PRIMARY GOLD

Appendix H - Water Balance and Groundwater Modelling Report

CDM Smith

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Key Project Terms

Term	Definition
Carbon in Leach	This process uses a dilute alkaline cyanide solution to leach (dissolve) gold from the ore material. Activated carbon removes gold out of dilute cyanide solution by adsorption (sticking). The leaching agent and activated carbon are added together in a slurry of ore and water.
Development Envelope	Defined as the maximum area within which the Project footprint could occur. The development envelope for the Project encompasses 790 ha, inclusive of Rustlers Roost, Quest 29, the accommodation camp and haul road.
Environmental Impact	Change to the environment whether adverse or beneficial, wholly or partially resulting from the Primary Gold's environmental aspects. Environmental impacts can be caused directly or indirectly from a Project activity or cumulatively with other non-Project related activities in a set area.
Heap Leach Pad	Existing areas where historic mining placed ore for processing via a leaching solution to dissolve and capture the mineral. The pads contain the remaining material.
Waste Rock Dump	An engineered and constructed impoundment into which overburden from the mining process is placed for safe storage in perpetuity.
Project	The Project includes the expansion of existing pits, waste rock landforms, water storage dams and internal roads in both the Rustlers Roost and Quest 29 MLs. Two new pits will be constructed at Rustlers Roost and new infrastructure includes an onsite processing plant, a tailings storage facility, a landfill, laydown area, magazine, administration office, accommodation camp and groundwater bores for water supply. The Project is inclusive of an expanded connecting haul road between the non-contiguous extraction areas and an accommodation camp.
Project Area	The Project area is defined as wholly including ML1083 (Rustlers Roost), ML 29783 (Quest 29), ML 29814 (accommodation camp) and the connecting haul road. The entire Project area covers 1,143.25 ha.
Significant Impact	A significant impact of an action is an impact of major consequence having regard to: (a) the context and intensity of the impact; and (b) the sensitivity, value and quality of the environment impacted on and the duration, magnitude and geographic extent of the impact.
Modelled area	Refers to the area included within the boundary for the groundwater model.
Tailings Storage Facility	A specially engineered and constructed impoundment into which tailings (residue) from the ore processing plant is deposited for placement in perpetuity. The storage facility is constructed with confining embankments consisting of earthen material (e.g. rock and soil) and capped following closure.

Glossary/Acronyms

Term	Definition
AHD	Australian Height Datum
AMD	Acid and Metalliferous Drainage
ANZG	Australia and New Zealand Government
BGL	Below Ground Level
BoM	Bureau of Meteorology
BUD	Beneficial Use Declaration
CIL	Carbon in Leach
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEM	Digital Elevation Model
DGV	Default Guideline Value
DITT	Department of Industry, Tourism and Trade (NT) (current)
DO	Dissolved Oxygen
EC	Electrical Conductivity
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
ET	Evapotranspiration
GDE	Groundwater Dependent Ecosystem
GHB	General Head Boundary
GL	Gigalitre
GV	Guideline Value
HSU	Hydro-Stratigraphic unit.
kL	Kilolitre
LOM	Life of Mine
MCP	Mine Closure Plan
ML	Mining Lease
MMP	Mine Management Plan
Mt	Million Tonnes
Mtpa	Million Tonnes Per Annum
NAF	Non-Acid Forming
NT	Northern Territory
NTU	Nephelometric Turbidity Unit
NWQMS	National Water Quality Management System
PAF	Potentially Acid Forming
PCO	Pine Creek Orogon
PGO	Primary Gold Limited
PPL	Perpetual Pastoral Lease
PWD	Process Water Dam
RCP	Representative Concentration Pathway
ROM	Run Of Mine
RMSE	Root Mean Squared Error
RSWL	Reduced Standing Water Level

Term	Definition
SRMSE	Scaled Root Mean Squared Error
SRTM	Shuttle Radar Topography Mission
SSTV	Site-Specific Trigger Values
SWL	Standing Water Level
TDS	Total Dissolved Solids
TOC	Top Of Casing
ToR	Terms of Reference
TSF	Tailings Storage Facility
WRD	Waste Rock Deposit

1. Introduction

1.1 Project Overview

Rustlers Roost and Quest 29 are brownfield sites on Mineral Leases (ML) located in the Mount Bundey locality, approximately 85 km south-east of Darwin in the Northern Territory (NT). These sites will be redeveloped for open-cut mining involving connection of the non-contiguous areas by a haul road and construction of an accommodation camp (the Project). The sites have a history of gold mining activity with first gold being discovered in the 1940s and activities occurring over intermittent periods during the past 70 years. Primary Gold Limited (PGO) (the Proponent) is proposing to redevelop the existing mine by expanding open-cut gold mining operations and connecting the two non-contiguous sites with a haul road.

The mine sites are located approximately 11 km apart and are connected by an existing unsealed access track, which will be upgraded to accommodate haulage of ore from the Quest 29 satellite pits to a proposed processing facility at Rustlers Roost. Ore mined at both sites will be processed at a new purpose-built processing facility located at the Rustlers Roost site to produce gold bullion which will be trucked offsite for sale. The rate of production will be up to 5 million tonnes per annum (Mtpa) over an approximately 10-year life of mine (LOM). Following completion of mining activities, the Project area will be closed and rehabilitated in accordance with an approved Mine Closure Plan (MCP).

The main Project areas of Rustlers Roost and Quest 29 are located between 5 km and 12 km directly south-west of the Arnhem Highway on Old Mount Bundey Station, Perpetual Pastoral Lease (PPL) 1163 and McKinlay River Pastoral Station (PPL 1184) (Figure 1-1).

The Project includes the expansion of existing pits, waste rock landforms, water storage dams and internal roads. Two new pits will be constructed at Rustlers Roost and new infrastructure includes an onsite processing plant, a tailings storage facility (TSF), a landfill, laydown area, magazine, administration office, accommodation camp and groundwater bores for water supply. The Project includes an entire development envelope of 790 ha which is taken to be the maximum extent within which disturbance may occur. However, a large portion of the additional Project footprint is within historically disturbed areas.

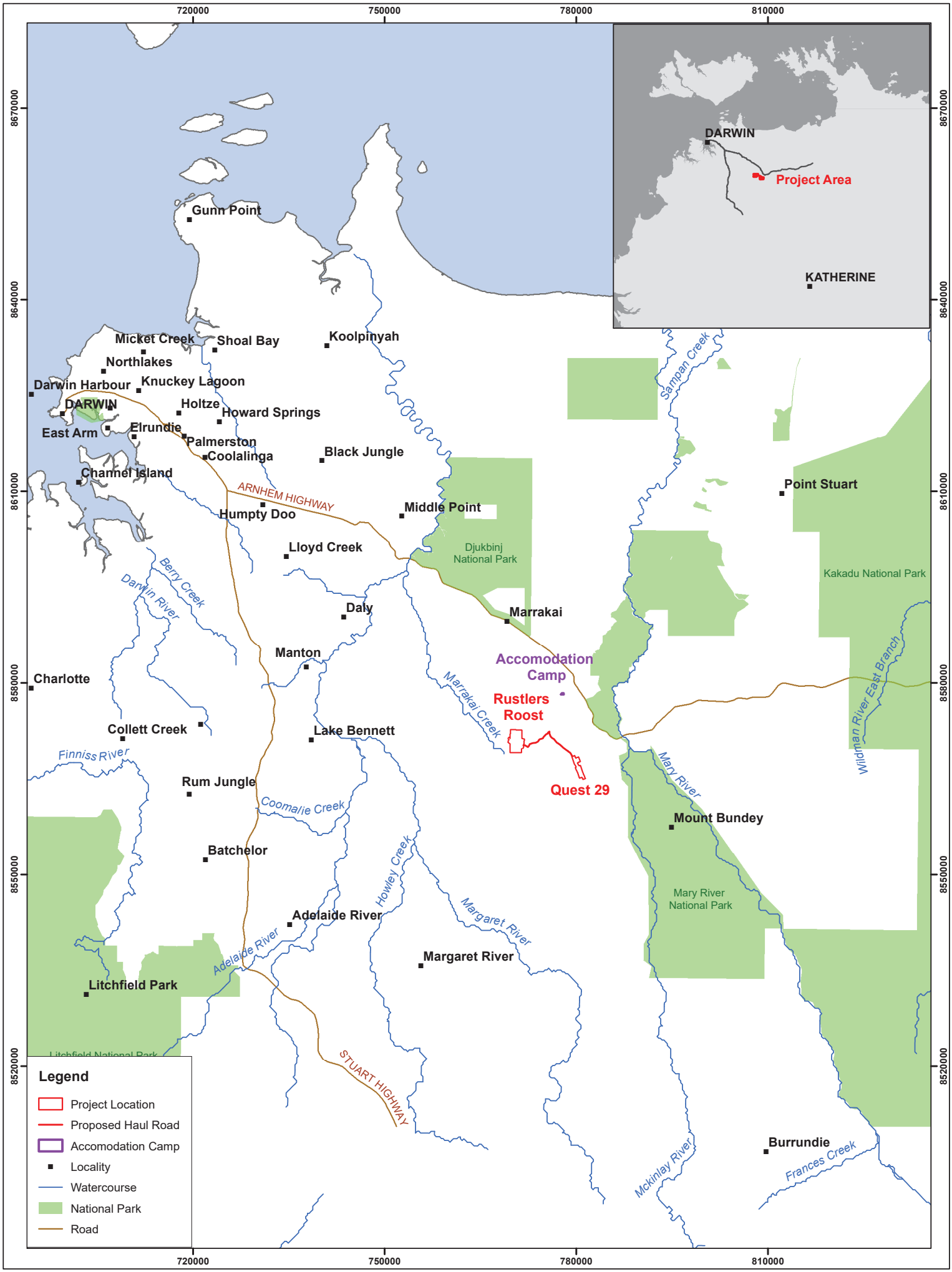

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FIGURE 1-1

Project Location and Regional Setting

DRG Ref: 1001087-EIS-01-1.1

\\bga1svr1\Projects\US DOT\Aust\Roads\Hanking Gold Mine EIS\1001087 - Rustlers Roost EIS\1001087 - Rustlers Roost EIS\02 MXD\Chapter 1\Figure 1-1.mxd

1.2 Report Purpose

These groundwater investigations and modelling have been undertaken as part of the draft Environmental Impact Statement (EIS) for the Project proposed by PGO.

The primary purpose of the investigations and modelling is to address groundwater-related requirements of the Terms of Reference (ToR) for the Project EIS, as issued by the Northern Territory Environment Protection Agency (NT EPA) in May 2021 and revised in September 2021 (ToR version 1.1, TRM number NTEPA2021/0038-006~0004). Refer to Appendix C of the Draft EIS for a listing of the ToR.

1.3 Project Areas

The Project comprises two main extraction areas, being Rustlers Roost (Figure 1-2) and the Quest 29 portions of the Project area (Figure 1-3). The mine sites are located approximately 11 km apart and are connected by an unsealed access track that will be upgraded to accommodate haulage of ore from the Quest 29 satellite pits to a processing facility at Rustlers Roost.

1.3.1 Rustlers Roost

The Rustlers Roost portion of the Project area is located on ML 1083 which covers approximately 756 ha. The current infrastructure and landforms at the Rustlers Roost mine area comprise the following (Figure 1-2):

- Associated open pits that have flooded and have become a single pit (approximate dimensions 50 m depth, 1,000 m length and 300 m width). The pit lake currently holds approximately 3.16 Gigalitres (GL) of water based on post mining pit shell bathymetry and current water level of 56.90 mAHD (surveyed on 3 November 2020).
- Remnants of old processing plant and ROM. In 1997 most of the plant, buildings and other mining infrastructure were removed, apart from three large tanks and some concrete footings.
- Annie Dam covering approximately 11.4 ha and with an estimated capacity of 200,000 kilolitres (kL).
- Existing waste rock dump (WRD), with approximate dimensions of 30 m heigh, 1,000 m long and 400 m wide.
- Two heap leach pads (total approximate dimensions 20 m in height, 600 m in length and 450 m width) and heap leach ponds.

The proposed development at Rustlers Roost includes the following key components:

- Processing plant and Run of Mine (ROM) - The processing facility will be constructed in the northern portion of Rustlers Roost, immediately north of the WRD and will be contained in an area approximately 1000 m long and 400 m wide.
- Expanded existing main pit and two minor pits - The Rustlers Roost main pit is proposed to be expanded by approximately 57% to the east and west and increased in depth from 50 m to 265 m. Dewatering of the pits will be undertaken with diesel powered in-pit sumps. Dewatering will occur as required as a result of direct precipitation from rain events and groundwater in-flow. To access ore that has been recently identified through drilling and to prevent future sterilisation through placement of the TSF over and immediately adjacent these areas, PGO is proposing to mine two small additional pits (Annie's Okaley and Annie's Dam Pits).
- Tailings storage facility - The TSF will be located in the southern section of ML 1083 and will occupy 243.0 ha of land. The TSF size is based on a nominal tailings disposal volume of 4 Mtpa for a total of 40 Mt capacity (i.e. 10 years production). The TSF will be raised in height progressively over a 10-year period to reach storage capacity for the LOM.
- Waste rock dumps – The area including and to the north of the existing U-shaped WRD will be the designated location for the disposal of waste rock from Rustlers Roost pit. Waste rock will be placed in two separate WRDs

termed the northern WRD and the southern WRD. A total of 50.9 Mt of waste material will be produced from the main Rustlers Roost pit. Approximately 45.6 Mt will be placed within the surface WRDs and 5.36 Mt of fresh waste backfilled into the pits.

- Mine laydown area – A compacted earth mine laydown area covering approximately 6.0 ha will be constructed in the Rustlers Roost portion of the Project area.
- Administration facility – An administration facility covering approximately 0.42 ha will be constructed in proximity of the laydown area and processing facility in the north of Rustlers Roost.
- Landfill – A landfill is proposed to be constructed at Rustlers Roost encompassing largely disturbed land to the west of the main pit and east of the TSF. The landfill will be constructed over 4.0 ha to a depth of 5 m and be utilised for the 10-year Project period.
- The final post-mining landform is anticipated to predominantly contain the mined main pit shells, with the Annie's Okaley pit backfilled and Annie's Dam pit consumed within the TSF. The elevated WRD, landfill and TSF will be surrounded by water diversion berms and capped. It is anticipated refilling of the main pit shell will result in one remaining pit lake.

1.3.2 Quest 29

Quest 29 is located 10 km south-east of Rustlers Roost; and is located across five MLs (i.e. ML 29781, ML 29782, ML29783, ML 29785 and ML 29786), which collectively cover approximately 658 ha. There are currently no proposed activities, other than exploration, on Quest 29 ML 29781, ML 29785 or ML 29786. Therefore, the Quest 29 portion of the Project area only includes mining lease ML 29783.

The current infrastructure and landforms at the Quest 29 mine area comprise the following (Figure 1-3):

- Five open-cut pits, being the BHS Pit, North Koolpin Pit, West Koolpin Pit (South Koolpin Pit), Zamu Pit and Taipan Pit, with dimensions of the largest of the pits approximately 25 m depth, 280 m length and 50 m width);
- Five WRDs (largest of the WRDs approximately 10 m height, 280 m length and 80 m width);
- One heap leach pad (approximate dimensions 20 m in height, 200 m length and 200 m width);
- Heap leach pond; and
- Remaining infrastructure of the Carbon in Leach (CIL) tanks.

The proposed development at Quest 29 included the following:

- Expanded existing pits – The five existing pits at Quest 29 are proposed to be expanded and mined to a depth of 75 m from the current depth of 25 m. On completion of mining Zamu pit, the pit will be backfilled with waste material from mining of the remaining Quest 29 pits;
- Waste rock dump - The proposed surface WRD at Quest 29 will be developed in the area north of Zamu Pit. This was selected to minimise haulage distances for the initial stage of mining Zamu pit. During construction the WRD face angle will be 37°, with a berm width of 19.5 m and 4 x 10 m lifts. The WRD construction will commence with the placement of non-acid forming (NAF) material for the base and outer annulus. Potential acid forming (PAF) material encountered will be placed onto of the NAF base and encapsulated within the centre of the WRD. No PAF material will be placed on outer perimeter, slopes, toe, surface or base of the dump; and
- The final post-mining landform is anticipated to contain the mined pit shells, with Zamu pit predominately backfilled using waste rock material, surrounded by water diversion berms and the capped WRD. It is anticipated refilling of the pit shells will result in five remaining pit lakes.

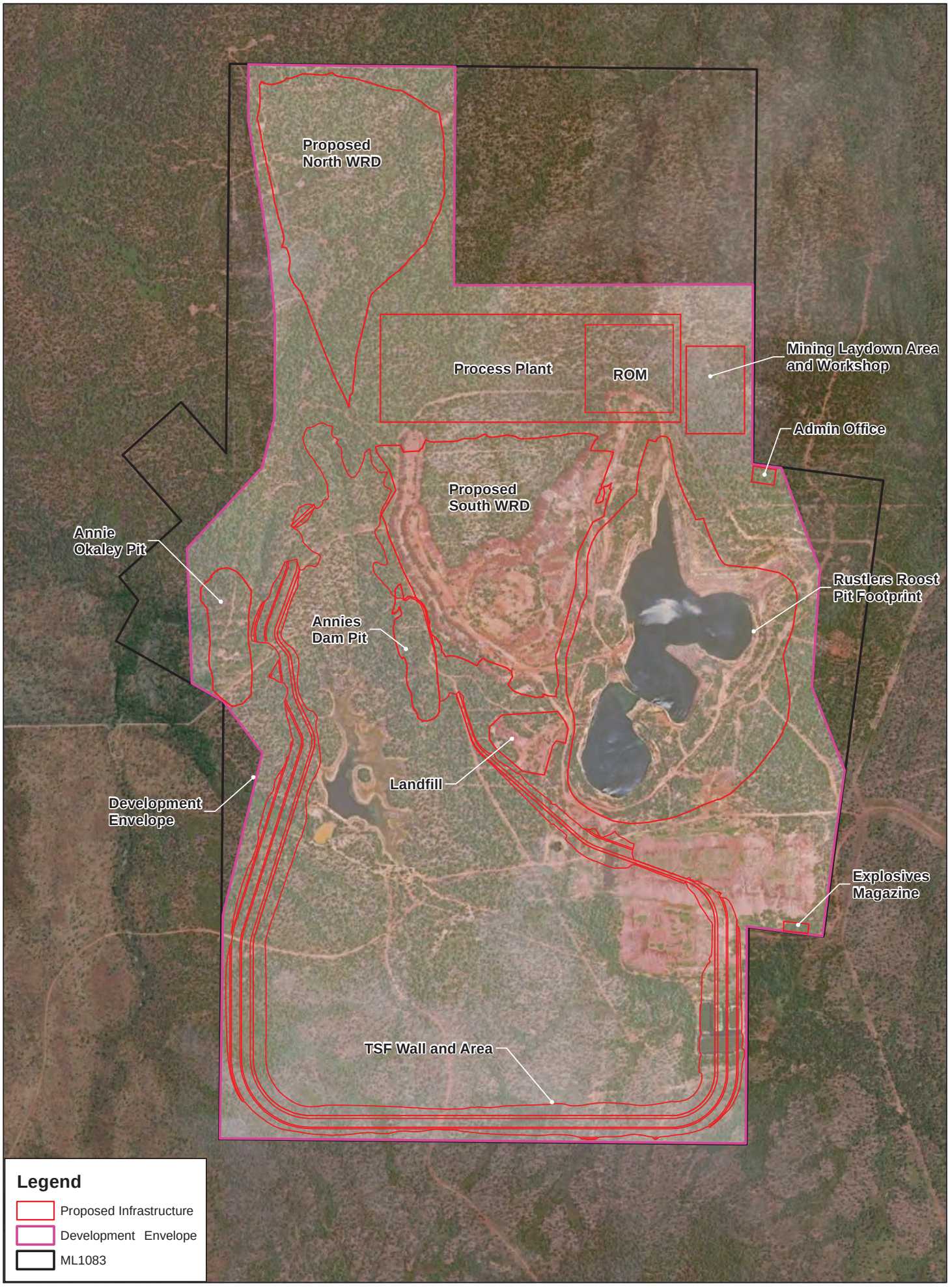

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FIGURE 1-2

Rustlers Roost Development Envelope and Infrastructure

DRG Ref: 1001087-EIS-04-4.3

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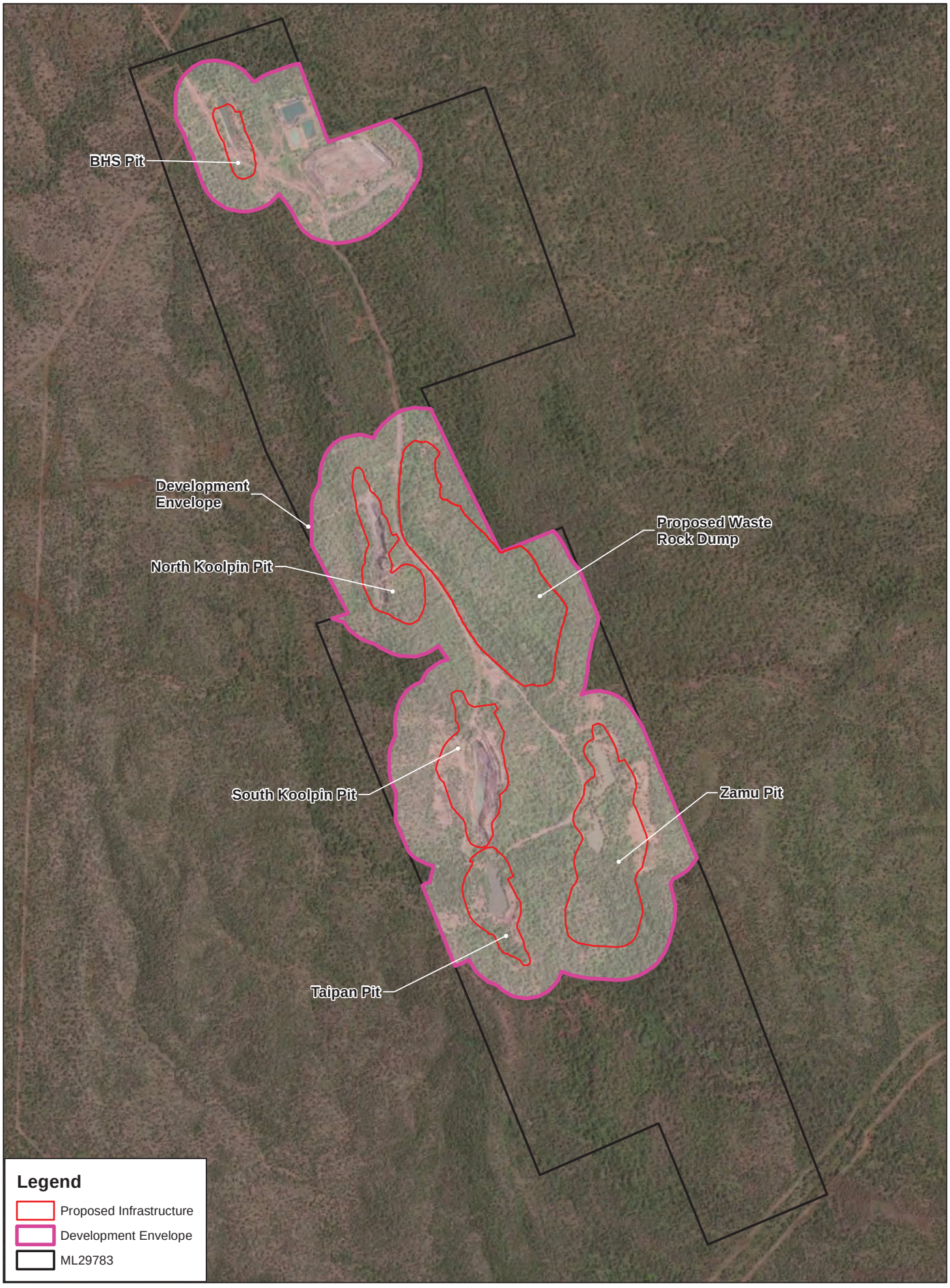

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FIGURE 1-3

Quest 29 Development Envelope and Infrastructure

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\\bga1svr1\Projects\US DOT\Aust\Roads\Hanking Gold Mine EIS\1001087 - Rustlers Roost EIS\1001087 - Rustlers Roost EIS\02 MXD\Chapter 4\Figure 4-4.mxd

2. Scope of Work and Methodology

2.1 Scope of Work

The scope of work for the groundwater investigations and modelling was based on the ToR for the Project (refer to Appendix C in the Draft EIS) and included the following:

- A desktop review of currently available data, information and reports relevant to the Project;
- Development of a numerical groundwater model to estimate the potential drawdown extents induced by the proposed mining pits;
- Development of a site water balance and mass balance model to assess the management of water and water quality from the water production to the water disposal during and beyond the life of mine until steady state conditions are established; and
- Preparation of this groundwater investigation and modelling report.

2.2 Methodology

2.2.1 Desktop Data Review

The data review included collation and review of:

- Historical groundwater investigations, studies and reports relevant to the Project;
- Publicly available data and information; and
- Regional climate and climate change projection.

Key historical studies/reports reviewed for the groundwater impact assessment included the following:

- CDM Smith 2019. Rustler's Roost Project – Desktop Groundwater assessment; and
- Primary Gold 2021. Rustlers Roost and Quest 29 Open-Cut mine redevelopment. Referral report.

Additional data sources included the following:

- Digital Elevation Model (DEM) of the Project area;
- SILO climate data (rainfall and pan evaporation);
- Historical and proposed pits shell geometry (and derived bathymetry curves); and
- Groundwater level records.

2.2.2 Field Investigations

Historical field investigations, including groundwater monitoring and sampling, have been undertaken by several entities since 1993, with results reported in the key historical studies/reports listed in Section 2.2.1.

As part of the technical studies for the EIS, the Proponent commissioned EcOz Environmental Consultants (EcOz) to undertake groundwater, surface water and open pit monitoring and sampling at Rustlers Roost and Quest 29 portions of the Project.

The results of the historical and current field investigations have been incorporated in this groundwater impact assessment report.

2.2.3 Groundwater Modelling

The objective of the numerical groundwater model, referred to as the Project groundwater model, was to estimate:

- The potential maximum drawdown extents induced by mining the proposed pits at the Rustlers Roost and Quest 29 portions of the Project; and
- The potential groundwater inflows to the proposed mining pits at Rustlers Roost and Quest 29.

2.2.4 Site Water Balance and Mass Balance Modelling

The objective of the site water balance and mass balance modelling was to estimate:

- The ability of the water management plan to prevent uncontrolled spill to the environment, and to keep a dry working environment during the mining phases;
- The Rustlers Roost and Quest 29 respective pit lake water balance and stabilisation level post-mining:
  - Evaluate the overflowing likelihood of all the pit lakes
  - The evolution of the water quality within pit lakes forming post-mining.
- The bore field production requirement to respond to the site demand.

3. Relevant Legislation

3.1 Environment Protection Act 2019

The EP Act and associated regulations has recently replaced the Environmental Assessment Act 1999 on 28 June 2020. The EP Act aims to protect the environment through sustainable development and manage significant disturbances through an environmental approval process. Under the Act, the NT EPA regulates the environment impact assessment process to identify potential environmental impacts of development proposals. This initial step is undertaken through a referral in which the NT EPA determines if further assessment is required (i.e. the tier of assessment).

A proponent initiated EIS referral was submitted by PGO to the NT EPA on 3 February 2021 for consideration under the EP Act. The NT EPA determined a standard assessment by EIS to be an appropriate method of assessment for the proposed action to address the requirements of section 42 and section 43 of the EP Act. The NT EPA issued a formal Notice of Decision and Statement of Reasons on the assessment approach concurrently with the ToR for the EIS issued on 11 May 2021 and revised in September 2021 (ToR version 1.1, TRM number NTEPA2021/0038-006~0004).

3.2 Mining Management Act 2001

The *Mining Management Act 2001* and regulations enables authorisation of mining activities, management of mining sites, protection of the environment on mining sites and related purposes. The *Mining Management Act 2001* is administered by the DITT. The objectives of the *Mining Management Act 2001* are to:

- Ensure development of the NT's mineral resources in a manner consistent with best environmental practice for the mining industry:
  - Protect the environment by
  - Requiring authorisation for and monitoring of mining activities
  - Requiring management of mine sites through implementation of management systems
  - Fostering consultation and cooperation between management and the mine workforce in implementing environment management systems
  - Implementing audits, inspections, investigations, monitoring and reporting to ensure compliance with agreed standards and criteria
  - Specifying personnel obligations on mine sites to protect the environment.
- Assist the mining industry introduce continuous improvement initiatives to achieve best practice environmental management;
- Enable people connected with the mining industry to participate in implementation of the Act through establishment of a Mining Board to advise the Minister on:
  - Industry guidelines
  - Competencies required by persons involved in the industry
  - Best practice in mining activities
  - Minimising liability of the NT Government by having a system requiring payment of security to provide for rehabilitation of mining sites or rectify environmental harm caused by mining activities.

A MMP and Authorisation for the proposed work is required from the Minister of Mines and Energy before any mining activities (as defined in the *Mining Management Act 2001*) can commence. The environmental assessment process will allow the Minister to be informed of potential environmental impacts and proposed management to assist in the decision-making process.

4. Description of Environmental Values

4.1 Physical Environment

4.1.1 Climate

The climate of the region is broadly classified as tropical monsoonal. It is characterised by seasonal shifting of the prevailing winds and consequently marked changes of air mass properties. Two distinct seasons can be identified, a summer wet season and winter dry season, with two subsidiary transitional periods between them. The dry season occurs from May to September and is characterised by prevailing south-easterly winds. The hot, "dry-wet" transition from October to November has high humidity and variable winds. The wet season occurs from December to March, with dominant northwest to westerly winds. The hot, "wet-dry" transition of April has variable winds, although predominantly from a westerly direction.

The Bureau of Meteorology (BoM) provide climate classification maps using three (3) methods of classifying the climate of Australia (Bureau of Meteorology, 2016). These different classification schemes are based on temperature/humidity, vegetation (Köppen) and seasonal rainfall. The climate classification for the Project, based on these maps, is as follows:

- Temperature/humidity zones map: The Project is located within the hot humid summer climate zone;
- Köppen map: The Project is located within the tropical classification group; and
- Seasonal rainfall map: The Project is located within a summer dominant climate class, with a marked wet summer and dry winter.

The long-term BoM weather station nearest to the Project area is the Middle Point Rangers Weather Station (BoM #14090), which is located approximately 42 km south of Rustlers Roost and approximately 40 km northwest of Quest 29.

Summary statistics of weather data from this station are provided in Table 4-1 to Table 4-3.

Table 4-1 Monthly Rainfall (mm) Statistics - Middle Point Rangers Weather Station (BoM #14090)

Month	Mean	Median	Highest Daily
Jan	347.4	322.4	210
Feb	280.1	271.9	134
Mar	249	240.4	158.8
Apr	89.1	64.8	112
May	23.5	6.6	91.4
Jun	1.4	0	30
Jul	0.7	0	7.4
Aug	2.2	0	38.4
Sep	14	5.8	65.6
Oct	57.7	51.7	60.6
Nov	128	127.2	97
Dec	226.8	193.2	242.3

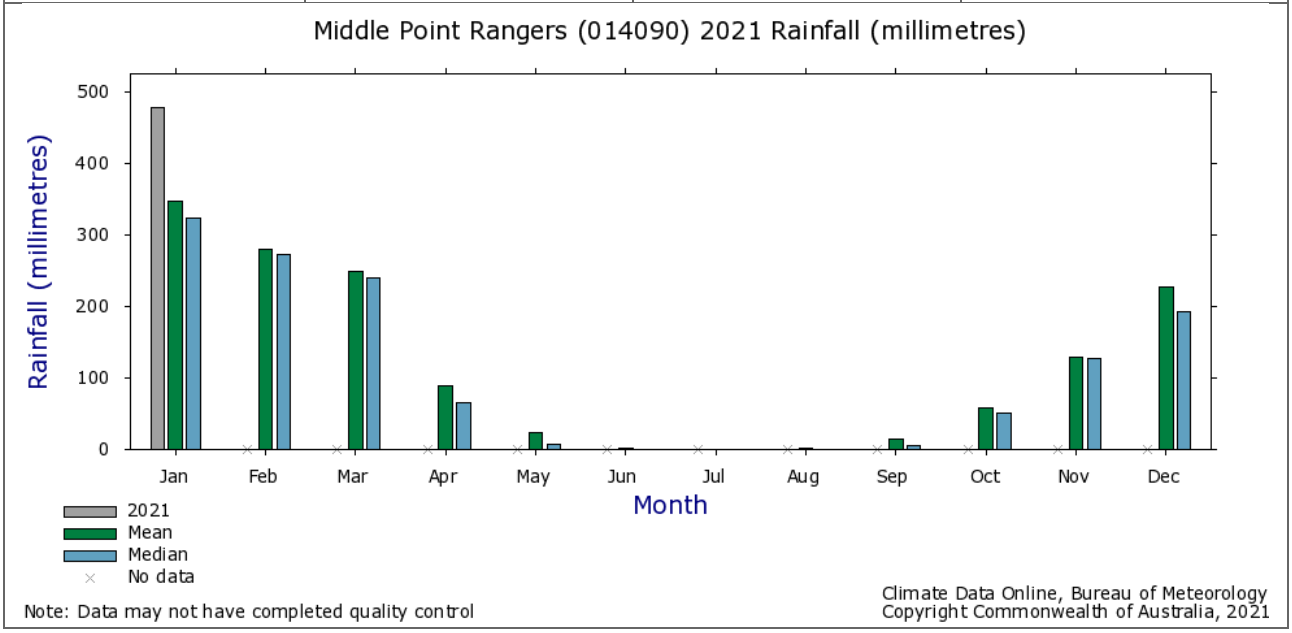


Table 4-2 Daily Temperature (°C) Statistics - Middle Point Rangers Weather Station (BoM #14090)

Month	Mean	Highest monthly mean	Lowest monthly mean	Highest Daily	Lowest Daily
Jan	32.6	35	30.4	38.2	25.2
Feb	32	34.2	29.8	36.2	24.5
Mar	32.4	34.3	30.4	37.5	26.1
Apr	33.1	34.4	31.7	39	25.8
May	32.5	33.9	30	35.9	22.2
Jun	31.3	32.9	29.4	34.9	25.3
Jul	31.3	33.1	29.5	35.5	19.9
Aug	32.9	34	31.5	37.1	18.6
Sep	34.7	35.9	33.5	38.8	27.6
Oct	35.6	37.3	33.9	40.3	24.5
Nov	35.1	36.4	32.9	40.2	26.5
Dec	33.8	35.4	31.5	38.7	25.4

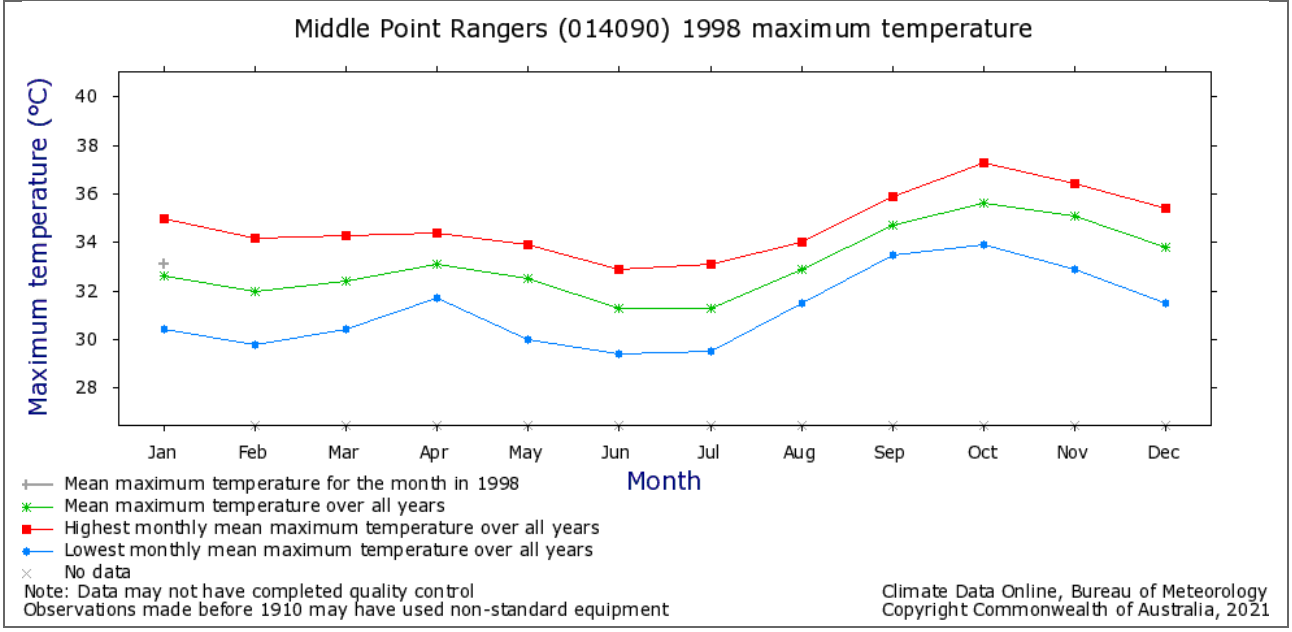
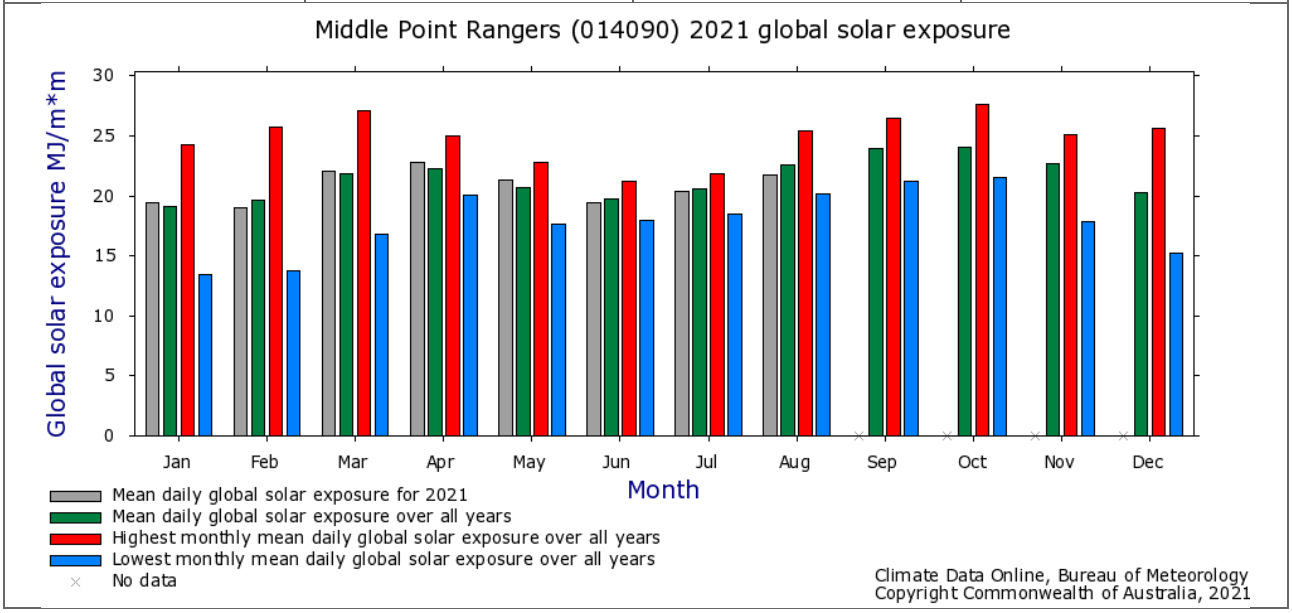


Table 4-3 Daily Solar Exposure (MJ/m^{-2}) Statistics - Middle Point Rangers Weather Station (BoM #14090)

Month	Mean	Highest monthly mean	Lowest monthly mean
Jan	19.1	24.3	13.4
Feb	19.6	25.7	13.8
Mar	21.9	27.1	16.8
Apr	22.3	25	20.1
May	20.7	22.8	17.7
Jun	19.8	21.2	18
Jul	20.6	21.9	18.5
Aug	22.6	25.4	20.2
Sep	23.9	26.5	21.2
Oct	24.1	27.6	21.5
Nov	22.7	25.1	17.9
Dec	20.3	25.6	15.2



4.1.2 Climate Change Variability

The climate of the Northern Territory is expected to experience changes due to human induced climate change. Climate of the Northern Territory is anticipated to become hotter, with longer fire seasons, more intense extreme rain events; however, with a projected decrease in cyclones and uncertain annual rainfall changes (CCA, 2021).

The representative concentration pathway (RCP) is a greenhouse gas concentration trajectory adopted by the International Panel on Climate Change of which, there are seven. RCP 4.5 is considered an intermediate scenario (https://ar5-syr.ipcc.ch/topic_futurechanges.php) which will result in a mean sea level rise and the inability of some plants and animals to adapt (https://ar5-syr.ipcc.ch/topic_futurechanges.php). The RCP 4.5 climate model was applied to the dewatering phase of the operation and the post-mining scenarios. The 100 year SILO rainfall from 1921 to 2021 was increased relative to the climate change model in accordance with the percentages provided by the Australian Rainfall and Runoff Data hub (Babister, Trim, Testoni, & Retallic, 2016).

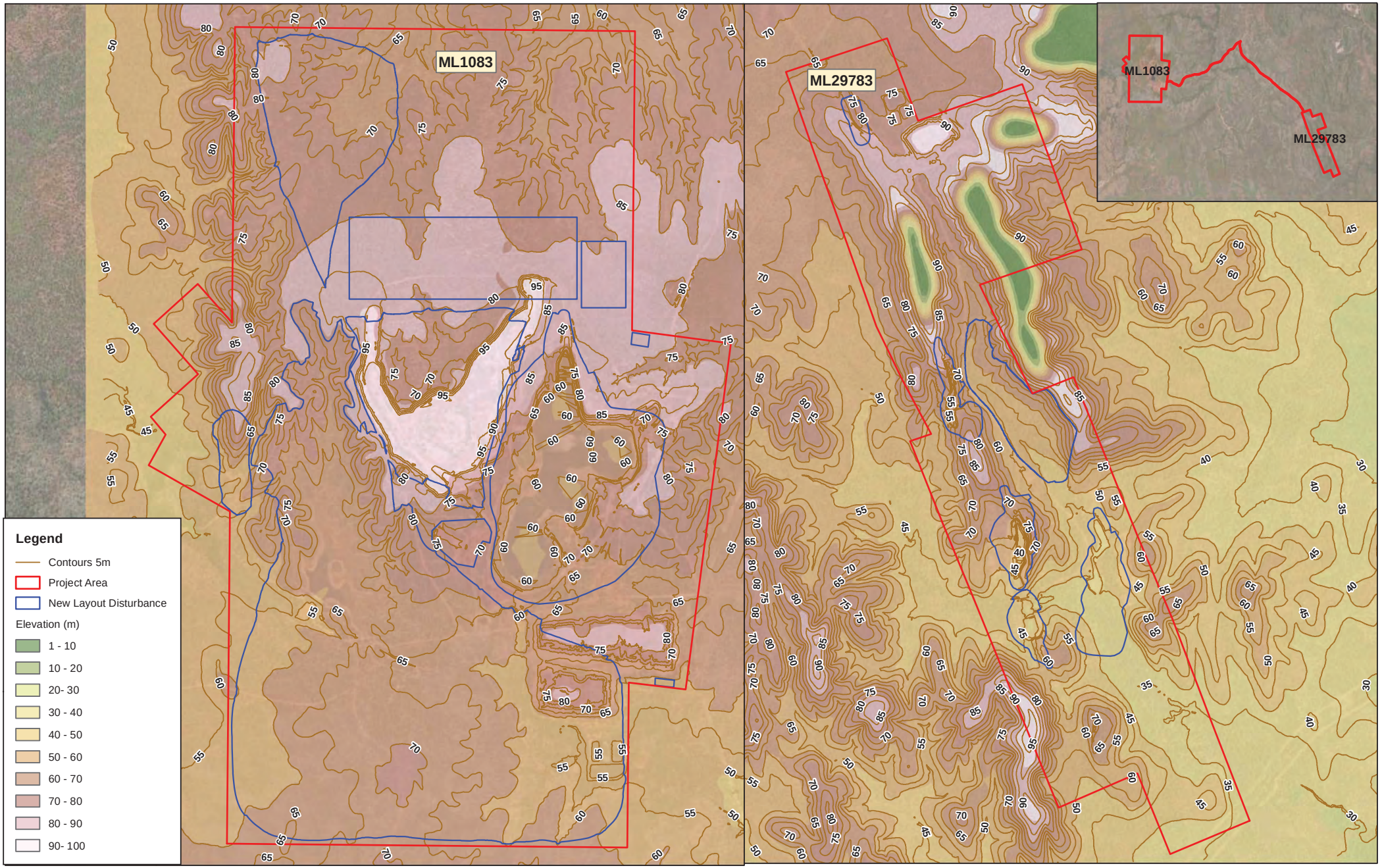
4.1.3 Topography and Drainage

The Rustlers Roost site is situated near a catchment divide at the headwaters of Mount Bundey Creek, which drains to the east. The Mount Bundy Creek catchment has a total area of approximately 150 km^2 and is a tributary catchment of the Mary River. The confluence of Mount Bundy Creek and Mary River is located roughly 5 km east of the Arnhem Highway crossing of Mount Bundey Creek. Like most creeks in the NT, Mount Bundy Creek is ephemeral and typically only flows for four to six months of the year during the wet season (November to April inclusive).

The local catchment comprises a series of ridges and dissected hills that are drained by small steep rivulets, which converge into two main creek channels, flowing to the west from Annie's Dam, and to the east from near the former ROM pad. The catchment upstream of Rustlers Roost operations covers around 2.2 km^2 and is characterised by outcropping rock. Runoff from the catchment is expected to occur rapidly following rainfall events.

The landscape has been altered due to prior mining and processing operations in the Project area. Today, there are two permanent water bodies located on the Rustlers Roost site, the pit lake and Annie's Dam. Water store in the pit is likely a combination of stormwater runoff, incident rainfall and possibly groundwater, whilst Annie's Dam is likely a combination of stormwater runoff and incident rainfall.

The topography for the Rustlers Roost and Quest 29 portions of the Project area is illustrated in Figure 4-1.



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This drawing is confidential and shall only be used for the purpose of this project.

DESIGNED	SS	CHECKED	TK
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APPROVED	TK	DATE	11/08/21

Notes:

N

0 175 350 700

Meters

1 cm = 161 meters

GCS GDA 1994 MGA Zone 52

DISCLAIMER
CDM Smith has endeavoured to ensure accuracy and completeness of the data. CDM Smith assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

DATA SOURCE
NT Government Open Source Data

DESIGNER

CDM Smith

CLIENT

PRIMARY GOLD

FIGURE 4-1

Rustlers Roost and Quest 29 Topography / Elevation

DRG Ref: 1001087-EIS-07-7.4

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4.1.4 Land Use

The Project area maintains two active mining authorisations (0738-01 and 0739-01) for the purpose of care and maintenance activities. Rustlers Roost has been in care and maintenance since 1998, with exploration works conducted by PGO in 2003, 2017 to 2018 and more recently during 2020. At Quest 29, limited exploration activities have taken place until more recently, during 2020. No mining activities have been conducted at Quest 29 since 2004. Since its purchase in 2013, PGO has undertaken reconnaissance and desktop investigations and maintained site environmental monitoring, maintenance and reporting as detailed further in this Draft EIS.

The Project area is located in the Mount Bundey region and is remote from any communities. The closest major town is Humpty Doo, which is approximately 46 km north-west of the Project with Darwin located approximately 85 km north-west. The Marrakai residential subdivision is located 14 km north-west.

The broader Mount Bundey locality includes the Mary River, the portion of the Mary River National Park south of the Arnhem Highway, the Mary River Wilderness Retreat and the Mount Bundey Military Training Area in the east. The Mary River National Park is utilised for environmental conservation, tourism and recreational purposes. The Mary River Wilderness Retreat is located 8.5 km north-east of the Project. The Mount Bundey Military Training area encompasses 117,300 ha east of the Mary River and is operated by the Commonwealth of Australia.

The most extensive land use in the vicinity of the Project area is pastoral, involving the grazing of beef cattle over the woodland terrain. There has been some improvement to pasture on Old Mount Bundey station. Under a state of care and maintenance, the pastoral landowner of Old Mount Bundey Station has been engaged by PGO to assist in monitoring and managing the mining tenements, in terms of weed, fire and water management compliance requirements.

Land use in the region includes agriculture (orchards and pastoral operations) and mining, with historic iron ore mining at Mount Bundey and gold mining at Toms Gully, Quest 29 and Rustlers Roost mines.

Tourism, including recreational fishing, is growing in the region. A number of conservation reserves and parks managed by the Parks and Wildlife Commission of the Northern Territory occur within a 50 km radius of the Project area. These include:

- Mary River Crossing Reserve (15 km);
- Mary River National Park (15 km);
- Leaning Tree Lagoon Nature Park (25 km);
- Wildman Reserve (40 km); and
- Fogg Dam Conservation Reserve (45 km).

The boundary of the Kakadu National Park, managed by the Australian National Parks and Wildlife Service, lies 60 km east of the Project area along the lowlands of the Wildman River. The Kakadu National Park currently covers 1.3 million ha, encompassing the drainage systems associated with the Wildman, West Alligator and South Alligator Rivers.

4.1.5 Hydrology

Rustlers Roost

The Rustlers Roost site is on the catchment divide and in the headwaters of Marrakai Creek and Mt Bundey Creeks and the mineral lease disturbance area is 9.35 km^2. Both creeks are ephemeral, flowing only through the wet season with the annual receding hydrograph continuing into the dry season.

The Rustlers Roost site has internally draining catchments reporting to the pit and the proposed TSF comprising 3.34 km^2 and externally draining catchments reporting to Marrakai and Mt Bundey Creeks comprising 6.01 km^2.

The local catchment is comprised of ridges and dissected hills that are drained by small step rivulets (CDM Smith 2019). Stream flows in these upper areas of the catchments are ephemeral, with flows occurring for only a few weeks-months each year throughout the wet season, in response to rainfall events (EcOz 2021).

Quest 29

The Quest 29 is predominantly located in the McKinley River sub-catchment, which also flows into the Mary River system. A minor northern portion of the Quest 29 is in the upper Mount Bundey Creek sub-catchment of the Mary River system.

The local catchment comprises ridges and dissected hills that are drained by small step rivulets (CDM Smith 2019). Stream flows in these upper areas of the catchments are ephemeral, with flows occurring for only a few weeks-months each year throughout the wet season, in response to rainfall events (EcOz 2021).

The Quest 29 site is split into a north catchment (Q29N), draining into Mount Bundey Creek, with a surface area of 96.06 ha, and a south catchment (Q29S), with a surface area of 492.68 ha, draining into the McKinley River.

4.2 Geology

4.2.1 Regional Geology

The Project area is located within the Pine Creek Orogon (PCO - the Pine Creek Inlier or the Pine Creek Geosyncline), which is a deformed and metamorphosed sedimentary basin that is exposed over 47,500 km² and comprises a thick (>4 km) succession of Palaeoproterozoic clastic, carbonate and carbonaceous sedimentary and volcanic rocks, unconformably overlying Neoarchaean (ca 2670–2500 Ma) granitic and gneissic basement (Ahmad & Hollis, 2013). These depositions experienced regional metamorphism and deformation of varying grades and intensities in different part of the orogen in the period ca 1867-1850 Ma and syn- to post-tectonic granite emplacement at ca 1830-1800 Ma.

The Palaeoproterozoic strata of the PCO are extensively mineralised, hosting over 1,000 known mineral occurrences. It is a multi-commodity province with the major commodities including gold, uranium, lead-zinc-silver, platinum-group elements, copper-cobalt-nickel, iron, tin-tantalum-tungsten and phosphate.

