BAAL BONE
UNDERGROUND

GLENCORE

Annual Review 2017

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 2017
Annual Review End Date	31st December 2017

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 2017 to 31st December 2017 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	E Fishpool
Date	15 May 2018

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 - Refuse Emplacement Area
TSS – Total Suspended Solids

Table of Contents

1 Introduction 6

1.1 Overview 6

1.2 Scope of this Annual Review 6

1.3 Mine Contacts 8

2 Approvals and Compliance Statement 11

2.1 Amendments During the Reporting Period 17

3 Operations Summary 18

3.1 Exploration 18

3.2 Land Preparation 18

3.3 Construction 18

3.4 Mining 18

3.5 Mineral Processing 19

3.5.1 Production, Processing and Waste Summary 19
3.5.2 Product Destination and Transportation 19
3.5.3 Ore and Product Stockpiles 19
3.5.4 Mineral Waste Management 19
3.5.5 CHPP Waste and Reject Emplacement 19
3.5.6 Reject Material 19

3.6 Water Management 20

3.6.1 Process Water Circuit 20
3.6.2 Potable Water 20
3.6.3 Sewage Treatment and Disposal 21
3.6.4 Water Balance 21

3.7 Hazardous Material Management 22

3.7.1 Status of Licence 22
3.7.2 Safety Data Sheets 23

3.8 Other Infrastructure Management 23

3.9 Site Security 23

3.10 Activities during Suspension of Mining 23

3.10.1 Salvage of Selected Underground Equipment 24
3.10.2 Maintenance of Services 24

4 Actions Required from Previous Annual Review 25

5 Environmental Performance 26

5.1 Air Pollution 26

5.1.1 Wind speed and direction 26
5.1.2 Dust Monitoring and Sample Locations 27
5.1.3 Review and interpretation of dust monitoring results 28
5.1.4 Comparison against previous Annual Reviews 30
5.1.5 Comparison against EA 30

5.2 Erosion and Sediment Control 31

5.3 Contaminated Land 32

5.4 Flora 32
5.5 Fauna 32
5.6 Weeds 32
5.7 Blasting 32
5.8 Operational Noise 32
5.8.1 Comparison against EA and previous Annual Reviews 33
5.9 Visual, Stray Light 33
5.10 Aboriginal and European Heritage 33
5.10.1 Aboriginal Heritage 33
5.10.2 European Heritage 33
5.10.3 Comparison against EA 34
5.11 Natural Heritage 34
5.12 Spontaneous Combustion 34
5.13 Bushfire Management 34
5.14 Mine Subsidence 35
5.14.1 Current Approvals 35
5.14.2 Longwalls 29-31 Subsidence Development (Summary of Survey Results) 35
5.15 Hydrocarbon Contamination 36
5.16 Methane Drainage and Ventilation 38
5.17 Public Safety 38
5.18 Other Issues and Risks 38
5.18.1 National Pollution Inventory 38
5.18.2 Reportable Incidents 38

6 Water Management 40

6.1 Surface Water 40
6.1.2 Interpretation and Review of Monitoring Results 41
6.1.3 Comparison against previous Annual Reviews 45
6.1.4 Comparison against EA 50
6.2 Groundwater 51
6.2.1 Groundwater Levels 54
6.2.2 Groundwater Chemistry 57
6.2.3 Groundwater Extraction 62

7 Rehabilitation 65

7.1 Buildings 65
7.2 Rehabilitation of Disturbed Land 65
7.2.1 Subsidence Remediation 66
7.3 Performance Indicators and Completion Criteria 68
7.4 Rehabilitation Inspections and Monitoring 68
7.4.1 Annual Environmental Rehabilitation Inspection 68
7.4.2 Annual Ecological Rehabilitation Monitoring 68
7.5 Works Outstanding to Date 76
7.6 Ben Bullen Creek Rehabilitation Project 76

7.7 Other Infrastructure 78
7.8 Rehabilitation Trials and Research 78
7.9 Finalisation of a Detailed Mine Closure Plan 78
7.9.1 Mine Closure Planning 78
7.9.2 Rehabilitation Liability Estimate 79

8 Community 80
8.1 Environmental Complaints 80
8.2 Community Liaison 80
8.2.1 Community Initiatives 80
8.2.2 Community Consultative Committee 81

9 Independent Audit 82

10 Incidents and Non-Compliances During the Reporting Period 84

11 Activities to be Completed in the Next Reporting Period 85
11.1 Operations and Systems 85
11.2 Care and Maintenance Period 85
11.3 Pit-top Facilities 85
11.4 ROM and Product Stockpiles 85
11.5 Mine Ingress/Egress 85
11.6 Voids 86
11.7 Other Infrastructure 86
11.8 Rehabilitation 86
11.9 Community Relations 87

12 References 88
A1. Appendix A – Plans 89
A2. Appendix B – Approval 95

ELECTRONIC COPY

This report is available electronically online via the website: http://www.glencore.com.au/en/who-we-are/energy-products/baal-bone/Pages/default.aspx .

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 2017 to 31 December 2017.

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.

Glencore is continuing to conduct feasibility studies for potential future uses of the mine.

1.2 Scope of this Annual Review

The layout of this Annual Review has been aligned to the DP&E's *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).

This document is also intended to fulfil the requirements of Condition 4 of both CL 391 and ML 1302. These conditions require the submission of an annual Compliance Report. The requirements of Condition 4 of CL 391 and ML 1302 and where these are addressed in the Annual Review are listed in **Table 1.2**.

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

Table 1.2: Requirements of Condition 4 of CL 391 and ML 1302

CL 391 and ML 1302, Condition 4 requirement	Annual Review Section
(i) the extent to which the conditions of this mining lease or any provisions of the Act or the regulations applicable to activities under this mining lease, have or have not been complied with.	Section 2
(ii) particulars of any non-compliance with any such conditions or provisions.	Section 10
(iii) the reasons for any such non-compliance;	Section 10
(iv) any action taken, or to be taken, to prevent any recurrence, or to mitigate the effects, of that non-compliance.	Section 10

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);
- Department of Primary Industries (DPI) Water;
- Environment Protection Authority (EPA); and
- Sydney Catchment Authority (SCA).

The reporting period for this Annual Review is 1 January 2017 to 31 December 2017.

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 2017 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 2017 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
John Hayward	Mine Manager	Ph: (02) 6350 6900 Email: **John.Hayward@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

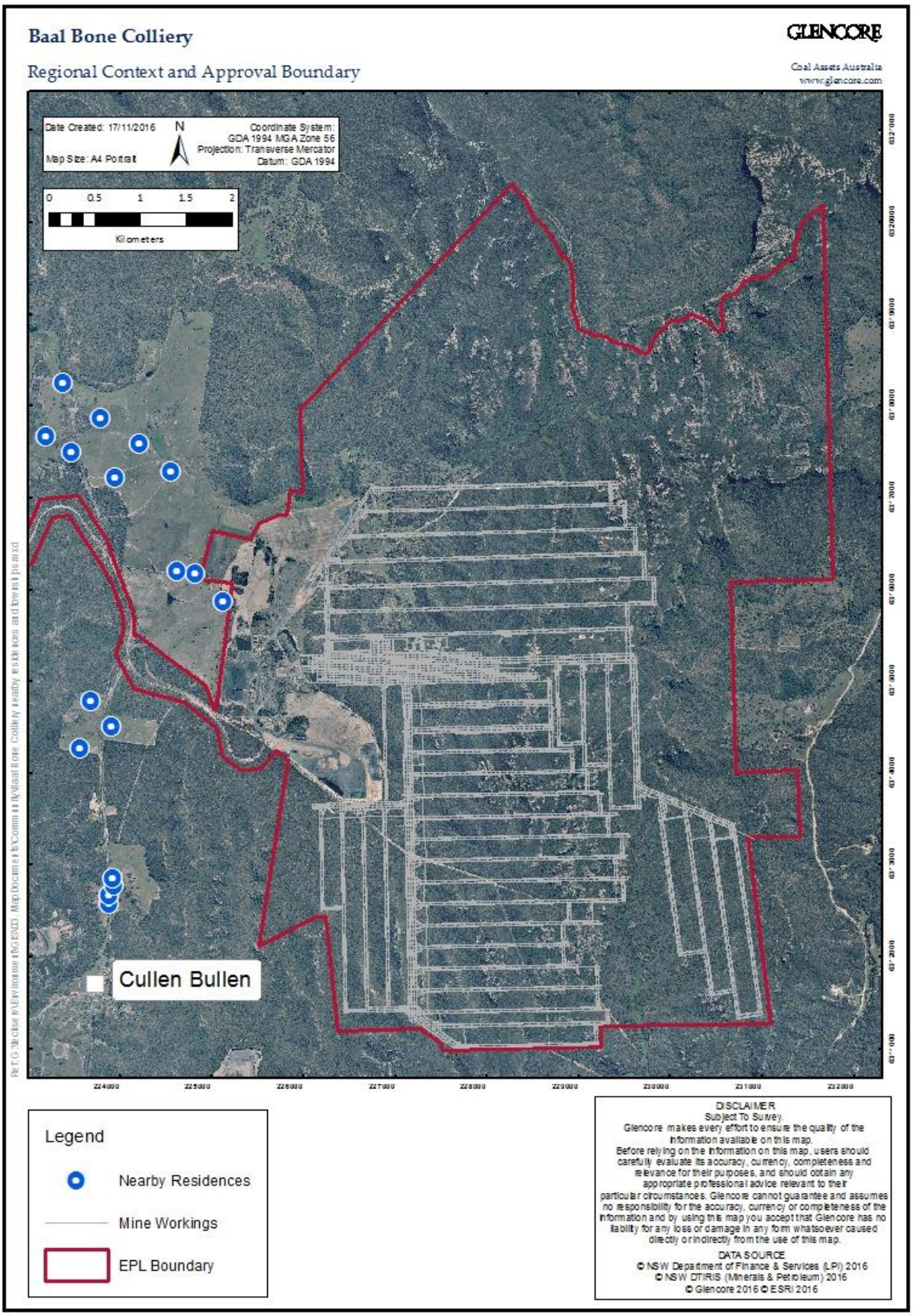


Figure 1.1: Locality plan showing approval boundary.

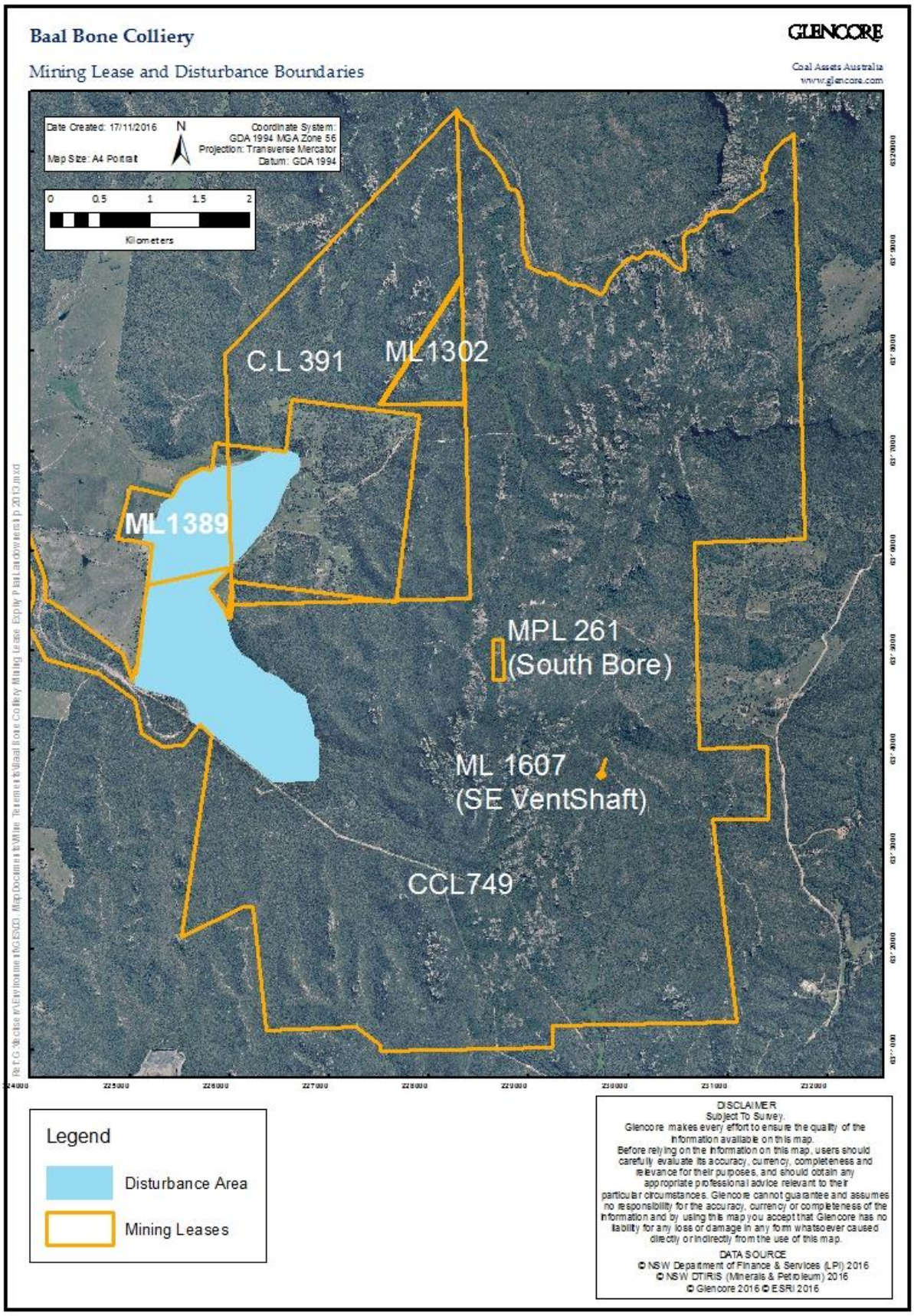


Figure 1.2: Mining lease boundaries and disturbance area.

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 2017 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 & Section10**
	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	1/8/2018	Premises and Scheduled Activity (Coal Mining/ Washery) Licence	**Yes**
Mining Operations Plan	DRG	09/2520	Wallerawang Collieries Pty Ltd	29/02/2016	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 SF.	Yes
Water Access Licence	DPI Water	WAL27887[2]	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)	

[2] Extraction of water allocated to 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 Linited.

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope	Were all Approval Conditions Complied With?
	DPI Water	80WA716836	Wallerawang Collieries Pty Ltd	4/10/2012	16/07/2027 [3]	Water Access Licence (under water management Act 2000).	Yes
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 [4]	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	Yes

[3] Replaces licences 80AL716835 and WAL34952.
[4] 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?
						monitoring piezometer	
	DPI Water	10BL601970	Wallerawang Collieries Pty Ltd	05/09/2007	Perpetuity	BBN 179; LW29-31 groundwater monitoring piezometer	Yes
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 levels in six bores in the Cox's River Swamp are taken every two months. No measurements were taken from September 2017 to November 2017.	Section 10

2.1 Amendments During the Reporting Period

A MOP amendment to PA 09_0178 was submitted to the NSW Department of Planning and Environment – Division of Resources and Geoscience (DRG) on 3 August 2017 for the Ben Bullen Creek Rehabilitation Design and Rehabilitation Plan. The MOP amendment is valid until 31 December 2019 and is limited to the rehabilitation objectives and completion criteria and the schedule of rehabilitation activities proposed for the MOP period.

During 2017, mining lease renewals were sought for ML 1389, which expired on the 9th May 2017 and ML 1607, which expired on the 8th January 2018. These renewals were approved with both Leases now expiring on the 11 March 2030.

A request to suspend the planned rehabilitation for 2017 as specified in the Baal Bone MOP 2016-2019, deferring the commitment for 6 month was submitted to the DRG on 1 November 2017. Approval was received 9 January 2018, allowing a suspension of the 2017 rehabilitation commitment until May 2018.

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 Longwall 31 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 (to align with MOP dates); and the application to suspend mining operations/extraction has been approved until 12 July 2021.

The equipment fleet utilised for care and maintenance during 2017 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 producing capacity. 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 2017 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 2017, approximately 68.5 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	10 ML	Remained even	37 ML
Process Water Dam	55 ML	55 ML	Remained even	55 ML
Box Cut Sump	3.5 ML	3.5 ML	Remained even	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 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 2017 reporting period was 1.8 ML, a decrease of 25% compared to the 2.4 ML of potable water usage in 2016.

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 in 2017.

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 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.

Major outputs of the 2017 reporting period were:

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

- 1600 ML overflow from the Overshot Dam (not including southern and northern de-watering bores).

For comparison, the major inputs for the 2016 reporting period were:

- 2.4 ML potable water from Fish River Water Supply (decreased by 25% in 2017);
- 2370 ML runoff and rainfall reporting to water stores (decreased by 30% in 2017);
- 1402 ML mine dewatered from southern and northern underground mining areas (decreased by 11% in 2017);and
- 266 ML mine dewatering from Adits 2 and 5 (decreased by 23% in 2017).

For comparison, the major outputs of the 2016 reporting period were:

- 1502 ML groundwater dewatered via north and south boreholes (leaving site via overshot dam LDP1) (decreased by 11% in 2017);and
- 2236 ML overflow from the Overshot Dam (not including southern and northern de-watering bores) (decreased by 28% in 2017).

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 (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 (EMS) there is a Hazardous Substance Standard (BBN SD STD 0007 – 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 2017 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 respond 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.

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. A High Risk Activity Notification for the decommissioning and sealing of this fan shaft was lodged with DRE on 9 August 2016.

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 2016 Baal Bone Annual Review was submitted on 30 March 2017. In correspondence dated 8 May 2017, the Department of Planning & Environment requested that additional information be included in the 2016 Annual Review (see **Table 4.1 and 4.2**). The 2016 Annual Review was resubmitted, and subsequently accepted by the Department on 19 May 2017.

There was no Annual Review meeting or site inspection held during 2017.

Table 4.1: Further requirements for the 2016 Annual Review

Requirement	Status
Include non-compliances identified in the Independent Environmental Audit (IEA) dated February 2017 in Section 2 and Section 11 of the Annual Review that occurred during the reporting period.	Sections 2, 9 and 10 have been updated.
Update the text in Section 4 to state that Senior Compliance Officer Chris Schultz of the Department also attended the site inspection accompanying the 2015 Annual Review.	Completed.
Include the water take from the site (if applicable) in the format as stated in Section 7 of the *Post approval requirement for State significant mining developments – Annual Review Guideline* dated October 2015.	Completed – Table 6.10
Update Table 6.9 to note the TARP exceedance for dissolved copper at BBPB1 over the reporting period.	Completed.
Update the plans provided in the Annual Review to ensure legibility. The labels and legends on most of the plans are unable to be read.	Completed.
Specifically label the Project Approval boundary on the relevant plan.	Completed.
Report on rehabilitation status at the site in accordance with Table 8 of the *Post approval requirements for State significant mining developments – Annual Review Guideline* dated October 2015.	Table 7.1 has been updated.
Remove text from the report for monitoring that is no longer being undertaken, particularly Section 5.4 and 5.5 and include text explaining why this monitoring is no longer undertaken.	Completed.
Include more detail regarding the significant increase in hydrocarbon fractions within groundwater bore MW01, including but not limited to: • The extent of the contamination (to be provided on a plan) • Any actions being undertaken to address the contamination now or in the future; and • Graphed data from the bore showing data prior to the identification of the contamination and current monitoring data for all relevant contaminants.	Section 5.15 updated.

Table 4.2: Requirements for the Baal Bone Website

Comments	Status
Update monitoring data under the headings of water, air, waste and noise.	Completed – monitoring data is uploaded as one document.
Copies of the approval, Environmental Assessment and Statement of Commitments.	Completed.

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 2017 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 2018 reporting period.

