BAAL BONE
UNDERGROUND

GLENCORE

Annual Review 2018

Name of Operation	Baal Bone Colliery
Name of Operator	Baal Bone Colliery
Project Approval Number	09_0178
Name of Holder of Project Approval	The Wallerawang Collieries Ltd
Mining Lease Number/s	CCL749, MPL261, CL391, ML1302, ML1389, ML1607
Name of Holder of Mining Lease/s	The Wallerawang Collieries Ltd
Water Licence Number/s	10BL601816, 10BL601817, 10BL601877, 10BL601970, 80BL236132, 80BL236134, WAL27887, WAL34952.
Name of Holder of Water Licence/s	The Wallerawang Collieries Ltd
MOP Start Date	29th February 2016
MOP End Date	31st December 2019
Annual Review Start Date	1st January 2018
Annual Review End Date	31st December 2018
I, Elizabeth Fishpool, certify that this audit report is a true and accurate record of the compliance status of Baal Bone Colliery for the period 1st January 2018 to 31st December 2018 and that I am authorised to make this statement on behalf of Baal Bone Colliery. *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	Elizabeth Fishpool
Title of Authorised Reporting Officer	Environment and Community Coordinator
Signature of Authorised Reporting Officer	
Date	6 August 2019

Abbreviations:

ACMA – Australian Communications and Media Authority
BOD –Biochemical Oxygen Demand
CCL – Consolidated Coal Lease
CL – Coal Lease
CMRA – Coal Mines Regulation Act 1982
DP&E – Department of Planning & Environment
DPI – Department of Primary Industry
DRE - Department of Industry, Division of Resources & Energy
DRG –Department of Planning and Environment – Division of Resources and Geoscience
EC – Electrical Conductivity
EPA – Environmental Protection Authority
EPL – Environment Protection Licence
MBAS – Methylene Blue Active Substances
ML – Mining Lease
MOP – Mining Operations Plan
MPL – Mining Purposes Lease
OEH – Office of Environment and Heritage
REA - Reject Emplacement Area
TSS – Total Suspended Solids

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1 Introduction

1.1 Overview

An Annual Review is prepared annually by Baal Bone Colliery (Baal Bone), to fulfil the reporting requirements of various regulatory departments. Baal Bone is operated by The Wallerawang Collieries Ltd (TWCL). The reporting period for this Annual Review is 1 January 2018 to 31 December 2018.

On 14 January 2011, Baal Bone received Project Approval (PA 09_0178) for the continuation of mining activities at Baal Bone via Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Project Approval granted approval for the continuation of mining operations at Baal Bone until 14 December 2014, and included:

- continuation of underground mining of Longwalls (LW) 29-31 in accordance with the approved Subsidence Management Plan (SMP) and Mining Operations Plan (MOP);
- continued operation of associated surface infrastructure;
- saleable coal production of 2.0 Mtpa (equating to 2.8 Mtpa run of mine (ROM) coal);
- continued transport of prepared saleable coal to markets by rail, and up to 900,000 tonnes per annum (tpa) by road; and
- mining of other isolated Remnant Areas within existing workings.

Underground mining at Baal Bone ceased on 3 September 2011, with the site entering into care and maintenance.

During 2012 and 2013, Baal Bone Colliery was utilised as a training facility for Glencore Xstrata employees. Underground workers completed a twelve-week training course including classroom tutorials, and equipment familiarisation. The objective of the training program was to provide employees with experience and skills in an underground mining environment. Until the current down turn in the industry, Baal Bone had trained over 270 new industry entrants from Glencore's Ulan West Mine and Blakefield South Mine.

The management and administration of Glencore's NSW generic induction program has been carried out from the Baal Bone site since June 2013. In February 2014, Baal Bone also took over the management and administration of the QLD generic induction program.

In February 2015, DP&E approved amendment to the Project Approval to extend the life of mine for an additional three years until 31 December 2019 to allow the Remnant Areas to be mined. Mining methods would remain the same as that currently approved, namely, through use of continuous miner using bord and pillar/partial extraction mining methods. In December 2015, DP&E approved a second modification to the Project Approval to allow Ben Bullen Creek to remain in its current alignment.

During 2017 and 2018, Glencore was engaged in negotiations to sell the Baal Bone Colliery site. Sale negotiations ceased in late 2018, and the site will remain under Glencore ownership. A firm commitment to progress into mine closure has been made by Glencore. Accordingly, a Mine Closure MOP is currently being developed and is anticipated to be submitted to the Resources Regulator in mid-2019. During 2019 works to seal the underground mine will commence.

1.2 Scope of this Annual Review

The layout of this Annual Review has been aligned to the DP&E *Post- approval requirement for state significant mining developments - Annual Review Guideline (October 2015)*.

This Annual Review has also been prepared to address the requirements of Schedule 5, Condition 3 of Baal Bone's Project Approval (PA 09_0178), which requires a report to be submitted to DP&E reviewing the annual environmental performance of the project. The requirements of Schedule 5, Condition 3 of the Project Approval and where these are addressed in the Annual Review are listed in **Table 1.1**. References to the environmental assessment (EA) in **Table 1.1** and throughout this report refer to the document titled *Baal Bone Colliery Environmental Assessment* dated March 2010 (AECOM, 2010).

Table 1.1: Requirements of Schedule 5, Condition 3 of Project Approval 09_0178

Schedule 5, Condition 3 requirement	Annual Review Section
a) describe the works that were carried out in the previous calendar year, and the works that are proposed to be carried out over the current calendar year.	Section 4 and Section 12
b) include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, which includes a comparison of these results against: • the relevant statutory requirements, limits or performance measures/criteria; • the monitoring results of previous years; and • the relevant predictions in the EA.	Sections 6, 7 and 8
c) identify any non-compliance over the previous calendar year, and describe what actions were (or are being) taken to ensure compliance;	Sections 2 and 11
d) identify any trends in the monitoring data over the life of the project;	Sections 6, 7 and 8
e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and	Sections 6, 7 and 8
f) describe what measures will be implemented over the current calendar year to improve the environmental performance of the project.	Section 12

The Annual Review will be submitted to the following authorities:

- NSW Department of Planning and Environment – Division of Resources and Geoscience (DRG)
- NSW Department of Planning and Environment - Resource and Energy Assessments (DP&E)
- Forestry Corporation of NSW (FCNSW);
- Lithgow City Council (LCC);
- Environment Protection Authority (EPA); and
- Water NSW

The reporting period for this Annual Review is 1 January 2018 to 31 December 2018.

It should be noted that this Annual Review does not necessarily provide a comprehensive description of each individual operation or environmental control that is currently employed at Baal Bone; this level of detail is available in the MOP. Rather, this Annual Review focuses on providing a succinct review of the significant operational and environmental activities undertaken throughout the year. It also examines the performance of key site operations and environmental controls throughout the 2018 reporting period.

Included is a summary of monitoring data (as applicable), a discussion regarding the level of compliance achieved, together with an overview of initiatives proposed and actions planned for the 2019 reporting period.

1.3 Mine Contacts

Baal Bone Colliery can be contacted via telephone on (02) 6350 6900 and fax (02) 6359 0530. The postal and street addresses are as follows:

Postal: Baal Bone Colliery
PO Box 13
Lithgow NSW 2790

Street: Baal Bone Colliery
Castlereagh Highway
Cullen Bullen NSW 2790

Personnel responsible for environmental management at Baal Bone Colliery are shown below:

Table 1.2: Mine Personnel Contact Details

Contact Person	Position	Contact Details
Mark Bulkeley	Operations Manager	Ph: (02) 6350 6943 Email: Mark.Bulkeley@Glencore.com.au Fax: (02) 6359 0530
Mark Munro	Mine Manager	Ph: (02) 6350 6900 **Email: Mark.Munro@Glencore.com.au** **Fax: (02) 6359 0530**
Elizabeth Fishpool	Environment and Community Coordinator	Ph: (02) 6350 6920 Email: Elizabeth.Fishpool@Glencore.com.au Fax: (02) 6359 0530

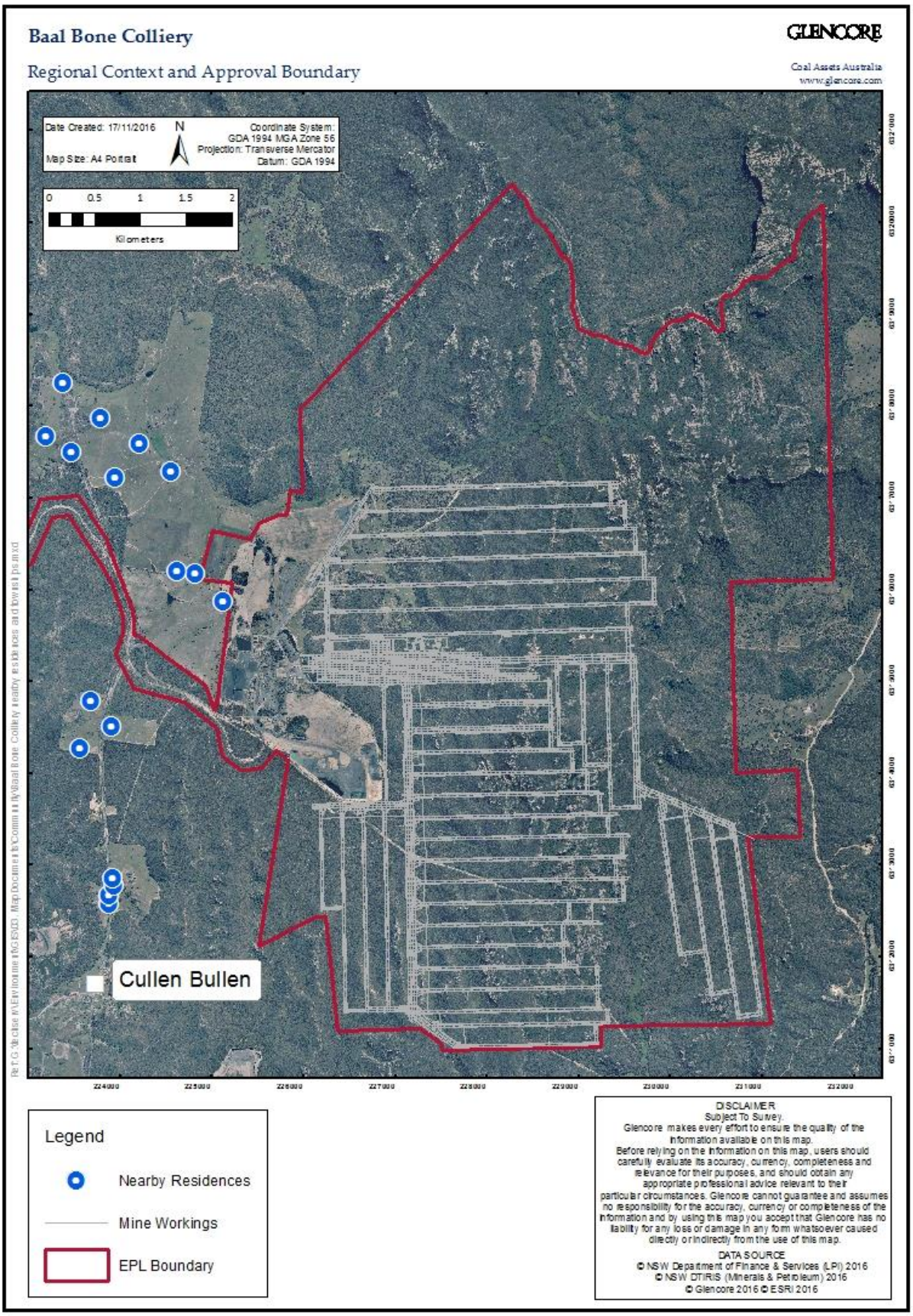


Figure 1.1: Locality plan showing approval boundary.

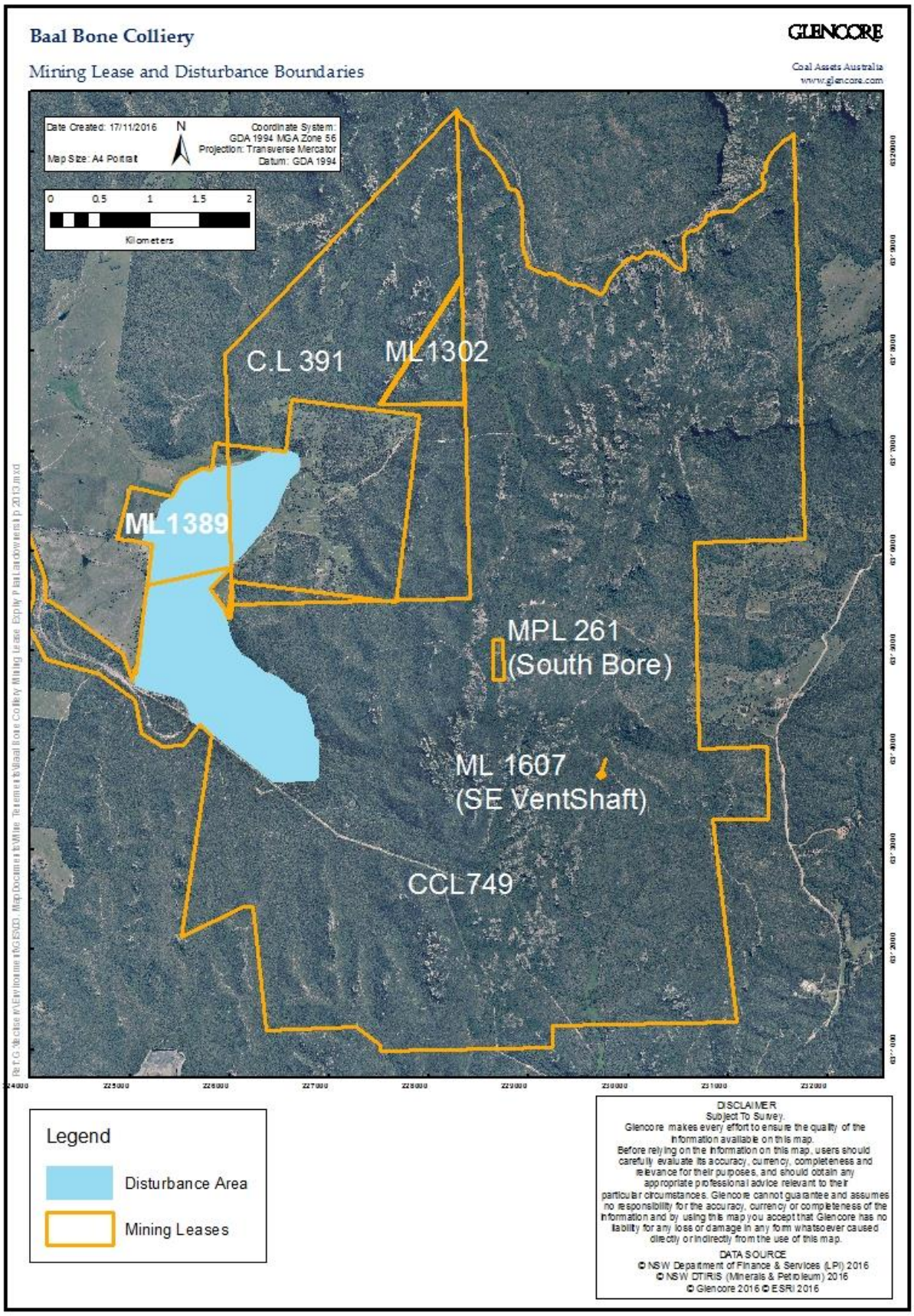


Figure 1.2: Mining lease boundaries and disturbance area.

2 Approvals and Compliance Statement

A list of all current consents, leases, licences and approvals are included below in Table 2.1 along with their compliance status for the 2018 calendar year.

Table 2.1: Consents, Leases, Licences and Approvals.

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope	Were all Approval Conditions Complied With?
Project Approval	DP&E	09_0178	The Wallerawang Collieries Ltd	01/12/15 Mod 2 Dec 2015	31/12/2019 (Mining operations)	s75W modification to maintain alignment of Ben Bullen Creek.	**No – refer to Table 2.2 and Section 10.**
	DP&E	09_0178	The Wallerawang Collieries Ltd	14/01/2011 Mod 1 Feb 2015	31/12/2019 (Mining operations)	Part 3A Project Approval for continued operations at Baal Bone Colliery until 31 December 2019.	**Yes**
	DP&E	07_0035	The Wallerawang Collieries Ltd	24/10/2007	Perpetuity	Part 3A Project Approval for the Ventilation Shaft and Power Line Project.	**Yes**
Environment Protection Licence	EPA	765	Wallerawang Collieries Pty Ltd	1/08/2013	Review pending	Premises and Scheduled Activity (Coal Mining/ Washery) Licence	**Yes**
Mining Operations Plan	DRG	09/2520	Wallerawang Collieries Pty Ltd	13/2/2019	31/12/2019	MOP for Baal Bone Colliery Suspension of Mining Operations.	**Yes**

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope	Were all Approval Conditions Complied With?
Mining Leases	DRG	CCL 749[1]	Wallerawang Collieries Pty Ltd	05/04/1990	11/3/2030	Mining Entitlement (Consolidates CL 209, CL 246, CL 329, CL 330, CL331 and CL332) Various depths	Yes
	DRG	Consolidated Coal Lease (CCL) 770 (Part)	The Wallerawang Collieries Ltd	10/03/1992	11/12/2024	Mining Entitlement (Consolidates ML424, ML536, ML570, ML571, ML572, ML581, ML640, ML1033, ML1125, PLL120, PLL132, PLL149, PLL144, PLL145, PLL203, CL124, CL338, CL593, CL606, MPL468, MPL72, PLL1951, PLL1952, PPL1953 and PLL1954) Various depths	Yes
	DRG	MPL 261 (Act 1973)	Wallerawang Collieries Pty Ltd	22/08/1990	22/08/2032	Mining Entitlement (Southern mine dewatering bores)	Yes

[1] In October 2015, Baal Bone Colliery lodged an Application for Suspension of Mining Operations & Conditions (Labour & Expenditure) for CCL 749, CL 391, ML 1302, ML1389 with DRE. Approval was receivied June 22 2017.

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope	Were all Approval Conditions Complied With?
						Parish: Ben Bullen, Depth: Surface - 10m	
	DRG	CL 391 (Act 1973)	Wallerawang Collieries Pty Ltd	24/02/1992	11/03/2030	Mining Entitlement Parish: Ben Bullen Depth: > 20m	Yes
	DRG	ML 1302 (Act 1992)	Wallerawang Collieries Pty Ltd	29/09/1992	11/03/2030	Mining Entitlement Parish: Ben Bullen Depth: >20m	Yes
	DRG	ML 1389 (Act 1992)	Wallerawang Collieries Pty Ltd	09/05/1996	11/03/2030	Mining Entitlement Parish: Ben Bullen Depth: Surface – unlimited Surface - 20m	Yes
	DRG	ML1607	Wallerawang Collieries Pty Ltd	08/01/2008	11/03/2030	Mining Lease (Purposes) Parish: Cox Depth: Surface – 10m	Yes
S126(1) Approval	DRG	317524306001	Baal Bone Colliery	14/11/2005	Perpetuity	Section 126(1) of the CMRA (1982) for the construction and operation REA 5	Yes
S100(1) Approval	DRG	317551291001	Baal Bone Colliery	12/02/2008	Perpetuity	Section 100(1) of the CMH&SA (2002) for the construction and operation of REA 6	Yes

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope	Were all Approval Conditions Complied With?
Occupation Permit	Forestry Corporation of NSW	14719	Baal Bone Colliery	05/03/1991	Perpetuity	Occupation permit relevant to the power line route from the company's freehold land to Mining Purposes Lease (MPL) 261 (LW 1 mine dewatering bore); includes various subsequent extensions (LW 19 dewatering bore).	Yes
		14161	Baal Bone Colliery	08/03/1991	Perpetuity	Occupation Permit for the powerline that supplies power to the railway loop -western edge of Ben Bullen State Forest.	Yes
Water Access Licence	DPI Water	WAL27887	Wallerawang Collieries Pty Ltd	17/7/2007	Perpetuity	Water Access Licence (under water management Act 2000) replaces bore licences: 80BL135509 (near rail loop) and 80BL136703 (near UC1)	Yes
	DPI Water	80WA716836	Wallerawang Collieries Pty Ltd	4/10/2012	16/07/2027 [2]	Water Access Licence (under water management Act 2000).	Yes

[2] Replaces licences 80AL716835 and WAL34952.

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope	Were all Approval Conditions Complied With?
Bore Licences	DPI Water	80BL236132	Wallerawang Collieries Pty Ltd	18/01/1995	Perpetuity	Section 115 of the Water Act 1912. Bore – Mine dewatering LW 1 (South Bore 1).	Yes
	DPI Water	80BL236134	Wallerawang Collieries Pty Ltd	18/01/1995	Perpetuity	Section 115 of the Water Act 1912. Bore – Mine dewatering LW 1 (South Bore 2).	Yes
	DPI Water	80BL239077	Wallerawang Collieries Pty Ltd	19/06/2006	18/06/2016 [3]	Section 115 of the Water Act 1912. Bore – Mine dewatering LW 19 (North Bore).	Yes
	DPI Water	10BL601877	Wallerawang Collieries Pty Ltd	08/06/2007	Perpetuity	BBN175; LW29-31 groundwater monitoring piezometer	Yes
	DPI Water	10BL601816	Wallerawang Collieries Pty Ltd	08/06/2007	Perpetuity	BBN176; LW29-31 groundwater monitoring piezometer	Yes
	DPI Water	10BL601817	Wallerawang Collieries Pty Ltd	08/06/2007	Perpetuity	BBN177; LW29-31 groundwater monitoring piezometer	Yes
	DPI Water	10BL601970	Wallerawang Collieries Pty Ltd	05/09/2007	Perpetuity	BBN 179; LW29-31 groundwater monitoring piezometer	Yes

[3] DPI Water confirms water can continue to be pumped as originally authorised by 80BL239077. It is recognised this licence has expired, however this is an administrative issue being addressed by DPI Water as per e-mail correspondence dated 19/12/2017.

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope	Were all Approval Conditions Complied With?
Water Licences	DPI Water	80SL046064	Wallerawang Collieries Pty Ltd	17/07/2007	17/07/2017	Section 12 of the Water Act 1912. Diversion works, 2 pumps, overshot and block dams, bywash dam.	Yes
Acknowledgement of Notification of Hazardous Chemicals on Premises	SafeWork NSW	NDG023231	Wallerawang Collieries Pty Ltd	13/02/2015	Perpetuity	Dangerous Goods Licence – UG diesel tank and 3 LPG tanks.	Yes
Licence to Store	SafeWork NSW	XSTR100123	Wallerawang Collieries Pty Ltd	19/05/2017	19/06/2022	Licence to possess and store explosives.	
Apparatus Licence	ACMA	95441/1	Wallerawang Collieries Pty Ltd	27/7/2013	26/07/2018	Land Mobile (Two way Radio)- Radio Communications Act 1992	Yes

Table 2.2 Details of non-compliances

Relevant Approval	Condition #	Condition description	Compliance status	Comment	Reference
PA 09-0178	Schedule 3, Condition 21	Groundwater Monitoring Plan inclusions	Administrative non-compliance	The approved Groundwater Monitoring Plan requires that water samples in six bores in the Cox's River Swamp be taken every month. Due to instrument malfunction, there was no sample taken at BBPB1 in January 2018. The other 5 bores were sampled as required.	Section 10 & Section 6.2

PA 09-0178	Schedule 3, Condition 23	Biodiversitry and Land Management Plan inclusions	Administrative non-compliance	The approved Biodiversity and Land Management Plan requires that rehabilitation inspections and monitoring be carried out annually. Due to the (now discontinued) sale process for Baal Bone Colliery, the 2018 rehabilitation inspection and monitoring were delayed until January 2019.	Section 10 & Section 7.4

2.1 Amendments During the Reporting Period

The Baal Bone Colliery MOP covers the Care and Maintenance of the site, and is approved for the period: 29 February 2016 - 31 December 2019. In January 2018, the Department of Resources and Geoscience approved a six-month suspension of 2017 rehabilitation commitments (which included ~ 28 ha of rehabilitation in the Northern Void and Northern Rehabilitation Area). In May 2018, approval of the rehabilitation suspension was extended to 31 December 2018.

On 20 December 2018, Baal Bone Colliery submitted a revised MOP 2016 -2019 to the Resources Regulator for approval. The revised MOP:

- provided further details and engineer plans for the sealing of the LW19 ventilation fan and shaft, and underground adits 1 – 11.
- extended the completion date for the ~28 ha of rehabilitation in the Northern Void and Northern Rehabilitation area until end 2019.

On 13 February 2019, approval for the revised MOP was granted by the Resources Regulator.

Baal Bone Colliery is currently developing a Mine Closure MOP – which is anticipated to be submitted to the Resources Regulator in mid-2019 for approval.

3 Operations Summary

3.1 Exploration

There was no exploration activity conducted during the reporting period.

3.2 Land Preparation

No land clearing, vegetation removal or soil removing activities were undertaken during the reporting period.

3.3 Construction

No construction activities were undertaken during the reporting period. The existing administration, amenities, workshops and coal handling infrastructure associated with the Baal Bone Colliery remained unchanged. Surface facilities and infrastructure are shown in appendices as **Plan 1**.

3.4 Mining

There was no underground mining extraction or transportation of coal product at Baal Bone during the reporting period.

Underground mining operations at Baal Bone ceased in September 2011 and entered care and maintenance. Coal washing operations were completed in December 2011. Transportation of coal product ceased in April 2012.

Following the completion of mining of LW31 on 3 September 2011, underground mining operations were suspended. A notice of the suspension of operations was provided to the DTI on 31 August 2011. Approval from the Department for the suspension of mining operation and labour/expenditure conditions of CCL 749, CL 391, ML 1302 and ML 1389 was received on 27 September 2012 for a period of three years.

In October 2015, Baal Bone Colliery lodged requests to further extend the suspension of mining and labour/expenditure conditions. Accordingly, DGR have approved the suspension of labour and expenditure conditions until 3 October 2019; and the application to suspend mining operations/extraction has been approved until 12 July 2021.

The equipment fleet utilised for care and maintenance during 2018 is outlined below.

Table 3.1: Equipment Fleet

Equipment Type	Number of Units
Toyota Landcruiser Utility/ Troop Carrier	3
Manitou Forklift	1
Bobcat Skid Steer Loader	1
130 Eimco	2
Domino Road Grader	1
PJB Man transports	2

3.5 Mineral Processing

3.5.1 Production, Processing and Waste Summary

Underground mining ceased in September 2011 and coal washing activities were completed in December 2011. When operational, Baal Bone produced three grades of washed coal, principally for the export market; these being 9%, 14% and 18% ash coal.

3.5.2 Product Destination and Transportation

The transport of saleable product coal off-site via rail was completed on 25 April 2012.

The Project Approval permits transport of up to 900,000 tonnes per annum (tpa) of saleable coal by public road to the Mount Piper and Wallerawang Power Stations. No product coal was transported by road during the reporting period.

3.5.3 Ore and Product Stockpiles

The maximum working capacity of the Baal Bone coal stockpiles (both ROM and product) is approximately 1,000,000 tonnes. During the reporting period there was no stockpiled ROM coal.

3.5.4 Mineral Waste Management

Processing and washing of coal was completed in December 2011. As such, no mineral waste was produced during the reporting period.

3.5.5 CHPP Waste and Reject Emplacement

Historical CHPP waste comprised a mixture of high ash coal and non-coal materials, such as sedimentary rock and clay. These materials occur both within the coal seam and as floor or roof materials extracted during the mining operation. They are rejected during the beneficiation process on a specific gravity basis. CHPP waste is managed through disposal in an on-site reject emplacement area (REA).

Former REAs historically used at Baal Bone have been fully rehabilitated and capped, with the exception of REA 6 (refer **Plan 1**). It is intended to retain and maintain REA 6 until a decision regarding the future activity at Baal Bone has been determined. As such, REA 6 has been bunded for safety and security. REA 6 has 3 Mt of coarse reject capacity remaining and 300 m^3 within cell 2 of fine reject capacity remaining.

3.5.6 Reject Material

Coarse reject at Baal Bone has a particle size ranging from 100 millimetres (mm) to 100 micron (µm) with fine reject being less than 100 µm. Analysis of the coarse reject material has previously confirmed that it is generally non-saline with a near neutral pH and negligible acid forming potential. It has been shown to exhibit poor physical characteristics with a coarse texture and low water holding capacity. Even though it is chemically benign, this material is not suitable for use as a growth medium. All reshaped areas are therefore covered with a minimum of 300 mm of soil (freedig) material to provide a layer in which a sustainable and protective vegetative cover is established.

3.6 Water Management

3.6.1 Process Water Circuit

The process water system at Baal Bone Colliery consists of water that has had the potential to be in contact with coal or carbonaceous material and therefore has the potential to be saline. Mine water is captured on site and stored in water storages within the mine water management system before being discharged off-site. The system also allows for the reuse and recycling of water throughout the operation.

The 2018 process water system consists of:

- groundwater inflows and outflows;
- rainfall/runoff into mine pit;
- runoff from unsealed roads; and
- dirty water runoff from CHPP, pit top facilities, stockpiles and rail load out facilities.

A network of water transfer pipelines is used to transfer water across the Baal Bone Colliery site.

As at 31 December 2018, approximately 72 ML of water was held within the process water circuit, see Table 3.2.

Table 3.2: Stored Water at Baal Bone Colliery – simulated using Goldsim model

	Volume Held			
Location	**Start of Reporting Period**	**End of Reporting Period**	**Volume lost/gained**	**Maximum Storage Capacity**
Dirty Water Dam	10 ML	16.3 ML	Volume gained	37 ML
Process Water Dam	55 ML	55 ML	Remained even	55 ML
Box Cut Sump	3.5 ML	0.7 ML	Volume lost	6.9 ML
Controlled Discharge Water (Salinity Trading Schemes)	Nil	Nil	Nil	Nil
Contaminated Water	Nil	Nil	Nil	Nil

Water from both the north and south boreholes is piped back to the pit top's 'Dirty Water' management system. After discharge through an iron aeration system and retention in Lake Tegan, water overflows into Ben Bullen Creek and then leaves site through Licenced Discharge Point 1 (LDP1) at the Overshot Dam. An overview of the current water management and monitoring system can be seen in **Plan 1** and **Plan 2** (supplied as appendices to this report).

3.6.2 Potable Water

Potable water is purchased from State Water and is supplied through a connection into the Fish River Water Supply Pipeline. This connection services the administration centres and bathhouses. Drinking water is also taken underground in containers.

