Boggabri Coal Operations Pty Ltd

# Boggabri Coal Mine
# 2022 Annual Review

30 March 2023

IDEMITSU
BOGGABRI COAL

idemitsu

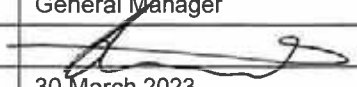
## Revision Control Chart

| Rev No | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Revision Date | 17 March 2023 | | | |
| Prepared by | James Bailey & Associates | | | |
| Reviewed by | T Mc Dermott & A Williams | | | |
| Approved by | L Bowden | | | |
| Signature | | | | |

## Distribution Control

| Company | Position |
|---|---|
| Boggabri Coal Operation Pty Ltd (BCOPL) | Environment Superintendent |
| Department of Regional NSW – Mining Exploration and Geosciences | Regional Environment Officer |
| Department of Regional NSW – Resources Regulator | Principal Inspector Environment & Rehabilitation Operations |
| Department of Planning and Environment | Senior Planning Officer |
| Department of Primary Industries – Agriculture | Area Manager North West |
| Department of Planning and Environment – Water | Water Regulation Officer |
| NSW Environment Protection Authority | Regional Operations Officer Armidale |
| Forestry Corporation of NSW | Forestry Occupancy Supervisor |
| Community Consultative Committee | Chairperson |

| Annual Review/Annual Rehabilitation Report Title Block | |
|---|---|
| Name of Operation | Boggabri Coal Mine |
| Name of Operator | Boggabri Coal Operations Pty Ltd |
| Development Consent/Project Approval # | 09_0182 |
| Name of Holder of Project Approval | • Idemitsu Australia Pty Limited via its subsidiary company, Boggabri Coal Pty Ltd – 80%;<br>• Chugoku Electric Power Australia Resources Pty Ltd – 10%; and<br>• NS Boggabri Pty Limited – 10%. |
| Mining Lease # | CL 368, ML 1755 |
| Name of Holder of Mining Leases | • Idemitsu Australia Pty Limited via its subsidiary company, Boggabri Coal Pty Ltd – 80%;<br>• Chugoku Electric Power Australia Resources Pty Ltd – 10%; and<br>• NS Boggabri Pty Limited – 10%. |
| Water Licence # | See Table 2-2 below for details |
| Name of Holder of Water Access Licences | • Idemitsu Australia Pty Limited via its subsidiary company, Boggabri Coal Pty Ltd – 80%;<br>• Chugoku Electric Power Australia Resources Pty Ltd – 10%; and<br>• NS Boggabri Pty Limited – 10%. |

| Annual Review/Annual Rehabilitation Report Title Block | |
|---|---|
| Annual Rehabilitation Reporting Commencement Date | 15 November 2022 |
| Annual Rehabilitation Reporting Completion Date | 31 December 2022 |
| Annual Review Commencement Date | 1 January 2022 |
| Annual Review Completion Date | 31 December 2022 |
| I, Ben Hiatt, certify that this audit report is a true and accurate record of the compliance status of Boggabri Coal Mine for the period 1 January 2022 to 31 December 2022 and that I am authorised to make this statement on behalf of Boggabri Coal Operations Pty Limited. | |
| Name of authorised reporting officer | Ben Hiatt |
| Title of authorised reporting officer | General Manager |
| Signature of authorised reporting officer |  |
| Date | 30 March 2023 |

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## Acronyms

| Abbreviations | Terms |
|---|---|
| **µg/m³** | Micrograms per metre cubed |
| **µS/cm** | Microsiemens per centimetre |
| **Ausdrill** | Ausdrill Limited |
| **AHCS** | Aboriginal Heritage Conservation Strategy |
| **AIA** | Acoustic Impact Assessment |
| **AN** | Ammonium Nitrate |
| **ANFO** | Ammonium Nitrate/ Fuel Oil |
| **AQGHGMP** | Air Quality and Greenhouse Gas Management Plan |
| **ASCF** | Aboriginal Stakeholder Consultative Forum |
| **BBAM** | BioBanking Assessment Methodology 2014 |
| **BC Act** | Biodiversity Conservation Act 2016 NSW |
| **BCM** | Boggabri Coal Mine |
| **BCOPL** | Boggabri Coal Operations Pty Limited |
| **BFMP** | Blast Fume Management Protocol |
| **BLMP** | Blast Management Plan |
| **BMP** | Biodiversity Management Plan |
| **BOA** | Biodiversity Offset Area |
| **BOS** | Biodiversity Offset Strategy |
| **BTM Complex** | Boggabri, Tarrawonga, Maules Creek Mining Complex |
| **CCC** | Community Consultative Committee |
| **CHMP** | Cultural Heritage Management Plan |
| **CHPP** | Coal Handling and Preparation Plant |
| **CL** | Coal Lease |
| **dB(A) $L_{eq\ (15\ minutes)}$** | Decibels A-Weighted with a Equivalent Continuous Sound Pressure Level over 15minutes |
| **DPE** | Department of Planning and Environment |
| **DPI** | Department of Primary Industries |
| **EA** | *Continuation of Boggabri Coal Mine Environmental Assessment* (Hansen Bailey, 2010) |
| **EC** | Electrical Conductivity |
| **EMP** | Environmental Management Plan |
| **EMS** | Environmental Management Strategy |
| **EP&A Act** | *Environmental Planning and Assessment Act 1979* (NSW) |
| **EPA** | Environment Protection Authority |
| **EPBC Act** | *Environment Protection and Biodiversity Conservation Act 1999* (Cth) |
| **EPL** | Environment Protection Licence |
| **Forestry NSW** | NSW Forestry Corporation of NSW |
| **g/m²/month** | Grams per metre squared per month |
| **GHG** | Greenhouse Gas |
| **GJ** | Gigajoules |
| **GSC** | Gunnedah Shire Council |
| **GWMP** | Groundwater Management Plan |
| **ha** | Hectares |
| **HTV** | High Trigger Value |
| **HVAS** | High Volume Air Sampler |
| **IA** | Idemitsu Australia Pty Ltd |
| **IEA** | Independent Environment Audit |

| Abbreviations | Terms |
|---|---|
| **kbcm** | Kilo Bank Cubic Metres |
| **$L_{Aeq\ (15\ minutes)}$** | Equivalent Continuous Sound Pressure Level over 15minutes |
| **LGA** | Local Government Area |
| **LTV** | Low Trigger Value |
| **m/s** | Metres per second |
| **mAHD** | Metres Australian Height Datum |
| **Mbcm** | Million bank cubic metres |
| **mBGL** [B] | Metres Below Ground Level |
| **mbtoc** | Metres below top of casing |
| **MCCM** | Maules Creek Coal Mine |
| **mg/L** | Milligrams per litre |
| **MIA** | Mine Infrastructure Area |
| **ML** | Megalitres |
| **Mining Lease** | Mining Lease |
| **MOP** | Mining Operations Plan |
| **Mt** | Million tonnes |
| **Mtpa** | Million Tonnes Per Annum |
| **MTV** | Medium Trigger Value |
| **NGER Act** | *National Greenhouse and Energy Reporting Act 2007* (Cth) |
| **NGERs** | National Greenhouse and Energy Reporting |
| **NMP** | Noise Management Plan |
| **NPI** | National Pollutant Inventory |
| **NSC** | Narrabri Shire Council |
| **Orica** | Orica Australia Pty Ltd |
| **PA** | Project Approval |
| **PAF** | Potential Acid Forming |
| **$PM_{10}$** | Particulate matter < 10 µm |
| **$PM_{2.5}$** | Particulate matter < 2.5 µm |
| **RAPs** | Registered Aboriginal Parties |
| **RBS** | Leard Forest Regional Biodiversity Strategy |
| **RMP** | Rehabilitation Management Plan |
| **ROM** | Run of Mine |
| **SIMP** | Social Impact Management Plan |
| **SPL** | Sound Power Level |
| **SSD** | State Significant Development approval (formerly Project Approval) 09_0182 |
| **SWB** | Site Water Balance |
| **SWMP** | Surface Water Management Plan |
| **t $CO_2$-e** | Tonnes of Carbon Dioxide Equivalent |
| **TCM** | Tarrawonga Coal Mine |
| **TEOM** | Tapered Element Oscillating Microbalance |
| **TLO** | Train Load-out Facility |
| **TMP** | Traffic Management Plan |
| **TSP** | Total Suspended Particulates |
| **ULSD** | Ultra-Low Sulphur Diesel |
| **WAL** | Water Access Licence |
| **WMP** | Water Management Plan |

# 1 STATEMENT OF COMPLIANCE

In accordance with the requirements of the *Post-approval requirements for State significant mining developments – Annual Review Guideline* (NSW Government, 2015), a statement of compliance has been prepared to document the status of compliance with Boggabri Coal Mine's (BCM's) planning approval State Significant Development approval (SSD) 09_0182 (including Statement of Commitments), mining leases (MLs) and other relevant approvals as at the end of the 2022 reporting period. Table 1.1 identifies whether or not non-compliances occurred during the reporting period for each statutory approval. Where non-compliances are identified, further details are provided in Table 1.2.
Non compliances have been colour-coded in that table, in accordance with the descriptions provided in the *Annual Review Guideline* (NSW Government, 2015).

**Table 1.1 Statement of Compliance**

| Approval | Were all conditions of the relevant approval(s) complied with during the reporting period? |
|---|---|
| Project Approval 09_0182 (incl. Statement of Commitments) | **No** |
| Coal Lease 368 | Yes |
| Authorisation 355 | Yes |
| Authorisation 339 | Yes |
| Environment Protection Licence (EPL) 12407 | **No** |
| Water Access Licence (WAL) 12691 | Yes |
| WAL 12767 | Yes |
| WAL 15037 | Yes |
| WAL 24103 | Yes |
| WAL 29473 | Yes |
| WAL 29562 | Yes |
| WAL 2571 | Yes |
| WAL 2572 | Yes |
| WAL 2595 | Yes |
| WAL 2596 | Yes |
| WAL 36547 | Yes |
| WAL 37519 | Yes |
| WAL 37067 | Yes |
| WAL 42234 | Yes |
| WAL 44134 | Yes |

**Table 1.2 Non-Compliances During the Reporting Period**

| Relevant approval | Ref. | Condition Description | Compliance status | Comment | Where addressed in the Annual Review |
|---|---|---|---|---|---|
| **SSD 09_0182** | Schedule 3 Condition 9 | Sound Power Levels | Non-Compliance Low Risk | Sound power screening during 2022 recorded 15 items of plant which exceeded the required sound power level by 3dB or more. | Section 6.3.2.2.2 |
| **SSD 09_0182** | Schedule 5 Condition 4 | Annual Review | Non-Compliance Low Risk | 2021 Annual Review was submitted subsequent to the due date. | Section 11 |
| **SSD 09_0182** | Schedule 3 Condition 38(b) | Surface Water Management Plan (SWMP) | Non-Compliance Low Risk | The implementation of the currently approved SWMP is non-compliant as the clean water drain presented in Appendix A of the SWMP to the north of the disturbance area has been mined through and has not been reinstated. | Section 11 |
| **SSD 09_0183** | Schedule 3 Condition 38(c) | Groundwater Management Plan (GWMP) | Non-Compliance Low Risk | The implementation of the currently approved GWMP is non-compliant as groundwater monitoring was not undertaken at all required bores during the reporting period. | Section 11 |
| **SSD 09_0182** | Schedule 3 Condition 54 | Eucalyptus Forestry Plantation Offset Strategy | Non-Compliance Low Risk | BCOPL has not prepared a Eucalyptus Forestry Plantation Offset Strategy to the satisfaction of NSW Forestry Corporation of NSW (Forestry NSW). | Section 11 |
| **EPL12407** | M4.1 | Weather Monitoring | Non-Compliance Low Risk | Continuous rainfall readings at the 60 m AWS were not recorded for the period between 5-12 May 2022. | Section 6.2.1 |
| **SSD 09_0182** | Schedule 3 Condition 22 | Blast Management Plan | | | |
| **EPL12407** | M4.1 | Weather Monitoring | Non-Compliance Low Risk | Continuous solar radiation readings at the 60 m AWS were not recorded for the period between 21 July 2022 and 7 December 2022. | Section 6.1 |
| **SSD 09_0182** | Schedule 3 Condition 22 | Blast Management Plan | | | |

| Relevant approval | Ref. | Condition Description | Compliance status | Comment | Where addressed in the Annual Review |
|---|---|---|---|---|---|
| **EPL12407** | M7.1 | Blasting | Non-Compliance Low Risk | Blast which was conducted on 14 November 2022 was not recorded by the 'Goonbri' blast monitor. | Section 6.1 |
| **SSD 09_0182** | Condition 3 Condition 15 | Blasting | | | |

*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-complaint | Non-compliance with:<br>• Potential for serious environmental consequences, but is unlikely to occur; or<br>• Potential for moderate environmental consequences, but is likely to occur |
| **Low** | Non-compliant | Non-compliance with:<br>• Potential for moderate environmental consequences, but is unlikely to occur; or<br>• 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) |

# 2 INTRODUCTION

## 2.1 Mine Operation Introduction and History

BCM is an open cut coal mine located 15 km north-east of the township of Boggabri in north-western New South Wales (NSW). BCM is managed by Boggabri Coal Operations Pty Ltd (BCOPL) on behalf of Idemitsu Australia Pty Ltd (IA) and its joint venture partners. BCOPL is owned by IA, a subsidiary of Japanese company, Idemitsu Kosan Pty Ltd. BCM is owned by the following joint venture partners:

- IA via its subsidiary company, Boggabri Coal Pty Ltd – 80%;
- Chugoku Electric Power Australia Resources Pty Ltd – 10%; and
- NS Boggabri Pty Limited – 10%.

Environmental assessment first commenced at BCM in 1976 followed by grant of approval for the project in 1989, and the commencement of operations in 2006. Truck and excavator operations produce a crushed and screened export quality thermal coal and pulverised coal injection product, which is transported from the mine via rail to the Port of Newcastle, for export to overseas markets.

In 2009, BCOPL lodged a major project application under the former Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Project Approval (PA) 09_0182, was granted by the NSW Planning Assessment Commission (now Independent Planning Commission) in June 2012, allowing for extraction of up to 8.6 Million tonnes per annum (Mtpa) of run of mine (ROM) coal from BCM until the end of 2033 (the Project).

Under SSD 09_0182, a new rail load-out facility and rail spur was constructed. Operation of this infrastructure commenced in December 2014. This has eliminated routine road transport of product coal between the mine infrastructure area (MIA) and the Boggabri Coal Terminal. All product coal is currently transported from site via rail. A new Coal Handling and Preparation Plant (CHPP) was commissioned in mid-2015, enabling beneficiation of ROM coal required for the mine to reach the approved production rates. The grant of SSD 09_182 also facilitates the upgrade of the overburden and coal production fleet and other ancillary infrastructure, as well as the option of a dragline.

Seven modifications to PA 09_0182 have been lodged since granting of the original approval. One of these modifications (Mod 1) was subsequently withdrawn. Mod 9 was most recently approved by the Department of Planning and Environment (DPE) on the 2 March 2023. MOD 8 was still being assessed as of March 2023.

On 20 June 2019, a delegate of Minister declared the SSD 09_0182, as modified to be “State Significant Development” under Clause 6 of Schedule 2 of the *Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017*, for the purposes of the EP&A Act. Accordingly, from 20 June 2019, PA 09_0182 is known as SSD 09_0182.

In NSW, mining operations and certain mining purposes were previously required to be carried out in accordance with a Mining Operations Plan (MOP) which had been approved by the Department of Regional NSW – Resources Regulator. BCM operated in accordance with the MOP, Amendment A dated March 2020 that applies to activities at the BCM between 2020 and 2024. An Addendum to the MOP, Amendment A was approved on 28 January 2022. With the commencement of the Rehabilitation Reforms on 2 July 2022, this approved MOP has been replaced by a Rehabilitation Management Plan and other supporting documentation. This documentation has been prepared in accordance with the relevant Resources Regulator Form and Way and Guideline documents.

## 2.2 Mine Contacts

**Table 2.1 BCM Mine Contacts**

| | |
|---|---|
| **General Manager Operations:** | **Ben Hiatt** |
| Company: | Boggabri Coal Operations Pty Limited |
| Address: | 386 Leard Forest Rd, Boggabri, NSW, 2382 |
| Phone: | 02 6749 6000 |
| Fax: | 02 6743 4496 |
| **Health, Safety, Environment, Community and Training Manager:** | **Luke Bowden** |
| **Company:** | Boggabri Coal Operations Pty Limited |
| **Address:** | 386 Leard Forest Rd, Boggabri, NSW, 2382 |
| **Phone:** | 02 6749 6000 |
| **Fax:** | 02 6743 4496 |
| **Environmental Superintendent:** | **Alex Williams** |
| Company: | Boggabri Coal Operations Pty Limited |
| Address: | 386 Leard Forest Rd, Boggabri, NSW, 2382 |
| Phone: | 02 6749 6000 |
| Fax: | 02 6743 4496 |

## 2.3 Purpose and Scope of Report

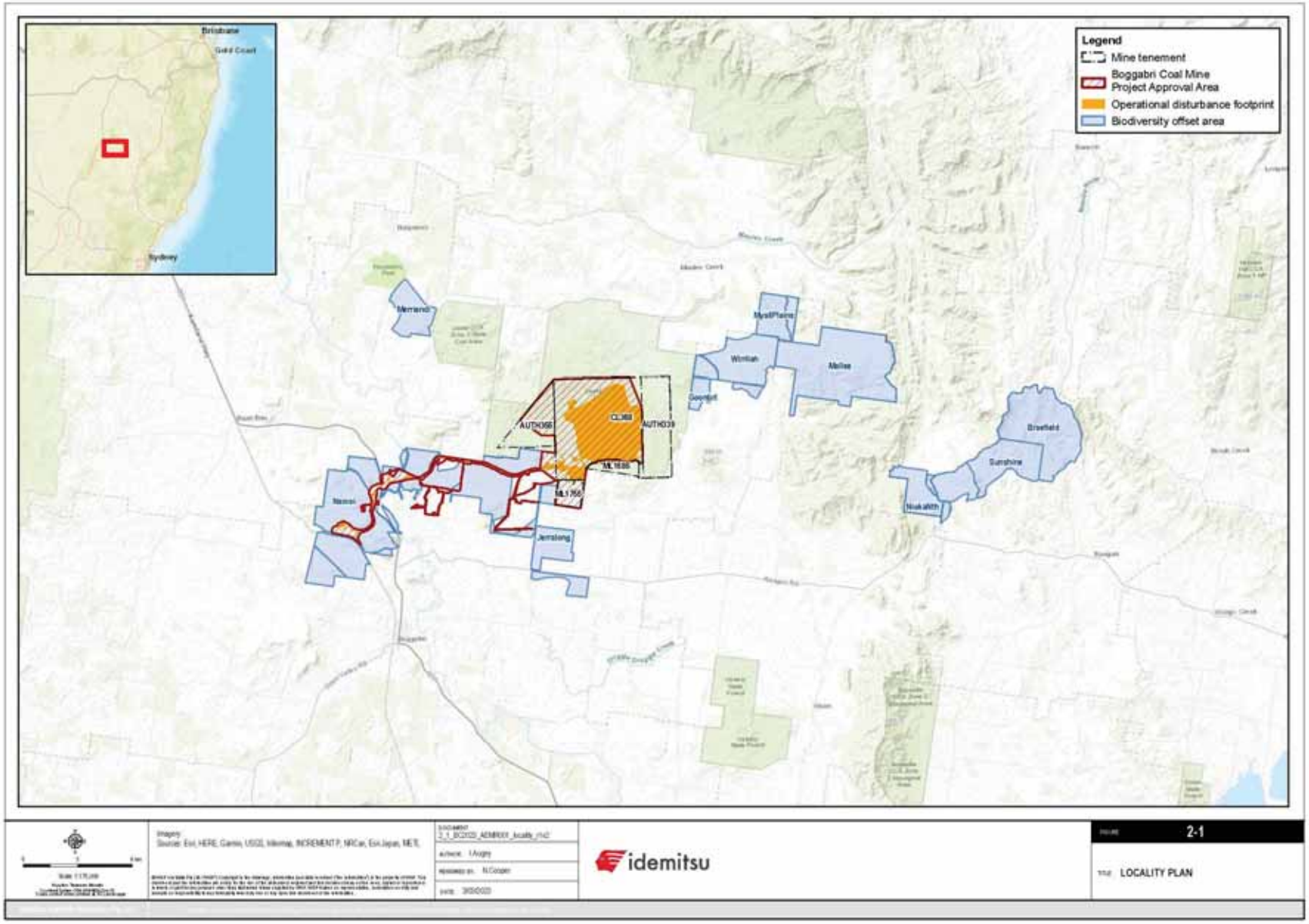
This Annual Review discusses the environmental performance of BCOPL and its contractors, in relation to compliance with the conditions of SSD 09_0182, and other relevant leases, licences and approvals. It provides a summary of operational and environmental management activities undertaken at the BCM during the reporting period (1 January to 31 December 2022) and provides a review against planned works, as described in the MOP (now replaced by the Forward Work Program), and predicted impacts documented in the *Continuation of Boggabri Coal Mine Environmental Assessment* (EA) (Hansen Bailey, 2010) and relevant modification documentation. The Annual Review also covers community relations and addresses mine development and rehabilitation undertaken during the reporting period.

The Annual Review has been prepared in accordance with the following:

- Schedule 5, Condition 4 of SSD 09_0182;
- Post-approval requirements for State significant mining developments – Annual Review Guideline (Annual Review Guideline) (NSW Government, 2015);
- Coal Lease 368 (CL 368) and Mining Lease 1755 (ML 1755); and
- Rehabilitation Management Plan (RMP) and Forward Work Program (dated 15 November 2022).

Key requirements of these approvals are described in Appendix A. A map illustrating the mine locality and BCM Project Boundary is provided in Figure 2-1, while figures illustrating the relevant monitoring points and land ownership are included within Appendix B. Offset properties for BCM are identified on the figures provided in Appendix C.

**Figure 2-1 Locality Map**



# 3 APPROVALS

## 3.1 Approvals, Licences and Mining Leases

Table 3.1 summarises the key mining leases and approvals currently held by BCOPL which are relevant to the operations at BCM.

**Table 3.1 Key Approvals, Consents, Mining Leases and Licences**

| Description | Date granted/ commencement date | Expiry/duration |
|---|---|---|
| **Project Approvals** | | |
| SSD 09_0182 (as modified) | 18-Jul-12 | 31-Dec-33 |
| EPBC Act Approval 2009/5256 (as varied) | 11-Feb-13 | 31-Dec-53 |
| EPBC Referral 2021/8875 (Regarding SSD 09_0182 (MOD 8)) | Under Assessment | |
| **Coal Leases/Mining Leases** | | |
| Coal Lease CL 368 | 15-Nov-90 | 14-Nov-32 |
| Mining Lease ML1755 | 30-Jun-17 | 30-Jun-38 |
| **Mining Leases/Authorisations** | | |
| Authorisation A 355 | 19-Jul-84 | 11-Apr-18 (renewal lodged) |
| Authorisation A 339 | 11-Apr-84 | 11-Apr-22 (renewal lodged) |
| **Environment Protection Licence** | | |
| EPL 12407 | 11-Jan-06 | In perpetuity (Anniversary 11 January) |
| **Water Licences** | | |
| WAL12691 | 1-Nov-06 | In perpetuity |
| WAL12767 | 1-Nov-06 | In perpetuity |
| WAL15037 | 1-Nov-06 | In perpetuity |
| WAL24103 | 29-Jun-11 | In perpetuity |
| WAL29473 | 16-Jan-12 | In perpetuity |
| WAL29562 | 16-Jan-12 | In perpetuity |
| WAL2571 | 1-Jul-04 | In perpetuity |
| WAL2572 | 1-Jul-04 | In perpetuity |
| WAL2595 | 1-Jul-04 | In perpetuity |
| WAL2596 | 1-Jul-04 | In perpetuity |
| WAL36547 | 17-Jan-14 | In perpetuity |
| WAL37519 | 16-Feb-16 | In perpetuity |
| WAL42234 | 9-Jan-19 | In perpetuity |
| 90FW833717 | 21-Sep-15 | 4-Apr-30 |
| 90FW834023 | 21-Sep-15 | 4-Jun-29 |
| **Mining Operations Plans (MOP)** | | |
| MOP | 1-Jan-20 | 2-Jul-22 |

| Description | Date granted/ commencement date | Expiry/duration |
|---|---|---|
| **Rehabilitation reforms** | | |
| Forward Works Program | 15-Nov-22 | 14-Nov-25 |
| **Radiation Licences** | | |
| Licence No. 5083602 | 14-Jun-17 | 14-Jun-23 |
| **Council Approvals** | | |
| CC 04-04-2012 Mod1 | 22-Oct-12 | In perpetuity |
| CC 02-03-2012 | 6-Jun-12 | In perpetuity |
| CC 10-01-2012 Mod1 | 1-Jun-12 | In perpetuity |
| OC 09-10-2013 | 19-Nov-13 | In perpetuity |
| OC 02-04-2013 | 9-Apr-13 | In perpetuity |
| OC 01-03-2013 | 28-Mar-13 | In perpetuity |
| C6 – Approval to Operate a System of Sewage Management | 20-Feb-12 | 13-May-24 |
| Part 5 Determination – Goonbri Road Upgrade | 28-Mar-14 | In perpetuity |
| **Forestry Corporation of NSW Agreements/Permits** | | |
| Forestry Compensation Agreement | 15-May-09 | 14-Nov-32 |
| Land Access and Compensation Arrangement | 15-May-09 | 14-Nov-32 |
| **Crown Lands Licences** | | |
| RI 507102 | 12-Nov-12 | 14-Nov-32 |
| RI 533986 | 5-Jun-14 | 14-Nov-32 |

## 3.2 Rehabilitation Reforms

On 2 July 2021, the NSW Resources Regulator commenced its Rehabilitation Reforms through an amendment to the *Mining Regulation 2016* (Mining Regulation). The amendment has enabled the introduction of new standard conditions for mining leases which include revised compliance and rehabilitation reporting requirements. The Rehabilitation Reforms are subject to a transition period of 12 months for large mines and 24 months for small mines. All mines in the Narrabri Local Government Area (LGA) are considered a large mine, given that they operate in accordance with an EPL issued under the *Protection of the Environment Operations Act 1997* (POEO Act).

In accordance with these reforms, BCOPL have developed a 'Rehabilitation Management Plan' (BCOPL, 2022) (2022 RMP). The 2022 RMP is currently a draft for consultation with relevant stakeholders. The RMP includes a Rehabilitation Risk Assessment, Rehabilitation Objectives and Rehabilitation Completion Criteria as well as a Final Landform and Rehabilitation Plan, referred to as the 'Rehabilitation Outcome Documents', required under the Rehabilitation Reforms. In addition to this, BCOPL have also submitted the 'Boggabri Coal Forward Program' (BCOPL, 2022) to the Resources Regulator. This program includes a schedule of mining activities and the spatial progression of rehabilitation activities for the next three years to ensure and demonstrate that rehabilitation is occurring as soon as reasonably practicable following disturbance. These documents replace the need for a MOP. However, BCOPL were still required to operate in accordance with the approved MOP until July 2022.

# 4 SUMMARY OF OPERATIONS

## 4.1 Mining Preparation

Vegetation is cleared in advance of mining activities in accordance with the following documents:

- Clearing and Fauna Management Protocol, which forms Appendix B of the approved Biodiversity Management Plan (BMP); and
- Cultural Heritage Management Plan (CHMP).

The adopted clearing protocol follows a two-stage clearing process to minimise impacts on native biodiversity. Prior to the removal of vegetation, trained ecologists survey the areas proposed for clearing (refer to Section 6.5.2.3). Archaeological survey and salvage is also undertaken as part of the clearing process to identify and recover artefacts within the approved disturbance limits (refer to Section 6.9.1).

Soil sampling is undertaken prior to the stripping of topsoils and subsoils to identify the qualities of soil resource and to determine soil amelioration requirements. The results of soil sampling are entered into a soil inventory which is subsequently used to assist with rehabilitation planning.

Topsoil is then stripped in accordance with the approved Soil Management Protocol and BMP. Stripped topsoil is preferentially hauled directly to re-profiled rehabilitation areas. Where re-profiled areas are not ready to receive topsoil, the topsoil is hauled to a temporary stockpile location where it is stored for future transport to rehabilitation locations.

During 2022, 343,133 $m^3$ of subsoil and 118,000 $m^3$ of topsoil was stockpiled. As at the end of December 2022, a total of 1,857,122 $m^3$ of topsoil and 542,506 $m^3$ of subsoil materials were stored in soil stockpiles across the BCM. This is a reduction from 2021 due to reconciliation which has occurred during reporting period.

## 4.2 Mining Operations

### 4.2.1 Equipment

Truck and excavator operations continued to be undertaken throughout the reporting period. The mining equipment fleet as at December 2022 is listed in Table 4.1.

**Table 4.1 Equipment Fleet as at December 2022**

| Equipment | Number in fleet |
|---|---|
| Haul Truck | 61 |
| Excavators | 11 |
| Front end Loaders | 6 |
| Dozers | 18 |
| Graders | 4 |
| Water Carts | 5 |
| Service Trucks | 7 |
| Drills | 5 |
| Scraper | 1 |
| **Total** | **118** |

### 4.2.2 Activities

Mining activities undertaken at BCM during the reporting period included:

- Drilling and blasting of overburden;
- Overburden removal by large hydraulic excavators, front-end loaders and dozers;
- Haulage of waste to pit emplacement areas;
- Extraction of coal using large hydraulic excavators, front-end loaders, dozers and various Komatsu, Caterpillar and Hitachi rear dump trucks;
- Movement of coal directly to a bypass crusher as product coal or stockpiled on ROM pads for further blending and crushing; and
- Coal processing through the CHPP.

Mining activities were compliant with the requirements of SSD 09_0182, including no clearing of native vegetation within 250 m of Maules Creek Coal Mine (MCCM) lease boundary.

### 4.2.3 Operational Closures During 2022

Operational closures and lost production was experienced over 81 days in 2022 (including days lost to flooding). A total of 26 days of lost production was due to flooding impacts over six events from September 2022 to November 2022 which restricted access to site.

### 4.2.4 Pit Progression

Coal is mined from eight coal seams including the Herndale, Onavale, Teston, Thornfield, Braymont, Bollol Creek, Jeralong and basal Merriown seams.

During the reporting period, mining development was primarily in Pits C and E (refer to Figure 8-1).

The Jeralong Pit, Merriown Pit (Pit 1), Bollol Creek Pits, Pit B (5), and Pit A were completed in 2009, 2010, 2013, 2014 and 2017 respectively. These pits are being progressively backfilled with waste in accordance with the Conceptual Final Landform design within Appendix 9 of SSD 09_0182.

#### 4.2.4.1 Pit C

Pit C is a north progressing continuation of the Bollol Creek Pit and Pit A. Operations commenced in June 2013. Progression is along the Merriown Seam in a northerly direction along 100 m wide east - west orientated mining strips, for the upper seams down to the Jeralong Seam and 50 m wide strips for the Merriown Seam. Pit C will be backfilled from the south to the north in line with pit progression.

#### 4.2.4.2 Pit E

Pit E is a pit adjacent to the north eastern corner of Pit A. Progression is along the Merriown Seam in an easterly, then northerly direction along 100 m wide mining strips for the upper seams down to the Jeralong Seam and 50 m wide strips for the Merriown Seam. Pit E will be backfilled from the south to north in line with pit progression.

### 4.2.5 Production Waste

Waste emplacement areas have been progressed by in–pit dumping to completed pits to a maximum Reduced Level (RL) of 395 m in accordance with the Conceptual Final Landform design within Appendix 9 of SSD 09_0182. The main emplacement areas are immediately bounded by the Merriown and Bollol Creek Pits to the east and south east, the Jeralong and Bollol Creek Pits to the north and the surface mine limit to the West and South (refer Figure 8-1).

## 4.3 Production Statistics

From January to December 2022, mine production at BCM was carried out by BCOPL. Mining was undertaken generally in accordance with the previously approved MOP and the recently prepared Forward Work Plan and site work standards and procedures, which have been developed to ensure ongoing compliance with the approved management plans.

A summary of production figures for the 2022 calendar year in relation to the previous 2021 calendar year and those forecast for the 2023 calendar year is provided in Table 4.2 below.

**Table 4.2 Production and Waste Rock Summary**

| Material | Project Approval Limit | Reporting Period (Calendar Year) | | |
|---|---|---|---|---|
| | | 2021 (actual) | 2022 (actual) | 2023 (predicted) |
| Waste Rock/ Overburden (Mbcm) | N/A | 45.4 | 46.5 | 55 |
| ROM Coal (Mt) | 8.6 | 7.6 | 6.8 | 8.2 |
| Reject Material (Mt) | N/A | 1.5 | 1.4 | 1.6 |
| Stripped Topsoil (kbcm) | N/A | 377.3 | 118 | 113.6 |
| Saleable Product (Mt) | 8.6 (by rail) | 6.6 | 5.7 | 6.5 |

Mining operations during the 2022 calendar year remained below the ROM coal and railed product coal limits specified in SSD 09_0182. Specific conditions from Schedule 2 of SSD 09_0182 are presented in Table 4.3 with responses on the compliance of each also provided.

**Table 4.3 Compliance with SSD Conditions**

| SSD Condition No. and Description | Compliance Response |
|---|---|
| 6. The Proponent may undertake mining operations 24 hours a day, 7 days a week. | Compliant. |
| 8. The Proponent shall not extract more than 3.5 million tonnes of ROM coal from the site in any calendar year (on a pro rata monthly basis) while ever coal is being transported along the private haul road to the coal loader, unless a road safety audit at the intersections of Leard Forest Road and Therribri Road has been completed in consultation with Council and RMS, and any recommended actions implemented to the satisfaction of the Secretary. | Not triggered – transport of product coal by road was ceased following the completion of the Boggabri Rail Spur Line. Product coal from BCM was transported via the rail spur during 2022. |
| 9. The Proponent shall not extract more than 4.5 million tonnes of ROM coal from the site in any calendar year (on a pro rata monthly basis) or undertake mining operations outside the disturbance area approved under DA36/88 MOD 2, unless the Biodiversity Management Plan required under condition 49 of Schedule 3 has been approved by the Secretary. | Compliant –The BMP has been approved. |
| 10. The Proponent shall not extract more than 8.6 million tonnes of ROM coal from the site in any calendar year. | Compliant – 6.8 Mt of ROM coal was extracted in 2022. |
| 11. The Proponent may process up to 4.2 million tonnes of ROM coal in the CHPP in any calendar year. | Compliant – 2.60 Mt of ROM coal was processed in the CHPP during 2022. |
| 11A. The Proponent shall not process any coal from the Tarrawonga coal mine unless it has demonstrated that adequate water license are held to account for the required water use associated with processing this coal, to the satisfaction of the Secretary. | Not triggered – no coal was processed from the Tarrawonga Coal Mine in 2022. |
| 12. The Proponent may transport up to 10 million tonnes of product coal via the Boggabri Rail Spur Line in any calendar year; comprising: | Compliant – 5.7 Mt of product coal from the BCM was transported by rail in 2022. No |

| SSD Condition No. and Description | Compliance Response |
|---|---|
| (a) 8.6 million tonnes of product coal from the Boggabri coal mine in any calendar year.<br>(b) 3 million tonnes of product coal from the Tarrawonga coal mine in any calendar year. | coal from the Tarrawonga Coal Mine was received at BCM for transported during 2022. |
| 13. The Proponent may transport up to 200 tonnes of coal per year from the site by road for marketing and testing purposes. All other coal must be transported from the site via the Boggabri Rail Spur Line, except in exceptional circumstances as agreed with RMS and Council and approved by the Secretary. | Compliant – transport of product coal by road was ceased following the completion of the Boggabri Rail Spur Line. The Rail Spur was operational throughout 2022. |

### 4.3.1 Saline or Potentially Acid Forming Materials

BCOPL monitors and manages the reject materials generated through its operations in accordance with the BCM Reject Potentially Acid Forming (PAF) Testing Procedure (October 2016). In January 2020, routine monitoring identified a reject sample with potentially acid forming qualities. This result was encountered from the sampling of the reject material from a special non-product typical sample (grab sample) of BR11-12 coal. In an operational setting, this coal would typically be co-blended with other non-PAF forming feed coals and limestone to manage water quality and maintain lower product sulphur and reject acid potential. Reject materials from the processing of this coal sequence were appropriately managed and co-disposed deep within the pit void in accordance with process previously outlined within Section 2.3.7 of the MOP and now described in the Rehabilitation Management Plan (RMP) and Forward Program.

To improve monitoring techniques, a reject sampler was installed and commissioned within the CHPP in September 2020. In line with the commissioning of this infrastructure, a static geochemical and physical testing program for fortnightly reject composites was implemented in coordination with RGS Environmental Consultants Pty Limited, to monitor the variability in reject characteristics through 2021 and 2022. All data through to the end of 2022 has indicated that overall, there has been a low risk of oxidation of reject and therefore a low potential for acid forming conditions to be generated from bulk reject materials, if there is "*At least 5 metres of non-carbonaceous capping material (must be category 3) (…) dumped over the top of the reject emplacement cell*" (RGS 2020)

BCOPL also looked at the BB8 and BB5 product trends and confirmed that product sulphur was not expected to change until mid to late 2024 where a small increase will be expected. BCOPL have a review of the process scheduled for Q1 2023 and intend to continue testing through 2023. BCOPL will continue to conduct routine sampling and testing of coal reject materials to identify PAF potential and to appropriately handle and disposed of these materials in accordance with the process previously described within Section 2.3.7 of the MOP and now described in the Rehabilitation Management Plan (RMP) and Forward Program.

## 4.4 Exploration

BCOPL continued an exploration drilling programme throughout 2022, to improve knowledge of coal quality and structure for modelling purposes.

A total of 50 exploration holes were drilled by BCOPL during the reporting period. Details of BCM's borehole drilling during 2022 and relevant figure is provided in Appendix E.

## 4.5 Construction Activities During 2022

A summary of construction activities undertaken during the reporting period and their completion status is provided in Table 4.4.

**Table 4.4 Summary of Construction Activities during the Reporting Period**

| Infrastructure | Commencement Date | Completion Date |
|---|---|---|
| ROM 1 Bin Construction | November 2021 | Completed September 2022 |
| Lime Dosing Plant | September 2022 | January 2023 (predicted) |

## 4.6 Next Reporting Period

### 4.6.1 Mining

During 2023, mining activity will involve the continuation of extraction within Pits C and E. Mining will advance in a northerly direction through Pit C and easterly direction into E Pit. Mining will advance towards the north utilising 100 m wide mining strips. Backfilling of the completed mining void will continue to the south as mining proceeds to the north.

### 4.6.2 Exploration

Exploration proposed for 2023 includes the drilling of 83 holes. The exploration programme will continue to improve knowledge of coal quality, structure, geotechnical, geochemical and fugitive emission calculation purposes.

### 4.6.3 Construction

Construction activities during the 2023 report period are proposed to include the construction of temporary in pit mining offices (including associated access road diesel farm and a maintenance bay), and two heavy vehicle workshop bays, off existing infrastructure.

### 4.6.4 Production Waste

During 2023, coal reject materials will continue to be co-disposed within the pit void in a planned manner in accordance with the process described within the approved Forward Program. Trucks take the reject material to the operational pit for co-disposal with overburden material in the mining void. A temporary reject transfer area adjacent to the ROM pad is also used to manage the relocation of coarse reject from the CHPP to the mining void. An Emergency Tailings Facility (ETF) is also available to store fine rejects, in the unlikely event this is required. All reject is covered with 5 m of inert overburden.

Heavy earthmoving tyres will be re-treaded and reused where possible; otherwise, they will be buried in pit in accordance with site guidelines and EPL 12407.

# 5 ACTIONS REQUIRED FROM 2021 ANNUAL REVIEW

The 2021 Annual Review was provided to the DPE in May 2022. The 2021 Annual Review was approved in December 2022 and sent to the NSW Environment Protection Authority (EPA), NSW Department of Primary Industries (DPI) – Land and Natural Resources, DPE – Water, Department of Regional NSW – Resources Regulator (Resources Regulator), Forestry NSW and the Narrabri Shire Council (NSC). No comments were received from DPE regarding actions to be addressed in 2022 Annual Review. Correspondence received from DPE in December 2022 confirmed that the previous Annual Review satisfied the Annual Review Guideline requirements (see Appendix D).

BCM received a letter from DPE on the 16 December 2022 requesting additional information on greenhouse gas emissions and biodiversity offsets to be reported in the 2022 Annual Review (DPE, 2022a). The additional Annual Review reporting requirements are described in Table 5.1.

**Table 5.1 Annual Review Reporting Requirements**

| Actions required for the 2022 Annual Review | Requested by | Where discussed in the Annual Review |
|---|---|---|
| Report on the status of the long term security arrangement for biodiversity offsets required by the development consent for the mine. Please include information on the type(s) of long term security arrangements that have been implemented and/or are to be implemented for the mine. | DPE | Section 6.5.3 |
| Report on greenhouse gas emissions for the reporting period and include a comparison of actual greenhouse gas emissions against the predictions in the environmental assessment(s) for the mine. Please ensure that the method used to calculate the environmental assessment prediction(s) and annual emissions are calculated the same. | DPE | Section 6.10.2.1 |
| Report all reasonable and feasible steps undertaken during the reporting period to improve energy efficiency and reduce greenhouse gas emissions generated by the mine. | DPE | Section 6.10.3 |

# 6 ENVIRONMENTAL MANAGEMENT AND PERFORMANCE

The Environment Management Strategy (EMS) provides the strategic framework for environmental management at BCM. The EMS:

- Outlines all relevant statutory leases, licences and approvals that apply to BCM;
- Details key plans, procedures, management plans and other documents that will be implemented to ensure compliance with all relevant leases, licences and approvals;
- Describes the key processes that will be implemented to:
  - Communicate with community and government stakeholders;
  - Manage community complaints;
  - Resolve disputes; and
  - Respond to non-compliance incidents and emergencies;
- Outlines BCM's monitoring, reporting and auditing requirements; and
- Outlines relevant roles, responsibilities and accountabilities relevant to environment management for all BCOPL employees and contractors.

A suite of environmental management plans (EMPs) has been developed to guide environmental management at BCM. They have been developed in accordance with the EMS, SSD 09_0182 and other statutory requirements. The revision status of approved key EMPs, as required by SSD 09_0182, is summarised in Table 6.1.
BCOPL maintains a register to capture and track details of when documents have been updated including the requirement for the review and revision of management plans.

**Table 6.1 Key EMPS**

| Management Plan | Version Approved by DPE* | BCOPL Revision | Awaiting Approval |
|---|---|---|---|
| Forward Program | In consultation with DPE | Under revision for Rehabilitation Reforms | - |
| Blast Management Plan (BLMP) | November 2018 (Rev 5) | Under Revision | - |
| Blast Fume Management Protocol | July 2018 (Rev 3) | Under Revision | - |
| Air Quality and Greenhouse Gas Management Plan (AQGHGMP) | July 2018 (Rev 6) | Under Revision | - |
| Traffic Management Plan (TMP) | August 2022 (Rev 5) | - | - |
| Cultural Heritage Management Plan (CHMP) | November 2016 (Rev 7) | Under Revision | - |
| Environment Management Strategy (EMS) | June 2020 (Rev 2) | Under Revision | - |
| Noise Management Plan (NMP) | April 2019 (Rev 13) | Under Revision | - |
| Water Management Plan (WMP) | May 2017 (Rev 6) | Under Revision | Rev 8 was submitted to DPE in July 2019. BCOPL is in consultation with NRAR. Resubmitted in January 2022. |
| Surface Water Management Plan (SWMP) | August 2021 (Rev 7) | Under Revision | |

| Management Plan | Version Approved by DPE* | BCOPL Revision | Awaiting Approval |
|---|---|---|---|
| Groundwater Management Plan (GWMP) | April 2020 (Rev 9) | Under Revision | |
| Site Water Balance (SWB) | October 2018 (Rev 12) | Under Revision | |
| Social Impact Management Plan (SIMP) | August 2021 (Rev 7) | - | - |
| Rehabilitation Management Plan (RMP) | April 2020 (Rev 9) | Under Revision | Incorporated into the MOP at the request of DPE. The current MOP was approved in April 2020. 2022 RMP currently in draft (see **Section 3.2**) |
| Forward Program | 2022 | | Submitted to Resources Regulator for approval |
| Biodiversity Management Plan (BMP) | October 2018 (Rev 12) | - | - |
| Biodiversity Offset Strategy | March 2019 (Rev G) | - | - |
| Pollution Incident Response Management Plan | NA | - | - |

*Based on internal final approval date

## 6.1 Meteorology

### 6.1.1 Environmental Management

SSD 09_0182 (Schedule 3, Condition 32) requires a permanent meteorological station to be installed and maintained for the life of the BCM. The station must comply with the requirements of the *Approved Methods for Sampling of Air Pollutants in New South Wales* Guideline (EPA, 2007) and be capable of determining the temperature lapse rate.

As such, a meteorological monitoring station (MET) has been established to continuously measure and record wind speed, wind direction, temperature, solar radiation and rainfall at BCM. The location of the BCM MET is shown on the Environmental Monitoring Location Plan in Appendix B.

The MET provides real-time data to BCOPL employees and contractors. Meteorological data is used for assessing compliance, proactive dust and noise management, and for investigative and reporting requirements.

The parameters recorded by the BCM MET and the method are outlined in Table 6.2.

**Table 6.2 MET Parameters**

| Parameter | Units | Frequency | Averaging period |
|---|---|---|---|
| Temperature at 2 m | ºC | Continuous | 15 minute |
| Temperature at 10 m | ºC | Continuous | 15 minute |
| Wind direction at 10 m | º | Continuous | 15 minute |
| Sigma theta at 10 m | º | Continuous | 15 minute |
| Rainfall | mm/hr. | Continuous | 1 hour |

| Parameter | Units | Frequency | Averaging period |
|---|---|---|---|
| Solar radiation | W/m2 | Continuous | 15 minute |
| Additional requirements:<br>– Siting & Measurement | n/a | n/a | n/a |

## 6.1.2 Environmental Performance

### 6.1.2.1 Temperature

Maximum, minimum and average temperatures are calculated daily from the 15 min recordings. Figure 6-1 shows average monthly temperature records for the reporting period (2 m MET recordings). Compared to the previous reporting period, the average minimum and maximum temperatures are notably higher in summer.

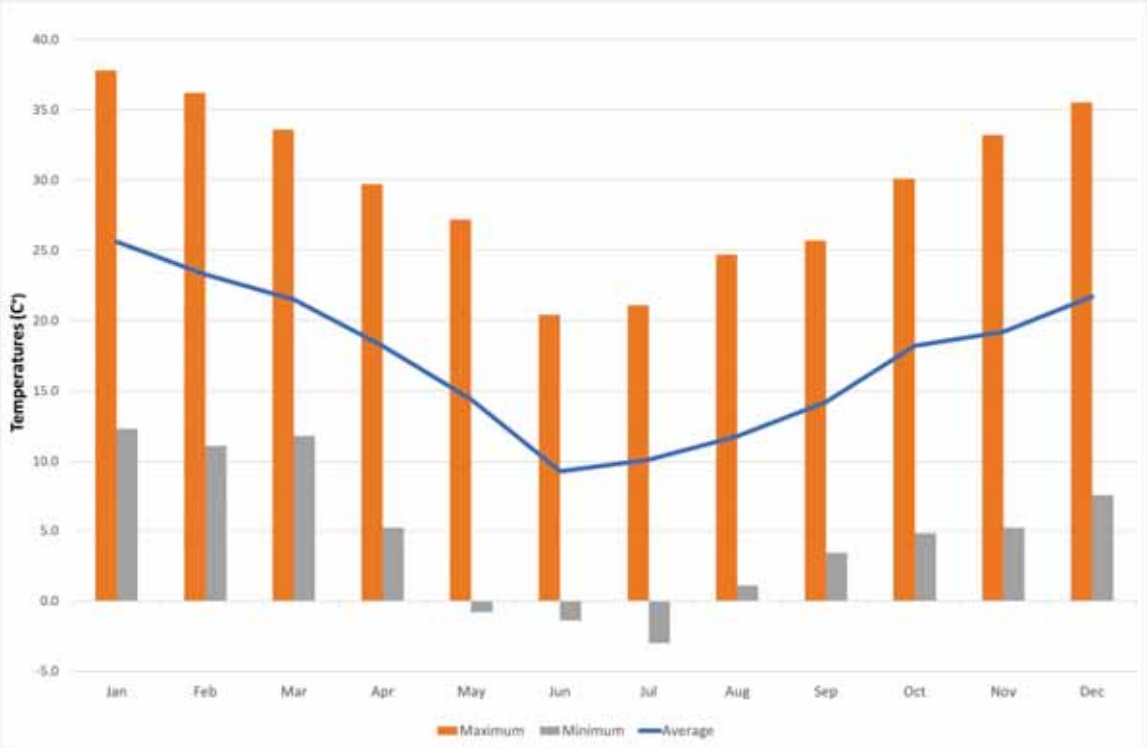



**Figure 6-1 2022 Monthly Temperature Records**

#### 6.1.2.2 Rainfall

Rainfall is measured using an RG5 type flow-through monitor, with a 15-minute recording interval. Monthly rainfall totals for the 2022 reporting period are presented in Figure 6-2. A comparison of 2021-2022 rainfall is shown in

Figure **6-3**.

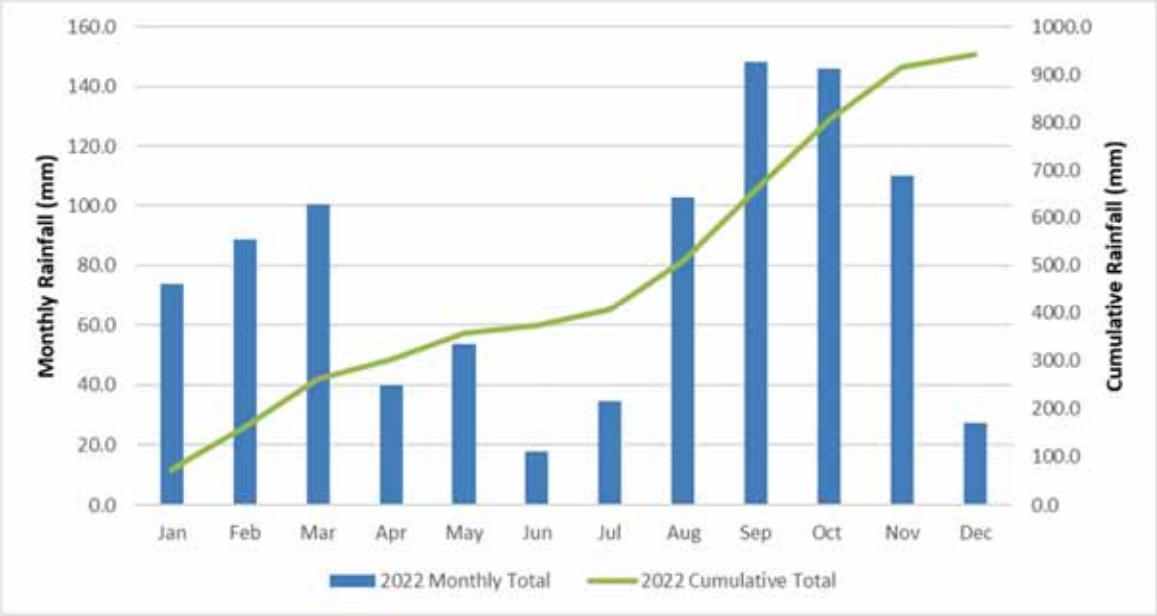



**Figure 6-2 Monthly Rainfall**

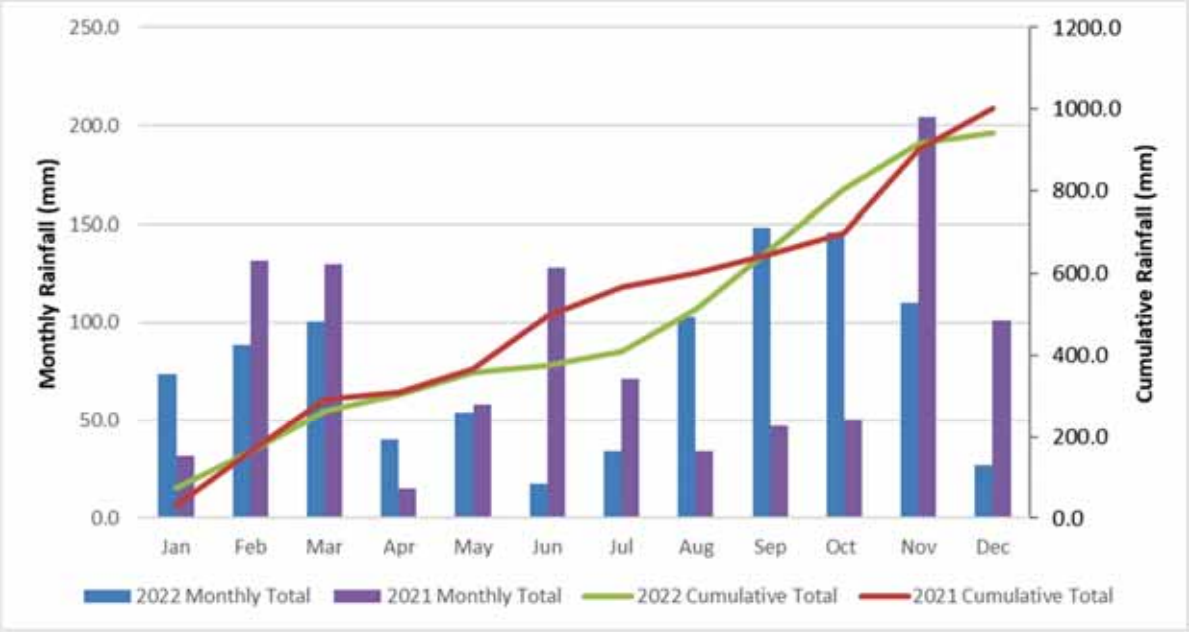



**Figure 6-3 Comparison of 2021 and 2022 Rainfall**

### 6.1.2.3 Wind

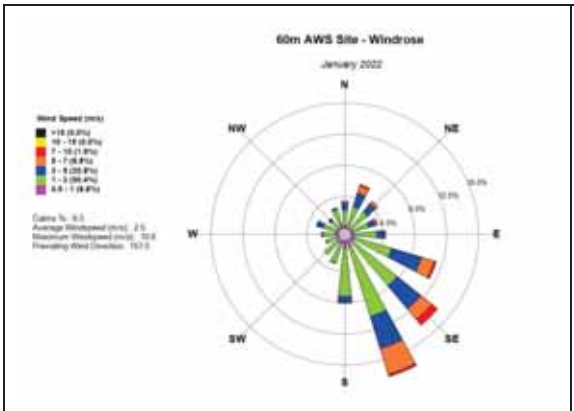
Wind speed and direction are important parameters for the planning and preparation of blasting activities, investigating noise and dust complaints, and assessing cumulative impacts as a result of other coal mines operating in the region. Wind data for the 2022 reporting period are provided in Table 6.3 and presented in the wind roses in Figure 6-4. Wind speed values are displayed as metres per second (m/s).

The prevailing wind conditions during the 2022 reporting period were relatively consistent with the historical data as presented in the 2010 EA (Hansen Bailey, 2010) which indicate BCM predominately receives wind from the south-east in summer and the north and north-west in winter. Autumn and spring months experienced a combination of these wind conditions.

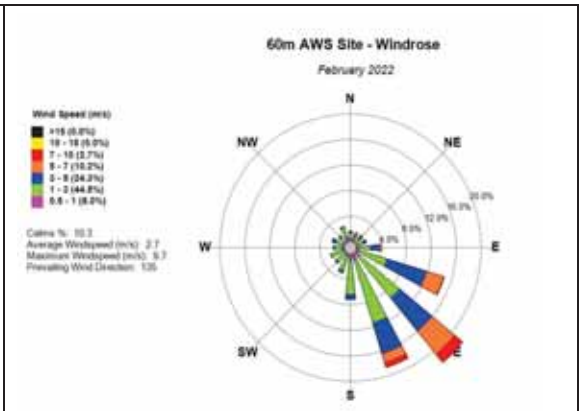
The meteorological data from MET identified that average monthly wind speed generally did not exceed 3 m/s.

**Table 6.3 Monthly Average and Maximum Wind Speeds and Dominant Wind Directions (60 m AWS)**

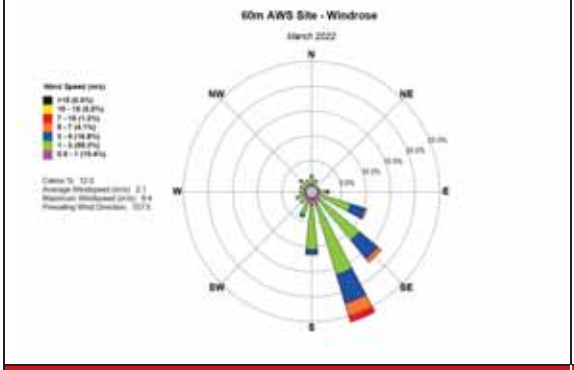
| Month | Average Wind Speed (m/s) | Maximum Wind Speed Recorded (m/s) | Dominant Wind Directions |
|---|---|---|---|
| January 2022 | 2.58 | 11.65 | SSE |
| February 2022 | 2.75 | 10.38 | SE |
| March 2022 | 2.22 | 9.86 | SSE |
| April 2022 | 1.74 | 7.43 | ESE |
| May 2022 | 1.57 | 10.14 | SSE |
| June 2022 | 1.32 | 6.97 | NNW |
| July 2022 | 1.8 | 8.33 | SSE |
| August 2022 | 1.85 | 8.82 | NW |
| September 2022 | 2 | 9.35 | NNW |
| October 2022 | 2.08 | 12.55 | N |
| November 2022 | 2.12 | 10.66 | NW |
| December 2022 | 2.41 | 12.2 | SSE |



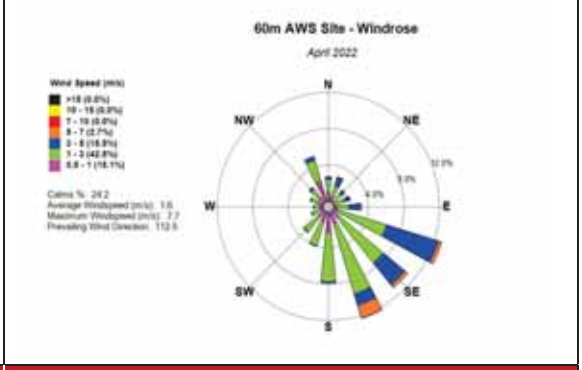

January 2022



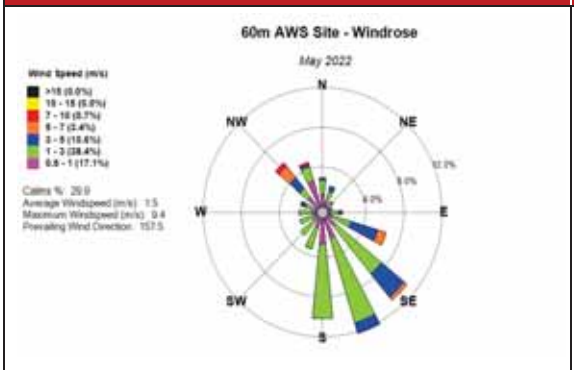

February 2022



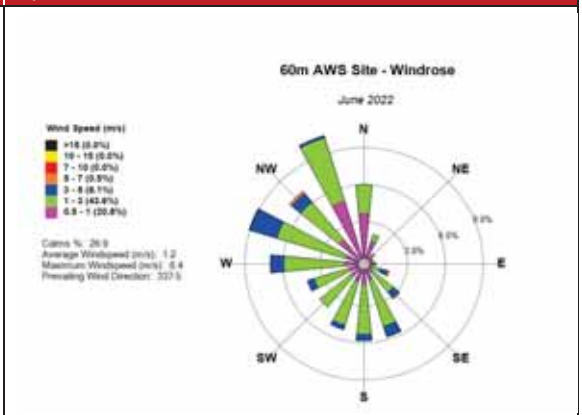

March 2022



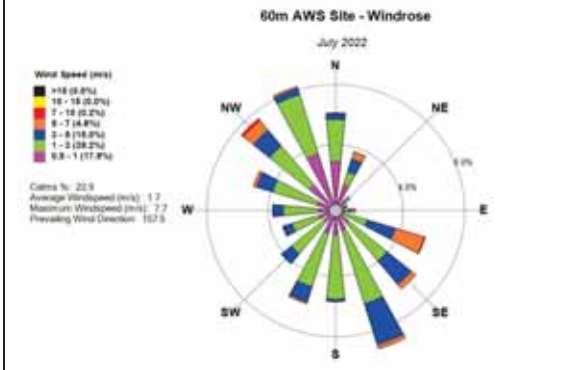

April 2022



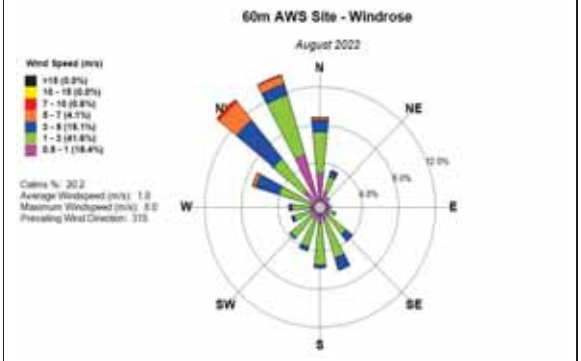

May 2022



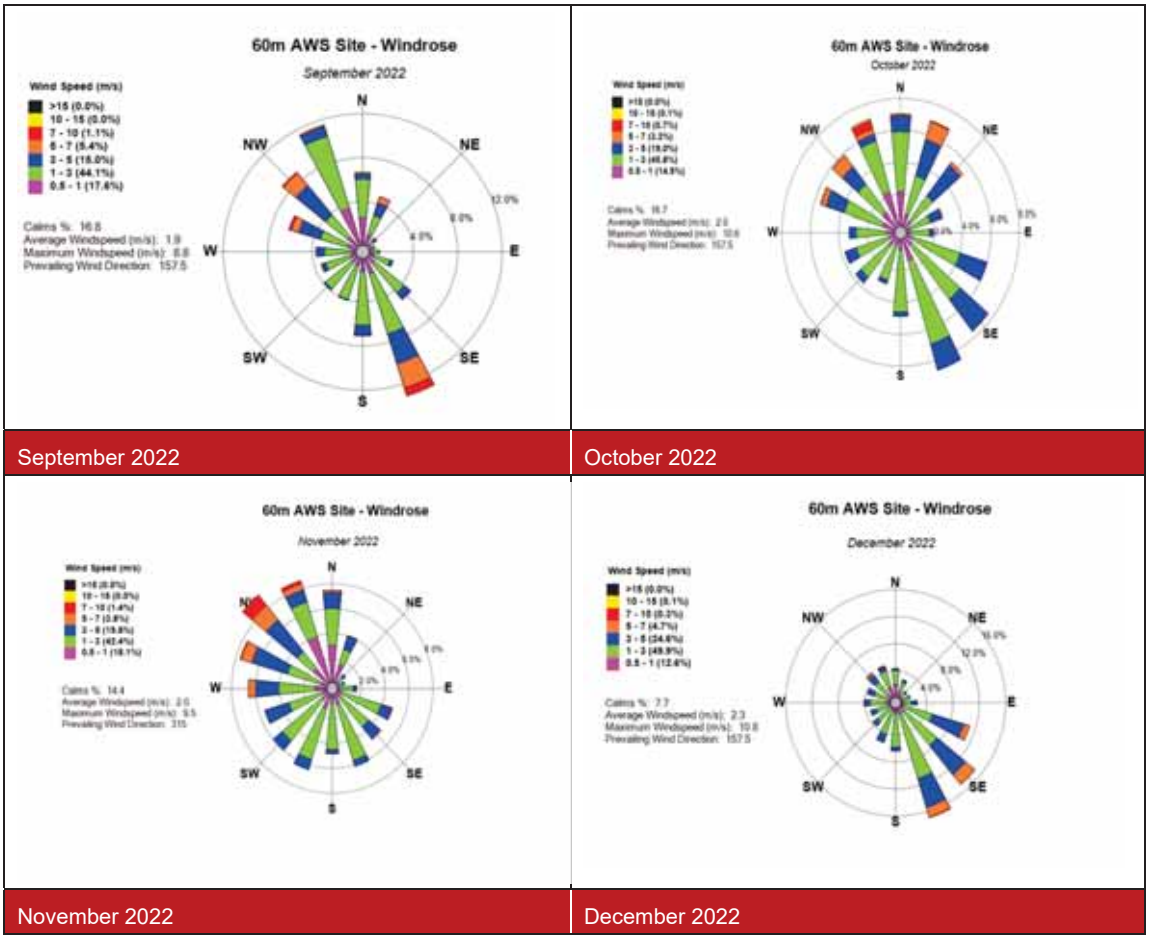

June 2022




July 2022




August 2022




September 2022 | October 2022

November 2022 | December 2022

**Figure 6-4 Monthly Wind Rose Summary January – December 2022**

### 6.1.3 Improvements and Initiatives

Building on the work completed during the previous reporting periods, BCOPL continued to implement and refine the real-time air quality management system at the BCM. This included ongoing utilisation of real-time meteorological data and weather forecasting software to guide the day-to-day implementation of reactive and proactive mitigation measures.

## 6.2 Air Quality

### 6.2.1 Environmental Management

Air quality management at BCM is undertaken in accordance with the approved AQGHGMP. Through implementation of the AQGHGMP, BCOPL execute a range of mitigation measures for air quality that have proved to be effective at managing dust impacts, demonstrated by generally maintaining compliance with criteria specified in SSD 09_0182. During the reporting period, mitigation measures included the following:

- Visual assessments of mining and coal transport areas to identify dust sources and modify operations as required;
- Revegetating disturbed areas of the rail corridor;

- Implementation of product coal handling controls to minimise dust generation;
- Maintaining unsealed surfaces and trafficable areas in good condition;
- Installation and maintenance of dust suppression equipment on drill rigs;
- Implementing good practice blast design to minimise dust and plan blasting to suit meteorological conditions; and
- Monitoring meteorological conditions to plan and modify operations as required.

These mitigation measures will continue to be employed during 2023.

BCOPL implements an air quality monitoring program to measure concentrations of depositional dust, Particulate Matter less than 10 microns (µm) ($PM_{10}$) and Particulate Matter less than 2.5 µm ($PM_{2.5}$) in the vicinity of the BCM.

Depositional dust monitoring provides an indication of levels of dust in the atmosphere measured in g/m²/month of insoluble matter using depositional dust gauges. $PM_{10}$ monitoring utilises High Velocity Air Sampler (HVAS) and tapered element oscillating microbalance (TEOM) monitoring units, whilst $PM_{2.5}$ is measured only using a TEOM monitoring unit.

The current air quality monitoring program includes 3 depositional dust gauges, two HVAS, four TEOMs, and up to four portable real-time $PM_{10}$ monitors details of which are provided in Table 6.4. A figure showing the location of each air quality monitoring site is provided in Appendix B.

**Table 6.4 Air Quality Monitoring Sites**

| Site ID | To be used for compliance monitoring? | Type | Units | Frequency |
|---|---|---|---|---|
| D4-Greenhills | Yes | Deposited dust gauge | g/m$^2$/month | Monthly |
| D5-Goonbri | Yes | Deposited dust gauge | g/m$^2$/month | Monthly |
| D6-Onavale | Yes | Deposited dust gauge | g/m$^2$/month | Monthly |
| Glenhope | Yes | HVAS ($PM_{10}$) | µg/m$^3$ | Every 6 days |
| Merriown | No | HVAS ($PM_{10}$) | µg/m$^3$ | Every 6 days |
| Tarrawonga | No | TEOM ($PM_{10}$) | µg/m$^3$ | Continuous |
| Wilberoi East | Yes | TEOM ($PM_{10}$ and $PM_{2.5}$) | µg/m$^3$ | Continuous |
| Velyama | No | TEOM ($PM_{10}$ and $PM_{2.5}$) | µg/m$^3$ | Continuous |
| Goonbri | No | TEOM ($PM_{10}$ and $PM_{2.5}$) | µg/m$^3$ | Continuous |
| BTM Complex Portable Samplers (x4) | No | TEOM ($PM_{10}$ and $PM_{2.5}$) | µg/m$^3$ | Continuous |

Monitoring data is routinely compared to the air quality assessment criteria provided within SSD 09_0182 and the EPL. Exceedances of the relevant air quality assessment criteria is considered an 'incident' under SSD 09_0182 and the Secretary will be notified as soon as practicable after the proponent becomes aware of the incident. Exceedances of the criteria can be attributed to variations in weather conditions, these 'extraordinary events' can be justified with evidence from meteorological monitoring from the site and surrounding areas. This evidence is logged in the incident register.

## 6.2.2 Environmental Performance

### 6.2.2.1 Depositional Dust

BCM's depositional dust monitoring is undertaken on a monthly basis at three monitoring sites: D4, D5 and D6 (refer to Appendix B). D5 is located on land owned by BCOPL, while D4 and D6 are located on land owned by Whitehaven Coal Pty Limited. All three sites are used for compliance monitoring.

