Klohn Crippen Berger

Anglo American

Moranbah North Extension

UWIR Update 2025

Final

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15 January 2025

Anglo American
Steelmaking Coal
201 Charlotte Street
Brisbane QLD 4000

Sunita Lata
Environmental Superintendent

Dear Ms Lata:

Underground Water Impact Report
Three-Year Update 2025
Final Report

KCB Australia Pty Ltd (KCB) is pleased to provide this updated Underground Water Impact Report for mining lease (ML) 700042 to Anglo American (Anglo). This report covers the period January 2025, to January 2028 (the review period). Should you have any queries regarding this document, please do not hesitate to contact the undersigned on +61 7 3004 0237 or cwaterhouse@klohn.com.

Yours truly,

KCB AUSTRALIA PTY LTD.

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AC/CW/XW:JJ

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Appendix I MNM Water Quality

CLARIFICATIONS REGARDING THIS REPORT

This report is an instrument of service of KCB Australia Pty Ltd (KCB). The report has been prepared for the use of Anglo American (Client) for the specific application to the Moranbah North Extension Project and may be published or disclosed by the Client to the Department of Environment, Tourism, Science, and Innovation (DETSI).

KCB has prepared this report in a manner consistent with the level of care, skill and diligence ordinarily provided by members of the same profession for projects of a similar nature at the time and place the services were rendered; however, the use of this report will be at the user's sole risk absolutely and in all respects, and KCB makes no warranty, express or implied. This report may not be relied upon by any person other than the Client or DETSI without KCB's written consent.

Use of or reliance upon this instrument of service by the Client is subject to the following conditions:

1. The report is to be read in full, with sections or parts of the report relied upon in the context of the whole report.
2. The observations, findings and conclusions in this report are based on observed factual data and conditions that existed at the time of the work and should not be relied upon to precisely represent conditions at any other time.
3. The report is based on information provided to KCB by the Client or by other parties on behalf of the client (Client-supplied information). KCB has not verified the correctness or accuracy of such information and makes no representations regarding its correctness or accuracy. KCB shall not be responsible to the Client for the consequences of any error or omission contained in Client-supplied information.
4. KCB should be consulted regarding the interpretation or application of the findings and recommendations in the report.
5. This report is electronically signed and sealed, and its electronic form is considered the original. A printed version of the original can be relied upon as a true copy when supplied by the author or when printed from its original electronic file.

1 INTRODUCTION

KCB Australia Pty Ltd (KCB) was commissioned by Anglo American (Anglo) to prepare an updated underground water impact report for the Moranbah North Extension Project (Project site) within mining lease (ML) 700042. This report covers the UWIR January 2025 to January 2028 period.

1.1 Project Overview

Moranbah North Mine (MNM) is an operating underground coal mine located approximately 7km north of Moranbah Township in Central Queensland. The MNM site comprises two mining leases (ML) 70108 and ML700042, with all surface facilities contained within ML70108. ML700042 is an adjoining area east of ML70108 and is shown in Figure 1.1.

The Project involves the extension of longwall mining into adjoining area east of ML70108. In October 2018, Anglo applied for a new ML for the Project site (ML700042) which was granted on 22 September 2020 for a period of 25 years. In November 2019, an amendment to the MNM Environmental Authority (EA) was granted by DETSI for the Project. The current EA (EPML00738813) therefore authorises the Project activities and the associated groundwater impacts described in the EA amendment application.

The Project targets the Goonyella Middle (GM) seam and mining will be at a maximum production rate of 13.5 million tonnes per annum (Mtpa) of Run of Mine (ROM) coal. Mining will be undertaken using the existing Moranbah North Mine portals and drifts and they will provide access to the Project longwall panels. Coal is extracted from the GM seam using longwall mining methods.

The existing UWIR for the Project, took effect on January 28, 2022 (DETSI, 2021) and gas drainage activities commenced in 2024. The Project involves the use of conventional gas drainage activities to remove residual gas from the GM seam within the Project where conditions allow. Hydraulic simulation activities may be used to remove residual gas from the GM seam in areas of the Project site that are not conductive to the use of conventional gas drainage methods. The longwall mining is not scheduled to commence until 2028.

1.2 Background to the UWIR

The Mineral Resources Act 1989 (State of Queensland, 2024a) entitles the holder of a ML to take or interfere with underground water (i.e., groundwater) as part of approved mining operations. This entitlement is termed the ML holder's 'underground water rights'.

Groundwater that is taken or interfered with while exercising the underground water rights is termed 'associated water'. The holder of the ML is entitled to use associated water for any purpose. In order to exercise the underground water rights for the Project - the ML holder must:

- Obtain an Environmental Authority (EA) under the *Environmental Protection Act 1994* (State of Queensland, 2022); and
- Comply with its reporting obligations under Chapter 3 of the *Water Act 2000* (State of Queensland, 2024c). The administering authority for Chapter 3 of the Water Act is the Department of Environment, Tourism, Science and Innovation (DETSI, 2024); and

- Lease holder obligations under Chapter 3 of the Water Act include undertaking baseline assessments of the groundwater regime and water supply bores, preparing UWIRs to provide for ongoing assessment, reporting of groundwater take and (where necessary) entering into make good agreements with owners of affected water supply bores.

An initial UWIR (KCB, 2021) was prepared and submitted to the Department of Environment, Tourism, Science and Innovation (DETSI) by Anglo. The initial UWIR was approved and took effect on 28th January 2022.

This UWIR report is relevant for the next reporting period from January 2025 to January 2028.

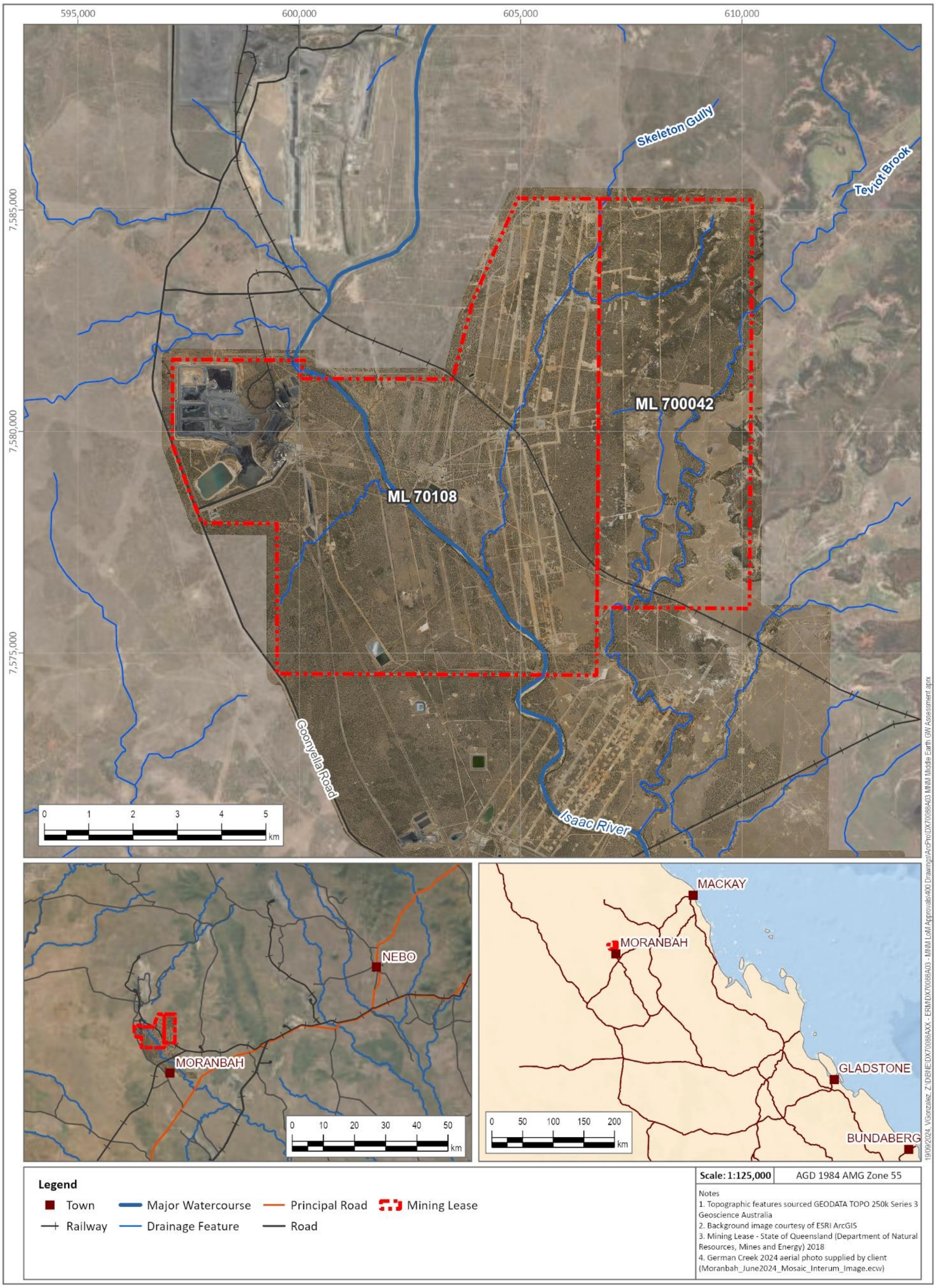


Figure 1.1 Project Location

1.3 UWIR Scope and Structure

The current UWIR (2020) addresses the initial three years of the Project from the date that Anglo commenced to exercise its underground water rights for the Project. The main purpose of the UWIR is to describe the groundwater take due to underground mining development (and any associated impacts) over a three-year period (the UWIR period).

This updated UWIR (2025) addresses the next three years (three-year Anniversary) of the Project from the date that Anglo exercises its underground water rights on the Project site. Anglo's groundwater take on the Project site commenced in January 2022. The planned activities during this UWIR period include surface-to-inseam (SIS) bores installations, the development and preliminary gas depressurisation. The SIS bores are at stage 1 of the installation and development, continuous pumping and dewatering of the Coal seam and longwall mining is not due to commence until 2028 (the next UWIR period).

This UWIR has been prepared in accordance with the requirements described in Section 376 of the *Water Act* and the DETSI guideline: Underground water impact reports and final reports (the UWIR guideline), where relevant. The requirements of Section 376 of the *Water Act* are complimentary to the information requirements of Section 126A and 227AA of the EP Act.

The specific scope of this UWIR includes:

- Presenting the relevant groundwater, geological and environmental information for the Project;
- Undertaking a review of the Queensland Government groundwater database and QSpatial database to confirm the current water bores registered within the Project, the immediate affected areas (IAA) and the long-term affected areas (LTAA);
- Presenting the conceptual understanding of the groundwater regime within the Project and its surrounds, based on historical groundwater studies and relevant public domain data;
- Update and present the current conceptual understanding of the groundwater regime within the Project and its surrounds, based on historical groundwater studies and relevant public domain data;
- Simulation of the 3D numerical groundwater flow model to include the water production to date and updated production plans for the life of the Project;
- Using the numerical groundwater flow model to produce predictions of the Project groundwater effects during the UWIR period, including drawdown predictions and predictions of groundwater take for years 1, 2 and 3 of the UWIR period;
- Using water production "type curves" from comparable gas wells within the vicinity of the Project, produce water production volumes for years 1, 2 and 3 of the UWIR period;
- Assessing the groundwater impacts and developing feasible mitigation and management strategies in the event of potential adverse impacts being identified. Impacts assessed included:

    - Measured and future potential groundwater drawdown impacts on groundwater supply bores;
    - Potential groundwater drawdown impacts on the Isaac River and larger creeks including Teviot Brook;
    - Potential groundwater drawdown impacts on Groundwater Dependent Ecosystems (GDEs);
    - Potential cumulative drawdown impacts with adjacent resource activities, including nearby existing coal seam gas and mining activities; and
    - Potential impacts on existing groundwater quality pre-mining as a result of the Project development.
- Confirmation of the existing approved EA groundwater monitoring program, the revised groundwater monitoring program, and management measures.

The structure of this UWIR has been prepared in accordance with that outlined in the Guideline: (Water Act 2000) Underground Water Impact Reports and Final Reports (DETSI, 2024c). This guideline specifies that a UWIR must contain information that has been outlined in each of the following parts of the guideline:

- Part A: Information about underground water extractions resulting from the exercise of underground water rights (Section 6);
- Part B: Information about aquifers affected, or likely to be affected (Section 7);
- Part C: Maps showing the area of the affected aquifer(s) where underground water levels are expected to decline (Section 8);
- Part D: An assessment of the impacts to the environmental values from the exercise of underground water rights (Section 9);
- Part E: A water monitoring strategy (Section 10);
- Part F: A spring impact management strategy (Section 11); and
- Part G: For a CMA, assignment of responsibilities to resource tenure holders (Section 12).

The relevant Water Act requirements for each part of the UWIR Guideline above are listed at the beginning of the relevant sections in this report. Anglo's current ML 700042 on EA: EPML00738813 is also referenced with regards to the groundwater monitoring program which is currently implemented for the Project.

2 REGULATORY FRAMEWORK

2.1 Mineral Resources Act 1989

The Mineral Resources Act 1989 is an Act to provide for the assessment, development and utilisation of mineral resources to the maximum extent practicable, consistent with sound economic and land use management.

The key purpose of this Act is to facilitate and regulate the undertaking of responsible exploration and mining activities and the development of a safe, efficient and viable mining industry.

Underground and open cut mining activities are authorised under the Mineral Resources Act 1989, (State of Queensland, 2024a), which states that the holder of a mining lease may take or interfere with underground water in the area of the lease if the taking or interference happens during the course of, or results from, the carrying out of an authorised activity for the lease. Underground water taken or interfered with in this way is termed 'associated water'.

2.2 Water Act 2000

General Purpose of the Water Act

The *Water Act 2000* is an Act to provide for the sustainable management of water and the management of impacts on underground water, among other purposes. This Act provides a framework for:

- The sustainable management of Queensland's water resources by establishing a system for the planning, allocation and use of water;
- The sustainable and secure water supply and demand management for designated regions;
- The management of impacts on underground water caused by the exercise of underground water rights by the resource sector; and
- The effective operation of water authorities.

This Act covers water in a watercourse, lake or spring, underground water (or groundwater), overland flow water, or water that has been collected in a dam.

Water Act and Mining Related Activities

Chapter 3 of the *Water Act 2000* has a stated purpose to provide for the management of impacts on underground water caused by the exercise of underground water rights by resource tenure holders, which includes mining lease holders. To achieve the stated purpose, a regulatory framework is provided which requires:

- Resource tenure holders to monitor and assess the impacts of the exercise of underground water rights on water bores and to enter into make good agreements with the owners of the groundwater bores as necessary;
- The preparation of UWIR that establish underground water obligations, including obligations to monitor and manage impacts on aquifers and springs; and

- Manage the cumulative impacts of the activities of two or more resource tenure holders' underground water rights on underground water.

Under this regulatory framework, where there is an area of concentrated development, a cumulative management area (CMA) can be declared. The Project is located beyond the northern extents of the Surat CMA, which was declared in 2011.

Trigger Thresholds

Under Section 362 of the *Water Act 2000*, a bore trigger threshold, for a consolidated aquifer, of 5 m applies (2 m for an unconsolidated aquifer). The 5 m threshold represents the maximum allowable groundwater level decline in a groundwater bore, due to resource tenure holder's activities, prior to triggering an investigation into the water level decline and potentially make good activities.

Under Section 379 of the *Water Act 2000* a spring trigger threshold for an aquifer applies. This includes vent springs / complexes and Watercourse Springs (i.e., gaining streams). This threshold value (0.2 m) represents the maximum allowable decline in the water level of an aquifer in connection with a spring, at the spring location, prior to triggering an investigation into the water level decline.

2.2.1 UWIR Requirements

Section 376 of the Water Act specifies the UWIR content requirements. Table 2.1 lists the specific content requirements and provides an explanation of where each requirement is addressed in this UWIR.

Table 2.1 UWIR Content Requirements

Water Act Section No.	Water Act Section Content	UWIR Cross Reference
376(1)(a)	An underground water impact report must include each of the following — for the area to which the report relates: (i) the quantity of water produced or taken from the area because of the exercise of any previous relevant underground water rights; and (ii) an estimate of the quantity of water to be produced or taken because of the exercise of the relevant underground water rights for a 3-year period starting on the consultation day for the report.	(i) Section 6.1 describes the groundwater produced (ii) Section 6.2 describes the estimated groundwater take over the UWIR period.
376(1)(b)	For each aquifer affected, or likely to be affected, by the exercise of the relevant underground water rights: (i) a description of the aquifer; (ii) an analysis of the movement of underground water to and from the aquifer, including how the aquifer interacts with other aquifers; and (iii) an analysis of the trends in water level change for the aquifer because of the exercise of the rights mentioned in paragraph (a)(i); (iv) a map showing the area of the aquifer where the water level is predicted to decline, because of the taking of the quantities of water mentioned in paragraph (a), by more than the bore trigger	(i) and (ii) Section 7 describes the groundwater regime in the relevant aquifers. (iii) Model results/analysis is described in Section 8 (iv) Section 8.2 provides discussion on the predicted groundwater level drawdown associated with the proposed groundwater depressurisation and long wall mining during the UWIR period. (v) Section 8.2 provides discussion on the predicted groundwater

Water Act Section No.	Water Act Section Content	UWIR Cross Reference
	threshold within 3 years after the consultation day for the report; and, (v) a map showing the area of the aquifer where the water level is predicted to decline, because of the exercise of relevant underground water rights, by more than the bore trigger threshold at any time.	level drawdown associated with the proposed groundwater depressurisation and long wall mining at any time during the development.
376(1)(c)	A description of the methods and techniques used to obtain the information and predictions under paragraph (b).	Section 4 describes the UWIR methodology
376(1)(d)	A summary of information about all water bores in the area shown on a map mentioned in paragraph (b)(iv), including the number of bores, and the location and authorised use or purpose of each bore.	Section 7.4 describes the water bores identified from the DRDMW groundwater database.
376(1)(d,a)	A description of the impacts on environmental values that have occurred, or are likely to occur, because of any previous exercise of underground water rights.	Section 9 presents the assessment of the environmental values due to the proposed groundwater depressurisation and long wall mining development.
376(1)(d,b)	An assessment of the likely impacts on environmental values that will occur, or are likely to occur, because of the exercise of underground water rights: i. during the period mentioned in paragraph (a)(ii); and, ii. over the Projected life of the resource tenure.	Section 9.2 presents an assessment of potential groundwater impacts due to the proposed groundwater depressurisation and long wall mining development.
376(1)(e)	A program for: i. conducting an annual review of the accuracy of each map prepared under paragraph (b)(iv) and (v); and, ii. giving the chief executive a summary of the outcome of each review, including a statement of whether there has been a material change in the information or predictions used to prepare the maps.	Section 12 describes the UWIR review and reporting process for the affected aquifers.
376(1)(f)	A water monitoring strategy.	Section 10 describes the groundwater monitoring program.
376(1)(g)	A spring impact management strategy.	There are no springs within the Project site or its surrounds. Hence, a strategy for spring management is not required.
376(1)(h)	If the responsible entity is the office: i. a proposed responsible tenure holder for each report obligation mentioned in the report; and, ii. for each immediately affected area—the proposed responsible tenure holder or holders who must comply with any make good obligations for water bores within the immediately affected area.	Not applicable.
376(1)(i)	The information or matters prescribed under a regulation.	No other relevant information or matters have been prescribed under a regulation.
376(2)	However, if the underground water impact report does not show any predicted water level decline in any area of an affected aquifer by more than the bore trigger	Section 12 describes the UWIR review and reporting process for the affected aquifers.

Water Act Section No.	Water Act Section Content	UWIR Cross Reference
	threshold during the period mentioned in subsection (1)(b)(iv) or at any time as mentioned in subsection (1)(b)(v), the report does not have to include the program mentioned in subsection (1)(e).	

Section 378 of the Water Act lists the content requirements for the water monitoring strategy. Table 2.2 lists the specific content requirements and provides an explanation of where each requirement is addressed in this UWIR.

Table 2.2 UWIR Water Monitoring Strategy Content Requirements

Water Act Section No.	Water Act Section Content	UWIR Cross Reference
378(1)	A responsible entity's water monitoring strategy must include the following for each immediately affected area and long-term affected area identified in its underground water impact report or final report: a) a strategy for monitoring— (i) the quantity of water produced or taken from the area because of the exercise of relevant underground water rights; and (ii) changes in the water level of, and the quality of water in, aquifers in the area because of the exercise of the rights; b) the rationale for the strategy; c) a timetable for implementing the strategy; d) a program for reporting to the office about the implementation of the strategy.	Section 10 describes the groundwater monitoring program.
378(2)	The strategy for monitoring mentioned in subsection (1)(a) must include: a) the parameters to be measured; b) the locations for taking the measurements; and, c) the frequency of the measurements.	Section 10 describes the groundwater monitoring program.
378(3)	If the strategy is prepared for an underground water impact report, the strategy must also include a program for the responsible tenure holder or holders under the report to undertake a baseline assessment for each water bore that is: a) outside the area of a resource tenure; but b) within the area shown on the map prepared under section 376(b)(v).	Section 7.4 describes the water bores identified from the DRDMW groundwater database.
378(4)	If the strategy is prepared for a final report, the strategy must also include a statement about any matters under a previous strategy that have not yet been complied with.	Not applicable.

2.3 Environmental Protection Act 1994

The *Environmental Protection Act 1994* (Environmental Protection Act 1994, 2021) is an Act with the objective to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development).

This Act states that 'to carry out an environmentally relevant activity (ERA) an environmental authority (EA) is required'. A resource activity, specifically an underground mining activity, is defined as an ERA.

2.3.1 Environmental Authority EPML00738813

Anglo currently holds an Environmental Authority (EMPL00738813) authorising mining activities within ML 70108 and ML 700042. EA (EMPL00738813) authorises the construction and operation of stimulation activities to depressurise the underground coal measures prior to longwall mining within ML 700042. The MNM EA prescribes a maximum production rate of 13.5 million tonnes per annum (Mtpa) of Run of Mine (ROM) coal.

3 PROJECT SETTING

3.1 Project Location and Land Use

The Project is located in Central Queensland and covers a total area of ~100 km^2, comprising ML70108 and ML700042. The Project is located approximately 9 km north of the township of Moranbah.

The Dominant land uses within the vicinity of the Project are coal mining, CSG production and cattle grazing. The existing and approved mines in the vicinity of the Project site are shown on Figure 3.1 and include:

- MNM and Grosvenor mine adjoining the Project;
- The Goonyella Riverside and Broadmeadow Mine Complex (GRBM), located north of MNM and the adjacent Red Hill Project;
- The Isaac Plains Mine, located east of the Grovner Mine; and,
- The inactive Burton and Broad Lea Mines, located east of the Project.

The Project is located within a gas field that forms part of the Moranbah Gas Project (PL 191, PL 196 and PL 224), one of Australia's largest CSG operations. The Moranbah Gas Project extends over the Project site and the surrounding area. The Moranbah Gas Project is owned by Arrow Energy, AGL and Queensland Pacific Metals. The Moranbah Gas Project comprises of over 120 production gas wells that are used to extract coal seam gas from the P, Q and GM seams of the Moranbah coal measures. Coal Seam Gas production across the Moranbah Gas Project commenced in 2003 and the production is forecast to increase to 130 production wells to produce 35TJ/year. Coal seam gas production across the Moranbah Gas Project commenced in 2003 and is anticipated to be completed in 2025. The Moranbah Gas Project extends over the Project site and the surrounding area (Figure 3.2).

Historical clearing for cattle grazing has been undertaken within the Project and the surrounding area.

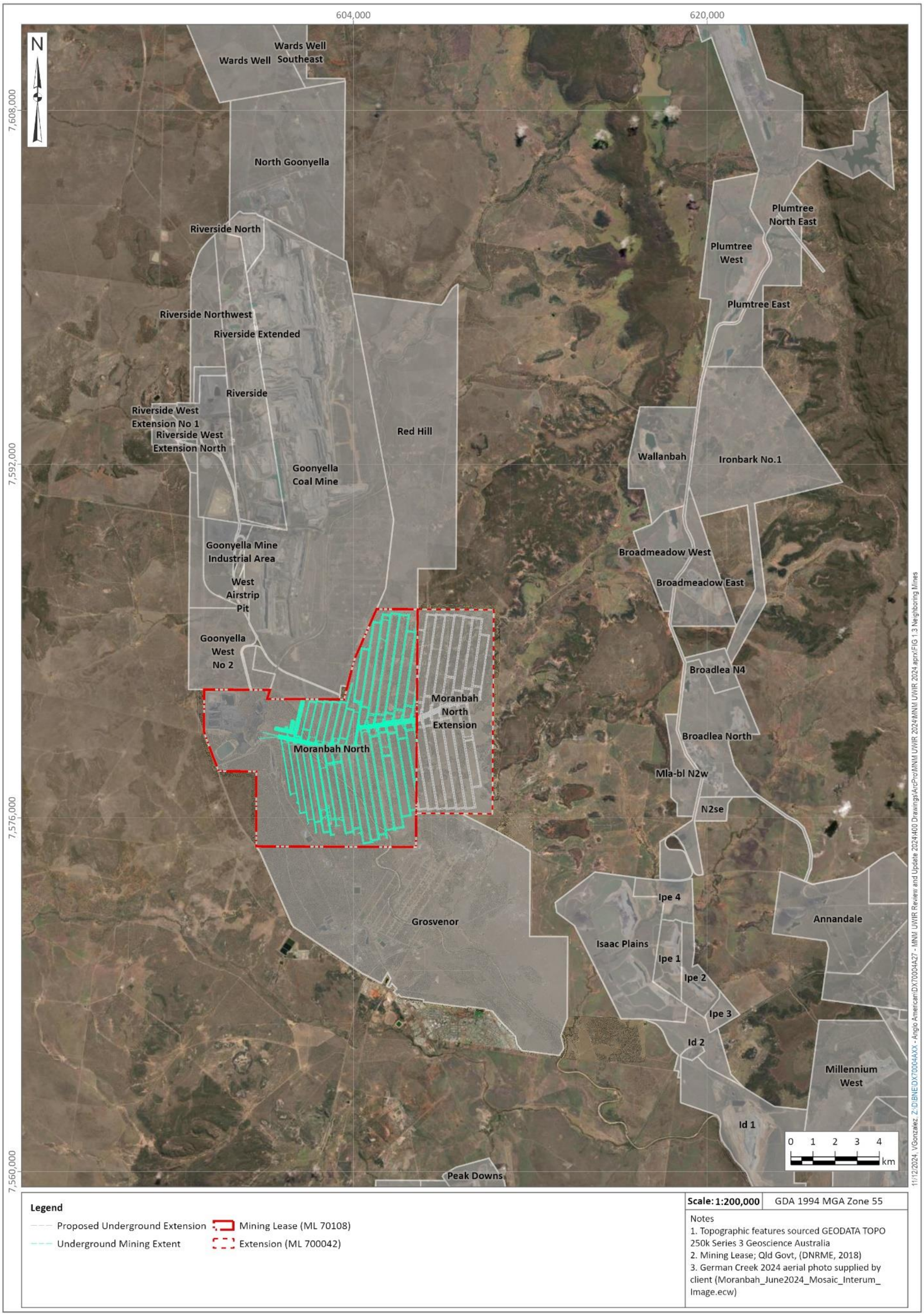


Figure 3.1 Existing and Approved Mining Areas surrounding the Project

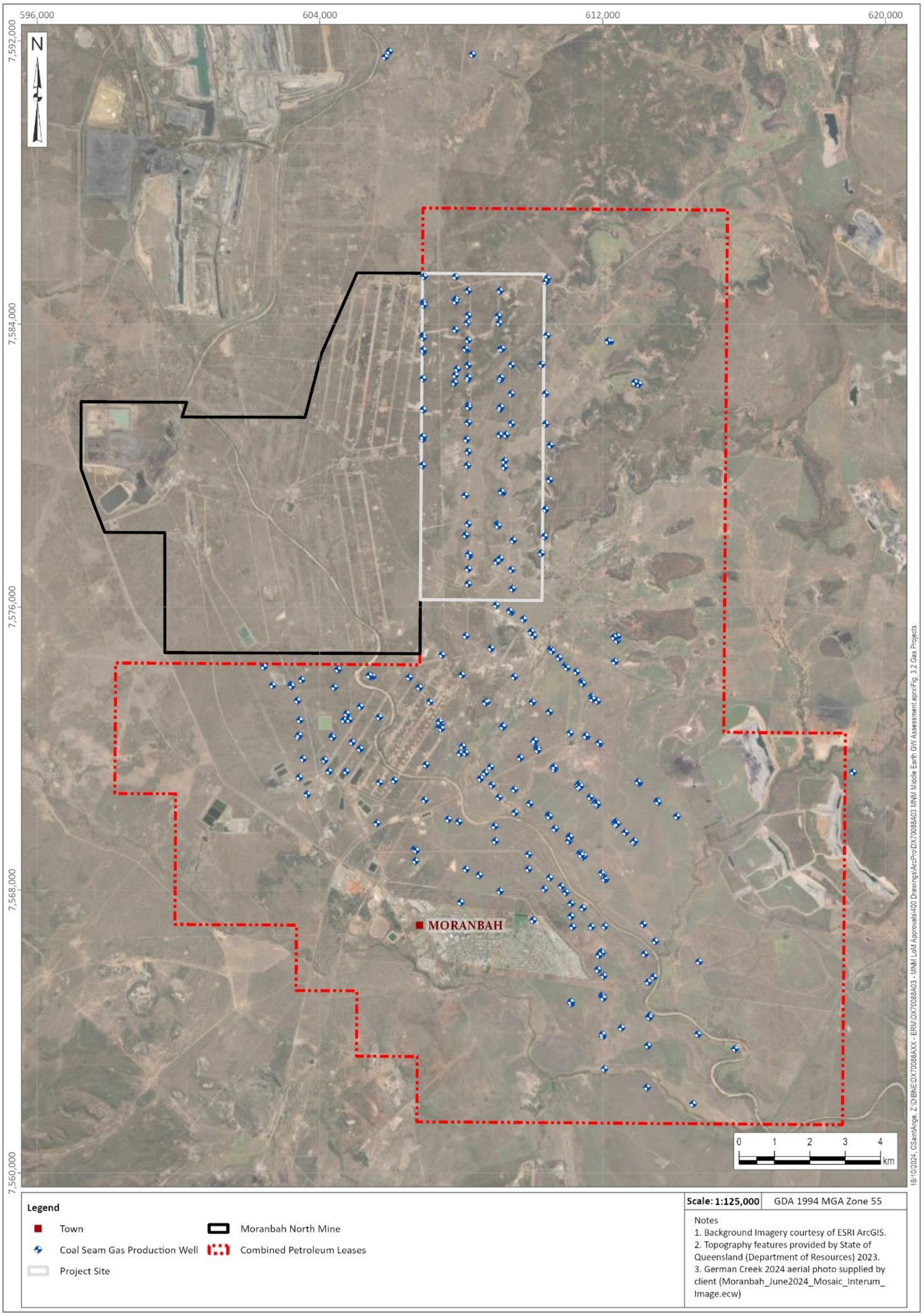


Figure 3.2 Moranbah Gas Project - Coal Seam Gas Well Layout

3.2 Topography and Drainage

The Project site is located in the Isaac River catchment, a sub-basin of the upper Fitzroy Basin. The Isaac River catchment covers an area of approximately 22,000 km^2, it discharges to the Connors River approximately 130 km to the southeast of the Project site, and subsequently into the Fitzroy River a further 170 km southeast. The Isaac River traverses MNM from northwest to southeast, located approximately 4 km west of the Project site.

