MAULES CREEK COAL MINE

2018 ANNUAL REVIEW

WHITEHAVEN COAL

Table 1 Annual Review Title Block

Name of Operation	Maules Creek Coal Mine
Name of Operator	Maules Creek Coal Pty Ltd
Development consent / Project Approval #	Project Approval 10_0138
Name of holder of development consent/project approval	Aston Coal 2 Pty Ltd.
Mining lease #	CL 375, ML1719 and ML1701.
Name of holder of mining lease	Maules Creek Coal JV which comprises: Aston Coal 2 Pty Ltd (75%), ICRA MC Pty Ltd (15%), J Power Australia Pty Ltd (10%)
Water Licence #	Refer to Water Licences in Table 1
Name of holder of water licence	Aston Coal 2 Pty Ltd, ICRA MC Pty Ltd, J Power Australia Pty Ltd
MOP/ RMP start date	January 2018
MOP/RMP end date	January 2020
Annual Review Commencement Date	1 January 2018
Annual Review Completion Date	31 December 2018
I, Nigel Wood, certify that this audit report is a true and accurate record of the compliance status of Maules Creek Coal Mine for the period 1 January 2018 to 31 December 2018, and that I am authorised to make this statement on behalf of Maules Creek Coal Pty Ltd. Note. a) The Annual Review is an 'environmental audit' for the purposes of section 122B (2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000. b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).	
Name of Authorised Reporting Officer	**Nigel Wood**
Title of Authorised Reporting Officer **Signature**  **Date** 29.4.2019	**General Manager**

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1 STATEMENT OF COMPLIANCE

This Annual Review has been prepared to provide a summary of the environmental performance of the Maules Creek Coal Mine (MCCM) over the reporting period. The compliance status of the MCCM against relevant approvals during the reporting period was assessed as at the end of the reporting period (i.e. 31 December 2018) and is summarised in **Table 2**. In addition, compliance with the Environment Protection Licence (EPL) has been assessed where required against the Project Approval, specifically Schedule 3, conditions 26, 30, 33 (c), 38 (b) and 40 (b).

Table 2 Statement of Compliance

Were all the conditions of the relevant approvals complied with?	Yes/No
Project Approval PA 10_0138	No
Coal Lease CL 375	Yes
Mining Operations Plan (MOP)	Yes
Mining Lease ML 1701	Yes
Mining Lease ML 1719	Yes
Exploration Licence A 346	Yes
Environment Protection Licence (No. 20221) (applicable conditions as above)	Yes
90WA801901 DWE Ref no: 90AL801900	Yes
Groundwater Monitoring Bores: 90BL255779, 90BL255780, 90BL255781, 90BL255782, 90BL255783, 90BL255784, 90BL255785, 90BL255786, 90BL255787, 90BL255788, 90WA822412, 90BL255789 and 90BL255790.	Yes
WAL12811	Yes
WAL29467	Yes
WAL29588	Yes
WAL27385	Yes
WAL12479	Yes
WAL27383	Yes
WAL13050	Yes
WAL41585	Yes
WAL36641	Yes
WAL12491	Yes
WAL12480	Yes
WAL12645	Yes

Any non-compliances during the reporting period are detailed in **Table 4** and ranked according to the compliance status key presented in **Table 3**. **Section 11** provides further details of any non-compliance and actions undertaken or proposed for the following reporting period to prevent re-occurrence and mitigate any potential adverse effects.

Table 3 Compliance Status Key

Risk Level	Colour Code	Description
High	Non–compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non–compliant	Non-compliance with: • potential for serious environmental consequences, but is unlikely to occur; or • potential for moderate environmental consequences, but is likely to occur
Low	Non–compliant	Non-compliance with: • potential for moderate environmental consequences, but is unlikely to occur; or • potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non–compliant	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)

Table 4 Non-Compliances

Relevant Documentation	Condition. #	Condition Description (Summary)	Compliance Status	Comment	Where addressed in Annual Review
PA10_0138	Schedule 3 Condition 12	Ensure all equipment and noise control measures deliver sound power levels that are equal to or better than the MCC EA.	Non-compliant	Not all fixed plant and individual mobile plant sound power levels for plant tested in 2018 met the predicted sound power targets described in the Project EA for modelling purposes. The overall site sound power level was within the modelled EA level.	Section 11

2 INTRODUCTION

This is the sixth Annual Review produced for the Maules Creek Coal Mine (MCCM) and has been prepared in accordance with the NSW Department of Planning and Environment's (DPE) Integrated Mining Policy – Annual Review Guideline, October 2015. This document has been prepared to satisfy the following requirements:

- the Annual Review requirements of the DPE under the Project Approval PA 10_0138 (Condition 4 Schedule 5);
- Environmental Management Report requirements of the Department Planning and Environment - Resources Regulator under the MCCM Mining Leases; and
- the routine reporting expectations of DoI-Water.

Though primarily covering the period from 1 January 2018 to 31 December 2018 (the reporting period), where relevant the Annual Review provides information on historical aspects of the Maules Creek Coal Mine, longer term trends in environmental monitoring results and provides relevant information on activities to be undertaken during the ensuing reporting period, or beyond.

2.1 PROJECT BACKGROUND AND DESCRIPTION

The Maules Creek Coal Mine (MCCM) is located on the north-west slopes and plains of New South Wales (NSW), approximately 18 kilometres (km) north-east of Boggabri within the Narrabri Local Government Area (LGA). The MCCM's regional locality is illustrated in **Figure 1**.

An Environmental Assessment for the Maules Creek Coal Project (referred to herein as the EA) was prepared by Hansen Bailey (2011) and was assessed under the NSW Environmental Planning and Assessment Act, 1979 (EP&A Act). The NSW Planning Assessment Commission (PAC), as a delegate for the NSW Minister for Planning and Infrastructure, issued the State environmental approval for the MCCM on 23 October 2012 (i.e. Project Approval PA 10_0138) for the construction and operation of an open cut coal mine with an approved maximum ROM coal production rate of 13 Mtpa until the end of December 2034. MCCM covers three mining leases CL 375, ML 1701 and ML1719. The Project Boundary (as defined by PA 10_0138) and mining authorities are shown on Figure 1 and Biodiversity Offset areas on Figure 2. The MCCM Commonwealth environmental approval (i.e. EPBC 2010/5566) was granted on 11 February 2013 by the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities.

A modification to PA 10_0138 was lodged and approved in 2013 to allow minor adjustments to the alignment of the CHPP infrastructure and the construction and operation of electrical infrastructure.

A second modification to PA 10_0138 was lodged and approved in 2014 to adjust the location of the raw water pipeline and associated pump station.

A third modification to PA 10_0138 was lodged in May 2016 and approved in January 2017 to amend the percentage of employee bus use to better reflect the locally residing workforce and associated transport regime.

Construction of the MCCM commenced in December 2013 and was substantially completed in 2015. The operations phase of the MCCM commenced in June 2014, and coal was first transported from the MCCM via the rail spur in December of 2014.

2.2 MINE CONTACTS

The key operational personnel responsible for environmental management at MCCM during the reporting period included:

Name	Peter Wilkinson (January – August)
	Nigel Wood (September – December)
Title	General Manager
Address	Therribri Road, Boggabri, NSW 2382
Phone Number	02 6749 7800

Name	Matthew Sparkes (January – October)
	Jason Conomos (November – December)
Title	Mine Manager
Address	Therribri Road, Boggabri, NSW 2382
Phone Number	02 6740 7003

Name	Scott Mitchell
Title	Environmental Superintendent
Address	Therribri Road, Boggabri, NSW 2382
Phone Number	02 6749 7800

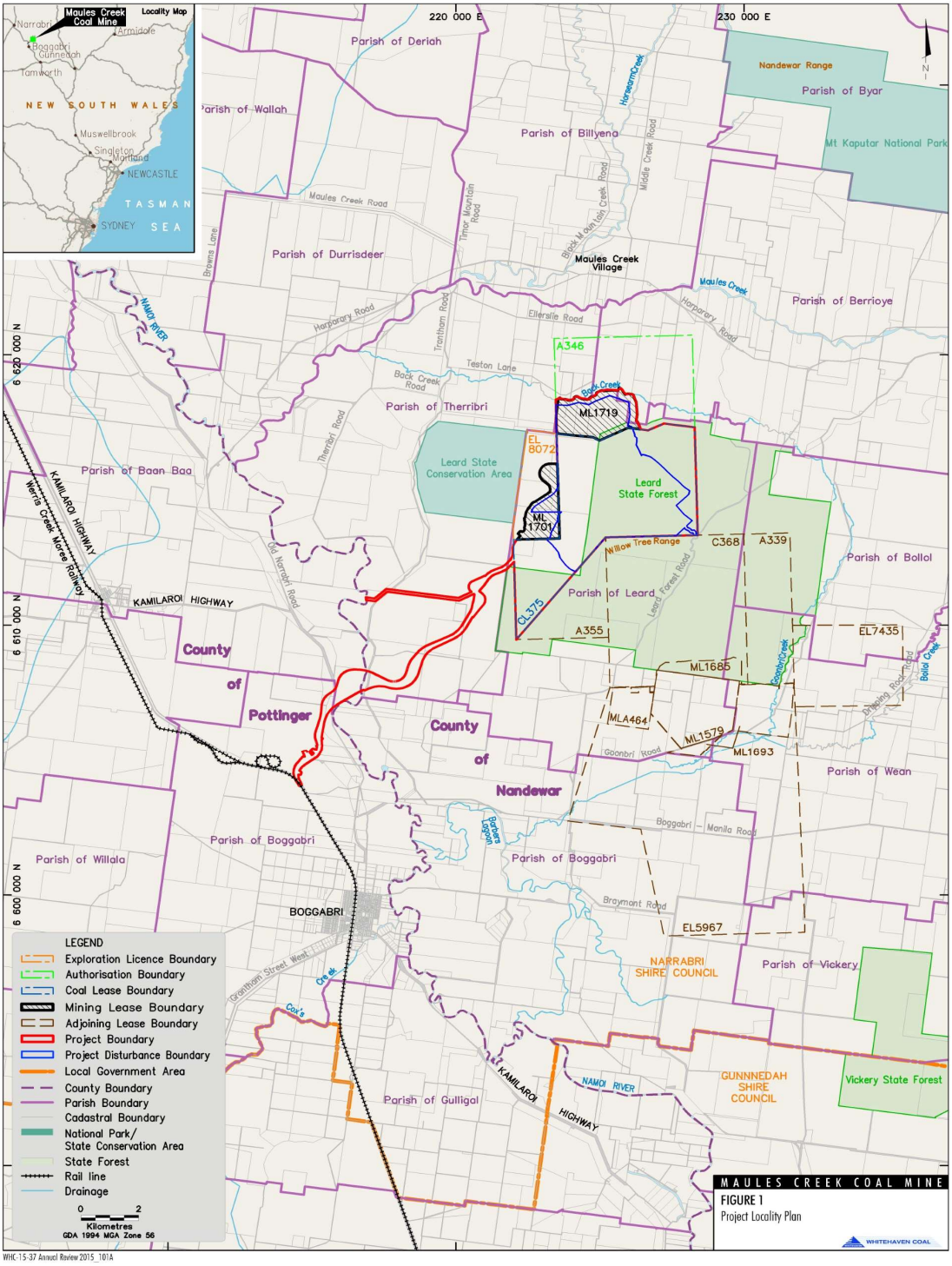


Figure 1 Project Locality Plan

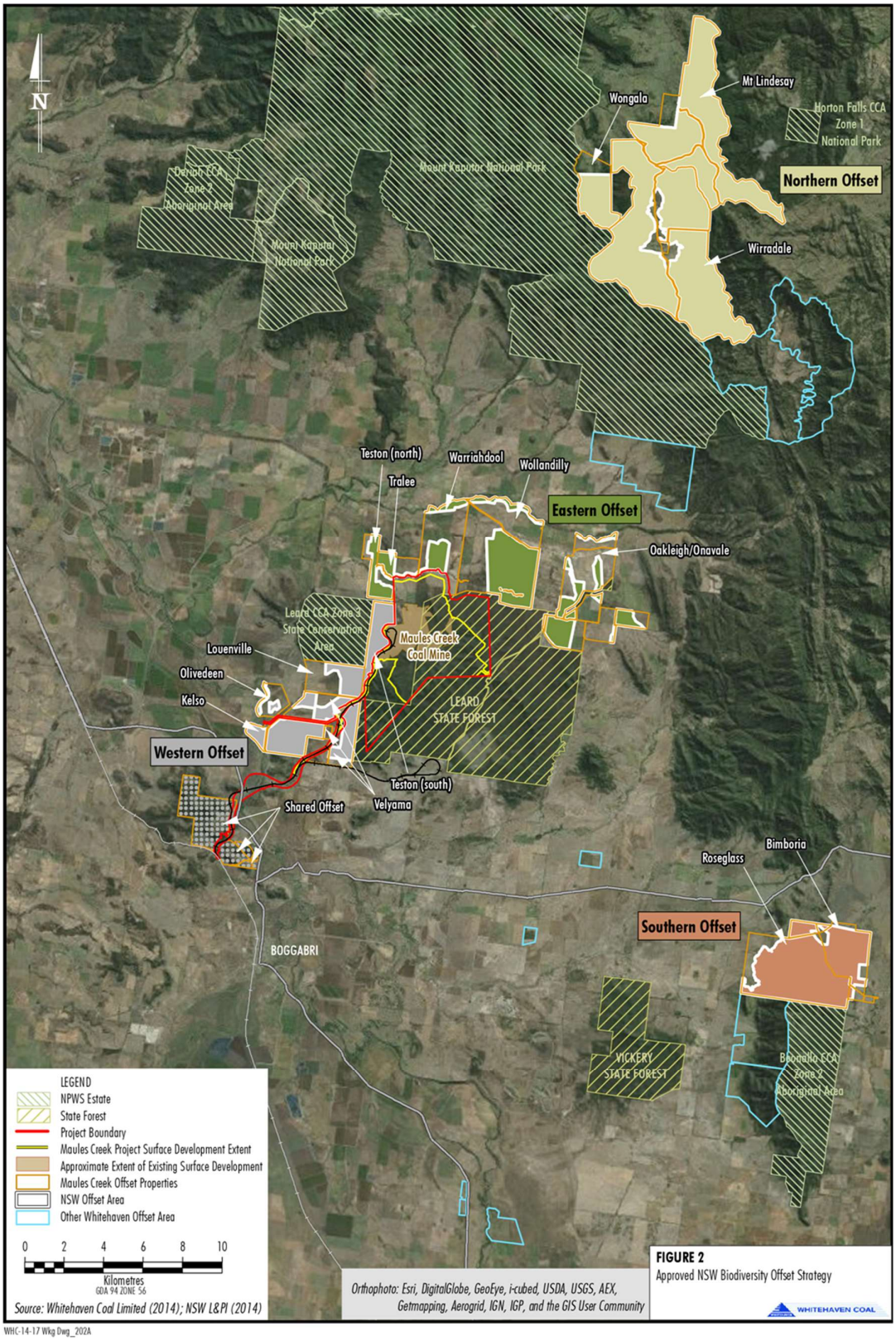


Figure 2 Biodiversity Offset Areas

3 APPROVALS

Table 5 provides a summary of the key licences, leases and approvals that have been obtained for the MCCM to enable the construction and operation of the mine.

Table 5 Licences, Leases and Approvals

Approval	Reference	Detail	Validity Dates
Project Approval	PA 10_0138	Pursuant to the Project EA, the PAC approval of the MCCM referred to in Schedule 1 subject to the conditions in Schedules 2 to 5.	23 October 2012 to December 2034
Project Approval Modification	PA 10_0138 (MOD1)	Pursuant to the Maules Creek Project Approval Modification Environmental Assessment, the Modification was granted to allow modifications to infrastructure requirements.	Granted on 25 July 2013
Project Approval Modification	PA 10_0138 (MOD2)	Pursuant to the Maules Creek Project Approval Modification Environmental Assessment, the Modification was granted to allow the design of key water related infrastructure to be optimised.	Granted on 10 March 2014
Project Approval Modification	PA 10_0138 (MOD3)	Pursuant to the Maules Creek Project Approval Modification Environmental Assessment, the Modification was granted to amend the employee bus use percentage to better reflect the locally residing workforce and associated transport regime.	Granted on 13 January 2017
Coal Lease	CL 375	Covers an area of approximately 4,200 hectares (ha). The southern part of the lease covers rights to mine from the surface to unlimited depth (~2,500 ha). The northern part of the lease covers rights to mine from 20 metre (m) depths to unlimited depth (~1,700 ha).	4 June 1991 to 4 June 2033
Authorisation	A 346	Covers the rights of the northern part of CL 375 from the surface to 20 m depth (~1,700 ha).	Expires 28 February 2021
Mining Lease	ML 1719	Covers the area to the north of the surface rights of CL 375, over a portion of A 346 that will accommodate part of the Northern Overburden Emplacement Area (OEA) for the MCCM.	Granted 11 November 2015 to 11 November 2036
Mining Lease	ML 1701	Covers the area to the west of CL 375 within the Project Boundary that will facilitate the extraction of some coal and accommodate some mine related infrastructure.	Granted 9 October 2014 to 9 October 2035
Exploration Lease	EL 8072	Covers the area to the west of CL 375 that will facilitate the extraction of some coal and accommodate some mine related infrastructure.	Renewal pending

Approval	Reference	Detail	Validity Dates
Surface Water Licence Water Supply Works and Water Use Approval	WAL41585 90CA834999	Previously 90SL101060. Water supply for mining and irrigation one overshot dam and a 150 millimetre (mm) Centrifugal Pump. 30 units.	Converted to WAL41585 Renewed 1 July 2017. Expires 9 November 2025
Water Supply Works Approval	90WA801901 DWE Ref no: 90AL801900	Allows construction of a 610 mm Axial Flow Pump located on the Namoi River.	1 July 2004 to 30 June 2027
Forest Corporation NSW Compensation	N/A	Agreement applies to part of Leard State Forest No. 420 that occurs within CL 375 and any mining lease pursuant to MLA 404 being ML1719.	From 1 July 2016
Emergency Tailings Emplacement	N/A	Notification of High Risk Activity – Emergency Tailings Emplacement	Notification provided April 2015.
Bore Licence	90WA809078	Bore constructed in the Upper Namoi Zone 4 Namoi Valley (Keepit Dam to Gins Leap) Groundwater Source.	Commencement 1 November 2006
Bore Licence	90WA809079	Bore constructed in the Upper Namoi Zone 4 Namoi Valley (Keepit Dam to Gins Leap) Groundwater Source.	Commencement 1 November 2006
Bore Licence	90WA809300	Bore constructed in the Upper Namoi Zone 4 Namoi Valley (Gins Leap to Narrabri) Groundwater Source.	Commencement 1 November 2006
Bore Licence	90WA809127	Bore constructed in the Upper Namoi Zone 4 Namoi Valley (Keepit Dam to Gins Leap) Groundwater Source.	Commencement 1 November 2006
Bore Licence	90WA822412	Previously 90BL255704. Gunnedah – Oxley Basin Murray Darling Basin Groundwater Source. Works approval for WAL29467.	Granted 16 January 2012 to 06 June 2025
Bore Licence	90WA820120	Previously 90BL001144. Gunnedah – Oxley Basin Murray Darling Basin Groundwater Source.	Granted 28 February 1939 for perpetuity. Converted 16 January 2012.

Approval	Reference	Detail	Validity Dates
Bore Licences	90BL255779 90BL255780 90BL255781 90BL255782 90BL255783 90BL255784 90BL255785 90BL255786 90BL255787 90BL255788 90BL255789 90BL255790	For the purpose of Monitoring Bores.	Granted 25 August 2010 for perpetuity.
Water Access Licence	WAL12811	135 Units with works approval 90CA807230. Upper Namoi Zone 5 Namoi Valley (Gins Leap to Narrabri) Groundwater Source.	Transferred to Aston 16 November 2010. Tenure continuing.
Water Access Licence	WAL29467	306 ML water licence from porous rock water source for construction purposes. Refer 90WA822412	Tenure continuing
Water Access Licence	WAL29588	0ML water licence from porous rock water source under works approval 90CA826925.	Granted 21 June 2012 for perpetuity.
Water Access Licence	WAL 27385	38 ML water licence from Namoi Groundwater Zone 4.	Granted 24 April 2012 for perpetuity.
Water Access Licence	WAL12479	78 ML water licence from Namoi Groundwater Zone 11 under works approval 90CA807652.	Granted 2 November 2011 for perpetuity
Water Access Licence	WAL27383	0 ML water licence from Namoi Groundwater Zone 11.	Spare WAL. Granted 24 October 2011 for perpetuity.
Water Access Licence	WAL13050	3000 ML water licence from Lower Namoi Regulated River Water under works approval 90WA801901.	Granted 23 August 2011 for perpetuity.
Water Access Licence	WAL36641	800 ML water licence from Gunnedah-Oxley Basin MDB groundwater source.	Perpetuity
Water Access Licence	WAL12491	77 ML water licence from Upper Namoi Zone 11.	Granted 1 November 2006 until 31 October 2019
Water Access Licence	WAL12480	215 ML water licence from Upper Namoi Zone 11 under works approval 90CA807654.	Granted 1 November 2006 until 31 October 2019.

Approval	Reference	Detail	Validity Dates
Environment Protection Licence	EPL 20221	The NSW Environment Protection Authority (EPA) issues environment protection licences to the owners or operators of various industrial premises under the *Protection of the Environment Operations Act, 1997* (POEO Act).	Issued 2 May 2013
Mining Operations Plan Amendment B	MOP 2018-2020 Amendment B	Details mining and rehabilitation activities during the applicable period at MCCM.	Approved November 2018

4 OPERATIONS SUMMARY

4.1 EXPLORATION ACTIVITIES

Exploration drilling was undertaken during the reporting period in accordance with the approved Mining Operations Plan (MOP) to further assist production planning and assess coal reserves within CL 375.

Core and chip holes were undertaken to further define coal quality, geotechnical and structural information.

4.2 CONSTRUCTION

Construction of a lubrication facility, office complex at the maintenance workshop, wastewater system, landscaping and a light vehicle workshop were completed in the reporting period.

4.3 MINING OPERATIONS

MCCM is an open cut coal mine with an approved maximum ROM coal production rate of 13 Mtpa to December 2034. Pre-mining clearance activities including ecological, archaeological and soil analysis were undertaken in line with the relevant approvals and management plans. The 2018 vegetation clearing activities were completed during the approved annual clearing period (15th February to the 30th April each year).

Topsoil was reclaimed from the area to be mined and stockpiled for later use on rehabilitation areas. Overburden is blasted prior to being removed by loader and / or excavator and trucks before proceeding with coal extraction. Table 6 presents the production summary for the previous and current reporting periods and the anticipated production schedule for the next reporting period.

Table 6 Production Summary

Material	Approved limit	Previous reporting period (actual)	This reporting period (actual)	Next reporting period (forecast)
Waste Rock / Overburden	81,000,000m3 (MOP Year 1, 2017, Table 4)	63,205,733	63,683,876	84,311,838
ROM Coal	13 Million Tonnes (PA 10_0138 Sch. 2 Cond.6) > 5 Million Tonnes handled (EPL 20221)	10,494,587	12,064,021	13,000,000
Reject Material*	NA	999,530	1,230,409	2,638,610
Saleable Product	12.4 Million Tonnes (PA 10_0138 Sch.2 Cond.9) > 5 Million Tonnes produced (EPL 20221)	9,583,239	9,755,073	11,213,096

4.4

4.4 COAL HANDLING AND PROCESSING

Product coal generated by the MCCM includes bypass coal (i.e. ROM coal that is crushed and screened but not washed in the CHPP) and washed coal that is processed in the CHPP. The product coal is stockpiled and then reclaimed and fed via conveyors to the Train Loading Facility. Once loaded, trains travel from the MCCM via the Maules Creek Rail Spur, Shared Rail Spur and the Werris Creek to Mungindi Railway Line to the Port of Newcastle for export.

4.5 OTHER OPERATIONS

4.5.1 Hours of Operation

Mining operations are conducted up to 24 hours per day, seven days per week.

4.5.2 Transport Rates

Coal is only transported from the MCCM via the Maules Creek rail spur and the shared portion of the Boggabri Coal rail spur.

The number of laden trains and amount of coal transported from MCCM, presented in

Table **7** has been recorded in accordance with:

- Schedule 2 Condition 8 and 9 of PA 10_0138, 'Coal Transport'; and
- Schedule 3 Condition 65 of PA 10_0138, 'Monitoring of Coal Transport'.

Table 7 Coal Transport

Parameter	Criteria	Total
Maximum number of laden trains from the site in any one day	10	8
Maximum number of laden trains from the site in a day when averaged over a calendar year	7	3.58
Maximum Tonnes of product coal transported from the site (Mt)	12.4	10.13

Appendix B details the coal transport records in accordance with the reporting requirements under Condition 65 (a) and (b) of PA 10_0138.

4.6 NEXT REPORTING PERIOD

4.6.1 Exploration

Exploration drilling will continue to be undertaken at the MCCM to further assess the coal reserves within the tenements. The focus of the ongoing exploration drilling is likely to involve the following:

- further exploration within CL 375; and
- further delineation of outlying coal prospective areas.

Further details of the proposed drilling program are provided in the approved MOP.

4.6.2 Construction Activities

Infrastructure upgrades are currently being investigated and may be implemented within the following reporting period including improvements to the CHPP, mine and maintenance infrastructure areas.

4.6.3 Mine Operations

The mine production rates are planned to ramp up to approximately 13 Mtpa of ROM coal and approximately 84 million bank cubic metres (Mbcm) of overburden during 2019.

Vegetation clearing activities in mining areas over the next reporting period will be conducted in accordance with relevant Environmental Management Plans. The clearing program will be undertaken during the annual clearing period from the 15 February to the 30 April as specified within the BMP, except under exceptional circumstances and with the approval by the Secretary of the DPE.

4.6.4 Overburden Emplacements

The OEA will continue to develop generally in accordance with Project Approval PA 10_0138 and the Mining Operations Plan 2019-22 which are available on the Whitehaven Coal website.

4.6.5 Mining Fleet Upgrades

Additional procurement of mining fleet will be subject to mine planning requirements during 2019 and 2020. Planning and the commencement of a trial to assess autonomous operation of equipment is planned.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

The DP&E requested the inclusion of information requested by DPI – Land & Water be addressed in the following AR. Appendix F includes a table summarising the feedback and the relevant section where this is addressed.

6 ENVIRONMENTAL PERFORMANCE

The following sub-sections report on the environmental performance achieved during the reporting period and provide a summary of the environmental monitoring data compared to data predictions, trends and management measures.

6.1 METEOROLOGICAL MONITORING

Meteorological monitoring is conducted onsite in accordance with Schedule 3 Condition 35 of the PA 10_0138 at the MCC Automatic Weather Station (AWS). Additional weather data is available from other monitoring locations for reference purposes. The location of the MCCM AWS is illustrated on **Figure 3** below, **Table 8** summarises the monthly meteorological conditions at the MCC AWS for the reporting period. The total annual rainfall recorded for the year was approximately 335.4 millimetres (mm). The annual rainfall total is below the average rainfall recorded in the EA. The maximum rainfall was recorded during November (59.0mm), which is higher than the historical average of (51.2mm). In addition, several months across the 2018 calendar year produced average rainfall results that were relatively lower than the mean rainfall recorded in the EA.

The temperature records and wind patterns are relatively consistent with the long term climatic data recorded at nearby BOM sites, and the predictions from the EA. The average temperature during the reporting period was 19.5°C, a minimum temperature of -4.2°C was recorded in July and a maximum temperature of 41.2°C was recorded in November. South easterly winds were predominant throughout the first half of 2018. July through to December 2018 recorded measured winds coming predominantly from the southern quadrants.

Table 8 Summary of Weather recorded at the MCC AWS

Month	Measured Rain (mm)	Cumulative Rainfall (mm)	Rainfall Days	2m Temperature (°C)			10m Temperature (°C)			Sigma Theta			10m Wind	
				Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Av. Speed (m/s)	Predominant Direction
January	39.2	39.2	4	14.1	28.6	40.7	15.3	28.6	40.1	0.0	10.8	83.5	2.6	S
February	48.2	87.4	7	13.1	26.4	39.5	14.8	26.4	38.3	0.0	9.1	88.8	2.8	SE
March	20.4	107.8	3	10.5	24.7	38.1	12.3	25.0	37.7	0.0	10.5	89.7	2.4	SSE
April	8.0	115.8	3	9.2	21.5	33.2	10.4	21.8	32.8	0.5	10.5	88.3	2.2	SSE
May	0.8	116.6	1	-2.0	13.9	27.3	0.2	14.7	26.7	0.5	12.6	96.3	1.7	S
June	5.8	122.4	6	-1.6	11.4	23.5	0.0	12.0	23.0	0.5	17.1	101.8	1.9	S
July	9.4	131.8	6	-4.2	10.2	25.5	-1.1	1.0	7.8	2.6	29.2	102.9	1.6	S
August	40.2	172.0	8	-2.4	10.9	24.8	-0.7	11.9	24.2	0.0	28.6	101.9	1.9	S
September	29.8	201.8	8	1.8	16.2	32.1	2.8	16.7	31.5	2.8	24.0	101.5	2.3	S
October	63.2	265.0	12	6.8	20.3	33.7	8.3	20.6	33.5	0.0	23.8	102.6	2.3	SSE
November	59.0	324.0	9	6.7	23.0	41.2	7.5	23.1	40.0	0.0	23.0	101.6	2.7	SSW
December	11.4	335.4	6	12.0	26.9	38.5	13.4	26.9	38.5	1.4	25.9	101.9	2.7	SSE

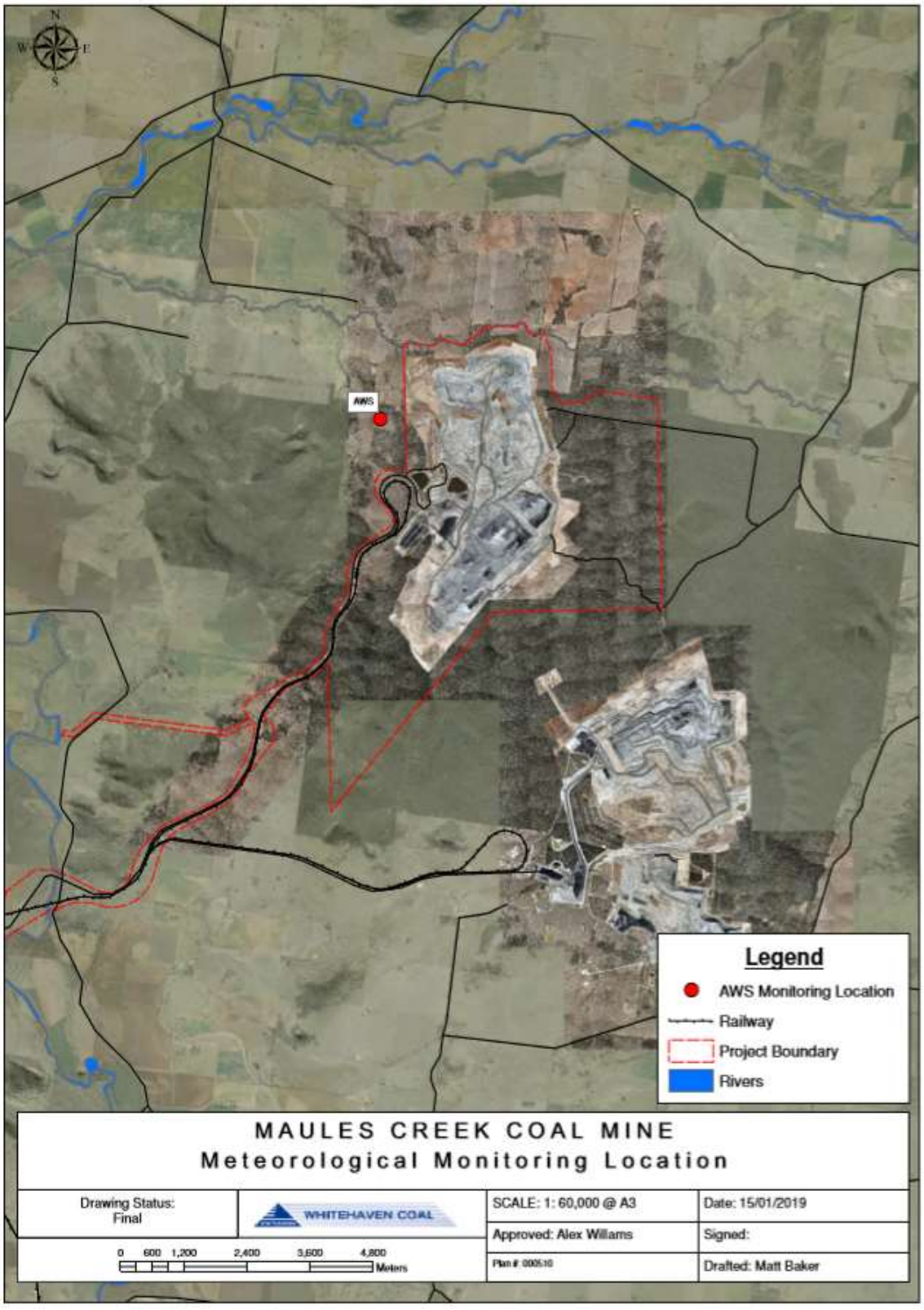


Figure 3 AWS Monitoring Location

6.2 AIR QUALITY

6.2.1 Environmental Management

Potential impacts to air quality are managed in accordance with the:

- air quality criteria prescribed under schedule 3 condition 29 of the Project Approval;
- relevant EPL conditions; and
- the MCC Air Quality and Greenhouse Gas Management Plan (AQGGMP).

Maules Creek Coal Mine implements a range of controls to manage dust, including but not limited to:

- utilising water carts across the site with water fill points appropriately positioned. Additional contractor water carts are also employed around infrastructure areas and light vehicle roads, together with during clearing, mulching and topsoil stripping activities;
- use of a dust suppressant additive on targeted haul roads;
- visual dust assessments regularly undertaken on haul roads;
- modification of work practices where required including changing dumping strategies;
- temporary cessation of operational equipment as required;
- predictive controls and Air Quality Trigger Action Response Plan (TARP) together with the daily risk response report presented to key operational personnel;
- pre-strip areas are kept to a minimum and mulch cover used on cleared areas ahead of mining activities where possible;
- operation of a real time SMS alarming system notifying of elevated dust levels;
- site vehicles restricted to designated routes, with speed limits enforced;
- blasting activities restricted to suitable weather conditions;
- 24 hour notification to key stakeholders and residents of planned blasts;
- water suppression on conveyor transfers and stockpiles at the CHPP;
- additional units within the air quality monitoring network; and
- meteorological monitoring system used to identify conditions pertaining to elevated dust risk.

The MCC Air Quality Monitoring network is illustrated on **Figure 4** and includes:

- continuous monitoring of PM_{10} levels at the MCC TEOM (TEOM1). These results are available publically via the EPA website. It is noted that monitoring results from location MCC TEOM2 shown on **Figure 4** which is located on mine owned land are used by MCC for internal management purposes only.
- a third TEOM (TEOM 3) was installed in the Maules Creek area for management purposes during late 2017. This was commissioned as a recommendation from the Katestone Dust Benchmarking Study and is also used as a management unit;
- PM_{10} levels are measured at a High Volume Air Sampler (HVAS) on a twenty-four hour basis every six days. Total Suspended Particulate Matter (TSP) is inferred from the measured PM_{10} data;
- a network of four dust deposition gauges (DDG's), measuring deposited dust and particulates on a monthly basis; and
- additional sampling units (E-sampling trailer units) to provide input data for the predictive air quality monitoring software.

In addition to the above, the Boggabri - Tarrawonga - Maules Creek (BTM) Air Quality Management Strategy (AQMS) was approved in 2017. New predictive air quality modelling simulation software was fully implemented to inform operational risk.

The NSW Office Environment & Heritage (OEH) and the NSW EPA installed a number of TEOM monitoring units in late 2017. The Namoi Region Air Quality Advisory Committee was established by the Minister for the Environment of which Whitehaven Coal is a stakeholder on the committee.

Daily ambient air quality data for PM10 and PM2.5 particulate sizes from the Maules Creek TEOM1 monitoring unit is provided and published on the OEH managed air quality website since. This has occurred since 2016 prior to the establishment of the Namoi Region Air Quality Monitoring Project.

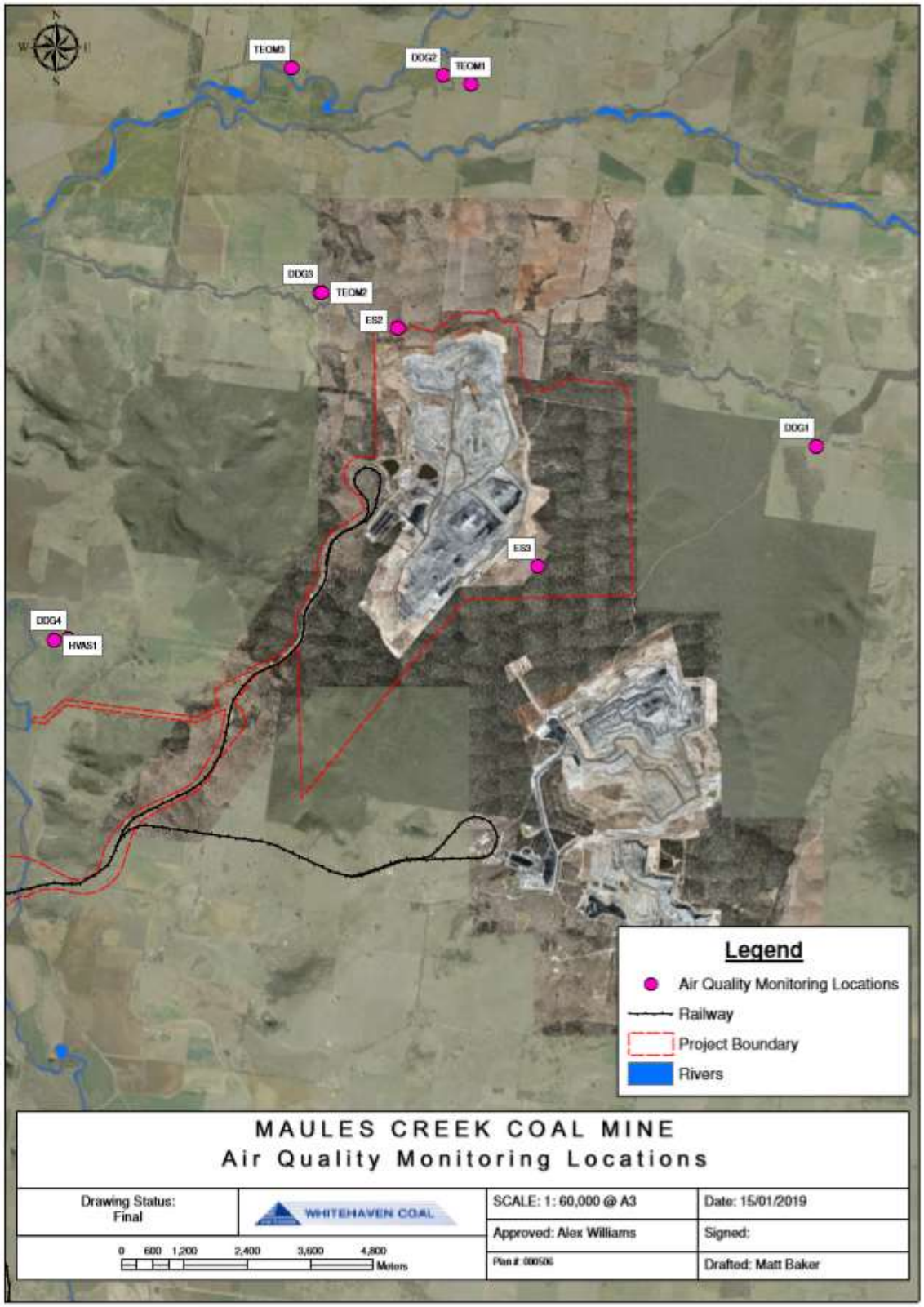


Figure 4 Air Quality Monitoring Locations

6.2.2 Environmental Performance

A summary of the Depositional Dust air quality monitoring results at MCCM for the 2018 reporting period is provided in **Table 9** .

Table 9 Deposited Dust Monitoring Results

Month	MC1 (g/m^2)	MC2 (g/m^2)	MC3 (g/m^2)	MC4 (g/m^2)
January	2.6	2.8	1.5	3.8
February	1.8	3.4	*	2.6
March	1.0	4.0	1.5	1.9
April	*	*	*	0.9
May	*	0.8	1.8	0.5
June	*	2.4	6.9*	1.8
July	0.7	*	2.1	2.8
August	1.1	1.1	3.7	3.1
September	2.7	2.7	*	2.7
October	1.0	0.8	2.5	0.9
November	2.2	3.6	5.0	*
December	2.5	3.0	4.4	4.9
Annual Average	1.7	2.5	3.2	2.3

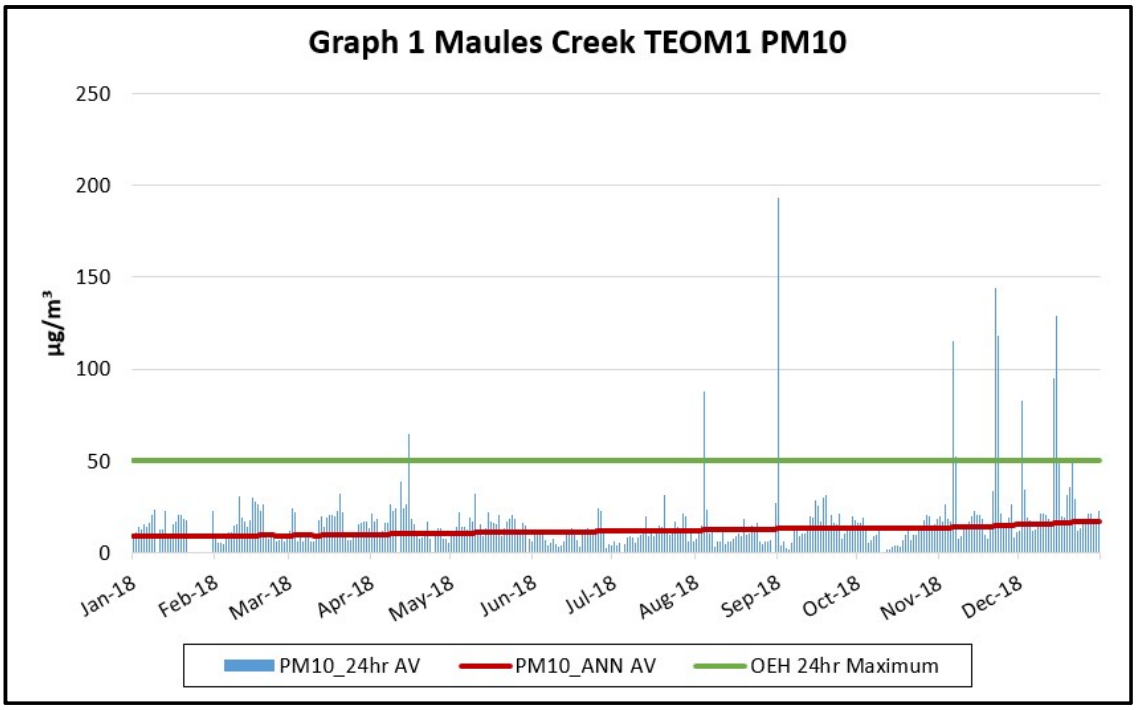
* Results have been removed as they were contaminated (bird droppings, insects and vegetation).

Deposited dust monitoring data demonstrated compliance with the Project Approval (<4g/m^2) throughout the 2018 calendar year. A result of 6.9 g/m^2 recorded at MC3 during June was further investigated and the result is attributed to demolition activity undertaken at the former Teston property house. TEOM2, which is located between the former house and MC3, recorded elevated results on the days of demolition. The annual average results at all dust deposition gauges were below the applicable criteria and are included in **Table 9** above.

The PM_{10} annual average remained below the applicable criteria of 30 µg/m^3 at TEOM1 during the reporting period. The PM_{10} monitoring results from TEOM1 are included in the **Graph 1** below. Results are also provided and publically available on the NSW OEH website, and communicated to the Maules Creek Coal Community Consultative Committee on a regular basis.

Elevated results above the 24 hour average occurred on (15/2/2018, 4/8/2018, 1/9/2018, 6/11/2018, 22/11/2018, 23/11/2018, 2/12/2018, 14/12/2018, 15/12/2018, 16/12/2018 and 21/12/2018).The results corresponded with extraordinary air quality events associated with prolonged below average rainfall and drought conditions during the reporting period and regionally dry conditions.

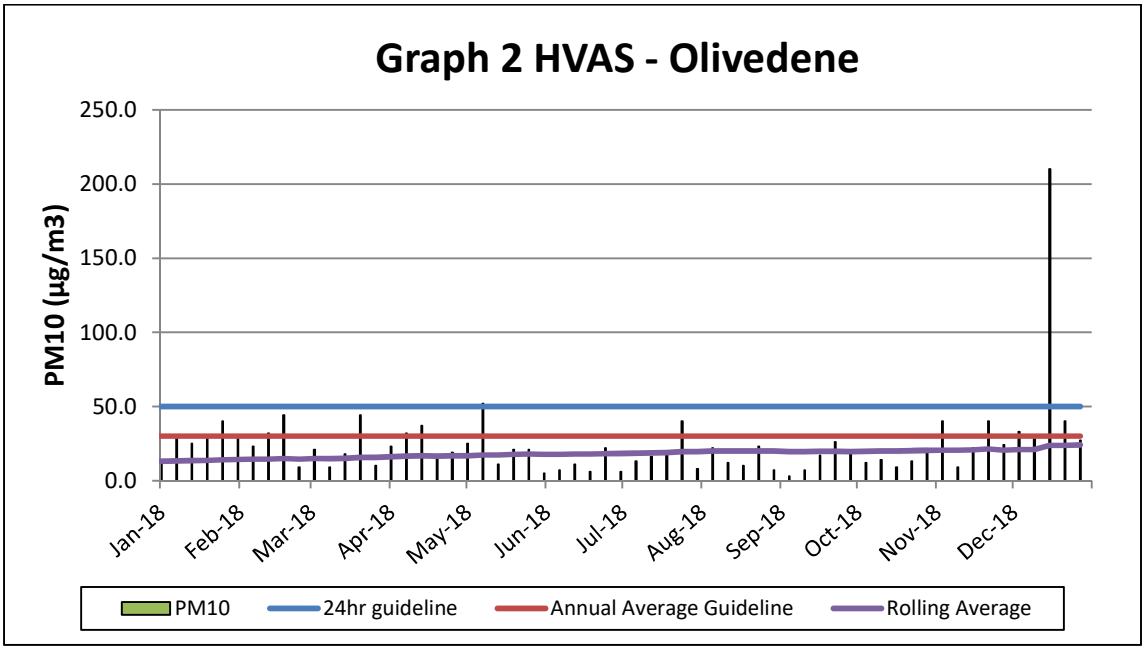
The annual average trend indicated in the graph below is on an upward trend during the reporting period. This was attributable to the frequency of elevated 24hr average results which occurred during the period, and likely due to the extended dry conditions and low ground vegetation cover during the 2018 period.



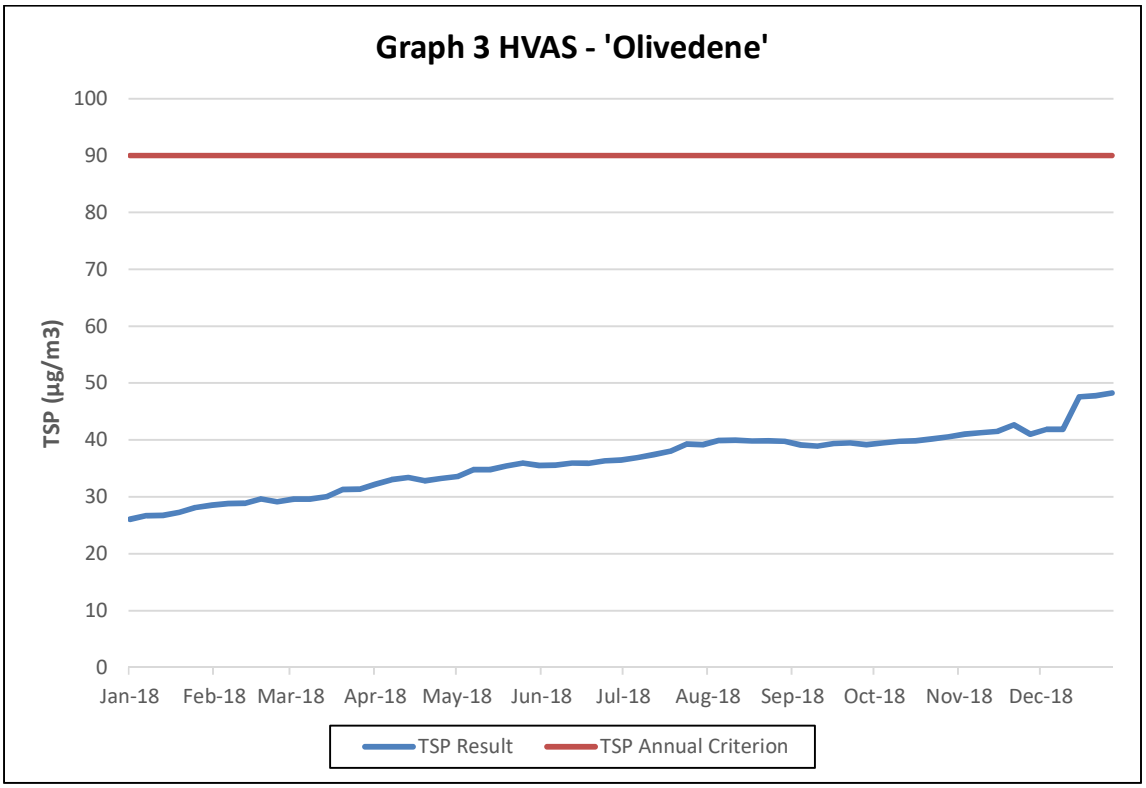
The HVAS PM_{10} monitoring results are illustrated in **Graph 2** below. Monitoring conducted at the MCC HVAS indicated the PM_{10} rolling average remained below the applicable criteria of 30 µg/m^3.

On the 15th December 2018, the HVAS recorded a PM10 result of 210 µg/m^3, above the 24 hour criteria of 50 µg/m^3. An investigation into MCC's meteorological and operational data during the 24 hour sampling period revealed that likely sources were from localised non-mining related activities including trucks nearby; as well as other localised dust observed during the time of sample collection. Results recorded at all other approved MCCM air quality monitoring sites, including closer to the operation, on that day remained within the relevant Project Approval criteria.

The air quality monitoring results are generally consistent with previous reporting periods and are in concurrence with the EA predictions.


Graph 2 HVAS - Olivedene
PM10 (µg/m3)
250.0
200.0
150.0
100.0
50.0
0.0
Jan-18
Feb-18
Mar-18
Apr-18
May-18
Jun-18
Jul-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
PM10
24hr guideline
Annual Average Guideline
Rolling Average

Total Suspended Particulates (TSP) is inferred from the measured PM_{10} data. Monitoring conducted at the MCC HVAS indicated the TSP rolling annual average remained well below the applicable criteria provided in Schedule 3 Condition 29 of PA10_0138 of 90 µg/m^3. The TSP monitoring results are illustrated in **Graph 3** below.



6.2.3 Proposed Improvement Measures

Proposed measures to continuously improve include:

- continued application of the BTM predictive modelling software and refinement where necessary;
- Continued implementation of recommendations from the independent Katestone Best Practice Dust Benchmarking Study;
- continue overburden shaping to assist with enabling the placement of topsoil and rehabilitation establishment in the northern emplacement of the MCCM footprint; and
- continued engagement with the EPA regarding the Namoi Regional Air Quality Monitoring network.

6.3 GREENHOUSE GAS

6.3.1 Environmental Management

Greenhouse Gas (GHG) emissions at MCCM are managed in accordance with Schedule 3 Condition 27 of PA 10_0138 and the AQGHGMP. The main sources of GHG emissions considered in the AQGHGMP are:

- fuel consumption (diesel) during mining operations – Scope 1; and
- release of fugitive methane (CH_4) from the fracturing of coal seams – Scope 1; and indirect emissions resulting from the MCCM's consumption and use of purchased electricity – Scope 2.

Electricity

A number of controls were applied to reduce electricity consumption at the MCCM during the reporting period, including:

- the energy efficiency of new electrical equipment is considered during procurement;
- use of variable speed drives on pumps and conveyors in the CHPP;
- avoiding idle running of conveyors in the CHPP; and
- management of lighting around the mine site.

Diesel Consumption

A number of controls were applied to reduce diesel consumption at the MCCM during the reporting period including:

- ensuring dump trucks are fully loaded where possible prior to hauling to maximise efficiency, i.e. fuel used per unit of material moved;
- maximising the efficiency of the mining fleet through regular maintenance;
- mine planning efficiencies to minimise the gradient, length and height of loaded haul runs for dump trucks, where possible;
- in-pit and mobile refueling facilities;
- monitoring system for heavy vehicle use and fuel burn. This system also determines individual equipment utilisation which assists in minimising fleet size and associated wastage; and
- continued operation of the employee shuttle bus system to and from site.