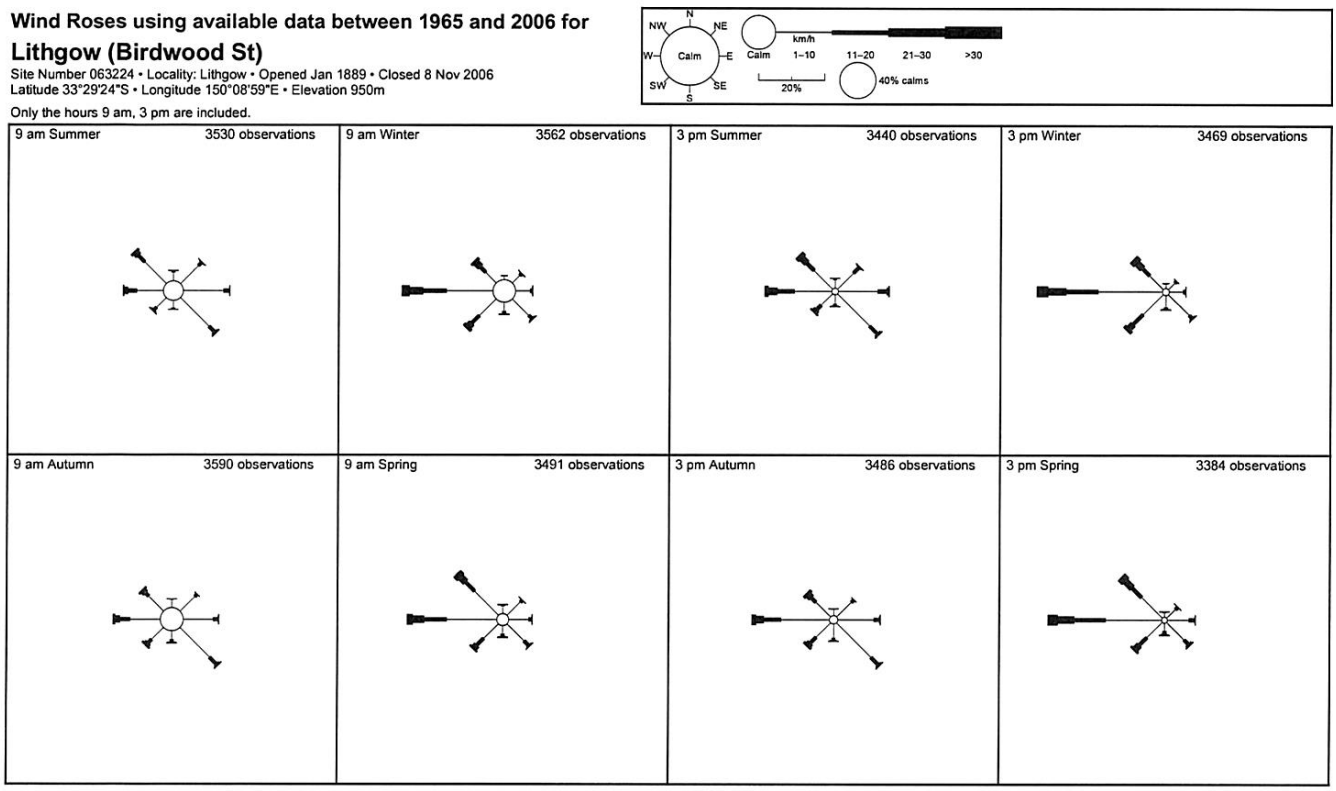
5.1 Air Pollution

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 conducts 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 2017 reporting period provided below.

Table 5.2: Deposited dust monitoring results for 2017 (g/m2/month)

Month	DM1	DM2	DM3	DM4
January	0.4	0.5	0.7	0.6
February	1.1	0.7	0.7	0.5
March	0.1	0.3	0.3	0.4
April	0.3	4.3*	0.2	0.3
May	0.2	0.5	0.2	0.3
June	0.2	0.4	0.2	0.3
July	<0.1	0.1	0.1	<0.1
August	0.2	0.4	0.2	6.2**
September	0.4	0.4	0.4	0.4
October	0.5	0.6	0.7	0.8
November	0.6	0.5	0.9	0.5
December	0.6	0.1	4.0	0.4

* The April 2017 dust monitoring result for DM2 recorded an abnormally high result of 4.3 g/m^2/month. A characterisation of particulates was carried out and found that the sample comprised approximately 45% organic matter.

** The August 2017 dust monitoring result for DM4 recorded an abnormally high result of 6.2 g/m^2/month. A characterisation of particulates was carried out and found that the sample comprised approximately 45% organic matter.

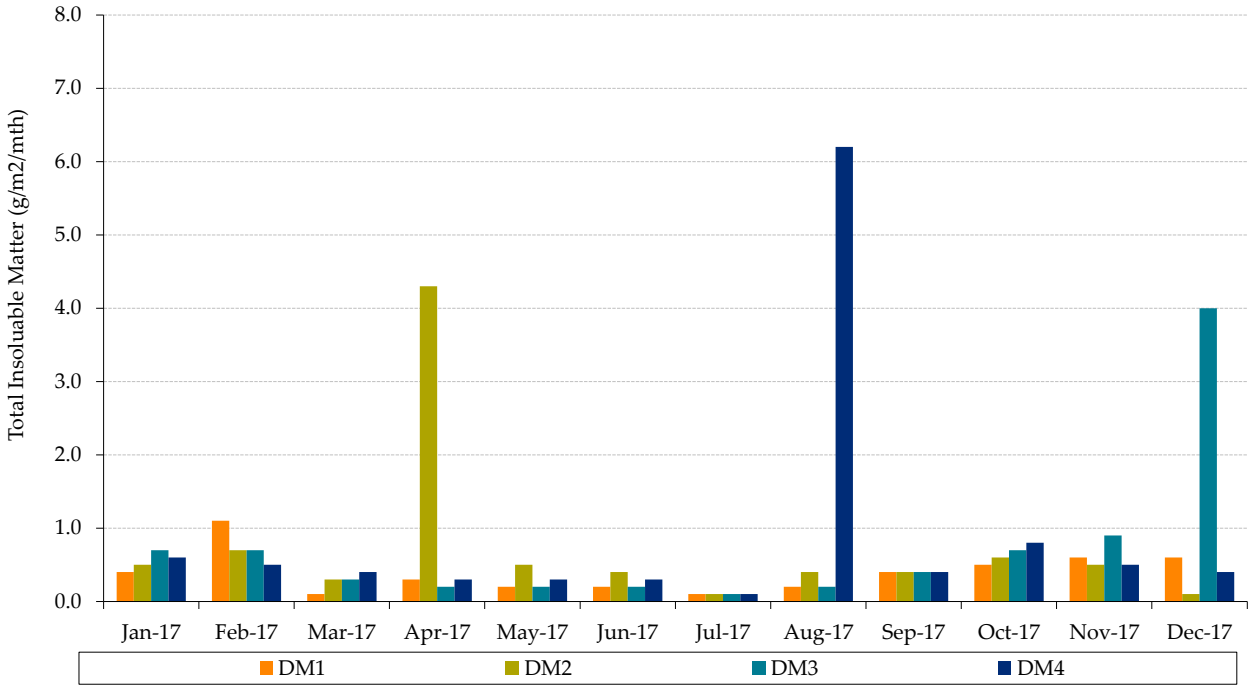


Figure 5.2: 2017 Deposited Dust Monthly Monitoring Results

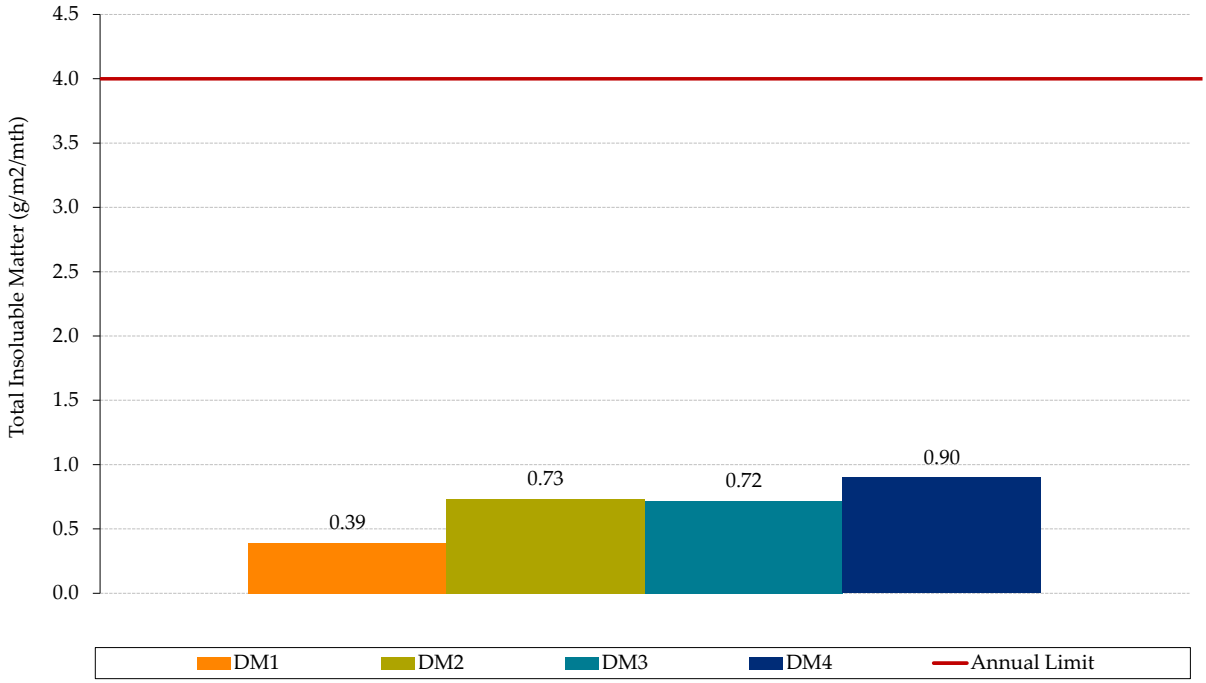


Figure 5.3: 2017 Annual Average Deposited Dust Results

All dust monitoring results for 2017, 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 DM2 in April 2017 and DM4 in August 2017 both returned results 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 2017.

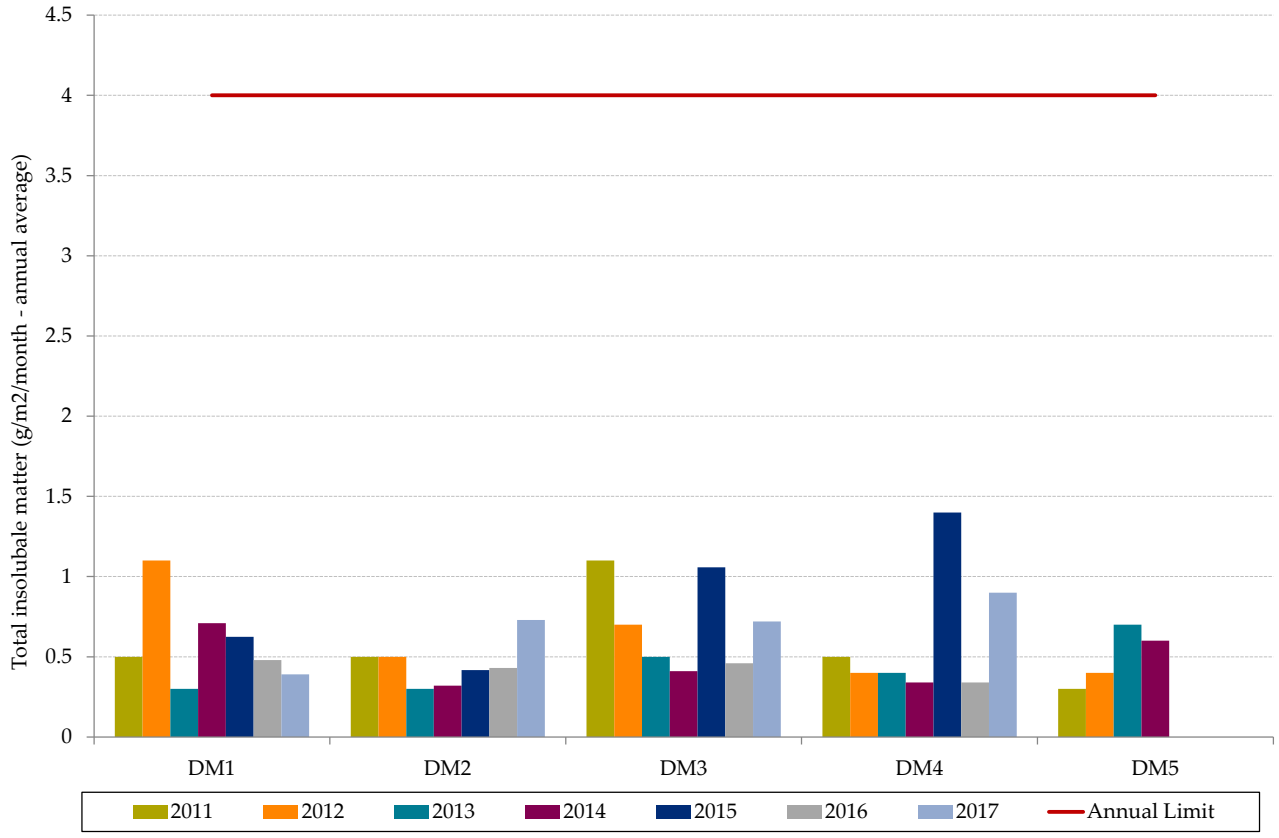


Figure 5.4: 2011 to 2017 Deposited Dust Monitoring Results

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 2017. In line with the Annual Land Management Review of the Baal Bone site conducted by DnA Environmental, a comprehensive weed spraying program targeting Blackberry was undertaken. The findings of the 2017 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 in July 2017 by Global Acoustics.

The audit report concluded that:

"Activities from BBC complied with the relevant noise limits during attended monitoring on 27 July 2017 at all monitoring locations. There were no exceedances, complaints or noise related incidents recorded by BBC since the previous monitoring was carried out (August 2016). No measurements occurred during which BBC mine was directly measurable, was within 5 dB of the relevant limits and where meteorological conditions resulted in criteria applying (in accordance with the EPL)."

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 2017 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 Longwalls 29-31 Subsidence Management Plan (SMP) application. This assessment identified a potential rock shelter site (BBC-RS1) located above Longwall 30 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.

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 Longwalls 29-31 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 Longwall 30 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 Longwall 30.

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 in 2017. 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 Longwalls 29-31 expired on 1 December 2014 with mining operations in the Longwall 29-31 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 Longwalls 29-31. 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 Longwall 29-31 SMP, a final post longwall 31 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

A six monthly review of the groundwater monitoring wells 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 petroleum hydrocarbon fractions within groundwater bore MW01 and results remain above the adopted criteria.

May 2017 Findings:

Several groundwater metal and TRH (Total Recoverable Hydrocarbons) concentrations remain above the adopted ecological or human health criteria including:

- *MW01 –Nickel, zinc and three TRH fractions remain above the ecological and human health criteria adopted.*
- *MW03 - Nickel and zinc remain above the ecological criteria adopted and chromium is also above the ecological criteria adopted.*
- *MW101 – Nickel remains above both the ecological and health criteria adopted and zinc remains above the ecological criteria. Chromium is also now above the ecological criteria adopted.*

Groundwater levels decreased between the 8 November 2016 and 30 May 2017 monitoring period across all monitoring wells between approximately 0.198m to 1.475m. MW04 and MW05 were exceptions as their levels increased by 0.03m and 0.06m.

At the time of the May 2017 sampling, it was noted that the bore hole cap at MW01 had been left off, and that was potentially the reason for the high result for petroleum hydrocarbon fractions. MW01 was retested on 10 July 2017 and the petroleum hydrocarbon fractions returned a considerably lower result, in line with historic results. MW03 and MW101 are downstream from MW01 and did not return high readings for petroleum hydrocarbon fractions, therefore the contamination was localised around MW01. Integrity testing of the underground diesel tank and lines, located adjacent to MW01, was also conducted in July 2017 with no issues found.

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

November 2017 Findings:

Several groundwater metal and TRH concentrations remain above the adopted ecological or Human Health Criteria including:

- *MW01 – Chromium, lead, nickel and zinc are above the ecological criteria adopted. Lead, nickel and four TRH fractions are above the human health criteria adopted.*
- *MW03 – Nickel and zinc are above the ecological criteria adopted. Nickel is above the health criteria adopted.*
- *MW101 – Copper, nickel and zinc are above the ecological criteria adopted. Nickel is above the health criteria adopted.*

Groundwater levels decreased between the 30 May and 22 November 2017 monitoring period across all monitoring wells by between 0.19m to 1.362m. MW01, MW08 and MW102 increased by between 0.096m and 0.41m.

Given the high concentrations of petroleum hydrocarbon fractions 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 petroleum hydrocarbon fractions decreased in December 2017, however increased in January 2018.

Following three consecutive high concentrations of petroleum hydrocarbon fractions, 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 petroleum hydrocarbon fractions in MW01. MW03 and MW101 returned consistently low concentrations of petroleum hydrocarbon fractions. Results are presented in Figure 5.6 below.

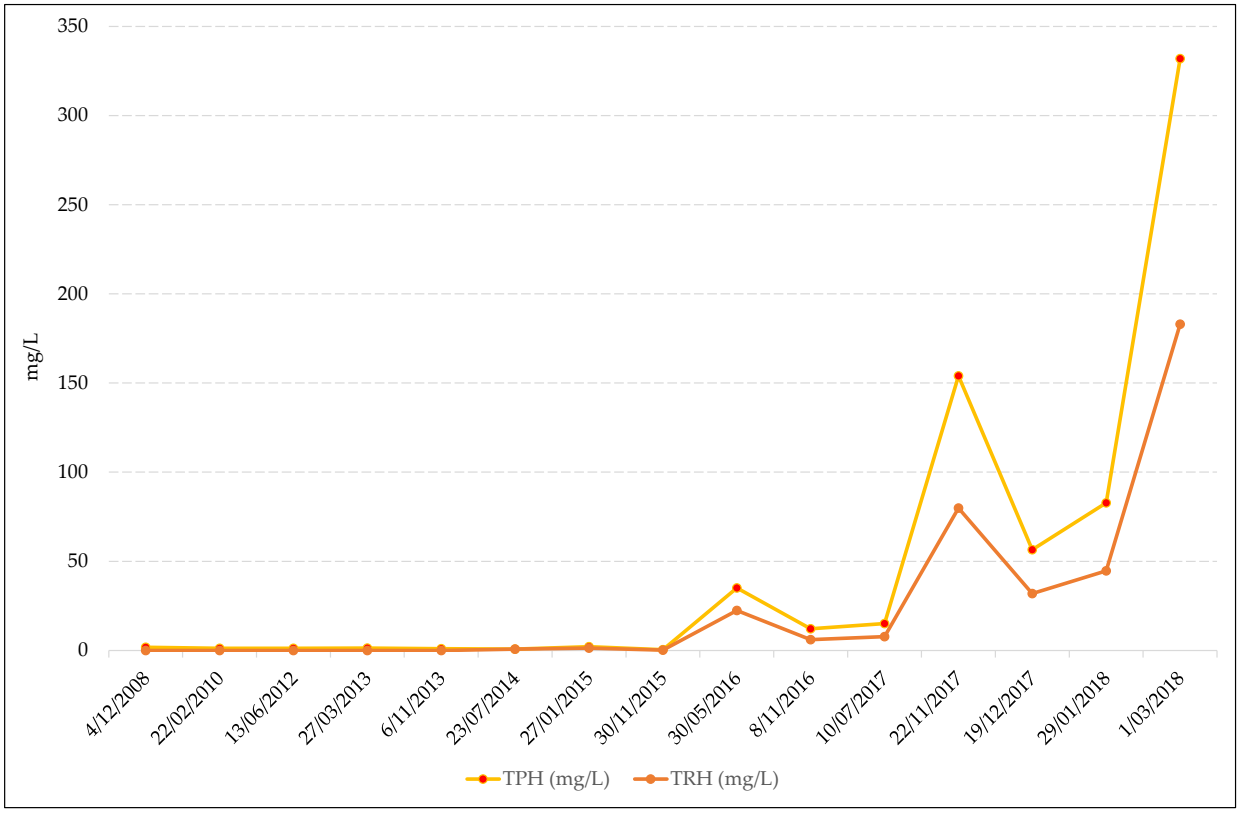
As part of mine closure activities, GHD were commissioned to undertake a detailed site contamination assessment (GHD, 2017). The report produced from this work noted the following:

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.

