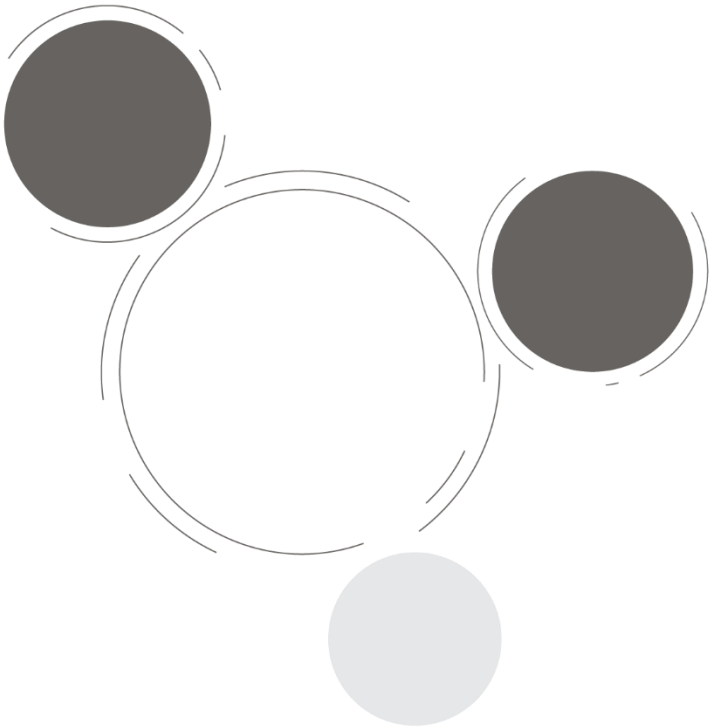
BAAL BONE UNDERGROUND

GLENCORE



Annual Review
2020

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	WAL27887, WAL34952, 80WA706034, 80WA706035, 80BL239077, 10BL601877, 10BL601816, 10BL601817, 10BL601970.
Name of Holder of Water Licence/s	The Wallerawang Collieries Ltd
MOP Start Date	20th December 2019
MOP End Date	31st December 2025
Annual Review Start Date	1st January 2020
Annual Review End Date	31st December 2020

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 2020 to 31st December 2020 and that I am authorised to make this statement on behalf of Baal Bone Colliery.

Note.

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

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

Name of Authorised Reporting Officer	Elizabeth Fishpool
Title of Authorised Reporting Officer	Environment and Community Coordinator
Signature of Authorised Reporting Officer	
Date	23 March 2021

Abbreviations:

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

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1 Statement of Compliance

Table 1.1: Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	Yes/No*
PA 09_0178	No
EPL 765	No
Mining Leases	Yes
Water Licences	Yes

Table 1.2 Details of non-compliances in 2020.

Relevant Approval	Condition #	Condition description	Risk	Comment	Reference
PA 09-0178	Schedule 3, Condition 21	Groundwater Monitoring Plan	Low	Ongoing exceedance of Water Quality Trigger Level for dissolved zinc (0.175mg/L) at BBPB3.	**Section 7.2.4** and **Section 11**
PA 09-0178	Schedule 3, Condition 21	Groundwater Monitoring Plan	Low	BBPB5 and BBPB6 outside of water quality trigger levels for pH for periods of 2020.	**Section 7.2.4** and **Section 11**
PA 09-0178	Schedule 3, Condition 21	Groundwater Monitoring Plan	Low	Groundwater quality analysis not carried out in accordance with schedule specified in Section 4.1.3 of the GWMP.	**Section 7.2.4** and **Section 11**
PA 09-0178	Schedule 3, Condition 21	Groundwater Monitoring Plan	Low	Groundwater levels not taken in BBPB1, BBPB3, BBPB4, and BBPB5 for two months – Dec 2019 and Jan 2020 (due to Gospers Mountain fire).	**Section 7.2.3** and **Section 11**
EPL 765	L2.4	Water and/or Land Concentration Limits	Low	Results received for January 2020 indicated an exceedance of oil and grease at EPL Monitoring Point 16 with a result of 11mg/L, compared to an EPL concentration limit of 10mg/L.	**Section 7.1.2** and **Section 11**
EPL 765	L2.4	Water and/or Land Concentration Limits	Low	Results received for August 2020 showed an exceedance of dissolved iron at EPL Monitoring Point 16, with a result of 1.68mg/L, compared to a EPL concentration limit of 1.0mg/L.	**Section 7.1.2** and **Section 11**

Compliance status key for Table 1.2

Risk Level	Colour Code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-compliant	Non-compliance with: • potential for serious environmental consequences, but is unlikely to occur; or • potential for moderate environmental consequences, but is likely to occur
Low	Non-compliant	Non-compliance with: • potential for moderate environmental consequences, but is unlikely to occur; or • potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)
Compliant	Compliant	Criteria met

2 Introduction

2.1 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 2020 to 31 December 2020.

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.

In February 2015, then 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.

In December 2015, DP&E approved a second modification to the Project Approval to allow Ben Bullen Creek to remain in its current alignment.

On 20 December 2019, the Resources Regulator approved the Mine Closure MOP until 31 December 2025.

In January 2020 demolition of infrastructure on the Baal Bone site commenced, which included the demolition of the Coal Handling Preparation Plant (CHPP), bathhouse and workshop, as well as all coal conveyors, reclaim tunnels, transfer towers, bins, sheds and other associated ancillary infrastructure. The rail loop linking the site to the Main Western Railway line was also decommissioned and all rail lines, ballast and sleepers were removed from the corridor.

The civil works and rehabilitation component of the closure activities commenced in September 2020. The remediation of the CHPP and Run of Mine (ROM) areas and the former rail corridor was undertaken over the remaining period of 2020. Activities included the addition of topsoil, fertiliser, lime and gypsum followed by the areas being ripped. The CHPP ROM area was then seeded with a pasture seed mix and the rail loop was seeded with a woodland seed mix.

During this period, filling of voids including the Leachate Dam, REA 6 Tailings Dam, Central Void and the Southern Void was also undertaken. The filling of the REA 6 Tailings Dam was completed in December. The remaining voids will continue to be filled throughout the 2021 reporting

period. Once filled the voids will be topsoiled and then ameliorated in a similar fashion to the rail loop prior to being seeded with a woodland seed mix.

2.2 Scope of this Annual Review

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

This Annual Review has also been prepared to address the requirements of Schedule 5, Condition 3 of Baal Bone's Project Approval (PA 09_0178), which requires a report to be submitted to the Secretary 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 2.1.**

Table 2.1: 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 3** and **Section 11**
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 1** and **11**
d) identify any trends in the monitoring data over the life of the project;	**Sections 6, 7** and **8**
e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and	**Sections 6, 7** and **8**
f) describe what measures will be implemented over the current calendar year to improve the environmental performance of the project.	**Section 12**

The Annual Review will be submitted to the following authorities:

- NSW Department of Planning, Industry and Environment (DPIE)
- Resources Regulator with the NSW Department of Planning, Industry and Environment – (Resources Regulator)
- Forestry Corporation of NSW (FCNSW);
- Lithgow City Council (LCC);
- Environment Protection Authority (EPA); and
- DPI Water / Natural Resource Access Regulator.

The reporting period for this Annual Review is 1 January 2020 to 31 December 2020.

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 2020 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 2021 reporting period.

2.3 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
Elizabeth Fishpool	Environment and Community Coordinator	Ph: (02) 6350 6945 Email: *Elizabeth.Fishpool@Glencore.com.au* Fax: (02) 6359 0530
Greg Peard	Environment and Community Coordinator	Ph: (02) 6350 6920 Email: *Greg.Peard@Glencore.com.au* Fax: (02) 6359 0530

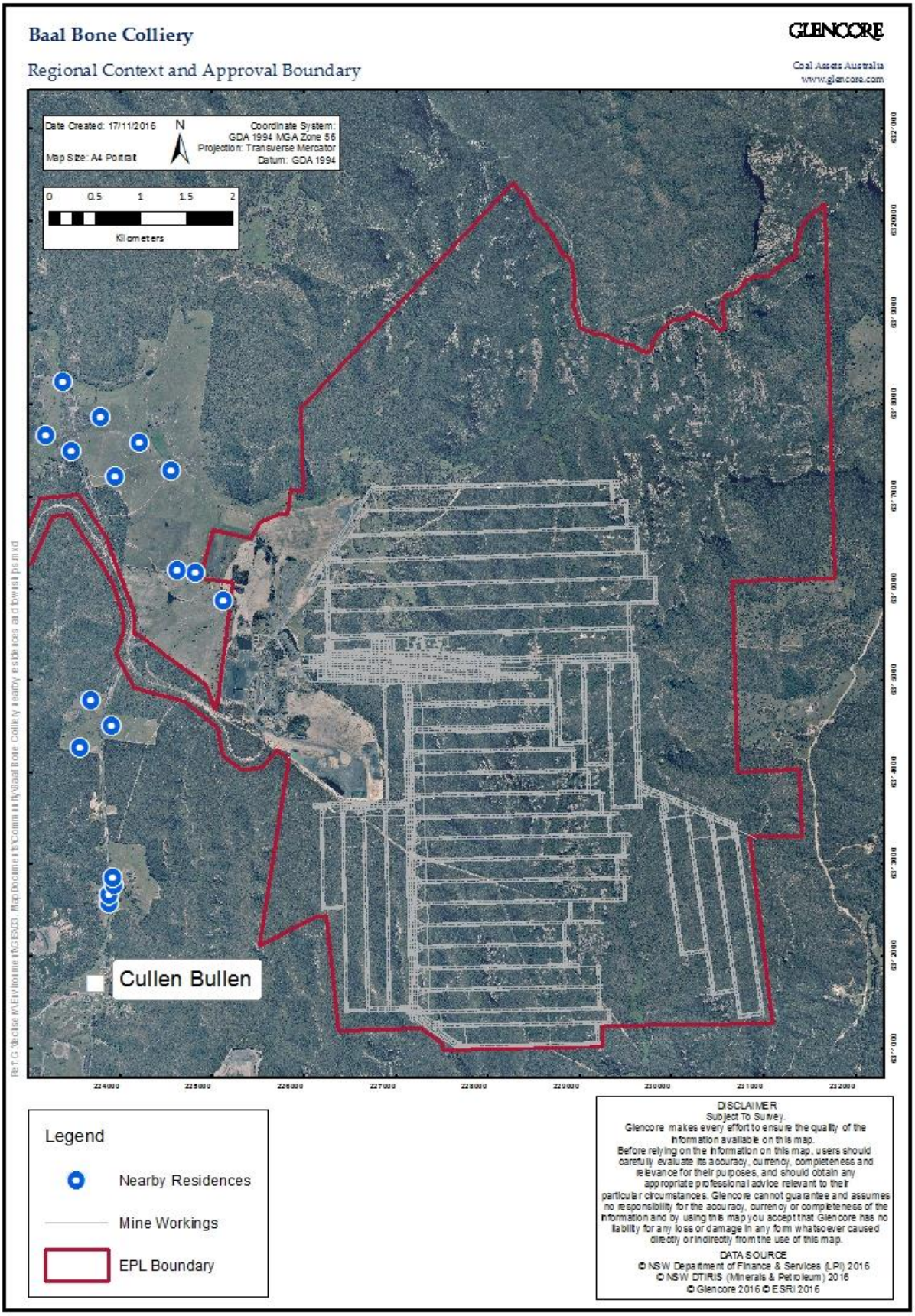


Figure 1.1: Locality plan showing approval boundary.

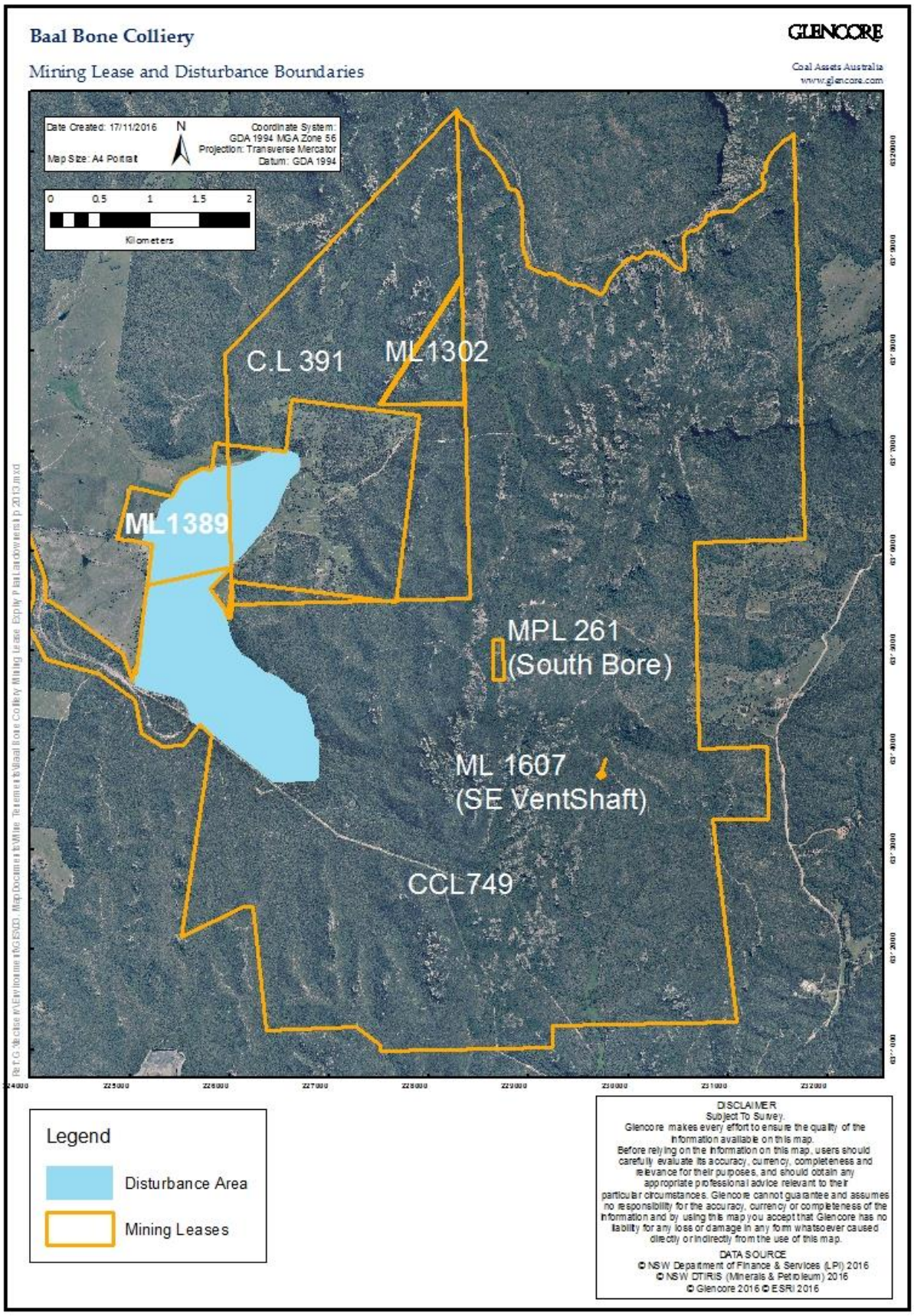


Figure 1.2: Mining lease boundaries and disturbance area.

3 Approvals

A list of all current consents, leases, licences and approvals are included below in **Table 3.1** along with their compliance status for the 2020 calendar year.

Table 3.1: 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	DPIE	07_0035	The Wallerawang Collieries Ltd	24/10/2007	Perpetuity	Part 3A Project Approval for the Ventilation Shaft and Power Line Project.	Yes
	DPIE	09_0178	The Wallerawang Collieries Ltd	14/01/2011	31/12/2014 (Mining operations)	Part 3A Project Approval for continued operations at Baal Bone Colliery.	Yes
	DPIE	09_0178 (MOD 1)	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
	DPIE	09_0178 (MOD 2)	The Wallerawang Collieries Ltd	01/12/2015 Mod 2 Dec 2015	31/12/2019 (Mining operations)[1]	s75W modification to maintain alignment of Ben Bullen Creek.	No – refer to Table 1.2 and Section 11.
Environment Protection Licence	EPA	765	The Wallerawang Collieries Pty Ltd	21/02/2020	Until surrendered, suspended or revoked.	Premises and Scheduled Activity (Coal Mining/ Washery) Licence	No – refer to Table 1.2
Mining Operations Plan	Resources Regulator	09/2520	The Wallerawang Collieries Pty Ltd	20/12/2019	31/12/2025	Mine Closure MOP for Baal Bone Colliery	Yes
Mining Leases	Resources Regulator	CCL 749	The Wallerawang Collieries Pty Ltd	05/04/1990	11/03/2030	Mining Entitlement (Consolidates CL 209, CL 246, CL 329, CL 330, CL331 and CL332) Various depths	Yes
	Resources Regulator	MPL 261 (Act 1973)	The Wallerawang Collieries Pty Ltd	22/08/1990	22/08/2032	Mining Entitlement (Southern mine dewatering bores) Parish: Ben Bullen, Depth: Surface - 10m	Yes

1 Expiry date relates only to mining operations. As per PA 09_0178: *"Under this approval, the Proponent is required to rehabilitate the site and perform additional undertakings to the satisfaction of the Secretary and DRE. Consequently this approval will continue to apply in all other respects other than the right to conduct mining operations until the site has been properly rehabilitated".*

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope	Were all Approval Conditions Complied With?
	Resources Regulator	CL 391 (Act 1973)	The Wallerawang Collieries Pty Ltd	24/02/1992	11/03/2030	Mining Entitlement Parish: Ben Bullen Depth: > 20m	Yes
	Resources Regulator	ML 1302 (Act 1992)	The Wallerawang Collieries Pty Ltd	29/09/1992	11/03/2030	Mining Entitlement Parish: Ben Bullen Depth: >20m	Yes
	Resources Regulator	ML 1389 (Act 1992)	The Wallerawang Collieries Pty Ltd	09/05/1996	11/03/2030	Mining Entitlement Parish: Ben Bullen Depth: Surface – unlimited Surface - 20m	Yes
	Resources Regulator	ML1607	The Wallerawang Collieries Pty Ltd	08/01/2008	11/03/2030	Mining Lease (Purposes) Parish: Cox Depth: Surface – 10m	Yes
S126(1) Approval	Resources Regulator	317524306001	Baal Bone Colliery	14/11/2005	Perpetuity	Section 126(1) of the CMRA (1982) for the construction and operation of REA 5	Yes
S100(1) Approval	Resources Regulator	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
Occupation Permit	Forestry Corporation of NSW	PB 03805 (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
		PB 03800 (14161)	Baal Bone Colliery	08/03/1991	Perpetuity	Occupation Permit for the power line that supplies power to the railway loop - western edge of Ben Bullen SF.	Yes
Water Access Licence	DPI Water	WAL27887	The Wallerawang Collieries Pty Ltd	17/7/2007	Perpetuity	Water Access Licence (under Water Management Act 2000) replaces bore licences: 80BL135509 (near rail loop) and 80BL136703 (near UC1)	Yes

Type	Regulatory Authority	Approval Number	Holder	Issue Date	Expiry/ Review Date	Scope	Were all Approval Conditions Complied With?
	DPI Water	WAL34952	The Wallerawang Collieries Pty Ltd	27/07/2013	Perpetuity	Water Management Act 2000 licence – replaces bore licence 80SL046064	Yes
Bore Licences	DPI Water	80WA706034	The 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	The 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	The Wallerawang Collieries Pty Ltd	19/06/2006	18/06/2016[2]	Section 115 of the Water Act 1912. Bore – Mine dewatering LW 19 (North Bore).	Yes
	DPI Water	10BL601877	The Wallerawang Collieries Pty Ltd	08/06/2007	Perpetuity	BBN175; LW29-31 groundwater monitoring piezometer	Yes
	DPI Water	10BL601816	The Wallerawang Collieries Pty Ltd	08/06/2007	Perpetuity	BBN176; LW29-31 groundwater monitoring piezometer	Yes
	DPI Water	10BL601817	The Wallerawang Collieries Pty Ltd	08/06/2007	Perpetuity	BBN177; LW29-31 groundwater monitoring piezometer	Yes
	DPI Water	10BL601970	The Wallerawang Collieries Pty Ltd	05/09/2007	Perpetuity	BBN 179; LW29-31 groundwater monitoring piezometer	Yes
Acknowledgement of Notification of Hazardous Chemicals on Premises	SafeWork NSW	NDG023231	The Wallerawang Collieries Pty Ltd	13/02/2015	Perpetuity	Dangerous Goods Licence – UG diesel tank and 3 LPG tanks.	Yes

2 In correspondence dated 19/12/2017 DPI Water confirmed that licence 80BL239077 is still valid, despite it being expired. This is due to an administrative issue being addressed by DPI Water. In correspondence dated 2/7/20 DPI Water reconfirmed that the licence is still valid. Note: dewatering from this bore ceased on 17/12/2019 in accordance with EPL 765.

Refer to **Section 10** for details of findings from 2019 Independent Environmental Audit.

3.1 Amendments during the Reporting Period

Mining Operations Plan

On 5 May 2020, Baal Bone Colliery submitted MOP Amendment A to the Resources Regulator for approval. The revised MOP Amendment A:

- Retained the Process Water dam as a water resource for future fire-fighting purposes; and
- Relocated a rock lined drain from the Dirty Water Dam to Ben Bullen Creek and retained a culvert underneath the haul road between reaches two and three of Ben Bullen Creek.

On 7 July 2020, approval for MOP Amendment A was granted by the Resources Regulator.

On 21 December 2020, Baal Bone Colliery submitted MOP Amendment B to the Resources Regulator for approval. The revised MOP Amendment B:

- Retained the Northern Void as a permanent sink.

On 1 March 2021, approval for MOP Amendment B was granted by the Resources Regulator.

Environment Protection Licence

On 21 February 2020, EPL 765 was varied to reinstate LDP11 and corresponding monitoring requirements (under a new EPA identification number: LDP16) to account for potential surface water discharges during the rehabilitation project phase.

4 Operations Summary

4.1 Exploration

There was no exploration activity conducted during the reporting period.

4.2 Land preparation, Mining and Mineral Processing

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

On 20 December 2019 the Baal Bone Colliery Mine Closure Mining Operations Plan (MOP) was approved and the site entered into a mine closure execution phase.

4.3 Demolition

During 2019, eleven entries into the underground mine, and the Longwall 19 ventilation shaft were filled and sealed in accordance with *MDG6001 Guidelines for Permanent Filling and Capping of Surface Entries to Coal Seams.* Adits 1-5 and 8-11 required the demolition of concrete collars. Adit 1 (Main Fan) and Longwall 19 also required the dismantlement of ventilation fans.

