ENV-WAT-PLN-002 Surface Water Management Plan

September 2024

idemitsu

IDEMITSU
BOGGABRI COAL

Document details and history

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1.0 INTRODUCTION

1.1 Project description

Boggabri Coal Mine (BCM or the project) is an open cut coal mine located 15 kilometres (km) north-east of the township of Boggabri in north-western New South Wales (NSW) (refer to Figure 1-1). BCM is managed by Boggabri Coal Operations Pty Ltd (BCOPL), a subsidiary of Idemitsu Australia Resources Pty Limited (Idemitsu).

Mining activities at BCM commenced in 2006. The mine currently operates under State Significant Development (SSD) Project Approval (SSD 09_0182), which allows BCOPL to produce 8.6 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal from BCM until the end of 2036. 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 several modifications.

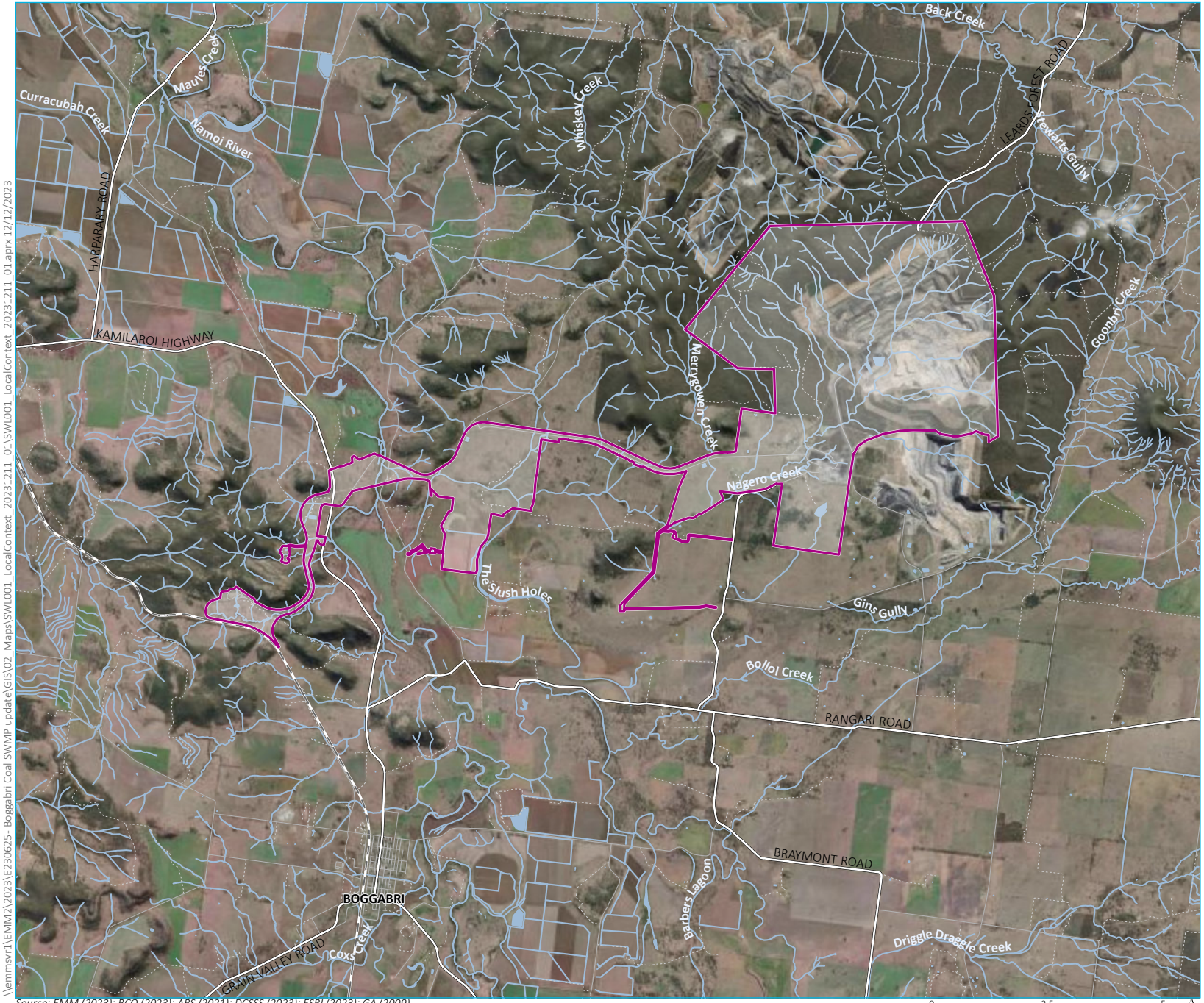
1.2 Purpose

The purpose of this Surface Water Management Plan (SWMP) is to describe the surface water management strategies, procedures, controls, monitoring program, and response measures at the BCM. The SWMP was prepared to directly address the surface water related conditions outlined in the Project Approval (SSD 09_0182), *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval, and mining lease conditions. The key objectives of this SWMP include:

- address the relevant approval conditions
- describe baseline surface water characteristics for the site
- describe the surface water management system and erosion and sediment control measures
- establish a surface water monitoring program
- describe proposed actions, operating protocols and response measures.

This SWMP was prepared with consideration of the relevant statutory requirements (Commonwealth, State or local), regulations, environmental planning instruments, and guidelines relevant to mine water management.

This SWMP applies to all employees and contractors at the BCM and covers activities within the ‘Project Approval’ area (refer to Figure 1-1) as defined in the Project Approval.



KEY

- Project approval area

Existing environment

- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Waterbody

INSET KEY

- NPWS reserve
- State forest

Source: EMM (2023); BCO (2023); ABS (2021); DCSSS (2023); ESRI (2023); GA (2009)

0 2.5 5 km

GDA2020 MGA Zone 56

N

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Local context

Boggabri Coal Operations Pty Ltd
Surface Water Management Plan
Figure 1.1

EMM
creating opportunities

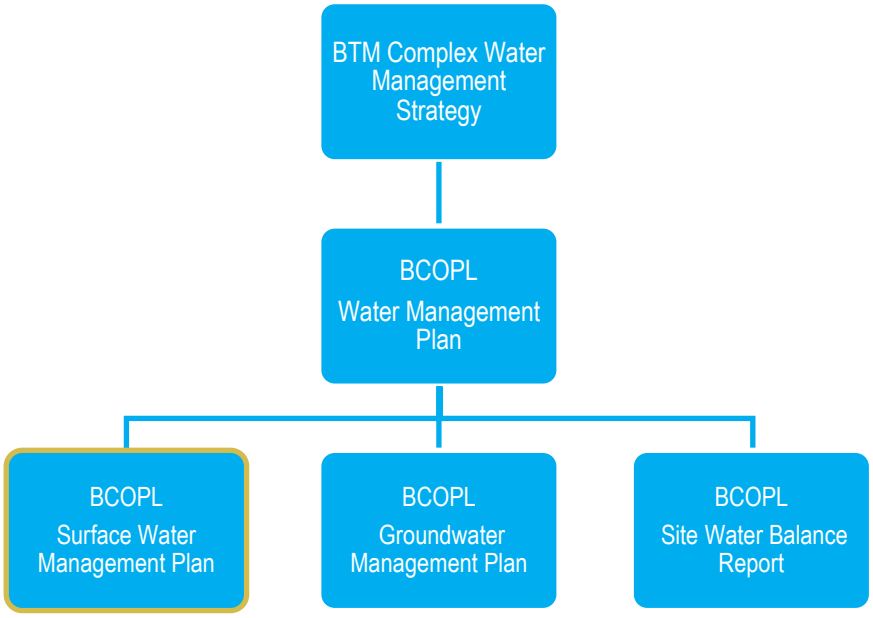
1.3 Related water management documents

This SWMP is a subplan of the overarching BCM Water Management Plan (WMP). The water management documents applicable to BCM are listed in Table 1-1. The WMP document hierarchy is shown in Figure 1-2.

Table 1-1: Related water management documents

Document	Description
Boggabri – Tarrawonga – Maules Creek (BTM) Complex Water Management Strategy	Regional strategy prepared in consultation with Tarrawonga Coal Pty Ltd (TCPL) and Maules Creek Coal Project (MCC).
BCOPL Water Management Plan (WMP)	Overarching document setting out water management framework, statutory requirements, and procedural requirements.
BCOPL Surface Water Management Plan (SWMP)	Surface water baseline data, performance criteria, monitoring program, response plan, water management system description, erosion and sediment controls.
BCOPL Groundwater Management Plan (GWMP)	Groundwater baseline data, performance criteria, monitoring program, response plan, and groundwater model validation program.
BCOPL Site Water Balance Report (SWBR)	Water balance modelling methodology, assumptions and results, and mine water management system operating philosophy.

Figure 1-2: Water management plan document hierarchy



1.4 Roles and responsibilities

The responsibilities for key site contacts are outlined in Table 1-2.

Table 1-2: Roles and responsibilities

Role	Responsibility
BCOPL General Manager	Providing sufficient environment resources to ensure the effective implementation of the requirements, as outlined in this SWMP.
BCOPL Mining Manager	Mining and water management is to be undertaken in accordance with this SWMP.
BCOPL Coal Handling and Preparation Plant Manager	Mining and water management is to be undertaken in accordance with this SWMP.
BCOPL Environment and Community Manager	Providing sufficient environment resources to ensure the effective implementation of the requirements, as outlined in this SWMP.
BCOPL Environmental Superintendent	Implementing the surface water management obligations in accordance this SWMP. Undertaking inspections and monitoring of surface water management measures. Liaising with regulatory authorities regarding surface water management obligations as detailed in this SWMP. Coordinating reviews and revisions of this SWMP. Ensuring all employees and contractors are aware of their environment management obligations in accordance with this SWMP. Engaging specialists to undertake specific monitoring and environmental management activities in accordance with the commitments outlined in this SWMP. Communicating the surface water requirements outlined in this SWMP to responsible parties at BCM.

1.5 Agency consultation

As required by consent condition 38 of Schedule 3 of the Project Approval, previous versions of the SWMP and this version of the SMWP were prepared in consultation with several NSW government agencies including:

- Department of Planning and Environment (DPE) – Water (DPE-Water), Biodiversity Conservation (BSC) and Natural Resources Access Regulator (NRAR) divisions
- North West Local Land Services (NLLS) (formerly Namoi Catchment Management Authority [NCMA])
- Community Consultative Committee (CCC)
- Environment Protection Authority (EPA).

1.6 Report preparation

This SWMP has been prepared by Senior Water Resource Engineer Jason O'Brien and reviewed by Associate Water Resource Engineer Sally Callander. Jason has eight years' experience as a water resource engineer

preparing surface water assessments, water management plans, water balance modelling and flood risk assessments. Sally has 15 years' experience in the water industry specialising in surface water assessments and management plans, water balance assessments, water quality assessments, hydrologic and hydraulic modelling and floodplain impact assessment, and risk management development and policy.

2.0 STATUTORY REQUIREMENTS

2.1 Relevant legislation

Key legislation that is relevant to this SWMP include:

- *Environmental Protection and Biodiversity Conservation Act (1999)* (EPBC Act) – Commonwealth
- *Environmental Planning and Assessment Act 1979* (EP&A Act) – NSW
- *Mining Act 1992* – NSW
- *Protection of the Environment Operations Act 1997* (POEO Act) – NSW
- *Water Management Act 2000* (WM Act) – NSW.

2.2 Project approval conditions

2.2.1 Commonwealth approval conditions

Commonwealth approval for the project was granted 11 February 2013 pursuant to Sections 130 (1) and 133 of the EPBC Act (EPBC Act referral 2009/5256). A variation to the EPBC Act conditions of approval was authorised in February 2020. The EPBC Act approval conditions relevant to this SWMP are reproduced in Table 2-1.

Table 2-1: Surface water related EPBC approval conditions

Condition	Description	Where addressed
Surface Water and Groundwater Management Plans		
No. 16	The surface and groundwater management plans must be consistent with the National Water Quality Management Strategy.	Section 2.5 Section 5.3
No. 18	The person taking the action must within 6 months of this approval, or such other timeframe specified by the Minister, provide to the Minister a report on: a) any updated modelling of surface and groundwater impacts that has been undertaken in preparing the surface and groundwater management plans b) how the surface and groundwater management plans addressed groundwater and surface water impacts on native vegetation.	Surface water modelling addressed in the SWBR Section 5.5 (stream riparian health)
No. 19	A risk-based assessment of the disposal of mine water by irrigation on soils must be undertaken. The assessment must include the risk of metal and salinity accumulation in soils.	Not applicable[1]

Notes: 1. The irrigation system has not been constructed and there are no current plans to dispose of excess mine water via irrigation.

2.2.2 State project consent conditions

State development consent (SSD 09_0182) was granted 18 July 2012 pursuant to Section 75J of the EP&A Act by the Planning and Assessment Commission of NSW as delegate of the Minister for Planning.

Development consent for Modification 8 was issued in January 2024. The NSW State development consent conditions relevant to this SWMP are reproduced in Table 2-2.

Table 2-2: Surface water related consent conditions

Condition	Description	Where addressed
Water licences		
-	Note: Under the Water Act 1912 and/or the Water Management Act 2000, the Proponent is required to obtain the necessary water licences for the project.	Chapter 8.0
Surface water discharges		
Sch 3, 35	The Proponent must ensure that all surface water discharges from the site comply with the discharge limits (both volume and quality) set for the project in any EPL.	Section 6.2.1
Flood impacts Boggabri Rail Spur Line and Haul Road		
Sch 3, 37	The rail spur line, rail spur bridges and any upgrade to the haul road must be designed and constructed to minimise impacts on flooding. Prior to construction of the rail spur line or any upgrades to the haul road, the Proponent must undertake a flood assessment of the detailed design to confirm there would be minimal impacts as predicted in the EA. This must include assessment of impacts of the rail spur line embankment and proposed design of stormwater culverts along the rail spur line to the Namoi River to assess changes to localised flood impacts within the Nagero creek catchment and adjoining Bollol Creek catchment. The assessment must be undertaken in consultation with DPE Water, North West LLS, Council and BCS, to the satisfaction of the Secretary.	Section 4.3.6
Water Management Plan		
Sch 3, 38	The Proponent must prepare and implement a Water Management Plan for the project to the satisfaction of the Secretary. This plan must be prepared in consultation with the EPA, DPE Water, North West LLS 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. In addition to the standard requirements for management plans (see Schedule 5, Condition 3), this plan must include:	Section 1.5 Section 1.6
	(b) a Surface Water Management Plan, which includes:	
	• detailed baseline data on surface water flows and quality in the water-bodies that could potentially be affected by the project;	Section 3.1 Section 3.2
	• detailed baseline data on soils within the irrigation management area;	Not applicable[1]

Condition	Description	Where addressed
	• detailed baseline data on hydrology across the downstream drainage system of the Namoi River floodplain from the mine site to the Namoi River;	Section 3.1
	• a detailed description of the water management system on site, including the:	
	– clean water diversion systems;	Section 4.3.2
	– erosion and sediment controls (dirty water system);	Section 4.3.3 Section 4.7
	– mine water management systems including irrigation areas;	Section 4.3.4[1]
	– discharge limits in accordance with EPL requirements including characterisation of surface water to confirm appropriate discharge criteria are applied, including a representative suite of heavy metals;	Section 6.2
	– water storages;	Appendix A
	– haul road and Boggabri Rail Spur Line and bridge flood and water diversions;	Section 4.3.6
	• detailed plans, including design objectives and performance criteria for:	
	– design and management of final voids;	Section 4.5
	– design and management for the emplacement of reject materials, sodic and dispersible soils and acid or sulphate generating materials;	Section 4.6
	– design and management for construction and operation of the Boggabri Rail Spur Line and bridge across the Namoi River floodplain and upstream adjoining Nagero/Bollol Creek catchments;	Section 4.3.6
	– reinstatement of drainage lines on the rehabilitated areas of the site; and	Section 4.5
	– control of any potential water pollution from the rehabilitated areas of the site;	Section 4.5
	• performance criteria for the following, including trigger levels for investigating any potentially adverse impacts associated with the project:	
	– the water management system;	Section 6.1 Section 6.2
	– soils within the irrigation area;	Not applicable[1]

Condition	Description	Where addressed
	– downstream surface water quality;	Section 6.2
	– downstream flooding impacts, including flood impacts due to the construction and operation of the Boggabri Rail Spur Line and rail bridge; and	Section 4.3.6 Section 6.3
	– stream and riparian vegetation health, including the Namoi River;	Section 6.4
	• a program to monitor:	
	– the effectiveness of the water management system;	Chapter 5.0
	– soils within the irrigation area;	Not applicable[1]
	– surface water flows and quality in the watercourses that could be affected by the project;	Section 5.2 and 5.3
	– downstream flooding impacts; and	Section 5.4
	– reporting procedures for the results of the monitoring program;	Section 9.1
	• a plan to respond to any exceedances of the performance criteria, and mitigate and/or offset any adverse surface water impacts of the project.	Chapter 7.0

Notes: 1. The irrigation system has not been constructed and there are no current plans to dispose of excess mine water via irrigation.

2.2.3 Mining Lease conditions

The objectives of the *Mining Act 1992* are to encourage and facilitate discovery and development of mineral resources having regard to the need to encourage ecologically sustainable development. In relation to water, the Act requires that BCOPL ensure effective rehabilitation of disturbed land and water and to ensure mineral resources are identified and developed in ways that minimise impact to the environment. BCOPL hold coal lease CL368 under this Act. Mining lease conditions relevant to this SWMP are reproduced in Table 2-3.