In accordance with SSD 09_0182 (Schedule 3, Condition 27), the annual average depositional dust must not exceed the limit of 4 g/m$^2$/month at any residence on privately owned land, or on more than 25 percent of any privately-owned land. Given that there are no criteria specified for non-privately owned land, the results have been assessed against these criteria for consistency, despite land being mine-owned.

Sampling and analysis is undertaken in accordance with *AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method.*

#### 6.2.2.1.1 Results

Depositional dust samples were subject to visual analysis by a NATA accredited laboratory to determine sample contamination by naturally occurring impurities. Table 6.5 presents the corrected results following visual analysis of the three dust monitors.

The results indicate that all depositional dust gauges remained below the criterion for the annual average during 2022.

**Table 6.5 Depositional Dust – Annual Average Results**

| Monitoring Point | Annual average limit (g/m$^2$/month) | Corrected annual average* (g/m$^2$/month) |
|---|---|---|
| D4 | 4 | 0.9 |
| D5 | 4 | 1.0 |
| D6 | 4 | 0.8 |

* Annual average applies to 2022 calendar year.

The results for D4 and D5 are above the predicted levels documented in the EA (i.e. 0.5 and 0.6 g/m$^2$/month) for the closest corresponding year of operations (Year 10). It is important to note that since the 2010 EA was prepared, further approvals for mining operations within the BCM, TCM and MCCM Complex (collectively referred to as the BTM Complex) have been granted which have subsequently resulted in increased background dust deposition levels. D6 is located outside the area assessed in the EA and no predictions were provided.

All dust gauge results for the 2022 reporting period remained well below the relevant assessment criteria specified in SSD 09_0182. Further the depositional dust levels recorded during the 2022 reporting period remain within the range of historical results.

### 6.2.2.2 $PM_{10}$

BCM monitors $PM_{10}$ dust compliance through one HVAS unit (Glenhope) and one TEOM (Wilberoi East) (see Appendix B). $PM_{10}$ monitoring using the HVAS unit is undertaken for a period of 24 hours every 6 days. $PM_{10}$ monitoring using the TEOM is ongoing from previous reporting periods with a 24hr average and Annual average provided for comparison with the relevant air quality assessment criteria.

#### 6.2.2.2.1 Results

Figure 6-5 provides the results for the Glenhope HVAS whilst the $PM_{10}$ monitoring results of the Wilberoi East TEOM over the reporting period are provided in Figure 6-6. In accordance with SSD 09_0182, the short-term concentration limit for $PM_{10}$ over each 24-hour period is 50 µg/m$^3$ while the long-term concentration limit for the annual average is 30 µg/m$^3$.
In 2022, the Wilberoi East TEOM experience power outages greater than 6hrs which resulted in Insufficient data for the 24hr averages over a total of 8 days. These occurred on the following dates:

- 16/01/2022;
- 18/01/2022;
- 24/01/2022-25/01/2022;
- 01/02/2022;
- 11/07/2022-14/07/2022; and
- 31/12/2022.

These are not being reported as non-compliances.

No exceedances of the $PM_{10}$ 24-hour air quality assessment criteria were recorded during the reporting period.

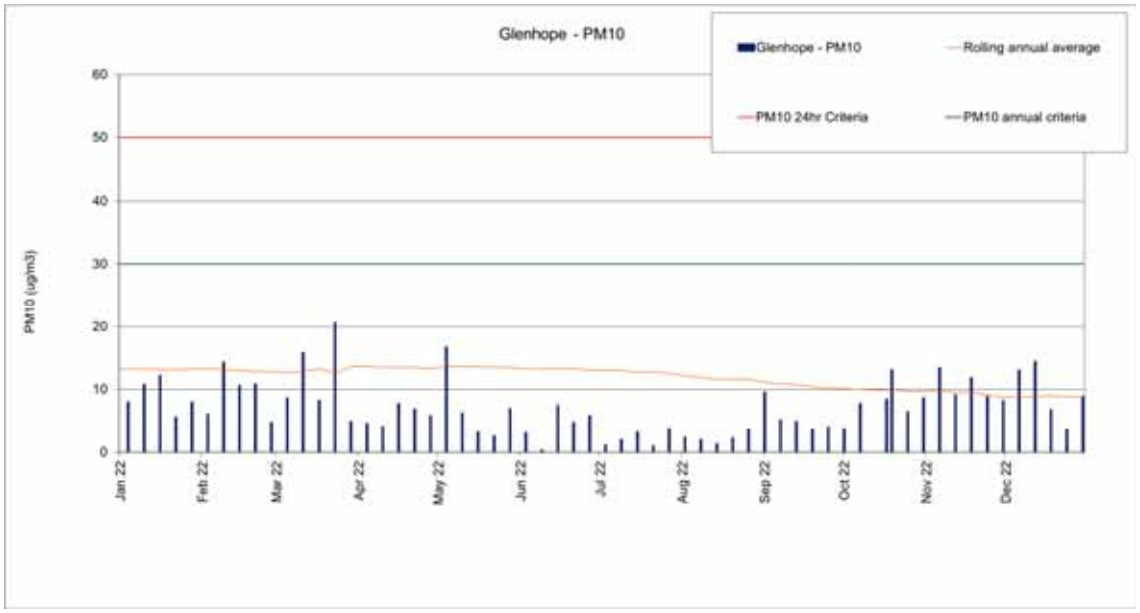



**Figure 6-5 Glenhope HVAS $PM_{10}$ Monitoring 2022 Results**

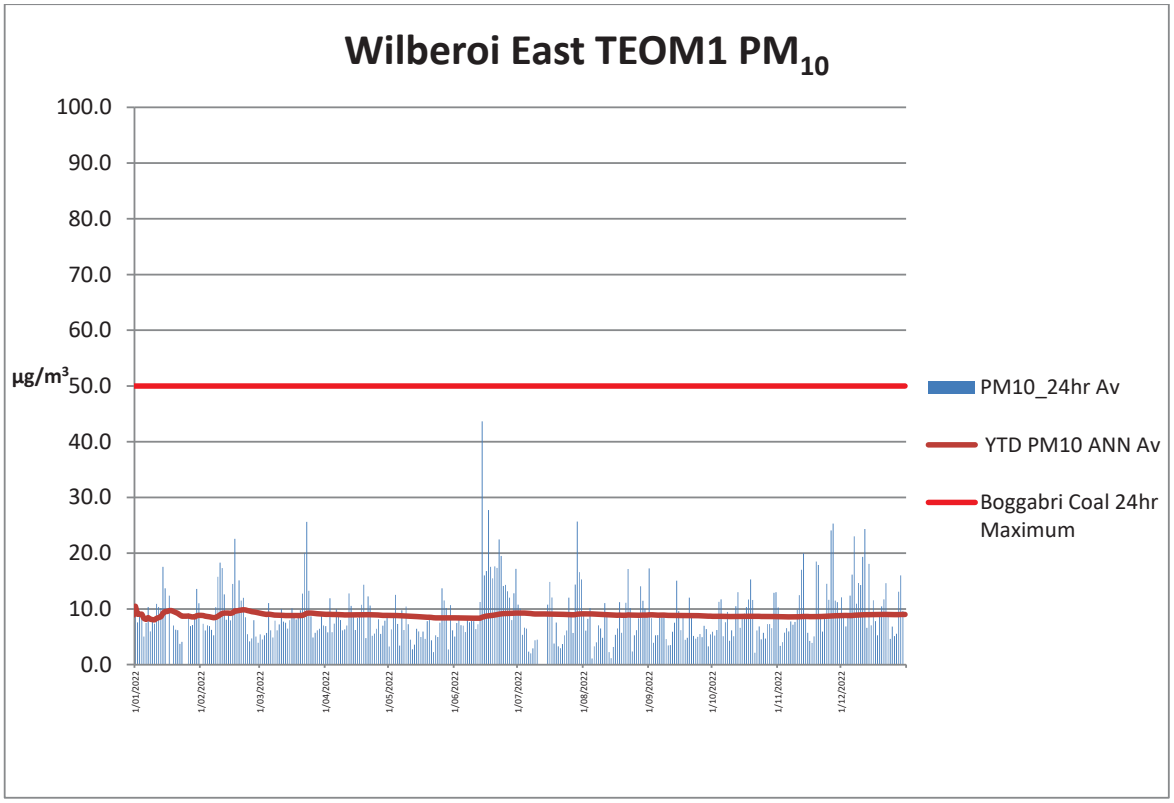



**Figure 6-6 Wilberoi East $PM_{10}$ TEOM Monitoring 2022 Results**

#### 6.2.2.3 Total Suspended Particulates

The ambient air quality criterion for Total Suspended Particulates (TSP) quoted in Table 9 of SSD 09_0182 (annual average 90 µg/m$^3$) is based on a value derived by the National Health and Medical Research Council in 1996. There is an established relationship between TSP concentration and the concentration of $PM_{10}$. In areas where coal mining is a significant component of the local particulate emission inventory, $PM_{10}$ typically comprises ~40% of the TSP (SPCC, 1986 and others).

As prior studies have confirmed that the long-term average $PM_{10}$ to TSP ratio is close to 0.4:1, that is, 40% of TSP is comprised of $PM_{10}$, inversely, the relationship between TSP and $PM_{10}$ can be written as: TSP = $PM_{10}$ x 2.5. Due to the nature of the relationship between TSP and $PM_{10}$ levels, the TSP criterion of 90 µg/m$^3$ (annual average) will always be satisfied when the long-term $PM_{10}$ criterion of 30 µg/m$^3$ is satisfied.

In consideration of the historical $PM_{10}$ monitoring undertaken for the BCM (i.e. results have historically been significantly below the $PM_{10}$ annual average criteria), BCOPL consider that compliance with the long-term annual average TSP criteria can be demonstrated via the application of the known relationship between $PM_{10}$ and TSP. The calculation of TSP is based on the available data at the Merriwon HVAS monitoring location and Glenhope HVAS monitoring location.

The results indicate the annual average TSP at the Glenhope HVAS (20 µg/m$^3$) is below the TSP air quality criterion in SSD 09_0182 of 90 µg/m$^3$ for the reporting period.

#### 6.2.2.4 Odour

There is no requirement to conduct odour monitoring at BCM. It is considered that there is a very low risk of odour generation as a result of BCM's operations.

#### 6.2.2.5 Long Term Trend Analysis

It is noted that air quality results are generally higher than what was predicted within the 2010 EA (Hansen Bailey, 2010). This is due to the fact the 2010 EA was assessed prior to surrounding mines being approved (MCCM and TCM). Therefore, BCM's cumulative assessment did not take into consideration the impact these approvals would have on the surrounding air quality. Whilst the 2022 results are generally marginally higher than that predicted for Year 10 of the 2010 EA, it is noted that the monitoring results continue to comply with the required criteria. In accordance with SSD 09_0182 a long term trend analysis of air quality monitoring results at BCM has been undertaken using data from 2015 to 2022 to identify any trends in the monitoring. The results indicate the following:

- Depositional dust monitoring results have been generally consistent since mining operations commenced. There have been no exceedances of the annual depositional dust criteria between the commencement of mining operations and as at end of 2022;
- $PM_{10}$ concentrations are slightly higher between 2017 and 2019, coinciding with drought conditions and lower than average rainfall during this period. These conditions led to increases in the number of days when the 24-hour average $PM_{10}$ concentration exceeded 50 $\mu g/m^3$ and increased annual average $PM_{10}$ concentrations. The elevated $PM_{10}$ concentrations were observed across many locations in NSW and were not unique to BCM. Concentrations have decreased during 2020 and 2021, coinciding with increased rainfall;
- There are seasonal variations with higher $PM_{10}$ concentrations generally occurring in the warmer months;
- Annual average TSP concentrations were clearly higher in 2018 and 2019 than in the preceding five years. Again, this outcome was influenced by the drought conditions and lower than average rainfall. The increases in TSP concentrations were not unique to the area; and
- A reduction in complaints relating to dust from 2015 to 2020 at BCM, with no complaints received in 2019, 2020,2021 or 2022.

### 6.2.3 Improvements and Initiatives

BCOPL continued to implement and refine the real-time air quality management system at BCM during the reporting period. The real-time air quality management system resulted in 294 triggers, which subsequently resulted in a review of operations in order to appropriately manage emissions from the BCM to remain within the relevant criteria.

## 6.3 Operational Noise

### 6.3.1 Environmental Management

Operational noise is managed by BCOPL in accordance with the approved Noise Management Plan (NMP) and EPL 12407. Revision 13 of the NMP was approved by the DPE in April 2019.

The NMP covers all operational activities with the potential to generate noise at the BCM. It details specific noise management and mitigation measures, outlines monitoring and reporting requirements and provides clear definition of the roles and responsibilities for noise management. Blast management is detailed in Section 6.4.

BCOPL proactively implements a range of noise mitigation measures for operational activities at BCM. Mitigation measures for BCM are included in Table 5.2 of the NMP. During the reporting period, these included the following:

- Implementing an annual monitoring plan to ensure the effectiveness of attenuated plant is maintained;
- Enforcing speed limits for product trucks in accordance with the NMP;
- Progressive replacement of components of the existing fleet found to be generating excessive noise;
- Maintaining plant and equipment to manufacturer's standards;
- Placement of spoil in strategic locations to enhance noise screening;
- Scheduling noisy activities between 7 am and 6 pm where possible;
- Selecting alarms, horns and warning devices such as reverse squawkers which produce the lowest possible noise level within safety requirements;
- Monitoring weather conditions on a daily basis;
- Screening or partially enclosing conveyor belt motors at the coal handling area; and
- Ensuring train loading chute and bins are closed.

BCOPL engaged acoustic specialists to undertake attended noise monitoring in 2022 on a monthly basis at locations defined in the NMP to adequately assess the noise impacts related to BCM. Prior to 2016, this was undertaken quarterly.

In addition, Sound Power Level (SPL) monitoring is undertaken annually, in accordance with SSD 09_0182, to assess the performance of mine plant against the SPL utilised within the modelling in the 2010 EA. SPL monitoring for 2022 was conducted on 24 August 2022 and 20 December 2022. Results of this monitoring is presented in Section 6.3.2.2.

## 6.3.2 Environmental Performance

### 6.3.2.1 Attended Noise Monitoring

Monthly attended noise monitoring surveys were carried out during 2022. Each monthly survey was undertaken during the night-time period only. Prior to 2016, three measurements were undertaken at each location during each time period (day, evening and night) on a quarterly basis. Due to the uniformity of noise limits across day, evening and night periods, an alternative monitoring methodology involving one fifteen minute measurement at each location during the night period, on a monthly basis, was agreed with DPE and the EPA. This alternative method was adopted from January 2016 onwards.

The monthly monitoring was undertaken at the three locations in Table 6.6, which were addressed within the updated NMP and EPL 12407. The results are presented in the following sections.

**Table 6.6 Current Attended Noise Monitoring Locations**

| Noise Monitoring Site ID | Current Monitoring Location |
|---|---|
| N2 | Sylvania, Dripping Rock Road |
| N3 | Picton, Dripping Rock Road |
| N4 | Barbers Lagoon, Boggabri-Manilla Road |

The conditions of SSD 09_0182 specify that BCM's operational noise limits apply to all nominated private residences, except for those that are either subject to a noise agreement with BCM, or subject to acquisition or noise mitigation upon request.

BCM's operational noise limits are 35 dB(A) $L_{Aeq\ (15\ minutes)}$ for day, evening and night time periods which are defined as follows:

- Day – 7 am to 6 pm Monday to Saturday and 8am to 6pm on Sunday and public holidays;
- Evening – 6 pm to 10 pm; and
- Night – Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

In addition to the above, the noise levels during the night period must not exceed the sleep disturbance level specified as 45dB(A) $L_{1\ (1\ min)}$, at any residence. Operational noise limits are specified in Table 6.7.

**Table 6.7 Noise Limits**

| Location | Operational Noise Impact Criteria | | | Sleep Disturbance Criteria | Cumulative Noise Criteria (BTM complex) |
|---|---|---|---|---|---|
| | Day $L_{Aeq\ (15\ min)}$ | Evening $L_{Aeq\ (15\ min)}$ | Night $L_{Aeq\ (15\ min)}$ | Night $L_{Aeq\ (1\ min)}$ | Day, Evening, Night, $L_{Aeq\ (15\ min)}$ |
| All privately-owned residences* | 35 dB(A) | 35 dB(A) | 35 dB(A) | 45 dB(A) | 40 dB(A) |

*Noise criteria does not apply if BCOPL has an agreement with the owner(s) of the relevant residence to generate higher noise levels

Table 5 in Schedule 3 of SSD 09_0182 also specifies long-term intrusive noise goals at all privately owned existing residences, which concur with the limits specified in Table 6.7.

#### 6.3.2.1.1 Results

A summary of the attended noise monitoring results is provided in Table 6.8. This includes all monthly monitoring conducted in 2022.

Noise levels assessed as part of the monitoring program remained within the relevant operational noise and sleep disturbance criteria. The monitored noise levels also remained below the maximum noise levels predicted in the noise assessment completed for the 2010 EA. 13 measurements occurred during meteorological conditions that coincided with modelled meteorological conditions. During these 13 measurements, BCM was either inaudible or lower than noise levels predicted in the 2010 EA.

Attended noise monitoring also considered the assessment of cumulative noise from the BTM Complex and confirmed the noise levels were within the cumulative noise criteria specified under SSD 09_0182 (refer to Table 6.7).

**Table 6.8 Summary of Attended Noise Monitoring Results - dB(A) $L_{Aeq\ (15\ minutes)}$ & L1 (1 min)**

| | Sylvania (N2) | | Picton (N3) | | Barbers Lagoon (N4) | |
|---|---|---|---|---|---|---|
| | Criteria dB(A) Leq (15 min)@ | Criteria dB(A) L1 (1 min)# | Criteria dB(A) Leq (15 min)@ | Criteria dB(A) L1 (1 min)# | Criteria dB(A) Leq (15 min)@ | Criteria dB(A) L1 (1 min)# |
| | 35 | 45 | 35 | 45 | 35 | 45 |
| 10-Jan | ^ | ^ | ^ | ^ | 25 | 31 |
| 8-Feb | ^ | ^ | ^ | ^ | ^ | ^ |
| 7-Mar | ^ | ^ | ^ | ^ | ^ | ^ |
| 12-Apr | ^ | ^ | <25 | <25 | ^ | ^ |
| 5-May | ^ | ^ | ^ | ^ | ^ | ^ |
| 8-Jun | ^ | ^ | ^ | ^ | ^ | ^ |
| 14-Jul | ^ | ^ | ^ | ^ | ^ | ^ |
| 22-Aug | 27 | 34 | ^ | ^ | ^ | ^ |
| 13-Sep | ^ | ^ | ^ | ^ | ^ | ^ |
| 4-Oct | ^ | ^ | <25 | <25 | ^ | ^ |
| 10-Nov | ^ | ^ | ^ | ^ | ^ | ^ |
| 20-Dec | ^ | ^ | ^ | ^ | <25 | <25 |

^ BCM Inaudible.

@ Operational noise impact criteria.

# Sleep disturbance noise criteria.

### 6.3.2.2 Sound Power Screening

Schedule 3, Condition 10 of SSD 09_0182 requires BCOPL to:

> *'(a) Conduct an annual testing program of the attenuated plant on site to ensure that the attenuation remains effective;*
> *(b) Restore the effectiveness of any attenuation if it is found to be defective; and*
> *(c) Report on the results of any testing and/or attenuation work within the Annual Review.'*

The annual sound power screening was undertaken on the 24 August 2022 and 20 December 2022 (EMM, 2022) and is available on BCM's website. The results of this monitoring was then compared against the SPLs used within the noise modelling for the 2010 EA. The plant assessed for sound power screening during both rounds consisted of the following:

- Caterpillar 6030 (EX257);
- Hitachi EX2600-6 (EX259, EX262);
- Caterpillar 16M (GR061);
- Caterpillar 24M (GR062);
- Komatsu 730E-7 (DT266, DT268, DT280, DT283, DT284, DT286, DT287);
- Hitachi EH3500ACII (DT309, DT316, DT317, DT320, DT321, DT325);
- Caterpillar 789C (DT365);
- Komatsu 930E-4 (DT720, DT721, DT722, DT723, DT724, DT725, DT748, DT750, DT754);
- Komatsu D475A-5EO (TD03, TD080);
- Caterpillar D11T (TD06, TD07);
- Komatsu D375A-8 (TD091); and
- Caterpillar 854K (WD001).

A total of 34 items of plant were screened during the 2022 program.

Overall sound power screening results which exceeded the relevant criterion by 2 dB or less are considered minor and not significant enough to require additional investigation. Results that exceeded the relevant criteria by 3 dB or more were considered significant. Sound power results have been assessed against sound powers used in modelling for the 2010 EA. Any difference in screening results for the same plant between consecutive years of +3 dB or more would trigger a more detailed analysis of results (third octave band results analysis) and potentially follow-up machine inspection and/or additional testing.

#### 6.3.2.2.1 Methodology

The measurement and calculation methodology adopted for the 2022 sound power screening was undertaking using the following standard methods:

- AS 2012.1-1990 'Acoustics – Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors – Stationary test condition – Determination of Compliance With Limits for External Noise';
- AS 2012.2-1990 'Acoustics – Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors – Stationary test condition – Operator's Position';
- AS 1269.1-2005 'Occupational Noise Measurement – Part 1 Measurement and assessment of noise immission and exposure';
- ISO 3744-2010 'Acoustics – Determination of SPLs and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane';
- ISO 6393:2008(E) 'Earth-moving machinery – Determination of SPL – Stationary test conditions'; and
- ISO 6395:2008(E) 'Earth-moving machinery – Determination of SPL – Dynamic test conditions'.

#### 6.3.2.2.2 Results

The results of the 2022 sound power screening program indicated that there were 15 items of screened plant that recorded exceedances of 3dB or greater. A summary of the SPL monitoring results is provided in Table 6.9.

**Table 6.9 Summary of 2022 Sound Power Screening Results**

| Plant type | Criteria (dB) | Criteria (dBA) | Number of exceedances of 3dB or more during testing | Comment/Recommendation |
|---|---|---|---|---|
| Komatsu 730E-7 | 126 | 117 | 3 | Komatsu 730E-7 rear-dump truck 266 and 268 exceeded the linear target by 3 dB or more and dump truck 266 exceeded the A-weighted target by 3 dB |
| Hitachi EH3500ACII | 126 | 117 | 9 | Hitachi EH3500ACII rear-dump trucks 309, 316, 317, 320, and 321 exceeded A-weighted or linear targets by 3 or more dB |
| Komatsu 930E-4 | 126 | 117 | 18 | Komatsu 930E-4 rear-dump trucks 721, 722, 723, 724, 748, 750, and 754 exceeded A-weighted or linear targets by 3 or more dB |
| Caterpillar D11T 07 | 126 | 116 | 2 | Caterpillar D11T 07 exceeded the A-weighted target by 3 dB and 6 dB for the 1st gear forward and reverse tests respectively |

Results show that 2022 linear sound power levels are between 1 to 6 dB lower than pre-attenuation 2016 levels.; and 2022 A-weighted sound power levels are up to 6 dB lower than pre-attenuated 2016 levels. As with the linear results.

Exceedances to SPLs have been classified as a low risk non-compliance as the routine attended noise monitoring undertaken at the nearest receivers indicates that noise from the site remains well within the relevant criteria and is generally inaudible.

#### 6.3.2.3 Noise Model Validation

In accordance with SSD 09_0182 Schedule 3, Condition 13 (f), BCOPL annually commissions an independent acoustic consultant to complete a validation of the noise model used in the Continuation of Boggabri Coal Mine Acoustic Impact Assessment (2010 AIA) (Bridges Acoustics, 2010). This involved comparing 2022 attended noise monitoring results with modelled noise impacts for the 2010 AIA. Predictions from Year 10[1] of the 2010 AIA were utilised, as that stage best aligns with 2022, which is Year 10 of BCM (EMM, 2022).

Attended environmental noise monitoring was conducted in accordance with Australian Standard AS1055 *'Acoustics, Description and Measurement of Environmental Noise'*, relevant NSW EPA requirements, and the BCM NMP. Meteorological data was obtained from the BCM automatic weather station (AWS) which allowed correlation of atmospheric parameters with measured noise levels.

Meteorological conditions included in the Acoustic Impact Assessment report did not regularly occur during attended monitoring in 2022. Of the 36 measurements conducted in 2022, 13 measurements occurred during meteorological conditions that coincided with modelled meteorological conditions. During these 13 measurements, BCM was either inaudible or lower than noise levels predicted in the 2010 EA.

#### 6.3.2.4 Long Term Trend Analysis

Attended compliance monitoring results indicate a trend toward reduced noise levels from BCM over time with all attended results since September 2018 being either inaudible, or at levels too low to quantify. Full compliance with approved noise limits has been achieved since 2015. Further, since SSD 09_0182 was granted in 2012, there have been a total of 10 complaints received relating to noise, none of which can be directly attributed to BCM's operations.

### 6.3.3 Improvements and Initiatives

The SPL attenuation trial of Komatsu 930E-4 continued during the 2022 reporting period. To assess the performance of this attenuation two measurements on trucks DT721, DT722, DT724, and DT725 were made during the 2022 sound power screening campaign on 24 August and 20 December 2022. Results show that 2022 linear sound power levels are lower than pre-attenuation 2016 levels and 2022 A weighted sound power levels are also lower than pre-attenuated 2016 levels. As with the linear results. The trial is currently ongoing as the kits have shown reliability issues.

[1] *Predictions were made for Year 5, Year 10, Year 15 and Year 20 of operations.*

## 6.4 Blasting

### 6.4.1 Environmental Management

Blast operations at BCM are managed in accordance with the approved Blast Management Plan (BLMP), which covers blasting activities associated with mining. The BLMP and Blast Fume Management Protocol (BFMP) was updated and approved in November 2018. Drill and blast design at BCM focuses on the following objectives:

- Control of air blast and ground vibration;
- Minimising fly-rock;
- Optimising fragmentation;
- Reducing coal seam damage; and
- Reducing blast fume.

Blast fume is managed in accordance with BCM's BFMP. The BFMP was prepared to satisfy the conditions of SSD 09_0182 in order to establish management measures for control of fume-related emissions from blasting operations. The BFMP is based on the Australian Explosive Industry and Safety Group's *Code of Good Practice: Prevention and Management of Blast Generated NOx Gases in Surface Blasting, Edition 2*. It describes site specific monitoring and rating/recording for blast fume events as well as incident response procedures.

### 6.4.2 Environmental Performance

#### 6.4.2.1 Blast Events

SSD 09_0182 permits blasting to occur only between 9:00 am and 5:00 pm Monday to Saturday, at a rate of up to one blast per day and an average of up to four blasts per week (when averaged over the calendar year), unless otherwise exempted.

##### 6.4.2.1.1 Results

Blasting events were not undertaken more than once a day at any time during the reporting period.
All blast operations were conducted between the approved times of 9:00 am – 5:00 pm Monday to Saturday.
No temporary road closures were required due to proximity of blasting.

A total of 125 blast events occurred during the 2022 reporting period, which remains well within the permitted maximum blasts when averaged over the calendar year.

#### 6.4.2.2 Blast Peak Vibration

Monitoring of peak vibration was conducted at Goonbri (MP1) and Wilberoi East (MP3) during the entire 2022 reporting period (refer to Appendix B).

The applicable SSD, EPL, and CL368 limits for peak vibration are 10 mm/sec at any privately owned residence, and 5 mm/sec at any noise sensitive location for up to 5 percent of all blast events occurring within the reporting period.

#### 6.4.2.2.1 Results

Blast monitoring results indicate all blasts complied with the vibration limits of 5 mm/sec (and peak vibration of 10 mm/sec) (refer to Figure 6-7). Blast vibration monitoring results for the 2022 reporting period were on average higher than those reported for the previous 2021 reporting period. Blast vibration for the past few years has consistently remained well below the relevant limits.

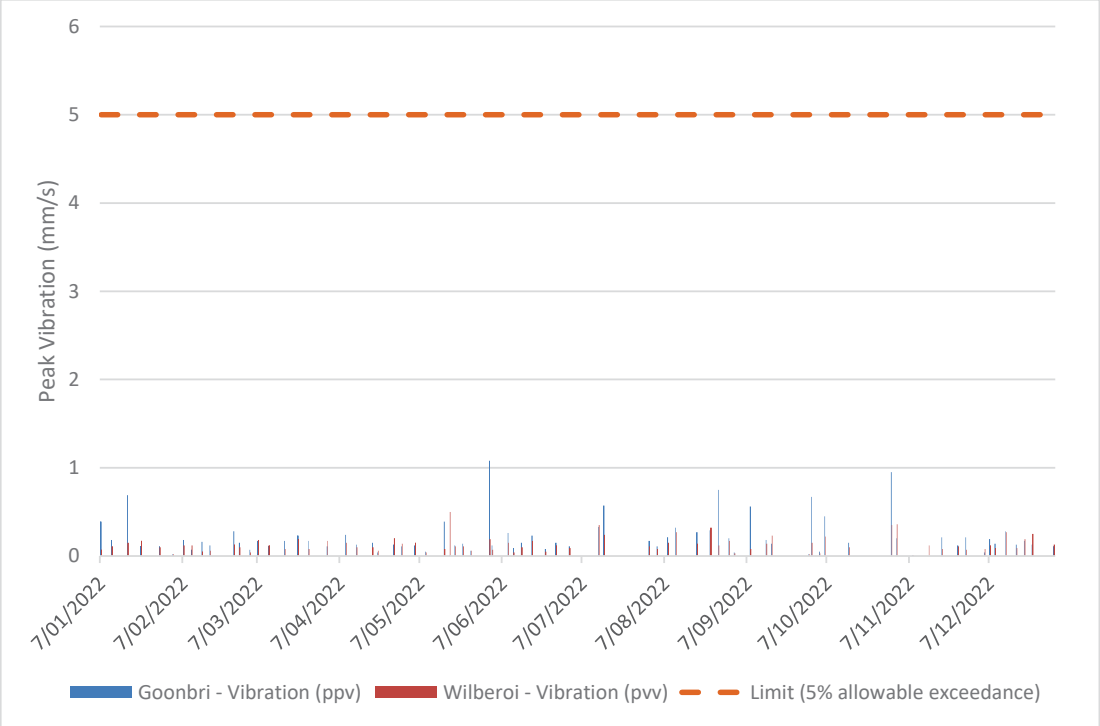



**Figure 6-7 Summary of Peak Vibration Monitoring Results 2022**

### 6.4.2.3 Blast Overpressure

Monitoring of blast overpressure was conducted at Goonbri (MP1) and Wilberoi East (MP3) during the entire 2022 reporting period (refer to Appendix B).

The applicable criteria for airblast overpressure under SSD 09_0182 are 120 dB(A) at any noise sensitive location (residence on privately owned land), and 115 dB(A) for up to 5 percent of all blast events conducted during the reporting period.

#### 6.4.2.3.1 Results

Figure 6-8 illustrates the blast overpressure monitoring results for the 2022 reporting period.

The monitoring results indicate that there was one blast that exceeded the 120 dB(A) criteria at Wilberoi during the reporting period. A blasting event on the 30th of April 2022 generated a blasting overpressure of 123 dB. This blast was investigated and was found to be due to wind gusts rather than blasting.
See Table 11.1 in Section 11 for correspondence details.

BCOPL complied with all its blast overpressure criteria during the 2015, 2016, 2017, 2018, 2020 and 2021 reporting periods. One exceedance of the 120 dB(A) criteria occurred in the 2019 reporting period.

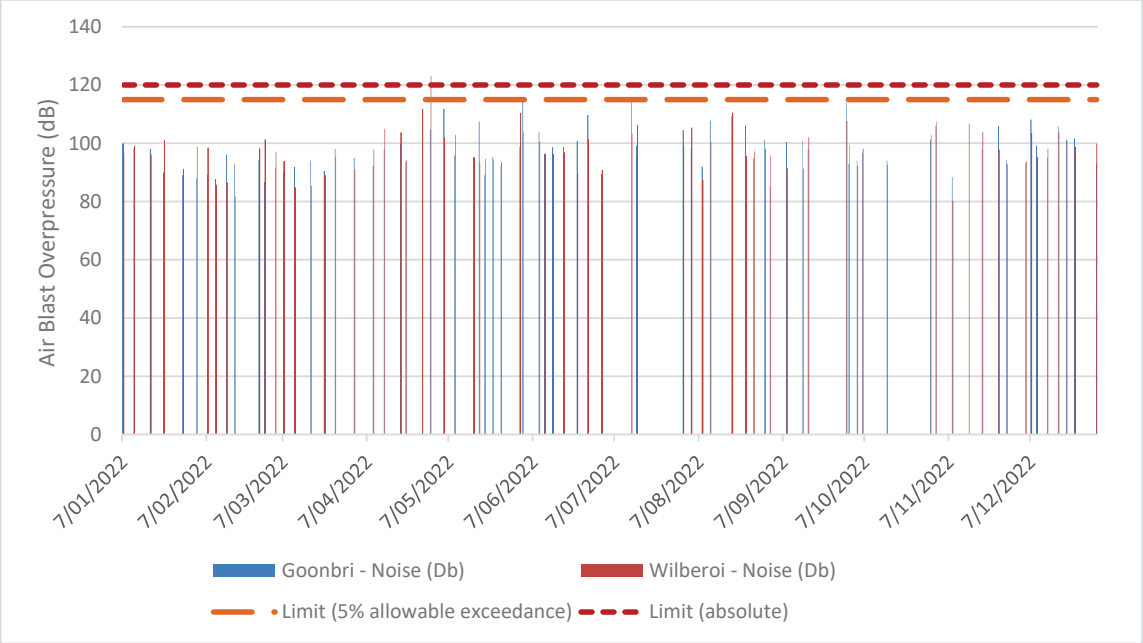



**Figure 6-8 Blast Overpressure Results 2022**

#### 6.4.2.1 Blast fume

Blast fume at BCM is managed and monitored in accordance with the Blast Fume Management Protocol (2018). Blast fume was monitored by BCOPL for all blast events that occurred during the reporting period.

A fume risk rating system is utilised at BCM to categorise fume events. This is based on the fume rating system detailed in the *Code of Good Practice: Prevention and Management of Blast Generated NOx Gases in Surface Blasting, Edition 2* (AEISG, 2011).

##### 6.4.2.1.1 Results

A total of 20 blast fume events were recorded during the reporting period. None of the fume events were categorised as a Level 3C fume event or higher requiring notification. All blast fume events recorded remained within the relevant criteria during the 2022 reporting period.

During the 2022 reporting period there was one blast event in June 2022 and one blast event in July 2022 which resulted in complaints from the community. See Table 9.2 for further details.

#### 6.4.2.2 Blast Monitoring Results

All blast monitoring results are provided on BCOPL's website for the 2022 reporting period.

### 6.4.3 Improvements and Initiatives

During 2022, BCOPL trialled an alternative emulsion product with a view to improving fume performance. The trial period was undertaken during a very wet period, which included flooding and intermittently cut access to the BCM. The trials demonstrated an improved fume response in extreme wet conditions which included less-than-ideal loaded hole sleeping conditions.

## 6.5 Biodiversity

### 6.5.1 Environmental Management

Biodiversity issues at BCM are managed in accordance with the approved Biodiversity Management Plan (BMP). The BMP provides a framework for managing biodiversity values within the Project Boundary, Biodiversity Offset Areas (BOAs) and wider locality.

The BMP guides the management of potential risks to biodiversity as a result of the BCM. Specifically, the BMP aims to:

- Provide details of the parties responsible for monitoring, reviewing, and implementing the BMP;
- Ensure compliance with all legislative requirements, statutory approvals/licences and corporate responsibilities of BCOPL;
- Describe the measures (short, medium and long-term) to be implemented to manage remnant vegetation and habitat within the project boundary and BOAs, including detailed performance and completion criteria;
- Describe the practical management strategies (including procedures) to be implemented to manage impacts on flora and fauna, maximising salvage and beneficial use of resources in areas to be impacted for habitat enhancement, rehabilitate creeks, drainage lines and disturbed areas, control weeds and pests; and
- Describe biodiversity monitoring and reporting requirements.

No impacts outside those predicted in the 2010 EA have occurred during the reporting period, indicating the management strategies specified by the BMP and implemented across the site are adequate to address potential impacts.

BCM's biodiversity offset requirements are outlined in the *Boggabri Coal Mine Biodiversity Offset Strategy* (WSP, 2018) (BOS). The BOS guides the implementation of BOAs. It identifies potential suitable offsets to adequately compensate the Project's impacts on local biodiversity, ensuring the Project complies with legislative and SSD 09_0182 offset requirements.

The BOS was revised in 2018 in accordance with Schedule 3, Condition 43 of SSD 09_0182 to incorporate an additional 1,000 ha of offsets. The revised strategy also included additional offset requirements identified in Condition 39, Table 15 of the SSD 09_0182. This BOS was prepared to accurately reflect the final offset areas to be subject to formal in perpetuity conservation in accordance with Schedule 3 Condition 47 of SSD 09_0182. In 2019, BCM commenced formal negotiations with the NSW Biodiversity Conservation Trust regarding formal in perpetuity conservation agreements for 8,076.8 ha committed as biodiversity offset to meet SSD 09_0182. This process was ongoing through 2022, with several site visits by representatives of the NSW Biodiversity Conservation Trust for formal commitments and approvals under the new legislative apparatus. Following BCOPL's request for an extension to finalise these agreements, DPE provided an extension until the end of 2023. BCOPL has developed a Total Fund Deposit which is currently with the National Parks and Wildlife for processing. Discussions are ongoing with Whitehaven in relation to the Shared Offsets Property. BCOPL is continuing to work with the NSW Biodiversity Conservation Trust to ensure that this extended timeframe is achieved.

BCOPL has implemented a range of biodiversity monitoring activities since the commencement of operations, in addition to those studies completed for the 2010 EA. Biodiversity monitoring has included the following programs or studies undertaken by WSP:

- Vegetation clearing monitoring (undertaken in conjunction with the annual tree clearing program) – completed in 2022.

- Leard State Forest annual biodiversity monitoring (an annual program of comprehensive flora and fauna surveys) – attempted but not completed in 2022 due to severe weather and flooding of local creeks and the Namoi River.
- Leard State Forest biodiversity corridor monitoring (a program to monitor biodiversity within a vegetation corridor between BCM and MCCM) – attempted but not completed in 2022 due to severe weather and flooding of local creeks and the Namoi River.
- BOA monitoring (an annual program to assess the progress of the BOAs in achieving biodiversity targets), including autumn Box Gum Woodland monitoring – attempted in autumn and spring 2022 however only limited data could be collected due to severe weather and flooding of local creeks and the Namoi River.
- Targeted seasonal threatened species surveys for Regent Honeyeater, Swift Parrot and Corben's Long-eared Bat – completed in 2022.
- Mine rehabilitation biodiversity monitoring (an annual program based on flora and fauna surveys to assess the progress of mine rehabilitation areas in achieving rehabilitation targets) – attempted but not completed in 2022 due to severe weather and flooding of local creeks and the Namoi River.
- Stygofauna monitoring (an annual program designed to monitor groundwater monitoring bores along the Nagero Creek and Namoi River floodplain for Stygofauna) – not completed in 2022 due to severe weather. Field sampling is proposed to be completed in March 2023.
- Stream and riparian vegetation health assessment and terrestrial vegetation monitoring within the locality of MOD5 (an annual program monitoring riparian vegetation health in accordance with BCM Surface Water and Groundwater Management Plans) – largely completed in autumn 2022, however attempted but not completed in spring 2022 due to severe weather and flooding of local creeks and the Namoi River.

Many of the biodiversity monitoring programs in 2022 were affected by significant rainfall received throughout the region preceding and during monitoring sessions. This impacted safe access/ egress to most monitoring sites and included multiple flood events along the Namoi River, Nagero Creek, Gins Gully and Bollol Creek between September and the end of November 2022. BCM was isolated and inaccessible during each flood event. Monitoring programs were implemented wherever possible and safe to do so.

The following sections summarise activities related to biodiversity management, provide updates on key biodiversity studies undertaken during the reporting period, and summarises the performance of BCOPL in meeting requirements of SSD 09_0182 and internal management plans.

## 6.5.2 Environmental Performance

### 6.5.2.1 Environmental Management Correspondence

Correspondence with MCCM and TMC has been undertaken on a regular basis to discuss cooperative management and protection of the vegetated corridor and Leard Forest Regional Biodiversity Strategy.

The *Leard Forest Regional Biodiversity Strategy (Stage 2 – Strategy Report)* (RBS) (Umwelt, 2017) was prepared to provide a strategic framework for the management and implementation of the BTM Complex biodiversity offset programs and to provide guidance for co-ordinated management with other land managers within the region. To achieve coordinated and successful biodiversity management within the region, the RBS specifies that the BTM Complex must prepare an 'Annual Summary Report' detailing the overall biodiversity performance and outcomes of biodiversity offsets.

An Annual Summary Report would summarise activities completed across the BTM Complex as they pertained to natural regeneration, seed collection and propagation, active revegetation, pest management, mine rehabilitation, biodiversity management consultation, biodiversity offset monitoring methodologies and biodiversity offset performance and outcomes (vegetation community attributes, key weed attributes, fauna monitoring results, threatened flora and fauna monitoring results).

#### 6.5.2.2 Commonwealth Consent Fauna Surveys

In accordance with the Commonwealth Department of Climate Change, Energy, the Environment and Water Conditions of Approval 13c and 14, BCOPL have commissioned annual surveys across BCM biodiversity offset lands for *Nyctophilus corbeni* (Corben's Long-eared Bat), *Anthochaera phrygia* (Regent Honeyeater) and *Lathamus discolor* (Swift Parrot). Targeted surveys for Regent Honeyeater and Swift Parrot were undertaken during May, June and August 2022, whilst surveys for Corben's Long-eared Bat were undertaken in December 2022 and January 2023.

Annual targeted threatened species surveys were undertaken for Regent Honeyeater and Swift Parrot with consideration of the Commonwealth *Survey Guidelines for Australia's Threatened Birds* (Department of Environment. Water, Heritage, and the Arts 2010). Surveys were completed in Leard State Forest, the biodiversity corridor and across the BOAs, extending from the Western offset (Merriendi BOA), through the Namoi offset, Central offsets (Goonbri BOA, Wirrilah BOA, Myall Plains BOA, Mallee BOA) and Eastern offsets (Nioka North BOA, Sunshine BOA, Braefield BOA). The key objective of these surveys is to determine if the threatened species are using winter blossom resources. *Eucalyptus albens* (White Box) is an important source of winter blossom resources in the western slopes region of NSW and it occurs widely across the BOAs and throughout Leard State Forest surrounding BCM.

During the May, June and August 2022 survey period, there was a general gain in blossom resources compared to previous years across the BOAs and throughout the region. Although the Regent Honeyeater was not detected during either the May, June or August survey periods, approximately 20 Swift Parrots were recorded in Leard State Forest during the August sampling period. Good numbers of friarbirds in the north-east section of Leard State Forest indicated that the blossom had attracted nomadic nectivorous bird species, including the Swift Parrot. There had been reports of Swift Parrots in more westerly locations throughout the season, notably nine birds observed flying through habitats in the Boggabri region prior to the May 2022 survey and ongoing reports of Swift Parrots within the Pilliga during the winter period. The location of Leard State Forest birds in August 2022 was consistent with the location where some 13 Swift Parrots were observed in Leard State Forest during surveys in August 2012. Elsewhere in the State, Swift Parrots were observed to have made a significant push west, with birds observed regularly in the Pilliga forests, while largely ignoring good blossom resources in more coastal areas. The Swift Parrot and Regent Honeyeater were not detected in the BOAs during the monitoring period.

Targeted surveys for Corben's Long-eared Bat were also undertaken within the BOAs, encompassing the Namoi, Central and Eastern Offset Areas, and the Leard State Forest boundary corridor. Whilst Corben's Long-eared Bat was not recorded in any BOA during the monitoring period (December 2022 and January 2023), two individuals were captured in the Leard State Forest boundary corridor in January 2023. Corben's Long-eared Bat is listed as Vulnerable under the *NSW Biodiversity Conservation Act 2016* (BC Act) and *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

#### 6.5.2.3 Vegetation Clearing

Vegetation clearing for the reporting period commenced on 31 January 2022 and ended 11 April 2022, inclusive of pre-clearing surveys, and Stage 1 and Stage 2 clearing operations. The program included the removal of vegetation from the forecasted active mining area for the 2022 period. The extent of clearing totalled 26.09 ha of vegetation, encompassing three vegetation communities (Table 6.10).

One vegetation community associated with a Threatened Ecological Community (TEC) was impacted by the 2022 tree clearing program; being PCT1383 – White Box Grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion. PCT 1383 is consistent with the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands (Box Gum Woodland) TEC listed as Critically Endangered under the EPBC Act and BC Act. A total of 6.02 ha of vegetation mapped as this TEC was removed in 2022.
The extent of each vegetation community cleared during the 2022 clearing period is provided in **Table 6.10**.

**Table 6.10 Vegetation communities identified in 2022 tree clearing area**

| Vegetation Community | Threatened Ecological community | | Total clearing extent (ha) |
|---|---|---|---|
| | BC ACT | EPBC ACT | |
| Narrow-leaved Ironbark shrubby woodland of the Brigalow Belt South Bioregion – PCT 1381 | Not listed | Not listed | 1.30 |
| White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion – PCT 1383[1] | Critically Endangered | Critically Endangered | 6.02 |
| White Cypress Pine – Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion – PCT 1313 | Not listed | Not listed | 10.41 |
| **Total** | | | 17.73 |

1. This community was commensurate with the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland community, listed as Critically Endangered under the BC Act and EPBC Act.

#### 6.5.2.4 Vegetation Clearing Ecological Monitoring

As with previous years, the 2022 tree-clearing program was undertaken in conjunction with a team of qualified ecologists to ensure, as far as practicable, the safe removal and relocation of native fauna.

Pre-clearing and relocation surveys completed prior to the commencement of the clearing activities recorded 380 habitat, hollow-bearing and/or significant trees within the 2022 tree clearing area.
These trees were marked with fluorescent pink paint in preparation for the Stage 2 clearing process.
During Stage 1 and Stage 2 clearing operations, 207 animals were successfully relocated, 179 animals were observed from habitat trees and evaded capture, and 13 animals were killed or euthanised as a result of clearing operations (Table 6.11). The most abundant groups of animals encountered during 2022 clearing operations were reptiles (328 individuals).

To minimise stress to displaced native animals, all individuals were appropriately retained and released into designated fauna relocations sites at the earliest practicable time following capture. It is anticipated that the number of microchiropteran bats, either relocated or evading capture, is likely to be higher, with numerous microbats observed within existing hollow-bearing trees or being present in broken hollow branches that were safely relocated to the designated fauna relocation sites.

**Table 6.11 Animal Groups Encountered During Clearing Operations**

| Fauna Group | Number of Individuals Recorded | | | |
|---|---|---|---|---|
| | Relocated | Observed | Deceased / Euthanised | Total |
| Reptiles | 179 | 136 | 13 | 328 |
| Microchiropteran bats | 14 | 37 | 0 | 51 |
| Birds | 0 | 0 | 0 | 0 |
| Amphibians | 14 | 1 | 0 | 15 |
| Mammals | 0 | 5 | 0 | 5 |
| **Total** | 207 | 179 | 13 | 399 |

The attendance of ecologist's supervising tree clearing greatly enhanced the likelihood of survival for the above listed species. In addition to the abovementioned animals, nine threatened species were encountered during the 2022 clearing operations (**Table 6.12**).

**Table 6.12 Threatened Species Encountered During Clearing Operations**

| Common Name | Scientific Name | EPBC ACT | BC ACT |
|---|---|---|---|
| Yellow-bellied Sheathtail-bat | *Saccolaimus flaviventris* | - | V |
| Dusky Woodswallow | *Artamus cyanopterus* | - | V |
| Speckled Warbler | *Chthonicola sagittata* | - | V |
| Brown Treecreeper (eastern subspecies) | *Climacteris picumnus victoriae* | - | V |
| Varied Sittella | *Daphoenositta chrysoptera* | - | V |
| Little Lorikeet | *Glossopsitta pusilla* | - | V |
| White-throated Needletail | *Hirundapus caudacutus* | V, M, A | - |
| Rainbow Bee-eater | *Merops ornatus* | Ma | - |
| Turquoise Parrot | *Neophema pulchella* | | V |

1. Listed as Vulnerable (V), Migratory (M) or Marine (Ma) under the EPBC Act.
2. Listed as Vulnerable (V) under the BC Act.

The rigorous fauna surveys undertaken as part of the BCM tree clearing program are regarded as a key practice in minimising harm to fauna prior to clearing activities and reducing the mine's impact on biodiversity.

The tree clearing program involved the salvage of woody debris, including fallen timber, felled hollow trees, and bush rock for later use in restoration areas in the BOAs and mine rehabilitation areas. A total of 2,045 lineal metres of woody debris was designated for salvage during clearing operations, and several bush rock locations were identified and pegged for salvage. Further to this, opportunistic seed collection was undertaken in 2022 during the tree clearing operation. Approximately 200 g of *Eucalyptus blakelyi* (Blakely's Red Gum) seed was collected and stored for potential use in restoration, offset and mine rehabilitation areas.

#### 6.5.2.5 Stygofauna Surveys

In 2022 rainfall totals exceeded the long-term annual rainfall values for the region with 898.3 mm received by the end of December. This included approximately 269 mm of rain in September and October and a further 119 mm in November 2022 which led to ongoing flood events of the Namoi River, Nagero Creek, Gins Gully and Bollol Creek between September and the end of November 2022, preventing safe access/egress to monitoring sites. Due to this, the stygofauna monitoring along the Nagero Creek and Namoi River floodplain was abandoned due to lack of access. Stygofauna sampling is now scheduled in March 2023.

#### 6.5.2.6 Annual Leard State Forest Biological Monitoring

A tailored biological monitoring program for BCM was established in 2006, prior to mining. The monitoring program aims to identify and assess potential impacts to biodiversity within Leard State Forest as a result of mining activities. It focuses on native vegetation, fauna habitat, invertebrates, birds and microbats within the forest. Monitoring is undertaken on an annual basis by qualified ecologists.

The monitoring program is based on the 'Beyond BACI' monitoring design, incorporating four replicate survey sites within the Leard State Forest (the potential impact location) and four survey sites in each of two reference locations (Central Offset Area and the Namoi Offset Area (Rocklea property)).

As discussed in previous Annual Reviews, reference locations prior to 2012 included the Vickery State Forest and Rocklea property. Due to increasing pressures of mining activities, including encroachment of open cut operations on long term biodiversity monitoring sites, the Central Offset Area of the BCM BMP was substituted as a reference location for the Vickery State Forest, on the basis it contains homogenous vegetation considered to be analogous with that of the Leard State Forest, and its relative absence of impacts associated with BCM. The Central Offset Area is located between Leard State Forest and the Nandewar Range, and at its furthest extent, approximately 10 km east of the Leard State Forest.

Survey sites within Leard State Forest were selected where possible to represent each of the two main vegetation types likely to be impacted by mining – Ironbark Woodland and White Box Woodland. These sites were located at varying distances around the area of mining. Likewise, survey sites at the reference locations/ control sites were selected, where possible, within vegetation types like those found in Leard State Forest, or at a minimum, with similar vegetation structures. Surveys at each site would typically include:

- Two 100 m transects for vegetation cover abundance.
- Two 100 m transects for invertebrates each containing 10 pitfall traps.
- Two nights of microbat recordings using Anabat SD1/SD2 or Anabat Express Bat Detector units.
- Two 20-minute area searches within 80 m (approximately 2 ha) of fixed monitoring sites on non-consecutive mornings
- A reference photograph for each transect.

##### 6.5.2.6.1 Results

The 2022 Leard State Forest biological monitoring program was scheduled for commencement from 12 September 2022, however, was abandoned due to severe weather, with significant rainfall preventing safe access/egress to monitoring sites throughout the entire spring period. Approximately 55 mm of rainfall was experienced in the week preceding the survey, which made access difficult and limited to hardstand areas only. Consequently, the survey was rescheduled to 19 September 2022. However, an

additional 58 mm was received on 16 September 2022 and by 19 September 2022, access to BCM was lost with the mine access road submerged by the Namoi River.

#### 6.5.2.7 Annual Leard State Forest Biodiversity Corridor Monitoring

The Leard State Forest biodiversity corridor refers to a vegetated boundary corridor that occurs in Leard State Forest between BCM and MCCM. This corridor forms a part of the larger East-West Corridor (as detailed in the BMP) representing the vegetation corridor between the Nandewar Range, BCM BOAs, Leard State Forest and the Namoi River.

The purpose of the corridor monitoring is to gain an understanding of biodiversity values within the Leard State Forest corridor and to identify any potential changes to these values as a result of the works being undertaken at BCM.

A biodiversity survey commenced 6 October 2022 at three replicate monitoring sites (LC3, LC4 and LC6) with limited methodologies employed. Monitoring targeted native vegetation, bird and microbat assemblages. The remaining sites, LC2, LC5, LC7 and LC8 were not sampled during the 2022 survey period due to the continued wet cycle experienced in the region, the effects of which limited safe access across the corridor and the monitoring event was terminated on 7 October 2022. BCM was again inaccessible from floodwater associated with the Namoi River from 9 October 2022.

The following general survey methodologies were completed at replicate monitoring site LC3, LC4 and LC6:

- One 20-minute area search within 80 m (approximately 2 ha) of fixed monitoring sites.
- One night of microbat recordings using Anabat Express Bat Detector units.
- One BioBanking plot (LC4 and LC6 only).

In addition, targeted seasonal survey methodologies were apportioned to Swift Parrot and Regent Honeyeater in May/ June and August 2022, and Corben's Long-eared Bat in December 2022.

##### 6.5.2.7.1 Results

Like the Stygofauna and Leard State Forest biological monitoring programs, the 2022 Leard State Forest biodiversity corridor monitoring program was abandoned due to severe weather which prevented safe access/egress to all monitoring sites throughout spring. The program commenced 6 October 2022; however only limited data could be collected prior to the program having to be abandoned. To prevent skewing long-term data trends, no data analysis was completed on the limited data collected. However, general results associated with monitoring completed in the biodiversity corridor include:

- A total of 26 species of bird were recorded from replicate monitoring sites, the composition of which suggest vegetation retains structural complexity capable of providing habitat to woodland and generalist species of bird common the region. The species recorded the most included Weebill, Silvereye, Rufous Whistler, Golden Whistler, Striated Pardalote, Spotted Pardalote, Spiny-cheeked Honeyeater and Yellow-faced Honeyeater.
- Two threatened species of bird, Speckled Warbler and Varied Sittella, which are listed as Vulnerable under the BC Act, were recorded at replicate monitoring site LC3 and LC4. Replicate monitoring site LC4 recorded the highest number of birds with a diurnal bird species richness of 16 (as derived from one 20 minute survey) recorded during the 2022 monitoring period.
- Nine species of microchiropteran bat were recorded from ultrasonic Anabat detectors, including Gould's Wattled Bat, Chocolate Wattled Bat, South-eastern Free-tailed Bat, Inland Free-tailed Bat, Long-eared Bat, White-striped Freetail-bat, Inland Broad-nosed Bat, Little Broad-nosed Bat and Little Forest Bat.

- Targeted Swift Parrot and Regent Honeyeater surveys were conducted in the corridor (and wider Leard State Forest and BCM BOAs) over two discrete sampling periods in May/ June and August 2022. Approximately 20 Swift Parrots were recorded at a moderately strong White Box blossoming event in the north-east section of Leard State Forest in August 2022. The Swift Parrot and Regent Honeyeater were not recorded from habitats associated with the corridor during these surveys.
- A total of eight harp trap nights was completed from three locations within (or immediately adjacent) the corridor. A total of nine individuals from two species of microchiropteran bat were trapped, processed and released, including Lesser Long-eared Bat (*Nyctophilus geoffroyi*) and Little Forest Bat (*Vespadelus vulturnus*). Corben's Long-eared Bat (*Nyctophilus corbeni*) was not recorded in the corridor during this survey.
- A total 71 species of plant were recorded from two replicate monitoring sites (LC4 and LC6), including 66 native species (93%) and five exotic species (7%). No threatened species of plant were recorded during the 2022 monitoring event. Despite this, *Tylophora linearis* (listed as Vulnerable under the BC Act and Endangered under the EPBC Act) is known to occur within the biodiversity corridor.

Further ongoing monitoring of the corridor will allow for long-term comparison of biological data to assist in assessing the functioning of the area as a biodiversity corridor. Similarly, ongoing monitoring will allow for potential quantification of the successfulness of any processes implemented to minimise operational impacts on the corridor.

#### 6.5.2.8 Annual Stream and Riparian Vegetation Health & Terrestrial GDE Monitoring within the Locality of MOD5

BCM is largely contained within the catchment of an unnamed ephemeral drainage line commonly known as 'Nagero Creek'. A small area to the south of BCM is also located within the catchment of Bollol Creek. Nagero Creek and Bollol Creek are both small tributaries of the Namoi River, with the former flowing approximately 8 km to the Namoi River.

The Namoi River is the main watershed for the region and is part of the Murray Darling Basin system and managed under two Water Sharing Plans. BCOPL holds existing licences under the *Water Management Act 2000* for the extraction of both surface water and groundwater associated with this watershed.

The purpose of this program is to monitor stream and riparian vegetation health due to the potential for impacts on surface water and groundwater systems. Survey methodologies for the 2022 monitoring program were completed between 10–17 May 2022 at only four of the five replicate monitoring sites due to inclement weather, incorporating:

- Quantitative transect/plots (one BioBanking plot)
- Stream characteristics (for example channel size, composition, flow category, clarity etcetera – stream health monitoring locations only)
- Photographic monitoring

Monitoring of terrestrial vegetation in the locality of MOD5 was also completed in conjunction with the stream and riparian health monitoring program in 2022. The purpose of this monitoring is to assess the impacts of the MOD5 borefield on terrestrial native vegetation health and composition within the locality of MOD5 and its proposed draw down impacts associated with groundwater extraction. Survey methodologies for the 2022 monitoring program were completed between 10–17 May 2022 at 10 of the 11 replicate monitoring sites (including only four of the five stream and riparian health monitoring sites), incorporating:

- Quantitative transect/plots (one BioBanking plot).
- Photographic monitoring.

Importantly, the spring monitoring session for these programs commenced at the end of October and start of November 2022, in conjunction with the BOA monitoring program. However, these programs were suspended on 2 November 2022 following recent rainfall (and predicted rainfall totals expected over subsequent days) making site access problematic across landscapes underlain by black soil and clay-based tracks. The region received approximately 269 mm of rain in September and October and a further 119 mm in November 2022. The effects of this ongoing significant rainfall prevented access to most monitoring sites, with BCM becoming inaccessible due to major flood waters associated with the Namoi River, Bollol Creek and Nagero Creek multiple times between September and the end of November 2022.

#### 6.5.2.8.1 Results

The results from the 2022 monitoring program confirmed that the condition of riparian vegetation health had remained relatively consistent since the 2018 baseline monitoring program. More specifically, vegetation attributes associated with floristic composition, structure and functionality monitored were consistent with or only showed slight increases/decreases in values compared to the 2018 baseline. The fluctuations in vegetation attribute values observed across the monitoring locations is likely attributable to climatic conditions experienced in the region, which has encompassed the cyclic nature from severe drought to major flood events. Nevertheless, these fluctuations were within the boundaries of the probable mean, as predicted by the standard error. It is considered unlikely that these changes in vegetation attributes are due to impacts associated with BCM.

A large proportion of vegetation attributes across all sites failed to meet the BioBanking Assessment Methodology (BBAM) benchmark values for their respective vegetation type, however this is not dissimilar to the results of the 2018 baseline data. This was largely attributed to past land uses (predominantly agriculture), which have cleared canopy and midstorey components and heavily disturbed the soil profile leading to the dominance of exotic species in the groundcover.

Similarly, stream characteristics of Nagero Creek and the Namoi River were relatively consistent with the 2018 baseline monitoring results. Exceptions to these included changes in attributes that are affected by drought conditions, such as water height, flow and where water was present, turbidity.

Overall, the structure and health of Nagero Creek was in moderate condition. The stream is an ephemeral waterway with intermittent flow, which is heavily dependent on high rainfall. In contrast to the volume and quality of water recorded along Nagero Creek in 2020, the autumn 2022 monitoring event recorded no water within the stream. The substrate was comprised of clay based soils and appeared to be stable in nature given no evidence of erosion was observed. Disturbances on this stream are likely attributed to past agricultural pressures rather than impacts associated with BCM. Although not surveyed in spring 2022, the Nagero Creek experienced multiple flood events between September and the end of November 2022, due to ongoing significant rainfall received in the region.

Overall, the structure and health of Namoi River was in moderate condition. In autumn 2022, the Namoi River within proximity of BCM contained a constant moderate flow and high volume of water. Although the river is a permanent waterway with many habitat features (such as fallen timber, hollow bearing trees, debris etc.), the riverbanks appeared to be partially unstable as substantial undercutting and scourging was recorded at all sites. This erosion is likely attributed to low vegetation cover and the high velocity of water the river receives during high rainfall or during scheduled water releases from Lake Keepit. It is unlikely that this erosion is due to impacts associated with BCM. Although not surveyed in spring 2022, the Namoi River experienced multiple major flood events between September and the end of November 2022 due to ongoing significant rainfall received in the region.

The results from the 2022 monitoring program confirmed that the health of terrestrial vegetation had remained relatively consistent since the 2018 baseline monitoring program. More specifically, vegetation attributes associated with floristic composition, structure and functionality monitored were consistent with

or only showed slight increases/decreases in values compared to the 2018 baseline data. The sites saw slight fluctuations in native/exotic species diversity and cover, native grass cover, length of fallen timber and overstorey projected foliage cover. The fluctuations in vegetation attribute values observed across the monitoring locations is likely attributable to climatic conditions experienced in the region, which has encompassed the cyclic nature of severe drought through to major flood events. It is considered unlikely that these changes in vegetation attributes are due to impacts associated with the MOD5 and proposed draw down impacts associated with groundwater extraction.

A large proportion of vegetation attributes across all sites failed to meet the BBAM benchmark values for their respective vegetation type, however this is not dissimilar to the results of the 2018 baseline data. This was largely attributed to past land uses (predominantly agriculture), which have cleared canopy and midstorey components and heavily disturbed the soil profile leading to the dominance of exotic species in the groundcover.

#### 6.5.2.9 Annual Biodiversity Offset Area Monitoring

Biodiversity offset area monitoring comprises annual surveys of vegetation, diurnal birds, microchiropteran bats, terrestrial mammals and vertebrate pest and biennial surveys of nocturnal mammals and birds. In addition, targeted annual seasonal surveys are undertaken for Regent Honeyeater, Swift Parrot and Corben's Long-eared Bat and autumn Box Gum Woodland monitoring was completed.

The 2022 biodiversity offset monitoring represents the eighth year of biodiversity monitoring completed on the BOAs for the Project. The 10 BOAs contain large patches of remnant vegetation and high-quality habitats adjoining existing vegetated lands and create direct linkages or key stepping-stones for a regional east-west wildlife corridor. BCOPL's ten BOAs are separated in to four management areas, including:

- Eastern Offset Area (Braefield BOA, Sunshine BOA, Nioka North BOA).
- Central Offset Area (Mallee BOA, Myall Plains BOA, Wirrilah BOA, Goonbri BOA).
- Namoi Offset Area (Namoi BOA, Jerralong BOA).
- Western Offset Area (Merriendi BOA).

The aims of the 2022 biodiversity offset monitoring were to:

- Outline the monitoring results for the 10 BOAs that form part of the BOS.
- Provide results of autumn and spring White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Community against plant community types and the State and Transition Model.
- Provide a comparison of 2022 monitoring results against biodiversity benchmark data collected during the 2015 baseline monitoring event and against Leard State Forest analogue benchmark data (fauna) and BBAM vegetation community benchmarks.
- Recommend potential mitigation or management actions that may be required based on the results of the 2022 biodiversity offset monitoring event.

Importantly, the 2022 annual (spring) BOA monitoring program was significantly impacted by severe weather systems and exceptional rainfall events experienced across the Boggabri region between September and November 2022. BOA monitoring commenced 31 October 2022 and was limited to hardstand areas within the Namoi BOA due to ongoing rainfall. The monitoring program was suspended on 2 November 2022 following an additional ~45 mm of rain, with BCM again becoming inaccessible due to floodwaters associated with the Namoi River. Fauna survey components of the BOA monitoring program recommenced 7 November 2022 and was ultimately limited to hardstand areas within the Namoi BOA, as the effects of ongoing significant rainfall made site access problematic across landscapes

underlain by black soil and clay-based tracks. The effects of widespread significant rainfall prevented access to the Western, Central and Eastern Offsets.

#### 6.5.2.9.1 Habitat Management Zone

Vegetation data collected and general observation made as part of the 2022 monitoring session suggests that the vegetation types within the habitat management zones across the four management areas are in good condition overall and typical of large relatively undisturbed patches of native vegetation in the locality. Ecosystem health and ecosystem structure were good. The monitoring sites established in the habitat management zones provide good analogue sites for which to compare the progress of habitat restoration zones against.

Key findings identified within the habitat management zones in 2022, included:

- Native species richness has remained relatively consistent across all BOAs, showing fluctuations over time in response to varying seasonal conditions such as extended periods of severe drought through to periods of above average mean rainfall and flooding.
- Exotic species richness has remained relatively consistent since 2020 across all BOAs. An increase in exotic species richness since 2019 can most likely be attributed to the above-average rainfall received in the region over the past few years.
- In 2022 evidence of livestock grazing was observed within areas of the Jerralong BOA. However, it appeared to have been removed/ access prevented from other habitat management areas.
- Only a single habitat management zone monitoring site surveyed in 2022 contained Cypress Pine densities that exceeded the 650 stems/per hectare threshold (W1). There are also other habitat management zone monitoring sites not surveyed in 2022 that have historically also contained densities above the threshold including M3, M4, Ma4, My3 and W4). Although they exceed this threshold, most vegetation attributes at these locations generally meet, are within or exceed the BBAM benchmark values for their corresponding vegetation type. It is possible that the germination and recruitment of canopy and midstorey species at these locations may be prohibited by the high density of Cypress Pine present, given the lack of canopy species recruitment and low cover of midstorey species recorded at some locations. Further investigations into the management of Cypress Pine at these locations should be considered. Continual monitoring of all other locations where Cypress Pine density is above the threshold is recommended in subsequent years to confirm whether Cypress Pine is inhibiting canopy recruitment prior to undertaking Cypress Pine thinning.
- BCOPL undertook a Cypress Pine thinning project in the second half of 2022 on the Goonbri BOA.
- All Box Gum Woodland monitoring sites monitored in 2022 within habitat management zones meet or are considered likely to meet the EPBC Act listing for the threatened ecological community White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands.
- Box Gum Woodland monitoring sites surveyed in 2022 within habitat management zones largely meet, are within or exceed BBAM benchmarks. Exceptions to this included the occasional site which did not meet fallen timber, hollow bearing tree and native groundcover (grass or other) percentage benchmarks.
- *Phyla canescens** recorded near two habitat management zone sites (N3 and N15) – although not a priority weed under the Biosecurity Act this species is highly invasive and control of this species should be considered. It poses a high threat to riparian ecosystems, predominantly those along watercourses and terraces such as the 'River Red Gum riverine woodlands and forests' vegetation community. At these locations, *Phyla canescens** is highly prolific and is forming dense mats which are likely to be preventing the recruitment of native species.

Habitat management zones across the BOAs provide habitat for a range of threatened species and the intact and semi-intact habitats remain in good condition. The association of habitat management zones with areas of high-quality extant vegetation with a diversity of woodland structural forms are key to the

diversity this zone supports, as illustrated by the presence of 11 threatened species recorded in these zones. Key findings identified in habitat management zones during the 2022 monitoring event included:

- The presence of 11 threatened fauna species recorded across the habitat management zones in 2022, including Black-chinned Honeyeater, Black Falcon, Brown Treecreeper, Diamond Firetail, Dusky Woodswallow, Grey-crowned Babbler, Hooded Robin, Little Lorikeet, Speckled Warbler, Turquoise Parrot and Varied Sittella. Additional threatened species of microchiropteran bat may be identified from bat call sequence data that is currently being processed.
- Diurnal bird species richness was typical of relatively undisturbed woodland and open forest habitats in the region.
- Comparatively, and within the Namoi BOA, mean diurnal bird species richness in 2022 is the highest observed since 2017. The continued trend in incremental increases to mean species richness in 2022 is likely a sign of recovery from the previous years of prolonged drought (2017-2019) with well above average rainfall experienced in the North-West Slopes and Plains of NSW and Eastern Australia between 2020 and 2022.
- In the Namoi BOA, mean diurnal bird species richness in habitat management zones achieved 95% of the Leard State Forest analogue benchmark.
- Several introduced species were recorded during the 2022 monitoring period, including Fox, Pig, Rabbit and Brown Hare.

#### 6.5.2.9.2 Restoration Zone

The habitat restoration zone was predominantly comprised of derived native grassland communities. Ecosystem health and ecosystem structure are generally poor. As such, the monitoring sites surveyed in 2022 generally fall below the BBAM vegetation type benchmarks for a range of attributes. Due to the general lack of canopy, midstorey, fallen logs and presence of grazing pressure, native grass cover is generally high and exceeds benchmark conditions. To date, restoration works are limited to revegetation activities within the Namoi, Merriendi, Nioka North, Wirrilah and Braefield BOAs. The restoration works planned for the habitat restoration zones will result in an overall improvement in the attributes over time.