6.3.2 Environmental Performance

GHG emissions associated with the MCCM are reported through participation in the National Pollutant Inventory (NPI) and as part of the Whitehaven Group in the National Greenhouse and Energy Report Scheme (NGERS). NPI data is publically available on the Commonwealth Department of the Environment website. The total GHG Emissions attributed to the MCCM reported for the NGERS 2018 Financial Year (FY) reporting period was 850kT CO_2-e. The following sections detail the three key GHG contributors calculated for the 2018 NGER reporting period.

Diesel Usage

83,733 kL of diesel (stationary and transport use) was consumed equating to 236,287 tCO_2-e GHG Emissions. This is less than the scope 1 emissions predicted in the EA.

Fugitive Emissions

There was an estimated total of 591,469 tCO_2-e fugitive emissions from MCCM in the 2018 FY. This is higher than the EA estimate as a result of the emissions calculation method used for fugitive gas that utilised the Method 1 approach which is an over-estimation versus a significantly lower and closely aligned site specific emission factor applied during the EA.

Electricity Consumption

24,097 MWh power equating to approximately 20 kT CO_2-e was consumed by MCCM. This is less than the predicted consumption from the EA of scope 2 emissions of 51,025 tCO_2-e.

6.3.3 Proposed Improvement Measures

Management measures described above will continue to be implemented during the next reporting period, however total emissions are expected to increase as production rates and some haulage distances increase.

6.4 NOISE

6.4.1 Environmental Management

Potential noise impacts associated with the MCCM are managed in accordance with the:

- Noise criteria and operating conditions prescribed under Schedule 3 Conditions 7 and 15 of PA 10_0138;
- EPL 20221 Conditions L3 and M7; and
- the MCC Noise Management Plan (NMP) approved by DPE, and prepared to satisfy the requirements of the EPL and PA 10_0138.

Additionally, various controls were implemented to manage noise during the reporting period, including but not limited to:

- real-time unattended noise monitoring systems at representative locations within the local area;
- monthly compliance attended monitoring by independent acoustic consultants;
- meteorological forecasting and daily risk reporting to advise of weather conditions in advance;
- annual noise model validation (refer 6.4.2);
- continued monitoring of TARP trigger levels and dissemination of trigger alerts to MCCM personnel via SMS;
- training of dispatch and supervisors regarding noise management and TARP's;
- dispatch operator that monitors real time noise data and can advise of any required modifications to work practices. Modifications may include changing dumping strategies, reducing the number of machines operating or ceasing operations;
- roaming inspections by personnel at offsite locations to identify any audible mine related noise;
- utilising overburden emplacement areas with acoustic shielding and higher windrows;
- equipment sound power testing and analysis of fixed and mobile fleet;
- operator training and awareness to reduce equipment noise;
- usage of 'silent horns' on the excavator and supporting truck fleet;
- ongoing maintenance of the MCC mining fleet including any noise suppression equipment;
- design and trials of new muffler systems on Hitachi 5100 class trucks;
- acoustic screening and paneling of parts of the CHPP;
- engaging a rubber tyre loader to reduce audible track noise;
- purchase of attenuated dozer's for dump operations;
- low frequency noise assessments; and
- investigations including truck revs and earthen bunds.

The MCCM noise monitoring network is illustrated on **Figure 5** and includes:

- continuous monitoring at real-time monitoring units that are utilised for daily management purposes; and
- monthly attended monitoring at six locations as described in the EPL (NM1 to NM6).

6.4.2 Environmental Performance

Attended Monitoring

Attended monitoring is completed on a monthly basis by an independent consultant and is used to assess compliance with licence and approval limits for mining generated noise. A summary of the noise

monitoring results at MCCM for the reporting period is provided below. Monthly noise survey results are also available in the EPL monitoring data reports available on the MCCM website.

There were no exceedances of the L_{A15min} or L_{A1min} criteria during the reporting period. There were no exceedances recorded against the cumulative noise criteria detailed in PA10_0138.

The Noise Policy for Industry (NPfI) was introduced in late 2017. The application of the low frequency assessment consistent with the NPfI applied during the reporting period.

Relocation of the NM4 monitoring location occurred during the period to be closer to the next private landholder property. Comparison of attended monitoring results from the 2017 and 2018 reporting periods indicates an overall improvement.

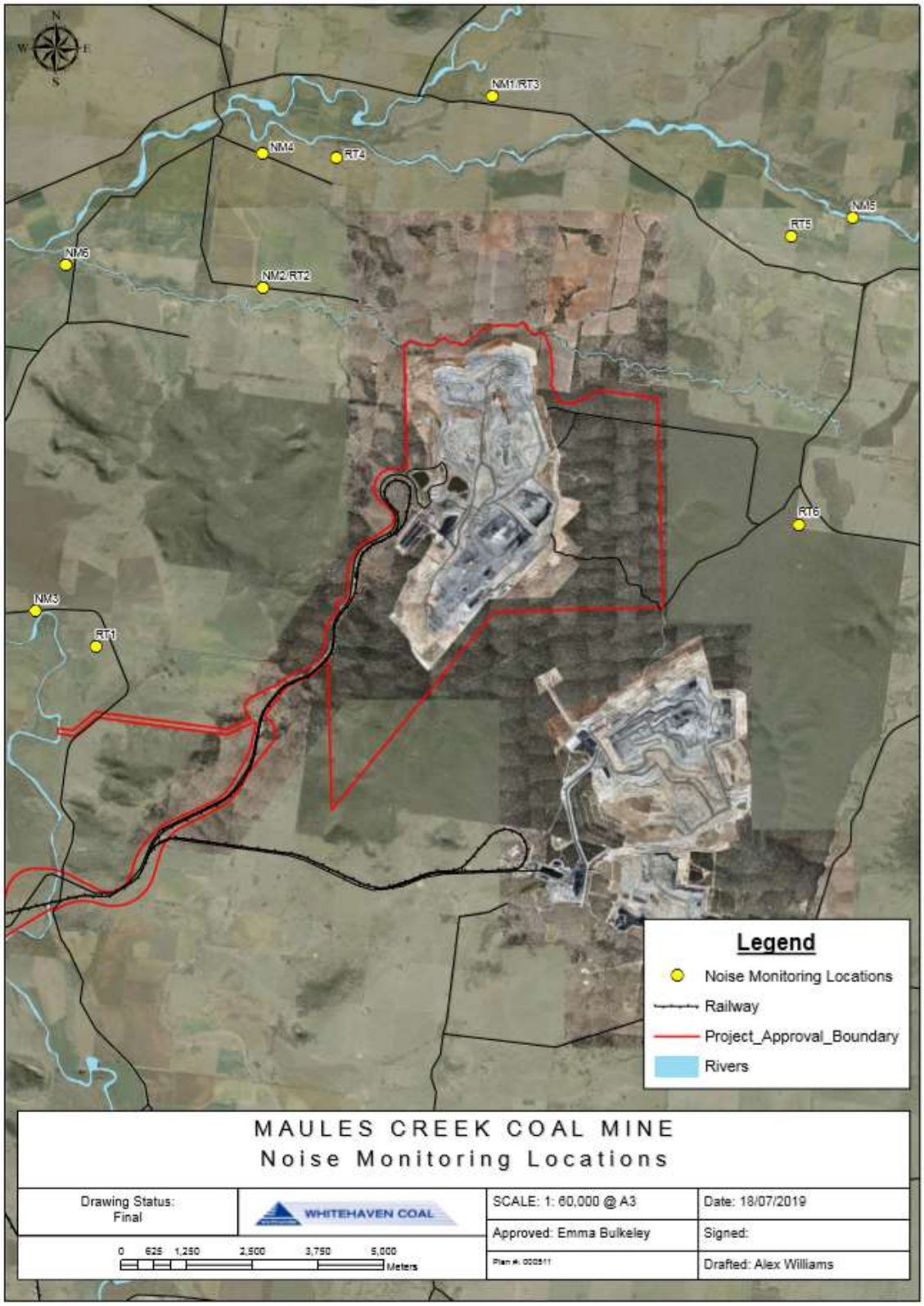


Figure 5 Noise Monitoring Network Locations

Annual Sound Power Testing

Sound power level testing of fixed and mobile plant has been undertaken and results are provided in **Appendix C**. Whilst not all fixed and individual mobile plant sound power levels met the predicted sound power targets described in the Project EA for modelling purposes the total measured sound power for MCC was at 136 dB(A) which is equal to that of the model for Year 5 Project EA site total.

Performance measurements by monthly attended monitoring results support the position that MCCM is operating generally in accordance with the respective Project Approval and EPL 20221 criteria for mining noise. Overall sound power output from the site is lower than modelled within the EA. 110 individual pieces of mobile plant were tested with an overall high percentage of individual equipment compliance.

MCCM is continuing to further develop solutions and reduce sound power levels on mobile equipment. Ongoing work continued during the reporting period to improve exhaust systems on the Hitachi class truck fleet.

Additional works in relation to SPL for fixed CHPP plant infrastructure were undertaken during the previous reporting periods of 2016 and 2017 related to various pieces of infrastructure and installation of screening in proximity to the ROM crusher, CPP and acoustic screening walls near train load out infrastructure. Upgrade of water pumps also included enclosure of primary and secondary transfer pumps for the supply of river water.

Annual Validation

Maules Creek Coal engaged an acoustic consultancy to undertake a validation assessment of the site noise model to fulfil the requirements of the MCC Noise Management Plan (NMP) and Schedule 3 Condition 16(f). The assessment aimed to review real-time and attended monitoring data for 2018, and validate the results against the model predictions from EA Acoustics Impact Assessment (NIA).

The validation exercise occurred comparing a period in June and concluded that the EA Project acoustic impact assessment model was generally more conservative in predicting noise impact relative to predictions for actual operations. Measured 90th percentile low pass LAeq were compared with 90th percentile model predictions to evaluate correlation between model predictions and measured mining noise. Results indicate the model provided a good level of accuracy and monitoring data from the current unattended monitoring locations are considered to provide a good indication of the upper range of received noise levels for the specific noise enhancing meteorological conditions modelled. In summary, model predictions correlated well with actual measured levels at three locations and over-predicted for two locations. Attended monitoring results indicate mine contributed noise levels are generally consistent with the modelled noise predictions for the Project.

6.4.3 Proposed Improvement Measures

A number of improvement measures are proposed for the next reporting period including:

- further review of exhaust systems on haul trucks;
- operational planning to continue to include screening options for overburden dumps;
- pending approval and implementation of the updated NMP; and
- additional improvements to the real time environmental noise monitoring system.

6.5 BLAST

6.5.1 Environmental Management

Blast management measures are implemented at MCCM to support the management and control of post blast fume generation, dust impacts, rock fragmentation, blast overpressure and ground vibration. Blasting impacts associated with the MCCM are managed in accordance with the:

- blasting criteria prescribed under Schedule 3 Conditions 18 to 20 of PA 10_0138; and
- Blast Management Plan (BLMP), relevant MCC procedures and the BTM Blast Management Strategy (BTMBS) that have been approved to satisfy the requirements of the EPL and PA 10_0138.

During the reporting period a number of controls were applied to reduce the potential for impacts associated with blasting at the MCCM. The key controls implemented include, but were not limited to:

- best practice blast design and drill practices in accordance with the relevant Australian Standards;
- blast scheduling considering meteorological conditions, including wind speed and direction;
- pre-blast assessment for each blast to determine blast exclusion zones, potential fume generation risks and appropriate controls measures to minimise potential risks;
- review of blasts and investigations as required;
- revision to the BLMP and improving commitments and control measures;
- coordination of blasts to avoid cumulative impacts in accordance with the BLMS; and
- the likelihood of fume generation is reduced through consideration of explosive product, geological conditions, best practice loading procedures, blast scheduling, 'sleep-time' and meteorological conditions.

Air blast overpressure and ground vibration monitoring are undertaken at four monitoring locations shown on **Figure 6**.

6.5.2 Environmental Performance

There were 111 blasts carried out during the reporting period. On the 13th March results at BM1 may have been influenced by a mechanical issue, however the records indicate the blast was below the prescribed limits. Excluding the above mentioned blast, all blast monitors were fully operational during these periods and indicated all events remained well within the applicable criteria at these locations. Modelled results indicated all missed blasts were likely to be within the criteria for both ground vibration and overpressure. Details of blasts are included in Appendix A. Complete capture rate for each unit occurred where blasts were above the trigger threshold.

Table 10 summarises the blasting monitoring results during the period.

Table 10 Summary of Blasting Results

Location	Parameter	Average	Maximum	100% Limit	Exceedance
BM1	Air blast overpressure (dB(Lin Peak))	90.23	106	120	-
	Vibration (mm/s)	0.1763	0.37	10	-
BM2#	Air blast overpressure (dB(Lin Peak))	95.13	112.1	120	-
	Vibration (mm/s)	0.1759	0.73	10	-
BM3	Air blast overpressure (dB(Lin Peak))	92.15	114.3	120	-
	Vibration (mm/s)	0.2336	0.68	10	-
BM4#	Air blast overpressure (dB(Lin Peak))	93.31	117.6	120	-
	Vibration (mm/s)	0.3033	1.11	10	-

* BM1 is on mine owned property.

BM2 and BM4 are on property either owned or acquired during the course of the reporting period.

As stated above there were no exceedances of the applicable ground vibration and air blast overpressure limits during the 2018 reporting period on mine owned property. On the 3rd September the blast overpressure was recorded at 117.6 dBL above the 95th percentile (115 dBL). This is an improvement from the 2017 reporting period which recorded one exceedance of the applicable maximum overpressure limit. Average results for the 2017 and 2018 reporting periods at corresponding monitoring sites were generally comparable indicating potential impacts of blasting were effectively managed during the 2018 reporting period. Both overpressure and ground vibration monitoring results are consistent with the blasting related details of the EA.

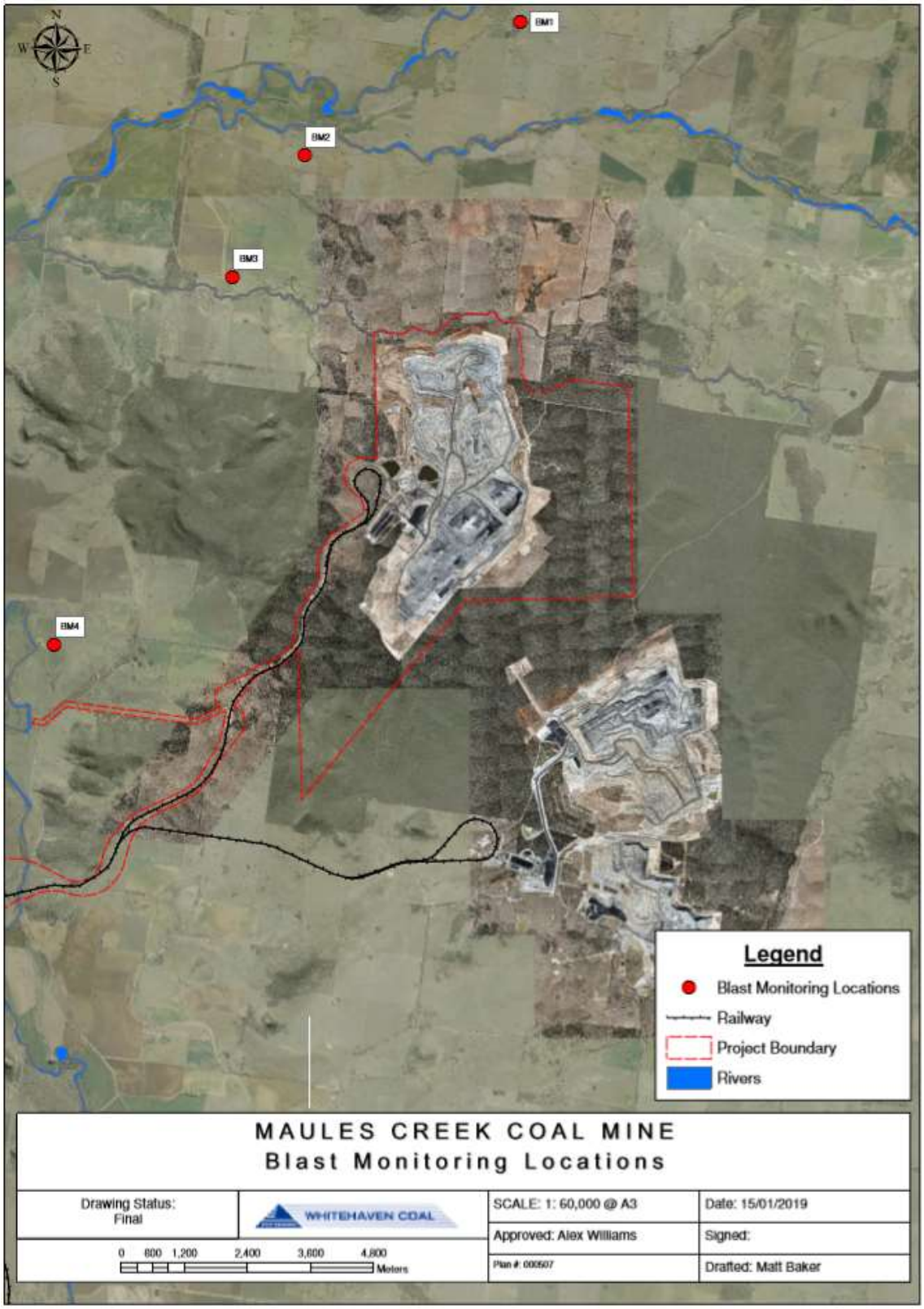


Figure 6 Blasting Monitoring Network Locations

Blast fume generation, including visible NOx fume, varies from yellow to orange to dark red depending on the concentration of NO_2 in the post-blast gases. There were no significant fume events (i.e. greater than Level 3C classified against the *Australia Explosives Industry & Safety Group* guideline) during the reporting period. There was a total of 23 recorded blasts with fume observed within the 2018 calendar year. 15 of those were classed as 1A, zero class 1B, 6 classed as 2A, 1 classed as 2B and 1 classed as 3B. All blasts were video recorded and categorised in line with the BLMP and relevant industry guidelines.

6.5.3 Proposed Improvement Measures

MCC revised the BLMP in consultation with stakeholders prior to the reporting period. The updated BLMP was approved in 2018 and included increased detail in relation to management and mitigation measures in respect to blasting at MCCM. Continual refinement to blasting design, geological definition, and engagement with blasting product suppliers, occurred during the reporting period.

6.6 BIODIVERSITY

6.6.1 Environmental Management

Biodiversity was managed in accordance with:

- Schedule 3 Conditions 52 of the PA 10_0138; and
- the MCC Biodiversity Management Plan (BMP) and Biodiversity Offset Strategy (BOS) prepared to satisfy the requirements of PA 10_0138.

Various treatments were implemented during the reporting period to mitigate impacts of the MCCM including (but not limited to):

- weed monitoring and inspections;
- feral animal monitoring and inspections;
- seed management and collection;
- flora and fauna monitoring; and
- fuel load assessment.

6.6.2 Environmental Performance

MCCM Revised Biodiversity Management Plan (BMP) was approved by DPE on 26th April 2017; with a revised BMP submitted in February 2018 as required by Stage 2 Leard Forest Regional Biodiversity Strategy. MCCM has an approved NSW Revised Biodiversity Offset Strategy for maintaining and improving 12,169ha of native woodland and forest covering four precincts called the Eastern and Western BOA (adjacent to MCCM, Leard Forest and Leard State Conservation Area); the Southern BOA (adjacent to the Boonalla Aboriginal Area) and the Northern BOA (adjacent to the eastern boundary of Mount Kaputar National Park).

Offset Security Management

During the reporting period, WHC undertook detailed cadastral survey definition and PCT assessment as part of preparation of Conservation Agreements with the NSW Biodiversity Conservation Trust (BCT). WHC worked closely with the BCT during 2018 to progress Conservation Agreements towards in perpetuity securement of MCCM BOAs. WHC have consulted with DPE and DoEE as required during the reporting period to keep key regulators abreast of securement progress. Following registration of Conservation Agreements; WHC will prioritise negotiations of those BOAs that NPWS has previously shown interest in being transferred to National Park Estate.

Infrastructure & Waste Management

During the reporting period, a total of 10.6km of new fencing (fauna friendly) was constructed along the perimeter of MCCM BOA as well as maintenance of signage and gates undertaken as required to continue to restrict unauthorised access and prevent inadvertent livestock grazing. Also during the reporting period, 46.0km of redundant internal fences were deconstructed across the MCCM BOA and combined with general waste removal of former agricultural rubbish (inherited from previous owners/land managers) that is either recycled (in the case for scrap metal) or disposed offsite (general municipal waste and tyres) at the Narrabri Waste Management Facility. The condition of the BOA fences, gates and signage were maintained to continue restricting unauthorised access and prevent inadvertent livestock grazing. Hazardous material assessments were completed during the reporting period for redundant and derelict assets/infrastructure (i.e. sheds and cottages) associated with the former agricultural use as part of planning for their demolition and removal in the next reporting period.

Seed Management

Routine seed assessments completed for the MCCM BOA were impacted by the severe drought conditions that were experienced during 2018. Seed assessments were completed as part of the mine site vegetation clearing program in February (prior to the annual clearing program) which resulted in Eucalyptus crebra seed being collected during the clearing program. The routine seed assessments aim to identify on a seasonal basis the life cycle stage and development of native plants to identify what, where, when and how to target appropriate resources to collect seed for future revegetation programs. Because of the drought conditions, additional seed collection opportunities within the MCCM BOA were limited.

As part of the WHC group wide revegetation planning; the onsite collected seed was supplemented with commercially sourced local and regional provident seed by reputable seed collectors. A local revegetation provider was engaged to propagate the seed to produce Box Gum and non-EEC/CEEC Woodland overstorey species seedlings required for the FY18 (completed) and currently being grown for the FY19 revegetation programs for the Eastern and Southern BOAs.

Revegetation Management

The MCCM BMP revegetation strategy focuses on restoration and revegetation of cleared non-native grassland (former cultivation) and derived native grasslands and assisting natural regeneration in better quality woodland areas. During the reporting period, revegetation ground preparation utilised the following equipment and methods including dozer ripping (three tines wide to a depth >0.3m every 5m along the contour and lightly scarifying the soil surface in lower condition areas) and tractor/excavator augured holes (to a depth >0.3m every 10m in higher condition areas) to relieve compaction, improve permeability and infiltration to increase sub-surface soil moisture as well improve soil seed bed to maximise soil-seed contact during sowing was completed over 938ha respectively of the Wirradale, Cattle Plain, Olivedene, Onavale, Roseglass and Bimbooria BOAs between January and October 2018 in preparation for next year's FY19 revegetation program. WHC coordinated two revegetation programs during the reporting period consisting of an understorey revegetation (direct seeding) program and an overstorey planting program. The understorey revegetation was undertaken on the Wirradale BOA between May and July 2018 with 233ha sown utilising 23 provident species within the seed mix of 2,240kg of native grass seed, 280kg of native forb seed and 4,480kg of bulking agent (lime) purchased. Overstorey revegetation program was undertaken between May and October 2018 with a total of 75,670 hiko seedlings of Box-Gum Woodland and Riparian Forest species across 893ha of MCCM BOA. Despite the prevailing drought conditions throughout 2018; routine tree watering and maintenance activities post planting have been successful to ensure that over an 80% survival has been achieved

for the Wirradale BOA and between 50% and 90% across the Eastern/Western BOAs which is commensurate with the target Box Gum Woodland vegetation structure of the MCCM BOAs.

Heritage Management

During the reporting period, historical heritage assessments were completed for redundant and derelict assets/infrastructure (i.e. sheds and cottages) associated with the former agricultural use as part of planning for their demolition and removal in the next reporting period. WHC completed the aboriginal cultural heritage field survey program between June and August 2018 in accordance with the approved Aboriginal Heritage Conservation Strategy, resulting in 36 previously unrecorded cultural heritage sites being identified in the MCCM Eastern and Western BOAs. There are now 209 known Aboriginal cultural heritage sites within and adjacent to MCCM BOAs with each site having identification/demarcating fencing installed around the heritage site perimeter and signage in accordance with the Heritage Management Plan.

Habitat Management

During the reporting period, MCCM has salvaged timber from its clearing areas and stockpiled within the mine boundary. In accordance with the Leard Forest Regional Biodiversity Strategy, MCCM will undertake additional habitat assessments of the BOAs to determine habitat augmentation requirements for nest boxes and other habitat techniques. There are a total of 11 rock debris habitat structures already constructed from salvaged rock on Roseglass, Louenville and Wollandilly BOAs.

Weed Management

WHC coordinated routine weed inspections undertaken across MCCM BOA in February, May, September and November 2018; as well as routine inspections undertaken by Narrabri Shire Council weeds officer. The priority weeds for control were noted as general broadleaf weeds (noxious and environmental species) in areas proposed for revegetation as well as legacy noxious weeds inherited from previous owners management regimes such as African Box Thorn, St John's Wort, Briar Rose, Green Cestrum and Cactus species (Common, Tiger and Rope Pear). The weed monitoring/inspections ensure that timely and prioritised weed control is undertaken on a seasonal basis with the spatial information directly given to spraying contractors to identify what, where, when and how to target appropriate resources across the MCCM BOA for weed control.

During the reporting period, WHC implemented a comprehensive weed control program across all MCCM BOAs including 2943ha treated across the Eastern and Western BOAs, 776ha treated on Southern BOA and 3409ha treated on Northern BOA. Only appropriately qualified and experienced weed contractors (AQF3 accreditation or higher for use of herbicide) were engaged to undertake weed control works for WHC.

Feral Animals Management

WHC coordinated routine formal feral animal monitoring across the MCCM BOA in February, May, September and November 2018. The adoption of a "monitor, measure and manage" approach to feral animal management will allow WHC to implement adaptive management in response to changes being measured through monitoring in feral animal abundance specific to the different geographical regions of the MCCM BOA. Feral animal monitoring utilises the relevant methodologies for specific feral animals generally in accordance with the NSW DPI Monitoring Techniques for Vertebrate Pests so that a range of methods can be used such as transects/spotlighting, sandpads, cameras traps where practicable and relevant to specific offset areas/properties. Monitoring demonstrated that certain animals like Feral Pigs or Eastern Grey Kangaroos can be seasonally moderate to high in abundance with all other feral

animal species recording scarce to low levels. The feral animal monitoring ensures that timely and prioritised feral animal control is undertaken on a seasonal basis identifying what, where, when and how to target appropriate resources across the MCCM BOA for feral animal management.

During the reporting period, WHC implemented a comprehensive feral animal control program across all MCCM BOA with fox and dog baiting; cat and pig trapping undertaken in March (35 Foxes baited from 194 baits presented and 36 Feral Pigs trapped), June (41 Foxes baited from 340 baits presented and 60 Feral Pigs trapped), October (33 Foxes baited from 340 baits presented and 61 Feral Pigs trapped) and November 2018 (25 Foxes baited from 340 baits presented and 16 Feral Pigs trapped). The Feral Goat harvesting during the reporting period resulted in 610 captured with the Feral Goats on sold to an abattoir. Only appropriately qualified and experienced feral animal contractors (appropriate feral animal management qualifications, NSW gun licence and pesticide accreditation where relevant) were engaged to undertake feral animal control works for WHC.

Soil & Erosion Management

No soil and erosion management works were required in MCCM BOA during the reporting period.

Grazing Management

MCCM BOAs continued to be destocked during 2018 as existing licences expire and the lands being transferred over to biodiversity management. No revegetation or sensitive waterways were stocked and/or grazed during the reporting period.

Bushfire Management

In accordance with the BMP, annual fuel load monitoring was undertaken in December 2018 as part of planning and assessment for an ecological burn of the Southern BOA revegetation areas in autumn 2019. WHC also completed a 234ha ecological burn of the Wirradale BOA in May 2018 and maintained 314.2km of fire break tracks to a zero fuel barrier standard across portions of the Northern, Southern, Eastern and Western BOAs. The ecological burn of the Wirradale BOA measured at the 5 fire treatment monitoring sites found that between the before and post burn results, the average native species richness increased by 42% and that grass groundcover decreased by 13% which are both positive restoration results.

***Tylophora linearis* Management**

In accordance with the BMP, Stages 1 (Root Architecture) to 4 (Seed Propagation) of the Tylophora linearis translocation program were completed previously in 2014 and 2015; with the Growth Study ongoing during the reporting period. Monitoring has continued of the 77 Tylophera linearis seedlings transplanted within Wollandilly BOA during December 2015 that were propagated from seed collected onsite at MCCM during 2014. Despite the drought conditions throughout 2018; of the seven plants presenting with above ground growth by the end of the period, two plants developed flower buds of which one plant progressed to a fruiting follicle and shedding seed by the end of December 2018. Hunter Eco (2019) observed that while stems appear and disappear unpredictably; there does seem to be a general pattern of reduction (often total) during the colder months of the year. No further opportunities to collect seed were identified during clearing operations in February 2018. The release of seed from the translocated Tylophora linearis marks a major milestone in the translocation process where the ultimate aim is to establish a self-sustaining population (Hunter Eco, 2019) with monitoring to continue for the appearance of germinants from the shed seed.

***Pomaderris queenslandica* Management**

In accordance with the BMP, Stages 1 (Root Architecture) to 4 (Seed Germination) of the Pomaderris queenslandica translocation program were completed previously in 2015 and 2016. Monitoring of the

translocated Pomaderris queenslandica plant that was propagated from a cutting in 2015 and planted within the Wollandilly BOA during November 2017. A protective enclosure was added following damage from macropods with the plant still in the process of recovering but has not progressed past small leaf sprouts at the end of the reporting period (Hunter Eco, 2019). No further opportunities to collect seed was identified during either clearing operations in February 2018 or from other wild populations in the area during the reporting period.

Monitoring Program

During the reporting period, the ecological monitoring program of the Maules Creek BOA included winter bird surveys that were undertaken in July 2018; annual spring flora monitoring of 59 sites (10 control, 5 reference and 44 treatment sites) in October 2018 and fauna monitoring of 23 sites undertaken during November 2018. During the winter bird surveys, eight threatened species were recorded (Brown Treecreeper, Diamond Firetail, Grey-crowned Babbler, Hooded Robin, Little Lorikeet, Speckled Warbler, Swift Parrot and Turquoise Parrot). Despite the prevailing dry conditions for much of 2018, native plant species richness increased from 41 sites last monitoring to 42 out of the 44 treatment sites meeting or exceeding the performance criteria (80% of native species richness benchmark for relevant biometric vegetation communities i.e. between 23 and 30 native species). Native overstorey cover decreased from 15 sites last monitoring to 11 out of the 44 treatment sites meeting or exceeding the performance criteria (overstorey cover benchmark for relevant biometric vegetation communities i.e. between 6% and 40% cover). Native midstorey cover had no change from the previous monitoring with 42 out of the 44 sites meeting or exceeding the performance criteria (midstorey cover benchmark for relevant biometric vegetation communities i.e. between 0% and 25% cover). Native ground cover grasses increased from 33 sites last monitoring to 37 out of the 44 treatment sites meeting or exceeding the performance criteria (grass groundcover benchmark for relevant biometric vegetation communities i.e. between 30% and 40% cover). A total of 92 bird species were recorded during standardised bird surveys in 2018. Average species richness at 16 woodland sites was 21 and ranged from 8 to 41. Average species richness at 7 revegetation/rehabilitation sites was 8 and ranged from 2 to 13. These results are lower than 2017 where average species richness at woodland sites was 20 (ranged from 7 to 28), and average species richness at revegetation/rehabilitation sites was 11 (ranged from 7 to 18). A total of 10 microbat species were recorded from harp trapping in 2018. Average species richness at 16 woodland sites was 3 but ranged from 0 to 8. The results are consistent with 2017 where a total of 10 microbat species were also recorded (site average 3, ranging from 0 to 8).

Independent Biodiversity Audit

The Independent Biodiversity Audit for MCCM BOAs undertaken in 2017 found no non-compliances but specified four recommendations which have been implemented resulting in the 2015 baseline weed monitoring program being repeated in 2018 (at the time of writing, the report had not been finalised); an erosion register established and undertaken a review of the Tylophora and Pomaderris propagation and translocation programs.

BCM and WHC engaged Umwelt (2018) to prepare the “Leard Forest Regional Biodiversity Strategy Stage 3 – Preliminary Strategy Review” in consultation with DPE and OEH as required by the Boggabri Coal, Tarrawonga Coal and Maules Creek Coal Project Approvals. The scope of the review was to focus on assessing the implementation of the RBS (Stage 2) in each Mines draft revised BMPs and to provide a list of recommendations to the BTM Complex for future revisions to the RBS. The Stage Review Report was submitted to DPE in December 2018.

Research

In accordance with Condition 15 & 16 of the MCCM EPBC Approval 2010/5566, MCC must fund $1 million into research of Box Gum Woodland mining rehabilitation as well as $1.5 million into research for threatened species recovery actions for the Regent Honeyeater, Swift Parrot and South-eastern (Corbens) Long-eared Bat. In accordance with approved Research Project Plans; Maules Creek Coal funded the following activities during 2018 including:

- Annual surveys were undertaken at over 1000 potential Swift Parrot foraging habitat sites across their breeding range in Tasmania during Spring 2018 with Swift Parrot presence-absence and abundance was recorded at each site;
- Twice yearly rapid assessment monitoring (five minute bird surveys in May and August 2018) of over 800 historical or potential Regent Honeyeater habitat sites across Victoria and NSW that is used to identify likely breeding sites to target for additional monitoring;
- Research to investigate if there are more effective field techniques (particularly ultrasonic detection) to survey for the South-eastern Long-eared Bat and determine detection probability using conventional trapping techniques to clarify the distribution patterns of the species with targeted surveys to determine the roosting requirements during both the non-breeding and breeding seasons;
- Germination trials of insitu seed out of the seed bank of natural and stockpiled soil samples at the Maules Creek Coal Mine is close to completion due to very few new germinant being recorded in the hot house experiments. Research will now move to focus on using microscope identification and analysis of seeds found within the sampled soil by sieving methods; and
- Preliminary root architecture assessment was undertaken of ten Box-Gum Woodland tree species at Maules Creek Coal Mine mapping the structural and tree protection zones of root systems and comparing to profiles and physical/chemical properties of insitu soils.

The findings of these research projects will be used to inform MCC on potential improvements to rehabilitation and restoration practices in particular during Box-Gum Woodland revegetation activities but also the management of threatened species both onsite and in the Biodiversity Offset Areas.

Pre-Clearing and Clearing Surveys

The 2018 clearing program occurred during February - March 2018 and consisted of the clearance of a total of 109 ha to facilitate the expansion of the mining pit area and the outer pit and overburden area (OOP).

The ecological works for the clearing program consisted of the following activities;

- Weed Mapping;
- Threatened Flora Surveys;
- Fauna Pre-clearing Surveys;
- Clearance Supervision; and
- Post-felling re-inspections.

Prior to the commencement of any clearing activities the limits of clearing are surveyed and marked with flagging tape.

The pre-clearance and clearance flora and fauna surveys are conducted in several stages, some of which were ongoing throughout the entire period of works and others were conducted in discrete phases.

Targeted threatened flora surveys were conducted prior to clearing activities commencing in conjunction with weed mapping surveys. All threatened flora identified during these surveys were recorded and their locations mapped using hand held GPS units.

Fauna pre-clearance surveys were also commenced prior to the beginning of clearance works to ensure that the areas were surveyed within one week of the clearance to minimise the risk of birds nesting between the time of the fauna habitat survey and the commencement of clearance works. This process ensured the maximum possible wellbeing of the native fauna within the clearance areas as outlined in the BMP. Fauna pre-clearance surveys consisted of identifying, marking and documenting suitable fauna habitat features. These features include significant rock outcrops and crevices, large boulders, nests and, in particular, trees bearing hollows which have the potential to support species such as bats, gliders, possums, reptiles and birds. All fauna pre-clearing teams were equipped with endoscopic cameras to enable the examination of hollows considered likely to contain fauna. Features identified as likely to support resident fauna were marked with a large “H” using fluorescent spray paint as well as with flagging tape and the habitat feature details were recorded using a hand-held GPS unit.

In addition to the identification and marking of likely habitat features, nocturnal spotlight surveys were also conducted throughout the clearing footprint area to identify hollows in use by resident fauna such as the Squirrel Glider (*Petaurus norfolcensis*) as well as potential microbat roosting trees. These surveys were typically conducted through the area surveyed diurnally on that date by the same field team. These surveys were conducted from dusk until approximately two hours after sunset.

Vegetation clearance was conducted following a two stage process, as follows:

- Stage 1 - After an area has been suitably surveyed for fauna habitat features grubbing, dozers then removed all understory vegetation leaving the marked habitat features isolated. Following grubbing works habitat items were allowed to stand overnight. This was to allow resident fauna the opportunity to self-relocate to adjacent undisturbed vegetation; and
- Stage 2 - In the following days, felling machinery conducted the removal of the isolated habitat items under the supervision of an ecology team. Habitat trees were shaken by the clearing machinery prior to felling to encourage fauna which had not already vacated the tree to now do so. After the shaking of the tree and following approval from the ecological team, the habitat tree was felled as softly as possible. Following felling the supervising ecology team inspected hollows and loose bark for resident fauna which had not self-relocated and rescued any present fauna.

Fauna was encountered during all work tasks on the 2018 clearance works, including species of frogs, birds, mammals and reptiles. Threatened species (under the *Threatened Species Conservation* (TSC) Act 1995 and/or *Environment Protection and Biodiversity Conservation* (EPBC) Act 1999) were also encountered.

The following threatened fauna species were encountered during 2018 clearing works:

- Brown Treecreeper (Eastern Subspecies) (*Climacteris picumnus victoriae*) – listed as Vulnerable under the TSC Act;
- Grey-crowned Babbler (Eastern Subspecies) (*Pomatostomus temporalis temporalis*) – listed as Vulnerable under the TSC Act;
- Pale Headed Snake (*Hoplocephalus bitorquatus*) – listed as Vulnerable under the TSC Act; and
- Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*) – listed as Vulnerable under the TSC Act;

Geomorphological Assessment

In accordance with PA 10_0138, previous monitoring for Stygofauna and Groundwater Dependent Ecosystems were completed as required near the mine in 2015, including portions of Maules Creek and Namoi River alluviums. The results of the current geomorphological survey undertaken by an independent consultant in 2018 indicate that the ecosystem condition along Maules Creek Alluvium is stable along this sub-catchment as indicated by the relatively consistent invertebrate community composition. There have been no adverse effects on at the Maules Creek subterranean aquatic ecosystem as a result of the mine's operations to date.

6.6.3 Proposed Improvement Measures

A number of improvement measures are proposed for the next reporting period including:

- Follow up monitoring of revegetation and weed management works across the offset areas and associated adaptive management;
- Continued implementation and progression of research projects required under the EPBC approval (refer section 8.1.9) ;
- Continuation of propagation and translocation programs for *Tylophora linearis* and *Pomaderris queenslandica*; and
- Implement improvements from audit findings.

6.7 ABORIGINAL CULTURAL HERITAGE

6.7.1 Environmental Management

Aboriginal cultural heritage is managed in accordance with the Aboriginal Archaeology and Cultural Heritage Management Plan (AACHMP) which was prepared to satisfy Schedule 3 Condition 58 and the SOC detailed in the PA 10_0138. The AACHMP was revised in 2016 by Whincop Archaeology and was approved in March 2017 by DPE. The BTM Aboriginal Cultural Heritage Strategy was approved in November 2017.

6.7.2 Environmental Performance

Annual Monitoring Program

The annual monitoring program was undertaken at MCCM in accordance with the requirements of section 6.4.1 of the AACHMP. The Annual Site Audit was undertaken on 8 and 9 August 2018 by Registered Aboriginal Party (RAP) representatives accompanied by a specialist archaeologist approved by DPE.

The Annual Site Audit included an inspection of all extant previously identified Aboriginal cultural heritage sites within the MCCM boundary. The inspection assessed the condition of 46 extant sites including fencing, potential nearby disturbance and photographic records. Any required fence maintenance identified during the audit was carried out immediately during the inspection.

All Aboriginal cultural heritage objects recovered from MCCM are stored securely at the Red Chief Local Aboriginal Land Council as part of an approved Care Agreement, which was approved in early 2018.

Additional Monitoring / Inspection of Sensitive Heritage Areas

Archaeological monitoring of Aboriginal cultural heritage sensitive areas, as defined in the AACHMP, are undertaken prior to topsoil clearance with RAP representatives accompanied by specialist archaeologists. Archaeological monitoring was undertaken between 21 February and 8 March 2018

during the clearing program, and included the visual inspection of 139 scrapes totalling approximately 30km of ground surface inspection. Archaeological monitoring identified two additional artefacts in the clearance area, with only one new site registered.

There remains low potential for finding significant archaeological sites during the archaeological monitoring process. This is consistent with the findings of the Aboriginal Archaeology Heritage Assessment undertaken as part of the EA.

Archaeological Salvage Report

All identified artefact scatters within the MCCM disturbance area have been salvaged in previous reporting periods through a combination of surface collection, test excavation and open-area excavation. The MCCM Archaeological Salvage report is being prepared and will be completed in 2019.

Aboriginal Heritage Conservation Strategy (AHCS)

As previously mentioned, the Aboriginal Heritage Conservation Strategy was approved by the DPE in November 2017 and the implementation of commitments within the strategy continued in 2018. In August 2018, the last of the Maules Creek Coal Mine biodiversity offset areas was subject to archaeological survey for the identification of Aboriginal cultural heritage values. All biodiversity offset areas have now been inspected for Aboriginal cultural heritage. Survey was undertaken by a qualified archaeologist with a minimum of two RAPs per team, with up to 3 teams in the field. Consultation of the MCCM RAPs regarding the cultural values of the offsets will continue in 2019, and will contribute to the final AHCS report.

Ongoing Consultation

In accordance with the AACHMP, meetings with RAPs are convened on approximately a six-monthly basis. Two meetings were held during 2018 (June and December), and were open to all RAPs.

Management of Quinine Bush

Quinine Bush (*Alstonia constricta*) continues to be mapped across the project as part of the land pre-clearance surveys, with the aim of identifying opportunities for seed collection and propagation. Ecologists have also been trained on the identification of potential Aboriginal scarred trees during the pre-clearance surveys.

6.7.3 Proposed Improvement Measures

In 2019, several aspects of cultural heritage work will continue, including the annual audit of Aboriginal cultural heritage sites and archaeological monitoring and salvage as required of Aboriginal cultural heritage sensitive areas during land clearance works. Engagement via meetings will occur in 2019, and RAPs will be consulted regarding the cultural values of the MCCM biodiversity offset areas. The MCCM salvage report will also be progressed during 2019, which provides a history of Aboriginal occupation and land use in the project area based on the results of the archaeological salvage program.

6.8 HISTORIC HERITAGE

6.8.1 Environmental Management

Historic heritage will be managed in accordance with Schedule 3 Condition 58 of PA 10_0138 and the Statement of Commitments included in Appendix 5 of PA 10_0138. No development work has occurred during the reporting period that impacted on historic heritage items identified in the EA.

6.8.2 Environmental Performance

Inspections of the identified historic heritage sites have been undertaken to assess condition and record any evidence of impacts. These inspections assist in determining ongoing maintenance requirements such as weed control and fence integrity. Photographic records are also recorded at each inspection.

Since Historic Heritage Assessment was undertaken as part of the EA there have been no additional sites identified within MCC owned land. As predicted in the EA, there have been no direct impacts to historic heritage items.

6.8.3 Proposed Improvement Measures

Annual monitoring of historic heritage sites will continue in 2019, development of a Conservation Management Plan (CMP) for the Velyama Site Complex will be developed, and maintenance and weed control will be undertaken as required.

6.9 TRAFFIC

6.9.1 Environmental Management

Traffic impacts associated with the MCCM are managed in accordance with Schedule 3 Condition 59 to 66 of the PA 10_0138 and the Traffic Management Plan (TMP). Various management measures were implemented during the reporting period to mitigate the traffic impacts of the MCCM including:

- a code of conduct for drivers of heavy and light vehicles;
- notification to contractors and staff regarding the driver code of conduct and to advise of any updated access arrangements;
- nominated access routes for all vehicles travelling to and from the MCCM, reinforced by approved signage and quarterly audits;
- provision of a shuttle bus service for employees to access site;
- consideration of school bus pick up and drop off times when scheduling shift changeovers;
- monitoring of traffic volumes, road safety inspections, quarterly auditing of approved access routes;
- results for coal transport monitoring are made publically available on the MCC website annually;
- community feedback via MCCM community contact line, website request and email, as well as consultation with the Community Consultative Committee (CCC); and
- consultation with the relevant authorities to obtain necessary permits prior to the movement of oversized loads on public roads.

6.9.2 Environmental Performance

MCC has conducted an annual audit regarding local road access restrictions as described in the TMP.

Analysis of employee transport records demonstrated that generally over 80% of wages employees utilised the bussing services provided over the 2018 reporting period, therefore within the specified limit.

There were no complaints regarding traffic generated by the MCCM received during the reporting period.

The utilisation of the Boggabri access road off the Kamilaroi Highway was the primary access for mine related traffic during the reporting period which assisted in reducing vehicle interactions of mine and public traffic on Therribri Road.

6.9.3 Proposed Improvement Measures

Annual audits of restricted roads, quarterly monitoring of traffic volumes to the site and responses to any community complaints will continue to be implemented during the next reporting period. Section 6 of the MCC Traffic Management Plan requires quarterly traffic surveys to be undertaken, these surveys assess operations, maintenance and CHPP wages employees utilise the bussing service. results for these surveys are presented in Table 11 below.

Table 11 Traffic Survey Results

Period	Wages Employees Accessing Site During Survey Period	Wages Employees Utilising Bus	Bus Utilisation (%)
Q1	1344	1285	96
Q2	1501	1385	92
Q3	1425	1301	91
Q4	1537	1419	92

6.10 WASTE MANAGEMENT

MCC aims to implement all reasonable and feasible measures to minimise waste and ensure it is appropriately stored, handled and disposed of. Waste materials at MCCM are managed in accordance with:

- Schedule 3 Condition 70 of PA 10_0138;
- Condition A1 & A3 of the EPL;
- the Materials Safety Management Plan (MSMP) & Pollution Incident Response Management Plan (PIRMP); and
- the legal and strategic framework for managing wastes in NSW.

MCCM waste streams include general waste, hazardous waste and sewage, and are collected and disposed of at authorised waste disposal sites by a licenced contractor. Sewage waste from the CHPP office building is now treated on site.

Any mineral waste material within the operation that is determined to be potentially acid forming (PAF) are placed (buried) in the OEA or within mined-out sections of the open cut and covered with non-acid generating material at a location to minimise further oxidation. Additional management measures are detailed in the approved MOP.

6.10.1 Environmental Performance

Waste Streams

Inspections of waste management practices are carried out to ensure general, hydrocarbon and recyclable waste is segregated.

Data on waste streams are collated using information provided by the licenced contractors. During the reporting period waste output increased by approximately 27% for general waste when compared with

the previous reporting period. An increase in waste production occurred consistent with increased production levels, workforce numbers and operational fleet in 2018.

A total of 559 t of general waste and 1,320 kL of septic were removed in the 2018 reporting period. Approximately 251 t of solid recyclable material and 1,078,200 L of used oils were collected for recycling by a licenced contractor.

No significant incidents relating to waste management practices occurred during the reporting period. Waste management was consistent with relevant management details in the EA.

6.10.2 Proposed Improvement Measures

MCC will continue to monitor and report waste streams on a regular basis to effectively manage waste generated by the operation of the MCCM.

MCC will continue to manage and check for potential PAF material and dispose of this material as per the requirements of the MOP.

6.11 HAZARDOUS MATERIALS

6.11.1 Environmental Management

Hazardous materials at the MCCM are managed and disposed of in accordance with the relevant Australian standards. Any spillages of potentially hazardous materials are required to be reported immediately to determine the appropriate response.

6.11.2 Environmental Performance

Hydrocarbons

No reportable or significant incidents involving fuel storage, handling or delivery occurred during the reporting period. Minor leaks and spills associated with plant maintenance and operation were managed on site. The PIRMP was not required to be activated for any significant reportable incidents. This will continue to be managed during the next reporting period.

Explosives

No environmental incidents involving explosives handling or storage occurred during the reporting period.

Other Materials

Soil material from temporary maintenance area and material impacted by minor spills in the operational areas were removed and are stored in the Soil Reclamation Area prior to treatment. No reportable incidents involving the handling or storage of other potentially hazardous materials occurred during the reporting period.

6.11.3 Proposed Improvement Measures

Continued operation of a bioremediation area will occur during the next reporting period.

6.12 VISUAL & LIGHTING

6.12.1 Environmental Management

Visual amenity and lighting impacts associated with the MCCM are managed in accordance with Schedule 3 Condition 67 and 68 of the PA 10_0138. Various onsite treatments were implemented during the reporting period to mitigate visual impacts of the MCCM including, but not limited to:

- use of directional lighting in lieu of general area lighting;
- consideration of fixed versus mobile lighting, locations and orientation;
- fixed lighting designed and procured in general accordance with Australian Standard *AS4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor Lighting* (AS4282);
- visual lighting inspections as required; and
- mine infrastructure designed and managed to blend with the surrounding landscape as far as practicable.

6.12.2 Environmental Performance

A visual and lighting assessment was undertaken during the previous reporting period to review the lighting levels at nearby receptors and roads. It was determined that there was minimal direct line of sight exposure for the closest sensitive residences to the north west of MCCM. Illuminance at all locations was within the allowable criteria stated under Condition 67 Schedule 3 of the approval.

No significant discrepancies have yet been identified between the EA predictions and actual visual impacts of the MCCM. No complaints were observed during the reporting period concerning visual or lighting. Training was provided regarding lighting management at the operation.

6.12.3 Proposed Improvement Measures

Management measures described above will continue to be implemented during the next reporting period.

6.13 BUSHFIRE

6.13.1 Environmental Management

Bushfire hazards and risks associated with the MCCM are managed in accordance with Schedule 3 Condition 69 of the PA 10_0138, the MCC Bushfire Management Plan and the BMP. Various treatments were implemented during the reporting period to manage and control potential bushfire risks including:

- a 1000L fire trailer onsite which can be utilised to control any fire outbreaks if required;
- onsite water trucks fitted with water cannons;
- meetings held with Namoi-Gwydir Regional Fire Control;
- implementation of various bushfire hazard controls during the reporting period including Hot Work areas and permits, maintenance of equipment and infrastructure, establishing Asset Protection Zones and assessment of fuel loads;
- monitoring and management of fuel loads occurred in the MCC offset areas prior to the bushfire season; and
- maintenance of the roads and tracks within the MCCM was undertaken prior to the bushfire season. Roads and tracks can act as firebreaks and help to facilitate access across the site. Specific fire breaks also installed in adjacent Offset areas.

6.13.2 Environmental Performance

No uncontrolled bushfires occurred immediately adjacent to or within the MCCM boundary during the reporting period. There were fires as part of controlled ecological burns within offset areas (refer section 6.6.2). There were fires regionally and as part of localised burning across private properties within the Maules Creek and Boggabri areas.

6.13.3 Proposed Improvement Measures

Management measures described above will continue to be undertaken during the next reporting period being fuel load assessment, maintenance of access tracks, hot work permits and asset protection zones.

6.14 PUBLIC SAFETY

The mine is located on land owned by Whitehaven and State Forest land in a relatively remote rural area, generally in excess of 1 km from any public road. The site is predominately fenced and appropriate gates, designated access points, warning signs and security personnel are in place.

During blasting, procedures are in place to ensure that the area around each blast site is clear of personnel and relevant residents are advised in advance of scheduled blasting.

6.14.1 Performance

The procedures in place have generally been effective throughout the reporting period to prevent unauthorised access to the mine site by the general public. Non authorised Drone and aerial flights have occurred over the site during the reporting period.

7 WATER MANAGEMENT

7.1 WATER SUPPLY

Table 12 Water Take For the 17/18 Water Year

Water Licence #	Water Sharing Plan	Water Source and Management Zone	Entitlement	Passive Take/ Inflows	Active Pumping by MCCM**	Total
WAL 27385	Upper and Lower Namoi Groundwater Sources 2003	Upper Namoi Zone 4 Namoi Valley (Keepit Dam to Gin's Leap) Groundwater Source	38	34	0	34
WAL 12811	Upper and Lower Namoi Groundwater Sources 2003	Upper Namoi Zone 5 Namoi Valley (Gin's Leap to Narrabri) Groundwater Source	135	0	0	0
WAL 12491	Upper and Lower Namoi Groundwater Sources	Upper Namoi Zone 11 Maules Creek Groundwater Source	77	0	0	0
WAL 12479	Upper and Lower Namoi Groundwater Sources 2003	Upper Namoi Zone 11 Maules Creek Groundwater Source	78	0	0	0
WAL 27383	Upper and Lower Namoi Groundwater Sources 2003	Upper Namoi Zone 11 Maules Creek Groundwater Source	0	0	0	0
WAL 12480	Upper and Lower Namoi Groundwater Sources 2003	Upper Namoi Zone 11 Maules Creek Groundwater Source	215	1	0	1
WAL 29467	NSW Murray Darling Basin Porous Rock Groundwater Sources	Gunnedah - Oxley Basin Mdb Groundwater Source	306	254 (+ <5 ML/yr from 2017)	0	254 (+ <5 ML/yr from 2017)^
WAL 29588	NSW Murray Darling Basin Porous Rock Groundwater Sources	Gunnedah - Oxley Basin Mdb Groundwater Source	0	0	0	0
WAL 41585	NA	Catchment: Unnamed Water Source	30	0	0	0
WAL 36641	NSW Murray Darling Basin Porous Rock Groundwater Sources	Gunnedah - Oxley Basin Mdb Groundwater Source	800	0	0	0
WAL 13050	Upper Namoi and Lower Namoi Regulated River Water Sources	Lower Namoi Regulated River Water Source	3,000	0	2,395	2,395

** Water use applicable to MCCM operations only and excludes any water use by tenants for stock and domestic or irrigation purposes.*

*** Note: Temporary transfer of water allocation occurred during the calendar year not included in the above table.*

^ <5 ML included in porous rock sources consistent with the water modelling for 2017.