The PCO is broadly correlated with other Palaeoproterozoic domains of Northern Australia (e.g. Tanami and Tennant regions, Arnhem and Murphy provinces and the Halls Creek Orogen). Younger strata conceal its margins, and the total extent is unknown (Figure 4-2). It is unconformably overlain by the Palaeo to Mesoproterozoic McArthur Basin to the east, the Palaeo to Neoproterozoic Victoria, Birrindudu and Fitzmaurice basins to the west, and Cambro–Ordovician and Mesozoic successions (Daly and Bonaparte basins) to the southwest and northwest. Mesozoic and Palaeozoic sediments of the Arafura and Money Shoal basins overlie parts of the PCO to the north and the Mesozoic onshore Carpentaria Basin overlies other parts to the south. Unconsolidated sand, silt and clay of Cenozoic age also cover much of the area. During the upper Cretaceous to mid Cenozoic, much of the land surface was subjected to intense chemical weathering, leading to laterite formation.

The PCO has been broadly subdivided into three domains (Needham *et al*., 1988, Hollis *et al.,* 2009), i.e. the greenschist-facies Central Domain (including the Rum Jungle region and the South Alligator Valley), the amphibolite-facies Nimbuwah Domain to the east, and the amphibolite- to granulite-facies Litchfield Domain (formerly 'Litchfield Province') to the west (Figure 4-2). The greenschist-facies Central Domain is separated from amphibolite-facies Nimbuwah Domain to the east by the Jim Jim Fault Zone. The boundary with the amphibolite- to granulite-facies Litchfield Domain to the west is defined by the westernmost extent of the Finniss River Group.

In addition to differences in metamorphic grade and structural styles, these regions are also distinct in the timing and nature of metamorphism and the timing and chemistry of the main phases of magmatism.

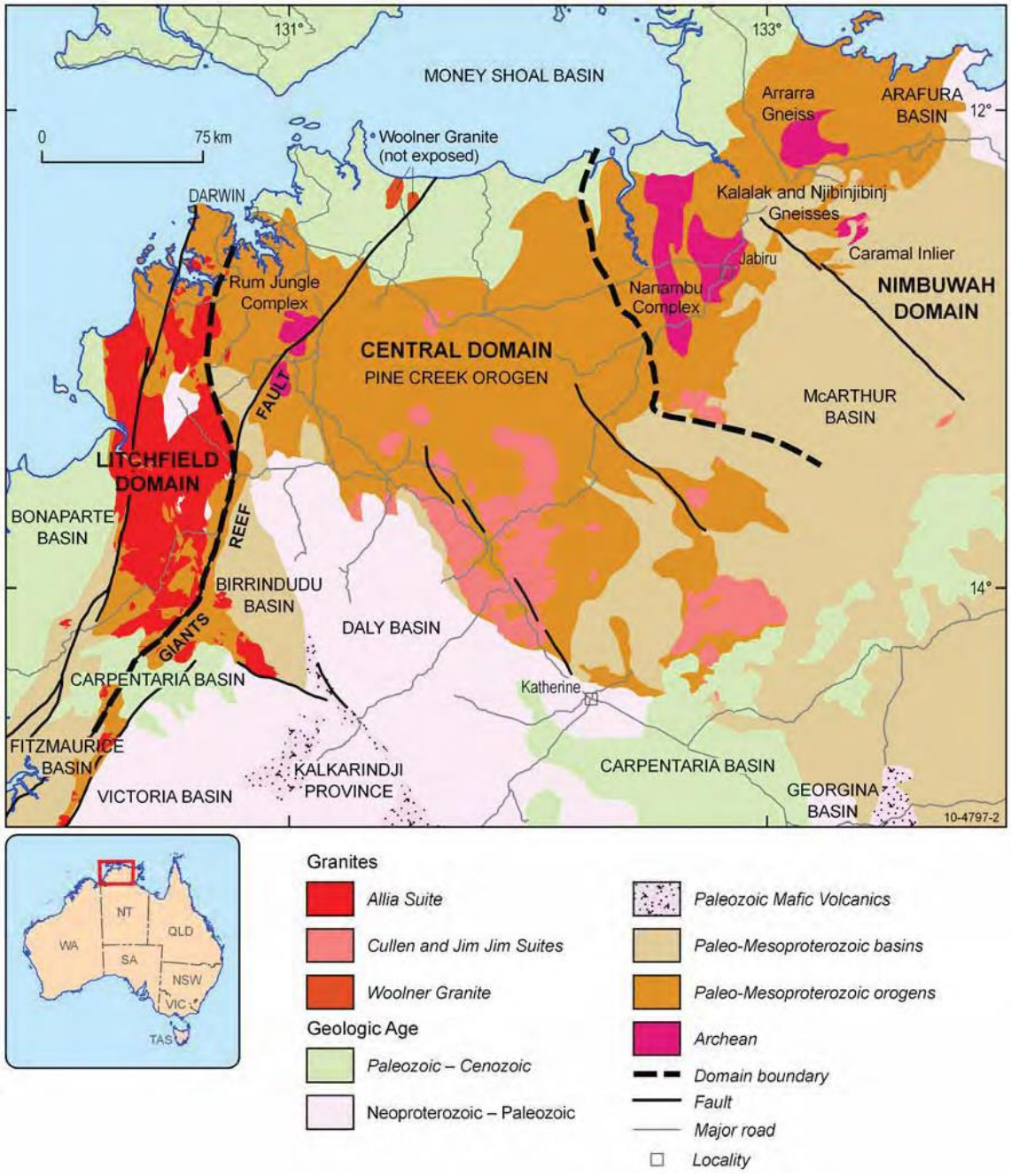


Figure 4-2 Geological Setting of PCO (Ahmad & Hollis, 2013)

The Palaeoproterozoic stratigraphic succession of the PCO (Figure 4-2 and Figure 4-3) comprises the Woodcutters and Cosmo supergroups. No strata of equivalent age to the Woodcutters Supergroup are recognised outside of the PCO in the Northern Territory. The succession is well constrained in the Central Domain with more tentative correlations into the Litchfield Domain and Nimbuwah Domain.

The Woodcutters Supergroup is represented by the Manton, Mount Partridge, and Namoona groups in the Central Domain and by the Kakadu Group in the Nimbuwah Domain.

The Cosmo Supergroup is more widespread than the underlying Woodcutters Supergroup and unconformably overlies the latter. The Cosmo Supergroup succession comprises the South Alligator Group and the regionally extensive Finniss River Group in the Central Domain, with the Hermit Creek and Welltree metamorphics representing probable equivalents of the Finniss River Group in the Litchfield Domain.

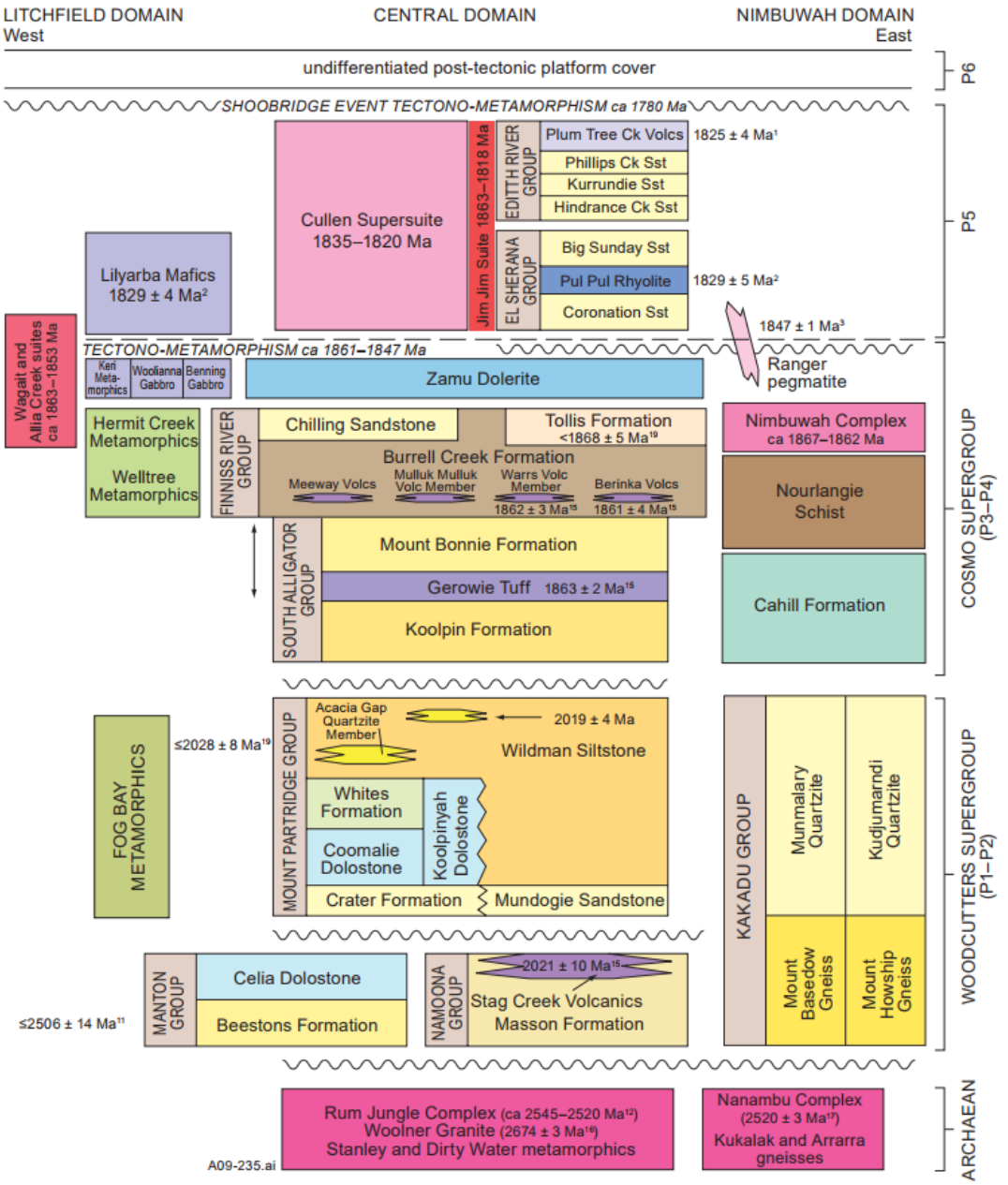


Figure 4-3 Simplified Palaeoproterozoic Stratigraphic Column of PCO (Ahmad & Hollis, 2013)

4.2.2 Rustlers Roost Geology

The Rustlers Roost site lies on the northern flank of the PCO within a transgressive marine sequence dominated by folded shallow marine sediments of the Early Proterozoic South Alligator Group. In general the PCO consists of an extensive but poorly exposed sequence of low to medium metamorphic grade, early Proterozoic sediments deposited in a shallow intra-cratonic geosyncline which overlies a late Archean granitic basement. The sediments were intruded and overlain by late early Proterozoic felsic volcanics and by later middle Proterozoic platform sequences.

The surface geology of the Rustlers Roost portion of the Project area is presented in Figure 4-4.

The Rustelr Roost site is underlain by shallow marine, iron rich and tuffaceous sediments of the South Alligator Group which are openly to tightly folded about gently south plunging axes (Environmental and Earth Sciences Pty Ltd, January 1993). The group includes the Koolpin Formation, Geowrie Tuff and Mount Bonnie Formation. The Koolpin Formation and Geowrie Tuff are exposed to the immediate north of the Rustlers Roost portion of the Project area.

- The Koolpin Formation consist of ferruginous siltstone and shale, with silicified haematite and chert breccias and minor silicified dolomite over an average thickness of 100 metres;
- The Geowrie Tuff (600 m thick) consists predominantly of thinly interbedded fine grain sediments, glassy crystal tuffs and tuffaceous cherts. Both the Koolpin Formation and Geowrie Tuff show extensive attenuation at fold hinges; and
- The Mount Bonnie Formation occupies the major portion of the Rustlers Roost Project area and consists of interbedded pelites, greywackes and tuffaceous sediments for an average thickness of 650 metres. The Mount Bonnie Formation shows little tectonically induced thickness variation.

Conformably overlying the Mount Bonnie Formation is the Burrell Creek Formation of the Finniss River Group. This formation consists of flysch style sediments consisting predominantly of interbedded shale, siltstone, phyllite and greywacke.

The South Alligator Group is unconformably underlain by fluviatile sediments of the Mount Partridge Group.

All early Proterozoic rocks within the Rustlers Roost portion of the Project area have been regionally metamorphosed to lower greenschist facies. A 500-metre-wide aureole of contact metamorphic hornfels surrounds the Mount Bundey Granite to the east.

Early Proterozoic metasediments in the vicinity of the Rustlers Roost portion of the Project area have undergone one major phase of folding resulting in tight folds in the South Alligator and Finniss River groups and tight to isoclinal folds in the underlying Mount Partridge Group fluviat sediments. Fold axes in all groups are subhorizontal to shallow, plunge south and trend 180 to 200 degrees. The change in fold axis orientation is gradational from 180 in the south the 200 in the north and reflects a regional rotation about a west-northwest-trending flexure, the Marrakai-Coirwong Flexure Zone.

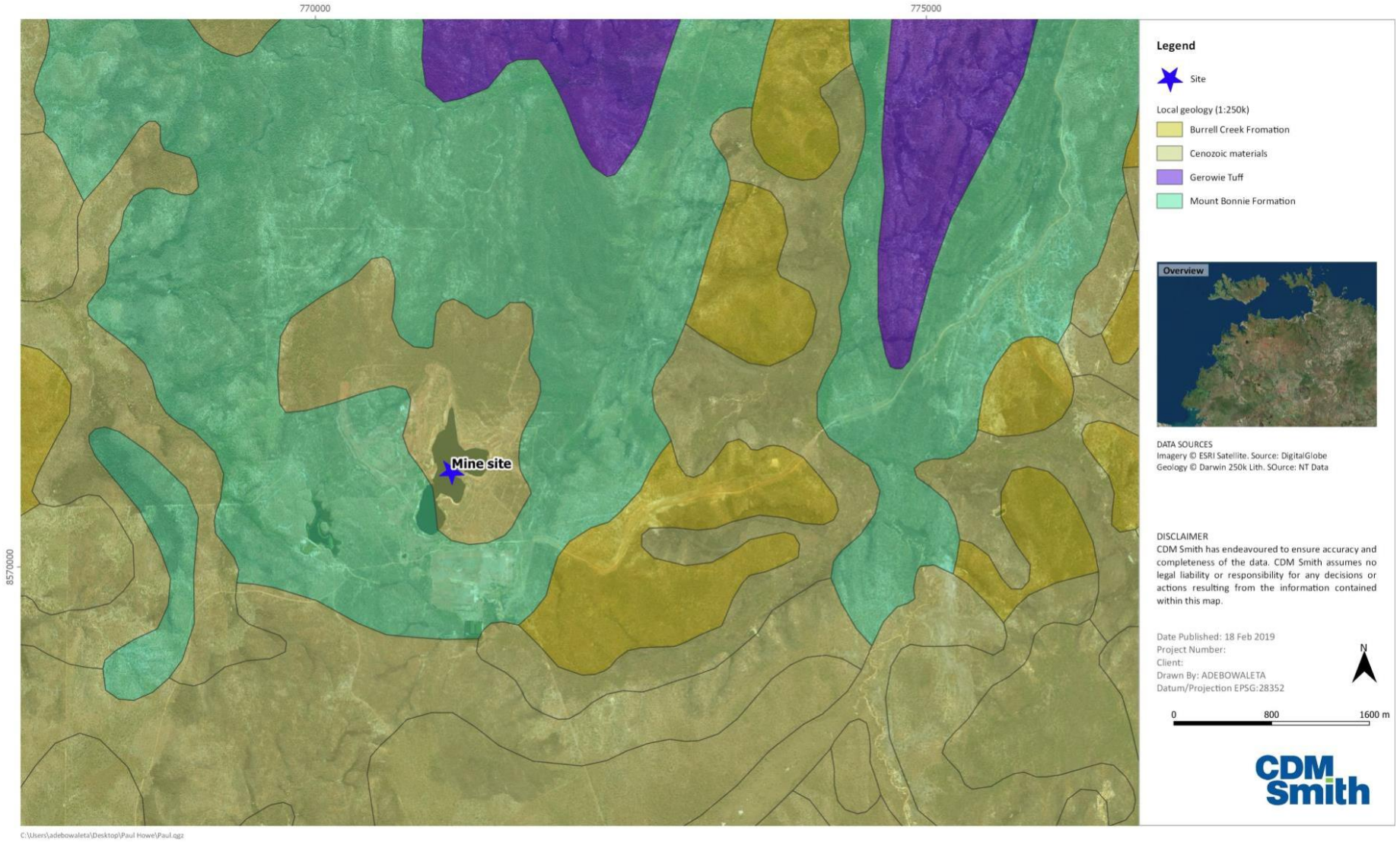


Figure 4-4 Surface Geology of Rustlers Roost Project Area.

The Rustlers Roost Gold Mine is predominantly underlain by folded greywacke and mudstone units. The greywacke units vary between 20 and 50 metres thick within individual beds and have upward fining sequences ranging from 0.5 to 10 metres. Individual beds are usually massive, weakly jointed, relatively soft and erode preferentially to form drainage features parallel to the bedding.

The mudstone units include varying amounts of chlorite, dolomitic carbonate, carbonaceous matter, chert, clastic quartz and accessory leucoxene. Chert nodules, surrounded by pyrite are common and occur preferentially in chlorite rich layers along with 1 - 1 0 mm thick pyrite rich zones. Disseminated pyrite euhedra up to 1mm diameter are common, often forming framboidal clusters. The oxidation of these sulphidic components gives rise to a pervasive haematisation within the oxidised zone.

Sediments are moderately folded about southwest plunging fold axes which have near vertical axial planes.

Geochemistry aspects of the local geology, particularly in relation to acidic metalliferous drainage (AMD), are not addressed in this report in any detail. However, PGO (2017) states that AMD is not likely to be an issue as former mining operations focused on non-acid forming (NAF) oxidised materials, and the water quality data for the pit lake and other surface water sample points supports this conclusion. It is anticipated, though, that materials transitioning from weathered to fresh, and fresh basement may be potentially acid forming (PAF).

4.2.3 Quest 29 Geology

Figure 4-5 shows the local geology of the Quest 29 portion of the Project area. The Quest 29 portion is underlain by shallow marine, iron rich and tuffaceous sediments of the South Alligator Group, which are open to tightly folded about gently south plunging axes.

The South Alligator Group includes the Koolpin Formation, Gerowie Tuff, Mount Bonnie Formation and the intrusive Zamu Dolerite. The Koolpin Formation consists of ferruginous siltstone and shale, with silicified hematite and chert breccias and minor silicified dolomite. The Gerowie Tuff consists predominantly of thinly interbedded fine grain sediments, glassy crystal tuffs and tuffaceous cherts. Both the Koolpin Formation and Gerowie Tuff show extensive attenuation at fold hinges. The Koolpin Formation and Zamu Dolerite occupy the majority of the Quest 29 portion of the Project area (Primary Gold, October 2020). Regionally, the Koolpin formation averages 100 m in thickness but ranges up to 200 m in fold hinges. The Koolpin formation is intruded in areas by the Zamu dolerite (massive quartz dolerite).

Two main auriferous trends have been identified along approximately north-south oriented shear structures. The main prospects occur on shear zones within the Koolpin Formation and Zamu Dolerite. Gold mineralisation at Quest 29 is related to a structurally prepared environment.

In the Koolpin Formation the gold is hosted by weakly sulphidic (pyrite-arsenopyrite) carbonaceous siltstone sequences with minor quantities of thin quartz veining. The dominant mineralised shear direction is 350°-020° (i.e. parallel to fold axes) dipping 20°-40° west.

In the Zamu Dolerite the gold is hosted by sulphidic (pyrite-arsenopyrite) shears within the dolerite and along the western contact between the dolerite and host sediments. The dominant mineralised shear direction is 350°-020° (i.e. parallel to fold axes) dipping 30°-50° west within the dolerite and steeply east along the eastern contact.

On the limbs of the anticline along the south-eastern and western edges of the lease exposures of Gerowie Tuff occur, comprising silicified silstone, argillite, crystal tuff end chert with an average thickness of 600 m. In the north of the Quest 20 portion, the anticline is truncated by the Mount Bundy Granite which outcrops in an extensive batholith. North-east of the lease the contact between the meta-sediments and the granite is truncated by major fault with an offset of 100 m. There are no other major faults mapped on the mining lease.

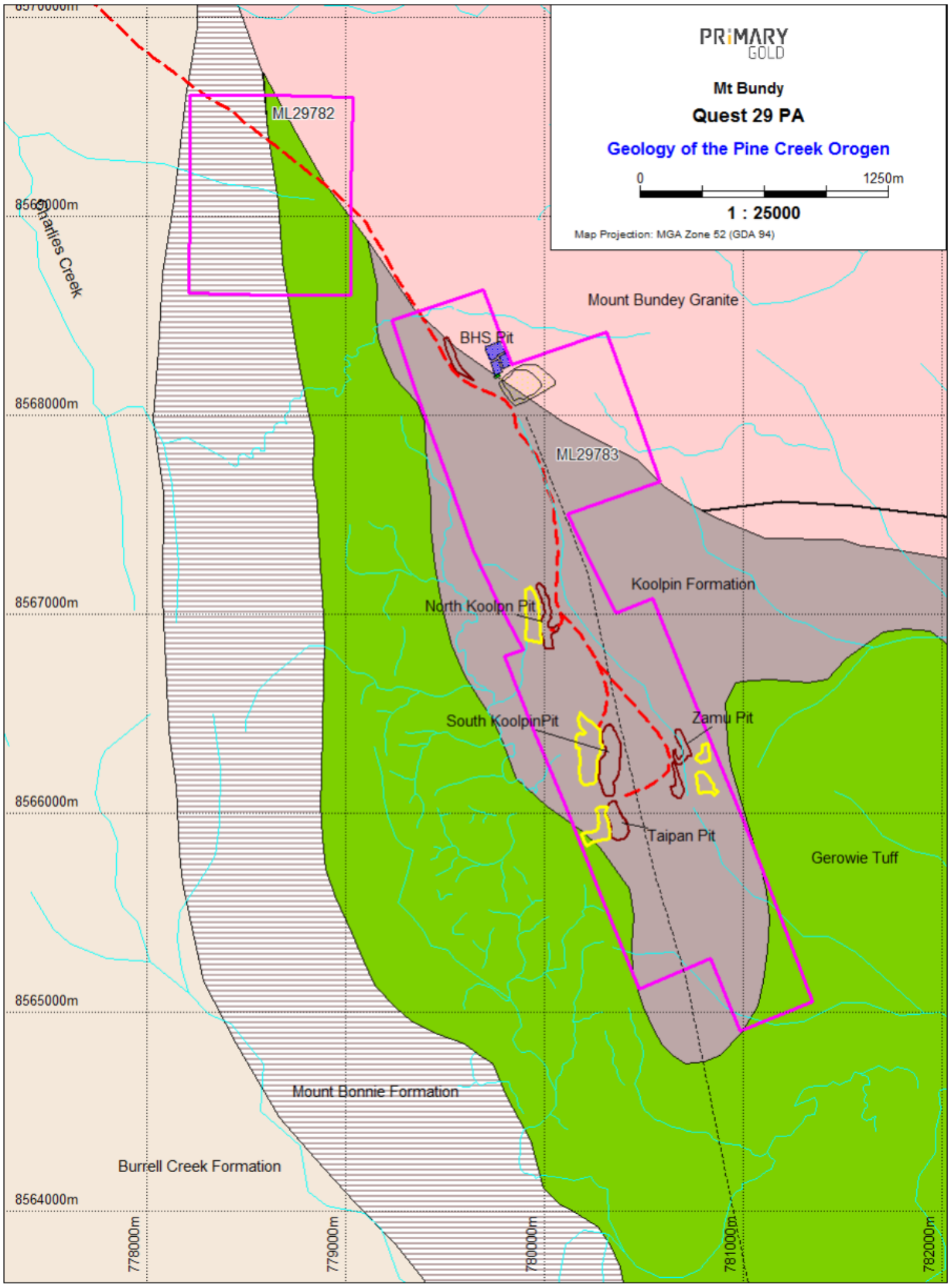


Figure 4-5 Surface Geology of Quest 29 Project Area

4.3 Beneficial Water Use and Environmental Values

4.3.1 Beneficial Water Use

An important part of water quality management is to identify how the community values and uses a water resource. Beneficial uses describe how a water resource benefits the community. Throughout the NT, beneficial uses or values have been set for major aquifers and river catchments. There are ten categories used to describe values for surface water and groundwater and these values are used to set water quality targets. The same water quality is not required for all types of water use.

Beneficial Use Declarations (BUDs) assist in the development of water management plans. The plans may result in an aim to improve the current water conditions, achieve different water quality in parts of a catchment or recognise that a water resource cannot achieve a certain quality in the short term. A BUD is also used to inform a Waste Discharge Licence (WDL); they establish the objectives or guidelines for a water resource to protect against unwanted water quality impacts.

A BUD for the Mary River surface water catchment (including all tributaries, lakes, lagoons, swamps, and marshes) has been set and the defined beneficial uses are environment, riparian and cultural. There is no BUD over the Adelaide River catchment to the east of the river, including Marrakai Creek and its tributaries. However, the Darwin Rural Water Control District includes the Adelaide River catchment to the west of the river and with defined beneficial uses for all surface water and groundwater being agriculture, aquaculture, public water supply, environment, cultural, industry, rural stock and domestic, mining and petroleum activities. The objectives that apply are specified in the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZG 2018). This BUD was gazetted on 13 February 2002 (Gazette G6). The Mary River Surface Water BUD transects the Rustlers Roost portion of the Project area and includes the historical mine area but not Annie's Dam (which forms part of the Adelaide River catchment).

There is also a BUD for the Mount Bundey Creek surface water which begins at the Arnhem Highway crossing of Mount Bundey Creek (approximately 16.5 km downstream of the Project area) and extends to just below the confluence with Coulter Creek. Beneficial uses are stock water supply for the defined part of the waterway and aquatic ecosystem protection for the remainder. This BUD was gazetted on 11 June 1997 (Gazette G23). The nearest location to the Project area is an aquatic ecosystem protection zone.

No BUD declarations are in place for McKinley River downstream of the Quest 29 portion of the Project (a declaration occurs on McKinley River upstream); however, the section of McKinley River between the Project area and Mary River is within the Mary River surface water BUD.

A BUD for the Mary River catchment groundwater has also been set with defined beneficial uses being environmental, riparian and agricultural.

Based on the BUD declarations for areas downstream of the Project, beneficial uses for the receiving environment include:

- Agricultural and stock water supply;
- Environmental and riparian; and
- Cultural.

These uses within the Project area, surrounds and downstream environment are discussed further below.

4.3.1.1 Agricultural and Stock Water Supply

The aim of the BUD is to maintain the productivity of the land and the water resource to ensure agricultural and stock water supply in accordance with the principle of ecologically and economically sustainable development.

Historically the Rustlers Roost and Quest 29 Project area has been concurrently used for pastoral activities like grazing of native vegetation by cattle as the mining leases are located on Old Mount Bundey Station and McKinlay River Pastoral Station.

Primary Gold holds an access agreement with the existing leaseholder of Old Mount Bundey Station. A separate agreement with the leaseholder of McKinlay River Station will be finalised prior to Project construction and is expected to align with the existing agreement. The agreements require that PGO, consistent with operational requirements and approval conditions, take reasonable measures to limit interference with surface and groundwater resources, to maintain water quality suitability for stock water supply in accordance with ANZG (2018) stock drinking water guidelines.

The predominant agricultural land use in the region includes pastoral stations and orchards, with the most extensive land use in the vicinity of the Project area being pastoral, involving low intensity grazing of beef cattle over the woodland terrain. Grazing is also widespread in neighbouring areas including Adelaide River, Jabiru, Pine Creek and further afield in the greater Darwin and Katherine regions. Smaller agricultural activities like orchards and aquaculture have been identified within the BUD areas.

4.3.1.2 Environmental and Riparian

Identified environmental values such as the wetland and permanent water bodies in the Mary Floodplain for surface water BUD and riparian vegetation associated with groundwater dependent ecosystems for groundwater are dependent on good water quality and reliable stream flows. The surface water in the lower Mount Bundey creek as a tributary to the larger Mary River Floodplain system is connected to the Project area and is of significance for the health of the aquatic ecosystems downstream of the Project area. Baseline and regular water monitoring will be undertaken to support the aquatic and riparian ecosystems of the Mary River Floodplain to confirm that water quality is in accordance with ANZG (2018) 95% species protection guidelines and Project related site specific trigger values (SSTV).

4.3.1.3 Cultural

The BUD also recognises that water resources have important cultural and spiritual values, particularly for indigenous peoples. While there were no recorded or registered sacred sites identified during an AAPA Certificates search, culturally significant areas relevant to the BUD and downstream of the Project area have been identified in the EIS.

Other cultural use may include recreational activities. For example, the Mary River floodplain is a major tourist and recreational fishing attraction for the region. Recreational fishing locations downstream within the Mary River system includes Hardies Creek (approximately 10 km downstream from the Arnhem Highway crossing), Corroboree Billabong (approximately 20 km downstream) and Shady Camp (approximately 60 km downstream). In addition, the Adelaide River floodplain is also a major tourist attraction for recreational fishing in the region.

While there is no specific guidance for protection of these values in the ANZG (2018) guidelines, consideration must be given to cultural issues in the planning and management of water resources. For example, to maintain water quality that supports cultural values the specific water quality objectives for the relevant environmental values are applied (e.g. ANZG (2018) 95% species protection) in the Project WMP.

4.3.2 Groundwater Environmental Values

Groundwater Dependent Ecosystems

Whilst regional groundwater systems provide water sources for pastoral and other anthropogenic uses, groundwater also supports surface (above ground) and subsurface (below ground) ecosystems that are likely to include habitat for threatened species. The Australian GDE toolbox (Richardson *et al.,* 2011) provides a framework to assist with the identification of GDEs and the management of their water requirements. The toolbox adopts the approach of Eamus *et al.,* (2006) and classifies GDEs based on the role groundwater plays in maintaining biodiversity and ecological condition.

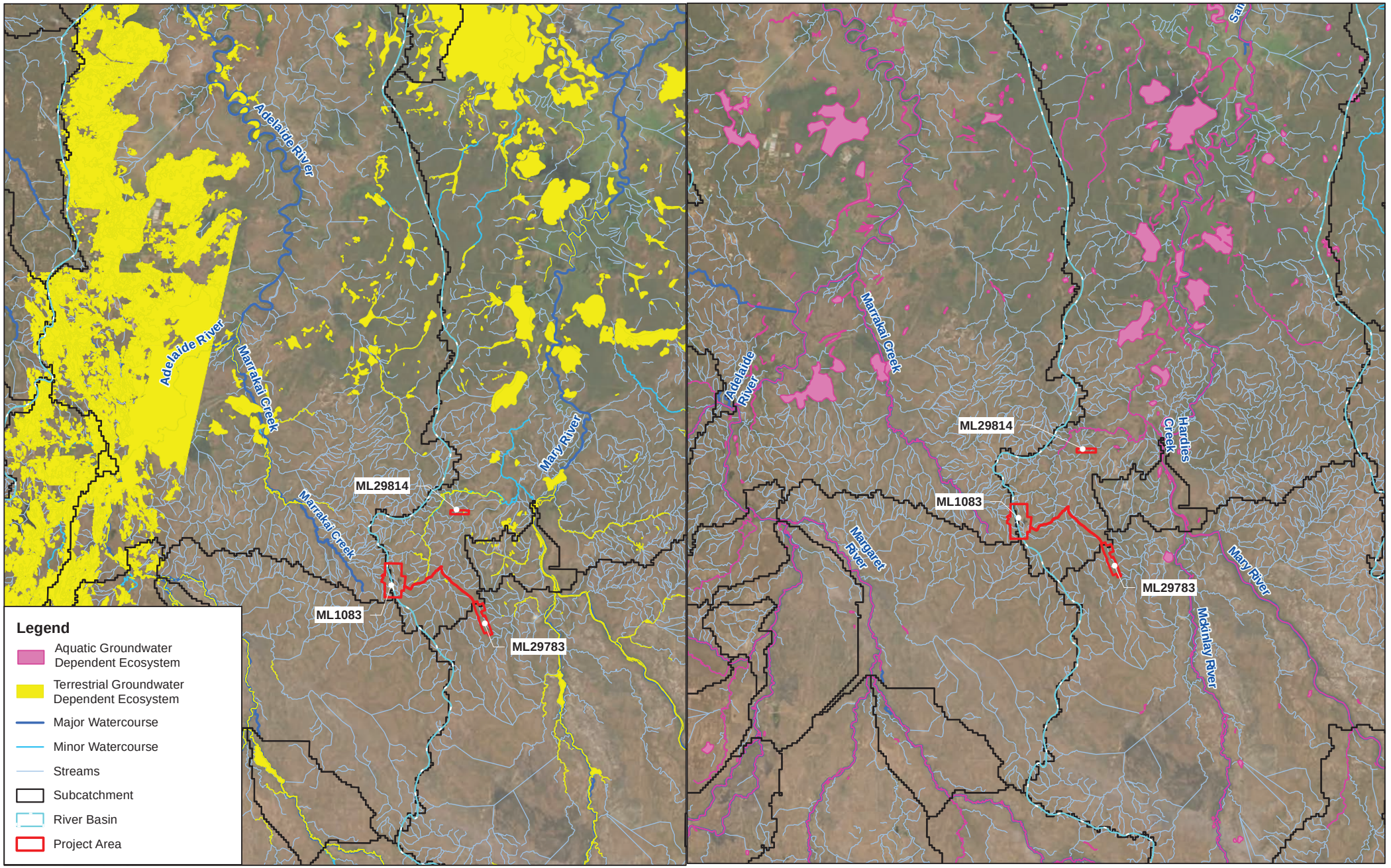
Three types of GDEs are defined by the GDE toolbox:

- Subterranean ecosystems dependent on water held in aquifers (e.g. stygofauna) or inundated caves (Type 1 GDEs). These ecosystems typically include karst aquifer systems and fractured rock groundwater environments;
- Ecosystems dependent on the surface expression of groundwater (Type 2 GDEs), including wetlands, lakes, seeps, springs, and river baseflow systems. In these cases, surface expression of groundwater exists, providing water that can support aquatic biodiversity through access to habitat (especially when surface run-off is low or non-existent) and regulation of water chemistry and temperature; and
- Ecosystems dependent on subsurface presence of groundwater (Type 3 GDEs), including terrestrial and riparian vegetation that depends on groundwater either seasonally, episodically or permanently to prevent water stress and avoid adverse impacts to their condition. Groundwater that Type 3 GDEs depend on is not visible from the surface. Type 3 GDEs can exist wherever the water table and capillary fringe is within the root zone of the plants, either permanently or episodically. The capillary fringe is the semi-saturated zone of soil above the water table.

For the Northern Territory, the National Atlas of GDEs (GDE Atlas) presents the best current knowledge of ecosystems that may depend on groundwater at a broadscale level. At the beginning of 2017, the GDE Atlas was updated with the latest information pertaining to GDEs and therefore the GDE Atlas can be considered as the primary data source.

There are no mapped Type 1 GDEs within either the Project area (including the general region) or downstream (the Northern Territory has not been mapped for type 1). In addition, there are no type 2 GDEs mapped within the Project area; however, the lower reaches of Mount Bundey Creek, the McKinley River and lower reaches of Marrakai Creek are mapped as having a high potential for aquatic GDEs.

The GDE Atlas maps Type 2 GDEs (i.e. surface expressions) as potentially occurring consistently along the entire length of the downstream receiving watercourses including the Adelaide River and Mary River (Figure 4-6). Similarly, Type 3 terrestrial GDEs are mapped as potentially occurring along large portions of the downstream area, but at a much broader scale (i.e. greater width along the riparian corridor). However, type 3 GDE mapping extends further upstream in both Marrakai Creek and Mount Bundey Creek, in proximity to the haul road. Potential GDE mapping covers areas mapped as potential habitat for threatened species. It is likely that swathes of the mapped downstream habitat access water through either surface expression of groundwater (Type 2) or subsurface groundwater (Type 3).



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DESIGNED	SS	CHECKED	TK
DRAWN	SS	CHECKED	TK
APPROVED	TK	DATE	20/08/21

Notes:

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0 4,125 8,250 16,500

Meters

1 cm = 3,872 meters

GCS GDA 1994 MGA Zone 52

DISCLAIMER
CDM Smith has endeavoured to ensure accuracy and completeness of the data. CDM Smith assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

DATA SOURCE
NT Government Open Source Data

DESIGNER

CDM Smith

CLIENT

PRIMARY GOLD

FIGURE 4-6

Groundwater Dependent Ecosystem Mapping

DRG Ref: 1001087-EIS-07-7.26

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Aquatic Vegetation

Aquatic habitat values that provide for aquatic plants in the Project area are limited by the ephemeral nature of flows in the higher order watercourses that drain the sites and the lack of natural permanent water bodies. No submerged aquatic plants were identified during the surveys. This underpins the highly ephemeral nature of the creeks and drainage lines (AES 2019). However, images from site inspections indicate the presence of aquatic vegetation at numerous locations related with previous mining and pastoral activities within the Project area (Annie's Dam, Rustlers Roost and Quest 29 pit lakes and leach ponds). These waterbodies, however, will be predominantly consumed by new and extended mining infrastructure.

4.3.3 Groundwater Environmental Values and Water Quality Objectives

In accordance with the surface water and groundwater beneficial use declarations, water quality objectives and indicators need to be considered within the Project area to protect the following beneficial uses/environmental values:

- Water use for agricultural purposes – irrigation water for primary production;
- Water use for farming purposes – livestock water supply;
- Health of aquatic ecosystems; and
- Cultural and spiritual environmental values.

The objectives of the National Water Quality Management Strategy (NWQMS) (Australian Government, 2018) is to enable effective water quality management for the delivery of fit-for-purpose water that supports community values. The NWQMS provides information that is applicable to all types of water in Australia, including fresh water, marine water, groundwater, estuarine water and recycled water; and that will support different purposes of the water, such as for drinking, the environment, primary industry, recreation, industry and cultural and spiritual values. The NWQMS provides a national framework for assessing and managing water quality issues and robust guidelines based upon best available science.

As per the NWQMS (Australian Government, 2018), water quality objectives are the locally specific guideline values for relevant indicators that will protect all the community values and management goals. These objectives can be numerical guideline values, a narrative statement and/or targets to be achieved over time. The guideline values are usually based on scientific or expert advice about what water quality is required to protect each community value or management goal.

Based on the identified beneficial uses, the following default guideline values have been adopted:

- The toxicant Default Guideline Values (DGVs) for the protection of freshwater ecosystems protection, as per the 2018 *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018). DGVs have been developed for three categories of current or desired ecosystem conditions, i.e:
  - High conservation or ecological value systems. Where local biological or chemical data have not yet been gathered, the 99% species protection default guideline values (DGVs) apply, if they exist.
  - slightly to moderately disturbed systems. For toxicants in water, apply 95% species protection DGVs, or 99% species protection for highly bioaccumulating toxicants, if local biological-effects data are unavailable.
  - highly disturbed systems. For toxicants in water, the 90% or 80% species protection DGVs are considered acceptable.

  It must be noted that the Mount Bundey catchment is classified as "tropical lowland rivers and streams" and is considered a highly disturbed ecosystem.
- The livestock (beef cattle) drinking water trigger values, as per the ANZECC 2000 Water Quality Guidelines (ANZECC/ARMCANZ, 2000); and

- The short- and long-term trigger values in irrigation water, as per the ANZECC 2000 Water Quality Guidelines (ANZECC/ARMCANZ, 2000).

As per the ANZG 2018 Water Quality Guidelines, ideally site-specific guideline values that are relevant to local conditions or situations should be used instead of default guideline values. Site-specific guideline values have not yet been developed for the Project area. However, in 2015 site-specific trigger levels (SSTVs) were developed for discharge of treated water into the Mount Bundy Creek from the Toms Gully Project Area, which is located about 10kms to the north of the Project area. In 2018, the CSIRO undertook a review of these SSTVs (Stauber & Batley, 2018) and proposed revised wet-season SSTV for the discharge point or compliance site at Toms Gully Mine (SWTG2) after dilution.

The guideline/trigger values adopted for the Project are presented in Table 4-4.

Table 4-4 Water Quality Guidelines/Trigger Values for the Project

Parameter	Units	SSTV [a]	Tropical Australia Lowland Rivers [b]	Freshwater Aquatic Ecosystem 95% Protection Level 95%	Livestock Watering (Beef cattle)	Irrigation	
						Long Term	Short Term
Physico-chemical							
pH	-	5.8 – 8.0	6.0 – 8.0	-	-	-	-
Electrical Conductivity	µS/cm	41	20 - 250	-	-	-	-
Dissolved Oxygen	% sat	-	85 - 120	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	4,000	-	-
Total Suspended Solids	mg/L	54	-	-	-	-	-
Turbidity	NTU	87	2 - 15	-	-	-	-
Metals/metalloids							
Aluminium (pH <6.5)	mg/L	-	-	-	5	5	20
Aluminium (pH >6.5)	mg/L	0.295	-	0.055	5	5	20
Arsenic (As III)	mg/L	0.042	-	0.024	0.5	0.1	2.0
Arsenic (As VI)	mg/L		-	0.013	0.5	0.1	2.0
Cadmium	mg/L	0.0004	-	0.0002	0.01	0.01	0.05
Chromium (Cr III)	mg/L	0.006	-	-	1	0.1	1
Chromium (Cr VI)	mg/L		-	0.001	1	0.1	1
Cobalt	mg/L	-	-	-	1	0.05	0.1
Copper	mg/L	0.0018	-	0.0014	2	0.2	5
Iron	mg/L	2.7	-	-	-	0.2	10
Lead	mg/L	0.0056	-	0.0034	0.1	2	5
Manganese	mg/L	2.5	-	1.9	-	0.2	10
Nickel	mg/L	0.013	-	0.011	1	0.2	2
Selenium (total)	mg/L	-	-	0.011	0.02	0.02	0.05
Uranium	mg/L	-	-	-	0.2	0.01	0.1
Zinc	mg/L	0.015	-	0.008	20	2	5
Major Ions							
Calcium	mg/L	-	-	-	1,000	-	-
Magnesium	mg/L	-	-	-	2,000	-	-
Sulfate as SO4	mg/L	210	-	-	1,000	-	-
Nutrients							
Ammonia	mg/L	1.4	0.01	0.9	-	-	-
Nitrate	mg/L	-	-	-	400	-	-
Nitrite	mg/L	-	-	-	30	-	-
Nitrite + Nitrate as N	mg/L	-	0.01	-	-	-	-
Total Nitrogen as N	mg/L	-	0.2 – 0.3	-	-	5	25 - 125
Total Phosphorus as P	mg/L	-	0.01	-	-	0.05	0.8 - 12

[a]: Toms Gully Project SSTVs (Stauber & Batley, 2018)

[b]: As per Table 3.3.4 and Table 3.3.5 in ANZECC & ARMCANZ 2000 Water Quality Guidelines for lowland rivers.

4.4 Hydrogeology

4.4.1 Introduction

The description of the hydrogeology of the Project area is based on the following information sources:

- Publicly available data and information;
- Historical investigations undertaken by Environmental and Earth Sciences in 1993 (Environmental and Earth Sciences Pty Ltd, January 1993) at the Rustlers Roost portion of the Project area. These investigations comprised:
  - Measurements of standing water levels in existing exploration bores to establish regional groundwater flow direction
  - Aquifer pumping tests within one cased production bore (RN024143), to determine basic hydraulic aquifer parameters in the southern section of the “Backhoe” prospect
  - Groundwater sampling and analysis from exploration bores in the vicinity of the four proposed pits (Backhoe, Beef Bucket, Dolly Pot and Sweat Ridge) and from two background locations within the mining lease.
- Drilling logs, lithological logs and well construction details of registered bores, including bores installed at the Project area in September/October 2020;
- Groundwater monitoring and sampling undertaken by Primary Gold between 2016 and 2019; and
- Groundwater, surface water and open pit monitoring and sampling undertaken by EcOz in 2020-2021.

Location and well construction details of the monitoring wells at the Rustlers Roost portion of the Project area that were monitored/sampled during the above-listed investigations are provided in Table 4-5 and Table 4-6, respectively. Locations are provided on Figure 4-7.

Location and well construction details of the monitoring wells at the Quest 29 portion of the Project area that were monitored/sampled during the above-listed investigations are provided in Table 4-7 and Table 4-8, respectively. Locations are provided on Figure 4-8.

Table 4-5 Details of Historical and Current Groundwater Bores at Rustlers Roost Portion of Project Area

Monitoring Bore ID	Registered Bore Number	PGO Bore ID/ Old Name	Date Drilled	Z52 MGA EASTING	Z52 MGA NORTHING	Top of Casing (mAHD)	Ground level (mAHD)	Bore Depth (mbgl)
RRMB07	RN040084	RMB1	Sep-2020	771121.17	8571662.04	83.12	81.71	68
RRMB08	RN040085	RMB2	Sep-2020	770482.58	8572233.43	78.11	76.77	69.5
RRMB04	RN040086	RMB3	Sep-2020	769630.14	8570176.53	57.43	56.05	69.5
RRMB03	RN040087	RMB4	Sep-2020	770468.34	8569051.5	67.79	66.29	69.5
RRMB05	RN040088	RMB5	Sep-2020	770806.25	8570746.62	73.05	71.67	69.5
RRMB06	RN040089	RMB6	Oct-2020	771554.23	8570825.74	81.17	79.75	69.5
RRMB02	RN041890	RMB7	Oct-2020	771419.83	8569482.53	56.19	54.88	39
RRMB01	-	MB01/GW01	-	771334	8569626	-	-	-
-	RN024143	HALL B MT BUNDEY	Sep-1985	771680	8570061	-	-	61
-	RN029335	HENRY & WALKER CAMP 1	Apr-1994	772230	8569961	-	-	76
-	RN029345	RUSTLERS MINE NO2 MT. BUNDEY	Apr-1994	771680	8570511	-	-	71.5
-	RN029414	VALDORA MINING RUSTLERS ROOST 003 - MT. BUNDY	Aug-1994	771530	8570361	-	-	78
-	RN029415	VALDORA MINING RUSTLER'S ROOST 004 - MT. BUNDEY	Jul-1994	771730	8570261	-	-	74
-	RN029416	VALDORA MINING RUSTLER'S ROOST 005-MOUNT. BUNDEY	Aug-1994	771730	8570761	-	-	86
-	RN029417	VALDORA MINING RUSTLER'S ROOST 006 - MT. BUNDEY	Aug-1994	771830	8570061	-	-	83

Table 4-6 Well Construction Details of Groundwater Bores at Rustlers Roost Portion of Project Area

Monitoring Bore ID	Registered Bore Number	Date Drilled	Bore Depth (mbgl)	Water Bearing Beds (mbgl)	Screened Depth (mbgl)	Screened Lithology
RRMB07	RN040084	Sep-2020	68	57 – 58/64 - 65	56 - 65	Red-brown saprolite
RRMB08	RN040085	Sep-2020	69.5	55 – 56/60 - 64	60.5 – 66.5	Grey-brown saprolite
RRMB04	RN040086	Sep-2020	69.5	20 – 20.5/36 – 36.5/ 44 – 44.5/59 - 60	41 – 47	Grey-brown-black shale with some quartz
RRMB03	RN040087	Sep-2020	69.5	31 - 61	44 – 56	Brown-grey saprolite
RRMB05	RN040088	Sep-2020	69.5	46 - 69	54.5 – 66.5	Black shale
RRMB06	RN040089	Oct-2020	69.5	45 - 61	54.5 – 66.5	Black siltstone/shale
RRMB02	RN041890	Oct-2020	39	34 - 35	27 - 36	Brown-red saprolite with some quartz
RRMB01	??	-	-	-	-	-
-	RN024143	Sep-1985	61	3.6	49 - 61	Grey and black shales
-	RN029335	Apr-1994	76	60 - 64	64 - 76	Fresh grey shales
-	RN029345	Apr-1994	71.5	50.7 – 51/64 – 64.7	59.2 – 67.3	Fresh grey shales
-	RN029414	Aug-1994	78	?	?	Grey shales
-	RN029415	Jul-1994	74	34 - 42	59 - 61	Grey and brown shale
-	RN029416	Aug-1994	86	62 - 74	68 - 80	Fresh grey shale
-	RN029417	Aug-1994	83	63 - 78	59 - 80	Grey shale

Table 4-7 Details of Historical and Current Groundwater Bores at Quest 29 Portion of Project Area

Monitoring Bore ID	Registered Bore Number	PGO Bore ID/ Old Name	Date Drilled	Z52 MGA EASTING	Z52 MGA NORTHING	Top of Casing (mAHD)	Ground level (mAHD)	Bore Depth (mbgl)
Q29MB01	RN32317	No 1	4/10/1999	779639.93	8568388.11			27
Q29MB02	?	-	-	779681.97	8568195.96	-	-	-
Q29MB03	RN41894	QMB3	25/10/2020	780710.69	8565612.63	50.36	48.92	54
Q29MB04	RN41895	QMB4	29/10/2020	780412.20	8566143.51	42.86	41.52	54
Q29MB05	RN41893	QMB2	23/10/2020	780525.43	8566473.66	46.68	45.55	54
Q29MB06	RN41896	QMB5/MB06	31/10/2020	779901.17	8566736.03	53.14	51.80	54
Q29MB07	RN41897	QMB6	4/11/2020	780100.99	8567019.96	57.28	55.88	54
Q29MB08	RN41898	QMB7	6/11/2020	780102.97	8568066.94	94.86	93.42	52.5
Q29MB09	RN41892	QMB1	8/10/2020	779410.88	8568472.57	68.04	66.66	54
-	RN008987	DDH QUEST 29/4 MT BUNDEY	22/12/1976	780130	8567361	-	-	153
-	RN008907	DDH QUEST 29/3 MT BUNDEY	3/09/1976	780480	8566811	-	-	22.5
-	RN008893	DDH QUEST 29/1 MT BUNDEY	23/07/1976	780630	8566311	-	-	17.8

Table 4-8 Well Construction Details of Groundwater Bores at Quest 29 Portion of Project Area

Monitoring Bore ID	Registered Bore Number	Date Drilled	Bore Depth (mbgl)	Water Bearing Beds (mbgl)	Screened Depth (mbgl)	Screened Lithology
Q29MB01	RN32317	4/10/1999	27	-	23 - 27	Fresh, broken, shattered dolerite
Q29MB02	?	-	-	-	-	-
Q29MB03	RN41894	25/10/2020	54	23 – 47	23.5 – 32.5 47.5 – 50.7	Shale and saprock
Q29MB04	RN41895	29/10/2020	54	37 – 38 40 – 44 50 - 52	40 – 52	Siltstone + dolerite + shale
Q29MB05	RN41893	23/10/2020	54	26 – 38	24 – 36	Shale
Q29MB06	RN41896	31/10/2020	54	18 – 19 24 – 25 33 – 37	19 – 25 31 – 37	Shale + dolerite + siltstone
Q29MB07	RN41897	4/11/2020	54	29 – 30 38 – 39 43 - 45	25 - 31	Sandstone
Q29MB08	RN41898	6/11/2020	52.5	49 – 49.5	45.5 – 51.5	Shale
Q29MB09	RN41892	8/10/2020	54	30 – 50	22 – 31	Siltstone
-	RN008987	22/12/1976	153	50	Not installed	Not installed
-	RN008907	3/09/1976	22.5	15?	11 - 17	Alluvium and weathered siltstone
-	RN008893	23/07/1976	17.8	15	10 - 17	Alluvium and granite wash

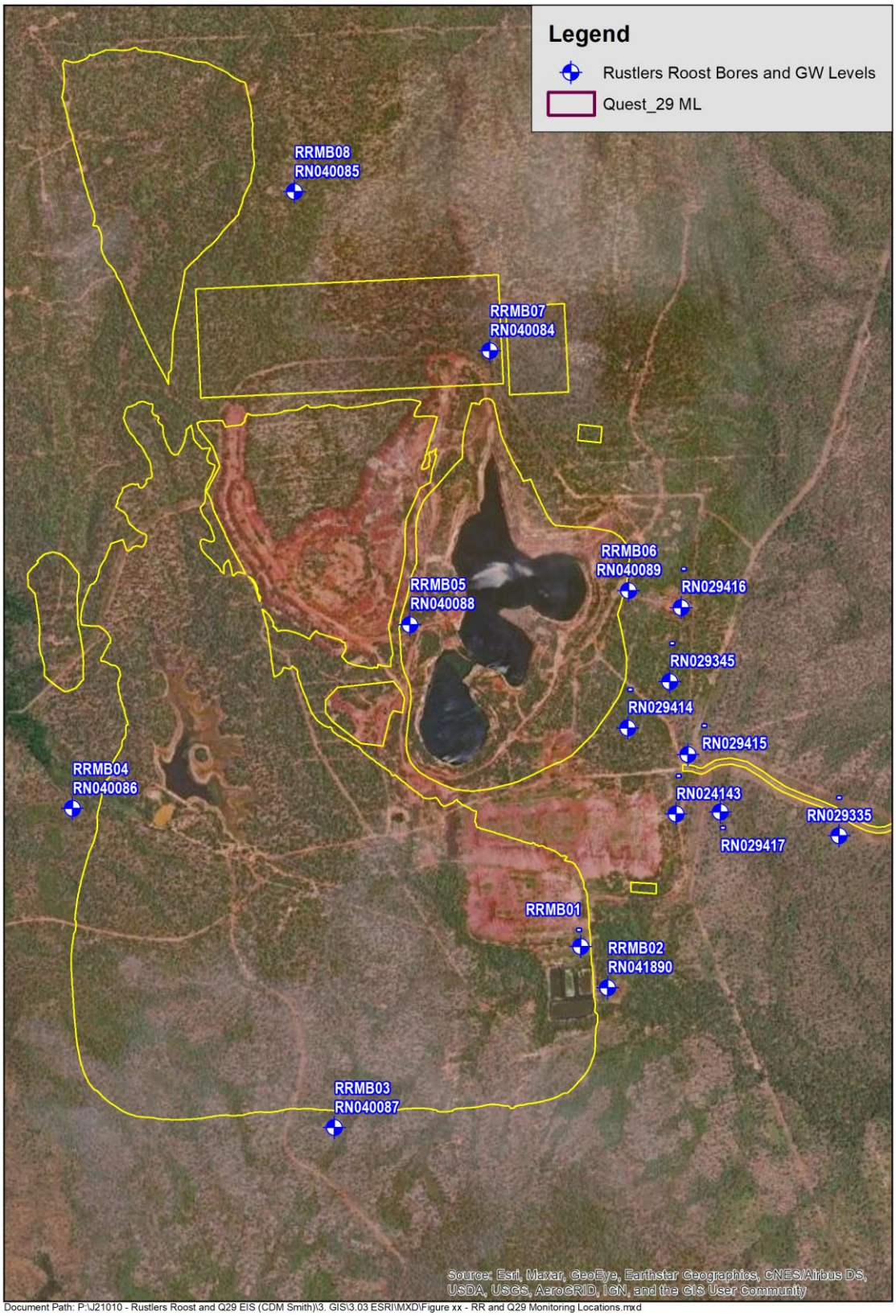


Figure 4-7 Location of Groundwater Monitoring Wells at Rustlers Roost

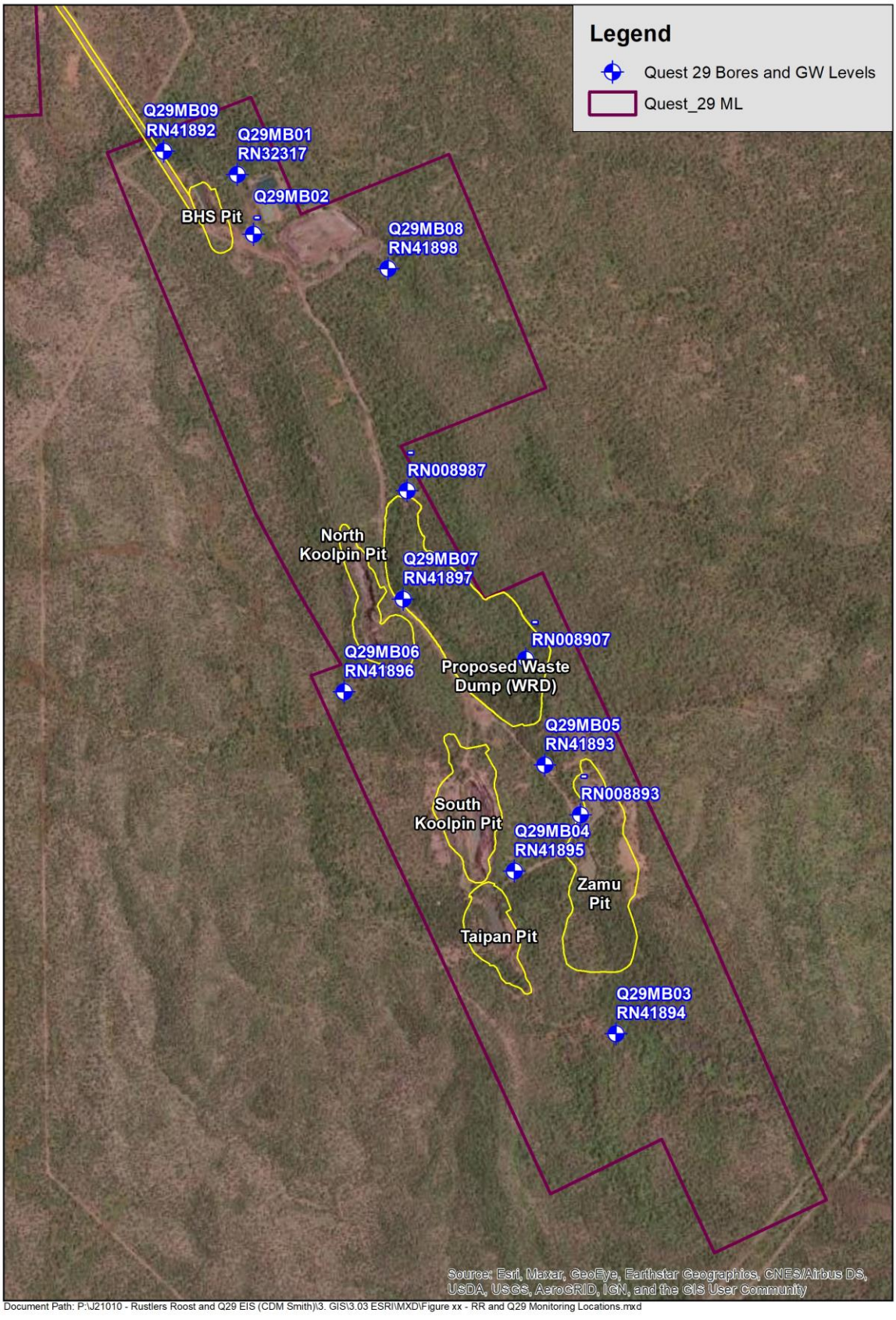


Figure 4-8 Location of Groundwater Monitoring Wells at Quest 29

4.4.2 Aquifer Systems

The regional groundwater system comprises of intermediate-scale aquifers associated with unconsolidated sediments and local-scale aquifers associated with fractured and weathered rocks (Tickell, 2019). The Project is situated near the northern flank of the Pine Creek Geosyncline. Aquifers, where they occur, are typically associated with increased structural deformation of the metasediments.

