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DIANNE COPPER MINE

Groundwater and Surface Water Impact Assessment Report

Report prepared for:
Mineral Projects Pty Ltd

Date:
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Prepared by:

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1. BACKGROUND

1.1 INTRODUCTION

Dianne Copper Mine (DCM) is located within the Cook Shire on the Cape York Peninsula in north Queensland, about 130 km northwest of Cairns and 100 km southwest of Cooktown (Figure 1). The region has historically been extensively fossicked for gold.

DCM was developed in the 1970s, targeting a high-grade (~30%) copper deposit. The mine operated until 1982, when it was placed into 'care and maintenance', which is still the status to date. However, following recent, successful exploration activities at DCM, Mineral Projects Pty Ltd (Mineral Projects) aims to recommence operations. The current environmental authority (EA; EPML00881213, dated 31 July 2023), covering six separate mining leases (Figure 2), has not undergone a significant amendment in several years. Furthermore, the locations of approved, historical works are not well defined under the EA.

C&R Consulting Pty Ltd (C&R) were commissioned by Mineral Projects to complete a groundwater and surface water assessment as part of the supporting studies for a major EA amendment application to allow further development of the DCM site, with the aim to re-commence extractive activities on site.

1.2 SCOPE

The scope of the groundwater and surface water study includes the following:

- Description of proposed and historical activities;
- Review of relevant legislative requirements associated with the project;
- Review of relevant literature of previous groundwater and surface water studies conducted in the region to determine the background setting;
- Field surveys to assess current conditions in the project site in relation to groundwater and surface water; and
- Assessment of the potential for the project to impact on the groundwater and surface water within the project site.

The report structure is as follows:

- Section 2 – summarises historical and proposed project activities;
- Section 3 – describes the regional setting, including the environmental values (EVs) of note to the Palmer River catchment;
- Section 4 – presents relevant legislation, policies and regulations;
- Section 5 – provides an overview of the desktop assessment and detailed field survey methods;
- Sections 6 – details the results of the groundwater and surface water study based on the results of the desktop assessment and field survey.
- Section 7 – discusses the potential impacts to groundwater and surface water EVs identified within the project site and details the best-practice mitigation measures to ensure the risk of these impacts is reduced to within an acceptable range.

All laboratory analysis results are presented in Appendix B and Appendix C, respectively.

Figure 1: Project site location.

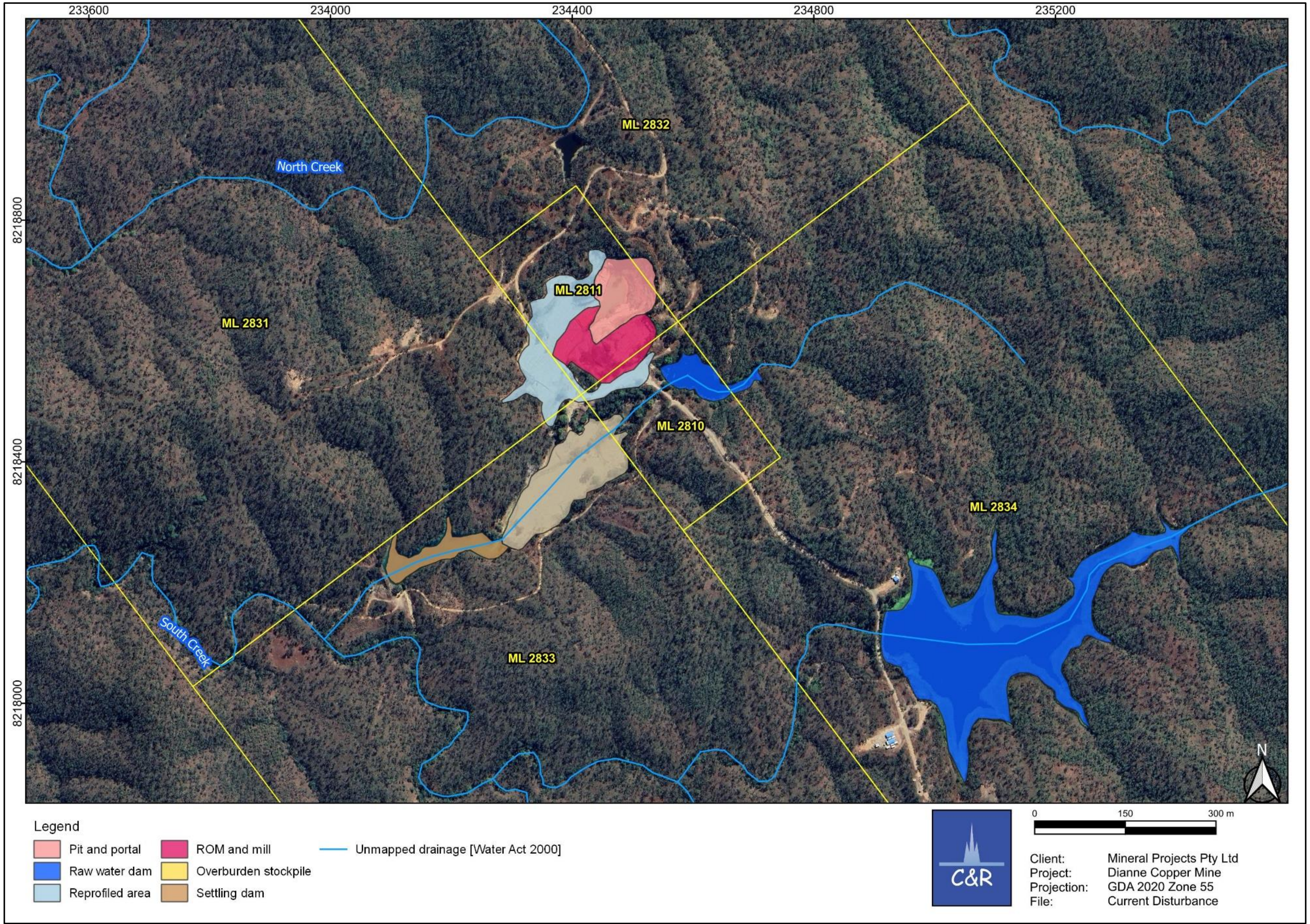

Figure 2: Existing disturbance footprint across DCM.

2. PROJECT DESCRIPTION

2.1 HISTORICAL ACTIVITIES

DCM operations are encompassed by six mining leases over an area of 518 ha (Table 1 and Figure 3). DCM started as an open-cut pit in 1979 before progressing underground via bord-and-pillar mining techniques. The current disturbance footprint includes an open-cut void and portal, mine-water management dams (including raw water dams and a settling dam containing mine-affected water [MAW]), access roads/tracks and a waste rock dump (Figure 4).

Table 1: Mining leases associated with the DCM operations.

Mining lease	Date granted	Expiry date	Area (ha)
ML 2810	24/04/1974	30/04/2028	5.67
ML 2811*	24/04/1974	30/04/2028	5.67
ML 2831	02/08/1973	30/04/2028	129.50
ML 2832	15/11/1973	30/04/2028	123.83
ML 2833	15/11/1973	30/04/2028	129.50
ML 2834	15/11/1973	30/04/2028	123.83
		Total	518.00

*The access road that connects the site to Whites Creek Road is associated with this mining lease.

The mine has been in ‘care and maintenance’ since the early 1980s. Although there are no current extraction activities, existing disturbance from historical activities still influences the surrounding environment. The main source of potential contaminants to the receiving environment is from leached waters associated with the waste rock dump. The dump is located within a small valley (Figure 4) and was reconfigured in 2020 to divert a drainage line around the dump instead of flowing through it.

The settling dam is located downstream of disturbance areas associated with the mine, including the waste rock dump (Figure 2). The only authorised release point to the receiving environment (RP1) is situated within the spillway of the settling dam. The spillway is currently has a flow meter installed so that any passive releases occurring throughout the wet season once the dam is full can be tracked.

Historically, the settling dam was found to be seeping underneath the dam wall and into the receiving environment. However, remediation works completed in 2020–2021 reduced the head pressure of water held within the dam (by pumping MAW from the settling dam to the pit) and installing a sump at the foot of the dam wall. The sump has an automated pump installed to return seepage back to the settling dam when required.

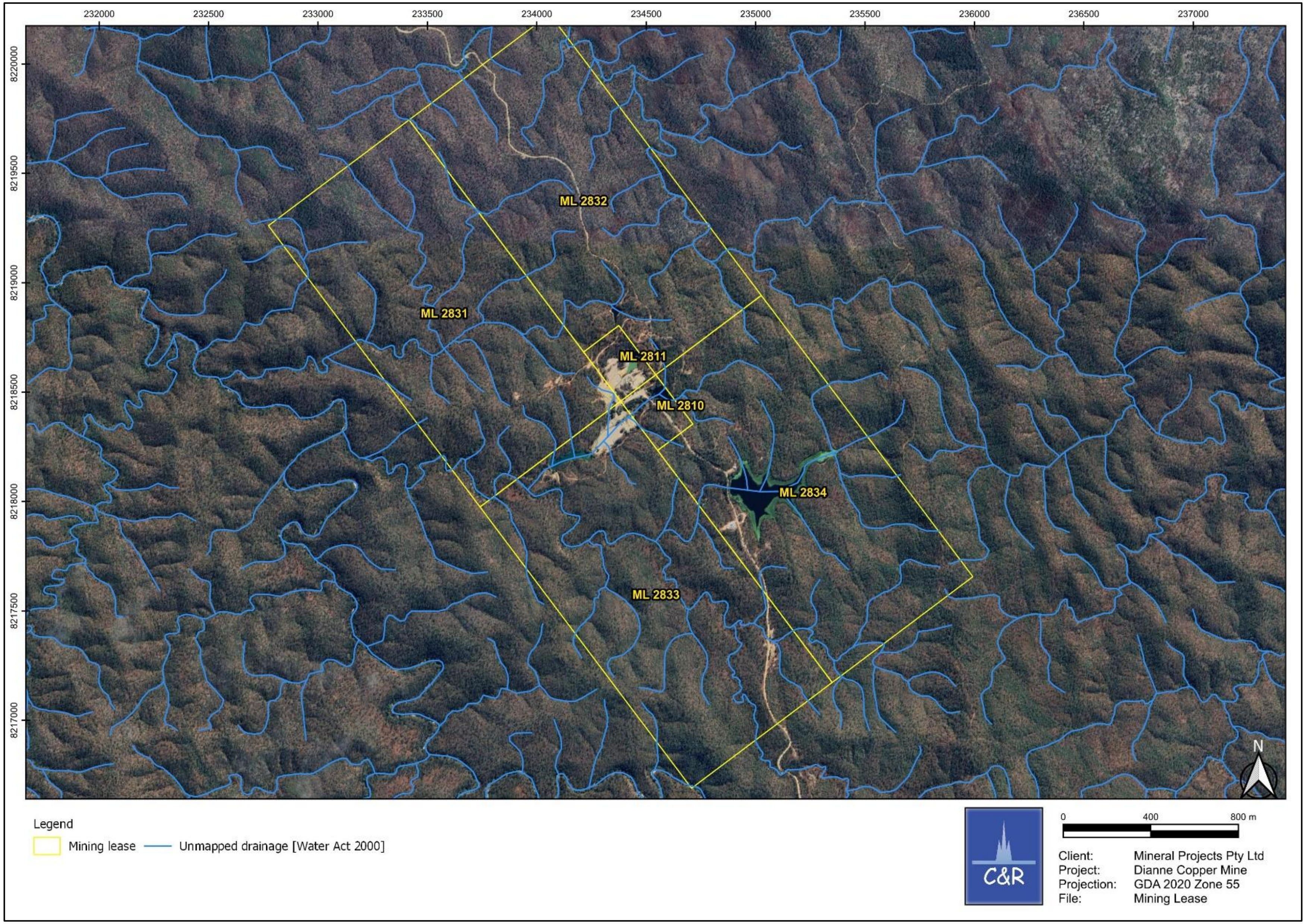

Figure 3: Mining leases associated with DCM operations.

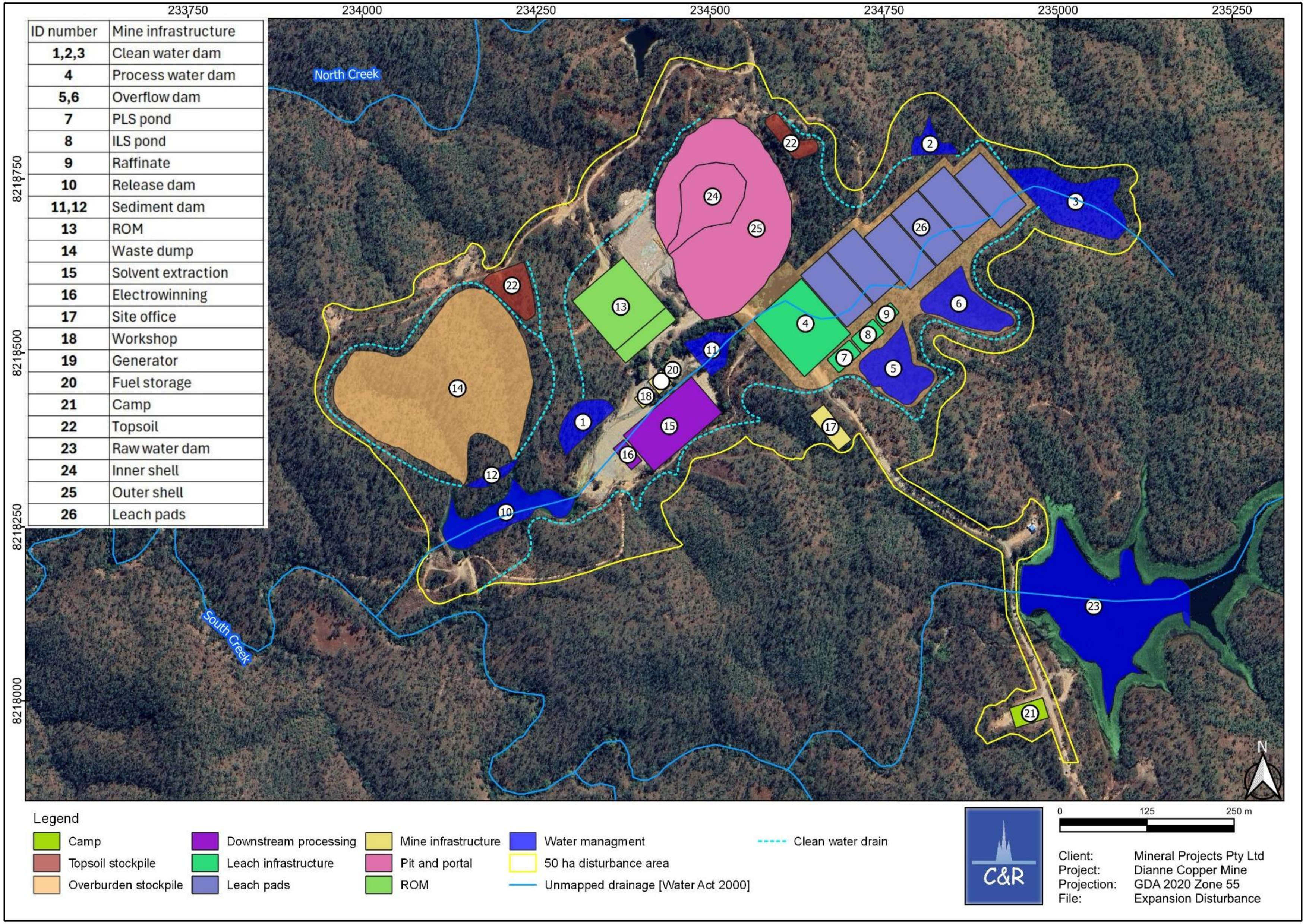

Figure 4: Proposed disturbance areas associated with the project.

2.2 Proposed Activities

The recommencement activities at DCM will involve the following:

- The extraction – and processing – of up to 900,000 tonnes per annum (tpa) of copper ore from a single open-cut pit via a truck and shovel operation (i.e. excavator and haul methods). Although copper will be the main target, additional minerals – including zinc and silver – will also be targeted.
- The pit will be situated over the old/existing open-cut and portal void, reaching a total depth of about 124 m (Figure 4).
- Initial processing of the extracted ore will be undertaken via a two-phase crushing, screening and agglomeration circuit prior to stacking on heap leach pads for copper extraction (Figure 5).
- The heap leach pads – with an overall area of approximately 3 ha – will be lined with high-density polyethylene (HDPE) sheeting to prevent any seepage to underlying soils and groundwater systems. The heap leach and electrowinning processing stage is a closed circuit. The heap leach pads are irrigated with an acidic solution. The copper-rich runoff (pregnant liquor) is captured and treated using electrowinning that extracts the copper onto sheets charged as cathodes in an electrical circuit (Figure 5). Once the extraction process is completed, the remaining liquor is treated through a solvent extraction process so that the acid can be recycled through the heap leach process again (Figure 5).
- The heap leach area includes overflow dams (Figure 4) to ensure that no solutions are released to the receiving environments.
- The copper cathode product will be transported to the Port of Townsville (PoT) via road (in 20 t trucks) for export to international markets. Up to 16 truck movements are required per week (on average).
- The construction and/or upgrade of various mine infrastructure (Figure 4), including:
    - Run-of-mine (ROM) area;
    - Access roads and tracks;
    - Temporary accommodation camp and associated sewage treatment plant (STP), with up to 40 staff working on site during the operational phase;
    - Water management infrastructure, including the development of diversion bunds/drains around the entire new operational footprint (including the heap leach area) and the remediation of the existing settling dam to develop the new release dam.
    - Workshop and administration buildings;
    - Power infrastructure (solar and diesel combination), including the development of bunded fuel storage areas; and
    - A small landfill pit for general (non-mining) waste.

The project has a mine life of approximately four years, commencing in late 2024. An additional six months is required for closure and rehabilitation. During this time, further exploration activities within the area will also be conducted.

The proposed total disturbance area is approximately 50 ha, which includes utilising 14.1 ha of existing disturbance areas (Figure 4).

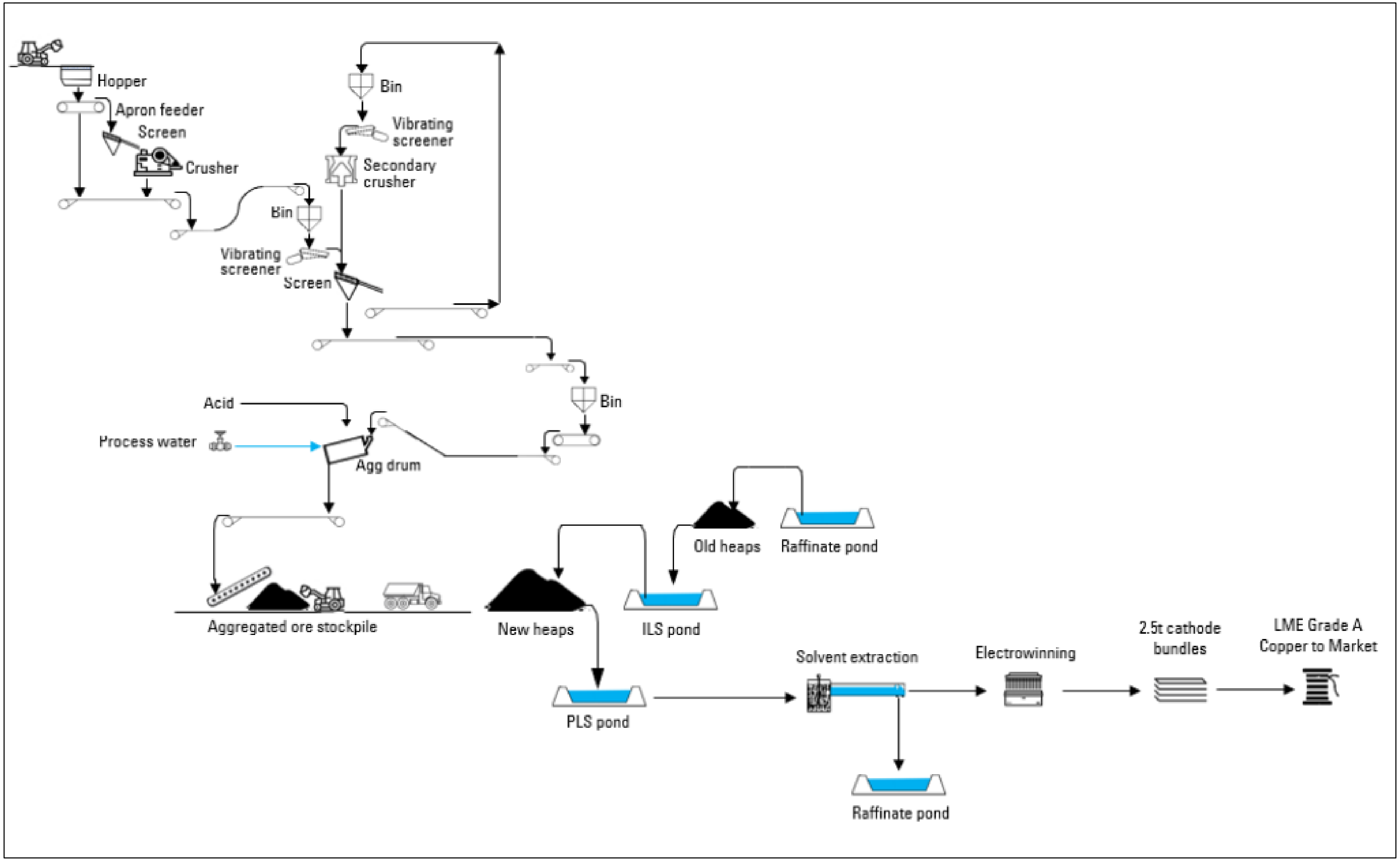

Figure 5: Indicative flowchart detailing the proposed mineral processing activities.

3. REGIONAL SETTING

3.1 CLIMATE

Rainfall in Queensland's seasonally dry tropics varies in its intensity, duration and location. Intense rainfall events characterise the wet season (November to April). These rainfall events are often highly variable in their spatial and temporal distribution, with much of the rain falling in distinct, spatially separated cells across the landscape. Commonly, no to little rainfall is recorded in the dry season months from May to October.

The nearest Bureau of Meteorology (BoM) rainfall gauge (28013, Maitland Downs Station; BoM, 2024a) is located about 24 km southeast of the project site. At gauge 28013, the median annual rainfall total over the 1965–2023 period was 922.1 mm. However, annual rainfall displays very high variability, ranging from 333.2 mm (1966) to 1,879.0 mm (1981). Most precipitation tends to fall in January and February (Figure 6), with moderate to high falls also common in March and December. Typically, little rain falls throughout the dry season, with an occasional shower in May, June or October.

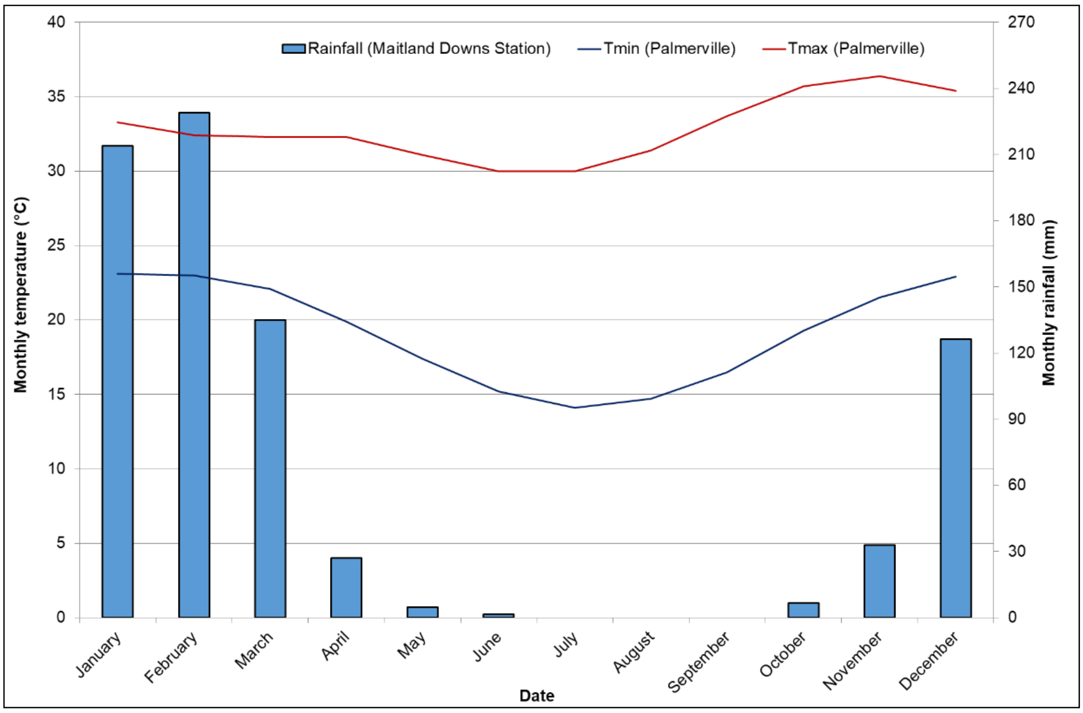

Figure 6: Long-term historical median monthly rainfall (BoM station 28013) and temperature (BoM station 28004).

The region is characterised by hot weather throughout the year. At Palmerville (BoM weather station 28004; BoM, 2024a), median monthly maximum temperatures (T_{max}) are generally above 30°C (Figure 6). The hottest day-time temperatures are typically during the monsoonal build-up before the beginning of the wet season (October–December; Figure 6). Conversely, median monthly minimum temperatures (T_{min}) more closely mirror the rainfall patterns, with the highest values (22°C – 23°C) observed between December and March, coinciding with the wettest months (Figure 6).

Evaporation tends to exceed rainfall for almost all days of the year except during intense rainfall events. The extended dry season causes baking and crusting of surface soils. These processes will reduce the infiltration capacity of surface soils unless suitable pre-wetting is provided by gentle rain prior to the wet season. During the onset of the wet season, in the absence of gentle, pre-wetting rains, more than 90% of rainfall can eventuate as runoff throughout catchments.