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7.2 SURFACE WATER MANAGEMENT

7.2.1 Environmental Management

The MCCM water management system aims to ensure there are no adverse impacts on receiving water quality, to allow for early detection of any potential impacts and develop appropriate corrective actions. Potential impacts to surface water quality are managed in accordance with:

- the surface water criteria prescribed under schedule 3 condition 36 to 40 of the PA 10_0138;
- EPL 20221 Conditions P1, L1, L2, L3 and M2; and
- the MCC Water Management Plan (WMP) prepared to satisfy the requirements of the EPL and PA 10_0138.

During the reporting period various controls strategies were implemented to manage surface water quality including:

- prior to disturbance of land, appropriate erosion and sediment controls were established;
- maintenance of a number of sediment dams previously constructed to collect runoff from disturbed areas, which is then used for dust suppression or pumped to the mine water dam for re-use on site;
- a combination of temporary and permanent clean and dirty water drains have been established to divert runoff from undisturbed areas and collect runoff from disturbed areas;
- additional erosion and sediment control measures have been used for other small disturbance areas including silt fences, rock checks and other measures as required;
- any water collected within the open cut pits is contained and reused on-site;
- no uncontrolled discharge of mine water off-site;
- maintaining an up-to-date water balance to ensure on-site water demands are satisfied whilst minimising offsite water impacts;
- validation of the site water balance model; and
- regular sampling and inspections of the onsite and surrounding surface water system.

Surface water monitoring locations are illustrated on **Figure 7** and **Figure 8**. A summary of the surface water quality findings from the reporting period is provided below.

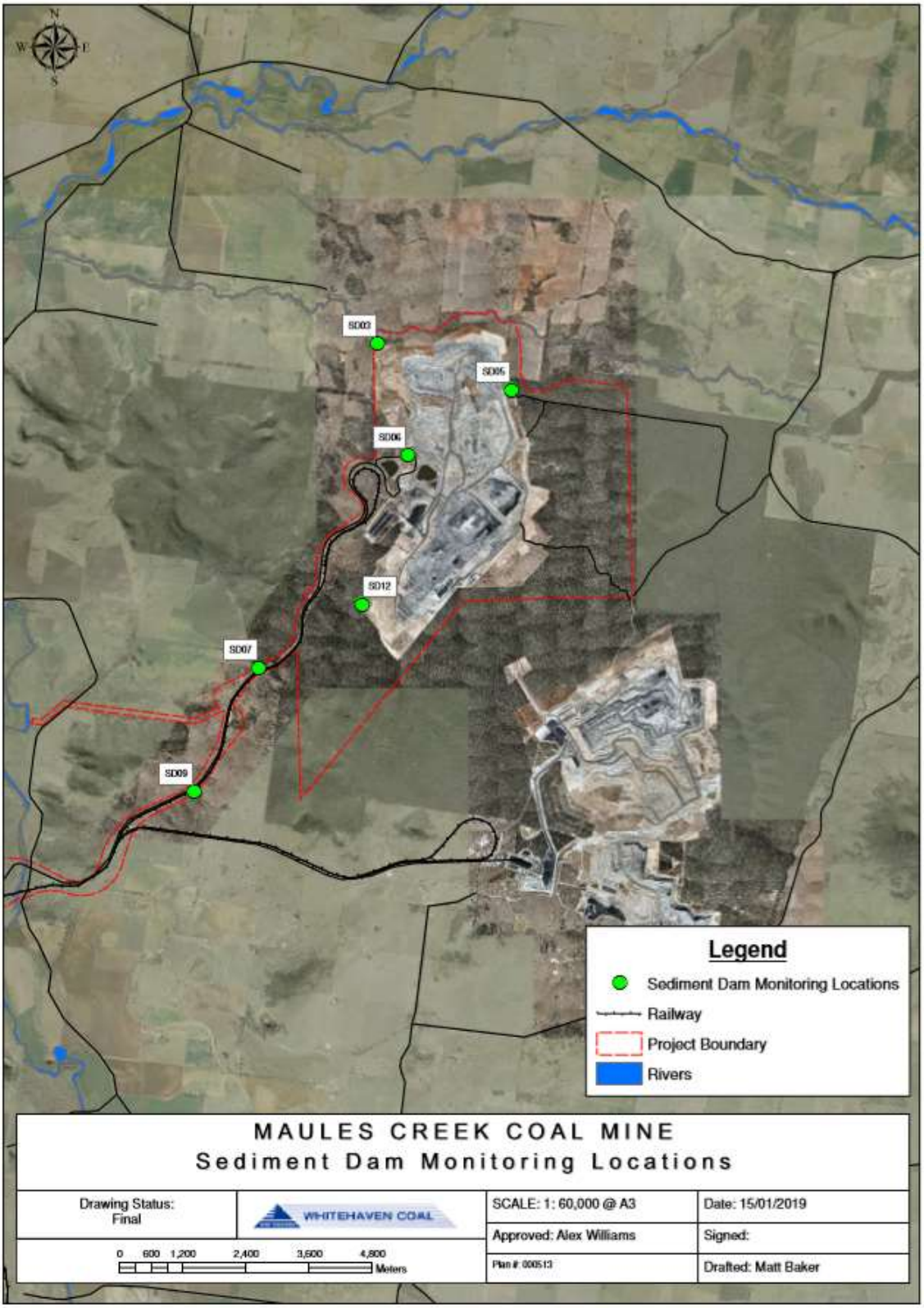

Figure 7 Sediment Dam Monitoring Locations

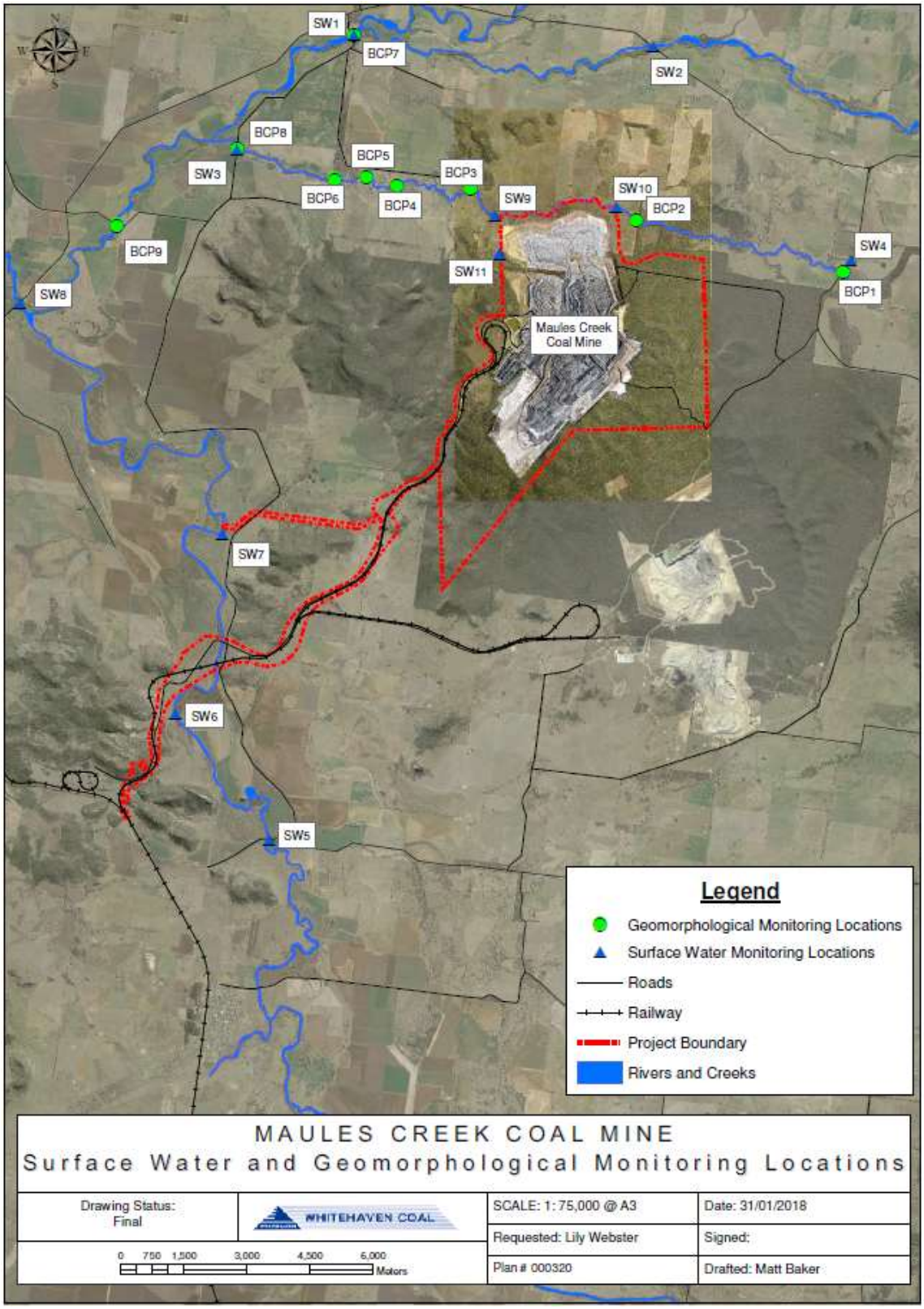

Figure 8 Surface Water and Geomorphological Monitoring Locations

7.2.2 Environmental Performance

Surface Water Quality

Routine surface water monitoring is conducted in surrounding watercourses on a monthly basis and the pH, EC and TSS monitoring results detailed in **Appendix D**. Samples are collected consistent with Water Sampling Methods, AS/NZS5667.1 and AS/NZS 5667.6. All laboratory analyses are conducted by a NATA accredited laboratory. Laboratory pH in creeks and rivers surrounding the project are all trending generally within the ANZECC acceptable range for Irrigation, Ecosystem Health and Recreation. Back Creek and upper Maules Creek are ephemeral and rarely contain flowing water. No community complaints were received during the reporting period in relation to surface water quality. Surface water EC and TSS trends are shown in **Appendix D**.

During the year, though some higher EC and metal levels were recorded at surface water sites, the upstream locations had the same or higher results than the downstream sites. This indicates that MCCM did not impact on the metal levels recorded at these locations. Overall, the surface water quality results recorded during the reporting period were generally consistent with historical trends recorded during baseline monitoring and previous years of operations at the MCCM. Additionally, the monitoring results are consistent with the EA prediction that the Project will not adversely affect surface water quality in downstream receiving waters. Water quality trends from 2014 are included in **Appendix D**. The EC, TDS and TSS values fluctuate between wet and dry periods over the monitoring periods from the commencement of monitoring.

Preliminary Trigger Values (PTVs) for twenty six key water quality parameters for Maules Creek, Back Creek and the Namoi River have been included in the WMP. Where insufficient data is available, ANZECC eco-system trigger values have been adopted (eleven parameters) in **Appendix D**. Trigger values have been developed using background data for fifteen parameters. The adopted trigger values will be refined based on further sampling to be undertaken as the operational stages of the MCCM proceed. Monitored values above the PTV's are related to variable flow and upstream effects not attributable to the operation.

Onsite Water Quality

MCC monitors 'mine water' defined in the WMP as water that has come into contact with coal (e.g. groundwater inflows and surface runoff to the open cut pit or stormwater runoff from the ROM and product coal stockpiles). The water quality sampling of any 'mine water' conducted during the 2018 reporting period has been characterised as coal contact water and results shown are in **Appendix D.**

Flow

There was negligible to very low flow recorded at the monitoring points in Back Creek at SW9 or SW10 as well as point SW2 along Maules Creek during the 2018 reporting period. Throughout the reporting period, flow in the Namoi River has been largely dictated by water releases from the Keepit Dam regulated by WaterNSW. Actual Namoi River pumping inflow was higher than predicted in the EA for Year 5 (1,620 ML). Annual 2018 rainfall was well below the historical median (approximately 10th percentile), and additional Namoi River water was likely required to offset the associated reduction in the volume of mine catchment runoff.

For the 2018 period, the estimated runoff volume captured by the mine was 436 ML. However, this volume does not represent the actual volume of water that would have flowed to the receiving waters if

the project was not constructed because land disturbance, construction of impervious surfaces and the presence of the dam water surfaces vary the volume of runoff above pre-mine conditions.

Wet Weather Discharge Monitoring

On the 21st and 22nd October water samples were obtained from SD9, SW5 and SW7 and the upstream and downstream environment and analysed in accordance licence requirements. MCCM does not believe that a discharge occurred from site on these dates however data was collected and this has been reported in good faith Water quality results for the event at discharge point SD9, SW5 and SW7 remained compliant with the concentration limits specified in conditions the Maules Creek EPL 20221 and are summarised in **Appendix D.** Site water balance modelling was also undertaken and is discussed in Section 7.4.

Geomorphological Assessment

Stream and riparian vegetation health assessments were conducted by a qualified consultant in November 2018 at upstream and downstream locations along Maules Creek, Back Creek and the Namoi River as illustrated on **Figure 8**. All sites were selected for photographic survey of the existing geomorphological condition of the downstream drainage system, from the mine site to the Namoi River. The assessment included macroinvertebrate monitoring as well as physical and chemical monitoring in accordance with Australian River Assessment System (AusRivAS) guidelines as required in the WMP.

Visual habitat assessments were conducted at twelve of the aquatic monitoring sites during the survey period in accordance with the NSW AusRivAS Manual. All twelve surveyed sites showed indications of disturbance from current land uses to varying degrees. All observations were recorded utilising the standard NSW AusRivAS field datasheets. A photograph was also taken at each sampling location, both upstream and downstream to provide a visual indication of the habitat at each location, and to form a baseline record of current conditions. The primary disturbances noted at all sites included presence of exotic vegetation, erosion of banks, disturbance from stock, feral animals and disruption of natural hydrology from existing tracks, roads, causeways and other infrastructure. Bank stabilisation and erosion control measures are also in place at SW5.

Water quality measurements were conducted at the Namoi River sites (SW5, SW8) and one Maules Creek site (BCP7). No water quality measurements were taken at BCP 9 (Maules Creek) or any of the Back Creek sites as these sections were dry and lacked any remnant pools.

The in situ water quality recordings for EC and pH for the majority of the sites were largely within the acceptable trigger values listed in the ANZECC guidelines.

Conductivity (EC) and dissolved oxygen was largely outside of the trigger values for all three sites. As conductivity and dissolved oxygen has largely been within or near the trigger conditions and reduced water levels experienced in 2018. The reduced water levels resulted in recorded water temperatures in 2018 being comparatively higher compared to previous years. As solubility of oxygen decreases with increasing temperatures, the reduced dissolved oxygen may partly be due to the increased temperatures of the water. The relatively lower DO content at BCP7 compared to SW8 despite the lower temperature is likely due to the relatively stagnant nature of the water at BCP7 as flow can also impact upon the level of dissolved oxygen. The higher levels of EC recorded in 2018 could also be partly related to the higher temperatures recorded as conductivity increases with increasing temperature. Natural impacts on EC in water are rain, geology and evaporation while anthropogenic impacts include road

salt, septic/landfill leachate, impervious surface runoff and agricultural runoff. The increased EC recorded in 2018 is likely due to impacts from a combination of increased concentration of runoff in water from increased evaporation/reduced water levels and relative lack of rain compared to previous years.

A total of 35 taxa were recorded across the 6 sampled habitats (3 edge and 3 bed) with an average of approximately 12 taxa per habitat. Overall the highest level of taxa richness was recorded in the edge habitat at BCP7 (18 taxa) while the lowest diversity was recorded in the bed habitats at BCP7 and SW5 (9 taxa each). Although higher numbers of taxa were recorded at BCP7 compared to previous years, this is largely attributed to recordings of single individuals of less common taxa in the edge habitat such as Hydrochidae (a beetle), Nepidae (water scorpions), Hebridae (velvet bugs), Stratiomyidae (soldier flies) and Isostictidae (a damselfly) which are not utilised in the AusRivAS models. Lower numbers of taxa were recorded at SW5 compared to previous years whereas numbers at SW8 were similar to those of previous years.

The overall total number of taxa recorded across all sites in the 2018 surveys (35 taxa) is similar to that recorded during the 2015 - 2017 surveys (34, 35 and 31 taxa respectively) despite the drier conditions compared to previous years. While the taxa recorded in 2018 were largely similar to those recorded in previous years, 1-2 individuals of four new taxa Glossiphoniidae (a leech), Hebridae (velvet bug), Isostictidae (a damselfly) and Stratiomyidae (soldier fly) were recorded during the 2018 surveys. However some taxa such as Dytisidae (diving beetles), Hydraenidae (a beetle) and Physidae (a snail) which were recorded in all previous years were absent from the 2018 samples. Due to the lack of discrete pools, no samples could be collected from any of the Back Creek sites in 2018. However, based on the previous monitoring survey results, the taxa present in the Back Creek sites are also present within the Maules Creek and Namoi river sites – i.e. there were no taxa that were unique to Back Creek. Therefore, overall taxa richness for 2018 is considered unlikely to increase significantly if samples from Back Creek could have been collected.

The relatively low number of taxa recorded across the different habitats is likely to be due to the relatively disturbed nature of the waterbodies. The relative paucity of aquatic microhabitats are also likely contributing factors to the low numbers of taxa and individuals recorded.

Overall the waterbodies surveyed during the November 2018 monitoring surveys remained in a moderately to highly disturbed condition. Riparian vegetation was generally in a moderately to highly disturbed state mainly due to high levels of exotic vegetation, sediment disturbance from stock and bank erosion. Vegetation in 2018 also showed some signs of reduced groundcover and decline in health of trees, likely due to water stress from drier/drought conditions experienced during this period.

Water quality was also relatively low mainly due to lower levels of dissolved oxygen and increased conductivity which may be a reflection of higher levels of runoff. While overall macroinvertebrate taxa richness was similar between survey periods, the types of taxa recorded differed across years. This is likely due to the difference in available habitats at the monitoring sites, given to the difference in water levels between years. While taxa richness was relatively consistent between years, there was a relative decrease in the proportion of sensitive taxa which is likely a reflection of the decreased water quality and habitat conditions from the drought conditions experienced in 2018. The AusRivAS models also indicate some decrease in integrity in some habitats in drier periods.

7.2.3 Proposed Improvement Measures

Water diversion works will continue to target segregation of clean and dirty water where feasible.

Planning of water supply options will occur, and identification of efficiencies will continue to be investigated. Approval of the BTM Water Strategy will also be sought during the next period incorporating feedback from stakeholders during 2018.

Ongoing work will continue to occur with management of sediment drainage systems, including desilting and maintenance where required.

Geomorphological monitoring will continue to occur, targeting spring 2019 to determine if changes in taxa richness and integrity bands are due to differing weather conditions between years.

7.3 GROUNDWATER

7.3.1 Environmental Management

Groundwater at MCCM is managed in accordance with:

- the groundwater criteria prescribed under schedule 3 condition 36 to 40 of the PA 10_0138;
- EPL 20221 Conditions P1 and M2; and
- the MCCM WMP prepared to satisfy the requirements of the EPL and PA 10_0138.

Currently groundwater monitoring is conducted at a network of regional bores and privately owned bores as illustrated in **Figure 9**. The groundwater sampling sites on privately owned land are sampled biannually for depth to water and water quality.

The regional bores are currently sampled monthly for depth to water and quarterly for water quality. Once the baseline groundwater quality of the regional bore network has been established water quality monitoring will be conducted on a biannual basis as per the WMP. Bores are sampled in accordance with the OEH Approved Water Sampling Methods and AS/NZS5667.11. All laboratory analysis is conducted by a NATA accredited laboratory.

In 2010, eight groundwater monitoring bores and four vibrating wire piezometers were constructed within former exploration holes to form a baseline monitoring network ('MAC' bores) as part of the Environmental Assessment (EA). All of these bores were progressively removed by mining or external activities, with the exception of one bore (MAC1280).

A replacement monitoring network was developed by MCC in consultation with DPI-Water in 2013. The majority of the regional bores were installed between 2013 and 2014. The replacement bores have the prefix 'RB' or 'BCM'. The two 'BCM' bores were installed along Back Creek to investigate the potential for a shallow water table to be present that could support vegetation occurring within the riparian zone along the drainage line. The progression of the mining resulted in the removal of RB01, RB01a, RB02 and RB02a in 2017, and an alternative sampling location was identified, and continued to be sampled, pending amendment of the EPL.

A network of 17 additional monitoring bores and VWPs were proposed as part of the EA to monitor the influence of mining on the groundwater regime. The bores were installed and positioned in lines radiating out from the Maules Creek Mine. The purpose of these proposed sites was to monitor for depressurisation in the Permian strata and any potential water level drawdown within the surrounding alluvial aquifer. Details for each of the monitoring sites are provided in Appendix E.

The table indicates where a bore has been installed in proximity to the preliminary sites recommended within the Maules Creek EA, and the original bore numbering proposed within the EA. The monitoring sites are either open PVC monitoring bores (standpipes) for shallow strata or arrays of multi-level vibrating wire piezometers (VWPs) installed within multiple deeper coal seams. In some sites a pair consisting of a shallow standpipe and a deeper VWP array was installed to allow monitoring of connectivity between the bedrock and coal seams. The sites chosen also aimed, where possible, to be adjacent to existing shallow alluvial monitoring bores monitored by the NSW government to further assist in understanding and monitoring connectivity between the different geological units.

7.3.2 Environmental Performance

Parameters recorded as part of the scheduled groundwater monitoring for this reporting period are summarised below and results provided in **Appendix E**.

Appendix E includes graphs for each bore that compare the measured groundwater levels with predicted water levels from the 2018 groundwater model, and water level and water quality triggers developed generally in accordance with the methodology proposed in the Water Management Plan.

Groundwater level trigger values were based on the 5th and 95th percentile values of all manual data collected for the regional monitoring bores from the start of data collection at each site until the end of 2016, noting this is a preliminary period of operation and contributes to establishing a greater data set for analysis.

Groundwater quality trigger values were developed for Total Dissolved Solids (TDS) and sulfate using the control chart methodology. A control chart is an x-y chart with three additional horizontal 'control lines' running parallel to the horizontal axis. The 'control lines' are equivalent to one, two and three standard deviations based on the baseline data. Equivalent percentiles are used to assist interpretation. Trigger events occur when:

- one data point is greater than the 99.87th percentile (3 x std dev);
- two consecutive data points greater than the 97.73rd percentile (2 x std dev); and
- five successive data points greater than the 84.13th percentile (1 x std dev).

When evaluating the results from control charts it is important to note that water chemistry results have some natural variability with a range that is determined by a variety of unique factors for each bore including the bore construction, depth, sample collection method, climatic conditions, and aquifer conditions as examples. Because of these factors water sample results from bores all exhibit some natural variability. This does not necessarily indicate an impact from mining, but is simply a trigger to further investigate and determine the cause for the variability within the sample results.

Control charts were not developed for electrical conductivity (EC) as there are no ANZECC guideline values for EC, and TDS is directly correlated with EC, allowing control charts developed for TDS to be used to evaluate changes in salinity of groundwater.

The concentrations of dissolved metals are commonly low and often below the level of laboratory detection. The concentrations of dissolved metals and nutrients in groundwater samples were therefore compared against ANZECC guideline values. It is important to note when sample results exceed these thresholds it simply provides information on the beneficial uses of the water, not necessarily an indication of impacts from mining.

Regional Groundwater Bores

The groundwater level trends observed during the reporting period include stable trends at REG4, REG5, REG12, REG13; fluctuating but overall declining trends at REG3 and REG14; and steadily declining trends at MAC1280, RB05A, REG6, REG7A. The annual changes since 2014 are quantified further in **Appendix E**. It should be noted that there has been little annual change in water level in the

REG bores completed in the Boggabri Volcanics until the 2018 calendar year. This likely reflects the ongoing drought rather than a mining effect. Only bore MAC1280, completed in interburden, has increased in level over the 2014-2018 monitoring period, all other sites have had recorded a long term decline since December 2014. MAC1280 is located at the northern corner of the Maules Creek Mine, adjacent to the waste rock dump. It is possible that the bore is showing the effects of altered water management in this area of the site, or potentially the effects of geomechanical loading from its proximity to the waste rock dump.

Nine of the ten bores triggered for high pH (laboratory) during 2018. However, five bores only triggered in the December 2018 sampling round with values of between pH 8.51 and pH 8.64. Field pH measurements in December were within the baseline range for all but two bores (MAC1280, and REG4). This suggests that the December laboratory pH readings were unusually high, which may have been due to extended holding times or atypical sample handling prior to reaching the laboratory. Conversely, two of the bores with typically high pH values since installation (REG4, REG13) have recorded a much more neutral pH throughout 2018. The bores are screened in Boggabri Volcanics to the southwest of Maules Creek mine. It is possible that the ongoing drought has led to a reduction in groundwater movement around the bore, and a disconnect from the materials that were causing the more alkaline pH.

Recorded TDS concentrations are variable within the monitoring network ranging from fresh to brackish. The majority of the samples collected from the monitoring bores recorded TDS concentrations generally consistent with historical trends and within the trigger thresholds. Two bores triggered for higher than baseline TDS (REG12, REG13), two bores triggered for lower than baseline TDS (REG5, REG6). In addition six bores triggered for sulfate; five bores were higher than baseline (REG5, REG6, REG7A, REG13, REG14), and one bore was lower (REG4). The trigger events are discussed further in Section 7.3.1.

Figure E1 included within **Appendix E** shows groundwater levels from the standpipe bores measured within the monitoring network spatially. The groundwater levels generally reduce in elevation down the alignment of Maules Creek and Back Creek. This indicates groundwater flow is a reflection of the topography in these areas. Slightly depressed groundwater levels are evident in the Permian monitoring bores in close proximity to the mining area, as has been previously predicted by numerical modelling. The figure also includes several bores within the Boggabri Coal monitoring network for additional context. The five Permian bores close to the active mining areas recorded the greatest reductions in water level across the monitoring network during 2018. The monitoring network targets a range of different stratigraphic units and groundwater systems at different vertical elevations, and therefore it is not appropriate to present water level contour lines on **Figure E1**. Despite this the available water level hydrographs can be interpreted to assess hydraulic gradients vertically and spatially.

Private Groundwater Bores

Groundwater monitoring was conducted at private bores twice during the reporting period. Graphs showing trends in groundwater level and water quality for the private bores are included within Appendix E. All of the bores have recorded relatively stable groundwater levels aligning with baseline data from previous years. The exception is WOL2, which has slowly declined since monitoring commenced in 2014. This is noted as no longer a private bore.

The pH, EC, TDS and sulfate concentrations all remained relatively stable during the reporting period and consistent with historical data. The exception is BRE2 which recorded a slightly increasing trend in EC and TDS which will be further investigated. It was noted that several of the private groundwater bores are showing signs of deterioration that may have the potential to effect sample results.

Vibrating Wire Piezometers

Data from the Vibrating Wire Piezometers (VWPs) is downloaded on a monthly basis, the locations of VWPs is illustrated in Figure 9. Appendix E includes graphs of water levels for each VWP group plus any adjacent shallow standpipe monitoring bores for the period of record. The VWP's measure the equivalent water level within selected coal seams and show the differing groundwater levels that occur

within the geological sequence vertically. The water level trends at the VWPs show cycle's related to climatic conditions and mining. The VWPs within proximity to the mining areas show a depressurisation attributed to mining as has been indicated by numerical modelling. Climatic influences are also evident within some of the VWPs with rising groundwater levels recorded in response to significant rainfall that occurred in winter 2016, followed by declining water levels due to the low rainfall recharge since this time. Analysis of annual trends at the VWPs is also included in Appendix E. During 2018 the rate of groundwater decline increased at a large number of VWP sites compared to previous years, at the regional sites that are some distance from the mine this likely reflects the effects of the ongoing drought. Three of the VWP sites with the greatest declines during 2018 (RB03, RB04, and RB05) all lie close to the Maules Creek Mine which progressed below the water table in 2018. The greatest total fall in the wider monitoring network is observed in the REG8_VW2 sensor (Merriown seam), which lies to the east of Maules Creek Mine. As the Merriown seam is the target seam at Boggabri Coal it is likely that the depressurisation partially reflects progressive mining at Boggabri mine in addition to mining at Maules Creek Mine.

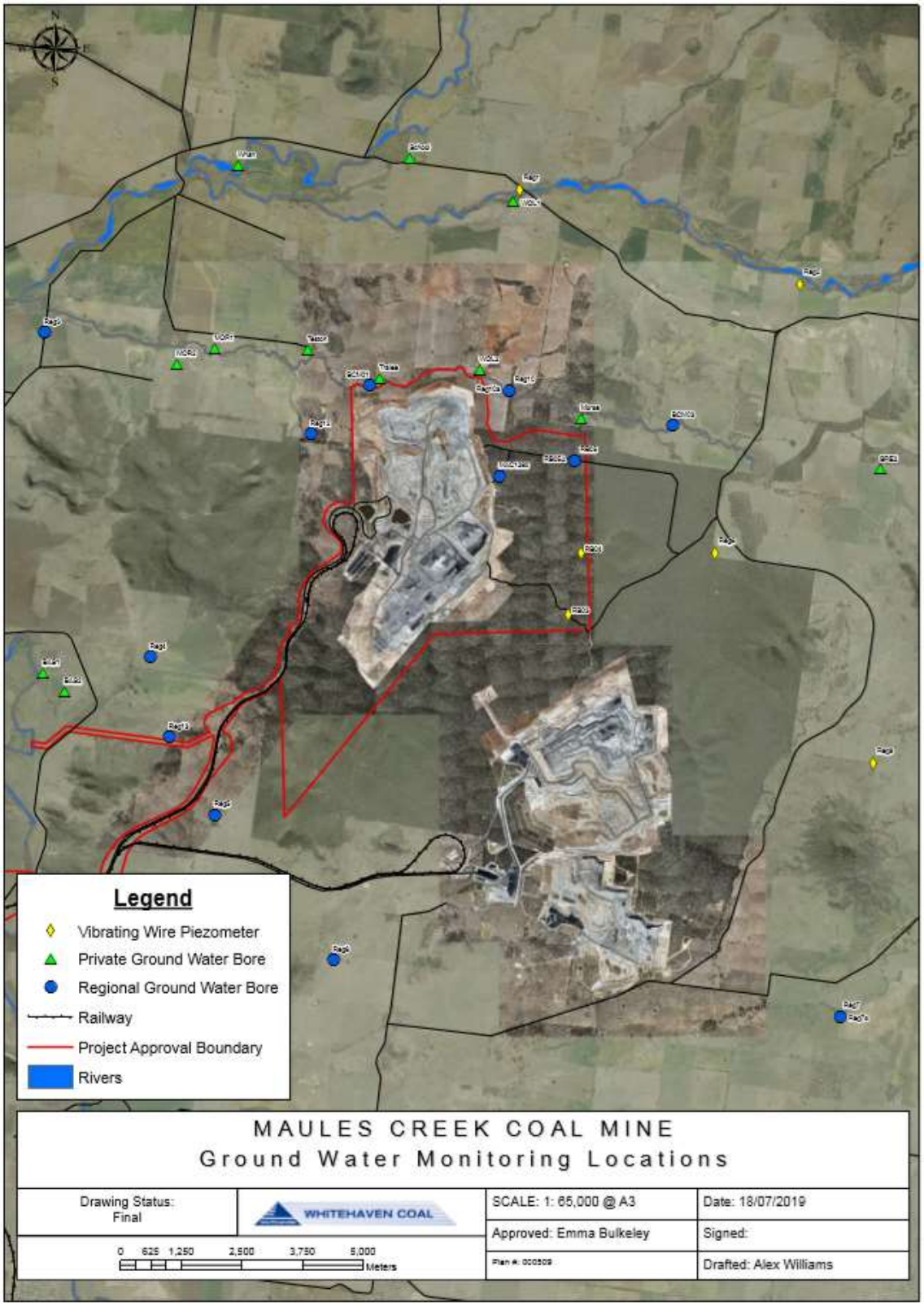

Figure 9 Groundwater Monitoring Locations

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7.3.1 Trigger events

Analysis of trigger events against the WMP were undertaken and shown within figures and tables in **Appendix E**. The trigger events are also summarised below in Table 13 WMP Trigger Events. The concentrations of dissolved metals and nutrients within the monitoring bores were compared with the thresholds from the ANZECC guidelines (refer **Appendix E, Table E-3**). The water level and quality records within these bores will continue to be monitored and further investigated.

Table 13 WMP Trigger Events

Bore	Geology	Triggered				Comment
		Level	TDS	SO_4	pH (lab)	
MAC1280	Permian	No	No	No	Yes	pH consistently higher than trigger value since the start of sampling – attributed to cement grout usage.
RB05A	Merriown seam	Yes – falling	No	No	Yes – Dec*	Water level falling as predicted due to proximity to active mining.
REG12	Boggabri volcanics	No	Yes - high	No	Yes – Dec*	Increased TDS potentially related to ongoing capture of natural range or ongoing drought. Peak TDS value obtained in late 2017 and beneficial use remains unchanged.
REG13	Boggabri volcanics	Yes – stable	Yes - high	Yes – high	No	Water level stable during 2018 but higher than trigger by ~0.5m. Rise in groundwater level occurred in 2016 and is correlated with last recharge event in region suggesting. The lack of decline is potentially related to poor interconnectivity of fracture networks within the Boggabri volcanics. High TDS and sulfate are potentially related to increase in water level or drought. Concentrations have stabilised during 2018.
REG14	Basement	Yes – falling	No	Yes - high	Yes - high	Water level has been variable throughout the record. The past trends and bore location suggest the recent trigger is likely a response to nearby abstractions from the alluvium and the effects of drought rather than mining. Sulfate high in March and June 2018 but returned to within baseline range for Sept and Dec 2018 sampling rounds.
REG3	Boggabri volcanics	Yes – falling	No	No	Yes – Dec*	Water levels variable throughout the record. The past trends and bore location suggest the recent trigger is likely a response to nearby abstractions from alluvium and the effects of drought rather than mining.
REG4	Boggabri volcanics	No	No	Yes - low	Yes - high	The lower sulfate trigger is very close to the median because of the low standard deviation in the data. Therefore a slight variation in concentration causes exceedance of triggers. Values are similar to previous sampling rounds and are likely to be related to natural variability. pH is higher than the upper trigger but is significantly reduced compared to 2017 values.
REG5	Boggabri volcanics	No	Yes - low	Yes - high	Yes – Dec*	The lower level TDS trigger is close to the median because of the limited standard deviation in the data. Therefore a slight variation in concentration causes exceedance of triggers. Values are similar to previous sampling rounds and are considered likely related to natural variability.

Bore	Geology	Triggered				Comment
		Level	TDS	SO_4	pH (lab)	
						Sulfate has been rising since early 2017, the rate of increase has slowed during 2018. Reason for the increased sulfate is not clear.
REG6	Boggabri volcanics	Yes - falling	Yes - low	Yes – high	Yes	Water levels have declined approximately 2 m during 2018. The reasons for this are unclear as water levels in alluvial and Boggabri Volcanics bores closer to the mining complex (monitored by Boggabri Mine) do not show the same decline. The REG6 response may therefore be a local response to drought conditions. TDS dropped below the lower trigger value for one sample in September 2018, sulfate rose above the upper trigger value for one sample in March 2018. In each case recorded concentrations returned to within the baseline range by the next sampling round. The pH trigger was exceeded slightly in the laboratory reading for September 2018 (pH 8.52) but was under for the field pH readings. The scale of the exceedance, and the field reading being within the baseline range indicate that there is minimal concern for this parameter.
REG7A	Alluvium	Yes - falling	No	Yes - high	Yes – Dec*	The water level decline observed in 2018 is a continuation of the trend observed after the sudden rise following the large recharge event in late 2016, and a repeat of the falling trend seen prior to the 2016 recharge event. The decline to below the trigger value is likely a result of the drought conditions. Sulfate rose above the upper trigger value for one sample in March 2018, but has since returned to within the baseline range.

Note: * - Discrepancy between field and laboratory data. Likely to be a sample handling error only for this month.

Groundwater Inflows

There has been a notable increase in estimated actual groundwater inflows over the last 12 months from less than 10 ML/year in 2017 to an estimated 578 ML/year (1.58 ML/d) in 2018 (WRM, 2019). This reflects the deepening of the pit below the regional water table. As mining progresses, groundwater inflows are predicted to vary with the changing mine layout, depending on the interception of porous rock water sources and the area of the mine being developed.

The Groundwater Impact Assessment (AGE, 2011) estimated the rate of groundwater seepage to the open cut pits in the mining complex using a numerical model. AGE (2014) updated the groundwater model and seepage estimates as summarised in the WMP. The groundwater model was further updated in 2018 (AGE, 2018). The Maules Creek mine plan used in the 2018 model update was the same as used in the 2014 model and to date the depth of actual mining has been shallower than the mine plan represented in the groundwater model.

The predicted groundwater inflows into the open cut for 2018 were approximately 146 ML/year (0.4 ML/day) for the 2014 model (as model yr1 is 2015), and 292 ML/year (0.8 ML/d) for the 2018 model. These values are approximately 25% - 50% of the estimated inflows from the site water balance model (WRM, 2019). The discrepancies could be due to a number of reasons including the uncertainty involved in accurately estimating groundwater inflows using the water balance method, difference between the actual and modelled mine plan depth and/or footprint for Maules Creek mine, smaller than modelled drawdown attributable to Boggabri Mine, grouping of coal seams in the numerical model, higher bedrock permeability than modelled, and non-uniqueness in the model calibration. To date in the modelling there have been no groundwater inflows to use in model calibration. Now that the Maules Creek mine is sub-water table the next model iteration will have actual inflow data to calibrate to which should improve the predictive capability of the model.

Monitoring bores to the east of Maules Creek Mine (RB03, RB04, RB05, REG10) have shown increased drawdown trends in 2018 compared to previous years. It would seem likely that these responses are starting to reflect depressurisation of the coal seams being mined at Maules Creek now that the pit floor has moved below the water table. However, it should also be remembered that Boggabri Mine is progressing northwards towards Maules Creek Mine, and that a cumulative impact could also be contributing to the observed depressurisation.

Inflows for the 2018 calendar year have been attributed (**Section 7.1**) to the different groundwater licenses held by Maules Creek using the proportional impacts predicted from the groundwater model for each water source as a guide.

It should be noted that the passive take from the alluvial Upper and Lower Namoi Groundwater Sources cannot be directly measured or validated, and that estimated takes rely on groundwater level monitoring between the mines and the alluvial zones, which can then be simulated in the groundwater model and used to estimate indirect passive take. There is therefore an inherent uncertainty in the estimates of the passive takes from the alluvial aquifers that cannot be reduced as direct measurement of this change is not possible.

The 2018 update to the numerical model notes the challenge associated with estimating the portion of the cumulative impacts attributable to each mine. The methodology chosen indicates a higher take for Maules Creek from Zone 4 compared to Zone 11 at this time. This seems counterintuitive given the distance to Zone 4. Discussions are ongoing with Natural Resources Access Regulator to evaluate alternative methods of apportioning impacts to each mine in the next model iteration.

7.3.2 Validation of Groundwater Model

As required by Schedule 3, condition 40 c) of PA10_0138, a review of the measured groundwater monitoring results against predictions made within the 2014 groundwater model was undertaken by AGE commencing in 2016 as part of a wider review of groundwater processes occurring in the Maules Creek area. The validation/verification process involved comparing:

- measured groundwater levels and trends in the monitoring bore and vibrating wire piezometer (VWP) network with the model predictions; and
- estimates of pit inflow from site water balances with model predictions.

The groundwater model was significantly updated and recalibrated in 2017-2018 (AGE, 2018). Modelled water levels for the 2018 model are provided in Appendix E for comparison with observed monitoring data. The 2018 groundwater model contains observed rainfall data to December 2017, and uses a synthetic rainfall dataset after that time. Therefore although the model does simulate a dry 2017 it does not model the ongoing significant drought that has been occurring around Maules Creek during 2018. Overall, the trends observed in the standpipe monitoring bore are comparable, even if the matches to absolute water level elevations are variable. The modelled VWP results show similar trends to the observed data. It is acknowledged the model's ability to replicate the vertical hydraulic gradients could be improved at several locations.

Estimated pit inflows have increased in 2018 compared to previous years as the pit moved below the regional water table. The estimated inflow of 578 ML/year (1.58 ML/d) (WRM, 2019) is higher than modelled, for the potential reasons discussed in Section 7.3.3.

The review indicated that the model does achieve the validation requirements, and improvements will continue to occur as data and models progressively develop.

7.3.3 Proposed Improvement Measures

The groundwater monitoring program and management measures described above will continue to be implemented during the next reporting period.

7.4 SITE WATER BALANCE

The site water balance for the reporting period is presented below in Table 14**.**

A review of the water balance found that inflows to the site during the reporting period were higher than the predictions made in the EA for Year 5 of MCCM operations. Pumping from the Namoi River to site was within the allocated water licence entitlement and slightly below the water year period of 2016/2017 (see Table 12) however significantly higher than that predicted for year 5. An upgrade was completed to pumping infrastructure including pump and pipeline capacity to facilitate improved efficiency during licenced flow and extraction periods.

Annual 2018 rainfall was below the historical median and additional Namoi River water was required to offset the reduction in rain fall and runoff. Net CHPP water usage was significantly less than that modelled for year 5. Dust suppression usage was higher than those predicted in year 5, this was due to the dry conditions being faced by the region. Additional water was needed for dust suppression on haul road and active pit areas.

Negligible groundwater inflows were recorded in prior years. This reporting year was the first period in the operational life to date at MCCM that notable groundwater inflow was observed in the operation. This is likely to be attributed to the mining sequence progressing deeper within the stratigraphy, resulting in increased groundwater inflow from the coal seams.

Table 14 Site Water Balance (Calendar Year 2018)

Aspect	Volume (ML)
Change in Storage	
Start of 2018	694
End of 2018[2]	1,494
Net Change in Storage	**804**
Water Inflows	
Namoi River Pumping[#]	3,104
Rainfall & runoff^	436
CHPP Water Recycling	1225
In-pit Groundwater Seepage[4]	578
Total Inflows	**5343**
Water Outflows	
CHPP water use	2229
Dust suppression	1880
Evaporation from storages[3]	331
Clearing / construction process water	99
Miscellaneous (wash-down bay, etc.)	-
Total Outflows	**4539**
Water Balance (2018)	**804**

* Volume for calendar year

[2] Includes recorded volumes in RWD2 and MWD1&2, as well as estimated volumes in sediment dams and pits.

Based on flow meter readings

^ Based on the calibrated MCCM water balance model, using site rainfall data

[3] Based on the calibrated MCCM water balance model, using SILO datadrill evaporation data

[4] Based on model calibration, operational observation & pumping meter records

8 REHABILITATION

The Rehabilitation Strategy for the MCCM is described in Section 7.16 of the EA. The State and Commonwealth approvals both specify that the rehabilitation of the MCCM must be consistent with the Rehabilitation Strategy (i.e. Condition 71 of Schedule 3 of PA 10_0138 and Condition 26 of EPBC 2010/5566). The MOP summarises the key elements of the Rehabilitation Strategy as well as providing a description of activities and mine landforms.

8.1 REHABILITATION PERFORMANCE DURING THE REPORTING PERIOD

8.1.1 Status of Mining and Rehabilitation

At the completion of the reporting period, all domains were classed as 'active' with only minor rehabilitation activities completed in association with stabilisation following the completion of particular construction activities. **Figure 10** below from the approved MOP represents the mining domains at the completion of the reporting period. Progressive shaping occurred on the northern emplacement, with approximately 5.58 hectares prepared with amelioration, subsoil and topsoil applied to the final landform. Bulk shaping of another 57 hectares also occurred during the calendar year.

8.1.2 Post Rehabilitation Land Uses

The proposed post mining land use for MCCM will be consistent with the description contained in the EA and as per the requirements of the State and Commonwealth approvals. The area will be returned to a mixture of native vegetation communities including grassy woodland, shrubby woodland/open forest and riparian forest natural forest and woodland. Condition 71 of Schedule 3 of PA 10_0138 lists the overall rehabilitation objectives for the MCCM. These are outlined below in **Table 15** and also included in the MOP.

Table 15 Rehabilitation Objectives

Feature	Objective
Mine site	• Safe, stable and non-polluting • Constructed landforms drain to the natural environment
Final void	• Minimise the size and depth of the final void as far as is reasonable and feasible • Minimise the drainage catchment of the final void as far as is reasonable and feasible
Surface Infrastructure	• To be decommissioned and removed, unless the Executive Director Mineral Resources agrees otherwise
All land, other than the final void	• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of: o local native plant species; and o a landform consistent with the surrounding environment, in accordance with the Revised Biodiversity Offset Strategy and the BMP (I.e. Conditions 45 and 53 of Schedule 3 of PA 10_0138 respectively).
Community	• Ensure public safety • Minimise the adverse socio-economic effects associated with mine closure

Rehabilitation Performance Indicators **Table 16** summarises the rehabilitation status for the MCCM. Short term (or temporary) rehabilitation occurred from the construction phase and included stabilisation of railway batters, road embankments, water management infrastructure and temporary stockpiles. These activities have been undertaken in accordance with the short term objectives defined in the MOP.

Table 16 Rehabilitation Status

Mine Area Type	Previous Reporting Period (Actual)	This Reporting Period 2018 (Actual)	Next Reporting Period 2019 (Forecast)
A. Total mine footprint	1,494	1,598	1,631
B. Total active disturbance	1,949	2,058	2,086
C. Land being prepared for rehabilitation	19	57	100
D. Land under active rehabilitation	0	5*	91
E. Completed rehabilitation	0	-	-

* Seed application targeted for improved soil moisture

8.1.3 Decommissioning and Demolition Activities

As anticipated in the MOP, no decommissioning activities of permanent infrastructure was undertaken during the reporting period.

8.1.4 Other Rehabilitation Activities

Rehabilitation activities associated with the exploration activities and embankment of a sediment dam have been undertaken during the reporting period. Where possible, exploration holes were located on previously disturbed land in order to minimise disturbance.

8.1.5 Departmental Sign-off of Rehabilitated Areas

Departmental sign-off has not been requested.

8.1.6 Variations in Activities against MOP/RMP

A new MOP was approved during the period that included modifications and refinement to the mine design, topsoil stockpiles, completion criteria description, rehabilitation trials and disturbance areas within the MOP term. The MOP was approved for the period November 2018 – January 2023 and is available on the Whitehaven Coal website.

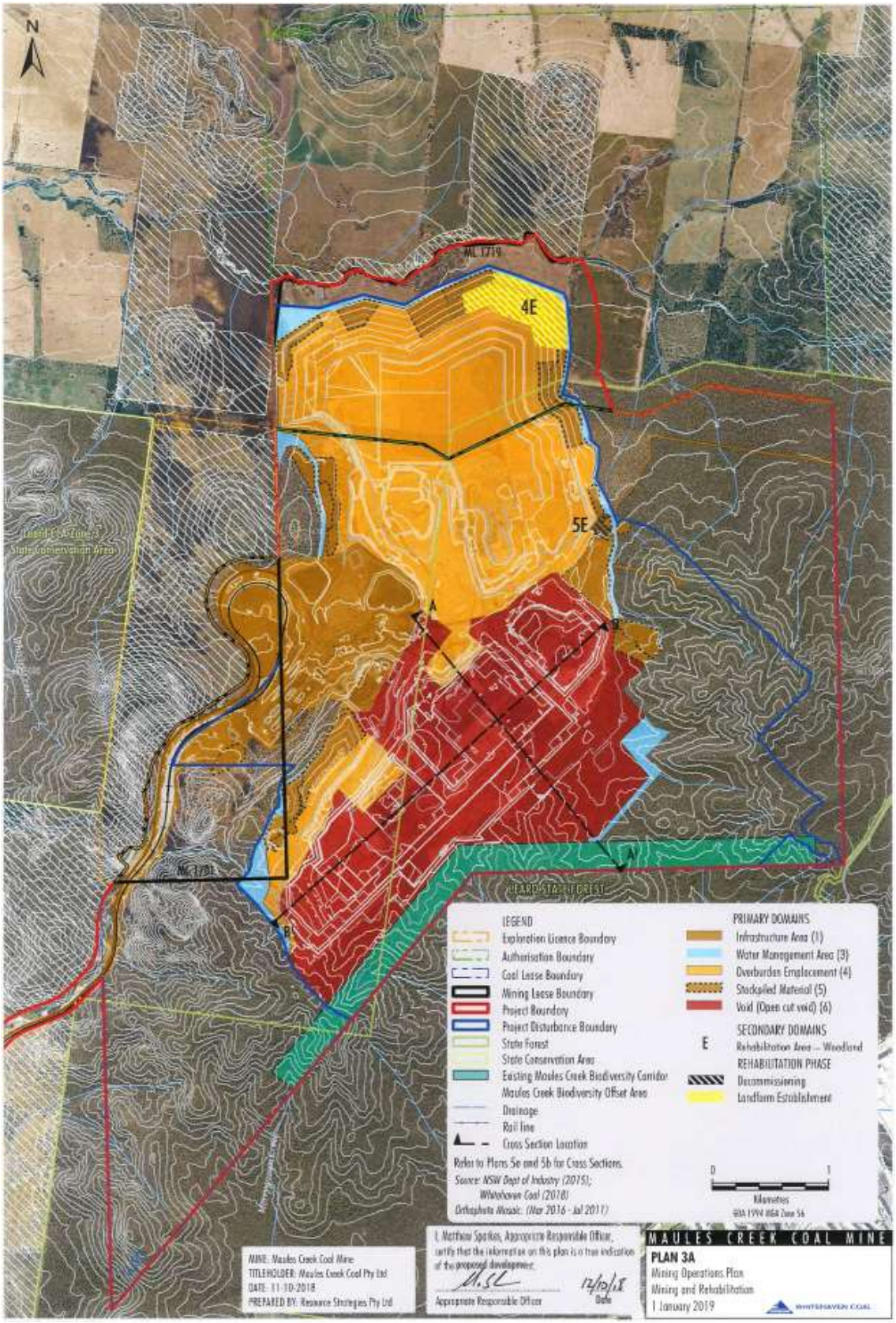

Figure 10 Mining Domains at Completion of the Reporting Period (2018)

8.1.7 Monitoring

Progressive bulk shaping, soil amelioration and topsoil placement on rehabilitation was undertaken in the reporting period. Accordingly, there are no monitoring results to report for the 2018 period. Visual inspections of short term (or temporary) rehabilitation are undertaken to assess surface stabilisation around infrastructure areas and topsoil stockpiles.

8.1.8 Topsoil Balance

In line with Condition 39 of Schedule 3 of PA 10_0138, and Conditions 26(b), 27(c) and 27(d) of EPBC 2010/5566, the management of topsoil at the MCCM is undertaken in accordance with the Soil Management Protocol.

Detailed soil surveys have been undertaken within the disturbance footprint, prior to the stripping of topsoil. An independent consultant completed surveys assessing suitability of topsoil and subsoils for use on mine rehabilitation and the preparation of stripping plans for each of the topsoil areas. Gypsum was applied on shaped areas, to topsoil stockpiles and to pre-strip areas during the reporting period. Topsoil volumes stored to date are summarised in **Table 17**. These include a forecast estimate for the ensuing period. MCCM will continue to monitor topsoil volumes to ensure appropriate volumes are recovered for later use on rehabilitation areas. A number of topsoil stockpiles may also require relocation during the following reporting period to enable to progression of mining operations.

Table 17 Topsoil Balance

Area	2017 Soil Balance (m^3)	2018 Soil Balance (m^3)	2019 Soil Balance (m^3)	Total Soil Balance (m^3)
MIA / Construction	-	-	-	685,156
Mining Operations	762,718	577,567	64,166	2,859,393
Still to clear / strip	-		1,014,226	1,014,226
Totals	**762,718**	**577,567**	**340,107**	**4,558,775**
EA Total for rehab	-	-	-	2,368,000
Net difference	-	-	-	2,190,775

8.1.9 Trials, Research Projects and Initiatives

In accordance with Condition 15 & 16 of the MCCM EPBC Approval 2010/5566, MCC must fund $1 million into research of Box Gum Woodland mining rehabilitation as well as $1.5 million into research for threatened species recovery actions for the Regent Honeyeater, Swift Parrot and South-eastern (Corbens) Long-eared Bat. In accordance with approved Research Project Plans; Maules Creek Coal funded the following activities during 2018 including:

- Annual surveys were undertaken at over 1000 potential Swift Parrot foraging habitat sites across their breeding range in Tasmania during Spring 2018 with Swift Parrot presence-absence and abundance was recorded at each site;
- Twice yearly rapid assessment monitoring (five minute bird surveys in May and August 2018) of over 800 historical or potential Regent Honeyeater habitat sites across Victoria and NSW that is used to identify likely breeding sites to target for additional monitoring;

- Research to investigate if there are more effective field techniques (particularly ultrasonic detection) to survey for the South-eastern Long-eared Bat and determine detection probability using conventional trapping techniques to clarify the distribution patterns of the species with targeted surveys to determine the roosting requirements during both the non-breeding and breeding seasons;
- Germination trials of insitu seed out of the seed bank of natural and stockpiled soil samples at the Maules Creek Coal Mine is close to completion due to very few new germinant being recorded in the hot house experiments. Research will now move to focus on using microscope identification and analysis of seeds found within the sampled soil by sieving methods; and
- Preliminary root architecture assessment was undertaken of ten Box-Gum Woodland tree species at Maules Creek Coal Mine mapping the structural and tree protection zones of root systems and comparing to profiles and physical/chemical properties of insitu soils.

