML 1605, ML 1606, ML1628, ML1691 and ML1715, and water licences. The report presents a summary of the regulatory compliance, environmental performance, and community engagement activities for MCO.

The following key agencies shall be provided with a copy of this report:

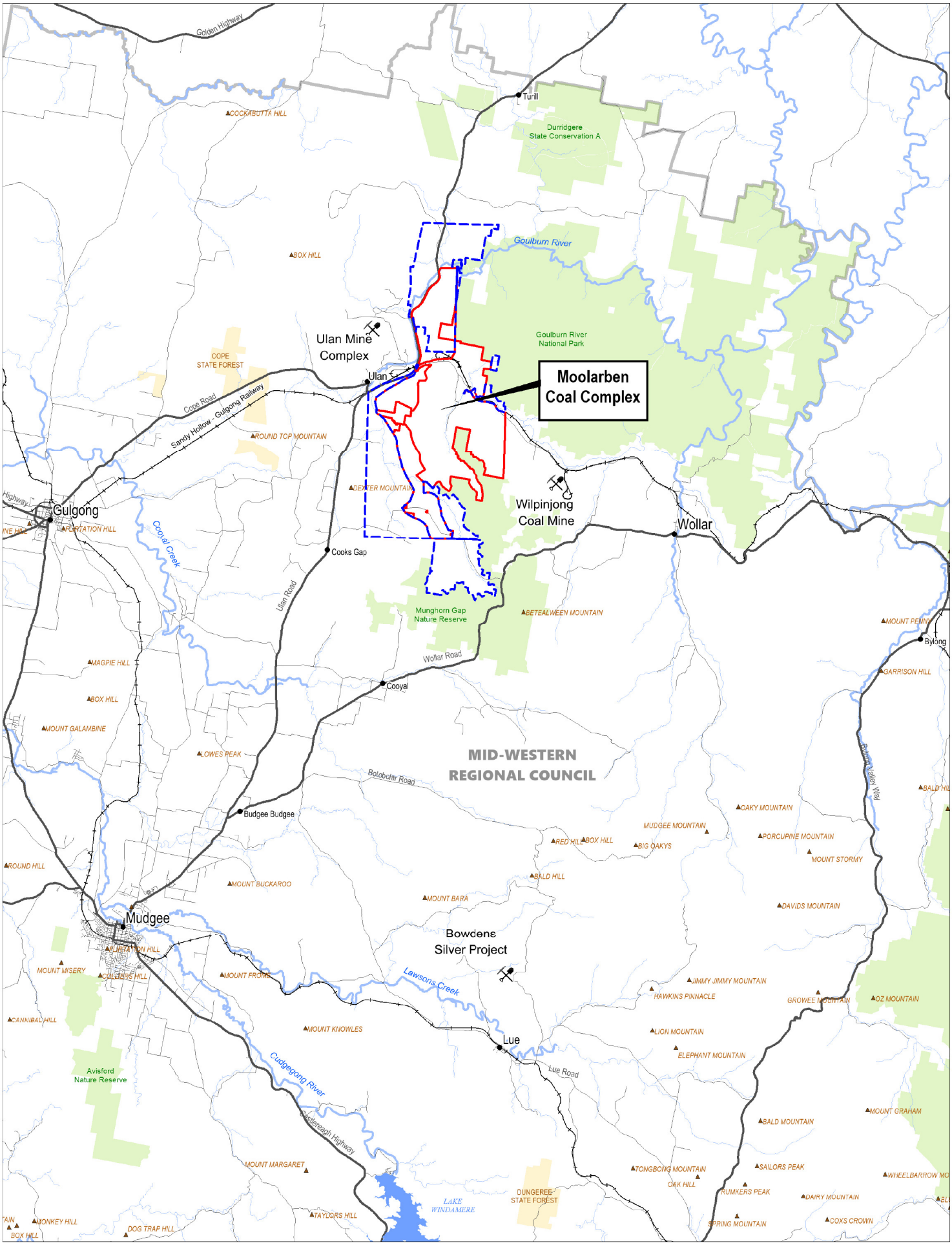
- NSW Department of Planning, Industry and Environment (DPIE) (For Approval);
- NSW Department of Regional NSW – Resources Regulator (RR) (For Approval);
- NSW Department of Planning, Industry and Environment – Biodiversity, Conservation and Science (BCs);
- NSW Department of Planning, Industry and Environment – Water (DPIE – Water)/Natural Resources Access Regulator (NRAR);
- NSW Environment Protection Authority (EPA);
- Mid-Western Regional Council (MWRC); and
- Members of the MCC Community Consultative Committee (CCC).

In addition, an electronic copy will be made publicly available on the Moolarben Coal website (http://www.moolarbencoal.com.au/) in accordance with Schedule 5, Condition 11 (a) of PA05_0117 and Schedule 6, Condition 11 (a) of PA08_0135.

2.2 STRUCTURE OF THIS ANNUAL REVIEW

The remainder of the AR is structured as follows and is based on the *Annual Review Guidelines – Post-approval requirements for State significant mining developments* (NSW Department of Planning and Environment, 2015):

Section 3: Outlines the relevant statutory approvals.
Section 4: Outlines the activities undertaken at Moolarben Coal Complex for the period and those proposed for the next period.
Section 5: Actions required from previous Annual Review.
Section 6: Outlines environmental performance including meteorological, noise, blasting, air quality, biodiversity, heritage, bushfire and waste.
Section 7: Outlines the water management performance.
Section 8: Outlines subsidence performance.
Section 9: Outlines the rehabilitation management performance
Section 10: Outlines the community performance.
Section 11: Describes independent audit requirements.
Section 12: Provides a summary of incidents and non-compliances.
Section 13: Outlines activities to be completed in the next reporting period.
Appendices: Supporting information and monitoring data.



Legend

- Exploration Licence Boundary
- Mining Lease Boundary
- LocalGovernmentArea
- National Park / Nature Reserve
- State Forest

N

YANCOAL 兖煤澳大利亚有限公司
MOOLARBEN COAL

Figure 1
Regional Location

File: O:\1.1 EMS\1.2 Management Plans\Biodiversity Management Plan\Draft\Complex Biodiversity Management Plan Rev 5\Draft\Mapinfo Workspaces\Locality WOR

2.3 PROJECT DESCRIPTION

The MCC comprises the Moolarben Stage 1 and Stage 2 Projects. An overview of the complex is provided in **Figure 2**. The Stage 1 and Stage 2 operations are summarised in **Table 4** below.

Stage 1 at the Moolarben Coal Complex has been operating for several years and at full development will comprise three open cut mines (OC1, OC2, and OC3), a longwall underground mine (UG4), and mining related infrastructure (including coal processing and transport facilities).

Stage 2 at the Moolarben Coal Complex has commenced and at full development will comprise one open cut mine (OC4), two longwall underground mines (UG1 and UG2), and mining related infrastructure.

Table 4: Moolarben Coal Complex production overview

Relevant Approval Component	Moolarben Coal Project	
	Stage 1 **Project Approval (05_0117)**	**Stage 2** **Project Approval (08_0135)**
Operational Mine Life	Mining operations can be carried out until 31 December 2038.	
Hours of Operation	Mining operations can be carried out 24 hours a day, 7 days a week.	
Coal Extraction Limits	Up to 10 Mtpa of ROM coal can be extracted from the open cut mining operations in any calendar year from Stage 1.	Up to 16 Mtpa of ROM coal can be extracted from the open cut mining operations in any calendar year from Stage 2.
	Up to 8 Mtpa (total) of ROM coal can be extracted from the underground mining operations at the Moolarben Coal Complex in any calendar year.	
Coal Processing and Offsite Transport	Up to 16 Mtpa (total) of ROM coal from the Moolarben Coal Complex can be washed in the calendar year. Not more than 8 laden trains on average or 11 laden trains maximum to leave the complex per day.	
	All coal is to be transported from the Moolarben Coal Complex by rail.	All coal extracted from the site is sent to the Moolarben Stage 1 mine surface infrastructure area for processing and/or transport to market.

2.4 KEY MINE CONTACT PERSONNEL

The following table provides contact details for key personnel responsible for environmental management across the Moolarben Coal Complex.

Table 5: Mine Contact Personnel

Position/Area of Responsibility	Name	Contact Number(s)	Email Address
General Manager	Steve Archinal	02 6376 1500	steve.archinal@yancoal.com.au
Environment and Community Manager	Graham Chase	02 6376 1407	graham.chase@yancoal.com.au
Environment and Community Superintendent	Trent Cini	02 6376 1436	trent.cini@yancoal.com.au
Environment and Community Complaints Line	1800 556 484		
Postal Address	Locked Bag 2003, Mudgee, NSW, 2850		

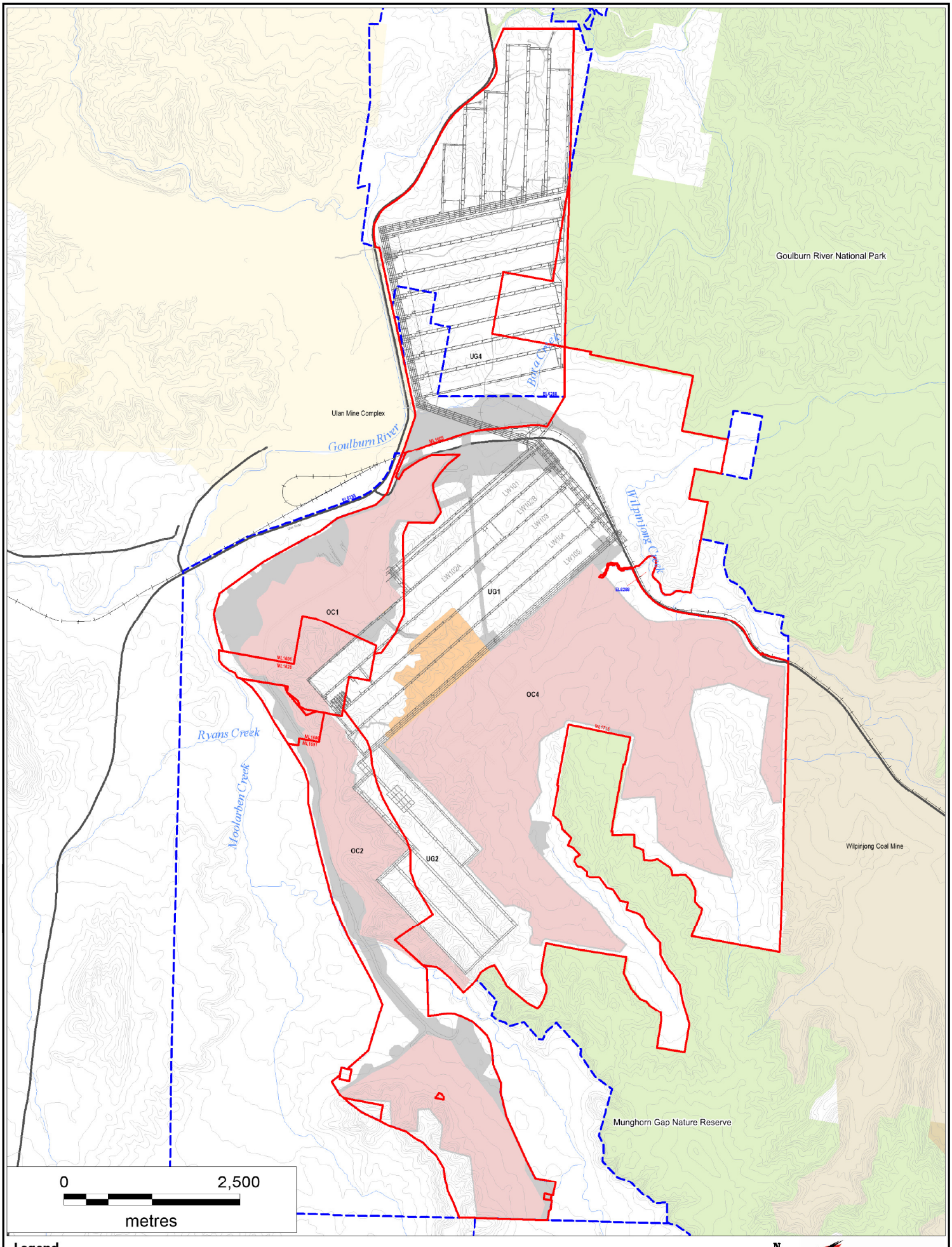


Figure 2
Approved Moolarben Coal Project
Indicative (Stage 1 and Stage 2) - General Arrangement

3.0 APPROVALS

3.1 SUMMARY OF APPROVALS

Project Approvals, Mining Leases, and other Licences relevant to MCO are provided in **Table 6**. Current Project Approvals, EPBC Approvals, Exploration Licences, and Mining Leases are available at www.moolarbencoal.com.au.

Table 6: Relevant Approvals, Leases and Licences

Approval	Description	Expiry Date
Project Approval – NSW Department to Planning, Industry and Environment		
05_0117	Stage 1 as modified	31 December 2038
08_0135	Stage 2 as modified	31 December 2038
Mining Lease – NSW Department of Regional NSW –Resources Regulator		
ML1605	Underground 4, CHPP and infrastructure areas	20 December 2028
ML1606	OC1, OC2, UG1 and associated infrastructure	20 December 2028
ML1628	OC1, OC2, OC3, UG1 and UG4	24 February 2030
ML1691	OC2, OC3, UG1, UG2 and associated infrastructure	23 September 2034
ML1715	OC2, OC4, UG1, UG2 and associated infrastructure	31 August 2036
Mining Operation Plan – NSW Department of Regional NSW –Resources Regulator		
MOP	Stage 1 and Stage 2 operations	31 December 2022
Exploration Licences – NSW Department of Regional NSW –Resources Regulator		
EL6288	Coal Exploration Licence	23 August 2023
EL7073	Coal Exploration Licence	12 February 2026
EL7074	Coal Exploration Licence	12 February 2026
Environmental Protection Licence – NSW Environment Protection Agency		
EPL12932	Licence authorising the carrying out of scheduled activities	N/A
Environment Protection and Biodiversity Conservation – Commonwealth Department of Agriculture, Water and the Environment		
2007/3297	Stage 1 coal mines and associated infrastructure	31 December 2027
2008/4444	Stage 2 coal mines	31 December 2065
2013/6926	Modify and extend the Stage 1 Moolarben Coal Project.	31 December 2064
2017/7974	Modify and extend the Stage 1 and Stage 2 Moolarben Coal Project	31 December 2050
Water Licences – NSW Department of Planning, Industry and Environment – Water		
WAL19424	Wollar Creek Water Source	N/A
WAL36340	Wollar Creek Water Source	N/A
WAL37582	Upper Goulburn River Water Source	N/A
WAL37583	Wollar Creek Water Source	N/A
WAL39799	Sydney Basin - North Coast Groundwater Sources	N/A
WAL41888	Upper Goulburn River Water Source	N/A
20BL173935	Monitoring Bore Licence	N/A

During the reporting period the following approvals and renewals were granted:

- Moolarben Coal Complex Mining Operations Plan 2020-2022 Amendment A;
- Moolarben Coal Complex Mining Operations Plan 2020-2022 Amendment B;
- Stage 1 PA 05_0117 Modification 15;
- EL6288 renewal;
- EL7073 renewal; and,
- EL7074 renewal.

3.2 ANNUAL REPORTING

Table 7 provides a checklist of AR requirements and performance conditions along with the relevant sections within this report.

Table 7: Annual Review Requirements

Approval Type & Reference		Annual Review Section
Project Approval 05_0117 Condition 4 Schedule 5	*By the end of March each year, or other timing as may be agreed by the Secretary, the Proponent shall review the environmental performance of the project to the satisfaction of the Secretary. This review must:* *a. describe the development that was carried out in the previous calendar year, and the development that is proposed to be carried out over the next year;* *b. include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, which includes a comparison of these results against the* • *the relevant statutory requirements, limits or performance measures/criteria;* • *the monitoring results of previous years; and* • *the relevant predictions in the EA;* *c. identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;* *d. identify any trends in the monitoring data over the life of the project;* *e. identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and* *f. describe what measures will be implemented over the next year to improve the environmental performance of the project.*	4.2 & 4.3 6 to 10 1, 6 to 10 & 12 6 to 10 6 to 10 6 to 10 & 13
Project Approval 08_0135 Condition 4 Schedule 6	*By the end of March each year, or other timing as may be agreed by the Secretary, the Proponent shall review the environmental performance of the project to the satisfaction of the Secretary. This review must:* *a. describe the development that was carried out in the previous calendar year, and the development that is proposed to be carried out over the next year;* *b. include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, which includes a comparison of these results against the* • *the relevant statutory requirements, limits or performance measures/criteria;* • *the monitoring results of previous years; and* • *the relevant predictions in the EA;* *c. identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;* *d. identify any trends in the monitoring data over the life of the project;* *e. identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and* *f. describe what measures will be implemented over the next year to improve the environmental performance of the project.*	4.2 & 4.3 6 to 10 1, 6 to 10 & 12 6 to 10 6 to 10 6 to 10 & 13
Mining Lease 1605, 1606 & 1628 Condition 4 & 5	*The lease holder must lodge Environmental Management Reports (EMR) with The Director-General annually or at dates otherwise directed by the Director-General.* *The EMR must:* *- report against compliance with the MOP;* *- report on progress in respect of rehabilitation completion criteria;*	This Report & Section 9

Approval Type & Reference		Annual Review Section
	- report on the extent of compliance with regulatory requirements; and *- have regard to any relevant guidelines adopted by the Director-General;*	
Mining Lease 1691 Condition 4	*(a) The lease holder must lodge Environmental Management Reports (EMR) with the Director-General annually or at dates otherwise directed by the Director-General.* *(b) The EMR must:* *I. Report against compliance with the MOP;* *II. Report on progress in respect of rehabilitation completion criteria;* *III. Report on the extent of compliance with regulatory requirements; and* *IV. Have regard to any relevant guidelines adopted by the Director-General.*	This Report & Section 9
Mining Lease 1715 Condition 3	*f) The lease holder must prepare a Rehabilitation Report to the satisfaction of the Minister. The report must:* *(i) provide a detailed review of the progress of rehabilitation against the performance measures and criteria established in the approved MOP;* *(ii) be submitted annually on the grant anniversary (or at such other times as agreed by the Minister; and* *(iii) be prepared in accordance with any relevant annual reporting guidelines published on the Department's website at www.resources.nsw.gov.au/environment.*	This Report & Section 9

4.0 OPERATIONS SUMMARY

4.1 MINING OPERATIONS

Details of production and associated waste generated by the site for the report period and next reporting period are provided in **Table 8**.

Table 8 : Production Summary

Material	Approved Limit (PA 05_0117 & 08_0135)	Reporting Period		
		Previous Period (actual)	Current Period (actual)	Next Period (forecast)
Waste Rock/ Overburden (BCM)	N/A	47,275,395	44,448,108	44,941,236
Open Cut ROM Coal (t) (OC1, 2 & 3)	10,000,000	3,890,579	3,237,139	4,884,898
Open Cut ROM Coal (t) (OC4)	16,000,000	10,198,715	10,873,793	9,555,406
Open Cut ROM Coal (t)	16,000,000	14,089,294	14,110,932	14,440,304
Underground ROM Coal (t)	8,000,000	6,424,761	7,545,551	8,000,000
Coal Washing (t)	16,000,000	13,489,718	13,957845	14,083,958
Rejects (Co Disposal)	N/A	2,662,424	2,522,377	2,545,397
Product Coal (t)	N/A	17,851,631	19,775,825	19,943,560

4.2 REPORTING PERIOD ACTIVITIES

This section provides further detail on the activities undertaken in the reporting period. Works were carried out in accordance with the relevant Mining Operations Plan (MOP). **Figure 4** presents the areas of activity.

4.2.1 EXPLORATION

Exploration activities were undertaken in EL6288 and ML1715, including a total of 2 exploration holes within EL6288, and a further 4 exploration holes primarily focusing on OC4 within ML1715.

4.2.2 LAND DISTURBANCE

During the reporting period 194ha were disturbed taking the total mine footprint to 1,687ha with the majority of the increased land disturbance associated with the progression of mining. The areas disturbed this reporting period are shown in **Figure 3**.

All land disturbance is undertaken in accordance with the Ground Disturbance Permit (GDP) process. This includes pre-clearance surveys, heritage clearance, erosion and sediment control plans, confirmation of land ownership and disturbance extents reviewed to ensure compliance with the MOP and relevant management plans (Surface Water, Heritage, Biodiversity and Rehabilitation Management Plans).

Topsoil, mulch and select salvageable hollows were reclaimed for use in rehabilitation areas, or stockpiled for future use.

4.2.3 CONSTRUCTION

Construction works undertaken during the reporting period included the progression of mining infrastructure for Open Cut 3 (OC3). Mine infrastructure works included water management infrastructure and ancillary works. Construction activities commenced or undertaken in the period included:

- Completion of the Water Treatment Plant and associated infrastructure;
- Completion of the Moolarben Creek Crossing;
- Completion of the Bora Creek discharge point; and
- Completion of the Open Cut 1 fuel farm upgrade works.

4.2.4 MINING OPERATIONS

Mining activities were undertaken in accordance with relevant project approvals and the approved MOP. During the reporting period general mining activities included:

- Overburden removal from OC2, OC3 and OC4 using excavator and truck fleets;
- Overburden removal from OC4 using cast and dozer push;
- Coal extraction from OC2, OC3 and OC4;
- Drilling and blasting select overburden and coal;
- Spoil emplacement in-pit in OC2, OC3, and OC4;
- Bulk spoil reshaping and rehabilitation;
- Construction and operation of water management works;
- Continued underground development; and
- Extraction of LW103 and commencement of LW104.

4.2.5 COAL PROCESSING AND TRANSPORT

Open Cut ROM coal for washing was transported from the ROMs via conveyor to the CHPP for processing. ROM coal was transported from the UG1 ROM to the product stockpile via conveyor. Washed product coal was transported to the product coal stockpile prior to railing. Coarse rejects were co-mingled with dewatered fine rejects and transported by conveyor to the Rejects Bin and trucked back to the open pit for selective placement with mine spoil.

All product coal was loaded onto trains via the Train Load-out in the Moolarben rail loop and transported via rail to port. MCO monitors the amount of coal transported from site each year and the date/time of each movement. During the period, the maximum number of train movements per day was 9 with an average of 5.9 per day.

4.2.6 REHABILITATION

Rehabilitation works during the reporting period were undertaken within Open Cut 2, Open Cut 4, and progressive rehabilitation of construction areas. More detail of rehabilitation activities during the reporting period is provided in **Section 9.0**.

4.3 NEXT REPORTING PERIOD

The proposed mining sequence for 2021 is detailed in the currently approved 2020-2022 MOP dated September 2020. The status of proposed activities at the end of 2021 are provided in **Figure 5**.

MCO will continue to operate 24 hours per day, 7 days per week with blasting limited to the hours and frequency detailed in PA 05_0117 Schedule 3, Condition 9 & 10 and PA 08_0135 Schedule 3, Condition 10 & 11.

4.3.1 EXPLORATION

Proposed exploration activities during 2021 will primarily focus on EL6288 and EL7073, with some exploration required within ML1605, ML1691, ML1715 and ML1628. Geophysical surveys are also being considered across all ML and ELs. All exploration carried out on MCO Exploration Licence areas will adhere to the relevant regulatory requirements which may include approval through the Resource Regulator's application to Conduct Exploration Activities.

4.3.2 LAND DISTURBANCE

During the next reporting period, approximately 273ha will be disturbed for open-cut mining across OC2, OC3 and OC4, for UG4 surface infrastructure and ancillary activities. The areas to be disturbed are shown in **Figure 3**.

4.3.3 CONSTRUCTION

Proposed construction works during the next reporting period includes mine sustaining infrastructure and Underground 4 surface infrastructure. Construction activities include:

- Construction of the Underground 4 Remote Services Infrastructure Area
- Construction of the Underground 4 Southern Dewatering Infrastructure
- Construction of water management infrastructure;

4.3.4 MINING OPERATIONS

Mining operations for the next period are shown in **Figure 5** and include:

- Drilling and blasting select overburden and coal;
- Overburden removal from OC2, OC3 and OC4 using dozer, excavator and truck fleets;
- Overburden removal from OC4 using cast and dozer push;
- Spoil emplacement in-pit in OC2, OC3 and OC4;
- Coal extraction from OC2, OC3, and OC4;
- Bulk spoil reshaping and rehabilitation;
- Construction and operation of water management works;
- Continued underground development within UG1 and UG4; and
- Continued longwall operations at UG1 in LW104 and LW105.

4.3.5 COAL PROCESSING AND TRANSPORT

Open Cut ROM coal for washing will be transported from the ROMs via conveyor to the CHPP for processing. Underground coal and Open Cut Bypass coal will be transferred with the UG coal handling system. Product coal will be stored on the product coal stockpile prior to transport. Coarse rejects will be co-mingled with dewatered fine rejects and transported by conveyor to the Rejects Bin from where it will be trucked back to the open pit for selective placement within mine spoil.

All product coal will be loaded onto trains in the Moolarben rail loop and transported via rail. All train movements will be conducted in accordance with the conditions of approval.

4.3.6 REHABILITATION

Rehabilitation works proposed for the next reporting period will be undertaken in OC2 and OC4. Rehabilitation activities will include landform establishment, growth medium development, ecosystem and landuse establishment and rehabilitation maintenance if required.

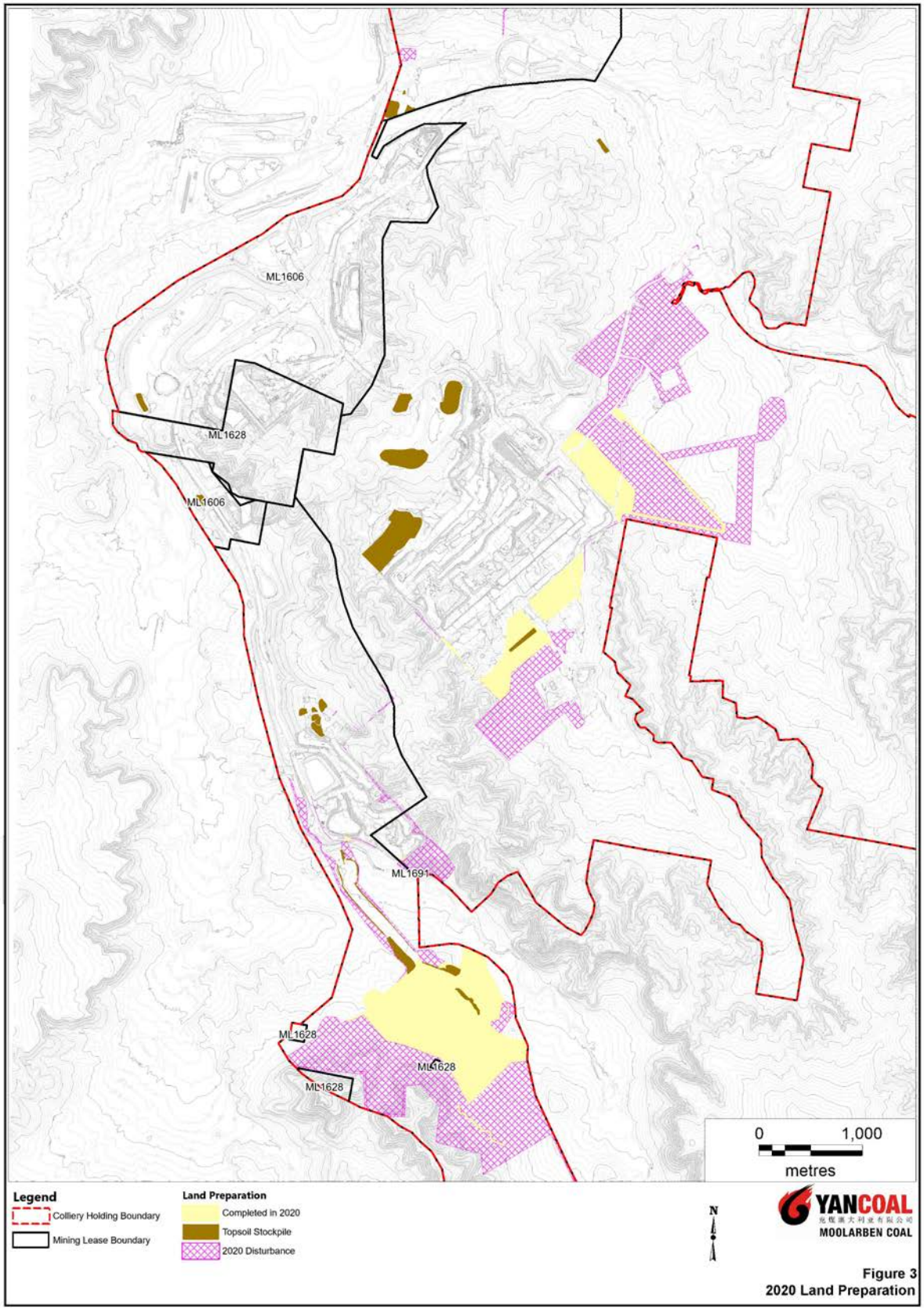


Figure 3: Land preparation areas

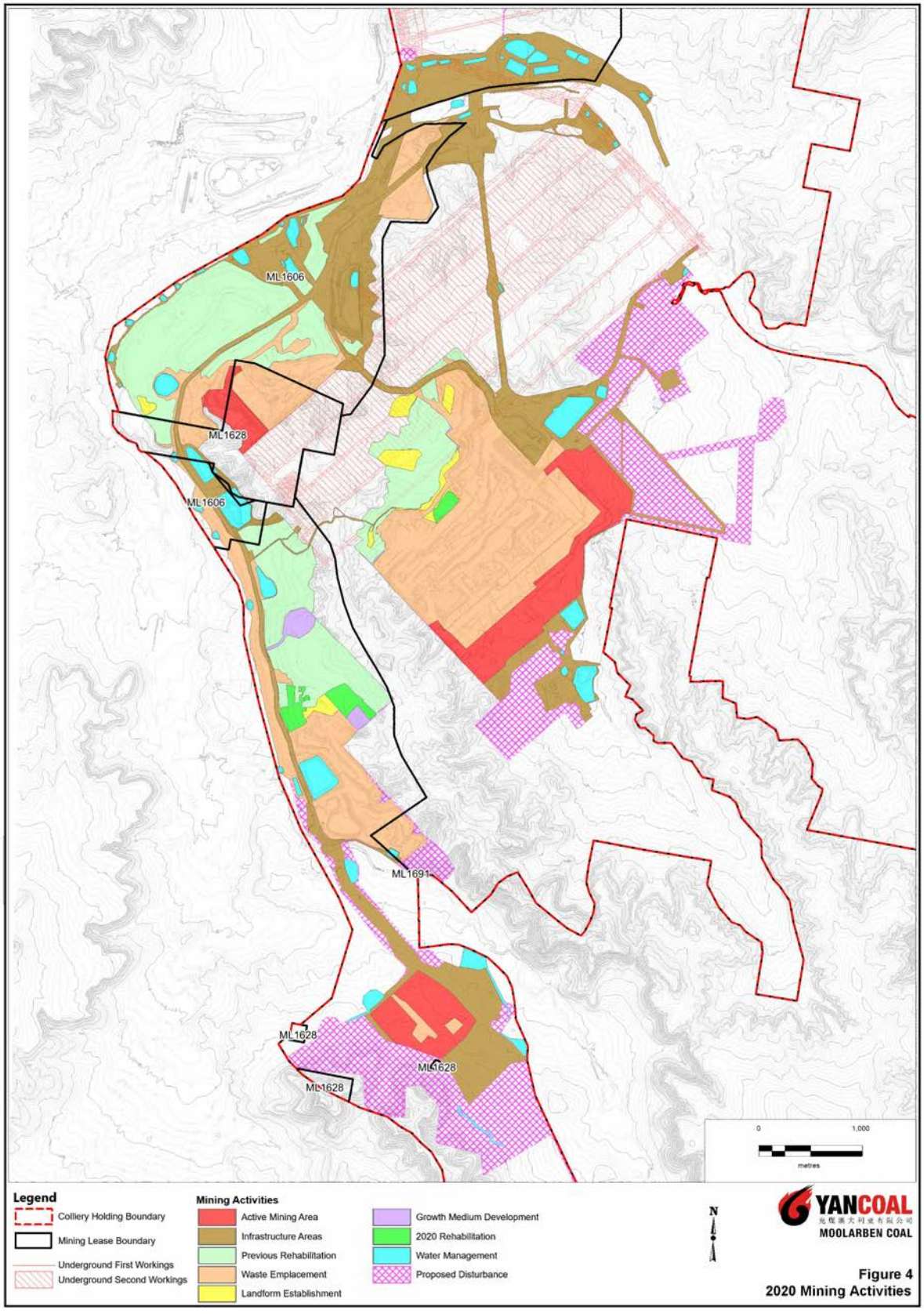


Figure 4: Mining activity areas during the reporting period

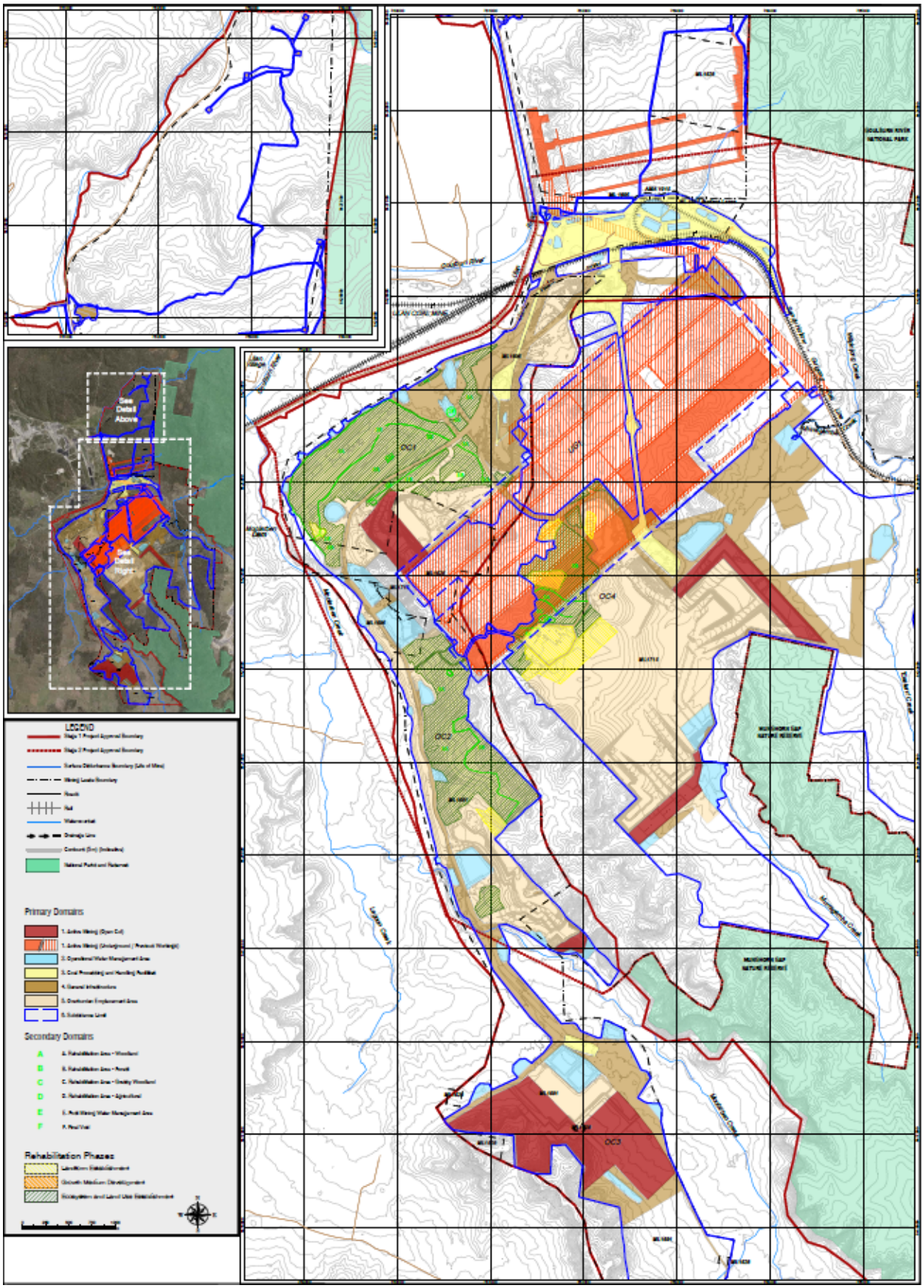


Figure 5: Mining Activities for the next reporting period (MOP Plan 3B)

5.0 ACTIONS REQUIRED FROM PREVIOUS REPORTING PERIOD

The 2019 AR was submitted to the RR and DPIE on the 28 April 2020 as agreed with the DPIE and RR. The 2019 AR was accepted and approved on the 13 May 2019 and 22 May 2019 respectively. There were no actions issued to MCO in regards to the 2019 AR, and the 2019 AR was placed on the MCO website within one month of approval.

Actions outlined by MCO in the 2019 AR are provided in **Table 9**.

Table 9 : Actions from Previous Annual Review

Action Required from previous Annual Review	Requested by	Action Taken by MCO	Section of AR addressing this action
Review and revise all environmental management plans as necessary	MCO	Complete	Sections 6 to 9
Review and revision of Biodiversity Management Plans.	MCO	Biodiversity MP revised. Action Ongoing	Section 6.5
Continue to progress offset security instruments.	MCO	Complete	Section 6.5
Continue baseline monitoring of PZ201, 202, 203, 211, 213 and 214 to develop SWL, pH and electrical conductivity triggers.	MCO	Complete	Section 7.4
Continued progressive rehabilitation.	MCO	Action Ongoing	Section 9
Development of revised OC2 rehabilitation performance and completion criteria for ecosystem and species credits.	MCO	Complete	Section 9
Establish baseline monitoring sites for LW104 where not already in place.	MCO	Complete	Section 8

6.0 ENVIRONMENTAL PERFORMANCE

In accordance with the MCC Project Approvals, MCO have developed a series of environmental Management Plans in consultation with the relevant government agencies. Current approved plans are available for review via the MCO website - http://www.moolarbencoal.com.au

In order to measure compliance with the project approvals, various licences, and site management plans, MCO undertakes a comprehensive environmental monitoring program. The locations of environmental monitoring undertaken during the 2020 reporting period are identified in **Appendix 2**. This section provides summary details on:

- **Section 6.1** - Meteorological overview
- **Section 6.2** - Noise;
- **Section 6.3** – Blasting;
- **Section 6.4** – Air quality;
- **Section 6.5** – Biodiversity; and,
- **Section 6.6** – Heritage.

Water, subsidence, rehabilitation and community aspects are reported in **Sections 7.0, 8.0, 9.0** and **10.0** respectively.

6.1 METEOROLOGICAL SUMMARY

Meteorological monitoring is undertaken at Automatic Weather Station (WS) WS03 (Ulan Road) in accordance with NSW Project Approval and EPL requirements. Additional weather stations may be used to supplement weather data as required including WS04 located near OC2, and WS05 located near OC3 (installed December 2020). The localities of the stations are illustrated in **Appendix 2** Meteorological parameters recorded by WS03 include:

- wind speed at 10 m;
- wind direction at 10 m;
- sigma theta;
- temperature at 2 m and 10 m;
- relative humidity at 2 m;
- solar radiation at 2 m; and,
- Rainfall

WS03 rainfall and temperature records for 2020 are summarised in **Table 10**. A total of 939.8mm of rainfall was recorded in 2020, with February the wettest month (163.2mm) and November the driest (20.6mm). The total rainfall at MCO for 2020 was 289.5mm above the annual average rainfall at the Gulgong Post Office of 650.3mm and above both 2019 and 2018 totals of 360 and 536.6mm respectively.

Temperature recorded at WS03 ranged from -3.9°C in August to 43.0°C in January. The lowest minimum temperature of -3.9°C was slightly warmer than the lowest minimum of -5.8°C recorded in 2019. The highest maximum temperature of 43.0°C was slightly more than the highest maximum temperature of 42.5°C recorded in 2019.

From January to March and then October to December north east and easterly winds were predominant with south westerly and southerly winds predominant from April to September. Meteorological data and monthly wind roses are presented in **Appendix 3A**.

Table 10: Meteorological Summary (WS03)

Month	Rainfall (mm)	Cumulative Rainfall (mm)	Long-term average Rainfall (mm)	Max Temp (°C) @ 2m	Min Temp (°C) @ 2m
Jan-20	29.6	29.6	70.5	43.0	12.8
Feb-20	163.2	192.8	60.9	40.9	7.9
Mar-20	100.0	292.8	55.0	34.1	7.7
Apr-20	109.0	401.8	43.7	26.7	3.2
May-20	12.8	414.6	44.9	22.8	-1.5
Jun-20	27.8	442.4	50.8	18.0	-1.4
Jul-20	75.2	517.6	48.8	19.8	-2.6
Aug-20	38.8	556.4	45.8	21.2	-3.9
Sep-20	75.6	632.0	47.0	26.6	0.5
Oct-20	143.8	775.8	55.6	29.8	2.2
Nov-20	20.6	796.4	60.0	37.7	5.8
Dec-20	143.4	939.8	67.3	40.4	6.7
Total	**939.8**	**939.8**	**650.3**		

6.2 NOISE

MCO manages noise in accordance with the MCO Noise Management Plan (NMP) (Version 5). The NMP was revised and approved in October 2020. The NMP was developed by MCO with advice from experienced and qualified experts (SLR Consulting Australia Pty Ltd) to satisfy Condition 7, Schedule 3 of PA 05_0117 (as modified) and Condition 8, Schedule 3 of PA 08-0135.

During the reporting period, major noise producing activities included Operations within:

- OC1, OC2, OC3, and OC4;
- Surface operations associated with UG1;
- The CHPP and rail load-out facilities; and,
- Construction activities.

Operational processes for MCO to reduce noise emissions included:

- Use of sound attenuated major equipment;
- Operation of some support fleet during the daytime only;
- Use of shielded areas in adverse weather conditions;
- Use of real-time noise monitoring data and Mine Production Environmental Assistants to assist operational personnel in proactive and reactive management of noise impacts;
- Use of predictive noise models to assess predicted noise risks associated with meteorological influences;
- Sound power testing equipment; and,
- Routine maintenance of equipment, including sound attenuation components.

6.2.1 REAL- TIME NOISE MONITORING

The NMP identifies response triggers for real-time noise via four monitoring stations (refer **Appendix 2** for localities). When a trigger has been reached, an SMS alarm is sent to operational personnel and members of the Environment and Community Department. The real-time monitoring network operated throughout the reporting period.

6.2.2 ATTENDED NOISE MONITORING

During the 2020 reporting period, attended environmental noise monitoring was conducted monthly (NA1, NA6 & NA12), with additional sites monitored quarterly (NA11) and annually (MGNR & GRNP). The purpose of attended noise monitoring is to quantify and describe the acoustic environment around MCO's operations and compare noise contribution from the MCC to the project Noise Criteria.

Noise Criteria are specified for day, evening, and night period for the amenity of neighbouring residences. Noise Criteria are expressed as $LAeq_{(15min)}$ and $LA1_{(1min)}$. **Table 11** provides a summary of project noise criteria and noise performance based on attended noise monitoring for 2020, together with management implications and proposed actions.

MCO complied with the project specific noise criteria at all monitoring sites during attended noise monitoring in the reporting period. A summary of results from attended noise monitoring undertaken during the period in accordance with the NMP is provided in **Appendix 3B**.

6.2.3 ATTENDED VALIDATION NOISE MONITORING

In accordance with the NMP, attended monitoring was undertaken during the reporting period at four locations (i.e. NA2, NA3, NA10 & NA12) to verify the results of real-time noise monitoring.

Validation monitoring continues to confirm that the current real-time monitors consistently overestimated the MCO LAeq during the validation periods. The real-time data appeared to be routinely influenced by extraneous low frequency noise sources such as road traffic, aircraft, dogs, and wind. Due to the inability to distinguish between contributing noise sources, the real-time data is not suitable for compliance purposes and cannot be relied upon to provide an accurate estimate of mine generated noise. Real-time monitoring remains suitable for management purposes.

6.2.4 COMPARISON AGAINST PREVIOUS YEARS

Attended noise monitoring results were reviewed against previous years to 2012. This review found a high level of variability in results. Of the results where a noise reading was determined (i.e. not inaudible and criteria applicable, there is some correlation between monitoring results and the distance of the receiver from the operations.

Attended noise monitoring undertaken at NA1 Ulan school between 2012 and 2020 during the day time period shows that MCO was inaudible during 81% of the samples, with no exceedances of criteria. Monitoring at NA6 Lower Ridge Road between 2012 and 2020 during the night period shows that MCO was inaudible during 16% of the samples, with no exceedances. Attended noise monitoring completed at NA12 Winchester Crescent between 2012 and 2020 during the night period shows that MCO was inaudible during 47% of the samples, with no sustained exceedances of criteria.

Annual attended noise monitoring results at the Goulburn River National Park and the Munghorn Gap Nature Reserve indicate that MCO was inaudible during 27% and 73% of the samples respectively, with no exceedances recorded during monitoring.

Table 11 : Attended Noise Monitoring Summary

Aspect	Approved Criteria					Performance During the Reporting Period	Key Management implications	Implemented/ proposed management Actions
Attended Noise Monitoring	**Land No.**	**Day [1] L_{A1eq} (15min).**	**Evening [2] L_{A1eq} (15min).**	**Night [3] L_{A1eq} (15min).**	**Night [3] L_{A1eq} (1min).**	Monthly attended monitoring was undertaken at the three required noise compliance locations (NA1, NA6 & NA12) throughout 2020 as required by the NMP. Quarterly monitoring was completed at NA11 during 2020 as required by the NMP Annual monitoring was undertaken at the two required noise compliance locations (GRNP & MGNR) throughout 2020 as required by the NMP. There were no recorded noise exceedances during the 2020 reporting period at the five noise compliance monitoring locations NA1, NA6, NA12, GRNP & MGNR. MCO continued to coordinate noise management with neighbouring mines. ***Note*** *approved noise compliance monitoring locations were selected as representative of residences* and are shown in **Appendix 2**.	Noise management controls effective.	Continue the implementation of the NMP. MCO will review, and if necessary revise, the NMP in accordance with Schedule 5 condition 5 and Schedule 6 condition 5 of PA05_0117 and PA08_0135 respectively.
	70	37	37	37	45			
	75	36	36	36	45			
	All other privately owned residences	35	35	35	45			
	Ulan Primary School	35 (internal) when in use			-			
	Ulan Anglican Church	35 (internal) when in use			-			
	Goulburn River National Park Munghorn Gap Nature Reserve	50 when in use			-			

1 Day is defined as the period between 7am-6pm Monday to Saturday, and 8am-6pm on Sundays and Public Holidays
2 Evening is defined as the period 6pm-10pm
3 Night is defined as the period from 10pm-7am Monday to Saturday, and 10pm-8am on Sundays and Public Holidays.

6.2.5 COMPARISON TO PREDICTED LEVELS

Predicted noise levels from Year 2019 of the Open Cut Optimisation Modification (Stage 1 Modification 14 and Stage 2 MOD 3) were compared against actual noise levels during 2020. The 2020 results indicated that MCO was generally lower than the predicted levels where meteorological conditions were relevant.

Measured operational levels are compared to predicted levels in **Table 12**. In this table, a 'positive' difference is where the measured level is greater than the predicted level. A 'negative' difference is where the measured levels are less than the predicted levels. Where the meteorological conditions (primarily wind direction and temperature gradient) during the attended monitoring do not correspond with those that are modelled, no further analysis is undertaken. Attended noise monitoring results are included in **Appendix 3B.**

Table 12: EA Predictions – Attended Noise Monitoring, Various Weather Conditions

	$dB(A)_{Leq\ (15min)}$[1]			$dB(A)_{LA1(1min)}$[1]		
	NA1 Ulan School	**NA6 Lower Ridge Rd**	**NA12 Winchester Cres**	**NA1 Ulan School**	**NA6 Lower Ridge Rd**	**NA12 Winchester Cres**
	Day	**Night**	**Night**	**Day**	**Night**	**Night**
January	NA	-7[2]	NC[3]	NA	-8[2]	-13[3]
February	NA	NA	NA	NA	NA	NA
March	NA	NA	NA	NA	NA	NA
April	NC[2]	NC[3]	NC[3]	NA	NC[3]	NC[3]
May	NC[4]	-4[3]	-5[3]	NA	-6[3]	-9[3]
June	NA	NC[3]	NC[3]	NA	NC[3]	NC[3]
July	NA	NC[2]	NC[2]	NA	-5[2]	NC[2]
August	NA	NA	NA	NA	NA	NA
September	NA	-2[3]	-4[3]	NA	-4[3]	-4[3]
October	NA	-10[2]	NA	NA	-11[2]	NA
November	NA	NA	NA	NA	NA	NA
December	NC[4]	NC	NC[2]	NA	NC[4]	NC[2]

[1.] NA indicates meteorological conditions during the measurement did not correspond with any modelled meteorological conditions, and were not applicable for comparison.
NC indicates measured MCO noise levels were inaudible (IA), not measurable (NM), or expressed as a "less than" quantity (e.g. less than 30 dB), therefore measured and predicted noise levels were not comparable.
[2.] Wind conditions assumes winds at speeds between 0.5 and 3 m/s during monitoring and assumes the following possible predicted wind directions: 45°-112.5° or 180°-270° Celsius.
[3.] Strong Inversion of 5.2° Celsius per 100 m altitude or greater.
[4.] Calm conditions assumes winds at speeds between 0.0 and 0.5 m/s.

6.3 BLASTING

MCO manages blasting in accordance with the Blast Management Plan (BMP) (Version 6). During the reporting period the BMP was revised and approved in October 2020 The BMP was developed by MCO with advice from experienced and qualified experts (SLR Consulting Australia Pty Ltd) to satisfy Condition 15, Schedule 3 of PA 05_0117 (as modified) and Condition 16, Schedule 3 of PA 08-0135 (as modified).

Blasting criteria, blasting hours, blasting frequency, property inspection requirements and operating conditions are provided in Conditions 8 to 14, Schedule 3 and Conditions 9 to 15, Schedule 3 of the NSW Project Approvals (05_0117) and (08_0135) respectively.

The blast monitoring locations are identified in **Appendix 2**. During the reporting period blast monitoring included airblast overpressure and ground vibration at locations representative of privately owned residences, schools and aboriginal rock shelters.

6.3.1 SUMMARY OF BLAST MONITORING RESULTS

Blast monitoring compliance for the reporting period is presented in **Table 13** and a summary of blast monitoring results for the period is provided in **Table 14**. Individual blast results are provided in full at **Appendix 3C**. No exceedances of the blasting criteria occurred during the reporting period.

No blasting was undertaken within 500m of any public road, railway line, 330kV powerline or private land.

Table 13 : Blast Monitoring Summary (BM1, BM5, BM8)

Blast Summary	Number	Compliance (% Of Blasts)
Total Blasts	175	Compliant
Days with >2 blasts (PA05 Sch 3 C 10)	0[1]	Compliant
Annual average blasts per week	3.35	Compliant
Blasts outside blasting hours	0	Compliant
Airblast Overpressure >115 dB(Lin Peak) [2]	2[3]	Compliant (3%)
Airblast Overpressure >120 dB(Lin Peak)	0	Compliant
Ground Vibration >5 mm/s [2]	0	Compliant (0%)
Ground Vibration >10 mm/s	0	Compliant
Reportable Fume Events	0	Nil

[1] *Misfires excluded as per PA05_0117 Sch 3 Con. 10 and PA08_0135, Sch. 3, Con. 11.*

[2] *Allowable exceedances of 5% of total blasts over a period of 12 months.*

[3] *Two blast events recorded in exceedance of 115dBL during the reporting period – one at BM1 located at Ulan School, and one at BM8 (located on MCO owned land) that was wind affected.*

Table 14 : Blast Monitoring Summary

Aspect	Approved Criteria				Performance During the Reporting Period	Trend/ Key Management Implications	Implemented/ proposed actions
Blast	Receiver	Air Blast Overpressure Level dB (Linear Peak) dBL[1]	Peak Particle Velocity – Ground Vibration mm/s[2]	Allowable Exceedance	Compliance monitoring was undertaken at the following representative locations for the 2020 reporting period • **BM1 – Ulan School** o Max. Overpressure = 116.4 dBL o Max Ground Vibration = 0.67 mm/s o Average Ground Vibration = 0.15 mm/s • **BM5 – Ridge Road** o Max. Overpressure = 109.2 dBL o Max Ground Vibration = 0.78 mm/s o Average Ground Vibration = 0.16 mm/s • **BM8 – Moolarben Road** o Max. Overpressure = 116.2 dBL[4] o Max Ground Vibration = 0.47 mm/s o Average Ground Vibration = 0.11 mm/s A full blast summary is contained at **Appendix 3C**.	In accordance with condition 13 (c), Schedule 3 of project approval 05_0117 and condition 14 (d), schedule 3 of project approval 08_0135 MCO co-ordinates the timing of blasting onsite with the timing of blasting at Ulan and Wilpinjong mines to minimise cumulative impacts. Air blast over pressure and peak particle velocity continue to remain stable over the life of the operation at BM1 Ulan School and BM5 Ridge Road.	MCO will review and if necessary revise, the BMP in accordance with Schedule 5 condition 5 and Schedule 6 condition 5 of PA05_0117 and PA08_0135 respectively. During the reporting period MCO continued to maintain the blast monitoring network.
	Residence Privately Owned	120	10	0%			
		115	5	5% of the total number of blasts over a period of 12-months			
	All Public Infrastructure	-	50[3]	0%			

Notes - [1]- dB (Linear Peak) dBL = decibel linear peak [2]- mm/s = millimetres per second [3] - These criteria do not apply if the Proponent has a written agreement with the relevant owner, and has advised the Department in writing of the terms of this agreement. MCO has written agreements with TransGrid and Australian Rail Track Corporation (ARTC) to undertake blasting within 500 metres (m) of the Wollar-Wellington 330 kV transmission line and within 500 m of ARTC infrastructure, respectively. [4] Wind affected result.

6.3.2 COMPARISON TO PREVIOUS BLAST MONITORING AND PREDICTED LEVELS

A comparison of the 2020 blast results to the 2019 results and predications in the Environmental Assessment (EA) for Stage 1 Modification 14 and Stage 2 Modification 3 (Year 2019) are outlined in **Table 15** below.

Table 15 : Comparison to Blasting Results - BM1 & BM5 2019, 2020 and EA

Site	EA Vibration Predictions (mm/s) [2]	2019 vibration range (mm/s)	2020 vibration range (mm/s)	Comment on results
BM1 Ulan School	2.1	0.02 – 0.80	0.03 – 0.67	Generally lower than previous results and predictions.
BM5[3] Ridge Rd	3.0	0.01 – 0.80	0.03 – 0.78	Generally lower than previous results and predictions.
BM8[4] Moolarben Rd	3.7	N/A	0.03 – 0.47	Generally lower than predictions.
Site	**EA Overpressure (dBL) [2]**	**2019 Overpressure range (dBL)[1]**	**2020 Overpressure range (dBL)[1]**	**Comment on results**
BM1 Ulan School	112.0	81.1 – 114.5	78.6 – 116.4	Generally consistent with previous results and predictions.
BM5[3] Ridge Rd	114.0	76.1 – 119.0	77.7 – 109.2	Generally consistent with previous results and predictions.
BM8[4] Moolarben Rd	115	N/A	70.0 – 113.2	Generally lower than predictions.

[1] Excludes environmental influenced results.
[2]Overburden blast design MIC 4,500 kg, 5% exceedance prediction.
[3]Modelled predictions taken from nearest private receiver ID No.70 adjacent from BM5
[4]BM8 installed in April 2020

Blast Monitoring 80%ile and 50%ile trends since 2012 are depicted below in **Figure 6** and **Figure 7**. The monitoring data indicates a correlation between monitoring results and distance of the receiver from the blast locations. Within the graphs the five percent and maximum limit has been included for the blast overpressure graph and the five percent limit has been included within the ground vibration graph. Results have generally been below these criteria.

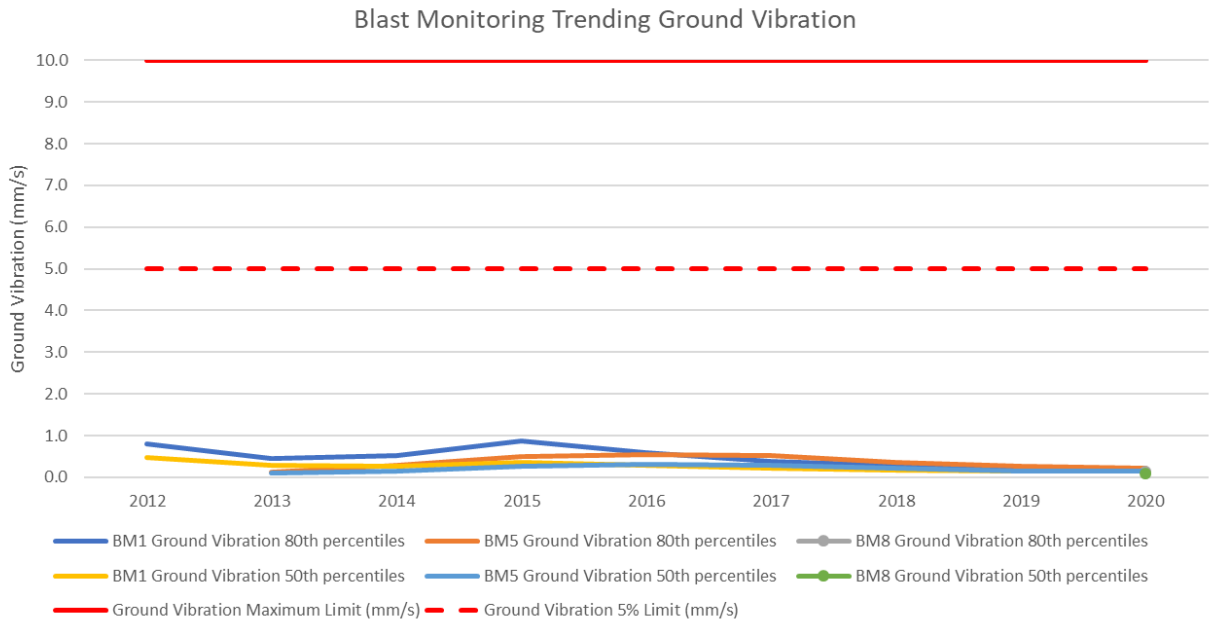


Figure 6 Blast Monitoring Trending Ground Vibration

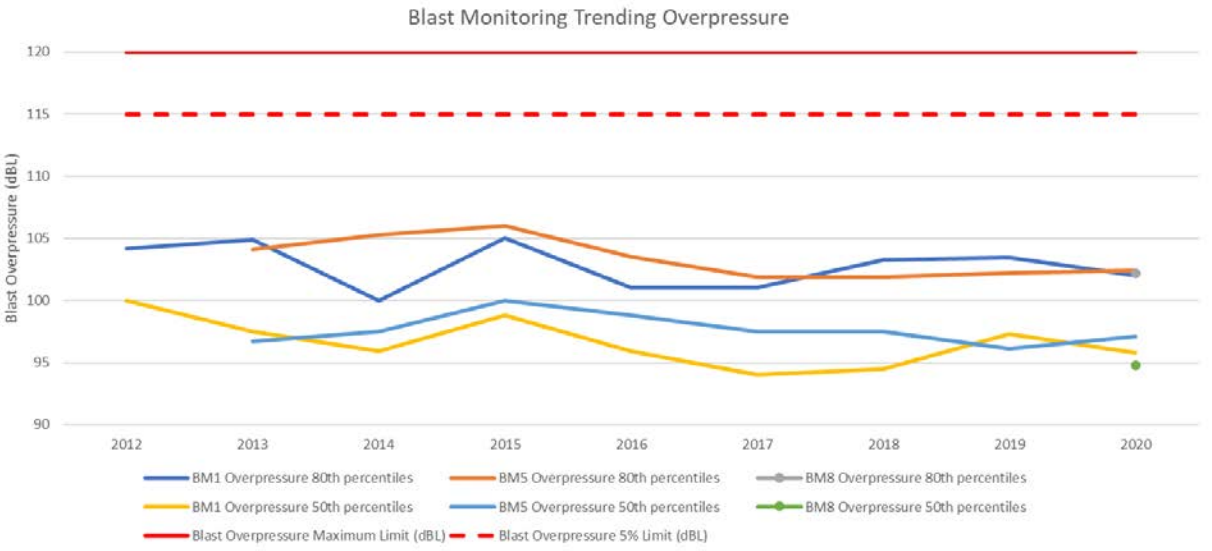


Figure 7 Blast Monitoring Trending Overpressure

6.4 AIR QUALITY

MCO manages air quality in accordance with Air Quality Management Plan (AQMP). The AQMP was revised and approved in October 2020. The AQMP was developed by MCO with advice from experienced and qualified experts (Todoroski Air Sciences) to satisfy Condition 19, Schedule 3 of PA 05_0117 and Condition 22, Schedule 3 of PA 08-0135.

During the reporting period, MCO undertook air quality monitoring in accordance with the approved AQMP (Version 6). This included:

- Deposited particulate matter monitoring with Dust Depositional (DD) gauges at four locations around the Moolarben Coal Complex;
- PM_{10} – High Volume Sampling (HVAS) monitoring at two sites – Ulan Village (PM01) and south-west of Open Cut 1 and west of Open Cut 2 (PM02);
- PM_{10} – Real Time Monitoring via Tampered Element Oscillating Mass Balance's (TEOMs) at three permanent locations around the Moolarben Coal Complex representative of private residences and one upwind of operations when winds towards private residences;
- PM2.5 - Real Time Monitoring via a dual function Tampered Element Oscillating Mass Balance's (TEOMs) at one location around the Moolarben Coal Complex representative of private residences
- Total Suspended Particulate (TSP) matter calculated from TEOM PM_{10} monitoring results;
- Meteorological monitoring is undertaken via Automatic Weather Stations (AWSs), with WS03 (located on Ulan Road) the principal station for reporting purposes.

The AQMP monitoring locations are identified in **Appendix 2**. The air quality monitoring program is outlined in **Appendix 3D**. A summary of air quality monitoring results for the reporting period is provided in **Table 16**, **Table 17** and **Appendix 3D**.

Table 16: Air Quality Monitoring Summary

Aspect	Monitoring Form	Approved Criteria	Performance during the Monitoring Period	Trend/ Key Management Implications	Implemented/proposed Management Action
Air Quality	**Dust Deposition**	4 g/m^2/month (max total)[1]	Annual averages for each dust depositional gauge are reported in **Table 18**. All dust depositional results for the 2020 reporting period were below the 4/g/m^2/month criterion. The 2g/m^2/month criterion was not triggered.	Annual Average Dust depositional results for the operation indicate a slight decreasing trend over the period, and remain well below the criteria.	MCO will review and if necessary, revise the AQMP in accordance with Schedule 5 condition 5 and Schedule 6 condition 5 of PA05_0117 and PA08_0135 respectively. During the reporting period MCO continued to maintain the air quality monitoring network.
		2 g/m^2/month above background average (Incremental increase)[2]			
	PM_{10}	50 µg/m^3 (24hr average)[2, 3]	All PM_{10} results were within criteria. Results due to extraordinary events are excluded from the dataset.	24-Hour average PM_{10} results for the operation indicate a slight decreasing trend over the period, and remain well below the criteria.	
		25 µg/m^3 (Annual average) [1, 3]	The average PM_{10} results for the reporting period are presented in **Table 19**. All sites were below the Annual average criteria.	Annual average PM_{10} results for the 2020 reporting period indicate a steady trend at all locations when compared to 2019.	
	$PM_{2.5}$	25 µg/m^3 (24hr average) [2, 3]	There were two events where cumulative $PM_{2.5}$ results were greater than the criteria. Both events were investigated concluding MCO contribution was below the criteria. Results due to extraordinary events are excluded from the dataset.	24-Hour average PM2.5 results for the operation indicate a slight decreasing trend over the period remaining below the criteria.	
		8 µg/m^3 (Annual average) [1, 3]	The annual average $PM_{2.5}$ results for the reporting period are presented in **Table 20**. All results were within criteria.	Annual average $PM_{2.5}$ results for the 2020 reporting period indicate a slight decreasing trend during the period. Annual average results were not available during the 2019 period.	
	Total Suspended Particulate (TSP)	90 µg/m^3(Annual average) [1]	TSP results are presented in **Table 21.** TSP is calculated using the approved AQMP methodology based on PM_{10} constituting 40% of the total TSP. During the reporting period, all sites where calculated as being below the 90µg/m^3 criterion.	Annual average TSP results for the 2020 reporting period indicate similar results when compared to 2019 with some sites increasing and some sites decreasing during the period.	

[1] Cumulative (i.e. incremental increase in concentrations due to the Moolarben mine complex plus background concentrations due to all other sources);
[2] Incremental impact (i.e. incremental increase in concentrations due to the Moolarben mine complex on its own) with up to 5 allowable exceedances over the life of the project
[3] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents, illegal activities or any other activity agreed by the Secretary.

6.4.1 DATA CAPTURE RATE

The following table (**Table 17**) provides details on the data capture rates for the reporting period. Data capture was impacted by maintenance, power loss and equipment failures.