Key findings identified within the habitat management zones in 2022 included:

- Native species richness has remained relatively consistent across all BOAs, showing fluctuations over time in response to varying seasonal conditions such as extended periods of severe drought through to periods of above average mean rainfall and flooding.
- Exotic species richness has remained relatively consistent since 2020 across all BOAs. An increase in exotic species richness since 2019 can most likely be attributed to the above-average rainfall received in the region over the past few years.
- In 2022 evidence of livestock grazing was observed within areas of the Jerralong and Namoi BOAs, however, appears to have been removed/ access prevented from other habitat restoration areas.
- Two habitat restoration zone monitoring sites surveyed in 2022 exceeded the Cypress pine density threshold of 650 stems/per hectare threshold (Wi3 and Na11– approximately double the threshold). Although, they exceeded this threshold most vegetation attributes meet, are within or exceed the BBAM benchmark values for its corresponding vegetation types. It is recommended that these sites be monitored in subsequent years to confirm whether Cypress Pine is inhibiting canopy recruitment etc. prior to undertaking Cypress Pine thinning.
- Most Box Gum Woodland monitoring sites monitored in 2022 within habitat restoration zones meet or are considered likely to meet the EPBC Act listing for the threatened ecological community White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands. The only exception to this was Ni2, which did not meet the native understorey species criterion. Despite this, however, it is possible that Ni2 would meet the understorey threshold of 12 native species if the assessment was extended to a 0.1 ha area in accordance with the EPBC Act Policy Statement.

- Box Gum Woodland monitoring sites within habitat restoration zones largely fail to meet BBAM benchmark values especially for attributes relating to the number of hollow bearing trees, length of fallen timber and native overstorey percentage cover. Furthermore, most sites showed no or limited evidence of regeneration of canopy species aside from restoration tube stock planting. This is not unexpected given many of these areas occur as derived native grassland. Most other vegetation attributes meet the BBAM benchmarks.
- Due to the above, management within habitat restoration zones should continue to focus on tube stock planting of canopy species and monitoring the success/failure of these which will lead to the eventual increase in canopy cover and formation of habitat resources such as hollow bearing trees, fallen timber, leaf litter etc to increase connectivity. As these resources take over 50 years to form, it is recommended that in the interim fauna habitat resources such as salvaged fallen timber and nest boxes should be introduced, where possible, to encourage fauna usage. These measures will also aid in increasing other BBAM vegetation attributes which do not currently meet benchmark values.
- *Phyla canescens** recorded at four habitat restoration zone sites (Na2, Na5, Na8 and Na11) - although not a priority weed under the Biosecurity Act this species is highly invasive and control of this species should be considered. It poses a high threat to riparian ecosystems, predominantly those along watercourses and terraces such as Pilliga Box – Poplar Box – White Cypress Pine grassy open woodland on alluvial loams associated with the floodplain of Bollol Creek and Bollol Creek at which most of these sites occur. At these locations, *Phyla canescens** only occurred in moderate abundance and cover, however, it has potential to become highly prolific and form dense mats that could prevent the recruitment of native species.

Generally, habitat restoration zones possessed a low diurnal bird species richness. This can be expected as these areas are typically disturbed areas that have long been dedicated to grazing of cattle. Such areas are structurally simplified, contain few habitat features and are generally devoid of canopy and understorey cover; attributes that may otherwise encourage a diverse woodland fauna. Bird species common to habitat restoration zones included disturbance tolerant species and common open country species, including Galah, Little Corella, Australian Magpie, Torresian Crow, Tawny Grassbird, Rufous Songlark and Eastern Rosella.

Key findings identified in habitat restoration zones in 2022 included:

- Comparatively, and within the Namoi BOA, mean diurnal bird species richness was observed in 2022 to be higher than the 2021 monitoring event, which is consistent with the general recovery of the North-West Slopes and Plains and Eastern NSW from a prolonged period of dry conditions.
- Habitat restoration zones in the Namoi BOA possessed a low to moderate diurnal bird species richness, averaging 66 % of the Leard State Forest analogue benchmark.
- Several introduced species were recorded opportunistically in habitat restoration zones during the 2022 monitoring period, including Pig, Fox, Brown Hare and Rabbit.

#### 6.5.2.9.3 Corridor Enhancement Zone

The corridor enhancement zone has been significantly disturbed by past land use practices, including clearing, cropping and pasture improvement and heavy grazing. The lack of canopy, midstorey and altered ground layer composition recorded during baseline monitoring supports this assumption. Likewise, the paucity of fauna species demonstrates how disturbed such areas are. The planned supplementary canopy planting and some targeted weed and post management activities should serve to increase woody canopy cover and build on adjoining existing wildlife corridors. A considerable improvement in habitat value should be seen in this area over the coming years.

Key findings identified within the corridor enhancement zones in 2022 included:

- Native species richness has remained relatively consistent across all BOAs, showing fluctuations over time in response to varying seasonal conditions such as extended periods of severe drought through to periods of above average mean rainfall and flooding.
- Exotic species richness has remained relatively consistent since 2020 across all BOAs. An increase in exotic species richness since 2019 can most likely be attributed to the above-average rainfall received in the region over the past few years.
- In 2022 no evidence of livestock grazing was observed within any corridor enhancement zones.
- Of the Box Gum Woodland monitoring sites within corridor enhancement zones 50 % met the EPBC Act listing for the threatened ecological community White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands (W7 failed to meet the native understorey species richness criterion in autumn 2022).
- Box Gum Woodland monitoring sites within corridor enhancement zones largely failed to meet BBAM benchmark values for attributes relating to the number of hollow bearing trees, length of fallen timber and native overstorey percentage cover. Furthermore, most sites showed no or limited evidence of regeneration of canopy species aside from restoration tube stock planting. This is not unexpected given many of these areas occur as derived native grassland. Most other vegetation attributes meet the BBAM benchmarks except for W7 which also failed to meet the native species richness (by a single species) and native groundcover (other) projected foliage cover in autumn 2022.
- Due to the above, management within habitat restoration zones should continue to focus on tube stock planting of canopy species and monitoring the success/failure of these which will lead to the eventual increase in canopy cover and formation of habitat resources such as hollow bearing trees, fallen timber, leaf litter etc to increase connectivity. As these resources take over 50 years to form, it is recommended that in the interim fauna habitat resources such as salvaged fallen timber and nest boxes should be introduced, where possible, to encourage fauna usage. These measures will also aid in increasing other BBAM vegetation attributes which do not currently meet benchmark values.

### 6.5.3 Improvements and Initiatives

Biodiversity management initiatives implemented during the reporting period continued to include ongoing biodiversity monitoring and management in accordance with the approved BMP and revegetation activities within BCOPL's BOAs. As mentioned in Section 6.5 BCM commenced formal negotiations with the NSW Biodiversity Conservation Trust regarding formal in perpetuity conservation agreements for 8,076.8 ha committed as biodiversity offset to meet SSD 09_0182. This process was ongoing through the 2022 reporting period, with several site visits by representatives of the NSW Biodiversity Conservation Trust for formal commitments and approvals under the new legislative apparatus.

## 6.6 Hazardous Materials

### 6.6.1 Environmental Management

The management of hazardous materials at BCM is undertaken in accordance with the following BCOPL documents:

- Waste Management Plan;
- Pollution Incident Response Management Plan; and
- Hazardous Material, Dangerous Goods Risk Assessment.

Contractors operating at the BCM also implement a range of company-specific standards and procedures to ensure alignment with BCOPL requirements and legal obligations for the management of hazardous materials.

Collectively the hazardous materials management documents:

- Set out the minimum requirements for contractors for the use, storage and control of hazardous materials;
- Provide protocols for hazardous material use, storage and clean-up response;
- Provide a mechanism for the assessment of potentially hazardous materials prior to them being delivered to site; and
- Specify design standards for which hazardous materials storage structures must comply.

Control measures implemented on site include but are not limited to the following:

- Locating spill kits in high risk areas around mine infrastructure and construction areas within the Project Boundary;
- Ensuring all BCOPL personnel and contractors are trained in incident and emergency response procedures. Specific training is also be provided to those personnel required to handle hazardous materials;
- All workshop and vehicle wash down water is directed to a sump/separator for containment and subsequent treatment or appropriate disposal;
- Vehicles, plant and equipment leaking fuel, oil coolant or any other hydrocarbons will not be operated where practicable and repaired at the earliest opportunity;
- All hazardous materials facilities on site will be designed, constructed and operated in accordance with all relevant legislation, standards and guidelines, with particular reference to *AS 1940:2004 – The Storage and Handling of Flammable and Combustible Liquids*; and
- Refuelling operations will be undertaken within areas specifically designated for that purpose, where practicable.

### 6.6.2 Environmental Performance

Hazardous materials used at the BCM that require licensing are listed in Table 6.13. Orica Australia Pty Ltd (Orica) holds the appropriate licences and notifications for the storage, handling and use of these substances. The use of hazardous materials during the 2022 reporting period was comparable with the 2021 reporting period.

**Table 6.13 Explosives and Hazardous Materials Licence/Notification Holders**

| Hazardous Materials: | Licence/Notification Holder: |
|---|---|
| Acetic Acid Solution<br>Ammonium Nitrate<br>Ammonium Nitrate Emulsion<br>Oxidizing Liquids | Orica |
| Bulk Diesel | Boggabri Coal Operations Pty Ltd |

All hydrocarbons including fuels and hydraulic/lubricating oils are stored in double-skinned, above ground tanks. Waste oils are stored in a bulk oil tank, for regular collection by a licensed waste contractor.

Three minor hydrocarbon spills were recorded and managed in accordance with BCOPL and contractor-specific hazardous materials management documentation. All spills during the reporting period were considered to present a low environmental risk and were promptly cleaned up and moved to the bioremediation areas where appropriate. The management measures contained within relevant documentation were considered to be adequate for the prevention and clean-up of hazardous spills. These will continue to be implemented in the event of future incidents.

#### 6.6.2.1 Diesel

Diesel fuel is stored in the maintenance workshop area in eight double-skinned, aboveground tanks plumbed in series as “slave and master”, with a total nominal capacity of 768,000 litres. Bunded areas are inspected on a regular basis to ensure their integrity.

In July 2009, the use of biodiesel was introduced at the BCM. Biodiesel was used in all mine vehicles except for light vehicles until it was discontinued during May 2015. At this time, ultra-low sulphur diesel (ULSD) was introduced and now constitutes the primary fuel used.

Diesel fuel consumption quantities for the 2016 to 2022 reporting periods are summarised in Table 6.14. Fuel consumption at BCM has notably increased during the reporting period and over time as a result of the progressive increase to approved maximum production rates.

**Table 6.14 Diesel Fuel Consumption**

| Fuel type | Quantity (L) | | | | | |
|---|---|---|---|---|---|---|
| | 2017 period | 2018 period | 2019 period | 2020 Period | 2021 Period | 2022 Period |
| Diesel | 62,586,313 | 67,132,896 | 65,987,493 | 69,734,267 | 60,559,675 | 64,631,567 |

**ULSD was used during all reporting periods*

#### 6.6.2.2 Ammonium Nitrate/Ammonium Nitrate Emulsions

Ammonium Nitrate (AN) and AN Emulsions are used in the blasting process and are stored in 1.2 tonne bulker bags and 40 tonne mobile trailers within the bunded AN storage compound. The AN storage compound is fitted with lockable access gates and is subject to daily inspections to safeguard against theft and/or spillages.

#### 6.6.2.3 Ammonium Nitrate/Fuel Oil

Ammonium Nitrate/Fuel Oil (ANFO) is a blasting agent used at BCM. Ingredients are stored separately. ANFO is blended using mobile mixing units at blast sites.

#### 6.6.2.4 Detonators

Detonators and other high explosives are used in the blasting process and are stored in purpose built isolated magazines, to the west of the AN storage compound, at the toe of the western overburden emplacement area. The magazines incorporate security fencing, lockable entry points and are bunded.

#### 6.6.2.5 Hydraulic/lubricating oils

Hydraulic/lubricating oils are stored in double-skinned above-ground tanks adjacent to the heavy vehicle workshop area. Waste oils are stored in a bunded bulk oil tank which is regularly removed off-site by a licensed waste contractor.

#### 6.6.2.6 Cleaning agents

Cleaning agents are used in the equipment wash down facility for preparing the fleet of mobile equipment prior to maintenance. The cleaning agents are kept within covered stores in the maintenance workshop area, adjacent to the wash down facility.

Water collected at the bunded wash down facility is treated by an oil-water separator at the wash down bay and recycled.

#### 6.6.2.7 Herbicides

Herbicides are used across the site for noxious weed control and are purchased on an as-needs basis. Therefore they are not stored on-site. Application of herbicides is conducted only by suitably qualified persons and records of application areas are maintained.

## 6.7 Waste Management

### 6.7.1 Environmental Management

Condition 68, Schedule 3 of SSD 09_0182 requires the following waste management actions:

- Implement all reasonable and feasible measures to minimise waste generated by the Project;
- Ensure waste generated by the Project is appropriately stored, handled and disposed of; and
- Monitor and report on the effectiveness of waste minimisation and management measures in the Annual Review.

Waste management measures employed on site include:

- General waste from operations (food etc.) is disposed of at an appropriate licensed waste management facility;
- Recyclable wastes are separated on site and collected for recycling at an appropriate facility;
- Contaminated soil is collected and transported to the on-site bioremediation area for treatment and eventual on-site disposal. This is undertaken in accordance with the site's Bioremediation Management Procedure;
- All plant and equipment wash down areas have oil/water separating devices. Water from these areas is collected onsite; sediment, oils and grease are separated. Any sediment collected during wash down activities is placed into the in pit bioremediation area for further treatment.
- Scrap metal materials are separated onsite and collected by a recycling contractor for off-site recycling;
- Sewage from permanent site facilities is collected onsite and treated within an aerated septic sewer system, with treated effluent being applied to a transpiration area. Sewage collected from in-pit crib hut locations is collected by a licenced waste contractor and disposed of off-site at an appropriate treatment facility;
- All waste oils and greases are segregated and stored appropriately until collection by a licensed waste contractor for appropriate offsite recycling/disposal;
- Heavy earthmoving tyres are re-treaded and reused where possible. Otherwise, they are buried in pit in accordance with site guidelines;
- Waste chemicals (including solvents) are segregated, stored appropriately and transported offsite by a licensed waste contractor for appropriate disposal;
- Concrete wash down areas are located away from surface water drains;
- Clean water surface water/runoff is diverted around mine facilities (where feasible); and
- Printer cartridges, bottles and waste collectors are all donated to PlanetArk.

**Table 6.15 Waste Disposal in Litres from 2019-2022**

| Waste Stream | 2019 reporting period (tonnes) | 2020 reporting period (tonnes) | 2021 reporting period (tonnes) | 2022 reporting period (tonnes) |
|---|---|---|---|---|
| General waste – bulk waste skips | 55.62 | 43.84 | 60.7 | 58.58 |
| General waste – industrial bins | 410 | 380.7 | 401.8 | 453.32 |
| Oily Rags | 9.72 | 4.28 | 8.99 | 7.34 |
| Oily Water - recycled | 5.28 | 4.36 | 7.13 | 3.90 |
| Waste Grease – recycled | 6.47 | 6.5 | 5.25 | 5.35 |
| Scrap metal - recycled | 223.25 | 269 | 1,684.06 | 414.07 |
| Aluminium Wire - recycled | - | - | 9.02 | - |
| Copper Wire - recycled | - | - | 5.63 | - |
| Empty Drums - recycled | 1.64 | 1 | 0.92 | 1.43 |
| Paper and cardboard- recycled | 46.59 | 41.27 | 28.43 | 55.76 |
| Timber packaging and pallets - recycled | 74.72 | 86.26 | 129.75 | 99.40 |
| Oil filters - recycled | 34.86 | 31.77 | 31.21 | 35.55 |
| Hydraulic hoses | 17.14 | 23.87 | 26.47 | 28.48 |
| Batteries –recycled | 20.85 | 15.93 | 5.79 | 10.92 |
| Nicad Batteries - recycled | - | - | 0.15 | - |
| Printer cartridges | 0.04 | 0.05 | 0.06 | 0.09 |
| Tyres (heavy oversize vehicle) – each | 144 | 162 | 174 | 426 |
| Tyres (light vehicle) - each | 392 | 363 | 116 | 366 |
| 1,000L plastic containers (IBCs) | - | 48 | 74 | 25 |
| Oil- recycled (litres) | 621,300# | 557,700# | 518,740# | 515,382# |
| Coolant – treatment and recycling (litres) | 25800# | 18,000# | 19,700# | 21,100# |
| Effluent - offsite recycled (Litres) | 848.55# | 867.3# | 807.5# | 875.7# |
| **TOTAL** | **1,748.02** | **1,776.13** | **2,405.36*** | **1,174.19*** |
| **Total Recycled** | **1,255.24*** | **1,323.39** | **1,907.19*** | **626.47*** |

* Total applies only to waste measured in tonnes # Total in Litres

Bioremediation areas are operated to manage contaminated waste materials at BCM. A Bioremediation Management Procedure guides the implementation of the bioremediation process and includes details on required maintenance actions, sampling and testing of contaminated materials within the area.

### 6.7.2 Environmental Performance

This reporting period has seen a decrease in a number of non-recyclable and recyclable waste streams compared to the 2021 reporting period. In 2021, there was a 'truck body' cutting and recycling program that was operated over February and July 2021. This operation was performed outside usual waste procedures and produced large amounts of non-recyclable and recyclable waste including scrap steel, aluminium and copper which has resulted in an effect on long term waste trends.

Several extra waste streams have been tracked since 2018 including timber packaging and pallets and printer cartridges. The inclusion of recording 1,000L plastic containers was introduced during the 2020 reporting period. Mining operation waste collection statistics for the 2019, 2020, 2021 and 2022 reporting periods are summarised in Table 6.15.

The total and total recycled figures have dropped in 2022 due to a recalculation. Previously, these totals included the effluent figure despite it being in litres. The totals from 2022 on will now only be the waste measured in tonnes as stated in the table notes.

BCOPL and its contractors have continued to implement the waste management hierarchy. Wherever possible, waste materials are re-used on site in preference to direct disposal. Recycling of materials is also undertaken where possible to minimise waste. An example of reuse is the integration of an oil water separator at the wash bay, which minimises waste water and returns water to the water management system for re-use.

Site induction packages include waste awareness components and waste practice is included in employee and contractor toolbox sessions. Environmental surveillance was undertaken by BCOPL throughout the reporting period, and observations and non-conformances were communicated as necessary to relevant employees and contractors.

#### 6.7.2.1 Bioremediation Areas

Fifteen bioremediation areas have been utilised at the BCM since 2007. Successful management of these bioremediation areas has allowed for onsite treatment of contaminated material and subsequently reduced the need to transfer contaminated waste material offsite. Bioremediation Area 15 was active during the 2022 reporting period (refer to Table 6.16). Bioremediation Areas 1 through 9 have been reported in previous Annual Reviews and have not been included below in Table 6.16.

Bioremediation area management was undertaken in accordance with the BCM Bioremediation Management Procedure, which includes details on the management, watering, aeration, sampling and testing of contaminated waste materials within the area. The materials retained in the bioremediation area were turned and watered as required. The bioremediation agent '*Enretech Remediator*' was also applied to the materials as necessary.

Compliance sampling was undertaken in Area 15 during the reporting period. Two sampling events in Area 15 were undertaken in the reporting period.

**Table 6.16 Summary of Bioremediation Areas**

| Bioremediation Area | Location | Est. | Decomm. | Description |
|---|---|---|---|---|
| Area 10 | RL 340 dump | 2018 | February 2020 | Area 10 was established in June 2018 with six cells. In December 2018, an extra five cells were added to the area. Before decommissioning, Area 10 held 1984 $m^3$ of material. 1224 $m^3$ was successfully remediated and disposed of in pit >20 m below final surface and the rest was relocated to Area 11 for further remediation. |
| Area 11 | RL 280 Western Central Dump | March 2020 | August 2020 | Area 11 was established in March 2020 containing six cells. 759.7 $m^3$ of material from Area 10 was relocated to cells 3 & 4 for further remediation. Area 11 was decommissioned in August 2020. 1290 $m^3$ was buried >20 m below final surface and the rest relocated to Area 12. |
| Area 12 | RL 309 East ROM 8 | August 2020 | November 2020 | Area 12 was commissioned in August 2020. 366.2 $m^3$ of contaminated material was held here and relocated to Area 13 after decommissioning in November 2020. |
| Area 13 | Adjacent to North Ramp | November 2020 | January 2021 | Area 13 was commissioned in November 2020 1266 $m^3$ of material was stored at this location at the end of the reporting period. |
| Area 14 | RL309 North Rom8 | January 2021 | November 2021 | Area 14 was commissioned in January 2021 with seven cells. Material was held and treated in accordance with procedure. A disposal of treated material occurred in September before Area 14 was decommissioned. |
| Area 15 | RL320 East | November 2021 | Ongoing | Area 15 was commissioned in November 2021 with seven cells. Remaining cells were moved to cell 7 of Area 15 biopad. In October 2022, three additional bioremediation pads were constructed adjacent to the ones originally established in Area 15, creating an additional 1,900 $m^2$ of space. Approx 317 $m^3$ of contaminated material is currently stored in Area 15. |

## 6.8 Spontaneous Combustion

### 6.8.1 Environmental Management

Spontaneous combustion is controlled by avoiding the disposal of combustible material in waste emplacement areas and emplacing combustible materials in locations where oxygen ingress is minimised (i.e. deep in pit burial, away from rehabilitation areas).

Four key principles apply to the management of spontaneous combustion at BCM:

- Prevention;
- Detection;
- Control; and
- Incident management.

Due to the varied nature of spontaneous combustion, the issue is dealt with on a case-by-case basis. Measures that were implemented during the reporting period include:

- Managing spontaneous combustion in accordance with the Spontaneous Combustion Management Plan;

- Capping all areas of combustible material with inert material where possible, noting some mined areas cannot be capped. In some cases capping is not practical for areas that require re-working in the near or medium future;
- Placing any identified combustible materials deep within in pit emplacement areas;
- Monitoring coal stockpiles for signs of spontaneous combustion and responding as required; and
- Implementing Safe work method statements as required.

The 2010 EA reported that spontaneous combustion presents a low risk of causing environmental impacts at BCM. All risks to rehabilitation from spontaneous combustion are managed in accordance with the strategies previously outlined in the MOP and now outlined in the RMP.

### 6.8.2 Environmental Performance

BCOPL continued to apply the above principals to minimise the occurrence of spontaneous combustion onsite. One minor spontaneous combustion incident occurred during April of the reporting period. The incident was reported and managed in accordance with the site Spontaneous Combustion Management Plan.

## 6.9 Heritage

### 6.9.1 Environmental Management

The management of cultural heritage at BCM is undertaken in accordance with the CHMP. The current CHMP was revised following the determination of Modification 5 and was approved by DPIE (Now DPE) in February 2017. A review of the CHMP was commenced in late 2020 and will be finalised in 2023. An outline of the process and draft document was discussed at the Aboriginal Stakeholder Consultative Forum (ASCF) meetings in 2021 and 2022. Time has been allowed for review of the draft CHMP by Registered Aboriginal Parties (RAPs) and feedback incorporated. The CHMP prescribes:

- The policies and practices for the preservation of sites during construction and operations.
- Other facets of cultural heritage practices and conservation measures including salvage of sites as required and practice of due diligence inspections.
- Other relevant cultural heritage considerations including consultation with the Aboriginal community.

During the reporting period, BCMs archaeological salvage of BC34 and BC54 continued in conjunction with the staged tree clearing program. As with previous years, all tree clearing was subject to comprehensive archaeological salvages lead by qualified archaeologists and RAPs, as specified in the CHMP.

Field investigations, reporting and salvage works undertaken during 2022 focussed on the proposed 2023 tree clearing areas not covered by previous archaeological due diligence and salvage works. This included a small area (5 hectares) on the eastern side of MW5 not covered in the 2022 archaeological clearance and a larger area to the west of MW5. The larger area includes the sites of BC34 and BC54 recorded by Hamm in 2005 (see Appendix G).

### 6.9.2 Environmental Performance

#### 6.9.2.1 Archaeological Salvage

The aim of the archaeological salvage work was to:

- Identify and salvage Aboriginal artefacts within the 2023 tree clearing areas to mitigate harm (refer Appendix G);
- Use the artefacts salvaged and the landscape context of the area to develop a picture of prehistoric land use and Aboriginal occupation of the area;

- Engage and involve the RAPs in all phases of the archaeological and cultural salvage; and
- Comply with the CHMP as approved by DPE and thereby comply with legislative requirements.

*Tree Clearing ahead of Pit Progression*

A 4.9 ha area of land to the north of the pit (east of BC34/54) was surveyed ahead of the planned 2023 tree clearing that is required for pit progression. No surface artefacts were located during the surface survey, however, on the basis of landform and discussion with RAPs two test pits were excavated. Three artefacts were salvaged from the two test areas including two square metres of excavation. The site is labelled TC23/1 and AHIMs recording forms have been submitted to Heritage NSW.

Initial work was also undertaken in a small area immediately north of the 2023 tree clearing area. No artefacts were found during the surface inspections. Four test pits were excavated on a terrace above a deeply incised drainage considered to be similar landscape context to BC 54. Test pit 1 contained seven artefacts and test pit 4 contained two artefacts. The site is labelled TC23/2 and AHIMs recording forms have been submitted to Heritage NSW.

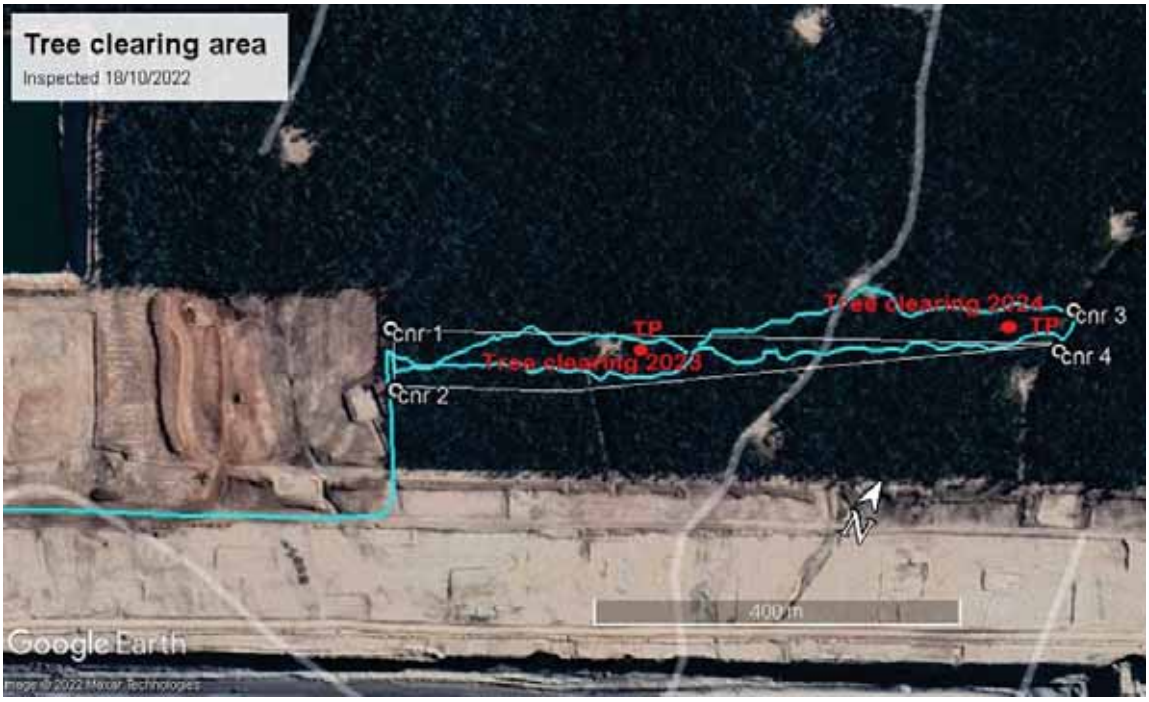



**Figure 6-9 Tree clearing 2023 area and part 2024 area inspected in October 2022 and sub-surface tested on the 21st November 2022**

*Open area excavation – BC54/34*

Archaeological salvage work in 2022 continued to focus on the previously recorded sites of BC34 and BC54 to the west of MW5. Surface collection and test pitting were completed in 2021 and 86 $m^2$ of open area excavation undertaken in 2021. Throughout 2022 work continued to expand the open area excavations to a total of 320.5 $m^2$. The overall objective of the open area excavations is to gain an artefact assemblage which enables the characterisation of the traditional use of the site and to retrieve a sufficient spatial sample to identify any inter and intra site variation. The open area excavations focus on two main areas – the west side of the deeply incised drainage line and the eastern side of the same drainage line.

### 6.9.3 Results to Date

- A total of 86 $m^2$ of material was excavated to December 2021 (including test pits and the initial open area excavations) with approximately 5,000 artefacts salvaged. Note that artefact numbers are based on field counts which may reduce when more closely inspected;
- During 2022 the open area excavations were expanded to include a total of 320.5 $m^2$ with an additional 15000 artefacts salvaged;
- As there is no opportunity to conserve any part of BC54 and BC34 in-situ, further open area excavation was undertaken to maximise the data retrieved;
- Results indicate that artefacts are generally located in the upper 300 mm of soil. The A soil horizon is generally up to 400 mm in depth.

The largest open area excavation areas extended in 2022 included:
- Open Area 1 (108 $m^2$) and Open Area 8 (79 $m^2$) which are both located on the western side of drainage line that passes through the site; and
- Open Area 9 (76,5 $m^2$) located on the eastern side of the drainage line.

Average artefact numbers per square meter for the main open areas excavated in 2022 are as follows:
- OA1 – 61.24
- OA8 - 67.66
- OA9 – 52.10

The BC 54 and BC 34 area have been excised from the 2022 tree clearing area and decisions regarding 2023 tree clearing remain to be resolved in consultation with RAPs.

**Figure 6-10 Excavation area OA9-1 view west toward OA9-2, which have now been joined by a metre wide trench**

#### 6.9.3.1 Geomorphic and landscape context review of BC 34/54

Dr Philip Hughes and Dr Marjorie Sullivan were invited to attend the site to provide an overview of the raw material and context of the site from a landscape / geomorphological perspective. The questions asked of the specialists were:

1. Why is this archaeologically rich site located where it is, and
2. What were the likely sources of the materials used in the making of the stone artefacts on the site.

Over the last 8,000 years a wetter environment would have formed the wetlands with low sandy rises evident in areas of Merriown, Victoria Park and Nagero. The gently elevated spur on which the site now being salvaged is located, serviced with potentially permanent water and with a protected easterly aspect, provided a protected location above the fog-hollows in cold weather and cooling breezes in the hot weather.

The geomorphologists visited stone source locations in the broader area on Boggabri Coal offset properties, reviewed the results of previous archaeological work, and geological maps. The landscape context of the site showed the site to be a base camp, located on the mid slope in this location for reasons of protection and water supplied as a probable near permanent spring formed between the sandstone beds and the coal measure which dip from north to south.

The stone sources from which the artefacts were made were sourced from various locations, including Goonbri Mountain and the quarry site at the mine entry, but generally from cobbles in creek beds and colluvial slopes such as in Victoria Park. The stone cobbles in the deeply incised gully beside which the site is located were not suitable for artefact manufacture.

#### 6.9.3.2 Discussion

Approximately 15,000 artefacts have been salvaged from the three main open excavation areas (OA1, OA8 and OA9) during 2022. In addition, approximately five thousand artefacts were salvaged during 2021 from test pits and the initial open area excavations. A substantial number of samples from sites BC54 and BC 32 have been retrieved and form a significant representative sample on which to base the archaeological analysis of site use, raw material selection and sources and the significance of the site relative to others in the Nandewar Range.

Archaeological sites of this size and density are rare in the Leard Forest. Significant resources are being invested into maximising the salvage of the site prior to tree clearance. The archaeological salvage works of BC54 / BC34 will continue in 2023. Due to the significance of the findings, the area was excised from the planned tree clearing to be undertaken in 2022 and delayed until 2023. The salvage works will continue in accordance with the CHMP until completed.

#### 6.9.3.3 Aboriginal Community Consultation

To facilitate ongoing Aboriginal stakeholder consultation, BCOPL hold Aboriginal Stakeholder Consultative Forum (ASCF) meetings, which are open to all RAPs who have registered in the course of the BCOPL Project and any other member of the Aboriginal community who wish to attend. The ASCF provide an inclusive platform for information exchange between BCOPL and Aboriginal stakeholders and allows for continued dialogue on cultural heritage issues and their management at BCM.

Meetings were held in February, May and September in 2022. Issues discussed in this forum include:

- Project update (including environmental monitoring rainfall and water storage);
- Exploration update;
- Status of management plans such as the revision of the Cultural Heritage Management Plan;
- Updates on Modification 8 and Modification 9 to SSD 09_0182
- The keeping place; and
- Archaeological salvage update.

The ASCF is considered to be a proactive and positive step in managing Aboriginal Stakeholder relations at BCM.

In addition to the ASCF, salvage program planning meetings have been held since early 2021 discussing timing and planning requirements for the 2022 salvage program and progress of this program for the 2023 tree clearing area. In the context of significant wet weather throughout 2023, the salvage process required flexibility and continued into 2023.

#### 6.9.3.4 Historic Cultural Heritage

No historic cultural heritage works were required in 2022.

### 6.9.4 Improvements and Initiatives

Pursuant to BCM's Project approval, an Aboriginal Heritage Conservation Strategy (AHCS) for the BTM Complex was developed in September 2014. The strategy was prepared in accordance with the guiding principles of DECCWs *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (2010) and the Australian Heritage Commissions (2002) *Ask First* principles. Version 2 of the AHCS, dated 16th October 2016 was approved by DPE in November 2017.

The strategy (in particular options for conservation and enhancement) is based on an extensive desktop analysis complemented by a cultural values assessment component. The cultural values assessment incorporated many opportunities for consultation including five formal opportunities for input from RAPS as well as informal opportunities.

The implementation of the AHCS shall be detail in Stage 1 AHCS Implementation Report that will be prepared in consideration of the *Guide to Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011) and *Aboriginal Cultural Heritage Regional Studies: an illustrative approach* (Guilfoyle, 2006) and the *Aboriginal Regional Assessment Policy* (OEH 2011). The draft of the AHCS, complete with documentation of the cultural values input by RAPs is under review.

## 6.10 Greenhouse Gases

### 6.10.1 Environmental Management

In accordance with the *National Greenhouse and Energy Reporting Act 2007 (NGER Act),* and the *National Environment Protection (National Pollutant Inventory (NPI)) Measure,* IA submits mandatory National Greenhouse and Energy Reporting (NGERs) and NPI reporting on an annual basis on behalf of BCM.

The AQGHGMP details air quality and greenhouse gas management and mitigation measures and outlines BCM's monitoring and reporting requirements for Greenhouse Gas (GHG) emissions.

### 6.10.2 Environmental Performance

Key GHG and energy statistics for BCOPL as reported in the 2021-2022 NGERs submission to the Clean Energy Regulator are summarised in Table 6.17 alongside statistics from the 2015-2016, 2016-2017,2017-2018, 2018-2019, 2019-2020 and 2020-2021 periods. As the reporting period for NGERs ends in June, data for the current financial year is not yet available.

For reporting purposes, emissions are categorised as either direct (Scope 1) or indirect (Scope 2) emissions. Scope 1 emissions are from sources that are owned or controlled by BCOPL. Scope 2 emissions are a consequence of the activities of BCOPL, but occur at external sources; e.g. emissions resulting from the purchase of electricity. Emissions are calculated as tonnes of carbon dioxide equivalent (t CO2-e).

Three gasses constitute the emissions of BCOPL, being primarily carbon dioxide, in addition to methane and nitrous oxide.

**Table 6.17 BCOPL GHG and Energy Statistics**

| GHG/Energy | 2015-2016 | 2016-2017 | 2017-2018 | 2018-2019 | 2019-2020 | 2020-2021 | 2021-2022 |
|---|---|---|---|---|---|---|---|
| Scope 1 (t $CO_2$-e) | 190,606 | 183,750 | 177,065 | 203,082 | 174,391 | 184,492 | 177,437 |
| Scope 2 (t $CO_2$-e) | 19,585 | 19,190 | 17,991 | 18,647 | 16,865 | 18,004 | 16,941 |

| GHG/Energy | 2015-2016 | 2016-2017 | 2017-2018 | 2018-2019 | 2019-2020 | 2020-2021 | 2021-2022 |
|---|---|---|---|---|---|---|---|
| Total Scope 1 and Scope 2 (t $CO_2$-e) | 210,191 | 202,940 | 195,056 | 221,729 | 191,256 | 202,496 | 194,378 |
| Energy consumed (total) (GJ) | 2,752,598 | 2,661,699 | 2,554,023 | 2,924,043 | 2,526,744 | 2,719,576 | 2,604,679 |
| Energy consumed (net) (GJ) | 2,752,598 | 2,661,699 | 2,554,023 | 2,924,043 | 2,526,744 | 2,719,576 | 2,604,679 |
| Energy produced (GJ) | 150,548,706 | 145,260,066 | 181,068,912 | 181,878,777 | 155,466,162 | 183,237,714 | 168,996,402 |

Sources of Scope 1 and Scope 2 emissions for 2021-2022 are illustrated in Figure 6-11. The main contributor to Scope 1 emissions was the combustion of diesel. Scope 2 emissions are attributed to the purchase of 21,443,787 kWh of electricity from the state grid.

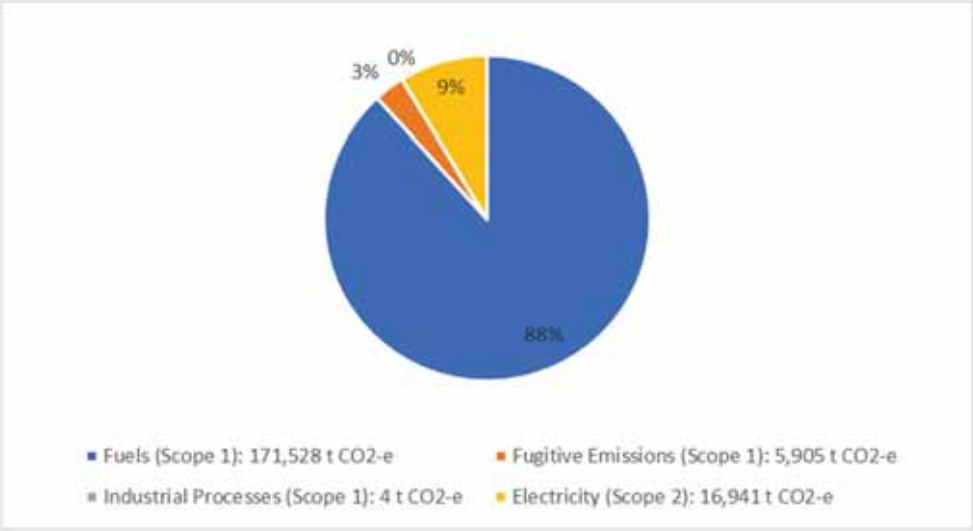



**Figure 6-11 Sources of BCM Scope 1 and Scope 2 Emissions**

Electricity usage during 2021-2022 was similar to 2020-2021 periods due to the ongoing operation of the CHPP. Emissions from diesel combustion were also similar to the 2020-2021 NGERS reporting period.

#### 6.10.2.1 Comparison to Predictions

The difference in emission predictions to actual can be explained by a number of changes from the assumptions made in 2010. These changes include a larger equipment fleet, a higher rate of electricity usage and a change in the way in which fugitive emissions are calculated.

**Table 6.18 Comparison of 2010 EIS Emissions Predictions and 2021-22 NGER Report**

| GHG (t $CO_2$-e) | 2021-2022 NGER Report | 2010 EIS Emissions Predictions |
|---|---|---|
| Scope 1 - Industrial Process | 4 | no comparable data estimated |
| Scope 1 - Fugitive Emissions | 5,905 | 329,763 |
| Scope 1 - Diesel Usage | 171,528 | 136,920 |
| Scope 1 - Total | 177,437 | 466,683 |
| Scope 2 - Electricity consumption | 16,941 | 3,233 |
| Total Scope 1 and Scope 2 | 194,378 | 469,916 |

## 6.10.3 Improvements and Initiatives

BCOPL continued to target a decrease in fuel burn during 2022 through improved operating conditions and practices, and efficient engine configuration. This initiative involved reviewing existing operating practices and engine configurations as well as, assessing the viability of alternate products through engaging specialist consultants. It is considered that all decreases in fuel burn achieved will improve fuel consumption and therefore GHG efficiencies.

During 2021, IA conducted an investigation in relation to the potential GHG initiatives which could potentially be implemented across its Queensland and NSW operations, including the BCM. Following on from this work, detailed site specific reviews of existing GHG measures and potential measures available to further reduce direct GHG measures are under consideration for implementation at BCM during 2022, the outcomes of which are reported in Section 6.10.3.1 and Section 6.10.3.3..

### 6.10.3.1 Solar Farm

BCOPL has commenced a project to build a small solar farm (4.95 Mw solar farm and battery) in close proximity to BCM. The solar farm aims to provide enough energy for all mining operations at BCM to be self-sufficient and run entirely from renewable energy during daytime operations.

A development approval is expected in May 2023, with construction complete and the plant operational by December 2023. The project is to be constructed on land adjacent to the mine on property already owned by BCOPL with initial discussions around the approval process having commenced with NSC.

### 6.10.3.2 Revegetation Works

Extensive revegetation works are being completed in the biodiversity offset areas (pursuant to it the biodiversity offset strategy) and mine rehabilitation areas together with a significant native vegetation corridor which will create a future carbon sink.

### 6.10.3.3 Modification 8 Workshop

During the course of the application process for MOD 8, BCOPL held a workshop in July 2022 to consider potential additional measures to further minimise the GHG emissions from BCM. Short term (2022 to 2025) initiatives identified during the workshop include:

- Reviewing fuel efficiencies in production;
- Reviewing available technologies to reduce electricity consumption;

- Encouraging staff to car-pool to and from work;
- Developing a business carbon management policy and roadmap that will form part of the IA decarbonisation strategy;
- Assessing the feasibility of utilising biodiesel for mining fleet;
- Assessing the feasibility of a solar plant; and
- Assessing the feasibility of carbon farming.

Medium-term (2025+) initiatives identified during the workshop include:

- Commissioning of detailed studies for alternative renewable energy supplies;
- Assessing opportunities for variable speed drive units;
- Assessing opportunities for diesel alternatives; and
- Assessing the establishment of a carbon farming project.

BCOPL are considering a range of reasonable and potentially feasible measures to minimise GHG emissions associated with their coal operations.

## 6.11 Public Safety

### 6.11.1 Environmental Management

The management of public safety at the BCM involves four key elements as follows:

- Traffic – to ensure a safe environment for public access to and egress from the site and movement within the site;
- Bushfire – to ensure that the public both onsite and offsite are not exposed to increased risk of bushfire as a result of the Project;
- Lighting – to ensure the provision of adequate lighting to minimise adverse risk to the public both onsite and offsite; and
- Security – to restrict public access to areas of BCM where non-inducted and non-trained members of the public may be exposed to adverse risks posed from mining and related activities.

### 6.11.2 Environmental Performance

#### 6.11.2.1 Traffic

Additional detail on traffic management is detailed in Section 6.12.

#### 6.11.2.2 Bushfire

During the reporting period, management of bushfire risk at BCM was achieved through monitoring and maintenance of bushfire hazards including:

- Monitoring and maintaining equipment and areas where bushfire hazards are present to prevent and minimise the potential outbreak of bushfire;
- Regular monitoring of fuel loads adjacent to mining areas and within the mining lease area portion of Leard State Forest;
- Maintaining adequate water supplies;
- Maintaining access tracks and fire breaks around the mining lease;
- Prohibition of burning any materials on-site;
- Maintaining appropriate firefighting equipment in consultation with the NSW Rural Fire Service and maintaining a fire control and emergency system in accordance with the *Work Health and Safety (Mines and Petroleum Sites) Act 2013*; and
- Assessing contractor safety plans to adequately address fire control and response.

BCOPL has historically worked closely with the NSW Rural Fire Service and Forestry NSW, and will continue to do so, to ensure that bushfire risks on-site are actively identified and managed. During 2018 BCOPL installed water fill points across biodiversity offset land to also aid in bushfire fighting circumstances.

No bushfires or fire related incidents at BCM were recorded during the reporting period.
Current management controls are considered to be appropriate.

#### 6.11.2.3 Lighting

BCOPL and its subcontractors ensure the careful positioning of on-site light sources to actively minimise associated impacts on surrounding receivers, while maintaining adequate illumination levels for operational activities to be carried out safely. This is particularly the case for the lighting sets at the waste emplacement areas. Lighting is provided and maintained in accordance with *AS/NZS 1158.0:2005 Lighting for roads and public spaces* and *AS 1680.1-1990 Interior lighting – General principles for recommendations*.

The control strategies implemented during the reporting period are considered appropriate and will be continued.

#### 6.11.2.4 Security

BCOPL implements a Site Access and Security Procedure which defines the conditions under which employees, contractors and visitors can access BCM. It outlines policies and strategies for limiting unauthorised access by members of the public with no commercial cause to be on the site, with a view to limiting the risk of personal harm, theft or damage of assets or personal property.

During the reporting period security measures implemented by BCOPL included, but were not limited to:

- Implementing a security check point where workers, contractors and visitors had to be approved by management to access the site and undergo a temperature check (due to COVID-19 restrictions);
- Maintaining site fencing, gates, and signage at perimeters and road;
- Providing CCTV surveillance at various areas of the site;
- Implementing an on-site tracking system to monitor personnel and vehicles;
- Performing security patrols including out-of-hours patrols by trained security personnel;
- Implementing a site wide policy for vehicle access; and
- Maintaining community engagement through the Community Consultative Committee (CCC).

## 6.12 Traffic

### 6.12.1 Environmental Management

Traffic generated by construction and operation activities at BCM is managed in accordance with the approved Traffic Management Plan (TMP). The TMP focuses on the broader issues of traffic management at BCM and prescribes the overall requirements of the contractors associated with the BCM. It details management strategies that address environmental and safety risks associated with traffic generated from construction and operation activities to mitigate potential impacts and to satisfy the requirements of SSD 09_0182 and other statutory obligations. The TMP also considers traffic associated with the TCM and MCCM.

The TMP describes forecast operational traffic volumes, site access arrangements, safety improvements, monitoring requirements and control measures to ensure the safe movement of pedestrians and vehicles, and to ensure roads are maintained in a ‘fit for purpose’ state.

Traffic counts were undertaken at six monthly intervals during the construction phase (2012 – 2015) and at 12 monthly intervals post- construction (mid-2015 onwards); to ensure actual traffic volumes are consistent with the TMP. Where there are significant variations in the traffic volumes on a given road as a result of BCM's operation, amendments to the TMP shall be considered. Internal and external audits of the implementation of the TMP are undertaken periodically.

## 6.12.2 Environmental Performance

### 6.12.2.1 Traffic Monitoring

Traffic incidents, monitoring of road conditions and road kill observations are recorded in weekly inspections and incident reports, where relevant. There were three traffic-related incidents recorded on roads in the vicinity of the BCM during the 2022 reporting period. These included two wildlife collision events on the main access road and a minor crash between vehicles at a stop sign.

### 6.12.2.2 Inspections and Audits

A traffic count audit was completed during the reporting period over a 2 week period between 16 and 29 June 2022 to investigate traffic flows on the key routes and to quantify the number of vehicles entering the BCM via each access routes.

The traffic monitoring recorded an Annual Average Daily Traffic Volume (AADT) of 566 vehicles per day (vpd) travelling to BCM via the former BCM haul road and 188 vpd traveling to BCM via the Leard Forest Road. This equates to approximately 75.1% via the former BCM haul road and 24.9% via the Leard Forest Road.

An analysis of the traffic counts indicates that less than 6% of vehicles travelling to the BCM were heavy vehicles (Class 4 to 12 vehicles). It is important to note that whilst Class 3 vehicles are also typically grouped as heavy vehicles, it was observed during the traffic counts that a significant proportion of Class 3 vehicles are small vehicles with wheel base of more than 3.1 m, which includes small busses, utes and 4 x 4 vehicles that are often driven by workers involved in construction and mining projects. Accordingly, these vehicles have been reported as light vehicles.

Over the 2-week traffic count period, the survey indicated an AADT of 754 vehicles (heavy and light vehicles). This figure is much lower than the predicted estimated daily traffic volume outlined in the Traffic Management Plan (2022). The TMP estimated a total of 1174 vehicle trips per day comprising 1138 vehicle trips per day generated by staff and 36 heavy vehicle movements per day.

*Discussion*
Due to COVID-19, BCOPL took measures of limiting site access to essential staff and where possible encouraged office staff to work from home in 2020. This approach continued into the 2021 and 2022 reporting period. However in line with the relaxing of the NSW Governments restrictions, personnel have largely returned to site. During the restriction period, all office staff and external contractors which were required to conduct work on the site were required to be signed off by the General Manager.

During 2022, extreme rainfall experienced across the region which resulted in flooding of the Namoi River and associated tributaries which led to closures of the roads providing access to BCM. As discussed earlier, this resulted in several days of lost production. Once flooding receded, BCOPL implemented a clean-up program for the key access routes.

# 6.13 Socio-economic

## 6.13.1 Socio-economic Management

Socio-economic impacts at the BCM are managed via implementation of the Social Impact Management Plan (SIMP). The approved SIMP contains a commitment to undertake a major review of the document every three years. The SIMP was drafted in November 2013 and approved by the Director-General on 21 April 2014. The SIMP was revised and issued to DPE in June 2016. A further revision was conducted on the SIMP during 2019 and 2020 with the revised draft SIMP being distributed to stakeholders (including DPE) for consultation in December 2020. Comments received during the consultation process were then addressed and the revised SIMP was approved by DPE in August 2021.

The approved SIMP summarises the findings of the Social Impact Assessment completed as part of the 2010 EA. It outlines BCOPL's commitments to the mitigation and management of social impacts throughout the life of the Project. This includes implementing adaptive management in response to impacts on:

- Housing affordability;
- Local employment;
- Local businesses;
- Social and community infrastructure;
- Community cohesion;
- Farming communities;
- Indigenous communities; and
- Traffic.

The SIMP also outlines strategies for the management of cumulative social impacts from BCM and other mines in the region.

## 6.13.2 Environmental Performance

Section 7.1 of the approved SIMP outlines a range of measures to be used to monitor the social impact of the BCM. BCOPL's performance against each of the monitoring mechanisms outlined in the SIMP has been assessed as part of the annual review process. The findings of that review are presented in Table 6.19.

**Table 6.19 Social Impact Monitoring Summary**

| Monitoring Mechanism | Type | Frequency | Purpose | Status (2022 Reporting Period) |
|---|---|---|---|---|
| Employment records | Quantitative | Quarterly | Monitor employment diversity (gender, Indigenous status), local residency, journey to work. | Details of the profile of the BCM workforce are provided in Section 9.4. |
| Procurement records | Quantitative | Six monthly | Monitor project spend on goods and services with local and regional business, including sub-contractors. | Approximately $38,660,655.61 was spent on goods and services procured from the local or regional areas around BCM. |
| Housing data | Quantitative | Quarterly | Monitor changes in house prices and rentals, vacancy rates, motels and temporary accommodation. | A summary of housing data monitoring is provided in Section 6.13.2.1 |

| Monitoring Mechanism | Type | Frequency | Purpose | Status (2022 Reporting Period) |
|---|---|---|---|---|
| Land use data | Quantitative | Annual | Monitor availability of zoned and serviced residential land and supply of new housing. | Refer to Section 6.13.2.2 for a summary of key land availability and housing supply data for the Narrabri and Gunnedah LGAs. |
| Social statistics | Quantitative | Six monthly | Monitor changes in service provider statistics (hospital admission rates, GP attendance, school enrolments, emergency response, reported crime). | Refer to Section 6.13 for a summary of key social statistics. |
| Attendance Records | Quantitative | Annual | Monitor workforce and community participation in education and training programs, induction programs, local sports events, local business forums and business events. | Details of workforce participation are provided in Section 9. |
| Workforce Survey | Qualitative | Annual | Record workforce perceptions about general wellbeing, family functioning, and community issues | In November 2022, the workforce was invited to participate in Idemitsu Australia's annual workforce survey. From the feedback captured in this survey elements of the BCO business that are going well and where improvement is required have been identified. The site leadership team is working through a program to provide the workforce with feedback from the survey, combined with proposed action plans to introduce constructive change through a continuous improvement process. This program will commence early in 2023. |
| Community Survey | Qualitative | Annual | Record community perceptions about company reputation, workforce integration into the community, access to local services, and specific project impacts. | Community is regularly engaged through the CCC meetings. Meetings discuss various topics on how the company is interacting with the community and any specific impacts that are viewed by the local community |

| Monitoring Mechanism | Type | Frequency | Purpose | Status (2022 Reporting Period) |
|---|---|---|---|---|
| Local business survey | Qualitative | Annual | Record perceptions about access to the supply chain, tender opportunities, and business engagement and support programs. | BCOPL is a member of the Narrabri and District Chamber of Commerce, which meets regularly to discuss business trends and opportunities within Narrabri and its surrounds. BCOPL has not attended meetings over the last 4 years although the District Chamber of Commerce allows BCOPL to provide information to local businesses on upcoming events. The Boggabri Business Chamber meetings were attended by management throughout the reporting period to provide the local business with updates on upcoming events and engage in local business issues. BCOPL's involvement in the Narrabri and Boggabri's business communities provides a mechanism for the company to gauge business perceptions about the BCM within the local community. |
| Indigenous engagement | Qualitative | Annual | Monitor labour demographics in local area | BCOPL facilitates an ASCF. The ASCF provides a forum for raising general issues by stakeholders or BCOPL. The forum met three times during the reporting period and discussed matters including Keeping Place for Aboriginal salvage items, results of environmental monitoring on site, consultation for upcoming modifications and consultation for the review of the CHMP. |
| Community complaints | Qualitative | Annual | Record workforce perceptions about general wellbeing, family functioning, and community issues | Details of all community complaints received during the reporting period and responses made by BCOPL are presented in Section 9.3. |

#### 6.13.2.1 Housing

During 2021 BCOPL Commissioned an SQM Research report on the Narrabri, Gunnedah and Boggabri area completed in December 2021. A housing survey was conducted in November 2022 during the reporting period.

Housing vacancy data indicated there have been substantial changes in residential vacancy rates over the past 11 years. Between 2009 and 2022, residential vacancy rates in Narrabri fluctuated significantly from less than 1% (two vacancies) in 2009, to a peak of around 5% (55 properties) in December 2015 and a vacancy rate of less than 1% (ten vacancies) in 2022 (SQM 2022).

Between 2009 and 2020, vacancy rates in Boggabri peaked in September 2013 at around 14% (25 vacancies) before dropping to a ten-year low of around 2% (4 vacancies) in September 2014. Between 2014 and 2019, vacancy rates in Boggabri fluctuated with another low of 2% in May 2018 before increasing to 4.6% in April 2019, and then decreasing to a current rate in 2022 of 2.6% (five vacancies) (SQM 2022).

Between 2009 and 2022, vacancy rates in Gunnedah peaked in both May 2013 and August 2015 at around 6% (more than 75 vacancies and more than 80 vacancies respectively). Over the 12-year period, vacancy rates dropped to a low of around 1% in September 2014 before increasing through to the August 2015 high. The residential vacancy rate in Gunnedah during 2022 increased slightly from 2021 to 1% (14 vacancies) (SQM 2022) from 0.7% (12 vacancies) (SQM 2021).

#### 6.13.2.2 Land Availability and New Housing Supply

DPE housing projections from 2016 to 2041 for the areas of interest are summarised below (DPE, 2022b). DPE housing projections indicate that the number of households in Gunnedah LGA and New England North West Region are expected to increase between 2016 and 2041, whilst the number of households is anticipated to decline (0.36%) in Narrabri LGA during the period of 2016 to 2041. This is consistent with the NSW population decline projections for Narrabri LGA. DPE projections suggest a forecast reduction in demand for housing in Narrabri into the future.

*Dwelling Approvals*

The Gunnedah Shire Council (GSC) *Community Strategic Plan* indicates that improved housing affordability and diversity is needed. GSC has identified that residential and commercial development increased significantly from 2009 to 2014 and remained constant till 2020(Profile ID, 2020). There was a slight decrease in housing approvals in 2022 compared to 2021 though still significantly greater than 2020. This indicates a substantial level of growth that is predicted to be sustained throughout the coming decade. In the Gunnedah LGA, 61 residential buildings were approved to be built in 2021-2022 (ABS 2022).

*Building Approvals*

Building approvals data provides an indication of population growth and the expansion of urban areas. Residential building approvals data from the Australian Bureau of Statistics shows:

- For the period 2017-2018:
    - Approvals for ten new houses in Narrabri LGA, with a total value of approximately $3.9 million (M).
    - Approvals for 41 new houses in Gunnedah LGA, with a total value of approximately $15.9 M.
- For the period 2018-2019:
    - Approvals for eight new houses in Narrabri LGA, with a total value of approximately $3.8 M.
    - Approvals for 30 new houses, and two other residential buildings in Gunnedah LGA, with a total value of approximately $10.2 M. (ABS, 2019).
- For the period 2019-2020:
    - Approvals for six new houses in Narrabri LGA, with a total value of approximately $2.3 M.
    - Approvals for 14 new houses in Gunnedah LGA, with a total value of approximately $5.6 M (ABS, 2021).
- For the period 2020-2021:
    - Approvals for four new houses in Narrabri LGA, with a total value of approximately $1.3 M.
    - Approvals for 64 new houses, and one other residential buildings in Gunnedah LGA, with a total value of approximately $24.5 M (ABS, 2021).
- For the period 2021-2022:
    - Approvals for 10 new houses in Narrabri LGA, with a total value of approximately $3.3 M.

- Approvals for 61 new houses, and one other residential buildings in Gunnedah LGA, with a total value of approximately $22.2 M (ABS, 2022).

*Future Development*

Future land development in the Narrabri and Gunnedah LGAs will be centred around housing development, and several key precinct plans. All future land development options were to be considered at the end of 2021. No further update is available on the NSC website.

In 2020, the NSC finalised its Local Strategic Planning Statement – Future 2040 (NSC LSPS) (NSC, 2020) report which provides a road map to manage the forecast growth within the region whilst ensuring that NSC can continue to deliver the required services and facilities for its local community. The NSC LSPS is supported by the NSC's 2017-2027 Community Strategic Plan and the Narrabri Local Environmental Plan (LEP) to sustainably deliver the forecast growth over the next 20 years. In relation to housing, the NSC has committed to implementing a precinct plan for the Narrabri CBD (Master Plan). The Master Plan aims to identify the constraints and opportunities to improve the functionality and appeal of the Narrabri business precinct, which will also include improvements to the existing industrial and logistics precinct to be able to support the development of the Northern NSW Inland Port. NSC has a series of additional planning studies underway that will lead to appropriate zonings and the finalisation of the Master Plan for the 'Inland Port'. These studies have continued throughout 2022 and are anticipated to be released in the near future. The Northern NSW Inland Port will facilitate future manufacturing, production and industrial and logistics operations (The Courier, 2020). It was noted during consultation with NSC that it had purchased several land parcels to develop and rezone for the purposes of supporting the 'Inland Rail' project.

NSC has committed to developing a Housing Strategy in accordance with Planning Priority 7 of the NSC LSPS (*Provide new space to grow and deliver greater housing diversity to suit changing needs*). The Housing Strategy which remains under development will address matters such as "*capacity for residential development in the CBD, building heights and densities, changing demand for housing due to an ageing population*".

The GSC *Local Strategic Planning Statement - Future 2040* (Gunnedah Shire Council, 2020b) report presents the planning priorities for the Gunnedah LGA over the next 20 years. The *Local Strategic Planning Statement - Future 2040* report indicates that the GSC will undertake regular monitoring of housing development, land demand and supply to remain informed of housing demands.

#### 6.13.2.3 Social statistics

##### 6.13.2.3.1 Schools

As part of the social impact monitoring required under the SIMP, BCOPL completed a review of school enrolment records for all public schools in Gunnedah, Narrabri, Maules Creek and Boggabri between 2011 and 2021. 2022 enrolment data is released Mid-to-late 2023 which will be reported in the 2023 Annual Review.

Enrolment records indicate there have been gradual increases and decreases in student numbers amongst schools, with no significant trends observed between different years. Narrabri and Gunnedah High Schools experienced similar declines in enrolment numbers since 2008, though recent enrolments at Narrabri high school have slightly increased. Enrolments at St Mary's College and Sacred Heart Boggabri have remained relatively stable. The declining enrolment at Gunnedah High School may be attributed to a growing trend of boarding school education or a shift to accessible private education options such as Carinya Christian School whose enrolments increased to 220 in 2021. A summary of annual enrolments for local schools between 2011 and 2022 is provided in Table 6.20.

**Table 6.20 Local School Enrolments 2011 - 2021**

| School | Annual Enrolments | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
| **Boggabri** | | | | | | | | | | | |
| Boggabri Public School | 98 | 101 | 105 | 123 | 117 | 117 | 113 | 88 | 83 | 69 | 77 |
| Sacred Heart Boggabri | 37 | 32 | 33 | 34 | 23 | 24 | 37 | 43 | 39 | 43 | 38 |
| **Narrabri** | | | | | | | | | | | |
| Narrabri Public School | ≈ 400 | ≈ 395 | ≈ 400 | ≈ 410 | ≈ 410 | 406 | 403 | 399 | 394 | 353 | 329 |
| Narrabri West Public School | ≈ 230 | ≈ 240 | ≈ 280 | ≈ 280 | ≈ 300 | 370 | 348 | 327 | 330 | 325 | 313 |
| Narrabri High School | 568 | 589 | 588 | 614 | 587 | 540 | 508 | 488 | 489 | 504 | 521 |
| St Xavier's Narrabri | 240 | 224 | 113 | 171 | 195 | 178 | 188 | 189 | 187 | 212 | 235 |
| Fairfax Public School | 8 | 8 | 13 | 10 | 10 | 12 | 14 | 11 | 11 | 8 | 6 |
| **Gunnedah** | | | | | | | | | | | |
| Carinya Christian School – Gunnedah | 37 | 43 | 6 | 17 | 42 | 69 | 89 | 99 | 155 | 186 | 220 |
| Saint Mary's College Gunnedah | - | - | 379 | 408 | 401 | 379 | 357 | 364 | 379 | 370 | 421 |
| St Xavier's Gunnedah | - | - | 350 | 350 | 358 | 350 | 371 | 381 | 365 | 382 | 374 |
| G S Kidd Memorial School | 45 | 49 | 32 | 33 | 40 | 40 | 40 | 36 | 36 | 33 | 33 |
| Gunnedah Public School | ≈ 135 | ≈ 130 | ≈ 120 | ≈ 122 | ≈ 122 | ≈ 122 | 156 | 155 | 156 | 164 | 154 |
| Gunnedah South Public School | ≈ 480 | ≈ 520 | ≈ 570 | 599 | 616 | 620 | 634 | 629 | 636 | 614 | 607 |
| Gunnedah High School | ≈ 550 | ≈ 550 | ≈ 500 | ≈ 450 | ≈ 430 | 430 | 391 | 414 | 426 | 432 | 399 |

#### 6.13.2.3.2 Health

BCOPL contacted local healthcare service providers via telephone during early 2020 to evaluate the effects that BCM may have had on healthcare services in recent years. The feedback received indicated that the demand on local services has remained stable in recent years and that local providers are sufficiently staffed to cope with the number of patient visits they typically receive. Further consultation during early 2021 with health care providers over an upcoming modification at BCM support this feedback. Findings indicated that current demand upon health services is manageable. (DPE, 2019)

# 7 WATER MANAGEMENT

Water management at BCM is undertaken in accordance with the approved water management plans, prepared in accordance with SSD 09_0182. The Water Management Plan (WMP) acts as the overarching document governing water management at BCM. Approved subordinate plans supporting water management include:

- Surface Water Management Plan (SWMP);
- Groundwater Management Plan (GWMP);
- Site Water Balance (SWB) report; and
- BTM Complex Water Management Strategy (WMS).

The water management system operates across four key elements as defined below:

- **Clean water** is defined as runoff from catchments that are not disturbed by mining operations;
- **Dirty water** is defined as runoff from disturbed areas within the mine site and includes runoff from spoil dumps, haul roads and parts of the mine infrastructure area. This water contains high levels of suspended solids;
- **Contaminated water** is defined as runoff generated from coal stockpiles, the CHPP, parts of the MIA and the mining void, as well as groundwater inflows to the mining void. This water contains high levels of suspended solids and is mildly saline; and
- **Erosion and sediment control** is defined as the suite of management and physical measures available to minimise the generation of soil erosion and to prevent soil and sediment entering the receiving water systems (i.e. 'Nagero Creek' and the Namoi River).

## 7.1 Surface Water

Surface water is managed in accordance with BCM's SWMP and associated water management plans which conform to the approvals, licences and other regulatory requirements of BCM. The key objectives of the surface water management system are to:

- Segregate clean runoff, dirty runoff, and contaminated water generated from rainfall events and mining operations;
- Minimise the volume of contaminated mine water (surface runoff draining to the pit and groundwater seepage) generated by BCM;
- Preferentially reuse contaminated water for dust suppression and coal washing;
- Provide sufficient on-site storage to avoid releases of contaminated water that could affect the quality of downstream watercourses;
- Treat all dirty runoff from un-rehabilitated overburden areas to settle coarse suspended solids; and
- Where practicable, divert 'clean' runoff to downstream creeks.

In accordance with SSD 09_0182, BCM maintains a SWB for effective management of water resources. The SWB details water use, water demand and water management at BCM, as well as the sources and security of water supply, including contingency for future reporting periods. The SWB is regularly revised in order to reflect modifications to the mine plan.

### 7.1.1 Erosion and Sediment Control

Erosion and sediment control at BCM is guided by the WMP and the SWMP and is consistent with the "Blue Book" - *Managing Urban Stormwater, Soils and Construction, Volume 1* (Landcom, 2004) and *Managing Urban Stormwater, Volume 2E: Mines and Quarries* (DECC, 2008).

Erosion and sediment control measures employed at BCM include:

- Minimising ground disturbance where possible;
- Amelioration of dispersive soil to minimise the risk of rill, gully and tunnel erosion and to allow the infiltration of surface water;
- Contour scarification of compacted surfaces to encourage infiltration and surface roughness;
- Placing removed soils in areas where they are less likely to be affected by rainfall;
- Stockpiling in a stable manner by ensuring that topsoil is not dispersed and the height of stockpiles is restricted to 3 m;
- Long term (greater than six months) stockpiles are stabilised by appropriate seeding or mulched vegetation where possible;
- Disturbed areas are rehabilitated as soon as possible following disturbance, including regrading where required;
- Where feasible, understorey and ground cover vegetation are retained in and around drainage lines;
- Preventing vehicles from entering topsoiled rehabilitation areas to prevent damage to vegetation and soil structure;
- Erosion and sediment control measures are installed before commencement of any works;
- All erosion control measures are maintained until all earthworks and mining activities are completed and site rehabilitation is complete; and
- All erosion and sediment control measures employed are appropriately designed, sized, located and installed. Erosion and sediment control measures include the use of:
    - Sediment fencing;
    - Channel bed and bank protection;
    - Earth bunds and diversion drains;
    - Geotextile sediment fencing; and
    - Sediment retention basins.

### 7.1.2 Surface Water Quality Monitoring

To track surface water quality within and around the site and to determine environmental compliance and performance, BCOPL undertakes ‘ambient’, ‘event’ and ‘frequency’ based water quality monitoring in accordance with the SWMP and EPL12407.

Ambient monitoring measures the surface water quality of the receiving environment surrounding BCM (i.e. outside the site water management system). Ambient monitoring is triggered by an event such as a ‘wet weather discharge’ rather than as part of a set sampling regime.

Mine site event-based monitoring is undertaken within the site water management system and includes monitoring of sediment dams and mine water dams (MWD) in response to controlled discharges (i.e. release from a sediment dam), uncontrolled discharges (i.e. spillage from a dam during wet weather) or emergency discharges (i.e. an emergency discharge due to wet weather).

Frequency based monitoring is undertaken within the site water management system on a quarterly basis to assess the condition of site water quality and inform ongoing management.
Details of BCM’s surface water quality monitoring program including monitoring locations, trigger events and sampling methods, are outlined in Table 7.1.

