ENV-WAT-PLAN-003 Groundwater Management Plan

September 2025

idemitsu

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BOGGABRI COAL

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1.0 INTRODUCTION

This Groundwater Management Plan (GWMP) has been developed for Boggabri Coal Operations Pty Ltd (BCOPL) who operates the Boggabri Coal Mine (BCM) on behalf of Idemitsu Australia Pty Ltd (IA) and its joint venture partners.

The BCM is an open cut coal mine located approximately 15 km north east of the township of Boggabri in the North West Region of NSW, wholly within the Narrabri Local Government Area (LGA) (refer to **Figure 1-1**). BCM has operated since 2006 and is part of the Leard Mining Precinct, being located immediately adjacent to the Tarrawonga Coal Mine (TCM) to the south and Maules Creek Coal Mine (MCCM) to the north.

Project Approval (PA) 09_0182 for the BCM Continuation of Mining Project was granted by the then NSW Planning Assessment Commission (PAC) under the former Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 18 July 2012. PA 09_0182 permits BCOPL to carry out mining operations until the end of December 2033, with an annual Run of Mine (ROM) coal extraction rate of up to 8.6 Million tonnes per annum (Mtpa).

On 20 June 2019, a delegate of Minister declared PA 09_0182, as modified to be "State Significant Development" under Clause 6 of Schedule 2 of the *Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017*, for the purposes of the EP&A Act. Accordingly, from 20 June 2019, PA 09_0182 has been referred to as SSD 09_0182. In July 2021, BCOPL lodged an application under Section 4.55 of the EP&A Act to modify SSD 09_0182 (MOD 8). The submission of MOD 8 sought approval for increased depth of mining operations. The application was approved on 22 January 2024 by the Department of Planning, Housing and Infrastructure (DPHI) (formerly known as the NSW Department of Planning and Environment (DPE)).

In October 2022, BCOPL lodged an application under Section 4.55 of the EP&A Act to modify SSD 09_0182 (MOD 9). The modification application sought approval for the operation of a mobile rock crushing plant, the construction of new Pre-shift Start-up infrastructure closer to active mining operations and minor administrative amendments. The application was determined by the then DPE Executive Director under delegation by the Minister for Planning on 2 March 2023.

In May 2024, BCOPL lodged an application under Section 4.55 of the EP&A Act to modify SSD 09_0182 (MOD 11). The application sought approval to extend the workshop and stores facility. The application was determined by delegate of the Minister of Planning and Public Spaces on 19 July 2024.

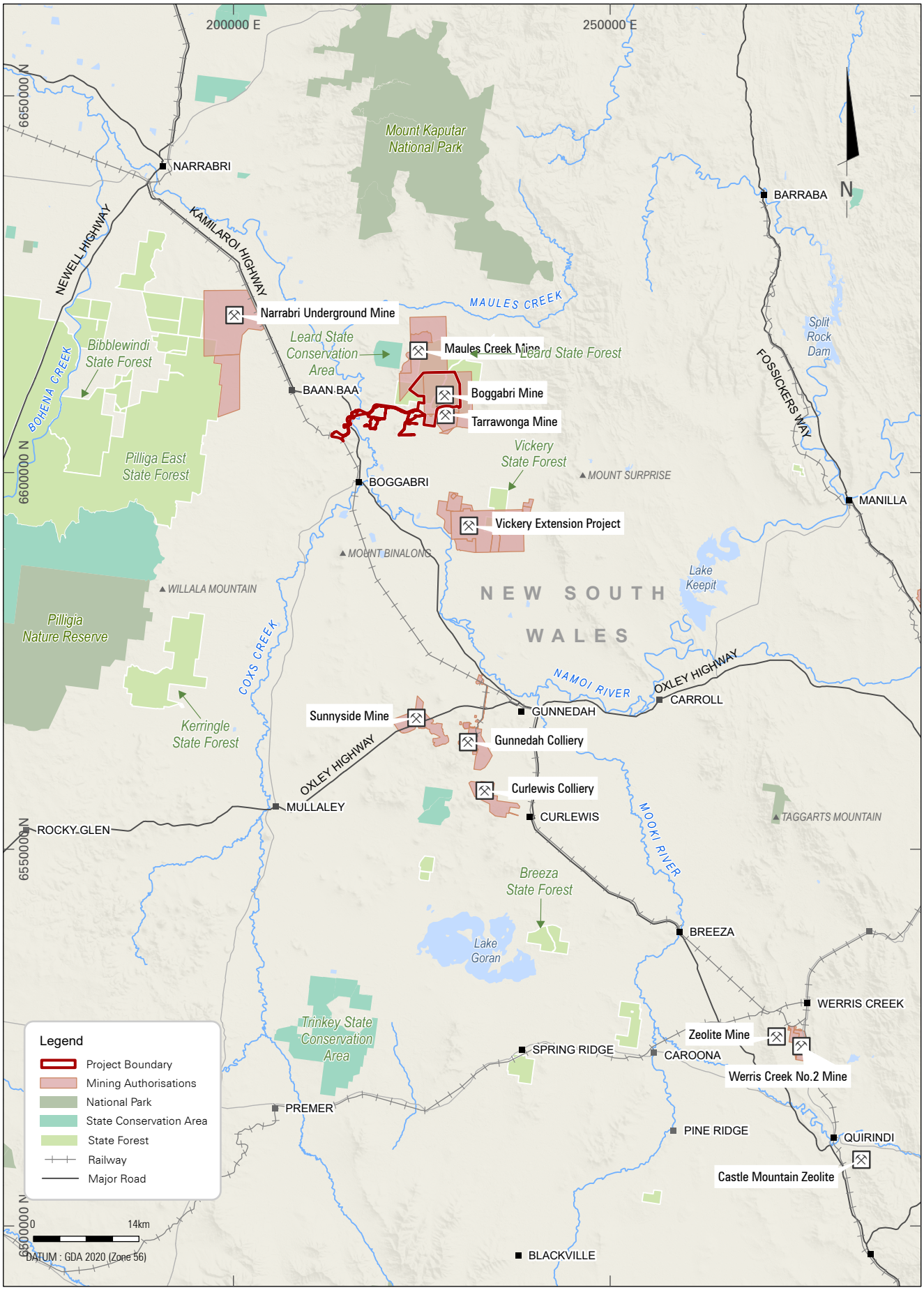
Schedule 3, Condition 38(c) of SSD 09_0182 requires the preparation of a GWMP. This GWMP has been prepared in fulfilment of these requirements under SSD 09_0182.

Conditions of approval under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) were granted by the then Federal Government Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) (now the Department of Climate Change, Energy, the Environment and Water (DCCEEW)) on 11 February 2013 (EPBC 2009/5256). Conditions 15 to 19 of EPBC 2009/5256 apply to the GWMP. The specific EPBC Approval requirements are listed in **Appendix A**

Commonwealth approval for Modification 8 to SSD 09_0182 (EPBC 2021/8875) was granted for the BCM on 19 December 2024. EPBC 2021/8875 relates to mining operations that occur below the Merriown Coal seam and includes several conditions in relation to water management, including the management of groundwater impacts and groundwater dependent ecosystems which are addressed within this plan.

1.1 Elements Covered by the GWMP

This GWMP applies to all employees and contractors at the BCM and covers activities undertaken in accordance with SSD 09_0182. **Figure 1-2** provides a layout of approved operations relevant to the Project Boundary for SSD 09_0182 (as modified). The operation of contingency production bores (as outlined within MOD 5 to SSD 09_0182) is not covered within this GWMP. This GWMP will be revised, and approval obtained from DPHI to include relevant management measures for the operation of contingency production prior to their use.

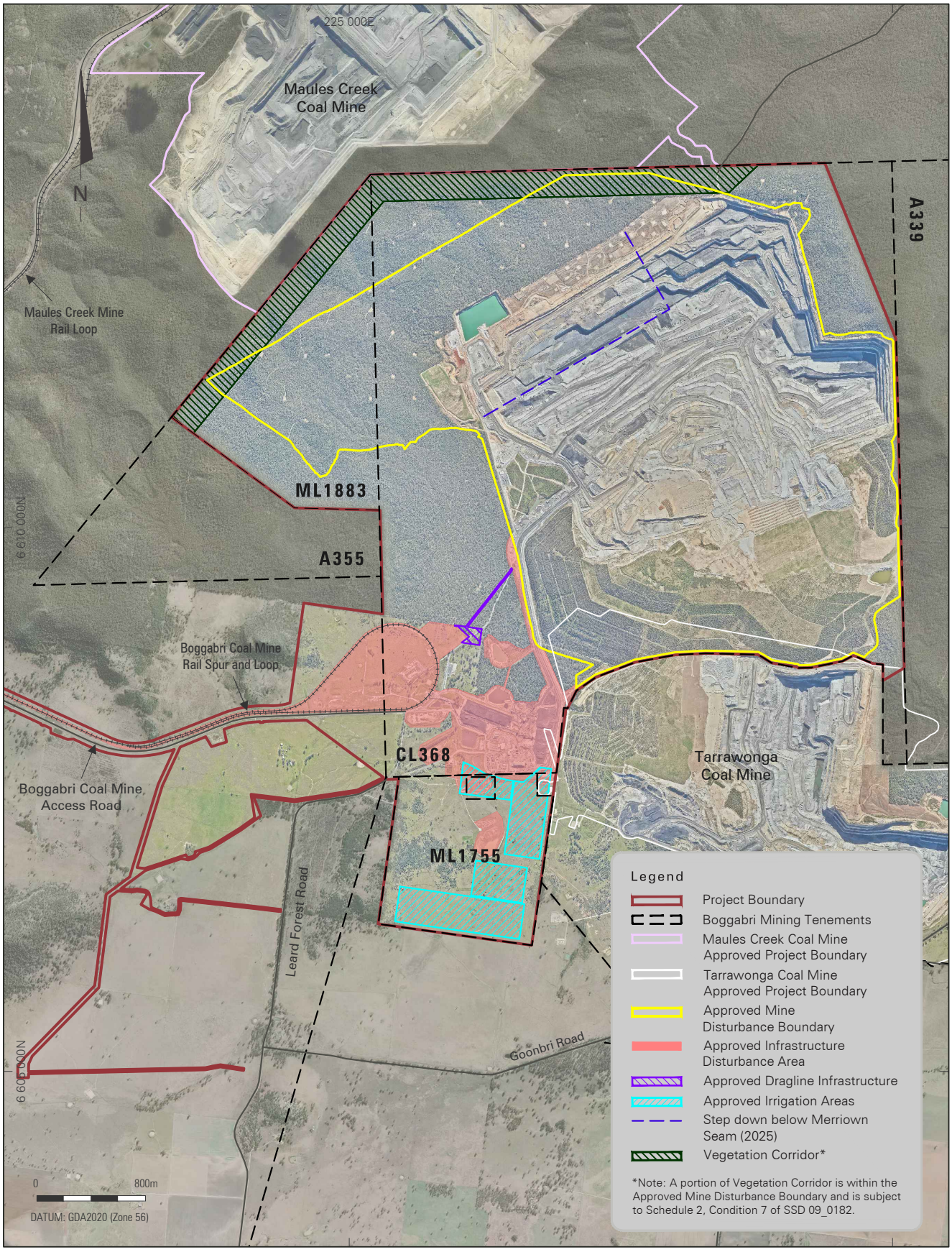


JBA 2347 - BCM GWMP - Regional Locality.aprx

BOGGABRI COAL MINE

Regional Locality

FIGURE 1-1



JBA 2347 - BCM GWMP - Approved Operations (30/01/2025)

BOGGABRI COAL MINE

Approved Operations

FIGURE 1-2

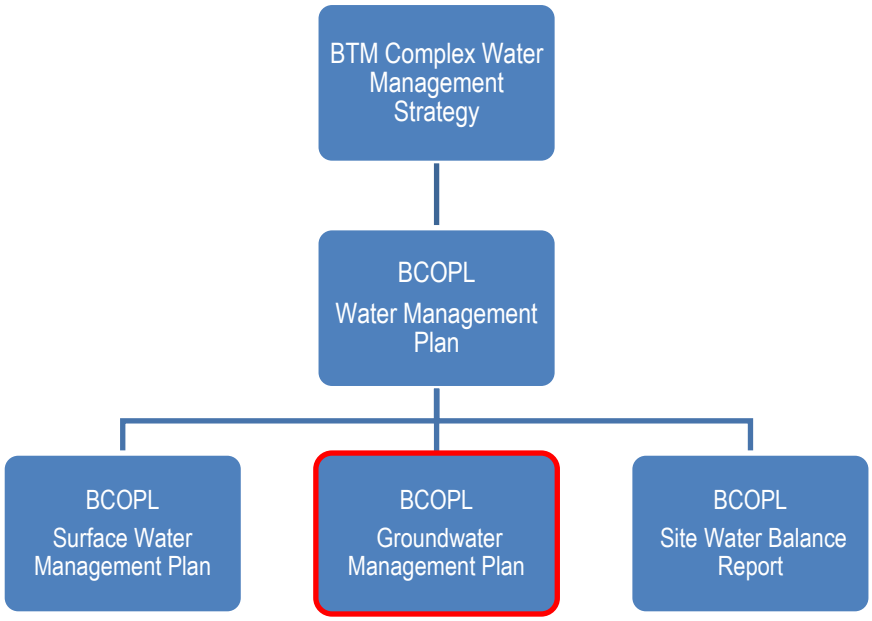
1.2 Related Water Management Documents

This GWMP has been prepared as an integral part of, and should be read in conjunction with, the documents listed in **Table 1-1**. The Water Management Plan (WMP) document hierarchy is shown in **Figure 1-3**.

Table 1-1: Related Water Management Documents

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

Figure 1-3: Document Hierarchy



1.3 Agency Consultation

This GWMP was initially prepared in April 2012 under the former approval for the BCM (DA 36/88). The GWMP was distributed to the various regulatory authorities for their review, comment and input. This GWMP has been revised and updated over time (in accordance with the contemporary conditions under SSD 09_0182 and distributed to the relevant regulatory authorities for review and comment. This version of the GWMP has been distributed for consultation with DPHI, Environment Protection Authority (EPA), NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) – Water, North West Local Land Services (LLS) and the Boggabri Community Consultative Committee (CCC) as required by the SSD 09_0182 (as modified). A summary of the feedback received from these agencies is included in **Table 1-2** and evidence of consultation from the various revisions to this GWMP is included in **Appendix C**.

Table 1-2: Summary of Consultation

Agency	Issue	Response
EPA	Feedback received from EPA in April 2024. Stated GWMP needed to be consistent with relevant EPL & POEO Act approvals.	Addressed in **Section 2.0**.
NSW DCCEEW – Conservation Programs, Heritage and Regulation Group (CPHR)	NSW DCCEEW – CPHR reviewed the draft GWMP and provided no further comments.	N/A
NSW DCCEEW - Water	NSW DCCEEW – Water reviewed the draft GWMP and recommended additional explanation over water licencing, borefield approvals and GDE monitoring.	**Section 3.3** has been revised to address NSW DCCEEW – Water comments in relation to water licencing and borefield approvals. An extraction limit assessment was completed by NSW DCCEEW-Water for the Victoria Park bore (which had not previously been completed) and the cover letter is provided within **Appendix C**. The GDE monitoring program is addressed in **Section 4.11**.
North West LLS	North West LLS reviewed draft GWMP and provided no further comments.	N/A
CCC	Discussed with CCC at August 2023 meeting. The GWMP was also provided for feedback in April 2025. No feedback received.	The August 2023 CCC meeting minutes are provided at the link below: https://idemitsu.com.au/wp-content/uploads/2016/03/230829-CCC-Minutes-Presentation.pdf
DPHI	DPHI reviewed draft GWMP and concluded that further information was required to satisfy Schedule 3, Condition 38(c) of SSD 09_0182.	**Sections 4.0, 6.0, 7.0** and **9.0** of the GWMP were revised to address DPHI comments.

1.4 Revision History

This GWMP has been revised and updated to reflect the status of operations as at the end of December 2024 and relates to the remaining years of approved mining operations (i.e. years 12 to 24 of mining (up to the end of December 2036). Previous revisions and updates made to this GWMP are summarised in **Table 1-3**.

Table 1-3: Revision Status

Controlled electronic copies of all original and revised versions are retained as per BMS-SMS-STD-003 Document and Data Control					
Version	**Approval Reference**	**Author**	**Approved by**	**Date**	**Comment**
Original	Boggabri Modification - DA 36/88 as modified on 19 October 2011	L Doeleman	J Rennick	27/04/12	Issue to DP&I, OEH, NOW, DRE, NCMA
1.0	Boggabri Coal Project PA 09_0182 - as approved on 18 July 2012	L Doeleman N Harcombe	J Green	16/01/13	Issue to DP&I, OEH, NOW, NCMA, CCC
2.0	Boggabri Coal Mine as per Draft MOP lodged June 2013 and Boggabri Coal Mine Extension (EPBC 2009/5256) – as approved 11 February 2013	C Callipari S Trott	J Green	31/07/13	DP&I comments addressed.
3.0	Boggabri Coal Mine as per Revised Draft MOP lodged November 2013 and Boggabri Coal Mine Extension (EPBC 2009/5256) – as approved 11 February 2013	C Callipari S Trott	J Green	09/10/13	BCOPL comments addressed. Issue to DP&I
4.0	Boggabri Coal Mine as per Revised Draft MOP lodged November 2013 and Boggabri Coal Mine Extension (EPBC 2009/5256) – as approved 11 February 2013	K Agllias S Trott	J Green	18/11/13	DP&I comments addressed. Issue to EPA and DoEE
5.0	Boggabri Coal Mine as per Revised Draft MOP lodged November 2013 and Boggabri Coal Mine Extension (EPBC 2009/5256) – as approved 11 February 2013	K Agllias S Trott	J Green	12/02/14	Relevant agencies comments addressed. Issue to DP&I

Controlled electronic copies of all original and revised versions are retained as per BMS-SMS-STD-003 Document and Data Control					
Version	**Approval Reference**	**Author**	**Approved by**	**Date**	**Comment**
6.0	Boggabri Coal Mine as per Revised MOP lodged January 2017 and Boggabri Coal Mine Extension (EPBC 2009/5256) – as approved 11 February 2013	A Blakeney H Russel	P Forbes	30/05/17	Revised MOD5 approval conditions and relevant sections from SWMP and GWMP.
6.1	Boggabri Coal Mine as per Revised MOP lodged January 2017 and Boggabri Coal Mine Extension (EPBC 2009/5256) – as approved 11 February 2013	A Blakeney H Russel	P Forbes	30/06/17	Revised to include DPIW Comments
6.2	Boggabri Coal Mine as per Project Approval 09_0182 Modification #6 and Mine Operations Plan 2017-2021 Amendment 'A'	H Russel	P Forbes	07/19	Regular review
6.3	Boggabri Coal Mine as per Project Approval 09_0182 Modification #6 and Mine Operations Plan 2021-2024 – Amendment A	K Halliday	H Russell	09/21	Regular review
7.1	Boggabri Coal Mine as per SSD 09_0182 Modification #8 and #9	N Cooper (JBA) T Edwards (JBA) J Tomlin (AGE)	A Williams	03/24	Distributed to Regulatory Authorities for comment.
7.2	Boggabri Coal Mine as per SSD 09_0182 Modification #8 #9 and #11	N Cooper (Xenith Consulting) T Edwards (Xenith Consulting) J Tomlin (AGE)	L Tolson	12/24	Addresses Regulatory Authorities comments.

Controlled electronic copies of all original and revised versions are retained as per BMS-SMS-STD-003 Document and Data Control					
Version	**Approval Reference**	**Author**	**Approved by**	**Date**	**Comment**
7.3	Boggabri Coal Mine as per EPBC 2021/8875	N Cooper (Xenith Consulting) T Edwards (Xenith Consulting) N Cooper (WSP)	L Tolson	02/25	Address Commonwealth Modification #8 conditions. Distributed to Regulatory Authorities for comment.
7.4	Boggabri Coal Mine as per EPBC 2021/8875	N Cooper (Xenith Consulting) T Edwards (Xenith Consulting)	L Tolson	08/25	Address Regulatory Authorities comments.
7.5	Boggabri Coal Mine as per EPBC 2021/8875	N Cooper (Xenith Consulting) T Edwards (Xenith Consulting)	L Tolson	08/25	Address Regulatory Authorities comments.
7.6	Boggabri Coal Mine as per EPBC 2021/8875	N Cooper (Xenith Consulting) T Edwards (Xenith Consulting)	L Tolson	09/25	Address DPHI further comments.

2.0 PLANNING AND STATUTORY REQUIREMENTS

2.1 Commonwealth Legislation

2.1.1 Controlled Action Approval

Commonwealth approvals for the BCM Project and MOD 8 to SSD 09_0182 were granted on 11 February 2013 and 19 December 2024 (EPBC 2009/5256 and EPBC 2021/8875). The EPBC Act protects Matters of National Environmental Significance (MNES). Based on the known and potential impacts on MNES, the BCM constitutes a controlled action which required approvals under the EPBC Act.

Specific approval conditions under EPBC 2009/5256 and EPBC 2021/8875 that are related to this WMP, and related plans are included in **Appendix A**.

2.1.2 National Water Quality Management Strategy

The *National Water Quality Management Strategy* (NWQMS) (Department of Agriculture and Water Resources, 2018) is a joint national approach to improving water quality in Australian and New Zealand waterways. The NWQMS aims to protect the nation's water resources, by improving water quality while supporting the businesses, industry, environment and communities that depend on water for their continued development.

The process for water quality management is based on national guidelines that are implemented at State, regional and local levels. The national water quality guidelines are the basis for development of the State and local plans and objectives. The Australian and New Zealand Environment Conservation Council (ANZECC) water quality guidelines have been used to assess baseline water quality used in this GWMP (as well as the SWMP).

2.1.3 Water Act 2007

The Murray-Darling Basin Authority (MDBA), established by the Commonwealth *Water Act 2007*, requires that the states who manage water resources within the Murray-Darling Basin (MDB) prepare a *water resource plan* for assessment against the accreditation requirements of the *Basin Plan 2012*. The most recent revision of the Namoi Alluvium Water Resource Plan was published in December 2022 (DPE – Water, 2022).

As part of this process, the then DPE-Water (now *NSW Department of Climate Change Energy, the Environment and Water – Water Group*) updated the state Water Sharing Plans (WSPs), prepared in accordance with the NSW *Water Management Act 2000* (**Section 2.2.3**), which were provided to the MDBA on 30 June 2020.

2.2 NSW Legislation

State statutory requirements associated with mine water management during the operation and rehabilitation phase of the BCM Project have been considered during the development of this GWMP and are outlined below.

2.2.1 Project Approval

SSD 09_0182 for the Project was granted on 18 July 2012 pursuant to the former Section 75J of the EP&A Act by the then Planning and Assessment Commission of NSW as the delegate of the Minister for Planning.

Specific project approval conditions related to the preparation of the WMP, and related plans are included in **Appendix A**.

2.2.2 Mining Lease Approval

The objectives of the *Mining Act 1992* (Mining Act) 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 the lease holders 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. IA and its joint venture partners hold Coal Lease (CL) 368, Mining Lease (ML) 1755 and ML1883 under the Mining Act to conduct mining operations in respect of the BCM. Authorisation (A) 355 and A 339 are also held under the Mining Act which facilitates the right to conduct exploration activities.

2.2.3 Water Management Act 2000 and Water Act 1912

The WM Act regulates water use and works that affect surface and groundwater covered by a Water Sharing Plan (WSP) in NSW and the *Water Act 1912* generally regulates the use of water not covered by a WSP.

The objectives of the WM Act are to provide for the sustainable and integrated management of the water sources of NSW for the benefit of present and future generations.

The WM Act provides for the following types of approval:

1. Water use approval (Section 89) which authorise the use of water at a specified location for a particular purpose;
2. Water management work approval (Section 90);
3. Controlled activity approval (Section 91); and
4. Aquifer interference activity approval (Section 91) authorising the holder to conduct activities that affect an aquifer such as approval for extractive industries that intersect groundwater, other than water supply bores.