Table 17 Data Capture Rate for PM_{10} & $PM_{2.5}$ Annual Averages

Location	2020 Data Capture Rate
TEOM 01 (Ulan School)	98%
TEOM 04 (Ulan Road)	97%
TEOM 06 (Ulan-Wollar Road)	98%
TEOM 07 (Ulan Road)[1]	95%
PM 01 (Ulan Village	100%
PM 02 (Ridge Road)	100%

[1] TEOM monitors for both PM_{10} and $PM_{2.5}$

6.4.2 COMPARISON TO PREVIOUS AIR QUALITY MONITORING AND BACKGROUND LEVELS

Dust Deposition

A comparison of the 2020 dust deposition results with previous results from 2012 and predications in the Environmental Assessment (EA) for Stage 1 Modification 14 and Stage 2 Modification 3 (Year 2019) is provided in **Table 18.**

All deposition results are within criteria and were generally consistent with predicted results(**Table 18**). Data trends are presented in **Appendix 3D.**

Table 18: Comparison of Depositional Dust results

Dust Gauge	Annual Average (g/m2/month) (Criteria = 4 g/m^2/month)										
	Back-ground	2012	2013	2014	2015	2016	2017	2018	2019	2020	EA Prediction[1]
DG01[#]	1.2	0.3	0.5	0.8	0.6	0.5	0.6	0.9	1.3	0.9	1
DG04^	2.0	1.3	1.3	1.6	1.0	1.2	1.0	1.4	1.8	1.0	1
DG05^	1.8	0.8	1.0	2.0	0.8	1.3	1.5	1.8	1.5	1.3	1
DG09^	-	0.4	0.7	2.0	0.6	0.6	0.9	1.9	1.5	1.3	1

[1] EA predictions for 2019
[#] Background monitoring
^Representative of nearest non-mine owned residence

PM_{10}

A comparison of the 2020 PM10 results with previous results from 2012 and predications in the Environmental Assessment (EA) for Stage 1 Modification 14 and Stage 2 Modification 3 is provided in **Table 19.**

Results are within criteria and generally consistent with or below predicted results (**Table 19**) indicating that current air quality management practices are effective . Data trends are presented in **Appendix 3D.**

Table 19: Comparison of annual average PM_{10} Results

Unit	Annual Average (µg/m³)[4] (Criteria = 25 µg/m³)										
	Back-ground	2012	2013	2014	2015	2016	2017	2018	2019	2020	EA Prediction[5]
Ulan School (TEOM01)	15.1	10.2	12.4	11.4	13.2	13.0	12.3	15.1	17.3	15.1	18
Ulan Road (TEOM04)	-[1]	8.9	10.8	12.7	9.0	11.6	15.1	18.7	20.0	14.1	17
Ulan-Wollar Road (TEOM06)	-[1]	-[2]	-[2]	-[2]	9.0	11.5	12.5	15.7	19.7	16.6	*
Ulan Road (TEOM07)	-[1]	-[2]	-[2]	-[2]	-[2]	-[2]	11.2[3]	16.5	15.6	11.4	11
Ulan Village HVAS (PM01)	17.9	11.9	12.2	13.8	13.2	11.5	13.0	16.9[6]	18.9	11.8	18
Ridge Road HVAS (PM02)	-[1]	9.7	10.0	11.7	10.8	9.9	13.5	18.1[6]	18.7	12.4	13

[1] No background values as site established after 2009.
[2] No previous data as site not established.
[3] Calculated on 5 months of data.
[4] Annual Averages exclude extraordinary events such as bushfires and prescribed burns.
[5] EA predictions based on the Open Cut Optimisation Modification 2019 Scenario
*No EA prediction was made for TEOM06 as it is representative of conditions 'upwind' of MCO (ie not a private residence)

$PM_{2.5}$

A comparison of the 2020 PM2.5 results with previous results and predications in the Environmental Assessment (EA) for Stage 1 Modification 14 and Stage 2 Modification 3 (Year 2019) is provided in **Table 20.**

Results are within criteria and generally consistent with predicted results (**Table 20**). Data trends are presented in **Appendix 3D.**

Table 20: Comparison of annual average $PM_{2.5}$ Results

Unit	Annual Average (µg/m³)[4] (Criteria = 8 µg/m³)										
	Back-ground	2012	2013	2014	2015	2016	2017	2018	2019	2020	EA Prediction[5]
Ulan Road (TEOM07)	-[1]	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]	5.8[3]	5.6	5.5

[1] No background values as site established after 2009.
[2] No previous data as site not established.
[3] Calculated on 6 months of data.
[4] Annual Averages exclude extraordinary events such as bushfires and prescribed burns.
[5] EA predictions based on the Open Cut Optimisation Modification 2019 Scenario.

Total Suspended Particulates

TSP results (**Table 21**) are within criteria and generally consistent with predicted results.

Table 21: Comparison of annual average TSP results

Unit	Annual Average Calculated TSP (µg/m3) (Criteria = 90 µg/m3)										
	Back-ground	2012	2013	2014	2015	2016	2017	2018	2019	2020	EA Predictions[4]
TEOM01 (Ulan School)	37.75	25.5	31	28.5	33	32.6	30.7	37.7	43.2	37.8	35
TEOM04 (Ulan Road)	0	22.25	27	31.75	22.5	29.0	37.9	46.8	50.1	35.3	37
TEOM06 (Ulan-Wollar Rd)	-[1]	-[2]	-[2]	-[2]	22.5	28.8	31.4	39.3	49.3	41.5	*
TEOM07 (Ulan Road)	-[1]	-[2]	-[2]	-[2]	-[2]	-[2]	27.9[3]	41.3	39.0	28.5	24
PM01 (Ulan Village HVAS)	44.75	29.75	30.5	34.5	33	28.8	32.4	49.0[5]	47.3	29.5	35
PM02 (Ridge Road HVAS)	-[1]	24.25	26.25	29.25	27	24.8	33.7	45.3[5]	46.7	31.0	28

[1] No background values as site established after 2009.
[2] No previous data as site not established.
[3] Calculated on 5 months of data.
[4] EA predictions based on the Open Cut Optimisation Modification 2019 Scenario
[5] 2018 values previous reported including extraordinary events
*No EA prediction was made for TEOM06 as it is representative of conditions 'upwind' of MCO (ie not a private residence).

6.4.3 SPONTANEOUS COMBUSTION

The revised Air Quality Management Plan was approved in October 2020 with updates to include additional measures for the management of odour related to spontaneous combustion.

During the reporting period MCO continued to manage spontaneous combustion within Open Cut emplacement areas in accordance with the Air Quality Management Plan. Operational actions to manage instances of spontaneous combustion included;

- Restricting access to identified areas
- Reviewing the risk to personnel, environment, community, and operations
- Watering to cool known heating
- Exposure, spreading, and excavation of the heating material
- Applying further water
- Cover with inert material, track roll and reshape
- Monitoring of area to identify any further areas of heating.

6.4.4 REVIEW OF PARTICULATE CONTROL EMISSIONS

MCC currently apply a number of air quality management measures designed to minimise the impact on the surrounding environment due to on-site activities. A review of particle control emissions at the MCC against industry best practice was completed by Todoroski Air Sciences on behalf of MCO. The review investigated the range of potential best practice dust controls applicable to the MCC and concluded, the air quality controls applied can be considered to be equivalent with industry best practice.

6.4.5 GREENHOUSE GAS

Yancoal's operations reported under the National Greenhouse and Energy Reporting Scheme for the 2019-20 financial year. MCC Scope 1 and Scope 2 emissions calculated for the 2019-20 financial year was 272,971t CO_2-e. MCC Scope 1 and Scope 2 emissions calculated for the 2018-19 financial year was 252,996t CO_2-e. The increase in emissions can be attributable to an increase in open cut production.

6.5 BIODIVERSITY

MCO manages biodiversity in accordance with the Biodiversity Management Plan (BioMP). The current BioMP (Version 5) was approved during the reporting period in September 2020. The BioMP was developed by MCO with advice from experienced and qualified experts (EcoLogical Australia) to satisfy Condition 36, Schedule 3 of PA 05_0117 (as modified) and Condition 39, Schedule 3 of PA 08-0135 (as modified). In accordance with Condition 13(a), Schedule 2 of the Project Approvals (05_0117 and 08_0135), the BioMP is being staged and revisions of the plan will be submitted on a progressive basis. Offset management is also undertaken in accordance with relevant components of the Landscape Management Plan and Biodiversity Offset Management Plan (2013/6926).

The objectives of the management plans are to provide procedures and strategies to be implemented during the life of the Project to minimise biodiversity impacts on site (albeit in consideration of the approved impacts) and enhance biodiversity values on the offset areas. In addition to monitoring, the management plans describe procedures for:

- Vegetation Clearance Protocol – including Ground Disturbance Permits (GDPs), Pre-clearance surveys, habitat features, identification of suitable release locations;
- Collection and use of locally sourced native seed and supplementary tubestock;
- Strategies to manage vegetation onsite and improve vegetation connectivity;
- Additional biodiversity measures – rehabilitation of the environmental bund, weed and pest management, surface water management and erosion control, management of grazing and agriculture, access restrictions, and bushfire management.

The objective of biodiversity monitoring is to evaluate the vegetation and fauna habitat condition at the Moolarben Coal Complex (including recovery and/or enhancement of native vegetation) and to identify appropriate management actions to be applied, where required. Biodiversity monitoring relating to the vegetation management zone also includes noxious weed and vertebrate pest monitoring. Monitoring will be used to measure success against the short, medium and long-term targets described in the management plans and identify the need for corrective actions.

Monitoring of mine rehabilitation areas is described in the Rehabilitation Management Plan.

6.5.1 BIODIVERSITY OFFSET WORKS UNDERTAKEN

During the reporting period weed and feral animal monitoring and control works were undertaken throughout the offsets. Wild dog and feral pig baiting programs were undertaken in conjunction with the NSW Local Land Service (LLS) and neighbouring landholders within biodiversity offset properties. Weed control works were undertaken throughout the offset areas focusing on Serrated Tussock, Blackberries, Blue Heliotrope, Tree of Heaven, St Johns Wort, Spiny Rush and Prickly Pear. Native seed collection was continued within MCO owned lands and some offset areas.

During the reporting period 700m of new fencing was installed and over 4 Kilometres of redundant fencing removed from MCO offsets. Track maintenance and upgrades were completed on over 15 kilometres of required access and bushfire management trails. Revegetation works were continued within the offsets with over 70,000

stems planted to supplement natural regeneration within the Ulan 18, Bobadeen and Dexter Mountain Biodiversity Offset clusters.

During the reporting period a 'Positive Covenant' and a 'Restriction on the Use of Land by a Prescribed Authority' under Section 88E (3) of the *NSW Conveyancing Act 1919* was executed by MCO and the NSW Department of Planning, Industry and Environment (DPIE) to secure seven offset.

6.5.2 BIODIVERSITY OFFSET MONITORING

Flora and fauna monitoring during the reporting period included the Stage 1 Biodiversity Offset Areas (BOAs), Stage 1 Mod 9 offset areas, and the Stage 2 BOAs. Flora monitoring included monitoring of analogue sites located in National Parks or State Conservation Areas. Monitoring locations are provided in **Appendix 2**.

Offset monitoring included:

- Full floristic surveys
- Rapid assessment
- Fauna surveys targeting diurnal and nocturnal birds, reptiles, amphibians, mammals, microbats and habitat assessment

Monitoring is undertaken across two management zones that have been mapped within the BOAs. Each of these zones have defined strategic ecological management objectives, with an overall aim to achieve a sustainable landscape with improved overall ecological quality in the long term. The management zones are:

- Management Zone 1 (MZ1) – Enhancement of remnant vegetation; and
- Management Zone 2 (MZ2) – Regeneration/revegetation of grassland to forest/woodland.

6.5.2.1 Offset Monitoring Results

Stage 1 offset areas monitoring

Floristic monitoring undertaken within the Stage 1 BOAs during Autumn and Spring 2020 recorded:
233 species were recorded across Area 1 BOA. This consisted of 171 native species, 47 exotic species and 15 species that could not be identified to species level nor confidently be determined as native or exotic species
168 species were recorded across Area 2 BOA. This consisted of 141 native species, 15 exotic species and 12 species that could not be identified to species level nor confidently be determined as native or exotic species
196 species were recorded across Area 3 BOA. This consisted of 158 native species, 24 exotic species and 14 species that could not be identified to species level nor confidently be determined as native or exotic species.

Overall, the condition of the Stage 1 Management Zone 1 (MZ1) sites compared favourably with analogue sites. The majority of areas had an overall ranking of moderate or high, with overall condition being similar to analogue sites. Native Tree Cover (NTC) and Native Mid-Storey Cover (NMC) were lower at 3 sites in Area 3 BOA than at analogue sites. A high level of canopy dieback was observed across all BOAs, particularly along the ridges within Area 2 and Area 3 BOAs which has likely affected the results of these attributes. The dieback is consistent with observations of responses to the drought in remnant vegetation in the surrounding landscape (including some analogue sites). Notwithstanding, the improved rainfall during 2020 has led to a mass germination of canopy species and seedling establishment in the Stage 1 BOAs.

The conditions at Management Zone 2 (MZ2) sites of Area 1 and Area 3 BOAs showed good progress towards benchmark conditions with low exotic cover and Native Ground Cover (NGC) and NMC attributes meeting benchmark values. Native Species Diversity (NSD) and NTC were also approaching benchmarks in Area 1 BOA, in part due to maturing revegetation plantings. Canopy cover was absent in MZ2 in the Area 3 BOA, but all other conditions are good and there is no apparent hindrance to natural regeneration at this site.

The fauna monitoring undertaken within the Stage 1 BOAs during spring 2020 demonstrated that all BOAs provide habitat for a diverse range of fauna species. The total bird and microbat species assemblages recorded in 2020 at MZ2 sites within both Area 1 and Area 2 are overall similar to those recorded at MZ1 sites. A diverse range of typical woodland species were recorded, including multiple threatened bird and microbat species, some of which were recorded for the first time. These results indicate that MZ2 along with MZ1 areas of the Stage 1 BOAs provide valuable habitat and provide a positive indication that enhancement of habitat is occurring in these areas.

Stage 1 Mod 9 offset areas monitoring.

Floristic monitoring undertaken within the MOD 9 BOAs during Autumn and Spring 2020 recorded:

- 204 species were recorded across Bobadeen BOA. This consisted of 126 native species, 61 exotic species and 17 species that could not be identified to species level nor confidently be determined as native or exotic species.
- 166 species were recorded across Clarke BOA. This consisted of 126 native species, 27 exotic species and 13 species that could not be identified to species level nor confidently be determined as native or exotic species.
- 150 species were recorded across Clifford BOA. This consisted of 113 native species, 23 exotic species and 14 species that could not be identified to species level nor confidently be determined as native or exotic species.
- 151 species were recorded across Elward BOA. This consisted of 123 native species, 18 exotic species and ten species that could not be identified to species level nor confidently be determined as native or exotic species.
- 122 species were recorded across Moolarmoo BOA. This consisted of 78 native species, 31 exotic species and 13 species that could not be identified to species level nor confidently be determined as native or exotic species.
- 92 species were recorded across Property 5 BOA. This consisted of 50 native species, 29 exotic species and 13 species that could not be identified to species level nor confidently be determined as native or exotic species
- 120 species were recorded across Property 24 & 25 BOA. This consisted of 80 native species, 33 exotic species and seven species that could not be identified to species level nor confidently be determined as native or exotic species.

The majority of MZ1 sites received an overall high or moderate ranking which compares favourably with the analogue site results. In general, spring conditions were poorer than in autumn which is similar results to the analogue sites. Most MOD 9 MZ1 sites ranked well for Native Species Diversity (NSD), NGC and exotic cover. Key feed species for Koala were recorded naturally regenerating at all MOD 9 BOAs with key feed species for Regent Honeyeater and Swift Parrot also recorded as naturally regenerating at Bobadeen, Clarke and Property 5 BOAs.

Widespread drought induced canopy dieback was observed in intact vegetation at Clarke BOA, particularly in the southern section of the BOA. This is similar to the dieback observed at some analogue sites and Stage 1 BOAs and observed more broadly in the region. However, there was evidence of natural recovery in response to the summer and autumn rainfall with epicormic growth observed.

The total bird and microbat species assemblages recorded across both MZ1 and MZ2 sites indicated that the majority of BOAs contain overall similar bird and microbat species assemblages between MZ1 and MZ2 sites, with MZ2 sites recording a range of typically woodland species, as well as multiple threatened species. Whilst

MZ2 areas of MOD 9 BOAs continue to develop under management by MCO, these results provide a positive indication of the enhancement of habitat values within the BOAs.

Stage 2 offset areas monitoring.

Floristic monitoring undertaken within the Stage 2 BOAs during Autumn and Spring 2020 recorded:

- 197 species were recorded across Dun Dun East BOA. This consisted of 143 native species, 40 exotic species and 14 species that could not be identified to species level nor confidently be determined as native or exotic species
- 171 species were recorded across Dun Dun West BOA. This consisted of 123 native species, 33 exotic species and 15 species that could not be identified to species level nor confidently be determined as native or exotic species
- 72 species were recorded across Libertus BOA. This consisted of 61 native species, seven exotic species and four species that could not be identified to species level nor confidently be determined as native or exotic species
- 149 species were recorded across Old Bobadeen BOA. This consisted of 94 native species, 43 exotic species and 12 species that could not be identified to species level nor confidently be determined as native or exotic species
- 166 species were recorded across Onsite Offset BOA. This consisted of 120 native species, 34 exotic species and 12 species that could not be identified to species level nor confidently be determined as native or exotic species
- 118 species were recorded across Ulan 18 BOA. This consisted of 72 native species, 32 exotic species and 14 species that could not be identified to species level nor confidently be determined as native or exotic species.

Canopy cover (NTC) varied across all BOAs when compared to 2019 monitoring, with some MZ1 decreasing but other locations within several BOAs (Dun Dun East, Dun Dun West and Onsite Offset BOA) showing an increase. This trend is similar to that seen at other BOAs, with the majority of sites within MOD 9 and Stage 1 BOAs also decreasing in NTC, as well as two analogue sites. Exotic species were recorded at all BOAs. Although exotic cover has increased compared to 2019 monitoring at some locations, it was generally low or absent across most MZ1 areas.

Regeneration of key feed species for Koala was recorded within both MZ1 and MZ2 areas across all Stage 2 BOAs and regeneration of key feed tree species for both Regent Honeyeater and Swift Parrot was recorded at Dun Dun East and Dun Dun West BOAs. For MZ1, this is a good indicator that conditions have been created for these areas to be self-sustaining and maintain provision of suitable habitat for Regent Honeyeater, Swift Parrot and Koala in the long-term. Additionally, it demonstrates that MZ2 areas have the potential to provide increased or improved habitat for Regent Honeyeater, Swift Parrot and Koala

Overall, there was an increase in native species diversity since 2019 autumn monitoring with 22 of the 39 sites recording the highest species diversity across all monitoring sites. This shows that the sites retain good native species banks. Natural regeneration is occurring in all BOAs in close proximity to intact vegetation.

6.5.3 ACTIONS FOR NEXT REPORTING PERIOD

During the next period activities to be undertaken include review of management plans and revision where necessary to develop a complex wide Biodiversity Offset Management Plan, continued monitoring, assisted regeneration planning and implementation, fencing, track and fire trail works, continued weed and feral animal control works, maintenance of property security and progression of Gilgal Biodiversity Stewardship Agreement.

6.6 HERITAGE

MCO manages heritage in accordance with the Heritage Management Plan (HMP). The current HMP (Version 8) was approved in September 2020.

During the reporting period MCO continued the salvage and management of Aboriginal heritage sites associated with the project. The results of all survey and salvage activities during the period have been included in the MCO heritage database.

Annual inspections of historic heritage conservation areas were completed during 2020, the areas continue to be managed in accordance with the HMP.

6.6.1 ACTIONS FOR NEXT REPORTING PERIOD

Further salvage and management of Aboriginal and European heritage sites associated with the project may be completed during the next reporting period. Registered Aboriginal Party (RAP) groups will continue to be involved in due diligence and salvage works in accordance with the Heritage Management Plan.

6.7 BUSHFIRE

During the reporting period the MCO Bushfire Management Plan was reviewed and updated. No major outbreaks of fire occurred at the MCC during the reporting period. MCO continued to implement the Bushfire Management Plan and conducted bushfire trail inspections and maintenance across Moolarben Coal owned lands. In the next reporting period inspection and maintenance works on fire trails will continue.

6.8 WASTE MANAGEMENT

During the reporting period MCO continued to maintain a Total Integrated Waste Management Service to manage all waste streams generated on site and to maximise recycling. This includes general waste, cardboard and paper recycling, batteries, waste oil, and steel. The volumes of total waste and recycled material removed from site are shown in **Table 22**. During the reporting period 67% of all waste removed from site was recycled. Waste volumes have been variable since 2012, with volumes increasing in association with the expansion of the operations, commencement of underground operations and construction works.

Table 22: Waste Removal Volumes removed during the reporting period

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total Waste (t)	990.6	1379.6	1490.5	1276.7	2615.1	2612.9	2559.3	3087.1	3578.4
Recycled Waste (t)	778.2	1173.1	1346.5	1058.3	1730.2	1806.0	1851.4	2178.0	2408.9
Percentage Recycled	79%	85%	90%	83%	66%	69%	72%	71%	67%

7.0 WATER MANAGEMENT

MCO manages water in accordance with the Water Management Plan (WAMP). The WAMP (Version 6) and its component plans including Site Water Balance (SWB) (Version 4), Surface Water Management Plan (SWMP) (Version 5) and Groundwater Management Plan (GWMP) (Version 4) were approved in October 2020. During the reporting period the WMP and its component plans were revised and approved on two occasions April 2020 and October 2020 too incorporate amendments associated with Modification 14 and Modification 15.

During the reporting period, MCO undertook water monitoring and data review in accordance with the WAMP. Surface water and groundwater monitoring sites are provided in **Appendix 2.** Surface water monitoring includes:

- Surface water quality and flow (monthly/6 monthly/event based);
- Stream health (annually);
- Channel stability (annually);
- Mine site water management structures quality (monthly); and
- Licensed discharge points.

Groundwater related monitoring includes:

- Groundwater levels/pressure (monthly);
- Groundwater quality (6 monthly);
- Groundwater take; and
- Potential seepage from mine water storages.

The groundwater monitoring includes the following lithological units:

- Quaternary alluvium;
- Tertiary aged unconsolidated sediments;
- Triassic sandstones;
- Permian coal measures;
- Ulan seam coal;
- Marrangaroo formation; and
- Basement units (consisting mostly of granites and metavolcanics).

During the period MCO completed construction of a water treatment facility, associated pipelines and discharge point, commence releases of treated water, constructed water storages (mine water and sediment), extended the dewatering and transfer network and installed operational and construction related erosion and sediment controls.

Details of water licensing and associated take are provided in **Section 7.1**. A summary of the site water balance is provided in **Section 7.2**. A summary of surface water monitoring and groundwater monitoring results for the reporting period are provided in **Section 7.3** and **Section 7.4** respectively. Detailed surface water and groundwater monitoring results for the reporting period are provided at **Appendix 3F** and **Appendix 3G** respectively.

7.1 WATER LICENCES

A summary of water take and available water under water access licences for the reporting period (1 January to 31 December 2020), as well as a prediction for the next reporting period (1 January to 31 December 2021) is provided in **Table 23**. Water take is provided in six monthly periods to coincide with the water year (i.e. 1 July 2019 to 30 June 2020).

Table 23: Water Licences and Take

Water Access Licence	Description	Available Water (Units) [1]	2020 Estimated Water take (ML)[2]			2021 Forecast Water Take (ML)
			Jan - Jun	Jul - Dec	Total	
36340 37583	Wollar Creek Water Source	436	13	16	29	37
37582 & 41888	Upper Goulburn River Water Source	427	28	34	62	88
39799	Sydney Basin - North Coast Groundwater Sources	5900	1,048[3]	1271[3]	2,319[3]	3271

[1] One unit equivalent to 1.0 ML as per the *Available Water Determination Order for Various NSW Unregulated and Alluvial Water Sources (No. 1) 2018* and *Available Water Determination Order for the North Coast Coastal Sands and the North Coast Fractured and Porous Rock Groundwater Sources 2018 for the 2018/19 water year. Available water is reported in IWAS including carry-over and temporary transfers.*

[2] Groundwater Model and water balance used to estimate water take by water source.

[3] No water was directly extracted from WAL 39799 tagged groundwater extraction bores.

Water take is estimated as part of the Annual Review after the end of the calendar year. MCO determines water take in accordance with the approved WAMP. Water take is either groundwater inflow removed from the operation, water extracted from licenced bores, or modelled take from surface and alluvial aquifers. The review estimate incorporates site water balance reconciliations, recirculation to underground and water take for the period. Indirect or passive take is based on modelling predictions for the relevant period.

Water take by water source has been determined in consideration of the Groundwater Model documented in the approved GWMP and based on the Open Cut Optimisation Modification application (Stage 1 (MOD 14) and Stage 2 (MOD 3)) and updated to reflect the LW104-105 Extraction Plan, river stage heights and current mine schedule. The estimated water take during the 2020 calendar year has been summarised in **Table 23**.

The available water for 2019/20 water year for all water sources was greater than the water take. MCO will continue to take necessary action to ensure that it holds sufficient water entitlements.

7.2 WATER BALANCE

MCO monitors the water balance for the operation to assist forecasting and management of site water. The site water balance (**Table 24**) for the reporting period was prepared with input from suitably qualified and experienced consultants WRM and SLR. Site water storage increased by 1,532ML during the reporting period due to an increase in rainfall run-off and groundwater inflows. The main demands were coal processing and dust suppression. The Balance includes a variance of 121ML (2.2%).

During the Period, no water was extracted from licences Production Bores.

Table 24: Site Water Balance

Water Sources (Inflows)	Volume (ML)
UCML Water	337
Groundwater Extraction (bores)	0
Rainfall / runoff	2,851
Groundwater inflows	2,411
Total	5,599
Water Loss (Outflows)	
Evaporation	569
Seepage	0
Construction & dust suppression	1,106
Licensed Discharge	1,426
Unlicensed Discharge	0
CHPP Demand	861
Underground demand	225
Total	4,188
Water Balance	
Inflows minus outflows	1,411
Change in inventory	1,532
Balance	-121 (2.2%)

7.3 SURFACE WATER

7.3.1 SURFACE WATER QUALITY AND FLOWS

7.3.1.1 Surface Water Flows

The Moolarben Coal Complex is within the Upper Goulburn River and Wollar Creek catchments. Moolarben Creek and Sportsmans Hollow creek are the primary tributaries of the upper Goulburn River catchment with Bora Creek a minor tributary. Wilpinjong Creek and its minor tributaries (Eastern and Murragamba creeks) drain to the Wollar Creek. Most of the adjacent watercourses are ephemeral in nature.

In accordance with the SWMP, stream flow gauges have been installed in the ephemeral Wilpinjong, Murragamba, and Eastern. Creek flow is heavily influenced by rain events. Data has been supplemented with data from Ulan Coal Mines as required. The recorded stream gauging is provided in **Appendix 3F**.

7.3.1.2 Surface Water Quality

Surface water monitoring was undertaken in the Goulburn River, Moolarben Creek, Wilpinjong Creek, Murragamba Creek, and Eastern Creek in accordance with the SWMP. Results varied both spatially and temporally consistent with fluctuations associated with rainfall events in ephemeral watercourses. Goulburn River sites SW01 and SW02 in the Goulburn River National Park and Conservation Area were closed by NPWS during January 2020 monitoring period due to bushfire conditions. NPWS closed access to Goulburn River site SW01 during February to May 2020 monitoring periods for safety concerns due to the access bridge being washed out.

Monitoring results during the reporting period were influenced by drought conditions continuing from 2019 followed by above average rainfall received during the remainder of 2020. The findings are described in **Section 7.3.1.3** below. Water quality data for the period is presented in **Figure 8, Figure 9** and **Figure 10**. Monitoring data is provided in **Appendix 3F**.

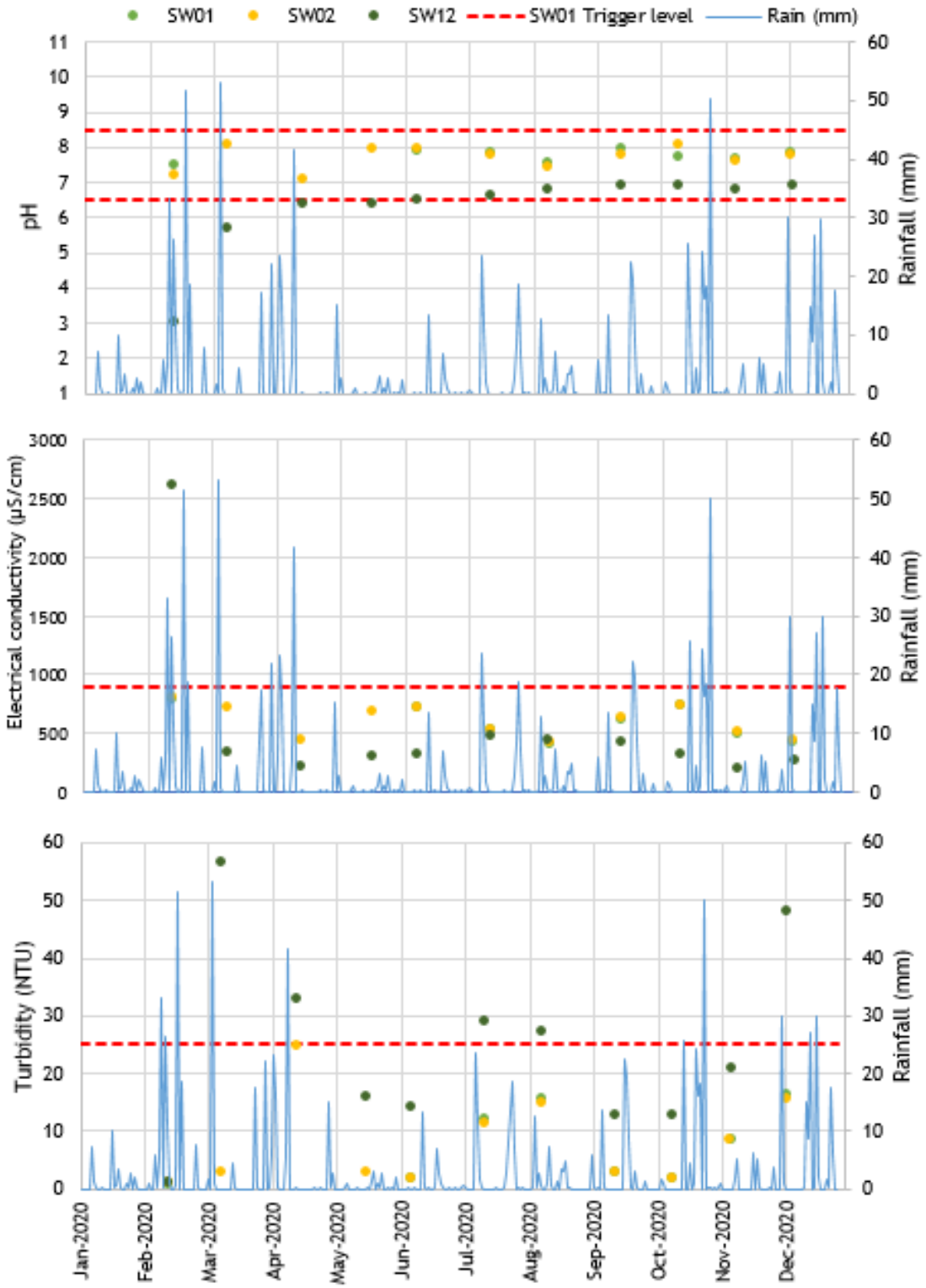


Figure 8: Goulburn River Water Quality

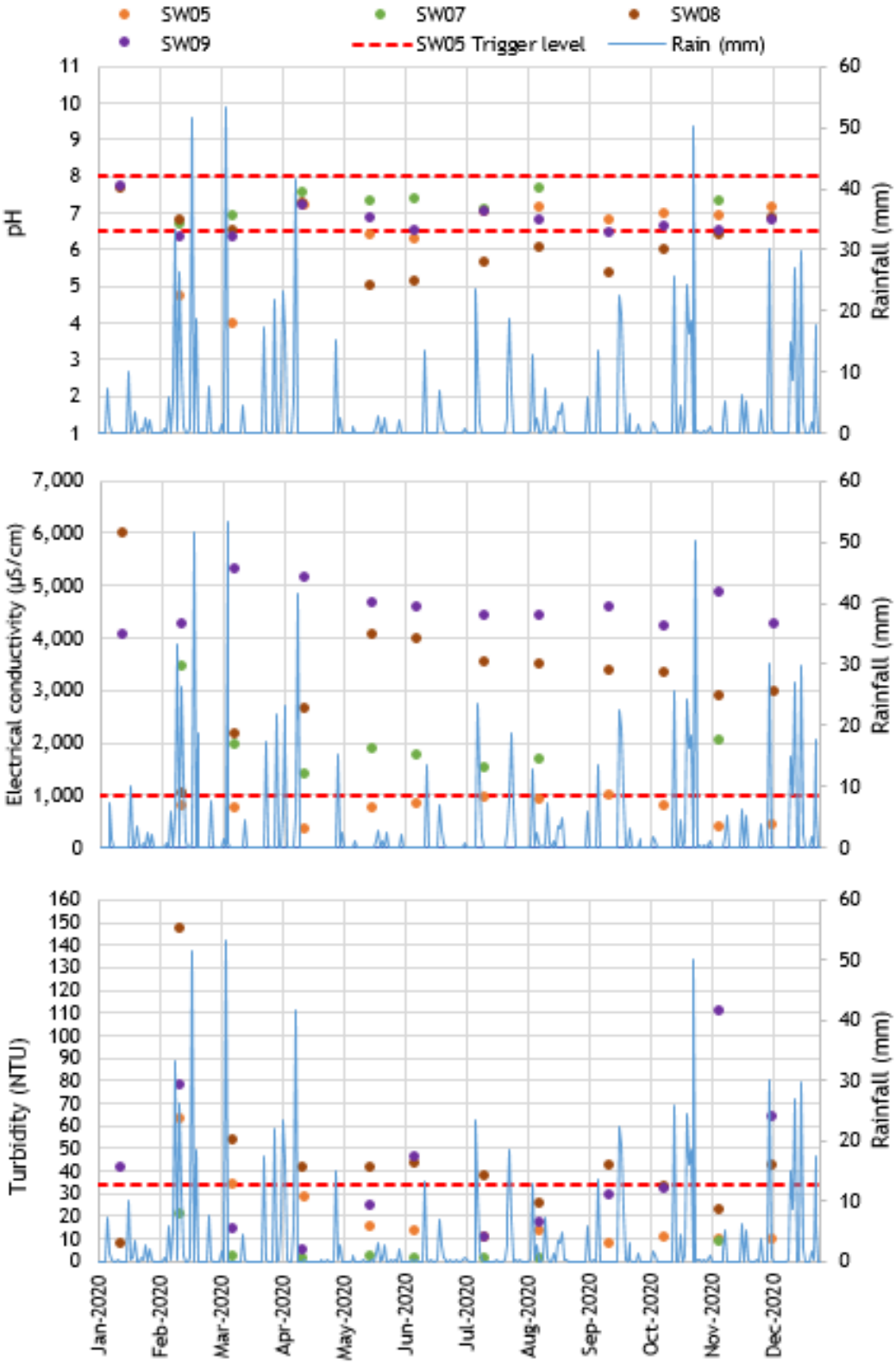


Figure 9: Moolarben and Lagoon Creek Water Quality

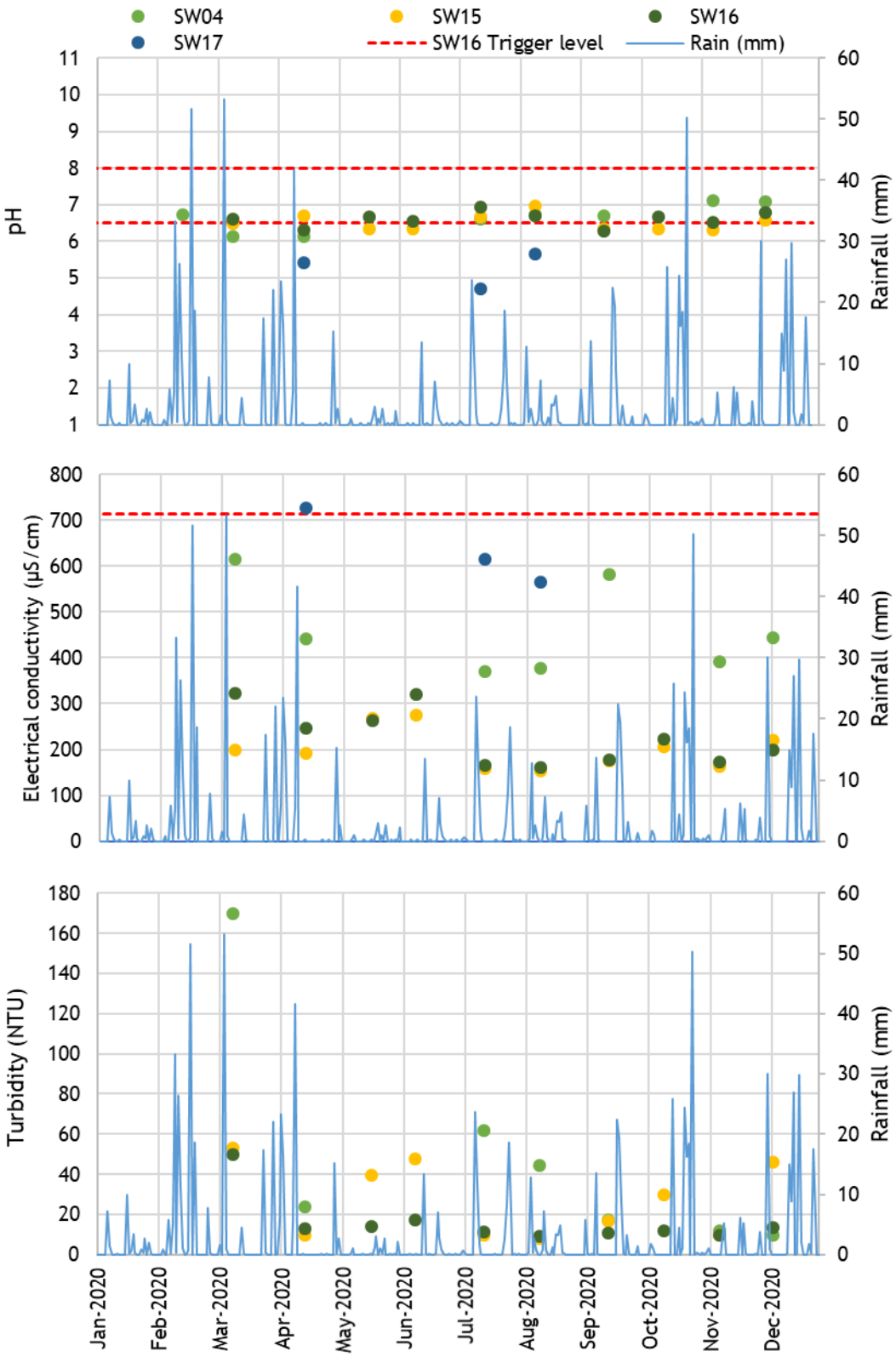


Figure 10: Murragamba, Eastern and Wilpinjong Creek Water Quality

7.3.1.3 Comparison to baseline and trends

Location	Trigger Investigation Values (20th / 80th %ile)		Performance during the Monitoring Period (01/01/2020 - 31/12/2020)	Trend/ Key Management Implications (Monitoring Period 01/01/2016 - 31/12/2020)	Implemented / proposed Management Action
Surface Water Quality					
Goulburn River Sites; SW01* SW02 SW12	PH	*6.5 - 8.5*	Surface water pH in the Goulburn River ranged from 6.3 to 8.0 (20%ile and 80%ile) during 2020. Readings were similar to historical data. All SW01 results were within the current trigger levels during the period. Lower than historic pH levels at SW12 were observed during early 2020 associated with very low to no-flow conditions.	pH readings range between 7.3 and 8.1 (20%ile and 80%ile) for SW01 and SW02 and between 6.8 and 7.5 (20th and 80th percentiles) for SW12.There is no discernible trend in pH at these locations over the last five years.	Continue the implementation of the SWMP. MCO will review, and if necessary revise, the SWMP in accordance with Schedule 5 condition 5 and Schedule 6 condition 5 of PA05_0117 and PA08_0135 respectively.
	EC	*900*	The EC readings were generally consistent with the samples over the last five years. EC ranged from 265 to 723 (20%ile and 80%ile) during the reporting period. Elevated EC concentrations were observed during early 2020 associated with very low to no flow conditions. All SW01 results were below the current applicable trigger levels.	EC readings range between 574 and 807 µS/cm (20%ile and 80%ile) for SW01 and SW02 and between 363 and 606 µS/cm (20th and 80th percentiles) for SW12.The recorded EC values for Goulburn River are generally below the trigger level (900 µS/cm) over the last five years.	
	Turbidity	*25*	All SW01 turbidity results were below the current applicable trigger level and all results consistent with historical data.	Turbidity readings range between 0.5 and 5.5 NTU (20%ile and 80%ile) for SW01 and SW02 and between 4.9 and 23.9 NTU (20%ile and 80%ile) for SW12. The turbidity readings for all three monitoring locations are generally below the trigger level (25 NTU), except for a number of readings in mid-2016 and mid-to-late 2020. The exceedances are likely due to natural flow conditions.	
	PH	*6.5 – 7.7*	Surface water pH in the Moolarben and Lagoon creeks ranged from 5.4 to 7.4 (20%ile and 80%ile). Readings were generally within the historical range, except for low readings at SW05	pH was neutral to slightly alkaline ranging from 6.4 to 8.0 (20%ile and 80%ile). Some of the samples were above the trigger levels for Moolarben Creek. The pH at SW08 and SW09,	

Location	Trigger Investigation Values (20th / 80th %ile)		Performance during the Monitoring Period (01/01/2020 - 31/12/2020)	Trend/ Key Management Implications (Monitoring Period 01/01/2016 - 31/12/2020)	Implemented / proposed Management Action
Moolarben and Lagoons Creek Sites; SW05* SW07 SW08 SW09			and SW08 at various times during 2020, these readings occurred during very low to no-flow conditions.	upstream of the confluence of Lagoon Creek, is generally lower than at SW05 and SW07. There is no discernible trend in the results.	
	EC	*1,000*	The EC readings were generally consistent with the samples over the last five years. EC ranged from 423 to 868 (20%ile and 80%ile) for SW05. All EC readings at SW05 were within the trigger level while upstream (non-mine impacted) EC readings continued to be elevated, consistent with historical records.	EC readings at SW05 range between 477 and 824 µS/cm (20%ile and 80%ile) and are generally lower than the trigger level. Upstream (non-mine impacted) Lagoon Creek (SW07) and Moolarben Creek (SW08 and SW09), the EC readings are elevated ranging between 1,632 and 4,210 µS/cm (20%ile and 80%ile).	
	Turbidity	*34*	Turbidity readings were consistent with the historical data and below the trigger level, with the exception of one reading at SW05	The 20th percentile turbidity readings for all four monitoring locations ranges between 1.2 and 5 NTU, while the 80th percentile ranges between 16.1 and 31.5 NTU. There are several recordings that exceed the trigger level during 2020, however they are consistent with historical recordings. There is no discernible trend in turbidity at these locations over the last five years.	
Murragamba, Eastern and Wilpinjong Creek Sites; SW04 SW15 SW16*	PH	*6.5-8.0*	Surface water pH in the Murragamba, Eastern and Wilpinjong Creek ranged from 5.1 to 6.9 (20%ile and 80%ile). Readings were generally within the historical range. pH readings at SW16 were consistent with the historical data, one trigger exceedance was recorded during the period.	pH readings range between 6.7 and 8.2 (20%ile and 80%ile) for Murragamba Creek (SW04). Wilpinjong Creek has a pH ranging between 5.4 and 7.2 (20%ile and 80%ile). There is no discernible trend in pH at these locations over the last five years.	
	EC	*714*	The EC readings were generally consistent with historical data. EC ranged from 172 to 273 (20%ile and 80%ile) for SW16. All SW16 EC	The EC in Murragamba Creek ranges between 366 and 851 µS/cm (20%ile and 80%ile) for SW04. SW04 recorded high EC readings between January	

Location	Trigger Investigation Values (20^{th} / 80^{th} %ile)		Performance during the Monitoring Period (01/01/2020 - 31/12/2020)	Trend/ Key Management Implications (Monitoring Period 01/01/2016 - 31/12/2020)	Implemented / proposed Management Action
SW17 SW18			readings were within the trigger level and consistent with historical records.	to July 2016. These high EC recordings are associated with extended dry periods. Wilpinjong Creek has EC ranging between 72 and 851 µS/cm (20%ile and 80%ile). There is no discernible trend in EC at these locations over the last five years.	
	Turbidity	*ND*	Turbidity readings were all consistent with the historical data.	Murragamba Creek has turbidity readings between 12 and 65 NTU (20%ile and 80%ile). Wilpinjong Creek has a turbidity ranging between 08 and 103 NTU (20%ile and 80%ile). There is no discernible trend in turbidity at these locations over the last five years.	

* Monitoring site associated with trigger investigation levels

ND. No data (i.e. less than 24 monitoring points)

7.3.1.4 Rainfall Event Sampling

As per MCO's approved SWMP, rainfall sampling is undertaken where rainfall exceeds 30mm in 24 hours. During the reporting period, there were ten occasions where rainfall events triggered the requirement to collect additional water samples. All samples were collected within the prescribed timeframes.

7.3.2 WATER DISCHARGES

MCO is licensed to discharge water in accordance with its Environmental Protection Licence (EPL 12932) subject to various water quality and rainfall criteria.

During the reporting period MCO released treated water from EPA Licenced Discharge Point 1. A total of 1,425 megalitres of treated water was released from MCO during 2020. All compliance limits were met during releases. One Oil and Grease sample was collected in accordance with EPL 12932. Discharge results are presented in **Figure 11**, **Figure 12**, **Figure 13**, **Figure 14** and **Figure 15**. A summary of discharge results is provided in **Appendix 3F**.

During the reporting period two incidents occurred that resulted in the release of sediment laden water at the MCC.

- During the construction of the Moolarben Creek crossing, a localised storm event on the 19th February 2020 resulted in Moolarben Creek entering the downstream culvert construction works then flowing back into Moolarben Creek. The PIRMP was activated including notification of EPA and other agencies and provision of report. Water quality sampling was undertaken at the time of the event, with downstream water quality results comparable to the upstream water quality results.
- On 21 December 2020 a sediment water release occurred from a sediment drain associated with Sediment Dam 304 (EPL Identification Point 51) in the vicinity of the Open Cut 3 pre-strip area (this being an area with only topsoil removed in preparation for mining operations). The PIRMP was activated including notification of EPA and other agencies and provision of report. Water quality sampling was undertaken at the time of the event, with results showing higher suspended solids than the Moolarben Creek monitoring but lower Electrical Conductivity. The drain design was reviewed and upgraded.

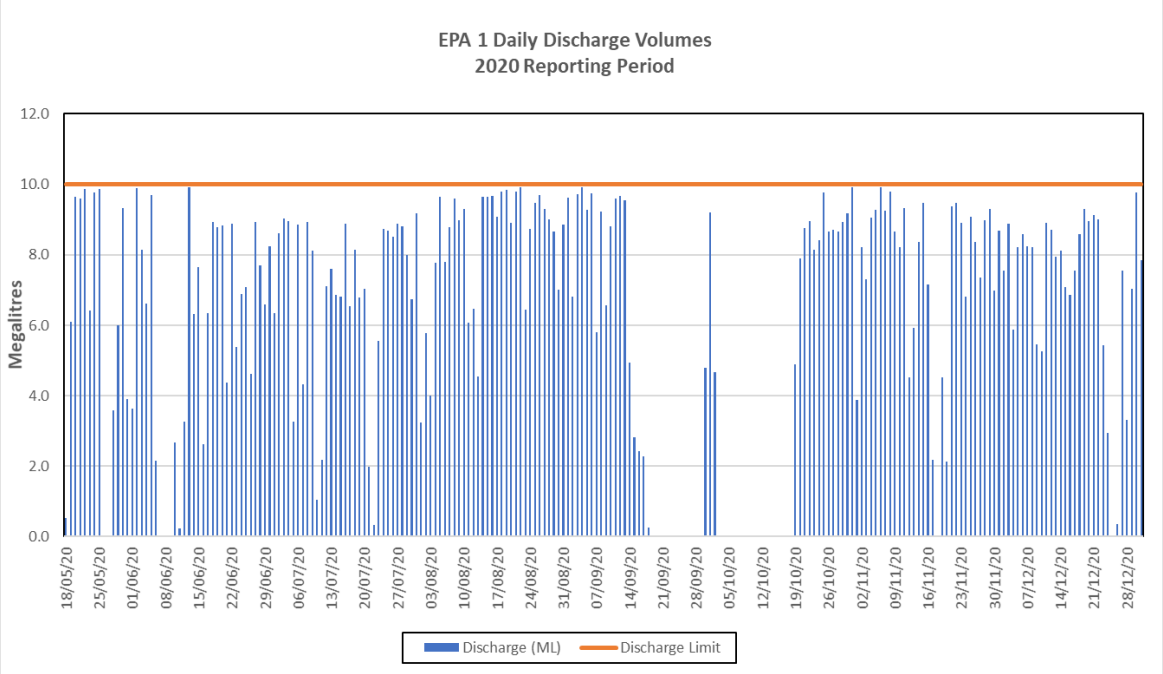


Figure 11 Daily Discharge Volumes EPL Pt 1

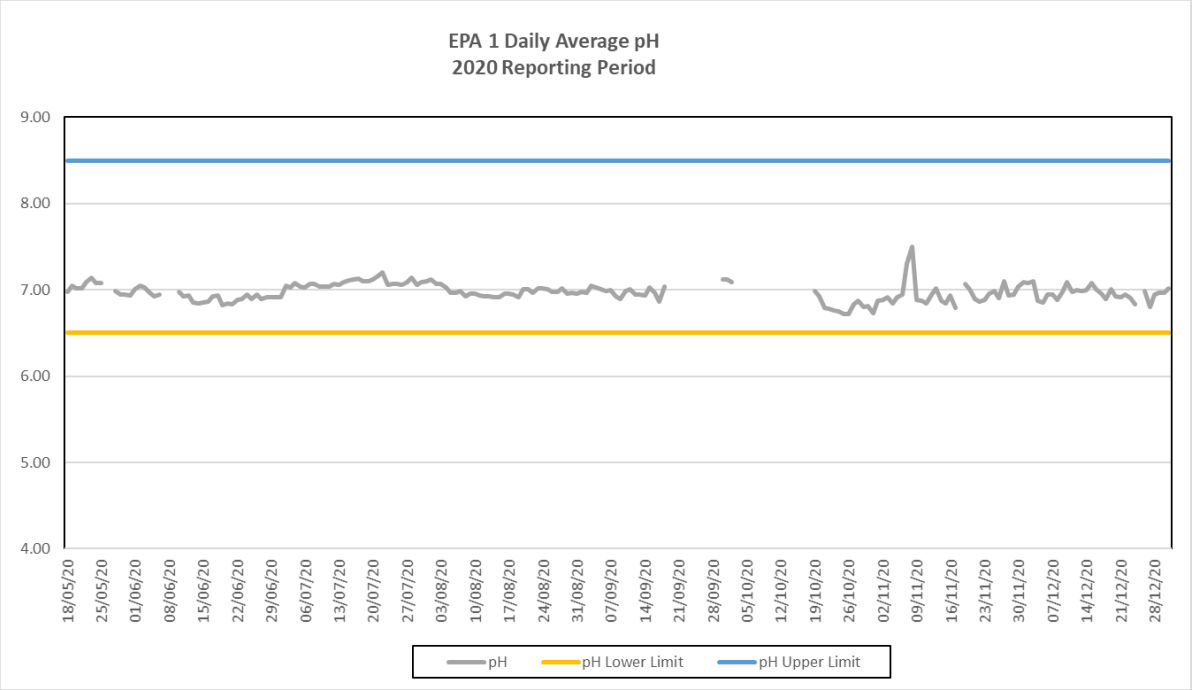


Figure 12: Daily Discharge pH

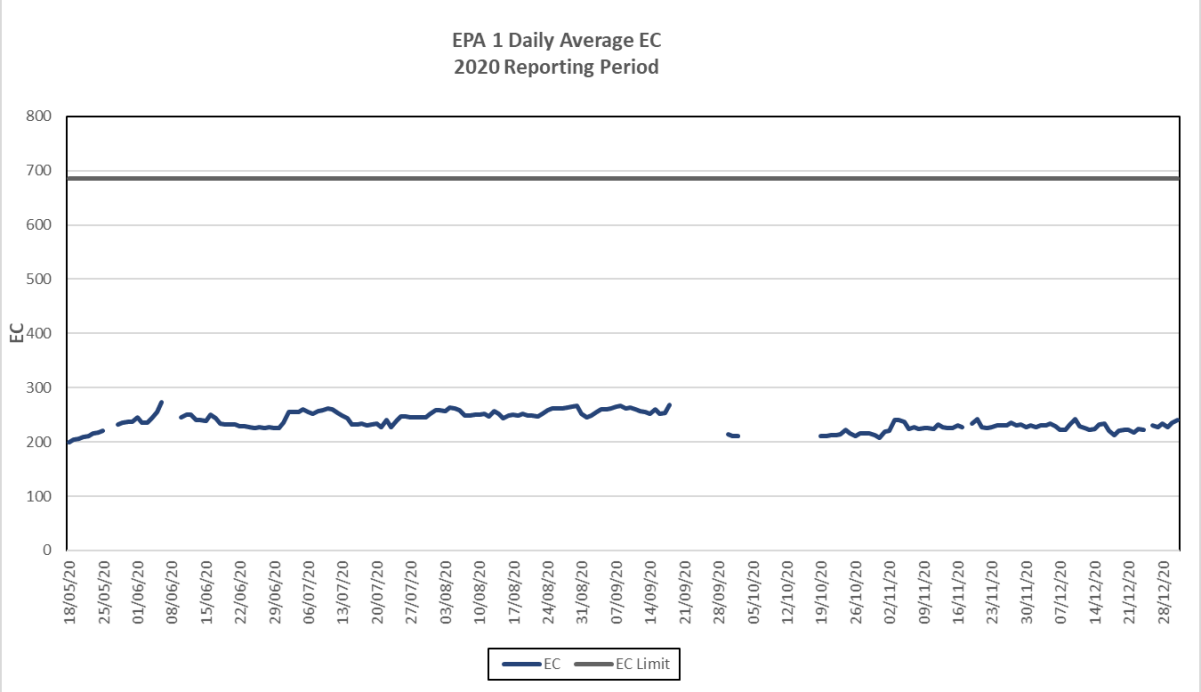


Figure 13: Daily Discharge EC (µs/cm)

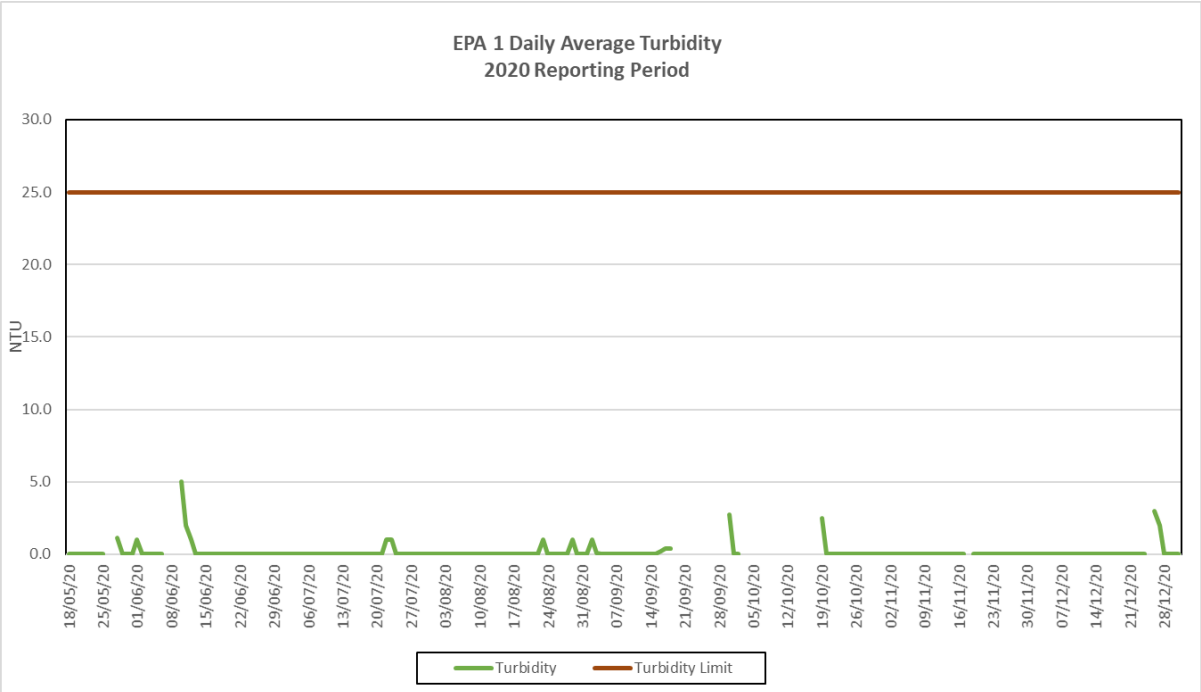


Figure 14: Daily Discharge Turbidity (NTU)

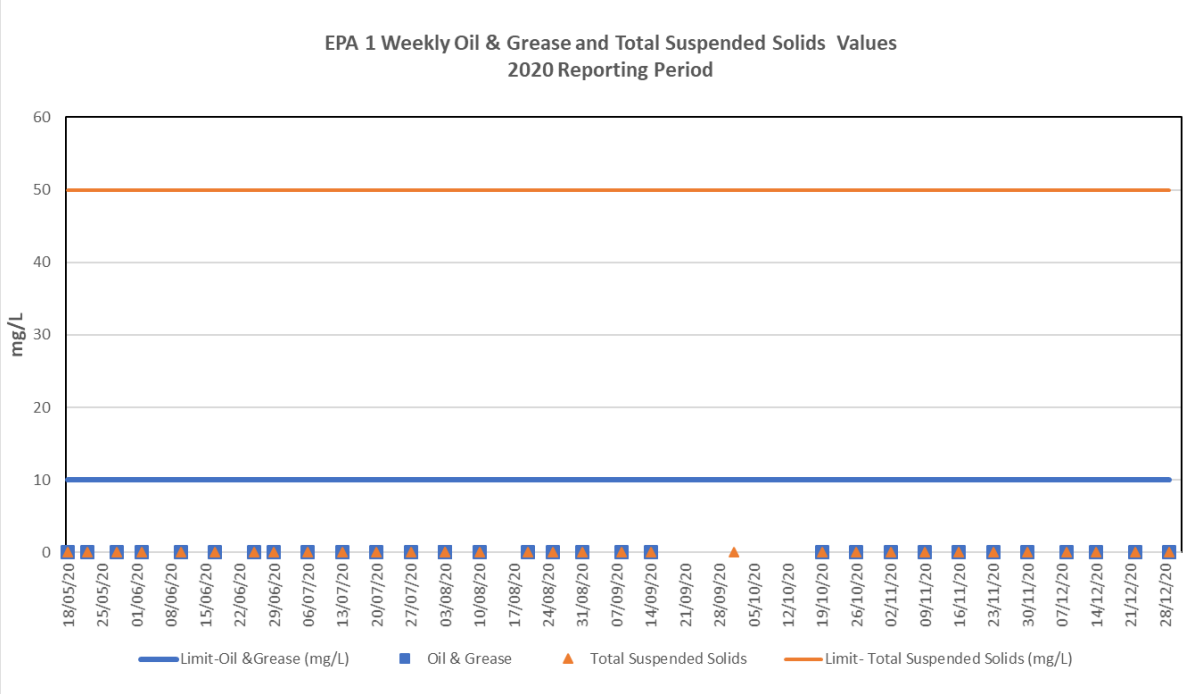


Figure 15: Weekly Discharge Oil & Grease and Total Suspended Solids (mg/L)

7.3.3 STREAM HEALTH MONITORING

Stream health monitoring was undertaken in Autumn and Spring 2020 including Aquatic Habitat Condition (RCE Index), Aquatic Macroinvertebrate Diversity and Pollution Tolerance SIGNAL2 Scores. Trigger investigation values have been incorporated into the SWMP with investigations triggered when values fall below the trigger value. Scores from the Autumn and Spring monitoring programs all identified above these values.

7.3.3.1 Autumn 2020

Rainfall patterns in the months preceding the autumn 2020 survey saw a shift from intensive drought conditions in late 2019 and early 2020 to wet conditions for the three-month period prior to the commencement of sampling. Several sites that were dry during the previous survey (mostly sites in the Wilpinjong Creek catchment), contained water. Sampling for the autumn 2020 stream health monitoring was undertaken between 19th and 21st May. Summaries of stream health index results for all monitoring locations except for SH03 (insufficient water) are provided below.

- Aquatic Habitat Condition (RCE Index) – The autumn 2020 RCE values ranged between 45% at SH20 and 81% at SH13 (**Figure 3-e**). Most of the sites recorded changes in RCE values over consecutive surveys due to variations in the levels of filamentous green algae and macrophytes, which was in part owing to increased proliferation of macrophytes due to wetter conditions. However, several sites had changes to RCE scores for several categories due to high flow impacts to channel environments as a result of large rainfall run-off events.

- Aquatic Macroinvertebrate Diversity – Overall, the site macroinvertebrate diversity ranged between 14 taxa at SH08, and 28 taxa at SH05 and were above the established trigger values at all sites (**Figure 3-e**). 9 of the 15 monitoring sites recorded increases to the number of taxa since their previous survey values. Sites SH12 and SH06 continue to support the highest diversity of macroinvertebrates in Moolarben Creek, whereas the larger downstream sites in the Goulburn River (SH013, SH01G and SH02) recorded relatively low scores compared to

historical result. Most of the Wilpinjong Creek sites showed improvements in diversity values in autumn 2020,

- Pollution Tolerance SIGNAL-2 Scores – The SIGNAL2 values over all the monitoring sites ranged from 2.85 at SH15 to 4.73 at SH13, and the values at SH02, SH06 and SH17 were above trigger levels (**Figure 3-e**). Of the sites for which pre-mining values exist, SH01B, SH06 and SH12 were the only sites to record SIGNAL-2 values lower than their respective pre-mining SIGNAL-2 mean values. Moolarben Creek catchment sites SH06 and SH12 recorded lower SIGNAL-2 values compared to the previous dry weather survey in spring 2020 site SH08 recorded an improved score, and SH10 had generally been recording improved SIGNAL-2 values since autumn 2016. Bobadeen Creek site SH01B recorded its lowest SIGNAL-2 value to date (3.25), and Goulburn River sites SH20 and SH13 recorded improved SIGNAL-2 values compared to recent surveys. For the Wilpinjong Creek sites, the SIGNAL-2 values at SH16 and SH17 were consistent with range of results over recent surveys, and SH14 was relatively low.

7.3.3.2 Spring 2020

The spring stream health monitoring was undertaken between the 10th and 12th November 2020. Even though June and August 2020 produced below average rainfall totals, the rain events were relatively consistent and the overall rainfall over the period between the autumn (May) and spring surveys was well above average due to consistent precipitation in September and October. As a result, it is likely that all sites would have maintained continuous aquatic habitats throughout the inter-survey period.

- Aquatic Habitat Condition (RCE Index) – For spring 2020 there were minor changes in site RCE scores at three sites only due to changes in the levels of filamentous green algae and macrophytes, reflecting the relative stability in conditions experienced over the winter and spring periods. Over all sites the RCE scores ranged between 46% at SH20 and 81% at SH13 (**Figure 3-e**).

- Aquatic Macroinvertebrate Diversity – The spring 2020 site macroinvertebrate diversity ranged from 18 taxa at both SH10 and SH16 to 33 taxa at SH12 and were above the established trigger values at sites SH02, SH06 and SH17 (**Figure 3-e**). Of the nine sites for which pre-mining values exist, SH02 was the only site which supported a lower diversity compared to pre-mining mean values. Goulburn River catchment sites showed significant increases of between 9 and 11 taxa between autumn and spring 2020, indicative of a recovery in macroinvertebrate diversity for the sites impacted by flow. All of the Moolarben Creek and Goulburn River sites recorded increases in the number of macroinvertebrate taxa compared to autumn 2020, and while Wilpinjong Creek site SH17 was the only site to record a lesser value (23 taxa), it remains much higher than the pre-autumn 2020 range of values (7 to 20 taxa).

- Pollution Tolerance SIGNAL-2 Scores – The SIGNAL-2 values at SH02, SH06 and SH17 were above the established trigger levels and all sites for which pre-mining average values exist recorded higher SIGNAL-2 scores compared to pre-mining average values. Over all sites, the spring 2020 site SIGNAL-2 values ranged between 3.05 at both SH08 and SH14 and 4.62 at downstream Goulburn River site SH02 (**Figure 3-e**). The Wilpinjong Creek sites reported similar or improved SIGNAL-2 scores for spring 2020 compared to the previous survey.

7.3.3.3 Trends

The 2020 sample year was characterised by a transition from the dry conditions that were encountered over previous years. Recent seasonal stream health monitoring surveys have documented the effects of the intense drought conditions experienced throughout the study area

catchments, culminating in the driest conditions to date during the previous spring (December) 2019 survey with many sampling sites dry or closed to sampling due to bushfire threats. Prior to the autumn 2020 stream health monitoring survey, Bora Creek site SH04 and Wilpinjong Creek upstream monitoring site SH15 had not contained water for the previous six surveys, and SH14 and SH16 had not contained water during the previous survey (spring 2019) only.

Consistent precipitation over the months of February to April 2020 resulted in periods of renewed surface flows in the Goulburn River and its tributaries which not only maintained aquatic habitats but also caused high flow events. In addition, MCO had commenced operation of treated water release from LDP1 at the junction of Bora Creek and the Goulburn River

The 2020 stream health results for the two aquatic macroinvertebrate condition indices (Diversity and SIGNAL-2) were all above the present SWMP trigger values. For the autumn 2020 survey the occurrence and extent of macrophytes were significantly reduced at Goulburn River sites SH01G, SH02 and SH01B, as was the overall aquatic habitat complexity. Site SH01B recorded very low macroinvertebrate indices (diversity, SIGNAL-2, EPT taxa and SALINITY Index) results in autumn 2020, however all of these downstream Goulburn River catchment sites (including SH01G and SH02) showed successive improvements in overall indices results over successive surveys in 2020. Several other sites recorded improvements in macroinvertebrate diversity since their previous survey, including Wilpinjong Creek sites (except SH15) and Goulburn River site SH20 each of which recorded their highest value to date. SIGNAL-2 values were mostly above the pre-mining mean values and within the range of readings recorded over recent surveys.

The 2020 stream health results have provided an indication of the recovery capabilities of macroinvertebrate communities from the drought conditions that prevailed over the region over recent years. There were no indications of MCO mine-related impacts to stream health or aquatic habitat conditions in 2020 with differences between sites generally relating to differences in the aquatic and riparian habitat attributes, and the contribution of sustained water levels to aquatic ecosystems.

7.3.4 CHANNEL STABILITY MONITORING

The channel stability monitoring program occurred between the 14th and 16th of November at locations in **Appendix 2**. Monitoring involved visual and written observational surveys of erosive and depositional features, cross sections at strategic locations and photographic records.

7.3.4.1 Monitoring results

Bora Creek channel stability monitoring results are comparable with previous monitoring with the exception of BC-pt3. At BC-pt3 there was a notable increase of ground vegetation along both banks in 2020, slightly improving the channel stability assessment from “Active” to “Potentially Stabilising”.

Moolarben Creek channel stability monitoring trend is considered comparable to the results previously recorded in 2017. The slight improvement to the overall channel stability trend in 2020 when compared to 2018 and 2019, was primarily due to the increased coverage of established ground vegetation at most sites. The average CSIRO classification for Moolarben Creek in 2020 was ‘Potentially Stabilising’.

Murragamba Creek channel stability monitoring trend is considered comparable to the results previously recorded in 2016 and 2017. The slight improvement to the overall channel stability trend in 2020 when compared to 2018 and 2019, was primarily due to the increased coverage of established

ground vegetation at most sites. The average classification for Murragamba Creek in 2020 was 'Potentially Stabilising'.

Wilpinjong Creek channel stability monitoring results trend is considered comparable to the results previously recorded in 2018 and 2019. The slight improvement to the overall channel stability trend in 2020, was primarily due to the increased ground vegetation at most sites. The one or more high flow events in 2020, although destructive at several sites (and some locations outside of the monitoring sites) did not appear to influence greatly the general stability at the majority of monitoring sites. The average CSIRO classification for Wilpinjong Creek in 2020 was 'Potentially Stabilising'.

Eastern Creek channel stability monitoring results identified continuation of morphological processes identified in previous monitoring. The 2020 scores are considered comparable to the results previously recorded. The slight improvement in 2020 was primarily due to the increase of established ground vegetation observed at site EC-pt2.

7.3.4.2 Trends

Channel stability within each creek was variable during the period. Locations vulnerable to erosion were characterised by steep banks, little vegetative cover and exposed dispersive subsoil. More stable locations were characterised by vegetated banks with low gradient slopes. Where active erosion was recorded at sites along each creek, this was predominantly the result of natural influences exacerbated by past land use and agricultural practices that exposed dispersive subsoils. The impact of creek stability within these creeks due to mining operations is considered negligible over the past 12 months.