At Rustlers Roost, aquifers are typically associated with increased structural deformation within the metasediments. The local aquifer system recharges by direct infiltration of rainfall and run-off through areas of aquifer outcrop or shallow subcrop and overlying cover materials (Primary Gold, 2019).

At Quest 29, Groundwater Enterprises (2020) indicates that there is limited groundwater information available onsite or in the immediate vicinity of the lease. Regional scale mapping suggests aquifers across the lease are local scale systems in fractured and weathered rocks with expected bore yields of 1-3 L/s in the metasediments and <0.75 L/s in the Mt Bundey Granite (Tickell, 2019). Higher permeabilities are likely associated with structural deformation within the metasediments/dolerite (Sirocco, 1999) and at local scale.

4.4.3 Aquifer Hydraulic Properties

4.4.3.1 Rustlers Roost and Quest 29

The results of aquifer pumping test undertaken by EES at Rustlers Roost in 1993 (Environmental and Earth Sciences Pty Ltd, January 1993) in the vicinity of the Backhoe Prospect area can be summarised as follows:

- The 26-hour duration test comprised a constant discharge test with pumping at a rate of 1.76 litres/second from the then existing production bore (RN24143) and measured of standing water levels within the production bore and fifteen (15) surrounding, uncased exploration bores;
- During the test, the aquifer behaved in an infinite, isotropic, non-leaky artesian manner where no aquifer boundaries were intercepted. In practice, due to the aquifer's facture nature, some long-term boundaries would be expected;
- Calculated transmissivity of the production bore was 93 $m^3/d/m$. Assuming a saturated aquifer thickness of 30 to 80 m, calculated hydraulic conductivity would range from 1 to 3.3 m/day;
- Calculated storativity values range from $2x10^{-3}$ to $8x10^{-4}$; and
- Anisotropy of the groundwater flow was expected in the north/south direction which is parallel to the main strike of the surrounding lithologies. However, any anisotropy that may be present in this area was not noted, primarily as a result of the lack of observation wells monitored laterally.

Hydraulic testing has been undertaken by slug test in groundwater monitoring wells at Rustlers Roost and Quest 29 (Groundwater Enterprises 2021). Reported hydraulic conductivity at Rustlers Roost ranges from 0.8 — 12.5 m/day, with a geometric mean of 4.1 m/day. Reported hydraulic conductivity at Quest 29 ranges from 0.3 — 38.8 m/day with geometric mean of 5.2 m/day.

The Project monitoring bores were constructed across the highest yielding zone of the drilled sequence. The derived hydraulic conductivities are representative of the more permeable, heavily fractured intervals of the aquifer system. The screened interval of the tested Rustlers Roost bores ranged from 27 m to 67 m below ground level (mBGL) mainly within shale, siltstone and saprolite, and of the tested Quest 29 bores from 19 mBGL to 52 mBGL mainly within shale, dolerite, siltstone and sandstone.

4.4.3.2 Nearby Toms Gully Site

Pumping test for the nearby Toms Gully Mine revealed hydraulic conductivity estimation ranging from 0.1 to 1 m/d for the fractured and jointed siltstone basement (AGE 2019). The calibration of the Toms Gully groundwater model (AGE 2019) assumed value of hydraulic properties of 0.001 m/d for the bedrock and much higher hydraulic conductivity for the ore body (0.2 m/d to 20 m/d). The results of the tests suggest that the fractured rock aquifer has a high secondary permeability.

4.4.3.3 Summary

Table 4-9 summarises the hydraulic conductivity estimates from previous and current investigations, including studies related to the nearby Toms Gully Mine. The slug test estimates are relatively high, which may be influenced by the gravel pack surrounding the tested bores.

Table 4-9 Hydraulic Conductivity Estimates (m/d) from Previous Investigations

Location	Method	Formation	Geometric mean	Minimum	Maximum	Source
Rustlers Roost	Pump test	Not specified	1.2	0.8	1.8	Valdora (1994)
Rustlers Roost	Slug test	Not specified	4.1	0.8	12.5	Groundwater Enterprises (2021)
Quest 29	Slug test	Not specified	5.2	0.3	38.8	Groundwater Enterprises (2021)
Toms Gully	Pump test	Fractured and jointed Siltstone	0.5	0.1	1.0	AGE (2019)
Toms Gully	Pump test	Ore zone and Crabb Fault	323	220	915	AGE (2019)
Toms Gully	Model calibration	Wildam Siltstone	0.001	0.001	0.001	AGE (2019)
Toms Gully	Model calibration	Ore zone	NA	0.2	20	AGE (2019)
Toms Gully	Model calibration	Bedrock	0.001	0.001	0.001	AGE (2019)
Toms Gully	Model calibration	Bedrock	0.2	0.01	1.0	GHD (2018)

4.4.4 Groundwater Levels and Flow Direction

4.4.4.1 Rustlers Roost Historical Investigations

Standing groundwater levels measured during the EES 1993 hydrogeological study (Environmental and Earth Sciences Pty Ltd, January 1993) were approximately 25 to 30 metres below ground level.

The groundwater gradient was flat, sloping gradually at 0.2 to 0.3% toward the Mary River (approximately 20 km) in the east. The groundwater level fell approximately 1.7m over 900m from west to east, (i.e. 0.2%) and 0.7 metres over 900 m from the north to the south. The measured depths indicated that the level fell 2.3m over 600m from south of the lateritic plateau (0.3%) to the north.

During the EES 1993 hydrogeological study, no wet and dry seasonal groundwater level variations had been measured within the mining lease. However, Power and Water Authority records indicated that the late wet season levels were approximately 6 to 8 metres higher than at the end of the dry season.

Groundwater monitoring undertaken by Valdora staff during November 1992 indicated water levels in the range of 0.5 to 0.9 m lower than in November 1993. This most likely reflected a drier than normal wet season, as well as different monitoring methods and annual rainfall variations.

4.4.4.2 Rustlers Roost 2020-2021 Groundwater Levels

Depth to groundwater measurements by EcOz during the 2020-2021 groundwater monitoring program are presented in Table 4-10, with corresponding reduced standing groundwater levels (relative to mAHD) presented in Table 4-11 and on Figure 4-9.

Groundwater levels generally rise during and immediately following the wet season, in response to increased rainfall and direct rainfall recharge to the aquifers. The response to the rainfall recharge is similar for all monitored bores. The average groundwater levels by season and the lowest and highest observed groundwater levels are presented in Table 4-12.

Table 4-10 Rustlers Roost Depth to Groundwater (mbTOC) 2020-2021

EcOz Bore ID	PGO ID	10/09/20	21/10/20	09/11/20	10/11/20	04/12/20	06/01/21	07/01/21	03/02/21	10/03/21	11/03/21	16/04/21	29/04/21	06/05/21	07/07/21	08/07/21
RRMB01	MB01/GW01	4.06	4.29	4.65	-	2.5	-	2.21	2.27	-	2.18	2.24	2.3	-		2.58
RRMB02	RMB7	-	-	4.5	-	4.56	3.59	-	2.83	1.4	-	0.78	0.91	-		1.91
RRMB03	RMB4	-	-	14.99	-	15.18	14.42	-	13.37	11.33	-	10.31	-	10.57	11.68	
RRMB04	RMB3	-	-	-	7.84	7.98	6.93	-	5.77	4.3	-	3.65	-	3.92	4.95	
RRMB05	RMB5	-	-	-	16.08	16.19	15.43	-	15.16	-	12.42	11.98	12.16	-		12.97
RRMB06	RMB6	-	-	24.43	-	24.52	-	23.88	23.7	20.98	-	20.44	-	20.62		20.4
RRMB07	RMB1	-	-	-	26.51	26.65	26.11	-	25.82	23.02	-	22.22	-	22.37		23.23
RRMB08	RMB2	-	-	-	27.28	27.49	27.53	-	26.84	24.75	-	22.34	-	21.97		22.71

mbTOC: metres below top of casing

Table 4-11 Rustlers Roost Reduced Standing Groundwater Level (mAHD) 2020-2021

EcOz Bore ID	PGO ID	10/09/20	21/10/20	09/11/20	10/11/20	04/12/20	06/01/21	07/01/21	03/02/21	10/03/21	11/03/21	16/04/21	29/04/21	06/05/21	07/07/21	08/07/21
RRMB02	RMB7	-	-	51.693	-	51.633	52.603	-	53.363	54.793	-	55.413	55.283	-	-	54.283
RRMB03	RMB4	-	-	52.803	-	52.613	53.373	-	54.423	56.463	-	57.483	-	57.223	56.113	-
RRMB04	RMB3	-	-	-	49.585	49.445	50.495	-	51.655	53.125	-	53.775	-	53.505	52.475	-
RRMB05	RMB5	-	-	-	56.971	56.861	57.621	-	57.891	-	60.631	61.071	60.891	-	-	60.081
RRMB06	RMB6	-	-	56.742	-	56.652	-	57.292	57.472	60.192	-	60.732	-	60.552	-	60.772
RRMB07	RMB1	-	-	-	56.613	56.473	57.013	-	57.303	60.103	-	60.903	-	60.753	-	59.893
RRMB08	RMB2	-	-	-	50.831	50.621	50.581	-	51.271	53.361	-	55.771	-	56.141	-	55.401

mAHD: metres Australian Height Datum

Note: Reduced standing groundwater levels relative to mAHD could not be calculated for bore RRMB01, as no survey data is available for this bore.

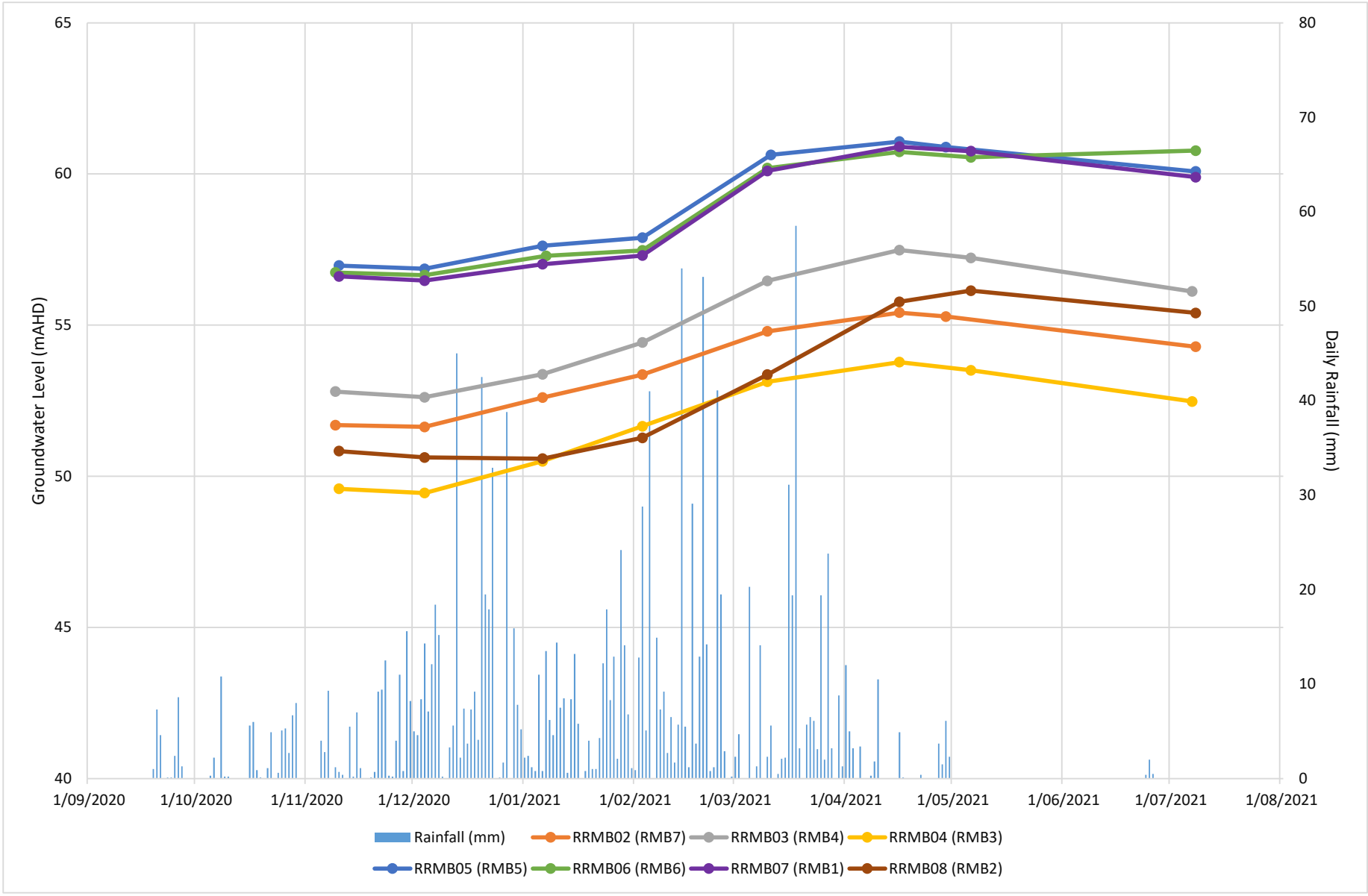


Figure 4-9 Rustlers Roost Reduced Standing Groundwater Levels (mAHD)

Table 4-12 Rustlers Roost Average Seasonal and Lowest and Highest Groundwater Levels (mAHD)

Bore ID	Winter, dry season	Hot, dry-wet transition	Summer, wet season	Hot, wet-dry transition	2020-2021	Lowest (04/12/2020)	Highest (16/04/2021)
RRMB02	54.28	51.69	53.10	55.35	53.63	51.63	55.41
RRMB03	56.67	52.80	54.22	57.48	55.06	52.61	57.48
RRMB04	52.99	49.59	51.18	53.78	51.76	49.45	53.78
RRMB05	60.08	56.97	58.25	60.98	59.00	56.86	61.07
RRMB06	60.66	56.74	57.90	60.73	58.80	56.65	60.73
RRMB07	60.32	56.61	57.72	60.90	58.63	56.47	60.9
RRMB08	55.77	50.83	51.46	55.77	53.00	50.62	55.77

The regional groundwater flow and direction would be to the east/northeast of Rustlers Roost, towards the Mary River. However, the groundwater flow and direction are modified on a local scale by the local topography (e.g. the north-east trending hills) and, to a minor extent, by the open pit.

Groundwater level contour maps representing lowest and highest water level conditions are presented in Figure 4-10 and Figure 4-11. Groundwater flow direction that can be inferred from observations is consistent with topographic relief indicating that the water table resemble a subdued representation of ground surface elevation. The open pit does not appear to act as a groundwater sink and is most likely a source of groundwater recharge, with localised outward radial groundwater flow.

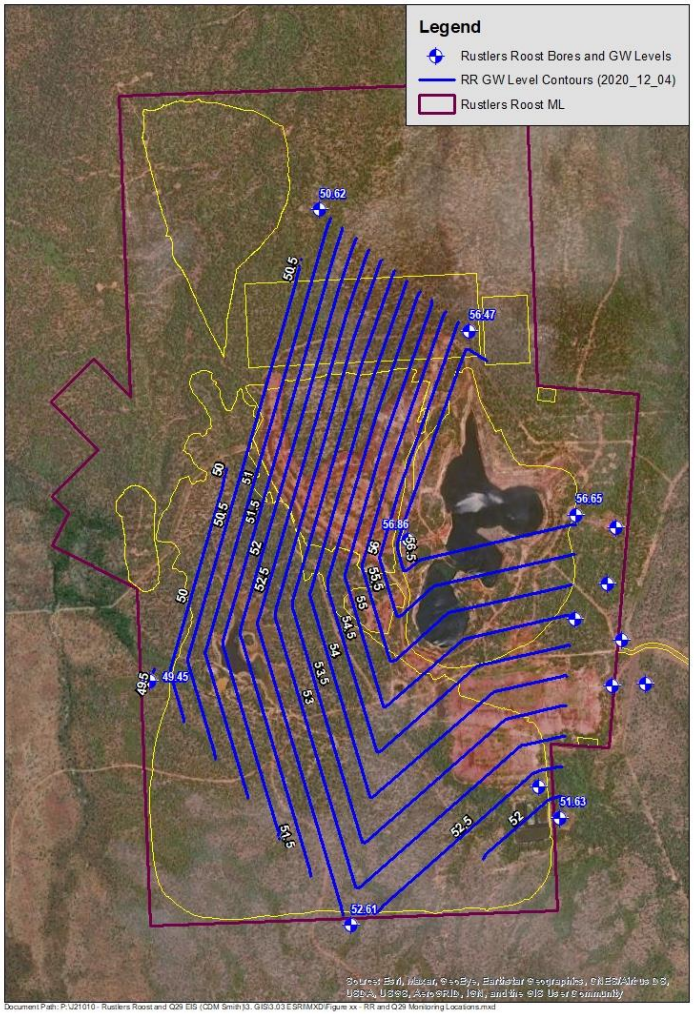


Figure 4-10 Rustlers Roost Groundwater Levels (04/12/2020)

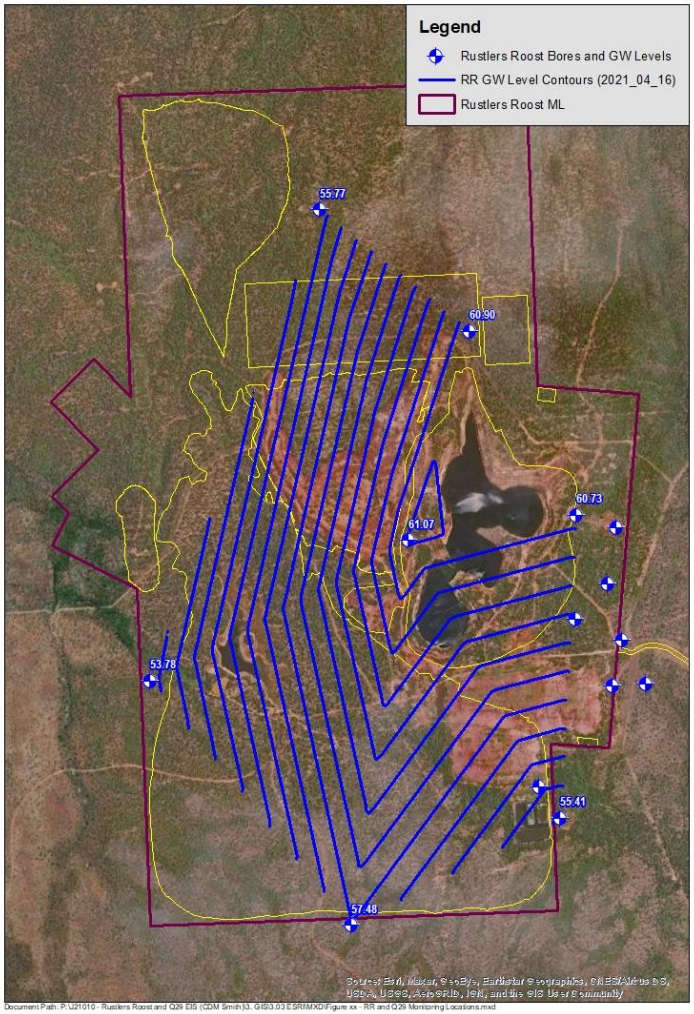


Figure 4-11 Rustlers Roost Groundwater Levels (16/04/2021)

4.4.4.3 Quest 29 2020-2021 Groundwater Levels

Depth to groundwater measured by EcOz during the 2020-2021 groundwater monitoring program are presented in Table 4-10, with corresponding reduced standing groundwater levels (relative to mAHD) presented in Table 4-11 and on Figure 4-9.

Table 4-13 Quest 29 Depth to Groundwater (mbTOC) 2020-2021

EcOz Bore ID	PGO ID	2020				2021					
		9	10	11	12	1	2	3	4	5	7
Q29MB01	No 1	4.91	5.24	5.42	5.31	3.1	2.4	0.42	0.66	-	2.72
Q29MB02	-	10.51	10.88	11.24	11.1	9.1	8.39	6.16	6.41	-	8.41
Q29MB03	QMB3	-	-	16.14	16.2	15.46	14.85	13.37	13.31	-	14.2
Q29MB04	QMB4	-	-	6.06	6.09	4.34	3.95	3.16	3.12	-	4.1
Q29MB05	QMB2	-	-	1.59	1.74	0.82	0.47	-	-	-	0.98
Q29MB06	QMB5/MB06	-	-	7.13	7.13	5.95	5.57	3.54	3.21	-	4.63
Q29MB07	QMB6	-	-	11.23	11.25	10.16	9.88	8.36	8.12	-	10.17
Q29MB08	QMB7	-	-	16.23	16.28	16.32	16.13	11.03	10	-	12.08
Q29MB09	QMB1	-	-	3.08	3	1.62	0.94	-	-	0.46	1.309

mbTOC: metres below top of casing

Table 4-14 Quest 29 Reduced Standing Groundwater Level (mAHD) 2020-2021

EcOz Bore ID	PGO ID	2020				2021					
		9	10	11	12	1	2	3	4	5	7
Q29MB01	-	-	-	-	-	-	-	-	-	-	-
Q29MB02	-	-	-	-	-	-	-	-	-	-	-
Q29MB03	QMB3	-	-	34.221	34.161	34.901	35.511	36.991	37.051	-	36.161
Q29MB04	QMB4	-	-	36.796	36.766	38.516	38.906	39.696	39.736	-	38.756
Q29MB05	QMB2	-	-	45.092	44.942	45.862	46.212	-	-	-	45.702
Q29MB06	QMB5/MB06	-	-	46.014	46.014	47.194	47.574	49.604	49.934	-	48.514
Q29MB07	QMB6	-	-	46.045	46.025	47.115	47.395	48.915	49.155	-	47.105
Q29MB08	QMB7	-	-	78.629	78.579	78.539	78.729	83.829	84.859	-	82.779
Q29MB09	QMB1	-	-	64.962	65.042	66.422	67.102	-	-	67.582	66.733

mAHD: metres Australian Height Datum

Note: Reduced standing groundwater levels relative to mAHD could not be calculated for bores Q29MB01 and Q29MB02, as no survey data is available for the bores.

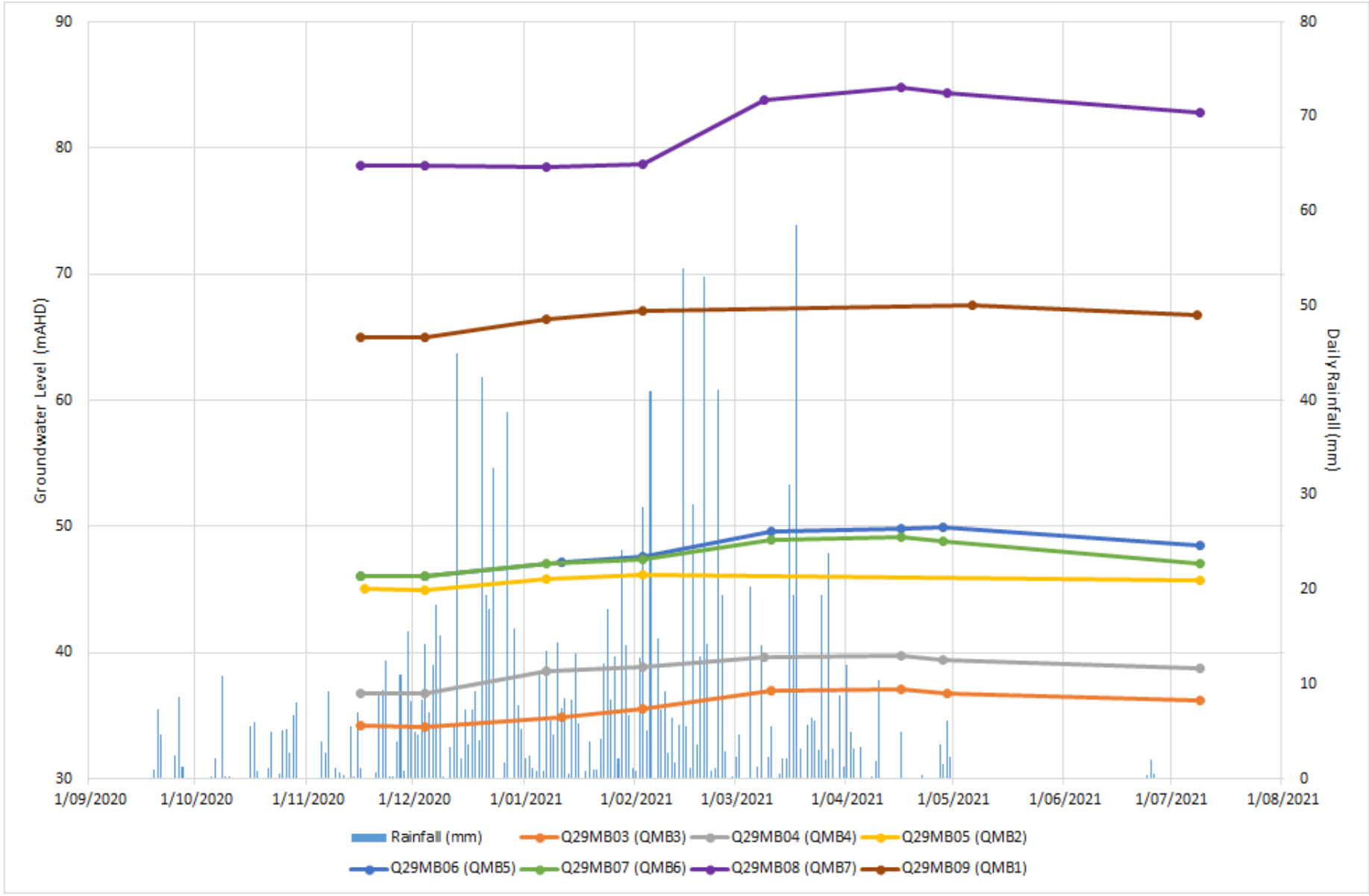


Figure 4-12 Quest 29 Reduced Standing Groundwater Levels (mAHD)

Table 4-15 Quest 29 Average Seasonal and Lowest and Highest Groundwater Levels (mAHD)

Bore ID	Winter, dry season	Hot, dry-wet transition	Summer, wet season	Hot, wet-dry transition	2020-2021	Lowest (04/12/2020)	Highest (16/04/2021)
Q29MB03	36.16	34.22	35.39	36.93	35.72	34.16	37.05
Q29MB04	38.76	36.80	38.47	39.59	38.58	36.77	39.74
Q29MB05	45.70	45.09	45.67	-	45.56	44.94	-
Q29MB06	48.51	46.01	47.60	47.89	47.59	46.01	49.84
Q29MB07	47.11	46.05	47.36	48.97	47.57	46.03	49.16
Q29MB08	82.78	78.63	79.92	84.64	81.30	78.58	84.86
Q29MB09	67.16	64.96	66.19	36.93	66.31	65.04	67.5

The regional groundwater flow and direction would be to the east/northeast of Quest 29, towards the Mary River. However, the groundwater flow and direction are modified on a local scale by the local topography and by the existing open pits. Groundwater level contour maps representing lowest and highest water level conditions are presented in Figure 4-13 and Figure 4-14.

At Quest 29, the groundwater level around the various pits suggests that:

- The Zamu pit lake may act as a through flow lake receiving groundwater from the northern side and losing to groundwater on the southern side. The pit is not bunded, and its catchment is not limited to the pit suggesting a larger runoff contribution than if the pit were bounded and pit catchment limited to the strict pit area;
- The Taipan pit lake is leaking to the groundwater aquifer at least on the north-east side of the pit. The pit lake may possibly be working also as a through flow lake as the higher ground elevation on the southern side may suggest higher groundwater level on this side;
- The South Koolpin pit lake is acting a throughflow for groundwater, with seepage into the pit from the north and recharge to groundwater along the southern edge of the pit;
- The North Koolpin pit is recharging the groundwater. However, the location of the pit along a ridge may indicate that groundwater along the ridge may be flowing toward the pit; and
- The BHS pit is recharging the aquifer. The standing water level in the BHS pit may result from rainfall runoff across a catchment that is not limited to the strict pit as the historical pit is not bunded.

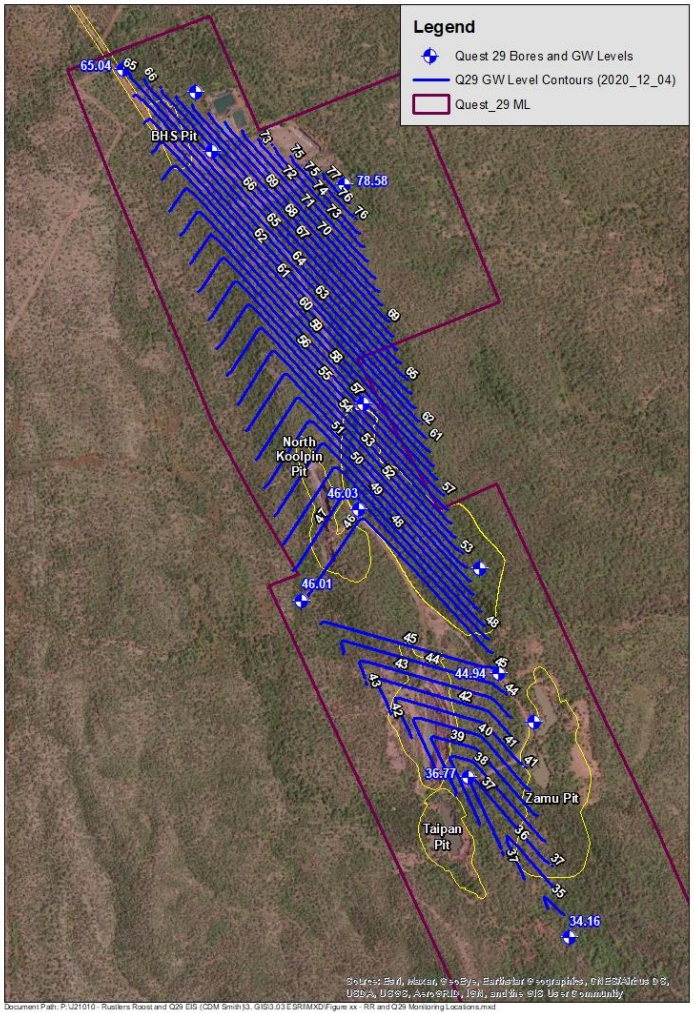


Figure 4-13 Quest 29 Groundwater Levels (04/12/2020)

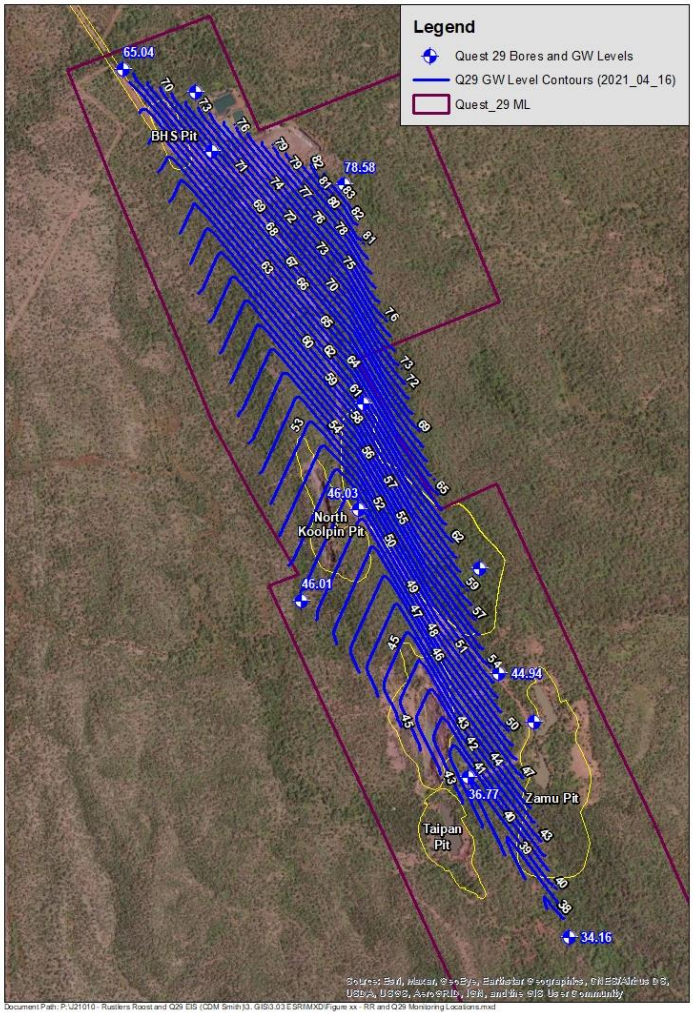


Figure 4-14 Quest 29 Groundwater Levels (16/04/2021)

4.4.5 Groundwater Quality

4.4.5.1 Rustlers Roost Historical investigations

An assessment of the groundwater quality at and near Rustlers Roost was undertaken as part of the EES 1993 hydrogeological study (Environmental and Earth Sciences Pty Ltd, January 1993). EES concluded that the groundwater showed minimal dissolution of major ions from the bedrock and no detectable copper, lead, zinc, cadmium, chromium, arsenic or mercury in the groundwater. Water quality throughout the lease was good with total dissolved solids (TDS) ranging from 10 to 50 mg/L. All parameters were within the ANZECC agricultural water quality guidelines.

The water is dominated by bicarbonate with chloride, potassium, sodium and magnesium subdominant. The bicarbonate levels most likely represent atmospheric carbon dioxide together with carbonate minerals dissolving in the groundwater whilst the other elements such as sodium, calcium, potassium and magnesium would be sourced from the fractured bedrock.

The low dissolved element levels indicate that there is minimal elemental dissolution from the rock and that a high level of meteoric rainfall infiltration into the folded and fractured turbidite sediments is occurring.

The bicarbonate to chloride ratios indicate that the water is relatively young with a low buffering capacity and pH values ranging from 4.9 to 5.5. The low to non-existent sulphate levels suggest that pyrite or other sulphides are absent or in minimal quantities in the oxidised and transitional weathering zones. The acidity is likely to be due to dissolved CO_2, particularly as bicarbonate is the dominant anion. Due to the presence of dissolved CO_2, the water is likely to be corrosive.

4.4.5.2 Rustlers Roost 2020-2021 Water Quality

Field water quality parameters measured during the 2020-2021 monitoring program and analysis results of groundwater and open pit sample are presented in Appendix A-1. A statistical summary of the groundwater analysis results is presented in Table 4-16.

Table 4-16 Rustlers Roost Statistical Summary of Groundwater Analysis Results

Analyte	Units	No. Results	No. Results <LOR	Results > LOR					Exceedances				
				No. Results	Minimum	Average	Maximum	StDev	Toms Gully SSTV (8th percentile)	Tropical Australia Lowland Rivers	ANZG 218 freshwater - 95% species protection	ANZECC 2 Livestock Watering (beef cattle)	ANZECC 2 long term irrigation
Alkalinity													
Bicarbonate Alkalinity	mg/L	40	1	39	2	68.0769	195	48.7228	-	-	-	-	-
Carbonate Alkalinity	mg/L	40	40	-	-	-	-	-	-	-	-	-	-
Hydroxide Alkalinity	mg/L	40	40	-	-	-	-	-	-	-	-	-	-
Total Alkalinity	mg/L	40	1	39	2	68.0769	195	48.7228	-	-	-	-	-
Field Measurements													
Dissolved Oxygen (%sat) (field)	%	40	-	40	1	13.2335	39.9	12.0022	-	-	-	-	-
Electrical Conductivity (field)	µS/cm	40	-	40	36.1	155.3000	305.4	89.1028	Yes	-	-	-	-
ORP (field)	mV	40	-	40	-118	84.7425	271	86.0935	-	-	-	-	-
pH (field)	-	40	-	40	3.77	5.6970	6.78	0.7671	Yes	Yes	-	-	-
Salinity (field)	ppt	38	-	38	0.02	1.8726	44.2	8.0644	-	-	-	-	-
Temperature (field)	°C	40	-	40	30.8	32.5125	34.8	0.9079	-	-	-	-	-
Total Dissolved Solids (field)	mg/L	39	-	39	23.4	105.3269	196.4	56.6634	-	-	-	-	-
Turbidity (field)	NTU	40	-	40	0.42	27.2033	576	100.1201	Yes	-	-	-	-
Major Ions													
Calcium	mg/L	40	8	32	1	11.8438	50	12.6417	-	-	-	-	-
Chloride	mg/L	40	-	40	2	3.3000	6	0.9392	-	-	-	-	-
Magnesium	mg/L	40	5	35	1	5.9143	15	4.5463	-	-	-	-	-
Sodium	mg/L	40	-	40	1	7.2750	28	6.9393	-	-	-	-	-
Sulphate	mg/L	40	14	26	1	8.5385	31	8.6775	-	-	-	-	-
Metals (dissolved)													
Aluminium (dissolved)	mg/L	40	25	15	0.01	0.0747	0.19	0.0437	-	-	-	-	-
Arsenic (dissolved)	mg/L	40	11	29	0.001	0.0099	0.07	0.0169	Yes	-	Yes	-	-
Cadmium (dissolved)	mg/L	40	40	-	-	-	-	-	-	-	-	-	-
Chromium (dissolved)	mg/L	40	38	2	0.001	0.0015	0.002	0.0007	-	-	Yes	-	-

Analyte	Units	No. Results	No. Results <LOR	Results > LOR					Exceedances				
				No. Results	Minimum	Average	Maximum	StDev	Toms Gully SSTV (8th percentile)	Tropical Australia Lowland Rivers	ANZG 218 freshwater - 95% species protection	ANZECC 2 Livestock Watering (beef cattle)	ANZECC 2 long term irrigation
Cobalt (dissolved)	mg/L	40	27	13	0.001	0.0055	0.015	0.0039	-	-	-	-	-
Copper (dissolved)	mg/L	40	19	21	0.001	0.0096	0.033	0.0103	Yes	-	Yes	-	-
Iron (dissolved)	mg/L	40	24	16	0.05	0.8831	2.47	0.8770	-	-	-	-	Yes
Lead (dissolved)	mg/L	40	37	3	0.003	0.0047	0.006	0.0015	1	-	2	-	-
Manganese (dissolved)	mg/L	40	2	38	0.001	0.1531	0.627	0.1821	-	-	-	-	Yes
Nickel (dissolved)	mg/L	40	18	22	0.001	0.0024	0.006	0.0015	-	-	-	-	-
Selenium (dissolved)	mg/L	40	40	-	-	-	-	-	-	-	-	-	-
Tin (dissolved)	mg/L	40	40	-	-	-	-	-	-	-	-	-	-
Uranium (dissolved)	mg/L	40	40	-	-	-	-	-	-	-	-	-	-
Zinc (dissolved)	mg/L	40	7	33	0.005	0.0222	0.078	0.0200	Yes	-	Yes	-	-
Metals (total)													
Aluminium (total)	mg/L	40	14	26	0.01	0.2031	1.29	0.2852	-	-	-	-	-
Arsenic (total)	mg/L	40	10	30	0.001	0.0106	0.083	0.0185	-	-	Yes	-	-
Cadmium (total)	mg/L	40	39	1	0.0002	0.0002	0.0002	#DIV/0!	-	-	-	-	-
Chromium (total)	mg/L	40	37	3	0.001	0.0017	0.002	0.0006	-	-	Yes	-	-
Cobalt (total)	mg/L	40	27	13	0.001	0.0069	0.018	0.0046	-	-	-	-	-
Copper (total)	mg/L	40	17	23	0.001	0.0114	0.041	0.0122	-	-	Yes	-	-
Ferrous Iron	mg/L	40	25	15	0.1	0.8853	2.89	0.9061	-	-	-	-	-
Iron (total)	mg/L	40	18	22	0.05	0.9682	2.59	0.8238	-	-	-	-	-
Lead (total)	mg/L	40	36	4	0.001	0.0023	0.003	0.0010	-	-	-	-	-
Manganese (total)	mg/L	40	4	36	0.001	0.1745	0.608	0.1877	-	-	-	-	Yes
Nickel (total)	mg/L	40	15	25	0.001	0.0027	0.008	0.0018	-	-	-	-	-
Selenium (total)	mg/L	40	40	-	-	-	-	-	-	-	-	-	-
Tin (total)	mg/L	40	40	-	-	-	-	-	-	-	-	-	-
Uranium (total)	mg/L	40	40	-	-	-	-	-	-	-	-	-	-
Zinc (total)	mg/L	40	6	34	0.007	0.0237	0.07	0.0188	-	-	Yes	-	-

Analyte	Units	No. Results	No. Results <LOR	Results > LOR					Exceedances				
				No. Results	Minimum	Average	Maximum	StDev	Toms Gully SSTV (8th percentile)	Tropical Australia Lowland Rivers	ANZG 218 freshwater - 95% species protection	ANZECC 2 Livestock Watering (beef cattle)	ANZECC 2 long term irrigation
Nutrients													
Ammonia	mg/L	40	27	13	0.01	0.2585	1.29	0.3873	-	Yes	1	-	-
Nitrate + Nitrite	mg/L	40	12	28	0.01	0.1371	1.6	0.2920	-	-	-	-	-
Total Kjeldahl Nitrogen as N	mg/L	40	35	5	0.3	0.8400	2.1	0.7301	-	-	-	-	-
Total Nitrogen as N	mg/L	40	28	12	0.1	0.6000	3.7	1.0000	-	-	-	-	-
Total Phosphorus	mg/L	40	6	34	0.01	0.1674	0.8	0.2317	-	Yes	-	-	Yes
Physico-chemical													
Total Hardness	mg/L	40	5	35	4	51.4000	187	45.3004	-	-	-	-	-
Total Suspended Solids	mg/L	40	27	13	5	30.0769	182	49.3684	Yes	-	-	-	-
Turbidity (lab)	NTU	40	13	27	0.1	20.3556	348	67.0665	Yes	-	-	-	-

Hydrogeochemistry

Based on the field water quality parameters, it can be concluded that the groundwater at Rustlers Roost:

- Is acidic to slightly acidic, with pH levels varying from 3.77 to 6.78, with an average of 5.7. Time series of field pH versus rainfall are presented in Figure 4-15. To a minor degree, pH levels vary with rainfall. pH levels in monitoring well RRMB07 are more acidic (i.e. between 3.8 and 4.4) than in the other monitoring wells (i.e. between 5.1 and 6.8). RRMB07 is located north of the open pit;
- Is fresh, with electrical conductivity (EC) varying from 36 µS/cm to 305 µS/cm, with an average of 155 µS/cm, and total dissolved solids (TDS) varying from 23 mg/L to 196 mg/L, with an average of 105 mg/L. Time series of field EC versus rainfall are presented in Figure 4-16;
- Has low dissolved oxygen levels, ranging from 1% to 40% saturation, with an average of 13%; and
- Has bicarbonate alkalinity (as $CaCO_3$) ranging from 2 mg/L to 195 mg/l, with an average of 68 mg/L.

Piper diagrams of groundwater (historical and current data) and open pit water are presented on Figure 4-17. Based on the ionic composition:

- The groundwater at wells RRMB02, RRMB03, RRMB04, RRMB05, RRMB06, RRMB07 and RRMB08 can be classified as a “calcium-magnesium-bicarbonate” water type;
- The groundwater at well RRMB01 can be classified as a “mixed sodium-bicarbonate-chloride” water type. Monitoring well RRMB01 is located adjacent to the former heap leach pad. Groundwater quality in well RRMB01 shows evidence of influence from potential waste rock leachate; and
- The water in the open pit can be classified as a “calcium-magnesium-bicarbonate” water type.