In accordance with Section 4.41 of the EP&A Act, the above approvals (1 to 3) under the WM Act do not apply to the BCM as an SSD that is authorised by a Development Consent under the EP&A Act. BCOPL will manage its operations and the potential impacts associated with the abstraction of groundwater from the bore field though the management measures detailed within this GWMP.

Where an area is covered by a gazetted WSP under the WM Act, an access licence must be obtained under the WM Act to obtain access to a specified share of water, to take water at a specified time, at a specified rate or at a specified area within a specified location. Different types and categories of access licence exist for different purposes.

WSPs contain various rules applying to the water sources such as access licence dealing rules, water supply works approval rules, water allocation account rules and access rules for rivers and creeks including cease to pump. BCOPL are required to consider the effect of the Section 4.41 of the EP&A Act on the applicability of these rules when accessing water from these systems. The Project is within the boundaries of a number of WSPs, and BCOPL holds existing water access licences under the WM Act which account for the direct and indirect extraction of both surface water and groundwater in the course of its mining operations.

2.2.4 Groundwater Sharing Plans

Groundwater within the vicinity of the BCM Project is regulated by the following WSPs:

- WSP for the Namoi Alluvial Groundwater Sources Order 2020 (Namoi Alluvial WSP); and
- WSP for the NSW MDB Porous Rock Groundwater Sources Order 2020 (MDB Porous WSP).

2.2.4.1 WSP for the Namoi Alluvial Groundwater Sources Order 2020

The Namoi Alluvial WSP repealed the WSP for the Upper and Lower Namoi Groundwater Sources 2019 on 30 June 2020. The Namoi Alluvial WSP establishes the rules for sharing groundwater within the Namoi Alluvial Groundwater Sources, in accordance with the requirements of the WM Act.

The BCM is located in the outcropping bedrock, with ancillary infrastructure including groundwater abstraction bores located in the surrounding alluvial sediments within Upper Namoi Groundwater Source Zone 4 (Keepit Dam to Gin's Leap) as defined in the Namoi Alluvial WSP. Minor incidental takes of water have also been predicted to occur as a result of the BCM's mining operations on the Upper Namoi Groundwater Source Zone 4 (Keepit Dam to Gin's Leap) and the Upper Namoi Groundwater Source Zone 11 (Maules Creek).

Water Access Licence (WAL) entitlements are held to account for these predicted takes of water from these water sources are further described below.

2.2.4.2 WSP for the NSW Murray-Darling Basin (MDB) Porous Rock Groundwater Sources Order 2020

The MDB Porous WSP repealed the WSP for the NSW MDB Porous Rock Groundwater Sources 2011 on 30 June 2020.

Mining at the BCM targets coal seams of the Maules Creek Formation within the Gunnedah-Oxley Basin Groundwater Source. The Gunnedah-Oxley Basin Groundwater Source is divided into two management zones with mining occurring within the Gunnedah–Oxley Basin MDB (Other) Management Zone. WAL entitlements are held to account for the predicted takes of water from this water source as summarised below.

2.2.5 Water Licencing

IA and its JV partners hold WALs for accessing water from the Gunnedah – Oxley Basin MDB Groundwater Source, the Zone 4 – Namoi Valley (Keepit Dam to Gin's Leap) Groundwater Source and the Zone 11 – Maules Creek Groundwater Source. Details of these WALs are provided in **Table 2-1**.

Table 2-1: Summary of Groundwater (Aquifer) WALs

Source	WAL No.	Unit Shares	Associated Works Approval No.	Description
Gunnedah - Oxley Basin MDB Groundwater Source	29473	142	90WA822528	Lovton Bore
	29562	700	90WA822528	Lovton Bore
			90CA822549	BCM Pit Ingress
Total Unit Shares		**842**		
Upper Namoi Groundwater Source Zone 4	15037	172	90CA807034	Cooboobindi & Victoria Park Bore
	24103	275	90CA807034	Cooboobindi & Victoria Park Bore
	12691	457	90CA807034 90MW833038	Cooboobindi & Victoria Park Bores
	37519	84	90CA807034	Cooboobindi & Victoria Park Bores
	12767	3	90CA807126	River block opposite 'The Rock' property
	36547	37	90CA807018 (inactive)	Callander Property
Total Unit Shares		**1,028**		
Upper Namoi Groundwater Source Zone 11	42234	20	N/A	Incidental take of alluvial water as a result of depressurisation
Total Unit Shares		**20**		

The actual volume of groundwater available during each year will depend on the Available Water Determinations (AWD) made annually under the respective WSP. These are likely to be at or close to 1 ML per unit share.

BCOPL utilises groundwater pumped from Lovton Bore for potable water, amenities and fire suppression. The Cooboobindi Bore and Victoria Park Bores supplement water supplies for the existing operations. These bores are installed into Gunnedah – Oxley Basin MDB Groundwater Source and the Upper Namoi Groundwater Source Zone 4, respectively.

All BCM Upper Namoi Groundwater Source Zone 4 WALs will be assigned to Miscellaneous Work 90MW833038 in accordance with NSW DCCEEW – Water correspondence in July 2025. Redundant work approvals will be decommissioned once the Miscellaneous Work Licence has been updated to avoid duplicate approvals. The cover letter for the July 2025 correspondence with NSW DCCEEW – Water is provided within **Appendix C**.

In accordance with SSD 09_0182 and the WM Act, BCOPL will obtain the necessary water licences for any new groundwater production bores prior to any water take occurring from them.

2.2.6 Protection of the Environment Operations Act 1997

The Protection of the Environment Operations Act 1997 (POEO Act) aims to protect, restore and enhance the quality of the environment in NSW by rationalising, simplifying and strengthening the regulatory framework for environment protection. The POEO Act and associated Regulations are administered by the Environmental Protection Authority (EPA).

BCOPL holds Environmental Protection Licence (EPL) No: 12407 under the POEO Act. Four groundwater monitoring points are listed within EPL 12407 (GW3115, IBC2110, IBC2111 and MW6) with the specific monitoring regime required for these monitoring points outlined in **Section 4.4**.

2.3 Guidelines and Policies

The following guidelines and policies have informed the preparation of this GWMP and accompanying documents.

2.3.1 ANZG Guidelines (2018)

The *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG Guidelines) 2018 provide guidance for assessing and managing ambient water quality in a wide range of water resource types and according to specified environmental values, such as aquatic ecosystems, primary industries, recreation and drinking water. Revised ANZG Guidelines were published in 2018 after a scientific review of the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000).

The ANZG Guidelines provide regional trigger values based on their location within Australia or New Zealand, which can be used to develop more local guidelines or strategies such as catchment water quality and river flow objectives, particularly in the absence of site specific water quality information. Parts of ANZG Guidelines relevant to this plan have not changed from ANZECC (2000).

2.3.2 Groundwater Assessment Toolbox

The Groundwater Assessment Toolbox (GAT) (NSW Department of Planning and Environment, 2022a) is a collection of technical guidelines that aim to create a collaborative, transparent, and enabling environment for preparing and reviewing groundwater assessments in NSW, particularly for state-significant developments (SSD) and state-significant infrastructure (SSI) projects. The specific objectives of the GAT are to:

Objective 1: Provide a framework to investigate, assess the impacts on, manage and monitor groundwater resources and their interaction with surface water resources within the footprint of a major project.

Objective 2: Clarify the department's expectations (minimum requirements) from groundwater documentation, including groundwater modelling that is prepared for major projects and used to support and inform the impact assessment.

Objective 3: Identify practical approaches for the assessment of cumulative groundwater impacts.

The GAT has five main elements as follows:

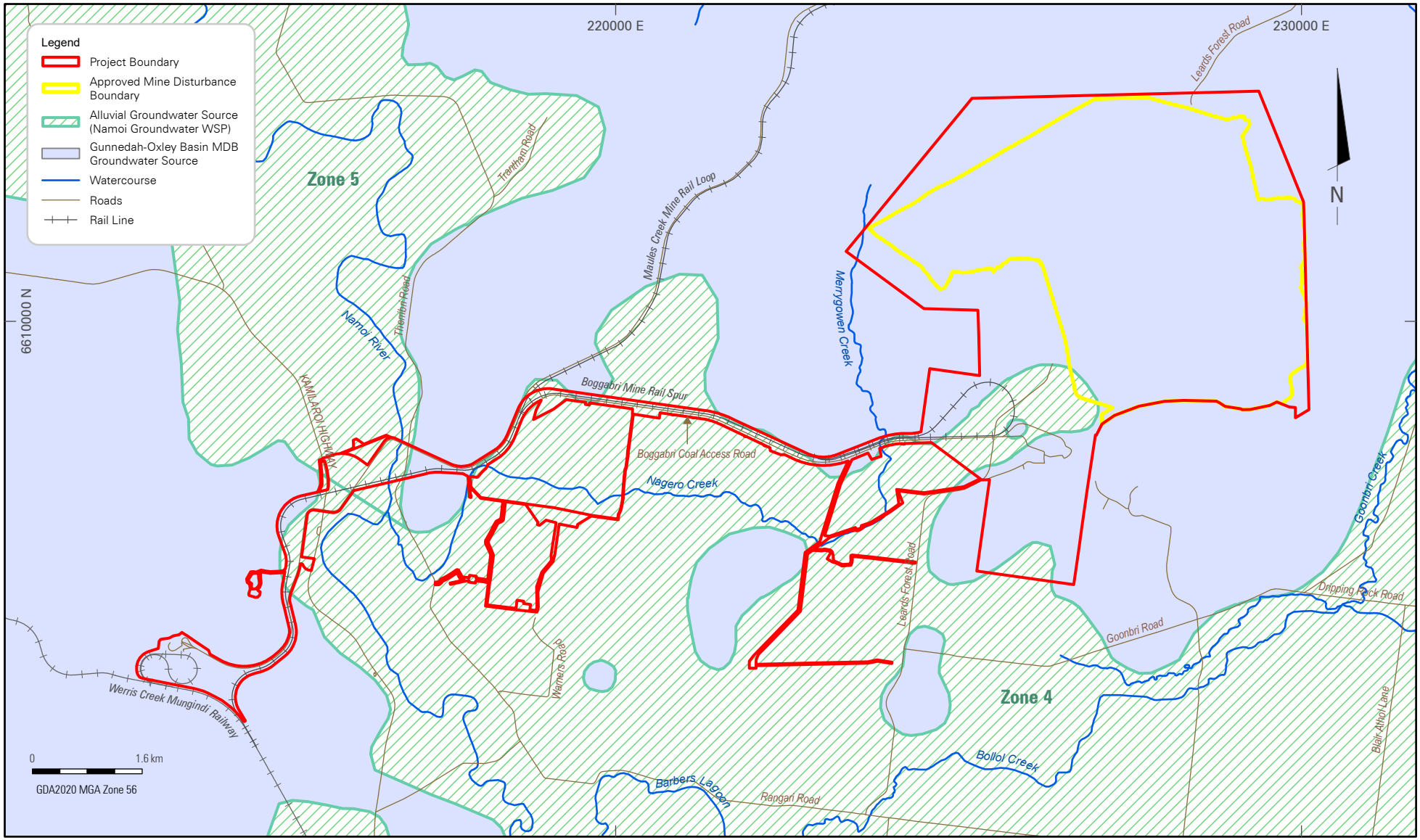
- Element 1 –GAT overview document (NSW Department of Planning and Environment, 2022a);
- Element 2 – Guidelines for groundwater documentation (NSW Department of Planning and Environment, 2022b);
- Element 3 – Minimum requirements for groundwater modelling (NSW Department of Planning and Environment, 2022c);
- Element 4 – Information paper on cumulative groundwater impact assessment (NSW Department of Planning and Envionment, 2022d); and
- Element 5 – NSW Aquifer Interference Policy (AIP) (NOW, 2012).

2.3.3 Aquifer Interference Policy (NOW 2012)

The AIP defines aquifer interference activities and describes how these will be managed under the licensing and approvals regime in the WM Act.

The AIP applies to incidental groundwater extracted as part of activities associated with extractive industries. The AIP does not apply to the abstraction of groundwater from the water supply bores to be used for consumptive purposes.

WALs are required, under the relevant WSP, for any water take that occurs as a result of open cut mining at BCM are outlined in **Table 2-1**.



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BOGGABRI COAL MINE

Water Sharing Plans

FIGURE 2-1

3.0 GEOLOGICAL AND HYDROGEOLOGICAL SETTING

3.1 Regional and Local Geology

BCM is located in the Gunnedah Basin, approximately 330km north-west of Sydney. The Gunnedah Basin forms the central part of the Sydney-Gunnedah-Bowen Basin system which extends along the eastern margin of Australia. The Gunnedah Basin covers an area of just over 15,000 square kilometres (km^2) and comprises of rocks of Permian and Triassic age.

The exposed geology across the mine lease area is dominated by the Permian Maules Creek Formation, with minor Quaternary alluvium to the north, south and west and Permian Boggabri Volcanics to the west (AGE, 2021). Coal is extracted from the seams of the Maules Creek Formation.

Beyond the BCM Project Boundary, extensive Quaternary alluvium deposits overlie the Boggabri Volcanic deposits to the west and south-west, and the Maules Creek Formation to the south. Further south, the alluvium directly overlies the Boggabri Volcanics. The surface geology is presented in **Figure 3-1**.

The individual geological units relevant to the BCM which comprise groundwater bearing strata are summarised in **Table 3-1**.

Table 3-1: Geology Units

Geological Unit	Thickness	Description
Quaternary alluvium	30 m to 120 m	Highly permeable sandy gravel and silty clays, underlain by colluvial clays originating from the weathered Boggabri Volcanics. Associated with the Namoi River and the lower reaches of Nagero and Bollol Creeks to the south and Maules Creek to the north. Minor alluvium is present to the east of the BCM (lower reaches of Goonbri Creek) and also within the south-west corner of the site associated with Nagero Creek (Parsons Brinckerhoff, 2009).
Maules Creek Formation	Over 350 m	Includes the Merriown, Braymont, Bollol Creek and Jeralong coal seams. Overburden and interburden consists mainly of conglomerate, sandstone, siltstone and minor shale.
Boggabri Volcanics	-	Basic and acidic lavas, trachytes and andesite, ignimbrites and ashflow tuffs with interbedded shale. Form the basement of the Gunnedah Basin. Out-crop in the south-western corner of the mine lease area.

3.2 Regional Hydrogeology

The groundwater systems in the region include an:

- Alluvial aquifer; comprising alluvial deposits associated with the Namoi River and its tributaries;
- Maules Creek Formation aquifer; the major transmissive units are within the coal seams, in particular the Merriown Seam; and
- Weathered and fresh rock associated with the Boggabri Volcanics.

3.2.1 Alluvial Aquifer

The Quaternary alluvium extends from south to north along the Namoi River and eastwards along the tributaries of Bollol Creek and Maules Creek. Groundwater movement within the alluvium is via intergranular flow, where sandy lenses are interconnected and in hydraulic continuity with the creeks and drainage channels. Within the vicinity of the BCM, the alluvial aquifer generally consists of thin valley infill deposits associated with Nagero and Bollol Creeks downgradient of the mine lease.

The groundwater levels are typically within 10 m of the surface, with hydraulic connection with surface water systems in some areas. pH is close to neutral, with salinity about 2,000 µS/cm, which is within irrigation guideline limits.

The alluvial aquifer is used extensively for irrigation, town water supply and stock and domestic purposes, with usage managed under the Namoi Alluvial WSP.

3.2.2 Coal Seam Aquifers (Maules Creek Formation)

Groundwater within the Maules Creek Formation (managed under the MDB Porous WSP) generally flows to the south-west consistent with the topographic gradient of the area, with groundwater levels typically between 40 to 70 metres below ground level (mbgl).

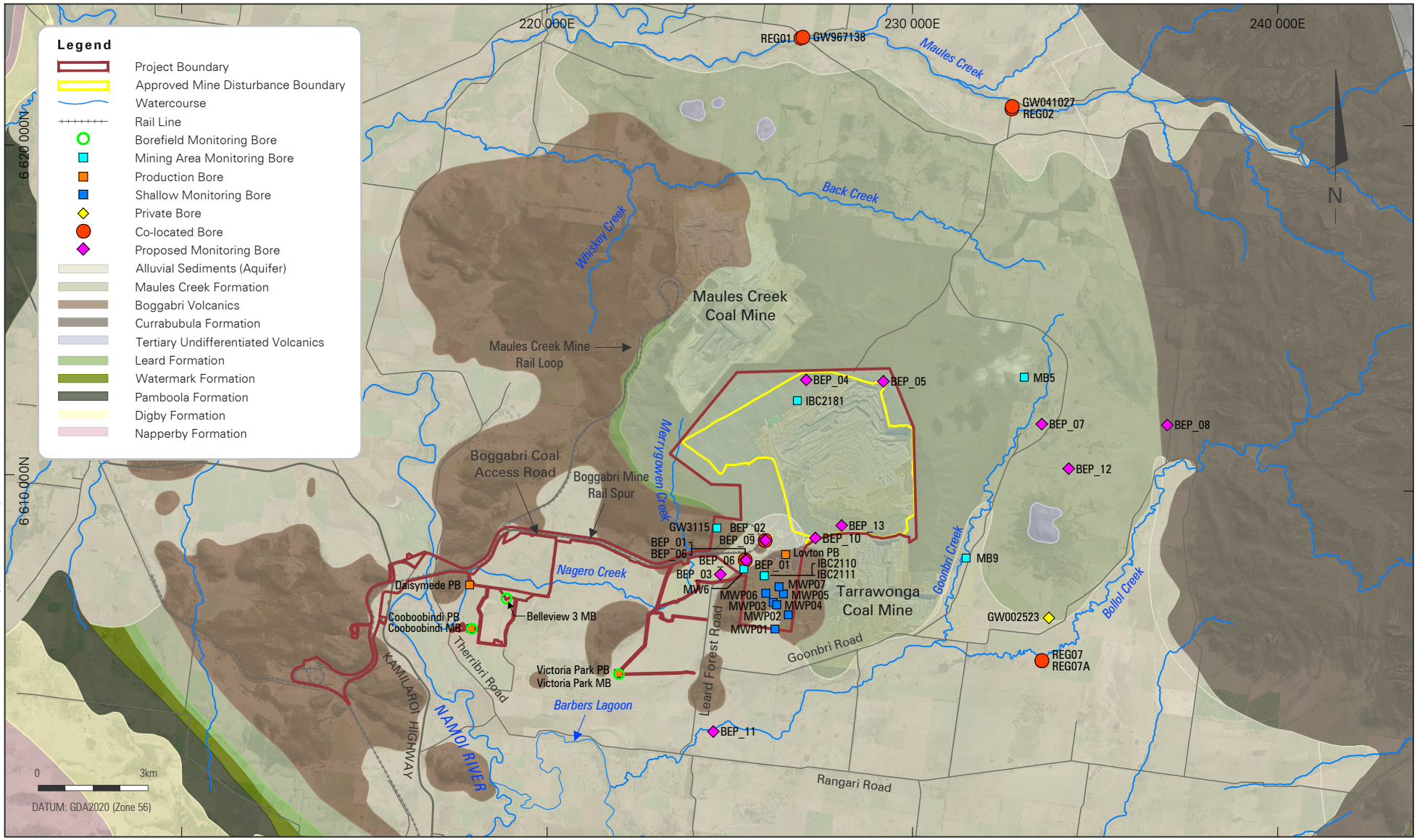
pH is typically neutral to slightly alkaline, with median EC values for the coal seams and interburden of 1,000 µS/cm and 2,300 µS/cm respectively (AGE, 2022b). Given the low yields from this aquifer, it is rarely utilised for agricultural purposes.

3.2.3 Boggabri Volcanics

The Boggabri Volcanics are considered to be of very low permeability or impermeable, particularly at depth. Where present, groundwater is likely stored in fractures and/or weathered material. The groundwater system yields water which is brackish to moderately saline in quality.

3.2.4 Groundwater Regional Baseline

The Groundwater Impact Assessment completed as part of MOD 8 (AGE, 2022a) identified that there are 1,049 registered bores within the assessment investigation area. Of these registered bores, records classify 252 as monitoring bores, 202 as water supply bores, 196 as irrigation bores, 180 as stock and domestic bores, 11 as commercial bores and 197 of unknown purpose. Licenced groundwater extraction bores located adjacent to the Namoi River have the greatest extraction volumes coinciding with identified irrigation areas (AGE, 2022a).



JBA 2347 - BOGGABRI GW MP - Surface Geology and Monitoring (1/08/2025)

BOGGABRI COAL MINE

Surface Geology and Groundwater Monitoring Locations

FIGURE 3-1

A desktop review indicated that the bores are located with either the alluvial sediments, or Permian overburden/interburden, Permian coal seams or within the Boggabri Volcanics (AGE, 2022a).

Further information on groundwater levels, yields and quality from the MOD 8 GIA is provided in the following sections.

3.2.5 Groundwater Levels

Regional groundwater levels are typically between 7 to 10 mbgl on the alluvial plain but can be deeper in places upslope towards the outcropping Boggabri Volcanics. Groundwater levels are shallower in the vicinity of drainage depressions and creeks, particularly during wetter months when they contain surface water.

A network of monitoring bores has been installed within the Namoi alluvium by the NSW government since the mid 1970's, providing a long record of aquifer responses to climatic conditions and pumping from landholders. The groundwater levels within these monitoring bores show a general decline of 1.5 m to 2 m since the late 1970's, although groundwater levels appear to have steadied off and, in some instances, recovered slightly since the mid-2000's. This may coincide with the introduction of the restrictions on groundwater allocations and commencement of the Namoi Groundwater Resource WSP in 2003 (Parsons Brinckerhoff, 2015b).

Variations in the water levels occur seasonally and also across several years, possibly relating to wetter and drier periods. The water levels in the DPE – Water monitoring bores also show fluctuations in groundwater level due to pumping for irrigation and water supply. Monitoring bore (GW030050), located east of Boggabri township and about 1.4km east of the town water supply bore, shows an increase in the magnitude of short term water level variations from the 1970's through to recent times which, is likely a response to increased pumping activity of nearby irrigation bores (Parsons Brinckerhoff, 2015b).

3.2.6 Groundwater Quality

The Namoi Alluvial WSP (DPE-Water, 2020) does not specify the beneficial uses of the Namoi alluvium. A description of the Namoi groundwater resource (Department of Industry, 2023) states that the salinity within the Upper and Lower Namoi Alluvium are generally less than 1,500 µS/cm and is capable of supporting irrigation, stock watering and raw water for drinking. Where pre-development or current groundwater quality is insufficient to meet raw water for drinking standards, the beneficial use will be for agricultural purposes (DPE - Water).

Beneficial uses for the porous rock aquifers are not specified in the Murray Darling Basin Porous Rock (Gunnedah-Oxley Basin) WSP. The resource description in support of the development of the WSP identified the water quality as generally unsuitable for potable or irrigation supplies and is likely suitable for stock watering (DPE – Water, 2022).

3.2.7 Groundwater Yields

High yielding aquifers can be found across wide areas of the Namoi alluvial plain (NOW, 2010). However, the most productive aquifer is the Gunnedah formation and main palaeo channel which is generally limited to the central portions of the valley (NOW, 2010). The coarseness of the sediment that make up the palaeo channels allows for high groundwater extraction rates (NOW, 2010).

The MOD 5 EA (Parsons Brinckerhoff, 2015a) identified the thickness of the alluvial aquifer in the vicinity of the groundwater production bores increases towards the centre of the Namoi Valley and this corresponds with higher sustainable yields. The Cooboobindi bore has the greatest alluvium aquifer thickness and a sustainable pumping rate (Parsons Brinckerhoff, 2015a) ranging from 7 to 7.5 ML/day.

3.2.8 Regional Groundwater Abstraction

The Namoi Alluvial WSP sets out the recharge, environmental water provisions, extraction requirements, share components and extraction limits for the Upper Namoi groundwater sources. The borefield is located in the Upper Namoi Zone 4, Namoi Valley (Keepit Dam to Gin's Leap) Groundwater Source (hereafter Zone 4) and comprises the alluvial sediments associated with Namoi River, running roughly south east to north west from Keepit Dam to Gin's Leap (NOW, 2010).