7.3.5 EFFLUENT

During the period MCO continued to operate four sewerage treatment plants. Discharge quantity was within design limits during the period. During the period effluent monitoring was not undertaken at EPL ID 22 during Quarter 1 due to unscheduled maintenance. Discharge quality is presented in **Appendix 3F**.

7.4 GROUNDWATER

7.4.1 GROUNDWATER LEVELS

MCO monitors a network of piezometers in accordance with the Groundwater Management Plan (GWMP). The monitoring program includes standing water level in standpipes and pressures for vibrating wire piezometers. Trigger values have been established to determine the need for investigation and possible response actions for potential impacts to groundwater levels in the Alluvial and Triassic aquifers. The Permian strata does not include triggers as it is already extensively affected by past mining, is predicted to undergo further impact from ongoing mining and contains groundwater of generally poor quality.

Response triggers for groundwater levels within Quaternary Alluvium and Triassic Sandstone aquifers are based on the minimal impact considerations in the Aquifer Interference Policy (DPI, 2012). Monitoring frequency and response triggers have been implemented to identify trends that could potentially lead to a private bore being impacted above the Aquifer Interference Policy considerations (i.e. greater than 2 m drawdown).

Over the 2020 reporting period MCO observed a combination of rainfall conditions, continued mining impacts for approved MCO open cut and underground operations and regional depressurisation due to neighbouring operations. Groundwater was influenced by the low rainfall in January and early

February, followed by generally above average rainfall for the remainder of the year as represented by the Rainfall Cumulative Deviation (RCD) trends (**Figure 16**).

Standing water level/pressures for all piezometers for the period (including vibrating wire piezometers) are presented in **Appendix 3G**. Investigation triggers, along with monitored groundwater levels are presented in **Table 25**.

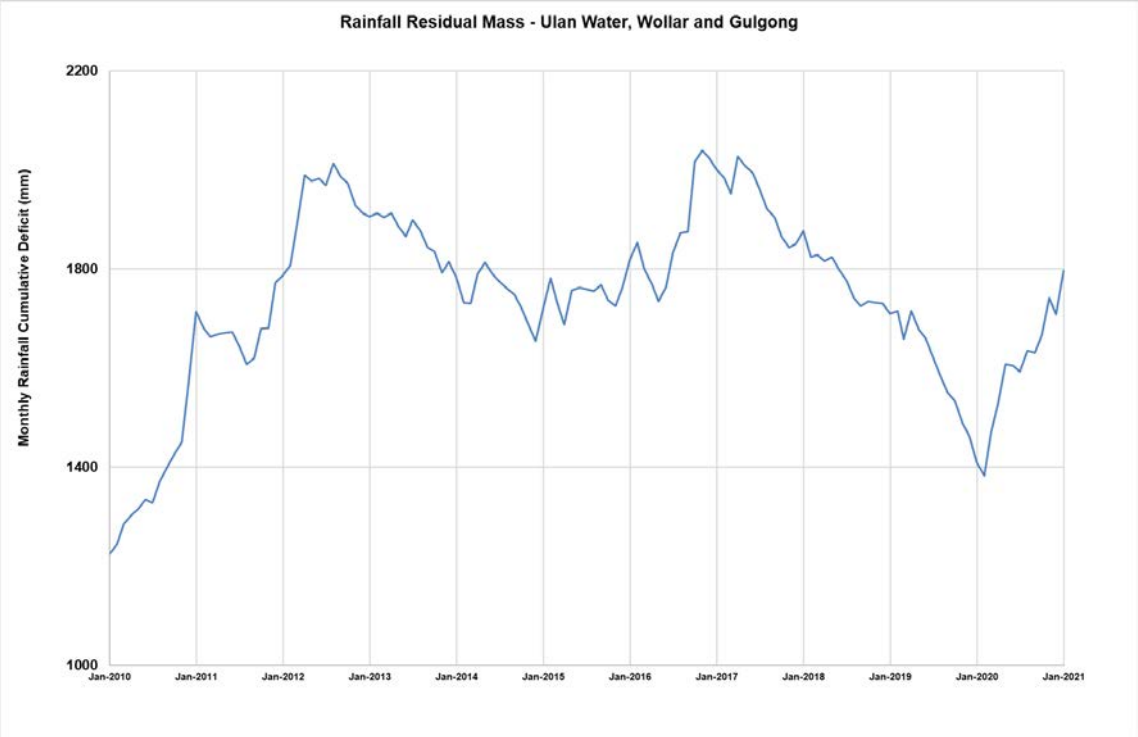


Figure 16: Rainfall Residual Mass - Wollar

Groundwater levels in the Ulan coal seam and Permian coal measures are extensively affected by past mining and are predicted to undergo further impact from mining at Moolarben and neighbouring operations. During the period, the Ulan Seam levels were influenced by open cut mining, Underground mining, neighbouring operations and in some cases rainfall recharge. The influence of UG1 secondary extraction, UG4 development and open cut operations continued over the period with water levels generally declining. Long-term trends generally show increases in levels up until 2012 then prolonged declines since that time, with addition influence of nearby mining operations.

Groundwater levels in the Permian coal measures exhibited a range of responses over 2020 with observations showing both increasing and declining levels. The greatest drawdown during the period was in vicinity of underground mining operations, with the exception of PZ179 (33) and PZ170 which exhibited level increases. Further from current MCO operations, Permian water levels exhibited variable results with small declines due to regional depressurisation and increase due to rainfall recharge. Vibrating wire sensors at PZ127 (74m) became dry and 130 (64m) failed during the period. Both monitoring points are located above UG1. Long-term trends in a number of bores show responses similar to the Ulan seam with increases in levels up until 2012 then gradual declines since that time with addition influence of nearby mining operations.

Groundwater levels in Triassic bores remained relatively stable over the period with changes less than 1m during the reporting period. PZ105C and PZ179 (29m) exhibited the largest change with increases of 0.9 and 0.8m respectively. All other water levels changed by 0.4m or less. PZ103C and PZ101C

exhibited small reductions in level with PZ103C have historically shown little correlation with the CRD. PZ128 (20m) and PZ127 (43m) remained dry. Long term trends indicate some regional depressurisation and areas of unsaturated (dry) Triassic sandstone.

Groundwater levels in the Alluvium and Tertiary Palaeochannel were stable or declined by 1.0m or less during the period. Rainfall recharge associated with the above average rainfall during the period was observed as an increase in level or reduction in rate of decline. PZ184 and PZ211 remained dry during the period. Long-term trends reflect a combination of climate and mining related influences. Groundwater levels in the granite exhibited an increasing trend during 2020 consistent with climate variability. Groundwater levels in the Marrangaroo were relatively stable with a slight increase.

7.4.2 GROUNDWATER QUALITY

Groundwater quality monitoring is undertaken at standpipe piezometers in accordance with the GWMP. The monitoring network covers the major hydrogeological units and are broadly distributed across the project area. Parameters include physical parameters, major cations and anions, dissolved metals and nutrients. Site specific triggers for acidity (pH) and electrical conductivity (EC) have been developed for Alluvial and Triassic aquifers across the Moolarben Coal Complex. A review of the groundwater quality performance is provided in **Table 26**. Water quality results from all piezometers are provided in **Appendix 3G**.

The Ulan Seam and Permian Coal measures water quality for the period is generally consistent with previous monitoring results. PZ103A and PZ170 both recorded a reduction in EC during October2020 with PZ170 pH also reducing slightly. PZ191 is located immediately adjacent to underground development and recorded EC lower than 2019, whilst PZ104 to the east of the site continued to show a decline in EC. Triassic water quality was consistent with previous results. Alluvium and Tertiary Palaeochannel water quality was generally consistent with historical results. PZ58a recorded EC of 15,000µs/cm greater than the EC investigation trigger of 14,765µs/cm in April and below the limit in October. PZ58a beneficial use category continued to Saline. PZ58a replaced PZ58 and the EC investigation trigger requires update to reflect the slightly different location. Granite and Marrangaroo water quality was variable with an EC increase at PZ55 during the year, though consistent with 2019 and slight EC reductions at PZ102A and PZ44.

7.4.3 PRIVATE GROUNDWATER USERS

MCO had negligible impact on private groundwater users during the reporting period. No compensatory water supply was required or supplied during the period.

7.4.4 ACTIONS FOR NEXT REPORTING PERIOD

During the next reporting period the following actions are proposed:

- Review PZ58a triggers as part of next Groundwater Management Plan Review.
- WAMP to be reviewed and revised as necessary.

Table 25: Water Levels – Triassic, Alluvium and Palaeochannel Bore Performance

Location	Investigation Trigger Level (mAHD)	Minimum 2020 Groundwater Level/Pressure (mAHD)	Trend/ Key Management Implications	Implemented/proposed Management Action
Alluvium, Palaeochannel and Marrangaroo Bores				
PZ55	418.1	422.8	Below average rainfall resulted in continued reduction in rainfall cumulative deviation during January followed by above average rainfall and increase in RCD. Piezometers in the vicinity of mining operations exhibited groundwater level reductions during the period. All levels were above trigger investigation levels. Overall trend directions were generally consistent and some drawdown above model predictions was observed. Groundwater monitoring results and level trends can be found in Appendix 3G.	Continue monitoring program. MCO will review and if necessary revise, the GWMP in accordance with Schedule 5 condition 5 and Schedule 6 condition 5 of PA05_0117 and PA08_0135 respectively. Monitoring results to be included in the next periodic model validation and recalibration where required. During the reporting period MCO continued to maintain the groundwater monitoring network.
PZ58a	466.4 (dry)	Dry		
PZ188	409.4	412.9		
PZ203	394.4	402.1		
PZ213	409.7	412.0		
PZ214	409.8	412.4		
Triassic Bores				
PZ101C	376.8	380.0	Below average rainfall resulted in continued reduction in rainfall cumulative deviation during January followed above average rainfall and increase in RCD. Groundwater levels in PZ101C and PZ129 (35m) remained stable and PZ105C increased by 0.9m during the period with overall trends consistent with model predictions. Groundwater monitoring results and level trends can be found in Appendix 3G.	Continue monitoring program. MCO will review, and if necessary revise, the GWMP in accordance with Schedule 5 condition 5 and Schedule 6 condition 5 of PA05_0117 and PA08_0135 respectively. Monitoring results to be included in the next periodic model validation and recalibration where required. During the reporting period MCO continued to maintain the groundwater monitoring network.
PZ105C	367.4	373.7		
PZ129 (VWP-35m)	385.7 (dry)	389.9		

Table 26: Water Quality Performance

Location	Lithology	Investigation Trigger Level(s)		2020 Performance	Trend/ Key Management Implications	Implemented/proposed Management Action
		pH	EC (µs/cm)			
PZ044	Ulan Granite	5.7 – 7.2	3000	PZ044 and PZ055 water quality was consistent with recent monitoring results. No investigations were trigger.	Water quality for the period was generally consistent with previous monitoring results with some evidence of recharge and mining influence. Groundwater quality trends will continue to be monitored. PZ58a replaced PZ58 and the EC investigation trigger requires update to reflect the different location. Water is of the same beneficial use category (saline). Water quality results from all piezometers are provided in **Appendix 3G**.	Continue monitoring program. MCO will review, and if necessary revise, the GWMP in accordance with Schedule 5 condition 5 and Schedule 6 condition 5 of PA05_0117 and PA08_0135 respectively. Review groundwater PZ58a triggers as part of next Groundwater Management Plan Review. During the reporting period MCO continued to maintain the groundwater monitoring network.
PZ055	Indurated Conglomerate	5.1 – 6.3	2756			
PZ058a	Tertiary Aged Sediment	2.8 – 4.7	14765	PZ058a and PZ188 water quality was consistent with recent monitoring results. No investigations were trigger for PZ188. PZ58a recorded an EC of 15,000µs/cm, greater than the EC investigation trigger of 14,765µs/cm in April and below the trigger in October.		
PZ188	Tertiary paleochannel	4.7 – 6.9	394			
PZ101C	Lower Triassic	6.1 – 7.7	810	Triassic water quality was water quality was consistent with recent monitoring results. No investigations were trigger.		
PZ103C	Lower Triassic	5.2 – 6.8	448			
PZ105C	Lower Triassic	5.3 – 7.4	319			
PZ101B	Permian OB	6.2 – 7.7	928	Permian Coal measures water quality for the period is generally consistent with previous monitoring results.		
PZ109	Permian OB	6.3 – 8.4	1145			

8.0 MINE SUBSIDENCE

MCO undertakes secondary extraction in accordance with the UG1 Longwalls (LW) 101 to 105 Extraction Plan (2020) (the Extraction Plan). The Extraction Plan and associated sub-plans were prepared with input from experienced and qualified experts to satisfy Condition 5, Schedule 4 of PA 08_0135 and was approved in September 2017, a revision was approved in March 2019 to include amendments to the 103 layout. A further revision was approved in June 2020 to include Longwalls 104 and 105.

During the reporting period, secondary extraction was undertaken in Longwall LW103 and LW104. Mining of longwall panel 103 was completed on 30 May 2020. A longwall move was carried out in June 2020 with LW104 commencing on 19 July 2020. As of the 31 December 2020 Longwall LW104 had retreated 2,272m. The combined total extracted length during the 2020 reporting period was 4,670m.

During the reporting period MCO continued to conduct monitoring of subsidence lines, flora and fauna habitats, cliffs, landscape features, and built features for LW101, LW102, LW103 and LW104. Monitoring of subsidence lines, surface water, groundwater, UG1 inflows and outflows continued. Built feature monitoring triggers were not exceeded in the period. Post mining inspections were carried out for flora and fauna above LW101, LW102, LW103 and LW104.

Subsidence monitoring included the 2D ground monitoring A, C, and E lines. Surveys of the B and D Lines are no longer required as these Lines are located above previously extracted longwall panels.

Monitoring line A is orientated transverse to the Longwalls and crosses LW101 near the commencing end. LW103 mined directly beneath this monitoring line during 2020. Line C is a monitoring line located along the centreline of LW101, at the longwall finishing end. During 2020, the monitoring line was surveyed on 01 September. Line E is a monitoring line located along the centreline of LW103 at the longwall finishing end. The baseline survey was carried out on 9 November 2017 during Longwall 101. During 2020, the monitoring line was surveyed 5 times on 08, 13, 18, 28 May, and 01 September.

Subsidence impacts during the period were consistent with predictions as shown in **Table 27.**

Table 27 Comparison of maximum observed and predicted vertical subsidence, tilt & strain for the A, C & E Line.

Survey Line	Type	Maximum vertical subsidence (mm)	Maximum tilt (mm/m)	Maximum tensile strain (mm/m)	Maximum compressive strain (mm/m)
A	Measured	1897	41	12	10
	Predicted	2400	45	16[1]	15[1]
C	Measured	1800	44	5	15
	Predicted	2350	70	25[1]	25_1
E	Measured	1755	67	8	21
	Predicted	2100	65	25[1]	30[1]

[1] denotes that the values represent the conventional strains based on the predicted curvatures multiplied by a factor of 10.

A summary of performance against the relevant subsidence performance indicators and subsidence performance measures (i.e. the subsidence performance assessment), detailed in the Extraction Plan and Condition 1 and Condition 3, Schedule 4 of Project Approval (08_0135) is provided in **Table 28** and **Table 29**.

Table 28: Assessment of Subsidence Performance Indicators Measures for UG1 – Natural and Heritage Features

Subsidence Impact Performance Measure		Subsidence Impact Performance Indicator	Indicators Exceeded?	Assessment of Subsidence Impact Performance Measures	Performance Measures Exceeded?
Water Resources:					
Drainage Lines *(DL1 – DL7)*	*No greater subsidence impacts or environmental consequences than predicted in the EA*	• Change in visible erosion. • Development of, or change in, headcut erosion along DL7. • Change in character, such as increased erosion or change in vegetation along drainage line. • Extensive duration of water ponding. • Downstream water quality (consistent with approved complex-wide SWMP). • Appearance of unsealed surface cracking across the bed of DL7.	**No**	DL7 is located within the extents of LW103 and was mined beneath during 2020 No impacts greater than predicted recorded. Pre and post mining inspections of DL7 completed.	**No**
Land:					
Cliffs C7, C9 and C10	*Negligible environmental consequences (that is occasional rockfalls, displacement or dislodgement of boulders or slabs or fracturing, that in total do not impact more than 0.5% of the total face of such cliffs within any longwall mining domain)*	• Not applicable (NA) subsidence impact performance indicators have been developed as cliffs C7, C9 and C10 are located outside the Study Area of Longwalls LW101 to LW105.	**No**	Cliffs C7, C9 and C10 were located outside the mined extents of LW103 and 104 at the end of 2020, at distances greater than 1.6 km. It is unlikely that these cliffs experienced measurable ground movements due to the mining. No impacts greater than predicted recorded.	**No**
Other cliffs	*No greater subsidence impacts or environmental consequences than predicted in the EA*	• The total length of cliffs within the Longwalls 101-105 Study Area that experiences cliff instabilities (i.e. the exposure of a fresh face of rock and debris scattered around the base of the cliff) is to be less than 6 m.	**No**	Post-mining inspections of monitoring points at cliff line C5 and C6 above LW103 have been completed. Ground movements measured during 2020 were similar to or less than those predicted	**No**
Minor cliffs *Rock face features* *Steep slopes*	*Minor environmental consequences (that is, occasional rockfalls, displacement of or dislodgement of boulders or slabs, or fracturing, that in total do not impact more than 5% of the total face area of each such type of features within any longwall mining domain)*	• In each instance of an identified impact (occasional rockfalls, displacement of boulders or slabs, or fracturing) the affected percentage of the total face area of the feature affected will be determined. It is expected that occasional rockfalls or fracturing would not impact more than 5% of the total face area of rock ledges and overhangs in the Longwall mining domain.	**No**	Pre-mining surveys completed, and monitoring sites established above LW103 and 104. Ground movements measured during 2020 were similar to or less than those predicted Rockfalls and cracking observed. No impacts greater than predicted recorded. Post-mining surveys to be undertaken at the completion of longwall mining.	**No**

Subsidence Impact Performance Measure		Subsidence Impact Performance Indicator	Indicators Exceeded?	Assessment of Subsidence Impact Performance Measures	Performance Measures Exceeded?
Biodiversity:					
Threatened species, threatened populations, or endangered ecological communities	*Negligible subsidence impacts or environmental consequences*	Subsidence related impacts to threatened flora, fauna or EECs, including: • Areas of cracking or ponding that exceed predictions in the subsidence predictions and assessments of the impacts relating to the predicted subsidence above Longwalls 101 to 105; • Declining trend in canopy health or vegetation structure inconsistent with seasonal trends at analogue sites; • Deterioration in tree health outside natural variations (analogue sites to be used as a guide); • Areas of weed incursion and/or infestation; or • Mortality of more than a small number of threatened flora or fauna species attributed to subsidence impacts. • Evidence of impacts (attributable to subsidence) to more than 5% of features that provide potential bat roosting sites in the Longwalls 101 to 105 Study Area (i.e. cliffs and minor cliffs).	**No**	Pre-mining baseline floristic monitoring along transects above LW104 and 105 completed. Eleven baseline floristic sites have been established along ten transects above LW101 to 105 Post-mining surveys were undertaken at LW102, 103 and 104 for biodiversity. No performance measures had been exceeded.	**No**
Heritage Sites:					
Aboriginal heritage sites S2MC 236 (AHIMS Nos. 36 3 0016 and 36 3 0134)	*Negligible subsidence impacts or environmental consequences*	• Not applicable (NA) subsidence impact performance indicators have been developed as S2MC236 [AHIMS Nos. 36-3-0016 and 36-3-0134] are located outside the Study Area of Longwalls LW101 to LW105.	**No**	S2MC236 [AHIMS Nos. 36-3-0016 and 36-3-0134] are located outside the Study Area of Longwalls LW101 to LW105.	**No**
Historic Heritage Sites	*No greater subsidence impacts or environmental consequences than predicted in the EA*	• Not applicable (NA) subsidence impact performance indicators have been developed as all historic heritage sites are located outside the mined extents of LW101 to 104.	**No**	All Historic heritage sites are located outside the mined extents of LW101 to LW104. Ground movements measured during 2020 were similar to or less than those predicted	**No**

Subsidence Impact Performance Measure		Subsidence Impact Performance Indicator	Indicators Exceeded?	Assessment of Subsidence Impact Performance Measures	Performance Measures Exceeded?
Mine Workings:					
First workings	*First working under an approved Extraction Plan beneath any feature where performance measures require negligible subsidence impacts or negligible environmental consequences to remain long-term stable and non-subsiding*	• First workings remain long-term stable and non-subsiding	**No**	First workings have been designed to meet the requirements of Condition 7, Schedule 4 of Project Approval (08_0135). First workings approvals were granted on the 24 March 2016, 4 May 2016, 31 August 2018 and 8 July 2019 by the Division of Resources and Geosciences, in accordance with the requirements under Condition 7, Schedule 4 of PA08_0135 and Condition 79 Schedule 3 of PA05_0117.	**No**
Second workings	*To be carried out only in accordance with an approved Extraction Plan*	• Not applicable (NA) subsidence impact performance indicators have been developed for this performance measure.	**NA**	Second workings have been carried out in LW103 and 104 in accordance with the approved *Longwalls 101-105 Extraction Plan* during the assessment period.	**No**

Table 29: Assessment of Subsidence Performance Indicators Measures for UG1 – Built Features

Subsidence Impact Performance Measure		Subsidence Impact Performance Indicator	Indicators Exceeded?	Assessment of Subsidence Impact Performance Measures	Performance Measures Exceeded?
Key Public Infrastructure:					
Gulgong-Sandy Hollow Railway Line	*Always safe and serviceable.* *Damage that does not affect safety or serviceability must be fully repairable, and must be fully repaired*	• No defects or deformation of the rail track and associated infrastructure due to mining. • No visual displacement at joints or cracks in culverts.	**No**	The Sandy Hollow Gulgong Railway Line is located outside the Longwalls 101 to 105 Study Area, but may be subject to far-field horizontal movements and non-conventional ground movements Pre-mining monitoring lines established and surveys completed (including FF Line). No triggers of FF Line indicating no defects, deformation or displacement of joints in culverts due to mining	**No**
Ulan-Wollar Road		• No additional visible pavement cracking or other defects of the road pavement (when compared against baseline conditions and sections of road outside the Study Area) resulting in deterioration of road quality. • No ponding of water on the road surface as a result of changes in grade from subsidence associated with Longwalls 101-105.	**No**	The Ulan-Wollar Road is located outside the Longwalls 101-105 Study Area, but may be subject to far-field horizontal movements and non-conventional ground movements. Pre-mining monitoring lines established and surveys completed (including FF Line).	**No**

Subsidence Impact Performance Measure		Subsidence Impact Performance Indicator	Indicators Exceeded?	Assessment of Subsidence Impact Performance Measures	Performance Measures Exceeded?
		• No joint displacement or cracking or other defects of the drainage structure (e.g. pipes/culverts) in excess of 5 mm. • Serviceability of guard rails, marker posts and signage are maintained.		No triggers of FF Line indicating no additional cracking, defects, additional ponding, deformation or displacement of joints in culverts due to mining.	
Transgrid		• the structural integrity of the 330 kV ETL (towers and transmission lines) is maintained; • the electrical clearance from land, vegetation and roads is maintained; and • the serviceability of the access roads/tracks is maintained.	**No**	The TransGrid powerline is located outside the Longwalls 101 to 105 Study Area, but may be subject to far-field horizontal movements and non-conventional ground movements. Pre-mining monitoring lines established and surveys completed (including FF Line). No triggers of FF Line indicating no structural integrity changes due to mining Ground movements measured at the TransGrid towers are consistent with the predictions	**No**
Other Infrastructure:					
Murragamba Road	*Always safe.* *Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated.* *Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.*	• Not applicable (NA) as Murragamba Road is not publicly accessible.	**NA**	Murragamba Road is not publicly accessible. No observed impacts to Murragamba Road occurred during the assessment period as a result of LW103 and 104.	**No**
Low voltage electricity power line		• The structural integrity of the 66 kV/22 kV dual circuit powerline (power poles and transmission lines) is maintained. • The electrical clearance from land, vegetation and roads is maintained. • The serviceability of the access roads/tracks is maintained.	**No**	Pre-mining installation of tilt monitoring points in consultation with Essential Energy and baseline structure survey at each timber pole completed. Monitoring undertaken of Essential Energy poles, with ground movements measured at the Essential Energy poles and Substation consistent with the predictions provided Access maintained. No loss of service or observed impacts to the 66kV/22kV powerline and three associated power poles occurred during the assessment period, as a result of LW103 and 104.	**No**
Telecommunication cable *Fibre-optic cable*	*Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated.*	• Negligible transmission loss from mine subsidence impacts. • Negligible impacts on structural integrity of the cable lines from mine subsidence.	**No**	The telecommunication cable and optical fibre cable are located outside the Longwalls 101-105 Study Area, but may be subject to far-field horizontal movements and non-conventional ground movements. Pre-mining monitoring lines established and surveys completed (including FF Line).	**No**

Subsidence Impact Performance Measure		Subsidence Impact Performance Indicator	Indicators Exceeded?	Assessment of Subsidence Impact Performance Measures	Performance Measures Exceeded?
	Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.			Pre-mining inspection and identification of potentially affected Telstra customers completed. No observed/recorded impacts to either the telecommunications line and/or the fibre optic cable occurred during the assessment period, as a result of LW103 and 104.	
Murragamba Trig Station		• The serviceability of the Murragamba Trig Station is maintained. • MCO to liaise with Subsidence Advisory NSW (formerly NSW Mine Subsidence Board [MSB]) regarding the re-establishment and/or replacement of the Murragamba Trig Station and/or other permanent marks, as necessary, on completion of subsidence.	**NA**	The Murragamba Trig Station is located outside the mined extents of Longwalls 101 to 104.	**No**
Other built features and improvements, including fences	*Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated.* *Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.*	• No applicable (NA) subsidence impact performance indicators have been developed for this performance measure as no other non-mine owned built features and improvements are located within the Longwalls 101-105 Study Area.	**NA**	No other non-mine owned built features and improvements are located within the Longwalls 101 to 105 Study Area.	**No**
Public Safety:					
Public safety	*Negligible additional risk*	• No more than negligible additional risk to public safety.	**No**	Public safety is considered in the LW101 to 105 PSMP. No more than negligible additional risk to public safety has occurred during the assessment period, as a result of LW103 and 104, due to the remote location and restricted access of UG1 within MCO's open cut operation. There were no incidents regarding public safety as a result of LW103 and 104 during the assessment period.	**No**

8.1.1 ACTIONS FOR NEXT REPORTING PERIOD

Activities in the 2021 reporting period include:

- Routine environmental and subsidence line monitoring.
- Establishment and baseline monitoring of additional monitoring locations associated with LW105 where not completed.
- Remediation works, (Eg. Tracks) as required.

8.1.2 SUBSIDENCE REMEDIATION

Minor subsidence management actions were required to be undertaken as a result of LW103 and LW104 extraction during the reporting period. These included maintenance of MCO managed access tracks and haul roads as well as minor adjustments to the OC4 conveyor to re-level the infrastructure after subsidence.

9.0 REHABILITATION

MCO manages rehabilitation in accordance with Rehabilitation Management Plan (RMP) and Mining Operations Plan (MOP). The RMP was developed by MCO with advice from experienced and qualified experts to satisfy Condition 68, Schedule 3 of PA 05_0117 and Condition 56, Schedule 3 of PA 08-0135. The MCO Rehabilitation Management Plan (RMP) describes the management of rehabilitation at the Moolarben Coal Complex for Stage 1 and Stage 2. The RMP was updated following the approval of the UG4 Ancillary Works Modification (Mod 15) and was approved in October 2020.

The MOP was developed to meet the requirements of Mining Lease conditions. The MCO Mining Operations Plan (MOP) was revised twice during the reporting period to capture amendments to mining progression and changes associated with the approval of Modification 15. The MOP describes the proposed Stage 1 and Stage 2 mining and rehabilitation activities for the period 1 January 2020 to 31 December 2022 (the MOP term). A description of the proposed rehabilitation activities during the MOP term is provided in Section 7.2 of the MOP. Mining and rehabilitation progression are shown on MOP Plans 3A, 3B and 3C. The MOP and RMP are available on the Moolarben Coal website (www.moolarbencoal.com.au).

This section addressed the annual rehabilitation reporting requirements for Project Approvals PA05_0117 and PA08_0135, the MOP and Moolarben Coal Complex MLs.

9.1 MINING AND REHABILITATION STATUS

At the end of December 2020 MCO had a Total Mine Footprint of 1,687ha, approximately 306ha less than described in the MOP B. The reduced disturbance resulted from the delayed progression of mining infrastructure within OC3 and OC4. The area under rehabilitation preparation and active rehabilitation activities increased to approximately 385ha, 20ha greater than predicted. The area under active rehabilitation increased by 22ha to 350ha, which is 2 ha greater than predicted. The area classified as being prepared for rehabilitation was 35 ha, 20 ha more than predicted.

In addition, interim/temporary rehabilitation in the form of landscaping and planting has been completed around the main offices, environmental bunds and entry to the operational areas. External batters on dam walls and other infrastructure areas have also been temporarily rehabilitated.

The mining and rehabilitation status is presented in **Table 30**. The land preparation activities undertaken in the period and proposed areas in the next period are discussed in **Section 9.5** and **Section 9.6** and presented in **Figure 3**. The status of mining and rehabilitation is presented in **Figure 4**. The status of mining and rehabilitation, and the agreed post rehabilitation land-use is presented in **Figure 5**.

During the reporting period MCO continued to undertake monitoring and maintenance activities within the existing rehabilitated areas. This included the management of spontaneous combustion areas, supplementary seeding of areas with limited cover, placement of mulch, and weed and feral animal control activities.

During the period, OC2 rehabilitation performance and completion criteria for ecosystem and species credits were approved.

Table 30: Mining and Rehabilitation Status

Mine Area Type	Previous Reporting Period (2019)	This Reporting Period (2020)	Next Reporting Period (2021)
Total Mine Footprint	1,493	1,687	1,960
Total Active Disturbance	1,113	1,302	1,404
Land being Prepared for Rehabilitation	52	35	57
Land under active Rehabilitation	328	350	366
Completed Rehabilitation	0	0	0

9.2 VEGETATION CLEARANCE AND TOPSOIL STRIPPING

Vegetation clearance was undertaken in accordance with the Vegetation Clearance Protocol and GDPs within the OC2, OC4 and infrastructure areas (**Figure 3**) as described in **Section 6.5.1**. Stripped topsoil was either placed in temporary stockpiles for later use, or placed directly on areas prepared for rehabilitation. Vegetation salvaged was either mulched or retained for use as habitat features within rehabilitation areas.

9.3 SEED COLLECTION

Native seed collection continued throughout the period with seed harvested from MCO owned lands. All activities were undertaken in accordance with the requirements of the Florabank Guidelines (2000). At December 2020 MCO's seed bank contained 312,206 grams of native seed for use in rehabilitation activities across the MCC.

9.4 REHABILIATION MONITORING

MCO undertakes a monitoring program of rehabilitation areas in accordance with the RMP. The monitoring program includes landscape function analysis, floristic monitoring, vegetation structure and growth, fauna monitoring and visual monitoring.

9.4.1 ECOSYSTEM FUNCTION ANALYSIS

EFA was undertaken at 21 EFA sites within the MCO open cut rehabilitation areas, as well as at three (3) analogue sites which are located within vegetation communities equivalent to the general rehabilitation target communities.

Landscape Function Analysis
LFA assessment allows for the calculation of a Landscape Organisation Index (LO), reflecting the proportion of a transect occupied by patches. Patches are defined by soil surface elements, such as perennial ground cover, litter, logs or rocks that help retain soil and other resources at a site. A higher LO index implies a more stable transect that is less prone to erosion and resource loss.

During 2020, LOI ranged from 68 (R9) to 99 (R10) at Box Gum Shrubby Woodland sites, with an average of 88. An LOI of 100 was recorded at both analogue sites (A1a and A2b). LOI ranged from 40 (R11) to 97 (R14) at Sedimentary Ironbark Forest sites, with an average of 74 compared to an LOI of 90 recorded at the analogue site (A5B). LOI comparison to analogue sites is shown in **Figure 17**.

Variation in the patch assemblages has been recorded throughout the duration of monitoring for each site which can be attributed to variation in climatic conditions across years and seasons, as well as monitoring timing and rehabilitation development.

The majority of sites recorded less than 10% bare soil patches during 2020 monitoring. There is an increasing tree and shrub canopy associated with maturing rehabilitation campaigns and seasonal changes in ground herbage year to year. Monitoring sites are presented in **Appendix 2**.

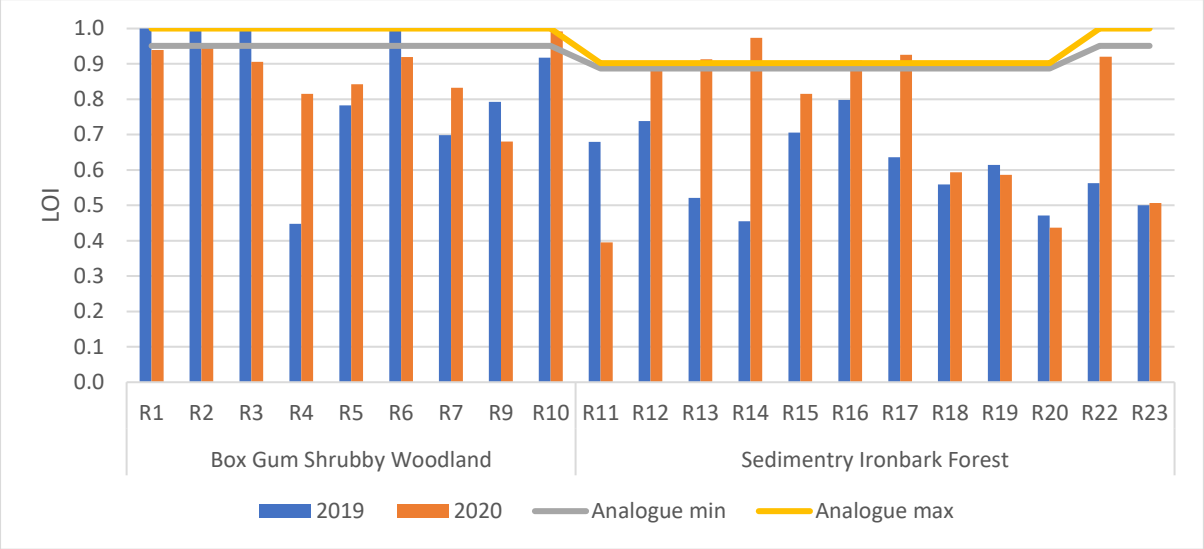


Figure 17: Landscape organisation indices (LOIs) for 2019 and 2020 compared to analogue LOI values

Floristic Monitoring

During the 2020 monitoring of Box Gum Shrubby Woodland, a total of 247 species were recorded including 14 native canopy species, 37 native mid-storey species, 114 native groundcover species and 72 exotic groundcover species. Ten (10) species were recorded which could not be identified to species level due to absence of material required for identification. All sites, except for R10, show an increasing trend in native species richness with time and in 2020 recorded the highest native species richness for the respective monitoring season since monitoring began.

During the 2020 monitoring of Sedimentary Ironbark Forest, a total of 11 native canopy species, 24 native mid-storey species, and 93 native and 63 exotic groundcover species were recorded. Five (5) species were recorded which could be not be identified to species level due to the absence of material required for identification. Native species richness in 2020 was the highest to date at all sites monitored in 2020 with the exception of R13, which was similar to the analogue site.

The trend in native species diversity at Box Gum Shrubby Woodland rehabilitation sites, shows a similar pattern in recent years to that at the equivalent analogue sites (**Figure 18**). At most sites, there was an increase in native species diversity from 2019 to 2020, likely in response to the recent improved rainfall in the region. The same pattern was observed for Sedimentary Ironbark sites (**Figure 19**). This indicates that the vegetation at rehabilitation sites are responding in a similar way to that at analogue sites which suggests that it may be developing resilience to environmental stress. If the rehabilitated vegetation continues to respond in a similar way to analogue sites this will be a clear demonstration of resilience which is a critical element for long-term sustainability.

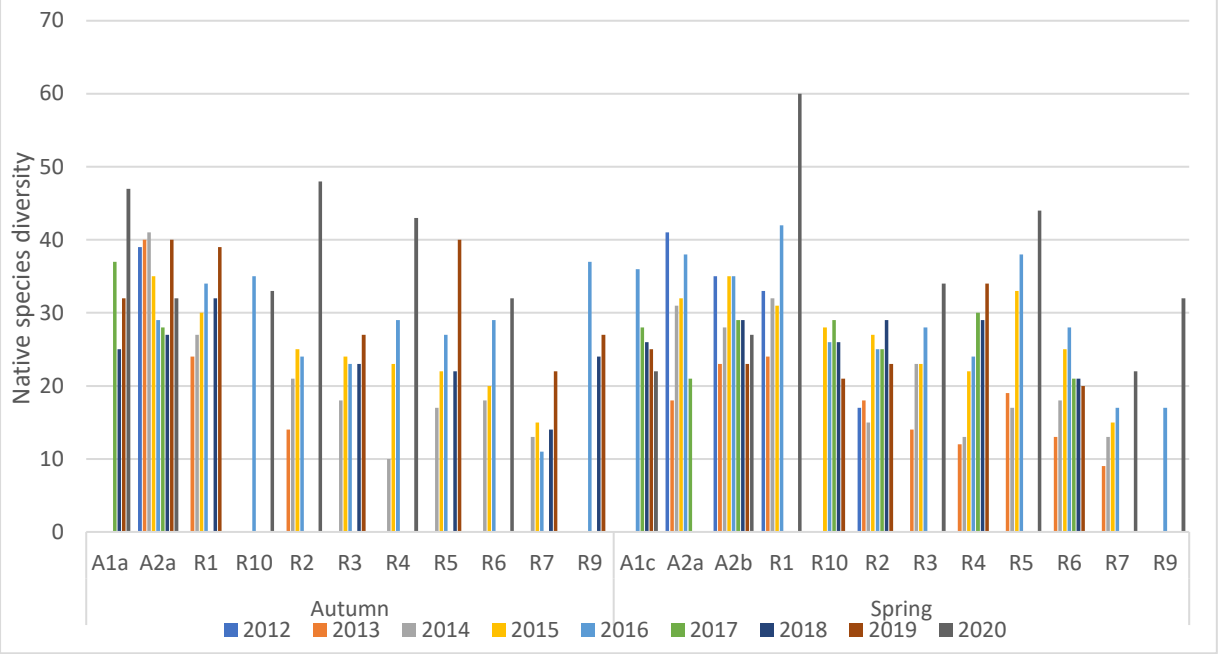


Figure 18: Native species diversity 2012 – 2020 for Box Gum Shrubby Woodland open cut rehabilitation monitoring sites and Box Gum Grassy Woodland analogue sites.

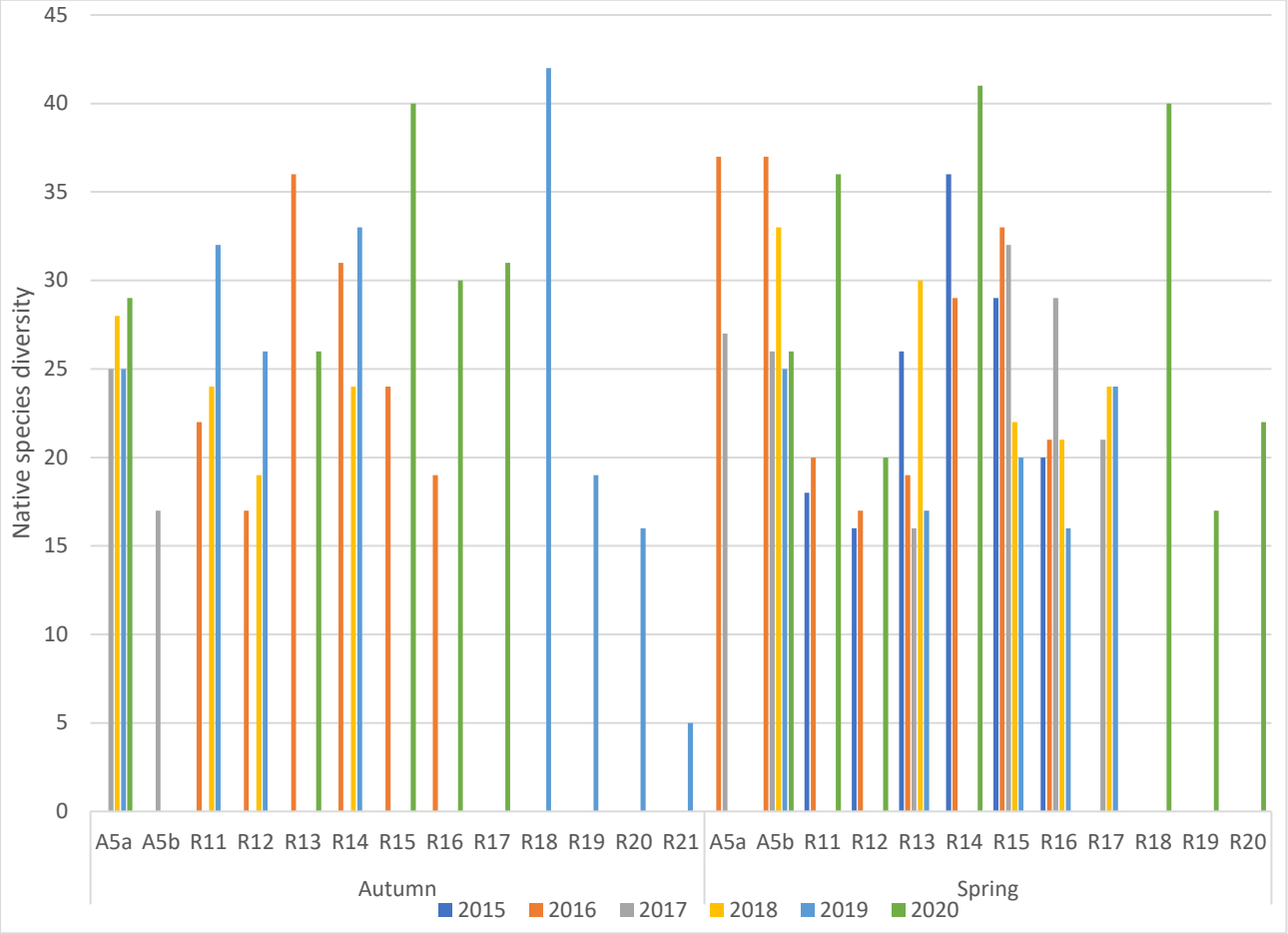


Figure 19: Native species diversity 2015 – 2020 for open cut rehabilitation and analogue Sedimentary Ironbark Forest sites

Vegetation Structure and Growth

Canopy cover for Box Gum Shrubby Woodlands averaged 10%, which is consistent with 2019 (12%), and continues to be less than that seen at the analogue sites which during 2020 averaged 21%. Canopy cover for Sedimentary Ironbark Forest sites averaged 5.5%, slightly lower compared to the average canopy cover recorded in 2019 (8.2%), however greater than the average canopy cover recorded during 2020 at analogue sites.

The average mid-storey cover for both Box Gum Shrubby Woodlands and Sedimentary Ironbark Forest sites in 2020 was slightly higher than 2019, with new growth on shrub species including Acacia species and *Cassinia sifton* (Sifton Bush).

Total native groundcover (grasses, herbs/forbs and shrubs <1 m in height) for Box Gum Shrubby Woodlands and Sedimentary Ironbark Forest sites in 2020 averaged 12% and 26% respectively, both increasing since 2019.

Fauna Monitoring

Two (2) amphibian species, 36 bird species, 12 mammal species and two (2) reptile species were recorded during monitoring in 2020 including three (3) threatened species being Speckled Warbler (Chthonicola sagittata), Large-eared Pied Bat (*Chalinolobus dwyeri*) and Large Bent-winged Bat (*Miniopterus orianae oceanensis*). A wide range of bird guilds were recorded during 2020 monitoring, including insectivores, nectivores and herbivores which forage at different stratum levels within vegetation.

Site R7 had the highest bird species richness with 15 species recorded and has been consistently recorded with the highest species richness since 2017; which is likely a result of the variety of habitat present nearby; and the presence of stags and a nearby water source.

Visual Monitoring

Results from 2020 were largely consistent with previous years for previously monitored transects across the OC1 rehabilitation. Transects in OC1 rehabilitation scored between 'moderate' and 'good' in all attributes and a score of 'good' for feral animals, soil compaction and runoff and disturbance factors.

Transect 13 (OC2) achieved a score of 'poor' for overstorey components, with no overstorey species recorded along the transect, however this is expected in rehabilitation in its first year of monitoring. Monitoring of the visual transects within the April 2017 rehabilitation campaign areas of OC1 and OC4 (Transect 11 and Transect 12- established during autumn 2019) demonstrated high midstorey species richness with low densities (<25 individuals per ha). It is expected that these attributes will increase as the rehabilitation matures.

Native and exotic ground cover along the transects were higher compared to 2019 results, which is consistent with data from the floristic monitoring.

Assessment of Rehabilitation Performance Indicators

Analysis of the Box Gum Woodland and Sedimentary Ironbark Forest rehabilitation against the RMP Performance Indicators (and vegetation structure indicators) for Ecosystem and Land Use Establishment is presented in **Table 31** and **Table 32**.

Table 31: Box Gum Shrubby Woodland rehabilitation assessment (Secondary Domain A)

Completion Criteria (by years 5-7)	**Objective:** Establish native vegetation comparable to Box Gum Shrubby Woodland communities including stands of Allocasuarina spp. Rehabilitation Monitoring Outcome
No evidence of significant noxious weed infestation	One priority weed species, *Senecio madagascarensis* was recorded and contributed less than 1% cover for this secondary domain. **Outcome:** Based on data from autumn and spring 2020, the area covered by all four rehabilitation campaigns within this secondary domain meet the completion criteria related to noxious weeds.
Pest animal populations are not causing significant damage to rehabilitation areas.	European Rabbit and Common Starling were observed in very low abundances within OC1 during both autumn and spring monitoring periods. **Outcome**: Based on data from autumn and spring 2020, the area covered by all four rehabilitation campaigns within this secondary domain meet the completion criteria related to pest animal populations.
There are one to three overstorey species from the Box Gum Shrubby Woodland EEC present by Years 5 to 7.	Between one (1) and six (6) overstorey species were recorded at each site. All individual rehabilitation campaigns had at least two (2) overstorey species from the Box Gum Shrubby Woodland community. These included *Angophora floribunda (Rough-barked Apple), Eucalyptus albens (White Box), E. blakelyi (Blakely's Red Gum), E. crebra (Narrow Leaf Ironbark), E. melliodora (Yellow Box), E. moluccana (Grey Box) and E. punctata (Grey Gum).* ***Outcome**:* Based on data from autumn and spring 2020; the area covered by all four rehabilitation campaigns within this secondary domain meet the completion criteria related to Box Gum Woodland overstorey species richness.
Indicator species plant densities are trending towards plant densities of analogue sites at Years 5 to 7.	This has been assessed on a rehabilitation campaign level. November 2010 and February 2012 rehabilitation campaigns indicator species plant densities are trending towards analogue site densities. Whilst indicator species densities at March 2012 and February 2013 have plateaued over the last two years, it is expected that these sites will continue to trend towards analogue densities as the rehabilitation continues to mature. **Outcome**: Based on data from autumn and spring 2020; All Secondary Domain A – Box Gum Shrubby Woodland rehabilitation campaigns meet the completion criteria related to indicator species plant density trends.
A minimum of four native ground cover species that are present in analogue sites are present by Years 5 to 7.	During 2020, all individual sites recorded a minimum of four (4) and ranged from nine (9) to 22 native ground cover species that are present in analogue sites. **Outcome**: Based on data from plots monitored in 2020, Secondary Domain A meets the completion criteria related to native ground cover species.
Stands of Allocasuarina spp. are present in Box Gum Shrubby Woodland rehabilitation areas by Years 5 to 7.	Stands of Allocasuarina spp. were recorded within the OC1 rehabilitation in R1 (six (6) individuals) and R5 (13 individuals). An *Allocasuarina spp*. stand was also recorded in an area downslope (west) of R1. **Outcome**: Based on data from plots and visual transects in 2020 this secondary domain meets the completion criteria related to the presence of stands of *Allocasuarina spp.*

Table 32: Sedimentary Ironbark Forest rehabilitation assessment (Secondary Domain B)

Completion Criteria (by years 5-7)	**Objective**: Establish native vegetation comparable to Sedimentary Ironbark Forest communities including stands of Allocasuarina spp. Rehabilitation Monitoring Outcome
No evidence of significant noxious weed infestation	Two priority weed species, (*H. perforatum* and *S. madagascarensis*) were recorded at less than 1% cover. **Outcome:** Based on data from autumn and spring 2020, the area covered by all five rehabilitation campaigns within this secondary domain meet the completion criteria related to noxious weeds.
Pest animal populations are not causing significant damage to rehabilitation areas.	European Rabbit and Common Starling were observed in very low abundances within this Secondary Domain in OC1 during both autumn and spring monitoring periods. No feral animals were recorded within this Secondary Domain within OC4. **Outcome**: Based on data from autumn and spring 2019, the area covered by all five rehabilitation campaigns within this secondary domain meet the completion criteria related to pest animal populations.
There are two to three overstorey species from the Sedimentary Ironbark Forest community present by Years 5 to 7	Between 1 and 4 indicator species were recorded within OC1 and OC4 Secondary Domain B – Sedimentary Ironbark Forest rehabilitation campaign areas during 2020. **Outcome**: The rehabilitation campaigns March 2012, November 2012 and November 2016 have met this completion criteria. The rehabilitation campaigns December 2014, April 2017 (OC1) and April 2017 (OC4) have not yet met the completion criteria.
Indicator species plant densities are trending towards plant densities of analogue sites at Years 5 to 7.	November 2016, OC1 April 2017 and OC4 April 2017 rehabilitation campaigns have not yet reached Year 5. There has been no change in density at the OC1 April 2017 and OC4 April 2017 rehabilitation campaigns, whilst the November 2016 rehabilitation campaign is trending towards analogue densities. Density at the March 2012 rehabilitation campaign have fluctuated since 2017 and is not trending towards analogue densities. Density at the November 2012 rehabilitation campaign is trending towards analogue densities (2017 compared to 2020). **Outcome**: Secondary Domain B – Sedimentary Ironbark Forest has not yet met the completion criteria on a landscape level. It is expected that densities across all rehabilitation campaigns will decrease (trend towards analogue values) as the rehabilitation matures.
A minimum of four native ground cover species that are present in analogue sites are present by Years 5 to 7.	All Rehabilitation campaigns except the more recently rehabilitated areas (OC1 April 2017 and OC4 April 2017) recorded a minimum of four native groundcover species that are present in analogue sites. **Outcome**: Four out of five OC1 rehabilitation campaigns have met the completion criteria. Therefore, this completion criteria has not been met on a landscape scale but is progressing. The OC4 area of Secondary Domain B has not yet achieved this completion criteria.
Stands of Allocasuarina spp. are present in Sedimentary Ironbark Forest rehabilitation areas by Years 5 to 7.	Two stands of *Allocasuarina spp*. were observed within the OC1 rehabilitation areas. R18 has over 50 individuals of *Allocasuarina spp* present and a less extensive stand is present at R14 (five (5) individuals). **Outcome**: Based 2020 results, the OC1 area of Secondary Domain B meets the completion criteria related to the presence of stands of *Allocasuarina.*

9.5 REHABILITATION WORKS

Rehabilitation of disturbed lands are undertaken sequentially (or in phases) to achieve the final land use. A description of these phases of rehabilitation relevant to the Moolarben Coal Complex are provided in the MOP. A summary of rehabilitation phases completed during the reporting period included:

Decommissioning
There were no decommissioning activities undertaken at MCO.

Landform Establishment
24.1ha of landform establishment in OC2 and OC4 were completed during 2020. Final landforms were established to the relevant completion criteria including:

- Constructed landforms consist with surrounding topography;
- Slopes were generally less than 10^0 to 18^0;
- Constructed landforms were free draining; and
- No hostile overburden material in the final surface layers.

Growth Medium Development
11ha in OC1, OC2, and OC4 underwent growth medium development during 2020. Growth medium was managed and applied to the relevant completion criteria including:

- Topsoil depths achieved a minimum of 100mm;
- Appropriate soil ameliorants have been applied in accordance with specification and recommendations from subsoil and topsoil material characterisation testing; and
- Topsoil areas ripped along the contour.

Ecosystem and Landuse Establishment
350ha of rehabilitation in the ecosystem and landuse establishment phase located in OC1, OC2 and OC4 were maintained and further enhanced during 2020.

9.6 ACTIONS DURING NEXT PERIOD

Rehabilitation actions to be progressed in the next period include:

- Continued progressive rehabilitation;
- Continued weed and feral animal control; and,
- Continued monitoring of rehabilitation areas with low cover or density with consideration of supplementary seeding.

10.0 COMMUNITY

10.1 COMMUNITY ENGAGEMENT

During 2020, MCO continued to foster positive relationships with the local community through engagement and ongoing support provided to a range of community groups and events – including, but not limited to – Lue Public School, Watershed Landcare, Mudgee and Gulgong Chamber of Commerce, Mudgee Rotary, Mudgee Lions Club, Mudgee Men's Shed, Survivor Life skills program, Mudgee Junior League and Sculptures in the Garden. MCO also supported the Mudgee Respiratory (COVID) Clinic, Western Area Health Service, Clontarf Academy, Lifeskills Plus. In total, MCO provided **$117,000** in community donations during 2020 to 29 community groups and events through its Community Support Program and other programs (**Appendix 5).**

Community/stakeholder related activities undertaken during the reporting period include:

- Mock Interviews with local High Schools
- Yancoal cadet student placements
- Max Potential Program at Club Mudgee
- Spirit Awards for 2019 overall winner (held in March);
- Active participation in Wild Dog Groups and the LLS; and
- Direct engagement with nearby landholders.
- Coordinated COVID-19 support of local health services.

Moolarben continued to provide the community with information on its website (www.moolarbencoal.com.au). Information available included project approvals, CCC meeting minutes, community complaint records, environmental monitoring information, environmental audits, environmental management plans and annual reviews.

10.2 COMMUNITY COMPLAINTS

MCO maintains a 24-hour Environment and Community Complaints Hotline (1800 556 484). This Hotline is available in order to receive any complaints from neighbouring residents or interested stakeholders. Details for the Hotline are available on the MCO website and in community newsletters.

MCO has developed a Community Complaints Procedure which details how to receive, respond to, record, and action any community complaint received to site. This procedure also outlines the reporting requirements relating to community complaints, including:

- Monthly reporting of community complaints on the MCO website;
- Discussion of community complaints as part of the operational performance provided during CCC meetings; and,
- A summary of complaints is provided in the Annual Review and Annual Return (as part of EPL reporting).

During 2020, a total of 16 complaints were received in relation to MCO Operations by 10 complainants. All complaints are investigated and included in the complaints register on the Moolarben Coal website (www.moolarbencoal.com.au). 31% of complaints were received by one complainant. Noise remained the primary issue of concern (75% of complaints), followed by Blasting (19%) (**Figure 20**).

A comparison of complaints to previous years is presented in **Table 33**. There has been a decrease in noise complaints during the period and continues the trend since 2015. A register of complaints is provided in **Appendix 4**.

The ongoing use of Mining and Production Environmental Assistants continues to provide real-time feedback to the mining operation and to inform proactive and reactive responses. Ongoing community and stakeholder liaison and consultation has continued.

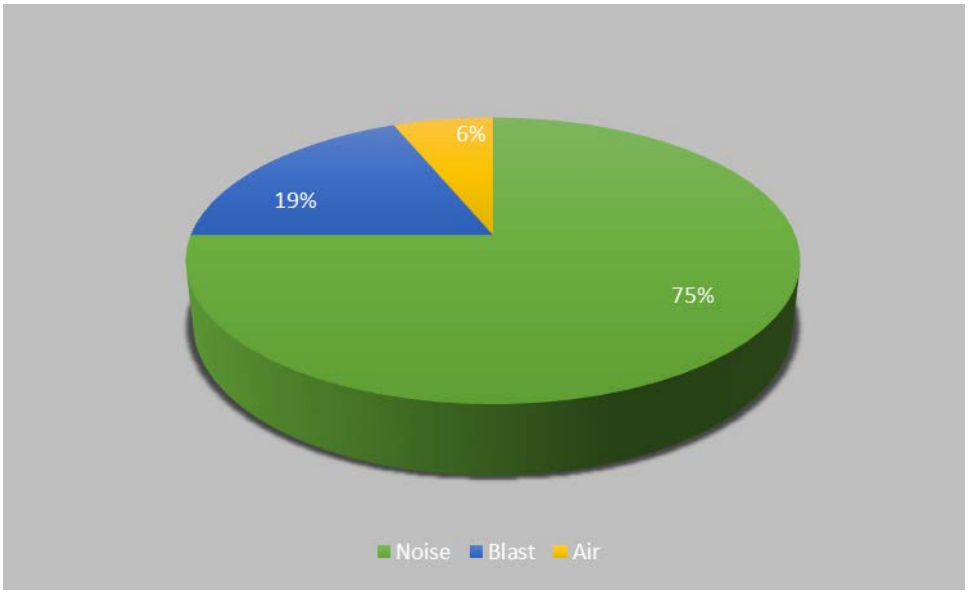


Figure 20: Community Complaints 2020 – Breakdown by Type

Table 33: Comparison of Community Complaints

Reporting Period	Noise	Blast	Air	Water	Other	Total
2013 - 2014	239	12	2	0	3	**256**
2015	274	6	2	0	4	**286**
2016	157	7	2	0	1	**167**
2017	108	3	1	2	1	**115**
2018	54	10	0	0	1	**65**
2019	33	1	4	0	0	**38**
2020	12	3	1	0	0	**16**

10.3 COMMUNITY CONSULTATIVE COMMITTEE (CCC)

In accordance with Condition 6, Schedule 5 of project approval (05_0117) and Condition 6, Schedule 6 of project approval (08_0135) the Community Consultative Committee (CCC) continued to meet during the 2020 reporting period. The purpose of a Community Consultative Committee is to provide a forum for open discussion between MCO, the community, the local council and other key stakeholders on issues directly relating to the project, including performance against any conditions, and to keep the community informed on these matters.

Members of the MCO CCC for 2020 are presented in **Table 34**. MCO conducted four CCC meetings during the reporting period with summaries provided in **Table 35.** Meetings were chaired by an independent chairperson with the minutes being available on the MCO website.

Table 34: CCC Members 2020

Name	Representing	Name	Representing
Aleshia Lonsdale	Mudgee Local Aboriginal Land Council	Helen Ungaro	Ulan Public School and Local Landholder.
Andrew Palmer	Mudgee Chamber of Commerce	David Stokes	Local resident
Julia Imrie	Local Landholder and Business Owner	John O'Neil	Councillor, Mid-Western Regional Council
Bev Smiles	Mudgee District Environment Group	Ms Lisa Andrews	DPIE endorsed Independent Chair.
Des Kennedy	Councillor, Mid-Western Regional Council	Stephen Alcorn[1]	Mudgee Chamber of Commerce

[1]Stephen Alcorn replaced Andrew Palmer as a CCC member at the 15th September CCC meeting.

Table 35: CCC Meeting Summary

Date	Meeting Summary
17 March	General update on community interaction, operations and exploration, environmental monitoring, community complaints, rehabilitation, biodiversity offset management, and employment. Update on the UG4 Ancillary Works Modification
2 June	General update on community interaction, operations and exploration, environmental monitoring, community complaints, rehabilitation, biodiversity offset management and employment. Update COVID-19 controls at MCO Update on the UG4 Ancillary Works Modification
15 September	General update on community interaction, operations and exploration, environmental monitoring, community complaints, biodiversity offset management, employment, and COVID-19 controls at MCO Information on the UG4 Ancillary Works Modification and the 2019 Annual Review
7 December	General update on community interaction, operations, exploration, environmental monitoring, community complaints, rehabilitation, biodiversity offset management, employment and COVID-19 controls at MCO. Information on Rehabilitation monitoring and performance.

10.4 ULAN ROAD STRATEGY

The Mid Western Regional Council has continued maintenance works on Ulan Road. Moolarben continues to make financial contributions to the maintenance costs of the Ulan Road works detailed in the agreement.

18 properties along Ulan road have also been identified for noise attenuation works. Works required at each of the properties was determined generally in accordance with the RMS guidelines. The current status is:

- 13 properties with works completed;
- 2 properties with agreements in place
- 1 property where owners have declined mitigation works;
- 2 properties on review are outside the mitigation zone; and

11.0 INDEPENDENT AUDIT

In October 2018, an Independent Environmental Audit (IEA) was undertaken in accordance with Condition 9, Schedule 5 of PA 05_0117 (as modified) and Condition 9, Schedule 6 of PA 08_0135. The IEA was undertaken by pitt&sherry. In general, operational environmental management activities observed during the site inspection were being carried out in a competent manner, with the non-compliances identified by the Auditors being the exception. All recommendations associated with audit have been undertaken. The staged development of the Biodiversity Offset Management Plan continues to be progressed.

A copy of the IEA including the Audit findings can be found on MCO's Website (www.moolarbecoal.com.au)

The next Independent Audit will be required by December 2021.

12.0 INCIDENTS & NON-COMPLIANCES

There were five non-compliance during the reporting period:

- Non-continuous monitoring of TEOMs due to power supply interruption, equipment failures and routine maintenance. Minor Administrative
- A single Oil & Grease sample was not collected on one occasion during discharge. Minor Administrative
- Quarter 1 Effluent monitoring was not completed at EPL ID 22 due to unscheduled maintenance. Minor Administrative
- During the construction of the Moolarben Creek crossing, a localised storm event on the 19th February 2020 resulted in Moolarben Creek entering the downstream culvert construction works then flowing back into Moolarben Creek. The PIRMP was activated including notification of EPA and other agencies and provision of report. Water quality sampling was undertaken at the time of the event, with downstream water quality results comparable to the upstream water quality results.
- On 21 December 2020 a sediment water release occurred from a sediment drain associated with Sediment Dam 304 (EPL Identification Point 51) in the vicinity of the Open Cut 3 pre-strip area (this being an area with only topsoil removed in preparation for mining operations). The PIRMP was activated including notification of EPA and other agencies and provision of report. Water quality sampling was undertaken at the time of the event, with results showing higher suspended solids than the Moolarben Creek monitoring but lower Electrical Conductivity. The drain design was reviewed and upgraded.

13.0 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

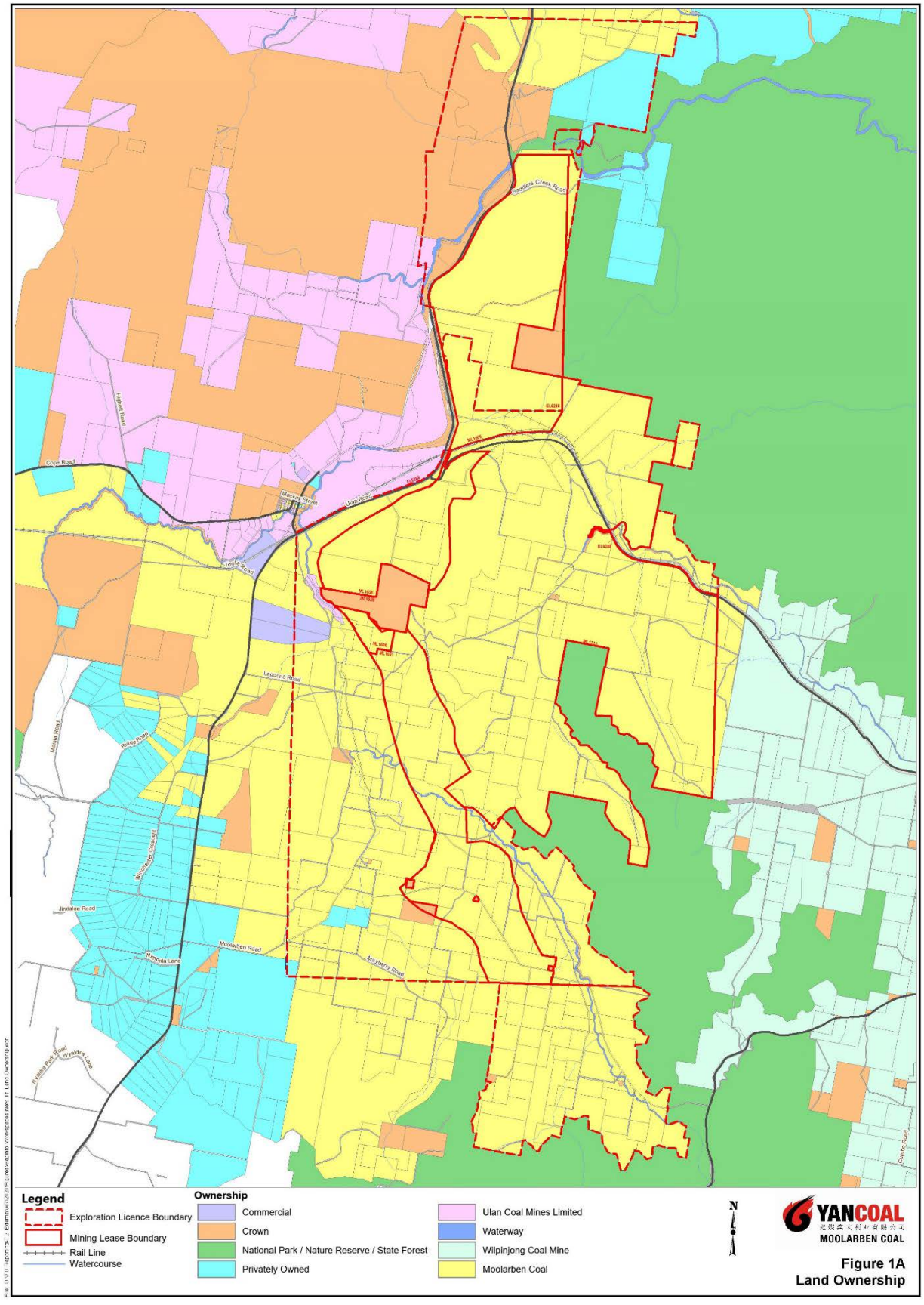
The following is a summary of measures to be implemented in the next reporting period.