Potable water usage for the 2018 reporting period was 3.05 ML, an increase compared to the 1.8 ML of potable water usage in 2017.

3.6.3 Sewage Treatment and Disposal

Sewage and grey water effluent from site facilities, including the administration building, bathhouse, CHPP and amenities are collected in a sump and directed through macerator pumps to an on-site sewage treatment plant (STP). The waste is treated by an activated sludge treatment process then is discharged into two maturation ponds, with a total residence time of approximately 20 days.

Following treatment and maturation the overflow from the second pond discharges onto a well vegetated transpiration bed; this is an EPL discharge location (LDP2) and monitoring point. The location of the STP and maturation ponds is shown on **Plan 1**.

With the completion of mining at Baal Bone and the reduced number of employees on site, the discharge of LDP2 has been greatly reduced, with no discharge recorded during monthly monitoring since September 2014.

3.6.4 Water Balance

The net water discharge from site has historically been in the order of 1,500 ML/year (AECOM, 2010). The majority of this water is intercepted within the underground mine workings and goaf, which is then discharged through the north and south boreholes.

During mining operations all runoff from the pit top area, stockpile area and CHPP area was used within the mine as process water as required (AECOM, 2010). Process water was supplemented with water from mine Adit No. 5 and surface runoff and seepage collected from the Boxcut Sump as required (AECOM, 2010).

Approximately 50% of leachate from the Tailings Dam was returned to the process system (AECOM, 2010). Recycled process water used on site comprising leachate return water and wash down water from the CHPP, coal stockpile and pit top areas, historically contributed approximately 63% of all process water used (AECOM, 2010).

Potable water used on site has historically accounted for approximately 4% of all water used.

The annual site water balance takes into account the following:

- water sources (including rainfall, groundwater and potable water);
- demands and losses;
- the change in the inventory of water stored underground and in surface dams; and
- discharge of water off site

Major inputs for the 2018 reporting period were:

- 3 ML potable water from Fish River Water Supply;
- 1539 ML runoff and rainfall reporting to water stores;
- 1002 ML mine dewatered from southern and northern underground mining areas; and
- 164 ML mine dewatering from Adit 5.

Major outputs of the 2018 reporting period were:

- 1002 ML groundwater dewatered via north and south boreholes (leaving site via Overshot Dam LDP1); and

For comparison, the major inputs for the 2017 reporting period were:

- 1.8 ML potable water from Fish River Water Supply;
- 1655 ML runoff and rainfall reporting to water stores;
- 1247 ML mine dewatered from southern and northern underground mining areas; and
- 205 ML mine dewatering from Adits 2 and 5.

For comparison, the major outputs of the 2017 reporting period were:

- 1247 ML groundwater dewatered via north and south boreholes (leaving site via overshot dam LDP1).

3.7 Hazardous Material Management

3.7.1 Status of Licence

Baal Bone holds an *Acknowledgement of Notification of Hazardous Chemicals on Premises* (NDG023231). Details of hazardous chemicals stored on-site during the reporting period are provided in **Table 3.3**.

Table 3.3: Hazardous Chemicals Stored On Site

Storage ID	Storage Type	Maximum Storage Capacity
1	Underground Tank: Diesel	50 000 L
2	Above Ground Tank: LPG	37 750 L
3	Above Ground Tank: LPG	37 750 L
4	Above Ground Tank: LPG	5 000 L

Baal Bone also holds a Licence to Store explosives (XSTR100123). In order to be granted a licence to store explosives, in accordance with the Explosives Regulation (2005), Baal Bone has nominated suitable persons to hold an Unsupervised Handling Licence following appropriate state and federal security background check. Accordingly, the Explosive and Detonator Magazine was also included in the Acknowledgement.

Location of hazardous chemicals and explosives can be found on **Plan 3**.

3.7.2 Safety Data Sheets

Under Baal Bone's Environmental Management Strategy there is a Hazardous Substance Standard (BBNNUG-882012935-1976 – Hazardous Substances), which deals with the safe storage, handling and disposal of chemicals and other hazardous substances. Safety Data Sheets (SDS) are made available to all employees at the store facility.

Baal Bone also has a comprehensive online "ChemAlert" database, which provides all employees easy access to information on all chemicals held on site. Information includes but is not limited to: the safe handling of products, Personal Protective Equipment (PPE) requirements, storage, use

and disposal of the materials and spill response procedures. ChemAlert is available on most PCs including the one for general employee use in the lamp room.

3.8 Other Infrastructure Management

The location of existing infrastructure is shown on **Plan 1**. During the 2018 reporting period, there were no alterations or additions to processes or infrastructure.

3.9 Site Security

A number of safety measures have been adopted on site to ensure employee and public safety throughout all aspects of operations at Baal Bone. These security measures include:

- offsite licensed security contractor who responds to alarms immediately;
- change of security locks;
- CCTV surveillance of key areas of site;
- lockable gates across all portals;
- perimeter fencing;
- compulsory surface and underground inductions for those working on site; and
- all visitors must be signed in and out and must be accompanied around the site by authorised personnel.

3.10 Activities during Suspension of Mining

A notice of the 'Suspension of Operations' was provided by Baal Bone Colliery to the Department of Resources and Energy on 30 August 2011. Recognition from the Department was received on 16 September 2011. Approval from the Department for the suspension of mining operation and labour/expenditure conditions of CCL 749, CL 391, ML 1302 and ML 1389 was received on 27 September 2012, with the suspension taking effect four working days after the date of the letter for a period of three years.

In October 2015, Baal Bone Colliery lodged requests to further extend the suspension of mining and labour/expenditure conditions. On the 22 June 2017 the Department of Planning and Environment – Division of Resources and Geoscience approved the suspension of labour and expenditure conditions until 3 October 2019; and on 18 July 2017, the application to suspend mining operations/extraction was approved until 12 July 2021.

A Suspension of Operations MOP was developed and submitted to the then Department of Trade and Investment (DTI) on 14 June 2012. Recognition from DTI of the acceptance of the MOP was received on 18 June 2012. A revision to the MOP was requested from DTI in February 2013 to accommodate mine de-watering activities and the incorporation of information from the Baal Bone Colliery draft Mine Closure Plan. On 18 November 2013, DTI approved amendments to the MOP including changes to the water management system at site, removal of the South East Ventilation fan and an update on the training mine status at site.

On 1 February 2016, Baal Bone submitted a new Care and Maintenance MOP to DRE for review. The new MOP period is 29 February 2016 to 31 December 2019 to align with the approved modification to PA09_0178 to extend the timeframe for mining of remnant coal until 31 December 2019.

On 20 December 2018, Baal Bone Colliery submitted a revised MOP 2016 -2019 to the NSW Resources Regulator for approval. The revised MOP:

- provided further details and engineer plans for the sealing of the LW19 ventilation fan and shaft, and underground adits 1 – 11.
- extended the completion date for the ~28 ha of rehabilitation in the Northern Void and Northern Rehabilitation area until end 2019.

On 13 February 2019, approval for the revised MOP was granted by the NSW Resources Regulator.

Baal Bone Colliery is currently developing a Mine Closure MOP – which is anticipated to be submitted to the Resources Regulator in mid-2019 for approval.

A summary of the activities associated with the care and maintenance activities is provided in the sections below. Refer to the Baal Bone Colliery MOP for further information.

3.10.1 Salvage of Selected Underground Equipment

During the reporting period, the salvage of plant and equipment from the mine workings was continued. Salvaged plant and equipment has been cleaned and is stored on the pit top or cut throughs close to the mine entrance. Where appropriate, equipment that has been salvaged may be sold within the Glencore Group.

Salvaged equipment that has no residual value may be scrapped and recycled.

3.10.2 Maintenance of Services

Baal Bone is proposing to continue operation of the pit top (1 adit) ventilation fan throughout suspended operations and therefore the current MOP period.

Baal Bone has developed a Care and Maintenance Mine Inspection Program Matrix. This will be used as a guideline for maintenance scheduling and inspection frequencies.

The box cut fan (North) has been switched off and it is not anticipated to operate again during the care and maintenance period. In August 2016 Baal Bone Colliery submitted a High Risk Activity (HRA) Notification and supporting documentation to the Chief Inspector of Coal Mines for the filling and capping of LW19 ventilation shaft and adits. However due to uncertainty regarding the future of the site, the sealing of the ventilation shaft and adits was subsequently put on hold. In December 2018 Baal Bone Colliery confirmed with the Resources Regulator that the 2016 HRA Notification was still valid. Works to fill and seal the shaft and adits are now scheduled to commence in 2019.

The South East ventilation fan has been removed, and the shaft filled and capped in 2013.

Electricity, water, compressed air and communications services to the underground mine, building and pit top infrastructure will continue to operate and be maintained, subject to continued mine operations. All powerlines to the site will remain to supply buildings and offices power during the care and maintenance phase of the mine. All mine related unsealed roads, monitoring sites and dewatering bore compounds on Forestry Corporation of NSW (FCNSW) land will be maintained during the care and maintenance phase.

Baal Bone Colliery currently has three mine dewatering bores, two groundwater supply bores and four shallow piezometer monitoring bores licenced with DPI Water.

Gas bag samples to monitor underground methane gas levels will continue to be taken during the MOP period.

4 Actions Required from Previous Annual Review

The 2017 Baal Bone Annual Review was submitted on 29 March 2018. In correspondence dated 25 April 2018, the Department of Planning & Environment requested that additional information be included in the 2017 Annual Review (see **Table 4.1**). The 2017 Annual Review was resubmitted on 16 May 2018, and subsequently accepted by the Department on 4 June 2018.

There was no Annual Review meeting or site inspection held during 2018.

Table 4.1: Further requirements for the 2017 Annual Review

Requirement	Status
Include the REA monitoring location on Plan 6.	Complete – refer to Plan 6.
Include an update on the close our of actions from the Independent Environmental Audit undertaken in 2016.	Complete – refer to Section 9.
Revise the Statement of Compliance and include in Section 10 detail of the non-compliance of failing to undertake two monthly groundwater level monitoring as reported in Section 6.2.1.	Complete – refer to Section 2.
Revise Table 6.10 to include the TARP exceedance of zinc at BBPB2 in October 2017.	Complete – refer to Table 6.10.
Provide additional information on how the possible cause of the water quality exceedance was a change in sampling technique.	Complete – refer to Section 6.2.2.

5 Environmental Performance

Baal Bone Colliery maintains and operates an Environmental Management System (EMS), which has been prepared to reflect industry best practice and to specifically address Project Approval conditions, Environmental Protection Licence conditions and other statutory requirements.

Detailed plans of management and performance standards for a wide range of environmental elements have subsequently been developed. These Plans and Standards detail relevant control measures, management strategies, monitoring requirements, reporting procedures and performance expectations/criteria. Management plans can be found on the Baal Bone public website at: http://www.glencore.com.au/en/who-we-are/energy-products/baal-bone/Pages/other-publications.aspx.

It should be noted that this section of the Annual Review does not necessarily provide a comprehensive description of each individual environmental control mechanism that is currently employed at Baal Bone; this level of detail is available in the Baal Bone MOP (Suspension of Mining Operations) February 2016 to December 2019 and management plans.

This section will focus on providing a succinct review of the performance and/or modification of key control measures throughout the 2018 reporting period. Also included is a review of significant activities undertaken or actions completed throughout the year, a summary of monitored data (as applicable), a discussion regarding the level of compliance achieved; together with an overview of initiatives proposed and actions planned for the 2019 reporting period.

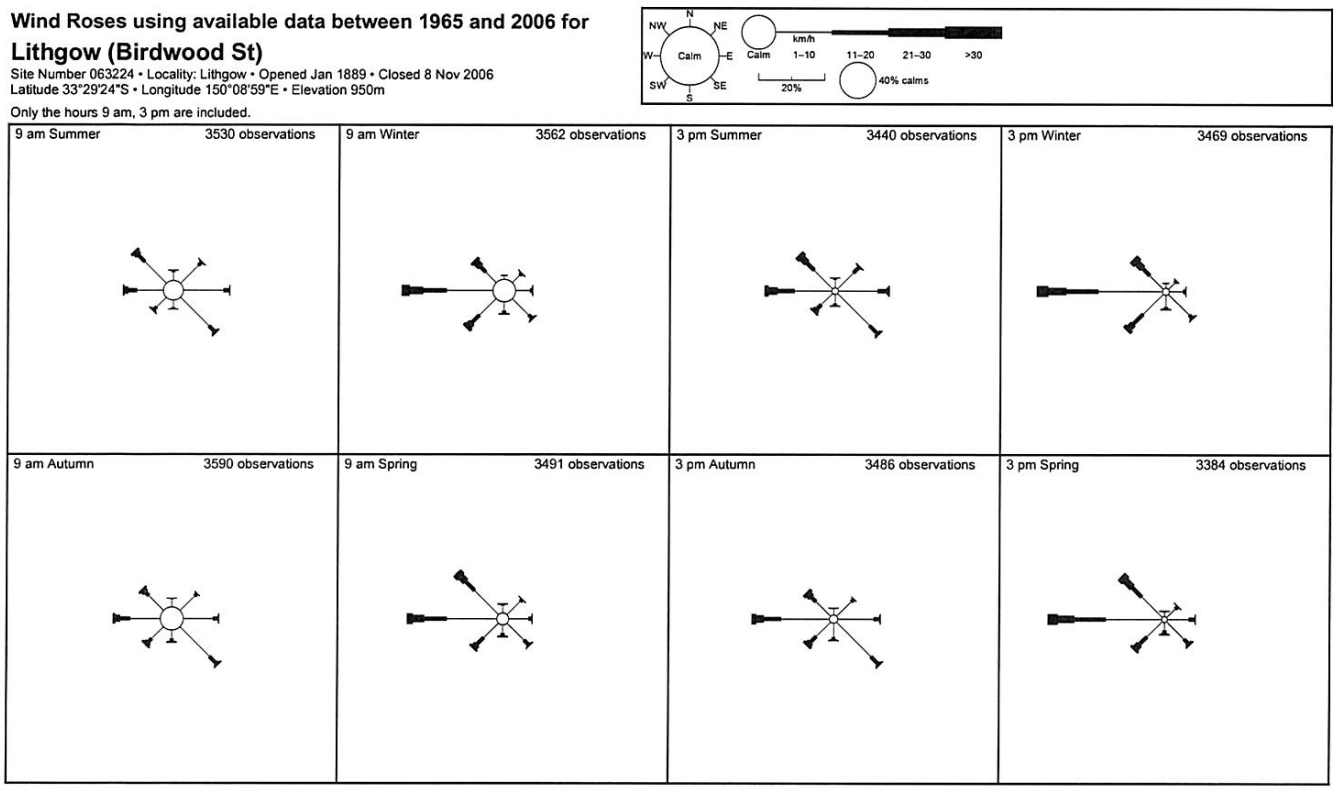
5.1 Air Pollution

5.1.1 Wind speed and direction

The Ben Bullen Range (and State Forest) provides Baal Bone with reasonable shelter from winds with the exception of those from the north-west which have a clear fetch of approximately 12 km upwind of the site. However, strong winds from the southwest and southeast may funnel through the gaps in the Ben Bullen Range and along the valleys towards the site.

Wind speed and direction at Baal Bone is comparable to the wind conditions from the Lithgow (Birdwood Street) Weather Station approximately 25 km south-east of the site. Historic seasonal wind roses for this weather station are found in **Figure 5.1**.

Figure 5.1: Historic Wind Roses for the Lithgow Weather Station (Birdwood Street)



5.1.2 Dust Monitoring and Sample Locations

Monthly dust fall-out monitoring is carried out in accordance with Australian Standard AS3580.10.1 and EPL requirements. From October 2017 onwards Baal Bone has carried out sample collection in house and has engaged ALS Group Environmental Division Lithgow, a NATA Accredited laboratory, to undertake the monthly monitoring and analysis. Prior to October 2017, Baal Bone Colliery employed ALS Group Environmental Division Mudgee to carry out sample collection and undertake monitoring and analysis of samples.

Baal Bone maintains a network of four dust deposition gauges to monitor dust levels around site and in the vicinity of the nearest neighbour, these are:

- Sample location DM1 (EPL monitoring point No. 7);
- Sample location DM2 (EPL monitoring point No. 13);
- Sample location DM3 (EPL monitoring point No. 14); and
- Sample location DM4 (EPL monitoring point No. 15);

Sample location DM5 (EPL monitoring point No. 16) was removed from the EPL in February 2014 following consultation with the EPA regarding site dust monitoring and risks.

Locations of all air quality monitoring gauges are shown in **Plan 2.**

5.1.3 Review and interpretation of dust monitoring results

Schedule 3, Condition 10 of PA 09_0178 includes air quality impact assessment criteria for the project which are summarised in below. The pollutants to be monitored include deposited dust, TSP and PM_{10}.

Table 5.1: Baal Bone air quality impact assessment criteria

Pollutant	Averaging period	Criterion	
Deposited dust	**Annual**	**Maximum increase**	**Maximum total**
		2 g/m^2/month	4 g/m^2/month
		Maximum Total	
TSP	Annual (suspended)	90 µg/m^3	
PM_{10}	24 hour (suspended)	50 µg/m^3	
	Annual (suspended)	30 µg/m^3	

Levels of deposited dust were monitored in accordance with the air quality impact assessment criteria. Results of deposited dust monitoring conducted during the 2018 reporting period provided below.

Table 5.2: Deposited dust monitoring results for 2018 (g/m^2/month)

Month	DM1	DM2	DM3	DM4
January	1.7	1.4	0.7	0.4
February	1.3	0.5	0.2	0.5
March	0.7	0.6	0.9	0.6
April	0.9	0.5	0.5	0.5
May	0.6	0.6	0.5	0.6
June	0.8	0.3	0.4	0.2
July	<0.1	<0.1	<0.1	<0.1
August	0.3	0.5	0.3	0.3
September	4.6*	1.0	0.9	1.9
October	1.3	0.5	0.5	0.5
November	0.4	0.9	0.6	0.5
December	1.5	2.2	2.4	2.8

*EPL Monitoring Point 7 (DM1) result for September 2018 is above the monthly maximum total deposited dust level of 4g/m^2/month however when the annual average is applied the result is well within Project Approval limits – refer to Figure 5.3 for 12 month rolling average.

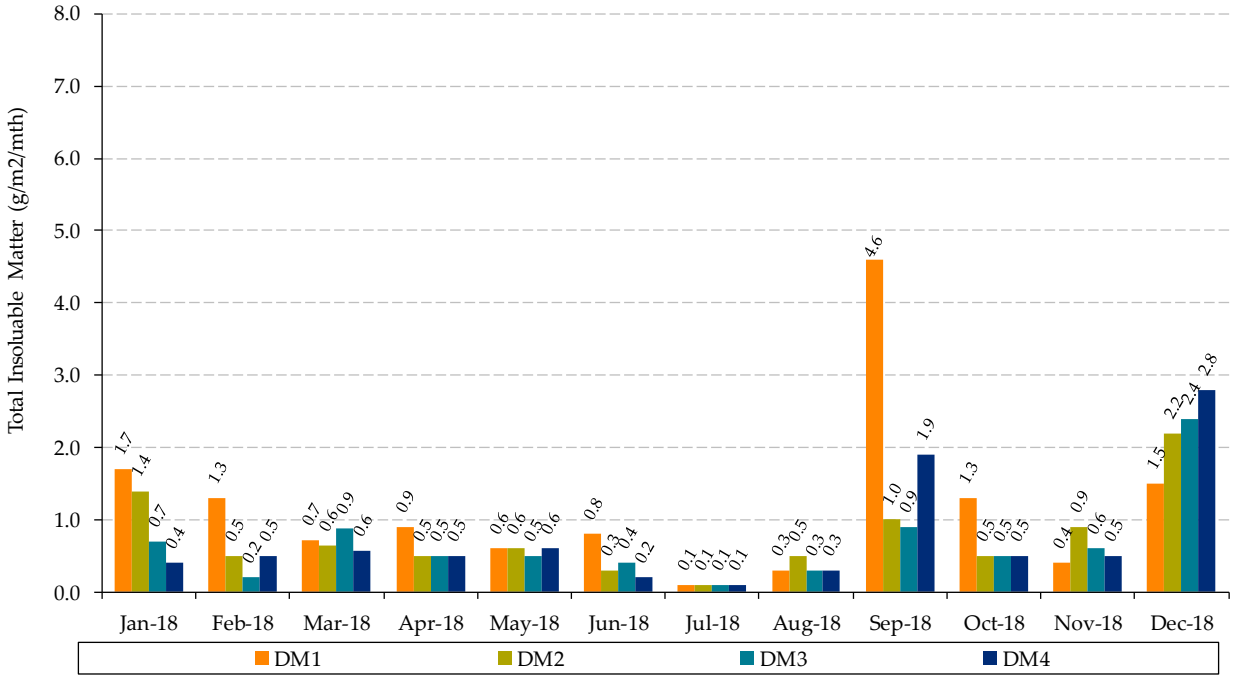


Figure 5.2: 2018 Deposited Dust Monthly Monitoring Results

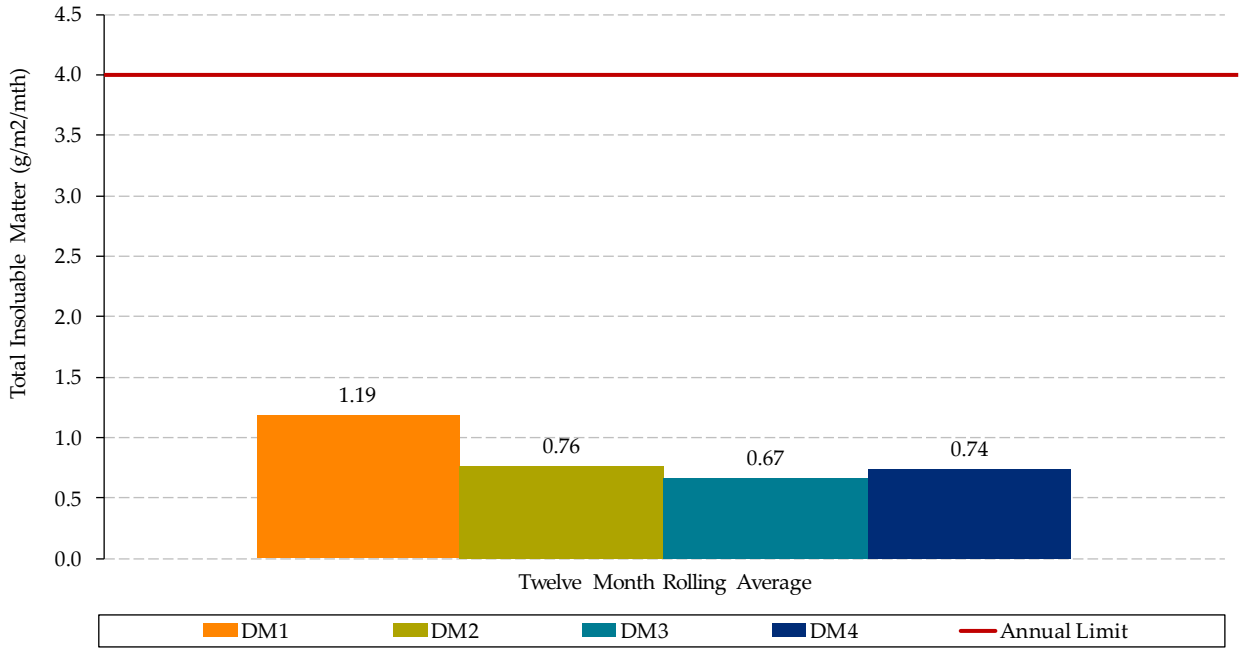


Figure 5.3: 2018 Annual Average Deposited Dust Results

All dust monitoring results for 2018, are below the maximum allowable annual average dust level of 4 g/m^2/month, in accordance with Schedule 3, Condition 10 of Project Approval 09_0178.

(Note: while DM1 in September 2018 returned a result above the monthly maximum total deposited dust level of 4 g/m^2/month, when the annual average is applied all results are well within Project Approval limits).

5.1.4 Comparison against previous Annual Reviews

Historically, deposited dust results have remained below the maximum allowable annual average dust level of 4 g/m^2/month in accordance with Schedule 3, Condition 10 of Project Approval 09_0178. **Figure 5.4** shows the annual averages for DM1 – DM5 for the period 2011 to 2018.

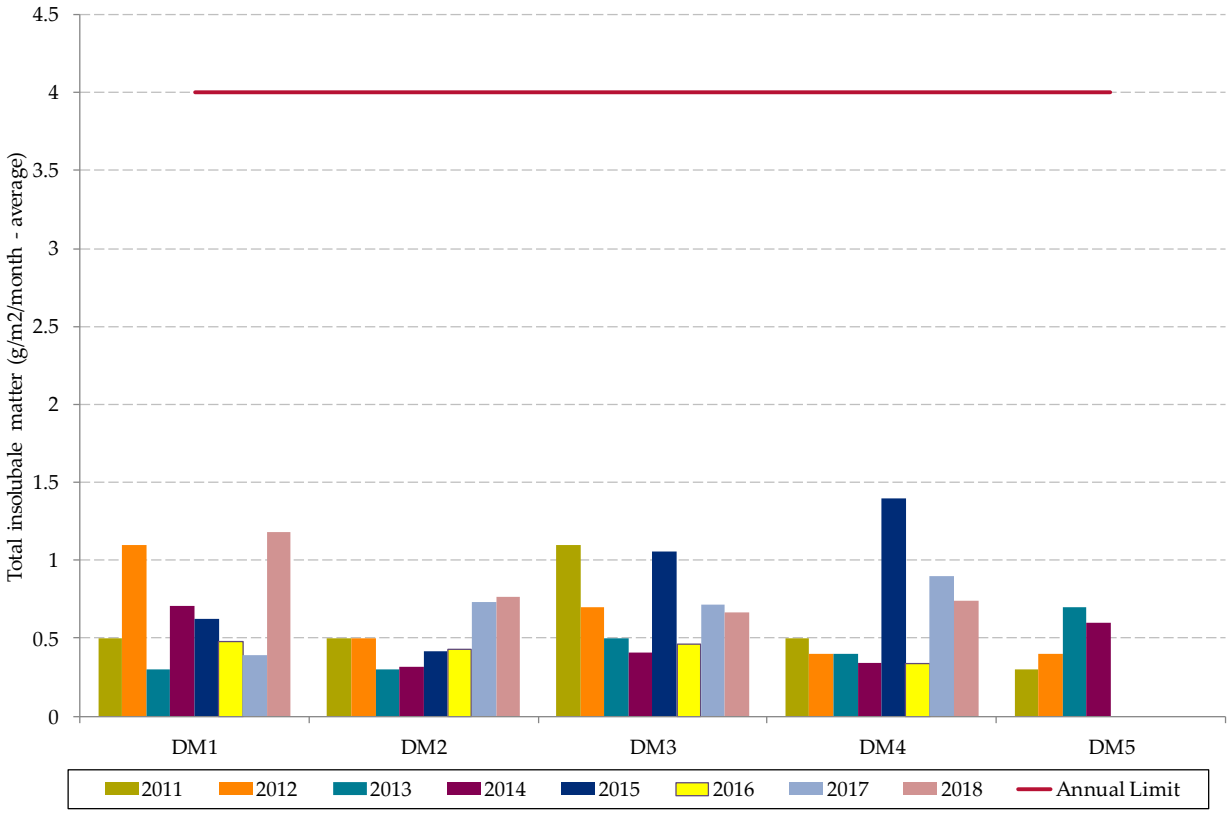


Figure 5.4: 2011 to 2018 Deposited Dust Monitoring Results

5.1.5 Comparison against EA

Levels of air quality pollutants as predicted under the EA are presented in below. **Table 5.3** shows the predicted cumulative pollutant concentration (which includes the predicted concentration from Baal Bone plus the background concentration). Deposited dust criteria are expressed as deposition rates and not concentrations. The predicted levels were all below the specified criteria.

Predicted odour levels are presented in **Table 5.3** below, and were assessed in the EA (AECOM 2010). Odour is not monitored as part of site operations; however no odour complaints were received during the reporting period.

Table 5.3: Maximum predicted pollutant results at the discrete sensitive receptors (AECOM, 2010).

Receptor Number	TSP (ug/m^3)		PM_{10} (ug/m^3)			Deposited Dust (g/m^2/month)		Odour (OU)
	Annual	Annual cumulative*	Annual	Annual cumulative*	24 hour	Annual	Annual cumulative*	One Second
1	13.5	58.5	5.0	23.0	36.2	0.76	3.3	2.6
2	7.4	52.4	2.6	20.6	23.2	0.4	3.0	1.8
4	3.3	48.3	1.2	19.2	12.5	0.2	2.8	1.0
5	4.2	49.2	1.5	19.5	16.1	0.2	2.8	0.9
6	4.5	49.5	1.7	19.7	13.2	0.2	2.8	2.1
7	2.5	47.5	0.9	18.9	13.6	0.2	2.8	1.3
8	2.6	47.6	1.0	19.0	16.4	0.2	2.8	1.8
9	5.2	50.2	1.7	19.7	26.5	0.4	3.0	1.1
10	5.4	50.4	1.8	19.8	19.4	0.4	3.0	2.5
11	3.8	48.8	1.3	19.3	13.0	0.2	2.8	0.7
12	3.3	48.3	1.1	19.1	18.5	0.2	2.8	1.5
13	2.8	47.8	0.8	18.8	10.6	0.2	2.8	0.7
Criteria	90 ug/m^3		30 ug/m^3		50 ug/m^3	4 g/m^2/month		5 OU

* Includes the predicted concentration from Baal Bone plus ambient background concentrations

The monitoring results at DM2 for deposited dust are likely to be representative of predicted deposited dust results at receptor number 2 listed in **Table 5.3**. The deposited dust monitoring results at DM2 during the reporting period, presented in **Section 3.1.3**, are consistently lower than the maximum predicted pollutant levels within the EA, as well as below the relevant criteria.

Therefore, the air quality impacts associated with Baal Bone's operations are consistent with the predicted impacts in the EA.

Note: Due to the care and maintenance status of Baal Bone Colliery, monitoring for TSP and PM_{10} ceased in 2012 in accordance with the approved Air Quality Monitoring Plan.

5.2 Erosion and Sediment Control

In non-active areas of the mining lease, there have been negligible levels of erosion and sedimentation. A portion of suitable non-active mining area is available for livestock agistment.

All active surface mining and rehabilitation areas fall within Baal Bone's Water Management System which is subdivided into 'clean water' and 'dirty water' systems. Features of the 'clean water' system includes upslope diversion banks, levee banks, lined channels and drains and reed beds within the Ben Bullen Creek; features of the 'dirty water' system include graded contour banks, containment bunds, primary arrestor/grit traps, sediment dams, water treatment plant and settlement dams.