Civil contractors were engaged in January 2020 to conduct the demolition and removal of mine infrastructure. The first stage of activities were completed by July 2020 and included the demolition of the Coal Handling Preparation Plant (CHPP), bathhouse and workshop, as well as all coal conveyors, reclaim tunnels, transfer towers, bins, sheds and other associated ancillary infrastructure. The rail loop linking the site to the Main Western Railway line was also decommissioned and all rail lines, ballast and sleepers were removed from the corridor.

Some infrastructure still remains, mainly in the Central Pit Top area. This includes the administration building, workshop and other ancillary infrastructure. This demolition work in this area is scheduled to take place throughout 2021.

5 Actions Required from Previous Annual Review

The 2019 Baal Bone Annual Review was submitted on 31 March 2020. In correspondence dated 6 April 2020, the Department of Planning, Industry & Environment advised *"the Department has reviewed the Annual Review and considers it to satisfy the reporting requirements of the consent in relation to the Annual Review".*

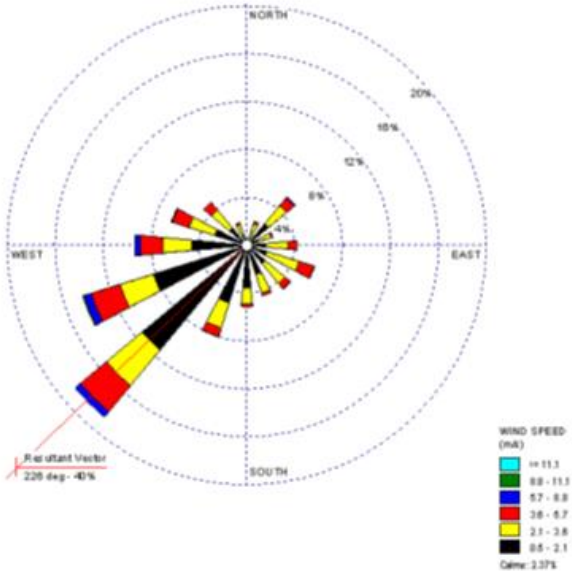
There was no Annual Review meeting or site inspection held during 2020.

6 Environmental Performance

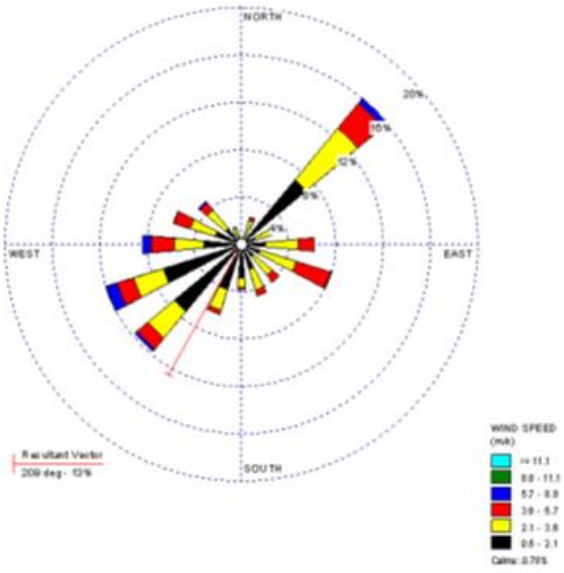
6.1 Air Pollution

6.1.1 Wind speed and direction

As discussed in the **Air Quality Monitoring Program**, local meteorological data for the area was sourced from the Mt Piper Power Station monitoring station to ensure consistency with previous air quality reports. The data shows a predominant northeast / southwest wind axis, although the northeast portion is predominant in the summer months. The annual and summer wind roses are shown in **Figure 5.1**.



Annual Wind Rose



Summer Wind Rose

Figure 6.1: Wind Roses (Mt Piper Power Station Meteorological Station)

6.1.2 Dust Monitoring and Sample Locations

Monthly dust deposition monitoring is carried out in accordance with Australian Standard AS3580.10.1 and EPL requirements.

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.**

6.1.3 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 6.1: 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 $\mu g/m^3$	
PM_{10}	24 hour (suspended)	50 $\mu g/m^3$	
	Annual (suspended)	30 $\mu g/m^3$	

Levels of deposited dust were monitored in accordance with the air quality impact assessment criteria. Results of deposited dust monitoring conducted during the 2020 reporting period provided below.

Table 5.2: Deposited dust monitoring results for 2020 (g/m^2/month)

Collection Date	EPL Point 7 DM1	EPL Point 13 DM2	EPL Point 14 DM3	EPL Point 15 DM4
16-Jan-20[3]	6.8	7.2	8.2	12.1
17-Feb-20	2.4	4.3	3.6	3.7
17-Mar-20	1.2	1.0	1.2	0.9
16-Apr-20	0.2	0.5	0.5	0.2
14-May-20	0.7	0.7	0.7	0.7
15-Jun-20	2.0	0.2	0.2	0.3
13-Jul-20	0.5	0.7	0.3	0.2
10-Aug-20	0.3	0.4	0.3	0.2
9-Sep-20	0.8	0.3	0.2	0.2
8-Oct-20	1.4	0.4	0.4	0.4
9-Nov-20	1.4	0.3	0.4	0.3
8-Dec-20	0.6	0.6	0.7	0.8

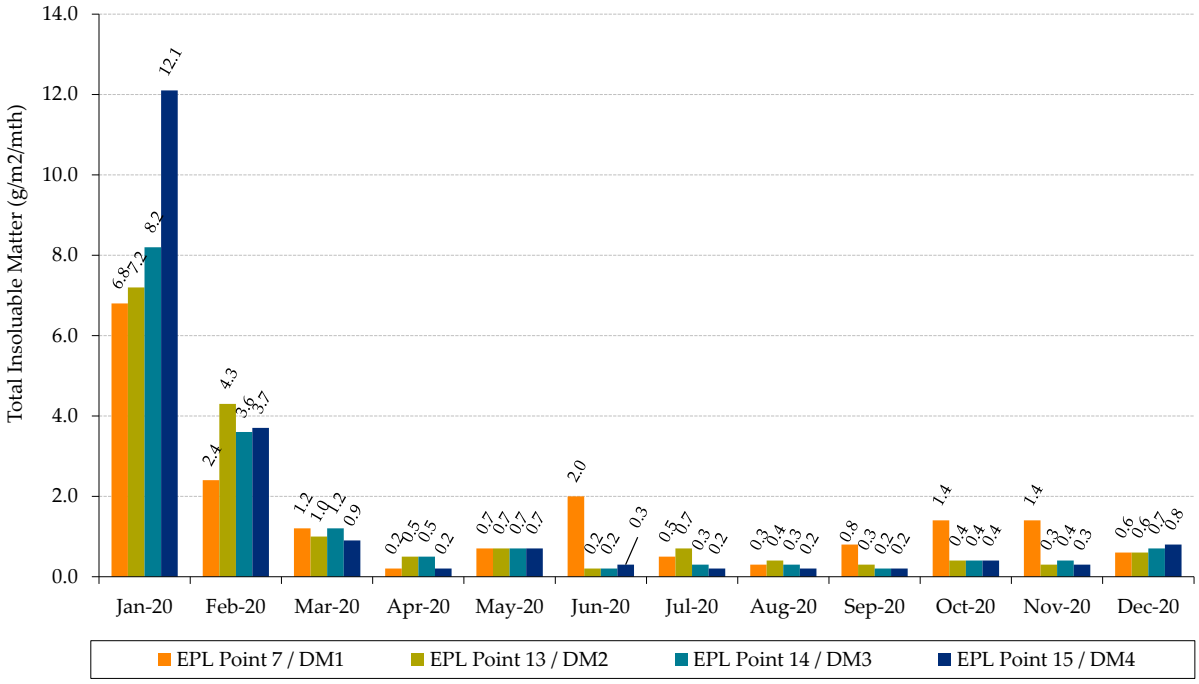


Figure 6.2: 2020 Deposited Dust Monthly Monitoring Results

[3] High deposited dust results were recorded in all dust gauges in January/February 2020, predominantly due to the 2019-20 bushfires in the area (Gospers Mountain fire).

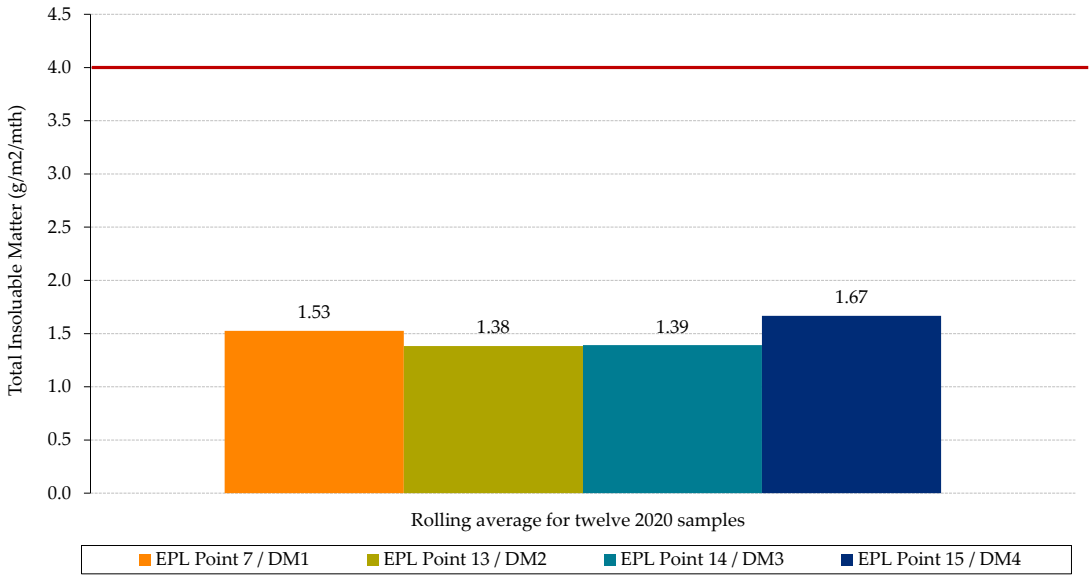


Figure 6.3: 2020 Annual Average Deposited Dust Results

Dust monitoring results for 2020 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 high deposited dust results were recorded in all dust gauges in January/February 2020 (predominantly due to bushfires in the area), when the annual average is applied all results are well within Project Approval limits –refer to **Figure 6.3**.

6.1.4 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 6.4** shows the annual averages for DM1 – DM5 for the period 2011 to 2020.

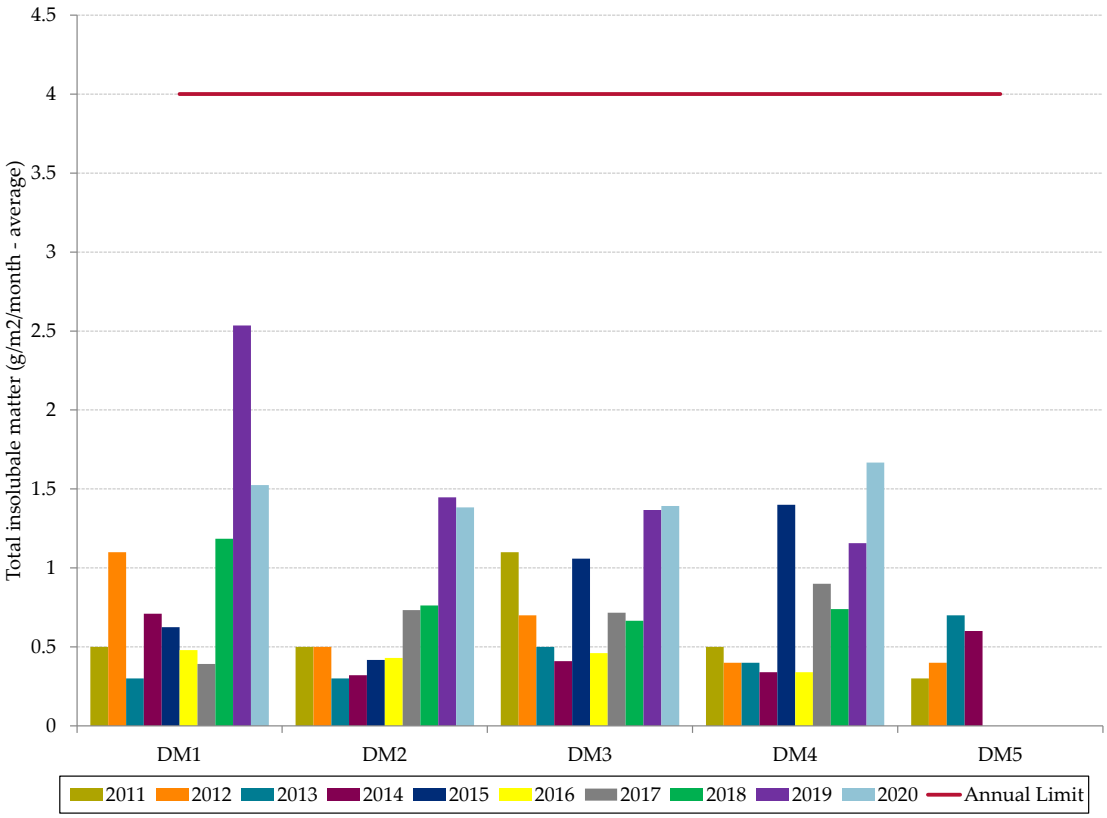


Figure 6.4: 2011 to 2020 Deposited Dust Monitoring Results

6.1.5 Comparison against EA

Levels of air quality pollutants as predicted under the EA are presented in below. **Table 6.3** 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 6.3** 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 6.3: Maximum predicted pollutant results at the discrete sensitive receptors (AECOM, 2010).

No.	TSP (ug/m³)		PM_{10} (ug/m³)			Deposited Dust (g/m²/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

No.	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
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 6.3**. The deposited dust monitoring results at DM2 during the reporting period, presented in **Section 6.1.3**, 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.

6.2 Blasting

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

6.3 Operational Noise

For the purpose of assessing the compliance status of site with licence noise limits, a site attended audit and noise measurements were conducted on Tuesday 30 July 2020, during the day, evening and night periods by Global Acoustics.

The audit report concluded that:
"Attended environmental noise monitoring described in this report was undertaken during the day, evening, and night periods of 30 July 2020. The purpose of the survey is to quantify and describe the acoustic environment around the site and compare with specified limits. There were no exceedances, complaints or noise related incidents recorded by BBC since the previous monitoring was carried out (July 2019). Noise levels from BBC complied with the relevant noise limits during the July 2020 survey. Criteria may not always be applicable due to meteorological conditions at the time of monitoring."

Full noise audit reports can be accessed from the Baal Bone publications webpage at: *https://www.glencore.com.au/operations-and-projects/coal/past-operations/baal-bone-colliery/reporting-documents*.

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

6.3.1 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.

6.4 Aboriginal and European Heritage

6.4.1 Aboriginal Heritage

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

Schedule 3, Condition_26 of the Project Approval granted in January 2011 required that the ACHMP be updated in accordance with the EA. The ACHMP was subsequently revised in July 2011 in accordance with Condition 26. The ACHMP was last reviewed during 2019.

6.4.2 European Heritage

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

6.4.3 Comparison against EA

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

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

On 7 December 2020 BBC-RS1 was inspected again by Baal Bone personnel with no issues found.

6.5 Natural Heritage

No natural heritage sites have been identified within the Baal Bone mining lease.

6.6 Mine Subsidence

The SMP for development and extraction of LW 29-31 expired on 1 December 2014 with mining operations in the LW 29-31 area completed on 3 September 2011.

Historic subsidence results can be found in Subsidence Status Reports published on the Baal Bone website in the following location: *https://www.glencore.com.au/operations-and-projects/coal/past-operations/baal-bone-colliery/reporting-documents*.

6.7 Hydrocarbon Contamination

Baal Bone Colliery conducts six-monthly testing of groundwater monitoring wells in the vicinity of the underground diesel storage tank (UST). Refer to **Plan 3** and **Plan 4** for locations.

Six-monthly testing of the groundwater monitoring wells has occurred since 2013. The results of this monitoring program acknowledge that previous activities at the site have resulted in contamination of shallow groundwater. The contamination is localised and associated with the known point source, the fuel storage area.

In late 2017 analysis of results from the groundwater monitoring wells (MW) in the vicinity of the underground diesel UST showed that when compared with the prior groundwater monitoring results there was an increase in total recoverable hydrocarbon (TRH) fractions within MW01 (the MW closest to the UST) and results were above the adopted criteria. There were no significant changes in results for MW03 and MW101. As a result an investigation was carried out and more frequent sampling of the groundwater wells conducted.

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

Groundwater sampling of the monitoring wells in June 2018 sampling found that TRH levels at MW01 had increased significantly since the March 2018 sampling. MW03 and MW101 continued to return consistently low concentrations of TRH. Due to the continued increases of TRH at

MW01, use of the underground diesel storage tank was discontinued in mid-2018 and an alternate small capacity above ground tank was utilised.

The groundwater monitoring wells were sampled again in November 2018, demonstrating a significant decrease in TRH levels at MW01.

Subsequently in May 2019, use of the diesel UST was recommenced due to mine closure works and increased diesel usage. Groundwater monitoring wells were sampled on an increased frequency during the remainder of 2019 and into 2020. Results show that MW03 has continued to return consistently low concentrations of TRH (MW101 has been unable to be sampled since mid-2019 due to damage to the well). MW01 TRH levels during 2019 and 2020 were broadly consistent with historical levels, with the exception of an increase noted in November 2019. Since November 2019 TRH levels at MW01 have steadily declined. Sampling will continue during 2021 at a reduced frequency of every six months. The UST will be removed as part of closure activities during 2021.

Results for TRH at MW01 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.

As per the Mine Closure MOP 2019-2025 the Remedial Action Plan (GHD, 2017) identifies the pit top area and CHPP area as the two locations where potential soil contamination issues have been found. The Remedial Action Plan outlines the proposed remediation, procedures and standards that will be followed during mine closure to ensure the successful remediation of the site.

On the basis of the evaluation presented in the Remedial Action Plan (GHD, 2017), the remediation strategy is bioremediation with re-use of validated land farm materials on site. This method will involve the excavation of all contaminated soils and removal to a designated area onsite which has been configured as a land farm for bioremediation in consultation with the EPA. The validated materials will be re-used on site. The areas to be remediated include the pit top area and CHPP area.

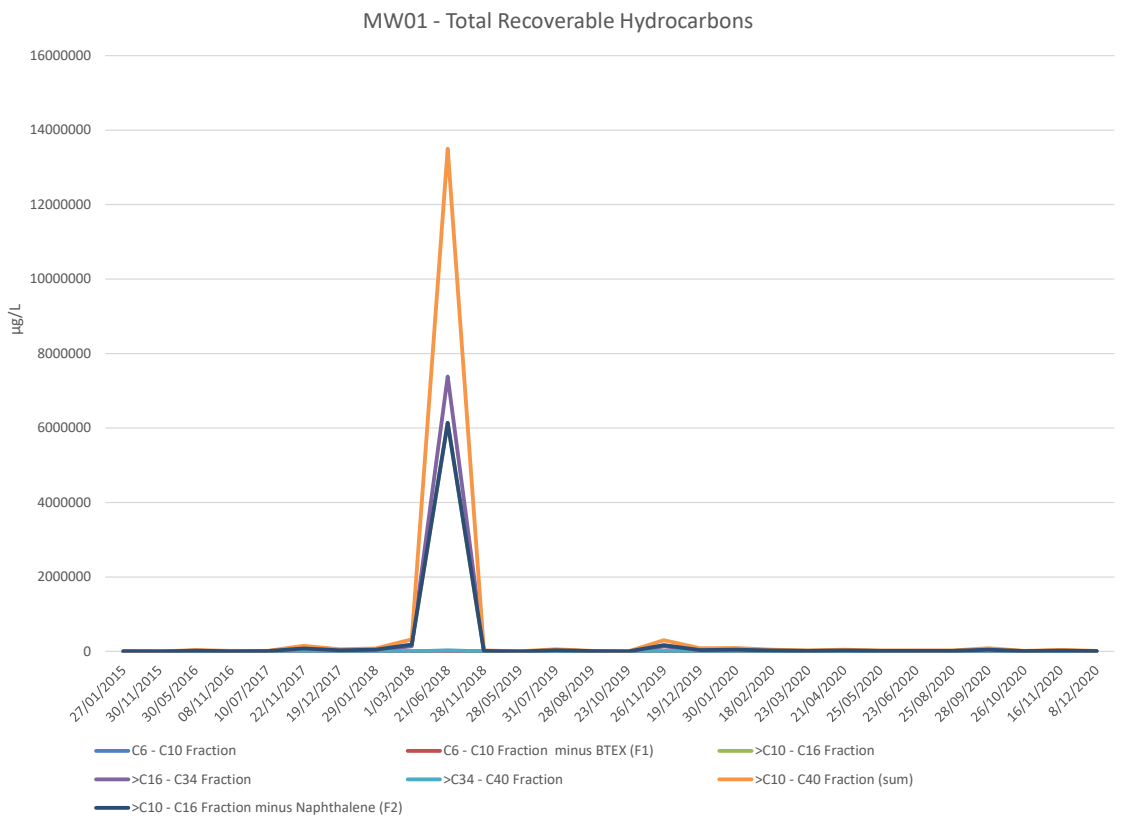


Figure 6.6: TRH results for MW01 (2015 to 2020)

6.8 Methane Drainage and Ventilation

On 16 September 2019, the main ventilation fan was isolated and disconnected. During 2019, longwall 19 ventilation shaft and adits 1-11 were filled and sealed.

6.9 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.

6.10 Visual Amenity and Lighting

During 2020 the majority of structures onsite, including the coal handling and preparation plant, overhead conveyors and rail infrastructure were demolished as part of mine closure activities. As at end 2020, the administration building, workshop and electrical substation were the main infrastructure not yet demolished.

6.11 Weed and Pest Management

During 2020 Baal Bone Colliery engaged Apex Predator Solutions to conduct a wild dog baiting program.

7 Water Management

7.1 Surface Water

EPL 765 licensed monitoring points are provided in the **Table 7.1** below. The location of monitoring points can be seen **in Plan 2.**

Note: In February 2020, EPL Monitoring Point 11 was replaced by EPL Monitoring Point 16 (BBLDP1), and EPL Monitoring Point 12 (WMP1) was removed.