- Review and revise environmental management plans as necessary.
- Review and revision of Biodiversity Offset Management Plan.
- Review PZ58a triggers as part of next Groundwater Management Plan Review.
- Continued progressive rehabilitation.
- Development of Extraction Plan for Underground 4 LW401-408
- Establish baseline monitoring sites for LW105 where not already in place.
- Undertake Independent Audit

LIST OF APPENDICES

LIST OF FIGURES

APPENDIX 1. LAND OWNERSHIP


Legend
Exploration Licence Boundary
Mining Lease Boundary
Rail Line
Watercourse
Ownership
Commercial
Crown
National Park / Nature Reserve / State Forest
Privately Owned
Ulan Coal Mines Limited
Waterway
Wilpinjong Coal Mine
Moolarben Coal
N
YANCOAL
MOOLARBEN COAL
Figure 1A
Land Ownership
Saddlers Creek Road
Cope Road
Ulan Road
Castle Rock Road
Lagoons Road
Ridge Road
Jindalee Road
Moolarben Road
Mayberry Road
Wyldes Park Road
Wyldra Lane
Castle Road

APPENDIX 2. MONITORING LOCATIONS

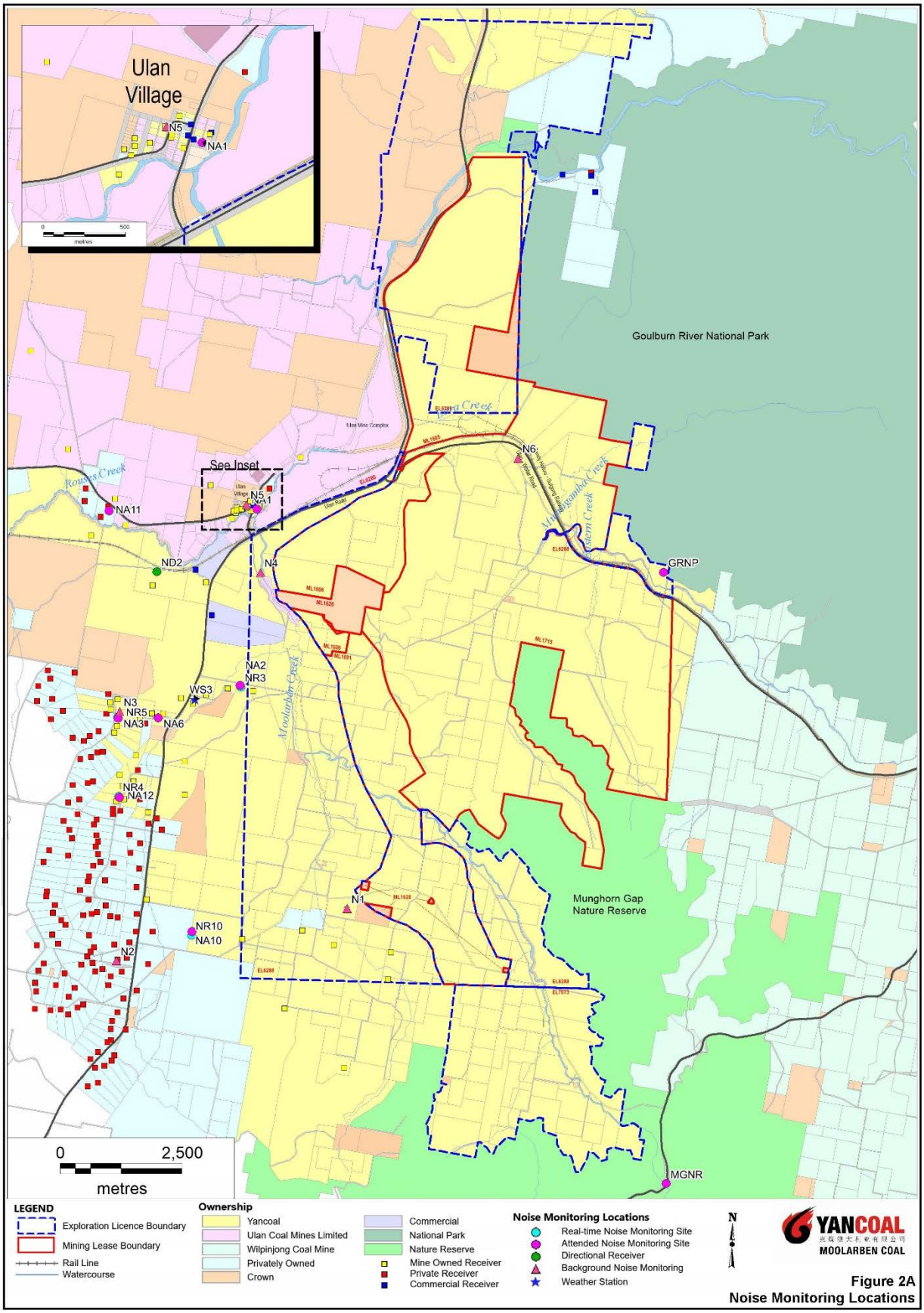


Figure 2A
Noise Monitoring Locations

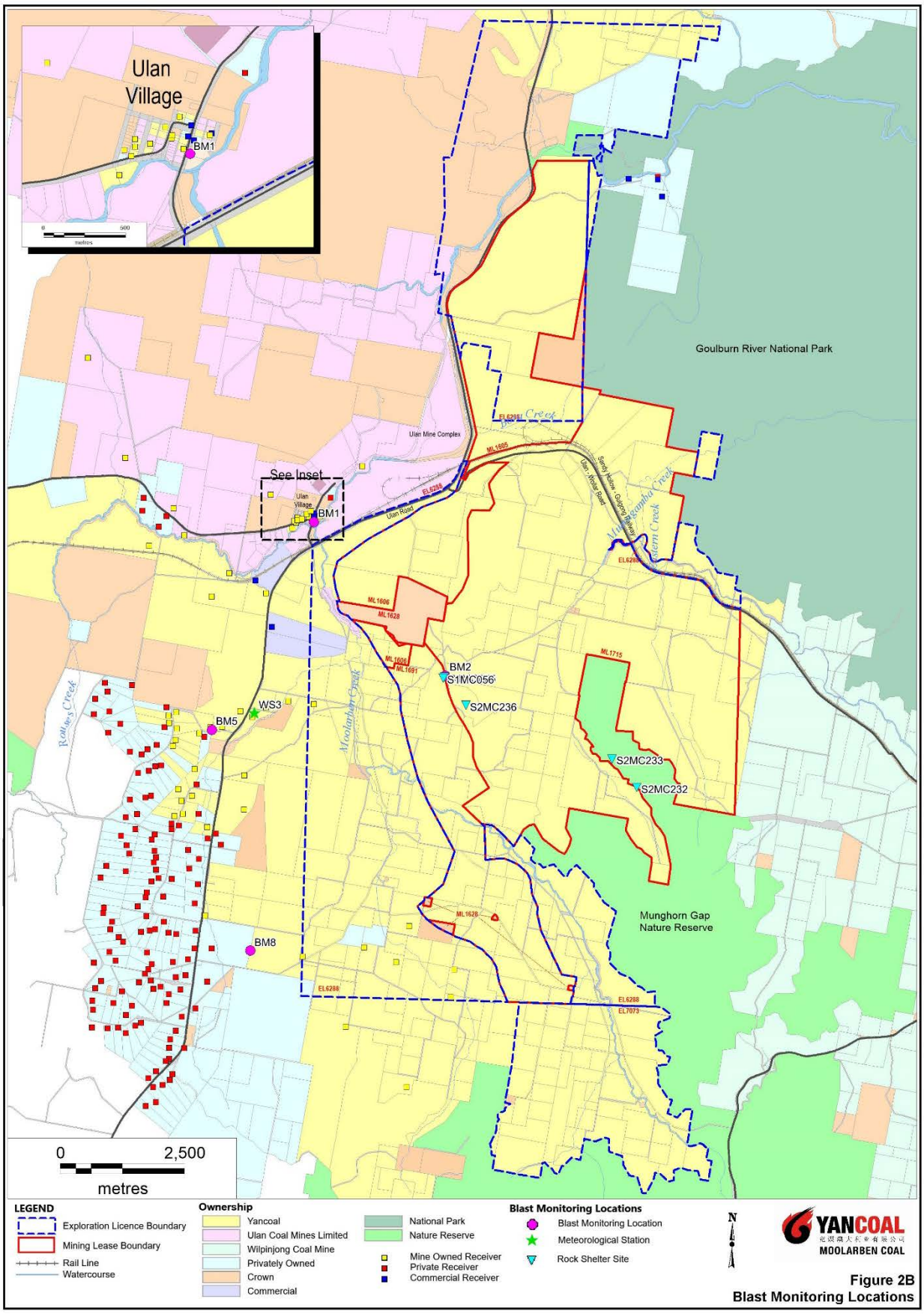


Figure 2B
Blast Monitoring Locations

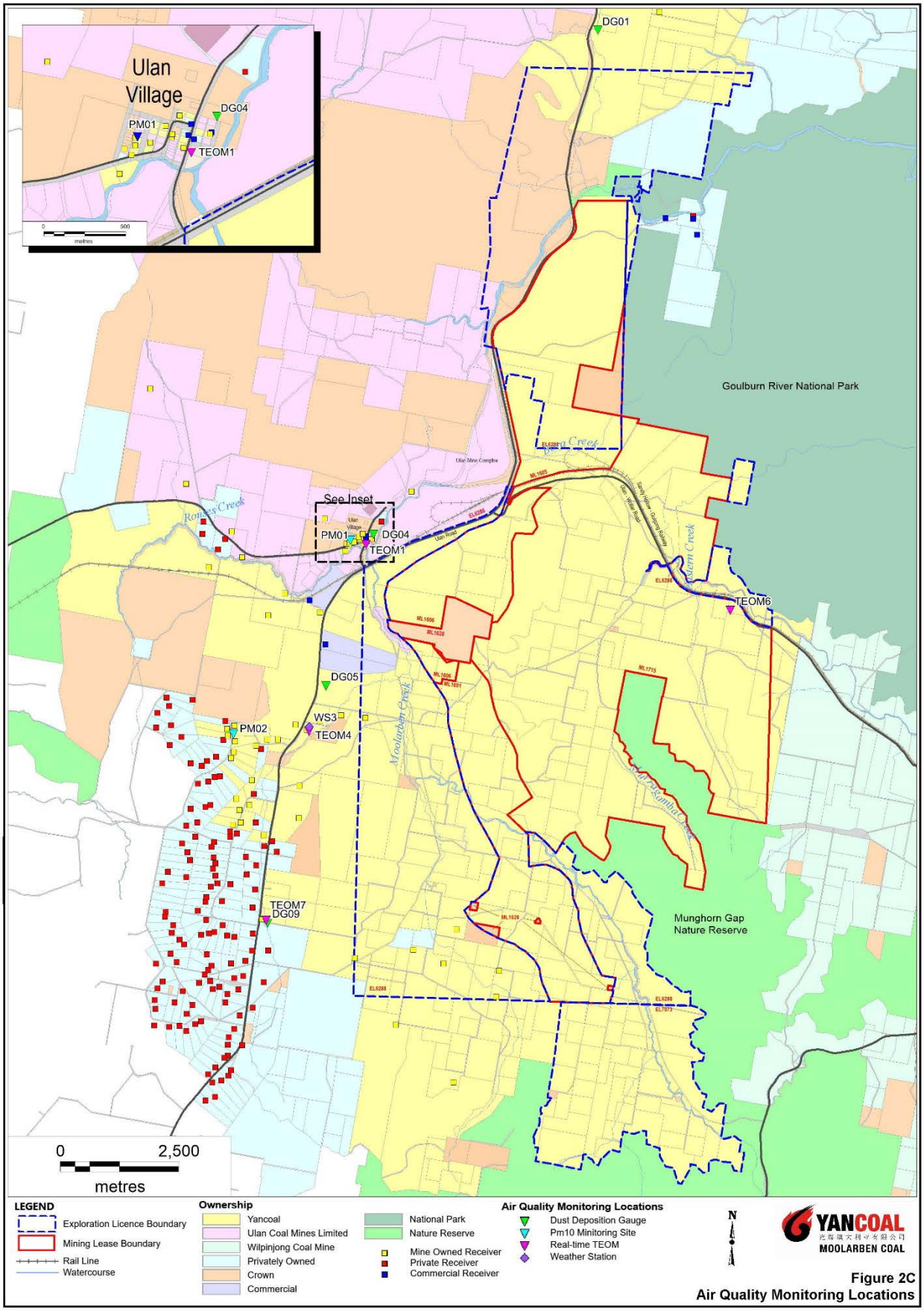


Figure 2C
Air Quality Monitoring Locations

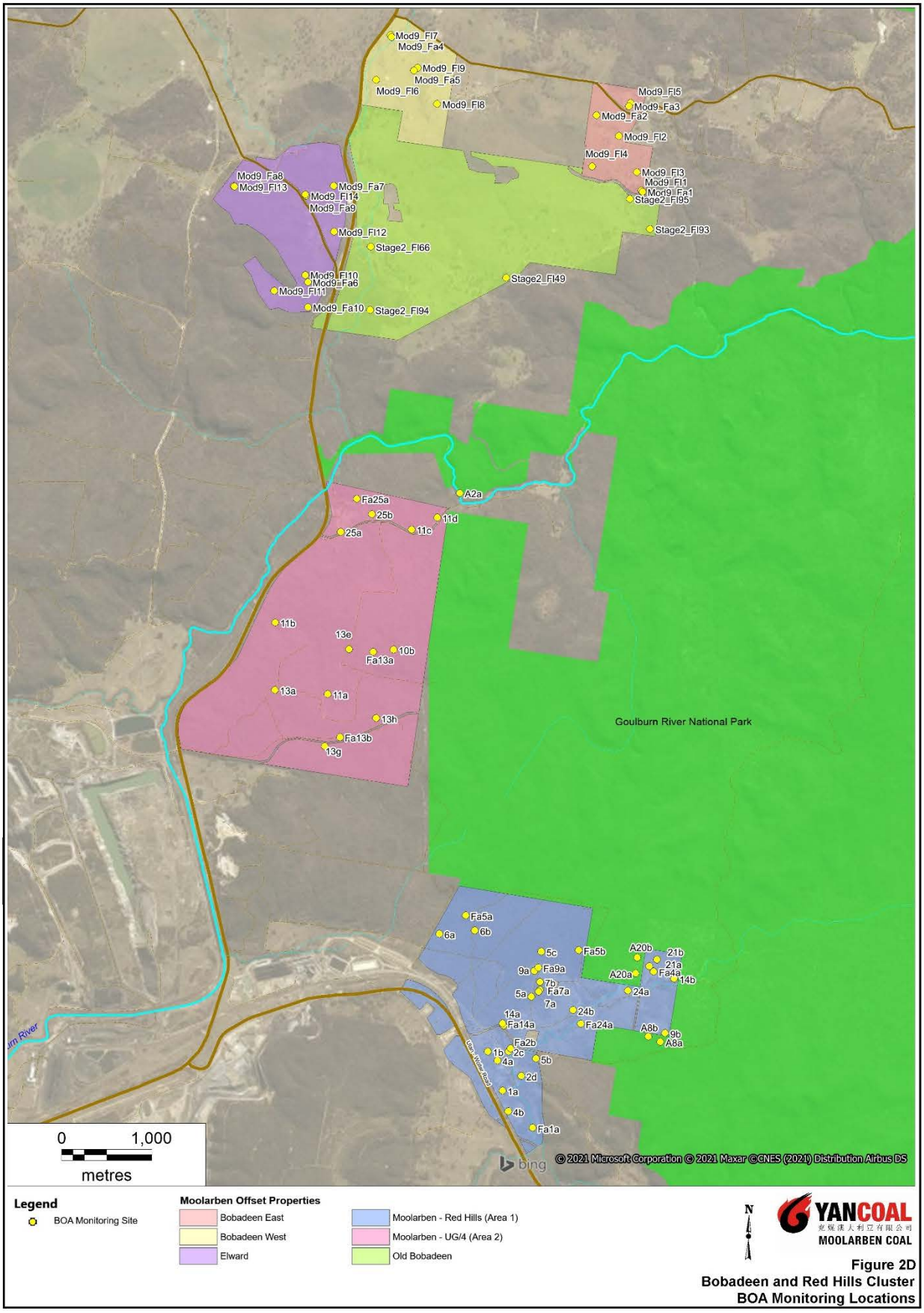
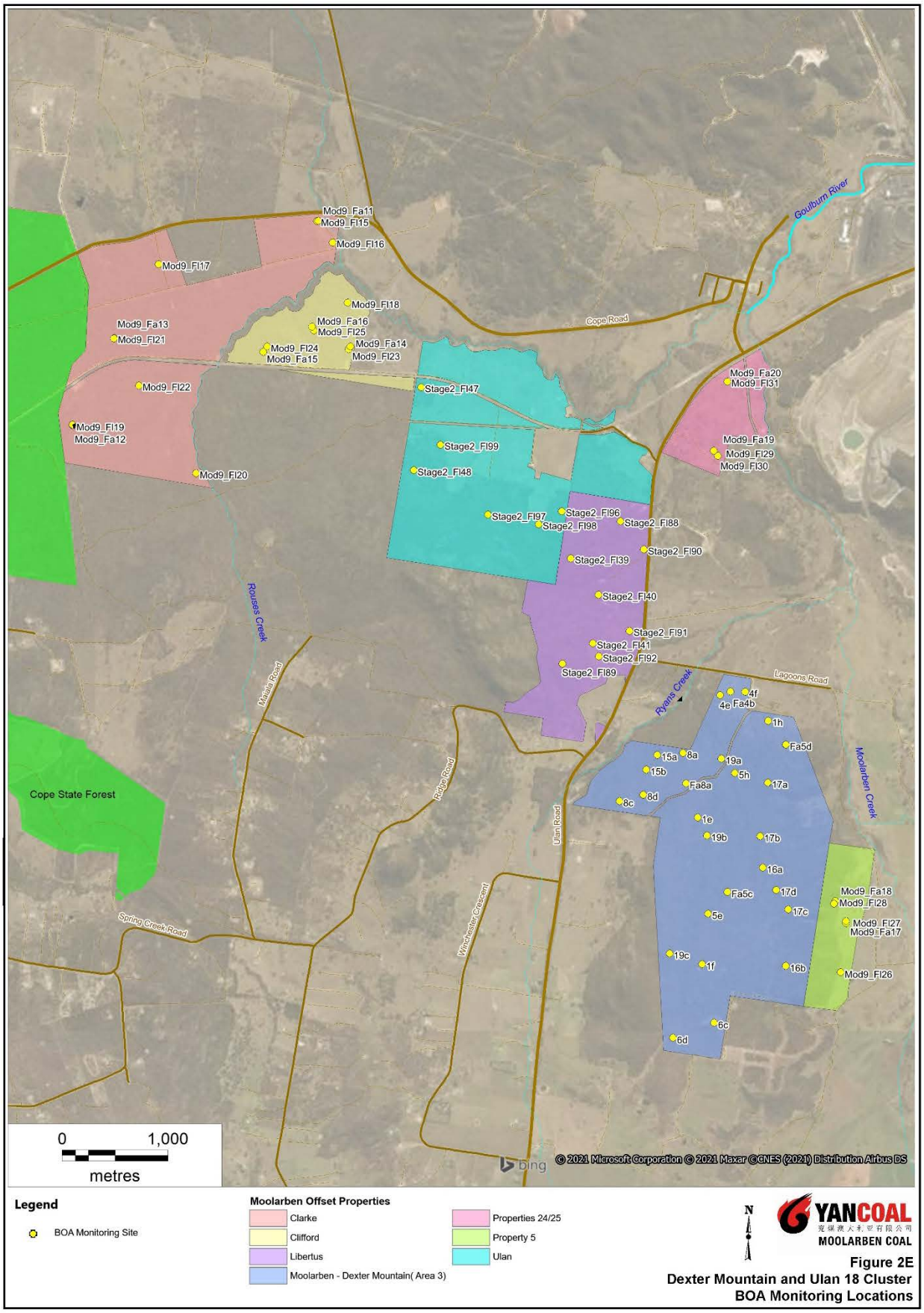
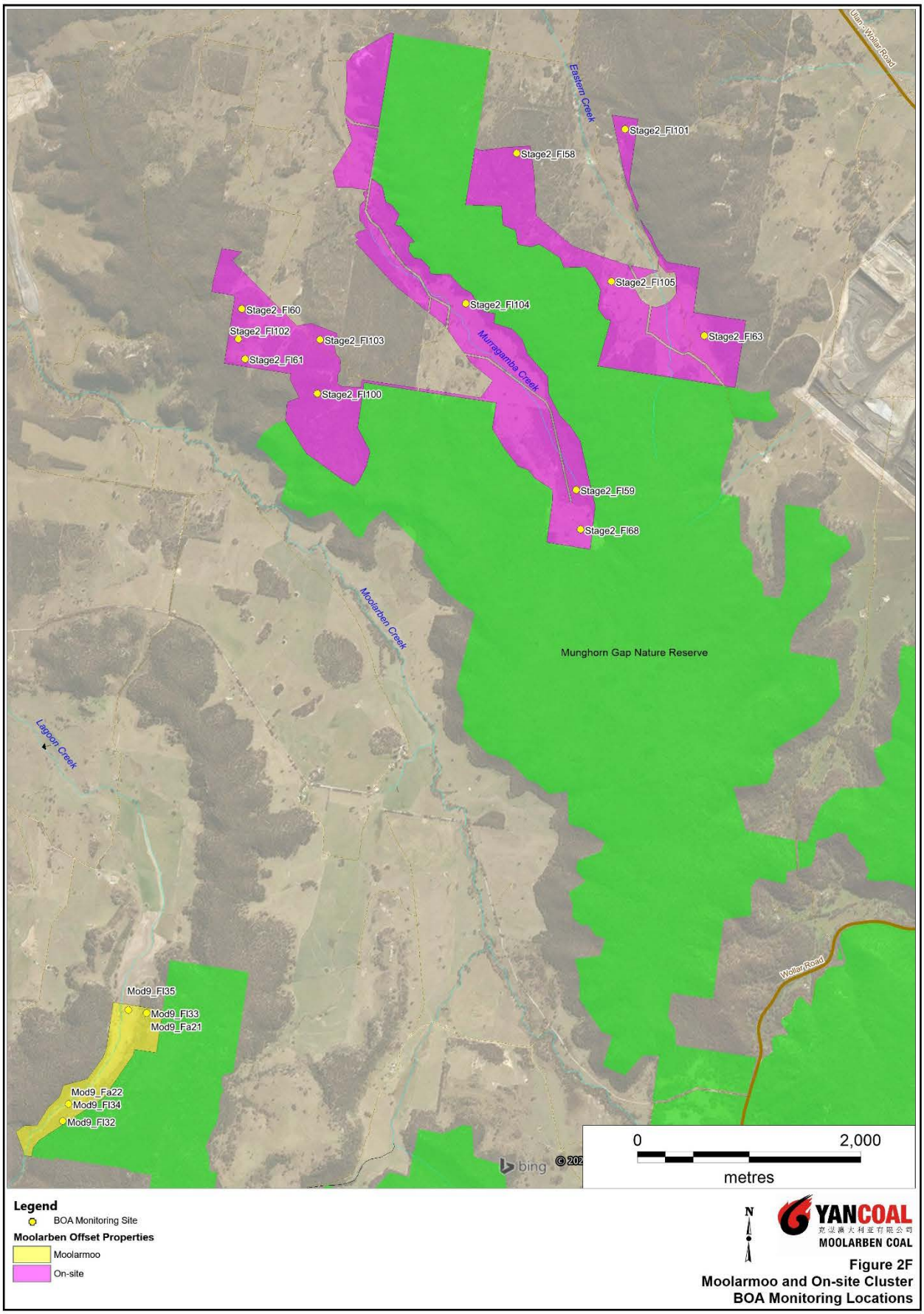


Figure 2D
Bobadeen and Red Hills Cluster
BOA Monitoring Locations


Mod9_Fa11
Mod9_Fl15
Mod9_Fl16
Mod9_Fl17
Mod9_Fl18
Mod9_Fa13
Mod9_Fl21
Mod9_Fa16
Mod9_Fl25
Mod9_Fl24
Mod9_Fa15
Mod9_Fa14
Mod9_Fl23
Mod9_Fl22
Stage2_Fl47
Mod9_Fl19
Mod9_Fa12
Mod9_Fl20
Stage2_Fl99
Stage2_Fl48
Stage2_Fl97
Stage2_Fl96
Stage2_Fl98
Stage2_Fl88
Stage2_Fl90
Stage2_Fl39
Stage2_Fl40
Stage2_Fl91
Stage2_Fl41
Stage2_Fl92
Stage2_Fl89
Mod9_Fa20
Mod9_Fl31
Mod9_Fa19
Mod9_Fl29
Mod9_Fl30
Goulburn River
Cope Road
Rouses Creek
Masala Road
Ryans Creek
Lagoons Road
Ridge Road
Ulan Road
Moolarben Creek
Windchester Crescent
Spring Creek Road
Cope State Forest
4f
4e
Fa4b
1h
Fa5d
15a
8a
19a
15b
5h
Fa8a
17a
8c
8d
1e
19b
17b
16a
Fa5c
17d
5e
17c
19c
1f
16b
6c
6d
Mod9_Fa18
Mod9_Fl28
Mod9_Fl27
Mod9_Fa17
Mod9_Fl26
0
1,000
metres
© 2021 Microsoft Corporation © 2021 Maxar ©CNES (2021) Distribution Airbus DS
Legend
BOA Monitoring Site
Moolarben Offset Properties
Clarke
Clifford
Libertus
Moolarben - Dexter Mountain(Area 3)
Properties 24/25
Property 5
Ulan
N
YANCOAL
MOOLARBEN COAL
Figure 2E
Dexter Mountain and Ulan 18 Cluster
BOA Monitoring Locations


Ulan-Wollar Road
Eastern Creek
Stage2_FI101
Stage2_FI58
Stage2_FI105
Stage2_FI104
Stage2_FI60
Stage2_FI102
Stage2_FI103
Stage2_FI61
Stage2_FI63
Murragamba Creek
Stage2_FI100
Stage2_FI59
Stage2_FI68
Moolarben Creek
Munghorn Gap Nature Reserve
Lagoon Creek
Wollar Road
Mod9_FI35
Mod9_FI33
Mod9_Fa21
Mod9_Fa22
Mod9_FI34
Mod9_FI32
0
2,000
metres
Legend
BOA Monitoring Site
Moolarben Offset Properties
Moolarmoo
On-site
N
YANCOAL
MOOLARBEN COAL
Figure 2F
Moolarmoo and On-site Cluster
BOA Monitoring Locations

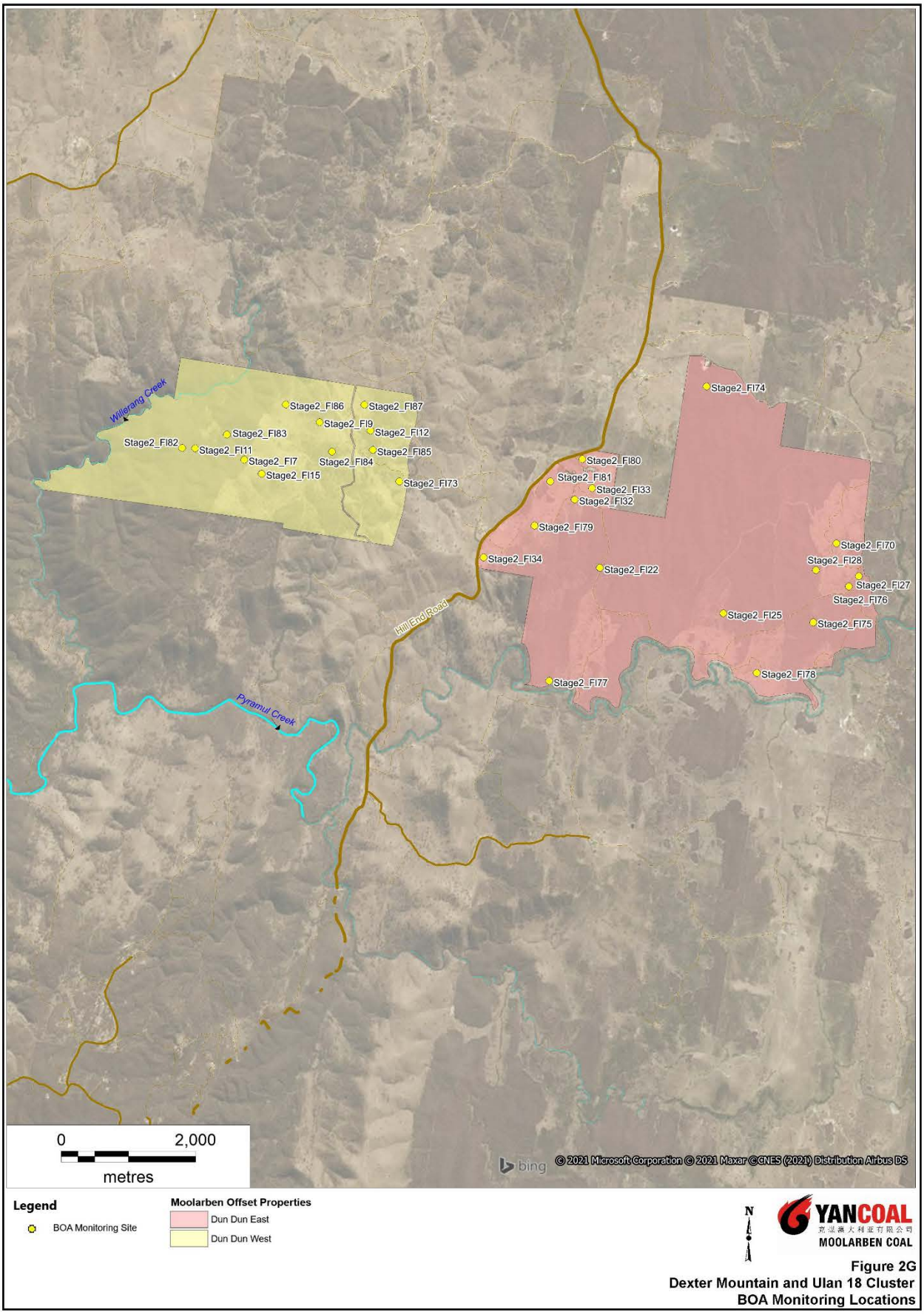


Figure 2G
Dexter Mountain and Ulan 18 Cluster
BOA Monitoring Locations

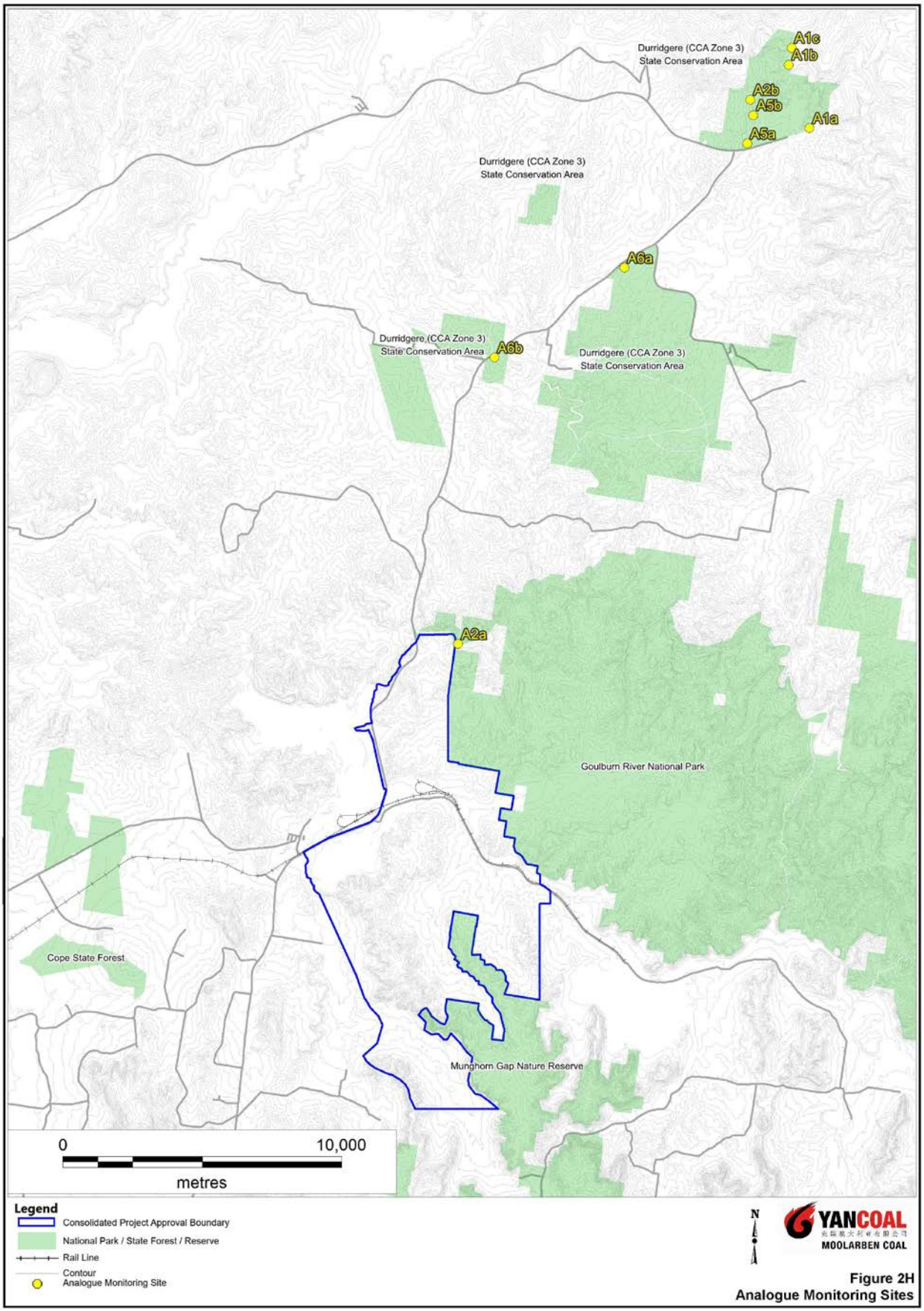


Figure 2H
Analogue Monitoring Sites

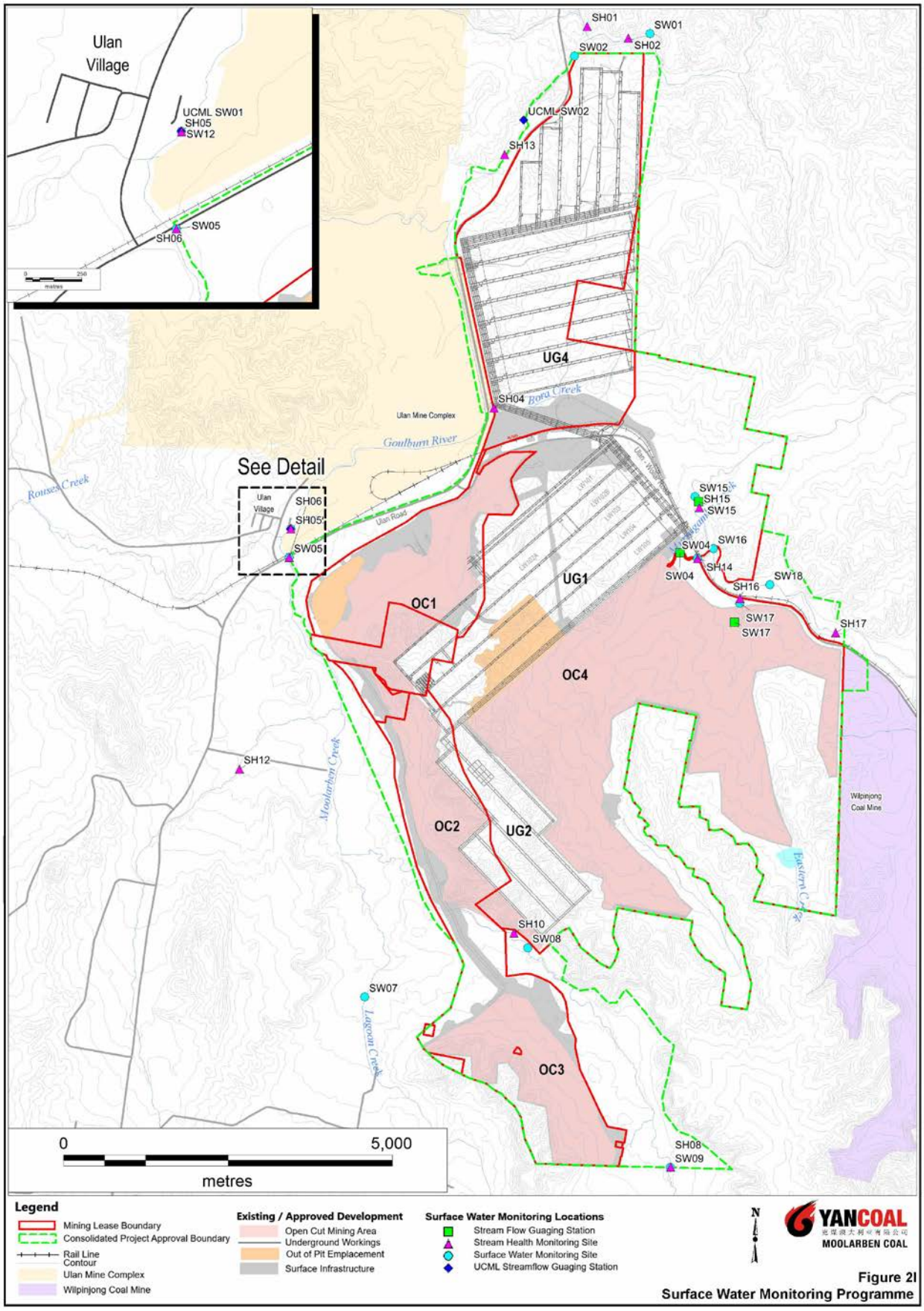


Figure 2I
Surface Water Monitoring Programme

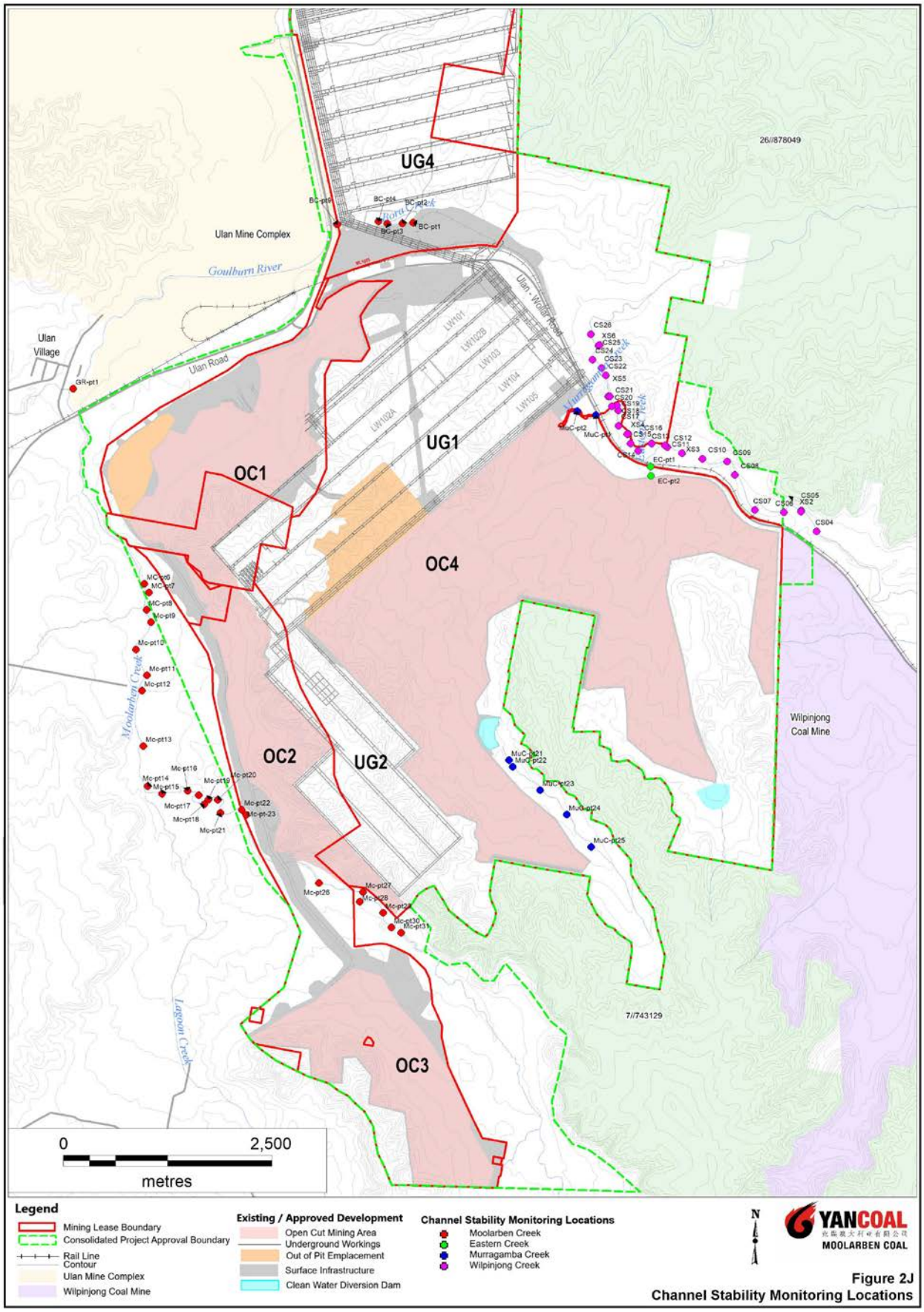
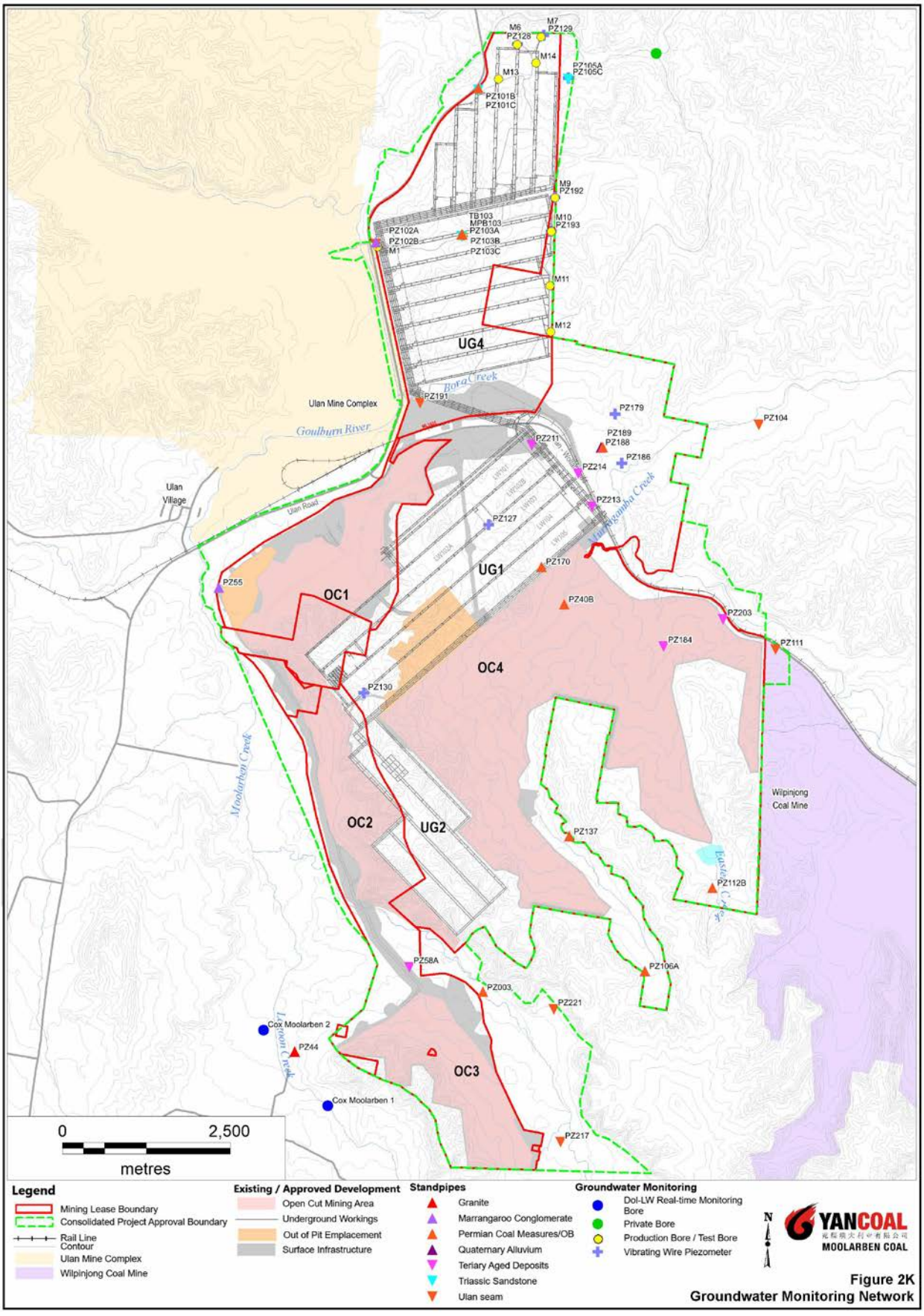


Figure 2J
Channel Stability Monitoring Locations


M6
PZ128
M7
PZ129
M14
M13
PZ105A
PZ105C
PZ101B
PZ101C
M9
PZ192
TB103
MPB103
PZ103A
PZ103B
PZ103C
PZ102A
PZ102B
M1
M10
PZ193
M11
M12
UG4
Bora Creek
PZ191
Ulan Mine Complex
Goulburn River
PZ179
PZ104
PZ189
PZ188
PZ211
PZ186
PZ214
Ulan
Village
Ulan Road
PZ213
Moolarboomba Creek
PZ127
UG1
PZ170
PZ55
OC1
PZ40B
PZ203
PZ184
PZ111
OC4
PZ130
Moolarben Creek
Wilpinjong
Coal Mine
OC2
UG2
PZ137
PZ112B
Bora Creek
PZ58A
PZ106A
PZ003
PZ221
Cox Moolarben 2
PZ44
Lagoon Creek
OC3
Cox Moolarben 1
PZ217
0
2,500
metres
Legend
Mining Lease Boundary
Consolidated Project Approval Boundary
Rail Line
Contour
Ulan Mine Complex
Wilpinjong Coal Mine
Existing / Approved Development
Open Cut Mining Area
Underground Workings
Out of Pit Emplacement
Surface Infrastructure
Standpipes
Granite
Marrangaroo Conglomerate
Permian Coal Measures/OB
Quaternary Alluvium
Teriary Aged Deposits
Triassic Sandstone
Ulan seam
Groundwater Monitoring
Dol-LW Real-time Monitoring Bore
Private Bore
Production Bore / Test Bore
Vibrating Wire Piezometer
N
YANCOAL
MOOLARBEN COAL
Figure 2K
Groundwater Monitoring Network

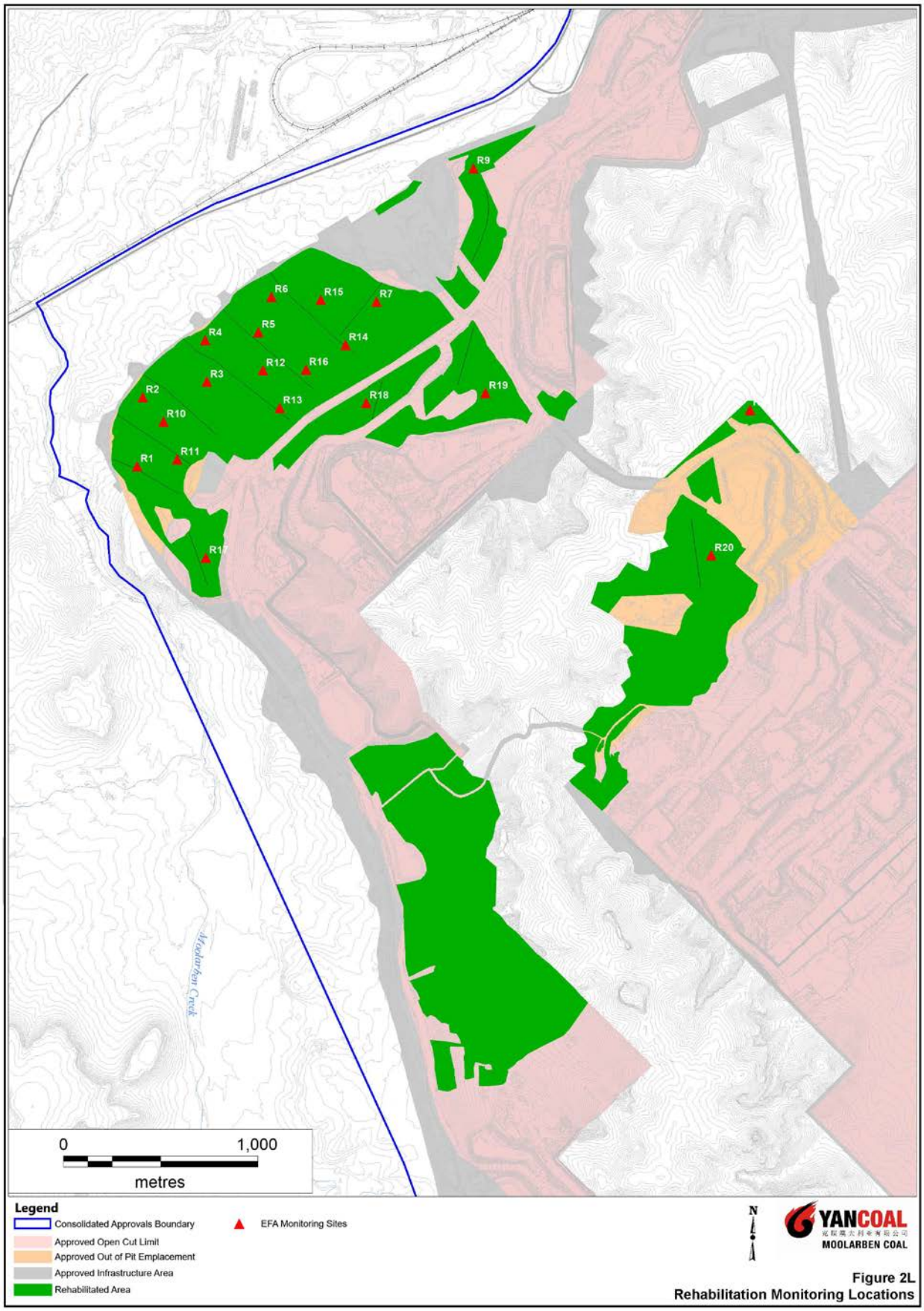


Figure 2L
Rehabilitation Monitoring Locations

APPENDIX 3. MONITORING DATA

APPENDIX 3A. DAILY METEOROLOGICAL DATA (WS03)

Date	Temperature (2m) (ºC)		Temperature (10m) (ºC)		Relative Humidity (%)	Rain (mm)
	Min	Max	Min	Max	Average	
1/01/2020	20.5	40.8	20.5	39.3	32.4	0
2/01/2020	20.3	34.3	20.2	33.9	60.1	0
3/01/2020	21	40.7	20.9	39.1	49.5	0
4/01/2020	20.8	43	22	41.3	32.2	0
5/01/2020	19	39.4	19	38.6	36.6	0
6/01/2020	16.1	28.3	16.1	27.9	68.1	7.2
7/01/2020	18.5	35	18.4	33.7	67.1	1.4
8/01/2020	20.9	38.9	21.4	37.6	58.3	0.2
9/01/2020	20.7	30.2	20.6	29.4	71.4	0
10/01/2020	20.2	40.5	20.2	39.5	49.8	0
11/01/2020	17.9	33.2	17.9	33.6	51.8	0.2
12/01/2020	17.2	26.1	17.3	25.5	56.1	0
13/01/2020	16.1	30	16.2	29.3	55	0
14/01/2020	16.5	33.5	16.7	32.9	53.6	0
15/01/2020	18.3	34.3	18.3	33.3	51.9	0
16/01/2020	18.3	24.7	18.3	25.2	77.9	10
17/01/2020	16	25.3	16.3	25.1	74	0.2
18/01/2020	18	24	18.1	23.4	79.9	0.6
19/01/2020	17.4	28	17.5	27	77.4	3.4
20/01/2020	18.2	35.2	18.6	33.9	59.7	0.4
21/01/2020	12.8	31	15.2	29.8	44.6	0
22/01/2020	13.8	36.4	15.5	35.2	41.9	0
23/01/2020	15.5	39	17	38.1	42.4	0.8
24/01/2020	21.6	32.9	22.2	32.2	69.1	0.4
25/01/2020	21	30.3	21	29.7	78.1	2.6
26/01/2020	19.4	35.4	19.8	34.2	66.2	0
27/01/2020	17.7	36.2	18.2	34.3	66.7	2
28/01/2020	20.4	37.6	21.1	37	54.9	0.2
29/01/2020	21.3	37.9	21.9	37.2	58.3	0
30/01/2020	19.9	38.6	19.9	37.7	55.2	0
31/01/2020	20.2	42	21	40.4	51.3	0
1/02/2020	23.3	40.9	24.5	39.6	39.1	0
2/02/2020	25.6	40.2	25.5	38.6	38.7	0
3/02/2020	21.5	31.7	21.9	30.8	50.2	0.8
4/02/2020	16.6	25.6	16.5	24.6	53.2	0
5/02/2020	15.6	23.6	15.6	22.9	67.2	0
6/02/2020	17.4	20.5	17.3	20.7	77.7	5.8
7/02/2020	18	23.3	18	23.1	76.9	0.2
8/02/2020	17.4	22.5	17.4	22.1	80.8	5.2
9/02/2020	16.7	21.1	16.7	20.8	91.6	33.2
10/02/2020	17.2	28.7	17.3	27.4	73.6	0.4
11/02/2020	16.8	28.6	16.8	27.3	85	26.4
12/02/2020	15.4	28.9	15.3	28.2	84.7	11.2
13/02/2020	19.8	26.6	19.6	26.4	80.7	1
14/02/2020	14.9	30.5	15.5	29.3	65.4	0
15/02/2020	15.5	31.8	16.1	31.1	65	0
16/02/2020	18.4	26.2	18.3	25.9	75.7	0.6
17/02/2020	17.6	20.4	16.8	20.3	93.9	51.6
18/02/2020	16.6	32.3	15.2	31.1	76.8	0
19/02/2020	15	24.7	16.1	25.3	62.2	18.6
20/02/2020	10.6	26.2	11.3	25.7	56.8	0
21/02/2020	14.3	26	15	25.2	69.2	0
22/02/2020	16.9	24.1	17.1	23.7	69.7	0
23/02/2020	17.4	21.8	17.4	21.7	73.4	0

Date	Temperature (2m) (ºC)		Temperature (10m) (ºC)		Relative Humidity (%)	Rain (mm)
	Min	Max	Min	Max	Average	
24/02/2020	15	25.1	15.5	24	72.9	0
25/02/2020	14.6	29.8	15.2	28.6	72.9	0
26/02/2020	16.4	28.6	17	27.8	85.8	7.8
27/02/2020	15.3	26.7	15.4	26.3	73.9	0.4
28/02/2020	7.9	29.3	8.7	28.6	50.8	0
29/02/2020	15.4	28.9	15.6	27.7	65.4	0
1/03/2020	14.5	31.6	15.5	30.5	64.5	0
2/03/2020	12.8	34.1	13.5	33.2	54.9	0
3/03/2020	17.9	23.9	17.9	24.4	82.7	1.6
4/03/2020	17.7	23.9	17.7	23.8	81.6	0
5/03/2020	17.9	20.2	17.1	20.3	96.1	53.2
6/03/2020	16.9	24.8	17.5	24.3	80.6	0.8
7/03/2020	16	23.2	16.4	22.7	76.1	0
8/03/2020	14.9	22	15	21.6	72.5	0
9/03/2020	14.4	20.7	14.7	20.6	73.6	0
10/03/2020	13.7	23.3	14	23	65.5	0
11/03/2020	11.3	23.8	12.6	23.6	67.5	0
12/03/2020	11.1	23.5	12.2	22.9	64.6	0
13/03/2020	9.3	25.2	10.5	24.5	63.6	0
14/03/2020	9.7	19.6	10.3	19.1	85.8	4.4
15/03/2020	7.7	19.9	8.4	19.8	74	0.2
16/03/2020	10.3	22	10.8	21.7	73.7	0
17/03/2020	9.4	22.7	10.2	22.4	70.2	0
18/03/2020	10.2	25.5	11.3	24.8	71.4	0
19/03/2020	8.6	29.9	9.4	28.9	63.9	0
20/03/2020	11.8	30.2	12.8	29.6	57.5	0
21/03/2020	9.9	29.7	11.1	29.1	56.8	0
22/03/2020	10.4	27.3	11.3	26.8	61.4	0
23/03/2020	12.2	21.8	13.6	21.3	69.2	0
24/03/2020	14.4	24.5	14.7	23.7	71.1	0
25/03/2020	12.1	22.1	12.6	20.9	90.9	17.4
26/03/2020	14.9	18.4	13.6	17.8	84.2	0.4
27/03/2020	14.1	20	14.2	19.6	76.9	0
28/03/2020	11.9	22	12.5	21.5	72.8	0
29/03/2020	14.5	25.3	15.3	24.5	78.3	0
30/03/2020	13.5	21.7	12.3	19.8	94.1	22
31/03/2020	12.5	24.9	12.6	24.4	80.1	0
1/04/2020	11.6	24.8	11.5	24.7	81.5	0.2
2/04/2020	15.4	19.1	14.3	18.3	95.3	6
3/04/2020	16.2	19.9	14.3	18.4	97.1	23.4
4/04/2020	10	19.1	11.3	18.7	77.2	16.4
5/04/2020	6.5	18.9	6.6	18.3	74.3	0.2
6/04/2020	6.7	19.3	6.6	18.8	77.3	0
7/04/2020	8.9	19.6	9.2	19.4	78.4	0
8/04/2020	12	19	12.3	18.4	78.6	0
9/04/2020	13.9	16.5	13.3	16.2	85.3	5.4
10/04/2020	11.5	18.9	6.8	16.7	96.7	41.6
11/04/2020	9.9	21.4	6.5	21	69.2	0
12/04/2020	4.9	20	6.2	18.9	59.6	0
13/04/2020	3.7	22.7	3.1	21.7	72.7	0
14/04/2020	4.9	23.3	4.4	23	73.3	0.2
15/04/2020	6.4	26.7	6.4	25.8	72.3	0
16/04/2020	9.6	26.5	8.7	25.7	71	0
17/04/2020	10.9	20.8	11.1	20.5	58.9	0
18/04/2020	5.9	19.8	6.3	19.1	72.1	0
19/04/2020	3.2	20.2	2.4	19.5	72.1	0
20/04/2020	4.9	19.8	4.7	19.3	70.6	0
21/04/2020	8.4	23.1	8.6	22.1	69.1	0
22/04/2020	6.1	22	5.7	21.5	73	0

Date	Temperature (2m) (ºC)		Temperature (10m) (ºC)		Relative Humidity (%)	Rain (mm)
	Min	Max	Min	Max	Average	
23/04/2020	3.4	21.1	3.2	20.7	68.6	0.2
24/04/2020	6.6	23.5	6.7	23	70.6	0
25/04/2020	5.9	24	5	23.6	73.3	0
26/04/2020	5.8	24.2	5.2	23.7	71	0.2
27/04/2020	6.2	20.8	6.4	20.8	77.6	0
28/04/2020	14.5	23.4	13.6	22.6	78.8	0
29/04/2020	13.6	23.6	11.2	22.9	81.2	0
30/04/2020	7.4	19.1	5.5	20	93.2	15.2
1/05/2020	6.7	12.1	5.5	11.3	74.4	0.2
2/05/2020	7.9	13.4	6.8	12.8	82.4	2.6
3/05/2020	3.8	14.5	4.8	14.3	73.6	0
4/05/2020	-0.1	17.5	-1.8	17.2	80.6	0
5/05/2020	1.9	17.3	1	16.8	83.8	0
6/05/2020	5.7	20	5.4	19.3	85.7	0
7/05/2020	4.2	20.7	3.1	20	83.3	0
8/05/2020	6	22.8	6.2	22.2	75.3	0.2
9/05/2020	6.7	20.2	7.4	19.5	79	1
10/05/2020	2.3	12.9	4.2	12.3	65.1	0
11/05/2020	-1.5	15.9	-1.8	15.6	70.8	0
12/05/2020	-1.2	17.8	-1.7	17.1	75.5	0
13/05/2020	2.7	16.6	2.6	16.1	81.1	0
14/05/2020	0.6	16.4	0.2	15.6	79.8	0.2
15/05/2020	2.5	16.8	3.5	16.6	78.1	0
16/05/2020	4.7	16.9	4	16.6	77.9	0
17/05/2020	4.3	17.6	3.6	17.1	82.2	0
18/05/2020	3.9	17.7	2.8	17.1	83.5	0.2
19/05/2020	7.6	18.7	7.7	18.3	78.9	0
20/05/2020	5.8	19.6	4.3	18.5	87	1.2
21/05/2020	5.7	15.8	5.2	14.6	87.9	3
22/05/2020	5.5	13.6	4.5	13.3	78.3	0
23/05/2020	5	12.2	4.5	11.7	82.5	1
24/05/2020	7.3	15.6	5.9	15.2	78.1	0.2
25/05/2020	1.5	15.1	2.3	14.7	81.2	2.6
26/05/2020	5.4	17.6	4.5	17	88.4	0
27/05/2020	2.4	16.1	1.4	15.6	89.7	0
28/05/2020	2.7	18.4	0.3	17.8	83.8	0.2
29/05/2020	3	17.7	2	17.1	83.9	0
30/05/2020	5.4	17.4	2.9	17.3	87.6	0.2
31/05/2020	4.8	19.3	2.6	18.4	82.9	0
1/06/2020	4.1	17.8	3.9	17.2	76.9	2.2
2/06/2020	3.9	7.3	2.9	6.8	81.6	0
3/06/2020	1.6	14.3	2.8	14.1	76.8	0
4/06/2020	-1	14.8	-1.1	14.3	80.9	0
5/06/2020	-1.1	15.8	-2.5	15.6	83.1	0
6/06/2020	-1.4	16.1	-2.6	15.7	81.3	0
7/06/2020	-1.1	16.9	-1.6	16	81	0.2
8/06/2020	-0.4	15.8	-0.9	15.6	83.8	0
9/06/2020	1.2	15.5	0.1	15.1	87	0
10/06/2020	9.9	15.8	8.1	15	90.5	0.2
11/06/2020	7.8	18	8.9	17.9	80.5	0
12/06/2020	5.7	16.6	6	16.4	83.6	0
13/06/2020	10.7	17.4	10.3	17.2	85	0
14/06/2020	3	15.7	3.4	15.2	84.5	13.4
15/06/2020	1.8	14.6	1	14.3	84.8	0.2
16/06/2020	0.3	15.9	-2	15.6	87.3	0
17/06/2020	0.4	16.3	-1.1	16.1	79.8	0.2
18/06/2020	8.7	15.6	8.3	15.5	73.4	0
19/06/2020	3.1	17.2	2.9	16.4	85.8	0
20/06/2020	2	16.4	0.7	15.6	86.8	0.2

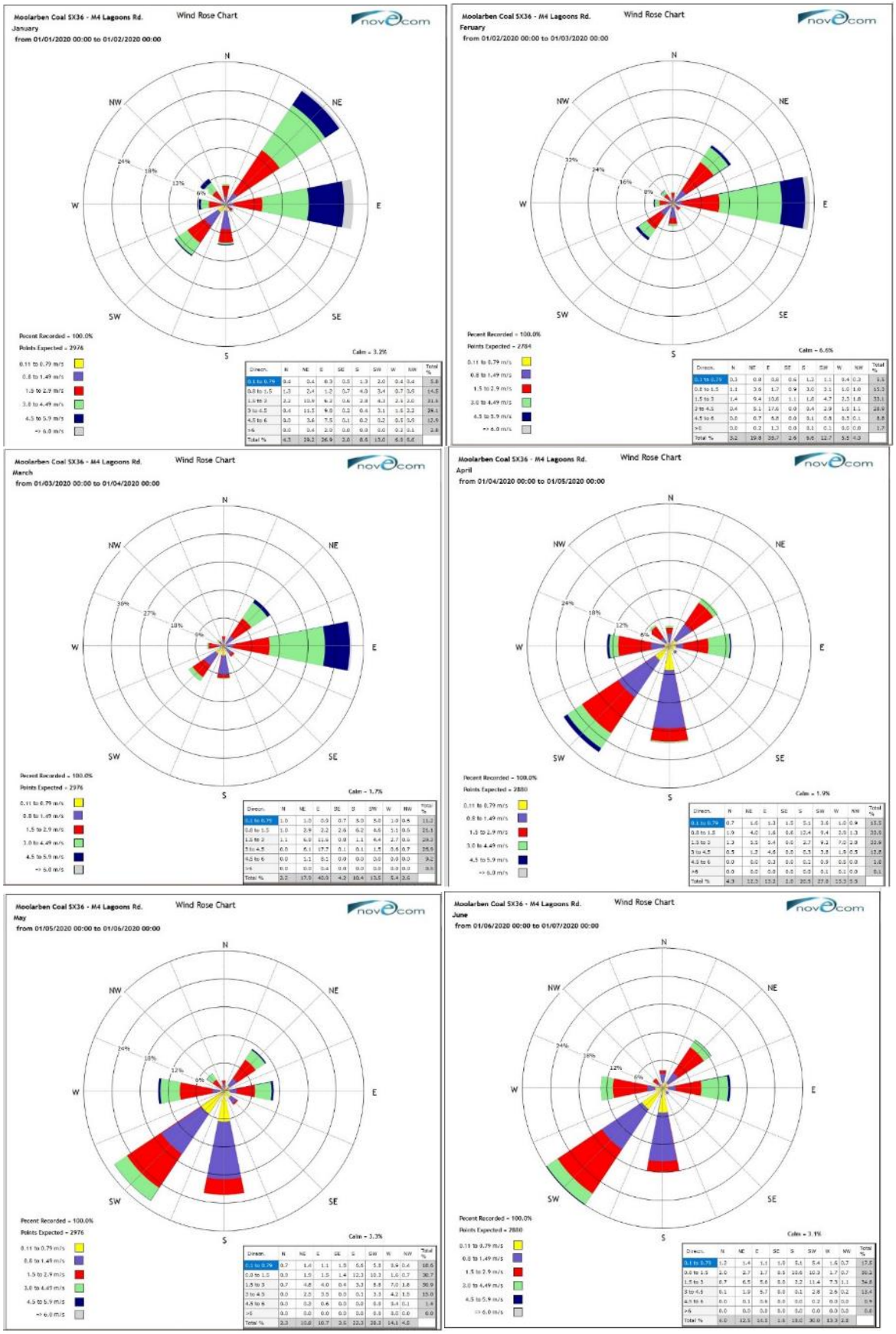
Date	Temperature (2m) (ºC)		Temperature (10m) (ºC)		Relative Humidity (%)	Rain (mm)
	Min	Max	Min	Max	Average	
21/06/2020	4.2	15.5	4.5	14.9	83.7	7
22/06/2020	4.6	10.2	4.6	9.2	88.7	2.8
23/06/2020	5.8	10.3	4.1	9.7	87.3	0.8
24/06/2020	6.4	10	4.5	9.1	86.2	0.2
25/06/2020	5.3	12.4	4.7	11.8	79.3	0
26/06/2020	-0.6	15	-0.9	14.8	79.5	0
27/06/2020	0.9	13.8	0.5	13.8	85.3	0.2
28/06/2020	1.9	14	2.6	13.6	84.4	0
29/06/2020	0.8	13	1.2	12.9	87.2	0
30/06/2020	1.3	17	-0.9	16.7	84.3	0.2
1/07/2020	0.2	18	-0.2	17.4	100	0
2/07/2020	3.3	19.8	3.2	19.5	100	0
3/07/2020	1.4	13.2	3.7	12.7	100	0.2
4/07/2020	3.2	9.6	3.3	9.3	94.9	0.6
5/07/2020	1	11.2	1.2	10.8	97.9	0.2
6/07/2020	-2.3	15.6	-3.3	15.3	100	0
7/07/2020	-1.7	14.2	-2.9	13.7	100	0
8/07/2020	1.4	13.6	2.4	13.5	100	0
9/07/2020	2.2	16.7	1.8	15.9	100	0
10/07/2020	5	10.7	3.6	7.2	100	23.6
11/07/2020	8.7	13.6	4.6	11.4	100	11.6
12/07/2020	2.4	14.6	1.8	14	100	1.8
13/07/2020	-0.1	11.1	-1.7	9.8	100	0.2
14/07/2020	4.2	15	1.2	14.9	100	0
15/07/2020	0.9	14.1	1.2	13.9	99.6	0
16/07/2020	-0.8	13.1	-0.6	12.8	100	0
17/07/2020	-1	16.3	-2.1	15.9	100	0
18/07/2020	0.6	14.6	-1.2	14.4	100	0
19/07/2020	-0.7	16.7	-3.2	16.1	100	0
20/07/2020	1.2	13.9	1.5	13.4	97.6	0.2
21/07/2020	-2.6	14	-3.3	13.6	100	0
22/07/2020	0.7	15	0	14.4	100	0
23/07/2020	-0.8	17.6	-1.8	17	100	0
24/07/2020	-1.2	15.9	-2.1	15.2	100	0.2
25/07/2020	3	13.2	1.5	12.2	100	2.6
26/07/2020	10.2	12.8	6.6	9.2	98.9	8.2
27/07/2020	8.5	11	4.7	8.2	100	18.6
28/07/2020	8.4	14	4.6	12.8	98.1	7
29/07/2020	3.6	17	1.1	16.2	100	0
30/07/2020	1.6	17.2	-0.2	16.6	100	0.2
31/07/2020	1.4	14.3	0.1	13.8	100	0
1/08/2020	-1.1	16.2	-3.2	15.7	83.3	0.2
2/08/2020	-1.8	18	-3.9	17.5	75.7	0
3/08/2020	-0.9	17.2	-2	16.3	79	0
4/08/2020	-0.1	17.8	-1.7	17.1	73.7	0
5/08/2020	-3.2	10.6	-2.7	9.9	72.4	0
6/08/2020	-3.9	12.7	-4.6	12	75	0.4
7/08/2020	7.1	9.1	4.6	8.4	84.8	12.8
8/08/2020	5.8	11.7	1.7	9.7	89.8	0.4
9/08/2020	5.2	9.5	2.6	8.6	86.7	2.6
10/08/2020	5.5	15.2	2.9	14.8	76.5	0.6
11/08/2020	2.6	15.1	3.3	13.9	75.5	0
12/08/2020	4.9	19.7	3	18.5	81.7	0
13/08/2020	4.7	19.3	3.2	18.6	75.1	0.8
14/08/2020	3.1	13.6	1.9	12.1	95	7.2
15/08/2020	9.2	12.8	5.3	11.8	87.6	0.6
16/08/2020	6.8	13.4	5.8	12.7	78.8	0
17/08/2020	3.6	13.8	4.4	13.2	77.9	0
18/08/2020	2.6	17.7	2.2	16.7	75.2	1.2