**Table 7.1 Surface Water Quality Monitoring Regime**

| EPL ID | Location | Location description | *Trigger event/ Type of monitoring | Frequency | Sampling method |
|---|---|---|---|---|---|
| **Ambient and Event Based Monitoring** | | | | | |
| 1 | SD6 | Nagero Dam | Wet weather discharge<br>Controlled discharge water quality | As soon as practicable at the commencement of a wet weather discharge | Grab sample with conductivity and pH in situ |
| 3 | SD3 | Southwest corner of spoil dump | Wet weather discharge<br>Controlled discharge water quality | As soon as practicable at the commencement of a wet weather discharge | Grab sample with conductivity and pH in situ |
| 4 | SD4 | Sediment dam at rail load out area, west of mine site | Wet weather discharge<br>Controlled discharge water quality | As soon as practicable at the commencement of a wet weather discharge | Grab sample with conductivity and pH in situ |
| 5 | SW1 'Nagero Creek' | Downstream of mining | Discharge water quality (from EPL points 1,3 & 4) | As soon as practicable during or following a rainfall event sufficient to generate flow in 'Nagero Creek' OR<br>As soon as practicable during a discharge event from EPL discharge points 1, 3 & 4 | Grab sample with conductivity and pH in situ |
| 6 | SW2 'Nagero Creek' | Upstream of mining | Discharge water quality (from EPL points 1,3 & 4) | As soon as practicable during or following a rainfall event sufficient to generate flow in 'Nagero Creek' OR<br>As soon as practicable during a discharge event from EPL discharge points 1, 3 & 4 | Grab sample with conductivity and pH in situ |
| **Frequency Based Monitoring** | | | | | |
| 36 | SD6^ | Nagero Dam | Surface water quality | Quarterly | In situ |
| 37 | SD10 & SD12 | Near CHPP | Surface water quality | Quarterly | In situ |
| 38 | SD3^ | Southwest corner of spoil dump | Surface water quality | Quarterly | In situ |
| 39 | SD4^ | Rail loop 15 km west of mine site | Surface water quality | Quarterly | In situ |
| 41 | MW3 | South of MIA | Surface water quality | Quarterly | In situ |

Notes:
* Wet weather discharge: An overtopping event from a dam as a result of excessive rainfall (i.e. typically via the emergency spillway).
* Controlled discharge water quality: a controlled discharge event from a dam (i.e. drawdown of a dam after adequate sediment settlement has occurred).
^ EPL Point – Licensed discharge point

Surface water quality testing parameters from the SWMP are specified in Table 7.2.

**Table 7.2 Surface Water Quality Testing Parameters**

| Monitoring type | Determinants |
|---|---|
| Ambient and event based | Conductivity, nitrate, nitrogen (total), oil and grease, pH, phosphorus (total), reactive phosphorus, total suspended solids, dissolved metals (arsenic, cadmium, chromium, copper, lead, nickel, zinc, iron) |
| Frequency based (quarterly) | Conductivity, pH, Temp |

BCOPL uses a handheld multi-parameter water quality probe (pH, EC, temperature) for field checks. All water quality samples requiring lab analysis are sent to a NATA-accredited laboratory for processing.

#### 7.1.2.1 Water Storage and Usage Monitoring

Water storage levels of all active sediment dams and mine water dams are monitored and recorded on a weekly basis. This allows for effective management of stored supplies in terms of consumption, potential discharges and infrastructure planning.

BCOPL submitted an updated SWMP (Rev 8) to DPIE for approval in July 2019; however, no approval has yet been received. It is noted that the implementation of the currently approved SWMP is non-compliant as the clean water drain presented in the SWMP to the north of the disturbance area has been mined through and has not been reinstated.

This current clean water drainage system is presented in the SWMP (Rev8) submitted to DPIE which removes this clean water drain. GHD were commissioned by BCOPL to complete a report to justify not reinstating this drain and provided evidence that BCM is not harvesting clean water outside of harvestable rights allowances (GHD, 2017). As the current SWMP (Rev8) is yet to be approved by DPIE the implementation of the approved SWMP is considered non-compliant.

BCOPL continue to liaise with DPE throughout the reporting period regarding the approval of the revised water management system, as part of the subsequent updated SWMP (Rev 9) which was submitted to DPE for approval in January 2022. The SWMP is currently under revision by BCOPL.

### 7.1.3 Environmental Performance

#### 7.1.3.1 Surface Water Quality Criteria

##### 7.1.3.1.1 Interim Trigger Levels

The SWMP specifies interim trigger levels for ambient monitoring, i.e. water quality of Nagero Creek when a discharge event occurs at BCM. Sufficient baseline data for the formation of statistically sound trigger levels is not available for Nagero Creek and the ANZECC (2000) default guidelines are considered to be unsuitable, as the ambient water quality has historically exceeded some of the criteria. The SWMP therefore assigns interim trigger levels based on the ANZECC *guideline values for the protection of Environmental Values* (2010) and the 80$^{th}$ percentile value of the limited ambient monitoring results historically collected from SW2.

#### 7.1.3.2 Results of Event Based Monitoring

The approved SWMP requires BCOPL to undertake surface water quality monitoring in Nagero Creek upstream (SW2) and downstream (SW1) of the BCM as soon as possible at the commencement of discharge.

There were six discharge events during the reporting period that triggered event based sampling. Two of these events were triggered by discharges from Licenced Discharge Point 1 (SD6) and four discharge events were triggered by discharges from Licenced Discharge Point 3 (SD3). These discharges occurred because of high rainfall occurring in September (148.2 mm), October (145.8 mm) and November (110.2 mm) 2022.

Sampling was undertaken in accordance with the EPL at Point 1 (SD6) and/or Point 3 (SD3), upstream (SW2) and downstream (SW1) of the LDP. The samples were analysed for the parameters included in test suite A as specified in EPL 12407 and the SWMP. The results are shown in Table 4-3 and demonstrate compliance with the criteria.

The results of the ambient event-based monitoring (Table 7.3) suggest that there is little difference in the ambient water quality upstream and downstream of BCM, specifically:

- pH is generally slightly higher downstream (SW1) compared to upstream (SW2)
- nutrients (nitrate, nitrogen, phosphorous) are slightly higher downstream (SW1) compared to upstream (SW2)
- TSS is higher between downstream (SW1) compared to upstream (SW2)
- Metals and other analytes are comparable between the upstream and downstream monitoring points
- Salinity (conductivity) was slightly higher downstream (SW1) compared to upstream (SW2) during discharge events from SD6

## Table 7.3 Summary of Event Based Discharge Monitoring Results

| Date | in situ pH (pHunits) | In Situ Conductivity (mS/cm) | pH (pH units) | Conductivity (µS/cm) | Nitrate (mg/L) | Nitrogen (total) (mg/L) | Phosphate (total) (mg/L) | Total Suspended Solids (mg/L) | Oil and Grease (mg/L) | Reactive Phosphorus (mg/L) | Arsenic (mg/L) | Cadmium (mg/L) | Chromium (mg/L) | Copper (mg/L) | Nickel (mg/L) | Lead (mg/L) | Zinc (mg/L) | Iron (mg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **EPL Discharge Point 1 (SD6)** | | | | | | | | | | | | | | | | | | |
| 18/10/2022 | 8.02 | 594 | 7.79 | 421 | 0.02 | 0.02 | 0.12 | 6 | <5* | 0.05 | 0.001 | <0.0001* | 0.001 | 0.002 | 0.002 | <0.001* | 0.006 | 1.44 |
| 21/11/2022 | 8.45 | 453 | 8.09 | 347 | <0.01* | 0.7 | 0.17 | 6 | <5* | 0.03 | 0.001 | <0.0001* | 0.002 | <0.001* | 0.004 | 0.002 | 0.006 | 2.06 |
| **EPL Discharge Point 3 (SD3)** | | | | | | | | | | | | | | | | | | |
| 21/09/2022 | 8.49 | 932 | 8.1 | 685 | 0.14 | 0.14 | 0.02 | 2 | <5* | 0.01 | 0.002 | <0.05* | 0.001 | 0.001 | 0.002 | 0.001 | 0.002 | 0.35 |
| 02/11/2022 | 8.15 | 569 | 8.02 | 580 | 0.14 | 0.14 | 0.16 | 100 | <5* | <0.01* | 0.004 | 0.0002 | <0.001* | 0.004 | 0.004 | 0.005 | 0.008 | 1.95 |
| 12/11/2022 | 7.60 | 1066 | 7.91 | 587 | 0.16 | 0.2 | 0.36 | 19 | <5* | <0.01* | 0.003 | <0.0001* | <0.001* | 0.002 | 0.004 | 0.004 | 0.006 | 1.19 |
| 14/11/2022 | 7.92 | 605 | 8.01 | 547 | 0.49 | 0.53 | 0.29 | 250 | <5* | <0.01* | 0.004 | 0.0002 | 0.007 | 0.009 | 0.014 | 0.01 | 0.037 | 6.74 |
| **SW1 (Nagero Creek Downstream of BCM)** | | | | | | | | | | | | | | | | | | |
| 21/09/2022 | 7.5 | 312 | 7.26 | 166 | <0.01* | <0.01* | 0.4 | 127 | <5* | 0.04 | 0.0026 | <0.06 | 0.011 | 0.009 | 0.014 | 0.006 | 0.033 | 11.0 |
| 18/10/2022 | 7.76 | 503 | 7.59 | 316 | <0.01* | <0.01* | 0.33 | 30 | <5* | <0.01* | 0.003 | <0.0001* | 0.01 | 0.008 | 0.017 | 0.006 | 0.027 | 11.80 |
| 02/11/2022 | 7.41 | 256 | 7.32 | 251 | <0.01* | <0.01* | 0.13 | 14 | <5* | 0.02 | 0.0020 | <0.0001* | <0.001* | 0.002 | 0.006 | 0.001 | 0.007 | 1.92 |
| 12/11/2022 | 7.34 | 429 | 7.73 | 422 | <0.01* | <0.01* | 0.12 | 34 | <5* | <0.01* | 0.0010 | <0.0001* | 0.002 | 0.002 | 0.007 | 0.001 | <0.005 | 1.47 |
| 14/11/2022 | 7.46 | 349 | 7.69 | 237 | 0.01 | 0.01 | 0.22 | 67 | <5* | 0.05 | 0.0020 | <0.0001* | 0.003 | 0.002 | 0.008 | 0.002 | 0.01 | 3.21 |
| 21/11/2022 | 7.53 | 582 | 7.71 | 523 | <0.01* | <0.01* | 0.25 | 97 | <5* | <0.01* | 0.003 | <0.0001* | 0.004 | 0.004 | 0.012 | 0.003 | 0.012 | 4.61 |
| **SW2 (Nagero Creek Upstream of BCM)** | | | | | | | | | | | | | | | | | | |
| 21/09/2022 | 8.01 | 251 | 6.91 | 124 | 0.01 | 0.01 | 0.21 | 30 | <5* | 0.01 | 0.002 | <0.05* | 0.006 | 0.005 | 0.009 | 0.004 | 0.017 | 6.11 |
| 18/10/2022 | 7.88 | 281 | 7.03 | 165 | <0.01* | <0.01* | 0.24 | 6 | <5* | <0.01* | 0.002 | <0.0001* | 0.008 | 0.007 | 0.013 | 0.006 | 0.026 | 9.54 |
| 21/11/2022 | 7.70 | 219 | 7.51 | 176 | <0.01* | <0.01* | 0.21 | 5 | <5* | <0.01* | 0.001 | <0.0001* | 0.005 | 0.003 | 0.011 | 0.003 | 0.014 | 6.84 |
| 02/11/2022 | 7.14 | 154 | 7.06 | 146 | <0.01* | <0.01* | 0.19 | 5 | <5* | <0.01* | 0.001 | <0.0001* | 0.003 | 0.003 | 0.009 | 0.004 | 0.012 | 4.53 |
| 12/11/2022 | 7.14 | 606 | 7.23 | 215 | <0.01* | <0.01* | 0.2 | 6 | <5* | <0.01* | 0.002 | <0.0001* | 0.004 | 0.003 | 0.009 | 0.002 | 0.013 | 4.32 |
| 14/11/2022 | 7.52 | 186 | 7.09 | 116 | <0.01* | <0.01* | 0.76 | 40 | <5* | <0.01* | 0.002 | <0.0001* | 0.004 | 0.004 | 0.013 | 0.005 | 0.014 | 6.12 |

*Below detectable limit

#### 7.1.3.3 Results of Frequency Based Monitoring

Frequency based monitoring was undertaken on the following dates:

- Quarter 1 – 3 March 2022;
- Quarter 2 – 16 June 2022;
- Quarter 3 – 12 September 2022; and
- Quarter 4 – 30 November 2022.

The in-situ results for quarterly monitoring are provided in Table 7.4, with the laboratory results indicated in brackets. Quarter 3 monitoring of SD23 and MW5 was not completed as the sites were inaccessible due to rain. Attempts were made to access the sites on the 12th, 16th and 19th of September 2022.

**Table 7.4 Summary of Frequency Based Monitoring Results**

| | MW3 | SD3 | SD4 | SD6 | SD10 | SD12 | SD23 | MW5 |
|---|---|---|---|---|---|---|---|---|
| pH | | | | | | | | |
| Q1 | 8.98 | 8.55 | 8.36 | 9.04 | 8.45 | 8.91 | 8.33 | 8.68 |
| Q2 | 8.53 | 8.38 | 8.48 | 7.07 | 8.08 | 8.09 | 8.20 | 8.48 |
| | (8.59) | (8.7) | (8.47) | (7.98) | (8.22) | (8.22) | (8.24) | (8.64) |
| Q3 | 8.57 | 7.33 | 8.12 | 9.24 | 8.16 | Site Inaccessible | | |
| Q4 | 8.29 | 7.57 | 7.94 | 8.01 | 8.19 | 8.51 | 8.69 | 8.74 |
| | (8.23) | (7.45) | (7.61) | (7.53) | (8.12) | (8.59) | (8.69) | (8.71) |
| Average of In Situ Results | 8.59 | 7.96 | 8.23 | 8.34 | 8.22 | 8.50 | 8.41 | 8.63 |
| Conductivity (µS/cm) | | | | | | | | |
| Q1 | 632 | 770 | 157 | 361 | 1251 | 1646 | 1421 | 1728 |
| Q2 | 665 | 774 | 206 | 372 | 1575 | 1441 | 1574 | 1759 |
| | (703) | (804) | (205) | (367) | (1469) | (1480) | (1570) | (1750) |
| Q3 | 554 | 373 | 127.8 | 323 | 1076 | Site Inaccessible | | |
| Q4 | 511 | 361 | 1462 | 370 | 651 | 911 | 1136 | 1095 |
| | (407) | (340) | (134) | (205) | (594) | (875) | (1070) | (1070) |
| Average of In Situ Results | 590.50 | 569.5 | 488.2 | 356.50 | 1138.25 | 1332.67 | 1377.00 | 1527.33 |

Results show pH measured in situ (site samples) ranged from 7.07 to 9.24, with an average of 8.36 across all sediment dams included in quarterly monitoring. This is a slightly lower average than recorded in the 2021 reporting period where the average overall pH was 8.52. The in situ pH results were generally similar to the lab analysis results.

Conductivity measured in situ ranged from 127.80 µS/cm to 1759 µS/cm with an average of 922.49 µS/cm across all surface water monitoring locations during the reporting period. This is a slightly lower average than recorded during 2021 reporting period where the average overall conductivity was 955.29 µS/cm. The in situ conductivity results were generally similar to the lab analysis results with the exception of SD4 during the Quarter 4 monitoring where conductivity measured in situ was 1462 µS/cm and lab conductivity was 134 µS/cm, indicating a potential error in the recording of the in suite salinity level.

#### 7.1.3.4 Demand, Take and Usage

In accordance with its surface water licences and SSD 09_0182, BCOPL accesses surface water from the Namoi River from time to time. BCOPL also holds water entitlements for groundwater extraction from

the Namoi River alluvium. Furthermore, BCOPL can trade additional water to make up shortfalls. Where necessary, BCM uses existing water entitlements to supplement demand. The water taken from the existing licenses as at the end of the water year (1 July 2021 to 30 June 2022) is detailed in Table 7.5.

**Table 7.5 Water Take**

| Water Access Licence No. | Water Source and Water Sharing Plan (WSP) | Allocation (ML) | Carryover from Previous Water Year | Temporary Transfers (ML) | Passive Take / Inflows (ML) | Active Pumping (ML) | TOTAL (ML)* |
|---|---|---|---|---|---|---|---|
| 15037<br>12767<br>24103<br>12691<br>36547<br>37519 | Upper Namoi Zone 4 Namoi Valley (Keepit Dam to Gin's Leap), Upper and Lower Namoi Groundwater Sources WSP | 1028 | 2056 | 833 | 42 | 158 | 200 |
| 29473<br>29562 | Gunnedah Oxley Basin Murray Darling Basin Groundwater Source, NSW Murray Darling Basin Porous Rock Groundwater Sources WSP | 842 | 210.5 | 0 | 321 | 12.7 | 333.7 |
| 44134 | Bluevale Water Source, Namoi and Peel Unregulated Rivers Water Sources 2012 | 0 ^ | 0 | 939 | 452 | 0 | 452 |
| 2571<br>2572<br>2595<br>2596 | Lower Namoi Regulated River, Upper Namoi and Lower Namoi Regulated River WSP | 251.2 | 188 | 63.8 | 0 | 0 | 0 |
| 37067 | Upper Namoi Regulated River, Upper Namoi and Lower Namoi Regulated River WSP | 128 | 64 | 128 | 0 | 0 | 0 |
| 42234 | Upper Namoi Zone 11 Maules Creek Groundwater source. Purchased 9/1/2019 | 20 | 40 | 0 | 1 | 0 | 1 |

^ Zero-allocation WAL now in place allowing for temporary transfer of allocations to take place.

#### 7.1.3.4.1 Water Demand

Core water demands during the 'water year' reporting period (1 July 2021 to 30 June 2022) were for coal processing in the CHPP and dust suppression. Quantities of water were also required for vehicle washdown and potable water uses. Table 7.6 outlines future estimated water volumes for key water demands as described in the SWB.

Water demand predictions were initially provided in the 2010 EA; however, these have been updated a number of times since to account for changes to water demand and usage in light of approved changes to the operations.

**Table 7.6 Predicted Water Demand**

| | Dust suppression (haul roads) | CHPP | MIA and Potable water |
|---|---|---|---|
| **Period** | Jan 2017 to 2033 | Jan 2017 to 2033 | Jan 2017 to 2033 |
| **Demand** | 1,460 ML/yr | 1,460 ML/yr | 365 ML/yr |

#### 7.1.3.4.2 Water Usage

Dust suppression accounts for the majority of water usage at BCM and involves application by water cart to unsealed roads, trafficable areas, windrows, stockpiles and batters.
During the reporting period 814.03 ML of water was used for dust suppression. This represents a slight reduction in water use from the previous reporting period, when 817.12 ML of water was used.
In addition, a total of 303.129 ML of water was used in the CHPP during the reporting period. This includes water used in the coal bypass, processing plant and train load out. The total water usage for dust suppression and the CHPP is below the predicted demand as detailed in Table 7.6.

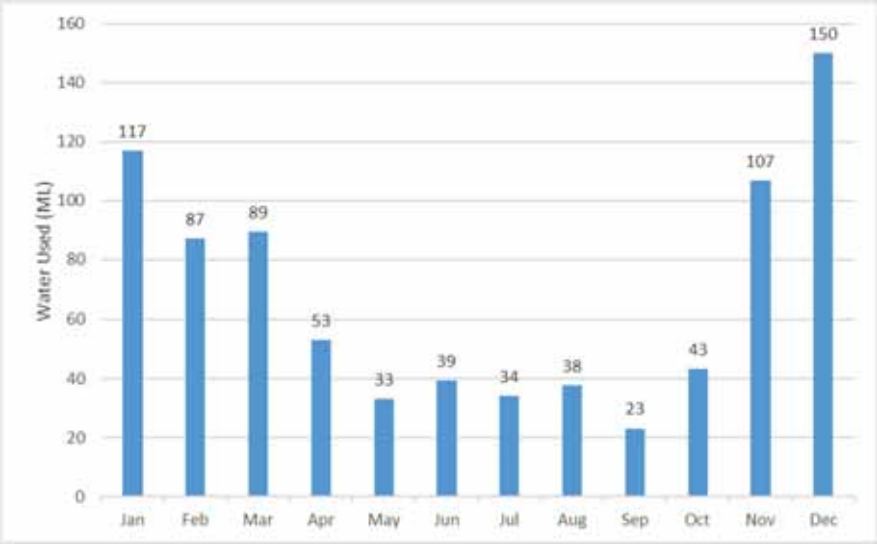



**Figure 7-1 2022 Monthly Dust Suppression Water Usage (ML)**

#### 7.1.3.4.3 Water Storage

Details of BCM's water storage dams including their design capacity and storage at the beginning (as at 3 January 2022) and end of the reporting period (as at 29 December 2022), are outlined in Table 7.7.

**Table 7.7 Water Storage Summary**

| Storage | Location/ description | Stored water | Catchment area (ha) | Required minimum capacity (ML) | Design capacity (ML) | Water stored start of period (ML) | Water stored end of period (ML) |
|---|---|---|---|---|---|---|---|
| **Dirty water** | | | | | | | |
| SD3 | West of spoil dump | Dirty Water: runoff from partially rehabilitated spoil dump | 194.8 | 76.5 | 102.3 | 50.6 | 48.3 |
| SD6 | Downstream of MIA (referred to as Nagero Dam) | Dirty Water: Runoff from grassed areas near MIA, and overflows from SD10 and SD8 | 65.2 | 28.5 | 52.2 | 29.0 | 12.7 |
| SD7 | Eastern spoil dump | Dirty Water: runoff from spoil dump and clean runoff from undisturbed catchment | 210.3 | - | 95.1 | 63.9 | 72.4 |
| SD8 | In MIA | Dirty Water: runoff from MIA | 11.2 | 4.9 | 13.39 | 2.8 | 3.7 |
| SD23 | Near topsoil stockpile | Dirty Water: runoff from topsoil stockpile | 51.6 | - | 16.96 | 16.7 | 16.7 |
| **Dirty water total** | | | | | | **163.0** | **153.8** |
| **Contaminated water** | | | | | | | |
| SD10 | CHPP | Contaminated Water: runoff from product coal stockpile | 31.4 | 81.9 | 116.4 | 53.2 | 64.8 |
| SD11 | At rail loop | Contaminated Water: runoff from rail loop | 3.8 | 10 | 16.4 | 3.6 | 2.1 |
| SD12 | CHPP | Contaminated Water: runoff from ROM coal stockpile | 46.2 | 120.5 | 206.6 | 41.9 | 131.9 |
| SD28 | Train load out facility (**TLO**) | Contaminated Water: Runoff from TLO | 0.7 | 1.7 | 3.5 | 1.0 | 3.5 |

| Storage | Location/ description | Stored water | Catchment area (ha) | Required minimum capacity (ML) | Design capacity (ML) | Water stored start of period (ML) | Water stored end of period (ML) |
|---|---|---|---|---|---|---|---|
| MW3 | South of MIA | Contaminated Water: surplus pumped from SD2 and clean runoff from small grassed catchment | 10.7 | 13.1 | 153.5 | 21.8 | 103.3 |
| MW5 | In pit | Contaminated Water Storage Dam | 208.4 | 1,000 | 2,200 | 1575.3 | 1890.0 |
| MW8[a] | In pit | Contaminated Water: surplus mine water from pit | - | - | 52.93 | 32.2 | - |
| MW9[b] | In pit | Contaminated Water: surplus mine water from pit | - | - | 102 | - | 75.1 |
| **Contaminated water total** | | | | | | **1729.0** | **2195.6** |

[a]Removed in March 2022 due to mining progression.

[b]Built in February 2022 to replace MW8.

### 7.1.3.5 Water Balance Modelling

The site water balance model was reviewed and recalibrated for 2022 (Appendix H BCOPL 2022) by comparing the observed and modelled site water Inventory (Figure 7-2). The calibrated site water balance model was considered to provide a reasonable fit to the observed site water inventory and is therefore expected to continue to provide reasonable estimates of future water demands, inventories, and discharges.

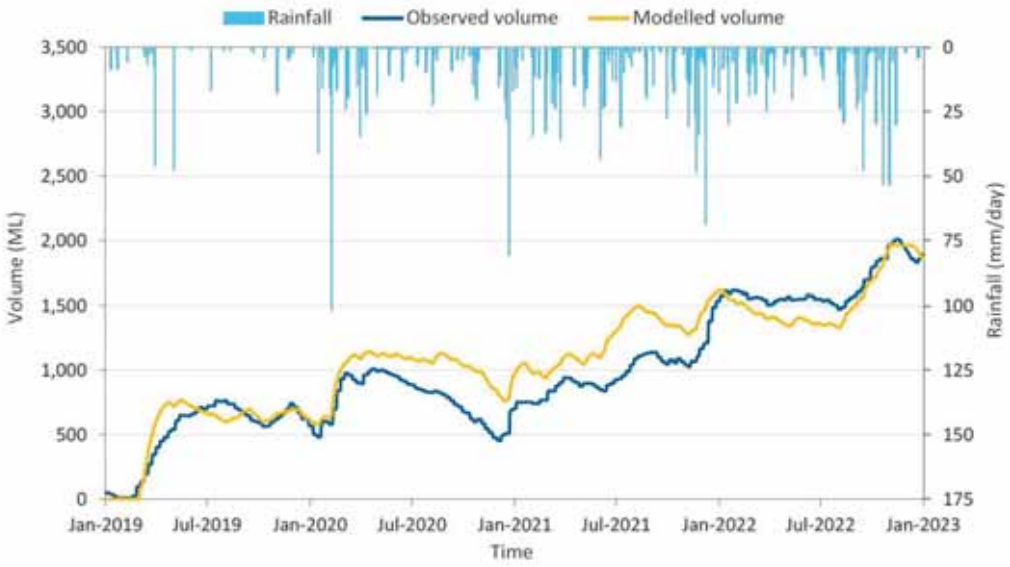



**Figure 7-2 Modelled vs observed site water inventory**

#### 7.1.3.5.1 Long Term Trend Analysis

In accordance with SSD 09_0182 a long term trend analysis of surface water monitoring results at BCM has been undertaken using data from 2017 to 2022 to identify any trends in the monitoring. The results indicate the following:

- The pH of surface monitoring results stayed relatively stable between 2017 and 2021 with values ranging between 7.07 and 9.24. In 2022 trends in pH exhibited more fluctuation, likely due to increased rainfall and increased frequency of monitoring (Figure 7-3).
- Historical trends show fluctuations in EC between 2017 and 2022. In the latter half of 2022, EC exhibited a decreasing trend for all monitoring sites. This is likely due to above average rainfall condition (Figure 7-4).

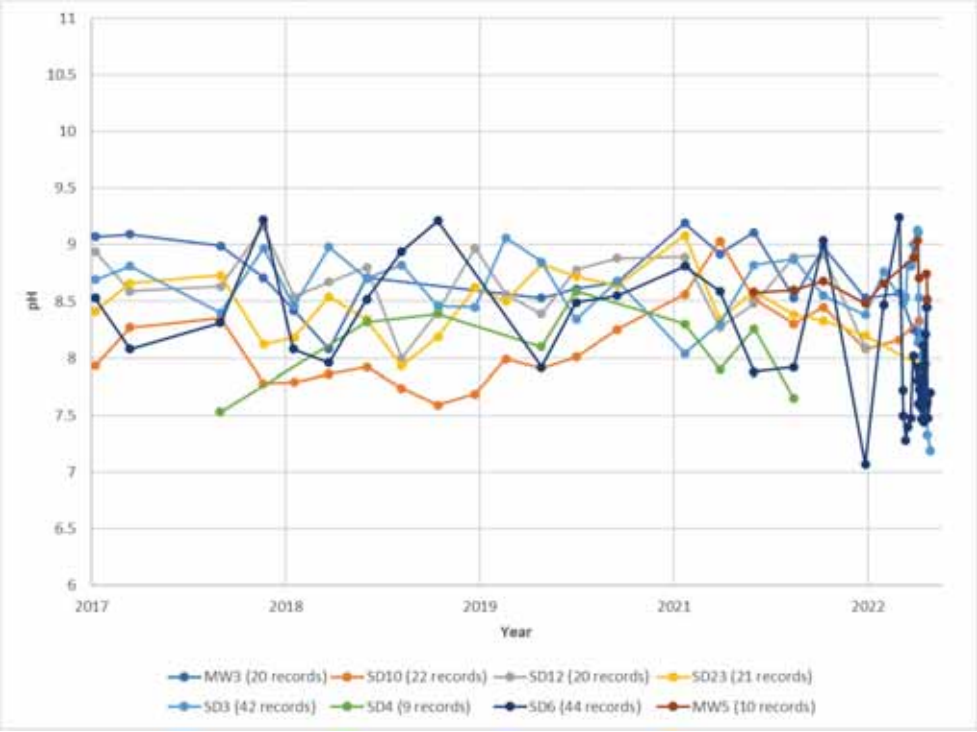



**Figure 7-3 Long Term Surface Water Monitoring Results for pH**

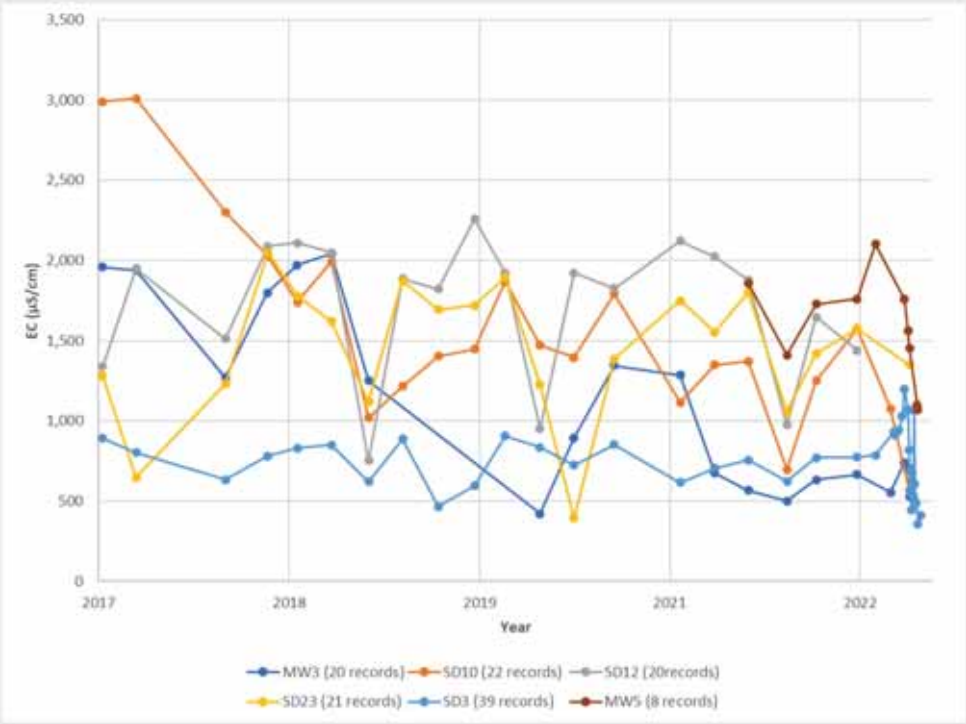



**Figure 7-4 Long Term Surface Water Monitoring Results for EC**

### 7.1.4 Improvements and Initiatives

Control strategies implemented under relevant management plans and strategies are considered to be adequate to manage and mitigate impacts to surface water downstream of the BCM. These will continue to be implemented throughout future reporting periods and updated where deemed necessary. Impacts to the downstream environment during the current reporting period are considered negligible.

## 7.2 Groundwater

### 7.2.1 Environmental Management

Groundwater is managed in accordance with BCM's approved water management plans, specifically the GWMP. A general overview of water management at BCM is provided in Section 7.1.

The GWMP provides a framework defining how BCOPL will assess, manage, and mitigate impacts to the groundwater system. This particularly focuses on impacts to the shallow alluvial aquifer attributable to mining activities such as dewatering the open pit void. The GWMP specifies impact assessment criteria and trigger levels to identify groundwater level and quality changes, and outlines BCOPL's monitoring and reporting requirements for groundwater management.

BCOPL holds licences for extraction from several groundwater bores. The amount of water extracted from groundwater sources and corresponding entitlements are identified in Table 7.5.

#### 7.2.1.1 Groundwater Monitoring Program

BCOPL's groundwater monitoring program focuses on potential impacts to environmental assets and groundwater users in the area surrounding BCM, and aims to:

- Identify changes to the natural groundwater system attributable to mining operations.
- Demonstrate compliance with the SSD (09_0182).

Groundwater monitoring during 2022 at BCM consisted of monitoring of groundwater levels and sampling of groundwater quality. Groundwater monitoring was undertaken in accordance with the requirements of EPL 12407 and the GWMP. Groundwater levels were monitored manually on a quarterly basis (March, June, September, and November 2022), as listed in Table 7.8.

**Table 7.8 Groundwater Quality Testing Parameters**

| Monitoring type | Determinants |
|---|---|
| Six-monthly laboratory analysis (June and December) | Sulphate as $SO_4^{2-}$ , chloride, calcium, magnesium, sodium, potassium, dissolved arsenic, dissolved cadmium, dissolved chromium, dissolved copper, dissolved lead, dissolved manganese, dissolved nickel, dissolved zinc, dissolved iron, ammonia as N, nitrite as N, nitrate as N, nitrite + nitrate as N, total nitrogen as N, total phosphorus as P, reactive phosphorus as P, hydroxide alkalinity, carbonate alkalinity, bicarbonate alkalinity and total alkalinity. |
| Quarterly field parameters (March, June, September, and December) | Conductivity (EC), pH, temperature, groundwater level |

Groundwater quality field parameters (EC, pH and temperature) were measured quarterly, while sampling for major ions, dissolved metals and nutrients was undertaken in June and November 2022.

Groundwater sampling was undertaken using a groundwater pump and a minimum of three well volumes were purged or until the field parameters stabilised prior to sample collection. Samples were filtered onsite for the dissolved metal suite.

During the reporting period the active groundwater monitoring network comprised five monitoring bores screened across different geological units. Details of these bores are listed in Table 7.9.

**Table 7.9 Groundwater Monitoring Bores**

| EPL ID | Bore | Licence | Depth (mBGL [A]) | Screen interval (mbtoc [B]) | Geological Unit | Screened geology | Notes for reporting period |
|---|---|---|---|---|---|---|---|
| 7 | GW3115 | 90BL253832 | - | 0-42 | Colluvial Aquifer | Boggabri Volcanics (weathered) | Water level and quality data collected as per groundwater management plan. |
| 12 | IBC2110 | 90BL253841 | 100 | 91-97 | Colluvial Aquifer | Boggabri Volcanics | Water level and quality data collected as per groundwater management plan. |
| 13 | IBC2111 | 90BL253840 | 45 | 36-42 | Colluvial Aquifer | Boggabri Volcanics (weathered) | Water level and quality data collected as per groundwater management plan. |

| EPL ID | Bore | Licence | Depth (mBGL [A]) | Screen interval (mbtoc [B]) | Geological Unit | Screened geology | Notes for reporting period |
|---|---|---|---|---|---|---|---|
| - | BC2181 (MW4) | 90BL255765 | 114 | 105-111 | Maules Creek Formation Aquifer | Merriown Coal Seam | Water level and quality unavailable for November 2022 due to inaccessibility. |
| - | MW6 | 90BL254255 | - | 18-22 | Nagero Creek Alluvium | Alluvium | Water level and quality data collected as per groundwater management plan. |

[A] Metres below ground level.

[B] Metres below top of casing.

#### 7.2.1.2 Annual Groundwater Monitoring Review

The groundwater monitoring data was analysis for the reporting period, in accordance with the GWMP. The review assesses BCM's groundwater monitoring data and provide analyses on groundwater levels and groundwater quality during the 2022 reporting period. Findings from the review are summarised in the following sections.

### 7.2.2 Environmental Performance

#### 7.2.2.1 Groundwater Level Results

The minimum recorded water levels recorded in 2022 have been compared with the trigger levels defined in the GWMP are provided in Table 7.10. Table 7.10 also includes updated trigger values that include the most recent monitoring data. This allows for long-term changes to the groundwater levels to be accounted for, whilst still allowing for sudden changes in groundwater levels to be identified and investigated.

The GMP requires that 5$^{th}$ percentile groundwater level trigger values be recalculated each year to include the additional data. The recalculated trigger values are generally within 400 mm of the triggers included in the GWMP triggers (Table 7.10). During the 2021 reporting period most of the recalculated trigger values were greater than those in the GWMP. This was in response to the higher than average rainfall in 2021 resulting in increased groundwater recharge. Recalculated triggers for the 2022 reporting period generally stayed the same (with only minor decreases of less than 100mm) or increased. This is likely due to continued above average rainfall in the 2022 reporting period.

During the monitoring period, two bores screened in the Boggabri Volcanics (IBC2110 and IBC2111) remained within trigger values defined in the GWMP. However, one bore in the Boggabri Volcanics was below the trigger value (GW3115). The monitoring bore within the alluvium (MW6) remained above the trigger value.

**Table 7.10 Minimum Measured Groundwater Levels**

| Monitoring bore | Trigger value (5th percentile) (mAHD) | | Minimum water level 2022 reporting period |
|---|---|---|---|
| | GWMP [A] | Recalculated | |
| GW3115 | 256.98 | 256.9 | 255.6 |
| IBC2110 | 257.11 | 257.5 | 266.36 |
| IBC2111 | 256.62 | 257.0 | 265.08 |
| BC2181 | - | 232.9 | 226.2 |
| MW6 | 258.48 | 258.4 | 263.38 |

[A] Approved trigger levels from the approved Groundwater Management Plan

The groundwater level monitoring results obtained during the reporting period have been added to the long-term hydrographs presented annually for BCM, as shown in Figure 7-5. Figure 7-5 also includes monitoring data from the discontinued bores.


**Figure 7-5 Long Term Groundwater Levels for all Bores**

Figure 7-5 clearly shows that the monitoring bores within the Boggabri Volcanics (IBC2110, IBC2111 and GW3115) and alluvium (MW6) have continued to remain relatively stable, whilst a clear downward trend continues for the monitoring bore within the Meriown Seam (BC2181), as mining progresses and depressurises the seam.

#### 7.2.2.1.1 Quaternary Alluvium

Monitoring bore MW6 is the only bore screened in the alluvium. Monitoring of MW6 resumed in August 2020. As indicated in Section 7.2.2.1 and Figure 7-5, the recorded water level in MW6 has increased by around 2m between 2020 and 2022. This is likely a result of above average rainfall in recent years.

#### 7.2.2.1.2 Boggabri Volcanics

Monitoring bore IBC2110 is installed deeper within the Boggabri Volcanics while IBC2111 and GW3115 are installed in the shallow weathered Boggabri Volcanics. As indicated in Figure 7-5, the recorded water levels in IBC2110 and IBC2111 have increased in 2022 and exhibiting the maximum recorded historical levels at these monitoring bores. Increases between 2021 and 2022 around 2m for both of the sites. This is likely a result of above average rainfall in for 2022.

Although GW3115 dropped below the trigger value of 256.9 mAHD, the measured value was only 0.03 mADH below, at 256.96 mAHD. Recorded water level at this location has remined continually stable at around 257 mAHD since 2006 (Figure 7-5).

GW3115 dropped below the trigger value of 256.9 mAHD twice during the reporting period. Measured water levels below the trigger value were 256.92 mAHD (June) and 255.05 mAHD (November).
The recorded water level at GW3115 is the lowest recorded historical value for the site. Monitoring of the water level at GW3115 should continue throughout the 2023 reporting period and further investigation may be required if a decreasing trend continues.

#### 7.2.2.1.3 Maules Creek Formation

The groundwater monitoring network at BCM includes a single bore in the Merriown Seam (BC2181).

As indicated in Section 7.2.2.1 and Figure 7-5, the water level in BC2181 continues to decrease as mining progresses.

### 7.2.2.2 Comparison of predicted and annual water levels

AGE (2010) developed and calibrated a groundwater model to predict possible void inflows and drawdown caused by the coal extraction activities. AGE have since revised the groundwater model to include cumulative impacts from adjacent operations within the BTM Complex.

Modelled water levels were predicted to decrease over the life of the mine (AGE, 2010). Drawdown has been observed in Maules Creek Formation, which is consistent with the predicted decrease in water levels at BC2181.

The BTM Ground Water Model was validated and updated in 2018. Immediately following acceptance of this model by DPIE, the BTM commenced consultation with members of DPIE's Resource Assessments team and their Water Division along with NRAR. Validation, update and consultation of this ground water model has been ongoing throughout 2018, 2019, 2020 & 2021 with submission of the resulting model report to DPE in January 2022.

### 7.2.2.3 Groundwater Quality Trigger Values

For certain parameters, the groundwater quality data collected to date has been reviewed and used to develop revised site trigger values for groundwater quality, which are documented in the latest version of the GWMP (May 2017).

Criteria to develop the trigger values have followed the percentiles approach instead of the standard deviation, as recommended for skewed data, which applies to the BCM. The following assessment criteria are defined in the GWMP:

- One data point greater than the High Trigger Value (HTV), defined as the 99.87th percentile.
- Two consecutive data points greater than the Medium Trigger Value (MTV), defined as the 97.73rd percentile.
- Five successive data points greater than the Low Trigger Value (LTV), defined as the 84.13th percentile.

Following this method, the trigger values derived in the GMP for the currently active monitoring bores are presented in Table 7.11.

#### 7.2.2.4 Compensatory groundwater

In accordance with Schedule 3 condition 34 of the PA, BCOPL is required to provide a compensatory water supply to any landowner of privately-owned land whose water supply is adversely and directly impacted because of the project.

No adverse or direct impacts to water supply was reported in 2022, therefore no compensatory water supplies were provided.

**Table 7.11 Groundwater Quality Trigger Values**

| Parameter | Trigger values | Exceedance criteria | Coal Measures | Alluvium | Boggabri Volcanics | | |
|---|---|---|---|---|---|---|---|
| | | | BC2181 | MW6 | IBC2110 | IBC2111 | GW3115 |
| pH | Median | | 6.9 | 7.1 | 7.9 | 6.9 | 7.6 |
| | HTV (99.87th %ile) | 1 data point | 8.2 | 7.6 | 8.3 | 8.1 | 8.3 |
| | MTV (97.73rd %ile) | 2 consecutive data points | 7.8 | 7.6 | 8.2 | 7.7 | 8.1 |
| | LTV (84.13th %ile) | 5 consecutive data points | 7.2 | 7.4 | 8 | 7.2 | 7.8 |
| | LTV (15.87th %ile) | 5 consecutive data points | 6.8 | 6.9 | 7.7 | 6.7 | 7.4 |
| | MTV (2.27th %ile) | 2 consecutive data points | 6.3 | 6.8 | 7.6 | 6.5 | 7.2 |
| | HTV (0.13th %ile) | 1 data point | 6.1 | 6.8 | 7.4 | 6.5 | 7.2 |
| EC (µS/cm) | Median | | 752 | 2095 | 2045 | 2350 | 3430 |
| | LTV (84.13th %ile) | 5 consecutive data points | 846 | 2310 | 2138 | 2490 | 3526 |
| | MTV (97.73rd %ile) | 2 consecutive data points | 1056 | 2356 | 2434 | 2538 | 3773 |
| | HTV (99.87th %ile) | 1 data point | 1267 | 2369 | 2666 | 2559 | 3846 |
| Sulphate (mg/L) | Median | | 23 | 52 | 60 | 62 | 179 |
| | LTV (84.13th %ile) | 5 consecutive data points | 30 | 70 | 85 | 85 | 202 |
| | MTV (97.73rd %ile) | 2 consecutive data points | 43 | 74 | 125 | 102 | 211 |

| Parameter | Trigger values | Exceedance criteria | Coal Measures | Alluvium | Boggabri Volcanics | | |
|---|---|---|---|---|---|---|---|
| | | | BC2181 | MW6 | IBC2110 | IBC2111 | GW3115 |
| | HTV (99.87th %ile) | 1 data point | 51 | 77 | 134 | 108 | 212 |
| Chloride (mg/L) | Median | | 48 | 296 | 285 | 348 | 641 |
| | LTV (84.13th %ile) | 5 consecutive data points | 76 | 296 | 396 | 409 | 695 |
| | MTV (97.73rd %ile) | 2 consecutive data points | 116 | 479 | 465 | 471 | 743 |
| | HTV (99.87th %ile) | 1 data point | 139 | 511 | 508 | 491 | 767 |
| Sodium (mg/L) | Median | | 69 | 377 | 431 | 348 | 695 |
| | LTV (84.13th %ile) | 5 consecutive data points | 83 | 403 | 463 | 365 | 766 |
| | MTV (97.73rd %ile) | 2 consecutive data points | 137 | 414 | 490 | 379 | 802 |

#### 7.2.2.5 Groundwater Quality Results – Field Parameters

Time series plots of pH and electrical conductivity (EC) are presented in Figure 7-6 and Figure 7-7 respectively. Water quality field parameters for EC and pH have also been compared to the trigger values, with results presented in Table 7.12.

Exceedances of the pH trigger values during the 2022 reporting include:

- MW6:
  - One exceedance of the lower bound HTV (November)
- IBC2110:
  - One exceedance of the upper bound HTV (March)
  - One exceedance of the lower bound HTV (November)
- IBC2111:
  - One exceedance of the lower bound HTV (November)

Exceedance of the lower bound HTV for pH at MW6 and IBC2111 fall within the historical range for pH at the monitoring sites. Exceedance of the lower bound HTV for pH at IBC2110 is the lowest value recorded at the site in recent years and it is possible that this value (6.4) is an outlier given the sudden drop from previous values. The exceedance of the upper bound HTV for pH at IBC2110 (8.36) is just above the previous historical maximum of 8.31. Exceedances of pH trigger values may be attributed to variation in flow conditions at the monitoring sites and may not be representative of typical water quality. Trends in pH should continue to be monitored at these sites to determine whether further investigation is required.

Exceedances of the EC trigger values during the 2022 reporting include:

- MW6:
  - Two exceedances of the HTV (March and September)
- IBC2111:
  - Two exceedances of the HTV (March and November)
  - There were six consecutive data points that fell above the LTV between March 2021 and June 2022 warranting an exceedance (>5 consecutive data points above the LTV).

Electrical conductivity exceedances may be attributed to increases in salinity, increases in the concentration of inorganic materials and/or increases in water temperature. TDS values for the site exceeded the IAC trigger for the same eight months as EC values. exceedance of EC trigger values at IBC2111 and MW6 are associated with an increasing trend in EC at these monitoring locations. Further investigation of the relative concentrations of specific dissolved solids may be needed to make a more informed assessment of water quality at these monitoring locations if increasing trends continue.

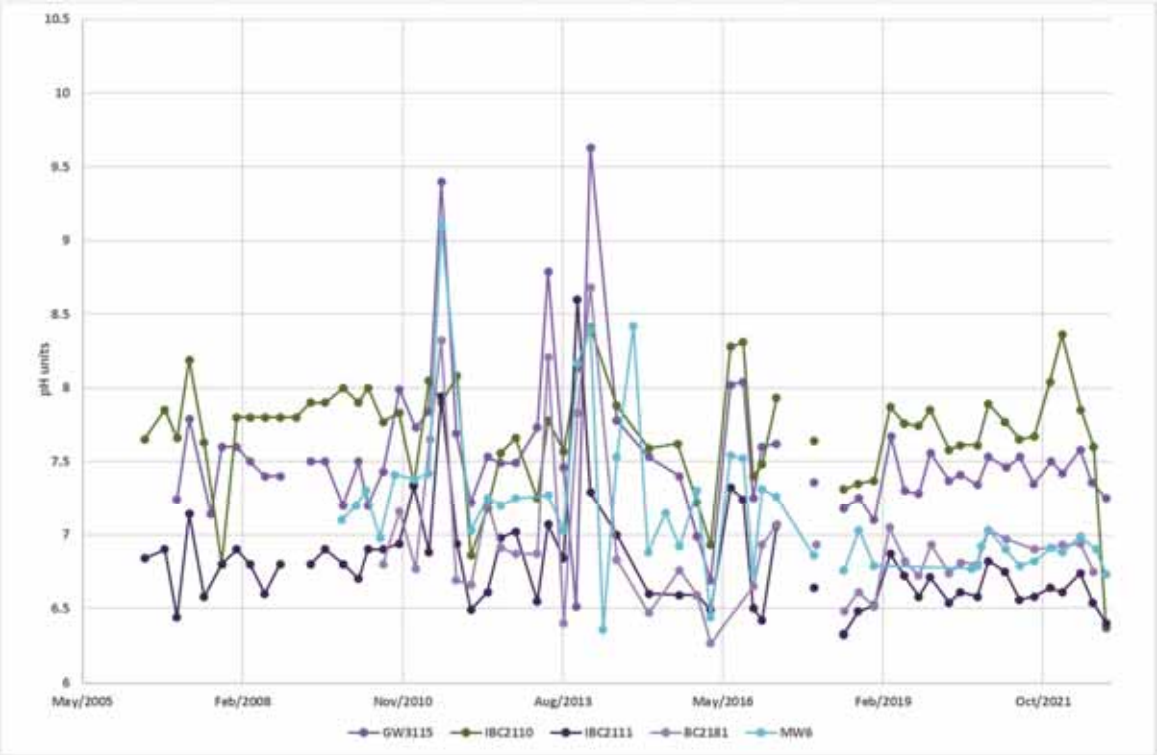



**Figure 7-6 Groundwater Trends in pH**

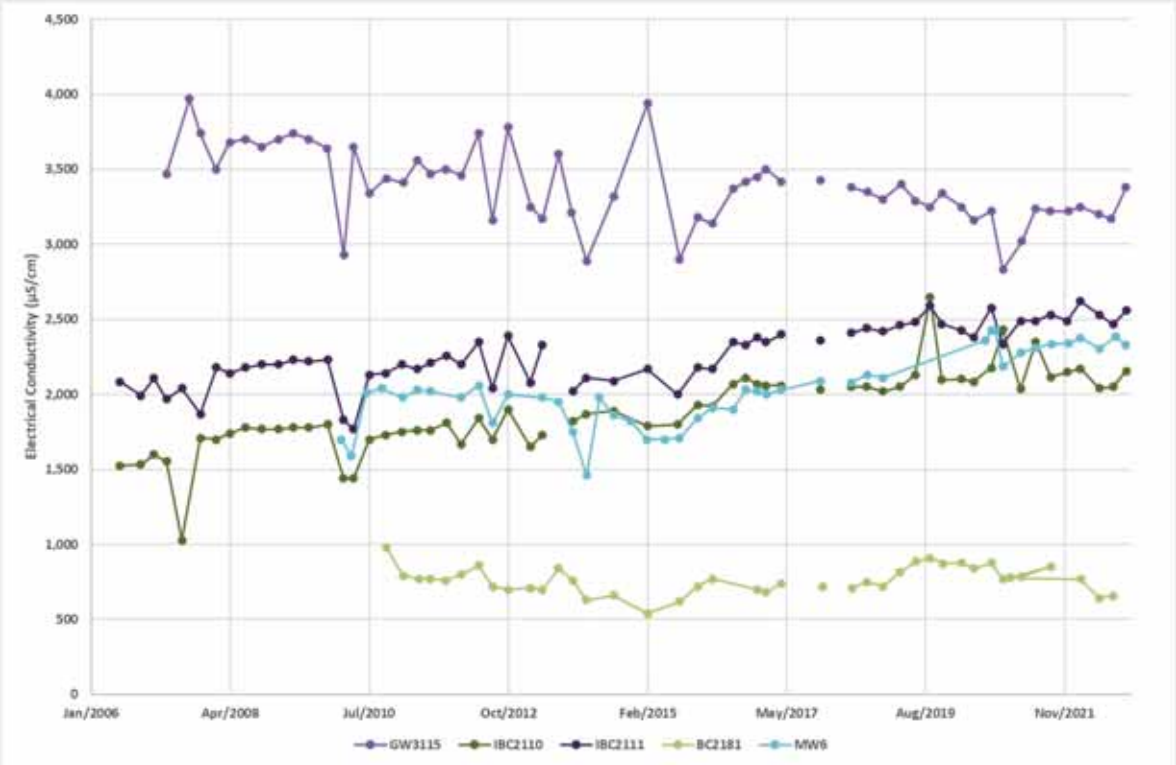



**Figure 7-7 Groundwater Trends in Electrical Conductivity**

**Table 7.12 Results Summary for In Situ Water Quality Measurements**

| Bore and date sample | Standing Water Level (m AHD) | pH (pH units) | Electrical Conductivity (µS/cm) |
|---|---|---|---|
| GW3115 (Boggabri Volcanics) | | | |
| 2/03/2022 | 257.05 | 7.42 | 3250 |
| 21/06/2022 | 256.92 | 7.58 | 3200 |
| 1/09/2022 | 256.99 | 7.36[a] | 3170 |
| 29/11/2022 | 255.06 | 7.25[a] | 3380 |
| IBC2110 (Boggabri Volcanics) | | | |
| 1/03/2022 | 265.36 | 8.36[***] | 2172[a] |
| 23/06/2022 | 265.49 | 7.85 | 2040 |
| 12/09/2022 | 265.37 | 7.60[a] | 2051 |
| 30/11/2022 | 266.38 | 6.37[***] | 2156[a] |
| IBC2111 (Boggabri Volcanics) | | | |
| 1/03/2022 | 265.15 | 6.61 [a] | 2622[***] |
| 22/06/2022 | 265.08 | 6.74 | 2530 [a] |
| 7/09/2022 | 265.31 | 6.54 [a] | 2468 |
| 29/11/2022 | 265.98 | 6.40[***] | 2560[***] |
| BC2181 (Merriown Seam) | | | |
| 3/03/2022 | 226.2 | 6.93 | 768 |
| 22/06/2022 | 232.8 | 6.94 | 643 |
| 12/09/2022 | 234.2 | 6.75 [a] | 658 |
| 30/11/2012 | Unable to access bore. | | |
| MW6 (Alluvium) | | | |
| 2/03/2022 | 263.38 | 6.88 [a] | 2376[***] |
| 22/06/2022 | 263.39 | 6.99 | 2306 |
| 29/09/2022 | 263.85 | 6.90 | 2385[***] |
| 29/11/2022 | 264.64 | 6.73[***] | 2328 [a] |

Notes:

[a] exceedance of the LTV (but less than 5 consecutive readings that would constitute a breach of the trigger).

[b] five consecutive exceedances of the LTV including previous data

[c] exceedance of the MTV (but less than the 2 consecutive readings required for a breach of trigger)

[***] exceedance of the HTV (as defined in section Table 7.11)

[**] two consecutive exceedances of the MTV (as defined in Table 7.11)

[*] five consecutive exceedances of the LTV (as defined in Table 7.11).

#### 7.2.2.5.1 Groundwater - Major Ions

Major ion compositions were analysed as part of the analytical suite. Results for major ions are presented in Table 7.13.

All major ions at sites sampled were compliant with the trigger values except for exceedances for sodium, chloride, and sulfate. The LTV for sulfate was exceeded in June for IBC2111 (as a result of five consecutive data points exceeding the LTV), the HTV for chloride was exceeded in November for IPC2111 and the LTV for chloride was exceeded in June and November for MW6 (as a result of five consecutive data points exceeding the LTV).

Statistically significant increasing trends in chloride and sulfate have been identified in bores installed in the alluvium (MW6) and the Boggabri Volcanics (IBC2111) (Section 7.2.2.5.4). The exceedance of trigger values for chloride and sulfate commenced in 2016. The trend in sulfate and chloride is associated with the increasing trend in EC in monitoring bores installed in the Boggabri Volcanics. Continued monitoring of major ions is recommended.

**Table 7.13 Results Summary for Analysis of Major Ions**

| Bore and date sample | Bicarbonate as CaCO3 (mg/L) | Sulfate as SO4 (mg/L) | Chloride (mg/L) | Calcium (mg/L) | Magnesium (mg/L) | Sodium (mg/L) | Potassium (mg/L) |
|---|---|---|---|---|---|---|---|
| GW3115 (Boggabri Volcanics) | | | | | | | |
| 21/06/2022 | 601 | 171 | 564 | 61 | 16 | 642 | 4 |
| 29/11/2022 | 682 | 178 | 693 | 67 | 18 | 634 | 0 |
| IBC2110 (Boggabri Volcanics) | | | | | | | |
| 23/06/2022 | 386 | 84 | 366 | 16 | 5 | 429 | 3 |
| 30/11/2022 | 420 | 90a | 448a | 16 | 9 | 425 | 0 |
| IBC2111 (Boggabri Volcanics) | | | | | | | |
| 22/06/2022 | 560 | 98 | 418a | 136 | 41 | 353 | 5 |
| 29/11/2022 | 601 | 95* | 497*** | 143 | 42 | 335 | 0 |
| BC2181 (Merriown Seam) | | | | | | | |
| 22/06/2022 | 276 | 24 | 22 | 57 | 19 | 58 | 9 |
| Unable to access bore. | | | | | | | |
| MW6 (Alluvium) | | | | | | | |
| 22/06/2022 | 576 | 69 | 378* | 77 | 31 | 403[a] | 6 |
| 29/11/2022 | 615 | 63 | 435* | 79 | 32 | 386 | 0 |

Note:
[a] exceedance of the LTV (but less than 5 consecutive readings that would constitute a breach of the trigger).
[b] exceedance of the MTV (but less than 2 consecutive readings that would constitute a breach of the trigger).
*** exceedance of the HTV (as defined in Table 7.11)
** two consecutive exceedances of the MTV (as defined in Table 7.11)
* five consecutive exceedances of the LTV (as defined in Table 7.11)

#### 7.2.2.5.2 Groundwater - Metals

Analytical results indicated that dissolved metal concentrations for Cadmium, Chromium, Copper, and Iron were generally below laboratory limit of reporting (LOR) (Table 7.14). Concentrations of Manganese, Nickel, and Zinc above the LOR were recorded (Table 7.14), however remain at levels generally consistent with historically observed values.

A summary of the metal concentrations recorded during the reporting period is presented in Table 7.14.

**Table 7.14 Results Summary for Analysis of Metals**

| Bore and date sample | Arsenic (mg/L) | Cadmium (mg/L) | Chromium (mg/L) | Copper (mg/L) | Lead (mg/L) | Manganese (mg/L) | Nickel (mg/L) | Zinc (mg/L) | Iron (mg/L) |
|---|---|---|---|---|---|---|---|---|---|
| GW3115 (Boggabri Volcanics) | | | | | | | | | |
| 21/06/2022 | <0.001 | <0.0001 | <0.001 | <0.001 | <0.001 | 0.092 | <0.001 | 0.053 | 1.73 |
| 29/11/2022 | <0.001 | <0.0001 | <0.001 | <0.001 | <0.001 | 0.069 | <0.001 | 0.02 | 1.73 |
| IBC2110 (Boggabri Volcanics) | | | | | | | | | |
| 23/06/2022 | <0.001 | <0.0001 | <0.001 | <0.001 | <0.001 | 0.041 | 0.002 | <0.005 | <0.05 |
| 30/11/2022 | <0.001 | <0.0001 | <0.001 | <0.001 | <0.001 | 0.004 | 0.002 | 0.014 | <0.05 |
| IBC2111 (Boggabri Volcanics) | | | | | | | | | |
| 22/06/2022 | <0.001 | <0.0001 | <0.001 | 0.002 | <0.001 | 0.004 | <0.001 | 0.117 | <0.05 |
| 29/11/2022 | <0.001 | <0.0001 | <0.001 | 0.007 | 0.001 | 0.003 | <0.001 | 0.074 | <0.05 |
| BC2181 (Merriown Seam) | | | | | | | | | |
| 22/06/2022 | 0.002 | <0.0001 | <0.001 | <0.001 | <0.001 | 0.038 | 0.002 | 0.009 | 0.07 |
| Unable to access bore. | | | | | | | | | |
| MW6 (Alluvium) | | | | | | | | | |
| 22/06/2022 | <0.001 | <0.0001 | <0.001 | 0.006 | <0.001 | 0.008 | <0.001 | 0.085 | <0.05 |
| 29/11/2022 | <0.001 | <0.0001 | <0.001 | 0.007 | 0.002 | 0.002 | 0.001 | 0.048 | <0.05 |

#### 7.2.2.5.3 Groundwater - Nutrients

Nutrient concentrations during 2022 were generally similar to historical concentrations, with spikes in nitrate (and total nitrogen) concentrations at MW6 in 2022, compared to previous years, and spikes in total nitrogen at BC2181 June 2022, compared to previous years (Table 7.15).

**Table 7.15 Results Summary for Analysis of Nutrients**

| Bore and date sample | Ammonia (mg/L) | Nitrite (mg/L) | Nitrate (mg/L) | Nitrite + Nitrate (mg/L) | Total Kjedahl Nitrogen (mg/L) | Total Nitrogen (mg/L) | Total Phosphorus (mg/L) | Reactive Phosphorus (mg/L) |
|---|---|---|---|---|---|---|---|---|
| GW3115 (Boggabri Volcanics) | | | | | | | | |
| 21/06/2022 | 0.08 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | <0.01 | <0.01 |
| 29/11/2022 | 0.1 | <0.01 | <0.01 | <0.01 | 0.2 | 0.2 | 0.07 | <0.01 |

| Bore and date sample | Ammonia (mg/L) | Nitrite (mg/L) | Nitrate (mg/L) | Nitrite + Nitrate (mg/L) | Total Kjedahl Nitrogen (mg/L) | Total Nitrogen (mg/L) | Total Phosphorus (mg/L) | Reactive Phosphorus (mg/L) |
|---|---|---|---|---|---|---|---|---|
| IBC2110 (Boggabri Volcanics) | | | | | | | | |
| 23/06/2022 | 0.01 | <0.01 | <0.01 | <0.01 | <0.1 | <0.1 | 0.05 | 0.02 |
| 30/11/2022 | 0.06 | <0.01 | 0.02 | 0.02 | 0.2 | 0.2 | 0.03 | 0.01 |
| IBC2111 (Boggabri Volcanics) | | | | | | | | |
| 22/06/2022 | <0.01 | <0.01 | 3.77 | 3.77 | 0.2 | 4 | 0.02 | 0.02 |
| 29/11/2022 | <0.01 | <0.01 | 5.58 | 5.58 | 0.7 | 6.3 | 0.05 | 0.02 |
| BC2181 (Merriown Seam) | | | | | | | | |
| 22/06/2022 | 0.46 | <0.01 | 0.01 | 0.01 | 9.6 | 9.6 | 1.2 | <0.01 |
| Unable to access bore. | | | | | | | | |
| MW6 (Alluvium) | | | | | | | | |
| 22/06/2022 | 0.02 | <0.01 | 2.35 | 2.35 | 0.2 | 2.6 | 0.04 | 0.02 |
| 29/11/2022 | <0.01 | <0.01 | 2.54 | 2.54 | 0.6 | 3.1 | 0.03 | 0.02 |

#### 7.2.2.5.4 Long-Term Water Quality Trend Analysis

Long term trends in groundwater quality were assessed using the Mann-Kendall test for the last seven years of data (Table 7.16).

**Table 7.16 Long Term Mann-Kendall Water Quality Trends**

| Analyte | GW3115 | IBC2110 | IBC2111 | BC2181 | MW6 |
|---|---|---|---|---|---|
| pH | N | N | ↓↓↓ | N | S |
| EC | ↓↓↓ | ↑↑ | ↑↑↑ | N | ↑↑↑ |
| Sulfate | S | N | ↑↑ | ↓ | ↑↑↑ |
| Chloride | S | N | ↑↑ | ↓↓ | ↑↑↑ |
| Sodium | ↓↓↓ | S | S | ↓↓ | ↑↑ |
| Calcium | ↓↓↓ | S | ↑↑ | ↑↑ | ↑↑↑ |
| Magnesium | ↓ | ↑ | ↑↑ | N | ↑↑↑ |
| Potassium | S | N | N | ↓ | S |
| Nickel | S | ↑↑ | N | N | N |
| Zinc | ↑↑ | ↑ | N | N | ↑↑↑ |
| Iron | ↓↓↓ | S | N | N | S |
| Nitrite | S | S | S | N | S |
| Nitrate | N | N | S | S | ↑↑↑ |
| Phosphorus | ↓↓ | ↓↓↓ | ↓↓ | N | ↓ |

↓↓↓ (↑↑↑) = decreasing (increasing) trend with > 99% confidence

↓↓ (↑↑) = decreasing (increasing) trend with > 95% confidence

↓ (↑) = probable decreasing (increasing) trend with > 90% confidence

S = Stable

N = No trend

I = Insufficient data

The analysis (Table 7.16) suggests statistically strong increasing trends are most notable at MW6. These increasing trends are attributed to low values for most parameters recorded for the first two years of data (2016 and 2017). The majority of parameters for MW6 have remained stable for the last five years. Results exhibit similar trends for EBC2111.

The recent decrease in EC, sodium, calcium and iron at GW3115 is likely the result of increased groundwater recharge due to the extended period of higher than average rainfall in the past three years.

#### 7.2.2.5.5 Groundwater Quality Summary

Groundwater quality was generally within trigger values except for several exceedances for pH and EC at Boggabri Volcanics, Merriown Seam and Alluvium sites, and several exceedances for sulfate and chloride.

#### 7.2.2.6 Mine Void Groundwater Inflow

#### 7.2.2.6.1 Inflow Volumes

The estimated groundwater make for the reporting period is about 321 ML. This value was estimated using the sites water balance model and there is no available data to validate this estimate. Further, total groundwater make into the pit is difficult to estimate based on pump data due to the presence of rainfall and runoff in dewatering volumes.

Estimated groundwater take (including pit inflows) are less than the total licenced water take for the Gunnedah – Oxley Basin groundwater source (WAL29562 and WAL29473) of 842 ML/year.

### 7.2.3 Improvements and Initiatives

Estimates of the groundwater volumes intercepted by the pit have previously been undertaken based on pump records for pit dewatering. As mining progresses, an increasing proportion of this water will be a result of seepages from the backfilled pit. Accurate separation of this seepage water from the groundwater take is required to:

- Better account for the volume of groundwater intercepted by the pit; and
- Improve the accuracy of water management across the site, including water balance modelling and water inventory forecasting.

A backfill seepage model has been developed and included in the site water balance model (refer to the Site Water Balance Review, 2022) in order to better estimate these inflows. The model will continue to be reviewed and periodically re-calibrated as part of the periodic review of the site water balance model.

# 8 REHABILITATION

The principal objective for rehabilitation at BCM is to return the site to a condition where its landforms, soils, hydrology, flora and fauna are self-sustaining and compatible with the surrounding landscape. Progressive rehabilitation is an ongoing activity at BCM and is carried out in accordance with regulatory requirements, previously the MOP, now the RMP.

The RMP guides rehabilitation for all operational activities and associated infrastructure, and fulfils the rehabilitation requirements specified in SSD 09_0182. It focuses on rehabilitation of active pit and waste emplacement areas within CL368. However, closure components also consider lands and infrastructure occupied by the private haul road, rail spur, power line easements and the BCT.

Rehabilitation objectives for the BCM are:

- Mine site (as a whole), including the final void - Safe, stable and non-polluting;
- Mine site (as a whole), including the final void - Minimise the size and depth of the final void as far as is reasonable and feasible and ensure the void contains no retained surface water (i.e. no pit lake);
- Mine site (as a whole), including the final void - Land degradation is minimised and vegetation removal is minimised
- Surface Infrastructure – Decommission and remove, unless the Executive Director, Mineral Resources in Resources Regulator agrees otherwise, and rehabilitate to a level equal or better to the original landscape;
- Waterways – Water is managed to ensure that clean and dirty water systems are separated.
- Waterways – No polluting waterways;
- Other land – Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of local native plant species, a landform consistent with the surrounding environment and stable free draining landform able to support proposed vegetation;
- Other land – Ecological biodiversity is promoted;
- Community / General – Safety risks are eliminated as far as is practical;
- Community / General – Minimise the adverse socio-economic effects associated with mine closure; and
- Community / General – Ensure that cultural heritage is not impacted and is appropriately managed.

This section of the Annual Review discusses the rehabilitation which has been undertaken or is proposed within the BCM Project Boundary as required in accordance with the conditions of SSD 09_01082. Appendix I provides a copy of the Annual Rehabilitation Report which has been prepared to satisfy the requirements under the Mining Act 1992 and reports on the rehabilitation undertaken and proposed within CL 368 and ML 1755.

## 8.1 Rehabilitation Methodology

The adopted rehabilitation methodology is described in detail in the RMP. Key components of the methodology include:

- Landform design;
- Contamination Management during Commissioning;
- Acid rock drainage;
- Reject and fines disposal;
- Groundwater barrier;
- Soil stripping and handling;

- Soil stockpiling;
- Top soil volume;
- Surface preparation;
- Soil respreading;
- Amelioration of growing media;
- Erosion control;
- Timing of revegetation works;
- Revegetation;
- Habitat creation;
- Seed collection and viability testing; and
- Revegetation species.

## 8.2 Rehabilitation Progress

### 8.2.1 Summary of Land Rehabilitation

During the reporting period no rehabilitation was completed. This aligns with the Forward Work Plan and MOP Addendum which was approved by the Resources Regulator on 28 January 2022 and valid until 2 July 2022. Significant rainfall during 2021 and 2022 resulted in damage to some areas of the rehabilitation area. During 2022 repair works continued and are on-going. Extensive redesign works are scheduled to begin in early 2024 to prevent erosion from large rainfall events.

A detailed breakdown of rehabilitation/disturbance footprints for the previous, current, and future reporting period is also provided in Table 8.1.

**Table 8.1 Rehabilitation Status**

| Mine Area Type | 2020 Reporting Period (Actual) (ha) | 2021 Reporting Period (Actual) (ha) | 2022 Reporting period (Actual) (ha) | 2023 Reporting period (Predicted) (ha) |
|---|---|---|---|---|
| A. Total mine footprint | 1529.99 | 2567.5 | 1664.7 | 1686.7 |
| B. Total actual disturbance | 1406.29 | 1443.83 | 1384.2 | 1362.5 |
| C. Land being prepared for rehabilitation | N/A | N/A | N/A | 43.7 |
| D. Land under active rehabilitation | 292.1 | 292.1 | 280.6* | 280.6* |
| E. Completed Rehabilitation | None | None | None | None |

Note:
* Reconciliation of rehabilitation areas was undertaken as part of the rehabilitation reforms work. This inconsistency with rehabilitation between 2022 and previous years may be a result of the inclusion of rehabilitation outside of the mining lease (along the rail spur).