The Project site is traversed by Teviot Brook and Skeleton Gully. Teviot Brook is a substantive tributary of the Isaac River with a catchment area of approximately 259 km^2. It is an ephemeral creek with highly variable flows characterised by short-duration flows driven by tropical low-pressure systems.

Skeleton Gully is a minor tributary of the Isaac River with a catchment area of approximately 47 km^2. Skeleton Gully is also ephemeral, and flows are highly variable, but smaller than those of Teviot Brook due to the smaller contributing catchment area.

Topography across the Project site is dominated by Teviot Brook and the associated floodplain adjacent to the creek (Figure 3.3). Two elevated ridgelines occur in the northwest and east of the Project site. The topography gently slopes from these elevated ridges towards the Teviot Brook floodplain, which is oriented along a north-northeast to south-southwest axis, parallel with the flow direction of the creek. In the northwest corner of the Project site the terrain is an elevated plateau that is incised by Skeleton Gully.

There are no known springs or groundwater seeps in the vicinity of the Project site.

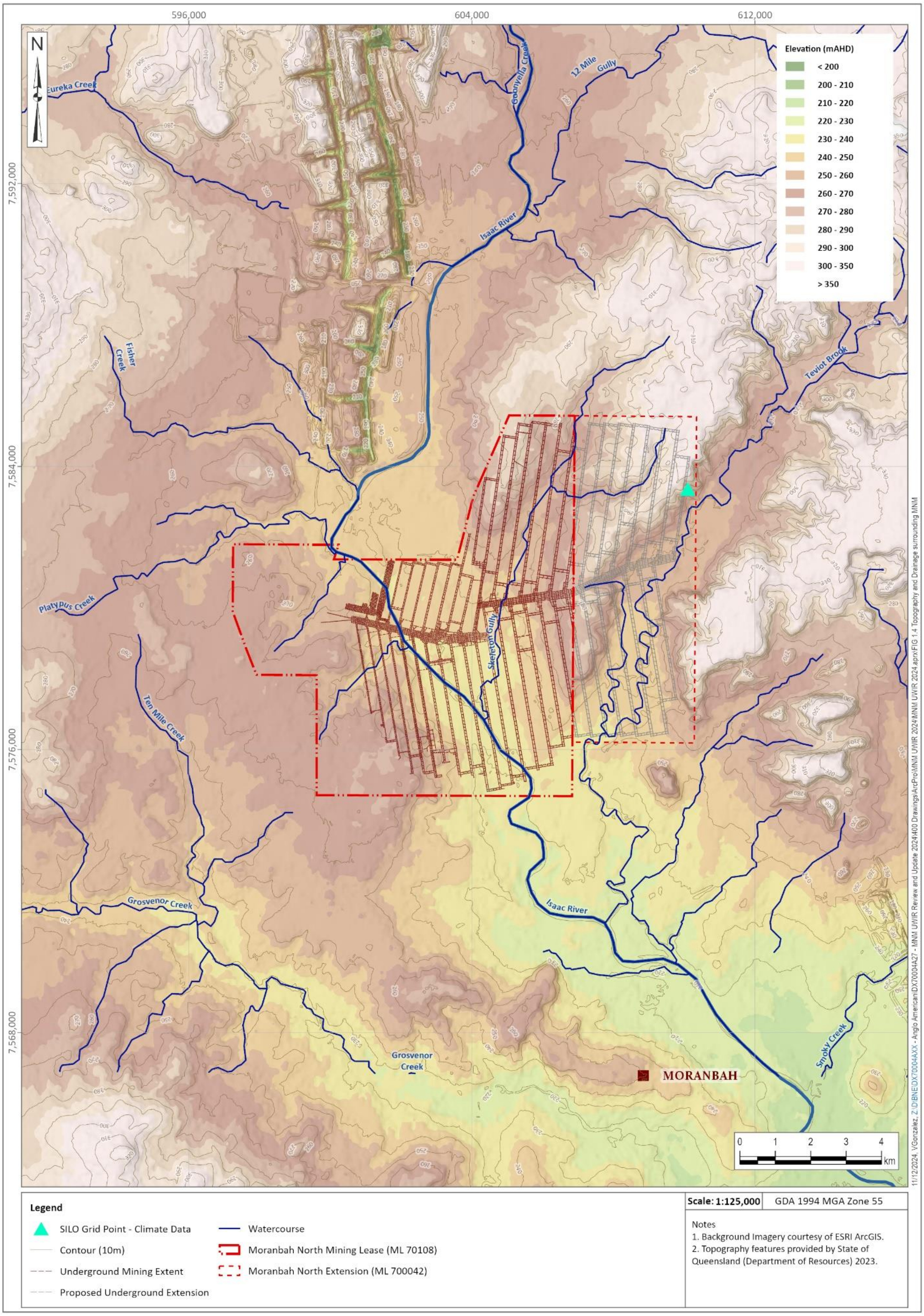


Figure 3.3 Project Site Topography and Drainage

3.3 Climate

The climate at the Project site is sub-tropical continental, characterised by high variability in rainfall, temperature and evaporation, typical of Central Queensland.

The closest open Bureau of Meteorology (BOM) weather station is located at Moranbah Airport (Station 034035), approximately 19 km to the south of the Project. Due to the distance of the Moranbah Airport weather station from the Project the SILO grid point data latitude -21.85, Longitude 148.05 (SILO, 2024) was used to assess the long-term rainfall trends of the Project.

Climate statistics sourced from the SILO grid point data located at latitude -21.85, Longitude 148.05 (SILO 2024) are presented in Table 3.1. The location of the SILO Grid point data is provided in Figure 3.3.

Table 3.1 Climate statistics for Site location Lat: -21.85, Long: 148.05 (SILO, 2024)

Site	SILO Grid Point (-21.85, 148.05)			
Statistic Element	Mean Minimum Temperature	Mean Maximum Temperature	Mean Rainfall (mm)	Mean Evaporation (mm)
Period of record	*1980 - 2024*	*1980 - 2024*	*1980 - 2024*	*1980 - 2024*
January	21.7	33.5	92.2	221.7
February	21.5	32.8	92.3	182.4
March	20.1	31.8	56.1	186.3
April	17.2	29.3	34.6	147.3
May	13.6	26.2	31.5	117.9
June	10.2	23.6	24.2	95.0
July	9.1	23.4	23.7	104.8
August	10.2	25.4	21.8	136.7
September	13.4	28.9	9.3	178.6
October	16.9	31.7	30.3	220.8
November	19.2	32.9	64.5	229.2
December	20.9	33.8	91.7	240.2
Annual	**16.1**	**29.4**	**572.0**	**2060.8**

Mean maximum temperature ranges between 33.8°C in the summer months and 23.4°C in the winter months. Mean minimum temperature ranges between 21.7°C in the summer months and 9.1°C in the winter months. The highest rainfall occurs during December to February, with the lowest rainfall occurring between June to September.

Evaporation data shows a mean monthly evaporation to range between 95.0 mm to 240.0 mm. The highest evaporation occurs during the summer months (November to January; 221.7 mm to 240.2 mm), while the lowest evaporation occurs during the winter months (May to August; 95.0 mm to 136.7 mm).

Figure 3.4 presents daily rainfall between 1980 and 2024 for the SILO grid point data location - latitude -21.90, Longitude 147.95, and a cumulative rainfall excess / deficit (CRD) trend for the same period.

CRD trends present a running deviation of long-term actual rainfall against the average. This provides seasonal-scale identification of trends (wet / dry) and longer term (e.g., decadal) deviation from average conditions. These trends result in a natural tempering of peaks for rainfall events, and therefore support the correlation of rainfall events to aquifer responses.

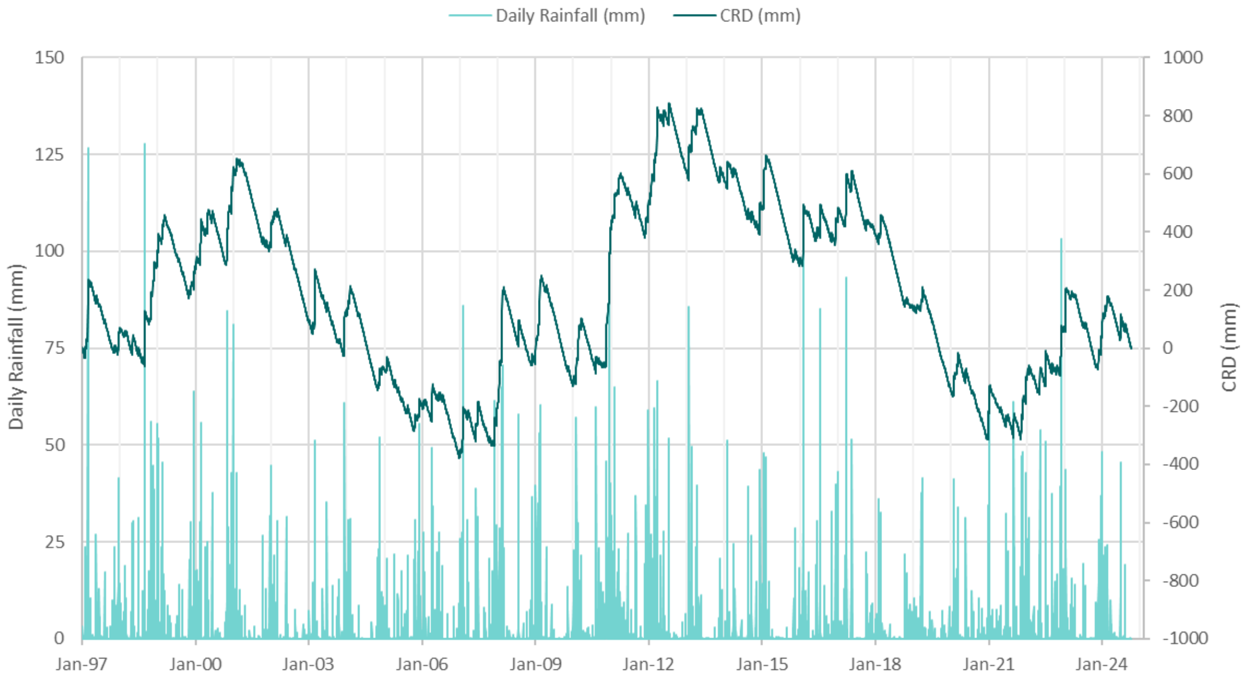


Figure 3.4 Daily Rainfall and Rainfall Excess / Deficit Trend (SILO Grid Point -21.90,147.95)

Observations from the rainfall / CRD trend include:

- The overall rainfall trend is characterised by the cyclic nature of the wet and dry seasons, with annual fluctuations of ~60 mm evident across the record.
- Large rainfall events were recorded in 1988, 1997, 1998, 2016 and 2017 and 2022 where more than 100 mm was recorded in a day. The highest rainfall was recorded in 1988 at 171.6 mm.
- The CRD trend reflects a decreasing trend through the 1980's through to 1988, where an increasing trend is established to 1991. A fluctuating increasing trend from 1991 to 1998 and a trend of declining annual rainfall persisting through to 2008.
- The CRD increased to 2012 and remained stable (with minor seasonal fluctuations) until 2018. There is a period of reduced rainfall from 2018 to 2021.
- The CRD decreased again from 2021 through to 2024.

4 ASSESSMENT METHODOLOGY

This section describes the UWIR methodology, including the desktop study of relevant groundwater bores, geological and environmental information, and groundwater monitoring data. It also provides an overview of the numerical groundwater modelling method. A detailed description of the numerical groundwater modelling method is provided in Section 8.1.

4.1 Information and Data Sources

A preliminary desktop assessment utilised data and information provided by Anglo, the DRDMW Office of Groundwater Impact Assessment (OGIA) and publicly available reports and data. Primary data and information utilised in this assessment include:

Datasets:

- Registered bore data from the DRDMW Groundwater Database (GWDB) (DRDMW 2024).
- Queensland Spring Register, published by the Queensland Herbarium (Queensland Herbarium 2018).
- Potential Groundwater Dependent Ecosystem (GDE) mapping published by the DETSI (DETSI, 2024d).
- The Queensland Spatial Catalogue (QSpatial), via Queensland Globe – comprising records of petroleum and coal seam gas (CSG) exploration, production and monitoring wells.
- Groundwater monitoring records (levels and quality) provided by Anglo.
- Geological model from Anglo of the Project site localised geological regime.
- Regional geological layers and associated hydraulic parameters from OGIA.

Reports:

- Integrated Isaac Plains Project Environmental Impact Statement (Matrix Plus Consulting, 2009).
- Grosvenor Coal Project EIS Groundwater Impact Assessment (JBT Consulting, 2010).
- Red Hill Project EIS Groundwater Report (URS, 2013).
- Moranbah South Project EIS Groundwater Report (AGE, 2013).
- Moranbah Gas Project underground water impact report (Arrow Energy 2016).
- G200s Project EAR Groundwater Report (AGE, 2016).
- Moranbah North Extension: Underground Water Impact Report (KCB, 2021).
- MNM Progressive Rehabilitation and Closure Plan: Groundwater Report (KCB, 2022b).
- MNM Groundwater Trigger Drilling: Site Investigation Report (KCB, 2023a).
- Moranbah North Mine: Groundwater Monitoring Annual Report (KCB, 2023b).
- Moranbah North Mine: Groundwater Monitoring and Management Plan Report (Anglo American, 2023).

4.2 Assessment Methodology

This assessment has been completed to assess potential impacts on the groundwater system from the proposed gas drainage and longwall extension of ML 700042 for the UWIR period (Immediately Affected Areas (IAA)) and for the proposed overall development (Long-Term Affected Areas (LTAA)). This report includes the reporting period from 2025 to 2028.

All relevant data (as identified in Section 4.2) was collated and analysed to develop a conceptual understanding of the groundwater regime, including the key geology, groundwater flow and groundwater quality characteristics. This conceptualisation served as the basis for the development and simulation of the numerical groundwater model, which was used to undertake the prediction of potential impacts to the groundwater regime. Details of the numerical groundwater model are provided in the following section.

4.2.1 Numerical Groundwater Modelling

A calibrated groundwater flow model was previously developed for the initial MNE UWIR (KCB, 2021). The GM seam continuous groundwater dewatering, gas depressurisation and underground mining on the extension area (ML 700042) has not commenced and is not scheduled to commence until 2028 (the next UWIR period). The existing MNE UWIR 2021 model predictions are adopted for this assessment as the existing conditions have not significantly changed.

The 3D numerical groundwater flow model was developed to predict the extent of depressurisation and the associated impacts on the groundwater regime and the surrounding environment. The groundwater model for the Project uses the MODFLOW-USG platform. MODFLOW is the most widely used groundwater modelling software in Australia and is considered to be the industry standard. A detailed description of the groundwater model is provided in Section 8.1.

The model was used to predict the groundwater response to the Project, including changes in groundwater levels as a result of the Project. The groundwater model allowed the impacts of the existing CSG operations (Moranbah Gas Project) and adjacent mining complexes to be distinguished from those of the Project.

The groundwater model was specifically used to predict the magnitude and extent of groundwater depressurisation; and these predictions have been used to identify the IAA and LTAA for the previous UWIR. Those predictions have also been used to assess the impacts of the Project on groundwater users and the sensitive environmental features.

5 REGIONAL GEOLOGY AND HYDROGEOLOGY

5.1 Geological Setting

The Project is located on the north-western flank of the Bowen Basin, a sedimentary basin comprising Permian to Triassic age geology. The regional geology in the vicinity of the Project site is shown in Figure 5.1. A veneer of more recent Tertiary and Quaternary age basalts and sediments typically overlie the Bowen Basin strata. The solid Bowen Basin geology is shown in Figure 5.2. A detailed stratigraphic profile is shown in Figure 5.3.

As shown in Figure 5.1, the relevant geology in the vicinity of the Project site includes:

- Cenozoic (i.e. Quaternary and Tertiary age) alluvium associated with the Isaac River and its tributary Teviot Brook;
- A veneer of Cenozoic (predominantly Tertiary) sediments comprising the Suttor Formation and associated colluvium, and weathered sediments;
- A highly variable and heterogeneous Tertiary basalt flow; and
- Permian Coal Measures including the Rangal Coal Measures, the Fort Cooper Coal Measures (FCCM), the Moranbah Coal Measures (MCM) and the Back Creek Group. The Goonyella Middle Seam (GM seam) is included in the MCM target coal seam.

The distribution of alluvium is limited to localised deposits associated with Teviot Brook and its floodplain in the central and southern parts of the Project site (Figure 5.1). In these areas, the creek channel is incised into the landscape and there is typically less than 3 m of alluvium present in the creek bed. Floodplain alluvial deposits are highly variable, typically ranging from a few centimetres to approximately 10 m thick on creek banks and older flood terraces, and locally thickening to 20 m. Alluvium is not present outside this localised area of creek and floodplain deposits. The Isaac River alluvium is located approximately 3 km south of the Project site.

The Tertiary sediments comprise a heterogeneous profile of semi-consolidated sandstone, mudstone and other minor sediments associated with the Tertiary Suttor Formation, duricrusted palaeosols at the top of deep weathering profiles, colluvium and regolith (Figure 5.1). Published geological mapping confirms that the colluvium deposits transition to Suttor Formation sediments, indicating that these materials are frequently indistinguishable due to lithological similarities between these materials. These materials are therefore considered to form a single unit, hereafter referred to as the Tertiary sediments. The Tertiary sediments are widely distributed over the Project site and its surrounds and are thin (i.e. typically less than 20 m thick) over the Teviot Brook floodplain, thickening to approximately 100 m in the elevated northern part of the Project site.

The Tertiary basalt comprises a heterogeneous profile of vesicular and massive basaltic lavas, with minor tuff and ash. The upper basalt profile is highly weathered forming a basaltic clay. The distribution of Tertiary basalt is confined to a paleochannel that is incised into the Permian Coal Measures and traverses the Project site and north-east to south-west. The Tertiary basalt is underlain by highly localised deposits of Tertiary alluvium that were present within the paleo-channels at the time the basalt flows occurred.

The Tertiary alluvium comprises medium to coarse grained sand and is informally referred to as Tertiary basal sand due to its association with the base of the basalt unit. Where present, the Tertiary basal sand is less than 5 m thick and laterally discontinuous, forming discrete sandy lenses below the basalt. Previous investigations have confirmed that these materials are not extensive across the mapped Tertiary basalt extent, and they have not been identified at the Project site.

The Rewan Group is a thinly interbedded sequence of siltstone, claystone, fine-grained sandstone and minor volcano-lithic pebble conglomerate. The Rewan Group sub-crops beneath the overlying alluvium, Tertiary sediments and basalt to the east of the Project site and dips to the east (Figure 5.1).

The Permian Coal Measures include the Rangal Coal Measures, the FCCM, the MCM and the underlying Back Creek Group. The coal measures comprise a sedimentary sequence with interbedded coal seams, including the target GM seam. The upper profile of the sub-cropping coal measures has been extensively weathered forming a clay.

The coal measures typically sub-crop under the Tertiary sediments and basalt and dip towards the east. As the coal measures dip to the east, the depth of cover above the Project longwall panels increases from approximately 370 m in the western part of the Project mining area to more than 540 m in the east (Figure 5.7).

No significant or extensive faults have been detected within the Project site or its surrounds.

Approximately 8 km to the east of the Project site, the north-south trending Isaac Thrust Fault system can be traced over 30 km. The Isaac Thrust Fault is typically steeply dipping and with a vertical displacement of 600 m to 800 m. This vertical displacement has resulted in contact between significantly different geological units, specifically the Triassic formations on the downthrown (western) side of the fault and the Permian formations on the upthrown (eastern) side of the fault.

Approximately 10 km east of the Project site a fault splays from the main Isaac Thrust Fault. This fault splay is orientated on a north-northwest to south-southeast axis and is steeply dipping. The fault splay has resulted in approximately 50 m to 100 m of vertical displacement within the Permian Coal Measures. Fault displacement has resulted in truncation of the Rangal Coal Measures and the lower seams of the MCM (including the GM seam) at the Isaac Thrust Fault, and associated splay, causing the coal seams to be juxtaposed with Permian interburden.

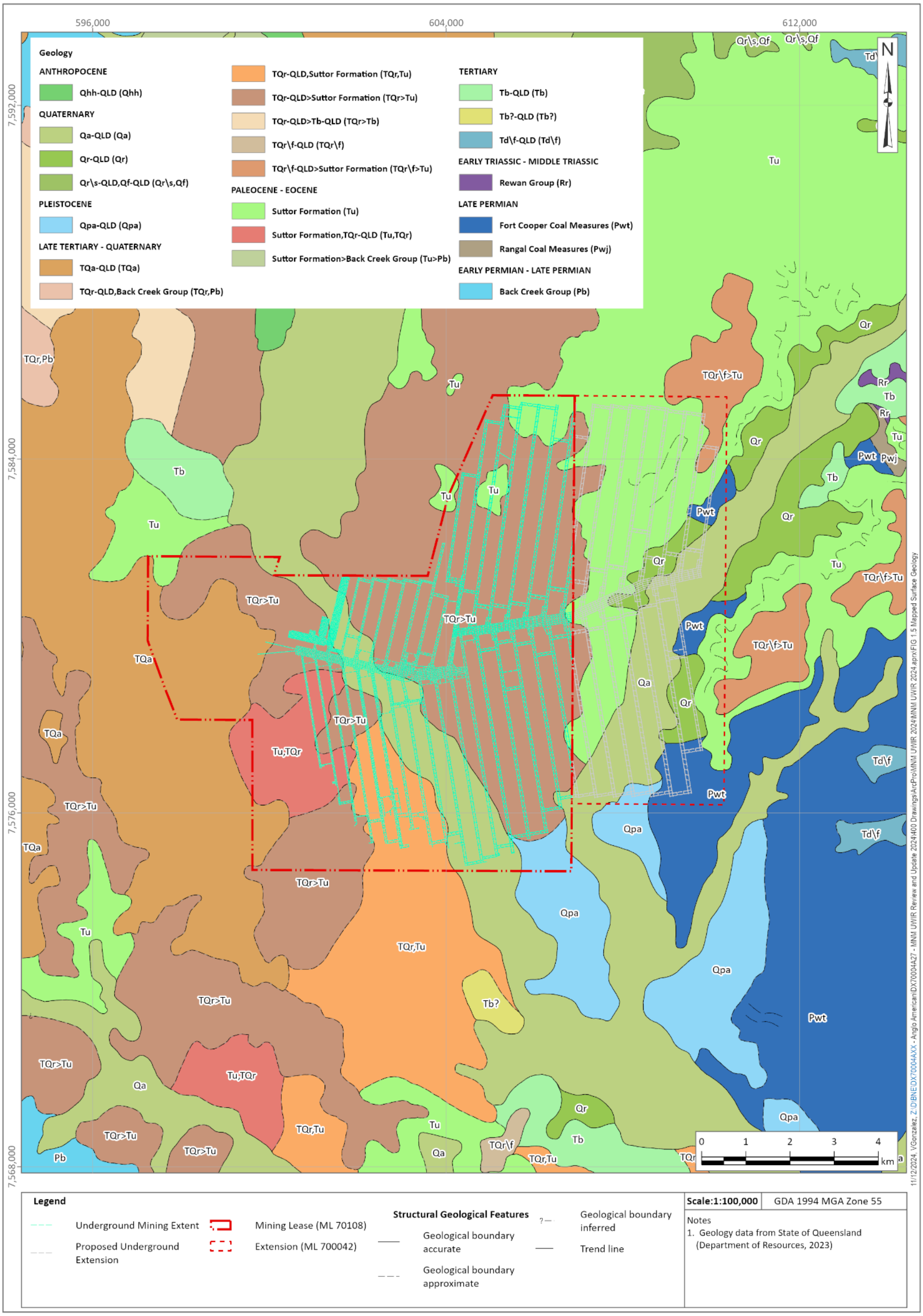


Figure 5.1 Mapped Surface Geology (State of Queensland, 2024b)

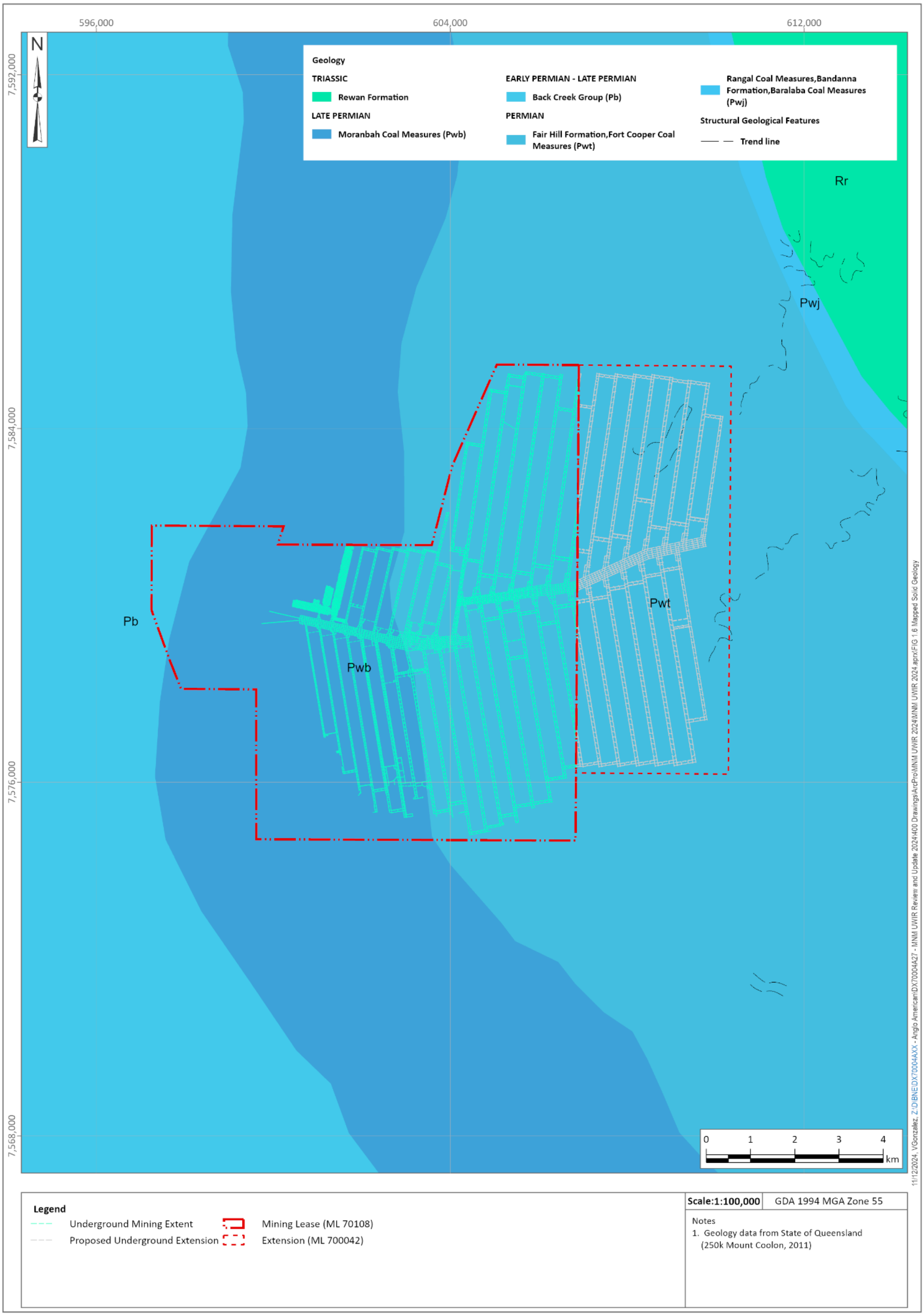


Figure 5.2 Mapped Solid (Regional) Geology (State of Queensland, 2024b)

Age	Formation	Seams / Lithotype
Cenozoic	Quaternary	Alluvium
	Suttor Formation	Tertiary Sediments
		Teriary Basalt
		Tertiary Basal Sands
Triassic	Rewan Group	
Permian	Rangal Coal Measures	Leichardt Vermont
	Fort Cooper Coal Measures	Cannis
		Fair Hill
	Morambah Coal Measures	Qa seam
		Qb seam
		Goonyella Upper
		P seam
		Goonyella Middel Rider (GMR)
		Goonyella Middle (GM)
		Harrow Ck Lower (HCL)
		Dysart Upper 1 (DYU1)
		Dysart Upper 2 (DYU2)
		Dysart Rider (DYR1 and 2)
		Goonyella Lower (GL)
	Back Creek Group	N/A

Australian Stratigraphic Units Database

Figure 5.3 Stratigraphic Profile

5.2 Regional Hydrostratigraphy

The relevant hydrogeological units of the Project site and its surrounds broadly comprise:

- Localised deposits of alluvium associated with the Isaac River and larger creeks including Teviot Brook;
- A shallow, highly weathered and heterogeneous veneer of low permeability Tertiary sediments;
- Tertiary basalt;
- Triassic Rewan Group; and
- Permian Coal Measures including coal seams and interburden sediments.