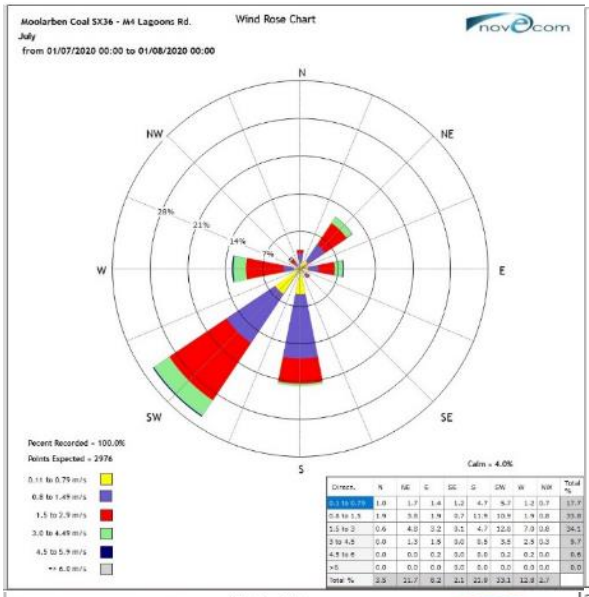
Date	Temperature (2m) (ºC)		Temperature (10m) (ºC)		Relative Humidity (%)	Rain (mm)
	Min	Max	Min	Max	Average	
19/08/2020	4.2	16.9	5.1	16	61.6	0
20/08/2020	4.5	12.3	3.8	11.4	80.1	3.4
21/08/2020	4.4	13.6	3.7	13.1	72.8	3.2
22/08/2020	4.6	8.8	3.4	8.2	82.1	4.8
23/08/2020	4.1	8.7	2.8	8.1	78.7	0.4
24/08/2020	-0.1	11.6	1	11	72.5	0.2
25/08/2020	-2.5	11.7	-2.9	11	74	0
26/08/2020	-2.8	16.3	-3.4	16.2	71.9	0
27/08/2020	-2.5	17	-3.6	16.2	68.5	0
28/08/2020	2.5	15.1	2.7	14.7	62.8	0
29/08/2020	-0.6	20.1	-1.2	19.8	68.3	0
30/08/2020	0.5	21.2	0.1	20.5	71.2	0
31/08/2020	4.1	18.3	4.8	17.5	67.4	0
1/09/2020	4.6	17.6	5.4	17.2	72.8	0
2/09/2020	1.5	22.7	0.2	21.9	73.6	0
3/09/2020	6.3	24.4	7.5	23.8	67.6	0
4/09/2020	11.3	23.6	11.7	23	61.8	5.8
5/09/2020	5.7	18.3	3.3	17.9	73.8	0.2
6/09/2020	2.8	18.5	1.6	18.2	77.6	0
7/09/2020	5.8	22.6	4.2	21.9	74	0.2
8/09/2020	3.9	23.9	2.8	23.4	74.4	0
9/09/2020	9.1	17	6	15.2	92.4	13.6
10/09/2020	6.2	15.4	5.7	15.1	74.5	0.2
11/09/2020	4.8	16.9	5	16.6	74.8	0
12/09/2020	3.7	20.5	2.8	19.6	78.5	0
13/09/2020	3.3	20.2	1.9	18.9	75.7	0
14/09/2020	3.8	22.3	2.2	21.6	71.8	0
15/09/2020	7.1	23.5	7	22.1	77	0
16/09/2020	6.3	24.1	4.4	23	73.5	0
17/09/2020	6.9	26.6	7	25.2	68.4	0
18/09/2020	12.6	18.9	11.9	18.2	74.7	0
19/09/2020	13.6	21.9	11.6	21.1	71.9	0
20/09/2020	11.1	19.7	7.1	18.3	90.5	22.4
21/09/2020	9.5	26.2	5.3	24.3	82.4	19.4
22/09/2020	9.1	20.9	5.9	20.2	69.1	8.8
23/09/2020	5.4	17.9	6	43.5	64.8	0.2
24/09/2020	3.5	16.5	4.9	15.9	70.1	0
25/09/2020	1.4	19.8	2.5	19.4	73.9	3.2
26/09/2020	3.5	11.5	3.8	11.2	72.4	0.2
27/09/2020	2	14.5	3	14.6	69.3	0
28/09/2020	0.5	17.4	1.6	17.5	72.8	0
29/09/2020	0.9	19.5	2.2	18.4	68.1	0
30/09/2020	7.5	14.2	8.5	13.8	85.9	1.4
1/10/2020	5.3	20.2	6.7	19.8	71	0
2/10/2020	2.2	24.1	3.3	23.7	66.1	0
3/10/2020	3.4	27.6	4.7	26.5	64	0
4/10/2020	6.8	27.8	8.7	26.6	65.3	0
5/10/2020	7.5	28.1	9.2	26.7	65.4	0
6/10/2020	9.8	26.4	11.1	26	69.8	0
7/10/2020	14.6	23.6	14.9	22.9	77.3	1.8
8/10/2020	11.9	23.8	12.9	22.8	76.5	1
9/10/2020	4.9	18.2	6.6	17.7	67.1	0
10/10/2020	4.2	22.3	5.5	21.7	60.8	0
11/10/2020	2.8	24.8	4	23.5	58.9	0
12/10/2020	5.1	26	6.7	24.7	60.5	0
13/10/2020	7.1	26.6	8.2	26.4	59.3	0
14/10/2020	9	24.1	11.5	23.5	65.1	0
15/10/2020	9.9	26.9	12	26.2	65.1	0
16/10/2020	8.1	25.5	10.1	24.2	62.2	0

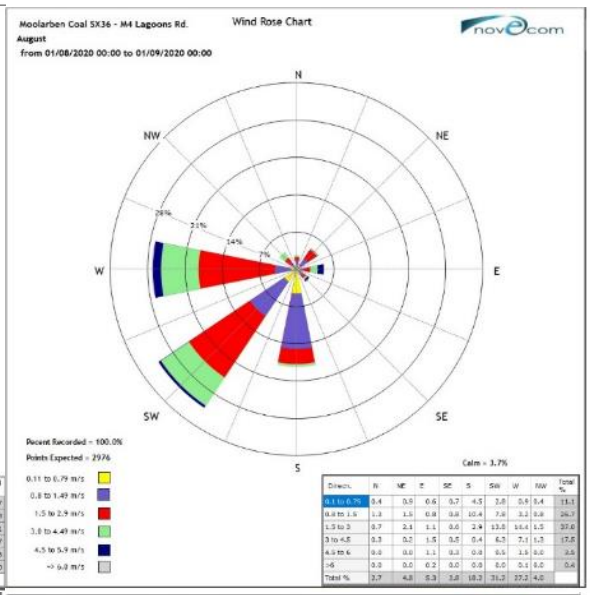
Date	Temperature (2m) (°C)		Temperature (10m) (°C)		Relative Humidity (%)	Rain (mm)
	Min	Max	Min	Max	Average	
17/10/2020	13.3	29.8	13.6	29.4	58.7	0
18/10/2020	12	19.1	13.4	18.4	93	25.8
19/10/2020	10.3	23	10.8	21.8	78.7	0
20/10/2020	8	23.5	9.1	22.8	70.9	0
21/10/2020	10.8	24.4	12	23.7	82.3	4.4
22/10/2020	9.8	27	10.8	25.3	69	0
23/10/2020	11.3	28.5	13.1	27.3	68.8	1
24/10/2020	14.7	23	15.3	22.2	92.7	24.4
25/10/2020	10.7	15.7	10.9	16	96	16.2
26/10/2020	10.1	15.5	10.6	15.6	93.3	18.4
27/10/2020	9.9	19.1	10.3	18.8	79.5	0
28/10/2020	7.9	19.9	8.6	19.7	89	50.2
29/10/2020	9.3	23.2	9.9	22.2	73.7	0
30/10/2020	7.4	21.3	8.1	21.2	80.2	0.4
31/10/2020	8.5	20.3	9.9	19.4	77.4	0.2
1/11/2020	6.1	22.1	7.1	21.2	73.2	0
2/11/2020	5.8	21.9	7.2	21.3	65.5	0.4
3/11/2020	6.5	23.5	8.4	23.2	68.9	0
4/11/2020	7.4	28.3	8.3	27.4	61.5	0.4
5/11/2020	8.6	18.7	9.5	19.3	72.7	1
6/11/2020	6.7	22.3	7.6	21.3	66	0
7/11/2020	6.3	24.9	7.3	23.8	66.8	0
8/11/2020	11.4	20.7	11.9	20.3	62.2	0
9/11/2020	10.1	23.8	10.9	22.2	61.5	0
10/11/2020	6.6	26	7.9	25	64.4	0
11/11/2020	8.8	30.1	10.4	28.8	63.8	0
12/11/2020	13.2	28.1	14.4	27	63.4	1.8
13/11/2020	11.9	27.7	13.1	26.5	81.9	5.2
14/11/2020	9.1	26.1	10.2	25.2	66.1	0
15/11/2020	7.9	31.9	8.9	30.7	57.3	0
16/11/2020	10.7	35.9	12.5	35.2	51.4	0
17/11/2020	16.6	29	17	28.3	41.2	0
18/11/2020	13.7	26	14.5	25.7	61.2	0
19/11/2020	11.8	32.6	12.8	30.8	63.7	0
20/11/2020	13.9	35.1	15.5	33.8	58.7	0
21/11/2020	18.3	34.1	20	33.6	60.4	6.2
22/11/2020	15.5	27.9	16.3	26.9	79.6	0
23/11/2020	14.2	25	16	24.5	87.3	5.2
24/11/2020	10.5	28.1	11.6	27	72.6	0.2
25/11/2020	12.7	27.8	13.9	26.7	65.7	0
26/11/2020	11	31.9	12.4	31.2	60.9	0
27/11/2020	16.9	34.7	18.1	33.4	61.9	0
28/11/2020	15	37.7	16.5	36.5	50.8	0
29/11/2020	21.8	37.7	22.9	37	37.4	0.2
30/11/2020	15.7	25.4	16.3	24.9	63.9	0
1/12/2020	14.4	40.4	14.8	39.5	62.8	3.8
2/12/2020	17.7	31.4	18	30	72.2	0
3/12/2020	16.1	25.4	16.5	24.7	74.5	0
4/12/2020	13.4	33.1	15.3	32.5	57.6	0
5/12/2020	11.4	25.3	13.4	24.7	77.3	30
6/12/2020	13.5	26.3	16.9	25.6	62.1	0.8
7/12/2020	10.1	26.3	10.9	25.4	50	0
8/12/2020	9.7	22.5	10.4	21.6	47.9	0
9/12/2020	6.7	28.5	7.9	26.7	57.3	0
10/12/2020	10.1	31.1	10.9	29.6	55.8	0
11/12/2020	13.6	20.6	14.2	20	63.2	0
12/12/2020	12.5	23.4	13.2	22.5	57.2	0
13/12/2020	13.8	24.7	14.5	24.3	58.3	0
14/12/2020	15.8	24.5	16.4	23.9	66.7	0

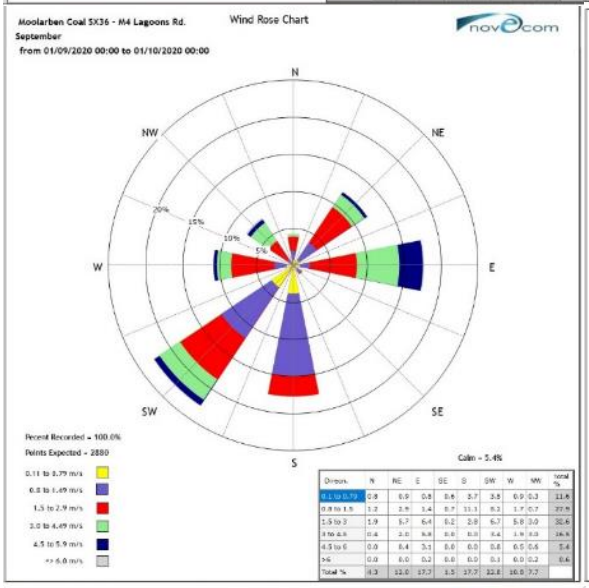
Date	Temperature (2m) (ºC)		Temperature (10m) (ºC)		Relative Humidity (%)	Rain (mm)
	Min	Max	Min	Max	Average	
15/12/2020	17.1	25.8	17.5	25.4	74.8	0.2
16/12/2020	19.6	28.1	19.9	26.6	88	15
17/12/2020	18.2	31.9	18.7	30.3	83.7	8.8
18/12/2020	18.2	29.5	18.7	28.5	89.8	27
19/12/2020	17.7	22.1	18.1	21.7	83.6	0
20/12/2020	16.6	26	16.9	24.9	78.2	0.2
21/12/2020	15.7	18.3	15.9	18.4	96	29.8
22/12/2020	13.5	23.9	14.5	22.9	72.4	2
23/12/2020	10.6	27.5	11.6	26.1	56.5	0
24/12/2020	14	28.6	14.8	27.1	64.7	0
25/12/2020	11.7	26.3	12.8	25.5	71.6	0
26/12/2020	15.5	26.3	16	25.6	76.3	1.8
27/12/2020	14.3	31.5	14.9	30	66.9	0.2
28/12/2020	16	30.6	16.9	29	71	17.6
29/12/2020	14.8	23.2	15.4	22.3	88.1	6.2
30/12/2020	14.9	25.1	15.6	24.7	75.8	0
31/12/2020	17.9	25.4	18.3	24.7	74.7	0

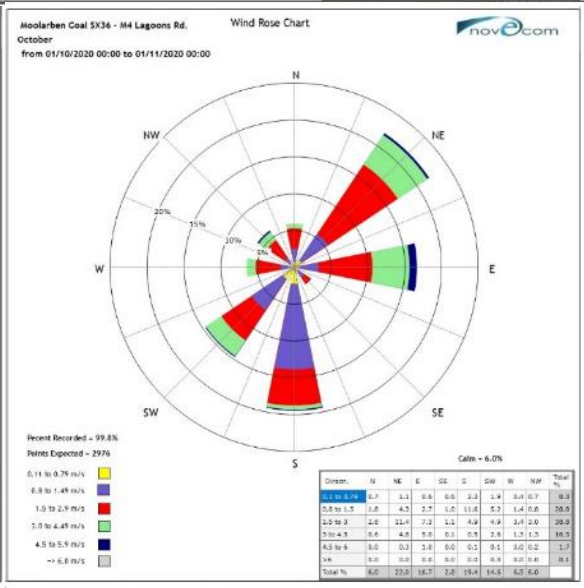
Figure 3-a Monthly Wind Rose (WS03)

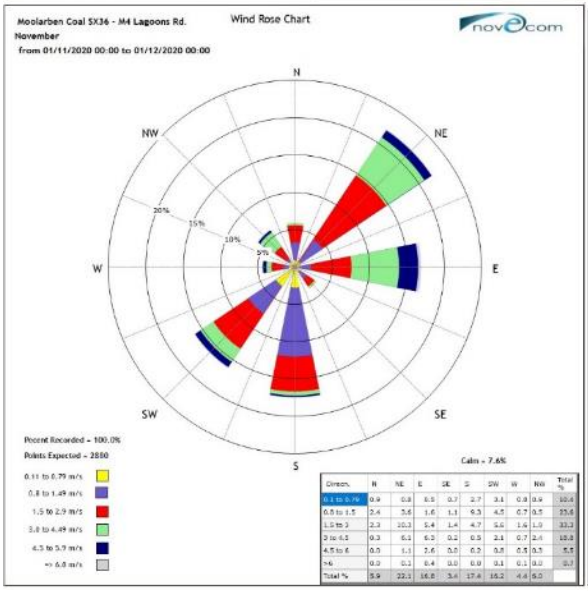


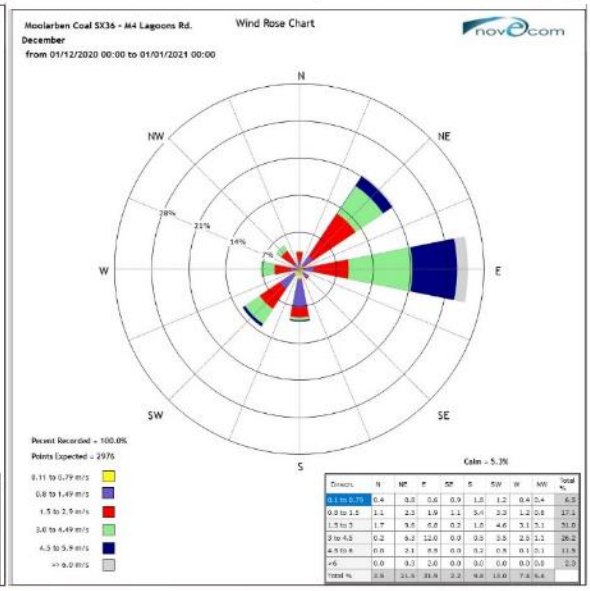

Moolarben Coal SX36 - M4 Lagoons Rd.
July
from 01/07/2020 00:00 to 01/08/2020 00:00
Wind Rose Chart
novocom
N
NE
E
SE
S
SW
W
NW
Calm = 4.0%


Moolarben Coal SX36 - M4 Lagoons Rd.
August
from 01/08/2020 00:00 to 01/09/2020 00:00
Wind Rose Chart
novocom
N
NE
E
SE
S
SW
W
NW
Calm = 3.7%


Moolarben Coal SX36 - M4 Lagoons Rd.
September
from 01/09/2020 00:00 to 01/10/2020 00:00
Wind Rose Chart
novocom
N
NE
E
SE
S
SW
W
NW
Calm = 5.4%


Moolarben Coal SX36 - M4 Lagoons Rd.
October
from 01/10/2020 00:00 to 01/11/2020 00:00
Wind Rose Chart
novocom
N
NE
E
SE
S
SW
W
NW
Calm = 6.0%


Moolarben Coal SX36 - M4 Lagoons Rd.
November
from 01/11/2020 00:00 to 01/12/2020 00:00
Wind Rose Chart
novocom
N
NE
E
SE
S
SW
W
NW
Calm = 7.6%


Moolarben Coal SX36 - M4 Lagoons Rd.
December
from 01/12/2020 00:00 to 01/01/2021 00:00
Wind Rose Chart
novocom
N
NE
E
SE
S
SW
W
NW
Calm = 5.3%

Appendix 3B. NOISE MONITORING RESULTS

Environmental Noise Monitoring – January 2020

4.3 Attended Noise Monitoring

Noise levels from MCO in the absence of other noise sources are shown in Table 4.2 and Table 4.3, and are reproduced in Appendix B in a format generally specified in the EPA guidelines *'Requirements for Publishing Pollution Monitoring Data'* (March 2012). Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – JANUARY 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO L_{Aeq} dB [2]	Exceedance dB [3]
NA1	16/01/2020 13:05	1.6	D	43[4]	Yes	IA	Nil
NA6	15/01/2020 23:10	1.6	E	37	Yes	29	Nil
NA12	15/01/2020 22:00	0.0	F	35	Yes	<25	Nil

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{Aeq,15minute}$ attributed to MCO; including modifying factors if applicable.*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL; and*
4. *External criterion. A difference of 8 dB between the internal and external criterion has been adopted at NA1 for consistency with previous versions of the NMP.*

As impact assessment criteria are more stringent than land acquisition or noise mitigation criteria and MCO levels complied with impact assessment criteria in all measurements as shown in Table 4.2, no comparison against mitigation or land acquisition criteria is required.

Table 4.3: $L_{A1,1minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – JANUARY 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NA6	15/01/2020 23:10	1.6	E	45	Yes	33	Nil
NA12	15/01/2020 22:00	0.0	F	45	Yes	26	Nil

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{A1,1minute}$ attributed to MCO; and*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL.*

4.4 Attended Validation Noise Monitoring

Table 4.4 presents data recorded concurrently at the real-time noise monitor and attended monitoring locations.

Table 4.4: REAL-TIME VERSUS ATTENDED DATA COMPARISON – JANUARY 2020

Location	Start Date and Time	Real-time Noise Monitor Levels – dB						Attended Noise Monitoring Levels – dB					
		L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	$L_{Aeq,LF}$ [1]	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	MCO L_{Aeq} [2]
NA2/SX36	15/01/2020 23:45	44	36	36	34	33	30	39	35	34	33	32	30
NA3/SX35	15/01/2020 22:30	33	31	30	29	28	28	43	36	33	28	25	26
NA10/SX44	16/01/2020 00:15	34	31	29	28	26	27	36	31	30	28	27	28
NA12/SX39	15/01/2020 22:00	42	36	33	30	26	30	43	37	33	28	25	<25

Notes:

1. *$L_{Aeq,LF}$ refers to $L_{Aeq,15minute}$ in the frequency range 20 to 630 Hz as measured by the real-time noise monitors; and*
2. *MCO L_{Aeq} refers to the site-only $L_{Aeq,15minute}$ attributed to MCO during attended monitoring.*

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain hail, or wind speeds above 5 m/s at microphone height.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – JANUARY 2020

Location	Start Date and Time	Temperature ° C	Wind Speed m/s	Wind Direction ° Magnetic North[1]	Cloud Cover 1/8s
NA1[2]	16/01/2020 13:05	NA[2]	NA[2]	NA[2]	NA[2]
NA2	15/01/2020 23:45	26	0.0	-	8
NA3	15/01/2020 22:30	26	1.2	40	8
NA6	15/01/2020 23:10	26	0.8	40	8
NA10	16/01/2020 00:15	26	1.0	60	8
NA12	15/01/2020 22:00	26	1.4	30	8

Notes:

1. *"-" indicates calm conditions at monitoring location; and*
2. *Data for this location was not available.*

Meteorological data used for compliance assessment is sourced from the WCP AWS.

6 SUMMARY

Global Acoustics was engaged by MCO to conduct a monthly noise survey of operations at Moolarben Coal Mine. The purpose of the survey was to quantify and describe the acoustic environment around the site and compare results with specified limits.

Monthly attended environmental noise monitoring described in this report was undertaken during the day period of 16 January and night period of 15/16 January 2020.

MCO complied with project specific criteria at all monitoring sites during the January 2020 survey. In accordance with Condition R4.2(b) of the EPL, no management actions have taken place at MCO as a result of attended monitoring as there were no exceedances recorded during the monitoring period.

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Environmental Noise Monitoring – February 2020

4.3 Attended Noise Monitoring

Noise levels from MCO in the absence of other noise sources are shown in Table 4.2 and Table 4.3, and are reproduced in Appendix B in a format generally specified in the EPA guidelines '*Requirements for Publishing Pollution Monitoring Data*' (March 2012). Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – QUARTER 1 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO L_{Aeq} dB [2]	Exceedance dB [3]
NA1	06/02/2020 11:00	4.1	B	43[4]	No	IA	NA
NA6	05/02/2020 23:24	3.5	D	37	No	<30	NA
NA12	06/02/2020 00:15	4.2	D	35	No	IA	NA
GRNP	05/02/2020 22:00	0.9	E	50	Yes	IA	Nil
MGNR	06/02/2020 01:39	4.3	D	50	No	IA	NA

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{Aeq,15minute}$ attributed to MCO, including modifying factors if applicable;*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL; and*
4. *External criterion. A difference of 8 dB between the internal and external criterion has been adopted at NA1 for consistency with previous versions of the NMP.*

As impact assessment criteria are more stringent than land acquisition or noise mitigation criteria and MCO levels complied with impact assessment criteria in all measurements as shown in Table 4.2, no comparison against mitigation or land acquisition criteria is required.

Table 4.3: $L_{A1,1minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – QUARTER 1 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NA6	05/02/2020 23:24	3.5	D	45	No	<30	NA
NA12	06/02/2020 00:15	4.2	D	45	No	IA	NA

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{A1,1minute}$ attributed to MCO; and*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL.*

Cumulative noise levels generated by total mining activity are shown in Table 4.4. The mining-only $L_{Aeq,15minute}$ is compared to cumulative criteria contained in the Ulan Coal Mines project approval.

Table 4.4: $L_{Aeq,15minute}$ GENERATED BY ALL MINES AGAINST UCML CUMULATIVE CRITERIA – QUARTER 1 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies?	Cumulative $L_{Aeq,15min}$ dB[1]	Exceedance
NA11	05/02/2020 22:31	1.0	E	40	Yes	Nil	Nil

Notes:

1. *By definition, cumulative noise refers to two or more noise sources. If only one source of mining noise is audible then the measured cumulative noise is defined here as 'Nil'.*

4.4 Attended Validation Noise Monitoring

Table 4.5 presents data recorded concurrently at the real-time noise monitor and attended monitoring locations.

Table 4.5: REAL-TIME VERSUS ATTENDED DATA COMPARISON – QUARTER 1 2020

Location	Start Date and Time	Real-time Noise Monitor Levels - dB						Attended Noise Monitoring Levels - dB					
		L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	$L_{Aeq,LF}$ [1]	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	MCO L_{Aeq} [2]
NA2/SX36	05/02/2020 23:01	43	39	39	37	35	38	39	37	36	35	34	36
NA3/SX35	05/02/2020 23:46	46	36	34	28	24	30	55	34	48	28	25	<25
NA10/SX44	06/02/2020 00:45	46	41	38	34	31	35	42	36	33	30	27	IA
NA12/SX39	06/02/2020 00:15	44	34	32	26	22	31	35	29	26	24	21	IA

Notes:

1. *L_{Aeq} LF refers to $L_{Aeq,15minute}$ in the frequency range 20 to 630 Hz as measured by the real-time noise monitors; and*
2. *MCO L_{Aeq} refers to the estimated or measured $L_{Aeq,15minute}$ attributed to MCO during attended monitoring..*

6 SUMMARY

Global Acoustics was engaged by MCO to conduct a quarterly noise survey of operations at Moolarben Coal Mine. The purpose of the survey was to quantify and describe the acoustic environment around the site and compare results with specified limits.

Attended environmental noise monitoring described in this report was undertaken for Quarter 1 2020 during the day period of 6 February and night period of 5/6 February 2020.

MCO complied with project specific criteria at all monitoring sites during the quarterly Quarter 1 2020 survey. In accordance with Condition R4.2(b) of the EPL, no management actions have taken place at MCO as a result of attended monitoring as there were no exceedances recorded during the monitoring period.

Global Acoustics Pty Ltd

Environmental Noise Monitoring – March 2020

4.3 Attended Noise Monitoring

Noise levels from MCO in the absence of other noise sources are shown in Table 4.2 and Table 4.3, and are reproduced in Appendix B in a format generally specified in the EPA guidelines '*Requirements for Publishing Pollution Monitoring Data*' (March 2012). Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – MARCH 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO L_{Aeq} dB [2]	Exceedance dB [3]
NA1	12/03/2020 10:04	5.3	C	43[4]	No	IA	NA
NA6	11/03/2020 22:01	3.8	D	37	No	<30	NA
NA12	11/03/2020 23:30	3.3	D	35	No	28	NA

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{Aeq,15minute}$ attributed to MCO, including modifying factors if applicable;*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL; and*
4. *External criterion. A difference of 8 dB between the internal and external criterion has been adopted at NA1 for consistency with previous versions of the NMP.*

As impact assessment criteria are more stringent than land acquisition or noise mitigation criteria and MCO levels complied with impact assessment criteria in all measurements as shown in Table 4.2, no comparison against mitigation or land acquisition criteria is required.

Table 4.3: $L_{A1,1minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – MARCH 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NA6	11/03/2020 22:01	3.8	D	45	No	<30	NA
NA12	11/03/2020 23:30	3.3	D	45	No	33	NA

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{A1,1minute}$ attributed to MCO; and*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL.*

4.4 Attended Validation Noise Monitoring

Table 4.4 presents data recorded concurrently at the real-time noise monitor and attended monitoring locations.

Table 4.4: REAL-TIME VERSUS ATTENDED DATA COMPARISON – MARCH 2020

Location	Start Date and Time	Real-time Noise Monitor Levels – dB						Attended Noise Monitoring Levels – dB					
		L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	$L_{Aeq,LF}$ [1]	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	MCO L_{Aeq} [2]
NA2/SX36	11/03/20 22:30	47	42	40	39	36	38	44	41	38	37	35	34
NA3/SX35	11/03/20 23:00	55	48	45	41	36	43	49	45	42	40	36	34
NA10/SX44	12/03/20 00:15	43	37	35	32	30	33	39	34	32	30	29	30
NA12/SX39	11/03/20 23:30	46	41	38	36	33	35	42	37	34	33	30	28

Notes:

1. *$L_{Aeq,LF}$ refers to $L_{Aeq,15minute}$ in the frequency range 20 to 630 Hz as measured by the real-time noise monitors; and*
2. *MCO L_{Aeq} refers to the site-only $L_{Aeq,15minute}$ attributed to MCO during attended monitoring.*

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain hail, or wind speeds above 5 m/s at microphone height.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – MARCH 2020

Location	Start Date and Time	Temperature °C	Wind Speed m/s	Wind Direction ° Magnetic North[1]	Cloud Cover 1/8s
NA1	12/03/2020 10:04	21	3.3	120	2
NA2	11/03/2020 22:30	17	1.9	70	0
NA3	11/03/2020 23:00	16	2.7	90	0
NA6	11/03/2020 22:01	18	3.3	80	0
NA10	12/03/2020 00:15	17	2.4	80	0
NA12	11/03/2020 23:30	16	1.9	70	0

Notes:

1. *"-" indicates calm conditions at monitoring location.*

Meteorological data used for compliance assessment is sourced from the WCP AWS.

6 SUMMARY

Global Acoustics was engaged by MCO to conduct a monthly noise survey of operations at Moolarben Coal Mine. The purpose of the survey was to quantify and describe the acoustic environment around the site and compare results with specified limits.

Monthly attended environmental noise monitoring described in this report was undertaken during the day period of 12 March and night period of 11/12 March 2020.

MCO complied with project specific criteria at all monitoring sites during the March 2020 survey. In accordance with Condition R4.2(b) of the EPL, no management actions have taken place at MCO as a result of attended monitoring as there were no exceedances recorded during the monitoring period.

Global Acoustics Pty Ltd

Environmental Noise Monitoring – April 2020

4.3 Attended Noise Monitoring

Noise levels from MCO in the absence of other noise sources are shown in Table 4.2 and Table 4.3, and are reproduced in Appendix B in a format generally specified in the EPA guidelines '*Requirements for Publishing Pollution Monitoring Data*' (March 2012). Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – APRIL 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO L_{Aeq} dB [2]	Exceedance dB [3]
NA1	21/04/2020 11:00	2.9	D	43[4]	Yes	IA	Nil
NA6	20/04/2020 22:05	0.0	F	37	Yes	IA	Nil
NA12	20/04/2020 23:30	0.0	F	35	Yes	IA	Nil

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{Aeq,15minute}$ attributed to MCO, including modifying factors if applicable.*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL; and*
4. *External criterion. A difference of 8 dB between the internal and external criterion has been adopted at NA1 for consistency with previous versions of the NMP.*

As impact assessment criteria are more stringent than land acquisition or noise mitigation criteria and MCO levels complied with impact assessment criteria in all measurements as shown in Table 4.2, no comparison against mitigation or land acquisition criteria is required.

Table 4.3: $L_{A1,1minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – APRIL 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NA6	20/04/2020 22:05	0.0	F	45	Yes	IA	Nil
NA12	20/04/2020 23:30	0.0	F	45	Yes	IA	Nil

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{A1\ 1minute}$ attributed to MCO; and*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL.*

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4.4 Attended Validation Noise Monitoring

Table 4.4 presents data recorded concurrently at the real-time noise monitor and attended monitoring locations.

Table 4.4: REAL-TIME VERSUS ATTENDED DATA COMPARISON – APRIL 2020

Location	Start Date and Time	Real-time Noise Monitor Levels – dB						Attended Noise Monitoring Levels – dB					
		L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	$L_{Aeq,LF}$ [1]	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	MCO L_{Aeq} [2]
NA2/SX36	20/04/2020 22:30	47	44	41	40	36	33	52	45	42	36	33	30
NA3/SX35	20/04/2020 23:00	44	38	33	29	23	30	42	37	33	28	23	IA
NA10/SX44	21/04/2020 00:00	36	34	32	32	29	30	35	32	30	30	27	<30
NA12/SX39	20/04/2020 23:30	43	37	33	26	20	28	43	38	33	24	20	IA

Notes:

1. *$L_{Aeq,LF}$ refers to $L_{Aeq,15minute}$ in the frequency range 20 to 630 Hz as measured by the real-time noise monitors; and*
2. *MCO L_{Aeq} refers to the site-only $L_{Aeq,15minute}$ attributed to MCO during attended monitoring.*

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6 SUMMARY

Global Acoustics was engaged by MCO to conduct a monthly noise survey of operations at Moolarben Coal Mine. The purpose of the survey was to quantify and describe the acoustic environment around the site and compare results with specified limits.

Monthly attended environmental noise monitoring described in this report was undertaken during the day period of 21 April and night period of 20/21 April 2020.

MCO complied with project specific criteria at all monitoring sites during the April 2020 survey. In accordance with Condition R4.2(b) of the EPL, no management actions have taken place at MCO as a result of attended monitoring as there were no exceedances recorded during the monitoring period.

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Environmental Noise Monitoring – May 2020

4.3 Attended Noise Monitoring

Noise levels from MCO in the absence of other noise sources are shown in Table 4.2 and Table 4.3, and are reproduced in Appendix B in a format generally specified in the EPA guidelines *'Requirements for Publishing Pollution Monitoring Data'* (March 2012). Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – QUARTER 2 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO L_{Aeq} dB [2]	Exceedance dB [3]
NA1	12/05/2020 09:58	0.5	A	43[4]	Yes	NM	Nil
NA6	11/05/2020 23:36	0.0	F	37	Yes	32	Nil
NA12	12/05/2020 00:30	0.0	F	35	Yes	29	Nil
GRNP	11/05/2020 22:00	0.7	F	50	Yes	IA	Nil
MGNR	12/05/2020 01:48	0.6	F	50	Yes	26	Nil

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{Aeq,15minute}$ attributed to MCO, including modifying factors if applicable.*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL; and*
4. *External criterion. A difference of 8 dB between the internal and external criterion has been adopted at NA1 for consistency with previous versions of the NMP.*

As impact assessment criteria are more stringent than land acquisition or noise mitigation criteria and MCO levels complied with impact assessment criteria in all measurements as shown in Table 4.2, no comparison against mitigation or land acquisition criteria is required.

Table 4.3: $L_{A1,1minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – QUARTER 2 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NA6	11/05/2020 23:36	0.0	F	45	Yes	35	Nil
NA12	12/05/2020 00:30	0.0	F	45	Yes	30	Nil

Cumulative noise levels generated by total mining activity are shown in Table 4.4. The mining-only $L_{Aeq,15minute}$ is compared to cumulative criteria contained in the Ulan Coal Mines project approval.

Table 4.4: $L_{Aeq,15minute}$ GENERATED BY ALL MINES AGAINST UCML CUMULATIVE CRITERIA – QUARTER 2 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies?	Cumulative $L_{Aeq,15min}$ dB[1]	Exceedance
NA11	11/05/2020 22:33	0.0	G	40	No	Nil	NA

Notes:

1. *By definition, cumulative noise refers to two or more noise sources. If only one source of mining noise is audible then the measured cumulative noise is defined here as 'Nil'.*

4.4 Attended Validation Noise Monitoring

Table 4.5 presents data recorded concurrently at the real-time noise monitor and attended monitoring locations.

Table 4.5: REAL-TIME VERSUS ATTENDED DATA COMPARISON – QUARTER 2 2020

Location	Start Date and Time	Real-time Noise Monitor Levels - dB						Attended Noise Monitoring Levels - dB					
		L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	$L_{Aeq,LF}$ [1]	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	MCO L_{Aeq} [2]
NA2/ SX36	11/05/2020 23:15	49	43	41	39	37	39	60	44	48	39	37	36
NA3/ SX35	12/05/2020 00:00	35	33	32	31	30	32	43	35	33	30	29	30
NA10/ SX44	12/05/2020 01:00	44	41	39	38	35	38	42	40	38	37	34	37
NA12/ SX39	12/05/2020 00:30	43	39	34	30	26	32	44	38	34	29	26	29

Notes:

1. *$L_{Aeq,LF}$ refers to $L_{Aeq,15minute}$ in the frequency range 20 to 630 Hz as measured by the real-time noise monitors; and*
2. *MCO L_{Aeq} refers to the estimated or measured $L_{Aeq,15minute}$ attributed to MCO during attended monitoring.*

6 SUMMARY

Global Acoustics was engaged by MCO to conduct a quarterly noise survey of operations at Moolarben Coal Mine. The purpose of the survey was to quantify and describe the acoustic environment around the site and compare results with specified limits.

Attended environmental noise monitoring described in this report was undertaken for Quarter 2 2020 during the day period of 12 May and night period of 11/12 May 2020.

MCO complied with project specific criteria at all monitoring sites during the quarterly Quarter 2 2020 survey. In accordance with Condition R4.2(b) of the EPL, no management actions have taken place at MCO as a result of attended monitoring as there were no exceedances recorded during the monitoring period.

Global Acoustics Pty Ltd

Environmental Noise Monitoring – June 2020

4.3 Attended Noise Monitoring

Noise levels from MCO in the absence of other noise sources are shown in Table 4.2 and Table 4.3, and are reproduced in Appendix B in a format generally specified in the EPA guidelines '*Requirements for Publishing Pollution Monitoring Data*' (March 2012). Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – JUNE 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO L_{Aeq} dB [2]	Exceedance dB [3]
NA1	16/06/2020 10:48	3.0	A	43	Yes	IA	Nil
NA6	15/06/2020 22:51	0.0	G	37	No	IA	NA
NA12	16/06/2020 00:00	0.0	G	35	No	IA	NA

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{Aeq,15minute}$ attributed to MCO, including modifying factors if applicable.*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL; and*
4. *External criterion. A difference of 8 dB between the internal and external criterion has been adopted at NA1 for consistency with previous versions of the NMP.*

As impact assessment criteria are more stringent than land acquisition or noise mitigation criteria and MCO levels complied with impact assessment criteria in all measurements as shown in Table 4.2, no comparison against mitigation or land acquisition criteria is required.

Table 4.3: $L_{A1,1minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – JUNE 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NA6	15/06/2020 22:51	0.0	G	45	No	IA	NA
NA12	16/06/2020 00:00	0.0	G	45	No	IA	NA

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{A1,1minute}$ attributed to MCO; and*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL.*

4.4 Attended Validation Noise Monitoring

Table 4.4 presents data recorded concurrently at the real-time noise monitor and attended monitoring locations.

Table 4.4: REAL-TIME VERSUS ATTENDED DATA COMPARISON – JUNE 2020

Location	Start Date and Time	Real-time Noise Monitor Levels – dB						Attended Noise Monitoring Levels – dB					
		L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	$L_{Aeq,LF}$ [1]	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	MCO L_{Aeq} [2]
NA2/SX36	15/06/2020 23:30	41	36	33	31	29	31	40	35	32	30	28	27
NA3/SX35	15/06/2020 23:30	29	26	24	22	20	22	30	25	23	21	19	<20
NA10/SX44	16/06/2020 00:15	38	33	31	29	26	28	42	36	32	30	24	28
NA12/SX39	16/06/2020 00:00	32	26	24	22	20	19	43	35	32	25	18	IA

Notes:

1. *$L_{Aeq,LF}$ refers to $L_{Aeq,15minute}$ in the frequency range 20 to 630 Hz as measured by the real-time noise monitors; and*
2. *MCO L_{Aeq} refers to the site-only $L_{Aeq,15minute}$ attributed to MCO during attended monitoring.*

6 SUMMARY

Global Acoustics was engaged by MCO to conduct a monthly noise survey of operations at Moolarben Coal Mine. The purpose of the survey was to quantify and describe the acoustic environment around the site and compare results with specified limits.

Monthly attended environmental noise monitoring described in this report was undertaken during the day period of 16 June and night period of 15/16 June 2020.

MCO complied with project specific criteria at all monitoring sites during the June 2020 survey. In accordance with Condition R4.2(b) of the EPL, no management actions have taken place at MCO as a result of attended monitoring as there were no exceedances recorded during the monitoring period.

Global Acoustics Pty Ltd

Environmental Noise Monitoring – July 2020

4.3 Attended Noise Monitoring

Noise levels from MCO in the absence of other noise sources are shown in Table 4.2 and Table 4.3, and are reproduced in Appendix B in a format generally specified in the EPA guidelines '*Requirements for Publishing Pollution Monitoring Data*' (March 2012). Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – JULY 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO L_{Aeq} dB [2]	Exceedance dB [3]
NA1	16/07/2020 10:53	3.4	A	43[4]	No	IA	NA
NA6	15/07/2020 22:01	1.6	E	37	Yes	<30	Nil
NA12	15/07/2020 23:30	2.4	E	35	Yes	IA	Nil

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{Aeq,15minute}$ attributed to MCO, including modifying factors if applicable.*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL; and*
4. *External criterion. A difference of 8 dB between the internal and external criterion has been adopted at NA1 for consistency with previous versions of the NMP.*

As impact assessment criteria are more stringent than land acquisition or noise mitigation criteria and MCO levels complied with impact assessment criteria in all measurements as shown in Table 4.2, no comparison against mitigation or land acquisition criteria is required.

Table 4.3: $L_{A1,1minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – JULY 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NA6	15/07/2020 22:01	1.6	E	45	Yes	36	Nil
NA12	15/07/2020 23:30	2.4	E	45	Yes	IA	Nil

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{A1,1minute}$ attributed to MCO; and*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL.*

4.4 Attended Validation Noise Monitoring

Table 4.4 presents data recorded concurrently at the real-time noise monitor and attended monitoring locations.

Table 4.4: REAL-TIME VERSUS ATTENDED DATA COMPARISON – JULY 2020

Location	Start Date and Time	Real-time Noise Monitor Levels – dB						Attended Noise Monitoring Levels – dB					
		L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	$L_{Aeq,LF}$ [1]	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	MCO L_{Aeq} [2]
NA2/SX36	15/07/2020 22:33	41	36	32	27	22	27	40	34	30	26	22	<25
NA3/SX35	15/07/2020 23:00	57	31	41	26	23	36	36	31	28	25	21	NM
NA10/SX44	16/07/2020 00:06	33	28	26	25	22	21	36	32	29	27	20	IA
NA12/SX39	15/07/2020 23:30	49	30	37	24	21	31	36	30	27	24	21	IA

Notes:

1. *$L_{Aeq,LF}$ refers to $L_{Aeq,15minute}$ in the frequency range 20 to 630 Hz as measured by the real-time noise monitors; and*
2. *MCO L_{Aeq} refers to the site-only $L_{Aeq,15minute}$ attributed to MCO during attended monitoring.*

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain hail, or wind speeds above 5 m/s at microphone height.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – JULY 2020

Location	Start Date and Time	Temperature °C	Wind Speed m/s	Wind Direction ° Magnetic North[1]	Cloud Cover 1/8s
NA1	16/07/2020 10:53	22	0.9	220	1
NA2	15/07/2020 22:33	3	0.0	-	0
NA3	15/07/2020 23:00	6	0.8	265	0
NA6	15/07/2020 22:01	9	1.5	235	0
NA10	16/07/2020 00:06	3	0.0	-	0
NA12	15/07/2020 23:30	4	0.0	-	0

Notes:

1. *"-" indicates calm conditions at monitoring location.*

Meteorological data used for compliance assessment is sourced from the WCP AWS.

6 SUMMARY

Global Acoustics was engaged by MCO to conduct a monthly noise survey of operations at Moolarben Coal Mine. The purpose of the survey was to quantify and describe the acoustic environment around the site and compare results with specified limits.

Monthly attended environmental noise monitoring described in this report was undertaken during the day period of 16 July and night period of 15/16 July 2020.

MCO complied with project specific criteria at all monitoring sites during the July 2020 survey. In accordance with Condition R4.2(b) of the EPL, no management actions have taken place at MCO as a result of attended monitoring as there were no exceedances recorded during the monitoring period.

Global Acoustics Pty Ltd

Environmental Noise Monitoring – August 2020

4.3 Attended Noise Monitoring

Noise levels from MCO in the absence of other noise sources are shown in Table 4.2 and Table 4.3, and are reproduced in Appendix B in a format generally specified in the EPA guidelines '*Requirements for Publishing Pollution Monitoring Data*' (March 2012). Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – QUARTER 3 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO L_{Aeq} dB [2]	Exceedance dB [3]
NA1	19/08/2020 11:10	5.7	A	43[4]	No	IA	NA
NA6	18/08/2020 23:39	0.6	G	37	No	27	NA
NA12	19/08/2020 00:32	1.6	G	35	No	<20	NA
GRNP	18/08/2020 22:06	0.6	F	50	Yes	38	Nil
MGNR	19/08/2020 01:34	1.7	G	50	No	<25	NA

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{Aeq,15minute}$ attributed to MCO, including modifying factors if applicable;*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL; and*
4. *External criterion. A difference of 8 dB between the internal and external criterion has been adopted at NA1 for consistency with previous versions of the NMP.*

As impact assessment criteria are more stringent than land acquisition or noise mitigation criteria and MCO levels complied with impact assessment criteria in all measurements as shown in Table 4.2, no comparison against mitigation or land acquisition criteria is required.

Table 4.3: $L_{A1,1minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – QUARTER 3 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NA6	18/08/2020 23:39	0.6	G	45	No	<30	NA
NA12	19/08/2020 00:32	1.6	G	45	No	<20	NA

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{A1,1minute}$ attributed to MCO; and*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL.*

Cumulative noise levels generated by total mining activity are shown in Table 4.4. The mining-only $L_{Aeq,15minute}$ is compared to cumulative criteria contained in the Ulan Coal Mines project approval.

Table 4.4: $L_{Aeq,15minute}$ GENERATED BY ALL MINES AGAINST UCML CUMULATIVE CRITERIA – QUARTER 3 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies?	Cumulative $L_{Aeq,15min}$ dB[1]	Exceedance
NA11	18/08/2020 22:40	1.0	G	40	No	Nil	NA

Notes:

1. *By definition, cumulative noise refers to two or more noise sources. If only one source of mining noise is audible then the measured cumulative noise is defined here as 'Nil'.*

4.4 Attended Validation Noise Monitoring

Table 4.5 presents data recorded concurrently at the real-time noise monitor and attended monitoring locations.

Table 4.5: REAL-TIME VERSUS ATTENDED DATA COMPARISON – QUARTER 3 2020

Location	Start Date and Time	Real-time Noise Monitor Levels - dB						Attended Noise Monitoring Levels - dB					
		L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	$L_{Aeq,LF}$ [1]	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	MCO L_{Aeq} [2]
NA2/SX36	18/08/2020 23:15	47	41	38	37	34	36	44	41	37	36	34	37
NA3/SX35	19/08/2020 00:03	56	44	41	27	22	36	45	33	33	24	21	IA
NA10/SX44	19/08/2020 01:05	35	32	30	30	27	28	38	34	32	31	27	29
NA12/SX39	19/08/2020 00:32	NR	NR	NR	NR	NR	NR	38	30	27	24	21	<20

Notes:

1. *$L_{Aeq,LF}$ refers to $L_{Aeq,15minute}$ in the frequency range 20 to 630 Hz as measured by the real-time noise monitors;*
2. *MCO L_{Aeq} refers to the estimated or measured $L_{Aeq,15minute}$ attributed to MCO during attended monitoring; and*
3. *'NR' denotes not recorded by Sentinex unit.*

6 SUMMARY

Global Acoustics was engaged by MCO to conduct a quarterly noise survey of operations at Moolarben Coal Mine. The purpose of the survey was to quantify and describe the acoustic environment around the site and compare results with specified limits.

Attended environmental noise monitoring described in this report was undertaken for Quarter 3 2020 during the day period of 19 August and night period of 18/19 August 2020.

MCO complied with project specific criteria at all monitoring sites during the quarterly Quarter 3 2020 survey. In accordance with Condition R4.2(b) of the EPL, no management actions have taken place at MCO as a result of attended monitoring as there were no exceedances recorded during the monitoring period.

Global Acoustics Pty Ltd

Environmental Noise Monitoring – September 2020

4.3 Attended Noise Monitoring

Noise levels from MCO in the absence of other noise sources are shown in Table 4.2 and Table 4.3, and are reproduced in Appendix B in a format generally specified in the EPA guidelines '*Requirements for Publishing Pollution Monitoring Data*' (March 2012). Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – SEPTEMBER 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO L_{Aeq} dB [2]	Exceedance dB [3]
NA1	02/09/2020 10:41	3.6	A	43[4]	No	IA	NA
NA6	01/09/2020 23:02	0.0	F	37	Yes	34	Nil
NA12	01/09/2020 23:30	0.0	F	35	Yes	30	Nil

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{Aeq,15minute}$ attributed to MCO, including modifying factors if applicable;*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL; and*
4. *External criterion. A difference of 8 dB between the internal and external criterion has been adopted at NA1 for consistency with previous versions of the NMP.*

As impact assessment criteria are more stringent than land acquisition or noise mitigation criteria and MCO levels complied with impact assessment criteria in all measurements as shown in Table 4.2, no comparison against mitigation or land acquisition criteria is required.

Table 4.3: $L_{A1,1minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – SEPTEMBER 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NA6	01/09/2020 23:02	0.0	F	45	Yes	37	Nil
NA12	01/09/2020 23:30	0.0	F	45	Yes	35	Nil

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{A1,1minute}$ attributed to MCO; and*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL.*

4.4 Attended Validation Noise Monitoring

Table 4.4 presents data recorded concurrently at the real-time noise monitor and attended monitoring locations.

Table 4.4: REAL-TIME VERSUS ATTENDED DATA COMPARISON – SEPTEMBER 2020

Location	Start Date and Time	Real-time Noise Monitor Levels – dB						Attended Noise Monitoring Levels – dB					
		L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	$L_{Aeq,LF}$ [1]	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	MCO L_{Aeq} [2]
NA12/SX390	01/09/2020 23:30	45	40	36	32	30	30	45	40	36	32	30	30

Notes:

1. *$L_{Aeq,LF}$ refers to $L_{Aeq,15minute}$ in the frequency range 20 to 630 Hz as measured by the real-time noise monitors; and*
2. *MCO L_{Aeq} refers to the site-only $L_{Aeq,15minute}$ attributed to MCO during attended monitoring.*

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain hail, or wind speeds above 5 m/s at microphone height.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – SEPTEMBER 2020

Location	Start Date and Time	Temperature °C	Wind Speed m/s	Wind Direction ° Magnetic North[1]	Cloud Cover 1/8s
NA1	02/09/2020 10:41	20	1.7	340	5
NA6	01/09/2020 23:02	11	-	-	0
NA12	01/09/2020 23:30	10	-	-	0

Notes:

1. *"-" indicates calm conditions at monitoring location.*

Meteorological data used for compliance assessment is sourced from the MCO AWS.

6 SUMMARY

Global Acoustics was engaged by MCO to conduct a monthly noise survey of operations at Moolarben Coal Mine. The purpose of the survey was to quantify and describe the acoustic environment around the site and compare results with specified limits.

Monthly attended environmental noise monitoring described in this report was undertaken during the day period of 2 September and night period of 1/2 September 2020.

MCO complied with project specific criteria at all monitoring sites during the September 2020 survey. In accordance with Condition R4.2(b) of the EPL, no management actions have taken place at MCO as a result of attended monitoring as there were no exceedances recorded during the monitoring period.

Global Acoustics Pty Ltd

Environmental Noise Monitoring – October 2020

4.3 Attended Noise Monitoring

Noise levels from MCO in the absence of other noise sources are shown in Table 4.2 and Table 4.3, and are reproduced in Appendix B in a format generally specified in the EPA guidelines '*Requirements for Publishing Pollution Monitoring Data*' (March 2012). Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – OCTOBER 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO L_{Aeq} dB [2]	Exceedance dB [3]
NA1	07/10/2020 10:35	4.1	B	43[4]	No	IA	NA
NA6	06/10/2020 23:17	2.9	E	37	Yes	26	Nil
NA12	06/10/2020 23:45	4.0	D	35	No	29	NA

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{Aeq,15minute}$ attributed to MCO, including modifying factors if applicable.*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL; and*
4. *External criterion. A difference of 8 dB between the internal and external criterion has been adopted at NA1 for consistency with previous versions of the NMP.*

As impact assessment criteria are more stringent than land acquisition or noise mitigation criteria and MCO levels complied with impact assessment criteria in all measurements as shown in Table 4.2, no comparison against mitigation or land acquisition criteria is required.

Table 4.3: $L_{A1,1minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – OCTOBER 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NA6	06/10/2020 23:17	2.9	E	45	Yes	30	Nil
NA12	06/10/2020 23:45	4.0	D	45	No	35	NA

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{A1,1minute}$ attributed to MCO; and*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL.*

4.4 Attended Validation Noise Monitoring

Table 4.4 presents data recorded concurrently at the real-time noise monitor and attended monitoring locations.

Table 4.4: REAL-TIME VERSUS ATTENDED DATA COMPARISON – OCTOBER 2020

Location	Start Date and Time	Real-time Noise Monitor Levels – dB						Attended Noise Monitoring Levels – dB					
		L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	$L_{Aeq,LF}$ [1]	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	MCO L_{Aeq} [2]
NA12/SX390	06/10/2020 23:45	47	39	37	34	31	34	40	37	34	32	30	29

Notes:

1. *$L_{Aeq,LF}$ refers to $L_{Aeq,15minute}$ in the frequency range 20 to 630 Hz as measured by the real-time noise monitors; and*
2. *MCO L_{Aeq} refers to the site-only $L_{Aeq,15minute}$ attributed to MCO during attended monitoring.*

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain hail, or wind speeds above 5 m/s at microphone height.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – OCTOBER 2020

Location	Start Date and Time	Temperature °C	Wind Speed m/s	Wind Direction ° Magnetic North[1]	Cloud Cover 1/8s
NA1	07/10/2020 10:35	20	1.2	40	7
NA6	06/10/2020 23:17	18	1.0	60	8
NA12	06/10/2020 23:45	17	2.7	100	8

Notes:

1. *"-" indicates calm conditions at monitoring location.*

Meteorological data used for compliance assessment is sourced from the MCO AWS.

6 SUMMARY

Global Acoustics was engaged by MCO to conduct a monthly noise survey of operations at Moolarben Coal Mine. The purpose of the survey was to quantify and describe the acoustic environment around the site and compare results with specified limits.

Monthly attended environmental noise monitoring described in this report was undertaken during the day period of 7 October and night period of 6/7 October 2020.

MCO complied with project specific criteria at all monitoring sites during the October 2020 survey. In accordance with Condition R4.2(b) of the EPL, no management actions have taken place at MCO as a result of attended monitoring as there were no exceedances recorded during the monitoring period.

Global Acoustics Pty Ltd

Environmental Noise Monitoring – November 2020

4.3 Attended Noise Monitoring

Noise levels from MCO in the absence of other noise sources are shown in Table 4.2 and Table 4.3, and are reproduced in Appendix B in a format generally specified in the EPA guidelines '*Requirements for Publishing Pollution Monitoring Data*' (March 2012). Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – NOVEMBER (Q4) 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO L_{Aeq} dB [2]	Exceedance dB [3]
NA1	12/11/2020 11:00	2.9	A	43[4]	Yes	IA	Nil
NA6	11/11/2020 23:02	0.8	F	37	Yes	27	Nil
NA12	11/11/2020 23:45	1.0	F	35	Yes	<25	Nil

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{Aeq,15minute}$ attributed to MCO, including modifying factors if applicable;*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL; and*
4. *External criterion. A difference of 8 dB between the internal and external criterion has been adopted at NA1 for consistency with previous versions of the NMP.*

As impact assessment criteria are more stringent than land acquisition or noise mitigation criteria and MCO levels complied with impact assessment criteria in all measurements as shown in Table 4.2, no comparison against mitigation or land acquisition criteria is required.

Table 4.3: $L_{A1,1minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – NOVEMBER (Q4) 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NA6	11/11/2020 23:02	0.8	F	45	Yes	32	Nil
NA12	11/11/2020 23:45	1.0	F	45	Yes	25	Nil

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{A1,1minute}$ attributed to MCO; and*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL.*

Cumulative noise levels generated by total mining activity are shown in Table 4.4. The mining-only $L_{Aeq,15minute}$ is compared to cumulative criteria contained in the Ulan Coal Mine project approval.

Table 4.4: $L_{Aeq,15minute}$ GENERATED BY ALL MINES AGAINST UCML CUMULATIVE CRITERIA – NOVEMBER (Q4) 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies?	Cumulative $L_{Aeq,15min}$ dB[1]	Exceedance
NA11	11/11/2020 22:02	1.2	F	40	Yes	Nil	Nil

Notes:

1. *By definition, cumulative noise refers to two or more noise sources. If only one source of mining noise is audible then the measured cumulative noise is defined here as 'Nil'.*

4.4 Attended Validation Noise Monitoring

Table 4.5 presents data recorded concurrently at the real-time noise monitor and attended monitoring locations.

Table 4.5: REAL-TIME VERSUS ATTENDED DATA COMPARISON – NOVEMBER (Q4) 2020

Location	Start Date and Time	Real-time Noise Monitor Levels – dB						Attended Noise Monitoring Levels – dB					
		L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	$L_{Aeq,LF}$ [1]	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	MCO L_{Aeq} [2]
NA12/SX39	11/11/2020 23:45	NA	NA	NA	NA	NA	NA	49	43	40	35	31	<25

Notes:

1. *$L_{Aeq,LF}$ refers to $L_{Aeq,15minute}$ in the frequency range 20 to 630 Hz as measured by the real-time noise monitors;*
2. *MCO L_{Aeq} refers to the site-only $L_{Aeq,15minute}$ attributed to MCO during attended monitoring; and*
3. *NA indicates the real-time noise monitor did not return data for the period in question.*

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.6. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain hail, or wind speeds above 5 m/s at microphone height.

Table 4.6: MEASURED ATMOSPHERIC CONDITIONS – NOVEMBER (Q4) 2020

Location	Start Date and Time	Temperature °C	Wind Speed m/s	Wind Direction ° Magnetic North[1]	Cloud Cover 1/8s
NA1	12/11/2020 11:00	25	0.6	330	8
NA6	11/11/2020 23:02	19	0.0	-	7
NA11	11/11/2020 22:02	19	0.0	-	8
NA12	11/11/2020 23:45	18	0.9	230	6

Notes:

1. *"-" indicates calm conditions at monitoring location.*

Meteorological data used for compliance assessment is sourced from the MCO AWS.

6 SUMMARY

Global Acoustics was engaged by MCO to conduct a monthly and quarterly noise survey of operations at Moolarben Coal Mine. The purpose of the survey was to to quantify and describe the acoustic environment around the site and compare results with specified limits.

Monthly and quarterly attended environmental noise monitoring described in this report was undertaken during the day period of 12 November and night period of 11/12 November 2020.

MCO complied with project specific criteria at all monitoring sites during the November (Q4) 2020 survey. In accordance with Condition R4.2(b) of the EPL, no management actions have taken place at MCO as a result of attended monitoring as there were no exceedances recorded during the monitoring period.

Global Acoustics Pty Ltd

Environmental Noise Monitoring – December 2020

4.3 Attended Noise Monitoring

Noise levels from MCO in the absence of other noise sources are shown in Table 4.2 and Table 4.3, and are reproduced in Appendix B in a format generally specified in the EPA guidelines '*Requirements for Publishing Pollution Monitoring Data*' (March 2012). Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – DECEMBER 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO L_{Aeq} dB [2]	Exceedance dB [3]
NA1	09/12/2020 11:12	0.4	A	43[4]	Yes	IA	Nil
NA6	08/12/2020 23:39	0.0	F	37	Yes	IA	Nil
NA12	08/12/2020 23:15	1.9	D	35	Yes	IA	Nil

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{Aeq,15minute}$ attributed to MCO, including modifying factors if applicable;*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL; and*
4. *External criterion. A difference of 8 dB between the internal and external criterion has been adopted at NA1 for consistency with previous versions of the NMP.*

As impact assessment criteria are more stringent than land acquisition or noise mitigation criteria and MCO levels complied with impact assessment criteria in all measurements as shown in Table 4.2, no comparison against mitigation or land acquisition criteria is required.

Table 4.3: $L_{A1,1minute}$ GENERATED BY MCO AGAINST IMPACT ASSESSMENT CRITERIA – DECEMBER 2020

Location	Start Date and Time	Wind Speed m/s	Stability Class	Criterion dB	Criterion Applies [1]	MCO $L_{A1,1min}$ dB [2]	Exceedance dB [3]
NA6	08/12/2020 23:39	0.0	F	45	Yes	IA	Nil
NA12	08/12/2020 23:15	1.9	D	45	Yes	IA	Nil

Notes:

1. *As detailed in the EPL, noise emission limits apply under all meteorological conditions except:*
   - *Wind speeds greater than 3 m/s at 10 metres above ground level; or*
   - *Stability class F temperature inversion conditions, and wind speeds greater than 2 m/s at 10 metres above ground level; or*
   - *Stability class G temperature inversions;*
2. *Site-only $L_{A1,1minute}$ attributed to MCO; and*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in EPL.*

4.4 Attended Validation Noise Monitoring

Table 4.4 presents data recorded concurrently at the real-time noise monitor and attended monitoring locations.

Table 4.4: REAL-TIME VERSUS ATTENDED DATA COMPARISON – DECEMBER 2020

Location	Start Date and Time	Real-time Noise Monitor Levels – dB						Attended Noise Monitoring Levels – dB					
		L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	$L_{Aeq,LF}$ [1]	L_{A1}	L_{A10}	L_{Aeq}	L_{A50}	L_{A90}	MCO L_{Aeq} [2]
NA12/SX39	08/12/2020 23:15	39	35	31	28	20	27	38	34	30	27	20	IA

Notes:

1. *$L_{Aeq,LF}$ refers to $L_{Aeq,15minute}$ in the frequency range 20 to 630 Hz as measured by the real-time noise monitors; and*
2. *MCO L_{Aeq} refers to the site-only $L_{Aeq,15minute}$ attributed to MCO during attended monitoring.*

4.5 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.5. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain hail, or wind speeds above 5 m/s at microphone height.

Table 4.5: MEASURED ATMOSPHERIC CONDITIONS – DECEMBER 2020

Location	Start Date and Time	Temperature °C	Wind Speed m/s	Wind Direction ° Magnetic North[1]	Cloud Cover 1/8s
NA1	09/12/2020 11:12	23	1.2	240	0
NA6	08/12/2020 23:39	13	0.7	220	0
NA12	08/12/2020 23:15	13	0.0	-	0

Notes:

1. *"-" indicates calm conditions at monitoring location.*

Meteorological data used for compliance assessment is sourced from the MCO AWS.

6 SUMMARY

Global Acoustics was engaged by MCO to conduct a monthly noise survey of operations at Moolarben Coal Mine. The purpose of the survey was to quantify and describe the acoustic environment around the site and compare results with specified limits.

Monthly attended environmental noise monitoring described in this report was undertaken during the day period of 9 December and night period of 8/9 December 2020.

MCO complied with project specific criteria at all monitoring sites during the December 2020 survey. In accordance with Condition R4.2(b) of the EPL, no management actions have taken place at MCO as a result of attended monitoring as there were no exceedances recorded during the monitoring period.