The Overshot Dam is located on the Colliery's northern boundary and is the final point of containment / retention for the clean water system. It also provides an additional opportunity for settlement and/or other treatment if required. The discharge from the Overshot Dam is Licenced

Discharge Point LDP1 within EPL 765 (monitoring point 11). LDP1 discharged water off-site during all months of the reporting period.

5.3 Contaminated Land

Known contaminated or polluted lands at Baal Bone are limited to those affected by hydrocarbons. Hydrocarbon contamination is discussed in **Section 5.15**.

There were no environmental incidents recorded or additional areas of contaminated land identified during the reporting period.

5.4 Flora

Following the completion of mining on 3 September 2011, no routine flora monitoring of the LW29-31 area was completed during the subsequent reporting periods as it was no longer required by the Subsidence Management Plan.

5.5 Fauna

Following the completion of mining on 3 September 2011, no routine fauna monitoring of the LW29-31 area was completed during the subsequent reporting periods as it was no longer required by the Subsidence Management Plan.

5.6 Weeds

Weed management at Baal Bone continued during 2018. In line with the Annual Land Management Review of the Baal Bone site conducted by DnA Environmental, a weed spraying program targeting Blackberry was undertaken. The findings of the 2018 Land Management Review will be used to assist in informing weed management activities for the next reporting period.

5.7 Blasting

No blasting was conducted at Baal Bone during the reporting period.

5.8 Operational Noise

For the purpose of assessing the compliance status of site with licence noise limits a site attended audit and noise measurements were conducted on Wednesday 4 July 2018, during the day, evening and night periods by Global Acoustics.

The audit report concluded that:

"Activities from BBC complied with the relevant noise limits during attended monitoring on 4 July 2018 at all monitoring locations. Criteria may not always be applicable due to meteorological conditions at the time of monitoring.

There were no exceedances, complaints or noise related incidents recorded by BBC since the previous monitoring was carried out (July 2017)."

Full noise audit reports can be accessed from the Baal Bone publications webpage at: http://www.glencore.com.au/en/who-we-are/energy-products/baal-bone/Pages/default.aspx

There were no complaints regarding operational noise received during the reporting period.

5.8.1 Comparison against EA and previous Annual Reviews

The EA predicted $L_{Aeq\ 15\ minute}$ dB(A) noise levels at residences R1 and R2/R3, both with and without the dozer operating on the ROM stockpile. The EA also predicted $L_{A1,\ 1min}$ dB(A) intermittent noise levels at R1 and R2/R3 at night. The results of the attended noise audits confirm that Baal Bone Colliery noise levels are consistent with the EA predicted noise levels.

During the 2011 Annual Review period one complaint was received from a residence adjacent to Baal Bone in relation to noise generated by surface plant operations. The complaint coincided with an environmental compliance noise audit for Baal Bone in October 2011. The October 2011 audit found that during evening hours when the dozers were operating on the ROM stockpiles, the long term licence noise limits specified under Schedule 3, Condition 4 of the Development Consent were exceeded at R1 and R2/3. However, when the dozer was not operating on the ROM stockpiles the operations would comply with the long term licence noise limits. Modification were made to equipment and stockpile orientation, and no further noise complaints have been received.

Noise audits carried out from 2012 onwards have found that LAeq, 15 min noise contributions from Baal Bone Colliery during the day, evening and night assessment periods satisfied the long-term licence noise limits. Baal Bone related LAmax noise levels were not observed to cause exceedances of the licence noise limits at measurement locations for the duration of the audits.

5.9 Visual, Stray Light

All lighting associated with the CHPP and the UC1 conveyor/ROM stockpile has been designed and constructed so as to minimise glare and stray light to sensitive receivers. During 2012, a review of lighting requirements during care and maintenance was conducted and where appropriate lighting was minimised.

No complaints have been received during the reporting period in respect to lighting.

5.10 Aboriginal and European Heritage

5.10.1 Aboriginal Heritage

In early 2007, an Indigenous Heritage Assessment was undertaken in conjunction with preparation of the LW29-31 SMP application. This assessment identified a potential rock shelter site (BBC-RS1) located above LW30 in the Ben Bullen State Forest. An Aboriginal Cultural Heritage Management Plan (ACHMP) for the potential rock shelter site BBC-RS1 was developed by OzArk Environmental & Heritage Management Pty Ltd in 2008, based on the findings of the Indigenous Heritage Assessment. The ACHMP was workshopped by the Registered Aboriginal Parties and representatives of the former Department of Environment, Climate Change and Water (now OEH).

Schedule 3, Condition 26 of the Project Approval granted in January 2011 required that the ACHMP be updated in accordance with the EA. The ACHMP was subsequently revised in July 2011 in accordance with Condition 26. The ACHMP was last reviewed in 2019.

5.10.2 European Heritage

No European Heritage Sites have been identified within the Baal Bone mining lease.

5.10.3 Comparison against EA

The EA predicted that, while subsidence may occur, it is unlikely to impact currently undetected Aboriginal sites such as open sites. Potential impacts to Aboriginal heritage associated with the mining of LW29-31 have been assessed in previous surveys (OzArk 2007a; 2010). No significant impacts were predicted in this area, however, subsidence monitoring was to be undertaken during extraction. The rock shelter site BBC-RS1 was also required to be managed in accordance with an ACHMP.

Extraction of LW30 beneath BBC-RS1 occurred in July 2010. During this time, Baal Bone inspected the site twice weekly. Following extraction beneath BBC-RS1, the area was resurveyed and movement vectors were calculated. Subsidence monitoring during the reporting period has confirmed the predictions in the EA. The data showed that the rock which forms the main shelter (overhang) moved 536 mm in a westerly direction and subsided approximately 717 mm (10 mm accuracy). However, there was no visible damage caused to BBC-RS1 as a result of the extraction of LW30.

5.11 Natural Heritage

No natural heritage sites have been identified within the Baal Bone mining lease. However, the Gardens of Stone National Park lies approximately 5 km north-east of Baal Bone and the Greater Blue Mountains World Heritage Area is located approximately 80 km to the south-east of Baal Bone. These areas are not expected to be affected by the operations at Baal Bone. The Ben Bullen State Forest covers a signification portion of the lease area.

5.12 Spontaneous Combustion

No spontaneous combustion events occurred during the reporting period. Whilst under care and maintenance no stockpiling of coal products is occurring. The last of Baal Bone's ROM stockpiles were transported off site in April 2012.

Baal Bone has a Spontaneous Combustion TARP for the ROM stockpile. The TARP principally involves regulating the duration of ROM storage on the stockpile to reduce residence time and therefore potential oxidation as well as monitoring of internal stockpile temperatures.

5.13 Bushfire Management

In the event that a bushfire is ignited on company owned land, or where bushfire poses a threat to the mining operations, the Baal Bone's Bushfire Emergency Preparedness System will be activated. In addition, site management will ensure that:

- all boundary roads around the land within the Colliery freehold area are maintained in a condition suitable for use as fire breaks and access tracks during an emergency situation;
- main access road and helipad are maintained suitable for use by emergency services;
- dams, voids and any other areas that may be utilised as watering points can be accessed by firefighting equipment;
- portable radios are used at the time of emergency solely by the emergency response team who are trained and are provided with protective clothing;
- site earthmoving equipment can be utilised; and

- emergency phone, fire extinguishers and fire depots are located at strategic locations around the surface facilities.

Bushfire preparedness has also been included in Baal Bone's Biodiversity and Land Management Plan.

5.14 Mine Subsidence

5.14.1 Current Approvals

The SMP for development and extraction of LW29-31 expired on 1 December 2014 with mining operations in the LW29-31 area completed on 3 September 2011.

5.14.2 Longwalls 29-31 Subsidence Development (Summary of Survey Results)

Surveys of various subsidence monitoring lines were undertaken during mining of LW29-31. Maximum results of surveys conducted since 2009 are listed below.

Table 5.6: LW 29-31 Subsidence Survey Data Summary

Parameter	Predicted Results	Maximum measured result		
		2009	2010	2011
Vertical subsidence (mm)	1400 - 1600	1341	1538	1726
Horizontal movement (mm)	400	450	188	538
Strain (mm/m)	9 - 21	11.7	13.7	14.2
Tilt (mm/m) K=5.0	32 - 52	25.6	23.2	43.7

As per the LW29-31 SMP, a final post LW31 subsidence survey was carried out in May 2012. Summarised results are listed below**.** Results from previous surveys can be found in Subsidence Status Reports published on the Baal Bone website in the following location: http://www.glencore.com.au/en/who-we-are/energy-products/baal-bone/Pages/other-publications.aspx.

Table 5.7: 2012 LW29-31 Subsidence Survey Data (8 May 2012)

Line	Measured Subsidence (mm)	Measured Strain (mm/m)	Measured Tilt (mm/m)	Measured Horizontal Movement (mm)
SMP Prediction (mm)	1400 – 1600	9 - 21	32 - 52	400
E Line (LW 31)	1742 (LW30)	13.3	43.2	280
Northern Pinch Point Reflectors	+9			33
Northern Pinch Point Prisms	13			24
Southern Pinch Point Reflectors	14			9
Southern Pinch Point Prisms	2			8

The minor exceedance on E Line over LW30 has previously been reported in the 2011 Annual Review. The post mining survey conducted on 8 May 2012 noted a further increase of 14 mm to a total of 142 mm. The distance where this occurred is limited to a length of less than 50 metres.

5.15 Hydrocarbon Contamination

During 2017, six monthly testing of groundwater monitoring wells (MW) in the vicinity of the underground diesel storage tank (UST) at Baal Bone was undertaken during May and November 2017. The results of this monitoring program acknowledged that previous activities at the site have resulted in contamination of shallow groundwater. The contamination was localised and associated with the known point source, the fuel storage area (refer to **Plan 3** and **Plan 4**).

The May 2017 results concluded that when compared with the prior groundwater monitoring results from 8 November 2016 there was an increase in total recoverable hydrocarbon (TRH) fractions within MW01 and results remain above the adopted criteria.

The 22 November 2017 results concluded that when compared with the prior groundwater monitoring results from 30 May 2017 there was an increase in TRH within MW01 with results remaining well above the adopted criteria. There were no significant changes in results for MW03 and MW101.

Given the high concentrations of TRH in the 22 November 2017 testing at MW01, the bore was resampled by Baal Bone personnel on 19 December 2017 and 29 January 2018. The results showed that the concentrations of TRH decreased in December 2017, however increased in January 2018.

Following three consecutive high concentrations of TRH, MW01 was purged and flushed with fresh water to remove potential residual petroleum hydrocarbon contamination. The bore was then retested on 1 March 2018 by ALS Lithgow. MW03 and MW101 were also retested at this time. The results returned significantly higher concentrations of TRH in MW01. MW03 and MW101 returned consistently low concentrations of TRH.

Given the high concentrations of TRH at MW01, integrity testing of the 50,000L diesel UST and lines was conducted on 9 April 2018. The integrity test found no issues with the tank, however noted a small leak in a line and hand nozzle. A replacement line and hand nozzle was fitted the week following the integrity test. Further investigations on site detected a leak in a second fitting (banlaw fitting) – only evident when the line was pressurised. Subsequently, the line and banlaw fitting was removed.

Groundwater monitoring wells were sampled again in June 2018. The June 2018 sampling found that TRH levels at MW01 had increased significantly since the March 2018 sampling. MW03 and MW101 continued to return consistently low concentrations of TRH. Due to the continued increases of TRH at MW01, use of the underground diesel storage tank was discontinued.

The groundwater monitoring wells were sampled again in November 2018, demonstrating a significant decrease in TRH levels at MW01. Results are presented in **Figure 5.6** below.

Due to mine closure works scheduled to occur during 2019, use of the underground diesel tank may resume in 2019. If use of the underground diesel tank resumes, MW01 will be tested monthly for at least 6 months after use resumes, to ensure that TRH levels remain stable/decrease.

As part of mine closure activities, GHD were commissioned to undertake a detailed site contamination assessment (GHD, 2017). The report produced from this work noted the following:

The detection of elevated TRH in groundwater at MW01 suggests there has been impact to

groundwater from the diesel UST. It is expected that levels of contaminants in groundwater will continue to attenuate over time with the planned mine closure, removal of the UST and remediation of the surrounding soils.

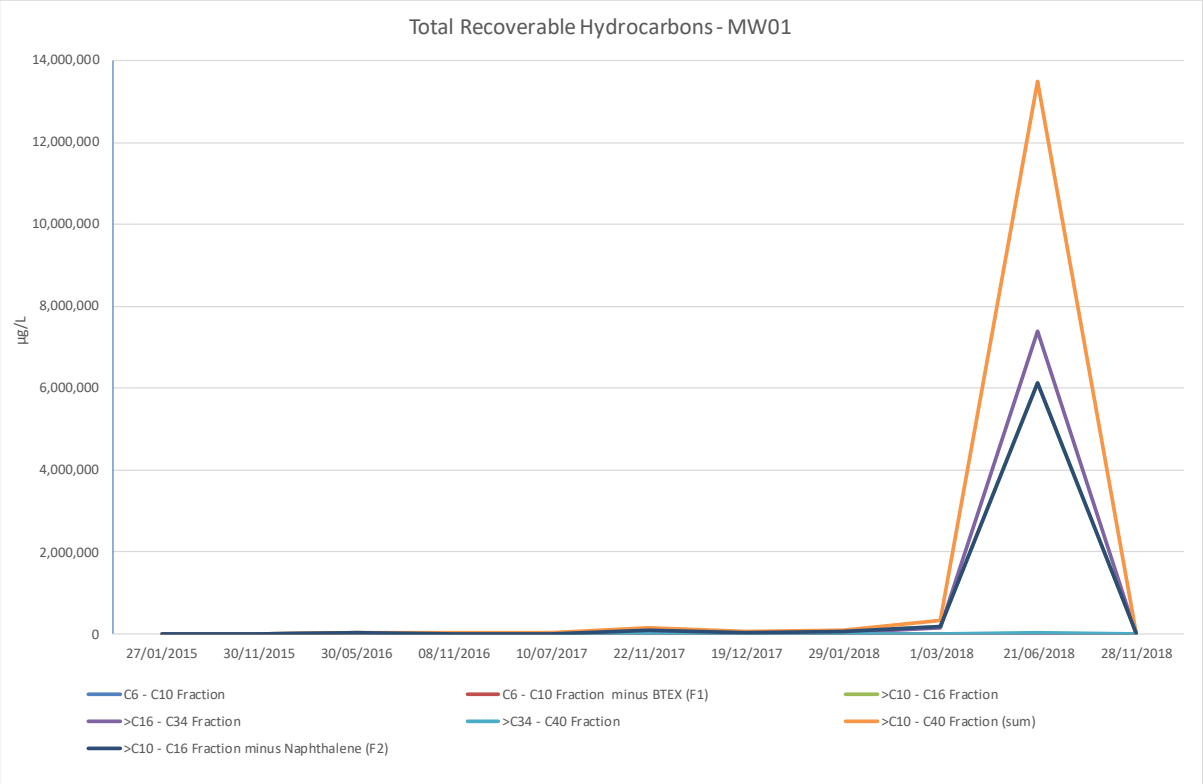


Figure 5.6: TRH results for MW01 (2015 to 2018)

5.16 Methane Drainage and Ventilation

During the reporting period, monthly gas bag samples from the underground ventilation system were analysed by Coal Mines Technical Services, a NATA accredited company – in accordance with the MOP.

Results from the sampling completed throughout the reporting period confirm extremely low levels of methane at Baal Bone (<0.0001%). Consequently, methane drainage is not required at Baal Bone.

5.17 Public Safety

Fences are in place around the mining lease area, with all other boundary gates locked and maintained in correct working order. All access points onto the mine area are signposted to warn the public of Baal Bone Colliery's mining operations and of the risks involved. Warning signs have also been erected along public tracks in the Ben Bullen State Forest warning of mine subsidence and prohibiting entry to unauthorised persons.

All employees and contractors who enter the mining operations or workshop areas are inducted and must be suitably trained. All visitors must sign in and be accompanied by an employee or staff member of the mine if they have not been inducted.

Security and safety measures were undertaken in 2011 to prepare for suspension of operations and included increased security controls and installing gates on adits. Grills were placed on conveyors in 2011. A gate lock change also took place in 2011. During 2012, fences were erected in the CHPP area and access roads blocked.

5.18 Other Issues and Risks

5.18.1 National Pollution Inventory

In December 1997, the NSW Parliament passed new legislation that saw the start of the National Pollution Inventory (NPI) reporting process. The NPI is an internet database designed to provide the community, industry and the government with information on the types and amounts of certain substances being emitted to the environment.

Baal Bone Colliery submitted an NPI report on 3 August 2018 for the period of 1 July 2017 to 30 June 2018. The report detailed emissions of listed substances from Baal Bone Colliery to air, water and land requiring collation, analysis and interpretation of site-specific data. Results can be obtained from the NPI website www.npi.gov.au.

5.18.2 Reportable Incidents

All incidents are reported in accordance with Project Approval 09_0178 – Schedule 5, Condition 5. There were no fines or penalties recorded during the reporting period.

Pursuant to Glencore's categorisation of incidents, any incident that falls into the categories below must be reported to the Group Environment and Community Manager, the General Manager for Open Cut or Underground Operations (depending on the type of incident) and the Chief Operating Officer.

Category I: An incident that has caused negligible, reversible environmental impact, requiring very minor or no remediation.

Category II: An incident that has caused minor, reversible environmental impact, requiring minor remediation.

Category III: An incident that has caused moderate, reversible environmental impact with short-term effect, requiring moderate remediation.

Category IV: An incident that has cause serious environmental impact, with medium-term effect, requiring significant remediation.

Category V: An incident that has caused disastrous environmental impact, with long-term effect, requiring major remediation.

In accordance with the Glencore definitions provided above, there were no reportable environmental incidents were recorded by Baal Bone during the reporting period.

During the 2017 reporting period, there were two reportable environmental incidents relating to cliff falls in Ben Bullen State Forest over LW3 and LW6. These incidents were reported to the DPE, DRG, and Forestry Corporation NSW. Baal Bone Colliery conducted investigations into the cliff falls, including geotechnical assessments conducted by Strata Control Technologies (SCT). The geotechnical investigations concluded that the falls were caused by rock fractures deep within the strata that was originally caused by subsidence in the area. SCT have indicated that the recent incidents are rare in respect of occurring ~30 years after the area was impacted. Extensive

geotechnical assessments have been conducted at Baal Bone Colliery in recent decades which have led to the modifications of subsequent mine designs to minimise the potential for impact upon such features. On 29 May 2018, Baal Bone Colliery received notification from the Resources Regulator that following an investigation into the rockfall events that "the Resources Regulator does not propose to take any further action in relation to this matter" (Investigation Outcome ACES: 0925-2017 DOC18/341492, Resources Regulator – 29 May 2018).

6 Water Management

6.1 Surface Water

Baal Bone engaged ALS Group Environmental Division Mudgee, a NATA Accredited laboratory, to undertake monthly sampling, monitoring and analysis of a range of surface and subsurface waters. In September 2017 Baal Bone personnel commenced the sampling and monitoring and ALS Group Environmental Division Lithgow conducted the analysis.

EPL No. 765 currently contains three licensed monitoring points in relation to surface water and groundwater management. The EPL licensed monitoring points are provided in the **Table 6.1** below. The location of monitoring points can be seen **in Plan 2.**

Table 6.1: EPL Licenced Monitoring Points

EPA Identification No.	Type of Monitoring Point	Description of Location
2	Discharge water quality monitoring	Sewage Transpiration Bed labelled as 'LD2'
11	Discharge to waters	Ben Bullen Creek downstream of active surface mining area, labelled as 'LDP1'
12	Upstream quality monitoring	Ben Bullen Creek upstream of active surface mining area, labelled as 'WMP1'

A copy of EPL 765 can be accessed here: www.epa.nsw.gov.au/prpoeoapp

A description of discharge and monitoring sites, analyses conducted, frequency of sampling and concentration limits (where applicable) are shown below. EPL Monitoring Points are shaded in yellow.

Table 6.2: Baal Bone Colliery water monitoring locations and monthly analysis during 2018

Sample Name	Sample Location	Frequency	Pollutants Analysed	EPL Limits Apply
BBLD2	EPL Monitoring Pt No.2. In sump at discharge from STP maturation pond to transpiration bed area	Monthly during discharge	Oil & grease, TSS, pH, BOD, faecal coliforms, nitrogen, phosphorus	Not specified
BBLDP1	EPL Monitoring Pt No.11 Immediately below the pipe outlet or in stilling pool below spillway of overshoot dam	Monthly during discharge	EC, oil & grease, sulphate, iron, TSS, pH, flow rate, hardness, MBAS, nitrogen, phosphorus	Oil & grease, pH, total iron, TSS

BBWMP1	EPL Monitoring Pt No. 12 Pool within Ben Bullen creek upstream of active surface mining area	Monthly (during flow)	EC, oil & grease, sulphate, iron, TSS, pH, flow rate, hardness, nitrogen, phosphorus	Not specified
BBPOT	Potable water from main kitchen in Administration	Monthly	pH, EC, Hardness, heterotrophic standard plate count, total coliforms, E coli, Pseudomonas	N/A
BBREAS	Spring on Ben Bullen Creek	Monthly (during flow)	EC, iron, oil & grease, pH, sulphate, nitrogen, phosphorous, and TSS	N/A
BBDW	Dirty water dam	Monthly	EC, Iron, oil & grease, pH, Sulphate, TSS	N/A
BBPRW	Process water dam	Monthly	EC, Iron, oil & grease, pH, Sulphate, TSS	N/A
BBSTP1	STP Maturation Pond No 1 Note: Only sampled if water levels in STP2 are too low.	Monthly	pH, BOD, Faecal coliforms, nitrogen, phosphorus	N/A
BBSTP2	STP Maturation Pond No 2	Monthly	pH, BOD, Faecal coliforms, nitrogen, phosphorus	N/A
BBBC	Box cut sump	Monthly	pH, EC, iron, sulphates	N/A
BBBBC Mid	Ben Bullen Creek mid-way through site	Monthly (during flow)	Flow rate, pH, EC, TSS, iron, sulphates, oil & grease, nitrogen, phosphorus	N/A
BBLT	'Lake Tegan'	Monthly	EC, iron, oil & grease, pH, sulphate, nitrogen, phosphorous, and TSS	N/A
BBJC2	Jews Creek upstream of mining operations, but below dewatering bore discharges	Monthly (during flow)	Flow rate, pH, EC, TSS, iron, sulphates, oil & grease, nitrogen, phosphorus	N/A
BBJCH	Jews Creek headwaters upstream of all mining operations and mine dewatering discharges	Monthly (during flow)	Flow rate, pH, EC, TSS, iron, sulphates, hardness, oil & grease, nitrogen, phosphorus	N/A
BBCR	Cox's River	Monthly (during flow)	Flow rate, pH, EC, TSS, iron, sulphates, oil & grease, nitrogen, phosphorus, Hardness	N/A

6.1.2 Interpretation and Review of Monitoring Results

Condition L2 of EPL 765 outlines water concentration limits for oil and grease, pH, total suspended solids and total iron. These limits are presented below:

Table 6.3: EPL concentration limits

Pollutant	LD2 (EPL Monitoring Point 2)	LDP1 (EPL Monitoring Point 11)	WMP1 (EPL Monitoring Point 12)
Oil and grease (mg/L)	-	10	-
pH	-	6.5-8.5	-
Total Suspended Solids (mg/L)	-	50	-
Iron (dissolved) (mg/L)	-	1.0	-

Monitoring results for Baal Bone's three monitoring points as required by EPL 765 are discussed in **Table 6.4**, and **Figures 6.1 to 6.4**. Samples were taken monthly during discharge in accordance with the EPL.

Table 6.4: 2018 concentrations as required by EPL 765.

EPL Point	Month	Pollutant									
		EC	O&G	SO_4^{2-}	Fe	TSS	pH	BOD	Faecal Coliform	N	P
		uS/cm	mg/L	mg/L	mg/L	mg/L	-	mg/L	cos/ 100ml	mg/L	mg/L
LD2	Jan	Sample not required	*Dry*	Sample not required		*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Feb		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Mar		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Apr		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	May		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	June		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	July		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Aug		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Sep		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Oct		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Nov		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
	Dec		*Dry*			*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*
LDP1	Jan	1036	<5	229	0.08	5	7.7	Sample not required			
	Feb	920	<5	275	0.18	<5	7.6				
	Mar	1060	<5	371	0.05	<5	8.1				
	Apr	1140	<5	313	0.1	<5	7.9				
	May	1205	<5	311	<0.05	<5	6.8				
	June	1190	<5	320	<0.05	<5	7.9				
	July	1191	<5	284	<0.05	<5	7.5				
	Aug	1208	<5	314	<0.05	<5	7.2				
	Sep	968	<5	250	<0.05	<5	7.9				
	Oct	1149	<5	330	<0.05	<5	7.6				

EPL Point	Month	Pollutant									
		EC	O&G	SO_4^{2-}	Fe	TSS	pH	BOD	Faecal Coliform	N	P
		uS/cm	mg/L	mg/L	mg/L	mg/L	-	mg/L	cos/ 100ml	mg/L	mg/L
	Nov	1004	<5	271	<0.05	<5	7.3				
	Dec	1072	<5	322	<0.05	<5	7.8				
WMP1	Jan	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	Sample not required			
	Feb	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*				
	Mar	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*				
	Apr	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*				
	May	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*				
	June	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*				
	July	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*				
	Aug	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*				
	Sep	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*				
	Oct	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*				
	Nov	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*				
	Dec	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*	*Dry*				

Legend

BOD = Biological oxygen demand
EC = Electrical conductivity
Fe = Iron (dissolved)
N = Nitrogen
O & G = Oil and Grease
P = Phosphorus
SO_4^{2-} = Sulphate
TSS = Total suspended solids