### 8.2.2 2022 Plantings

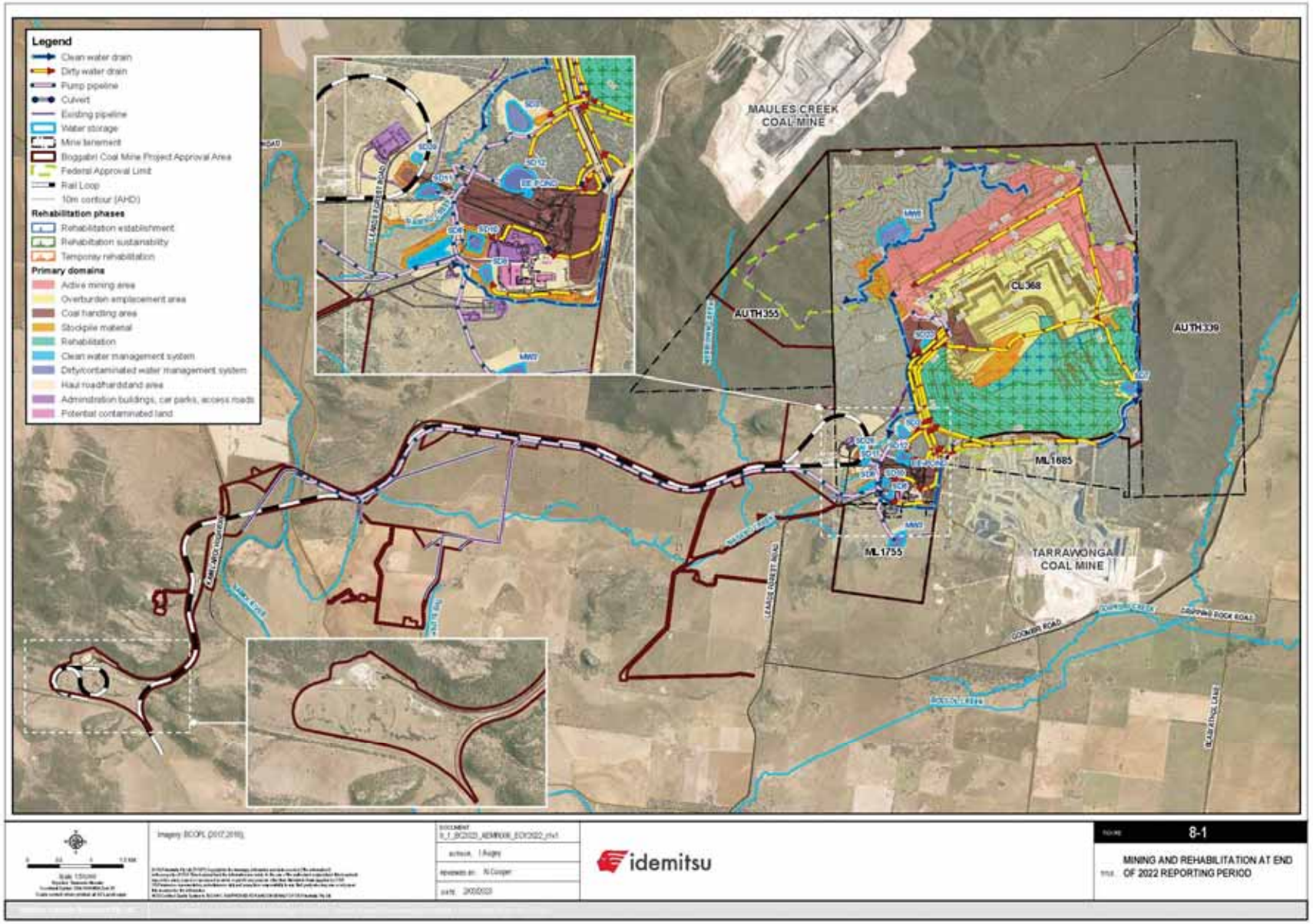
No plantings occurred during the 2022 reporting period in the rehabilitation area.

### 8.2.3 Rehabilitation Status

BCOPL has adopted ten primary rehabilitation domains (refer to Figure 8-1). These domains define areas based on operational or functional purpose and geophysical similarities. The RMP outlines the regulatory requirements, rehabilitation objectives, indicators and completion criteria for each rehabilitation phase of all rehabilitation domains.

The calculated rehabilitation status based on the requirements of the *Annual Review Guideline* (2015) for 2020, 2021, 2022 and predicted values for 2023 in accordance with the Forward Work Plan and RMP are summarised in Table 8.1.

**Figure 8-1 Extent of Mining and Rehabilitation at the end of the 2022 Reporting Period**



### 8.2.4 Comparison with MOP Predictions

A MOP Addendum was approved by the Resources Regulator on 28 January 2022 to align the MOP with the disturbance and rehabilitation on the ground at BCM. Rehabilitation for the end of 2022 will be reported against the MOP Addendum and subsequent Forward Program which has been prepared to address the requirements of the Rehabilitation Reforms under the *Mining Act 1992*.

## 8.3 Removal of Buildings

During the 2022 reporting period, there has been no removal of buildings.

## 8.4 Rehabilitation Biodiversity Monitoring

Biodiversity monitoring of rehabilitation areas is completed annually to assess the biodiversity status of rehabilitated areas to further guide rehabilitation methodologies, procedures and maintenance activities, in order to achieve site rehabilitation objectives. The monitoring reports on aspects of ecosystem establishment and ecosystem development.

Biodiversity surveys in the mine rehabilitation areas were scheduled for October 2022, however, the Boggabri region was significantly impacted by severe weather and BCM was largely inaccessible during this period.

Rehabilitation monitoring for the reporting period commenced 8 October 2022 at four (of 10) replicate monitoring sites located within the 11,12 and 14-year-old mine rehabilitation age-classes. Grassy woodland native ecosystem (secondary domain) within the mine rehabilitation area is known from two replicate monitoring sites; being RH2017 and RH2020. These monitoring locations, and a further four associated with shrubby woodland/ forest native ecosystem (RH2016, RH 2018A, RH2018B and RH2018C), were not sampled during the 2022 survey period. This was due to the continued wet cycle experienced in the region, with a further 55 mm experienced between 8 and 9 October 2022. The effects of previous and ongoing rainfall limited safe access to and within the mine rehabilitation area (impassable roads). The monitoring program progressed on foot between accessible monitoring sites with a reduced sub-set of sampling methodologies employed. The monitoring event was terminated on 8 October 2022, with BCM again inaccessible from flood water associated with the Namoi River on 9 October 2022.

The 2022 monitoring program involved a reduced sub-set of sampling methodologies from the four monitoring sites sampled, including:

- One single modified BBAM plot, species inventories only.
- One standard 20-minute, 2 ha bird and general fauna census (generally within 80 m radius of fixed monitoring site and consistent with rehabilitation age-class).
- Photo point monitoring (to track changes in plant growth and ecology of the rehabilitated areas).
- Salinity monitoring (observational).
- Canopy species recruitment and presence of reproductive structures monitoring (observational).

**Table 8.2 Survey Locations for Rehabilitation Monitoring Sites at BCM**

| Site Reference | Location (GDA94 zone 56) | | Sampled in 2022 |
|---|---|---|---|
| | Easting | Northing | |
| RH2008 | 226985 | 6609210 | Yes |
| RH2008D | 227128 | 6608951 | Yes |
| RH2010 | 227117 | 6609125 | Yes |
| RH2011 | 226819 | 6609901 | Yes |
| RH2016 | 230013 | 6610349 | No |
| RH2017 | 227930 | 6609359 | No |
| RH2018A | 229429 | 6608914 | No |
| RH2018B | 229567 | 6609131 | No |
| RH2018C | 228411 | 6609191 | No |
| RH2020 | 228959 | 6609097 | No |

### 8.4.1 Photographic Monitoring

Photographs of the monitoring sites for 2008, 2008D, 2010 and 2011 rehabilitation areas are provided in Figure 8 2, Figure 8 3, Figure 8 4, and Figure 8 5 respectively.

**Figure 8-2 2008 Rehabilitation (14 years old)**

Figure 8-3 2008D Rehabilitation (14 years old)

Figure 8-4 2010 Rehabilitation (12 years old)

Figure 8-5 2011 Rehabilitation (11 years old)

### 8.4.2 Summary of Findings

Although limited data was collected in 2022, previous years' data, and observations made in 2022, indicate that native species diversity and structure of the vegetation are progressing over time. Acquired data indicate that biodiversity values (vegetation and birds) are trending well against analogue sites associated with the Leard State Forest remnant. To prevent skewing long-term data trends, no data analysis was completed on the limited data collected. However, general results associated with the monitoring program completed in the mine rehabilitation area is provided below.

#### 8.4.2.1 Vegetation

A total of 107 species of plant were recorded from the four replicate mine rehabilitation monitoring sites surveyed during the 2022 monitoring event, of which 81 were native (76%) and 26 species were exotic (24%). No plant species recorded in the mine rehabilitation area during the 2022 monitoring event were listed as threatened species under the BC Act and/ or EPBC Act.

Comprehensive data analysis was unable to be completed due to the program having to be terminated early. Flora surveys conducted however identified the following:

- Mean native species richness from the four sites surveyed in 2022 was recorded highest from within the 2010 and 2011 mine rehabilitation areas and lowest within the 2008 rehabilitation sites.
- Data acquired during the 2022 monitoring event indicates that the mean native species richness for mine rehabilitation established in 2010 and 2011 are likely to exceed the Leard State Forest analogue benchmarks of 42.1 species for the shrubby woodland/forest final land use and secondary domain. To meet the RMP performance criteria, each rehabilitation area must meet 80 % of the Leard State Forest analogue benchmark (i.e. 33.7 species for shrubby woodland/forest). The remaining rehabilitation monitoring location sampled (i.e. RH2008 and RH2008D) are likely to have met 80 % of the Leard State Forest benchmarks in 2022. Based on this and monitoring data collected over the past nine years, mine rehabilitation areas appear to be meeting or progressing on a trajectory to meet the native species RMP performance criteria.
- Data acquired during the 2022 monitoring event indicates that the mean exotic species richness for all mine rehabilitation age-classes sampled occurred above the Leard State Forest analogue benchmark of 2.8 exotic species for shrubby woodland/forest final land uses and secondary domain. To meet the RMP performance criteria, each rehabilitation area must be at or below the Leard State Forest analogue benchmark. All mine rehabilitation monitoring locations sampled failed to meet the RMP criteria for exotic species richness in 2022.
- Structural characteristics which take time to develop within natural ecosystems (such as fallen timber and hollow bearing trees) are mostly absent across the rehabilitation area except for salvaged timber and stags which have been distributed/erected in localised areas.
- No salinity was identified in any of the rehabilitation monitoring sites surveyed during 2022.
- Planted canopy species showed evidence of reproductive structures with a small number of Eucalyptus albens observed in flower with the 2010 mine rehabilitation age-class. Other reproductive structures, such as bud or fruit, were not recorded and the recruitment of canopy species from the soil seed bank at these locations was not observed.
- Many native groundcover and midstorey species recorded across all rehabilitation areas were observed recruiting from the soil seed bank and/or were producing reproductive structures. This suggests the groundcover and midstorey stratum is trending towards a self-sustaining native ecosystem.
- There are isolated individuals of African Boxthorn, Prickly Pear and Galenia which are either priority weeds or weeds of concern that may spread if left untreated.

#### 8.4.2.2 Birds

Bird data results presented for the 2022 monitoring period should be considered cautiously. A small subset of mine rehabilitation monitoring sites were accessible by foot only, due to the mine rehabilitation access roads being largely impassable from ongoing significant rainfall. Bird surveys were completed once at four (of 10) replicate monitoring sites, one of which occurred outside core bird activity periods.

A total of 37 diurnal species of bird were recorded from the four replicate mine rehabilitation monitoring sites surveyed during the 2022 monitoring event. This comprised several woodland and generalist species common to the region. Species commonly recorded included Weebill, Brown Honeyeater, Rufous Whistler, Mistletoebird, Grey Fantail and Speckled Warbler. Two threatened species were recorded from replicate monitoring sites, including Speckled Warbler and Little Lorikeet, which are listed as Vulnerable under the BC Act. Speckled Warbler was recorded from three of the four monitoring sites sampled, including RH2008, RH2008D and RH2010.

Mine rehabilitation planted in 2008 recorded the highest diurnal bird diversity (15.0), followed by 2010 (11.0) and 2011 (7.0). Within shrubby woodland/ forest native ecosystems, mine rehabilitation planted in 2008 exceeded the Leard State Forest analogue benchmark of 13.7 during the 2022 monitoring event, whilst 2010 and 2011 rehabilitation occurred below the benchmark. To meet the RMP performance criteria, each rehabilitation area must meet 80 % of the Leard State Forest analogue benchmark (i.e. 11.0 species). Replicate monitoring sites RH2008, RH2008D, RH2010 and RH2011 achieved approximately 95 %, 124 %, 80 % and 51 % of the Leard State Forest analogue benchmark.

Diurnal bird abundance was highest in the 2008 mine rehabilitation age-class (28.5) in comparison to the 2010 and 2011 mine rehabilitation age-classes (22.0 and 14.0 respectively). To meet the RMP performance criteria, each rehabilitation area must meet 80 % of the Leard State Forest analogue benchmark (i.e. 26.1). Three replicate monitoring achieved or exceeded the Leard State Forest analogue benchmark for diurnal bird abundance. Replicate monitoring sites RH2008, RH2008D, RH2010 and RH2011 achieved approximately 84 %, 134 %, 84 % and 54 % of the Leard State Forest analogue benchmark.

### 8.4.3 Rehabilitation Biodiversity Thinning Trials And Monitoring

Dense woody vegetation has been shown to have negative impacts on vegetation structure and the availability of habitat for flora and fauna species. Examples of impacts of dense woody vegetation includes the reduction in density and diversity of understorey and groundcover vegetation (as indicated by the previous BCM mine rehabilitation monitoring results) and inhibits the growth of trees and the development of hollows. Essentially, dense woody vegetation can reduce the availability of wildlife habitat.

Dense vegetation will generally thin by itself over time via natural die-off, however this process can take considerable time. Ecological thinning of dense woody vegetation aims to speed up the natural process to establish higher structural diversity of habitat types and assist in re-establishing an ecosystem that more closely resembles the structure of an undisturbed natural ecosystem.

Given this, BCOPL intend on conducting eucalypt thinning trials within the BCM mine rehabilitation areas. The eucalypt thinning trials would be situated in the older areas of mine rehabilitation, where tube stock plantings were limited to canopy species and/or where fertiliser treatments were applied. Based on previous monitoring data and general observations, the cover and in some locations, the diversity of groundcover and midstorey species within these areas have been typically low. These areas contained large areas of bare soil and erosion appears to be more evident.

The eucalypt thinning trial would endeavour to reduce the competition for natural resources at these locations, with an aim of increasing native species diversity and cover to create a less homogenous ecosystem than what is typically represented in the older mine rehabilitation areas.

Baseline monitoring for the eucalypt thinning trials was completed in June 2022, prior to any thinning activities commencing. The purpose of this monitoring program was to determine the baseline condition and to identify any subsequent changes of the biodiversity values within the BCM mine rehabilitation in response to the eucalypt thinning trials. Specifically, this monitoring would evaluate the success of the trials and/or identify potential failures to enable adaptive management of future thinning activities within the BCM mine rehabilitation areas.

To date the mine rehabilitation works within the grassy woodland on fertile soils secondary domain has been limited due to the progression of the mine operations (i.e. are located where mining activities are currently occurring). Mine rehabilitation within the grassy woodland on fertile soils secondary domain was conducted in 2017 and 2020 and biodiversity monitoring sites have been established at these locations. The eucalypts at these locations, however, were not mature enough to be included as part of this eucalypt thinning trial.

Therefore, treatment sites were selected from older mine rehabilitation areas (mine rehabilitation established in 2008, 2010 and 2011) from within the shrubby woodland/ open forest on skeletal soils secondary domain. These areas contained the highest densities of eucalypt trees and exhibit a low diversity/ cover of native groundcover, high bare ground/ leaf litter cover and lack a diversity of fauna habitats. To reduce survey effort existing mine rehabilitation monitoring sites were used as controls for this monitoring program. The treatment monitoring sites were typically located at least 100 m from the control site and orientated in the same direction as the control site. A summary of the thinning trial monitoring sites established in 2022 are presented in Table 8.3.

**Table 8.3 Eucalypt thinning trial monitoring sites established and sampled within the BCM mine rehabilitation area in 2022**

| Site Location | Site Identifier | Transect Orientation (degrees) | Location (GDA94 Zone 56) | |
|---|---|---|---|---|
| | | | Easting | Northing |
| Mine rehabilitation thinning treatment sites | RT2008D | 180 | 227028 | 6609001 |
| | RT2010 | 150 | 227195 | 6609107 |
| | RT2011 | 125 | 226916 | 6609981 |
| Mine rehabilitation thinning control site locations – existing annual monitoring sites | RH2008D | 190 | 227186 | 6608919 |
| | RH2010 | 15 | 227140 | 6609133 |
| | RH2011 | 125 | 226818 | 6609904 |

| Site Location | Site Identifier | Transect Orientation (degrees) | Location (GDA94 Zone 56) | |
|---|---|---|---|---|
| | | | Easting | Northing |
| Leard State Forest and Biodiversity Corridor control site locations – existing annual monitoring locations | LSF1 | 20 | 229032 | 6613117 |
| | LSF4 | 16 | 230216 | 6609311 |
| | LC7 | 330 | 226628 | 6613121 |

The following methodologies were completed at each site:

- One modified BBAM plot; and
- Photo point monitoring (to track changes in plant growth and ecology of the rehabilitated areas).

### 8.4.4 Results

The mine rehabilitation area eucalypt baseline monitoring event was completed between 6 and 10 June 2022 by two ecologists. The 2022 baseline mine rehabilitation thinning program identified the following:

- Mean native and exotic species richness was similar between all the monitoring site locations. However, LC7 reference monitoring site had considerably higher native plant species diversity (61 species) compared to the remaining monitoring sites. No threatened flora species listed on the BC Act and/or the EPBC Act were recorded during the field surveys.
- The mine rehabilitation area monitoring sites had considerably higher mean tree stem density with most trees occurring in the two DBH stem size classes of 5-9 cm and 10-19 cm. In comparison, the Leard State Forest reference monitoring sites had a considerably lower stem density with trees occurring in all but one stem class size (i.e. >80 cm).
- Most of the mine rehabilitation monitoring and Leard State Forest monitoring sites met or exceeded the native species richness, native overstorey midstorey percentage foliage cover and native groundcover (grass, shrub and other) BBAM benchmark values. However, RT2011 failed to meet the native midstorey percentage foliage cover and LSF1 and LC7 reference monitoring sites failed to meet native groundcover (shrubs) percentage foliage cover. The percentage foliage cover of native groundcover (grass) was considerably higher in the Leard State Forest reference monitoring sites compared to the mine rehabilitation monitoring sites.
- In terms of structural characteristics, the Leard State Forest reference monitoring sites contained fallen timber, hollow-trees and regeneration, whereas these structural features are largely absent from the mine rehabilitation monitoring sites.

## 8.5 Rehabilitation Improvements and Initiatives

During the 2022 reporting period BCOPL has continued with approved rehabilitation activities as usual. No trials or research projects were undertaken during the reporting period.

## 8.6 Rehabilitation in 2023

Rehabilitation activities proposed for the next reporting period will focus on the progressive decommissioning of mining areas and overburden emplacement areas, followed by the establishment of suitable landforms and growth mediums. All rehabilitation will be undertaken in accordance with the RMP.

### 8.6.1 Topsoils and Forest Resources

The gathering of topsoil and subsoil from Leard State Forest will continue, in conjunction with the Soil Management Protocol (appendix H of the BMP). Other recovered forest resources from the tree clearing program, such as salvaged timber containing hollows, will be salvaged to be used in rehabilitation and biodiversity offset areas. Particular emphasis will be placed on the insertion of salvaged logs, hollows and stags into the rehabilitation area and installation of nest boxes into the rehabilitation areas during 2023. Topsoils will be ameliorated where required, including through application of gypsum, and spread on shaped landforms or stockpiled for later use.

### 8.6.2 Drainage and Erosion Controls

Drainage and erosion controls will be installed on exposed overburden emplacement areas undergoing rehabilitation in accordance with the *NSW Soil Conversation Service, Design Manual for Soil Conservation Works – Technical Handbook No. 5* (Aveyard, 1982).

### 8.6.3 Seed Collection and Planting

BCOPL engages contractors for the collection of seed from the Leard State Forest for future plantings. These seeds are sent to a local nursery for propagation and the seedlings are then returned to site for planting. Seed collection will remain an ongoing activity in the next reporting period. Native vegetation continues to be established on the western and southern overburden emplacement areas using tube stock propagated from seed collected from the Leard State Forest.

### 8.6.4 Temporary Stabilisation

Temporary stabilisation works continue to occur in batters, windrows, drains and stockpiles, as necessary. These temporary exposed areas are typically seeded with a mixture of native grasses and fast growing, sterile cover crops using pasture species such as Rye Corn and Japanese Millet in order to reduce wind and water erosion.

### 8.6.5 Monitoring

Further rehabilitation biodiversity monitoring will be undertaken in the next reporting period through the services of qualified ecologists.

# 9 COMMUNITY

BCOPL's involvement with the local community is guided by:

- Studies undertaken as part of the EA for the Project.
- BCM's SIMP.
- Consultation with key stakeholders including the CCC.
- BCOPL's internal environmental management plans and corporate guidance.

In accordance with SSD 09_0182 (Schedule 3, Condition 77(b)), BCOPL has prepared a SIMP, in consultation with relevant stakeholders. BCOPL undertook revisions to the SIMP which were approved by the DPE in August 2021.

## 9.1 Community Programs and Investment

BCOPL is committed to supporting the local community in which they operate. Over the 2022 reporting period and in concurrence with previous reporting periods, BCOPL and its contractors were involved in a number of community initiatives and events. BCOPL contributed $115,443.91 to local projects and sponsorships in the 2022 reporting period, as summarised in Table 9.1.

Contributions for the reporting period are about 23% more than the previous year's contributions ($21,403.91) This is due to the reducing impacts of Covid-19 on community events which were scheduled to occur although did not proceed during the previous reporting period of 2021. During 2022 these community events were able to proceed.

BCOPL also regularly hosts site visits from the community, industry professionals, the media and other interested parties. The impacts and restrictions that the Covid-19 pandemic brought prevented mine tours from being completed in 2021. During 2022 these mine tours were able to resume.

**Table 9.1 BCOPL Community Funding 2022**

| Community Group/Project | BCOPL Contribution |
|---|---|
| Westpac Helicopter Partnership | $30,000.00 |
| Gunnedah Show | $15,000.00 |
| G S Kidd School - Shade Shelter | $10,000.00 |
| Maules Creek Campdraft | $5,000.00 |
| Narrabri Carp Muster | $5,000.00 |
| Boggabri Rugby League | $5,000.00 |
| Boggabri Golf Club - Workplace Challenge | $5,000.00 |
| Cancer Council NSW - Longest Day Donation | $5,000.00 |
| Keepit Commando - GHFC Pty Ltd | $5,000.00 |
| Boggabri Carp Muster | $4,545.45 |
| Dorothea Mackellar - Poetry Awards | $4,545.45 |
| Manilla Show | $2,500.00 |
| Gunnedah South Public School - Xmas Raffle | $2,500.00 |
| Gunnedah Motor Cycle Club 2022 Golf Day | $2,500.00 |
| PRAMS - Golf Charity Day | $2,500.00 |
| Black "n" Blue Youth Centre | $2,000.00 |
| Boggabri Anglican Church - Carols | $2,000.00 |

| Community Group/Project | BCOPL Contribution |
|---|---|
| Gunnedah RSPA | $2,000.00 |
| Narrabri Junior Challenge - Polocrosse Team | $1,053.00 |
| Gunnedah District AFL | $1,000.00 |
| Gunnedah Ministers Fraternal - Carols in The Park | $1,000.00 |
| Gunnedah Motor Cycle Club | $1,000.00 |
| Women in Mining Donation - Breakfast | $800.00 |
| Gunnedah South Public School - 2021 Xmas Raffle | $500.00 |
| **Total** | **$115,443.9** |

## 9.2 Community Consultative Committee

In accordance with SSD 09_0182 (Schedule 5 Condition 7), a CCC based on the DPE *Community Consultative Committees Guideline for State Significant Projects 2019* (DPE, 2019) has continued through the reporting period.

The purpose of the CCC is to provide a forum for open discussion between representatives of BCOPL, the community, the local council and other stakeholders on issues directly relating to BCM's operations and community relations.

Quarterly CCC meetings were held during the reporting period on the following dates:

- 24 February 2022;
- 26 May 2022;
- 25 August 2022; and
- 24 November 2022.

Key topics discussed included:

- Overview of recent activities and reports from BCM;
- 2021/2022 Archaeological Salvage Program;
- Modification 8 to BCM and proposed amendment;
- Modification 9 update;
- Exploration update;
- Biodiversity offset areas;
- Biodiversity Corridor Plan submission;
- Housing VPA – General Housing;
- Recent correspondence with regulatory agencies;
- Tyre management and waste;
- Environmental Monitoring conditions;
- Tree clearing;
- Community Sponsorship 2022; and
- Community complaints.

Copies of the minutes from CCC meetings are publicly available on the BCM website: https://idemitsu.com.au/operations/boggabri-coal/approvals-plans-and-reports/community-consultative-committee/

## 9.3 Complaints

### 9.3.1 Management of Complaints

Community complaints are managed in accordance with the BCOPL Complaint Management Procedure. This procedure outlines a standard process for reporting and responding to community complaints for all BCOPL employees and contractors at BCM.

The procedure includes reporting:

- The nature of the complaint;
- The method of the complaint, for example, telephone;
- The monitoring results, including any relevant conditions at the time of the complaint;
- Site investigation outcomes;
- Site activity and activity changes; and
- Any necessary actions assigned.

BCOPL maintains a 24 Hour Community Response Line to provide the community or interested stakeholders with an accessible and reliable communications point for complaints. In turn, the response line allows for rapid response to community complaints. The phone number for this Community Response Line is 1800BOGGABRI (1800 264 422 74).

The Community Response Line is advertised in the local media every three months and is available on the BCM website. It is also available from site personnel and community representatives on the CCC.

Where possible, complainants are contacted within 24 hours of BCOPL's Environment Superintendent being advised of a complaint. Where requested to notify the complainant of any remedial or required actions undertaken, a follow-up on the complaint is made by BCOPL's Environment Superintendent or other authorised representative.

Every effort is made to ensure that concerns are addressed to facilitate a mutually acceptable outcome for both the complainant and mining entity concerned. All complaints received are tabled at CCC meetings. BCOPL maintains records of completed internal complaint forms for a period of no less than five years.

### 9.3.2 Registered Environmental Complaints

Two community complaints were received by BCOPL during the 2022 reporting period. This is the same as 2021.

A summary of complaints received during the reporting period and BCOPL's responses is provided in Table 9.2. Complaints were handled in accordance with BCM's Complaints Management Protocol as previously described. Where the EPA was either notified of the complaint, or directly received the original complaint, results of the investigation and follow-up actions conducted by BCOPL and its contractors were provided to the EPA for review.

Complaints received during the reporting period were tabled at the CCC meetings for discussion. Monthly summaries of complaints are made publicly available on BCOPL's website at: https://www.idemitsu.com.au/operations/boggabri-coal/approvals-plans-reports/

**Table 9.2 Complaint Summary**

| Date of Complaint | Complaint Reference | Issue | BCOPL Response |
|---|---|---|---|
| 2 June 2022 | Community Member | Blasting | Environmental Superintendent engaged in numerous emails and phone calls with complainant. Offer to meet face to face declined. Blast was within EPL limits at BCOP, MCCM & TCM blast monitors. |
| 23 July 2022 | Community Member | Blasting | Complaint made to BCOP & EPA. Environmental Superintendent contacted complainant to discuss. Blast monitoring pack and footage supplied to EPA upon request. Review undertaken found the blast was within EPL limits and did not contain any fume. |

## 9.4 Workforce Profile

As of 31 December 2022, the total workforce on BCM was 723 employees. A breakdown of the workforce and their residential locality are detailed in Sections 9.4.1 and 9.4.2.

### 9.4.1 BCOPL Employees

Wherever possible, local personnel are employed by BCOPL and its contractors. The BCOPL team at BCM consists of 467 staff, the majority (~70%) of whom are based locally within the Narrabri, Gunnedah and Tamworth LGA's. All BCOPL employees are employed full time. A breakdown of the location is found in Table 9.3.

**Table 9.3 Residential Locality of BCOPL Employees**

| Locality | BCOPL Employee Residency |
|---|---|
| Boggabri | 49 |
| Gunnedah | 184 |
| Curlewis | 12 |
| Narrabri | 40 |
| Manilla | 31 |
| Tamworth | 54 |
| Other NSW | 90 |
| QLD | 7 |
| Other Australia | 0 |
| **Total** | **467** |

### 9.4.2 Mining Contractors

Expansion project related construction activities concluded in late 2015, at which point the BCM moved to an operational phase. From late 2015, BCM continued to be contractor operated. In 2017 BCOPL took over the operation of BCM with assistance of mining contractor staff. The 2022 reporting period represents the BCM's seventh year of operations since the commencement of mining operations under SSD 09_0182.

During the reporting period, the major mining contractors on site included Orica, Ausdrill Limited (Ausdrill), BPA and One Key.

The largest share of the total contractor workforce at BCM during the 2022 reporting period is attributed to the mine contractor One Key. At the end of December 2022, the One Key workforce consisted of 153 personnel, predominantly contract staff, of which around 76% resided locally. The Orica workforce was 42 personnel, BPA workforce was 38 and Ausdrill had 23 personnel employed at the BCM.

Ninety seven percent (97%) of the BCM contractors resided in NSW and 66% resided within the localities of Boggabri, Gunnedah, Curlewis, Narrabri, Manilla and Tamworth (see Table 9.4).

BCOPL took over the maintenance operations in September 2022 and approximately 130 staff were brought over to BCOPL.

**Table 9.4 Residential Locality of Contractor Employees**

| Locality | One Key Resources Pty Ltd | Orica | BPA | Ausdrill |
|---|---|---|---|---|
| Boggabri | 17 | 4 | 4 | 2 |
| Narrabri | 62 | 17 | 15 | 4 |
| Gunnedah | 2 | 3 | 1 | 0 |
| Curlewis | 9 | 4 | 2 | 2 |
| Manilla | 13 | 1 | 0 | 2 |
| Tamworth | 28 | 4 | 9 | 1 |
| QLD | 20 | 5 | 7 | 10 |
| Other NSW | 2 | 4 | 0 | 1 |
| Other Australia | 0 | 0 | 0 | 1 |
| **Total** | **153** | **42** | **38** | **23** |

# 10 AUDITS

## 10.1 Independent Environmental Audit (2020)

### 10.1.1 Scope of Audit

In accordance with Schedule 5, Conditions 10 and 11 of SSD 09_0182, BCOPL engaged independent certified auditors to undertake an independent environmental compliance audit (IEA) of BCM during November 2020. It was broken into two parts.

SLR Consulting Pty Ltd was approved by the DPE to assess BCOPL's compliance with the conditions of SSD 09_0182 and other relevant leases, licences and approvals. It also included assessing the environmental performance of the Project in meeting the requirements of SSD 09_0182 through the implementation of a range of environmental management measures outlined in the various environmental management plans developed for the Project. This covered the period from the 3 August 2017 to 6 November 2020.

The biodiversity aspects of the Project were audited separately by Umwelt (Australia) Pty Limited as agreed with the DPE. This audit also took place during November 2020 and addressed the period since the last Independent Biodiversity Audit which was finalised in May 2018.

### 10.1.2 Audit Outcomes

Overall, 267 conditions were identified during the audit conducted by SLR, 46 (17%) were not triggered during the audit period, and 23 (9%) were a note for information. Of the 198 remaining audited conditions, 172 (87%) were compliant, 9 (5%) were non-compliant (low risk) and 12 (6%) were administrative non-compliances. Five (5) conditions could not be verified based on available information at the time of the audit. No high or medium risk non-compliances were identified. BCOPL has developed an action plan in response to the recommendations made as part of the IEAs as shown within Appendix F.

The final report noted by the auditor that it was evident that the site was generally being managed with a commitment to minimise the impact on the environment and surrounding residents.

The biodiversity component of the audit found one non-compliance with SSD 09_0182 that applies to the BCM. This related to Schedule 3, Condition 54 of SSD 09_0182. The IEA noted that there is evidence that BCOPL has made efforts to finalise this approval requirement working with Forestry NSW, with a draft report currently with Forestry NSW. It was noted that a significant time had passed since the date of SSD 09_0182 and to avoid future non-compliance ratings, the IEA recommended that this outstanding issue is finalised promptly. BCOPL has continued to consult with Forestry NSW throughout the reporting period to resolve the requirement of Schedule 3, Condition 54 of SSD 09_0182. This matter will continue into the next reporting period.

Overall, the audit found that the management plans, strategies, and programs that have been prepared for BCM were adequate and prepared in accordance with the relevant compliance requirements.
The audit found that on-site staff displayed a good understanding of the key biodiversity issues and were focused on implementing measures that would minimise impacts and achieve good biodiversity/environmental outcomes.

### 10.1.3 DPE Review

The IEA was lodged with the DPE on 17 December 2020. The DPE found the audit to generally satisfy the requirements of SSD 09_0182 and the DPE's Independent Audit Guidelines (2015).

The DPE also requested that a status update on the recommended actions be included in future Annual Reviews until each action is completed.

### 10.1.4 Status of Audit Recommendations

BCOPL have proposed completion dates for the actions in response to the non-compliances highlighted in the 2020 IEA (Refer to the Response Action Plan in Appendix F). The audit action plan is continuing to be closed out and the next IEA is due in 2023.

## 10.2 EPBC Independent Audit (2020)

An independent audit of the approval conditions for the Boggabri Coal Mine Extension (i.e. SSD 09_0182 and EPBC 2009/5256) was undertaken in November 2020 by an approved assessor (Umwelt Australia Pty Limited).

The final audit report was received by BCOPL on 25 March 2021 and submitted to the Department of Agriculture, Water and Environment on the same day.

# 11 INCIDENTS AND NON-COMPLIANCES

All incidents and non-compliances are detailed in Table 1.2 of the Statement of Compliance. Table 11.2 outlines the non-compliances which occurred during the 2022 reporting period and BCOPL's response. Actions that have resulted from the Independent Environmental Audits can be found in the Response Action Plan in Appendix F.

One Penalty Notice was received by BCOPL during the 2022 reporting period. This has been outlined with BCOPL's response in Table 11.1.

**Table 11.1 Notices and Warnings Received during the Reporting Period**

| Agency | Date | Correspondence Details | BCOPL response |
|---|---|---|---|
| EPA | 30-Apr-22 | A Penalty Notice Advice was issued by the NSW EPA in relation to breaches of Environmental Protection Licence 12407<br><br>The letter was in response to a self-reported blasting overpressure exceedance that occurred 30 April 2021.<br><br>BCOPL requested a review of the penalty notice and the justification is summarised below:<br>• The exceedance was due to wind gusts and not blasting operation<br>• DPE satisfied that no exceedance occurred (see appendix D)<br>• Exceedance not associated with any monitoring equipment error<br>• No complaints/feedback received in relation to blast<br><br>The NSW EPA retracted the Penalty Notice Advice in December 2022 | BCOPL undertook an internal investigation and engaged an external consultant to investigate the air blast overpressure exceedance. The investigation findings revealed that the trigger exceedance was triggered by a non-blast related event. Future exceedances will be investigated prior to reporting to ensure accurate information is passed to the relevant agencies. |

**Table 11.2 Non-Compliances and Exceedances during 2022**

| Time Period | Condition Description | Relevant approval | Comment |
|---|---|---|---|
| Ongoing | Sound Power Levels | SSD 09_0182 & AQGHGMP | Sound power screening during 2022 recorded 15 items of plant which exceeded its required Sound power Level by 3dB or more. BCOPL has undertaken extensive consultation with DPE in relation to this non-compliance. The condition requiring this monitoring to occur is subject of Project Approval Modification Application by BCOPL |
| 30-Apr-22 | Annual Review Submission | SSD 09_0182 | 2021 Annual Review was submitted late due to unforeseen circumstances. Notified DPE on 14/3/22 and received feedback on 17/3/22. |
| Ongoing | Implementation of SWMP | SWMP | The implementation of the currently approved SWMP is non-compliant as the clean water drain presented in Appendix A of the SWMP to the north of the disturbance area has been mined through and has not been reinstated. DPE are aware of the non-reinstatement of the clean water drain. SWMP currently under revision. |
| Ongoing | Implementation of GWMP | GWMP | The implementation of the currently approved GWMP is non-compliant as groundwater monitoring was not undertaken at two required bores during the reporting period. Bores 2104 and 2105 have been removed through mine progression. GWMP currently under revision. |
| Ongoing | Development of the Eucalyptus Forestry Plantation Offset Strategy | SSD 09_0182 | BCOPL submitted a Forestry Planation Offset Strategy in July 2013 to NSW Forestry Corporation. Feedback has been received which suggests NSW Forestry Corporation does not see benefit in the proposed strategy. BCOPL will continue to liaise with NSW Forestry Corporation to finalise this strategy. |
| 5-12 May 2022 | Weather Monitoring | EPL12407 BMP | The wire to the 60M AWS rain gauge was severed during vegetation management. No rain data was recorded between 5-12th May 2022 before being repaired. RL395 rainfall was used to supplement this loss of rainfall data. |
| 21 July - 7 December 2022 | Weather Monitoring | EPL12407 BMP | Solar radiation sensor ceased working on 21/7/2022. Due to accessibility issues, fault was repaired by electricians in EWP on 7/12/22. |
| Nov-22 | Blast Monitoring | EPL12407 BMP | Goonbri Blast monitor outage for blast occurring 14/11/22. Outage caused by a thunderstorm on Saturday 12/11/22 which had also made monitor inaccessible due to wet roads. Notified EPA on 15/11/22. Blast monitor repaired 16/11/22. |

# 12 ACTIVITIES PROPOSED FOR NEXT ANNUAL REVIEW PERIOD

Activities that are proposed for the next Annual Review reporting period are detailed in Table 12.1.

**Table 12.1 Activities Proposed for Next Reporting Period**

| Activity | Target Completion Date |
|---|---|
| Clearing of vegetation in advance of mining | February - April 2023 |
| Continued implementation of a noise attenuation program for items of plant exceeding modelled sound power levels. This will continue as an iterative process and be ongoing throughout the next reporting period | Ongoing |
| Continued implementation of the southern rehab strategy | Ongoing |
| Undertake exploration activities ahead of mining | Ongoing |
| Review and update management plans where required by SSD 09_0812 | Jun-2023 |
| Fauna habitat resources such as salvaged fallen timber and nest boxes will be introduced in rehabilitation areas | Ongoing |
| Tubestock planting of canopy species in BOAs and rehabilitation areas | Ongoing |
| Continuation of Project Approval Modification 8 | 2023 |
| Continuation of Project Approval Modification 9 | 2023 |
| Commence construction of houses in Boggabri | 2023 |

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# Appendix A

## Annual Review Requirements

**Table A.1 Annual Review requirements**

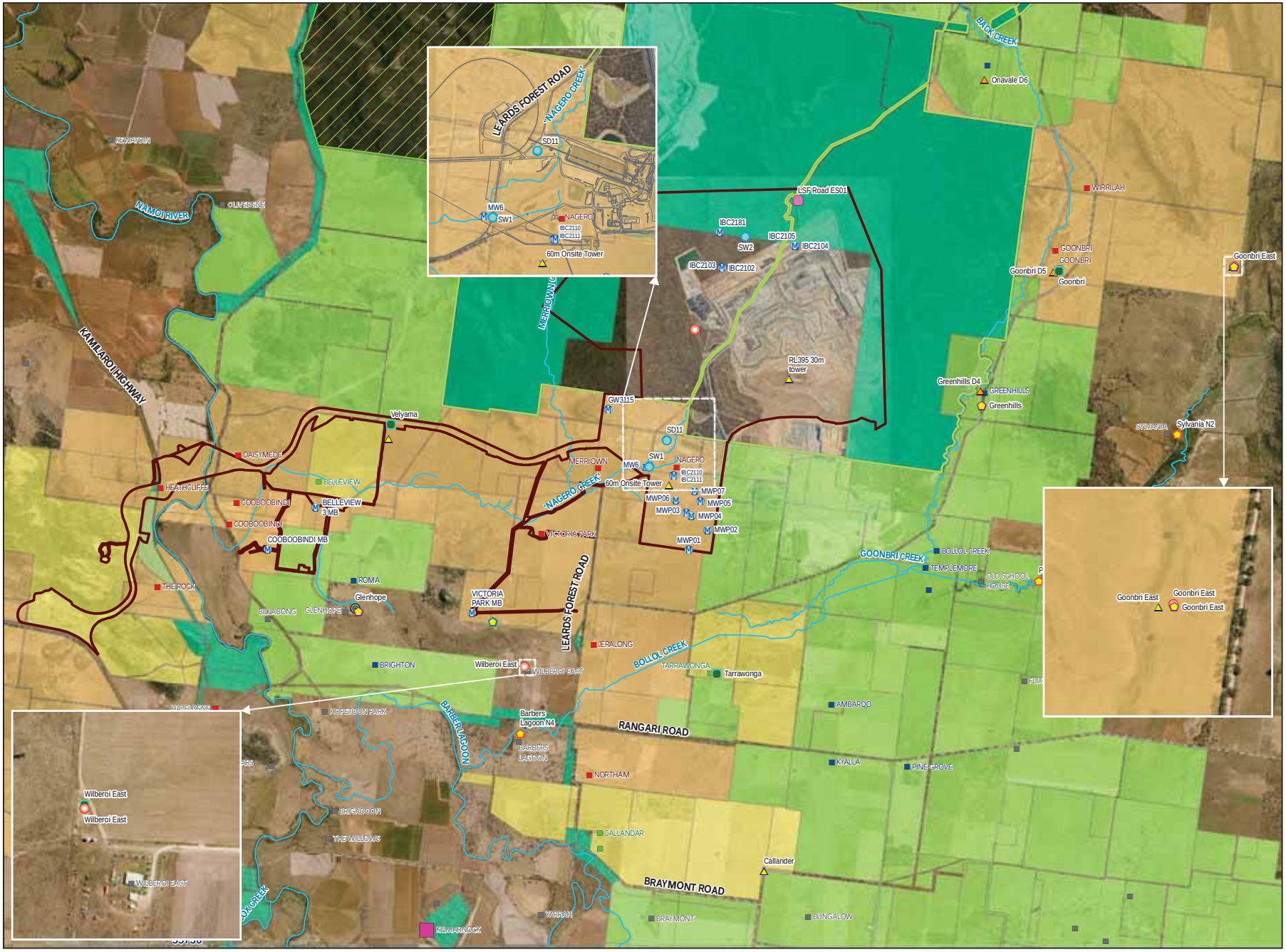
| Licence, Approval or Guideline | Section Reference | Requirement | Reference in this report |
|---|---|---|---|
| CL 368 | Condition 4 | (a) The lease holder must lodge Environmental Management Reports (**EMRs**) with the Director-General annually or at dates otherwise directed by the Director-General.<br>(b) The EMR must:<br>i. Report against compliance with the MOP;<br>ii. Report on progress in respect of rehabilitation completion criteria;<br>iii. Report on the extent of compliance with regulatory requirements; and<br>iv. Have regard to any relevant guidelines adopted by the Director-General | Whole document |
| ML 1755 | Condition 3(f) | (f) The lease holder must prepare a Rehabilitation Report to the satisfaction of the Minister. The report must:<br>i. provide a detailed review of the progress of rehabilitation against the performance measures and criteria established in the approved MOP;<br>ii. be submitted annually on the grant anniversary date (or at such other times as agreed by the Minister); and<br>iii. be prepared in accordance with any relevant annual reporting guidelines published on the Department's website at www.resources.nsw.gov.au/environment.<br>Note: The Rehabilitation Report replaces the Annual Environmental Management Report. | Section 7 |
| Project Approval 09_0182 | Schedule 5, Condition 4 | Annual Review<br>By the end of March each year, the Proponent shall review the environmental performance of the project for the previous calendar year to the satisfaction of the Secretary. This review must:<br>(a) Describe the development (including any rehabilitation) that was carried out in the past calendar year, and the development that is proposed to be carried out over the current calendar year; | Section 7 |
| | | (b) Include a comprehensive review of the monitoring results and complaints records of the project over the past year, which includes a comparison of these results against the:<br>• Relevant statutory requirements, limits or performance measures/criteria;<br>• Monitoring results of previous years; and<br>• Relevant predictions in the EA | Section 4, Section 9.3 |
| | | (c) Identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance; | Section 4, Section 7 |
| | | (d) Identify any trends in the monitoring data over the life of the project; | Section 4 |
| | | (e) Identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and | Section 4 |
| | | (f) Describe what measures will be implemented over the next year to improve the environmental performance of the project. | Section 5 |

| Licence, Approval or Guideline | Section Reference | Requirement | Reference in this report |
|---|---|---|---|
| | Schedule 3, Condition 10 | The Proponent shall:<br>(a) Conduct an annual testing program of the attenuated plant on site to ensure that the attenuation remains effective;<br>(b) Restore the effectiveness of any attenuation if it is found to be defective; and<br>(c) Report on the results of any testing and/or attenuation work within the Annual Review. | Section 6.3 |
| | Schedule 3, Condition 12 | The proponent shall …<br>(i) Use its best endeavours to achieve the long term intrusive noise goals for the project in Table 5, where this is reasonable and feasible, and report on the progress towards achieving these goals in the Annual Review; | Section 4.3.2 |
| | Schedule 3, Condition 68 | The Proponent shall:<br>(a) Implement all reasonable and feasible measures to minimise the waste (including coal reject) generated by the project;<br>(b) Ensure that the waste generated by the project is appropriately stored, handled and disposed of;<br>(c) Monitor and report on the effectiveness of the waste minimisation and management measures in the Annual Review. | Section 6.7 |
| | Schedule 3, Condition 77 | The proponent shall prepare and implement a Social Impact Management Plan (which will)<br>(h) Include a monitoring program, incorporating key performance indicators and a review and reporting protocol, including reporting in the Annual Review. | Section 11 |
| Boggabri Coal Project EA | Section 8 | BCOPL will prepare an Annual Review (which summarises monitoring results and reviews performance) and distribute it to the relevant regulatory authorities and the Boggabri CCC. | Whole document |

# Appendix B

Environmental Monitoring

Location Maps




## Legend

- Blast monitor
- Dust gauge
- E-sampler
- High volume air sampler (PM10)
- Meteorological station
- Noise monitor (attended)
- Noise monitor (unattended)
- Real time noise monitoring
- Surface water monitoring site
- TEOM location
- Groundwater monitoring bores
- Boggabri Coal residence
- Whitehaven Coal residence
- Mine jointly owned residence
- Privately owned
- Crown
- Waterway
- Boggabri Coal Mine Project Approval Area
- State Conservation Area
- State Forest

**Property Ownership**

- BCOP
- Joint
- WH
- Crown

0 0.5 1 1.5 2 KM

Scale 1:75,000

Projection: Transverse Mercator
Coordinate System: GDA 1994 MGA Zone 56
Scale correct when printed at A3 Landscape

Imagery:
BCOPL (2017,Dec 2018);



| | |
|---|---|
| DOCUMENT | A_1_BC2023_AEMR002_MON_r1v1 |
| AUTHOR. | I.Augey |
| REVIEWED BY. | N.Cooper |
| DATE. | 2/03/2023 |

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FIGURE A-1

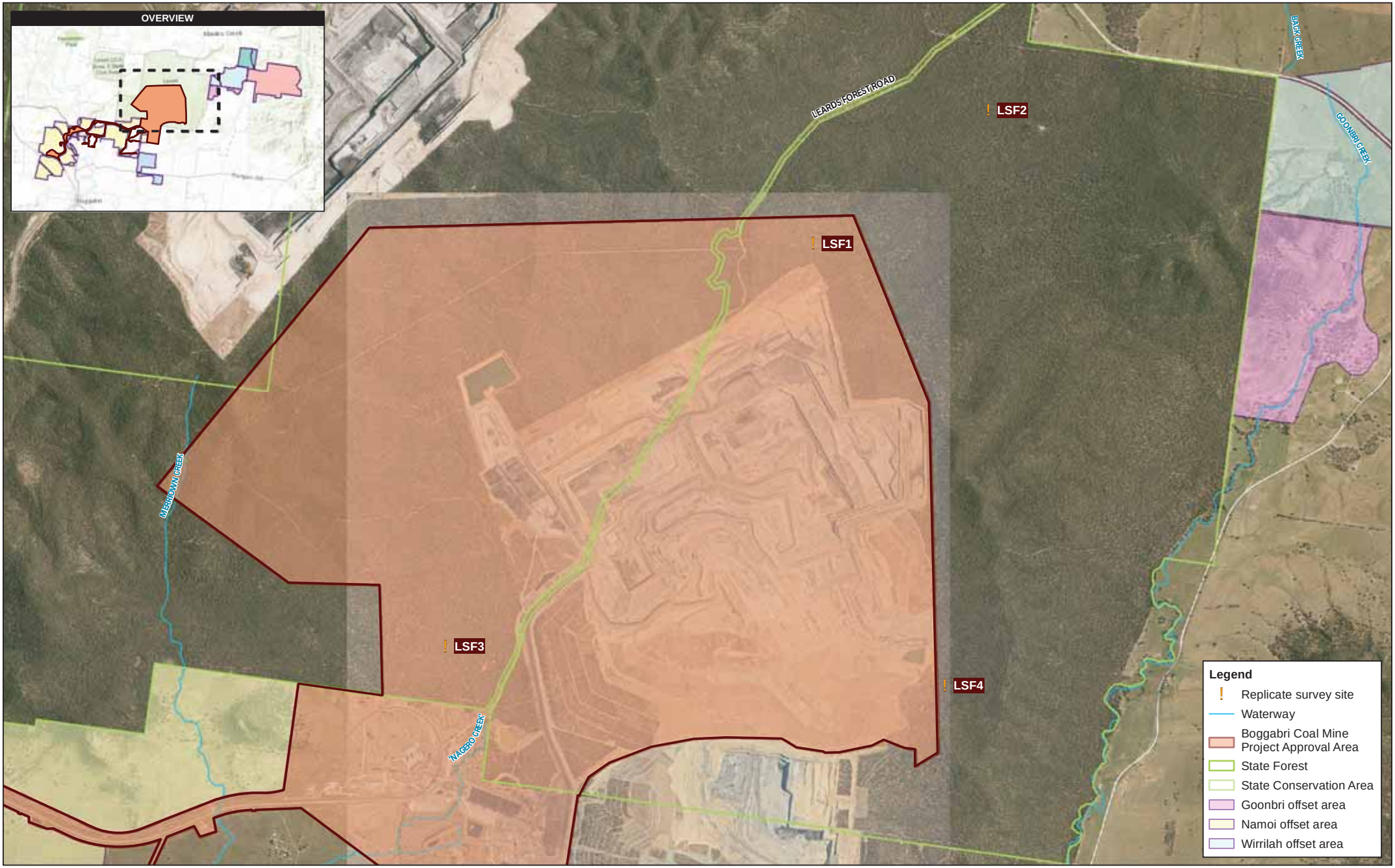
TITLE. BOGGABRI COAL MINE PROJECT BOUNDARY AND ENVIRONMENTAL MONITORING SITES



DRAWING C:\Users\AUIA503787\WSP O365\Boggabri GIS-Ecology - General\5_Shared\S4_Production\Maps\2023\AEMR\A_1_BC2023_AEMR002_MON_r1v1.mxd

# Appendix C

Biodiversity Monitoring Maps

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Projection: Transverse Mercator
Coordinate System: GDA 1994 MGA Zone 56
Scale correct when printed at A3 Landscape

Imagery:
Atlass-Aerometrex Pty Ltd via BCOPL (2017)Sources: Esri, HERE, Garmin, Intermap,



| | |
|---|---|
| DOCUMENT | B_1_BC2023_AEMR003_MON_LSF_r1v2 |
| AUTHOR. | I.Augey |
| REVIEWED BY. | N.Cooper |
| DATE. | 3/03/2023 |

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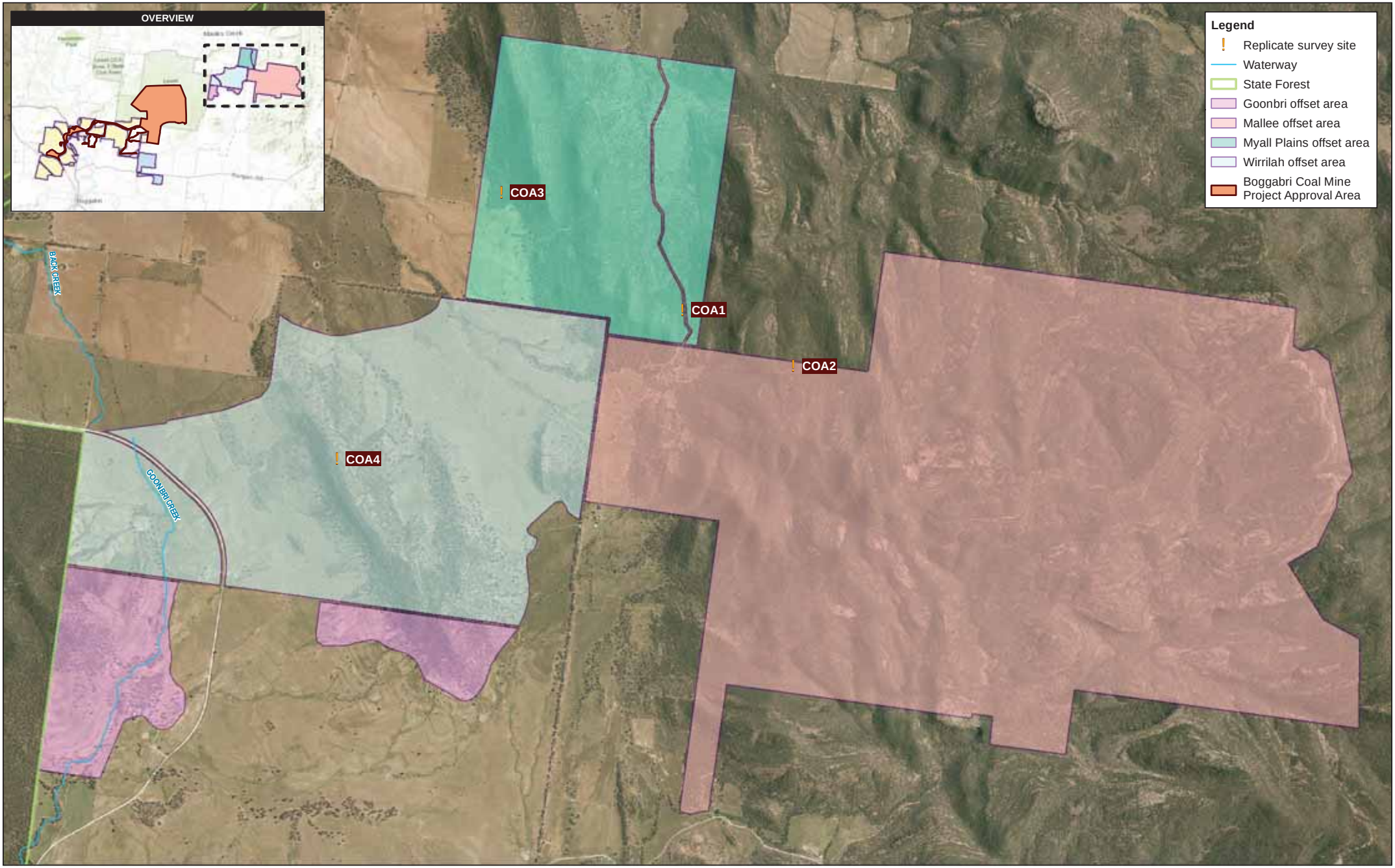
FIGURE B-1

TITLE. LOCATION OF REPLICATE SURVEY SITES - LEARD STATE FOREST



DRAWING: C:\Users\AUIA503787\WSP O365\Boggabri GIS-Ecology - General\5_Shared\54_Production\Mapx\2023\AEMR\B_1_BC2023_AEMR003_MON_LSF_r1v2.mxd

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Coordinate System: GDA 1994 MGA Zone 56
Scale correct when printed at A3 Landscape

Imagery:
Atlass-Aerometrex Pty Ltd via BCOPL (2017)Sources: Esri, HERE, Garmin, Intermap,



DOCUMENT B_2_BC2023_AEMR004_MON_COA_r1v1

AUTHOR. I.Augey

APPROVED BY. N.Cooper

DATE. 2/03/2023

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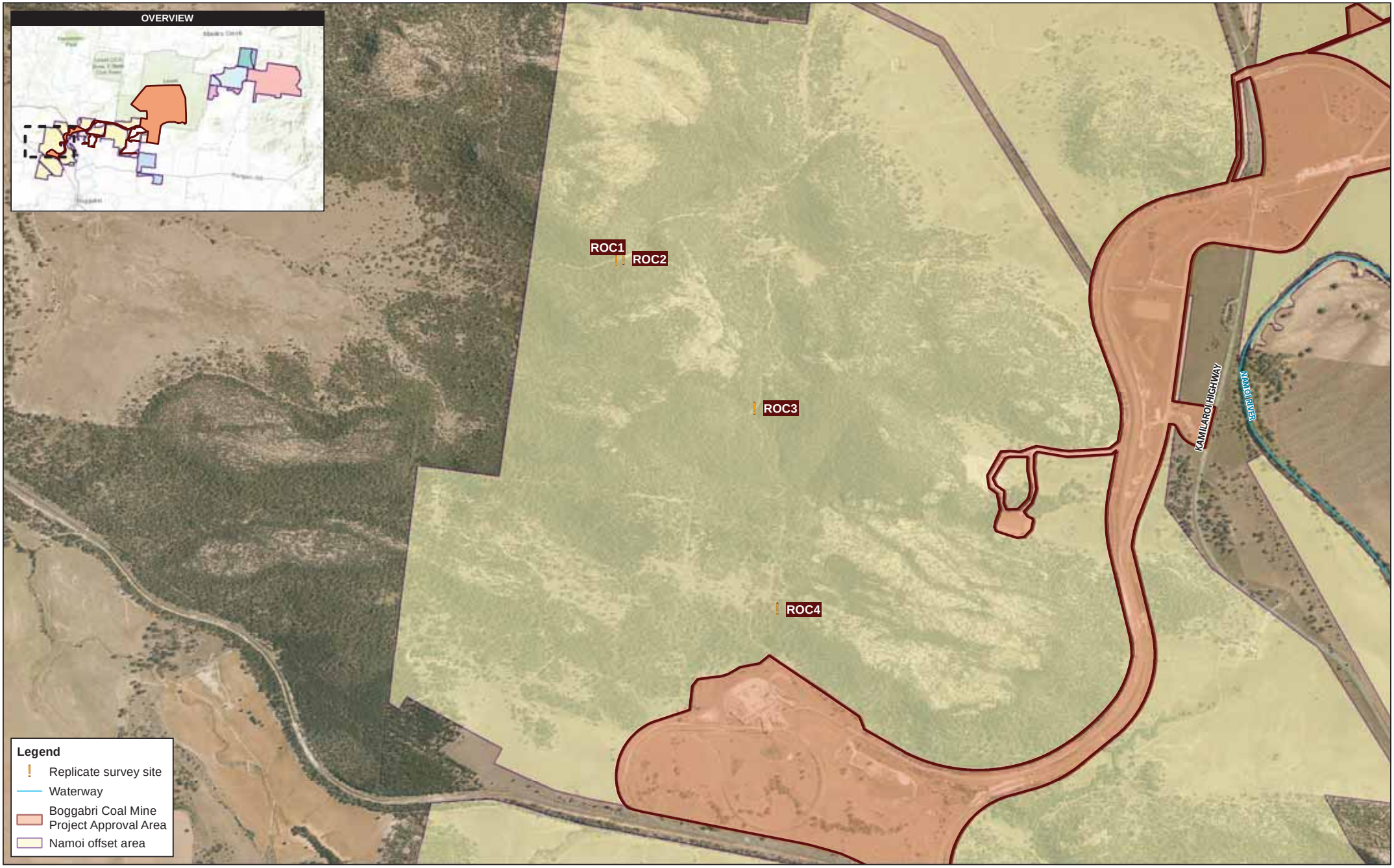
FIGURE B-2

TITLE. LOCATION OF REPLICATE SURVEY SITES - CENTRAL OFFSET AREA



DRAWING: C:\Users\AU0A50376\WSP O365\Boggabri GIS-Ecology - General\5_Shared\04_Production\Maps\2023AEMR\B_2_BC2023_AEMR004_MON_COA_r1v1.mxd

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Projection: Transverse Mercator
Coordinate System: GDA 1994 MGA Zone 56
Scale correct when printed at A3 Landscape

Imagery:
Atlass-Aerometrex Pty Ltd via BCOPL (2017)Sources: Esri, HERE, Garmin, Intermap,



DOCUMENT B_3_BC2023_AEMR005_MON_Rocklea_r1v1

AUTHOR. I.Augey

REVIEWED BY. N.Cooper

DATE. 2/03/2023

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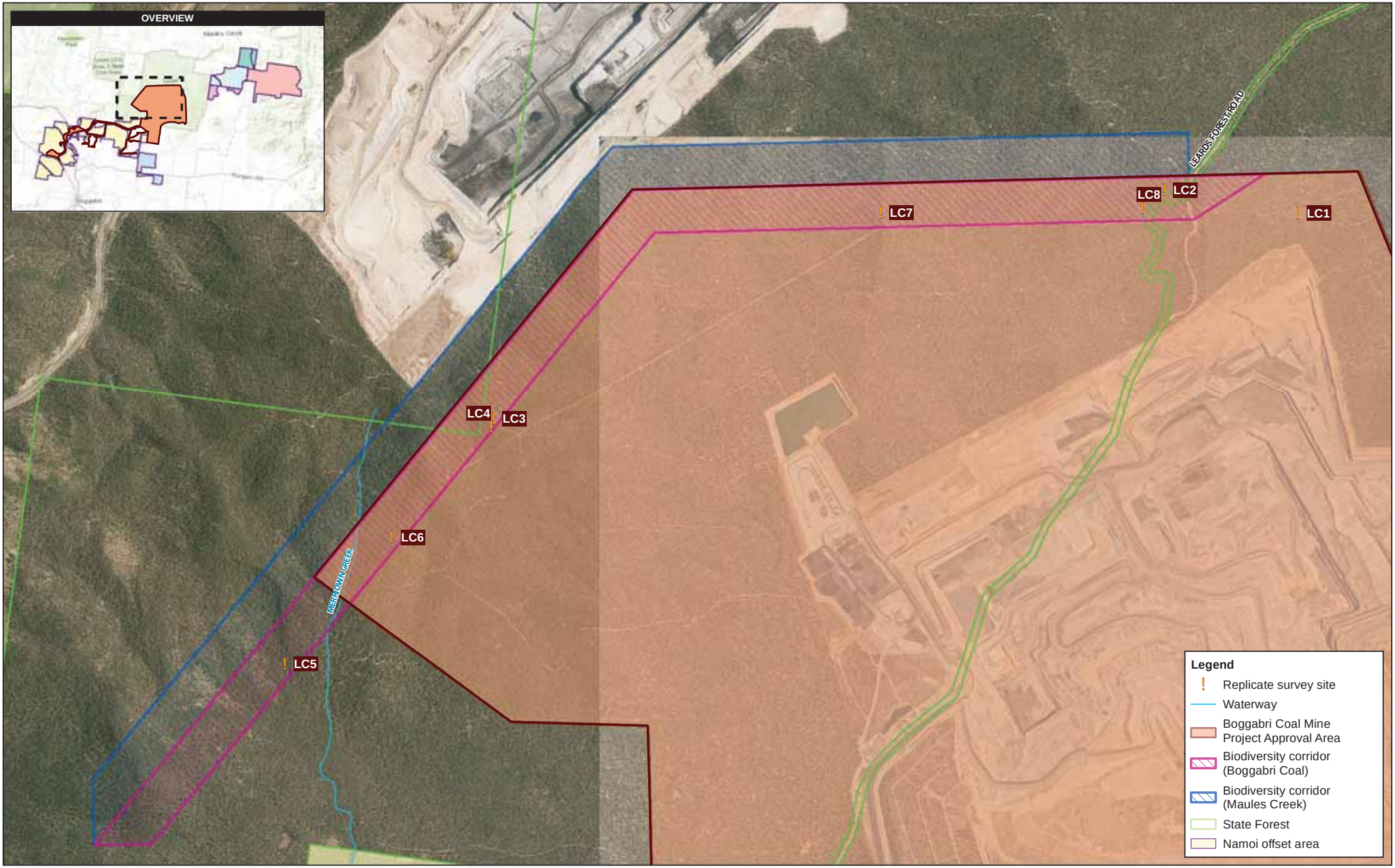
FIGURE B-3

TITLE. LOCATION OF REPLICATE SURVEY SITES - ROCKLEA PROPERTY (NAMOI OFFSETS)



DRAWING C:\Users\AUA903787\WSP O365\Boggabri GIS-Ecology - General\S_Shared\54_Production\Maps\2023\AEMR\B_3_BC2023_AEMR005_MON_Rocklea_r1v1.mxd

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Imagery:
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DOCUMENT B_4_BC2023_AEMR006_MON_Corridor_r1v2
AUTHOR. I.Augey
REVIEWED BY. N.Cooper
DATE. 3/03/2023

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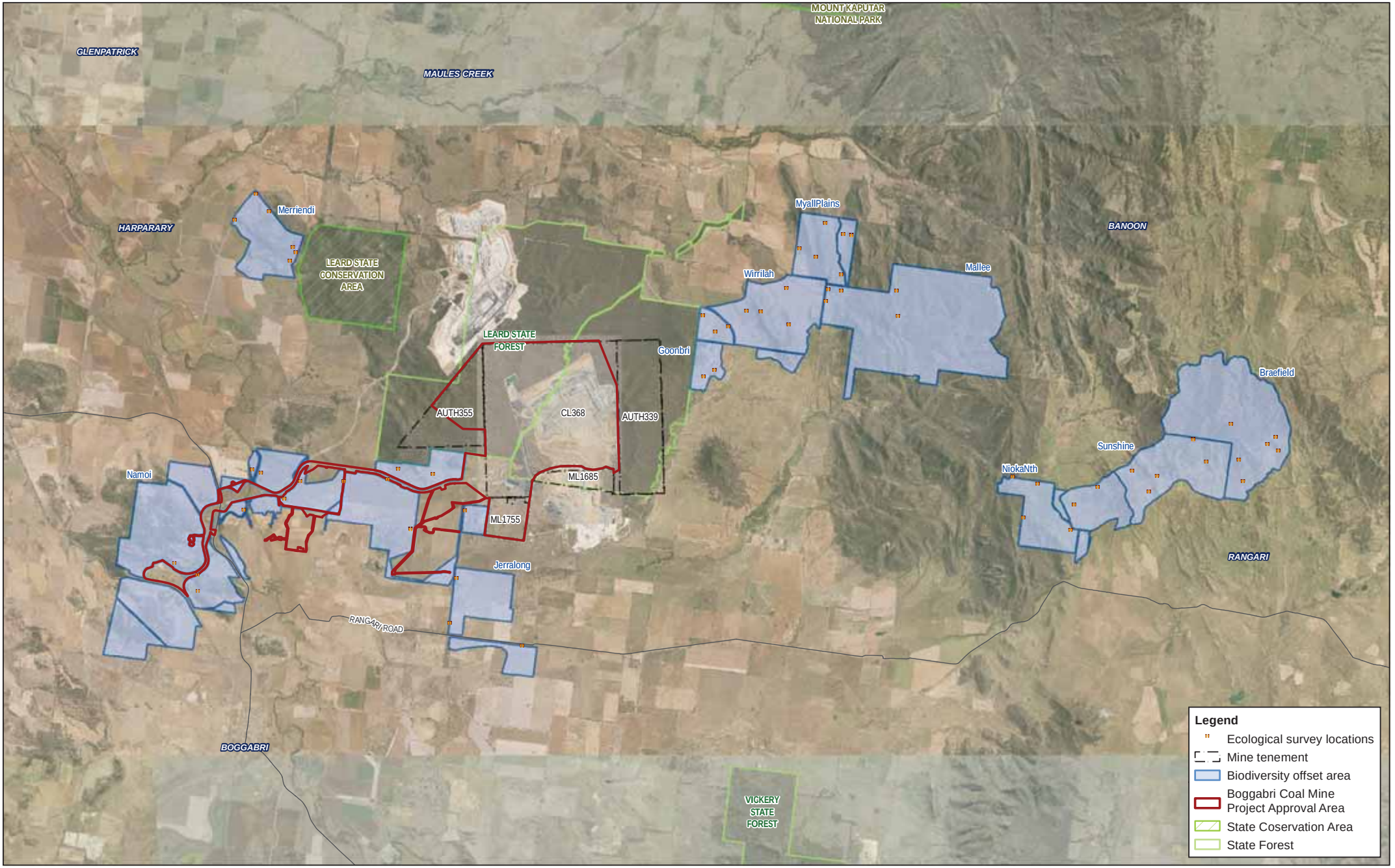
FIGURE B-4