At the Maitland Downs station (BoM station 28013), wet season (November to April) rainfall in the four years up to April 2024 (Figure 7) was persistently higher in comparison to the long-term annual median (883.5 mm) over the equivalent 6-month period. The initial wet season (2020/2021) was comparable to the long-term median at a total of 887 mm. However, the three most recent summers recorded totals of 977.5 mm, 1,461.5 mm and 1,395.5 mm, respectively. Rainfall during the 2023–2024 wet season was extensive as a result of severe tropical cyclone (TC) Jasper. TC Jasper formed in the Coral Sea and made landfall near Wujal Wujal on 13 December 2023, before stalling over the Cape York Peninsula for several days, bringing large amounts of rain to the region (BoM, 2024c). December 2023 was the wettest month (582.5 mm) over the four years (Figure 7).

Dry season (May to October) patterns were mostly comparable to the long-term median, with totals of 33.0 mm (2024) to 34.5 mm (2020) slightly below the long-term average (44.8 mm; Figure 7). However, unusually elevated rainfall (209.5 mm) was received during the cooler months in 2022. The 2021/2022 wet season ended late (41 mm in May) and was followed by a notably wet July (64 mm). Further, the subsequent (2022/2023) wet season started early, with rainfall from September 2022 to May 2023 above the long-term median. Notably, between the 2-year period from September 2021 and August 2023, only three months registered rainfall amounts at or below the long-term median, emphasising the persistence of uncharacteristically wet conditions throughout the years and seasons.

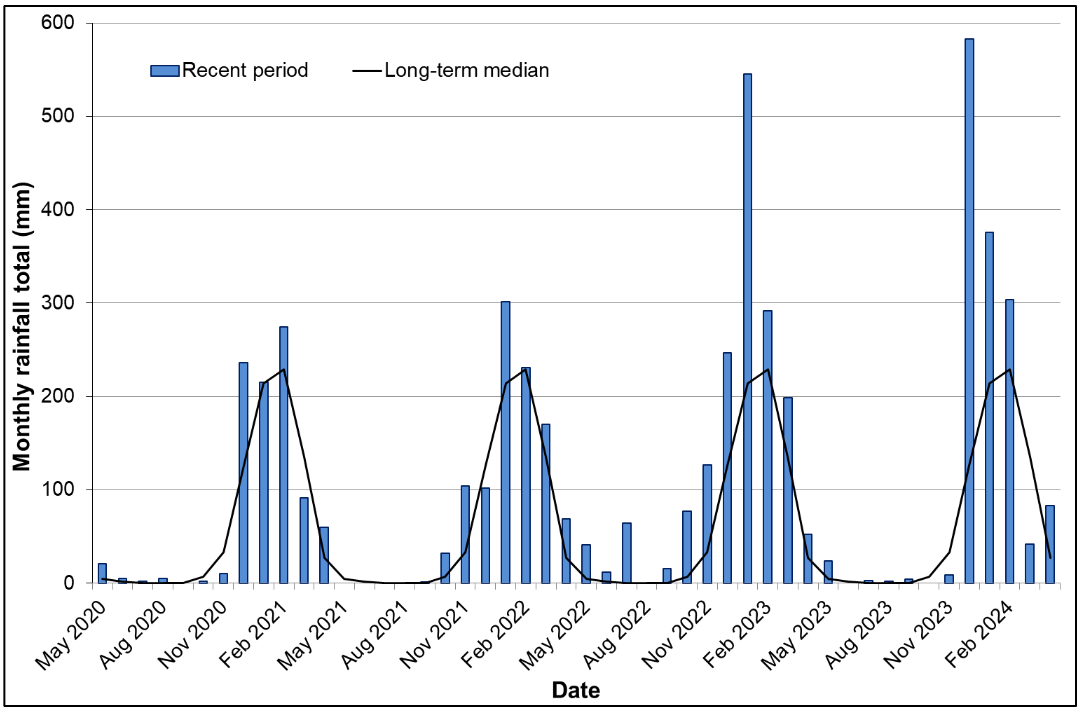

Figure 7: Rainfall over the recent four years and the long-term, monthly median (BoM station 28013).

3.2 Geology

The mine lease lies within the Hodgkinson Province of the Mossman Orogen, comprising a deformed Ordovician to early Carboniferous sedimentary package with minor, mafic volcanics (Halfpenny and Hegarty, 1991; Kositcin et al., 2015). The western margin of the province, defined by the north-/northwest-trending Palmer Fault, lies about 45 km to the west of the project site. The Cannibal Creek granite, one of several local, Permian granitoid intrusions (Donchak et al., 2013), lies about 9 km south of the mine lease, forming an elevated (~100–300 m) tableland.

The project area covers marine siliclastics of the Silurian to upper Devonian Hodgkinson Formation, which is extensively distributed across the Hodgkinson Province. The formation is a thick, lithologically homogenous package of quartzo-feldspathic sandstone and mudstone, with subordinate, interbedded conglomerate, chert and mafic volcanics, and minor shallow-water limestone (Withnall and Cranfield, 2013). The siliciclastics are deep-water, density current deposits (turbidites). These were interpreted a) as accumulating in a fore-arc accretionary wedge east of an active, continental, magmatic arc (Henderson, 1980) or, b) more recently, as a back-arc basin or rifted margin setting (Garrad and Bultitude, 1999).

The Chillagoe Formation is the only other formation recognised in Mossman Orogen rocks of the Hodgkinson Province (Henderson and Donchak, 2013). It is exposed in the west of the project site as the Chillagoe Subprovince, forming a linear belt adjacent to the Palmerville Fault. It comprises limestone, chert, mafic, volcanic rocks and sandstone. Its stratigraphic association as correlative with – or younger than – the Hodgkinson Formation remains unresolved (Henderson and Donchak, 2013).

Major regional and local deformation events impacted the Hodgkinson Province, resulting in strong folding and faulting of the stratigraphic package. Hodgkinson Formation strata strike north, dipping steeply and younging to the west (Henderson and Donchak, 2013). Structural complexity results in stratal repetition across fold limbs and in fault slices (Henderson and Donchak, 2013). Strata are disrupted into north-/northwest-oriented, fault-bounded belts, in turn disrupted by extensive thrust faults (Withnall and Cranfield, 2013). A secondary fault set trends west-northwest and is characterised by brittle, sinistral transpression, with multiple reactivation episodes (Davis and Henderson, 2013). Regional metamorphism is to sub-greenschist facies, with local higher-grade contact aureoles around the Permian granitoid intrusives.

A four-phase deformational history has resulted in complex secondary overprinting fabrics. Melange is widely developed, particularly in the east of the province, and penetrative fabrics and stratal disruption are accentuated by fold-related strain (Henderson and Donchak, 2013). Mudstone matrix shows scaly anastomosing cleavage of coeval generation (Davis and Henderson, 2013). Locally, melange fabric may be cut by regional, structural cleavage, sheer-related overprinting, fold-related crenulation cleavage and contact metamorphism, resulting in variable zones of heterogeneous, secondary rock fabric across the province.

The DCM lease area in the central-northwestern Hodgkinson Province is characterised by shallow, plunging, isoclinal folding and associated north/northwestern, pervasive, slaty cleavage. The dominant fault system trends north to northwesterly, subparallel to the major bedding and cleavage direction (Davis and Henderson, 2013). Displacement along faults is mostly indeterminate. However, associated north-plunging kink folds along north-/northwest-trending faults east of DCM suggest oblique-slip movement (Halfpenny and Hegarty, 1991). A later east-/southeast-trending fault set persists across the region, along with extensive dolerite dykes aligned parallel to the northwest major faults. These structures and fabrics are associated with the main shortening events (D1 and D2) of the Mossman Orogen.

Additionally, a northeast-trending lineament array is notable across the lease area. This array is interpreted as conjugates to the major north-/northwest-trending faults (Halfpenny and Hegarty, 1991), and possible dilatational faults or joints. Creeks commonly follow these lineaments.

The Hodgkinson Province is unconformably overlain by Carboniferous to Triassic, non-marine successions. These successions comprise conglomerate, coal measures, volcanic rocks and sandstone, including rocks of the Ngarrabullgan and Lakefield basins (Horn et al., 1995). This cover sequence is sparsely distributed and shows no metamorphic overprint.

The Hodgkinson Province contains several small deposits, including Besshi-type, volcanic-hosted, massive sulphide deposits (e.g. Mount Molloy, Dianne, OK), Carboniferous to Permian lode gold deposits of the Hodgkinson gold field, and a number of granite-related deposits – particularly tin, tungsten and gold (e.g. Mount Garnet, Collingwood, Mungana and Red Dome; Horn et al., 1995).

3.3 HYDROGEOLOGY

The project site lies within the Northeast Australian Fractured Rock Province (Geoscience Australia, 2024b) which includes areas of orogenic rock outcrop or sub-crop not covered by younger sedimentary basins (Geoscience Australia, 2024a). The Hodgkinson Province of the Mossman Orogen comprises the northern extent of this hydrogeological province.

Fractured aquifers are characterised by sometimes complex arrays of fracture cleavage, joints, faults, schistocity, quartz veining and bedding planes, producing cavities (secondary porosity) at variable scales within the rock mass. Groundwater yield is extremely variable depending on the geometry of these structural elements, topography, rainfall and distance from surface water drainage (Geoscience Australia, 2024b). Likewise, rates of groundwater movement in fractured rock systems are difficult to quantify and flow direction can be related more to the orientation of fractures than the hydraulic head distribution (Geoscience Australia, 2024a). Fractured rock aquifers are typically unconfined, forming discontinuous, local groundwater flow systems restricted within catchment boundaries (Leach, 2013). Likewise, recharge is mostly local, mainly via vertical infiltration through fractures and surface weathered zones, and closely linked to rainfall (Geoscience Australia, 2024a).

The DCM site – associated with an elevated bedrock plateau (~400–450 m AHD [metres Australian Height Datum]) to the west and south of the Great Dividing Range – lies within the surface water catchment system of the Mitchell–Coleman rivers. The local, geological context of deformed, metamorphosed, fractured, folded and faulted, fine- to medium-grained siltstone and sandstone (Hodgkinson Formation) is characteristic of a fractured aquifer system. Groundwater storage is most likely within open cavities within the indurated, low-permeability siltstone and sandstone host rock, and associated with joints and fractures developed through multiple deformation events. Moderate- to highly-weathered, near-surface rocks are potential additional groundwater repositories.

Regional groundwater drilling experience indicates that groundwater resources are associated with well-developed, orthogonal joint sets. Local, structural analysis of the project site will provide conceptual constraint on likely groundwater storage capacity. Bore yields in the northern zone of this fractured rock province range from 0.5–30 L/s; most rates are <1.5 L/s; typical range is 0.5–10 L/s, with highest values closest to modern water courses; yields up to 30 L/s are associated with intense fracturing and faulting (Geoscience Australia, 2024a).

Determining flow systems across DCM – within the context of the discontinuity typical of these unconfined, fractured aquifers – will be challenging. However, because groundwater in upper catchment areas may naturally discharge through springs and as baseflow to streams (Geoscience Australia, 2024a), local topographic constraints and surface water discharge features, together with local, structural characterisation (cleavage trends and delineation of fracture types), may help in developing a suitable, conceptual model.

3.4 GEOMORPHOLOGY

Local geomorphology is controlled by surface geology. Hodgkinson Formation mudstone and sandstone form rugged, low to hilly terrain incised by a fine, dendritic drainage pattern.

Resistant chert and indurated sandstone conglomerates form strike ridges along bedding orientation (Halfpenny and Hegarty, 1991). The area is characterised by eucalypt woodlands covering rocky hills, interconnecting ridge-lined valleys and associated, non-perennial watercourses.

The primary soil type found around DCM is a tenosol, specifically Fu25 (Northcote, 1960–1968). This type of soil is generally found in low, hilly to hilly lands closely dissected by numerous, small streams. Undulating areas occur marginally and there are some areas of high hills with very steep slopes and common rock outcrops. The dominant soils are very shallow, gravelly, bleached loams (Um2.12), with lesser areas of similar loams (Um2.21, Um4.1, and Um4.21). Smaller areas of similar, sandy loams (such as Uc2 and Uc4) occur locally. Associated throughout the unit are areas of shallow, gravelly duplex soils (namely Dy3.41, Dr2.41, and Dr3.41), particularly on lesser slopes. In some valley floors, there are small areas of Dy3.43 soils. Small areas of basic volcanic rocks in the unit have deeper, red, friable clays (i.e. Uf6.31). At the northern margin of the project site, the unit may be capped by small sandstone mesas of unit Ca35.

Stream beds of the targeted watercourses are dominated by coarse sands, gravel and cobble, interspersed with bedrock throughout the reaches. The systems often present steep gradients, generating fast-flowing water in the wet season.

3.5 Hydrology

The project site lies within the Palmer River sub-basin (~8,424 km^2), which is part of the Mitchell River basin (71,622 km^2), draining west into the Gulf of Carpentaria (Figure 1). The main watercourse associated with the project site is an unnamed tributary of Gum Creek, herein referred to as 'South Creek' (Figure 2). A second unnamed tributary of Gum Creek traverses the northern sections of the project site and will be herein referred to as 'North Creek' (Figure 2). Both these tributaries flow into Gum Creek, which joins Granite Creek before entering the Palmer River less than 2 km north of the mine lease boundary.

Watercourses within the region record peak flows in the wet season. Many smaller systems are ephemeral (e.g. North Creek), only flowing while rains persist. Intermittent streams, fed by groundwater outputs (e.g. Gum Creek), flow for extended periods following the cessation of the wet season. Like Gum Creek, South Creek is an intermittent system, with minor flows sustained for an extended period after the wet season via groundwater seepage from the highly fractured rock (Hodgkinson Formation) within the upper reaches. It is likely that all three systems dry out entirely over the dry season, although pools are expected to persist year-round in some areas.

South Creek receives flows from the existing disturbance areas associated with the historical mining operations via the settling dam. The settling dam has the potential to passively release during flood events. Additionally, seepage has been documented below the settling dam wall. A sump and return pump system has been set up at the base of the wall to capture seepage and return it to the settling dam. However, the effectiveness of the system to capture all seepage is unknown. Further, the connectivity of the shallow subsurface seepage to the downstream receiving environment is undetermined.

The Gum Creek catchment area is a relatively small catchment in the Palmer River sub-basin, situated within the hills to the south of the main channel of the Palmer River. The hills restrict the drainage lines in terms of width. Most drainage lines of Gum Creek are deeply incised and steep, creating fast-flowing waters during the wet season.

3.6 Riparian Communities

Two main types of riparian vegetation communities are associated with watercourses within the region, their designation dependent on the size of the watercourse.

Small drainage channels with limited alluvium in the upper reaches of the catchment have riparian communities characterised as a heterogeneous mix of regional ecosystem (RE) 9.11.3a (85%) and RE 9.3.14a (15%). Along these minor drainage lines, most of the fringing vegetation in this habitat type is analogous with the adjacent woodland, which is dominated by Cullen's ironbark (*Eucalyptus cullenii*), Clarkson's bloodwood (*Corymbia clarksoniana*), Cooktown ironwood (*Erythrophleum chlorostachys*) and Dallachy's gum (*Corymbia dallachiana*). Northern swamp mahogany (*Lophostemon grandiflorus*), bluegum (*Eucalyptus tereticornis*), river sheoak (*Casuarina cunninghamiana*) and sedges (*Cyperus* spp.) – vegetation synonymous with riparian zones – occur infrequently.

Greater alluvial development downstream allows for more pronounced riparian vegetation. These riparian communities are consistent with a heterogeneous mix of RE 9.3.14a (90%) and RE 9.11.3a (10%). Large creek lines (such as Gum Creek) present a more established riparian zone, consisting of similar species as described in the upper catchment riparian communities – but with additional riparian species such as auri (*Acacia auriculiformis*), Leichhardt tree (*Nauclea orientalis*) and Cape fig (*Ficus nodosa*).

Further discussion on the riparian communities present across the site is provided within the terrestrial ecology report (C&R, 2024c).

3.7 LAND USE

Large portions of the Palmer River catchment area have historically been targeted for gold mining, including the Gum Creek catchment. Although alluvial gold mining still occurs within Gum Creek, it is no longer the dominant land use within the region, superseded by cattle grazing. Despite this, small-scale gold hunters are still observed in the area, with evidence of their recent activities (small diggings) often observed. Although there are some station homesteads in the Gum Creek catchment, there are no major settlements.

DCM is the only known hard rock mining operation within the Gum Creek catchment area.

3.8 ENVIRONMENTAL VALUES

The *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* (EPP Water) provides a framework for the protection of EVs associated with Queensland rivers, streams, wetlands, lakes, aquifers, estuaries and coastal areas. Under this framework, EVs for specific catchments and drainage basins have been formalised through a process of statutory declaration. EVs formalised in this way are listed in Schedule 1 of the EPP Water. For other waters, a site-specific assessment of the potential EVs is required. To date, no EVs have been declared for the Palmer River catchment (or its tributary catchments, i.e. Gum Creek).

Due to the anthropogenic disturbances that have occurred throughout the region (i.e. mining, grazing, etc.), the local catchments are considered slightly to moderately disturbed. Despite this, the local surface water resources currently support a range of EVs, including aquatic ecosystems, industry, stock watering and human uses. The existing EVs have been identified from a review of known land and water uses within the catchment, stakeholder consultation and through reference to published information.

In summary, the surface water EVs relevant to the project are:

- Aquatic ecology;
- Stock drinking water;
- Drinking water supply (potentially/unknown);
- Cultural values; and
- Industrial use (downstream alluvial mine operations).

4. RELEVANT LEGISLATION, GUIDELINES AND REGULATORY REQUIREMENTS

The legislation, policies and regulations relevant to the management of groundwater and surface water in relation to the project are discussed in sections 4.1 to 4.3 include:

- The Queensland *Water Act 2000* (Water Act);
    - *Environmental Protection (Underground Water Management) and Other Legislation Amendment Act 2016*;
- The Queensland *Environmental Protection Act 1994* (EP Act);
    - *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* (EPP Water and Wetland Biodiversity).
- Directory of important wetlands of Australia (DIWA; DCCEEW, 2024a), Ramsar wetlands (DCCEEW, 2024a) and the Department of Environment, Science and Innovation (DESI, 2024b) Map of Queensland wetland EVs;
- The Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC, 2012) environmental offsets policy; and
- The Queensland environmental offsets framework.

The NC Act also lists *special least concern* species. These species are allocated *special least concern* status based on either their special cultural significance or the existing population needing to be conserved. The only aquatic *special least concern* fauna species identified in database searches potentially occurring within the Palmer River catchment was the platypus (*Ornithorhynchus anatinus*). Several aquatic *special least concern* flora species are recognised as potentially occurring within the Palmer River catchment. These species are considered unlikely to occur within the project site, as discussed in section 6.1.

4.1 QUEENSLAND WATER ACT 2000

The Water Act provides for the sustainable management of water resources – as well as any other resources with the potential to impact water resources. This is achieved through a range of processes, including the establishment and operation of water authorities. Under the Water Act, any potential works that will destroy vegetation, excavate – or place fill within – a watercourse, lake or spring will require a riverine protection permit application. Mining operations may be exempt from obtaining a riverine protection permit under the guideline *Activities in a watercourse, lake or spring associated with mining operations* (Department of Environment and Resource Management [DERM], 2010), provided works are consistent with the guideline. The Water Act provides for the identification of watercourses on the watercourse identification map – or declaration of a watercourse by the administering authority.

A review of the Water Act watercourse identification map was undertaken for the area, with the results discussed in Section 6.1.2.

4.2 QUEENSLAND ENVIRONMENTAL PROTECTION ACT 1994

The Queensland EP Act aims to protect the designated EVs of Queensland watercourses, wetlands and groundwaters. This is achieved through the adoption of the associated EPP Water and the *Environmental Protection Regulation 2019*.

The EP Act and its subordinate legislation provide a range of tools to ensure its objectives are met. These range from approvals (called EAs) for environmentally relevant activities (ERAs) through to statutory and enforcement tools such as environmental protection orders.

The EPP Water outlines the EVs identified for each basin and/or sub-basin within Queensland – as well as defining the catchment-specific water quality objectives (WQOs) required to ensure the protection of each unique EV. Section 6.1 discusses the EVs of the area, in accordance with the framework defined in the EPP Water.

The *Map of Queensland wetland environmental values* (DESI, 2024b) is a state-wide statutory map under the EPP Water. DESI (2024b) identifies wetlands of high ecological significance (HES) and general ecological significance (GES) across the state. Wetlands in wetland protection areas (WPAs) and HES wetlands are identified as matters of state environmental significance (MSES) under planning and environmental offsets legislation.

Section 6.1.2 details the potential for HES and WPAs to occur within the project site and/or the immediate downstream areas.

4.3 Ramsar Wetlands and Nationally Important Wetlands

The directory of important wetlands (DCCEEW, 2024a) is an online database that lists internationally and nationally important wetlands. The directory provides data and information about important wetlands on which to base management decisions. Although managed via the same database as MNES, nationally important wetlands are not protected under the EPBC Act.

The directory includes wetlands identified under the Ramsar convention which is an international cooperative designed to conserve wetlands. Ramsar wetlands are those that are representative, rare or unique wetlands, or are important for conserving biological diversity. Ramsar wetlands are considered MNES under the EPBC Act.

As discussed in Section 6.1.2, these databases list no wetlands on the project site, or within close proximity to the site.

5. METHODS

5.1 Desktop Assessment

5.1.1 Database Searches

Database searches for this study targeted listed aquatic flora, fauna and communities previously documented in the area, as well as known wetlands. The results of the database searches are provided in section 6.1. Database searches included reviews of the following publicly available resources:

1. **Department of Natural Resources, Mines and Energy [DNRME] (2024), Groundwater Database**: The DNRME maintains information on water bores across Queensland in its groundwater database which can be accessed via Queensland Globe (Department of Resources [DoR] 2024). The accessible list of bores includes those registered with the Department of Regional Development, Manufacturing and Water, as well as those registered for private use.
2. **BoM (2024) Groundwater Dependent Ecosystems Atlas**: The Groundwater Dependent Ecosystems Atlas (GDE Atlas) was developed as a national dataset of Australian GDEs to inform groundwater planning and management. The atlas contains information about three types of ecosystems – aquatic, terrestrial and subterranean.
3. **Australian wetlands database (DCCEEW, 2024a):** This online database provides information about Australia's Ramsar wetlands (internationally important wetlands) and wetlands identified in the directory of important wetlands of Australia (nationally important wetlands).
4. ***Map of Queensland wetland environmental values* (DESI, 2024b) and the *Map of Great Barrier Reef wetland protection areas* (DESI, 2024a):** These mapping layers identify the occurrence and location of wetland management areas, including HES wetlands and WPAs. The mapping layers were viewed using the Department of Resources (DoR, 2024) Queensland Globe interactive mapping portal.

5.2 Surface Water Sampling

DCM has undertaken surface water quality monitoring across sites detailed within the existing EA since 2020. Additionally, various sites assessed for aquatic ecology purposes were also targeted for water quality sampling as part of the baseline investigations for the expansion project. Unfortunately, no historical water quality data is available for the targeted systems prior to DCM operations or prior to Mineral Projects assuming control of the mine.

5.2.1 Monitoring Sites

Potential sampling sites were determined through an assessment of aerial photographs, available site infrastructure information, historical sampling locations and proposed site boundaries. As a result, the DCM surface water monitoring program for the expansion project consisted of a total of 14 sites. These were mostly located upstream and/or downstream of historical mining disturbance areas, along North Creek and South Creek, although Gum Creek and some farm dams were also targeted, where possible. Monitoring site coordinates and descriptions are presented in Table 2, with the locations shown on Figure 8, and include:

- Ten watercourse sites:

  - Two located along Gum Creek (AQ06 and AQ03);
  - Two along North Creek (AQ01 and AQ02); and
  - Six along South Creek (AQ05, S13, S7, S11, S12 and S14); and
- Four water storages:
  - Two within the settling dams (i.e. MAW storage; S6 and S9); and
  - Two raw water dams (S1 and S3).

Table 2: Surface water site locations and descriptions at DCM.

Site	Latitude*	Longitude*	Receiving environment	Description
S1	-16.1026	144.5232	Raw water dam	Large raw water dam
S3	-16.0987	144.5188	Raw water dam	Raw water dam
S6	-16.1016	144.5145	MAW dam	Settling dam
S9	-16.1019	144.5141	MAW dam	Seep sump and release point (RP1)
AQ01	-16.0948	144.5168	Upstream North Creek	REMP and aquatic ecology background site
AQ02	-16.0978	144.5046	Downstream North Creek	REMP and aquatic ecology receiving site
AQ05	-16.1139	144.5242	Upstream South Creek	REMP and aquatic ecology background site
S13	-16.1046	144.5160	Upstream South Creek	Surface water background site
S7	-16.1030	144.5148	Upstream South Creek	Surface water background site
S11	-16.1020	144.5127	Downstream South Creek	Surface water receiving site
S12	-16.1016	144.5106	Downstream South Creek	Surface water receiving site
S14	-16.1012	144.5060	Downstream South Creek	Surface water receiving site
AQ06	-16.1234	144.5258	Upstream Gum Creek	REMP and aquatic ecology background site
AQ03	-16.0984	144.5003	Downstream Gum Creek	REMP and aquatic ecology receiving site

*All coordinates in GDA94.