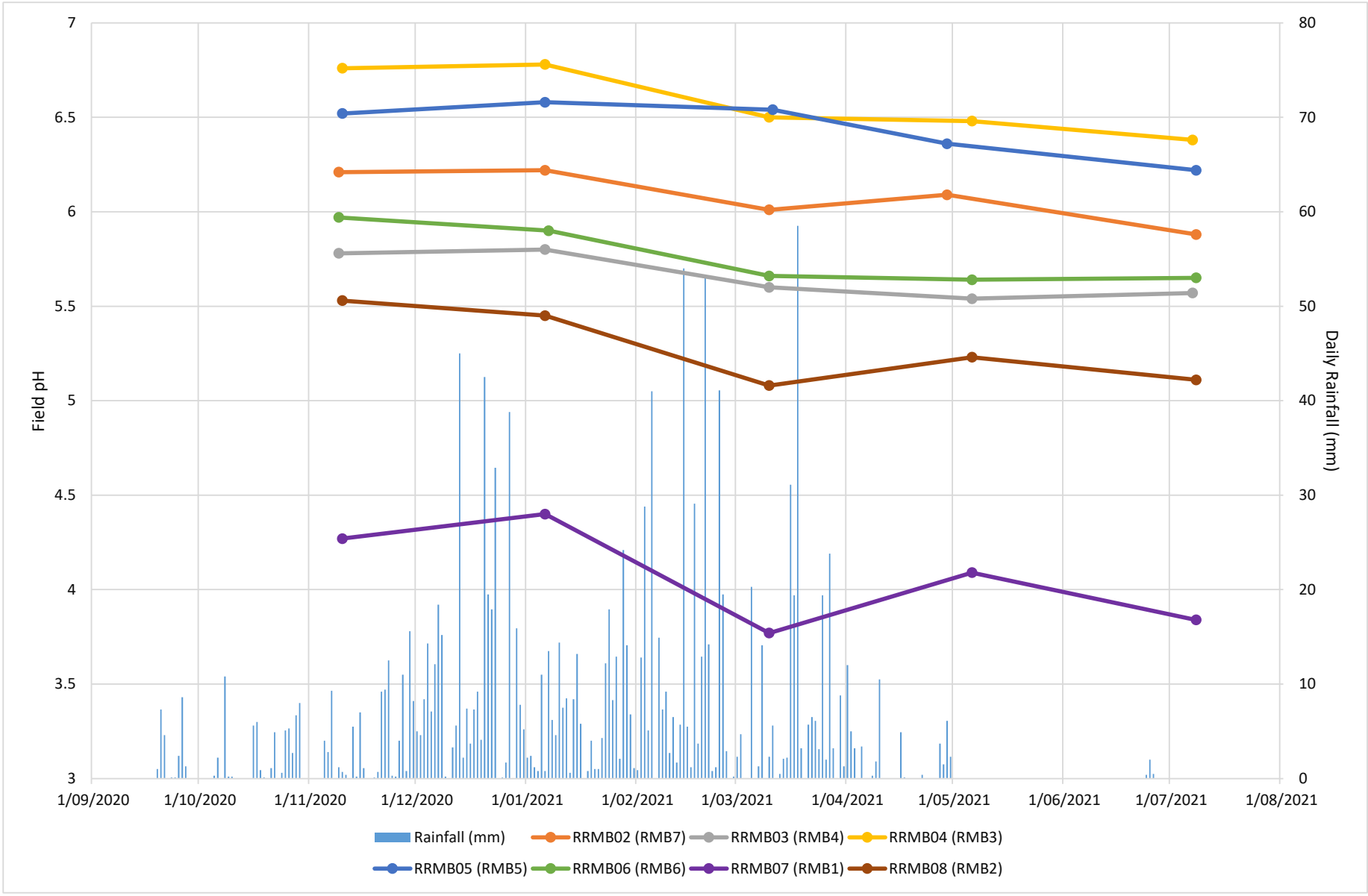


Figure 4-15 Field pH versus Rainfall in Monitoring Wells at Rustlers Roost

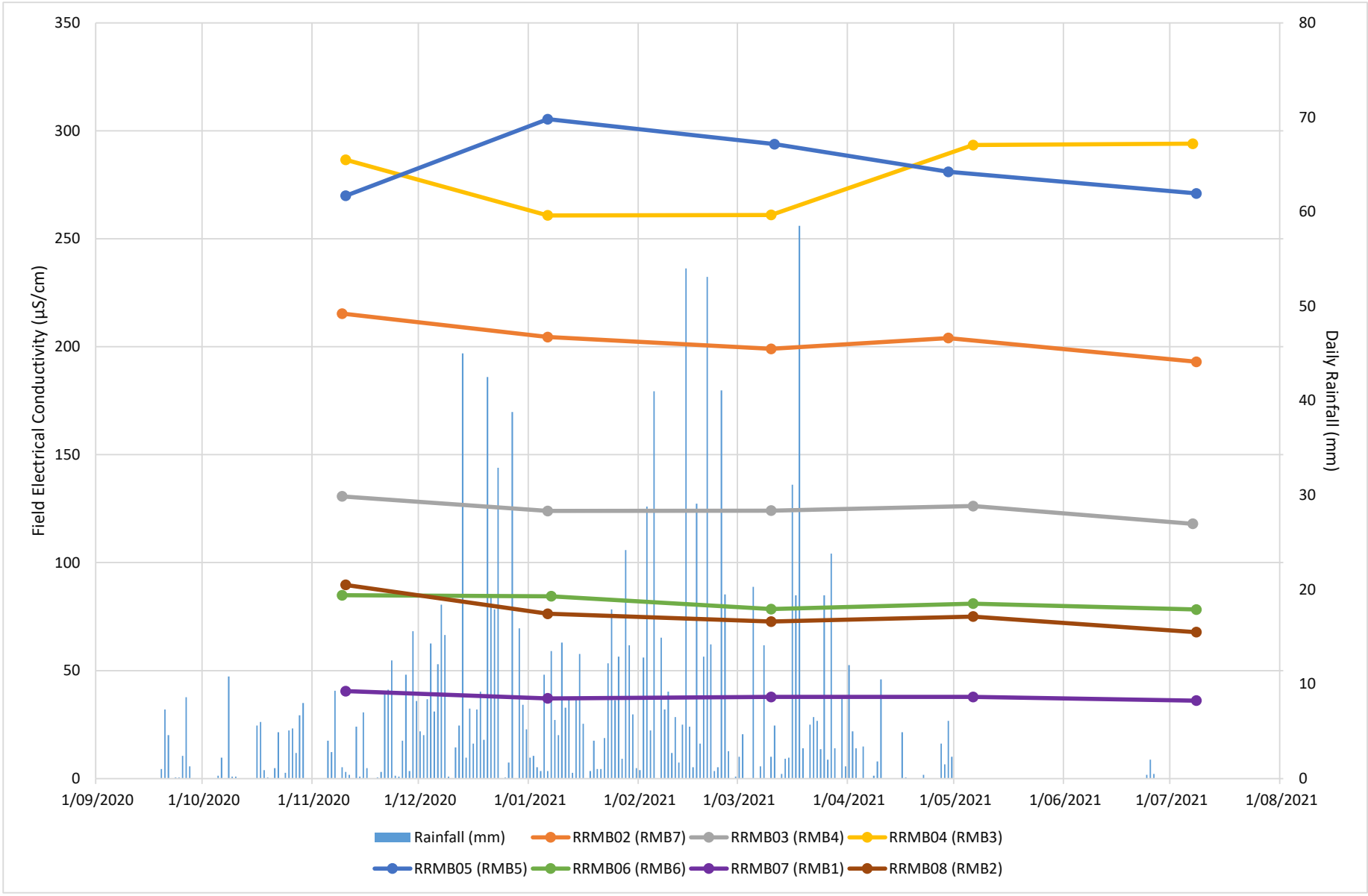


Figure 4-16 Field Electrical Conductivity versus Rainfall in Monitoring Wells at Rustlers Roost

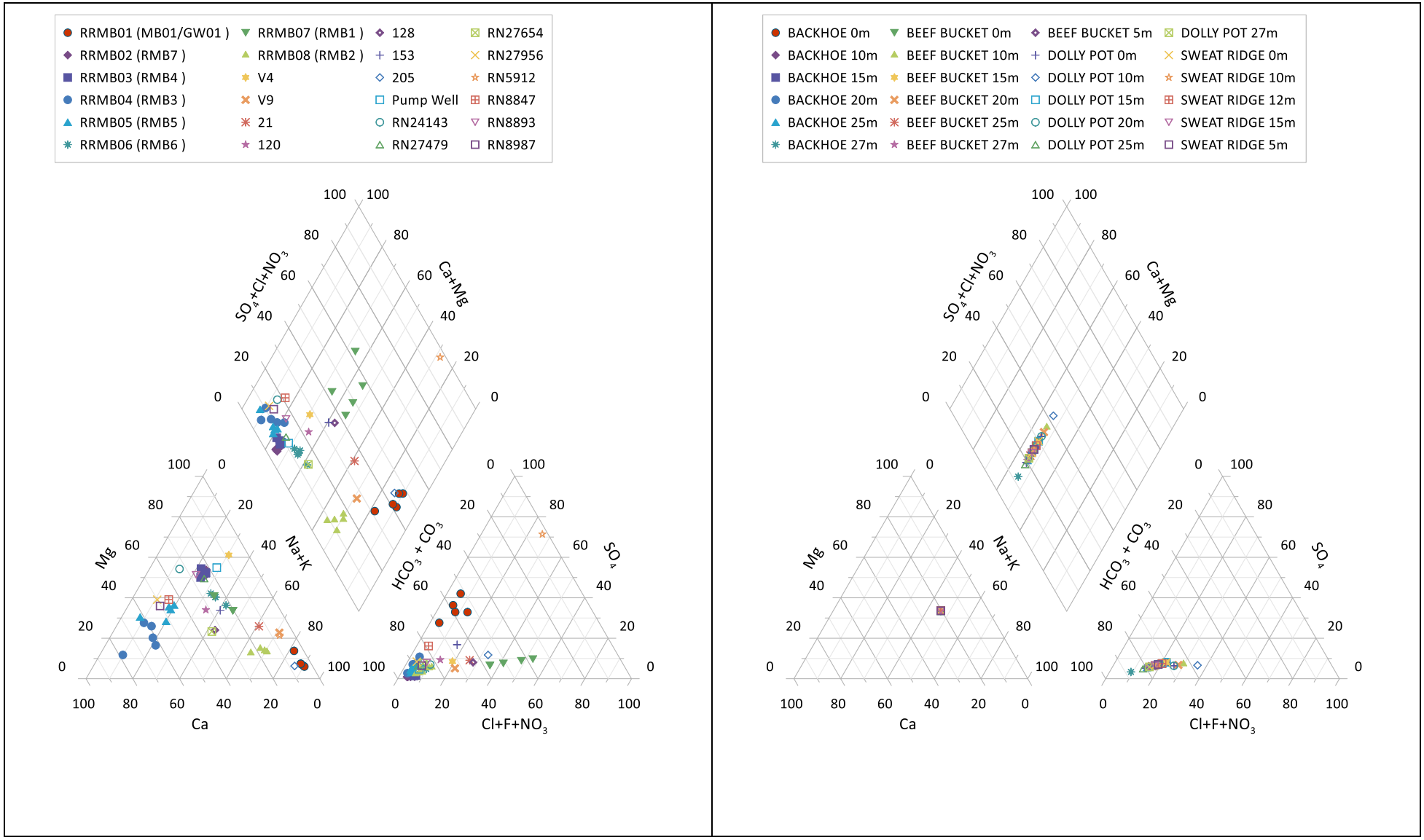


Figure 4-17 Piper Diagram – Groundwater and Open Pit Water at Rustlers Roost

Baseline Water Quality

Detailed groundwater, open pit and surface water analysis results, with comparison against the adopted water quality guidelines/trigger values are presented in Appendix A.

With respect to the groundwater exceedances of the adopted water quality guidelines/trigger values:

- Exceedances of the adopted trigger values for aquatic ecosystems are summarised in Table 4-17. It must be noted that, given the absence of GDEs in the Project area and the absence of groundwater discharge into local creeks and drainages, these trigger values are only relevant in case of abstraction of groundwater and discharge to surface water (e.g. for pit dewatering);
- There were no exceedances of the water quality guidelines for livestock watering; and
- Exceedances of the long-term irrigation guideline values were observed for iron, manganese and total phosphorus in some of the wells.

Table 4-17 Rustlers Roost Summary of Groundwater Exceedances of Aquatic Ecosystem Trigger Values

Analyte	RRMB01	RRMB02	RRMB03	RRMB04	RRMB05	RRMB06	RRMB07	RRMB08
Field Readings								
Electrical Conductivity	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	-	**Yes**
pH	**Yes**	-	**Yes**	-	-	**Yes**	**Yes**	**Yes**
Turbidity	-	-	-	-	-	-	-	-
Metals (dissolved)								
Arsenic	-	-	-	-	**Yes**	**Yes**	-	-
Chromium	-	-	-	**Yes**	-	-	-	-
Copper	**Yes**	**Yes**	**Yes**	-	-	**Yes**	**Yes**	**Yes**
Lead	-	-	**Yes**	-	-	-	**Yes**	-
Zinc	**Yes**	**Yes**	**Yes**	**Yes**	-	**Yes**	**Yes**	**Yes**
Nutrients								
Ammonia	**Yes**	-	-	-	-	-	-	-
Physico-chemical								
pH (lab)	**Yes**	-	-	-	-	-	-	-
Total Suspended Solids	**Yes**	-	-	-	-	-	-	-
Turbidity	**Yes**	-	-	-	-	-	-	-

Notes:
Light green highlight: only exceeds the Toms Gully SSTV
Light blue highlight: only exceeds the ANZG 2018 trigger value

Box and Whisker plots for selected analytes are presented in Appendix A. A summary description of selected water quality parameters for groundwater monitoring and analysis results obtained during the 2020-2021 monitoring program is presented in Table 4-18.

Table 4-18 Baseline Groundwater Quality at Rustlers Roost

Parameter	Water quality summary
Field Measurements	
Dissolved Oxygen (%sat) (field)	Based on 40 readings, values ranged from 1 % (at RRMB05) to 39.9 % (at RRMB07), with an average of 13.2 %. The DO values were outside the Tropical Australia Lowland Rivers guideline range of 85% to 120%.
Electrical Conductivity (field)	Based on 40 readings, values ranged from 36.1 µS/cm (at RRMB07) to 305.4 µS/cm (at RRMB05), with an average of 155.3 µS/cm. Exceedances of the Tropical Australia Lowland Rivers guideline range (20 – 250 µS/cm) were observed at wells RMB04 and RRMB05.
pH	Based on 40 readings, values ranged from 3.77 (at RRMB07) to 6.78 (at RRMB04), with an average of 5.697, indicating that the groundwater was acidic to near neutral. Lowest, most acidic pH levels were observed at RRMB07. Values outside the adopted trigger value range were observed at wells RRMB01, RRMB03, RRMB06, RRMB07 and RRMB08.
Turbidity (field)	Based on 40 readings, values ranged from 0.42 NTU (at RRMB03) to 57.6 NTU (at RRMB01), with an average of 7.8 NTU.
Alkalinity	
Bicarbonate Alkalinity as $CaCO_3$	Based on 39 readings, values ranged from 2 mg/L (at RRMB07) to 195 mg/L (at RRMB05), with an average of 68.1 mg/L. The low levels are reflected by the measured pH <7 and indicate the reduced buffer capability, hence reduced acid neutralising ability of the groundwater.
Physico-Chemical	
Total Hardness	Based on 35 readings, values ranged from 4 mg/L (at RRMB01) to 187 mg/L (at RRMB05), with an average of 51.4 mg/L, indicating that the groundwater hardness varies from soft to moderately hard.
Major Ions	
Calcium	Based on 32 readings, values ranged from 1 mg/L (at RRMB01) to 50 mg/L (at RRMB05), with an average of 11.8 mg/L.
Chloride	Based on 40 readings, values ranged from 2 mg/L (at RRMB01) to 6 mg/L (at RRMB01), with an average of 3.3 mg/L.
Magnesium	Based on 35 readings, values ranged from 1 mg/L (at RRMB01) to 15 mg/L (at RRMB05), with an average of 5.9 mg/L.
Sodium	Based on 40 readings, values ranged from 1 mg/L (at RRMB04) to 28 mg/L (at RRMB01), with an average of 7.3 mg/L.
Sulphate	Based on 26 readings, values ranged from 1 mg/L (at RRMB07) to 31 mg/L (at RRMB01), with an average of 8.5 mg/L.
Metals	
Aluminium	Based on 15 readings, values ranged from 0.01 mg/L (at RRMB05) to 0.19 mg/L (at RRMB01), with an average of 0.075 mg/L. There are no trigger values for dissolved aluminium when pH is less than 6.5.
Arsenic	Based on 29 readings, values ranged from 0.001 mg/L (at RRMB01) to 0.07 mg/L (at RRMB05), with an average of 0.0099 mg/L. Exceedances of the adopted trigger values were observed only in wells RRMB05 and RRMB06.
Chromium	Based on 2 readings, values ranged from 0.001 mg/L (at RRMB04) to 0.002 mg/L (at RRMB04), with an average of 0.0015 mg/L. Exceedances of the adopted trigger values were observed only in well RRMB02.
Copper	Based on 21 readings, values ranged from 0.001 mg/L (at RRMB01) to 0.033 mg/L (at RRMB07), with an average of 0.0096 mg/L. Exceedances of the adopted trigger values were observed in most wells.
Manganese	Based on 38 readings, values ranged from 0.001 mg/L (at RRMB02) to 0.627 mg/L (at RRMB04), with an average of 0.153 mg/L.

Parameter	Water quality summary
Zinc	Based on 33 readings, values ranged from 0.005 mg/L (at RRMB02) to 0.078 mg/L (at RRMB03), with an average of 0.022 mg/L. Exceedances of the adopted trigger values were observed in all wells, except in RRMB05
Nutrients	
Ammonia	Based on 13 readings, values ranged from 0.01 mg/L (at RRMB03) to 1.29 mg/L (at RRMB01), with an average of 0.26 mg/L. Exceedances of the adopted trigger values were observed only in well RRMB01.
Total Nitrogen as N	Based on 12 readings, values ranged from 0.1 mg/L (at RRMB04) to 3.7 mg/L (at RRMB01), with an average of 0.6 mg/L.
Total Phosphorus	Based on 34 readings, values ranged from 0.01 mg/L (at RRMB07) to 0.8 mg/L (at RRMB06), with an average of 0.16 mg/L.

Summary

Overall, the groundwater quality monitoring has shown groundwater is typically fresh, acidic to near neutral and has exceedances of aquatic ecosystems guideline values (GVs) for some metals and nutrients at some sampling occasions and locations. The elevated phosphorus and metal concentrations may be associated with underlying mineralogical deposits entailing weathered zones.

The groundwater monitoring bores show limited impacts from previous mining activities. Only RRMB01, which is located next to the heap leach pad, shows signals of influence from potential waste rock leachate.

4.4.5.3 Quest 29 2020-2021 Water Quality

Field water quality parameters measured during the 2020-2021 monitoring program and analysis results of groundwater and open pit sample are presented in Appendix B. A statistical summary of the groundwater analysis results is presented in Table 4-19.

Table 4-19 Quest 29 Statistical Summary of Groundwater Analysis Results

Analyte	Units	No. Results	No. Results <LOR	Results > LOR					Exceedances				
				No. Results	Minimum	Average	Maximum	StDev	Toms Gully SSTV (8th percentile)	Tropical Australia Lowland Rivers	ANZG 218 freshwater - 95% species protection	ANZECC 2 Livestock Watering (beef cattle)	ANZECC 2 long term irrigation
Alkalinity													
Bicarbonate Alkalinity	mg/L	66	2	64	12	136.0313	255	53.6127	-	-	-	-	-
Carbonate Alkalinity	mg/L	69	63	6	5	41.6667	133	57.9333	-	-	-	-	-
Hydroxide Alkalinity	mg/L	48	48	-	-	-	-	-	-	-	-	-	-
Total Alkalinity	mg/L	48	-	48	12	129.6042	255	58.9792	-	-	-	-	-
Field Measurements													
Dissolved Oxygen (%sat) (field)	%	45	-	45	1	8.6022	59.9	13.5569	-	-	-	-	-
Electrical Conductivity (field)	µS/cm	64	-	64	4.29	473.6889	1213	337.6680	Yes	-	-	-	-
ORP (field)	mV	45	-	45	-237	-22.1800	192	88.6116	-	-	-	-	-
pH (field)	-	68	-	68	4.47	6.3775	7.6	0.6408	Yes	Yes	-	-	-
Salinity (field)	ppt	44	-	44	0.02	0.1880	0.51	0.1229	-	-	-	-	-
Temperature (field)	°C	45	-	45	30.7	32.0911	33.7	0.7147	-	-	-	-	-
Total Dissolved Solids (field)	mg/L	45	-	45	25.1	247.2600	676	168.0982	-	-	-	-	-
Turbidity (field)	NTU	58	-	58	0.32	34.8486	400	93.3683	Yes	-	-	-	-
Major Ions													
Calcium	mg/L	69	-	69	3	54.0043	140	43.6974	-	-	-	-	-
Chloride	mg/L	68	-	68	2	6.2588	16	3.0799	-	-	-	-	-
Magnesium	mg/L	26	-	26	8	13.0000	19	3.9192	-	-	-	-	-
Sodium	mg/L	68	-	68	2	12.6426	44	9.2435	-	-	-	-	-
Sulphate	mg/L	67	-	67	1	105.3448	445	159.1398	Yes	-	-	-	-
Metals (dissolved)													
Aluminium (dissolved)	mg/L	67	52	15	0.01	0.0327	0.31	0.0768	Yes	-	-	-	-
Arsenic (dissolved)	mg/L	67	5	62	0.00185	0.0406	0.2	0.0471	Yes	-	Yes	-	Yes
Cadmium (dissolved)	mg/L	67	52	15	0.0001	0.0002	0.00113	0.0003	Yes	-	Yes	-	-

Analyte	Units	No. Results	No. Results <LOR	Results > LOR					Exceedances				
				No. Results	Minimum	Average	Maximum	StDev	Toms Gully SSTV (8th percentile)	Tropical Australia Lowland Rivers	ANZG 218 freshwater - 95% species protection	ANZECC 2 Livestock Watering (beef cattle)	ANZECC 2 long term irrigation
Chromium (dissolved)	mg/L	67	51	16	0.001	0.0041	0.011	0.0029	Yes	-	Yes	-	-
Cobalt (dissolved)	mg/L	67	36	31	0.001	0.0016	0.005	0.0010	-	-	-	-	-
Copper (dissolved)	mg/L	67	49	18	0.001	0.0029	0.009	0.0026	Yes	-	Yes	-	-
Iron (dissolved)	mg/L	67	5	62	0.01	3.1869	19	5.1002	Yes	-	-	-	Yes
Lead (dissolved)	mg/L	67	56	11	0.001	0.0014	0.005	0.0012	-	-	Yes	-	-
Manganese (dissolved)	mg/L	67	-	67	0.013	0.4864	1.5	0.3831	-	-	-	-	Yes
Nickel (dissolved)	mg/L	67	34	33	0.001	0.0046	0.02	0.0048	Yes	-	4	-	-
Selenium (dissolved)	mg/L	45	45	-	-	-	-	-	-	-	-	-	-
Tin (dissolved)	mg/L	45	45	-	-	-	-	-	-	-	-	-	-
Uranium (dissolved)	mg/L	57	57	-	-	-	-	-	-	-	-	-	-
Zinc (dissolved)	mg/L	67	14	53	0.001	0.0208	0.0846	0.0208	Yes	-	Yes	-	-
Metals (total)													
Aluminium (total)	mg/L	45	28	17	0.01	0.0518	0.29	0.0889	-	-	-	-	-
Arsenic (total)	mg/L	45	5	40	0.004	0.0568	0.209	0.0577	-	-	Yes	-	Yes
Cadmium (total)	mg/L	66	61	5	0.0001	0.0007	0.0028	0.0012	-	-	Yes	-	-
Chromium (total)	mg/L	66	66	-	-	-	-	-	-	-	-	-	-
Cobalt (total)	mg/L	59	41	18	0.001	0.0022	0.004	0.0010	-	-	-	-	-
Copper (total)	mg/L	66	50	16	0.002	0.0057	0.013	0.0036	-	-	Yes	-	-
Ferrous Iron	mg/L	45	7	38	0.1	1.6971	5.38	1.4392	-	-	-	-	-
Iron (total)	mg/L	45	4	41	0.13	1.7354	4.56	1.2349	-	-	-	-	-
Lead (total)	mg/L	66	62	4	0.001	0.0123	0.044	0.0212	-	-	Yes	-	-
Manganese (total)	mg/L	66	19	47	0.0005	0.3599	1.08	0.2724	-	-	-	-	Yes
Nickel (total)	mg/L	45	22	23	0.001	0.0063	0.025	0.0058	-	-	Yes	-	-
Selenium (total)	mg/L	45	45	-	-	-	-	-	-	-	-	-	-
Tin (total)	mg/L	45	44	1	0.001	0.0010	0.001	-	-	-	-	-	-
Uranium (total)	mg/L	45	45	-	-	-	-	-	-	-	-	-	-

Analyte	Units	No. Results	No. Results <LOR	Results > LOR					Exceedances				
				No. Results	Minimum	Average	Maximum	StDev	Toms Gully SSTV (8th percentile)	Tropical Australia Lowland Rivers	ANZG 218 freshwater - 95% species protection	ANZECC 2 Livestock Watering (beef cattle)	ANZECC 2 long term irrigation
Zinc (total)	mg/L	66	19	47	0.0012	0.0323	0.472	0.0688	-	-	Yes	-	-
Nutrients													
Ammonia	mg/L	45	21	24	0.01	0.0571	0.23	0.0666	-	Yes	-	-	-
Nitrate + Nitrite	mg/L	45	28	17	0.02	0.0506	0.15	0.0378	-	-	-	-	-
Total Kjeldahl Nitrogen as N	mg/L	45	36	9	0.1	0.1889	0.3	0.0601	-	-	-	-	-
Total Nitrogen as N	mg/L	45	35	10	0.1	0.2100	0.3	0.0568	-	-	-	-	-
Total Phosphorus	mg/L	45	7	38	0.01	0.0658	0.14	0.0380	-	Yes	-	-	Yes
Physico-chemical													
Total Hardness	mg/L	48	-	48	7	165.6667	455	118.9485	-	-	-	-	-
Total Suspended Solids	mg/L	68	24	44	5	35.2273	470	71.8949	Yes	-	-	-	-
Turbidity (lab)	NTU	45	2	43	0.2	8.5093	29.9	8.2711	-	-	-	-	-

Hydrogeochemistry

Based on the field water quality parameters, it can be concluded that the groundwater at Quest 29:

- Is acidic to neutral, with pH levels varying from 4.47 to 7.6, with an average of 6.38. Time series of field pH versus rainfall are presented in Figure 4-18**.** To a minor degree, pH levels vary with rainfall. pH levels in monitoring well Q29MB03 are more acidic (i.e. between 4.47 and 5.86) than in the other monitoring wells (i.e. between 4.73 and 7.33);
- Is fresh, with electrical conductivity (EC) varying from 4.3 µS/cm to 1,213 µS/cm, with an average of 473 µS/cm, and total dissolved solids (TDS) varying from 25 mg/L to 676 mg/L, with an average of 247 mg/L. Time series of field EC versus rainfall are presented in Figure 4-19;
- Has low dissolved oxygen levels, ranging from 1% to 60% saturation, with an average of 9%; and
- Has bicarbonate alkalinity (as $CaCO_3$) ranging from 12 mg/L to 255 mg/l, with an average of 136 mg/L.

Piper diagrams of groundwater and open pit water are presented on Figure 4-20. Based on the ionic composition:

- The groundwater at wells Q29MB03, Q29MB04, Q29MB05, Q29MB06, Q29MB07, Q29MB08 and Q29MB09 can be classified as a “calcium-magnesium-bicarbonate” water type;
- The groundwater at wells Q29MB01 and Q29MB02 can be classified as a “calcium-magnesium-sulphate” water type. These wells are located near the BHS heap leach pad and groundwater may have been impacted by leachate from the heap leach pad; and
- The water in the open pit can be classified as a “sodium-chloride” water type.

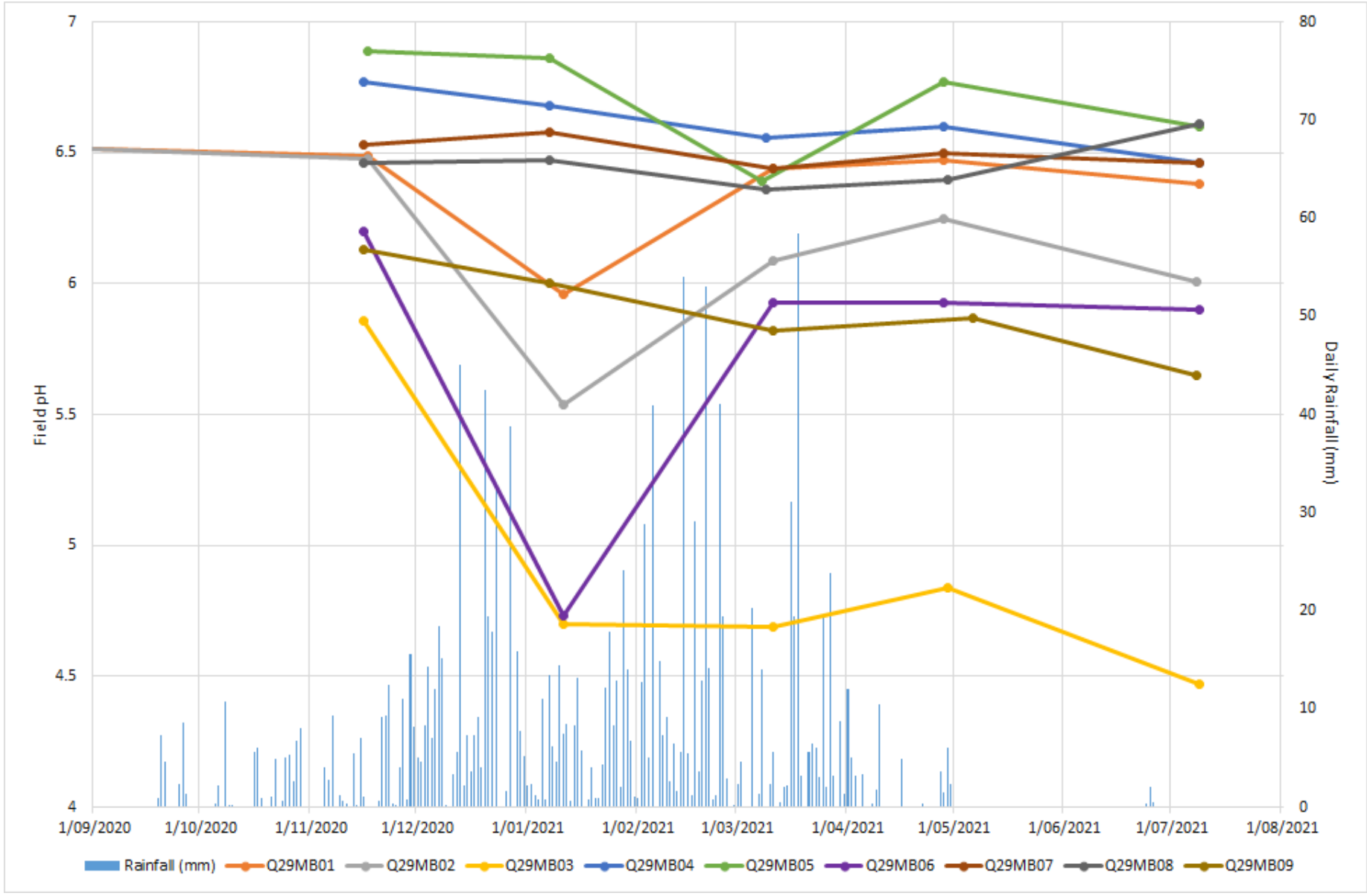


Figure 4-18 Field pH versus Rainfall in Monitoring Wells at Quest 29

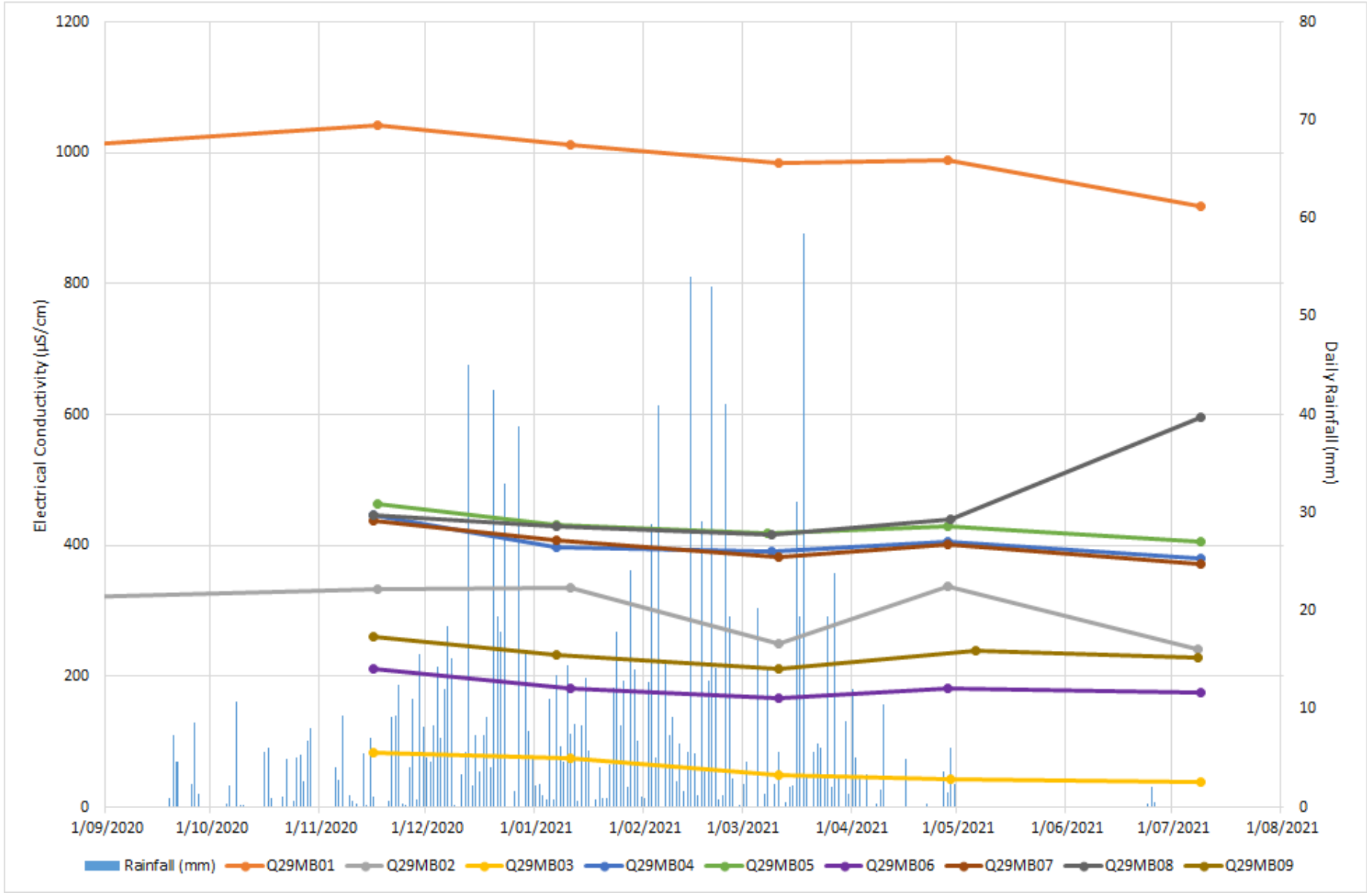


Figure 4-19 Field Electrical Conductivity versus Rainfall in Monitoring Wells at Quest 29

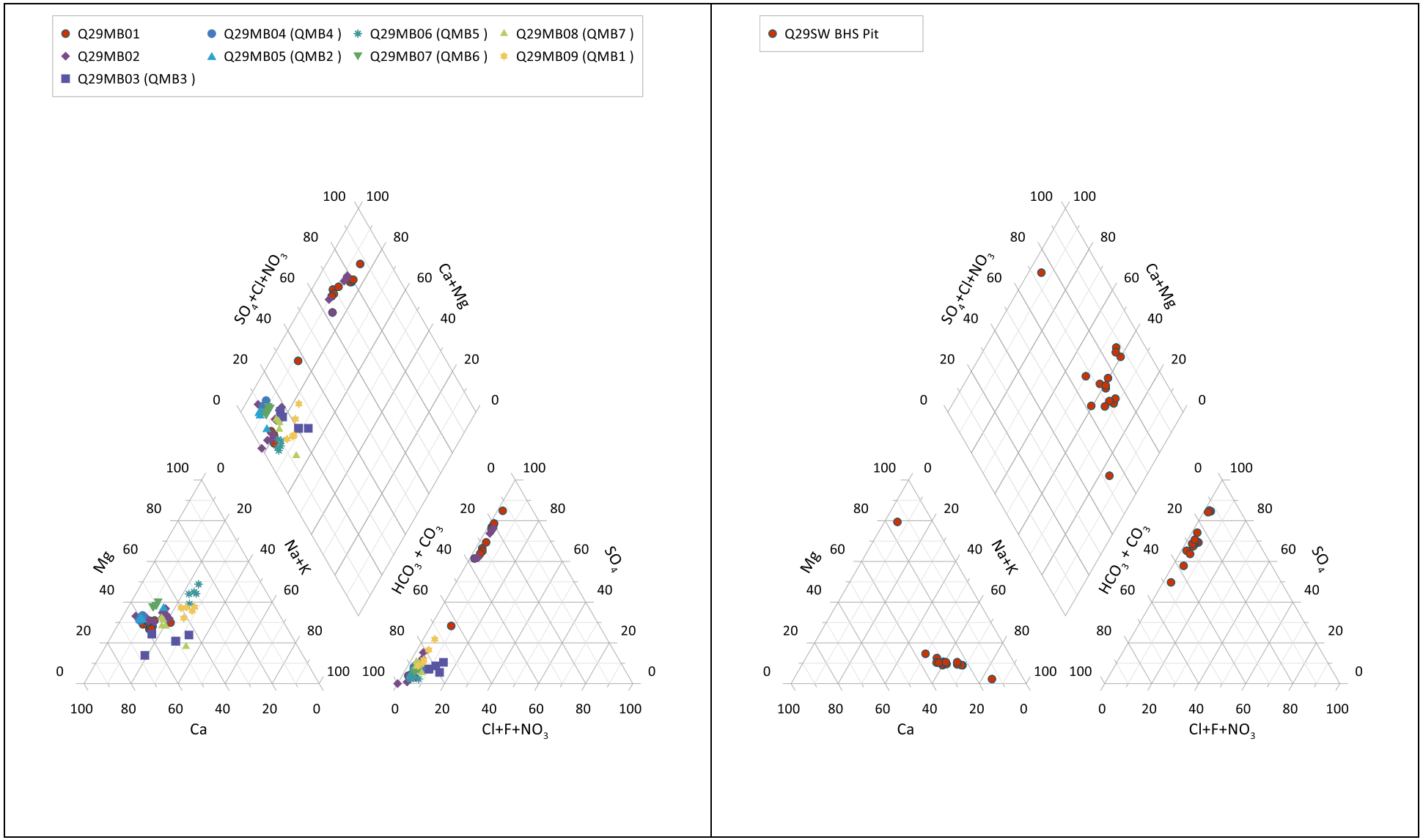


Figure 4-20 Piper Diagram – Groundwater and Open Pit Water at Quest 29

Baseline Water Quality

Detailed groundwater, open pit and surface water analysis results, with comparison against the adopted water quality guidelines/trigger values are presented in Appendix B.

With respect to the groundwater exceedances of the adopted water quality guidelines/trigger values:

- Exceedances of the adopted trigger values for aquatic ecosystems are summarised in Table 4-20. It must be noted that, given the absence of GDEs in the Project area and the absence of groundwater discharge into local creeks and drainages, these trigger values are only relevant in case of abstraction of groundwater and discharge to surface water (e.g. for pit dewatering);
- There were no exceedances of the water quality guidelines for livestock watering; and
- Exceedances of the long-term irrigation guideline values were observed for arsenic, iron, manganese and total phosphorus in most wells.

Table 4-20 Quest 29 Summary of Groundwater Exceedances of Aquatic Ecosystem Trigger Values

Analyte	Q29 MB01	Q29 MB02	Q29 MB03	Q29 MB04	Q29 MB05	Q29 MB06	Q29 MB07	Q29 MB08	Q29 MB09
Field Readings									
Electrical Conductivity	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
pH	-	**Yes**	**Yes**	-	-	**Yes**	-	-	**Yes**
Turbidity	**Yes**	**Yes**	-	-	-	-	-	-	-
Major Ions									
Sulphate	**Yes**	**Yes**	-	-	-	-	-	-	-
Metals (dissolved)									
Aluminium	**Yes**	-	-	-	-	-	-	-	-
Arsenic	**Yes**	**Yes**	-	**Yes**	**Yes**		**Yes**	-	-
Cadmium	**Yes**	-	-	-	-	-	-	-	-
Chromium	**Yes**	**Yes**	-	-	-	-	-	-	-
Copper	**Yes**	-	**Yes**	-	-	-	-	-	**Yes**
Iron	**Yes**	**Yes**	-	-	-	-	**Yes**	-	-
Lead	-	**Yes**	-	-	-	-	-	-	-
Nickel	-	-	**Yes**	**Yes**	-	-	-	-	-
Zinc	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Physico-chemical									
Total Suspended Solids	**Yes**	**Yes**	-	-	-	-	-	-	-

Notes:
Light green highlight: only exceeds the Toms Gully SSTV
Light blue highlight: only exceeds the ANZG 2018 trigger value

Box and Whisker plots for selected analytes are presented in Appendix B. A summary description of selected water quality parameters for groundwater monitoring and analysis results obtained during the 2020-2021 monitoring program is presented in Table 4-21.

Table 4-21 Baseline Groundwater Quality at Quest 29

Parameter	Water quality summary
Field Measurements	
Dissolved Oxygen (%sat) (field)	Based on 45 readings, values ranged from 1 % (at Q29MB07) to 59.9 % (at Q29MB03), with an average of 8.6%. The DO values were outside the Tropical Australia Lowland Rivers guideline range of 85% to 120%.
Electrical Conductivity (field)	Based on 64 readings, values ranged from 4.29 µS/cm (at Q29MB05) to 1213 µS/cm (at Q29MB01), with an average of 473 µS/cm. Exceedances of the Tropical Australia Lowland Rivers guideline range (20 – 250 µS/cm) were observed at in all monitoring wells. However, the groundwater is still classified as "fresh".
pH	Based on 68 readings, values ranged from 4.47 (at Q29MB03) to 7.6 (at Q29MB02), with an average of 6.3, indicating that the groundwater was acidic to near neutral. Lowest, most acidic pH levels were observed at Q29MB03. Values outside the adopted trigger value range were observed at wells Q29MB01, Q29MB02, Q29MB03, Q29MB06 and Q29MB09.
Turbidity (field)	Based on 58 readings, values ranged from 0.32 NTU (at Q29MB02) to 400 NTU (at Q29MB02), with an average of 34.8 NTU. Exceedances of the adopted trigger value were observed at wells Q29MB01 and Q29MB02.
Alkalinity	
Bicarbonate Alkalinity as $CaCO_3$	Based on 64 readings, values ranged from 12 mg/L (at Q29MB03) to 255 mg/L (at Q29MB08), with an average of 136.0 mg/L. The low levels are reflected by the measured pH <7 and indicate the reduced buffer capability, hence reduced acid neutralising ability of the groundwater.
Physico-Chemical	
Total Hardness	Based on 48 readings, values ranged from 7 mg/L (at Q29MB03) to 455 mg/L (at Q29MB02), with an average of 165.7 mg/L, indicating that the groundwater hardness varies from soft to hard.
Major Ions	
Calcium	Based on 69 readings, values ranged from 3 mg/L (at Q29MB03) to 140 mg/L (at Q29MB01), with an average of 54.0 mg/L.
Chloride	Based on 68 readings, values ranged from 2 mg/L (at Q29MB03) to 16 mg/L (at Q29MB08), with an average of 6.3 mg/L.
Magnesium	Based on 26 readings, values ranged from 8 mg/L (at Q29MB06) to 19 mg/L (at Q29MB07), with an average of 13 mg/L.
Sodium	Based on 68 readings, values ranged from 2 mg/L (at Q29MB03) to 44 mg/L (at Q29MB08), with an average of 12.6 mg/L.
Sulphate	Based on 67 readings, values ranged from 1 mg/L (at Q29MB03) to 445 mg/L (at Q29MB01), with an average of 105.3 mg/L.
Metals	
Aluminium	Based on 15 readings, values ranged from 0.01 mg/L (at Q29MB01) to 0.31 mg/L (at Q29MB01), with an average of 0.033 mg/L. Exceedances of the adopted trigger values were observed only in well Q29MB01.
Arsenic	Based on 62 readings, values ranged from 0.00185 mg/L (at Q29MB01) to 0.2 mg/L (at Q29MB04), with an average of 0.041 mg/L. Exceedances of the adopted trigger values were observed in all wells, except Q29MB03, Q29MB06, Q29MB08 and Q29MB09.
Cadmium	Based on 15 readings, values ranged from 0.0001 mg/L (at Q29MB01) to 0.00113 mg/L (at Q29MB01), with an average of 0.00024 mg/L. Exceedances of the adopted trigger values were observed only in well Q29MB01.
Chromium	Based on 16 readings, values ranged from 0.001 mg/L (at Q29MB01) to 0.011 mg/L (at Q29MB01), with an average of 0.004 mg/L. Exceedances of the adopted trigger values were observed only in wells Q29MB01 and Q29MB02.
Copper	Based on 18 readings, values ranged from 0.001 mg/L (at Q29MB01) to 0.009 mg/L (at Q29MB03), with an average of 0.0029 mg/L. Exceedances of the adopted trigger values were observed only in wells Q29MB01, Q29MB03 and Q29MB09.

Parameter	Water quality summary
Lead	Based on 11 readings, values ranged from 0.001 mg/L (at Q29MB01) to 0.005 mg/L (at Q29MB02), with an average of 0.00136 mg/L. Exceedances of the adopted trigger values were observed only in well Q29MB02.
Zinc	Based on 53 readings, values ranged from 0.001 mg/L (at Q29MB01) to 0.0846 mg/L (at Q29MB01), with an average of 0.0208 mg/L. Exceedances of the adopted trigger values were observed in all wells.
Nutrients	
Ammonia	Based on 24 readings, values ranged from 0.01 mg/L (at Q29MB01) to 0.23 mg/L (at Q29MB02), with an average of 0.0571 mg/L. Ther were no exceedances of the adopted trigger values.
Total Nitrogen as N	Based on 10 readings, values ranged from 0.1 mg/L (at Q29MB02) to 0.3 mg/L (at Q29MB02), with an average of 0.21 mg/L.
Total Phosphorus	Based on 38 readings, values ranged from 0.01 mg/L (at Q29MB03) to 0.14 mg/L (at Q29MB02), with an average of 0.066 mg/L.

Summary

Overall, the groundwater at Quest 29 is acidic to neural and fresh. Exceedances of the adopted aquatic freshwater trigger values were observed for several analytes in all monitoring wells. All monitoring bores, except for Q29MB01 and Q2MB02, showed similar water chemistry with small variations indicating limited impacts from previous mining activities.

Existing water quality results indicate that groundwater may have been locally impacted by historical mining activities (i.e. at Q29MB01 and Q29MB02), as evidenced by the elevated sulphate levels observed in these bores. Bores Q29MB01 and W29MB02 are located in proximity to the BHS leach pad and appear to be impacted by ae rock solutes with elevated sulphate levels.

Recent monitoring of Q29MB01 shows elevated EC and dissolved metals in comparison to other sites. pH values range between 6.09 to 7.33, and elevated EC, well above the aquatic ecosystem protection GVs of 250 µS/cm (ranging from 210 to 1,213 µS/cm) and exceedance of the ecosystem protection GVs of Al, As, Cd, Cr, Cu and Zn.

Q29MB02 located west of the heap leach ponds and pad has had elevated EC and occasional exceedances of the aquatic ecosystem protection GVs of As, Cd, Cr, Cu, Pb and Zn. pH values range from slightly acidic (6.49) to slightly alkaline (7.6), and elevated EC, above the aquatic ecosystem protection GVs of 250 µS/cm (ranging from 210 to 336 µS/cm).

4.4.6 Groundwater Recharge and Discharge

Groundwater recharge within the mining lease is considered to result from direct rainfall infiltration during runoff and, to a much lesser extent, from small dams located within the lease area. These dams would give localised groundwater "highs" which are superimposed on the regional flow pattern (Environmental and Earth Sciences Pty Ltd, January 1993).

Groundwater discharge would be mainly through limited seepage within the existing open pits or regionally through discharge into creeks and surface water drainages/bodies.

5. Groundwater Modelling

5.1 Overview

A numerical groundwater model, referred to as the Project groundwater model, was developed as part of this study. The objectives of the model were to estimate the:

- Potential maximum drawdown extents induced by the proposed mining pits at the Rustlers Roost and Quest 29 portions of the Project area; and
- Potential groundwater inflows to the proposed mining pits at Rustlers Roost and Quest 29.

Given the minimal data availability, the model was developed in a simple and conservative manner to ensure the predicted drawdowns and groundwater inflows were not underestimated. At this study stage, the results of the groundwater model are considered preliminary due to the lack of detailed data (e.g. transient groundwater levels, aquifer hydraulic property data) that could be used for model refinement and model calibration.

The groundwater model incorporated the following assumptions/simplifications:

- The fault zones were not included in the model;
- A detailed geological model was not available at the time of reporting;
- The hydro-stratigraphic units (HSUs) in the modelled area were simplified to be homogeneous and isotropic;
- The interaction between surface water bodies and groundwater was not yet defined/quantified;
- Only major watercourses were considered in this study; and
- The model was run in steady state.

In addition, based on the model objectives and discussions with PGO, surface water flow and infiltration processes related to the proposed TSF and WRD were not simulated in the current version of the model, but can be included in the future should the need arise.

The Project model comprised two stress periods. The first period represented the pre-proposed mining conditions (but post-legacy mining) and was used for historical calibration. This period was set to steady state as the groundwater system was assumed to have reached equilibrium after the legacy mining ceased. The second stress period represented the proposed mining conditions and was used for predictive modelling. Given the model objectives, this period was also set to steady state to estimate the maximum drawdown extents induced by the dewatering of the proposed pits.

5.2 Model Confidence Level Classification

The degree of confidence with which a model's predictions can be used is a critical consideration for any groundwater modelling exercise. Several factors are typically considered to determine model confidence level classification, and the Australian Groundwater Modelling Guidelines (Barnett *et al*., 2012) define a system to classify the confidence level of groundwater models based on the following factors:

- Available data;

- Calibration procedures;
- Calibration and prediction consistency; and
- Level of stress (i.e. hydraulic stress in the model).

Models are classified as Class 1, 2 or 3 in order of increasing confidence (and complexity). In general, a model will not fit entirely into one class of confidence level because determining the most appropriate class depends upon multiple factors. The current developed groundwater model is mostly consistent with the level 1 confidence level.

The Class 1 groundwater model developed for the Project is considered capable of adequately predicting the impacts on groundwater levels due to the dewatering of the pts during mining. As it is considered that the assumptions and simplifications inherent to the model have resulted in an overestimation of the predicted impacts, the model is considered fit-for-purpose to assess the potential impacts of the Project on existing and future groundwater levels. As the Project develops, monitoring of groundwater system response will further inform the certainty around model predictions and the model could be fine-tuned toward a Class 2 or Class 3 model.