Global Acoustics Pty Ltd

APPENDIX 3C. BLAST MONITORING DATA

Date	Time	BM1 Ulan School		BM5 Ridge Road		BM8 Moolarben Road	
		Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)
7/01/2020	12:01 PM	0.11	99.8	0.08	96.8		
9/01/2020	12:24 PM	0.3	116.4	0.2	106.5		
10/01/2020	3:59 PM	0.09	107.3	0.06	92.4		
11/01/2020	4:29 PM	0.13	97.9	0.06	101.6		
15/01/2020	12:55 PM	0.08	91.8	0.12	101.4		
17/01/2020	12:04 PM	0.14	101.6	0.06	97		
21/01/2020	4:07 PM	0.16	97.3	0.08	88		
21/01/2020	4:11 PM	0.13	87.3	0.15	90		
25/01/2020	2:42 PM	0.17	102.4	0.07	101.6		
25/01/2020	3:01 PM	0.09	87.2	0.05	89.2		
28/01/2020	12:07 PM	0.1	92.8	0.14	91.5		
28/01/2020	12:13 PM	0.09	81.8	0.04	95.1		
1/02/2020	3:56 PM	0.07	88.4	0.07	93.4		
4/02/2020	4:00 PM	0.05	98.6	0.07	107.4		
5/02/2020	4:04 PM	0.24	103.8	0.08	102.3		
6/02/2020	3:06 PM	0.06	95.7	0.06	103.4		
7/02/2020	4:36 PM	0.15	111.4	0.07	102		
8/02/2020	4:36 PM	0.05	97.1	0.06	96.8		
11/02/2020	4:07 PM	0.1	102.6	0.05	98.2		
12/02/2020	4:08 PM	0.15	108.4	0.14	98.2		
12/02/2020	4:14 PM	0.1	93.9	0.11	101.9		
15/02/2020	4:04 PM	0.25	107	0.13	107.8		
18/02/2020	4:06 PM	0.03	85.2	0.04	89.3		
18/02/2020	4:14 PM	0.19	82.1	0.13	93.3		
22/02/2020	3:57 PM	0.09	91.3	0.13	104		
25/02/2020	12:28 PM	0.19	96.6	0.16	103.7		
26/02/2020	12:33 PM	0.14	86	0.12	85.9		
26/02/2020	12:37 PM	0.08	100.1	0.03	82.5		
2/03/2020	12:06 PM	0.13	100.3	0.23	107.9		
3/03/2020	4:45 PM	0.18	105.2	0.16	99.2		
4/03/2020	4:06 PM	0.11	93.4	0.07	99.4		
9/03/2020	12:10 PM	0.14	87.8	0.27	100.9		
9/03/2020	4:09 PM	0.14	100.4	0.16	96.4		
11/03/2020	12:23 PM	0.1	93.7	0.1	95.3		
14/03/2020	4:05 PM	0.28	111.2	0.3	105.9		
16/03/2020	12:10 PM	0.1	94.5	0.09	98.8		
18/03/2020	3:57 PM	0.2	87.2	0.18	87.1		
19/03/2020	1:07 PM	0.12	93	0.12	92.4		
21/03/2020	12:04 PM	0.1	89	0.12	96.2		
23/03/2020	4:02 PM	0.16	94.9	0.23	104		
25/03/2020	4:38 PM	0.25	102.1	0.23	101.6		
25/03/2020	4:42 PM	0.26	104.2	0.6	105.8		
26/03/2020	12:00 PM	0.08	96	0.09	101.4		
31/03/2020	4:40 PM	0.27	101.8	0.23	98.8		
1/04/2020	1:10 PM	0.1	97.2	0.22	103		
2/04/2020	4:28 PM	0.07	94.5	0.13	94.9	0.12	99.0

Date	Time	BM1 Ulan School		BM5 Ridge Road		BM8 Moolarben Road	
		Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)
6/04/2020	12:14 PM	0.05	94.2	0.14	95.7	0.08	99.3
7/04/2020	12:14 PM	0.12	93.4	0.12	99.4	0.09	99.7
8/04/2020	12:06 PM	0.29	105.2	0.18	99.9	0.11	91.9
14/04/2020	2:34 PM	0.13	97.7	0.32	97	0.15	94.9
16/04/2020	4:02 PM	0.19	97.9	0.2	92.4	0.08	93.9
17/04/2020	1:05 PM	0.17	93.2	0.14	93.8	0.06	97.3
18/04/2020	4:02 PM	0.22	90.1	0.22	89.8	0.14	79.3
20/04/2020	12:09 PM	0.1	86.4	0.13	87.6	0.07	94.6
22/04/2020	12:03 PM	0.16	91.3	0.09	93.6	0.08	88.3
24/04/2020	4:01 PM	0.16	91	0.11	89.8	0.08	95.6
27/04/2020	12:26 PM	0.08	95.1	0.09	105.3	0.05	96.8
27/04/2020	12:32 PM	0.22	107.3	0.18	102.5	0.16	85.9
1/05/2020	4:12 PM	0.23	102.8	0.35	98.1	0.17	104
2/05/2020	4:01 PM	0.17	90.9	0.15	89.1	0.07	97.9
2/05/2020	4:07 PM	0.1	84.3	0.14	86	0.03	102.7
5/05/2020	4:08 PM	0.23	104.4	0.19	106.1	0.08	93.7
5/05/2020	4:14 PM	0.11	100.1	0.12	102	0.09	93.3
9/05/2020	4:03 PM	0.13	89	0.21	91	0.09	88.5
11/05/2020	4:05 PM	0.08	80.8	0.22	97	0.15	98.9
18/05/2020	11:54 AM	0.25	107.7	0.19	105	0.08	102
20/05/2020	12:02 PM	0.09	87.2	0.23	101	0.12	101.4
21/05/2020	4:13 PM	0.13	95.3	0.2	93.4	0.07	101.2
22/05/2020	12:04 PM	0.1	86	0.09	103.1	0.06	101.9
26/05/2020	12:03 PM	0.14	98.6	0.16	100.5	0.09	89
28/05/2020	12:14 PM	0.17	97.8	0.1	95.3	0.07	81.4
29/05/2020	4:15 PM	0.12	96.4	0.07	97.7	0.06	91.8
29/05/2020	4:21 PM	0.14	92.8	0.07	93.3	0.03	85.2
1/06/2020	11:57 AM	0.24	99.2	0.24	80.6	0.15	105.9
3/06/2020	12:22 PM	0.13	88.5	0.35	100	0.21	97.6
4/06/2020	4:02 PM	0.13	99.9	0.19	101.1	0.05	73.1
5/06/2020	12:04 PM	0.16	101.5	0.14	89.9	0.08	85.8
9/06/2020	4:00 PM	0.2	97	0.22	99.7	0.12	92.9
10/06/2020	4:06 PM	0.17	97.5	0.2	104	0.06	79.7
11/06/2020	4:05 PM	0.1	103.4	0.11	96.2	0.04	74.3
12/06/2020	4:02 PM	0.32	96.1	0.14	96.9	0.12	99.4
17/06/2020	12:08 PM	0.2	103.8	0.12	109.2	0.07	104.9
20/06/2020	1:01 PM	0.12	99	0.13	100.6	0.1	105.5
23/06/2020	12:17 PM	0.19	94.8	0.19	98.4	0.17	95.7
23/06/2020	12:17 PM	0.08	94.8	0.09	94.6	0.07	103.7
24/06/2020	12:09 PM	0.17	94.7	0.11	92.5	0.06	90.3
25/06/2020	12:04 PM	0.14	91.7	0.08	94.1	0.05	98.1
26/06/2020	4:07 PM	0.28	100.5	0.3	93.7	0.1	71.1
26/06/2020	4:13 PM	0.14	92.6	0.08	91.9	0.11	89.3
30/06/2020	1:12 PM	0.16	97	0.21	95.7	0.08	81.5
30/06/2020	1:19 PM	0.22	102	0.18	98.8	0.07	90.1
2/07/2020	12:10 PM	0.11	95.4	0.08	104.8	0.04	101.3
4/07/2020	12:06 PM	0.14	100	0.13	91.5	0.05	101.5
8/07/2020	12:05 PM	0.2	99.7	0.21	101.5	0.2	104.1
8/07/2020	12:10 PM	0.29	109.2	0.39	108.3	0.17	100.1

Date	Time	BM1 Ulan School		BM5 Ridge Road		BM8 Moolarben Road	
		Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)
10/07/2020	12:06 PM	0.11	97.5	0.19	95.1	0.09	73.1
13/07/2020	4:15 PM	0.21	89.8	0.12	94.1	0.04	83.4
16/07/2020	4:05 PM	0.17	98.8	0.15	91.3	0.1	94.9
18/07/2020	4:19 PM	0.17	94.8	0.31	97	0.17	73.5
18/07/2020	4:24 PM	0.14	106	0.16	104.1	0.18	75.7
20/07/2020	11:55 AM	0.09	84.5	0.25	97.7	0.19	97.3
21/07/2020	12:10 PM	0.2	100.3	0.1	92.8	0.1	85.8
25/07/2020	12:03 PM	0.16	98.4	0.22	101.7	0.12	90.3
27/07/2020	12:15 PM	0.13	102.6	0.35	101.7	0.27	109.3
3/08/2020	1:28 PM	0.22	99.7	0.29	97.1	0.14	93.2
4/08/2020	1:01 PM	0.05	94.8	0.08	98.7	0.06	107.7
6/08/2020	4:08 PM	0.06	98.1	0.13	105.6	0.1	110.2
8/08/2020	12:06 PM	0.04	87.2	0.15	104.9	0.09	102.4
8/08/2020	4:56 PM	0.08	89.8	0.13	85.1	0.06	88.3
14/08/2020	4:19 PM	0.21	109.9	0.27	103.9	0.1	83.6
14/08/2020	4:25 PM	0.12	108.4	0.19	104.8	0.08	76.9
15/08/2020	4:11 PM	0.14	93.2	0.12	102	0.14	102.1
17/08/2020	4:02 PM	0.14	102.1	0.16	99.6	0.08	101.3
17/08/2020	4:08 PM	0.14	95.5	0.16	103.9	0.07	94.5
17/08/2020	4:08 PM	0.14	95.5	0.09	100.6	0.07	90.7
20/08/2020	12:01 PM	0.21	96.6	0.18	102.4	0.06	100.8
24/08/2020	12:15 PM	0.13	88.9	0.13	92.1	0.05	103.1
24/08/2020	12:20 PM	0.28	93.5	0.23	98.3	0.08	100.8
27/08/2020	4:08 PM	0.13	89.2	0.15	86.9	0.07	96.9
28/08/2020	12:02 PM	0.15	101.6	0.2	94.6	0.1	81.9
29/08/2020	12:02 PM	0.14	92.5	0.08	95.2	0.05	75.7
2/09/2020	4:09 PM	0.17	85.8	0.45	97.1	0.29	101.4
3/09/2020	4:05 PM	0.06	92.6	0.12	99.5	0.08	104.7
5/09/2020	4:06 PM	0.16	103	0.16	98.8	0.15	95.1
8/09/2020	3:57 PM	0.28	103.1	0.26	96.6	0.21	72.6
10/09/2020	12:03 PM	0.15	104.1	0.08	101.9	0.06	108.4
12/09/2020	4:01 PM	0.09	80.8	0.08	77.7	0.1	78.4
12/09/2020	4:08 PM	0.23	103.6	0.37	98.4	0.16	83.3
14/09/2020	12:00 PM	0.14	87.6	0.09	97.6	0.17	94.9
16/09/2020	4:18 PM	0.13	92	0.24	91.3	0.15	99
19/09/2020	3:58 PM	0.07	82.9	0.08	99.5	0.07	111.7
21/09/2020	4:13 PM	0.17	95.7	0.21	95.7	0.12	92.3
26/09/2020	12:08 PM	0.15	111	0.1	106.7	0.09	109.6
30/09/2020	4:06 PM	0.3	106.7	0.28	100.1	0.17	92.2
1/10/2020	4:16 PM	0.07	88.2	0.07	97.1	0.04	97.5
3/10/2020	4:02 PM	0.1	89	0.1	86.5	0.04	70
7/10/2020	4:04 PM	0.16	85.8	0.12	97.1	0.05	99.2
8/10/2020	4:14 PM	0.13	99.2	0.16	95.8	0.08	102.5
8/10/2020	4:20 PM	0.09	99.4	0.09	100.7	0.04	90.1
9/10/2020	4:09 PM	0.13	97.6	0.12	103	0.08	91.2
9/10/2020	4:19 PM	0.21	101.9	0.12	104.2	0.1	103.3
10/10/2020	4:08 PM	0.14	87.6	0.19	95.3	0.13	103.7
15/10/2020	12:50 PM	0.17	99	0.15	96.2	0.07	92.4
17/10/2020	4:00 PM	0.09	97	0.13	98.7	0.07	99

Date	Time	BM1 Ulan School		BM5 Ridge Road		BM8 Moolarben Road	
		Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)	Ground Vibration (mm/s)	Blast Overpressure (dBL)
20/10/2020	4:03 PM	0.11	95.8	0.14	92.5	0.09	84.7
24/10/2020	12:07 PM	0.2	88.1	0.1	93.8	0.04	81.4
26/10/2020	11:57 AM	0.15	81.3	0.09	102.8	0.09	96
27/10/2020	4:10 PM	0.2	103.9	0.19	101.9	0.12	101.3
29/10/2020	3:19 PM	0.09	84.8	0.1	85.5	0.08	91.5
30/10/2020	4:01 PM	0.15	96.8	0.09	98.6	0.05	99.8
4/11/2020	4:01 PM	0.08	80.2	0.07	102.8	0.09	104.9
5/11/2020	4:04 PM	0.28	100.4	0.41	96.4	0.19	111.3
6/11/2020	4:03 PM	0.04	96.1	0.06	103.6	0.07	106.1
7/11/2020	4:16 PM	0.13	89.3	0.12	83.6	0.09	72.2
9/11/2020	4:07 PM	0.23	95.2	0.56	98.2	0.47	89.6
9/11/2020	4:13 PM	0.08	89.4	0.05	85.1	0.06	80.7
11/11/2020	11:58 AM	0.14	84.8	0.19	84.5	0.1	91.7
13/11/2020	11:58 AM	0.43	94.5	0.18	96.3	0.1	94.2
14/11/2020	3:58 PM	0.23	95.1	0.33	94.9	0.43	96.4
16/11/2020	12:13 PM	0.14	99	0.12	95.9	0.12	113.2
19/11/2020	4:12 PM	0.24	100.4	0.12	94.9	0.1	91.6
19/11/2020	4:13 PM	0.08	100.4	0.1	94.9	0.08	94.2
24/11/2020	4:16 PM	0.16	88.5	0.17	92.8	0.11	79.9
26/11/2020	12:14 PM	0.08	86.5	0.28	104.8	0.2	107.3
1/12/2020	4:00 PM	0.12	96.8	0.27	91.9	0.18	103.9
3/12/2020	4:02 PM	0.09	90	0.15	86.7	0.06	75.4
5/12/2020	12:30 PM	0.16	94.4	0.14	99.9	0.07	116.2*
5/12/2020	1:18 PM	0.07	78.6	0.2	85.8	0.1	88.4
7/12/2020	1:05 PM	0.1	103.1	0.24	103.6	0.13	98.2
9/12/2020	12:04 PM	0.49	86.1	0.27	86.2	0.19	92.9
16/12/2020	12:13 PM	0.19	103.6	0.12	99.5	0.13	90.7
17/12/2020	12:05 PM	0.07	86.9	0.23	85.6	0.19	92.8
18/12/2020	4:17 PM	0.13	89.3	0.07	84.8	0.03	86
23/12/2020	4:05 PM	0.16	90.8	0.15	89.2	0.14	88.7
23/12/2020	4:11 PM	0.67	112.4	0.78	106.9	0.28	86.7

*Results affected by wind

APPENDIX 3D. AIR QUALITY DATA

Table A : Summary of the MCO Air Quality-Monitoring Program

Monitoring Parameter	Monitoring Location	Frequency	Justification
Dust Deposition	DG01 – Bobadeen	Every 30 days ± 2 days	Background monitoring north of the Moolarben Coal Complex.
	DG04 – Ulan Village	Every 30 days ± 2 days	Representative of nearest non-mine owned residences to the north-west of the Moolarben Coal Complex.
	DG05 – Glenmoor	Every 30 days ± 2 days	Representative of nearest non-mine owned residences to the south-west and west of the Moolarben Coal Complex.
	DG09 – Wilga	Every 30 days ± 2 days	Representative of non-mine owned residences to the south-west and west of the Moolarben Coal Complex.
HVAS – PM10	PM 01 (Ulan Village)	Every 6 days	Indicative of potential impacts to nearest non-mine owned residences to the north-west of the Moolarben Coal Complex.
	PM 02 (Ridge Road)	Every 6 days	Background monitoring south-west and west of the Moolarben Coal Complex.
Real Time PM_{10}	TEOM 01 (Ulan School)	Real Time PM_{10}	Real time monitoring at Ulan Public School.
	TEOM 04 (Ulan Road)	Real Time PM_{10}	Real time monitoring representative of nearest non-mine owned residences to the west of the Moolarben Coal Complex.
	TEOM 07 (Ulan Road)	Real Time PM_{10}	Real time monitoring representative of non-mine owned residences to the south-west of and west of the Moolarben Coal Complex.
	TEOM 06 (Ulan-Wollar Rd)	Real Time PM_{10}	Real time monitoring not representative of private residences, used to measure “upwind” air quality.
Real Time $PM_{2.5}$	TEOM 07 (Ulan Road)	Real Time $PM_{2.5}$	Real time monitoring representative of non-mine owned residences to the south-west of and west of the Moolarben Coal Complex.

Table B : Summary of the MCO Air Quality-Monitoring Program – Dust Deposition

Dust Gauge	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
DG1	8.6c	2	0.6	0.6	0.3	0.3	0.4	0.5	0.9	1	1.3	1.7
DG4	5.4c	1.9	1.7	0.4	0.6	0.6	0.4	0.5	0.9	1	1.4	1.4
DG5	5.9c	2.7	1.3	0.6	0.6	0.7	0.5	0.5	1.3	1	2.4	2.7
DG9	7.9c	1.9	0.8	0.5	0.8	0.5	0.3	1.3	1.5	0.8	3.1	3.3

C – Dust gauge deemed contaminated after analysis of influencing factors. These factors include an ash residue result of <50%, the presence of bird droppings or other contaminants such as insects in the dust gauge and analysis of historical results from the dust gauge.

Figure 3-b 2016 to 2020 Dust Depositional Results

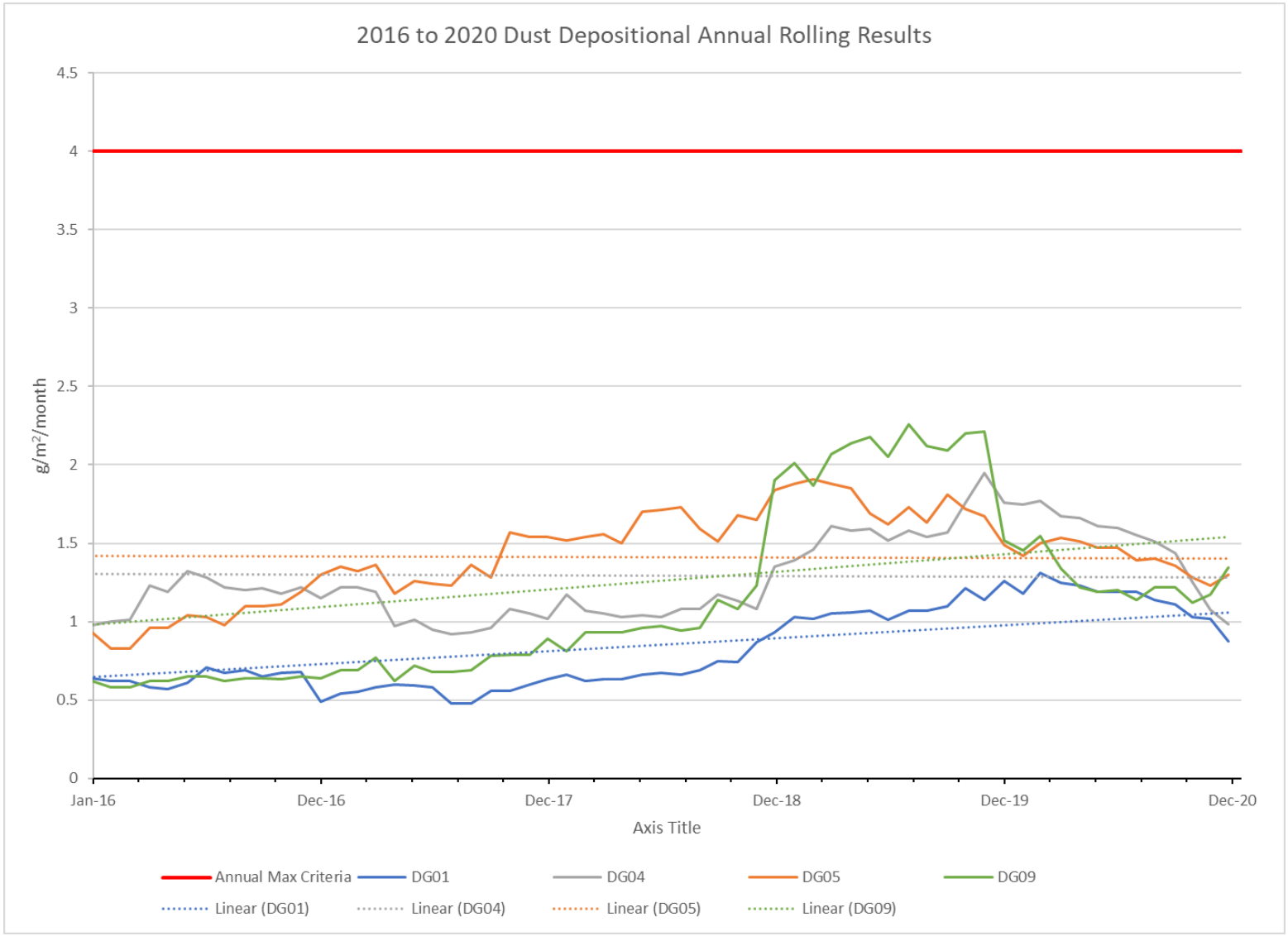


Table 3: TEOM Monitoring Data (Cumulative)

Date	Ulan School TEOM01 EPL 17	Lagoons Road TEOM04	Ulan Road TEOM07 EPL27		Ulan-Wollar Road TEOM06^ EPL15	Comment
	PM10 Daily Result (24hr Average Limit = 50µg/m³)			PM2.5 Daily Result (24hr Average Limit = 25µg/m³)	PM10 Daily Result (µg/m³)	
1/01/2020	120.4	118.3	125.8	72.7	121.7	Extraordinary Event
2/01/2020	65.0	67.4	79.2	41.2	57.1	Extraordinary Event
3/01/2020	43.0	44.8	47.4	22.0	37.8	Extraordinary Event
4/01/2020	61.3	53.6	59.2	23.3	52.9	Extraordinary Event
5/01/2020	157.4	159.1	-	-	161.4	Extraordinary Event, Equipment Breakdown
6/01/2020	61.6	73.8	-	-	55.5	Extraordinary Event, Equipment Breakdown
7/01/2020	27.6	25.5	104.0	63.7	28.9	Extraordinary Event
8/01/2020	39.2	40.8	37.3	25.9	-	Extraordinary Event, Equipment Breakdown
9/01/2020	38.5	34.8	38.2	30.3	-	Extraordinary Event, Equipment Breakdown
10/01/2020	74.4	79.9	72.0	22.5	79.6	Extraordinary Event
11/01/2020	585.5	581.9	437.9	57.7	581.3	Extraordinary Event
12/01/2020	75.7	76.6	64.4	50.0	71.4	Extraordinary Event
13/01/2020	40.5	44.7	35.6	24.3	36.3	
14/01/2020	38.2	43.9	34.1	21.2	33.4	
15/01/2020	51.8	51.0	43.7	31.9	56.0	Extraordinary Event
16/01/2020	22.9	20.0	16.5	9.9	24.0	
17/01/2020	21.6	18.7	14.1	12.5	16.0	
18/01/2020	18.9	19.2	17.0	14.8	15.3	
19/01/2020	15.7	15.1	13.8	10.9	12.1	
20/01/2020	77.7	73.0	64.3	14.5	79.3	Extraordinary Event
21/01/2020	40.1	36.4	30.0	6.0	48.9	Extraordinary Event
22/01/2020	40.2	42.1	36.4	15.7	49.4	
23/01/2020	152.4	151.8	131.1	21.3	156.9	Extraordinary Event
24/01/2020	44.3	46.1	38.5	14.6	45.0	Extraordinary Event
25/01/2020	53.6	62.0	43.1	22.2	51.2	Extraordinary Event
26/01/2020	17.0	16.5	13.5	5.0	20.0	
27/01/2020	17.6	17.9	15.5	7.1	28.6	
28/01/2020	34.6	37.0	32.3	11.0	61.3	Extraordinary Event
29/01/2020	41.0	42.7	31.4	17.3	45.5	
30/01/2020	43.6	48.0	37.4	23.3	38.2	
31/01/2020	34.0	35.9	33.6	13.0	33.1	
1/02/2020	72.6	57.0	49.6	11.7	80.4	Extraordinary Event
2/02/2020	45.7	44.1	35.1	8.7	68.5	Extraordinary Event
3/02/2020	45.2	48.1	35.2	9.2	49.6	
4/02/2020	60.5	57.5	44.7	23.1	48.3	Extraordinary Event
5/02/2020	20.2	21.5	13.8	6.5	28.5	
6/02/2020	13.4	12.0	9.2	3.9	10.0	
7/02/2020	6.1	7.5	3.5	2.8	4.0	
8/02/2020	6.3	8.2	3.9	1.8	5.7	
9/02/2020	-	-	-	-	-	Power Outage
10/02/2020	6.1	7.7	6.9	4.5	6.0	
11/02/2020	12.8	12.2	8.3	4.5	14.0	
12/02/2020	14.9	14.6	11.4	8.6	12.6	

Date	Ulan School TEOM01 EPL 17	Lagoons Road TEOM04	Ulan Road TEOM07 EPL27		Ulan-Wollar Road TEOM06^ EPL15	Comment
	PM10 Daily Result (24hr Average Limit = 50µg/m³)			PM2.5 Daily Result (24hr Average Limit = 25µg/m³)	PM10 Daily Result (µg/m³)	
13/02/2020	8.7	8.2	6.6	4.1	6.8	
14/02/2020	20.2	13.7	10.7	4.4	16.1	
15/02/2020	26.1	23.4	19.7	5.8	30.2	
16/02/2020	19.1	19.5	15.5	9.3	14.2	
17/02/2020	-	-	8.3	4.6	-	Power Outage
18/02/2020	-	-	16.9	6.2	19.4	Power Outage
19/02/2020	65.2	59.4	58.8	8.0	63.9	Extraordinary Event
20/02/2020	18.8	15.7	12.9	3.9	29.2	
21/02/2020	25.4	25.9	19.8	9.0	21.1	
22/02/2020	18.8	19.0	14.4	7.6	15.7	
23/02/2020	16.0	15.0	8.9	3.5	10.8	
24/02/2020	19.3	18.1	10.4	5.1	11.5	
25/02/2020	11.5	9.1	8.7	3.3	8.2	
26/02/2020	14.1	9.8	6.7	2.6	22.8	
27/02/2020	14.5	13.6	13.2	4.7	16.5	
28/02/2020	30.6	24.3	17.8	4.1	35.2	
29/02/2020	24.9	27.1	17.1	7.2	23.5	
1/03/2020	19.8	18.6	12.5	4.8	21.1	
2/03/2020	25.5	23.1	17.1	4.5	47.7	
3/03/2020	23.7	24.1	13.5	5.7	21.1	
4/03/2020	20.9	15.4	8.9	5.3	12.1	
5/03/2020	10.3	9.9	-	-	8.7	Power Outage
6/03/2020	4.5	4.5	-	-	6.8	Power Outage
7/03/2020	12.8	12.9	7.9	4.0	11.1	
8/03/2020	11.3	12.3	8.6	4.9	8.5	
9/03/2020	13.6	12.5	7.8	4.6	9.6	
10/03/2020	12.9	12.6	8.7	4.7	8.9	
11/03/2020	18.4	13.1	8.0	4.3	10.6	
12/03/2020	13.0	13.1	6.1	2.2	7.9	
13/03/2020	15.8	15.5	6.4	2.9	13.1	
14/03/2020	16.1	14.7	9.1	4.9	22.9	
15/03/2020	11.6	8.8	7.0	3.3	9.3	
16/03/2020	10.6	7.3	4.2	3.2	7.2	
17/03/2020	13.5	12.8	6.4	3.2	9.0	
18/03/2020	13.4	14.2	9.9	4.2	14.8	
19/03/2020	18.7	19.2	14.8	5.7	32.0	
20/03/2020	19.7	18.8	16.5	3.8	32.5	
21/03/2020	29.2	34.1	24.0	7.3	38.8	
22/03/2020	24.6	23.3	19.3	7.3	37.1	
23/03/2020	22.8	26.7	13.7	5.5	24.0	
24/03/2020	17.0	20.5	11.9	4.1	14.0	
25/03/2020	17.0	19.2	9.5	4.1	18.3	
26/03/2020	7.4	7.8	4.9	3.1	6.3	
27/03/2020	13.9	13.1	8.6	4.8	11.6	
28/03/2020	16.8	16.6	11.2	5.4	14.9	

Date	Ulan School TEOM01 EPL 17	Lagoons Road TEOM04	Ulan Road TEOM07 EPL27		Ulan-Wollar Road TEOM06^ EPL15	Comment
	PM10 Daily Result (24hr Average Limit = 50µg/m³)			PM2.5 Daily Result (24hr Average Limit = 25µg/m³)	PM10 Daily Result (µg/m³)	
29/03/2020	10.3	12.3	5.7	3.3	10.4	
30/03/2020	9.4	9.3	5.6	3.9	10.8	
31/03/2020	12.3	9.8	6.0	3.5	11.8	
1/04/2020	22.2	20.8	12.7	7.9	23.0	
2/04/2020	11.9	13.4	9.4	6.0	13.3	
3/04/2020	8.3	8.1	5.6	3.9	8.1	
4/04/2020	6.4	6.7	4.7	1.3	6.4	
5/04/2020	16.4	17.7	12.0	3.3	19.1	
6/04/2020	12.3	11.0	6.5	3.2	14.5	
7/04/2020	14.8	14.1	7.5	4.0	18.6	
8/04/2020	14.5	12.9	6.5	3.5	9.2	
9/04/2020	11.0	9.7	3.3	1.2	9.0	
10/04/2020	4.6	5.0	4.5	3.3	6.5	
11/04/2020	15.7	14.7	10.5	2.1	16.8	
12/04/2020	12.9	12.6	8.4	4.1	15.8	
13/04/2020	14.9	15.6	7.7	4.1	18.3	
14/04/2020	16.0	16.4	10.1	4.9	26.8	
15/04/2020	16.0	19.5	10.5	5.1	28.3	
16/04/2020	16.8	15.4	10.7	4.6	22.4	
17/04/2020	14.2	11.9	12.2	4.5	17.6	
18/04/2020	12.4	12.2	9.6	4.2	17.1	
19/04/2020	12.0	15.1	11.2	6.2	17.9	
20/04/2020	12.9	12.7	12.0	5.4	18.4	
21/04/2020	14.5	12.5	6.7	3.0	21.8	
22/04/2020	20.6	17.2	10.1	3.7	20.6	
23/04/2020	14.5	13.8	12.2	3.5	21.3	
24/04/2020	24.1	21.8	20.0	6.9	32.2	
25/04/2020	20.2	20.2	16.4	5.3	28.7	
26/04/2020	21.1	18.6	15.8	3.3	31.5	
27/04/2020	13.8	11.6	7.6	3.1	9.8	
28/04/2020	21.6	18.6	13.8	5.4	12.7	
29/04/2020	20.0	13.3	11.8	5.2	12.5	
30/04/2020	6.7	7.5	7.8	4.6	8.3	
1/05/2020	7.1	6.2	3.4	0.8	6.7	
2/05/2020	5.3	5.5	2.8	1.5	5.7	
3/05/2020	6.5	6.5	4.0	2.7	7.6	
4/05/2020	10.3	8.9	6.7	4.3	10.5	
5/05/2020	12.0	8.9	4.5	2.3	11.0	
6/05/2020	13.4	10.0	7.2	4.8	14.8	
7/05/2020	12.3	9.1	7.9	5.0	20.0	
8/05/2020	15.4	10.2	7.4	3.3	19.5	
9/05/2020	13.5	11.5	9.4	4.9	30.8	
10/05/2020	7.4	7.1	3.6	0.4	10.4	
11/05/2020	10.5	9.5	5.1	2.9	10.2	
12/05/2020	13.3	13.0	12.9	4.2	20.6	

Date	Ulan School TEOM01 EPL 17	Lagoons Road TEOM04	Ulan Road TEOM07 EPL27		Ulan-Wollar Road TEOM06^ EPL15	Comment
	PM10 Daily Result (24hr Average Limit = 50µg/m³)			PM2.5 Daily Result (24hr Average Limit = 25µg/m³)	PM10 Daily Result (µg/m³)	
13/05/2020	14.7	12.5	7.9	4.4	28.3	
14/05/2020	16.1	11.4	6.5	2.8	17.8	
15/05/2020	15.2	11.9	7.5	4.1	18.2	
16/05/2020	10.1	9.5	4.6	3.0	6.6	
17/05/2020	11.9	9.8	5.5	2.5	13.3	
18/05/2020	11.4	10.6	5.0	2.4	11.9	
19/05/2020	12.1	12.3	6.3	2.1	9.5	
20/05/2020	18.3	10.4	8.8	4.0	20.9	
21/05/2020	7.2	5.3	3.0	1.0	8.5	
22/05/2020	6.7	5.3	5.0	2.4	6.2	
23/05/2020	7.5	7.1	7.2	4.4	7.8	
24/05/2020	6.9	6.1	5.0	3.7	8.4	
25/05/2020	7.0	6.4	5.4	3.5	9.3	
26/05/2020	9.5	6.4	3.2	1.5	8.7	
27/05/2020	16.7	12.1	8.2	3.2	12.5	
28/05/2020	15.0	9.9	8.5	4.6	15.0	
29/05/2020	12.7	13.8	9.2	4.7	14.1	
30/05/2020	12.4	12.7	8.7	3.7	15.4	
31/05/2020	13.6	13.3	11.0	5.4	16.3	
1/06/2020	10.5	8.2	6.5	3.1	19.7	
2/06/2020	7.6	6.7	3.8	1.8	6.9	
3/06/2020	7.8	6.6	3.2	1.9	8.1	
4/06/2020	15.3	13.8	6.6	2.8	14.3	
5/06/2020	13.0	11.8	6.6	2.9	18.7	
6/06/2020	14.3	17.3	12.6	8.2	19.2	
7/06/2020	17.0	18.9	11.4	6.0	22.1	
8/06/2020	14.5	13.2	7.7	5.2	25.4	
9/06/2020	11.7	10.7	4.7	2.5	17.5	
10/06/2020	10.0	9.0	5.5	3.5	6.4	
11/06/2020	13.5	10.7	8.6	5.2	13.2	
12/06/2020	16.0	-	8.7	4.9	15.1	Equipment Breakdown
13/06/2020	15.4	-	12.5	7.0	12.5	Equipment Breakdown
14/06/2020	8.3	-	5.9	3.7	9.6	Equipment Breakdown
15/06/2020	9.7	-	6.0	2.4	11.2	Equipment Breakdown
16/06/2020	9.7	6.9	6.8	2.7	10.4	
17/06/2020	11.4	9.0	4.8	2.6	11.3	
18/06/2020	13.8	12.7	7.9	3.0	10.0	
19/06/2020	12.1	12.3	7.2	3.1	10.7	
20/06/2020	13.6	11.1	8.3	5.0	27.1	
21/06/2020	7.5	6.3	6.2	4.0	14.9	
22/06/2020	4.7	4.0	2.7	2.0	5.4	
23/06/2020	5.6	4.1	2.2	1.6	4.3	
24/06/2020	6.4	4.2	2.9	2.2	4.4	
25/06/2020	6.1	4.0	2.8	2.4	7.2	
26/06/2020	10.1	7.2	3.6	2.2	8.2	

Date	Ulan School TEOM01 EPL 17	Lagoons Road TEOM04	Ulan Road TEOM07 EPL27		Ulan-Wollar Road TEOM06^ EPL15	Comment
	PM10 Daily Result (24hr Average Limit = 50µg/m³)			PM2.5 Daily Result (24hr Average Limit = 25µg/m³)	PM10 Daily Result (µg/m³)	
27/06/2020	15.6	12.7	6.4	2.9	23.6	
28/06/2020	15.1	12.1	6.5	3.6	20.0	
29/06/2020	12.6	10.4	5.6	3.3	18.4	
30/06/2020	13.3	12.1	7.7	4.6	13.7	
1/07/2020	14.2	10.8	7.3	3.9	17.7	
2/07/2020	12.2	8.7	6.0	2.9	16.5	
3/07/2020	9.6	8.5	7.6	2.9	12.7	
4/07/2020	5.4	5.1	3.3	1.8	7.1	
5/07/2020	5.3	4.6	3.4	2.6	7.6	
6/07/2020	9.9	8.5	5.3	3.0	11.4	
7/07/2020	14.2	11.0	7.2	4.0	17.4	
8/07/2020	13.5	10.5	5.0	2.3	12.5	
9/07/2020	13.9	14.4	6.9	3.7	15.1	
10/07/2020	11.8	8.4	6.0	3.9	14.7	
11/07/2020	3.8	3.5	-	-	4.2	Equipment Breakdown
12/07/2020	5.6	4.2	3.5	3.0	5.3	
13/07/2020	6.3	4.4	2.0	1.7	6.0	
14/07/2020	7.8	4.8	3.4	2.6	6.8	
15/07/2020	7.7	5.0	2.4	1.2	7.3	
16/07/2020	6.6	5.1	2.9	1.8	12.2	
17/07/2020	10.2	8.0	6.0	3.1	9.8	
18/07/2020	9.8	10.1	5.5	3.3	14.7	
19/07/2020	8.2	7.4	4.6	2.5	15.1	
20/07/2020	10.2	7.4	7.1	2.8	11.3	
21/07/2020	12.6	12.0	5.8	2.1	13.5	
22/07/2020	17.7	12.2	8.9	3.3	19.2	
23/07/2020	14.1	12.9	9.7	4.3	16.1	
24/07/2020	19.0	15.9	12.3	7.0	19.6	
25/07/2020	12.7	11.3	6.8	4.8	20.0	
26/07/2020	3.8	3.9	2.4	2.2	3.9	
27/07/2020	3.9	3.8	1.7	1.4	-	Power Outage
28/07/2020	6.0	5.2	2.7	2.1	3.3	
29/07/2020	11.1	5.4	3.0	2.0	7.5	
30/07/2020	12.6	8.6	4.1	1.9	8.4	
31/07/2020	14.8	13.1	10.8	4.5	11.5	
1/08/2020	12.6	11.0	8.1	4.1	18.1	
2/08/2020	9.2	9.6	7.5	4.8	17.2	
3/08/2020	10.2	8.3	9.0	3.8	17.2	
4/08/2020	10.4	8.1	6.7	2.7	15.4	
5/08/2020	8.8	7.0	5.8	1.9	7.6	
6/08/2020	9.7	6.7	11.8	4.8	11.0	
7/08/2020	6.2	5.4	3.0	1.2	4.4	
8/08/2020	4.0	3.6	3.7	3.0	3.4	
9/08/2020	1.7	1.2	1.1	0.9	2.1	
10/08/2020	9.1	5.0	2.8	1.6	7.0	

Date	Ulan School TEOM01 EPL 17	Lagoons Road TEOM04	Ulan Road TEOM07 EPL27		Ulan-Wollar Road TEOM06^ EPL15	Comment
	PM10 Daily Result (24hr Average Limit = 50µg/m³)			PM2.5 Daily Result (24hr Average Limit = 25µg/m³)	PM10 Daily Result (µg/m³)	
11/08/2020	13.6	9.7	5.9	2.5	7.7	
12/08/2020	19.2	12.4	7.4	3.4	14.4	
13/08/2020	9.2	6.2	4.5	2.6	12.6	
14/08/2020	11.8	7.3	4.4	2.4	23.5	
15/08/2020	4.5	4.3	3.2	2.5	4.4	
16/08/2020	4.4	3.8	3.1	1.9	5.1	
17/08/2020	5.9	4.0	3.7	2.3	6.3	
18/08/2020	6.2	3.6	3.4	2.4	5.7	
19/08/2020	61.0	56.3	47.8	7.9	64.4	Extraordinary Event
20/08/2020	20.6	16.5	10.6	4.0	20.6	
21/08/2020	8.2	6.0	2.5	0.5	8.5	
22/08/2020	5.0	4.5	1.9	1.1	5.2	
23/08/2020	6.0	5.6	3.3	1.8	6.1	
24/08/2020	8.1	5.4	-	-	8.2	Equipment Breakdown
25/08/2020	9.0	5.6	3.7	1.6	9.7	
26/08/2020	13.6	10.7	6.4	3.7	16.3	
27/08/2020	9.8	7.6	6.4	2.7	17.9	
28/08/2020	12.5	10.2	9.8	4.0	15.6	
29/08/2020	17.2	19.6	11.1	4.9	25.0	
30/08/2020	18.6	15.5	17.1	9.9	37.9	
31/08/2020	13.4	11.5	12.1	4.3	31.7	
1/09/2020	22.5	23.8	18.1	6.5	20.6	
2/09/2020	28.9	18.9	16.5	6.8	28.2	
3/09/2020	34.9	19.5	17.4	9.0	35.4	
4/09/2020	23.8	16.4	13.1	6.9	19.4	
5/09/2020	11.0	8.7	9.4	5.7	14.5	
6/09/2020	17.5	16.3	9.2	3.3	18.7	
7/09/2020	18.0	18.1	10.6	4.0	16.8	
8/09/2020	20.1	18.1	12.4	4.7	23.6	
9/09/2020	13.2	10.6	8.1	4.7	20.0	
10/09/2020	10.3	7.7	5.1	2.9	7.8	
11/09/2020	14.2	10.4	6.5	3.2	12.1	
12/09/2020	10.1	9.5	8.0	3.3	15.0	
13/09/2020	11.9	10.3	10.4	3.1	18.1	
14/09/2020	12.8	11.1	10.4	3.2	18.5	
15/09/2020	19.8	22.7	14.5	7.4	22.0	
16/09/2020	22.3	16.8	12.9	5.4	22.1	
17/09/2020	19.2	17.4	11.7	6.2	28.8	
18/09/2020	18.5	19.4	13.6	7.2	14.3	
19/09/2020	19.7	20.4	17.5	11.0	16.1	
20/09/2020	8.4	8.6	6.2	4.4	8.0	
21/09/2020	11.6	10.2	7.3	4.4	10.7	
22/09/2020	20.1	18.3	17.4	4.6	21.0	
23/09/2020	14.2	11.9	10.0	3.2	16.4	
24/09/2020	8.8	7.9	6.8	1.7	9.2	

Date	Ulan School TEOM01 EPL 17	Lagoons Road TEOM04	Ulan Road TEOM07 EPL27		Ulan-Wollar Road TEOM06^ EPL15	Comment
	PM10 Daily Result (24hr Average Limit = 50µg/m³)			PM2.5 Daily Result (24hr Average Limit = 25µg/m³)	PM10 Daily Result (µg/m³)	
25/09/2020	13.4	8.9	7.9	3.4	15.8	
26/09/2020	5.9	6.0	3.1	1.8	7.8	
27/09/2020	7.5	6.5	4.5	3.4	9.4	
28/09/2020	14.0	13.8	10.2	4.9	18.1	
29/09/2020	19.1	20.3	11.0	4.3	18.7	
30/09/2020	13.8	13.9	9.5	5.6	12.9	
1/10/2020	11.1	8.5	7.1	3.5	12.7	
2/10/2020	11.9	12.4	10.3	5.2	21.9	
3/10/2020	13.1	13.9	10.6	6.3	24.7	
4/10/2020	17.0	15.6	13.5	6.7	24.6	
5/10/2020	14.7	16.1	12.2	6.3	22.3	
6/10/2020		21.1	17.3	8.2	32.8	Equipment Breakdown
7/10/2020	24.2	24.4	20.9	12.7	20.0	
8/10/2020	12.8	10.3	12.5	7.3	14.4	
9/10/2020	8.1	7.7	4.6	1.0	14.6	
10/10/2020	9.0	12.7	5.2	2.2	16.9	
11/10/2020	10.8	13.3	6.1	3.5	28.6	
12/10/2020	23.6	22.0	12.6	4.8	36.6	
13/10/2020	-	-	-	-	-	Power Outage
14/10/2020	33.5	31.3	23.9	12.1	31.7	
15/10/2020	19.1	20.9	-	-	24.0	Equipment Breakdown
16/10/2020	21.2	19.5	-	-	44.6	Equipment Breakdown
17/10/2020	22.7	22.9	19.6	8.7	31.4	
18/10/2020	4.6	4.7	3.1	1.8	8.0	
19/10/2020	9.2	9.7	8.1	4.8	10.1	
20/10/2020	12.6	16.1	12.0	5.4	10.6	
21/10/2020	15.7	17.5	13.1	6.9	12.0	
22/10/2020	17.4	15.9	13.1	5.8	16.3	
23/10/2020	17.4	17.5	16.3	7.5	15.7	
24/10/2020	7.5	7.5	8.1	6.2	8.2	
25/10/2020	5.6	5.3	2.9	2.1	5.1	
26/10/2020	4.0	4.2	1.3	0.4	4.0	
27/10/2020	7.0	7.0	4.7	2.6	5.4	
28/10/2020	6.8	6.9	4.1	2.5	6.1	
29/10/2020	9.1	7.5	10.3	5.6	8.1	
30/10/2020	13.8	12.3	8.6	5.0	9.8	
31/10/2020	9.0	8.8	8.8	5.5	9.9	
1/11/2020	7.4	6.6	4.0	2.4	8.8	
2/11/2020	14.9	15.6	8.3	3.2	10.9	
3/11/2020	15.8	17.3	12.4	5.0	11.1	
4/11/2020	16.4	16.4	13.5	6.8	20.0	
5/11/2020	11.9	10.4	10.2	5.4	19.6	
6/11/2020	7.6	5.2	5.7	3.0	10.1	
7/11/2020	18.8	18.4	13.7	6.1	18.6	
8/11/2020	17.2	19.1	11.7	4.0	14.7	

Date	Ulan School TEOM01 EPL 17	Lagoons Road TEOM04	Ulan Road TEOM07 EPL27		Ulan-Wollar Road TEOM06^ EPL15	Comment
	PM10 Daily Result (24hr Average Limit = 50µg/m³)			PM2.5 Daily Result (24hr Average Limit = 25µg/m³)	PM10 Daily Result (µg/m³)	
9/11/2020	14.5	16.5	10.4	4.8	10.1	
10/11/2020	15.7	17.1	12.9	5.7	13.1	
11/11/2020	20.3	25.1	23.2	9.8	19.3	
12/11/2020	32.4	28.2	24.8	12.2	38.4	
13/11/2020	16.3	14.1	11.5	6.1	15.6	
14/11/2020	10.8	10.1	10.7	5.2	16.6	
15/11/2020	14.9	12.7	12.5	5.7	23.4	
16/11/2020	28.2	24.8	19.9	7.1	43.0	
17/11/2020	24.4	22.5	19.5	7.9	29.6	
18/11/2020	29.6	28.9	23.5	9.6	25.5	
19/11/2020	28.1	28.8	22.2	8.6	23.2	
20/11/2020	27.3	28.2	26.8	12.0	29.4	
21/11/2020	32.5	31.7	27.5	12.0	35.3	
22/11/2020	25.5	22.0	20.4	11.6	25.4	
23/11/2020	12.3	10.0	12.3	7.8	15.1	
24/11/2020	14.0	13.5	12.6	7.9	10.4	
25/11/2020	19.2	18.7	17.5	8.4	16.7	
26/11/2020	18.6	18.8	20.7	13.1	21.4	
27/11/2020	27.9	26.9	37.8	28*	28.1	
28/11/2020	22.9	20.9	30.8	20.2	28.0	
29/11/2020	25.2	22.9	26.3	11.4	31.6	
30/11/2020	27.5	30.3	25.4	15.3	24.9	
1/12/2020	29.4	28.4	36.7	23.7	29.6	
2/12/2020	29.5	29.0	46.1	33.6*	30.5	
3/12/2020	14.6	14.4	27.1	23.7	12.0	
4/12/2020	16.0	15.8	23.8	14.8	16.6	
5/12/2020	25.4	28.3	-	-	-	Power Outage
6/12/2020	22.0	21.4	28.6	13.2	24.2	
7/12/2020	15.0	13.8	13.2	5.5	20.9	
8/12/2020	9.4	9.3	5.9	3.2	12.5	
9/12/2020	15.3	15.3	16.1	7.7	16.8	
10/12/2020	24.0	23.1	18.7	10.8	24.9	
11/12/2020	14.5	12.8	12.3	9.0	9.7	
12/12/2020	14.4	14.6	10.0	6.6	10.9	
13/12/2020	13.6	13.4	8.9	6.1	9.4	
14/12/2020	15.7	12.4	12.8	11.2	10.1	
15/12/2020	8.1	9.2	-	-	6.7	PM 2.5 > PM10 excluded
16/12/2020	8.9	10.2	-	-	9.3	Equipment Breakdown
17/12/2020	12.2	9.8	7.9	6.6	6.2	
18/12/2020	9.5	6.5	-	-	10.7	Power Outage
19/12/2020	8.7	6.9	7.7	6.5	5.9	
20/12/2020	13.9	10.7	7.7	6.2	12.9	
21/12/2020	7.8	5.3	-	-	-	Equipment Breakdown, Power Outage
22/12/2020	6.9	5.4	-	-	7.6	PM 2.5 > PM10 excluded
23/12/2020	10.4	8.6	4.2	3.4	10.0	

Date	Ulan School TEOM01 EPL 17	Lagoons Road TEOM04	Ulan Road TEOM07 EPL27		Ulan-Wollar Road TEOM06^ EPL15	Comment
	PM10 Daily Result (24hr Average Limit = 50µg/m³)			PM2.5 Daily Result (24hr Average Limit = 25µg/m³)	PM10 Daily Result (µg/m³)	
24/12/2020	14.2	13.1	5.9	3.9	11.8	
25/12/2020	14.8	13.5	8.2	6.5	12.9	
26/12/2020	11.4	11.2	8.2	6.8	10.8	
27/12/2020	13.9	9.4	7.4	5.2	10.1	
28/12/2020	9.4	7.8	4.6	3.8	8.6	
29/12/2020	9.0	8.8	-	-	8.1	Power Outage
30/12/2020	6.9	7.2	-	-	4.5	Power Outage
31/12/2020	7.8	7.1	4.4	3.7	5.4	

Notes:
All readings are cumulative (Moolarben Mine Contribution plus background). PM10 24 hour average criteria is cumulative. PM2.5 24 hour average criteria is Incremental Impact (Concentration due to Moolarben Mine Complex on its own).
*Cumulative PM2.5 results were greater than the criteria. MCO contribution (Incremental impact) is below the criteria.
^ TEOM06 is used to measure "upwind" air quality when wind is in the direction of private residences. It is not representative of private residences.

Figure 3-c 2016 to 2020 TEOM Rolling Average

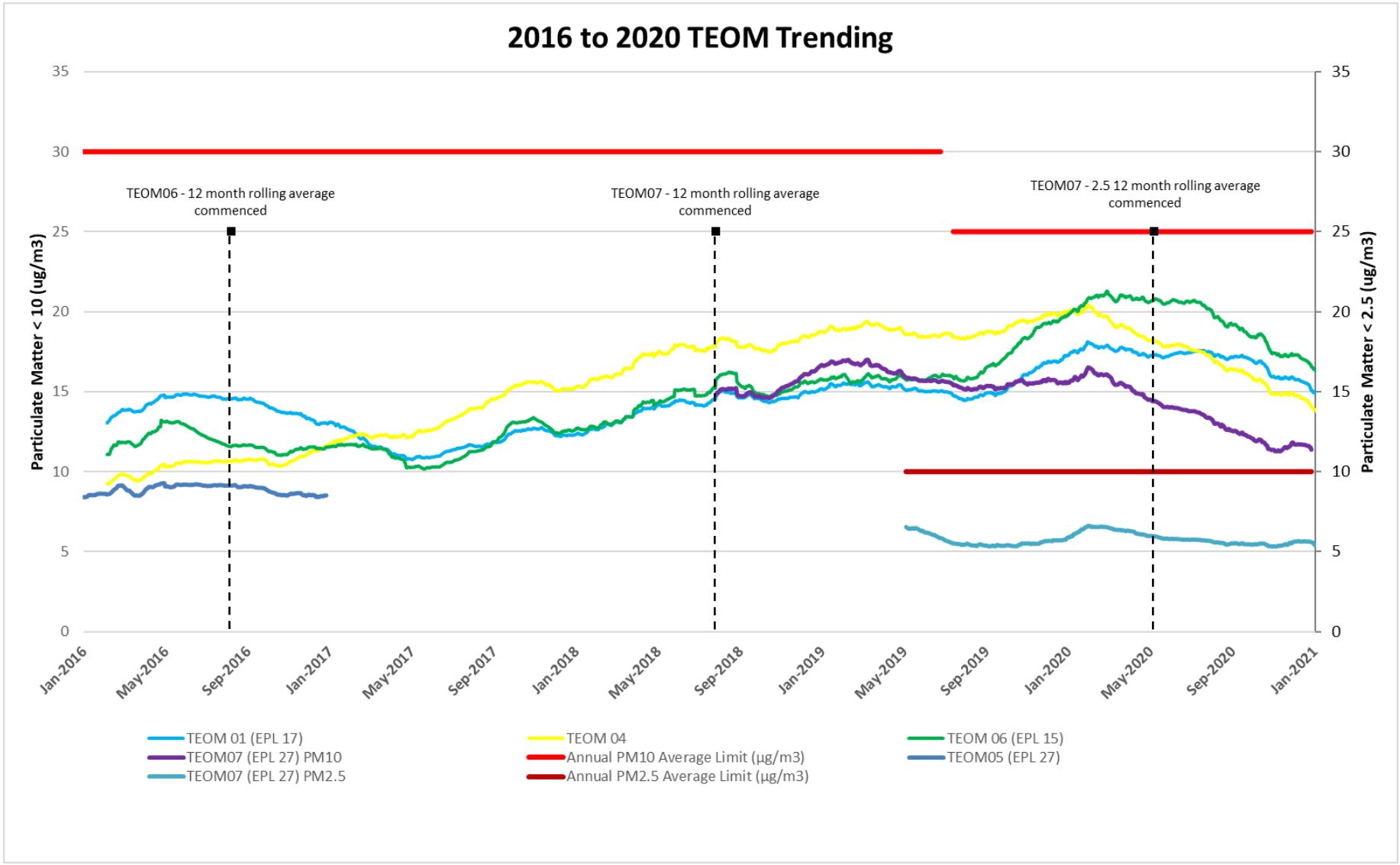


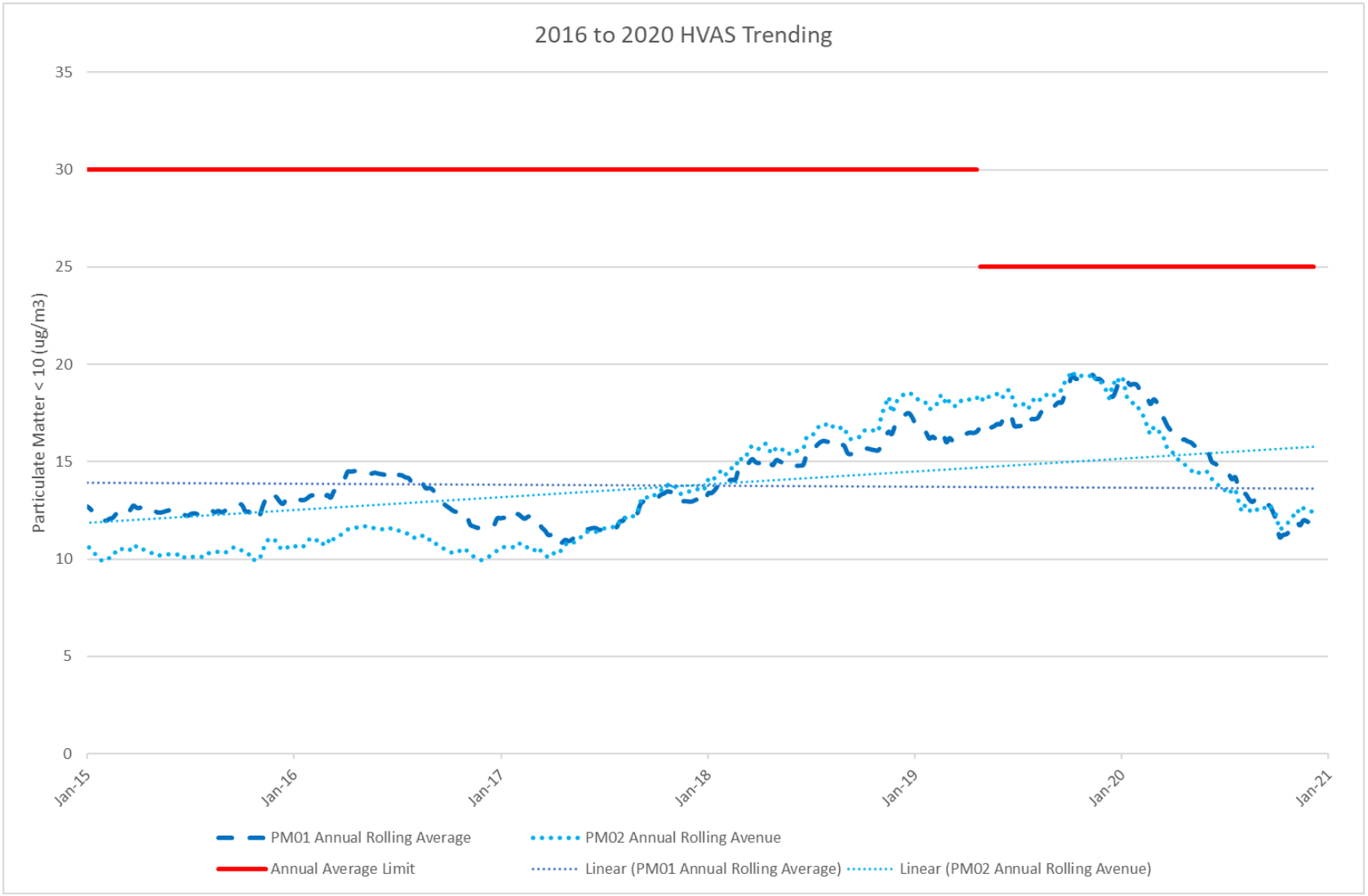
Table 4: HVAS monitoring results

Sampling Date	PM01	PM02
	Particulate Matter <10 µm (µg/m³)	Particulate Matter <10 µm (µg/m³)
3/01/2020	60c	62c
9/01/2020	44c	51c
15/01/2020	56c	66c
21/01/2020	42c	44c
27/01/2020	23	24
2/02/2020	55c	62c
8/02/2020	5	7
14/02/2020	21	14
20/02/2020	17	16
26/02/2020	10	5
3/03/2020	19	16
9/03/2020	13	10
15/03/2020	8	5
21/03/2020	26	33
27/03/2020	11	9
2/04/2020	9	10
8/04/2020	10	9
14/04/2020	10	10
20/04/2020	7	10
26/04/2020	17	19
2/05/2020	3	2
8/05/2020	8	6
14/05/2020	10	7
20/05/2020	10	7
26/05/2020	4	1
1/06/2020	3	2
7/06/2020	9	12
13/06/2020	10	14
19/06/2020	5	6
25/06/2020	<1	<1
1/07/2020	3	<1
7/07/2020	9	10
13/07/2020	2	2
19/07/2020	3	7
25/07/2020	7	5
31/07/2020	7	11
6/08/2020	7	6
12/08/2020	10	9
18/08/2020	1	<1
24/08/2020	5	<1
30/08/2020	14	20
5/09/2020	7	5
11/09/2020	10	7

Sampling Date	PM01	PM02
	Particulate Matter <10 µm (µg/m³)	Particulate Matter <10 µm (µg/m³)
17/09/2020	12	11
23/09/2020	8	10
29/09/2020	16	26
5/10/2020	12	16
11/10/2020	10	18
17/10/2020	24	28
23/10/2020	14	19
29/10/2020	6	4
4/11/2020	12	13
10/11/2020	14	20
16/11/2020	29	28
22/11/2020	26	25
28/11/2020	23	29
4/12/2020	20	24
10/12/2020	26	26
16/12/2020	9	11
22/12/2020	7	7
28/12/2020	11	8

c - Result attributable to regional Extraordinary Events

Figure 3-d 2016 to 2020 HVAS Trending



APPENDIX 3E. BIODIVERSITY MONITORING DATA

2020 Autumn Flora Monitoring Results

BOA	Plot Number	MZ	Native Overstorey Species	Native Mid Storey Species	Native ground cover (Grasses)	Native Ground Cover (Shrubs)	Native Ground Cover (Other)	Exotic Ground Cover	Litter	Bare soil	Crypto	# Hollow Barring Trees	Logs (m)
BOA 1	1a	MZ1	16.5	0	12	0	0	0	66	10	14	0	40
BOA 1	1b	MZ1	20	0	16	2	0	0	68	14	0	0	10
BOA 1	2c	MZ1	36	2	10	0	10	0	76	8	0	0	30
BOA 1	4a	MZ2	7	0	24	0	18	6	6	34	10	0	0
BOA 1	5a	MZ1	13.5	0	10	10	8	2	56	24	0	0	100
BOA 1	5c	MZ1	7.5	2	2	0	20	0	46	30	2	1	50
BOA 1	6a	MZ1	5	2.5	2	2	4	0	86	6	0	1	50
BOA 1	6b	MZ1	7	6	2	0	4	0	68	6	0	6	90
BOA 1	7a	MZ2	0	5	26	4	8	0	28	50	4	0	0
BOA 1	14a	MZ1	19.5	0	8	16	8	0	58	0	0	0	20
BOA 1	24a	MZ2	0	0	8	0	2	36	4	52	0	0	0
BOA 2	13e	MZ1	2.5	1	0	12	6	0	46	32	4	0	4
BOA 2	11a	MZ1	16	2	6	0	12	0	42	36	0	2	250
BOA 2	11c	MZ1	31	0.5	6	6	2	2	74	4	8	1	30
BOA 2	11d	MZ1	13	0	2	16	0	0	54	4	24	0	40
BOA 2	13a	MZ1	7	0	0	0	8	0	38	4	50	2	28
BOA 2	10a2	MZ1	11	5	6	0	6	2	80	6	0	0	100
BOA 2	12a	MZ1	6	6	4	2	4	0	52	22	20	2	25
BOA 3	1e	MZ1	12	0	14	0	18	0	58	14	0	0	45
BOA 3	5e	MZ1	12	0	12	8	34	0	38	4	6	0	50
BOA 3	1f	MZ1	10	10	6	28	28	0	76	8	2	0	0
BOA 3	1h	MZ1	11.5	0	50	2	14	4	28	2	0	0	23
BOA 3	4f	MZ2	0	1	36	0	24	2	14	10	14	0	0
BOA 3	8d	MZ1	6	6	6	10	10	0	66	8	0	0	60
BOA 3	15a	MZ1	3.5	8.5	8	4	6	0	34	26	20	5	30
BOA 3	16a	MZ1	0.5	2	0	12	30	0	22	10	26	0	0

BOA	Plot Number	MZ	Native Overstorey Species	Native Mid Storey Species	Native ground cover (Grasses)	Native Ground Cover (Shrubs)	Native Ground Cover (Other)	Exotic Ground Cover	Litter	Bare soil	Crypto	# Hollow Barring Trees	Logs (m)
BOA 3	17a	MZ1	14	0.5	0	2	20	0	50	6	22	2	28
BOA 3	17b	MZ1	11	1	4	2	30	0	48	12	4	0	51
BOA 3	17c	MZ1	4.5	4.5	2	0	38	0	38	4	18	2	15
BOA 3	19b	MZ1	3	0.5	16	12	42	0	22	4	14	3	55
BOA 3	19c	MZ1	6.5	3.5	0	4	40	0	30	22	4	0	0
Bobadeen	Mod9_Fl1	MZ1	17	0	48	0	20	10	16	6	0	0	113
Bobadeen	Mod9_Fl3	MZ2	0	16	44	0	18	26	4	8	0	0	0
Bobadeen	Mod9_Fl5	MZ2	0	0	20	0	0	76	0	2	2	0	0
Bobadeen	Mod9_Fl9	MZ2	0	0.1	60	0	10	30	0	0	0	0	0
Bobadeen	Mod9_Fl2	MZ2	0	0	58	0	6	36	0	0	0	0	0
Bobadeen	Mod9_Fl4	MZ2	0	0	32	0	12	52	0	4	0	0	0
Bobadeen	Mod9_Fl6	MZ2	0	0	52	0	24	20	2	0	0	1	10
Bobadeen	Mod9_Fl7	MZ2	6.4	0	56	0	6	36	0	0	0	0	2
Bobadeen	Mod9_Fl8	MZ2	0	0	82	0	4	14	0	0	0	0	0
Clarkes	Mod9_Fl24	MZ1	17	0	24	4	6	0	64	2	0	1	15
Clarkes	Mod9_Fl25	MZ1	17.7	0.2	16	18	4	0	54	6	0	2	40
Clifford	Mod9_Fl19	MZ1	20.5	3	4	0	12	2	70	12	0	0	0
Clifford	Mod9_Fl17	MZ1	13	2	24	0	2	0	60	12	2	0	15
Clifford	Mod9_Fl21	MZ1	12	6	18	12	6	0	46	12	6	0	10
Clifford	Mod9_Fl22	MZ1	8.5	0	8	12	6	4	50	18	4	0	45
Clifford	Mod9_Fl20	MZ1	10	0	4	4	8	0	80	4	0	1	60
Clifford	Mod9_Fl15	MZ2	0	0	68	0	28	0	0	4	0	0	0
Clifford	Mod9_Fl16	MZ2	8.7	0	32	0	28	6	14	20	0	0	0
Clifford	Mod9_Fl18	MZ1	17.7	0.5	24	0	4	2	50	20	0	1	14
Clifford	Mod9_Fl23	MZ2	18	0.3	34	2	4	0	54	6	0	0	4
Dun Dun East	Stage2_Fl70	MZ2	0	0	20	0	2	62	2	14	0	0	0.3
Dun Dun East	Stage2_Fl71	MZ2	0	0	44	2	0	30	0	24	0	0	0
Dun Dun East	Stage2_Fl19	MZ1	15.8	0	10	0	6	2	52	30	0	0	95
Dun Dun East	Stage2_Fl20	MZ1	3.6	0.5	8	6	10	14	32	30	0	0	68

BOA	Plot Number	MZ	Native Overstorey Species	Native Mid Storey Species	Native ground cover (Grasses)	Native Ground Cover (Shrubs)	Native Ground Cover (Other)	Exotic Ground Cover	Litter	Bare soil	Crypto	# Hollow Barring Trees	Logs (m)
Dun Dun East	Stage2_Fl21	MZ1	11.5	3.8	6	12	0	0	60	22	0	2	170
Dun Dun East	Stage2_Fl22	MZ1	10	0	2	0	0	0	86	12	0	6	161
Dun Dun East	Stage2_Fl23	MZ1	12.5	9	16	8	0	0	52	22	0	6	172
Dun Dun East	Stage2_Fl24	MZ1	16	1.5	6	2	0	0	62	24	4	3	136
Dun Dun East	Stage2_Fl25	MZ1	7.5	2.9	20	4	6	2	58	10	0	0	87
Dun Dun East	Stage2_Fl26	MZ1	11.5	0.2	4	0	2	0	95	2	0	6	124
Dun Dun East	Stage2_Fl27	MZ1	9	0	4	0	4	0	84	8	0	0	4
Dun Dun East	Stage2_Fl28	MZ1	11	0.5	6	0	2	0	76	16	0	5	151
Dun Dun East	Stage2_Fl29	MZ1	8	0	8	0	2	0	72	18	0	8	100
Dun Dun East	Stage2_Fl30	MZ1	11	0.2	22	4	8	0	40	26	0	0	35
Dun Dun East	Stage2_Fl31	MZ2	0	0	22	0	6	8	12	48	0	0	0
Dun Dun East	Stage2_Fl32	MZ2	0	0	30	0	4	26	6	34	0	0	0
Dun Dun East	Stage2_Fl33	MZ2	0	0	42	0	0	26	0	32	0	0	0
Dun Dun East	Stage2_Fl34	MZ2	0	0	8	0	0	78	0	14	0	0	4
Dun Dun East	Stage2_Fl35	MZ2	0	0	22	0	4	18	22	34	0	0	30
Dun Dun East	Stage2_Fl36	MZ2	5.9	1.5	6	0	4	2	50	34	0	2	101
Dun Dun East	Stage2_Fl37	MZ2	0	0	12	0	2	42	18	26	0	0	0.5
Dun Dun East	Stage2_Fl38	MZ2	0	0	42	2	4	20	2	32	0	0	0
Dun Dun West	Stage2_Fl10	MZ1	13.3	0	6	2	4	0	74	14	0	3	100
Dun Dun West	Stage2_Fl11	MZ1	16.6	11.6	14	24	20	0	34	8	0	3	160
Dun Dun West	Stage2_Fl12	MZ1	23	0	0	0	0	0	96	4	0	2	120
Dun Dun West	Stage2_Fl13	MZ2	0	0	52	0	2	38	2	6	0	1	53
Dun Dun West	Stage2_Fl14	MZ2	0.5	0.2	38	12	12	6	6	26	0	0	65
Dun Dun West	Stage2_Fl15	MZ2	0	0.2	10	4	0	60	2	24	0	0	30
Dun Dun West	Stage2_Fl16	MZ2	0	0	52	6	10	10	2	20	0	0	37
Dun Dun West	Stage2_Fl17	MZ2	0	0	30	6	6	24	10	24	0	0	72
Dun Dun West	Stage2_Fl18	MZ2	0	0	0	0	12	78	8	2	0	0	98
Dun Dun West	Stage2_Fl7	MZ1	14.8	3.1	10	4	0	0	54	30	0	7	59
Dun Dun West	Stage2_Fl72	MZ2	0	0	42	0	6	8	8	36	0	0	35