The findings of these research projects will be used to inform MCC on potential improvements to rehabilitation and restoration practices in particular during Box-Gum Woodland revegetation activities but also the management of threatened species both onsite and in the Biodiversity Offset Areas.

The conceptual design of an area of rehabilitation on the northern emplacement area utilising geomorphic landform design principles was developed during the reporting period. This is proposed to be trialled in 2019 and will involve establishment of an area to provide a landform with variable relief in shape without traditional linear contour bank drainage systems.

8.1.10 Key Issues to Achieving Successful Rehabilitation

The key issues to achieving successful rehabilitation at MCCM include:

- excessive erosion and sedimentation (e.g. gullying and sedimentation resulting in land stability and vegetation growth issues);
- weed and feral animal infestation;
- poor vegetation establishment and growth (including the Box-Gum Woodland EEC/CEEC); and
- landform instability.

In cases where rehabilitation performance is sub-optimal, additional management measures will be implemented (e.g. replanting, repairing landform and water management features, application of mulch/fertilisers, feral animal and weed control etc.). An updated TARP for rehabilitation at the MCCM has been included in the MOP, which outlines appropriate actions and varied responses that will be implemented as required.

8.1.11 Actions for the next reporting period

The rehabilitation actions and detailed justification for the next reporting period will be detailed in the MOP. Rehabilitation is taking place on the northern overburden emplacement area.

8.1.12 Proposed Research and Rehabilitation for 2019

MCCM will continue to progressively shape available areas that are at final landform and elevation for rehabilitation. Continuing shaping and rehabilitation of available areas will be targeted in the north-eastern extent of the overburden emplacement during the 2019 reporting period. Minor exploration site rehabilitation and short term (or temporary) rehabilitation will also occur as required. As outlined in **Section 8.1.9,** implementation of research into both the Box-Gum Woodland rehabilitation and Threatened Species recovery actions is underway and, on the research schedule, is on track for completion in 2022/2023.

9 COMMUNITY

Social impacts and opportunities associated with the MCCM are managed in accordance with the Social Impact Management Plan (SIMP), Schedule 3 Condition 78 and the Statement of Commitments (SoC) Appendix 5 of PA 10_0138.

9.1 COMMUNITY ENGAGEMENT ACTIVITIES

MCC uses a variety of community engagement and consultation methods including the MCCM Community Consultative Committee (CCC), Whitehaven website, MCCM phone hotline, local media updates, MCCM Open Days, local school visits, sponsorship of local community events and groups, meetings as required with neighbours and a range of stakeholders including government and non-government agencies.

MCCM operates a Community Consultative Committee, with meetings held quarterly during the reporting period. In addition joint meetings between Maules Creek Coal, Boggabri Coal and Tarrawonga Coal Mines CCC's were held in May and November 2018. Minutes of these meetings are posted on the Whitehaven website once ratified at the following meeting.

MCCM are also involved and attend various community events and information forums as part of engaging with the local community including; Business Chamber forums, Progress Association meetings, Council meetings, industry forums, local school functions, community gatherings and charity club functions.

9.2 COMMUNITY CONTRIBUTIONS & INITIATIVES

As well as attending functions, WHC and MCCM also contribute to the community by providing financial support and sponsorship to various community events and initiatives throughout the community, these include:

Aboriginal Steel Art

Apex Gunnedah

Armajun Health Service Aboriginal Corporation

ASX Thomson Reuters Charity Foundation

AUSIMM - Women in Mining Conference

Australian Indigenous Oztag - ITF World Cup

Australian Red Cross - Currabubula Art Show

Baan Baa Community Committee - War Memorial Fund

Black & Blue Gym

Boggabri Business & Community Progress Association - Art Exhibition and Small Business & Community Awards

Boggabri Community Church - Carols in the Park

Boggabri Fishing Club - Carp Muster

Boggabri Girl Guides - 2018 Jamboree attendance

Boggabri Public School

Boggabri Public School P & C

Challenge Community Service - Community Disco

Country Education Foundation of Aust

Curlewis Public School

Dorothea Mackellar Memorial Society - Dorothea Mackellar Poetry Awards

Gomeroi Elders - Aboriginal Elders Olympics

Gunnedah & District Chamber of Commerce - 2018 Business & Service Awards, Drought Relief and 2018 Spirit of Christmas Fair

Gunnedah Cycling & Triathlon Club Inc.

Gunnedah Eisteddfod Society

Gunnedah Family Support

Gunnedah High School

Gunnedah Men of League

Gunnedah Ministers Fraternal - Christmas Carols

Gunnedah Multiple Sclerosis Club

Gunnedah PCYC - Aboriginal Nation of Origin

Gunnedah Show Society

Gunnedah West Rotary Club

Killarney Bike Committee

Leah Brideson - Aboriginal Artwork

Life without Barriers - Annual Disability Ball

Lions Club of Boggabri - 2018 Drovers Campfire

Liverpool Plains Business Chamber - Drought Relief

Manilla Minor League - NYE Community Carnival

Manilla Show Society

Maules Creek Campdraft Club - Campdraft Sponsorship 2018

Narrabri District Chamber of Commerce - 2018 Business Awards and Christmas Street Fair

Narrabri District Cricket Association

Narrabri High School

Narrabri Jockey Club

Narrabri Public School

Narrabri Shire Council - 2018 Annual Aboriginal Local Government Network Conference and STEM Awards.

Narrabri Show Society

NSW Minerals Council

NW Courier - Narrabri Community Charities - Tipping Competition

Old Bank Galley - Kamilaroi People plaque

Quirindi Public School

Quirindi Show Society

Role Models and Leaders Australia Ltd - Gunnedah Girls Academy

Rotary Club of Boggabri - Pool Seating

Rotary Club of Gunnedah - Drought Relief

Rotary Club of Gunnedah West - Charity Golf Day - Mental Health Research

Rotary Club of Narrabri - Drought Relief

Rotary Club of Tamworth - 2018 Science & Engineering Challenge

Sacred Heart School Boggabri

Tamworth Business Chamber

Tamworth Show Society

Uralla Shire Council - Elders Olympics 2018

Variety - 2018 Postie Bike Dash - Rowan McClung

Walhallow Local Aboriginal Land Council - Granny Sampson Hall

Wee Waa High School P & C Association

Wee Waa Koori Netball

Wee Waa Netball

Werris Creek Public School

Werris Creek Swimming Club

Westpac Rescue Helicopter Service

William Smith (Wirrigan Aboriginal Elder) - Welcome to Country

Winanga-Li Aboriginal Child & Family Centre

Zoe Flemming - Aboriginal Cricket Tour of England

The MCCM Social Impact Management Plan (SIMP) outlines a number of objectives to monitor the effect of the MCCM within the local community relating to housing, employment, training, economic development, community infrastructure and traffic. The following reports on the activities, monitoring and results with regards to the objectives outlined in the SIMP.

Housing

To reduce the pressure on the local short term housing market during this phase of operations, third party accommodation was supplied to contractors at the Civeo Accommodation Villages in predominantly Boggabri with some to Narrabri.

In addition, with the ramp up of mining employment this third party accommodation is also available to mine operations employees at a subsidised rate, to assist in reducing peak rental/leasing concerns in the local area. The fee for use, increases every three months in order to encourage employees to move to the area permanently. Whitehaven has a strong focus on employing local people at its operations, and this subsidised approach has been positively received as a short term housing solution by new employees to the mine as they investigate and look to relocate to the local area. WHC will continue to monitor in conjunction with local councils the ongoing housing and accommodation market to ensure impacts are managed.

Employment and Training

As at the end of the reporting period, MCCM workforce, including supplementary labour hire, was 728 with over 60% residing in the local area, which is slightly lower than previous reporting period. The remaining workforce (including management and professional staff) have permanent residence listed as being outside the Narrabri and Gunnedah LGAs. The associated transport solution of both residential

and non –residential workforce is satisfied by the ongoing shuttle bus service that is provided by MCCM for both operational employees as well as staff/management where this is practicable.

Whitehaven's *Workforce Diversity Policy* has supported strong representation of women, Indigenous and young people. Of the almost 600 strong MCCM workforce at the end of the period:

- 97 employees (approximately 17%) are Indigenous, with the percentage markedly up from 12.5% on the previous reporting period;
- 96 employees (approximately 13%) are women, with the percentage down from 14% for the previous reporting period; and
- 124 employees who commenced production operator's roles (approximately 22%) are new to mining, an increase from the previous reporting period of 17%.

Whitehaven and MCCM provide training opportunities for apprenticeships and traineeships in order to support local employment and increase local skills levels. During the reporting period four (4) young locals accepted positions as one (1) Apprentice Electrical Technology and three (3) Apprentice Plant Mechanics as part of the WHC MCCM apprenticeship program. This takes the total number of apprenticeships accepted under the program to 46, since 2011.

Whitehaven also provides opportunities for scholarships and cadetships for tertiary studies. The Cadetship Program offers the opportunity for up to four Year 12 students from Narrabri/Gunnedah regional area financial support and work experience throughout the duration of their university studies. During the period MCCM also provided vacation employment to 18 students in the fields of civil engineering, environment, electrical engineering, mechanical engineering and mechatronics.

Provision of employment figures and amount of local spend by WHC is also available and provided to councils as requested to assist the councils in their forward planning, these figures are also included in financial reports released by WHC.

Economic Development

Whitehaven, which includes MCCM contributes financially to the economy at both state and federal level and to the communities in which we operate. Employees and contractors also add a significant economic contribution to the Gunnedah, Narrabri, Boggabri and Werris Creek townships through their purchases from local businesses.

In 2018 Whitehaven spent:

- $191.9m in salaries, wages, taxes and superannuation to employees (on an equity joint venture basis)
- $180.8m in royalties to the New South Wales Government (on an equity joint venture basis)
- Over $631.1m on mining, washing and delivering coal onto trains at our mine sites
- Over $277.2m in port and rail charges for track access haulage costs and port costs
- More than $440,000 towards local education activities and community groups.

Community Infrastructure

During the reporting period MCCM paid a lump sum cash contribution to Narrabri Shire Council (NSC) of $1,000,000 under its VPA to go towards the Narrabri Airport upgrade. In addition, as a result of coal sales directly from the MCCM, over $700,000 has been allocated and paid to NSC during 2018 to be spent on further infrastructure projects.

During the 2018 period WHC spent approximately $293 million with local businesses and suppliers in the Narrabri, Gunnedah, Tamworth and Liverpool Plains Shires. Local jobs and local spend with local businesses will remain a focus in future years.

9.3 COMMUNITY COMPLAINTS

MCC maintains a dedicated Community Hotline 1800 MAULES (1800 628537) for the MCCM and is answered by an operator. The contact line is advertised on the Whitehaven Coal website.

A summary of the complaints (by category) received by MCCM over the last two reporting years are detailed in. The Community Complaints Register is also available on the Whitehaven Coal website and a summary provided at CCC meetings.

Table 18 Summary of Community Complaints and Enquiries

Category	2017	2018
Air quality	33	4
Traffic	4	0
Lighting	1	0
Noise	109	36
Blasting	13	16
Social impacts	1	0
Other	3	0
TOTAL	164	56

Note: a single complaint may involve multiple categories.

9.3.1 Complaint Trends

The total number of complaints received in 2018 is significantly lower than those recorded in the 2017 reporting period.

9.3.2 Actions & Proposed Improvements

Community complaints primarily related to noise, air quality and blasting concerns. Actions taken in response to complaints included a range of measures, including however not limited to, the following:

- Investigations into specific mining activities and trialing and implementing equipment upgrades;
- Reviewing video footage or visual media where available;
- Reviewing real time data monitoring and operational activities;
- Reviewing daily risk reports to determine appropriate TARP levels dependent on specific mining activities and weather patterns to support operational management;
- Analysis of meteorological data and physical inspections of offsite locations;
- Communicating learnings and issues to operational personnel;
- Community consultation; and
- Ongoing engagement with regulatory agencies and local community members.

10 INDEPENDENT AUDITS

10.1 INDEPENDENT BIODIVERSITY AUDIT

A biodiversity audit was required in accordance with Schedule 3 Condition 56 of PA10_0138. This was commissioned and commenced in 2017 with results and a finalised report completed and published in the first half of 2018. The audit found no non-compliances but specified four recommendations which have been implemented. For further information refer to **Section 6.6.2**.

10.2 INDEPENDENT ENVIRONMENTAL AUDIT

An Independent Environmental Audit (IEA) is required under Schedule 5, Condition 10 of the PA 10_0138 to be completed on a three yearly basis and submitted to the DPE. The following actions that were reported as outstanding in the 2016 Annual Review, are included below.

Table 19 IEA Action Plan Progress

IEA Recommendations	Original MCCM Response to Recommendations in IEA	Annual Review Progress Status
The BTM Complex Strategies constitute an important part of the cumulative management of the impacts from mining in the area. If they remain unapproved, MCCM should consider whether cumulative impacts are adequately addressed and mitigated through a review of the pertinent MCCM management plans.	The BTM Complex Strategies are currently being prepared, consulted and reviewed. MCCM will raise the importance of progressing and finalising the Strategies as soon as possible for approval by the DPE and with the other mines in the BTM complex. MCCM will also continue to monitor and consider any potential cumulative impacts to determine whether further revisions of the MCCM Management Plans are required.	The BTM Strategies for Air, Noise, Biodiversity and Aboriginal Heritage were approved in the previous reporting period. Water strategy was submitted in 2018 following consultation with stakeholders, and anticipating approval in 2019.

An IEA was undertaken in 2018 by an independent consultancy approved by the DP&E as required under Schedule 5, Condition 10 of the PA10_0138.

The following actions were identified during the 2018 IEA in **Table 19 below**. A copy of the audit report and the action plan in response to the audit recommendations is available on the Whitehaven Coal website. These include recommendations that may have been relevant during the audit period however outside the applicable Annual Review reporting period.

Table 20 IEA Recommendations and Actions

Item	Assessment requirement	Auditor recommendation	Proposed Action	Estimated completion date
Sch 2 Cond 10	*By the end of 2013, or as otherwise agreed by the Secretary, the Proponent shall surrender the existing development consent (i.e. DA85/1819) for mining on the site in accordance with Section 104A of the EP&A Act.*	This is a legacy Administrative Non Compliance. MCCM satisfied the requirements of this condition during the current audit period, however the required date was not met. No further action required.	No further action required	Not applicable.
Cond 17	*By the end of March 2013, unless the Secretary agrees otherwise, the Proponent shall enter into a planning agreement with Council in accordance with:* *(a) Division 6 of Part 4 of the EP&A Act; and* *(b) the terms of the Proponent's offer in Appendix 3.*	No further action required as this is a legacy ANC relating to timeframe.	No further action required	Not applicable
Sch 3 Cond 7	*Noise Criteria* *Except for the noise affected land in Table 1, the Proponent shall ensure that operational noise generated by the project does not exceed the criteria in Table 5.* *Table 5: Noise criteria dB(A)* Land: All privately-owned residences — Day/Evening/Night $L_{Aeq(15\ min)}$: 35 — Night $L_{A1\ (1\ min)}$: 45 *Note:* • *Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.* • *Operational noise includes noise from the mining operations and the use of private roads and rail spurs.* *However, these noise criteria do not apply if the Proponent has an agreement with the owner/s of the relevant residence or land to generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.*	MCCM is to ensure that all noise mitigation measures are implemented and TARPs are monitored and responded to accordingly to minimise the potential for noise exceedances.	MCC will continue to monitor real time noise levels and respond to TARP levels and responsibilities specified within the NMP. Attended monitoring results and compliance will be reported within the required external reports (EPL monthly report and Annual Review).	Ongoing
12	*Attenuation of Plant* *The Proponent shall:* *(a) ensure that:* • *all mining trucks and water carts used on the site are commissioned as noise suppressed (or attenuated) units;* • *ensure that all equipment and noise control measures deliver sound power levels that are equal to or better than the sound power levels identified in the EA, and correspond to best practice or the application of the best available technology economically achievable;*	MCCM needs to continue to implement improvement of controls to reduce the sound power levels of the equipment that exceeds the EA criteria.	MCCM will continue to undertake SPL testing and report on mitigation measures within the Annual Review.	Ongoing

	• *where reasonable and feasible, improvements are made to existing noise suppression equipment as better technologies become available; and* *(b) monitor and report on the implementation of these requirements annually on its website.*			
24	*BLASTING* *Operating Conditions* *The Proponent shall not undertake blasting on-site within 500 metres of:* *(a) any public road without the approval of Council; or.* *(b) any land outside the site that is not owned by the Proponent, unless:* • *the Proponent has a written agreement with the relevant landowner to allow blasting to be carried out closer to the land, and the Proponent has advised the Department in writing of the terms of this agreement, or* • *the Proponent has:* ○ *demonstrated to the satisfaction of the Secretary that the blasting can be carried out closer to the land without compromising the safety of the people or livestock on the land, or damaging the buildings and/or structures on the land; and* ○ *updated the Blast Management Plan to include the specific measures that would be implemented while blasting is being carried out within 500 metres of the land.*	No further action required, as all necessary agreements are now in place.	Complete	Complete
33	*AIR QUALITY & GREENHOUSE GAS* *Operating Conditions* *The Proponent shall:* *(a) implement best management practice to minimise the off-site odour, fume and dust emissions of the project, including best practice coal loading and profiling and other measures to minimise dust emissions from coal transportation by rail;* *(b) operate a comprehensive air quality management system on site that uses a combination of predictive meteorological forecasting, predictive and real time air dispersion modelling and real-time air quality monitoring data to guide the day to day planning of mining operations and implementation of both proactive and reactive air quality mitigation measures*	No further action required as the predictive model is now operational and the official caution related to a specific event with no ongoing air quality impacts.	Operation of the predictive tool is implemented and safeguards in place to ensure continued operation.	Complete

	(such as relocate, modify and/or suspend operations) to ensure compliance with the relevant conditions of this approval; *(c) manage PM2.5 levels in accordance with any requirements of an EPL;* *(d) minimise the air quality impacts of the project during adverse meteorological conditions and extraordinary events (see note d in condition 29);* *(e) minimise any visible off-site air pollution;* *(f) minimise the surface disturbance of the site generated by the project; and* *(g) co-ordinate the air quality management on site with the air quality management at other mines within the Leard Forest Mining Precinct to minimise the cumulative air quality impacts of the mines, to the satisfaction of the Secretary.*			
40	**Water Management Plan** *The Proponent shall prepare and implement a Water Management Plan for the project to the satisfaction of the Secretary. This plan must be prepared in consultation with OEH, DPI Water and North West LLS, by suitably qualified and experienced person/s whose appointment has been approved by the Secretary, and be submitted to the Secretary for approval prior to the commencement of construction.* *In addition to the standard requirements for management plans (see condition 3 of schedule 5), this plan must include:* *(a) a Site Water Balance, that:* *• includes details of:* *o sources and security of water supply, including contingency for future reporting periods;* *o water use on site;* *o water management on site;* *o any off-site water discharges;* *o reporting procedures, including the preparation of a site water balance for each calendar year;* *o a program to validate the surface water model, including monitoring discharge volumes from the site and comparison of monitoring results with modelled predictions; and* *• describes the measures that would be implemented to minimise clean water use on site;* *(b) a Surface Water Management Plan, which includes:* *• detailed baseline data on surface water flows and quality in the water-bodies that could potentially be affected by the project;*	MCCM should follow-up with DP&E to achieve approval of the WMP to satisfy Condition 48(b). For the groundwater chemistry baseline, the Auditor suggests that MCCM consider undertaking a consolidated review and assessment of available baseline data. This review should include consideration (and potential exclusion) of data that may have been affected by elevated pH in cement grouted bores. Outputs of the assessment should include descriptive statistics of baseline chemistry data and evaluation of temporal trends and potential seasonal variation.	MCC will continue to engage with DP&E to seek approval of the revised WMP. As part of the annual review process all groundwater data was reviewed and collated. This included the review of the chemical parameters.	Ongoing

	• detailed baseline data on hydrology across the downstream drainage system of the Namoi River floodplain from the mine site to the Namoi River; • a detailed description of the water management system on site, including the: o clean water diversion systems; o erosion and sediment controls (dirty water system); o mine water management systems; o discharge limits in accordance with EPL requirements; o water storages; o mine access road and Maules Creek rail spur line; • detailed plans, including design objectives and performance criteria for: o design and management of final voids; o design and management for the emplacement of reject materials, sodic and dispersible soils and acid or sulphate generating materials; o design and management for construction and operation of the rail spur line and mine access road; o reinstatement of drainage lines on the rehabilitated areas of the site; and o control of any potential water pollution from the rehabilitated areas of the site; • performance criteria for the following, including trigger levels for investigating any potentially adverse impacts associated with the project: o the water management system; o downstream surface water quality; o downstream flooding impacts, including flood impacts due to the construction and o operation of the rail spur line and mine access road, and flooding along Back Creek; o and o stream and riparian vegetation health, including the Namoi River; • a program to monitor: o the effectiveness of the water management system; and o surface water flows and quality in the watercourses that could be affected by the project; o downstream flooding impacts; and • reporting procedures for the results of the monitoring program;			

	• a plan to respond to any exceedances of the performance criteria, and mitigate and/or offset any adverse surface water impacts of the project; and (c) a Groundwater Management Plan, which includes: • detailed baseline data of groundwater levels, yield and quality in the region, and privately- owned groundwater bores including a detailed survey/schedule of groundwater dependent ecosystems (including stygo-fauna and Melaleuca riparian forest communities), that could be affected by the project; • the monitoring and testing requirements specified in the PAC recommendations for groundwater management as set out in Appendix 6; • detailed plans, including design objectives and performance criteria, for the design and management of: o the proposed final void; and o coal reject and potential acid forming material emplacement; • groundwater assessment criteria including trigger levels for investigating any potentially adverse groundwater impacts; • a program to monitor and assess: o groundwater inflows to the open cut mining operations; o the seepage/leachate from water storages, emplacements, backfilled voids and the final void; o interconnectivity between the alluvial and bedrock aquifers; o background changes in groundwater yield/quality against mine-induced changes; o the impacts of the project on: - regional and local (including alluvial) aquifers; - groundwater supply of potentially affected landowners; - groundwater dependent ecosystems (including potential impacts on stygo-fauna and Melaleuca riparian forest communities) and riparian vegetation; • a program to validate the groundwater model for the project, including an independent review of the model every 3 years, and comparison of monitoring results with modelled predictions; and • a plan to respond to any exceedances of the performance criteria; and (d) a Leard Forest Mining Precinct Water Management Strategy that has been prepared in consultation with other mines within the Precinct to:			

	• *minimise the cumulative water quality impacts of the mines;* • *review opportunities for water sharing/water transfers between mines;* • *co-ordinate water quality monitoring programs as far as practicable;* • *undertake joint investigations/studies in relation to complaints/exceedances of trigger levels where cumulative impacts are considered likely; and* • *co-ordinate modelling programs for validation, re-calibration and re-running of the groundwater and surface water models using approved mine operation plans.* *Note: The Leard Forest Mining Precinct Water Management Strategy can be developed in stages and will need to be subject to ongoing review dependent upon the determination of and commencement of other mining projects in the area*			
51	*Aquatic Habitat Prior to the design and construction of the permanent Namoi water pipeline and pump station, the Proponent must consult with DPI Fisheries regarding the general operation and design of the pump station and screens to minimise entrainment of fish. The Proponent must implement all reasonable and feasible recommendations from DPI Fisheries to the satisfaction of the Secretary.*	MCCM should consider engaging with DPI Fisheries to ensure the temporary pump station is satisfactory to align with the intent of this condition. The current temporary pump includes a steel mesh cover over the pump to prevent fish ingress and the intake sits mid-stream to prevent bed intake	MCCM will contact DPI Fisheries to confirm adequacy of the temporary pump station.	Ongoing
66	*Rail Transport* *Within 12 months of the completion of the Gunnedah Traffic Study, the Proponent shall:* *……..* *b) provide a report of the outcomes of this liaison and identify reasonable and feasible proposals recommended by the Proponent and/or the Gunnedah Shire Council towards implementing the Study's recommendations, to the satisfaction of the Secretary.*	No further action required as this is a legacy ANC.	No further action required.	Complete.
70	*WASTE* *The Proponent shall:* *(a) implement all reasonable and feasible measures to minimise the waste (including coal reject) generated by the project;* *(b) ensure that the waste generated by the project is appropriately stored, handled and disposed of; and* *monitor and report on the effectiveness of the waste minimisation and management measures in the Annual Review.*	Review waste management practices around segregation of waste.	Reviewed. New waste management contract provider implemented.	Complete.

Schedule 4 Condition 2	*NOTIFICATION OF LANDOWNERS/TENANTS* *Prior to entering into any tenancy agreement for any land owned by the Proponent that is predicted to experience exceedances of the recommended dust and/or noise criteria, or for any of the land listed in Table 1 that is subsequently purchased by the Proponent, the Proponent shall:* *(a) advise the prospective tenants of the potential health and amenity impacts associated with living on the land, and give them a copy of the NSW Health fact sheet entitled "Mine Dust and You" (as may be updated from time to time);* *(b) advise the prospective tenants of the rights they would have under this approval; and* *(c) request the prospective tenants consult their medical practitioner to discuss the air quality monitoring data and predictions and health impacts arising from this information, to the satisfaction of the Secretary.*	No further action required given that Tenancy Agreement is in accordance with this condition.	No further action required.	Complete.
Schedule 4 Condition 13	*Online Communication of Onsite Activities and Monitoring of Noise and Air Quality* *The Proponent shall, within 3 months of the date of this approval:* *(a) make the following information for the project publicly available on its website, on a daily basis and in a clearly understandable form:* • *daily weather forecasts for the coming week;* • *proposed operational responses to these weather forecasts;* • *real-time noise and air quality monitoring data (subject to any necessary caveats); and* • *any operational responses that were taken in response to the noise and air quality monitoring data, and* *(b) make provision on its website for the provision of on-line and/or email comments by members of the community regarding this information, to the satisfaction of the Secretary*	MCCM should include on its website details about its daily "*operational responses*" to the weather forecast.	Complete. Daily website details now address the recommendation. Additionally, operational responses are already included within the respective management plans. Furthermore, a daily risk output from 'Envirosuite' informs weather conditions and risk levels, with controls already identified within the management plans applied accordingly. An administrative change was made to the new website format to include reference to proposed operational responses.	Complete
Appendix 5 Statement of Commitments	*Mining Operations* *Maules Creek Coal shall surrender its existing development consent DA 85/1819 following the grant of the Project Approval.*	Refer to CoA Schedule 2 condition 10. This is a legacy ANC. No further action required.	No further action required.	Complete.
Coal Lease 375				

Condition 10.	*Blasting* *Blast Overpressure* *The lease holder must ensure that the blast overpressure noise level generated by any blasting within the lease area does not exceed 120 dB (linear) and does not exceed 115 dB (linear) in more than 5% of the total number of blasts over a period of 12 months, at any dwelling or occupied premises, as the case may be, unless determined otherwise by the Department of Environment, Climate Change and Water.*	Refer to CoA Condition 18.	Noted. No further exceedances have occurred since this event. This unit was on mine owned land.	Not applicable.
Condition 14	*Roads and Tracks* *During wet weather the use of any road or track must be restricted so as to prevent damage to the road or track.*	MCCM should endeavour and commit to restricting unnecessary traffic movement on roads and tracks in wet weather.	The Resources Regulator completed an audit in May 2018 and identified this condition was compliant. Many tracks and roads are inaccessible in wet conditions. Pre-work notification to biodiversity contractors is provided to specify the level of access permitted, including excluding access where required. Section 6.12 of the Biodiversity Management Plan addresses control of access and designated tracks. No further controls are proposed.	Not applicable
CoA PA10_0138 Management Plans				
25	*Blast Management Plan* *The Proponent shall prepare and implement a Blast Management Plan for the project to the satisfaction of the Secretary.*	Ensure approval records for all plans requiring Secretary approval are maintained. Ensure that all blast notifications are issued in accordance with the BMP.	Noted.	As required
45	*Revised Biodiversity Offset Strategy* *The Proponent shall prepare and implement a revised biodiversity offset strategy for the identified offset areas in Table 16 to the satisfaction of the Secretary. The revised Strategy must:*	There is an opportunity to update the BOS to ensure the consistency as required by condition (b).	Noted. The BOS has been revised to align, as far as possible, with the objectives of the RBS and is pending approval from DP&E.	Complete.

	(a) not reduce the size or quality of the proposed offset areas; *(b) be consistent (as far as is possible) with the recommendations and objectives of the Leard Forest Mining Precinct Regional Biodiversity Strategy;*			

A compliance audit was undertaken by the DP&E – Resources Regulator during the reporting period against the requirements of the Mining Act 1992 and conditions of mining leases. Key recommendations included:

- Condition 10 of CL375 includes blast criteria. The auditor noted for 2016 one blast overpressure exceedance at monitoring location BM1 (noting BM1 is a mined owned residence). The DP&E-Resources Regulator recommended ensuring that blasts are conducted within the required criteria. No exceedances had occurred since this event.

- Condition 9 of ML 1701 and ML1719 and condition 24 of CL375 require the titleholder to make every reasonable attempt to enter into a co-operation agreement with the holder of any overlapping title. It was recommended that MCC make reasonable attempts to negotiate a co-operation agreement or hold ongoing consultation with the holder of overlapping title PEL1. Evidence was provided noting that demonstrated discussions with the overlapping titleholder were held a number of years ago.

- In relation to above recommendations, it is suggested that Maules Creek develop a self-assessment process to support the compliance statements. It was noted that Condition 4 of the Mining Leases has been rescinded for both ML1701 and ML1719 since February 2018, therefore compliance reports will no longer be required.

- A recommendation to improve the MOP suggesting that the TARP is amended to include responses to any potentially poor monitoring results in respect to soil health and vegetation success. This was addressed as part of the new MOP approved during the reporting period.

- The Department suggested that a more thorough risk assessment which focuses on specific risks to rehabilitation, and those risks which may require considerable time to rectify, is included in the next iteration of the MOP. This was completed as part of the new MOP approved during the reporting period.

- The Department suggested that Maules Creek add the compliance requirements of other permits and licences (eg the Forest Permit) into CMO to enable all compliance obligations to be recorded, actioned and tracked. Ongoing implementation and utilisation of CMO will address this recommendation.

11 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

11.1 NON-COMPLIANCES

The compliance status of the MCCM against relevant approvals during the reporting period was assessed in **Section 1** as of the end of the reporting period (31 December 2018). Further details of any actions undertaken or proposed for non-compliances, including within the following reporting period, are summarised in **Table 18**

Table 21 Non-Compliance Details and Proposed Action Plan

Non - Compliance	Date / Location	Cause	Action Plan	Estimated Completion Date
Schedule 3 Condition 12 a)	Q4 testing	Technical non-compliance of a limited number of individual items. Overall site sound power level is compliant.	Continue maintenance program, testing and reporting	Complete

11.2 REPORTABLE INCIDENTS OR EXCEEDANCES

There were no reportable incidents or exceedances during the period. **Section 6.4.2.** Other exceedances related to air quality were not attributed to mining activities (i.e. regional air quality events).

11.3 REGULATORY ACTIONS

The following official cautions, warning letters and penalty notices were issued to MCC during the reporting period. There were no penalty notices received during the reporting period. Two Official Caution notices were received during the calendar year.

- An Official Caution from DP&E was received in relation to Schedule 3 Condition 12(a) of the approval regarding equipment delivering sound power levels equal to or better than SPL's identified in the EA.
- An Official Caution was received from the NSW EPA in October in relation to the EPL Condition O1.1 following investigation of a blast in April. MCCM appealed the determination.

12 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Activities to be completed in the next reporting period to improve the environmental or community performance of the MCCM, in addition to those separately identified in **Section 11** include implementing revised management plans, progressing overburden shaping and rehabilitation opportunities, undertaking research related projects regarding Box-Gum Grassy Woodlands, and continuing identification of community support opportunities.

APPENDIX A

BLAST MONITORING RECORDS

Appendix A
Blast Monitoring Records

The records presented in Table A-1 have been included to satisfy the blast reporting requirements of Schedule 3 Condition 19 and 20 of PA 10_0138.

Table A-1
Blast Monitoring Records

Date	Time	ID/Location	BM1 mm/s	BM1 dBL	BM2 mm/s	BM2 dBL	BM3 mm/s	BM3 dBL	BM4 mm/s	BM4 dBL
Exceedance Criteria (0% (5%))			10 (5)	120 (115)	10 (5)	120 (115)	10 (5)	120 (115)	10 (5)	120 (115)
2/01/2018	12:49	TES78	0.36	87.9	0.27	86.8	0.3	82.7	0.56	96.8
4/01/2018	12:13	BRA75D	0.23	95.3	0.22	86.8	0.3	90.6	0.2	88.3
5/01/2018	12:28	JEA02B	0.12	84.4	0.1	96.4	0.13	88.7	0.19	90.8
8/01/2018	12:26	PS052	0.13	96.4	0.11	95.4	0.15	107.5	0.14	100.3
10/01/2018	12:38	ONV38_ONV38B_TES74B	0.17	92.3	0.15	89.3	0.26	86.2	0.32	84.7
12/01/2018	12:51	BRA76	0.34	84.4	0.73	96.4	0.52	97.5	0.51	90.8
16/01/2018	12:28	JEA09B	0.15	99.2	0.19	98.9	0.27	82.7	0.36	88.3
17/01/2018	9:22	BRA75E	0.18	87.9	0.16	96.4	0.21	82.7	0.18	90.8
18/01/2018	12:21	RL350_01	0.12	93.9	0.11	94.2	0.14	94.7	0.15	92.7
19/01/2018	12:16	TNN46B	0.15	92.3	0.15	96.4	0.18	92.2	0.15	90.8
23/01/2018	12:18	BRA75E_TRIM	0.13	90.4	0.1	94.2	0.13	95.7	0.11	97.8
24/01/2018	12:33	JEA11A	0.21	90.4	0.18	86.8	0.21	88.7	0.33	94.3
25/01/2018	12:15	BRA75F	0.14	90.4	0.14	91.3	0.16	90.6	0.12	94.3
30/01/2018	12:27	RL395_04	0.13	98.4	0.12	99.6	0.19	82.7	0.19	92.7
2/02/2018	12:26	RL395_06_RL400_01_RL375_01	0.11	90.4	0.11	97.3	0.17	97.5	0.18	95.6
6/02/2018	12:24	JEA11B	0.26	84.4	0.22	83.3	0.38	82.7	0.54	84.7
8/02/2018	12:20	RL375_02_RL395_05	0.13	96.4	0.13	98.1	0.22	82.7	0.21	88.3
14/02/2018	10:35	TES79_PS053	0.37	84.4	0.28	89.3	0.33	90.6	0.57	88.3
15/02/2018	12:20	RL400_02	0.13	93.9	0.11	92.9	0.15	92.2	0.14	97.8
22/02/2018	12:54	TNN47_PS056_TES80	0.22	92.3	0.19	89.3	0.23	88.7	0.56	96.8
23/02/2018	12:35	BRA74B_oversize	0.13	98.4	0.1	95.4	0.13	96.6	0.11	94.3
2/03/2018	12:25	RL445_BRA77A	0.23	87.9	0.27	89.3	0.28	82.7	0.34	90.8
3/03/2018	12:16	BRA75G	0.13	103.9	0.11	101.4	0.13	90.6	0.11	92.7
5/03/2018	12:43	TES81	0.21	84.4	0.23	89.3	0.19	98.9	0.24	88.3
13/03/2018	12:41	TES76_TNN48	*0.7	*87	0.26	86.8	0.68	86.2	1.11	90.8
17/03/2018	10:06	JEA02D	0.11	84.4	0.11	86.8	0.15	88.7	0.12	95.6
19/03/2018	12:24	BRA77B	0.16	98.4	0.15	100.8	0.2	97.5	0.19	94.3
23/03/2018	12:26	JEA07B_RL375	0.18	87.9	0.15	101.4	0.27	86.2	0.29	99.5
24/03/2018	12:24	TNN49_PS58	0.19	87.9	0.17	94.2	0.33	88.7	0.34	88.3
26/03/2018	12:10	PS058	0.19	84.4	0.29	89.3	0.25	82.7	0.41	90.8
29/03/2018	15:27	RL295_01	0.21	84.4	0.25	91.3	0.34	88.7	0.59	88.3
6/04/2018	12:36	TES77A_BRA77C_TNN46C	0.18	84.4	0.17	97.3	0.25	82.7	0.25	92.7
11/04/2018	12:29	ONV39A	0.18	84.4	0.16	98.1	0.22	82.7	0.18	84.7

Date	Time	ID/Location	BM1 mm/s	BM1 dBL	BM2 mm/s	BM2 dBL	BM3 mm/s	BM3 dBL	BM4 mm/s	BM4 dBL
Exceedance Criteria (0% (5%))			10 (5)	120 (115)	10 (5)	120 (115)	10 (5)	120 (115)	10 (5)	120 (115)
13/04/2018	12:33	RL295_02	0.21	84.4	0.19	89.3	0.31	96.6	0.52	95.6
17/04/2018	12:32	TES82	0.17	87.9	0.12	92.9	0.2	82.7	0.2	88.3
19/04/2018	12:28	ONV39B	0.17	90.4	0.16	96.4	0.18	96.6	0.18	92.7
20/04/2018	12:22	RL295_03	0.18	87.9	0.14	91.3	0.16	93.5	0.3	88.3
26/04/2018	12:31	TES77B_PS55	0.17	87.9	0.17	96.4	0.19	92.2	0.17	92.7
2/05/2018	12:16	BRL23_24_PS62	0.18	90.4	0.14	98.1	0.23	88.7	0.21	88.3
4/05/2048	12:10	TES83	0.17	90.4	0.12	99.6	0.2	100.7	0.25	90.8
8/05/2018	12:33	JEB04_TES83	0.17	90.4	0.11	91.3	0.16	95.7	0.18	88.3
12/05/2018	11:06	TNN52	0.2	87.9	0.21	96.4	0.35	90.6	0.53	94.3
16/05/2018	12:28	RL355_09	0.18	87.9	0.12	89.3	0.16	86.2	0.18	102.8
18/05/2018	12:35	ONV40	0.17	92.4	0.14	92.9	0.18	88.7	0.15	92.7
21/05/2018	12:45	RL375_03_PS64	0.18	84.4	0.15	92.9	0.29	82.7	0.28	90.8
23/05/2018	12:37	JEB02A	0.18	90.4	0.21	91.3	0.2	82.7	0.22	94.3
24/05/2018	14:31	BRA80	0.17	90.4	0.12	86.8	0.15	91.5	0.2	84.7
1/06/2018	13:45	TNN51	0.17	87.9	0.15	95.4	0.19	96.6	0.28	94.3
6/06/2018	12:41	JEB03A	0.17	104.4	0.1	101.9	0.14	97.5	0.13	101
7/06/2018	12:33	ONV43_RL355_09A	0.17	98.4	0.12	94.2	0.22	88.7	0.19	98.7
8/06/2018	12:59	TES84	0.19	84.4	0.19	89.3	0.21	88.7	0.28	88.3
15/06/2018	9:37	RL275_01	0.25	87.9	0.39	96.4	0.33	88.7	0.51	90.8
18/06/2018	14:48	BRA81	0.18	92.4	0.15	92.9	0.22	92.2	0.31	101.6
23/06/2018	9:24	JEB05B_JEB02B_JEA05B_PS061A	0.2	84.4	0.21	89.3	0.36	82.7	0.34	90.8
26/06/2018	12:40	MER02	0.2	84.4	0.26	89.3	0.33	88.7	0.58	90.8
28/06/2018	12:22	RL275_02	0.23	84.4	0.21	98.1	0.29	90.6	0.7	90.8
29/06/2018	12:39	JEA14_PS68	0.2	84.4	0.18	91.3	0.26	86.2	0.22	88.3
3/07/2018	12:27	MER01A	0.19	84.4	0.22	83.3	0.28	86.2	0.59	88.3
5/7/2018	12:28	JEA16_PS69	0.19	84.4	0.2	86.8	0.29	82.7	0.44	88.3
9/07/2018	14:24	BRA84A	0.18	87.9	0.15	95.4	0.22	96.6	0.21	92.7
11/07/2018	13:21	TES85	0.26	84.4	0.21	89.3	0.42	86.2	0.39	98.7
13/07/2018	14:32	JEA15_MER01B	0.26	87.9	0.5	86.8	0.55	82.7	0.65	90.8
19/07/2018	12:37	JEB07_BRA84B	0.18	87.9	0.16	100.2	0.21	105.3	0.31	96.8
24/07/2018	12:32	BRA82	0.17	92.4	0.12	98.1	0.17	98.2	0.2	103.8
25/07/2018	12:34	MER03	0.23	97.5	0.32	96.4	0.35	82.7	0.58	88.3
27/07/2018	12:22	TES86	0.17	94	0.12	107.1	0.17	98.9	0.15	98.7
31/07/2018	12:43	ONV41	0.18	84.4	0.14	94.2	0.18	96.6	0.19	88.3
2/08/2018	12:38	RL275_03	0.18	84.4	0.13	91.3	0.19	82.7	0.28	88.3
3/8/2018	12:23	JEA16B	0.18	84.4	0.18	95.4	0.18	104.2	0.21	99.5
7/08/2018	12:24	JEB08	0.17	90.4	0.1	102.9	0.14	102.2	0.12	92.7
8/08/2018	12:52	TNN54	0.18	84.4	0.16	97.3	0.18	102.2	0.24	90.8
10/08/2018	12:18	ONV42B	0.17	84.4	0.12	92.9	0.16	90.6	0.14	92.7
15/08/2018	12:58	RL355_11	0.2	84.4	0.15	103.7	0.26	94.7	0.34	90.8

Date	Time	ID/Location	BM1 mm/s	BM1 dBL	BM2 mm/s	BM2 dBL	BM3 mm/s	BM3 dBL	BM4 mm/s	BM4 dBL
Exceedance Criteria (0% (5%))			10 (5)	120 (115)	10 (5)	120 (115)	10 (5)	120 (115)	10 (5)	120 (115)
18/08/2018	12:49	TES88	0.18	84.4	0.15	108.2	0.22	111.1	0.3	94.3
23/08/2018	13:01	TES87_RL355_12_ONV41B	0.18	84.4	0.15	95.4	0.29	82.7	0.3	88.3
25/08/2018	13:15	JEA12_PS067_JEB08B	0.22	96.5	0.25	89.3	0.36	98.9	0.56	92.7
1/09/2018	12:34	MER04A	0.17	87.9	0.14	102.9	0.19	86.2	0.24	92.7
3/09/2018	10:55	TES89_TES90_PS071_PS072	0.24	94	0.29	105.9	0.28	114.3	0.24	117.6
6/09/2018	15:39	BRA85A	0.18	87.9	0.18	83.3	0.2	88.7	0.25	88.3
10/09/2018	13:32	JEB05A_PS061B	0.17	92.4	0.15	100.8	0.19	93.5	0.24	95.6
13/09/2018	13:19	RL355_13_TES93_PS	0.19	87.9	0.19	98.1	0.34	95.7	0.43	97.8
14/09/2018	12:32	RL275	0.18	90.4	0.15	104.5	0.17	98.2	0.28	95.6
18/09/2018	14:25	MER04B	0.17	106	0.15	97.3	0.17	101.7	0.23	88.3
20/09/2018	12:33	HRN09	0.17	92.4	0.14	103.3	0.16	96.6	0.15	104.7
21/09/2018	12:23	JEB05C_TES90A	0.17	84.4	0.13	91.3	0.17	86.2	0.2	90.8
26/09/2018	14:21	JEA05C	0.17	84.4	0.11	86.8	0.13	90.6	0.05	88.3
27/09/2018	12:36	TNN55-57	0.17	96.5	0.15	99.6	0.25	82.7	0.24	88.3
28/09/2018	12:24	PS074	0.19	84.4	0.19	100.2	0.29	96.6	0.35	88.3
4/10/2018	15:18	TNN50A_RL325	0.2	84.4	0.24	86.8	0.35	86.2	0.54	90.8
8/10/2018	13:23	TNN60	0.17	87.9	0.1	98.9	0.13	90.6	0.11	92.7
10/10/2018	14:26	TNN04_16_OB	0.19	87.9	0.16	101.9	0.39	95.7	0.36	94.3
15/10/2018	12:19	HRN07-45-OB	0.17	105.2	0.1	86.8	0.13	86.2	0.11	105.6
19/10/2018	14:43	TNN04_20_OB	0.21	84.4	0.15	94.2	0.33	104.2	0.56	88.3
23/10/2018	15:27	TNN04_17_TES93B	0.11	91.4	0.14	100.6	0.26	90.9	0.27	92.1
26/10/2018	16:07	JEA18	0.13	101.8	0.23	95.6	0.27	98.3	0.53	99
30/10/2018	12:24	TNN06-35-OB	0.14	94.5	0.19	94.6	0.21	95.4	0.23	95.1
6/11/2018	12:33	VEL03-33-OB	0.14	102.1	0.23	112.1	0.23	109.4	0.49	108.8
9/11/2018	15:11	JEA03-27-OB_TEB03-27-OB	0.12	90.1	0.16	90.5	0.17	90.9	0.5	84.2
13/11/2018	15:33	BRA06-31-OB	0.12	92.6	0.17	88.5	0.19	93.4	0.26	84.2
14/11/2018	15:51/ 15:52	BRA04-21-OB_BRA04-22-OB	0.11	93.6	0.13	95.6	0.11	98.3	0.17	102.3
16/11/2018	15:11	BRA03-45-OB_TSM06-36-OB	0.11	92.6	0.15	95.6	0.13	97.7	0.18	98.2
21/11/2018	12:02	TSM06-36-OB	0.1	99.1	0.1	105.4	0.09	106.3	0.12	87.7
26/11/2018	10:19	TS04-45-OB	0.1	94.5	0.13	100	0.11	98.9	0.16	101.7
1/12/2018	12:31	BRA05-20-OB	0.16	88.5	0.19	93.4	0.3	87.4	0.54	84.2
5/12/2018	12:48	BRA06-33-OB	0.11	86.6	0.13	88.5	0.11	93.4	0.12	97.3
6/12/2018	15:03	BRA05-20-OB	0.12	97.5	0.13	111.3	0.25	97.7	0.33	97.3
7/12/2018	15:21	BRA06-40-OB	0.1	99.6	0.12	101.6	0.1	96.2	0.19	102.3
11/12/2018	15:02/ 15:03	BRA-04-45-OB	0.11	101	0.13	99.4	0.17	97.7	0.15	104.6
14/12/2018	9:21	BRA-06-31-OB	0.1	88.5	0.17	102.5	0.1	84.9	0.19	97.3
19/12/2018	15:41	TES-06-42-OB_VEL-03-30A-PS	0.16	91.4	0.17	100	0.25	97	0.4	98.2
21/12/2018	15:49	JEA04-30-OB_VEL03-30-OB_VEL03-34-OB_JEA-16-PS	0.23	86.6	0.35	104.1	0.63	95.4	0.96	93.7

*Results may be influenced by a mechanical malfunction of monitoring equipment

APPENDIX B

COAL TRANSPORT RECORDS

Appendix B
Coal Transport Records

The records presented in **Appendix B** have been included to satisfy the coal transport reporting requirements of Condition 65 (a) and (b) of PA 10_0138. The amount of coal transported from the site on a monthly basis and the date and time of each rail movement generated by the MCCM has been listed in the **Table B-1 and Table B-2** below.