Table 2-3: Surface water related mining lease approval conditions

Condition	Description	Where addressed
Water related conditions		
No. 11	The registered holder shall: • submit for the Ministers approval an environmental management plan relating to the operation of the registered holder on the subject area • the plan shall describe the methods to be used to protect the environment, including the methods used to: – minimise air, noise and water pollution – minimise erosion.	This SWMP
No. 22	Settling dams or other dams constructed or to be constructed on the subject area shall be constructed, maintained and sealed to the satisfaction of the Minister.	Section 4.3
No. 23	The registered holder shall provide and maintain to the satisfaction of the Minister efficient means to prevent contaminated waters discharging or escaping from the subject area onto the surrounding areas and shall comply with any written directions given of which may be given in this regard by the Minister.	Section 4.3
No. 25	The registered holder shall provide and maintain to the satisfaction of the Minister efficient means to prevent the contamination, pollution, erosion or saltation of any stream or watercourse or catchment area or any undue interference to fish or their environment and shall observe any instruction which may be given by the Minister with a view to protecting or minimising the contamination, pollution, erosion or saltation of any stream, watercourse or catchment area, or any under interference to fish or their environment.	Section 4.3 to Section 4.7
No. 29	The registered holder shall conduct operations in such a manner as not to cause or aggravate soil erosion and the registered holder shall observe and perform any instruction which may be given by the Minister or the Director General with a view to minimising or preventing soil erosion.	Section 4.7
No. 32	The registered holder shall ensure that the runoff from any disturbed area including the overflow from any depression or ponded area is discharged in such a manner that it will not cause erosion.	Section 4.7

2.3 Enforceable Undertaking

NRAR issued an Enforceable Undertaking (EU 230608) (EU) to BCOPL on 8 June 2023 regarding water take from the Bluevale Water Source (refer to Appendix D). Several commitments were made by BCOPL as part of the EU. Commitments that are relevant to this SWMP are reproduced in Table 2-4.

Table 2-4: Surface water related Enforceable Undertaking (EU 230608) commitments

EU ID	Commitment	Where addressed
4.1 a)	i) Install additional water metering and telemetry at Boggabri Coal Mine's main water arterials to measure water transferred out of the pit into the mine water dams, as set out in Appendix 1 (of the EU), by 31 December 2023.	Section 5.2
	ii) purchase and implement a GOLDSIM modelling license by 31 July 2023. To implement the license once purchased, BCOPL must undertake weekly monitoring of dam storage curves and pumping flow rates to enable the GOLDSIM site model balance to be updated regularly. Implementation of the GOLDSIM license must deliver as ongoing outputs (including beyond 31 July 2023): 1) real time site water balances inclusive of all surface water inflows; 2) forecast modelling to determine future surface water licensing requirements; and 3) verification of water intakes and usage, and provide predictive modelling capacity for upcoming weather events.	Section 5.2 Section 8.6 The GOLDSIM water balance model is described in the SWBR.
	iii) By 31 December 2023, submit to the NSW Department of Planning and Environment for its approval an updated site water management plan (SWMP). The SWMP must include information relevant to the additional metering, telemetry and monitoring referred to in paragraph 4.1a)i).	The SWMP was submitted to NRAR for review. Section 5.2
	iv) Use information and data derived from water metering, telemetry and monitoring improvements to report and account for surface water taken during each water year until 31 December 2027 in accordance with the methodology set out in Appendix 2 of the EU.	Section 8.6 Section 9.1 Appendix B

2.4 Permits and licences

2.4.1 Environmental protection licence

Environmental protection licence (EPL) No. 12407 applies to the BCM operations. The current EPL includes 10 surface water related reference points for which specific discharge and monitoring conditions are applied. The EPL water quality monitoring requirements are addressed as part of the water quality monitoring program described in Section 5.3.

EPL No. 12407 also includes a requirement to maintain an air capacity (cumulative freeboard) of 1,000 megalitres (ML) within the BCM mine water inventory. The available air capacity in the BCM mine water storages is routinely measured in accordance with the monitoring program described in Section 5.2.

2.4.2 Water access licences

BCOPL are required to hold water access licences (WAL) for surface water take associated with the BCM. Water licensing requirements, existing WALs and water supply works approvals, and the methodology to account for surface water take at the BCM are described in Chapter 8.0.

Water licensing requirements and existing WALs associated with groundwater take are described in the GWMP.

2.5 Guidelines

The water management guidelines relevant to the BCM are summarised in Table 2-5.

Table 2-5: Relevant guidelines for the project

Guideline name	Description
National Water Quality Management Strategy (NWQMS)	The purpose of the NWQMS is to protect the nation's water resources by maintaining and improving water quality, while supporting dependent aquatic and terrestrial ecosystems, agricultural and urban communities, and industry. Water quality management is based on national guidelines that are implemented at state, regional and local levels. The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000) and subsequently the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) are benchmark documents of the NWQMS. The water quality monitoring program has been developed with consideration of the NWQMS and the ANZECC (2000) and ANZG (2018) guidelines.
NSW Water Quality and River Flow Objectives	The *NSW Water Quality and River Flow Objectives* (DECCW 2006) provides water quality objectives (WQO) that are consistent with the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000) water quality guidelines. The WQOs have been developed to guide plans and actions to achieve healthy waterways in NSW. The WQOs for a water resource are dependent on the community and environmental values of that resource. The environmental values of a water system are related to its use, from both a human and environmental perspective. The river flow objectives (RFO) are the agreed high-level goals for surface water flow management. They identify the key elements of the flow regime that protect river health and water quality for ecosystems and human uses. Where water sharing plans (WSP) have been made, RFOs informed the development of these plans but typically more detailed work and understanding of flow management objectives has since been derived to the extent that WSPs effectively supersede the RFOs. WQO and RFOs are provided for catchments throughout NSW. The BCM is within the Namoi River catchment. Watercourses within and immediately downstream of the BCM are classified as "uncontrolled streams" on the DECCW (2006) watercourse mapping.
Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2018	The ANZG (2018) guidelines describe WQOs for freshwater and marine environments, aquatic ecosystems and primary industries within Australia and New Zealand. The ANZG (2018) guidelines are a revision to the ANZECC (2000) guidelines. The ANZG (2018) guidelines provide a framework for the development, assessment, and implementation of WQOs to sustain current, or likely future community values for natural and semi-natural water resources. The ANZG (2018) guidelines include default guideline values (DGVs) that define ranges and maximum values for certain parameters that are suitable for the protection of specific water uses or values. The DGVs do not make allowance for site-specific factors that may influence water quality. In accordance with the *NSW Water Quality and River Flow Objectives* (DECCW 2006), the ANZG (2018) and (where relevant) ANZECC (2000) guidelines have been applied to the water quality assessment criteria in Section 6.2.
Managing Urban Stormwater: Soils and Construction	*Managing Urban Stormwater: Soils and Construction, Volume 1* (Landcom 2004) (the "Blue Book") describes best practice erosion and sediment control measures, including the calculation methodologies for sizing sedimentation basins.

	Managing Urban Stormwater: Soils and Construction, Volume 2E – Mines and quarries (DECC 2008) describes best practice erosion and sediment control measures with a focus towards mining and quarry operations.
NSW Guidelines for Controlled Activities on Waterfront Land 2012	The WM Act defines waterfront land as the bed of any river, lake or estuary and any land within 40 m of the riverbanks, lake shore or estuary mean high water mark. Works undertaken on waterfront land generally require a controlled activity approval, unless defined as exempt. Guidelines for controlled activities have been prepared by NSW Department of Industry (now DPE). These guidelines provide information on the design and construction of a controlled activity, and other ways to protect waterfront land. As the project is categorised as SSD, Section 75U of the EP&A Act precludes the need for a controlled activity approval.

3.0 BASELINE CONDITIONS

3.1 Watercourses and hydrology

3.1.1 Available streamflow data

Streamflow in proximity to BCM is recorded at several WaterNSW operated gauges. Gauge information and streamflow statistics for each of the nearby gauges is presented in Table 3-1. The statistics are presented as annualised totals that have been calculated from available gauge records.

Table 3-1: Stream flow gauges along Namoi River

	Namoi River at Gunnedah	Namoi River at Boggabri	Namoi River at Turrawan	Maules Creek at Avoca East
Stream gauge information				
Station number	419001	419012	419023	419051
Record	1968–present	1979–present	1995–present	1975–present
Record available	99%	100%	100%	100%
Distance from BCM	41 km south	12 km south-east	28 km north-west	15 km north-west
Catchment area	17,100 km^2	22,600 km^2	24,500 km^2	739 km^2
Annual streamflow statistics (gigalitres/year)				
Average	624	652	617	23
Minimum	1	4	2	0
10^{th} percentile	124	105	85	1
25^{th} percentile	229	206	168	3
Median	362	344	313	7
75^{th} percentile	640	727	703	37
90^{th} percentile	1,862	1,533	1,509	51
Maximum	2,849	3,197	3,117	150

3.1.2 Available flooding information

Several flood studies have been undertaken regionally for the Namoi River, but only a few relate to the stretch of the Namoi River downstream of Boggabri. Key studies undertaken for the Namoi River near BCM include:

- *Continuation of BCM – Namoi River Flood Impact Assessment (WRM 2009)*

- *Tarrawonga Coal Mine Modification – Surface Water Assessment* (Gilbert and Associates 2010)
- *Namoi River flood study for the proposed Maules Creek Mine* (Parsons Brinckerhoff 2011)
- *Drainage Hydrology and Hydraulic Assessment - Common and Boggabri* (Aurecon 2013).

Flooding along the reaches of the Namoi River nearest to BCM is characterised by overbank flows which inundate the extensive floodplain areas on both sides of the channel. During intense and prolonged rainfall events, large areas of the alluvial flats become inundated forming large slow-moving sheets of water which slowly dissipate by evaporation and seepage into the alluvial plains and by slow drainage into the Namoi River via the relic lagoons that are present on the edges of the river.

The largest recorded flood event (maximum daily flow) for the Namoi River at Boggabri and Namoi River at Gunnedah gauges occurred in February 1955. Both gauges have a long period of record. The Namoi River at Turrawan gauge recorded its highest daily flow during another significant flood event in 1976. Other large floods have occurred in January 1971, February 1956 and February 1984 (WRM 2009). The Namoi River flood flows take about two days to travel the 40 km stretch of river from Gunnedah to Boggabri (WRM 2009).

Most infrastructure associated with the BCM is located 9 km east of the Namoi River and is elevated above the floodplain and as such is not expected to be impacted by river flooding. The BCM haul road and spur rail line traverse the Namoi River floodplain. Sections of the haul road are inundated during flood events of 20% annual exceedance probability (AEP) magnitude and greater. The rail spur line (including the rail bridge) was designed and constructed to be located above the 1% AEP flood level.

3.1.3 Regional hydrology

BCM is largely contained within the catchment of an unnamed ephemeral waterway, locally referred to as Nagero Creek. A small area to the south of the Mine Infrastructure Area (MIA) is located within the catchment of Bollol Creek. Nagero Creek and Bollol Creek are both small tributaries of the Namoi River, which is part of the Barwon-Darling River system.

The Namoi River catchment is bounded by the Great Dividing Range in the east, the Liverpool Ranges and Warrumbungle Ranges in the south, and the Nandewar Ranges and Mount Kaputar to the north. Major tributaries of the Namoi River include Coxs Creek, Mooki River, Peel River, Cockburn River, Manilla River, and Macdonald River, which all join the Namoi River upstream of Boggabri.

The Namoi River has a catchment area of about 42,000 km^2, which extends over 350 km in an east-west direction between the Great Dividing Range and the Barwon River. The Namoi River catchment area upstream of Boggabri is 22,600 km^2.

Split Rock Dam on the Manilla River and Keepit Dam on the Namoi River are the two main water storages in the Namoi River catchment. These structures allow the delivery of flows to meet the needs of downstream water users. Streamflow in the Namoi River is heavily regulated by releases from Keepit Dam. Releases are generally lower during autumn and winter months due to less demand from irrigators.

Average annual rainfall in the Namoi River catchment is highly variable with around 1,000 millimetres (mm) along the Great Dividing Range in the east, to around 470 mm in the western extent of the catchment.

The Namoi Valley is subject to regular flooding. The existing mining area and MIA are not located within the floodplain, however the access road and Boggabri Coal Rail Spur Line both cross the floodplain.

3.1.4 Nagero Creek

The existing mining area and MIA are entirely contained within the catchment of Nagero Creek. The Nagero Creek catchment is bounded by the Willowtree Range to the north-east and falls generally to the south-west.

The catchment area is approximately 87 km^2 to the confluence with the Namoi River (about 8 km west of BCM) and accounts for about 0.2% of the total Namoi River catchment area at the Turrawan (419023) gauge.

The majority of Nagero Creek catchment upstream of BCM is contained within the Leard State Forest. The forest has been selectively logged in the past but is generally still forested except for the areas required for BCM, Tarrawonga Coal Mine (TCM), Maules Creek Mine (MCM), and Leard Forest Road. Most of the catchment downstream of BCM comprises cleared farmland.

Nagero Creek has generally well vegetated banks, and the bed comprises sand and/or rock. Longitudinal slopes range from about 2% at the top of the catchment to about 0.8% at the downstream edge of the BCM.

Downstream of the BCM, Nagero Creek becomes indistinct as it flows across the Namoi River floodplain. These alluvial flats become swampy following rainfall, and natural ponds (such as the 'Slush Holes') and farm dams store water for long periods. There is anecdotal evidence of flood break out flows that connect Nagero Creek to Bollol Creek upstream of the rail spur line and loop leading to BCM.

Local watercourses including Nagero Creek are displayed on Figure 1-1.

3.1.5 Bollol Creek

The Bollol Creek catchment is to the south of the MIA and mining area. Bollol Creek is an ephemeral waterway that flows in a south-west direction past Goonbri Mountain and the TCM. The upper catchment consists of forest, while the lower catchment is characterised by a low-lying wide floodplain, which is predominately cleared and used for cropping, grazing and other agricultural purposes. Bollol Creek has an inferred catchment area of approximately 149 km^2 which accounts for about 0.4% of the total Namoi River catchment area.

The Bollol Creek channel is poorly defined across the low-lying floodplain area. Downstream of the TCM, flows disperse across the landscape via several pathways associated with shallow, discontinuous swales and divots before eventually reaching Barbers Lagoon to the south and into a series of lagoons to the west known as the Slush Holes (and eventually Nagero Creek), which are relic river channels of the Namoi River. Local anecdotal evidence indicates that the bulk of the flow heads south-west to Barbers Lagoon, and ultimately to the Namoi River (Gilbert and Associates 2010).

A mine water dam (MW3) and the southern portion of an approved irrigation area are located in the Bollol Creek catchment. It is noted that the irrigation system has not been constructed and no mining areas or other BCM mine infrastructure are located within Bollol Creek catchment.

3.2 Surface water quality

Water quality monitoring is completed at the BCM in accordance with the monitoring program described in Section 5.3. The water quality results for monitoring location SW2 (EPL point 6), which is upstream of mining operations, are considered representative of the baseline water quality characteristics of Nagero Creek. Due to the ephemeral nature of Nagero Creek, water quality samples can only be obtained during or shortly after runoff producing rainfall events. Water quality data at SW2 is available for the following periods:

- sporadic monitoring from September 2008 to February 2012 (5 samples over 5 days)
- three-times daily sampling from 17 February 2012 to 28 March 2012 (122 samples over 41 days)
- sporadic monitoring from July 2012 to February 2021 (12 samples over 12 days).

The resulting baseline water quality data for Nagero Creek is presented in Table 3-2.

Table 3-2: Baseline surface water quality in Nagero Creek – SW2 (upstream of mining)

Parameter	Units	Default guideline value	Water quality range	80th percentile value
pH	pH	6.5 – 8.0[2]	**5.9** – 7.83	7.2 – 7.7
Conductivity	µS/cm	30 – 350[2]	33 – **542**	160
Total suspended solids	mg/L	50[3]	3 – **232**	3
Nitrate	mg/L	2.4[4]	0.005 – **3.250**	0.005
Nitrogen (total)	mg/L	0.25[2]	0.4 – 4	0.5
Phosphorus (total)	mg/L	0.02[2]	0.01 – **0.84**	0.02
Dissolved metals				
Arsenic	mg/L	0.013[1,5]	0.0005 – 0.002	0.0005
Cadmium	mg/L	0.0002[1]	0.00005 – 0.0001	0.00005
Chromium	mg/L	0.001[1]	0.0005 – **0.005**	0.0005
Copper	mg/L	0.0014[1]	0.001 – 0.012	0.001
Lead	mg/L	0.0034[1]	0.001 – **0.005**	0.001
Nickel	mg/L	0.011[1]	0.0005 – **0.0300**	0.0005
Zinc	mg/L	0.008[1]	0.005 – **0.824**	0.005
Iron	mg/L	-	0.03 – 6.05	0.06

Notes: 1. ANZG (2018) guideline for the protection of aquatic ecosystems, south-east Australia, slightly to moderately disturbed ecosystem.

2. ANZECC (2000) guideline for the protection of aquatic ecosystems physical and chemical stressors, south-east Australia, upland river (greater than 150 m AHD).

3. As per conditions of EPL 12407.

4. NIWA (2013) guideline for nitrate toxicity impacts on freshwater aquatic species (as recommended by ANZG (2018)).

5. As per Arsenic V.

Bold denotes result exceeds DGV.