Table 7.1: EPL Licenced Monitoring Points

EPA Identification No.	Type of Monitoring Point	Description of Location
2	Discharge water quality monitoring	Sewage Transpiration Bed labelled as 'BBLD2'
12	Upstream quality monitoring	Ben Bullen Creek upstream of active surface mining area, labelled as 'BBWMP1'
16	Discharge to waters	Ben Bullen Creek downstream of active surface mining area, labelled as 'BBLDP1'

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 7.2: Baal Bone Colliery water monitoring locations and monthly analysis during 2020

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
BBWMP1 **(removed February 2020)**	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
BBLDP16 (BBLDP1)	EPL Monitoring Pt No.16. Immediately below the pipe outlet or in stilling pool below spillway of overshoot dam (Previously BBLDP1/EPL Monitoring Pt No. 11)	Monthly during discharge	EC, oil & grease, sulphate, iron, TSS, pH, flow rate, hardness, MBAS, nitrogen, phosphorus	Oil & grease, pH, dissolved iron, TSS
BBPOT	Potable water from main kitchen in Administration	Monthly	pH, EC, Hardness, heterotrophic standard plate count, total coliforms, E coli, Pseudomonas	N/A
BBDW	Dirty water dam	Monthly	EC, Iron, oil & grease, pH, Sulphate, TSS	N/A

Sample Name	Sample Location	Frequency	Pollutants Analysed	EPL Limits Apply
BBPRW	Process water dam	Monthly	EC, Iron, oil & grease, pH, Sulphate, TSS	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

7.1.2 Interpretation and Review of Monitoring Results

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

Table 7.3: EPL concentration limits

Pollutant	BBLD2 (EPL Monitoring Point 2)	BBWMP1 (EPL Monitoring Point 12)	BBLDP16/BBLDP1 (EPL Monitoring Point 16)
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 7.4**, and **Figures 7.1 to 7.4**. Samples were taken monthly during discharge in accordance with the EPL.

Table 7.4: 2020 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
BB 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*
BB WMP1	Jan	*Dry*	*Dry*	*Dry*		*Dry*	*Dry*	Sample not required			
	Feb	*Dry*	*Dry*	*Dry*		*Dry*	*Dry*				
	Mar	*Dry*	*Dry*	*Dry*		*Dry*	*Dry*				
	Apr	*Dry*	*Dry*	*Dry*		*Dry*	*Dry*				
	May	*Dry*	*Dry*	*Dry*		*Dry*	*Dry*				
	June	*Dry*	*Dry*	*Dry*		*Dry*	*Dry*				
	July	*Dry*	*Dry*	*Dry*		*Dry*	*Dry*				
	Aug	*Dry*	*Dry*	*Dry*		*Dry*	*Dry*				
	Sep	*Dry*	*Dry*	*Dry*		*Dry*	*Dry*				
	Oct	*Dry*	*Dry*	*Dry*		*Dry*	*Dry*				
	Nov	*Dry*	*Dry*	*Dry*		*Dry*	*Dry*				
	Dec	*Dry*	*Dry*	*Dry*		*Dry*	*Dry*				
BB LDP16 (LDP1)	Jan	1018	**11**	370	0.06	<5	7.9	Sample not required			
	Feb	980	<5	354	<0.05	<5	6.9				
	Mar	1025	<5	382	0.06	<5	7.3				
	Apr	910	<5	344	0.05	5	7.0				
	May	885	<5	332	<0.05	6.0	6.9				
	June	932	<5	345	<0.05	<5	7.2				
	July	962	<5	398	<0.05	6.0	7.0				
	Aug	673	<5	261	**1.68**	18.0	6.5				
	Sep	769	<5	275	<0.05	<5	7.0				
	Oct	790	<5	255	0.09	<5	6.8				
	Nov	931	<5	290	0.06	<5	7.2				
	Dec	839	<5	305	<0.05	<5	7.2				

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

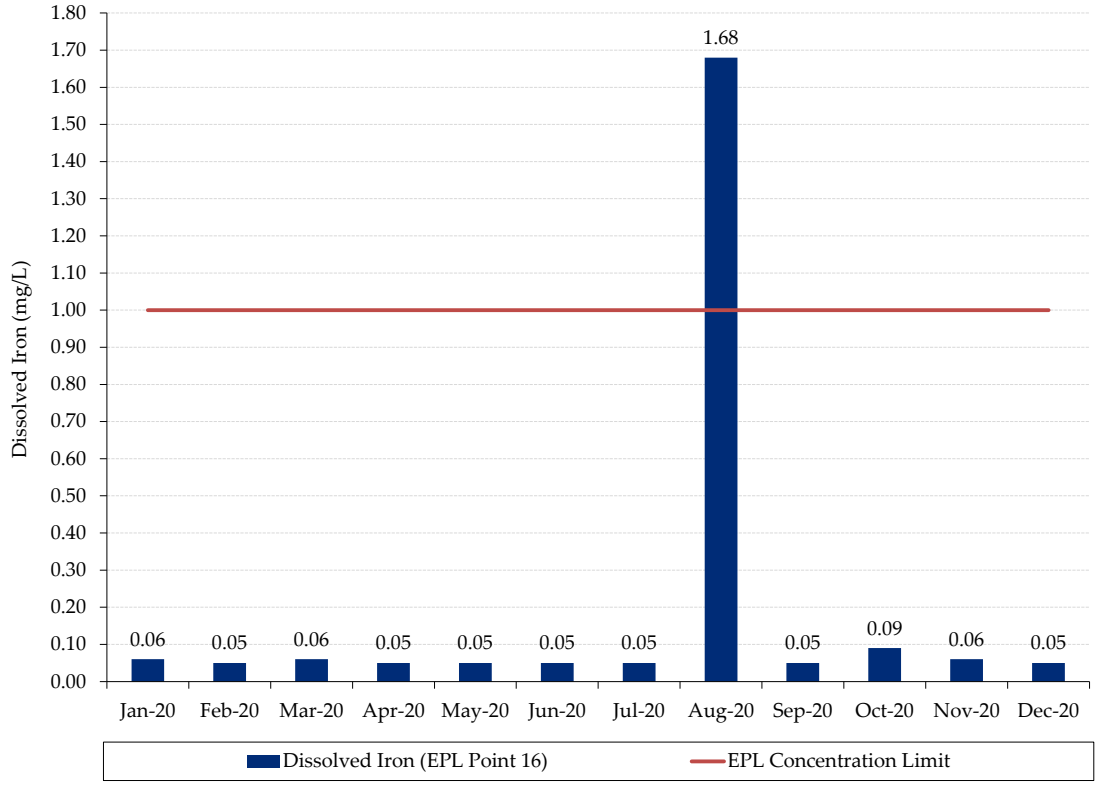


Figure 7.1: Dissolved Iron

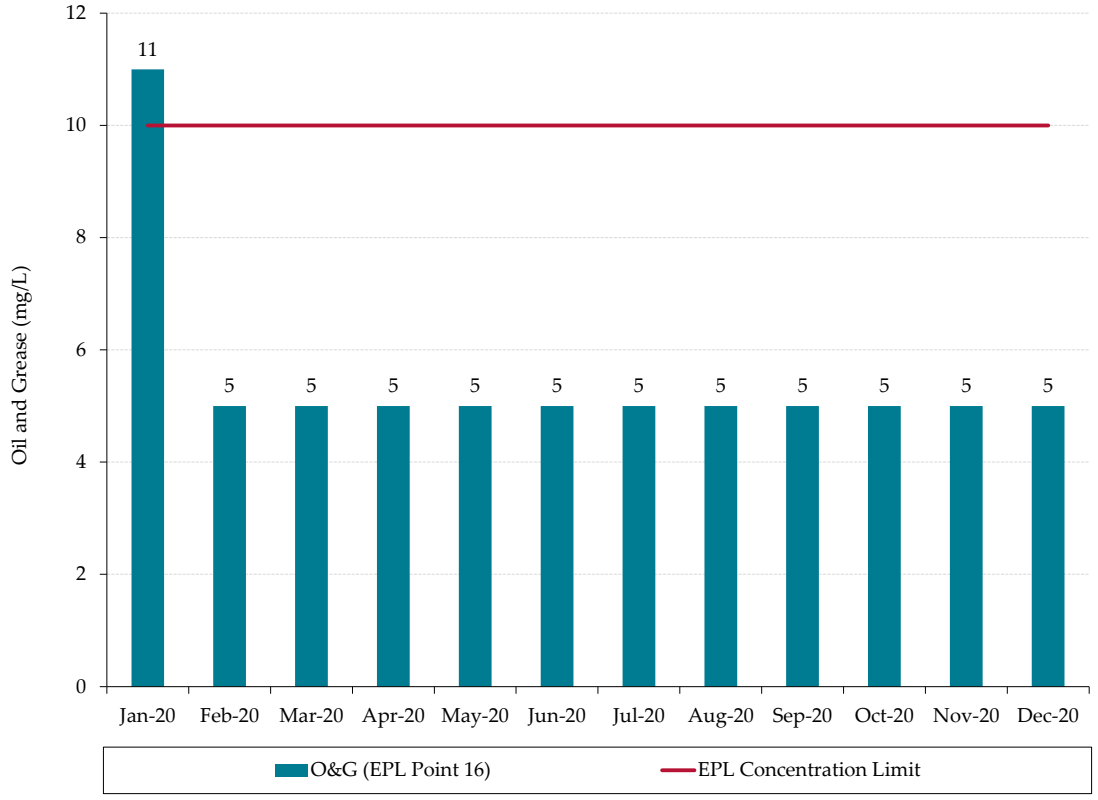


Figure 7.2: Oil & Grease

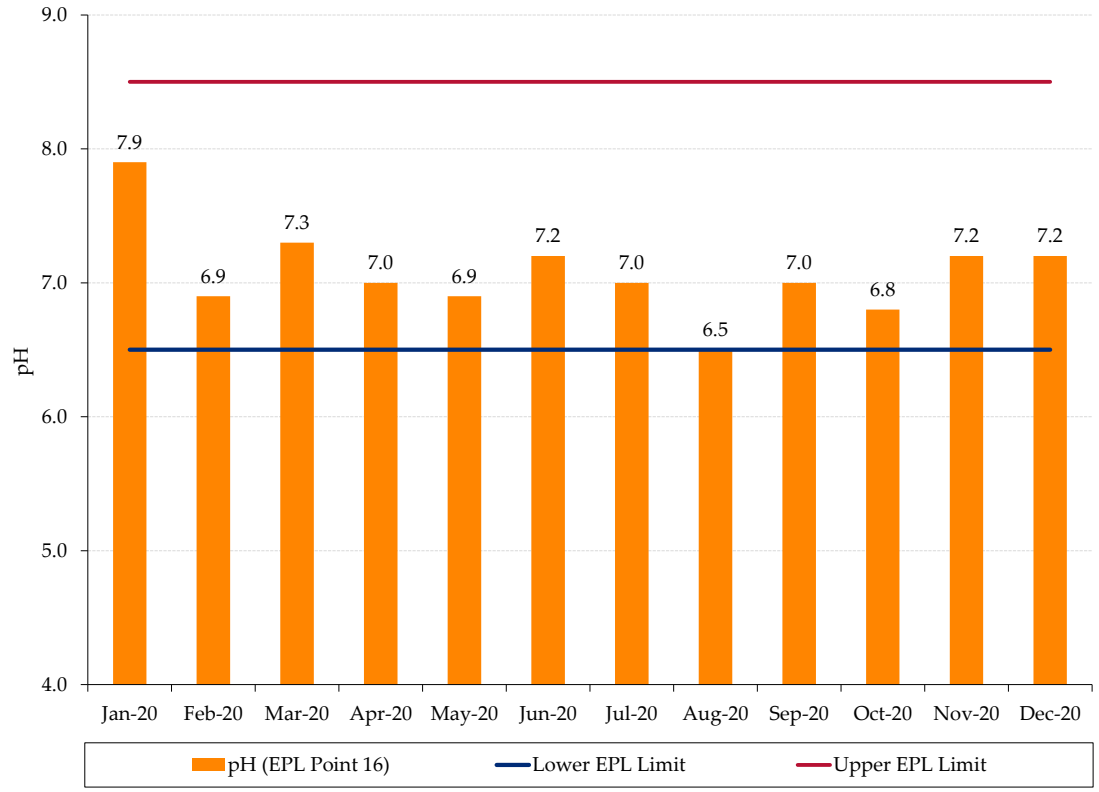


Figure 7.3: pH

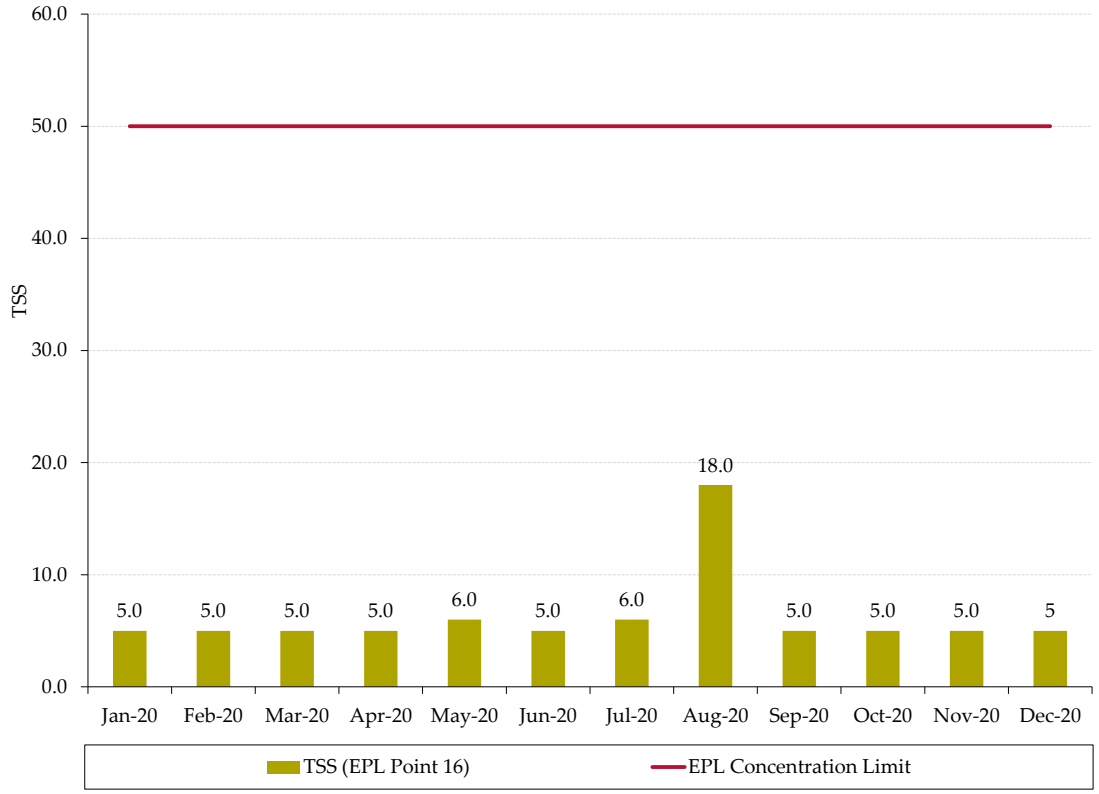


Figure 7.4: Total Suspended Solids

A summary of monitoring results for EPL discharge and monitoring points (those with specified concentration limits) can be found below for the 2020 reporting period:

- 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;
- Oil and grease levels were below the EPL concentration limit of 10mg/L with the exception of the January 2020 result at EPL Point 16 (BBLDP16) which returned an elevated result:
    - Oil and grease levels in the sample taken on 22 January 2020 exceeded the EPL concentration limit of 10mg/L, with a result of 11 mg/L.
    - A written report was sent to the Environment Protection Agency and the Department of Planning, Industry and Environment on 19 February 2020 regarding the oil and grease exceedance.
    - Response received from EPA on 21 February 2020 stating no further action required unless other exceedances occur.
    - An investigation was undertaken into this exceedance which found that potential contributors may have been the extended dry spell and recent rainfall, the bushfires moving through the area as well as vehicles and machinery on site.
    - Oil and grease levels for the remainder of 2020 were below the EPL concentration limit.
- Dissolved iron results were below the EPL concentration limit, except for the sample taken on 25 August 2020 at EPL Point 16 (BBLDP16) which returned an elevated result for dissolved iron:
    - EPL 765 has a concentration limit of 1.0 mg/L for dissolved iron. The analysis of the sample identified that there was a concentration level of 1.68 mg/L dissolved iron.
    - Initial notification to Environment Protection Agency and the Department of Planning, Industry and Environment (DPIE), DPIE – Resources Regulator and National Resource Access Regulator took place on 8 September 2020. A subsequent investigation report was provided to the same Regulators on 14 September 2020.
    - EPA responded to written report on 15 September 2020 stating: "the EPA considers it appropriate to report this non-compliance in your Annual Return and continue to maintain ongoing monitoring as required".
    - Actions undertaken include: checking the result with the lab, and retesting the sample; conducting additional water sampling across the site during September 2020; regular inspections; and the application of lime to the Overshot Dam to raise pH.
    - Dissolved iron levels for the remainder of 2020 were below the EPL concentration limit.

- Monthly EPL reporting can be accessed here: *https://www.glencore.com.au/operations-and-projects/coal/past-operations/baal-bone-colliery/reporting-documents*.

7.1.3 Comparison against previous Annual Reviews

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

Table 7.5: Water quality results 2006 - 2020

Annual Review Year	Iron	Oil and Grease	pH	TSS
2006	One minor exceedance at BBLDP16.	Compliant	Compliant	Compliant
2007	One erroneous exceedance at BBLDP16 of 5.4mg/L in August 2007 – retesting showed compliant level of 0.9mg/L	Compliant	Compliant	One erroneous exceedance at BBLDP1 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 BBLDP16 of 2mg/L in February 2010.	Compliant	Compliant	Compliant
2011	2 exceedances at BBLD6 in April and October and 1 exceedance at BBLDP16 in June 2011 of 1.2, 1.2 and 3mg/L respectively.	Compliant	Compliant	Compliant
2012	1 exceedance at BBLD6 of 2mg/L in September 2012.	Compliant	Compliant	Compliant
2013	Compliant	Compliant	Compliant	Two Total Suspended Solids (TSS) exceedances at BBLDP3 (60mg/L) and BBLDP6 (85mg/L) in February
2014	Total iron recorded in Jan 2014 at BBLDP16 was 1.11mg/L. However note that EPL limit is for *dissolved iron.* Sampling routine changed to include dissolved iron.	Compliant	Compliant	Compliant
2015	Compliant	Compliant	Compliant	Compliant
2016	Compliant	Compliant	Compliant	Compliant
2017	Compliant	Compliant	Compliant	Compliant
2018	Compliant	Compliant	Compliant	Compliant
2019	Compliant	Compliant	Compliant	Compliant
2020	Dissolved iron level exceedance of 1.68mg/L in August at BBLDP16.	1 exceedance at BBLDP16 in January.	Compliant	Compliant

Occasional exceedances of iron have been recorded in 2006, 2010, 2011, 2012, 2014 and 2020. 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 7.5 – 7.8 illustrate the long term trends for dissolved iron, oil and grease, pH and total suspended solids at current EPL monitoring points. Note that there has been no flow recorded at

BBWMP1 and BBLD2 during the reporting period. Furthermore EPL monitoring points BBLD3 and BBLD6 were removed in 2013.

Figure 7.5 shows the iron level recorded at BBLDP16 from 2014 to 2020. From 1 August 2013 EPL 765 specified a *dissolved* iron concentration limit of 1 mg/L at BBLDP16. Prior to this time, the iron concentration limit at BBLDP16 was 1 mg/L of *total* iron. Between 2014 and 2020 there has been one exceedance of the EPL dissolved iron concentration limit, in August 2020, with a reading of 1.68 mg/L. An investigation which included follow up testing of BBLDP16 and examination of water transfers could find no definitive reason for the isolated spike in iron levels.

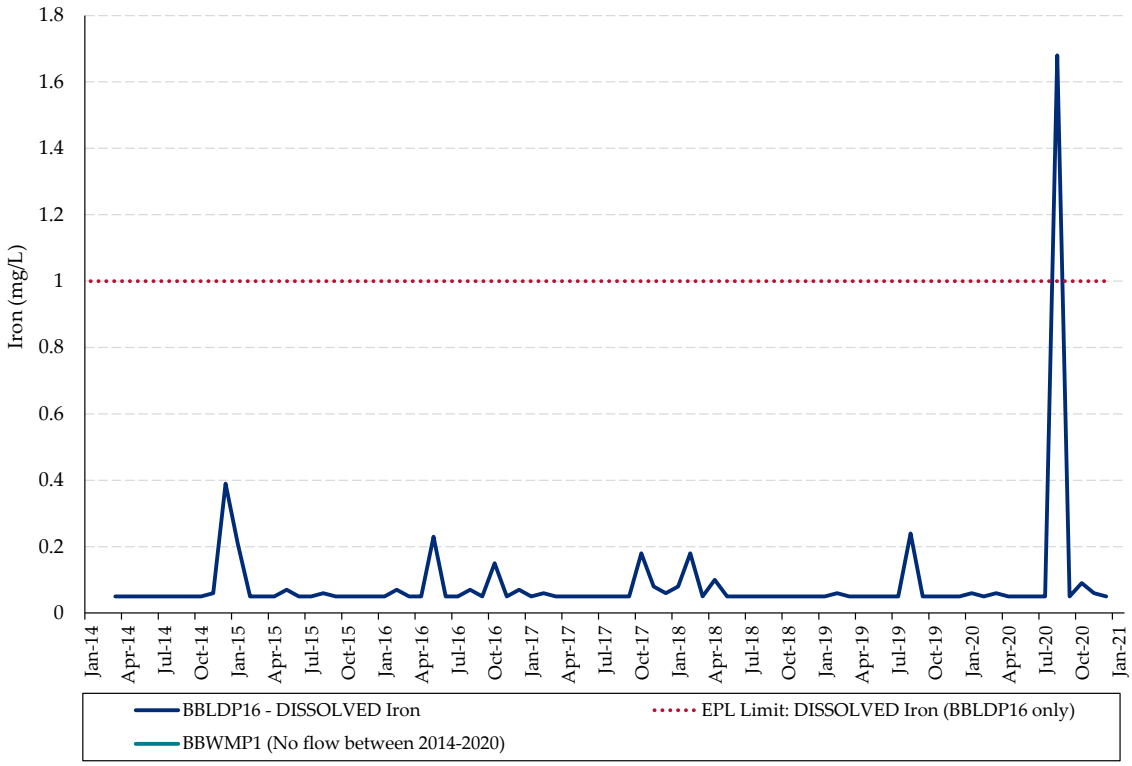


Figure 7.5: Iron – Total and Dissolved (2014 – 2020)

Figure 7.6 shows oil and grease levels from 2011 to 2020 at BBLD2 and BBLDP16. All oil and grease levels at BBLDP16 during 2011 – 2020 have remained well below the EPL limit of 10 mg/L, with the exception of January 2020.

Oil and grease levels in the sample taken on 22 January 2020 exceeded the EPL concentration limit of 10mg/L, with a result of 11 mg/L. An investigation was undertaken into this exceedance which found that potential contributors may have been the extended dry spell and recent rainfall, the bushfires moving through the area as well as vehicles and machinery on site. Refer to **Section 7.1.2** for further information.