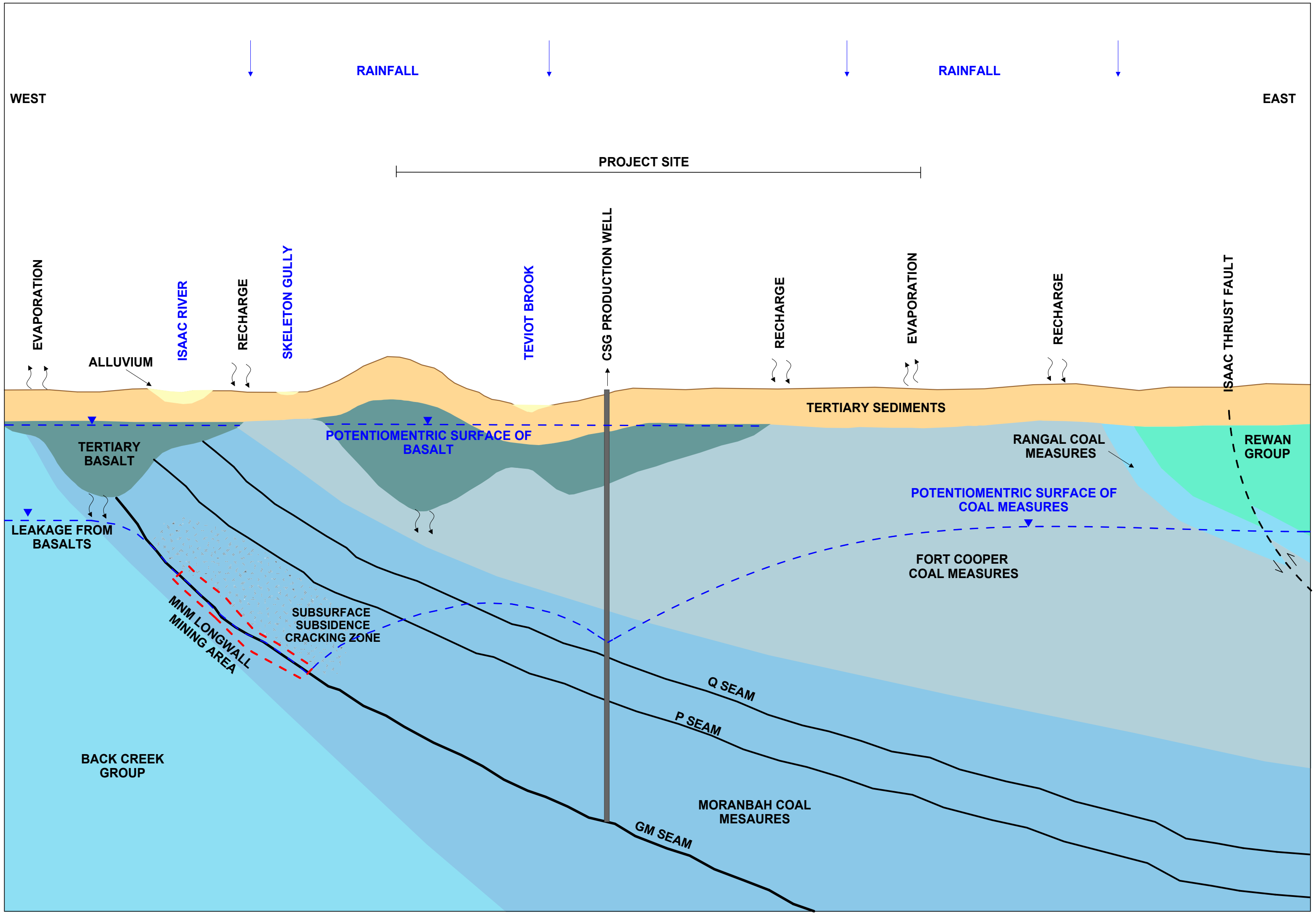
The main groundwater-bearing formations are the Tertiary basalt and the coal seams of the Permian Coal Measures. These formations have been significantly depressurised and impacted by mining and gas production activities at nearby operations. The Rewan Group (located east of MNM) is a low permeability formation that is a regionally recognised aquitard. The alluvium and Tertiary sediments do not form permanent, saturated aquifers, and persistent groundwater occurs only where these sediments extend below the regional water table.

Over undisturbed areas, recharge predominately occurs via direct and diffuse rainfall to the weathered Tertiary sediments and Permian Coal Measures, or the localised alluvium. A portion of the rainfall moves downwards to the groundwater table, and then flows through the groundwater system following the hydraulic gradient (generally east to west in the Project area). Minor localised recharge also occurs via leakage from the alluvium during flow events in larger creeks such as Teviot Brook. Recharge to the Tertiary sediments and Permian Coal Measures will occur where these units sub-crop below the alluvium.

Groundwater quality within the ML700042 ranges from saline to highly saline. Regionally, groundwater is moderately to highly saline. Local and regional groundwater is generally unsuitable for potable, irrigation or stock watering uses. Where water quality is suitable, yields are generally very low. There are no current groundwater users in ML700042 or its surrounds.

Groundwater quality within the Project site (and its surrounds) ranges from saline to highly saline. Regionally, groundwater is moderately saline to highly saline. Local and regional groundwater is therefore generally unsuitable for potable, irrigation or stock watering uses. Where water quality is suitable, yields are generally very low. There are no current groundwater users in the Project site or immediately adjacent to the Project.

Figure 5.4 shows a conceptual cross-section of the geology and groundwater regime within the Project site and its surrounds.



Not to scale

Figure 5.4 Hydrogeological Conceptualisation Cross-Section for Moranbah North Extension

5.2.1 Alluvium

The alluvium comprises clay, silt, sand and gravel associated with stream channels and flood deposits. The distribution of alluvium is limited to Teviot Brook and its floodplain in the central and southern part of the Project site (Figure 5.5).

Observations made during the field surveys undertaken as part of the EAR ecology assessment (Hansen and Bailey, 2020) indicate that the Teviot Brook channel is incised into the floodplain and there is typically 1.5 to 3 m of alluvium present in the creek bed. This is consistent with observations made during the field surveys undertaken in the Isaac River at MNM. Project site drilling investigations and previous investigations in the Isaac River and its local tributaries show that floodplain alluvial deposits are highly variable, typically ranging from a few centimetres to 10 m thick, locally thickening to approximately 20 m on riverbanks and older flood terraces (Figure 5.5). Project site investigations encountered alluvium to a depth of 11 m below ground level. Alluvium is not present outside this localised area of river and floodplain deposits.

5.2.2 Tertiary Sediments

The Tertiary sediments comprise a heterogeneous profile of semi-consolidated quartz sandstone, clayey sandstone, mudstone and conglomerate, fluvial lacustrine sediments, and minor interbedded basalt.

The Suttor Formation has been extensively weathered and reworked during the Tertiary and Quaternary, resulting in an upper profile that includes Tertiary and Quaternary colluvial sheetwash deposits and residual soils (regolith) that comprise clay, silt, sand, gravel and soil. The colluvium and regolith exhibit similar properties to each other and are considered comparable due to the predominance of clays. These sediments are also lithologically comparable to the underlying parent rock of the Suttor Formation.

These sediments are widely distributed over the Project site and its surrounds (Figure 5.6). Where present they generally form a thin veneer less than 40 m thick over the Tertiary basalt and Permian Coal Measures, thickening to approximately 90 m where it forms elevated plateaus and ridgelines (Figure 5.6). The Tertiary sediments do not store significant groundwater due to their generally limited thickness.

5.2.3 Tertiary Basalt

The Tertiary basalt underlies the Tertiary sediments and overlies weathered Permian strata at the Project site and typically occurs as a single composite unit comprising massive and vesicular lava, tuff and ash flows. Within the Project site, the basalt flows are thickest towards the northeast where they are up to 100 m thick. The upper basalt profile is highly weathered to a depth of up to 55 m and comprises basaltic clay. The weathered Tertiary basalt outcrops to the northeast and south of the Project site. The maximum thickness of fresh basalt within the Project site is 41 m.

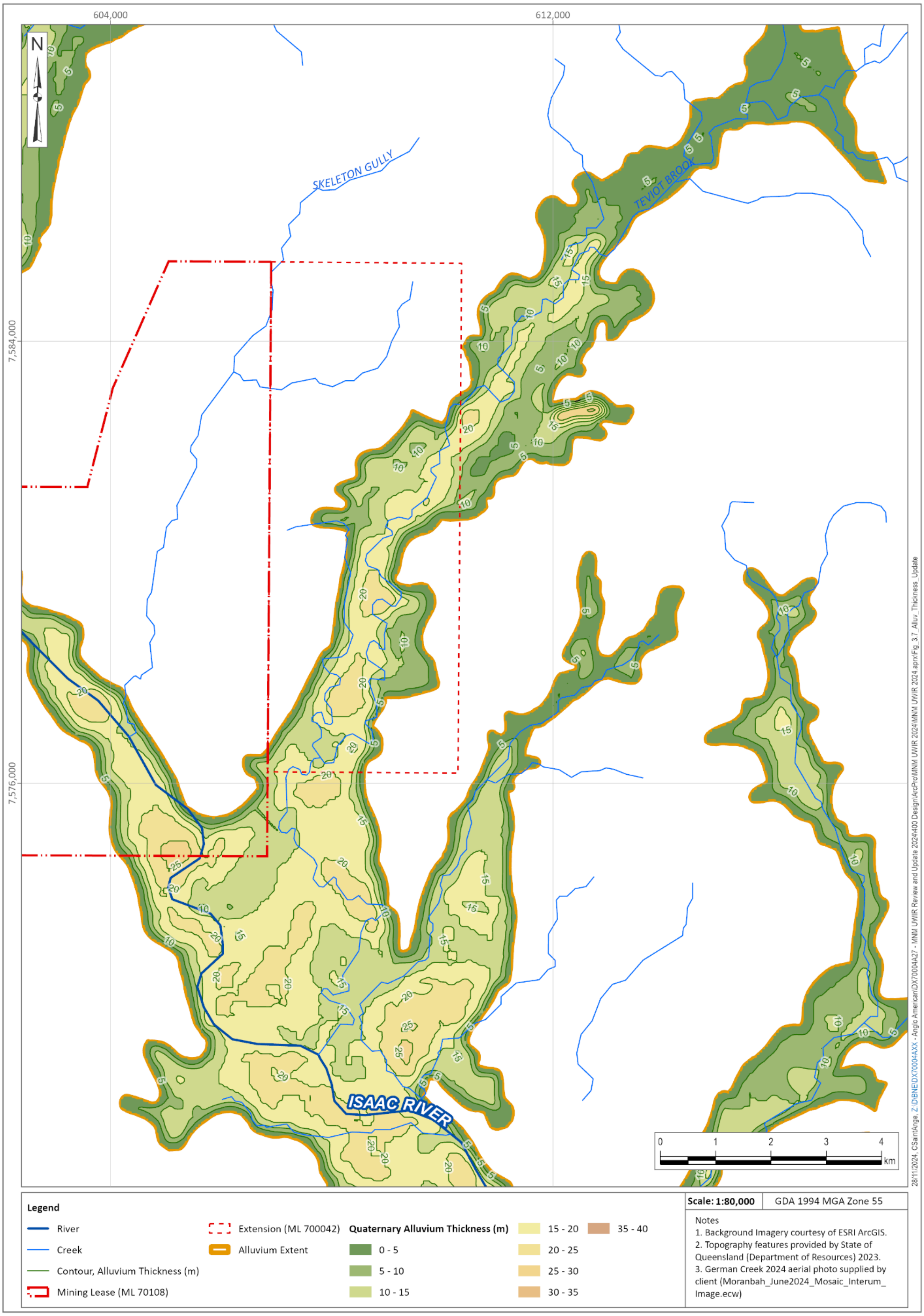


Figure 5.5 Alluvium Extent and Thickness

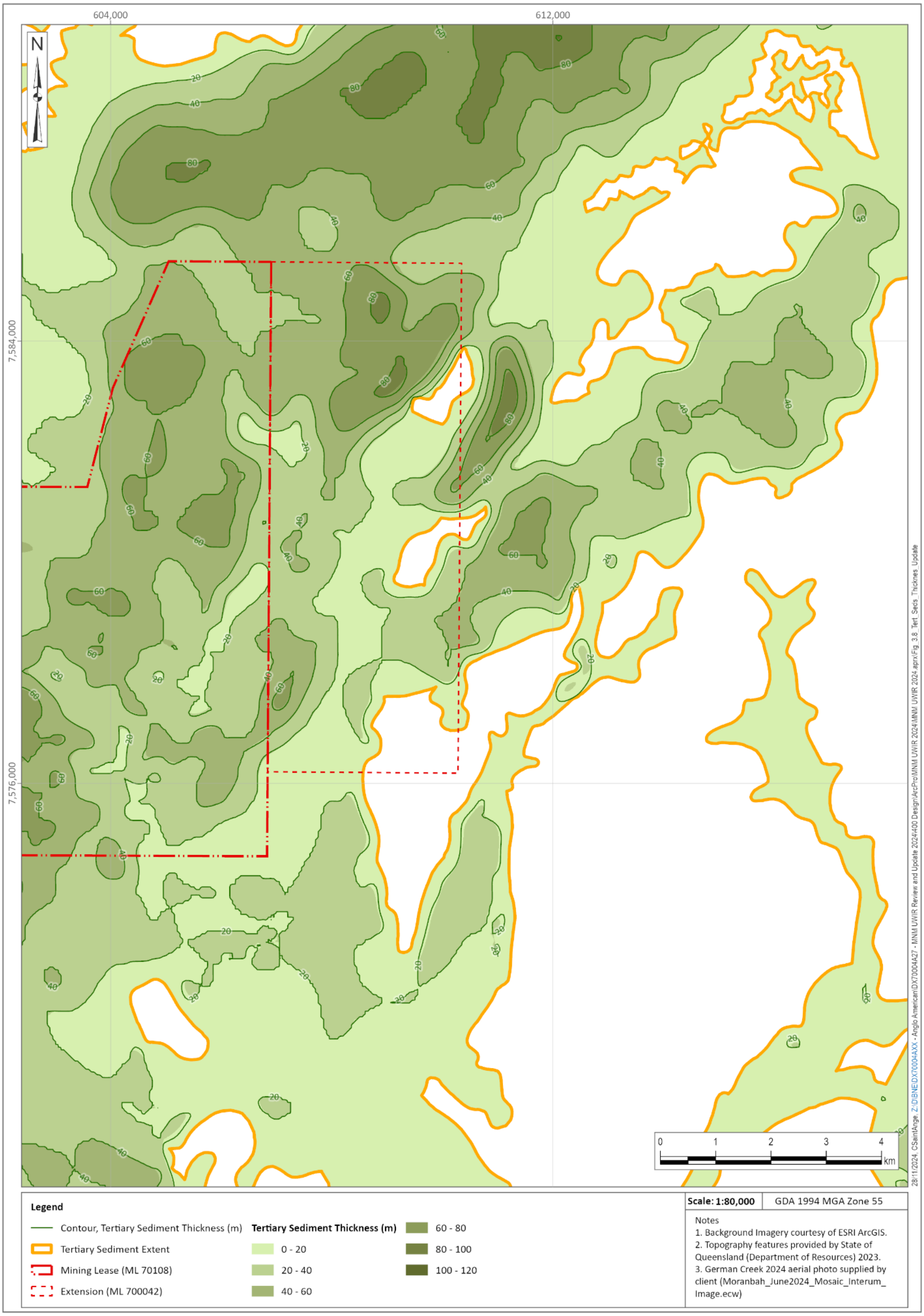


Figure 5.6 Tertiary Sediment Extent and Thickness

5.2.4 Triassic Rewan Group

The Rewan Group is a thinly interbedded sequence of siltstone, claystone and minor fine-grained sandstone. This unit sub-crops and outcrops approximately 3 km east of the Project site where it overlies the Permian Coal Measures (Figure 5.4). The Rewan Group is absent from the Project site.

5.2.5 Permian Coal Measures

The Permian coal measures include the Rangal Coal Measures, the Fort Cooper Coal Measures, the Moranbah coal measures, and the underlying Back Creek Group (Figure 5.4). They comprise alternating layers of fine to medium grained sandstone, siltstone and coal, including the target GM seam.

The coal measures sub-crop under the Tertiary sediments and basalt and dip towards the east. The GM seam reaches a maximum depth of approximately 540 m at the eastern extent of the Project mining area (Figure 5.7).

The upper profile of the sub-cropping coal measures has been extensively weathered forming a clay cap.

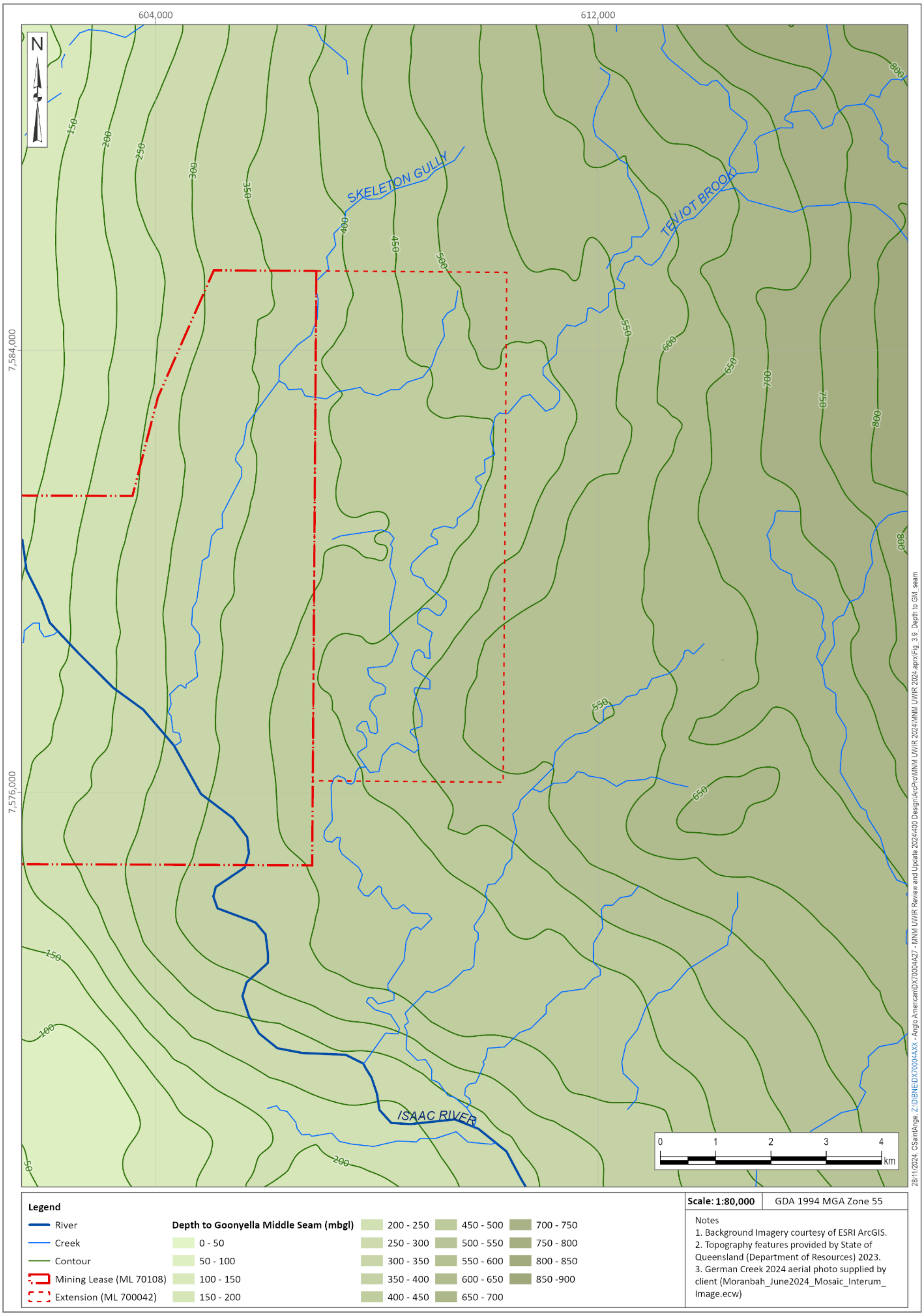


Figure 5.7 Depth to Goonyella Middle Seam

6 PART A : UNDERGROUND WATER EXTRACTION

6.1 Quantity of Water Produced to Date

Underground water rights have been exercised at the Project during the reporting period. Current operations have involved SIS bore installation and minor coal seam to depressurisation.

Nine surface-to-inseam (SIS) directional drilling bores were installed over the UWIR period (Figure 6.1). From 20th August 2023 to 16th October 2024, a total of 2,016 KL of water was produced across the Teviot Brook gas field. Each commissioned bore produced 224 KL of water in the 2023 and 2024 years (Figure 6.1). The total volume produced, 2,016 KL (2 ML) is much lower than the predicted groundwater take of 60 ML. The new bores are in Stage 1 of the installation, development and preliminary gas depressurisation. There has not been any dewatering of the GM seam since the installation and development of the bores. The SIS bores are to be commissioned, and continuous pumping and dewatering of the coal seam is not due to commence until 2028.

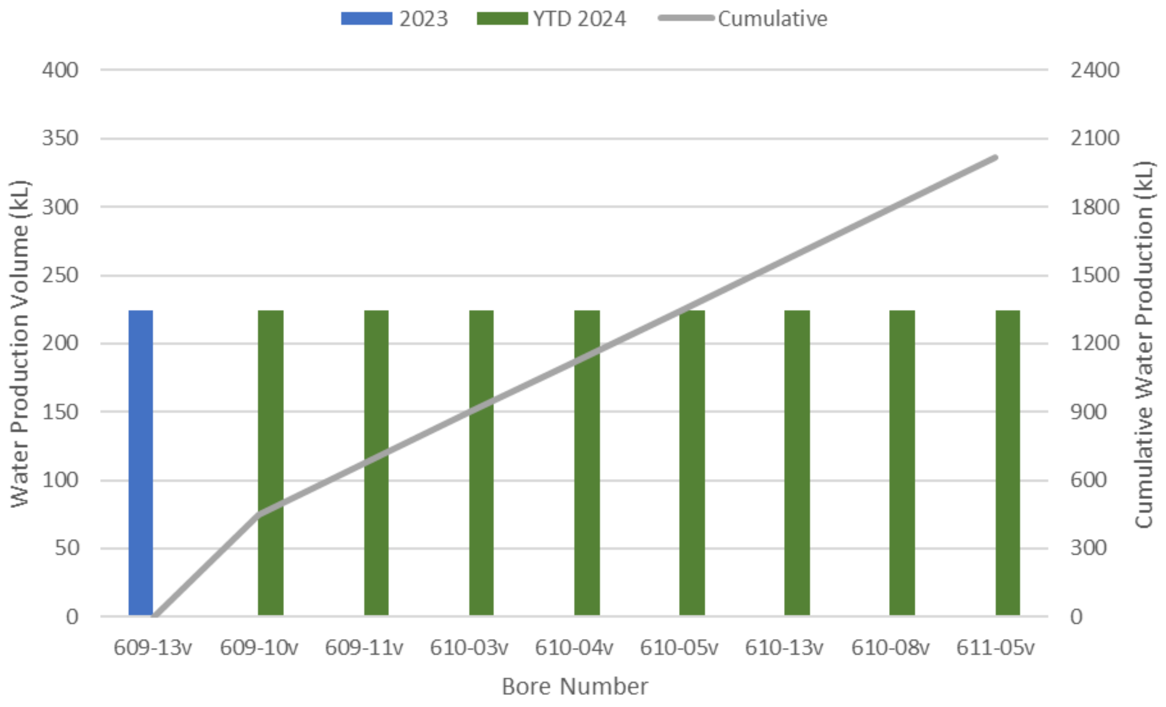


Figure 6.1 Current Water Production Summary – Moranbah North Teviot Bores

6.2 Quantity of Water to be Produced in the Next Three Years

Produced water volumes and rates for the Project are predicted using the standard SIS bore installation and development techniques; 11 new bores are proposed to be installed in the 2025 to 2026 period. Figure 6.2 shows the predicted water production rates per bore and the cumulative water take over the UWIR period.

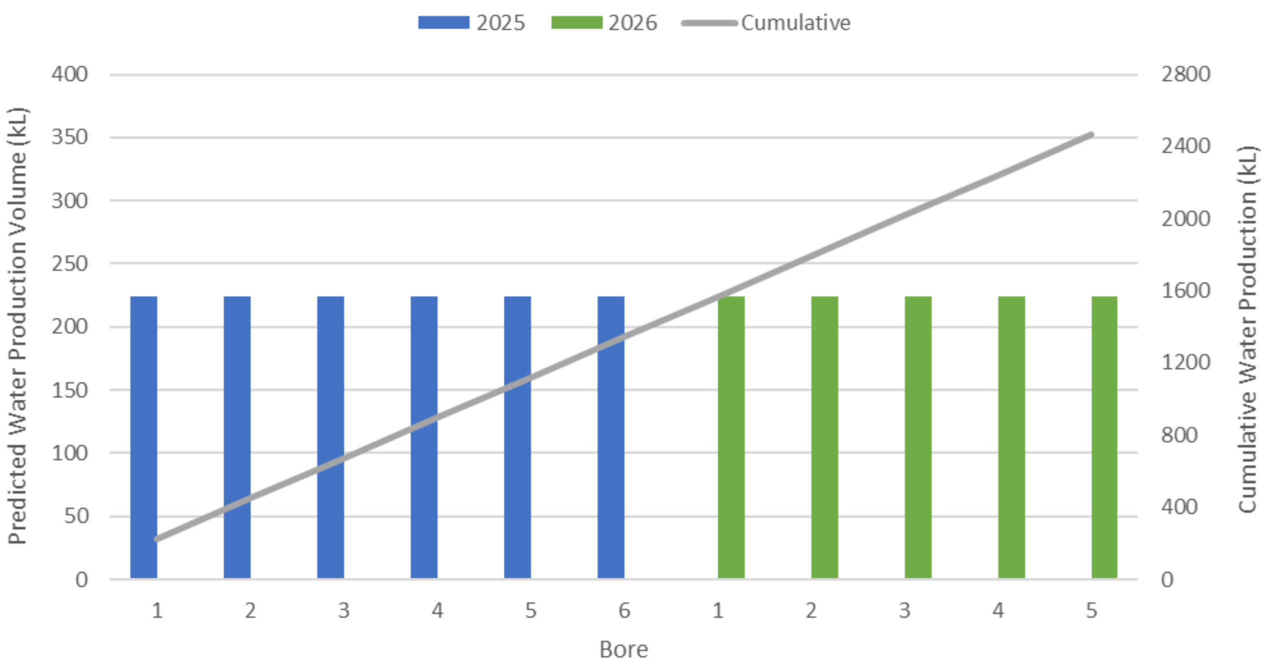


Figure 6.2 Predicted Water Production Rate and Cumulative Volume for the Project

Table 6.1 shows the predicted volume of groundwater and the water take from the Moranbah Coal Measures in the Project area. A total of 1.344 ML of groundwater is predicted to be produced in year 1 and 1.120 ML is predicted to be produced in year 2. No water take is predicted in year 3. The total predicted groundwater take during active production for the 2025 to 2026 period is 2.464 ML (similar to the 2023 to 2024 period).