The results presented in Table 3-2 indicate the following:

- Total suspended solids, nitrogen and phosphorous concentrations are naturally elevated compared to the DGVs which is consistent with historical observations for Nagero Creek and Bollol Creek (Gilbert and Associates 2010).

- pH was generally neutral to slightly alkaline but was lower (i.e. more acidic) than the DGV on one occasion.
- Electrical conductivity values range between 30–550 µS/cm and are within the guideline range for most samples.
- Dissolved chromium, copper, lead, and zinc were all observed to exceed the DGVs in at least one sample, indicating there are background levels of dissolved metals present in the natural catchment.

3.3 Soil characteristics

A *Soil Survey and Land Resource Impact Assessment* (GSS Environmental 2010) was undertaken for the *Part 3A Continuation of BCM Project Environmental Assessment* (Hansen Bailey 2010). The soil units identified in the project area are summarised in Table 3-3.

The Grey Brown Gradational Loams, Light Brown Duplex Loams, and Brown Gradational Clay showed a similar pattern, with the upper layers being non-dispersive and non-sodic, and the subsoils tending to be highly sodic with depth. The Light Brown Uniform Gravelly Sands were found to be non-dispersive and non-saline throughout the soil profile (GSS Environmental 2010).

Table 3-3: Soil units identified within the project area

Soil	Description
Grey Brown Gradational Loam	• Moderately drained soils ranging from slightly acidic to neutral in the upper layers, to strongly acidic to moderately alkaline at depth • Generally non saline with poor to moderate fertility characteristics • Non-sodic topsoil tending to moderately sodic subsoil • Found on the waning mid to lower slopes within the Leard State Forest
Light Brown Uniform Gravelly Sand	• Well drained soils ranging from moderately acidic to strongly acidic at depth • Generally non saline with poor fertility characteristics • Topsoil and subsoil are non-sodic • Found on the upper slopes, crests and ridgelines within the Leard State Forest
Light Brown Duplex Loam	• Moderately drained soils ranging from moderately acidic in the upper layers to strongly alkaline at depth • Generally non saline with poor fertility characteristics • Topsoil is non-sodic whilst subsoil is sodic to very sodic • Found on the waning lower slopes within the Leard State Forest and nearby grazing land
Brown Gradational Clay	• Poorly drained soils ranging from neutral to strongly alkaline in the upper layers, to moderate to strong alkaline at depth • Generally non saline with good fertility characteristics • Topsoil is non-sodic tending to highly sodic in the subsoil • Found on the lower slope, flats and floodplain of the higher quality grazing and cropping soil

4.0 WATER MANAGEMENT SYSTEM

4.1 Water management terminology

Key terms that have been adopted for the water management system and referenced throughout this chapter are defined in Table 4-1.

Table 4-1: Water management terminology

Term	Definition
Clean water	Water that is typically of a higher quality and incudes stormwater runoff from catchments that are not disturbed by mining operations.
Dirty water	Stormwater runoff from catchments disturbed by mining activities such as spoil dumps, rehabilitation areas that are yet to be stabilised, Boggabri Rail Spur Line, haul roads and parts of the MIA. Dirty water may contain elevated concentrations of suspended solids and sediments.
Mine water (or contaminated water)	Includes stormwater runoff generated from coal stockpiles, the coal handling and process plant (CHPP), parts of the MIA and the mining void, as well as groundwater inflows to the mining void. Mine water may have elevated concentrations of suspended solids, sediments, and metals.
Erosion and sediment control	Defined as the suite of physical and management measures available to minimise soil erosion and to prevent soil and sediment entering the receiving water systems (i.e. Nagero Creek). Erosion and sediment control measures aim to reduce sediment loads entering the dirty water management system.

4.2 Water management objectives

The water management system is designed and operated with consideration of the following key objectives:

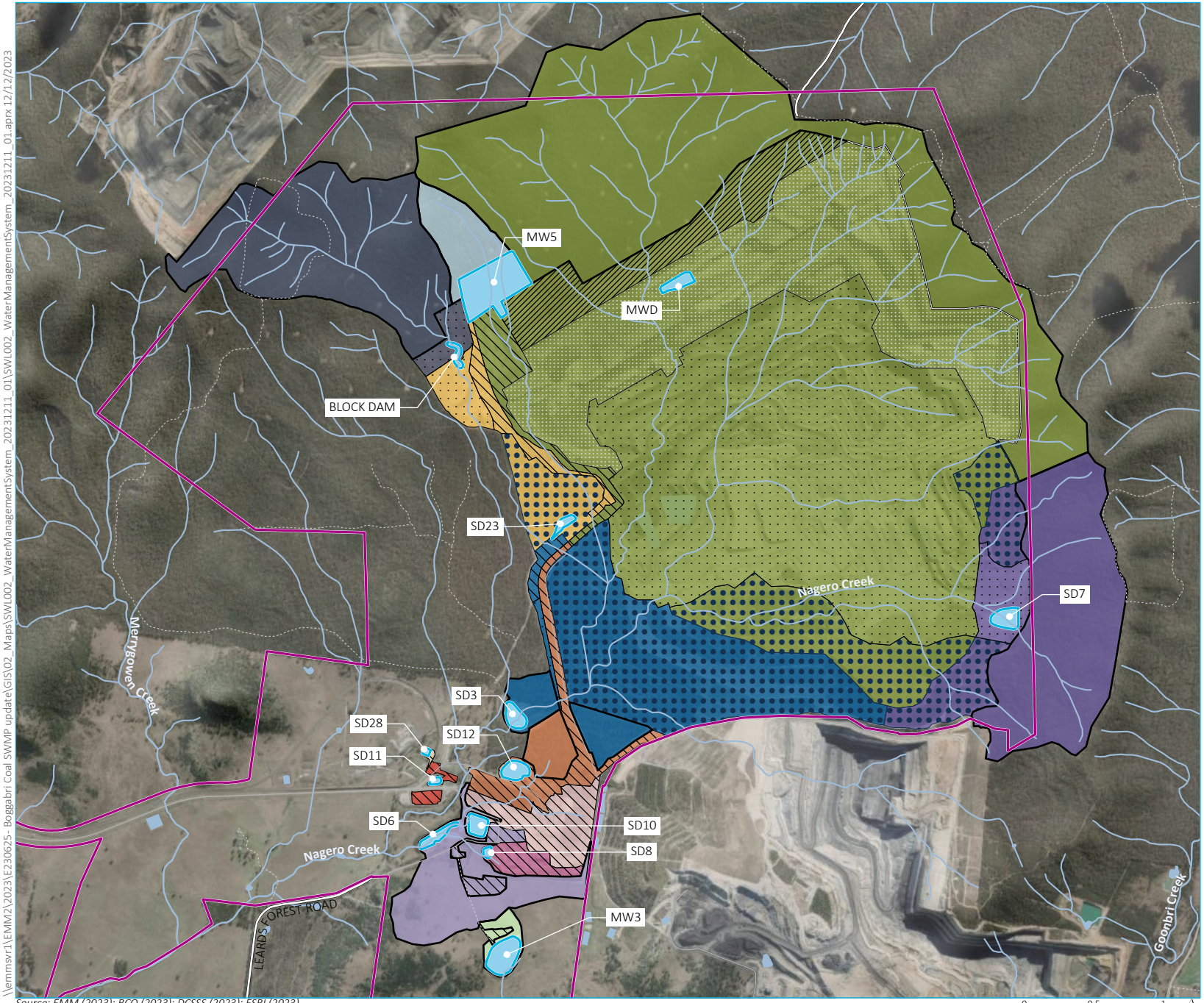
- Separate clean runoff, dirty runoff, and contaminated water.
- Minimise the volume of contaminated mine water generated.
- Provide sufficient on-site storage to minimise the risk of releases of contaminated water that could affect the quality of downstream watercourses.
- Where reasonable and feasible, treat dirty runoff from unrehabilitated overburden areas to settle coarse suspended solids.
- Where reasonable and feasible, divert clean runoff to downstream creeks.
- Prioritise the use of contaminated and dirty water where reasonable and feasible in preference to imported water.

Erosion and sediment control measures are used to supplement the water management system.

4.3 Water management system

The water management system comprises diversion drains, water management dams, water storages, pumps, and pipelines. This section describes the management measures and design principles applied to each component of the water management system.

The existing water management system is shown in Figure 4-1. Details of existing water storages are provided in Appendix A.



KEY

- Project approval area
- Water storage

Storage catchment

- MW3
- MW5
- Pit
- Block Dam
- SD3
- SD4
- SD6
- SD7
- SD8
- SD10
- SD11
- SD12
- SD23
- SD28

Land use type

- Industrial
- Mine void
- Pre strip
- Rehabilitation
- Undisturbed
- Unshaped spoil dump

Existing environment

- Major road
- Minor road
- Vehicular track
- Regulation hydroline
- Waterbody

Source: EMM (2023); BCO (2023); DCSSS (2023); ESRI (2023)

0 0.5 1 km

GDA2020 MGA Zone 56

N

\\emmsvr1\EMM2\2023\E230625- Boggabri Coal SWMP update\GIS\02_Maps\SWL002_WaterManagementSystem_20231211_01\SWL002_WaterManagementSystem_20231211_01.aprx 12/12/2023

Existing water management system

Boggabri Coal Operations Pty Ltd
Surface Water Management Plan
Figure 4.1

EMM
creating opportunities

4.3.1 Water sources

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 captured on site in contaminated water dams and sediment dams and stored in mine water 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 a 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.

4.3.2 Clean water management

The clean water management system consists of a series of diversion bunds and drains that intercept clean runoff from undisturbed catchment areas prior to it entering the active mining areas. Clean water that is diverted around the mine is discharged to Nagero Creek. The objective of the clean water management system is to:

- minimise the mixing of clean and dirty water runoff
- minimise the volume of runoff that requires management within the BCM water management system.

The design principles applied to the clean water management system are described in Table 4-2.

Table 4-2: Clean water management system design principles

Aspect	Management approach
Clean water diversions	The following design principles are applied to the design and construction of clean water diversions where appropriate: • Safely convey the peak flow rate generated from the 1% AEP critical duration design storm event. • Include a trapezoidal cross section with internal batter slopes no steeper than 3H:1V. • Incorporate gypsum into the channel base and batters where constructed in dispersive clay soils. • Include scour protection (e.g. rip-rap) where peak design flow velocities exceed 2 metres per second (m/s) or diversion drains are constructed in highly erosive soils.

In locations where it is not feasible to provide diversion drains due to topographic constraints and advancing topsoil stripping and stockpiling, clean water will be allowed to enter the active mining areas and the water management system.

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. In 2018, this diversion drain was mined through. At present, all undisturbed catchments upstream of the mining void drain directly into the mining void. The intercepted water is managed within the water management system. Water licensing requirements for runoff intercepted by the mining void are discussed in Chapter 8.0.

4.3.3 Dirty water management

The dirty water management system consists of a series of dirty water catch drains that intercept sediment-laden runoff from disturbance areas and convey it to sediment dams. The sediment dams provide the primary mechanism for dirty water management and sediment control at the BCM. Sediment dams are used to facilitate the settling of suspended solids from intercepted sediment laden runoff. Sediment dams are generally 'wet basins', comprising:

- a 'settling zone' for temporary storage of sediment-laden runoff, providing sufficient residence time for the suspended sediments to settle, potentially with assistance from a suitable coagulant or flocculant
- a 'sediment zone' for the storage of accumulated sediment, which is periodically removed.

Dirty water that is captured in the sediment dams is either harvested by the mine water management system for reuse or discharged to Nagero Creek in accordance with the conditions of EPL 12407. The design principles applied to the dirty water management system are described in Table 4-3.

Table 4-3: Dirty water management system design principles

Aspect	Management approach
Dirty water catch drains	The following design principles are applied to the design and construction of dirty water catch drains where appropriate: • Safely convey the peak flow rate generated by the local catchment area in response to the 5% AEP (1 in 20 year), critical duration design storm event. • Include a trapezoidal cross section with internal batter slopes no steeper than 3H:1V. • Include scour protection (e.g. rip-rap) where peak design flow velocities exceed 2 m/s or catch drains are constructed in highly erosive soils.
Sediment dams	Sediment dams are designed and constructed to: • Contain the total runoff generated by the local catchment area in response to the 90th percentile, 5-day duration storm event (38.4 mm), assuming runoff coefficients of 0.75 and 0.4 for disturbed and undisturbed areas respectively. • Sediment zone capacity to be 50% of the settling zone volume. Sediment dams are to be maintained in a dewatered state to provide stand-by capacity during a storm event. Sediment dams may be dewatered either by discharging into Nagero Creek or transferred (via pump) to mine water dams for storage and reuse on site within five days following a storm event. Accumulated sediment is to be removed as required. Sight boards or markers may be used to easily identify when the accumulated sediments reach the maximum settling zone volume.

There are currently five sediment dams located around the mine site. SD3 was upgraded in 2015 to a capacity of 100 ML (previously 31.8 ML) to cater for the expanding overburden catchment from 2015 to 2019.

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 usage. As mining has progressed, this fill point is no longer utilised.

A dirty water catch drain diverts overflows from the TCM northern waste rock emplacement area dams around the BCM MIA. Currently, this drain discharges into SD6.

4.3.4 Mine water management

The mine water management system aims to capture and contain stormwater runoff from coal contact areas. The mine water management system comprises the following:

- Contaminated water dams – capture runoff from the coal stockpile pads in the CHPP. Water stored in contaminated water dams is reused onsite for dust suppression, CHPP process water, or pumped to mine water dams (MWDs) for future reuse.
- Mine water dams – are the main long-term water storages for BCM. They receive dirty water from the sediment dams, contaminated water dams, or in-pit areas, as well as imported water from the borefield or Namoi River.

The design principles applied to the mine water management system are described in Table 4-4.

Table 4-4: Mine water management system design principles

Aspect	Management approach
Contaminated water dams	Contaminated water dams are designed and constructed to: • contain the total runoff generated by the local catchment area in response to the 1% AEP, 72-hour design storm event, assuming runoff coefficients of 0.85 (CHPP and hardstand areas) and 0.75 (coal crushing and handling area) • provide additional storage capacity of 20% to allow for sediment storage. Contaminated water dams are to be maintained in a generally drawn down state to provide stand-by capacity during a storm event minimising the risk of a wet weather overflow. Contaminated water dams are dewatered by transferring (via pump) to the MWDs.
Mine water dams[1]	Mine water dams are designed and constructed to meet the long-term storage and reuse requirements identified by the site water balance model, but also provide a freeboard equal to the total runoff generated by the local catchment area in response to the 1% AEP, 72-hour design storm event.

Notes: 1. MWDs are the primary mechanism used to satisfy the EPL 12407 requirement to maintain 1,000 ML of air space within the mine water management system.

At present, there are two out-of-pit MWDs, MW3 and MW5, in addition to in-pit storage of mine water. In-pit storage is largely contained to wet periods when the capacity of the MWDs is reached.

SD12 was upgraded in 2015 to a capacity of 200 ML (previously 25.9 ML) to cater for the expanded MIA and CHPP and haul road catchments.

MW3 has a capacity of 116.4 ML and can be utilised to dewater surplus water from SD10. MW5 was completed in late 2018 to cater for predicted pit dewatering requirements and has an approximate capacity of 2,200 ML. The total out-of-pit MWD storage in MW3 and MW5 is approximately 2,300 ML.

4.3.5 Leaks and spills

The containment of leaks and spills of hazardous materials will be managed within covered and bunded areas and in general accordance with the NSW Government guideline *Storing and Handling Liquids: Environmental Protection: Participant's Manual* (DECC 2007). Measures that will be implemented to manage accidental leaks and spills are described in Table 4-5.

Table 4-5: Measures to manage accidental leaks and spills

Aspect	Management approach
Leaks and spills	The following management measures are implemented to prevent contamination due to accidental leaks and spills: • Spill control kits are to be located for use around the site. • Staff are to be appropriately trained in procedures for the management of fuel and chemical spills and on the location and use of spill kits. • Vehicles will be maintained to minimise the risk of fuel and oil leakages. • Fuels, oils, and chemicals are to be appropriately stored. • Storage in open areas will be bunded to minimise the risk of spills to the receiving environment. • Any spills are to be contained and absorbed with a suitable material which is disposed of in an approved manner.

4.3.6 Haul road and rail spur line

Surface water management for the haul road and rail spur line requires minimising potential flood impacts (through design) and managing runoff from, and adjacent to, the infrastructure.

In accordance with consent condition 37, Aurecon (2013) undertook detailed flood modelling for the sections of the Boggabri Maules Creek Rail (BMCR) within the vicinity of Nagero Creek and Bollol Creek, as well as the BMCR cross and longitudinal drainage. A previous flood assessment undertaken by Parsons Brinckerhoff (2011) was used to determine flooding impacts from the viaduct crossing of the Namoi River. The flooding assessments indicated the following potential flood impacts:

- Nagero Creek – Minor impacts to flooding within Nagero Creek will occur, with increases in flood depths extending about 500 m upstream of the BMCR formation, and increased flood depths of about 8 mm at the nearest sensitive property.
- Bollol Creek – Anecdotal evidence suggests that during flooding, "break outs" from Nagero Creek to Bollol Creek (or vice versa) can occur. The location of the potential "break out" is about 7 km upstream of the BMCR formation. Given the minimal flood impacts expected within Bollol Creek, the potential for the BMCR formation to affect flooding within Bollol Creek was considered minor.