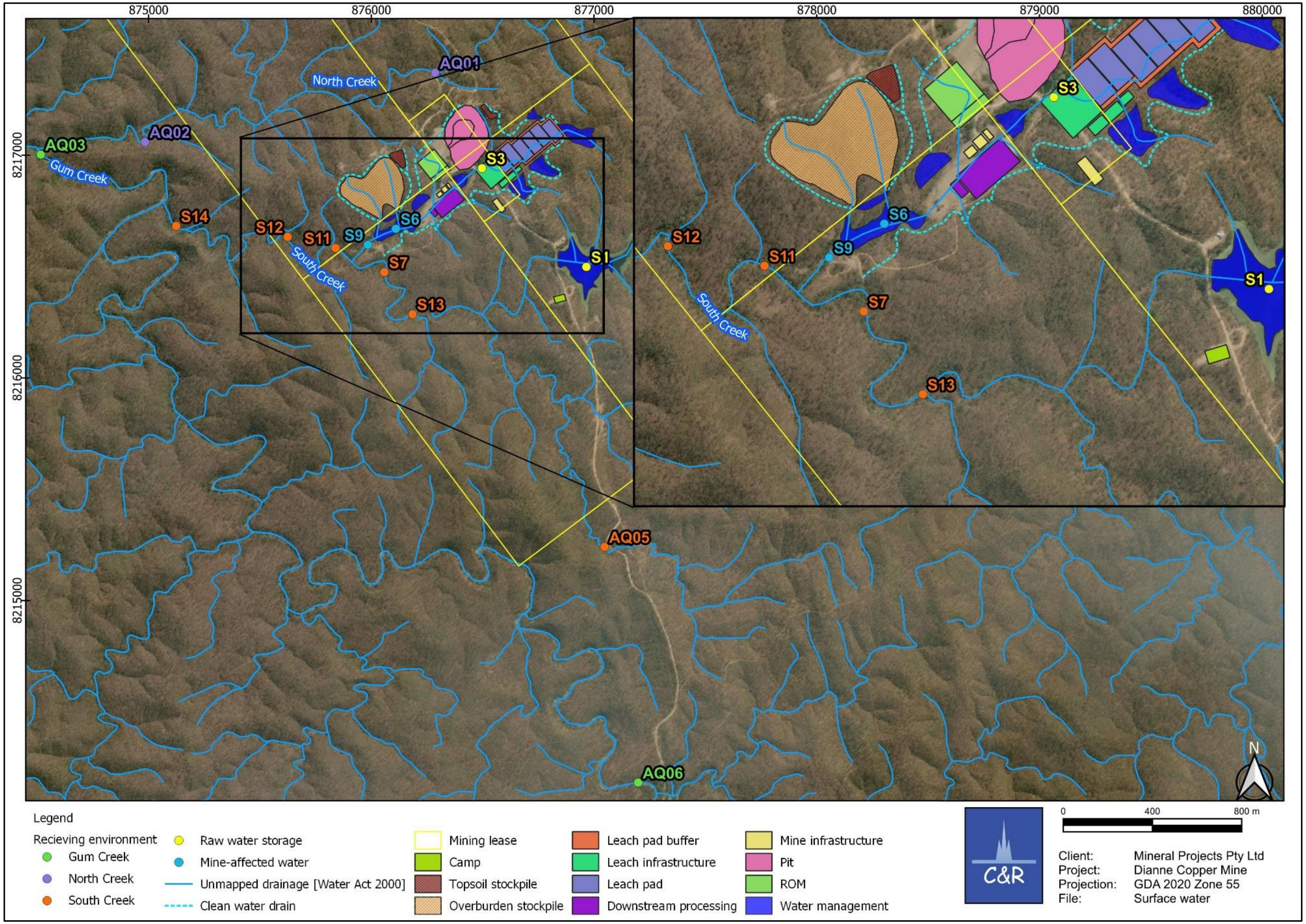

Figure 8: Surface water monitoring sites at Dianne Copper Mine. The inset map shows an enlarged section of DCM.

5.2.2 TIMING

Table 3 shows the timing of sampling at each site, since monitoring began. Water quality monitoring within watercourse sites has been opportunistic, with the site regularly inaccessible during large wet season flow events and sampling generally occurring at the beginning (early January) and later in the wet season (March, April and/or May), once flows had reduced and access was regained to the mine site. Dam locations have been more regularly sampled (Table 3).

Sampling personnel have observed that flows within the watercourses generally cease within ten weeks of the last significant rainfall of the wet season, with any sampling undertaken in watercourses at the end of the dry season (i.e. October or November) targeting remnant pools.

5.2.3 SAMPLING PROCEDURE

All samples were collected in accordance with the Australian standard (AS) AS5667 (*Water quality – Sampling*) and the Queensland monitoring and sampling guidelines (DES, 2018). Water quality analysis was undertaken by a National Association of Testing Authorities (NATA) accredited laboratory.

The precision in the sampling process was paramount to ensure the accuracy of the results. The location and depth of the sampled water were considered to collect samples that best represented the water at each site. At each sampling site, the bottles were labelled with the site location, project name, time, date and sampler's name using a waterproof pen. Powder-free latex gloves were worn when taking samples, and they were changed in between sample collections to avoid cross-contamination.

A sterile 500 mL sample bottle was attached to the telescoping sample pole and, where possible, bottles were placed approximately 20 cm under the surface and inverted. The bottle was then flipped, expelling the air contained in the bottle and collecting a representative sample. Where only shallow points remained, the 500 mL bottle was placed at the greatest depth possible to allow filling. Samples were put on ice within eskies immediately after the sample had been taken for transport back to the laboratory.

The In-situ Aqua Troll 600 water quality meter was used to measure various quality characteristics in-situ, with the results carefully monitored for stability before being recorded on field sheets. Field sheets were filled out at each site – regardless of the presence of water. All site observations were recorded on the field sheets, including in-situ water quality results, water colour, flow descriptions (i.e. low, bank full, no flow, etc.), date, time, site name, sampler's name and quality assurance samples collected, reinforcing the scientific rigour of the report.

Georeferenced and date-/time-stamped photographs were taken upstream and downstream of each monitoring site, regardless of water being present on each sampling occasion. Wide-angle photographs of the pits/dams were taken where no clear upstream/downstream variation is observed.

Further quality assurance and control control (QA/QC) measures employed for water quality sampling in both surface water and groundwater systems are detailed in Section 5.4.

Table 3: Month and year of water quality monitoring rounds undertaken at each monitoring site.

Receiving environment	Site	2020			2021				2022						2023		2024		
		Jan	Mar	Oct	Jan	Mar	May	Nov	Jan	Feb	Mar	May	Jun	Oct	Apr	Nov	Jan	Mar	Apr
Raw water dams	S1																		
	S3																		
Settling Dam	S6																		
	S9																		
North Creek	AQ01																		
	AQ02																		
South Creek	AQ05																		
	S13																		
	S7																		
	S11																		
	S12																		
	S14																		
Gum Creek	AQ06																		
	AQ03																		

5.2.4 Analytes Targeted

Basic water quality analysis was undertaken at each site using an in-situ field meter. The following parameters were measured:

- Water temperature (°C);
- EC (µS/cm);
- pH (pH units);
- Dissolved oxygen (DO; mg/L and %sat);
- Total dissolved solids (TDS; mg/L);
- Turbidity (Nephelometric Turbidity Units [NTU]); and
- Oxidation-reduction potential (ORP; mV).

Grab water samples were also collected from each site and analysed at a NATA accredited laboratory for the following quality characteristics:

- pH;
- EC (µS/cm);
- TDS (mg/L);
- Total suspended solids (mg/L);
- Major anions and cations (mg/L);
- Alkalinity (full suite; mg/L);
- Total hardness (mg/L);
- Dissolved and total metals (including Al, As, B, Cd, Cr, Cu, Pb, Mn, Ni, Se, Zn, Fe, Ag and Hg; mg/L);
- Ammonia as N (mg/L);
- Nitrate as N (mg/L);
- Nitrite as N (mg/L);
- Nitrite + nitrate as N (mg/L);
- Total Kjeldahl nitrogen as N (mg/L);
- Total nitrogen as N (mg/L);
- Total phosphorus as P (mg/L);
- Reactive phosphorus as P (mg/L);
- Total petroleum hydrocarbons (µg/L); and
- Benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN; µg/L).

5.3 Groundwater Sampling

DCM established a monitoring bore network in the dry season of 2022 with the first monitoring round undertaken approximately two months post bore installation. A site-specific groundwater monitoring program is yet to be developed for the site with the majority of monitoring undertaken to date coinciding with the receiving environment monitoring program sampling timing.

5.3.1 Monitoring Bores

The DCM groundwater monitoring network consists of three bores. Coordinates and construction details of groundwater bores are shown in Table 4. The locations of each of the groundwater bores are shown in Figure 9.

Table 4: Groundwater monitoring bore locations and construction details at Dianne Copper Mine.

Bore ID	Eastings*	Northings*	Total depth (mBGL)	Surface elevation (m AHD)	Screen interval (mBGL)	Screened formation	Screened lithology
GW01	234497	8218901	86.5	429.34	80.5–86.5	Hodgkinson	Sandstone
GW03	234025	8218165	58.0	387.27	50–56	Hodgkinson	Sandstone
GW04	234740	8218311	83.0	420.31	75–81	Hodgkinson	Sandstone

*All coordinates in GDA 2020, MGA 55.

5.3.2 Timing

Table 5 displays the timing of sampling of the groundwater bores since installation. GW03 could not be safely accessed on one sampling occasion (in March 2024), otherwise all bores have been sampled on each occasion.

Table 5: Water quality and level sampling timing in groundwater bores.

Bore ID	2022	2023		2024		
	Oct	Apr	Nov	Jan	Mar	May
GW01						
GW03						
GW04						

5.3.3 Sampling Procedures

Pressure transducers (Solinst Levelogger 100) were installed in each of the monitoring bores following construction, with a barometric pressure transducer also installed in one bore to allow for the logged level data to be calibrated. Each pressure transducer was set to measure the change in groundwater elevation at four-hourly intervals. Additionally, on each sampling occasion, an electrode-sensor water level meter was used to determine the depth to water in each bore before sampling commenced. The level was then recorded on the respective field sheet.

Low-flow purging techniques were used to sample groundwater bores at DCM. The low-flow pumps were lowered into the bores 0.5–1 m above the bottom of the screen of each bore. The In-situ Aqua Troll 600 water quality meter was used to measure quality characteristics in-situ via a low-flow cell. Targeted in-situ water quality characteristics were recorded every litre. Samples were collected once the required purge volume was achieved, and three consecutive stable readings were captured for all field parameters. The In-situ app *VuSitu* was used to verify that stable parameter criteria were met before sampling began.

All samples were collected in accordance with AS5667 (*Water quality – Sampling*) and the Queensland monitoring and sampling guidelines (DES, 2018). Water quality analysis was undertaken by the NATA-accredited ALS laboratory.

5.3.4 Analytes Targeted

Groundwater quality samples were analysed in-situ and within the laboratory (via grab samples) for the same quality characteristics as surface waters detailed in Section 5.2.4.

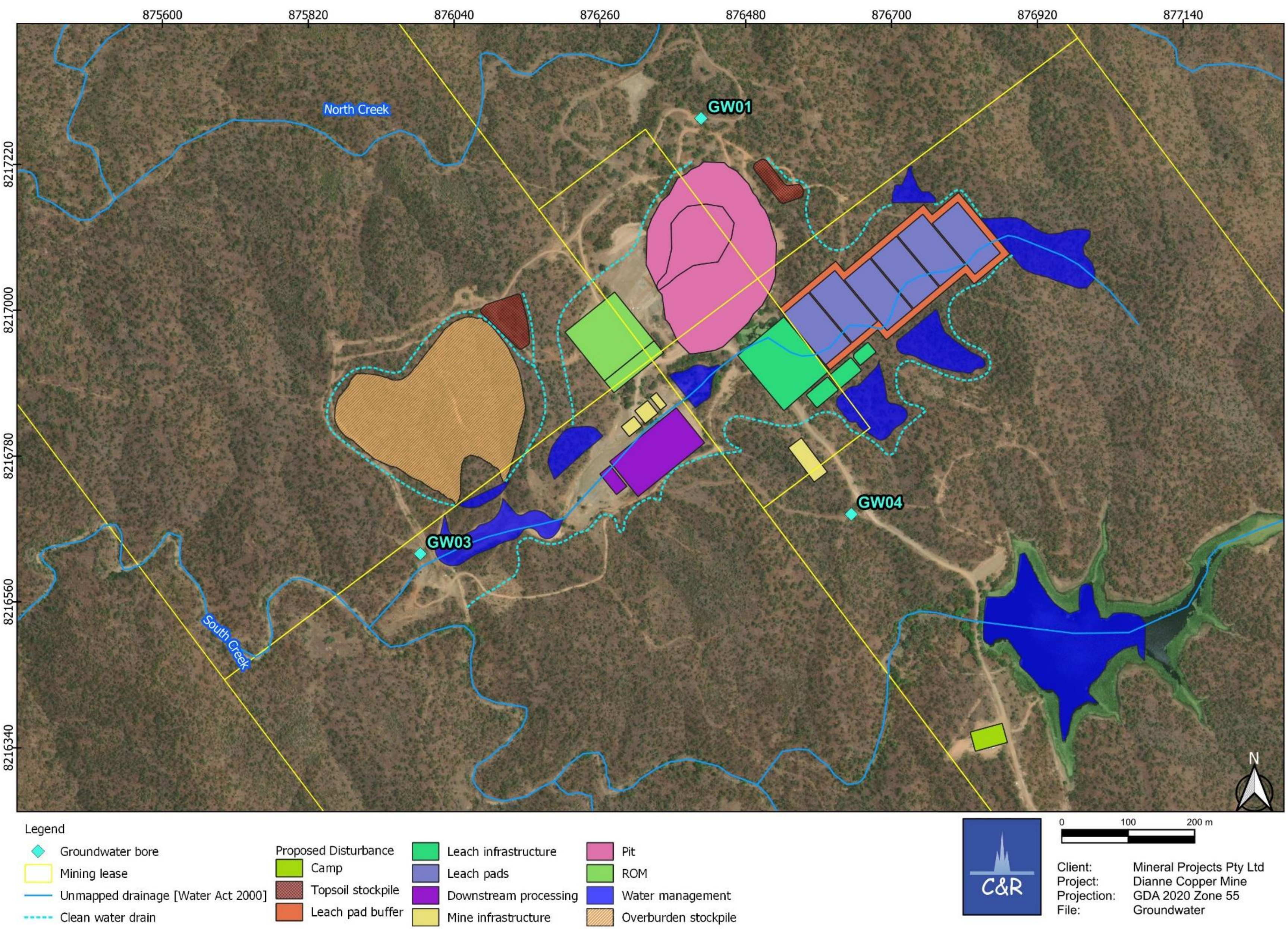

Figure 9: Groundwater monitoring bores at Dianne Copper Mine.

5.4 Quality Assurance and Quality Control

To ensure appropriate sampling procedures are followed in the field, additional samples, quality assurance and quality control (QA/QC) techniques are required. These included the following:

- In-situ water quality meter is regularly calibrated;
- In-situ water quality meter is washed with ambient, potable water prior to sampling and thoroughly cleaned at the end of a sampling event;
- Samples were delivered to the laboratory within the appropriate holding times and holding conditions (specified by the NATA-accredited laboratory);
- One field duplicate for every 10 samples and one field blank for every 20 samples were collected during both the surface and groundwater sampling events to assess handling procedures;
- Field-filtering (0.45 µm) was undertaken for dissolved metals samples; and
- An appropriate chain-of-custody form was completed for each sample event for submission to the laboratory.

Duplicate samples were assessed for laboratory precision using the relative percent difference (RPD) equation, defined in the Queensland *Monitoring and sampling manual* (DES, 2018). DES (2018) reported that RPD values below 20% for water may be acceptable, provided the result is five to ten times the laboratory limit of reporting. Values greater than 20% may be acceptable if the result is close to the limit of reporting. This is an expression of the reduced certainty associated with results near the limit of reporting.

Blank samples were assessed for any results above the laboratory limit of reporting to provide an estimate of potential contamination associated with environmental conditions or sampling procedures.

5.5 Data Collation, Processing and Analysis

Water quality data (both surface waters and groundwater) were collated and analysed. Data analysis included evaluating, cleaning and summarising the data. For the purposes of summarising the data and developing key statistics, all results below the limit of reporting have been assumed to be half the limit of reporting, in accordance with the QWQG. This approach generates slightly lower descriptive statistics than using the limit of reporting, hence any water quality objectives (WQOs) developed from these statistics will be conservative.

There are no regionally specific WQOs available for the area. Instead, water quality data are assessed against the current best practice guideline values detailed in ANZG (2018). Under these guidelines, watercourses of the area are considered ‘slightly to moderately’ disturbed due to the existing land uses within the catchment area. Therefore, the 95% species protection level guideline values for freshwater ecosystems are considered the most relevant to the study area.

Additional analysis of the data was undertaken using box plots, time series graphs and piper diagrams with downstream sites compared to background and/or reference sites.

5.5.1 Determination of Site-Specific Objectives

Site-specific WQOs were developed for the surface waters of South Creek in accordance with the following relevant guidelines/methods:

- *Using monitoring data to assess groundwater quality and potential environmental impacts* (DES, 2021);
- ANZG (2018); and
- The QWQG (DEHP, 2009).

Data collected from the upstream monitoring sites on South Creek (AQ05, S7 and S13) were considered reference, collated and assessed collectively for the purposes of calculating site-specific WQOs (i.e. the data was pooled from all three upstream sites to determine the WQOs for downstream South Creek). It should be noted that AQ05 only has two data points while S7 and S13 have 9 and 10, respectively. Therefore, it is recommended that the developed site-specific WQOs be viewed as interim only (which can be developed on as few as 8 data points from multiple reference sites; DEHP, 2009), with the WQOs revisited once sufficient additional data points have been collected (i.e. a minimum of 20 data points from each site).

Employing pooled dataset of South Creek upstream sites, the site-specific WQOs were developed using a stepwise approach (as defined in DES, 2021) that included:

1. Any quality characteristics that recorded less than eight data points above the limit of reporting were removed from the calculation. Site-specific water quality guidelines were not calculated for these parameters.
2. For the remaining quality characteristics, data points that were recorded below the limit of reporting (<LOR) were assigned a value of 50% of the LOR.
3. For any quality characteristic, if a high proportion of the results (i.e. more than 25%) were <LOR, those values were removed from the dataset used to calculate the site-specific WQOs, rather than being provided a value of 50% of the LOR and included in the calculation.
4. Outliers were identified as datapoints that are more than four times the standard deviation from the mean of the pooled dataset. It was noted that (with a single exception) all outliers were recorded in the Ward River during the dry season when the river was influenced by tidal/estuarine waters.
5. Outliers were removed from the pooled dataset prior to further analysis.
6. Following the removal of the outliers, the 20th, 50th and 80th percentiles were determined along with 75% confidence intervals for each percentile. The 75% confidence intervals for each percentile were adopted as the site-specific WQOs.
7. The calculated site-specific WQOs were reviewed and any results that were found to be <LOR were removed from the assessment and not provided a site-specific WQO.

Note; interim site-specific WQOs could not be developed for any other watercourses or for groundwater bores as too few data points are currently available. It is recommended that site-specific WQOs be determined for these systems once sufficient data has been collected (i.e. interim WQOs can be developed on a minimum of 8 data points from each reference site).

6. RESULTS AND DISCUSSION

6.1 DATABASE SEARCHES

6.1.1 GROUNDWATER

6.1.1.1 *Registered Bores*

Excluding the three groundwater monitoring bores, no registered groundwater bores exist within the bounds of the DCM mining leases.

Government records accessed through the Queensland Globe (DoR, 2024) spatial data portal suggest that – within a 30 km radius of the mining lease – there are 23 registered bores. Stated within the bore registration details, the purpose of individual boreholes varies, including:

- Groundwater monitoring bores of nearby mines;
- Exploration; and
- Homestead water supply.

These registered bores represent potential groundwater users in the vicinity of the mine.

The government register states that nine of these bores are abandoned, with three of the abandoned bores remaining operable. Eight of the abandoned bores are associated with the Greasy Bill Creek Mine (ML100286) which targets tin and gold. The registered bore reports within a 30 km radius of DCM are listed in Appendix A.

6.1.1.2 *Groundwater-Dependent Ecosystems*

Groundwater-dependent ecosystems (GDEs) typically exist where groundwater is shallow or in a discharge zone of a groundwater flow regime. Groundwater can be important in sustaining aquatic and terrestrial ecosystems in settings which include springs, wetlands, rivers and vegetation. A review of the GDE Atlas national scale mapping (BoM, 2024b) identified that no GDEs are currently mapped around DCM.

However, water quality assessments completed as part of this investigation reviewed the likely connectivity between receiving environments and potential groundwater systems within the DCM locality.

6.1.2 WATERWAYS AND WETLANDS

6.1.2.1 *Waterways*

No watercourses are defined under the Water Act within the project site. The main channel of Granite Creek is the closest downstream, mapped watercourse. However, there are several unmapped tributaries that flow east to west across the project site before entering Gum Creek (Figure 2). These watercourses are considered relatively minor, with the VM Act watercourse mapping allocating stream orders for Gum Creek, South Creek and North Creek as four, two and two, respectively (DoR, 2024).

The Department of Agriculture and Fisheries (DAF, 2024) *Queensland waterways for waterway barrier works* mapping indicates the level of 'risk' associated with undertaking waterway barrier works within Queensland waterways with regards to fish passage. Please refer to the *Dianne Cooper Mine – Aquatic ecology report* (C&R, 2024a) for further information.

6.1.2.2 *Wetlands*

A database search of DIWA and Ramsar wetlands (DCCEEW, 2024a) found no internationally or nationally significant wetlands within a 20 km radius of the project site. Similarly, assessment of the *Map of Queensland wetland environmental values* (DESI, 2024b) using Queensland Globe (DoR, 2024) did not identify any WPAs or HES wetlands within or immediately (within 20 km) downstream of the project site. The nearest mapped HES wetland is located approximately 9 km northeast of the project site in a direct line, which is greater than 100 km upstream of the project site, via the watercourses, on the banks of the Palmer River.

6.2 SURFACE WATER

The current surface water monitoring network consists of 14 sites at DCM (Table 1):

- Eleven watercourse sites:
  - Four located along Gum Creek (AQ06 and AQ03);
  - Two along North Creek (AQ01 and AQ02); and
  - Five along South Creek (AQ05, S13, S7, S11 and S12); and
- Four water storages:
  - Two MAW storages (S6 and S9); and
  - Two raw water dams (S1 and S3).

All discussed surface water data are presented with comparison to the ANZG (2018) WQOs in Appendix B.

6.2.1 PHYSICAL PARAMETERS

The pH values in the receiving environment and on-site water storages between 2020 and 2024 are shown in Figure 10. Excluding S6 and S9, which contain MAW, all sites exhibit pH levels ranging from neutral to mildly alkaline, with a minimum of 6.40 and a maximum of 9.11. Upstream and downstream receiving environments vary minimally. The exception is North Creek, where pH increases from 6.8 at AQ01 (upstream) to 7.8 at AQ02 (downstream). However, it should be noted that only three data points have been collected from each location, so these data cannot substantiate any specific effects occurring within the receiving environment. All levels remained within the WQO guideline values for pH (6.5 to 8.5; ANZG, 2018).

S6 and S9 collect mine-affected runoff and seepage from the waste rock stockpile. Both water storages exhibit acidic pH levels, ranging from 4.00 to 6.76 in S6 and 4.70 to 6.43 in S9. With median values of 4.93 and 5.70, respectively, the pH levels in S6 and S9 are outside the guideline pH limits for 95th percentile species protection (ANZG, 2018).

The acidic pH levels within S6 and S9 are not surprising considering the waters' source is runoff from the waste rock stockpile. The oxidation of sulphide minerals – such a pyrite – within the waste rock stockpile can lead to a decrease in pH when a chemical reaction occurs between the sulphate and hydrogen ions.

Figure 11 shows the degree of variability in EC values across the receiving environment and on-site water storages between 2020 and 2024. Levels range from a minimum of 30 µS/cm in S3 (raw water dam) to a maximum of 1,500 µS/cm in S12 (downstream South Creek). All levels remained within the WQO guideline values for EC (5,000 µS/cm; ANZG, 2018).

The water quality data captured at aquatic ecology sites (identified as AQ) were collected between November 2023 and April 2024, and are typically based on four data points. The degree of variation observed in most sites is attributable to flow conditions, whereby pooled water experienced a high level of evaporation once flows have ceased. Consequently, samples collected in April and May had elevated ECs in comparison to samples from January to March. Previous assessments (C&R, 2022, 2023 and 2024) found that EC levels are likely influenced by a source (potentially the natural geology) upstream of DCM operations, although the levels at S11 in November 2023 are likely further concentrated by natural, evaporative processes.

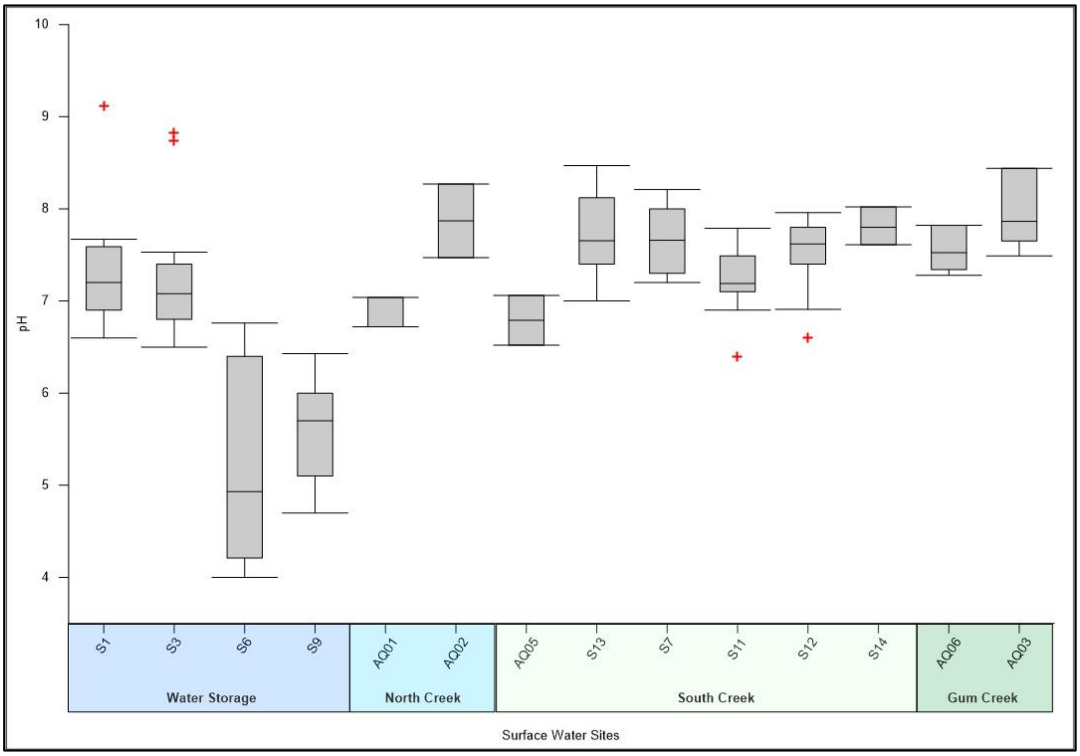

Figure 10: pH of surface water network at DCM from January 2020 to May 2024.