Table 6.1 Predicted Volume of Groundwater Take during the UWIR Period

Year of UWIR Period	Predicted Water Production Volume (kL)	Predicted Water Production Volume (ML)
1	1344	1.344
2	1120	1.120
3	0	0
Total for UWIR Period	**2464**	**2.464**

6.2.1 Coal Seam Gas Drainage and Underground Longwall Activities

The Project involves the use of conventional gas drainage activities to remove residual gas from the GM seam within the Project site where conditions allow. Eleven additional SIS wells are proposed to be drilled in 2025 and 2026 on ML700042 for stage 1 bore installation, development and preliminary gas depressurisation. The bores will not be commissioned, and continuous pumping and dewatering of the Coal seam is not due to commence until 2028.

The longwall mining is expected to commence in 2028 which will be assessed in the next UWIR period. Mining will be undertaken using Moranbah North's mining equipment and the existing Moranbah North Mine portals and drifts will provide underground access to the Project longwall panels.

7 PART B: AQUIFER INFORMATION AND UNDERGROUND WATER FLOW

7.1 Local Hydrogeology

7.1.1 Alluvium

The regional groundwater table is typically located several metres below the base of the alluvium. The significant separating depth means that the alluvium is typically dry and unsaturated.

As discussed previously, the mapped alluvium in the Project is associated predominantly with Teviot Brook and its floodplain in the central and southern part of the Project site (Figure 5.5). In small, discrete areas, where the alluvium is thickest and the groundwater table is shallowest, the base of the alluvium may intersect the regional water table at depths of approximately 15 m or deeper. Monitoring bore MNM_MB002 was installed in 2023 to the south of the Project site adjacent to Teviot Brook (Figure 7.3). MNM_MB002 was screened across the alluvium to monitor the shallow aquifer system. This bore has remained dry since commissioning indicating that there is no significant alluvial aquifer present.

The regional water table does not saturate the shallow alluvium or intersect the ground surface (either in the riverbed or on the floodplain) in the vicinity of the Project site. There is therefore no expression of the regional water table at the ground surface and no direct groundwater – surface water interconnection within the vicinity of the Project. As there is little evidence of significant alluvial aquifers identified in the monitoring bores, groundwater does not appear to provide baseflow to a watercourse in the vicinity of the Project site. This is supported by the highly ephemeral nature of Isaac River and Teviot Brook flows (i.e. no baseflow) and absence of recorded springs in the vicinity of the Project site.

7.1.2 Tertiary Sediments

As with the alluvium, the Tertiary sediments are typically located above the regional groundwater table and are therefore generally dry and unsaturated in the vicinity of the Project site.

The Tertiary sediments were modelled to extend below the regional groundwater table, up to a maximum thickness of approximately 50 m within minor areas of the Project site (KCB, 2021). The limited saturated thickness indicates that these sediments do not store significant groundwater and are not considered to be a significant aquifer.

7.1.3 Tertiary Basalt

The hydraulic properties of the basalt can vary considerably as groundwater is primarily stored within highly compartmentalised fractures and vesicular zones. Massive zones without either of these properties will have a very low hydraulic conductivity. Furthermore, highly weathered basalt breaks down to clay with a very low hydraulic conductivity. Shallow highly weathered basalt, therefore, will generally not contain significant groundwater and can act as a barrier to flow. In contrast, localised vesicular and fractured zones can store and transmit larger volumes of groundwater. The depth of the groundwater table within the Tertiary basalt is typically more than 50 m below ground level (KCB, 2021).

The Tertiary basal sands comprise medium to coarse grained unconsolidated sand. The basal sands are thin (less than 5 m thick) and not laterally extensive. They form discrete lenses below the basalt, restricted to the palaeo-channels. The Tertiary basal sands are hydraulically connected to the overlying basalts and together form a single aquifer system. The presence of aquifers within the Tertiary basal sands could not be confirmed with the recent 2023 drilling as the bores intersecting the basal sands were dry.

7.1.4 Triassic Rewan Group

The Rewan Group is uniformly saturated at depth; and may become unsaturated where it outcrops or sub-crops above the regional groundwater table east of the Project site.

7.1.5 Permian Coal Measures

The Permian Coal Measures are uniformly saturated across the Project site. Some units of the Permian Coal Measures (e.g. Fort Cooper Coal Measures) may become unsaturated in areas where they outcrop to the east and southeast of the Project site.

The coal seams have been extensively depressurised within the Project site and surrounds due to CSG production and underground mining.

7.2 Aquifer / Aquitard Hydraulic Properties

7.2.1 Hydraulic Conductivity

Hydraulic conductivity data has been reviewed from Golder Associates and KCB investigations from 2018 to 2020 (KCB, 2022a). This included the test results from 38 monitoring bores in the Tertiary sediments, weathered basalts and fresh basalt. The data is summarised in Table 7.1 and is shown in terms of screen depth in Figure 7.1.

The data suggests:

- The lower Tertiary sediment has the lowest hydraulic conductivity (average of 0.003 m/d). This is representative of a low permeability clay.
- The upper Tertiary sediments also have low hydraulic conductivity (average of 0.044 m/day). Low hydraulic conductivity values in the Tertiary sediments were confirmed by both KCB and Golder (KCB, 2020).
- The weathered basalt has the highest hydraulic conductivity (average of 0.71 m/day).

Figure 7.1 presents a visual representation of the key units and their average hydraulic conductivity.

Table 7.1 Hydraulic Conductivity Statistics

Unit	Number of tests	Hydraulic Conductivity (m/d) - Kh			
		Minimum	Maximum	Average	Geometric mean
Alluvium	6	0.002	0.864	0.144	0.002
Tertiary sediment (upper)	5	0.010	0.080	0.044	0.03

Unit	Number of tests	Hydraulic Conductivity (m/d) - Kh			
		Minimum	Maximum	Average	Geometric mean
Tertiary sediment (lower)	4	0.001	0.009	0.003	0.002
Tertiary basalt – weathered	17	0.0002	7.240	0.706	0.08
Tertiary basalt - intact	5	0.0004	0.330	0.072	0.01

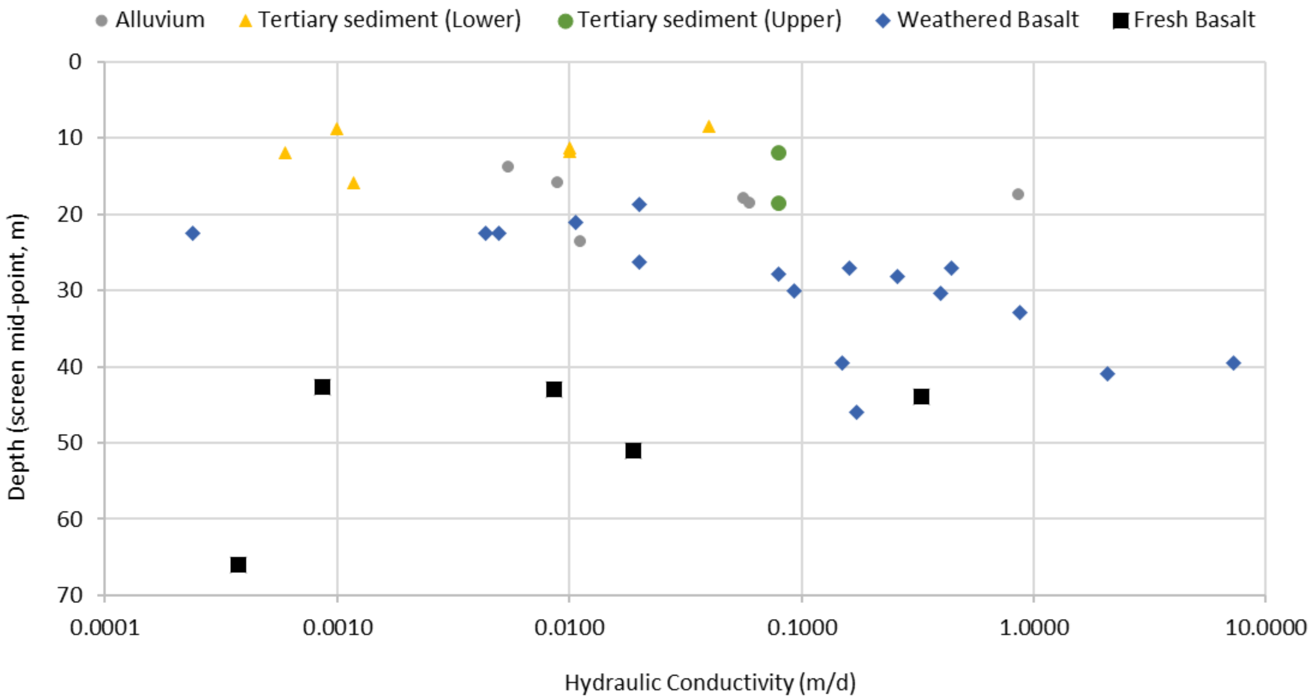


Figure 7.1 Hydraulic Conductivity and Depth of Screen

7.3 Groundwater Recharge

7.3.1 Alluvium

Regionally, and within the Project site, groundwater flow in the alluvium is from northeast to southwest and follows the gradient and alignment of Teviot Brook (KCB, 2021).

Any alluvial groundwater accumulated during discrete, short-duration surface water flow events will subsequently dissipate to the groundwater regime associated with the underlying and adjacent Permian Coal Measures and Tertiary sediments and basalts.

Recharge to the alluvium occurs via:

- Direct rainfall infiltration to the alluvium;
- Seepage of surface water into the creek bed during seasonal flow events in the river and larger creeks. Stream gauging data collected from the Isaac River downstream of the Project site, and observations of Teviot Brook at the Grosvenor Mine, indicate that

surface water flows are limited to short-duration events during and immediately following sustained seasonal rainfall;

- These flow events result in discrete, short-duration recharge events through the alluvium that will dissipate to the surrounding groundwater regime; and
- Localised seepage from the underlying groundwater regime in the Tertiary and Permian sediments during periods of no surface water flow (where the alluvium is thicker, and the base of the alluvium extends below the regional groundwater table).

All creeks near the site are ephemeral, with no measurable baseflow and therefore there is no significant groundwater contribution to surface water baseflow.

7.3.2 Tertiary Sediments

The Tertiary sediments are recharged by direct infiltration from rainfall where these sediments are present at the surface. Short-duration recharge also occurs via seepage from the alluvium (where present) for short periods following surface water flow events. The Tertiary sediments are also recharged by the underlying groundwater regime where they are hydraulically connected.

Groundwater flow in the Tertiary sediments reflects the topography and is continuous only where this unit is saturated.

Groundwater flow in the Tertiary sediments is to the southwest, reflecting the topography of the Teviot Brook and Skeleton Gully catchments (KCB, 2021). Groundwater flows in the Tertiary sediments have also been influenced by the presence of mining and CSG production. The influence of these activities is observed in groundwater levels west of the Project site, where coal seams are located at relatively shallow depths.

Discharge of the Tertiary sediments groundwater predominantly occurs as seepage to the underlying Permian sediments and Tertiary basalt (where present).

Due to the depth of groundwater in the Tertiary sediments, there is no significant interaction with surface waters within the vicinity of the Project site.

7.3.3 Tertiary Basalt

Recharge to the Tertiary basalt occurs via direct rainfall infiltration in areas where the Tertiary basalt outcrops and via seepage from the overlying Tertiary sediments and alluvium where present.

Groundwater flow in the Tertiary basalt is typically towards the southwest (KCB, 2021). Groundwater flows in the basalt are locally influenced by mining, particularly to the west of the Project site where groundwater flows are towards MNM.

Groundwater discharge from the Tertiary basalt occurs as seepage to the underlying Permian Coal Measures and the underground workings at MNM. Depressurisation of the underlying Permian Coal Measures has increased the vertical gradient and seepage from the Tertiary basalt.

Due to the depth of groundwater in the Tertiary basalt (i.e. more than 50 m), there is no significant interaction with surface water or alluvial groundwater in the vicinity of the Project site.

7.3.4 Triassic Rewan Group

The Rewan Group is recharged via direct rainfall infiltration in outcropping areas and via seepage from overlying units (including the Tertiary sediments, Tertiary basalt, and alluvium).

Groundwater flow is towards the southwest and is a subdued reflection of the topography and surface water catchments. Discharge into the underlying Permian Coal Measures is the main discharge mechanism. However, discharge volumes are very low due to the very low rates of groundwater recharge.

7.3.5 Permian Coal Measures

Recharge occurs via rainfall infiltration on localised outcrops of Permian sediments to the east and southeast of the Project site, and slow downward seepage from overlying strata. The outcrop to the east is the Fort Cooper Coal Measures, which lies stratigraphically above the Moranbah Coal Measures. As a result, the groundwater recharge to the Permian – Moranbah Coal Measures is typically very low. The rate of recharge may also be enhanced where the coal measures sub-crop against the overlying strata, although the clayey nature of this weathered material will also limit recharge. Overall, the rate of recharge remains very low.

Conceptually, the undisturbed groundwater flow direction in the Permian Coal Measures is towards the southeast.

Underground coal mining at MNM, Grosvenor Mine and the Goonyella Riverside Broadmeadow complex, and CSG production at the Moranbah Gas Project have reduced groundwater pressures in the surrounding coal measures, creating a zone of depressurisation that gradually diminishes with distance from these operations. The Project site lies within the zone of depressurisation associated with both MNM and the Moranbah Gas Project. Depressurisation of the coal measures has reduced the potentiometric groundwater surface creating a hydraulic gradient towards the centre of the zone of depressurisation (i.e. MNM and the Moranbah Gas Project). Groundwater movement in vicinity of the Project site is therefore a reflection of the depressurisation within the coal measures (i.e. towards these mining and CSG operations).

Groundwater discharge within the vicinity of the Project site is therefore dominated by CSG production at the Moranbah Gas Project and groundwater drainage associated with the Moranbah North Mine and Grosvenor Mine. Groundwater discharge into overlying formations is negligible in the vicinity of the Project site.

7.4 Groundwater Level and Flow

A total of 259 groundwater bores are registered on the GWDB with water level readings in a 10 km radius of the Project (Figure 7.2). The majority of these bores are dedicated mine monitoring in the Permian Coal Measures and are in the alluvium. A summary of the Registered bores is presented in Table 7.2 along with their type and status, as derived from the GWDB.

Table 7.2 Summarised Bore Type and Condition within a 10 km radius of Project

Type	Abandoned and Destroyed (AD)	Abandoned But Useable (AU)	Existing (EX)	Total
Condition Unknown (AB)	0	0	14	14

Type	Abandoned and Destroyed (AD)	Abandoned But Useable (AU)	Existing (EX)	Total
Water Supply (WS)	0	0	2	2
Mine Monitoring (MM)	0	0	182	182
Petroleum Exploration (PE)	0	0	11	11
Coal Seam Gas Monitoring (CM)	0	0	35	35
Sub-artesian Facility (SF)	0	0	15	15
Total	**0**	**0**	**259**	**259**

Table 7.3 presents the number of groundwater monitoring bores within a 10 km radius of the Project for each monitored hydrostratigraphic unit.

Table 7.3 Summary of Registered Groundwater Bores within 10 km of the Project with Groundwater Level Monitoring Records

Hydrostratigraphic Unit	No. of Bores
Alluvium	18
Tertiary Sediments	8
Tertiary basalt	16
Rewan Group	1
Permian Coal Measures	16
Total	**59**

The MNE groundwater monitoring bore locations and their screened units are presented on Figure 7.3. The following section provides a summary of the available groundwater monitoring data.

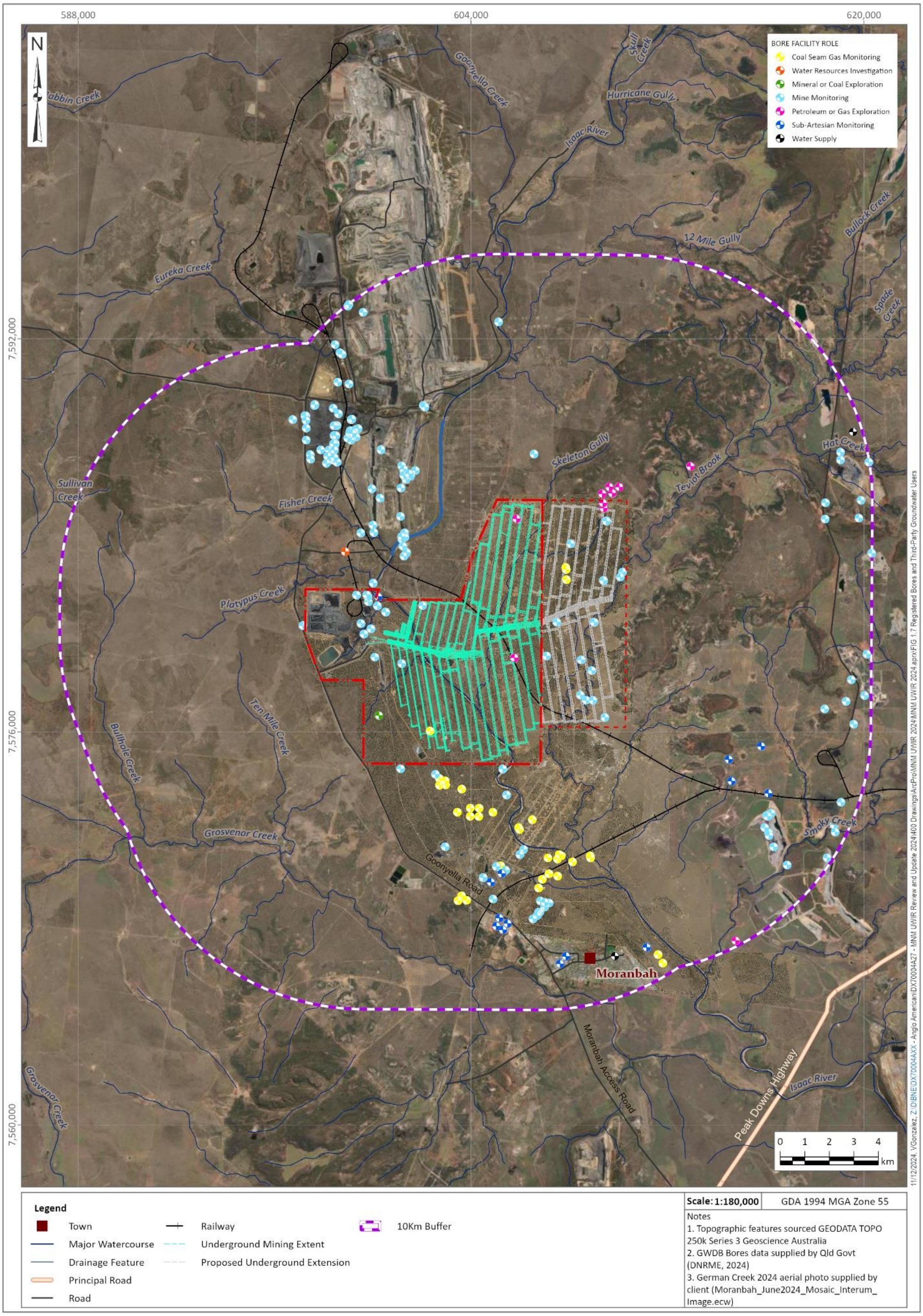


Figure 7.2 Location of Registered Groundwater Bores within 10 km of the Project

Figure 7.3 MNE Groundwater Monitoring Bore Locations

7.4.1 Alluvium

Groundwater bore TWM17008A and the newly installed MNM_MB002 are both screened across the alluvium. Both monitoring bores are dry, and no data has been collected. Bore TWM17008A has been monitored since October 2017 and MNM_MB002 has been monitored since 2023.

TWM17008A is located east of Teviot Brook, in the centre of the Project site. MNM_MB002 is located at the southern boundary of the Project, adjacent to Teviot Brook (Figure 7.3).

7.4.2 Tertiary Sediments Above the Basalt

Monitoring bore TWM17007A which is screened across the Tertiary sediments above the basalt, is also **dry.** Figure 7.4 presents a groundwater elevation hydrograph for TWM17007A, which is screened across the Tertiary sediments.

TWM17007A is located east of Teviot Brook, in the centre of the Project site.

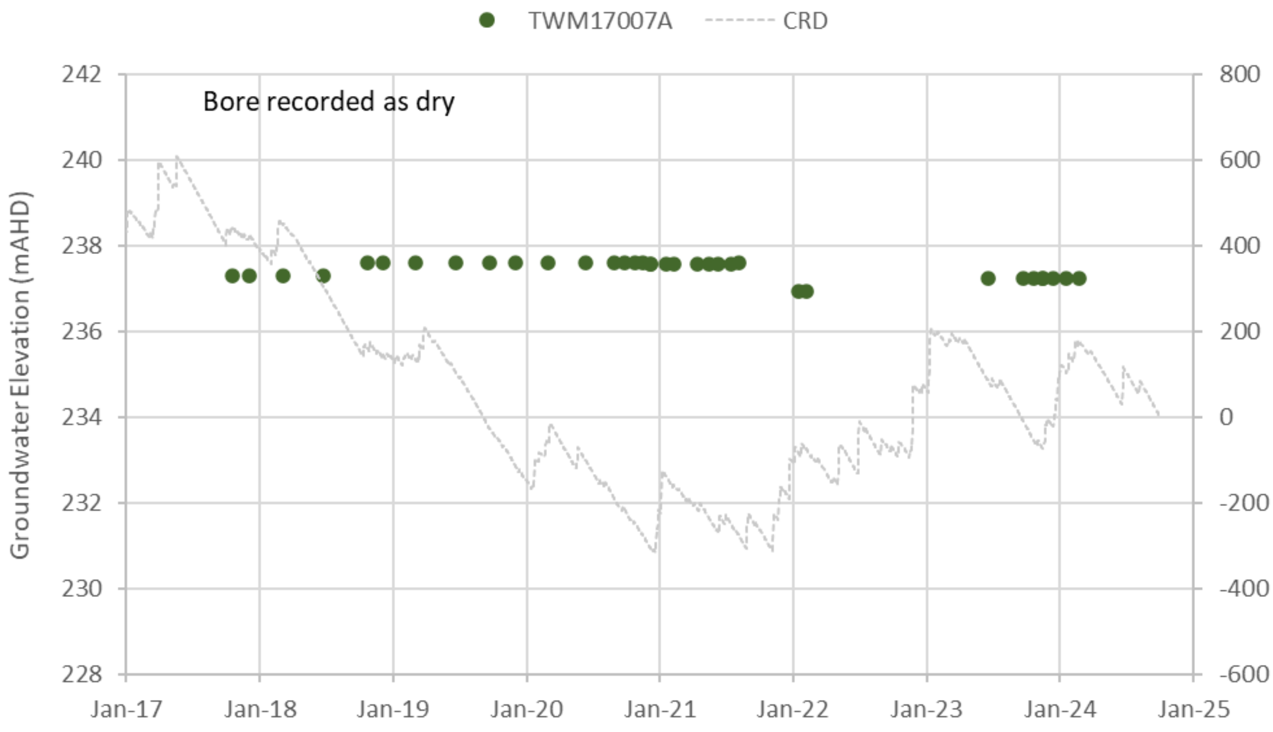


Figure 7.4 TWM17007A Groundwater Elevation Hydrograph – Tertiary Sediments

7.4.3 Tertiary Basalt

Figure 7.5 presents a groundwater elevation hydrograph for the bores which are screened across the Tertiary basalt. The bores have been monitored since 2017.

TWM17010B is located in the north of the tenure, towards the northern boundary and TWM17004 is located to the west of the tenure near the western boundary. The bores TWM17006B, TWM17007B, and TWM17010A are located in the centre of the tenure along Teviot Brook.

The hydrograph of the bores shows:

- The water levels in TWM17010B remain stable and do not respond significantly to changes in rainfall.
- TWM17004 shows an increase observed in the datalogger data from the end of August 2023 to the end of September. This is likely attributed to the datalogger being placed at a different (incorrect) depth downhole following sampling in August.

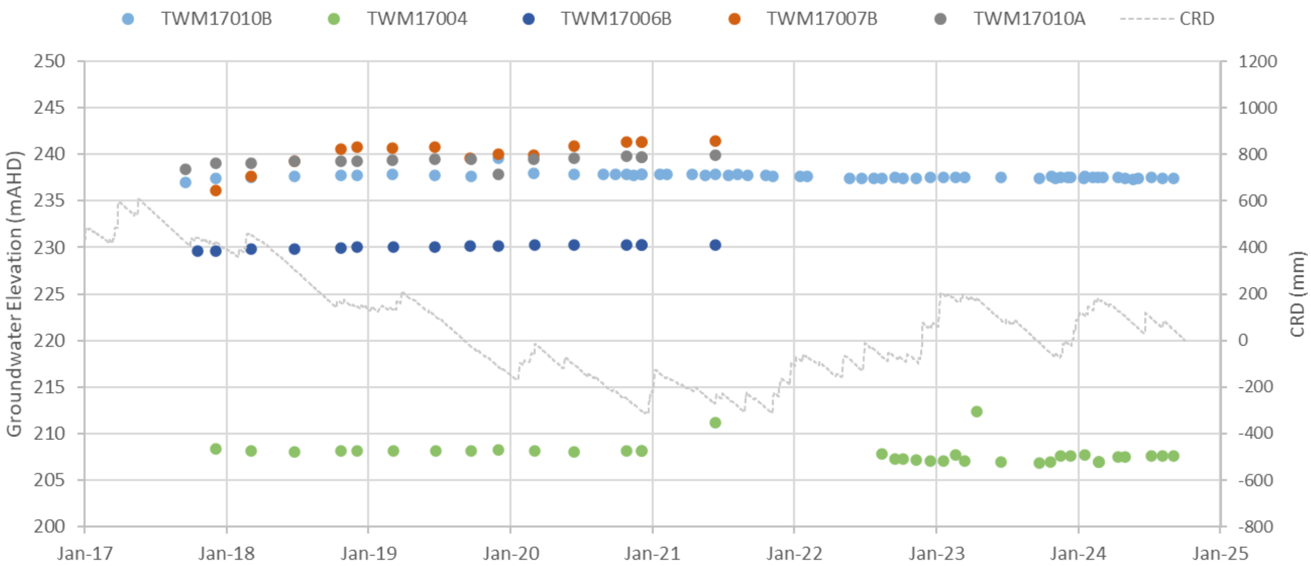


Figure 7.5 Groundwater Elevation Hydrographs – Tertiary basalt

7.4.4 Permian Coal Measures

Figure 7.6 presents a groundwater elevation hydrograph for bores screened across the Permian Coal Measures. The bore has manual dip measurements available since October 2017.

TWM17008B is located in the centre of the tenure, close to Teviot Brook. The hydrograph shows:

- Stable groundwater levels during the review period.
- However, groundwater elevations have increased since monitoring records began.
- No correlation between CRD and groundwater elevation data is observed.

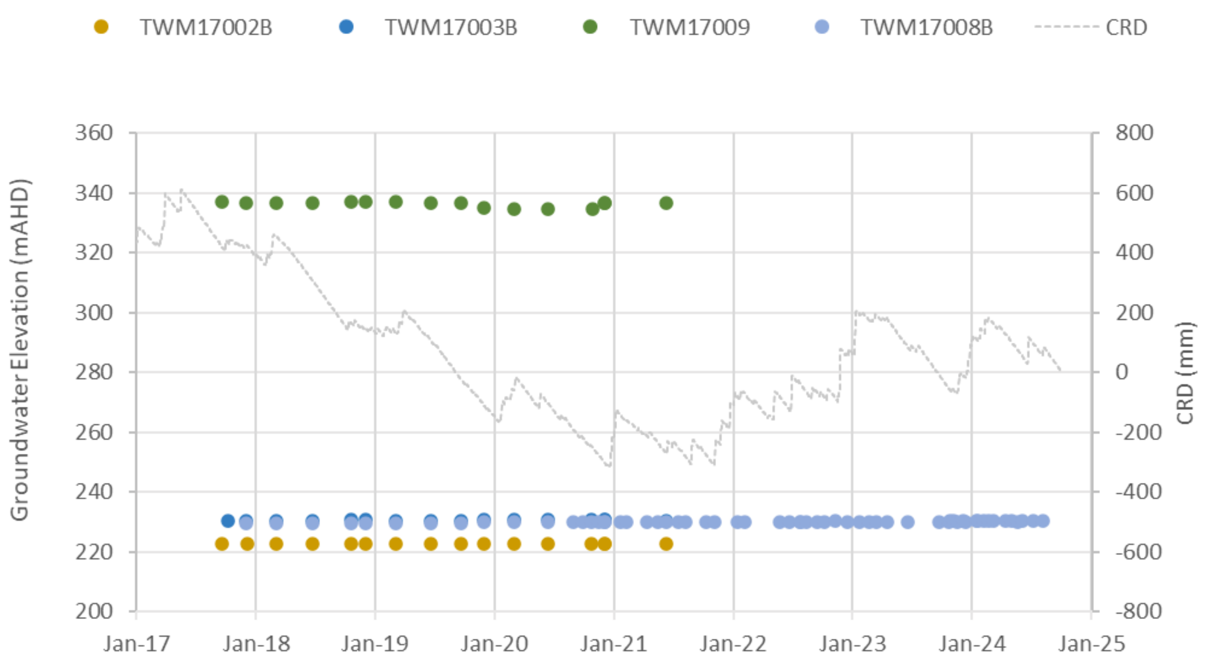


Figure 7.6 TWM17008B Groundwater Elevation Hydrograph – Permian Coal Measures

7.5 Overview of Area's Groundwater Chemistry

Groundwater quality within the Project site and its surrounds ranges from saline to highly saline. Regionally, groundwater is moderately saline to highly saline. Local and regional groundwater is therefore generally unsuitable for potable, irrigation or stock watering uses. Where water quality is suitable, yields are generally very low. There are no current groundwater users in the Project site or its surrounds. The groundwater chemistry of each unit is described in the following sections (KCB, 2018).