The principles that were applied to the design and construction of the haul road and rail spur line and the measures implemented to manage surface water runoff from the road and rail line are described in Table 4-6.

Table 4-6: Haul road and rail spur line design principles

Aspect	Management approach
Haul Road	• The haul road is constructed near ground level to minimise the impacts on flood flows. • Road culverts installed at drainage lines have a design capacity equivalent to the 1% AEP design storm event to further minimise flood impacts and allow flows to move downstream to Nagero Creek. • The haul road surface and verges are stable to minimise potential erosion and scouring. • Runoff from the haul road is managed via vegetated swales in accordance with the erosion and sediment control measures described in Table 4-10.
Rail spur line	• The rail spur line (including the rail bridge) is designed and constructed to be located above the 1% AEP flood event and includes drainage culverts and underbridges designed to convey the 1% AEP flood event. • The rail spur line and associated structures are designed to be long term stable and the existing water management structures are designed to manage surface water. • Runoff from the rail line is managed via vegetated swales in accordance with the erosion and sediment control measures described in Table 4-10.

4.4 Future mine staging water management system

As mining progresses to the north, the water management system will be modified to maintain compliance with EPL 12407, approval conditions, and to meet the objectives described in Section 4.2. An overview of the key water management system changes to be implemented during future mine stages is provided in Table 4-7. The details of future mine water storages are provided in Appendix A.

Table 4-7: Future water management system overview

Objective	Design principles
Clean water management	Highwall dams may be used (where practical) to provide temporary storage of intercepted clean water runoff before dewatering to Nagero Creek via pumping. The highwall dams are intended to minimise the volume of clean water runoff intercepted by BCM. Highwall dams will be sized to contain the total runoff generated by the local catchment area in response to the 1% AEP, 72-hour duration design storm event.
Dirty water management	SD3 may be upgraded in 2024 to a capacity of 209 ML (from existing capacity of 100 ML). The upgrade to SD3 in 2024 may be required as it is no longer proposed to commission sediment dam SD13 (as previously proposed) within the overburden emplacement area and storage capacity previously allocated to SD13 is now provided in SD3. Alternatively, the additional capacity may be provided in MW5 or its replacement (see below). New dirty water sediment dams, SD19, SD20, SD21, SD22 and SD24 are planned to cater for runoff from the expanded spoil dump. SD7 will be decommissioned by 2036 as the overburden catchment draining to this sediment dam is expected to be fully rehabilitated.

Objective	Design principles
Mine water management	MW5 is the primary water storage onsite with an estimated capacity of 2,200 ML. MW5 is located to the north of the advancing pit wall and is expected to be mined through by 2026. BCOPL will replace MW5 with an equivalent MWD (MW11) prior to the decommissioning of MW5. The optimal location and capacity of MW11 are currently under investigation. MW11 will be commissioned by 2025.

4.5 Post mining surface water management

The mining area will be progressively rehabilitated over the BCM life-of-mine. Rehabilitated areas will be free draining following the successful rehabilitation and stabilisation of overburden emplacement areas. The rehabilitated landform will be revegetated with a mixture of native trees and shrubs.

The short-, medium-, and long-term objectives for soil, water quality, and landform rehabilitation are outlined in the BCM Rehabilitation Management Plan (RMP). Key aspects of the RMP as relevant to surface water management are summarised in Table 4-8.

Table 4-8: Summary of post mining surface water management

Rehabilitation aspect	Management approach
Re-establishment of drainage lines	Reinstatement of drainage lines on the rehabilitated areas of the site will be integrated with the existing topography and natural drainage. Sediment basins will remain in place during mining and be removed during decommissioning following the rehabilitation of mining areas. Temporary erosion and sediment control measures will be required during the rehabilitation establishment phase (e.g. contour banks, graded banks, erosion blankets, ground-cover vegetation, rip-rap).
Pollution control	The quality of runoff from rehabilitated areas is expected to be similar to pre-mining water quality conditions. Based on the conclusions of the Modification 8 geochemical assessment (RGS 2021), leachate generated from overburden and coal reject materials is unlikely to significantly impact surface water quality downstream of the BCM. Water pollution control will be achieved via the appropriate design and revegetation of rehabilitated landforms to minimise soil loss rates in runoff. Sediment basins will remain in place to control pollution from rehabilitation areas until runoff water quality is deemed to be non-polluting.
Final void	The final void will be in the northern section the BCM. The details of the final void will be documented in a Final Void and Mine Closure Plan as a component of the overall RMP. This plan is to be completed by the end of December 2025. BCOPL has committed to back fill the final void, so the final void does not remain a groundwater sink in the landscape. Rehabilitation design objectives for the final void include the following: • The final landform high wall will be designed in consultation with geotechnical and erosion specialists. • The size and depth of the final void is to be minimised as far as reasonable and feasible and ensure that the void contains no retained water (i.e. no pit lake). • The final landform is to be consistent with surrounding environment including plant species and ecosystem function.

4.6 Emplacement of reject materials

Reject material will be co-disposed with overburden material within the overburden emplacement areas and mining area. Reject material that is identified as sodic, dispersible and acid or sulphate generating have an increased risk to water quality unless appropriately managed. Reject material is managed in accordance with the BCM Reject Management Plan which details the characterisation, handling and disposal requirements. The management measures implemented to mitigate risks to risks associated with reject materials are summarised in Table 4-9.

Table 4-9: Summary of reject material management measures

Reject material type	Management approach
Sodic and dispersible soils	Topsoil, subsoil and spoil material are regularly tested to determine if suitable for reuse as a growth media (for rehabilitation purposes) or if further treatment is required prior to placement. Soils that are identified as sodic or dispersible will be treated as follows: • Material that is identified as sodic or dispersible will be mixed with suitable ameliorates such as gypsum to improve soil structure. • If not able to be ameliorated, unsuitable spoil will be capped with a minimum of 1.0 m of suitable spoil (compacted depth) or, more appropriately, capped to a depth greater than the minimum rooting depth of the vegetation.
Acid or sulphate generating materials	The Modification 8 geochemistry assessment (RGS 2021) concluded the majority of the interburden and potential coal reject materials contain negligible sulfur, have excess Acid Neutralising Capacity and are classified as Non-Acid Forming. Based on these outcomes, the risk of acid mine drainage at BCM is considered low. Regardless, the following management measures will continue to be implemented to manage Potential Acid Forming (PAF) material: • The geochemical and physical characteristics of coal reject materials will be analysed as bulk samples become available from the CHPP. • Material that is identified as PAF will be disposed of via deep in-pit burial limit oxidation potential.

4.7 Erosion and sediment control

Erosion and sediment control measures will be implemented during the construction, operational and closure phases of the BCM. Erosion and sediment controls will be designed, constructed, maintained, and rehabilitated in accordance with:

- *Managing Urban Stormwater: Soils and Construction, Volume 1* (Landcom 2004)
- *Managing Urban Stormwater: Soils and Construction, Volume 2E – Mines and quarries* (DECC 2008).

Regular maintenance and inspections are required to identify additional or changed risk, to instigate improvements and to ensure the continued functionality of the treatment measures. Regular inspection and maintenance of erosion and sediment control measures will be undertaken for during all phases of the BCM.

4.7.1 Construction and operational phase measures

Erosion and sediment control measures, including those that form part of the clean and dirty water management systems, to be implemented during construction and operations are described in Table 4-10.

Table 4-10: Erosion and sediment control – construction and operations

Aspect	Management approach
Erosion control	The following controls will be considered on a case-by-case basis to minimise soil erosion: • The extent of disturbed/exposed areas is to be kept to the minimum area necessary for works. The boundary between the disturbed and undisturbed extent should be clearly marked or fenced. • Stripped topsoil will be stockpiled in a stable manner. • Watering to reduce visible dust generated from exposed areas and stockpiles will be conducted as needed. • Long term stockpiles (greater than six months) to be stabilised by appropriate seeding or mulched vegetation where possible. • Traffic movement and traffic speeds will be restricted through construction areas. • Personnel and vehicles to use designated access areas and routes only. • Vehicle wash-down to be carried out in designated areas. • Clearing of vegetation to be minimised to authorised and delineated areas only. • Where approved, the width of clearing disturbance on creek banks is to be minimised. • Where feasible, understorey and ground cover vegetation to be retained in and around drainage lines. • Erosion control measures are to be maintained until rehabilitation of disturbed areas are complete. • Erosion and sediment control measures will be installed prior to the commencement of any ground disturbance works.
Sediment control	The following controls will be considered on a case-by-case basis to minimise sediment mobilisations: • Silt fencing, or other appropriate sediment controls may be constructed down gradient of all excavation and construction works as needed. • Earth bunds and/or diversion drains will be constructed around the perimeter of the site, particularly on the upslope of excavations to prevent surface water entering these areas. • Sediment fencing and retention traps will be constructed on the down slope of stockpiles to prevent downstream sediment migration. • Clean water will be prevented from entering the construction and mining areas where practicable by installing diversion systems to drain surface runoff away from these areas. • Stormwater runoff from rehabilitated areas will be directed to sediment control structures until the area is considered stable. • Stabilise diversion drains to direct dirty water to sediment traps (e.g. rock check dams). • Sediment control dams will be utilised to store dirty or contaminated water from disturbed areas. • All sediment control measures will be maintained until rehabilitation of disturbed areas are complete. • Rehabilitated areas shall be monitored periodically to check for the possible onset of soil erosion.

4.7.2 Closure and rehabilitation phase measures

Management strategies for topsoil stripping and handling, topsoil respreading, post disturbance regrading, and growth medium to re-establish vegetation communities are outlined in the RMP.

Erosion and sediment control management measures to be implemented where practicable, to minimise the potential for soil erosion and to control potential sediment and pollution impacts from all closure and rehabilitation works are described in Table 4-11.

Table 4-11: Erosion and sediment control – post mining

Rehabilitation aspect	Management approach
Erosion control	The following controls will be considered on a case-by-case basis to minimise soil erosion: • Post disturbance regrading will produce slopes, angles and lengths, and shapes that are compatible with the proposed land use and are not prone to an unacceptable rate of erosion as outlined in the RMP. • Where practicable, contoured furrows or contour banks will be constructed post disturbance at intervals down the slope to divide long slopes into short slopes, preventing runoff from reaching a depth or velocity that would cause erosion. • Intercepted runoff will be diverted via temporary engineered channel banks, slope drains, and energy dissipaters to reduce flow velocity until adequate vegetation cover is achieved. • Amelioration of dispersive soil materials will be undertaken to minimise the risk of rill, gully, and tunnel erosion, and to allow the infiltration of surface water into the constructed landform, reducing the volume and velocity of surface water runoff generated within the emplacement areas. • Reshaping and contour scarification will be used for compacted surfaces to increase infiltration and increase surface roughness. • Cover crops, including salt tolerant grasses and legumes, will be used with the aim to minimise raindrop and sheet erosion of reshaped areas. • Stockpiles will be designed to minimise additional disturbance and have a maximum batter slope of 1V:3H. • The surface of soil stockpiles will be shaped in a manner to promote infiltration and minimise erosion until vegetation cover is established.
Sediment control	The following controls will be considered on a case-by-case basis to minimise sediment mobilisations: • Clean water runoff will be diverted around any active mine areas. • Dirty water from disturbed or unstable rehabilitation areas will be captured within sediment control structures (e.g. dirty water catch drains and sediment basins) until the rehabilitation criteria in the RMP are achieved. • Traffic will be prevented from entering an area once topsoil is spread (excluding requirements to maintain rehabilitation).

5.0 SURFACE WATER MONITORING PROGRAM

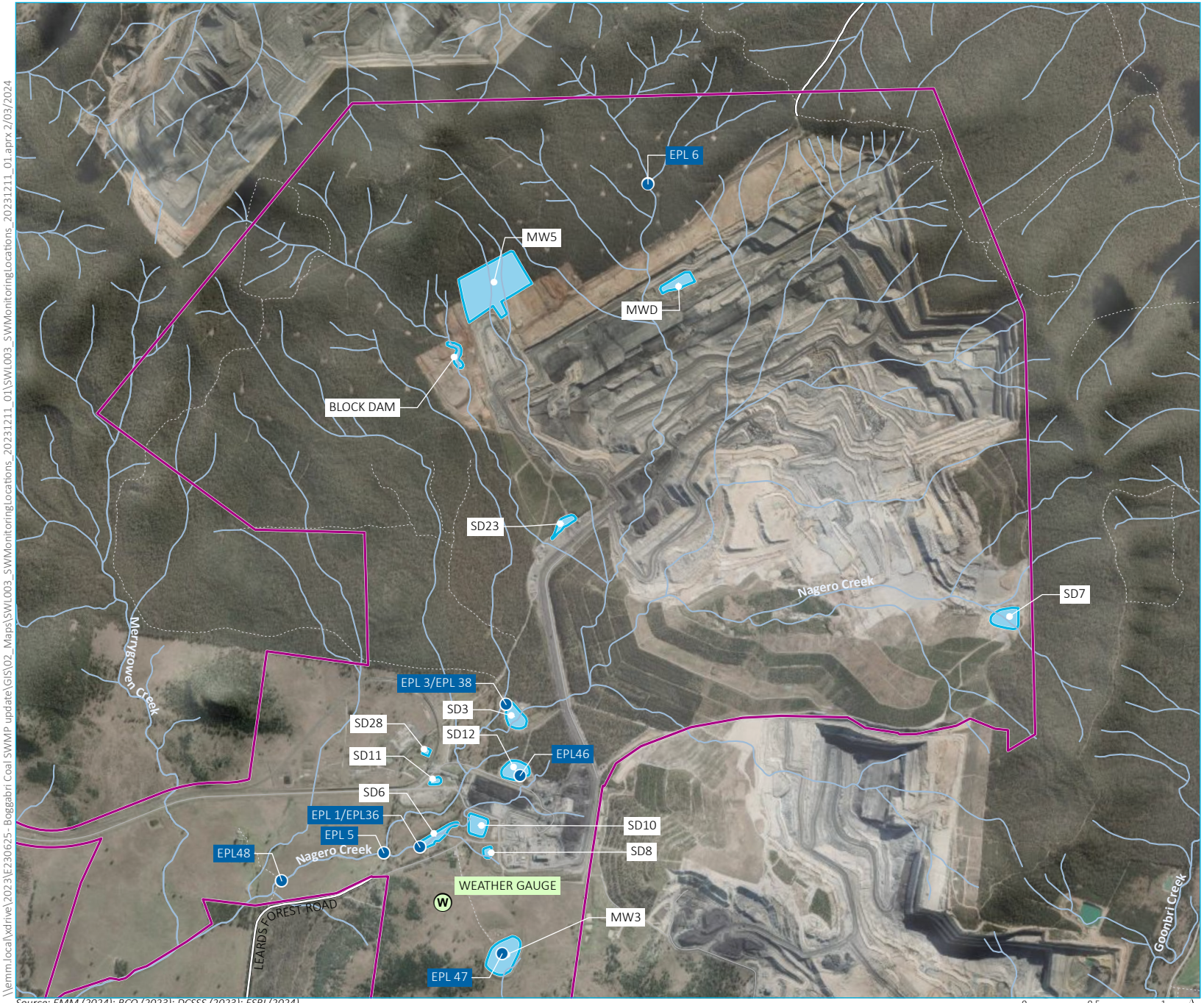
5.1 Overview of monitoring program

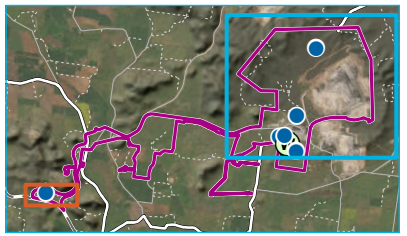
The surface water monitoring program will enable the effectiveness of the BCM water management system to be evaluated and improved (where required) over time. The surface water monitoring program will also allow BCOPL to identify and respond to off-site impacts due to mining activities.

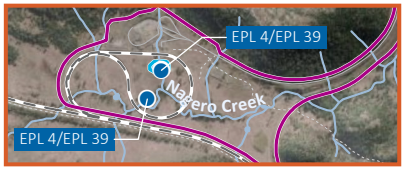
The chapter describes the monitoring requirements for the effective implementation of this SWMP. An overview of the surface water monitoring program is provided in Table 5-1. Surface water monitoring locations are displayed in Figure 5-1.

Table 5-1: Surface water monitoring program overview

Monitoring aspect	Monitoring type	Objective	Monitoring description
Weather	Daily rainfall	Record site weather conditions. This information will be used to validate and calibrate the site water balance model (SWBM).	BCOPL will continue to monitor daily rainfall totals at the site weather station.
Storage levels	Continuous	Record the volume of water stored onsite to assess against EPL minimum air capacity requirements and calibrate the SWBM.	Water levels will be automatically recorded using dataloggers. Manual spot checks may be implemented for some storages.
Pump transfers	Continuous	Record the volume of water transferred between storages to inform operational decisions and calibrate the SWBM.	Pumped flows will be automatically recorded using dataloggers with the water origin and destination recorded.
Water use	Continuous	Record the volume of water required for operational purposes to inform operational decisions and calibrate the SWBM.	Water use will be automatically recorded using a datalogger.
Water quality	Event based, ambient, and quarterly	Characterise water quality within and around the site to assess against EPL discharge limits.	Samples taken during discharge from sediment dams, when flows are observed in Nagero Creek, and quarterly from around and within the mine site.
Flooding	Event based	Determine flood risk from the Namoi River and the potential for concurrent releases from sediment dams to exacerbate overall flood risks.	Regular checks of the Bureau of Meteorology (BoM) warning system during wet weather for flood warnings on the Namoi River.
Stream and riparian health	Annual inspection	Identify changes to stream and riparian conditions of Nagero Creek and Namoi River.	Conditions recorded via photographs annually to identify changes as mining operations progress.