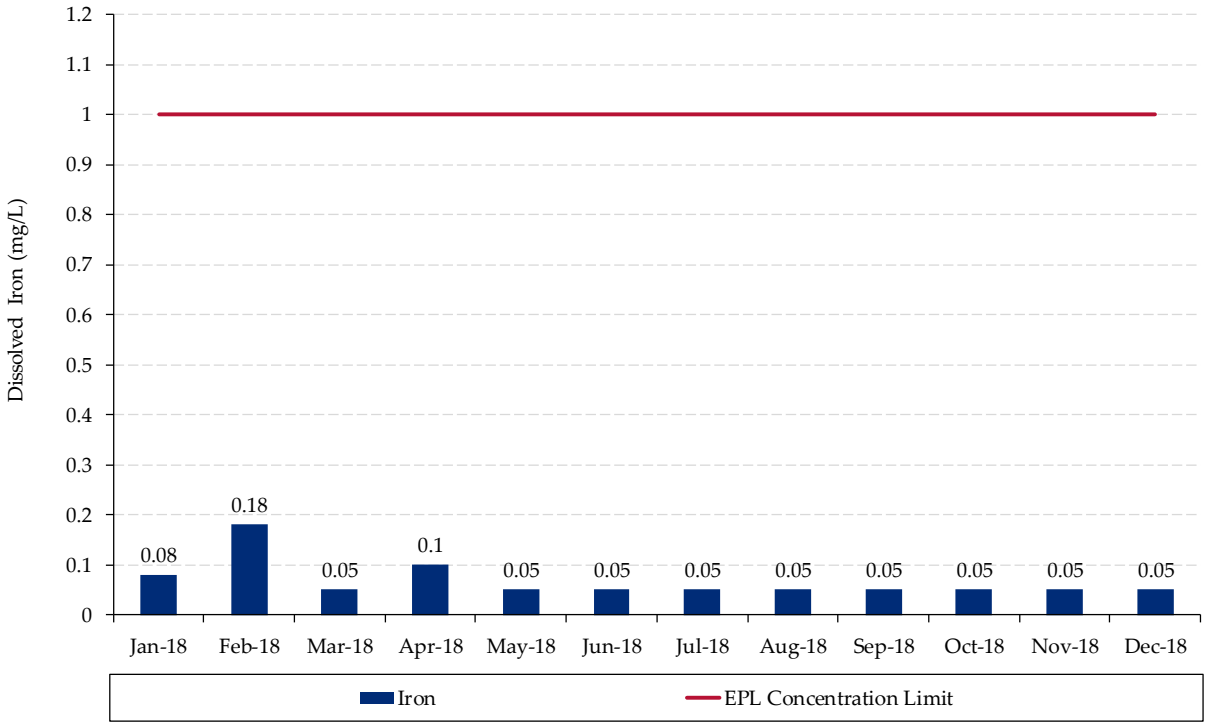


Figure 6.1: Dissolved Iron

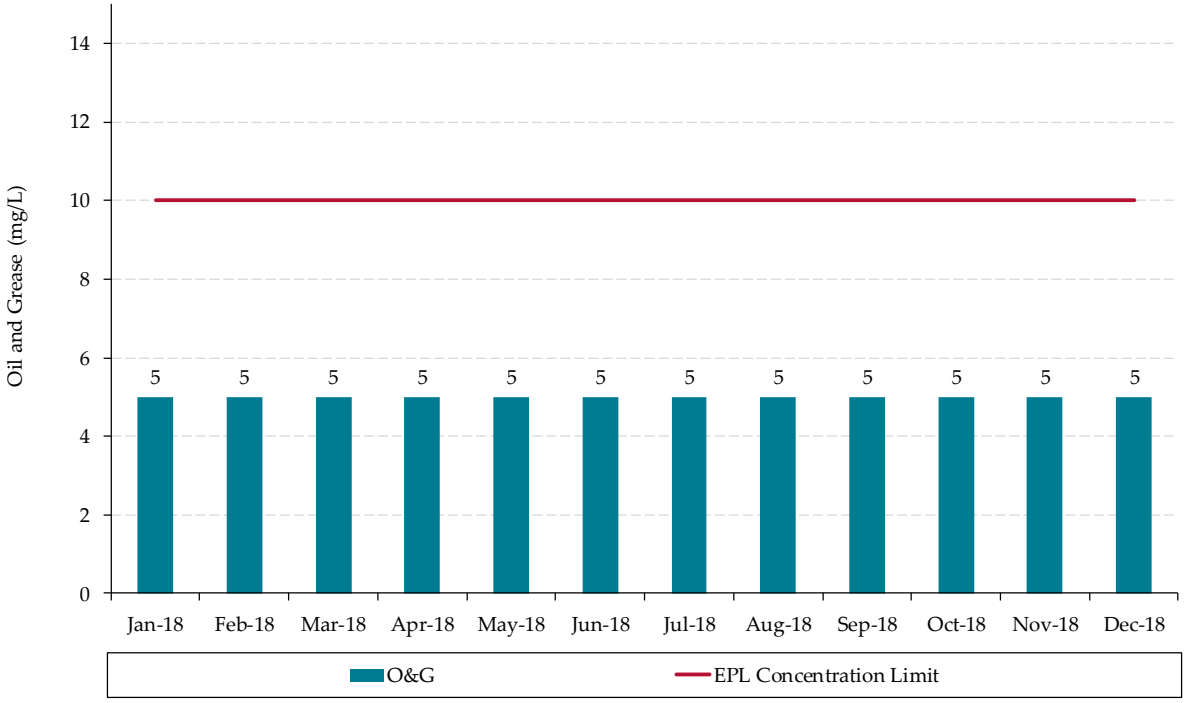


Figure 6.2: Oil & Grease

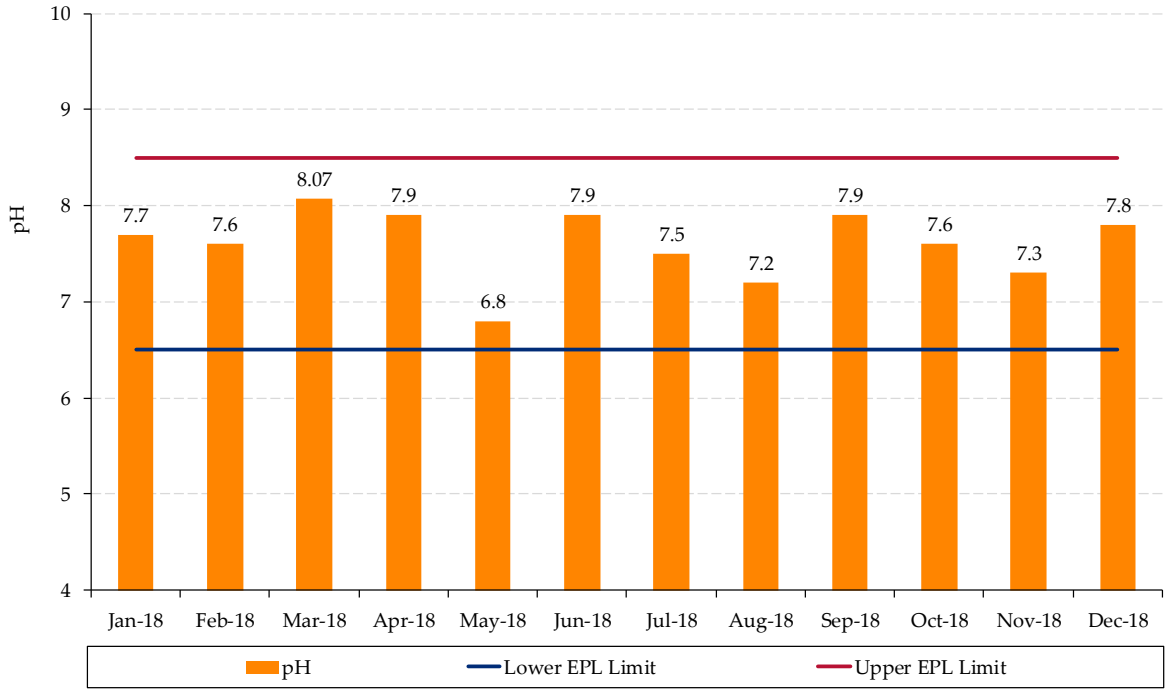


Figure 6.3: pH

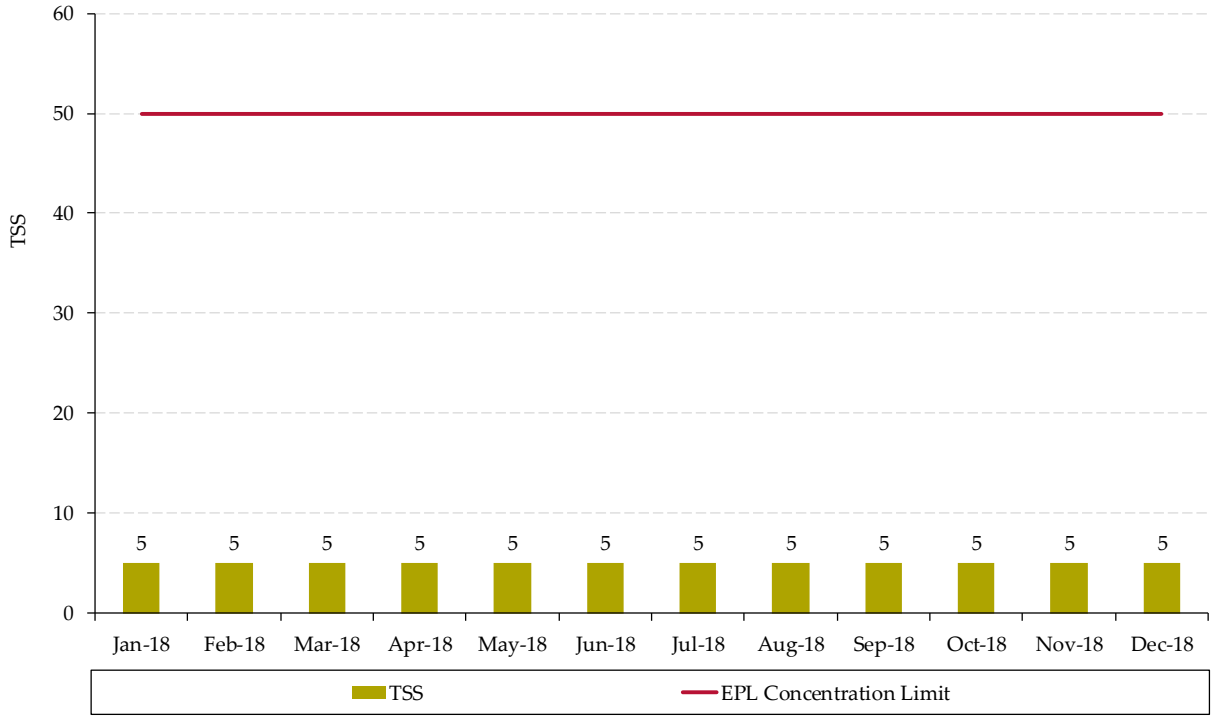


Figure 6.4: Total Suspended Solids

All samples recorded were within EPL concentration limits during the 2018 reporting period.

A summary of monitoring results for EPL discharge and monitoring points (those with specified concentration limits) can be found below:

- All dissolved iron samples for 2018 were well below the concentration limit of 1 mg/L, with the highest reading of 0.18 mg/L returned in February 2018.
- All oil and grease returned levels of 5 mg/L or less, well below the EPL concentration limit of 10 mg/L.
- All samples returned pH results that were within the upper and lower EPL limits (8.5 and 6.5 respectively).
- All monthly TSS results were below the EPL concentration limit of 50 mg/L, with the highest reading of 5 mg/L returned in January 2018.

Monthly EPL reporting can be accessed here: http://www.glencore.com.au/en/who-we-are/energy-products/baal-bone/Pages/epl-reporting.aspx.

6.1.3 Comparison against previous Annual Reviews

A summary of water quality results from previous Annual Reviews is provided below.

Table 6.5: Water quality results 2006 - 2018

Annual Review Year	Iron	Oil and Grease	pH	TSS
2006	One minor exceedance at LDP1.	Compliant	Compliant	Compliant
2007	One erroneous exceedance at LDP1 of 5.4mg/L in August 2007 – retesting showed compliant level of 0.9mg/L	Compliant	Compliant	One erroneous exceedance at LDP1 of 266mg/L in August 2007 – retesting showed compliant level of 25mg/L
2008	Compliant	Compliant	Compliant	Compliant
2009	Compliant	Compliant	Compliant	Compliant
2010	1 exceedance at LDP1 of 2mg/L in February 2010.	Compliant	Compliant	Compliant
2011	2 exceedances at LD6 in April and October and 1 exceedance at LDP1 in June 2011 of 1.2, 1.2 and 3mg/L respectively.	Compliant	Compliant	Compliant

Annual Review Year	Iron	Oil and Grease	pH	TSS
2012	1 exceedance at LD6 of 2mg/L in September 2012.	Compliant	Compliant	Compliant
2013	Compliant	Compliant	Compliant	Two Total Suspended Solids (TSS) exceedances at LDP3 (60mg/L) and LDP6 (85mg/L) in February
2014	Total iron recorded in Jan 2014 was 1.11mg/L. However note that EPL limit is for *dissolved iron.* Sampling routine changed to include dissolved iron.	Compliant	Compliant	Compliant
2015	Compliant	Compliant	Compliant	Compliant
2016	Compliant	Compliant	Compliant	Compliant
2017	Compliant	Compliant	Compliant	Compliant
2018	Compliant	Compliant	Compliant	Compliant

Occasional exceedances of iron have been recorded in 2006, 2010, 2011, 2012 and 2014. Following further investigations, no apparent relation to mining operations was identified. Furthermore the EPL limit of 1 mg/L is for Dissolved Iron, and the exceedances reported in previous years were Total Iron results. Monitoring was amended during 2014 to include dissolved iron at EPL monitoring points.

Figures 6.5 – 6.8 illustrate the long term trends for dissolved iron, oil and grease, pH and total suspended solids during the period 2011 to 2018 at current EPL monitoring points. Note that there has been no flow recorded at WMP1 and LD2 during the reporting period. Furthermore EPL monitoring points LD3 and LD6 were removed in 2013.

Figure 6.5 shows the iron level recorded at LDP1 from 2011 to 2018. From 1 August 2013 EPL 765 specifies a *dissolved* iron concentration limit of 1 mg/L at LDP1. Prior to this time, the iron concentration limit at LDP1 was 1 mg/L of *total* iron. Between 2011 and 2018 there has been one exceedance of the EPL iron concentration limit, in June 2011, with a reading of 3 mg/L. An investigation which included follow up testing of LDP1 and examination of water transfers could find no definitive reason for the isolated spike in iron levels.

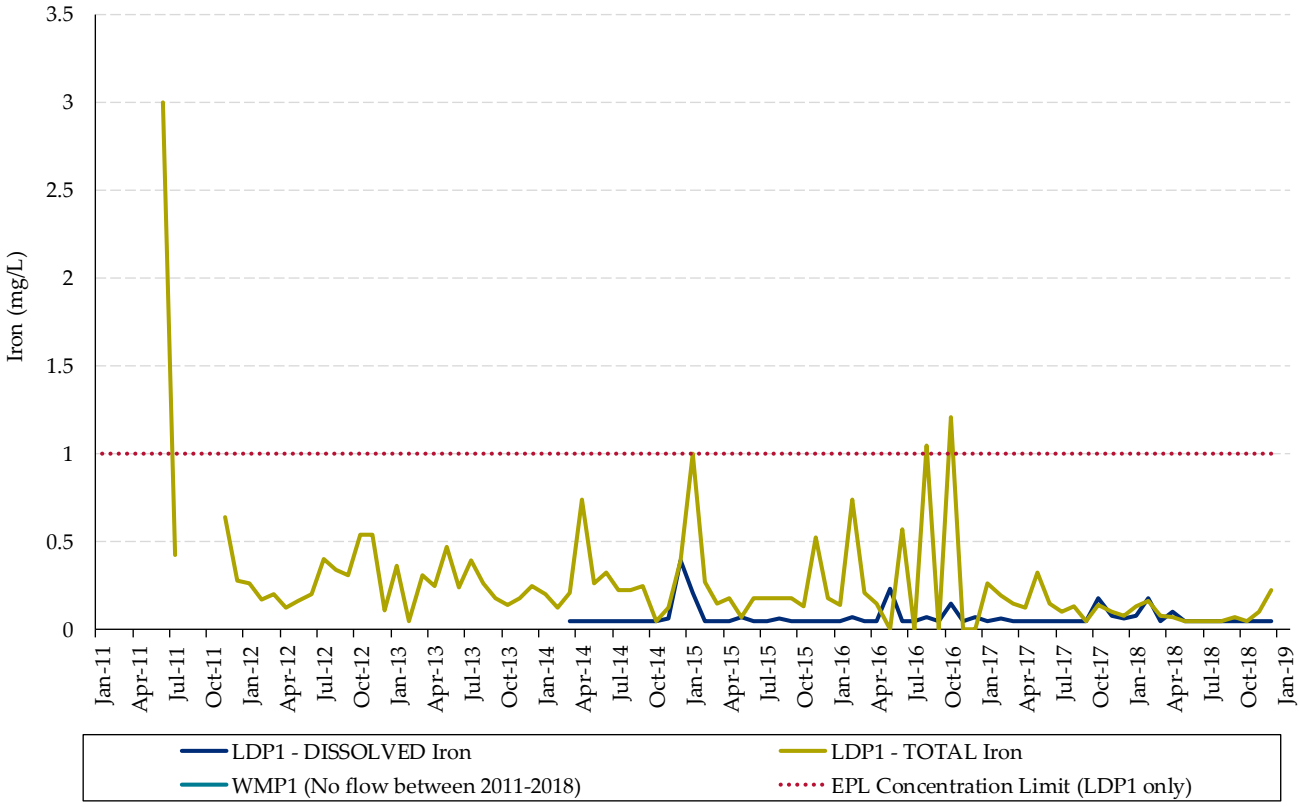


Figure 6.5: Iron – Total and Dissolved (2011 – 2018)

Figure 6.6 shows oil and grease levels from 2011 to 2018 at LD2 and LDP1. All oil and grease levels at LDP1 during 2011 - 2018 have remained well below the EPL limit of 10 mg/L.

Prior to January 2014, the limit of reporting for oil and grease was < 2 mg/L. From January 2014, limit of reporting value became < 1 mg/L before increasing back to <2 mg/L in March 2016. From October 2017 the limit of reporting increased to <5 mg/L due to changing to ALS Group Environmental Division Lithgow, a NATA Accredited laboratory, to undertake the monthly monitoring and analysis.

These changes in the limit of reporting account for the step change in reported oil and grease levels.

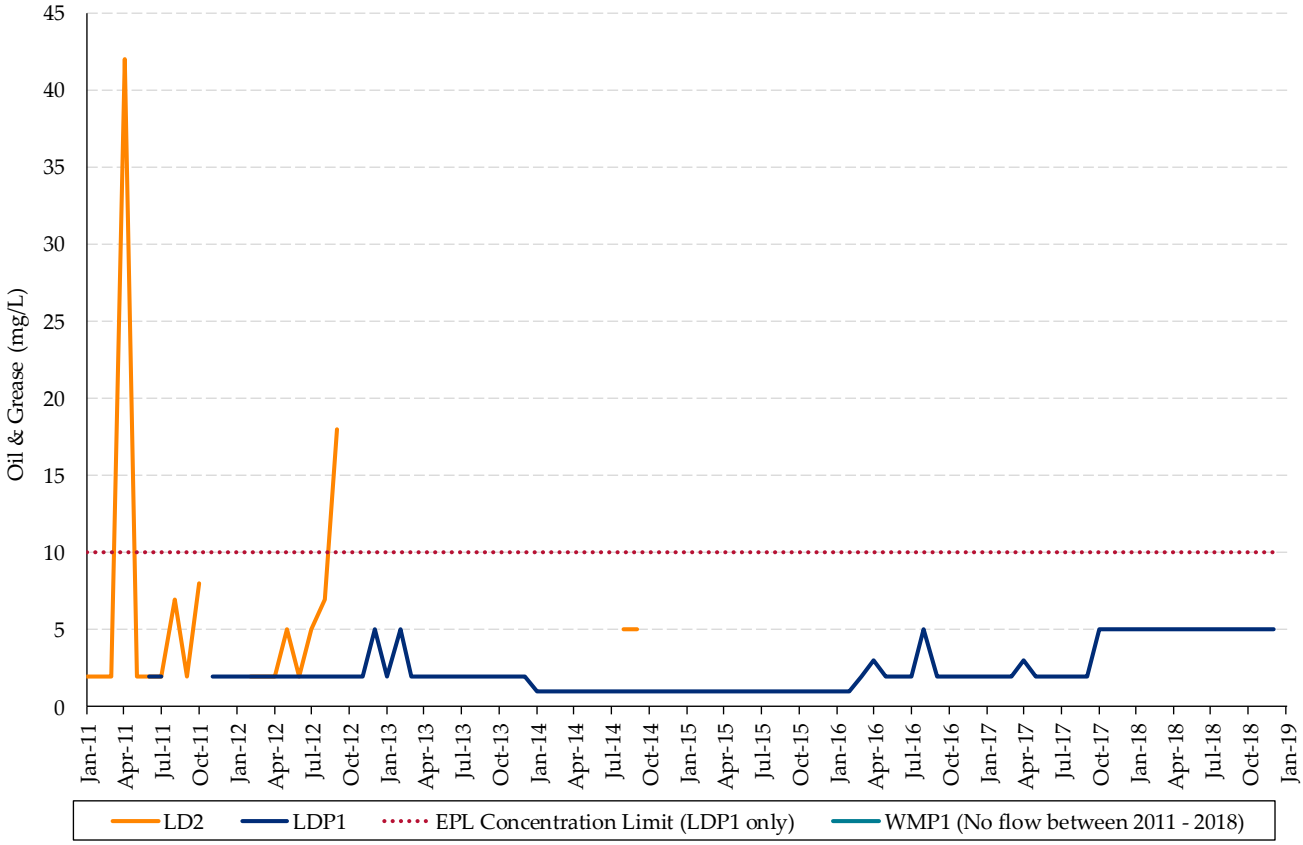


Figure 6.6: Oil and grease levels from 2011 to 2018.

Figure 6.7 shows pH levels at LDP1 and LD2 between 2011 and 2018. All LDP1 pH levels during the reporting period were between the upper and lower EPL pH limits of 6.5 and 8.5.

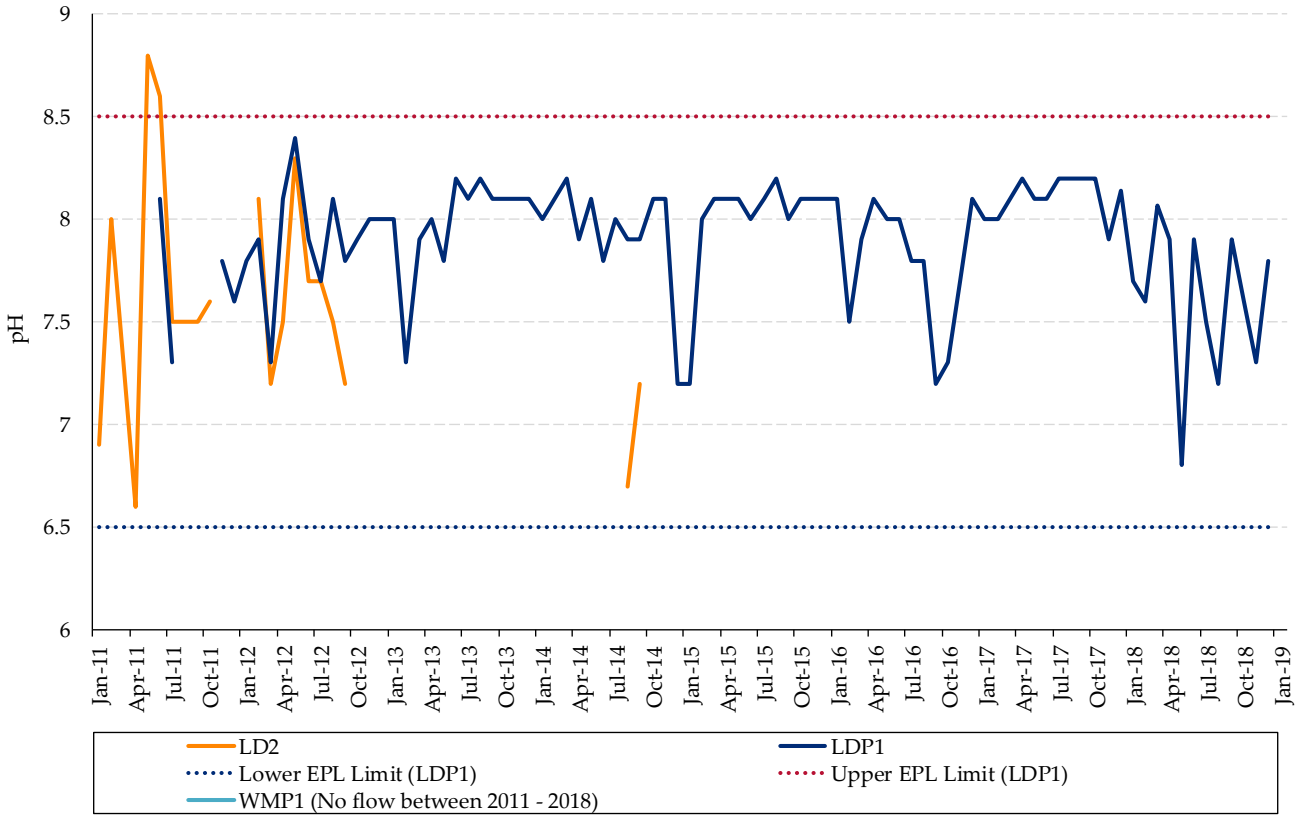


Figure 6.7: pH levels from 2011 to 2018.

Figure 6.8 shows the total suspended solids at LDP1 and LD2 between 2011 and 2018. All results recorded for LDP1 are well below the EPL concentration limit of 50 mg/L. 2013, 2014 and 2015 saw a slight increase in TSS levels at LDP1 during November/December, possibly due to seasonal changes.

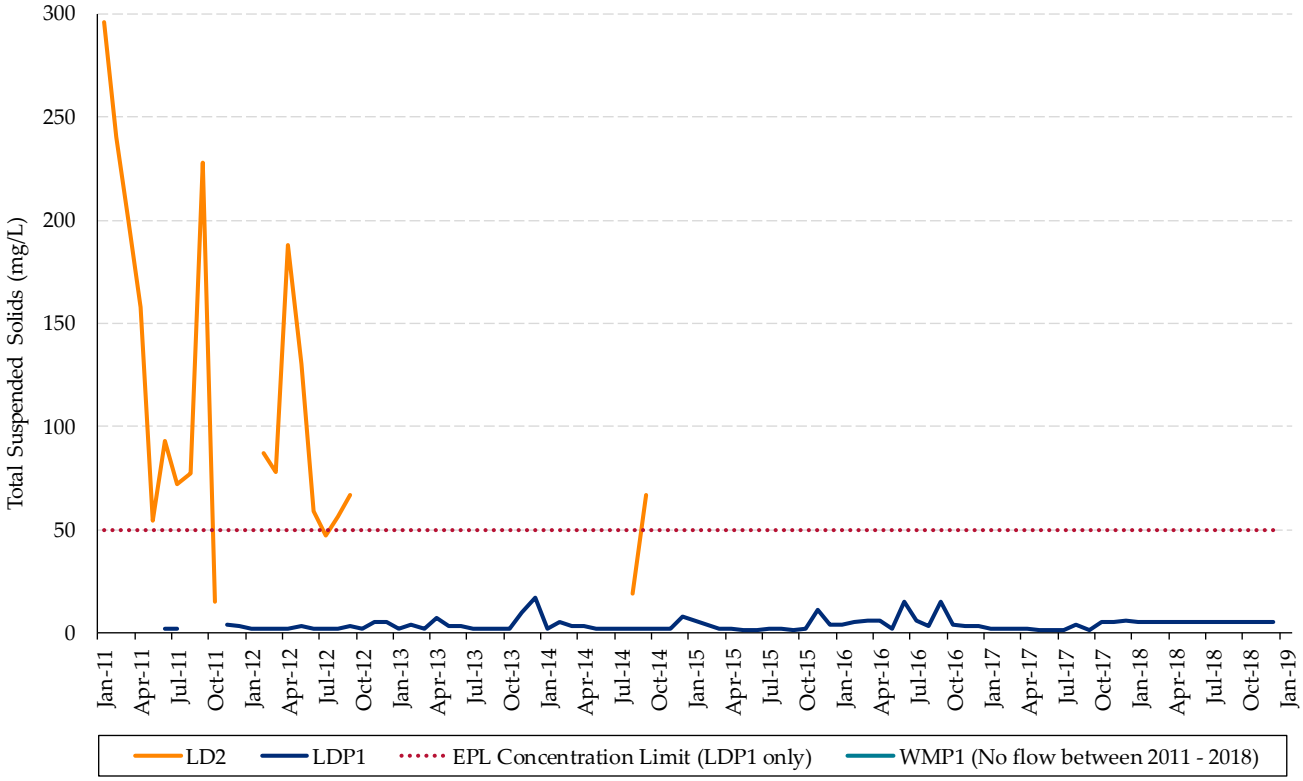


Figure 6.8: Total suspended solids levels from 2011 to 2018.

6.1.4 Comparison against EA

The EA reported that, based on past monitoring results for EPL discharge and monitoring points, water quality was expected to continue to be within the EPL limits during extraction of LW29-31. This prediction is supported by the results presented in the current and past Annual Reviews.

6.2 Groundwater

Baal Bone Colliery currently has three mine dewatering bores, two groundwater supply bores and four shallow piezometer monitoring bores licenced with DPI Water; these are summarised in **Table 6.6**.

Baal Bone engaged ALS Group Environmental Division Mudgee, a NATA Accredited laboratory, to undertake monthly sampling, monitoring and analysis of a range of surface and subsurface waters.

Water quality for the three dewatering boreholes was monitored by ALS on a monthly basis in conjunction with the Surface Water Monitoring Program up until July 2013 as described above in **Section 6.1.**

After the relinquishment of LDP3 and LDP6 in July 2013, the north and south de-watering borehole sites were no longer able to be sampled and were removed from the monthly sampling schedule. The two groundwater supply bores for WAL27887 (80BL136703 and 80BL135509) are not currently used and samples are therefore not available for testing.

In September 2017 Baal Bone personnel commenced the sampling and monitoring of surface and subsurface waters, and ALS Group Environmental Division Lithgow (a NATA Accredited Laboratory) conducted the analysis.

Table 6.6: Licensed bores and piezometers[1]

Licence Number	Expiry Date	Location / Use
WAL 27887 (80BL136703)	Perpetuity	CHPP water make-up bore near UC1 (not used during reporting period)
WAL 27887 (80BL135509)		Borehole No. 6 near Rail Loop; previously used for dust suppression (low yielding; no longer used)
WAL 34952 (80AL716835)	Perpetuity	Turon Crudine River water source
80BL236132	Perpetuity	Mine dewatering LW1 (South Bore 1)
80BL236134	Perpetuity	Mine dewatering LW1 (South Bore 2)
80BL239077	18/06/2016[2]	Mine dewatering LW19 (North Bore)
10BL601877	Perpetuity	BBN175; LW 29-31 groundwater monitoring piezometer - BBPB1, and monitors the sandstone aquifer north of the Coxs River Swamp.
10BL601816	Perpetuity	BBN176; LW 29-31 groundwater monitoring piezometer - BBPB2, and monitors the sandstone aquifer north of the Coxs River Swamp
10BL601817	Perpetuity	BBN177; LW 29-31 groundwater monitoring piezometer - BBPB3, and monitors the sandstone aquifer on the eastern side of the Coxs River Swamp
10BL601970	Perpetuity	BBN 179; LW 29-31 groundwater monitoring piezometer - BBPB4, and monitors the sandstone aquifer on the western side of the Coxs River Swamp

[1] In addition to the four piezometers licensed with DPI Water (**BBPB1-4**), Baal Bone has two other monitoring piezometers (**BBPB5 and BBPB 6**) which due to the shallowness of the bores do not require licencing.

[2]. DPI Water confirms water can continue to be pumped as originally authorised by 80BL239077. It is recognised this licence has expired, however this is an administrative issue being addressed by DPI Water as per e-mail correspondence dated 19/12/2017.

The six groundwater monitoring piezometers in and around Cox's River Swamp (**Appendix A - Plan 5)** were installed and equipped with data loggers in 2007 to gather background data and to monitor subsidence effects on local groundwater regimes as part of the SMP for LW29-31.

Data loggers in the piezometers were monitored on a regular basis to gather data regarding groundwater level fluctuations in the vicinity of the Coxs River Swamp before, during and after mining LW29-31. Baseline data obtained prior to commencement of mining confirms a strong correlation between groundwater levels and prevailing climatic conditions, in particular a strong relationship to rainfall which is a major source of recharge.

Following the removal of the data loggers in January 2017 (due to the continued care and maintenance status of Baal Bone Colliery) groundwater levels in the six piezometers are measured manually at least every two months in accordance with the approved Groundwater Monitoring Plan.

Monitoring data in the six piezometers (four aquifer and two swamp/alluvial) are presented in **Figure 16** to **Figure 22**. Piezometers BBPB1-BBPB4 monitor groundwater levels and chemistry in the deeper sandstone aquifer, while piezometers BBPB5 and BBPB6 monitor groundwater levels and chemistry in the shallower Coxs River Swamp.

Baal Bone's Surface and Groundwater Response Plan includes Trigger, Action, and Response Plans (TARP), which include triggers for assessing changes to groundwater levels and groundwater chemistry. Additionally, there are water quality trigger values for a number of water chemistry parameters contained in Baal Bone's approved Groundwater Monitoring Plan. The TARP and trigger levels are used as a measure of impacts to groundwater levels and quality in both the deep sandstone and shallower swamp groundwater aquifers. The groundwater level and quality trigger levels are presented below. Response and rehabilitation methodologies have also been included where appropriate.

Table 6.7: Groundwater Model TARP

Trigger	Action	Response	Plan	Timeframe
• Groundwater monitoring results deviate from predictions made in the EA; • Increased groundwater make in the underground workings compared to predictions made in the EA (AECOM, 2010); • Consecutive pressure monitoring data from the regional monitoring network, over a period of 6 months, shows an adverse impact from the previous data or groundwater model predictions; or • Annual review of the depressurisation of the coal measures shows an adverse impact from the previous data or groundwater model predictions.	• Notify the Baal Bone Colliery Environment and Community Manager (ECM), or delegate; • Review all groundwater pumping data; • Identify if the installation of additional piezometers is required; • Investigate any external influence which may be affecting the results including climatic data; and • Review operations and investigate for links to operational activities.	• Review the frequency of groundwater monitoring in the affected area; and • Notify and consult with relevant government agencies on investigation and outcomes (e.g. DPI Water, DPE, and EPA).	• Amend the groundwater model if required; and • Amend the Groundwater Monitoring Plan if required.	Notification to Secretary and any other relevant agencies (e.g. EPA, DPI Water) as soon as practicable (Schedule 5, Condition 5 of PA 07_0178).