5.3 Numerical Model

5.3.1 Numerical Code

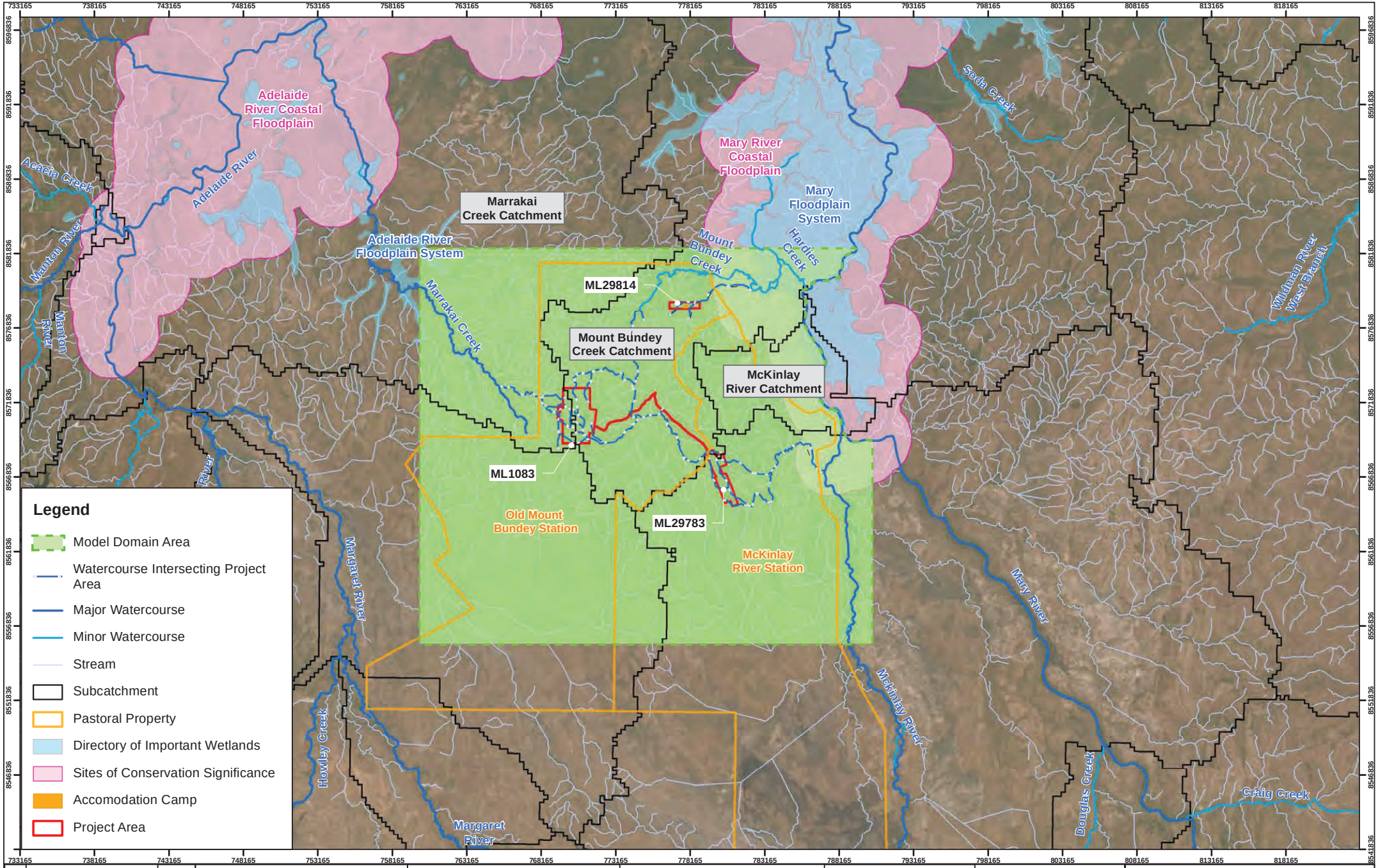
The Project model was developed using MODFLOW-USG (Panday *et al.*, 2013), which is part of the industry standard MODFLOW suite. MODFLOW-USG was selected due to its support for flexible grid structure, enabling features such as the proposed mining pits to be represented more accurately compared to traditional MODFLOW. MODFLOW-USG also allows cell refinement within areas of interest without extending the refinement to the model edges like traditional MODFLOW does. It is therefore possible to set up extremely fine cells within areas of interest (as was done in this study) whilst keeping the model run time reasonable for the Project timeframe.

Groundwater Vistas version 8 (ESI, 2020) and FloPy (Bakker *et al*., 2016) were used as the pre- and post-processor for the Project model.

5.3.2 Spatial discretisation

The Project model domain (Figure 5-1 with detailed site maps shown in Figure 1-2 and for Rustlers Roost and Figure 1-3 for Quest 29) was designed such that the boundary conditions at the model edges are sufficiently distant from the proposed mining pits to avoid the boundary conditions from constraining the pit simulations (also known as the boundary effect).

The southern and western model edges were approximately 10 km from the proposed pits, while the northern and eastern model edges were extended further than 10 km from the proposed pits to capture the Mount Bundey Creek and part of the Mary River. This resulted in a model domain that extended 30.4 km in the east-west direction and 26.6 km in the north-south direction, with the origin positioned at Easting-760000 and Northing-8555600 (GDA 94 MGA Zone 52). The Mary River was considered as a major model boundary condition and hence the portion of the model domain to the east of Mary River was set to be inactive.



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Notes:

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0 2,500 5,000 10,000

Meters

1 cm = 2,296 meters

GCS GDA 1994 MGA Zone 52

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FIGURE 5-1

Regional Site Map and Model Domain

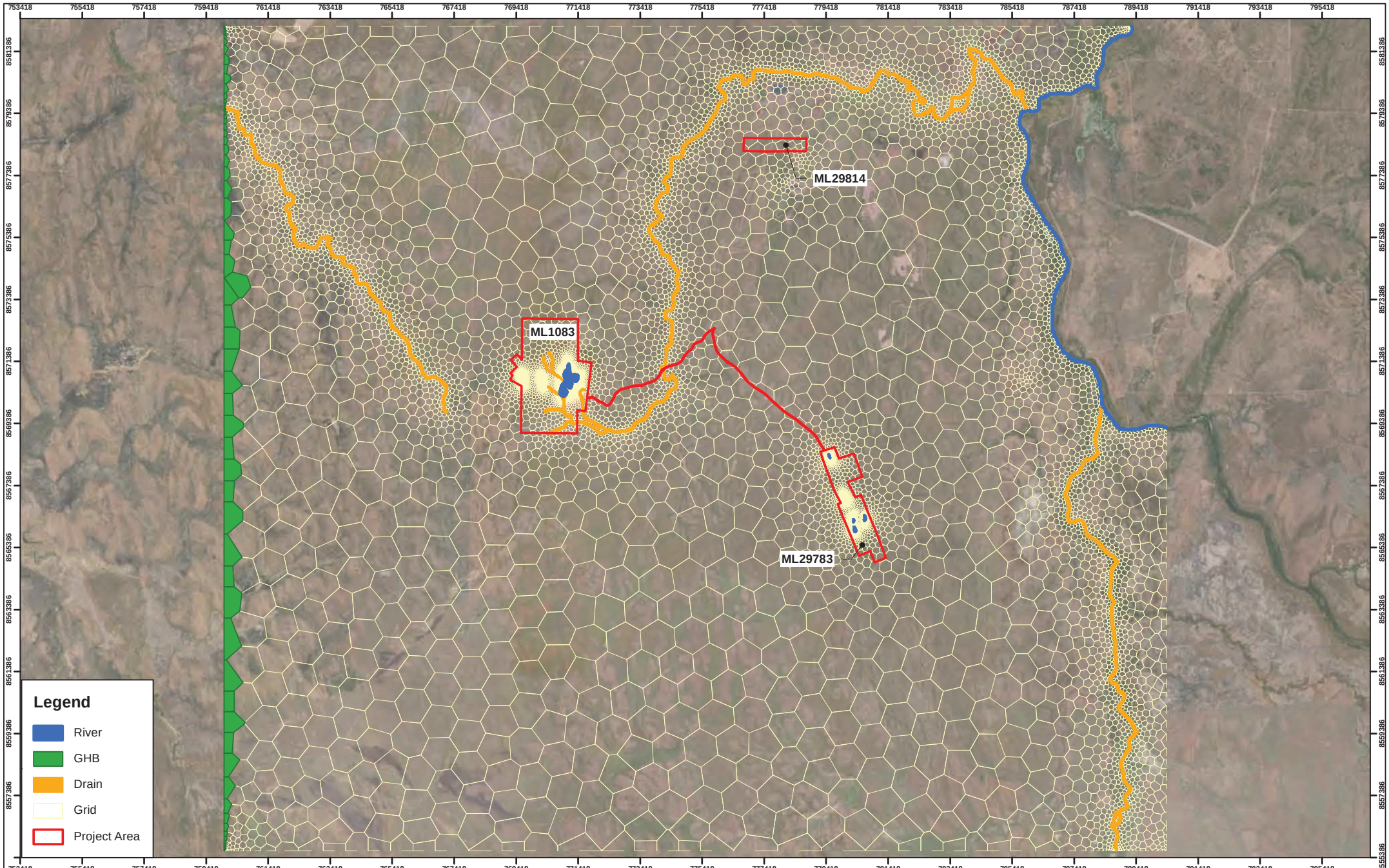
DRG Ref: 1001087-WATERBAL-1.5

C:\Users\shilpass\Desktop\Hanking Gold Mine EIS\1001087 - Rustlers Roost EIS\1001087 - Rustlers Roost EIS\02 MXD\Additional Section\Figure 1-5.mxd

A Voronoi grid, generated by Algomesh version 2 (HydroAlgorithmics, 2020), was used for the Project model **(**Figure 5-2). The use of a Voronoi grid improves the model accuracy and convergence as it ensures the lines connecting the cell nodes are perpendicular to the cell interfaces. The maximum edge length (a proxy for cell size) was capped at:

- 15 m within the proposed maximum pit extents (equivalent to a square cell size of 10 m x 10 m);
- 150 m at the groundwater observation wells and key registered bores (equivalent to a square cell size of 100 m x 100 m); the key registered bores include RN036401, RN032317, RN005912 and RN027956, as suggested by previous investigations (CDM Smith, 2019; Groundwater Enterprises, 2020);
- 150 m for the pit lakes (pre-proposed mining) and along the Mary River, McKinlay River, Mount Bundey Creek and Marrakai Creek (equivalent to a square cell size of 100 m x 100 m); and
- 1,500 m for the remaining part of the model domain (equivalent to a square cell size of 1 km x 1 km).

The cell size specifications above resulted in 61,125 cells per model layer. With three model layers (see Section 5.3.3), the Project model had a total of 183,375 cells.



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0 1,200 2,400 4,800

Meters

1 cm = 1,112 meters

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FIGURE 5-2

Groundwater Model Grid and Boundary Conditions

DRG Ref: 1001087-WATERBAL-1.7

C:\Users\shilpass\Desktop\Hanking Gold Mine EIS\1001087 - Rustlers Roost EIS\1001087 - Rustlers Roost EIS\02 MXD\Additional Section\Figure 1-7.mxd

5.3.3 Model Layers and Surfaces

The HSUs within the model domain were simulated collectively as a single fractured rock aquifer, based on previous investigations (CDM Smith, 2019; Groundwater Enterprises, 2020). The fractured rock aquifer was discretised into three model layers to enhance the vertical resolution of the model.

The top model layer surface was based on the Digital Elevation Model (DEM) from LiDAR (2 m resolution) where available, and 1-second Shuttle Radar Topography Mission (SRTM) (30 m resolution) elsewhere (Figure 5-3). Given the proposed maximum pit depth of approximately 265 m (or 175 metres below the spill level) in Rustlers Roost (Groundwater Enterprises, 2020), a constant thickness of 100 m was assigned to each model layer.

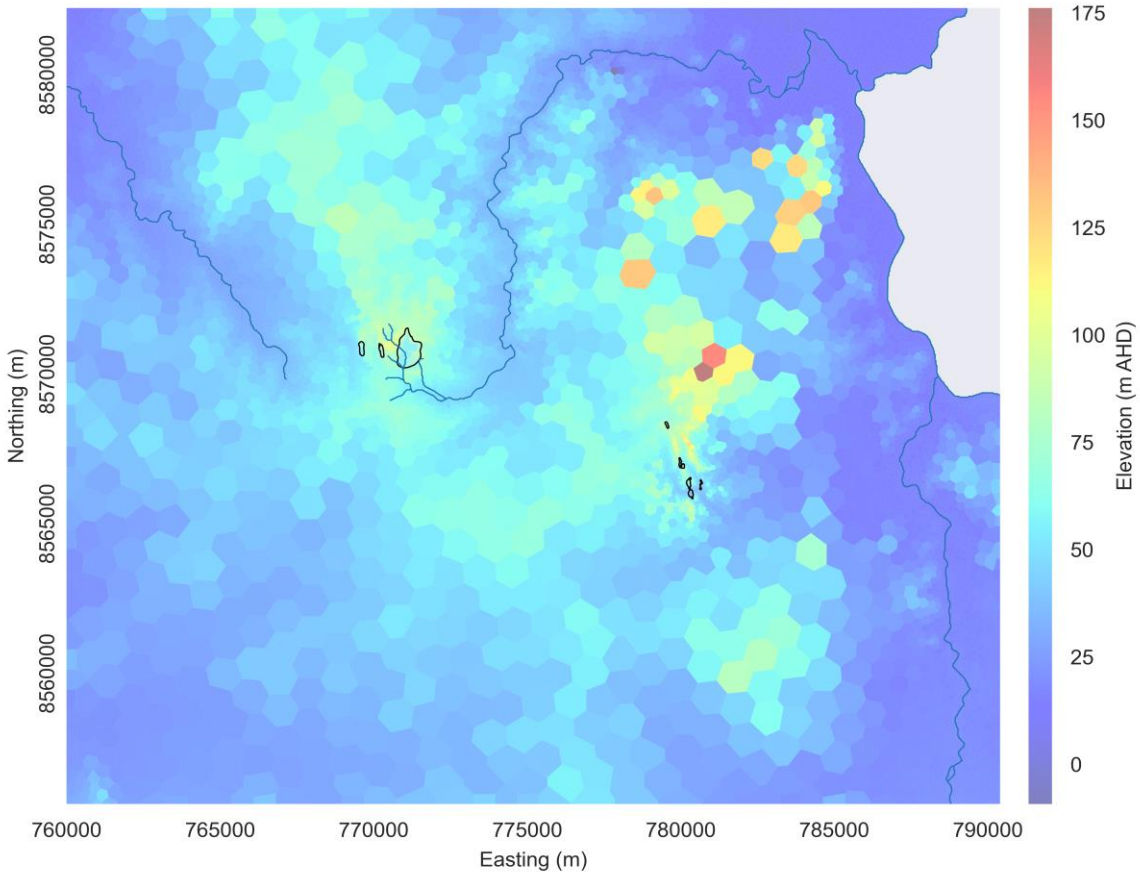


Figure 5-3 Top Model Layer Elevation Surface (m AHD)

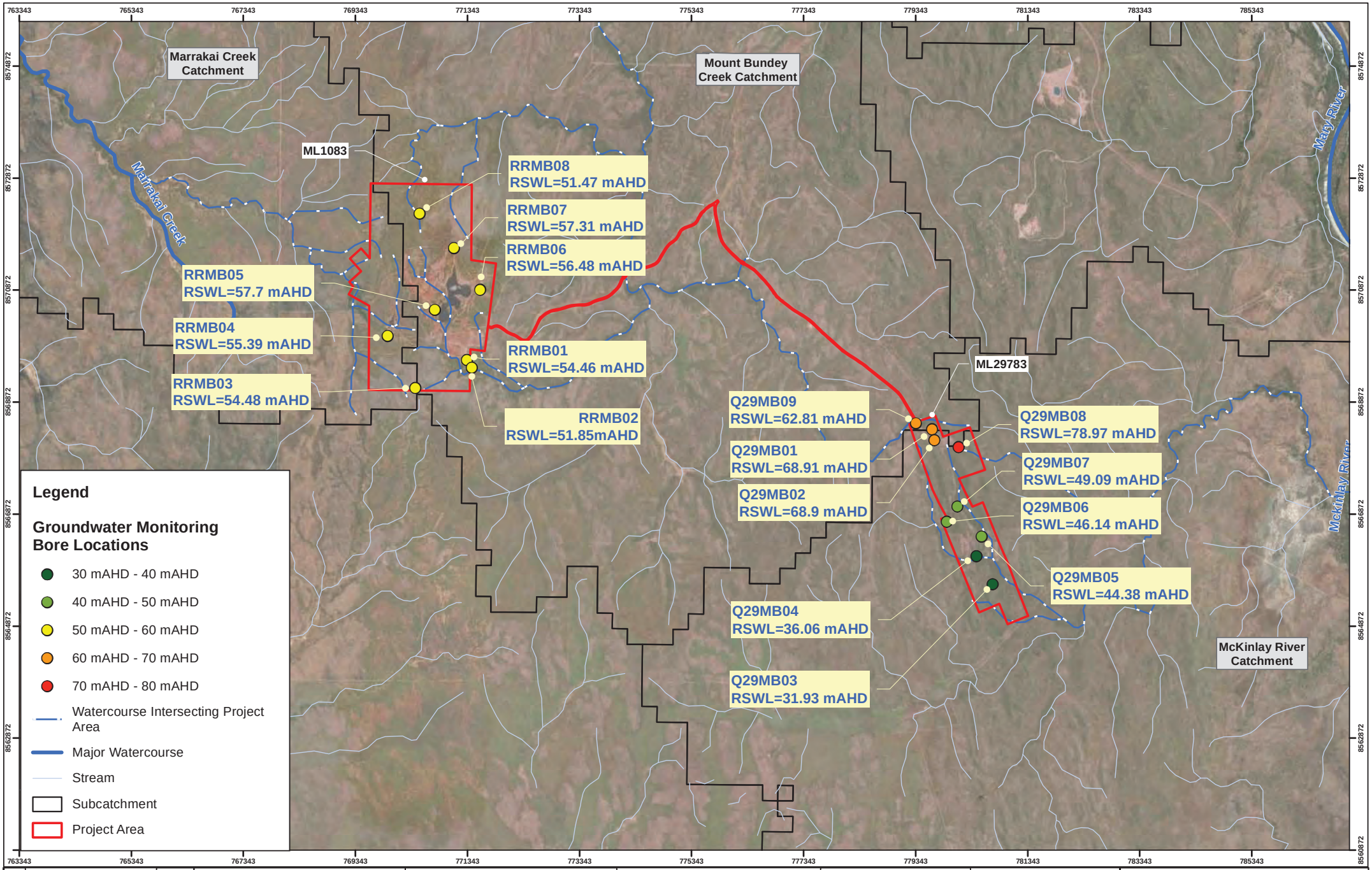
5.3.4 Boundary Conditions

The Project model comprised a range of boundary conditions (Figure 5-2), including regional groundwater flow, surface water features, proposed mining pits, rainfall recharge and evapotranspiration (ET). Each of these boundary conditions is discussed in detail in the following sections.

5.3.5 Regional Groundwater Flow and Groundwater Level

In the model domain, regional groundwater generally flowed to the east/north-east towards the Mary River (CDM Smith, 2019; Groundwater Enterprises, 2020). A General Head Boundary (GHB) was set along the western model edge to provide regional groundwater inflow. The GHB head was set to 3 m below the land surface based on the surrounding groundwater level observations. The GHB conductance was derived from model calibration (see Section 5.3.12). A hydrostatic equilibrium was assumed by applying the same GHB to all model layers.

The average groundwater level recorded on site are illustrated in Figure 5-4.



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Notes:

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0 650 1,300 2,600

Meters

1 cm = 608 meters

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FIGURE 5-4

Average Recorded Groundwater Levels

DRG Ref: 1001087-WATERBAL-1.9

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5.3.6 Surface Water Features

There are four significant rivers and creeks in the model domain, including the Mary River, McKinlay River, Mount Bundey Creek and Marrakai Creek. The spatial locations of these water features are based on the Hydrological Geofabric (Bureau of Meteorology, 2021).

The Mary River is conceptualised to be flowing for the majority of time (Primary Gold, 2021) and simulated using the MODFLOW River package. The riverbed elevation was sourced from the DEM (see Section 5.3.3). The river stage was assumed to be 2.5 m above the riverbed based on gauging station G8180084 and G8180085 (Department of Environment, Parks and Water Security, 2021). The riverbed conductance was derived from model calibration (see Section 5.3.12).

The McKinlay River, Mount Bundey Creek and Marrakai Creek are ephemeral in nature (Primary Gold, 2021) and were simulated using the MODFLOW Drain package. The drain stage was sourced from the DEM (see Section 5.3.3) and the drain conductance was derived from model calibration (see Section 5.3.12).

The pit lakes formed from legacy mining were simulated using the MODFLOW River package. The surface areas of these pit lakes were digitised from satellite imagery. As the North Koolpin pit lake was barely visible on satellite imagery and is relatively unsignificant in volume, this pit was not included in the model for calibration purposes. The assumed pit water levels are presented in Table 5-1. Lake bottom elevations were sourced from the DEM. The riverbed conductance was derived from model calibration.

The above discussed surface water features were assigned to the top model layer. The pit lakes and the part of Mount Bundey Creek that overlaps with the proposed mining pits were excluded from the predictive modelling.

Table 5-1 Assumed Pit Standing Water Levels

Pit lake	Standing Water Level (mAHD)
Rustlers Roost	56.9
Zamu pit	37.5
Taipan pit	39
South Koolpin pit	40
North Koolpin pit	52.5
BHS pit	70.5

5.3.7 Mining Pits

The proposed mining pits were represented using the MODFLOW Drain package in the predictive modelling. As a conservative approach, the maximum pit extents were used to set up the drain cells. Also, the minimum pit base elevation was applied uniformly as the drain stage for each pit (Table 5-2). The drain conductance was set to a relatively high value of 100 m^2/d to ensure the predicted drawdowns and groundwater inflows are not underestimated. The drain cells were assigned to the top model layer, as well as the second model layer in areas where the drain stage is below the bottom elevation of layer 1.

Table 5-2 Minimum Base Elevation for the Proposed Pits

Location	Proposed Mining Pit	Minimum Pit Base Elevation (m AHD)
Rustlers Roost	Rustlers Roost Main Pit	-125
Rustlers Roost	Annie Okaley Pit	5
Rustlers Roost	Annie's Dam Pit	35
Quest 29	BHS Pit	48

Location	Proposed Mining Pit	Minimum Pit Base Elevation (m AHD)
Quest 29	North Koolpin Pit	22
Quest 29	South Koolpin Pit	-3.5
Quest 29	Taipan Pit	-11
Quest 29	Zamu Pit	-36

5.3.8 Rainfall Recharge

Rainfall groundwater recharge was estimated using the chloride mass balance technique (Leaney *et al*., 2011) as follows.

$$R = \frac{D}{C} \times 100$$

where:

- R is rainfall groundwater recharge (mm/y);
- D is chloride deposition rate from rainfall (kg ha^{-1} y^{-1});
- C is chloride concentration of groundwater (mg/L); and
- The value of 100 is a unit conversion factor.

The chloride deposition rate from rainfall is assumed to be 5 kg ha^{-1} y^{-1} for the modelled area (Davies and Crosbie, 2018). Site monitoring data indicate a mean groundwater chloride concentration of 3.8 mg/L (Q: average Cl at Rustlers Roost is 3.3 mg/L and at Quest 29 is 6.3 mg/L based on EcOz monitoring results. Average across both areas is 5.2 mg/L) (see Section 4.4.5). Using the average chloride concentration from Rustlers Roost, the calculated rainfall groundwater recharge rate is 151 mm/y, which is comparable to the deep drainage estimate of approximately 150 mm/y from the Bureau of Meteorology (BoM) that was used in the Toms Gully groundwater model (GHD, 2018). Given the mean annual rainfall of 1420 mm/y recorded at the Middle Point Rangers station (Station 14090; located approximately 40 km south-west of the modelled area), the chloride mass balance analysis suggests 10.6% of rainfall becomes groundwater recharge.

There are some degrees of uncertainty in the adopted chloride deposition rate from rainfall as it is based on a national mapping study (Davies and Crosbie, 2018). Therefore, the recharge rate of 132mm/y was used as the initial value and refined through model calibration (see Section 5.3.12).

5.3.9 Evapotranspiration

Evapotranspiration (ET) from shallow groundwater was represented using the recharge ponding function of MODFLOW-USG, which removes water from the model as negative recharge to keep the groundwater level below the ponding elevation. The ponding elevation was set to 1 m below the land surface based on the groundwater level observations. The ponding function was selected over the traditional MODFLOW EVT package due to its simplicity and numerical stability.

5.3.10 Hydraulic parameters

The hydrostratigraphic units within the model domain were simulated collectively as a single fractured rock aquifer (CDM Smith, 2019; Groundwater Enterprises, 2020). Section 4.4.3 summarises the hydraulic conductivity estimates from

previous investigations, including studies related to the Toms Gully Mine. The slug test estimates are relatively high, which may be influenced by the gravel pack surrounding the tested bores.

Based on Section 4.4.3, an initial hydraulic conductivity value of 0.1 m/d was used for model calibration, with an upper bound of 10 m/d and lower bound of 0.001 m/d. Given the data availability and as the three HSU represent one aquifer system, the vertical anisotropy was assumed to be 1.0 (i.e. horizontal hydraulic conductivity equals vertical hydraulic conductivity), and the same hydraulic conductivity field was applied to all model layers. Storage parameters are not discussed herein as no transient modelling was involved in the current version of Project model (see Section 5.3.11).

Table 5-3 Hydraulic Conductivity Estimates (m/d) from Previous Investigations

Location	Method	Geometric mean	Min	Max	Source
Rustlers Roost	Pump test	1.2	0.8	1.8	Valdora (1994)
Rustlers Roost	Slug test	4.1	0.8	12.5	Groundwater Enterprises (2021)
Quest 29	Slug test	5.2	0.3	38.8	Groundwater Enterprises (2021)
Toms Gully	Pump test	0.5	0.1	1.0	AGE (2019)
Toms Gully	Model calibration	0.001	0.001	0.001	AGE (2019)
Toms Gully	Model calibration	0.2	0.01	1.0	GHD (2018)

5.3.11 Temporal Discretisation

The Project model comprised two stress periods. The first period represented the pre-proposed mining conditions (but post-legacy mining) and was used for historical calibration. This period was set to steady state as the groundwater system was assumed to have reached equilibrium after the legacy mining ceased. The second stress period represented the proposed mining conditions and was used for predictive modelling. Given the model objectives, this period was also set to steady state to estimate the maximum drawdown extents induced by the dewatering of the proposed pits.

5.3.12 Model Calibration and Sensitivity Analysis

5.3.12.1 Calibration Approach

Model calibration, also known as model inversion, is a process of estimating the model inputs that can produce outputs that match the field observations. As only a steady-state calibration was undertaken (Section 5.3.11), the steady-state groundwater levels were calculated as the average of the groundwater levels observed in the monitoring wells during the 2020-2021 monitoring program. The average groundwater levels were calculated using levels from 8 wells in the Rustlers Roost portion of the Project area and 9 wells in the Quest 29 portion (Figure 5-4).

The steady-state groundwater levels were calibrated against hydraulic conductivity, rainfall recharge and conductance values of surface water features and the GHB. A groundwater model calibration is non-unique in that there are numerous combinations of parameters that can achieve a similar fit to the field observations. To address this issue, this study used a stochastic modelling approach through PESTPP-IES (White, 2018) to develop 100 different parameter combinations (also known as realisations) that were calibrated to the groundwater level observations. This approach is superior to the traditional deterministic modelling approach where only a single model is used for predictions. The stochastic approach used in this study also enabled probabilistic predictions and more robust uncertainty analysis (see Section 5.3.13).

Hydraulic conductivity and rainfall recharge were calibrated using pilot points (Doherty *et al*., 2010), a technique where parameters are estimated at the pilot point locations and then interpolated onto the whole model domain. As the run time of PESTPP-IES is not dependent on the number of calibration parameters, this study used a highly parameterised modelling approach (i.e. an extremely high number of calibration parameters) with 3,859 pilot points for hydraulic

conductivity and 3,859 pilot points for recharge. In addition, the conductance values of surface water features and GHB were included in the calibration, resulting in a total of 7,728 calibration parameters.

In addition to matching the field observations, the calibration parameters also needed to be constrained within a range that applies to the hydrogeological understanding of the site. The upper and lower bounds for each calibration parameter are provided in Table 5-4.

Table 5-4 Parameter Upper and Lower Bounds for Model Calibration

Parameter	Initial Value	Lower Bound	Upper Bound
Hydraulic conductivity (m/d)	0.1	0.001	10
Rainfall recharge (mm/y)	132	1.4	284
Proportion of rainfall rechange (%)	9.3	0.1	20
Surface water feature conductance (m^2/d)	10	0.001	50
GHB conductance (m^2/d)	10	0.001	50

5.3.12.2 Calibration Performance

The locations of the monitoring bores at Rustlers roost and Quest 29 are shown on Figure 4-7 and Figure 4-8, respectively.

The observed and simulated (i.e. obtained through the steady-state calibration process) groundwater levels are compared in Figure 5-5. The dots in the figure represent the base model, i.e. the model simulation with initial parameter values as per Table 5-4. The error bars in the figure represent the simulated range of groundwater levels from the 100 model realisations, which included the base model and 99 other model realisations with model parameter values selected at random between the upper and lower bounds in Table 5-4.

A narrower error bar suggests a better agreement between the 100 model realisations and hence a higher confidence on the model results. Figure 5-5 shows that all data points and error bars are close to the 1:1 reference line (i.e. the observed and simulated values are very similar), indicating a satisfactory calibration. The base model had a Root Mean Squared Error (RMSE) of 0.48 m and a Scaled RMSE (SRMSE) of 1.0%, while the other 99 model realisations had a RMSE of 0.4 to 0.86 m and a SRMSE of 0.9% to 1.8%. Some of the 99 model realisations showed smaller errors than the base model. The very low RMSE and SRMSE suggested that the 100 model realisations matched the field observations satisfactorily and that the developed model was suitable for predictive modelling.

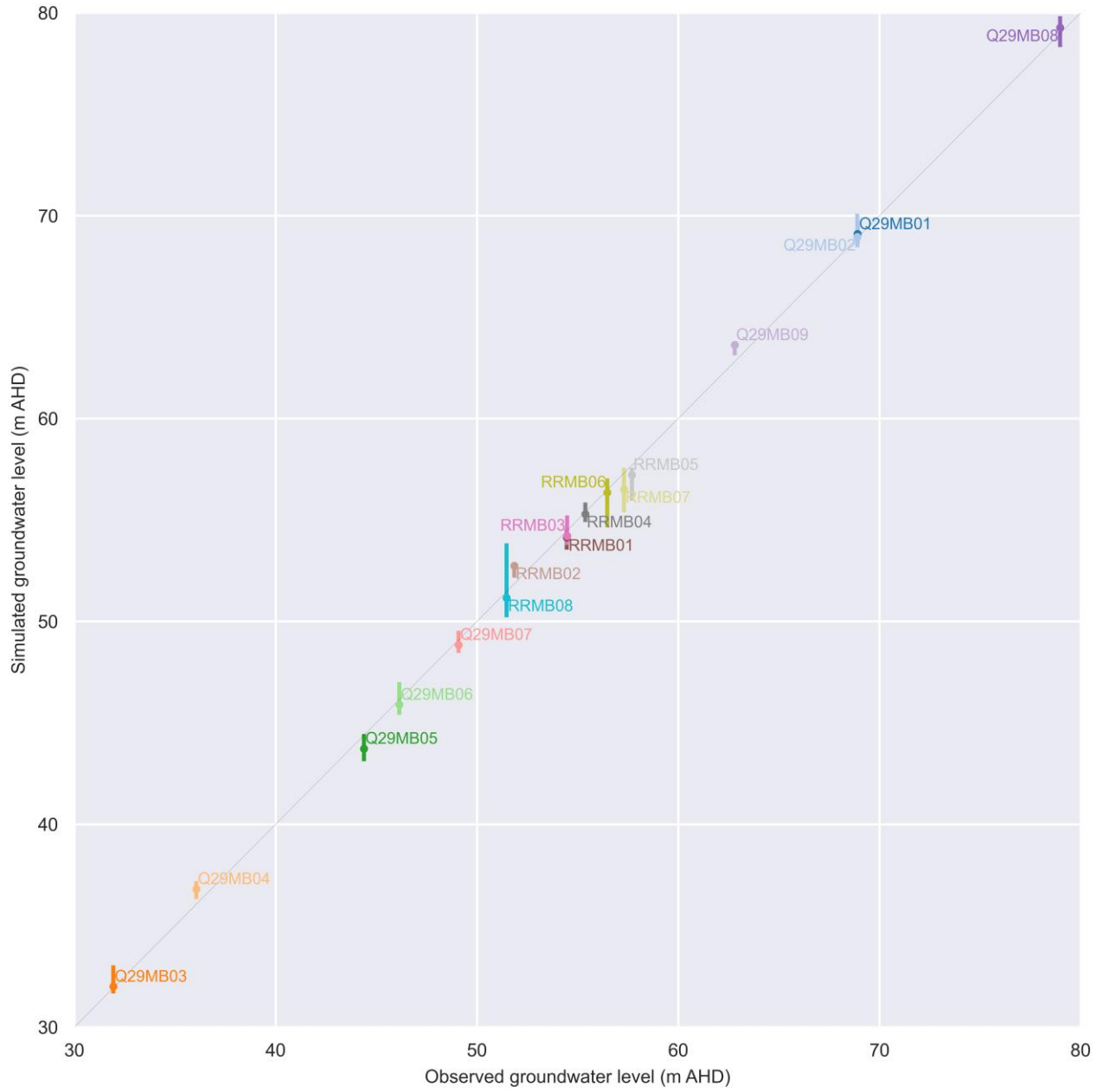


Figure 5-5 Comparison of Observed and Simulated Groundwater Levels Under Steady-State Calibration

5.3.12.3 Calibrated Parameters

Although all the 100 model realisations fitted the field observations satisfactorily (see Section 5.3.12.2), calibrated parameters varied considerably across the realisations, demonstrating the impact of non-uniqueness (see Section 5.3.12.1).

Figure 5-6 shows a subset of the calibrated model realisations to illustrate the non-uniqueness in hydraulic conductivity. For instance, the four randomly selected realisations show agreement that there is a permeable feature in the south-eastern part of the model domain, but there is uncertainty in whether this permeable feature extends to the Mary River. The top-left realisation conceptualises the site as a low permeability system, while the top-right realisation conceptualises the site as a high permeability system, and both realisations can fit the field observations similarly well. This demonstrates the constraints of traditional deterministic modelling where only a single model is used for

predictions. In comparison, this study uses a stochastic modelling approach where 100 calibrated model realisations are used for predictive modelling.

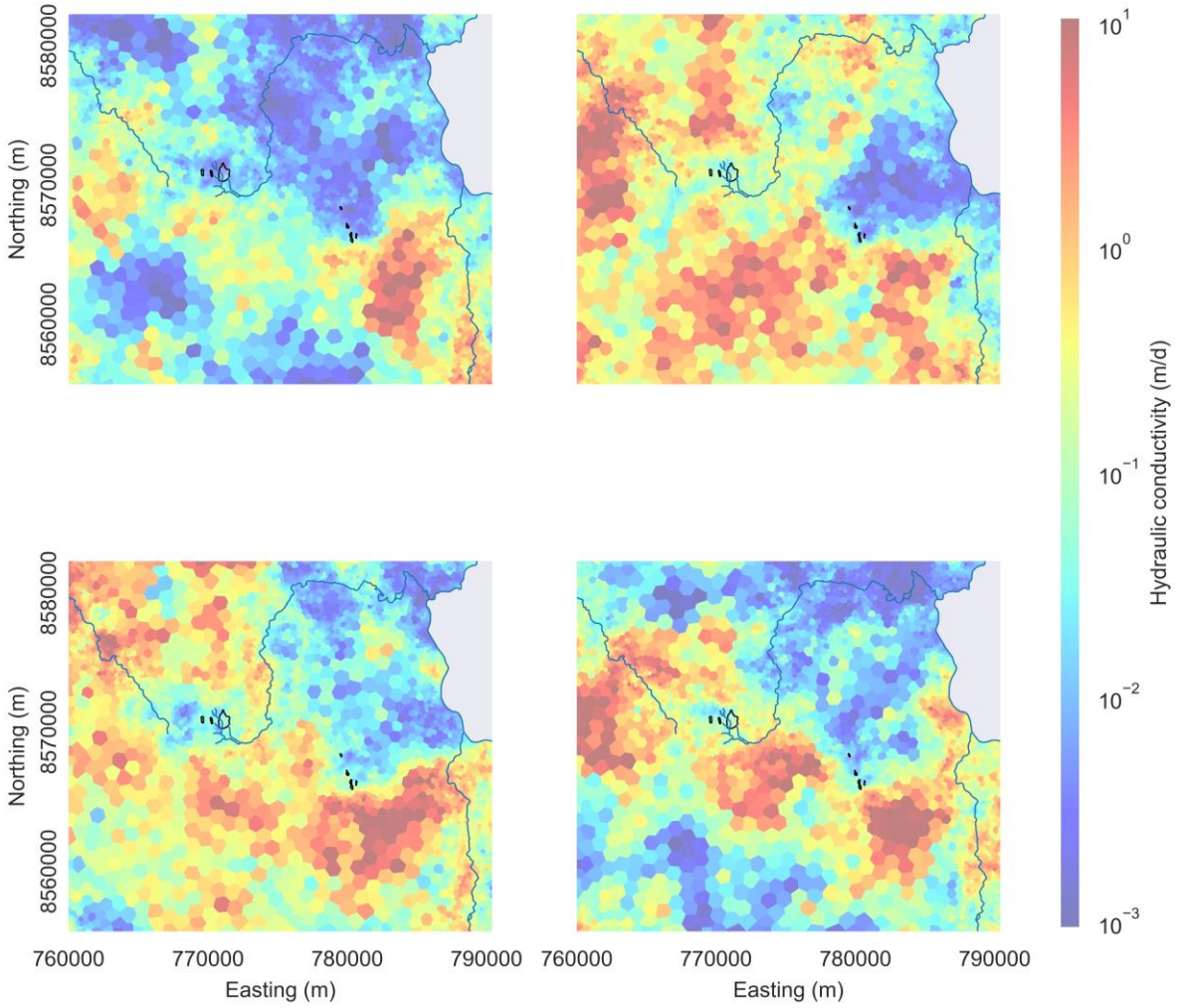


Figure 5-6 A Subset of Calibrated Model Realisations to Illustrate the Non-Uniqueness in Hydraulic Conductivity (in m/d)

To maintain the readability of this report, the calibrated parameters of the base model are shown herein, along with the logarithmic standard deviations of the calibrated parameters to indicate the variations across the realisations, as an indicator of parameter uncertainty.

Figure 5-7 shows the calibrated hydraulic conductivity of the base model realisation. Hydraulic conductivity is relatively low around the pits in Rustlers Roost and Quest 29. There is a significantly high permeability feature to the south of all pits, and a relatively impermeable feature to the north-east of Quest 29.

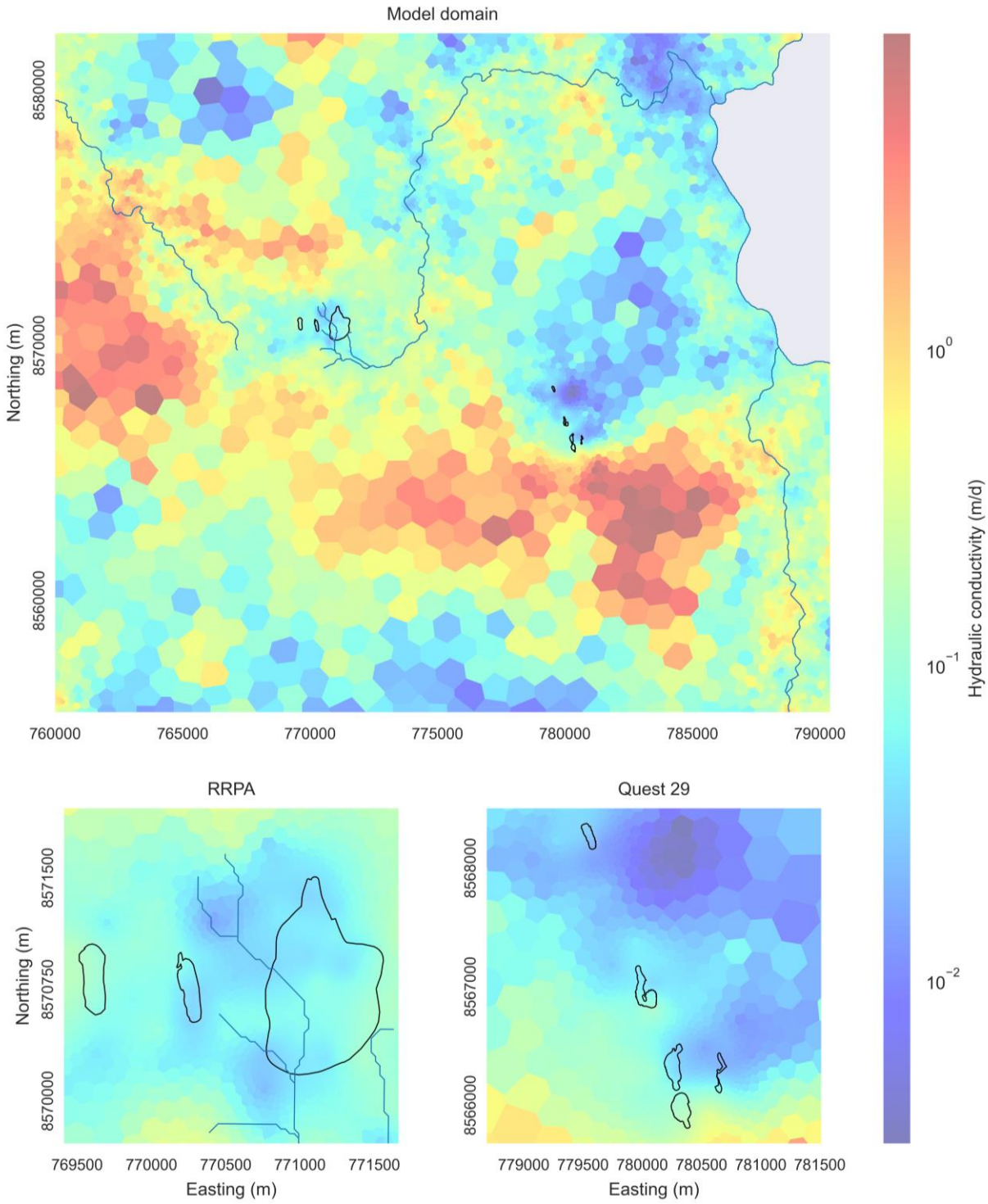


Figure 5-7 Calibrated Hydraulic Conductivity (m/d) of the Base Model Realisation

Figure 5-8 shows the logarithmic standard deviations of hydraulic conductivity from the base model realisation, which is a proxy for parameter uncertainty. The uncertainty is relatively low near the pits, indicating the groundwater level observations in these areas are effective in reducing the uncertainty in hydraulic conductivity. As expected, the uncertainty increases further away from the pits and groundwater level observations.

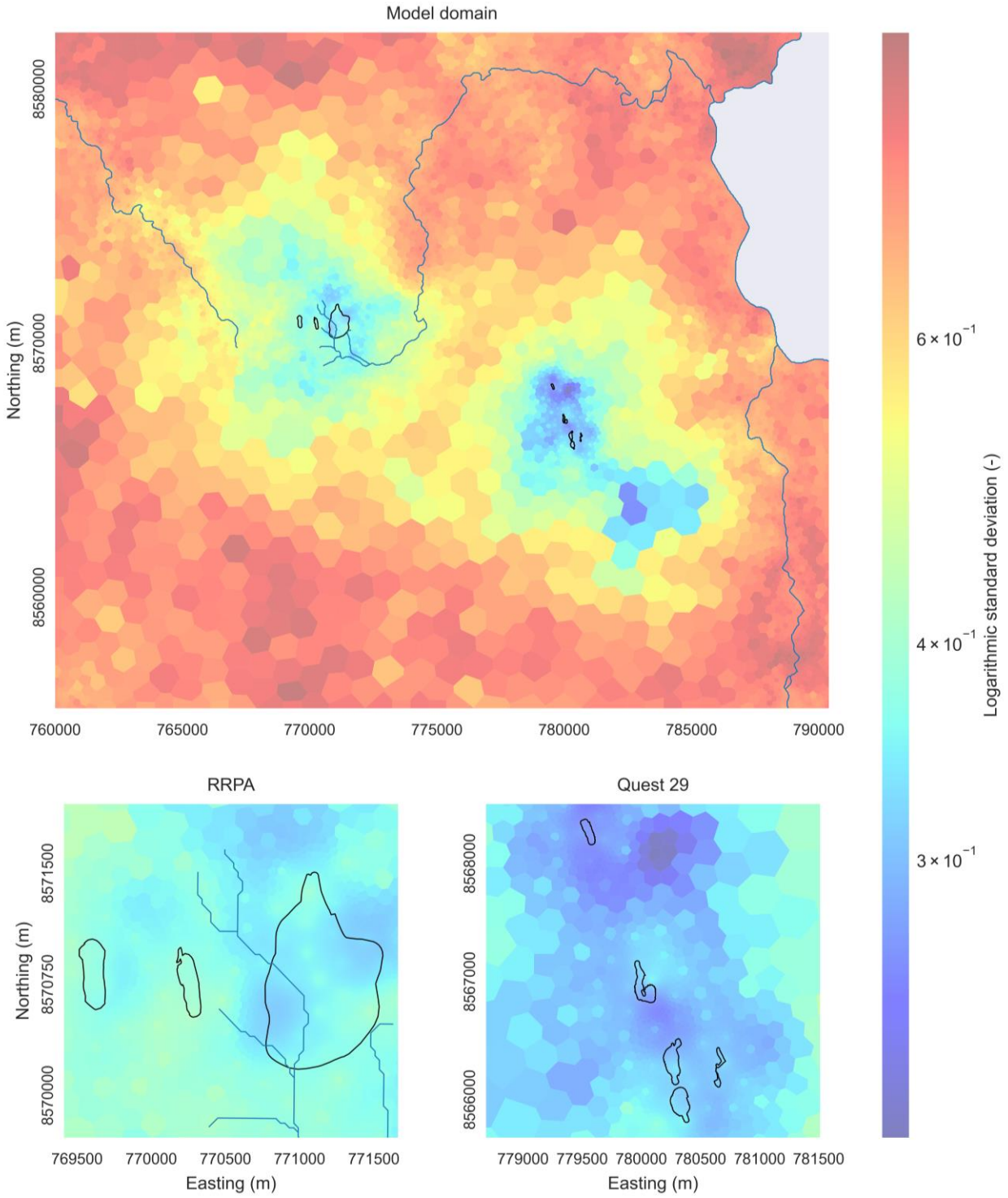


Figure 5-8 Uncertainty in Hydraulic Conductivity, Expressed as the Logarithmic Standard Deviations of the 100 Calibrated Model Realisations (in m/d)

Figure 5-9 shows the calibrated rainfall recharge of the base model realisation. Recharge is generally high in the area, including Rustlers Roost, but relatively low near the North Koolpin pit in Quest 29.

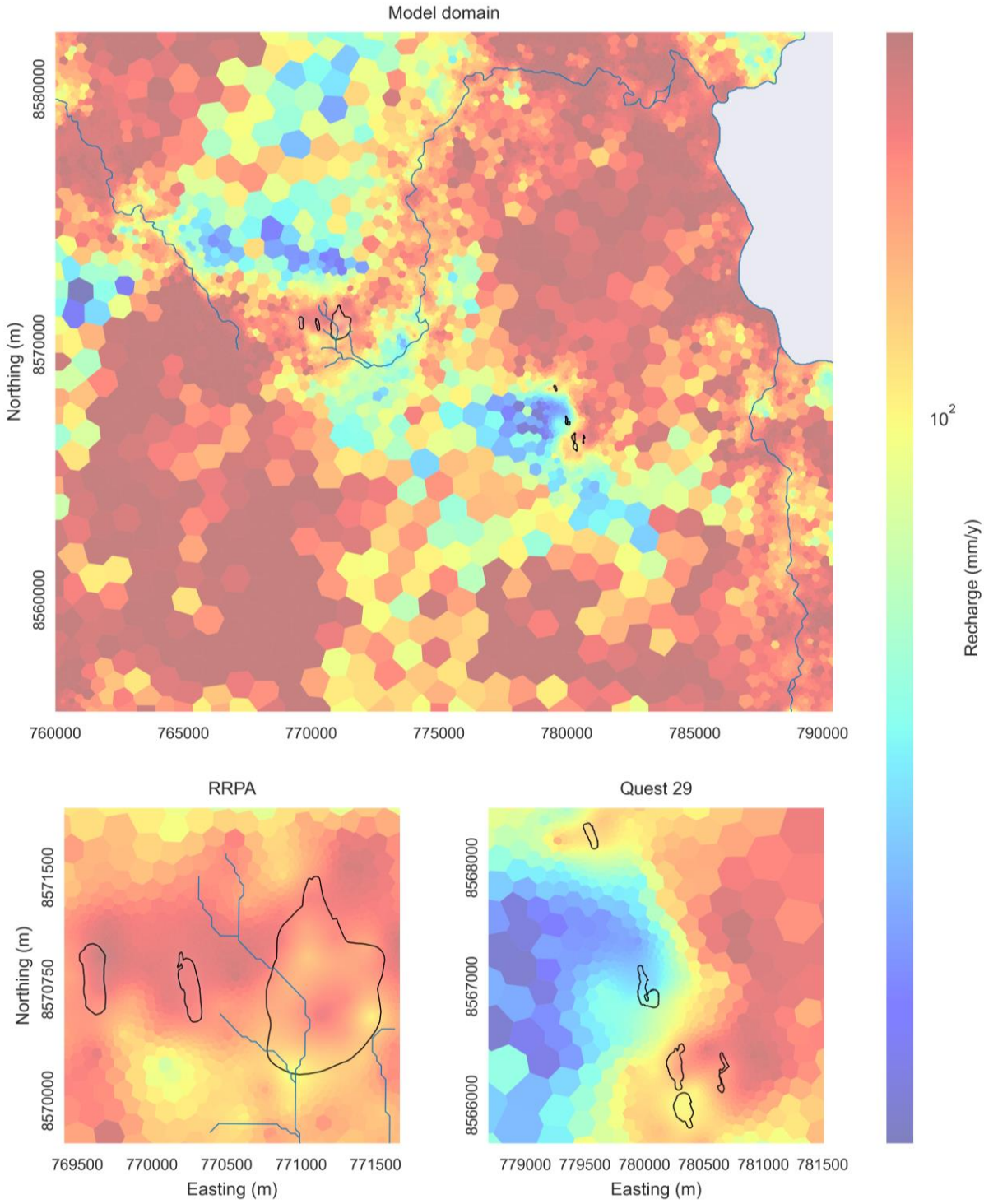


Figure 5-9 Calibrated Rainfall Recharge (mm/yr) of the Base Model Realisation

Figure 5-10 shows the uncertainty in rainfall recharge, expressed as the logarithmic standard deviations of the 100 calibrated model realisations. The uncertainty near the pits is only reduced slightly by the groundwater level observations, potentially suggesting the project areas may be more sensitive to recharge in the outer areas, which controls the regional groundwater flow fields.