The extent of the elevated hydrocarbon levels has not been investigated, however MW03 and MW101 are downstream from MW01. MW03, which is approximately 10m north of MW01, has remained below the detection limit for both TPH (Total Petroleum Hydrocarbons) and TRH since February 2010 until 2016, with the exception of one result of 0.11 mg/L for TRH in July 2014. MW101 has always remained below detection limits.

Given the recent results of high concentrations of TRH and TPH at MW01, integrity testing of the 50,000L underground diesel tank and lines will be conducted in March/April 2018. Six monthly hydrocarbon testing will continue in 2018 with a focus on MW01.

Figure 5.6: TPH and TRH analysis results for MW01 (2008 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 Mining Operations Plan.

Results from the sampling completed throughout the reporting period confirm extremely low levels of methane at Baal Bone (<0.01%). 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 29 September 2017 for the period of 1 July 2016 to 30 June 2017. 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, two Category II reportable environmental incidents were recorded by Baal Bone during the reporting period.

On 26 September 2017 a cliff fall over Longwall 3 was identified. The incident was reported to the DPE, DRG, and Forestry Corporation NSW on 28 September 2017. A geotechnical assessment was conducted on 2 October 2017 and the report was provided to the government departments above on 6 October. The investigation, conducted by Strata Control Technologies (SCT), concludes that the cliff fall has been caused by an extension of a previous rock fall which occurred in 1988 during the mining of Longwall 3. The report concludes that the fall is caused by a rock fracture deep within the strata that was originally caused by subsidence in the area. SCT have indicated that the recent incident is rare in respect of occurring 30 years after the area was impacted. Longwall 3 was mined approximately 12 years prior to Glencore acquiring Baal Bone Colliery in 2000. 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. The cliff fall over Longwall 3 was also reported to the DPE Safety Regulator on 12 October 2017. Further information relating to the geotechnical assessment and degree of public access was provided on 13 October 2017.

A second cliff fall over Longwall 6 was identified via aerial photography during the DPE Safety Regulator's investigation of the cliff fall over Longwall 3 on 19 October 2017. The DPE, DRG, and Forestry Corporation NSW were notified of the second cliff fall incident on 24 October 2017 and it was also reported through the DPE Safety Regulator online portal on 25 October 2017. A geotechnical investigation was conducted on 2 November 2017 with the report being provided to the above government agencies on 8 December 2017.

The Forestry Corporation NSW conducted a site inspection of the cliff fall areas on 1 November 2017. The purpose of the visit was to understand the degree of public access to the two reported cliff falls. During the site visit it was evident that the locations of the cliff falls were remote and very difficult to access. The only action arising from of the site inspection was to order and erect permanent signage in the vicinity of the two cliff falls which has been completed.

Chris Shultz from the DPE also conducted a site visit on the 14 December 2017. The purpose of the visit was also to understand the degree of public access to the two reported cliff falls. No actions were received during the site inspection and no further correspondence has been received from the Department.

Baal Bone has been conducting an investigation into other potential cliff falls which may have occurred on the Baal Bone leases. This investigation is ongoing.

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 2017

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: 2017 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	1050	<2	249	<0.05	2	8.0	Sample not required			
	Feb	1070	<2	230	0.06	2	8.0				
	Mar	1080	<2	271	<0.05	2	8.1				
	Apr	1110	3	305	<0.05	2	8.2				
	May	1080	<2	242	<0.05	1	8.1				
	June	1080	<2	295	<0.05	1	8.1				
	July	1080	<2	220	<0.05	<1	8.2				
	Aug	1100	<2	278	<0.05	4	8.2				
	Sep	1080	2	203	0.05	1	8.2				
	Oct	1119	<5	322	0.18	<5	8.2				
	Nov	1079	<5	331	0.08	<5	7.9				
	Dec	1080	<5	302	0.06	6	8.1				
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*				

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
	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

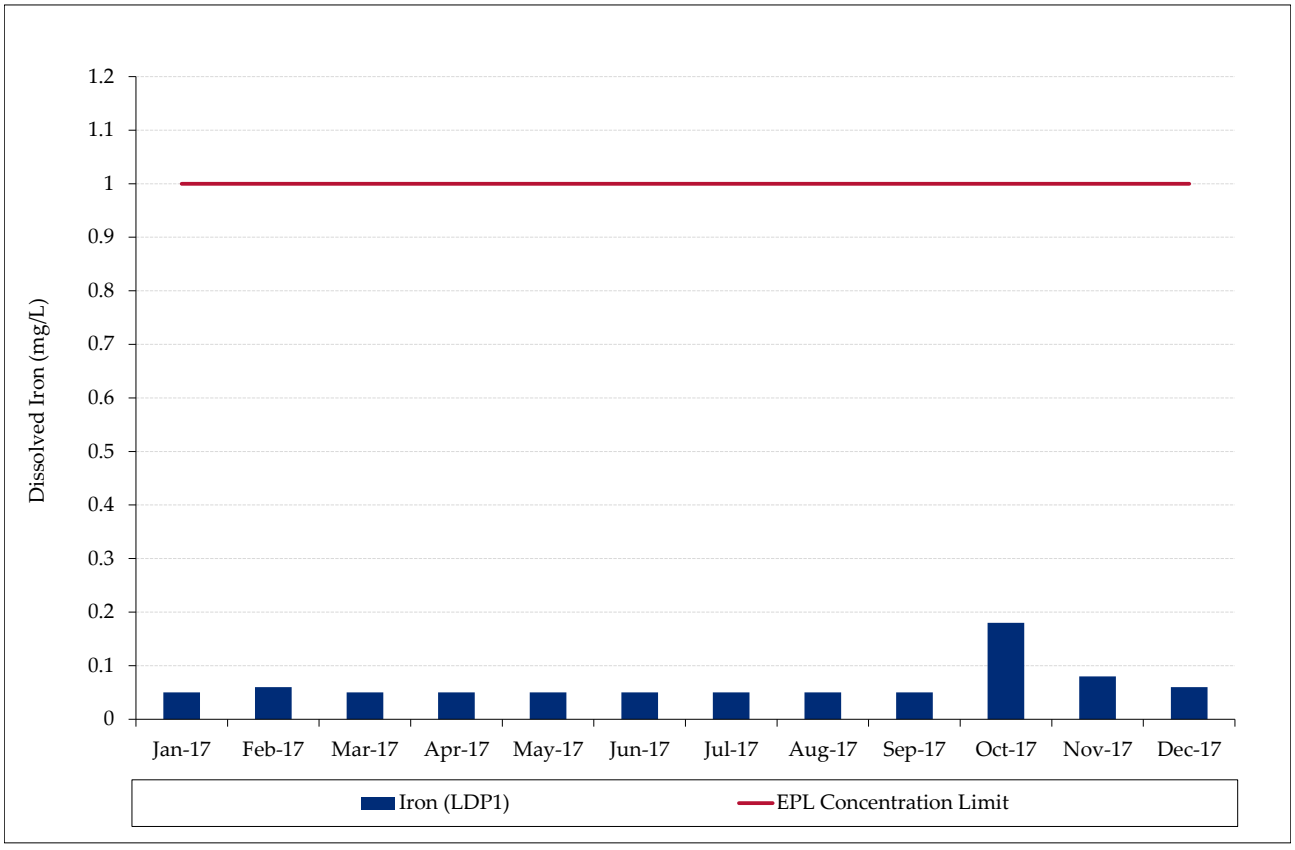


Figure 6.1: Dissolved Iron

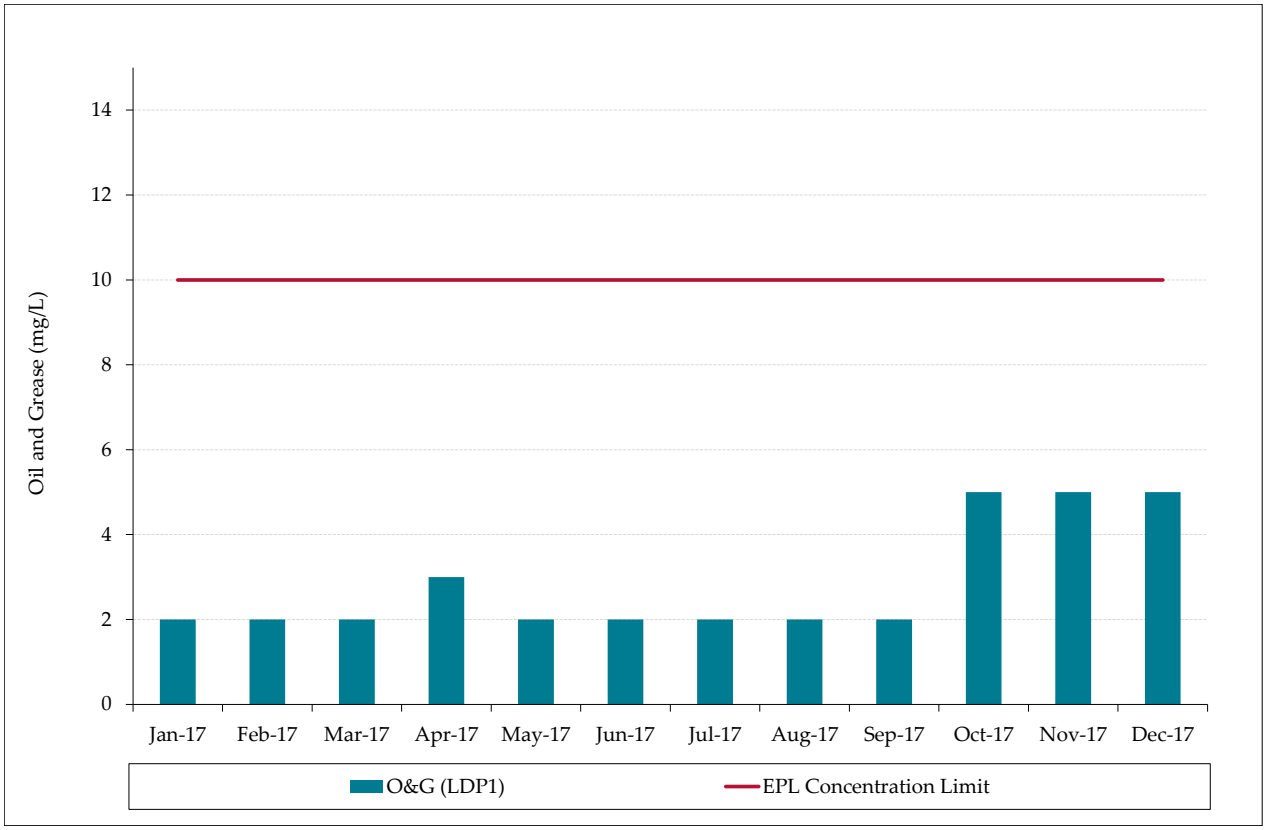


Figure 6.2: Oil & Grease

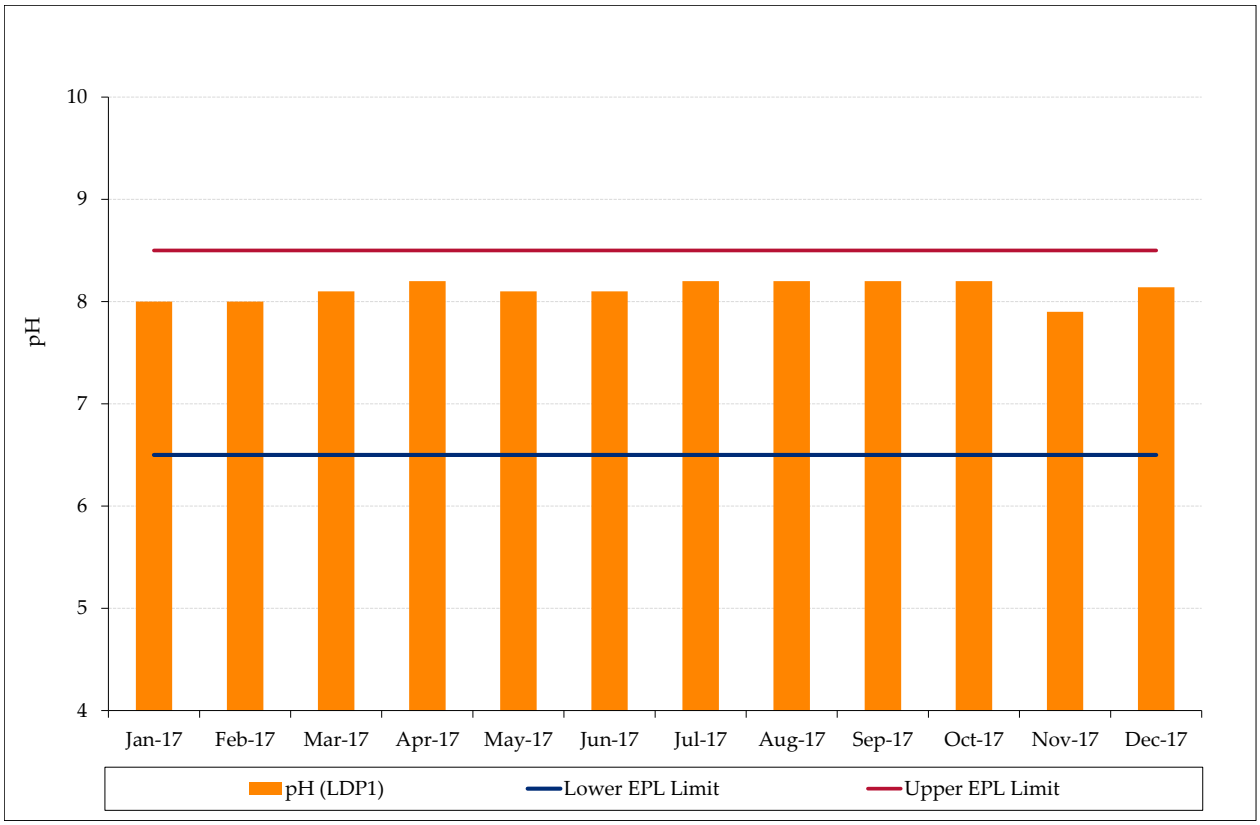


Figure 6.3: pH

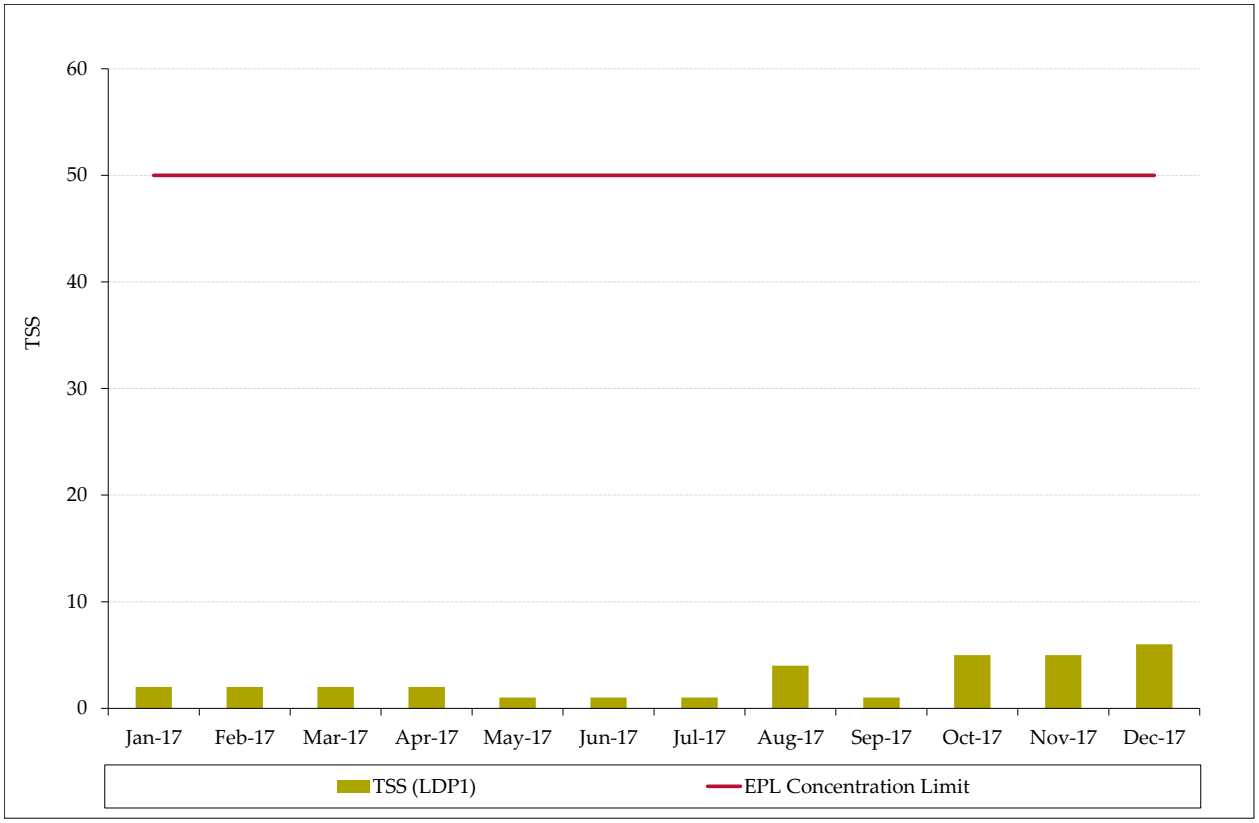


Figure 6.4: Total Suspended Solids

All samples recorded were within EPL concentration limits during the 2017 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 2017 were well below the concentration limit of 1 mg/L, with the highest reading of 0.18 mg/L returned in October 2017.
- 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 6 mg/L returned in December 2017.

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 - 2017

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
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

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 2017 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 2017. 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 2017 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.

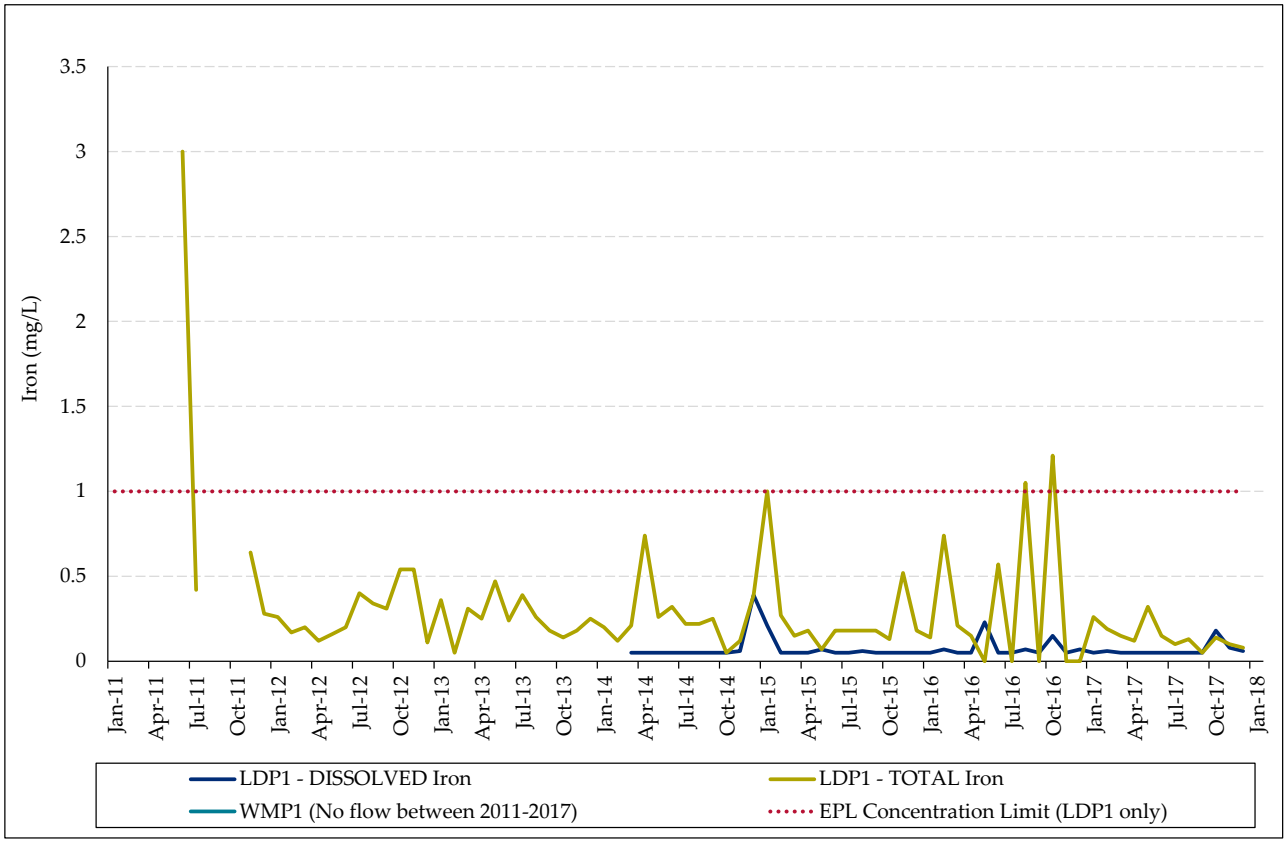


Figure 6.5: Iron – Total and Dissolved (2011 – 2017)

Figure 6.6 shows oil and grease levels from 2011 to 2017 at LD2 and LDP1. All oil and grease levels at LDP1 during 2011 - 2017 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.