TITLE. LOCATION OF REPLICATE SURVEY SITES - LEARD STATE FOREST WILDLIFE CORRIDOR



DRAWING C:\Users\AUA003787\WSP O 365\Boggabri GIS-Ecology - General\S_Shared\54_Production\Maps\2023\AEMR\B_4_BC2023_AEMR006_MON_Corridor_r1v2.mxd




0 1.5 3 km

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Projection: Transverse Mercator
Coordinate System: GDA 1994 MGA Zone 56
Scale correct when printed at A3 Landscape

Imagery: BCOPL (2017,2018);Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)



DOCUMENT B_5_BC2023_AEMR007_MON_Replicate_r1v1

AUTHOR. I.Augey

REVIEWED BY. N.Cooper

DATE. 2/03/2023

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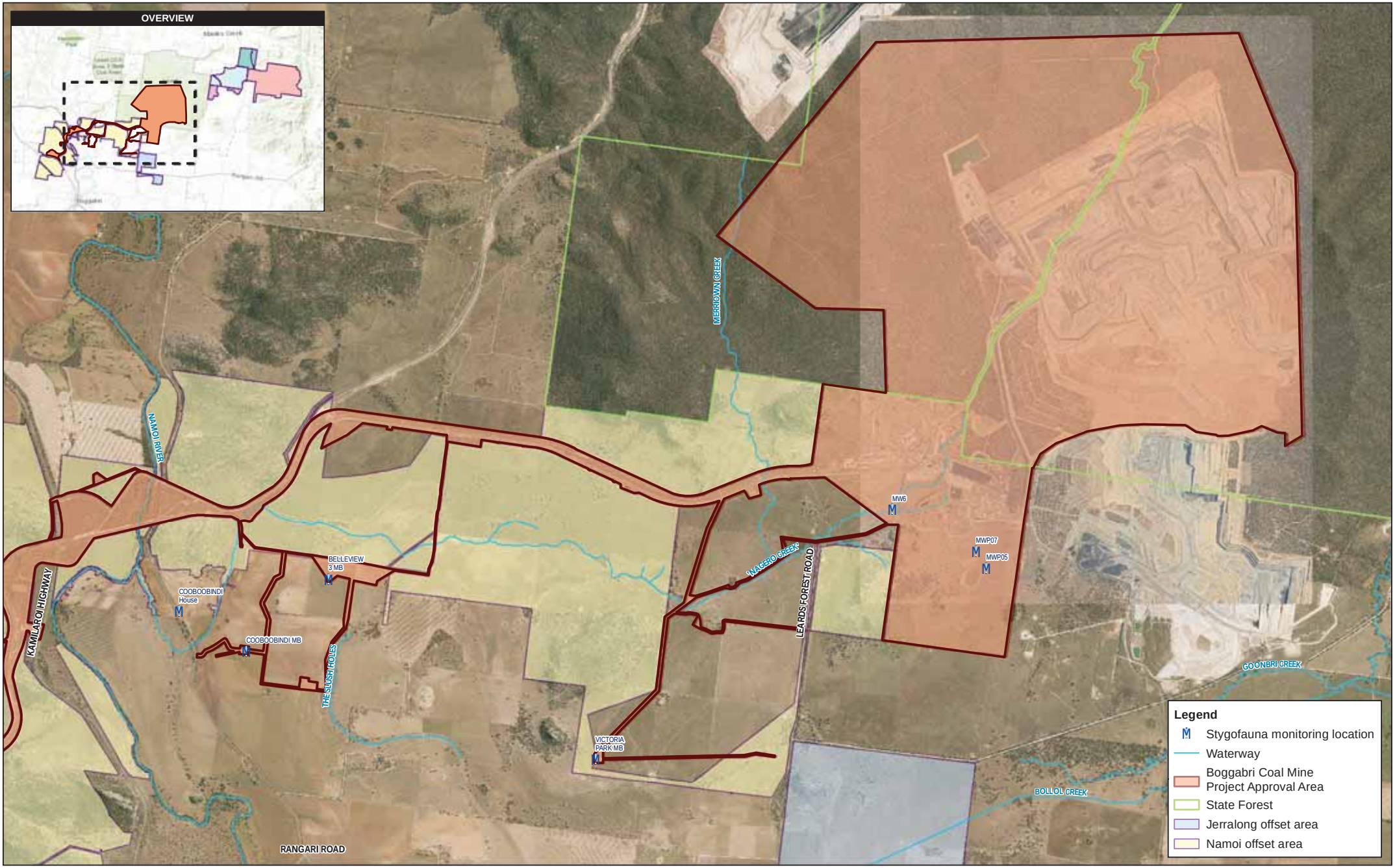
FIGURE B-5

TITLE. LOCATION OF REPLICATE SURVEY SITES



DRAWING C:\Users\AUA503787\WSP\O365Boggabri GIS-Ecology - General\5_Shared\54_Production\Maps\2023\AEMR\B_5_BC2023_AEMR007_MON_Replicate_r1v1.mxd

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Coordinate System: GDA 1994 MGA Zone 56
Scale correct when printed at A3 Landscape

Imagery:
Atlass-Aerometrex Pty Ltd via BCOPL (2017)Sources: Esri, HERE, Garmin, Intermap,



| | |
|---|---|
| DOCUMENT | B_6_BC2023_AEMR009_MON_stygo_r1v2 |
| AUTHOR. | I.Augey |
| REVIEWED BY. | N.Cooper |
| DATE. | 3/03/2023 |

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FIGURE B-6

TITLE. LOCATION OF STYGOFAUNA MONITORING SITES



DRAWING: C:\Users\AUA503787\WSP O365\Boggabri GIS-Ecology - General\5_Shared\04_Production\Maps\2023\AEMR\B_6_BC2023_AEMR009_MON_stygo_r1v2.mxd


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Projection: Transverse Mercator
Coordinate System: GDA 1994 MGA Zone 56
Scale correct when printed at A3 Landscape

Imagery:
Atlass-Aerometrex Pty Ltd via BCOPL (2017)Sources: Esri, HERE, Garmin, Intermap,



DOCUMENT B_7_BC2023_AEMR011_MON_Rehab_r1v1

AUTHOR. I.Augey

REVIEWED BY. N.Cooper

DATE. 2/03/2023

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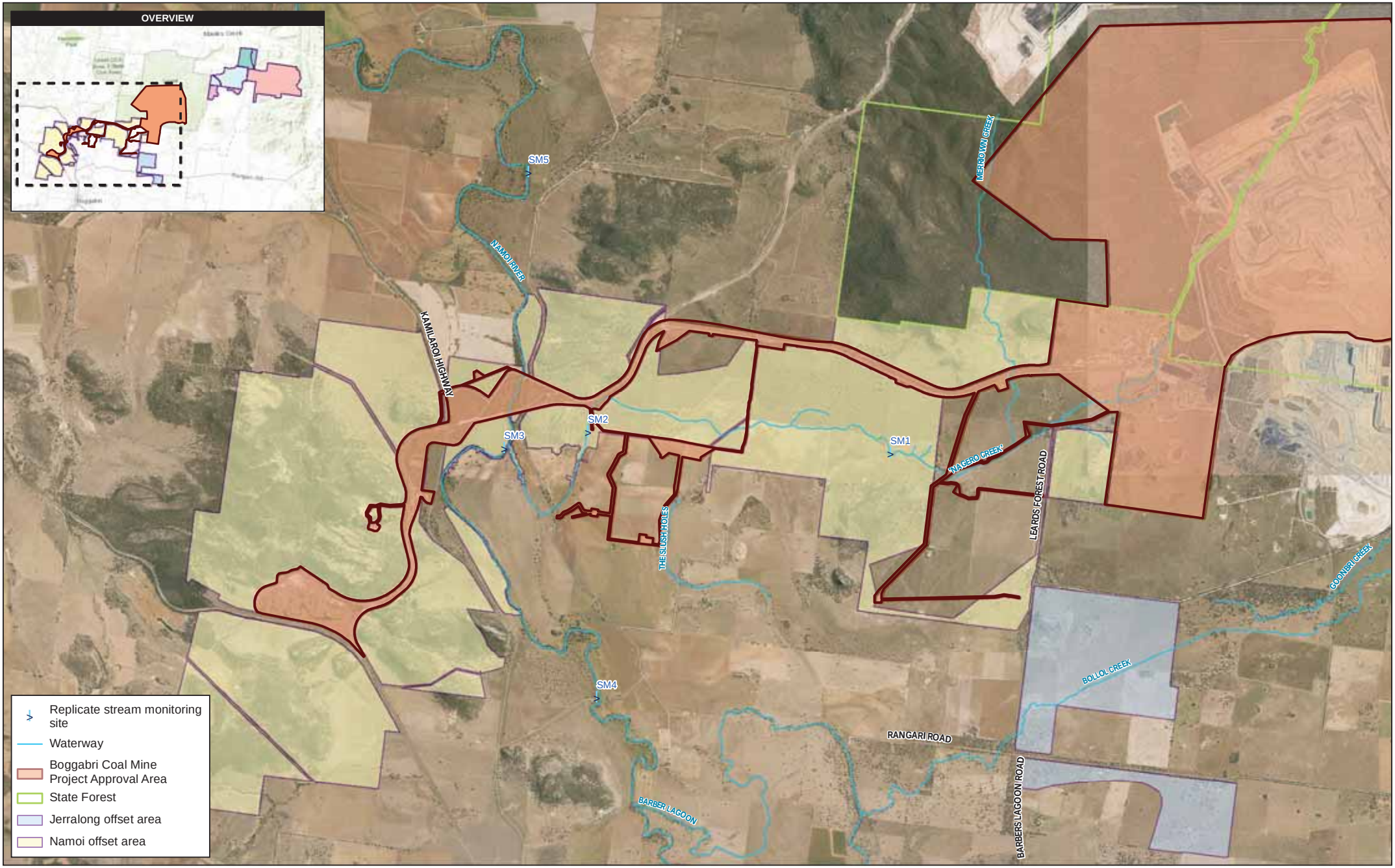
FIGURE B-7

TITLE. LOCATION OF REPLICATE SURVEY SITES - MINE REHABILITATION AREA



DRAWING: C:\Users\AUIA503787\WSP O365\Boggabri GIS-Ecology - General\5_Shared\S4_Production\Maps\2023\AEMR\B_7_BC2023_AEMR011_MON_Rehab_r1v1.mxd

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Scale 1:50,000

Projection: Transverse Mercator
Coordinate System: GDA 1994 MGA Zone 56
Scale correct when printed at A3 Landscape

Imagery:
Atlass-Aerometrex Pty Ltd via BCOPL (2017)Sources: Esri, HERE, Garmin, Intermap,



DOCUMENT B_8_BC2023_AEMR010_MON_Stream_r1v1

AUTHOR. I.Augey

REVIEWED BY. N.Cooper

DATE. 2/03/2023

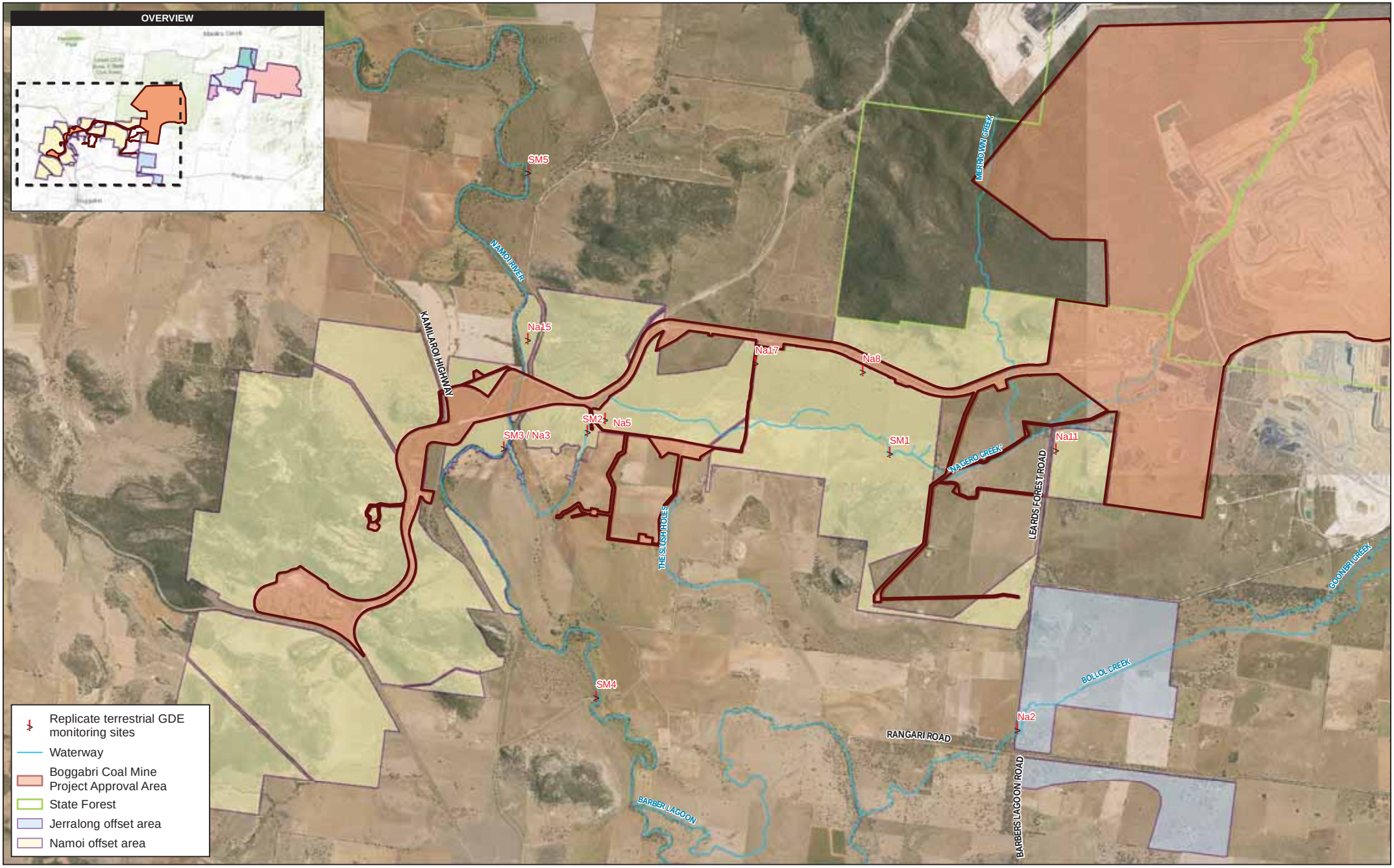
idemitsu

FIGURE B-8

TITLE. LOCATION OF REPLICATE SURVEY SITES – STREAM AND RIPARIAN VEGETATION HEALTH MONITORING SITES



DRAWING C:\Users\AUA503787\WSP O365\Boggabri GIS-Ecology - General\5 Shared\54_Production\Maps\2023\AEMR\B_8_BC2023_AEMR010_MON_Stream_r1v1.mxd




0 0.5 1 1.5 KM

Scale 1:50,000

Projection: Transverse Mercator
Coordinate System: GDA 1994 MGA Zone 56
Scale correct when printed at A3 Landscape

Imagery:
Atlass-Aerometrex Pty Ltd via BCOPL (2017)Sources: Esri, HERE, Garmin, Intermap,



DOCUMENT B_9_BC2023_AEMR011_MON_TerrestrialGDE_r1v1

AUTHOR. I.Augey

REVIEWED BY. N.Cooper

DATE. 2/03/2023

idemitsu

FIGURE B-9

TITLE. LOCATION OF REPLICATE MONITORING SITES – TERRESTRIAL GROUNDWATER DEPENDENT ECOSYSTEM MONITORING

# Appendix D

Regulator Correspondence

Department of Planning and Environment

Alex Williams
Environmental Superintendent
Idemitsu Boggabri Coal
Kamilaroi Country

By email only: alex.williams@boggabricoal.com.au

13/06/2023

**Boggabri Coal (MP09_0182)**
**Annual Review 2022**

Dear Ms Williams

Reference is made to your post approval matter, MP09_0182-PA-42, Boggabri Coal Mine Annual Review for the period 1January 2022 to 31 December 2022 (AR 2022), submitted as required by Schedule 5, Condition 4 of MP09_0182 as modified (the approval) to the Department of Planning and Environment (the department) on 31 March 2023. Reference is also made to the amended AR 2022 submitted in response to the department's request for information, RFI-57063466.

The department has reviewed the amended AR 2022 and considers it to generally satisfy the reporting requirements of the approval and the department's *Annual Review Guideline* (October 2015). Please make publicly available a copy of the amended AR 2022 on the company website.

Please note that the department's acceptance of this Annual Review is not an endorsement of the compliance status of the project.

The non-compliance identified in the amended AR 2022 with Schedule 5, Condition 4 of the approval has previously been addressed by the department and no further action is proposed.

The non-compliances identified in the amended AR 2022 with Schedule 3, Condition 9 (sound power level exceedances), Schedule 3, Condition 22 (missed rainfall and solar radiation data), and Schedule 3, Condition 22 (14 November 2022 missed blast monitoring data) of the approval have been assessed in accordance with the department's Compliance Policy with the department on this occasion, determining to record the breaches with no further enforcement action. However, please note that recording the breach does not preclude the department from taking alternative enforcement action, should it become apparent that an alternative response is more appropriate.

The department notes the ongoing non-compliances identified in the amended AR 2022 with Schedule 3, Conditions 38(b) and 38(c), and Condition 54 of the approval. Under the provisions of Schedule 2, Condition 4 of the approval, I, as nominee of the Planning Secretary, require an update to be provided to the department (via the Major Projects Portal) by 30 November 2023, or as otherwise agreed by the Planning Secretary, detailing all action taken during the period to resolve these non-compliances. This update should include a register of correspondence with the relevant parties.

Finally, the department notes that a search of its records cannot locate any notification of the non-compliances with Schedule 3, Condition 22 (missed rainfall and solar radiation data), and Schedule 3, Condition 22 (14 November 2022 missed blast monitoring data). In accordance with Schedule 5, Condition 15 of the approval the applicant must notify the department with 7 days of becoming aware of a non-compliance. Further correspondence may be sent in relation to these non-compliances with

Schedule 5, Condition 15 of the approval.

Should you wish to discuss the matter further, please contact Joel Curran, Senior Compliance Officer, on 02 4904 2702 or compliance@planning.nsw.gov.au

Yours sincerely

Heidi Watters
Team Leader Northern
Compliance

As nominee of the Planning Secretary

Department of Planning and Environment

Hamish Russell
Environmental Superintendent
Boggabri Coal Operations Pty Ltd
Kamilaroi Country

By email only: Hamish.russell@boggabricoal.com.au

07/07/2022

Dear Mr Russell

**Boggabri Coal (MP09_0182)**
**30 April 2022 Blast Over Pressure**

Reference is made to your post approval matter, MP09_0182-PA-35, 30 April 2022 Blast Over Pressure incident notification, submitted as required by Schedule 5, Condition 8 of MP09_0182 as modified (the approval) to the Department of Planning and Environment (the department) on 4 May 2022. Reference is also made to your responses to the department's requests for more information (RFI-42278295 and RFI-42764956) submitted to the department on 6 May 2022 and 24 June 2022 respectively.

The department has reviewed the incident notification and detailed report and considers them to satisfy the requirements of Schedule 5, Condition 8 of the approval. Further, the department notes the following:

- On 30 April 2022 at 11:55am Boggabri Coal initiated C_MN23_22 overburden blast
- C_MN23-22 was brought forward due to predicted adverse meteorological conditions in the afternoon
- All pre-blast checklists were completed and weather conditions appropriate for blasting
- Preliminary results from the Wilberoi East blast monitor indicated a 123 dBL blast overpressure result
- An examination of all available data from the blast by specialist consultants has determined that:
    - The blast was fired in a controlled manner with no visual signs of excessive air blast emission from the stemming columns and front row burdens
    - The PSRA analysis (blast overpressure time of arrival) indicated a discrepancy of several seconds between the predicted blast overpressure arrival time and the peak overpressure reading
    - Wind gusts are thought to have been the cause of the peak overpressure reading

Accordingly, the department has considered the above and satisfied that no exceedance of the blast overpressure limit has occurred at the Wilberoi East monitor due to the C_MN23-22 overburden blast.

Should you wish to discuss the matter further, please contact Joel Curran, Senior Compliance Officer on 02 4904 2702 or compliance@planning.nsw.gov.au

Yours sincerely

James Epstein
A/ Team Leader
Compliance

As nominee of the Planning Secretary

Ms Keren Halliday
Environmental Superintendent Compliance
Boggabri Coal

By email only: keren.halliday@boggabricoal.com.au

16 December 2022

Subject: Additional Reporting Requirements for Coal Mine Annual Reviews

Dear Ms Halliday

All contemporary coal mine development consents require an Annual Review report to be submitted to the Department of Planning and Environment each year. These reports provide a summary of the annual environmental performance of the mine, are reviewed by the department, and are publicly available to the community.

The general requirements for the content of an Annual Review are provided in the mine's development consent, as well as the Annual Review Guidelines (Department, October 2015). In addition, from time to time, the department may request additional information to be included in an Annual Review.

The department notes that there is community concern regarding the status and management of biodiversity offsets, and the reporting of greenhouse gas management measures by coal mines. To address these community concerns and ensure all mines are reporting consistently, the department is requesting that all coal mine annual reviews include the following additional information in their Annual Reviews. For clarity, this also includes those coal mines reporting on the 2022 calendar year period.

## Biodiversity offsets

- Report on the status of the long term security arrangement for biodiversity offsets required by the development consent for the mine. Please include information on the type(s) of long term security arrangements that have been implemented and/or are to be implemented for the mine.

## Greenhouse gas

- Report on greenhouse gas emissions for the reporting period and include a comparison of actual greenhouse gas emissions against the predictions in the environmental assessment(s) for the mine. Please ensure that the method used to calculate the environmental assessment prediction(s) and annual emissions are calculated the same.
- Report all reasonable and feasible steps undertaken during the reporting period to improve energy efficiency and reduce greenhouse gas emissions generated by the mine.

The department appreciates the cooperation from the mining industry in providing the additional information in Annual Reviews.

If you wish to discuss further, please contact the department's Compliance branch at compliance@planning.nsw.gov.au

Yours sincerely,

Ben Harrison
Director Compliance
NSW Planning

Department of Planning and Environment

Hamish Russell
Environmental Superintendent
Idemitsu Boggabri Coal
386 Leards Forest Road
BOGGABRI New South Wales 2382

By email only: hamish.russell@boggabricoal.com.au

21/12/2022

**Boggabri Coal Mine (MP09_0182)**
**Annual Review 2021**

Dear Mr Russell

Reference is made to your post approval matter, MP09_0182-PA-40, Annual Review for the period 1 January 2021 to 31 December 2021, submitted as required by Schedule 5, Condition 4 of MP09_0182 as modified (the approval) to the Department of Planning and Environment (the department) on 16 May 2022.

The department has reviewed the Annual Review and considers it to generally satisfy the reporting requirements of the approval and the department's *Annual Review Guideline* (October 2015). Please make publicly available a copy of the 2021 Annual Review on the company website.

Please note that the department's acceptance of this Annual Review is not an endorsement of the compliance status of the project.

The department has assessed the non-compliances with Schedule 3, Condition 9 (sound power level exceedances), and Schedule 5, Condition 4 of the approval (late submission of the Annual Review) and has determined at this stage to record the breaches, with no further action proposed at this time.

Non-compliances with Schedule 3, Conditions 38(b), 38(c) and 54 identified in the Annual Review will be assessed in accordance with the department's Compliance Policy. Further correspondence may be sent in relation to these non-compliances.

Finally, the department notes that Appendix F of the Annual Review (2021 BCM IEA Response Action Plan) should be updated. In accordance with Schedule 2, Condition 4 of the approval, please submit to the department an updated action plan addressing the below points by 15 February 2023 or as otherwise agree by the Planning Secretary:

- Update the status of actions that have been closed out
- Where actions remain outstanding, please detail progress made during the Annual Review reporting period toward achieving compliance and provide an alternative target date for completion

Should you wish to discuss the matter further, please contact Joel Curran, Senior Compliance Officer, on 02 4904 2702 or compliance@planning.nsw.gov.au

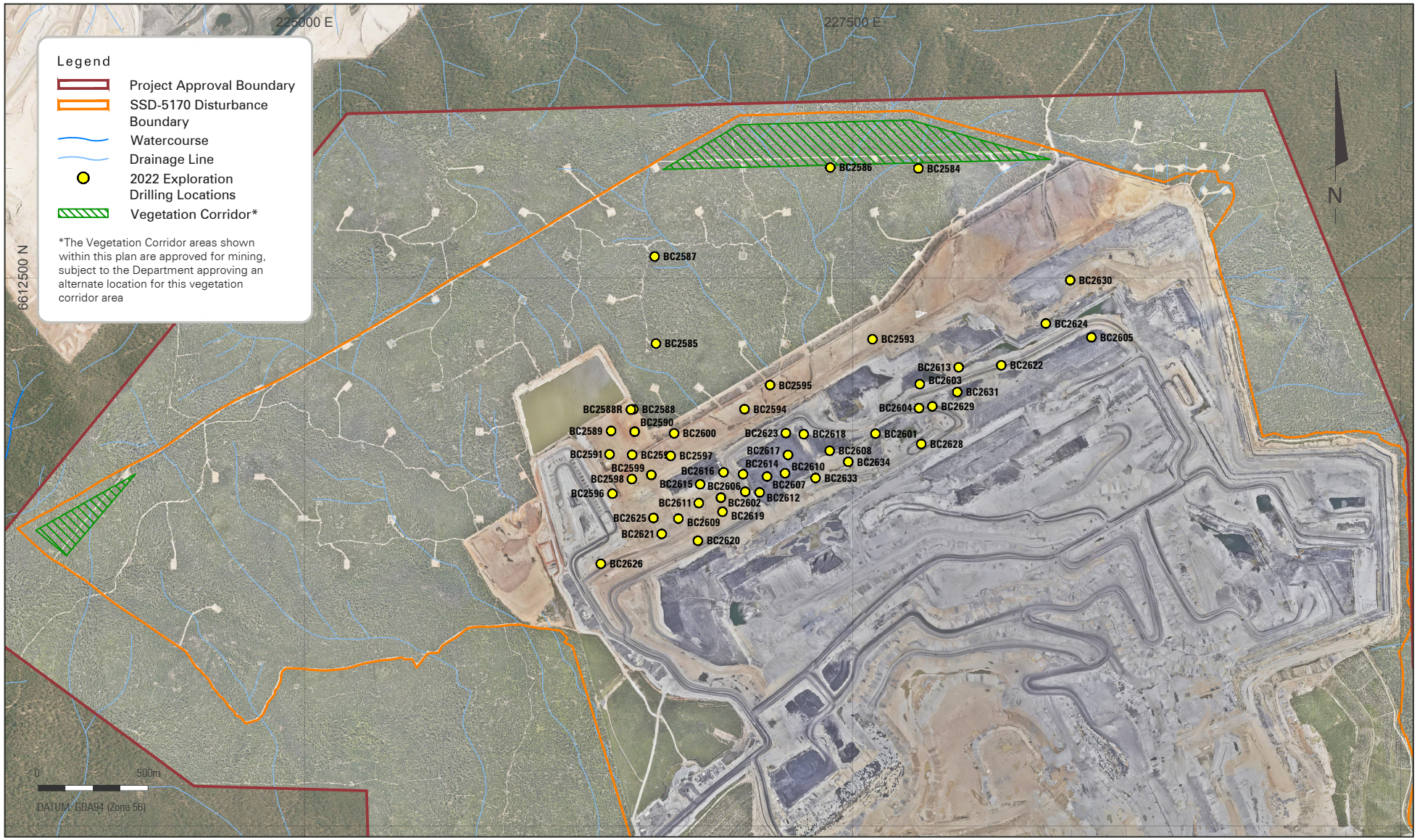
Yours sincerely

Ann Hagerthy
Team Leader Northern
Compliance

As nominee of the Planning Secretary

# Appendix E

BCM 2022 Exploration Drilling




JBA 2263 001 BOGGABRI - EXPLORATION DRILLING (7/02/2023)

BOGGABRI COAL MINE

2022 Exploration Drilling Locations

**FIGURE 1**

**Table E.1 Exploration Drilling Holes 2022**

| Borehole Name | MGAEasting | MGANorthing | RL (m) | Total Depth (m) | Drill Start | Drill Finish | Borehole Status | Purpose |
|---|---|---|---|---|---|---|---|---|
| BC2584 | 227799.9 | 6613000 | 349 | 339.22 | 14/01/2022 | 10/02/2022 | Cemented | Coal Quality |
| BC2585 | 226602.9 | 6612201 | 347.6 | 285.4 | 11/02/2022 | 26/02/2022 | Cemented | Coal Quality Environmental |
| BC2586 | 227398.1 | 6613004 | 345.8 | 322.91 | 12/02/2022 | 3/03/2022 | Cemented | Coal Quality |
| BC2587 | 226596.9 | 6612598 | 349.1 | 309.4 | 28/02/2022 | 17/03/2022 | In progress | Coal Quality |
| BC2588 | 226499.8 | 6611901 | 333.3 | 24 | 24/03/2022 | 24/03/2022 | Cemented | Structure |
| BC2588R | 226488.5 | 6611900 | 333.2 | 290 | 24/03/2022 | 29/03/2022 | Cemented | Structure |
| BC2589 | 226398.5 | 6611803 | 330.6 | 246.41 | 24/03/2022 | 9/04/2022 | Cemented | Coal Quality |
| BC2590 | 226505.8 | 6611800 | 328.5 | 270 | 5/04/2022 | 8/04/2022 | Cemented | Structure |
| BC2591 | 226391.3 | 6611696 | 328.3 | 264 | 8/04/2022 | 10/04/2022 | Cemented | Structure |
| BC2592 | 226494.3 | 6611694 | 325.9 | 264 | 11/04/2022 | 13/04/2022 | Cemented | Structure |
| BC2593 | 227590.7 | 6612221 | 327.6 | 321.38 | 12/04/2022 | 9/05/2022 | Cemented | Coal Quality Environmental |
| BC2594 | 227007.2 | 6611902 | 319.5 | 276 | 21/04/2022 | 23/04/2022 | Cemented | Structure |
| BC2595 | 227123.4 | 6612012 | 317.5 | 276 | 23/04/2022 | 25/04/2022 | Cemented | Structure |
| BC2596 | 226404.3 | 6611517 | 322 | 252 | 25/04/2022 | 26/04/2022 | Cemented | Structure |
| BC2597 | 226670.1 | 6611689 | 322 | 270 | 4/05/2022 | 6/05/2022 | Cemented | Structure |
| BC2598 | 226493.1 | 6611583 | 322 | 246 | 7/05/2022 | 8/05/2022 | Cemented | Structure |
| BC2599 | 226581.8 | 6611602 | 321.2 | 249.31 | 10/05/2022 | 26/05/2022 | Cemented | Coal Quality |
| BC2600 | 226686 | 6611791 | 326.4 | 270 | 10/05/2022 | 19/05/2022 | Cemented | Structure |
| BC2601 | 227604.5 | 6611790 | 265.1 | 261.25 | 31/05/2022 | 9/06/2022 | Cemented | Coal Quality Geotechnical |
| BC2602 | 226898.9 | 6611499 | 272.9 | 246 | 6/06/2022 | 8/06/2022 | Cemented | Structure |
| BC2603 | 227806.3 | 6612016 | 263.8 | 267.15 | 15/06/2022 | 22/06/2022 | Cemented | Coal Quality |
| BC2604 | 227802.9 | 6611907 | 270.5 | 276 | 16/06/2022 | 18/06/2022 | Cemented | Structure |
| BC2605 | 228589.1 | 6612230 | 252.9 | 312.35 | 23/06/2022 | 5/07/2022 | Cemented | Coal Quality Geotechnical |
| BC2606 | 227010.5 | 6611526 | 271 | 265 | 29/06/2022 | 1/07/2022 | Cemented | Structure |
| BC2607 | 227109.8 | 6611595 | 269.3 | 259 | 1/07/2022 | 4/07/2022 | Cemented | Structure |
| BC2608 | 227395.4 | 6611712 | 260 | 277 | 4/07/2022 | 6/07/2022 | Cemented | Structure |

| Borehole Name | MGAEasting | MGANorthing | RL (m) | Total Depth (m) | Drill Start | Drill Finish | Borehole Status | Purpose |
|---|---|---|---|---|---|---|---|---|
| BC2609 | 226705.2 | 6611403 | 277.3 | 271 | 13/07/2022 | 17/07/2022 | Cemented | Structure |
| BC2610 | 227191.9 | 6611610 | 263 | 252.33 | 15/07/2022 | 19/07/2022 | Cemented | Coal Quality |
| BC2611 | 226798.3 | 6611474 | 276.2 | 225.16 | 21/07/2022 | 4/08/2022 | Cemented | Coal Quality |
| BC2612 | 227075.9 | 6611522 | 265.6 | 265 | 27/07/2022 | 29/07/2022 | Cemented | Structure |
| BC2613 | 227983.9 | 6612093 | 252.7 | 289 | 30/07/2022 | 31/07/2022 | In progress | Structure |
| BC2614 | 227000.4 | 6611605 | 278.1 | 249.13 | 11/08/2022 | 17/08/2022 | Cemented | Coal Quality |
| BC2615 | 226804.6 | 6611559 | 280.3 | 241 | 11/08/2022 | 14/08/2022 | Cemented | Structure |
| BC2616 | 226911.4 | 6611614 | 281.5 | 247 | 14/08/2022 | 15/08/2022 | Cemented | Structure |
| BC2617 | 227205.6 | 6611693 | 268.7 | 259 | 16/08/2022 | 17/08/2022 | Cemented | Structure |
| BC2618 | 227277.1 | 6611788 | 274.3 | 271 | 24/08/2022 | 26/08/2022 | Cemented | Structure |
| BC2619 | 226906.4 | 6611434 | 265.1 | 259 | 26/08/2022 | 27/08/2022 | Cemented | Structure |
| BC2620 | 226794.5 | 6611301 | 255.5 | 253 | 28/08/2022 | 29/08/2022 | Cemented | Structure |
| BC2621 | 226629.3 | 6611333 | 274.1 | 235 | 29/08/2022 | 31/08/2022 | In progress | Structure |
| BC2622 | 228178.1 | 6612102 | 254.1 | 312 | 7/09/2022 | 12/09/2022 | In progress | Structure |
| BC2623 | 227195.6 | 6611793 | 280.7 | 261.26 | 7/09/2022 | 15/09/2022 | In progress | Coal Quality |
| BC2624 | 228381.2 | 6612293 | 276.3 | 319 | 13/09/2022 | 16/09/2022 | Cemented | Structure |
| BC2625 | 226591.5 | 6611406 | 286 | 228.1 | 15/09/2022 | 9/10/2022 | In progress | Coal Quality |
| BC2626 | 226351.6 | 6611197 | 310.5 | 234 | 6/10/2022 | 8/10/2022 | In progress | Structure |
| BC2628 | 227813.2 | 6611743 | 236.6 | 243.07 | 19/10/2022 | 29/11/2022 | In progress | Coal Quality |
| BC2629 | 227863.7 | 6611915 | 271 | 293 | 20/10/2022 | 9/11/2022 | In progress | Structure |
| BC2630 | 228492.5 | 6612491 | 288.5 | 373 | 10/11/2022 | 22/11/2022 | Cemented | Structure |
| BC2631 | 227977.6 | 6611980 | 267.3 | 285.21 | 15/11/2022 | 24/11/2022 | In progress | Coal Quality |
| BC2633 | 227331 | 6611588 | 217.6 | 235 | 1/12/2022 | 3/12/2022 | In progress | Structure |
| BC2634 | 227480.3 | 6611662 | 219.4 | 235 | 4/12/2022 | 6/12/2022 | In progress | Structure |

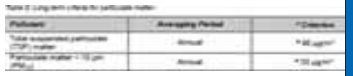
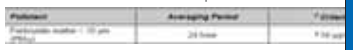
# Appendix F

2022 BCM IEA Response

Action Plan

**Boggabri Coal Mine Independent Environmental Audit, August 2020 – Audit Action Plan**

| Reference | Schedule and Condition Number | Condition | Compliance status | Evidence | Recommendation | Proposed action | Target Completion Date | Jan 2023 Status | Revised target date for completion (if required) |
|---|---|---|---|---|---|---|---|---|---|
| **Project Approval 09_0182** | | | | | | | | | |
| NC1 | Schedule 3 Condition 9 | The Proponent shall:<br>(a) Ensure that:<br>- All new trucks, dozers, drills and excavators purchased for use on the site after the date of this approval are commissioned as noise suppressed (or attenuated) units;<br>- Ensure that all equipment and nose control measures deliver sound power levels that are equal to or better than the sound power levels identified in the EA and that correspond to best practice or the application of best available technology economically achievable.<br>- Where reasonable and feasible, improvements are made to existing noise suppression equipment as technologies become available; and<br>Monitor and report on the implementation of these requirements annually on its website. | Non-Compliant Low Risk | (a) Annual testing of mobile plant and equipment is undertaken. Test results are compared with the Boggabri Coal Mine Environmental Assessment (Hanson Bailey 2010). Sound power screening levels greater than 3 dBA are considered significant and require further investigation.<br>Non compliances of sound power levels for a number of mobile plant were reported in the 2017, 2018 and 2019 Annual Reviews. BCOPL have been implementing a plant attenuation, monitoring and review program across the audit period which has involved the trail of three sound attenuation kits on six 930E Komatsu trucks. This trial is ongoing.<br>As reported in the Boggabri Coal Mine - Noise Modelling Assessment (April 2020) the majority of the mining fleet currently operates at sound power levels higher than modelled for the EA. The noise modelling assessment was undertaken to evaluate if compliance with noise limits can be achieved with the current plant. | **NC REC**: continue investigations and dialogue with DPIE regarding sound power level requirements. | BCO will continue to liaise with DPE regarding sound power level requirements. | 30/01/2022 | Ongoing consultation with DPE via MOD8 undertaken over the past 3 years. | 30/9/2023 |
| NC2 | Schedule 3 Condition 15 | The Proponent shall ensure that the blasting on the site does not cause exceedances of the criteria in Table 6.<br>  <br>However, these criteria do not apply if the Proponent has a written agreement with the relevant owner or infrastructure provider/owner, and the Proponent has advised the Department in writing of the terms of this agreement. | Non-Compliant (Low Risk) | As reported in the 2019 Annual Review, a blast fired on 21 August 2019 recorded an airblast overpressure of 123 dBL exceeding the 120dBL criteria. This exceedance was attributed to a short-term fluctuation in the upper air wind conditions that could not have been reasonably foreseen.<br>An incident report was prepared which concluded that:<br>*Blast design investigations indicate that tie in and firing conditions of the blast would ordinarily result in basic blast emission of less than 115dBL and that 123dBL can only be explained by the effects of meteorology.*<br>It is noted that no exceedances have been recorded since this time. The real time blast monitoring and weather system has been sighted and is implemented.<br>This exceedance was reported to DPIE on 28 August. BCOPL was issued with a warning letter from DPIE on 18 October 2019 for not reporting the blast overpressure exceedance within seven days of the incident. Notification of the exceedance was sent via text and email but was originally missed. This is attributable to the amount of trigger text messages which were received, particularly under the old system. | **NC REC**: Ensure blasts are undertaken under appropriate weather conditions. Delays to blasts should be implemented if required based on real time weather data review.<br><br>**NC REC**: Implement changes to the TARP notifications system to distinguish "triggers" from "exceedances" so that reportable exceedances are not missed | Blasts will only be undertaken during appropriate weather conditions. Delays will be implemented if required based on weather conditions in accordance with the Blast Management Plan<br><br>The TARP notification system will be revised to distinguish between 'triggers' and 'exceedances'. | 01/08/2021 | Blasting activities are only undertaken during appropriate weather conditions. Training with supervisors completed in October 2021.<br><br>Consultation with blast monitoring contractor re: distinguishing between 'triggers' and 'exceedances' is ongoing.<br><br>Replaced 'Texcel' monitors with new technology provided by 'Ecotech'. This has led to improved blast reporting packages and less non-blast triggers. In addition, internal process of reviewing blasting results has improved. | Closed |
| NC3 | Schedule 3 Condition 22 | The proponent shall prepare and implement a Blast Management Plan for the project to the satisfaction of the Secretary. This plan must:<br>(a) Be submitted to the Secretary for approval within 6 months from the date of project work. | Non-Compliant (Low Risk) | **Preparation**<br>The latest version of the Blast Management Plan is dated November 2018. Approved by DPIE on 21st February 2019.<br>i. The Blast Management Plan | **NC REC**: Ensure blasts are undertaken under appropriate weather conditions. Delays to blasts should be implemented if required based on real time weather data review. | Blasts will only be undertaken during appropriate weather conditions. Delays will be implemented if required based on weather conditions in accordance with the Blast Management Plan. | 01/08/2021 | Blasting activities are only undertaken during appropriate weather conditions. | Closed |

| Reference | Schedule and Condition Number | Condition | Compliance status | Evidence | Recommendation | Proposed action | Target Completion Date | Jan 2023 Status | Revised target date for completion (if required) |
|---|---|---|---|---|---|---|---|---|---|
| | | (b) be prepared in consultation with the EPA, the CCC and interested members of the local community potentially affected by blasting operations;<br>(c) propose any alternative ground vibration limits for public infrastructure in the vicinity of the site;<br>(d) describe the measures that would be implemented to ensure:<br>- best management practice is being employed; and<br>- compliance with the relevant conditions of this approval;<br>(e) include a road closure management plan for blasting within 500 metres of a public road, that has been prepared in consultation with Council;<br>(f) include a specific blast fume management protocol to demonstrate how emissions will be minimised including risk management strategies if blast fumes are generated;<br>(g) include a monitoring program for evaluating the performance of the project including:<br>- compliance with the applicable criteria; and<br>- minimising fume emissions from the site; and<br>(h) include a Leard Forest Mining Precinct Blast Management Strategy that has been prepared in consultation with other mines within the Leard Forest Mining Precinct to minimise cumulative blasting impacts.<br>*Note: The Leard Forest Mining Precinct Blast Management Strategy can be developed in stages and will need to be subject to ongoing review dependent upon the determination of and commencement of other mining projects in the area.* | | was originally prepared in January 2013, with this being within six months of the Project Approval.<br>ii. the current Blast Management Plan November 2018 summarises consultation undertaken in Appendix D<br>iii. Alternate ground vibration covered in Section 5.1 of plan<br>iv. Section 6 of BLMP<br>v. Section 6.3 of BLMP<br>vi. Appendix C<br>vii. Section 7 of BLMP<br>iii. Appendix E of BLMP<br>**Implementation**<br>Non-compliant due to 120 dBL exceedance. | | | | | |
| NC4 | Schedule 3 Condition 27 | Except for the air quality affected land in Table 7, the Proponent shall ensure that particulate matter emissions generated by the project do not exceed the criteria listed in Table 9, Table 10 and Table 11 at any residence on privately- owned land or on more than 25 percent of any privately- owned land.<br>Table 9: Long-term criteria for particulate matter<br>  <br>Table 10: Short-term criteria for particulate matter<br>  <br>Table 11: Long-term criteria for deposited dust<br>  <br>Notes to Table 9, Table 10 and Table 11:<br>a Total impact (ie incremental increase in concentrations due to the project plus background concentrations due to all other sources);<br>b Incremental impact (ie incremental increase in concentrations due to the project on its own);<br>c Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - | Administrative Non-Compliance | Evidence of air quality monitoring in Annual Reviews. Evidence of assessing the potential contribution of the site towards air quality criteria provided as notes and not included in the Annual Reviews.<br><br>1 Jan 2017 - 31 Dec 2017 - Table 4-3 of the Annual Review identifies the Roma and Merriown monitoring locations as locations to be used for compliance monitoring. However, Section 4.2.2.2 of the 2017 Annual Review outlines that the one exceedance of the short-term PM10 criterion recorded at the Merriown HVAS monitor and the two exceedances recorded at the Roma HVAS monitor "are not considered exceedances as the monitoring location is not used as a compliance measurement tool". Moreover, the exceedances described above do not match data presented in the charts. According to the chart, only a single exceedance of the 24-hour average PM10 criteria was recorded at Roma and no exceedances at Merriown.<br><br>1 Jan 2018 - 31 Dec 2018 - Based on the information provided, the site was | **NC REC**: It is recommended that in line with the requirements of note (d) of Schedule 3 Condition 27 of the Boggabri Coal PA, confirmation be sought from the secretary on the status of days believed to be extraordinary events prior to classifying any day as an extraordinary event day and removing the day from the annual average.<br><br>**NC REC**: all exceedances of the relevant air quality criteria be investigated in accordance with the requirements of the AQGHGMP to determine if they are attributable to BCOPL operations<br><br>**NC REC**: DPIE should be informed of any exceedance of the relevant air quality criteria, regardless of the exceedance being a non-compliance or not. If the exceedance is not attributable to BCOPL operations, evidence of the investigation or data that led to this conclusion should be provided with the notification;<br><br>**NC REC**: a standard methodology | BCOPL will seek the concurrence of the secretary for the classification of 'extraordinary events' prior to the status of days being classified as 'extraordinary events'.<br><br>All exceedances of the relevant air quality criteria will be investigated in accordance with the requirements of the AQGHGMP to determine if they are attributable to BCOPL operations.<br><br>BCOP will inform DPIE of exceedances of air quality criteria regardless of whether it is a non-conformance or not. Evidence of investigation or data used in concluding whether an exceedance is attributable to BCOP will be provided with exceedance notification to DPIE. .<br>A standard methodology for the investigation and reporting of any exceedance of relevant air quality criteria will be incorporated into the next revision of the AQGHGMP.<br>B<br>BCOPL will report in the Annual Review | 01/08/2021 | AQGHGMP currently under review and revision. | AQGHGMP to be submitted for approval by 30/9/2023 |

| Reference | Schedule and Condition Number | Condition | Compliance status | Evidence | Recommendation | Proposed action | Target Completion Date | Jan 2023 Status | Revised target date for completion (if required) |
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| | | Determination of Particulate Matter - Deposited Matter - Gravimetric Method.<br>d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Secretary. | | within criteria. There were some days of extraordinary events and some days when the site was upwind from the monitoring stations which recorded an exceedance.<br><br>1 Jan 2019 - 31 Dec 2019 - Based on the information provided, the site's compliance could not be established. The Annul Review mentions that 53 exceedances of the short term PM10 criteria were recorded by the Wilberoi East TEOM and that these were either due to extraordinary events (41 occasions) or due to sources other than the site. No evidence of incident investigations for 2019 was provided.<br>Based on the information presented, there is no evidence that the criteria in S3 C27 have been exceeded as a result of BCOPL emissions.<br><br>Admin non-compliant as status of extraordinary event days has not been agreed with the Secretary and DPIE was not notified of recorded exceedances of the relevant air quality criteria.<br>Whilst it is acknowledged that exceedances of the air quality criteria do not necessarily equate to a non-compliance, it is considered that all exceedances should be notified to DPIE, particularly given that note (a) to Schedule 3 Condition 27 states that criteria are "Total impact (ie incremental increase in concentrations due to the project plus background concentrations due to all other sources)". If the exceedance is not attributable to BCOPL operations, evidence of the investigation or data that led to this conclusion should be provided with the notification. | should be developed for the investigation and reporting of any exceedances recorded by the air quality monitors.<br><br>**Improvement REC**: In the interest of transparency it is recommended that:<br>1) a table of all days with exceedances of the 24-hour average criteria be included in the annual reports together with findings of any investigations and status of days as determined by DPIE (extraordinary day or not); and<br>all valid data captured by the TEOM be reported and included in the chart. Extraordinary days may then be excluded from the annual average calculations | 1) a table of all days with exceedances of the 24-hour average criteria together with findings of any investigations into the status of days as determined by DPIE (extraordinary day or not); and<br>**2)** all valid data captured by the TEOMs will be reported. Extraordinary days can then be excluded from the annual average calculations. | | | |
| NC5 | Schedule 3<br>Condition 31 | The Proponent shall prepare and implement an Air Quality and Greenhouse Gas Management Plan for the project to the satisfaction of the Secretary. This plan must:<br>(a) be prepared in consultation with the EPA and the CCC, and be submitted to the Secretary for approval within 6 months from the date of project approval;<br>(b) integrate the recommendations of a Site Specific Best Management Determination and Reactive Dust Management Strategy prepared to the satisfaction of the EPA;<br>(c) describe the measures that would be implemented to ensure:<br>…<br>(d) describe the proposed air quality management system;<br>(e) include a risk/response matrix to codify mine operational responses to varying levels of risk resulting from weather conditions and specific mining activities;<br>(f) include commitments to provide summary reports and specific briefings at CCC meetings on issues arising from air quality monitoring;<br>(g) include an air quality monitoring program that:<br>…. | Administrative Non-Compliance | There is evidence of the site not effectively implementing the AQGHGMP as follows:<br><br>1) DPIE was not notified of recorded exceedances of the relevant air quality criteria. Whilst it is acknowledged that exceedances of the air quality criteria do not necessarily equate to a non-compliance, it is considered that all exceedances should be notified to DPIE, particularly given that note (a) to Schedule 3 Condition 27 states that criteria are "Total impact (ie incremental increase in concentrations due to the project plus background concentrations due to all other sources)". If the exceedance is not attributable to BCOPL operations, evidence of the investigation or data that led to this conclusion should be provided with the notification;<br><br>2) while notes relating to exceedances of relevant air quality criteria were provided, these exceedances (even though not necessarily non- | **NC REC**: all exceedances of the relevant air quality criteria be investigated in accordance with the requirements of the AQGHGMP to determine if they are attributable to BCOPL operations<br>**NC REC**: DPIE should be informed of any exceedance of the relevant air quality criteria, regardless of the exceedance being a non-compliance or not. If the exceedance is not attributable to BCOPL operations, evidence of the investigation or data that led to this conclusion should be provided with the notification;<br>**NC REC**: a standard methodology should be developed for the investigation and reporting of any exceedances recorded by the air quality monitors. | All exceedances of the relevant air quality criteria will be investigated in accordance with the requirements of the AQGHGMP to determine if they are attributable to BCOPL operations.<br><br>A standard methodology for the investigation and reporting of any exceedance of relevant air quality criteria will be incorporated into the next revision of the AQGHGMP.<br>This will reflect outcomes of consultation with DPIE in relation to the classification of the status of days as 'extraordinary events'. | 01/08/2021 | AQGHGMP currently under review and revision. | AQGHGMP to be submitted for approval by 30/9/2023 |

| Reference | Schedule and Condition Number | Condition | Compliance status | Evidence | Recommendation | Proposed action | Target Completion Date | Jan 2023 Status | Revised target date for completion (if required) |
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| | | Includes a Leard Forest Mining Precinct Air Quality Management Strategy that has been prepared in consultation with other coal mines in the Precinct to minimise the cumulative air quality impacts of all mines within the Precinct, that includes: | | compliances) were not logged in the Incident Register and evidence of completion of BCOPL Incident Report Forms were not provided. It is also noted that a standard methodology was not adopted for the presentation of the investigation findings. | | | | | |
| NC6 | Schedule 3 Condition 38b | A Surface Water Management plan, which includes:<br>- Detailed baseline data on surface water flows and quality in the waterbodies that could potentially be affected by the project.<br>- Detailed baseline data on soils within the irrigation management area;<br>- Detailed baseline data on hydrology across the downstream drainage system of the Namoi River floodplain from the mine site to the Namoi River.<br>- A detailed description of the water management system on site, including the;<br>  Clean water diversion system<br>  Erosion and sediment controls (dirty water system);<br>  Mine water management systems irrigation areas<br>  Discharge limits in accordance with EPL requirements<br>  Water storages<br>  Haul road and Boggabri Rail Spur Line and bridge flood and water diversions;<br>- Detailed plans including design objectives and performance criteria for:<br>  Design and management of final voids<br>Design and management for the emplacement of reject materials, sodic and dispersible soils and acid or sulphate generating materials. | Non-Compliant (Low Risk) | The implementation of the currently approved surface water management plan is non-compliant as the clean water drain presented in Appendix A of the SWMP to the north of the disturbance area has been mined through and has not been reinstated. It is acknowledged that the update to the SWMP (Rev8) has been prepared depicting the absence of the clean water drain and that a report has been prepared by GHD to justify not reinstating this drain and to evidence that the site is not harvesting clean water outside of harvestable rights allowances.<br>The update to the SWMP was submitted to the DPIE for approval in July 2019; however, given that it has yet to be approved the implementation of the approved SWMP is non-compliant. It is recommended to continue to liaise with DPIE with regard to the approval of the revised water management system and the removal of the clean water diversion. | **NC REC:** continue to liaise with DPIE with regard to the approval of the revised water management system and the removal of the clean water diversion. | BCOP will submit to DPIE revised SWMP's that contemplate the removal of the clean water diversion drain. | 01/08/2021 | Revised SWMP submitted in 2021, NRAR feedback currently being reviewed. | Revised SWMP to be submitted to DPE for approval by 15/12/2023 |
| NC7 | Schedule 3 Condition 38© | (A) ©a Groundwater Management Plan, which includes: detailed baseline data of groundwater levels, yield and quality in the region, and privately-owned groundwater bores including a detailed survey/schedule of groundwater dependent ecosystems (including stygo-fauna), that could be affected by the project;<br>the monitoring and testing requirements specified in the PAC recommendations for groundwater management as set out in Appendix 6;<br>detailed plans, including design objectives and performance criteria, for the design and management of the proposed final void;<br>groundwater assessment criteria including trigger levels for investigating any potentially adverse groundwater impacts;<br>a program to monitor and assess:<br>o groundwater inflows to the open cut mining operations;<br>o the seepage/leachate from water storages, backfilled voids and the final void;<br>o interconnectivity between the alluvial and bedrock aquifers;<br>o background changes in groundwater yield/quality against mine-induced changes;<br>o the impacts of the project on: | Administrative Non-Compliance | "Preparation Approved Groundwater Management Plan (May 2017) reviewed.<br>* Baseline data provided in Section 3.3<br>*Monitoring and testing requirements in Section 4<br>* Trigger levels included in Section 5<br>* Section 7.3 states groundwater model will be reviewed very three years.<br>* Procedures for managing exceedances is included<br>Implementation<br>Groundwater monitoring is undertaken quarterly with a detailed analysis of results presented in the Annual Groundwater Monitoring Review undertaken by GHD. The review assesses BCM's groundwater monitoring data and provides analyses on groundwater levels and groundwater quality. Findings from the review are summarised in the Annual Reviews.<br>Based on the results presented in the Annual Reviews, groundwater levels have remained within trigger | **NC REC:** Continue to liaise with EPA regarding EPL variation to ensure that monitoring points in EPL align with those utilised by the site. | BCOP will continuing to liaise with EPA regarding EPL variation to ensure that monitoring points in EPL align with those utilised by the site. | 01/08/2021 | EPL Variation approved | Closed |

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| | | - regional and local (including alluvial) aquifers;<br>- groundwater supply of potentially affected landowners;<br>- aquifers potentially affected by the mine irrigation area;<br>- groundwater dependent ecosystems (including potential impacts on stygo-fauna) and riparian vegetation.<br>A program to validate the groundwater model for the project, including an independent review of the model every 3 years, and comparison of monitoring results with modelled predictions; and<br>a plan to respond to any exceedances of the performance criteria; and | | levels during the audit period.<br><br>Groundwater bores 2102 and 2103 were not monitored in 2018 and 2019 due to damage of the bore casing. Monitoring at bores 2104 and 2105 was not undertaken as they were not accessible and MW6 was not monitored as it was blocked.<br><br>Boggabri, Tarrawonga, Maules Creek Complex Numerical Model Update prepared by AGE dated 17 August 2018. " | | | | | |
| NC8 | Schedule 3<br>Condition 64 | Within 12 months of the completion of the Gunnedah Traffic Study, the Proponent shall provide a report of the outcomes of this liaison and identify any proposals recommended by either the Proponent or the Gunnedah Shire Council towards implementing reasonable and feasible recommendations, to the satisfaction of the Secretary." | Administrative Non-Compliance | No evidence of a report could be provided however, the rail over pass in Gunnedah was constructed during the audit period and opened to traffic in November 2020. This condition can be closed out. | | NO ACTION REQUIRED | No action required | N/A | Closed |
| NC9 | Schedule 4<br>Condition 3 | As soon as practicable after obtaining monitoring results showing:<br>(a) An exceedance of the relevant criteria in schedule 3, the Proponent shall notify the affected landowner in writing of the exceedance, and provide regular monitoring results to each of these parties until the projects is complying with the relevant criteria again; and<br>(b) An exceedance of the relevant air quality criteria in schedule 3, the Proponent shall send a copy of:<br>- The NSW Health fact sheet entitled "mine Dust and You" (as may be updated from time to time); and<br>The air quality monitoring data, in an appropriate format so that a medical practitioner can assist the resident in making an informed decision on the health risks associated with occupation of the property to the landowner/s and/or existing tenants of the land. | Non-Compliant (Low Risk) | (A) **Non-compliant** – A blast on the 21 August 2019 exceeded the limit of 120 dBL. A recording of 123dBL was recorded at Wilderoi East. Verbal notification was provided to landowners. However, this was not notified to EPA and residents until 28 August. The DPIE and EPA issued notices for the non-reporting.<br>No reportable dust exceedances were recorded in the audit period. | **NC REC:** Implement changes to the TARP notifications system to distinguish "triggers" from "exceedances" so that reportable exceedances are not missed. | The TARP notification system will be revised to distinguish between 'triggers' and 'exceedances'. | 01/08/2021 | Refer to NC2 | |
| NC10 | Schedule 5<br>Condition 4 | "By the end of March each year, the Proponent shall review the environmental performance of the project for the previous calendar year to the satisfaction of the Secretary. This review must:<br>(a) describe the development (including any rehabilitation) that was carried out in the past calendar year, and the development that is proposed to be carried out over the current calendar year;<br>(b) include a comprehensive review of the monitoring results and complaints records of the project over the past year, which includes a comparison of these results against the:<br>relevant statutory requirements, limits or performance measures/criteria;<br>monitoring results of previous<br>years; and relevant<br>predictions in the EA;<br>(c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;<br>(d) identify any trends in the monitoring data over the life of the project; | Administrative Non-Compliance | "Annual reviews for 2017, 2018 and 2019 were provided. They are also available on the BCOPL website. Each were submitted to DPIE prior to the end of March.<br><br>A) Rehabilitation details are provided in Section 8 of the Annual Review<br>b) Monitoring results and comparison with performance are included in Section. 4. Complaints are summarised in Section 7.3<br>c) non-compliances are summarised in Section 5<br>d) trends in monitoring are included in Section 4. As noted in the previous audit, while long term trends associated with groundwater are presented in the annual reviews, there is little information relating to longer terms trends for air quality, surface water and noise over the life of mine as required by this condition.<br>e) discrepancies against predictions (as relevant) are covered in Section 4 | **Improvement REC:** Include additional information in the annual reviews regarding longer term trends particularly in terms of surface water, noise and air quality | BCOP will include additional information in the annual reviews regarding longer term trends particularly in terms of surface water, noise and air quality. | Annual Review 2021 | Now included in scope for all Annual Reviews. | Closed |

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| | | (e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and<br>describe what measures will be implemented over the next year to improve the environmental performance of the project." | | next years activities and improvements are included in section 5 and 9" | | | | | |
| NC11 | Schedule 5 Condition 5 | "Within 3 months of the submission of:<br>(a) an annual review under condition 4 above;<br>(b) an incident report under condition 8 below;<br>(c) an audit under condition 10 below; and<br>(d) any modification to the conditions of this approval,<br><br>the Proponent shall review the strategies, plans, and programs required under this approval.<br><br>Where this review results in revisions to any such document, then within 4 weeks of the completion of the revision, unless the Secretary agrees otherwise, the revised document must be submitted to the Secretary for approval." | Administrative Non-Compliance | "It is acknowledged that BCOPL has been progressively working on updating management plans for several years with revised versions submitted to department.<br><br>Management plans and strategies have been updated over the last three years with the exception of the CHMP which is dated November 2016. " | **Improvement REC:** Prepare a document review register to evidence dates when documents are reviewed. Register should identify if any changes are identified as being required. | BCOP will create a register to capture and track details of when documents are updated including the review and revision of management plans and relevant supporting documents. | 01/07/2021 | Closed. Document map prepared | Closed |
| NC12 | Schedule 5 Condition 8 | The Proponent shall notify, at the earliest opportunity, the Secretary and any other relevant agencies of any incident that has caused, or threatens to cause, material harm to the environment. For any other incident associated with the project, the Proponent shall notify the Secretary and any other relevant agencies as soon as practicable after the Proponent becomes aware of the incident. Within 7 days of the date of the incident, the Proponent shall provide the Secretary and any relevant agencies with a detailed report on the incident, and such further reports as may be requested. | Non-Compliant (Low Risk) | This exceedance was reported to DPIE on 28 August. BCOPL was issued with a warning letter from DPIE on 18 October 2019 for not reporting the blast overpressure exceedance within seven days of the incident. Notification of the exceedance was sent via text and email but was originally missed. This is attributable to the amount of trigger text messages which were received, particularly under the old system. | **NC REC:** Implement changes to the TARP notifications system to distinguish "triggers" from "exceedances" so that reportable exceedances are not missed. | The TARP notification system will be revised to distinguish between 'triggers' and 'exceedances'. | 01/08/2021 | Refer to NC2 | Closed |
| | | | | | | | | | |
| NC13 | 9 | Boggabri Coal will manage its blasting practices such that the recommended DECCW guidelines, existing at the time of approval; will be met at all privately owned receivers. | Non-Compliant (Low Risk) | As reported in the 2019 Annual Review, a blast fired on 21 August 2019 recorded an airblast overpressure of 123 dBL exceeding the 120dBL criteria. This exceedance was attributed to a short-term fluctuation in the upper air wind conditions that could not have been reasonably foreseen. | **NC REC:** Ensure blasts are undertaken under appropriate weather conditions. Delays to blasts should be implemented if required based on real time weather data review.<br><br>**NC REC:** Implement changes to the TARP notifications system to distinguish "triggers" from "exceedances" so that reportable exceedances are not missed. | Blasts will only be undertaken during appropriate weather conditions. Delays will be implemented if required based on weather conditions in accordance with the Blast Management Plan<br><br>The TARP notification system will be revised to distinguish between 'triggers' and 'exceedances'. | 01/08/2021 | Refer to NC2 | Closed |
| | | | | | | | | | |
| NC14 | P1.3 | The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point. | Administrative Non-Compliance | 'Review of "EPL Boundary and Environmental Monitoring Locations" figure confirm locations of each EPA monitoring ID number.<br><br>There was no water discharge events in 2017 to 2019 therefore sampling was not triggered. In February 2020 there was one discharge event. Sampling was undertaken at SW1, SW2 and SD6.<br><br>Groundwater bores 2102 and 2103 were not monitored in 2018 and 2019 due to damage of the bore casing. Monitoring at 2104 and 2105 was not undertaken as they were not accessible and MW6 was not monitored as it was blocked. | **NC REC:** Continue to liaise with EPA regarding EPL variation to ensure that monitoring points in EPL align with those utilised by the site. | BCOP will continue to liaise with EPA regarding EPL variation to ensure that monitoring points in EPL align with those utilised by the site. | 01/08/2021 | EPL variation approved. | Closed |

| Reference | Schedule and Condition Number | Condition | Compliance status | Evidence | Recommendation | Proposed action | Target Completion Date | Jan 2023 Status | Revised target date for completion (if required) |
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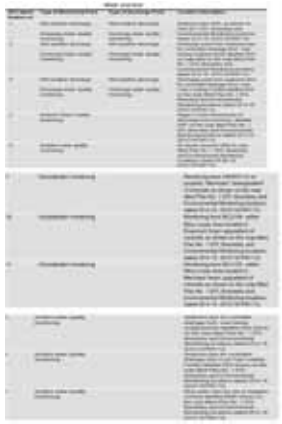
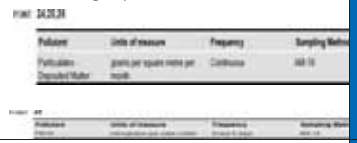
| | |  | | | | | | | |
| NC15 | L4.1 | The airblast overpressure level from blasting operations at the premises must not exceed 120dB (Lin Peak) at any time at any noise sensitive locations. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded. | Non-Compliant (Low Risk) | 'As reported in the 2019 Annual Review, a blast fired on 21 August 2019 recorded an airblast overpressure of 123 dBL exceeding the 120dBL criteria. This exceedance was attributed to a short-term fluctuation in the upper air wind conditions that could not have been reasonably foreseen.<br>An incident report was prepared which concluded that:<br>Blast design investigations indicate that tie in and firing conditions of the blast would ordinarily result in basic blast emission of less than 115dBL and that 123dBL can only be explained by the effects of meteorology.<br>This exceedance was reported to DPIE on 28 August. BCOPL was issued with a warning letter from DPIE on 18 October 2019 for not reporting the blast overpressure exceedance within seven days of the incident. Notification of the exceedance was sent via text and email but was originally missed. This is attributable to the amount of trigger text messages which were received, particularly under the old system. | **NC REC:** Ensure blasts are undertaken under appropriate weather conditions. Delays to blasts should be implemented if required based on real time weather data review.<br><br>**NC REC:** Implement changes to the TARP notifications system to distinguish "triggers" from "exceedances" so that reportable exceedances are not missed. | Blasts will only be undertaken during appropriate weather conditions. Delays will be implemented if required based on weather conditions in accordance with the Blast Management Plan<br><br>The TARP notification system will be revised to distinguish between 'triggers' and 'exceedances'. | 01/08/2021 | Refer to NC2 | |
| NC16 | M2.2 | Air Monitoring Requirements<br>  | Administrative Non-Compliance | In the 2019 - 2020 annual return sampling at three of the HVAS was not undertaken as private residences requested urgent removal of the monitoring units. | **NC REC:** Continue to liaise with EPA regarding EPL variation to ensure that monitoring points in EPL align with those utilised by the site. | BCOP will continue to liaise with EPA regarding EPL variation to ensure that monitoring points in EPL align with those utilised by the site. | 01/08/2021 | EPL Variation approved | Closed |
| NC17 | M2.3 |  | Administrative Non-Compliance | As reported in the Annual Returns sampling of some groundwater locations was not able to be undertaken (site 10,11 and 18). This was due to 10 and 11 being destroyed by mining and 18 being blocked. A variation has been submitted to the EPA for a variation to remove the destroyed bores. | **NC REC:** Continue to liaise with EPA regarding EPL variation to ensure that monitoring points in EPL align with those utilised by the site. | BCOP will continue to liaise with EPA regarding EPL variation to ensure that monitoring points in EPL align with those utilised by the site. | 01/08/2021 | EPL variation approved | Closed |