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 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.

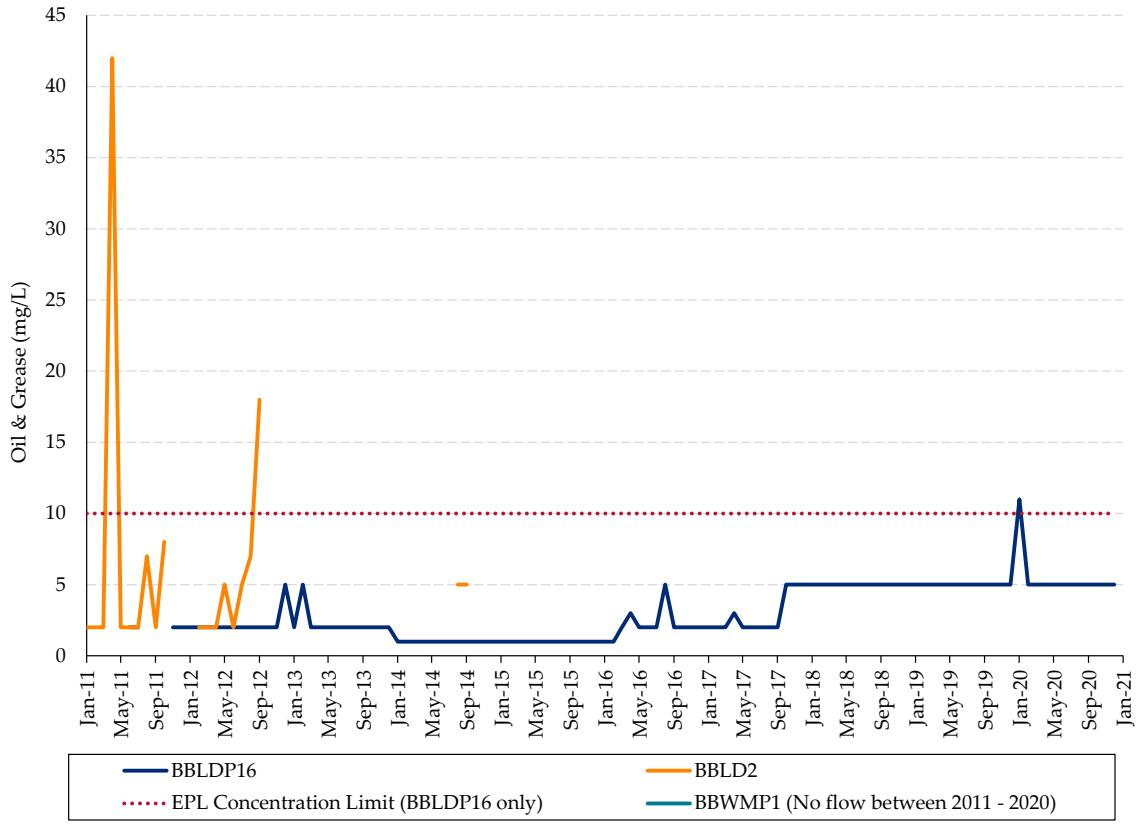


Figure 7.6: Oil and grease levels from 2011 to 2020

Figure 7.7 shows pH levels at BBLDP16 and BBLD2 between 2011 and 2020. All BBLDP16 pH levels during the reporting period were between the upper and lower EPL pH limits of 6.5 and 8.5.

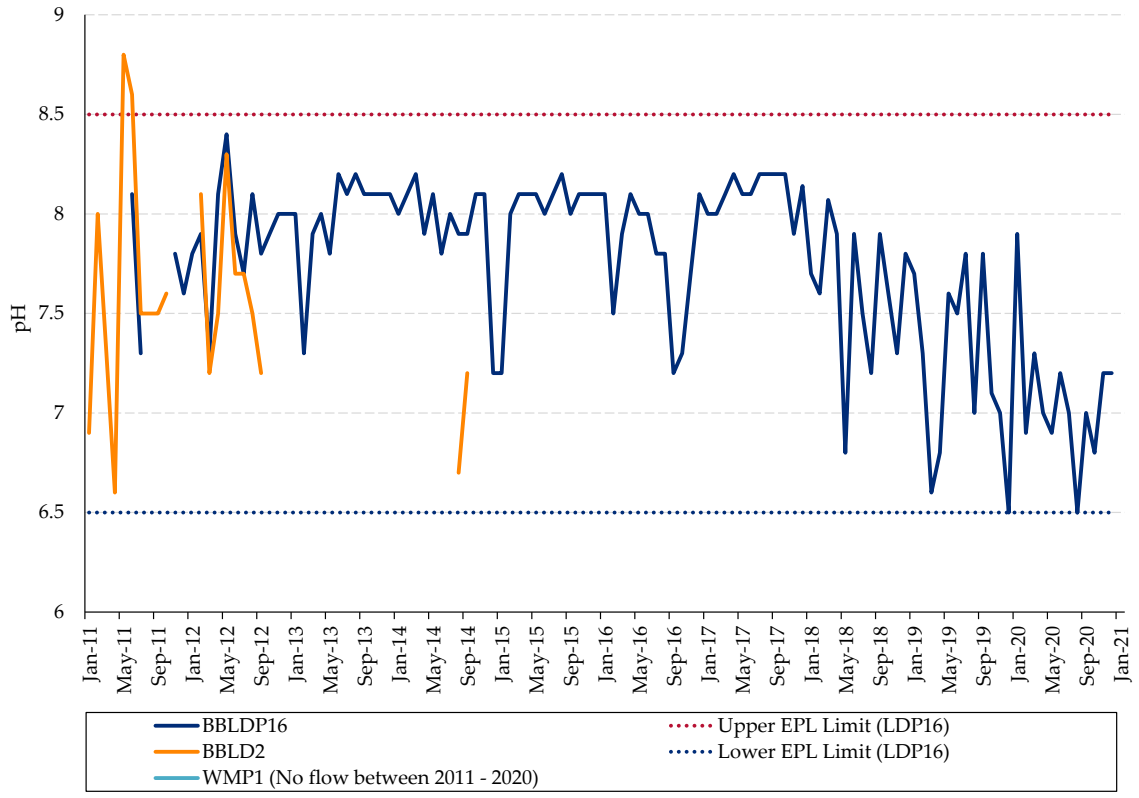


Figure 7.7: pH levels from 2011 to 2020

Figure 7.8 shows the total suspended solids at BBLDP16 and BBLD2 between 2011 and 2020. All results recorded for BBLDP16 are well below the EPL concentration limit of 50 mg/L.
In 2013, 2014 and 2015 a slight increase in TSS levels at BBLDP16 was noted during November/December, possibly due to seasonal changes.

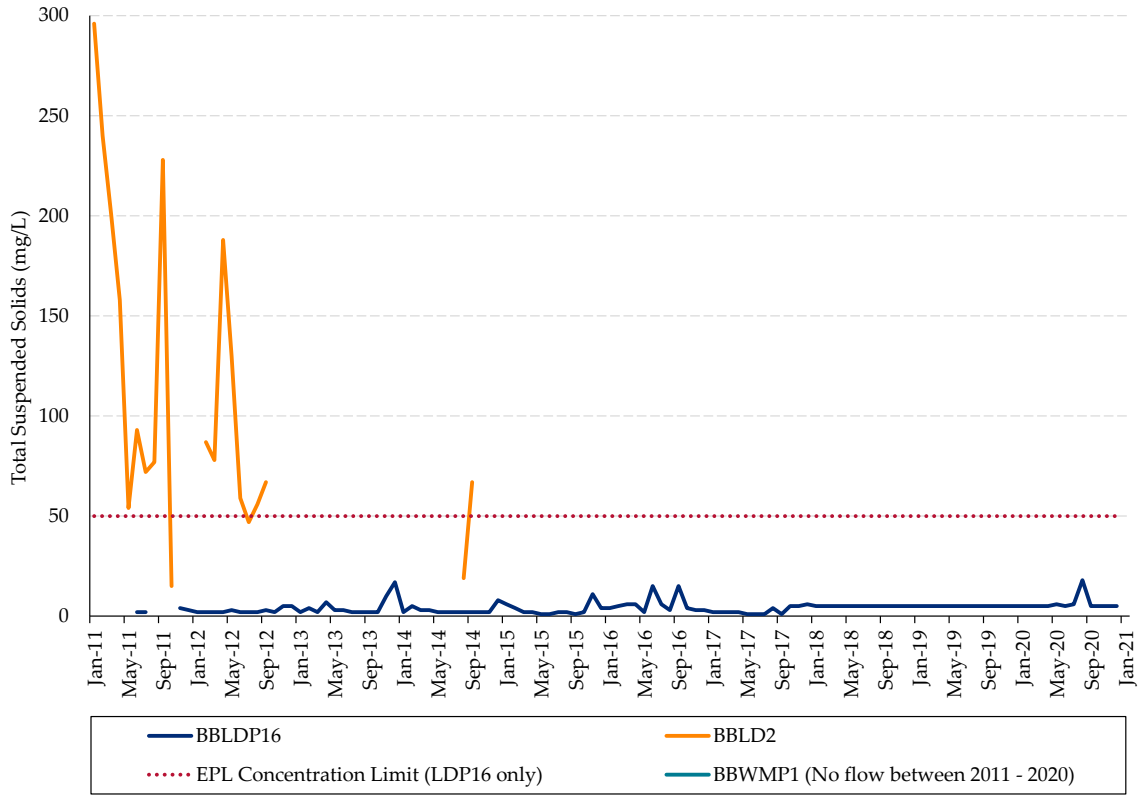


Figure 7.8: Total suspended solids levels from 2011 to 2020

7.1.4 Comparison against EA

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

7.2 Groundwater

Section 3 outlines the water bore and piezometer licences held by Baal Bone Colliery.

7.2.1 Groundwater Extraction

Mine water discharge from EPA Licenced Discharge Point LDP11 (now BBLDP16) ceased on 17 December 2019 in accordance with EPL Licence No. 765, Special Condition E2 which required this to occur prior to 31 December 2019.

Historical groundwater extraction is reported in previous Annual Reviews available here: *https://www.glencore.com.au/operations-and-projects/coal/past-operations/baal-bone-colliery/reporting-documents*.

Table 7.6 Groundwater Extraction

Water Licence	Water sharing plan, source and management zone	Entitlement (Unit Shares)	Water Approval Number/ Water Supply Works	TOTAL Water Take
WAL 27887	NSW Murray Darling Basin Porous Rock Groundwater Sources	750 units	80WA706118	Nil
WAL 34952	Macquarie Bogan Unregulated and Alluvial Water Sources	25 units	80WA716836	Nil

7.2.2 Groundwater Monitoring

Baal Bone Colliery monitors groundwater levels and groundwater chemistry in six piezometers in and around Cox's River Swamp (**Appendix A -Plan 5)**.

Monitoring data in the six piezometers (four aquifer and two swamp/alluvial) are presented in **Figure 6.9 to Figure 7.5**. 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 7.7: 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	• Notify the Baal Bone Colliery Environment and Community Manager (ECM), or delegate; • Review all groundwater pumping data; • Identify if the installation of additional piezometers is required; • Investigate any external influence which may be affecting the results including climatic data; and • Review operations and investigate for links to operational activities.	• Review the frequency of groundwater monitoring in the affected area; and • Notify and consult with relevant government agencies on investigation and outcomes (e.g. DPI Water, DPIE, 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).

Trigger	Action	Response	Plan	Timeframe
the previous data or groundwater model predictions; or • Annual review of the depressurisation of the coal measures shows an adverse impact from the previous data or groundwater model predictions.				

Table 7.8: 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 ECM, or delegate; • Review monitoring results against historical monitoring data; • Review recent monitoring results for adjacent monitoring sites; • Review any relevant operational data (i.e. clearing activities, UG mining activities, meteorological data etc.); • Determine if an incident has potentially occurred; • Complete investigation IF Investigation reveals actual or potential material harm to the environment, the EO (together with the Ops Mgr) will initiate the PIRMP[4] immediately. • Inform regulatory agencies as required.	• A remedial action plan is developed and implemented to address the investigation findings. • Remedial action plan could include: o Increase monitoring frequency where relevant; o Undertake additional monitoring (stream health monitoring, etc.) if necessary. o Corrective/preventative actions based on the outcomes of the investigation and/or additional monitoring;	• Follow up information is provided to regulatory agencies as requested; and • A summary of monitoring results, investigations and remedial actions plans are 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.

[4] PIRMP- Pollution Incident Response Management Plan

Table 7.9: 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.

7.2.3 Groundwater Levels

Rainfall deficit and groundwater levels in the six groundwater monitoring piezometers are presented in **Figure 7.9**. Long term trends of groundwater levels and daily rainfall are shown in **Figure 7.10.**

Rainfall deficit is plotted on **Figure 7.9.** 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 than 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 2020, the rainfall deficit has seen a general upwards trend. Six months during 2020 saw monthly rainfall totals above long term averages. In January 2020 the deficit was -1171 mm, compared to -967 mm by end 2020. The total rainfall received in Lithgow during 2020 was 1038 mm, which is 179 mm more than the long term average annual rainfall in Lithgow of 859 mm, or 120% of the long term average rainfall.

The water levels in all the bores (BBPB1 – BBPB5) have seen a general increase during 2020, which is interpreted to be due to wetter conditions compared to previous years.

BBPB6 was recorded as dry from February 2018 until groundwater levels dropped throughout 2017 in response to the dry conditions, and in February 2018 the piezometer has been recorded as dry. BBPB6 has remained dry from February 2018 until July 2020. From August 2020 until end 2020 water levels in BBPB6 have increased.

As per the Groundwater Monitoring Plan groundwater levels are required to be taken every two months. In December 2019 no groundwater levels (or samples) were able to taken due to the Gospers Mountain fire in/around Cox's River Swamp. In January 2020 groundwater levels were only able to be taken for BBPB2 and BBPB6 due to fallen trees across the access tracks.

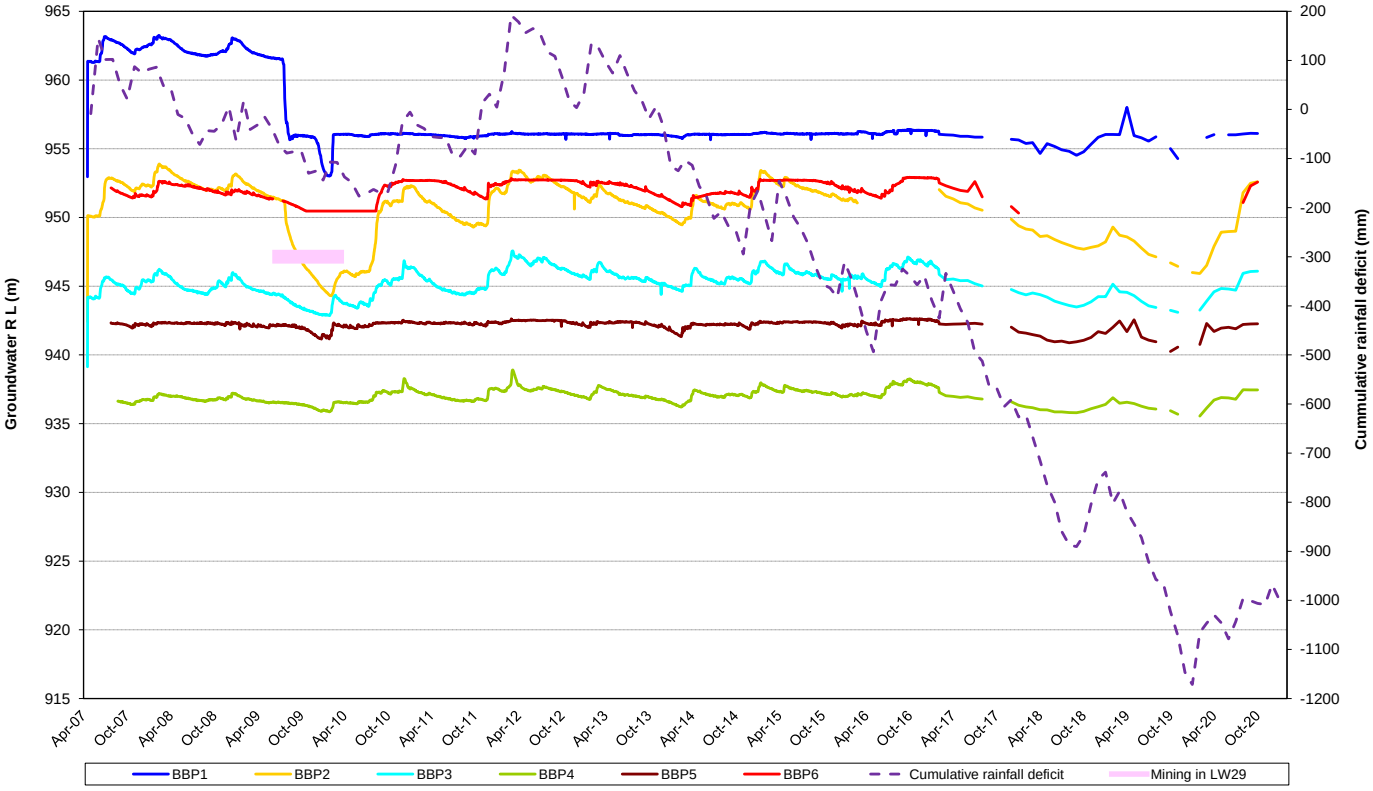


Figure 7.9: Coxs River Swamp groundwater levels and rainfall deficit

7.2.3.1 Comparison against Previous Annual Reviews

Groundwater data are plotted on **Figure 7.9** and **Figure 7.10**. The north – to – south downstream groundwater gradient has been broadly maintained (highest level observed in BBPB1 and lowest level observed in BBPB4), indicating that overall flow has been maintained down through the swamp.

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

All bores saw a decrease in groundwater RL corresponding to the prolonged drought period and rainfall deficit from early 2017 until end 2019. During 2020 the higher volume of rainfall received comparative to previous years, corresponded with an increase in groundwater RLs in all bores.

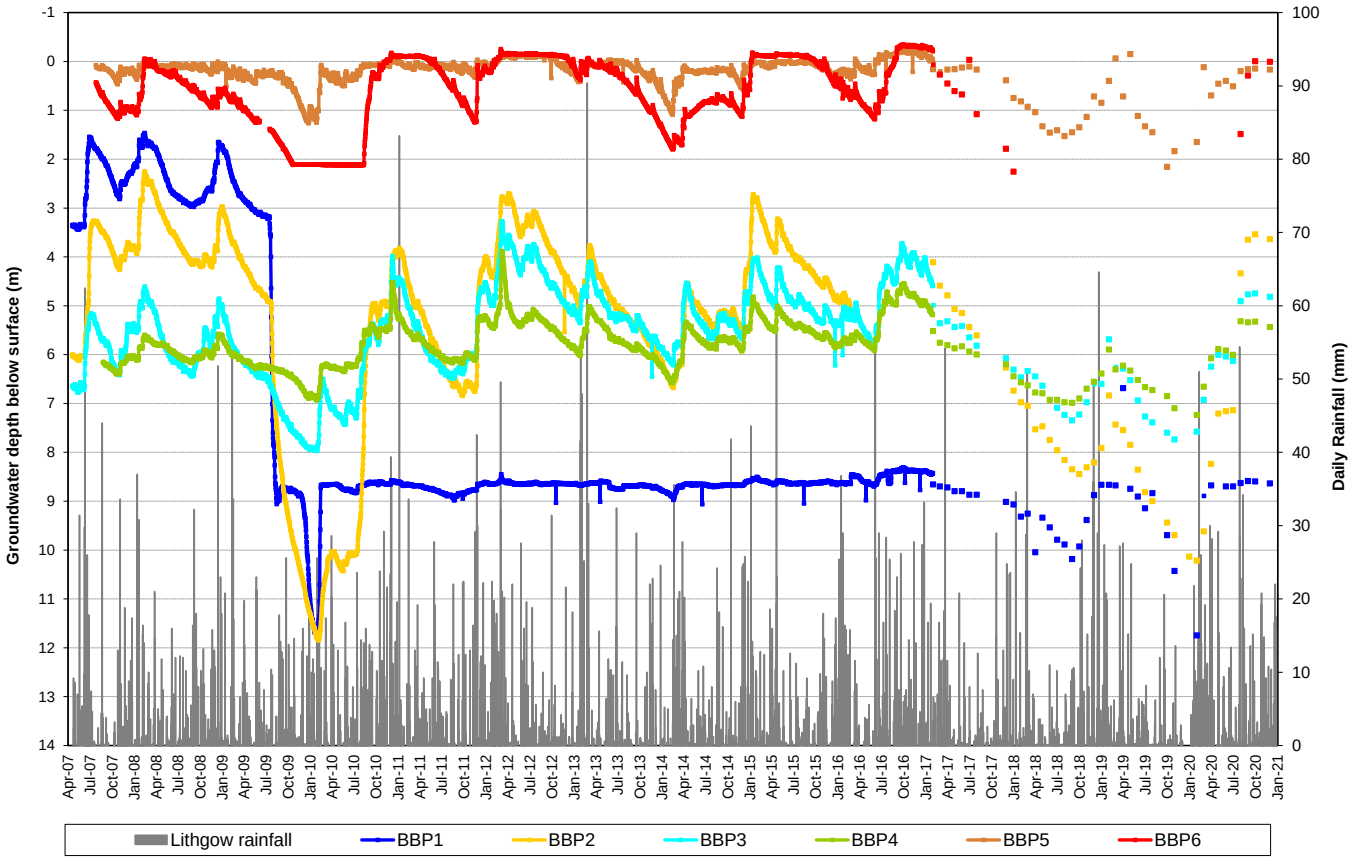


Figure 7.10: Longterm groundwater trends

7.2.3.2 Comparison against EA

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

All groundwater levels appear to be approximately at pre-mining levels, with the only exception being BBPB1, where groundwater has re-stabilised at RL956 (approximately 5 metres below pre-mining level).

Over the long-term, an emerging trend shows that groundwater levels in BBPB2, BBPB3 and BBPB4 all appear to correlate well with the overall cumulative rainfall deficit (difference between the monthly rainfall and the long-term average). The other remaining piezometers (BBPB5 and BBPB6), all appear resistant to short-term weather variances, due to the location of BBPB5 and BBPB6 in the centre of the swamp, which generally remains saturated. The prolonged drought period, as evidenced by the steady rainfall deficit from early 2017 until early 2020, saw all bores respond with decreasing water levels, and BBPB6 was recorded as dry from February 2018 until July 2020.

7.2.4 Groundwater Chemistry

Groundwater chemistry monitoring results for the reporting period are provided below in **Figures 7.11 to 7.15**.

Section 4.1.3 of the Groundwater Monitoring Plan requires the Cox's Swamp bores (BBPB1 – BBPB6) to be sampled according to schedule outlined below.