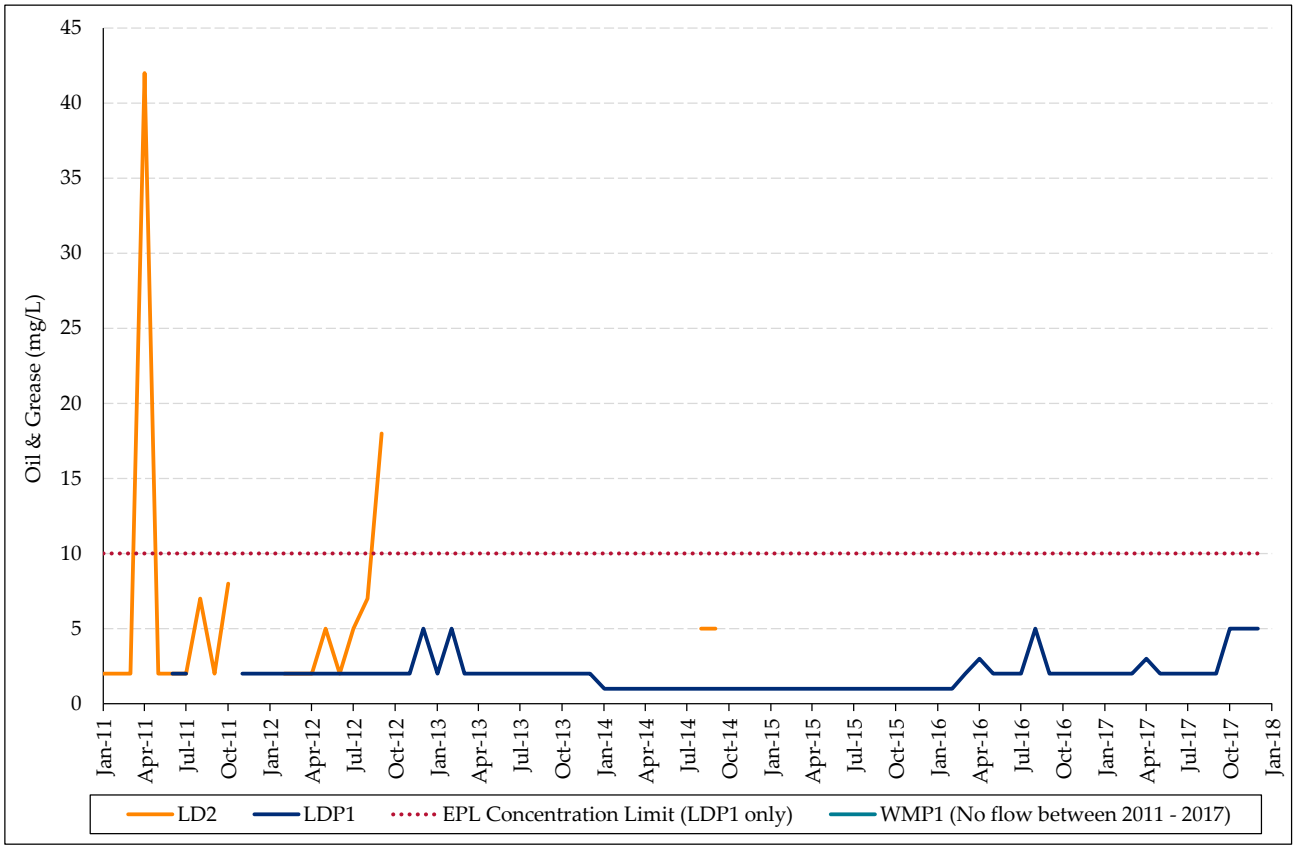


Figure 6.6: Oil and grease levels from 2011 to 2017.

Figure 6.7 shows pH levels at LDP1 and LD2 between 2011 and 2017. All LDP1 pH levels during the reporting period were between the upper and lower EPL pH limits of 6.5 and 8.5. 2012, 2013, 2015, 2016 and 2017 saw a decline in pH levels at LDP1 in the summer months – possibly due to seasonal changes.

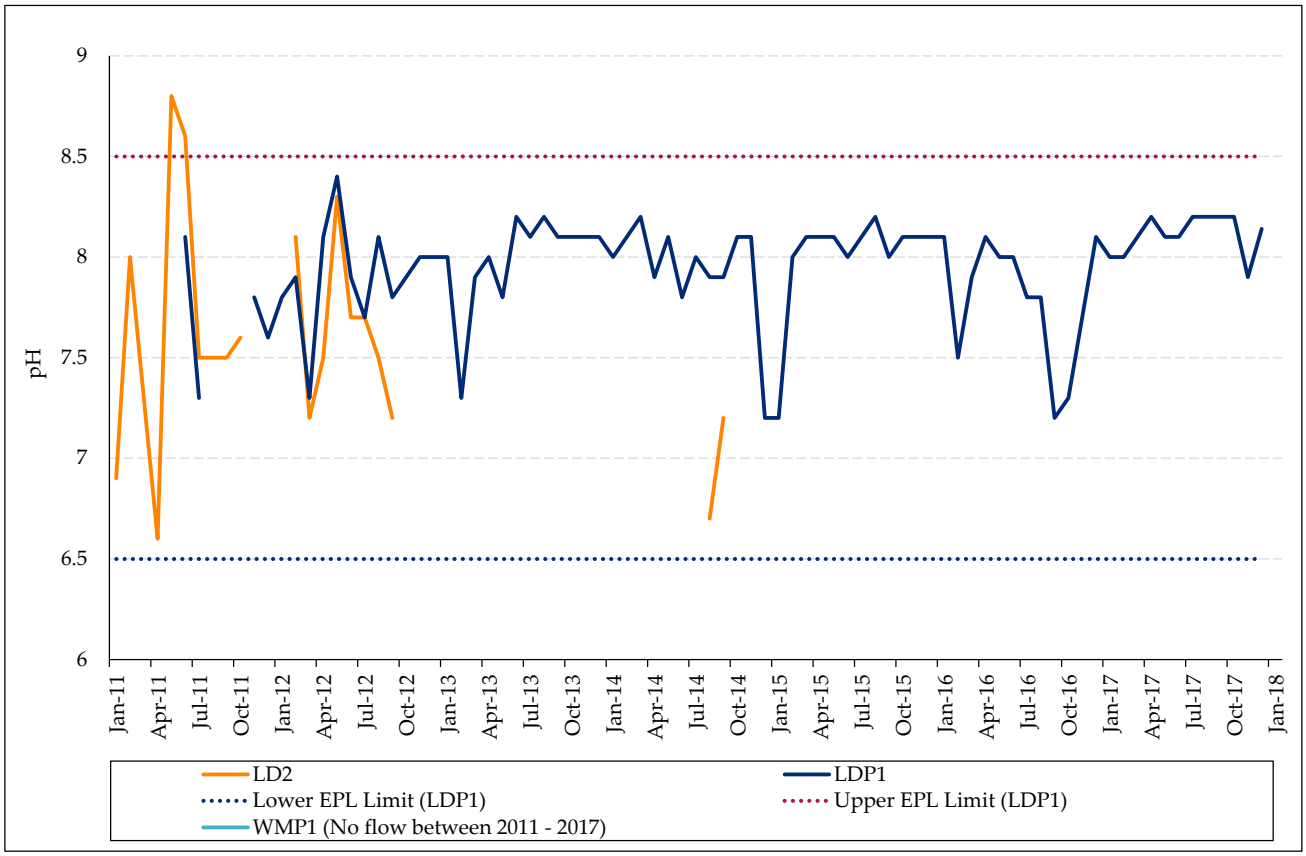


Figure 6.7: pH levels from 2011 to 2017.

Figure 6.8 shows the total suspended solids at LDP1 and LD2 between 2011 and 2017. 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.

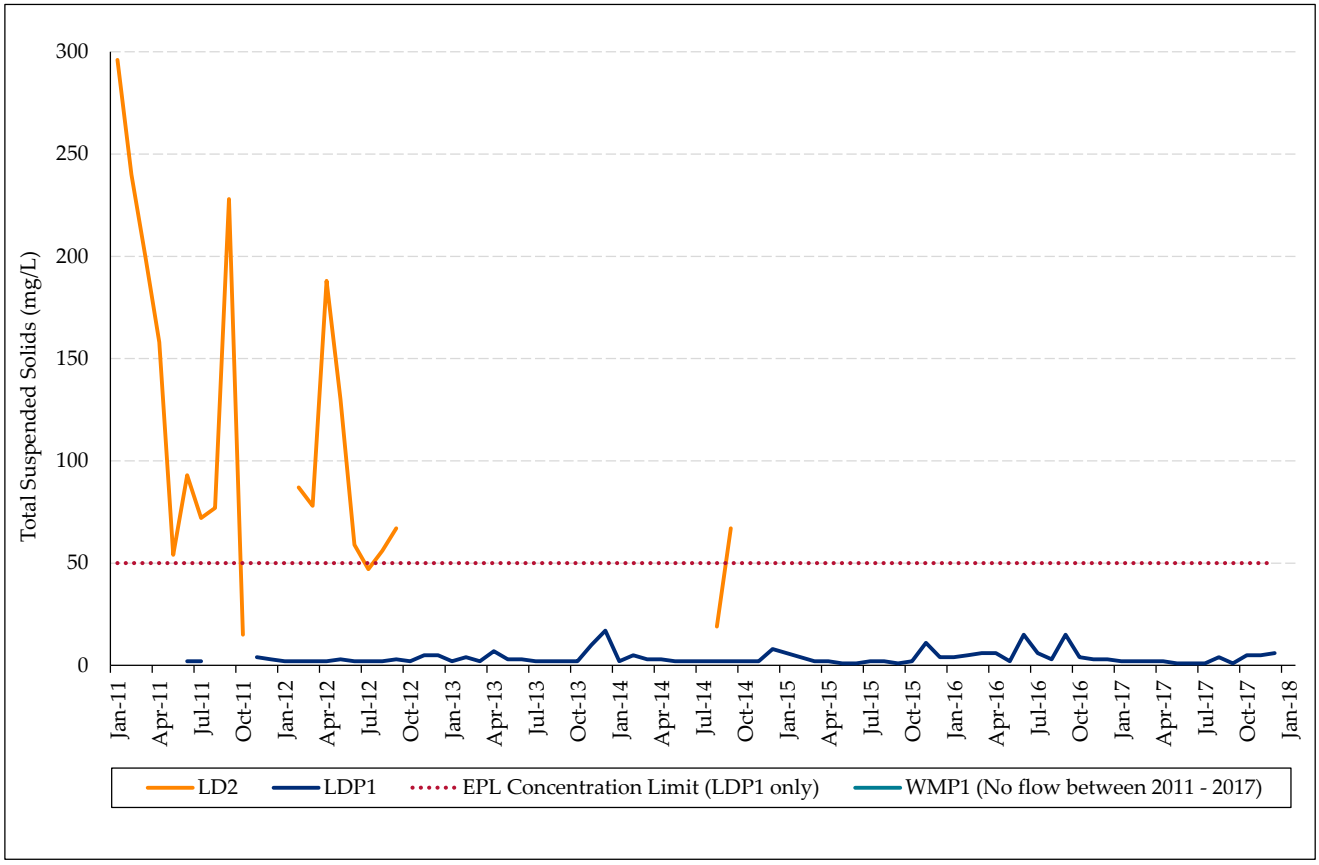


Figure 6.8: Total suspended solids levels from 2011 to 2017.

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 Longwalls 29-31. 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 WAL27887 (80BK136703 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 Longwall 1 (South Bore 1)
80BL236134	Perpetuity	Mine dewatering Longwall 1 (South Bore 2)
80BL239077	18/06/2016[2]	Mine dewatering Longwall 19 (North Bore)
10BL601877	Perpetuity	BBN175; LW 29-31 groundwater monitoring piezometer. This piezometer is known as BBPB1, and monitors the sandstone aquifer north of the Coxs River Swamp.
10BL601816	Perpetuity	BBN176; LW 29-31 groundwater monitoring piezometer This piezometer is known as BBPB2, and monitors the sandstone aquifer north of the Coxs River Swamp
10BL601817	Perpetuity	BBN177; LW 29-31 groundwater monitoring piezometer This piezometer is known as 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 This piezometer is known as 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 Longwalls 29-31.

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 Longwalls 29-31. 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	• Notify the Baal Bone Colliery Environment and Community Manager, 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	• 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).

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.	operational activities.			

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 environmental harm; three (3) consecutive values are outside the adopted impact assessment criteria; or the measurement varies significantly from background water quality trends.	• Notify the Baal Bone Colliery Environment and Community Manager, 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 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 immediately. • Inform regulatory agencies as required.	• A remedial action plan is developed and implemented to address the investigation findings. • Remedial action plan could include: ○ Increase monitoring frequency where relevant; ○ Undertake additional monitoring (stream health monitoring, etc.) if necessary. ○ Corrective/preventative actions based on the outcomes of the investigation and/or additional monitoring;	• Follow up information is provided to regulatory agencies as requested; where requested, and • A summary of monitoring results, investigations and remedial actions plans is provided within 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.	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 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 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 2017, the rainfall deficit has been tracking predominantly downwards. In January 2017 the deficit was -388 mm, and following a short upward movement to -334 mm in March 2017, the deficit has steadily fallen to -667 mm in March 2018.

The total rainfall received in Lithgow during 2017 was 606 mm, which is 253 mm less than the long term average annual rainfall in Lithgow of 859 mm.

Since Janaury 2017, 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.

Generally, piezometers BBPB2, BBPB3, and BBPB4 display the greatest variation, as they are located on the valley slopes outside the swamp and are predominately influenced by rainfall. This trend has continued in the available data. These piezometers demonstrated a steady drop in groundwater level in response to the dry conditions in late 2016 and throughout 2017.

Groundwater levels in BBPB1 and BBPB5 remained relatively stable throughout 2017, keeping with historical trends. Both piezometers have also shown a slight increase in water levels in early 2018 following the minor increase in rainfall in late 2017 and early 2018.

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.

Note: The approved Groundwater Monitoring Plan requires groundwater levels in the Cox's River Swamp piezometers be recorded every two months. Groundwater levels in the Cox's River Swamp were not recorded in September 2017 as the sampler (ALS Mudgee) did not have the necessary equipment available on the selected sampling day. In October 2017 Baal Bone Colliery personnel commenced sampling all surface and groundwaters across the site. Unfortunately groundwater levels were also not recorded in October and November 2017 as the Colliery was awaiting the delivery of the necessary equipment.

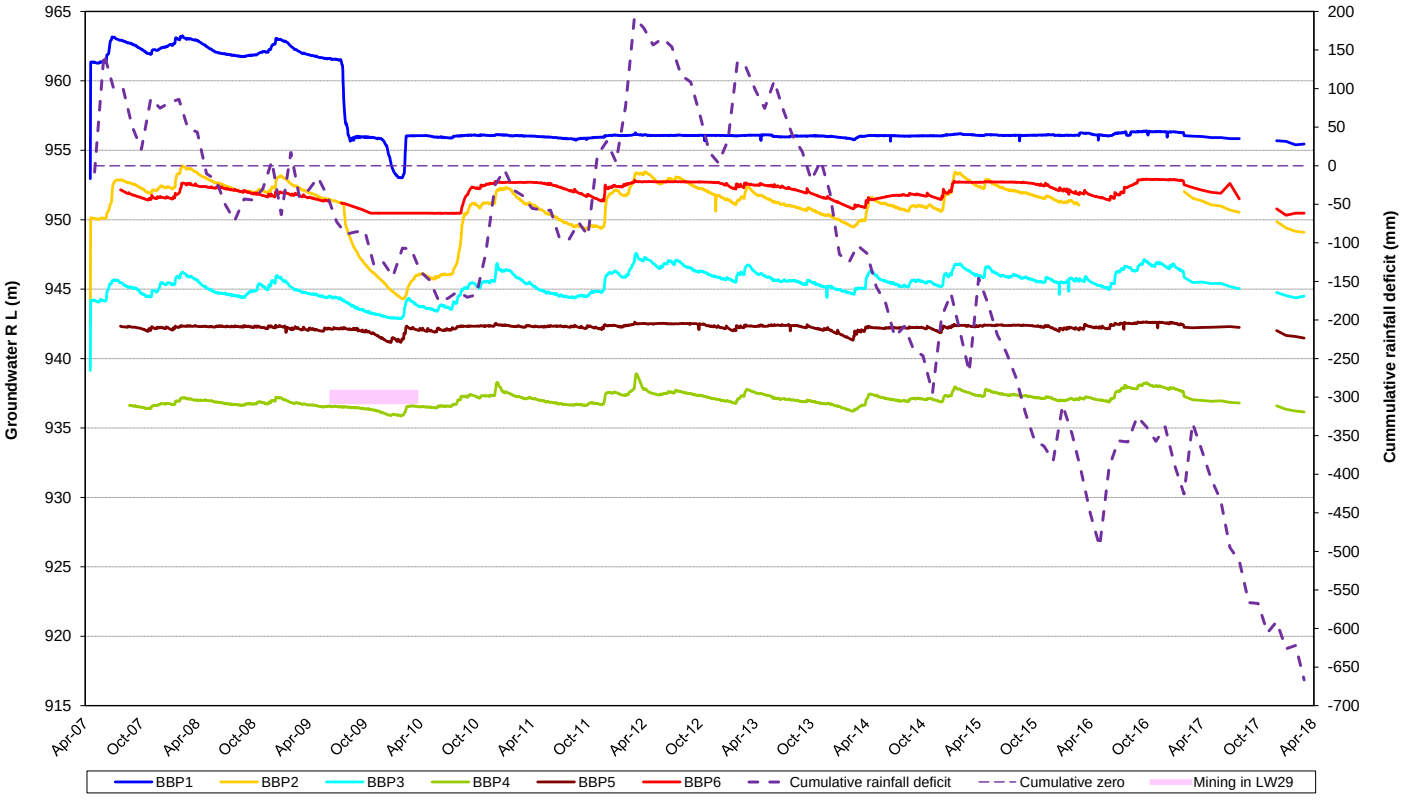


Figure 6.9: Coxs River Swamp groundwater levels and rainfall deficit

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 BBP1 and lowest level observed in BBP4), 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).