KEY

Project approval area

Water storage

Existing environment

Rail line

Major road

Minor road

Vehicular track

Regulation hydroline

Surface water monitoring location

Surface water quality

Weather gauge

Source: EMM (2024); BCO (2023); DCSSS (2023); ESRI (2024)

0 0.5 1 km

GDA2020 MGA Zone 56

N

\\emm.local\xdrive\2023\E230625- Boggabri Coal SWMP update\GIS\02_Maps\SWL003_SWMonitoringLocations_20231211_01\SWL003_SWMonitoringLocations_20231211_01.aprx 2/03/2024

Surface water monitoring locations

Boggabri Coal Operations Pty Ltd
Surface Water Management Plan
Figure 5.1

EMM
creating opportunities

5.2 Surface water quantity

BCOLP currently (and historically) monitor the total stored water onsite by undertaking routine (approximately daily) water level measurements at all water management dams. Pumping volumes are recorded for several key water transfers across the site.

In response to an Enforceable Undertaking (EU 230608) issued by NRAR on 8 June 2023, BCOPL have upgrade the monitoring system to include additional water metering and telemetry functionality on key water storages and water transfers. This will allow the measurement of water transferred out of the pit and into the MWDs and provide a better understanding of water use at the site. The monitoring data will also be used to improve the calibration and performance of the SWBM.

The water level and water transfer monitoring network are summarised in Table 5-2. Storage dam locations are identified on Figure 4-1. It should be noted that the metering and telemetry locations identified in Table 5-2 may vary over time due to operational changes (e.g. relocation of mine water dam locations). Any changes to the metering and telemetry system will be undertaken in consultation with NRAR.

Table 5-2: Water meter telemetry devices installed at the BCM

Location	Transfer type	Telemetry devices to be installed					Manual water level
		Remote start	Level monitor	Digital flow monitor	Reporting to Citec	Water sampling[1]	
SD3	-	●	●	●	●	●	-
SD6	-	●	●	●	●	●	-
SD7	Diesel pump	●	●	●	●	●	-
SD8	-	●	●	●	●	-	-
SD10	-	●	●	●	●	-	-
SD11	-	●	-	-	-	-	●
SD12	-	●	●	●	●	-	-
SD23	Pump	●	●	●	●	-	-
	Fill point	-	-	●	●	-	-
SD28	-	-	-	-	-	-	●
MW3	-	-	●	-	●	-	-
MW5	Electric pump	●	●	●	●	-	-
	Diesel pump	-	-	●	●	-	-
MWD	-	-	-	-	-	-	●

Notes: 1. Automatic water sampling to test for pH, electrical conductivity, and total suspended solids.

5.3 Surface water quality

5.3.1 Monitoring procedure

Surface water quality monitoring is completed to satisfy the conditions of EPL 12407. Surface water quality monitoring is undertaken in accordance with the NWQMS and the *Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales* (EPA 2022). The surface water quality monitoring methodology is detailed in BCOPL's *Water Monitoring Procedure* which includes the following quality assurance and control process:

- Water quality monitoring will be completed by a suitably experienced employee or contractor.
- Quality control samples such as duplicates and field blanks will be taken as appropriate.
- Samples will be delivered to the laboratory within the maximum holding time where practical and accompanied by a completed chain of custody form.
- All samples will be analysed by a National Association of Testing Authorities (NATA) accredited laboratory.
- All site-equipment will be maintained as per the manufacturer recommendations.

A record will be kept of all monitoring data in accordance with the conditions EPL 12407.

5.3.2 Analytical suite

The analytical suite to be tested in each surface water quality monitoring event is provided in Table 5-3. The analytical suite is consistent with the surface water quality monitoring parameters defined in EPL 12407. The dissolved metals listed in Table 5-3 are to be monitored until deemed not significant or consistently below the ANZG (2018) DGVs. The removal of parameters from the analytical suite will be undertaken in consultation with the relevant NSW Government regulator.

Table 5-3: Surface water quality analytical suites

Analytical suite	Analyte group	Analytes to be tested	Analysis method
Field	Field	Conductivity, pH, temperature	To be measured using a portable water quality meter in the field.
Laboratory	General	Oil and grease, total suspended solids	Analysis to be undertaken by a NATA certified laboratory
	Nutrients	Nitrate, total nitrogen, total phosphorous, reactive phosphorous	
	Dissolved metals	Aluminium, arsenic, cadmium, chromium, copper, iron, lead, molybdenum, nickel, selenium, zinc	

5.3.3 Monitoring frequency

In accordance with EPL 12407, surface water monitoring events are categorised as either event based monitoring or quarterly monitoring. Each monitoring event category including the relevant analytical suite (refer to Table 5-3) is described in Table 5-4.

Table 5-4: Surface water quality monitoring frequency

Frequency	Objective	Description	Analytical suite
Event based	Demonstrate discharges comply with EPL limits.	Event based monitoring is to be completed in response to: • A controlled discharge such as dewatering a sediment dam after suitable settlement has occurred. • An uncontrolled discharge such as spilling from a dam during wet weather. • A unique discharge event such as an emergency discharge resulting from a water surplus. Samples to be taken as soon as practicable after a discharge and not more than 12 hours after a discharge commences.	• Field • Laboratory
Quarterly	Characterise the water quality of mine water management dams.	In situ sampling to track the surface water quality in terms of conductivity, pH, and temperature.	• Field

5.3.4 Monitoring locations

Surface water quality monitoring locations are shown in Figure 5-1. The monitoring locations along with their respective sampling frequencies are described in Table 5-5.

It is noted that while a small portion of the BCM is located within the Bollol Creek catchment, BCM does not discharge to Bollol Creek and therefore no surface water quality monitoring of Bollol Creek is undertaken or proposed.

Table 5-5: Surface water monitoring locations

EPL point	Location	Location description	Event based	Quarterly
1	SD6	Nagero Dam – LDP[1]	●	-
3	SD3	Southwest corner of spoil dump – LDP[1]	●	-
4	SD4	Rail loop west of mine site – LDP[1]	●	-
5	SW1	Nagero Creek downstream of mining	●	-

EPL point	Location	Location description	Event based	Quarterly
6	SW2	Nagero Creek upstream of mining	●	-
48*	SW3	Nagero Creek Downstream of Mining	●	
36	SD6	Nagero Dam	-	●
38	SD3	Southwest corner of spoil dump	-	●
39	SD4	Rail loop west of mine site	-	●
46	SD12	Run-of-mine coal stockpile	-	●
47	MW3	South of MIA	-	●

Notes: 1. LDP – Licensed discharge point.

*Pending EPL variation.

5.3.5 Operational water quality

The water quality of water management dams has been characterised for pH, electrical conductivity, total nitrogen, and total phosphorus based on the results of the quarterly monitoring. The periods of data collection for these parameters are as follows:

- pH – approximately quarterly from January 2017 to June 2021
- electrical conductivity – approximately quarterly from January 2017 to June 2021
- total nitrogen as N – approximately six-monthly from June 2019 to June 2021
- total phosphorus as P – approximately six-monthly from June 2019 to June 2021.

The observed water quality in the water management dams is summarised in Table 5-6.

Table 5-6: Summary of quarterly dam water quality monitoring data

EPL point	Location	pH		Electrical conductivity		Total nitrogen		Total phosphorus	
		No.	Range	No.	Range	No.	Range	No.	Range
36	SD6	15	7.92 – 9.22	15	340 – 1,790	4	0.4 – 3.3	4	0.02 – 0.41
38	SD3	17	8.04 – 9.06	17	466 – 1,020	5	0.5 – 1.3	5	0.02 – 0.49
39	SD4	7	7.22 – 8.59	7	152 – 370	3	1.4 – 2.7	3	0.20 – 0.47
47	MW3	12	8.03 – 9.20	12	421 – 2,040	2	0.8 – 2.0	2	0.05 – 0.06

5.4 Flooding

5.4.1 Monitoring of waterway structures

Waterway crossings (i.e. culverts and bridges) installed along the haul road and rail spur line are designed to convey flows resulting from the 1% AEP storm event (refer to Table 4-6). Ensuring waterway crossings are free from debris will allow the floodplain to adequately drain during a flood event. BCOPL will routinely monitor waterway crossings (if safe to do so) along the haul road and rail spur line to ensure structures are free from blockages and able to pass the design flood flows when required.

5.4.2 Regional flood monitoring

BCOPL will routinely monitor the Bureau of Meteorology (BoM) flood warning system (http://www.bom.gov.au/nsw/warnings/) during wet weather conditions or when significant rainfall is predicated in the Namoi River catchment. The following upstream WaterNSW streamflow gauges will be monitored:

- Namoi River at Boggabri (Station number 419012)
- Namoi River at Gunnedah (Station number 419001).

The earlier identification of significant flood conditions will allow BCOPL to notify potentially impacted landholders in a timely manner (i.e. prior to flooding occurring).

5.5 Stream and riparian health

BCOPL will monitor the stream and riparian condition of Nagero Creek and the Namoi River at permanent monitoring locations to identify the potential for impacts to stream and riparian condition due to changes in catchment area and discharges associated with the BCM. The monitoring locations will be aligned with existing biodiversity and surface water quality monitoring points where possible. Stream and riparian conditions at these locations will be monitored annually by recording photographs to identify changes over time as mining operations at BCM progress.

6.0 ASSESSMENT CRITERIA AND TRIGGER VALUES

6.1 Surface water quantity

BCOPL monitor the volume of water stored within the water management system (refer to Section 5.2) to identify when there is:

- a surplus of water and, therefore, a risk of non-compliance with the condition of EPL 12407 to maintain an air capacity of 1,000 ML within the BCM mine water storages
- a deficit of water and, therefore, a requirement to import water from external sources (i.e. borefield or Namoi River).

BCOPL implement five water storage alert levels, with management measures and actions required at each level. Indicative water storage alert levels and trigger values applied to the BCM water storages are provided in Table 6-1. An example trigger action response plan (TARP) for each level is provided in Appendix C. It should be noted that both the water storage alert levels and TARP presented in this SWMP are indicative only and that the specific levels and actions may be modified overtime to account for changes to the water management system (e.g. as new dams are constructed) and operational procedures.

Table 6-1: Water storage alert levels and trigger values

Alert level	Tigger level volume
Red alert – lower (water security risk)	The total volume of water stored in the system is below 700 ML.
Amber alert – lower	The total volume of water stored in the system is below 1,000 ML.
Green	The total volume of water stored in the system is between 1,000 ML and 1,800 ML.
Amber alert – upper	The total volume of water stored in the system is above 1,800 ML.
Red alert – upper (uncontrolled release risk)	The total volume of water stored in the system is above 2,100 ML (EPL non-compliance risk).

6.2 Surface water quality

6.2.1 Environmental protection licence limits

Surface water assessment criteria and trigger values for site discharges are specified in EPL 12407 for licenced discharge points 1 (SD6), 3 (SD3) and 4 (SD4). Surface water discharges must remain within the limits provided in Table 6-2.

Table 6-2: Water discharge pollution limits

Parameter	Units of measure	100 percentile concentration limit
Oil and grease	mg/L	10
pH	pH units	6.5 – 8.5

Parameter	Units of measure	100 percentile concentration limit
Total suspended solids	mg/L	50[1]

Notes: 1. The total suspended solids concentration limit specified may be exceeded provided that the following are true:

a) the discharge occurs solely due to rainfall at the premises exceeding 38.4 mm over any consecutive 5-day period immediately prior to the discharge occurring

b) all practical measures have been implemented to dewater all sediment dams within 5 days of rainfall such that they have sufficient capacity to store run off from a 38.4 mm, 5-day rainfall event.

6.2.2 Default guideline values

ANZG (2018) provides DGVs for many of the various toxicants sampled through the monitoring program. Where ANZG (2018) did not provide guideline values, ANZECC (2000) was used instead. DGVs for the protection of aquatic ecosystems were taken where possible and are presented in Table 6-3.

Table 6-3: Surface water quality default guideline values

Analyte group	Parameter	Units	Default guideline value
Field	pH	pH	6.5 – 8.0[2]
	Conductivity	µS/cm	30 – 350[2]
Nutrients	Nitrate	mg/L	2.4[3]
	Nitrogen (total)	mg/L	0.25[2]
	Phosphorus (total)	mg/L	0.02[2]
Dissolved metals	Aluminium	mg/L	0.055[1]
	Arsenic	mg/L	0.013[1,4]
	Cadmium	mg/L	0.0002[1]
	Chromium	mg/L	0.001[1]
	Copper	mg/L	0.0014[1]
	Lead	mg/L	0.0034[1]
	Molybdenum	mg/L	0.034[1]
	Nickel	mg/L	0.011[1]
	Selenium	mg/L	0.005[1]
	Zinc	mg/L	0.008[1]

Notes: 1. ANZG (2018) guideline for the protection of aquatic ecosystems, south-east Australia, slightly to moderately disturbed ecosystem.

2. ANZECC (2000) guideline for the protection of aquatic ecosystems physical and chemical stressors, south-east Australia, upland river (greater than 150 m AHD).

3. NIWA (2013) guideline for nitrate toxicity impacts on freshwater aquatic species (as recommended by ANZG (2018)).

4. As per Arsenic V.

6.3 Flooding

Runoff from the BCM is attenuated in water management dams which reduce the risk of downstream flood impacts occurring due to changes in land use associated with the mine (i.e. increased impervious area). Regardless, flood response actions are proposed to identify and respond to situations where discharges from BCM could potentially impact downstream flood conditions.

Where a flood class of 'minor to major' is identified at either Namoi River at Boggabri (419012) or Namoi River at Gunnedah (419001) stream gauges, and there is a potential for (controlled or uncontrolled) releases from sediment dams to further exacerbate flooding downstream of the BCM, local landholders shall be informed. A list of contact details for nearby residents are maintained by BCOPL.

6.4 Stream and riparian health

Stream and riparian health in Nagero Creek and the Namoi River will be assessed relative to the 2018 baseline monitoring data. The assessment will be completed via visual inspection of photographic records and review of field observations. The following stream and riparian health indicators will be assessed:

- surrounding land use
- channel characteristics
- bank stability/presence of erosion
- benthic composition
- turbidity/water clarity
- riparian vegetation (including native species diversity, and native species overstory, midstory, and ground cover composition).

Where there is an observed loss of vegetation not attributed to private landowner activities or seasonal variation BCOPL will undertake an investigation into the loss of stream or riparian health.

7.0 MITIGATION AND RESPONSE PLAN

The mitigation and response plan provided in Table 7-1 establishes the actions which must be undertaken if any of the established triggers are exceeded.

Table 7-1: Surface water mitigation and response plan

Trigger	Action required	Follow-up action
Water quantity		
The volume of water stored onsite changes alert level as defined in Table 6-1.	Follow the appropriate actions defined in the water storage trigger action response plan (TARP) provided in Appendix C.	Continue to monitor water storage volumes.
The volume of water stored onsite is recorded above the upper red alert level as defined in Table 6-1.	Report exceedance internally as per BCOPL incident response process.	Provide written details of the notification to the EPA and DPE within 7 days of the date on which the incident occurred. Investigate options to draw down stored water to meet operational water demands and undertake relevant TARP actions (refer to Appendix C).
Water balance modelling indicates incidental water take exceeds BCOPL's water allocations.	Report exceedance internally as per BCOPL incident response process. Obtain sufficient water allocations to cover the additional water take.	Continue to monitor water take in accordance with the procedure described in Section 8.6 and Appendix B.
Water quality		
Controlled discharge water quality exceeds the: • EPL water quality limits defined in Table 6-2. • ANZG (2018) DGVs defined in Table 6-3.	Report exceedance internally as per BCOPL incident response process. Implement all reasonable measures to minimise discharge into watercourses if safe to do so, including pumping to the MWDs. During prolonged rainfall periods, apply to the EPA for an emergency discharge event. Investigate and outline causes, impacts, and recommended mitigation measures. During prolonged rainfall periods, apply to the EPA for an emergency discharge event.	If the incident causes actual or potential material environmental harm: • initiate the Pollution Incident Response Management Plan (PIRMP) and immediately notify EPA (Environment Line 131 555). • provide written details of the notification to the EPA and DPE within 7 days of the date on which the incident occurred. Discharges may be resumed if water quality parameters comply with the POEO Act, EPL limits and consent conditions. If required, report in Annual Review.

Trigger	Action required	Follow-up action
Uncontrolled discharge water quality exceeds the: • EPL water quality limits defined in Table 6-2. • ANZG (2018) DGVs defined in Table 6-3.	Report exceedance internally as per BCOPL incident response process. Implement all reasonable measures to minimise discharge into watercourses if safe to do so, including pumping to the MWD. If required notify relevant government regulators and landowners in accordance with PIRMP. Investigate and outline causes, impacts, and recommended mitigation measures.	If the incident causes actual or potential material environmental harm: • initiate the PIRMP and immediately notify EPA (Environment Line 131 555) • provide written details of the notification to the EPA and DPE within 7 days of the date on which the incident occurred. If required, report in Annual Review.
Oil/chemicals spill(s) that result in material harm to the environment	Cease work in the affected area. Deploy spill kits if applicable and contain the spill if safe to do so. Notify the Environment Superintendent and report incident as per PIRMP. Notify potentially affected persons.	If the incident causes actual or potential material environmental harm: • initiate the PIRMP and immediately notify EPA (Environment Line 131 555) • provide written details of the notification to the EPA and DPE within 7 days of the date on which the incident occurred. If required, report in Annual Review.
Flooding		
Namoi River flood warning issued	Monitor the situation.	Monitor the situation.
Releases from onsite water storages (e.g. sediment dams) are predicted to cause flood impacts to downstream landowners.	Notify downstream landowners.	If the incident causes actual or potential material environmental harm: • initiate the PIRMP and immediately notify EPA (Environment Line 131 555) • provide written details of the notification to the EPA and DPE within 7 days of the date on which the incident occurred. If required, report in Annual Review.