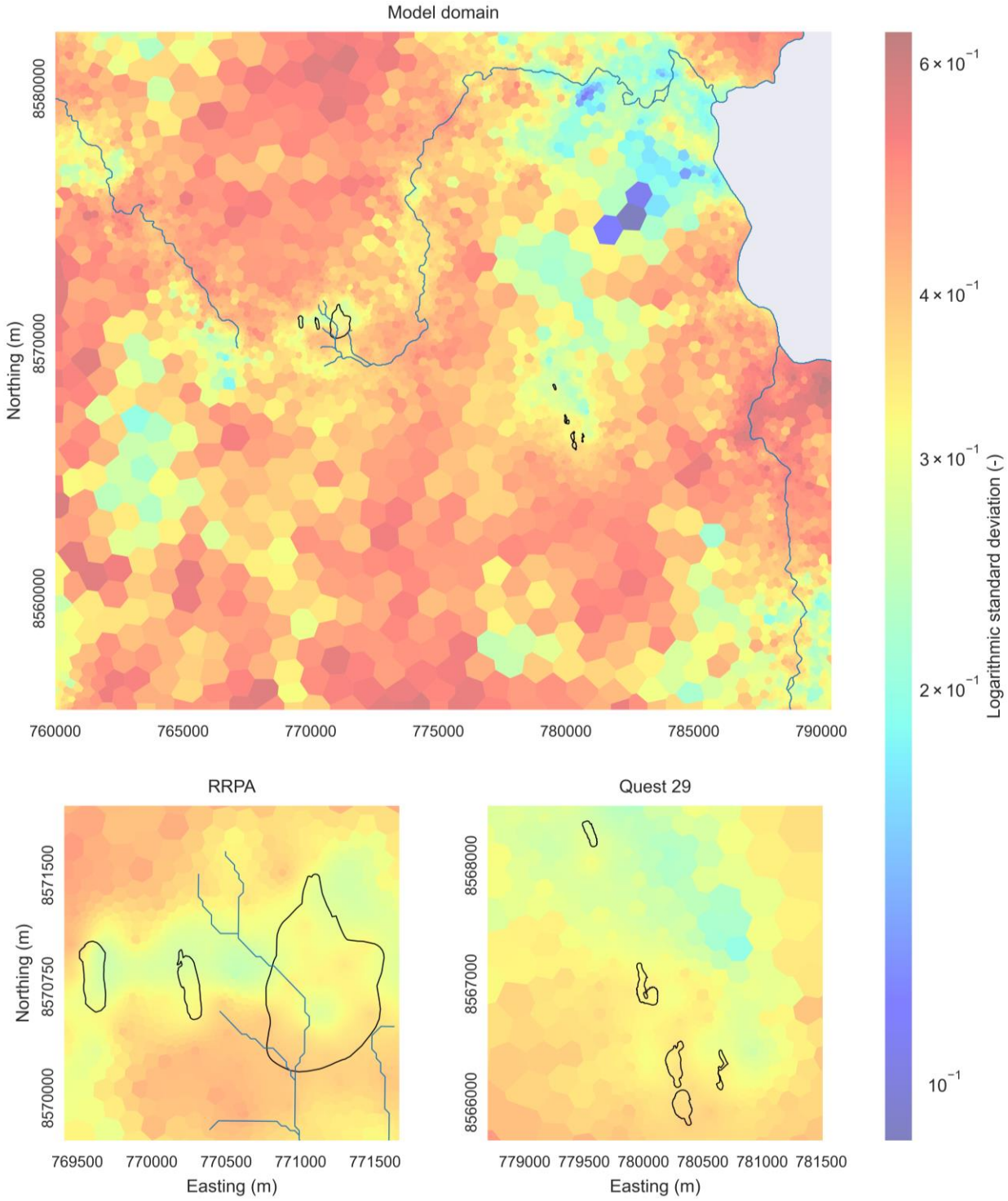


Figure 5-10 Uncertainty in Rainfall Recharge, Expressed as the Logarithmic Standard Deviations of the 100 Calibrated Model Realisations (in mm/yr)

Table 5-5 summarises the calibrated parameters for the base model realisation and statistics for the 100 calibrated model realisations. For most model parameters, the range between the 5th and 95th percentiles were very wide, suggesting a reasonable coverage of parameter space for predictive modelling (i.e. the parameter combinations used for predictive modelling are sufficiently different from each other). The base model had relatively high rainfall recharge, which is reasonable (11.2% of rainfall). Also, the base model was complemented by realisations with lower recharge for predictive modelling to show a comprehensive picture.

Table 5-5 Calibrated Parameters for the Base Model Realisation and Statistics for the 100 Calibrated Model Realisations

Parameter	Description	Base	100 Calibrated Model Realisations		
			Geomean	5th percentile	95th percentile
Hydraulic conductivity (m/d)	Geometric mean	0.17	0.11	0.04	0.24
Rainfall recharge (mm/y)	Geometric mean	159	96	62	147
Riverbed conductance(m²/d)	Rustlers Roost pit lake	6.1	5.5	1.5	23.2
	BHS pit lake	10.6	10.9	1.8	36.0
	South Koolpin pit lake	7.8	5.4	1.0	18.6
	Taipan pit lake	15.4	13.8	2.8	47.4
	Zamu pit lake	2.4	1.8	0.5	7.9
	Mary River	23.1	20.9	6.6	48.9
Drain conductance (m²/d)	Mount Bundey Creek	16.3	12.3	3.0	42.9
	Marrakai Creek	5.5	3.9	1.0	16.8
	McKinlay River	22.2	19.3	5.7	43.5
GHB conductance (m²/d)	-	15.7	14.9	4.7	50.0

5.3.12.4 Calibrated Model Results

Groundwater Levels

The simulated groundwater levels from the calibrated base model realisation are shown in Figure 5-11. In the Quest 29 area, groundwater generally flows to the east/south-east towards the McKinlay River, with a groundwater mound to the north-east of the site that coincides with the topographic high. The Rustlers Roost portion of the Project area is located on a groundwater divide, with some groundwater flowing to the east towards Mount Bundey Creek and some flowing to the west towards the Marrakai Creek.

Mass Balance

Table 5-6 shows the mass balance for the base model realisation and statistics for the 100 calibrated model realisations. The inflows and outflows of the groundwater system are dominated by rainfall recharge and ET respectively. All 100 model realisations show minimal mass balance discrepancies, indicating good convergence performance.

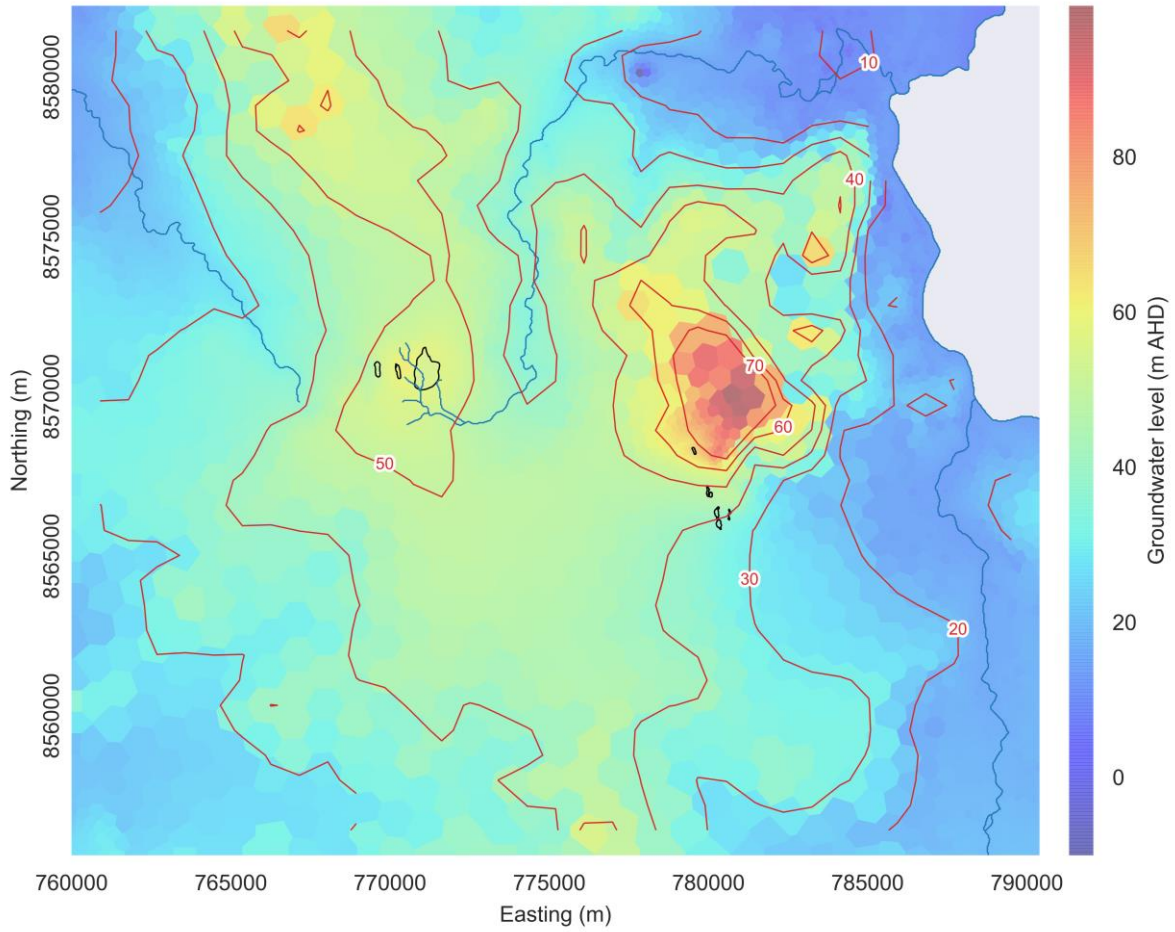


Figure 5-11 **Modelled Groundwater Levels (m AHD) from the Calibrated Base Model Realisation for the Pre-Proposed Mining Conditions**

Table 5-6 **Mass Balance (ML/d) for the Base Model Realisation and Statistics for the 100 Calibrated Model Realisations**

Type	Component	Base Model	100 Calibrated Model Realisations		
			Geometric Mean	5th percentile	95th percentile
Inflows	River leakage	65	67	31	139
	GHB	4	3	1	10
	Recharge	211	151	111	208
	Total	280	-	-	-
Outflows	GHB	3	2	1	5
	ET	277	224	154	319
	Total	280	-	-	-
IN - OUT		0	0	0	0
Percent Discrepancy		0%	0%	0%	0%

Sensitivity Analysis

Due to the nature of stochastic modelling, sensitivity analysis was not undertaken in the traditional manner where parameters are varied individually, as this approach only focuses on a very small part of the vast parameter space. Instead, this study inferred sensitivities from Table 5-5, where a narrower range (i.e. difference between the 5th and 95th percentile) indicates a higher parameter sensitivity. This is based on the rationale that calibration is expected to have a larger impact on sensitive parameters, hence the range of sensitive parameters would be reduced more by calibration. For instance, the Zamu pit lake conductance has a relatively narrow range and is therefore considered more sensitive than the GHB conductance, which shows a relatively large range.

5.3.13 Probabilistic Predictive Modelling and Uncertainty Analysis

The developed steady-state groundwater model was used in predictive model to simulate the impact of the proposed mining operations (in terms of dewatering of the mining pits) on groundwater levels and drawdown, using the stochastic approach adopted for the model calibration.

5.3.13.1 Groundwater Drawdowns from Dewatering of Proposed Pits

The extents of predicted maximum drawdown (as represented by the 1m drawdown level) resulting from the dewatering of the proposed pits are shown in Figure 5-12. The 1 metre drawdown has been selected as the indicator of the maximum extent as drawdowns of less than 1 m are considered beyond the model accuracy, due the limited data availability and associated model uncertainty.

The 1m drawdown contours from the 100 model realisations are plotted as semi-transparent lines, where a more solid colour resulting from the superposition of individual semi-transparent lines indicates better agreement between the realisations and hence a higher confidence on the model predictions.

Most model realisations in Figure 5-12 show that the 1 m drawdown contours extend approximately between 5km and 10 km to the north and 3 km to 6 km to the south of the Rustlers Roost pits, while the drawdown contours to the east and west are bounded by Mount Bundey Creek and Marrakai Creek, respectively. However, the constraints on the drawdown extent limitations to the east and west is related to a loss of evaporation and potential baseflow along the upstream reaches of Mount Bundey and Marrakai creeks. Water table evaporation (cf. Section 5.3.9) is dropping by an average of 17% (ranging from a drop of 8% to 40% for the 100 model realisations). This has the potential of affecting terrestrial and aquatic GDEs (cf. Figure 4-6).

For the Quest 29 area, the drawdown contours extend approximately 2km to 5km to the south-west of the proposed pits and 3 km to 8 km to the south-east. The extent to the north-east of the pits is constrained, possibly due to the presence of an impermeable feature emerging from the calibration process (cf. Figure 5-7). This feature is consistent with the outcropping of Mount Bundey Granite as illustrated in Figure 4-5. The predictive modelling suggest that the Mary River and McKinlay River are unlikely to be impacted by the proposed pits (all of the 100 realisations 1m drawdown contours remain at least 3km away from the Mary River and the McKinlay River).

5.3.13.2 Groundwater Inflows to the Proposed Pits

The 100 predictive model realisations were used to obtain probabilistic predictions of groundwater inflows to the proposed pits. The results are presented as probability distributions in Figure 5-13, with the peak of distribution being considered as the most likely value. The 5th and 95th percentile values were used to inform the predictive uncertainty.

All model realisations show no groundwater inflows to the Annie's Dam East Pit. This is due to its base elevation (35 m AHD) being substantially higher than the base elevation of the adjacent Rustlers Roost main pit, which is at -125 m AHD (Table 5-2). The Rustlers Roost main pit shows a relatively wide range of predicted groundwater inflows. Further data

collection (e.g. aquifer tests and installation of additional monitoring wells) would be required to fine-tune the model and obtain more accurate predictions.

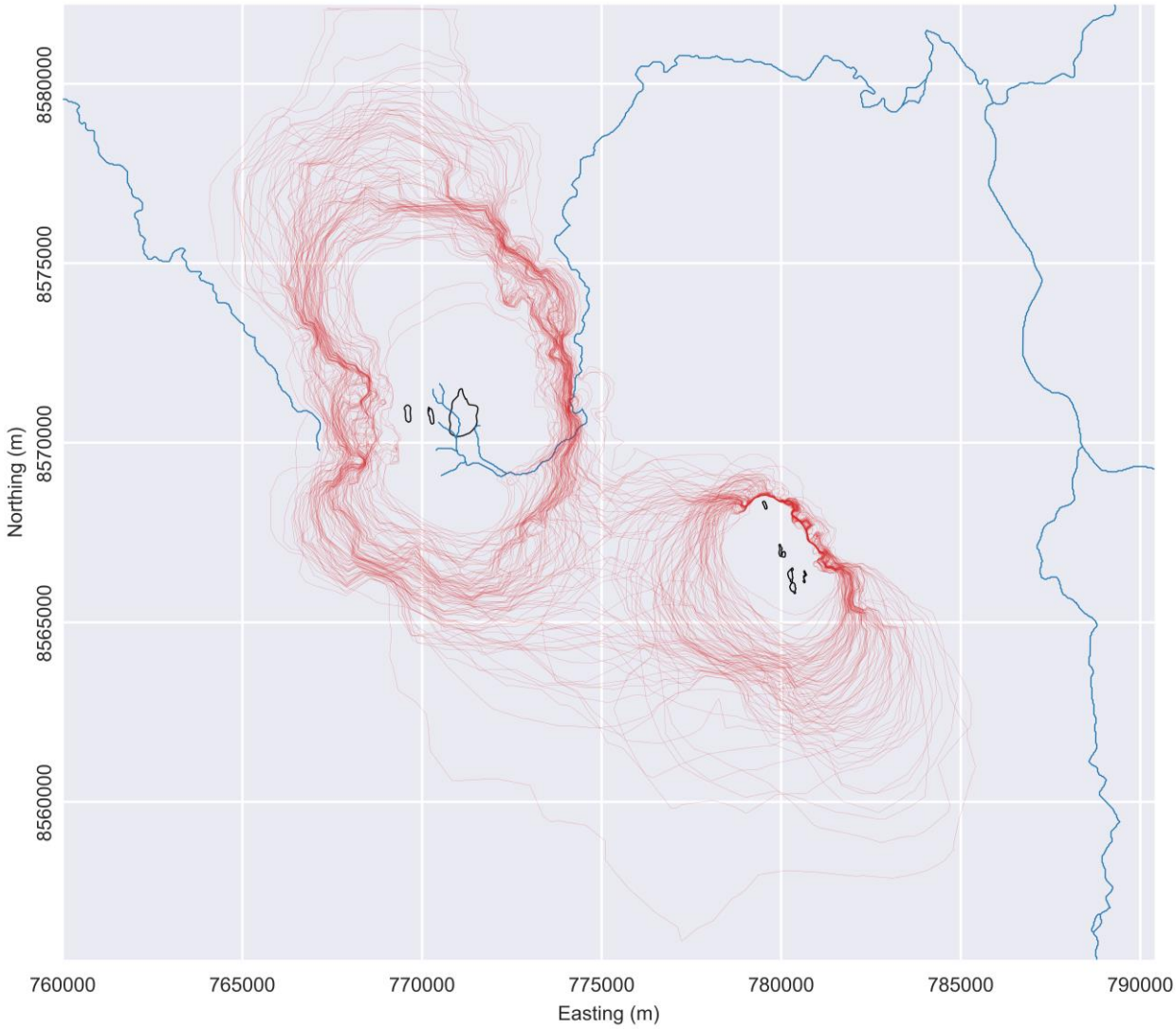


Figure 5-12 Drawdown Contours (1 m) Predicted by the 100 Calibrated Model Realisations

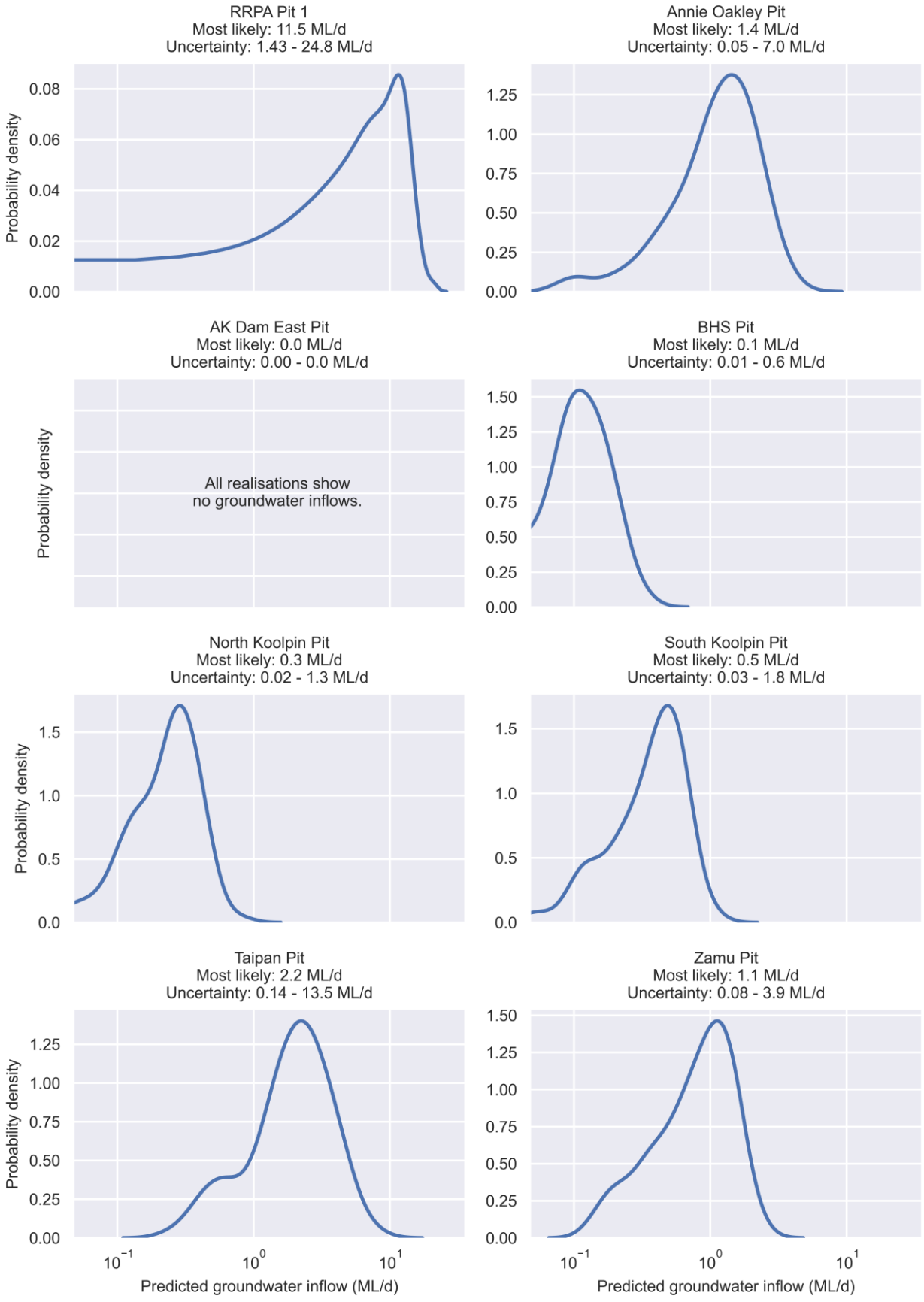


Figure 5-13 Probabilistic Predictions of Groundwater Inflows to the Proposed Pits Okaley Conclusions

A three dimensional, regional-scale numerical groundwater model was developed for the proposed Rustlers Roost and Quest 29 mining activities to estimate:

1. The maximum drawdown extents induced by the dewatering of the proposed pits; and
2. Groundwater inflows to the proposed pits.

A stochastic groundwater modelling approach was used in this study, with the development and steady-state calibration of 100 different model realisations. The calibration is considered satisfactory with a RMSE of 0.4 to 0.86 m and an SRMSE of 0.9% to 1.8%.

The 100 calibrated model realisations predicted that the extent of the 1m drawdown contours resulting from the dewatering of the proposed pits would be as follows:

- At Rustlers Roost, approximately 5km to 10km to the north and 3km to 6km to the south of the Rustlers Roost pits, with the drawdown contours to the east and west constrained by Mount Bundey Creek and Marrakai Creek, respectively;
- At Quest 29, approximately 2 km to 5km to the south-west of the proposed pits and 3km to 8km to the south-east. The extent to the north-east of the pits is constrained, possibly due to the presence of an impermeable feature (Mount Bundey Granite); and
- The modelling suggests that the probability of Marrakai Creek, Mary River and McKinlay River being impacted by the proposed pits is minimal.

Groundwater inflows to the proposed pits were predicted by the 100 calibrated model realisations to be as follows.

- Rustlers Roost Main Pit: 11.5 ML/d, with an uncertainty range of 1.4 – 24.8 ML/d;
- Annie Okaley Pit: 1.4 ML/d, with an uncertainty range of 0.1 – 7.0 ML/d;
- Annie's Dam: no groundwater inflows due to its base elevation (35 m AHD) being substantially higher than the base elevation of the adjacent Rustlers Roost main pit (-125 m AHD) and Annie Okaley Pit (5 m AHD);
- BHS Pit: 0.1 ML/d, with an uncertainty range of 0.01 – 0.6 ML/d;
- North Koolpin Pit 1: 0.3 ML/d, with an uncertainty range of 0.02 – 1.3 ML/d;
- South Koolpin Pit: 0.5 ML/d, with an uncertainty range of 0.03 – 1.8 ML/d;
- Taipan Pit: 2.2 ML/d, with an uncertainty range of 0.1 – 13.5 ML/d; and
- Zamu Pit: 1.1 ML/d, with an uncertainty range of 0.1 – 3.9 ML/d.

With respect to potential impacts on the surrounding environment and groundwater users:

- As mentioned above, the constraints on the drawdown extent limitations to the east and west are related to a loss of evaporation and potential baseflow along the upstream reaches of Mount Bundey and Marrakai Creeks which may have the potential to affect terrestrial and aquatic GDEs as shown in Figure 5-12; and
- Based on the anticipated groundwater drawdown, there are no identified groundwater users that will be impacted as a result of mine dewatering activities.

6. Site Water Balance and Solute Transport Modelling

6.1 Overview

A site water and solute balance model was developed using GoldSim® software to estimate:

- The ability of the water management plan to prevent uncontrolled spill to the environment, and to keep a dry working environment during the mining phases;
- The Rustlers Roost and Quest 29 respective pit lake water balance and stabilisation levels post-mining to:
  - Predict post-closure recovery of groundwater levels in the pit lakes
  - Evaluate the overflowing likelihood of the pit lakes
  - Estimate the concentrations of potential contaminants within the pit lake forming post-mining operations.
- The bore field production requirement to respond to the site' water demand.

The site conceptualisation, model construction methodology, data inputs and model results are presented in this section.

6.2 Modelling Conceptualisation Overview

6.2.1 Water Management and Conceptualisation Overview

The water management of the Rustlers Roost and Quest 29 sites consists of:

- Initially dewatering the historical pits lake; and
- Followed by maintaining a dry working environment by continuously dewatering pit inflows during mining operation while supplying enough water to respond to the demand of the ore processing, dust suppression activities and other site water demand (drinkable water). Surplus water that cannot be store on site will be disposed to both Mount Bundey and Marrakai Creek catchments, while any water demand shortfall will be supplied by the site bore field.

The water management system is conceptualised as a network of surface water storages (pit lakes, dams, turkeys nest storages), operational processes (pumping) and natural processes (rainfall, runoff, groundwater seepage, evaporation). Each water storage balances its inflows and outflows and is connected to other water storages by transfer of water (pumping).

With respect to the open pits, the mining operations can be divided into 3 phases (Table 6-1):

- Phase 1: pre-mining dewatering of the historical pits;
- Phase 2: mining operation; and

- Phase 3: post-mining pit lake recovery for the pits that are not fully backfilled including Rustlers Roost pit, South and North Koolpin pits, Taipan pit and BHS pit. The Zamu pit, Annie Okaley Pit and Annie's Dam pit are to be fully backfilled after operations.

During Phase 1 and 2, the water balance for each pit consists of inflows from direct rainfall to the pit lake, pit catchment runoff and groundwater seepage. The outflows consist of evaporation from the residual pit lake surface areas and of dewatering of the pits using sumps. During Phase 3, the dewatering of the open pits will cease and water levels in the pit lakes will recover through a balance of direct rainfall, catchment runoff, groundwater seepage and evaporation.

Table 6-1 Overview of Mining Operation Phases

	Phase 1:Pre-Mining Dewatering			Phase 2: Mining	Phase 3 : Post-mining	
	Start Date	**End date**	**Note**	**Start Date**	**Start Date**	**Note**
Rustlers Roost pit	1/12/2021	30/04/2023	With a pause between 30/04/2022 and 1/12/2022)	1/03/2023	31/10/2031	-
Annie Okaley pit	-	-	Not Applicable	1/02/2024	31/05/2024	Backfilled pit
Annie's Dam pit	-	-	Not Applicable	1/03/2023	31/01/2024	Backfilled pit
Zamu pit	15/12/2024	30/04/2025	maintain empty pit until start of operation	1/07/2025	30/06/2030	Backfilled pit
South Koolpin pit	15/02/2029	30/04/2030	maintain empty pit until start of operation	1/07/2030	30/06/2031	-
North Koolpin pit	15/02/2029	30/04/2030	maintain empty pit until start of operation	1/07/2030	30/06/2031	-
Taipan pit	15/02/2029	30/04/2030	maintain empty pit until start of operation	1/07/2030	30/11/2031	-
BHS pit	15/03/2030	30/04/2031	maintain empty pit until start of operation	1/08/2031	30/11/2031	-

At Rustlers Roost, the water management system comprises the following features/components (Figure 6-1).

- Annie's Dam raw water storage facility (The Annie Dam raw water storage is not to be confused with Annie's Dam pit. Both features are within the footprint of the TSF and will eventually become filled with tailings). The Annie's Dam raw water storage facility collects the water from the pit's dewatering (after transiting through the Turkey's nest) and the make-up water from the bore field. This make -up water is only to be sourced to maintain the demand of the ore processing plant. The Annie's Dam storage facility then feeds the process water dam. Excess water of the Annie's Dam storage facility is diverted into the Mount Bundey or Marrakai creeks. The Annie's Dam storage facility is located within the TSF footprint, and its bathymetry will evolve as tailings are progressively disposed during operations;

- The Turkeys nest storage facility. The Turkeys nest is a 50 ML water storage facility, collecting water from the Rustlers Roost pits dewatering. A portion of the water collected in the Turkey's nest is used for dust suppression on the site and the remainder is transferred to the Annie's Dam raw water storage facility;

- The process water dam. The process water dam has a capacity of 100 ML and receives the water from the decant dam and from the Annie's Dam water storage facility to maintain the capacity to feed the ore processing plant at the required water demand rate;

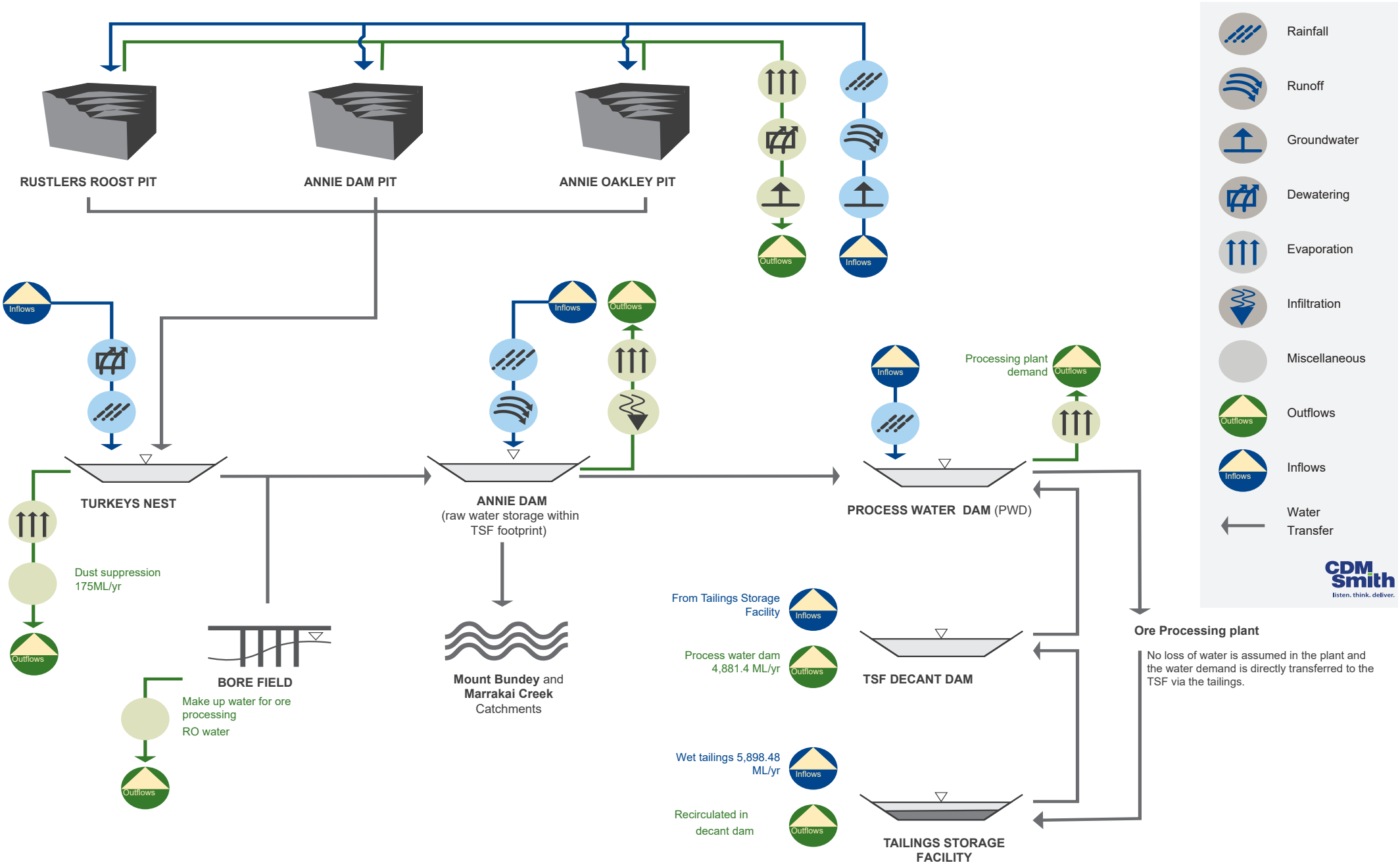
- The decant dam. The decant dam collects desorbed water from the tailing storage facilities. The water of the decant dam is recirculated in the ore processing circuit; and
- A bore field is to be used to supply all the site potable water after a reverse osmosis treatment. It will also provide make-up water when the pit's dewatering rate is unable to sustain the ore processing water demand.

As there is no ore processing ore at Quest 29, the water management system only includes the management of inflow and outflows of the open pits, transfer of water between the pits and potential discharge into surrounding creeks. Dust suppression water will be pumped from Taipan Pit via a pump and standpipe at 500kL/d. The water management schematic for Quest 29 is illustrated on Figure 6-2.

The water balance features inflows and outflows are summarised in the following tables.

- Table 6-2 details the conceptualisation of the inflows as well as their implementation in the model, the data sources, and the related predictive uncertainty;
- Table 6-3 lists the inflows of the water balance model features;
- Table 6-4 details the conceptualisation of all outflows as well as their implementation in the model, the data sources, and the related predictive uncertainty; and
- Table 6-5 lists inflows of all the water balance model features.

WRDs at Rustles Roost and Quest 29 have not been incorporated in the site water balance models, as their impact/influence on the site's water balance is considered minimal. The impact of the WRDs on the site's hydrology is addressed in detail in the technical reports in Appendix N of the Draft EIS (Hydrology and Flood Assessment report). Given the small catchment area associated with each WRD, potential runoff from the WRDs will be captured into dedicated decant dams, with the runoff water treated before release to the surrounding creeks.



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DESIGNED	VP	CHECKED	JM
DRAWN	MM	CHECKED	VP
APPROVED	TK	DATE	24/08/21

Notes:

N

0 700 1,400 2,800

Meters
1 cm = 644 meters
GCS GDA 1994 MGA Zone 56

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DATA SOURCE
NT Government Open Source Data

DESIGNER
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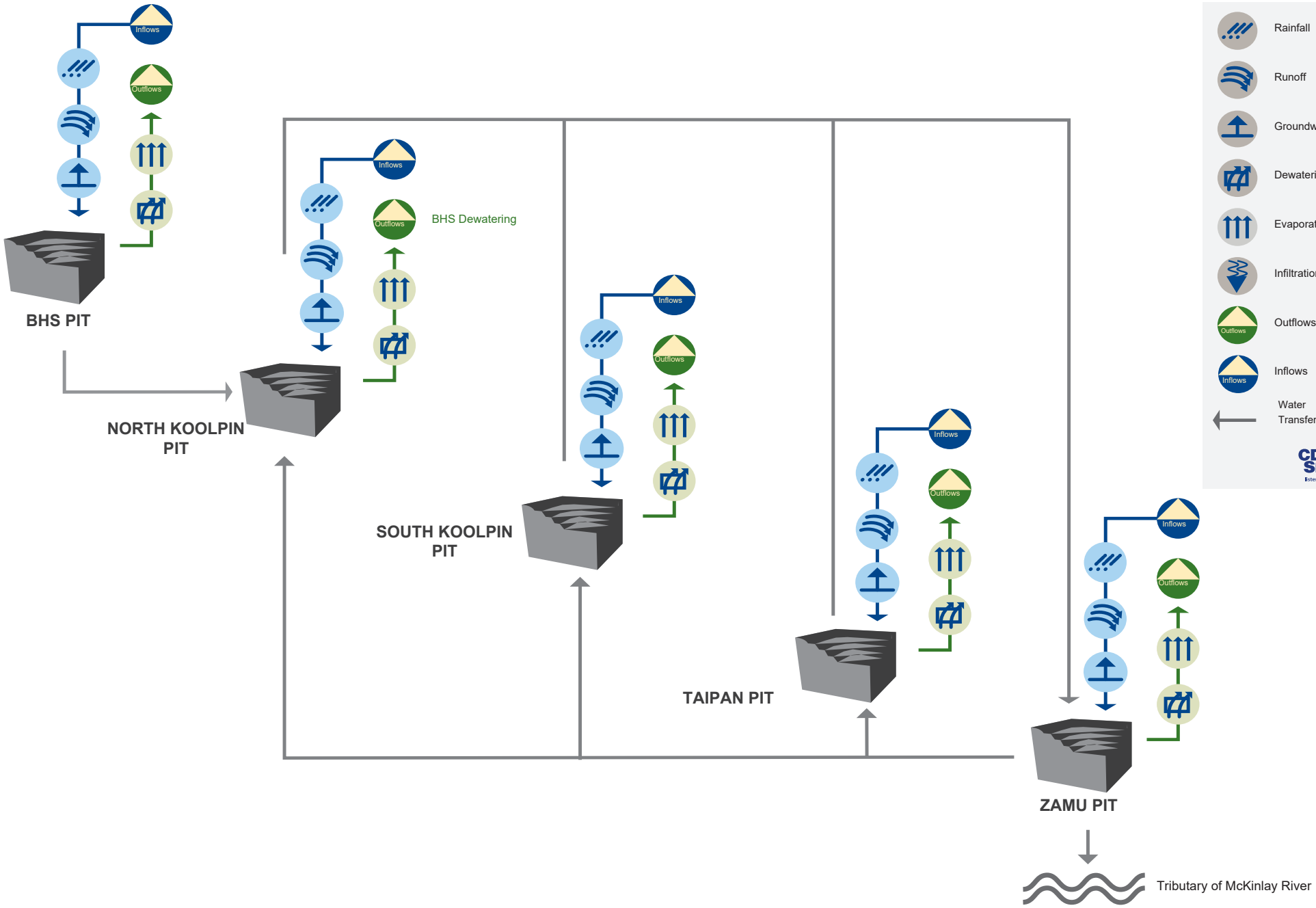
FIGURE 6-1

Rustlers Roost Water Balance Schematic

DRG Ref: **1001087-EIS-04-4.14**



R	Details	Date
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Notes:

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Meters
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DATA SOURCE
NT Government Open Source Data

DESIGNER
CDM Smith
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FIGURE 6-2

Quest 29 Water Balance Schematic

DRG Ref: **1001087-EIS-04-4.15**

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Table 6-2 Inflow Conceptualisation

	Rainfall	Pit Wall Runoff/Pond Surface Flow	Groundwater Inflow	Water Transfer Inflow (Pump)
Conceptualisation and Implementation	Direct rainfall on lake wet surface. The lake input corresponds to 100% of the daily rainfall amount	A runoff coefficient default value of 0.7) is applied to daily rainfall over the pit area that is not covered by the lake. The pit area is defined by a 2-m high bund that is assumed to surround the pit.	Groundwater seeping into the pit. It is estimated by a steady state analytical solution (Dupuit Forchheimer). The seepage estimation is mainly controlled by the water table elevation and the aquifer hydraulic conductivity	Water transferred into the store (water management ponds)
Input Data	SILO data (lat: -12.9, lon 131.5	Whilst runoff coefficient for pit void walls may vary with rainfall (e.g. from 0.3 for rainfall < 40mm to 0.6 for rainfall >40mm (McCullough *et al*., 2013)), as a conservative measure, a value of 0.7 has been adopted.	Available groundwater level data near historical pits. Estimation of aquifer hydraulic conductivity found in the literature	At pumping rate provided by client according to operation schedules.
Limitations and Source of Uncertainty.	Directly proportional to rainfall data accuracy	Applying a factor on rainfall is a simplistic model with a large uncertainty as it fails to account for surface angle, prior rainfall, soil material and vegetation.	The analytical model has many limitations and uncertainty, particularly as there is a lack of data to constrain (calibrate) the model: ▪ The analytical model is steady state and does not represent the transient inflow which is occurring during mining operations. ▪ The model only simulates horizontal flow and can only represent a single gradient between the aquifer and the pit lake (i.e. pit acts as either a sink or source). Therefore, whilst throughflow (i.e. whereby the lake receives groundwater inflow along one portion of its area and water seeps out of the pit into groundwater along another other portion (cf. McCullough *et al*., 2013) may occur, the model cannot simulate this complex process. ▪ The aquifer is assumed to be homogeneous and isotropic and is represented by a single value of Kh (in general hydraulic conductivity in fractured rock aquifer drops with depth.	Information provided by PGO is preliminary only and based on current plans.
Uncertainty analysis	Run with climate change scenario.	Random sampling of runoff coefficient for the Monte Carlo approach. Sensitivity analysis on the runoff factor (0.4 to 0.8)	Sensitivity on the analytical model parameters (Kh, WT elevation). Random sampling of model parameter for the Monte Carlo approach	NA

Table 6-3 Water Balance Features Inflows

Model Feature/Storage	Rainfall	Pit Wall/Pond Runoff	Groundwater Inflow	Water Transfer Inflow (Pump)
Rustlers Roost pit	Yes	Yes	Yes	N/A
Annie's Dam pit	Yes	Yes	as Rustlers Roost pit	N/A
Annie Okaley pit	Yes	Yes	as Rustlers Roost pit	N/A
Turkey's nest	Yes	NA	NA	Receives inflow from pit dewatering.
Annie's Dam (raw water dam)	Yes	NA	NA. Annie's Dam is above the groundwater table	Receives water from Turkey's nest and from the bore field.
Process water dam	Yes	N/A	N/A	Get water from Annie's Dam (controlled by water demand) and from the decant dam (at constant rate during ore processing operations)
TSF	N/A	N/A	/NA	Outflow from the Processing plant
Borefield	N/A	N/A	N/A	N/A
Zamu pit	Yes	Yes	Yes	Transfer from North Koolpin pit, South Koolpin pit and Taipan pit. Zamu pit is to be used as storage for the dewatering requirement of North Koolpin pit, South Koolpin pit and Taipan pit
South Koolpin pit	Yes	Yes	Yes	Transfer from Zamu pit during Zamu mining operations. The water produced from Zamu pit is to be stored in North Koolpin pit, South Koolpin pit and Taipan pit.
North Koolpin pit	Yes	Yes	Yes	Transfer from Zamu pit during Zamu mining operations and from BHS pit during BHS mining operations. The water produced from Zamu pit is to be stored in North Koolpin pit, South Koolpin pit and Taipan pit.
Taipan pit	Yes	Yes	Yes	Transfer from Zamu pit during Zamu mining operations. The water produced from Zamu pit is to be stored in North Koolpin pit, South Koolpin pit and Taipan pit.
BHS pit	Yes	Yes	Yes	N/A

N/A: not applicable.

Table 6-4 Outflow and Storage Conceptualisation

	Evaporation	Dewatering (Water Transfer to other Water Store)	Groundwater Infiltration	Overflow	Storage (Bathymetry)
Conceptualisation & Implementation	Evaporation applied to lake wet surface. Implemented by applying a reduction factor on pan ET to account for atmospheric water saturation near the lake surface.	Sump pumps to be used to dewater the pit during the initial phase (pre-mining) and during mine operation	If a pit lake level exceeds the surrounding water table (possibly locally on one side of the pit and temporally during the wet season) some infiltration will occurs (leading to a risk of contamination).	When the water level reaches the lowest highwall level the water storage (pit or pond) is set to overflow.	Represent the volume of water stored in
Input Data	Pan ET (SILO data). Pan evaporation factor = 0.7 (D Mc Jannet & al.2019)	Controlled by mining operation schedules and sump pumps capacity (accounting for pump maintenance).	No input data. The model output ought to indicate a risk of pit lake level exceeding the water table.	Bathymetry data provided by the client.	Look up table provided by the table linking, the lake surface area and lake volume with the lake water (discretisation of 1m).
Limitations and Source of Uncertainty	Evaporation is controlled by many other climatic and landscape processes (wind, shading) that are not currently represented in the model.	N/A	The groundwater seepage is not currently represented in the model.	Relying on provided data accuracy	Proportional to the reliability of input data
Uncertainty Analysis	Random sampling of the reduction factor for the Monte Carlo approach. Do a sensitivity analysis on the pan evaporation reduction factor (0.75 to 1.0).	N/A	N/A	N/A	N/A

N/A: not applicable.

Table 6-5 Water Balance Features, Outflows and Storage

Model Feature/Storage	Evaporation	Dewatering (Water Transfer to other Water Store)	Groundwater Infiltration	Overflow	Storage (Bathymetry)
Rustlers Roost pit	Yes	Dewatering at maximum 600 L/s toward Turkey's Nest pond during pre-mining and operation phases.	Current representation of the water table elevation by a flat surface surrounding the pit doesn't currently allow groundwater infiltration.	Defined as the top of the provided stage height/volume curve.	Historic pit and future pit shell stage height/volume curve. Historical void shape morphology is amended to future pit morphology on first day of mining operation.
Annie's Dam Pit	Yes	Dewatering at 125 L/s toward Turkey's Nest pond	Not applicable as pit is to be backfilled post-mining	Defined as the top of the provided stage height/volume curve.	Future pit shell morphology assumed at the start of mining
Annie Okaley Pit	Yes	Dewatering at 125 L/s toward Turkey's)	Not applicable as pit is to be backfilled post-mining	Defined as the top of the provided stage height/volume curve.	Future pit shell morphology assumed at the start of mining
Turkey's Nest	Yes	Diversion to Annie's Dam (raw water dam)	Assumed negligible	Defined as the top of the provided stage height/volume curve.	
Annie's Dam (raw water dam)	Yes	Diversion to Process Water Dam.	Yes	Defined as the top of the provided stage height/volume curve.	
Process Water Dam (PWD)	Yes	Diversion to the Ore Processing plant	Assumed negligible	Defined by the PWD maximum capacity	
TSF	N/A	Nominal rate	Implicit in the simplified model representation of the TSF	NA	
Borefield	N/A	Demand is controlled by the RO demand,	NA	NA	
Zamu Pit	Yes	Dewatering at 125 L/s to North Koolpin, South Koolpin and Taipan pit	Not applicable as pit is to be backfilled post-mining	Defined at top of the provided stage height/volume curve	Historic pit and future pit shell stage height/volume curve received in local datum. In the model, historical stage height/volume curve is shifted to future pit stage height/volume curve on first day of mining operation.

Model Feature/Storage	Evaporation	Dewatering (Water Transfer to other Water Store)	Groundwater Infiltration	Overflow	Storage (Bathymetry)
South Koolpin pit	Yes	Dewatering at 125 L/s to Zamu pit	Current representation of the water table elevation by a flat surface surrounding the pit doesn't currently allow groundwater infiltration.	Defined at top of the provided stage height/volume curve	Historic pit and future pit shell stage height/volume curve received in local datum. In the model, historical stage height/volume curve is shifted to future pit stage height/volume curve on first day of mining operation.
North Koolpin pit	Yes	Dewatering at 125 L/s to Zamu pit	Current representation of the water table elevation by a flat surface surrounding the pit doesn't currently allow groundwaterinfiltration.	Defined at top of the provided stage height/volume curve	Historic pit and future pit shell stage height/volume curve received in local datum. In the model, historical stage height/volume curve is shifted to future pit stage height/volume curve on first day of mining operation.
Taipan pit	Yes	Dewatering at 125 L/s to Zamu pit	Current representation of the water table elevation by a flat surface surrounding the pit doesn't currently allow groundwater infiltration.	Defined at top of the provided stage height/volume curve	Historic pit and future pit shell stage height/volume curve received in local datum. In the model, historical stage height/volume curve is shifted to future pit stage height/volume curve on first day of mining operation.
BHS pit	Yes	Dewatering at 125 L/s to North Koolpin pit	Current representation of the water table elevation by a flat surface surrounding the pit does not allow groundwater infiltration.	Defined at top of the provided stage height/volume curve	Historic pit and future pit shell stage height/volume curve received in local datum. In the model, historical stage height/volume curve is shifted to future pit stage height/volume curve on first day of mining operation.

N/A: not applicable.

6.3 GoldSim Water Balance Model

6.3.1 Model Structure

The water balance model structure consisted of the numerical translation of the water management schematic provided in Figure 6-1 and Figure 6-2 into GoldSim features. The model simulated the water management from the start of operations, commencing with the dewatering of the historical Rustlers Roost pit (Phase 1) until stable steady state conditions are re-established post-mining (Phase 3). The water balance model concurrently simulated all the pits and site water storage facilities to allow for a seamless transfer of water between the model features.

The model used daily time step to progress through the simulation. All inflows, outflows and water transfer between the various feature were calculated using a daily time step.

6.3.2 Model Approach

There are two main types of modelling approaches available in GoldSim:

- A deterministic approach: With a deterministic approach, the model input parameters are determined exactly, and the outcome of the simulation is a unique set of results. This approach is appropriate if the input parameters are well known or for testing some definite condition as for instance the best estimate parameter; and

- A probabilistic approach (Monte Carlo analysis): With a probabilistic approach, the uncertainty of the input parameters is accounted for to determine the likelihood of the outcome. A Monte Carlo analysis consists of describing the uncertainty of model predictions based on the quantification of the input parameter uncertainty (i.e. values selected within realistic parameter bounds). The methodology involves running the models a large number of times (realisations). For each realisation, inputs are sampled randomly and at the end of all model realisations, the outputs are aggregated to determine their distribution. Many of the model parameters (e.g. aquifer representative hydraulic conductivity, average water table elevation, pan evaporation reduction factor, runoff coefficient) are not well defined by field or other data assessment. This uncertainty in the model input parameters leads to an uncertainty of the model outputs. The modelling approach adopted here accounts for model parameter uncertainty through a Monte Carlo analysis. For the analysis, 100 realisations were generated by GoldSim.

As some parameters controlling the site water management were not well known or defined, the probabilistic approach has been adopted for the study. Each of the model components and parameters included in this analysis are described in the following sub-sections. The parameter distributions used in the Monte Carlo analysis are summarised in Table 6-10 and Table 6-14.

6.3.2.1 Monte Carlo Output Figures

The results of the Monte Carlo simulations (i.e. results of 100 model realisations) are presented as probabilistic time history results. The outcomes of the simulations are tabulated or plotted as time series of statistical parameters of the simulations, including the bounds (i.e. minimum and maximum), the median and the 5th, 25th, 75th and 95th percentiles of the simulations. Figure 6-3 provides an example of a Monte Carlo result figure.

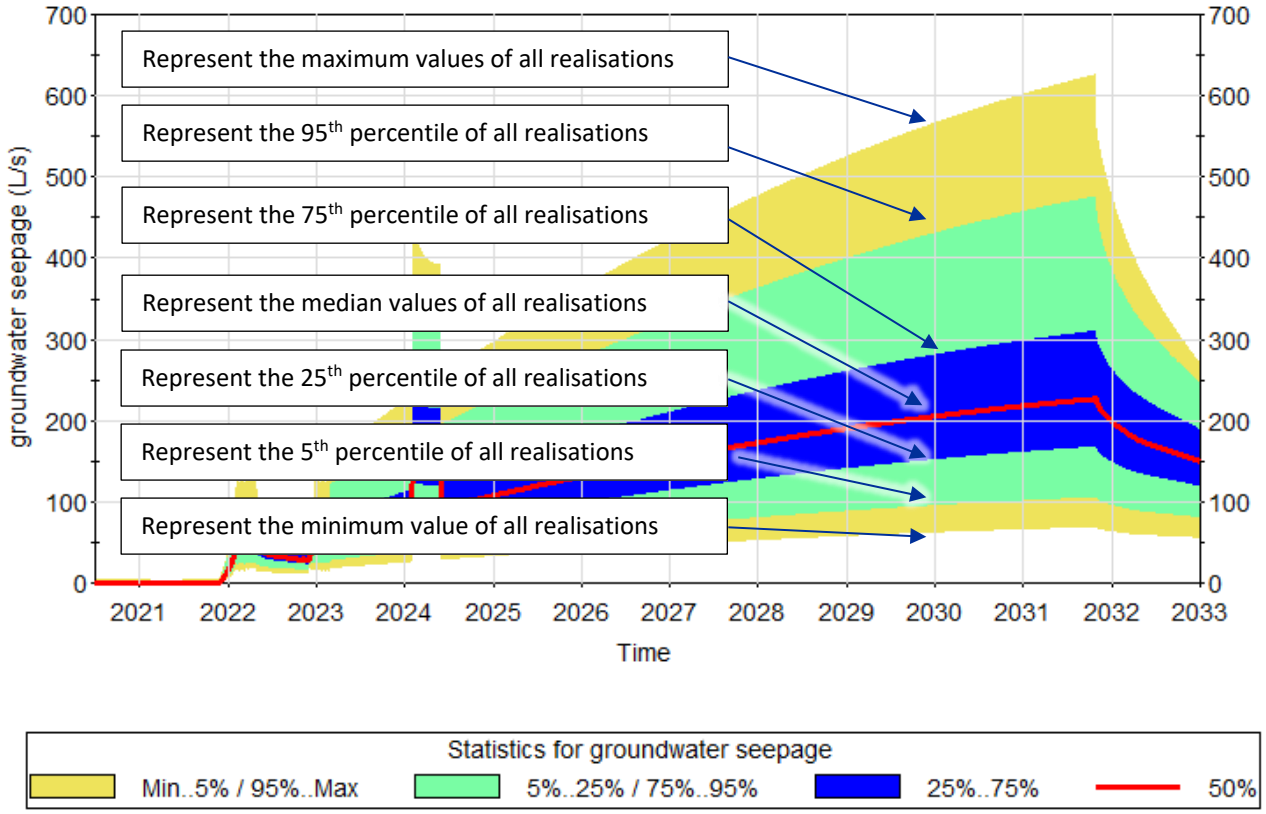


Figure 6-3 Example of Monte Carlo Probabilistic Time Series Output

6.3.3 Model Construction

This section details how the components of the water balance were implemented in the model, describing the inherent assumptions and simplification required to numerically represent the real system.