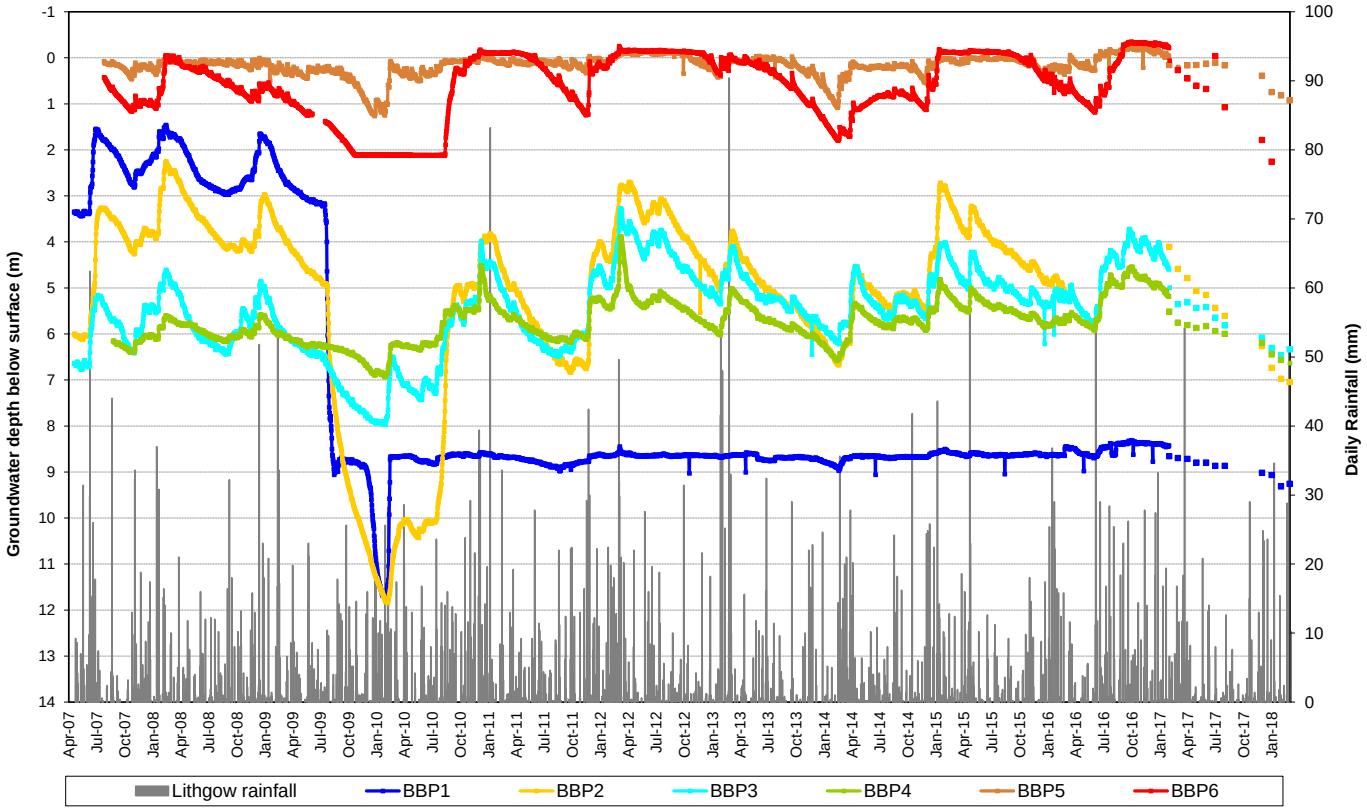


Figure 6.10: Longterm groundwater trends

6.2.1.2 Comparison against EA

The EA concluded that the likelihood of extraction of Longwalls 29-31 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 always remains saturated.

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**.

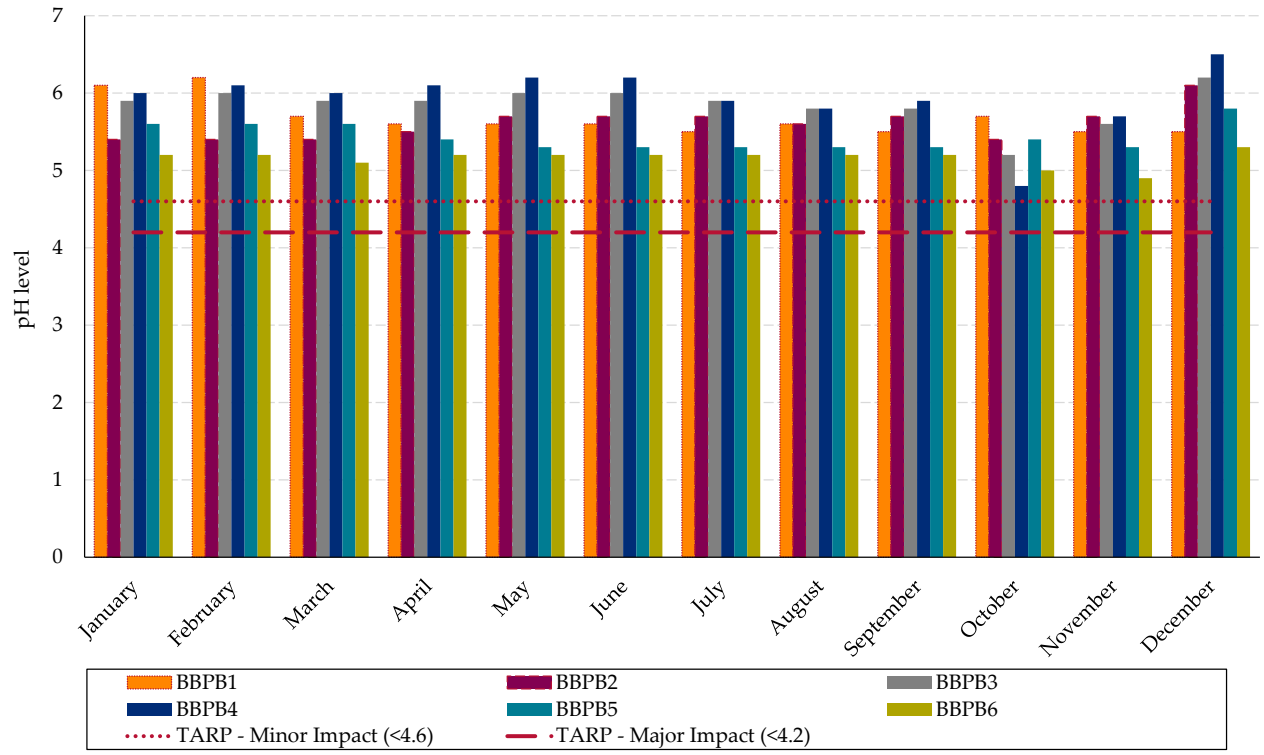


Figure 6.11: 2017 Groundwater pH levels.

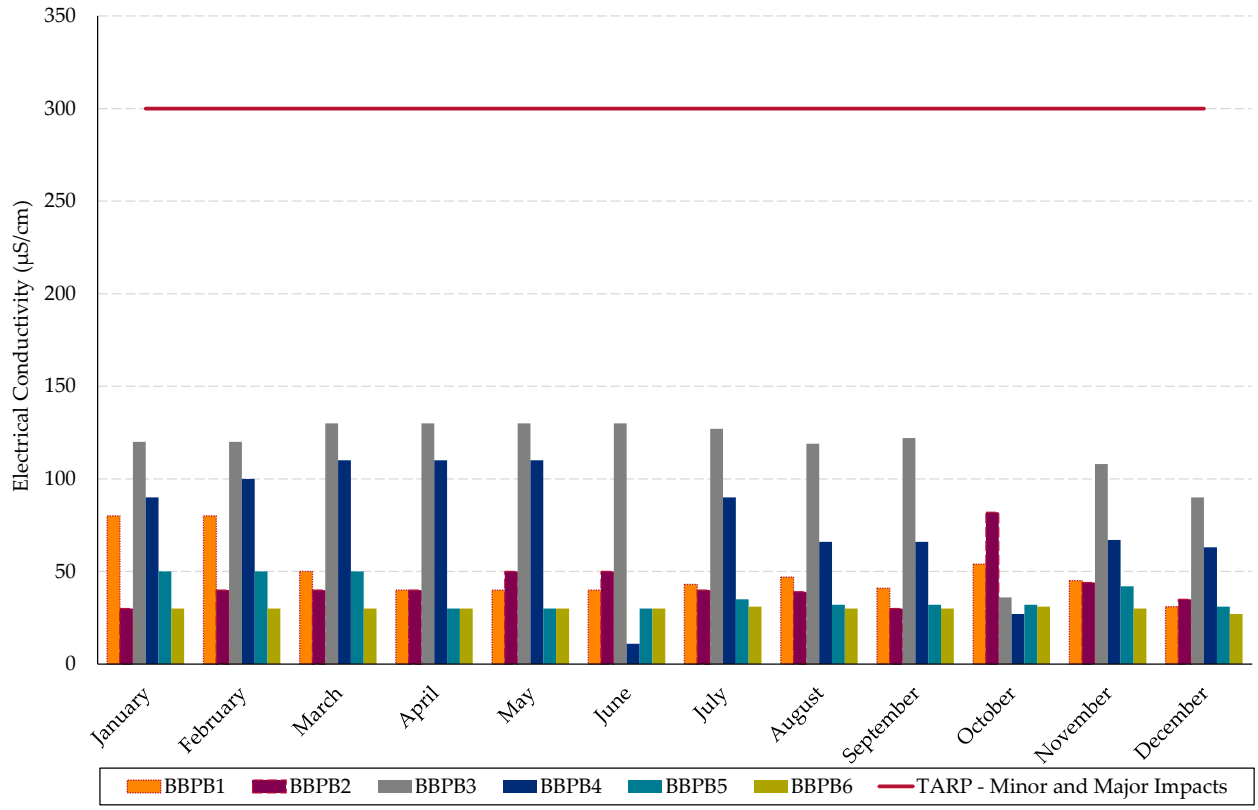


Figure 6.12: 2017 Groundwater Electrical Conductivity.

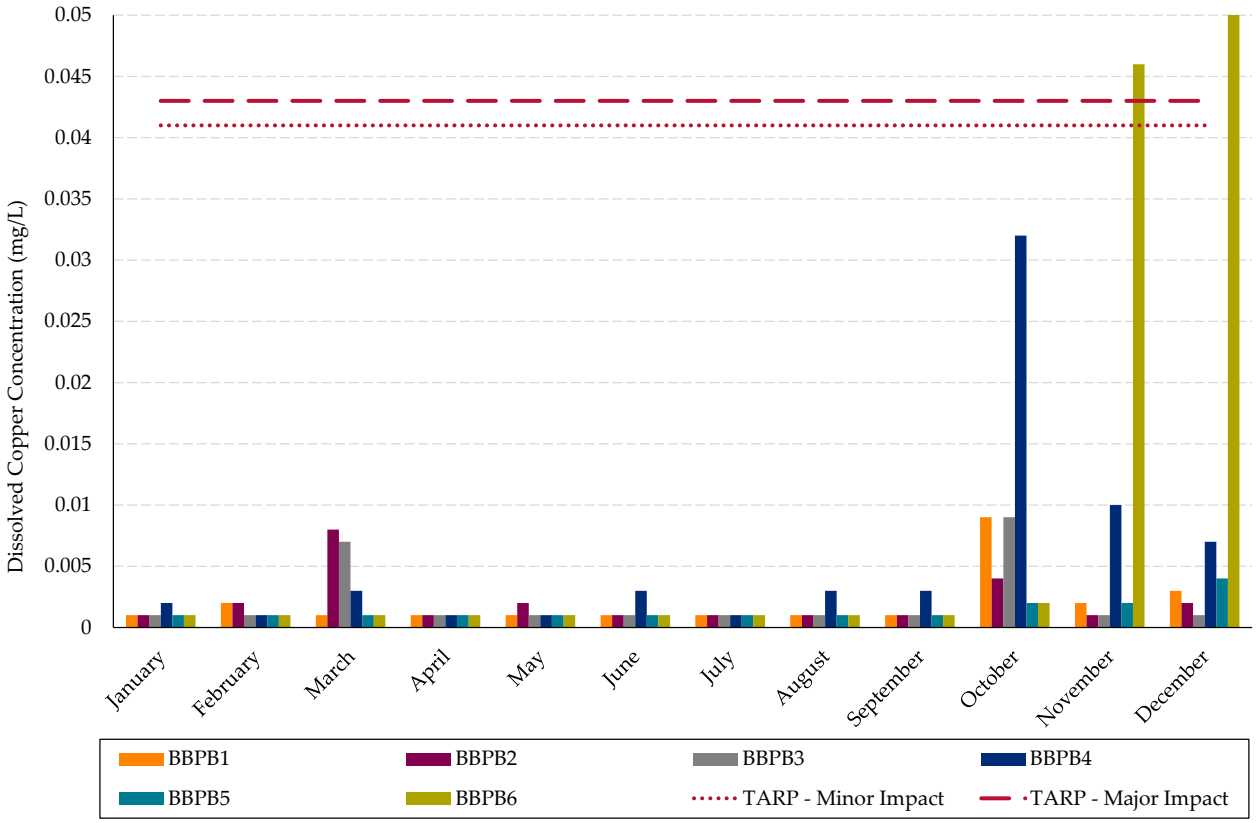


Figure 6.13: 2017 Groundwater Copper levels.

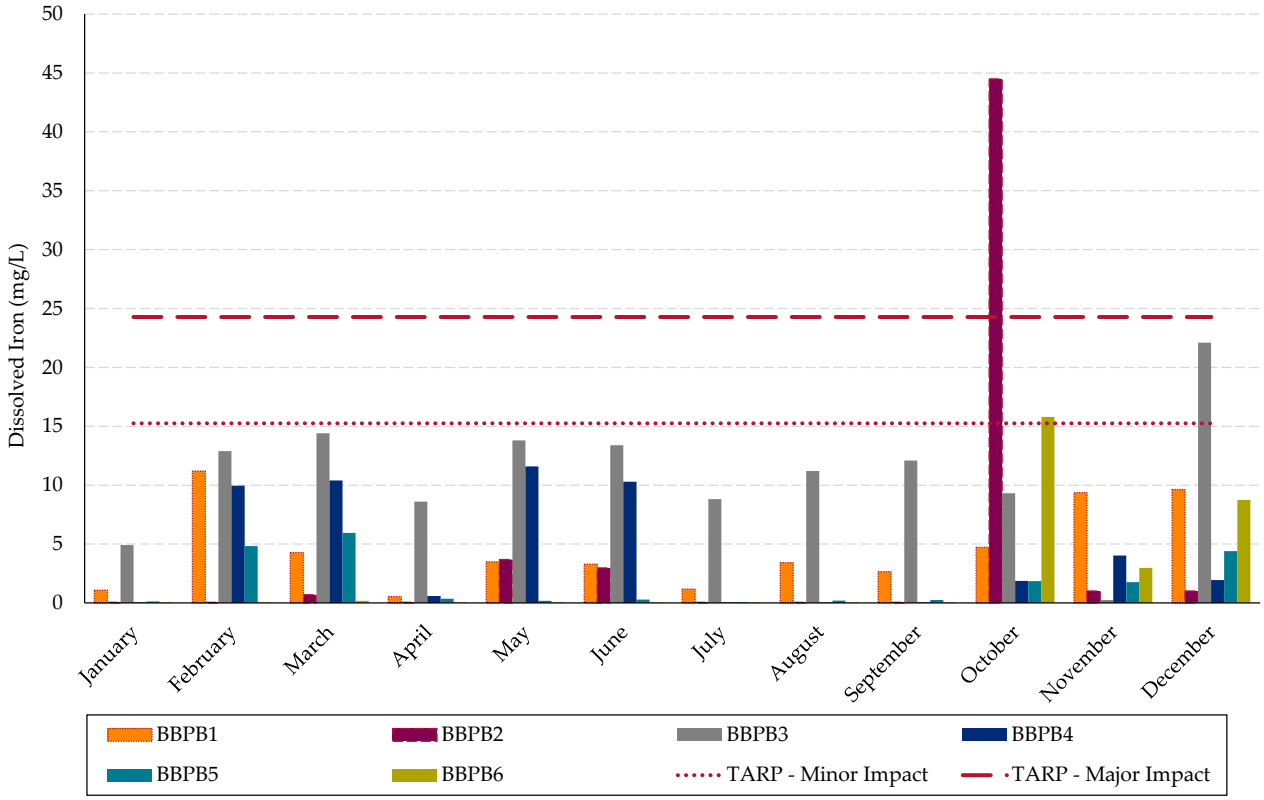


Figure 6.14: 2017 Groundwater Iron levels.

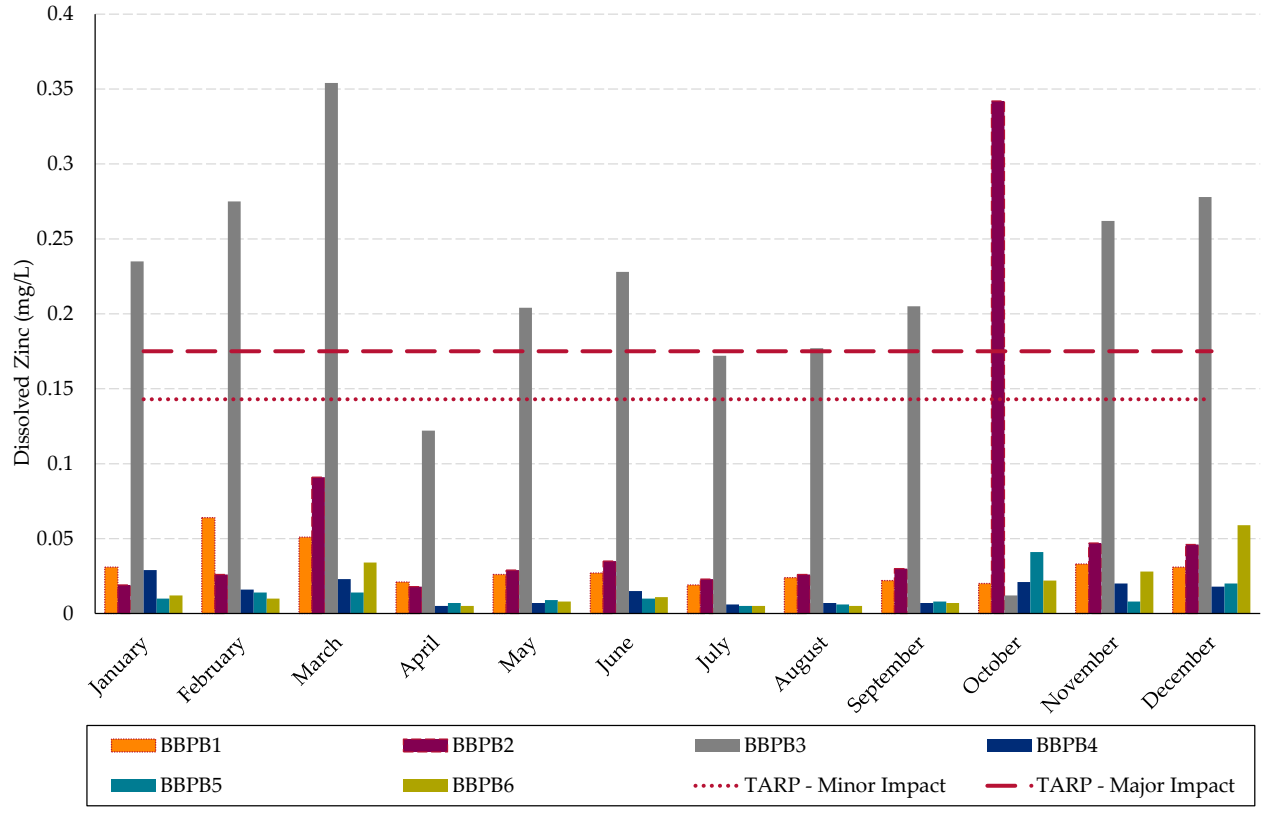


Figure 6.15: 2017 Groundwater Zinc Levels.

As shown in **Figures 6.11** and **6.12** above: pH and electrical conductivity levels were within both the minor and major impact criteria for all groundwater monitoring bores during 2017.

As shown in **Figure 6.13**, copper levels were also within impact criteria for all groundwater monitoring bores, except BBPB6 during November and December 2017 when levels exceeded both the minor and major impact criteria. This exceedance did not continue into 2018 as BBPB6 was dry between January – March 2018 –as such the TARP was not activated (refer to **Table 6.8).** It is worth noting, that all bores saw a general increase in copper, zinc and iron levels in October to December 2017. This general increase coincides with both a change in sampling and monitoring methods that occurred in October 2017 (refer to **Section 6.2**), and a period of increased rainfall deficiency.