Trigger	Action required	Follow-up action
Complaints received regarding flooding impacts downstream	Review flow quantity monitoring data to confirm if the cause of flooding is from BCM discharges or natural flood event. Refer to the BCOP incident response process.	If the incident causes actual or potential material environmental harm: • initiate the PIRMP and immediately notify EPA (Environment Line 131 555) • provide written details of the notification to the EPA and DPE within 7 days of the date on which the incident occurred. If required, report in Annual Review.
Stream and riparian health		
Loss of stream or riparian health identified	Notify the Environmental Superintendent. Investigate causes of vegetation loss.	If vegetation loss is attributed to BCOPL activities, issue a report in accordance with the BCOPL incident response plan. If required, consult with relevant government regulators to develop appropriate mitigation measures.

8.0 WATER LICENSING

8.1 Overview

BCOPL is required to licence water that is either taken or intercepted in accordance with the WM Act. This includes water taken for use as well as water intercepted and managed as a result of mining activities. BCOPL is required to hold WALs in each affected water source to account for all water extracted and intercepted. The water sharing plans (WSPs), existing WALs, licensing requirements and water accounting approach applicable to BCM are described in the sections below.

8.2 Water sharing plans

WSPs are statutory documents developed under the WM Act that are designed to establish sustainable use and management of water resources at specific locations and for specific water resource types. WSPs establish the rules for sharing water between the environment and water users, and between competing extractive demands for water. WSPs apply to one or more water sources and establish overall limits to water take, environmental water rules, trading rules and mandatory licence conditions that apply to licence holders within each water source. Surface water WSPs and water sources relevant to the BCM are identified in Table 8-1.

Table 8-1: WSPs and water sources relevant to BCM

WSP	Water Source	Interaction with BCM operations
Water Sharing Plan for the Namoi and Peel Unregulated Rivers Water Sources 2012	Bluevale Water Source	Location of the physical mining operations. Water management features that intercept runoff may require a licence or allocation from this water source.
	Maules Creek Water Source	The Project Approval boundary interacts with small areas of the Maules Creek Water Source. There is water infrastructure in this water source. No water is taken form the Maules Creek Water Source.
	Eulah Creek Water Source	The haul road, rail siding and old train loading facilities are located to the west of the BCM mine extraction area in the Eulah Creek Water Source. No water is taken form the Eulah Creek Water Source.
Water Sharing Plan for the Upper Namoi and Lower Namoi Regulated River Water Sources 2016	Upper Namoi Regulated River Water Source	Contains the rules relating to water extraction from the Namoi Regulated River from Split Rock Dam water storage to Keepit Dam water storage. A licence from this water source is required if BCOPL were to withdraw water directly from the Upper Namoi River.

WSP	Water Source	Interaction with BCM operations
	Lower Namoi Regulated River Water Source	Contains the rules relating to water extraction from the Namoi Regulated River from Keepit Dam water storage to the junction of the Namoi River with the Barwon River. A licence from this water source is required if BCOPL were to withdraw water directly from the Lower Namoi River.

8.3 Existing licences and approvals

BCOPL currently holds surface water WALs in the Bluevale Water Source, Upper Namoi Regulated River Water Source, and Lower Namoi Regulated River Water Source. BCOPL's existing WALs and associated works approvals are identified in Table 8-2.

Table 8-2: Existing water access licences held by BCOPL

WAL number	Category	Entitlement (units)	WSP	Water Source	Nominated works
WAL 44134	Unregulated River	93	Namoi and Peel Unregulated Rivers Water Sources 2012	Bluevale Water Source	-
WAL 37067	Regulated River (General Security)	128	Upper Namoi and Lower Namoi Regulated River Water Sources 2016	Upper Namoi Regulated River Water Source	-[1]
WAL 2571		51		Lower Namoi Regulated River Water Source	90CA801763
WAL 2595		143			90CA801819
WAL 2596	Supplementary Water	26.5			90CA801819
WAL 2572		5.6			90CA801763

Notes: 1. WAL 37067 is used for downstream temporary trade purposes and water is not directly taken from the Upper Namoi Regulated River Water Source.

8.4 Harvestable rights potential

BCOPL's harvestable rights potential has been calculated in accordance with the *Harvestable Rights (central inland-draining catchments) 2023*. The total capacity of all dams on a property allowed under the harvestable right is called the MHRDC. The following steps were completed to determine BCOPL's MHRDC.

1. The MHRDC is calculated based on the owner/occupier's contiguous landholding. BCOPL's contiguous landholding was determined to be 10,428 ha which is shown in Figure 8-1.
2. WaterNSW's Maximum harvestable right calculator (WaterNSW 2023) was used to determine the MHRDC to capture 10% of the average regional rainfall runoff based on BCOPLs contiguous landholding. BCOPL's MHRDC was calculated as 678 ML.
3. Existing harvestable rights dams were identified by reviewing the NSW Government's "hydro area" spatial dataset and aerial photography for the identified landholding. Storages on minor streams that appeared to be functioning as dams were included. Storages associated with mining operations were excluded as

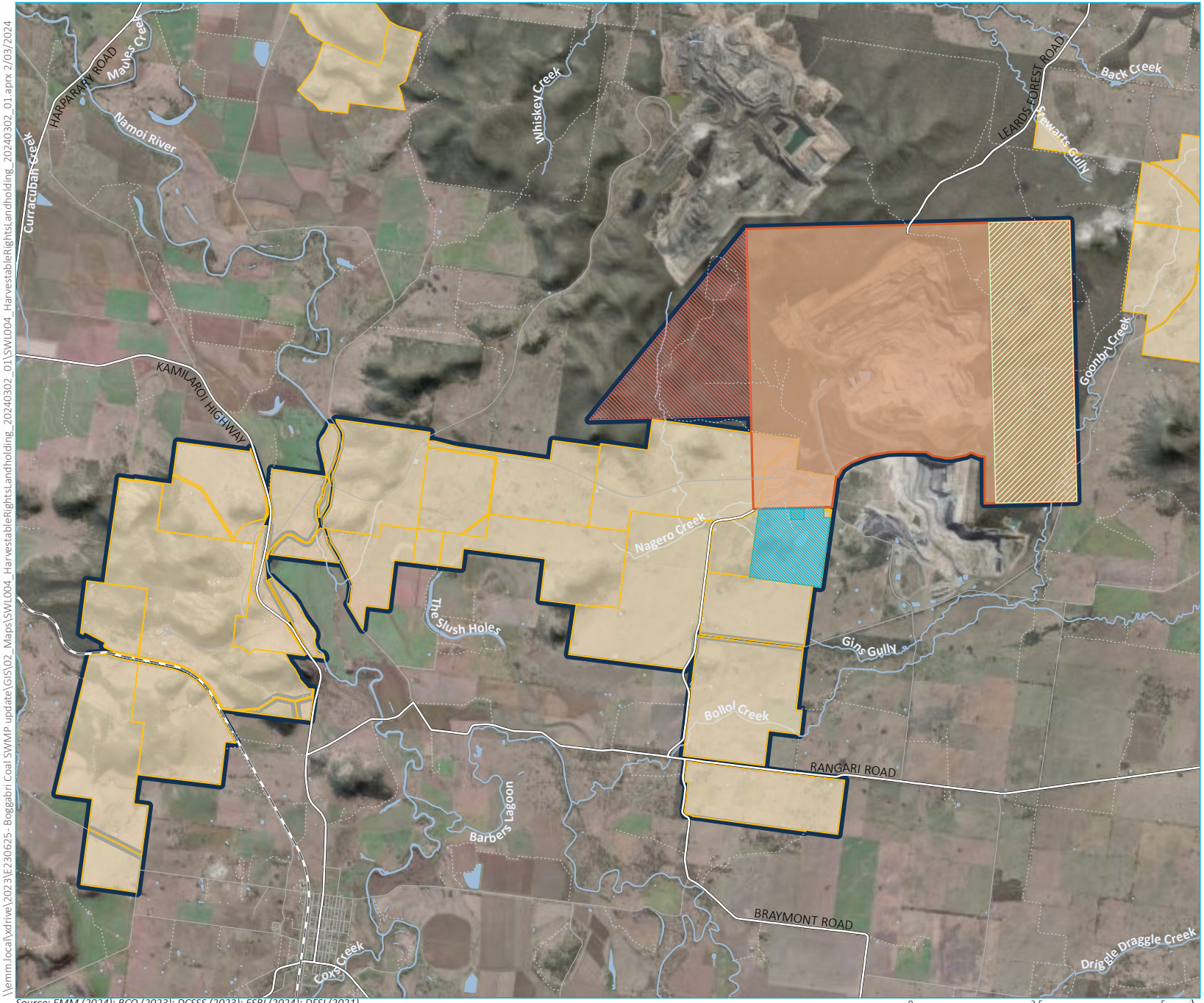
they are not considered harvestable rights dams. The capacity of the existing dams was estimated using the following dam sizing methodology recommended by (DPE-Water 2023b):

Dam volume (m^3) = 0.4 x surface area (m^2) x depth (m)

The total surface area of existing harvestable rights dams within the landholding was estimated at 16 ha. An existing harvestable rights dam volume of 96 ML was calculated using an assumed average water depth of 1.5 m.

4. The remaining MHRDC that may be utilised by the storages associated with mining operations was determined by subtracting the volume of the existing farm dams (step 3) from the MHRDC (step 2). BCOPL's remaining MHRDC was determined to be 582 ML.

BCOPL's harvestable rights potential is 582 ML.



KEY

- BCM ownership
- Harvestable rights landholding

Statutory boundary

- CL368
- ML1755
- A339
- A355

Existing environment

- Rail line
- Major road
- Minor road
- Vehicular track
- Named watercourse
- Named waterbody

Source: EMM (2024); BCO (2023); DCSSS (2023); ESRI (2024); DFSI (2021)

0 2.5 5 km

GDA2020 MGA Zone 56

N

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BCOPL's landholding for harvestable rights entitlement

Boggabri Coal Operations Pty Ltd
Surface Water Management Plan
Figure 8.1

EMM
creating opportunities

8.5 Water licensing requirements

The following surface water take mechanisms are relevant to the BCM:

- interception of local catchment runoff from non-minor streams in the Bluevale Water Source under the WSP for the Namoi and Peel Unregulated Rivers Water Sources 2012
- extraction via pump and pipeline from the Lower Namoi Regulated River Water Source under the WSP for the Upper Namoi and Lower Namoi Regulated River Water Sources 2016.

The volume of runoff that is intercepted and therefore requires licensing from the local catchment will decrease as mining progresses to north-west, reducing the contribution catchment area.

8.6 Surface water accounting

Water take from the Lower Namoi Regulated River Water Source is controlled and accounted for via pump metering. Monitoring of the pump metering ensures BCOPL does not exceed its WAL entitlements in this water source.

Water take associated with the interception of local catchment runoff from the Bluevale Water Source is uncontrolled and weather dependent. Hence, the volume of surface water take that occurs from year to year will vary, with lower water take volumes occurring in dry years and higher water take volumes occurring in wet years. The local catchment area that is intercepted and requires licensing by the BCM will also change (generally reduce) over time as mining progresses to the north and west. To account for this variation and to ensure BCOPL hold sufficient WALs to cover any water take, water take from the Bluevale Water Source is accounted for using recorded site data and the SWBM (as documented in the SWBR).

The water accounting methodology is outlined in the Enforceable Undertaking (EU 230608) issued by NRAR on 8 June 2023 and is reproduced in Appendix B. Water accounting will be completed on a quarterly basis whereby the SWBM will be used to determine the volume of water take that occurred during the previous quarter (using measured site data) and predict (using short-term climate forecasts) the volume of water take expected to occur in the following quarter. BCOPL will purchase additional water entitlements to cover any measured or predicted water take in excess of BCOPL's existing WALs.

9.0 REPORTING AND REVIEW

9.1 Reporting

General and specific reporting requirements relevant to this SWMP are described in Table 9-1.

Table 9-1: Reporting requirements

Reporting aspect	Reporting procedure
Annual return	EPL 12407 contains conditions that require BCOPL supply the EPA with an annual return. Details of the annual return reporting requirements and procedures are documented in the WMP.
Annual Review	BCOPL prepares and submits an Annual Review with respect to the environmental performance of the development to relevant agencies. The Annual Review will present all surface water monitoring results for the reporting period and assess the effectiveness of the monitoring program. Further details of the Annual Review are documented in the WMP.
Incidents and non-compliance	BCOPL will manage and report environment incidents, complaints, non-conformances with relevant statutory requirements and exceedances of performance criteria as outlined in the BCOPL Incident Management Standard and documented in the WMP. This includes any exceedances of the assessment criteria identified via the monitoring program.
Water accounting	BCOPL will complete quarterly reporting of water take volumes in accordance with Enforceable Undertaking (EU 230608). Reporting will be in the form of: • minutes of quarterly Community Consultative Committee (CCC) meetings • quarterly email to NRAR • quarterly email to Registered Aboriginal Parties (RAPs) and Biannual ASCF meetings • annual reporting of water accounts to WaterNSW • annual reporting of water accounts in the Annual Review.
NRAR updates	In accordance with Enforceable Undertaking (EU 230608), BCOPL will provide quarterly progress reports to NRAR on the status and outcome of the new metering and telemetry until 31 December 2027. Within these reports, BCOPL will include any key information that may be relevant to NRAR for the development of best practice guidelines for the mining sector.

9.2 Review

Review requirements relevant to this SWMP are described in Table 9-2.

Table 9-2: Review requirements

Review aspect	Reporting procedure
SWMP review	BCOPL will review the SWMP in accordance with Schedule 5, Condition 5 of the project approval. Details of the review process are documented in the WMP. In accordance with Enforceable Undertaking (EU 230608), BCOPL will notify NRAR in writing following the submission of an updated SWMP.

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11.0 ABBREVIATIONS

Abbreviation	Definition
ARI	Average Recurrence Interval
ASCF	Aboriginal Stakeholder Consultation Forum
BCM	Boggabri Coal Mine
BCOP	Boggabri Coal Operations Pty Ltd
BCSD	Department of Planning and Environment – Biodiversity Conservation and Science Division
BCT	Boggabri Coal Terminal
BMP	Biodiversity Management Plan
BOA	Biodiversity Offset Areas
BTM	Boggabri, Tarrawonga, Maules Creek
CBIMP	Common Boundary Integration Management Plan
CCC	Community Consultative Committee
CEC	Cation Exchange Capacity
CFMP	Clearing and Fauna Management Protocol
CHMP	Cultural Heritage Management Plan
CHPP	Coal Handling and Preparation Plant, including By-pass crusher
CL	Coal Lease
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DA	Development Application
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DECC	Former Department of Environment and Climate Change
DECCW	Former Department of Environment, Climate Change and Water
DPI	NSW Department of Primary Industries
DPE	Former Department of Planning and Environment (now Department of Planning Housing and Infrastructure (DPHI))
DPHI	Department of Planning Housing and Infrastructure

Abbreviation	Definition
DRE	Former NSW Department of Trade and Investment - Division of Resources and Energy
DRG	Former Department of Planning and Environment – Division of Resources and Geoscience
DTIRIS	Former NSW Department of Trade and Investments, Regional Infrastructure and Services
EA	Environmental Assessment
EC	Electrical Conductivity
EMPs	Environment Management Plans
EP&A Act	Environmental Planning and Assessment Act, 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act, 1999
EPL	Environment Protection Licence
GMP	Groundwater Management Plan
GSC	Gunnedah Shire Council
IA	Idemitsu Australia Pty Ltd
Km	Kilometre
MCA	Minerals Council of Australia
MEG	Department of Regional NSW – Mining, Exploration and Geoscience
MIA	Mine Infrastructure Area
ML	Mining Lease
Mt	Million Tonnes
Mtpa	Million Tonnes Per Annum
NOW	Former NSW Office of Water
NSC	Narrabri Shire Council
NSW	New South Wales
OEH	Former NSW Office of Environment and Heritage
PAC	Former NSW Planning and Assessment Commission
PAF	Potentially Acid Forming
POEO Act	Protection of the Environment (Operations) Act, 1997

Abbreviation	Definition
Resources Regulator	Department of Regional NSW – Resources Regulator
RMP	Rehabilitation Management Plan
RL	Relative Level
RMS	NSW Roads and Maritime Services
ROM	Run of Mine
SCMP	Spontaneous Combustion Management Plan
SD	Sediment Dam
SWB	Site Water Balance
SMP	Soil Management Protocol
SWC	State Water Corporation
SWMP	Surface Water Management Plan
t	Tonne
TARP	Trigger Action Response Plan
TCPL	Tarrawonga Coal Pty Limited
TSS	Total Suspended Solids
WMP	Water Management Plan
WMS	Water Management Strategy

Appendix A
Summary of water management storages

A.1 Summary of water management storages

Table A-1: Summary of existing storages (2023)