Piezometer ID	Water Level	pH	Electrical Conductivity (µS/cm)	Copper	Zinc	Iron	Speciation
BBPB1 - 6	Two Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly

Due to the Gospers Mountain fire which burnt Ben Bullen State Forest (where BBPB1 to BBPB6 are located) and surrounding areas during December 2019, only two bores were able to be sampled in January 2020 (BBPB2 and 6), as access was blocked by fallen trees to the other bores.

Furthermore due to an error by the laboratory which processes the water samples, the quarterly 'speciation' analysis of water samples was only carried out in January, July and October 2020 (Note: therefore only the two samples collected in January 2020 were able to have 'speciation' analysis conducted).

Water samples were unable to be collected from BBPB2 in December 2020 and January 2021 due to damage to the bore. The bore was repaired, and samples taken in February 2021.

BBPB6 was dry from January 2020 until July 2020.

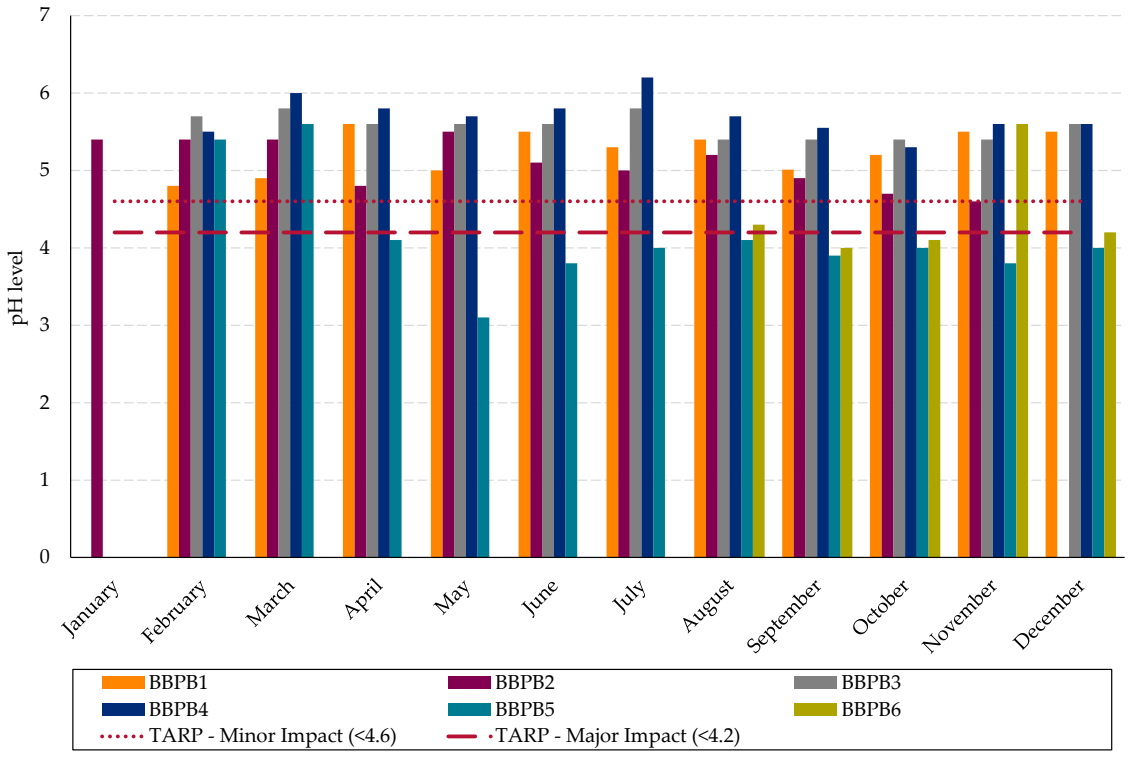


Figure 7.11: 2020 Groundwater pH levels.

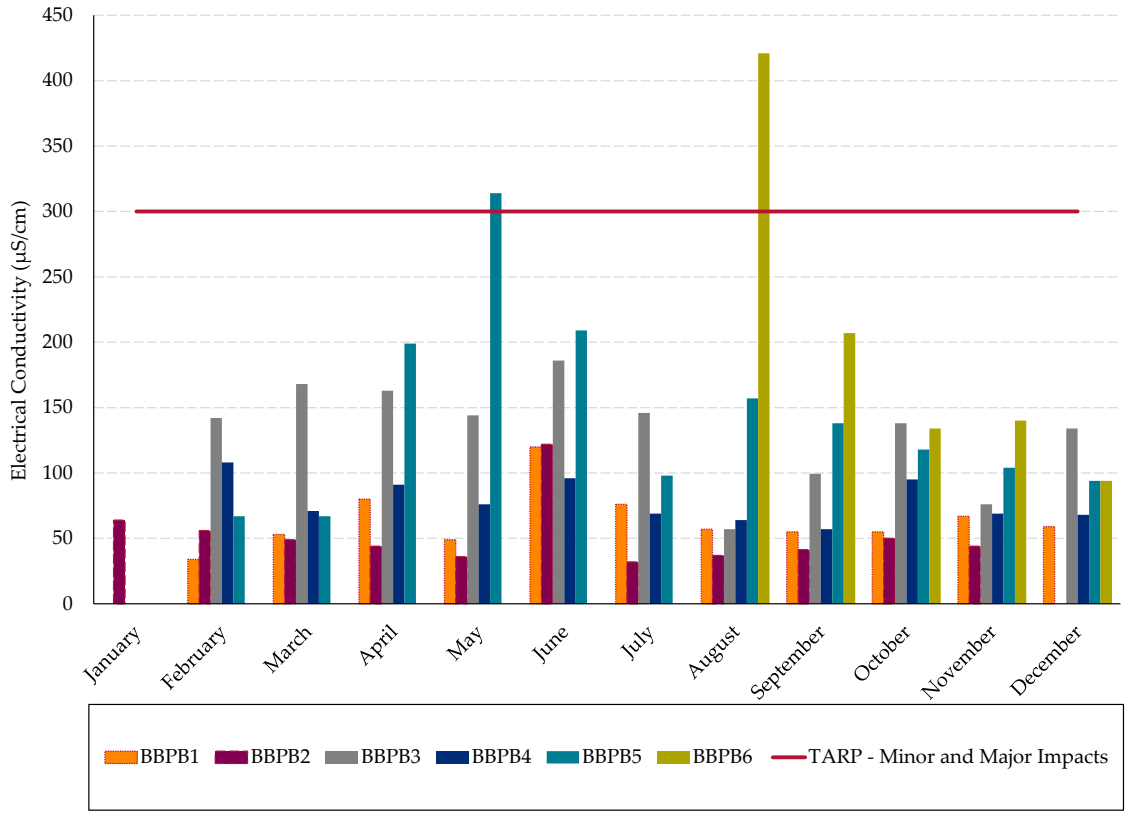


Figure 7.12: 2020 Groundwater Electrical Conductivity.

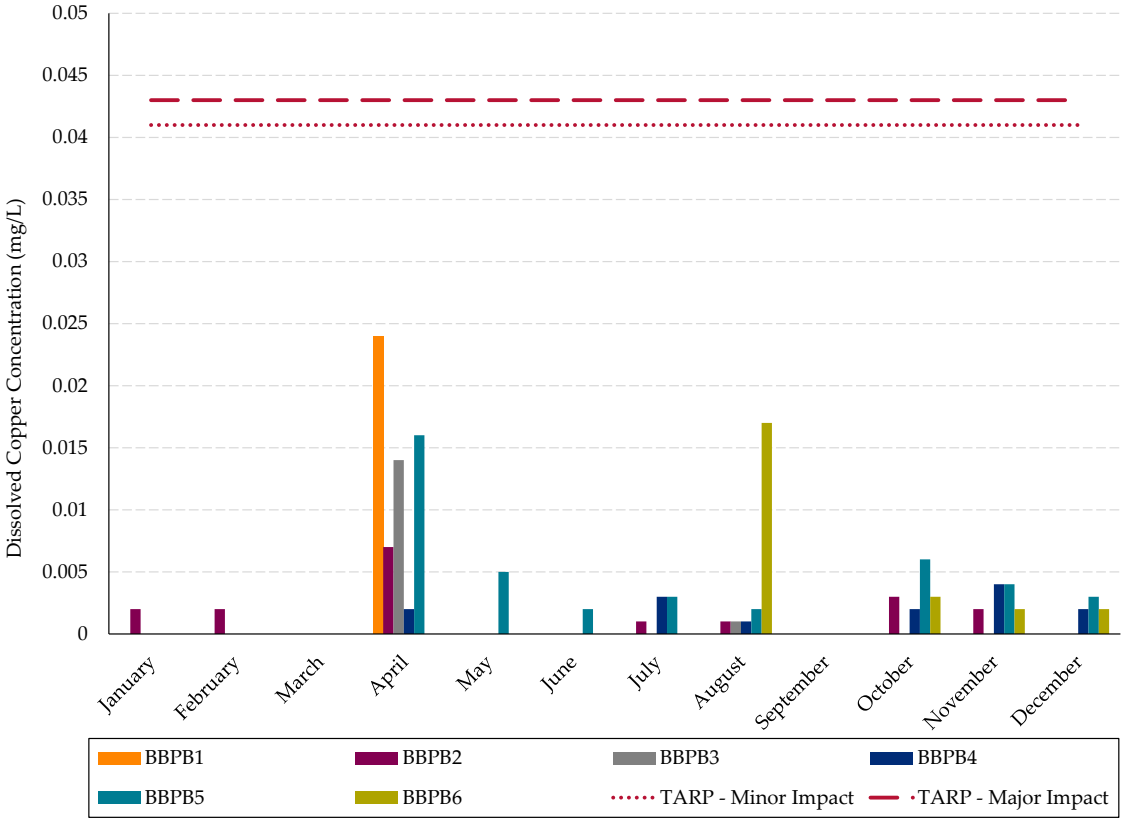


Figure 7.13: 2020 Groundwater Copper levels.

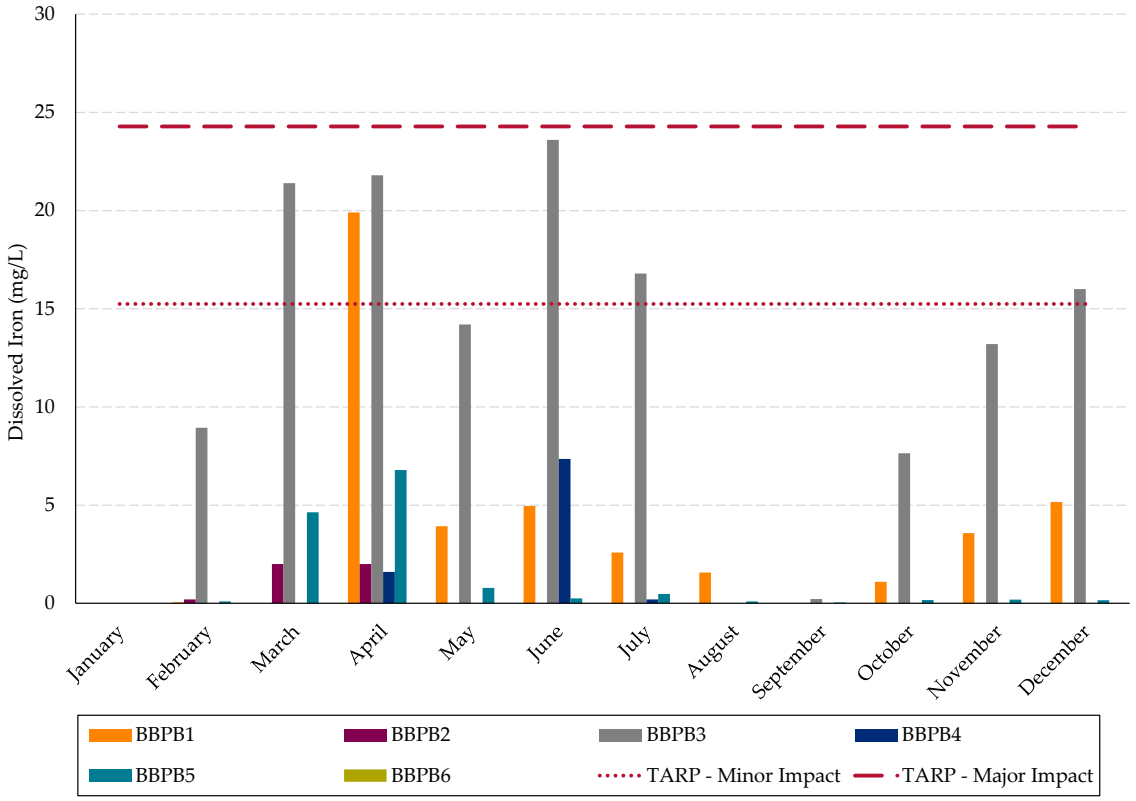


Figure 7.14: 2020 Groundwater Iron (dissolved) levels.

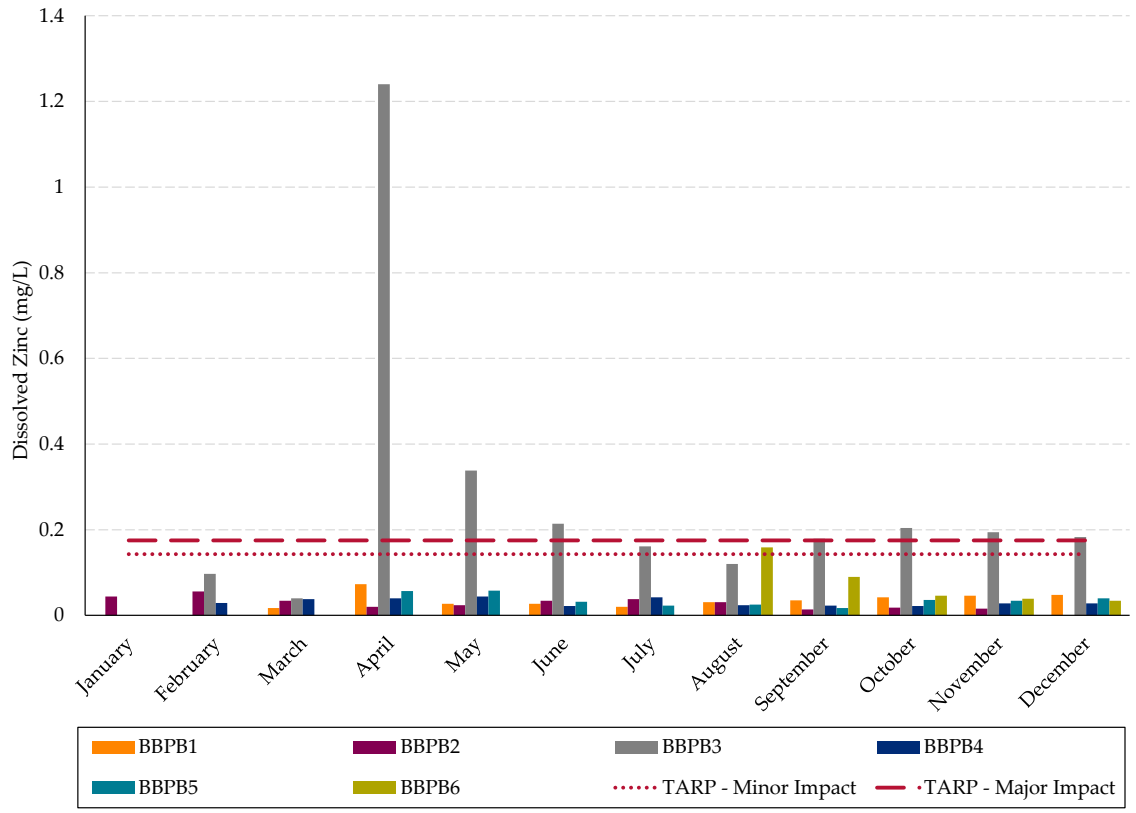


Figure 7.15: 2020 Groundwater Zinc Levels.

As shown in **Figure 7.11** above, all pH levels for bores BBPB1 through 4 were within both the minor and major impact criteria for all groundwater monitoring bores during 2020. BBPB5 was outside either the major and/or minor impact trigger levels for 8 months from April 2020 to December 2020. BBPB6 also dropped below the major and/or minor impact trigger levels for August, September, October and December 2020. This major impact TARP event was investigated and notifications sent to DPIE on 1 March 2021.

As shown in **Figure 7.12** above: electrical conductivity (EC) levels were within both the minor and major impact criteria for all groundwater monitoring bores during 2020, except BBPB5 in May 2020 and BBPB6 in August 2020. In both these instances, EC levels exceeded the trigger level for a single sampling events before returning to within criteria levels.

As shown in **Figure 7.13**, copper levels were also within impact criteria for all groundwater monitoring bores during 2020.

As shown above in **Figure 7.14**, 2020 iron levels were below the minor and major impact trigger levels for all bores except BBPB1 and BBPB3. Dissolved iron levels at BBPB3 exceeded the minor impact trigger level in March, April, June, July and December 2020. BBPB1 exceeded the minor impact trigger level in April 2020. Due to the short duration of these exceedances of the minor impact level, no further action was undertaken.

As shown above in **Figure 7.15**, 2020 zinc levels were below the minor impact trigger level for all groundwater monitoring wells with the exception of BBPB3. BBPB3 exceeded the major and/or minor impact trigger levels from April to July 2020, and September to December 2020.

This major impact TARP event has continued since August 2012. Note that mining in LW29-31 ceased in September 2011.

In 2012, Baal Bone Colliery commissioned a report by Aurecon which investigated groundwater quality and the TARP trigger levels. The Aurecon report (March 2012) 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.

The 2019 Independent Environmental Audit (IEA) carried out by Hansen Bailey determined that the ongoing exceedance of Water Quality Trigger Levels for dissolved zinc at BBPB3 was a low risk non-compliance. The audit recommended that Baal Bone Colliery, “revisit the zinc trigger levels for BBP3 in consultation with DPIE for the closure stage”.

In the 2019 IEA Action Plan, Baal Bone Colliery committed that by 30 March 2021 a consultant will be engaged to further investigate the exceedance with consideration to be given to calibrating the groundwater triggers to site specific conditions if appropriate.

In 2020, Umwelt were engaged in part to determine the potential causes of elevated zinc concentrations at BBP3 and identify whether the existing groundwater minor and major change

criteria (trigger values) should be updated. In relation to zinc Umwelt found that "t*he peak concentrations during many of these events was recorded shortly after increased rainfall following a prolonged dry period. This suggests that rainfall-runoff infiltration has mobilised zinc from dry strata within the BBP3 catchment and that a wetting and drying process could be a significant contributor to groundwater zinc concentrations."* Also that *"Elevated zinc concentrations were observed to occur pre-mining, during mining and post-mining. Elevated zinc concentrations at times followed a rise in groundwater level in BBP3".*

Baal Bone Colliery provided a copy of the 2020 groundwater investigation report to DPIE in correspondence dated 17 November 2020. Formal notifications regarding the zinc exceedances were made to DPIE on 10 December 2020 and 1 March 2021.

7.2.4.1 Comparison against previous Annual Reviews

Table 7.10 summarises previous Annual Review results and any exceedances of TARP trigger levels (minor and major) in BBPB1 – BBPB6 during the period 2011 – 2020.

Table 7.10: Summary of TARP exceedances and previous Annual Review results

	BBPB1	BBPB2	BBPB3	BBPB4	BBPB5	BBPB6
2011	No TARP exceedance	No TARP exceedance	**Dissolved Iron**: Feb to Dec **Dissolved Zinc**: Jan, Feb, Aug, Nov, Dec	**Dissolved Copper**: Aug – Dec	No TARP exceedance	No TARP exceedance
2012	No TARP exceedance	No TARP exceedance	**Dissolved Iron**: Jan **Dissolved Zinc**: Jan, Jun, Aug to Dec	**Dissolved Copper:** Jan, Jul to Oct **Dissolved Zinc:** Oct	No TARP exceedance	No TARP exceedance
2013	No TARP exceedance	No TARP exceedance	**Dissolved Iron:** Jan, May, Oct to Dec **Dissolved Zinc:** Jan to Dec	**Dissolved Copper:** Sep to Dec **Dissolved Zinc:** Dec	No TARP exceedance	No TARP exceedance
2014	No TARP exceedance	No TARP exceedance	**Dissolved Iron:** Jan to Mar, Jul **Dissolved Zinc:** Jan to Dec	**Dissolved Copper:** Jan, Sep	No TARP exceedance	No TARP exceedance
2015	No TARP exceedance	No TARP exceedance	**Dissolved Iron:** Jan, Feb, Apr, Jun, Dec **Dissolved Zinc**: Jan to Dec	No TARP exceedance	No TARP exceedance	No TARP exceedance
2016	**Dissolved Copper:** Feb	No TARP exceedance	**Dissolved Iron:** Feb, Mar **Dissolved Zinc**: Jan, Feb, Mar, Apr, Jun, Jul, Aug, Oct, Dec	No TARP exceedance	No TARP exceedance	No TARP exceedance
2017	No TARP exceedance	**Dissolved Iron**: Oct **Dissolved Zinc:** Oct	**Dissolved Iron**: Oct **Dissolved Zinc:** Jan, Feb, Mar, May, June, July, Aug, Sept, Nov, Dec	No TARP exceedance	No TARP exceedance	**Dissolved Copper**: Nov and Dec **Dissolved Iron**: Oct
2018	**Dissolved Iron**: July	**pH:** Nov	**Dissolved Iron:** Jan, Mar, Jun, Jul **Dissolved Zinc:** Jan to Jul, Sept to Dec	No TARP exceedance	**Dissolved Iron:** Mar, Jul **Dissolved Copper:** Mar, Jun, Jul	No TARP exceedance **(**BBPB6 dry during 2018)
2019	**EC:** July	No TARP exceedance	**Dissolved Iron:** Jun, July, Nov **Dissolved Zinc:** Jan to Nov	No TARP exceedance	No TARP exceedance	No TARP exceedance

2020	**Dissolved Iron:** April	No TARP exceedance	**Dissolved Zinc:** Apr to Jul, Sept to Dec **Dissolved Iron:** Mar, Apr, Jun, Jul, Dec	No TARP exceedance	**pH:** Apr to Dec **EC:** May	**Dissolved Zinc:** Aug **pH:** Aug to Dec **EC:** Aug

7.2.4.2 Comparison against EA

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

In terms of groundwater quality, minor and major changes have been noted for pH and trace metals at some bores however electrical conductivity has generally remained below 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.

As noted in **Section 7.2.4**, there were a number of minor and major trigger level events during 2020 – particularly for zinc and pH. Both the 2012 Aurecon report and the 2020 Umwelt report on groundwater quality conclude that minor changes to groundwater quality can occur by chance in the variable conditions of rainfall and the resulting groundwater level changes. The 2020 reporting period saw significantly higher rainfall in comparison to previous reporting periods.