Table B-1
Coal Transported Monthly

Month	Coal Transported (MT)
January	0.95
February	0.71
March	1.01
April	0.83
May	0.73
June	0.77
July	0.78
August	0.83
September	0.35
October	0.70
November	0.69
December	1.78
TOTAL	**10.13**

Table B-2
Daily Train Movements

(next page)

Date	Time	Date	Time	Date	Time	Date	Time
1/01/2018	0144	9/01/2018	1240	24/01/2018	0058	2/02/2018	1500
1/01/2018	0508	9/01/2018	1620	24/01/2018	1013	2/02/2018	1853
1/01/2018	0852	9/01/2018	1906	24/01/2018	1300	3/02/2018	0338
1/01/2018	1330	9/01/2018	2335	24/01/2018	1901	3/02/2018	0644
1/01/2018	1626	10/01/2018	0650	25/01/2018	0008	3/02/2018	1151
1/01/2018	2323	10/01/2018	1052	25/01/2018	0323	3/02/2018	1600
2/01/2018	0312	10/01/2018	1433	25/01/2018	0658	3/02/2018	2038
2/01/2018	0621	10/01/2018	1831	25/01/2018	1143	5/02/2018	1146
2/01/2018	1110	11/01/2018	1054	26/01/2018	0457	5/02/2018	1446
2/01/2018	1344	11/01/2018	1431	26/01/2018	0740	5/02/2018	1811
2/01/2018	1954	11/01/2018	1952	26/01/2018	1007	5/02/2018	2151
3/01/2018	0033	12/01/2018	0718	26/01/2018	1614	6/02/2018	0044
3/01/2018	0514	12/01/2018	1009	26/01/2018	2058	6/02/2018	0825
3/01/2018	0804	12/01/2018	1432	26/01/2018	2327	6/02/2018	1055
3/01/2018	1056	12/01/2018	1910	27/01/2018	0750	6/02/2018	1531
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8/09/2018	0744	3/10/2018	1316	17/10/2018	1713	3/11/2018	0350
8/09/2018	1731	3/10/2018	1607	17/10/2018	2135	3/11/2018	0714
10/09/2018	0605	3/10/2018	2055	18/10/2018	0726	3/11/2018	1457
10/09/2018	0950	4/10/2018	0432	18/10/2018	1616	3/11/2018	1807
11/09/2018	0524	4/10/2018	0801	19/10/2018	2254	4/11/2018	1007
11/09/2018	1407	4/10/2018	1137	20/10/2018	0137	4/11/2018	1239
12/09/2018	0941	4/10/2018	1617	20/10/2018	2227	4/11/2018	1556
12/09/2018	1307	4/10/2018	1932	21/10/2018	0234	4/11/2018	1917
12/09/2018	1558	4/10/2018	2232	21/10/2018	2239	5/11/2018	0117
12/09/2018	1937	5/10/2018	0353	22/10/2018	1335	5/11/2018	0851
13/09/2018	0343	5/10/2018	0820	22/10/2018	1833	5/11/2018	1435
13/09/2018	0610	5/10/2018	1734	22/10/2018	2147	5/11/2018	1931
14/09/2018	1101	6/10/2018	0018	23/10/2018	1126	5/11/2018	2222
15/09/2018	0745	6/10/2018	0224	23/10/2018	1531	6/11/2018	0359
Date	Time	Date	Time	Date	Time	Date	Time
15/09/2018	1057	6/10/2018	0314	24/10/2018	0137	6/11/2018	1835
15/09/2018	1448	6/10/2018	0955	24/10/2018	0907	6/11/2018	2149
17/09/2018	0424	6/10/2018	1452	24/10/2018	1212	7/11/2018	0131
20/09/2018	1753	7/10/2018	0639	24/10/2018	2048	7/11/2018	0514
20/09/2018	2137	7/10/2018	1052	25/10/2018	0000	7/11/2018	0910

21/09/2018	0214	7/10/2018	1255	25/10/2018	0326	7/11/2018	1204
21/09/2018	1242	7/10/2018	1604	25/10/2018	1309	7/11/2018	1839
21/09/2018	1818	7/10/2018	2237	26/10/2018	0541	7/11/2018	2240
23/09/2018	0020	8/10/2018	0026	27/10/2018	0041	8/11/2018	0424
23/09/2018	1330	8/10/2018	0611	27/10/2018	0449	8/11/2018	1820
23/09/2018	1815	8/10/2018	1920	27/10/2018	0737	8/11/2018	2133
23/09/2018	2054	9/10/2018	0625	27/10/2018	1912	9/11/2018	0416
24/09/2018	0119	12/10/2018	1105	28/10/2018	0022	9/11/2018	0913
9/11/2018	1310	27/11/2018	1534	6/12/2018	1746	20/12/2018	0955
9/11/2018	2057	27/11/2018	2119	6/12/2018	2219	20/12/2018	1440
10/11/2018	1928	28/11/2018	0008	7/12/2018	0038	20/12/2018	1747
10/11/2018	2250	28/11/2018	0540	7/12/2018	0549	21/12/2018	0038
11/11/2018	0312	28/11/2018	0936	8/12/2018	1307	21/12/2018	0338
11/11/2018	1432	28/11/2018	1505	8/12/2018	1647	21/12/2018	0620
11/11/2018	1752	29/11/2018	0058	9/12/2018	0112	21/12/2018	1355
11/11/2018	2358	29/11/2018	0329	9/12/2018	0431	21/12/2018	2027
12/11/2018	0422	29/11/2018	0801	9/12/2018	0954	21/12/2018	2259
12/11/2018	0713	29/11/2018	1606	9/12/2018	1355	22/12/2018	0317
12/11/2018	1713	29/11/2018	1901	9/12/2018	1651	22/12/2018	0543
13/11/2018	0259	30/11/2018	0559	9/12/2018	2039	22/12/2018	1214
13/11/2018	0901	30/11/2018	0836	10/12/2018	0405	22/12/2018	1457
13/11/2018	1238	30/11/2018	1110	10/12/2018	0645	22/12/2018	1952
14/11/2018	0119	30/11/2018	1554	10/12/2018	2124	23/12/2018	0859
14/11/2018	1219	30/11/2018	2108	12/12/2018	0224	23/12/2018	1255
14/11/2018	2130	1/12/2018	0049	12/12/2018	1020	23/12/2018	1608
15/11/2018	1445	1/12/2018	0509	12/12/2018	1822	23/12/2018	2125
15/11/2018	2120	1/12/2018	0801	13/12/2018	0021	24/12/2018	0200
15/11/2018	2355	1/12/2018	1438	13/12/2018	0409	24/12/2018	1044
16/11/2018	0031	1/12/2018	1746	13/12/2018	1207	24/12/2018	1326
16/11/2018	0221	1/12/2018	2029	13/12/2018	2240	24/12/2018	1942
16/11/2018	0604	2/12/2018	0023	14/12/2018	0749	25/12/2018	0206
16/11/2018	2110	2/12/2018	0757	14/12/2018	1056	25/12/2018	0441
17/11/2018	0010	2/12/2018	1550	14/12/2018	1507	25/12/2018	0802
17/11/2018	0450	2/12/2018	2355	15/12/2018	0638	25/12/2018	1037
17/11/2018	1432	3/12/2018	1004	15/12/2018	1626	25/12/2018	1319
17/11/2018	1818	3/12/2018	1505	15/12/2018	2343	25/12/2018	1607
Date	Time	Date	Time	Date	Time	Date	Time
17/11/2018	2140	3/12/2018	1823	16/12/2018	1119	25/12/2018	1833
18/11/2018	1001	3/12/2018	2112	16/12/2018	1837	25/12/2018	2238
23/11/2018	0451	3/12/2018	2339	16/12/2018	2324	26/12/2018	0111
23/11/2018	1053	4/12/2018	0614	17/12/2018	0301	26/12/2018	0406
24/11/2018	1430	4/12/2018	1125	17/12/2018	1641	26/12/2018	0648
24/11/2018	1655	4/12/2018	1404	17/12/2018	1943	26/12/2018	1149

24/11/2018	1943	4/12/2018	1813	18/12/2018	0139	26/12/2018	1412
24/11/2018	2209	4/12/2018	2038	18/12/2018	0249	26/12/2018	1614
25/11/2018	1305	5/12/2018	0027	18/12/2018	0710	26/12/2018	1830
25/11/2018	2036	5/12/2018	0609	18/12/2018	1447	26/12/2018	2111
25/11/2018	2315	5/12/2018	0836	18/12/2018	2302	27/12/2018	0107
26/11/2018	0158	5/12/2018	1217	19/12/2018	1908	27/12/2018	0401
26/11/2018	0951	5/12/2018	1826	19/12/2018	1436	27/12/2018	0743
26/11/2018	1218	6/12/2018	0459	19/12/2018	2018	27/12/2018	1102
26/11/2018	2339	6/12/2018	1409	20/12/2018	0731	27/12/2018	1707

Date	Time
27/12/2018	2224
28/12/2018	0050
28/12/2018	0455
28/12/2018	1535
28/12/2018	1826
28/12/2018	2123
28/12/2018	2346
29/12/2018	0414
29/12/2018	1413
29/12/2018	1734
29/12/2018	2346
30/12/2018	0227
30/12/2018	1431
30/12/2018	1657
31/12/2018	0115
31/12/2018	0609
31/12/2018	0853
31/12/2018	1611

APPENDIX C

Annual Sound Power Testing

Appendix C
Annual Sound Power Testing

Table C-1

Sound Power Level Testing Results

Unit	Equipment Type	Parameter	Criteria dBA	Result dBA
DOZ301	Dozer - CAT D10T	Stationary	115	108.0
		1 Gear Back	127	119
DOZ302	Dozer - CAT D10T	Stationary	115	106.0
		1 Gear Back	127	116
DOZ303	Dozer - CAT D10T	Stationary	115	115.0
		1 Gear Back	127	118.0
DOZ320	Dozer - CAT D11T	Stationary	115	106.0
		1 Gear Back	127	119
DOZ321	Dozer - CAT D11T	Stationary	115	107.0
		1 Gear Back	127	117.0
DOZ322	Dozer - CAT D11T	Stationary	115	107.0
		1 Gear Back	127	120.0
DOZ323	Dozer - CAT D11T	Stationary	115	105.0
		1 Gear Back	127	117.0
DOZ324	Dozer - CAT D11T	Stationary	115	111.0
		1 Gear Back	127	119.0
DOZ858	Dozer - Cat D11T - Emeco D	Stationary	115	107.0
		1 Gear Back	127	120
DOZ859	Dozer - Cat D11T - Emeco D	Stationary	115	118.0
		1 Gear Back	127	119.0
DOZ860	Dozer - Cat D11T - Emeco DZ280	Stationary	115	107.0
		1 Gear Back	127	119.0
DOZ870	Dozer - Cat D10T - Emeco	Stationary	115	107.0
		1 Gear Back	127	114.0
DOZ872	Dozer - Cat D11T - Emeco DZ273	Stationary	115	106.0
		1 Gear Back	127	116.0
DOZ876	Dozer - Cat D10T - Emeco DZ236	Stationary	115	109.0
		1 Gear Back	127	117.0
DRG451	Drill - CAT MD6290	Stationary	118	117.0
DRG452	Drill - CAT MD6290	Stationary	118	116.0
DRG453	Drill - CAT MD6290	Stationary	118	117.0
DRG454	Drill - CAT MD6290	Stationary	118	117.0
DRG455	Drill - CAT MD6290	Stationary	118	117.0
DRG456	Drill - CAT MD6290	Stationary	118	117.0
EXC221	Excavator - Hitachi EX3600	Dynamic	119	113.0
EXC222	Excavator - Hitachi EX3600	Dynamic	119	112.0
EXC223	Excavator - Hitachi EX3600	Dynamic	119	106.0
EXC224	Excavator - Hitachi EX3600	Dynamic	119	114.0
EXC261	Excavator - Hitachi EX8000	Dynamic	123	114.0
EXC262	Excavator - Hitachi EX8000	Dynamic	123	120.0
EXC263	Excavator - Hitachi EX8000	Dynamic	123	116.0
EXC264	Excavator - Hitachi EX8000	Dynamic	123	116.0

Unit	Equipment Type	Parameter	Criteria dBA	Result dBA
GRD401	Grader - CAT 16M	1 Gear Forward	112	107.0
GRD402	Grader - CAT 16M	1 Gear Forward	112	106.0
GRD415	Grader - CAT 24M	1 Gear Forward	112	109.0
GRD416	Grader - CAT 24M	1 Gear Forward	112	107.0
GRD862	Grader - CAT 16M - Emeco MG082	1 Gear forward	112	106.0
GRD864	Grader - CAT 16M - Emeco MG082	1 Gear Forward	112	106.0
RDT001	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	116.0
RDT002	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	116.0
RDT003	Dump Truck - Hitachi EH5000-3	Average Uphill / Downhill	117	114
RDT004	Dump Truck - Hitachi EH5000-3	Average Uphill / Downhill	117	114.5
RDT005	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	117.0
RDT006	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	117.0
RDT007	Dump Truck - Hitachi EH5000-3	Average Uphill / Downhill	117	114
RDT008	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	117.0
RDT009	Dump Truck - Hitachi EH5000-3	Average Uphill / Downhill	117	114.5
RDT010	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	117.0
RDT011	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	116.0
RDT012	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	116.0
RDT013	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	116.0
RDT014	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	117.0
RDT015	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	117.0
RDT016	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	116.0
RDT017	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	117.0
RDT018	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	115.0
RDT019	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	116.0
RDT020	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	117.0
RDT021	Dump Truck - Hitachi EH5000-3	Average Uphill / Downhill	117	115.0
RDT022	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	117.0
RDT023	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	116.0
RDT024	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	116.0
RDT025	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	116.0
RDT026	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	116.0
RDT027	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	117.0
RDT028	Dump Truck - Hitachi EH5000-3	Average Uphill / Downhill	117	114.0
RDT029	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	115.0
RDT030	Dump Truck - Hitachi EH5000-3	Average Uphill / Downhill	117	117.0
RDT031	Dump Truck - Hitachi EH5000-3	Average Uphill / Downhill	117	114.0
RDT032	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	117.0
RDT033	Dump Truck - Hitachi EH5000-3	Dynamic, Forward	117	117.0
RDT051	Dump Truck - Hitachi EH3500-3	Dynamic, Forward	117	116.0
RDT052	Dump Truck - Hitachi EH3500-3	Dynamic, Forward	117	116.0
RDT053	Dump Truck - Hitachi EH3500-3	Dynamic, Forward	117	117.0
RDT054	Dump Truck - Hitachi EH3500-3	Dynamic, Forward	117	116.0
RDT055	Dump Truck - Hitachi EH3500-3	Dynamic, Forward	117	117.0
RDT071	Dump Truck - Hitachi EH4000-AC2	Dynamic, Forward	117	121.0
RDT072	Dump Truck - Hitachi EH4000-AC2	Average Uphill / Downhill	117	115.0

Unit	Equipment Type	Parameter	Criteria dBA	Result dBA
RDT073	Dump Truck - Hitachi EH4000-AC2	Dynamic, Forward	117	118.0
RDT074	Dump Truck - Hitachi EH4000-AC2	Dynamic, Forward	117	119.0
RDT075	Dump Truck - Hitachi EH4000-AC2	Dynamic, Forward	117	114.0
RDT076	Dump Truck - Hitachi EH4000-AC2	Dynamic, Forward	117	117.0
RDT077	Dump Truck - Hitachi EH4000-AC2	Dynamic, Forward	117	118.0
RDT078	Dump Truck - Hitachi EH4000-AC2	Dynamic, Forward	117	118.0
RDT079	Dump Truck - Hitachi EH4000-AC2	Average Uphill / Downhill	117	115.0
RDT101	Dump Truck - CAT 789D XQ	Average Uphill / Downhill	117	114.0
RDT102	Dump Truck - CAT 789D XQ	Dynamic, Forward	117	118.0
RDT103	Dump Truck - CAT 789D XQ	Average Uphill / Downhill	117	113.5
RDT104	Dump Truck - CAT 789D XQ	Dynamic, Forward	117	115.0
RDT882	Dump Truck - Cat 789D - EMECO - RD280	Dynamic, Forward	117	116.0
RDT883	Dump Truck - Cat 789D - EMECO - RD281	Dynamic, Forward	117	117.0
RDT884	Dump Truck - Cat 789D - EMECO - RD284	Dynamic, Forward	117	116.0
RDT885	Dump Truck - Cat 789D - EMECO - RD289	Dynamic, Forward	117	117.0
RDT887	Dump Truck - Cat 789C - EMECO - RD182	Dynamic, Forward	117	116.0
RDT888	Dump Truck - Cat 789C - EMECO - RD246	Dynamic, Forward	117	114.0
RDT889	Dump Truck - Cat 789C - EMECO - RD334	Dynamic, Forward	117	116.0
RDT890	Dump Truck - Cat 789C - EMECO - RD335	Dynamic, Forward	117	115.0
RDT891	Dump Truck - Cat 789C - EMECO - RD340	Dynamic, Forward	117	116.0
WAT501	Watercart - Cat777G	Dynamic	115	111.0
WAT502	Watercart - Cat777G	Dynamic	115	112.0
WAT503	Watercart - Cat777G	Dynamic	115	115.0
WAT802	Watercart - Cat773 - EMECO	Dynamic	115	114.0
WAT803	Watercart - Cat777 - EMECO	Dynamic	115	115.0
WAT814	Watercart - Cat773 - EMECO	Average Uphill / Downhill	115	113.5
WAT821	Watercart - Cat773D - EMECO	Dynamic	115	115.0
WLO430	Wheel Loader - Komatsu - WA1200	1st gear forward	115	118.0
WLO812	Wheel Loader - Cat992K - EMECO	1st gear forward	115	110.0
FIXED PLANT				
CPP			117	117
Primary sizer			109	109
Secondary sizer			112	117
Stacker			104	103
Reclaimer			115	110
Conveyor 200m			108	108
Conveyor 500m			112	112
Raw coal transfer station[1]			103	110
Train load out transfer station (and conveyor drives)			103	113
CHPP Product Transfer Station			103	106
Train loadout			103	115
Train on Rail Spur			108	104
Access road			95	101

1. Raw coal transfer station measurements included noise from the nearby secondary sizer

APPENDIX D

Surface Water

Appendix D
Surface Water

The surface water monitoring results for the reporting period are detailed in the table below.

Table D-1
MCC Surrounding Surface Water Monitoring Results

Site	Date	pH Value	Electrical Conductivity @ 25°C	Total Dissolved Solids (mg/L)	Suspended Solids (mg/L)	Turbidity (NTU)	Total Alkalinity as CaCO3 (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Aluminium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Zinc (mg/L)	Boron (mg/L)	Iron (mg/L)	Arsenious Acid, As (III) (µg/L)	Arsenic Acid, As (V) (µg/L)	Mercury (mg/L)	Nitrite + Nitrate as N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorous as P (mg/L)	Total Anions (meq/L)	Total Cations (meq/L)
SW1	16/01/2018	7.72	318	190	10	0.8	133	25	10	28	2	0.16	<0.0001	<0.001	<0.001	<0.001	0.055	<0.001	<0.01	<0.001	<0.005	<0.05	0.52	<0.5	1.2	<0.0001	0.01	0.1	0.12	3.3	3.34
SW1	16/02/2018	7.78	326	178	27	1.4	132	23	8	25	2	0.13	<0.0001	<0.001	<0.001	<0.001	0.03	<0.001	<0.01	<0.001	<0.005	<0.05	0.31	<0.5	1.2	<0.0001	<0.01	0.3	0.08	3.28	2.94
SW1	19/03/2018	7.61	315	182	22	1.9	133	23	9	32	1	0.21	<0.0001	<0.001	<0.001	<0.001	0.032	<0.001	<0.01	<0.001	<0.005	<0.05	0.45	<0.5	1.4	<0.0001	<0.01	0.2	0.08	3.43	3.3
SW1	16/04/2018	7.77	319	202	8	3.1	142	26	10	27	1	0.12	<0.0001	<0.001	<0.001	<0.001	0.053	<0.001	<0.01	<0.001	<0.005	<0.05	0.29	<0.5	<0.5	<0.0001	0.01	0.2	0.08	3.58	3.32
SW1	14/05/2018	7.96	332	207	11	1.8	131	26	10	29	1	0.1	<0.0001	<0.001	<0.001	<0.001	0.048	<0.001	<0.01	<0.001	<0.005	<0.05	0.34	<0.5	<0.5	<0.0001	<0.01	0.2	0.08	3.55	3.41
SW1	14/06/2018	7.83	329	208	13	4.2	136	26	10	28	1	0.14	<0.0001	<0.001	<0.001	<0.001	0.061	<0.001	<0.01	<0.001	<0.005	<0.05	0.42	<0.5	<0.5	<0.0001	0.02	0.2	0.07	3.56	3.36
SW1	16/07/2018	7.58	321	221	8	3.4	133	25	10	26	1	0.12	<0.0001	<0.001	<0.001	<0.001	0.073	<0.001	<0.01	<0.001	<0.005	<0.05	0.52	<0.5	0.9	<0.0001	0.01	0.2	<0.01	3.6	3.23
SW1	16/08/2018	7.69	330	238	16	9.4	122	25	9	31	1	0.2	<0.0001	<0.001	<0.001	<0.001	0.073	<0.001	<0.01	<0.001	<0.005	<0.05	0.45	<0.5	<0.5	<0.0001	<0.01	0.2	0.04	3.46	3.36
SW1	17/09/2018	8.03	372	236	30	3.6	122	27	10	28	2	0.38	<0.0001	<0.001	<0.001	<0.001	0.085	<0.001	<0.01	<0.001	<0.005	<0.05	0.77	<0.5	<0.5	<0.0001	<0.01	0.2	0.07	3.59	3.44
SW1	19/10/2018	7.79	428	251	42	17.6	138	28	10	30	2	0.96	<0.0001	<0.001	0.001	<0.001	0.094	<0.001	<0.01	<0.001	0.007	<0.05	1.29	<0.5	0.5	<0.0001	<0.01	1.2	0.18	3.76	3.58
SW1	19/11/2018	7.81	392	269	64	39.1	114	29	11	31	3	0.91	<0.0001	<0.001	0.002	<0.001	0.259	<0.001	<0.01	<0.001	<0.005	<0.05	1.46	<0.5	0.6	<0.0001	<0.01	1.6	0.19	3.78	2.83
SW1	18/12/2018	7.47	352	232	44	5	130	30	11	30	2	0.77	<0.0001	<0.001	0.001	<0.001	0.122	<0.001	<0.01	<0.001	0.006	<0.05	1.27	<0.5	0.5	<0.0001	<0.01	0.9	0.13	3.99	3.76
SW2	16/01/2018	**Dry - No Sample**																													
SW2	16/02/2018	**Dry - No Sample**																													
SW2	19/03/2018	**Dry - No Sample**																													
SW2	16/04/2018	**Dry - No Sample**																													
SW2	14/05/2018	**Dry - No Sample**																													
SW2	14/06/2018	**Dry - No Sample**																													
SW2	16/07/2018	**Dry - No Sample**																													
SW2	16/08/2018	**Dry - No Sample**																													
SW2	17/09/2018	**Dry - No Sample**																													
SW2	19/10/2018	**Dry - No Sample**																													
SW2	19/11/2018	**Dry - No Sample**																													
SW2	18/12/2018	**Dry - No Sample**																													
SW3	16/01/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW3	16/02/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW3	19/03/2018	**No Sample Required - No Discharge at this Location this Month**																													

Site	Date	pH Value	Electrical Conductivity @ 25°C	Total Dissolved Solids (mg/L)	Suspended Solids (mg/L)	Turbidity (NTU)	Total Alkalinity as CaCO3 (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Aluminium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Zinc (mg/L)	Boron (mg/L)	Iron (mg/L)	Arsenious Acid, As (III) (µg/L)	Arsenic Acid, As (V) (µg/L)	Mercury (mg/L)	Nitrite + Nitrate as N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorous as P (mg/L)	Total Anions (meq/L)	Total Cations (meq/L)
SW3	16/04/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW3	14/05/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW3	14/06/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW3	16/07/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW3	16/08/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW3	17/09/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW3	19/10/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW3	19/11/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW3	18/12/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW4	16/01/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW4	16/02/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW4	19/03/2018	**Dry - No Sample**																													
SW4	16/04/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW4	14/05/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW4	14/06/2018	**Dry - No Sample**																													
SW4	16/07/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW4	16/08/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW4	17/09/2018	**Dry - No Sample**																													
SW4	19/10/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW4	19/11/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW4	18/12/2018	**Dry - No Sample**																													
SW5	16/01/2018	**No Sample Required - Non Sampling Month**																													
SW5	16/02/2018	**No Sample Required - Non Sampling Month**																													
SW5	19/03/2018	8.07	531	272	29	9.1	185	34	19	44	4	0.81	<0.0001	0.001	0.002	<0.001	0.081	0.002	<0.01	<0.001	<0.005	<0.05	1.14	<0.5	1.5	<0.0001	<0.01	0.7	0.07	5.69	5.28
SW5	16/04/2018	**No Sample Required - Non Sampling Month**																													
SW5	14/05/2018	**No Sample Required - Non Sampling Month**																													
SW5	14/06/2018	8.00	638	347	26	23.7	207	43	27	50	4	1.13	<0.0001	0.001	0.003	<0.001	0.118	0.002	<0.01	<0.001	<0.005	<0.05	1.34	<0.5	<0.5	<0.0001	0.06	0.6	0.07	0.02	0.56
SW5	16/07/2018	**No Sample Required - Non Sampling Month**																													
SW5	16/08/2018	**No Sample Required - Non Sampling Month**																													
SW5	17/09/2018	8.27	611	324	14	2.7	197	40	24	41	3	0.64	<0.0001	<0.001	<0.001	<0.001	0.101	0.002	<0.01	<0.001	<0.005	<0.05	0.67	<0.5	<0.5	<0.0001	0.2	<0.01	0.4	0.4	0.03
SW5	19/10/2018	**No Sample Required - Non Sampling Month**																													
SW5	19/11/2018	**No Sample Required - Non Sampling Month**																													
SW5	18/12/2018	8.10	510	324	34	13.6	197	41	24	35	4	1.03	<0.0001	0.001	0.002	<0.001	0.078	0.002	<0.01	<0.001	<0.005	<0.05	1.23	<0.5	0.9	<0.0001	0.2	<0.01	0.7	0.7	0.09
SW6	16/01/2018	8.01	279	174	25	3.9	**Suite 2 Not Required**																								
SW6	16/02/2018	8.11	364	201	45	8.6	**Suite 2 Not Required**																								
SW6	19/03/2018	8.1	544	326	54	10.9	**Suite 2 Not Required**																								
SW6	16/04/2018	8.2	541	327	15	12.9	**Suite 2 Not Required**																								

Site	Date	pH Value	Electrical Conductivity @ 25°C	Total Dissolved Solids (mg/L)	Suspended Solids (mg/L)	Turbidity (NTU)	Total Alkalinity as CaCO3 (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Aluminium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Zinc (mg/L)	Boron (mg/L)	Iron (mg/L)	Arsenious Acid, As (III) (µg/L)	Arsenic Acid, As (V) (µg/L)	Mercury (mg/L)	Nitrite + Nitrate as N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorous as P (mg/L)	Total Anions (meq/L)	Total Cations (meq/L)
SW6	14/05/2018	8.26	597	318	18	4.2	**Suite 2 Not Required**																								
SW6	14/06/2018	8.12	914	484	20	4.2	**Suite 2 Not Required**																								
SW6	16/07/2018	8.01	524	304	6	3.6	**Suite 2 Not Required**																								
SW6	16/08/2018	8.19	606	383	28	17.9	**Suite 2 Not Required**																								
SW6	17/09/2018	8.12	748	379	<5	2	**Suite 2 Not Required**																								
SW6	19/10/2018	8.06	1100	582	268	150	**Suite 2 Not Required**																								
SW6	19/11/2018	8.4	521	399	34	21.3	**Suite 2 Not Required**																								
SW6	18/12/2018	8.21	504	334	32	19.6	**Suite 2 Not Required**																								
SW7	16/01/2018	8.09	276	174	44	3.7	**Suite 2 Not Required**																								
SW7	16/02/2018	8.19	373	214	58	9.7	**Suite 2 Not Required**																								
SW7	19/03/2018	8.13	511	260	18	10.6	**Suite 2 Not Required**																								
SW7	16/04/2018	8.27	535	329	14	12.8	**Suite 2 Not Required**																								
SW7	14/05/2018	8.34	596	318	13	4.4	**Suite 2 Not Required**																								
SW7	14/06/2018	8.12	776	399	24	3.6	**Suite 2 Not Required**																								
SW7	16/07/2018	8.07	480	282	15	6.1	**Suite 2 Not Required**																								
SW7	16/08/2018	8.28	532	340	17	11.3	**Suite 2 Not Required**																								
SW7	17/09/2018	8.28	569	300	27	13.7	**Suite 2 Not Required**																								
SW7	19/10/2018	7.84	325	266	1270	1050	**Suite 2 Not Required**																								
SW7	19/11/2018	8.5	523	345	36	20	**Suite 2 Not Required**																								
SW7	18/12/2018	8.26	499	289	38	19.4	**Suite 2 Not Required**																								
SW8	16/01/2018	**No Sample Required - Non Sampling Month**																													
SW8	16/02/2018	**No Sample Required - Non Sampling Month**																													
SW8	19/03/2018	8.1	463	256	24	8.7	175	33	18	32	4	0.79	<0.0001	0.001	0.002	<0.001	0.073	0.002	<0.01	<0.001	<0.005	<0.05	1.15	<0.5	1.7	<0.0001	<0.01	0.7	0.7	0.05	<0.01
SW8	16/04/2018	**No Sample Required - Non Sampling Month**																													
SW8	14/05/2018	**No Sample Required - Non Sampling Month**																													
SW8	14/06/2018	**Dry - No Sample**																													
SW8	16/07/2018	**No Sample Required - Non Sampling Month**																													
SW8	16/08/2018	**No Sample Required - Non Sampling Month**																													
SW8	17/09/2018	**Dry - No Sample**																													
SW8	19/10/2018	**No Sample Required - Non Sampling Month**																													
SW8	19/11/2018	**No Sample Required - Non Sampling Month**																													
SW8	18/12/2018	8.24	490	329	48	25.4	190	40	23	35	4	1.13	<0.0001	0.001	0.002	<0.001	0.088	0.002	<0.01	<0.001	<0.005	<0.05	1.38	<0.5	0.7	<0.0001	<0.01	0.6	0.6	0.07	<0.01
SW9	16/01/2018	**No Sample Required - Non Sampling Month**																													
SW9	16/02/2018	**No Sample Required - Non Sampling Month**																													
SW9	19/03/2018	**Dry - No Sample**																													
SW9	16/04/2018	**No Sample Required - Non Sampling Month**																													
SW9	14/05/2018	**No Sample Required - Non Sampling Month**																													

Site	Date	pH Value	Electrical Conductivity @ 25°C	Total Dissolved Solids (mg/L)	Suspended Solids (mg/L)	Turbidity (NTU)	Total Alkalinity as CaCO3 (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Aluminium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Zinc (mg/L)	Boron (mg/L)	Iron (mg/L)	Arsenious Acid, As (III) (µg/L)	Arsenic Acid, As (V) (µg/L)	Mercury (mg/L)	Nitrite + Nitrate as N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorous as P (mg/L)	Total Anions (meq/L)	Total Cations (meq/L)
SW9	14/06/2018	**Dry - No Sample**																													
SW9	16/07/2018	**No Sample Required - Non Sampling Month**																													
SW9	16/08/2018	**No Sample Required - Non Sampling Month**																													
SW9	17/09/2018	**Dry - No Sample**																													
SW9	19/10/2018	**No Sample Required - Non Sampling Month**																													
SW9	19/11/2018	**No Sample Required - Non Sampling Month**																													
SW9	18/12/2018	**Dry - No Sample**																													
SW10	16/01/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW10	16/02/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW10	19/03/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW10	16/04/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW10	14/05/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW10	14/06/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW10	16/07/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW10	16/08/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW10	17/09/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW10	19/10/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW10	19/11/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW10	18/12/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW11	16/01/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW11	16/02/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW11	19/03/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW11	16/04/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW11	14/05/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW11	14/06/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW11	16/07/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW11	16/08/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW11	17/09/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW11	19/10/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW11	19/11/2018	**No Sample Required - No Discharge at this Location this Month**																													
SW11	18/12/2018	**No Sample Required - No Discharge at this Location this Month**																													

Sampling was unable to be taken at all monitoring locations as Back Creek and upper Maules Creek are ephemeral.

Table D-2
Sediment Dam Triggers

Parameter	100th percentile
Oil and grease (mg/L)	10
pH	6.5-8.5
Total suspended solids (mg/L)	50

Table D-3
Off-site Discharge Monitoring Laboratory Results

Site	Date	pH Value	Electrical Conductivity @ 25°C	Total Dissolved Solids (mg/L)	Suspended Solids (mg/L)	Turbidity (NTU)	Total Alkalinity as CaCO3 (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Aluminium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Copper (mg/L)	Lead (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Zinc (mg/L)	Boron (mg/L)	Iron (mg/L)	Mercury (mg/L)	Nitrite + Nitrate as N (mg/L)	Total Nitrogen (mg/L)	Total Phosphorous as P (mg/L)	Total Anions (meq/L)	Total Cations (meq/L)
SW5	21/10/2018	8.15	523	266	52	26.5	156	34	19	32	4	0.69	<0.0001	<0.001	0.002	<0.001	0.05	0.002	<0.01	<0.001	<0.005	<0.05	0.81	<0.0001	0.03	1	<0.01	4.86	4.75
SW7	21/10/2018	8.09	531	264	42	24.3	157	36	20	33	4	1.37	<0.0001	0.002	0.002	<0.001	0.105	0.002	<0.01	<0.001	<0.005	<0.05	1.62	<0.0001	<0.01	0.7	<0.01	4.9	4.98
SW9	21/10/2018	7.82	556	409	132	146	122	21	8	74	3	0.69	<0.0001	0.002	0.003	0.004	0.096	0.002	<0.01	<0.001	0.011	<0.05	3.66	<0.0001	2.39	3.7	0.25	4.76	5
SW5	22/10/2018	8.23	519	288	66	32.8	159	37	20	33	4	1.79	<0.0001	0.002	0.002	<0.001	0.116	0.003	<0.01	<0.001	<0.005	<0.05	2.17	<0.0001	1.82	4.3	0.12	6.12	6
SW7	22/10/2018	8.24	515	276	50	31.6	156	35	19	31	4	1.78	<0.0001	0.002	0.002	<0.001	0.114	0.003	<0.01	<0.001	<0.005	<0.05	2.14	<0.0001	0.01	0.7	<0.01	5.12	5.03
SW9	22/10/2018	7.91	667	440	59	90	157	22	10	92	3	3.95	<0.0001	0.002	0.002	0.002	0.058	0.002	<0.01	<0.001	0.008	<0.05	3.08	<0.0001	1.82	4.3	0.23	6.12	6

Site Water Monitoring

Table D-4
On-site Surface Water Monitoring

Site	Parameter	Units	Frequency	Samples	Date	Min	Mean	Max/Only Value
Mine Void	TSS	mg/L	Every 2 Months	1	19/02/2018	-	-	26
	Conductivity	µs/cm				-	-	1840
	Oil & Grease	mg/L				-	-	<5
	pH	pH				-	-	7.58
Mine Void	TSS	mg/L	Every 2 Months	1	11/04/2018	-	-	<5
	Conductivity	µs/cm				-	-	1400
	Oil & Grease	mg/L				-	-	<5
	pH	pH				-	-	8.24
Mine Void	TSS	mg/L	Every 2 Months	1	15/06/2018	-	-	12
	Conductivity	µs/cm				-	-	1630
	Oil & Grease	mg/L				-	-	<5
	pH	pH				-	-	7.79
Mine Void	TSS	mg/L	Every 2 Months	1	17/08/2018	-	-	<5
	Conductivity	µs/cm				-	-	1560
	Oil & Grease	mg/L				-	-	<5
	pH	pH				-	-	7.72
Mine Void	TSS	mg/L	Every 2 Months	1	18/10/2018	-	-	82
	Conductivity	µs/cm				-	-	1580
	Oil & Grease	mg/L				-	-	<5
	pH	pH				-	-	7.83
Mine Void	TSS	mg/L	Every 2 Months	1	17/12/2018	-	-	7
	Conductivity	µs/cm				-	-	898
	Oil & Grease	mg/L				-	-	<5
	pH	pH				-	-	8.15

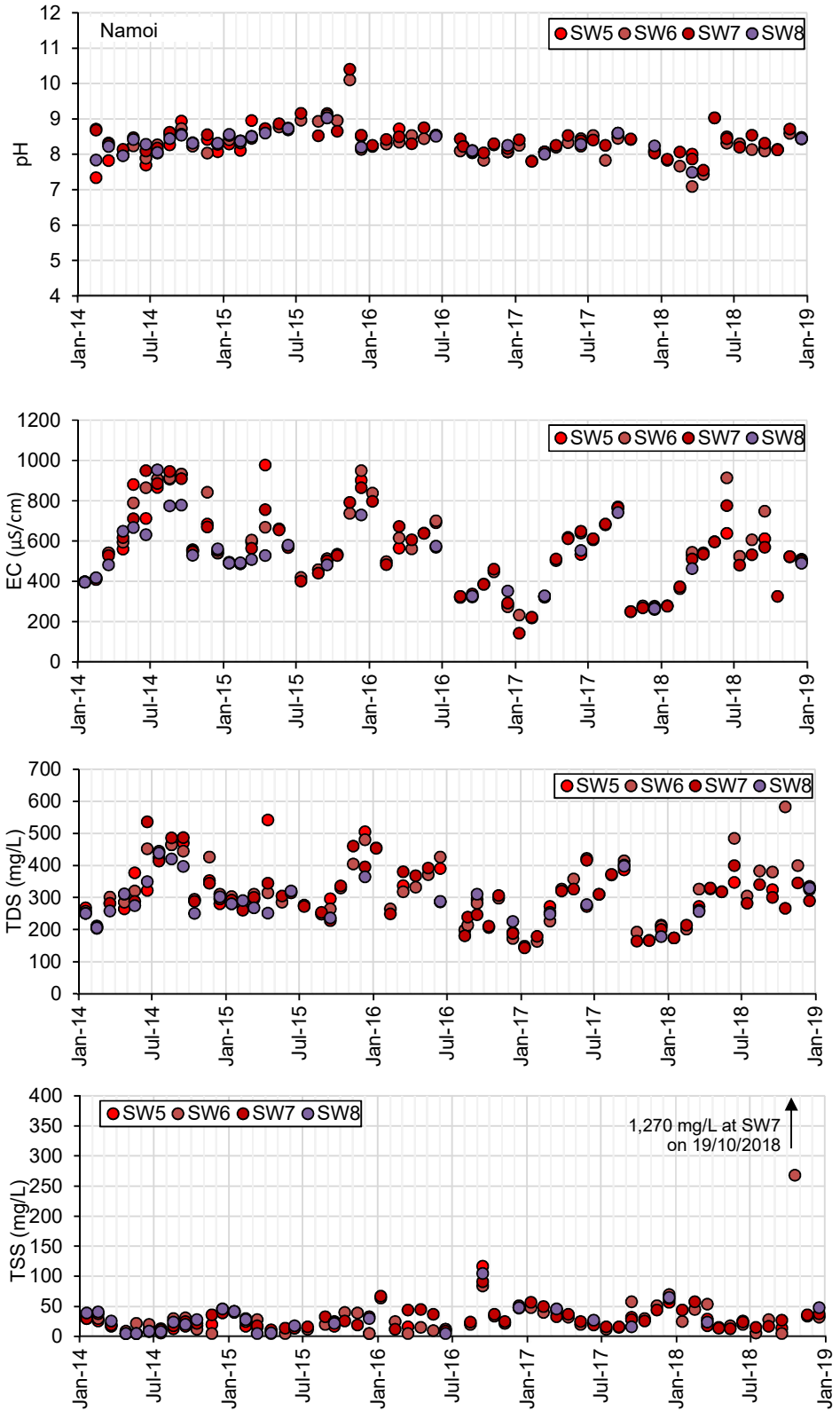


Figure D-1 – Surface water quality trends

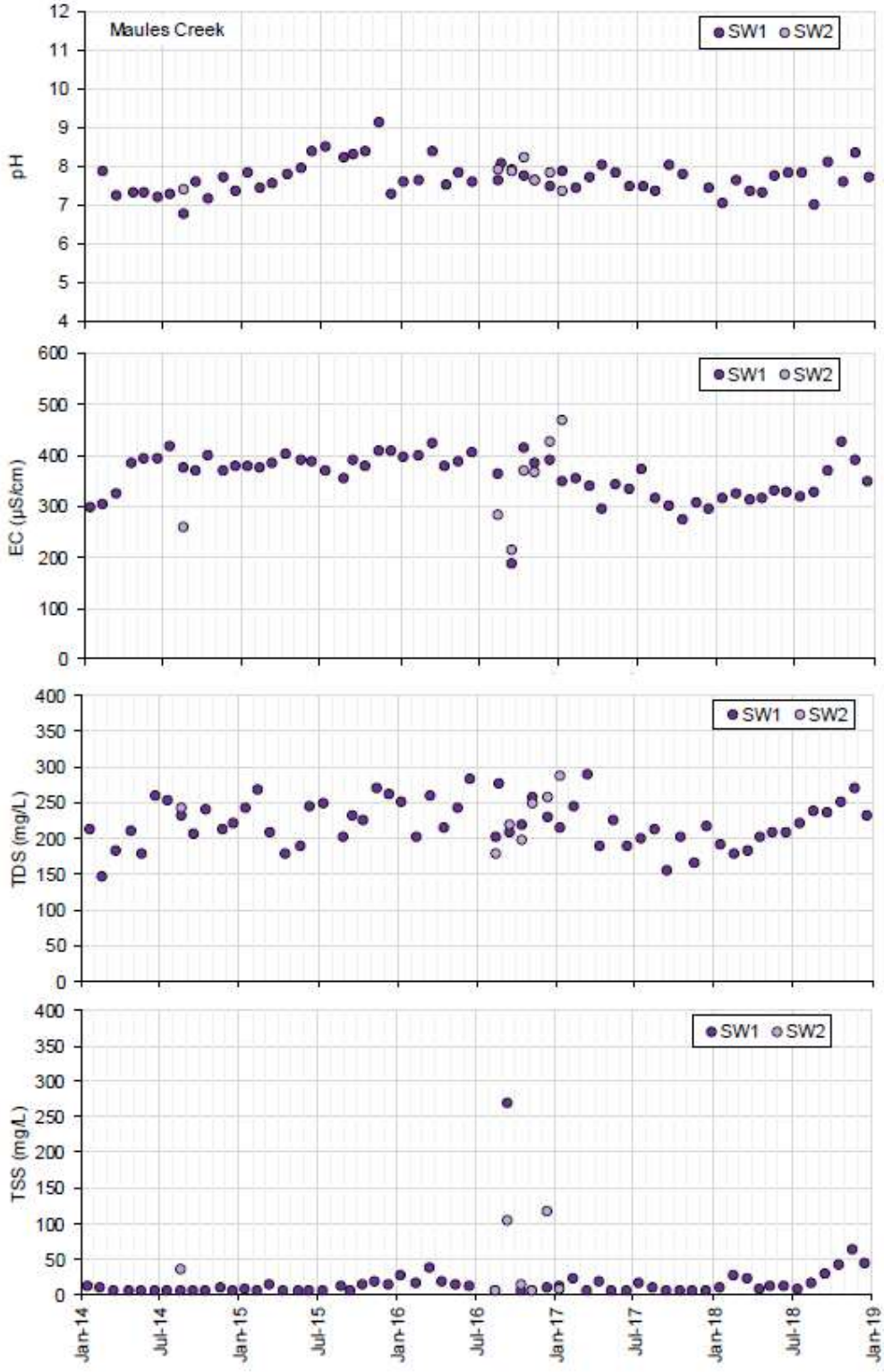


Figure D-2 – Surface water quality trends Maules Creek

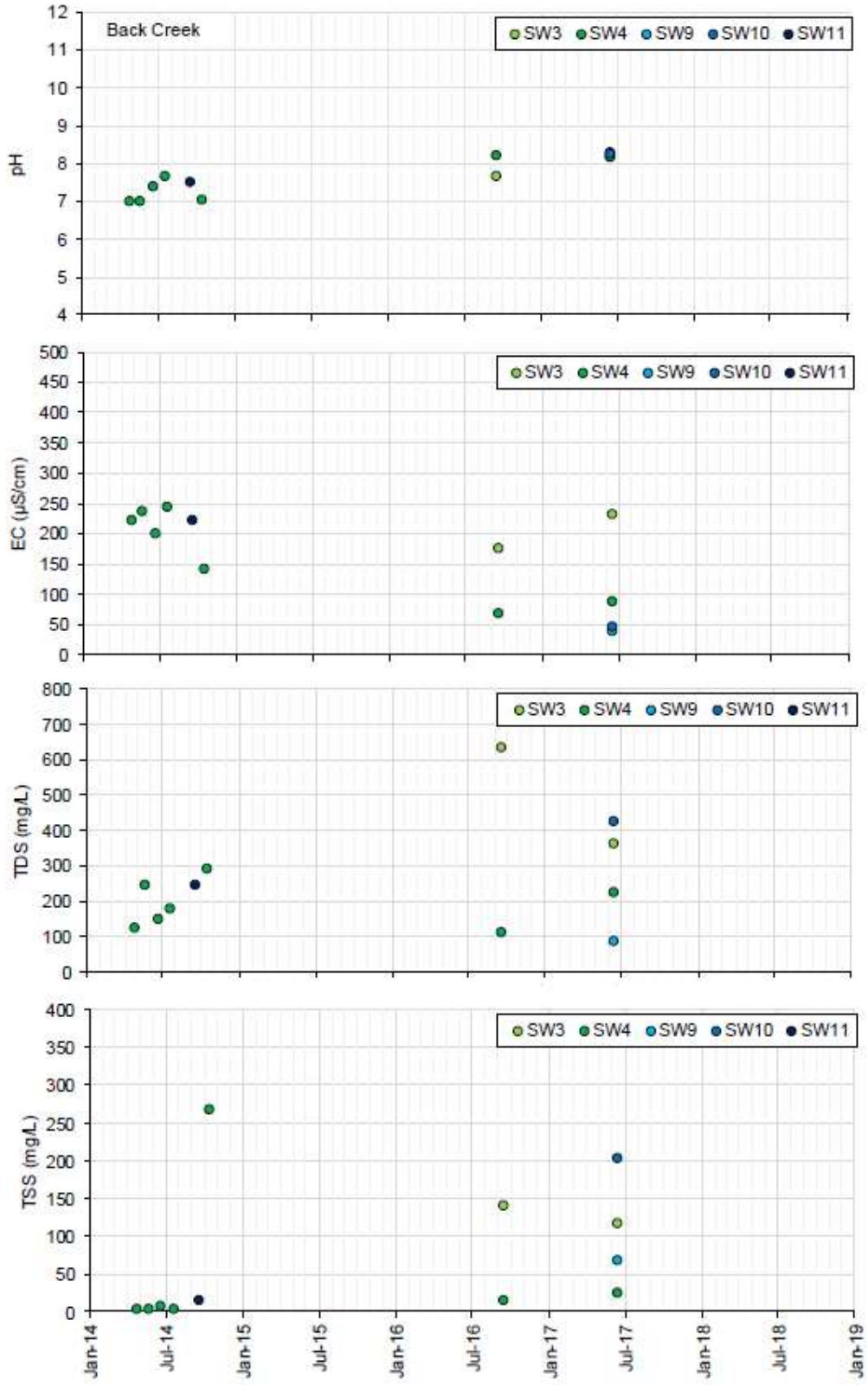


Figure D-3 – Surface water quality trends Back Creek

APPENDIX E

Groundwater

Appendix E
Groundwater

Table E-1
Monitoring bore details

Bore ID	Approx. EIS proposed site	Type	Network	GL (mAHD)	Bore depth (m)	Screen/sensor depth (mbgl)	Target geology
BCM01	BCMB01	SP	Maules Creek	273.39	10	6.75 - 9.75	Alluvium
BCM03	BCMB03	SP	Maules Creek	305.02	10	6.75 - 9.75	Alluvium
MAC1280	-	SP	Maules Creek	322.5	146	56 – 59	Interburden between Braymont seams
RB03_V1	-	VWP	Maules Creek	407.89	-	164	Braymont
RB03_V2	-	VWP	Maules Creek	407.89	-	242	Merriown
RB03_V3	-	VWP	Maules Creek	407.89	-	289	Nagero
RB03_V4	-	VWP	Maules Creek	407.89	-	317	Templemore
RB04_V1	-	VWP	Maules Creek	437.53	-	209	Braymont
RB04_V2	-	VWP	Maules Creek	437.53	-	272.5	Merriown
RB04_V3	-	VWP	Maules Creek	437.53	-	309	Nagero
RB04_V4	-	VWP	Maules Creek	437.53	-	339	Lower Northam
RB05A	-	SP	Maules Creek	328.1	246.5	239 - 245	Merriown
RB05_V1	-	VWP	Maules Creek	328.4	-	107	Braymont
RB05_V2	-	VWP	Maules Creek	328.4	-	213	Jeralong
RB05_V3	-	VWP	Maules Creek	328.4	-	280	Nagero
RB05_V4	-	VWP	Maules Creek	328.4	-	390	Templemore
REG1_V1	L1VWP2	VWP	Regional	286.17	-	118.7	Jeralong
REG1_V2	L1VWP2	VWP	Regional	286.17	-	134.5	Merriown

Bore ID	Approx. EIS proposed site	Type	Network	GL (mAHD)	Bore depth (m)	Screen/sensor depth (mbgl)	Target geology
REG1_V3	L1VWP2	VWP	Regional	286.17	-	193.5	Nagero
REG1_V4	L1VWP2	VWP	Regional	286.17	-	281.5	Therribri
REG2_V1	-	VWP	Regional	317.01	-	60	Braymont
REG2_V2	-	VWP	Regional	317.01	-	120	Jeralong
REG2_V3	-	VWP	Regional	317.01	-	200	Merriown
REG2_V4	-	VWP	Regional	317.01	-	260	Therribri
REG3	L2VWP2	SP	Regional	241.6	57	50.50 - 56.50	Boggabri Volcanics
REG4	L3MB1	SP	Regional	259.95	72.5	65.5 - 71.5	Boggabri Volcanics
REG5	-	SP	Regional	252.17	78.7	72.2 - 78.2	Boggabri Volcanics
REG5A	-	SP	Regional	252.03	22	18 – 21	Alluvium
REG6	L4VWP1	SP	Regional	250.65	96	88.0 – 94.0	Boggabri Volcanics
REG7_V1	-	VWP	Regional	291.62	-	67.5	Braymont
REG7_V2	-	VWP	Regional	291.62	-	148.2	Merriown
REG7_V3	-	VWP	Regional	291.62	-	242.5	Nagero
REG7A	-	SP	Regional	291.71	36	24 - 30	Alluvium
REG8_V1	L5VWP1	VWP	Regional	341.6	-	91.5	Braymont
REG8_V2	L5VWP1	VWP	Regional	341.6	-	221	Merriown
REG8_V3	L5VWP1	VWP	Regional	341.6	-	274	Nagero
REG9_V1	-	VWP	Regional	346.81	-	115.8	Braymont
REG9_V2	-	VWP	Regional	346.81	-	175.2	Merriown
REG9_V3	-	VWP	Regional	346.81	-	268	Nagero
REG10_V1	L1VWP1	VWP	Regional	287.12	-	55	Braymont
REG10_V2	L1VWP1	VWP	Regional	287.12	-	144.2	Merriown

Bore ID	Approx. EIS proposed site	Type	Network	GL (mAHD)	Bore depth (m)	Screen/sensor depth (mbgl)	Target geology
REG10_V3	L1VWP1	VWP	Regional	287.12	-	178	Nagero
REG10_V4	L1VWP1	VWP	Regional	287.12	-	185.5	Upper Northam
REG10A	BCMB02	SP	Regional	287.12	10	6.75 - 9.75	Alluvium
REG12	L2MB1	SP	Regional	285.61	48.3	38.4 - 44.4	Boggabri Volcanics
REG13	-	SP	Regional	277.08	133	128 - 132	Boggabri Volcanics
REG14	-	SP	Regional	250.18	102	90 - 96	Basement
WHAN (GW060214)	-	Bore + logger	Private	264*	10	TBC	-
School (GW027653)	-	Bore	Private	282*	8.4	TBC	Gravel
WOL1 (GW062778)	-	Bore + logger	Private	290*	7.2	TBC	-
WOL2	-	Bore	Private	285*	-	TBC	-
MOR1	-	Bore + logger	Private	260*	-	TBC	-
MOR2	-	Bore + logger	Private	2560*	-	TBC	-
TESTON (GW003489)	-	Bore	Private	270*	45.4	TBC	Hard rock
TRALEE (GW003478)	-	Bore	Private	278*	33.8	TBC	Basalt
MORSE (GW001869)	-	Bore	Private	302*	63.1	TBC	Sandstone
BRE2 (GW000583)	-	Bore	Private	354*	96.3	TBC	Hard rock
BAS1	-	Bore	Private	239*	-	TBC	-
BAS2	-	Bore	Private	238*	-	TBC	-

SP = standpipe bore, VWP = vibrating wire piezometer, logger = datalogger installed, dry = bore currently dry so no datalogger installed.
Details for private bores have been estimated based on the registered bore closest to the monitored location. Not all construction details are available for each site, and several bores are some distance from the closest registered bore so all construction details remain uncertain. * = elevation of private bore interpolated from groundwater model DEM, TBC = to be confirmed.

Regional Groundwater Bores

Table E-2
Groundwater Levels

SWL	RB05a	Reg3	Reg4	Reg5	Reg5a	Reg6	Reg7a	Reg10a	Reg12	Reg13	Reg14	BCM01	BCM03
Jan-18		13.99	20.53	17.95		20.34	7.27		25.84	22.43	21.27		
Feb-18		14.79	20.59	17.97		20.75	7.48		25.87	22.49	21.65		
Mar-18		15	20.54	17.43		21.31	7.75		25.83	22.39	20.77		
Apr-18		14.75	20.26	18.02		20.7	7.84		25.89	22.51	20.77		
May-18		14.4	20.26	18.01		21.65	8.01		25.91	22.49	20.68		
Jun-18		14.17	20.24	17.7		21.92	8.18		25.87	22.43	21.96		
Jul-18		14.12	22.24	17.78		22.2	8.28		25.88	22.43	21.04		
Aug-18		14.14	20.34	17.77		22.2	8.46		25.92	22.53	20.91		
Sep-18		14.51	20.68	17.77		22.07	8.62		25.97	22.53	20.44		
Oct-18		15.01	20.3	17.75		22.02	8.68		25.91	22.47	20.96		
Nov-18		15.45	21.39	17.78		22.16	8.81		25.98	22.55	20.96		
Dec-18		15.37	20.33	17.77		22.36	8.97		25.95	22.51	21.25		

Shaded cells indicate dry bore.