Table 6.8: Loss of Water Quality TARP

Trigger	Action	Response	Plan	Timeframe
Monitoring results outside the relevant trigger levels in the SWMP or GWMP: ECM determines that the deviation from background trends and adopted impact assessment criteria could result in	• Notify the Baal Bone Colliery ECM, or delegate; • Review monitoring results against historical monitoring data; • Review recent monitoring results for adjacent monitoring sites; • Review any relevant operational data (i.e. clearing activities, UG	• A remedial action plan is developed and implemented to address the investigation findings. • Remedial action plan could include: ○ Increase monitoring frequency where relevant;	• Follow up information is provided to regulatory agencies as requested; and • A summary of monitoring results, investigations and remedial actions plans are provided within	Notification to Secretary and any other relevant agencies (e.g. EPA, DPI Water) as soon as practicable (Schedule 5, Condition 5 of PA 07_0178). ***Immediate*** reporting of

environmental harm; three (3) consecutive values are outside the adopted impact assessment criteria; or the measurement varies significantly from background water quality trends.	mining activities, meteorological data etc.); • Determine if an incident has potentially occurred; • Complete investigation IF Investigation reveals actual or potential material harm to the environment, the EO (together with the Ops Mgr) will initiate the PIRMP[4] immediately. • Inform regulatory agencies as required.	○ Undertake additional monitoring (stream health monitoring, etc.) if necessary. ○ Corrective/preventative actions based on the outcomes of the investigation and/or additional monitoring;	the Annual Review. • Monitor the completion of actions to ensure they have been effective. IF • Material Harm Incident occurred- Internal and External Reporting requirements are completed in accordance with Section 5 of Baal Bone's PIRMP, and reporting obligations detailed in EPL No. 765 and the Project Approval.	material harm incident required by POEO Act.

Table 6.9: Groundwater Quality Trigger Levels

Element	Short Term Minor Change Criteria^	Short Term Major Change Criteria^	All Bore 80th Percentile	BBP4 80th Percentile
pH	4.6	4.2	5.0*	5.5*
Electrical Conductivity (µS/cm)	300	300	90	90
Copper (mg/L)	0.041	0.043	0.011	0.007
Iron (mg/L)	15.25	24.28	11	11
Zinc (mg/L)	0.143	0.175	0.098	0.074

Source: ^Aurecon (2012)

*Note: * 20th Percentile*

Note: 300 µS/cm is ANZECC (2000) guideline

Note: Minor change criteria apply for periods of 1 or 2 consecutive months while Major Change Criteria apply for periods of more than 2 months.

6.2.1 Groundwater Levels

Rainfall deficit and groundwater levels in the six groundwater monitoring piezometers are presented in **Figure 6.9**. Long term trends of groundwater levels and daily rainfall are shown in Figure 6.10.

Rainfall deficit is plotted on **Figure 6.9.** The rainfall deficit uses data from the Lithgow BOM weather stations, and is calculated by accumulating monthly differences between observed and average rainfall. A negative value indicates that the month is drier that average, and a positive value

[4] PIRMP- Pollution Incident Response Management Plan

indicates a wetter month. Falling legs on the deficit plot indicate a move towards drought conditions; rising legs indicate a retreat from drought.

Since January 2018, the rainfall deficit has been tracking predominantly downwards. February, October, November and December 2018 saw monthly rainfall totals above long term averages. In January 2018 the deficit was -626 mm, falling to -890 mm in September 2018. The higher than average rainfall in late 2018 and early 2019 saw the deficit decrease to -739 mm in January 2019.

The total rainfall received in Lithgow during 2018 was 696 mm, which is 163 mm less than the long term average annual rainfall in Lithgow of 859 mm.

From January 2018 to Sepember/October 2018, the water levels in all the bores (BBPB1 – BBPB6) have seen a general decline, which is interpreted to be due to the very dry conditions. Increasing rainfall in late 2018 saw an increase in water levels in BBPB1-5. Note: BBPB6 ran dry in February 2018, and has since remained dry.

BBPB6 groundwater levels have also dropped throughout 2017 in response to the dry conditions, and in February 2018 the piezometer has been recorded as dry.

On 18 April 2018 Baal Bone Colliery received a request from the Department of Planning and Environment to undertake a review of groundwater level data, in response to community concern about water levels in the Cox's River Swamp. On 9 May 2018, Baal Bone Colliery provided a report to the Department on Cox's River Swamp groundwater levels and climatic conditions. The report found that the "recent decrease in water levels in the Cox's River Swamp is climate related and does not appear to be mining related" (Cox's River Swamp, Baal Bone Colliery – May 2018). No reponse from the Department of Planning and Environment has been received to date.

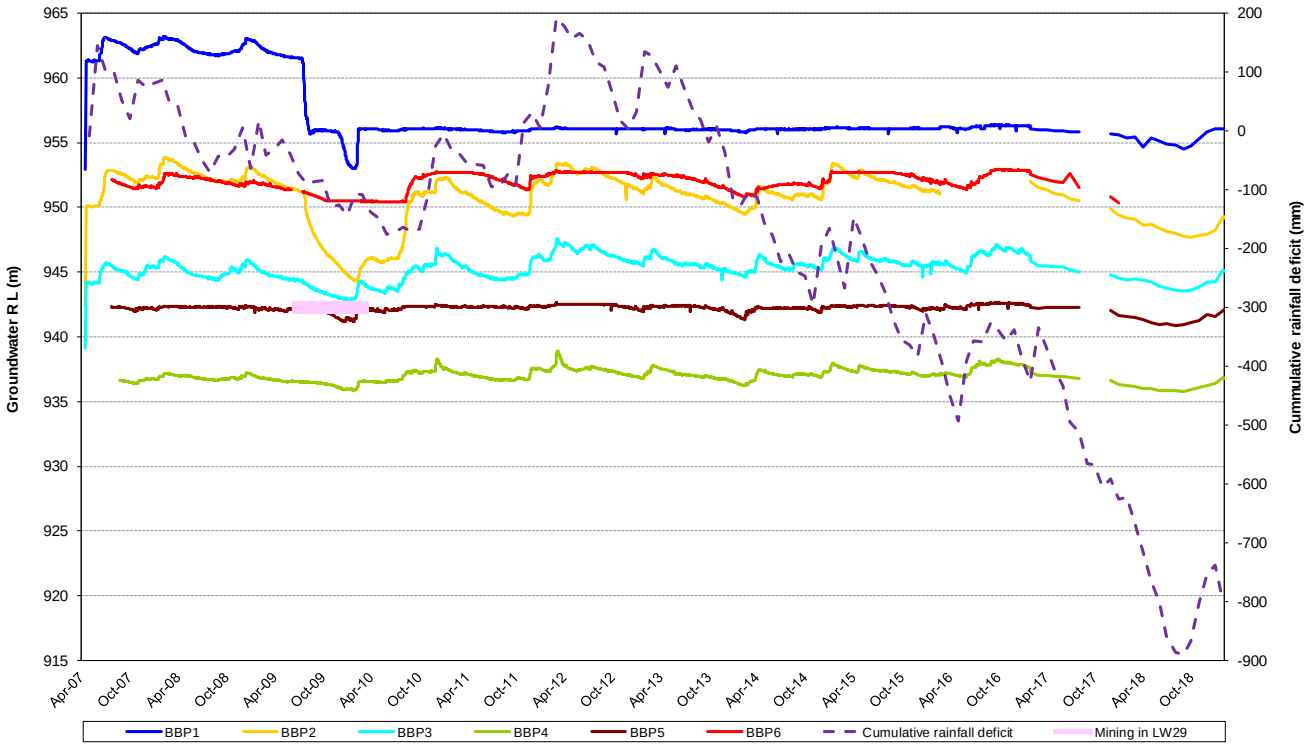


Figure 6.9: Coxs River Swamp groundwater levels and rainfall deficit

6.2.1.1 Comparison against Previous Annual Reviews

Groundwater data are plotted on Figure 6.9 and Figure 6.10. The north – to – south downstream groundwater gradient has been broadly maintained (highest level observed in BBPB1 and lowest level observed in BBPB4), indicating that overall flow has been maintained down through the swamp.

All groundwater levels appear to be approximately at pre-mining levels, with the only exception being at piezometer BBP1, where a groundwater level has re-stabilised at RL 956 m (approximately 5 m below pre-mining level).

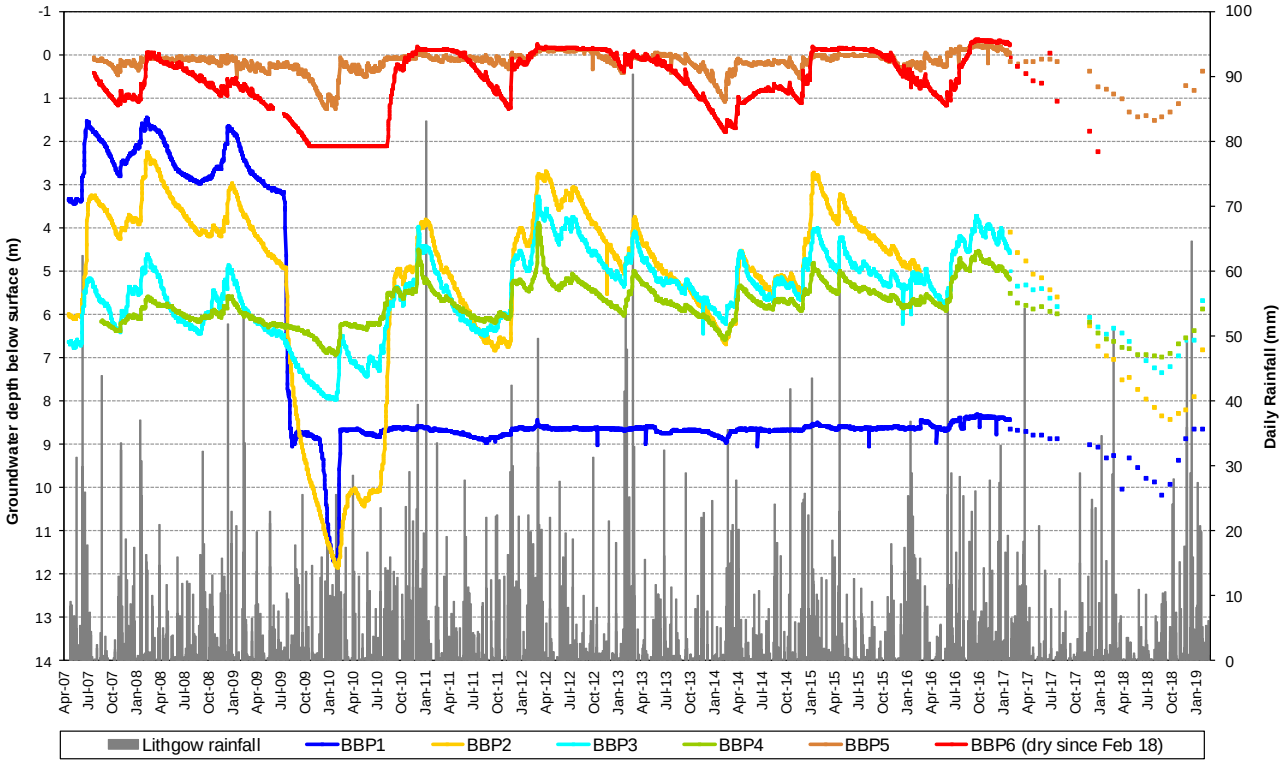


Figure 6.10: Longterm groundwater trends

6.2.1.2 Comparison against EA

The EA concluded that the likelihood of extraction of LW29-31 resulting in a significant impact on the Coxs River Swamp is considered extremely low.

All groundwater levels appear to be approximately at (or above) pre-mining levels, with the only exception being BBPB1, where groundwater has re-stabilised at RL956 (approximately 5 metres below pre-mining level). BBPB1 has shown a stable groundwater level since February 2010. There is still some influence from the fault zone at this site as the groundwater level is below pre-mining levels. The fault zone lies between the BBPB1 and the swamp, so there is unlikely to be any hydraulic connection between the zone of depleted groundwater and the swamp. The groundwater level at BBPB1 is still higher than the groundwater level in the swamp so that even if there is a connection across the fault, groundwater flow would still be towards the swamp.

Over the long-term, an emerging trend shows that groundwater levels in BBPB2, BBPB3 and BBPB4 all appear to correlate well with the overall cumulative rainfall deficit (difference between the monthly rainfall and the long-term average). The other remaining piezometers (BBPB5 and

BBPB6), all appear resistant to short-term weather variances, due to the location of BBPB5 and BBPB6 in the centre of the swamp, which generally remains saturated. The prolonged drought period, as evidenced by the steady rainfall deficit since early 2017, has seen the swamp area around BBPB6 dry considerably, with no water recorded since February 2018.

Also refer to **Section 3.4.2.2.**

6.2.2 Groundwater Chemistry

Groundwater chemistry monitoring results for the reporting period are provided below in **Figures 6.11 to 6.15**.

Due to an instrument malfunction BBPB1 was unable to be sampled for groundwater chemistry in January 2018. All other bores (BBPB2 through to BBPB6) were sampled for groundwater chemistry in January 2018. Groundwater levels were still able to be taken for BBPB1 (and all other bores) during January 2018.

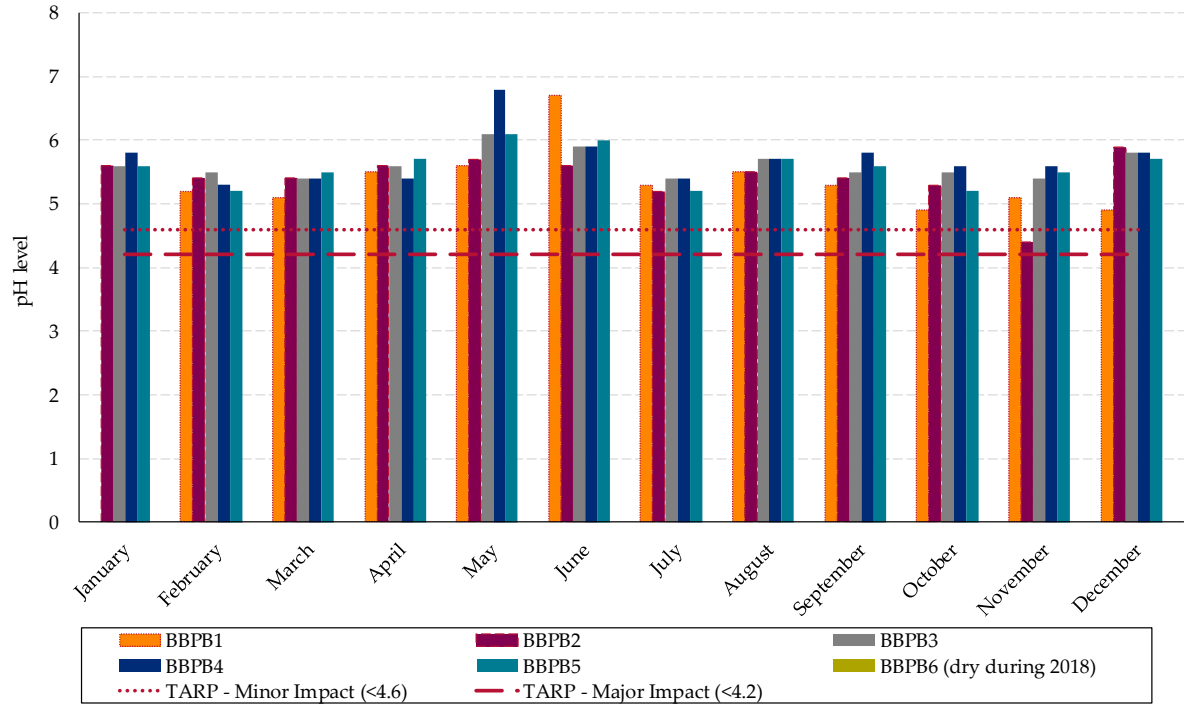


Figure 6.11: 2018 Groundwater pH levels.

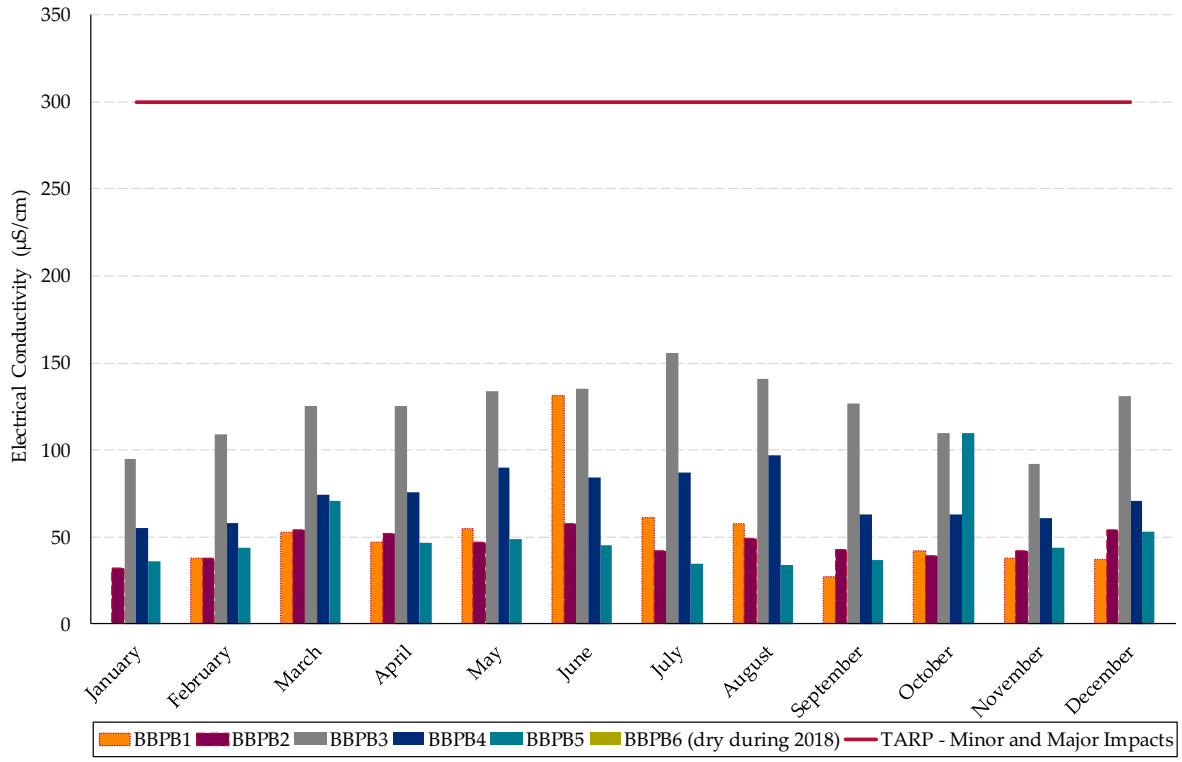


Figure 6.12: 2018 Groundwater Electrical Conductivity.

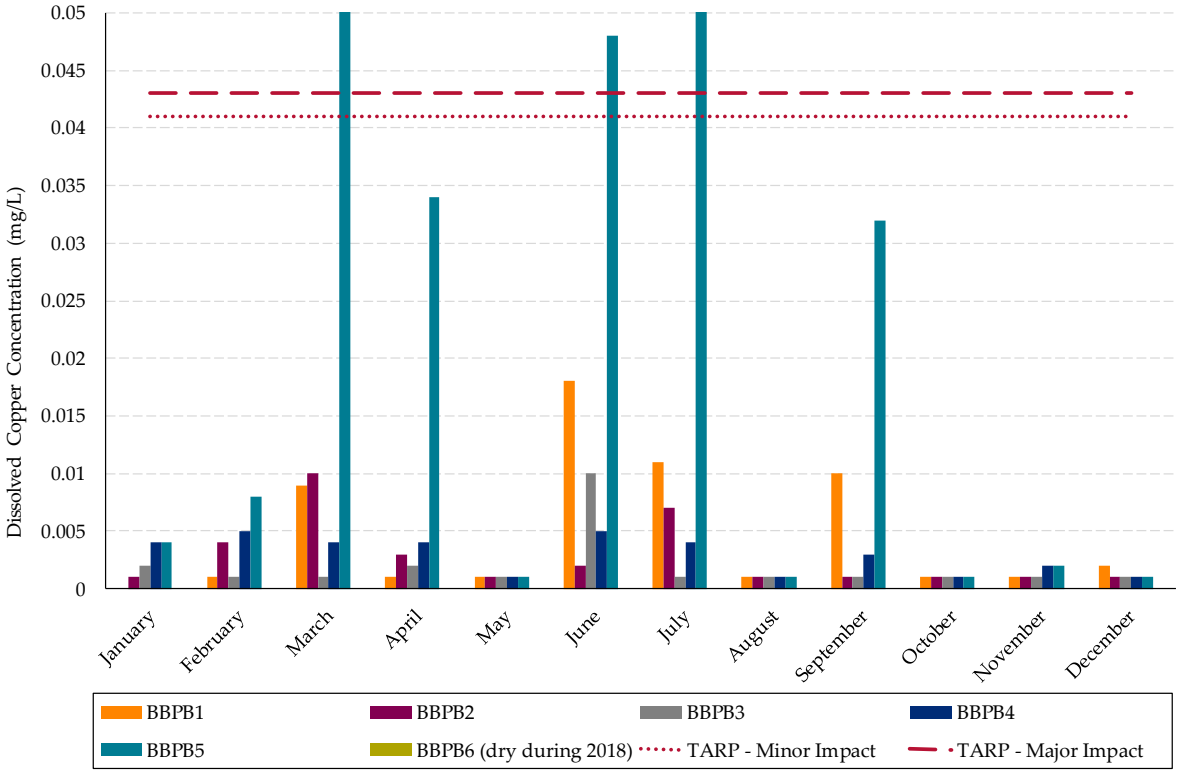


Figure 6.13: 2018 Groundwater Copper levels.

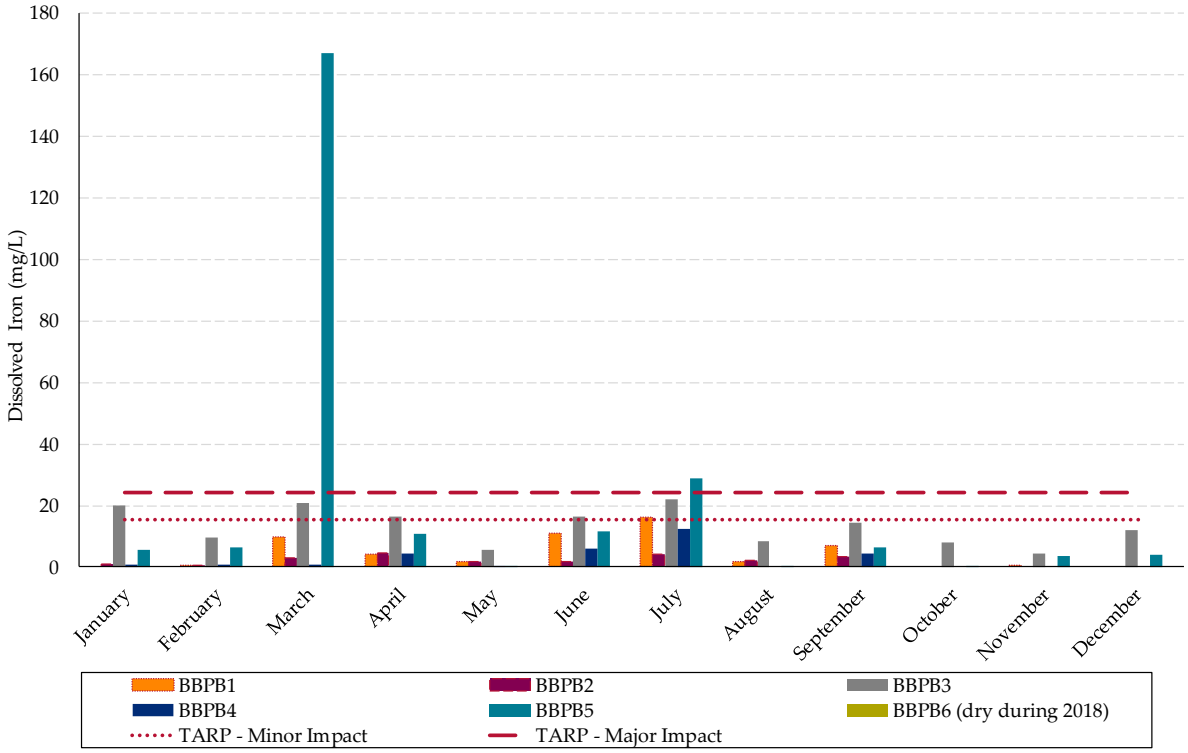


Figure 6.14: 2018 Groundwater Iron levels.

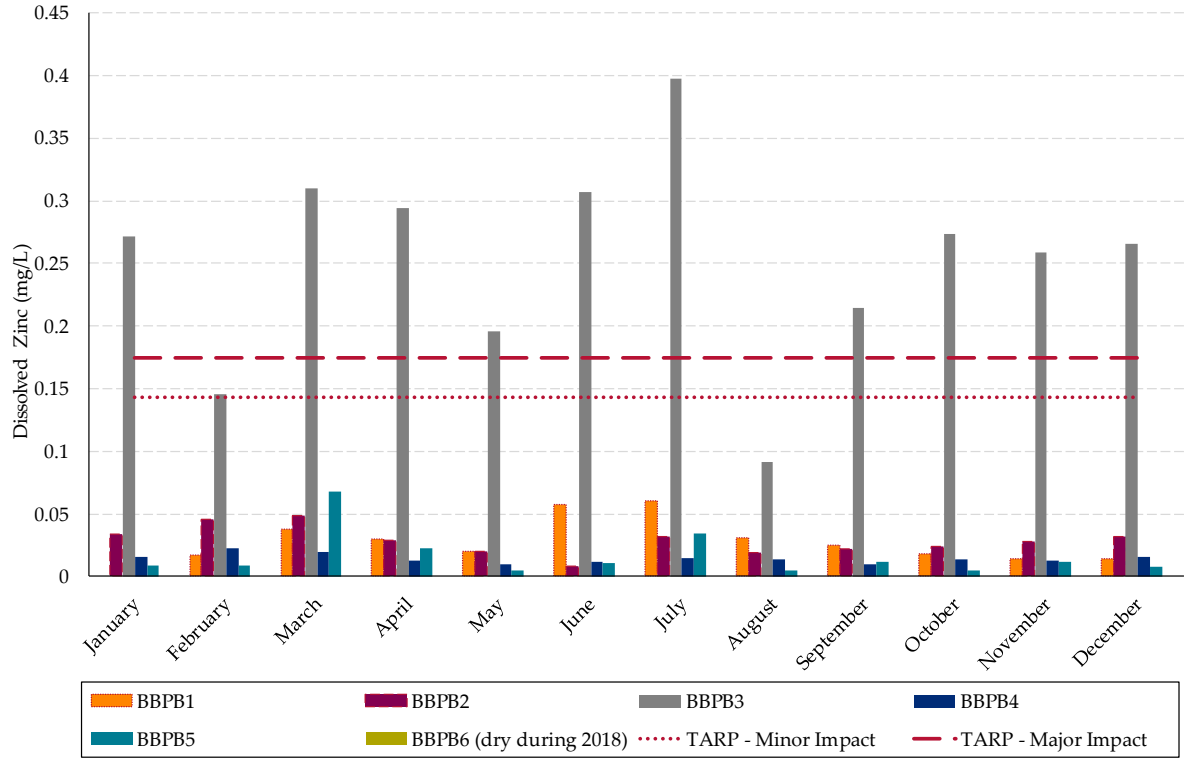


Figure 6.15: 2018 Groundwater Zinc Levels.

As shown in **Figure 6.11** above, all pH levels were within both the minor and major impact criteria for all groundwater monitoring bores during 2018, with the exception of BBPB2 in November 2018. A reading of 4.4 was returned for pH at BBPB2 in November 2018, which exceeded the minor impact threshold. As this was a minor exceedance for only one month, no further action was undertaken.

As shown in **Figure 6.12** above: electrical conductivity (EC) levels were within both the minor and major impact criteria for all groundwater monitoring bores during 2018.

As shown in **Figure 6.13**, copper levels were also within impact criteria for all groundwater monitoring bores, except BBPB5 during March, June and July 2018 when levels exceeded both the minor and major impact criteria. As these exceedances only occurred for two consecutive months, no further action was undertaken.

As shown above in **Figure 6.14**, 2018 iron levels were below the minor impact trigger level at BBPB2 and BBPB5. BBPB1 marginally exceeded the minor impact level in July 2018. BBPB3 exceeded the minor impact level on a number of months – with the longest duration being two consecutive months.BBPB5 exceeded the major impact level in March 2018 and July 2018. Due to the short duration of these exceedances of the minor and major impact levels, no further action was undertaken.

As shown above in **Figure 6.15**, 2018 zinc levels were below the minor impact trigger level for all groundwater monitoring wells with the exception of BBPB3. BBPB3 exceeded the minor and major impact TARP trigger levels for eleven months in 2018. This major impact TARP event has continued since August 2012. Note that mining in LW29-31 ceased in September 2011.

In 2012, Baal Bone Colliery commissioned a report by Aurecon which investigated groundwater quality and the TARP trigger levels:

Groundwater Level and Water Quality Changes compared to TARP Trigger Values in and around the Coxs River Swamp from 2009 to 2011 for SMP Area LW29-31 (Aurecon, March 2012).

The Aurecon (March 2012) report investigated the increases in zinc at BBPB3 however was unable to find obvious reasons for these increases. The Aurecon investigation suggested that variable rainfall and corresponding changes in groundwater levels could be contributing to changes in zinc levels.

In response to the major impact TARP event at BBPB3, Baal Bone Colliery submitted an initial formal notification to the Principal Subsidence Engineer and Interagency Committee on 5 December 2012. With the continuation of the TARP major impact levels, further formal notifications were issued to the Principal Subsidence Engineer and interagency committee on 17 June and again on 5 December 2013.

6.2.2.1 Comparison against previous Annual Reviews

Table 6.10 summarises previous Annual Review results and any exceedances of TARP trigger levels (minor and major) in BBPB1 – BBPB6 during the period 2011 – 2018.