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| NC18 | M2.3 |  | Administrative Non-Compliance | There was no sample undertaken at location 39 for three out of the four quarters in the 2017 - 2018 reporting period. The 2017-2018 annual return also identified that samples were not taken from sites 19 and 20 but these have subsequently been removed from the EPL. | **NC REC:** Continue to liaise with EPA regarding EPL variation to ensure that monitoring points in EPL align with those utilised by the site. | **BCOP** will continue to liaise with EPA regarding EPL variation to ensure that monitoring points in EPL align with those utilised by the site. | 01/08/2021 | EPL variation approved | Closed |
| NC19 | R2.2 | The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred. | Administrative Non-Compliance | 'As reported in the 2019 Annual Review, a blast fired on 21 August 2019 recorded an airblast overpressure of 123 dBL exceeding the 120dBL criteria. This exceedance was attributed to a short-term fluctuation in the upper air wind conditions that could not have been reasonably foreseen. | **NC REC:** Implement changes to the TARP notifications system to distinguish "triggers" from "exceedances" so that reportable exceedances are not missed. | The TARP notification system will be revised to distinguish between 'triggers' and 'exceedances. | 01/08/2021 | Refer NC2 | |
| | | | | | | | | | |
| NC20 | 4 | (a) The lease holder must lodge Environmental Management Reports (EMR) with the Director-General annually or at dates otherwise directed by the Director- General.<br>(b) The EMR must:<br>(i) report against compliance with the MOP;<br>(ii) report on progress in respect of rehabilitation completion criteria;<br>(ii) report on the extent of compliance with regulatory requirements; and<br>have regard to any relevant guidelines adopted by the Director-General. | Administrative Non-Compliance | The site annual reviews are prepared to meet this condition.<br>Annual reviews are prepared for the site for the period of 1 January to 31 December.<br>All Annual Reviews for audit period are signed and dated prior to end of March. Also sighted submission confirmation of submission for each year.<br>The annual reviews generally cover these requirements.<br>However, progression towards rehabilitation completion criteria is only mentioned with regard to the species richness analogue benchmark. Rehabilitation areas should be tracked against the phases in the MOP with evidence provided to justify whether the rehabilitation has met the rehabilitation objectives of that phase and domains.<br>It is noted that the Resources Regulator has recently released proposed amendments to the rehabilitation compliance and reporting requirements | **NC REC:** Future Annual Reviews must report on progress in respect of rehabilitation completion criteria.<br><br>**NC REC:** Review rehabilitation monitoring process in line with the Resources Regulator Annual Rehabilitation Report guidance (http://www.resourceregulators.nsw.gov.au/_data/assets/pdf_file/00171262330/Form-And-way-Annual-rehabilitation- report-and -forward-program-for-large- mines.pdf) to ensure that progress against completion criteria is completed as required. | BCOP will report on progress in respect of rehabilitation completion criteria in future Annual Reviews.<br><br>BCOP will review the rehabilitation monitoring process in line with the Resources Regulator Annual Rehabilitation Report guidance (http://www.resourceregulators.nsw.gov.au/_data/assets/pdf_file/00171262330/Form-And-way-Annual-rehabilitation-report-and -forward-program-for-large-mines.pdf) to ensure that progress against completion criteria is completed as required. | 2021 Annual Review | Now included in scope for all Annual Reviews. | Closed |
| NC21 | 10 | **(a) Ground Vibration**<br>The lease holder must ensure that the ground vibration peak particle velocity generated by any blasting within the lease area does not exceed 10 mm/second and does not exceed 5 mm/second in more than 5% of the total number of blasts over a period of 12 months at any dwelling or occupied premises as the case may be, unless determined otherwise by the Department of Environment, Climate Change and Water.<br><br>**(b) Blast Overpressure**<br>The lease holder must ensure that the blast overpressure noise level generated by any blasting within the lease area does not exceed 120 dB (linear) and does not exceed 115 dB (linear) in more than 5% of the total number of blasts over a period of 12 | Non-Compliant (Low Risk) | A blast on the 12 August 2019 exceeded the limit of 120 dBA. A recording of 123dBA was recorded at Wilberoi East. Landowners were verbally notified and notification was provided to DPIE as per PA 09_0182 | **NC REC:** Ensure blasts are undertaken under appropriate weather conditions. Delays to blasts should be implemented if required based on real time weather data review. | Blasts will only be undertaken during appropriate weather conditions. Delays will be implemented if required based on weather conditions in accordance with the Blast Management Plan. | 01/08/2021 | Blasting activities are only undertaken during appropriate weather conditions. | Closed |

| Reference | Schedule and Condition Number | Condition | Compliance status | Evidence | Recommendation | Proposed action | Target Completion Date | Jan 2023 Status | Revised target date for completion (if required) |
|---|---|---|---|---|---|---|---|---|---|
| | | months, at any dwelling or occupied premises, as the case may be, unless determined otherwise by the Department of Environment, Climate Change and Water. | | | | | | | |

| Reference | Schedule and Condition Number | Condition | Compliance status | Evidence Collected | Recommendation | Proposed action | Target date completion | Feb 2023 Status | Revised target date for completion (if required) |
|---|---|---|---|---|---|---|---|---|---|
| **Project Approval - Schedule 3, Conditions 39-54 (BIODIVERSITY MATTERS)** | | | | | | | | | |
| NC1 (Biodiversity Compliance Audit) | Schedule 3, Condition 54 | The Proponent shall prepare a Eucalyptus Forestry Plantation Offset Strategy to the satisfaction of Forests NSW, within 12 months of the date of this approval. The Forestry Plantation Offset Strategy shall provide at least a minimum 168 ha plantation area (as committed in the EA), or alternative as agreed by Forests NSW. The Strategy shall identify proposed funding and management arrangements for the development and maintenance of the plantation offset. If there is a dispute over these requirements, either party may refer it to the Secretary for resolution, whose decision shall be final. | Non-compliance | Boggabri Coal have provided Umwelt with information that shows evidence of progress being made on this strategy. As of November 2020 Boggabri Coal have provided Forestry NSW with a draft strategy. Evidence has been provided that Forestry NSW does not see benefit in the strategy proposed by Boggabri Coal. | It is recommended that an extension to this approval condition is sought. It is recommended that, together with Forests NSW, this strategy is promptly finalised to the satisfaction of the relevant parties. | BCOP will continue to consult with Forests NSW to seek achieve their satisfaction. | 01/12/2021 | Boggabri Coal has agreed with Forestry Corporation NSW to provide compensation in lieu of the Eucalyptus Forestry Plantation Offset Strategy required by Schedule 3, condition 54. | Closed |

**Improvement Recommendations**

| Rec # | Aspect | Recommendation | Proposed response | Target Completion Date | Feb 2023 Status | Revised target date for completion (if required) |
|---|---|---|---|---|---|---|
| Improvement REC 1 | Blasting | Recommend for drone footage to continue for longer so that future complaints may be verified to determine whether blast fume did remain and travel off site at a distance. | Drone footage will be extended beyond the initial blast to record more of the blast cloud to assist with determining whether blast fume did remain and travel off site at a distance. | 31/3/21 | Complete | Closed |
| Improvement REC 2 | Noise Management Plan | Update the Noise Management Plan to reflect new TARPs developed since the transition to Teledata real time system. | The next revision of the noise management plan will include the revised TARPs. | 1/8/2021 | Revised NMP contains revised TARPs. To be submitted for approval. | 30/9/2023 |
| Improvement REC 3 | Dust | Regularly include discussion around dust impacts in morning briefings and make EPA Dust Handbook available to all operators. Empower operators to contact OC to request water cart or mitigation if dust generation is observed. | The EPA dust handbook will be made available at the morning briefings. During the prestart information session dust impacts will be discussed and operators reminded to call up OCE and request water carts when required. | Ongoing | Complete | Closed |
| Improvement REC 4 | Weed management | Undertake weed management on topsoil stockpiles to mitigate risk of weed infestation to rehabilitation areas. | Periodic spraying and management of weeds in topsoil stockpiles will be undertaken as part of ongoing management of weeds and pests on site. | Ongoing | Complete | Closed |
| Improvement REC 5 | Surface water management | Undertake appropriate investigations to determine how requirements for 1 GL air capacity can be retained following mining through of MW5. | The long term mine planning team is developing options to ensure adequate air capacity and water storage is planned and provided prior to MW5 being mined through. | Ongoing | Complete | Closed |
| Improvement REC 6 | EPL | Vary the EPL in consultation with EPA to align with the appropriate borehole locations and remove those that have been mined through. | BCOP is continuing to liaise with EPA regarding EPL variation to ensure that monitoring points in EPL align with those utilised by the site. | 01/08/2021 | Complete | Closed |
| Improvement REC 7 | Heritage | Implement the outstanding recommendations from the 2017 Audit as reported in the 2019 Annual Review in the updated CHMP. | The CHMP is currently being revised and recommendations will be addressed in the revision. | 30/09/2021 | Draft complete, consultation ongoing. To be submitted to DPE. | 30/9/2023 |
| Improvement REC 8 | Heritage | Incorporate the recommended improvements from the OEH into the revised CHMP. | The CHMP is currently being revised and recommendations will be addressed in the revision. | 30/09/2021 | Draft Complete, consultation ongoing. To be submitted to DPE. | 30/9/2023 |
| Improvement REC 9 | Rehabilitation | Undertake further investigations to confirm that the proposed "rice paddy" final landform meets this development consent condition of "constructed landforms drain to the natural environment" and the MOP rehabilitation objective of creating a stable free draining landform. | Investigation in landform design will be undertaken to confirm conformance with development consent. | 01/07/2021 | Complete | Closed |
| Improvement REC 10 | Rehabilitation | Undertake additional weed management in rehabilitation areas and repairs to erosion / scouring as required. | Periodic spraying and management of weeds in rehabilitation areas will be undertaken as part of ongoing management of weeds and pests on site. | Ongoing | Complete | Closed |
| Improvement REC 11 | Rehabilitation | Consider cover crops and/or hydromulch to assist with stabilisation in tubestock areas until tubestock takes off and ground cover increases. | A review of the 2020 tree planting and rehabilitation program will be undertaken to identify what has worked well and areas for improvement. The review consider the use of cover crops and/or hydromulching to assist with stabilisation. | 01/08/21 | Complete | Closed |
| Improvement REC 12 | Annual review | Include additional information in the annual reviews regarding longer term trends particularly in terms of surface water, noise and air quality | BCOP will include additional information in the annual reviews regarding longer term trends particularly in terms of surface water, noise and air quality. | 2021 Annual Review | Complete | Closed |
| Improvement REC 13 | Management plans | Prepare a document review register to evidence dates when documents are reviewed. Register should identify if any changes are identified as being required. | BCOP will create a register to capture and track details of when documents are updated including the review and revision of management plans and relevant supporting documents. | 01/06/21 | Complete | Closed |
| Improvement REC 14 | Real time monitoring data | Include the daily operational response information in the real time summary report available on the website to evidence to the public that operational changes are made. | A review of information provided on the website regarding operational responses to conditions will be undertaken. | 01/06/21 | Complete | Closed |
| Improvement REC 15 | WAL reporting | It is recommended that the Annual Review includes additional information to detail the amounts of water in the account at the start of the accounting period and to provide further justification, transparency and evidence that the total water extraction remains within the total allowed allocations. | The information provided in the Annual Review on water allocations will be reviewed. | 31/03/21 | Complete | Closed |

**Biodiversity Improvement Recommendations**

| | Biodiversity Audit recommendations for continual improvement | Response | Target Completion Date | Feb 2023 Status | Revised target date for completion (if required) |
|---|---|---|---|---|---|
| 1 | Recommendations to aid the continual improvement of the site:<br>• Trial some thinning of dense eucalypts in woodland rehabilitation to stimulate the growth of those remaining and also to stimulate general flora species diversity and establishment | A trial of selectively thinning eucalyptus in the more advanced and dense rehabilitated areas will be undertaken. This will help to determine if such practices and may stimulate growth of the remaining flora and encourage greater species diversity. | December 2021 | Experts engaged and scoping study performed. Recommendations received by BCOP | 15/12/2023 |
| | • Perform remediation works in established rehabilitation areas affected by erosion | Areas affected by erosion will be remediated. | December 2021 | Ongoing – Repairs commenced in 2022 | Ongoing |
| | • Opportunities for rehab planting design improvements/trials | Rehab planting design improvements/ trials will be incorporated into future rehabilitation areas. | December 2024 | Rehab design improvement report received. To be incorporated into future rehabilitation | Ongoing |
| | • Erect nest boxes over rehabilitation and Biodiversity Offset Areas (BOAs) | Installation of nest boxes in the rehabilitation area and the BOA's will commence in 2021 | Commence 2021 | Ongoing | Ongoing |
| | • Finalise placement of salvaged habitat (logs) across BOAs | A plan will be developed for the final placement of salvaged habitat logs across the BOAs. | December 2021 | BOA's for habitat log placement have been identified | Ongoing |
| | • Ensure soil storage stockpiles are maintained at heights no greater than 3 m (as per management plan) | Soil storage stockpiles will be managed in accordance with the management plan. | Ongoing | Regular inspections ongoing | Ongoing |
| 2 | Recommendations regarding the inadvertent understorey over clearing cleared area: | Regular inspection of the IUO area will be undertaken to detect changes. | Ongoing | Regular inspections ongoing | Ongoing |
| | • Ecological monitoring to assess the development of understorey vegetation and weeds | Ecological monitoring to assess the development of understorey vegetation will be undertaken during inspection. | Ongoing | Annual monitoring ongoing | Ongoing |
| | • Erosion areas be appropriately remediated | Remediation of eroded areas will be undertaken as required. | Ongoing | Erosion repairs completed | Ongoing |
| | • Ensure signage is effective. | Signage will be checked and replaced and or moved to ensure it remains effective. | Ongoing | Signed installed | Ongoing |

**Appendix G**

Proposed 2023 Tree Clearing Areas Covered by Arch Survey & Salvage during 2022


| REV | REVISIONS | DATE |
|---|---|---|
| | | |
| | | |
| | | |

Completion of the Quality Record is evidence that the design and drawing have been verified conforming with the requirements of the Quality Plan. Where the Quality Record is incomplete, all information on this drawing is assumed for preliminary purposes only, as it is unchecked.

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BOGGABRI COAL

| QUALITY RECORD | | | |
|---|---|---|---|
| REVIEW | NAME | SIGNATURE | DATE |
| DRAWN | MC GARDNER | | 24/1/23 |
| DWG CHECKED | | | |

SCALE: See Bar Scale

Planned Arch Survey and Salvage for Proposed 2023 Tree Clearing

Proposed 2023 Tree Clearing Area

FILE REF: Proposed 2022 Tree clearing assess Arch salvage 020522.dwg

PLOT FILE: Proposed 2022 Tree clearing assess Arch salvage 020922.pdf

JOB REF: 0045

ORIG. FILE SIZE: A4

# Boggabri Coal Mine

FIGURE:
PROPOSED 2023 TREE CLEARING AREAS COVERED BY ARCH SURVEY AND SALVAGE DURING 2022

DRAWING NO.: 2401234

REV:

# Appendix H

2022 Site Water Balance

Boggabri Coal Operations Pty Ltd

# Site Water Balance

27 March 2023

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## Revision Control Chart

| Revision | Date | Prepared by | Reviewed by | Approved by |
|---|---|---|---|---|
| 0 | 27/04/2012 | L Doeleman | L Gleeson,<br>T Swanson | J Rennick |
| 1 | 14/09/2012 | L Doeleman | B Bird | J Green |
| 2 | 19/07/2013 | N Harcombe,<br>A Hedjripour | S Trott,<br>V O'Keefe | C Dingle |
| 3 | 9/10/2013 | N Harcombe,<br>A Hedjripour | S Trott,<br>V O'Keefe | C Dingle |
| 4 | 18/11/2013 | N Harcombe | S Trott | J Green |
| 5 | 12/02/2014 | K Agllias | S Trott | J Green |
| 6 | 4/06/2015 | L Doeleman | N Geale | J Green |
| 7 | 10/09/2015 | L Doeleman | N Geale | J Green |
| 8 | 18/05/2017 | T Tinkler,<br>A Wyatt | H Russell | P Forbes |
| 9<br>(Calendar year 2019) | 23/04/2021 | M Best,<br>A Wyatt | K Halliday | H Russell |
| 10<br>(Calendar Year 2020) | 30/08/2021 | M Best,<br>A Wyatt | K Halliday | H Russell |
| 11<br>(Calendar Year 2020) | 20/04/2021 | M Best,<br>A Wyatt | K Halliday | H Russell |
| 12<br>(Calendar Year 2022) | 27/03/2023 | J O'Brien | T McDermott | A Williams |

# Contents

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# Abbreviations

| Abbreviation | Term |
|---|---|
| ARI | Average Recurrence Interval |
| AWBM | Australian Water Balance Model |
| AWD | Available Water Determinations |
| BCM | Boggabri Coal Mine |
| BCOPL | Boggabri Coal Operations Pty Limited |
| BOM | Bureau of Meteorology |
| BTM | Boggabri-Tarrawonga-Maules Creek |
| CCC | Community Consultative Committee |
| CWHD | Clean Water Highwall Dam |
| CHPP | Coal Handling and Preparation Plant |
| DPEW | Department of Planning and Environment – Water |
| EA | Environmental Assessment |
| EPA | Environment Protection Authority |
| EP&A Act | *Environmental Planning and Assessment Act 1979* |
| EPBC Act | *Environmental Protection and Biodiversity Conservation Act 1999* |
| EPL | Environment Protection Licence |
| GWMP | Groundwater Management Plan |
| HOV | High Operating Volume |
| LDP | Licensed Discharge Point |
| LOM | Life-of-Mine |
| LOV | Low Operating Volume |
| MCCM | Maules Creek Coal Mine |
| MIA | Mine Infrastructure Area |
| ML | Megalitres |
| MOP | Mine Operations Plan |
| Mtpa | Million Tonnes Per Annum |
| MWD | Mine Water Dam |
| NLLS | North West Local Lands Services (formerly Namoi Catchment Management Authority) |
| NSW | New South Wales |
| PAC | NSW Planning Assessment Commission |
| RMP | Rehabilitation Management Plan |
| ROM | Run of Mine |
| SILO | Scientific Information for Land Owners |
| SWB | Site Water Balance |
| SWMP | Surface Water Management Plan |
| TCM | Tarrawonga Coal Mine |
| WAL | Water Access Licence |

| Abbreviation | Term |
|---|---|
| WMP | Water Management Plan |
| WMS | Water Management System |
| WSP | Water Sharing Plan |

# 1. Introduction

## 1.1 Overview

This Site Water Balance (SWB) has been developed for Boggabri Coal Mine (BCM) which is managed by Boggabri Coal Operations Pty Ltd (BCOPL). BCOPL is owned by Idemitsu Australia Resources Pty Limited (80%), Chugoku Electric Power Australia Resources Pty Ltd (10%) and NS Boggabri Pty Limited (10%). BCM is located 15 km north-east of the township of Boggabri in north-western New South Wales (NSW).

BCM is an open cut coal mine that has been operating since 2006. Truck and excavator operations are used to mine a run-of-mine (ROM) coal which is crushed and screened to produce a thermal coal product or washed in the Coal Handling Preparation Plant (CHPP) to produce Coking or Pulverised Coal Injected product. Product coal is loaded onto trains via a train loading facility at the mine site and transported by rail to the Port of Newcastle for export.

The mine currently operates under State Significant Development Consent (SSD 09_0182), which allows BCOPL to produce 8.6 million tonnes per annum (Mtpa) of ROM coal from BCM until the end of 2033. Approval was granted by the NSW Planning Assessment Commission (PAC) under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 18 July 2011 and has been subject to a number of modifications.

In 2015, BCOPL lodged an application under Section 75W of the EP&A Act to modify PA09_0182 (MOD 5). The modification was supported by an Environmental Assessment (Parsons Brinckerhoff, 2015) for the conversion of existing test bores to operational production bores to supply water to BCM and the installation of ancillary infrastructure on adjoining properties. The application was determined by the NSW Department of Planning and Infrastructure, Executive Director under delegation by the Minister for Planning and was approved on 30 August 2016.

Schedule 3, Condition 38 (a) of the state Project Approval requires the preparation of a SWB. This SWB has been prepared to meet this requirement. The requirements of the SWB are listed in Table 1-1.

Conditions of approval under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) were granted by the then Commonwealth Department of Sustainability, Environment, Water, Population and Communities (now Department of Climate Change, Energy, the Environment and Water (DCCEEW)) on 11 February 2013 (EPBC Approval). The EPBC Approval conditions do not relate specifically to the SWB, but rather to the Surface Water Management Plan (SWMP). This SWB should be read in conjunction with the SWMP.

The SWB considers the current Life-of-Mine (LOM) planning and information available to define components of the SWB. To ensure clarity throughout the SWB, reference is made to two distinct mine plans for which demand, usage and storage characteristics are based, specifically the:

1. Mining Operations Plan 2020-2024 Amendment A (MOP): The MOP spans a period between 2020 and 2024. Mine plan snapshots and water management system (WMS) components relevant to mine years 2022, 2023 and 2024 are aligned with the MOP. It should be noted the MOP was replaced with a Rehabilitation Management Plan (RMP) and other supporting documentation as of July 2022.

2. Environmental Assessment (EA) Mine Plan: lodged in 2009 and conditionally approved by the NSW Minister for Planning and Infrastructure in July 2012. The EA mine plan spans a 21-year period between 2013 and 2034. Mine plan snapshots and the WMS for years 2025 to 2033 are based on the EA mine plan.

The Project Approval (PA 09_0182) conditions outlining the requirements for the SWB are provided in the Water Management Plan (WMP) and summarised in Table 1-1.

**Table 1-1 Project Approval Conditions – Planning Assessment Commission of NSW**

| Applicable Condition | Requirement | SWB Reference |
|---|---|---|
| Schedule 3, Condition 38(a) | The Proponent shall prepare and implement a Water Management Plan for the project to the satisfaction of the Secretary. This plan must be prepared in consultation with OEH, DPIW, North Water Local Land Service and the CCC, by suitably qualified and experienced person/s whose appointment has been approved by the Secretary, and be submitted to the Secretary for approval within 6 months of the date of this approval [which shall include]: | This SWB forms part of the WMP. Suitably qualified and approved persons have prepared the plan in accordance with this requirement. |
| | a Site Water Balance, that: | Section 3 and 4 |
| | • includes details of: | |
| | - sources and security of water supply, including contingency for future reporting periods; | Section 3.3.2 and 4.3.4 |
| | - prioritisation strategy for water sources; | Section 3.3.2.1 |
| | - water use on site; | Section 3.3 |
| | - water management on site; | Section 3.3 |
| | - any off-site water discharges; | Section 4.3.5 |
| | - reporting procedures, including the preparation of a site water balance for each calendar year; | Section 6.3 |
| | - a program to validate the surface water model, including monitoring discharge volumes from the site and comparison of monitoring results with modelled predictions; | Section 4.2 and 6.2 |
| | - methodologies used in the preparation of the site water balance, including provision of data sources, measurement type (direct sample/mass balance/engineer calculations/factors) and formulas used for all inflows, processes and outflows; and | Section 4 and Appendix B |
| | • is supported by an annual improvement program to identify and address deficiencies and improvements within monitoring, measurement and calculation methods; and | Section 6.1 |
| | • includes an action plan and schedule to implement annual water efficiency initiatives and the recommendations in the Advisian peer review report titled “Peer Review of Site Water Balance Use Aspects of Boggabri Coal MOD 5 Project, 22 July 2016” as set out in Appendix 6A; and | Section 5 |
| | • describes the measures that would be implemented to minimise clean water use on site | Section 3.3.2 and Section 5 |

## 1.2 Related Water Management Documents

This SWB report has been prepared as an integral part of, and should be read in conjunction with, the documents listed in Table 1-2. The WMP document hierarchy is shown in Figure 1-1.

**Table 1-2 Related Water Management Documents**

| Document | Description |
|---|---|
| Boggabri Tarrawonga Maules Creek (BTM) Complex Water Management Strategy | Regional strategy prepared in consultation with Tarrawonga Coal Mine (TCM) and Maules Creek Coal Mine (MCCM) |
| Water Management Plan | Overarching document setting out water management framework, statutory requirements and procedural requirements |
| Surface Water Management Plan | Surface water baseline data, performance criteria, monitoring program, response plan, WMS description, erosion and sediment controls |
| Groundwater Management Plan | Groundwater baseline data, performance criteria, monitoring program, response plan and groundwater model validation program |
| **Site Water Balance** | **Mine water balance modelling methodology, assumptions, and results, mine water management system operating philosophy** |

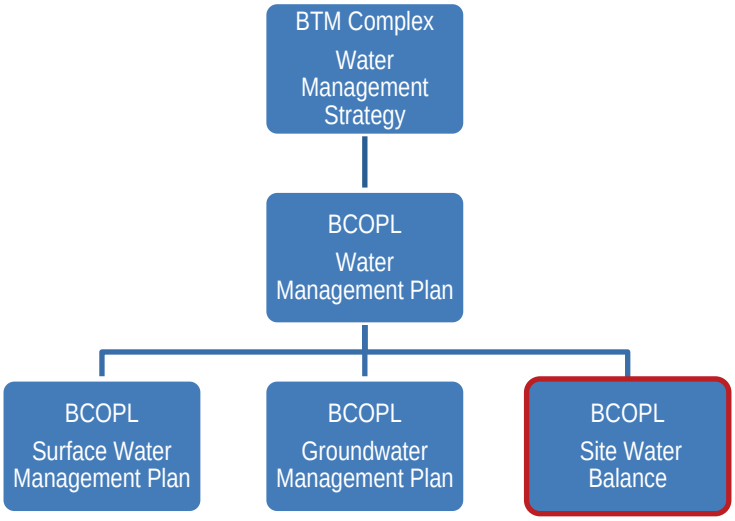



**Figure 1-1 Document Hierarchy**

## 1.3 Consultation

Previous versions of this SWB were prepared in consultation with representatives from the NSW Environment Protection Agency (EPA), NSW Department of Primary Industry – Water (now Department of Planning and Environment – Water (DPEW)), North West Local Land Services (NLLS) (formerly Namoi Catchment Management Authority) and the Community Consultative Committee (CCC).

The SWB has been prepared by suitably qualified persons approved by DPE to undertake this work.

## 1.4 Environment Protection Licence

The conditions described in this SWB reflect the conditions set out in the current Environment Protection Licence (EPL 12407, as at the date of the SWB). Condition L1.1 requires compliance with Section 120 of the *Protection of the Environment Operations Act 1997*.

BCOPL currently have three approved Licenced Discharge Points (LDP)s. These are listed in Section P1.3 of EPL 12407.

As mining progresses, EPL discharge points will be reviewed and updated in consultation with the EPA. Surface water discharge criteria are specified in the EPL and outlined in the SWMP.

# 2. Existing Environment

## 2.1 Catchment Description

BCM is contained within the catchments of Nagero Creek and Bollol Creek. Both Nagero Creek and Bollol Creek are ephemeral tributaries of the Namoi River, which is part of the Barwon-Darling River system.

Most of BCM is within the Nagero Creek catchment. Nagero Creek flows south-west from its headwaters in Leard State Forest upstream of the mine before flowing west through agricultural lands to its confluence with the Namoi River (via Cooboobindi Creek), about 13 km downstream of BCM.

BCM is bordered by TCM to the south-east which is approved to operate until 2030, and MCCM to the north which is approved to operate until 2034.

The Nagero Creek catchment is described further in the SWMP.

## 2.2 Climate

BCOPL maintains a weather station on site with rainfall data available from 2013 to present. There are two operating Bureau of Meteorology (BoM) rainfall gauges in the vicinity of BCM. Rainfall data from the site gauge is the most representative of the short-term (i.e the last 10 years) rainfall record at the site. Rainfall data at the BoM operated Boggabri Post Office gauge is considered the most representative of the long-term rainfall record at the site due to proximity (16 km south-west) and length of record (139 years).

The 2022 calendar year was the third year in a row of significant wet weather conditions with all three years (2020 to 2022) exceeding the long-term 90$^{th}$ percentile (i.e rainfall conditions that are only exceeded in 10% of years) annual rainfall total (801 mm/year) at the Boggabri Post Office gauge. The extended period of wet weather resulted in substantial volumes of water accumulating in site water storages over the 2020 to 2022 period (refer to Section 4.2.1).

Available rainfall and evaporation data including recent and long-term trends are described further in Appendix A.

# 3. Surface Water Management System

## 3.1 Water Management System Objectives

The key objectives of the existing WMS are to:

- separate clean runoff, dirty runoff and contaminated water generated from rainfall events and mining operations where reasonable and feasible;
- minimise the volume of contaminated mine water (surface runoff draining to pit) generated by BCM;
- provide sufficient on-site storage to store contaminated water that could affect the quality of downstream watercourses;
- where reasonable and feasible treat dirty runoff from un-rehabilitated overburden areas to settle coarse suspended solids; and
- where reasonable and feasible divert clean runoff to downstream creeks.

The design objectives for the approved WMS are described in detail in the WMP. Details relevant to the SWB and model parameters are provided in the following sections.

## 3.2 Design Criteria

### 3.2.1 Dirty Water Storages

Dams required to manage dirty water runoff have been sized based on the criteria recommended in the guidelines Managing Urban Stormwater - Soils and Construction - Volume 2E Mines and Quarries (DECCW, 2008) (The Blue Book). The criteria specify sediment dams to be sized to capture the 90$^{th}$ percentile 5-day rainfall event with the sediment zone sized at 50% of the settling zone volume.

Dirty water storages are to be maintained in a drawn down state as much as practical, thus ensuring sufficient capacity is available in the ‘settling zone’ to capture water from subsequent storm events. Water will only be stored in the ‘settling zone’ of dirty water storages on a temporary basis (i.e. the nominated 5 day management period) following a rainfall event large enough to result in runoff being generated.

If water stored in dirty water storages is not suitable for discharge, it will be pumped to SD10 or MW5 for reuse in the WMS to meet site water demands.

### 3.2.2 Contaminated Water Storages

Contaminated water storages capture runoff from the in-pit area and coal stockpile pads in the CHPP. Water stored in contaminated water storages is reused onsite for dust suppression or CHPP process water.

Contaminated water storages have been designed to store runoff from a 100-year average recurrence interval (ARI) 72-hour duration design storm event, with a 20% allowance for sediment storage.

The design capacity of MW5 (2,200 ML) was based on previous water balance modelling with the aim to contain contaminated water onsite. The results of the water balance model indicate the discharge of contaminated water from BCM is not predicted over the LOM (refer to Section 4.3.5).

BCM storages are not prescribed dams listed under the NSW Dam Safety Regulation so are not subject to specific design requirements under this regulation.

### 3.2.3 Clean Water Storages

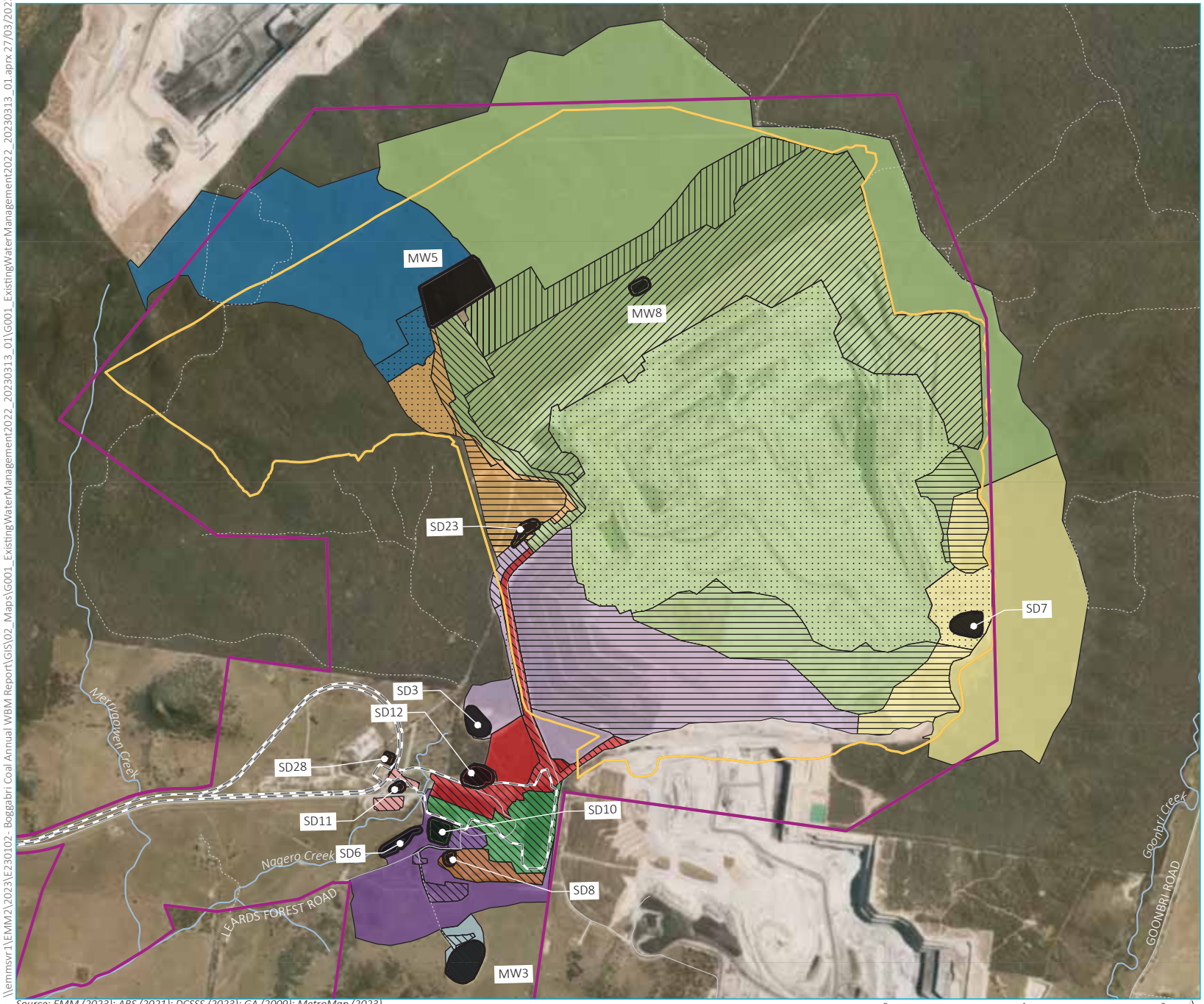
Four clean water highwall dams (CWHDs) are proposed to be constructed by 2033 to capture runoff from undisturbed catchments ahead of the pit where reasonable and feasible, reduce inflows to the pit, and maintain more natural flows in the downstream creek system. The CWHDs are to be maintained in a drawn down state and are to be pumped out following a rainfall event that results in runoff entering the storages. Where water quality meets the EPL discharge quality criteria, CWHDs will be pumped out to the creek system.

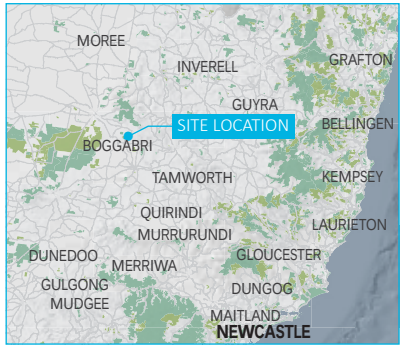
CWHDs were sized to capture runoff from the 100-year ARI 24-hour storm event for the remnant catchment, assuming a runoff coefficient of 0.4 for undisturbed areas. Rainfall events that exceed the design capacity will result in the CWHDs overflowing into the pit.

The pump-out system for CWHDs is sized to dewater the storages within 10 days. CWHDs are only present for the 2033 indicative WMS layout. Water from the clean water dams will be pumped to the east and then south around the edge of the mine disturbance area. The pumped clean water will be discharged into an existing drainage line/natural depression, which flows back to Nagero Creek north of the rail loop. Where required erosion sediment control measures will be used to minimise the potential for erosion at the pump outlet.

## 3.3 Existing Water Management System

The existing WMS is described below and shown in Figure 3-1 and schematically in Figure D-1, Appendix D. A summary of the existing storage characteristics is provided in Appendix C.




## KEY

- Project approval boundary
- Federal disturbance boundary
- Water storage

Existing environment

- Rail line
- Minor road
- Vehicular track
- Named watercourse

| Storage catchment | Land use type |
|---|---|
| MW3 | Industrial |
| MW5 | Mine void |
| Pit | Pre strip |
| SD10 | Rehabilitation |
| SD11 | Undisturbed |
| SD12 | Unshaped spoil dump |
| SD23 | |
| SD28 | |
| SD3 | |
| SD6 | |
| SD7 | |
| SD8 | |

INSET KEY

- Major road
- NPWS reserve
- State forest

*Source: EMM (2023); ABS (2021); DCSSS (2023); GA (2009); MetroMap (2023)*

0 1 2 km

GDA2020 MGA Zone 56

N

# Existing water management system- 2022

Boggabri Coal Operations Pty Ltd
Site Water Balance
Figure 3.1

EMM creating opportunities

### 3.3.1 Key WMS Storages and Features

MW5 was constructed in late 2018 and commissioned in early 2019 to cater for predicted pit dewatering requirements and has an approximate capacity of 2200 ML.

MW3 has a capacity of 153.50 ML and can be utilised to dewater surplus water from SD10. The total out-of-pit storage in MW3 and MW5 is 2353.5 ML.

Fill points for dust suppression currently operate from SD23 and the in-pit mine water dam (MWD). The in-pit MWD was referred to as MW8 at the start of 2022 and was transitioned to MW9 in February 2022. The in-pit MWD is referred to as MW8 throughout this document for consistency but is intended to represent any such storage that may exist in the future as the mine progresses. Both SD23 and MW8 also receive water transfers from in-pit dewatering.

SD10 is used to supply water to the CHPP, and also acts as a transfer point from the MIA to MW5 and the dust suppression fill points at SD23 and MW8.

A licensed discharge point (LDP) is located at SD3 (LDP1) and SD6 (LDP2). Overflows to the external environment occur when dirty water storages have exceeded the design capacity. A diversion drain diverts discharge from TCM's LDP (EPL 12365- LDP 1) around the BCM MIA and discharges into SD6. Controlled and uncontrolled discharges from TCM's WMS occur intermittently and are difficult to predict.

SD3 was upgraded in 2015 to a capacity of 102.3ML (previous capacity 31.8 ML). This upgrade catered for the expanding overburden catchment from 2015 to 2021. As the topography of the overburden dump does not allow for water stored in SD7 to be released to the creek system, water stored in SD7 is reused onsite. Until late 2020, SD7 was used as a fill point for water trucks for dust suppression use. As mining has progressed, this fill point is no longer utilised.

SD12 was upgraded in 2015 to a capacity of 206.56 ML (previous capacity 25.9 ML). The SD12 upgrade was required to allow for the expanded MIA and CHPP and haul road catchments.

A diversion drain constructed ahead of the mining void previously diverted runoff from undisturbed areas to the north of the mining void into the Nagero Creek catchment. During 2018, this diversion drain was mined through. Remnant undisturbed catchments to the east of the mine void drain directly into the pit and this water is managed within the contaminated water management system.

Table C-1 in Appendix C provides capacities for all WMS storages while Table C-2 lists pumped transfers between all WMS storages.

### 3.3.2 Water Sources

BCM receives water from rainfall and runoff and from licensed water imports. Clean water runoff from the undisturbed areas upslope of the mining void is currently intercepted by the pit and transferred to MW5 for re-use on site. Licensing of this runoff is partially covered by Harvestable Rights Provision under the Water Management Act, with the balance to be covered by Water Access Licence (WAL) 44134 (refer to Section 3.3.2.3.

#### 3.3.2.1 Water Source Prioritisation Strategy

Water is required for several activities on site including dust suppression, use in the CHPP and as washdown water in the MIA. Water requirements are sourced from water storages and supplemented with imported water in the following priority:

1. Surface water stored in water storages (consisting of contaminated water stored in MWDs and the pit void, and dirty water in sediment dams).

2. Imported groundwater from the Upper Namoi Zone 4 Groundwater Source via the borefield.

3. Imported surface water from the Lower Namoi Regulated River Water Source via the pump station on the Namoi River.

Over the long term, contaminated and dirty water will be used for mining activities in preference to import water. However, on occasion imported water may be sourced while stored water is present onsite to meet operational demands.

Previously, the water quality of contaminated and dirty water made it unsuitable for some water uses in the CHPP and MIA. BCOPL have since installed filters on the outlets from SD6 and SD10 to allow water stored onsite to be reused in the CHPP and MIA, therefore reducing the reliance on imported water.

#### 3.3.2.2 Groundwater Entitlements

BCOPL hold WALs for the Upper Namoi Zone 4 Namoi Valley Groundwater Source, the Upper Namoi Zone 11 Namoi Valley Groundwater Source, and the Gunnedah-Oxley Basin MBD Groundwater Source. Details of these WALs are provided in the Groundwater Management Plan (GWMP). A total of 1,028-unit shares of groundwater are available to BCOPL from the Upper Namoi Zone 4 Groundwater Source and 20-unit shares for the Upper Namoi Zone 11 Groundwater Source. The actual volume of groundwater available each year depends on the Available Water Determinations (AWD) made under the rules of the relevant Water Sharing Plan (WSP). The AWDs are likely to be at or close to 1 ML per unit share held under each WAL. Groundwater intercepted by the pit can be reused onsite under WAL 29562.

BCOPL currently use groundwater pumped from the Lovton, Cooboobindi and Victoria Park bores for existing operations. Groundwater pumped from Lovton and Victoria Park bore are currently used onsite for potable water, vehicle washdown, amenities and fire suppression. Groundwater pumped from Cooboobindi bore is used for dust suppression.

Groundwater can also be traded on a temporary or permanent basis within the Gunnedah-Oxley Basin MDB Groundwater Source and Upper Namoi Zone 4 Groundwater Source, subject to availability and local impact considerations.

No temporary transfers of WALs were required for the 2022 calendar year.

#### 3.3.2.3 Surface Water Entitlements

BCOPL hold WALs for the Lower Namoi Regulated River Water Source, Upper Namoi Regulated River Water Source, and Bluevale Water Source. Details of these WALs are provided in the SWMP.

BCOPL hold a total of 294-unit shares of general security water and 32.2-unit shares of supplementary water in the Lower Namoi Regulated River Water Source. A further 128-unit shares of general security water is held in the Upper Namoi Regulated River Water Source. The actual volume of regulated river water available from the general security licences depends on the AWD made from time to time in accordance with the WSP for the Upper Namoi and Lower Namoi Regulated River Water Sources 2016.BCOPL can access regulated surface water from the Namoi River in accordance with its surface water licences via a pump station from the Namoi River. BCOPL can also trade additional water, either temporarily or permanently, to make up shortfalls on a contingency basis. Typically, water from the Namoi River is not used due to a lack of water availability and the greater reliability of groundwater sources.

BCOPL temporary trade unregulated river entitlements in the Bluevale Water Source to WAL 44134 at the commencement of each water year. These entitlements are required to account for the volume of surface water runoff intercepted by the pit that is subject to licensing.

## 3.4 Proposed Water Management System

The BCOPL Rehabilitation Management Plan (RMP) forecasts the mine progression to 2024 including land use and overburden progression. The existing RMP is currently being revised to reflect recent regulatory reforms.

The SWB is updated in accordance with the RMP to 2024. From 2025 to 2033, the mine plan from the Project EA is used to forecast pit and overburden progression and the associated catchments. Sediment dams (i.e. dirty water storages) are proposed based on the expected requirement for runoff control or dewatering demands based on the forecast mine plan.

The following sections outline the proposed WMS for years 2024 and 2033. Schematic diagrams showing the WMS layout and general connectivity between water sources, demands and storages for the 2024 and 2033 WMS are provided in Figure D-2 to Figure D-3, Appendix D.

### 3.4.1 2024 Water Management System

An indicative layout of the proposed WMS is shown schematically in Figure D-2, Appendix D.

SD3 may be upgraded in 2024 to a capacity of 209 ML (from existing capacity of 102 ML). The SD3 upgrade in 2024 may be required as it is no longer proposed to commission sediment dam SD13 (as proposed in the EA) within the overburden emplacement area and storage capacity previously allocated to SD13 is now provided in SD3. Alternatively, if SD3 remains at 102 ML in 2024, it may be necessary to provide the appropriate additional storage capacity elsewhere (such as MW5). This will be examined as part of the review of the SWMP.

MW5 will be mined through as the open cut progresses to the north. It is expected that a similar sized storage will be established to offset the loss in storage associated with mining through MW5.

### 3.4.2 2033 Water Management System

An indicative layout of the proposed WMS is shown schematically in Figure D-3, Appendix D.

New dirty water storages SD19, SD20, SD21, SD22 and SD24, will be established to capture runoff from the expanded spoil dump. SD7 will be decommissioned by 2033 as the overburden catchment draining to this storage is expected to be fully rehabilitated.

New CWHDs CD5, CD6, CD7 and CD8, will be established to minimise inflows from the undisturbed upstream catchment to the mining void. The CWHDs will be pumped out to the Nagero Creek system, however, they will overflow to the pit during storm events that exceed the design capacity.

# 4. Site Water Balance

The SWB model is built in the GoldSim software package and was originally developed as part of the Continuation of Boggabri Coal Mine Project Surface Water Assessment (WSP, 2010). The model is updated annually to reflect the mine as it has developed and to simulate on-site conditions.

The model is used to quantify the water inflows (rainfall, catchment runoff, groundwater interception, water imported from the borefield and the Namoi River) and outflows (evaporation, CHPP and MIA water use, and dust suppression water use), and likely range of water deficits, surpluses, and discharges from BCM.

The SWB model is used as a strategic planning tool to assess the performance of the BCM WMS under a wide range of climate scenarios (sampled from a historical rainfall record) that may occur over the life of the mine.

This section describes the SWB model updates that have been made since the 2021 Annual Review (BCOPL, 2022), the outcomes of the model validation process, and provides forecast model results for the WMS over the approved mine life (up to 2033).

The water balance model methodology including key inputs and assumptions is described further in Appendix B.

## 4.1 Model Updates

A new SWB model was developed for the 2022 Annual Review as BCMs existing model could not be edited or updated to reflect WMS changes that have occurred since the 2021 Annual Review. The SWB model was developed in Goldsim (version 14). The new model is similar to the previous model in that it simulates water movements around the mine site and many of the physical components of the WMS remain unchanged.

The following key components of the WMS were reviewed as part of the SWB model update:

- Catchment areas;
- Land use;
- Pump rates and transfers;
- Storage data (including capacity and operating levels); and
- AWBM runoff parameters.

The new SWB model methodology and assumptions are described in Appendix B while key model inputs are provided in Appendix C.

## 4.2 Model Validation

This section presents the outcomes of the model validation for the 2022 calendar year. Validation of the model is completed by comparing modelled results against observed results for the following key model elements:

- Total site water storage volume;
- Stored water volume at several key storages (MW5 and SD10);

- External water import; and
- Dust suppression water use.

### 4.2.1 Water Inventory

BCOPL survey storage levels on a weekly basis. Surveyed storage levels were used to validate the total site, MW5 and SD10 stored volumes.

#### 4.2.1.1 Total site storage

The observed and modelled total site stored volume from January 2019 to December 2022 are compared in Figure 4-1.

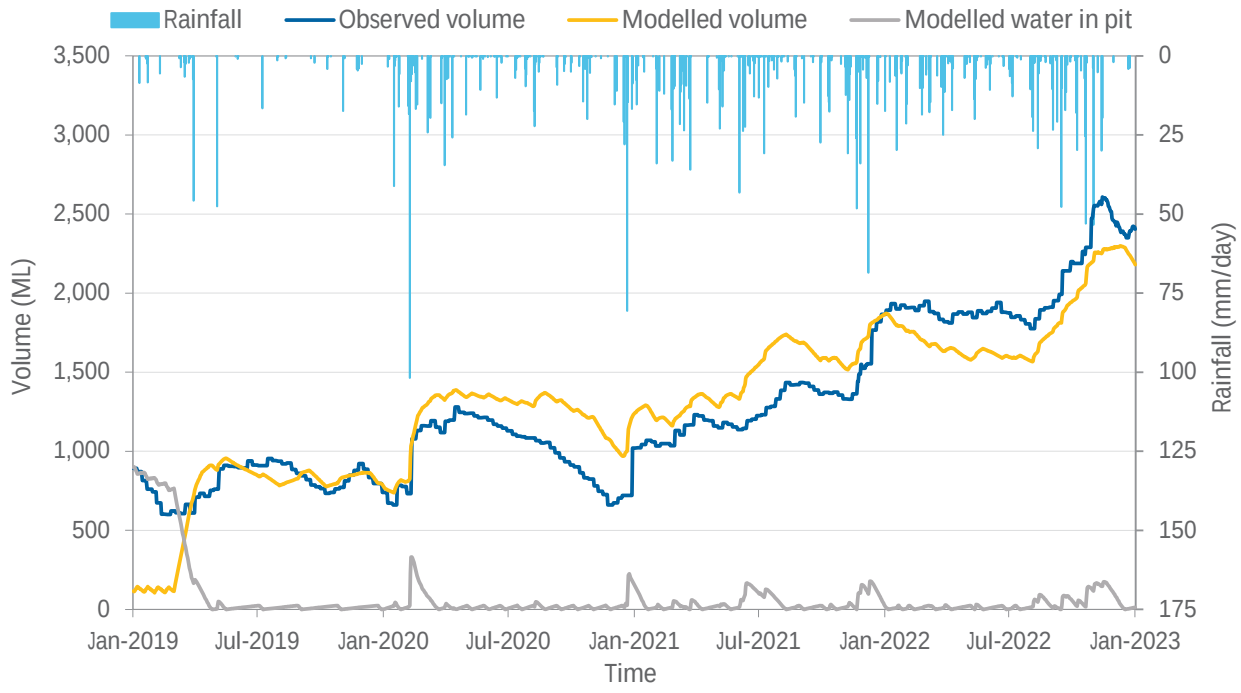



**Figure 4-1 Observed vs Modelled Total Site Storage Volume**

Figure 4-1 indicates the modelled storage volume (yellow line) is similar to the observed storage volume (blue line) with similar responses to rainfall occurring for both results.

At the start of 2019. the modelled site storage is substantially less than the observed value. This is due to most of the water onsite being stored in the mining void or legacy (pre-2019) in-pit MWDs that are not included in the new model. The modelled site storage increases towards the observed value as the in-pit MWDs are dewatered to MW5 which was commissioned in March 2019. The modelled total site storage is similar to the observed total site storage for the remained of 2019.

The modelled site storage is shown to exceed the observed values as a result of the February 2020 rainfall event. The modelled result remains above the observed result until December 2021. However, after the initial rainfall event, the modelled result is shown to follow a similar rise and fall in response to rainfall and storage outflows over the February 2020 to December 2021 period. It is understood a controlled discharge event occurred in February 2020 which is not considered in the SWB model which may be contributing to the larger modelled storage volumes resulting from this event.

The model overestimates drawdown over the January 2022 to January 2023 period while a similar trend is shown from July 2022 to January 2023 (although slightly lower due to the initial drawdown).

The modelled result underestimates the peak storage volume that occurs in November 2022. Approximately 200 ML is modelled to remain in the pit during this period due to the SWB model assumptions and rules that limit pit dewatering when MW5 exceeds its high operating volume (HOV). The combination of the modelled site storage and in-pit volume are similar to the observed total site storage.

Overall, the model shows an acceptable fit for total inventory, with the modelled rate of drawdown after rainfall events correlating well with the observed data. The magnitude of inflows from rainfall events is also captured by the runoff model.

#### 4.2.1.2 MW5 storage

The observed and modelled stored volume in MW5 from January 2019 to December 2022 are compared in Figure 4-2.

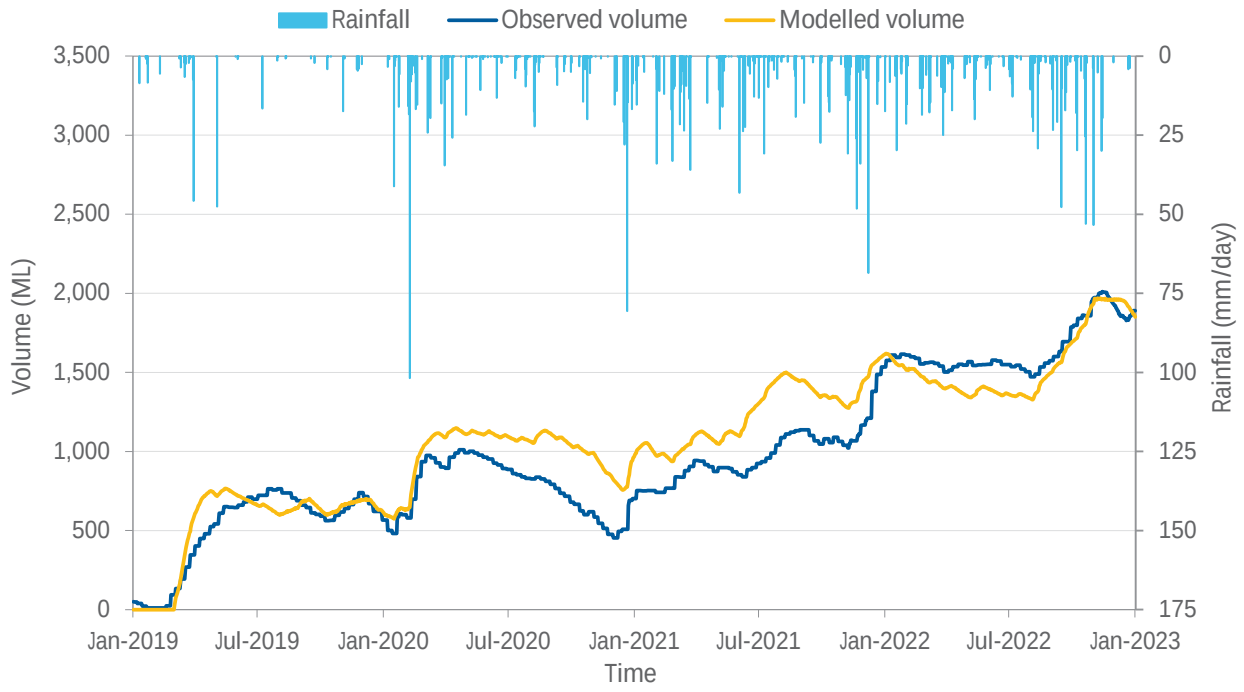



**Figure 4-2 Observed vs Modelled Volumes in MW5**

Figure 4-2.shows the modelled storage volume in MW5 is similar to the observed storage volume with similar responses to rainfall occurring for both results. The modelled volume exceeds the observed value from January 2020 to January 2022 in line with the observations for total site stored water. The pumping and transfer rules described in Appendix C preferentially send water to MW5 from the rest of the WMS whenever an excess is observed up until MW5 reaches its HOV. This results in the volume of water that is transferred to MW5 in the model is likely to exceed the actual transfer volumes which are subject to operator discretion. The modelled volume of stored water in MW5 is considered to be generally representative of observed values.

#### 4.2.1.3 SD10 storage

The observed and modelled stored volume in SD10 from January 2019 to December 2022 are compared in Figure 4-3.

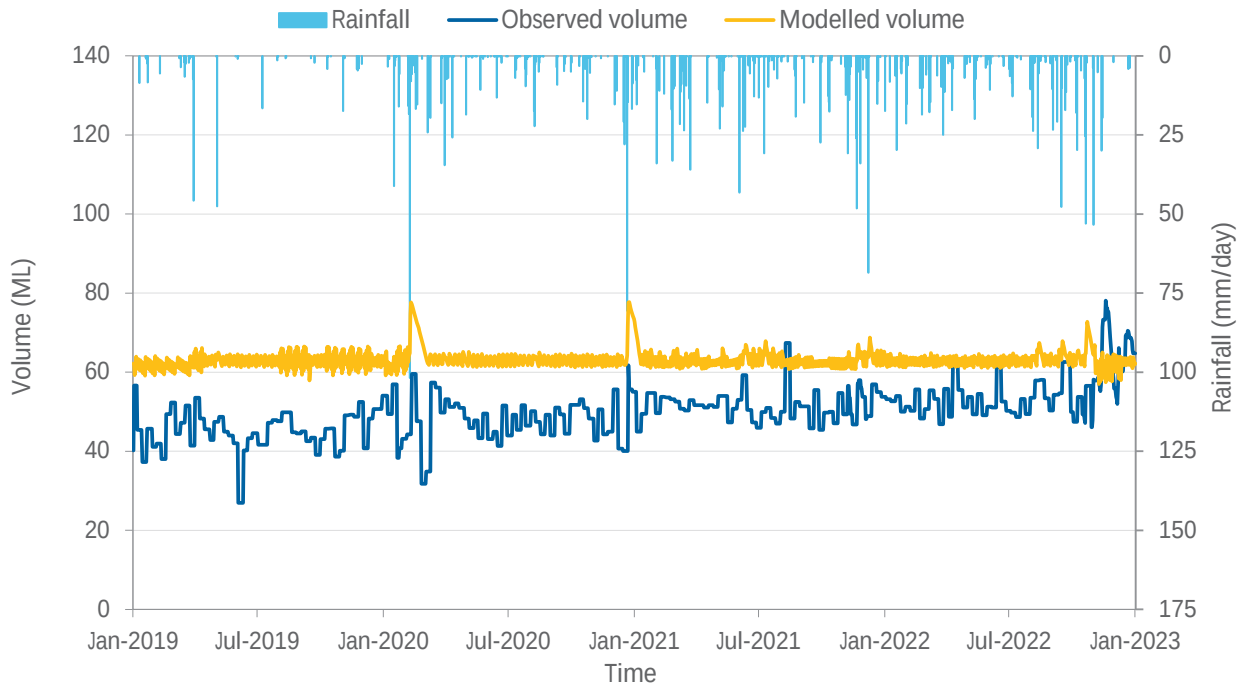



**Figure 4-3 Observed vs Modelled SD10 Volumes**

SD10 operates as a transfer point for water to and from MW5 as well as supplying water to the CHPP. Modelled storage volumes for SD10 are elevated compared to observed values due to the operating conditions applied to the model. However, modelled volumes are shown to follow a relatively stable trend as per the observed values. This is expected as SD10 has a relatively small contributing catchment area and is therefore strongly influenced by pumped transfers to and from other aspects of the WMS. The modelled operating logic is considered to be capturing the operation of SD10 adequately.

#### 4.2.1.4 Summary

Modelled storage volumes generally match observed storage volumes with the key trends in rainfall and runoff adequately represented. Typically, modelled results differ from observed results (such as the peak in MW5 not rising to observed values) due to the model operating rules described in Appendix B and Appendix C. In reality, water may be preferentially held in one storage or another on a case-by-case basis which is difficult to replicate in a model based on rules and assumptions.

### 4.2.2 Water Import

Consistent with the water source prioritisation strategy in Section 3.3.2.1, the model sources import water preferentially from groundwater sources as water from the Namoi River is often unreliable during dry periods. As a result, modelled water import has been classified as either groundwater import or additional import, where the additional import is assumed to be sourced from the purchase of additional temporary groundwater licenses (but other options such as river water may be explored).

Modelled water imports are compared to observed water imports on a water year (July to June) basis in Figure 4-4.

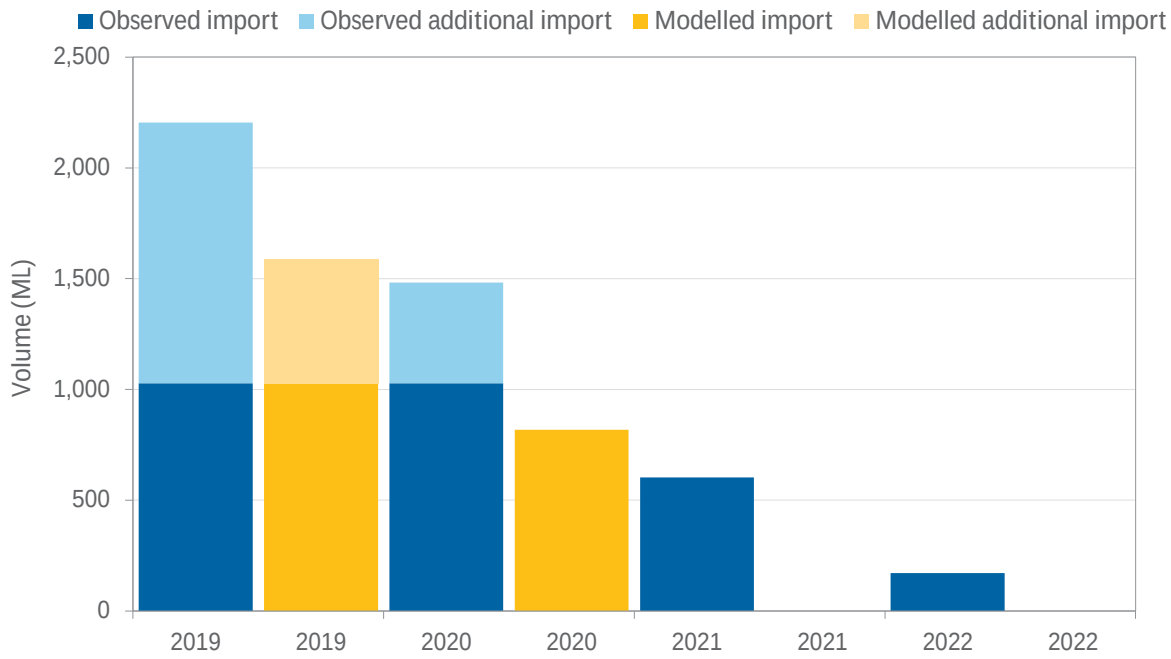



**Figure 4-4 Observed vs Modelled Water Import: Water Year (July to June)**

The SWB model is shown to generally underestimate the volume of water imported from the borefield or additional sources. An observed water import of 2,205 ML occurred in 2019 with 410 ML of this water take transferred to MCCM as make up water. Hence, BCM's net water import in 2019 was 1,795 ML which is 205 ML greater than the modelled volume.

The underestimation of imported water from 2020 to 2022 is primarily associated with the new SWB model logic which preferentially sources CHPP and MIA water demand (several hundred megalitres a year) from SD10 via a filtration system (implemented in the 2022 calendar year) rather than directly from the borefield. The overestimation of total stored water through 2020 and 2021 (refer to Figure 4-1) is also expected to contribute to a lower requirement for import water.

The SWB is considered to be adequately replicating the current WMS water import requirements, but this should be confirmed in future Annual Reviews with the results likely to vary with different climate patterns.

### 4.2.3 Dust Suppression

Monthly and annual modelled dust suppression use is compared to observed values from 2019 to 2022. In Figure 4-5. The methodology for modelling dust suppression is outlined in Section B.3.2 of Appendix B.

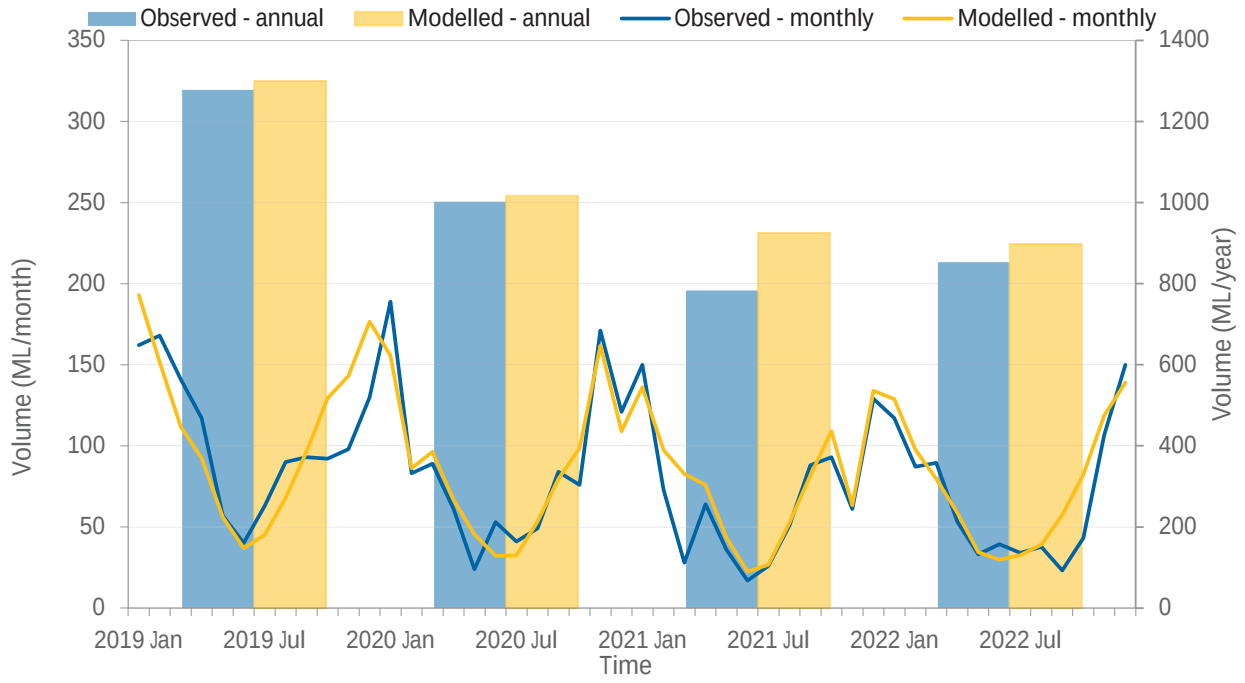



**Figure 4-5 Observed vs Modelled Dust Suppression**

Modelled dust suppression usage generally shows a good match to observed values. Annual modelled dust suppression values exceed observed values in the order of 1% in 2020 to 18% in 2021. Monthly modelled dust suppression is shown to follow similar trends to observed values (i.e. higher in summer and lower in winter).

Total haul road area and the applied evaporation rate both have a degree of uncertainty around them when estimating dust suppression, as such the small variance from observed usage is acceptable for the SWB model.

### 4.2.4 Validation Outcome

The validation of the model against total and key storage volumes, as well as water import, and demands was found to provide a suitable estimation of the observed values. Overall, the SWB model validation, is considered adequate and suitable to estimate forecast conditions for the LOM.

## 4.3 Forecast Model Results

The SWB model was used to forecast the performance of the BCM WMS over the LOM to assess the risk of water shortfall or water excess and to allow for mine planning to be undertaken to mitigate potential risks.

The model was run for a total of 134 times using simulated rainfall and evaporation conditions sampled from the historical climate record (refer to Appendix A). The results of the simulation are presented in the following sections.

### 4.3.1 Model Results

The median annual site water balance for the 2023, 2024, 2025 and 2033 mine layout is provided in Table 4-1.

It should be noted the median values of the different inflows and outflows do not coincide. Unlike mean values, the median of the total inflows and total outflows do not balance exactly. Nonetheless, median values have been shown as they are a more representative measure of central tendency for processes with skewed distribution, such as rainfall.

**Table 4-1 Median Site Water Balance for each of the Snapshot Years**

| | 2023 | 2024 | 2025 | 2033 |
|---|---|---|---|---|
| **Inflows (ML)** | | | | |
| *Runoff and direct rainfall:* | | | | |
| Clean Water Highwall Dams | - | - | - | 30 |
| Dirty water storages | 111 | 121 | 121 | 375 |
| Contaminated water storages and pit | 658 | 605 | 608 | 340 |
| Groundwater interception | 322 | 263 | 185 | 72 |
| Imported water from borefield | 0 | 941 | 953 | 1064 |
| Import water from additional sources | 0 | 0 | 0 | 491 |
| **Total Inflows (ML)** | **1091** | **1929** | **1868** | **2371** |
| **Outflows (ML)** | | | | |
| *Demands:* | | | | |
| Dust suppression - haul roads | 1399 | 1361 | 1512 | 1453 |
| CHPP | 365 | 367 | 365 | 365 |
| MIA and potable water | 183 | 183 | 183 | 183 |
| *Evaporation:* | | | | |
| Clean Water Highwall Dams | - | - | - | 0 |
| Dirty water sediment dams | 43 | 41 | 40 | 162 |
| Contaminated water dams, MWDs and pit | 348 | 270 | 246 | 198 |
| *Uncontrolled Discharges:* | | | | |
| Clean Water Highwall Dams | - | - | - | 0 |
| Dirty water sediment dams | 0 | 0 | 0 | 0 |
| Mine water dams and pit | 0 | 0 | 0 | 0 |
| Controlled Discharge of Clean Water | - | - | - | 30 |
| **Total Outflows (ML)** | **2337** | **2220** | **2345** | **2390** |
| **Change in storage (ML)** | **-1259** | **-144** | **-253** | **-11** |

The SWB model results presented in Table 4-1 indicate water imported from the borefield is the greatest source of inflows to the system, representing between 45% and 51% of total median inflows from 2024 onwards. No water is required from the borefield in 2023 due to the significant volume stored onsite at the end of 2022 (refer to Figure 4-1). Rainfall and runoff make up between 30% and 40% of total median inflows while groundwater interception represents between 3% and 30% of total median inflows.

Import from additional water sources is not predicted to be required under median conditions until 2033 when a substantial portion of the disturbed area will drain to proposed dirty water storages which are not currently proposed to be extracted from for reuse (refer to Section 3.4.2). Hence, an additional water source is required to offset the loss in harvestable dirty water. The volume of additional water import is expected to decrease if water from proposed dirty water storages is harvested for reuse onsite.

Water used for dust suppression is the largest outflow from the system, representing approximately 60% of total median outflows. CHPP and MIA water demand represent 24% of total median outflows while evaporation losses account for approximately 15% of total median outflows. No uncontrolled discharges are expected under median conditions while controlled discharges from CWHDs only occur once these storages come online in 2033.

The SWB model results presented in Table 4-1 are similar to those presented in the 2021 Annual Review indicating the updated model is producing result in line with those previously reported. It should be noted dust suppression estimates are slightly higher in the updated model due to a change in the calculation methodology whereby dust suppression demand is based on the deficit between rainfall and evaporation rather than the application of a set rainfall depth trigger. The dust suppression model assumptions are described in Appendix B.

### 4.3.2 Total Site Storage

Forecasted estimates for total site storage volume (less the volume stored in the pit) are shown in Figure 4-6. The results are presented as the range between the minimum and 5th percentile, 5th percentile and 25th percentile, 25th percentile and median, median and 75th percentile, 75th percentile and 95th percentile, and 90th percentile and maximum values.

Note the percentile values for stored volumes represent the daily results, whereas the percentile values shown in Table 4-1 are the percentile values of the annual results.