6.3.3.1 Rainfall and Runoff

Natural inflow to all the pits consists of rainfall and runoff. The surface water catchment for each pit was estimated to be equal to the maximum pit extent, as it is assumed that the pits will be bunded. The catchment of each pit is provided in Table 6-6.

100% of rainfall was accounted for over the wet surface of any pit lake or water storage (Turkey's nest, Annie Dam, Processing dam). Over the rest of the pit/feature catchment areas, runoff was estimated using a runoff coefficient to account for the soil interception. Pit slopes are steep, and a significant amount of rainfall is expected to run-off.

Whilst runoff coefficient for pit void walls may vary with rainfall (e.g. from 0.3 for rainfall < 40mm to 0.6 for rainfall >40mm (McCullough *et al*., 2013)), as a conservative measure, a default value of 0.7 has been adopted. A range of 0.4 to 0.8 has been adopted for the Monte Carlo simulations.

For rainfall, the historical rainfall estimation from SILO series for 1900 to 2021 downloaded from SILO point data for latitude -12.9 and longitude 131.5 (Jeffery, Carter, Moodie, & Beswick, 2001) was used as an estimation of future rainfall. To address rainfall uncertainty, a different starting point on the historical sequence was used for each model realisation in the Monte Carlo simulation. Moreover, based on the future rainfall assumptions adopted for nearby Tom's Gully Underground Project EIS submission (Surface Water & Erosion Solutions, 2019), a dry climate scenario and a wet climate

scenario assuming 5% more and 5% less rainfall were also generated for the uncertainty analysis. During a simulation, when the end of the rain sequence is reached, the historical data is recycled from the beginning of the sequence.

6.3.3.2 Pits

The deepening of the pits from their historical shape to their full extent at the end of operations is a progressive mining process that continuously changes some parameters controlling the pit water balance (e.g. inflows, outflows, runoff, evaporation, etc.).

As a pit external limit extends, its catchment extends, and more rainfall water is collected by runoff. As a pit depth increases, the gradient with the regional water table increases and the groundwater seepage/inflow is also expected to increase. As the pit shape changes, the retention lake changes form which affects evaporation.

For modelling purposes, it was assumed that the transition from the historical pit catchment to the final pit catchment occurs immediately at the start of mining (i.e. the start of Phase 2). During the mining phase, as the dewatering is designed to maintain a dry environment in the pit, there is no pit lake formation and hence the adopted stage/volume relationship in the model has no effect. However, the pit depth (which control the modelling of the groundwater seepage) was assumed to increased linearly from the historical pit depth to the final depth for the whole period of scheduled mining (whole of Phase 2). Both assumptions (on catchment size and pit depth) were considered conservative in terms of estimating the pit inflows.

The pit catchment areas were considered equal to the maximum extent of the pits at surface, as the pits are considered bunded to prevent excess runoff flooding the pits. The historical and maximum extents of the pit catchments are summarised in Table 6-6, with respective maximum depths summarised in Table 6-7.

The representation of the physical shape of the pits' lake is expressed by a stage height/volume curve. In line with the assumptions regarding the final pit shape and depth,

- Rustlers Roost Pit and Quest 29 site pits (Zamu pit, Taipan pit, South Koolpin pit, North Koolpin pit and BHS pit) – during the dewatering period (Phase 1), the pit shape used in the mass balance correspond to the historical pit shape and from the start of the proposed mining operation of each pit (Phase 2), the pit shape and associated stage height/volume curve is swapped to the planned final pit shape at the end of mining. The pit depth / pit lake volume relationship for those pits is illustrated in Figure 6-4 and the pit depth / pit lake area relationship is illustrated in Figure 6-5; and

- Annie Okaley pit and the Annie's Dam pit – These pits do not exist during Phase of the mining operations. For Phase 2 of the operations, a stage height/volume curve matching the final pit shape was adopted immediately at the start of Phase 2. At the end of mining, both pits are to be fully backfilled at the end of mining. The stage/pit lake area/pit lake volume relationship for those two pits assumed a linear relationship between the pit depth, area and volume at completion.

Table 6-6 Historic and Planned, Maximum Surface Catchment Areas of Pits

Pit	Historical Pit [m^2]	Planned Pit [m^2]
Rustlers Roost	276,000	598,000
Annie Okaley	NA	62,000
Annie's Dam	NA	42,000
Zamu	14,000	91,600
South Koolpin	12,000	32,200
North Koolpin	6,300	32,600

Pit	Historical Pit [m^2]	Planned Pit [m^2]
Taipan	16,700	31,200
BHS	3,500	13,700

Table 6-7 Historic and Planned, Maximum Depth of Pits

Pit	Historical Pit [mbgl]	Planned Pit [mbgl]
Rustlers Roost	32	187
Annie Okaley	NA	50
Annie's Dam	NA	40
Zamu	15	62
South Koolpin	18	39
North Koolpin	9	32
Taipan	11	47
BHS	10	24

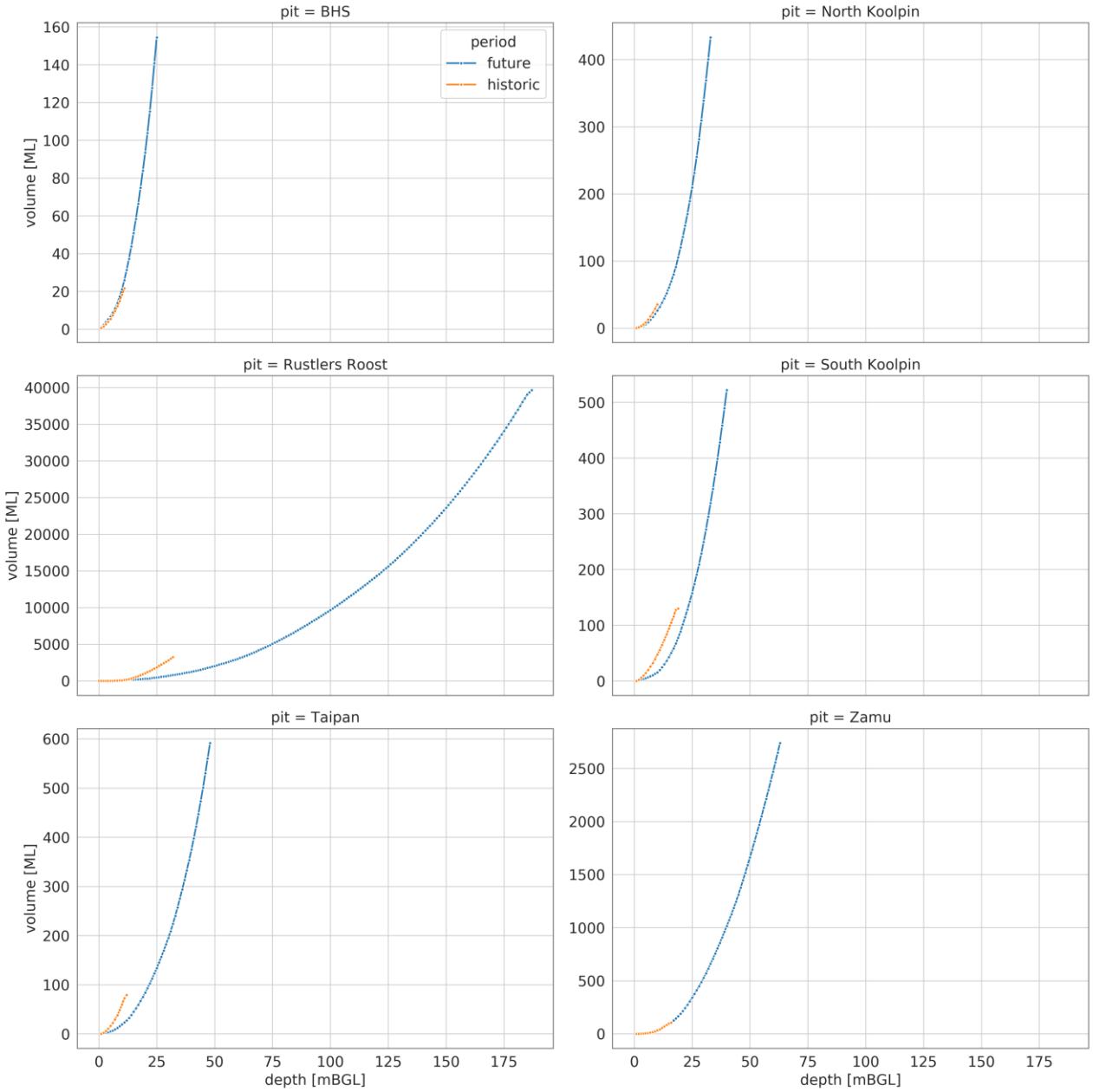


Figure 6-4 Pit Depth/Pit Lake Volume Relationship Adopted in the Model

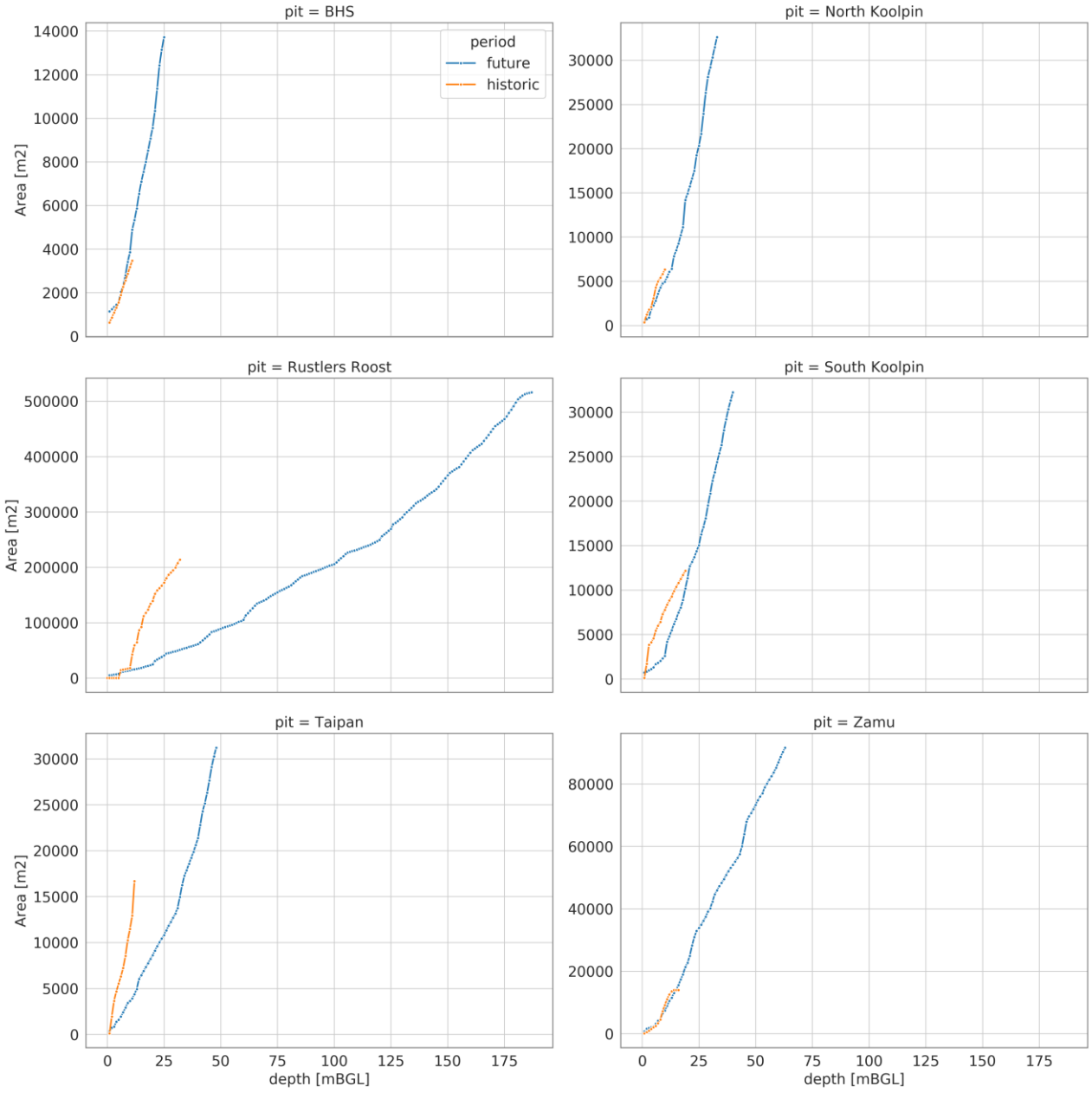


Figure 6-5 Pit Depth/Pit Lake Area Relationship Adopted in the Model

6.3.3.3 Groundwater Seepage

Groundwater seepage is controlled by the hydraulic properties of the bedrock and the hydraulic gradient between the pit lake level and the surrounding aquifer (Figure 6-6). In the water balance model, the groundwater seepage was simulated using the Dupuit-Forcheimer equation using a GoldSim package available documented from the Goldsim website[1].

The seepage model requires one unique value of hydraulic conductivity to characterise the aquifer and one unique value for the water table elevation (which is therefore assumed to be flat). Finding both representative values is challenging

[1] (https://support.goldsim.com/hc/en-us/articles/115012610927-Groundwater-Inflow-to-a-Mine-Pit).

as the actual distribution of hydraulic conductivities is complex and not well documented (cf. Section 4.4.3) and the hydraulic gradient is also variable all around a pit.

With this model, the mine pit is simplified, geometrically, to a cylinder of radius effectively equivalent to its irregular size and shape. The regional groundwater inflow to the open pit is estimated using the method first developed by Dupuit (1863), improved by Forchheimer (1930) and described as the Dupuit-Forchheimer equation for radial flow conditions for an unconfined aquifer. The conceptualisation of inflow in the Dupuit-Forchheimer equation is illustrated in Figure 6-6, with pit inflow calculated as:

$$Q = \pi K \frac{(h_0^2 - h_w^2)}{\ln\left(\frac{R + r_w}{r_w}\right)}$$

where:

- K is the hydraulic conductivity of the rock mass;
- h_0 is the pre-mining groundwater level above the base of the aquifer;
- h_w is the base of the pit floor above the base of the aquifer;
- r_w is the pit diameter; and
- R is the radius of influence.

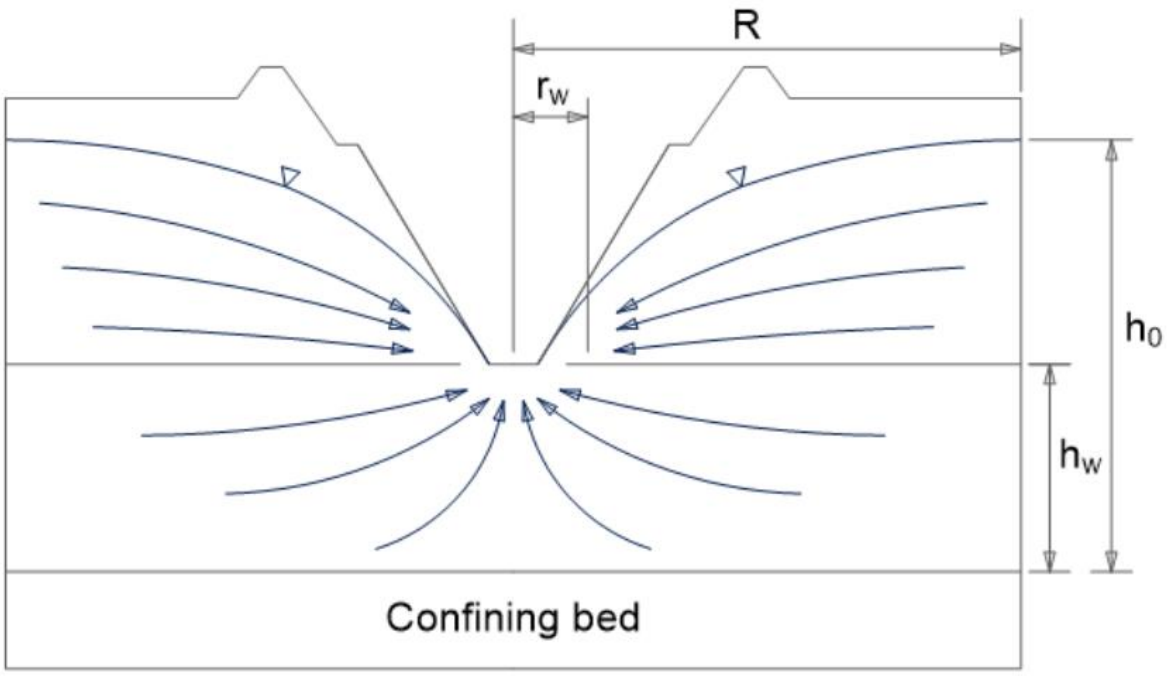


Figure 6-6 Conceptualisation of the Pit Inflow using the Dupuit-Forchheimer Equation to Estimate Inflow (from Goldsim)

The hydraulic conductivity of the rock mass is an important factor in the calculation of groundwater inflow into the open pits. To gain a better understanding of the possible range of the hydraulic conductivity, the historical recovery of water levels in the Rustlers Roost open pit was simulated using Goldsim.

As no field data regarding the recovery of this pit water level was available, online available imagery was used to assess the timeframe within which the pit water levels recovered. Mining at Rustlers Roost ceased in 1998. A 2004 satellite imagery available on Google Earth (the earliest available image post 1998) shows that the 2004 pit lake extent matched the current extent, suggesting that the maximum recovery of water levels in the open pit was already complete by 2004.

The recovery of the pit water levels since the historical mining finished in 1998 was modelled using Goldsim and a range of hydraulic conductivities for the rock mass, with the results presented in Figure 6-7. These results showed that with an assumed hydraulic conductivity of 0.5 m/d or more, the pit lake had fully recovered by 2004. With a hydraulic conductivity comprised between 0.5 m/d and 0.1 m/d, the pit lake was nearing full recovery by 2004, and with a hydraulic conductivity of less than 0.1 m/d, the pit lake was decades away from a full recovery.

Those results suggest that a representative hydraulic conductivity would be at least 0.1 m/d. However, this estimation is only valid for the first 30 meters of the aquifer (i.e. the depth of the historical pit) and as hydraulic conductivity in fractured rock are expected to decline with depth, a lower value of hydraulic conductivity should be considered to represent the entire aquifer depth that would contribute to inflow into the open pit.

Results of the numerical model calibration (Section 5.3.12.3) also suggest that hydraulic conductivity of the rock mass is likely to be between 0.01 m/d and 0.1 m/d.

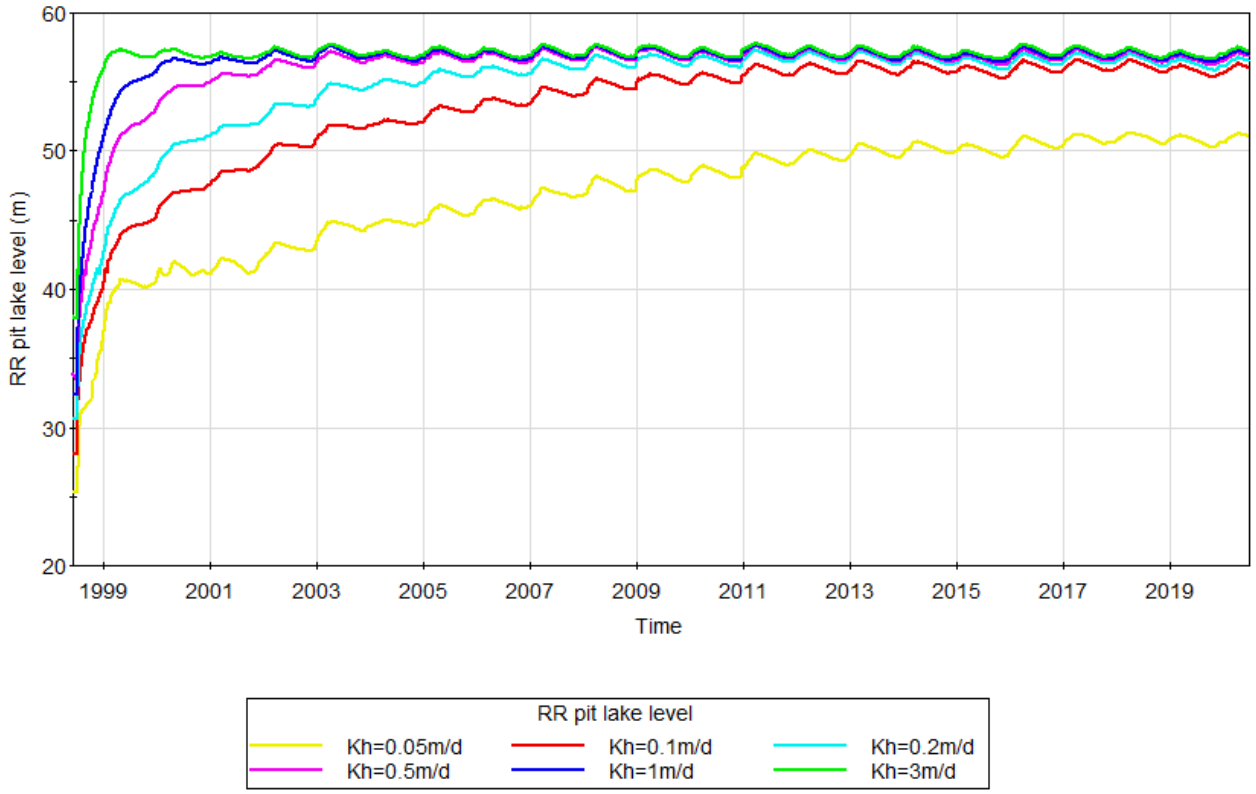


Figure 6-7 Modelled Pit Lake Water Level Increase for Rustlers Roost Historic Pit

6.3.3.4 Pit Dewatering Capacity

The mining schedule for each pit is summarised in Table 6-1. Dewatering of each pit is required during Phase 1 and Phase 2 of the mining operations. Based on available Project information, the in-pit sump pumping units used for pit dewatering rate are assumed to have a capacity of 125 L/s each. Therefore, the Goldsim model assumes initially a dewatering capacity of 125 L/s. The number of dewatering units were to be scaled up (i.e. increasing dewatering capacity by 125 L/s steps) to provide dry working environment (the resulting dewatering requirement are advised in the model results in section 6.3.5.

6.3.3.5 Water Demand

The Rustlers Roost and Quest 29 Gold Project requires approximately 175 ML per year of non-potable water (Primary Gold, 2021), which will be sourced from the Turkeys Nest storage facility during the mining operation (from December 2021 to December 2032). The water is assumed to be suitable for dust suppression on the pit, road and other site infrastructure.

The ore processing plant (operating from February 2024 to April 2032) has a water demand of 5,898 ML/yr (Primary Gold, 2021). The majority of this water demand is to be covered by recirculation of 4,881 ML/yr from the TSF (Primary Gold, 2021), with the balance to be provided by pit dewatering. If the pit dewatering is not able to provide the balance, make-up water will be sourced from the bore field. The Goldsim water balance model was used to calculate the bore field water requirement.

The potable water demand (394.2 ML per year) is to be sourced from the bore field and treated with reverse osmosis and was included in the water balance model.

6.3.3.6 Processing Plant and TSF Representation

The ore processing plant and the TSF are key elements of the Rustlers Roost site water management balance. The water demand of the ore processing plant was estimated at 5,898 ML/yr. It was also estimated that water losses in the processing plant will be negligible and that the 5,898.4 ML/yr are to be disposed in the TSF as tailings water content. However, not all TSF water is available, due to physical processes within the TSF, including:

- Evaporation;
- Infiltration to underlying groundwater;
- Retention within TSF tailings/sediment; and
- Seepage of water at the toe of the TSF. This seepage water will be collected at the decant dam at the foot of the TSF and recirculated to the PWD.

The modelling of the TSF processes is out of scope of the water balance model. In the Goldsim model, the Processing Plant/TSF link is represented as an output to the Process water dam at the nominal rate of 5,898.4 ML/yr during the whole ore processing period, but with an inflow to the Process water dam of only 4,881 ML/L.

6.3.3.7 Groundwater Infiltration (Leakage)

Where the surface water level of any of the water management feature is located above the water table, there is a likelihood of water leakage seeping to groundwater.

The Turkeys nest and process water dam are engineered to minimised water loss by leakage and leakage is assumed negligeable and therefore omitted from the water balance model.

The Annie Dam raw water storage facility is unlined, and the water balance model assumes some leakage calculated with the Darcy flux equation applied across a clayey soil (with Kv = 0.03 m/d and a thickness of 3 m) and over the wet surface area and the average depth of the Annie Dam. The infiltration uncertainty is addressed by the Monte Carlo approach by assuming a wide range of potential soil conditions (cf. Table 6-14).

6.3.3.8 Evaporation

Simulated evaporation was based on a proportion of pan evaporation and was applied over the entire wet area of pit lakes and all water storage facilities (Annie Dam, Turkeys nest, ore processing pond). Mean daily evaporation used for the model (Table 6-8) was sourced from BOM site Middle Point Rangers from 1965 to 1998.

A commonly used factor of 0.7 (D Mc Jannet & al.2019) was applied to pan evaporation rates to account for water saturation (i.e. where relative humidity is 100% and no evaporation can occur) over the pits' lake.

Table 6-8 Mean Daily Evaporation for BoM Station 014090 Middle Park Ranger

Month	Evaporation (mm)
January	5.26
February	5.06
March	5.20
April	5.75
May	5.90
June	5.81
July	6.09
August	6.77
September	7.46
October	7.63
November	6.76
December	5.88

6.3.3.9 Pit Starting Volumes

For the simulation, it was assumed that the water storage infrastructures were empty and that the historical pits started as the current estimated volume as summarised in Table 6-9.

Table 6-9 Pit Starting Volumes

Pit Lake	Initial Volume [m^3]
Rustlers Roost	3,160,000
Annie Okaley	NA
Annie's Dam	NA
Zamu	80,000
South Koolpin	73,000
North Koolpin	3,000
Taipan	37,000
BHS	15,000

6.3.4 Summary of Model Parameters

The model parameters, including the range of values used in the Monte Carlo analysis, are summarised in Table 6-10, Table 6-11, Table 6-12 and Table 6-13.

A summary of the model parameters range used for the sensitivity and stochastic approach is presented in Table 6-14.

Table 6-10 Summary of the Model Parameters - Pits

Pit	Initial Pit Lake Volume	Initial Pit Water Level	Surrounding Groundwater Level	Pan to Lake Evaporation Factor	Runoff Coefficient	Pit Equivalent Radius (for groundwater seepage modelling)	Historical Maximum Volume	Future Pit Maximum Volume
	m^3	mAHD	mAHD	-	-	m	m^3	m^3
Rustlers Roost pit	3,160,000	57.0	57.0	0.70	0.70	440	3,999,000	39,648,923
Annie Dam pit	N/A	N/A	N/A	0.70	0.70	115	N/A	290,000
Annie Okaley pit	N/A	N/A	N/A	0.70	0.70	140	N/A	290,000
Zamu pit	80,000	37.5	35.5	0.70	0.70	170	103,812	2,738,395
South Koolpin pit	73,000	40.5	37.0	0.70	0.70	100	129,728	521,767
North Koolpin pit	3,000	53.0	49.0	0.70	0.70	100	35,278	433,136
Taipan pit	37,000	39.0	37.0	0.70	0.70	100	79,253	591,343
BHS pit	15,000	71.0	69.0	0.70	0.70	66	21,637	154,485

Table 6-11 Summary of the Model Parameters - Landforms

Landform	Capacity (Storage Volume)	Water Storage Area
	m^3	m^2
Turkey's nest	50,000	5,000
Annie's Dam (raw water dam)	290,000	29,000
Process water dam	100,000	10,000

Table 6-12 Summary of the Model Parameters - Feature

Feature	Water Demand During Operation	Water Output
	ML/yr	ML/yr
Ore processing	5898.4	

Feature	Water Demand During Operation	Water Output
Dust suppression	175.0	
RO water (drinkable water) - from bore field	394.2	
Decant dam (of TSF)		4881.4

Table 6-13 Summary of the Model Parameters – Climate and Aquifer

Parameter	Unit	Value
Climate Data		
Rainfall	mm/d	Daily time series of historical rainfall (SILO lat: -12.9, lon 131.5 Check with Ken)
Pan evaporation	mm/month	Use monthly average of pan ET
Aquifer Data		
Hydraulic conductivity	m/d	0.2
Aquifer recharge	mm/d	0
Aquifer base	mAHD	-200
Soil thickness	m	3
Kv soil	m/d	0.0034

Table 6-14 Summary of the Model Parameters Range for the Sensitivity and Stochastic Approach

Parameter	Unit	Mean Value	Minimum Value	Maximum Values	Note
Hydraulic conductivity (Kh)	m/d	0.2	0.01	0.5	High values provided by slug test analysis (with single test having value as high as 30m/d but not representative of the whole aquifer), while the lower values are derived from model calibration (CDM Smith, GHD at Tom's Gully).
Pan to lake evaporation factor (reduction factor to account for humidity saturation in a lake compared to pan evaporation	-	0.7	0.6	0.8	-

Parameter	Unit	Mean Value	Minimum Value	Maximum Values	Note
Water table elevation	mAHD	Ref	Ref value -2	Ref value +2	Defining the representative water table elevation is uncertainty as the water table elevation is not constant around the pit and only documented at a few observation bores not necessarily representative
Runoff coefficient (Multiplier to the rainfall amount to account or the portion that is evaporated or infiltrated before reaching the water store)	-	0.7	0.4	0.8	-
Annie's Dam water storage facility soil hydraulic conductivity	m/d	0.0034	0.0005	0.05	No soil testing data were available, and the values were chosen from soil testing of the Fountain head Gold project in the Northern Territory (CDM Smith 2020)
Rainfall (climate change)	-	Historical climate	Dry climate (-5% to historical value)	Wet climate (+5% to historical values	

6.3.5 Model Results

The Monte Carlo results of 100 Goldsim model realisations are described below.

- The site water balance summing up the inflows into the water management system comprising rainfall, runoff, bore field production and pit groundwater seepage, and the outflows of the system through evaporation, infiltration, or disposal into the Mount Bundey or Marrakai creeks and Quest 29 Creek;
- The groundwater seepage into the open pits;
- The water disposal to creeks;
- The borefield production requirements;
- The pits' lake stabilisation level and volume post-mining due to the balancing of the pits' lake inflows and outflows; and
- The evolution of the concentration of chemical of potential concern into each of the final pits' lake.

The model was run for a period of 300 years from beginning of mining operation (i.e. start of Phase 1). However, the water levels in the open pit lakes stabilise within the first 60 years post-mining for all model simulations. Therefore, the time series results do not show the simulation results of the entire 300 years, but only focus on the transition period to steady-state water levels, to better visualise the results. Some figures are also focusing on the mining period only.

6.3.5.1 Site Water Balance

The site water balance during mining operations (from beginning of pit dewatering in December 2021 to the end of the stock-piled ore processing in December 2032) is summarised in Table 6-15.

Median inflows to be managed amounts to about 7,300 ML/yr for the 11 years of operations. About 6,000 ML/yr are predicted to be generated from groundwater seepage into the open pits (i.e. 83% of all inflow into the water management system). The second largest contributor to the pit inflows is runoff with an average of 570 ML/yr (i.e. 8% of all inflow). Direct rainfall into the pits' lake and the water storage facilities (Turkey's nest, processed water dam and Annie's Dam) accounts for 3% (240 ML/L) and the bore field production accounts for about 6% (450 ML/yr).

Around 5,800 ML/yr (or 78%) of the water produced on site is expected to be disposed into the Mount Bundey or Marrakai Creeks or creeks/surface water drainages at Quest 29. A total of 11% of the water produced (or 790 ML/yr) is expected to be consumed by the TSF (portion that is not recovered by the decant dam). The production of potable water (treated by reverse osmosis) represents 5% of the outflows (370 ML/yr), and water used for dust suppression amount to 160 ML/yr (2%). The evaporation of surface water within pit lakes and water storage facilities and the infiltration from Annie's Dam water storage are predicted to represent each 190 ML/yr or 3% of all outflows.

The minor imbalance between the total inflows and total outflows can be attributed to two reasons. The first reason is that the median values of the water balance components within the Monte Carlo approach are not from the same simulation but the median value for each component across all simulations. The second reason is due to the change of storage in the water balances features (pits' lake, Annie's Dam, Turkey's nest and PWD).

Considering the current uncertainties in the model controlling parameters, the sum of all inflows is anticipated to range somewhere between 3,300 ML/yr to 15,000 ML/yr. Most of the uncertainty arises from the difficulty to estimate a representative value of hydraulic conductivity for the aquifer (cf Section 4.4.3).

Table 6-15 Water Management Site Inflows and Outflows During Operation (from beginning of operation in 2021 to end of ore processing in December 2032)

	Median Value	Minimum	Maximum	Portion of Total Inflows
Inflow	**ML/yr**	**ML/yr**	**ML/yr**	**%**
Groundwater seepage	6,070	2,330	13,380	83%
Runoff	570	380	810	8%
Bore Field production	450	380	480	6%
Direct rainfall	240	210	330	3%
TOTAL INFLOW	7,330	3,300	15,000	100%
Outflow				
Disposal	5,830	2,170	11,910	78%
TSF loss (TSF evaporation, infiltration and adsorption combined)	790	790	790	11%
Potable water (reverse osmosis water)	370	370	370	5%
Infiltration	190	50	690	3%
Evaporation	190	150	220	3%
Dust Suppression	160	160	160	2%
TOTAL OUTFLOW	7,530	3,690	14,140	100%
Change in storage				
All pit and feature storage (negative values indicates that the final volume stored is smaller than the initial and vice versa).	-100	-500	670	

6.3.5.2 Groundwater Seepage

The groundwater seepage into the open pits is the largest contributor to the water balance inflow as it amounts for about 83% of all inflows. Figure 6-8 illustrates the groundwater seepage from all the pits combined. Most of the seepage is into the Rustlers Roost open pit. The groundwater seepage spike in 2024 is due to the Zamu pit mining operations.

The groundwater seepage is expected to increase as the pits deepen during mining operation. At the end of the mining operations, groundwater inflow into the Rustlers Roost open pit would be 225 L/s. However, uncertainty analysis suggests that this inflow could vary between 100 L/s and 600 L/s. Monitoring of pit seepage during the initial phase of mining operation would greatly reduce the uncertainty.

Figure 6-9 illustrates the cumulative amount of seepage. At the end of the mining operations (in October 2031), a cumulative amount of about 60 GL of groundwater is estimated to have seeped into the open pits. Based on the uncertainty analysis, this amount ranges from 30GL (for a hydraulic conductivity of 0.01 m/d) to 130 GL (for a hydraulic conductivity of 0.5 m/day).

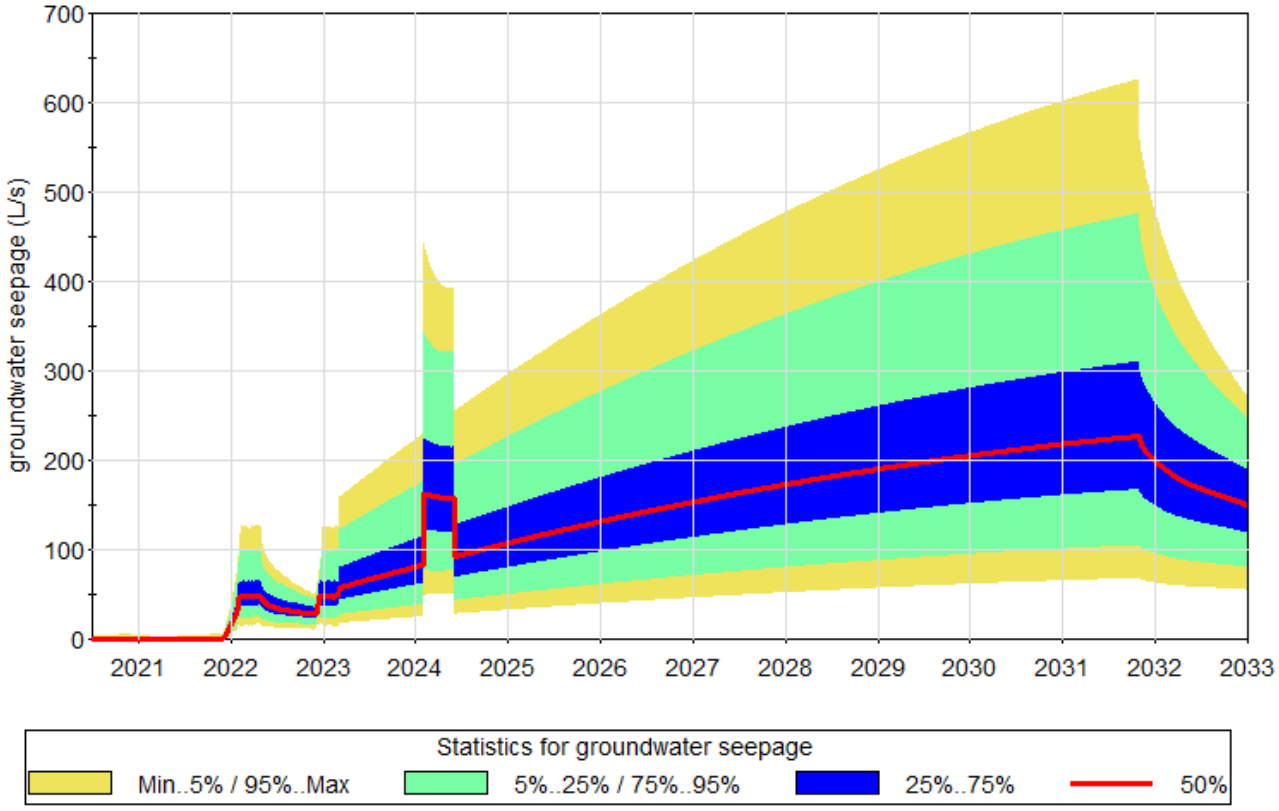


Figure 6-8 **Predicted Total Amount of Groundwater Seepage from all the Pits Combined over Time**

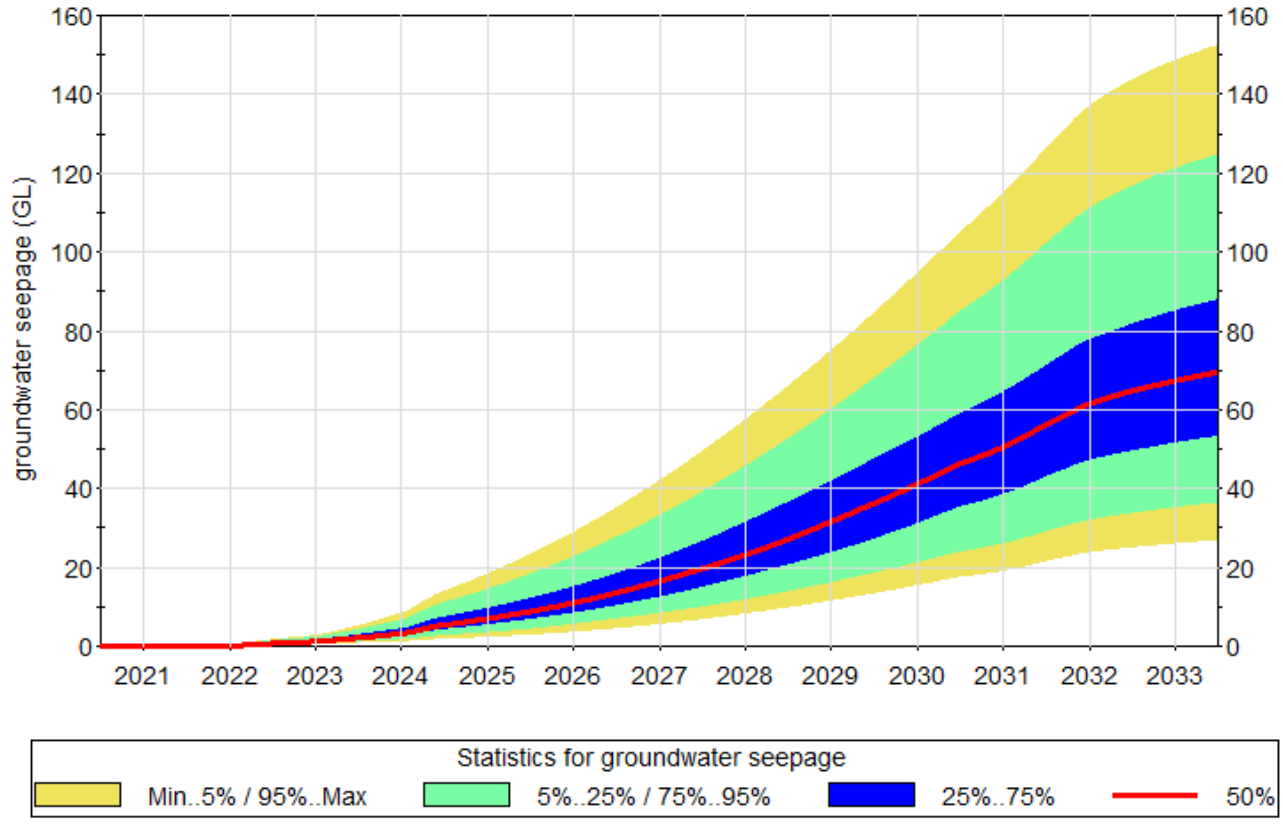


Figure 6-9 **Cumulative Groundwater Seepage from all Pits over Time**

6.3.5.3 Pit Dewatering Requirement

The pits dewatering requirements are summarised on Table 6-16. For the five Quest 29 pits, the average dewatering rate is less than 60 L/s and hence one single unit of the 125 L/s capacity sump pump would be sufficient to maintain dry pit environment.

For the Rustler Roost pit, according to current hypothesis in term of uncertainty of the controlling parameters, the dewatering requirement is 175 L/s on average, and a maximum dewatering capacity of 600L/s was required to maintain a dry working environment during operations. A refinement of the aquifer hydraulic conductivity parameter would reduce the uncertainty of the dewatering requirement as this parameter controls the groundwater seepage inflow which account for more than 80% of the dewatering requirement (Table 6-15).

Table 6-16 Pits Dewatering Requirement

	Rustler Roost Pit	Zamu Pit	South Koolpin Pit	North Koolpin Pit	Taipan Pit	BHS Pit
Mean daily dewatering rate [L/s]	175	60	52	20	40	8
Number of days of dewatering	3,407	2,024	866	866	1,019	595
Maximum dewatering rate [L/s]	600	125	125	125	125	125

6.3.5.4 Water Disposal to Creeks

Figure 6-10 illustrates the amount of water that would need to be released into the environment when there is insufficient storage on site.

For the median (i.e. 50% percentile) case, the first environmental release would happen in 2022 during the Rustlers Roost dewatering phase. From 2023 to 2027, environmental releases would be required as the site's water storage infrastructures are full. From 2027 onwards, as the groundwater seepage in Rustlers Roost open pit is expected to increase, the environmental release would be necessary to dispose of pit seepage that would exceed (by about 300 L/s) the demand of the ore processing plant. From 2030 to 2031, more releases are required to manage the dewatering of the Quest 29 pits (Taipan, South and North Koolpin). At the end of mining operations (i.e. after 2032), no more releases are expected. The cumulative amount of environmental water release is illustrated on Figure 6-11. About 65 GL of water is required to be released (with an uncertainty range from 25 GL to 130 GL).

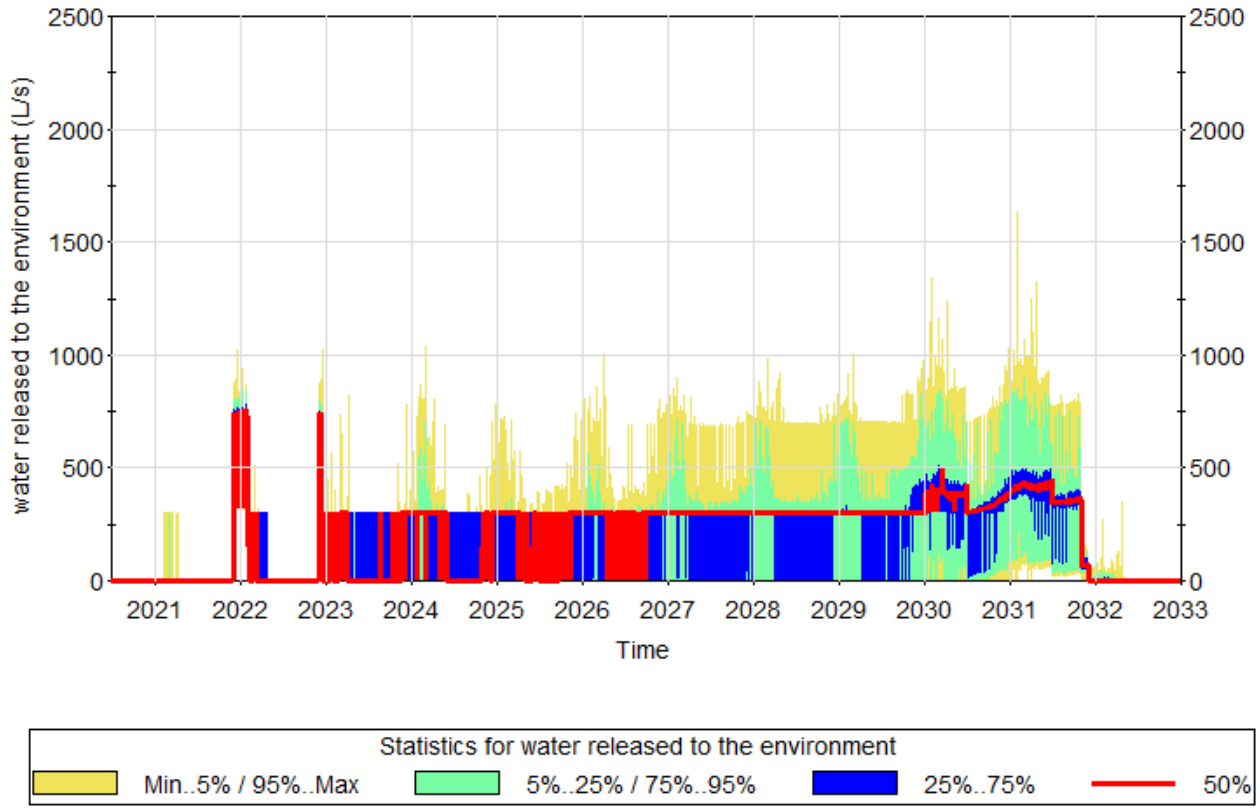


Figure 6-10 Water Flow Rates Planned for Release to the Environment over Time

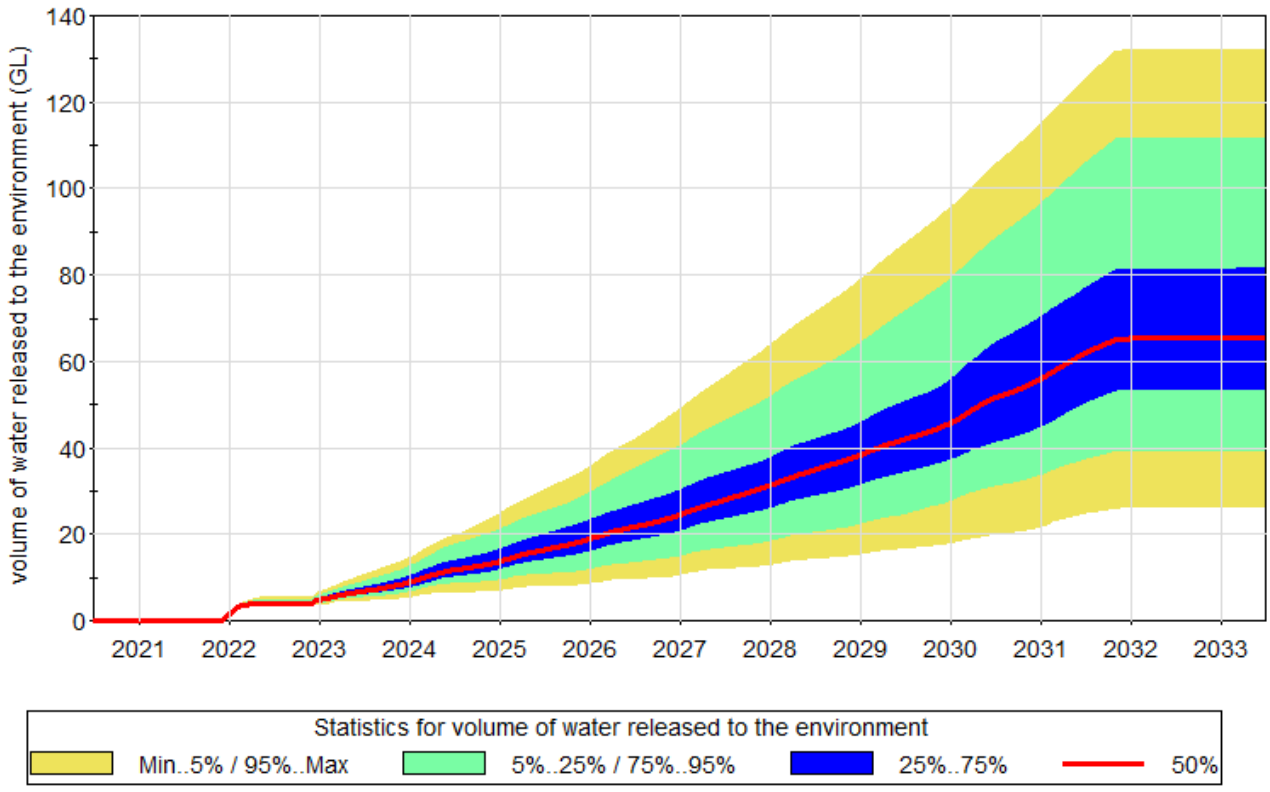


Figure 6-11 Cumulative Volume of Water Release to the Environment

6.3.5.5 Borefield Production Requirement

Borefield production requirements are illustrated on Figure 6-12 and the cumulative bore field production is illustrated on Figure 6-13. Between 2022 and 2032, the borefield water production is limited to the production of potable water (reverse osmosis water) at a rate of 12.5 L/s. No make-up water is required as the pit dewatering is predicted to generate more water than the ore processing demand. Between 2032 and 2033, the demand of the bore field production increases to about 55 L/s as made-up water is required for the ore processing. Whilst the model assumes that the bore field is to supply the made-up water, this water could alternatively be sourced from the Rustlers Roost pit lake.