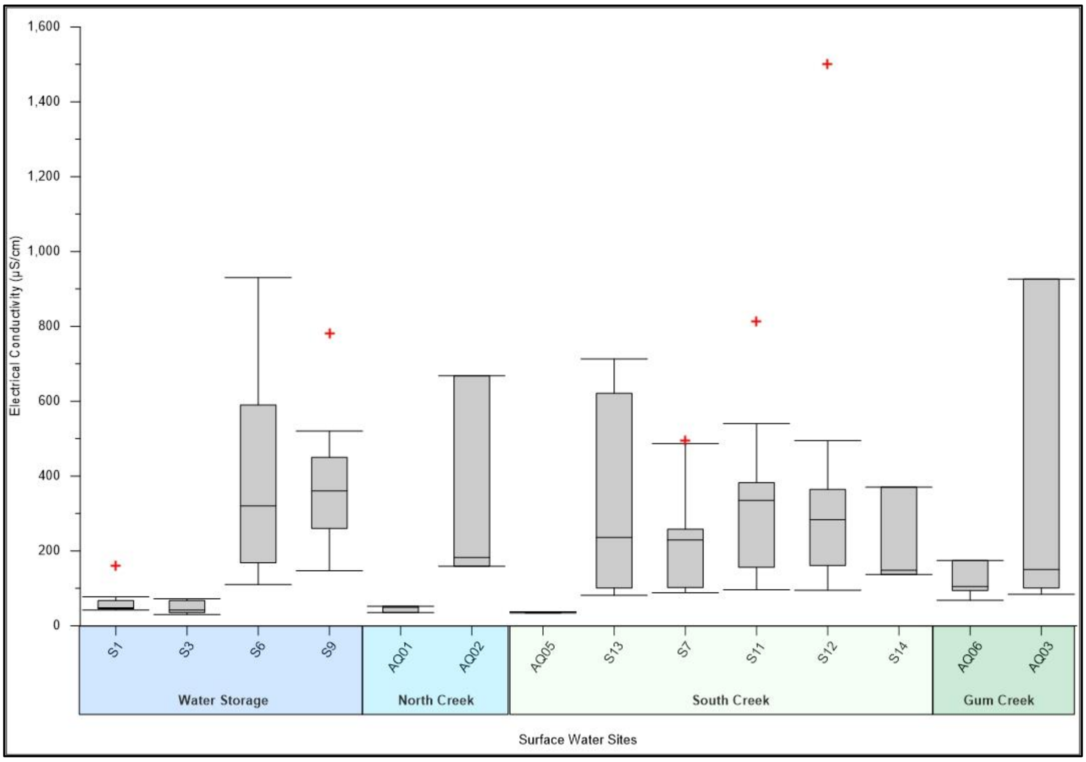

Figure 11: Electrical conductivity of surface water network at DCM from January 2020 to May 2024.

The ionic composition from the water storages and receiving environments are depicted in Piper diagrams (Figure 12 and Figure 13). Figure 12 shows a clear difference between the raw water dams (S1 and S3) and the MAW (S6 and S9), with bicarbonate and sulphate being the dominant anions, respectively. There is less distinction among the cations. The raw water dams fluctuate between sodium and sodium–magnesium, whereas the MAW shows no dominant type. The ionic composition varies significantly across different systems and individual sites (Figure 13). S11 and S12, located directly downstream of S6 and S9, share a similar anion signature, with a depletion in dissolved carbonates and enrichment in sulphate. All remaining receiving environments reflect a similar composition to the raw water dams.

The influence of releases of MAW on the downstream receiving environment is further evidenced by the Piper plot showing the analysis of the ionic composition of samples collected from each of the surface water monitoring sites (Figure 12 and Figure 13). The Piper diagrams show that the cations at upstream and downstream monitoring sites are similar. However, the anions are notably different between sites, with S11 and S12 generally located between S6 and the background sites (S7 and S13). On one occasion, S11 displayed a very similar cation composition to the settling dam (S6; Figure 12 and Figure 13). This sample was collected during the November 2023 sampling round when the receiving environment was otherwise dry. These waters showed a depletion in dissolved carbonates and an enrichment of sulphate. The results suggest that the downstream sites – particularly S11 – consist of a mixture of both MAW water and background waters during flows. Conversely, the water composition at S11 is consistent with that of the settling dam when no flows are flushing the site in the dry season.

These results suggest that the downstream sites are influenced by a mixture of both S6 and background waters to varying degrees (Figure 12 and Figure 13). Based on the downstream water quality results, it is suggested that releases – either through seepage or surface flows – from the settling dam (S6) are impacting the downstream water quality. Seepage is more likely the cause. If the changes were due to a previous release during the wet seasons, they would likely have been flushed through the system by the time of sampling. A similar result was observed in the 2022, 2023 and 2024 assessment reports (C&R, 2022, 2023, 2024b).

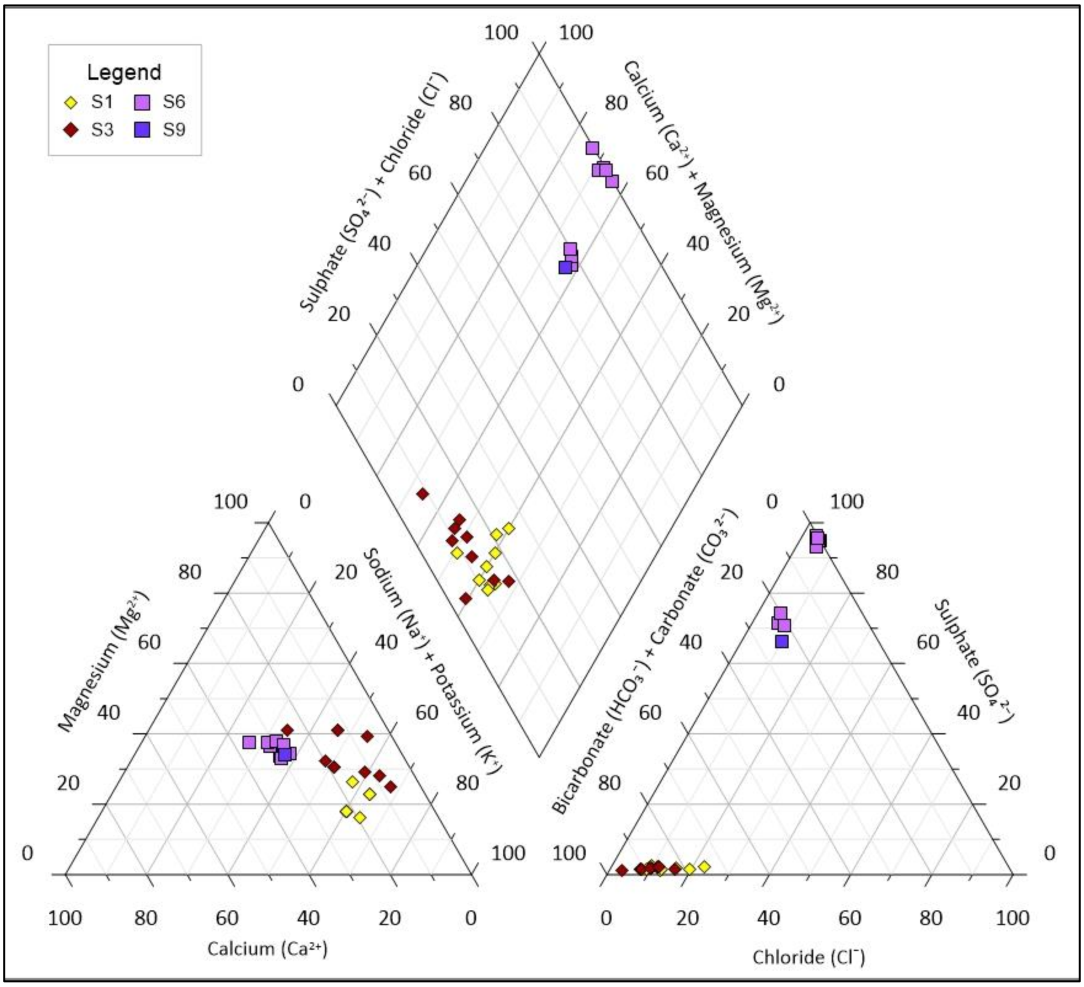

Figure 12: Ionic composition of water storage units at DCM from January 2020 to May 2024.

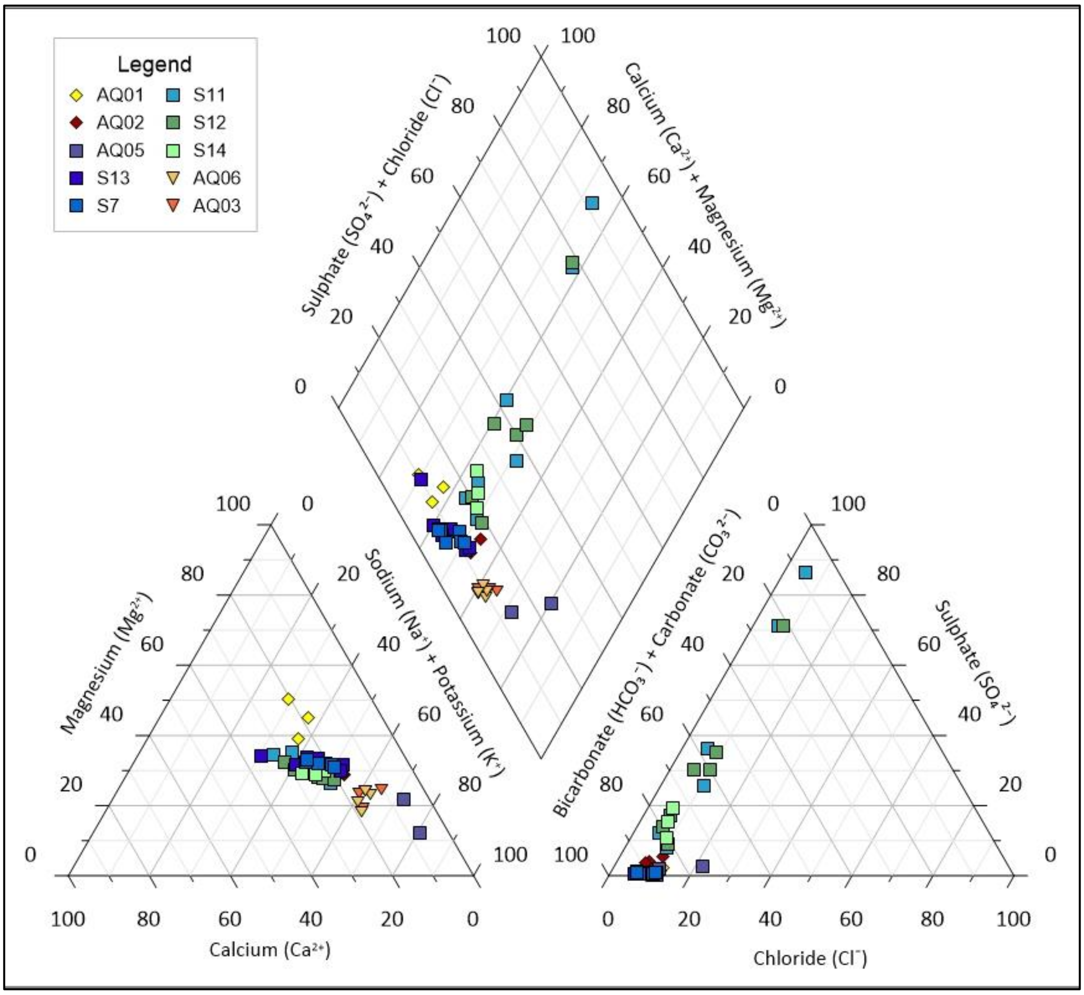

Figure 13: Ionic composition of receiving environments at DCM from January 2020 to May 2024.

6.2.2 SULPHATE

Sulphate has been analysed sporadically between May 2021 and November 2023, with continuous monitoring only occurring since early 2024 (Table 6). Typically, both the raw water dams and all receiving environments (North Creek, South Creek and Gum Creek) display low-level concentrations ranging between below the limit of reporting (1 mg/L) and 13 mg/L. However, as depicted in Figure 12, Table 6 shows that elevated sulphate concentrations are recorded in S6, S9, S11, S12 and, to a lesser extent, S14. The elevated sulphate concentrations between the MAW storage and the three immediately downstream monitoring sites in South Creek.

When compared to monthly rainfall data recorded at BoM station 28013 (Figure 7), there is no discernible correlation suggesting that similar concentrations within the MAW storages and receiving environment are due to rainfall and subsequent release events. Specifically, in May 2022 and November 2023, the monthly rainfall totals were 41 mm and 9 mm, respectively. Corresponding sulphate levels were 222 mg/L and 370 mg/L at S6, and 105 mg/L and 371 mg/L at S11. Therefore, the connection between the MAW storages and the receiving environment is likely occurring via uncontrolled seepage.

Table 6: Sulphate concentrations (mg/L) recorded between May 2021 and April 2024.

Date		S1	S3	S6	S9	AQ01	AQ02	AQ05	S13	S7	S11	S12	S14	AQ03	AQ06
2021	May	<1	<1	–	–	–	–	–	2	<1	46	50	–	–	–
	November	<1	<1	–	–	–	–	–	–	–	–	–	–	–	–
2022	May	<1	<1	222	–	–	–	–	1	<1	105	53	–	–	–
	October	<1	<1	358	–	–	–	–	<1	–	–	158	–	–	–
2023	April	<1	<1	170	–	–	–	–	1	<1	53	47	–	–	–
	November	1	<1	370	–	–	–	–	–	–	371	–	–	<1	<1
2024	January	<1	<1	–	36	<1	5	<1	<1	<1	5	6	8	<1	<1
	March	<1	<1	92	–	<1	4	<1	<1	<1	10	12	12	<1	<1
	April	<1	<1	69	–	<1	13	–	4	2	35	–	38	<1	<1

6.2.3 METALS AND METALLOIDS

Metal and metalloid concentrations from both the water storage units and receiving environments have been compared against the WQO to determine the natural levels within the systems surrounding DCM. S1 and S3 represent the two raw water dams and display similar hydrochemical characteristics, with the 80th percentiles for dissolved aluminium, copper, and total iron exceeding the respective WQO. However, dissolved copper in S3 is consistently elevated compared to S1, with median values of 0.003 mg/L and <0.001 mg/L, respectively.

The MAW storage units (S6 and S9) both exhibit median values above the associated WQO for dissolved cadmium, copper, zinc and total iron. Additionally, S6 exceeds the WQO for dissolved aluminium, manganese, nickel and selenium – and total copper and manganese.

Monitoring points in North Creek are relatively newly established sites, with only three data points each between January and April 2024. Both sites exhibit levels of dissolved aluminium and copper – as well as total iron – above the WQO. However, the levels of dissolved copper differ substantially between the two sites. At AQ01, values range from <0.001 mg/L to 0.002 mg/L. Conversely, at AQ02, concentrations vary between 0.01 mg/L and 0.029 mg/L.

South Creek can be divided into upstream (AQ05, S13 and S7) and downstream sites (S11, S12 and S14), with any influence from current mining infrastructure potentially impacting the downstream hydrochemical signatures. Across all monitoring sites, both upstream and downstream, dissolved aluminium and copper frequently exceed the associated WQO. However, a substantial difference in dissolved copper concentration is observed when comparing median values: upstream 0.007 mg/L (n = 23) versus downstream 0.0825 mg/L (n = 28). Additionally, dissolved zinc and – to a lesser extent – cadmium frequently exceed the WQO across all downstream sites (median = 0.023 mg/L), whereas only one elevated zinc concentration was recorded at the upstream sites (median < 0.005 mg/L).

AQ06 is located in the upper catchment of Gum Creek, whereas AQ03 is the further downstream monitoring point within the DCM surface water monitoring network. Elevated levels of dissolved aluminium and total iron are present in both datasets. However, dissolved copper levels differ noticeably. AQ03 ranges from a minimum of 0.002 mg/L to a maximum of 0.008 mg/L – compared to AQ06, where levels are below 0.001 mg/L.

Copper is an essential nutrient for plants, animals and humans. However, at high concentrations, copper can be toxic to aquatic organisms. The concentrations released during the reporting period were substantially higher than these toxicity values and background levels (Appendix B).

The levels of copper and zinc at downstream sites (S11 and S12) suggest that releases of MAW from the settling dam – potentially via seepage but also via overtopping (especially in March 2024) – continue to influence the receiving environment. However, levels of copper and zinc recorded at the downstream sites over the reporting period were below levels observed at these sites in previous years (C&R, 2022, 2023 and 2024b).

Given the high quantity of rainfall the area received from TC Jasper, during the wet season, the water level within the settling dam likely rose and overtopped multiple times into the drainage channel leading to Gum Creek. However, the results from the current assessment and previous REMPs (C&R, 2022, 2023 and 2024b) suggest that downstream water quality is also being influenced by seepage from the settling dam, especially during the dry season, when pooled water at S11 displays a similar composition to that of the settling dam. Despite DCM undertaking measures to mitigate seepage and passive releases (i.e. overtopping of the settling dam through RP1) from the settling dam (refer to Section 2.1), the results from this survey indicate that additional action is warranted to prevent the release of toxic heavy metals into the downstream environment.

6.2.4 NUTRIENTS

All surface water monitoring sites display low-level concentrations of nutrients. The total nitrogen as N concentrations predominantly consist of total Kjeldahl nitrogen, which is the sum of organic nitrogen and ammonia within a system. This is typical of a freshwater system with high levels of organic matter from decaying vegetation.

6.2.5 TOTAL PETROLEUM HYDROCARBONS

Total petroleum hydrocarbons have infrequently had elevated readings above the limit of reporting in both raw water dams and several receiving environments. These tended to be single events, with no apparent trend. Like nitrogen (Section 6.2.4), total petroleum hydrocarbons can result from the breakdown of organic matter, particularly in environments rich in organic compounds. Natural sources of total petroleum hydrocarbons include the degradation of plant material and microbial processes that release hydrocarbons into the water.

6.2.6 INTERIM WATER QUALITY OBJECTIVES

Data collected from the upstream monitoring sites on South Creek (AQ05, S7 and S13) were considered reference, collated and assessed collectively for the purposes of calculating site-specific WQOs (i.e. the data was pooled from all three upstream sites to determine the WQOs for downstream South Creek). In accordance with the methods outlined in section 5.5.1, only pH, electrical conductivity, sulphate, aluminium, arsenic, copper and manganese contain enough values above the limit of reporting, to derive limits.

Based on the calculated 80th percentiles, only electrical conductivity, dissolved aluminium and dissolved copper are above the stipulated water quality objectives within the site's current EA. Timeseries have been created for each of the parameters (Figure 14 to Figure 16). While an outlier assessment was completed on the dataset, the proposed limits are still impacted by a limited number of elevated results, due to the small number of samples/data points collected from each monitoring site. The hydrological state of South Creek at the time of sampling likely influences water quality, with groundwater seepage potentially dominating the baseflow during the later part of each wet season, when the direct runoff contribution subsides. This subsequently influences the water quality.

Instead of applying the derived interim limits, it is recommended to formalise the three reference sites (AQ05, S13, and S7) within the EA and keep the current wording provided for WQOs (i.e. default value or 80th percentile of the reference site concentration, whichever is higher). Additionally, these sites should be monitored during flow events over multiple wet seasons to build a robust dataset (a minimum of 24 data points from each monitoring site), improving the understanding of the system before applying site-specific WQOs.

Table 7: Interim water quality objectives derived from upstream reference sites in South Creek compared against best practice guideline values.

Parameters	Units	Default WQOs EA Schedule C - Table 3	Reference Site 80th Percentile
pH (pH units with an acceptable range)	pH units	6.0 to 8.0	7.2 to 8.1
Electrical conductivity	µS/cm	125	***487***
Dissolved oxygen	% sat	For interpretive purposes only	
Total suspended solids	mg/L		
Sulphate	mg/L	770	1.2
Fluoride	mg/L		
Major cations	mg/L	For interpretive purposes only	
Major anions	mg/L	For interpretive purposes only	
Aluminium	mg/L	0.055	***0.3***
Antimony	mg/L	Not applicable	
Arsenic	mg/L	0.013	0.002
Boron	mg/L	0.37	
Cadmium	mg/L	0.0002	
Chromium	mg/L	0.001	
Copper	mg/L	0.0014	***0.014***
Lead	mg/L	0.0034	
Manganese	mg/L	1.9	0.011
Mercury (inorganic)	mg/L	0.00006	
Nickel	mg/L	0.011	
Selenium (Total)	mg/L	0.005	
Silver	mg/L	0.000053	
Zinc	mg/L	0.0083	
Total Hardness	mg/L	For interpretive purposes only	
Total Organic Carbon	mg/L	Not applicable	
Total petroleum hydrocarbons	-	No detectable film or odour	

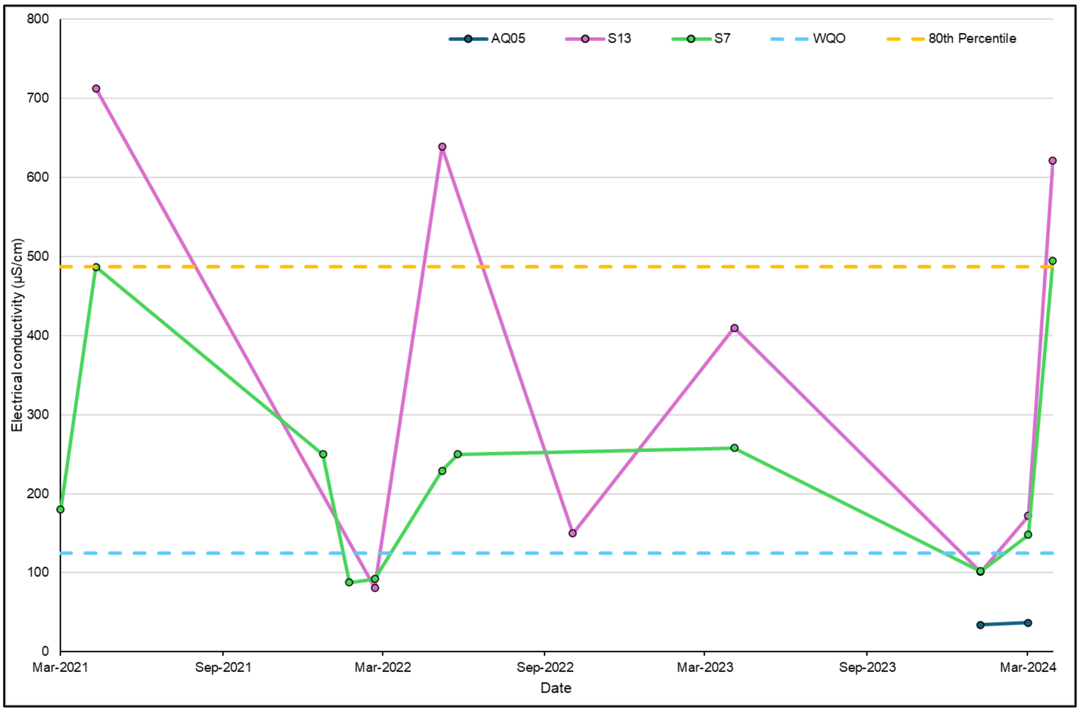

Figure 14: Electrical conductivity in South Creek between March 2021 and April 2024.

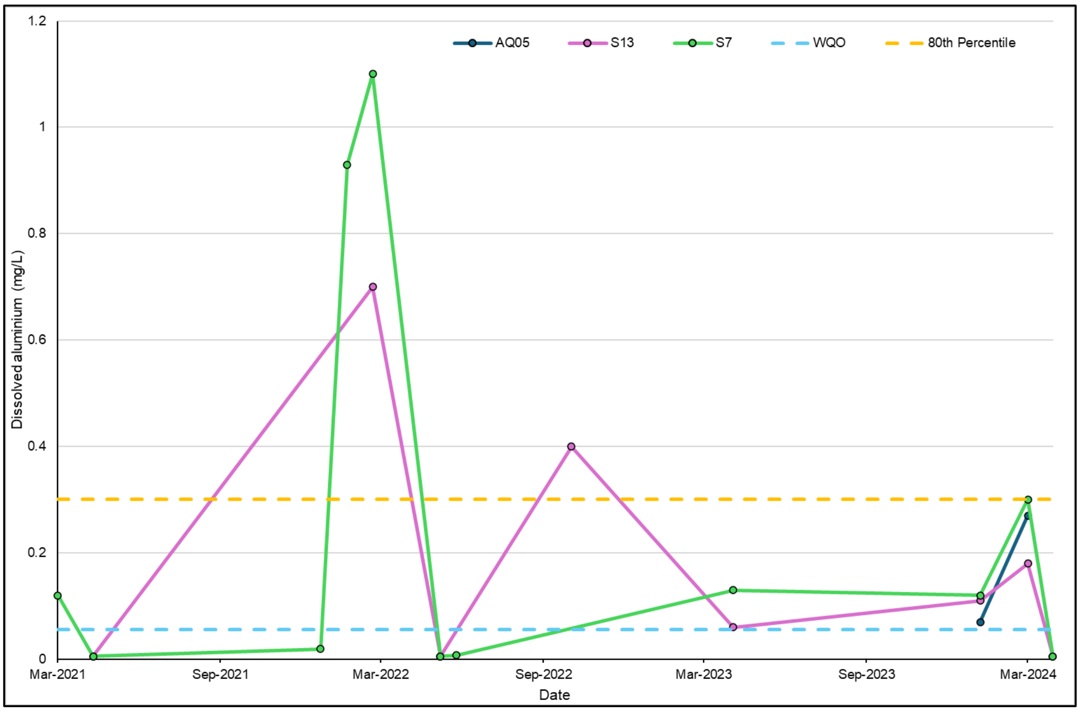

Figure 15: Dissolved aluminium in South Creek between March 2021 and April 2024.