BOA	Plot Number	MZ	Native Overstorey Species	Native Mid Storey Species	Native ground cover (Grasses)	Native Ground Cover (Shrubs)	Native Ground Cover (Other)	Exotic Ground Cover	Litter	Bare soil	Crypto	# Hollow Barring Trees	Logs (m)
Dun Dun West	Stage2_Fl73	MZ2	0	0	26	0	6	26	6	36	0	0	25
Dun Dun West	Stage2_Fl8	MZ1	10.7	0.1	28	2	12	44	12	2	0	0	70
Dun Dun West	Stage2_Fl9	MZ1	10.7	0.9	20	2	6	0	54	18	0	3	140
Elward	Mod9_Fl12	MZ1	50	4	44	0	24	14	14	4	0	10	137
Elward	Mod9_Fl10	MZ1	7.2	0.4	0	0	22	0	54	2	22	4	47
Elward	Mod9_Fl13	MZ1	16.3	0	2	0	6	0	78	14	0	4	47
Elward	Mod9_Fl11	MZ1	1.9	4.7	26	10	20	10	8	8	0	0	6
Elward	Mod9_Fl14	MZ2	5.5	7.7	44	4	24	4	2	16	2	0	0
Libertus	Stage2_Fl39	MZ1	2	13	0	2	30	0	58	6	4	0	50
Libertus	Stage2_Fl40	MZ1	17.5	1	2	2	0	0	96	0	0	0	0
Libertus	Stage2_Fl41	MZ2	0	0	24	0	38	12	22	2	2	0	0
Moolarmoo	Mod9_Fl32	MZ1	15	0	2	0	6	0	66	26	0	0	70
Moolarmoo	Mod9_Fl33	MZ1	11.7	6.1	20	0	32	0	6	40	0	0	50
Moolarmoo	Mod9_Fl34	MZ2	0	0	42	0	18	32	0	8	0	0	2
Moolarmoo	Mod9_Fl35	MZ2	0	0	20	0	46	34	0	0	0	0	0
Old Bobadeen	Stage2_Fl49	MZ1	13	0	16	0	18	14	40	10	2	1	10
Old Bobadeen	Stage2_Fl50	MZ2	0	0	42	0	24	24	0	10	0	0	0
Old Bobadeen	Stage2_Fl51	MZ2	0	0	40	0	18	40	0	2	0	0	0
Old Bobadeen	Stage2_Fl52	MZ2	0	0	34	0	36	30	0	0	0	0	0
Old Bobadeen	Stage2_Fl53	MZ2	0	0	22	0	18	58	0	2	0	0	0
Old Bobadeen	Stage2_Fl54	MZ2	0	0	34	0	20	46	0	0	0	0	0
Old Bobadeen	Stage2_Fl55	MZ2	0	0	38	0	36	24	2	0	0	0	0
Old Bobadeen	Stage2_Fl66	MZ2	0	0	38	0	8	12	2	40	0	0	4
Old Bobadeen	Stage2_Fl67	MZ2	0	0	46	0	24	20	0	10	0	0	0
Onsite Offset	Stage2_Fl58	MZ1	22.2	0	0	0	6	0	86	6	2	0	154
Onsite Offset	Stage2_Fl59	MZ1	23	0	22	0	12	0	64	2	0	2	60
Onsite Offset	Stage2_Fl60	MZ1	22	0.2	6	2	2	0	66	24	0	4	80
Onsite Offset	Stage2_Fl61	MZ2	0	0	22	0	50	10	4	14	0	0	8
Onsite Offset	Stage2_Fl62	MZ2	0	0.5	20	12	42	0	4	22	0	0	0

BOA	Plot Number	MZ	Native Overstorey Species	Native Mid Storey Species	Native ground cover (Grasses)	Native Ground Cover (Shrubs)	Native Ground Cover (Other)	Exotic Ground Cover	Litter	Bare soil	Crypto	# Hollow Barring Trees	Logs (m)
Onsite Offset	Stage2_Fl63	MZ2	0.8	12.5	30	4	24	22	6	14	0	0	0
Onsite Offset	Stage2_Fl64	MZ2	0	0	28	0	36	22	0	14	0	0	0
Onsite Offset	Stage2_Fl68	MZ2	0	0	40	0	24	2	6	28	0	0	0
Onsite Offset	Stage2_Fl69	MZ2	0	0	38	0	50	0	0	12	0	0	0
Property 24 & 25	Mod9_Fl29	MZ1	16.8	0.5	20	0	38	2	34	6	0	0	34
Property 24 & 25	Mod9_Fl31	MZ2	0	0	36	2	38	26	0	0	0	0	0
Property 24 & 25	Mod9_Fl30	MZ2	0	0	16	0	64	6	0	14	0	0	0
Property 5	Mod9_Fl28	MZ1	20.8	0	20	0	30	8	40	4	0	0	290
Property 5	Mod9_Fl27	MZ2	0	0	6	0	26	66	0	0	0	0	0
Property 5	Mod9_Fl26	MZ2	0	0	4	0	22	76	0	0	0	0	12
Ulan 18	Stage2_Fl43	MZ2	0	0	58	0	4	32	0	6	0	0	0
Ulan 18	Stage2_Fl44	MZ2	0	0	34	0	42	24	0	0	0	0	0
Ulan 18	Stage2_Fl45	MZ2	0	0	40	0	0	56	0	4	0	0	0
Ulan 18	Stage2_Fl47	MZ1	15.3	0.4	2	2	6	2	52	10	26	3	13
Ulan 18	Stage2_Fl48	MZ1	19.5	0	2	0	50	0	36	12	0	2	100
Ulan 18	Stage2_Fl65	MZ2	0	0	38	0	2	52	0	8	0	0	1

2020 Spring Flora Monitoring Results

BOA	Plot Number	MZ	Native Overstorey Species	Native Mid Storey Species	Native ground cover (Grasses)	Native Ground Cover (Shrubs)	Native Ground Cover (Other)	Exotic Ground Cover	Litter	Bare soil	Crypto	# Hollow Barring Trees	Logs (m)
BOA1	2d	MZ1	19.5	0	4	0	6	0	90	0	0	1	62
BOA1	4b	MZ2	0	4.5	14	0	0	10	42	34	0	0	0
BOA1	5b	MZ1	16	1	0	4	6	0	84	4	0	0	20
BOA1	7b	MZ2	0	5	20	2	20	0	24	20	8	0	2
BOA1	9a	MZ2	0	5.5	8	0	16	60	10	6	0	0	0
BOA1	9b	MZ2	4.5	1.5	10	0	4	0	30	44	0	0	3
BOA1	14b	MZ1	3.5	3.7	32	0	14	6	40	6	4	0	10

BOA	Plot Number	MZ	Native Overstorey Species	Native Mid Storey Species	Native ground cover (Grasses)	Native Ground Cover (Shrubs)	Native Ground Cover (Other)	Exotic Ground Cover	Litter	Bare soil	Crypto	# Hollow Barring Trees	Logs (m)
BOA1	21a	MZ2	0	1.5	18	0	66	10	2	2	2	0	0
BOA1	21b	MZ2	0	0	14	0	52	0	24	8	4	0	0
BOA1	24b	MZ2	0	1	8	0	10	0	54	28	0	0	0
BOA2	10b	MZ1	5	4.5	0	20	14	0	40	6	0	0	63
BOA2	11b	MZ1	12.5	3.5	6	8	10	0	56	20	0	2	67
BOA2	13g	MZ1	10	5.4	0	0	12	0	84	2	2	2	180
BOA2	13h	MZ1	15	2	6	2	10	0	78	0	4	5	60
BOA2	25a	MZ2	0	3	16	6	30	4	18	24	2	0	0
BOA3	4e	MZ2	3	0	40	0	20	4	30	4	2	0	0
BOA3	5h	MZ1	17	0	0	0	44	2	54	0	0	0	50
BOA3	6c	MZ1	19.5	1.5	2	0	2	0	60	12	2	4	85
BOA3	8c	MZ1	16	1.5	0	2	2	0	96	0	0	0	100
BOA3	15b	MZ1	2	2.5	0	6	84	0	4	6	0	5	15
BOA3	16b	MZ1	21.5	0.2	0	10	66	2	18	2	2	0	20
BOA3	17d	MZ1	2.5	0	6	0	50	0	26	6	12	0	2
BOA1	2d	MZ1	19.5	0	4	0	6	0	90	0	0	1	62
BOA3	19a	MZ1	4	7.7	4	0	28	4	44	10	10	4	40
Bobadeen	Mod9_Fl1	MZ1	21.1	0	26	0	36	22	12	2	2	0	0
Bobadeen	Mod9_Fl2	MZ2	0	0	48	0	4	44	0	2	0	0	0
Bobadeen	Mod9_Fl3	MZ2	11.1	0.5	20	20	16	50	8	6	0	0	0
Bobadeen	Mod9_Fl4	MZ2	0	0	36	0	6	50	0	6	0	0	0
Bobadeen	Mod9_Fl5	MZ2	0	0	6	0	4	84	0	6	0	0	0
Bobadeen	Mod9_Fl6	MZ2	0	0	14	0	16	38	22	10	0	1	20
Bobadeen	Mod9_Fl7	MZ2	7.7	0	38	0	6	56	0	0	0	0	2
Bobadeen	Mod9_Fl8	MZ2	0	0	10	0	2	42	42	4	0	0	0
Bobadeen	Mod9_Fl9	MZ2	0	0	28	4	2	64	2	0	0	0	0
Clarkes	Mod9_Fl15	MZ2	0	0	10	0	30	8	44	8	0	0	0
Clarkes	Mod9_Fl16	MZ2	7.3	0	4	0	12	16	34	32	2	0	0

BOA	Plot Number	MZ	Native Overstorey Species	Native Mid Storey Species	Native ground cover (Grasses)	Native Ground Cover (Shrubs)	Native Ground Cover (Other)	Exotic Ground Cover	Litter	Bare soil	Crypto	# Hollow Barring Trees	Logs (m)
Clarkes	Mod9_FI17	MZ1	20.4	2	8	0	14	0	78	0	0	0	30
Clarkes	Mod9_FI19	MZ1	10	0	0	0	28	0	62	0	4	0	0
Clarkes	Mod9_FI20	MZ1	14	0.06	0	4	10	0	82	4	0	0	0
Clarkes	Mod9_FI21	MZ1	23.9	8.1	2	12	4	0	70	8	4	0	0
Clarkes	Mod9_FI22	MZ1	25.3	0.12	10	6	0	0	68	14	2	0	0
Clifford	Mod9_FI18	MZ1	16.4	0	6	0	18	0	56	20	0	0	0
Clifford	Mod9_FI23	MZ2	19	0.7	12	0	16	2	68	2	0	0	0
Clifford	Mod9_FI24	MZ1	17.4	0.5	0	0	10	2	86	0	2	0	0
Clifford	Mod9_FI25	MZ1	12.1	6.4	0	0	6	0	8	10	4	0	0
Elward	Mod9_FI10	MZ1	21.5	12.4	4	18	30	0	32	0	0	1	124
Elward	Mod9_FI11	MZ1	3	5.4	4	20	56	0	16	4	0	0	12
Elward	Mod9_FI12	MZ1	9.3	6	34	6	40	0	16	0	0	2	62
Elward	Mod9_FI13	MZ1	28.5	0	0	0	4	0	64	30	0	2	74
Elward	Mod9_FI14	MZ2	5	7.4	30	26	18	6	4	16	0	0	0
Moolarmoo	Mod9_FI32	MZ1	15	0	2	0	18	0	54	10	0	0	9
Moolarmoo	Mod9_FI33	MZ1	7.6	10.8	6	0	20	22	10	14	0	0	0
Moolarmoo	Mod9_FI34	MZ2	0	0	20	0	6	66	4	0	2	0	0
Moolarmoo	Mod9_FI35	MZ2	0	0	12	0	14	70	4	0	0	0	0
Property 24 & 25	Mod9_FI29	MZ1	15.7	0.1	16	0	30	4	44	6	0	0	34
Property 24 & 25	Mod9_FI30	MZ2	0	0	20	0	32	28	14	6	0	0	0
Property 24 & 25	Mod9_FI31	MZ2	0	0	16	0	50	16	2	16	0	0	0
Property 5	Mod9_FI26	MZ2	0	0	0	0	16	0	84	0	0	0	0
Property 5	Mod9_FI27	MZ2	0	0	0	0	28	72	0	0	0	0	0
Property 5	Mod9_FI28	MZ1	21.4	0	10	0	30	18	36	6	0	0	0

Stage 2

BOA	Plot Number	MZ	Native Overstorey Species	Native Mid Storey Species	Native ground cover (Grasses)	Native Ground Cover (Shrubs)	Native Ground Cover (Other)	Litter	Bare soil	Rock	Crypto	High Threat Exotics (HTE's) <15
Dun Dun	Stage2_Fl22	1a)	14.2	0	0	0	0	80	4	10	0	0
Dun Dun	Stage2_Fl25	1a)	20	0	20	2	14	40	8	0	0	N
Dun Dun	Stage2_Fl27	1b)	25.7	0	2	0	30	48	10	0	0	N
Dun Dun	Stage2_Fl28	1b)	26.1	0	8	0	14	64	2	2	4	N
Dun Dun	Stage2_Fl32	1a)	0	0	20	0	26	0	4	0	0	N
Dun Dun	Stage2_Fl33	1a)	0	0	8	2	10	0	0	0	0	N
Dun Dun	Stage2_Fl34	1a)	0	0	0	0	4	0	0	0	0	N
Dun Dun	Stage2_Fl70	1b)	0	0	0	0	2	0	0	0	0	N
Dun Dun	Stage2_Fl74	1b)	36.9	0	10	0	2	86	2	0	0	N
Dun Dun	Stage2_Fl75	1a)	30.8	0	14	0	20	60	0	2	2	N
Dun Dun	Stage2_Fl76	1a)	17.5	0	4	0	40	28	4	4	8	N
Dun Dun	Stage2_Fl77	1b)	3	0	24	8	22	34	10	0	4	N
Dun Dun	Stage2_Fl78	1b)	0	0	38	0	34	0	12	0	8	N
Dun Dun	Stage2_Fl79	1b)	23.6	0	10	0	30	24	10	6		N
Dun Dun	Stage2_Fl80	1b)	0	0	6	0	2	0	2	0	0	N
Dun Dun	Stage2_Fl81	1a)	0	0	10	0	2	0	4	0	0	N
Nori	Stage2_Fl7	1a)	11.5	1.1	14	0	4	66	6	10	0	N
Nori	Stage2_Fl9	1b)	9.5	3	22	2	6	50	12	2	4	N
Nori	Stage2_Fl11	1b)	23	4.6	12	0	28	40	10		4	N
Nori	Stage2_Fl12	1a)	26	0	0.2	0	8	84	4	2	0	N
Nori	Stage2_Fl15	1a)	0	0	0	5	5	0	0	0	0	N
Nori	Stage2_Fl73	1a)	0	0	34	0	0	2	4	0	2	N
Nori	Stage2_Fl82	1a)	14.5	2	0	6	0	80	6	6	0	N
Nori	Stage2_Fl83	1a)	14.5	3.5	2	0	6	76	6	10	0	N
Nori	Stage2_Fl84	1b)	12	0.5	24	0	6	26	6	10	2	N

BOA	Plot Number	MZ	Native Overstorey Species	Native Mid Storey Species	Native ground cover (Grasses)	Native Ground Cover (Shrubs)	Native Ground Cover (Other)	Litter	Bare soil	Rock	Crypto	High Threat Exotics (HTE's) <15
Nori	Stage2_Fl85	1b)	9.7	0	18	0	14	4	2	4	0	N
Nori	Stage2_Fl86	1a)	0	0	15	0	15	2	4	0	4	N
Nori	Stage2_Fl87	1a)	30	0	12	0	12	0	12	4	4	N
Old Bobadeen	Stage2_Fl49	1b)	19.6	0	10	0	44	6	0	0	0	N
Old Bobadeen	Stage2_Fl93	1a)	27.8	0	6	2	32	32	24	0	0	N
Old Bobadeen	Stage2_Fl94	1a)	29	0	14	0	44	24	8	0	0	N
Old Bobadeen	Stage2_Fl95	1b)	5.8	0	6	0	24	2	4	0	0	N
Old Bobadeen	Stage2_Fl106	1a)	2.5	0	20	10	20	40	0	2	8	N
Onsite	Stage2_Fl58	1a)	24	1	18	0	30	44	8	0	0	N
Onsite	Stage2_Fl59	1b)	34.2	0	14	0	18	68	0	0	0	N
Onsite	Stage2_Fl60	1a)	30.8	2.1	4	2	2	80	4	8	0	N
Onsite	Stage2_Fl61	2c)	0	0	8	0	42	10	4	8	0	N
Onsite	Stage2_Fl63	1a)	0	0	38	0	18	12	16	0	4	N
Onsite	Stage2_Fl68	1a)	0	0	24	0	36	6	16	0	0	N
Onsite	Stage2_Fl100	1a)	40.9	0	2	0	14	82	2	0	0	N
Onsite	Stage2_Fl101	1a)	15.5	0	24	0	48	16	8	0	2	N
Onsite	Stage2_Fl102	1b)	42.3	0.5	2	0	10	58	14	4	6	N
Onsite	Stage2_Fl103	1b)	24	1	18	0	30	44	8	0	0	N
Onsite	Stage2_Fl104	1a)	0	0	4	0	14	0	0	0	0	N
Onsite	Stage2_Fl105	1a)	0	0	40	0	16	0	0	0	0	N
Ulan 18	Stage2_Fl47	1a)	20	0	0	4	8	60	4	0	24	N
Ulan 18	Stage2_Fl48	1a)	0	0	2	0	50	30	18	0	0	N
Ulan 18	Stage2_Fl96	1a)	12.4	2	0	52	0	34	12	0	0	N
Ulan 18	Stage2_Fl97	1a)	12	1.5	4	2	46	34	12	2	0	N
Ulan 18	Stage2_Fl98	1b)	17.5	2	60	0	14	16	0	0	0	N
Ulan 18	Stage2_Fl99	1b)	0	0	32	0	14	38	6	0	0	N

Appendix 3F. SURFACE WATER MONITORING DATA

Table 5: 2020 Surface water quality data

Sample Point	Sample Date	pH (Field) (Unit)	pH (Lab) (Unit)	EC (Lab) (µS/cm)	EC (Field) (µS/cm)	TSS (mg/L)	TDS (mg/L)	Temperature (°C)	Turbidity - Lab (NTU)	Al - T (mg/L)	Cu - T (mg/L)	Pb - T (mg/L)	Zn - T (mg/L)	Ni - T (mg/L)	Fe - T (mg/L)	Mn - T (mg/L)	As - T (mg/L)	Se - T (mg/L)	Cd - T (mg/L)	Cr - T (mg/L)	Li (mg/L)	Ba - T (mg/L)	Sr (mg/L)	DO (mg/L)	P - T (mg/L)	N - T (mg/L)	Oil & Grease
Surface Water 01	10/02/2020 12:00	7.1	7.8	782	799	<5	488	25.6	0.9				<0.005		0.25												
Surface Water 01	12/02/2020 8:15	7.5	7.9	782	881	<5	502	21.5	0.7																		
Surface Water 01	9/06/2020 9:30	7.9	8.0	715	776	<5	386	9.8	1.8	0.04	<0.001	<0.001	0.005	0.005	0.16	0.043	<0.001	<0.01	<0.0001	<0.001	0.107	0.028	0.177	11	<0.01	<0.1	
Surface Water 01	11/07/2020 10:40	7.4	7.4	351	300	33	246	12.7	63				0.007		1.44												
Surface Water 01	14/07/2020 8:30	7.9	7.7	516	156	<5	328	8.9	11.8																		
Surface Water 01	11/08/2020 13:30	7.5	7.5	406	394	<5	248	13.4	15.4																		
Surface Water 01	15/09/2020 9:30	7.9	7.9	607	544	8	342	15.5	2.9																		
Surface Water 01	13/10/2020 10:30	7.7	8.0	729	650	<5	458	25.5	1.5																		
Surface Water 01	29/10/2020 11:40	6.7	6.8	143	144	94	170	16	171				0.014		3.62												
Surface Water 01	10/11/2020 13:50	7.6	7.8	479	478	<5	300	27.5	8.3																		
Surface Water 01	7/12/2020 9:20	7.8	7.7	423	436	12	326	21	16.1																		
Surface Water 01	7/12/2020 9:20	7.7	7.6	426	489	12	326	20.6	17.2				<0.005		1.61												
Surface Water 01	19/12/2020 12:00	7.5	7.4	258	288	20	230	24	69				<0.005		2.65												
Surface Water 01	22/12/2020 11:30	7.2	7.2	265	273	33	209	22	117				0.009		2.98												
Surface Water 02	10/02/2020 12:30	7.5	7.7	815	832	<5	474	25.5	0.8				<0.005		0.1												
Surface Water 02	12/02/2020 8:45	7.2	7.6	802	828	<5	482	21.7	0.8																		
Surface Water 02	18/02/2020 10:20	6.9	6.8	470	472	63	518	22.8	251				0.04		2.67												
Surface Water 02	6/03/2020 9:20	7.3	6.4	610	583	34	436	23.2	60.4				0.1		2.83												
Surface Water 02	9/03/2020 9:20	8.1	7.5	705	670	<5	431	21.3	2.7																		
Surface Water 02	10/04/2020 13:00	7.1	6.5	190	181	378	262	17.7	397				0.05		10.3												
Surface Water 02	14/04/2020 13:10	7.1	7.3	436	24	16	300	23.8	24.7																		
Surface Water 02	18/05/2020 10:40	7.9	7.8	682	656	<5	372	13.4	2.8																		

Sample Point	Sample Date	pH (Field) (Unit)	pH (Lab) (Unit)	EC (Lab) (µS/cm)	EC (Field) (µS/cm)	TSS (mg/L)	TDS (mg/L)	Temperature (°C)	Turbidity - Lab (NTU)	Al - T (mg/L)	Cu - T (mg/L)	Pb - T (mg/L)	Zn - T (mg/L)	Ni - T (mg/L)	Fe - T (mg/L)	Mn - T (mg/L)	As - T (mg/L)	Se - T (mg/L)	Cd - T (mg/L)	Cr - T (mg/L)	Li (mg/L)	Ba - T (mg/L)	Sr (mg/L)	DO (mg/L)	P - T (mg/L)	N - T (mg/L)	Oil & Grease
Surface Water 02	9/06/2020 10:10	8.0	8.0	718	760	<5	424	11.3	1.6	0.03	<0.001	<0.001	<0.005	0.005	0.12	0.028	<0.001	<0.01	<0.0001	<0.001	0.11	0.025	0.177	11	0.02	<0.1	
Surface Water 02	11/07/2020 10:55	7.2	7.5	399	345	13	250	11.8	24				0.005		0.61												
Surface Water 02	14/07/2020 9:00	7.8	7.7	527	529	<5	338	8.9	11.3																		
Surface Water 02	11/08/2020 13:00	7.4	7.6	413	404	<5	250	12.5	14.8																		
Surface Water 02	15/09/2020 9:15	7.8	7.9	623	582	8	342	15.3	2.7																		
Surface Water 02	13/10/2020 10:45	8.0	8.1	733	615	<5	449	23.4	1.6																		
Surface Water 02	29/10/2020 10:45	7.0	6.7	143	143	88	194	15.6	170				0.013		3.54												
Surface Water 02	10/11/2020 9:50	7.6	7.7	505	508	<5	328	18.1	8.4																		
Surface Water 02	7/12/2020 9:30	7.8	7.6	434	431	10	332	21.4	15.5																		
Surface Water 02	7/12/2020 9:30	7.7	7.5	440	436	11	324	21.2	16				<0.005		1.66												
Surface Water 02	19/12/2020 12:30	7.5	7.4	276	295	21	240	24.5	68.7				<0.005		2.65												
Surface Water 02	22/12/2020 11:45	7.3	7.2	267	262	47	231	21.6	114				0.008		2.96												
Surface Water 04	18/02/2020 8:30	6.8	5.9	371	368	155	472	21	365				0.051		3.82												
Surface Water 04	6/03/2020 11:30	6.2	6.2	508	476	144	456	26.7	342				0.057		5.61												
Surface Water 04	9/03/2020 11:00	6.1	6.6	615	582	39	471	23.4	170																		
Surface Water 04	4/04/2020 14:00	6.5	6.1	230	216	72	210	25.8	142				0.041		2.88												
Surface Water 04	10/04/2020 16:00	6.5	6.2	137	1331	44	163	19.9	99.7				0.026		2.18												
Surface Water 04	14/04/2020 16:15	6.1	6.4	442	441	10	322	20.6	23.6																		
Surface Water 04	11/07/2020 14:50	6.5	6.6	238	194	56	219	13	120				0.024		2.26												
Surface Water 04	14/07/2020 13:40	6.6	6.7	370	367	14	276	11.1	61.7																		
Surface Water 04	11/08/2020 14:50	6.7	6.8	378	371	14	251	14.1	44.5																		
Surface Water 04	15/09/2020 10:55	6.7	6.9	581	552	12	355	16.3	17.5																		
Surface Water 04	29/10/2020 13:05	6.6	6.6	136	129	18	137	20.8	58.1				0.011		1.48												
Surface Water 04	10/11/2020 12:10	7.1	7.1	392	376	<5	258	24	11.9																		
Surface Water 04	7/12/2020 11:50	7.1	7.0	444	434	13	334	27	9.7																		

Sample Point	Sample Date	pH (Field) (Unit)	pH (Lab) (Unit)	EC (Lab) (µS/cm)	EC (Field) (µS/cm)	TSS (mg/L)	TDS (mg/L)	Temperature (°C)	Turbidity - Lab (NTU)	Al - T (mg/L)	Cu - T (mg/L)	Pb - T (mg/L)	Zn - T (mg/L)	Ni - T (mg/L)	Fe - T (mg/L)	Mn - T (mg/L)	As - T (mg/L)	Se - T (mg/L)	Cd - T (mg/L)	Cr - T (mg/L)	Li (mg/L)	Ba - T (mg/L)	Sr (mg/L)	DO (mg/L)	P - T (mg/L)	N - T (mg/L)	Oil & Grease
Surface Water 04	7/12/2020 11:50	7.1	7.0	447	447	14	340	25.1	10.4				0.009		2.3												
Surface Water 04	19/12/2020 14:00	6.6	6.6	167	172	112	276	24.3	238				0.019		3.79												
Surface Water 04	22/12/2020 12:50	6.6	6.6	171	165	51	205	21.3	108				0.011		2.4												
Surface Water 05	10/02/2020 14:05	3.4	3.8	1110	1164	34	813	25.4	51.3				0.337		6.22												
Surface Water 05	12/02/2020 10:45	4.7	5.0	787	819	38	612	22.8	62.5																		
Surface Water 05	18/02/2020 11:05	3.3	3.5	1110	1110	19	748	24.2	34				0.396		9.41												
Surface Water 05	6/03/2020 12:10	6.1	5.6	644	609	28	490	23.2	44.3				0.036		5.68												
Surface Water 05	9/03/2020 13:00	4.0	4.1	725	675	29	489	25.1	33.4																		
Surface Water 05	4/04/2020 14:10	6.4	6.3	601	610	34	428	21.8	66.1				0.012		4.49												
Surface Water 05	10/04/2020 12:30	7.1	6.2	365	4	36	292	17.9	54.7				0.013		5.19												
Surface Water 05	14/04/2020 12:30	7.2	6.4	345	348	7	256	20.2	27.5																		
Surface Water 05	18/05/2020 15:15	6.4	6.3	747	567	8	438	14.1	14.7																		
Surface Water 05	9/06/2020 12:10	6.3	6.5	807	852	<5	481	10.7	12.8	0.05	<0.001	<0.001	<0.005	0.003	3.86	0.38	<0.001	<0.01	<0.0001	<0.001	0.004	0.038	0.252	7.2	0.02	0.8	
Surface Water 05	11/07/2020 12:55	6.9	6.8	838	672	9	490	12	12.7				<0.005		2.47												
Surface Water 05	14/07/2020 12:00	7.0	6.9	917	892	<5	574	10.3	9.7																		
Surface Water 05	11/08/2020 11:40	7.1	7.0	886	836	<5	554	11.9	12.8																		
Surface Water 05	15/09/2020 11:15	6.8	7.0	957	900	5	527	18.2	7																		
Surface Water 05	13/10/2020 11:40	6.9	7.0	790	710	<5	489	21.4	10																		
Surface Water 05	29/10/2020 13:20	6.7	6.9	207	185	44	196	19	65.1				0.008		1.6												
Surface Water 05	10/11/2020 12:20	6.9	7.0	367	376	<5	264	23.7	9																		
Surface Water 05	7/12/2020 12:00	7.1	7.0	420	405	16	317	25.3	9.5																		
Surface Water 05	7/12/2020 12:00	7.2	7.0	423	382	18	340	24	11.5				<0.005		2.82												
Surface Water 05	19/12/2020 14:15	7.1	7.2	413	431	7	262	23.7	8.3				<0.005		2.22												
Surface Water 05	22/12/2020 13:05	7.0	7.2	436	437	13	303	22.3	29.9				<0.005		2.53												
Surface Water 07	12/02/2020 12:00	6.7	7.4	3430	3510	14	2550	25.2	20.2																		

Sample Point	Sample Date	pH (Field) (Unit)	pH (Lab) (Unit)	EC (Lab) (µS/cm)	EC (Field) (µS/cm)	TSS (mg/L)	TDS (mg/L)	Temperature (°C)	Turbidity - Lab (NTU)	Al - T (mg/L)	Cu - T (mg/L)	Pb - T (mg/L)	Zn - T (mg/L)	Ni - T (mg/L)	Fe - T (mg/L)	Mn - T (mg/L)	As - T (mg/L)	Se - T (mg/L)	Cd - T (mg/L)	Cr - T (mg/L)	Li (mg/L)	Ba - T (mg/L)	Sr (mg/L)	DO (mg/L)	P - T (mg/L)	N - T (mg/L)	Oil & Grease
Surface Water 07	18/02/2020 12:15	6.6	7.3	3030	3050	<5	1970	27.2	1.9				<0.005		0.67												
Surface Water 07	6/03/2020 13:20	7.0	7.1	1110	1166	9	700	26.5	5.5				<0.005		0.49												
Surface Water 07	9/03/2020 15:20	6.9	7.3	1950	1860	<5	1170	25.9	1.3																		
Surface Water 07	4/04/2020 15:30	6.7	7.1	651	666	9	412	21.4	18.4				<0.005		0.74												
Surface Water 07	10/04/2020 11:50	7.1	6.7	262	2570	36	164	16.9	53.6				0.012		1.55												
Surface Water 07	14/04/2020 10:30	7.5	7.3	1390	1411	<5	865	21.3	1.2																		
Surface Water 07	18/05/2020 14:45	7.3	7.3	1860	1799	<5	1130	17.4	2																		
Surface Water 07	9/06/2020 14:50	7.3	7.4	1760	1968	<5	1120	13.6	0.6	<0.01	<0.001	<0.001	<0.005	0.001	<0.05	0.91	<0.001	<0.01	<0.0001	<0.001	0.002	0.086	0.887	6.4	0.01	0.5	
Surface Water 07	11/07/2020 12:30	7.3	7.2	975	812	<5	573	12.8	7.6				<0.005		0.41												
Surface Water 07	14/07/2020 10:40	7.1	7.3	1490	1492	<5	970	12.7	0.6																		
Surface Water 07	11/08/2020 10:10	7.6	7.4	1680	1735	<5	1010	13.3	1																		
Surface Water 07	29/10/2020 15:00	7.0	7.3	513	515	14	377	26.1	30.2				0.006		1.08												
Surface Water 07	10/11/2020 15:30	7.3	7.4	2020	2120	21	1430	31.6	8.3																		
Surface Water 07	19/12/2020 15:45	7.1	7.2	2270	2357	10	1570	23.7	0.7				<0.005		0.24												
Surface Water 07	22/12/2020 13:40	7.1	7.4	1090	1047	3	649	22.7	2.9				<0.005		0.34												
Surface Water 08	13/01/2020 10:50	7.7	7.1	5990	6010	12	4200	20.8	7.2		<0.001	0.002	<0.005	0.006	1.16	4.21	0.001	<0.01	<0.0001	0.002	0.016	0.214	1.18	3.8	0.19	1.2	
Surface Water 08	10/02/2020 10:00	6.5	5.9	718	728	59	482	21.6	77.5				0.034		1.8												
Surface Water 08	12/02/2020 11:40	6.8	6.2	999	983	92	882	23.1	147																		
Surface Water 08	18/02/2020 11:55	6.2	6.5	1520	1524	23	992	25.3	29				0.038		3.28												
Surface Water 08	9/03/2020 14:50	6.5	6.5	2150	2037	25	1340	23.1	53.1																		
Surface Water 08	4/04/2020 15:10	6.6	6.9	712	740	28	456	23	20.2				0.008		1.94												
Surface Water 08	10/04/2020 11:30	7.6	6.7	195	193	90	116	16.8	77.7				0.009		2.34												
Surface Water 08	14/04/2020 9:45	7.3	6.0	2640	2760	30	1590	15	41																		
Surface Water 08	18/05/2020 14:30	5.0	4.7	4030	3820	16	2620	14.1	40.7																		
Surface Water 08	9/06/2020 14:00	5.1	5.2	3950	4400	23	2480	10.5	43.3	0.04	<0.001	<0.001	0.013	0.029	7.06	9.08	<0.001	<0.01	<0.0001	<0.001	0.017	0.135	1.16	12	0.12	0.9	

Sample Point	Sample Date	pH (Field) (Unit)	pH (Lab) (Unit)	EC (Lab) (µS/cm)	EC (Field) (µS/cm)	TSS (mg/L)	TDS (mg/L)	Temperature (°C)	Turbidity - Lab (NTU)	Al - T (mg/L)	Cu - T (mg/L)	Pb - T (mg/L)	Zn - T (mg/L)	Ni - T (mg/L)	Fe - T (mg/L)	Mn - T (mg/L)	As - T (mg/L)	Se - T (mg/L)	Cd - T (mg/L)	Cr - T (mg/L)	Li (mg/L)	Ba - T (mg/L)	Sr (mg/L)	DO (mg/L)	P - T (mg/L)	N - T (mg/L)	Oil & Grease
Surface Water 08	11/07/2020 12:10	6.4	5.6	2940	2531	33	1700	11.5	57.6				0.013		6.96												
Surface Water 08	14/07/2020 10:20	5.6	5.5	3500	3500	10	2110	9.3	37.5																		
Surface Water 08	11/08/2020 8:50	6.1	5.8	3490	3610	10	2240	8	25.1																		
Surface Water 08	15/09/2020 13:15	5.3	5.7	3350	3090	24	2100	17.2	41.9																		
Surface Water 08	13/10/2020 13:40	6.0	6.0	3320	3150	6	2080	19.6	32.3																		
Surface Water 08	29/10/2020 16:00	7.1	7.1	605	576	30	479	23.2	92.2				0.008		1.92												
Surface Water 08	10/11/2020 14:30	6.4	6.4	2890	2930	7	1970	20.7	22.6																		
Surface Water 08	7/12/2020 14:40	6.8	6.7	2950	3030	26	1840	22	42.1																		
Surface Water 08	7/12/2020 14:40	6.9	6.7	2970	2990	24	1920	21.1	41.7				<0.005		6.68												
Surface Water 08	22/12/2020 14:20	7.5	7.5	2290	2347	167	1640	21.7	321				0.01		6.03												
Surface Water 09	13/01/2020 9:30	7.7	7.0	4050	4170	34	2510	22	41.3		<0.001	0.002	0.006	0.002	5.75	7.61	0.002	<0.01	<0.0001	0.002	0.002	0.256	1.18	5.5	0.12	0.6	
Surface Water 09	10/02/2020 9:25	6.4	6.7	3810	4250	24	2440	21	32.1				0.015		2.66												
Surface Water 09	12/02/2020 11:20	6.3	6.7	4250	4330	24	3000	24.1	77.6																		
Surface Water 09	18/02/2020 11:40	6.0	6.8	4240	4200	23	2640	25.3	35.9				<0.005		6.81												
Surface Water 09	6/03/2020 12:40	6.4	6.6	4810	458	20	3060	25.5	18.8				0.02		5.44												
Surface Water 09	9/03/2020 13:40	6.3	7.0	5310	5100	10	3300	24.2	14.2																		
Surface Water 09	4/04/2020 14:50	6.3	6.7	1960	1955	18	1130	22.6	22.7				0.011		1.88												
Surface Water 09	10/04/2020 11:00	7.7	6.4	425	447	99	322	16.7	162				0.014		4												
Surface Water 09	14/04/2020 10:00	7.2	7.2	5120	5280	8	3100	16.4	4.3																		
Surface Water 09	18/05/2020 14:10	6.8	6.8	4630	3780	12	2880	15.7	24.1																		
Surface Water 09	9/06/2020 14:40	6.5	6.6	4570	5030	14	2730	11.8	45.6	<0.01	<0.001	<0.001	<0.005	0.002	6.68	3.18	<0.001	<0.01	<0.0001	<0.001	<0.001	0.14	1.19	4.4	0.02	0.2	
Surface Water 09	11/07/2020 11:50	6.7	6.6	4500	3770	30	2730	12.5	54.4				<0.005		9.27												
Surface Water 09	14/07/2020 10:05	7.0	6.9	4400	4470	11	2660	7.9	10.2																		
Surface Water 09	11/08/2020 9:35	6.8	6.8	4420	4530	5	2730	8.8	16.8																		
Surface Water 09	15/09/2020 13:40	6.5	6.6	4550	4290	31	2500	17.3	28.7																		

Sample Point	Sample Date	pH (Field) (Unit)	pH (Lab) (Unit)	EC (Lab) (µS/cm)	EC (Field) (µS/cm)	TSS (mg/L)	TDS (mg/L)	Temperature (°C)	Turbidity - Lab (NTU)	Al - T (mg/L)	Cu - T (mg/L)	Pb - T (mg/L)	Zn - T (mg/L)	Ni - T (mg/L)	Fe - T (mg/L)	Mn - T (mg/L)	As - T (mg/L)	Se - T (mg/L)	Cd - T (mg/L)	Cr - T (mg/L)	Li (mg/L)	Ba - T (mg/L)	Sr (mg/L)	DO (mg/L)	P - T (mg/L)	N - T (mg/L)	Oil & Grease
Surface Water 09	13/10/2020 14:00	6.6	6.8	4210	4080	15	2700	19.8	31.9																		
Surface Water 09	29/10/2020 14:40	6.5	6.8	506	490	33	431	19.6	104				0.011		2.28												
Surface Water 09	10/11/2020 14:50	6.5	6.6	4870	4890	79	3270	20.4	110																		
Surface Water 09	7/12/2020 14:00	6.8	6.7	4230	4290	98	2570	22	63.4																		
Surface Water 09	7/12/2020 14:00	6.8	6.7	4240	4310	129	2670	21	64.1				<0.005		10.4												
Surface Water 09	19/12/2020 16:15	6.7	6.9	4190	4170	47	2570	23.1	36.3				0.013		5.6												
Surface Water 09	22/12/2020 14:00	6.6	6.6	4280	4290	38	2910	21.1	50.6				<0.005		8.12												
Surface Water 12	10/02/2020 13:55	2.4	2.9	3340	3460	<5	3150	24.5	0.8				1.41		31.5												
Surface Water 12	12/02/2020 10:10	3.1	3.0	2610	2640	<5	2150	22.3	0.8																		
Surface Water 12	18/02/2020 10:50	6.1	4.8	261	254	25	391	23.4	224				0.057		7.08												
Surface Water 12	6/03/2020 12:00	6.6	6.0	166	148	22	235	25.3	135				0.016		5.81												
Surface Water 12	9/03/2020 12:20	5.4	5.7	326	304	8	222	22.8	56.4																		
Surface Water 12	4/04/2020 14:20	6.6	6.1	98	92	91	238	21	202				0.006		2.08												
Surface Water 12	10/04/2020 12:15	7.4	6.0	67	64	366	210	17	375				0.014		8.93												
Surface Water 12	14/04/2020 12:15	7.4	6.4	211	248	10	213	22.8	32.9																		
Surface Water 12	18/05/2020 13:00	6.5	6.4	292	261	<5	212	15.2	15.8																		
Surface Water 12	9/06/2020 11:45	6.3	6.5	306	325	<5	221	10	14	0.52	<0.001	<0.001	<0.005	0.002	1.68	0.162	<0.001	<0.01	<0.0001	<0.001	0.002	0.022	0.078	7.5	<0.01	0.7	
Surface Water 12	11/07/2020 13:45	6.9	6.4	140	113	48	264	12.5	143				0.011		4.37												
Surface Water 12	14/07/2020 12:15	6.7	6.6	476	462	<5	350	10.6	28.8																		
Surface Water 12	11/08/2020 12:00	6.9	6.8	429	403	<5	292	13.4	27																		
Surface Water 12	15/09/2020 11:30	6.7	6.9	414	383	6	284	16.7	12.6																		
Surface Water 12	13/10/2020 12:10	6.8	6.9	321	304	<5	242	20.6	12.7																		
Surface Water 12	29/10/2020 13:55	6.4	6.5	85	76	51	154	21.4	107				<0.005		1.61												
Surface Water 12	10/11/2020 12:30	6.7	6.8	197	193	8	187	23.7	20.7																		
Surface Water 12	7/12/2020 13:10	7.0	6.9	265	269	18	296	24.6	48																		

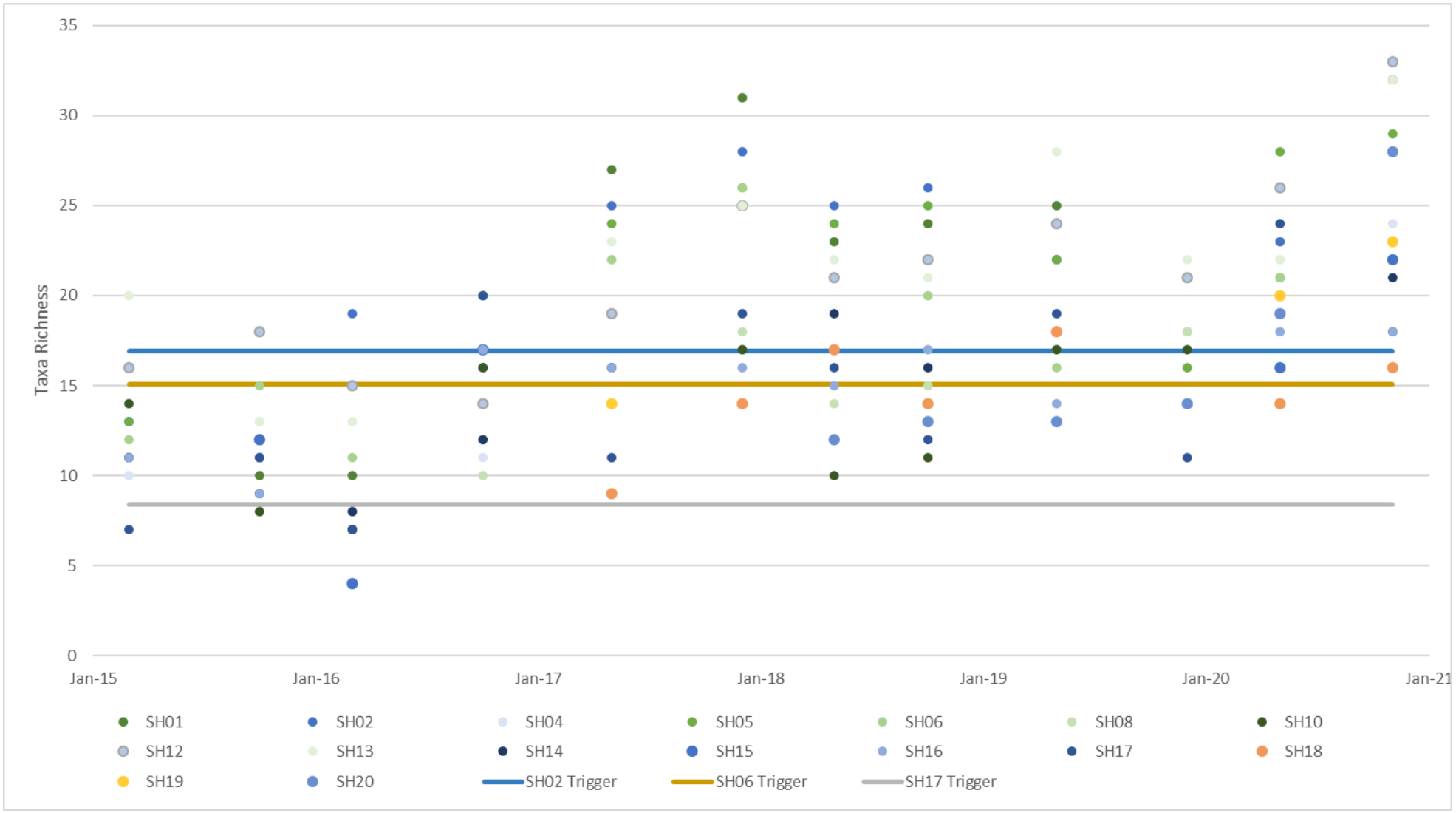
Sample Point	Sample Date	pH (Field) (Unit)	pH (Lab) (Unit)	EC (Lab) (µS/cm)	EC (Field) (µS/cm)	TSS (mg/L)	TDS (mg/L)	Temperature (°C)	Turbidity - Lab (NTU)	Al - T (mg/L)	Cu - T (mg/L)	Pb - T (mg/L)	Zn - T (mg/L)	Ni - T (mg/L)	Fe - T (mg/L)	Mn - T (mg/L)	As - T (mg/L)	Se - T (mg/L)	Cd - T (mg/L)	Cr - T (mg/L)	Li (mg/L)	Ba - T (mg/L)	Sr (mg/L)	DO (mg/L)	P - T (mg/L)	N - T (mg/L)	Oil & Grease
Surface Water 12	7/12/2020 13:10	7.0	6.8	261	253	21	309	24.4	48.7				<0.005		4.03												
Surface Water 12	19/12/2020 14:30	7.0	6.8	212	216	24	279	23.7	80.9				0.008		4.23												
Surface Water 12	22/12/2020 13:20	6.6	6.5	139	136	75	306	21.5	147				0.009		5.57												
Surface Water 15	18/02/2020 14:40	6.4	5.4	162	164	16	186	29.1	87.2				0.014		1.98												
Surface Water 15	6/03/2020 10:05	7.1	5.9	115	102	6	160	24.4	45.8				0.008		2.96												
Surface Water 15	9/03/2020 10:15	6.5	5.8	199	192	25	228	21	53.2																		
Surface Water 15	4/04/2020 12:30	7.0	5.9	81	72	26	90	22.4	48.3				0.008		1.25												
Surface Water 15	10/04/2020 14:30	6.7	5.8	85	81	9	110	19	27.7				0.008		1.21												
Surface Water 15	14/04/2020 15:15	6.7	6.0	192	192	6	163	19.9	9.9																		
Surface Water 15	18/05/2020 11:10	6.4	6.2	268	160	22	208	14	39.3																		
Surface Water 15	9/06/2020 10:45	6.3	6.2	275	297	21	240	9.1	47.7	0.3	<0.001	<0.001	<0.005	0.009	29.9	0.669	0.002	<0.01	<0.0001	0.003	<0.001	0.071	0.073	4	0.29	0.9	
Surface Water 15	11/07/2020 14:10	6.5	6.1	112	88	11	130	13.1	28.2				<0.005		1.59												
Surface Water 15	14/07/2020 12:30	6.7	6.2	158	150	<5	150	10.8	9.6																		
Surface Water 15	11/08/2020 13:55	7.0	6.4	154	144	<5	120	13	8.2																		
Surface Water 15	15/09/2020 9:55	6.4	6.3	174	167	16	141	15.1	16.9																		
Surface Water 15	13/10/2020 10:50	6.4	6.3	205	191	18	175	16.5	30																		
Surface Water 15	29/10/2020 12:10	6.4	6.2	105	100	12	117	19	16.6				<0.005		1.97												
Surface Water 15	10/11/2020 11:00	6.3	6.3	163	168	6	164	21.3	9.9																		
Surface Water 15	7/12/2020 10:50	6.6	6.4	220	213	32	203	22	45.9																		
Surface Water 15	7/12/2020 10:50	6.5	6.4	215	213	32	203	20.6	48.4				<0.005		12												
Surface Water 15	19/12/2020 13:00	6.7	6.4	134	135	24	175	23.1	52.5				<0.005		6.7												
Surface Water 15	22/12/2020 12:00	6.5	6.2	120	119	10	140	21	23.4				<0.005		2.46												
Surface Water 16	18/02/2020 14:55	6.0	5.8	291	297	18	329	29.2	121				0.022		2.61												
Surface Water 16	6/03/2020 10:15	7.0	6.2	212	196	48	255	24.6	121				0.031		8.19												
Surface Water 16	9/03/2020 10:35	6.6	6.4	322	304	18	288	21.2	49.9																		

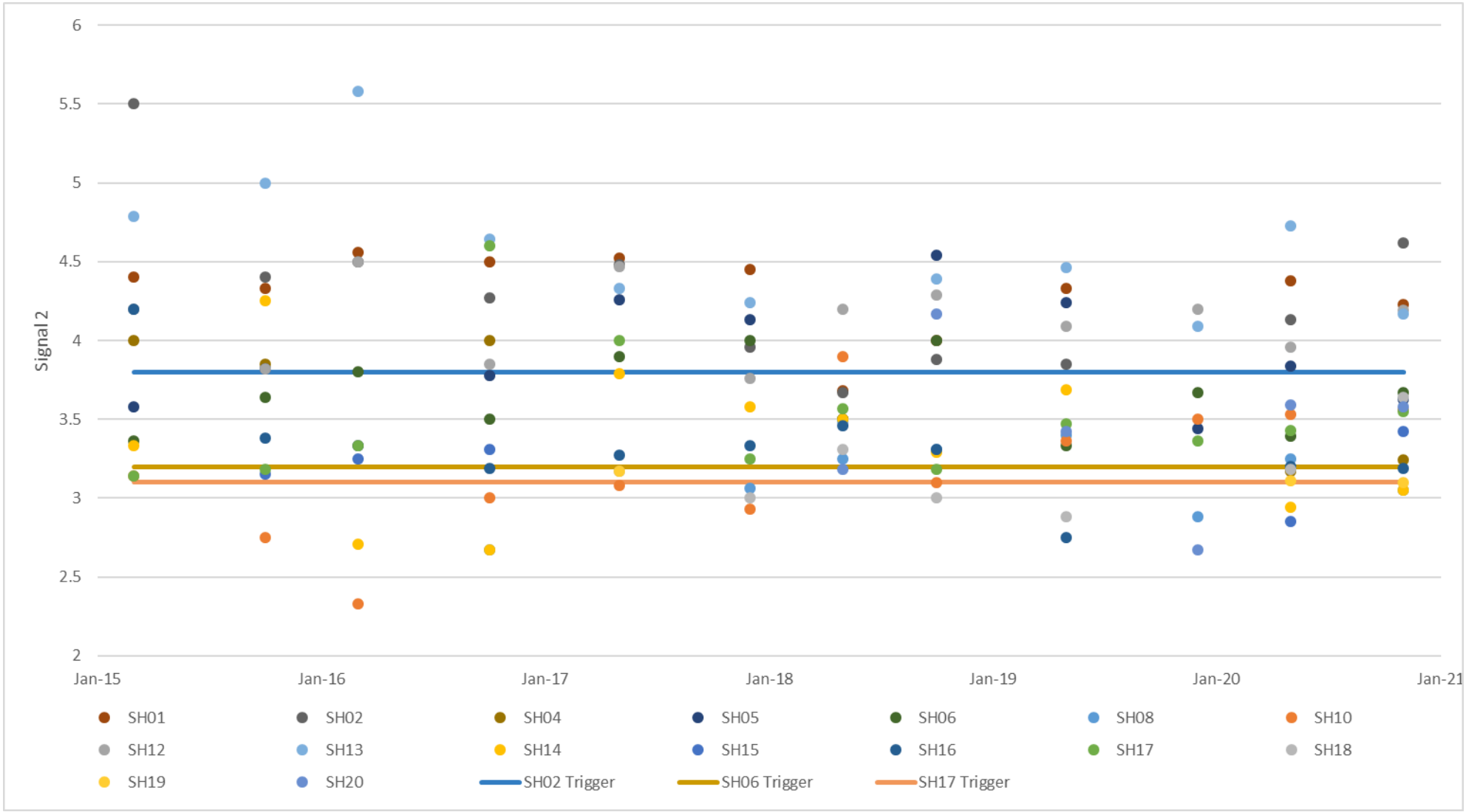
Sample Point	Sample Date	pH (Field) (Unit)	pH (Lab) (Unit)	EC (Lab) (µS/cm)	EC (Field) (µS/cm)	TSS (mg/L)	TDS (mg/L)	Temperature (°C)	Turbidity - Lab (NTU)	Al - T (mg/L)	Cu - T (mg/L)	Pb - T (mg/L)	Zn - T (mg/L)	Ni - T (mg/L)	Fe - T (mg/L)	Mn - T (mg/L)	As - T (mg/L)	Se - T (mg/L)	Cd - T (mg/L)	Cr - T (mg/L)	Li (mg/L)	Ba - T (mg/L)	Sr (mg/L)	DO (mg/L)	P - T (mg/L)	N - T (mg/L)	Oil & Grease
Surface Water 16	4/04/2020 12:40	6.4	6.0	109	98	43	105	20.8	97.6				0.013		1.6												
Surface Water 16	10/04/2020 14:45	6.6	6.1	96	94	37	137	18.7	75.3				0.018		1.92												
Surface Water 16	14/04/2020 15:30	6.3	6.2	247	248	<5	204	19.8	12.8																		
Surface Water 16	18/05/2020 11:30	6.7	6.4	262	240	<5	204	14.1	14.2																		
Surface Water 16	9/06/2020 11:00	6.6	6.4	319	334	<5	224	9.1	17	0.2	<0.001	<0.001	<0.005	0.018	10.7	0.327	0.002	<0.01	<0.0001	0.004	0.001	0.05	0.079	9	0.02	0.8	
Surface Water 16	11/07/2020 14:20	6.5	6.3	133	109	15	146	12.6	45.6				0.008		2.12												
Surface Water 16	14/07/2020 12:40	6.9	6.5	166	152	<5	141	13	11.5																		
Surface Water 16	11/08/2020 14:10	6.7	6.6	161	147	<5	114	13.8	9																		
Surface Water 16	15/09/2020 10:10	6.3	6.7	177	173	7	139	16.1	10.9																		
Surface Water 16	13/10/2020 11:10	6.7	6.7	223	199	<5	168	18	11.7																		
Surface Water 16	29/10/2020 12:20	6.6	6.3	108	102	46	134	20	38.8				0.007		2.26												
Surface Water 16	10/11/2020 11:20	6.5	6.6	173	175	<5	166	21.6	9.4																		
Surface Water 16	7/12/2020 11:00	6.8	6.7	200	197	18	192	21.4	13.5																		
Surface Water 16	7/12/2020 11:00	6.9	6.7	197	197	14	192	21.1	12.7				<0.005		8.5												
Surface Water 16	19/12/2020 13:15	6.9	6.8	155	155	44	197	23.5	124				0.006		5.74												
Surface Water 16	22/12/2020 12:10	6.6	6.6	126	120	19	142	24.2	51.3				0.006		2.84												
Surface Water 17	6/03/2020 11:20	5.7	4.2	411	399	65	320	26.9	89				0.273		8.91												
Surface Water 17	4/04/2020 13:50	6.0	5.6	171	166	50	195	26.4	110				0.033		2.04												
Surface Water 17	10/04/2020 15:45	6.5	5.8	117	115	98	140	19.8	79.2				0.028		2.27												
Surface Water 17	14/04/2020 16:10	5.4	3.7	726	688	56	444	22	50																		
Surface Water 17	11/07/2020 14:45	5.7	4.9	222	185	34	224	13.1	97.3				0.046		4.34												
Surface Water 17	14/07/2020 13:30	4.7	4.2	614	579	37	422	12.9	44																		
Surface Water 17	11/08/2020 14:40	5.7	5.5	565	561	59	348	14.9	38.2																		
Surface Water 17	29/10/2020 12:55	5.9	5.9	265	269	48	246	23.5	75.3				0.035		1.95												
Surface Water 17	19/12/2020 13:45	5.9	5.9	354	371	32	344	25.3	105				0.066		8.57												

Sample Point	Sample Date	pH (Field) (Unit)	pH (Lab) (Unit)	EC (Lab) (µS/cm)	EC (Field) (µS/cm)	TSS (mg/L)	TDS (mg/L)	Temperature (°C)	Turbidity - Lab (NTU)	Al - T (mg/L)	Cu - T (mg/L)	Pb - T (mg/L)	Zn - T (mg/L)	Ni - T (mg/L)	Fe - T (mg/L)	Mn - T (mg/L)	As - T (mg/L)	Se - T (mg/L)	Cd - T (mg/L)	Cr - T (mg/L)	Li (mg/L)	Ba - T (mg/L)	Sr (mg/L)	DO (mg/L)	P - T (mg/L)	N - T (mg/L)	Oil & Grease
Surface Water 17	22/12/2020 12:40	6.1	6.0	247	241	22	238	23.2	55.6				0.029		2.87												
Surface Water 18	6/03/2020 10:40	6.6	5.9	374	364	59	285	28	119				0.571		9.44												
Surface Water 18	4/04/2020 13:05	6.5	5.9	127	122	72	160	22	117				0.056		2.25												
Surface Water 18	10/04/2020 15:00	6.5	6.0	102	101	74	98	19.1	87.8				0.035		2.22												
Surface Water 18	14/04/2020 16:00	6.2	5.9	332	329	<5	273	21.5	12.6																		
Surface Water 18	18/05/2020 11:50	5.4	5.4	457	391	<5	292	16.8	6.4																		
Surface Water 18	9/06/2020 11:20	5.5	5.1	1090	1307	64	612	12.6	97.3	0.13	<0.001	<0.001	0.564	0.284	51.3	13.6	<0.001	<0.01	0.0001	0.001	0.046	0.039	0.382	4.2	0.02	0.9	
Surface Water 18	11/07/2020 14:40	6.6	6.3	155	123	18	168	13	61				0.029		2.51												
Surface Water 18	14/07/2020 13:25	6.5	6.3	209	197	10	177	13.1	15.5																		
Surface Water 18	11/08/2020 14:30	6.7	6.5	186	174	<5	148	14.9	9.9																		
Surface Water 18	15/09/2020 10:40	6.3	6.6	223	211	10	162	17.6	7.9																		
Surface Water 18	29/10/2020 12:40	6.3	6.3	125	121	31	138	20.7	47.5				0.012		2.37												
Surface Water 18	10/11/2020 11:50	6.4	6.6	274	289	<5	218	22.9	8.8																		
Surface Water 18	7/12/2020 11:30	6.4	6.3	342	334	18	284	24.8	17.8																		
Surface Water 18	7/12/2020 11:30	6.5	6.3	346	346	16	286	24	20.7				0.024		7.05												
Surface Water 18	19/12/2020 13:30	6.5	6.4	190	194	39	200	23.5	90.3				0.023		4.66												
Surface Water 18	22/12/2020 12:30	6.5	6.5	136	135	33	175	22.6	75.1				0.013		2.96												

Notes:
Sampling events where location was too low to sample have not been included.
Underlined Dates are from Rainfall Events.