At the commencement of the Namoi Water Sharing Plan (1st November 2006), groundwater entitlements in the Zone 4 were reduced from approximately 82 Giga Litres (GL) down to 25.7 GL. Supplementary access was also provided to assist water users to progressively adjust to the reduced entitlement volumes. In 2021 (DPE – Water 2021), there were approximately 295 production bores in Zone 4. Annual extraction from 2012-2013 averaged over this period is approximately 22,100 ML (DPIE, 2021).

3.3 Borefield Operation

Groundwater production bores are utilised to supply supplementary water for use in dust suppression and other purposes at the BCM. The approximate locations of the groundwater production bores that are utilised by BCOPL are shown in **Figure 3-1**. Following consultation with NSW DCCEEW – Water in May 2025, an assessment of the potential extraction limit for the Victoria Park bore was completed in July 2025. The maximum extraction rates identified by NSW DCCEEW – Water in its assessment of the Victoria Park bore are presented in **Table 3-2**. The July 2025 correspondence from NSW DCCEEW – Water is provided within **Appendix C**. As noted within this letter, an earlier assessment of the Cooboobindi bore was completed as part of MOD 5.

The production bores have the combined capacity to supply up to 2,802 ML per year of groundwater as noted in **Table 3-2**. IA and its JV partners only hold 1,028 ML of WALs within this water source.

Table 3-2: Maximum Abstraction Rates for Groundwater Production Bores

Bore	Maximum Abstraction Rate (ML/day)	Maximum Abstraction Rate (ML/year)
Cooboobindi[a]	3.97	1,450
Victoria Park	2.74	1,000
Daisymede[a]	0.9	328
Lovton	0.066	24
Total	**7.68**	**2,802**

[a] *MOD 5 borefield assessment*

The Cooboobindi and Victoria Park production bore maximum abstraction rates have been nominated on Miscellaneous Works licence 90MW833038.

The Lovton bore has been identified as a low yielding bore located within the BCM infrastructure area, and is used to supply small volumes of potable water to the BCM administration area. The Cooboobindi, Daisymede and Victoria Park bores have previously been assessed by the former DPI-Water (now DCCEEW - Water) as part of the MOD 5 EA (Parsons Brinckerhoff, 2015a). A dealing application will be submitted for any future proposed production bores to undergo an impact assessment by DCCEEW – Water prior to these being used to supply water for the BCM (including Lovton bore).

Metering as required by the *NSW Non-Urban Metering Policy* will be installed at all bores utilised for operational purposes.

Where impacts to landholder water supplies are reported to BCOPL as having been caused by the operation of the borefield, BCOPL will undertake the management measures described in **Section 6.2**.

3.4 BCM Groundwater Baseline Data

Groundwater quality sampling and monitoring of levels in key groundwater bores has been carried out since 2005. Groundwater monitoring trends of groundwater levels and quality collected between 2005 and 2023 are presented in Figures 5 – 17 in **Appendix B**. Further discussion and analysis of groundwater monitoring results is undertaken on an annual basis and reported in the Annual Review, as discussed in **Section 8.1**.

3.4.1 Groundwater Quality Criteria

The Namoi Alluvial WSP states that the beneficial uses of the groundwater sources relevant to the BCM are raw water for drinking and agricultural use.

Land use within the Upper Namoi groundwater management area is dominated by sheep and cattle grazing. Wheat, cotton and other broad acre crops are grown along the alluvial floodplains (Green et al, 2011). The irrigated cropping areas are primarily used for cotton production (Green et al, 2011).

Groundwater quality data collected from the monitoring bores has been subject to assessment against the ANZECC (2000) guidelines for stock and irrigation and Australian Drinking Water Guidelines (NHMRC, NRMMC, 2011) (presented in **Table 3-3**).

It is noted that these guidelines are currently under review with drafts out for public consultation. The guideline values will be updated following the finalisation and publishing of the new guidelines. The values presented are not trigger values, and instead are used to put the observed water quality into regional context. Site specific trigger values for EC, pH and major ions are presented in **Section 5.0**.

Table 3-3: Groundwater Assessment Criteria

Parameter	Units	Upper limit for irrigation	Upper limit for livestock [b]	Upper limit for drinking water
EC	µS/cm	6,000-7,700 [a]	-	1,800 [e]
pH	pH units	6-8.5	-	6.5-8.5 [e]
Total Dissolved Solids (TDS)	mg/L	4,020-5,160 [c]	3,000-13,000 [b] 500 [g]	1,200 [e]
Sodium	mg/L	460	-	180 [e]
Potassium	mg/L	-	-	-
Calcium	mg/L	-	1,000 [b & g]	-
Magnesium	mg/L	-	600 [b] 500 250 (lactating cows and ewes with lambs) [g] 125 (poultry) [g]	-
Chloride	mg/L	700	-	250 [e]
Bicarbonate	mg/L	-	-	-
Sulphate	mg/L	-	1,000 [b] 500 (livestock in general) 250 (poultry)	250e/500 [f]
Arsenic	mg/L	0.1 [d]	0.5 [b] 0.025 [g]	0.01 [f]
Cadmium	mg/L	0.01 [d]	0.01 [b & g]	0.002 [f]
Chromium	mg/L	0.1 [d]	1 [b] 0.05 [g]	0.0 5 [f]

Parameter	Units	Upper limit for irrigation	Upper limit for livestock [b]	Upper limit for drinking water
Copper	mg/L	0.2 [d]	0.4 [b] 05 (sheep) [g] 1 (cattle) [g] f (pigs) [g] 5 (poultry) [g]	1e/2 [f]
Iron	mg/L	0.2 [d]	-	0.3 [e]
Manganese	mg/L	0.2 [d]	10 [g]	0.1e/0.5 [f]
Nickel	mg/L	0.2 [d]	1 [b & g]	0.02 [f]
Lead	mg/L	2 [d]	0.1 [b & g]	0.01 [f]
Zinc	mg/L	2 [d]	20 [b & g]	3 [e]
Nitrogen	mg/L	5 [d]	-	-
Nitrate as N	mg/L	-	90 [b] 100 (livestock in general) [g] 25 (poultry) [g] 400 (cattle) [g]	11 [f]
Nitrite as N	mg/L	-	9 [b] 10 [g]	0.9 [f]
Phosphorus	mg/L	0.05 [d]	-	-

Notes:

a. ANZECC (2000) - maximum trigger level for wheat and cotton
b. ANZECC (2000) - recommended trigger levels (low risk) for livestock drinking water
c. ANZECC (2000) - TDS value based on EC values for wheat and cotton (1 µS/cm = 0.67 mg/L)
d. ANZECC (2000) – Agricultural irrigation water long-term trigger values for heavy metals and metalloids, nitrogen and phosphorus
e. (NHMRC, NRMMC, 2011) – aesthetic criterion
f. (NHMRC, NRMMC, 2011) – health-based criterion
g. DCCEEW (2023) – Draft guideline value for livestock drinking water

3.4.2 Survey and Assessment of Impacts on Groundwater Dependent Ecosystems

The groundwater assessment completed by AGE (2022) indicated that there is a high potential for the presence of aquatic and terrestrial GDEs within or surrounding the Project Area. The MDB Porous WSP and the Namoi Alluvial WSP consider the high potential terrestrial GDEs as high priority GDEs under the WM Act.

The GDE mapping was compared to the depth of the water table that is variable in nature. Ecological assessments of the GDEs identified the flora species immediately surrounding the BCM Complex not to be groundwater dependent which is consistent with the water table depth greater than 20 mbgl (AGE, 2022a).

Field surveys of the Bollol Creek and Goonbri Creek terrestrial GDEs were undertaken by WSP in September 2022 (WSP, 2022). One terrestrial Plant Community Type (PCT) was recorded within the survey area, PCT 112 Black Tea-tree – River Oak – Wilga riparian low forest/shrubland wetland.

The study found that the health of all of the trees within the Bollol and Goonbri Creeks were in good condition with no die back or dead trees present. The assessment concluded that the current condition of PCT 112 was moderate (WSP, 2022).

A baseline stygofauna survey was undertaken in 2022 as part of the MOD 8 approvals (WSP, 2022). A total of 18 groundwater bores in the vicinity of Nagero Creek, Bollol Creek, Goonbri Creek and the Namoi River were surveyed.

The survey found that the overall water quality within the surveyed bores was optimal for supporting stygofauna and confirmed the presence of two stygofauna species including Parabathynellidae and an Isopod. A range of taxa were also identified in the survey with the possibility of being stygofauna and further investigation is proposed. The assessment concluded that MOD 8 is not likely to significantly impact stygofauna associated within the alluvium (WSP, 2022).

4.0 GROUNDWATER MONITORING PROGRAM

The groundwater monitoring program has been designed in consideration of the available background monitoring data. As the monitoring program continues, monitoring data will be used to assess the interconnectivity between the alluvial and bedrock aquifers and to confirm the influences of natural variations in the groundwater system. The monitoring data will also be used to identify how the system responds to anthropogenic influences, including mining operations and groundwater abstraction by irrigators.

This section addresses in part, Condition 38, Schedule 3 of SSD 09_0182, which requires the GWMP to include a program to monitor:

- Groundwater inflows into the open cut mining area;
- Seepages from water storages, backfilled voids and the final void;
- Interconnectivity between the alluvial and the bedrock aquifer;
- Changes to background groundwater yields and quality; and
- Changes to other groundwater users, including landowners and GDEs.

4.1 Groundwater Sampling Methods

Water quality monitoring is undertaken in line with *AS/NZS 5667.1:1998 Water quality- sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples* (Standards Australia, 1998) (or its latest version). Where this sampling methodology is impractical for deeper bores, alternative more practical methods will be implemented. Laboratory analysis of water quality samples is carried out by NATA accredited environmental laboratories. Results are analysed and reported each year in an Annual Review as discussed in **Section 8.2**.

The sampling methods for groundwater bores GW3115, IBC2110, IBC2111 and MW6 are outlined in EPL 12407. The sampling methods include collecting samples to monitor major ions, dissolved metals, nutrients, alkalinity every six months and sampling of pH and EC quarterly in situ.

The groundwater monitoring frequency and parameters to be monitored at each location are detailed in **Table 4-2**, **Table 4-3** and **Table 4-5**.

4.2 Groundwater Monitoring Mining Area

Monitoring of groundwater levels and quality will be undertaken for the bores in proximity to the mining area (refer to **Table 4-2**) to assess the effect that mining operation at BCM and neighbouring BTM Complex mines have on the local and regional groundwater system. Existing monitoring bores are screened across different geological units, including the Maules Creek Formation aquifer and the alluvial aquifer. A number of monitoring bores installed within the Maules Creek Formation (IBC2102, IBC2103, IBC2104, IBC2105 IBC2114, IBC2115, IBC2138 & IBC2139) in proximity to BCM have been decommissioned due to the progression of mining.

The coordinates, screened geology, monitoring frequency and parameters for each of the mining area monitoring bores are set out in **Table 4-2** and **Table 4-5**. The locations of the existing monitoring bores are shown in **Figure 3-1**. The BTM Complex WMS includes a network of regional groundwater monitoring bores that monitor groundwater conditions for cumulative impacts from the mines within the BTM Complex (BCM, TCM and MCCM). The cumulative groundwater monitoring locations listed in the BTM Complex WMS include 14 bores to monitor the regional groundwater quality within the alluvium and coal seams surrounding BTM Complex mines. The BTM Complex WMS should be referred to for further information regarding groundwater monitoring and the assessments of cumulative groundwater impacts on the regional aquifer systems.

4.3 Interconnectivity between Alluvium and Bedrock

Monitoring interconnectivity between the alluvial aquifers south and west of Boggabri and the underlying bedrock groundwater systems (coal measures or volcanics) is a key purpose of the groundwater monitoring network. The interconnectivity will be assessed by comparing groundwater level trends and water quality between bores installed within the alluvium and the bedrock.

Co-located bores located south, west and north of BCM (**Table 4-1**) monitor groundwater in the bedrock aquifers and overlying alluvium. Interconnectivity is assessed by comparing the groundwater levels at the same location and time to determine vertical gradients. The potential for temporal changes to these vertical gradients are also regularly reviewed.

Table 4-1 Co-located Bores

Location	Bore	Depth (mbgl)	Formation	Alluvium	Method
West of mine in near Nagero Creek	BEP_01	17 27	Lower alluvium Upper alluvium	Nagero	Connectivity between Nagero Alluvium and Boggabri Volcanics estimated based on water level correlations and hydraulic gradient.
	BEP_06	30 70 90	Volcanics upper Volcanics mid Volcanics lower		
South-east of mine near Bollol Creek	REG07-v1 REG07-v2 REG07-v3 REG07A	67.5 148.2 242.5 24-30	Braymont Merriown Nagero Alluvium	Bollol Creek	Connectivity between Bollol Creek Alluvium and Permian Coal seams based on water level correlation and hydraulic gradients.
North of MCCM near Maules Creek	REG01-v1 REG01-v2 REG01-v3 REG01-v4 GW967138	118.7 134.5 193.5 281.5 7-11	Jeralong Merriown Nagero Therribri Alluvium	Maules Creek	Connectivity between Maules Creek Alluvium and Permian Coal seams based on water level correlation and hydraulic gradients
North of MCCM near Maules Creek	REG02-v1 REG02-v2 REG02-v3 REG02-v4 GW041027	60 120 200 260 8 – 14	Braymont Jeralong Merriown Therribri Alluvium	Maules Creek	Connectivity between Maules Creek Alluvium and Permian Coal seams based on water level correlation and hydraulic gradients.

4.4 Groundwater Monitoring Borefield

BCOPL will operate three existing production bores (Cooboobindi, Victoria Park and Lovton) to supply water to BCM as discussed in **Section 3.3**. The groundwater model included in the MOD 5 EA (Parsons Brinckerhoff, 2015a) predicted the abstraction of groundwater from these bores may cause a drawdown of alluvial groundwater levels. The production bores and the groundwater monitoring bores will be monitored for the groundwater level and quality parameters outlined in **Table 4-3** and **Table 4-5**. The location of these bores is shown in **Figure 3-1**.

The monitoring data will be analysed (refer to **Section 5.2**) to identify the potential for drawdown impacts on alluvium groundwater levels and registered groundwater bores as a result of the borefield. Where BCOPL has an access agreement with a private landowner for the purpose of conducting groundwater monitoring, the registered bore(s) on the property will be monitored biannually, for the parameters outlined in **Table 4-5**.

One private bore was predicted to be impacted by BCM operations as part of the MOD 8 Groundwater Impact Assessment (AGE, 2021). A bore census of the bore was undertaken as part of the MOD 8 Response to Submissions (SAGE, 2022) that identified that the bore was unlikely to be constructed into the coal seam aquifer but located within the weathered interburden of the Maules Creek Formation and unlikely to be impacted. The bore will continue be monitored in accordance with the methods described in **Section 4.5**. Where a landowner reports an impact to their registered private bore as a result of the operation of the borefield, BCOPL will undertake the investigation as outlined in **Section 6.2**.

4.5 Groundwater Monitoring Private Bores

As part of the Groundwater Impact Assessment for MOD 8, the cumulative drawdown in the deeper Permian coal seam strata from all mining within the BTM Complex was predicted to exceed the 2 m minimal impact threshold of the AIP at one bore (GW002523) on privately owned land. Due to the potential impacts of the BTM Complex mining upon private bore GW002523, BCOPL will complete groundwater level monitoring at this bore throughout the period of mining. Groundwater level monitoring data collected from this bore will be used to ensure that make good provisions are applied, if there is more than a negligible impact on the water supply of GW002523 as per Condition 34, Schedule 2 of SSD 09_0182. The groundwater monitoring parameters and frequencies for monitoring of private bores are detailed in **Table 4-4**.

Table 4-2: Details of Mining Area Monitoring Bores (Note all bores are open standpipe)

Bore	License	Easting	Northing	Depth (mbgl)	Screen Interval	Screened Geology	Relative Location	Frequency	Parameters
Mining Area Groundwater Monitoring									
IBC2110	90BL253841	225935	6607685	100	91-97	Boggabri Volcanics	Downgradient	Daily	Water levels automated logger
								Quarterly	Field parameters
								Half yearly	Major ions, dissolved metals, nutrients, alkalinity
IBC2111[1]	90BL253840	225948	6607685	45	36-42	Boggabri Volcanics (weathered)	Downgradient	Daily	Water levels automated logger
								Quarterly	Field parameters
								Half yearly	Major ions, dissolved metals, nutrients, alkalinity
GW3115[1]	90BL253832	224649	6608990	83	-	Boggabri Volcanics (weathered)	Downgradient	Quarterly	Water levels, field parameters
								Half yearly	Major ions, dissolved metals, nutrients, alkalinity
MW6[1]	90BL254255	225466	6608059	32	18-22	Alluvium	Downgradient	Daily	Water levels automated logger

[1] Bore used to monitor seepage and leachate from storages

Bore	License	Easting	Northing	Depth (mbgl)	Screen Interval	Screened Geology	Relative Location	Frequency	Parameters
Mining Area Groundwater Monitoring									
								Quarterly	Field parameters
								Half yearly	Major ions, dissolved metals, nutrients, alkalinity
MB5	TBA	233060	6613116	166 188 192 202	-	Merriown seam Permian Sediments	Upgradient	Daily	Water levels automated logger
MB9	TBA	231468	6608167	53 65 74 82	-	Merriown seam Permian Sediments	Downgradient	Daily	Water levels automated logger

Table 4-3: Details of Borefield Monitoring Bores (Note all bores are open standpipes)

Bore	License	Easting	Northing	Depth (mbgl)	Screen Interval	Screened Geology	Relative Location	Frequency	Parameters
Borefield Groundwater Monitoring									
Victoria Park Production Bore (PB)	90CA807034	221961	6605011	60	34-37 50-57	Alluvium	Victoria Park Property	Daily	Water volumes (during abstraction – ML or m^3)
								Quarterly	Field parameters
								Half yearly	Major ions, dissolved metals, nutrients, alkalinity
Victoria Park Monitoring Bore (MB)	90BL256311	221966	6604988	60	34-37 50-57	Alluvium	Adjacent Victoria Park PB	Daily	Water levels (automated water level logger)
								Quarterly	Water levels, field parameters
								Half yearly	Major ions, dissolved metals, nutrients, alkalinity
Cooboobindi PB	90CA807034	217917	6606240	89	18-31 34-45 48-64 66-76 78-89	Alluvium	Cooboobindi Property	Daily	Water volumes (during abstraction -ML or m^3)
								Quarterly	Field parameters
								Half yearly	Major ions, dissolved metals, nutrients, alkalinity
Cooboobindi MB	90BL256299	217939	6606232	89	23-89	Alluvium	Adjacent Cooboobindi PB	Daily	Water levels (automated water level logger)
								Quarterly	Water levels, field parameters

Bore	License	Easting	Northing	Depth (mbgl)	Screen Interval	Screened Geology	Relative Location	Frequency	Parameters
Borefield Groundwater Monitoring									
								Half yearly	Major ions, dissolved metals, nutrients, alkalinity
Belleview 3 MB	90CA807034	218887	6607064	42	24-30	Alluvium	Near former Daisymede PB	Daily	Water levels (automated water level logger)
								Quarterly	Water levels, field parameters
								Half yearly	Major ions, dissolved metals, nutrients, alkalinity

Table 4-4: Details of Private Monitoring Bores

Bore	License	Easting	Northing	Depth (mbgl)	Screen Interval	Screened Geology	Relative Location	Frequency	Parameters
Private Bore Groundwater Monitoring									
GW002523	Unknown	233735	6606529	38	-	Unknown	Private property south east of Project Boundary	Half yearly	Water levels, field parameters.

Table 4-5: Monitoring Parameters

Groundwater Monitoring	Parameters
Water Level	Groundwater level
Volume	Extraction volume (for production bores)
Field Parameters	pH, EC, temperature
Major Ions	Sulphate as SO_4^{2-}, chloride, calcium, magnesium, sodium, potassium
Dissolved Metals	Aluminium, arsenic, cadmium, chromium, copper, iron, lead, manganese, molybdenum, nickel, selenium, zinc
Nutrients	Ammonia as N, nitrite as N, nitrate as N, nitrite + nitrate as N, total nitrogen as N, total phosphorus as P, reactive phosphorus as P
Alkalinity	Hydroxide alkalinity as $CaCO_3$, carbonate alkalinity as $CaCO_3$, bicarbonate alkalinity as $CaCO_3$, total alkalinity as $CaCO_3$

4.6 Proposed Groundwater Monitoring Bores

An additional 12 monitoring locations are proposed to be constructed following recommendations by Australasian Groundwater and Environment Consultants (AGE, 2023). The purpose of the additional monitoring bores is to replace exiting bores that are no longer operational, monitor groundwater in deeper coal seams (as proposed to be mined as part of the MOD 8 application) and to assess the groundwater-surface water relationship within the Nagero Creek alluvial region (AGE, 2023). Previously Permian monitoring bores (IBC2102, IBC2103, IBC2104 and IBC2105) have been decommissioned to facilitate the progression of mining.

A review of the groundwater monitoring network at the BCM conducted by AGE in 2023 identified that additional monitoring points should be added in the Nagero Creek alluvium and Bollol Creek to gain a better understanding of the connectivity between the surface water and groundwater resources, assessments of faults in the project area and in assessment of the depressurisation over time within the deeper coal seams.

Condition 12 of EPBC 2021/8875 requires the installation of groundwater monitoring bores illustrated on the plan in Appendix A of EPBC 2021/8875 prior to the commencement of mining below the Merriown Coal Seam. This includes BEP_01 to BEP_06 within the list below.

The indicative locations, rationale, target geology and monitoring frequency for the proposed bores are provided in **Table 4-6** and the indicative site locations illustrated in **Figure 3-1**. The VWPs sensors will be located within the target aquifers/aquitards where appropriate, with groundwater pressures and water levels logged daily. Logging at this frequency will allow rainfall recharge and pumping to be distinguished from potential water level declines due to depressurisation as a result of mine operations (AGE, 2023). It will also provide data to allow the calibration of the model to be improved over time and the connectivity between the alluvium and coal measures to be assessed.