Table E-3 Groundwater Monitoring Results and comparison with ANZECC guideline trigger values

Location	Date	Lab pH value pH Unit	Lab electrical conductivity @ 25°C µS/cm	TDS @ 180°C mg/L	Sulfate as SO4 - turbimetric mg/L	Aluminum (filt.) mg/L	Arsenic (filt.) mg/L	Barium (filt.) mg/L	Cadmium (filt.) mg/L	Copper (filt.) mg/L	Lead (filt.) mg/L	Lithium (filt.) mg/L	Manganese (filt.) mg/L	Molybdenum (filt.) mg/L	Nickel (filt.) mg/L	Zinc (filt.) mg/L	Boron (filt.) mg/L	Iron (filt.) mg/L	Ammonia as N mg/L	Nitrite as N mg/L	Nitrate as N mg/L	Total anions meq/L	Total cations meq/L	Ionic balance %
ANZECC Guideline value	Drinking water	6.5-8.5	-	600	500/250	0.2**	0.01	0.2*	0.002*	2/1	0.01*	-	0.5*/0.1**	0.05*	0.02*	3	4*	0.3**	0.5	3	50	-	-	-
	Livestock drinking water	-	-	3000-13000	1000-2000	5	0.5	-	0.01	0.5-5	0.1	-	-	0.15	1	20	5	-	-	30	-	-	-	-
	Long-term irrigation water	6.0-8.5	-	-	-	5	0.1	-	0.01	0.2	2	2.5	0.2	0.01	0.2	2	0.5	0.2	-	-	-	-	-	-
	Limit of reporting	0.1	1	1	1	0.01	0.001	0.001	0.0001	0.001	0.001	0.001	0.001	0.001	0.001	0.005	0.05	0.05	0.01	0.01	0.01	0.01	0.01	0.01
RBO5a	Mar-18	7.74	1860	973	93	<0.01	<0.001	0.278	<0.0001	<0.001	<0.001	0.028	0.065	0.004	0.005	0.008	0.06	0.52	0.69	0.02	0.02	21.5	17.8	9.49
	Jun-18	7.9	1820	944	85	<0.01	<0.001	0.289	<0.0001	<0.001	<0.001	0.024	0.08	0.004	0.011	0.01	<0.05	0.53	0.65	<0.01	0.14	20.6	18.7	4.67
	Sep-18	7.83	1820	958	79	<0.01	<0.001	0.27	<0.0001	<0.001	<0.001	0.024	0.08	0.004	0.007	0.009	0.05	0.58	0.68	<0.01	0.03	18.8	17.5	3.5
	Dec-18	8.56	1760	1020	95	0.02	<0.001	0.301	<0.0001	<0.001	<0.001	0.027	0.112	0.005	0.014	0.01	0.06	0.17	0.71	0.09	0.27	20.1	19.9	0.44
Reg3	Mar-18	7.9	1320	714	107	<0.01	0.002	0.02	<0.0001	0.001	<0.001	0.002	0.2	0.014	<0.001	0.008	0.07	<0.05	0.06	<0.01	0.02	13.8	12.1	6.56
	Jun-18	8.02	1310	656	103	<0.01	0.002	0.021	<0.0001	<0.001	<0.001	0.002	0.222	0.014	0.001	0.014	0.05	0.06	0.03	<0.01	0.02	14.4	12.9	5.53
	Sep-18	8.16	1160	668	81	<0.01	0.002	0.017	<0.0001	<0.001	<0.001	<0.001	0.133	0.017	0.002	0.01	0.06	<0.05	0.1	<0.01	0.01	11.8	11.3	2.08
	Dec-18	8.64	1120	698	98	<0.01	0.003	0.021	<0.0001	<0.001	<0.001	<0.001	0.17	0.017	0.002	0.024	0.07	0.06	0.05	<0.01	<0.01	12.6	12.7	0.48
Reg4	Mar-18	8.13	1090	576	10	<0.01	0.001	0.018	<0.0001	0.001	<0.001	0.029	0.041	0.005	0.001	<0.005	0.07	<0.05	0.04	0.06	12.2	-	-	-
	Jun-18	8.41	1080	618	10	<0.01	<0.001	0.016	<0.0001	0.004	<0.001	0.04	0.031	0.006	<0.001	0.013	0.06	<0.05	0.13	0.02	12	-	-	-
	Sep-18	8.51	1070	456	9	<0.01	0.001	0.024	<0.0001	0.002	<0.001	0.046	0.048	0.006	<0.001	<0.005	0.06	<0.05	0.13	0.05	10.5	-	-	-
	Dec-18	8.66	1010	594	18	<0.01	0.001	0.048	<0.0001	<0.001	<0.001	0.064	0.033	0.007	<0.001	<0.005	0.07	<0.05	0.35	0.07	11.7			
Reg5	Mar-18	7.91	1920	1090	263	<0.01	<0.001	0.028	<0.0001	0.001	<0.001	0.006	0.568	0.002	0.002	0.023	<0.05	<0.05	0.34	<0.01	<0.01	20.5	17.3	8.48
	Jun-18	8.07	1920	944	250	<0.01	<0.001	0.018	<0.0001	0.002	<0.001	0.005	0.548	0.004	0.001	0.023	<0.05	<0.05	0.37	<0.01	<0.01	20.3	18.3	5.13
	Sep-18	8.07	1920	1130	246	<0.01	<0.001	0.031	<0.0001	0.001	<0.001	0.005	0.516	0.004	0.001	0.032	<0.05	<0.05	0.2	<0.01	0.01	18.6	17.4	3.32
	Dec-18	8.64	1920	1060	280	<0.01	<0.001	0.04	<0.0001	0.001	<0.001	0.006	0.392	0.004	0.001	0.021	0.06	<0.05	0.25	<0.01	0.02	19.6	19.4	0.32
Reg5a	Mar-18	Dry																						
	Jun-18	Dry																						
	Sep-18	Dry																						
	Dec-18	Dry																						
Reg6	Mar-18	8.41	2130	1100	182	<0.01	<0.001	0.052	<0.0001	<0.001	<0.001	0.021	0.047	0.02	0.002	<0.005	0.06	<0.05	0.26	0.08	<0.01	21.3	17.9	8.6
	Jun-18	8.21	2020	1080	135	<0.01	<0.001	0.043	<0.0001	<0.001	<0.001	0.006	0.08	0.013	0.002	<0.005	0.06	<0.05	0.1	0.02	<0.01	20.8	19.1	4.3
	Sep-18	8.52	2060	782	130	<0.01	<0.001	0.048	<0.0001	<0.001	<0.001	0.008	0.07	0.014	0.002	0.05	0.08	<0.05	0.11	<0.01	<0.01	19.1	18.8	0.78
	Dec-18	8.5	2060	1150	147	<0.01	0.001	0.049	<0.0001	<0.001	<0.001	0.006	0.094	0.013	0.002	<0.005	0.08	<0.05	0.06	<0.01	<0.01	20.4	19.8	1.47
Reg7a	Mar-18	7.44	899	506	47	<0.01	0.004	0.087	<0.0001	0.008	<0.001	0.002	0.463	<0.001	0.002	0.032	<0.05	0.3	0.02	<0.01	0.07	9.19	8.7	2.74
	Jun-18	7.73	799	427	34	<0.01	0.005	0.089	<0.0001	0.004	<0.001	0.002	0.39	<0.001	<0.001	0.028	<0.05	0.23	<0.01	<0.01	13.7	9.05	8.54	2.93
	Sep-18	7.69	766	398	28	<0.01	0.005	0.077	<0.0001	0.007	<0.001	0.001	0.32	<0.001	0.002	0.054	<0.05	0.22	0.02	<0.01	0.02	7.77	7.67	0.67
	Dec-18	8.51	752	460	36	<0.01	0.004	0.092	<0.0001	<0.001	<0.001	0.002	0.436	0.001	0.001	0.062	<0.05	0.26	0.02	<0.01	0.04	8.64	9.15	2.87
Reg10a	Mar-18	Dry																						
	Jun-18	Dry																						
	Sep-18	Dry																						
	Dec-18	Dry																						
Reg12	Mar-18	7.76	2440	1400	68	<0.01	0.001	0.081	<0.0001	0.007	<0.001	0.041	0.067	0.002	0.002	0.021	0.1	0.07	0.03	<0.01	<0.01	27.4	24.2	6.21
	Jun-18	7.89	2350	1380	65	0.01	0.001	0.08	<0.0001	0.007	<0.001	0.037	0.098	0.003	0.003	0.047	0.1	0.26	0.05	<0.01	<0.01	27.2	24.5	5.2
	Sep-18	7.79	2350	1180	62	<0.01	0.001	0.076	<0.0001	<0.001	<0.001	0.04	0.066	0.002	0.002	0.042	0.1	0.24	0.05	<0.01	<0.01	24.2	23.5	1.53
	Dec-18	8.59	2290	1370	73	<0.01	0.001	0.081	<0.0001	<0.001	<0.001	0.04	0.096	0.003	0.001	0.05	0.12	0.23	0.04	<0.01	0.04	26.3	26.1	0.35
Reg13	Mar-18	7.81	3550	2440	1340	<0.01	<0.001	0.052	<0.0001	<0.001	<0.001	0.013	0.238	0.011	0.003	0.008	0.15	<0.05	0.05	<0.01	0.02	41.9	36	7.53
	Jun-18	7.86	3430	2330	1240	<0.01	<0.001	0.051	<0.0001	<0.001	<0.001	0.016	0.257	0.013	0.003	0.011	0.13	<0.05	0.13	<0.01	<0.01	39.7	37.4	2.93
	Sep-18	8.2	3680	2310	1240	<0.01	0.002	0.052	<0.0001	0.001	<0.001	0.01	0.282	0.012	0.003	0.078	0.15	<0.05	0.03	<0.01	<0.01	39.1	37.9	1.59
	Dec-18	8.21	3550	2490	1360	<0.01	<0.001	0.045	<0.0001	<0.001	<0.001	0.044	0.187	0.017	0.003	0.015	0.13	<0.05	0.08	<0.01	<0.01	41.2	39.4	2.23
Reg14	Mar-18	7.62	1050	595	75	<0.01	0.004	0.028	<0.0001	<0.001	<0.001	0.005	0.234	0.004	0.002	0.007	<0.05	0.28	0.03	<0.01	0.02	10.9	9.75	5.72
	Jun-18	7.84	978	566	54	<0.01	0.003	0.03	<0.0001	<0.001	<0.001	<0.001	0.262	0.004	0.003	0.009	<0.05	0.37	0.03	<0.01	<0.01	10	9.91	0.54
	Sep-18	8.55	988	520	41	<0.01	0.004	0.032	<0.0001	<0.001	<0.001	<0.001	0.225	0.005	0.002	0.129	<0.05	0.27	0.05	<0.01	<0.01	8.88	9.09	1.18
	Dec-18	8.55	951	588	45	<0.01	0.003	0.038	<0.0001	<0.001	<0.001	0.001	0.346	0.005	0.003	0.014	<0.05	0.08	0.03	<0.01	<0.01	10.4	10.3	0.6
BCM01	Mar-18	Dry																						
	Jun-18	Dry																						
	Sep-18	Dry																						

	Dec-18	Dry																					
BCM03	Mar-18	Dry																					
	Jun-18	Dry																					
	Sep-18	Dry																					
	Dec-18	Dry																					
MAC1280	Mar-18	11.6	4010	2030	23	1.17	<0.001	0.197	<0.0001	0.009	<0.001	0.208	<0.001	0.023	0.017	0.006	<0.05	<0.05	3.66	1.92	1.67	29.5	24.7	8.99
	Jun-18	11.5	3340	1700	25	1.6	<0.001	0.197	<0.0001	0.014	<0.001	0.154	<0.001	0.024	0.017	0.006	<0.05	<0.05	5	2.04	0.38	28.2	27.5	1.29
	Sep-18	11.7	3790	1900	17	1.92	<0.001	0.205	<0.0001	0.012	<0.001	0.162	<0.001	0.023	0.019	0.014	<0.05	<0.05	5.71	1.09	<0.01	30.4	28.3	3.53
	Dec-18	11.2	3170	2010	13	2.32	<0.001	0.215	<0.0001	0.012	<0.001	0.166	<0.001	0.024	0.02	0.005	<0.05	<0.05	4.98	0.58	0.17	27.1	32.8	9.38

Private Groundwater Bores

Table E-4
Groundwater Levels

SWL	MOR1	MOR2	BRE2	WOL1	WOL2	School	Whan	Tralee	Morse	Bas1	Bas2	Teston
Jan-18	-[2]	13.03	13.03	-[2]	11.51	-[1]	4.31	20.12	21.63	-[2]	-[2]	19.84
Jul-18	12.1	13.12	13.12	5.55	12.73	-[2]	-[1]	20.21	21.77	-[2]	-[2]	19.88

Shaded cells indicate dry bore.

1 Groundwater level could not be obtained as personnel were unable to access the site.

2 Groundwater level could not be obtained as the site is a capped bore.

Table E-5
Groundwater Monitoring Results and comparison with ANZECC guideline trigger values

Location	Date	Lab pH value pH Unit	Lab electrical conductivity @ 25°C µS/cm	TDS @ 180°C mg/L	Sulfate as SO4 - turbimetric mg/L	Arsenic (filt.) mg/L	Cadmium (filt.) mg/L	Copper (filt.) mg/L	Lead (filt.) mg/L	Nickel (filt.) mg/L	Zinc (filt.) mg/L	Iron (filt.) mg/L	Ammonia as N mg/L	Nitrite as N mg/L	Nitrate as N mg/L	Total anions meq/L	Total cations meq/L	Ionic balance %
ANZECC Guideline value	Drinking water	6.5-8.5	-	600	500/250	0.01	0.002*	2/1	0.01*	0.02*	3	0.3**	0.5	3	50	-	-	-
	Livestock drinking water	-	-	3000-13000	1000-2000	0.5	0.01	0.5-5	0.1	1	20	-	-	30	-	-	-	-
	Long-term irrigation water	6.0-8.5	-	-	-	0.1	0.01	0.2	2	0.2	2	0.2	-	-	-	-	-	-
	Limit of reporting	0.1	1	1	1	0.001	0.0001	0.001	0.001	0.001	0.005	0.05	0.01	0.01	0.01	0.01	0.01	0.01
MOR1	04-01-18	7.87	1700	998	35	<0.001	<0.0001	0.036	0.002	0.007	-	<0.01	20.5	<0.01	20.5	15.7	17.8	6.14
	13-08-18	7.82	1670	941	41	<0.001	<0.0001	0.012	<0.001	0.002	0.14	<0.01	13.1	<0.01	13.1	16.7	16.7	<0.01
MOR2	04-01-18	7.5	66	56	<1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	0.6	0.07	<0.01	0.04	0.66	0.71	----
	13-08-18	7.2	78	50	<1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	0.08	0.04	<0.01	0.02	0.84	0.81	----
BRE2	04-01-18	8.16	3930	2020	<1	0.008	<0.001	0.002	<0.001	0.002	0.011	0.28	1.99	<0.01	<0.01	41.6	37	5.9
	13-08-18	7.99	3620	1910	<1	0.007	0.167	<0.001	<0.001	<0.001	<0.005	1.79	2.5	<0.01	0.01	37.2	35.2	2.62
WOL1	04-01-18	7.61	569	338	33	<0.001	<0.0001	0.002	<0.001	<0.001	0.007	<0.05	<0.01	<0.01	1.14	5.35	5.17	1.7
	13-08-18	7.31	516	318	34	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.005	<0.05	<0.01	<0.01	1.14	5.16	5.03	1.26
WOL2	04-01-18	Sample not obtainable[2]																
	13-08-18	Sample not obtainable[2]																
School raw	20-03-18	7.54	444	278	23	<0.001	<0.001	0.009	<0.001	<0.001	0.013	<0.05	0.01	0.01	0.58	4.78	4.39	4.28
	13-08-18	7.41	422	284	20	<0.001	<0.001	0.008	<0.001	<0.001	0.023	<0.05	<0.01	<0.01	0.56	4.26	4.03	2.84
Whan	04-01-18	7.58	357	215	8	<0.001	<0.0001	0.001	<0.001	0.002	0.007	<0.05	<0.01	<0.01	0.32	3.49	3.46	0.36
	13-08-18	7.19	362	237	12	<0.001	<0.0001	0.002	<0.001	<0.001	0.012	<0.05	0.02	<0.01	0.42	3.71	3.69	0.28
Tralee	04-01-18	7.76	1410	758	5	<0.001	<0.0001	<0.001	<0.001	0.002	0.02	16.3	3.11	<0.01	<0.01	15.5	14.2	4.55
	13-08-18	7.41	1340	725	28	<0.001	<0.0001	<0.001	<0.001	0.004	0.019	11.4	0.31	<0.01	0.04	14.8	14.2	1.91
Morse	04-01-18	7.6	723	506	12	<0.001	<0.0001	0.003	<0.001	0.005	0.106	6.62	0.12	<0.01	<0.01	7.25	7.79	3.6
	13-08-18	7.36	921	550	11	<0.001	0.01	<0.001	<0.001	0.001	0.056	0.79	0.02	<0.01	0.02	9.79	9.99	1.02
Bas1	04-01-18	7.41	504	293	17	<0.001	<0.0001	<0.001	<0.001	0.003	0.02	0.18	<0.01	<0.01	<0.01	5.06	5.06	0.05
	13-08-18	7.15	463	289	17	<0.001	<0.0001	<0.001	<0.001	0.001	<0.005	0.92	0.02	<0.01	<0.01	4.89	4.83	0.61
Bas2	04-01-18	Sample not obtainable[2]																
	13-08-18	Sample not obtainable[2]																
Teston	04-01-18	8.07	2430	1300	13	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.005	1.7	0.06	<0.01	<0.01	26.2	24.5	3.33
	13-08-18	7.91	2400	1430	11	<0.001	0.0002	<0.001	<0.001	<0.001	<0.005	1.42	0.04	<0.01	0.04	25.4	23.8	3.18

1 Sample could not be obtained as personnel were unable to access the site.

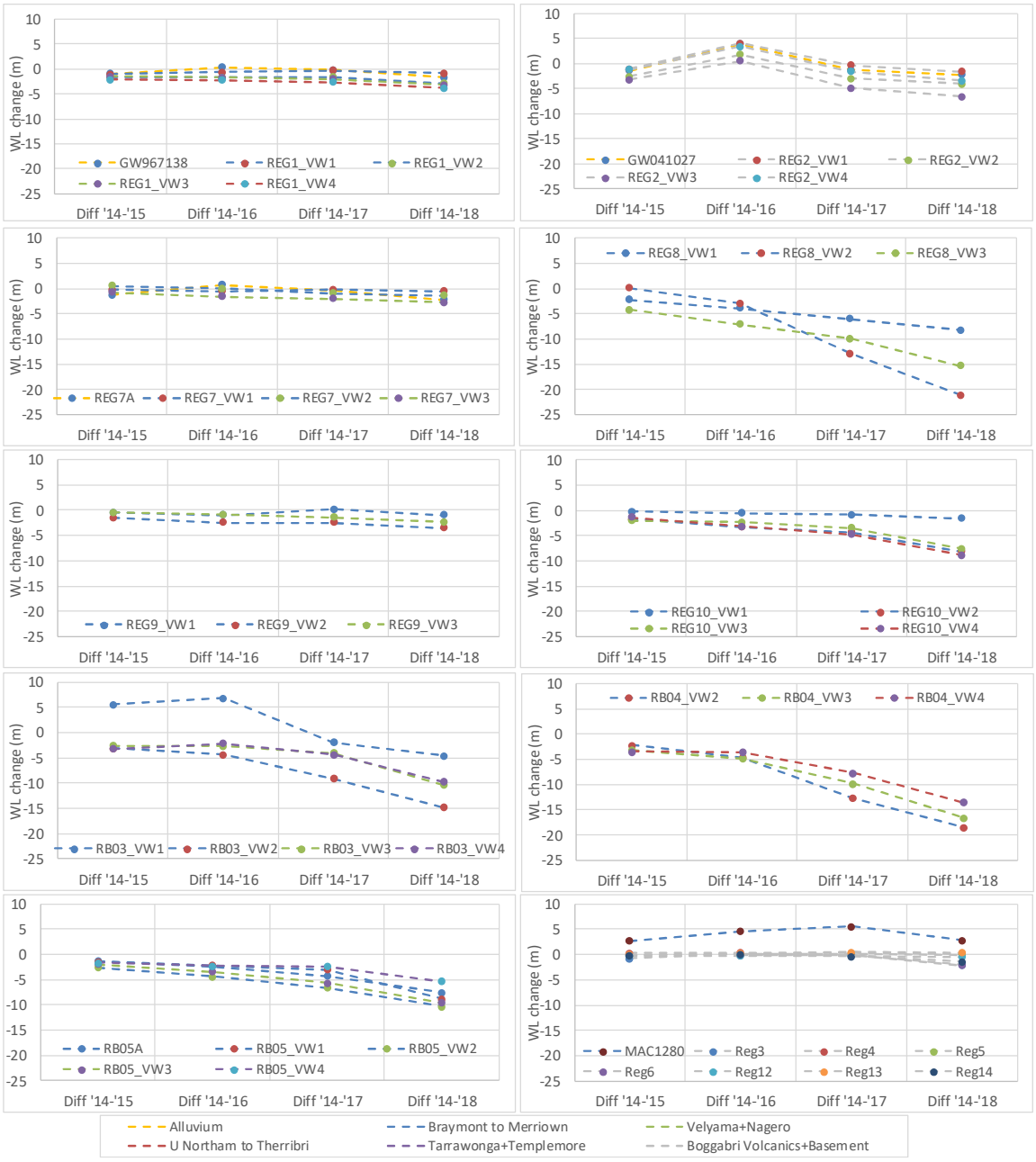
2 Sample could not be obtained as the site is a capped bore and the pump was not operating at the time of sampling.

Table E-6
Annual trend analysis

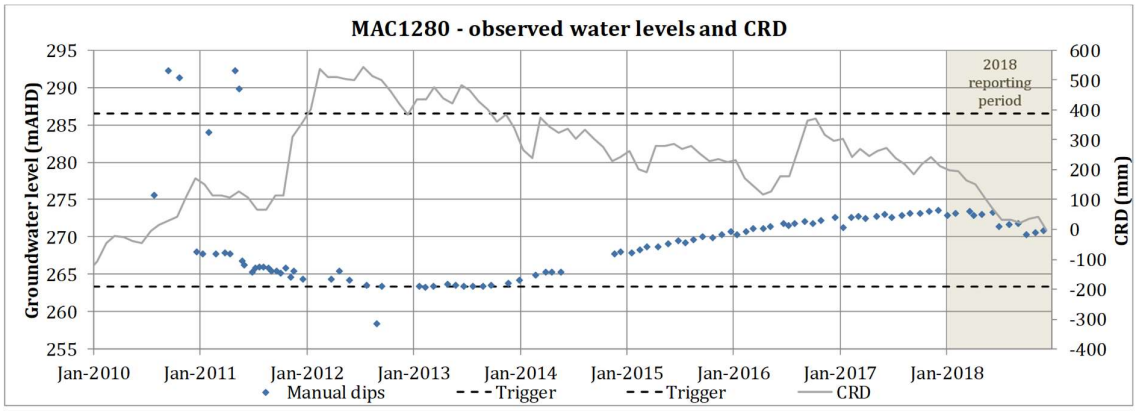
Bore	Annual difference (m)				Cumulative annual difference since December 2014 (m)				Geology
	Dec'14-Dec'15	Dec'15-Dec'16	Dec'16-Dec'17	Dec'17-Dec'18	Diff '14-'15	Diff '14-'16	Diff '14-'17	Diff '14-'18	
GW967138	-1.03	1.32	-0.52	-1.53	-1.03	0.29	-0.23	-1.76	Alluvium
REG1_VW1	-1.04	0.40	0.32	-0.52	-1.04	-0.64	-0.32	-0.85	Jeralong seam
REG1_VW2	-1.71	-0.01	0.09	-1.22	-1.71	-1.72	-1.63	-2.85	Merriown seam
REG1_VW3	-1.46	-0.27	-0.29	-1.16	-1.46	-1.74	-2.03	-3.18	Nagero seam
REG1_VW4	-2.12	-0.15	-0.39	-1.16	-2.12	-2.27	-2.66	-3.82	Therribri seam
GW041027	-1.38	5.28	-5.22	-0.91	-1.38	3.90	-1.32	-2.22	Alluvium
REG2_VW1	-1.11	5.12	-4.29	-1.31	-1.11	4.01	-0.28	-1.59	Fault zone
REG2_VW2	-2.52	4.32	-4.80	-1.00	-2.52	1.80	-3.00	-4.00	Fault zone
REG2_VW3	-3.15	3.67	-5.37	-1.69	-3.15	0.52	-4.85	-6.54	Fault zone
REG2_VW4	-1.18	4.57	-4.99	-1.84	-1.18	3.39	-1.60	-3.44	Fault zone
REG7A	-1.34	2.09	-1.24	-1.79	-1.34	0.75	-0.49	-2.28	Alluvium
REG7_VW1	-0.27	-0.31	0.37	-0.36	-0.27	-0.59	-0.22	-0.57	Braymont seam
REG7_VW2	0.53	-0.53	-1.03	-0.40	0.53	0.00	-1.04	-1.44	Merriown seam
REG7_VW3	-0.81	-0.80	-0.43	-0.79	-0.81	-1.61	-2.04	-2.83	Nagero seam
REG8_VW1	-2.29	-1.65	-2.11	-2.25	-2.29	-3.93	-6.04	-8.29	Braymont seam
REG8_VW2	0.07	-3.08	-9.92	-8.23	0.07	-3.00		-21.16	Merriown seam
REG8_VW3	-4.24	-2.85	-2.85	-5.36	-4.24	-7.09	-9.94		Nagero seam
REG9_VW1	-0.48	-0.57	1.18	-1.15	-0.48	-1.04	0.14	-1.02	Braymont seam
REG9_VW2	-1.50	-0.94	-0.04	-1.05	-1.50	-2.44	-2.49	-3.53	Merriown seam
REG9_VW3	-0.44	-0.51	-0.49	-0.96	-0.44	-0.95	-1.44	-2.39	Nagero seam
REG10_VW1	-0.24	-0.31	-0.31	-0.71	-0.24	-0.55	-0.87	-1.57	Braymont seam
REG10_VW2	-1.68	-1.56	-1.10	-3.77	-1.68	-3.24	-4.34	-8.11	Merriown seam
REG10_VW3	-1.98	-0.38	-1.16	-4.13	-1.98	-2.35	-3.51	-7.64	Nagero seam
REG10_VW4	-1.37	-1.79	-1.62	-4.12	-1.37	-3.15	-4.77	-8.89	Upper Northam seam

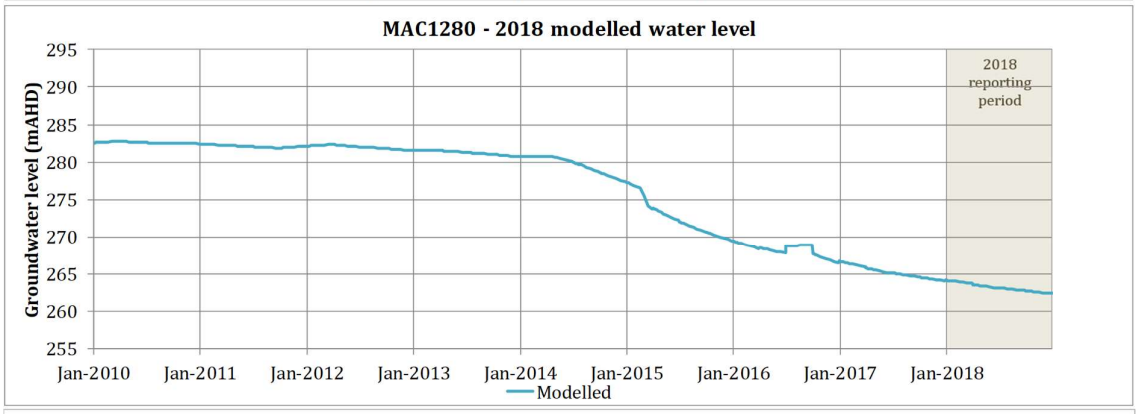
Bore	Annual difference (m)				Cumulative annual difference since December 2014 (m)				Geology
	Dec'14-Dec'15	Dec'15-Dec'16	Dec'16-Dec'17	Dec'17-Dec'18	Diff '14-'15	Diff '14-'16	Diff '14-'17	Diff '14-'18	
RB03_VW1	5.47	1.33	-8.80	-2.57	5.47	6.79	-2.01	-4.58	Braymont seam
RB03_VW2	-3.15	-1.23	-4.77	-5.68	-3.15	-4.38	-9.15		Merriown seam
RB03_VW3	-2.61	-0.12	-1.41	-6.27	-2.61	-2.73	-4.13		Nagero seam
RB03_VW4	-3.29	1.06	-2.13	-5.41	-3.29	-2.23	-4.36	-9.77	Templemore seam
RB04_VW2	-2.16	-2.44	-8.09	-5.76	-2.16	-4.60			Merriown seam
RB04_VW3	-3.14	-1.71	-4.91	-6.77	-3.14	-4.85	-9.76	-	Nagero seam
RB04_VW4	-3.50	-0.10	-4.06	-5.79	-3.50	-3.60	-7.66	-	Lower Northam seam
RB05A	-1.27	-1.08	-1.93	-3.29	-1.27	-2.35	-4.28	-7.57	Merriown seam
RB05_VW1	-1.39	-0.79	-0.83	-5.75	-1.39	-2.18	-3.01	-8.77	Braymont seam
RB05_VW2	-2.57	-1.82	-2.20	-3.73	-2.57	-4.38	-6.59		Jeralong seam
RB05_VW3	-1.99	-1.39	-2.22	-3.95	-1.99	-3.39	-5.60	-9.55	Nagero seam
RB05_VW4	-1.59	-0.71	-0.09	-2.91	-1.59	-2.30	-2.39	-5.30	Templemore seam
MAC1280	2.69	1.90	0.99	-2.80	2.69	4.59	5.58	2.78	Interburden
REG3	-0.80	0.91	-0.13	-1.99	-0.80	0.11	-0.02	-2.01	Boggabri Volcanics
REG4	0.30	0.09	-0.06	-0.18	0.30	0.39	0.33	0.15	Boggabri Volcanics
REG5	---	0.06	0.00	-0.07	---	0.06	0.06	-0.01	Boggabri Volcanics
REG6	---	-0.10	-0.03	-2.06	---	-0.10	-0.13	-2.19	Boggabri Volcanics
REG12	-0.19	-0.07	0.06	-0.11	-0.19	-0.26	-0.20	-0.31	Boggabri Volcanics
REG13	0.02	0.13	0.30	-0.09	0.02	0.15	0.45	0.36	Boggabri Volcanics
REG14	-0.15	0.24	-0.39	-1.10	-0.15	0.09	-0.30	-1.40	Basement

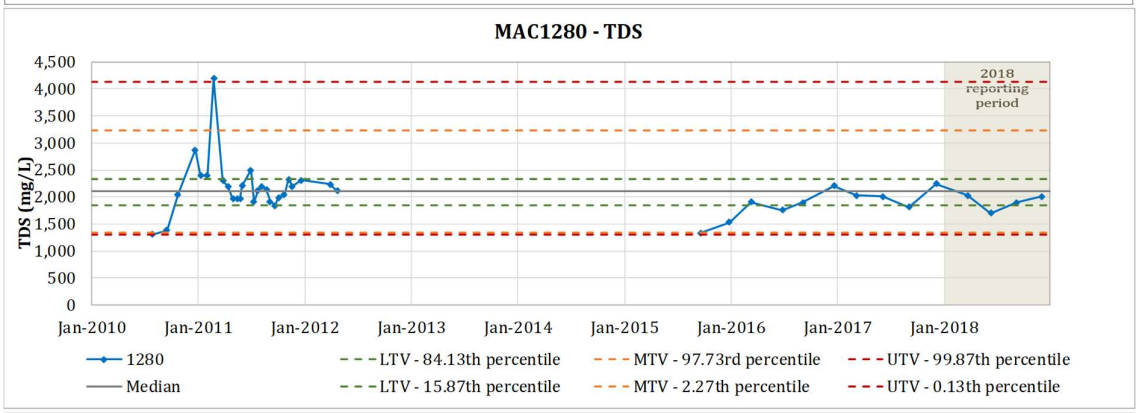
Cumulative annual difference in water level since December 2014

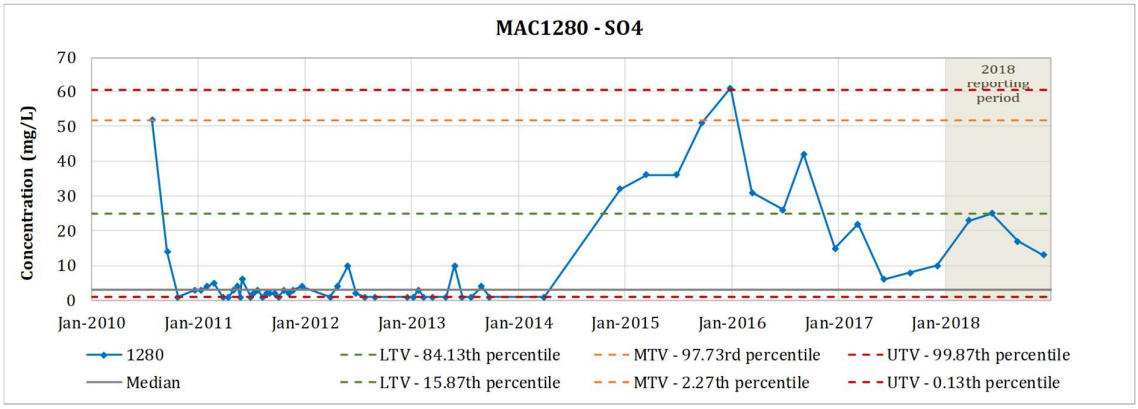


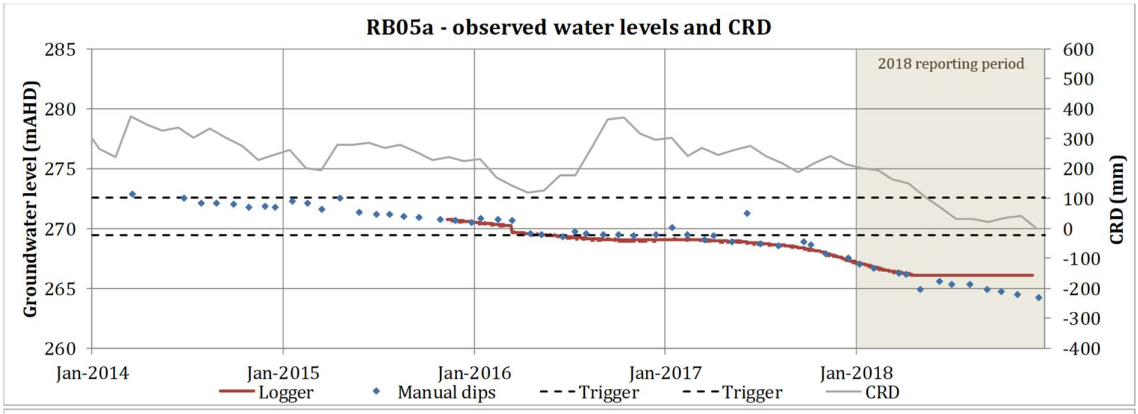
Regional standpipe monitoring bores – observed and modelled water levels, and water quality trigger parameters

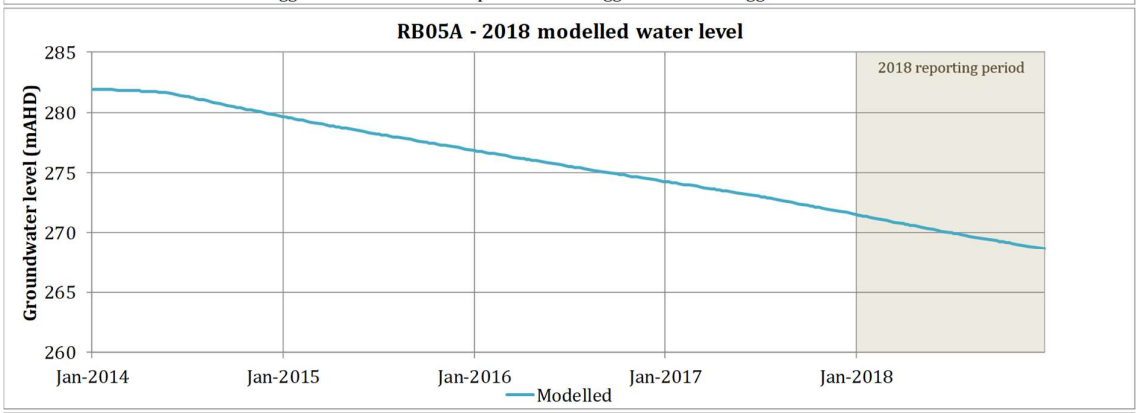


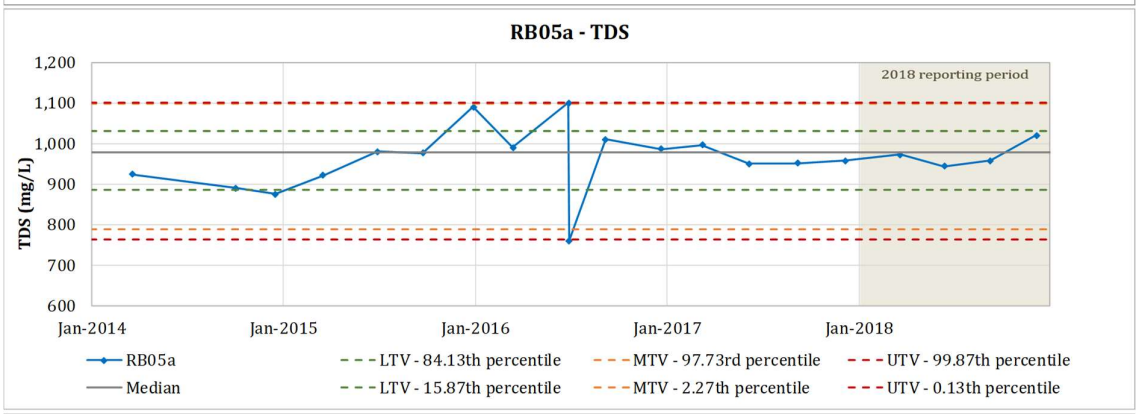


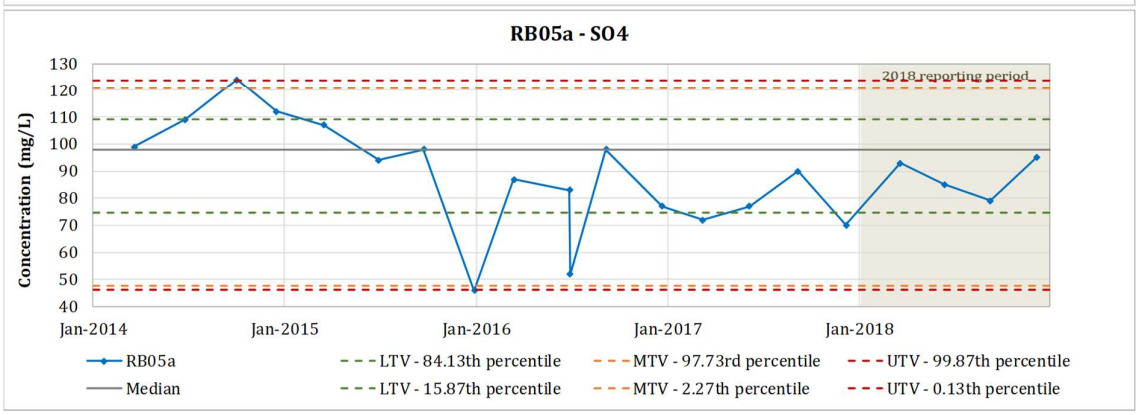


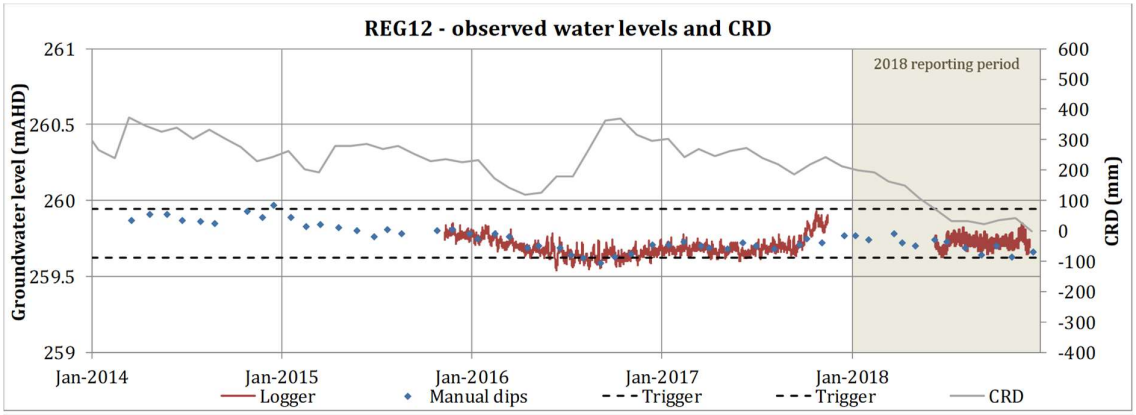


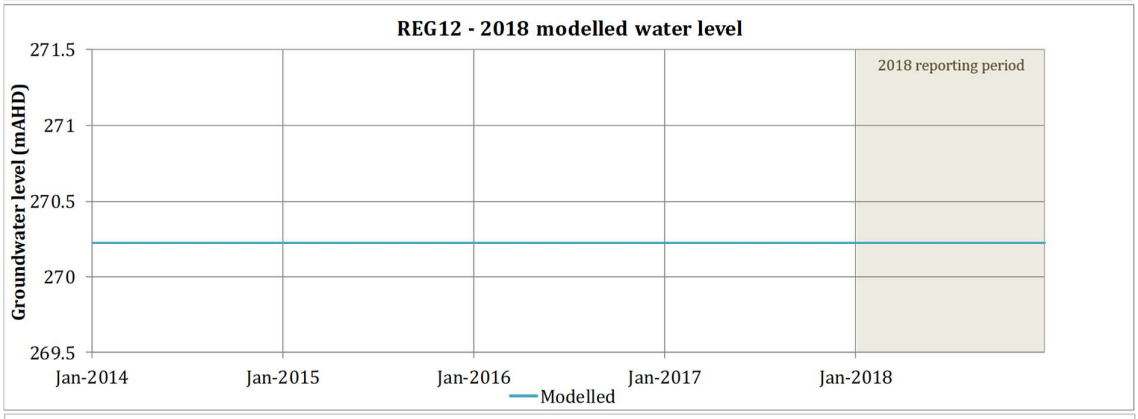

RB05a - observed water levels and CRD
Groundwater level (mAHD)
CRD (mm)
2018 reporting period
285
280
275
270
265
260
600
500
400
300
200
100
0
-100
-200
-300
-400
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Logger
Manual dips
Trigger
Trigger
CRD

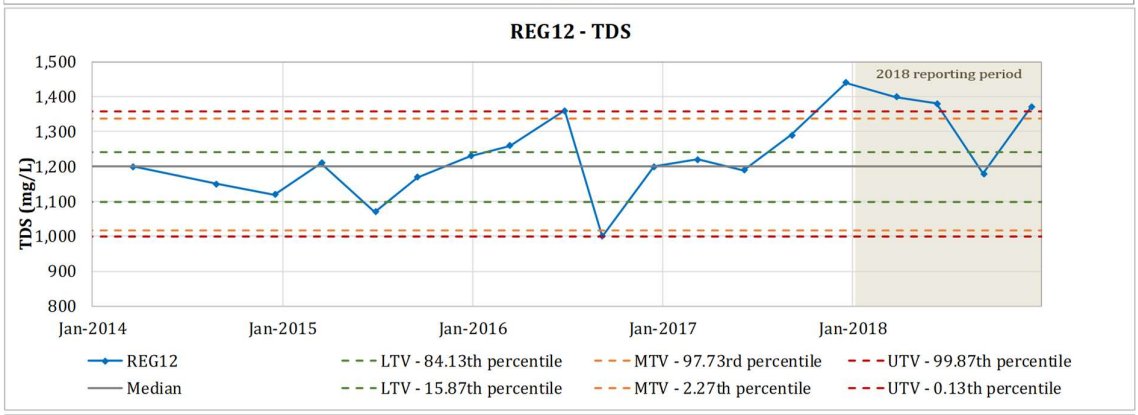

RB05A - 2018 modelled water level
Groundwater level (mAHD)
2018 reporting period
285
280
275
270
265
260
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Modelled

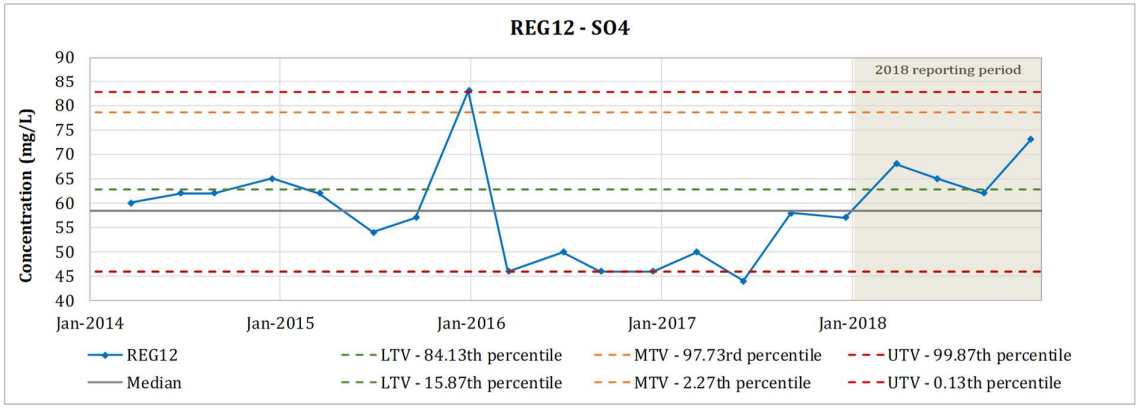

RB05a - TDS
TDS (mg/L)
2018 reporting period
1,200
1,100
1,000
900
800
700
600
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
RB05a
LTV - 84.13th percentile
MTV - 97.73rd percentile
UTV - 99.87th percentile
Median
LTV - 15.87th percentile
MTV - 2.27th percentile
UTV - 0.13th percentile

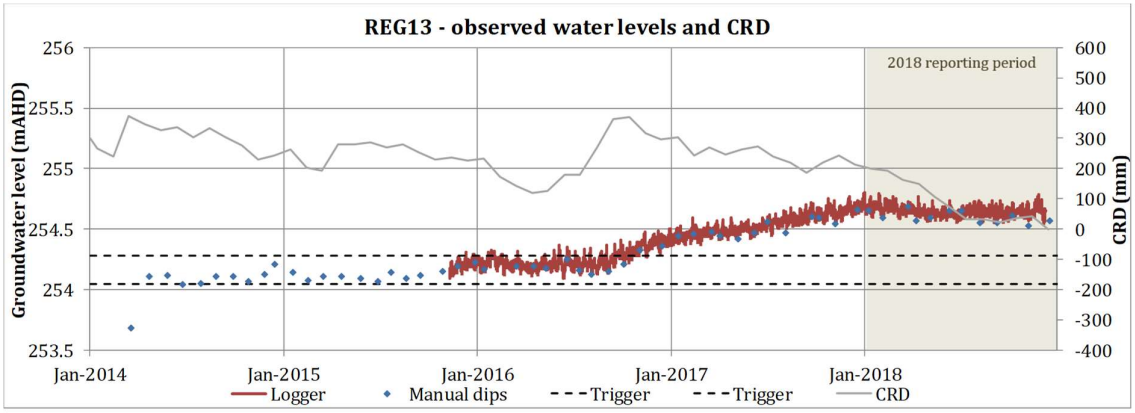

RB05a - SO4
Concentration (mg/L)
2018 reporting period
130
120
110
100
90
80
70
60
50
40
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
RB05a
LTV - 84.13th percentile
MTV - 97.73rd percentile
UTV - 99.87th percentile
Median
LTV - 15.87th percentile
MTV - 2.27th percentile
UTV - 0.13th percentile

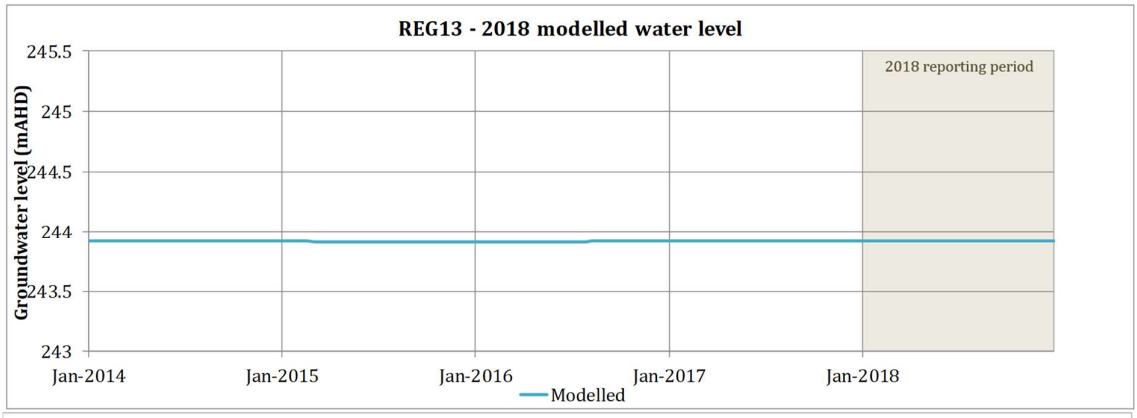

REG12 - observed water levels and CRD
Groundwater level (mAHD)
CRD (mm)
2018 reporting period
261
260.5
260
259.5
259
600
500
400
300
200
100
0
-100
-200
-300
-400
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Logger
Manual dips
Trigger
Trigger
CRD

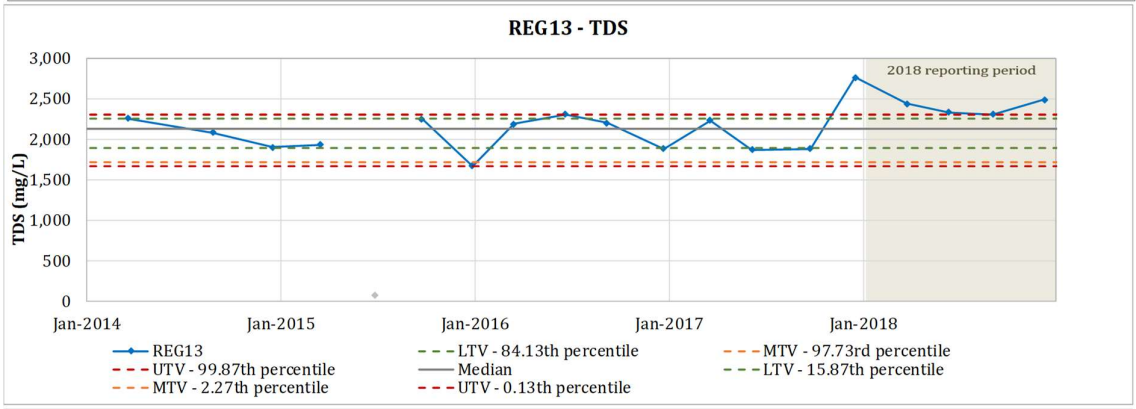

REG12 - 2018 modelled water level
Groundwater level (mAHD)
2018 reporting period
271.5
271
270.5
270
269.5
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Modelled

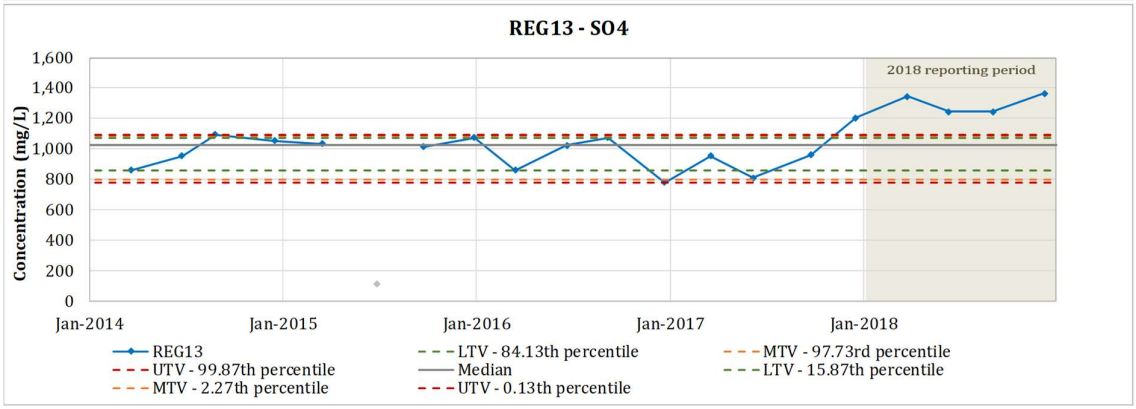

REG12 - TDS
TDS (mg/L)
2018 reporting period
1,500
1,400
1,300
1,200
1,100
1,000
900
800
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
REG12
Median
LTV - 84.13th percentile
LTV - 15.87th percentile
MTV - 97.73rd percentile
MTV - 2.27th percentile
UTV - 99.87th percentile
UTV - 0.13th percentile

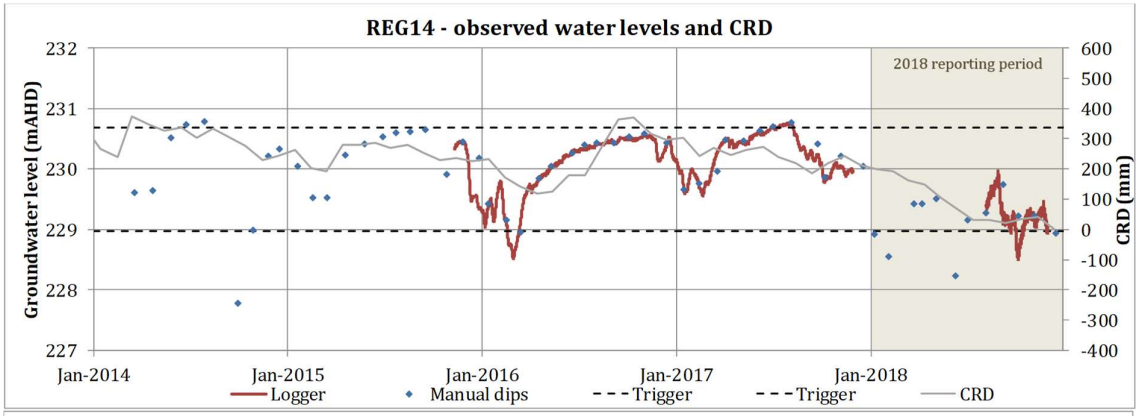

REG12 - SO4
Concentration (mg/L)
2018 reporting period
90
85
80
75
70
65
60
55
50
45
40
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
REG12
Median
LTV - 84.13th percentile
LTV - 15.87th percentile
MTV - 97.73rd percentile
MTV - 2.27th percentile
UTV - 99.87th percentile
UTV - 0.13th percentile

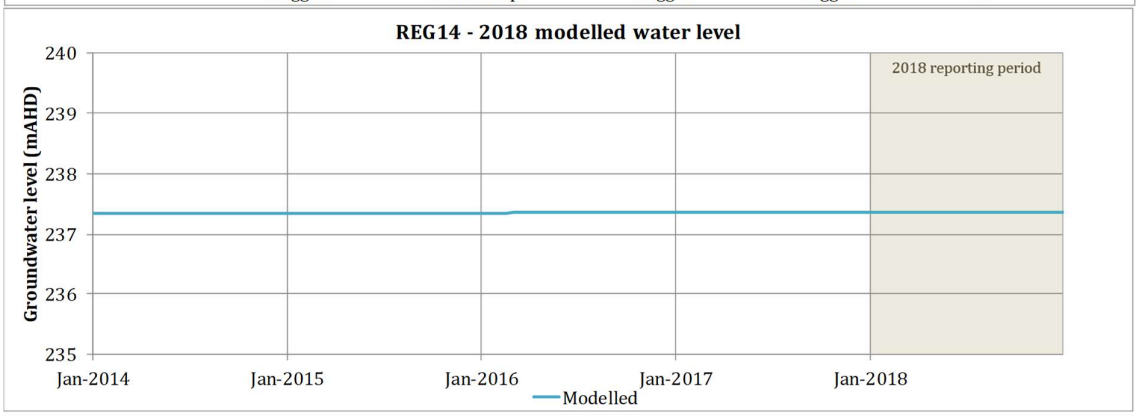

REG13 - observed water levels and CRD
Groundwater level (mAHD)
CRD (mm)
2018 reporting period
256
255.5
255
254.5
254
253.5
600
500
400
300
200
100
0
-100
-200
-300
-400
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Logger
Manual dips
Trigger
Trigger
CRD

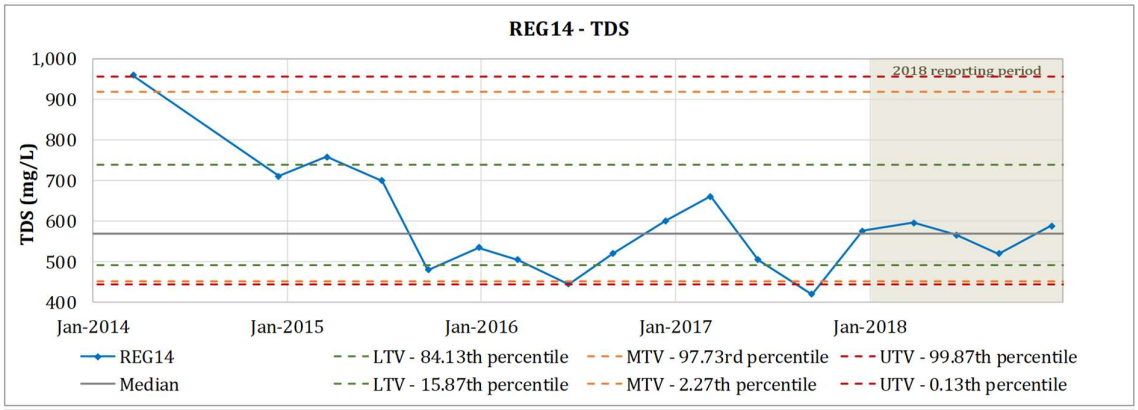

REG13 - 2018 modelled water level
Groundwater level (mAHD)
2018 reporting period
245.5
245
244.5
244
243.5
243
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Modelled