As shown above in **Figure 6.14**, 2017 iron levels were below the minor impact trigger level for all groundwater monitoring wells with the exception of three bores in October 2017. In October 2017, BBPB2, BBPB3 and BBPB6 were all above the minor impact trigger level, and BBPB2 was also above the major impact trigger level. This exceedance was limited to the month of October 2017, therefore the TARP was not triggered (refer to Table 6.8).

As shown above in **Figure 6.15**, 2017 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 nine months in 2017. This major impact TARP event has continued since August 2012. Note that mining in longwalls 29-31 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 in BBPB1 – BBPB6 during the period 2011 – 2017.

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

6.2.2.2 Comparison against EA

The EA concluded that the likelihood of extraction of Longwalls 29-31 resulting in a significant impact on the Coxs River Swamp 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 longwalls 29 to 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.

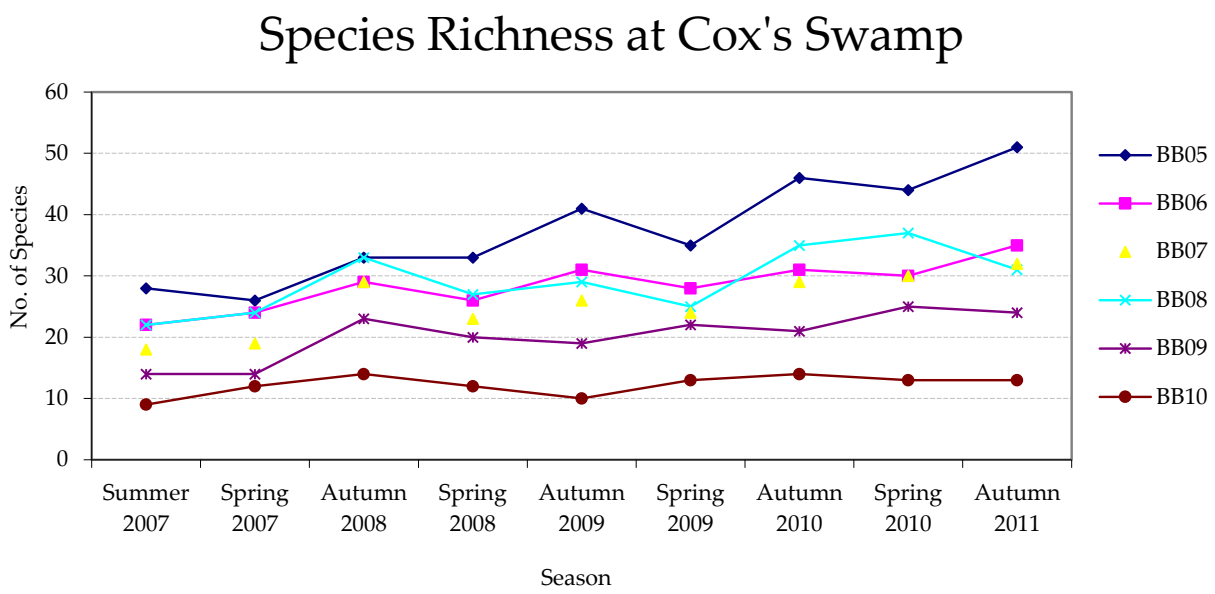


Figure 6.16: Summary of species richness at the monitoring sites

6.2.3 Groundwater Extraction

Mine water and groundwater intercepted by underground mining operations is extracted from both the north (Longwall 19) and south (Longwall 1) 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 Licence Discharge Points 3 and 6 (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 (Longwall 19) in 2017 was 810 ML. During 2017, the total amount of water extracted through the south bores (Longwall 1) was 437 ML. **Table 6.11** shows water taken by the Baal Bone operation for the 2017 reporting period.

Table 6.11: Water take for 2017 reporting period.

Water License #	Water sharing plan, source and management zone (as applicable)	Entitlement (ML)	Passive take/ inflows (ML)	Active pumping (ML)	TOTAL (ML)
80BL236132	Not Applicable	-	-	-	-
80BL236134	Not Applicable	-	437	-	437
80BL239077	Not Applicable	-	810	-	810
WAL27887*	NSW Murray Darling Basin Porous Rock Groundwater Sources Sydney Basin MDB Groundwater Source Sydney Basin MDB (Pther) Management Zone	750	-	Not Metered	-

* Extraction of water allocated to 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 2017. 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 (Longwalls 29 to 31 and Remnant Areas). The volume of groundwater extracted in 2008 was approximately 1.5 GL/annum.

In 2017, 1.25 GL of groundwater was extracted via the north and south dewatering bores – hence within the expected range of groundwater extraction predicted in the EA.

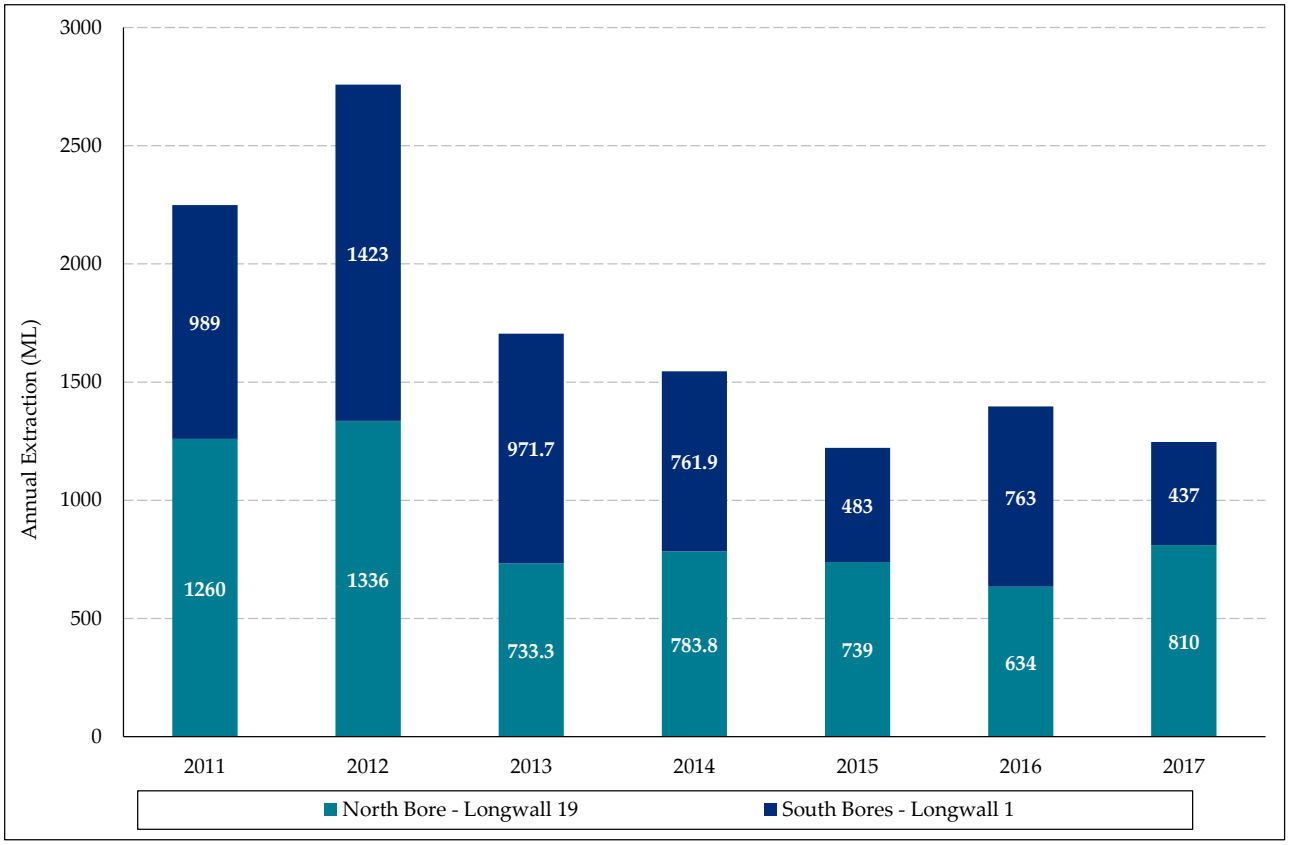


Figure 6.17: Annual extraction from North and South bores from 2011 to 2017

7 Rehabilitation

7.1 Buildings

No buildings were removed during 2017.

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 longwall panels 29-31) was removed and the shaft filled. Site levelling, fence removal and topsoil replacement was completed in June 2013. In consultation with the State Forest, the area was prepared and seeded in 2014 using a mix of local seeds.

During 2017 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)
	2016	2017	2018
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	27*
D. Land under active rehabilitation	0	0	27*
E. Completed rehabilitation	183.28	183.28	210.28

* Rehabilitation of the Northern Void and adjacent areas is planned to occur during 2018, should no mining activities occur.
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 27ha of rehabilitation planned for 2018 (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 27 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 Department of Planning and Environment granted an extension/postponement of the MOP rehabilitation associated with the Northern Void/Northern Rehabilitation area until 31 December 2018.

7.2.1 Subsidence Remediation

In 2010, tension cracking around the start of Longwall 30 was identified. Following various meetings, site inspections and consultation, a remediation plan, including preparation of a Review of Environmental Factors 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 Longwall 31. In response to a request from DTIRIS a full inspection of the surface above the entire Longwall 29-31 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 Review of Environmental (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 Longwalls 16 to 18a within Consolidated Coal Lease 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 Mining Operations Plan 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

The annual environmental rehabilitation inspection was conducted by DnA Environmental in November 2017. Consistent with the inspections conducted in 2014, 2015 and 2016, the 2017 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

Annual Ecological Rehabilitation Monitoring 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 an 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.

The results of the 2017 monitoring, undertaken by DnA Environmental from the 20th – 23rd November 2017 are summarised below:

Mixed eucalypt woodland rehabilitation sites

The mixed eucalypt woodland reference sites consisted of deep, well developed litter layers in moderate to extensive states of decomposition, scattered perennial grass tussocks and herbs and a mature eucalypt canopy, often with some scattered shrubs and sub-shrubs. These sites had a very stable humus layer, increasing the capacity for moisture retention and protection against erosion. In comparison, the rehabilitation sites typically had lower levels of perennial ground cover vegetation and litter cover and the litter was not as decomposed. The rehabilitation sites however often had a high perennial plant cover and increasing canopy cover due to the establishing trees and shrubs, especially in the younger SOC and NOC sites which had particularly high stem densities.

The once loose and unstable soil surfaces have over time developed into stable soil crusts which have become colonised with cryptogams and combined with the increasing protective vegetative cover have become more stable. In some cases the soils had also demonstrated increased coherency and a reduction in slaking potential due to increased microbial activity and development of a humus layer, especially in the older sites such as SOC3. Despite some periods of high rainfall activity, these increased ecological traits have also resulted in a reduction in the extent of erosion and deposition.

In some of the younger rehabilitation areas including NOC1 and SOC2 however, there continued to be persistent bare patches, limited soil surface relief and there may have been some slaking of the soils, especially in the bare patches though cryptogams were starting to colonise these areas. Nonetheless there has been an improvement in most ecological attributes and the rehabilitation sites have typically demonstrated an increasing trend in ecological function since 2009. This year, however the prolonged dry conditions, self thinning and increased grazing levels in some sites have resulted in a decline in tree and shrub cover, and in some sites there was a loss of integrity of the litter cover, with these being most evident in Box Cut, SOC2 and SOC4 and to some degree NOC1.

While all rehabilitation sites were not as functional as the mixed eucalypt woodlands, sites NOC2 and SOC3 had a comparable stability. All rehabilitation sites however met 70% stability, infiltration and nutrient capacity KPI targets, with the exception of SOC2 which had low infiltration and REA5 which was low in all KPI targets due to its limited development time.

The sum of the LFA stability, infiltration and nutrient recycling components provide an indication of the most functional and least functional monitoring sites recorded in 2017. The three reference sites continue to be the most ecologically functional sites and scored 218 in RWood01 to 186% in RWood03, out of a possible 300. In comparison the developing woodland rehabilitation sites were in a less functional state, but sites NOC2, SOC3, SOC4 and SOC1 were functionally similar to each other with scores of 176 – 168. The next most functional sites were NOC1 and SOC2 with a sum of 159 and 149 respectively. Of the older rehabilitation areas Box Cut was the least functional community this year with a total score of 146. The newest area of rehabilitation REA5 had the lowest score of 129%.

All sites except REA5 had a tree and mature shrub population. Previously, all other rehabilitation sites had an increasing tree and mature shrub population indicating good growth and development of the tree and shrub saplings. This year tree population densities continued to increase in NOC1, SOC1 and SOC2. In Box Cut, NOC2 and SOC3 however many mature acacias had died as part of the natural successional development of the site, with an overall decline in the tree populations in these sites being recorded this year. The density of trees and mature shrubs ranged from a low of 16 in NOC1 to a high of 84 individuals in SOC1, a significant increase from that recorded last year. This year all rehabilitation sites had tree populations which were comparable to the local woodlands.

Most tree and mature shrub species were considered to be endemic species, except in Box Cut and in SOC3 where some species were considered to have a more northern distribution. The largest trunk diameter in the rehabilitation sites was 16cm and was recorded in the older site SOC3. Most individuals across the NOC and SOC rehabilitation areas had diameters ranging from 6 – 9 cm this year. Most individuals were considered to be in medium health however 37% were in a state of advanced dieback in Box Cut. In Box Cut, NOC1 and NOC2, many acacias were dying as a result of natural successional thinning with 33 – 55% of the tree populations being [dead] stags. In SOC3, 16% of the population were acacia stags. Most individuals were bearing some reproductive structures except in NOC1 and SOC1. Presently no trees within the rehabilitation areas contained important wildlife habitat such as mistletoe or tree hollows.

In the rehabilitation sites there was also a declining trend in the shrub and juvenile tree populations across all sites. While some of the larger individuals were now being recorded as part of the tree population, the vast majority of individuals had died outright as competition levels increase especially during the prolonged dry conditions and self thinning processes occurred. In previous years there has tended to be lower density of shrubs and juvenile trees in the older Box Cut and SOC3 sites. In 2015, there were high densities of regenerating acacias and voluntary Cassinia arcuata (Chinese Shrub) seedlings in both sites, thus significantly increasing seedling densities.

In the younger NOC and SOC rehabilitation areas there was also high variability in shrub densities that ranged from a low of 428 in NOC2 to a high of 2324 in SOC2. In REA5, 279 seedlings were recorded however 257 (92%) were volunteer Cassinia seedlings. There continued to be a low proportion of eucalypts compared to acacias in most of the rehabilitation areas however increasing mortality of the acacias is expected to continue, thus increasing the proportion of eucalypts within the sites in the longer-term. There was a high diversity of shrubs and juvenile trees in the rehabilitation areas with 9 – 18 species being recorded. In most cases the species were considered to be local endemic (but may not be strictly associated with the immediate vegetation communities surrounding Baal Bone). All sites had trees and shrubs occurring in all height categories and with

the exception of the newly germinated seedlings the vast majority of individuals exceeded 2.0m in height indicating positive growth and development of thesites.

There continued to be an increasing trend in total ground cover in all rehabilitation sites largely due to the accumulation of leaf litter, increasing perennial ground cover and cryptogam cover but this year a minor reduction was recorded in Box Cut and SOC3. Sites that did not meet minimum ground cover targets this year included Box Cut, SOC2 and REA5.

In the rehabilitation sites leaf litter continued to be the dominant form of ground cover and the cover provided by perennial ground plants had increased in all sites this year. Sites that had perennial ground covers comparable to the local woodlands included NOC1, NOC2, SOC1 and SOC2. Cryptogams continued to be recorded in low abundance in NOC1, SOC1 and SOC2 and cryptogams were particularly important in REA5 where they provided 30% cover on average. Scattered rocks were common in all rehabilitation areas except in SOC3 as dead leaf litter and ground cover plants become well established and had covered them over.

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 area. This year 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. 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 older rehabilitation site SOC3 has continued to have a mature canopy cover comparable to the woodland reference sites, and since 2015 so has SOC1. SOC1 however continued to have a denser understorey. The older rehabilitation area SOC3 has developed into a woodland which has a similar structural composition to the reference sites, while NOC2 and SOC1 appear to be trending in that direction. The loss of mature acacias in Box Cut, NOC1 and SOC2 has resulted in these sites to lose some structural development.

In most of the rehabilitation areas there has been an increasing trend in floristic diversity as the sites develop and additional species colonise the rehabilitation areas. This year however there was a reduction in species diversity in all rehabilitation areas as a result of the dry conditions, with the exception of NOC2 and this was reflected in the woodland reference sites. Due to the low diversity of species recorded in RWood03, all rehabilitation sites contained an adequate diversity of species and ranged from a low of 24 in SOC1 to a high of 44 species in Box Cut and REA5. In the reference sites only one exotic species was recorded this year, and there was also a decline in exotic species in most of the rehabilitation sites, however only one rehabilitation site SOC1 had an acceptable diversity of exotic species.

Native plants provided most of the live ground cover and were more abundant than exotic species in most rehabilitation sites with native plant cover ranging from 70% in Box Cut to 100% in SOC3. In REA5, exotic plants continue to be dominant with the site presently having 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.

In the rehabilitation sites the diversity of most growth forms was similar to the local woodlands in most sites, however there was a low diversity of sub-shrubs and no vine species were present. The diversity of herbs was also low in NOC1 and SOC1. There was also a particularly high diversity of tree species (i.e. eucalypts) in the SOC3 rehabilitation sites.

This year four species were common to all rehabilitation areas and these included the exotic perennial forb Hypochaeris radicata (Flatweed) and the native shrubs Acacia rubida (Red-leaved wattle), Cassinia arcuata (Chinese Shrub) and Eucalyptus macrorhyncha (Red Stringybark). The

native grass Microlaena stipoides (Weeping Rice-grass) which was included in the seeding mixes was also recorded in six of the woodland rehabilitation areas.

The rehabilitation sites were dominated by a different composition of species to the reference sites, with the native perennial grass Microlaena stipoides (Weeping Rice-grass) being recorded in relatively high abundance in all rehabilitation areas, except Box Cut and SOC3, with the abundance scores having increased over the past year. Rytidosperma species (Wallaby Grasses) were quite abundant in Box Cut and SOC3 with these cover scores also having increased. In NOC1, the small native sub-shrub Pultenaea microphylla provided comparatively high levels of ground cover with this ground cover also being recorded as relatively abundant in Box Cut this year. The exotic annual Plantago lanceolata (Ribwort) was also relatively abundant in Box Cut. The exotic perennial Hypochaeris radicata (Flatweed) was scattered throughout NOC1 and NOC2.

The soils chemistry in most of the rehabilitation area are similar to those obtained in the local woodlands with these being moderately to very strongly acidic, non saline, non sodic and low nitrates (N). In REA5, however the soils were sodic and in most sites organic matter (OM) and phosphorous (P) were very low this year.

Exotic pasture rehabilitation sites

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 become more dense, thus reducing the level of ground cover plants. The loss of lower leaves and branches over time has also resulted in a decline in rain splash protection. In 2014, numerous mature acacias had died, which opened up the sites resulting in improved levels of ground cover plants. Due to an increase in protective litter cover and improved soil coherency there has been an increase in stability and infiltration and nutrient recycling capacity in NOC3 and NOC4 despite heavy grazing pressure by macropods (and goats?). In NOC5, heavy grazing has significantly reduced the abundance of perennial plant covers and there has been increased soil surface crusting and erosion with the exposed soils vulnerable to slaking. Since 2014 however the stability, infiltration and nutrient recycling capacity of this site has demonstrated a declining trend.

All sites on the Northern Open Cut area continued to be heavily grazed by macropods (and goats?) and this year all three pasture sites had high LOI but were slightly less stable than the reference sites and had a low infiltration capacity. NOC5 also had low nutrient recycling capacity. At the 70% KPI however, all sites met LFA targets, except in NOC5 were nutrient recycling indices were too low.