Table 4-6: Proposed Additional Groundwater Monitoring Locations

Bore	Easting	Northing	Rationale	Target Geology	Monitoring Regime	
BEP_01	225421	6608111	Monitoring in Nagero Creek alluvium. Bores adjacent to mapped Poplar Box Woodland.	2 x Stand pipes (SPs) in alluvium	Quarterly	Water levels, field parameters
					Half yearly	SP - Major ions, dissolved metals, nutrients, alkalinity (refer to **Table 4-5**)
BEP_02	225951	6608659	Monitoring in Nagero Creek alluvium.	1 x SP in alluvium	Quarterly	Water levels, field parameters
					Half yearly	Major ions, dissolved metals, nutrients, alkalinity (refer to **Table 4-6**)
BEP_03	224742	6607720	Monitoring in downstream Nagero Creek alluvium.	1 x SP in alluvium	Quarterly	Water levels, field parameters
					Half yearly	Major ions, dissolved metals, nutrients, alkalinity (refer to **Table 4-6**)
BEP_04	227094	6613043	Partially replaces mined out 'IBC' series of bores. Allows for the collection of groundwater level/quality data in the deeper seams that are targeted by MOD 8 and the Extension Project.	3 x SPs in Templemore, Nagero, and Merriown seams	Quarterly	Water levels, field parameters
					Half yearly	Major ions, dissolved metals, nutrients, alkalinity (refer to **Table 4-6**)
BEP_05	229997	6612925	BCM specific monitoring of groundwater levels in the deeper seams that are targeted by the MOD 8 Amendment. Records of the expected coal seam depressurisation as mining progresses will improve the calibration of future updates to the numerical groundwater model.	VWP – 4 x sensors in Templemore, Tarrawonga, Nagero, and Merriown seams	Daily	VWP - Water levels

Bore	Easting	Northing	Rationale	Target Geology	Monitoring Regime	
BEP_06	225450	6608109	Assessment of potential impacts propagating to the west through the volcanics.	VWP – 3 x sensors in Boggabri Volcanics	Daily	VWP - Water levels
BEP_07	233411	6611834	Long term monitoring in deep to shallow Permian coal seams. Assessment of impact propagation towards Goonbri Creek and Bollol Creek.	1 x SP in shallow regolith VWP – 4 x sensors in Templemore, Nagero, and Merriown, and Braymont seams	Daily	VWP - Water levels
BEP_08	236972	6611808	Assessment of lithology and water pressures east of the mapped Mooki thrust fault. Appreciation of fault behaviour in line with IESC guidance.	1 x SP on eastern side of Mooki Thrust Fault	Quarterly	Water levels, field parameters
					Half yearly	Major ions, dissolved metals, nutrients, alkalinity (refer to **Table 4-5**)
BEP_09	225982	6608649	In line with IESC guidance, assessment of the Conomos Faults role in the hydrogeological regime. Also, further afield monitoring of potential impact propagation.	VWP – 3 x sensors in Nagero, Merriown, and Jeralong 1 x SP in alluvium	Daily	VWP - Water levels
					Quarterly	SP - Water levels, field parameters
					Half yearly	SP - Major ions, dissolved metals, nutrients, alkalinity (refer to **Table 4-5**)
BEP_10	227344	6608717	Monitoring connectivity between the coal seams and the volcanics.	VWP – 3 x sensors in Therribri, Templemore, and Boggabri volcanics	Daily	VWP - Water levels

Bore	Easting	Northing	Rationale	Target Geology	Monitoring Regime	
BEP_11	224551	6603416	Monitoring of groundwater levels and groundwater quality in a downstream portion of Bollol Creek where cumulative impacts are predicted and where there is some evidence that the water table may be close to the surface.	1 x SP in alluvium	Quarterly	Water levels, field parameters
					Half yearly	Major ions, dissolved metals, nutrients, alkalinity (refer to **Table 4-5**)
BEP_12	234275	6610613	Coal seam monitoring bore for verification of existing VWP data as per NRAR requests.	1 x SP in Braymont seam	Quarterly	Water levels, field parameters
					Half yearly	Major ions, dissolved metals, nutrients, alkalinity (refer to **Table 4-5**)

4.7 Groundwater inflows into the open cut mining area

Monitoring of inflows to the pit will continue to be undertaken to estimate the groundwater inflows to the open cut mining operations. Quantifying the total groundwater inflows into the BCM mining areas with accuracy is difficult, as groundwater within the pit mixes with rainfall runoff, dump seepage and water pumped around the pit which masks the source of water. Groundwater may also be removed from the system via evaporation or bound in spoil. These factors do not make it possible to accurately monitor and account for groundwater inflows into the pit.

BCOPL will rely on modelling results from the BCM Groundwater Model (AGE, 2022a) to estimate the total volume of groundwater removed from the regime. The model predicted that the MOD 8 Amendment mine plan will increase inflows into the mining area at a proposed rate of 1.2 ML/day and a total predicted maximum inflow of 583 ML/year in 2024 (AGE, 2022a). Modelled groundwater inflow water take will be reported in the Annual Review.

The numerical groundwater model for the BTM Complex (which was relied upon for the MOD 8 Amendment) is reviewed and updated every three years. The latest version of the BTM Complex groundwater model will be relied upon for the purpose of estimating groundwater inflows into the BCM mining areas.

4.8 Groundwater Seepage Monitoring

Contaminated water dams at BCM are largely located within and adjacent to the CHPP, with surplus water sometimes captured within pit storages during wet periods. Seepage monitoring is undertaken at bores that are hydraulically down gradient of the CHPP and contaminated water dam MW3 (**Table 4-7**). Bores are monitored on a quarterly basis with water levels and field parameters collected. Water quality parameters including major ions, dissolved metals, nutrients and alkalinity are collected bi-annually. Mining area monitoring bores GW3115, IBC2111 and MW6 (**Table 4-2**) will also be utilised to monitor the seepage and leachate from BCM water storages.

Groundwater modelling for MOD 8 indicates the long-term groundwater level will be below the final void surface elevation and therefore no water storage or pit lake is expected within the final void. Potential seepage from the backfilled voids is similarly monitored by hydraulically down gradient bores (**Table 4-7**).

Table 4-7 Seepage and Leachate Monitoring Bore Locations

Bore	Easting	Northing	Location	Screened Geology	Monitoring Regime	
MWP05	226468	6607187	Adjacent to MW3 (east)	Boggabri Volcanics	Quarterly	Water levels, field parameters
					Half yearly	Major ions, dissolved metals, nutrients, alkalinity
MWP07	226349	6607382	North of MW3	Boggabri Volcanics	Quarterly	Water levels, field parameters
					Half yearly	Major ions, dissolved metals, nutrients, alkalinity

4.9 Core Testing

Opportunistic testing of drill core will be carried out on unfractured samples of interburden (Maules Creek Formation) to quantify characteristic hydraulic conductivity, porous groundwater flow and storage parameters representative of the interburden intersected at BCM. BCOPL will use representative core samples to assess the distribution and variability of porous groundwater flow and storage contributions.

X-ray diffraction (XRD) and X-ray fluorescence (XRF) analysis will also be carried out on core samples, to assess the mineralogy of the interburden which may be exposed to re-saturation within the pit. This testing is a specific requirement of the groundwater and hydrochemical modelling requirements set out within Appendix 6 of SSD 09_0182.

4.10 Hydrochemical Modelling

Hydrochemical modelling will be conducted to assess the likely long term water quality in the void. Full saturation batch reaction trials on waste interburden will be conducted to confirm the likely hydrochemical modelling outcomes.

Results from the modelling will be considered in the development of the Final Void and Mine Closure Plan to be developed in accordance Condition 72, Schedule 3 of SSD 09_0182 by the end of December 2025.

4.11 Groundwater Dependent Ecosystems

There are predicted groundwater impacts within parts of the alluvial aquifer which support native vegetation which has a potential dependence on groundwater. BCOPL monitors the health and composition of the terrestrial vegetation within the predicted groundwater drawdown areas. The GDE monitoring program for the BCM is presented in **Figure 4-1** and includes:

- Annual stream and riparian health monitoring across five monitoring locations along Nagero Creek and the Namoi River. The riparian health monitoring program involves recording photographs to identify changes over time as mining operations at BCM progress;
- Annual monitoring of terrestrial vegetation composition across 11 monitoring locations along the Namoi River floodplain, including the five stream and riparian health monitoring sites. The terrestrial GDE monitoring involves undertaking a quantitative transect survey to assess the general structure and health of the GDEs (including tree canopy conditions); and
- Annual stygofauna groundwater bore monitoring along the Namoi River and Nagero Creek floodplain to identify habitat conditions and identify the presence of stygofauna following laboratory analysis.

This monitoring regime is utilised to identify a correlation between poor vegetation health which may potentially be associated with the groundwater drawdown. If impacts are identified, they will be assessed against water levels in groundwater monitoring bores and climatic conditions to identify any potential correlation between vegetation health and groundwater extraction. The results of this vegetation condition monitoring will be reported within the Annual Review (refer to **Section 8.2**). The management responses for GDEs are described in **Section 6.5**.

Additional GDE and stygofauna monitoring locations were proposed as part of the MOD 8 approvals to monitor the existing baseline conditions and the potential impacts associated with the drawdown of the alluvium associated with BCM's mining operations.

The additional monitoring locations (GDE1 and GDE2 presented **Figure 4-1**) are positioned along Nagero Creek, in proximity to BCM coal handling infrastructure and along Nagero Creek, west of the Leard Forest Road within the Victoria Park Property. Ongoing monitoring of stygofauna is also proposed for MWP07 as stygofauna was identified in this bore during the survey completed in 2022 (WSP, 2022).

As part of the MOD 8 approvals process, WSP recommended that canopy condition of terrestrial GDEs is specifically targeted as part of the existing GDE monitoring program to assist in detecting any changes in health over time (WSP, 2022). Canopy decline has shown to be an indicator of vegetation experiencing stresses due to groundwater disconnection. Groundwater disconnection can show signs of severe dieback in Polar Box, present along the Namoi River floodplain.

The above terrestrial vegetation composition will incorporate the monitoring of canopy condition of terrestrial GDEs. This monitoring of canopy condition will be monitored in conjunction with the associated alluvial water level monitoring.

The MOD 8 Groundwater Impact Assessment identified the potential for cumulative impacts to the water table associated with GDEs which have been regionally mapped along Goonbri and Bollol Creeks. BCOPL and the BTM Complex have existing groundwater monitoring bores within the Permian strata to the east of mining operations in the BTM Complex nearby Goonbri and Bollol Creeks to monitor the depressurisation of aquifer pressures during mining operations. To date, only minor depressurisation has been experienced in these eastern bores indicating minimal impacts are anticipated.

This existing monitoring program along with the additional monitoring bores (discussed in **Section 4.0**) will be utilised to identify any changes in the elevation of the groundwater table. Groundwater level monitoring will be paired with the existing vegetation monitoring undertaken within the BCM Biodiversity Offset Areas (BOAs) (specifically the Goonbri property within the Central Offsets) to identify any correlation between poor vegetation health and groundwater drawdown. Vegetation monitoring within the BCM BOAs is undertaken on an annual basis in accordance with the monitoring methodology described in the BCOPL Biodiversity Management Plan (BMP). The surveys which are described in **Section 4.11.1** will also be undertaken.

Consultation with Whitehaven Coal will be undertaken to further extend the GDE monitoring within the lower portions of Goonbri Creek as part of the BTM Complex monitoring program. Existing groundwater bores associated with the TCM will be utilised to identify any changes to groundwater levels, in collaboration with ongoing vegetation monitoring in the area. Should an impact be identified, an investigation will be undertaken to determine the cause, including to determine the contribution of the three mines within the BTM Complex (where relevant). Outcomes of this consultation with Whitehaven will be included in the next revision of the BTM Complex WMS.

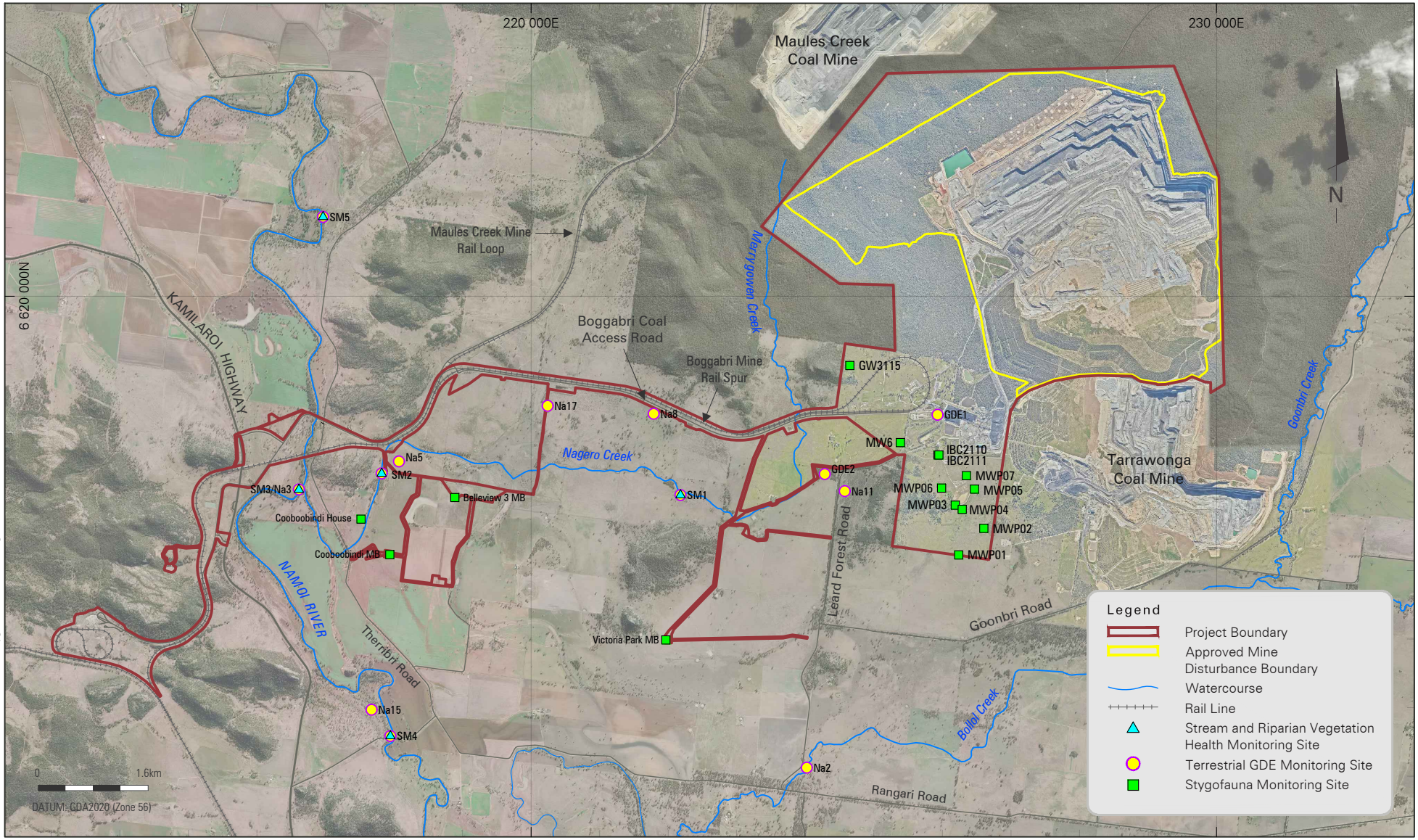
4.11.1 Vegetation Monitoring Methods

Quantitative Transects / Plots

Riparian and terrestrial vegetation health is monitored via the completion of quantitative transect/plot surveys using a modified version of the method contained within the BioBanking Assessment Methodology (BBAM) (Office of Environment and Heritage, 2014) and as described in Section 7.2 of the BCOPL BMP. A quantitative transect/plot survey is completed at each of the stream and riparian health and terrestrial GDE monitoring sites presented in **Figure 4-1**.

Photo Point Monitoring

To assess the overall health and structure of the vegetation community, a photograph is taken from the start of the 50 m transect for all stream and riparian health and terrestrial GDE monitoring locations. In addition, a photo of the canopy from the start and finish of the 50 m transect line will be taken to monitor canopy condition as described in Section 7.2 of the BCOPL BMP.



JBA 2347 - BCM GWMP - GDE and Stygofauna Monitoring Sites (26/02/2025)

BOGGABRI COAL MINE

GDE and Stygofauna Monitoring Sites

FIGURE 4-1

5.0 GROUNDWATER TRIGGER VALUES

5.1 Mining Area Groundwater Trigger levels

BCOPL will use the monitoring results from the bores in proximity to the mining area (refer to **Table 4-2**) to assess the potential for impacts to groundwater from BCM. The groundwater quality data collected to date has been reviewed and used to develop revised site trigger values for groundwater quality as shown in **Table 5-1**. A review of these triggers is undertaken annually, as part of the Annual Review (**Section 8.2**).

Monitoring results will be collated and reviewed to ensure that the data quality is appropriate and then compared to the relevant trigger values. Water quality monitoring results will be plotted to identify any relevant trends as well as to identify exceedances of the relevant trigger values.

In the event that a trigger value is exceeded, BCOPL will complete an investigation over the reason for the change in water quality. If necessary, an additional sample will be collected for laboratory analysis as soon as practicable following the identification of a potentially anomalous result. Samples that are determined not to be representative of the water quality will be flagged and removed in subsequent data analysis.

In addition to the trigger thresholds in **Table 5-1**, all field and laboratory analytes will be compared against ANZECC guideline values for stock and/or irrigation water as outlined in **Table 3-3**. Exceedances of the relevant ANZECC stock and/or irrigation guidelines will trigger the completion of an investigation to identify the source of the water quality change.

Table 5-1: Groundwater Quality Trigger Values

Analytes	Triggers Values	Alluvium	Boggabri Volcanics		
		MW6	IBC2110	IBC2111	GW3115
pH	5th %ile	6.7	6.9	6.4	7.0
	95th %ile	8.3	8.3	7.3	8.1
EC (µS/cm)	5th %ile	1,953	1,606	1,952	3,110
	95th %ile	2,310	2,182	2,524	3,698
Sulphate (mg/L)	5th %ile	38	1	46	154
	95th %ile	70	108	101	211
Chloride (mg/L)	5th %ile	239	104	229	559
	95th %ile	434	447	470	713
Sodium (mg/L)	5th %ile	349	372	317	621
	95th %ile	411	484	373	797

5.1.1 Groundwater Levels

Conditions 17a and 17b of EPBC 2009/5256 require the assessment of the allowable drawdown in the alluvial and hard rock strata due to the cumulative impacts of mining.

For the monitoring bores located in the Boggabri Volcanics (IBC2110, BC2111 & GW3115) and alluvium (MW6), groundwater level triggers are based on the 5th percentile groundwater level calculated for each individual monitoring bore. Details of this method are included in **Section 5.1**. The resulting trigger levels are included in **Table 4-3**.

A review of groundwater monitoring results against these triggers is undertaken annually, as part of the Annual Review (**Section 8.2**). If groundwater levels at the nominated bores fall below the 5th percentile water level for a period of 30 days or more (established from all existing monitoring data), a trigger level event occurs.

Assessment of historical groundwater data has produced the 5th percentile water level calculated for the monitoring bores in proximity to mining installed within the Boggabri volcanics (IBC3115, IBC2110 & IBC2111) and alluvium (MW6) as described in **Table 5-2**. Bores within the Maules Creek Coal Measures at BCM are directly affected by dewatering from mining operations and the data cannot be used to set meaningful trigger levels.

The 5th percentile water level triggers will be revised annually, as part of the Annual Review (**Section 8.2**), to include the available groundwater results from the monitoring program. Where a trigger level event occurs at a monitoring bore listed in **Table 4-2**, BCOPL will initiate the management measures described in **Section 6.1.1**.

Table 5-2: Mining Area Monitoring Bore Triggers for Groundwater Levels

Monitoring Bore	Screened Lithology	Trigger Water Level (m AHD) 5th %tile	Trigger Water Level (m AHD) 95th %tile
GW3115	Boggabri Volcanics	256.92	257.25
IBC2110	Boggabri Volcanics	257.16	265.54
IBC2111	Boggabri Volcanics	256.65	265.59
MW6	Alluvium	258.79	264.16

5.2 Borefield Triggers

No explicit operational triggers are used for water quality or level monitoring within the borefield. Instead, groundwater levels are recorded to allow for an annual comparison to the changes predicted to occur to groundwater (**Section 4.3**). Borefield abstraction volumes will be monitored and maintained within the water licence entitlements held by BCM to ensure that only allocated water is extracted.

It is important to note that the water licences utilised for the borefield are also utilised to account for the incidental takes of groundwater from the alluvial aquifer resulting from the depressurisation of the Maules Creek Formation due to mining operations.

5.3 Groundwater Seepage

No explicit operational trigger levels are implemented to identify seepage from surface water storages and contaminated water dams at BCM. Instead, they have been adopted from relevant mining area monitoring bore triggers and the ANZECC guidelines. Groundwater seepage monitoring from BCM water storages is undertaken in accordance with the monitoring program outlined in **Section 4.8**. The water quality from the monitored bores will be assessed and compared to historical monitoring data to identify any trends in increasing EC, pH, major ions, dissolved metals, nutrients and alkalinity. The seepage monitoring bores described in **Table 4-7** and will be compared against ANZECC guideline values for stock and/or irrigation water to identify elevated results as outlined in **Table 3-3**. The water quality trigger values as described in **Table 5-1** will be adopted for the mining area monitoring bores also utilised to monitor seepage and leachate from BCM water storages.

In the event that a trigger value is exceeded, BCOPL will complete an investigation over the reason for the change in water quality as outlined in **Section 6.4**. If necessary, an additional sample will be collected for laboratory analysis as soon as practicable following the identification of a potentially anomalous result. Samples that are determined not to be representative of the water quality will be flagged and removed in subsequent data analysis.

5.4 Groundwater Dependent Ecosystems

No explicit operational trigger levels are implemented for the health and function of vegetation with potential groundwater dependence. Instead, potential impacts to vegetation which may form part of a GDE are assessed in accordance with the monitoring program outlined in **Section 4.11** to identify if there is any correlation between declining water levels and any deterioration of general vegetation canopy health. Groundwater levels in proximity to GDEs are monitored to determine if a decline in GDE function correlates to a decrease in water levels within the alluvial aquifer (from natural and/or mining induced impacts).

Vegetation attributes identified from the GDE monitoring program**,** including floristic composition, structure and functionality, will be assessed against the baseline conditions obtained from the initial vegetation health monitoring undertaken in 2018 (WSP, 2021) and/or the BBAM vegetation attribute benchmarks detailed in the BCOPL BMP. The vegetation attributes are assessed against the (combined) probable mean of the baseline conditions, as predicted by the standard error. This method will be adopted to allow for fluctuations in vegetation attributes caused by regional climatic conditions such as periods of drought or prolonged rainfall. If the GDE monitoring program identifies a decline in native overstorey percent foliage cover (outside the range of the probable mean sustained over three consecutive sampling periods) that cannot be attributed to natural variation against baseline monitoring data and groundwater drawdown as a result of BCM is identified, there is potential that the groundwater drawdown may result in impacts to GDE function and will require further investigation.

In the event that declining water levels within the alluvial aquifer as a result of mining leads to a decline in GDE function, BCOPL will implement the response plan as described in **Section 6.5**.

6.0 GROUNDWATER MANAGEMENT MEASURES

6.1 Mining Area Monitoring Bores

The process for responding to exceedances of groundwater triggers for the bores listed in **Table 4-2** in proximity to the mining area are further detailed in the following subsections.

6.1.1 Groundwater Level and Quality

Assessment of the groundwater level and quality monitoring results will be undertaken annually against the groundwater trigger values listed in **Table 4-2** and **Table 5-1**. This assessment will identify if any trigger values have been exceeded and warrant further investigation.

Where any exceedance of a trigger level is confirmed, further investigation will be carried out by a suitably qualified specialist to determine the cause of the exceedance. The review will consider trends in monitoring data, mining activities, climatic conditions and may recommend management, monitoring and/or mitigation measures. If the review considers the monitoring results are the result of mining operations, these results will be considered against the minimal impact considerations under the NSW Government's Aquifer Interference Policy (AIP) (NOW, 2012) to determine the appropriate treatment.

The minimal impact considerations under the AIP are prescribed by the productivity (i.e. highly or less productive) and type of the groundwater source (i.e. alluvial or porous/fractured rock). For the purposes of the AIP, the Namoi River alluvial system is classified as a highly productive groundwater source and the Maules Creek Formation is classified as a less productive porous rock system. These two water sources comprise different minimal impact considerations under the AIP.

The Namoi Alluvial WSP and the MDB Porous WSP includes a map illustrating the boundaries of high-priority groundwater dependent ecosystems within these water sources. These are predominantly located along the ephemeral drainage lines surrounding the Leard State Forest, including Goonbri Creek, Bollol Creek and Back Creek. It is noted that neighbouring mining operations within the BTM Complex occur closer to these mapped GDEs and conduct monitoring of these areas.

The performance measures of each monitored groundwater system with respect to groundwater receptors and the applicable monitoring locations are presented in **Table 6-1**.