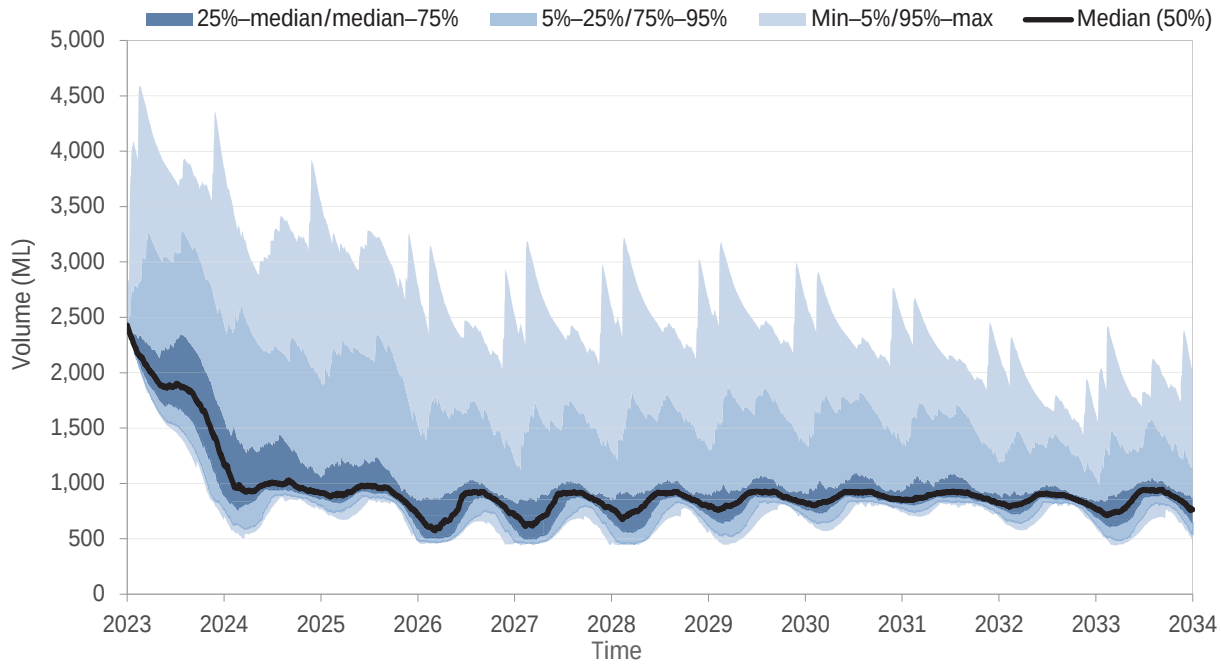



**Figure 4-6 Modelled Daily Timeseries for Total Site Volume**

Total site storage is shown to remain relatively stable as the mine progresses with minimum to 75th percentile value range tightly grouped to the median result (shown as the black line). This is expected as the mine is generally in water deficit on an annual basis as rainfall and runoff volumes are typical less than water demands. Hence, the volume of stored water in the system is maintained at a constant level due to imports form the borefield. The 75th percentile to maximum result represents the WMS response to potential significant wet weather periods in the future. The largest predicted total site storage volume would occur if a significant wet weather period was observed during 2023. This is due to the substantial volume of water stored onsite at the end of 2022.

### 4.3.3 Contaminated Water Storage and Pit Availability

The SWB model results indicate no overflows from contaminated water dams are expected over the life of BCM. Forecasted model results of water stored in the pit and MW5 over the LOM are provided in Figure 4-7 and Figure 4-8, respectively.

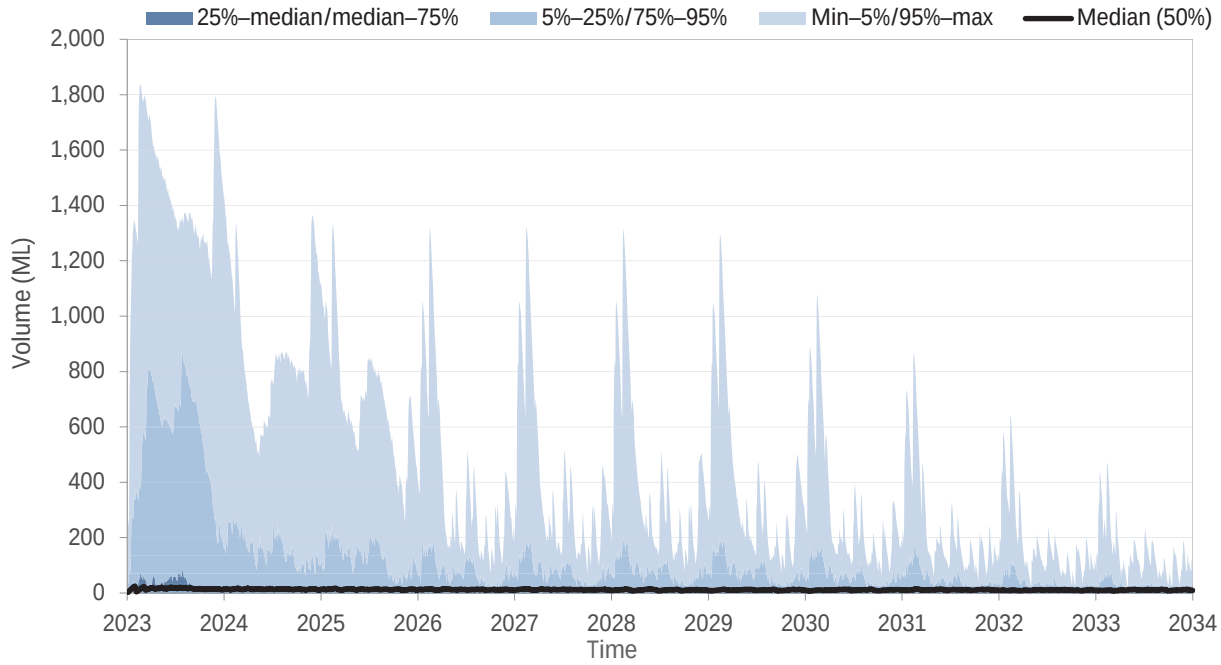



**Figure 4-7 Modelled Daily Time Series of Water Stored In-Pit**

Figure 4-7 shows the pit void is predicted to be empty most of the time, however, the volume stored at any one time may reach up to 1,800 ML. This maximum volume may reduce following 2024 as the catchment area reporting to the pit is reduced.

Due to above average rainfall experienced during from 2020 to 2022 (refer to Section 2.2), MW5 is almost at capacity at the start of 2023 with a stored volume of 1,900 ML. It can be seen in Figure 4-8 the volume stored in MW5 for minimum (i.e. dry) to 75$^{th}$ percentile conditions is predicted to gradually reduce during 2023 and then remains close to the assumed normal low operating volume (LOV) of 600 ML but may fluctuate between the LOV and HOV depending on rainfall conditions.

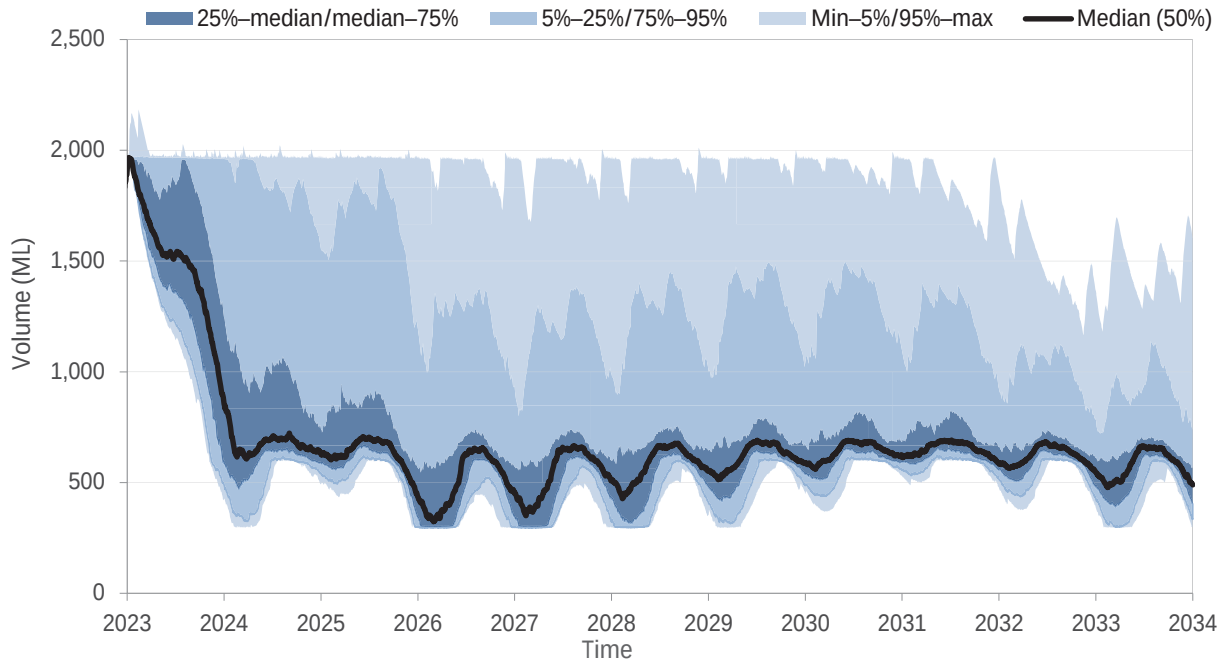



**Figure 4-8 Modelled Daily Time Series of Water Stored in MW5**

### 4.3.4 Water Supply Reliability

The annual modelled water import from the borefield under BCM's existing 1,028 ML groundwater entitlement is shown in Figure 4-9**.**

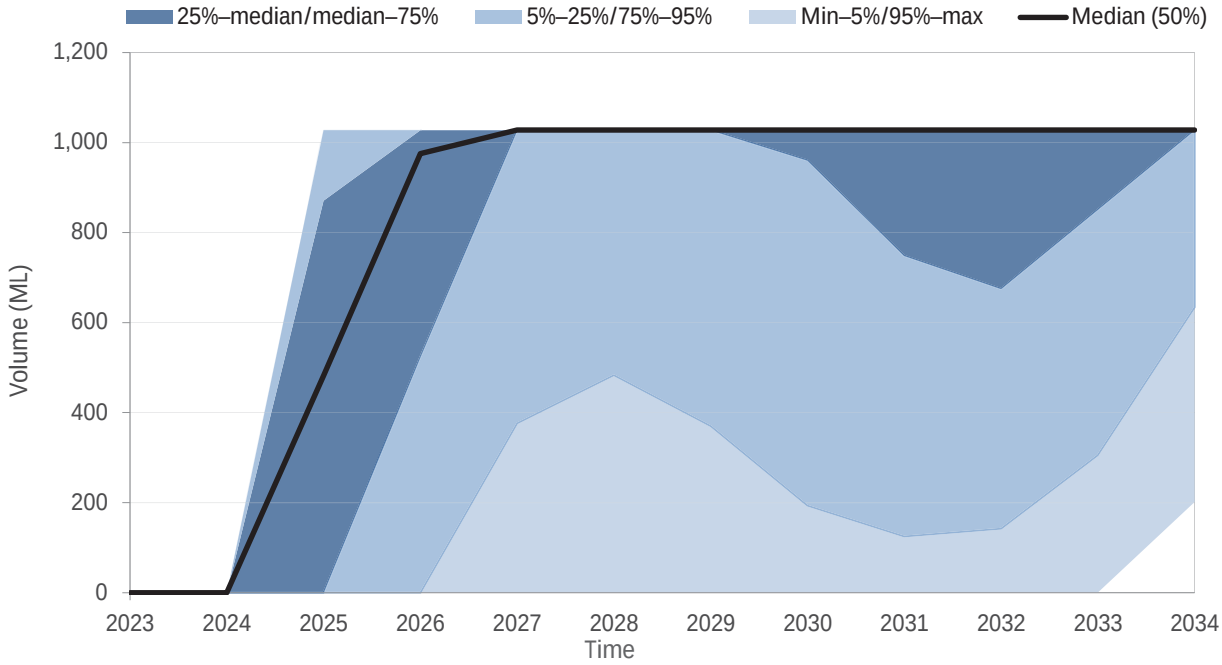



**Figure 4-9 Annual Modelled Bore water Imported to Site**

Figure 4-9 shows no borefield imports are required during 2023 as a result of the substantial volume of stored water available at the end of 2022. The model uses this water in preference to import bore water. Once this volume has been drawn down, modelled imported water requirements increase. The median

results indicate the full 1,028 ML entitlement will be required in most years from 2024 onwards. The full groundwater entitlement is not required in approximately 25% of years as a result of wetter than average conditions.

An additional water source is predicted to be required to meet onsite water demands in more than 50% of years. The annual modelled additional water import is shown in Figure 4-10**.**

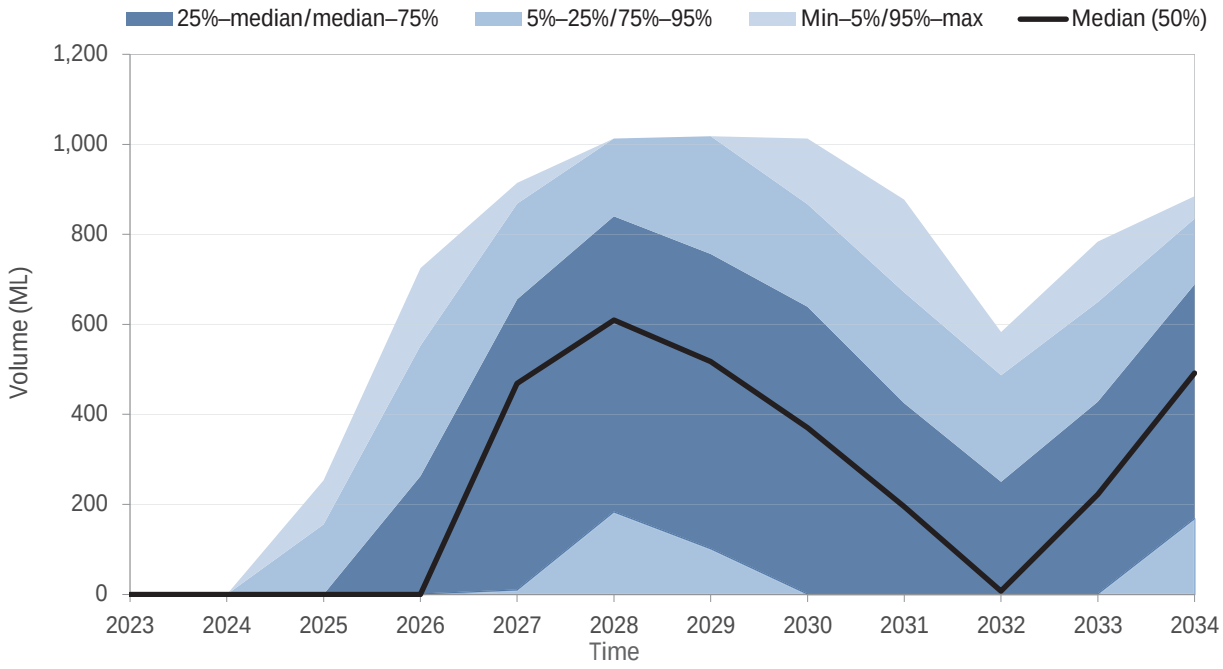



**Figure 4-10 Annual Modelled Additional Water Import Required**

Annual additional import requirements are shown to peak at the end of 2027 as a result of increased dust suppression requirements associated with longer proposed haul roads and decreased runoff potential as larger areas of the mine are rehabilitated. Up to 1,000 ML of additional water imports may be required.

The total (borefield and additional) water import requirements for 2023, 2024, 2025 and 2033 are summarised in Table 4-2.

**Table 4-2 Annual Totals of Imported Water Requirements**

| | Annual Total (ML) | | | |
|---|---|---|---|---|
| | **2023** | **2024** | **2025** | **2033** |
| 5th percentile (wet) | 0 | 0 | 0 | 202 |
| 25th percentile | 0 | 0 | 0 | 640 |
| 50th percentile (median) | 0 | 0 | 525 | 1,196 |
| 75th percentile | 0 | 483 | 980 | 1,520 |
| 95th percentile (dry) | 0 | 871 | 1,291 | 1,717 |
| Greatest result (driest on record) | 0 | 1,184 | 1,580 | 1,863 |

Condition 33 of the Project Approval requires BCOPL to have sufficient water for all stages of the Project, and if necessary, adjust the scale of mining operations on site, to match its available water supply. Historically, BCOPL have been able to successfully secure additional water requirements through temporary trade, including during the recent 2018/2019 drought. However, there is a risk mining operations may be impacted if BCOPL are unable to successfully temporary trade additional water entitlements to meet potential water demands in the future.

### 4.3.5 Modelled Overflows

Figure 4-11 shows the modelled overflows from dirty water storages. No overflows from the dirty water storages are predicted under median conditions. This is largely due to the design capacity of MW5 and the ability to store water there in larger rainfall events.

A maximum dirty water overflow of up to 400 ML/year is predicted to occur up to 2030. The maximum dirty water storage overflow of 1,070 ML/year occurs in 2033 when a substantial portion of the disturbed area will drain to proposed sediment dams which are not currently proposed to be harvested from for reuse onsite.

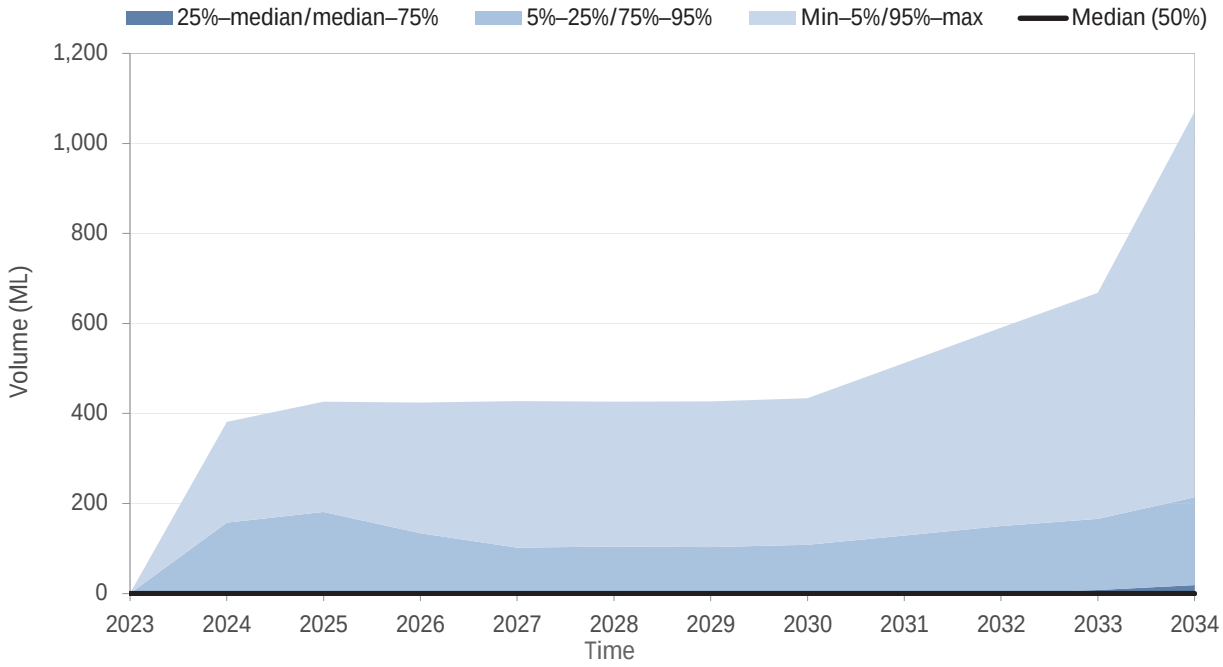



**Figure 4-11 Modelled Dirty Water Overflows**

# 5. Water Efficiency Initiatives

The action plan to implement water efficiency initiatives and the recommendations (Advisian, 2016) referenced in Appendix 6A of the Project Approval are provided in Table 5-1.

**Table 5-1 Water Balance Initiatives Action Plan**

| **BCOPL Water Efficiency Initiatives** | |
|---|---|
| Action Plan | Schedule |
| Propose water efficiency initiatives during the SWB annual review process. | Annually during the SWB annual review process |
| Report on the effectiveness of water efficiency initiatives. | Annually in the Annual Review |
| **Water Efficiency Initiatives Project Approval Appendix 6A** | |
| Action Plan | Schedule |
| Install meters for all major water flows including: | |
| Water transfers from sediment dams and mine pits into mine water storages. | Complete |
| All water-cart fill points. | Complete |
| All elements of the anticipated water demand for various purposes associated with CHPP (as identified in Table 4 of the letters dated 8 July). | Complete |
| All water imports including any bore water obtained onsite. | Complete |
| Install water level meters on all significant water storages as a check on inflows and outflows and a means of assessing evaporation and seepage losses. This data will also provide a basis for improving estimates of runoff from different surface types (hardstand, mine pit, “raw’ overburden, etc.). | In progress |
| Collect moisture content data for all coal flows associated with the CHPP to permit full water balance accounting. | In progress |
| Record all flow meters and water levels at least weekly (preferable by means for continuous recording) and analyse the data on a monthly basis to develop a full accounting of all water sources and losses. | In progress |
| Compare monitored gains from rainfall and losses by evaporation from water storages to the rainfall and evaporation data from the weather station. | Modelled storage volumes are compared to observed storage volumes in Section 4.2.1 |
| Update the site water balance annually based on monitored data and provide details in the Annual Report to the Department. | Commitment to update annual SWB provided in Section 6.3 |

# 6. Improvement and Reporting

## 6.1 Review and Improvement

BCOPL undertake annual reviews to identify and address deficiencies and make improvements to the monitoring, measurement, and calculation methods presented in the SWB. The results of the improvement program will be incorporated into the annual revision of the SWB.

### 6.1.1 Recommended Improvements

It is recommended the following elements of the water balance are reviewed as part of the 2023 SWB review:

- Model calibration; and
- Review of AWBM parameters.

Input data improvements including:

- Review and update the water use data for the CHPP to use metered data; and
- Staging and operational improvements including review the staging of previously recommended upgrades to dams (e.g. SD3).
- Metering of dewatering from the pit to inform spoil runoff estimation.
- Metering of undisturbed catchment inflows where practical to allow a more refined calibration of the undisturbed land use runoff AWBM parameters.

## 6.2 Validation Program

BCOPL will perform a validation of the SWB model on an annual basis. The existing model will be used to simulate the WMS for the previous year using observed site rainfall. The observed borefield extraction, river water extraction, dust suppression water use, discharge events, and storage volumes (total storage, MW5 and SD10) will be compared to modelled results.

As BCM is predicted to be in water deficit under most climate conditions and the contaminated water system is designed to contain and manage the 100-year ARI 72-hour rainfall event, discharges from BCM are only expected to occur from dirty water storages following significant rainfall events. Therefore, the discharge volumes from BCM may be estimated and validated using observations of discharge events.

If the SWB model is found to not be realistically representative of the WMS, an investigation will be undertaken that may involve a calibration process to identify the source of the discrepancy. The updated SWB model will be used to update predictions described in Section 4.3.

The outcomes of the validation process will be incorporated into the annual revision of the SWB as part of the Annual Review.

## 6.3 Annual Review

The Annual Review summarises the environmental performance of the mine for the previous calendar year. In accordance with Schedule 5, Condition 4 of the Project Approval. Relevant environmental

monitoring data will be used to revise the SWB annually and a summary will be provided in the Annual Review.

The Annual Review is publicly available on the BCM website (www.idemitsu.com.au/operations/boggabri-coal/approvals-plans-reports/).

# 7. Review and Revision

## 7.1 Review

Review of the SWB will be undertaken by BCOPL in accordance with Schedule 5, Condition 5 of the Project Approval within three months of the submitting the following:

- An Annual Review under condition 4 of the Project Approval;
- An incident report under condition 8 of the Project Approval;
- An audit under condition 10 of the Project Approval; and
- A modification to the Project Approval.

# 8. References

Australasian Groundwater & Environmental Consultants (AGE), December 2020. Boggabri, Tarrawonga, Maules Creek Complex Groundwater Model Update.

Boggabri Coal Operations Pty Ltd (BCOPL), 5 December 2022. Boggabri Coal Mine – 2021 Annual Review.

Boughton 2004, Australian water balance model, Environmental Modelling & Software 19 (2004) pp. 946-956.

Department of Environment, Climate Change and Water (DECCW), 2008. Managing Urban Stormwater - Soils and Construction - Volume 2E Mines and Quarries.

Parsons Brinckerhoff (PB), 28 August 2015. Boggabri Coal Mine – Drawdown Impact Assessment of Proposed Borefield Operations (2200555A_WAT_REP_Borefield assessment_RevC)

WSP, 2010. Boggabri Coal Mine Project Surface Water Assessment.

# Appendix A:

Climate Data

# A.1 Rainfall Data

BCOL maintains a rainfall gauge on site with data available from 2013 to present. There are also several Bureau of Meteorology (BoM) operated rainfall gauges nearby that provide representative records for the site. Key information and statistical data for the site gauge and three representative BoM gauges are provided in Table A-1. The BoM operated rainfall gauges presented in Table A-1 have been chosen based on proximity, and length and completeness of record.

**Table A- 1 Annual Rainfall Statistics**

| | Units | Boggabri (Mayfield) | Boggabri (Kanownda) | Boggabri Post Office | Site Gauge |
|---|---|---|---|---|---|
| Rainfall record | | 1934 – 1986 (52 years) | 1899 – present (124 years) | 1884 – present (139 years) | 2013 – present (10 years) |
| Distance from the site | km | 8 km east | 12 km north | 16 km south-west | 0 km |
| Average rainfall | (mm/year) | 597 | 576 | 593 | 621 |
| Lowest rainfall | (mm/year) | 308 | 280 | 235 | 211 |
| 10$^{th}$ percentile rainfall | (mm/year) | 391 | 369 | 394 | 363 |
| Median rainfall | (mm/year) | 605 | 588 | 589 | 580 |
| 90$^{th}$ percentile rainfall | (mm/year) | 772 | 756 | 801 | 934 |
| Highest rainfall | (mm/year) | 1,022 | 886 | 1,211 | 1003 |

The annual rainfall totals shown in Table A-1 indicate rainfall is relatively consistent across the three BoM gauges and the site gauge. Differences between the lowest and highest annual rainfall totals at each gauge may be attributed to the variability of rainfall distribution across the catchment that may occur in any given year along with differences in the length of record.

Review of the site gauge data over the 2013 to 2023 period indicated annual rainfall totals were similar to those recorded at the Boggabri Post Office and Boggabri (Kanownda) gauges. Hence, regional rainfall data is considered appropriate to represent site conditions in the absence of site-specific data (i.e. prior to the site gauge being commissioned).

Rainfall data from the site gauge is the most representative of the short-term (i.e the last 10 years) rainfall record at the site. Rainfall data at the Boggabri Post office gauge is considered the most representative of the long-term rainfall record at the site due to proximity and length of record.

Daily rainfall data at the Boggabri Post Office gauge was obtained as SILO (Scientific Information for Land Owners) patched point data from the Queensland Climate Change Centre of Excellence. SILO patched point data is based on historical data from the BoM rainfall stations, with missing data ‘patched’ in by interpolating data from nearby operating stations. SILO data was obtained for Boggabri Post Office gauge from January 1889 to December 2022.

Monthly rainfall statistics for the Boggabri Post Office gauge are shown in Figure A-1. Median monthly rainfall totals and monthly rainfall totals for the 2022 calendar year recorded at the site rainfall gauge are also shown for comparative purposes.

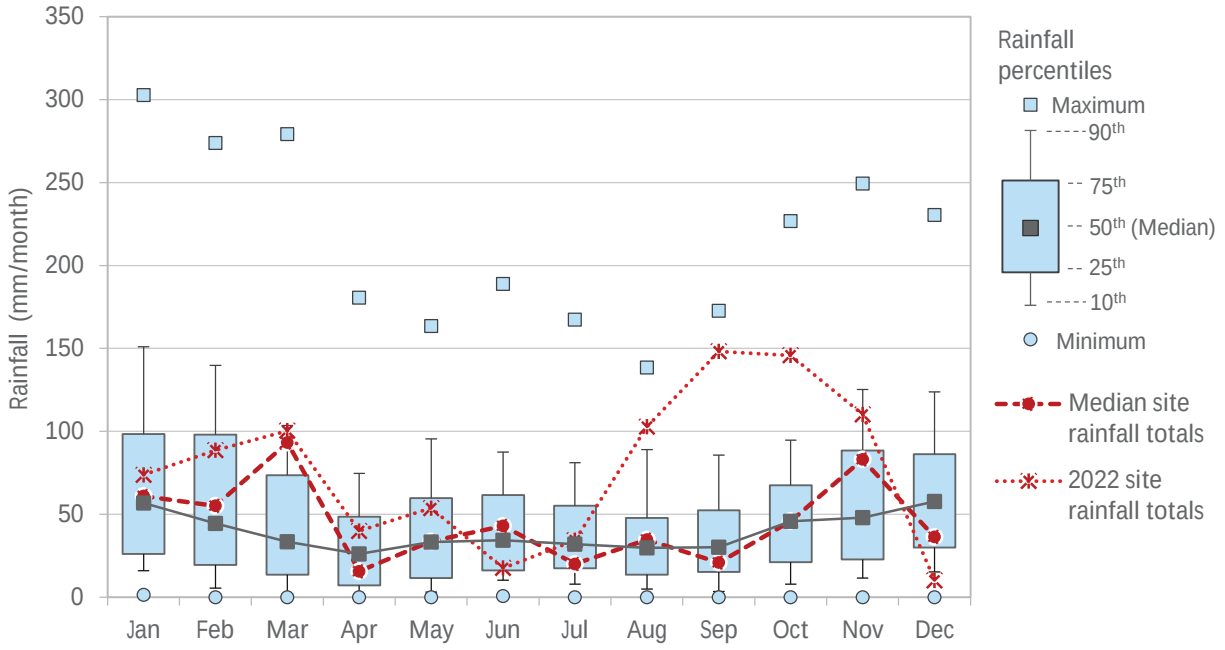



**Figure A- 1 Monthly rainfall statistics – Boggabri Post Office and site rainfall gauge**

The rainfall data in Figure A-1 shows higher rainfall totals are generally experienced from November to March. The larger difference between the 25th and 75th percentile values indicate greater rainfall variation also occurs from November to March. While less rainfall typically occurs from April to October, large monthly rainfall totals (greater than 150 mm/month) can still occur at any time of the year.

Median monthly rainfall totals at the site gauge are similar to median monthly totals at Boggabri Post Office except during March and November. The larger median rainfall totals at the site gauge can be attributed to a disproportionate number of high rainfall periods occurring in March and November over the 10-year (2013 to 2023) data record. It is expected the median March and November rainfall totals at the site gauge will trend towards the Boggabri Post Office median values as more data becomes available over time.

Rainfall during the 2022 calendar year was substantially wetter than typical conditions with most months exceeding the historical median value at Boggabri Post Office. Monthly rainfall totals from August to November either exceed or were similar to the 90th percentile rainfall totals (i.e rainfall conditions that are only exceeded in 10% of years). The annual rainfall total at the site gauge of 926 mm is approximately equivalent to a 97th percentile rainfall year based on the 139 years of available rainfall data at the Boggabri Post Office gauge.

# A.2 Evaporation Data

Daily evaporation rates were obtained as SILO patched point data at the Boggabri Post Office gauge over the January 1889 to December 2022 period. Evaporation data was sourced as Class A pan evaporation, Morton's potential evapotranspiration, and Morton's shallow lake evaporation.

The BoM records daily evaporation data at the Gunnedah Resource Centre (055024) weather station which is approximately 46 km south-east of the site. The Gunnedah Resource Centre weather station has recorded evaporation data since 1948. The Gunnedah Resource Centre evaporation data is compared to the SILO patched point data for Boggabri Post Office in Figure A-2. The comparison is intended to provide confidence the SILO data reflects actual recorded evaporation values. Average monthly rainfall totals are also presented in Figure A-2 for context.

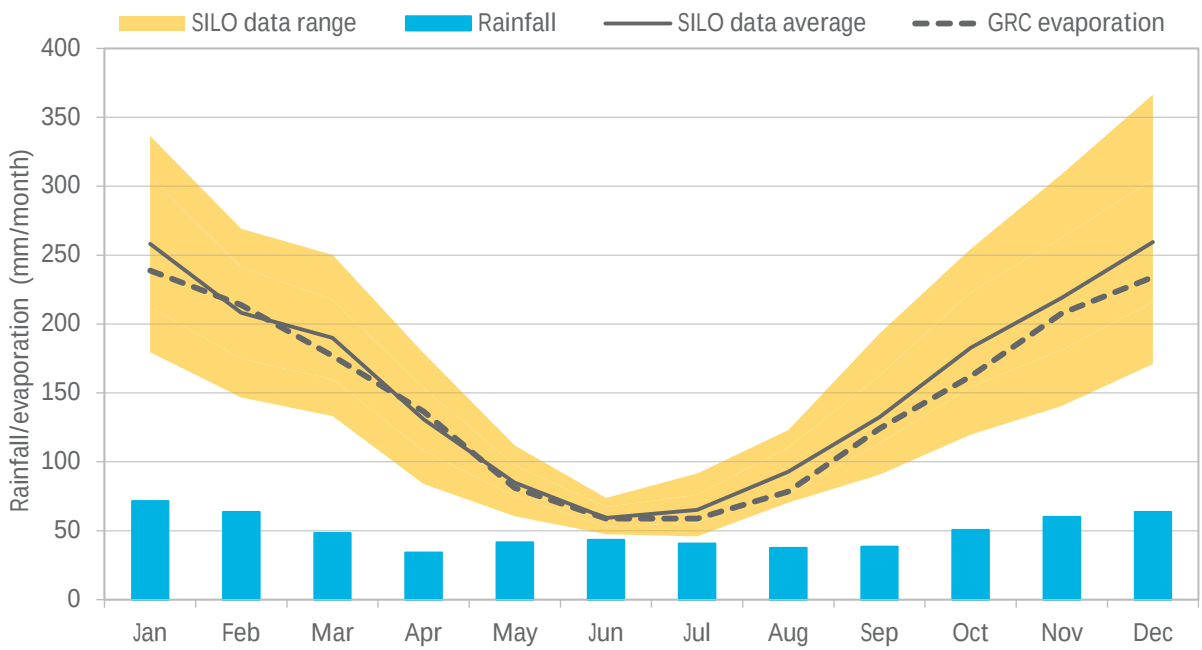



**Figure A- 2 Daily evaporation (range and mean)**

Figure A-2 shows the long-term average data from the SILO patched point data at Boggabri Post Office matches well with the data recorded at Gunnedah Research Station. Monthly evaporation totals are up to four times larger in summer compared to winter. Average monthly evaporation totals are shown to substantially exceed average monthly rainfall totals throughout the year.

# Appendix B:

Water Balance Methodology

# B.1 Modelling Approach and Assumptions

## B.1.1 Model Overview

The Site Water Balance (SWB) model was developed in GoldSim (version 14). The model applies a continuous simulation methodology that assessed the performance of the Boggabri Coal Mine (BCM) water management system (WMS) under a range of climate conditions. The model was created by representing the WMS as a series of elements, each containing pre-set rules and data, that were linked together to simulate the interaction of these elements.

The water balance model simulated the volume of water stored within the BCM WMS based on the following equation:

Change in volume over time = inflows – outflows

Where:

- Modelled inflows consisted of direct rainfall onto the water surface area of each storage, catchment runoff, groundwater inflows, transfers of water between storages and make up water imported from the BCM borefield and the Namoi River.
- Modelled outflows consisted of evaporation from the water surface area of each storage, transfers of water between storages, dust suppression water use, Coal Handling and Preparation Plant (CHPP) and Mine Infrastructure Area (MIA) water use, and via discharge from storage outlets due to overflows.

The modelled WMS including how each component is linked is shown schematically in Appendix D.

## B.1.2 Simulation period

The SWB model simulates the historical WMS performance (back to approximately 2019) for verification purposes as well as the next 10 years (between 2023 and 2033) of the Life-of-Mine (LOM) for forecasting purposes. The simulation period can be updated as needed to investigate a shorter or longer LOM or future operational scenarios.

The SWB model includes 134 years of historical rainfall and evaporation data allowing the LOM to be simulated using a range of climate conditions (refer to Appendix A).

## B.1.3 Timestep

Water is pumped across the BCM WMS based on pre-determined rules and pump rates (refer to Appendix C.2). Daily pump rates for some transfers, such as those between MW5 and SD23 to meet dust suppression demands, may exceed the actual volume of water that requires pumping in each day resulting in more water being transferred than what would occur under actual operations.

A sub-daily timestep is required to allow less than the maximum daily pump rate to be transferred per day. The SWB model applies a 6-hour timestep to adequately simulate the ability to operate pumps at sub-daily intervals.

### B.1.4 Summary of Key Model Assumptions

The following key assumptions are included in the SWB model:

- Pumping operations and rules are based on the existing and proposed infrastructure (refer to Appendix C.2). It is assumed that pumping occurs at an average pump rate and no allowance has been made for changes to flowrate with changes in head.
- Adequate surface water allocations or alternative water sources are available to make-up the external water requirement. Where the annual external water requirement exceeds BCOPL's current water entitlements, it was assumed that BCOPL would secure additional water to make up the difference.
- It is assumed that the Tarrawonga Coal Mine (TCM) catchment area to Nagero Creek discharging across the western boundary of mining lease 1579 discharges directly to Nagero Creek. However, it is understood that these discharges are captured within SD6. The volumes discharged from TCM are not expected to result in any material impact to the SWB due to the relatively large volume of water storage available at BCM.
- While the model assesses the performance of the system under historical extremes that may reasonably be expected to recur in the future. It does not explicitly consider the potential impact of future climate change.
- No allowance has been made for seepage from water storages.

Assumptions applied to model inflows and outflows are described further in Appendix B.2 and Appendix B.3 respectively. WMS inputs applied to the SWB model including storage volumes, catchment areas and pumping rules are provided in Appendix C.

## B.2 Model Inflows

### B.2.1 Rainfall

Historical daily rainfall data from 1889 to 2022 (134 years) obtained as patched point data from the SILO database, as discussed in Appendix A was applied the SWB model. Daily rainfall was applied to calculate direct rainfall onto the simulated water surface of each modelled storage whereby the volume of direct rainfall was calculated as the product of the simulated rainfall depth (refer to Appendix A.1) and the water surface area of the storage, calculated from surveyed stage-storage-area relationships.

Daily rainfall was also applied to the rainfall runoff model described in Appendix B.2.2 to estimate runoff from the WMS contributing catchment.

### B.2.2 Rainfall Runoff Model (AWBM)

The volume of surface water runoff from the mine site catchment has been estimated using the Australian Water Balance Model (AWBM). The AWBM was developed by Boughton (2004) and is widely used across Australia to estimate stream flow and runoff. The AWBM has been incorporated into the SWB model.

The AWBM is a 'bucket model'. It describes catchment runoff processes using the concept of surface stores (buckets), which trap rainfall and must fill before runoff can occur. Spatial variability is incorporated by using three stores, each with a different capacity (C1, C2 and C3) and partial areas (A1, A2 and A3,

where A1+A2+A3=1). Hence, parts of the catchment generate runoff after only a small depth of rain has fallen, while other parts of the catchment only generate runoff after significant ponds have formed and overflowed.

Since the AWBM is a continuous simulation model, antecedent moisture conditions within the catchment are tracked over time within the stores such that catchment wetness from preceding rainfall affects runoff generated by subsequent rainfall. For example, the first day of rain after a dry summer may generate a lower percentage of runoff than subsequent days of rainfall.

The AWBM was used to estimate catchment runoff from the various land use categories across BCM. The land use categories considered were undisturbed, rehabilitated spoil, industrial (hardstand and infrastructure areas), mining void (pit), active spoil and pre-strip.

A schematic of how the AWBM represents rainfall runoff is shown in Figure B-1.

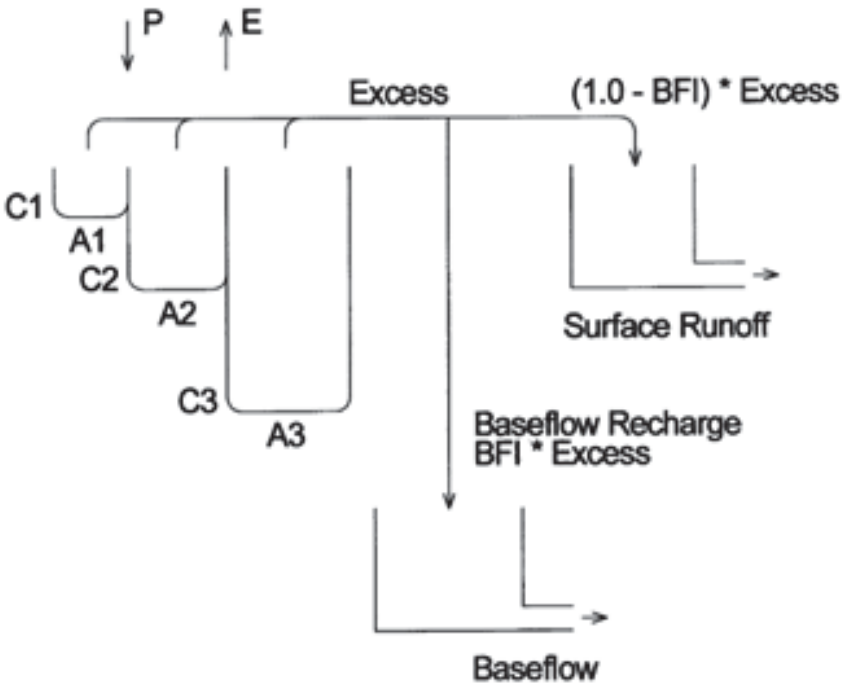



**Figure B- 1 Schematic Layout of the AWBM Rainfall-Runoff Model (Boughton, 2004)**

The AWBM is defined by nine parameters: three soil storage capacities, three partial areas, and three recession parameters. The AWBM parameters were selected to reflect the different hydrological responses of each of the six catchment land use types included in the SWB model. The AWBM parameters applied to the SWB model are presented in Table B-1. The model validation results presented in Section 4.2 indicate the adopted AWBM parameters are representing the WMS processes adequately.

**Table B- 1 Adopted AWBM Parameter Values**

| Land Use | BFI | $K_{base}$ | $K_{surf}$ | A1 | A2 | A3 | C1 | C2 | C3 |
|---|---|---|---|---|---|---|---|---|---|
| Industrial | 0.0 | 0.0 | 0.0 | 0.134 | 0.433 | 0.433 | 10 | 35 | 85 |
| Open Cut | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 0.6 | 15 | 50 | 200 |
| Pre-Strip | 0.2 | 0.98 | 0.0 | 0.134 | 0.433 | 0.433 | 15 | 60 | 150 |
| Rehabilitation | 0.6 | 0.90 | 0.0 | 0.2 | 0.2 | 0.6 | 24 | 140 | 200 |
| Spoil | 0.9 | 0.90 | 0.0 | 0.2 | 0.2 | 0.6 | 20 | 160 | 240 |

| Land Use | BFI | $K_{base}$ | $K_{surf}$ | A1 | A2 | A3 | C1 | C2 | C3 |
|---|---|---|---|---|---|---|---|---|---|
| Undisturbed | 0.05 | 0.98 | 0.0 | 0.134 | 0.433 | 0.433 | 20 | 140 | 200 |

## B.2.3 Water Imports

External water supply can be sourced from the BCM borefield or the Namoi River via pump and pipeline. Water imports are triggered in the model when the volume of water stored in MW5 recedes below the low operating volume (LOV) of 600 ML. Water imports enter the WMS via SD10 prior to being pumped to the CHPP and MIA to meet water demands or MW5 to meet dust suppression demands via the fill points in SD23 and MW8. Water imports are assumed to occur at a rate of 5.6 ML/day.

Due to the unreliable nature of the Namoi River water source, the option to extract water from the river is currently switched off in the SWB model. Hence all water is sourced from the borefield under exiting groundwater entitlements held by BCOPL or via additional groundwater entitlements that can be traded to make up system shortfalls.

Allowing MW5 to drawdown to the LOV before importing water is intended to maximise the reuse of dirty and contaminated water stored on site before sourcing water from external sources.

## B.2.4 Groundwater

Groundwater inflows to the mining void were adopted from values reported in historical Annual Review documents up until 2022, and from the Boggabri, Tarrawonga, Maules Creek Complex Groundwater Model Update (AGE, 2020) report from 2023 onwards. The AGE (2020) report considers the cumulative impact on groundwater resources resulting from the three adjacent mines and therefore provides the most robust estimate of future groundwater inflows. The predicted annual groundwater inflow volumes for BCM were applied to the water balance model and are presented in Figure B-2.

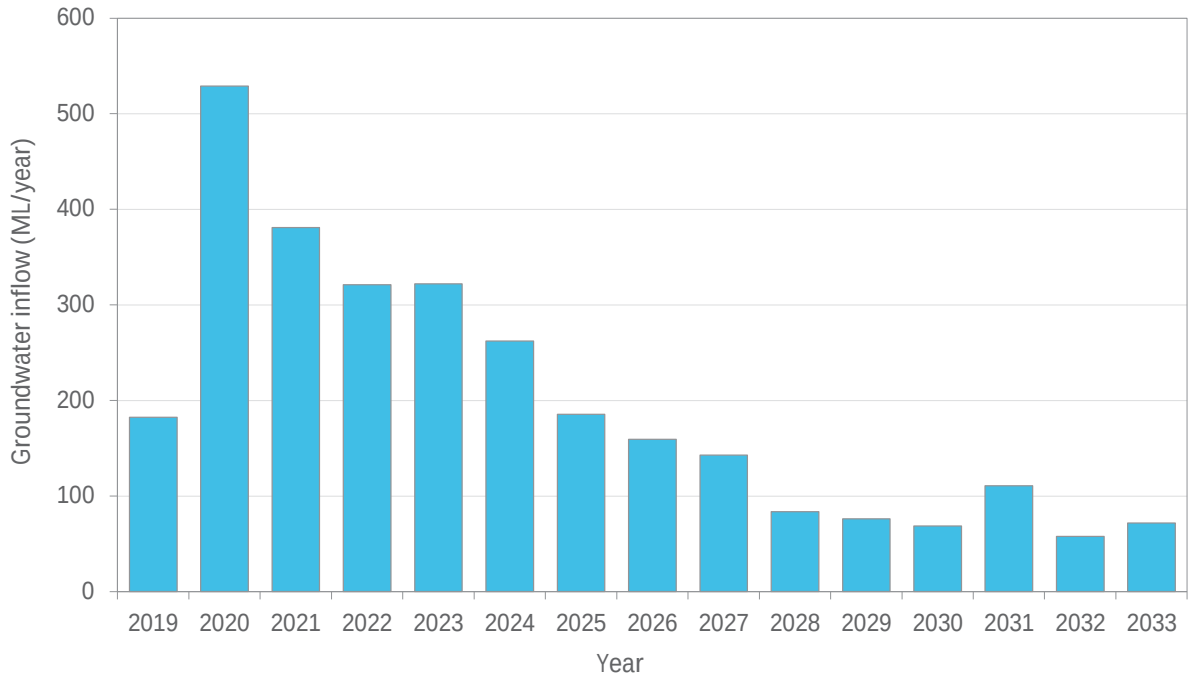



**Figure B- 2 Estimated Groundwater Inflows to Mining Void**

Figure B-3 shows groundwater inflow to the mining void was predicted to peak in 2020. Groundwater inflows are predicted to gradually decline over the life of the mine so that inflows are generally less than 100 ML/year from 2028 onwards. Some of the predicted groundwater inflows will be lost through evaporation. Any excess groundwater that is collected in the mine void is pumped to the water storages in accordance with the pump operational rules described in Appendix C.2.

# B.3 Model Outflows

## B.3.1 Evaporation

Evaporation loss from each storage water surface was calculated as the product of the daily Morton's shallow lake evaporation depth and the water surface area of the storage. Morton's potential evapotranspiration data was used in the AWBM runoff calculations to estimate soil moisture losses.

## B.3.2 Dust Suppression

Water is required for dust suppression on haul roads and other disturbed areas. Dust suppression for the CHPP coal stockpiles, coal crushing areas, and coal loading areas and MIA are accounted for in the CHPP demands (refer to Appendix B.3.4).

Modelled dust suppression demand is calculated as a factor of haul road surface area multiplied by the daily evaporation rate less rainfall so that no dust suppression occurs on days where the rainfall rate exceeds the evaporation rate. An effective width of 50 m was assumed for all haul roads. Historical and future haul road lengths were provided by BCOPL.

Water used for dust suppression is preferentially sourced from recycled contaminated water from various storages depending on the mine progression. Currently, there are fill points at MW8 and SD23. There is also a fill point located at SD7 which is not currently being utilised.

## B.3.3 MIA Water Demand

Water is required for vehicle washdown in the MIA. Washdown water is recycled, however, water is required to make-up evaporative losses. Make-up water for vehicle washdown is currently sourced from SD6 and SD10 via a filtration system.

Potable water is used in the administration building and amenities during operations. Potable water is currently sourced from groundwater entitlements (WAL 29473) assigned to the Lovton Bore. Wastewater from the administration building and amenities will be treated in an onsite Envirocycle treatment plant. Wastewater generated by the onsite Envirocycle treatment plant has not been considered in the water balance analysis.

BCOPL estimates approximately 0.5 ML/day of water is required for the MIA. This net demand is simulated in the model as a constant flow rate that is extracted from SD10. The assumption of a constant flow rate is considered appropriate for the purpose of the SWB model as actual day to day variations in operations will be attenuated by the water storage on site.

## B.3.4 CHPP Water Demand

The CHPP requires water for coal washing, dust suppression, and as fire suppression. BCOPL estimates approximately 1.0 ML/day of water is required for the CHPP. This net demand is simulated in the model as a constant flow rate that is extracted from SD10. The assumption of a constant flow rate is considered

appropriate for the purpose of the SWB model as actual day to day variations in operations will be attenuated by the water storage on site.

### B.3.5 Seepage

Typically, losses associated with seepage from water storages are minor compared to evaporation and pumped outflows. Hence, seepage losses are assumed to be negligible for modelling purposes and are therefore set to zero in the SWB model.

# Appendix C:

Storage Data

# C.1 Storage Summary

Table C-1 provides a summary of all site storages and their key operating volumes. BCOPL maintain an in-pit mine water dam (MWD) during operations. The in-pit MWD is typically relocated and renamed frequently as the mine progresses. However, the functionality of the storage to transfer water from the pit to MW5 and to provide a dust suppression fill point for the pit area remain similar over time.

The in-pit MWD was referred to as MW8 at the start of 2022 and was transitioned to MW9 in February 2022. The in-pit MWD is referred to as MW8 throughout this document for consistency but is intended to represent any such storage that may exist in the future as the open cut pit void develops.

**Table C- 1 Storage Summary**

| Storage | Date Online | Dead Storage Volume (ML) | LOV (ML) | HOV (ML) | Capacity (ML) |
|---|---|---|---|---|---|
| ***Existing Storages*** | | | | | |
| MW3 | - | 1.0 | 5.0 | 131.0 | 153.5 |
| MW5 | - | 1.0 | 600.0 | 1,961 | 2,200 |
| MW8 | - | 1.0 | 1.0 | 33.8 | 92.8 |
| Pit | - | 1.0 | 25.0 | 200.0 | - |
| SD3 | - | 16.7 | 33.3 | 34.3 | 102.3 |
| SD6 | - | 8.7 | 17.4 | 18.4 | 55.9 |
| SD7 | - | 11.7 | 23.3 | 24.3 | 95.1 |
| SD8 | - | 1.6 | 3.3 | 4.3 | 13.4 |
| SD10 | - | 9.7 | 19.4 | 61.7 | 116.4 |
| SD11 | - | 1.4 | 2.7 | 3.7 | 16.4 |
| SD12 | - | 17.2 | 34.4 | 35.4 | 206.6 |
| SD23 | - | 1.6 | 3.2 | 4.2 | 17.0 |
| SD28 | - | 1.0 | 0.6 | 1.6 | 3.5 |
| ***Proposed Storages*** | | | | | |
| CD5 | 2030 | 1.0 | 0.0 | 1.0 | 20.5 |
| CD6 | 2030 | 1.0 | 0.0 | 1.0 | 21.4 |
| CD7 | 2030 | 1.0 | 0.0 | 1.0 | 105.4 |
| CD8 | 2030 | 1.0 | 0.0 | 1.0 | 19.1 |
| SD19 | 2033 | 30.0 | 60.0 | 61.0 | 179.9 |
| SD20 | 2033 | 7.0 | 13.9 | 14.9 | 41.8 |
| SD21 | 2033 | 9.3 | 18.5 | 19.5 | 55.6 |
| SD22 | 2033 | 1.0 | 0.8 | 1.8 | 2.4 |
| SD24 | 2033 | 1.2 | 2.4 | 3.4 | 7.3 |

# C.2 Pump Transfers

## C.2.1 Operating Rules

The operating rules applied to pump transfers in the Site Water Balance (SWB) model are summarised in Table C-2. The pumps were modelled to switch on when the *on trigger* occurred and the specific *conditions* were true. The pump remained on until the *off trigger* occurred, or the *conditions* became false. The pump triggers and conditions are generally based on the low operating volume (LOV) and high operating volume (HOV) for each storage as defined in Appendix C.1.

- Water was not pumped from dirty water storages for reuse in the WMS when the volume stored in the pit exceeded the HOV. This rule is intended to allow dirty water discharges to occur (subject to meeting EPL conditions) rather than risking overflows from contaminated storages as a result of harvesting excess dirty water.
- Water was pumped from contaminated storages (via SD10) to MW3 when the stored volume in MW5 exceeds the HOV. MW3 is no longer used in the day-to-day operation of the WMS and is instead used as an evaporation basin to increase water losses during wet periods.
- Water was pumped from contaminated storages to the pit to avoid overflows in wet periods. This operating rule only occurs as a last resort once the stored volume in MW3 and MW5 exceeds their respective HOV.

The pump operating rules applied to SWB model are summarised in Table C-2.

**Table C- 2 Operating Rules**

| Pump from | Pump to | Pump rate (ML/day) | On trigger | Off trigger | Conditions |
|---|---|---|---|---|---|
| ***Existing storages*** | | | | | |
| Pit | MW8 | 5.0 (10.0 if pit volume exceeds 200 ML) | Pit > LOV | Pit < LOV | MW8 < HOV |
| Pit | MW5 | 5.0 (10.0 if pit volume exceeds 200 ML) | Pit > LOV | Pit < LOV | MW5 < HOV |
| Pit | SD23 | 5.0 (10.0 if pit volume exceeds 200 ML) | Pit > LOV | Pit < LOV | SD23 < HOV |
| MW3 | SD10 | 3.5 | MW3 > HOV | MW3 < LOV | SD10 < HOV |
| MW5 | MW8 | 5.0 | MW5 > dead storage volume | MW5 < dead storage volume | MW8 < HOV |
| MW5 | SD23 | 5.0 | MW5 > dead storage volume | MW5 < dead storage volume | SD23 < HOV |
| MW5 | SD10 | 5.0 | MW5 > dead storage volume | MW5 < dead storage volume | SD10 <HOV |
| SD3 | SD12 | 5.0 | SD3 > HOV | SD3 < LOV | SD12 < HOV<br>Pit < HOV |
| SD6 | SD10 | 2.0 | SD6 > HOV | SD6 < LOV | SD10 < HOV<br>Pit < HOV |
| SD7 | SD12 | 10.0 | SD7 > HOV | SD7 < LOV | SD12 < HOV |
| SD8 | SD10 | 1.9 | SD8 > HOV | SD8 < LOV | SD10 < HOV |
| SD10 | MW5 | 10.0 | SD10 > HOV | SD10 < HOV | MW5 < HOV |
| SD10 | MW3 | 10.0 | SD10 > HOV | SD10 < HOV | MW3 < HOV |

| Pump from | Pump to | Pump rate (ML/day) | On trigger | Off trigger | Conditions |
|---|---|---|---|---|---|
| | | | | | MW5 > HOV |
| SD10 | Pit | 10.0 | SD10 > HOV<br>MW3 > HOV<br>MW5 > HOV | SD10 < HOV<br>MW3 < HOV<br>MW5 < HOV | - |
| SD11 | SD10 | 2.0 | SD11 > HOV | SD11 < LOV | SD10 < HOV |
| SD12 | MW5 | 20.0 | SD12 > HOV | SD12 < LOV | MW5 < HOV |
| SD23 | MW5 | 3.0 | SD23 > HOV | SD23 < HOV | MW5 < HOV |

# C.3 Catchment Areas

Catchment areas that contribute runoff to each storage as adopted in the SWB model are provided in Table C-3.

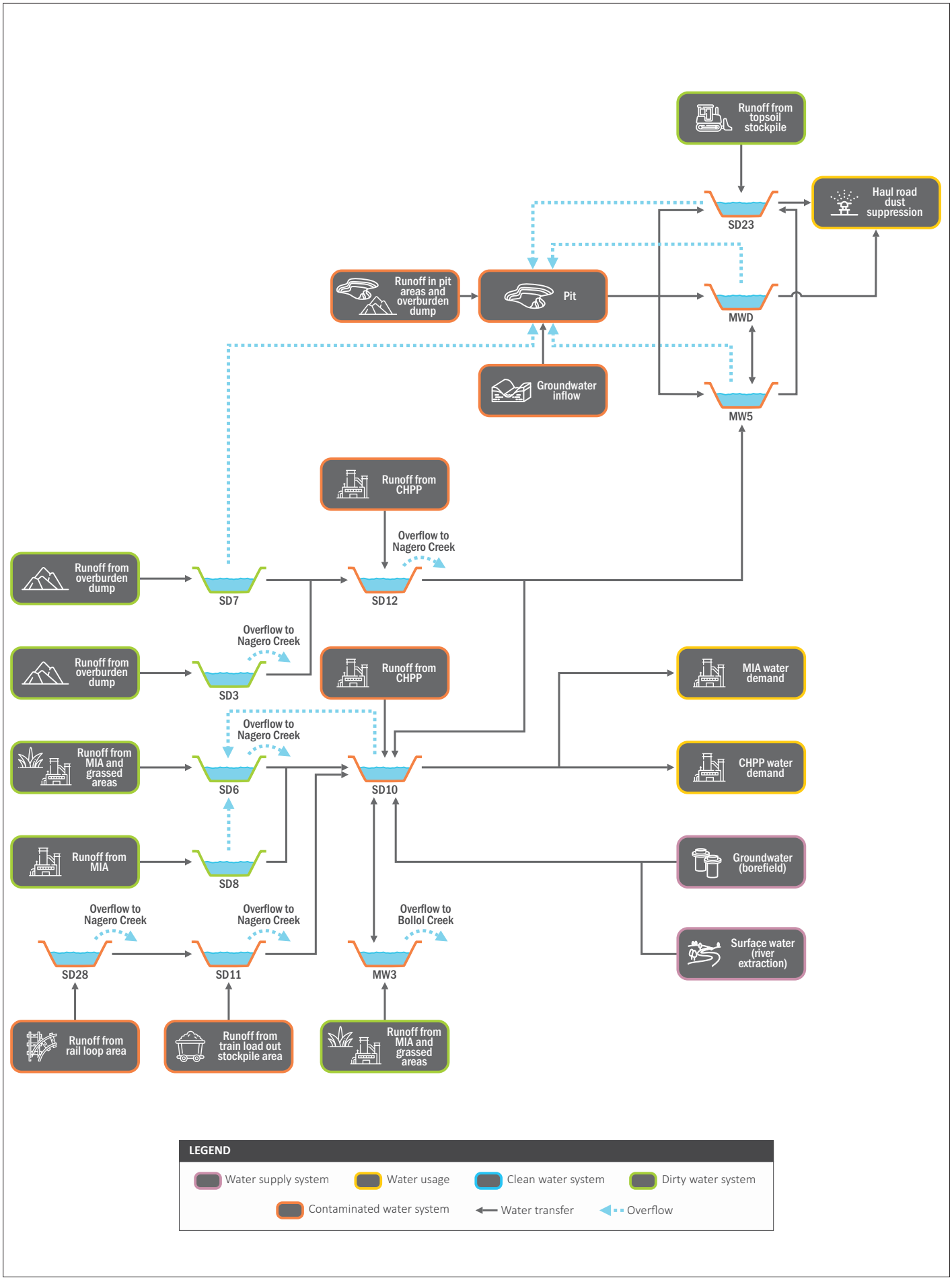
**Table C- 3 WMS Catchment Areas (ha)**

| System | Storage | 2022 | 2024 | 2033 |
|---|---|---|---|---|
| Contaminated water dams [1] | MW3 | 10.7 | 10.7 | 10.7 |
| | MW5 | 208.1 | 208.1 | 10[2] |
| | MW8 | 0.6[2] | 0.6[2] | 0.6[2] |
| | SD10 | 31.4 | 31.4 | 31.4 |
| | SD11 | 3.9 | 3.9 | 3.9 |
| | SD12 | 46.2 | 46.2 | 173.8 |
| | SD28 | 0.7 | 0.7 | 0.7 |
| | Pit | 1,414.2 | 1,259.8 | 533.7 |
| | **Subtotal** | **1715** | **1561** | **754** |
| Dirty water dams | SD3 | 194.6 | 314 | 639.9 |
| | SD6 | 65.1 | 65.1 | 13.9 |
| | SD7 | 210 | 245.1 | - |
| | SD8 | 11.2 | 11.2 | 11.2 |
| | SD19 | - | - | 357.2 |
| | SD20 | - | - | 95.2 |
| | SD21 | - | - | 116.4 |
| | SD22 | - | - | 7.0 |
| | SD23 | 51.5 | 51.5 | 70.7 |
| | SD24 | - | - | 16.5 |
| | **Subtotal** | **532** | **687** | **1,328** |
| Clean water dams | Clean Water Highwall Dams | - | - | **162.1** |
| **Total** | | **2248** | **2248** | **2255** |

[1] Excludes approved irrigation area draining to Bollol Creek catchment.
[2] Represents nominal water surface area assumed for storage that replaces MW5.

# Appendix D:

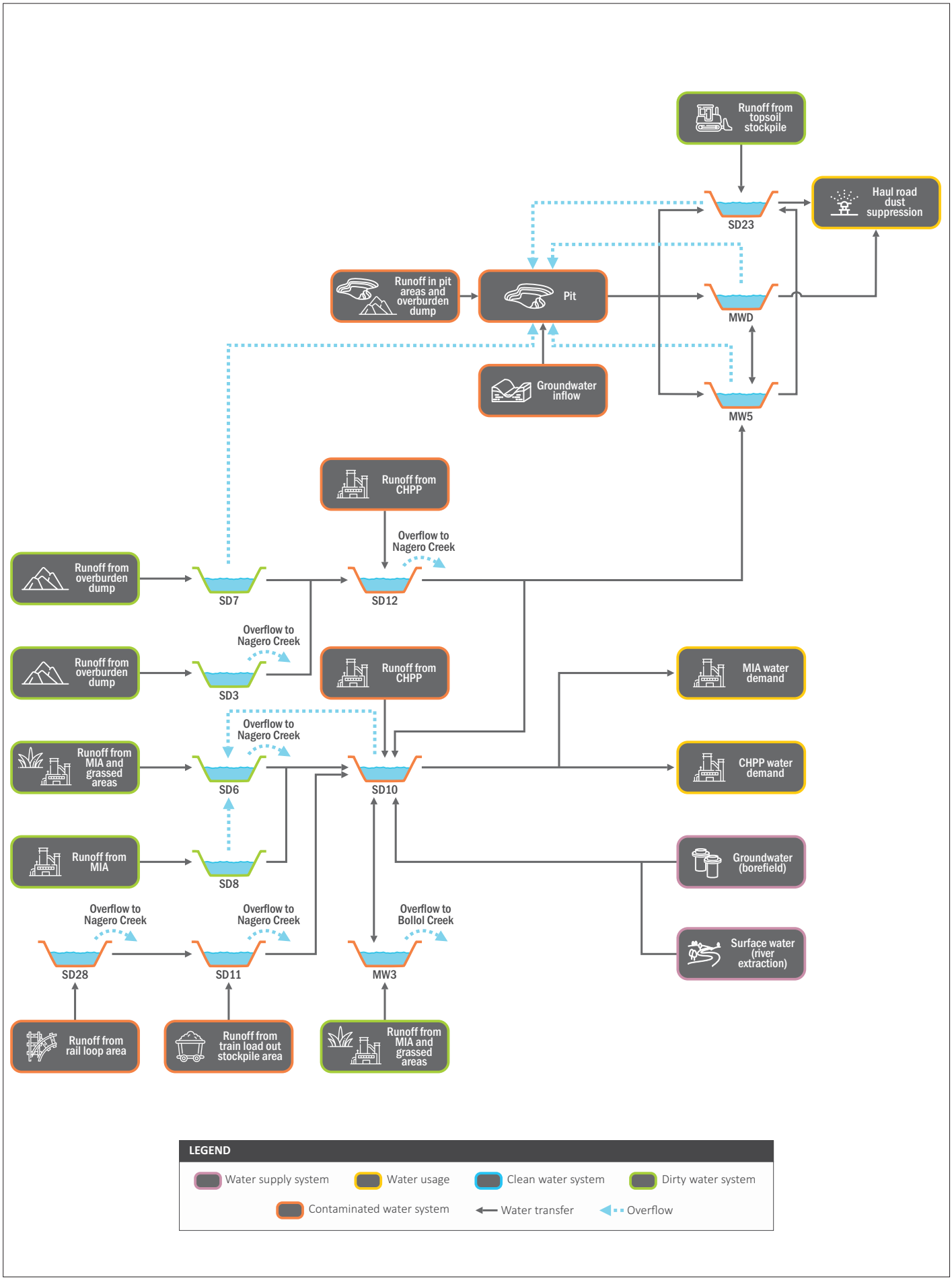
Water Management System Plans and Schematics




Water balance model schematic (2022)

Boggabri Coal Operations Pty Ltd
Site Water Balance
Figure D.1

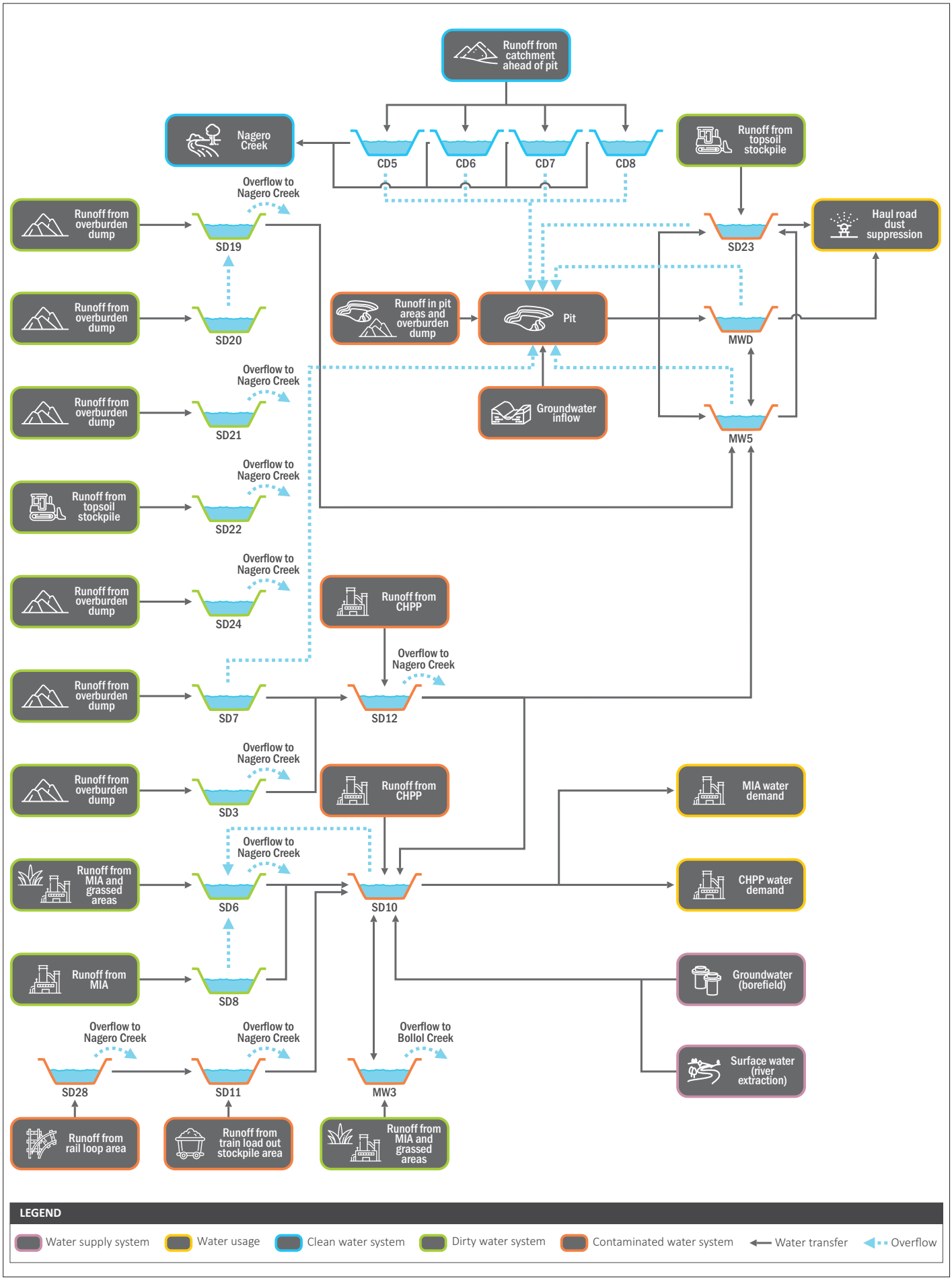
EMM
creating opportunities




Water balance model schematic – indicative conditions (2024)

Boggabri Coal Operations Pty Ltd
Site Water Balance
Figure D.2

EMM
creating opportunities




Water balance model schematic – indicative conditions (2033)

Boggabri Coal Operations Pty Ltd
Site Water Balance
Figure D.3

EMM
creating opportunities

# Appendix I

Annual Rehabilitation Report