The sum of the LFA stability, infiltration and nutrient recycling components provide an indication of the most functional to least functional monitoring site recorded in 2017, with the highest possible score being 300. This year RPast03 and NOC4 were ecologically comparable with total scores of 186 and 185 respectively. NOC3 continued to have a slightly lower ecological function and scored 180, largely due to a lower cover of perennial grasses, with increased grazing reducing the integrity of the soil crusts in the open clearings. In NOC5 heavy grazing has 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 140.

The pasture rehabilitation areas were tree seeded in an attempt to provide some scattered shade trees and as a result there were scattered individuals as well as large thickets of acacias across much of the Northern Open Cut area. This year some of the shrubs had sufficiently grown and in NOC3 and NOC4 there were 29 and 13 mature acacias (> 5 cm dbh) respectively.

Except in 2014 where shrubs (< 5cm dbh) densities declined as many died as a result of frosts and extended dry conditions, there has typically been an increasing number of shrubs. In NOC3 and NOC4, some acacias were regenerating from seed and volunteer Cassinia were colonising the area. This year however, overall shrub densities have declined, caused partly by good growth of larger individuals which are now recorded as trees, but some have died outright as a result of self thinning successional processes.

This year there were 216 and 147 shrubs in NOC3 and NOC4 respectively. The most common species were Acacia dealbata and A. rubida and in NOC4 most individuals exceeded 2m in height. Only one Eucalyptus macrorhyncha 1.0 – 1m high was recorded in NOC4. While many individuals were also >2.0m in height in NOC3, the vast majority were newly germinated seedlings and less than 0.5 m. In both sites there were increasing numbers of Cassinia arcuata. Site NOC5 was comparatively shrub free however six A. rubida individuals of various sizes <2.0m continue to recorded.

Total ground cover is a combination of leaf litter, annual plants, cryptogams, rocks, logs and live perennial plants (<0.5m in height). Despite heavy macropod grazing all three pasture rehabilitation sites continued to maintain a good cover of exotic pasture species and ground cover has marginally improved in NOC3 and NOC4 to provide 99.5% and 100% total ground cover. Total ground cover in NOC5 remained unchanged but was slightly lower than the required minimum with a total ground cover of 92.5%.

The rehabilitation sites were largely comprised of perennial plants and dead leaf litter however the proportion of perennial vegetation in comparison to the reference sites was slightly low and did not yet meet this important ecological indicator, despite having increased over the last two years. The pasture rehabilitation sites also contained a much larger proportion of annual plants especially in NOC5. Cryptogams and scattered rocks were in low abundance in NOC3 and NOC4, but in NOC5 rocks were a significant ground cover component. The increasing height of persisting shrubs and increasing mortality within NOC3 and NOC4 has resulted in a low percentage of projected foliage cover in each of the heights classes up to 6.0m tall. No vertical canopy cover was recorded along the vegetation transect in NOC5 due to the limited occurrence of shrubs

As the final landuse of the NOC is an area of exotic pasture/grassland with grazing potential, total and native species diversity indicators were not considered to be relevant ecological attributes. Exotic species continue to be more common than native species in all pasture monitoring sites except in RPast03 which was the least disturbed native grassland reference site and this year exotic species had decline in the reference sites. Exotic species diversity had also declined in NOC4, but had increased in NOC3 and NOC5, however all rehabilitation sites had more exotic species than desired.

The rehabilitation sites were characteristically similar in many ways to the pasture reference sites with NOC4 having a comparable diversity of growth forms. There was however a higher diversity of shrubs in the rehabilitation sites, most of which were sown as part of the rehabilitation program. In NOC3 and NOC5 there was also a low diversity of grasses and reeds.

Six native species Acacia rubida (Red-leaved wattle), Cassinia arcuata (Chinese Shrub), Eragrostis spp. (A Lovegrass), Geranium solanderi (Native Geranium), Haloragis heterophylla (Rough Raspwort) and Oxalis perennans (Yellow Wood-sorrel) were recorded in all three rehabilitation sites, with all species except Acacia rubida also being recorded in at least one of the pasture reference sites. There were also eleven exotic species which were common to all three rehabilitation areas, with most species being exotic annual weeds with the exception of three species. Dactylis glomerata (Cocksfoot), an exotic perennial grass was sown as part of the rehabilitation program, and Hypochaeris radicata (Flatweed) a common and relatively abundant

perennial weed in the local area. The third species perennial exotic species being the priority weed Hypericum perforatum (St. John's Wort).

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 annual exotic species, was also abundant in NOC5.

The pasture rehabilitation sites typically had a soil chemistry similar to the local pastures or were within desirable agricultural levels, except NOC4 had strongly acidic soils. The rehabilitation sites were also deficient in Organic Matter, Phosphorous and had low Cation Exchange Capacity.

Ridgetop woodland rehabilitation sites

The 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 was improving.

In the woodland reference site there was a slight increase in the tree population as young saplings continue to grow. This year there was a stem density of 84 live individuals with a dbh >5cm. Presently no trees were recorded in the rehabilitation area.

In the Vent Rehab site, there were 284 seedlings represented by nine different species. The most common species were Leptospermum polygalifolium (Jelly Bush), Acacia brownii (Heath Wattle; previously confused to be A. gunnii) and Acacia buxifolia. There were also scattered Acacia terminalis, Cassinia spp, Daviesia latifolia (Bitter-Pea), Exocarpos strictus and a prickly Leptospermum species. This year no eucalypts were recorded in the monitoring plot. The vast majority (97%) of individuals were <0.5m high.

Total ground cover is a combination of leaf litter, annual plants, cryptogams, rocks, logs and live perennial plants (<0.5m in height). Presently the ground cover in the rehabilitation area was comprised of 21% dead litter with scattered annual plants providing 10% cover on average. There was also a minor contribution provided by rocks and logs. This year there was a minor increase in perennial plants and cryptogam cover which provided 10% and 4% cover on average.

There was decrease in species diversity in both monitoring sites, with only 27 species being recorded at the Ridgetop woodland reference site this year. Species diversity in the rehabilitation site was higher with 37 species, with these being attributed to the colonisation of the disturbed areas from adjacent vegetation, combined with germination of weed from the soil seed bank as well as germination from seed applied as part of the rehabilitation of the area. While there were no exotic species in the reference site, there was a reduction in exotic species in the rehabilitation site with seven species being recorded this year. In the rehabilitation area there has been a decline in cover provided by native species and this year there was 41% native plant cover. The site was therefore weedier than desired. Presently the rehabilitation site had a low diversity of tree species in comparison to the reference site.

This year, five species were recorded as occurring in the rehabilitation site and the adjacent Ridgetop woodland. The most common species were Acacia buxifolia (Box-leaved Wattle), A. terminalis (Sunshine Wattle), Dillwynia phylicoides, Exocarpos strictus (Dwarf Cherry) and Microlaena stipoides (Weeping Rice-grass). While some species were sown onto the rehabilitation as part of the rehabilitation the data suggest that many native species are likely to have colonised the site from adjacent vegetation or have germinated from the soil seed bank. The rehabilitation site also contained a range of weed species including several exotic reed species which are not usually found in the Ridgetop communities which may be implicated with the disturbance associated with the construction and rehabilitation of the ventilation shaft.

The most abundant species in the rehabilitation site was the exotic perennial herb Hypochaeris radicata (Flatweed) and exotic reed Cyperus Eragrostis (Umbrella Sedge) which have most likely germinated from the soil seed bank. This year the exotic annuals Centaurium erythraea (Common Centaury) and Gamochaeta americana (Cudweed) were also relatively abundant. No priority or threatened species were recorded in the Ridgetop monitoring sites.

No rills were present in the Vent Rehab site. The soil chemistry in the rehabilitation area was very similar to the reference site and both had soils which were very strongly acidic, non saline and non sodic. While they had high OM they had a low CEC and were low in P and N.

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 SOC2 and REA5.

The high densities of acacias have been critical to the successional development of the woodland (and pasture) sites, especially in SOC1 which has undergone the most significant transformation within only nine years. This has largely been due to excellent growth and development of the trees and shrubs, and cryptogams and accumulating dead leaf litter which provided increasing levels of protective ground cover. There has also been increasing states of decomposition of the dead leaf litter which indicates there have been increasing microbial and fungal activity. The development of the humus layer had resulted in a reduction in soil surface crusting and an increased soil stability and coherency and subsequently there is less evidence of erosion or deposition across the site.

Perennial ground covers were slow to establish however with the loss of lower leaves and branches and self thinning of the mature acacias, the dense canopy has become more open, allowing perennial ground covers to become established. 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.

These natural successional processes were evident across the wider NOC and SOC rehabilitation areas and since 2014 there has been a significant decline in shrub densities as a result of self thinning and a concurrent increase in ground cover. 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. The loss of the mature acacias has resulted in a much more open environment which has promoted an increase perennial ground cover plants, especially the native grass Microlaena stipoides and the native sub-shrub Pultenaea microphylla which is also becoming increasingly common.

Box Cut and SOC4 sites have previously been slow to establish, however there have been significant improvements in SOC4 over the past few years, but there was a decline in ecological function in Box Cut this year. Despite some adverse soil conditions in the younger woodland rehabilitation areas in particular NOC2, natural succession is likely to see the ongoing transformations in function, structure and composition with little need for direct management intervention across majority of the rehabilitation areas. Due to low establishment of desirable native tree and shrub seedlings in REA5, scarification followed by reseeding in autumn and/or spring is likely to be required, as per recommendations provided in June 2017.

The pasture rehabilitation sites on the NOC continue to meet many of the primary completion targets and these are also likely to continue to improve unassisted in the absence of disturbance events. 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, with more normal grazing intensities likely to return in better seasonal conditions. Monitoring of macropod (and goat?) numbers should be regularly undertaken to determine if management intervention is required.

Priority weeds including Rubus fruticosus (Blackberry) and Hypericum perforatum (St John's Wort) were becoming increasingly more common as was Rosa rubiginosa (Sweet Briar). Hypericum perforatum was noted mostly growing along the roadsides but was increasing in abundance and distribution in rehabilitation areas. It will be important to implement targeted weed control programs with the intent to eradicate these invasive species before they develop into extensive infestations.

During the monitoring three wild dogs were observed to using REA5 as a day time refuge and should also be monitored and/or controlled.

The addition of artificial fertilisers is not encouraged on the woodland rehabilitation area as unnatural increases in fertility levels are more likely to promote growth of undesirable weeds rather than invigorate growth of desirable native species which are adapted to naturally low fertility soils. The exotic pasture area on the NOC however may benefit from the application of artificial fertilisers in order to maintain and promote the growth of the desired exotic pasture species.

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 Reject Emplacement Area. 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 2017 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 the detailed Mine Closure Plan was prepared and is ready for submission. Elements of the Mine Closure Plan and Ben Bullen Creek Rehabilitation Plan will be included in the Mine Closure MOP.

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 Mining Operations Plan 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 BBN SD PRO 0012 - 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.

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 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 Mining Operations Plan, Baal Bone Colliery will hold CCC meetings at least annually.

Membership of the 2017 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
- Angela van der Kroft (Environment and Community Coordinator)

A CCC meeting was held during the reporting period in June 2017.

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

- Status of Full Mine Closure MOP (Mining Operations Plan)
- Remediation of legacy exploration boreholes and subsidence cracks
- Ben Bullen Creek Rehabilitation Plan
- Annual Review report

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.

A CCC meeting will be held during 2018.

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**, two Category II reportable environmental incidents were recorded by Baal Bone during the reporting period. These incidents both relate to cliff falls over Longwall 3 and Longwall 6. Refer to **Section 5.18.2** for further detail.

During 2017 there was also one non-compliance relating to a failure to undertake two monthly groundwater level monitoring in the Cox's River Swamp as required by the Baal Bone Surface Water Monitoring Plan. Further detail on this non-compliance can be found in **Section 6.2.1.**

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
Longwall 3 Cliff Fall	26 September 2017	Incident	Category II	Section 5.18.2
Longwall 6 Cliff Fall	19 October 2017	Incident	Category II	Section 5.18.2
Coxs River Swamp Groundwater Level – failure to undertake two monthly water level monitoring	September –November 2017	Non-complaint	N/A	Section 6.2.1

11 Activities to be Completed in the Next Reporting Period

11.1 Operations and Systems

Projects and targets for the 2018 reporting period include the following:

- 27ha of rehabilitation in the Northern Void and surrounding area (if no mining activities are to occur).
- Investigation into other potential cliff falls which 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 2018 Annual Review period, required infrastructure will remain intact and the site will continue to be managed and maintained for potential future mining or industrial land use.

The potential utilisation of the Baal Bone site for future mining activities including mining, mine training facility and/or use of the coal processing, rail loop or coal emplacement areas will be considered, however have not been confirmed as a future land use.

11.3 Pit-top Facilities

During the 2018 Annual Review period all infrastructure will be maintained to an operational standard. In the event that a full mine closure is decided, a rehabilitation strategy for pit top facilities will be detailed in a Mining Operations Plan and Mine Closure Plan.

As the current future of mining operations at Baal Bone 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 should investigations identify suitable and economically viable reserves for extraction.

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 2018 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. With the exception of No.4 adit, all adits will be kept locked throughout the 2018 Annual Review period. 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. Should a decision be made to commence Mine Closure during 2018, the first planned activity is to seal the adits 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). These areas will not be decommissioned and rehabilitated until after a decision to commence mine closure occurs.

Further rehabilitation of 27 ha in the Northern Void and adjacent areas is planned to occur during 2018 (following an extension granted by DP&E refer to **Section 7.2**), should no mining activities occur. Rehabilitation activities that may occur include sealing of the 4 adits in the northern void, stabilisation of the highwall, recontouring of the area and placement of growth medium material. The growth medium material will be treated as required and seeded with pasture species.

It should also be noted that the southern REA including REA 6 will be maintained during the suspension of operations period. Whilst it may be progressively or temporarily rehabilitated if the opportunity arises, final rehabilitation will be completed concurrent with mine closure. Species used in this rehabilitation will match the species composition that was used in the Southern Area.

To ensure Baal Bone will be able to meet the final rehabilitation objectives and completion criteria set out in the Mining Operations Plan, rehabilitation monitoring methodologies will include a combination of Landscape Function Analyses (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 2018 Annual Review reporting period include the following:

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

12 References

AECOM (2010). Dangerous Good Review, Baal Bone Colliery. AECOM Australia Pty Ltd, Gordon.

Aurecon (2012). 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 Australia Pty Ltd, Neutral Bay.

Aurecon (2012) REA5 Bund Wall Geotechnical Stability Assessment. Aurecon Australia Pty Ltd, Neutral Bay.

Baal Bone, (2009). MP01.09.01.02.007 Social Involvement Plan. Baal Bone Colliery, Cullen Bullen.

Carbon Based Environmental (May 2016) Baal Bone Colliery 6 Monthly CHPP and Pit Top Groundwater Monitoring Event.

Carbon Based Environmental (November 2016) Baal Bone Colliery 6 Monthly CHPP and Pit Top Groundwater Monitoring Event.

DnA Environmental (2018). Baal Bone Colliery Rehabilitation Monitoring 2017, DnA Environmental.

DPI-MR, (2006). Rehabilitation Security Deposit Requirements for Mining and Petroleum Titles. NSW Department of Primary Industries – Mineral Resources, Maitland.

ENSR-AECOM Australia (2010). Annual Groundwater Monitoring, Baal Bone Colliery (2009). ENSR Australia Pty Ltd, Pymble.

GHD (2017) Baal Bone Colliery – Detailed Contamination Site Assessment.

Glencore Coal NSW Sustainable Development Annexure 0038, 10.1 Mine Closure (Version 2.0).

GSS Environmental, (2011). Baal Bone Close Now Rehabilitation Liability Estimate. GSS Environmental, Newcastle.

Land Asset Management (2010). Land Management Assessment, Baal Bone Colliery. Land Asset Management, Singleton.

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

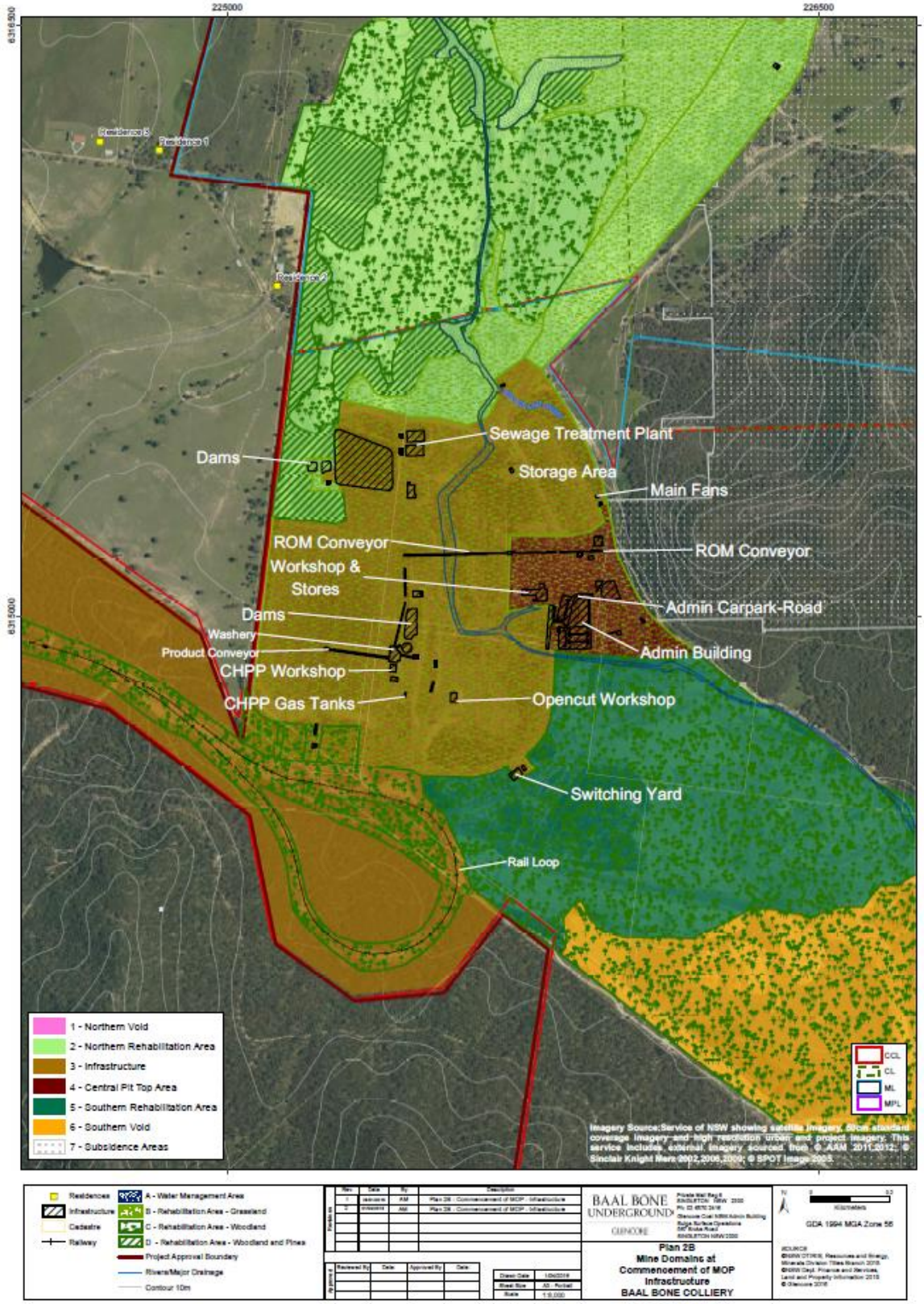
NGHenvironmental (2010). Environment and Community Risk Assessment, Baal Bone Colliery Lithgow, NSW. NGHenvironmental, Wagga Wagga.