Table 6-1: Mining Area Monitoring Bore Triggers for Groundwater Levels

Potential Impact from Mining	Receptor	Water Source Type	Applicable Monitoring Bores	Mining Impacts Performance Measures
Water level drawdown (or depressurisation)	Water Supply Bores	Highly Productive Alluvials Less Productive Porous Rock (Maules Creek Formation)	MW6, BEP_01, BEP_02, BEP_03, BEP_07, BEP_11 BEP_08, BEP_09, BEP_12, GW3115, IBC2110, IBC2111, GW002523 (private water bore)	Less than 2 m drawdown
	Standpipe monitoring bore within 40 m of high priority GDE	Highly Productive Alluvials Less Productive Porous Rock (Maules Creek Formation)	BEP_07	Less than 10% cumulative variation in water table at 40 m from GDEs

Potential Impact from Mining	Receptor	Water Source Type	Applicable Monitoring Bores	Mining Impacts Performance Measures
	Regional standpipe monitoring bore	Highly Productive Alluvials	MW6, BEP_01, BEP_02, BEP_03, BEP_07, BEP_11	Cumulative pressure head decline to remain less than 40% of pressure head above base of water source
Changes to Water Quality	Water Supply Bore	Highly Productive Alluvials Less Productive Porous Rock (Maules Creek Formation)	MW6, BEP_01, BEP_02, BEP_03, BEP_07, BEP_11 BEP_08, BEP_09, BEP_12, GW3115, IBC2110, IBC2111, GW002523 (private water bore)	No change in existing beneficial use
	Standpipe monitoring bore within 40 m of high priority GDE	Highly Productive Alluvials Less Productive Porous Rock (Maules Creek Formation)	BEP_07	No change in existing beneficial use
	Regional Standpipe Monitoring Bore	Highly Productive Alluvials Less Productive Porous Rock (Maules Creek Formation)	MW6, BEP_01, BEP_02, BEP_03, BEP_07, BEP_11 BEP_08, BEP_09, BEP_12, GW3115, IBC2110, IBC2111, GW002523 (private water bore)	No change in existing beneficial use

If BCM is confirmed to have caused the impact, the monitored impact is beyond the predictions from the most recent modelling for the BCM and the minimal impact considerations under the AIP are exceeded, BCOPL will notify DPHI of the exceedance and develop recommendations for monitoring or mitigation measures will be provided. BCOPL will consult with DPHI and NSW DCCEEW - Water (or relevant regulators) on the outcomes of the review prior to the implementation of any mitigation measures.

The annual groundwater quality assessment will detail reviews resulting from trigger level exceedances and be reported in the Annual Review (**Section 8.2**).

6.2 Borefield

The annual groundwater assessment includes a comparison of observed groundwater levels adjacent to the Project borefield against the predicted impacts identified within the MOD 5 EA (**Section 3.3**). The assessment takes into consideration the borefield abstraction rates, climatic conditions, river flows, rainfall recharge and pumping rates of other adjacent private bores. The assessment will be used to identify if the monitoring results are within the predicted drawdown effects for the alluvium and loss of baseflow in the Namoi River as described in the MOD 5 EA. If BCM is confirmed to have caused an impact beyond the predicted groundwater impacts from MOD 5 EA, the review will provide recommendations for the implementation of further monitoring or mitigation measures.

BCOPL will consult with DPHI and NSW DCCEEW - Water (or relevant regulators) on the outcomes of the review prior to the implementation of any further recommended monitoring or mitigation measures.

6.3 Impacts on Water Supply

Where a landowner of a privately registered bore reports that their water supply is adversely and directly impacted by the abstraction of groundwater from the borefield, an investigation will be undertaken by a suitably qualified hydrogeologist. The investigation will consider the potential causes of the impact including, private landowner and mining activities, local groundwater abstraction rates, climatic conditions, condition of water supply works and assess if the impact has occurred as a result of BCOPL's operations.

Where the investigation confirms BCOPL has adversely and directly impacted the water supply, other than an impact that is negligible, a compensatory water supply will be provided to the landowner as per Schedule 3, Condition 34 of SSD 09_0182. The types of compensatory water supply to be made available may include financial provisions, alternative water supply provisions or other 'make good' provisions and will be developed in consultation with the landowner and DPHI.

6.4 Groundwater Seepage from BCM

The water quality values recorded during seepage and leachate monitoring outlined in **Section 4.8** will be assessed against the mining area monitoring bore triggers, ANZECC guideline values and compared against historical trends. The results of this assessment will be included in the Annual Review (**Section 8.2**). Where groundwater seepage values exceed the relevant trigger values or a trend in water quality values is identified, a suitably qualified hydrogeologist will undertake a review of the potential cause(s) of the exceedance and provide recommendations for the implementation of further monitoring and management measures.

Reporting of any groundwater incidents and the outcomes of management measures will be included in the Annual Review (**Section 8.2**).

6.5 Impacts on Groundwater Dependent Ecosystems

The Namoi Alluvial WSP and MDB Porous WSP includes various high priority GDEs within proximity to the BCM. A GDE impact assessment was completed for the BCM in 2021 to consider the potential impacts of the changes to mining operations at BCM will result in any impacts to the high priority GDEs located along several drainage features within the area. The maximum cumulative drawdown in the water table associated with MOD 8 is predicted to occur beneath the potential high priority GDEs. However, it has been determined that the GDEs present are proportionally dependent on groundwater and will not be adversely affected by cumulative drawdown from mining operations within the BTM Complex (AGE 2022).

The approach to monitor GDE health and function in conjunction with groundwater levels is outlined in **Section 5.4**. If vegetation conditions are assessed to fluctuate beyond the boundaries of the probable mean of the baseline conditions, a preliminary investigation will be undertaken, including a review of site activities, monitoring results, streamflow and meteorological conditions and any changes to land in the vicinity of the GDEs. If considered to be the appropriate course of action following the preliminary investigation, a suitably qualified hydrogeologist and/or ecologist will be commissioned to assess the potential impacts.

Following investigation by a suitably qualified hydrogeologist and/or ecologist, a contingency plan will be developed to remediate the impact in consultation with the relevant agencies as required. The results and response to the investigation will be reported in the Annual Review (**Section 8.2**). The GWMP will be reviewed and revised as necessary, following the investigation and implementation of the contingency plan. If the investigation identifies that the BCM will have /has had irreversible adverse impacts to the GDE vegetation (i.e. in the case of tree death), an offset plan will be developed in consultation with NSW DCCEEW - CPHR and DPHI to compensate for any loss of native vegetation in accordance with the NSW Biodiversity Offsets Scheme.

6.6 Contingency and Improvements

Where monitoring indicates unexpected impacts and consequences, BCOPL (in conjunction with other mines within the BTM Complex (as required)) will commission a suitably qualified specialist to conduct a review of relevant monitoring information to identify the potential cause of the impact.

This investigation will include:

- The extent of the potential water issues;
- The receiving environment of the potential water issue; and
- The timeframe of the potential water issue.

Best endeavours will be implemented to determine the possible cause of the exceedance and implement measures to rectify the exceedance where possible. The results of the investigation including the identified measures to rectify the exceedance will be reported to the relevant external agencies as described in **Section 9.0.**

If BCM is confirmed to have caused the impact, recommendations for the implementation of additional monitoring or mitigation measures will be provided. BCOPL will consult with the DPHI and NSW DCCEEW - Water (and/or the relevant regulator) on the outcomes of such reviews prior to the implementation of any recommended monitoring or mitigation measures. These measures will then be included within the next revision of this GWMP as part of efforts to continually improve the environmental performance of the BCM.

6.7 Cumulative Impacts

Management of the cumulative impacts associated with mining within the area are addressed in the BTM Complex Water Management Strategy.

7.0 FINAL VOID

The BCM EA (Hansen Bailey, 2010) explains that a final void will remain to the north of the Project Boundary shaped to ensure that the final landform is safe stable and non-polluting with a catchment area of approximately 413 ha and a surface area of up to 120 ha. If mining is to cease following the 21 year approval period, the final void will be filled to RL 285 which is a higher level than pre mining groundwater levels. It was envisaged within the BCM EA and associated Groundwater Impact Assessment (AGE, 2010) that partially infilling the final void to a level higher than the pre-mining groundwater levels would effectively avoid the development of a long-term pit lake within the final void. It is understood that during wet weather conditions, runoff from the catchment area which is unable to be diverted around this lower lying area may establish, an ephemeral lake that has very limited connectivity to the underlying aquifer and will gradually fill with runoff.

The Conceptual Final Landform for MOD 8 resulted in some changes to the size and location of the final void, albeit will continue to align with the Rehabilitation Objectives for the Final Void landform as outlined within Schedule 3 Condition 69 of the SSD 09_0182. This includes the requirement for the final landform to be developed to minimise the size and depth of the final void as far as reasonable and feasible and to ensure the void contains no retained surface water (i.e. no pit lake).

8.0 REPORTING

8.1 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.

8.2 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 groundwater monitoring results for the reporting period and identify any exceedances of trigger levels. A review of trigger levels will also be undertaken annually and results updated in the Annual Review (Section 5.1.1) Further details of the Annual Review are documented in the WMP.

8.3 Groundwater Monitoring Reports

In accordance with Schedule 5 Condition 12 of Development Consent SSD 09_0182, BCOPL publish quarterly groundwater monitoring results to the Idemitsu website on a three-monthly basis.

The monitoring results can be found at:

https://idemitsu.com.au/mining/operations/boggabri-coal/approvals-plans-reports/

9.0 INCIDENTS, NON-COMPLIANCE AND COMPLAINT MANAGEMENT

9.1 Incident Identification and Notification

Development Consent SSD 09_0182 defines an 'incident' as a set of circumstances that:

- Causes or threatens to cause material harm to the environment; and
- Breaches or exceeds the limits or performance measures/criteria in this approval.

Exceedances of the criteria will be identified using the existing groundwater monitoring network (see **Section 8.1**) and the criteria listed in **Section 3.1**.

An investigation of the exceedance will be completed to identify BCM operations at the time of the exceedance to determine whether the exceedance was the result of the BCM or not.

In line with Schedule 14, Condition 14 of Development Consent SSD 09_0182, BCOPL will immediately notify the DPHI and any other relevant agencies after it becomes aware of an incident that was as a result of the BCM. The notification must be in writing via DPHI's Major Projects Website and must identify the development (including the application number and name) and set out the location and nature of the incident.

The conditions of EPBC 2021/8875 describe an incident as an event that has potential to impact MNES, potential or actual non-compliance with any of the of EPBC 2021/8875 conditions or conditions within plans or strategies required by EPBC 2021/8875. In accordance with Condition 34 and 35 of EPBC 2021/8875, BCOPL will notify DCCEEW within two business days of becoming aware of any incident and will specify the following information:

- The condition or commitment made in any plan required by EPBC 2021/8875 that has not been, or may not have been complied with;
- A brief description of the incident; and
- The location, date and time of the incident.

Within 12 business days of becoming aware of the incident, BCOPL are required to provide DCCEEW with the following information:

- Potential impacts of the incident;
- Corrective measures and investigations undertaken to address the incident;
- The method and timing of any corrective measures implemented; and
- Any variation to the conditions or a management plan or strategy required under EPBC 2021/8875.

9.2 Non-compliance Notifications

A non-compliance occurs where BCOPL has not complied with the statutory requirements of which BCM falls under (e.g. any requirements related to groundwater as specified in Development Consent SSD 09_0182). In accordance with Schedule 5, Condition 14 of the Development Consent SSD 09_0182, within seven days of becoming aware of a non-compliance, BCOPL will notify DPHI of the non-compliance. The notification will be in writing via DPHI's Major Projects Website and will:

- Identify the development (including the application number and name);
- Set out the condition of Development Consent SSD 09_0182 that the development is non-compliant with;
- State why it does not comply and give the reasons for the non-compliance (if known); and
- Detail what actions have been, or will be, undertaken to address the non-compliance.

As noted in Development Consent SSD 09_0182, a non-compliance which has been notified as an incident will not also be notified as a non-compliance.

9.3 Complaints

A complaints management system is currently in place and is managed by BCOPL. BCOPL maintains a Community Complaints Line and online contact via the BCM website for the purpose of receiving community complaints, or enquiries.

Investigations into complaints will generally commence within 24 hours of receipt, or as soon as practical. The cause of the complaint will be analysed and actions to attempt to address the complaint taken as soon as reasonably possible. In complex cases where resolution will take more than 48 hours, BCOPL will commit to updating the community member throughout the investigation.

A summary of complaints for each operational year is available on the Idemitsu website[2]. The summaries detail the date of the complaint, details of the complaint, and actions taken by BCOPL to investigate the matter. BCOPL will continue to maintain the complaints log which will be updated monthly in accordance with Schedule 5, Condition 12, of Development Consent SSD 09_0182.

[2] https://idemitsu.com.au/mining/operations/boggabri-coal/approvals-plans-reports/

10.0 REVIEW

10.1 Review and Revision

Review of this GWMP will be undertaken in accordance with Schedule 5, Condition 5 of SSD 09_0182 within 3 months of submitting the following:

- Annual Review under Schedule 5, Condition 4 of SSD 09_0182;
- Incident report under Schedule 5, Condition 8 of SSD 09_0182;
- Audit under Schedule 5, Condition 10 of SSD 09_0182; and
- A modification to SSD 09_0182.

Where a review results in the need for revisions to this GWMP, then within 4 weeks of the completion of the revision, unless the Secretary agrees otherwise, the revised document will be submitted to the Secretary for approval.

BCOPL will revise the groundwater trigger values in this GWMP annually to include the available groundwater results. In the event the groundwater trigger values within this GWMP need to be updated, this GWMP will be submitted to DPHI for its approval.

10.2 Independent Model Review

An independent review of the groundwater model for BCM will be carried out every 3 years in accordance with Schedule 3, Condition 38(c) of SSD 09_0182 with the aim of continuously improving and validating the model with the results of the monitoring program. At the time of independent review, a comparison of monitoring results with modelled predictions will be undertaken.

11.0 ROLES AND RESPONSIBILITIES

The roles and responsibilities for implementation of this GWMP are presented in **Table 11-1**.

Table 11-1: Roles and Responsibilities

Role	Responsibility
BCOPL General Manager	Provide sufficient environmental resources to ensure the effective implementation of this GWMP.
BCOPL Manager Operations	Mining activities and groundwater management are to be undertaken in accordance with this GWMP.
BCOPL CHPP Manager	Mining activities and groundwater management are to be undertaken in accordance with this GWMP.
BCOPL Manager in charge of Environment & Community	Groundwater monitoring and mitigation measures are to be undertaken in accordance with this GWMP. Providing sufficient resources for the effective implementation of this GWMP.
BCOPL Environment Superintendent	Respond to exceedances of groundwater triggers in accordance with this GWMP. Engaging specialists to undertake studies and environmental management activities in accordance this GWMP. Coordinate the groundwater monitoring program in accordance with this GWMP. Review and updating this GWMP where required. Respond to community complaints and liaise with regulatory authorities regarding groundwater management. Make relevant employees and contractors aware of their obligations under this GWMP.
Mining Superintendents	Develop and implementing specific procedures for the employees and subcontractors under their responsibility to ensure compliance with this GWMP. Ensure all employees and subcontractors under their control are aware of their obligations under this GWMP. Provide relevant environmental data to assist BCOPL with their reporting requirements, in accordance with this GWMP.
All BCOPL Employees and Contractors	Undertake activities, as required, in accordance with this GWMP under instruction from their supervisor. Inform the BCOPL Environment Superintendent of any groundwater related issues as they arise.

12.0 REFERENCES & GUIDES

The following documents have been reviewed for input into this procedure and may be accessed for further information:

- Australasian Groundwater and Environmental Consultant Pty Ltd, (AGE) 2010. Continuation of Boggabri Coal Mine, Groundwater Assessment.
- Australasian Groundwater and Engineering, (AGE), 2018. Boggabri, Tarrawonga, Maules Creek Complex – Numerical Model Update. Prepared for Boggabri Coal and Whitehaven Coal.
- Australasian Groundwater and Environmental Consultant Pty Ltd, (AGE) 2021. Groundwater Impact Assessment, Boggabri Coal Mine MOD8 to SSD09_0182.
- Australasian Groundwater and Environmental Consultant Pty Ltd , (AGE) 2022a, Groundwater Impact Assessment, Boggabri Coal Mine MOD 8 Amendment to SSD 09_0182.
- Australasian Groundwater and Environmental Consultant Pty Ltd, (AGE), 2022b. Report on Boggabri, Tarrawonga, Maules Creek Complex Groundwater Model Update. Prepared for Boggabri, Tarrawonga, Maules Creek (BTM).
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- ANZECC, 2000. Australian and New Zealand Water Quality Guidelines, Australian and New Zealand Environment and Conservation Council.
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- Canadell, J., Jackson, R.B., Ehleringer, J.B., Mooney, H.A., Sala, O.E. and Schulze, E.D, 1996. 'Maximum rooting depth of vegetation types at the global scale', Oecologia, 108(4), 583-595.
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- Department of Land and Water Conservation (DLWC), 2002. The NSW State Groundwater Dependent Ecosystems Policy – A Component Policy of the NSW State Groundwater Policy Framework Document.
- Department of Planning and Environment – Water (DPE – Water), 2020. Water Sharing Plan for the Namoi Alluvial Groundwater Sources 2020, NSW Legislation 2020.
- Department of Planning and Environment – Water (DPE – Water), 2022. Murray-Darling Basin Porous Rock Water Resource Plan Groundwater Resource Description.
- Department of Planning, Industry and Environment, (DPIE) 2021. Groundwater Annual Report Upper Namoi Zone 4 and Upper Namoi Zone 12 Groundwater Sources – 2021.

- Department of Primary Industries (DPI), 2012. NSW Aquifer Interference Policy. Office of Water.
- Fensham, R.J. and Fairfax, R.J, 2007. 'Drought-related tree death of savanna eucalypts: Species susceptibility, soil conditions and root architecture', Journal of Vegetation Science, 18: 71-80.
- Green, D., Petrovic, J., Moss, P., Burrell, M.,2011. 'Water resources and management overview: Namoi catchment', NSW Office of Water, Sydney.
- Hansen Bailey, 2010. Environmental Assessment – Modification to Development Consent for Boggabri Coal Mine, dated August 2011.
- Hansen Bailey, 2021. Boggabri Coal Mine Modification 8 to SSD 09_0182 Modification Report prepared for Boggabri Coal Operations Pty Limited.
- Heritage Computing, 2012. Cumulative Groundwater Management Protocol for Boggabri Coal Mine, Tarrawonga Coal Mine and Maules Creek Coal Project, dated November 2011.
- James Bailey & Associates (JBA), 2022. Boggabri Coal Mine Modification 8 to SSD 09_0182 Amendment Report prepared for Boggabri Coal Operations Pty Limited.
- James Bailey & Associates (JBA), 2022. Boggabri Coal Mine Modification 8 to SSD 09_0182 Submissions Report prepared for Boggabri Coal Operations Pty Limited.
- NHMRC, NRMMC, 2011. Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy. National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra.
- NSW Government (undated). No. 8 Groundwater Quantity Management – source http://www.water.nsw.gov.au/__data/assets/pdf_file/0004/547492/policy_advice_8-gwquantitymanagement.pdf
- NSW Government, 2012. Project Approval, Section 75J of the Environmental Planning and Assessment Act 1979.
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- Parsons Brinckerhoff, 2015(a). Boggabri Coal Mine – Project Approval Modification Environmental Assessment (MOD 5), dated November 2015.
- Parsons Brinckerhoff, 2015(b). Boggabri Coal Mine – Landholder Bore Hydrocensus at Boggabri Coal Operations, dated July 2015
- Parsons Brinckerhoff, 2015(c), Site Water Balance. A report prepared by Parsons Brinckerhoff for Boggabri Coal Pty Ltd. September 2015.Standards Australia, 1998. Water quality – Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples, Australian/New Zealand Standard.
- Parsons Brinckerhoff, 2016, Boggabri Coal Modification 5 Response to Department of Environment and Energy in Regards to Groundwater Drawdown Impacts on Mines and GDES.
- SAGE Environmental Services, 2022, Private Landholder Bore Census (GW002523).
- WSP, 2021. Boggabri Coal Mine MOD 8 Groundwater Dependent Ecosystem Assessment.
- WSP, 2022. Boggabri Coal Mine Modification 8 Response to Independent Expert Scientific Committee.

12.1 BC Referenced Documents

- BCOPL Water Management Plan

- BCOPL Biodiversity Management Plan
- BCOPL Rehabilitation Management Plan
- BCOPL Rehabilitation Strategy
- BCOPL Incident Management Standard
- BCOPL Pollution Incident Response Management Plan
- BCOPL Surface Water Management Plan
- BTM Complex Water Management Strategy

13.0 ABBREVIATIONS

Abbreviation	Definition
AIP	Aquifer Interference Policy
ANZECC	Australian and New Zealand Environment Conservation Council
ANZG Guidelines	The Australian and New Zealand Guidelines for Fresh and Marine Water Quality
AWD	Available Water Determinations
BBAM	BioBanking Assessment Methodology
BCM	Boggabri Coal Mine
BCOPL	Boggabri Coal Operations Pty Limited
BMP	Biodiversity Management Plan
BOA	Biodiversity Offset Area
BTM Complex	Boggabri-Tarrawonga-Maules Creek Complex
CCC	Community Consultative Committee
CL	Coal Lease
CRD	Cumulative Rainfall Departure
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DLWC	Former Department of Land and Water Conservation
DoEE	Former Commonwealth Department of Environment and Energy (now DCCEEW)
DP&I	Former Department of Planning and Infrastructure (now DPHI)
DPE	Former NSW Department of Planning and Environment (now DPHI)
DPE - Water	Former NSW Department of Planning and Environment – Water Division (now NSW DCCEEW – Water Division)
DPHI	Department of Planning, Housing and Infrastructure
DPIW	Former NSW Department of Primary Industry – Water Division (now NSW DCCEEW – Water Division)
DRE	Former NSW Division of Resources and Energy (now Resources Regulator and MEG)
EC	Electrical Conductivity
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act, 1979*
EPL	Environment Protection Licence
EPBC Act	*Environment Protection and Biodiversity Conservation Act, 1999*

Abbreviation	Definition
EPBC Approval	Conditions of approval under the *Environmental Protection and Biodiversity Conservation Act 1999*
GDE	Groundwater Dependent Ecosystem
GL	Gigalitre
GWMP	Groundwater Management Plan
IA	Idemitsu Australia Pty Limited
LGA	Local Government Area
LLS	Local Land Services
mbgl	Metres Below Ground Level
MCCM	Maules Creek Coal Mine
MDB	Murray-Darling Basin
MDBA	Murray Darling Basin Authority
MOD 5	Project Approval Modification 5
MOD 8	State Significant Development Modification 8
MOD 9	State Significant Development Modification 9
MOD 11	State Significant Development Modification 11
ML	Mega Litre
MNES	Matters of National Environmental significance
MOP	Former Mining Operations Plan (now known as a Rehabilitation Management Plan)
NCMA	Former Namoi Catchment Management Authority (now North West Local Land Services)
NOW	Former NSW Office of Water (now DCCEEW – Water)
NSW	New South Wales
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
NSW DCCEEW - Water	NSW Department of Climate Change, Energy, the Environment and Water – Water Division
NSW DCCEEW - CPHR	NSW Department of Climate Change, Energy, the Environment and Water – Conservation Programs, Heritage and Regulation (formerly Biodiversity, Conservation and Science)
Mtpa	Million Tonnes Per Annum
NWQMS	National Water Quality Management Strategy
OEH	Former Office of Environment and Heritage (now CPHR)
PA	Former Project Approval (now State Significant Development Consent)

Abbreviation	Definition
PAC	Former NSW Planning Assessment Commission
Planning Systems SEPP	*State Environmental Planning Policy (Planning Systems) 2021*
POEO Act	Protection of the Environment Operations Act 1997
RMP	Rehabilitation Management Plan
ROM	Run of Mine
SEWPaC	Former Sustainability, Environment, Water, Population and Communities (now DCCEEW)
SSD	State Significant Development
SWB	Site Water Balance
SWMP	Surface Water Management Plan
TCM	Tarrawonga Coal Mine
VWP	Vibrating Wire Piezometer
WAL	Water Access Licence
WM Act	*Water Management Act 2000*
WMP	Water Management Plan
WMS	Water Management Strategy
WSP	Water Sharing Plan
XRD	X-ray Diffraction
XRF	X-ray Fluorescence