Alluvial Aquifers

Groundwater quality in the alluvium within the vicinity of the Project site is brackish to moderately saline.

Brackish water quality data relates to areas where the alluvial groundwater is ephemeral and recharged by surface water flows. In these areas, evaporative concentration of surface water recharge over a short residence time has resulted in a slight increase in the salinity. More saline groundwater has been recorded in areas where the alluvium is inferred to be recharged by the underlying regional groundwater regime.

Tertiary Sediments

Groundwater in the Tertiary sediments at the Project site is saline (EC = 14,500 µS/cm). Regionally, groundwater in the Tertiary sediments vary from brackish to highly saline (EC = 1,300 to 29,100 µS/cm). The elevated salinity is a reflection of the degree of connectivity with the underlying Permian Coal Measures and the long groundwater residency times and low permeability of groundwater in this unit.

Groundwater in the Tertiary basalt at the Project site ranges from brackish to saline (EC = 2,310 to 17,300 µS/cm). The range in salinity reflects the highly heterogeneous characteristics of the basalt.

Rewan Group

Groundwater in the Rewan Group is typically saline (KCB, 2016). This is due to the low hydraulic conductivity and long groundwater residence times of this unit, which results in solute contribution from the rock mass to the groundwater. Groundwater within highly weathered zones of outcropping Rewan Group sediments can be slightly less saline due to enhanced direct recharge in these areas.

Permian Coal Measures

Groundwater in the Permian Coal Measures is predominantly moderately saline to saline (Table 7.5)

7.6 Groundwater Quality over Reporting Period

The groundwater monitoring locations for the Project are presented in Table 7.4. Trigger levels have been established for the groundwater for three bores (TWM17007A, TWM17008A and TWM17010B) in the UWIR approval (DETSI, 2021) . A description of the trigger values is presented in Table 7.5.

Groundwater trigger levels are also specified for TWM17004 and TWM17010B in the Project site, Environmental Authority (DETSI, 2024a). The groundwater quality monitoring for three monitoring bores TWM17004, TWM17008B and TWM17010B are presented in Appendix I. Two bores with specified trigger levels (TWM17008A and TWM17007A) were dry and have been dry since 2023. A summary of the hydrochemistry observations for bore TWM17010B screened across the basalt is presented below:

- In general, water quality was stable during the review period.
- pH was stable and varied between pH 7.5 to 7.91 and remained below the trigger value.
- EC varied from 19,000 (µs/cm) and 21,300 (µs/cm), it exceeded the trigger value of 20,545 (µs/cm) four times over the UWIR period.
- Sulfate ranged between 598 (mg/L) and 810 (mg/L) during the review period; however, the records show that Sulfate concentrations are increasing and have exceeded the trigger value of 759 (mg/L) for most of 2023 and 2024.
- Arsenic ranged between 0.0005 (mg/L) and 0.005 (mg/L) during the three-year review period. Arsenic concentrations have remained below the trigger value of 0.0012 (mg/L) over the UWIR period.
- Molybdenum has maintained concentrations below the trigger value of 0.003 (mg/L) for the three-year review period, except for one sampling round where a value of 0.006 (mg/L) was recorded in September 2022.

- Aluminium varied between 0.005 (mg/L) and 0.035 (mg/L) during the review period and remained below the trigger value of 0.055 (mg/L).
- The concentration of iron varied between 0.03 (mg/L) and 2.2 (mg/L) over the UWIR period. The concentration of iron exceeded the trigger value of 1.68 (mg/L) on six occasions. Iron should be monitored in future sampling rounds to determine if the elevated concentrations of iron are due to a change in conditions.
- Selenium shows a decreasing concentration from 0.005(mg/L) to 0.001(mg/L) over the UWIR period. Selenium remains below the trigger level of 0.005 (mg/L).
- TRH (C6-C9) remained stable throughout the review period and remains below the trigger level of 50 (µg/L).
- TRH (C10-C36) remained below the trigger level of 200 (µg/L) until December 2023. In 2024, TRH (C10-C36) spiked to 1040 (µg/L) however decreased to below the trigger value in the next sampling round. No activities (SIS bore installations etc) have occurred near this monitoring bore location during the review period. The TRH (C10-36) should be closely monitored in future sampling rounds to determine if the result is anomalous, or indicative of a change in conditions.

A summary of the hydrochemistry observations for bore TWM17008B screened across the Permian Coal Measures is presented below:

- In general water quality was stable during the review period.
- pH was stable and varied between pH 7.36 to 7.80.
- EC and sulfate vary over the UWIR period. Monthly monitoring should continue to track the trend of EC.
- Iron, aluminium and Selenium showed a decreasing trend since January 2024.
- Arsenic remained stable throughout the review period and shows a slightly decreasing trend.
- Molybdenum and TRH (C6-C9) remained stable through the review period.
- TRH (C10-C36) varied throughout the review period. The reading in March 2024 was significantly higher than previously recorded value. The May 2024 value was significantly lower than the previous value. No activities have occurred near this monitoring bore during the review period. The TRH (C10-36) has decreased significantly in the last sampling round and should be closely monitored in future sampling rounds. It appears the high value is anomalous and not indicative of a change in conditions.

Changes to water quality, or exceedance of triggers, are not considered to be attributable to the activities of the site due to a lack of surface activities in the MNE area.

Table 7.4 Groundwater Monitoring Locations, Frequencies and Levels

Monitoring Point	Longitude[1]	Latitude[1]	Frequency of Groundwater Quality Monitoring	Frequency of Groundwater Level Monitoring	Groundwater Surface (mAHD)[2]	Target Units
TWM17008A	148.06537440	-21.86120640	Quarterly	Monthly	245.85	Alluvium
TWM17007A	148.06017500	-21.85952360	Quarterly	Monthly	261.00	Tertiary sediments above basalt
TWM17010B	148.06112520	-21.83749370	Quarterly	Monthly	298.69	Tertiary basalt
TWM17008B	148.06540000	-21.86110000	Not Required	Monthly	250.57	Permian Coal Measures

Notes: 1: Decimal degree AGD84; 2. mAHD denotes metres above Australian Height Datum; *note erroneous longitude (146.06017500) provided in Attachment A.*

Table 7.5 Groundwater Investigation Trigger Values

Monitoring Point	pH	EC	SO_4	Al	As	Fe	Mo	Se	TRH C6 – C9	TRH C10 – C36
Unit	pH units	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L
TWM17008A	<6.5 or >8.5	5,964	79	0.07	0.013	0.3	0.034	0.01	20	100
TWM17007A	<6.5 or >8.5	19,230	946	0.07	0.013	0.3	0.034	0.01	20	100
TWM17010B	<6.0 or >9.0	20,545	759	0.055	0.012	1.68	0.003	0.005	20	100

8 PART C: PREDICTED WATER LEVEL DECLINES FOR AFFECTED AQUIFERS

8.1 Groundwater Model

A calibrated groundwater flow model was previously developed for the initial MNE UWIR (KCB, 2021). The underground mining on the extension area (ML 700042) has not commenced, so the existing MNE UWIR 2021 model predictions would not have changed and are adopted for this assessment.

8.1.1 Previous Model Design and Summary

The groundwater model for the Project was developed using MODFLOW software. MODFLOW is the most widely used groundwater modelling software in Australia and is considered to be the industry standard.

The groundwater model was constructed using a detailed geological model developed by the proponent from exploration data. It was further enhanced by inclusion of bore logs from groundwater monitoring bores, exploration bores, CSG production wells installed within the Project site and its surrounds, and all published lithological logs within the model extents. The model was calibrated to existing groundwater levels using reliable measurements from all representative local and regional bores within the model domain.

The hydrostratigraphy of the study area is represented using 19 model layers that are mainly discontinuous across the model domain.

Once calibrated, the model was used to predict the groundwater response to the Project, including changes in groundwater levels and inflows to the proposed mining area. The groundwater model allowed the impacts of the existing approved mining and CSG operations to be distinguished from those of the Project.

Conservative values were used to model the effects of subsidence and subsurface fracturing on the hydraulic properties of the overlying geology and the local groundwater regime. Overburden within the subsidence and subsurface fracturing profile was represented as highly permeable material to the top of the uppermost cracked unit. This approach is a realistic worst-case representation of the effects of subsidence and depressurisation on the groundwater regime.

The sensitivity of the model predictions to the input parameters was tested and analysed. The sensitivity analysis included varying model parameters and design features that could most influence the model predictions. The model parameters were adjusted to encompass the range of likely uncertainty in key parameters. Overall, the sensitivity analysis confirmed that there is a high degree of confidence in the model's calibration and predictions, and that the model is not likely to have under-predicted any significant impacts.

The groundwater model has specifically been used to predict groundwater take and resulting groundwater depressurisation; and these predictions have been used to identify the Immediately Affected Areas (IAA) and Long-Term Affected Areas (LTAA) for the UWIR. These predictions have also been used to assess the impacts of the Project on groundwater users and the sensitive environmental features.

8.2 Predicted Water Level Declines

Two predictive model scenarios were simulated to allow assessment of potential impacts to surrounding water resource as a result of the Project development. These scenarios comprised:

- Scenario A – Cumulative Scenario; which comprises existing CSG wells, underground coal mining activities associated with the existing Moranbah North Mine and the long wall mining associated with the proposed Project development.
- Scenario B – Current Conditions Scenario; which comprises the development activities identified in Scenario A, with the proposed Project development removed.

Groundwater level drawdown associated with the Project development is estimated based on the difference between the drawdown results from Scenario A and Scenario B, which provides a Project-only scenario. Scenario A provides the cumulative drawdown within the vicinity of the Project.

The predictive simulation was completed for the entire duration of the proposed Project development, with the predicted drawdowns abstracted from the model after three (3) years of development and at the completion of development to represent the drawdown for the IAA at the end of the UWIR period and the LTAA, respectively.

8.2.1 Scenario Results

8.2.2 Groundwater Depressurisation During the UWIR Period (2025 to 2028)

The continuous groundwater dewatering and depressurisation and underground longwall mining for the Project is planned to commence in 2028. As underground mining is not planned until the next UWIR period (2028 and 2031) no water level declines (IAA) are expected during this UWIR period.

8.2.3 Groundwater Depressurisation Over the Project Life

Figure 8.1 shows that localised depressurisation is predicted in the GM seam around the proposed longwall panels. Depressurisation of the GM seam is predicted to be greatest in the eastern part of the Project site, where the seam is deepest and hence groundwater pressure is greatest. The GM seam is predicted to experience up to approximately 356 m of depressurisation in this area (Figure 8.1), effectively lowering the potentiometric groundwater surface to 94 m above the GM seam. The zone of depressurisation is predicted to extend less than 1.02 km north and west of the Project site, and less than 520 m to the east and south.

Figure 8.1 also shows the extent of the LTAA in the GM seam. The LTAA encompasses the area where drawdown over the life of the mine is predicted to exceed the applicable bore trigger threshold of 5 m for consolidated aquifers.

Depressurisation in the GM seam does not extend to the overlying Fort Cooper Coal Measures, Tertiary basalt and sediments, or the alluvium due to the thickness of overburden separating the coal seam from these formations. The Fort Cooper Coal Measures, Tertiary basalt and sediments, or the alluvium are not predicted to be depressurised by the Project.

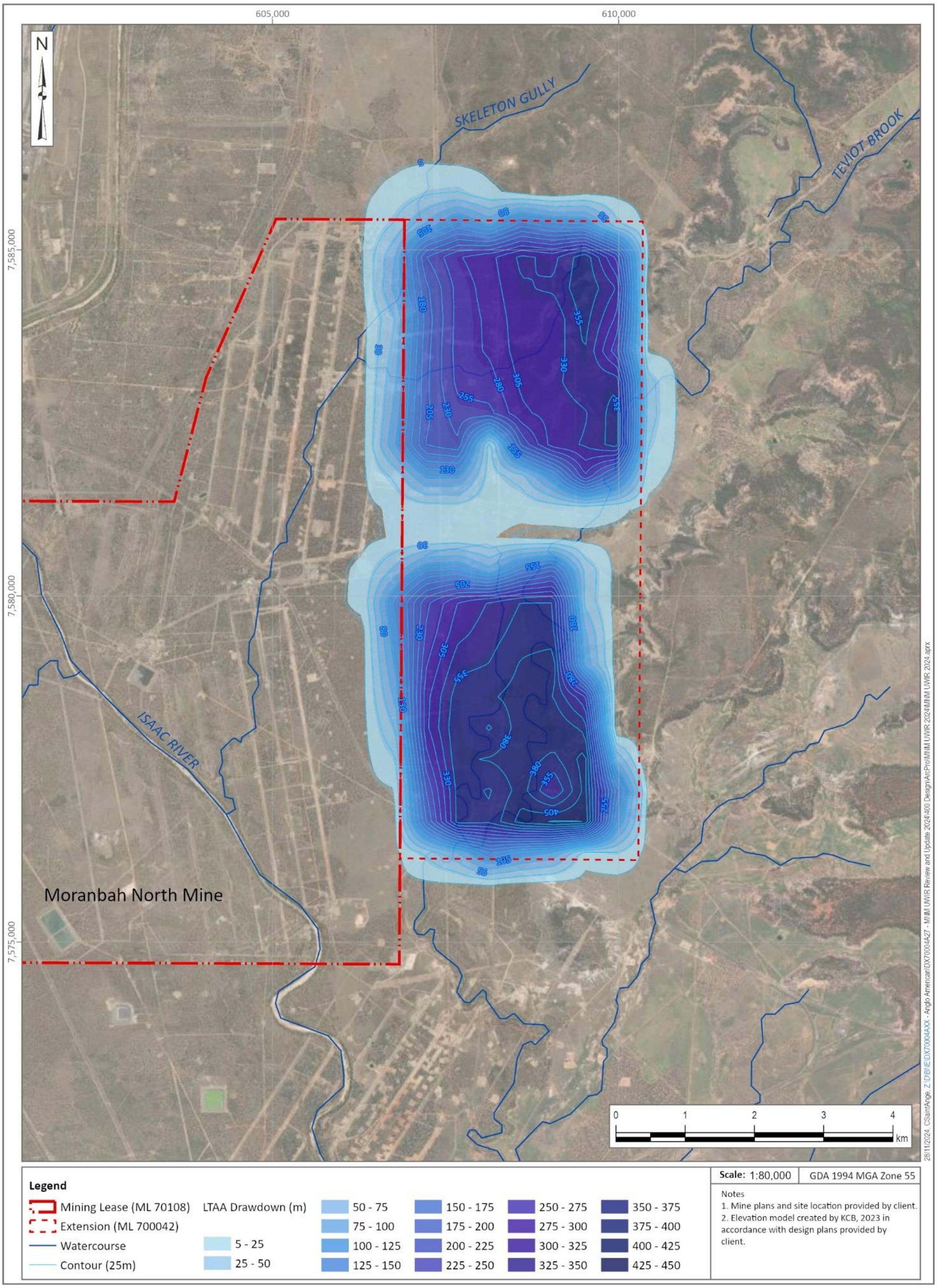


Figure 8.1 Predicted depressurisation in the Goonyella Middle Seam (LTAA), (KCB, 2021)

9 PART D : IMPACTS TO THE ENVIRONMENTAL VALUES

9.1 Identified Environmental Values

9.1.1 Groundwater Surface Water Interactions

The groundwater - surface water interaction within the Project may occur as a result of two key processes:

- Recharge of aquifers as leakage from watercourses; and
- Discharge of groundwater to watercourses as baseflow.

Recharge to groundwater systems from watercourses may occur across the Project, however, this only occurs when there are conditions of sufficient saturation in the alluvium and associated hydraulic head to allow water to infiltrate into the underlying aquifers. This is likely for the majority of the ephemeral watercourses across the Project where flow is only observed during and following rainfall events.

Alluvial aquifers are recharged by direct rainfall infiltration. Seepage of surface water into the creek bed during seasonal flow events in the Isaac River and larger creeks. Stream gauging data collected from the Isaac River downstream of the Project site, and observations of Teviot Brook at the Grosvenor Mine, indicate that surface water flows are limited to short-duration events during and immediately following sustained seasonal rainfall. These flow events result in discrete, short-duration recharge events through the alluvium that will dissipate to the surrounding groundwater regime. Localised seepage from the underlying groundwater regime in the Tertiary and Permian sediments during periods of no surface water flow (where the alluvium is thicker, and the base of the alluvium extends below the regional groundwater table).

Any alluvial groundwater accumulated during discrete, short-duration surface water flow events will subsequently dissipate to the groundwater regime associated with the underlying and adjacent Permian Coal Measures and Tertiary sediments and basalts.

All creeks near the site are ephemeral, with no measurable baseflow and therefore there is no significant groundwater contribution to surface water baseflow.

The Tertiary sediments generally form a thin veneer less than 40 m thick over the Tertiary basalt and Permian Coal Measures, thickening to approximately 90 m where it forms elevated plateaus and ridgelines. The Tertiary sediments do not store significant groundwater due to their generally limited thickness. The limited saturated thickness means that these sediments do not store significant groundwater and are not considered a significant aquifer.

The geological logs from registered bores (RN162880 and 162886) in the southern section of the Project show the presence of 10 m to 15 m of clay between the underlying Permian units and the Tertiary sediments. The clay layer represents an aquitard separating the underlying Moranbah Coal Measures, indicating they are not hydraulically connected to the overlying Tertiary sediments. Therefore, changes in groundwater levels in the Moranbah Coal Measures have limited influence on the groundwater levels in the Tertiary and Alluvial sediments. There is also no evidence of a direct connection of the Moranbah Coal Measures to the alluvium units of Teviot Brook.

The Tertiary basalt underlies the Tertiary sediments and overlies weathered Permian strata at the Project site and typically occurs as a single composite unit comprising massive and vesicular lava, tuff and ash flows. There is 9 m to 25 m of clay situated above the basalt in the central region of the Project as identified in the central bores (RN162488, RN162481 and RN162484). In the northern area of the Project approximately 10 m of clay exists at the base of the basalt (RN162447, RN162883 and RN162874). The presence of the clay layer between the Moranbah Coal Measures and the overlying Tertiary sediments also supports that the units are not hydraulically connected in the central and northern areas of the Project. The registered bore locations are presented on Figure 9.1.

Similarly, In the previous groundwater assessment for MNM on ML 70108, there is no evidence of direct hydraulic connection from the Tertiary sediments or basalt to the Isaac River. In the vicinity of the Isaac River, there is a low permeability clay layer present at the contact of the Tertiary sediments and Tertiary basalt, as confirmed through site investigations (KCB, 2020). This restricts flow upwards from the basalt into the Tertiary sediment in the eastern portions of the site near the Isaac River.

9.1.2 Groundwater Dependent Ecosystem

Potential groundwater dependent ecosystems (GDEs) have been mapped in the vicinity of the Project by the DETSI (DETSI, 2024b). GDEs are defined in water-related responses to coal seam gas extraction and coal mining (DoEE, 2015) as:

> *'Natural ecosystems which require access to groundwater on a permanent or intermittent basis to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services* (Richardson et al., 2011)*. The broad types of GDE are* (Eamus et al., 2006)*:*
>
> - Ecosystems dependent on surface expression of groundwater;
> - Ecosystems dependent on subsurface presence of groundwater; and
> - Subterranean ecosystems.

OGIA (2019) provides further terminology relating to surface expression GDE's, which include spring vents / complexes:

- Spring vents are described as a single location in the landscape where groundwater discharges at the surface. A spring vent can be mounded or flat and can also present as wetland vegetation, with no visible water at the location of the spring.
- A spring complex is a group of spring vents located close to each other. The spring vents are located in the same surface geology and share the same source aquifer and landscape position. No adjacent pair of spring vents in the complex is more than 10 km apart.
- A watercourse spring is a section of a watercourse where groundwater from an aquifer enters the stream through the streambed. This includes waterholes and flowing sections of streams dependent on groundwater. This type of spring is also referred to as a baseflow-fed section of a watercourse.

9.1.2.1 Spring Complexes

Spring complexes, as recorded in the Queensland spring database (Queensland Herbarium 2018), are located over 150 km to the southwest of the Project.

9.1.2.2 Potential Terrestrial GDEs

The distribution of Potential Terrestrial Groundwater Dependent Ecosystems (TGDE), as mapped by DETSI (DETSI, 2024d), within the vicinity of the Project is presented in Figure 9.2. The potential GDEs are generally located in the vicinity of watercourses, such as the Isaac River and associated tributaries (Skeleton Gully/ Teviot Brook). The majority of potential GDEs are mapped as being 'low confidence' and are all derived from National Assessment satellite or regional ecosystem mapping, rather than assigned based on known groundwater dependence.

Figure 9.2 presents the potential terrestrial GDEs using the GDE mapping rule sets as defined by the Queensland Government (2017) in 'Groundwater dependent ecosystem mapping rulesets for the Lake Eyre Basin and surrounding catchments. The rule set occurring in the vicinity of the Project include:

- LEB_RS_01D—Quaternary alluvial aquifers with fresh, intermittent groundwater connectivity regime.
- LEB_RS_01I—Closed alluvial systems with fresh, intermittent groundwater connectivity regime.
- LEB_RS_01N—Closed alluvial systems with brackish, intermittent groundwater connectivity regime.
- LEB_RS_02H—Permeable sandy plain aquifers with fresh, intermittent groundwater connectivity regime.

LEB_RS_03B—Sandstone aquifers with fresh, permanent groundwater connectivity regime associated with recharge springs

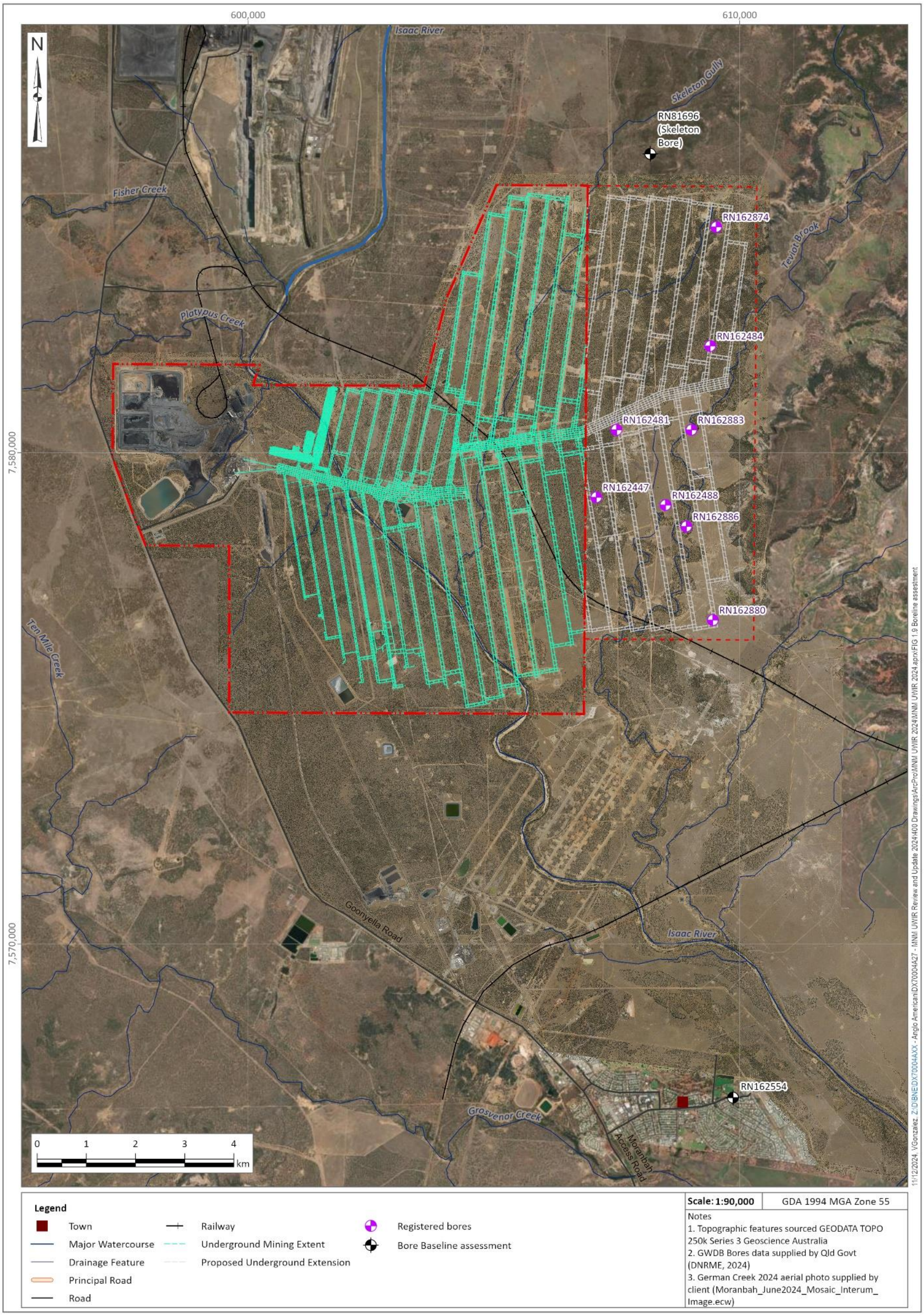


Figure 9.1 Bore Baseline Assessment Locations

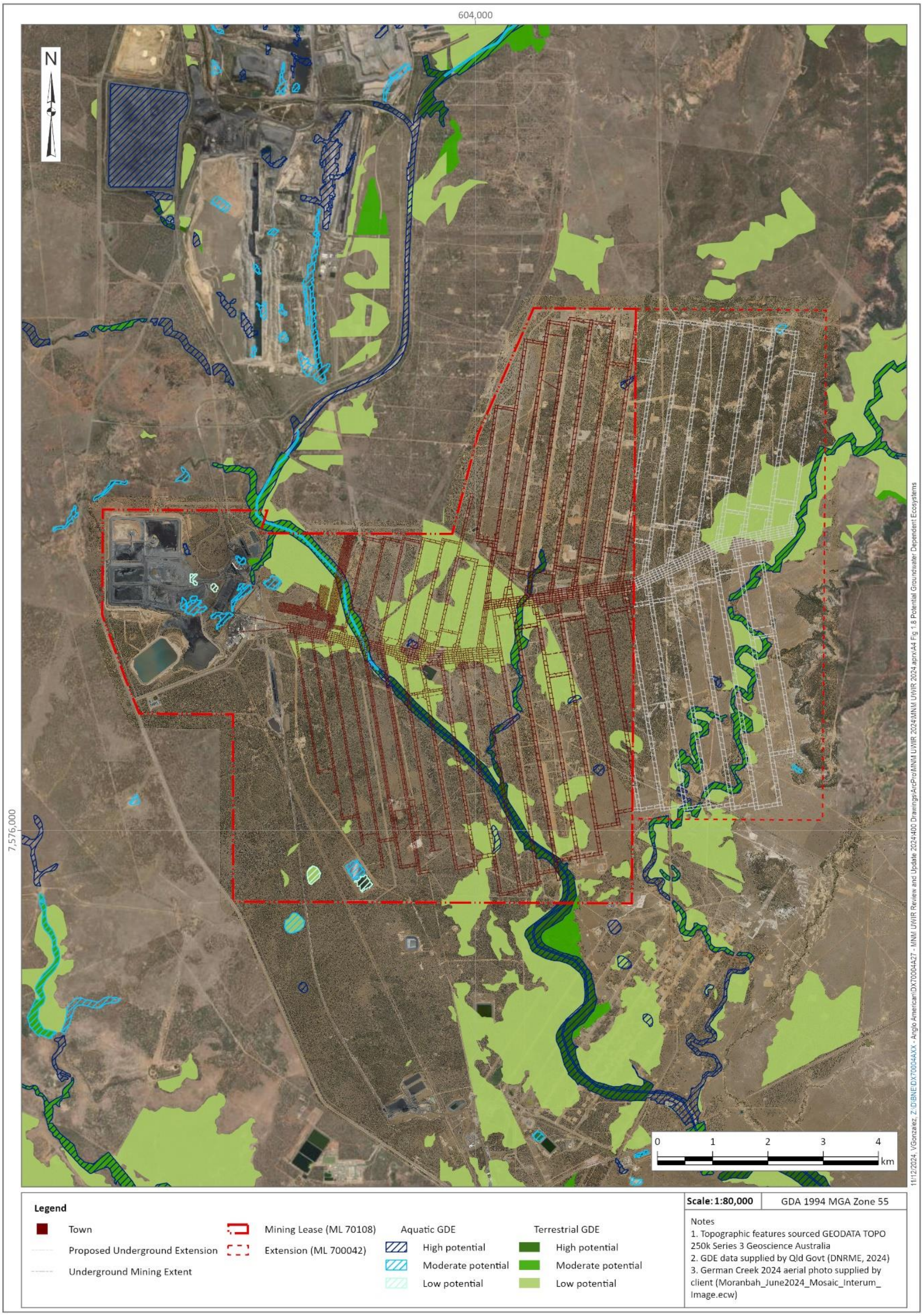


Figure 9.2 Location of Potential Terrestrial and Aquatic GDEs in the Vicinity of the Project

9.1.3 Third-Party Groundwater Users

9.1.3.1 Registered Groundwater Bores

Within a 10 km buffer around the Project there are 259 registered groundwater bores recorded in the GWDB, as of September 2024 (DRDMW 2024). A summary of registered bores is presented in Table 7.2 along with their type and status, as derived from the GWDB. There are only two water supply bores identified within 10 km of the Project area.