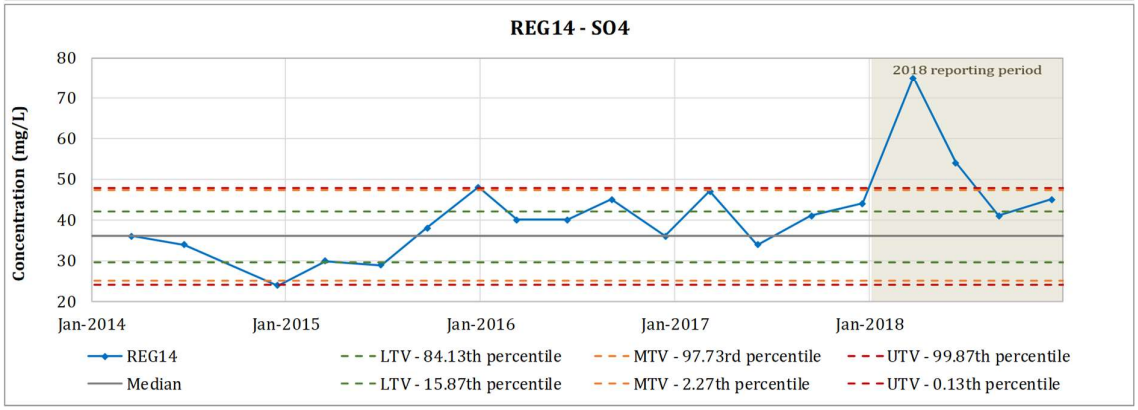

REG13 - TDS
TDS (mg/L)
2018 reporting period
3,000
2,500
2,000
1,500
1,000
500
0
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
REG13
LTV - 84.13th percentile
MTV - 97.73rd percentile
UTV - 99.87th percentile
Median
LTV - 15.87th percentile
MTV - 2.27th percentile
UTV - 0.13th percentile

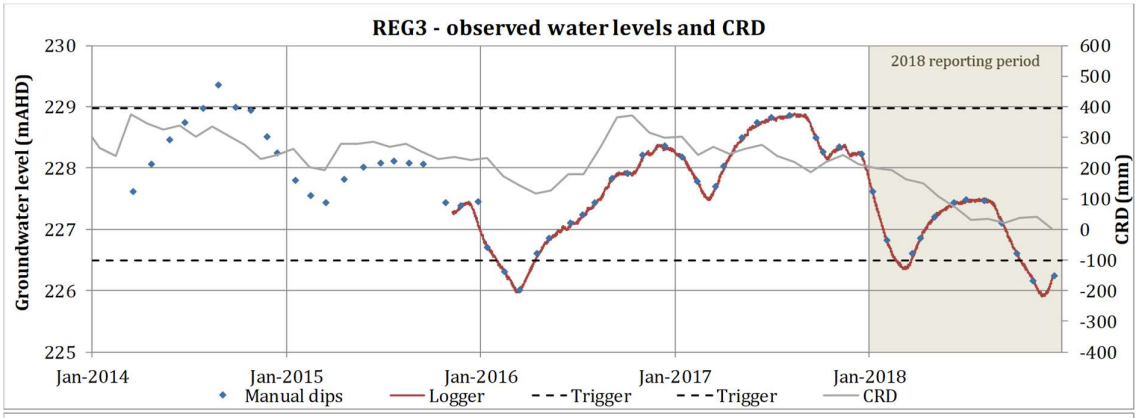

REG13 - SO4
Concentration (mg/L)
2018 reporting period
1,600
1,400
1,200
1,000
800
600
400
200
0
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
REG13
LTV - 84.13th percentile
MTV - 97.73rd percentile
UTV - 99.87th percentile
Median
LTV - 15.87th percentile
MTV - 2.27th percentile
UTV - 0.13th percentile

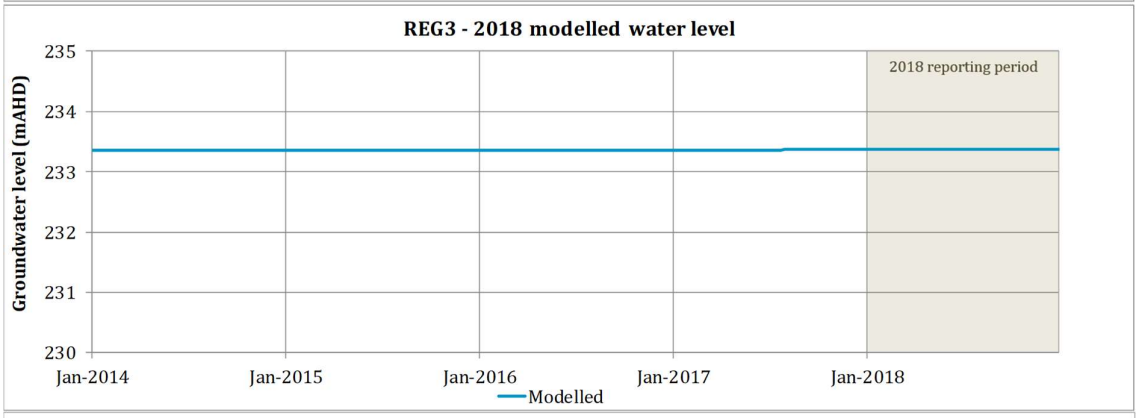

REG14 - observed water levels and CRD
Groundwater level (mAHD)
CRD (mm)
2018 reporting period
Logger
Manual dips
Trigger
Trigger
CRD

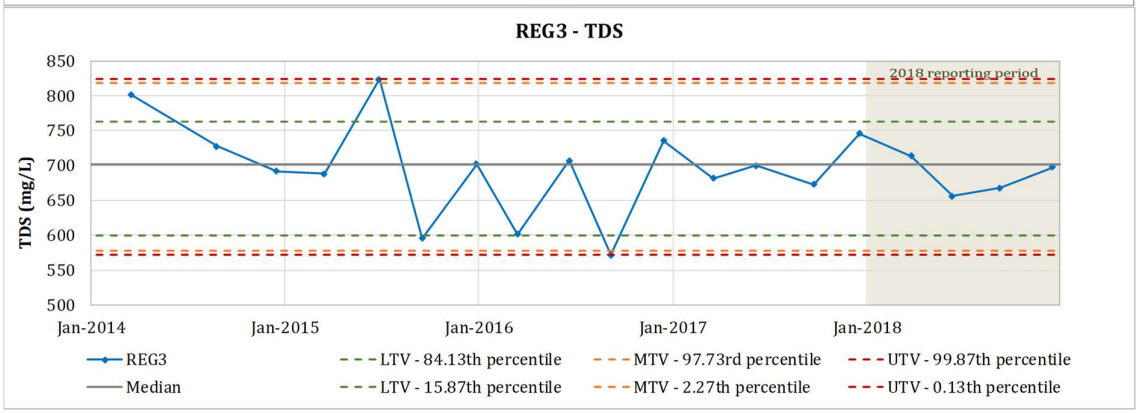

REG14 - 2018 modelled water level
Groundwater level (mAHD)
2018 reporting period
Modelled

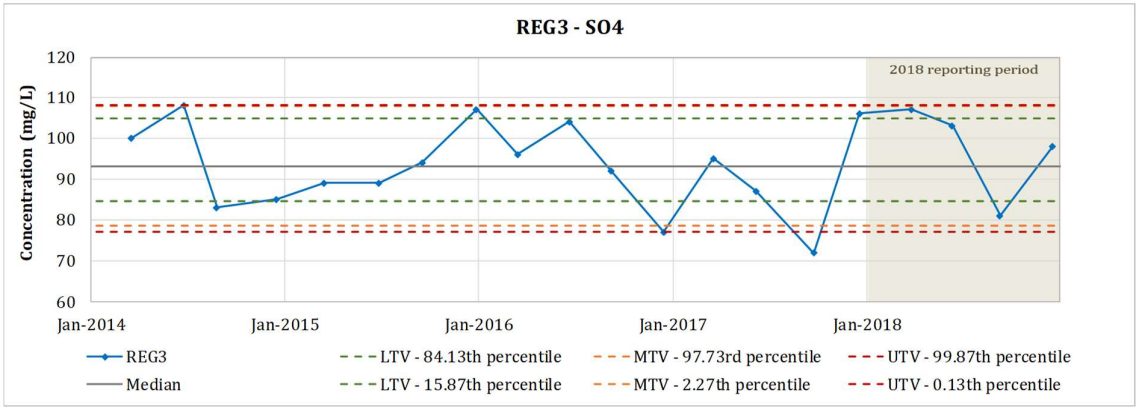

REG14 - TDS
TDS (mg/L)
2018 reporting period
REG14
Median
LTV - 84.13th percentile
LTV - 15.87th percentile
MTV - 97.73rd percentile
MTV - 2.27th percentile
UTV - 99.87th percentile
UTV - 0.13th percentile

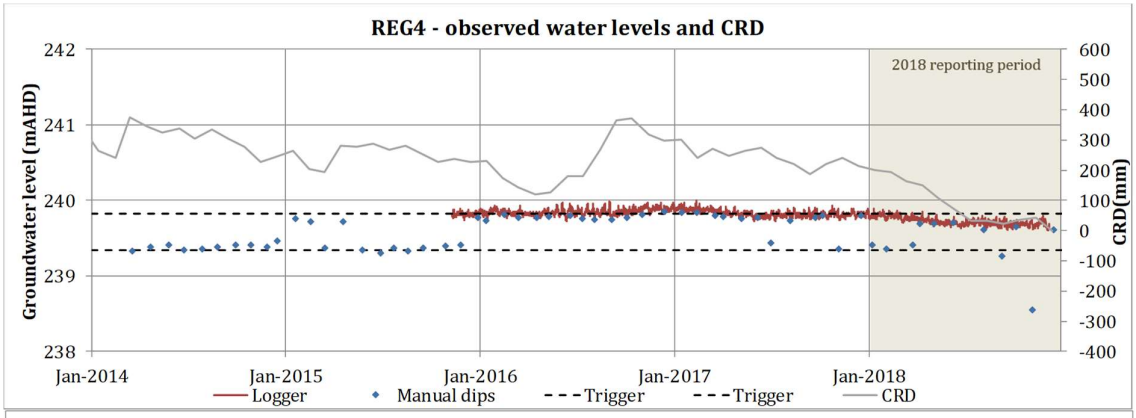

REG14 - SO4
Concentration (mg/L)
2018 reporting period
REG14
Median
LTV - 84.13th percentile
LTV - 15.87th percentile
MTV - 97.73rd percentile
MTV - 2.27th percentile
UTV - 99.87th percentile
UTV - 0.13th percentile

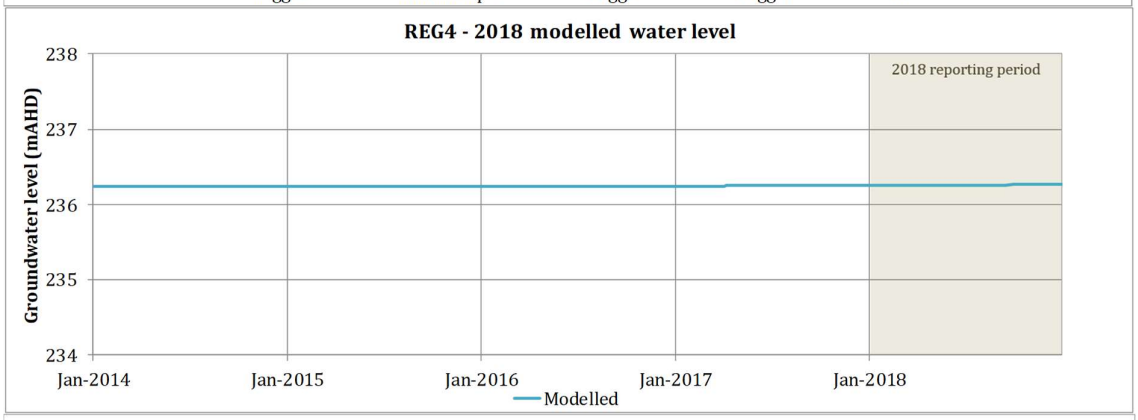

REG3 - observed water levels and CRD
Groundwater level (mAHD)
CRD (mm)
2018 reporting period
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Manual dips
Logger
Trigger
Trigger
CRD

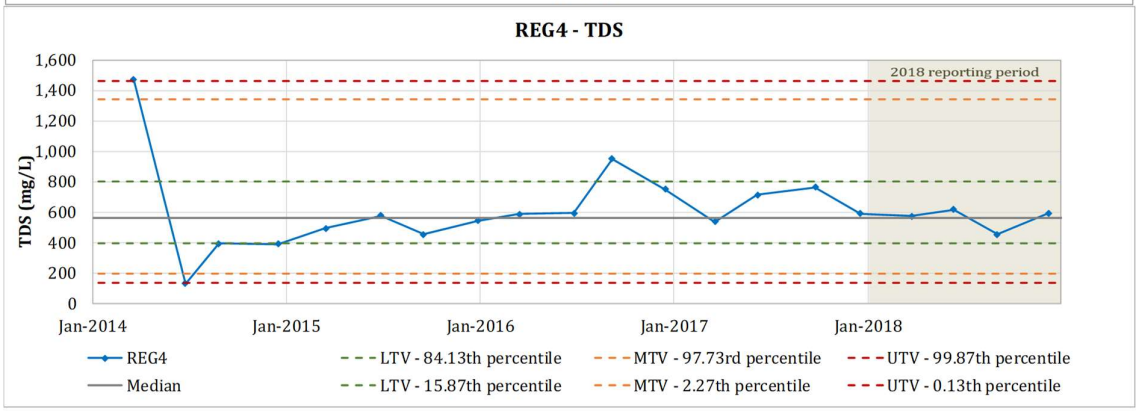

REG3 - 2018 modelled water level
Groundwater level (mAHD)
2018 reporting period
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Modelled

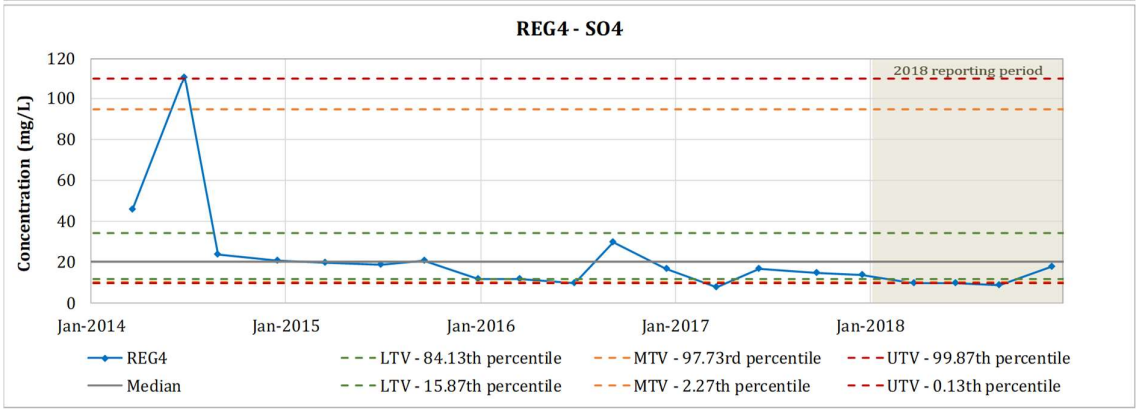

REG3 - TDS
TDS (mg/L)
2018 reporting period
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
REG3
LTV - 84.13th percentile
MTV - 97.73rd percentile
UTV - 99.87th percentile
Median
LTV - 15.87th percentile
MTV - 2.27th percentile
UTV - 0.13th percentile

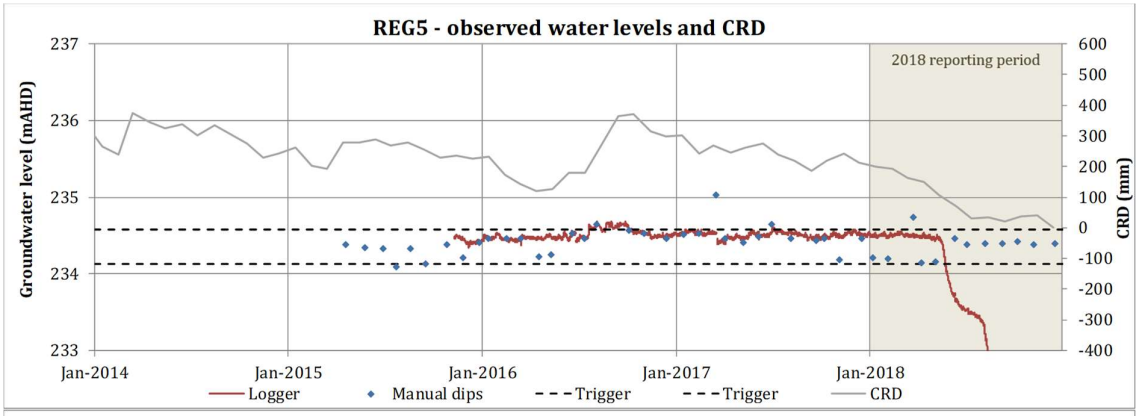

REG3 - SO4
Concentration (mg/L)
2018 reporting period
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
REG3
LTV - 84.13th percentile
MTV - 97.73rd percentile
UTV - 99.87th percentile
Median
LTV - 15.87th percentile
MTV - 2.27th percentile
UTV - 0.13th percentile

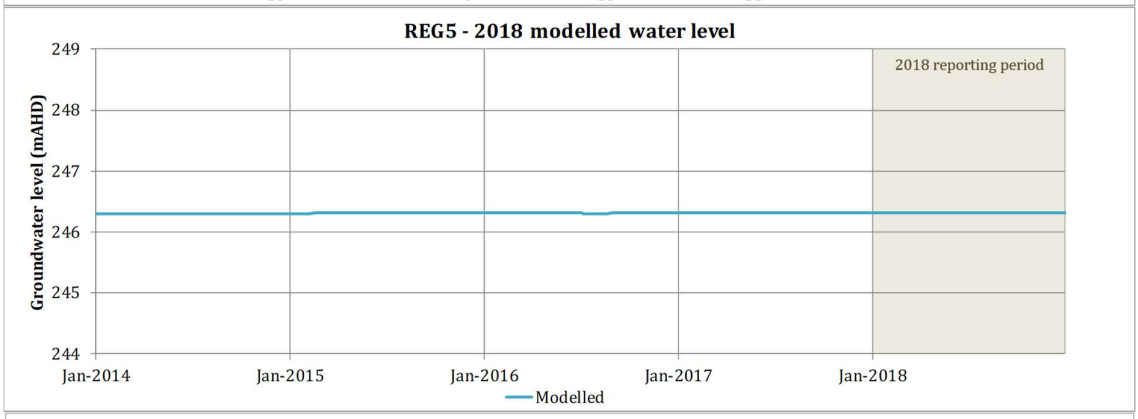

REG4 - observed water levels and CRD
Groundwater level (mAHD)
CRD(mm)
2018 reporting period
Logger
Manual dips
Trigger
Trigger
CRD

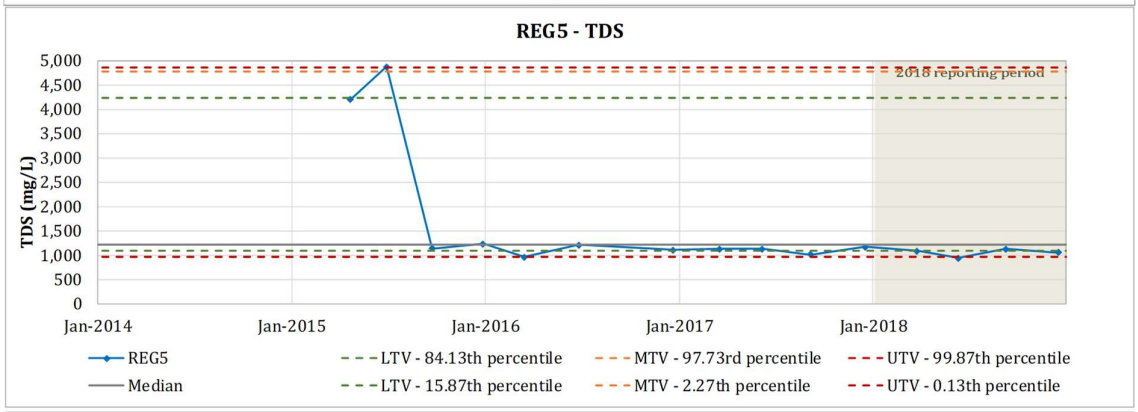

REG4 - 2018 modelled water level
Groundwater level (mAHD)
2018 reporting period
Modelled

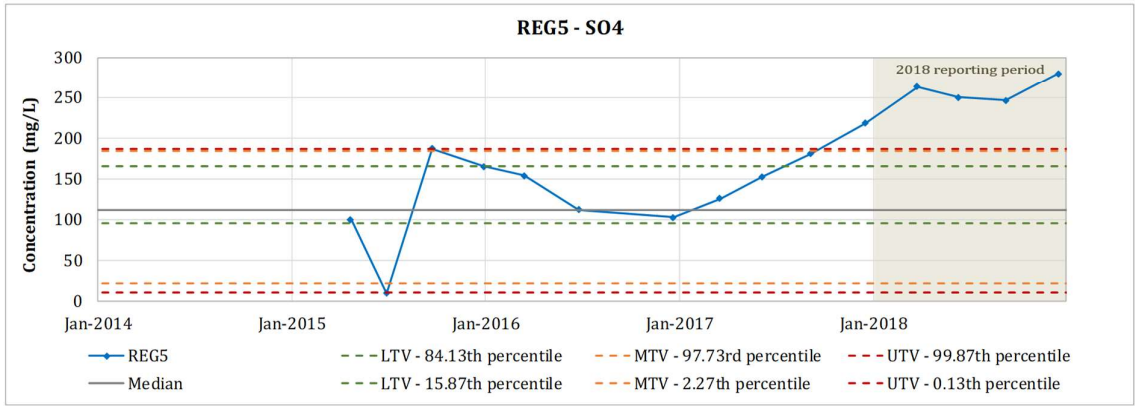

REG4 - TDS
TDS (mg/L)
2018 reporting period
REG4
Median
LTV - 84.13th percentile
LTV - 15.87th percentile
MTV - 97.73rd percentile
MTV - 2.27th percentile
UTV - 99.87th percentile
UTV - 0.13th percentile

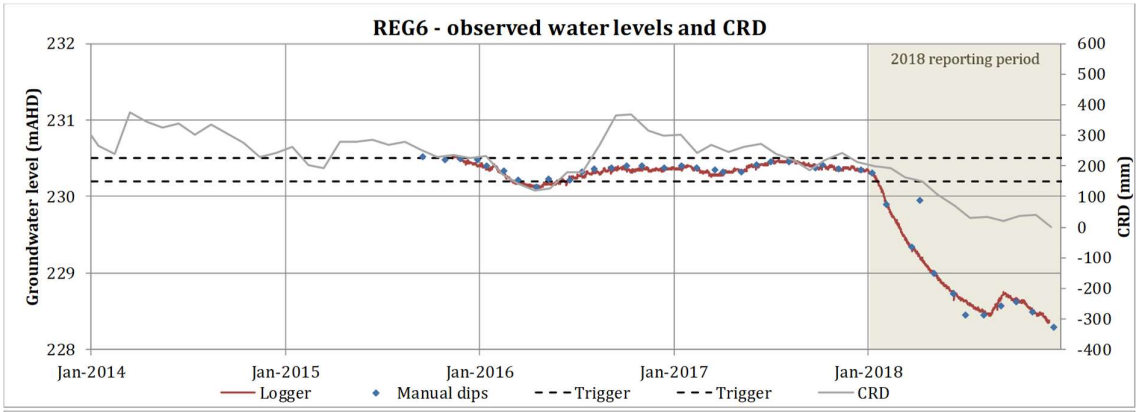

REG4 - SO4
Concentration (mg/L)
2018 reporting period
REG4
Median
LTV - 84.13th percentile
LTV - 15.87th percentile
MTV - 97.73rd percentile
MTV - 2.27th percentile
UTV - 99.87th percentile
UTV - 0.13th percentile

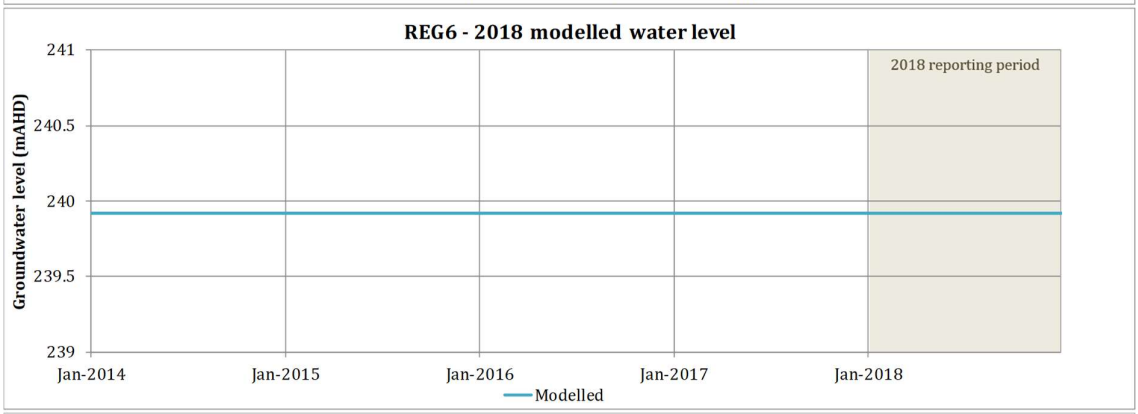

REG5 - observed water levels and CRD
Groundwater level (mAHD)
CRD (mm)
2018 reporting period
237
236
235
234
233
600
500
400
300
200
100
0
-100
-200
-300
-400
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Logger
Manual dips
Trigger
Trigger
CRD

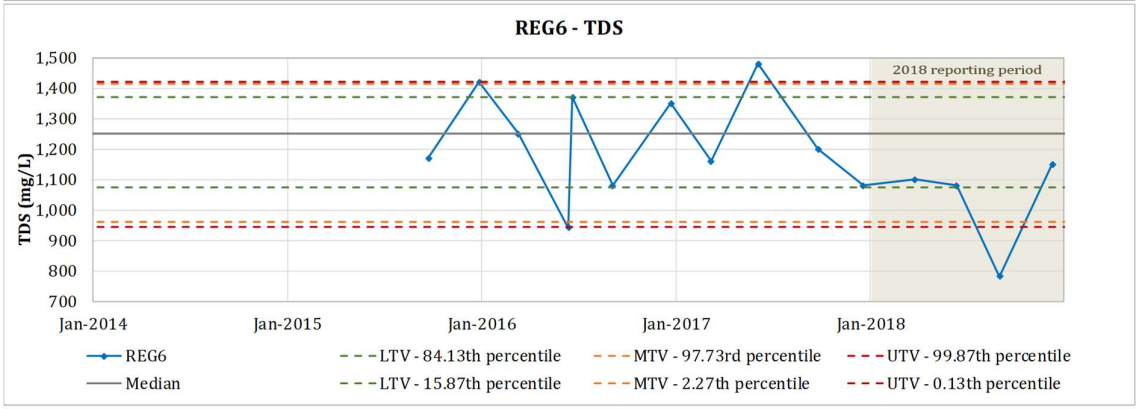

REG5 - 2018 modelled water level
Groundwater level (mAHD)
2018 reporting period
249
248
247
246
245
244
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Modelled

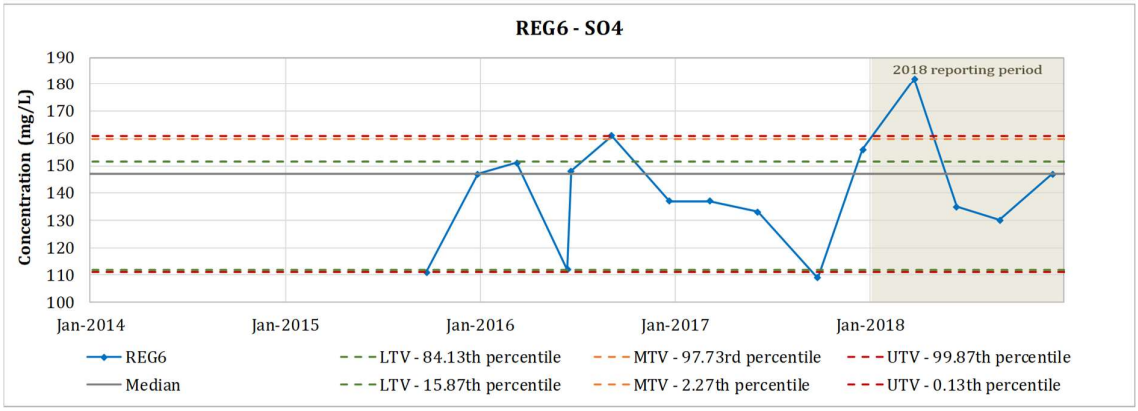

REG5 - TDS
TDS (mg/L)
2018 reporting period
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
REG5
LTV - 84.13th percentile
MTV - 97.73rd percentile
UTV - 99.87th percentile
Median
LTV - 15.87th percentile
MTV - 2.27th percentile
UTV - 0.13th percentile

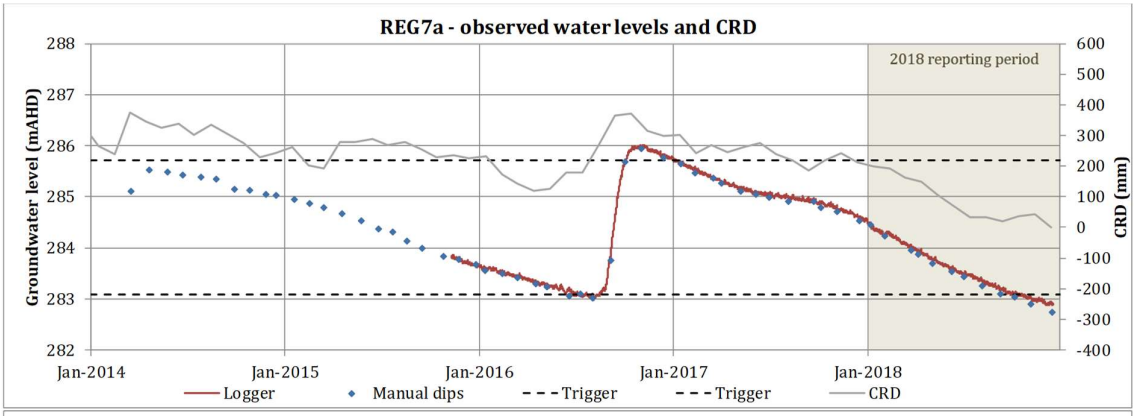

REG5 - SO4
Concentration (mg/L)
2018 reporting period
300
250
200
150
100
50
0
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
REG5
LTV - 84.13th percentile
MTV - 97.73rd percentile
UTV - 99.87th percentile
Median
LTV - 15.87th percentile
MTV - 2.27th percentile
UTV - 0.13th percentile

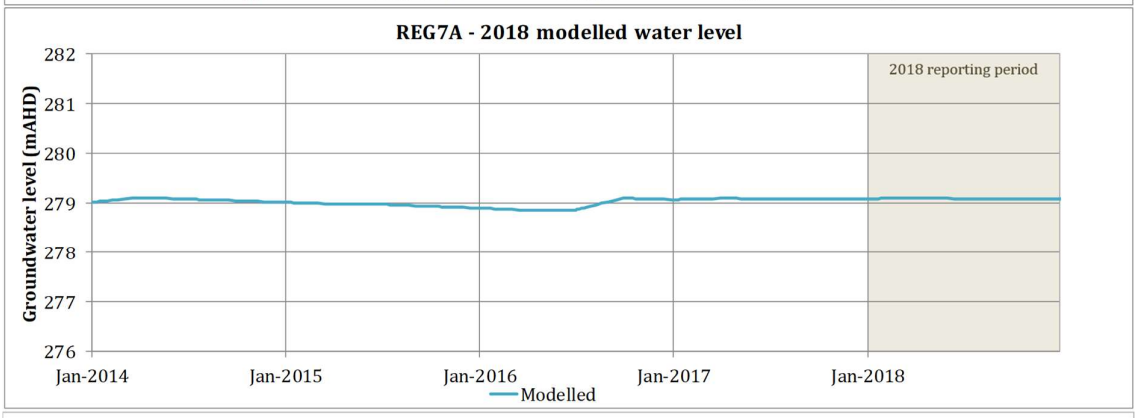

REG6 - observed water levels and CRD
Groundwater level (mAHD)
CRD (mm)
2018 reporting period
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Logger
Manual dips
Trigger
Trigger
CRD

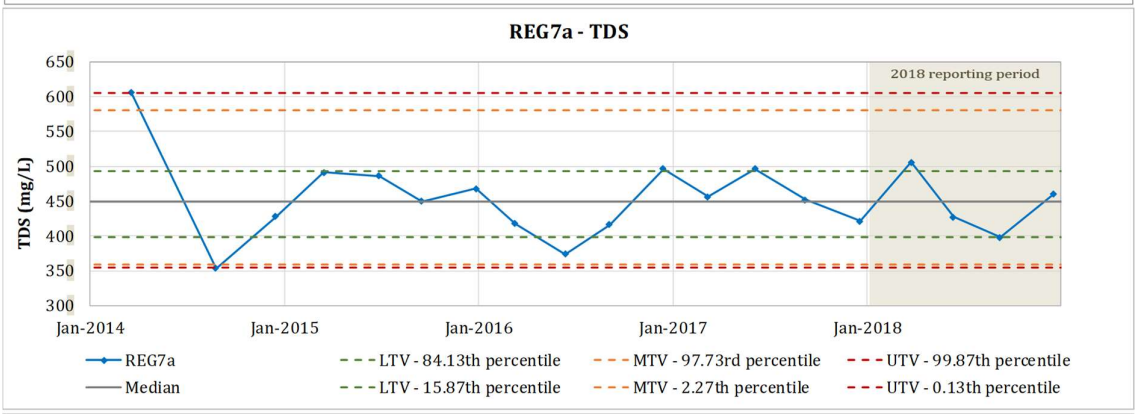

REG6 - 2018 modelled water level
Groundwater level (mAHD)
2018 reporting period
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Modelled

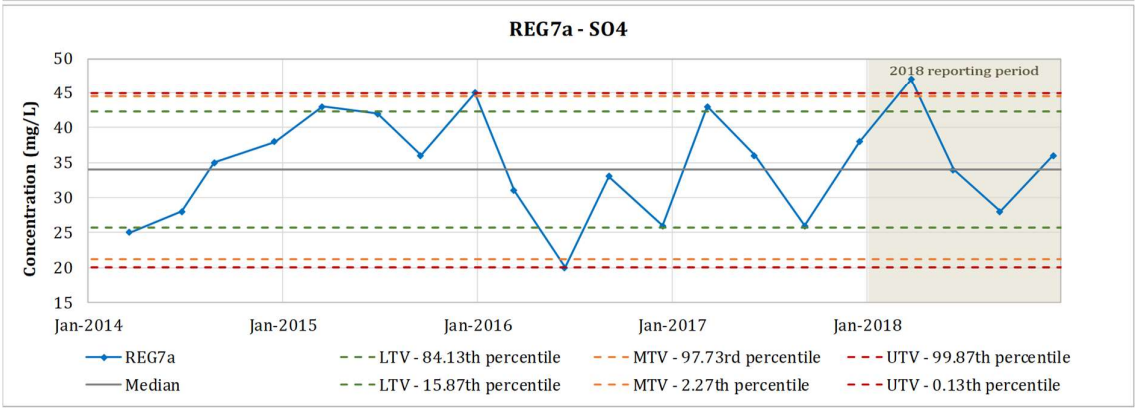

REG6 - TDS
TDS (mg/L)
2018 reporting period
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
REG6
Median
LTV - 84.13th percentile
LTV - 15.87th percentile
MTV - 97.73rd percentile
MTV - 2.27th percentile
UTV - 99.87th percentile
UTV - 0.13th percentile


REG6 - SO4
Concentration (mg/L)
2018 reporting period
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
REG6
Median
LTV - 84.13th percentile
LTV - 15.87th percentile
MTV - 97.73rd percentile
MTV - 2.27th percentile
UTV - 99.87th percentile
UTV - 0.13th percentile

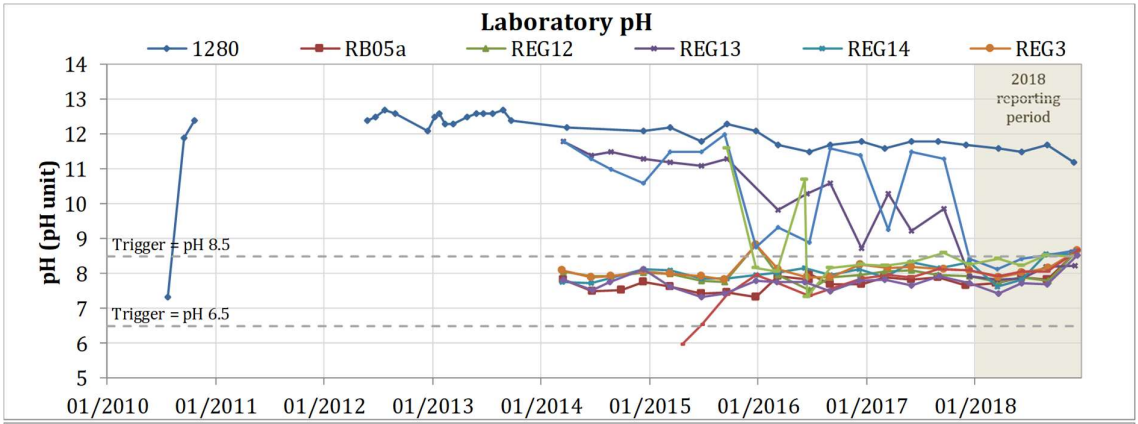

REG7a - observed water levels and CRD
Groundwater level (mAHD)
CRD (mm)
2018 reporting period
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Logger
Manual dips
Trigger
Trigger
CRD

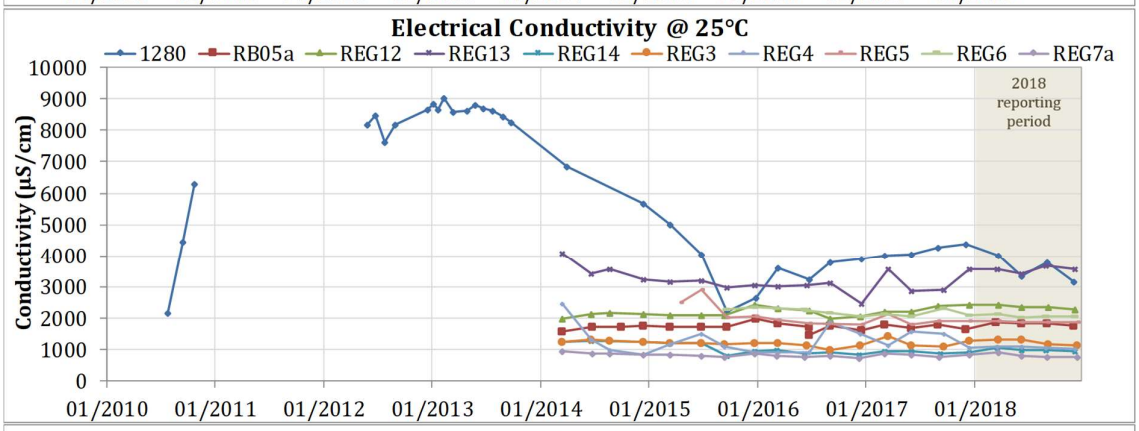

REG7A - 2018 modelled water level
Groundwater level (mAHD)
2018 reporting period
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Modelled

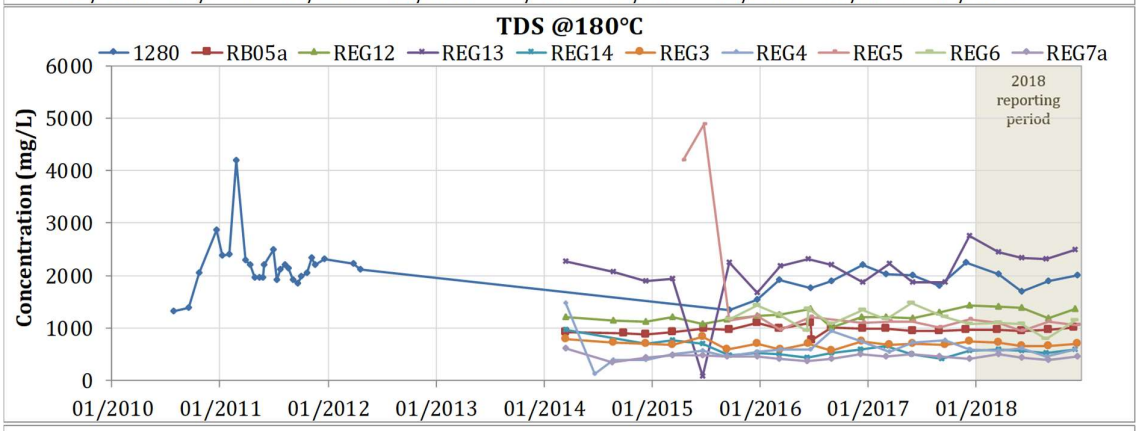

REG7a - TDS
TDS (mg/L)
2018 reporting period
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
REG7a
LTV - 84.13th percentile
MTV - 97.73rd percentile
UTV - 99.87th percentile
Median
LTV - 15.87th percentile
MTV - 2.27th percentile
UTV - 0.13th percentile

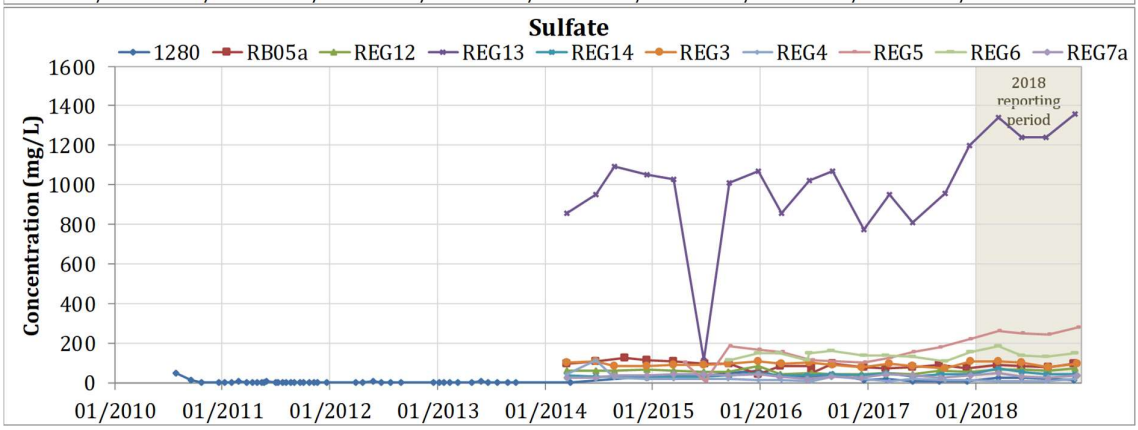

REG7a - SO4
Concentration (mg/L)
2018 reporting period
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
REG7a
LTV - 84.13th percentile
MTV - 97.73rd percentile
UTV - 99.87th percentile
Median
LTV - 15.87th percentile
MTV - 2.27th percentile
UTV - 0.13th percentile

Regional standpipe monitoring bores – Individual water quality parameters

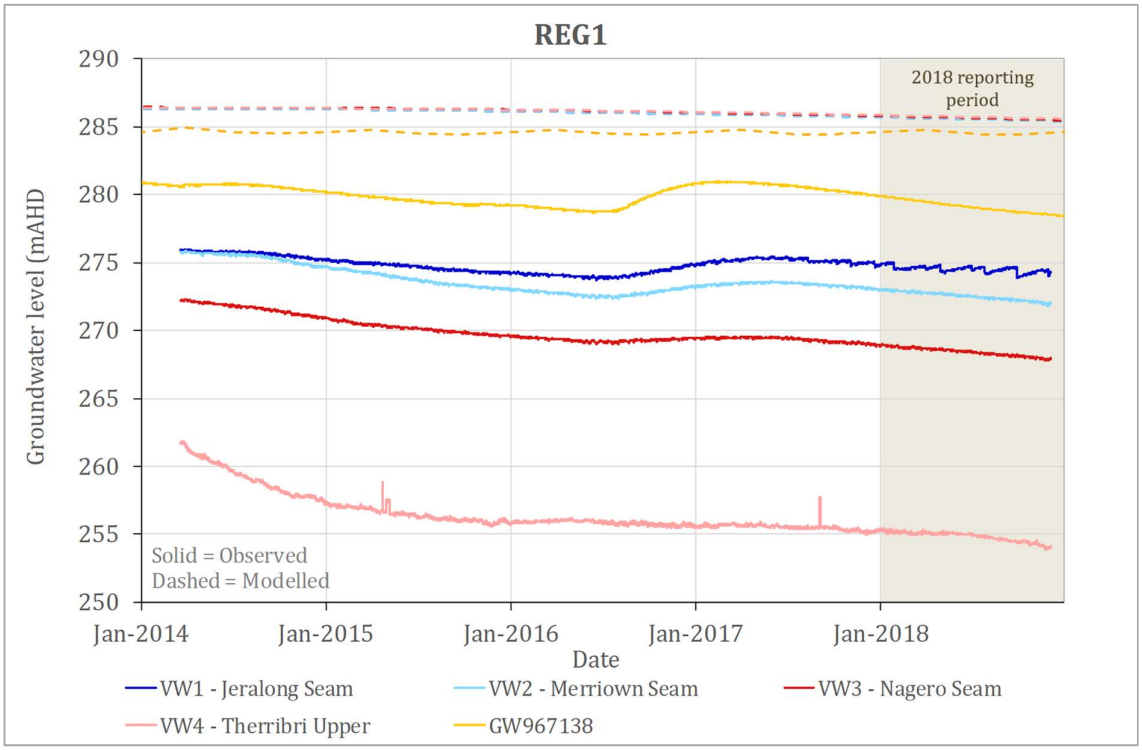


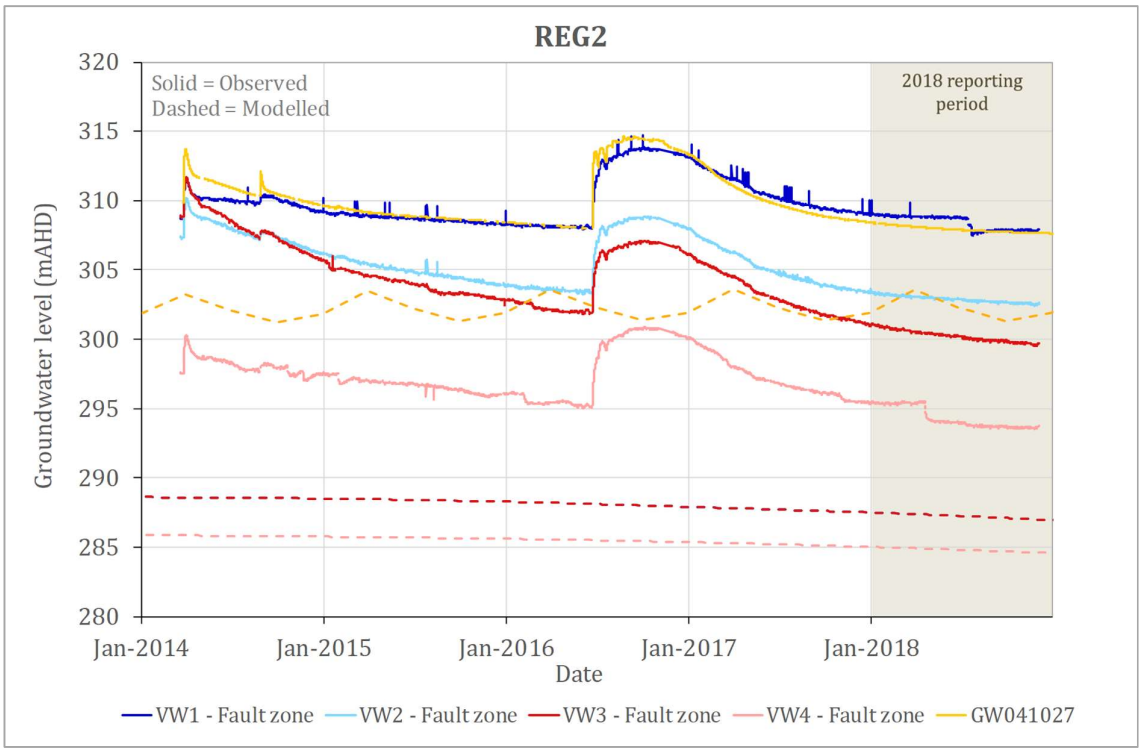


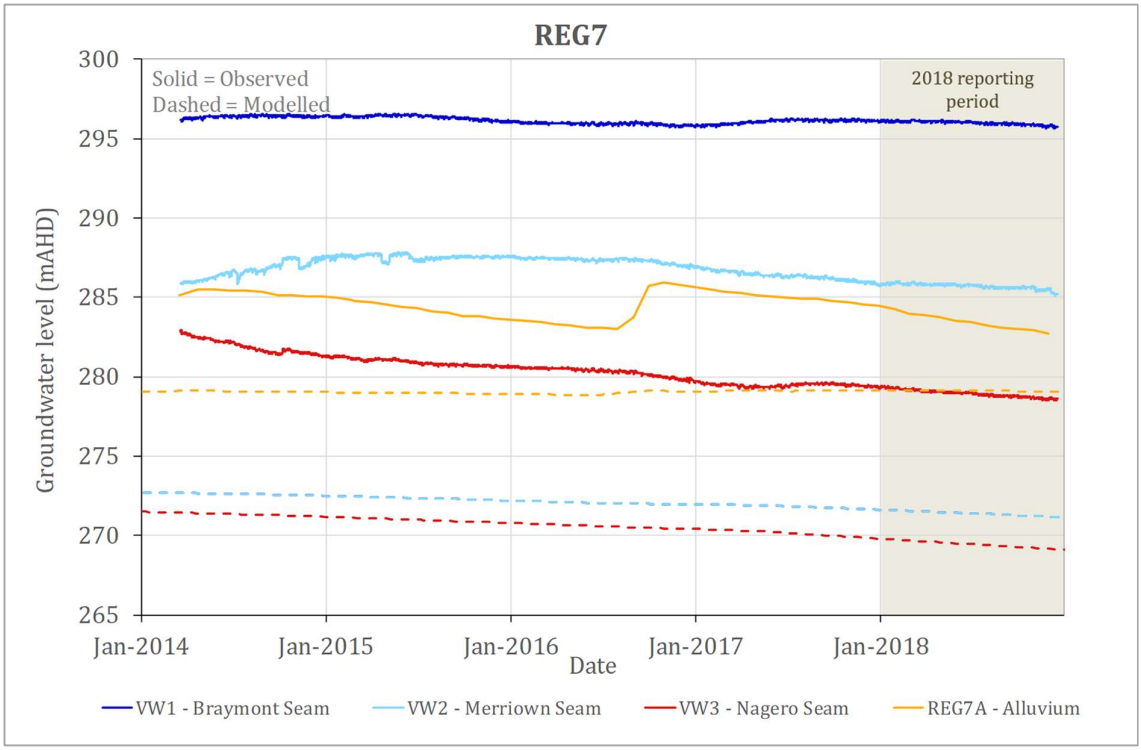


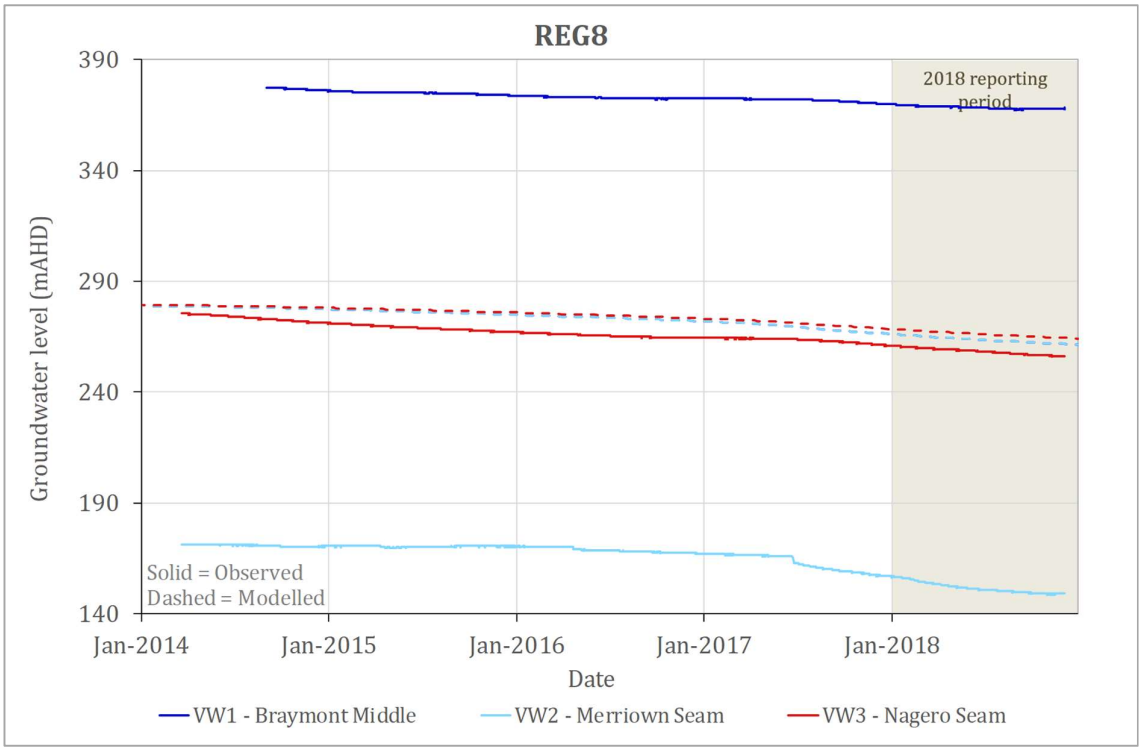


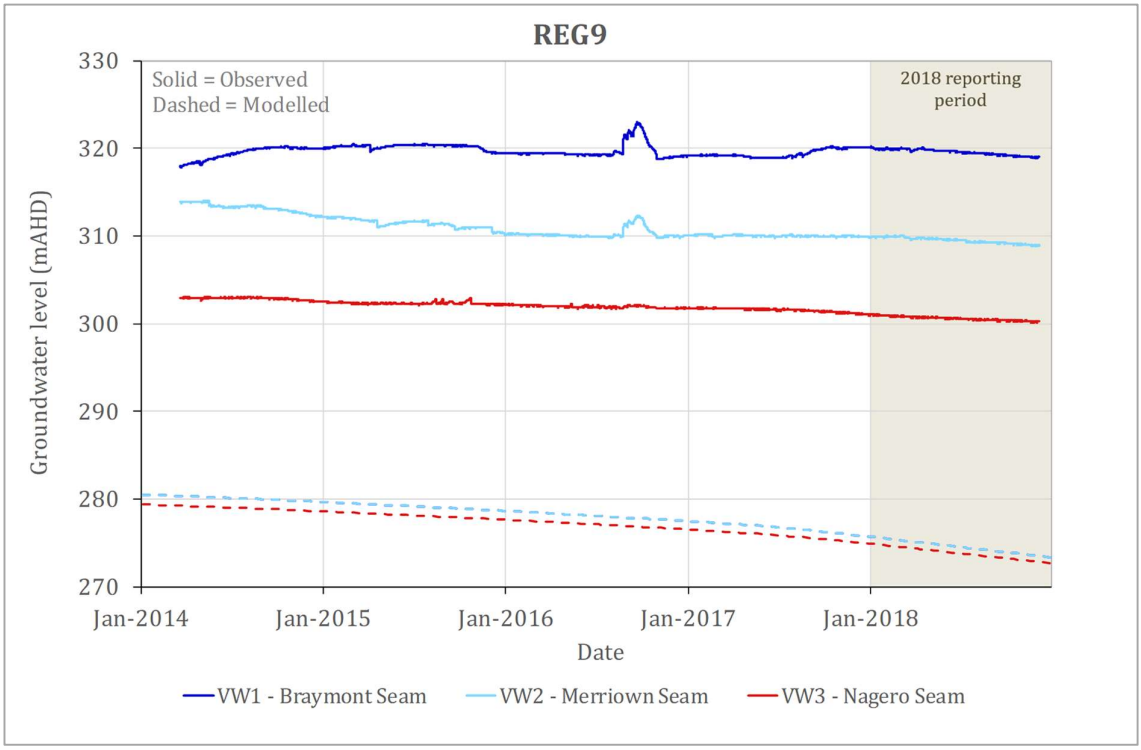
Regional Vibrating Wire Piezometers - observed and modelled (2018) water levels