Table 6.10: Summary of TARP exceedances and previous Annual Review results

	BBPB1	BBPB2	BBPB3	BBPB4	BBPB5	BBPB6
2011	No TARP exceedance	No TARP exceedance	**Dissolved Iron**: Feb to Dec **Dissolved Zinc**: Jan, Feb, Aug, Nov, Dec	**Dissolved Copper**: Aug - Dec	No TARP exceedance	No TARP exceedance
2012	No TARP exceedance	No TARP exceedance	**Dissolved Iron**: Jan **Dissolved Zinc**: Jan, Jun, Aug to Dec	**Dissolved Copper:** Jan, Jul to Oct **Dissolved Zinc:** Oct	No TARP exceedance	No TARP exceedance
2013	No TARP exceedance	No TARP exceedance	**Dissolved Iron:** Jan, May, Oct to Dec **Dissolved Zinc:** Jan to Dec	**Dissolved Copper:** Sep to Dec **Dissolved Zinc:** Dec	No TARP exceedance	No TARP exceedance
2014	No TARP exceedance	No TARP exceedance	**Dissolved Iron:** Jan to Mar, Jul **Dissolved Zinc:** Jan to Dec	**Dissolved Copper:** Jan, Sep	No TARP exceedance	No TARP exceedance
2015	No TARP exceedance	No TARP exceedance	**Dissolved Iron:** Jan, Feb, Apr, Jun, Dec **Dissolved Zinc**: Jan to Dec	No TARP exceedance	No TARP exceedance	No TARP exceedance
2016	**Dissolved Copper:** Feb	No TARP exceedance	**Dissolved Iron:** Feb, Mar **Dissolved Zinc**: Jan, Feb, Mar, Apr, Jun, Jul, Aug, Oct, Dec	No TARP exceedance	No TARP exceedance	No TARP exceedance
2017	No TARP exceedance	**Dissolved Iron**: Oct **Dissolved Zinc:** Oct	**Dissolved Iron**: Oct **Dissolved Zinc:** Jan, Feb, Mar, May, June, July, Aug, Sept, Nov, Dec	No TARP exceedance	No TARP exceedance	**Dissolved Copper**: Nov and Dec **Dissolved Iron**: Oct
2018	**Dissolved Iron**: July	**pH:** Nov	**Dissolved Iron:** Jan, Mar, Jun, Jul **Dissolved Zinc:** Jan to Jul, Sept to Dec	No TARP exceedance	**Dissolved Iron:** Mar, Jul **Dissolved Copper:** Mar, Jun, Jul	No TARP exceedance **(**BBPB6 dry during 2018)

6.2.2.2 Comparison against EA

The EA concluded that the likelihood of extraction of LW29-31 resulting in a significant impact on the Coxs River Swamp water quality and quantity (levels) is considered extremely low.

In terms of groundwater quality, minor and major changes have been noted for pH and trace metals at some bores however electrical conductivity has not exceeded its trigger level of 300 µS/cm. This indicates that the local groundwater has a very low salinity and is consistent with the local background of only 100µS/cm.

With the exception of the major changes for copper and zinc, noted in Section 3.4.2, the other changes to groundwater quality were minor in terms of duration above the trigger levels. The Aurecon (2012) report on groundwater quality concludes that minor changes to groundwater quality can occur by chance in the variable conditions of rainfall and the resulting groundwater level changes.

In terms of both groundwater levels and quality, monitoring confirms that there has been no measurable impact from mining on the swamp.

To assess potential impacts on the swamp, monitoring of vegetation on the surface above LW29-31 at Baal Bone Colliery commenced with a baseline survey in 2007 and have continued until 2011 with systematic monitoring of selected sites which are within the area predicted to be affected by subsidence. Gingra Ecological Surveys were engaged to prepare the final report in 2011. The report concluded that: "*There has been no evidence which would indicate an effect of subsidence on vegetation distribution and abundance at the monitoring sites."*

Species richness recorded across all sites during spring and autumn since the recording commenced is provided **Figure 6.16.** The results show that levels of species diversity recorded in 2011 were at the higher end or above the previously recorded range at each site.

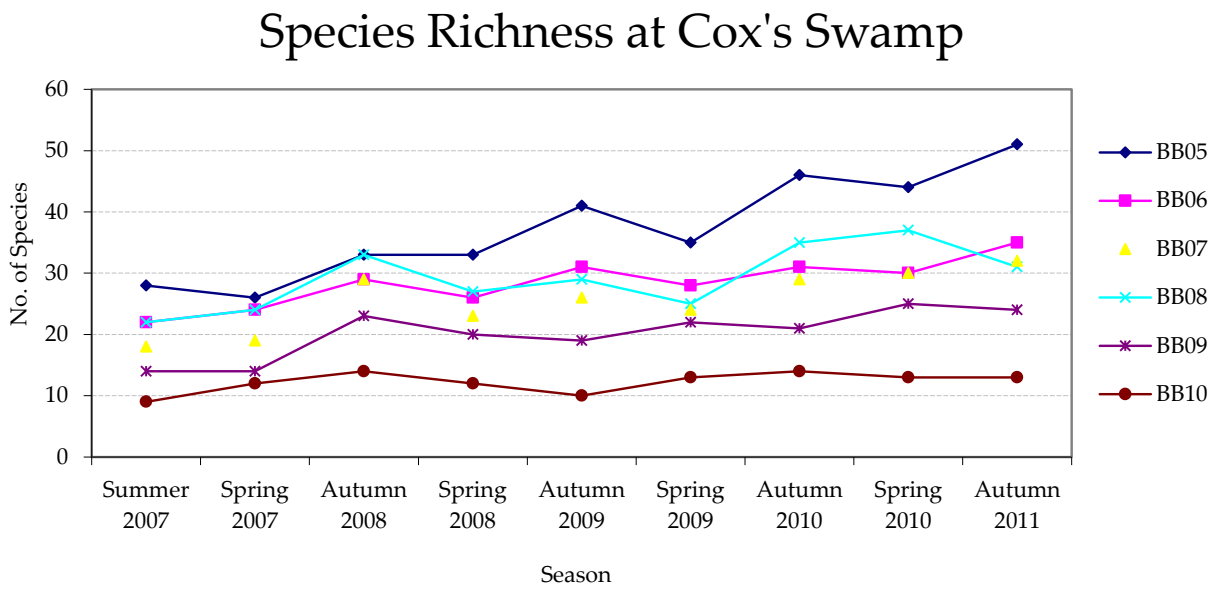


Figure 6.16: Summary of species richness at the monitoring sites

6.2.3 Groundwater Extraction

Mine water and groundwater intercepted by underground mining operations is extracted from both the north (LW19) and south (LW1) boreholes. This water is pumped via a total length of 7 kilometres of pipeline back to the pit top's 'Dirty Water' management system. After discharge through an iron aeration system and retention in Lake Tegan, water overflows into the overshot dam and leaves site through LDP1. Alternatively this water can be discharged into the dirty water dam, after retention time the water is then pumped to the process water dam, overflows onto Ben Bullen Creek and then leaves site through LDP1 at the overshot dam.

Historically discharges from the north and south dewatering bores were discharged via LDP3 and LDP6 into the Temperate Peat Swamp of Baal Bone Creek. In late 2012 the EPA requested that Baal Bone Colliery cease discharging into the Temperate Peat Swamp. Due to the requirement to sustain lowered water levels within the underground mine for the purpose of maintaining the current training facility layout, an agreement was reached by the site and the EPA that water from the boreholes would be piped back to the water management system at the pit top and discharged through LDP1 and into Jews Creek. Subsequently LDP3 and LDP6 were relinquished on 31st July 2013.

The total water extraction through the northern borehole (LW19) in 2018 was 357 ML. During 2018, the total amount of water extracted through the south bores (LW1) was 645 ML. **Table 6.11** shows water taken by the Baal Bone operation for the 2018 reporting period.

Table 6.11: Water take for 2018 reporting period.

Water License #	Water sharing plan, source and management zone (as applicable)	Entitle-ment (ML)	Passive take/ inflows (ML)	Active pumping (ML)	TOTAL (ML)
80BL236132	Not Applicable	-	-	-	-
80BL236134	Not Applicable	-	645	-	645
80BL239077	Not Applicable	-	357	-	357
WAL27887*	NSW Murray Darling Basin (MDB) Porous Rock Groundwater Sources Sydney Basin MDB Groundwater Source Sydney Basin MDB (Other) Management Zone	750	-	Not Metered	-

* Extraction of water allocated to The Wallerawang Collieries Limited by WAL27887 will be undertaken by Ulan Coal Mines Limited until 18 May 2018, facilitated under the DPI Water '*Application to change water access licence*' process. As such, all conditions of this licence are the responsibility Ulan Coal Mines Limited.

6.2.3.1 Comparison against previous Annual Reviews

Figure 6.17 shows the reported annual extractions for the North and South bores from 2011 to 2018. Since 2012 total groundwater extraction had been steadily decreasing, but experienced an increase in 2016 which was likely due to an increase in rainfall and availability of dewatering equipment.

6.2.3.2 Comparison against EA

The EA concluded that the volume of groundwater removed from the mine in 2008 was representative of the volume of groundwater that would need to be dewatered annually to ensure safe working conditions in the areas to be mined (LW29-31 and Remnant Areas). The volume of groundwater extracted in 2008 was approximately 1.5 GL/annum.

In 2018, 1.0 GL of groundwater was extracted via the north and south dewatering bores – hence within the expected range of groundwater extraction predicted in the EA.

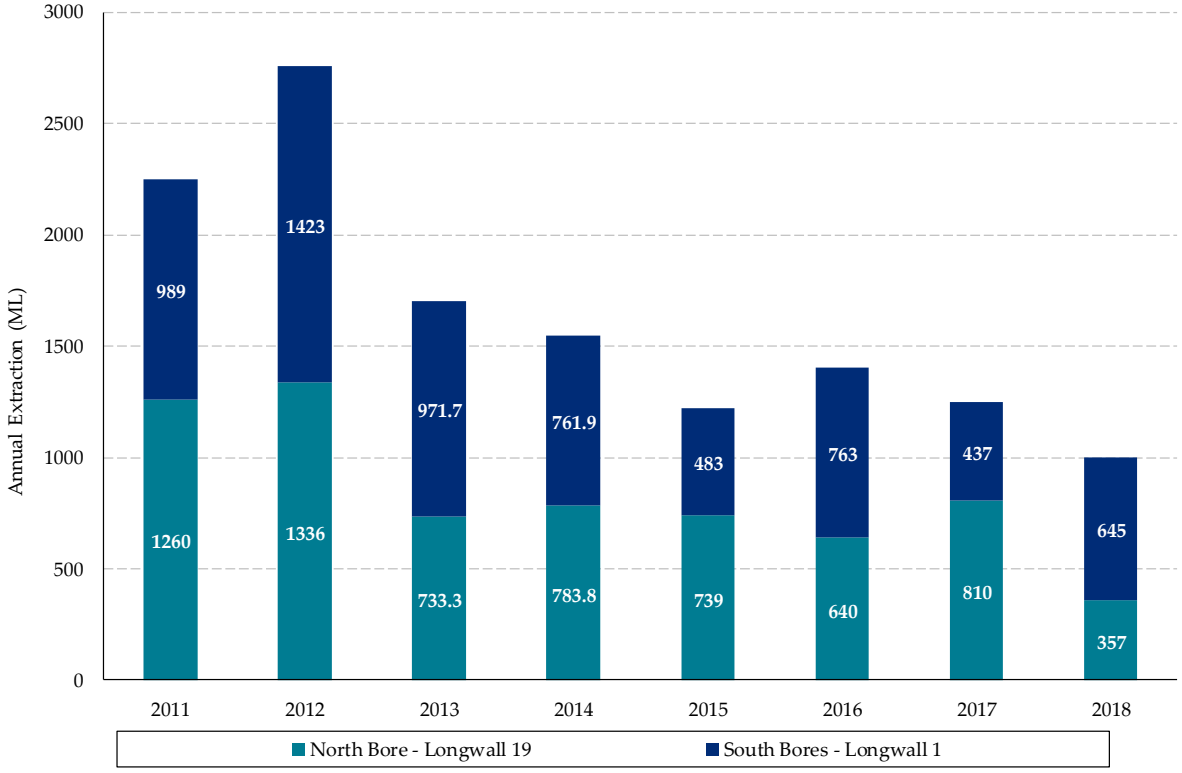


Figure 6.17: Annual extraction from North and South bores from 2011 to 2018

6.3 Channel Stability Monitoring

The Surface Water Monitoring Plan requires that Channel Stability Monitoring be undertaken annually for Coxs River, Ben Bullen Creek, Baal Bone Creek and Jews Creek to assess the condition of the watercourse.

Channel Stability Monitoring was first undertaken in 2014 (mining ceased in 2011). Following the intial monitoring in 2014, the scope of the monitoring program was limited to only areas of active erosion as identified in the 2014 monitoring program (Stream Health Monitoring Recommendations – Umwelt, dated 30 Novemver 2015).

Therefore if mining does not recommence, only monitoring locations Co-2, Co-3 and Co-4 on Cox's Creek, Be-2, Be-3, Be-4, Be-5 and Be-6 on Ben Bullen Creek, and Ba-2 and Ba-3 on Baal Bone Creek need to be inspected as part of the annual monitoring program. Should mining recommence at Baal Bone, a full survey of each of the Creeks will be undertaken prior to mining recommencing.

Channel Stability Monitoring was undertaken on 25 and 26 June 2018.

The 2018 monitoring found that " each of the four watercourses assessed as part of the channel stability monitoring contained at least one site showing 'active' and/or 'very active' erosion. The

original causes of the erosion are varied, but likely include subsidence, high flow events and other activity that exposes slaking and dispersive material and/or concentrates flow paths, namely wombats and motorcycle tracks".

The 2018 report recommended that monitoring continue until mine closure occurs and the Ben Bullen Creek Rehabilitation Plan commences.

6.4 Stream Health Monitoring

The Surface Water Monitoring Plan requires that Stream Health Monitoring be undertaken for Coxs River, Ben Bullen Creek, Baal Bone Creek and Jews Creek to determine the overall health and condition of each of the four watercourses

Stream Health Monitoring was undertaken in 2014. Following the results of the 2014 monitoring and due to the care and maintenance status of Baal Bone Colliery, annual Stream Health Monitoring has been suspended.

Should mining recommence, a further baseline survey consistent with the monitoring conducted in 2014 will be undertaken prior to any mining recommencing.

7 Rehabilitation

7.1 Buildings

No buildings were removed during 2018.

7.2 Rehabilitation of Disturbed Land

The current disturbed footprint of Baal Bone has been systematically and progressively reduced due to substantial rehabilitation carried out in conjunction with and following the open cut mining program which concluded in 2007. The current levels of disturbance at the site have been significantly reduced due to these rehabilitation works.

During 2012, aerial re-seeding and fertilisation of approximately 15 ha in the Norther Rehabilitation Area was conducted to improve the cover of eucalypts and native grasses.

The capping of REA 5, cell 1 was completed in April 2012. A geotechnical study carried out in November 2013, indicated that REA 5, cell 2 was sufficiently dry and subsequently was capped in August 2014. Contouring and seeding of REA 5, cell 1 and 2 was completed in November 2015. The REA 5 area has now been rehabilitated.

During 2013, the south east ventilation fan (utilised for LW29-31) was removed and the shaft filled. Site levelling, fence removal and topsoil replacement was completed in June 2013. In consultation with State Forest NSW, the area was prepared and seeded in 2014 using a mix of local seeds.

During 2017 and 2018 Baal Bone Colliery commenced locating and capping legacy exploration boreholes across the site.

A summary of rehabilitation works for previous, current and next reporting period are detailed in **Table 7.1**.

Table 7.1: Summary of Rehabilitation Performance

Mine Area Type	Previous Reporting Period (Actual) (ha)	This Reporting Period (Actual) (ha)	Next Reporting Period (Forecast) (ha)
	2017	2018	2019
A. Total Mine Footprint	351.36	351.36	351.36
B. Total active disturbance	168.08	168.08	141.08
C. Land being prepared for rehabilitation	0	0	28*
D. Land under active rehabilitation	0	0	28*
E. Completed rehabilitation	183.28	183.28	210.28

* Rehabilitation of the Northern Void and adjacent areas is planned to occur during 2019 as per current MOP. A Mine Closure MOP is currently being developed, and is anticipated to be submitted to the Resources Regulator in mid 2019. Rehabilitation plans and commitments in the Mine Closure MOP will supersede the existing MOP commitments.
Note: Values at B and C are given as at the end of the reporting period whilst values at C and D reflect areas rehabilitated during the period.

The ~28ha of rehabilitation planned for 2019 (see **Table 7.1**) was originally scheduled to occur during 2017, as per the 2016-2019 Baal Bone Colliery MOP and 2016 Annual Review. Due to the potential sale of the Baal Bone assets to a third party who is proposing to recommence operations, an extension on the timeframe to complete the ~28 ha of rehabilitation was sought. In an email dated 9 January 2018, Baal Bone Colliery received a six month extension for the completion of this rehabilitation from the Department of Planning and Environment – Division of Resources and Geoscience.

Due to delays in the finalisation of the sale process, Baal Bone Colliery requested a further extension for the rehabilitation works. In a letter dated 27 April 2018, the DP&E granted an extension/postponement of the MOP rehabilitation associated with the Northern Void/Northern Rehabilitation area until 31 December 2018.

On 20 December 2018, Baal Bone Colliery submitted a revised MOP 2016 -2019 to the Resources Regulator for approval. The revised MOP:

- provided further details and engineer plans for the sealing of the LW19 ventilation fan and shaft, and underground adits 1 – 11.
- extended the completion date for the ~28 ha of rehabilitation in the Northern Void and Northern Rehabilitation area until end 2019.

On 13 February 2019, approval for the revised MOP was granted by the Resources Regulator.

Baal Bone Colliery is currently developing a Mine Closure MOP – which is anticipated to be submitted to the Resources Regulator in mid-2019 for approval.

7.2.1 Subsidence Remediation

In 2010, tension cracking around the start of LW30 was identified. Following various meetings, site inspections and consultation, a remediation plan, including preparation of a Review of Environmental Factors (REF) was developed and approved in conjunction with officers of DTIRIS and Forests NSW. These remediation works commenced on 9 February 2011 and completed on 24 February 2011. DTIRIS inspected the remediation works in 2011 and provided positive feedback on the outcomes of the remedial actions.

In 2012, Baal Bone submitted an exceedance notification to DTIRIS regarding cracking over LW31. In response to a request from DTIRIS a full inspection of the surface above the entire LW29-31 area was completed in late February / early March 2012 to confirm the location of any additional surface cracking. A risk assessment to determine appropriate remediation methods for the identified subsidence cracking was held on 5 June 2012 with representatives from Baal Bone Colliery, Forests NSW, Soil Conservation Service, and SCT Operations. Following this, a REF has been prepared, including flora and fauna studies and remediation program. The REF was accepted by DTIRIS and Forests NSW on 8 November 2012. The major remediation of identified cracking areas was carried out in June 2013 via mechanical means. Inspections were undertaken after the remediation work was completed on 20 June and again six months later on 2 December 2013 with generally good results across all sites.

As part of mine closure processes, Baal Bone Colliery conducted an investigation into areas of potential subsidence cracking. Two high risk areas were identified within Baal Bone's mining leases: steep slope areas and shallow cover areas. The steep slope areas were inspected for subsidence cracks in April 2015, while the shallow cover areas were inspected in May/June 2016.

The high risk subsidence cracks identified during the steep slope survey (April 2015) were progressively remediated during the second half of 2015. In February 2017 Baal Bone Colliery remediated a number of subsidence cracks in the shallow cover area over LW16-18a within CCL 749 (refer to **Plate 1**).

Plate 1: Before and after photos of shallow cover subsidence repairs in February 2017.

Before	After
	
	
	

7.3 Performance Indicators and Completion Criteria

The Baal Bone Colliery MOP divides the lease area into seven different domains. **Section 6 of the 2016-2019 Baal Bone Colliery MOP** outlines the rehabilitation performance indicators and closure criteria that must be met to demonstrate that the rehabilitation objectives for each domain have been achieved over the six different rehabilitation phases (i.e. (1) decommissioning, (2) landform establishment, (3) growth medium development, (4) ecosystem and land use establishment, (5) ecosystem and land use sustainability, and (6) relinquished lands).

A range of different environmental monitoring and inspections are used to measure progress towards the rehabilitation completion criteria for each phase, including; landform surveys and inspections, water monitoring, soil tests, flora and fauna monitoring. In particular the completion criteria outlined in the Ecosystem and Land Use Establishment phase, and Ecosystem and Land Use Sustainability phase are tracked via the Annual Ecological Rehabilitation Monitoring outlined below at **Section 7.4.2.**

7.4 Rehabilitation Inspections and Monitoring

Three types of rehabilitation monitoring/inspections are undertaken at Baal Bone. These include;

- Regular inspections by site personnel,
- An annual environmental rehabilitation walk around inspection as per *CAA HSEC FRM 0025 11.16* and
- Annual Ecological Rehabilitation Monitoring which was implemented in 2009.

7.4.1 Annual Environmental Rehabilitation Inspection

Due to delays caused by the potential sale of Baal Bone Colliery, the 2018 annual environmental rehabilitation inspection was conducted by DnA Environmental in January 2019. Consistent with the inspections conducted from 2014-2017, the 2018 inspection identified ongoing improvements in the results of the rehabilitation areas within both the north and south former open cut areas. The inspection noted generally good rehabilitation across all areas, with some isolated areas needing additional work to remediate erosion and rilling.

7.4.2 Annual Ecological Rehabilitation Monitoring

An Annual Ecological Rehabilitation Monitoring program is undertaken at Baal Bone Colliery to evaluate the success of rehabilitation and Baal Bone Colliery's progress towards fulfilling long term land use objectives. The monitoring program will continue within rehabilitation areas until all rehabilitation closure criteria are satisfied, as well as the requirements of the DRE.

A total of 15 permanent monitoring sites have been established throughout Baal Bone Colliery's land holdings to monitor flora, fauna, landscape function and habitat values aimed at assessing ecosystem function in remnant vegetation and rehabilitation areas. Six sites are located in remnant vegetation and 9 sites are located in rehabilitated areas (refer to **Appendix A – Plan 6**).

Monitoring of these sites is undertaken annually until rehabilitation areas reach acceptable levels of establishment, and then monitoring will be undertaken periodically.

Monitoring of these sites assesses:

- Plant community structural attributes;
- Cover, species density, height and structural diversity;
- Species richness (the number of plant species present in each structural layer of each vegetation community);
- The presence and abundance of any weed species; and
- Assessment of natural regeneration/recruitment of new species.

The findings of this monitoring program are used to assist in management recommendations for appropriate rehabilitation works within Baal Bone Colliery holdings. Where necessary, rehabilitation procedures are amended accordingly to continually improve rehabilitation standards.

The findings of the Annual Ecological Rehabilitation Monitoring program are also used to assess progress towards rehabilitation commitments in the 2016-2019 Baal Bone Colliery MOP. Section 6 in the 2016-2019 MOP sets out performance indicators and completion criteria. Baal Bone Colliery will demonstrate achievement of all completion criteria prior to seeking relinquishment of the site.

Due to the potential sale of the Baal Bone Colliery site (now discontinued) the completion of the Annual Ecological Rehabilitation monitoring program for 2018 was delayed until January 2019.

The results of the 2018 monitoring, undertaken by DnA Environmental from the 20th – 21st January 2019 are summarised below:

MIXED EUCALYPT WOODLAND REHABILITATION SITES

The mixed eucalypt woodland reference sites consisted of a mature eucalypt canopy, often with some scattered shrubs and sub-shrubs deep, well developed litter layers in moderate to extensive states of decomposition and scattered perennial grass tussocks and herbs. These sites had a very stable humus layer, increasing the capacity for moisture retention and protection against erosion.

In comparison, the rehabilitation sites often had a high perennial canopy cover due to the establishing trees and shrubs, especially in the younger SOC and NOC sites which had particularly high stem densities and all sites had a developing litter layer. The stability in the rehabilitation sites have typically demonstrated an increasing trend since monitoring first began with minor reductions caused by drought and increased grazing pressure, especially last year. This year the rehabilitation sites demonstrated no change, or marginal increases in stability in all sites except NOC2. Good growing conditions in spring and early summer have promoted the growth of ground cover plants and there was typically a good cover of cryptogams and/or leaf litter. Numerous sites were developing a humus layer, with a reduction in soil surface hardness and demonstrated improved soil coherency. The soils in all rehabilitation sites tended to now be moderately to highly stable, with some minor exceptions in less developed patches within individual sites. In REA5, the use of organic growth media (OGM) during rehabilitation, establishing vegetation and extensive cryptogam cover also has resulted in moderate soil stability.

In Box Cut, NOC1, SOC2 and SOC4, there continued to be some small persistent bare areas which continued to be affected by localised erosion and deposition, but these were relatively minor and tending to show a declining trend. There was a significant increase in perennial ground covers in NOC1 and NOC2 this year, while in REA5, there was increased levels of ground cover largely due to the abundance of annual plants and extensive cryptogam cover.

The three reference sites continue to be the most ecologically functional sites and scored 211 in RWood01 to 191 in RWood03 out of a possible 300. In comparison the developing woodland rehabilitation sites were in a less functional state, with the most functional rehabilitation sites being SOC3 with a total sum of scores of 175. This was closely followed by NOC2, SOC1 and NOC1 with scores of 171 – 166. SOC4 and Box Cut were similar to each other with scores of 160 and 157. Of the older rehabilitation areas SOC2 was the least functional community this year with a total score of 150. The newest area of rehabilitation REA5 has improved significantly and has increased from 129 to 140, but remained the least functional of the rehabilitation areas.

In 2014 all rehabilitation sites except SOC2 contained some vertical structure greater than 6.0m in height providing an indication of the good growth and development of the rehabilitation areas. In 2017 however no vertical cover > 6.0m high was recorded in Box Cut, NOC1 or SOC2 as numerous mature acacias had died and none had sufficiently grown in SOC2. This year, there was also less cover >6.0m in height recorded in NOC2 as the acacias continue to dieback. Box Cut, NOC2 and SOC1 continued to have some cover 4.0 – 6.0m in height.

The older rehabilitation site SOC3 has continued to have a mature canopy cover comparable to the woodland reference sites, and since 2015 so did SOC1. SOC3 has developed into a woodland which has a similar structural composition to the reference sites, while SOC1 appears to be trending in that direction. Due to its limited development time, REA5 was dominated by annual plants and cryptogams and did not have vertical structure > 0.5m in height.

The rehabilitation sites had a native species diversity that was comparable to the reference sites but had a higher diversity of exotic species. While native plants were more dominant than exotics in most rehabilitation sites, native plant cover ranged from 67% in Box Cut to 100% in SOC3. In REA5, exotic plants continue to be dominant with the site continuing to have only 47% endemic plant cover. While many of the sites were weedier than the reference sites there has typically been an increase in native ground covers since monitoring began.

The rehabilitation sites were dominated by a different composition of species compared to the reference sites, however the native perennial grass Microlaena stipoides (Weeping Rice-grass) was recorded in relatively high abundance in all rehabilitation areas, except Box Cut and REA5, with the abundance of Microlaena stipoides continuing to increase in these sites. Rytidosperma species (Wallaby Grasses) were quite abundant in Box Cut, SOC1, SOC2 and SOC3 with relatively high cover provided in SOC3.

The small native sub-shrub Pultenaea microphylla provided comparatively high levels of ground cover in Box Cut and NOC1 this year. The exotic annual Plantago lanceolata (Ribwort) had increased in abundance in Box Cut but overall cover was low. The exotic perennial Hypochaeris radicata (Flatweed) was scattered throughout NOC2 but overall cover scores were low. In REA5, a variety of exotic annual species and the natives Euchiton involucratus (Star Cudweed) and Lachnagrostis filiformis (Blown Grass) provided most of the ground cover.

Performance of the mixed eucalypt woodland rehabilitation monitoring sites against 70% primary completion performance indicators

The table below indicates the performance of the woodland rehabilitation monitoring sites against 70% primary completion performance indicators in 2018. The selection of criteria has been presented in order of rehabilitation phases according to the ESG3 MOP guidelines excluding Phase 1: Decommissioning. The ecological targets begin at Phase 2: Landform establishment (yellow) and end with indicators in Phase 5: Ecosystem Sustainability (dark blue). The range values of the ecological targets are amended annually. Rehabilitation sites meeting or exceeding the range

values of their representative community type have been identified with a coloured box have therefore been deemed to meet these primary completion criteria targets this year. Hashed coloured boxes indicate they may be outside of the reference target ranges, but within acceptable agricultural limits. Grey shaded boxes are indicators not measured during the reporting year (only measured every 2 years).

Performance of the mixed eucalypt woodland rehabilitation sites against 70% primary completion performance indicators in 2018.

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measure	Woodland ecosystem KPI range 2018	Box Cut	NOC1	NOC2	SOC1	SOC2	SOC3	SOC4	REA5
Performance indicators are quantified by the range of values obtained from replicated reference sites and/or agricultural standards				70% KPI target	70% meet criteria							
Phase2: Landform establishment and stability	Landform slope, gradient	Slope	< Degrees (°)	<18	14	5	5	8	6	6	5	2
	Active erosion	Cross-sectional area of rills	m^2	0	na	na	na	na	na	na	na	na
Phase 3: Growth medium development	Soil chemical, physical properties and amelioration	pH	pH (5.6-7.3)	na	na	na	na	na	na	na	na	na
		EC	< dS/m (<0.150)	na	na	na	na	na	na	na	na	na
		Phosphorous	mg/Kg (50)	na	na	na	na	na	na	na	na	na
		Nitrate	mg/Kg (>13)	na	na	na	na	na	na	na	na	na
		ESP[5]	% (<5)	na	na	na	na	na	na	na	na	na
Phase 4: Ecosystem& Landuse Establishment	Landscape Function Analysis (LFA): Landform stability and organisation	LFA Stability	%	51.7	66.8	72.5	71.0	65.5	69.2	70.0	69.4	70.0
		LFA Landscape organisation	%	70	90	97	100	100	91.0	100	90	100

[5] ESP- exchangeable sodium percentage

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measure	Woodland ecosystem KPI range 2018	Box Cut	NOC1	NOC2	SOC1	SOC2	SOC3	SOC4	REA5
	Vegetation diversity	Diversity of shrubs and juvenile trees	% population	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
		Total species richness	No./area	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
	Vegetation density	Density of shrubs and juvenile trees	No./area	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
	Ecosystem composition	Tree species	No./area	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
		Shrub species	No./area	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
		Herb species	No./area	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Phase 5: Ecosystem & Landuse Sustainability	**Landscape Function Analysis (LFA): Landform function and ecological performance**	LFA Infiltration	%	**42.4**	**45.7**	**45.7**	**49.7**	**50.3**	**38.3**	**52.3**	**44.1**	**34.2**
		LFA Nutrient recycling	%	**39.4**	**44.6**	**47.6**	**50.4**	**52.0**	**42.1**	**52.7**	**46.0**	**35.3**
	Protective ground cover	Perennial plant cover (< 0.5m)	%	**6.3**	**18.0**	**28.5**	**56.5**	**28.5**	**32.5**	**29.5**	**na**	**16.5**

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measure	Woodland ecosystem KPI range 2018	Box Cut	NOC1	NOC2	SOC1	SOC2	SOC3	SOC4	REA5
		Total Ground Cover	%	69.3	84.0	96.5	100.0	99.0	82.5	97.0	na	96.0
	Ground cover diversity	Native understorey abundance/m^2	> species/m^2	1.8	4.4	4.6	3.8	4.6	5.4	4.6	na	4.0
		Percent ground cover provided by native vegetation <0.5m tall	%	70.0	67.3	92.9	75.9	91.7	96.2	100.0	na	47.4
	Ecosystem growth and natural recruitment	shrubs and juvenile trees 0 - 0.5m in height	No./area	na	na	na	na	na	na	na	na	na
		shrubs and juvenile trees 1.5 - 2m in height	No./area	na	na	na	na	na	na	na	na	na
	Ecosystem structure	Foliage cover 0.5 - 2m	% cover	0.0	18	17	5	28	19	4	na	10
		Foliage cover 2 - 4m	% cover	0.0	7	11	17	26	12	13	na	0
	Tree diversity	Endemic Species	% population	na	na	na	na	na	na	na	na	na
	Tree density	Tree density	No./area	na	na	na	na	na	na	na	na	na

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measure	Woodland ecosystem KPI range 2018	Box Cut	NOC1	NOC2	SOC1	SOC2	SOC3	SOC4	REA5
	Ecosystem health	Healthy trees	% population	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
		Flowers/fruit: Trees	% population	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**

EXOTIC PASTURE REHABILITATION SITES

The pasture reference sites were native perennial pastures with a well developed litter layer and these were intact functional patch areas. In the exotic pasture rehabilitation sites, NOC3 and NOC4 have patches of acacias dispersed amongst exotic perennial pastures, and these two sites continued to have complete functional patch areas. While NOC5 was not entirely free of shrubs, it was essentially an open pasture area, with overgrazing causing small bare pockets and a reduction in functional patch area this year.