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

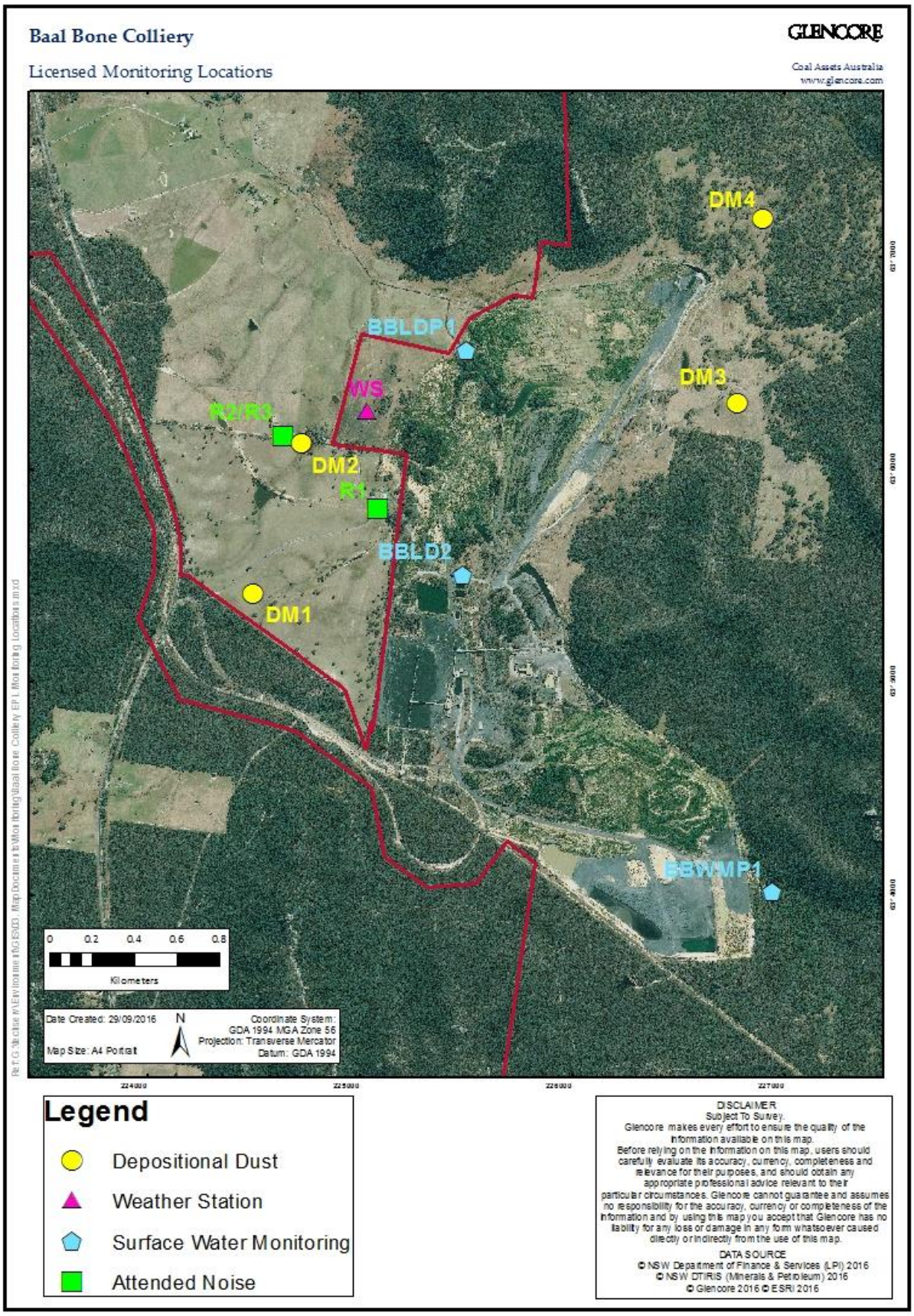
SCT Operations Pty Ltd, (2011). Review of subsidence and stress cell change monitoring adjacent to the Wolgan Escarpment at completion of longwalls 29 and 30, SCT Operations Pty. Ltd, Wollongong.

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

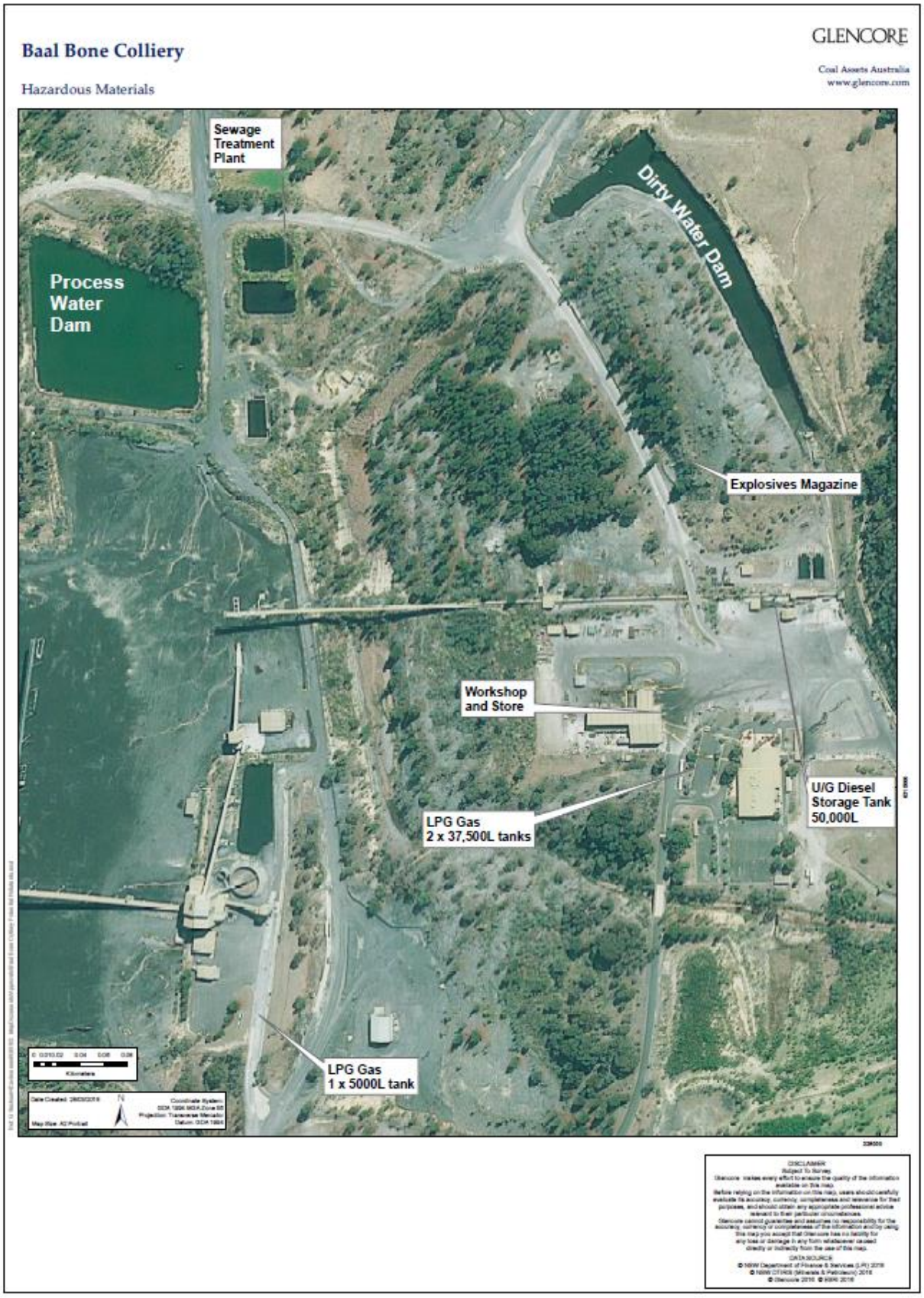
A.1 Appendix A - Plans



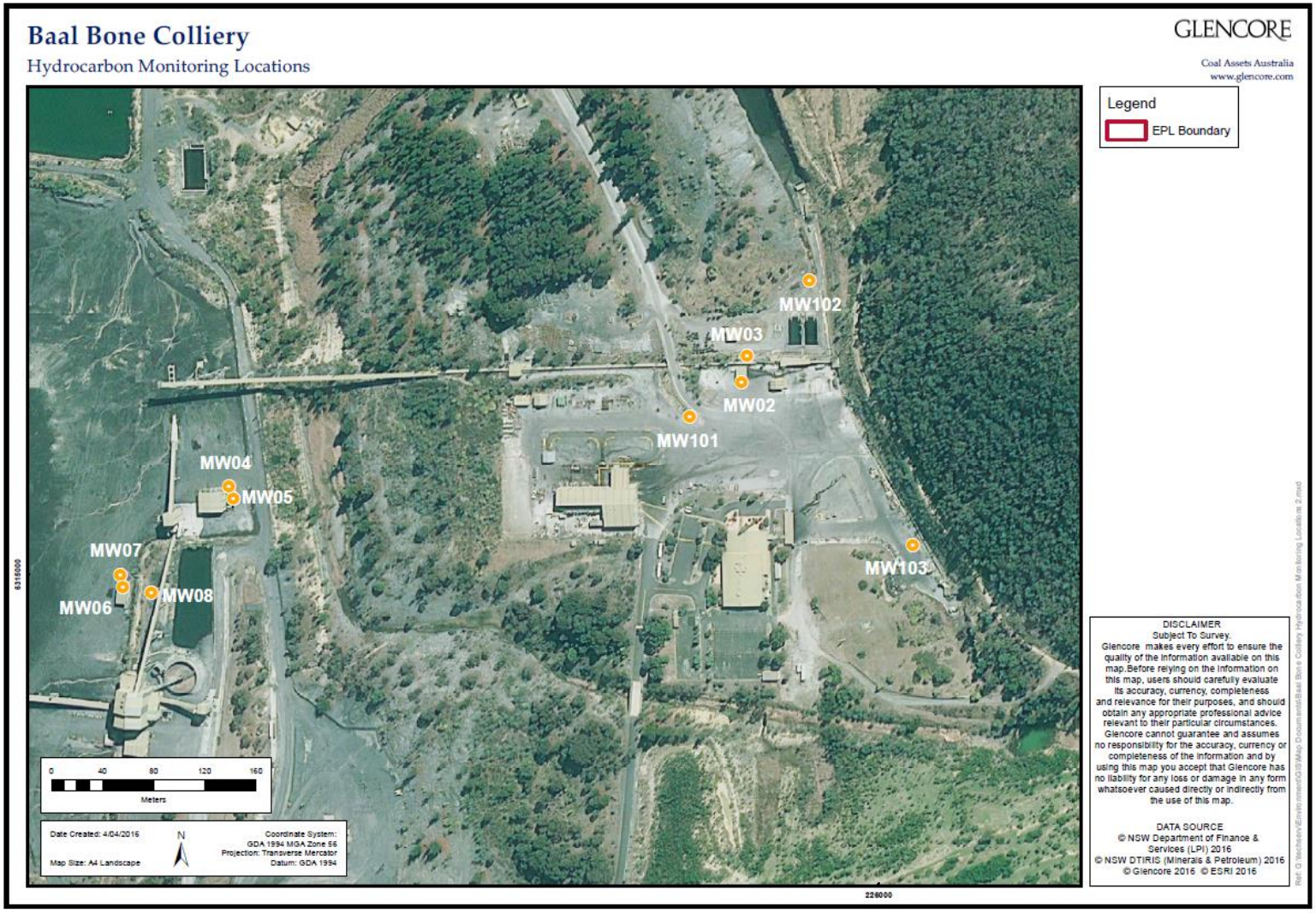
Plan 1 – Site Infrastructure



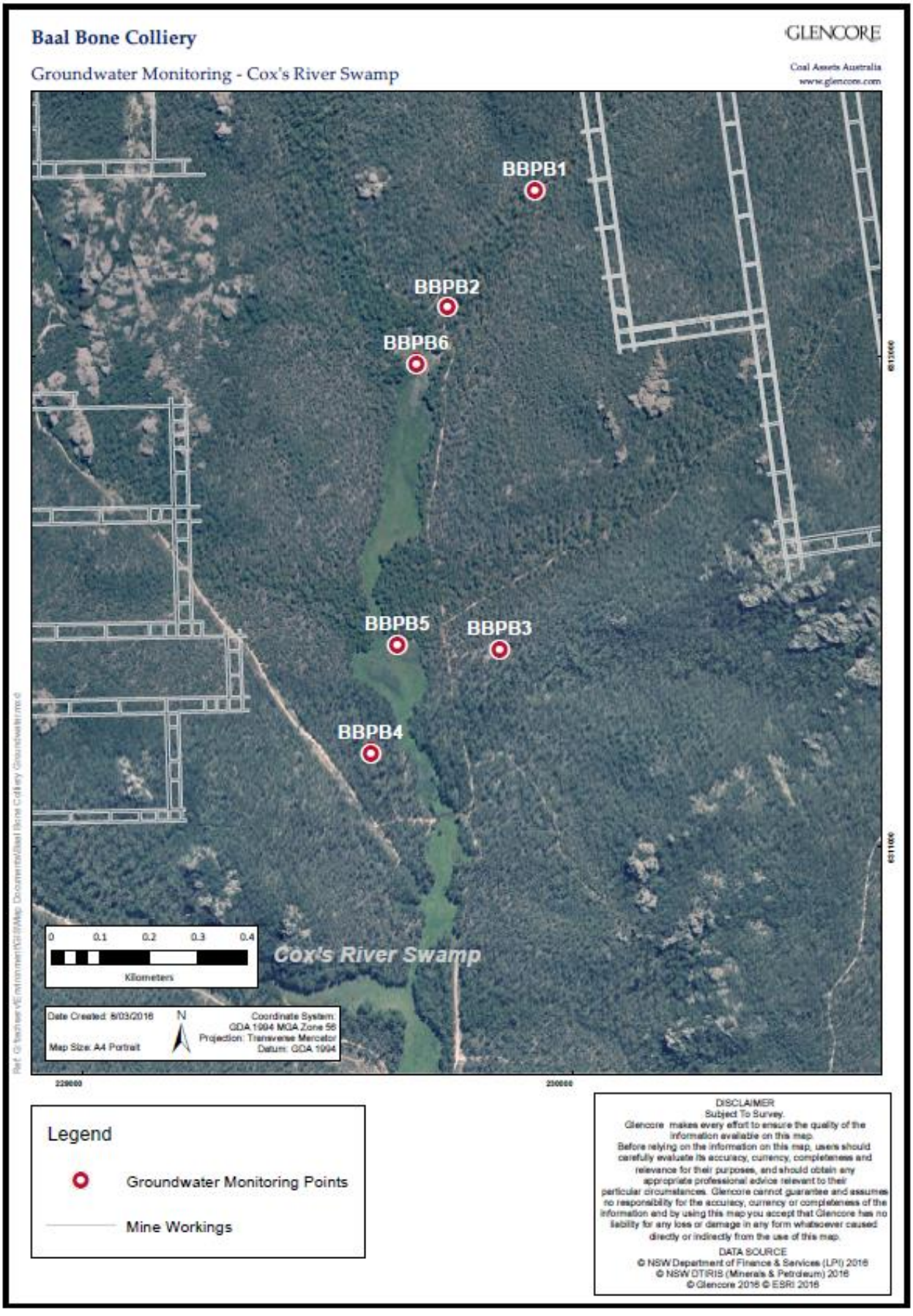
Plan 2 – Licensed Monitoring Locations



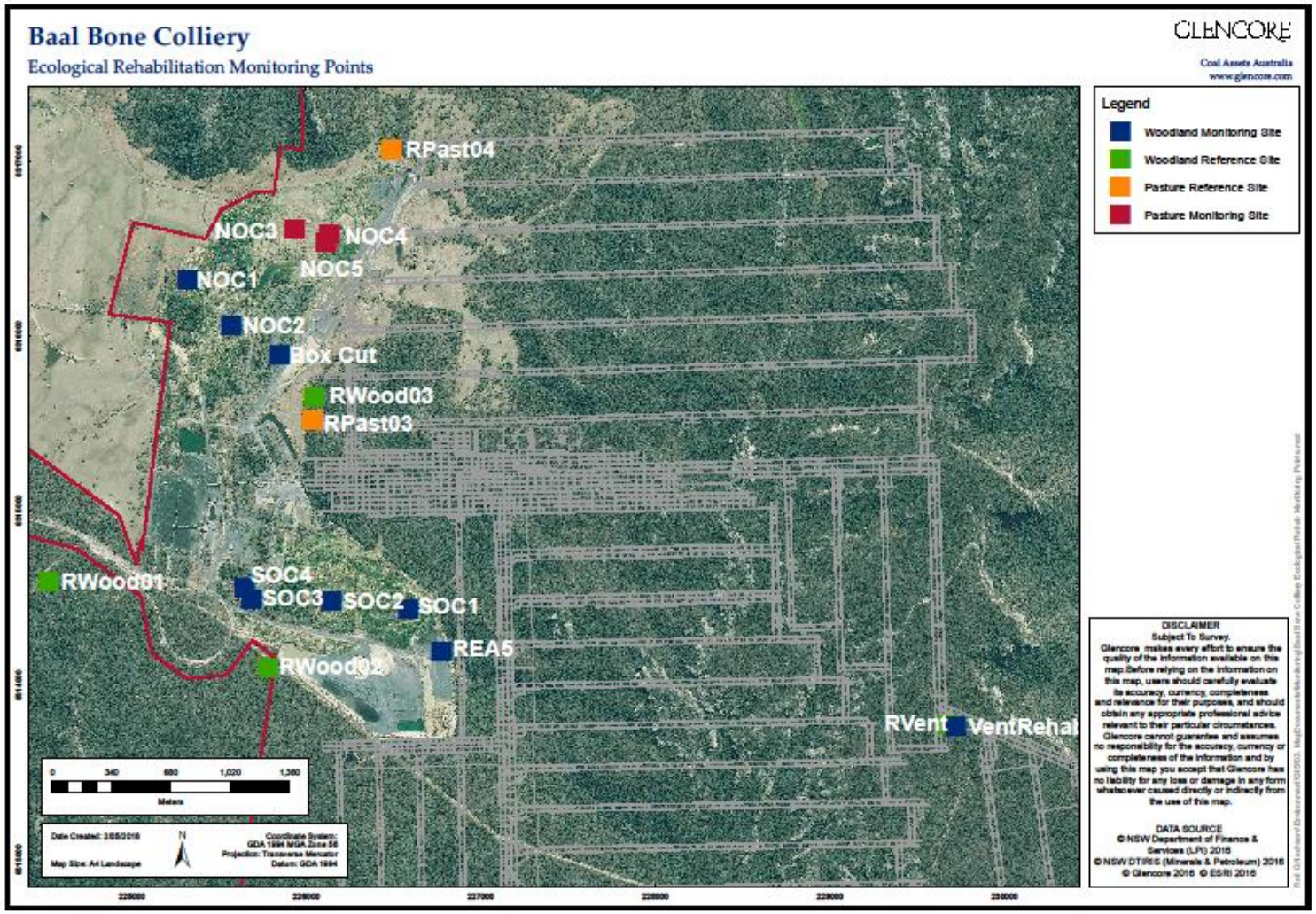
Plan 3 – Hazardous Materials



Plan 4 – Hydrocarbon Monitoring Locations



Plan 5 – Groundwater Monitoring Cox's River Swamp



Plan 6 – Ecological Rehabilitation Monitoring Points

A.2 Appendix B – Approval

NSW GOVERNMENT Planning & Environment

Contact: Chris Schultz
Phone: 02 4224 9476
Fax: 02 4224 9470
Email: chris.schultz@planning.nsw.gov.au

Elizabeth Fishpool
Environment and Community Coordinator
Baal Bone Colliery
Castlereagh Highway
Cullen Bullen NSW 2790

Email: Elizabeth.Fishpool@glencore.com.au

Dear Ms Fishpool

Baal Bone Coal Project (Project Approval 09_0178)
Annual Review 2017 - resubmitted

Reference is made to the Annual Review for the Baal Bone Coal Project for the period 1 January to 31 December 2017, resubmitted to the Department on 16 May 2018 as requested in correspondence from the Department dated 23 April 2018 and as required under Condition 3 of Schedule 5 of Project Approval 09_0178, as modified (the approval).

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

In accordance with Condition 9 of Schedule 5 of the approval, the Proponent is required to make a copy of the documents listed by this condition publicly available on the company website and also ensure that these documents are up-to-date. It is requested that the Annual Review is uploaded within one month of the date of this letter.

Should you need to discuss the above, please contact Chris Schultz as per the details provided.

Yours sincerely,

4/6/18

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