Appendix A
Approval Requirements

Table A-1: Project Approval Conditions

Applicable Condition	Requirement	GWMP Reference
Schedule 3 Condition 38	The Proponent shall prepare and implement a Water Management Plan for the project to the satisfaction of the Secretary. This plan must be prepared in consultation with OEH, DPI 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 …(which shall include)…	**This plan forms part of the WMP**
	(c) a Groundwater Management Plan, which includes:	
	• detailed baseline data of groundwater levels, yield and quality in the region, and privately-owned groundwater bores including a detailed survey/schedule of groundwater dependent ecosystems (including stygo-fauna), that could be affected by the project;	**See Section 3**
	• the monitoring and testing requirements specified in the PAC recommendations for groundwater management as set out in Appendix 6;	**See Section 4.9 and Section 4.10**
	• detailed plans, including design objectives and performance criteria, for the design and management of the proposed final void;	**See Section 7.0**
	• groundwater assessment criteria including trigger levels for investigating any potentially adverse groundwater impacts;	**See Section 5.0**
	• a program to monitor and assess:	
	– groundwater inflows to the open cut mining operations;	**See Section 4.7**
	– the seepage/leachate from water storages, backfilled voids and the final void;	**See Section 4.8**
	– interconnectivity between the alluvial and bedrock aquifers;	**See Section 4.3.**
	– background changes in groundwater yield/quality against mine-induced changes	**See Section 4.2 and Section 4.4**
	– the impacts of the project on: ○ regional and local (including alluvial) aquifers; ○ groundwater supply of potentially affected landowners; ○ aquifers potentially affected by the mine irrigation area ○ groundwater dependent ecosystems (including potential impacts on stygo-fauna) and riparian vegetation	**See Section 4.2 and Section 4.4** **See Section 4.2 and Section 4.4** **N.A (Not constructed)** **Section 3.4.2. and Section 4.11.**
	– alluvial groundwater and groundwater dependent ecosystems including tree canopy health, as recommended by WSP in Appendix I of *the Boggabri Coal Mine Modification to SSD 09_0182 Submissions Report* dated 28 November 2022	**See Section 4.11**
	– a program to validate the groundwater model for the project, including an independent review of the model every 3 years,	**Section 10.2**

Applicable Condition	Requirement	GWMP Reference
	and comparison of monitoring results with modelled predictions; and	
	– a plan to respond to any exceedances of the performance criteria	**Section 6.0.**

Table A-2: Project conditions of EPBC 2009/5256 – DCCEEW (formerly SEWPAC)

Applicable Condition	Requirement	GWMP Reference
15	The person taking the action must provide to the Minister for approval, the surface and groundwater management plans as identified in condition 38 of the NSW state government Project Approval dated 18 July 2012 (application no, 09-0182). The surface and groundwater management plans approved by the Minister must be implemented prior to the commencement of new mining operations	**See Table 2.2**
16	The surface and groundwater management plans must be consistent with the National Water Quality Management Strategy	**See Section 2.1.2 of WMP**
17	The person taking the action must within 6 months of this approval, in collaboration with the person taking the action to develop and operate the Maules Creek Coal Project (EPBC 2010/5566) and any other approved mines within 20km of the mine site provide written advice to the Minister demonstrating how the approved surface and groundwater management plans (specified in condition 15), addresses the cumulative impact of groundwater drawdown as a result of mining and how this may impact on the consequent health of the remnant native vegetation in the Leard State Forest, the Leard State Conservation Area and surrounding areas. In particular advice must address the following matters:	
	a. maximum amount of allowable drawdown in the alluvial aquifer	**See Section 2.2.4**
	b. drawdown in hard rock aquifer	**See Section 2.2.5**
	c. trigger levels pertaining to drawdown in the alluvial aquifer when corrective actions will be required to be undertaken	**See Section 5.1**
	d. identify the depth of root zone of the native vegetation	**See Section 3.4**
	e. monitoring to assess the ongoing quality and quantity of both surface and groundwater to identify impacts on the native vegetation	**See Section 4.0**
18	The person taking the action must within 6 months of the date of this approval, or such other timeframe as specified by the Minister, provide to the Minister a report on:	
	f. any updated modelling of surface and groundwater impacts that has been undertaken in preparing the surface and groundwater management plans	**No additional modelling has been undertaken as part of this GWMP, other than that specified in Section 10.2**
	g. how the surface and groundwater management plans address groundwater and surface water impacts on native vegetation	**Section 3.4.2**
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 on the soils	**NA***

* An irrigation management area is not currently planned for the Boggabri Coal Mine. If this changes this plan will be updated to include a risk-based assessment.

Table A-3: Project conditions of EPBC 2021/8875 – DCCEEW

Applicable Condition	Requirement	GWMP Reference
11	The approval holder must ensure that the Approved Water Management Plan required by condition 38 of the NSW Approval, includes:	**This Plan**
	a. a program to monitor alluvial groundwater and groundwater dependent ecosystem health, as recommended by WSP in Appendix I of the *Boggabri Coal Mine Modification 8 to SSD 09_0182 Submissions Report* dated 28 November 2022,	**See Section 4.11**
	b. specific performance criteria and trigger levels for alluvial groundwater and groundwater dependent ecosystem function,	**See Section 5.4**
	c. reporting procedures for the results of the monitoring program,	**See Section 8.0**
	d. a plan to respond to any exceedances of the performance criteria, and to mitigate any adverse effects of the Action, and	**See Section 6.5**
	e. a plan to offset any adverse effects to groundwater dependent ecosystems in accordance with the EPBC Act Environmental Offsets Policy or NSW Biodiversity Offset Scheme.	**See Section 6.5**
12	Prior to the commencement of coal extraction from below the Merriown Seam, the approval holder must install groundwater monitoring bores in general accordance with Attachment A and ensure:	**See Section 4.6**
	a. at least 3 bores are installed to detect changes to groundwater levels, pressure and quality within the Templemore, Nagero and Merriown seams,	**See Section 4.6**
	b. the bores installed in the alluvial sediments of Nagero Creek are capable of detecting changes to groundwater levels and quality within the alluvial sediments in Nagero Creek, and	**See Section 4.6**
	c. bores are installed that are capable of monitoring the depressurisation in the coal seams as the mining progresses.	**See Section 4.6**
13	The approval holder must ensure that the Approved Water Management Plan required by condition 38 of the NSW Approval includes the monitoring bores listed in condition 12, as part of the Groundwater Management Plan.	**See Section 4.6**

Appendix B
Groundwater Baseline Data

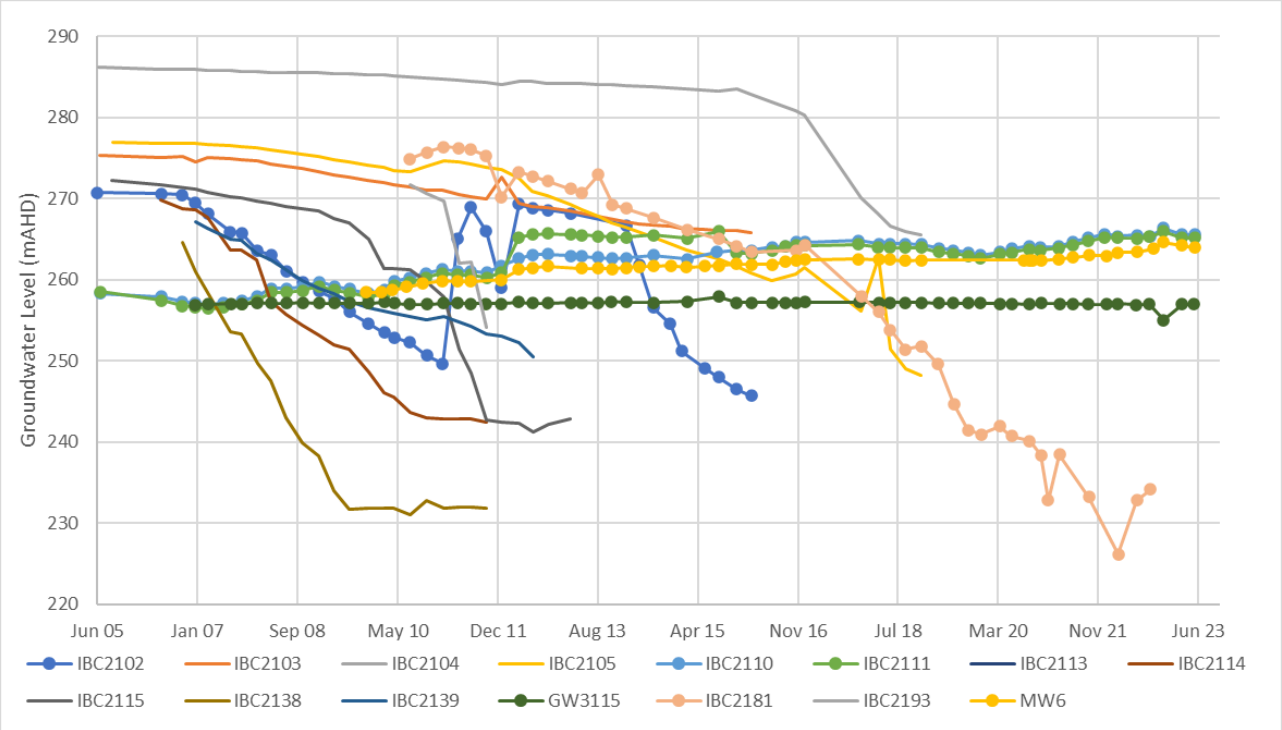
B.1 BCM GROUNDWATER DATA

B.1.1 Groundwater Levels

Groundwater levels in key monitoring bores within and surrounding the BCM have been measured since 2005. Groundwater levels for monitoring data collected between 2005 and 2023 are presented in **Figure B-1** and **Figure B-2**. Historical monitoring data from discontinued monitoring bores is included for comparison.

Groundwater levels within the Boggabri Volcanics (IBC2110, IBC2111, and GW3115) and alluvium (MW6) have continued to remain relatively stable. A clear downward trend continues for the monitoring bore within the Merriown Seam (BC2181), as mining progresses and depressurises the seam (as predicted to occur over time) as shown in **Figure B-1**.

Figure B-1: Long Term Groundwater Levels for All Bores

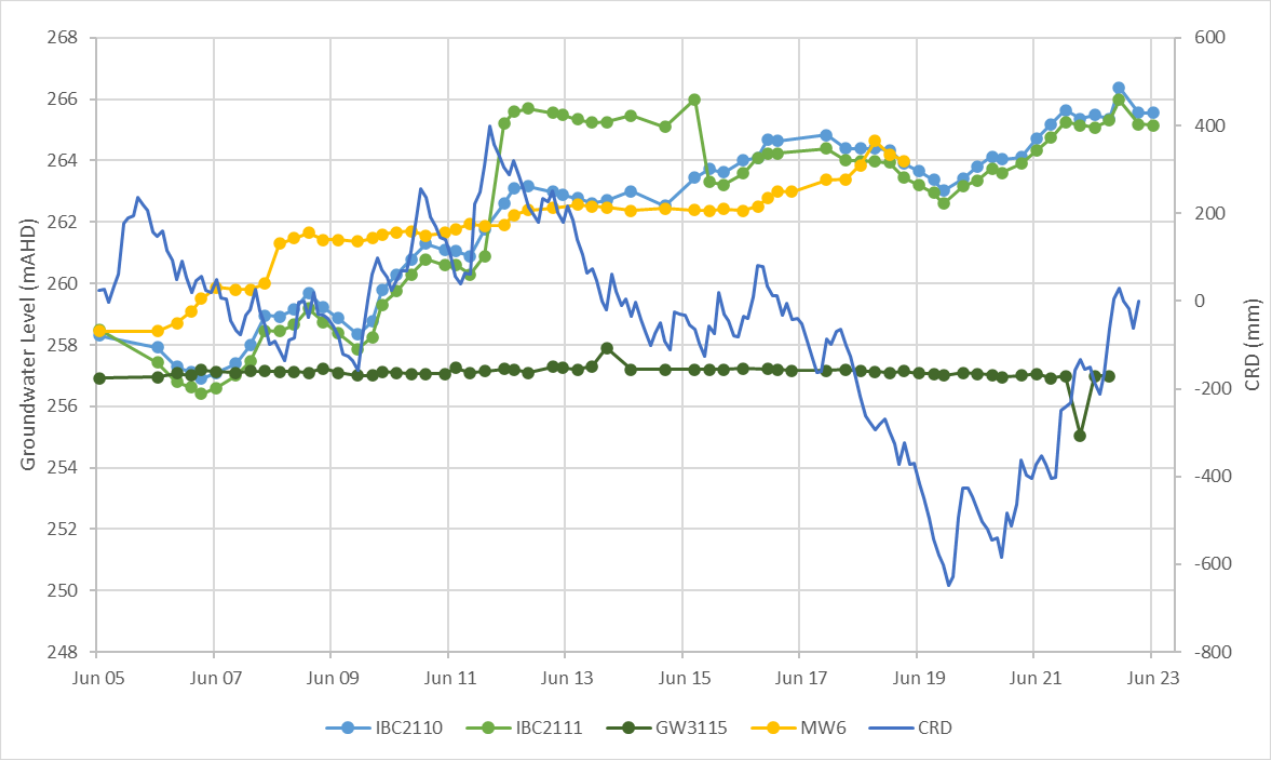


Monitoring bores installed downgradient of the mine include IBC2110, IBC2111 and GW3115 (Boggabri Volcanics) and MW6 (alluvial aquifer). Groundwater levels at these bores have been plotted with the cumulative rainfall departure (CRD) curve (based on data from Boggabri Post Office weather station (station number 055007)) as shown in **Figure B-2**. The CRD curve indicates the monthly accumulation of the difference between the observed monthly rainfall and long term average monthly rainfall. Any increase in the CRD curve reflects above average rainfall while a decrease in the CRD reflects below average rainfall.

Figure B-2 indicates the groundwater levels in the Boggabri Volcanics and the alluvium have historically responded to periods of above average rainfall. Since 2012, groundwater levels in the Boggabri Volcanics and the alluvium have remained steady or were increasing due to changes in land use in the mine infrastructure despite a falling CRD curve.

There appears to be no overall downward trend in water levels at monitoring locations in the Boggabri Volcanics and the alluvium, as would be expected in bores affected by mine dewatering.

Figure B-2: Groundwater Levels in Groundwater Monitoring Bores Down Gradient of BCM



B.1.2 Groundwater Quality

The Namoi Alluvial WSP states that the beneficial uses of the groundwater sources relevant to the BCM are raw water for drinking and agricultural use.

Land use within the Upper Namoi groundwater management area is dominated by sheep and cattle grazing. Wheat, cotton and other broad acre crops are grown along the alluvial floodplains (Green et al, 2011). The irrigated cropping areas are primarily used for cotton production (Green et al, 2011). Groundwater quality data collected from the monitoring bores has been subject to assessment against the ANZECC (2000) guidelines for stock and irrigation and Australian Drinking Water Guidelines (NHMRC, NRMMC, 2011) (presented in **Table B-1**). The values presented are not trigger values, and instead are used to put the observed water quality into regional context. Site specific trigger values for EC, pH and major ions are presented in **Section 5.0**.

Table B-1: Groundwater Assessment Criteria

Parameter	Units	Upper limit for irrigation	Upper limit for livestock b	Upper limit for drinking water
EC	µS/cm	6,000-7,700 [a]	-	1,800 [e]
pH	pH units	6-8.5	-	6.5-8.5 [e]
Total Dissolved Solids (TDS)	mg/L	4,020-5,160 [c]	3,000-13,000	1,200 [e]
Sodium	mg/L	460	-	180 [e]
Potassium	mg/L	-	-	-

Parameter	Units	Upper limit for irrigation	Upper limit for livestock b	Upper limit for drinking water
Calcium	mg/L	-	1,000	-
Magnesium	mg/L	-	600	-
Chloride	mg/L	700	-	250 [e]
Bicarbonate	mg/L	-	-	-
Sulphate	mg/L	-	1,000	250 [e] / 500 [f]
Arsenic	mg/L	0.1 [d]	0.5	0.01 [f]
Cadmium	mg/L	0.01 [d]	0.01	0.002 [f]
Chromium	mg/L	0.1 [d]	1	0.05 [f]
Copper	mg/L	0.2 [d]	0.4	1 [e] / 2 [f]
Iron	mg/L	0.2 [d]	-	0.3 [e]
Manganese	mg/L	0.2 [d]	-	0.1 [e] / 0.5 [f]
Nickel	mg/L	0.2 [d]	1	0.02 [f]
Lead	mg/L	2 [d]	0.1	0.01 [f]
Zinc	mg/L	2 [d]	20	3 [e]
Nitrogen	mg/L	5 [d]	-	-
Nitrate as N	mg/L	-	90	11 [f]
Nitrite as N	mg/L	-	9	0.9 [f]
Phosphorus	mg/L	0.05 [d]	-	-

Notes:

h. ANZECC (2000) – maximum trigger level for wheat and cotton

i. ANZECC (2000) – recommended trigger levels (low risk) for livestock drinking water

j. ANZECC (2000) – TDS value based on EC values for wheat and cotton (1 µS/cm = 0.67 mg/L)

k. ANZECC (2000) – Agricultural irrigation water long-term trigger values for heavy metals and metalloids, nitrogen and phosphorus

l. (NHMRC, NRMMC, 2011) – aesthetic criterion

m. (NHMRC, NRMMC, 2011) – health-based criterion

B.1.3 Field Parameters

Groundwater quality sampling has been carried out since 2006. Groundwater monitoring trends for pH and EC collected between 2006 and 2023 are presented in **Figure B-3** and **Figure B-4**.

Within the alluvium (MW6), pH is typically neutral (pH typically between 6.5 and 7.5), with the exception of a series of pH spikes around July 2011, February 2014, October 2014 and March 2022, which exceeded pH 8.0 (**Figure B-3**). Salinity (as EC) is generally around 2,000 µS/cm, but there is a recent upward trend associated with the rising water levels in the infrastructure area, with salinity levels reaching about 2,500 µS/cm (**Figure B-4**).

Within the Boggabri Volcanics (IBC2110, IBC2111 and GW3115), pH is generally neutral (pH 6.5 to 8.0), with spikes (exceeding pH 8.5) occurring at similar times to those in the alluvium (**Figure B-3**). EC values at GW3115 are within ANZECC guidelines for irrigation use (tolerant crops: 7,700 µS/cm) and have remained consistent since monitoring commenced.

Figure B-3: Mine Area Groundwater pH (field)

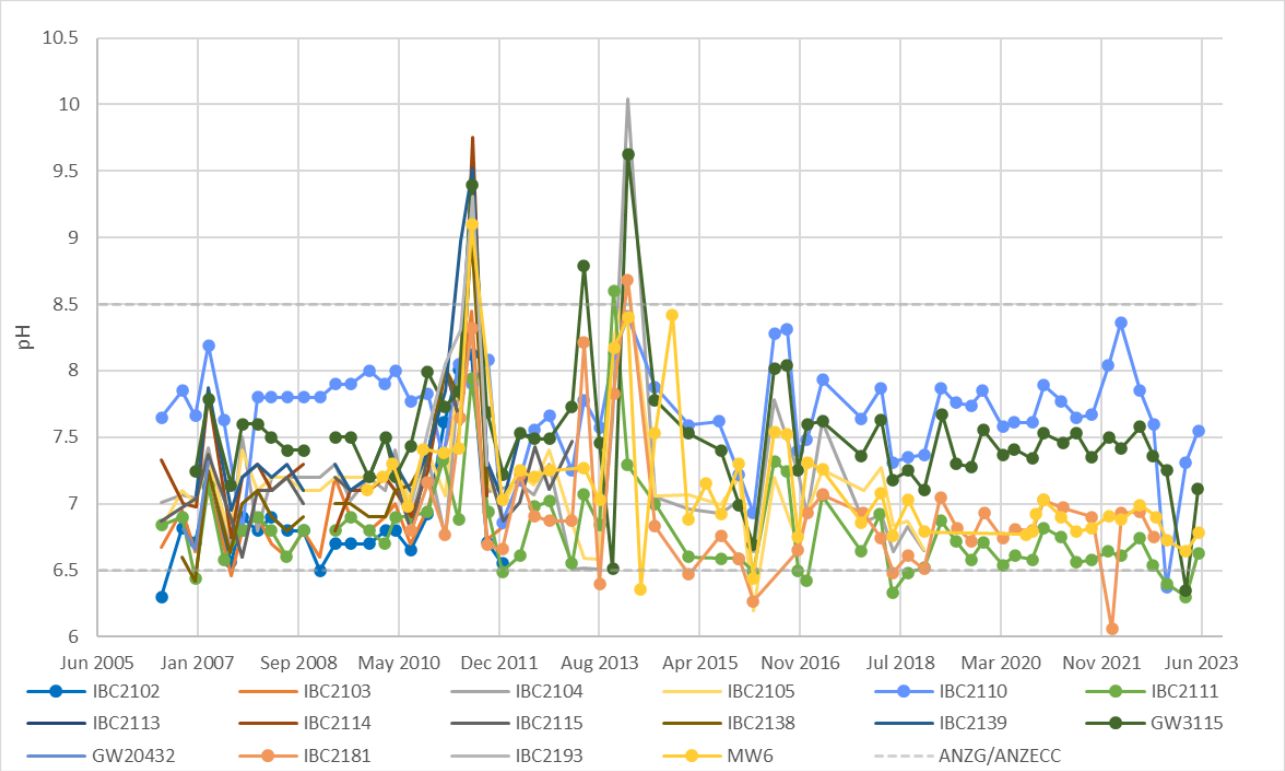
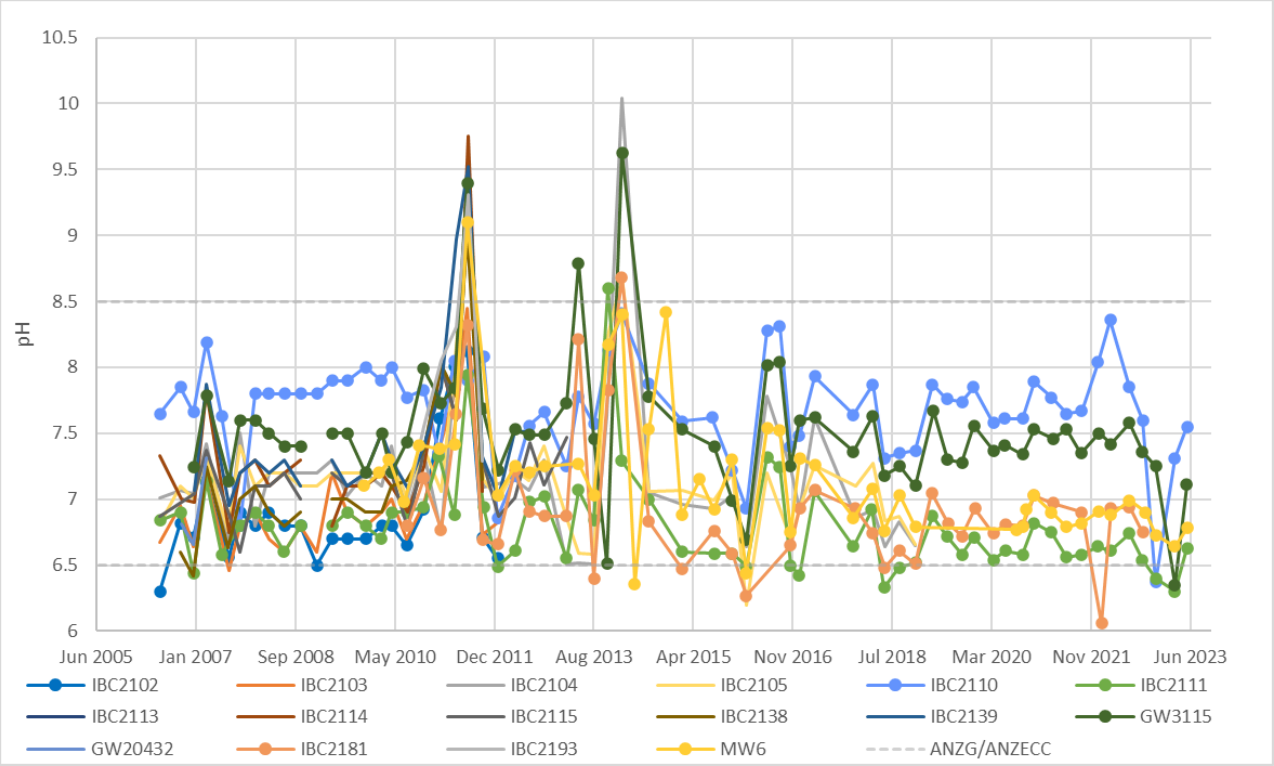


Figure B-4: Mine Area Groundwater EC (field)



The pH of groundwater in the alluvium range is generally neutral and typically within the ANZECC (2000) guideline limits for irrigation. Within the Boggabri Volcanics, the pH range is generally neutral to alkaline and typically within ANZECC (2000) guideline limits for irrigation, with the exception of GW3115, which recorded a pH value outside guideline limits once in 2014. Within the Maules Creek Formation, pH values are generally neutral to slightly alkaline and typically within ANZECC (2000) irrigation guideline limits, with the exception of one monitoring event in 2011 (IBC2114 and IBC2139), and two monitoring events during 2014 (IBC2104). These events are not considered to be representative of average groundwater conditions, as subsequent monitoring has consistently recorded a near neutral pH.