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

7.3 Channel Stability Monitoring

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

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

Therefore, as mining will not recommence, only monitoring locations Co-2, Co-3 and Co-4 on Cox's Creek, Be-2, Be-3, Be-4, Be-5 and Be-6 on Ben Bullen Creek, and Ba-2 and Ba-3 on Baal Bone Creek need to be inspected as part of the annual monitoring program.

Channel Stability Monitoring was undertaken on 17 and 18 November 2020 by Umwelt.

The 2020 Channel Stability Monitoring Report recommendations for future management are:

- *areas of 'active' to 'very active' erosion, particularly those along Ben Bullen Creek and the Coxs River continue to be monitored annually, with inspections undertaken in accordance with the Surface Water Monitoring Plan*
- *where subsidence caused by mining has caused active erosion sites and if monitoring indicates that areas of 'active' to 'very active' erosion are becoming less stable, remedial works should be undertaken if required*
- *options to provide additional scour protection to the incised lateral inflow channels flowing into the Ben Bullen Creek realignment at Be-6 should be investigated*

- *annual channel stability monitoring should continue to ensure that rehabilitation activities have been successful and that any further erosion can be identified and addressed."*

7.4 Stream Health Monitoring

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

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

As per advice from Umwelt (Stream Health Monitoring Recommendations – Umwelt, dated 30 November 2015) and the **Surface Water Monitoring Plan**:

Prior to the commencement of Ben Bullen Creek Rehabilitation works, aquatic fauna monitoring sites will be identified in Jew's Creek and in analogue sites in order to establish baseline completion criteria. Following the completion of physical Ben Bullen Creek rehabilitation works, the monitoring will be extended to sites in the rehabilitated creek line with rehabilitation success being assessed against the analogue site(s).

Accordingly in June 2020 an aquatic fauna monitoring event was completed by Umwelt to establish analogue sites and collect baseline aquatic fauna data prior to rehabilitation works commencing in Ben Bullen Creek. Three analogue aquatic fauna monitoring sites were established in Ben Bullen Creek, Wangcol Creek and Coxs River, as these are considered permanent creeks during drought conditions.

Following the completion of the Ben Bullen Creek rehabilitations works in 2021, aquatic fauna monitoring will be extended to sites in the rehabilitated creek line, as well as the analogue sites already monitored.

8 Rehabilitation

8.1 Status of Rehabilitation

Rehabilitation activities are carried out in accordance with the approved Baal Bone Colliery Mine Closure MOP 2019 -2025. The primary objective of rehabilitation is to create a safe, stable final landform with self-sustaining native vegetation communities.

A summary of rehabilitation works for the previous, current and next reporting periods are detailed in **Table 8.1**.

Table 8.1: Summary of Rehabilitation Performance[5]

Mine Area Type	Previous Reporting Period (Actual) (ha)	This Reporting Period (Actual) (ha)	Next Reporting Period (Forecast) (ha)
	2019	2020	2021
A. Total Mine Footprint[6]	475	475	475
B. Total active disturbance	197.9	152.8	116.2
C. Land being prepared for rehabilitation	0	45.7[7]	36.6
D. Land under active rehabilitation	172.3	217.4	254
E. Completed rehabilitation	0	0	0

In January 2020 demolition of infrastructure on the Baal Bone site commenced, which included the demolition of the Coal Handling Preparation Plant (CHPP), bathhouse and workshop, as well as all coal conveyors, reclaim tunnels, transfer towers, bins, sheds and other associated ancillary infrastructure. The rail loop linking the site to the Main Western Railway line was also decommissioned and all rail lines, ballast and sleepers were removed from the corridor.

The civil works and rehabilitation component of the closure activities commenced in September 2020. The remediation of the CHPP and Run of Mine (ROM) areas and the former rail corridor was undertaken over the remaining period of 2020. Activities included the addition of topsoil, fertiliser, lime and gypsum followed by the areas being ripped. The CHPP ROM area was then seeded with a pasture seed mix and the rail loop was seeded with a woodland seed mix.

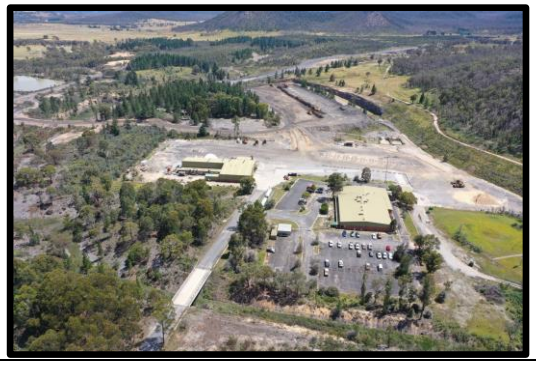
During this period, filling of voids including the Leachate Dam, REA 6 Tailings Dam, Central Void and the Southern Void was also undertaken. The filling of the REA 6 Tailings Dam was completed in December. The remaining voids will continue to be filled throughout the 2021 reporting period.

Plate 1 provides photos demonstrating rehabilitation progress.

[5] Values at A and B are given as at the end of the reporting period whilst values at C and D reflect areas rehabilitated during the period

6 This figure excludes the Subsidence Domain as per Annual Review Guideline (2015).

[7] Total rehabilitation area includes 0.6 ha in previously rehabilitated areas.

ROM Pad – July 2019 	ROM Pad – February 2021 
Leachate Dam – September 2020 	Leachate Dam – February 2021 
Southern REA – July 2019 	Southern REA - February 2021 
Pit Top – July 2019 	Pit Top – February 2021 

8.1.1 Subsidence Remediation

Subsidence that occurred historically was in accordance with previous predictions for potential subsidence impacts at Baal Bone Colliery. Minimal impacts occurred to surface features, infrastructure, heritage areas, watercourses, groundwater, swamps, wetlands and flora and fauna. Any subsidence impacts were managed by the SMP required under PA 09-0178.

The SMP for development and extraction of Longwalls 29-31 expired on 1 December 2014, with mining operations in this area completed in early September 2011. The results of final monitoring were presented in the Annual Environment Review 2014 – Baal Bone Colliery. These results were reviewed by a Subsidence Engineer from DT&I, Mine Safety. In light of the results from this assessment and pursuant to Condition 12 of Deputy Director General's approval of the SMP, the request to discontinue subsidence monitoring and remove survey lines and monitoring equipment was approved.

A number of surveys have been undertaken to identify subsidence cracks that require remediation over the longwall mining area. The first surveys were undertaken through the period of mining LW29 to LW31 (2009 to 2011). The subsequent two surveys concentrated on assessing cracks for longwalls 1 to 28. The first was undertaken in April 2015 and the second conducted between May and June 2016.

In 2017 an assessment of residual subsidence impacts was undertaken by Glencore in 2017. The process of the subsidence assessment included:

- Surveys
- Risk assessment
- Consultation with landowners and relevant agencies
- Development of a database
- Identification of appropriate remediation actions.

As a result of these ongoing surveys, inspections and assessments a number of cracks associated with FCNSW land and Baal Bone Colliery land over longwalls 1 to 31 have been repaired.

There were no subsidence repairs undertaken during 2020. During 2020 subsidence inspections were carried out in March, August, October, November and December 2020.

The assessment and remediation criteria set out the **Mine Closure MOP 2019-2025 (Section 3.2.5)** will be used as a guide for future remediation activities. Remediation activities will be undertaken in response to regular monitoring until rehabilitation has been achieved.

Each site once rehabilitated will have an inspection and photograph taken to provide evidence that the work has been completed to the required scope of work determined for the closure criteria stage. This information will be recorded and maintained within the subsidence database until tenure relinquishment.

8.2 Performance Indicators and Completion Criteria

The Baal Bone Colliery MOP divides the lease area into seven different domains. **Section 6 of the Baal Bone Colliery Mine Closure MOP 2019 - 2025** 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 8.3.2.**

8.3 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 and
- Annual Ecological Rehabilitation Monitoring which was implemented in 2009.

8.3.1 Annual Environmental Rehabilitation Inspection

The 2020 Annual Environmental Rehabilitation Inspection was conducted by DnA Environmental from 23-26th November 2020.

The inspection noted some isolated areas needing additional work to remediate weeds; erosion and rilling; and other minor issues. Recommended actions have been entered into CMO - Baal Bone's compliance tracking system.

8.3.2 Annual Ecological Rehabilitation Monitoring

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

Twelve monitoring sites and four reference sites have been established to monitor flora, fauna, landscape function and habitat values aimed at assessing ecosystem function in remnant vegetation and rehabilitation areas (**Appendix A – Plan 6.**
Monitoring of these sites is undertaken annually until rehabilitation areas reach acceptable levels of establishment, and then monitoring will be undertaken periodically. Monitoring of these sites assesses:

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

The findings of this monitoring program are used to assist in management recommendations for appropriate rehabilitation works within Baal Bone Colliery holdings. Where necessary, rehabilitation procedures are amended accordingly to continually improve rehabilitation standards.
The findings of the Annual Ecological Rehabilitation Monitoring program are also used to assess progress towards rehabilitation commitments in the Baal Bone Colliery Mine Closure MOP 2019-

2025. **Section 6** in the **Mine Closure MOP 2019-2025** sets out performance indicators and completion criteria. Baal Bone Colliery will demonstrate achievement of all completion criteria prior to seeking relinquishment of the site.

2020 Annual Ecological Rehabilitation Monitoring Results

The results of the 2020 monitoring, undertaken by DnA Environmental from the 23rd – 26th November 2020 are summarised below. The table indicates the performance of the mixed eucalypt woodland and exotic pasture rehabilitation monitoring sites against 70% primary completion performance indicators in 2020. The selection of criteria has been presented in order of rehabilitation phases according to the ESG3 MOP guidelines. The range values of the ecological performance targets are amended annually. Rehabilitation sites meeting or exceeding the range values of their representative target community type have been identified with a coloured box and have therefore been deemed to meet these primary completion performance targets this year. Hashed coloured boxes associated with soil condition indicate they may be outside of the reference target ranges, but within acceptable agricultural limits.

Performance of the mixed eucalypt woodland and exotic pasture rehabilitation sites against 70% primary performance indicators in 2020

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measure (*desirable)	NOC3 Pasture 2020 - *Domain 2*	NOC4 Pasture 2020 - *Domain 2*	NOC5 Pasture 2020 - *Domain 2*	Box Cut 2020 - *Domain 2*	NOC1 2020 - *Domain 2*	NOC2 2020 - *Domain 2*	SOC1 2020 - *Domain 5*	SOC2 2020 *Domain 5*	SOC3 2020 *Domain 5*	SOC4 2020 *Domain 5*	REA5 2020 *Domain 6*	Vent Rehab - *Domain 7*
Performance indicators are quantified by the range of values obtained from representative reference sites					**70% meet criteria**											**100% meet criteria**
Phase2: Landform establishment and stability	**Landform slope, gradient**	Landform suitable for final land use and generally compatible with surrounding topography	Slope	< Degrees (°)	**7**	**1**	**1**	**14**	**5**	**5**	**8**	**6**	**6**	**5**	**2**	**5**
	Active erosion	Areas of active erosion are limited	Cross-sectional area of rills	m2	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Phase 3: Growth medium development	**Soil chemical, physical properties and amelioration**	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH (5.6-7.3)	**6.1**	**5.4**	**7.9**	**6.1**	**5.3**	**4.9**	**5.1**	**5.5**	**5.2**	**na**	**7.0**	**5.7**
			EC	< dS/m (<0.150)	**0.018**	**0.045**	**0.058**	**0.051**	**0.023**	**0.045**	**0.033**	**0.066**	**0.026**	**na**	**0.066**	**0.020**
			Phosphorous	mg/Kg (50)	**10.4**	**10.1**	**8.8**	**8.5**	**9.4**	**9.2**	**8.4**	**8.4**	**10.8**	**na**	**22.2**	**10.5**
			Nitrate	mg/Kg (>13)	**0.7**	**0.9**	**0.7**	**1.3**	**0.8**	**0.7**	**0.6**	**0.7**	**1.1**	**na**	**0.7**	**0.7**

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measure (*desirable)	NOC3 Pasture 2020 - *Domain 2*	NOC4 Pasture 2020 - *Domain 2*	NOC5 Pasture 2020 - *Domain 2*	Box Cut 2020 - *Domain 2*	NOC1 2020 - *Domain 2*	NOC2 2020 - *Domain 2*	SOC1 2020 - *Domain 5*	SOC2 2020 *Domain 5*	SOC3 2020 *Domain 5*	SOC4 2020 *Domain 5*	REA5 2020 *Domain 6*	Vent Rehab - *Domain 7*
			ESP	% (<5)	2.7	4.6	3.4	2.7	1.4	1.2	3.3	4.9	2.9	na	3.7	2.0
Phase 4: Ecosystem& Land Use Establishment	**Landscape Function Analysis (LFA): Landform stability and organisation**	Landform is stable and performing as it was designed to do	LFA Stability	%	64.0	73.5	67.7	66.2	74.5	71.5	70.5	67.4	68.0	66.3	71.5	61.1
			LFA Landscape organisation	%	100	100	90	95	100	100	100	94	100	94	100	75.0
	Herbage Biomass	Pasture productivity is comparable to analogue sites.	Green Dry Matter Biomass	kg/ha	na	na	na	na	na	na	na	na	na	na	na	na
	Vegetation diversity	Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Diversity of shrubs and juvenile trees	species/area	na	na	na	na	na	na	na	na	na	na	na	na
				% endemic	na	na	na	na	na	na	na	na	na	na	na	na
			Total species richness	No./area	na	na	na	na	na	na	na	na	na	na	na	na

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measure (*desirable)	NOC3 Pasture 2020 - *Domain 2*	NOC4 Pasture 2020 - *Domain 2*	NOC5 Pasture 2020 - *Domain 2*	Box Cut 2020 - *Domain 2*	NOC1 2020 - *Domain 2*	NOC2 2020 - *Domain 2*	SOC1 2020 - *Domain 5*	SOC2 2020 *Domain 5*	SOC3 2020 *Domain 5*	SOC4 2020 *Domain 5*	REA5 2020 *Domain 6*	Vent Rehab - *Domain 7*
	Vegetation density	Vegetation contains a density of species comparable to that of the local remnant vegetation	Density of shrubs and juvenile trees	No./area	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
	Ecosystem composition	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Tree species	No./area	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
			Shrub species	No./area	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
			Herb species	No./area	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Phase 5: Ecosystem & Land Use Sustainability	**Landscape Function Analysis (LFA): Landform function and ecological performance**	Landscape Function Analysis (LFA): Landform function and ecological performance	LFA Infiltration	%	**49.2**	**53.9**	**30.1**	**49.9**	**46.9**	**51.8**	**48.0**	**40.5**	**49.9**	**43.8**	**38.3**	**32**
			LFA Nutrient recycling	%	**49.2**	**52.7**	**33.3**	**50.1**	**51.1**	**53.6**	**54.1**	**43.7**	**52.0**	**47.8**	**41.1**	**30.1**

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measure (*desirable)	NOC3 Pasture 2020 - *Domain 2*	NOC4 Pasture 2020 - *Domain 2*	NOC5 Pasture 2020 - *Domain 2*	Box Cut 2020 - *Domain 2*	NOC1 2020 - *Domain 2*	NOC2 2020 - *Domain 2*	SOC1 2020 - *Domain 5*	SOC2 2020 *Domain 5*	SOC3 2020 *Domain 5*	SOC4 2020 *Domain 5*	REA5 2020 *Domain 6*	Vent Rehab - *Domain 7*
	Protective ground cover	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Perennial plant cover (< 0.5m)	%	57.5	27.5	31.0	21.5	33.5	60.5	13.5	24.5	51.0	na	20.0	29.0
			Total Ground Cover	%	94.0	98.0	91.5	64.0	95.5	96.0	99.0	74.5	100.0	na	92.0	40.5
	Ground cover diversity	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation	Native understorey abundance/m2	> species/m^2	2.4	3.0	2.2	5.6	5.6	3.6	3.8	5.6	4.4	na	4.6	5.6
		Native ground cover abundance is comparable to that of the local remnant vegetation	Percent ground cover provided by native vegetation <0.5m tall	%	20.3	25.0	18.2	60.0	97.4	89.5	95.5	95.0	90.7	na	45.2	80.0
	Ecosystem growth and natural recruitment	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local	shrubs and juvenile trees 0 - 0.5m in height	No./area	na	na	na	na	na	na	na	na	na	na	na	na
			shrubs and juvenile trees 1.5 - 2m in height	No./area	na	na	na	na	na	na	na	na	na	na	na	na

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measure (*desirable)	NOC3 Pasture 2020 - *Domain 2*	NOC4 Pasture 2020 - *Domain 2*	NOC5 Pasture 2020 - *Domain 2*	Box Cut 2020 - *Domain 2*	NOC1 2020 - *Domain 2*	NOC2 2020 - *Domain 2*	SOC1 2020 - *Domain 5*	SOC2 2020 *Domain 5*	SOC3 2020 *Domain 5*	SOC4 2020 *Domain 5*	REA5 2020 *Domain 6*	Vent Rehab - *Domain 7*
		remnant vegetation														
	Ecosystem structure	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 - 2 m	% cover	14	19	0	5	14	10	21	5	3	na	6	0
			Foliage cover 2 - 4m	% cover	19	13	0	10	6	10	24	5	3	na	0	0
			Foliage cover >6m	% cover	0	0	0	0	0	0	2	2	9	na	0	0
	Tree diversity	Vegetation contains a diversity of maturing tree and shrubs species comparable to that of the local remnant vegetation	Endemic Species	% endemic	na	na	na	na	na	na	na	na	na	na	na	na
	Tree density	Vegetation contains a density of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree density	No./area	na	na	na	na	na	na	na	na	na	na	na	na

Rehabilitation Phase	Aspect or ecosystem component	Completion criteria	Performance Indicators	Unit of measure (*desirable)	NOC3 Pasture 2020 - *Domain 2*	NOC4 Pasture 2020 - *Domain 2*	NOC5 Pasture 2020 - *Domain 2*	Box Cut 2020 - *Domain 2*	NOC1 2020 - *Domain 2*	NOC2 2020 - *Domain 2*	SOC1 2020 - *Domain 5*	SOC2 2020 *Domain 5*	SOC3 2020 *Domain 5*	SOC4 2020 *Domain 5*	REA5 2020 *Domain 6*	Vent Rehab - *Domain 7*
	Ecosystem health	The vegetation is in a condition comparable to that of the local remnant vegetation.	Healthy trees	% population	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
			Flowers/fruit: Trees	% population	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**

The 2020 Annual Ecological Rehabilitation Monitoring Report concludes that:

"The most advanced successional development of the rehabilitation areas has been recorded 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. Significant transformations similar to these are taking place on many areas of the wider NOC and SOC rehabilitation areas with sites BoxCut, SOC1, NOC1 and NOC2 also appearing to be trending in that direction.

Some sites have however been slower to develop and include SOC2 and the vent rehabilitation area. Areas such as these could benefit from some management intervention via the application of organic materials such as native pasture hay (or other weed free mulches), logs and branches and/or selectively cut acacias and spread out across the site to enhance stability and increase nutrients and protective microsites. Re-seeding native grasses may also be beneficial. At the vent rehabilitation site, there has been additional human impacts including firewood collection, camping and vehicle disturbances which will also need to be addressed.

Despite some adverse soil chemistry in REA5, there has also been a significant increase in function and stability and the areas has become rapidly colonised by cryptogams and Cassinia arcuata (Chinese Shrub), however there has been low establishment of other desirable native tree and shrub seedlings and additional intervention is likely to be required. Scarification in areas devoid of native tree and shrubs seedlings followed by reseeding in autumn and/or spring as per recommendations provided in June 2017 are recommended when more favourable weather conditions return.

In the pasture rehabilitation sites there has continued to be heavy grazing by macropods (and goats?) resulting 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. While grazing intensity has probably been much more apparent during the prolonged dry conditions, they are likely to be repeatedly overgrazed due to the presence of nutritious pasture species and their close proximity to extensive bushland areas.

The results to date indicate that the addition of fertilisers and resowing exotic perennial pastures will be required in order to meet pasture completion criteria, and these are most likely going to need fencing off to reduce grazing pressure. There are no known areas of exotic pasture around Baal Bone, suggesting that the soils are not suitable for sustaining introduced pastures, particularly when they are also subjected to pests and feral animals. As exotic pastures suitable for grazing are unlikely to be sustainable in the longer- term, it would seem that livestock grazing is not a suitable or viable management option for the NOC. Rather, it would be more appropriate to replace exotic pasture domains in the NOC for native woodland as a final land use in the Mine Closure Plan.

The results of the soil analyses indicate that the soils in the NOC and SOC were strongly acidic, and in previous years several sites had sodic and saline soils. This year, there was significant decline in EC and ESP in most rehabilitation areas, however numerous sites continued to have low pH and excessively high concentrations of sulfur and iron. High concentrations of iron were also recorded in the reference sites, indicating high iron levels are likely to be natural, however iron concentrations in some rehabilitation sites far exceed these local levels.

The results of the annual walkover also suggest that "hotspots" which are indicative of adverse soil chemistry are present throughout the NOC and SOC. These are evident by patches where tree and shrub saplings were chlorosed or brightly coloured and/or were stunted with curled leaves with some having died outright. Often these areas were associated with limited ground cover and active erosion. While some of these areas have been slower to develop than the wider rehabilitation areas, there has been a gradual increase in cover of perennial native ground cover such as Pultenaea microphylla and numerous acacias and Cassinia that were starting to colonise some of these areas. The drought and increased grazing and disturbances by animals has however delayed further development in some of these areas.

The effects of adverse soil chemistry which can delay and/or impede the successional development of the rehabilitation areas reinforces the requirement to undertake soil tests of spoil material and topsoil stockpiles prior to constructing any additional rehabilitated landforms. In most cases, the larger rehabilitation areas appear to be developing adequately, despite these adverse soil conditions. Areas that continue to have limited ground cover and have been slow to develop may benefit from the application of weed free hay and/or organic mulches.

Areas that continue to demonstrate extensive sheet and rill erosion may require amelioration by undertaking earthworks, additional topsoil application, slope stabilisation using logs and branches and seeding with native woodland mixes. Some of these areas have been identified on the annual walkover map.

Priority weeds including Rubus fruticosus (Blackberry) and Hypericum perforatum (St John's Wort) are becoming increasingly more common and have spread from the roadsides and access tracks into rehabilitation areas. Targeted weed control programs need to be implemented to control these invasive species before they develop into unmanageable extensive infestations. Pinus radiata (Radiata Pine) and Acacia baileyana (Cootamundra Wattle) are environmental weeds that exist in some areas of the mine site, especially near the CHPP plant and sedimentation ponds and are a legacy of old mining rehabilitation practices. They have however been noted to be regenerating, and pine wildings and acacia seedlings should be controlled to limit their spread into native rehabilitation areas.