Storage	Description	Stored water	Design criteria	Additional sediment allowance	Runoff coefficient	Catchment area (ha)	Required minimum capacity (ML)	Capacity (ML)	Excluded works?	Licensing approach	Relevant WAL	Notes
Dirty water dams												
SD3	Sediment dam located south-west of spoil dump	Dirty runoff from partially rehabilitated spoil dump	90th percentile, 5-day rainfall	50%	0.4 to 0.75	194.2	92.1	102.3	No – non-minor stream	WAL required for runoff into dam from entire catchment	WAL 44134	-
SD6	Sediment dam located downstream of MIA (referred to as Nagero Dam)	Runoff from grassed areas near MIA, and overflows from SD8	90th percentile, 5-day rainfall	50%	0.4 to 0.75	64.3	14.6	55.9	No – collects most runoff from undisturbed catchment that would not otherwise become contaminated	WAL required for runoff into dam from entire catchment	WAL 44134	-
SD7	Sediment dam located in eastern spoil dump	Dirty runoff from spoil dump and clean runoff from undisturbed catchment	90th percentile, 5-day rainfall	50%	0.4 to 0.75	207.8	57.5	95.1	Yes – intercepts mixture of dirty runoff and clean water runoff that would otherwise become contaminated in void	Excluded work exemption	n/a	-
SD8	Sediment dam located in MIA	Dirty runoff from MIA	90th percentile, 5-day rainfall	50%	0.75	10.9	5.6	13.4	Yes – prevents contamination	Excluded work exemption	n/a	-
Block Dam	Transfer dam upstream of soil stockpile	Inflows from upstream catchment	-	-	-	167.4	-	17.5	No – non-minor stream	WAL required for runoff into dam from entire catchment	WAL 44134	-
Contaminated water dams												
SD10	MWD located in CHPP	Contaminated runoff from product coal stockpile	1% AEP, 72 hr rainfall event + ‘reuse zone’	20%	0.85	31.8	70.7	116.4	No – dam also stores water for another purpose (water supplied under a WAL)	WAL required for flows into dam from entire catchment	WAL 44134	-
SD11	MWD located at rail loop	Contaminated runoff from rail loop	1% AEP, 72 hr rainfall event	20%	0.85	3.9	10.0	16.4	Yes – prevents contamination	Excluded work exemption	n/a	-
SD12	MWD located in CHPP	Contaminated runoff from ROM coal stockpile	1% AEP, 72 hr rainfall event	20%	0.85	45.7	136.6	206.6	Yes – prevents contamination	Excluded work exemption	n/a	-
SD23	MWD located near topsoil stockpile	Dirty runoff from topsoil stockpile and transfers from MW5	90th percentile, 5-day rainfall	50%	0.75	56.5	8.7	17.0	Yes – prevents contamination	Excluded work exemption	n/a	-
SD28	MWD located in CHPP	Contaminated runoff from rail loop area	1% AEP, 72 hr rainfall event	20%	0.85	0.7	2.6	3.5	Yes – prevents contamination	Excluded work exemption	n/a	-
Mine water dams												

Storage	Description	Stored water	Design criteria	Additional sediment allowance	Runoff coefficient	Catchment area (ha)	Required minimum capacity (ML)	Capacity (ML)	Excluded works?	Licensing approach	Relevant WAL	Notes
MW3	MWD located south of MIA	Surplus contaminated water pumped from SD10 and clean runoff from small, grassed catchment	1% AEP, 72 hr rainfall event	0%	1.0 (Turkey's nest)	10.7	22.5	153.5	Yes – prevents contamination by storing mine water	Excluded work exemption	n/a	Freeboard of 22.5 ML will be maintained
MW5	Out of pit mine water storage	Surplus mine water from pit and other areas	1% AEP, 72 hr rainfall event	0%	1.0 (Turkey's nest)	208.1	39.8	2,200	Yes – prevents contamination by storing mine water	Excluded work exemption	n/a	Minimum freeboard of 38.8 ML will be maintained
MWD	In pit water storage	Surplus mine water from pit and transfers from MW5	-	0%	1.0 (Turkey's nest)	-	-	-	Yes – prevents contamination by storing mine water	Excluded work exemption	n/a	-
In-pit	In-pit storage during wet periods	Contaminated runoff and groundwater make captured in the mining void sumps	-	0%	-	1,408.4	Predicted maximum volume stored in pit 1,120 ML	-	No – not a dam	WAL required for runoff into void from non-minor streams. Runoff intercepted from minor streams to be covered under BCOPL's harvestable rights entitlement. This relates to the undisturbed catchment draining to the void, not the area occupied by the void itself.	WAL 44134	Surplus contaminated water stored in-pit when capacity of MWDs reached.

A.2 Future water management storages

Table A-2: Summary of future water storages

Storage	Description	Stored water	Design criteria	Additional sediment allowance	Runoff coefficient	Catchment area (ha)	Required minimum capacity (ML)	Proposed capacity (ML)	Excluded works?	Licensing approach	Relevant WAL	Notes
Dirty water dams												
SD20	Sediment dam located in spoil dump	Dirty runoff from spoil dump	90th percentile, 5-day rainfall	50%	0.75	95.2	41.8	41.8	Yes – prevents contamination	Excluded work exemption	n/a	New dam
SD21	Sediment dam located in spoil dump	Dirty runoff from spoil dump	90th percentile, 5-day rainfall	50%	0.75	116.4	55.6	55.6	Yes – prevents contamination	Excluded work exemption	n/a	New dam
SD22	Sediment dam located in spoil dump	Dirty runoff from spoil dump	90th percentile, 5-day rainfall	50%	0.75	7.0	2.4	2.4	Yes – prevents contamination	Excluded work exemption	n/a	New dam
SD24	Sediment dam located in spoil dump	Dirty runoff from spoil dump	90th percentile, 5-day rainfall	50%	0.75	16.5	7.3	7.3	Yes – prevents contamination	Excluded work exemption	n/a	New dam

Storage	Description	Stored water	Design criteria	Additional sediment allowance	Runoff coefficient	Catchment area (ha)	Required minimum capacity (ML)	Proposed capacity (ML)	Excluded works?	Licensing approach	Relevant WAL	Notes
Mine water dams												
MW11	Out of pit mine water storage	Surplus mine water from pit and other areas	1% AEP, 72 hr rainfall event	0%	1.0 (Turkey's nest)	TBD	TBD	TBD	Yes – prevents contamination by storing mine water	Excluded work exemption	n/a	Location and capacity of dam under investigation

Appendix B
Water accounting methodology

B.1 Background

Boggabri Coal Operations Pty Ltd (BCOPL) utilises a site water balance model (SWBM) to predict how the water management system (WMS) will react to future or observed climate data based on observed storage volumes and planned mine progression. The SWBM is verified by comparing model outputs with observed operational data. This verification is key to provide confidence that the modelled outputs are an adequate representation of the WMS response to climate data.

Runoff from undisturbed catchment areas is modelled in the SWBM using the Australian water balance model (AWBM) rainfall runoff model. The AWBM was calibrated to achieve a similar average annual runoff coefficient to the nearby Maules Creek catchment immediately north west of the mine. Establishing parameters in the AWBM to gauge data provides confidence the model is adequately representing the local rainfall runoff relationship from undisturbed catchment areas in the absence of more site specific data.

B.2 Water metering

To ensure an accurate measure of water take, BCOPL have installed water metering on pump transfers that divert inflows from the watercourse upstream of the soil stockpile area (refer to Section 5.2 of the Surface Water Management Plan [SWMP]). These metering devices track pump transfer volumes, and thus, may be used to:

- quantify the water take from the watercourse draining to the soil stockpile area
- quantify the water take from undisturbed catchment areas that the mine intercepts but are not feasible for metering on a pro rata basis.

The operational data observed by the metering devices will also be used for model verification purposes.

B.3 Calculating water take

Water accounting will occur on a quarterly basis using the following approach to calculate and verify water take over each previous quarter:

- Update the SWBM to include observed rainfall, evaporation, water use and storage volume data over the previous quarter.
- Run the SWBM to estimate the volume of runoff intercepted from the undisturbed catchment area over the previous quarter.
- Verify the SWBM is correctly modelling the WMS by:
  - comparing runoff volumes from the AWBM to metered pump volumes (where available) to verify model is adequately representing the rainfall runoff response from the undisturbed catchment area
  - comparing simulated and observed storage volumes to ensure model is adequately representing the response of the WMS to the runoff.
- Calculate the total licensable take over the previous quarter as the sum of:
  - runoff from all third order and higher watercourses
  - volume of runoff from minor watercourses in excess of the landholdings' harvestable rights.

The pump transfer volumes obtained through the additional metering devices may be used to calculate the volume of water take using a pro rata approach. Where possible and practical, metered volumes will also be used to improve the reliability of the WBM to provide a consistent and long term methodology for determining water take from the undisturbed catchment area.

B.3.1 Forecasting water take for allocation acquisition

BCOPL will use the SWBM to forecast water take for the following quarter to verify BCOPL holds enough water allocation in its water account ahead of any surface water take. To do this, the following procedure will be used:

- BCOPL will obtain the three month climate outlook from the Bureau of Meteorology to determine the climate scenario which will be applied to modelling.
- Run the model using a probabilistic simulation approach where historical climate records are used to estimate future rainfall and runoff.
- A range of possible water take volumes will be obtained for the given scenario, where the predicted water take will be taken as:
  - the maximum water take volume for very dry, dry, and average scenarios
  - the 80th percentile water take volume for wet and very wet scenarios.
- The total allocation required will then be calculated as the sum of:
  - the predicted volume of runoff from all third order and higher watercourses
  - the predicted volume of runoff from minor watercourses in excess of the landholdings' harvestable rights.

More allocation can be assigned as needed if wet or very wet conditions are more extreme than the 80th percentile estimation. Forecasting further than three months ahead is not considered appropriate due to the difficulty of predicting long term weather conditions.

B.3.2 Proposed water accounting approach

BCOPL will use the SWBM outputs of each previous quarter and the forecasted outputs for each following quarter to determine the total volume of allocation required. Additional allocation will be acquired if either of the following are true:

- Water take over the previous quarter exceeded the allocation held in BCOPLs water allocation account.
- Water take over the following quarter is predicted to exceed the allocation held by BCOPL.

Appendix C
Water storage TARP

	Water Risk Level				
	Red Alert - Lower	**Amber Alert - Lower**	**Green**	**Amber Alert - Upper**	**Red Alert - Upper**
TRIGGER LEVEL Volumes	Below 700 ML (70 days water remaining)	Below 1,000 ML (100 days water remaining)	Between 1,000-1,800 ML	Above 1,800 ML Potential to impact operation	Above 2,100 ML Likely to impact operation
Operational Activities	Utilise imported water for dust suppression Consider standing down sections of fleet on hot windy days Weekly Crisis Management Team meeting	Discuss water cart efficiencies with operators Consider importing water from bores during summer and/or hot dry conditions forecast Close non-essential roads	Utilise pit water for dust suppression Pump water back to MIA for usage in CHPP Use water carts efficiently	Maximise watercart dust suppression	Plan for potential water storage in pit Watering of non-essential roads Weekly Crisis Management Team meeting
CHPP/MIA Activities	Installing river pumps (if water/licence available) Consider importing Lower Namoi River Water Maximise bypass coal Close non-essential roads	Utilise bore water for MIA needs Utilise water stored in evaporation dams Minimise water stored in non-essential storages Maintain bore critical spares	Utilise pit water for all MIA needs (excluding potable) All dams stored below design air capacity Maximise harvest/recycling of water Regular inspections of bore infrastructure	Maximise water stored in evaporation dams Maintain dirty water dams at design criteria storage limit Utilise pit water for all MIA needs (excluding potable)	Increase water storage limits on storage dams to 85% (to reduce to design criteria prior to rainfall events) Additional survey pickups of dam volumes Install infrastructure to accommodate manual discharge out of licensed discharge points.

Management Activities	Review daily import data Investigate evaporation control measures Consider purchasing additional water allocation	Weekly water meetings Weekly water efficiency notifications Consider dust suppressing agents Increase bore SWL monitoring (monitoring, production, and neighbouring bores) Weekly analysis of Digital Flow monitor data	Monthly water meetings or when significant rain forecast Monthly water efficiency notifications Weekly survey pickups Regular dam inspections Regular analysis of Digital Flow monitor data	Weekly water meetings Monthly dam inspections Discharge from licensed discharge points in accordance with EPL Floc/treat water in licensed discharge points	Weekly dam inspections Consider manual water discharge in accordance with EPL Daily review of evel monitoring and Auto Water Sampling Data

Appendix D
NRAR Enforceable Undertaking

Natural Resources Access Regulator
Locked Bag 5022,
Parramatta NSW 2124
T 1800 633 362
www.nrar.nsw.gov.au

Enforceable Undertaking

Section 336E of the *Water Management Act 2000*

1 Parties

Name: **Natural Resources Access Regulator (NRAR)**
Notice details: **4 Parramatta Square, 12 Darcy Avenue, Parramatta NSW 2150**
Attention: **Grant Barnes, Chief Regulatory Officer**

Name: **Boggabri Coal Operations Pty Ltd (BCOPL)**
ACN/ABN: **ABN 76 600 191 455**
Notice details: **386 Leard Forest Road, Boggabri, NSW 2382**
Attention: **Stewart Dunlop, Deputy General Manager**

2 Background

2.1 The Natural Resources Access Regulator (**NRAR**) created by the *Natural Resources Access Regulator Act 2017* (NSW) (**NRAR Act**) is the regulator responsible for compliance and enforcement measures for natural resources management legislation in New South Wales. It has responsibility for compliance and enforcement of the specified functions of the Minister administering the *Water Management Act 2000* (**WM Act**) as specified in Schedule 2 of the NRAR Act. Section 336E of the WM Act (read with section 11 of the NRAR Act) empowers the NRAR to accept enforceable undertakings from parties alleged to have breached the WM Act.

Boggabri Coal Operations Pty Ltd (**BCOPL**) operates the Boggabri Coal Mine (**BCM**) on behalf of Idemitsu Australia Pty Ltd (**IA**) and its joint venture partners. BCM is owned by the following joint venture partners:

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

The joint venture partners identified above have owned the mine, in an unincorporated joint venture structure, since December 2014. BCOPL was appointed as operator of the mine when the joint venture was established.

BCM is located approximately 15 km north-east of the township of Boggabri in the Northwest Region of New South Wales (**NSW**) and is located wholly within the Narrabri Local Government Area. BCM is part of the Boggabri, Tarrawonga, Maules Creek Coal Mining Complex and is immediately adjacent to the Tarrawonga Coal Mine to the south and Maules Creek Coal Mine to the north. BCOPL is the lawful occupier of the Boggabri Coal Mine and the "landholder" for the purposes of the WM Act.

BCM has been operating as an open cut coal mine since 2006. Development consent was first obtained on 25 August 1989 (DA36-88) and the continuation project further approved in July 2012 (state significant development consent PA09_0182). Section 4.41(1)(g) of the *Environmental Planning Assessment Act 1979* operates such that approvals under sections 89, 90 and 91 of the WM Act are not required for state significant development authorised by

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a development consent. BCOPL however must account for water taken from a water source that is the subject of a water sharing plan.

BCM's Water Management Plan relevantly includes a Surface Water Management Plan which sets out the management systems which apply to clean, dirty and contaminated water runoff and capture at the mine. Water required to satisfy the site demands is sourced from onsite surface water storages (consisting of contaminated water stored in mining water storages and pit void, and dirty water in sediment dams) and supplemented with imported water using ground water and river water. BCOPL holds specific groundwater water access licences (WALs) and general security and supplementary WALs for the Lower and Upper Namoi Regulated River Water Source.

2.2 Between 1 July 2019 and 20 April 2022, it is alleged that BCOPL took surface water from the Bluevale Water Source, being an unregulated river water source to which the *Water Sharing Plan for the Namoi and Peel Unregulated Rivers Water Sources 2012* applies, in the course of mining operations at the Boggabri Coal Mine, and without obtaining a requisite water access licence. Water was taken by capturing or impounding clean surface water from upstream third and fourth order streams in dams and water storages at the BCM.

On 7 April 2022, BCOPL was granted a zero-share unregulated river access licence (WAL 44134). Once registered, BCOPL acquired and transferred a total of 939ML of temporary account water in the Bluevale water source for the Water Year 2021-2022. BCOPL then further acquired and transferred 846ML of water entitlements to this WAL to account for potential water taken in the Water Year 2022/23.

2.3 The Alleged Contravention:

NRAR considers that the conduct referred to in paragraph 2.2 has contravened the following provision in the WM Act:

a) Section 60A(2) makes it an offence for a person to take water from a water source to which Part 2 of the WM Act applies where that person does not hold an access licence for that water source.

b) In accordance with section 60I of the WM Act, a person who takes water in the course of carrying out a mining activity is, for the purposes of the Act, taking water from a water source. Further, a person takes water in the course of carrying out a mining activity if, as a result of or in connection with, the activity or a past mining activity carried out by the person, water is removed or diverted from a water source (whether or not water is returned to that water source) or water is re-located from one part of an aquifer to another part of an aquifer.

c) It is alleged that BCOPL took water in the course of carrying out its mining activities as referred to in section 60I(2) and did not hold a surface access licence for this take and the water was not otherwise lawfully taken (e.g. pursuant to a statutory exemption from the requirement for a WAL or harvestable rights).