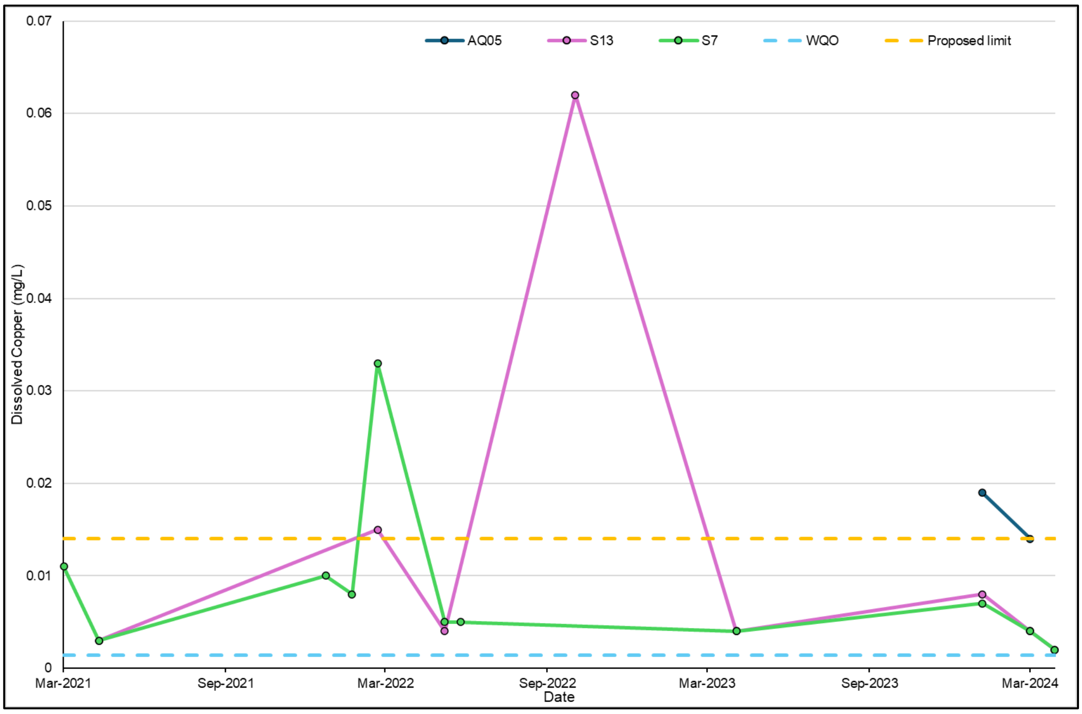

Figure 16: Dissolved copper in South Creek between March 2021 and April 2024.

6.3 GROUNDWATER

The current DCM groundwater monitoring network consists of three monitoring bores (Table 4).

The three bores were initially positioned and designed to target the mapped major fault and fracture lines depicted in the Queensland detailed surface geology map, produced by the Department of Natural Resources and Mines and released in 2018. Targeting the fault and fractures within the Hodgkinson Formation (Section 3.2), each bore terminates at the depth of the current void. As discussed within the Section 3.3, groundwater is likely stored within open cavities in the indurated, low-permeability siltstone and sandstone host rock, as well as within joints and fractures formed by multiple deformation events.

The three bores were drilled and constructed in line with the *Minimum construction requirements for water bores in Australia* (National Uniform Drillers Licensing Committee, 2020) by a class 1 driller using rotary air. During development, the estimated water supply rate ranged between 0 L/s (GW03) and 1.3 L/s (GW01). No further hydraulic conductivity tests have occurred at DCM after the initial measurements.

The positioning of the monitoring bores is as follows:

- GW01 – 150 m directly north of the current void;
- GW03 – 150 m northeast of South Creek and slightly west between S6 and S9; and
- GW04 – 400 m south-southeast of the current mining infrastructure area.

When conceptualising the groundwater regime at DCM, it is important to consider how the geological complexity of the Hodgkinson Formation impacts and controls the hydrogeological regime within the mining lease. Typically, unconfined, fractured rock aquifers consist of networks of fractures, joints and faults that store and transmit groundwater. The discontinuous nature of such fractures results in groundwater flow often being localised and compartmentalised, leading to a series of small, isolated flow systems, rather than the more commonly characterised, large, interconnected aquifers. Therefore, the boundaries of the groundwater flow systems are defined by the topography of the catchment area boundaries. Additionally, recharge to these aquifers is mainly from rainfall infiltration, and their storage capacity and yield can vary significantly depending on the density and connectivity of the fractures.

Based on currently available data, the site is considered to have individual, compartmentalised groundwater systems, with minimal connectivity between the monitoring bores at DCM. Further investigations would provide supporting information on the presence or absence – and directional slope – of geological structures that define the hydrogeological systems, enabling the development of a preliminary, conceptual groundwater flow model for the site.

Quarterly monitoring occurred between October 2022 and May 2024. All bores were sampled using the low-flow micro-purge method or a point-source bailer (when vehicle access was limited due to wet conditions).

All discussed groundwater data are presented with comparison to the ANZG (2018) WQOs (see Appendix C).

6.3.1 GROUNDWATER ELEVATIONS

A Solinst Levelogger 100 was installed in each of the monitoring bores following construction. Each pressure transducer was set to measure the change in groundwater elevation on a four-hourly interval. Figure 17 displays the hydrograph for the three bores using the logged pressure transducer data and manual measurements. No logger data were retrieved from MB04, with multiple loggers failing during the reporting period.

The hydrograph shows the difference in groundwater elevation across the DCM site. Since the inception of the groundwater monitoring network, two wet seasons have occurred, providing an insight into the nature of recharge for each bore. During the 2022/2023 and 2023/2024 wet seasons (November to April), the Maitland Downs Station recorded 1,461.5 mm and 1,395.5 mm, respectively. The wet season recharge response is measured as the difference between the lowest groundwater elevation and the highest groundwater elevation, reflecting the change in water levels from the point of minimal recharge to the point of maximum recharge.

The GW01 logger captured the changes in groundwater elevation, with the water level rising by 1.12 m and 1.09 m, respectively, over the two wet seasons. The hydrograph shows a rapid response to recharge events, with a sharp incline, before the infiltration is quickly dispersed, which is observed in the form of a rapid decline (Figure 17). The response within GW01 supports the information provided during drilling and construction, when the highest hydraulic conductivity (1.3 L/s) was recorded.

The groundwater elevation in GW03 is significantly lower than that in GW01 and GW04 (Figure 17). The recharge response to wet season rainfall is a steady, prolonged incline, with the elevation rising by 3.17 m and 2.74 m during the 2022/2023 and 2023/2024 wet seasons, respectively. Dry season levels in both years suggest that the lowest groundwater elevation is around 382 m AHD.

Based on manual measurements only, GW04 displays a similar trend to that of GW01 and GW03, with groundwater elevations climbing during the wet season, before an extended decline during the dry season. Measured rises during the 2022/2023 and 2023/2024 wet seasons were 1.5 m and 1.6 m, respectively.

All DCM groundwater monitoring bores display a varying degree of recharge in response to wet season rainfall events. From the initial drilling campaign, GW03 and GW04 reported very low rates of hydraulic conductivity, which may support the rate of recharge and dispersal in comparison to GW01. Additionally, GW03 is located in the lower catchment area of South

Creek, where supplementary recharge may occur through seepage from watercourses and small tributaries.

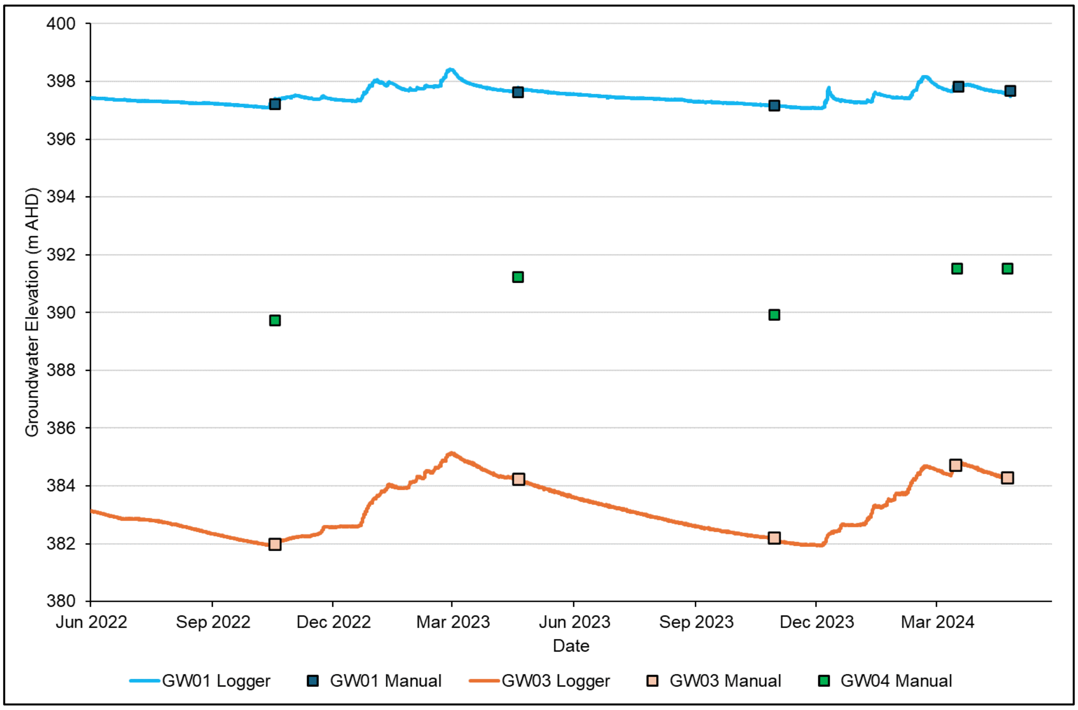

Figure 17: Hydrograph of groundwater bores in DCM from October 2022 to May 2024.

6.3.2 GENERAL PHYSICAL PARAMETERS

Based on the laboratory analysis data, the pH for all bores was within the range of 7.07 and 7.90 (Figure 18). ECs generally also varied minimally within and between the three DCM monitoring bores (Figure 19). However, GW01 and GW03 display very tightly clustered EC levels with minimal variation, unlike GW04. Based on the respective median values, GW01 (1,050 µS/cm), GW03 (1,410 µS/cm) and GW04 (1,245 µS/cm) are suitable for drinking (EC < 1,500 µS/cm; ANZG, 2018). The changes noted within GW04 – and in the initial sample collected from GW03 – are likely a result of drilling and construction. The initial two GW04 results were 1,840 µS/cm and 1,680 µS/cm, respectively. The four subsequent values then ranged from 1,080 µS/cm to 1,290 µS/cm. The collection of further data may warrant the removal of these two data points when deriving site-specific groundwater trigger levels.

The groundwater ionic composition supports the suggested influence from drilling and construction in GW03 and GW04, with the three outliers displaying elevated levels of sulphate in comparison to the remaining dataset (Figure 20). The sulphate levels suggest that MAW was used during this process. The composition percentage of sulphate within the three impacted samples ranges between 20% to 27%, whereas all other samples exhibit values below 8%. Excluding these results, the groundwater composition aligns with the raw water dams (Figure 12) and receiving environments (Figure 13), with bicarbonate the dominant anion, and the cations displaying a more even composition, ranging between sodium, sodium–calcium and calcium–sodium.

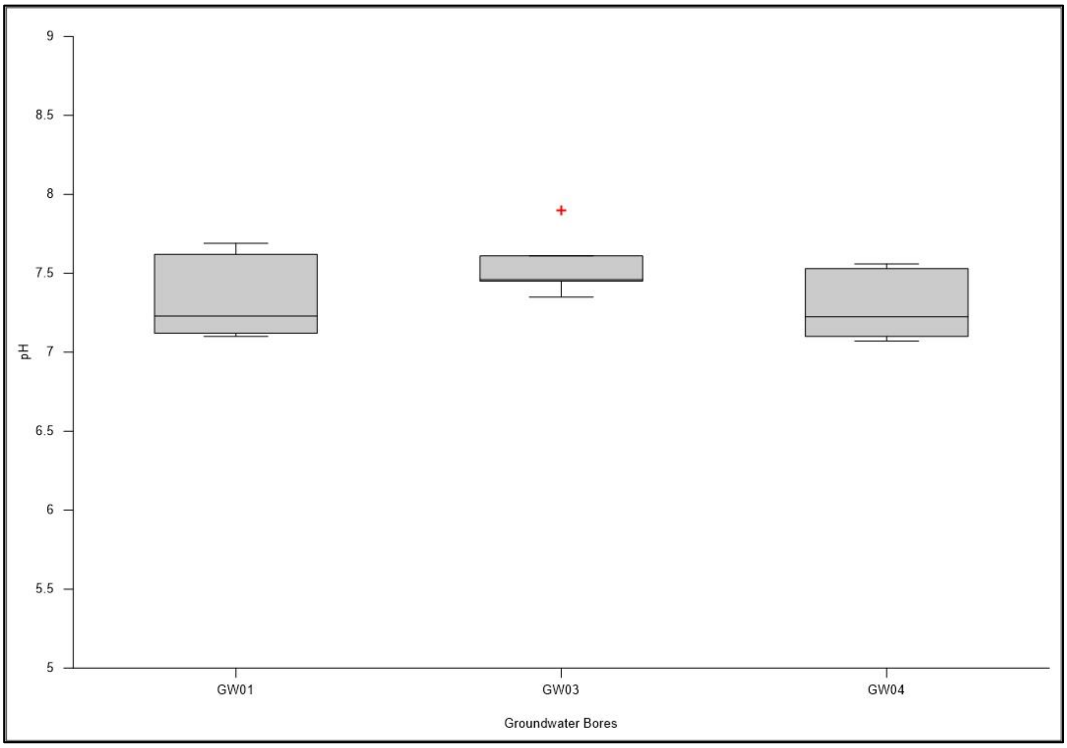

Figure 18: pH of groundwater bores at DCM from October 2022 to May 2024.

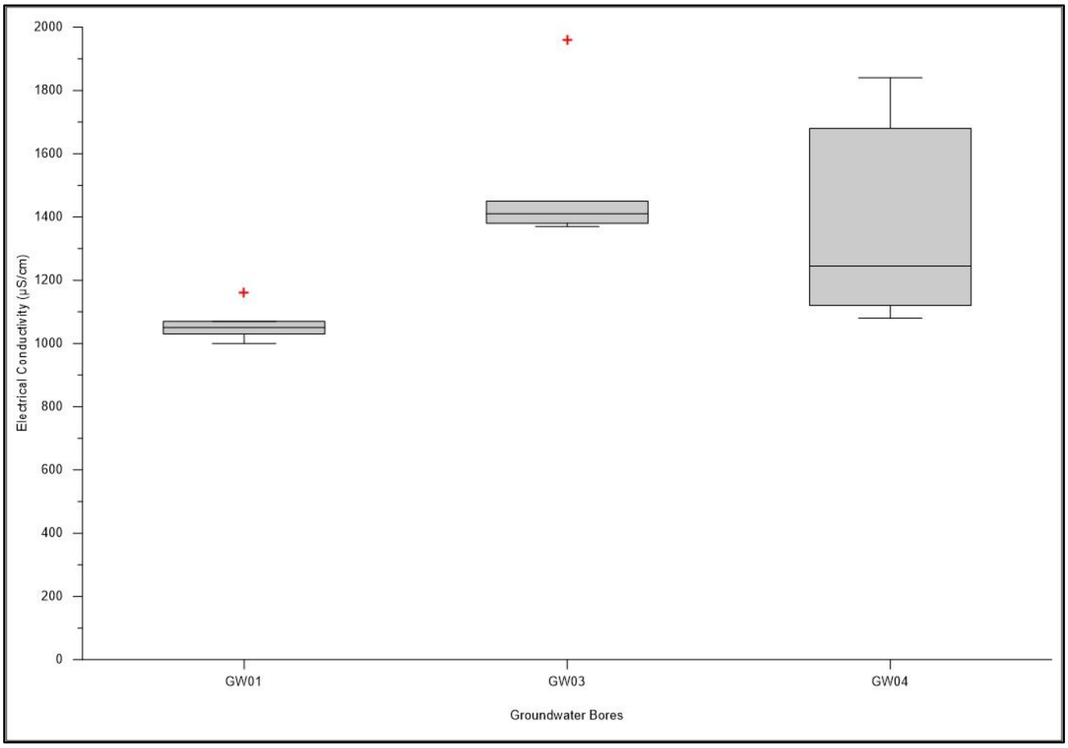

Figure 19: Electrical conductivity of groundwater bores at DCM from October 2022 to May 2024.

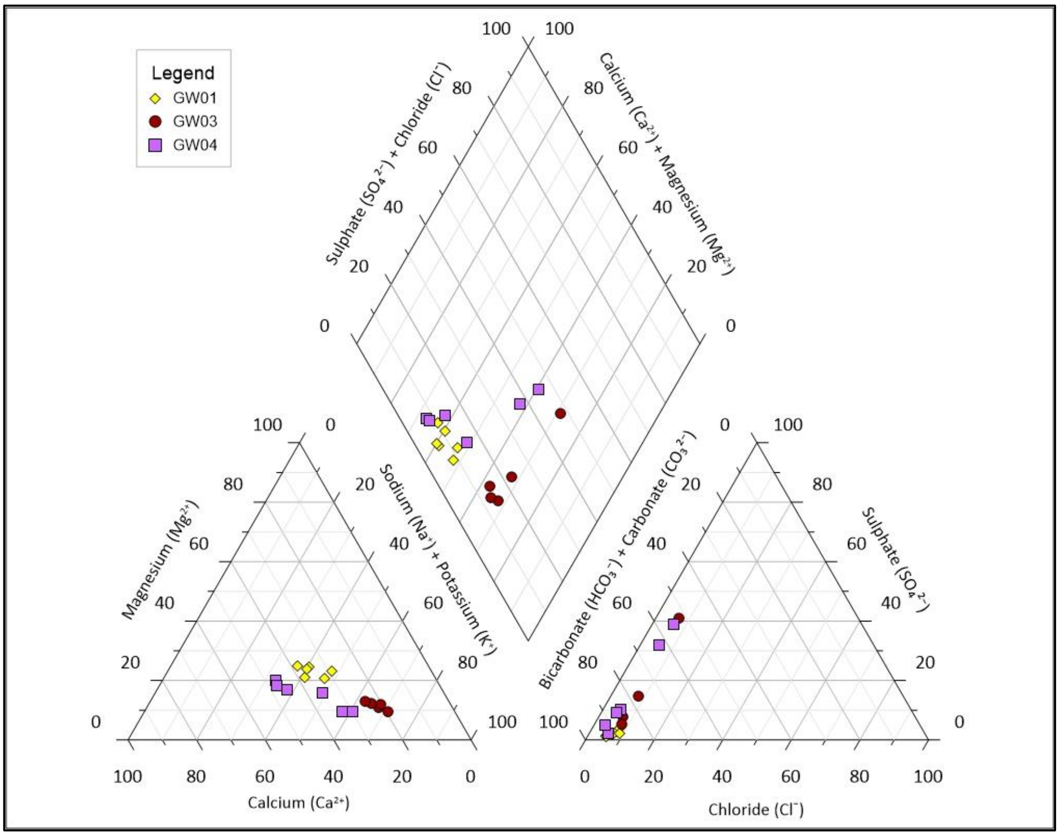

Figure 20: Ionic composition of groundwater monitoring network at DCM from October 2022 to May 2024.

6.3.3 SULPHATE

GW03 and GW04 samples in October 2022 (415 mg/L and 384 mg/L) and April 2023 (112 mg/L and 290 mg/L) appear to be influenced by the drilling and construction process, which has resulted in elevated sulphate levels. The four subsequent rounds reported sulphate levels between 41 mg/L and 70 mg/L in GW03, and 14 mg/L and 69 mg/L in GW04. Conversely, GW01 has consistently showed overall lower levels of sulphate, with concentrations ranging from 9 mg/L to 24 mg/L over the six monitoring rounds. All levels of sulphate are substantially below the ANZG (2018) WQO for sulphate (1,000 mg/L).

6.3.4 METALS AND METALLOIDS

All metal and metalloid concentrations were well below those stated within the livestock drinking water guideline (ANZG, 2023). However, when compared against the 95th percentile for species protection levels, copper, manganese, nickel and zinc recorded concentrations above the associated limit. Elevated levels of copper, nickel and zinc are infrequently present above the WQO and limit of reporting over the six rounds of monitoring in each bore.

Manganese is consistently elevated in GW03 and GW04. The copper ore deposit, occurring as chalcopyrite at DCM, is held within three sulphide-rich zones (Revolver Resources, 2021). Manganese can be present in the form of manganese carbonates or oxides. These are often associated with the chemical, sedimentary processes that also concentrate other metals, which would also include zones of alteration.

6.3.5 NUTRIENTS

All groundwater monitoring displays low level concentrations of nutrients. The total nitrogen as N concentrations predominantly consist of total Kjeldahl nitrogen, which is the sum of organic nitrogen and ammonia within a system.

6.3.6 TOTAL PETROLEUM HYDROCARBONS

Concentrations in both the C6–C9 and C10–C36 (sum) fractions, have intermittently been above the limit of reporting in all groundwater bores at DCM throughout the monitoring history.

Hydrocarbons were detected in GW01 on single occasions at different times, and would be considered as outliers based on the currently available dataset.

In GW03, the C6–C9 fraction was above the limit of reporting for the first four monitoring rounds, with only the latest result below detection. The maximum concentration of 50 µg/L was recorded in April 2023. Slightly higher levels (190 µg/L) were obtained in the C10–C36 (sum) fraction in April 2023 and January 2024.

GW04 has recorded substantially elevated levels within the C10–C36 (sum) over the six monitoring rounds, with the maximum concentration of 2,180 µg/L reported in January 2024. Levels have since reduced to 190 µg/L (May 2024) which is the lowest concentration since monitoring commenced.

The presence of total petroleum hydrocarbons is not uncommon following the construction and development of groundwater monitoring bores. However, the delayed response and elevated concentrations in GW04 suggest an alternate source. It is possible that the presence of total petroleum hydrocarbons within the groundwater is naturally occurring, with similar levels also detected within the receiving environments. Total petroleum hydrocarbons enter the groundwater system via recharge and are likely sourced from the eucalypt vegetation and breakdown of organic matter. The chain structure of biological hydrocarbons often contains free carbon molecules, which stimulates the reducing environment whereby electrons are pulled from the soluble, ferric iron. This understanding is further supported by the ratio of dissolved to total iron concentrations, with minimal change detected within the total fraction. Future monitoring rounds should confirm this by undertaking silica-gel clean-up of the analyses where total petroleum hydrocarbons are present above the limit of reporting.

6.4 GROUNDWATER AND SURFACE WATER CONNECTIVITY

Groundwater, receiving environments and raw water storages report similar ionic compositions (Figure 12, Figure 13 and Figure 20). The comparable hydrochemistry and field observations suggest intermittent streams (e.g. Gum Creek) fed by groundwater outputs, thus flowing for extended periods following the cessation of the wet season. Similar to Gum Creek, South Creek is an intermittent system, with small flows continuing for an extended period after the wet season. This supports the understanding that flows within the receiving environments continue into the dry season as a result of groundwater seepage from the highly fractured rock of the Hodgkinson Formation in the upper reaches. It is likely that all three systems (i.e. including the ephemeral North Creek) dry up completely during the dry season, although some pools are expected to remain throughout the year in certain areas. The understanding of surface water and groundwater connectivity would benefit from additional investigations focusing on delineating hydrogeological parameters, controls on hydraulic conductivity, as well as recharge and discharge dynamics.

6.5 QUALITY CONTROL

Field blanks were used to estimate the level of sampler and environmental contamination during the sample collection procedure. All ions and metals of field blanks for surface water and groundwater were within the acceptable limit.

Surface water and groundwater duplicate samples found typical results, with minor discrepancies in surface water total dissolved solids (RPD < 11%). True duplication of surface water samples is often difficult because fine sediments within a sample cannot be controlled. The discrepancies found in these duplicates are therefore deemed a result of the ever-changing nature of sampling, a flowing surface water system, and not laboratory error.

7. IMPACT ASSESSMENT

This section of the report reviews the activities undertaken for the project throughout construction, operation and post-mining phases, and determines the potential risks posed to the groundwater and surface water environmental values (discussed throughout the preceding sections of this report), while taking into consideration the adoption of appropriate mitigation measures.

The following project activities have the potential to give rise to impacts on water quality within the receiving environments (surface water and groundwater), and are described in further detail in Section 7.1:

- Physical disturbance/clearing of upstream catchment areas, generating erosion and sediment-laden runoff;
- Mining and associated activities, giving rise to changes in the groundwater regime, including changes in groundwater levels and groundwater quality impacting GDEs; and
- MAW (including existing volumes stored on site) releases to the downstream receiving environment;

The information in Section 7.1 is drawn from the description of the historical and proposed operations detailed in Section 2 as well as a range of other specialist reports, including the aquatic ecology report (C&R, 2024a) and the DCM water management plan (WMP; Engeny, 2024). Section 7.1 provides a summary of the key points from these studies, as relevant to potential impacts on the surface water and groundwater. Section 7.2 describes the potential impact of these activities on the surface water and groundwater.