Other groundwater bores may also be present within the Project that are not registered in the GWDB (e.g. installed prior to the requirement to register water bores with the DRDMW). It is not known how many unregistered bores may exist; however, these bores may be identified during future bore baseline assessments.

9.1.3.2 Bore Baseline Assessment

Under the Water Act, petroleum tenure holders are required to undertake baseline assessments of water bores prior to commencement of production. Baseline assessments are undertaken in accordance with the 'Baseline Assessment Guideline' (DETSI, 2016), to obtain information such as:

- Bore status;
- Type and purpose;
- Information related to construction of the bore; and
- Bore equipment.

Baseline assessments for bores located within the Project were undertaken as part of the Moranbah North UWIR (KCB, 2021), which was completed in accordance with Water Act requirements. The baseline information with regards to existence, construction, condition and accessibility of water bores, and where possible, aquifer data including water level, water quality, groundwater yield and use were assessed. A summary of the groundwater bores within the Project for which baseline assessment have been undertaken are provided in Table 9.1. The Groundwater bore locations are presented in Figure 9.1.

Table 9.1 Summary of Completed / Attempted Bore Baseline Assessments

Bore ID / Local Name	Easting	Northing	Landholder	Static Water Level Monitoring	Groundwater Quality Analysis
RN81696 (Skeleton Bore)	608182	7586081	SP208194	YES	X
RN162554#	609861	7566872	Moranbah Township	YES	YES

* Coordinates in GDA94, Zone 55.
# Bore no longer used

9.1.3.3 Groundwater Use and Purpose

Two water supply bores are registered within 10 km of the Project. Groundwater abstraction within the Project area provides a water source for the pastoral industry and the population centre of Moranbah. The majority of the bores in the area registered for mine monitoring, petroleum and coal seam gas exploration and monitoring. A summary of the estimated purpose for bores located within the 10 km buffer of the Project is shown in Figure 7.2.

9.2 Impacts to Environmental Values

9.2.1 Impacts on Groundwater Resources

The Project site and its surrounds are located within the Isaac Connors Groundwater Management Area (GMA). Groundwater resources in the Isaac Connors GMA are managed under the *Water Plan (Fitzroy Basin) 2011* (the Water Plan). The Isaac Connors GMA comprises two groundwater units. Groundwater Unit 1 includes alluvial aquifers and Groundwater Unit 2 comprises all other sub-artesian aquifers.

The Project involves the use of conventional gas drainage activities to remove residual gas from the GM seam within the Project site where conditions allow. Hydraulic stimulation activities may be used to remove residual gas from the GM seam in areas of the Project site that are not conducive to the use of conventional gas drainage methods.

As underground mining will not be conducted over the UWIR period there is no change to the predicted drawdown within the alluvium as a result of the Project. There will be no groundwater take from the alluvium (i.e. Groundwater Unit 1) and therefore, no predicted drawdown within the alluvium as a result of the Project.

Groundwater depressurisation is limited to the Moranbah Coal Measures which form part of Groundwater Unit 2. Figure 6.2 shows the predicted groundwater take from the Moranbah Coal Measures, and hence, Groundwater Unit 2. The Project will result in a total groundwater take of up to approximately 2.464 ML from Groundwater Unit 2 during the UWIR period.

As discussed in Section 6, the Project's groundwater take and associated groundwater impacts have been approved under the EP Act. Those potential impacts, where receptors exist within the vicinity of the Project, are assessed against the *Water Act 2000* trigger thresholds as outlined in Section 2.2.

Monitoring, management, and mitigation practices associated with the above activities are discussed further in Section 10.

9.2.2 Impacts on Groundwater Users

Many groundwater bores within the Project vicinity are constructed to intersect multiple formations. There is a general lack of water supply bores in the surrounding area. This is to be expected, given the generally low yields, access to alternative supplies (i.e. water supply pipelines) and brackish to highly saline quality of the groundwater.

There are two water supply bores within identified within 10 km of the Project site, namely:

- Registered bore RN 81696 (i.e. Skeleton Bore) located approximately 0.65 km north of the Project site boundary; and
- Moranbah Township water supply bore located 10 km to the south of the Project site.

Skeleton Bore is currently installed with pumping equipment and groundwater from this bore is currently used as a stock watering supply. This bore is approximately 30 m deep and screened in the Tertiary sediments.

The closest water supply abstraction bore considered to be a valid environmental receptor is bore RN 162554 located in the township of Moranbah. This bore is located over 10 km from the ML 700047 southern boundary. This bore is shallow at 18 m deep, and sources water from Quaternary sands. This bore is registered as existing, however is recorded as no longer used for water supply. The location of this bore is shown on Figure 7.2.

As discussed in Section 9.1.1, the Project is not predicted to result in any depressurisation of the Tertiary sediments or the alluvium. As a result, the two bores are not predicted to be impacted by the Project.

Table 9.2 Summary of Drawdown Predictions for Groundwater Bores

RN	Bore Use	Hydrogeological Unit	IAA Drawdown (m)	LTAA Drawdown (m)
81696	Water Supply	Tertiary Sediments	NA	0
#162554	Water Supply	Quaternary alluvium	NA	0

#Bore no longer used

Bores installed within unconsolidated aquifers (i.e. applicable to the groundwater bore trigger threshold of 2 m) are not predicted to have an induced drawdown in groundwater levels as a result of Project development.

As underground mining is not due to commence in the next UWIR period, the Moranbah Township water supply bore (RN162554) is not predicted to experience a drawdown that exceeds the trigger thresholds (>5 m) (IAA). No water supply bores have predicted drawdowns that exceed the trigger threshold over the Project life (LTAA). The location and a summary of the estimated purpose for bores located within the 10 km buffer of the Project is shown in Figure 7.2. As per the requirements of the *Water Act 2000*: bore assessments will be undertaken at those bores and make good agreements will be implemented with each bore owner where required, prior to the trigger threshold being exceeded. This is further discussed in Section 8.2.

9.2.3 Impacts on Surface Drainage

The Project site is traversed by Teviot Brook and Skeleton Gully. The majority of surface water discharges across the site is via these drainage lines and associated minor tributaries. A small portion of the southeastern corner of the Project site drains to an unnamed creek via overland sheet flow.

Teviot Brook, Skeleton Gully and their tributaries exhibit highly ephemeral short-duration surface water flows that are typically restricted to periods during and immediately following rainfall events. This is consistent with observations made during the field surveys undertaken as part of the EAR.

This is also supported by surface water flow data collected from DNRME's surface water gauging stations sited downstream of the Project site and groundwater modelling predictions, which both indicate no perennial flows in the vicinity of the Project site.

The Project does not include any planned discharge to, or abstraction from (including abstraction due to groundwater drawdown impacts), the surface water system. Numerical modelling did not predict drawdown within the surficial Quaternary alluvium or Tertiary sediments aquifers. Other potential impacts associated with Project construction and operation will be managed through implementation of the appropriate management, mitigation, and monitoring practices associated with construction and operation.

Longwall mining results in the collapse of the overlying rock strata (goaf) into the void that is left after extraction of the coal. There is the potential for increased groundwater connectivity between the goaf and the overlying strata. Subsurface fracturing can result in the connection with the overlying alluvium and Tertiary sediments. Any subsidence at the surface has the potential to impact on surface water infiltration and overland flow.

9.2.4 Impacts on Springs

The nearest spring complex to the Project is approximately 152 km to the southwest of the Project. Predicted depressurisation/drawdown from the Project will not propagate to the spring locations, therefore, no impacts to surrounding spring complexes are expected as a result of Project development.

9.2.5 Impacts on Groundwater Dependent Ecosystems

Section 9.1.2 identified the potential TGDEs that have been mapped in the vicinity of the Project. Typically, the mapped areas of TGDEs in the vicinity of the Project are located adjacent to watercourses (e.g., Isaac River and Teviot Brook), which are reliant on groundwater within the shallow Quaternary alluvium or Tertiary sediments.

The predicted groundwater level drawdowns from the numerical modelling (Section 8.2.1) indicate that drawdown resulting from the proposed Project development will be limited to the Rewan Group and the Permian Coal Measures; and will not propagate to the shallow Cenozoic units (i.e. Quaternary alluvium, Tertiary sediments). Therefore, no impacts to the mapped potential TGDEs as a result of the Project development are anticipated.

10 PART E: GROUNDWATER MONITORING PROGRAM

The following sections describe the monitoring and management measures for groundwater levels and quality and groundwater take. Each section provides an overview of the existing monitoring requirements and proposed monitoring and management measures. These measures will be implemented.

10.1 Groundwater Level and Quality Monitoring and Management

10.1.1 Environmental Authority Requirements

EA Schedule D requires the maintenance of a groundwater monitoring and management program. The monitoring program must:

- Include a background groundwater monitoring program;
- Be able to detect a significant change to groundwater quality values due to mining activities carried out under the EA;
- Include measures to minimise the impact of the mining activities on groundwater resources;
- Include a program to investigate and respond to trends in changes to groundwater quality values and quantity that are identified to be associated with mining activities carried out under the EA;
- Include a program for monitoring and review of the effectiveness of the groundwater monitoring and management program; and
- Include contingency procedures for emergencies.

EA condition D8 requires that the groundwater monitoring and management program (GMMP) review must be reviewed every three years by an appropriately qualified person. The review must include an assessment of groundwater levels and groundwater quality data, an assessment of the suitability of the groundwater monitoring network and its compliance with the above requirements, recommended actions to ensure actual and potential environmental impacts are effectively managed and any necessary amendments to the groundwater monitoring and management program.

EA condition D9 requires that an annual groundwater monitoring report (AGMR) must be completed each year and submitted to the administering authority via WaTERS. EA condition D10 requires that the AGMR include a review of all groundwater quality and water level data for all monitoring bores. An assessment of any impacts on groundwater levels, surface water levels and surface water quality and groundwater resources.

EA condition D12 requires that if a limit defined in Table D3: Groundwater Investigation Trigger Values is exceeded on three (3) consecutive monitoring occasions, an investigation must be completed within twenty-eight (28) days of detection to determine if the exceedance is a result of:

- Mining activities authorised under this environmental authority;
- Natural variation;

- Neighbouring land use resulting in groundwater impacts; and
- If the exceedance is due to D12(a), determine whether environmental harm has occurred or may occur.

Groundwater monitoring must be undertaken in accordance with the approved groundwater monitoring and management program.

In the event that groundwater level fluctuations in excess of two (2) metres per year beyond predictable seasonal fluctuations as determined by condition D2(d) are detected at the groundwater monitoring locations nominated in Table D4: Groundwater level monitoring locations, frequency and triggers, an investigation must be undertaken within fourteen (14) days of detection to determine if the groundwater level fluctuations are a result of:

- The mining activities carried out under this environmental authority;
- Pumping from licensed bores; or
- Seasonal variation.

If the trigger levels are exceeded, then the environmental authority holder must complete an investigation into the potential for environmental harm and notify the DETSI via WaTERS within the required timeframes. Compliance with the groundwater trigger levels is enforceable under Queensland legislation.

10.1.2 Current Annual Groundwater Monitoring

In accordance with the requirements of the MNM EA, the groundwater monitoring program includes the following:

- Groundwater levels are recorded on a monthly basis, which enables natural groundwater level fluctuations (such as seasonal responses to rainfall) to be distinguished from potential water level impacts due to depressurisation resulting from mining activities, including any changes in the IAA and/or LTAA; and
- Groundwater quality monitoring is undertaken on a quarterly basis to enhance the existing baseline dataset available prior to commencement of the Project. This is used to detect any changes in groundwater quality during and post-mining and hydraulic stimulation. Water quality samples are analysed for physico-chemical parameters including pH, electrical conductivity, alkalinity, major ions (Ca, Mg, Na, K, Cl and SO_4), metals and metalloids (Al, As, Fe, Mo and Se) and total petroleum hydrocarbons.

If the monitoring results show any unexpected results, an investigation will be triggered. The scope of the investigation will include confirming the likely cause of the unexpected results. If investigation findings show that the unexpected results are due to the approved mining activities (rather than natural fluctuations), additional management measures will be implemented. A risk assessment will be undertaken to determine whether any potential additional management measures are required to prevent adverse environmental impacts.

Anglo has undertaken annual monitoring in four groundwater bores and gas wells for the initial UWIR period (January 2021 to January 2024). The groundwater bores and Gas wells which were monitored in 2024 are presented in Table 10.1.

Table 10.1 Groundwater Bores and Monitoring Locations

Monitoring Point	Bore Type	Monitoring Formation	Water Quality Monitoring Frequency	Water Level Monitoring Frequency	Sampled	Comment
TWM17008A	Monitoring Bore	Alluvium	Quarterly	Monthly	245.85	Dry
TWM17007A	Monitoring Bore	Tertiary sediments above basalt	Quarterly	Monthly	261.00	Dry
TWM17010B	Monitoring Bore	Tertiary basalt	Quarterly	Monthly	298.69	October 2024
TWM17008B	Monitoring Bore	Permian Coal Measures	Not Required	Monthly	250.57	October 2024

The results for the groundwater level data for the Project bores and surrounding registered groundwater bores are presented on Figure 7.4 to Figure 7.6. The water quality sampling results summary are presented in Section 7.6.

The EA groundwater monitoring and management program is reviewed annually to ensure that the groundwater regime is monitored effectively.

10.1.3 Proposed Monitoring and Management Measures

As the longwall mining is scheduled to commence in 2028, there are no predicted groundwater drawdown/depressurisation results modelled for this UWIR period (IAA). The drawdown/depressurisation results from the numerical modelling of the proposed Project development period (LTAA) identified that no third-party water supply bores were bore triggered (i.e. >2 m drawdown in an unconsolidated aquifer and >5 m drawdown in a consolidated aquifer) during the UWIR period.

The numerical groundwater modelling has also identified that impacts to the surface water system, surrounding springs and mapped TGDEs are not anticipated, resulting from the proposed Project development.

Moranbah North Mine operates an extensive groundwater monitoring network in accordance with the Moranbah North Mine EA. The current groundwater compliance monitoring network has 51 bores listed in the EA. This includes additional monitoring bores drilled in 2023 located on the Moranbah North Mining Lease and the Moranbah North Extension Mining Lease. At the time, the 2023 bores were located to either provide additional coverage or replace existing bores. The purpose of the groundwater monitoring network is to monitor groundwater levels and quality in the GM seam, Tertiary sediments, basalt, and alluvium in response to mining and hydraulic stimulation activities.

The groundwater monitoring network for the Project site has a total of 13 monitoring bores, including four EA compliance groundwater monitoring bores. The location of the monitoring bores is presented on (Figure 7.3) and listed in Table 10.2.

Table 10.2 Project Groundwater Monitoring Program

Bore ID	Easting	Northing	Target Unit
TWM17001	609454	7576594	Permian Coal Measures

Bore ID	Easting	Northing	Target Unit
TWM17002B	608696	7577287	Permian Coal Measures
TWM17003B	608916	7578498	Permian Coal Measures
TWM17004	607078	7579092	Tertiary basalt
TWM17005	607474	7580454	Tertiary basalt
TWM17006B	609007	7580461	Tertiary basalt
*TWM17007A	609430	7582164	Tertiary Sediments
TWM17007B	609393	7582165	Tertiary Sediments
*TWM17008A	609966	7581974	Alluvium
*TWM17008B	609968	7581986	Fort Cooper Coal Measures
TWM17009	608062	7583653	Alluvium
*TWM17010B	609545	7584602	Tertiary basalt
MNM_MB002	607791	7576317	Alluvium

*EA Compliance Bores

The approved EA groundwater monitoring network is suitable for monitoring the effects of the Project on the groundwater regime and will continue to be utilised throughout the life of the Project.

In accordance with the requirements of the MNM EA, the groundwater monitoring program includes the following:

- Groundwater levels are recorded on a monthly basis, which enables natural groundwater level fluctuations (such as seasonal responses to rainfall) to be distinguished from potential water level impacts due to depressurisation resulting from mining activities, including any changes in the IAA and/or LTAA; and
- Groundwater quality monitoring is undertaken on a quarterly basis to enhance the existing baseline dataset available prior to commencement of the Project. This is used to detect any changes in groundwater quality during and post-mining and hydraulic stimulation. Water quality samples are analysed for physico-chemical parameters including pH, electrical conductivity, alkalinity, major ions (Ca, Mg, Na, K, Cl and SO_4), metals and metalloids (Al, As, Fe, Mo and Se) and total petroleum hydrocarbons.

If the monitoring results show any unexpected results, an investigation will be triggered. The scope of the investigation will include confirming the likely cause of the unexpected results. If investigation findings show that the unexpected results are due to the approved mining activities (rather than natural fluctuations), additional management measures will be implemented. A risk assessment will be undertaken to determine whether any potential additional management measures are required to prevent adverse environmental impacts.

The EA groundwater monitoring and management program is reviewed annually to ensure that the groundwater regime is monitored effectively.

10.2 Groundwater Production Monitoring and Management

10.2.1 Regulatory Requirements

Anglo has an existing obligation to quantify its actual groundwater take from the Project site under the Mineral Resources Act (State of Queensland, 2024a). The DNRME *Guideline for quantifying the volume of take of associated water under a mining lease or mineral development license* (DNRME, 2020), describes the acceptable methods for monitoring and quantifying actual groundwater take under the Mineral Resources Act.

10.2.2 Approved Monitoring and Management Measures

In accordance with the requirements of the MR Act, Anglo will continue to assess actual groundwater take using acceptable methods. The method used will be reviewed annually and revised, as necessary.

The actual groundwater take assessed under the MR Act requirements will be compared to the predicted groundwater take presented in this UWIR. This comparison will be undertaken annually. If the monitoring program shows groundwater take exceeds the predictions presented in this UWIR, an investigation will be undertaken to confirm whether the actual impacts on groundwater users or sensitive environmental features are likely to be significantly greater than expected. The investigation outcomes will be considered as part of the annual UWIR review described in Section 12.

10.3 Hydraulic Stimulation Monitoring and Management

10.3.1 Environmental Authority Requirements

EA Schedule K – Stimulation Activities imposes the following key requirements on the Project stimulation activities:

- Preparation of a comprehensive Stimulation Risk Assessment prior to undertaking hydraulic stimulation activities;
- Implementation of a baseline bore water quality assessment for any active landholder bores or other groundwater supply bores that could be adversely impacted by the stimulation activities, prior to undertaking hydraulic stimulation activities;
- Implementation of a stimulation impact monitoring program prior to undertaking hydraulic stimulation activities. The stimulation impact monitoring program must be able to detect groundwater quality impacts from the stimulation activities, and must specifically address the following:
    - Monitoring the quantity and quality of fluids used in the hydraulic stimulation activities;
    - Monitoring the quantity of flow back water from the hydraulic stimulation activities;
    - Monitoring that demonstrates the volume of flow back water recovered from each well is equal to, or greater than, 150% of the volume of fluids used and that all additives used in the hydraulic stimulation activities have been removed;

- Monitoring of active landholder bores and other relevant groundwater supply bores; and
- The required monitoring frequency and timings (per EA conditions K13 and K14).

The proponent is required to make the findings of the stimulation impact monitoring program available to any potentially affected landholder. If the stimulation impact monitoring program detects a 10% increase in concentrations of monitoring parameters and the use of any active landholder bores is impaired, the proponent is required to notify the DETSI within 48 hours. In addition, the proponent is also required to notify the DETSI of any use of restricted stimulation fluids, or the unauthorised release of stimulation fluids or additives.

Hydraulic stimulation activities of the GM soal seam aquifer for the Project site were not initiated in the previous UWIR period (January 2022 to January 2025). The hydraulic stimulation activities of the GM seam aquifer for the Project site are also not due to commence in this UWIR period (January 2025 to January 2028) as coal seam dewatering and underground longwall activities will start in 2028.

10.3.2 Approved Monitoring and Management Measures

The proponent has approved stimulation activities under the EA EMPL0073313 permit with the conditions in Schedule K and is detailed in section 10.3.1. Hydraulic stimulation of the GM coal seam aquifer has not been initiated for the Project site and is scheduled to commence in 2028. Therefore, the approved monitoring and management measures for hydraulic stimulation have not been conducted for the pervious UWIR period (January 2022 to January 2025) and the current UWIR period (January 2025 to January 2028). The EA conditions for groundwater monitoring and stimulation risk assessments will be undertaken in line with Moranbah North's current approved monitoring program detailed below when stimulation activities at the Project site commence.

The proponent has an existing Moranbah North hydraulic stimulation monitoring program (approved in 2019). This is undertaken during and following hydraulic stimulation activities and includes:

- Additional monitoring of groundwater quality and levels in the gas drainage bore and groundwater monitoring bores located within a radius of 2 km of a stimulation event. These bores will be monitored at monthly intervals for six months following a stimulation event. Monitoring will continue annually for five years, or until monitoring data returns to baseline levels for two monitoring rounds, or longwall mining progresses through the gas bore location;
- Stimulation fluid quality and quantity monitoring at representative intervals during each stimulation event;
- Microseismic monitoring comprising multi-level geophone arrays installed above the GM seam at the hydraulic stimulation site to measure the height of fracturing in the coal seam and surrounding rock;
- Sonic logging to measure the integrity of the well seal and identify any potential for inter-aquifer connectivity; and

- Flow back fluid quality and quantity monitoring to demonstrate that 150% of the volume of the stimulation fluids has been extracted from the gas drainage bore and that all additives used in the stimulation activities have been removed.

The hydraulic stimulation monitoring program (including the requirement for removal of 150% of the volume of the stimulation fluids has been extracted from the gas drainage bore) is consistent with the Queensland Guideline: *Streamlined model conditions for petroleum activities* that is used successfully throughout the State.

If the monitoring results show any unexpected results, an investigation will be triggered. The scope of the investigation will include confirming the likely cause of the unexpected results. Hydraulic stimulation activities will be temporarily suspended during the investigation.

If investigation findings show that the unexpected results are due to the Project's hydraulic stimulation activities (rather than natural fluctuations), additional management measures will be implemented. A risk assessment will be undertaken to determine whether any potential additional management measures are required to prevent adverse environmental impacts.

Management measures will be implemented to prevent any unexpected adverse impacts on sensitive environmental features. These management measures include:

- The storage of hydrocarbon and chemicals in accordance with the existing Moranbah North Mine management practices, including the use of bunding and immediate clean-up of spills which are standard practice and a legislated requirement at mine sites that will prevent the contamination of the groundwater regime; and
- Storage and handling of hydrocarbon and chemicals in accordance with the relevant legislative requirements and Australian Standards as necessary, including the provisions of AS 3780:2008 – The storage and handling of corrosive substances and AS 3833:2007 – Storage and handling of mixed classes of dangerous goods in packaged and intermediate bulk containers.

The approved monitoring and management measures are adequate for the potential impacts of the Project.

11 PART F : SPRING IMPACT MANAGEMENT STRATEGY

According to the GAB Spring Register, there are no Discharge Springs, Recharge Springs, or Watercourse Springs located within the vicinity of (ML) 700042. As discussed in Section 9.2.4, no impacts to surrounding spring complexes are expected as a result of the Project.

A spring impact management strategy is not required and has not been developed.

12 PART G: UWIR UPDATES AND REVIEW

12.1 Roles and Responsibilities

Anglo is responsible for ensuring that the UWIR is implemented.

12.2 Review and Revision

As underground mining is scheduled to commence after this UWIR period, no depressurisation or change in the groundwater level is expected in the Permian Coal seams.

MNM will continue to undertake the annual review of the accuracy of the IAA and LTAA mapping, as required by Section 376(1)(e) of the Water Act.

The review process will comprise:

- An initial review of any new geology or groundwater data to identify potentially significant departures from the data used in the UWIR to develop the IAA and LTAA mapping.
- Where potentially significant departures are identified, the potential effect of these departures on the IAA and LTAA will be investigated.
- If the investigation concludes that the IAA or LTAA are likely to have been under-estimated and additional water bores are likely to be affected, the IAA and LTAA will be revised.

The UWIR has been designed to align with the current EA groundwater conditions. It is therefore necessary to review and update the UWIR in response to any material changes to the EA groundwater conditions.

12.3 Reporting and Record Keeping

The outcome of each annual review will be reported to DETSI following completion of each annual review. The reported outcomes will include a statement of whether there has been a material change in the information or predictions used to prepare the maps.

13 CONCLUSIONS

The key conclusions of this UWIR are as follows:

- The impacts of the Project over the previous UWIR period and the life of the mine have been assessed and the Project has been approved as part of MNM EA- EPML00738813 (August 2024).
- The total amount of groundwater produced from the installed SIS wells for the project between 20th August 2023 to 16th October 2024, a total of 2,016 KL.
- The groundwater levels in the monitoring bores (between January 2022 and October 2024) indicate that SIS well installation activities within the GM seam aquifer have not noticeably impacted the water levels within the overlying unconfined aquifers.
- Changes to water quality, or exceedance of triggers, are not considered to be attributable to the activities of the site due to a lack of surface activities in the MNE area.
- In the current UWIR reporting period:
  - There will not be any localised depressurisation of the GM Seam as underground mining is scheduled for commencement after the reporting period (scheduled for 2028).
  - The other potential aquifers and shallow formations (i.e. the Tertiary basalt, Tertiary sediments and alluvium) will not be depressurised by the Project.
  - The anticipated total amount of groundwater produced from the gas drainage wells (SIS) for the Project January 2025 to January 2028 is 2,464 kL (2.46 ML). This is similar to 2023 to 2024 period where ~ 2 ML of water was produced.
- The water level data shows no material change in any of the groundwater monitoring bores around the project supporting the findings that impacts to groundwater levels are considered negligible to date.
- The Project will not impact surface waters or alluvial aquifers during the UWIR period because:
  - Localised alluvium that is present in the vicinity of the Project site is typically unsaturated, relatively thin and compartmentalised, and it does not represent a significant aquifer;
  - All creeks near the site are ephemeral, with no measurable baseflow and therefore there is no significant groundwater contribution to surface water baseflow; and,
  - The significant depth of cover over the Project mining area during the UWIR period (over 300 m) and the low permeability interburden of the Permian sediments will effectively prevent significant depressurisation of the shallow formations.
- There are no groundwater users or other sensitive environmental features within the GM seam at the Project site or its surrounds, and therefore no significant groundwater impacts as a result of the Project.
- There is a very low potential for groundwater contamination as a result of the Project and no groundwater impacts from the Project are anticipated water in the reporting period.

14 CLOSING

We would like to thank you for the opportunity to work on this assignment. Should you have any questions, please do not hesitate to contact the undersigned.