Cassinia arcuata is a native colonising species and is valuable in mine site rehabilitation to assist the recovery of degraded and/or disturbed grazing lands. This species is one which should be appreciated, particularly in native woodland rehabilitation areas during their early developmental stages and should not be targeted in weed control programs. Cassinia will however, rapidly colonise weakened and degraded (grazing) pastures, therefore emphasising the need to implement strategic grazing practices that maintain strong perennial pastures which will limit the establishment of Cassinia in grazing pastures where it is not wanted.

Continued monitoring of the rehabilitation areas will dictate the need for further management requirements."

8.4 Ben Bullen Creek Rehabilitation Project

Stabilisation and restoration works were completed along two sections of the Ben Bullen Creek including riparian vegetation (tube stock) planting in upper and lower reaches.

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 recommended that the existing diversion be maintained for Ben Bullen Creek.

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.

Rehabilitation works in Ben Bullen Creek commenced in early 2021.

8.5 Other Infrastructure

During 2020, a number of buildings and other infrastructure onsite have been demolished as outlined in **Section 4.3.**

9 Community

9.1 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.

Membership of the 2020 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);
- Elizabeth Fishpool (Environment and Community Coordinator); and
- Greg Peard (Environment and Community Coordinator).

One CCC meeting was held during the reporting period on 24 November 2020..

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.

As per the Baal Bone Colliery Mine Closure MOP 2019-2025, CCC meetings will continue to be held at least annually.

9.2 Community Complaints

There were no community complaints received during the 2018, 2019 or 2020 reporting periods. A community complaint summary is available from the Baal Bone website: *https://www.glencore.com.au/operations-and-projects/coal/past-operations/baal-bone-colliery/community-documents*.

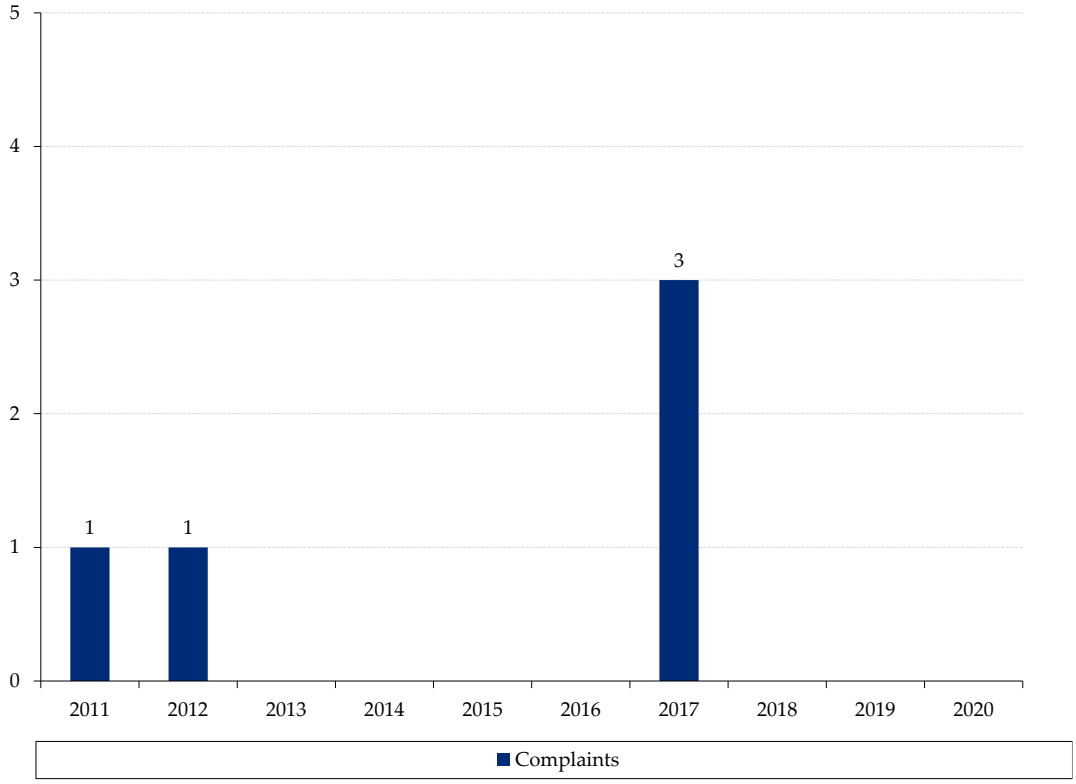


Figure 9.1: Community complaints by year

9.3 Community Sponsorship

Glencore invests in Health, Arts and Culture, Education and Enterprise, Environment and the Community, including, as an example, education grants to NSW Government Schools.

During 2020 Baal Bone Colliery donated a laptop to the Cullen Bullen Tidy Towns group to assist them with book keeping and administration.

10 Independent Audit

Baal Bone Colliery underwent an Independent Environmental Audit (IEA), as per Schedule 5, Condition 7 of PA 09_0178 in December 2019. The site component of the audit was conducted on 17 and 18 December 2019 by Hansen Bailey. Baal Bone Colliery received the final audit report from Hansen Bailey on 27 February 2020. The IEA Report Executive Summary concludes that "*Baal Bone Colliery is being managed at a high level of compliance on environmental matters*".

A copy of the most recent as well as previous audit reports, and responses to audit recommendations can be found on the Baal Bone Colliery website at: Audit findings are presented in the tables below.

The next Independent Environmental Audit of Baal Bone Colliery will occur in 2022.

Tables 10.1 and **10.2** outline the current status of actions arising from the 2019 Audit.

Table 10.1: Status of actions arising from non-compliances identified during 2019 Independent Environmental Audit

Sch and Cond Number	Audit Recommendation	Response/Action Plan	Status / Due Date
Project Approval 09_0178			
Schedule 2, Condition 11	Include reference to AS 2601-2001 Standard and summary of requirements for demolition in relevant documentation for Mine Closure phase.	Reference to AS 2601-2001 to be included in relevant documentation for Mine Closure phase.	Ongoing
Schedule 3, Condition 21	Revisit the zinc trigger levels for BBPB3 in consultation with DPIE for the closure stage.	Consultant to be engaged to further investigate. Consideration to be given to calibrating the groundwater triggers to site specific conditions if appropriate.	Complete
Environment Protection Licence 765			
P1.3	Although current monitoring plan appears consistent with the current EPL text, at next EPL Variation, update 2012 figure for 2019020 plan.	EPL 765 was varied on 21 February 2020. The varied licence now refers to an updated monitoring plan.	Complete
Consolidated Coal Lease (CCL749)			
Condition 33	DSCL is consulted six-monthly for site-wide rehabilitation or written exemption sought from DRG if it can be justified.	An action is in place. Consultation recommenced in December 2019 prior to this audit occurring.	Ongoing

Table 10.2: Status of continual improvement actions from IEA.

Sch and Cond Number	Audit Recommendation	Response/Action Plan	Status
Project Approval 09_0178			
Schedule 2, Condition 11	Add a note in future Annual Reviews regarding demolition undertaken in the period.	To be included in 2019 Annual Review.	Complete
Schedule 3, Condition 1	Create a single register for all known existing subsidence repairs and a clear process for sign-off of each occasion and actions to be documented to completion.	Register and process to be established for any known existing subsidence impacts.	Complete
Schedule 3, Condition 10	Consider reduction in the number of air quality monitoring points during Mine Closure. Potential to relocate monitor DM2 to be representative of closest residence and remove others.	Consideration to be given to a reduction in the number of air quality monitoring points during the next management plan review.	Complete
Schedule 3, Condition 16 (a)	"By 31 December 2019, the licensee must cease all mine water discharge from licenced discharge point 11 (LDP0011)". Update water balance in the Water Management Plan to reflect the change in discharge regime.	Discharge ceased on 17 December 2019. Water balance to be updated as appropriate at next management plan review.	Complete
Schedule 3, Condition 16 (b)	It is understood that the groundwater model will be updated in early 2020 to incorporate the abovementioned change in discharge. Recommend that following receipt of 2020 report and confirmation of any water take or ongoing discharge required (considered unlikely), confirmation that no security and relinquishment of a relevant groundwater licences under the Water Management Act 2000 is required.	Groundwater model to be reviewed and reflect this change. Identify whether there are any changes required in regards to relevant groundwater licences.	Complete
Schedule 3, Condition 16 (c)	Although the Water Management Plan was approved, recommend that for future updates where consultation with other regulators is required, that regulators are offered an opportunity to comment for a duration of at least 30 days prior to submission to DPIE for approval.	Future Management Plan updates to allow for thirty day response period by regulators.	Ongoing - *On 29/4/20 BB submitted a request to DPIE to consolidate management plans. On 14/8/20 DPIE approved this request. Work to consolidate the management plans is currently underway.* *Once complete, the Consolidated Plan will be sent to regulators, and allow for a thirty day response period.*

Schedule 3, Condition 19 (a)	Minesoils recommends the site forms a register of water management structures with locations shown on Geographic Information Systems (GIS) and linked to original design drawings and maintenance inspections. This should include drop structures, banks, dams, diversion drains and Ben Bullen creek diversion.	To be considered at next management plan review.	Complete
Schedule 3, Condition 19 (b)	The site visited identified an area requiring bunding between Jews and Baal Bone Creek in the Northern Rehabilitation Area (Plate 10). Recommend this area be urgently reviewed and bunded as required.	This area has now had the bund reinstated.	Complete
Schedule 3, Condition 23	Include a discussion within relevant documentation on bushfire management, specifically in and/or near the Wolgan Escarpment.	To be considered at next review of Bushfire Preparedness System.	Complete
Schedule 3, Condition 24 (a)	Surface water structures including banks, drop structures and dams need to be inspected and any failures or high-risk items should be repaired.	Monthly Rehabilitation Inspection form has been expanded to include further detail on inspecting dams and other structures as required in Erosion and Sediment Control Plan.	Complete
Schedule 3, Condition 24 (b)	It was noted on Thistle Hill, one contour drain was not repaired following a track to the top was installed to bring in and place soil material on the top section. This drain requires immediate attention so water can be transferred to the designed drop structure (Plate 4).	Repairs to be made to this contour drain.	Complete
Schedule 3, Condition 24 (c)	Weeds were evident onsite including blackberry. It is understood weed maintenance occurs regularly onsite and should continue, an especially high risk period will be following decent rain.	Weed management will continue to occur.	Ongoing
Schedule 3, Condition 24 (d)	REA5 showed two areas of complete failure. Minesoils recommends soil tests for Electrical Conductivity (EC), pH, Cation Exchange Capacity (CEC) and Exchangeable Sodium Percentage. It appears these two areas have received and pooled saline water from irrigation which has resulted in an area too salty for most vegetation. Some simple soil tests will indicate if this is true. In the event salinity is the limiting factor it is recommended to either leach the salts through the primary root zone via natural rainfall (slow) or irrigate with non-saline water. Alternatively, bring in additional material suitable for growth medium, subject to relevant approvals.	Consideration to be given to soil testing being undertaken. This area will be subject to rehabilitation efforts as part of the closure phase of the operation.	Ongoing

Schedule 3, Condition 24 (e)	REA5: The remainder of REA5 showed no acacia species established (Plate 6). This is believed to have occurred due to the tree seed not being treated prior to sowing. Most acacia species require a mechanism to break the seedcoat such as boiling, scarifying or low heat fire. It is recommended that low depth (<300mm surface ripping be strategically undertaken to avoid areas already establishing with Eucalypts. Additional seed mix (especially Acacia species) should then be treated, brought in and sown in the newly ripped areas. Recommended REA 5 repair mix includes Capertee Stringybark (as per SoC 31)	This area will be subject to rehabilitation efforts as part of the closure phase of the operation. Capertree Stringybark is listed in the Project Closure Plan Revegetation Species List.	Ongoing
Schedule 3, Condition 24 (f)	Overall the rehabilitation is establishing adequately in most areas (Plate 5,7), however recommend additional intervention is required to meet target species composition (especially the lower storey species) within a timeframe suitable for lease relinquishment.	Additional intervention will occur throughout the closure phase of the operation to ensure compliance with completion criteria associated with species composition.	Ongoing
Schedule 3, Condition 24 (g)	Recommend that the stockpiles identified in the 2016 IEA (Ref 6.1b of the 2016 IEA Action Plan) be seeded as per 2016 IEA recommendation during rehabilitation / closure period if not used within three months.	Stockpiles to be seeded where required.	Complete
Schedule 3, Condition 31	Consistent with previous IEA recommendation, site inspection reviewed significant capacity for ongoing scrap steel recycling and general waste clean-up which should be continued as part of closure, as Glencore indicated is proposed (Plate 15 and Plate 16).	Occurring as part of closure activities.	Complete
Schedule 5, Condition 2 (a)	Recommend for closure, re-approve specialists where required.	To be considered at next management plan review.	Ongoing - *On 29/4/20 BB submitted a request to DPIE to consolidate management plans. On 14/8/20 DPIE approved this request. Work to consolidate the management plans is currently underway.* *Specialist approval will be resent with Consolidated Plan.*
Schedule 5, Condition 2 (b)	Consideration of combining all relevant management plans from this consent into single, reduced Closure	To be considered at next management plan review.	Ongoing - *On 29/4/20 BB submitted a request*

	Management Plan relevant to closure (Noise, Air Quality, Aboriginal Cultural Heritage, Biodiversity and Land Management, Rehabilitation, Erosion and Sediment Control, Groundwater Monitoring, Surface Water Monitoring, Waste and Water, Road Haulage) (with approval from DPIE) and/or include single document as appendix to draft Mine Closure MOP.		*to DPIE to consolidate management plans. On 14/8/20 DPIE approved this request. Work to consolidate the management plans is currently underway.*
Schedule 5, Condition 2 (c)	In management plan update: • Tabulate condition showing where each point is addressed; • Ensure that all agencies are consulted with during preparation of management plan; and • All technical specialists, where required by conditions of consent to be approved by the Secretary.	To be considered at next management plan review.	Ongoing - *On 29/4/20 BB submitted a request to DPIE to consolidate management plans. On 14/8/20 DPIE approved this request. Work to consolidate the management plans is currently underway.*
Schedule 5, Condition 3 (a)	Consider request to DPIE to reduce the content of the Annual Review commensurate with closure status	To be considered for 2020 Annual Review.	Complete - *Content of this Annual Review reduced to the extent possible, whilst remaining in accordance with guidelines and Project Approval requirements.*
Schedule 5, Condition 3 (b)	b) replace "comprehensive" with "relevant" and not address i to iii which are not included in the EA;	Consideration to be given to seeking consent to have the recommended changes made to the Project Approval.	Complete - *Considered, however deemed to be impractical and unnecessary given the complexity of amending Project Approval. If future changes to the Project Approval are required, this action will be reconsidered.*
Schedule 5, Condition 3 (c)	d and e) not address as trends during operations cannot be compared to trends during closure.	Consideration to be given to seeking consent to have the recommended changes made to the Project Approval.	Complete - *Considered, however deemed to be impractical and unnecessary given the complexity of amending Project Approval. If future changes to the Project Approval are required, this action will be reconsidered.*
Consolidated Coal Lease (CCL749)			

Condition 5	Going forward, ensure the Domain's listed table in Section 7.4.2 of the Annual Review correlate to Section 6 of the draft Closure MOP.	To be considered for 2020 Annual Review.	Complete
Condition 32	Warragamba Outer Catchment Area be shown on a draft Closure MOP figure to ensure that work in relation to rehabilitation is completed before termination of the authority.	Consideration to be given to having a figure reflect information that is currently available in relation to the Warragamba Outer Catchment Area at the next review of the current MOP.	Ongoing
Previous IEA (2016) Recommendations			
21	6.7a) Recommend at next review, that all management plans should include a table cross referencing the requirements in Schedule 5 Condition 2 of the Project Approval, with the relevant sections of management plans, consistent with previous audit recommendation.	To be completed at next management plan review.	Ongoing – *On 29/4/20 BB submitted a request to DPIE to consolidate management plans. On 14/8/20 DPIE approved this request. Work to consolidate the management plans is currently underway.*
23	6.7c) The copy of the Biodiversity Management Plan should be provided to OEH for consultation.	To be completed at next management plan review.	Ongoing – *On 29/4/20 BB submitted a request to DPIE to consolidate management plans. On 14/8/20 DPIE approved this request. Work to consolidate the management plans is currently underway. Copy of Consolidated Plan will be provided to OEH for comment.*

11 Incidents and Non-Compliances during the Reporting Period

Incidents are notified to the EPA, DPI&E and other relevant agencies immediately on becoming aware of a notifiable incident.[8]

11.1 Reportable Incidents

There were no reportable incidents during the 2020 reporting period.

11.2 Non-Compliances

There were six non-compliances during the 2020 reporting period, as summarised in **Table 11.1** below.

Table 11.1: Non-Compliances

Relevant Approval	Date	Details of non-compliance	Cause of Non-compliance	Action to address Non-compliance
PA 09-0178 **Schedule 3, Condition 21**	Ongoing during 2020	Ongoing exceedance of Water Quality Trigger Level for dissolved zinc (0.175mg/L) at BBPB3	A 2020 Umwelt investigation found that the zinc exceedances were likely the result of increased rainfall, and rises in groundwater levels.	Ongoing monitoring.
PA 09-0178 **Schedule 3, Condition 21**	Ongoing during 2020	BBPB5 and BBPB6 outside of Water Quality Trigger Level for pH for periods of 2020.	An internal investigation determined that the likely cause of the non-compliance was the lengthy rainfall deficit period, followed by increased rainfall and rises in groundwater levels.	Ongoing monitoring.
PA 09-0178 **Schedule 3, Condition 21**	Ongoing during 2020	Groundwater quality analysis not carried out in accordance with schedule specified in Section 4.1.3 of the GWMP.	Errors by laboratory resulted in quarterly 'speciation' monitoring not conducted at correct intervals. Damage to monitoring bore BBPB2 resulted in samples unable to be extracted from bore in December 2020 and January 2021.	Changes to laboratory and Baal Bone procedures to ensure samples are collected at correct intervals. Repairs to BBPB2.
PA 09-0178 **Schedule 3, Condition 21**	January 2020	Groundwater levels not taken in BBPB1, BBPB3, BBPB4, and BBPB5 for two	Gospers Mountain fire prevented access to the Cox's River Swamp in December 2019. In January 2020 a number of burnt trees were fallen across tracks in the Ben	None.

[8] PA09_0178 Schedule 5, Condition 5 and Condition 6 and Protection of the Environment Operations Act 1997, Section 153 - Pollution Incident Response Management Plan (PIRMP, BBNUG-882012935-2894).

Relevant Approval	Date	Details of non-compliance	Cause of Non-compliance	Action to address Non-compliance
		months – Dec 2019 and Jan 2020.	Bullen State Forest preventing access to monitoring bores.	
EPL 765 **L2.4**	22/01/2020	Results received for January 2020 indicated an exceedance of oil and grease at EPL Monitoring Point 16 with a result of 11mg/L, compared to an EPL concentration limit of 10mg/L.	An investigation into the exceedance determined that potential contributors may have been: * the extended drought period and 40.44mm of rain in the week leading up to the sampling; * bushfires moving through the area in December 2019; and * large equipment moving through the site to establish fire breaks.	Since being advised of the exceedance, Baal Bone environmental personnel have conducted regular inspections of this area with an increased focus on all areas with the potential to lead to an oil or grease spill. The exceedance has also been raised with contractors on site to improve their awareness of and need to report this type of matter.
EPL 765 **L2.4**	25/08/2020	Results received for August 2020 showed an exceedance of dissolved iron at EPL Monitoring Point 16, with a result of 1.68mg/L, compared to a EPL concentration limit of 1.0mg/L.	Investigation determined that potential contributors may have been: * demolition and civil works conducted on site since January 2020; * rainfall impacting the site leading up to the day the sample was taken. and * lower pH levels recorded in 2020, both onsite and upstream.	Additional water sampling was conducted across the site, regular inspections are conducted of the area, with an increased focus on water quality and appearance; and lime is applied to the Overshot Dam (as required) to raise the pH.

12 Activities to be completed in the Next Reporting Period

Activities to be completed during the 2021 reporting period include:

Demolition

- Demolition of administration, workshop and electrical substation.

Rehabilitation

- Continued rehabilitation in the following areas in accordance with the approved Mine Closure MOP 2019 – 2025:
    - Domain 1- Northern Void: roads and unvegetated areas.
    - Domain 2 – Northern Rehabilitation Area: roads and maintenance of previously rehabilitated areas.
    - Domain 3 – Infrastructure: land shaping, topsoiling and seeding of electrical substation area, dollar shed and roads; and maintenance of previously rehabilitated areas.
    - Domain 4 – Central Pit Top Area: land shaping, topsoiling and seeding of administration and workshop areas.
    - Domain 5 – Southern Rehabilitation Area: roads and maintenance of previously rehabilitated areas.
    - Domain 6 – Southern Reject Emplacement Area: continued filling of voids, land shaping, topsoiling and seeding.
    - Domain 7 – Subsidence Area: continued rehabilitation of any subsidence cracks.
    - Domain 8 – Ben Bullen Creek: shaping, topsoiling and seeding of sections of creek.