7.1 Project Activities and Mitigation Measures

7.1.1 Physical Disturbances

The historical mining area is relatively small, covering just 14.1 ha. The proposed disturbance footprint is approximately 50 ha, greater than a three-fold increase in cleared/disturbed area. Large portions of this cleared land will then be covered and/or internally drained, limiting any sediment-laden runoff entering the downstream receiving environments. The natural topography of the project site also assists in limiting the potential to disturb neighbouring catchments. The entire proposed disturbance area (except for the mine camp) is situated within one catchment area associated with a minor tributary of South Creek.

The DCM WMP (Engeny, 2024) also details the clean-water diversion drains surrounding the entire operational mining area (everything but the site office and camp; Figure 4), the internal water management infrastructure, and an associated soil erosion and sediment control plan. The proposed internal water management infrastructure channels all MAW and potentially sediment-laden water to the one release dam positioned at the current location for the settling dam. It is proposed that the historical settling dam will be decommissioned and remediated prior to a new, lined dam being appropriately designed and constructed in the former's location. Although it is proposed that much of the collected water will be reused on site for various operations, this location corresponds with the existing, licenced release point associated with DCM activities. To limit any potential impacts from sediment-laden runoff, the existing settling dam will be remediated and a new release dam should be constructed before undertaking any other clearing in the upstream catchment area.

This relatively small, closed-system approach to water management allows for the effective control of sediment-laden runoff from the proposed operations, limiting any potential impacts to downstream aquatic EVs.

7.1.2 Releases of MAW

Currently, the mine is permitted to release MAW from the settling dam at RP1 in accordance with the requirements of the EA. However, since the mine was placed in 'care and maintenance' in the mid-1980s and effectively abandoned (i.e. no maintenance of the existing facilities), the settling dam would have had uncontrolled releases during subsequent wet seasons but also developed a seep below the dam wall. REMP assessments undertaken across the site have found that these historical (and potentially ongoing) releases have impacted the downstream receiving environment.

Since taking control of the site, Mineral Projects have taken steps to reduce the potential for uncontrolled releases to continue to occur. With the development of the recommencement project, the settling dam will be decommissioned, rehabilitated and reconstructed into the release dam.

The release dam will continue to capture MAW, with the potential to undertake controlled releases via a release point. However, the system will be designed, built and managed in accordance with current best-practice standards, limiting the potential for any further seepage and/or uncontrolled releases. This, in turn, will be beneficial to the downstream receiving environment, allowing the system to slowly attenuate historical impacts.

7.1.3 Overburden Seepage

Interpretation of groundwater trends is dependent on the fractured aquifer context typical of the Hodgkinson Province. The hydrogeological framework of fractured bedrock aquifers is often dominated by anisotropic, polydeformed, metamorphic rocks where ductile and brittle structures are superimposed (Kim et al., 2014). Fractured aquifer systems have complicated permeability patterns that affect groundwater flow paths, yields and quality, including transport of contaminants. Delineating hydrogeological parameters (potentiometric surfaces, hydraulic gradients and hydrochemistry) and controls on hydraulic conductivity (porosity and permeability) – as well as recharge and discharge dynamics – is therefore more challenging. An improved understanding of the local, structural regime and cleavage orientation within the potential impact zones will provide a greater insight into groundwater flow direction in the event of contamination.

The proposed management localities and strategies outlined within the DCM WMP (Engeny, 2024) should take into consideration any defined surface hydrogeological controls that may act as a preferentially pathway for contaminants to enter the fractured rock aquifer.

7.2 Potential Impacts

The potential impacts of the expansion project have been categorised into direct and indirect impacts, based on the project activities and mitigation measures outlined in section 7.1. Direct impacts include the degradation of surface water and groundwater quality, as well as a decline in groundwater elevations. Conversely, indirect impacts may potentially be observed in groundwater-dependent ecosystems.

7.2.1 Surface Water Quality

As discussed in Section 6.2 and in previous REMP assessments (C&R, 2022, 2023, 2024b), downstream ecosystems within South Creek already display impacts from releases of poorquality MAW. Sections 2.2 and 7.1.2 detail the improvements that will be made to potential releases via the decommissioning of the existing settling dam and the development of the new release dam. Despite this, there is still a risk of an uncontrolled release of MAW to the receiving environment. The signature heavy metal contaminants associated with the operations and historical results suggest that such a release will negatively influence the downstream water quality associated with the receiving environment. However, the DCM WMP (Engeny, 2024) clearly details strategies to limit the potential of such a release occurring to within appropriate risk levels.

The risk of potential impacts on the surface water quality is also reliant on the mitigation measured implemented to protect the groundwater quality (refer to Section 7.2.2).

7.2.2 Groundwater Quality

Excluding the initial samples in GW03 and GW04 that appear to be impacted during the drilling and construction phase, the groundwater quality displays no evidence of impacts from the historical mining operations. However, the proposed expansion significantly increases the levels of disturbance and operational activities, which may pose a risk to groundwater quality. Chemicals used in ore processing and the failure to contain MAW may lead to detrimental impacts on groundwater quality, resulting in elevated salinity and heavy metal contamination. These rises could subsequently affect groundwater-dependent ecosystems and downstream receiving environments. The DCM WMP (Engeny, 2024, section 4.2) details strategies to limit the potential of such a release occurring to within appropriate risk levels.

7.2.3 Groundwater Drawdown

Limited data are available to accurately establish the level of hydraulic conductivity between the void and groundwater system. Current estimates suggest that the groundwater inflows could reach 32 ML/year, although this aspect of the project requires further investigation. The potential connectivity between the void and groundwater may only become evident once the void has been drained of water, impeding the ability to measure potential drawdown extents. A clearer understanding of the local, structural regime and cleavage orientation near the void will offer further insight into the direction of groundwater flow and the possible extent of the cone of depression.

7.2.4 Groundwater-Dependent Ecosystems

Most of the waterways within the local area are considered GDEs because water (flows and remnant pools) is maintained for an extended period (i.e. months) following significant rainfalls. This is due to the fractured rock geology of the region creating connectivity between groundwater and surface water systems (refer to sections 3.3 and 6.4). The degradation of groundwater quality (elevated salinity and heavy metal contaminants) – because of MAW releases and waste rock seepage – could adversely affect the flora and fauna reliant on the groundwater-dependent ecosystems.

The mine plan includes excavating to a depth of approximately 124 m below ground level. This total depth target means that the pit will likely intersect groundwater systems. Engeny (2024) state that the inflow of groundwater to the pit is expected to be approximately 32 ML/year, although it is noted that further work is required to assess potential drawdown impacts. Any reduction in the water table may also reduce the volume and/or duration of inputs into any associated watercourses following significant rainfall events.

8. CONCLUSIONS

The project site is located in the Palmer River catchment area of the Mitchell River within far north Queensland. Two freshwater reaches are associated with the site: North Creek and South Creek, which both converge with Gum Creek downstream of the project site. No wetlands of state or national significance occur within the project site or within the 20 km of the downstream reaches.

The local area has been targeted over the years for gold prospecting, with alluvial gold mining operations still occurring in the upper reaches of Gum Creek. The entire area has also been used for cattle grazing, with feral cattle still roaming the project site. These land uses – combined with historical operations associated with DCM that was established in the late 1970s – suggest that watercourses within the region are slightly to moderately disturbed with respect to water quality and aquatic ecosystems.

Evidence of historical impacts on the outlined EVs was observed in the results of the current study. The study identified that the impact on receiving environments from past MAW releases is limited to the immediate downstream monitoring locations in South Creek. However, greater emphasis needs to be placed on consistent monitoring across all receiving environments (Gum Creek, South Creek and North Creek), capturing changes within the system as primary flows recede and the influence of groundwater input increases.

Interim water quality objectives for South Creek were derived using data from the three upstream monitoring sites — AQ05, S13, and S7. However, the current dataset suggests that the derived limits may be influenced by isolated elevated values. Therefore, it is proposed that these upstream sites be formally designated as reference sites within the EA, with monitoring focused on capturing flow events. Once sufficient data is collected, the site-specific WQOs can be reassessed.

Three groundwater monitoring bores were installed in mid-2022, with six groundwater monitoring campaigns completed between October 2022 and May 2024. Excluding the initial samples collected from GW03 and GW04, the water quality meets all WQOs except for dissolved manganese, which is common in highly altered zones and is associated with the target ore body. Developing a suitable, conceptual model for the site requires further investigation into key hydrogeological parameters (such as potentiometric surfaces, hydraulic gradients, and hydrochemistry) and the factors controlling hydraulic conductivity (including porosity and permeability), as well as recharge and discharge dynamics. This will also facilitate the implementation of more effective mitigation measures, considering that the degradation of groundwater quality could have cascading effects on groundwater-dependent ecosystems and downstream receiving environments.

An impact assessment undertaken for the project identified the key potential hazards posed to the receiving surface water and groundwater systems from the activities associated with the project during construction, operation and closure. Potential key hazards include:

- Physical disturbance of aquatic ecosystems, with such activities resulting in increased erosion and sediment-laden runoff;
- Releases of MAW; and
- Waste rock seepage.

While further studies and the continuation of the current monitoring program are necessary, the project, with the adoption of appropriate mitigation measures, was found to have a limited impact on the surface water and groundwater EVs identified in the study area.

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Appendix A – Bore Registry

Table A. 1 Registered groundwater bores within 10 km of the DCM mining lease boundary.

Bore ID	Drill Date	Easting	Northing	Lithology	Depth (m)	Status
RN193204	18/11/2020	253388	8229420	Siltstone	25	Existing
RN193203	18/11/2020	253659	8229154	Phyllite, sandstone	40	Existing
RN193202	25/11/2020	254226	8228880	Sandstone, phyllite, siltstone	25	Existing
RN183574	10/05/2019	259260	8225702	Hodgkinson Formation - Slate	39	Existing
RN183166	19/09/2018	261206	8224463	Colluvium - clay, silt. Sand, gravel and soil	37	Existing
RN157970	10/08/2015	259496	8212267	Hodgkinson Formation - Mudstone	43	Existing
RN72868	3/10/1987	258087	8208386	Hodgkinson Formation - Sedimentary	58	Existing
RN72867	24/09/1987	256320	8206853	Hodgkinson Formation - Shale	42	Existing
RN183957	16/12/2019	226389	8195210	Hodgkinson Formation - Granite	51	Abandoned/ Destroyed
RN72900	2/05/1986	219500	8203938	Hodgkinson Formation - Shale	45.11	Abandoned/ Destroyed
RN72901	3/05/1986	218279	8204550	Hodgkinson Formation - Shale	52.73	Abandoned/ Destroyed
RN72902	3/05/1986	218267	8205473	Hodgkinson Formation - Shale	52.73	Abandoned/ Usable
RN72903	4/05/1986	218295	8206102	Hodgkinson Formation - Shale	50	Abandoned/ Usable
RN72904	5/05/1986	218577	8206401	Hodgkinson Formation - Shale	46.94	Abandoned/ Destroyed
RN72905	5/05/1986	218858	8206737	Hodgkinson Formation - Shale	44.81	Abandoned/ Destroyed
RN72906	6/05/1986	219139	8207036	Hodgkinson Formation - Shale	52.8	Abandoned/ Destroyed
RN72907	7/05/1986	217379	8205166	Hodgkinson Formation - Shale	51.8	Abandoned/ Usable
RN148193	5/11/2009	216476	8204052	Hodgkinson Formation - Granite	26	Existing

Bore ID	Drill Date	Easting	Northing	Lithology	Depth (m)	Status
RN171328	31/03/2016	211325	8224915	Hodgkinson Formation - Slate	18.2	Existing
RN148090	5/06/2009	211558	8225318	Hodgkinson Formation - Shale	17	Existing
RN148091	6/06/2009	211525	8225293	Hodgkinson Formation - Shale	19	Existing
RN72573	15/05/1991	211262	8225482	Hodgkinson Formation - Slate	62.4	Existing
RN72158	13/08/1991	211227	8225585	Hodgkinson Formation - Shale	69	Existing

Appendix B – Surface Water Assessment

Water quality characteristic	Units	WQO	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
			14/01/2020	25/03/2021	4/05/2021	23/11/2021	16/01/2022	15/02/2022	16/03/2022	30/05/2022	18/06/2022	25/10/2022	26/04/2023	8/11/2023	31/01/2024	25/03/2024	24/04/2024
Laboratory																	
pH	-	6.5 < > 8.5	7.6	7.2	7.38	7.59	6.9	6.9	6.8	6.96	6.6	7.67	9.11	7.45	7.05	7.23	6.83
Electrical conductivity	µS/cm	5000	160	45	46	67	59	48	45	46	77	57	50	69	44	42	44
Suspended solids	mg/L		16	<5			<5	<5	<5		<5	50	<5	<5	<5	<5	<5
Hydroxide alkalinity	mg/L				<1	<1				<1		<1	<1	<1	<1	<1	<1
Carbonate alkalinity	mg/L				<1	<1				<1		<1	10	<1	<1	<1	<1
Bicarbonate alkalinity	mg/L				21	28				18		38	24	37	28	26	28
Total alkalinity	mg/L	200			21	28				18		38	34	37	28	26	28
Sulphate	mg/L	1000			<1	<1				<1		<1	<1	1	<1	<1	<1
Chloride	mg/L	1500			3	5				4		4	2	3	3	2	2
Calcium	mg/L	1500			2	2				2		2	2	2	2	1	2
Magnesium	mg/L	300			1	2				1		1	2	2	1	1	1
Sodium	mg/L				6	8				6		7	6	10	6	5	6
Potassium	mg/L				<1	<1				<1		1	<1	1	<1	<1	<1
Fluoride	mg/L	2	0.3	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nutrients																	
Ammonia as N	mg/L				0.02	<0.50				0.07		0.01	0.01	<0.01	0.03	<0.01	0.07
Nitrite as N	mg/L	30			<0.01	<0.01				<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate as N	mg/L	400			<0.01	0.02				<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrite + nitrate as N	mg/L				<0.01	0.02				<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Kjeldahl nitrogen as N	mg/L				0.3	0.3				0.6		0.3	0.2	0.2	0.2	0.1	0.2
Total nitrogen as N	mg/L				0.3	0.3				0.6		0.3	0.2	0.2	0.2	0.1	0.2
Total phosphorus as P	mg/L				<0.01	0.01				0.04		0.03	0.02	<0.01	<0.01	<0.01	0.01
Reactive phosphorus as P	mg/L				<0.01	<0.01				<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved metals and metalloids																	
Aluminium	mg/L	0.055	0.027	0.013	<0.01	<0.01	<0.005	0.077	0.009	<0.01	<0.005	<0.01	<0.01	<0.01	0.19	0.05	<0.01
Antimony	mg/L	0.009	<0.002	<0.002			<0.002	<0.002	<0.002		<0.001						
Arsenic	mg/L	0.013	0.004	<0.003	<0.001	<0.001	<0.003	<0.003	<0.003	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
Boron	mg/L	0.94	0.039	0.009	<0.05	<0.05	0.015	0.013	0.010	<0.05	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	mg/L	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.007	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001
Iron	mg/L				0.19	0.08				0.67		0.22	0.11	0.18	0.25	0.14	0.12
Lead	mg/L	0.034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	1.9	0.06	<0.005	0.002	0.001	<0.005	<0.005	<0.005	0.004	<0.005	0.002	0.002	0.004	0.002	0.006	0.002
Mercury	mg/L	0.00006	<0.00005	<0.00005	<0.0001	<0.0001	<0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.011	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.005	<0.002	<0.002	<0.01	<0.01	<0.002	<0.002	<0.002	<0.01	<0.001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total metals and metalloids																	
Aluminium	mg/L	5	0.055	0.050	<0.01	0.06	<0.005	0.077	0.044	0.02	0.005	0.03	0.04	0.05	0.13	0.07	0.02
Antimony	mg/L	0.01	<0.002	<0.002			<0.002	<0.002	<0.002		<0.001						
Arsenic	mg/L	0.5	0.003	<0.003	<0.001	<0.001	<0.003	<0.003	<0.003	0.001	0.001	0.001	0.001	<0.001	<0.001	0.001	0.001
Boron	mg/L	5	0.039	0.010	<0.05	<0.05	0.015	0.013	0.009	<0.05	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	mg/L	0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1	0.007	0.012	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.007	0.007	<0.001	<0.001	<0.001	<0.001
Iron	mg/L	0.3			0.44	0.63				0.78		0.44	0.39	0.31	0.34	0.28	0.29
Lead	mg/L	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.1	0.081	0.030	0.006	0.069	<0.005	<0.005	0.007	0.013	0.034	0.016	0.02	0.014	0.006	0.017	0.038
Mercury	mg/L	0.002	<0.00005	<0.00005	<0.0001	<0.0001	<0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	1	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.02	<0.002	<0.002	<0.01	<0.01	<0.002	<0.002	<0.002	<0.01	<0.001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.1	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	20	<0.005	0.028	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005
Hydrocarbons																	
C6 - C9 Fraction	µg/L	20			<20	<20				<20		<20	<20	<20	<20	<20	<20
C10 - C36 Fraction (sum)	µg/L	100			<50	110				210		120	<50	<50	<50	<50	<50

Water quality characteristic	Units	WQO	S3	S3	S3	S3	S3	S3	S3	S3	S3	S3	S3	S3	S3	S3	S3
			14/01/2020	25/03/2021	4/05/2021	23/11/2021	16/01/2022	15/02/2022	16/03/2022	30/05/2022	18/06/2022	25/10/2022	26/04/2023	8/11/2023	31/01/2024	25/03/2024	24/04/2024
Laboratory																	
pH	-	6.5 < > 8.5	7.4	7.0	8.74	8.82	7.2	6.8	6.5	7.08	6.7	6.98	7.12	7.53	6.95	7.22	6.79
Electrical conductivity	µS/cm	5000	65	40	36	69	67	35	30	42	56	71	50	72	36	33	34
Suspended solids	mg/L		8	<5			<5	9	<5		17	43	<5	5	<5	8	<5
Hydroxide alkalinity	mg/L				<1	<1				<1		<1	<1	<1	<1	<1	<1
Carbonate alkalinity	mg/L				5	6				<1		<1	<1	<1	<1	<1	<1
Bicarbonate alkalinity	mg/L				20	23				21		34	32	42	25	20	20
Total alkalinity	mg/L	200			25	29				21		34	32	42	25	20	20
Sulphate	mg/L	1000			<1	<1				<1		<1	<1	<1	<1	<1	<1
Chloride	mg/L	1500			2	4				2		2	2	1	2	2	2
Calcium	mg/L	1500			<1	1				2		4	2	2	1	<1	1
Magnesium	mg/L	300			2	2				2		4	2	3	2	1	2
Sodium	mg/L				5	10				6		6	5	11	4	4	4
Potassium	mg/L				<1	<1				<1		<1	1	1	<1	<1	<1
Fluoride	mg/L	2	<0.1	<0.1	<0.1	0.2	0.2	<0.1	<0.1	0.1	<0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1
Nutrients																	
Ammonia as N	mg/L				0.02	0.03				0.06		0.1	0.06	0.02	0.03	0.05	0.42
Nitrite as N	mg/L	30			<0.01	<0.01				<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate as N	mg/L	400			<0.01	<0.01				0.03		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrite + nitrate as N	mg/L				<0.01	<0.01				0.03		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Kjeldahl nitrogen as N	mg/L				0.4	0.9				0.7		0.7	1.1	0.8	0.2	0.2	0.3
Total nitrogen as N	mg/L				0.4	0.9				0.7		0.7	1.1	0.8	0.2	0.2	0.3
Total phosphorus as P	mg/L				0.02	0.03				0.05		0.05	0.04	0.03	0.02	<0.01	0.02
Reactive phosphorus as P	mg/L				<0.01	<0.01				<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved metals and metalloids																	
Aluminium	mg/L	0.055	0.012	0.012	0.02	0.02	0.008	0.18	0.26	0.02	<0.005	0.02	<0.01	0.02	0.12	0.14	0.03
Antimony	mg/L	0.009	<0.002	<0.002			<0.002	<0.002	<0.002		<0.001						
Arsenic	mg/L	0.013	<0.003	<0.003	0.001	0.001	<0.003	<0.003	<0.003	0.002	0.001	0.002	<0.001	0.002	0.001	<0.001	<0.001
Boron	mg/L	0.94	0.007	0.010	<0.05	<0.05	0.021	0.010	0.008	<0.05	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	mg/L	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.014	0.006	0.003	0.008	0.007	0.003	0.002	0.003	0.002	0.005	0.003	0.007	0.002	0.002	<0.001
Iron	mg/L				0.5	0.45				1.91		0.88	0.79	0.38	0.42	0.74	1.03
Lead	mg/L	0.034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	1.9	<0.005	<0.005	0.003	0.005	<0.005	0.011	<0.005	0.008	<0.005	0.012	0.004	0.007	0.002	0.003	0.009
Mercury	mg/L	0.00006	<0.00005	<0.00005	<0.0001	<0.0001	<0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.011	<0.001	0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.005	<0.002	<0.002	<0.01	<0.01	<0.002	<0.002	<0.002	<0.01	<0.001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	0.024	0.006	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total metals and metalloids																	
Aluminium	mg/L	5	0.055	0.028	0.01	0.14	0.012	0.29	0.6	0.05	0.048	0.07	0.05	0.11	0.37	0.17	0.1
Antimony	mg/L	0.01	<0.002	<0.002			<0.002	<0.002	<0.002		<0.001						
Arsenic	mg/L	0.5	<0.003	<0.003	<0.001	0.001	<0.003	<0.003	<0.003	0.003	0.002	0.002	0.001	0.002	0.001	<0.001	0.002
Boron	mg/L	5	0.007	0.008	<0.05	<0.05	0.021	0.010	0.007	<0.05	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	mg/L	0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1	0.017	0.007	<0.001	0.008	0.007	0.003	0.003	0.002	0.002	0.005	0.002	0.006	0.002	0.002	0.001
Iron	mg/L	0.3			0.77	0.95				4.03		1.37	2.12	1.08	1.12	1.25	2.87
Lead	mg/L	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.1	0.023	0.015	<0.001	0.012	<0.005	0.016	0.043	0.218	0.21	0.046	0.036	0.024	0.007	0.026	0.037
Mercury	mg/L	0.002	<0.00005	<0.00005	<0.0001	<0.0001	<0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	1	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.02	<0.002	<0.002	<0.01	<0.01	<0.002	<0.002	<0.002	<0.01	<0.001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.1	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	20	0.034	0.007	<0.005	0.005	0.005	<0.005	<0.005	0.006	<0.005	<0.005	0.005	0.008	<0.005	<0.005	<0.005
Hydrocarbons																	
C6 - C9 Fraction	µg/L	20			<20	<20				<20		<20	<20	<20	<20	<20	<20
C10 - C36 Fraction (sum)	µg/L	100			<50	<50				190		<50	<50	<50	100	<50	<50