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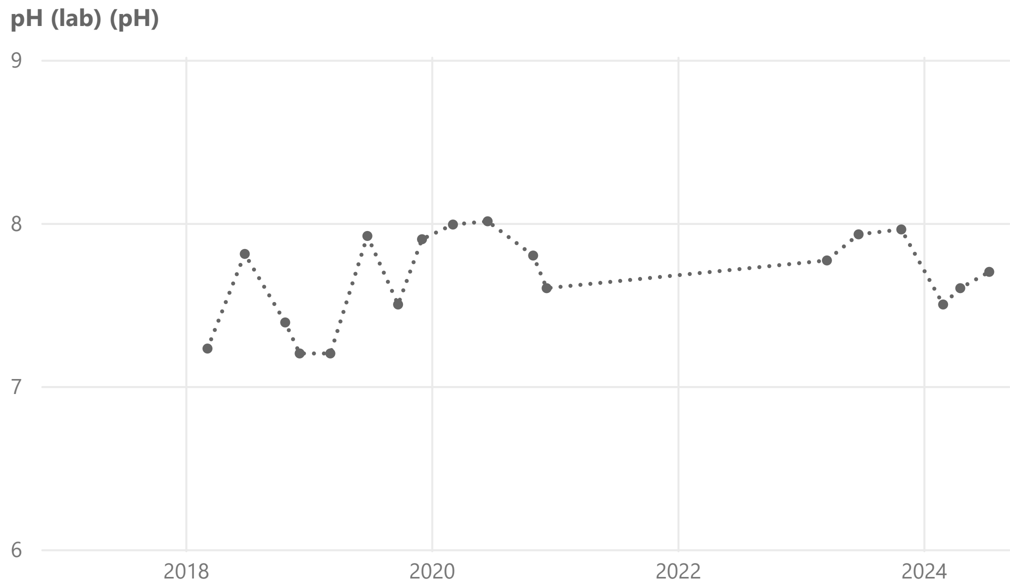
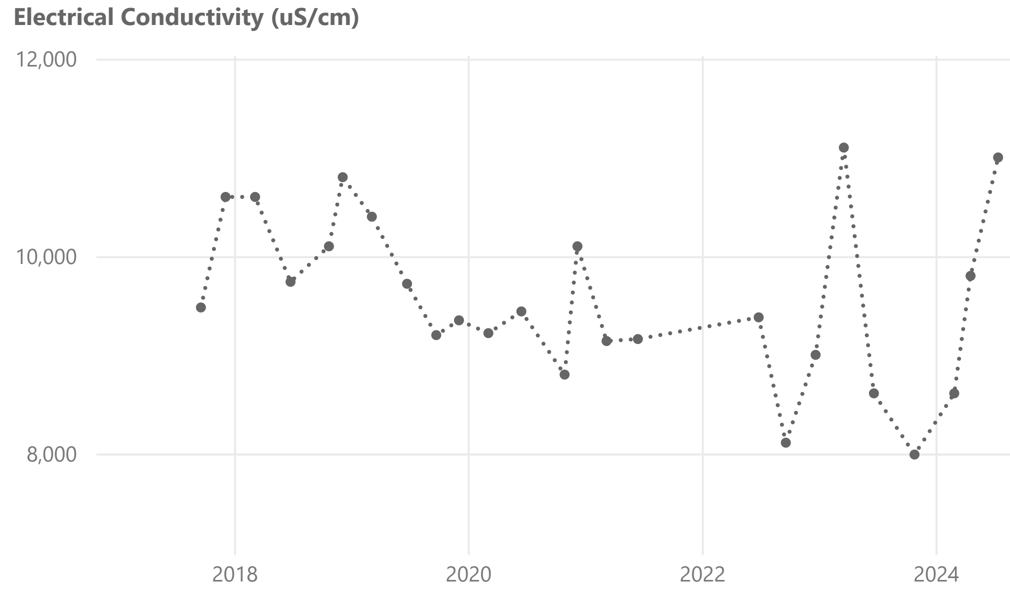
APPENDIX I

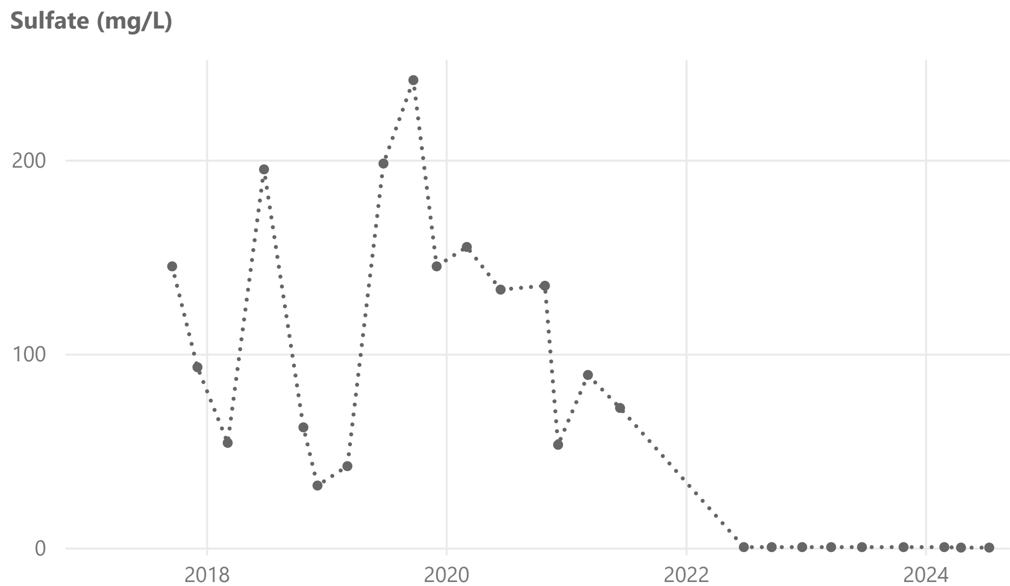
MNM Water Quality

TWM17004

Value







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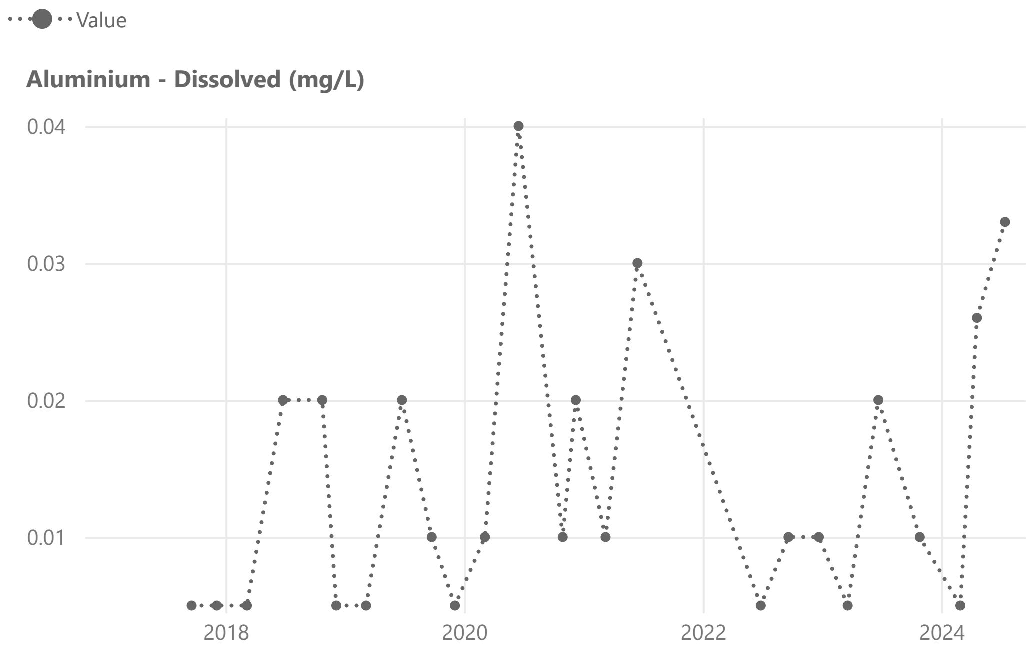
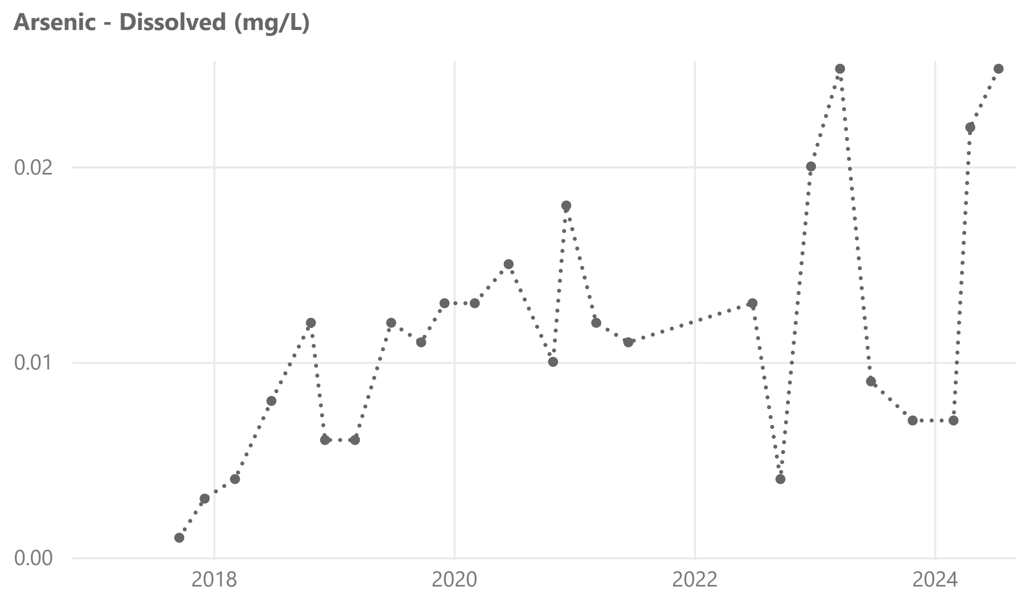
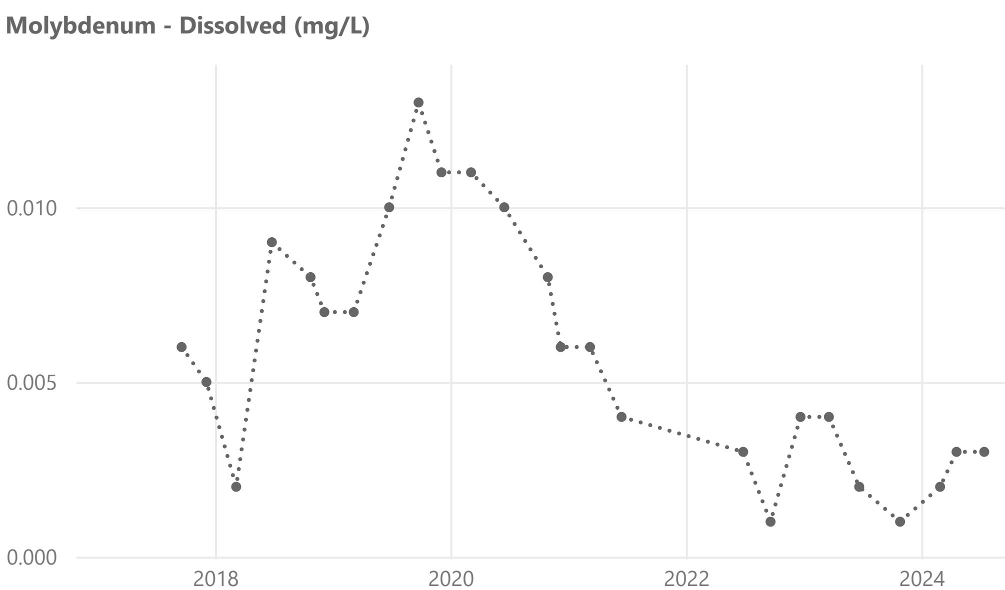
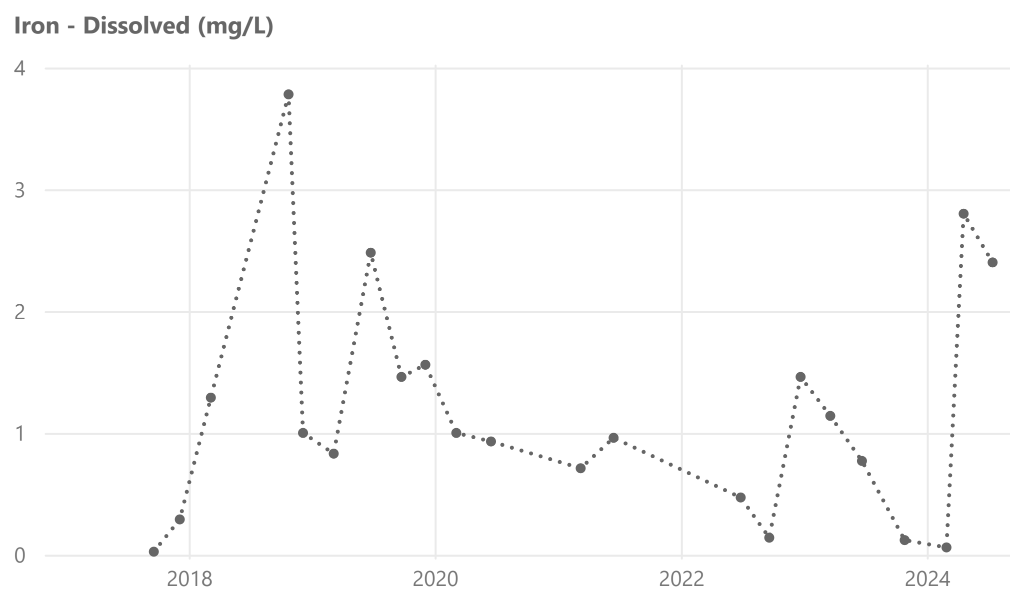
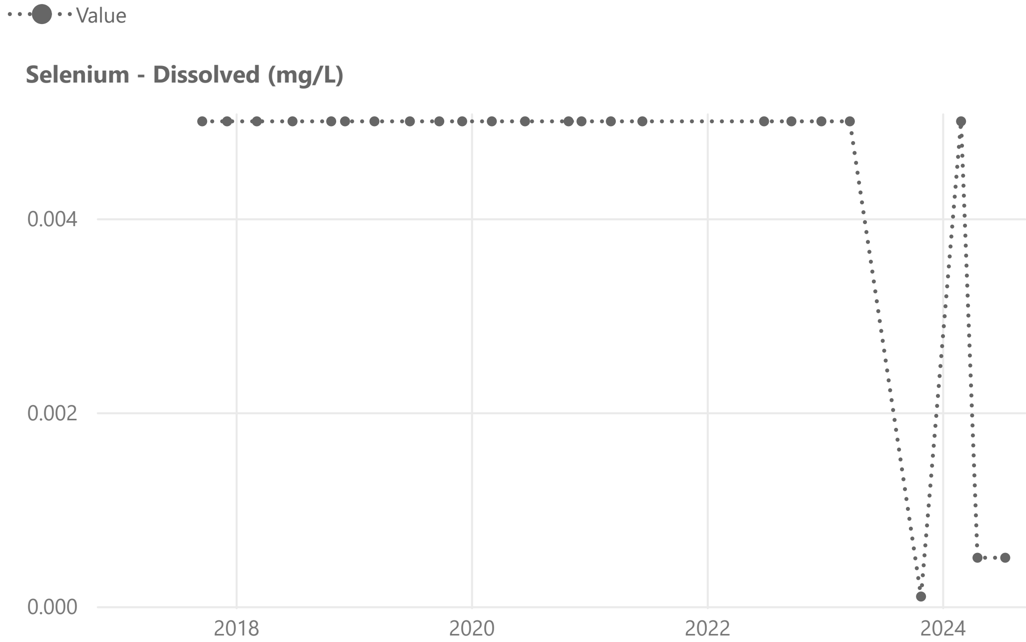

Value
Aluminium - Dissolved (mg/L)
0.04
0.03
0.02
0.01
2018
2020
2022
2024

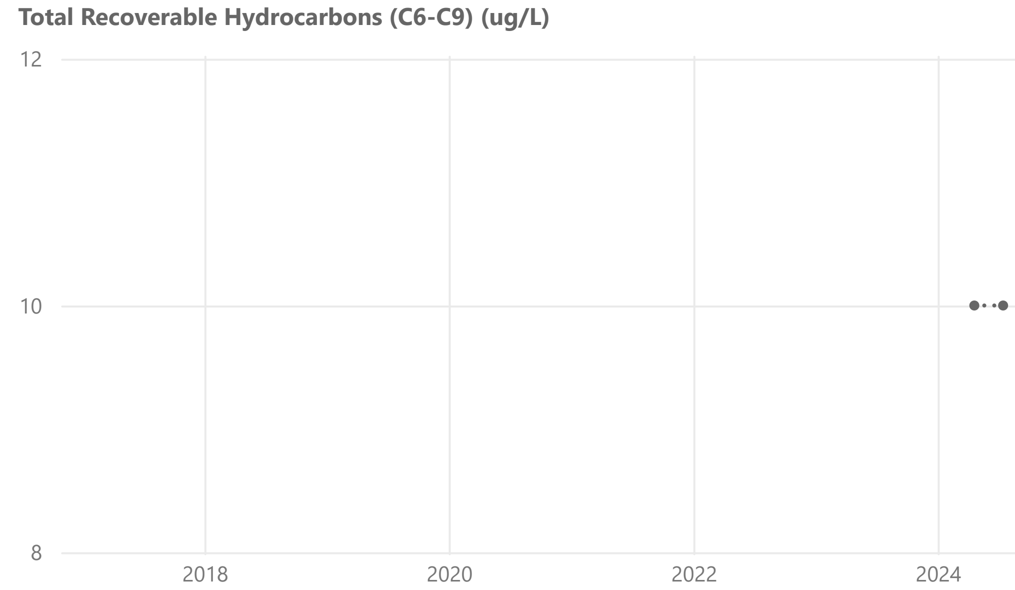

Arsenic - Dissolved (mg/L)
0.02
0.01
0.00
2018
2020
2022
2024

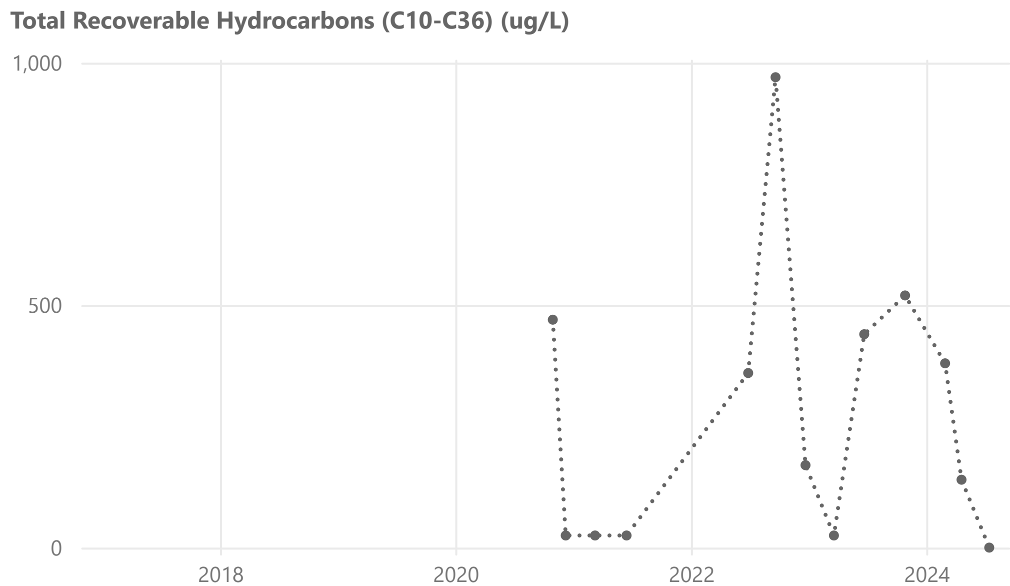

Molybdenum - Dissolved (mg/L)
0.010
0.005
0.000
2018
2020
2022
2024


Iron - Dissolved (mg/L)
4
3
2
1
0
2018
2020
2022
2024

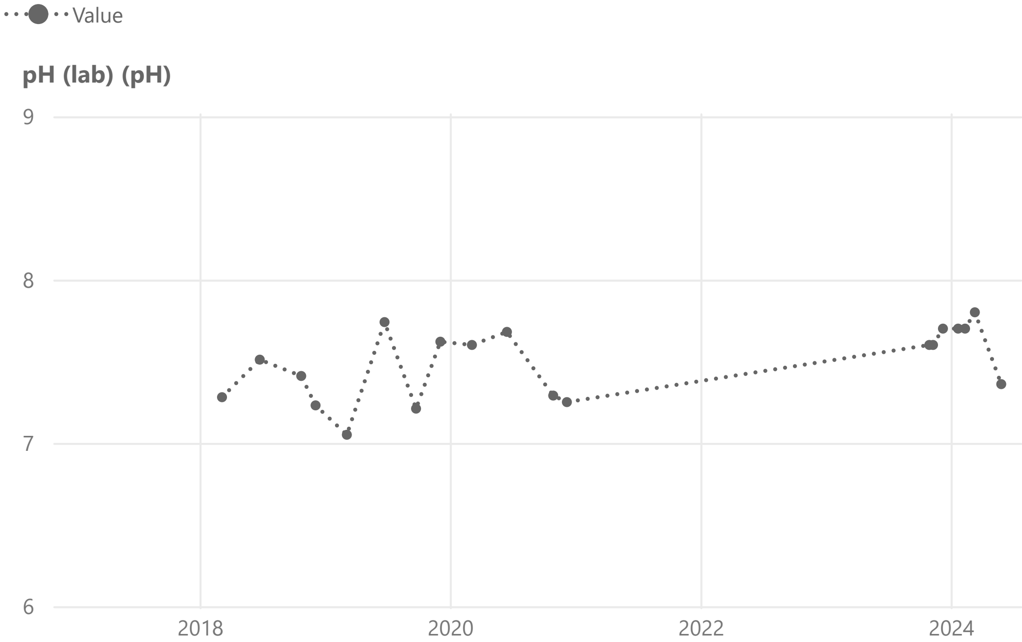
TWM17004

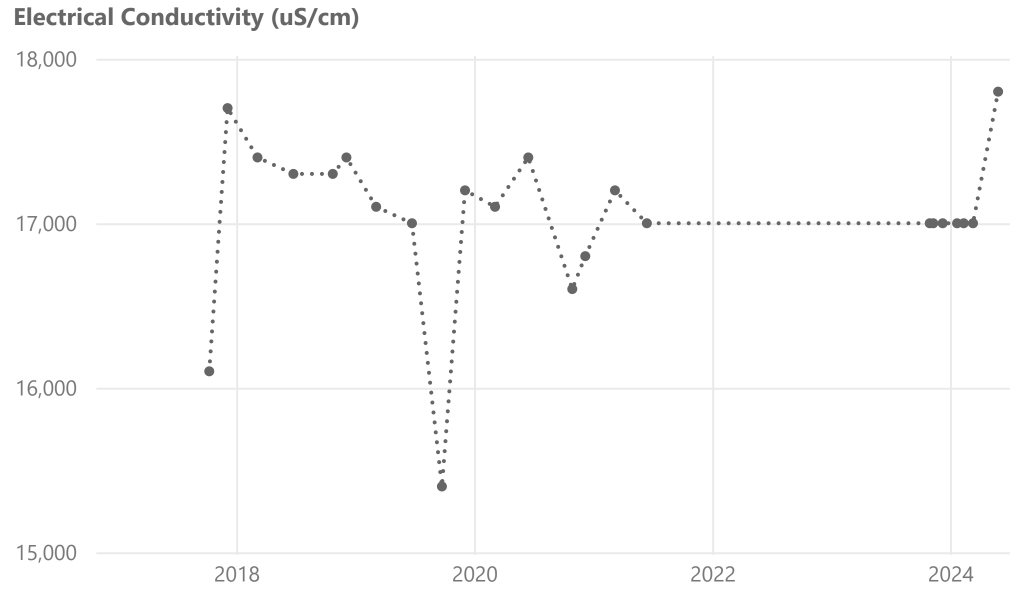

Value
Selenium - Dissolved (mg/L)
0.004
0.002
0.000
2018
2020
2022
2024

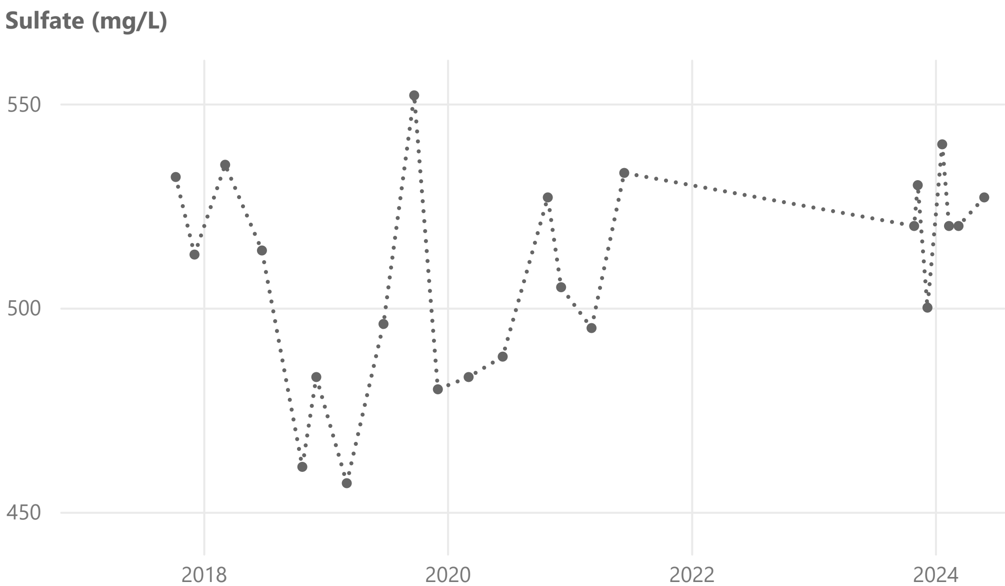

Total Recoverable Hydrocarbons (C6-C9) (ug/L)
12
10
8
2018
2020
2022
2024


Total Recoverable Hydrocarbons (C10-C36) (ug/L)
1,000
500
0
2018
2020
2022
2024

TWM17008B


Value
pH (lab) (pH)
9
8
7
6
2018
2020
2022
2024

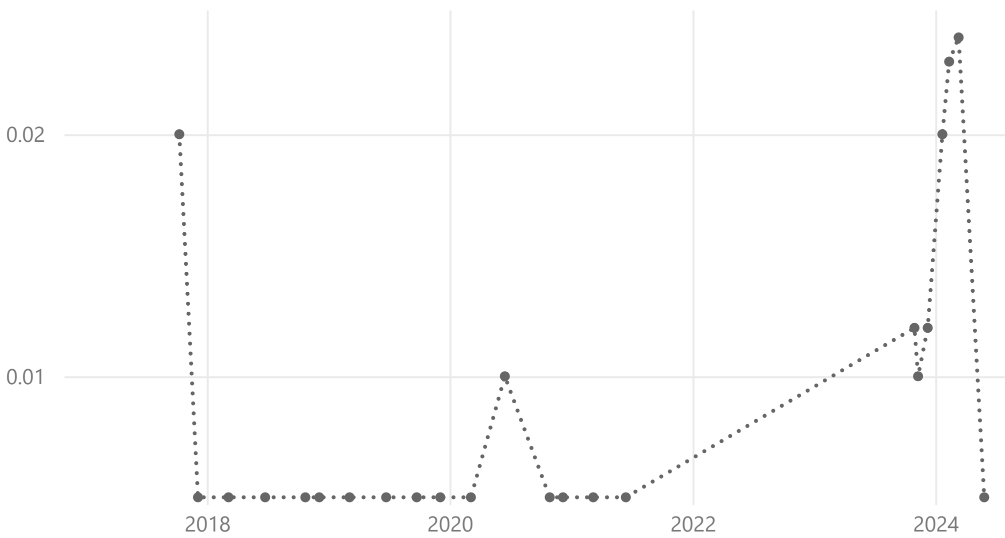

Electrical Conductivity (uS/cm)
18,000
17,000
16,000
15,000
2018
2020
2022
2024


Sulfate (mg/L)
550
500
450
2018
2020
2022
2024

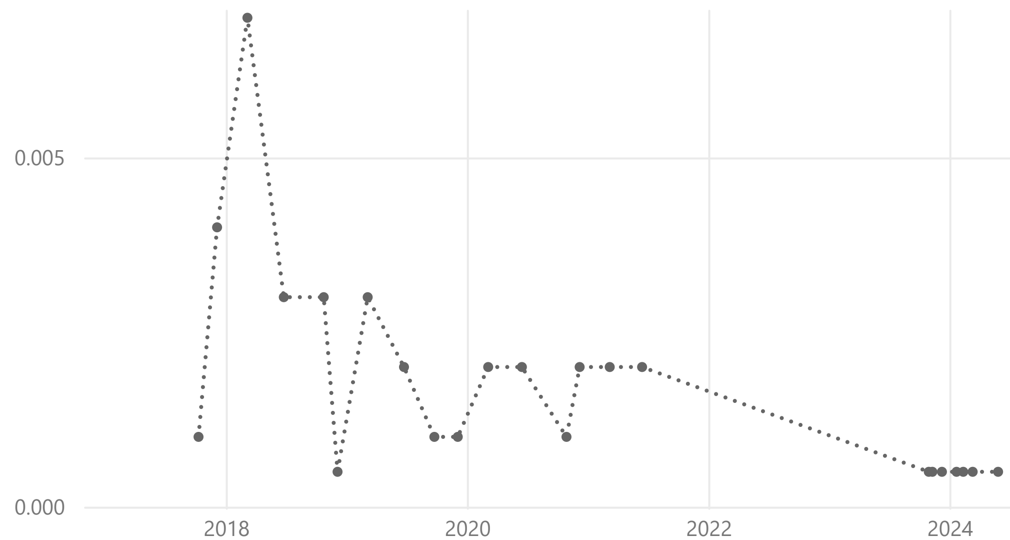
TWM17008B

Value

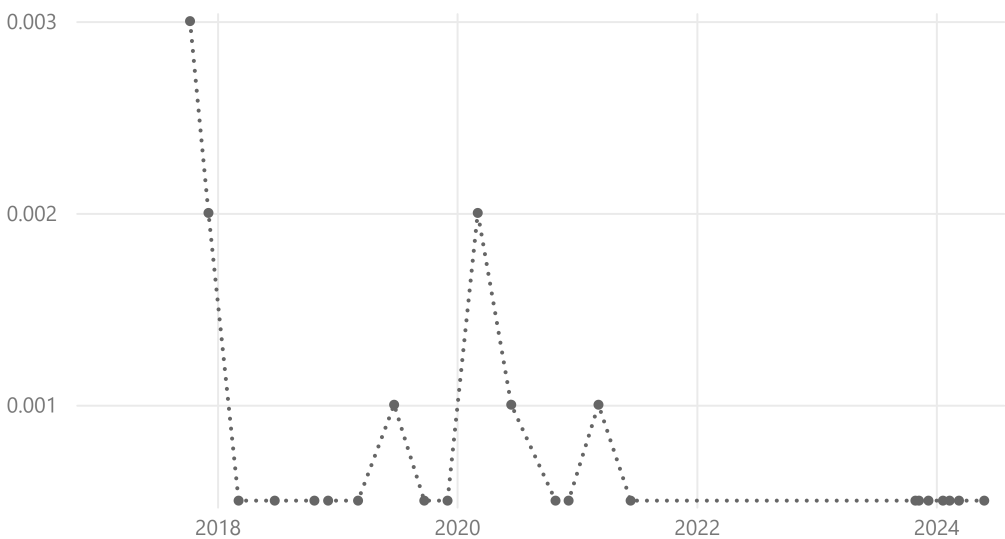
Aluminium - Dissolved (mg/L)