The ecological stability in the pasture sites can be correlated with seasonal conditions which tended to influence the degree of grazing pressure. During 2009 to 2011, there were major increases in stability in the pasture rehabilitation sites due to the development of the perennial pasture species, increasing litter and cryptogam cover and improvement in numerous other soil attributes. However since then the thickets of acacias in NOC3 and NOC4 have increased in density, thus reducing the level of ground cover plants. Over time there has been a loss of the lower leaves and branches, and with the increased mortality of the acacias there has been a decline in rain splash protection and canopy cover. More recently, the loss of the mature acacias has resulted in the opening up of the canopy and improved levels of ground cover vegetation.

This year there continued to be a loss of mature acacias in NOC3, and previous overgrazing had reduced the abundance of perennial plant covers. Subsequently the stability of NOC3 has significantly declined, while there was no change in stability in NOC4. In NOC5 a moderate cover of perennial ground covers (which are now mostly exotic broadleaf weeds) has been maintained but there was no perennial canopy cover due to the absence of shrubs. This grassy clearing continues to be heavily grazed by macropods but this year, there was a marginal increase in stability.

This year, the reference site RPast04 was the most functional pasture community with a sum of indices of 191, which was closely followed by RPast03 with a score of 187. The most functional pasture rehabilitation area was NOC4 which was functionally very similar to RPast03 this year with a sum of scores of 182. The ecological function in NOC3 has declined this year and scored a sum of scores of 163. In NOC5 heavy grazing had degraded the perennial grasses and there continued to be some erosion and slaking of the exposed soils. This was the least functional of the pasture rehabilitation sites and scored 135.

The composition of the pasture rehabilitation sites NOC3 and NOC4 were similar to each other, with these having 40.5 – 44.5% cover of perennial ground cover. There was also some cover provided by dead litter, annual plants and both sites had scattered rocks and cryptogams. In NOC5,

the site was dominated by annual plants and cryptogams. No rehabilitation pasture areas had an adequate cover of perennial ground cover plants compared to the pasture reference sites this year.

In the pasture rehabilitation sites, exotic species were more diverse than native species. This year there was a similar diversity of exotic species in the rehabilitation areas as the reference sites, thus having a satisfactory diversity of weeds for the area. In the pasture rehabilitation areas there were marginal increases in native plant cover in all three sites however native plant cover continued to be very low and ranged from 10 – 21%. As the final land use of the Northern Open Cut is an area of exotic pasture/grassland with grazing potential, native species diversity is not considered to be a relevant ecological attribute.

The rehabilitation areas NOC3 and NOC4 were dominated by exotic species including Dactylis glomerata (Cocksfoot) which was sown as part of the rehabilitation and Hypochaeris radicata (Flatweed) was also becoming increasingly abundant, especially in NOC3. The exotic annual Plantago lanceolata (Ribwort) was also relatively abundant in all pasture rehabilitation areas this year and was particularly abundant in NOC5. Leontodon taraxacoides subsp. taraxacoides (Lesser Hawkbit), another exotic species, was also abundant in NOC5.

Performance of the pasture rehabilitation monitoring sites against 70% primary completion performance indicators

The table below indicates the performance of the pasture rehabilitation monitoring sites against 70% primary completion performance indicators in 2018. The selection of criteria has been presented in order of rehabilitation phases according to the ESG3 MOP guidelines excluding Phase 1: Decommissioning. The ecological targets begin at Phase 2: Landform establishment (yellow) and end with indicators in Phase 5: Ecosystem Sustainability (dark blue). The range values of the ecological targets are amended annually. Rehabilitation sites meeting or exceeding the range values of their representative community type have been identified with a coloured box have therefore been deemed to meet these primary completion criteria targets this year. Hashed coloured boxes indicate they may be outside of the reference target ranges, but within acceptable agricultural limits. Grey shaded boxes are indicators not measured during the reporting year (only measured every 2 years).

Performance of the pasture rehabilitation sites against 70% primary completion performance indicators in 2018.

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measure	Pasture ecosystem KPI range 2018			NO C3	NO C4	NO C5
Performance indicators are quantified by the range of values obtained from replicated reference sites and/or agricultural standards					Lower	Upper	70% KPI target	70% meet criteria		
Phase2: Landform establishment and stability	**Landform slope, gradient**	Landform suitable for final landuse and generally compatible with surrounding topography	Slope	< Degrees (°)	**2**	**5**	**<18**	**7**	**1**	**1**

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measure	Pasture ecosystem KPI range 2018			NO C3	NO C4	NO C5
	Active erosion	Areas of active erosion are limited	Cross-sectional area of rills	m^2	**0**	**0**	**0**	**na**	**na**	**na**
Phase 3: Growth medium development	**Soil chemical, physical properties and amelioration**	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH (5.6-7.3)	**0.0**	**0.0**	**na**	**na**	**na**	**na**
			EC	< dS/m (<0.150)	**0.000**	**0.000**	**na**	**na**	**na**	**na**
			Phosphorous	mg/Kg (50)	**0.0**	**0.0**	**na**	**na**	**na**	**na**
			Nitrate	mg/Kg (>13)	**0.0**	**0.0**	**na**	**na**	**na**	**na**
			ESP	% (<5)	**0.0**	**0.0**	**na**	**na**	**na**	**na**
Phase 4: Ecosystem & Landuse Establishment	**Landscape Function Analysis (LFA): Landform stability and organisation**	Landforms is stable and performing as it was designed to do	LFA Stability	%	**82.4**	**83.0**	**57.7**	**67.0**	**75.0**	**69.4**
			LFA Landscape organisation	%	**100**	**100**	**70**	**100**	**100**	**88**
	Vegetation diversity	Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Total species richness	No./area	**na**	**na**	**na**	**na**	**na**	**na**
	Ecosystem composition	The vegetation is comprised by a range of growth	Herb species	No./area	**na**	**na**	**na**	**na**	**na**	**na**

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measure	Pasture ecosystem KPI range 2018			NO C3	NO C4	NO C5
		forms comparable to that of the local remnant vegetation								
Phase 5: Ecosystem & Landuse Sustainability	**Landscape Function Analysis (LFA): Landform function and ecological performance**	Landscape Function Analysis (LFA): Landform function and ecological performance	LFA Infiltration	%	**54.5**	**58.3**	**38.2**	**49.1**	**53.9**	**30.6**
			LFA Nutrient recycling	%	**49.4**	**50.4**	**34.6**	**47.1**	**53.1**	**34.7**
	Protective ground cover	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Perennial plant cover (< 0.5m)	%	**73.5**	**85**	**51.5**	**40.5**	**44.5**	**8.0**
			Total Ground Cover	%	**95.5**	**98.5**	**66.9**	**100.0**	**100.0**	**94.5**
	Ground cover diversity	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation	Exotic understorey abundance /m^2	< species/m^2	**2.2**	**5.6**	**7.3**	**3.2**	**3.6**	**2.6**

SANDSTONE DRY RIDGETOP WOODLAND REHABILITATION SITE

The Sandstone Dry Ridgetop woodland reference site contained a mature eucalypt overstorey, scattered shrubs and a well developed litter layer with little evidence of erosion or deposition and had very stable soils. In comparison the rehabilitated vent shaft consisted largely of bare earth with scattered logs, woodchips and scattered annual and perennial plants were starting to establish. While the stability of the soils was variable and there was some evidence of erosion and deposition occurring across the site. In the plant litter patches, perennial plant and cryptogam covers were increasing and there was some litter decomposition. Subsequently the infiltration and nutrient recycling capacity of the rehabilitated area was very low but slowly improving.

The reference site was the most ecologically functional site and scored 203 out of a possible 300. In comparison the rehabilitation site was presently in a much less functional state and scored a total landscape function of 110.

In the Ridgetop Woodland reference site, there was a slightly higher diversity of native species this year while no exotic species have been recorded in any monitoring year. There was a minor decline in native and exotic species diversity in the rehabilitation area, however there has been an increase in native species abundance which provided 53.3% native plant cover, however it remained weedier than the reference sites.

Performance of the Sandstone Dry Ridgetop woodland rehabilitation monitoring site against 100% primary completion performance indicators

The table below indicates the performance of the Sandstone Dry Ridgetop woodland rehabilitation monitoring site against a selection of proposed primary completion performance indicators in 2018. The selection of criteria has been presented in order of rehabilitation phases according to the ESG3 MOP guidelines excluding Phase 1: Decommissioning. The ecological targets begin at Phase 2: Landform establishment (yellow) and end with indicators in Phase 5: Ecosystem Sustainability (dark blue). The range values of the ecological targets are amended annually. The rehabilitation site which has met or exceeded the range value of the reference site have been identified with a coloured box and have been deemed to meet these primary completion criteria targets this year. Hashed coloured boxes indicate they may be outside of the reference target ranges, but within acceptable agricultural limits. Grey shaded boxes are indicators not measured during the reporting year (only measured every 2 years).

Performance of the Sandstone Dry Ridgetop woodland rehabilitation site against 100% primary completion performance indicators in 2018.

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	RVent 2018	VentRehab 2018
Phase2: Landform establishment and stability	**Landform slope, gradient**	Slope	< Degrees (°)	**6**	**5**
	Active erosion	Cross-sectional area of rills	m^2	**na**	**na**
	Soil chemical, physical	pH	pH (5.6-7.3)	**na**	**na**

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	RVent 2018	VentRehab 2018
Phase 3: Growth medium development	**properties and amelioration**	EC	< dS/m (<0.150)	**na**	**na**
		Phosphorous	mg/Kg (50)	**na**	**na**
		Nitrate	mg/Kg (>13)	**na**	**na**
		ESP	% (<5)	**na**	**na**
Phase 4: Ecosystem& Landuse Establishment	**Landscape Function Analysis (LFA): Landform stability and organisation**	LFA Stability	%	**67.5**	**57.2**
		LFA Landscape organisation	%	**100**	**70**
	Vegetation diversity	Diversity of shrubs and juvenile trees	% population	**na**	**na**
		Total species richness	No./area	**na**	**na**
	Vegetation density	Density of shrubs and juvenile trees	No./area	**na**	**na**
	Ecosystem composition	Tree species	No./area	**na**	**na**
		Shrub species	No./area	**na**	**na**

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	RVent 2018	VentRehab 2018
		Herb species	No./area	**na**	**na**
Phase 5: Ecosystem & Landuse Sustainability	**Landscape Function Analysis (LFA): Landform function and ecological performance**	LFA Infiltration	%	**69.1**	**27.1**
		LFA Nutrient recycling	%	**66.2**	**25.2**
	Protective ground cover	Perennial plant cover (< 0.5m)	%	**10**	**34.0**
		Total Ground Cover	%	**99**	**49**
	Ground cover diversity	Native understorey abundance/m^2	> species/m^2	**4.2**	**3.8**
		Percent ground cover provided by native vegetation <0.5m tall	%	**100**	**53.3**
	Ecosystem growth and natural recruitment	shrubs and juvenile trees 0 - 0.5m in height	No./area	**na**	**na**
		shrubs and juvenile trees 1.5 - 2m in height	No./area	**na**	**na**

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	RVent 2018	VentRehab 2018
	Ecosystem structure	Foliage cover 0.5 - 2m	% cover	**10**	**2**
		Foliage cover 2 - 4m	% cover	**8**	**0**
	Tree diversity	Endemic Species	% population	**na**	**na**
	Tree density	Tree density	No./area	**na**	**na**
	Ecosystem health	Healthy trees	% population	**na**	**na**
		Flowers/fruit: Trees	% population	**na**	**na**

Conclusion

Most rehabilitation sites were establishing particularly well despite the extremes in seasonal conditions and increased grazing pressure by resident macropod and goat populations. While the developments occurring within the rehabilitation areas were patchy, there tended to be increasing ecological function. Most ecological parameters recorded were showing positive successional trends, with most sites meeting most of the 70% LFA Key Performance Indicator Targets. The exceptions included some shortfalls in Box Cut and SOC2 which have been slower to develop and REA5 which was only rehabilitated in spring 2015.

The high densities of acacias have been particularly important in the development of the soil profile as their stems assist in accumulating mobilised resources, their roots improve soil characteristics and the extensive addition of deaf leaves and spent pods add nutrients and improve the extent and decomposition of the litter layers. Over the past few years extensive dieback of the acacias has been observed, allowing the persisting eucalypt trees and ground cover vegetation to grow more effectively. This year there has been significant transformation in many of the woodland sites whereby the canopy has opened up considerably and there was an abundance of native perennial grasses and a variety of other native ground covers establishing across significant areas of the NOC and SOC rehabilitation areas. In addition, there were many other positive indicators being

observed a various parts of the rehabilitation including the establishment of toadstools, bracket fungi, colonisation by ants and other insects, birds nests and in a sedimentation pond a turtle was observed to be hunting newly hatched tadpoles.

In 2015 there was a significant natural regeneration event with hundreds of small seedlings of acacias and Cassinia arcuata in many of the rehabilitation sites. This process has also been evident in the oldest rehabilitation site SOC3 which has transformed into open eucalypt dominated woodland with many ecological attributes of the remnant reference sites, including a native grass understorey, a well developed canopy and natural regeneration of acacias and eucalypt species and SOC1 also appears to be trending in that direction, while significant transformation has take place on the remaining NOC and SOC rehabilitation areas.

In REA5 there has been low establishment of desirable native tree and shrub seedlings and additional intervention is likely to be required. Scarification followed by reseeding in autumn and/or spring as per recommendations provided in June 2017 are recommended.

The pasture rehabilitation sites NOC3 and NOC4 continue to meet the 70% primary completion targets, except that perennial plant cover is too low. Heavy and continued grazing by macropods and goats has however resulted in a decline in perennial grasses and increased abundance of exotic weeds over the past few years. The effects of heavy pressure have become more apparent in the grassy clearings such as in site NOC5. Grazing intensity has probably been much more apparent during the prolonged dry conditions over the past few years. They are however likely to be repeatedly overgrazed by macropods (and goats?), suggesting livestock grazing is not a suitable or viable management option for these domains at Baal Bone. If perennial plant cover does not improve and exotic pastures suitable for grazing by livestock are required, the exotic pasture sites may need to be resown. Monitoring of macropod (and goat?) numbers should also be regularly undertaken.

Priority weeds including Rubus fruticosus (Blackberry) and Hypericum perforatum (St John's Wort) were becoming increasingly more common. Hypericum perforatum was noted mostly growing along the roadsides but was increasing in abundance and distribution in many areas of the rehabilitation. Targeted weed control programs need to be implemented to control these invasive species before they develop into unmanageable extensive infestations. Pine wildlings should also be controlled where they are impacting natural rehabilitation areas.

7.5 Works Outstanding to Date

The areas which have not yet been rehabilitated are generally limited to the current surface infrastructure areas, including the pit-top area, CHPP, mine adits, transmissions lines, pipelines, various water management structures and the southern REA, including REA 6 and the Course REA. These areas will be rehabilitated at the end of the approved mine life.

7.6 Ben Bullen Creek Rehabilitation Project

Stabilisation and restoration works have been completed along two sections of the Ben Bullen Creek including riparian vegetation (tube stock) planting in sections 1 and 3. These works have been specifically designed and constructed using the philosophy of natural channel design.

Under Project Approval 09_0178, Baal Bone was required to review its water management systems which included a review of the Ben Bullen Creek Natural Channel Design and Restoration Plan, originally prepared in 2007.

A review of the Ben Bullen Creek Natural Channel Design and Restoration Plan during 2012/2013 indicated that remediation of the current Ben Bullen Creek diversion through the pit top area may be optimal to the reinstatement of the creek to its pre-disturbance pathway (approximately pathway post Ben Bullen Mine 1952).

URS were commissioned in 2013 to carry out a Phase 1 assessment of Ben Bullen Creek to consider the options of rehabilitating the current diversion verse reinstatement of the creek to its approximate pre-disturbance pathway.

Findings from the assessment recommend that the existing diversion be maintained for Ben Bullen Creek.

"The current ecological values along the existing alignment are high, with successful rehabilitation works along a large portion of the creek line. This has provided structured vegetation, a diverse mixture of flora species and fauna habitat potential. With some further remedial works, including further rehabilitation works along eastern bank (e.g. mulch, plantings and installation of woody debris) the ecological value of the creek line will improve. If any civil works are required (e.g. batter the high wall, removal of native vegetation or removal of pipelines/culverts), an impact assessment will be required to assess the effects to threatened species habitat that is currently present.

The pre-disturbance alignment for the creek line traverses the existing pit top area and consequently currently contains low ecological value. It would require substantial rehabilitation works to replicate the ecological value of the current creek alignment. This alignment is not preferred, and potential re-alignment may have impacts upon the ecological values (in-stream vegetation and flora species) of the current creek system.

The remediation of the existing course can commence in a timely manner following receipt of required approvals, allowing for additional benefits. Once the construction works are complete, the revegetation effort can begin. If the site is operational, staff will be available to review the progress of the vegetation on a regular basis. This will allow any issues to be identified and remedial action to be taken in a timely manner. Whilst this would still occur after mine closure, the time between inspections would be much greater and duration of monitoring would be shorter. It is likely that this would impact on the success of the revegetation process.

The existing course is geomorphologically stable and requires only minor adjustments to improve the geotechnical stability and revegetation potential of the banks. The modelling is a conservative estimate of channel conditions, but this also suggests the channel is stable.

The longer path of the existing course suggests that the creek will have less erosive power and is therefore more likely to remain stable in the long term. The pre-disturbance path also passes close to the adits, posing a potential risk of flood waters entering the underground workings."

Following discussions held with DP&E in 2014, a modification was sought by Baal Bone to modify the approved final landform plan and associated conditions for the Baal Bone Coal Project under Project Approval 09_0178. The modification was sought under Section 75W of the Environmental Planning and Assessment Act 1979 (EP&A Act), and will facilitate the changes to final alignment and rehabilitation of Ben Bullen Creek. In December 2015, DP&E approved the modification to allow Ben Bullen Creek to remain in its current alignment.

On the 13 December 2016, the Ben Bullen Creek Rehabilitation Plan was submitted to DP&E for review and approval. It was also sent to OEH, Fisheries NSW, DRE and DPI Water for consultation purposes as required by PA 09_0178. The Ben Bullen Creek Rehabilitation Plan was approved by the DP&E on 13 December 2017.

7.7 Other Infrastructure

No other rehabilitation was undertaken during 2018 as a result of construction or decommissioning of site infrastructure.

7.8 Rehabilitation Trials and Research

There has not been any formal rehabilitation trials or research carried out at Baal Bone during the reporting period.

7.9 Finalisation of a Detailed Mine Closure Plan

7.9.1 Mine Closure Planning

In accordance with Glencore Coal NSW Sustainable Development Annexure 0038, 10.1 Mine Closure, Baal Bone has prepared a Detailed Mine Closure Plan.

Activities completed include the following:

- Desktop Constraints and Opportunities Analysis for Mine Closure (Umwelt Australia);
- Final Landuse Options Workshop and Risk Register (GSSE Environmental);
- Preparation of draft closure objectives and completion criteria for final Landuse options;
- Phase 1 and Phase 2 Contamination Survey and Assessment (ENSR Australia);
- Hazardous Materials Survey and Site Register (SP Solutions);
- Completion of a Demolition and Dismantlement Closure Study for the site (Liberty Industrial);
- Finalisation of Mine Seal Design (Burke Engineering Services) and submission of High Risk Activity Notification to DRE;
- Indicative market valuation of final Landuse options and accompanying cost to benefit and economic analysis of Landuse options (Trevor Hudson and Associates);
- Mine Closure Social Impact Assessment (Coakes Consulting);
- Development and progressive implementation of Mine Closure Consultation Strategy;
- Contaminated Site Assessment (GHD);
- Water Modelling Report – Mine Closure Water Balance (GHD); and
- Ben Bullen Creek Rehabilitation Plan (GHD).

As a result of these activities, a decommissioning plan has been developed for each domain within the mine area. The plan is to be revised yearly in accordance with any changes that may occur with company goals, legislation and planning. The domain areas which require decommissioning activities are dominated by the current infrastructure areas associated with Domain 1 – Northern Void, Domain 3 – Infrastructure, Domain 4 – Central Pit Top Area, Domain 6 – Southern Void and Domain 7 – Subsidence areas. Decommissioning of current infrastructure is the first step to meet the Mine Closure criteria.

During 2017 a detailed Mine Closure Plan was prepared, however due to the potential sale of the site this plan was not activated.

Baal Bone Colliery is currently developing a Mine Closure MOP – which is anticipated to be submitted to the Resources Regulator in mid-2019 for approval.

7.9.2 Rehabilitation Liability Estimate

Baal Bone's rehabilitation liability estimate was increased in early 2012 to a total of $13,022,000 increasing from $9,723,000 at the end the 2011 reporting period.

An internal review of Baal Bone's rehabilitation liability estimate carried out in December 2012 further increased the liability estimate to $18,770,763. The revised estimate was submitted to DTI for approval together with the 2012 Annual Review.

A further review of the rehabilitation liability estimate carried out in December 2015 increased the estimate to $23,256,120. The revised estimate was submitted to DRE for approval in February 2016 together with the revised MOP 2016 -2019.

During 2017 a review of the rehabilitation liability estimate was conducted in association with the approval of the Ben Bullen Creek Rehabilitation Plan and was increased to $23,793,000. The revised rehabilitation liability estimate was submitted to DRG in October 2017 and was approved in December 2017.

8 Community

8.1 Environmental Complaints

In accordance with the **Baal Bone Community Complaints Management Procedure,** Baal Bone Colliery has a comprehensive system in place to document and respond to community complaints in a timely manner and to maintain a comprehensive complaints database.

Consistent with conditions of Baal Bone's EPL, Baal Bone maintains a telephone complaints line for the purposes of receiving and responding to complaints from members of the public in relation to activities conducted at Baal Bone.

Upon receipt of a complaint, the following details are obtained from the complainant:

- Date of complaint;
- Notification method;
- Date of incident;
- Name of complainant;
- Contact details of complainant;
- Type of complaint;
- Actions taken;
- Persons notified; and
- Details of follow up actions taken, if required.

Following the receipt of a complaint, a thorough investigation of the complaint is undertaken and the complainant advised of the results of the investigation. Any action to be taken to prevent a recurrence is undertaken as soon as practicable.

There were no complaints received during the 2018 reporting period.

During the 2017 reporting period there were three complaints received by Baal Bone Colliery. Two of the complaints originated from one complainant: the occupant of an illegal dwelling adjacent to the Mine boundary. Both complaints were related Baal Bone Colliery disconnecting power supply to the illegal dwelling – after the Colliery received advice from Endeavour Energy stating that the power cable did not meet AS3000. A third complaint received during 2017 related to overgrown vegetation on Colliery land within Lithgow town limits.

No complaints were received from 2013-2016. One complaint was recorded in both 2011 and 2012, being noise and subsidence complaints, respectively. As the site is in care and maintenance, it is expected that complaint levels will remain negligible.

Further information on complaints can be found here: http://www.glencore.com.au/en/who-we-are/energy-products/baal-bone/Pages/other-publications.aspx.

8.2 Community Liaison

8.2.1 Community Initiatives

Funding is allocated for community involvement activities annually.

During 2018 Baal Bone Colliery donated $800 to Cullen Bullen Public School to assist with the costs of an overnight school excursion.

During 2017 Baal Bone Colliery made a donation of goods to the Portland District Motor Sports Club for the benefit of the Cullen Bullen Speedway.

8.2.2 Community Consultative Committee

The Baal Bone Colliery Community Consultative Committee (CCC) has been established to provide a formal conduit for exchange of information and views between the local community and Baal Bone's Management Team. As per the 2016-2019 MOP, Baal Bone Colliery will hold CCC meetings at least annually.

Membership of the 2018 Baal Bone CCC:

- Ray Blackley (Resident);
- Barbara Milne (Resident);
- Karen Desch (Adjacent landholder);
- Representative from Lithgow City Council;
- Representative from Cullen Bullen Public School;
- Mark Bulkeley (Operations Manager); and
- Elizabeth Fishpool (Environment and Community Coordinator)

A CCC meeting was held during the reporting period on 28 August 2018.

The meeting was well attended by members and the following items were presented by Baal Bone:

- Future of Baal Bone Colliery – potential sale of site.
- Review of rockfall incidents that occurred during 2017.
- Rehabilitation review
- Discussion of EPL and water discharge

Regular agenda items included:

- Operations Manager's update;
- Health and Safety update;
- Environment and Community update; and
- General Business and any other issues of concern from the community.

Another CCC meeting was held on 30 January 2019 to inform CCC members that the sale of Baal Bone Colliery had been terminated, and that the site would remain in Glencore ownership.

A second CCC meeting will be held later in 2019.

9 Independent Audit

As reported in the 2016 Annual Review Baal Bone Colliery underwent an Independent Environmental Audit, as per Schedule 5, Condition 7 of PA 09_0178. The site component of the audit was conducted on 6 and 7 December 2016 with the final audit report received on 22 February, 2017. Table 9.1 outlines the current status of actions arising from the 2016 Audit.

Refer to http://www.glencore.com.au/en/who-we-are/energy-products/baal-bone/Pages/other-publications.aspx for the audit report and action plan.

The next Independent Environmental Audit of Baal Bone Colliery will occur in December of 2019.

Table 9.1: Status of actions arising from 2016 Independent Environmental Audit

Sch and Cond Number	Nature	Cause	Action Plan	Status
	Project Approval 09_0178			
Sch. 3, Cond. 12	Air Quality Monitoring Program is prepared for the Care and Maintenance phase of mining operation. No provision has been made for proposed rehabilitation activities.	Oversight during document preparation.	Include note in Plan that air quality will be assessed for future proposed rehabilitation activities with identified air quality controls as deemed necessary at this time to be implemented.	Complete: refer to Section 4.3 of Air Quality Monitoring Program.
Sch. 3, Cond. 22	The groundwater TARP in Section 2.6 of the Surface and Groundwater Response Plan is different to that in Section 3.4 of the 2015 Annual Review.	The groundwater TARP in Section 3.4 of the 2015 Annual Review was sourced from a consultant report for use prior to approval of Water Management and associated Plans.	The groundwater TARP in future Annual Reviews will be updated to reflect the TARP in the approved Surface and Groundwater Response Plan.	Complete: refer to Section 6.2 of this 2017 Annual Review (Tables 6.7, 6.8 and 6.9).
Sch. 5, Cond. 1	Dispute resolution has not been covered in the EMS.	Oversight during document preparation.	Include reference to Baal Bone's Conflict Resolution Procedure in EMS at next review.	Complete: refer to Section 7.4 of the Environmental Management Strategy.
Sch 5, Cond. 2	All management plans required under the Project Approval are to have input or be prepared by a qualified expert who has been endorsed by the Secretary of the DP&E and Contingency Plans.	Oversight during document preparation.	Seek endorsement of experts that have had input in preparing all manage ment plans required under the Project Approval. Contingency Plans be included at next review.	Complete: in correspondence from the Department of Planning and Environment dated 24/1/2018 Baal Bone Colliery received approval of experts.

Sch and Cond Number	Nature	Cause	Action Plan	Status
Sch 5, Cond. 3	Annual Reviews have been completed to the former guidelines. Monitoring results have been prepared against EA predictions.	Oversight during document preparation.	This and future Annual Reviews to be prepared to current guidelines. Include a comparison against key criteria from the MOP in future Annual Reviews to meet this condition if applicable.	Complete: 2016 and 2017 Annual Reviews have been prepared to current guidelines.
Sch. 5, Cond. 4	Management Plan Reviews not completed within 3 months of approval of MOD 2 (December 2015).	Delay in submitting reviewed Management Plans.	Management Plan Reviews were submitted in April 2016.	Complete. The 2016 IEA Report and 2016 Annual Review were submitted on 30 March 2017, and the required management plan review was submitted on 15 June 2017. Following an incident reported on 26 September 2017, a management plan review was submitted on 22 January 2018.
	Mining Purposes Lease 261			
Condition 5	Too little detail regarding reporting against compliance with the MOP in the Annual Reviews completed during the audit period.	Lack of firm commitments in the MOP to report against due to suspended operations/care and maintenance status of operation.	Include more detail of compliance with MOP in future Annual Reviews.	Due to the care and maintenance status of Baal Bone Colliery, there is a lack of firm commitments in the MOP to report against. Where possible, further detail has been included in this Annual Review.
	Mining Lease 1302 and Coal Lease 391			
ML 1302 - Condition 4f CL 391 - Condition 3f	Although results of rehabilitation monitoring are provided in the Annual Review there is no comparison against criteria from the MOP.	Rehabilitation monitoring criteria are the same as MOP criteria.	Clarify in future Annual Reviews.	Complete. Refer to Section 7.3
	Mining Lease 1607			
Condition 5	Although results of rehabilitation monitoring are provided in the Annual Review there is no comparison against criteria from the MOP.	Rehabilitation monitoring criteria are the same as MOP criteria.	Clarify in future Annual Reviews.	Complete. Refer to Section 7.3

10 Incidents and Non-Compliances During the Reporting Period

In accordance with the Glencore definitions provided at **Section 5.18.2**, there were no reportable environmental incidents recorded by Baal Bone during the reporting period.