Water quality characteristic	Units	WQO	S6	S6	S6	S6	S6	S6	S6	S6	S6	S6	S6	S6	S6	S6	S6	S6	S6	S6	S6
			14/01/2020	14/01/2020	14/01/2020	16/03/2020	15/10/2020	21/01/2021	25/03/2021	23/11/2021	16/01/2022	15/02/2022	16/03/2022	30/05/2022	18/06/2022	25/10/2022	26/04/2023	8/11/2023	25/03/2024	25/03/2024	22/04/2024
Laboratory																					
pH	-	6.5 < > 8.5	4	4.1	4	6.4	4.8	5.6	5.4	4.21	4.0	6.2	6.6	4.12	4.8	4.34	4.93	4.44	6.76	6.91	6.63
Electrical conductivity	µS/cm	5000	800	780	800	130	390	210	250	4060	930	110	130	525	590	778	422	757	168	180	215
Suspended solids	mg/L		<5	<5	<5	16	7		15		<5	21	11		16	<5	<5	<5	7	12	6
Hydroxide alkalinity	mg/L									<1				<1		<1	<1	<1	<1	<1	<1
Carbonate alkalinity	mg/L									<1				<1		<1	<1	<1	<1	<1	<1
Bicarbonate alkalinity	mg/L									<1				<1		<1	3	<1	14	14	19
Total alkalinity	mg/L	200								<1				<1		<1	3	<1	14	14	19
Sulphate	mg/L	1000								2280				222		358	170	370	45	47	69
Chloride	mg/L	1500								88				8		9	7	12	3	4	4
Calcium	mg/L	1500								298				27		46	22	44	8	9	10
Magnesium	mg/L	300								200				19		29	16	35	6	6	8
Sodium	mg/L									390				30		36	24	55	12	12	14
Potassium	mg/L									30				3		5	2	4	1	1	1
Fluoride	mg/L	2	0.2	0.3	0.2	<0.1	0.1	<0.1	<0.1	0.2	0.2	<0.1	<0.1	0.2	0.1	0.3	0.2	0.2	<0.1	0.1	<0.1
Nutrients																					
Ammonia as N	mg/L									0.01				0.18		0.49	0.19	0.05	0.05	<0.01	0.07
Nitrite as N	mg/L	30								<0.01				<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate as N	mg/L	400								0.03				<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrite + nitrate as N	mg/L									0.03				<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Kjeldahl nitrogen as N	mg/L									0.6				0.3		0.7	0.2	0.2	0.1	0.2	0.2
Total nitrogen as N	mg/L									0.6				0.3		0.7	0.2	0.2	0.1	0.2	0.2
Total phosphorus as P	mg/L									<0.01				<0.01		<0.01	0.02	0.06	<0.01	<0.01	0.01
Reactive phosphorus as P	mg/L									<0.01				<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved metals and metalloids																					
Aluminium	mg/L	0.055	8.4	8.4	8.4	0.26	1.1	0.53	0.87	1.71	11	0.29	0.079	1.4	1.5	5.97	0.73	0.92	0.16	0.13	0.03
Antimony	mg/L	0.009	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002		<0.002	<0.002	<0.002		<0.001						
Arsenic	mg/L	0.013	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.002	0.003	<0.003	<0.003	0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	0.94	0.008	0.008	0.008	<0.005	0.018	0.009	0.011	0.05	0.013	0.009	0.007	<0.05	0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	mg/L	0.0002	0.02	0.02	0.02	0.0023	0.0075	0.005	0.0061	0.017	0.047	0.0022	0.0024	0.0127	0.0033	0.0255	0.0097	0.0102	0.0028	0.0027	0.0032
Chromium	mg/L	0.001	0.001	0.0013	0.0014	<0.001	<0.001	<0.001	<0.001	<0.001	0.0011	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	25	26	26	1.2	6.6	5.2	5.0	8.68	43	0.98	1.1	9.83	8.8	29.2	9.9	7.64	1.43	0.975	1.52
Iron	mg/L									0.29				0.42		0.28	0.27	0.11	0.3	0.21	<0.05
Lead	mg/L	0.034	0.002	0.001	0.002	<0.001	<0.001	<0.001	0.001	0.001	0.004	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	68
Manganese	mg/L	1.9	2	2	1.8	0.24	1	0.5	0.50	22.6	3.2	0.20	0.32	1.28	1.2	2.22	0.792	1.15	0.238	0.225	0.309
Mercury	mg/L	0.00006	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.011	0.046	0.045	0.046	0.005	0.017	0.012	0.014	0.051	0.081	0.004	0.005	0.026	0.006	0.056	0.021	0.026	0.006	0.006	0.007
Selenium	mg/L	0.005	0.014	0.013	0.015	<0.002	0.005	0.003	0.004	<0.01	0.015	<0.002	0.003	<0.01	0.004	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	4.5	4.7	4.8	0.43	1.3	1.1	1.1	2.97	7.9	0.43	0.52	2.31	2.1	5.31	1.92	1.85	0.5	0.447	0.578
Total metals and metalloids																					
Aluminium	mg/L	5	8.5	8.4	8.4	1.8	1.5	0.63	0.89	1.84	11	2.2	2.1	1.42	1.6	5.92	0.88	0.92	0.73	0.63	0.7
Antimony	mg/L	0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		0.003	<0.002	<0.002		<0.001						
Arsenic	mg/L	0.5	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.001	0.004	<0.003	<0.003	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	5	0.008	0.008	0.009	<0.005	0.02	0.01	0.008	0.05	0.013	0.010	0.007	<0.05	0.006	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	mg/L	0.01	0.02	0.019	0.02	0.0023	0.0083	0.0054	0.0062	0.0183	0.048	0.0023	0.0024	0.0125	0.0035	0.025	0.0099	0.0102	0.0028	0.0026	0.0033
Chromium	mg/L	1	0.001	0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1	26	25	26	2	7.2	5.2	5.3	7.96	45	1.6	1.8	10.6	11	27.6	10.5	7.52	2.23	1.95	2.32
Iron	mg/L	0.3								0.43				0.4		0.3	0.28	0.14	1.28	1.08	0.98
Lead	mg/L	0.1	0.003	0.002	0.002	0.003	0.002	0.001	0.002	0.001	0.005	0.002	0.002	<0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	<0.001
Manganese	mg/L	0.1	2	2	2	0.25	1.1	0.52	0.53	22.4	3.2	0.21	0.32	1.21	1.5	2.13	0.78	1.09	0.236	0.216	0.326
Mercury	mg/L	0.002	0.00006	0.00006	0.00005	0.00007	0.0003	<0.00005	<0.00005	0.0002	<0.00005	0.00005	<0.00005	<0.0001	0.00013	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	1	0.045	0.045	0.046	0.006	0.017	0.012	0.014	0.049	0.082	0.005	0.006	0.024	0.006	0.051	0.023	0.025	0.006	0.006	0.008
Selenium	mg/L	0.02	0.014	0.013	0.014	<0.002	0.006	0.003	0.005	<0.01	0.017	<0.002	0.003	<0.01	0.005	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.1	0.0001	0.0002	0.0002	0.0002	0.001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	20	4.5	4.7	4.7	0.46	1.4	1.2	1.1	2.71	8.0	0.45	0.52	2.23	2.2	4.85	1.87	1.74	0.514	0.456	0.605
Hydrocarbons																					
C6 - C9 Fraction	µg/L	20								<20				<20		<20	<20	<20	<20	<20	<20
C10 - C36 Fraction (sum)	µg/L	100								<50				<50		70	<50	<50	<50	<50	<50

Water quality characteristic	Units	WQO	S9	S9	S9	S9	S9	S9	S9	S9	S9	S9
			14/01/2020	16/03/2020	15/10/2020	21/01/2021	25/03/2021	16/01/2022	15/02/2022	16/03/2022	18/06/2022	30/01/2024
Laboratory												
pH	-	6.5 < > 8.5	4.7	5.7	5.1	5.7	5.6	4.9	6.4	6.0	5.9	6.43
Electrical conductivity	µS/cm	5000	520	260	330	270	260	780	450	390	450	147
Suspended solids	mg/L		<5	32	<5		<5	51	<5	5	6	8
Hydroxide alkalinity	mg/L											<1
Carbonate alkalinity	mg/L											<1
Bicarbonate alkalinity	mg/L											13
Total alkalinity	mg/L	200										13
Sulphate	mg/L	1000										36
Chloride	mg/L	1500										4
Calcium	mg/L	1500										7
Magnesium	mg/L	300										5
Sodium	mg/L											10
Potassium	mg/L											<1
Fluoride	mg/L	2	0.2	0.2	0.1	0.1	<0.1	<0.1	0.1	0.2	<0.1	<0.1
Nutrients												
Ammonia as N	mg/L											<0.01
Nitrite as N	mg/L	30										<0.01
Nitrate as N	mg/L	400										<0.01
Nitrite + nitrate as N	mg/L											<0.01
Total Kjeldahl nitrogen as N	mg/L											0.3
Total nitrogen as N	mg/L											0.3
Total phosphorus as P	mg/L											0.04
Reactive phosphorus as P	mg/L											<0.01
Dissolved metals and metalloids												
Aluminium	mg/L	0.055	0.97	0.22	0.19	0.4	0.084	0.046	0.010	0.031	0.033	0.05
Antimony	mg/L	0.009	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.001	
Arsenic	mg/L	0.013	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.001	<0.001
Boron	mg/L	0.94	0.006	0.005	0.017	0.012	0.010	0.018	0.013	0.010	0.006	<0.05
Cadmium	mg/L	0.0002	0.0096	0.005	0.0052	0.006	0.0043	0.015	0.0068	0.0082	0.0054	0.0025
Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	7.7	3.2	2.3	3	1.9	2.5	1.4	2.6	1.7	1.08
Iron	mg/L											0.06
Lead	mg/L	0.034	0.009	0.002	0.002	0.002	<0.001	0.001	<0.001	0.001	<0.001	<0.001
Manganese	mg/L	1.9	1.7	0.69	1	0.5	0.81	2.9	1.3	1.2	1.8	0.209
Mercury	mg/L	0.00006	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.0001
Nickel	mg/L	0.011	0.025	0.011	0.012	0.011	0.010	0.027	0.012	0.015	0.010	0.005
Selenium	mg/L	0.005	0.003	<0.002	0.002	<0.002	<0.002	0.003	0.002	<0.002	<0.001	<0.01
Silver	mg/L	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.00005	<0.001
Zinc	mg/L	0.008	1.8	0.78	0.81	0.78	0.62	1.5	0.85	1.2	1.1	0.463
Total metals and metalloids												
Aluminium	mg/L	5	1	2.5	0.25	1.2	0.11	0.075	0.053	0.3	0.090	0.85
Antimony	mg/L	0.01	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	
Arsenic	mg/L	0.5	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.001	<0.001
Boron	mg/L	5	0.006	0.008	0.017	0.012	0.012	0.018	0.013	0.011	0.008	<0.05
Cadmium	mg/L	0.01	0.0095	0.0051	0.0052	0.0062	0.0043	0.016	0.0068	0.0083	0.0056	0.0026
Chromium	mg/L	1	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.011
Copper	mg/L	1	8	3.5	2.4	3.1	1.9	2.5	1.6	2.8	1.8	1.9
Iron	mg/L	0.3										1.18
Lead	mg/L	0.1	0.01	0.011	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.001
Manganese	mg/L	0.1	1.7	0.69	1	0.57	0.86	2.9	1.3	1.2	1.8	0.224
Mercury	mg/L	0.002	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00007	<0.0001
Nickel	mg/L	1	0.025	0.012	0.013	0.012	0.010	0.028	0.012	0.016	0.010	0.006
Selenium	mg/L	0.02	0.003	<0.002	0.002	0.003	<0.002	0.004	<0.002	<0.002	<0.001	<0.01
Silver	mg/L	0.1	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.00005	<0.001
Zinc	mg/L	20	1.8	0.8	0.82	0.88	0.66	1.6	0.84	1.2	1.1	0.502
Hydrocarbons												
C6 - C9 Fraction	µg/L	20										<20
C10 - C36 Fraction (sum)	µg/L	100										<50

Water quality characteristic	Units	WQO	S13	S13	S13	S13	S13	S13	S13	S13	S7	S7	S7	S7	S7	S7	S7	S7	S7	S7	S7
			4/05/2021	16/3/2022	31/05/2022	26/10/2022	27/04/2023	31/01/2024	25/03/2024	22/04/2024	25/3/2021	5/05/2021	16/1/2022	15/2/2022	16/3/2022	31/05/2022	18/6/2022	27/04/2023	30/01/2024	25/03/2024	22/04/2024
Laboratory																					
pH	-	6.5 < > 8.5	8.47	7.4	8.12	7	7.98	7.61	7.6	8.17	7.3	8.07	7.6	7.2	7.2	8	7.5	7.79	7.66	7.9	8.21
Electrical conductivity	µS/cm	5000	713	81	639	150	410	101	172	621	180	487	250	88	92	229	250	258	102	148	495
Suspended solids	mg/L			12		75	<5	<5	8	<5	<5		<5	<5	55		<5	<5	<5	<5	<5
Hydroxide alkalinity	mg/L		<1		<1	<1	<1	<1	<1	<1		<1				<1		<1	<1	<1	<1
Carbonate alkalinity	mg/L		14		<1	<1	<1	<1	<1	<1		<1				<1		<1	<1	<1	<1
Bicarbonate alkalinity	mg/L		326		313	67	209	54	78	329		218				115		123	56	79	262
Total alkalinity	mg/L	200	340		313	67	209	54	78	329		218				115		123	56	79	262
Sulphate	mg/L	1000	2		1	<1	1	<1	<1	4		<1				<1		<1	<1	<1	2
Chloride	mg/L	1500	27		27	5	10	5	4	16		21				10		7	5	4	13
Calcium	mg/L	1500	36		24	12	26	4	9	34		23				10		14	4	7	27
Magnesium	mg/L	300	34		28	7	18	4	7	29		22				10		11	4	6	22
Sodium	mg/L		86		86	9	43	13	18	68		61				29		27	12	16	53
Potassium	mg/L		1		1	5	<1	<1	<1	<1		1				1		<1	<1	<1	<1
Fluoride	mg/L	2	0.5	<0.1	0.4	0.1	0.4	0.1	0.2	0.4	0.1	0.3	0.1	<0.1	<0.1	0.2	0.1	0.2	0.1	0.1	0.3
Nutrients																					
Ammonia as N	mg/L		0.03		0.06	0.06	0.05	0.02	0.04	<0.01		0.02				0.04		0.02	<0.01	<0.01	0.08
Nitrite as N	mg/L	30	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01				<0.01		<0.01	<0.01	<0.01	<0.01
Nitrate as N	mg/L	400	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01				<0.01		<0.01	<0.01	0.01	<0.01
Nitrite + nitrate as N	mg/L		<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01				<0.01		<0.01	<0.01	0.01	<0.01
Total Kjeldahl nitrogen as N	mg/L		0.3		0.3	1.4	0.3	0.3	0.1	0.2		0.3				0.2		0.6	0.2	0.1	0.1
Total nitrogen as N	mg/L		0.3		0.3	1.4	0.3	0.3	0.1	0.2		0.3				0.2		0.6	0.2	0.1	0.1
Total phosphorus as P	mg/L		<0.01		0.02	0.47	0.02	0.09	<0.01	<0.01		<0.01				<0.01		0.02	0.01	<0.01	<0.01
Reactive phosphorus as P	mg/L		<0.01		<0.01	0.07	<0.01	<0.01	<0.01	<0.01		<0.01				<0.01		<0.01	<0.01	<0.01	<0.01
Dissolved metals and metalloids																					
Aluminium	mg/L	0.055	<0.01	0.7	<0.01	0.4	0.06	0.11	0.18	<0.01	0.12	<0.01	0.019	0.93	1.1	<0.01	0.007	0.13	0.12	0.3	<0.01
Antimony	mg/L	0.009		<0.002							<0.002		<0.002	<0.002	<0.002		<0.001				
Arsenic	mg/L	0.013	0.002	<0.003	0.002	0.004	0.002	<0.001	0.001	0.002	<0.003	0.001	0.004	<0.003	<0.003	0.001	0.001	0.001	<0.001	0.001	0.002
Boron	mg/L	0.94	<0.05	0.006	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.010	<0.05	0.022	0.011	0.006	<0.05	<0.005	<0.05	<0.05	<0.05	<0.05
Cadmium	mg/L	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.003	0.015	0.004	0.062	0.004	0.008	0.004	0.002	0.011	0.003	0.010	0.008	0.033	0.005	0.005	0.004	0.007	0.004	0.002
Iron	mg/L		<0.05		0.13	0.93	0.16	0.14	0.2	<0.05		<0.05				<0.05		0.25	0.15	0.3	<0.05
Lead	mg/L	0.034	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	1.9	0.005	<0.005	0.03	0.279	0.014	0.005	0.004	0.006	<0.005	0.002	0.040	<0.005	<0.005	0.001	<0.005	0.01	0.003	0.002	0.002
Mercury	mg/L	0.00006	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.0001	<0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.011	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.005	<0.01	<0.002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.002	<0.01	<0.002	<0.002	<0.002	<0.01	<0.001	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total metals and metalloids																					
Aluminium	mg/L	5	<0.01	3.3	0.03	3.09	0.11	0.43	0.47	0.15	0.31	<0.01	0.025	1.7	9.7	0.01	0.024	0.31	0.49	0.5	<0.01
Antimony	mg/L	0.01		<0.002							0.002		<0.002	<0.002	<0.002		<0.001				
Arsenic	mg/L	0.5	0.001	<0.003	0.002	0.005	0.002	0.001	0.001	0.002	<0.003	<0.001	0.004	<0.003	<0.003	0.001	0.001	0.002	0.001	0.001	0.001
Boron	mg/L	5	<0.05	0.007	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.009	<0.05	0.022	0.011	0.010	<0.05	<0.005	<0.05	<0.05	<0.05	<0.05
Cadmium	mg/L	0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	1	<0.001	0.002	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1	<0.001	0.024	0.003	0.118	0.004	0.012	0.006	0.003	0.016	<0.001	0.011	0.010	0.072	0.004	0.006	0.004	0.011	0.005	0.002
Iron	mg/L	0.3	0.14		0.24	4.46	0.28	0.61	0.63	0.06		0.05				0.07		0.44	0.66	0.68	<0.05
Lead	mg/L	0.1	<0.001	0.002	<0.001	0.007	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.002	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.1	0.035	0.013	0.038	0.314	0.026	0.009	0.01	0.011	0.017	0.004	0.052	0.008	0.025	0.007	0.014	0.02	0.007	0.007	0.009
Mercury	mg/L	0.002	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.0001	<0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	1	<0.001	0.001	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.02	<0.01	<0.002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.002	<0.01	<0.002	<0.002	<0.002	<0.01	<0.001	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	20	<0.005	<0.005	<0.005	0.015	<0.005	<0.005	<0.005	<0.005	0.015	0.006	<0.005	<0.005	0.014	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hydrocarbons																					
C6 - C9 Fraction	µg/L	20	<20		<20	<20	<20	<20	<20	<20		<20				<20		<20	<20	<20	<20
C10 - C36 Fraction (sum)	µg/L	100	<50		<50	420	<50	<50	<50	<50		<50				<50		<50	<50	<50	<50

Water quality characteristic	Units	WQO	AQ05	AQ05	S11	S11	S11	S11	S11	S11	S11	S11	S11	S11	S11	S11	S11
			31/01/2024	25/03/2024	14/01/2020	25/3/2021	4/05/2021	16/01/2022	15/2/2022	16/3/2022	31/05/2022	18/6/2022	27/04/2023	7/11/2023	30/01/2024	25/03/2024	22/04/2024
Laboratory																	
pH	-	6.5 < > 8.5	6.52	7.06	6.4	7.3	7.56	6.9	7.3	7.1	7.1	6.9	7.19	7.14	7.49	7.79	7.54
Electrical conductivity	µS/cm	5000	34	37	540	200	382	370	96	110	335	350	295	813	114	156	383
Suspended solids	mg/L		<5	<5	<5	<5		<5	19	50		<5	<5	21	7	<5	<5
Hydroxide alkalinity	mg/L		<1	<1			<1				<1		<1	<1	<1	<1	<1
Carbonate alkalinity	mg/L		<1	<1			<1				<1		<1	<1	<1	<1	<1
Bicarbonate alkalinity	mg/L		14	21			118				34		87	37	54	70	162
Total alkalinity	mg/L	200	14	21			118				34		87	37	54	70	162
Sulphate	mg/L	1000	<1	<1			46				105		53	371	5	10	35
Chloride	mg/L	1500	3	2			14				7		7	17	5	4	10
Calcium	mg/L	1500	<1	<1			18				18		17	56	5	8	19
Magnesium	mg/L	300	<1	1			13				14		11	36	4	6	15
Sodium	mg/L		6	6			47				28		27	64	13	16	41
Potassium	mg/L		<1	<1			2				1		1	4	<1	<1	1
Fluoride	mg/L	2	<0.1	<0.1	<0.1	0.1	0.2	0.1	<0.1	<0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.2
Nutrients																	
Ammonia as N	mg/L		0.06	0.04			<0.01				0.06		0.04	0.06	<0.01	<0.01	0.02
Nitrite as N	mg/L	30	<0.01	<0.01			<0.01				<0.01		<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate as N	mg/L	400	<0.01	<0.01			<0.01				<0.01		<0.01	<0.01	0.03	<0.01	<0.01
Nitrite + nitrate as N	mg/L		<0.01	<0.01			<0.01				<0.01		<0.01	<0.01	0.03	<0.01	<0.01
Total Kjeldahl nitrogen as N	mg/L		0.1	0.1			0.2				0.2		0.2	0.4	0.3	0.1	0.1
Total nitrogen as N	mg/L		0.1	0.1			0.2				0.2		0.2	0.4	0.3	0.1	0.1
Total phosphorus as P	mg/L		<0.01	<0.01			0.01				<0.01		0.02	<0.01	0.12	<0.01	<0.01
Reactive phosphorus as P	mg/L		<0.01	<0.01			<0.01				<0.01		<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved metals and metalloids																	
Aluminium	mg/L	0.055	0.07	0.27	0.016	0.041	<0.01	0.061	0.91	0.71	<0.01	0.007	0.12	<0.01	0.15	0.19	0.01
Antimony	mg/L	0.009			<0.002	<0.002		<0.002	<0.002	<0.002		<0.001					
Arsenic	mg/L	0.013	<0.001	<0.001	<0.003	<0.003	<0.001	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	0.94	<0.05	<0.05	0.011	0.008	<0.05	0.018	0.010	0.007	<0.05	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	mg/L	0.0002	<0.0001	<0.0001	0.0018	0.0002	0.0002	0.0002	0.0002	0.0003	0.0002	<0.0001	0.001	0.0003	0.0002	0.0003	0.0003
Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.019	0.014	0.21	0.031	0.046	0.088	0.085	0.12	0.022	0.014	0.273	0.033	0.062	0.126	0.065
Iron	mg/L		0.09	0.22			<0.05				<0.05		0.15	0.09	0.17	0.23	<0.05
Lead	mg/L	0.034	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	1.9	<0.001	0.002	0.73	<0.005	0.02	0.024	0.005	0.039	0.023	<0.005	0.046	0.159	0.015	0.031	0.048
Mercury	mg/L	0.00006	<0.0001	<0.0001	<0.00005	<0.00005	<0.0001	<0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.011	<0.001	<0.001	0.008	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.005	<0.01	<0.01	<0.002	<0.002	<0.01	<0.002	<0.002	<0.002	<0.01	<0.001	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	<0.001	<0.001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	<0.005	<0.005	0.35	0.022	0.031	0.022	0.033	0.039	0.017	0.012	0.129	0.022	0.021	0.041	0.031
Total metals and metalloids																	
Aluminium	mg/L	5	0.43	1.06	0.022	0.11	<0.01	0.077	1.9	6.7	0.02	0.010	0.5	0.03	0.45	0.5	<0.01
Antimony	mg/L	0.01			<0.002	<0.002		<0.002	<0.002	<0.002		<0.001					
Arsenic	mg/L	0.5	<0.001	0.001	<0.003	<0.003	<0.001	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Boron	mg/L	5	<0.05	<0.05	0.012	0.007	<0.05	0.018	0.010	0.009	<0.05	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	mg/L	0.01	<0.0001	<0.0001	0.0018	0.0002	<0.0001	0.0002	0.0003	0.0004	0.0002	0.0002	0.0011	0.0002	0.0002	0.0003	0.0003
Chromium	mg/L	1	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1	0.024	0.021	0.31	0.043	0.054	0.096	0.15	0.29	0.028	0.021	0.437	0.041	0.102	0.228	0.076
Iron	mg/L	0.3	0.53	1.1			<0.05				0.05		0.4	0.2	0.6	0.75	<0.05
Lead	mg/L	0.1	<0.001	0.002	0.001	<0.001	<0.001	0.002	0.002	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.1	0.002	0.004	0.74	0.034	0.015	0.030	0.038	0.064	0.035	0.045	0.049	0.152	0.02	0.038	0.046
Mercury	mg/L	0.002	<0.0001	<0.0001	<0.00005	<0.00005	<0.0001	<0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	1	<0.001	<0.001	0.008	<0.001	<0.001	<0.001	0.001	0.003	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.02	<0.01	<0.01	0.003	<0.002	<0.01	<0.002	<0.002	<0.002	<0.01	<0.001	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.1	<0.001	<0.001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	20	<0.005	<0.005	0.37	0.026	0.029	0.026	0.047	0.086	0.02	0.017	0.162	0.022	0.032	0.059	0.029
Hydrocarbons																	
C6 - C9 Fraction	µg/L	20	<20	<20			<20				<20		<20	<20	<20	<20	<20
C10 - C36 Fraction (sum)	µg/L	100	<50	<50			<50				<50		<50	<50	<50	<50	<50