The highest EC values (2,930-3,970 µS/cm) have been measured at monitoring bore GW3115 (Boggabri Volcanics), located approximately 2.5 km west of mine workings. EC values at GW3115 are within ANZECC (2000) guidelines for irrigation use (tolerant crops) and have remained consistent since monitoring commenced. EC values in the alluvium range from 1,450 to 2,150 µS/cm, and EC in the Maules Creek Formation ranges from 300 to 3,050 µS/cm.

B.1.4 Major Ions

Groundwater in the alluvium is dominated by sodium, bicarbonate and chloride ions. There have been no significant long term trends identified for the major ions at MW6. Chloride and sodium ion levels have previously exceeded the aesthetic criterion (NHMRC, NRMMC, 2011) but has remained below the upper limit for irrigation.

The dominant water ions within the coal seam bores of the Maules Creek Formation are sodium and bicarbonate and to a lesser extent calcium, magnesium and chloride. Sodium levels at monitoring bore IBC2139 have consistently been above the irrigation guideline upper limit of 460 mg/L (ANZECC, 2000). Historically, four of the eleven Maules Creek Formation monitoring bores have detected sodium levels consistently greater than the aesthetic criterion of 250 mg/L (NHMRC, NRMMC, 2011) as shown in **Figure B-5**.

The dominant water ions within the Boggabri Volcanics are sodium, bicarbonate (**Figure B-6**) and chloride, with IBC2111 showing relatively high calcium concentrations. Sodium concentrations have consistently been above the aesthetic criterion of 180 mg/L (NHMRC, NRMMC, 2011) for the aquifer, but only GW3115 has consistently recorded sodium concentrations higher than the upper guideline limit for irrigation (ANZECC, 2000). Exceedances of aesthetic drinking water criterion for chloride (250 mg/L: NHMRC/NRMMC 2011) has consistently occurred at monitoring bores installed in the Boggabri Volcanics since mid-2013. Additionally, chloride at GW3115 has exceeded the ANZECC (2000) irrigation guideline upper limit (700 mg/L) on three occasions (**Figure B-7**).

All results at all monitoring bores have been below the health-based drinking water criterion for Sulphate as SO42- (500 mg/L: NHMRC/NRMMC 2011) (**Figure B-8**).

Figure B-5: Long Term Groundwater Sodium

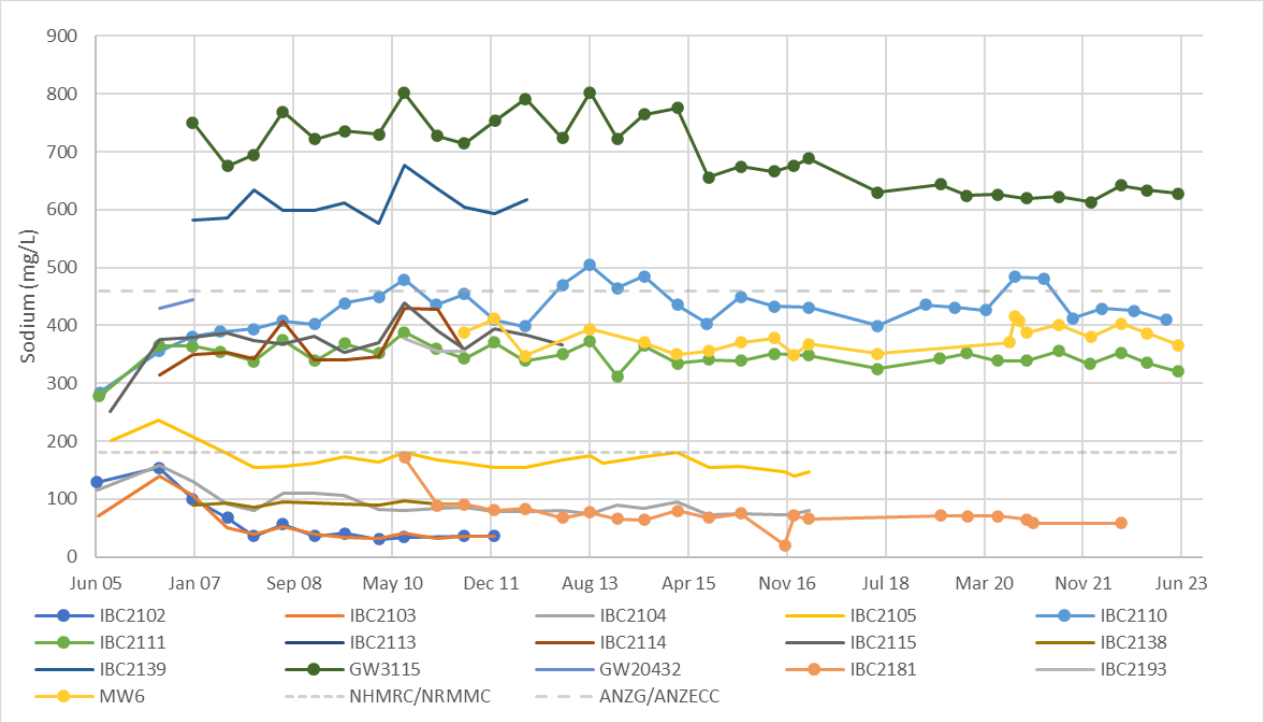


Figure B-6: Long Term Groundwater Bicarbonate

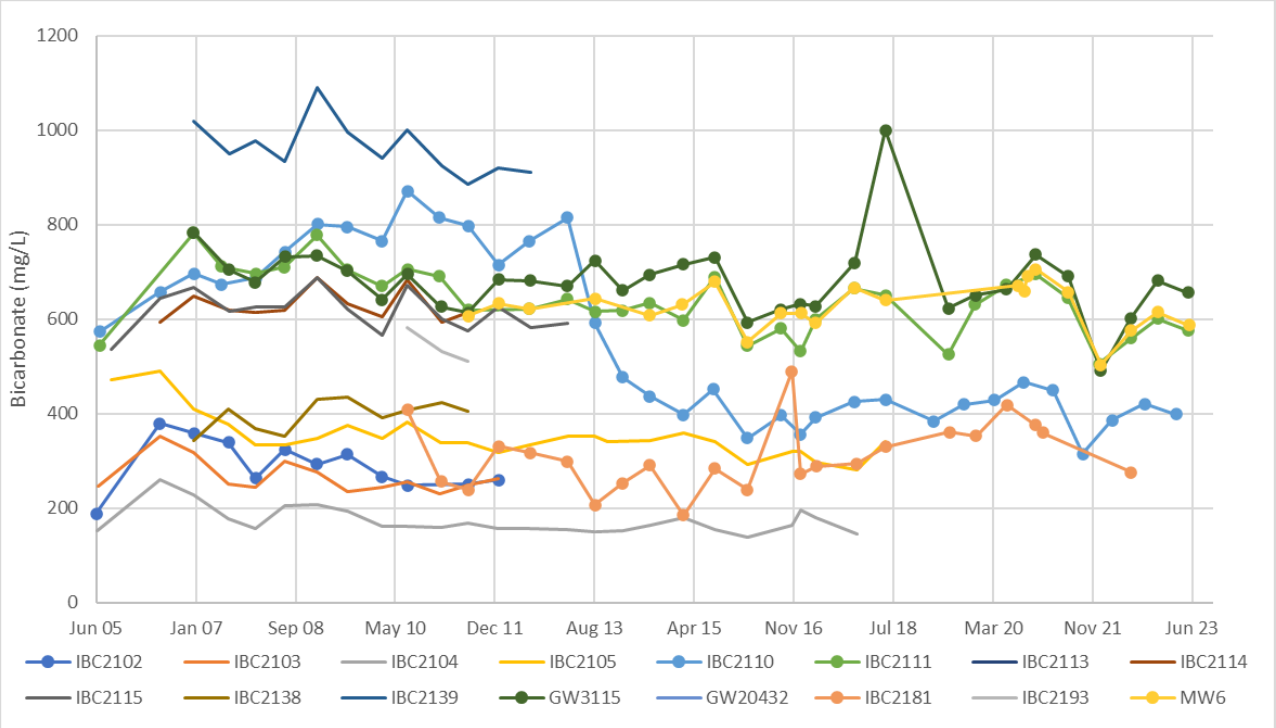


Figure B-7: Long Term Groundwater Chloride

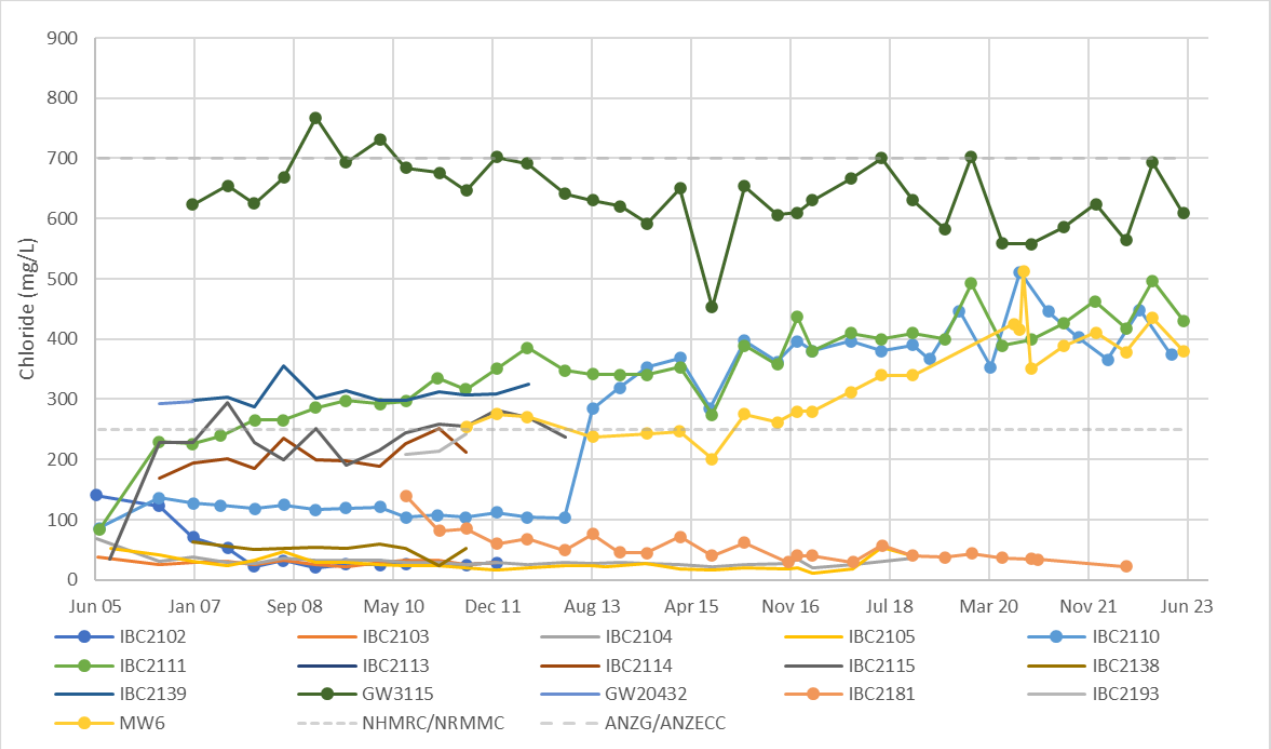
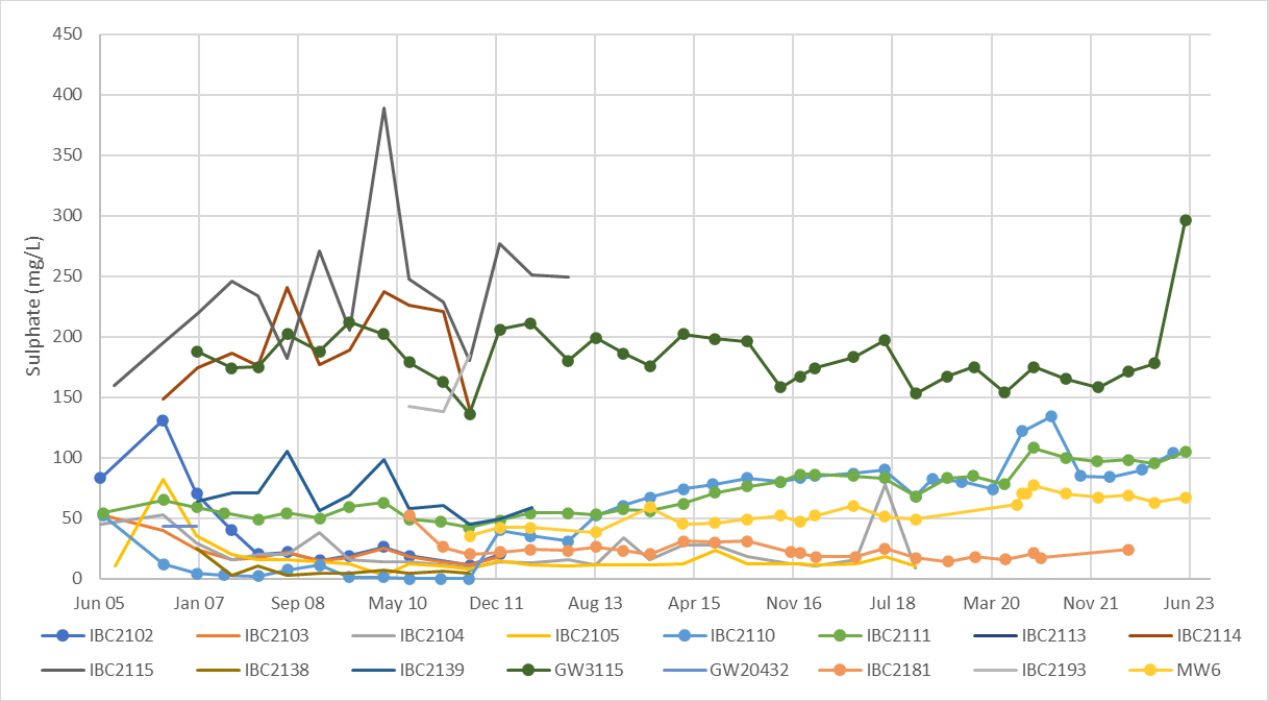


Figure B-8: Long Term Groundwater Sulphate



B.1.5 Metals

Dissolved metal concentrations have historically been below the nominated ANZECC (2000) guidelines for all metals in MW6. They have also been below NHMRC & NRMMC (2011) health based criterion limits for the Maules Creek Formation monitoring bores, with the exception of two instances whereby spikes of arsenic and lead were recorded (although levels remained below the ANZECC (2000) guidelines for livestock). **Figure B-9** illustrates the long term groundwater arsenic monitoring results and **Figure B-10** illustrates the long term groundwater lead monitoring results within the BCM monitoring bores.

Iron levels have been recorded above the ANZECC (2000) guideline concentrations (<0.2 mg/L) for long term irrigation within bores IBC2102, IBC2103, IBC2105, IBC2110, IBC2114, INC2115, IBC2138 and BC2181 as shown in **Figure B-11**. Elevated iron concentrations are typical for the Boggabri area.

Figure B-9: Long Term Groundwater Arsenic

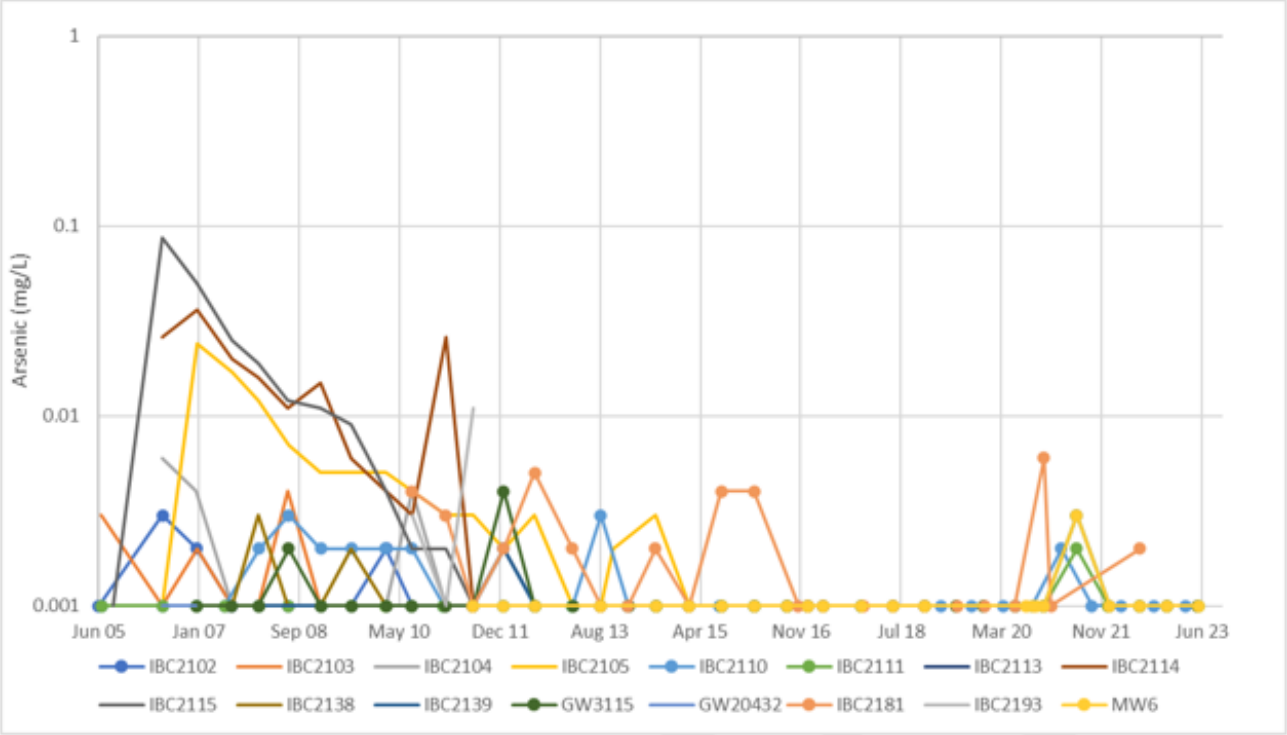


Figure B-10: Long Term Groundwater Lead

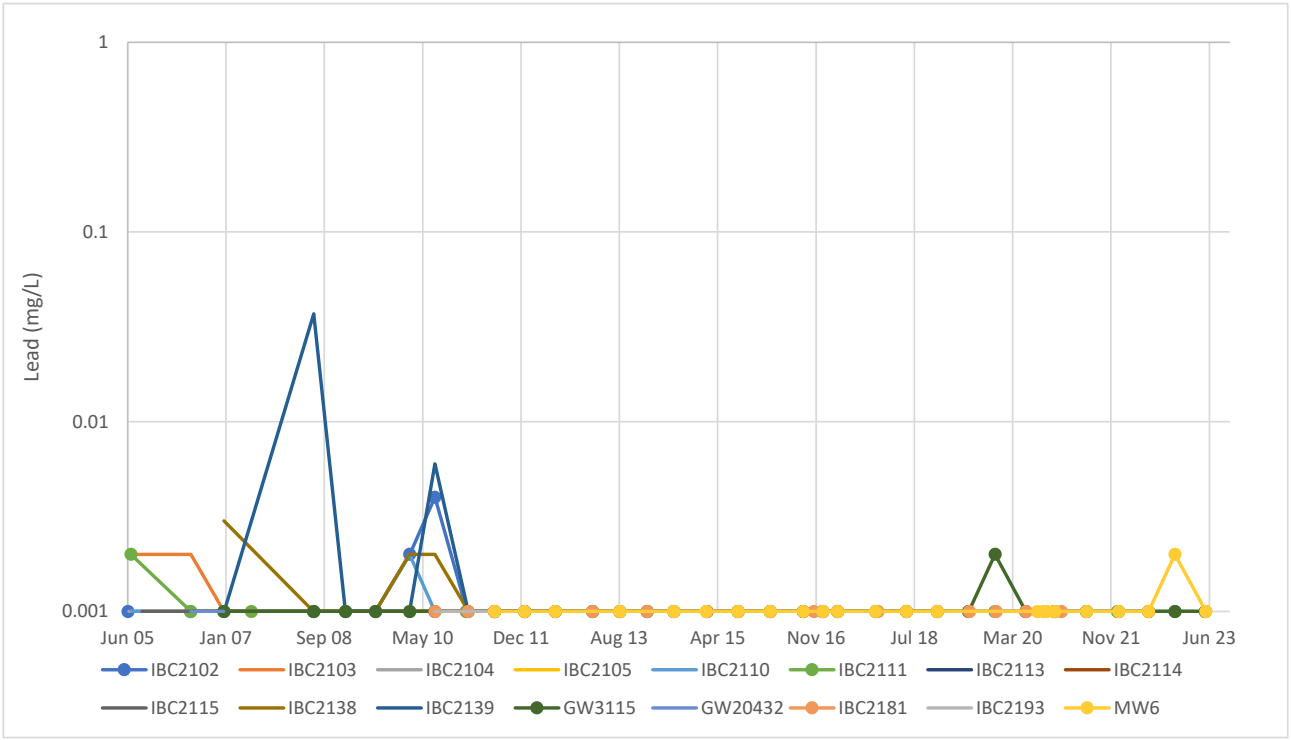
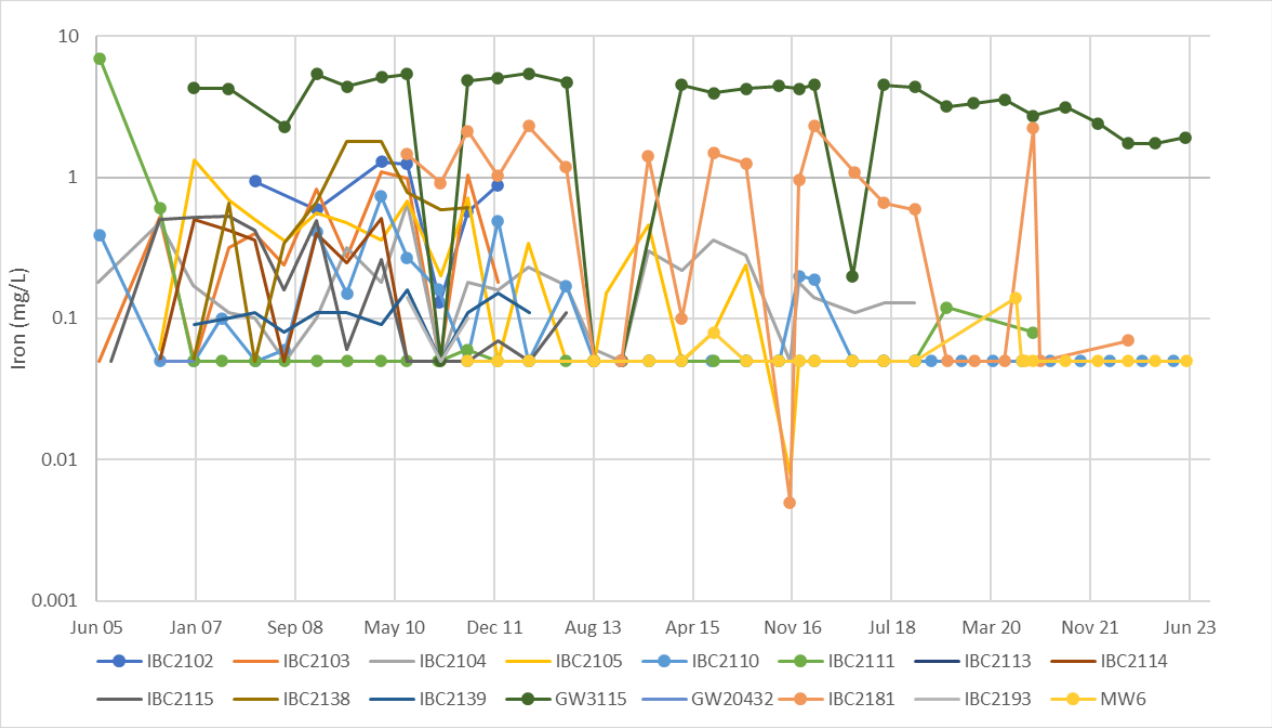


Figure B-11: Long Term Groundwater Iron



B.1.6 Nutrients

No monitoring bores have recorded nitrate or nitrite values over the nominated NHMRC & NRMMC (2011) guideline limits except for the nitrogen upper irrigation limit (5 mg/L. NHMRC/NRMMC 2011) at bores IBC2111 and IBC2181. Increasing trends for nitrate were recorded at monitoring bore IBC2111 (Boggabri Volcanics), but concentrations are still below the guidelines for health-based criteria (NHMRC, NRMMC, 2011). Increasing trends for ammonia were recorded at monitoring bores IBC2110 (Boggabri Volcanics) and IBC2103 and IBC2139 (Maules Creek Formation).