2.4 BCOPL acknowledges the alleged contravention and undertakes to carry out the commitments and preventative measures set out in this undertaking.

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2.5 BCOPL has offered the commitments set out in this undertaking.

2.6 BCOPL considers that the commitments in this undertaking support the water management principles as outlined in section 5 of the *Water Management Act 2000* in the following ways:

a) Improvements to the surface water management system through the metering, telemetry and monitoring commitments will:

i) provide a more accurate picture of water use at the site and in the area, enabling cumulative impacts on water sources to be considered and minimised; and
ii) encourage adaptive management of water sources and water use for the protection of those sources and their ecosystems.

b) BCOPL's commitment to implement improved systems and report on its learnings and experiences to NRAR will promote adaptive management of water sources at an industry level. This information will provide NRAR with first hand data and accounts to assist it in its commitment to develop guidelines to improve water reporting across the mining sector. Industry wide improvements assist the community at large as improved systems for large water users ultimately protect water sources.

c) The contribution to a community project will seek to support the protection of water sources and/or dependent ecosystems in the local/regional area.

d) Consultation with Aboriginal communities and groups will support the promotion and protection of cultural values and practices that are affected by mining at the BCM.

3 Start of this Undertaking

3.1 This Undertaking comes into effect when both of the following are completed:

a) this Undertaking is executed by BCOPL, and

b) this Undertaking so executed is accepted by NRAR,

(**Commencement Date**).

4 Undertaking

4.1 BCOPL commits to the following undertakings, for the purposes of section 336E of the WM Act and NRAR**:**

a) carry out the following measures as a way of redressing the effects its contravening conduct has had on the environment and community:

i) install additional water metering and telemetry at Boggabri Coal Mine's main water arterials to measure water transferred out of the pit into the mine water dams, as set out in Appendix 1, by 31 December 2023.

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ii) purchase and implement a GOLDSIM modelling license by 31 July 2023. To implement the license once purchased, BCOPL must undertake weekly monitoring of dam storage curves and pumping flow rates to enable the GOLDSIM site model balance to be updated regularly. Implementation of the GOLDSIM license must deliver as ongoing outputs (including beyond 31 July 2023)

(1) real time site water balances inclusive of all surface water inflows;

(2) forecast modelling to determine future surface water licensing requirements; and

(3) verification of water intakes and usage, and provide predictive modelling capacity for upcoming weather events

iii) By 31 December 2023, submit to the NSW Department of Planning and Environment for its approval an updated site water management plan (**SWMP**). The SWMP must include information relevant to the additional metering, telemetry and monitoring referred to in paragraph 4.1a)i).

iv) Use information and data derived from water metering, telemetry and monitoring improvements to report and account for surface water taken during each water year until 31 December 2027 in accordance with the methodology set out in Appendix 2.

v) Within 28 business days of the Commencement Date, make a payment to NRAR in the amount of A$54,240 in recognition of the value of the volume of water allegedly taken without an access licence during the relevant period of 1 July 2019 and 20 April 2022, calculated based on an estimated annual intake of 452 ML, for each of three 3 years (2019-20, 2020-21, 2021-22) at $40/ML.

vi) By 31 July 2023 submit to NRAR for approval, a proposal to make a financial contribution of A$10,000 to a community project with a water management focus in the local and/or regional area proximate to but outside of the BCM. Payment of the financial contribution will be made within 30 days of receipt of NRAR's written approval. The obligation to provide a project to NRAR for approval under this clause continues beyond 31 July 2023 until a project is approved by NRAR. BCOPL acknowledges that NRAR will, in determining whether or not to approve the project, have regard to the water management principles, in accordance with s 9 of the WM Act.

vii) Carry out consultation with the local Aboriginal community through the Boggabri Coal Aboriginal Stakeholder Consultative Forum, which includes members of Native Title Claimants, Local Land Council and Registered Aboriginal Parties. Initial consultation is to take place by 31 July 2023 and at six monthly intervals thereafter until 31 December 2024. The objectives of consultations undertaken will be to:

(1) consult on the impact of past and future water take on Aboriginal communities and their cultural practices and values;

(2) provide an opportunity for concerns to be raised and respond to should issues arise with the ongoing operation of the water management system at BCM; and

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(3) where practical and reasonable, assist in promoting and protecting cultural values and practices in the area affected by mining operations of BCM.

viii) Report summaries of the consultations in BCOPL's Annual Review in accordance with the BCM Project Approval. Commitments arising out of the consultation must be included in revisions of BCOPL's Cultural Heritage Management Plan.

5 Reporting of compliance

5.1 BCOPL will:

a) Within 7 days of their occurrence, notify NRAR in writing about the following matters:

i) its submission of an updated SWMP to the NSW Department of Planning and Environment as referred to in paragraph 4.1a)iii); and

ii) the payment of its financial contribution to the relevant community project as referred to in paragraph 4.1a)vi).

b) Provide NRAR with quarterly progress reports on the status and outcomes of the new metering and telemetry referred to in paragraph 4.1a)i) in accordance with the commitments detailed in Appendix 2. The progress reports will include any learnings identified which may be relevant for NRAR in the development of best practice mining sector guidelines for water reporting in mining. A copy of the quarterly progress reports will be published on IA's website for the BCM. BCOPL will report to NRAR and publish quarterly progress reports until 31 December 2027.

c) Provide NRAR with written progress reports every six months about the consultation referred to in paragraph 4.1a)vii). By 30 June 2025 a final report documenting how the consultation has achieved the objectives outlined in paragraph 4.1a)vii) will be provided to NRAR.

6 Payment of costs

6.1 BCOPL will:

a) Within 28 days after the Commencement Date, BCOPL will reimburse NRAR in the sum of $5,000 being agreed costs associated with investigating the Alleged Contravention and monitoring this Undertaking.

b) Within 28 days after the Commencement Date, BCOPL will reimburse NRAR the sum of $10,000 as a contribution towards its legal costs associated with accepting this Undertaking.

7 Acknowledgments

7.1 BCOPL acknowledges the following:

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a) NRAR will make this Enforceable Undertaking publicly available including by publishing it on NRAR's website;

b) NRAR will, from time to time, make public reference to this Enforceable Undertaking including in news media statements and in NRARs publications;

c) this Enforceable Undertaking in no way derogates from the rights and remedies available to any other person arising from the alleged conduct; and

d) this Enforceable Undertaking does not affect the ability of NRAR to take any other enforcement action for the contravention or alleged contravention of the WM Act to which this undertaking relates.

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Executed as an Undertaking

Company

Executed by **Boggabri Coal Operations Pty Ltd ABN 76 600 191 455** pursuant to section 127(1) of the *Corporations Act 2001* by:

Signature of director:

Name of director: **Fumitake Uyama**

Date: 8 June 2023

Signature of director:

Name of director: **Tsutomu Kunomura**

Date: 8 June 2023

For NRAR

Signature:

Accepted by NRAR or its delegate pursuant to section 336E of the WM Act:

Name: **Grant Barnes**

Title: **Chief Regulatory Officer**

Natural Resources Access Regulator

(By delegation)

Date: 15-6-2023

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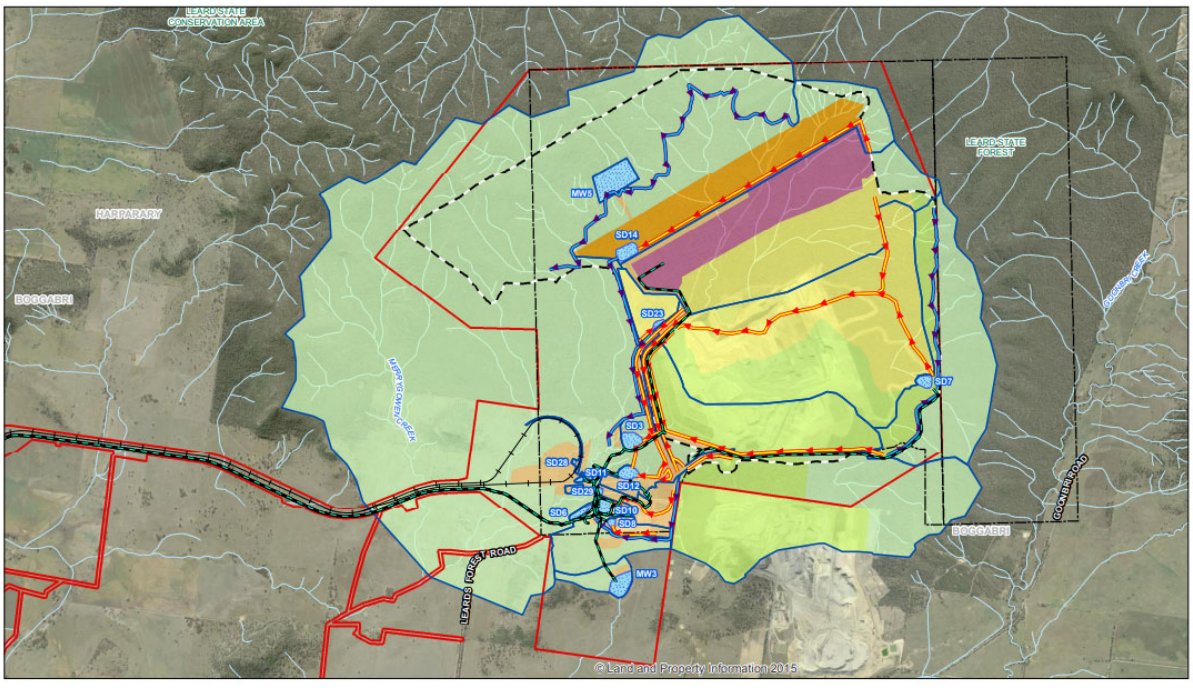
Appendix 1 – proposed improvements to water metering and telemetry

The following water meter telemetry capability will be installed at the listed dams:

Dam	Remote start	Level monitors	Digital flow monitoring	Reporting to CITEC	Auto Water Sampling for pH, EC & TSS
MW5 - Electric	✓	✓	✓	✓	
MW5 - Diesel			✓	✓	
SD23 - Transfer	✓	✓	✓	✓	
SD23 - Fill point			✓	✓	
SD7 - Diesel	✓	✓	✓	✓	✓
SD3	✓	✓	✓	✓	✓
SD6	✓	✓	✓	✓	✓
SD12	✓	✓	✓	✓	
SD10	✓	✓	✓	✓	
MW3		✓			
SD8		✓			

The below plan shows the indicative layout of the water management system for the whole Boggabri Coal Mine. It identifies the locations of the dams listed in the above table, which will have meter telemetry installations:



Note: the above plan also shows the locations of dams which are not listed in the above table and will not have installations.

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The parties acknowledge that the metering and telemetry locations identified above may vary over time due to operational changes (for example, relocation of mine water dam locations) and this may impact on the data available for inclusion in BCOPL's reports. In this instance, BCOPL will ensure revised metering and telemetry locations are identified and notified to NRAR, and data from those revised locations is included in corresponding reports.

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Appendix 2 – proposed surface water accounting and reporting methodology

Water balance model

BCOPL maintains a Site Water Balance model (**WBM**) that is used to predict how the mine Water Management System (**WMS**) will respond based on observed storage volumes, planned mine progression, and future climate variability. The WBM can also be verified by comparing modelled results to observed operational data. Model verification is important to provide confidence the WBM will also adequately represent the WMS response when predicting future outcomes during forecast modelling runs.

The WBM estimates runoff from the undisturbed catchment upstream of the mine using the Australian Water Balance Model (**AWBM**) rainfall runoff model. Relevant parameters of the AWBM were used to achieve a similar average annual runoff coefficient to the nearby Maules Creek catchment immediately north-west of the mine. Establishing parameters in the AWBM to gauge data provides confidence the model is adequately representing the local rainfall runoff relationship from undisturbed catchment areas in the absence of more site-specific data.

Proposed water metering

To provide site-specific data for undisturbed catchment runoff, BCOPL will install water metering on pump transfers that divert inflows (which primarily occur from an undisturbed catchment area) from the watercourse upstream of the soil stockpile area. The recorded pump volumes can be used to:

- directly quantify water take from the watercourse that drains to the soil stockpile area
- be used on a pro-rata basis to quantify water take from undisturbed catchment areas that are intercepted by the mine, but for which metering is not practical; and
- verify the WBM AWBM parameters are adequately representing the rainfall runoff relationship from undisturbed catchment areas upstream of the mine.

Calculating water take

Water accounting will be completed on a quarterly basis by BCOPL.

BCOPL will use the following approach to calculate and verify water take over each previous quarter:

1. Update the WBM to include observed rainfall, evaporation, water use and storage volume data over the previous quarter.
2. Run the WBM to estimate the volume of runoff intercepted from the undisturbed catchment over the previous quarter.
3. Verify the WBM is adequately representing the rainfall runoff response by:
    a) comparing simulated and observed storage volumes to confirm the model is adequately representing the rainfall runoff response to the WMS; and

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   b) comparing runoff volumes from the AWBM model to metered pump volumes (where available) to confirm the mode is adequately representing the rainfall runoff response from the undisturbed catchment area.
4. Once the WBM outputs are verified, the total licensable take (volume) over the previous quarter will be calculated as the sum of:
   a) runoff from all third order and higher watercourses; and
   b) the volume of runoff from minor watercourses in excess of the landholdings' harvestable rights.

Metered pump volumes may also be used to calculate the volume of water take from the undisturbed catchment using a pro-rata approach. Where possible and practical, metered volumes will be used to improve the reliability of the WBM estimates to provide a consistent and long-term methodology for determining water take from the undisturbed catchment area.

Forecasting water take for allocation acquisition

BCOPL will use the WBM to forecast water take over each following quarter to ensure BCOPL holds sufficient water allocation in its water account ahead of surface water take. The following approach is proposed to estimate water take and thus water allocation requirements over each following quarter:

1. Obtain the three-month climate outlook from the Bureau of Meteorology (BoM) website to determine the climate condition 'scenario' (very dry, dry, average, wet or very wet) to be applied to the forecast modelling.
2. Run the WBM for the climate condition scenario using a probabilistic simulation approach where the historical climate record is used to estimate future rainfall and runoff.
3. The probabilistic simulation will output a range of possible water take volumes for the following quarter for the climate condition scenario. For the very dry, dry and average scenarios, it is proposed to adopted the maximum predicted water take volume when determining future allocation assignment requirements. For the wet and very wet scenarios, the 80th percentile values will be used. Under these scenarios, further allocations can be assigned as the quarter progresses if the wet or very wet conditions are more extreme than the 80th percentile. This strategy ensures that sufficient allocation can be held prior to any take without having to purchase allocation up front that in all likelihood would not be required.
4. The total water allocation required over the following quarter will be calculated as the sum of:
   a) the predicted volume of runoff from all third order and higher watercourses as outlined above; and
   b) the predicted volume of runoff from minor watercourses in excess of the landholdings' harvestable rights.

Forecast modelling for periods further in the future than three months are not considered appropriate for the purposes of water accounting due to the difficulty in predicting long-term weather conditions.

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Proposed water accounting approach

BCOPL will use WBM outputs for each previous quarter and forecast model results for each following quarter in combination to determine the total volume of water allocation required. Additional allocation will be acquired if the WBM outputs indicate:

1. Water take over the previous quarter exceeded the allocation held in BCOPL's water allocation account; or
2. Water take over the following quarter is predicted to exceed the allocation held by BCOPL.

BCOPL will undertake quarterly reporting of water take volumes to NRAR and relevant groups identified below. Reporting will be in the form of:

- Minutes of quarterly Community Consultative Committee (CCC) meetings
- Quarterly email to NRAR
- Quarterly email to Registered Aboriginal Parties (RAPs) and Biannual ASCF meetings.
- Annual reporting of water accounts to WaterNSW
- Annual reporting of water accounts in the Annual Review

Annual reviews of model

BCOPL will undertake annual reviews of the WBM performance in conjunction with BCOPL's Annual Review process. The WBM is currently reviewed annually against observed WMS data such as storage volumes and water use. It is proposed to also include a review of how well the model simulates runoff from the undisturbed catchment by comparing modelled runoff volumes against observed runoff volumes recorded at the proposed pump metering location upstream of the soil stockpile area. The AWBM parameters for undisturbed catchment area may need to be revised if there are significant differences between the modelled and observed runoff volumes.

The parties acknowledge that the WBM and WMS may evolve over time as mining progresses, for example, new dams may be added and existing dams removed from the water monitoring program.

Department of Planning, Housing & Infrastructure

Our ref: MP09_0182-PA-49

Alex Williams
Environmental Superintendent
Boggabri Coal Pty Limited
Leard State Forest 386
Leards Forest Road
Boggabri, NSW, 2382

17/09/2024

Boggabri Coal: Surface Water Management Plan

Dear Miss. Williams

Thank you for submitting the Surface Water Management Plan in accordance with Condition 38b, Schedule 3 of the consent/approval for the Boggabri Coal (MP09_0182-PA-49). I also acknowledge your response to the Department's review comments and request for additional information.

I note the Surface Water Management Plan contains the information required by the conditions of approval.

Accordingly, as nominee of the Planning Secretary, I approve the revised Surface Water Management Plan (Rev. Edition 9, September 2024).

You are reminded that if there are any inconsistencies between the Plan and the conditions of approval, the conditions prevail.

Please ensure you make the document publicly available on the project website at the earliest convenience.

If you wish to discuss the matter further, please contact Charissa Pillay on 02 99955944.

Yours sincerely

Stephen O'Donoghue
Director
Resource Assessments

As nominee of the Planning Secretary