Water quality characteristic	Units	WQO	S12	S12	S12	S12	S12	S12	S12	S12	S12	S12	S12	S12	S14	S14	S14	S14	S14
			14/01/2020	25/3/2021	4/05/2021	16/01/2022	15/2/2022	16/3/2022	31/05/2022	18/6/2022	25/10/2022	27/04/2023	30/01/2024	25/03/2024	16/01/2022	15/2/2022	31/01/2024	25/03/2024	23/04/2024
Laboratory																			
pH	-	6.5 < > 8.5	6.6	7.5	7.96	7.4	7.4	7.6	7.73	7.8	6.91	7.74	7.64	7.86	7.4	7.7	7.61	7.8	8.02
Electrical conductivity	µS/cm	5000	1500	270	364	270	95	160	296	320	495	315	119	161	300	100	137	148	370
Suspended solids	mg/L		<5	<5		<5	<5	6		<5	<5	<5	<5	8	<5	5	<5	5	<5
Hydroxide alkalinity	mg/L				<1				<1		<1	<1	<1	<1			<1	<1	<1
Carbonate alkalinity	mg/L				<1				<1		<1	<1	<1	<1			<1	<1	<1
Bicarbonate alkalinity	mg/L				103				88		49	103	56	71			62	63	154
Total alkalinity	mg/L	200			103				88		49	103	56	71			62	63	154
Sulphate	mg/L	1000			50				53		158	47	6	12			8	12	38
Chloride	mg/L	1500			12				10		12	7	5	4			5	4	9
Calcium	mg/L	1500			17				14		31	19	5	8			6	7	22
Magnesium	mg/L	300			12				10		20	12	4	6			5	5	14
Sodium	mg/L				38				33		41	30	14	17			15	15	39
Potassium	mg/L				1				1		4	1	<1	<1			<1	<1	<1
Fluoride	mg/L	2	0.1	0.2	0.2	0.1	<0.1	0.1	0.2	0.2	0.1	0.2	0.1	0.1	0.2	<0.1	0.2	0.1	0.3
Nutrients																			
Ammonia as N	mg/L				0.02				0.04		0.08	0.09	0.02	0.09			<0.01	0.02	0.06
Nitrite as N	mg/L	30			<0.01				<0.01		0.05	<0.01	<0.01	<0.01			<0.01	<0.01	<0.01
Nitrate as N	mg/L	400			<0.01				<0.01		0.2	<0.01	<0.01	<0.01			<0.01	<0.01	<0.01
Nitrite + nitrate as N	mg/L				<0.01				<0.01		0.25	<0.01	<0.01	<0.01			<0.01	<0.01	<0.01
Total Kjeldahl nitrogen as N	mg/L				0.3				0.2		1.7	0.2	0.3	0.2			0.3	0.2	0.1
Total nitrogen as N	mg/L				0.3				0.2		2	0.2	0.3	0.2			0.3	0.2	0.1
Total phosphorus as P	mg/L				<0.01				<0.01		0.09	0.02	0.13	<0.01			0.03	<0.01	<0.01
Reactive phosphorus as P	mg/L				<0.01				<0.01		<0.01	<0.01	<0.01	<0.01			<0.01	<0.01	<0.01
Dissolved metals and metalloids																			
Aluminium	mg/L	0.055	0.03	0.008	<0.01	0.009	0.92	0.66	<0.01	0.009	<0.01	0.13	0.16	0.2	0.70	0.80	0.16	0.28	<0.01
Antimony	mg/L	0.009	<0.002	<0.002		<0.002	<0.002	<0.002		<0.001					<0.002	<0.002			
Arsenic	mg/L	0.013	<0.003	<0.003	<0.001	<0.003	<0.003	<0.003	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.001	<0.001	<0.001
Boron	mg/L	0.94	0.064	0.009	<0.05	0.025	0.010	0.007	<0.05	<0.005	<0.05	<0.05	<0.05	<0.05	0.018	0.011	<0.05	<0.05	<0.05
Cadmium	mg/L	0.0002	0.0031	0.0003	0.0002	<0.0001	0.0002	0.0003	<0.0001	<0.0001	0.0005	0.001	0.0002	0.0002	<0.0001	<0.0001	0.0002	0.0002	0.0002
Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	0.33	0.047	0.037	0.088	0.085	0.13	0.038	0.022	0.182	0.281	0.07	0.104	0.025	0.008	0.08	0.098	0.042
Iron	mg/L				<0.05				<0.05		<0.05	0.14	0.19	0.23			0.22	0.32	<0.05
Lead	mg/L	0.034	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001
Manganese	mg/L	1.9	0.31	0.011	0.007	<0.005	0.009	0.036	0.001	<0.005	0.342	0.093	0.016	0.023	0.025	<0.005	0.017	0.016	0.02
Mercury	mg/L	0.00006	<0.00005	<0.00005	<0.0001	<0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.00005	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.011	0.007	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.003	0.002	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.005	0.003	<0.002	<0.01	<0.002	<0.002	<0.002	<0.01	<0.001	<0.01	<0.01	<0.01	<0.01	<0.002	<0.002	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	0.62	0.041	0.014	<0.005	0.024	0.041	0.006	<0.005	0.033	0.136	0.018	0.028	0.005	<0.005	0.018	0.022	0.014
Total metals and metalloids																			
Aluminium	mg/L	5	0.034	0.025	<0.01	0.010	1.8	2.4	<0.01	0.033	0.05	0.38	0.48	0.56	0.71	1.7	0.4	0.73	<0.01
Antimony	mg/L	0.01	<0.002	0.002		<0.002	<0.002	<0.002		<0.001					<0.002	<0.002			
Arsenic	mg/L	0.5	<0.003	<0.003	<0.001	<0.003	<0.003	<0.003	<0.001	<0.001	0.002	<0.001	0.001	0.001	<0.003	<0.003	<0.001	0.001	<0.001
Boron	mg/L	5	0.062	0.009	<0.05	0.025	0.010	0.007	<0.05	<0.005	<0.05	<0.05	<0.05	<0.05	0.018	0.011	<0.05	<0.05	<0.05
Cadmium	mg/L	0.01	0.0032	0.0003	<0.0001	<0.0001	0.0002	0.0004	<0.0001	<0.0001	0.0005	0.0011	0.0002	0.0003	<0.0001	<0.0001	0.0002	0.0002	0.0001
Chromium	mg/L	1	<0.001	<0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1	0.41	0.056	0.031	0.097	0.12	0.20	0.045	0.038	0.194	0.54	0.108	0.19	0.032	0.012	0.114	0.181	0.048
Iron	mg/L	0.3			<0.05				0.1		0.06	0.42	0.66	0.82			0.6	1.11	<0.05
Lead	mg/L	0.1	0.001	<0.001	<0.001	<0.001	0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.001	<0.001	0.001	<0.001
Manganese	mg/L	0.1	0.33	0.035	0.014	0.007	0.017	0.048	0.042	0.040	0.352	0.098	0.02	0.027	0.026	0.018	0.021	0.02	0.026
Mercury	mg/L	0.002	<0.00005	<0.00005	<0.0001	<0.00005	<0.00005	<0.00005	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.00005	<0.0001	<0.0001	<0.0001
Nickel	mg/L	1	0.007	0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.002	0.002	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.02	0.003	<0.002	<0.01	<0.002	<0.002	<0.002	<0.01	<0.001	<0.01	<0.01	<0.01	<0.01	<0.002	<0.002	<0.01	<0.01	<0.01
Silver	mg/L	0.1	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	20	0.63	0.044	0.009	0.006	0.035	0.068	0.006	0.006	0.039	0.152	0.03	0.048	0.005	<0.005	0.029	0.042	0.013
Hydrocarbons																			
C6 - C9 Fraction	µg/L	20			<20				<20		<20	<20	<20	<20			<20	<20	<20
C10 - C36 Fraction (sum)	µg/L	100			<50				<50		240	<50	<50	<50			<50	<50	<50

Water quality characteristic	Units	WQO	AQ06	AQ06	AQ06	AQ06	AQ03	AQ03	AQ03	AQ03
			8/11/2023	31/01/2024	25/03/2024	23/04/2024	7/11/2023	31/01/2024	25/03/2024	23/04/2024
Laboratory										
pH	-	6.5 < > 8.5	7.28	7.34	7.71	7.82	8.44	7.49	7.65	8.08
Electrical conductivity	µS/cm	5000	115	68	94	174	926	84	101	199
Suspended solids	mg/L		10	<5	<5	<5	7	<5	<5	<5
Hydroxide alkalinity	mg/L		<1	<1	<1	<1	<1	<1	<1	<1
Carbonate alkalinity	mg/L		<1	<1	<1	<1	28	<1	<1	<1
Bicarbonate alkalinity	mg/L		60	40	52	100	444	47	54	108
Total alkalinity	mg/L	200	60	40	52	100	472	47	54	108
Sulphate	mg/L	1000	<1	<1	<1	<1	<1	<1	<1	<1
Chloride	mg/L	1500	4	3	4	6	49	4	3	7
Calcium	mg/L	1500	5	2	3	7	24	3	3	7
Magnesium	mg/L	300	3	2	3	5	34	2	3	6
Sodium	mg/L		19	10	14	27	169	12	14	29
Potassium	mg/L		1	<1	<1	<1	5	<1	<1	<1
Fluoride	mg/L	2	<0.1	0.1	0.1	0.2	0.3	0.1	0.1	0.2
Nutrients										
Ammonia as N	mg/L		0.17	0.06	0.03	<0.01	0.06	0.04	<0.01	0.04
Nitrite as N	mg/L	30	<0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	<0.01
Nitrate as N	mg/L	400	<0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	<0.01
Nitrite + nitrate as N	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Kjeldahl nitrogen as N	mg/L		0.9	0.1	<0.1	0.1	1.3	0.1	<0.1	0.1
Total nitrogen as N	mg/L		0.9	0.1	<0.1	0.1	1.3	0.1	<0.1	0.1
Total phosphorus as P	mg/L		0.04	0.01	<0.01	0.02	0.05	0.02	<0.01	<0.01
Reactive phosphorus as P	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved metals and metalloids										
Aluminium	mg/L	0.055	0.01	0.08	0.1	0.01	0.01	0.09	0.11	0.01
Antimony	mg/L	0.009								
Arsenic	mg/L	0.013	0.003	0.002	0.002	0.003	0.008	0.003	0.002	0.003
Boron	mg/L	0.94	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	mg/L	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.008	0.004	0.007	0.002
Iron	mg/L		0.29	0.14	0.12	0.22	0.16	0.18	0.14	0.14
Lead	mg/L	0.034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	1.9	0.01	0.005	0.005	0.02	0.101	0.004	0.003	0.004
Mercury	mg/L	0.00006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.011	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total metals and metalloids										
Aluminium	mg/L	5	0.07	0.39	0.18	0.02	0.04	0.28	0.21	<0.01
Antimony	mg/L	0.01								
Arsenic	mg/L	0.5	0.003	0.002	0.002	0.003	0.01	0.003	0.002	0.003
Boron	mg/L	5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	mg/L	0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1	<0.001	<0.001	<0.001	<0.001	0.011	0.005	0.011	0.004
Iron	mg/L	0.3	0.94	0.56	0.26	0.27	0.53	0.48	0.37	0.15
Lead	mg/L	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.1	0.067	0.012	0.006	0.024	0.504	0.007	0.006	0.008
Mercury	mg/L	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	20	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hydrocarbons										
C6 - C9 Fraction	µg/L	20	<20	<20	<20	<20	<20	<20	<20	<20
C10 - C36 Fraction (sum)	µg/L	100	<50	<50	<50	<50	<50	<50	<50	<50

Water quality characteristic	Units	WQO	AQ01	AQ01	AQ01	AQ02	AQ02	AQ02
			31/01/2024	25/03/2024	24/04/2024	31/01/2024	25/03/2024	23/04/2024
Laboratory								
pH	-	6.5 < > 8.5	6.72	7.04	6.72	7.47	7.87	8.27
Electrical conductivity	µS/cm	5000	52	35	49	159	182	668
Suspended solids	mg/L		9	<5	9	<5	<5	<5
Hydroxide alkalinity	mg/L		<1	<1	<1	<1	<1	<1
Carbonate alkalinity	mg/L		<1	<1	<1	<1	<1	21
Bicarbonate alkalinity	mg/L		29	19	30	77	92	321
Total alkalinity	mg/L	200	29	19	30	77	92	342
Sulphate	mg/L	1000	<1	<1	<1	5	4	13
Chloride	mg/L	1500	2	2	2	7	6	20
Calcium	mg/L	1500	2	2	2	6	7	29
Magnesium	mg/L	300	3	2	3	6	7	30
Sodium	mg/L		3	3	4	21	24	89
Potassium	mg/L		<1	1	1	<1	<1	1
Fluoride	mg/L	2	<0.1	<0.1	<0.1	0.1	0.1	0.3
Nutrients								
Ammonia as N	mg/L		0.04	0.11	<0.01	0.03	0.02	<0.01
Nitrite as N	mg/L	30	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate as N	mg/L	400	<0.01	0.04	<0.01	<0.01	<0.01	<0.01
Nitrite + nitrate as N	mg/L		<0.01	0.04	<0.01	<0.01	<0.01	<0.01
Total Kjeldahl nitrogen as N	mg/L		0.2	0.5	0.2	0.4	0.3	0.1
Total nitrogen as N	mg/L		0.2	0.5	0.2	0.4	0.3	0.1
Total phosphorus as P	mg/L		0.02	<0.01	0.01	0.01	0.02	<0.01
Reactive phosphorus as P	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved metals and metalloids								
Aluminium	mg/L	0.055	0.04	0.13	0.04	0.26	0.33	<0.01
Antimony	mg/L	0.009						
Arsenic	mg/L	0.013	0.002	0.002	0.001	0.001	0.001	0.002
Boron	mg/L	0.94	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	mg/L	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	0.001	<0.001	0.002	<0.001	0.029	0.011	0.01
Iron	mg/L		0.23	1.64	0.17	0.33	0.34	<0.05
Lead	mg/L	0.034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	1.9	0.032	0.025	0.015	0.013	0.004	0.004
Mercury	mg/L	0.00006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.011	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.00005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	0.008	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total metals and metalloids								
Aluminium	mg/L	5	0.08	0.2	0.1	0.35	1.42	<0.01
Antimony	mg/L	0.01						
Arsenic	mg/L	0.5	0.002	0.002	0.001	<0.001	0.001	0.001
Boron	mg/L	5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium	mg/L	0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	1	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Copper	mg/L	1	<0.001	0.003	<0.001	0.036	0.02	0.01
Iron	mg/L	0.3	0.48	2.44	0.36	0.51	1.86	<0.05
Lead	mg/L	0.1	<0.001	0.001	<0.001	<0.001	0.002	<0.001
Manganese	mg/L	0.1	0.037	0.04	0.021	0.02	0.013	0.009
Mercury	mg/L	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Silver	mg/L	0.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	mg/L	20	<0.005	<0.005	<0.005	0.008	<0.005	<0.005
Hydrocarbons								
C6 - C9 Fraction	µg/L	20	<20	<20	<20	<20	<20	<20
C10 - C36 Fraction (sum)	µg/L	100	960	<50	<50	230	<50	<50

Appendix C– Groundwater Assessment

Table A1: Groundwater sites physico-chemical and major ions at DCM from October 2022 to May 2024 at DCM.

Bore/Site Name	Date	pH Value	Electrical Conductivity @ 25°C	Total Dissolved Solids @180°C	Total Dissolved Solids (Calc.)	Suspended Solids (SS)	Total Hardness as CaCO3	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulfate as SO4 - Turbidimetric	Chloride	Calcium	Magnesium	Sodium	Potassium	Fluoride
			µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
			1	10	1	5	1	1	1	1	1	1	1	1	1	1	1	0.1
ANZG Low (95th %ile species protection)																		
ANZG High (livestock drinking water)				4000	4000							1000		1000				2.00
GW01	26/10/2022	7.1	1000	572	650	<5	364	<1	<1	486	486	15	29	88	35	97	2	0.6
GW01	27/04/2023	7.12	1160	636	754	<5	366	<1	<1	576	576	24	38	89	35	148	2	0.6
GW01	07/11/2023	7.33	1070	638	696	<5	333	<1	<1	575	575	11	31	74	36	139	2	0.5
GW01	31/01/2024	7.13	1030	618	670	<5	319	<1	<1	538	538	12	38	75	32	99	1	0.7
GW01	25/03/2024	7.69	1050	592	682	66	366	<1	<1	553	553	9	22	94	32	116	2	0.6
GW01	03/05/2024	7.62	1050	600	682	9	341	<1	<1	553	553	7	23	82	33	104	2	0.5
GW03	26/10/2022	7.35	1960	1320	1270	38	327	<1	<1	554	554	415	50	88	26	366	5	0.6
GW03	28/04/2023	7.46	1450	878	942	12	261	<1	<1	608	608	112	44	70	21	248	3	0.7
GW03	07/11/2023	7.61	1370	910	890	42	269	<1	<1	691	691	61	41	68	24	258	3	0.5
GW03	31/01/2024	7.45	1380	848	897	<5	272	<1	<1	688	688	41	44	71	23	230	3	0.7
GW03	03/05/2024	7.9	1410	858	916	<5	270	<1	<1	664	664	70	29	70	23	207	2	0.5
GW04	26/10/2022	7.1	1840	1300	1200	64	439	<1	<1	564	564	384	46	133	26	308	6	0.6
GW04	27/04/2023	7.2	1680	1120	1090	34	424	<1	<1	592	592	290	37	132	23	264	6	0.8
GW04	07/11/2023	7.25	1200	754	780	34	358	<1	<1	599	599	69	27	99	27	154	4	0.5
GW04	31/01/2024	7.07	1080	670	702	28	402	<1	<1	593	593	14	25	113	29	90	2	0.5
GW04	25/03/2024	7.56	1120	656	728	64	429	<1	<1	601	601	31	16	124	29	101	3	0.4
GW04	03/05/2024	7.53	1290	744	838	32	422	<1	<1	605	605	62	23	123	28	117	2	0.4

Table A2: Groundwater sites dissolved metals at DCM from October 2022 to May 2024 at DCM.

Bore/Site Name	Date	Aluminium	Arsenic	Cadmium	Chromium	Copper	Lead	Manganese	Nickel	Selenium	Silver	Zinc	Boron	Iron	Mercury
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		0.01	0.001	0.0001	0.001	0.001	0.001	0.001	0.001	0.01		0.005	0.05	0.05	0.0001
ANZG Low (95th %ile species protection)		0.055	0.013	0.0002	0.001	0.0014	0.0034	1.9	0.011	0.011		0.008	0.94		0.0006
ANZG High (livestock drinking w ater)															
GW01	26/10/2022	<0.01	0.006	<0.0001	<0.001	<0.001	<0.001	0.298	0.01	<0.01	<0.001	0.006	0.05	0.7	<0.0001
GW01	27/04/2023	<0.01	0.006	<0.0001	<0.001	0.026	<0.001	0.15	0.007	<0.01	<0.001	0.018	<0.05	0.41	0.0001
GW01	07/11/2023	<0.01	0.005	<0.0001	<0.001	<0.001	<0.001	0.352	0.005	<0.01	<0.001	<0.005	<0.05	0.52	<0.0001
GW01	31/01/2024	<0.01	0.004	<0.0001	<0.001	<0.001	<0.001	0.133	0.008	<0.01	<0.001	0.031	<0.05	0.5	<0.0001
GW01	25/03/2024	0.04	0.005	<0.0001	<0.001	<0.001	<0.001	0.15	<0.001	<0.01	<0.001	<0.005	<0.05	0.61	<0.0001
GW01	03/05/2024	<0.01	0.004	<0.0001	<0.001	<0.001	<0.001	0.274	0.004	<0.01	<0.001	<0.005	<0.05	1.36	<0.0001
GW03	26/10/2022	<0.01	0.005	<0.0001	<0.001	<0.001	<0.001	6.11	0.017	<0.01	<0.001	<0.005	0.1	3.12	<0.0001
GW03	28/04/2023	<0.01	0.007	<0.0001	<0.001	0.001	<0.001	4.14	0.003	<0.01	<0.001	0.016	0.07	1.04	<0.0001
GW03	07/11/2023	<0.01	0.004	<0.0001	<0.001	0.002	<0.001	4.63	0.01	<0.01	<0.001	<0.005	0.08	0.56	<0.0001
GW03	31/01/2024	<0.01	0.003	<0.0001	<0.001	<0.001	<0.001	4.23	0.002	<0.01	<0.001	<0.005	0.08	<0.05	<0.0001
GW03	03/05/2024	<0.01	0.004	<0.0001	<0.001	<0.001	<0.001	4.46	0.007	<0.01	<0.001	<0.005	0.07	1.18	<0.0001
GW04	26/10/2022	<0.01	0.006	<0.0001	<0.001	<0.001	<0.001	6.96	0.011	<0.01	<0.001	<0.005	0.1	4.25	<0.0001
GW04	27/04/2023	<0.01	0.006	<0.0001	<0.001	0.003	<0.001	7.93	0.004	<0.01	<0.001	0.011	0.12	5.79	<0.0001
GW04	07/11/2023	<0.01	0.006	<0.0001	<0.001	<0.001	<0.001	5.83	0.005	<0.01	<0.001	<0.005	<0.05	4.76	<0.0001
GW04	31/01/2024	<0.01	0.004	<0.0001	<0.001	<0.001	<0.001	1.25	0.005	<0.01	<0.001	0.032	<0.05	1.75	<0.0001
GW04	25/03/2024	<0.01	0.004	<0.0001	<0.001	<0.001	<0.001	0.921	<0.001	<0.01	<0.001	<0.005	<0.05	2.19	<0.0001
GW04	03/05/2024	<0.01	0.005	<0.0001	<0.001	0.001	<0.001	2.99	0.021	<0.01	<0.001	0.008	<0.05	4.02	<0.0001

Table A3: Groundwater sites total metals at DCM from October 2022 to May 2024 at DCM.

e Name	Date	Aluminium	Arsenic	Cadmium	Chromium	Copper	Lead	Manganese	Nickel	Selenium	Silver	Zinc	Boron	Iron	Mercury
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		0.01	0.001	0.0001	0.001	0.001	0.001	0.001	0.001	0.01		0.005	0.05	0.05	0.0001
ANZG Low (95th %ile species protection)															
ANZG High (livestock drinking w ater)		5	0.5	0.01	0.5	1	0.1		1	0.02		20	5		0.002
GW01	26/10/2022	0.04	0.006	<0.0001	0.001	0.001	<0.001	0.287	0.01	<0.01	<0.001	0.015	<0.05	0.74	<0.0001
GW01	27/04/2023	0.06	0.006	<0.0001	<0.001	0.031	<0.001	0.146	0.008	<0.01	<0.001	0.45	<0.05	0.48	0.0003
GW01	07/11/2023	0.04	0.006	<0.0001	<0.001	0.001	<0.001	0.4	0.006	<0.01	<0.001	0.006	0.11	0.58	<0.0001
GW01	31/01/2024	0.02	0.005	<0.0001	0.003	0.001	<0.001	0.155	0.011	<0.01	<0.001	0.044	<0.05	0.62	<0.0001
GW01	25/03/2024	0.65	0.005	<0.0001	0.001	0.135	0.002	0.167	0.004	<0.01	<0.001	0.018	<0.05	1.17	<0.0001
GW01	03/05/2024	0.07	0.004	<0.0001	<0.001	0.004	<0.001	0.29	0.006	<0.01	<0.001	0.005	<0.05	1.45	<0.0001
GW03	26/10/2022	0.54	0.006	<0.0001	<0.001	0.003	<0.001	5.74	0.02	<0.01	<0.001	0.036	0.11	3.84	<0.0001
GW03	28/04/2023	0.27	0.008	<0.0001	<0.001	0.008	<0.001	4.26	0.008	<0.01	<0.001	0.041	0.07	2.09	<0.0001
GW03	07/11/2023	0.44	0.006	<0.0001	<0.001	0.003	0.002	4.77	0.014	<0.01	<0.001	0.036	0.08	2.9	<0.0001
GW03	31/01/2024	0.05	0.004	<0.0001	<0.001	0.001	<0.001	4.47	0.003	<0.01	<0.001	0.026	0.08	1.02	<0.0001
GW03	03/05/2024	0.06	0.004	<0.0001	<0.001	0.008	<0.001	4.79	0.008	<0.01	<0.001	0.008	0.08	1.52	<0.0001
GW04	26/10/2022	0.6	0.006	<0.0001	0.003	0.004	<0.001	6.94	0.012	<0.01	<0.001	0.018	0.1	4.64	<0.0001
GW04	27/04/2023	0.48	0.007	<0.0001	0.002	0.013	<0.001	7.87	0.006	<0.01	<0.001	0.022	0.11	5.92	0.0002
GW04	07/11/2023	0.4	0.006	<0.0001	0.01	0.002	0.001	6.35	0.01	<0.01	<0.001	0.023	<0.05	5.52	<0.0001
GW04	31/01/2024	0.22	0.005	<0.0001	0.003	<0.001	<0.001	1.44	0.01	<0.01	<0.001	0.047	<0.05	2.2	<0.0001
GW04	25/03/2024	0.29	0.005	<0.0001	0.004	0.003	<0.001	0.987	0.01	<0.01	<0.001	0.028	<0.05	2.46	<0.0001
GW04	03/05/2024	0.27	0.005	<0.0001	0.004	0.003	<0.001	3.18	0.024	<0.01	<0.001	0.022	<0.05	4.37	<0.0001

Table A4: Groundwater sites ions and hydrocarbons at DCM from October 2022 to May 2024 at DCM.

Bore/Site Name	Date	Ammonia as N	Nitrite as N	Nitrate as N	Nitrite + Nitrate	Total Kjeldahl Nitrogen TKN	Total Nitrogen	Total Phosphorus	Reactive Phosphorus	Total Anions	Total Cations	Ionic Balance	C6-C9	C10-C36 (Sum of Total)	Benzene	Toluene	Ethylbenzene	Xylene Total
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
										0.01	0.01	0.01	20	100	1	2	2	2
ANZG Low (95th %ile species protection)																		
ANZG High (livestock drinking water)																		
GW01	26/10/2022	0.02	<0.01	<0.01	<0.01	0.1	0.1	0.02	<0.01	10.8	11.5	3.13	30	<50	<1	<2	<2	<2
GW01	27/04/2023	0.03	<0.01	<0.01	<0.01	<0.1	<0.1	0.02	<0.01	13.1	13.8	2.72	<20	<50	<1	<2	<2	<2
GW01	07/11/2023	0.11	<0.01	<0.01	<0.01	0.7	0.7	0.05	<0.01	12.6	12.8	0.63	<20	<50	<1	<2	<2	<2
GW01	31/01/2024	0.06	<0.01	0.04	0.04	<0.1	<0.1	0.02	<0.01	12.1	10.7	5.98	<20	<50	<1	<2	<2	<2
GW01	25/03/2024	0.04	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01	<0.01	11.8	12.4	2.32	<20	820	<1	<2	<2	<2
GW01	03/05/2024	0.09	<0.01	0.02	0.02	0.4	0.4	0.07	<0.01	11.8	11.4	1.98	<20	<50	<1	<2	<2	<2
GW03	26/10/2022	<0.01	<0.01	<0.01	<0.01	0.2	0.2	0.07	<0.01	21.1	22.6	3.34	20	<50	<1	<2	<2	<2
GW03	28/04/2023	0.04	<0.01	<0.01	<0.01	0.2	0.2	0.19	0.01	15.7	16.1	1.15	50	190	<1	<2	<2	<2
GW03	07/11/2023	<0.01	<0.01	<0.01	<0.01	0.2	0.2	0.2	0.07	16.2	16.7	1.32	30	<50	<1	<2	<2	<2
GW03	31/01/2024	0.04	<0.10	<0.10	<0.01	<0.1	<0.1	0.27	0.13	15.8	15.5	1.03	50	190	<1	<2	<2	<2
GW03	03/05/2024	<0.01	<0.01	0.01	0.01	0.4	0.4	0.14	0.02	15.5	14.4	3.67	<20	50	<1	<2	<2	<2
GW04	26/10/2022	0.05	<0.01	<0.01	<0.01	0.3	0.3	0.1	0.04	20.6	22.3	4.12	80	490	<1	<2	<2	<2
GW04	27/04/2023	0.03	<0.01	<0.01	<0.01	0.2	0.2	0.09	<0.01	18.9	20.1	3.09	100	290	<1	<2	<2	<2
GW04	07/11/2023	0.07	<0.01	0.02	0.02	0.1	0.1	0.06	<0.01	14.2	14	0.72	40	360	<1	<2	<2	<2
GW04	31/01/2024	0.04	<0.01	<0.01	<0.01	<0.1	<0.1	0.06	<0.01	12.8	12	3.44	<20	2180	<1	<2	<2	<2
GW04	25/03/2024	0.05	<0.01	<0.01	<0.01	<0.1	<0.1	0.05	<0.01	13.1	13	0.23	<20	330	<1	<2	<2	<2
GW04	03/05/2024	0.35	<0.01	<0.01	<0.01	0.2	0.2	<0.01	<0.01	14	13.6	1.61	<20	190	<1	<2	<2	<2