There has been some variability in ammonia concentrations at IBC2110 (Boggabri Volcanics) and IBC2181 (Maules Creek Formation), which have exceeded the NHMRC/NRMMC (2011) aesthetic limit (0.5 mg/L) as shown in **Figure B-12**. Despite the variability, visual review of monitoring data does not indicate any increasing trend at these sites.

Phosphorus levels at monitoring bores MW6 (Alluvial), IBC2102 (Maules Creek Formation), and IBC2110 and IBC2111 (Boggabri Volcanics) are consistently above the ANZG (2018) / ANZECC (2000) irrigation guideline value for total phosphorus (0.05 mg/l) as shown in **Figure B-13**.

Figure B-12: Long Term Groundwater Ammonia

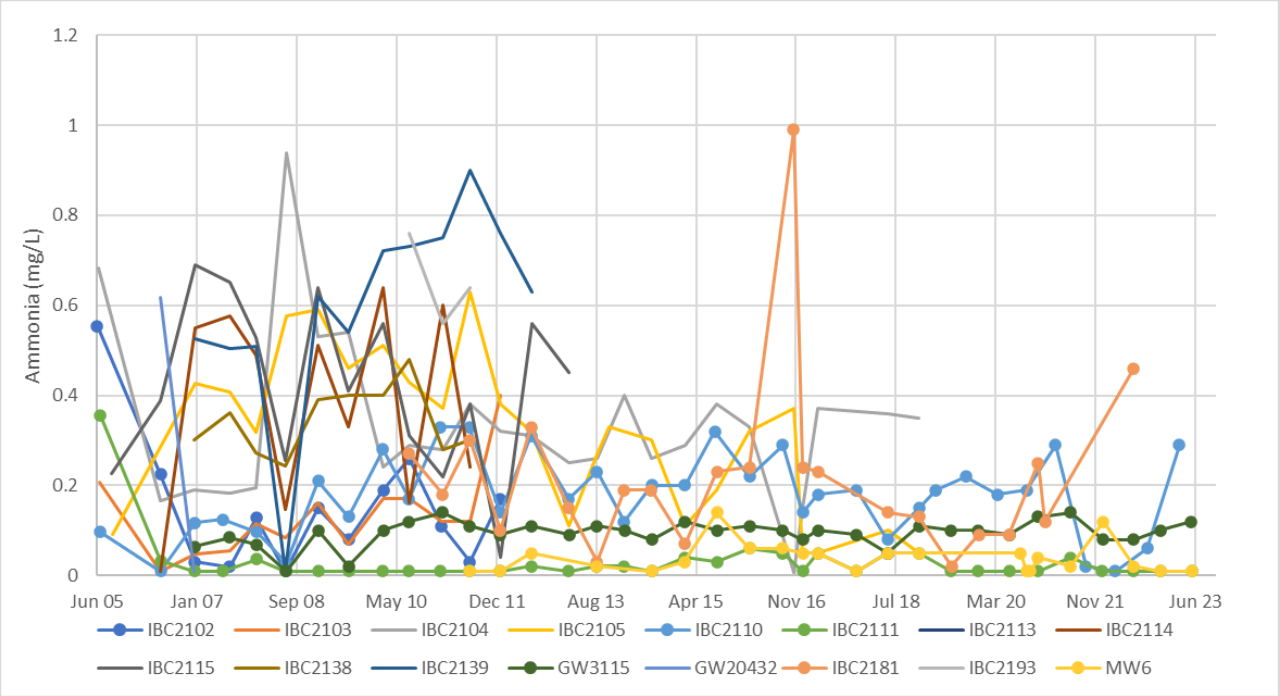
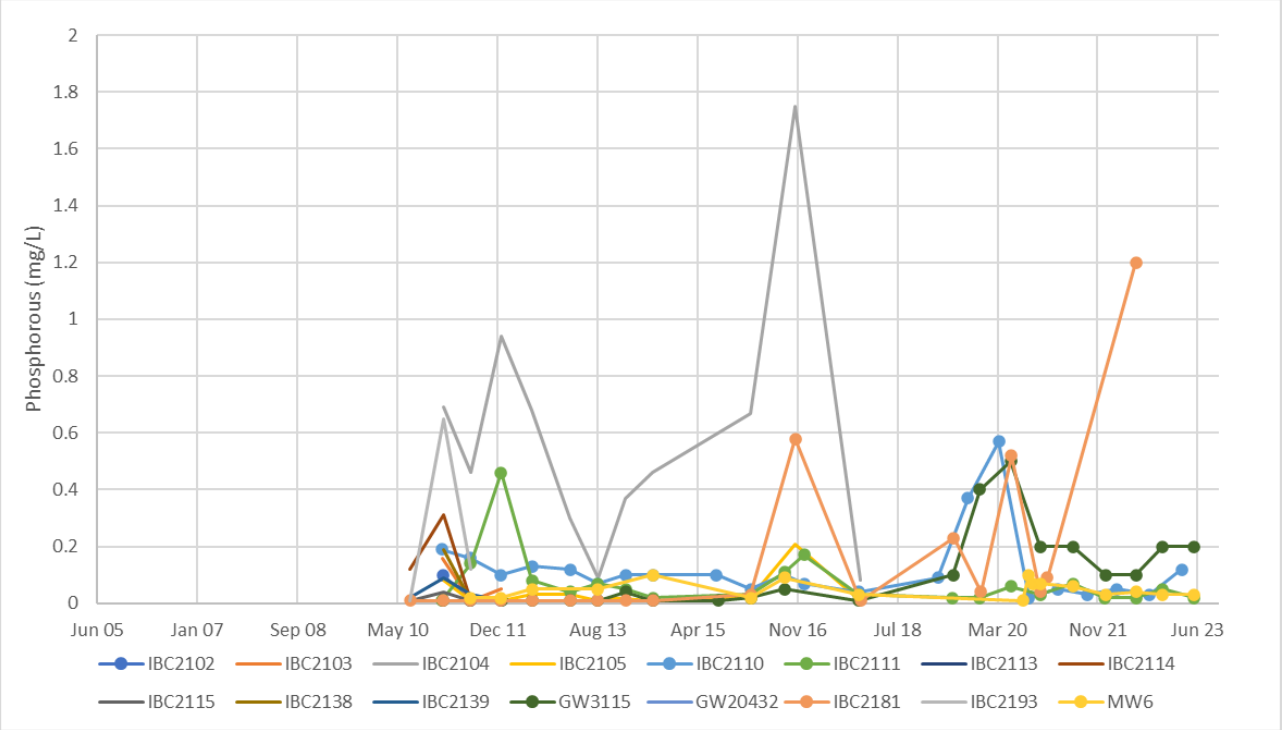


Figure B-13: Long Term Groundwater Phosphorous



B.1.7 Survey and Assessment of Impacts on Groundwater Dependent Ecosystems

The groundwater assessment completed by AGE (2022) indicated that there is a high potential for the presence of aquatic and terrestrial groundwater dependent ecosystems (GDEs) within or surrounding the Project Area. The MDB Porous WSP and the Namoi Alluvial WSP consider the high potential terrestrial GDEs as high priority GDEs under the WM Act.

The GDE mapping was compared to the depth of the water table that is variable in nature. Ecological assessments of the GDEs identified the flora species immediately surrounding the BCM Complex not to be groundwater dependent which is consistent with the water table depth greater than 20 mbgl (AGE 2022).

Field surveys of the Bollol Creek and Goonbri Creek terrestrial GDEs were undertaken by WSP in September 2022 (WSP, 2022). One terrestrial Plant Community Type (PCT) was recorded within the survey area, PCT 112 Black Tea-tree – River Oak – Wilga riparian low forest/shrubland wetland. The study found that the health of all of the trees within the Bollol and Goonbri Creeks were in good condition with no die back or dead trees present. The assessment concluded that the current condition of PCT 112 was moderate (WSP, 2022).

A baseline stygofauna survey was undertaken in 2022 as part of the MOD 8 approvals (WSP, 2022). A total of 18 groundwater bores in the vicinity of Nagero Creek, Bollol Creek, Goonbri Creek and the Namoi River were surveyed. The survey found that the overall water quality within the surveyed bores was optimal for supporting stygofauna and confirmed the presence of two stygofauna species including Parabathynellidae and an Isopod. A range of taxa were also identified in the survey with the possibility of being stygofauna and further investigation is proposed. The assessment concluded that MOD 8 is not likely to significantly impact stygofauna associated within the alluvium (WSP, 2022).

Appendix C
Record of Consultation

DOC24/275475

17 April 2024

BOGGABRI COAL OPERATIONS PTY LTD
PO BOX 12
BOGGABRI, NSW, 2382

Attention: Ms Alex Williams

Email: bclbgi-environmental@boggabricoal.com.au **BY EMAIL**

Dear Ms Williams,

Boggabri Coal Operations Pty Ltd, Air Quality and Greenhouse Gas, Blast, Noise and Groundwater Management Plans

The Environment Protection Authority (EPA) refers to the abovementioned Management Plans, (the Plans). The Plan were provided to the EPA for review and are a requirement of the Development Consent for the Boggabri Coal Mine, located at 386 Leard Forest Road, BOGGABRI, NSW, 2382 (the premises).

The Environment Protection Authority (EPA) thanks you for providing the Plans for our records.

The EPA encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, the EPA does not review, approve or endorse these documents as our role is to set environmental objectives for environmental/ conservation management, not to be directly involved in the development of strategies to achieve those objectives.

Please note that it is a requirement for activities at the premises to remain consistent with relevant approvals, Environment Protection Licence No. 12407 and the *Protection of the Environment Operations Act 1997*.

If you have any questions regarding this matter, please contact me on 131 555 or by email to info@epa.nsw.gov.au, marked to Ross Briggs' attention.

Yours sincerely

ROSS BRIGGS
Acting Head Regional Operations Unit
Regulatory Operations Regional - West
Environment Protection Authority

Department of Planning, Housing and Infrastructure

Our ref:

MP09_0182-PA-71

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

14/08/2024

Boggabri Coal - Groundwater Management Plan

Dear Ms. Williams

Reference is made to your post approval matter, MP09_0182-PA-71, Groundwater Management Plan, submitted as required by Schedule 3, Condition 38(c) of Boggabri Coal (MP09_0182 as modified (the consent) to the NSW Department of Planning, Housing and Infrastructure (NSW Planning) on 22 January 2024.

NSW Planning has reviewed Groundwater Management Plan and considers more information is required to satisfy the condition of consent. Under the provisions of Schedule 3, Condition 38(c) of the consent, I, as nominee of the Planning Secretary, request that an amended Groundwater Management Plan be submitted as a response to this request for information (RFI-747431218) addressing the comments in the 'Action Required' column attached in the Review Table by 6 September 2024 or as otherwise agreed by the Planning Secretary).

Should you wish to discuss the matter further, please contact Charissa Pillay, (Senior Planner) on 02 99955944 or email charissa.pillay@planning.nsw.gov.au

Yours sincerely

Wayne Jones
Team Leader - Post Approval
Resource Assessments

As nominee of the Planning Secretary

Department of Climate Change, Energy, the Environment and Water

Our ref: DOC25/240180

Leticia Tolson
Environmental Operations Superintendent
Boggabri Coal Operations Pty Limited
leticia.tolson@boggabricoal.com.au

Dear Leticia

Boggabri Coal Mine Water Management Plans

Thank you for your referrals through the Major Projects Portal to the Conservation Programs, Heritage and Regulation Group (CPHR), formerly the Biodiversity, Conservation and Science Group (BCS), of the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) inviting comments on the Boggabri Water Management Plans.

CPHR has commented on previous water management plans which have subsequently been approved. In this instance we have reviewed the:

- Water Management Plan
- Surface Water Management Plan
- Groundwater Management Plan
- Site Water Balance Report.

CPHR have no comments to make on these plans other than to point out an error in the editing of the Site Water Balance Report.

Section A.1 states "*Rainfall during the 2023 calendar year was generally drier than typical conditions with most months exceeding the historical median value at Boggabri Post Office gauge*". This is then emphasised by the statement "*The 2023 annual rainfall total at the site gauge of 453 mm is approximately equivalent to a 20th percentile rainfall year based on the 135 years of rainfall data at the Boggabri Post Office gauge*". The data provided indicates that the historical mean was not exceeded.

If you have any questions about this advice, please do not hesitate to contact David Geering, Senior Conservation Planning Officer, via david.geering@environment.nsw.gov.au or (02) 6885 0335.

Yours sincerely,

Candice Larkin
A/Senior Team Leader Regional Conservation, North West
Conservation Programs, Heritage and Regulation Group

21 March 2025

From: Mal Scott
Sent: Thursday, 10 April 2025 12:31 PM
To: Leticia Tolson
Cc: Tim McDermott
Subject: RE: Boggabri Coal Surface Water Management Plan Consultation - NWLLS

Hi Leticia,
I have reviewed

- Site Water Balance
- Water Managment Plan
- Surface Water Manamgent Plan
- Ground Water Management Plan

North West Local Land Services and have nothing further to add to the four plans.

Thank you for the opportunity to review and comment.

Regards

Mal Scott

Mal Scott | Team Leader TSR's
North West Local Land Services
101 Barwan Street | Narrabri | NSW 2390
PO Box 466 | Narrabri | NSW 2390
W: northwest.lls.nsw.gov.au

From: Boggabri Coal CCC
Sent: Wednesday, 23 April 2025 12:26 PM
To: Michael Silver
Subject: Water Management Plan, Surface Water Management Plan, Groundwater Management Plan and Site Water Balance

Dear CCC Member,

Boggabri Coal has advised it is updating its water management plans and is required to advise the CCC of the proposed amendments. Updates of the Water Management Plan, Surface Water Management Plan, Groundwater Management Plan and Site Water Balance have been undertaken. The following commentary provides a summary of the amendments.

Accordingly, Boggabri Coal has advised as follows:

Boggabri Coal is currently revising all water management plans upon the federal approval of Modification 8 (EPBC 2021/8875). This approval requires all management plans to include conditions around protecting water resources and these plans must be revised and approved prior to deeper mining.

See below summary of changes for each plan:

Water Management Plan
Administrative updates to the overarching document and repeated information removed.
Approval conditions updated.
Updated reporting requirements.

Surface Water Management Plan
Updated approval conditions
Administrative changes
Updates to performance criteria and trigger levels

Updated reporting requirements
Updated monitoring location

Groundwater Management Plan
Updated approval conditions
Administrative changes
Updates to performance criteria and trigger levels
Details around GW monitoring bores to be drilled.

Site water balance
Updated approval conditions
Administrative changes
Routine updates to the model based on 2024 data.

It will be appreciated that these are extensive documents, however Boggabri Coal have advised a copy of the management plans can be provided if requested. Please let me know if you require copies or extracts from the documents.

Michael J Silver OAM
Chair
Boggabri Coal Community Consultative Committee
P.O. Box 37
Gunnedah NSW 2380

Our ref: OUT25/4436

Tim McDermott
Boggabri Coal
Email: Tim.McDermott@boggabricoal.com.au

15 April 2025

Subject: **Boggabri Coal (MP09_0182) Groundwater Management Plan dated Feb 2025**

Dear Tim McDermott,

I refer to your request for advice sent on 13 March 2025 to the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) Water Group about the above matter.

NSW DCCEEW Water Group has reviewed the Groundwater Management Plan and has recommendations regarding:

- Water licensing, extraction points and approvals for the borefield.
- Monitoring and management of impacts to groundwater dependent ecosystems.

Please see Attachment A for further detail. DCCEEW Water considers a meeting would be most effective to discuss and progress these matters and will make contact to arrange a suitable time.

Should you have any further queries in relation to this submission please do not hesitate to contact NSW DCCEEW Water Assessments water.assessments@dpie.nsw.gov.au.

Yours sincerely

Rob Brownbill,
Manager, Water Assessments, Knowledge Division
NSW Department of Climate Change, Energy, the Environment and Water

Attachment A

Detailed advice to Boggabri Coal regarding the Groundwater Management Plan dated February 2025

1.0 Bore use, impact assessment and management

1.1 Recommendation – prior to approval

The proponent should review and update the references in the Groundwater Management Plan (GWMP) to water supply work approvals and extraction points that relate to the borefield. This is to ensure consistency between the GWMP and the Departments database, and clear identification of all works and their relevant approvals.

Explanation

There is insufficient information to confirm which water supply works are being used for the project and there are inconsistent bore references in the report. The following aspects require review and clarification:

- Table 2-1 and Table 4-3 provide conflicting information regarding work approval references for different bores. Tables must be reviewed to ensure correct work approvals are listed and bores identified. An example of this is Table 2-1 which identifies the Cooboobindi and Victoria Park bores as 90CA807034, but Table 4-3 identifies Cooboobindi production bore as 90CA807015 and Victoria Park bore as 90BL256305.
- Table 4-3 lists the Victoria Park production bore as 90BL256305 which has a condition that it is only for groundwater investigation. As such, this reference should not be used for this production bore.
- Bores identified, assessed and approved under Modification 5, are eligible for a miscellaneous work. Miscellaneous work 90MW833038 was issued after approval of modification 5 for a number of bores but the information appears to be out of date or incorrect. A review of the bores which should be included on 90MW833038 is recommended as it may allow the cancellation of works approvals if the works are duplicated.
- The proponent notes in Section 3.3 that the Daisymede bore has been decommissioned. The relevant approvals should be updated to reflect this.
- There is reference to owned bores on the Roma and Brighton properties and Bellview bores. If these are used by Boggabri Coal they should be referenced in the management plan.
- Applications to amend held water supply works approvals or miscellaneous works, notifications of decommissioned bores (supported by decommission information required by approval conditions) or notification of intention to surrender held

water supply work approvals should be submitted to the department's Water Group Licensing & Approvals team (waterlicensing.servicedesk@dpie.nsw.gov.au).

1.2 Recommendation – prior to approval

The proponent should:

- Update the GWMP to include the specific extraction limit conditions as determined by the former DPI Water for the 'Daisymede' and 'Cooboobindi" bores.
- Confirm where an assessment by DCCEEW Water has or has not been carried out for the bores currently being or proposed to be used for the Boggabri Coal mine.
- Submit relevant dealing applications to authorise use of bore/s which are yet to undergo an impact assessment by DCCEEW Water.

Explanation

The GWMP currently does not reference extraction limits as defined by assessments and approvals under water legislation. Extraction limit conditions were referred to in DPI Water correspondence dated 11 May 2017 on a previous Water Management Plan revision and relate to extraction limit conditions on water supply work approval 90CA807034 and the outcome of dealing D1013551.

It is understood from Boggabri's documentation that only 'Daisymede' bore is currently operational, and that others are either proposed production bores or contingency bores. This should be confirmed.

The GWMP and the Mod 5 assessment documentation refer to a third production bore, Victoria Park, and four other contingency bores. However, according to DCCEEW Water's records, Boggabri Coal has not applied for any of these bores to be included on Miscellaneous Work 90MW833038. Therefore, an assessment of taking water from these bores has not been carried out. The impact assessment process for these bores was outlined in DPI Water's submissions on the Mod 5 project.

DCCEEW Water has identified that the 'Roma Bore' is referenced in an impact assessment for approval 90CA807023. However, this site appears to be owned by Whitehaven Coal so clarification on the use of this bore for Boggabri Coal is requested.

1.3 Recommendation – post approval

The proponent must ensure that relevant nomination of work dealing applications for Water Access Licences proposed to account for water take by the project have been completed prior to the water take occurring.

Explanation

WAL 42234 is not currently linked to an extraction point. Dealing applications to nominate water supply works or extraction points must be submitted to WaterNSW.

2.0 Groundwater dependent ecosystems

2.1 Recommendation – prior to approval

The proponent should update the Groundwater Management Plan (GWMP) to ensure specific monitoring and management actions are included for all potentially impacted water sharing plan-listed groundwater dependent ecosystems (GDEs) located to the east and south of Boggabri Coal Mine. Where appropriate this is to include documentation of the cause where it has been attributed to other mines of the BTM Complex.

Explanation

The Boggabri Mod 8 documentation (Section 8.1.7.1) identifies impact more than the Aquifer Interference Policy minimal impact consideration thresholds to water sharing plan listed Groundwater Dependent Ecosystems (GDEs) at multiple locations. While the GWMP does include vegetation monitoring and a response plan in the event of water level decline near GDEs, the sites are all located to the south of Boggabri mine (ref Figure 4-1 in the GWMP).

DCCEEW Water notes there are other GDEs identified to the east e.g. along Goonbri Creek adjacent to Boggabri Coal mine within the Gunnedah-Oxley Basin Groundwater Source (see Figure 1), Boggabri Mine being the closest to these GDEs. There does not appear to be any monitoring activity related to these GDEs or indication of the cause of impacts if attributed to one of the other mines of the BTM Complex.

End of Attachment A

NSW Department of Climate Change, Energy, the Environment and Water

Our ref: OUT25/8471

Tim McDermott
Senior Environmental Advisor
Boggabri Coal

Email: tim.mcdermott@boggabricoal.com.au

23 July 2025

Subject: **Boggabri Coal Mine (MP09_0182) – Victoria Park Bore assessment**

Dear Tim McDermott,

I refer to your request for an assessment of an extraction limit for the Victoria Park bore following a meeting with the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) Water Group on 5 May 2025. It is noted requests were also made in relation to the approval and use status of bores and their locations, which will be partly addressed in this response but will require further review.

NSW DCCEEW Water's assessment of the Victoria Park bore has the following key outcomes:

- An extraction limit of 1,000 ML/yr is to be set for the Victoria Park bore.
- The extraction limit must be included in the Water Management Plan.
- The Victoria Park bore needs to be included on the Miscellaneous Work (90MW833083) for the Boggabri Coal mine.

Further detailed recommendations on the above key outcomes and the administration of water supply works at the site are provided in Attachment A. Please note the position to include the Victoria Park bore on 90MW833038 rather than 90CA807034. This is due to the Victoria Park bore being approved under Modification 5 (same as the Cooboobindi Bore) and being excluded from the requirement for a water supply work approval under the *Environmental Planning and Assessment Act 1979*.

Should you have any further queries in relation to this submission please do not hesitate to contact the Water Assessments team at water.assessments@dpie.nsw.gov.au.

Yours sincerely

Rob Brownbill,
Manager, Water Assessments, Knowledge Division
NSW Department of Climate Change, Energy, the Environment and Water

Department of Planning, Housing and Infrastructure

Our ref: MP09_0182-PA-71

Alex Williams

Environmental Superintendent

Boggabri Coal Pty Limited

12/09/2025

Boggabri Coal – Groundwater Management Plan

Dear Ms. Alex

Thank you for submitting the groundwater management plan in accordance with Condition, Schedule 3 of the consent for the Boggabri Coal (MP09_0182-PA-71). I also acknowledge your response to the Department's review comments and request for additional information.

I note the groundwater management plan has been prepared in consultation with the EPA, DCCEEW Water, North West Local Lands Service and the Boggabri Coal Communicty Consultative Committee; and contains the information required by the conditions of approval.

Accordingly, as nominee of the Planning Secretary, I approve the revised Groundwater Management Plan (Rev V07.06, September 2025).

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