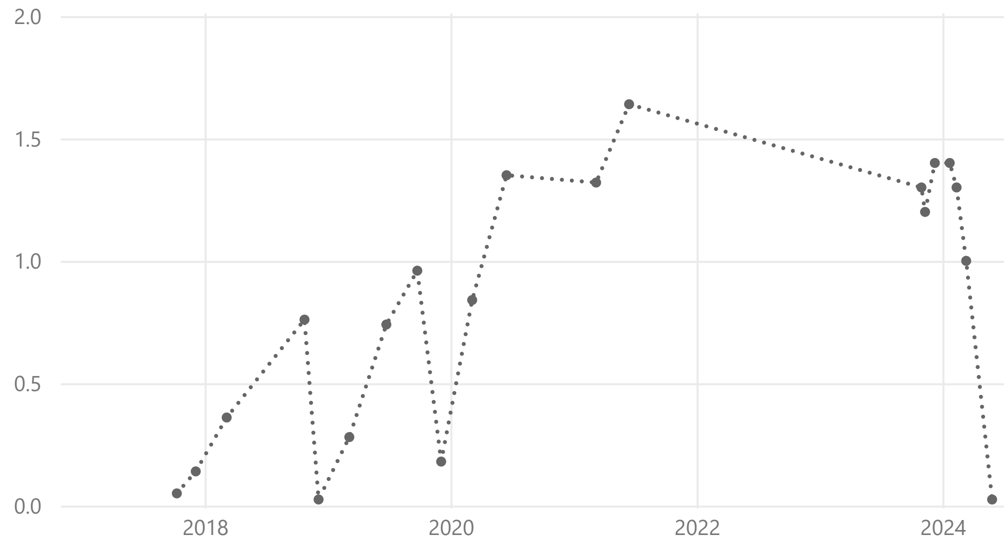
Arsenic - Dissolved (mg/L)



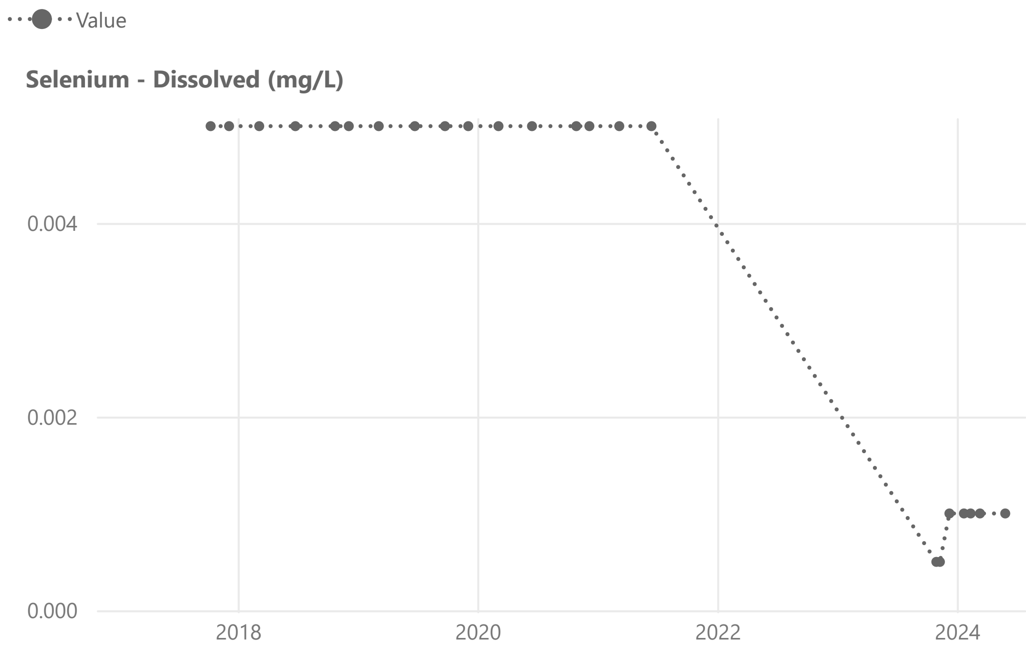
Molybdenum - Dissolved (mg/L)

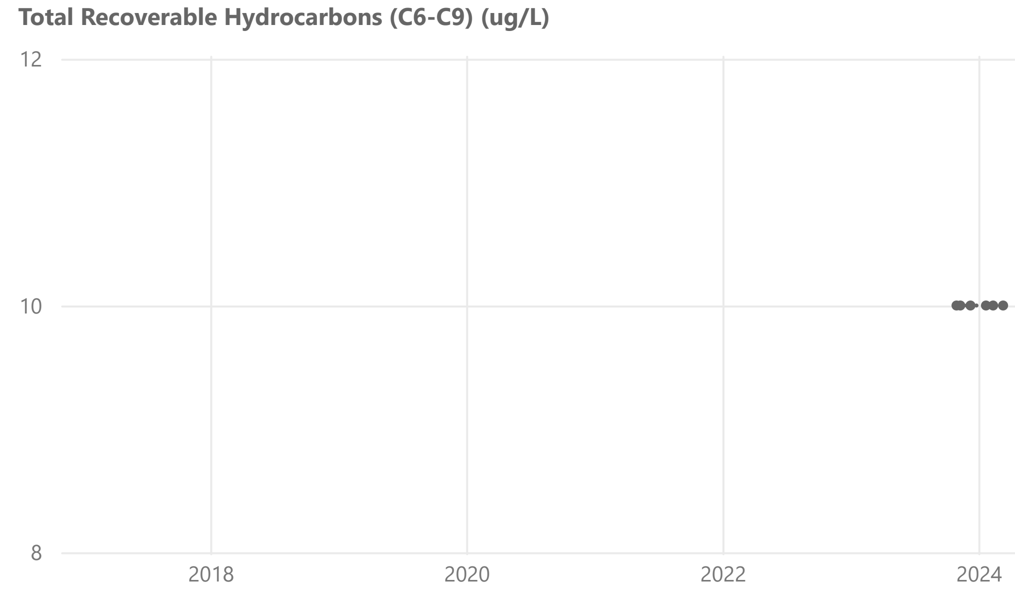


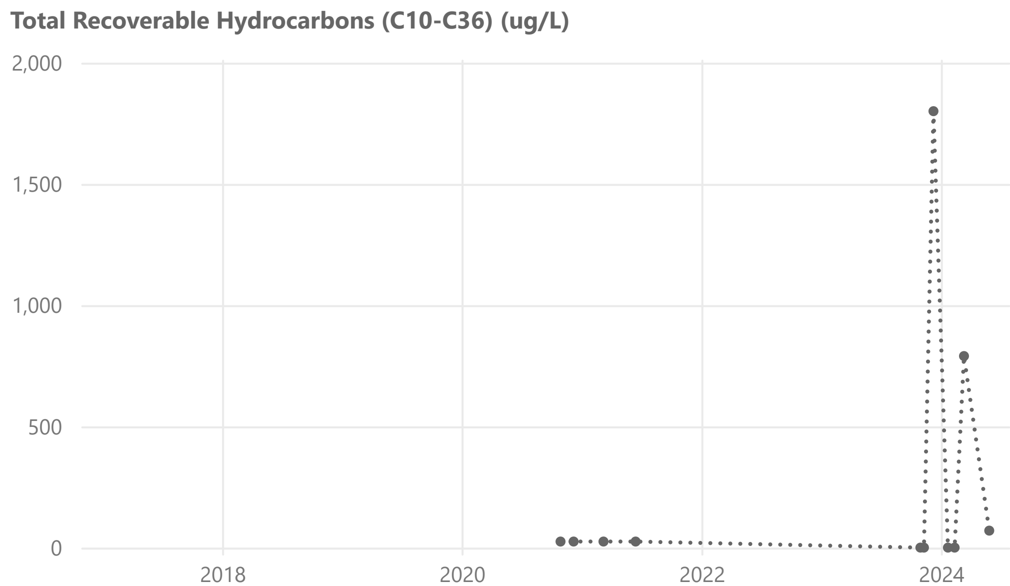
Iron - Dissolved (mg/L)



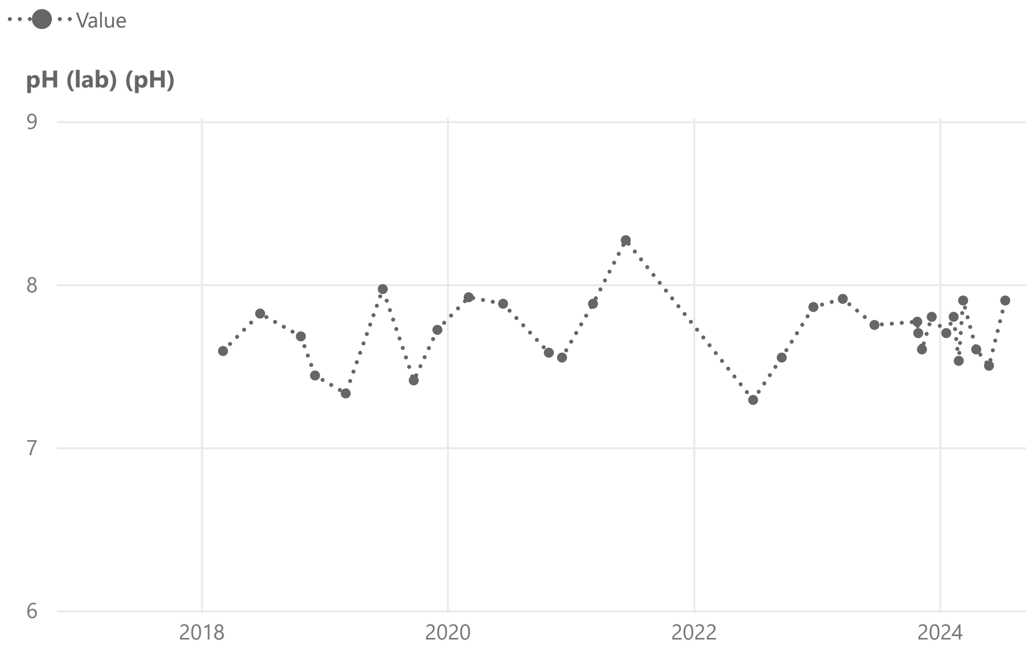
TWM17008B

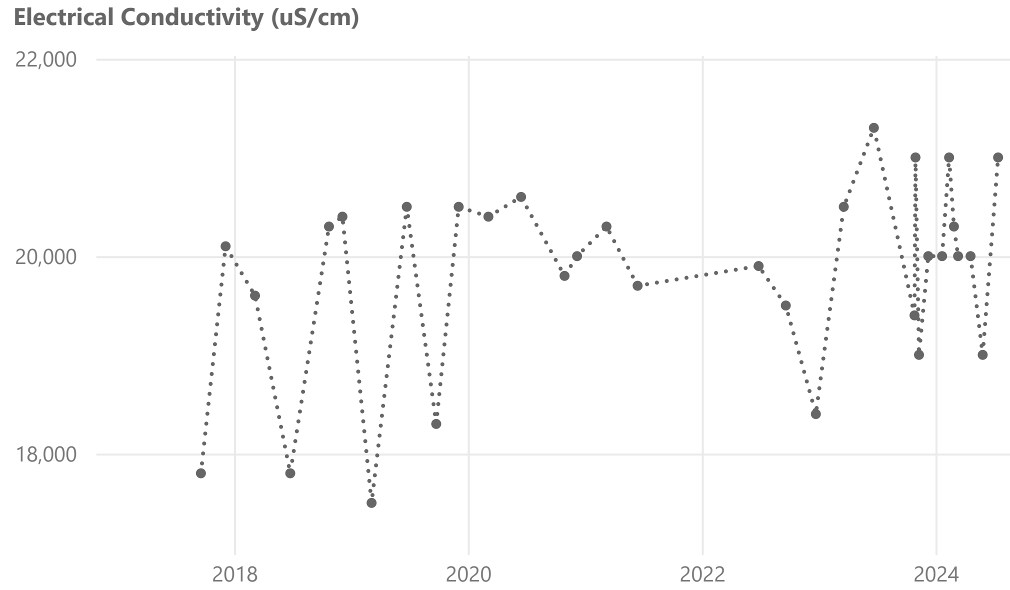

Value
Selenium - Dissolved (mg/L)
0.004
0.002
0.000
2018
2020
2022
2024

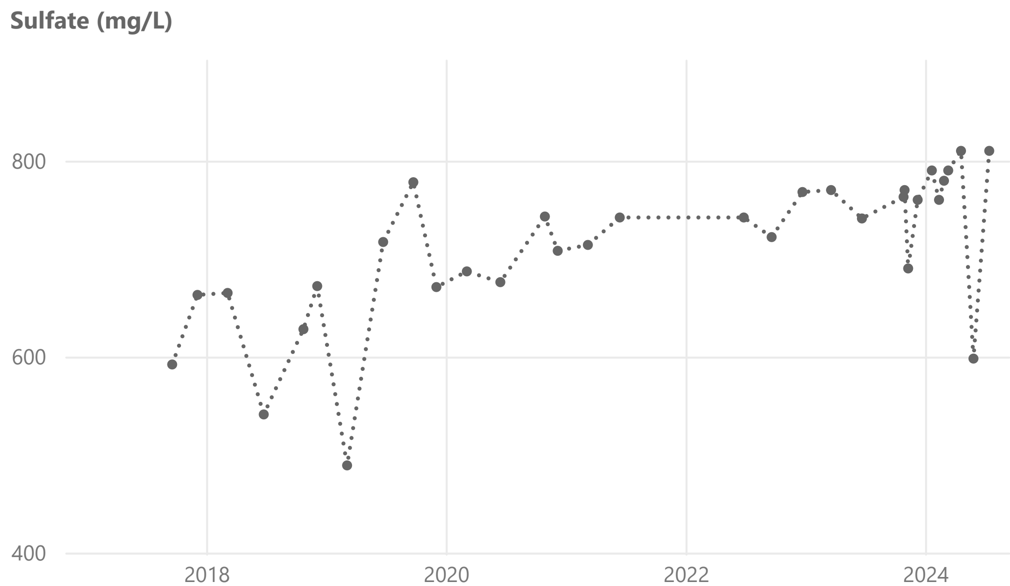

Total Recoverable Hydrocarbons (C6-C9) (ug/L)
12
10
8
2018
2020
2022
2024


Total Recoverable Hydrocarbons (C10-C36) (ug/L)
2,000
1,500
1,000
500
0
2018
2020
2022
2024

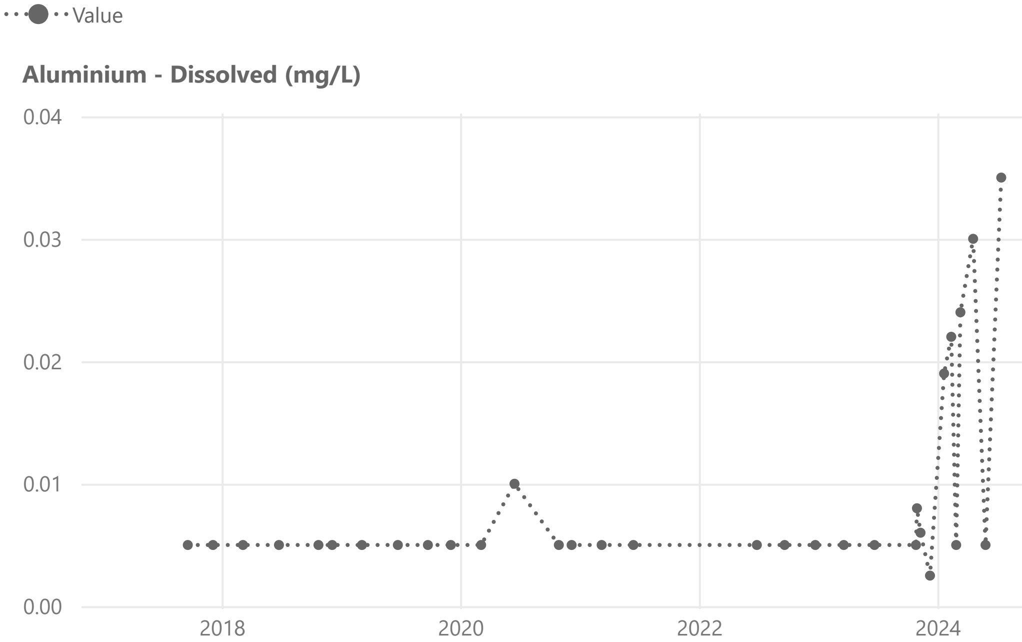
TWM17010B

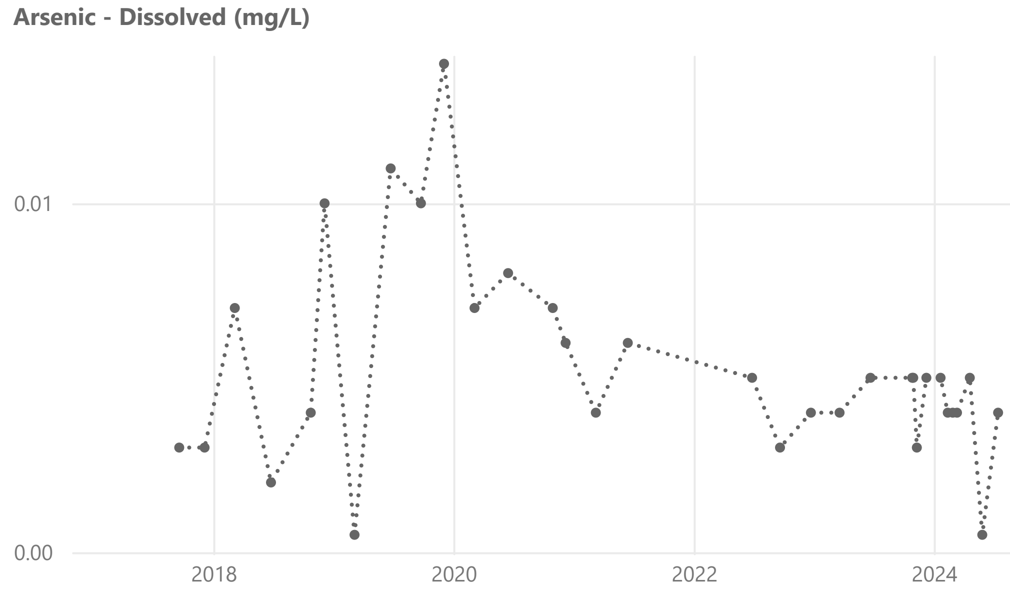

Value
pH (lab) (pH)
9
8
7
6
2018
2020
2022
2024

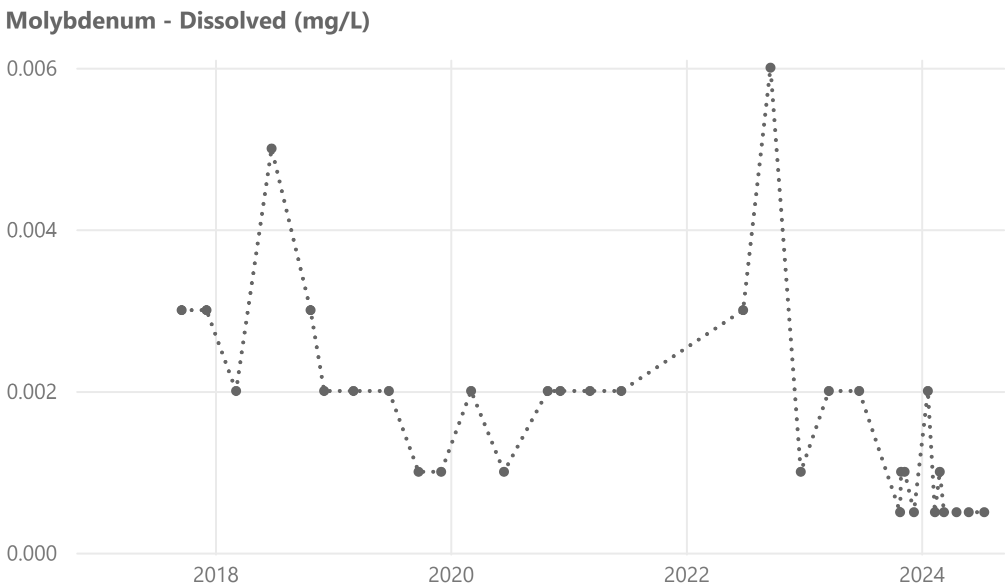

Electrical Conductivity (uS/cm)
22,000
20,000
18,000
2018
2020
2022
2024

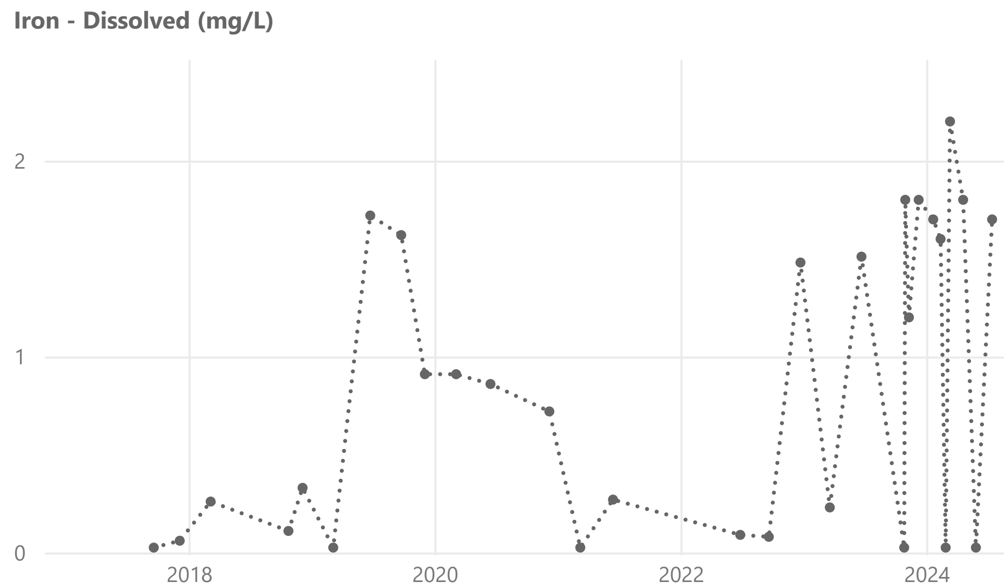

Sulfate (mg/L)
800
600
400
2018
2020
2022
2024

TWM17010B

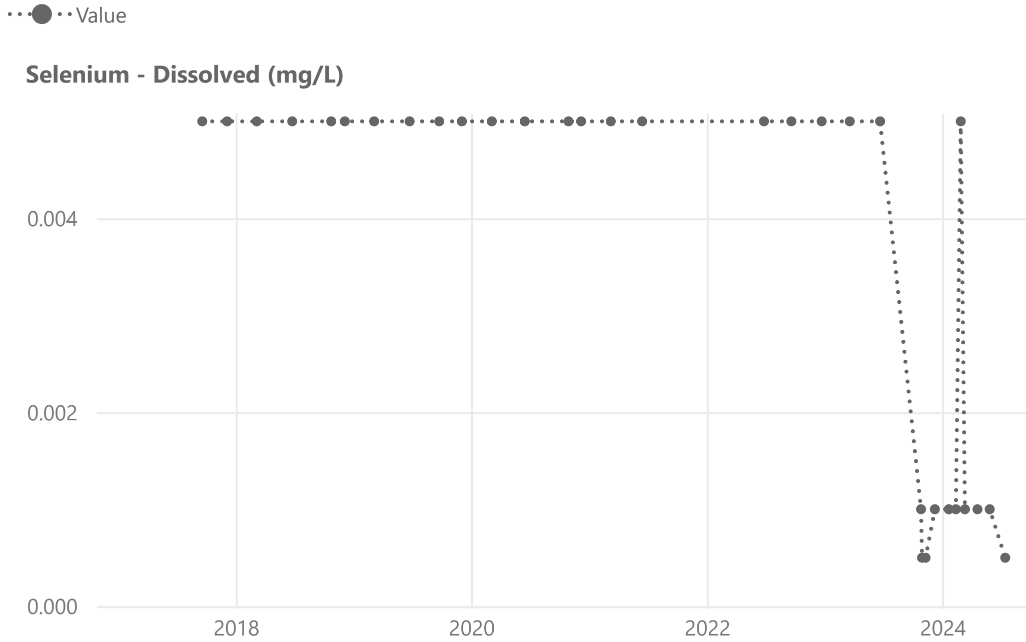

Value
Aluminium - Dissolved (mg/L)
0.04
0.03
0.02
0.01
0.00
2018
2020
2022
2024

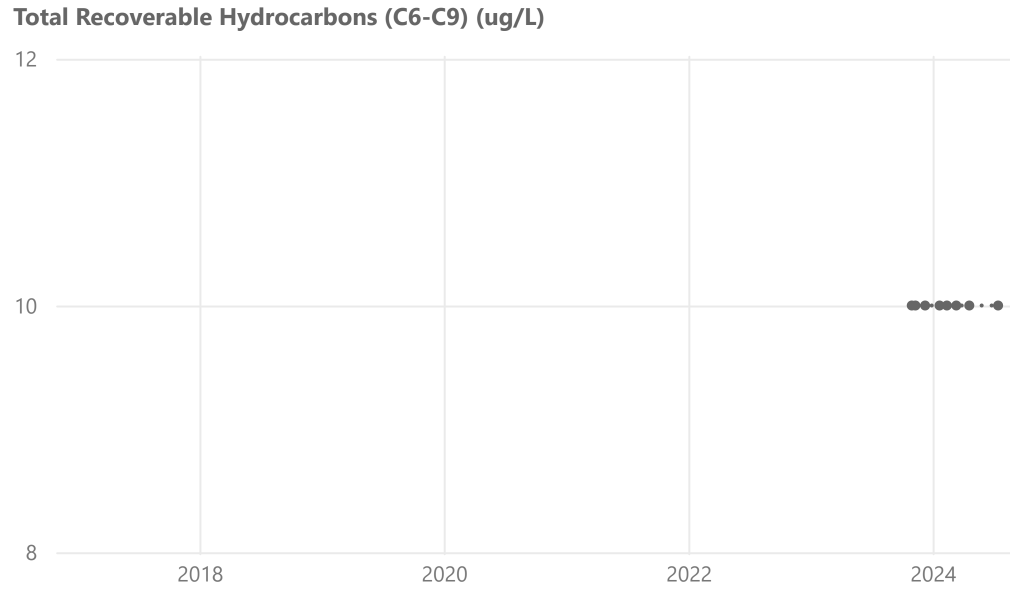

Arsenic - Dissolved (mg/L)
0.01
0.00
2018
2020
2022
2024

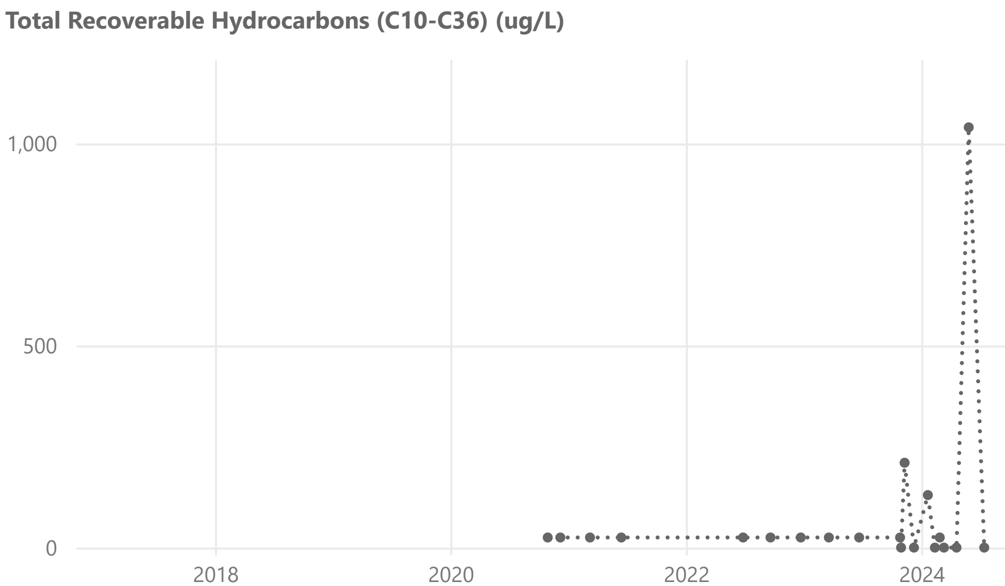

Molybdenum - Dissolved (mg/L)
0.006
0.004
0.002
0.000
2018
2020
2022
2024


Iron - Dissolved (mg/L)
2
1
0
2018
2020
2022
2024

TWM17010B


Value
Selenium - Dissolved (mg/L)
0.004
0.002
0.000
2018
2020
2022
2024


Total Recoverable Hydrocarbons (C6-C9) (ug/L)
12
10
8
2018
2020
2022
2024


Total Recoverable Hydrocarbons (C10-C36) (ug/L)
1,000
500
0
2018
2020
2022
2024