Figure 3-e Stream Health Trending data




6
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Signal 2
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SH01
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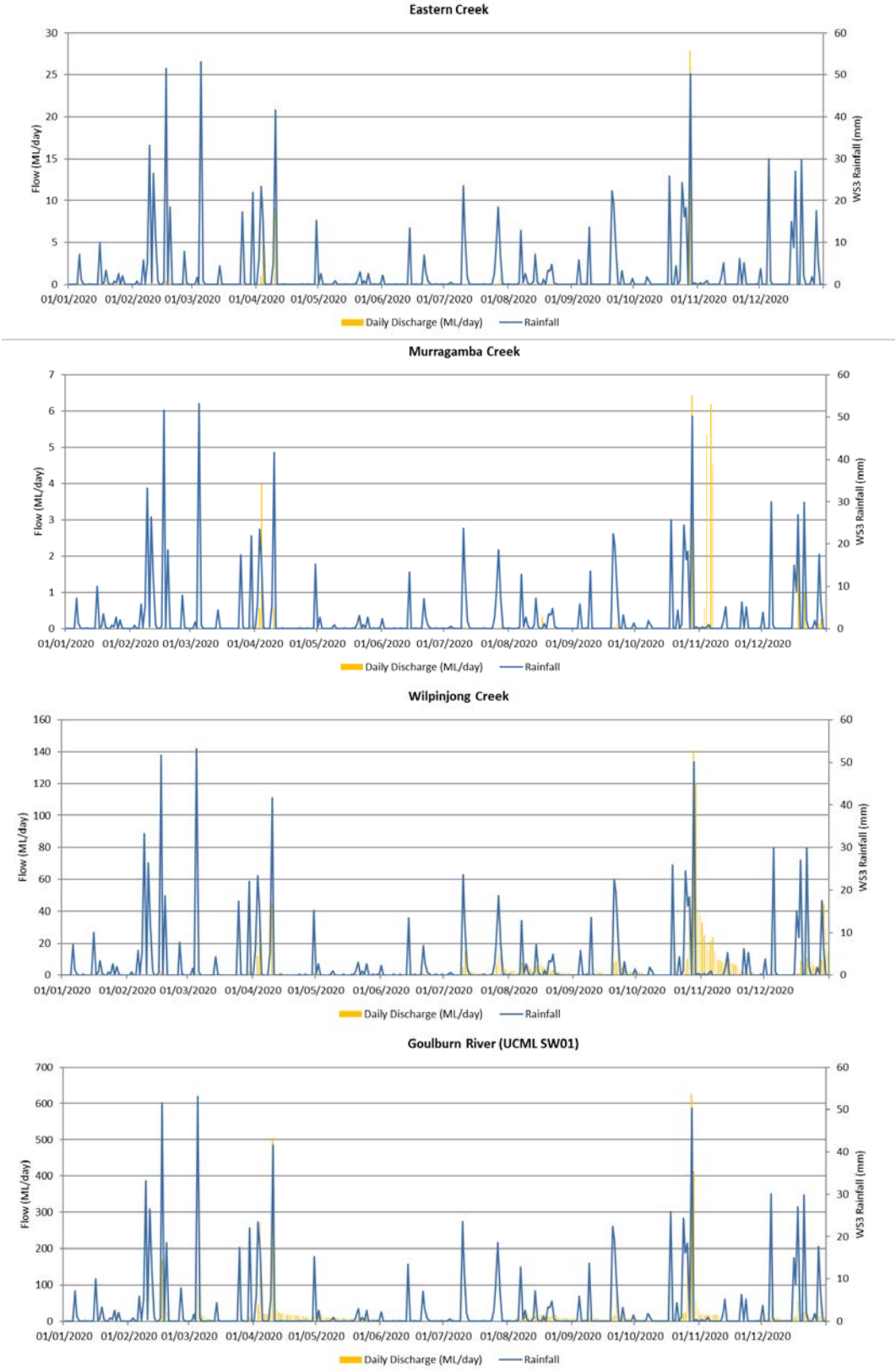
SH14
SH15
SH16
SH17
SH18
SH19
SH20
SH02 Trigger
SH06 Trigger
SH17 Trigger

Table 6: Effluent Discharge Quality

Sample Location	Sample Date	Biological Oxygen Demand (mg/L)	Total Nitrogen (mg/L)	Oil & Grease (mg/L)	Total Phosphorus (mg/L)	pH	Total Suspended Solids (mg/L)
OC Effluent Tank	11/02/2020	2	28.3	<5	3.43	6.5	7.2
OC Effluent Tank	8/05/2020	23	20.7	<5	2.99	7.9	7
OC Effluent Tank	6/08/2020	6	10.3	5	1.05	7.0	7.1
OC Effluent Tank	3/11/2020	34	37.8	<5	4.96	7.3	7.3
Admin Effluent	8/05/2020	11	100	<5	28.2	7.9	7.7
Admin Effluent	6/08/2020	8	41.6	<5	23.6	7.2	7.3
Admin Effluent	3/11/2020	2	16	<5	24.4	7.2	7.2
CHPP Effluent	11/02/2020	16	6	<5	0.25	5.9	7
CHPP Effluent	8/05/2020	11	3.8	8	0.13	7.7	6.9
CHPP Effluent	6/08/2020	12	6.7	9	0.27	7.0	7.2
CHPP Effluent	3/11/2020	6	4	<5	0.2	7.0	6.8
UG Effluent Tank	13/02/2020	66	9.8	<5	0.77	6.7	7
UG Effluent Tank	8/05/2020	61	7.8	17	0.37	7.5	7
UG Effluent Tank	12/08/2020	40	6.3	9	0.41	6.5	6.9
UG Effluent Tank	5/11/2020	39	7.3	10	0.7	7.4	7

*Admin Effluent not sampled in quarter 1 due to unscheduled maintenance

Figure 3-f 2020 Stream Flow and rainfall



Note: Eastern Creek flow monitor damage caused data loss after 28th October 2020

Table 7: Discharge Quality

Date	Flow (ML)	Electrical Conductivity -Field (µS/cm)	pH (Field) (Unit)	Turbidity (NTU)	Oil & Grease	Total Suspended Solids (mg/L)	Aluminium – Dissolved (mg/L)	Manganese – Dissolved (mg/L)	Nickel – Dissolved (mg/L)	Zinc – Dissolved (mg/L)	Copper – Dissolved (mg/L)	Cadmium – Dissolved (mg/L)	Arsenic – Dissolved (mg/L)	Lead – Dissolved (mg/L)
18/05/2020	0.5	199	7.0	0.0	<2	<1	<0.01	0.068	0.005	<0.005	<0.001	<0.0001	<0.001	<0.001
19/05/2020	6.1	205	7.1	0.0										
20/05/2020	9.6	206	7.0	0.0										
21/05/2020	9.6	210	7.0	0.0										
22/05/2020	9.9	211	7.1	0.0	<2	<1								
23/05/2020	6.4	215	7.1	0.0										
24/05/2020	9.8	217	7.1	0.0										
25/05/2020	9.9	220	7.1	0.0										
26/05/2020	2.5	235	7.0	0.0										
27/05/2020	Nil													
28/05/2020	3.6	238	7.0	0.6	<2	<1								
29/05/2020	6.0	235	7.0	0.0										
30/05/2020	9.3	238	6.9	0.0										
31/05/2020	3.9	243	6.9	0.0										
1/06/2020	3.6	240	7.1	3.4										
2/06/2020	9.9	236	7.0	0.0	<2	<1	<0.01	0.042	0.003	<0.005	<0.001	<0.0001	<0.001	<0.001
3/06/2020	8.1	236	7.0	0.0										
4/06/2020	6.6	242	7.0	0.1										
5/06/2020	9.7	255	6.9	0.0										
6/06/2020	2.2	260	6.9	0.0										
7/06/2020	Nil													
8/06/2020	Nil													
9/06/2020	Nil													
10/06/2020	2.7	235	6.9	2.9	<2	<1								
11/06/2020	0.2	246	6.9	1.2										
12/06/2020	3.3	244	6.9	0.3										
13/06/2020	9.9	241	6.9	0.0										
14/06/2020	6.3	238	6.9	0.0										
15/06/2020	7.6	238	6.8	0.0										
16/06/2020	2.6	236	6.8	0.0										
17/06/2020	6.3	236	6.9	0.0	<2	<1								
18/06/2020	8.9	234	6.9	0.0										
19/06/2020	8.8	233	6.8	0.0										

Date	Flow (ML)	Electrical Conductivity -Field (µS/cm)	pH (Field) (Unit)	Turbidity (NTU)	Oil & Grease	Total Suspended Solids (mg/L)	Aluminium – Dissolved (mg/L)	Manganese – Dissolved (mg/L)	Nickel – Dissolved (mg/L)	Zinc – Dissolved (mg/L)	Copper – Dissolved (mg/L)	Cadmium – Dissolved (mg/L)	Arsenic – Dissolved (mg/L)	Lead – Dissolved (mg/L)
20/06/2020	8.8	232	6.8	0.0										
21/06/2020	4.4	231	6.9	0.0										
22/06/2020	8.9	230	6.9	0.0										
23/06/2020	5.4	228	6.9	0.0										
24/06/2020	6.9	227	6.9	0.0										
25/06/2020	7.1	226	6.9	0.0	<2	<1								
26/06/2020	4.6	227	6.9	0.0										
27/06/2020	8.9	225	6.9	0.0										
28/06/2020	7.7	226	6.9	0.0										
29/06/2020	6.6	225	6.9	0.0	<2	<1								
30/06/2020	8.3	226	6.9	0.0										
1/07/2020	6.4	231	6.9	0.0										
2/07/2020	8.6	254	7.0	0.0										
3/07/2020	9.0	256	7.0	0.0										
4/07/2020	9.0	256	7.1	0.0										
5/07/2020	3.3	258	7.1	0.0										
6/07/2020	8.8	260	7.0	0.0	<2	<1	<0.01	0.072	0.004	<0.005	<0.001	<0.0001	<0.001	<0.001
7/07/2020	4.3	256	7.0	0.0										
8/07/2020	8.9	254	7.0	0.9										
9/07/2020	8.1	256	7.1	0.0										
10/07/2020	1.1	257	7.1	0.0										
11/07/2020	2.2	256	7.0	0.0										
12/07/2020	7.1	258	7.0	0.0										
13/07/2020	7.6	263	7.0	0.0	<2	<1								
14/07/2020	6.9	262	7.0	0.5										
15/07/2020	6.8	258	7.1	0.0										
16/07/2020	8.9	246	7.1	0.0										
17/07/2020	6.5	253	7.1	0.0										
18/07/2020	8.1	234	7.1	0.0										
19/07/2020	6.8	234	7.1	0.0										
20/07/2020	7.0	234	7.1	0.0	<2	<1								
21/07/2020	2.0	232	7.1	0.0										
22/07/2020	0.3	230	7.1	0.0										
23/07/2020	5.5	236	7.1	0.0										
24/07/2020	8.7	231	7.1	0.0										

Date	Flow (ML)	Electrical Conductivity -Field (µS/cm)	pH (Field) (Unit)	Turbidity (NTU)	Oil & Grease	Total Suspended Solids (mg/L)	Aluminium – Dissolved (mg/L)	Manganese – Dissolved (mg/L)	Nickel – Dissolved (mg/L)	Zinc – Dissolved (mg/L)	Copper – Dissolved (mg/L)	Cadmium – Dissolved (mg/L)	Arsenic – Dissolved (mg/L)	Lead – Dissolved (mg/L)
25/07/2020	8.7	234	7.1	0.0										
26/07/2020	8.5	233	7.1	0.0										
27/07/2020	8.9	230	7.1	0.0	<2	<1								
28/07/2020	8.8	236	7.2	0.8										
29/07/2020	8.0	244	7.1	0.1										
30/07/2020	6.7	227	7.0	0.0										
31/07/2020	9.2	247	7.1	0.0										
1/08/2020	3.2	251	7.1	0.8										
2/08/2020	5.8	259	7.1	0.1										
3/08/2020	4.0	250	7.0	0.2	<2	<1								
4/08/2020	7.8	261	7.0	0.0										
5/08/2020	9.6	262	7.0	0.0										
6/08/2020	7.8	256	7.0	0.0										
7/08/2020	8.8	247	7.0	0.0										
8/08/2020	9.6	249	6.9	0.0										
9/08/2020	9.0	250	7.0	0.0										
10/08/2020	9.3	250	7.0	0.0	<2	<1	<0.005	0.101	0.0034	0.007	0.0008	<0.00005	<0.0002	0.0002
11/08/2020	6.1	251	6.9	0.0										
12/08/2020	6.5	247	6.9	0.1										
13/08/2020	4.5	253	6.9	0.0										
14/08/2020	9.7	252	6.9	0.0										
15/08/2020	9.7	244	6.9	0.0										
16/08/2020	9.7	248	7.0	0.0										
17/08/2020	9.1	249	7.0	0.0										
18/08/2020	9.8	249	6.9	0.0										
19/08/2020	9.8	252	6.9	0.0										
20/08/2020	8.9	249	7.0	0.0	<2	<1								
21/08/2020	9.8	248	7.0	0.0										
22/08/2020	9.9	247	7.0	0.0										
23/08/2020	6.5	253	7.0	0.1										
24/08/2020	8.7	256	7.0	0.0										
25/08/2020	9.5	261	7.0	0.0	<2	<1								
26/08/2020	9.7	261	7.0	0.0										
27/08/2020	9.3	261	7.0	0.0										
28/08/2020	9.0	264	7.0	0.0										

Date	Flow (ML)	Electrical Conductivity -Field (µS/cm)	pH (Field) (Unit)	Turbidity (NTU)	Oil & Grease	Total Suspended Solids (mg/L)	Aluminium – Dissolved (mg/L)	Manganese – Dissolved (mg/L)	Nickel – Dissolved (mg/L)	Zinc – Dissolved (mg/L)	Copper – Dissolved (mg/L)	Cadmium – Dissolved (mg/L)	Arsenic – Dissolved (mg/L)	Lead – Dissolved (mg/L)
29/08/2020	8.7	265	7.0	0.0										
30/08/2020	7.0	266	7.0	0.0										
31/08/2020	8.8	252	7.0	0.0	<2	<1								
1/09/2020	9.6	245	7.0	0.0										
2/09/2020	6.8	248	7.0	1.0										
3/09/2020	9.7	256	7.1	0.1										
4/09/2020	9.9	260	7.0	0.0										
5/09/2020	9.3	259	7.0	0.0										
6/09/2020	9.7	262	7.0	0.0										
7/09/2020	5.8	264	7.0	0.0										
8/09/2020	9.2	266	6.9	0.0	<2	<1	<0.005	0.105	0.0039	0.006	0.0006	<0.00005	<0.0002	0.0001
9/09/2020	6.6	263	6.9	0.0										
10/09/2020	8.8	263	7.0	0.0										
11/09/2020	9.6	261	7.0	0.0										
12/09/2020	9.7	257	6.9	0.0										
13/09/2020	9.6	256	6.9	0.0										
14/09/2020	5.0	252	6.9	0.0	<2	<1								
15/09/2020	2.8	260	7.0	0.0										
16/09/2020	2.4	253	7.0	0.2										
17/09/2020	2.3	253	6.9	0.4										
18/09/2020	0.3	268	7.0	0.4										
19/09/2020	Nil													
20/09/2020	Nil													
21/09/2020	Nil													
22/09/2020	Nil													
23/09/2020	Nil													
24/09/2020	Nil													
25/09/2020	Nil													
26/09/2020	Nil													
27/09/2020	Nil													
28/09/2020	Nil													
29/09/2020	Nil													
30/09/2020	4.8	214	7.1	2.7										
1/10/2020	9.2	212	7.1	0.0		<1								
2/10/2020	4.7	212	7.1	0.0										

Date	Flow (ML)	Electrical Conductivity -Field (µS/cm)	pH (Field) (Unit)	Turbidity (NTU)	Oil & Grease	Total Suspended Solids (mg/L)	Aluminium – Dissolved (mg/L)	Manganese – Dissolved (mg/L)	Nickel – Dissolved (mg/L)	Zinc – Dissolved (mg/L)	Copper – Dissolved (mg/L)	Cadmium – Dissolved (mg/L)	Arsenic – Dissolved (mg/L)	Lead – Dissolved (mg/L)
3/10/2020	Nil													
4/10/2020	Nil													
5/10/2020	Nil													
6/10/2020	Nil													
7/10/2020	Nil													
8/10/2020	Nil													
9/10/2020	Nil													
10/10/2020	Nil													
11/10/2020	Nil													
12/10/2020	Nil													
13/10/2020	Nil													
14/10/2020	Nil													
15/10/2020	Nil													
16/10/2020	Nil													
17/10/2020	Nil													
18/10/2020	Nil													
19/10/2020	4.9	210	7.0	2.5	<2	<1	<0.005	0.0899	0.0032	0.003	<0.0005	<0.00005	<0.0002	<0.0001
20/10/2020	7.9	211	6.9	0.0										
21/10/2020	8.8	212	6.8	0.0										
22/10/2020	9.0	212	6.8	0.0										
23/10/2020	8.1	215	6.8	0.0										
24/10/2020	8.4	222	6.8	0.0										
25/10/2020	9.8	215	6.7	0.0										
26/10/2020	8.6	211	6.7	0.0	<2	<1								
27/10/2020	8.7	215	6.8	0.0										
28/10/2020	8.7	216	6.9	0.0										
29/10/2020	8.9	216	6.8	0.0										
30/10/2020	9.2	212	6.8	0.0										
31/10/2020	9.9	208	6.7	0.0										
1/11/2020	3.9	208	6.8	0.0										
2/11/2020	8.2	212	6.8	0.0	<2	<1	<0.005	0.084	0.0032	0.004	<0.0005	<0.00005	<0.0002	<0.0001
3/11/2020	7.3	222	6.8	0.0										
4/11/2020	9.1	231	6.8	0.0										
5/11/2020	9.3	225	6.8	0.0										
6/11/2020	9.9	216	6.8	0.0										

Date	Flow (ML)	Electrical Conductivity -Field (µS/cm)	pH (Field) (Unit)	Turbidity (NTU)	Oil & Grease	Total Suspended Solids (mg/L)	Aluminium – Dissolved (mg/L)	Manganese – Dissolved (mg/L)	Nickel – Dissolved (mg/L)	Zinc – Dissolved (mg/L)	Copper – Dissolved (mg/L)	Cadmium – Dissolved (mg/L)	Arsenic – Dissolved (mg/L)	Lead – Dissolved (mg/L)
7/11/2020	9.3	219	7.2	0.0										
8/11/2020	9.8	217	7.3	0.0										
9/11/2020	8.7	216	6.8	0.0	<2	<1								
10/11/2020	8.2	216	6.8	0.0										
11/11/2020	9.3	216	6.8	0.0										
12/11/2020	4.5	219	6.8	0.0										
13/11/2020	5.9	217	6.8	0.0										
14/11/2020	8.4	217	6.8	0.0										
15/11/2020	9.5	217	6.8	0.0										
16/11/2020	7.2	219	6.8	0.0	<2	<1								
17/11/2020	2.2	222	6.8	0.0										
19/11/2020	4.5	210	6.9	0.0										
20/11/2020	2.1	225	6.9	0.0										
21/11/2020	9.4	217	6.8	0.0										
22/11/2020	9.5	217	6.8	0.0										
23/11/2020	8.9	216	6.8	0.0	<2	<1								
24/11/2020	6.8	219	6.9	0.0										
25/11/2020	9.1	220	6.9	0.0										
26/11/2020	8.4	219	6.8	0.0										
27/11/2020	7.4	218	6.9	0.0										
28/11/2020	9.0	220	6.8	0.0										
29/11/2020	9.3	222	6.9	0.0										
30/11/2020	7.0	217	7.0	0.0	<2	<1								
1/12/2020	8.7	216	6.9	0.0										
2/12/2020	7.5	218	7.0	0.0										
3/12/2020	8.9	213	6.9	0.0										
4/12/2020	5.9	220	6.8	0.0										
5/12/2020	8.2	220	6.8	0.0										
6/12/2020	8.6	212	6.8	0.0										
7/12/2020	8.3	212	6.8	0.0										
8/12/2020	8.2	213	6.8	0.0	<2	<1								
9/12/2020	5.5	218	6.8	0.0										
10/12/2020	5.3	222	6.8	0.0										
11/12/2020	8.9	217	6.9	0.0										
12/12/2020	8.7	214	6.9	0.0										

Date	Flow (ML)	Electrical Conductivity -Field (µS/cm)	pH (Field) (Unit)	Turbidity (NTU)	Oil & Grease	Total Suspended Solids (mg/L)	Aluminium – Dissolved (mg/L)	Manganese – Dissolved (mg/L)	Nickel – Dissolved (mg/L)	Zinc – Dissolved (mg/L)	Copper – Dissolved (mg/L)	Cadmium – Dissolved (mg/L)	Arsenic – Dissolved (mg/L)	Lead – Dissolved (mg/L)
13/12/2020	7.9	213	6.9	0.0										
14/12/2020	8.1	214	7.0	0.0	<2	<1	<0.005	0.0912	0.0045	0.003	<0.0005	<0.00005	<0.0002	<0.0001
15/12/2020	7.1	214	7.0	0.0										
16/12/2020	6.9	216	6.9	0.0										
17/12/2020	7.6	204	6.8	0.0										
18/12/2020	8.6	203	6.8	0.0										
19/12/2020	9.3	207	6.9	0.0										
20/12/2020	9.0	211	6.8	0.0										
21/12/2020	9.1	210	6.8	0.0										
22/12/2020	9.0	207	6.8	0.0	<2	<1								
23/12/2020	5.4	206	6.8	0.0										
24/12/2020	2.9	212	6.8	0.0										
26/12/2020	0.4	217	6.9	1.5										
27/12/2020	7.5	219	6.7	0.2										
28/12/2020	3.3	211	6.9	0.0										
29/12/2020	7.0	212	6.9	0.0	<2	<1								
30/12/2020	9.8	222	6.9	0.0										
31/12/2020	7.9	221	6.9	0.0										

APPENDIX 3G. GROUNDWATER MONITORING DATA

Sample Point	Date	Electrical Conductivity -Field (µS/cm)	Electrical Conductivity - Lab (µS/cm)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	pH (Field) (Unit)	pH Lab (Unit)	Calcium - Dissolved (mg/L)	Magnesium - Dissolved (mg/L)	Sodium - Dissolved (mg/L)	Potassium - Dissolved (mg/L)	Alkalinity Carbonate (mg/L)	Alkalinity Bicarbonate (mg/L)	Chloride (mg/L)	Sulphate - Turbidimetric (mg/L)	Aluminium - Dissolved (mg/L)	Arsenic - Dissolved (mg/L)	Boron - Dissolved (mg/L)	Cobalt - Dissolved (mg/L)	Cadmium - Dissolved (mg/L)	Chromium - Dissolved (mg/L)	Copper - Dissolved (mg/L)	Iron - Dissolved (mg/L)	Lead - Dissolved (mg/L)	Manganese - Dissolved (mg/L)	Mercury - Dissolved (mg/L)	Nickel - Dissolved (mg/L)	Selenium - Dissolved (mg/L)	Silver - Dissolved (mg/L)	Zinc - Dissolved (mg/L)	Ammonia as N (mg/L)	Nitrate (mg/L)	Phosphorus - Total (mg/L)	Reactive Phosphorus - Total (mg/L)	Fluoride (mg/L)
PZ003	8/04/20	849	788	410	41	5.6	6.2	3	20	119	6	<1	115	180	24	<0.01	<0.001	<0.05	<0.0001	<0.001	<0.001	<0.001	8.46	<0.001	0.315	<0.0001	<0.001	<0.01	<0.001	<0.005	0.06	0.14	0.07	<0.01	0.2
PZ003	7/10/20	737	753	436	52	6.3	6.4	3	18	108	7	<1	120	180	32	0.05	<0.001	<0.05	<0.0001	<0.001	0.001	<0.001	<0.05	<0.001	0.003	<0.0001	0.002	<0.01	<0.001	0.01	0.07	0.23	0.04	<0.01	0.2
PZ040B	9/04/20	1018	934	521	61	5.2	5.2	12	19	120	7	<1	16	285	29	0.04	0.001	<0.05	<0.0001	<0.001	0.018	<0.001	8.66	<0.001	0.159	<0.0001	0.013	<0.01	<0.001	0.03	0.8	0.09	0.08	<0.01	<0.1
PZ040B	12/10/20	1164	1210	640	79	4.9	5.0	14	26	142	7	<1	9	365	28	0.06	0.002	<0.05	<0.0001	<0.001	0.037	<0.001	9.92	<0.001	0.203	<0.0001	0.027	<0.01	<0.001	0.068	0.43	0.18	0.07	<0.01	<0.1
PZ044	8/04/20	2550	2780	2110	44	6.7	6.6	430	76	98	39	<1	438	252	900	<0.01	0.004	<0.05	<0.0001	<0.001	<0.001	<0.001	3.68	<0.001	0.48	<0.0001	<0.001	<0.01	<0.001	0.011	0.26	0.15	0.08	<0.01	0.2
PZ044	7/10/20	2610	2590	1970	14	6.5	6.6	356	70	91	37	<1	482	259	848	<0.01	0.004	<0.05	<0.0001	<0.001	<0.001	<0.001	3.59	<0.001	0.522	<0.0001	0.002	<0.01	<0.001	0.034	0.28	0.18	0.07	<0.01	0.2
PZ055	8/04/20	1560	1730	1110	878	5.4	5.6	15	61	211	15	<1	46	322	405	0.02	<0.001	<0.05	<0.0001	<0.001	0.239	<0.001	10.9	<0.001	4.32	<0.0001	0.054	<0.01	<0.001	0.044	1.05	0.09	0.06	<0.01	<0.1
PZ055	21/10/20	2287	2260	1380	167	5.3	5.4	23	90	281	18	<1	30	443	455	0.02	<0.001	<0.05	<0.0001	<0.001	0.388	<0.001	13.1	<0.001	6.05	<0.0001	0.091	<0.01	<0.001	0.074	1.44	<0.01	0.01	<0.01	0.1
PZ058A	8/04/20	13670	15000	13000	8510	3.5	3.5	135	625	2020	9	<1	<1	3500	4990	292	0.032	<0.05	0.0126	0.081	1.47	0.263	8.06	0.005	1.48	<0.0001	2.03	0.1	<0.001	10.2	0.08	0.01	2.94	0.14	0.3
PZ058A	7/10/20	1290	12900	10500	2100	3.4	3.6	125	532	1770	13	<1	<1	3060	3990	232	0.032	<0.05	0.004	0.065	1.23	0.002	5.76	0.004	1.36	<0.0001	1.61	0.18	<0.001	7.46	0.17	<0.01	1.4	0.09	0.4
PZ101C	7/04/20	583	624	338	376	6.9	6.9	34	17	63	9	<1	221	59	4	<0.01	0.002	<0.05	<0.0001	<0.001	0.002	<0.001	0.77	<0.001	0.46	<0.0001	0.002	<0.01	<0.001	0.015	0.22	0.5	0.18	<0.01	0.5
PZ101C	6/10/20	572	591	380	64	6.9	6.8	37	15	55	10	<1	216	57	6	0.04	0.002	<0.05	<0.0001	<0.001	0.002	0.002	0.66	<0.001	0.403	<0.0001	0.005	<0.01	<0.001	0.07	0.26	0.07	0.1	0.03	0.4
PZ101B	7/04/20	753	815	412	113	7.0	7.4	56	21	78	17	<1	368	52	1	<0.01	0.007	<0.05	<0.0001	<0.001	<0.001	<0.001	1.52	<0.001	0.238	<0.0001	0.003	<0.01	<0.001	0.008	0.57	0.02	0.56	0.05	1.1
PZ101B	6/10/20	731	791	489	42	7.5	7.6	56	20	76	17	<1	327	48	1	<0.01	0.006	<0.05	<0.0001	<0.001	<0.001	<0.001	2.01	<0.001	0.203	<0.0001	0.002	<0.01	<0.001	<0.005	0.53	0.14	0.19	<0.01	1.2
PZ102B	9/04/20	2490	2390	1810	82	6.7	6.6	193	84	236	31	<1	220	138	938	<0.01	<0.001	<0.05	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.004	<0.0001	0.007	<0.01	<0.001	0.23	<0.01	0.65	0.03	<0.01	1.2
PZ102B	6/10/20	2088	2400	1900	49	6.7	6.7	189	77	222	31	<1	218	148	922	0.01	<0.001	<0.05	<0.0001	<0.001	<0.001	0.002	<0.05	<0.001	0.015	<0.0001	0.007	<0.01	<0.001	0.201	<0.01	0.7	0.02	<0.01	1.2
PZ102A	9/04/20	1452	1380	812	133	7.6	7.0	68	29	170	21	<1	318	205	138	<0.01	<0.001	<0.05	<0.0001	<0.001	0.017	<0.001	0.33	<0.001	0.152	<0.0001	0.044	<0.01	<0.001	0.021	0.48	0.16	0.02	<0.01	1.9
PZ102A	6/10/20	1307	1380	822	16	7.1	7.0	68	27	165	21	<1	332	199	127	<0.01	<0.001	<0.05	<0.0001	<0.001	0.004	<0.001	0.47	<0.001	0.172	<0.0001	0.008	<0.01	<0.001	<0.005	0.52	<0.01	0.03	<0.01	2
PZ103C	9/04/20	334	315	206	668	5.6	5.2	5	8	36	7	<1	27	73	16	0.02	<0.001	<0.05	<0.0001	<0.001	0.01	<0.001	0.11	<0.001	0.245	<0.0001	0.13	<0.01	<0.001	0.066	<0.01	0.06	0.29	<0.01	0.1
PZ103C	6/10/20	309	326	196	929	5.4	5.2	5	9	34	8	<1	24	66	15	0.01	<0.001	<0.05	<0.0001	<0.001	0.012	<0.001	0.2	<0.001	0.253	<0.0001	0.135	<0.01	<0.001	0.044	0.12	0.04	0.25	<0.01	<0.1
PZ103A	9/04/20	829	796	494	69	6.9	7.1	45	18	92	15	<1	308	73	25	<0.01	<0.001	<0.05	<0.0001	<0.001	<0.001	<0.001	1.52	<0.001	0.033	<0.0001	<0.001	<0.01	<0.001	0.008	0.36	0.03	0.04	<0.01	1.6
PZ103A	6/10/20	397	385	241	60	6.1	6.1	9	11	35	8	<1	52	69	16	<0.01	0.004	<0.05	<0.0001	<0.001	0.003	<0.001	8.87	<0.001	0.35	<0.0001	0.029	<0.01	<0.001	<0.005	0.1	<0.01	0.02	<0.01	0.1
PZ104	9/04/20	3370	3860	776	904	11.8	12.1	308	<1	39	5	26	<1	23	8	0.24	<0.001	<0.05	<0.0001	0.436	<0.001	<0.001	<0.05	<0.001	<0.001	<0.0001	<0.001	<0.01	<0.001	<0.005	0.18	0.05	0.32	<0.01	0.2
PZ104	6/10/20	2930	3350	837	373	12.7	12.2	250	<1	36	6	80	<1	22	11	0.23	<0.001	<0.05	<0.0001	0.328	<0.001	0.001	<0.05	<0.001	<0.001	<0.0001	<0.001	<0.01	<0.001	<0.005	0.2	0.04	0.1	<0.01	0.2
PZ105C	7/04/20	196	201	107	115	6.5	5.8	5	3	24	2	<1	30	43	<1	<0.01	0.001	<0.05	<0.0001	<0.001	0.015	<0.001	2.84	<0.001	0.771	<0.0001	0.054	<0.01	<0.001	0.018	0.25	0.25	0.1	<0.01	<0.1
PZ105C	6/10/20	206	208	105	59	6.0	5.9	5	4	24	3	22	58	42	<1	<0.01	0.002	<0.05	<0.0001	<0.001	0.017	<0.001	2.59	<0.001	0.89	<0.0001	0.054	<0.01	<0.001	0.024	0.4	0.08	0.09	<0.01	<0.1
PZ106A	7/04/20	687	738	377	108	6.3	9.1	24	2	98	18	<1	53	190	13	0.48	<0.001	<0.05	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001	0.002	<0.0001	<0.001	<0.01	<0.001	<0.005	0.03	0.97	0.03	0.03	<0.1
PZ106A	12/10/20	650	742	402	83	8.3	8.5	25	3	100	18	<1	59	200	12	0.33	<0.001	<0.05	<0.0001	<0.001	<0.001	0.002	<0.05	<0.001	0.003	<0.0001	<0.001	<0.01	<0.001	<0.005	0.02	1.17	0.06	<0.01	0.1
PZ109	7/04/20	667	703	356	140	6.7	6.6	36	32	56	2	<1	230	79	15	<0.01	<0.001	<0.05	<0.0001	0.001	<0.001	<0.001	<0.05	<0.001	0.003	<0.0001	0.002	<0.01	<0.001	0.018	0.08	0.15	0.04	0.02	0.1
PZ109	6/10/20	780	699	383	36	6.7	6.8	35	31	56	3	<1	255	75	16	<0.01	<0.001	<0.05	<0.0001	0.001	<0.001	<0.001	<0.05	<0.001	0.009	<0.0001	0.002	<0.01	<0.001	0.016	0.02	0.25	0.03	<0.01	0.1
PZ111	7/04/20	911	968	618	560	5.8	6.2	60	32	56	16	<1	166	226	17	<0.01	<0.001	<0.05	<0.0001	<0.001	0.014	<0.001	6.43	<0.001	0.585	<0.0001	0.037	<0.01	<0.001	0.006	0.6	0.08	<0.01	<0.01	0.2
PZ111	7/10/20	930	1010	678	1730	6.4	6.2	66	33	55	17	<1	156	255	22	<0.01	<0.001	<0.05	<0.0001	<0.001	0.013	<0.001	0.52	<0.001	0.56	<0.0001	0.035	<0.01	<0.001	0.016	0.26	0.1	0.02	<0.01	0.2
PZ112B	8/04/20	2790	2960	2470	7810	4.9	4.9	2	40	511	11	<1	5	865	345	0.23	<0.001	<0.05	0.0004	0.001	0.039	<0.001	<0.05	<0.001	0.086	<0.0001	0.096	<0.01	<0.001	0.162	0.03	1.93	1.72	<0.01	0.2
PZ112B	7/10/20	2840	3040	2570	4080	5.0	4.9	3	42	534	12	<1	13	790	344	0.24	<0.001	<0.05	0.0005	<0.001	0.044	0.001	<0.05	<0.001	0.099	<0.0001	0.104	<0.01	<0.001	0.162	0.07	2.15	1.59	<0.01	0.2
PZ137	7/04/20	1277	1360	778	70	5.8	6.0	54	44	111	28	<1	74	338	74	<0.01	<0.001	<0.05	<0.0001	<0.001	0.001	<0.001	2.43	<0.001	0.372	<0.0001	0.003	<0.01	<0.001	0.012	0.15	0.04	<0.01	<0.01	<0.1

Sample Point	Date	Electrical Conductivity - Field (µS/cm)	Electrical Conductivity - Lab (µS/cm)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	pH (Field) (Unit)	pH Lab (Unit)	Calcium - Dissolved (mg/L)	Magnesium - Dissolved (mg/L)	Sodium - Dissolved (mg/L)	Potassium - Dissolved (mg/L)	Alkalinity Carbonate (mg/L)	Alkalinity Bicarbonate (mg/L)	Chloride (mg/L)	Sulphate - Turbidimetric (mg/L)	Aluminium - Dissolved (mg/L)	Arsenic - Dissolved (mg/L)	Boron - Dissolved (mg/L)	Cobalt - Dissolved (mg/L)	Cadmium - Dissolved (mg/L)	Chromium - Dissolved (mg/L)	Copper - Dissolved (mg/L)	Iron - Dissolved (mg/L)	Lead - Dissolved (mg/L)	Manganese - Dissolved (mg/L)	Mercury - Dissolved (mg/L)	Nickel - Dissolved (mg/L)	Selenium - Dissolved (mg/L)	Silver - Dissolved (mg/L)	Zinc - Dissolved (mg/L)	Ammonia as N (mg/L)	Nitrate (mg/L)	Phosphorus - Total (mg/L)	Reactive Phosphorus - Total (mg/L)	Fluoride (mg/L)
PZ137	12/10/20	1648	1730	1090	78	6.0	6.2	79	61	133	33	<1	113	458	155	<0.01	0.001	<0.05	<0.0001	<0.001	0.002	<0.001	10.6	<0.001	0.754	<0.0001	0.006	<0.01	<0.001	0.016	0.39	0.05	<0.01	<0.01	<0.1
PZ170	9/04/20	3740	3580	2440	56	6.3	6.3	190	144	278	24	<1	350	1060	2	<0.01	0.007	<0.05	<0.0001	<0.001	0.007	<0.001	10	<0.001	0.302	<0.0001	0.03	<0.01	<0.001	0.021	0.19	0.05	0.04	0.02	0.1
PZ170	12/10/20	1571	1980	1240	60	6.2	6.4	74	55	145	14	<1	272	542	3	0.02	0.004	<0.05	0.0001	0.001	0.012	<0.001	4.42	<0.001	0.135	<0.0001	0.032	<0.01	<0.001	0.287	0.55	0.33	0.15	<0.01	0.1
PZ188	9/04/20	134	140	113	97	5.1	5.3	<1	2	22	<1	<1	11	43	<1	<0.01	<0.001	<0.05	<0.0001	<0.001	0.003	<0.001	0.06	<0.001	0.014	<0.0001	0.006	<0.01	<0.001	0.01	0.02	0.08	0.05	<0.01	<0.1
PZ188	6/10/20	191	216	90	44	5.1	5.1	<1	3	29	<1	<1	8	44	<1	<0.01	<0.001	<0.05	<0.0001	<0.001	0.004	0.001	<0.05	<0.001	0.017	0.0002	0.012	<0.01	<0.001	0.015	0.02	0.04	0.13	<0.01	<0.1
PZ189	9/04/20	441	362	232	48	5.8	5.6	12	11	34	5	<1	38	88	3	<0.01	<0.001	<0.05	<0.0001	<0.001	<0.001	<0.001	23.4	<0.001	0.578	<0.0001	0.003	<0.01	<0.001	0.016	0.03	0.01	0.12	<0.01	0.2
PZ189	6/10/20	404	390	254	102	6.1	6.0	12	12	31	5	<1	41	74	3	0.02	<0.001	<0.05	<0.0001	<0.001	<0.001	<0.001	18.6	<0.001	0.487	<0.0001	0.003	<0.01	<0.001	0.03	0.26	<0.01	0.19	<0.01	0.1
PZ191	8/10/20	1108	1140	800	52100	6.6	6.6	28	13	161	15	<1	205	117	239	<0.01	<0.001	<0.05	<0.0001	<0.001	<0.001	<0.001	0.8	<0.001	0.049	<0.0001	0.001	<0.01	<0.001	<0.005	0.48	0.19	40.3	<0.01	0.7
PZ203	7/04/20	319	339	184	35	5.1	5.4	4	6	47	<1	<1	4	76	18	<0.01	<0.001	<0.05	<0.0001	<0.001	0.048	<0.001	<0.05	<0.001	0.261	<0.0001	0.041	<0.01	<0.001	0.043	0.07	0.13	<0.01	<0.01	<0.1
PZ203	7/10/20	343	356	248	61	5.6	5.7	3	6	47	<1	<1	15	73	22	<0.01	<0.001	<0.05	<0.0001	<0.001	0.043	<0.001	<0.05	<0.001	0.219	<0.0001	0.037	<0.01	<0.001	0.038	<0.01	0.1	<0.01	<0.01	<0.1
PZ213	16/04/20	426	464	283	44	5.1	5.1	10	14	45	2	<1	8	125	10	0.02	<0.001	<0.05	0.0002	<0.001	0.067	0.005	2.14	<0.001	0.666	<0.0001	0.103	<0.01	<0.001	0.132	0.03	<0.01	0.22	<0.01	<0.1
PZ213	12/10/20	435	473	286	10	5.2	5.3	13	13	44	3	<1	13	44	3	0.02	<0.001	<0.05	<0.0001	<0.001	0.065	<0.001	2.57	<0.001	0.5	<0.0001	0.099	<0.01	<0.001	0.144	0.03	<0.01	0.02	<0.01	<0.1
PZ214	16/04/20	180	180	110	28	5.5	5.8	5	6	20	1	<1	37	28	3	<0.01	<0.001	<0.05	<0.0001	<0.001	0.001	0.001	<0.05	<0.001	0.009	<0.0001	0.006	<0.01	<0.001	0.012	<0.01	1.28	<0.01	<0.01	<0.1
PZ214	12/10/20	193	296	158	28	5.8	6.0	6	7	22	2	<1	38	139	8	<0.01	<0.001	<0.05	<0.0001	<0.001	<0.001	0.002	<0.05	<0.001	0.004	<0.0001	0.006	<0.01	<0.001	0.015	<0.01	1.87	0.06	<0.01	<0.1
PZ217	7/10/20	4040	4360	2170	8	6.8	6.8	93	161	584	15	<1	434	922	569	<0.01	<0.001	<0.05	<0.0001	<0.001	0.002	<0.001	<0.05	<0.001	0.148	<0.0001	0.002	<0.01	<0.001	0.008	0.04	0.36	0.15	<0.01	0.8
PZ221	7/10/20	1192	1250	706	36	6.5	6.5	34	47	145	12	<1	317	216	68	<0.01	<0.001	<0.05	<0.0001	<0.001	<0.001	<0.001	1.85	<0.001	0.185	<0.0001	<0.001	<0.01	<0.001	0.006	0.38	0.02	0.06	<0.01	0.6

BORE	PZ105A – 28m	PZ105A – 80m	PZ105A – 118m	PZ105A – 130m	PZ127 - 43m	PZ127 - 68m	PZ128 - 20m	PZ128 - 36m	PZ128 - 55m
Jan-20	373.68	367.94	353.99	347.63	449.13	434.93	388.77	374.37	369.92
Feb-20	373.65	369.00	353.55	347.82	449.07	434.81	388.7	374.35	369.77
Mar-20	373.76	369.92	353.10	348.56	449.13	434.81	388.77	374.34	369.77
Apr-20	373.95	369.92	352.59	349.78			388.73	374.3	369.73
May-20	374.09	368.56	352.16	351.48			388.8	374.3	369.73
Jun-20	374.26	368.38	351.54	352.85			388.8	374.34	369.63
Jul-20	374.40	367.97	350.92	353.33			388.82	374.34	369.66
Aug-20	374.47	368.37	350.65	354.55	449.24	423.85	388.75	374.26	369.57
Sep-20	374.56	368.63	349.57	356.16	449.36	423.85	388.74	374.25	369.51
Oct-20	374.67	369.21	349.01	356.33	449.42	423.91	388.75	374.25	369.49
Nov-20	374.81	369.76	348.71	356.27	449.30	423.91	388.70	374.24	369.54
Dec-20	374.98	370.08	348.35	356.28	449.30	423.85	388.69	374.24	369.54
min	*373.65*	*367.94*	*348.35*	*347.63*	*449.07*	*423.85*	*388.69*	*374.24*	*369.49*
max	*374.98*	*370.08*	*353.99*	*356.33*	*449.42*	*434.93*	*388.75*	*374.26*	*369.57*
BORE	**PZ129 - 35m**	**PZ129 - 53m**	**PZ129 - 74m**	**PZ130 - 38.5m**	**PZ130 - 64m**	**PZ179 - 28m**	**PZ179 - 33m**	**PZ179 - 145m**	**PZ-186 – 40m**
Jan-20	389.96	383.26	364.49	496.38	472.61	416.93	417.12	331.51	401.23
Feb-20	389.94	383.43	364.78	496.35	472.67	417.03	417.14	331.16	401.24
Mar-20	389.99	383.67	364.94	496.33	472.75	417.11	417.18	331.16	401.15
Apr-20	390	383.74	365	496.32	472.75	417.19	417.25	331.33	400.86
May-20	389.93	383.88	365.06	496.30	472.88	417.25	417.33	331.33	400.68
Jun-20	389.98	383.82	365.13	496.30	472.99	417.34	417.33	331.33	396.44
Jul-20	390	383.93	365.13	496.28	472.97	417.42	417.39	331.28	396.17
Aug-20	389.93	383.68	365.04	495.75	536.04	417.48	417.41	330.99	396.18
Sep-20	389.95	383.52	365.04	494.82	535.47	417.55	417.47	330.99	396.11
Oct-20	389.96	383.68	365.03	494.74	536.65	417.58	417.50	330.82	396.02
Nov-20	389.97	383.73	365.02	494.70	537.39	417.64	417.52	330.82	395.97
Dec-20	389.97	383.86	365.00	494.77	537.42	417.71	417.52	330.82	395.92
min	*389.93*	*383.52*	*365.00*	*494.70*	*472.61*	*416.93*	*417.12*	*330.82*	*395.92*
max	*389.97*	*383.86*	*365.04*	*496.38*	*537.42*	*417.71*	*417.52*	*331.51*	*401.24*
BORE	**PZ-186 – 65m**	**PZ-186 – 86m**	**PZ-186 – 118m**	**PZ192-68m**	**PZ192-166m**	**PZ192-178m**	**PZ193 - 80m**	**PZ193 - 162m**	**PZ193 - 184m**
Jan-20	392.72	391.2	330.14	402.11	350.86	346.09	417.61	357.97	345.53
Feb-20	392.63	391.19	330.18	402.04	350.15	345.66	417.59	357.74	344.97
Mar-20	386.98	390.39	330.46	401.86	349.81	345.66	417.63	357.81	344.90
Apr-20	386.52	389.45	330.82	401.69	350.00	346.00	417.60	358.13	345.11
May-20	386.71	389.45	331.10	402.86	349.90	346.28	417.77	358.40	345.38
Jun-20	379.43	381.40	331.31	402.90	349.94	346.35	417.79	358.61	345.43
Jul-20	379.52	381.42	331.45	402.92	349.52	345.96	417.87	358.56	345.09
Aug-20	379.64	381.39	331.57	402.72	349.28	345.80	417.95	358.54	344.82
Sep-20	379.88	381.22	331.59	402.51	349.18	345.75	417.97	358.54	344.64
Oct-20	379.82	380.93	331.60	402.41	349.04	345.33	417.79	358.54	344.54
Nov-20	379.34	380.72	331.56	402.43	348.92	345.43	417.94	358.62	344.47
Dec-20	379.04	380.50	331.51	402.53	348.94	345.61	418.01	358.83	344.53
min	*379.04*	*380.50*	*330.18*	*401.69*	*348.92*	*345.33*	*417.59*	*357.74*	*344.47*
max	*392.63*	*391.19*	*331.60*	*402.92*	*350.86*	*346.35*	*418.01*	*358.83*	*345.53*

Gaps in data indicate that no result is available

BORE	PZ003	PZ40B	PZ44	PZ55	PZ58A	PZ101C	PZ101B	PZ102B	PZ102A	PZ103C	PZ103B	PZ103A	PZ104	PZ105C	PZ106A
Jan-20	467.4	413.4	478.9	422.8	466.8	380.2	365.3	353.9	353.4	400.0	Blocked	351.6		373.7	425.3
Feb-20	467.5	413.4	478.8	422.8	466.7	380.2	365.0	353.8	353.2	400.0	Blocked	351.3	372.9	373.7	425.6
Mar-20	467.6	413.2	478.8	422.8	466.6	380.1	365.1	354.7	354.1	400.0	Blocked	351.9	373.3	373.8	425.6
Apr-20	468.0	412.0	478.9	422.9	466.7	380.1	365.1	355.1	355.7	400.7	Blocked	352.1	373.5	373.9	425.6
May-20	468.2	411.6	478.9	422.9	466.5	380.2	365.2	355.7	356.3		Blocked		373.7	374.1	424.8
Jun-20	468.1	409.4	478.9	422.9	466.5	380.1	365.2	355.0	354.4	399.3	Blocked	352.3	373.7	374.2	424.8
Jul-20	468.7	409.3	479.0	422.9	466.5	380.0	365.2	354.4	354.7	399.4	Blocked	351.6	373.6	374.3	425.0
Aug-20	469.0	409.6	479.1	423.0	466.5	380.3	365.2	354.5	353.9	399.8	Blocked	351.6	373.6	374.4	425.1
Sep-20	469.0	409.8	479.2	422.9	466.4	380.0	365.1	354.4	353.8	399.8	Blocked	351.5	373.4	374.4	425.3
Oct-20	469.1	409.9	479.3	423.0	466.5	380.1	365.2	354.8	355.6	399.9	Blocked	351.7	373.4	374.5	425.4
Nov-20	469.4	410.2	479.4	423.0	466.5	380.0	365.2	354.7	353.9	401.0	Blocked	351.6	373.4	374.5	424.3
Dec-20	469.5	410.0	479.6	423.0	466.4	380.1	365.2	354.7	353.8	399.7	Blocked	352.0	373.2	374.6	424.6
min	*467.4*	*409.3*	*478.8*	*422.8*	*466.4*	*380.0*	*365.0*	*353.8*	*353.2*	*399.3*		*351.3*	*372.9*	*373.7*	*424.3*
max	*469.5*	*413.4*	*479.6*	*423.0*	*466.8*	*380.3*	*365.3*	*355.7*	*356.3*	*401.0*		*352.3*	*373.7*	*374.6*	*425.6*
BORE	**PZ109**	**PZ111**	**PZ112B**	**PZ137**	**PZ170**	**PZ184**	**PZ186a**	**PZ188**	**PZ189**	**PZ191**	**PZ203**	**PZ211**	**PZ213**	**PZ214**	**PZ217**
Jan-20	381.4	368.2	478.5	460.6	419.5	410.1		413.4	399.5	357.0	402.1	Dry	412.7	412.8	
Feb-20	381.3	361.0	478.5	460.7	419.4	410.1		413.4	399.6	348.3	402.1	Dry	412.7	412.8	
Mar-20	381.3	365.5	478.4	460.6	419.3	410.1		413.3	399.5	348.5	402.2	Dry	412.6	412.7	
Apr-20	381.3	367.8	478.4	460.6	419.2	410.1	408.9	413.2	399.3	348.5	402.4	Dry	412.6	412.7	492.3
May-20	382.2	370.0	478.4	460.7	419.3	410.1	409.0	413.3	398.1	348.6	402.2	Dry	412.6	412.7	492.4
Jun-20	382.2	369.9	478.4	460.6	419.2	410.1	408.3	413.2	395.4	348.5	402.2	Dry	412.5	412.6	492.3
Jul-20	382.2	369.5	478.4	460.6	419.3	410.1	407.9	413.1	395.4	347.7	402.1	Dry	412.4	412.6	492.2
Aug-20	382.3	368.2	478.4	460.6	419.4	410.1	407.9	413.1	395.5	347.4	402.2	Dry	412.3	412.5	492.4
Sep-20	382.1	368.9	478.3	460.6	419.4	410.1	407.9	413.0	395.5	347.5	402.1	Dry	412.2	412.4	492.2
Oct-20	382.2	368.7	478.4	460.7	419.5	410.1	407.8	413.0	395.5	347.4	402.1	Dry	412.1	412.4	492.3
Nov-20	382.2	368.4	478.5	460.8	419.7	410.1	407.8	413.0	395.5	347.2	402.3	Dry	412.1	412.4	492.4
Dec-20	382.2	368.2	478.6	460.8	419.7	410.1	407.8	412.9	395.5	347.3	402.2	Dry	412.0	412.3	492.3
min	*381.3*	*361.0*	*478.3*	*460.6*	*419.2*	*410.1*	*407.8*	*412.9*	*395.4*	*347.2*	*402.1*	*Dry*	*412.0*	*412.3*	*492.2*
max	*382.3*	*370.0*	*478.6*	*460.8*	*419.7*	*410.1*	*409.0*	*413.4*	*399.6*	*357.0*	*402.4*	*Dry*	*412.7*	*412.8*	*492.4*

Gaps in data indicate that no result is available

GROUNDWATER LEVEL GRAPHS

Figure 3-g: Ulan Granite Composite Hydrograph

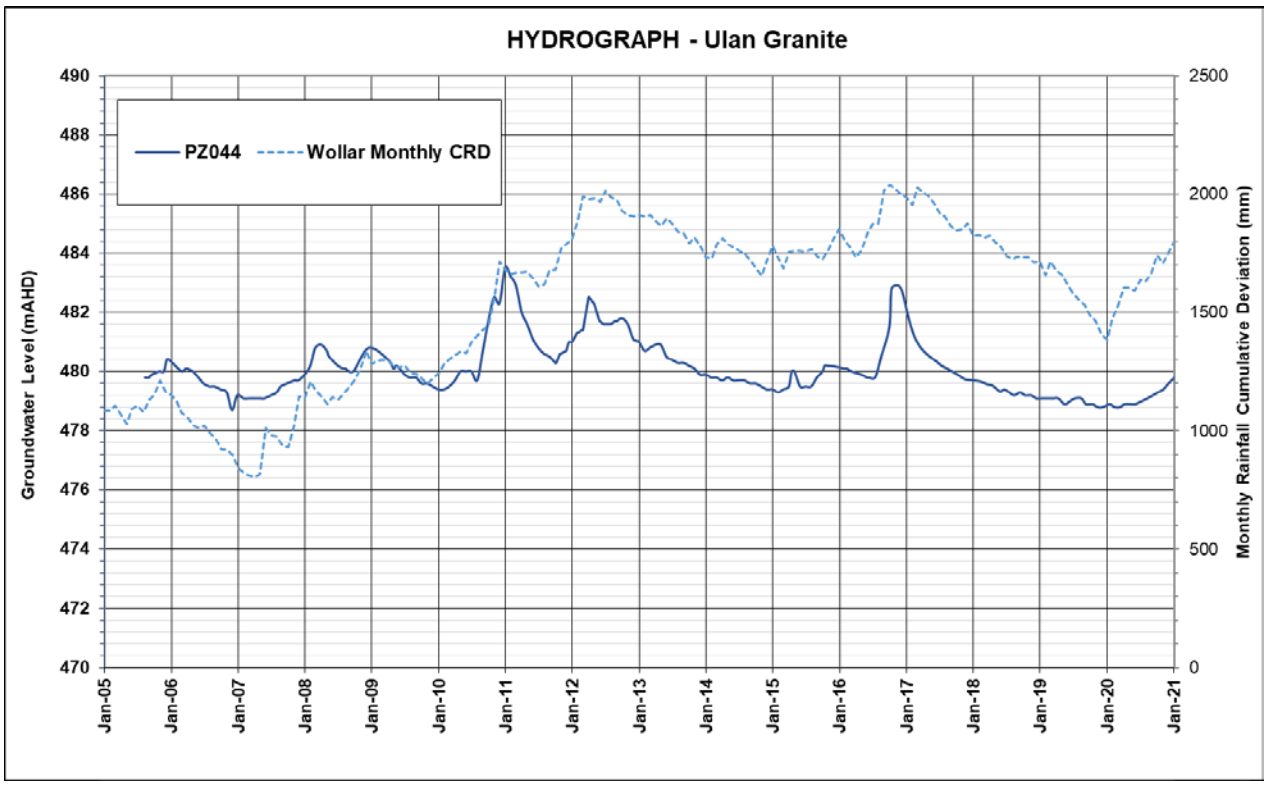


Figure 3-h: Marrangaroo and Ulan Seam Composite Hydrograph

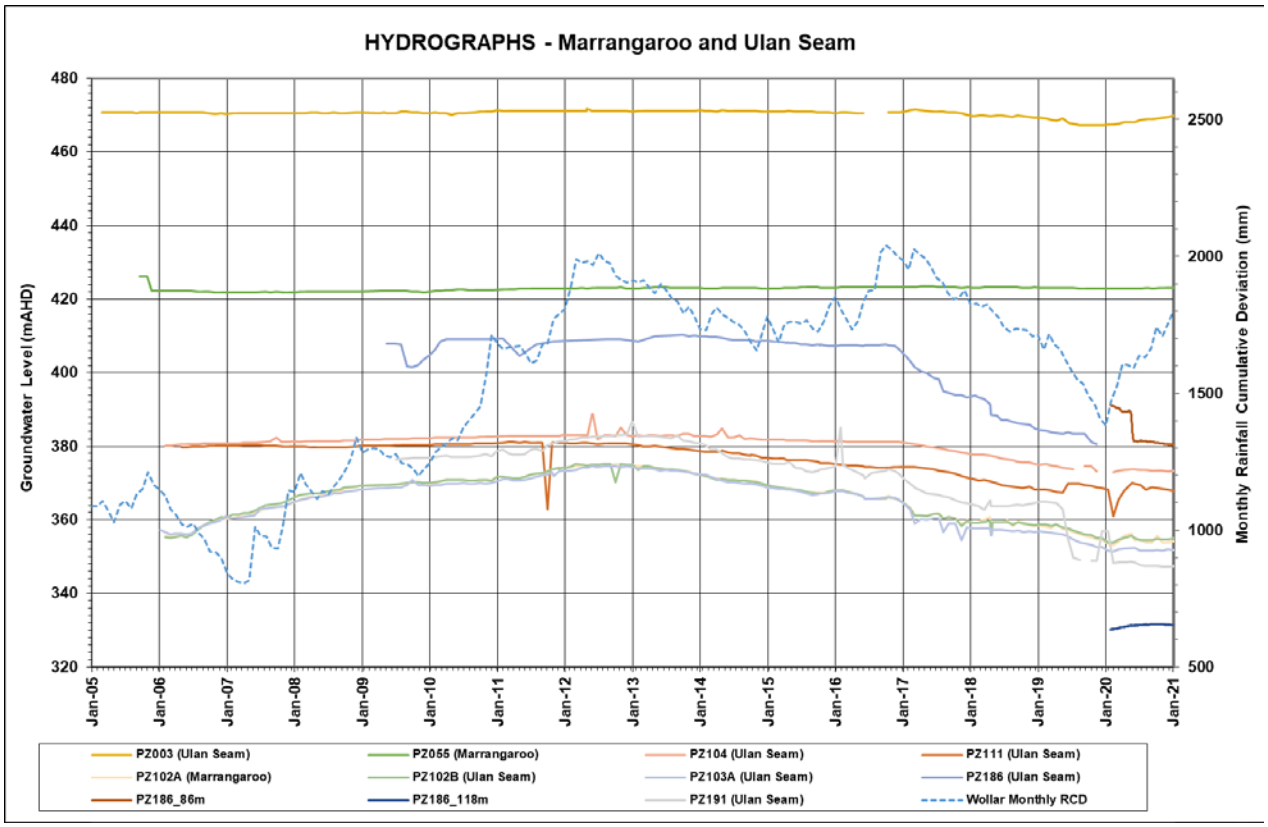


Figure 3-i: Permian Overburden Composite Hydrograph

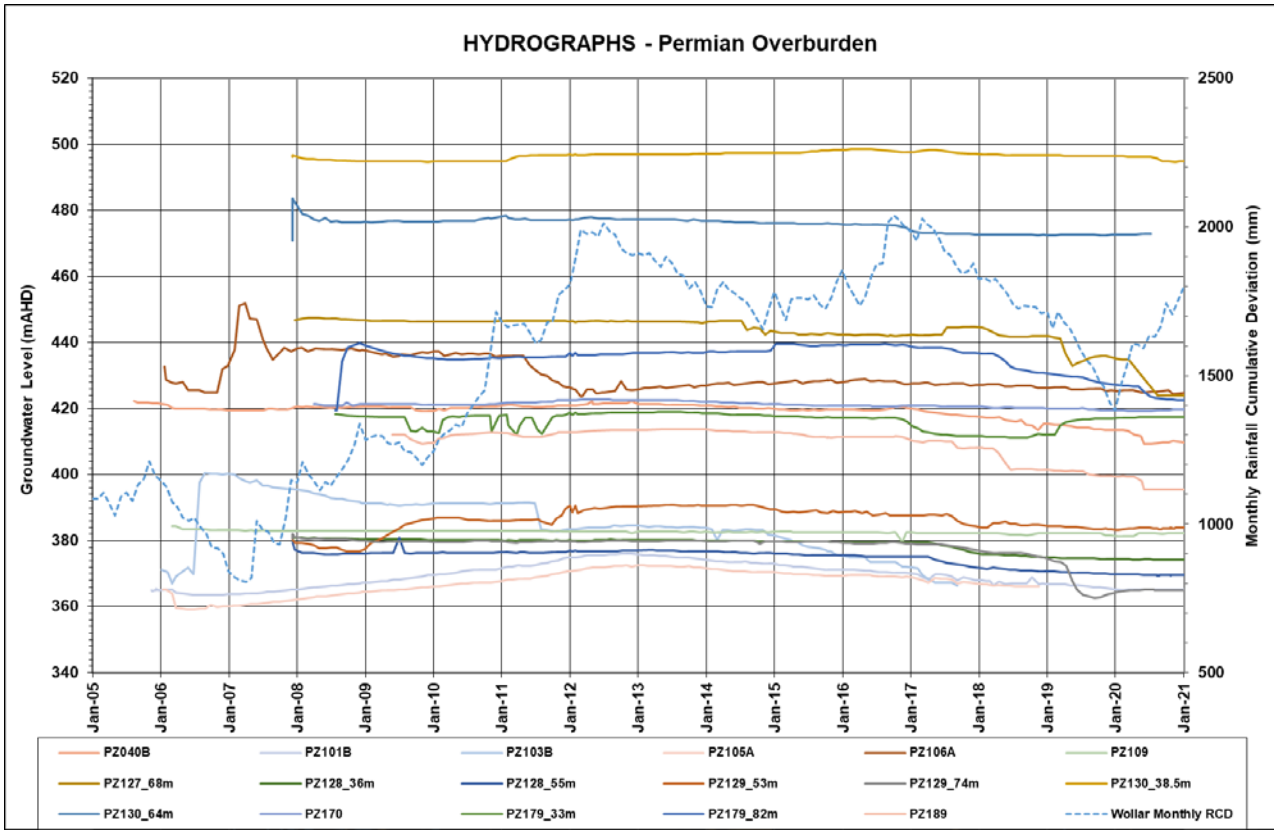


Figure 3-j: Triassic Composite Hydrograph

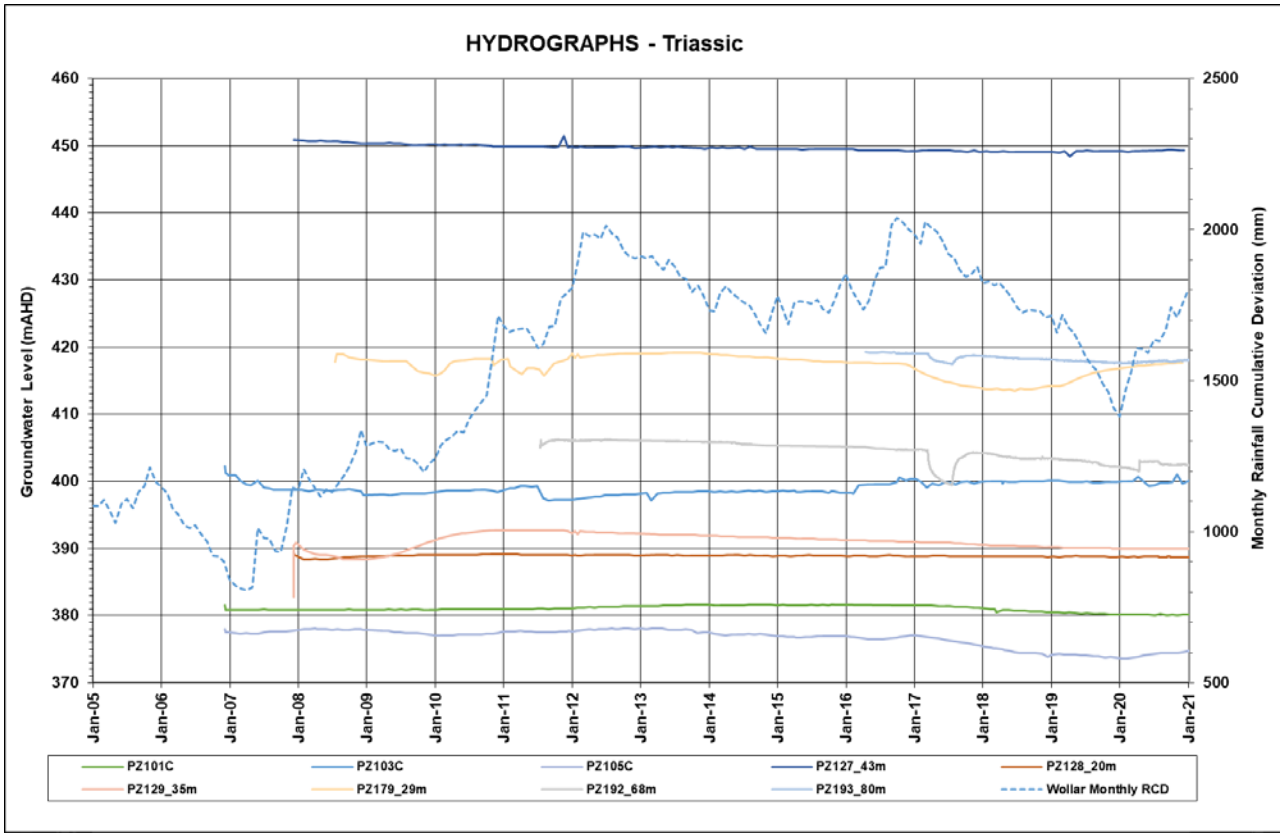
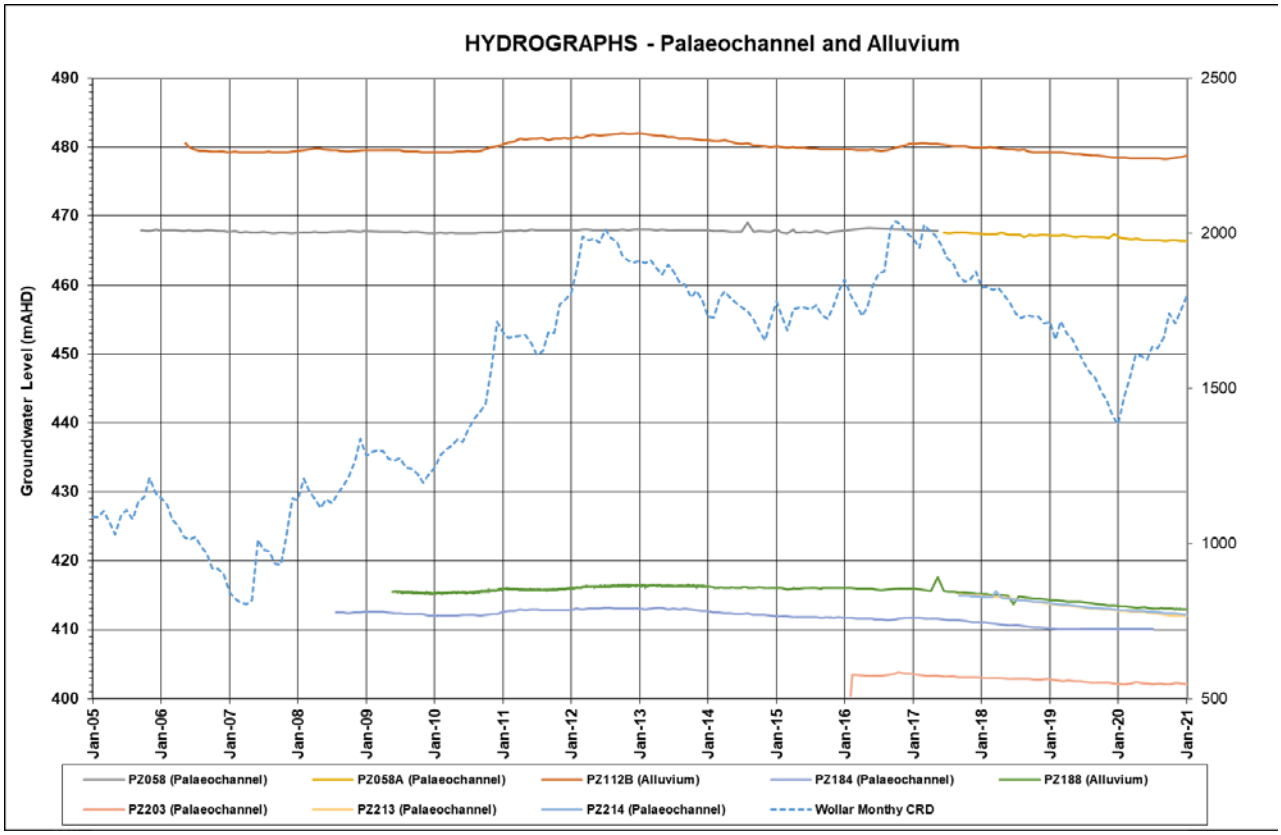


Figure 3-k Alluvium Composite Hydrograph



APPENDIX 4. COMMUNITY COMPLAINTS SUMMARY 2020

Date	Type	Location	Complaint Description
19/10/2020	Noise	Nimoola Road	Investigation revealed no unusual mining operations were occurring at the time. Monitoring results indicated acceptable Noise levels. No actions required. Complainant not contacted upon their request.
11/09/2020	Blasting (V/O)	Ridge Road	Investigation revealed no unusual mining operations were occurring at the time. No actions required. Complainant was Contacted on 11/09/2020.
2/08/2020	Noise	Winchester Crescent	Investigation revealed no unusual mining operations were occurring at the time. Monitoring results indicated acceptable Noise levels. No actions required. Complainant not contacted upon their request.
1/08/2020	Noise	Winchester Crescent	Investigation revealed no unusual mining operations were occurring at the time. Monitoring results indicated acceptable Noise levels. No actions required. Complainant not contacted upon their request.
9/07/2020	Noise	Moolarben Road	Investigation revealed no unusual mining operations were occurring at the time. Monitoring results indicated acceptable Noise levels. Complainant advised of investigation, results and actions.
17/06/2020	Blasting (V/O)	Carramar Road	Investigation revealed no unusual mining operations were occurring at the time. No actions required. Complainant advised of investigation, results and actions.
17/06/2020	Blasting (V/O)	Carramar Road	Investigation revealed no unusual mining operations were occurring at the time. No actions required. Complainant advised of investigation, results and actions.
18/05/2020	Air (Odour)	Ridge Road	Investigation revealed no unusual mining operations were occurring at the time. Monitoring results indicated acceptable Odour levels. No actions required. Complainant was Contacted on 20/05/2020, a message was left.
10/05/2020	Noise	Spring Creek Road	Investigation revealed no unusual mining operations were occurring at the time. Monitoring results indicated acceptable Noise levels. No actions required. Complainant advised of investigation, results and actions.
13/04/2020	Noise	Winchester Crescent	Investigation revealed no unusual mining operations were occurring at the time. Monitoring results indicated acceptable Noise levels. No actions required. Complainant not contacted upon their request.
12/04/2020	Noise	Ridge Road	Investigation revealed no unusual mining operations were occurring at the time. Monitoring results indicated acceptable Noise levels. No actions required. Complainant not contacted upon their request.
27/03/2020	Noise	Ridge Road	Investigation revealed no unusual mining operations were occurring at the time. Monitoring results indicated acceptable Noise levels. No actions required. Complainant not contacted upon their request.
22/03/2020	Noise	Spring Creek Road	Investigation revealed no unusual mining operations were occurring at the time. Monitoring results indicated acceptable Noise levels. No actions required. Complainant not contacted upon their request.
16/03/2020	Noise	Spring Creek Road	Investigation revealed no unusual mining operations were occurring at the time. Monitoring results indicated acceptable Noise levels. No actions required. Complainant not contacted upon their request.
4/03/2020	Noise	Winchester Crescent	Investigation revealed no unusual mining operations were occurring at the time. Monitoring results indicated acceptable Noise levels. No actions required. Complainant not contacted upon their request.
5/02/2020	Noise	Winchester Crescent	Investigation revealed no unusual mining operations were occurring at the time. Monitoring results indicated acceptable Noise levels. No actions required. Complainant not contacted upon their request.

APPENDIX 5. COMMUNITY CONTRIBUTIONS

Community Support Program

Beneficiary	Project/Event
Lue Public School	Pool enclosure upgrade
Mudgee Men's Shed	Members Gym at the Men's Shed
Mudgee Amateur Swim Club	Air-conditioning for the Clubhouse
Rylstone Hospital & Health	Swim School for children and First Aid course
Gulgong Showground	Main switchboard upgrade for the Showground
Hargraves / Hill End Pest Group	Purchase 10 x field cameras for Wild Dog monitoring
The Business Concierge	2020 Survivor Life Skills Program
Gulgong Show Society	2020 Gulgong Show
Mudgee Junior League	New defibrillator for Club House
Mudgee RSL	WWII plaque restoration on town clock
Mudgee Show Society	New PA system for the Mudgee Showground
Rylstone Kandos Show Society	2020 Rylstone Show
Rylstone Public P&C	Funding for raffle prizes
Cudgegong Cruisers	2020 Can Cruise event
Sculptures in the Garden	2020 Sculptures in the Garden Event
Gulgong Hospital Auxiliary	New crash cart for the Gulgong Hospital
Mudgee District Hospital Operating Theatre	New Thrive Oxygen machine for the operating theatre
Gulgong Arts Society	2020 Scarecrow Stroll
Mudgee Community Pre-School	New children's fort at the pre-school
Educar	2020 Max Potential Program

Additional Donations

Beneficiary	Project/Event
Mudgee High School	Swimming Carnival Fundraiser
Clontarf Foundation	Tickets to the Charity Shield at Glen Willow - Mudgee
LifeSkills Plus Mudgee	PPE to help with COVID-19 precautions
Western Area Health – Mudgee Hospital	PPE to help with COVID-19 precautions
Western Area Health – Dunedoo Hospital	Palliative Carer's Chair for the Dunedoo Hospital
Kids & Carer's House - Kandos	New flooring for the Kids & Carer's House
Mudgee Respiratory & Fever Clinic	PPE to help with COVID-19 precautions
Mudgee Chamber of Commerce	Magnificent Mudgee Awards
Western Area Health – Mudgee Aged Care	Dignity of Risk training
Local Land Services – Central Tablelands	Wild Dog trapping program for the local regions
Watershed Landcare	Green Day event for local schools