Incidents and non-compliances during the reporting period are summarised in **Table 10.1** below.

Table 10.1: Incidents and Non-Compliances

Summary	Date	Incident/Non-compliance	Incident Category	Further Information
Coxs River Swamp: failure to take groundwater chemistry sample at BBPB1 in January 2018 in accordance with Groundwater Monitoring Plan.	January 2018	Non-compliance	NA	Section 6.2
Annual Ecological Rehabilitation Monitoring and Rehabilitation Inspection: failure to complete monitoring and inspection during 2018 in accordance with Biodiversity and Land Management Plan. *Monitoring and Inspection delayed until January 2019.*	2018	Non-compliance	NA	Section 7.4

11 Activities to be Completed in the Next Reporting Period

11.1 Operations and Systems

Projects and targets for the 2019 reporting period include the following:

- Completion and submission of Mine Closure MOP
- Dismantle, seal and cap LW19 ventilation fan and shaft
- Commencement of sealing of adits 1 - 11
- Continued investigation into other potential cliff falls that may have occurred on the Baal Bone leases.

11.2 Care and Maintenance Period

Baal Bone entered a care and maintenance period following the cessation of mining operations in 2011. During the 2019 Annual Review period, works will commence to seal the underground mine. Required infrastructure will remain intact and the site will continue to be managed and maintained for potential future land use.

11.3 Pit-top Facilities

During the 2019 Annual Review period the LW19 ventilation fan will be dismantled, and the shaft capped and sealed. Works will commence to seal adits 1-11. Other infrastructure will be maintained to an operational standard.

As the current future of Baal Bone infrastructure is uncertain, a standby strategy has been adopted for the CHPP. This has allowed the CHPP to be temporarily decommissioned, and then restarted in the future if required.

Reclaim tunnels and other infrastructure have been man-proofed.

11.4 ROM and Product Stockpiles

All stockpiles have been depleted, cleaned of carbonaceous material and left in a stable condition. No activities are proposed for the 2019 Annual Review period.

11.5 Mine Ingress/Egress

The main ingress to the underground operations is provided through the No.4 adit. The primary ingress to each previous longwall is provided through the maingate roadways. Secondary egress is provided through the tail gate of each longwall panel.

All adits have been secured with steel gates. The main ingress through No.4 adit is only open during operating hours and access is only available to approved underground operators for completion of routine underground maintenance, statutory inspections and possible training activities.

During 2019, works will commence to seal adits 1-11 as per the High Risk Activity Notification submitted to DRE on 9 August 2016.

11.6 Voids

It is intended to retain and maintain REA 6 for future use should Baal Bone decide to continue operations in accordance with its Project Approval. Final rehabilitation of this area will occur after mine closure.

11.7 Other Infrastructure

Other infrastructure associated with Baal Bone or in the immediate vicinity includes powerlines, access tracks, boreholes and monitoring sites. All powerlines to the site will remain to supply buildings and offices power during the care and maintenance phase of the mine. All mine related access tracks and monitoring sites present on Forestry Corporation of NSW land will be maintained during the care and maintenance phase of the mine.

11.8 Rehabilitation

The principal objective for the rehabilitation of mined land at Baal Bone is to return the site to a condition where its landforms, soils, hydrology, flora and fauna are self-sustaining, and compatible with the surrounding land fabric.

The proposed end land use for the site includes a combination of grazing and bushland/wildlife habitat. The stated land use combination is compatible with adjoining lands. The overriding principle is to create the most beneficial future use of rehabilitated land, which can be sustained in view of the range of limiting factors. The post-mining landscape will be dominated by Class IV (grazing – occasional cultivation) and Class VI (grazing – no cultivation) Rural Land Capability Classification. Drainage paths, contour drains, ridgelines, and emplacements are to be shaped in undulating informal profiles in keeping with natural landforms of the surrounding environment. The rehabilitation work completed to date is illustrated in Plan 3.

The areas which have not yet been rehabilitated are generally limited to the current surface infrastructure areas; these include the pit-top area, CHPP, mine adits, transmissions lines, pipelines, various water management structures, northern void as well as the southern void and reject emplacement area (Plan 3). During 2019 plans for the rehabilitation of these areas will be developed and finalised as part of the Mine Closure MOP.

During 2019, the LW19 ventiliation fan will be dismantled, and the shaft capped and sealed. Works will commence to seal underground adits 1 –11.

To ensure Baal Bone will be able to meet the final rehabilitation objectives and completion criteria set out in the MOP, rehabilitation monitoring methodologies will include a combination of LFA, biennial accredited soil analyses and an annual rehabilitation walkover inspection. The Annual Rehabilitation Walkover inspection of previously rehabilitated sites will be completed by a suitably qualified external environmental professional and will ensure that any land management issues such as weeds and erosion are raised and addressed. Inspections by site personnel will also be undertaken on monthly basis for rehabilitation, with pit top inspections occurring at least fortnightly.

11.9 Community Relations

Community relations projects for the 2019 Annual Review reporting period include the following:

- Hosting a CCC meeting; and
- Distribution of a community newsletter (if required).

12 References

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Maltby,E (2009). The Wetlands Handbook. John Wiley and Sons.

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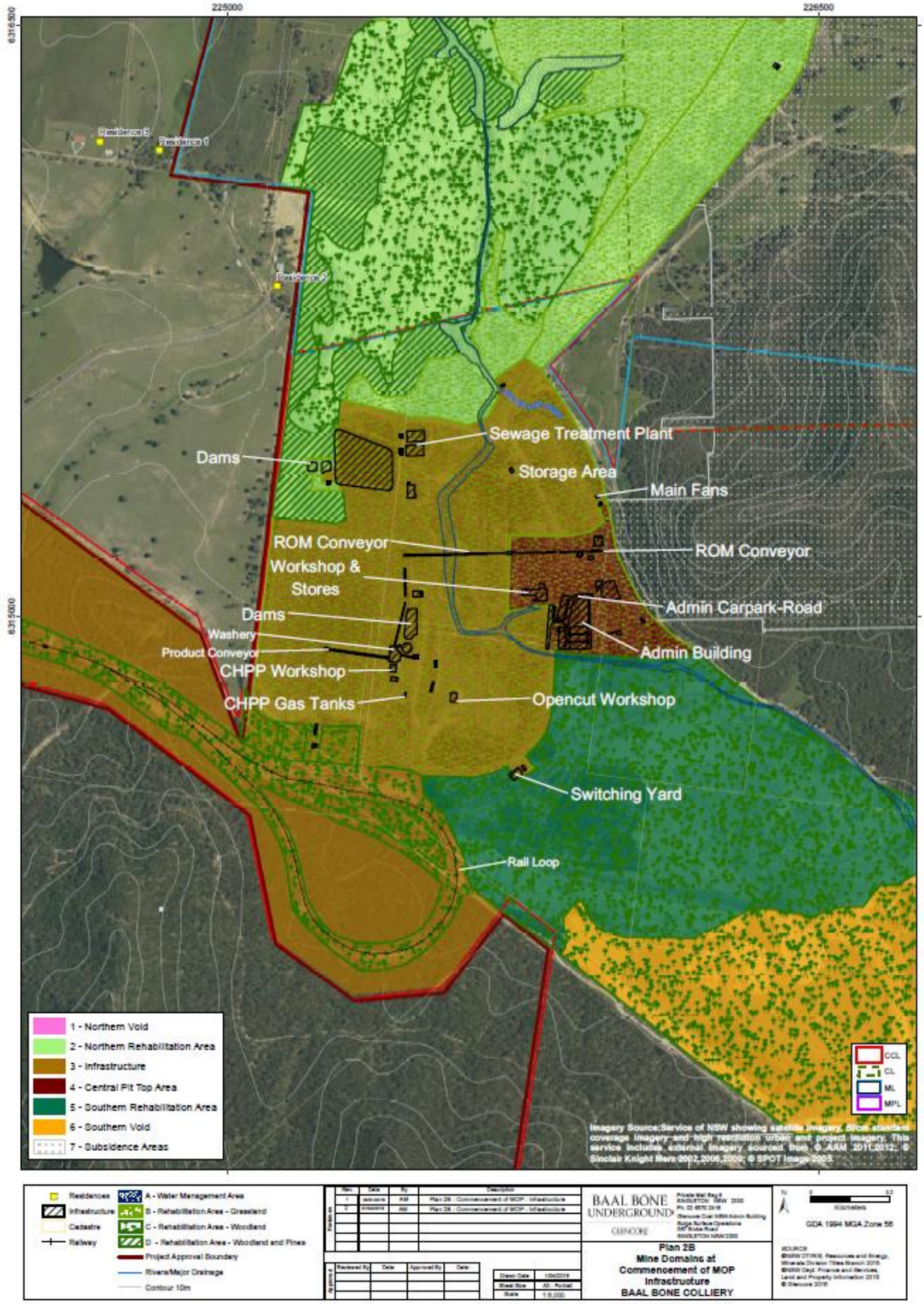
Schaller, J, Brackhage, C, Mkandawire, M and Dudel, E G (2011). Metal/metalloid accumulation/remobilization during aquatic litter decomposition in freshwater: A review. Science of the Total Environment 409: 4891-4898

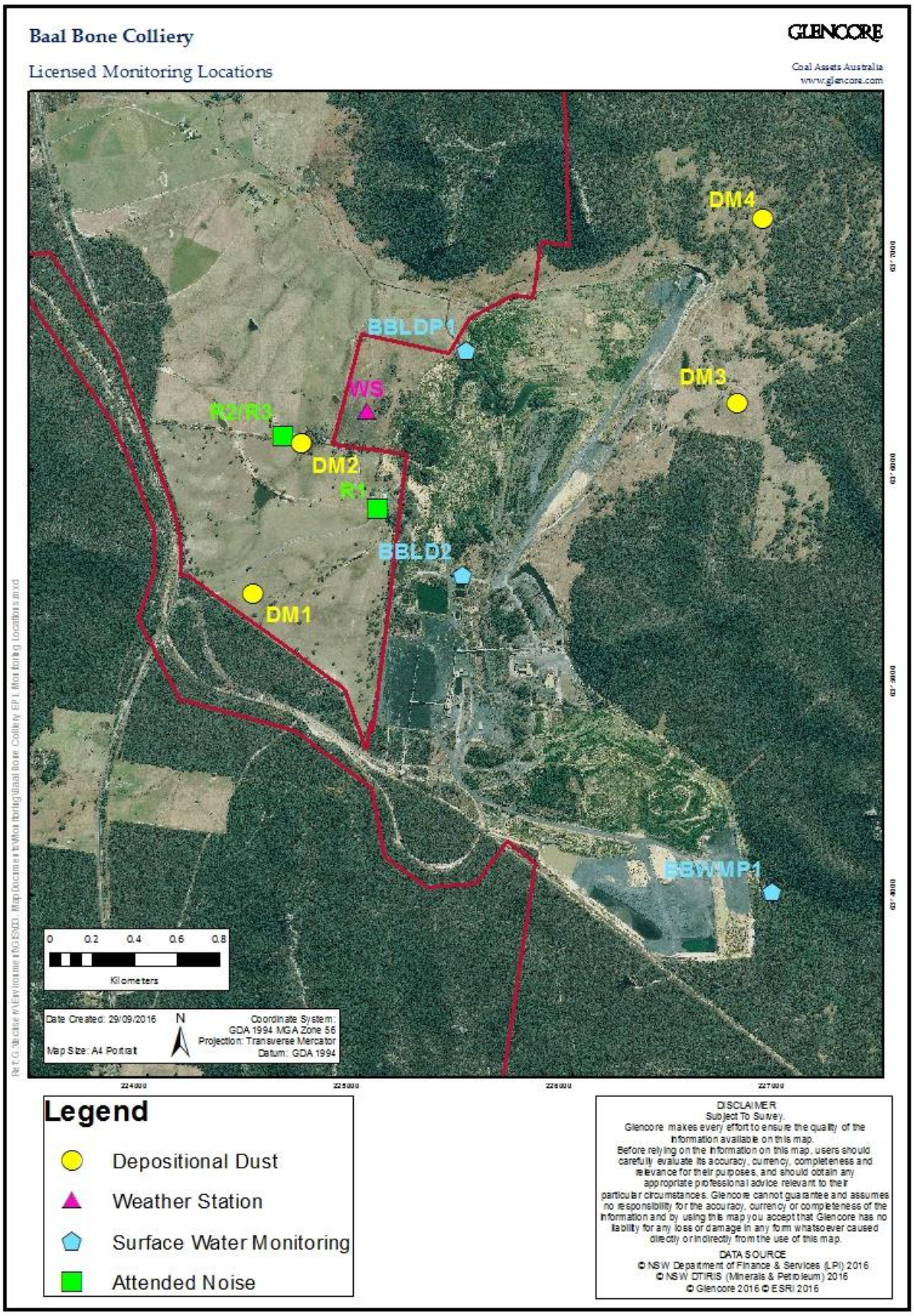
SCT Operations Pty Ltd, (2011). Review of subsidence and stress cell change monitoring adjacent to the Wolgan Escarpment at completion of longwalls 29 and 30, SCT Operations Pty. Ltd, Wollongong.

URS Australia (2014). Phase 1 – Ben Bullen Creek, Options analysis and concept design. URS Australia Pty Ltd, Hamilton NSW.

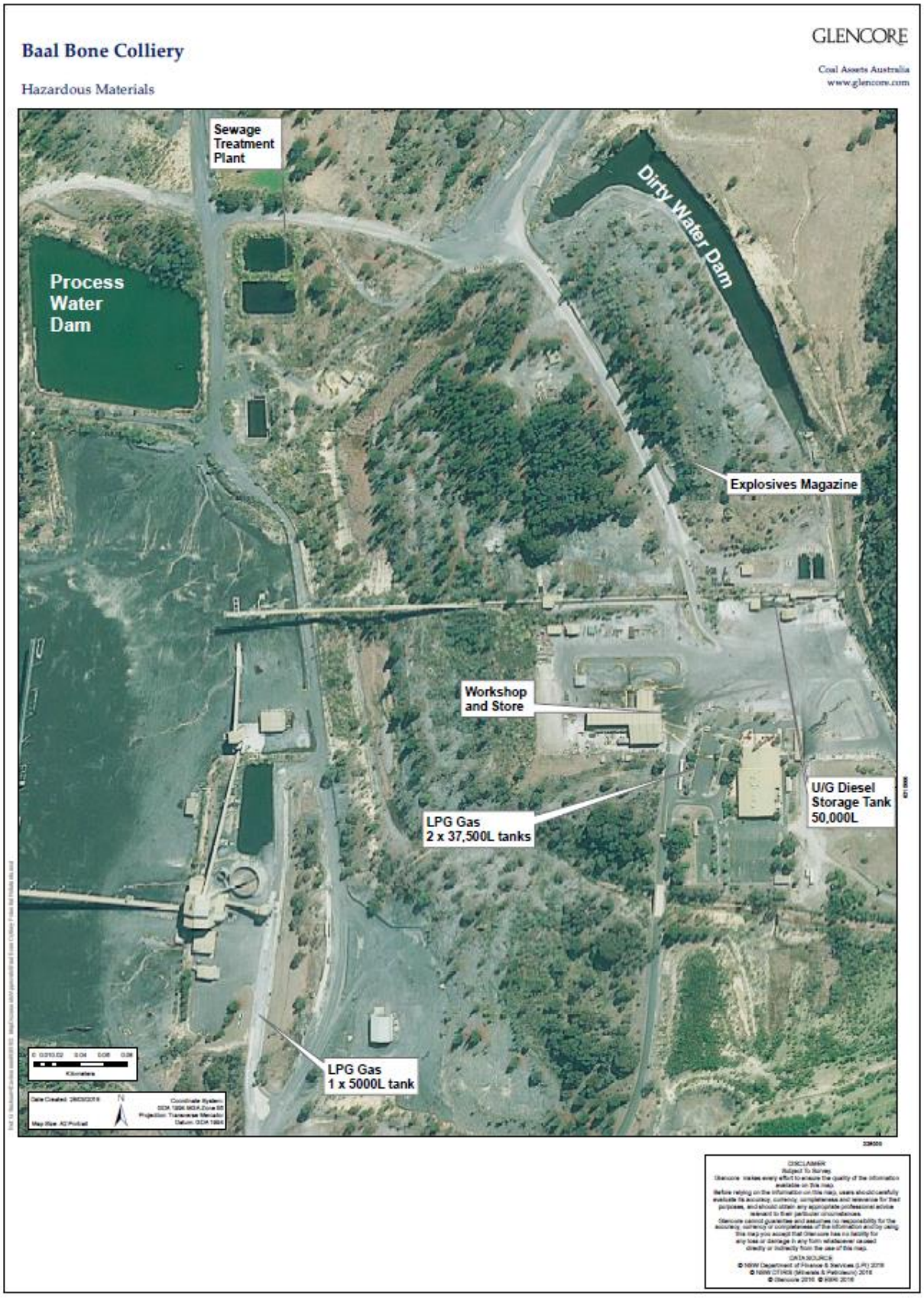
A.1 Appendix A - Plans



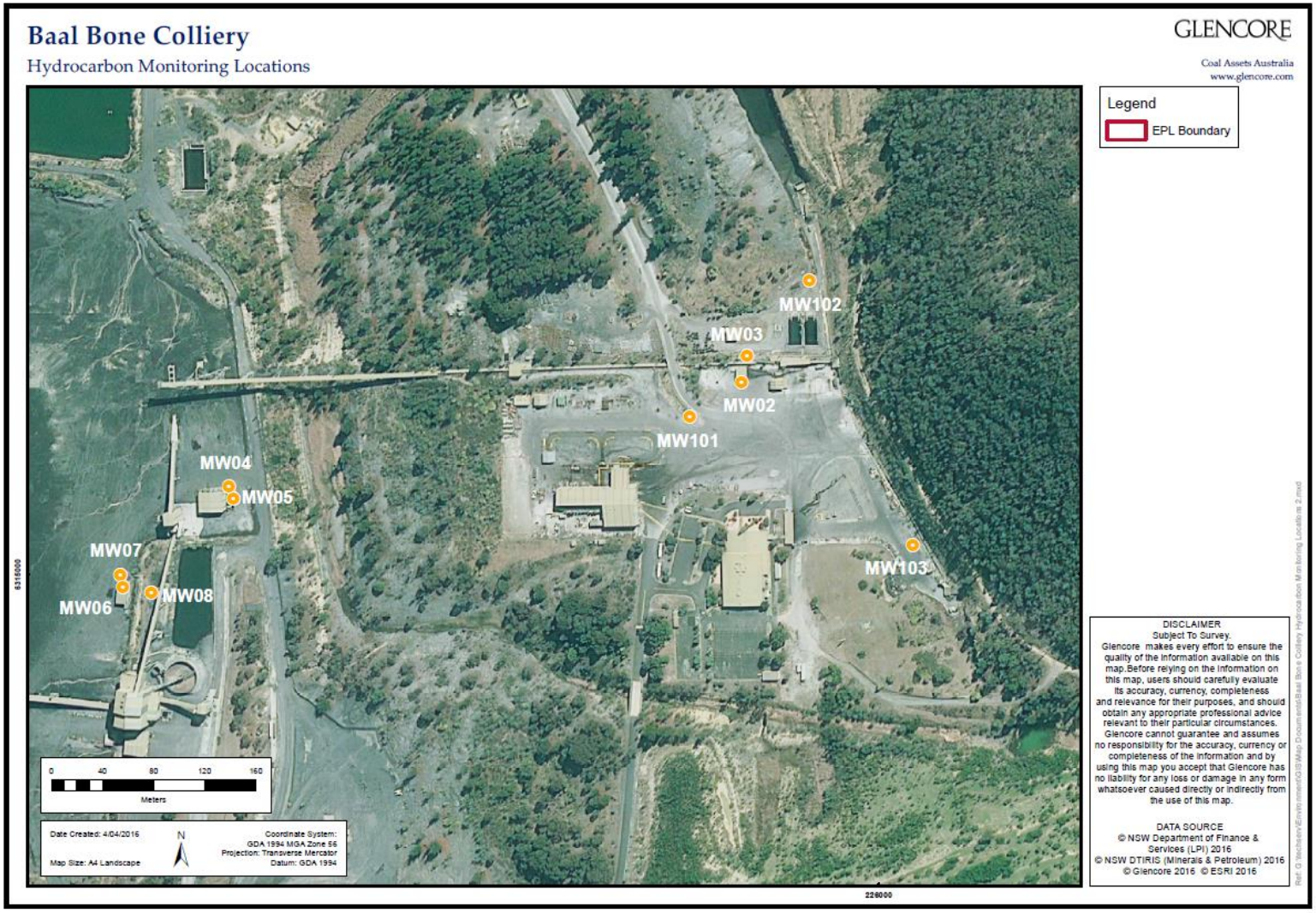
Plan 1 – Site Infrastructure



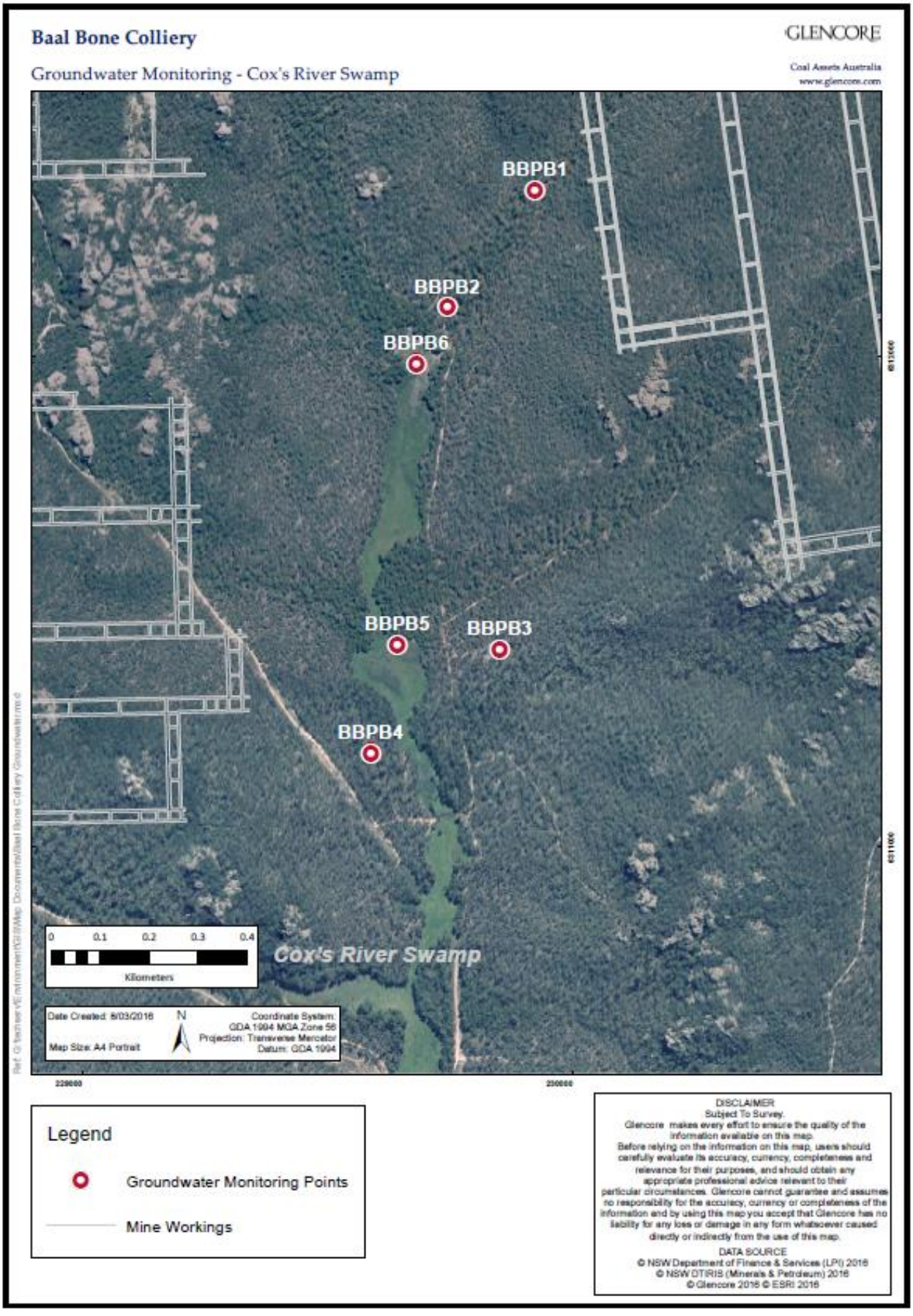
Plan 2 – Licensed Monitoring Locations



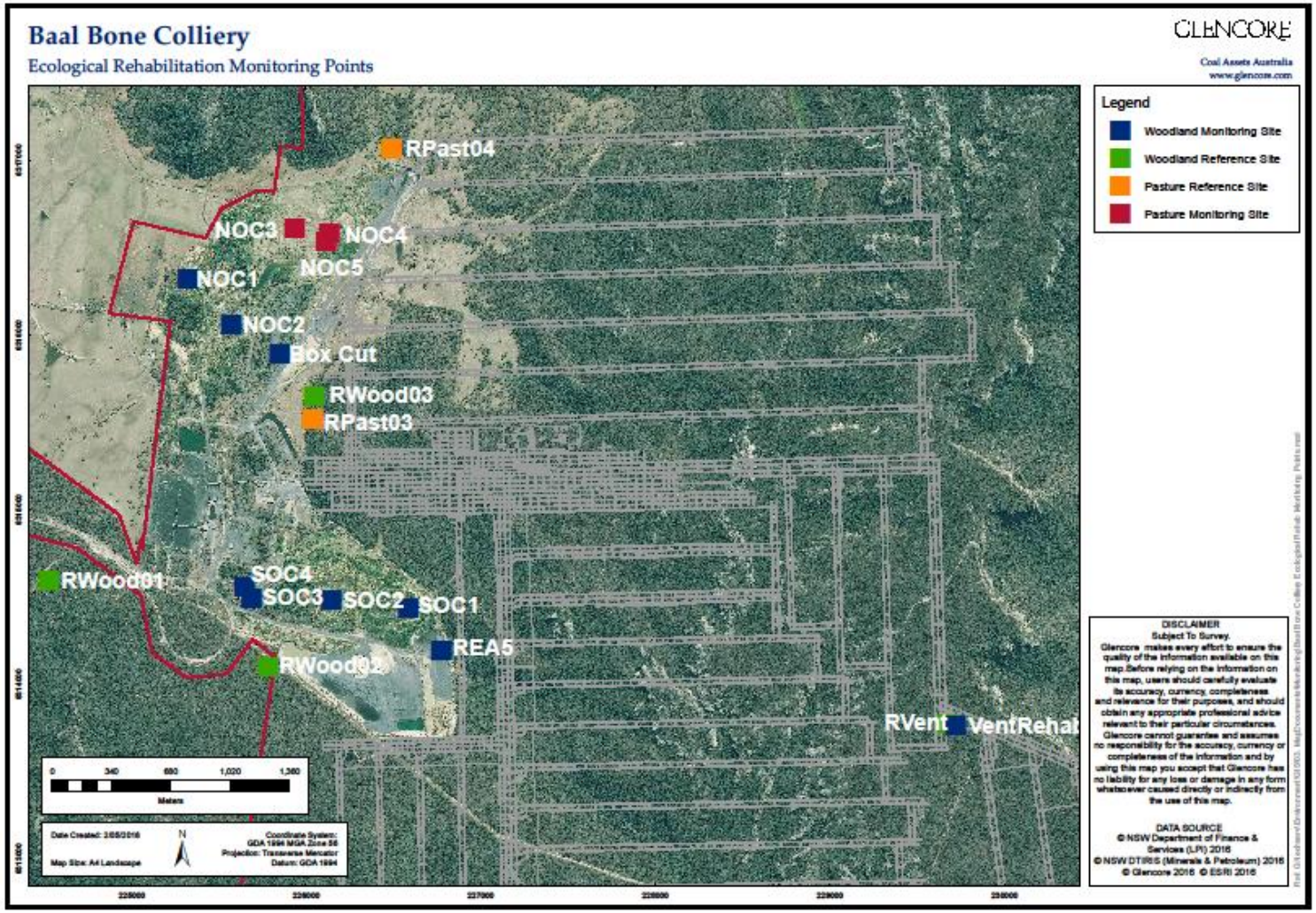
Plan 3 – Hazardous Materials



Plan 4 – Hydrocarbon Monitoring Locations



Plan 5 – Groundwater Monitoring Cox's River Swamp



Plan 6 – Ecological Rehabilitation Monitoring Points

A.2 Appendix B – Approval

Planning, Industry & Environment

Baal Bone Colliery
Attention: Mr Mark Davis
Castlereagh Highway
Cullen Bullen NSW 2790

Name: Jennifer Rowe
Contact: (02) 4247 1851
Email: Jennifer.rowe@planning.nsw.gov.au

20 August 2019

Dear Mr Davis

Baal Bone Coal Project SSD 09_0178
2018 Annual Review

Reference is made to the revised Annual Review for the Baal Bone Coal Project, for the period 1 January to 31 December 2018, submitted to the Department on 6 August 2019 as required under Condition 3 of Schedule 5 of SSD 09_0178, as modified (Consent).

The Department has reviewed the revised Annual Review and considers it to generally satisfy the requirements of the Consent in relation to the Annual Review. Please note that approval of this Annual Review is not endorsement of the compliance status of the project.

The Department notes your response and the actions implemented to rectify the reported non-compliance with Schedule 3 Condition 21 and Schedule 3 Condition 23.

With regards to the non-compliance with Schedule 3 Condition 23 of the Consent, this matter is being investigated separately by the Department. The Department will assess whether any enforcement action is warranted, in accordance with the Departments' Compliance Policy. The Policy is available at: http://www.planning.nsw.gov.au/Assess-and-Regulate/Compliance-functions/Compliance-policy-and-guidelines.

In accordance with Schedule 5 Condition 9 of the Consent, the Proponent is required to make a copy of the documents listed by this condition publicly available on the company website. It is requested that the revised Annual Review is uploaded to the website by no later than one month after the date of this letter.

If you wish to discuss this further, please contact Jennifer Rowe on the details above.

Yours sincerely,

Katrina O'Reilly
Team Leader Compliance
As nominee of the Secretary

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