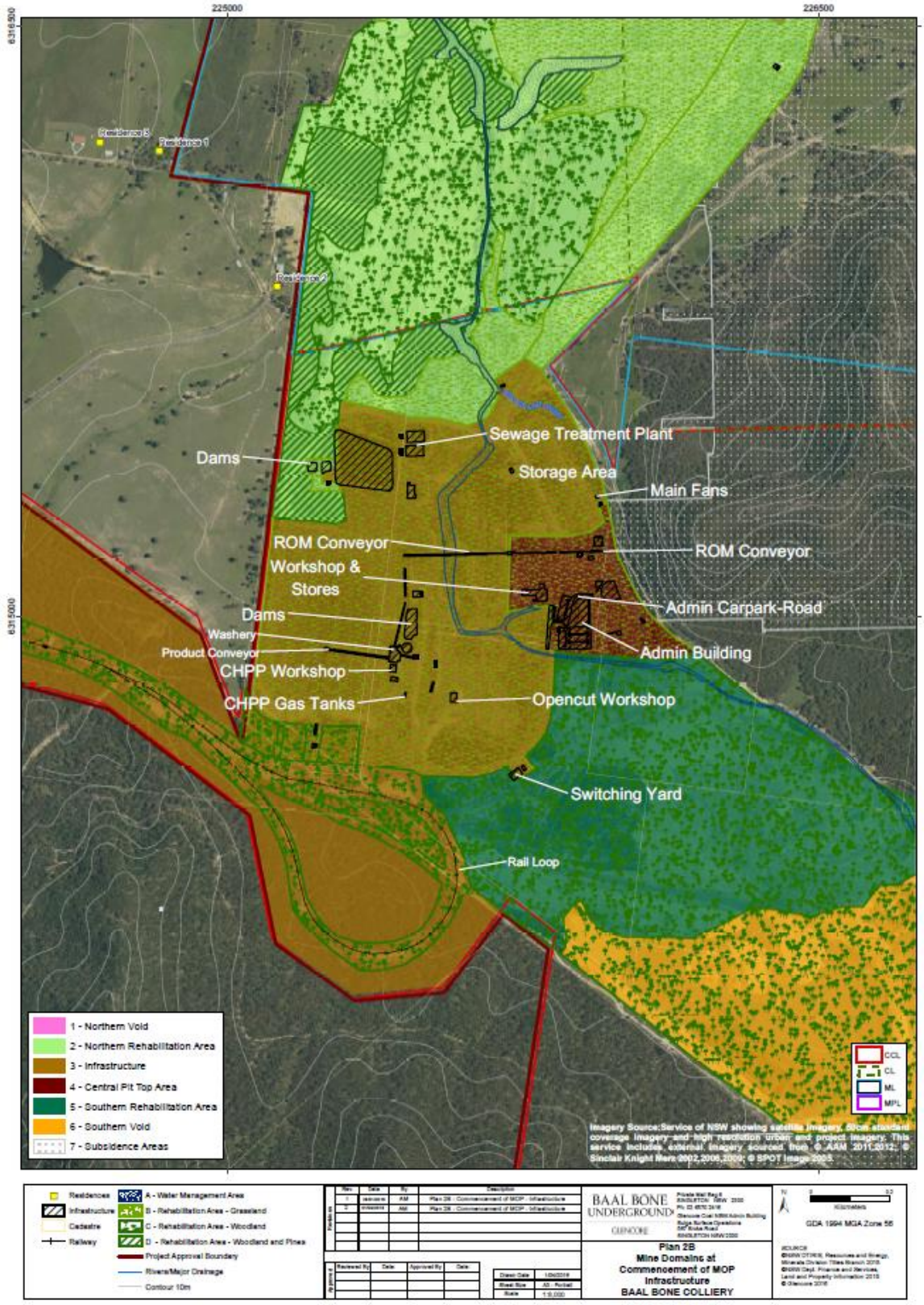
Management Systems

- Consolidation of a number of environmental management plans into a single concise document.

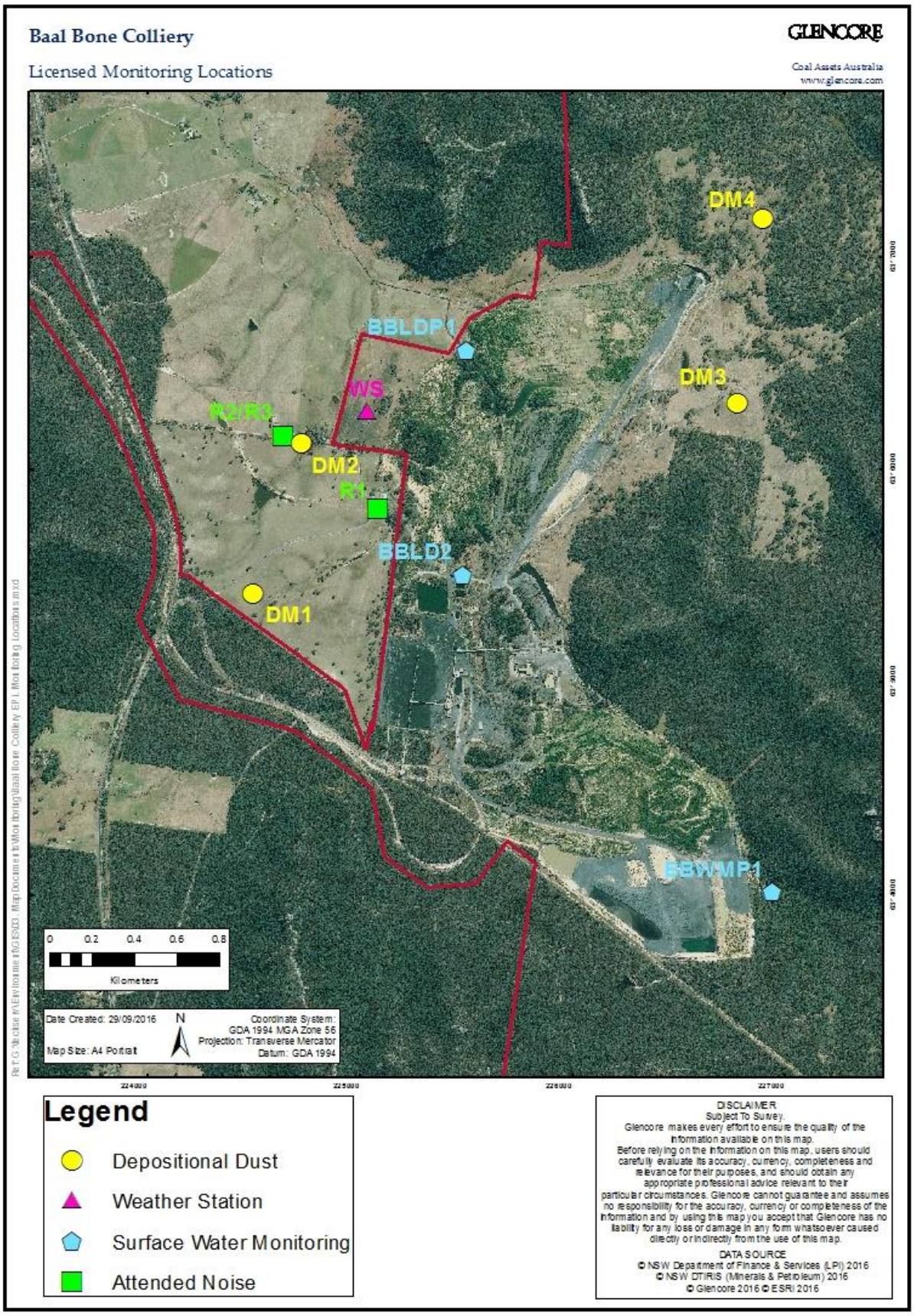
Community

- Hosting a CCC meeting; and
- Distribution of a community newsletter.

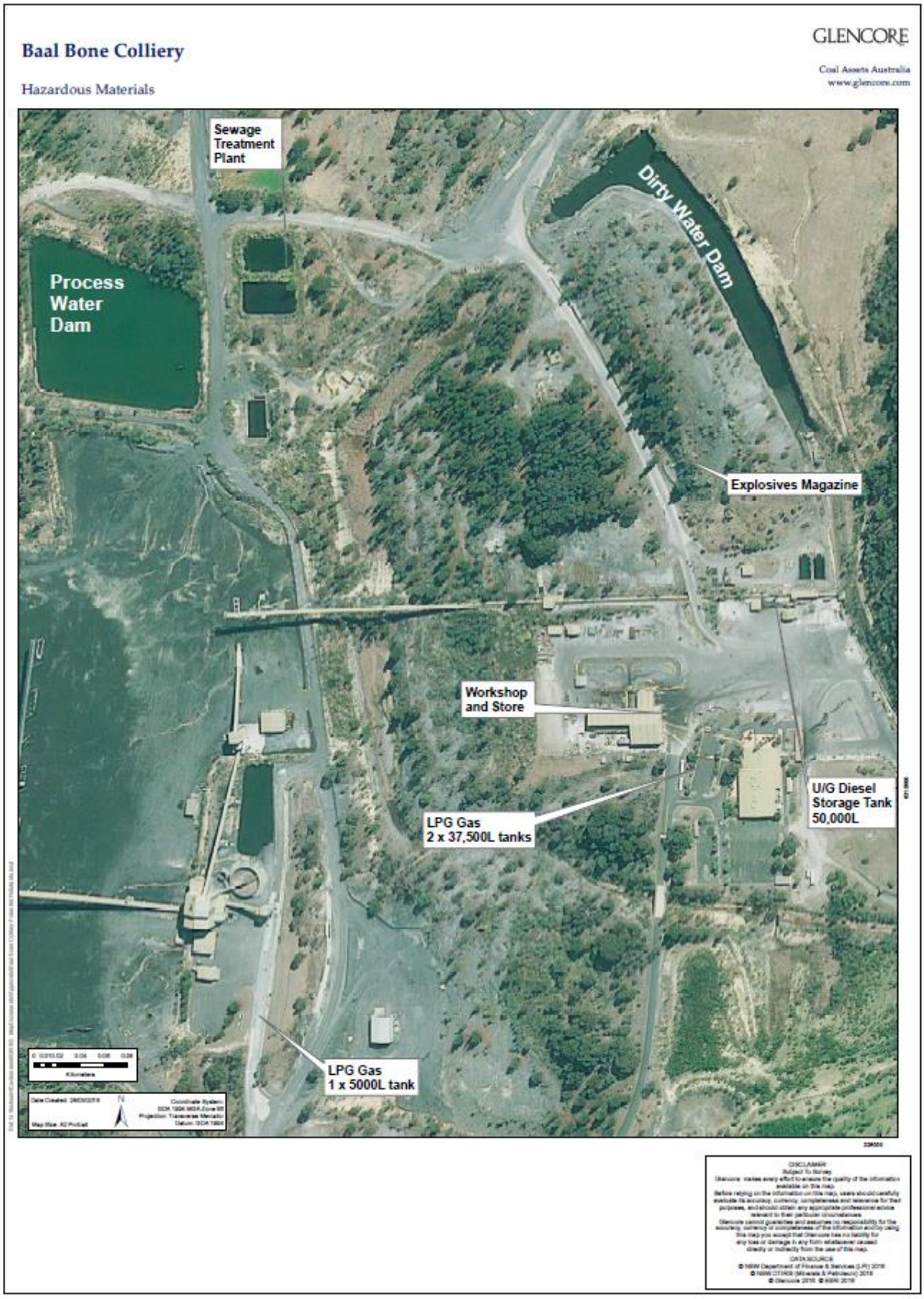
A.1 Appendix A - Plans



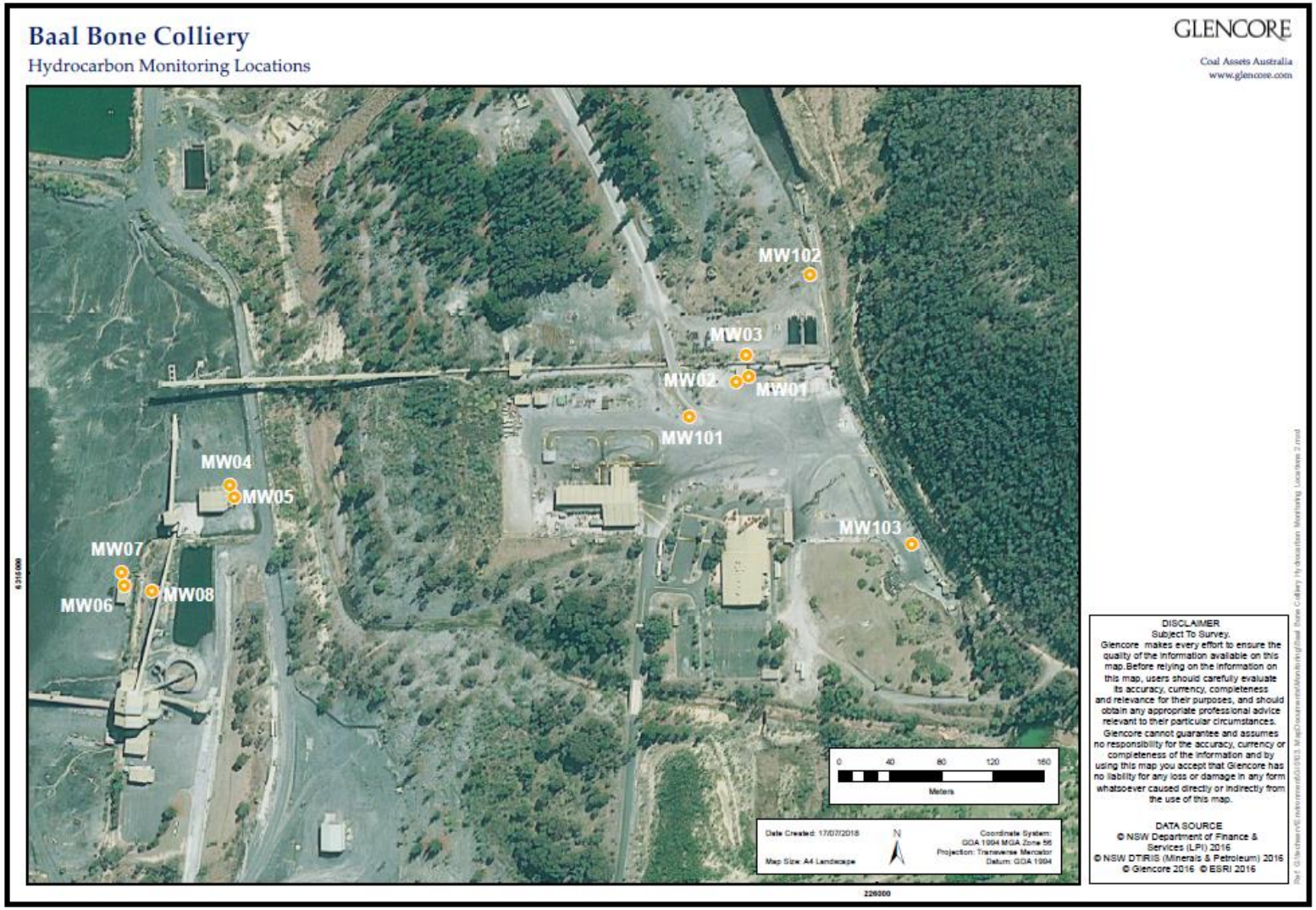
Plan 1 – Site Infrastructure (Prior to demolition and closure activities)



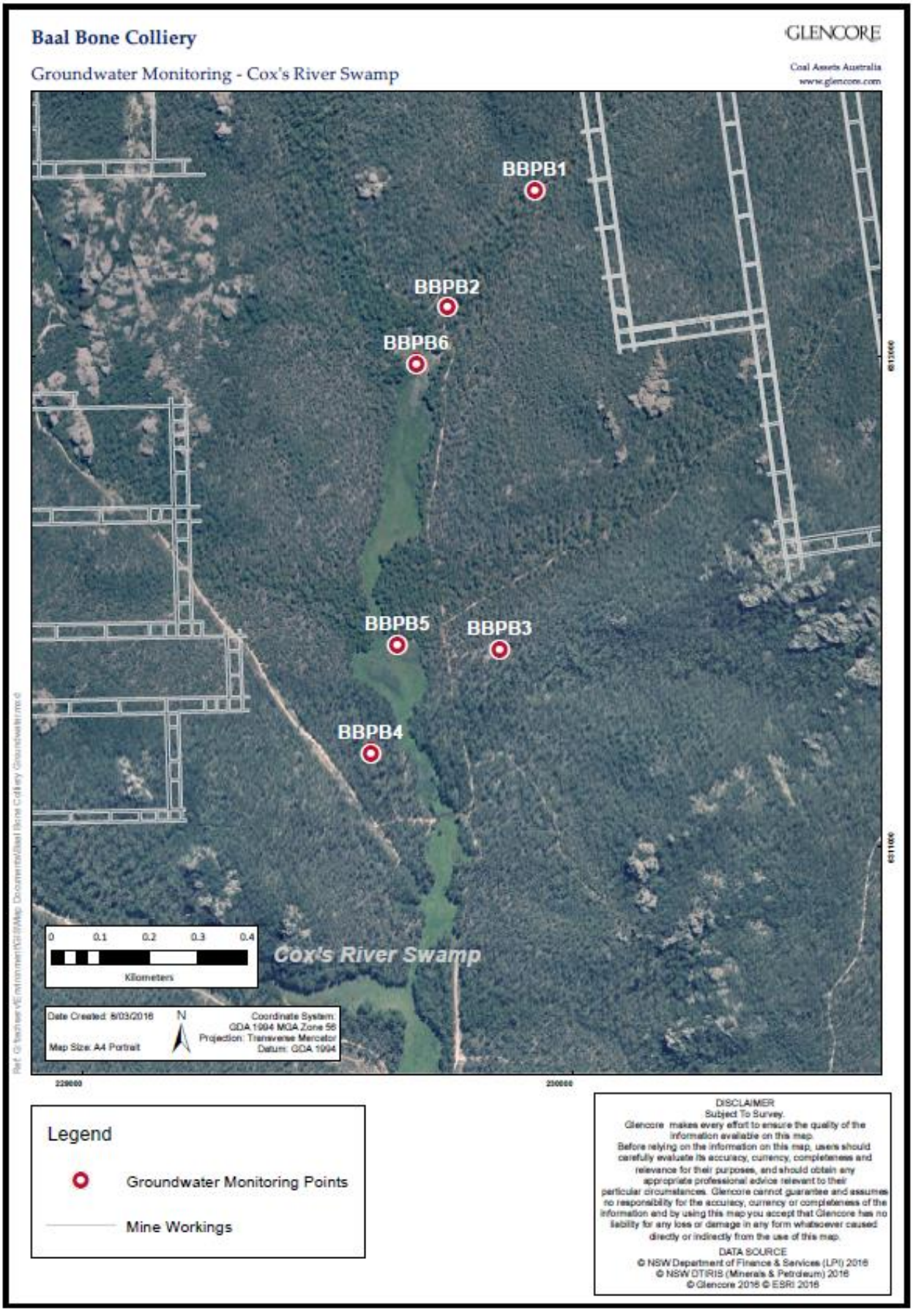
Plan 2 – Licensed Monitoring Locations



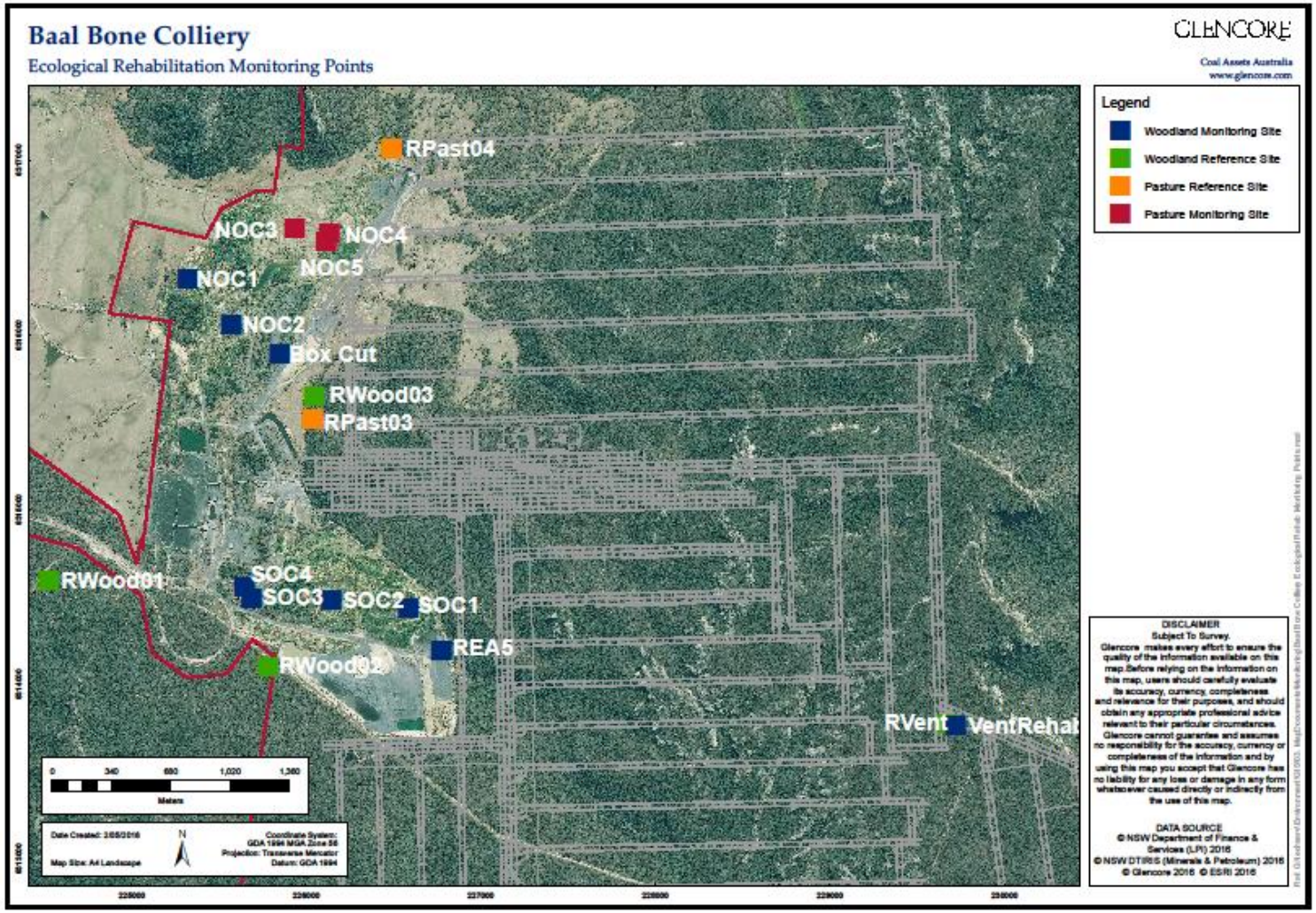
Plan 3 – Hazardous Materials (prior to demolition and closure activities)



Plan 4 – Hydrocarbon Monitoring Locations



Plan 5 – Groundwater Monitoring Cox's River Swamp



Plan 6 – Ecological Rehabilitation Monitoring Points

A.2 Appendix B – Approval

Planning, Industry & Environment

THE WALLERAWANG COLLIERIES LIMITED
Attention: Mr Greg Peard
Castlereagh Highway
Cullen Bullen New South Wales 2790

29/03/2021

Baal Bone Coal (MP09_0178)
Annual Review 2020

Dear Mr Peard

Reference is made to the 2020 Annual Review for the period 1 January 2020 to 31 December 2020, submitted to the Department of Planning, Industry and Environment (Department) on 23 March 2021 as required under Schedule 5 Condition of Baal Bone Coal Project MP09_0178 (Consent).

The Department has reviewed the Annual Review and considers it to satisfy the reporting requirements of the approval. Please note that the Department's acceptance of this Annual Review is not endorsement of the compliance status of the project.

Non-compliances with Schedule 3 Condition 21 identified in the Annual Review have been noted by the Department, with no further action at this stage.

In accordance with Schedule 5 Condition 9, it is requested that a copy of the 2020 Annual Review is made publicly available on the company website within 1 month from the date of this letter.

Should you need to discuss the above, please contact Ms Jennifer Rowe on 02 4247 1851 or at jennifer.rowe@planning.nsw.gov.au

Yours sincerely

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

Department of Planning, Industry & Environment
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