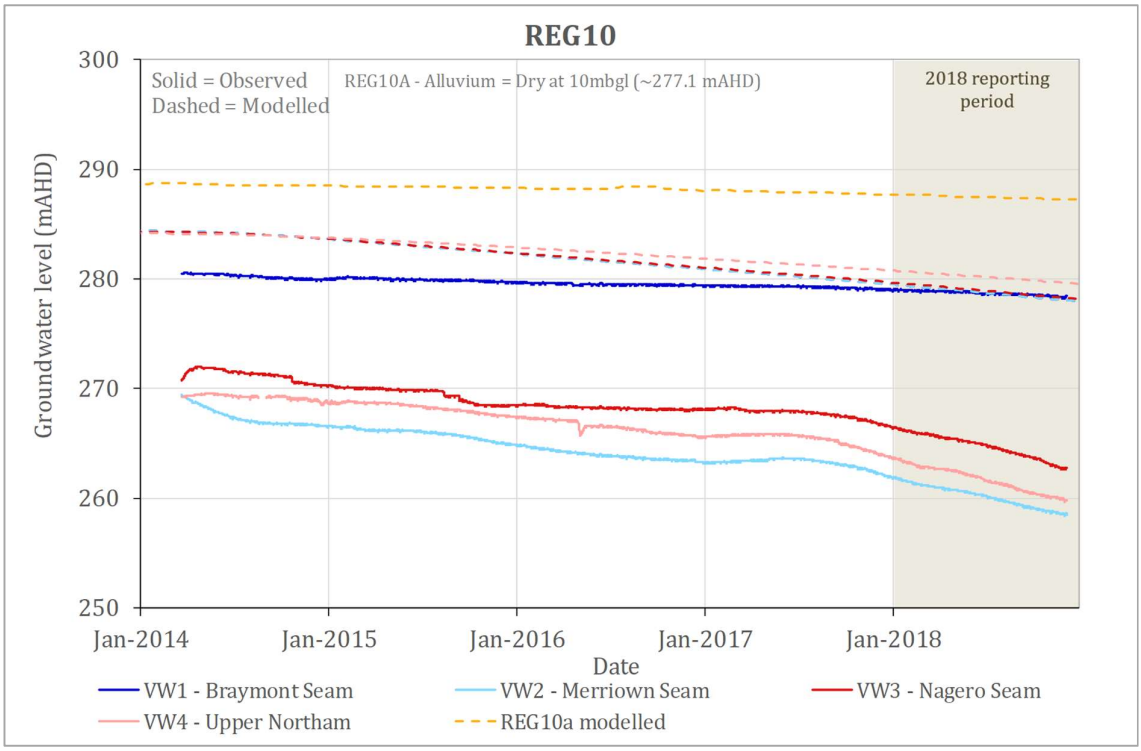


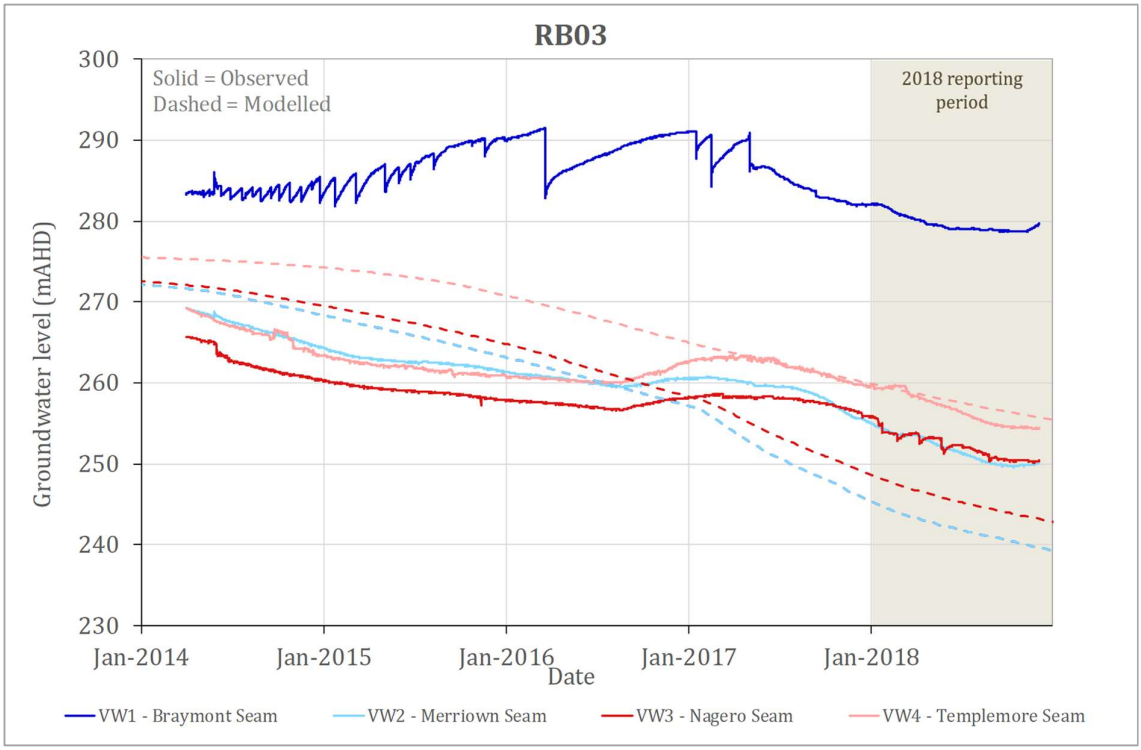


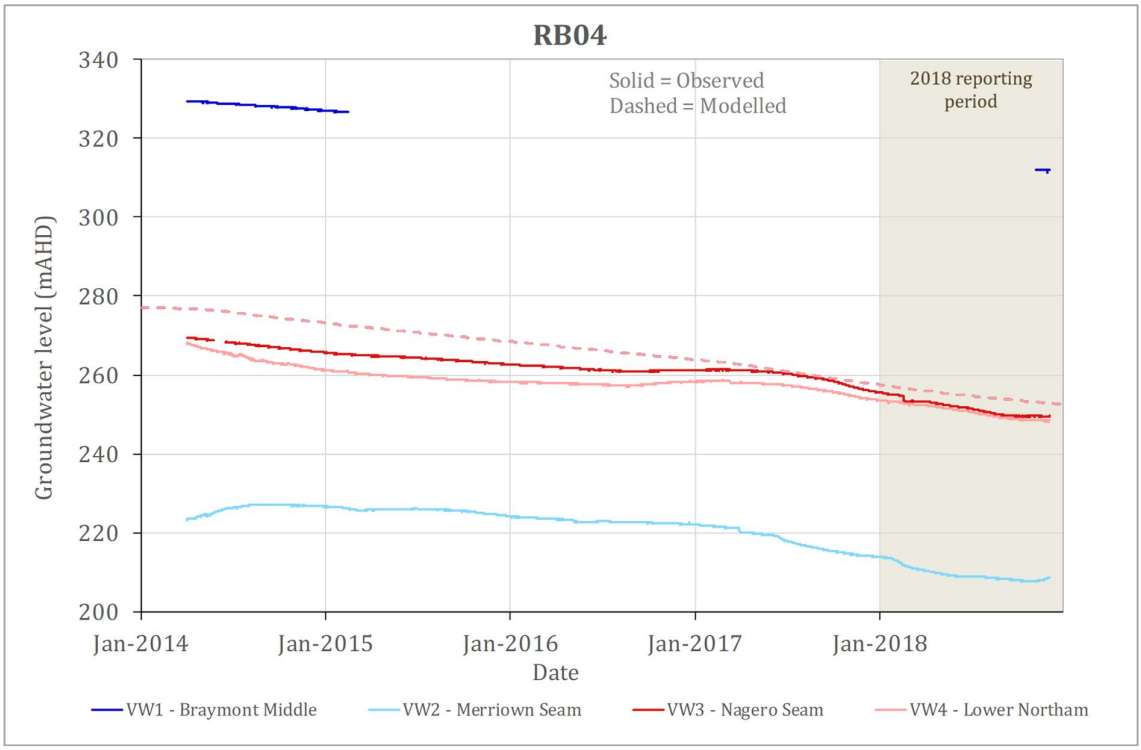

REG7
Solid = Observed
Dashed = Modelled
2018 reporting period
Groundwater level (mAHD)
300
295
290
285
280
275
270
265
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Date
VW1 - Braymont Seam
VW2 - Merriown Seam
VW3 - Nagero Seam
REG7A - Alluvium

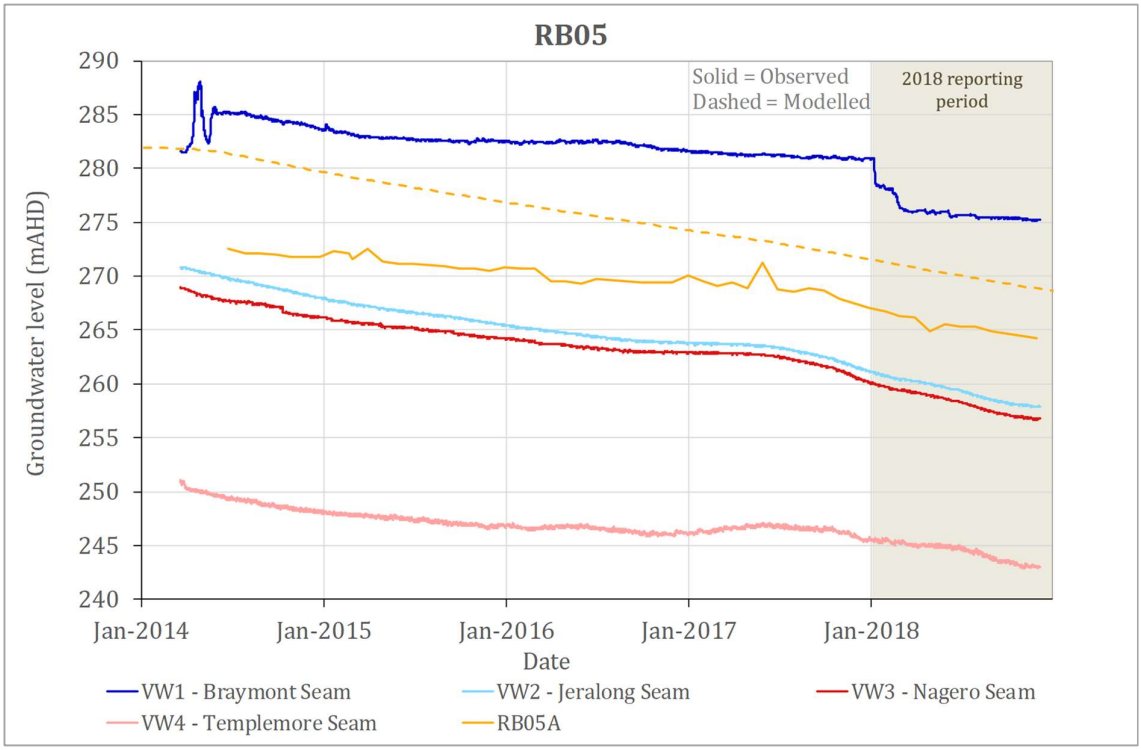

REG8
2018 reporting period
Groundwater level (mAHD)
390
340
290
240
190
140
Solid = Observed
Dashed = Modelled
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Date
VW1 - Braymont Middle
VW2 - Merriown Seam
VW3 - Nagero Seam


REG9
Solid = Observed
Dashed = Modelled
2018 reporting period
Groundwater level (mAHD)
330
320
310
300
290
280
270
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Date
VW1 - Braymont Seam
VW2 - Merriown Seam
VW3 - Nagero Seam

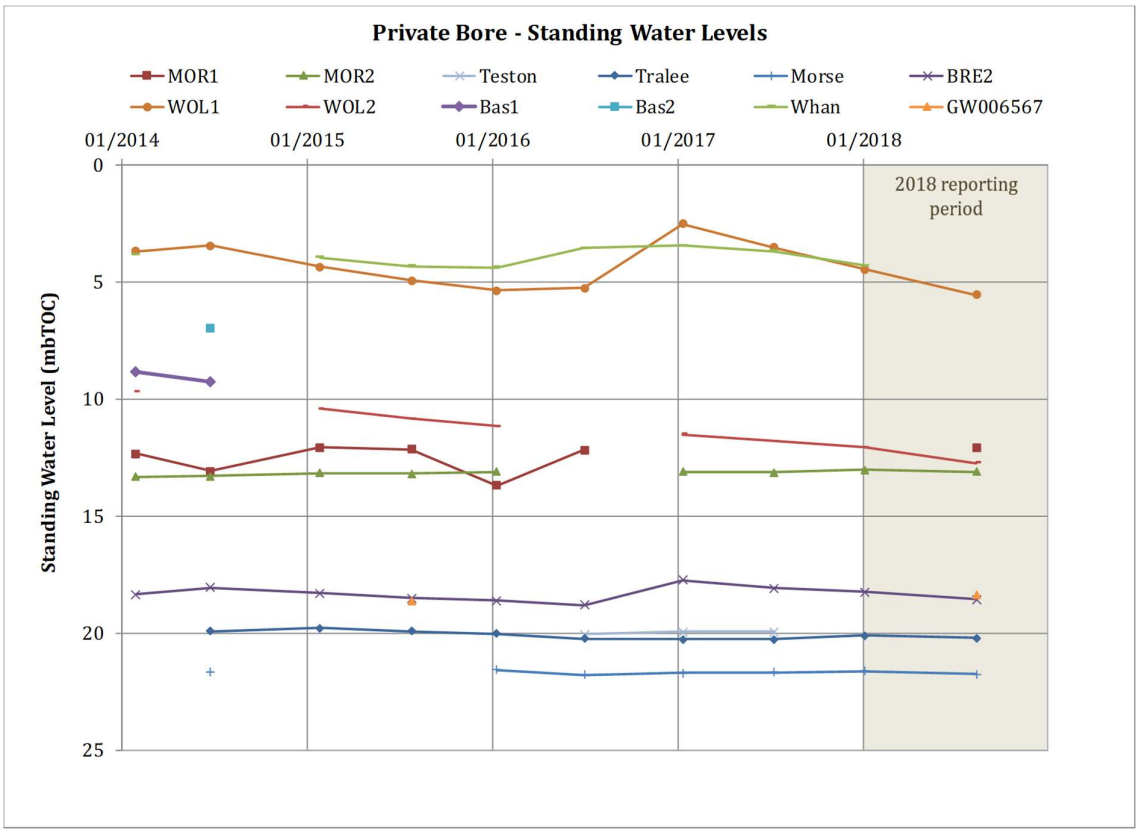

REG10
Solid = Observed
Dashed = Modelled
REG10A - Alluvium = Dry at 10mbgl (~277.1 mAHD)
2018 reporting period
Groundwater level (mAHD)
300
290
280
270
260
250
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Date
VW1 - Braymont Seam
VW2 - Merriown Seam
VW3 - Nagero Seam
VW4 - Upper Northam
REG10a modelled


RB03
Solid = Observed
Dashed = Modelled
2018 reporting period
Groundwater level (mAHD)
300
290
280
270
260
250
240
230
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Date
VW1 - Braymont Seam
VW2 - Merriown Seam
VW3 - Nagero Seam
VW4 - Templemore Seam

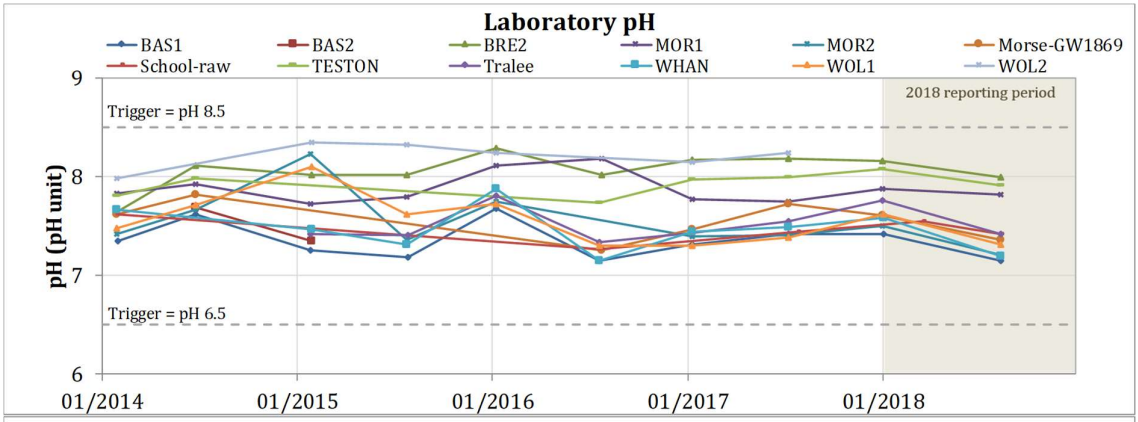

RB04
Solid = Observed
Dashed = Modelled
2018 reporting period
Groundwater level (mAHD)
340
320
300
280
260
240
220
200
Jan-2014
Jan-2015
Jan-2016
Jan-2017
Jan-2018
Date
VW1 - Braymont Middle
VW2 - Merriown Seam
VW3 - Nagero Seam
VW4 - Lower Northam

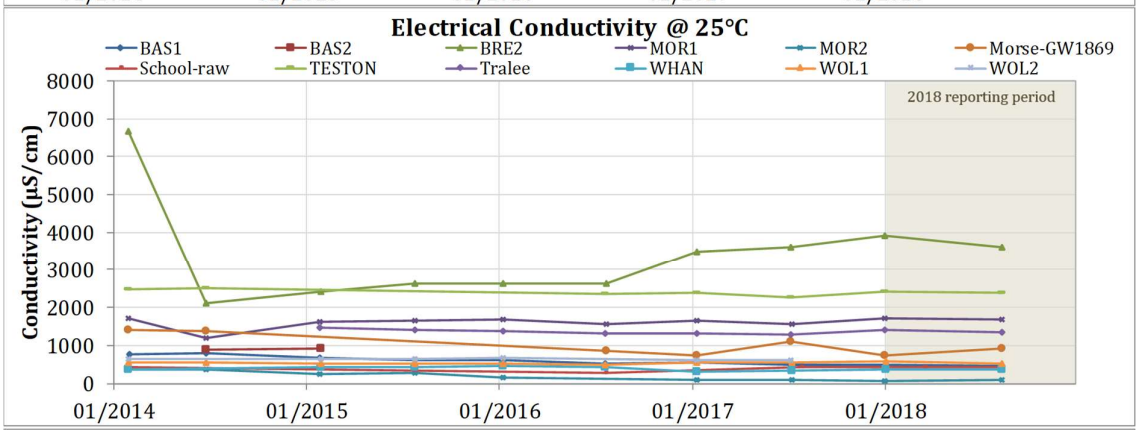


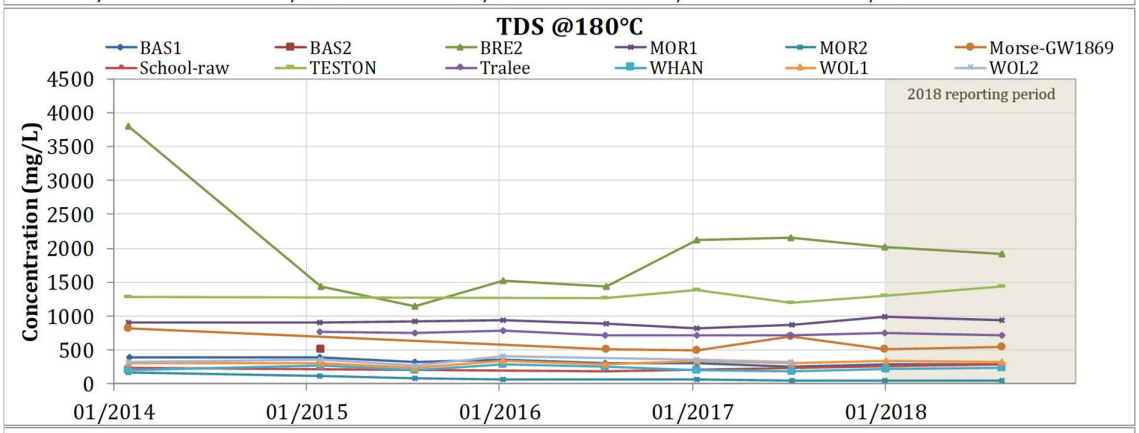
Private Groundwater Bores – Water levels

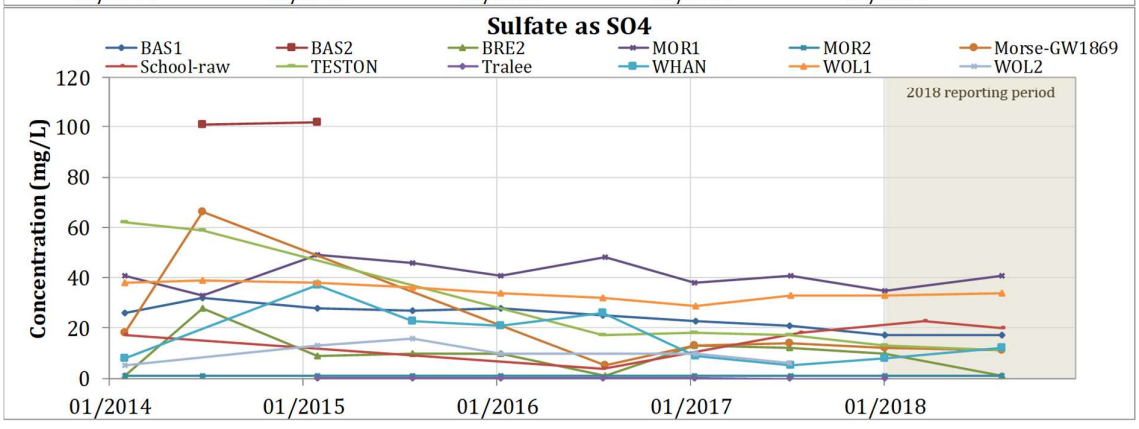


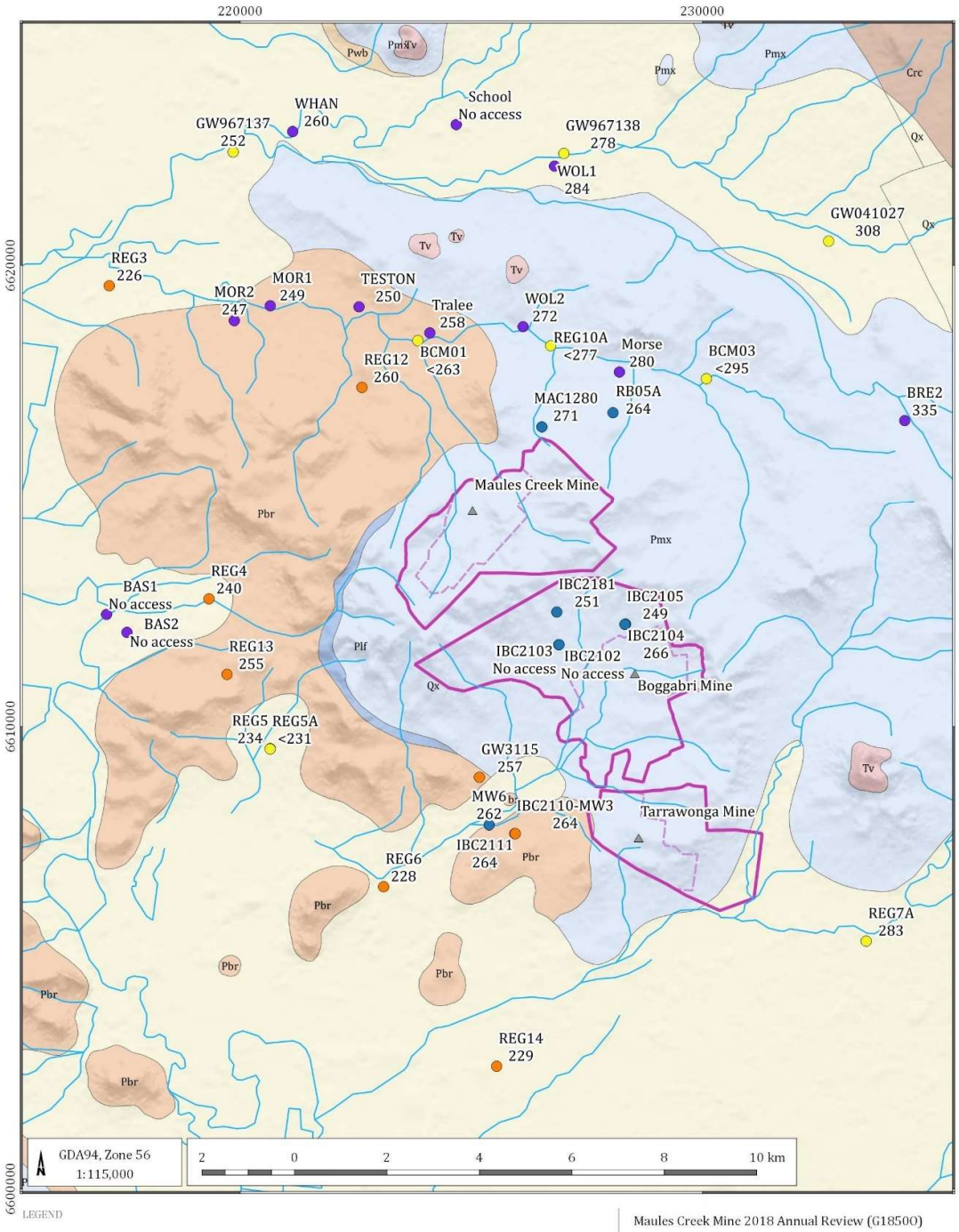
Private Groundwater Bores – Individual water quality parameters











LEGEND

Standpipe piezometer water levels - late 2018 (mAHD)

- Alluvium bore
- Permian bore
- Private bore (TOC estimated)
- Boggabri Volcanics bore
- Approximate pit depth (2018)
- Drainage
- Mine maximum open cut pit outline
- Approx. 2018 mining extent

Gunnedah Coalfield rock unit (1:100k)

- Qx - Quaternary Sediments
- Tv - Tertiary Volcanics
- Pmx - Maules Creek and Goonbri formations
- Plf - Leard Formation
- Pbr - Boggabri Volcanics
- Cbc - Currabubula Formation
- Crc - Rocky Creek Conglomerate

Maules Creek Mine 2018 Annual Review (G18500)

Approximate groundwater elevations in standpipe bores - late 2018

DATE 05/03/2019

FIGURE No: **E-1**

APPENDIX F

DP&E DOI-WATER RESPONSE TABLE

No.	DPI-Water/NRAR comments	Revised comments on review	Comment
1	Revise the 2017 Annual Review by 30 June 2018 or within two months of notification of not-suitability and submit to Lands and Water for further review. The revised Annual Review must include: a. Measurement/estimation of passive and active water take per year from all intercepted and connected water sources along with their method of measurement/estimation and details of the pit seepage monitoring program.	Recommendation not addressed satisfactorily. The footnotes added to page 57 do not provide the requested information, additionally the footnotes do not specify which model the version was used for the predictions. Add a column in Table 11 stating the method by which water take was measured/estimated for both passive and active water take per year from all intercepted and connected water sources. E.g. flow meter, modelled estimate etc. Meter reads for actual measure take should be included in the document. It is not stated against which model the site water balance data is based on given MCCM has referenced three versions of the model, this is significant given the NRAR/DoI Water have concerns regarding the conceptualisation and calibration of the model from the modelled data presented in the documents reviewed (see e. for further comment).	The groundwater model used for comparison is the output from the recent BTM Groundwater model, August 2018. The table is as per the DP&E Annual Review Guideline (2015). Rather than a column, it is noted within the footnotes below Table 11.
	b. Measurement/estimation and analysis of all inputs and outputs to the pit including rainfall, runoff, groundwater inflows, pumping and evaporation (the proponent explains lack of inflows is due to evaporations – this needs to be qualified).	Recommendation not addressed satisfactorily. The footnotes added to page 57 do not provide the requested information. Noting page 89 of the revised MCCM WMP references a pit seepage monitoring plan listing numerous methods for collection of pit seepage data – this data should be tabulated and included in the Annual Review.	Due to the various water sources (rainfall, groundwater seepage, runoff) reporting to the pit, the water balance accounts for these within the calculations of the water balance. MCC noted the footnotes inserted to Table 11 – refer to comment above. Relevant footnotes # Based on flow meter readings ^ Based on the calibrated MCCM water balance model, using site rainfall data [3] Based on the calibrated MCCM water balance model, using SILO datadrill evaporation data [4] Based on model calibration, operational observation & pumping meter records

	c. A summary of all groundwater monitoring points in the network presented in figure form, as well as a table listing coordinates, depth, type of monitoring installation and monitoring target formation details for each monitoring bore included in the report.	Recommendation not addressed satisfactorily. There is not a one to one match between Figure 9, the figure on page E-124 and the table on page E-101-103.	The table has been updated to show available private bore information. Other bores included in Figure E1 have been included in a separate table (Table E-7).
	d. All monitoring data included in the annual review (hydrograph) i.e. not just the current years data. New data to be added each year and the trend analysis updated each year. A short term graphic representation may be necessary for better visualization.	Recommendation partially addressed. Current and prior data included. Trend analysis not included. It is noted the hydrograph shown on page E-118 for REG02 is showing questionable results i.e. the vibrating wire piezometers (VWP) data from the Gunnedah-Oxley Basin formations strongly mimic the alluvial water level response indicated a high level of hydraulic connection between the alluvium and the coal basin at this location. The proponent is required to validate the accuracy of all the VWP data to show the VWP data is representative of the formations it is monitoring.	A table (Table E-6) and figure have been added that compare the annual changes at all active regional sites. REG2 is in a fault zone and the response is atypical. VWP's are grouted in and obviously cannot be removed. An inspection was completed by a monitoring contractor to check the monitoring loggers and VWP's in the area.

	e. Groundwater levels compared against modelled predictions and trigger levels each year.	Recommendation partially addressed. Trigger levels and model predictions included. It is noted that at some locations water levels vary significantly from predictions and are outside trigger levels. Commentary on these deviations is not included (see Section 7.3.2, pages 53-54). For example RB05 (page E-108) and Reg13 (page E-110) significantly deviate outside the trigger boundaries over a prolonged period (>1 year) with no mention of an investigation as per the requirement of the WMP – this must be addressed. Additionally, the Annual Report indicates validation of the groundwater model was undertaken comparing the 2014 model to the observed data however no comment is included on the generally poor correlation between modelled and observed data as shown in Appendix E. There is reference to a MCCM 2017 AGE "significantly updated and recalibrated" model which "does achieve" the requirements for model validation. It is unclear if the '2017 MCCM model' is the same as the 2018 AGE BTM cumulative numerical model reviewed as part of this assessment. It is noted the modelled vertical flux and gradients between the Gunnedah-Oxley Basin and Alluvium has been modelled as upward gradient with the Groundwater Impact Assessment (appendix M) of the GIS stating "The seepage will result in a reduction in the volume of groundwater from the Permian bedrock into the alluvial aquifer." The actual measured data generally indicates downward gradient from the Upper Namoi alluvium to the Gunnedah-Oxley Basin (page E-118 as an example). This apparent error in the modelling has significant implications re potential impacts, licensing requirements and the water balance and hence is specifically relevant to this requirement and must be addressed. Noting this same error in conceptualisation and model calibration is also present in the updated BTM cumulative groundwater model developed by AGE 2018 for Boggabri Coal mine.	Additional text is inserted into the AR to clarify the difference. Modelled outputs are updated to show 2018 model results.

	f. Groundwater levels interpreted via maps showing hydraulic head contours and in cross sections showing vertical and horizontal gradients. These to be updated each year as new data is collected.	Recommendation not addressed satisfactorily. The requested information was not provided. NRAR/DoI Water was not implying that water levels from different units should be contoured together. To be more explicit the recommendation requires that a contour map of the shallow alluvial groundwater sources (most relevant to the project) and individual maps for a number of coal basin formations be presented. Given this confusion it is suggested a qualified hydrogeologist is employed to address the groundwater aspects of all the reporting and assessment requirements of the project. Department technical staff will be available for further clarification. The reason for this recommendation is because there is insufficient *review* of the monitoring results by the proponent. It is noted that the conditions of consent require that the Annual Review: "include[s] a *comprehensive review* of the monitoring results….includ[ing] a comparison of these results against ... requirements…monitoring results of previous years…predictions in the EA". Presently, the annual review does not provide the explicitly required "comprehensive review of the monitoring results".	A review of the conceptual model will occur as part of the next update to the model. Please also refer to Figure within Appendix E addressing NRAR's request.
	g. Greater time series graphical presentation of monitoring data and time series trend analyses and statistical testing of monitoring data to enhance interpretability of any emerging time series trends for surface water monitoring data.	Recommendation not addressed satisfactorily. Trend analysis etc not completed for surface water data.	Surface water monitoring data for previous reporting periods is included in Appendix D.
	h. Presentation of the water quality data in graphical format including historical data would allow improved comparison with trigger levels and trend analysis.	Recommendation partially addressed. Surface water quality data not presented as requested (see Appendix D). Groundwater quality data has been updated (see Appendix E).	Groundwater and surface water monitoring data for the reporting period was included in Appendix D and E. Additional monitoring data and graphical presentation has been included in the Appendices for the 2018 Annual Review.

2	2 In Table 4 it is stated that groundwater samples were unable to be taken from two locations from early 2017 onwards as they were removed due of the progression of monitoring. This is ranked with a risk level of "Administrative non-compliance". NRAR/DoI Water notes that not only were samples not collected but groundwater levels were not recorded. NRAR/DoI Water disputes the assigned risk level of "Administrative non-compliance" (which is applicable to such events as submitting a report late). NRAR/DoI Water recommends this item be addressed in a review of the monitoring network.	Response not explicitly given by MCCM. Unknown if DP&E passed on recommendation or not. Refer to separate review of Water Management Plan.	Addressed in EPL Annual Return. Alternative monitoring point approved.
3	3 The proponent equips all monitoring bores in the network with pressure loggers, recording pressure, temperature and EC where possible.	Refer to separate review of Water Management Plan.	All but one of the Maules Creek Mine and REG sites already have loggers recording temperature and pressure. Four of the private bores also have loggers. The sites with loggers have been noted in Table E-1. In low permeability sites where groundwater can stagnate in the bore EC is best measured after purging of the bore rather than with a continuous logger.
4	4 The revised Water Monitoring Plan must ensure the recommendations made by the Planning Assessment Commission (PAC) are addressed and previous commitment of monitoring implemented.	Refer to separate review of Water Management Plan.	Noted. Monitoring and installation of bores were completed.

5	**5** It is requested a reference be made to the applicability of the Harvestable Right Dam Policy to the current extent of mine surface water catchments and whether all runoff sourced from minor streams is being captured in dams that fit within the exclusion provisions of Schedule 1 of the Water Management Regulation 2011. Confirmation is also requested of runoff being captured from third order or higher order streams where water entitlement would need to be considered.	Partially addressed. It is unclear based on the additions in Section 7.2.2 as to the application of the Harvestable Rights Dam Policy (HR) by the proponent. HR only applies to minor streams (first or second order) hence the reference to higher order streams is not relevant. HR also needs to be considered in terms of the classification of stream order for watercourses prior to mining, not after they have been modified. It is recognized mining sites regularly modify surface water management infrastructure to accommodate changes in clean and dirty water catchments as mining areas expand/change. A review against the Harvestable Rights Dam Policy is therefore considered relevant on an annual basis and needs to be considered prior to modifications taking place. Please note water obtained via Harvestable Rights can be used on the landholding which holds those rights and may be extended to contiguous landholdings. Generally there is a lack of detail provided at the environmental assessment stage to confirm the detailed design elements relevant to the Harvestable Rights Dam Policy. It is noted a disturbance footprint approved by DP&E does not authorize the take of water where required by water policy eg. if not consistent with the Harvestable Rights Dam Policy.	Comments noted, however, water taken during the reporting period is consistent with allowance in the HRO and land holding. Ownership has not changed in the reporting period.

6	**6** In regards to the licenses and approvals listed in Table 5 the following comments are provided: a. 90WA801901 is linked to WAL13050. It is recommended this WAL be referred to. b. A number of the work approvals listed are for bores authorised for stock, or stock and domestic use. It is recommended this purpose be listed in this table to assist in understanding the works relevant to use for the mining activities. Relevant bores include 90WA809078, 90WA809079, 90WA809300, 90WA809127, 90WA820120. c. Approval 90WA822412 is a bore authorised for mining and industrial purposes and is linked to WAL29467. It is recommended this purpose and WAL be referred to. d. WAL12811, WAL29467, WAL27385 and WAL12479 are all linked to a miscellaneous work to account for groundwater take from the excavation. It is recognised these 4 WALs are not linked to a water supply work approval due to that requirement being excluded from an approved SSD. It is recommended a reference be made to these WALs as being held for predicted groundwater take from the excavation to assist in interpreting water accounting at the site. This would also be useful to see in Table 11.	Partially addressed. The 5 bores authorized for stock, or stock and domestic use (90WA809078, 90WA809079, 90WA809300, 90WA809127, 90WA820120) are not appropriately authorised for mine use unless the impacts of their installation and operation has been assessed and approved as part of a DP&E approval, and hence covered by an exclusion to an approval under the *Water Management Act 2000*. This requires clarification to ensure they are appropriately authorised. As requested, it is recommended WAL12811, WAL29467, WAL27385 and WAL12479 be referred to as being used to account for water take from an excavation. The comment to be addressed is not that they are not referenced in the table, only that all works that water is to be accounted from are not referenced. eg. Table 5 refers to WAL12811 being associated with works approval 90CA807230 (which is for 2 bores), but no reference is made to this WAL also being used to account for water take from an excavation in Zone 5.	Noted. MCCM have noted in the Annual Review.

7	7 Revise the Water Management Plan by end July 2018 and submit to Lands and Water for review. The revised Water Management Plan must include: a. Ensure all previous comments/recommendations provided in a letter by NSW Office of Water dated 20 November 2014 on the WMP have been addressed b. A revised monitoring network, including consideration of which bores will be removed/replaced due to expansion of the pit. c. An updated site water balance model. d. An updated groundwater model as previously committed to.	Refer to separate review of Water Management Plan.	Noted and submitted to DP&E.
8	8 Finalise the Leard Forest Mining Precinct Water Monitoring Strategy by 30 June 2018 and submit to NRAR/DoI Water for review. It is understood this strategy requires development with the other mines, however it is recognised as an outstanding matter in the consent conditions.	Refer to separate review of Water Management Strategy.	Noted. Approval of Strategy pending.
A2			

9	The Annual Review has tabulated the relevant water access licences (page 1, 10-12). The Annual Review has also tabulated the water take per water access licence and per water source (page 46). The passive take/inflows are listed as 0 ML for all water sources but the *NSW Murray Darling Basin Porous Rock Groundwater Sources* where it is shown as <10 ML. It is not clear how these numbers have been derived. The Annual Review (page 55) makes the point that predicted inflows for year 6 were about 1.9ML/day (695 ML/yr), whereas the actual inflows have been negligible. It is noted that there appears to be some confusion of year 5 vs year 6 in the text. It is also noted that these figure appear to differ from the predicted inflows in the site water balance (see WMP, pages 80 and 85). Evaporation is mentioned as a reason for limited inflow (page 55) however, this statement is not qualified, an estimate of how much evaporation has occurred is not provided. The WMP (page 81) states there is an in-pit pump and in addition states (page 120) that there is a pit seepage monitoring program. It is recommended that the Annual Review is revised such that: • Both passive and active water take are documented along with their method of measurement/estimation and details of the pit seepage monitoring program. • Measurement/estimation and analysis of evaporation from the pits is documented. The water take is compared against historical data and modelled predictions, on a year-by-year basis.	Response not explicitly given by MCCM. Unknown if DPE passed on table or not. It is recommended that this table is provided to the proponent, and all matters contained in it are addressed.	Porous rock passive inflow was considered negligible during the reporting period and conservatively included as <10ML. This was primarily due to mining depth not as deep within the stratigraphy as originally anticipated in earlier predictions for the stage of mining. Additional information included in the 2018 AR as requested.
10	A number of concerns were identified about the groundwater level data presented in the Annual Review (page E99-E112): • Figure 9 (page 54) does not include all monitoring points, but only those reported on for the last year • The symbols used Figure 9 are unclear for Reg7, Reg7a, Reg10, Reg10a, RB05 and RB05a and possibly missing for Reg1 (elsewhere called Reg01). • Data for the regional and private bores is presented in tabular rather than figure form • Data for the VWPs is presented with varying y-axis scales, making comparisons difficult • Only data from 2017 is presented	Response not explicitly given by MCCM. Unknown whether DP&E passed on table or not. It is recommended that this table is provided to the proponent, and all matters contained in it are addressed.	GW level data is included for all active sites for their entire period of record. Annual trend analysis has been added to Appendix E (Table E-6 and the relevant figure). Groundwater levels are compared against triggers. Additional commentary has been added on the comparison with modelled levels. The conceptual groundwater model will be completed as part of the numerical model update within future revisions required during the project period.

	• Depths are not provided for the regional bores, private bores or vibrating wire piezometers (VWP) • The monitoring depth/formation is not presented for the regional or private bores • Declining trends of 5+ meters evident in some of the VWP data – trend analysis not included • Apparent data errors (e.g. step changes) evident in some of the VWP data – error analysis not included • Groundwater level data are not synthesized (e.g. in maps showing hydraulic head contours, or in cross sections showing vertical and horizontal gradients) or set it the larger regional hydrogeological context • Groundwater level data are not compared against historic data, modelled predictions or trigger levels (n.b. the groundwater trigger levels in the WMP (page 121-122) need to be clarified) – long term trend analysis not included. It is recommended the Annual Review be revised to include: • Groundwater level data presented for all monitoring points in the network, not just those monitored in 2017, and presented in figure form • Groundwater levels are not limited to the reporting year but to the full dataset, groundwater levels are to be quantitatively analyzed for trends • Groundwater levels are compared against modelled predictions and trigger levels • Groundwater levels are interpreted via maps showing hydraulic head contours and in cross sections showing vertical and horizontal gradient It is suggested the Annual Review is revised to also address all other concerns raised above.		
11	The 2017 Annual Review satisfactorily addresses the specific points that are required to be addressed as outlined in Attachment B. However the proponent should note the requirement to identify any trends in monitoring data over the life of the development. The 2017 Annual Report is currently deficient in this regard. Presentation of water level and water quality monitoring data in graphical format, together with appropriate time series trend analyses and other statistical analyses, would enhance the interpretability of any emerging trends in surface water and groundwater monitoring data. The current surface water monitoring network in Maules Creek with the single long-term active station equipped with continuously recorded water levels located at Elfin Crossing is sufficient to assess the effects of mining activities on the hydrology of the lower reaches of Maules Creek. There are currently no active gauging stations on the smaller Back Creek. Back Creek is likely to be even more intermittent than Maules Creek which presents technical difficulties in monitoring flow. There are no long term surface water hydrology data with which to assess trends in Back Creek prior to and after the commencement of mining activity. As a part of the monitoring system for the mining development, there are a reasonable number of groundwater monitoring bores situated along the length of Back Creek, including private landholder bores that are being monitored for water level and water quality. Any potential mining impacts on surface water hydrology in Back Creek that are related to mining disturbance of aquifers are likely to be registered first in these groundwater monitoring bores. None of the groundwater level data in monitoring bores along Back Creek presented as tables in the Annual Report showed fluctuations of the magnitude of monitoring bores in the agricultural area.	Response not explicitly given by MCCM. Unknown if DP&E passed on table or not. It is recommended that this table is provided to the proponent, and all matters contained in it are addressed.	Noted. Addressed above and within the AR.

12	NRAR/DoI Water does not consider the Annual Review provides sufficient evidence to adequately determine if impacts are occurring to groundwater, and at what magnitude. Also, Tables 2-4 summarise the status of compliance for the project (pages 1-4). In Table 4 it is stated that groundwater samples were unable to be taken from two locations from early 2017 onwards as they were removed due of the progression of monitoring. This is ranked with a risk level of "Administrative non-compliance". Lands and Water notes that not only were samples not collected but groundwater levels were not recorded. NRAR/DoI Water disputes the assigned risk level of "Administrative non-compliance" (which is applicable to such events as submitting a report late).	Response not explicitly given by MCCM. Unknown if DP&E passed on table or not. NRAR/DoI Water recommends that this table is provided to the proponent, and all matters contained in it are addressed.	Addressed in previous comments above. Monitoring bore were within porous rock source. All mines will inevitably remove bores within a mine footprint as the operation advances over project life. Replaced by alternative monitoring points on EPL licence.
13	The groundwater monitoring network, as presented in the WMP, consists of: • A baseline monitoring network (refer Table 6.1 on page 96 and Figure 6-1 on page 98) • A wider monitoring bore network inclusive of monitoring at three mines sites and nearby government monitoring points (refer to Figure 6-7 on page 107) • Replacements bores (refer to Table 6.3 on page 110 and Figure6-8 on page 111) • Cumulative impact groundwater monitoring locations (refer to Table 6.4 on page 113 and Figure 6-9 on page 115) • Some of the registered bores near the mine site (refer to Table 6.5 on page 117). NRAR/DoI Water has previously had input into the design of this monitoring network. As presented in the WMP, the monitoring network is satisfactory. However, the groundwater monitoring network, as presented in the Annual Review, consists of: • 13 regional monitoring bores – a mix of the baseline monitoring network, replacements bores and cumulative impact groundwater monitoring locations • 12 private bores (although 4 are 'capped' which appears to prevent groundwater level monitoring) • 32 VWPs in 9 locations. It appears that only those bores monitored in 2017 are presented in the Annual Review. The Annual Review states that the regional monitoring bores are measured monthly (page 53). It is recommended that all regional monitoring bores are equipped with pressure loggers, recording pressure/temperature and possible EC) daily. Appendix 6 of the Approval of Consent (page 55) included the recommendations from the Planning Assessment Commission for additional groundwater monitoring. This included the recommendation that the 17 additional monitoring bores proposed be equipped with water level or pore pressure transducers. It is unclear if this, and the other three recommendation, has been complied with. NRAR/DoI Water notes that in the WMP (page 123) there is a stated commitment to address the PAC commitment within 5 years of approval. The updated WMP should address this. NRAR/DoI Water recommends that the monitoring network (including consideration of which bores will be removed/replaced due to expansion of the pit) is reviewed as part of an updated Water Management Plan (WMP)	Response regarding additional monitoring bores given as: "The additional bores were installed, and also reviewed as part of the recent IEA. Bore details are included in Appendix E and text inserted on page 52. " A response to the remainder is not explicitly given by MCCM. Unknown if DPE passed on table or not. NRAR/DoI Water recommends that this table is provided to the proponent, and all matters contained in it are addressed.	Addressed previously above where relevant to the AR. The revised WMP revision pending approval will address a number other points. MCCM note previous established monitoring network communicated to agencies.

14	The WMP (page 120) states that "monitoring results of previous years", "identification any trends in the monitoring data over the life of the development" and "identification any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies" would be included in the Annual Review. As noted above, these were not satisfactorily done in the 2017 Annual Review. NRAR/DoI Water notes that it is unclear from the Annual Review if reporting under the EPBC Act 1999 has been completed. Section 8.3 in the WMP (page 131) states that "In accordance with Schedule 5, Condition 9 of PA 10_0138, MCC will regularly (at least every six months) prepare a summary of monitoring results and make these publicly available at the mine site and on the Maules Creek website." The site http://www.whitehavennews.com.au/maules-creek-site-monitoring/ does not include water monitoring. NRAR/DoI Water recommends that the proponent's website is updated to include monitoring data every 6 months.	Response not explicitly given by MCCM. Unknown if DP&E passed on table or not. NRAR/DoI Water recommends that this table is provided to the proponent, and **all** matters contained in it are addressed.	Duplicate of NRAR feedback above, addressed in comments above. Trends addressed in Appendix E. Monitoring is included in various reporting including to CCC's, within Annual Reviews, EPL monthly reporting.
15	The site groundwater balance is presented in Table 12 (page 55) of the Annual Review. The balance is shown with each line-item to the nearest ML (with the exception of groundwater seepage and miscellaneous). The water balance would be strengthened by inclusion of the uncertainty (e.g. +/- 10%) associated with each figure, and information about the method(s) used to compute each item. The WMP (page 79) says that a predictive water balance model was prepared for the first 5 years of mine life only. As per Section 5.4 in the WMP (page 94), the site water balance needs to be updated and validated as new information becomes available. NRAR/DoI Water recommends that the updated WMP revises the site water balance, and includes years 6-10 also.	Response not explicitly given by MCCM. Unknown if DPE passed on table or not. NRAR/DoI Water recommends that this table is provided to the proponent, and **all** matters contained in it are addressed.	Noted. Reference to OPSIM model included. Comments related to WMP not relevant to AR and is addressed in the revised document pending approval.
16	The groundwater model appears to have been last updated in 2014 (WMP, page 119). Further, it is stated in the WMP (page 55) that "Additional BTM complex wide groundwater modelling will also be finalized [during the next reporting period] to ensure calibration and review of modelled predictions". This appears not to have been completed. It is also noted that seepage into the mine is expected to rapidly increase around year 7 (WMP, page 120), thereby potentially causing impacts to surrounding aquifers/creeks. A revised model is imperative at this juncture of the mine life. NRAR/DoI Water recommends that the updated WMP also includes an updated groundwater model.	Refer to separate review of numerical model.	Addressed above. BTM groundwater model completed and available on the WHC website. Future revision and update will progressively occur during project life.