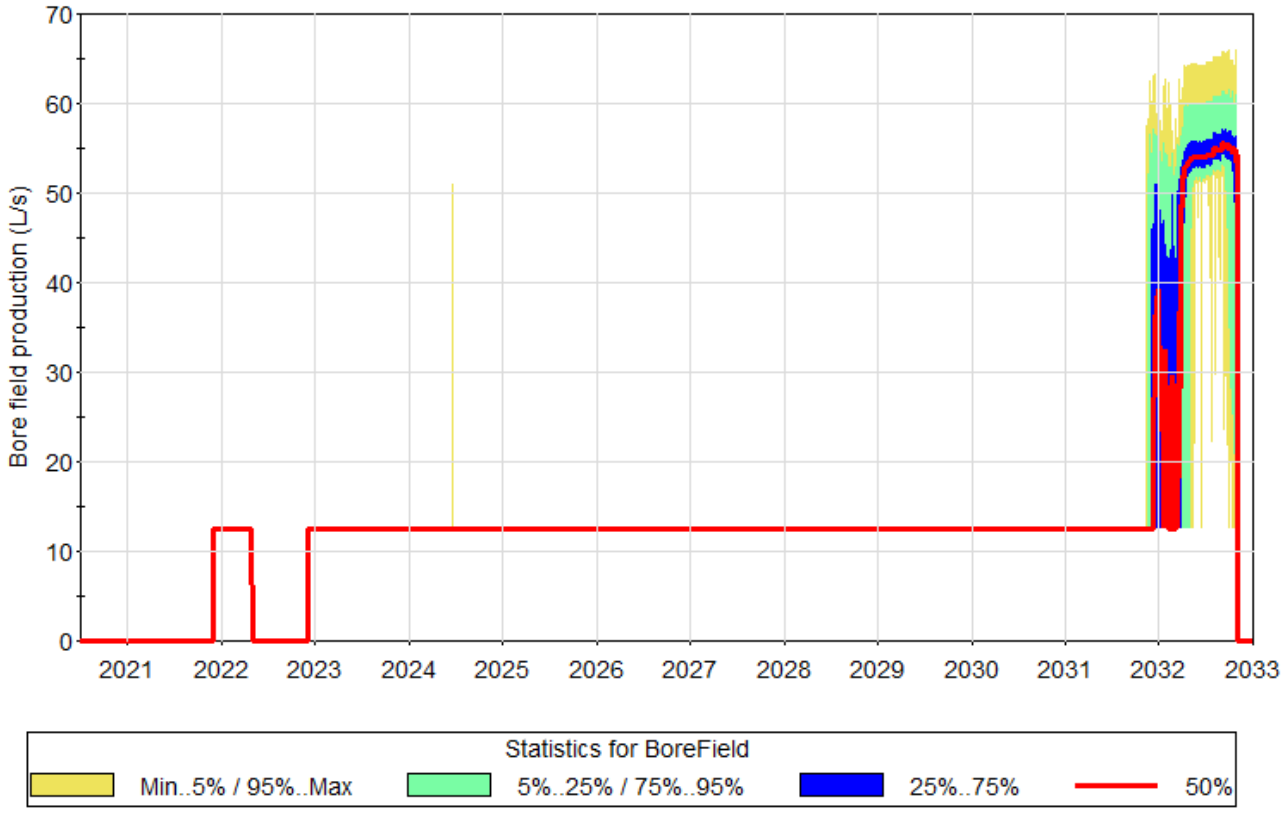


Figure 6-12 Proposed Borefield Production over Time

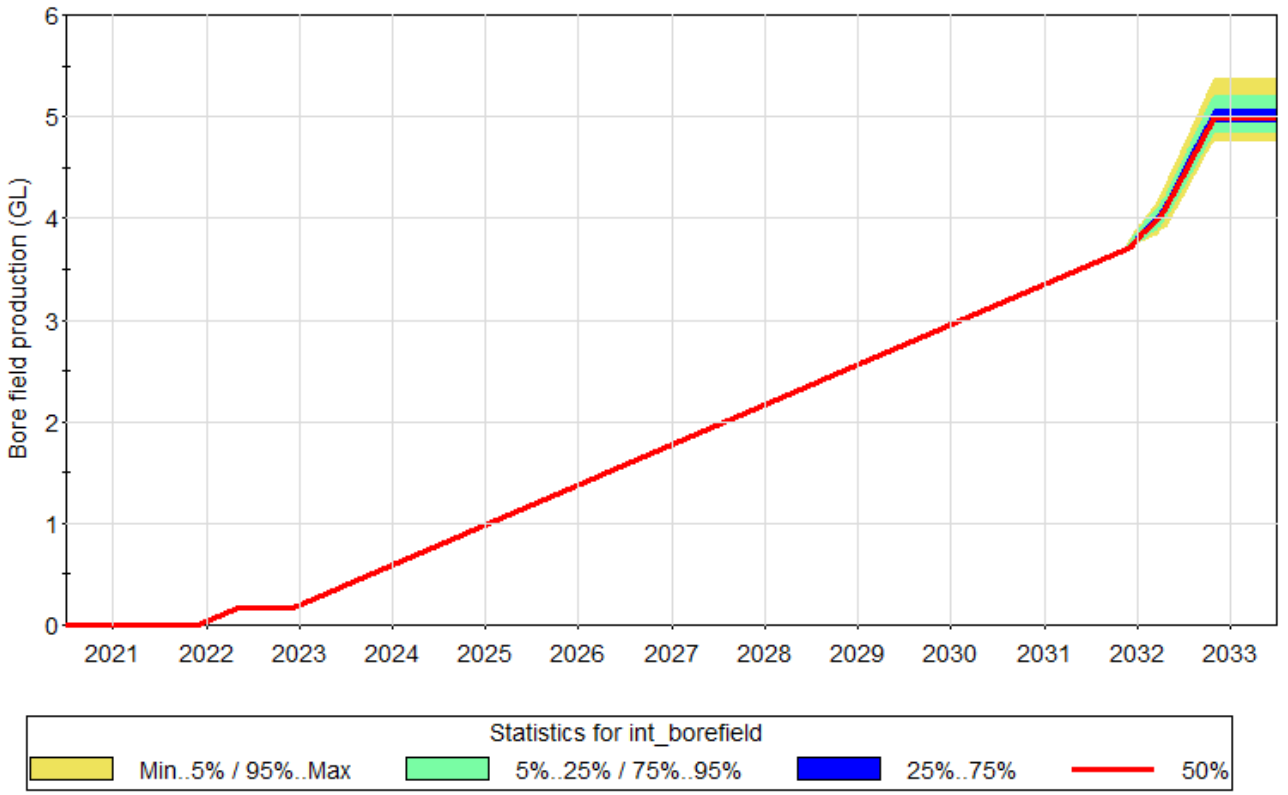


Figure 6-13 Predicted Cumulative Borefield Production over Time

6.3.5.6 Post-mining Pit Lake Recovery and Pit Lake Overflow Likelihood

Post-mining, pit lakes are created by the balancing effect of inflows (groundwater seepage, direct rainfall into the lake and runoff on the pit catchment) and outflows (evaporation and potential water infiltration if the lake level rises above the water table elevation). Table 6-17 summarises the long-term pit lake stabilisation levels and the water table elevation that was estimated and adopted in the model. The type of interaction between the lake and the groundwater is determined by the gradient between the water table and the pit lake level. There are three possible cases:

- The lake water level stabilises above the water table: the net interaction between the lake and the groundwater aquifer is toward a net recharge of the aquifer. This is the case for the North Koolpin pit lake;
- The lake water level stabilises at or near the water table. Due to the seasonal variation of the lake water level (which is likely to respond to the seasonal variation faster than the groundwater levels), the interaction is likely to alternate between net seepage during the dry season and net infiltration during the wet season. The Taipan pit lake, the South Koolpin and BHS pits are predicted to be in this situation; and
- The lake water level stabilises beneath the water table. In this case, the pit lake acts as a sink to the regional groundwater and a net groundwater infiltration dominates. Rustlers Roost pit is in this category; however, due to the small hydraulic gradient, the interaction between the open pit and the groundwater is limited.

As discussed before, the modelling of the interaction between the pit lake and the groundwater is limited by the representation of the water table as a flat surface (parameterised by a single value in the model). With this representation, the possibility for a pit lake to become a through flow (i.e. receiving groundwater inflow on one side and releasing water to groundwater on the other side) is not considered.

Table 6-17 Pit Lake Stabilisation Levels and Water Table Elevation

Pit	Estimated representative water table elevation [mAHD]	Predicted pit lake stabilisation level (median case)	Comment
Rustlers Roost	57	55	The pit lake stabilises just below the water table elevation. Groundwater is expected to seep at least seasonally into the pit (with potential interruption during the rainy season)
Taipan	37	37	The pit lake stabilises at the water table elevation. Groundwater interaction with the pit lake is expected to be limited with potential seasonal variation (groundwater seepage during the dry season and pit lake infiltration during the wet season).
South Koolpin	37	38	The pit lake stabilises just above the water table. The interaction with groundwater is expected to be limited with a potential interannual net infiltration.
North Koolpin	49	55	The pit lake stabilises significantly above the water table. No groundwater seepage is expected, and a net lake infiltration is to be expected.
BHS	69	70	The pit lake stabilises just above the water table. The interaction with groundwater is expected to be limited with a potential interannual net infiltration.
Zamu	35.5	NA	Zamu pit will be backfilled by the end of operations

Rustlers Roost Pit Lake Recovery

Figure 6-14 shows Rustlers Roost pit lake water level during and post-mining operations. The red line shows the median case, while the various colour bands show the confidence intervals. It is anticipated that by 2060 (about 30 years post mining) the pit lake level would have returned near the currently observed level at 56 mAHD (with a seasonal variability of 1 m). The uncertainty band is relatively narrow, and for most cases, the stabilised level is at 56mAHD +/-2.5m. However, uncertainty in our current conceptual understanding suggests that the recovery process to equilibrium could take somewhere between 10 years and 60 years to complete. The pit is not predicted to overflow and instead to act in the same way as current pit lake.

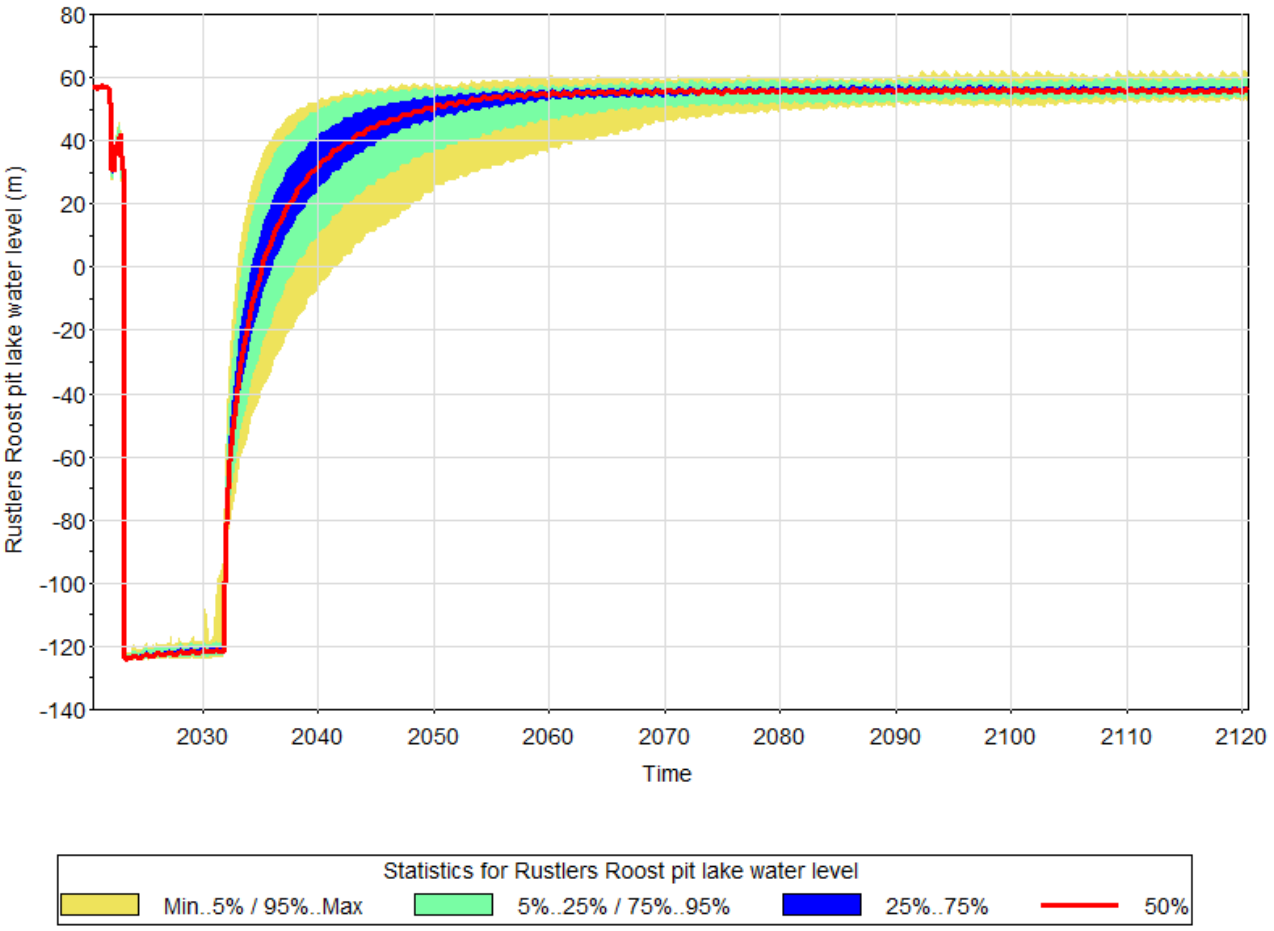


Figure 6-14 Modelled Rustlers Roost pit lake water levels recovery

Zamu Pit Lake Recovery

Figure 6-15 shows Zamu pit lake water level during and post-mining operations. The Zamu pit will be fully backfilled during the mining of the other Quest 29 pits (assumed backfilling to be complete by the end of 2031 in the model). The model shows a quick recovery accelerated by the plan of using Zamu pit as the discharge point for the dewatering of the Taipan, South Koolpin and North Koolpin pits. The proposed pit is also expected to have a lower spill level than the historical pit and the model predicts that, with the disposal of dewatering water from the Taipan, South Koolpin and North Koolpin pit, there is a significant risk (>95%) of the pit overflowing within the three year following the end of mining of the Zamu pit as illustrated in Figure 6-16.

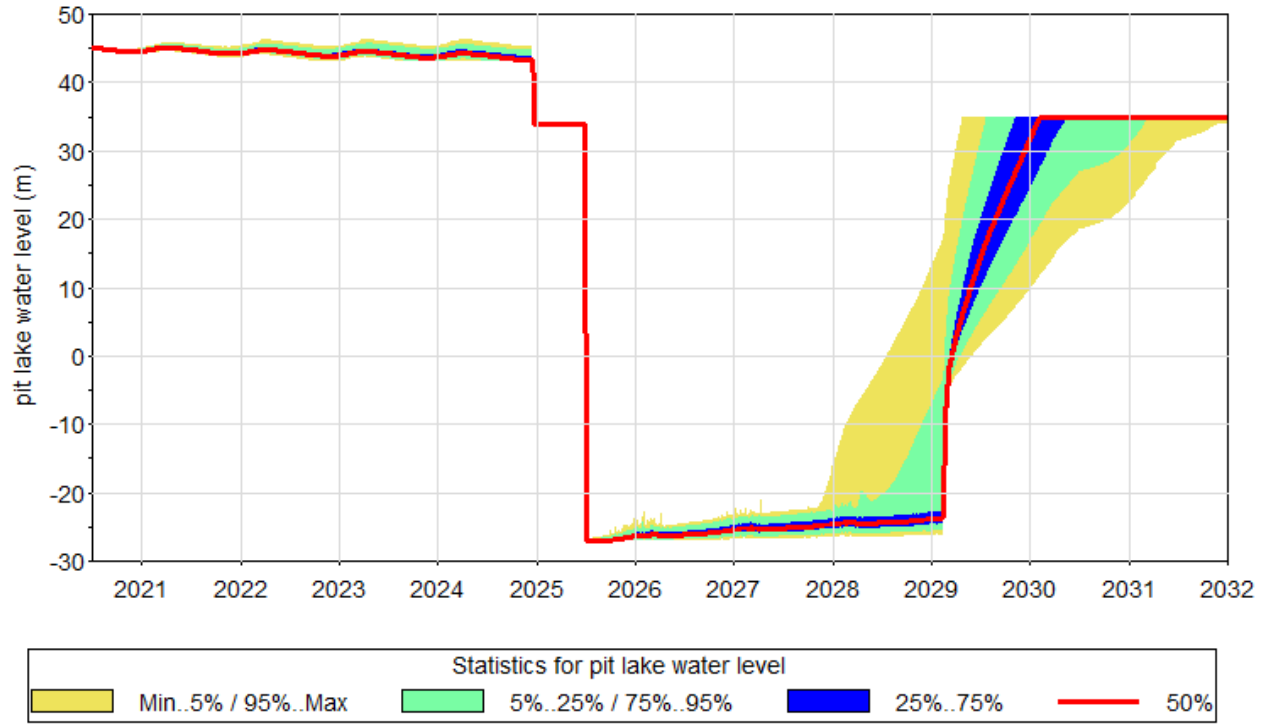


Figure 6-15 Predicted Zamu Pit Lake Water Level Recovery

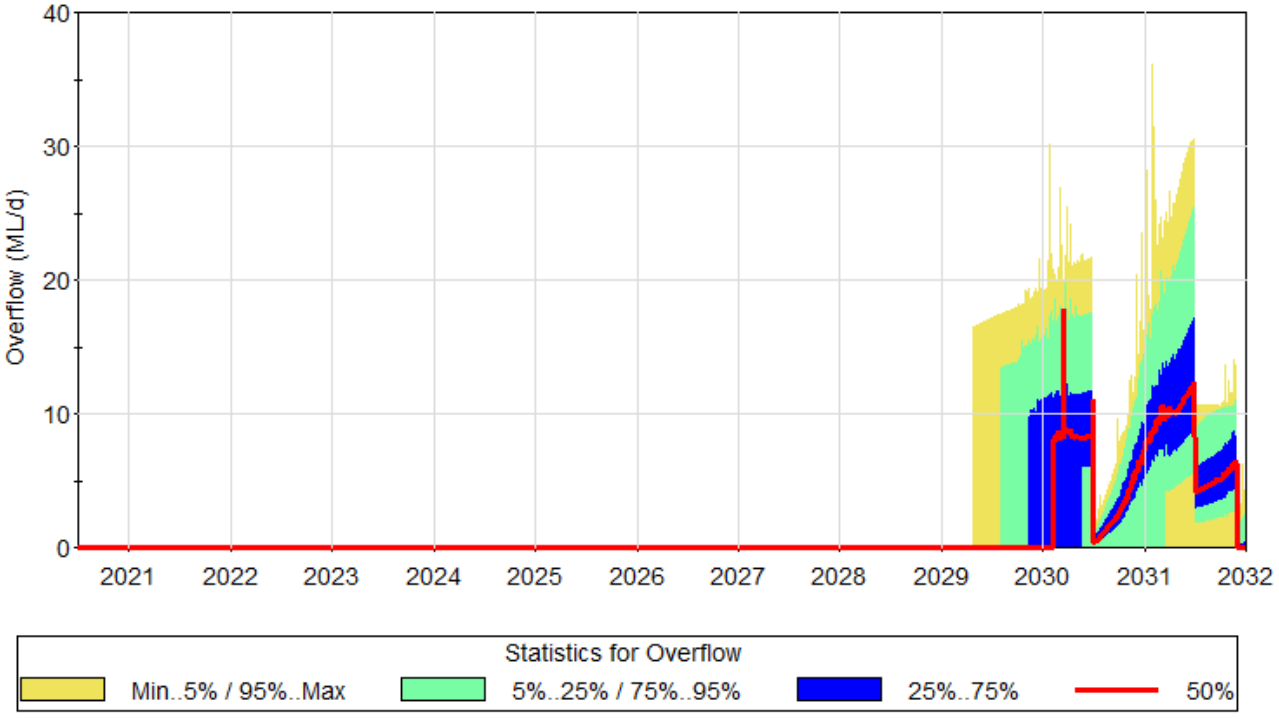


Figure 6-16 Predicted Zamu Pit Overflow over Time

Taipan Pit Lake Recovery

Figure 6-17 illustrates the Taipan pit lake water level during and post-mining operations. Taipan pit levels are predicted to increase in 2025 due to the dewatering of Zamu pit, before the dewatering of the historical pit starts in 2029. The pit lake recovery is expected to occur over a brief period of up to a couple of years. The median scenario does not predict

any pit overflow. However, according to current uncertainty analysis, there is 25% of chance for the pit to overflow during the Zamu pit dewatering period as illustrated in Figure 6-18. However, as the pit lake level would rise above the water table, the disposal of water in Taipan pit would likely generate some groundwater leakage into the aquifer that are not modelled. The risk of overflowing is therefore over-estimated.

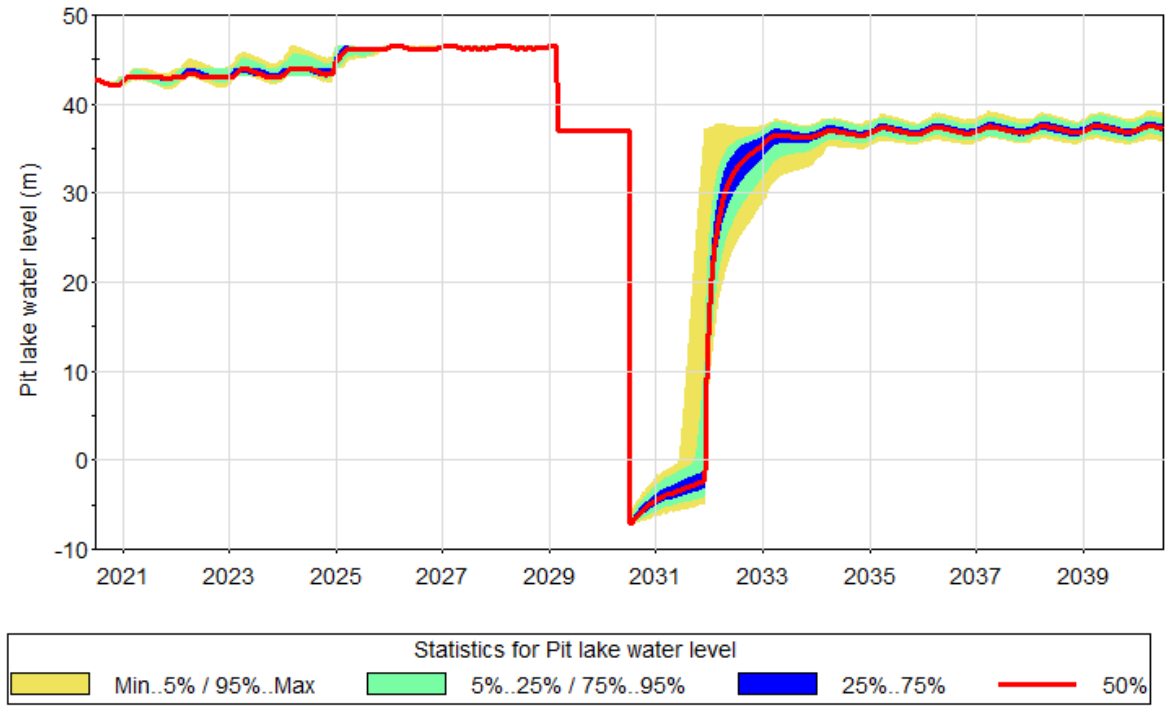


Figure 6-17 Predicted Taipan Pit Lake Level Recovery over Time

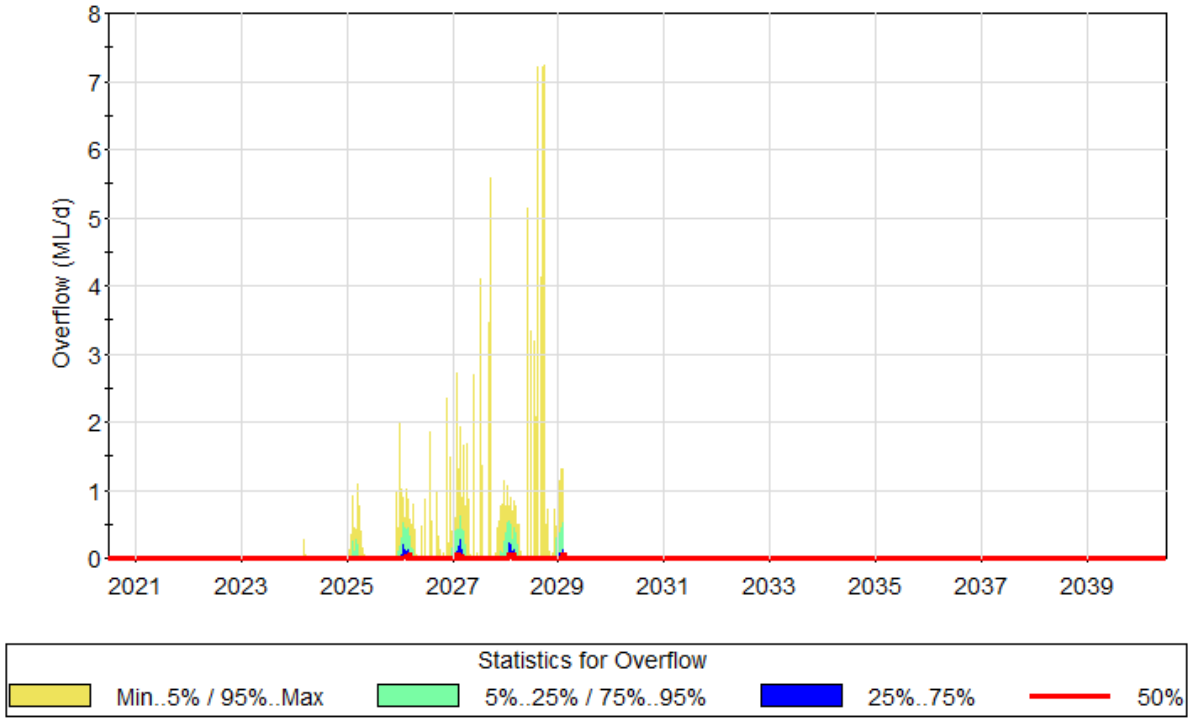


Figure 6-18 Predicted Taipan Pit Lake Overflow Rates over Time

South Koolpin Pit Lake Recovery

As for the Taipan pit lake, the South Koolpin pit lake levels increase due to the Zamu pit dewatering between 2025 and 2029 (Figure 6-19). According to current uncertainty analysis, the pit has about 75% probability to contain the extra water without overflowing (Figure 6-20) and a 25% chance of overflowing (though potential leakage to the groundwater is not modelled).

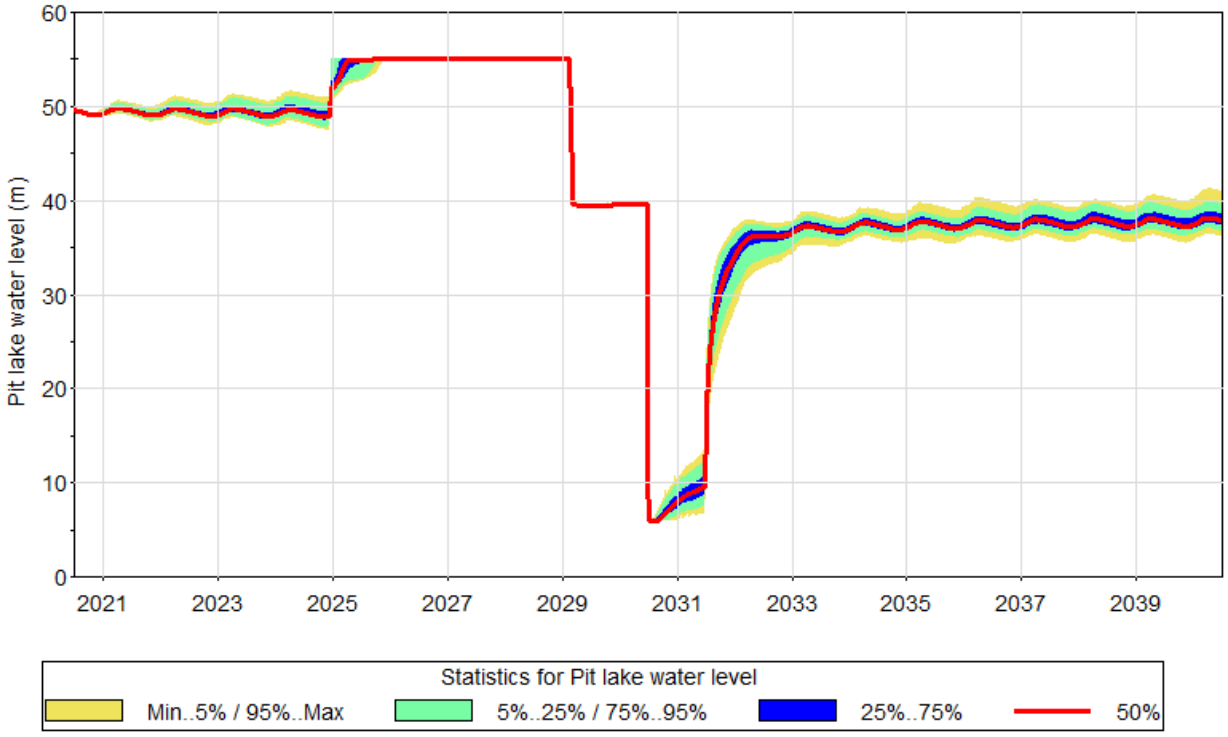


Figure 6-19 Predicted South Koolpin Pit Lake Level over Time

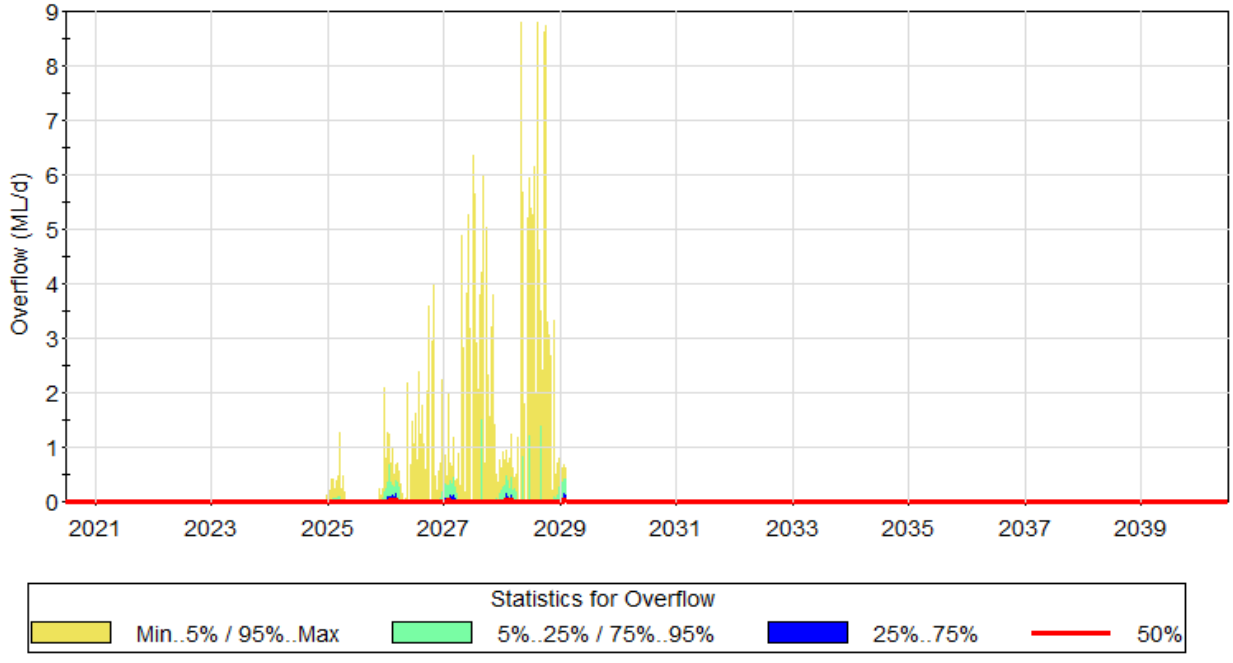


Figure 6-20 Predicted South Koolpin Pit Overflow Rates over Time

North Koolpin Pit Lake Recovery

As for the Taipan and South Koolpin pit lakes, the North Koolpin pit lake levels increase due to the Zamu pit dewatering between 2025 and 2029 (Figure 6-21). According to current uncertainty analysis, the pit has about 75% probability to contain the extra water without overflowing (Figure 6-22) and a 25% probability of overflowing (though potential leakage to the groundwater is not modelled). There is also some probability of overflow during the diversion of the BHS pit in 2031.

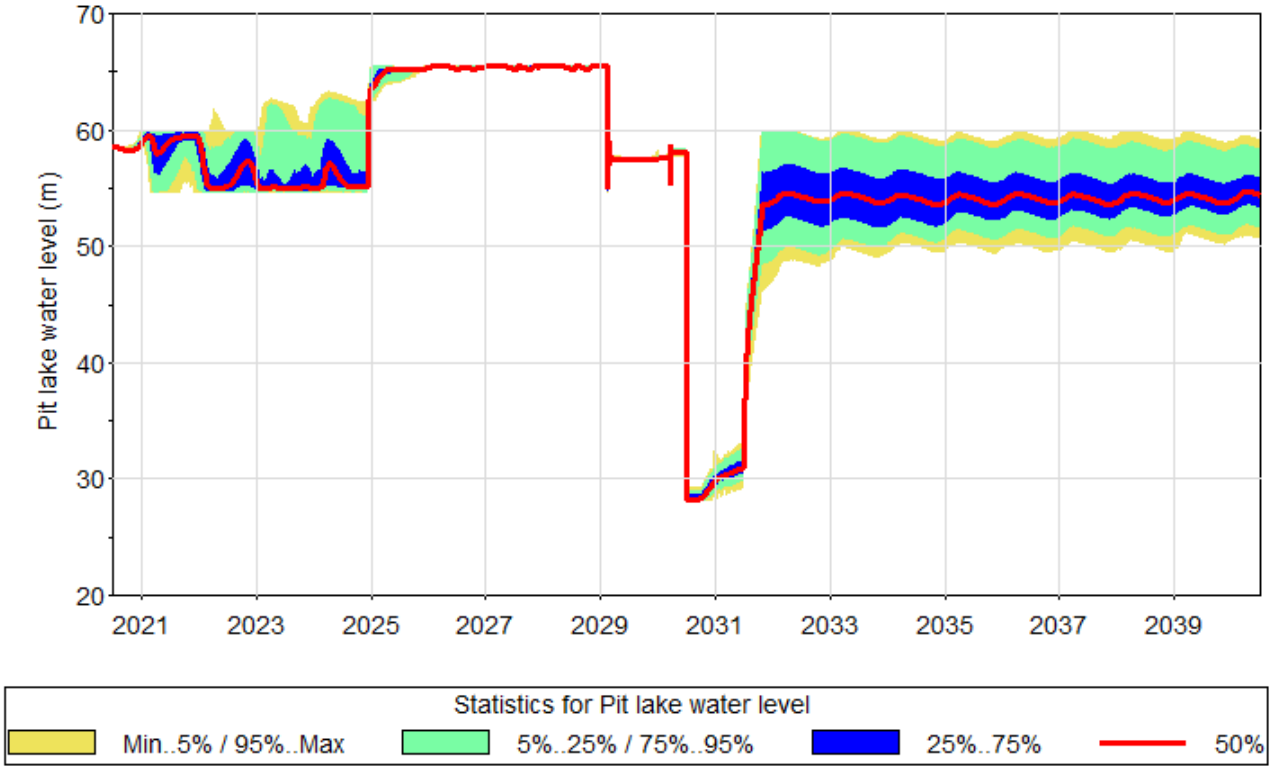


Figure 6-21 North Koolpin Pit Lake Water Level

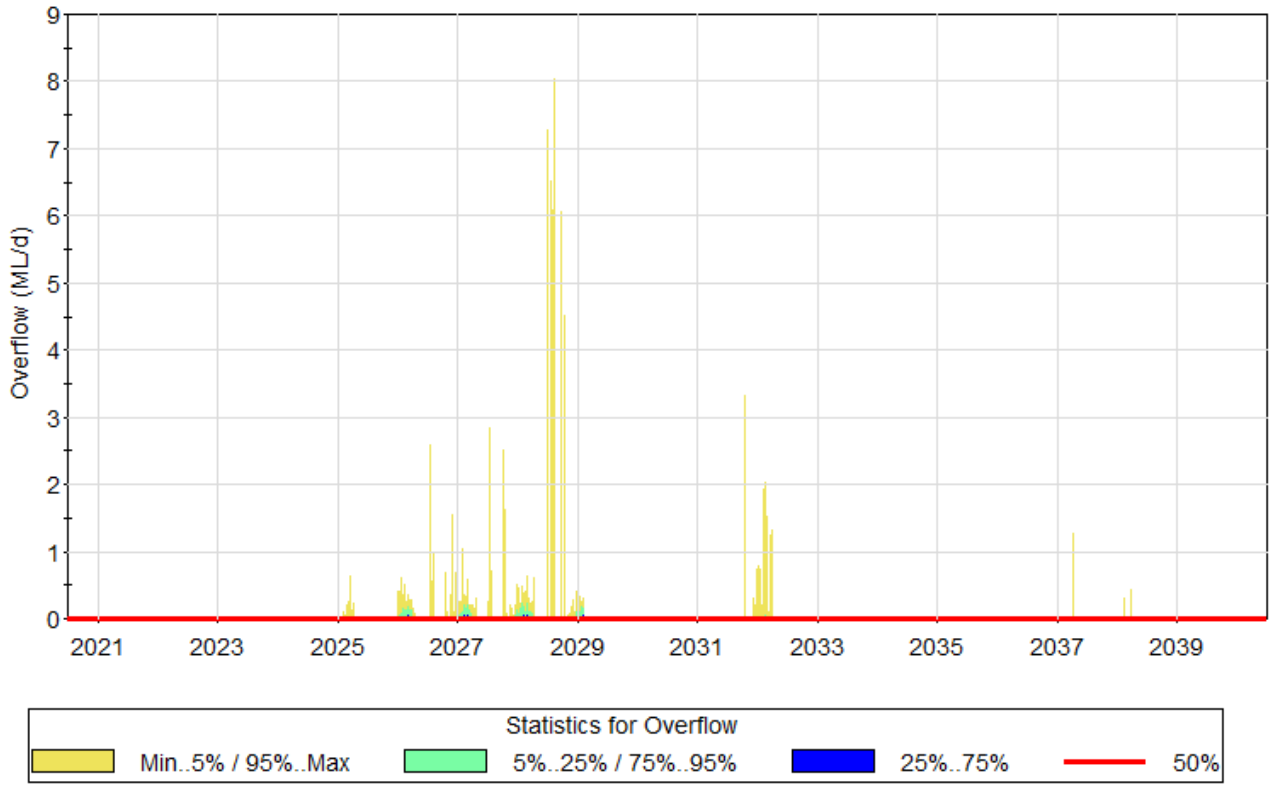


Figure 6-22 North Koolpin Pit Overflow

BHS Pit Lake Recovery

The BHS pit water level recovery is illustrated in Figure 6-23. The pit level is predicted to stabilise at a slightly lower level than the current pit lake level due an imbalance between inflow (groundwater seepage, rainfall and runoff) and outflow (evaporation). The BHS pit has not overflown in any of the scenarios.

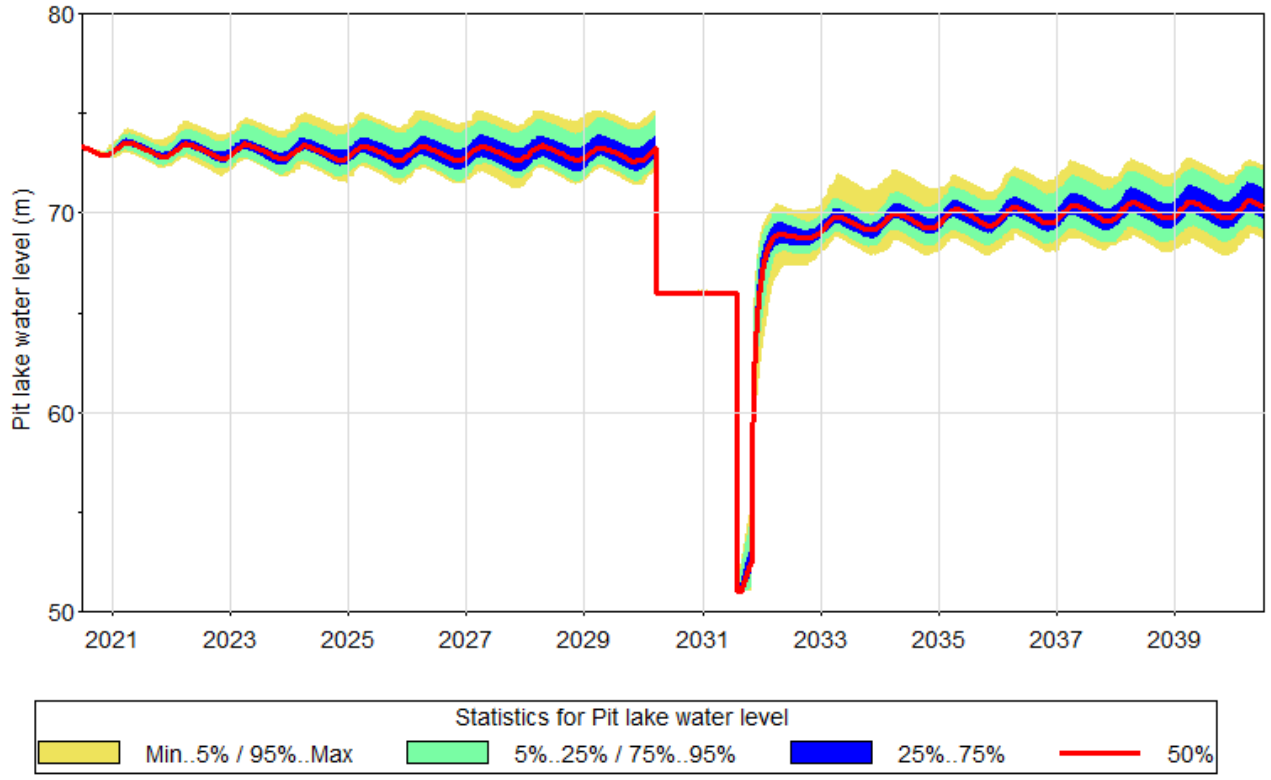


Figure 6-23 BHS Pit Lake Level Recovery

6.3.6 Climate Variability

The Rustlers Roost pit lake recovery under the wet and dry scenarios (Section 6.3.3.1) is illustrated in Figure 6-24, with cumulative inflows into the water management system summarised in Table 6-18. For comparison, the sensitivity of the water management system to the hydraulic conductivity of the aquifer (using the upper and lower range of the uncertainty distribution for Kh) is also reported.

A 5% drier climate would only generate 0.5% less inflows into the system, whilst a 5% wetter climate would generate a mere 0.5% more inflow in the Rustlers Roost open pit. By comparison, current uncertainty in aquifer hydraulic conductivity generates between 75% less inflow to 110% more inflow than the reference scenario. The uncertainty related to the climate variability is insignificant in comparison to other parameters that are not well documented such as the representative hydraulic conductivity.

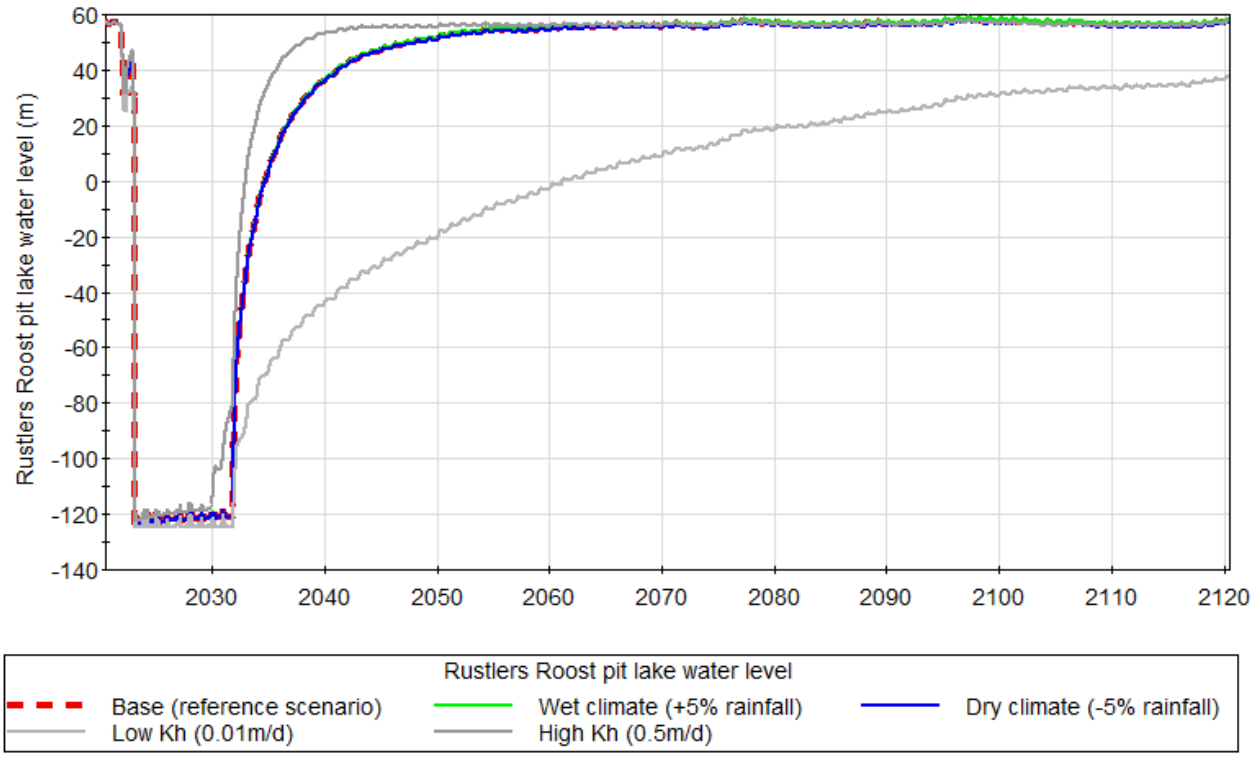


Figure 6-24 Climate Sensitivity of the Rustlers Roost Pit Lake Recovery

Table 6-18 Water Balance Summary for Various Climate and Aquifer Hydraulic Conductivity Assumptions

	Reference	Wet Climate	Dry Climate	Low Kh (0.01m/d)	High Kh (0.5m/d)
Total Inflows [ML/yr]	8,085	8,123	8,0.47	2,060	16,900
Variation from Reference Scenario	0%	+0.5%	-0.5%	-75%	+110%

6.4 Goldsim Solute Balance Model

6.4.1 Overview

A non-reactive solute balance was paired with the water balance model to estimate the concentrations of potential contaminants in the Rustlers Roost and Quest 29 mine pits. The modelling is conservative, such that there is no decay or transformation of the source water components into other compounds and no precipitation due to geochemical reactions or dissolution from rock material. The modelling approach is a normalised approach that can be applied to any potential contaminant under the assumption that the natural surface water environment has no background concentration of that contaminant. The source is exclusively due to the mining and processing operation (e.g. through groundwater inflow into the mined pit). A prediction of the concentrations of a contaminant of potential concern (CoPC) can be obtained by multiplying the normalised concentration value at a future time (assumptions described below) by the estimate of the potential contaminant source-term concentration.

6.4.2 Method

As an initial assessment, for the CoPC estimation, groundwater is assumed to be the sole source of contaminant with a hypothetical concentration of 100mg/L (or by analogy 100%) while other inflows (rainfall or runoff[2]) have no presence of contaminant (i.e. CoPC concentration is at 0 mg/L or 0%). The initial pit lake concentration is irrelevant as the pit lake will be emptied during the initial dewatering phase. Therefore, the assessment is only concerned by the long-term evolution of water quality within the pit lakes. With those assumptions, the concentration of a CoPC in the pit lake due to groundwater seepage increases by direct evaporation from the pit water surface and decreases by the dilution provided by direct rainfall and runoff into the pit.

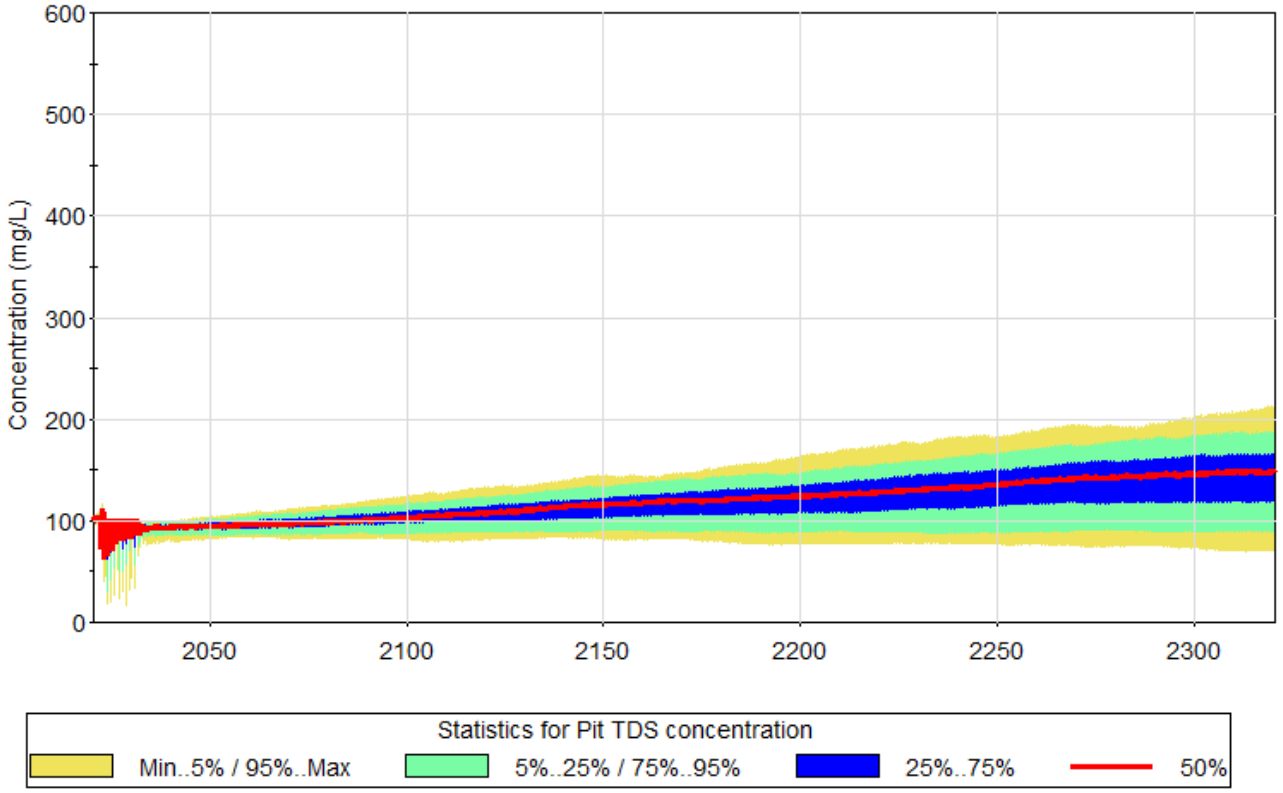
To calculate the chemical concentration at a given time, the source concentration from groundwater is adjusted in accordance with the relationship presented in the result figures provided in the following sections.

6.4.3 Model Results

6.4.3.1 Rustlers Roost Pit

The predicted concentration evolution of the Rustlers Roost pit for 300 years post-mining is illustrated in Figure 6-25. The median case prediction shows a very slowly increasing trend of the CoPC concentration in the pit lake, with the pit lake CoPC concentration after 300 years being 1.5 times the CoPC concentration in the groundwater.

For the first 100 years post-mining, the CoPC concentration in the pit remains sensibly unchanged. The increasing trend is indicative of an excess evaporation compared to rainfall and runoff to the pit. The uncertainty analysis suggests that at most the pit lake concentration of a CoPC would be twice as much of its concentration in the groundwater.



[2] The WRDs leachates are not directed toward the pit lake in current site design. The runoff is therefore limited to the pit walls and the source of contamination for the runoff is therefore limited and negligeable.

Figure 6-25 Rustlers Roost Pit Lake Concentration

The resulting concentration estimates (in accordance with the relationship presented in Figure 6-25) 50 years post-mining and 300 years post-mining are summarised in Table 6-19. A very conservative assumption is made by assuming that the groundwater concentration is equal to the maximum measured concentration at any of the site bore.

Table 6-19 Current and Predicted Concentration of Water Chemical Elements after 50 and 300 years in Rustlers Roost Pit

Parameter	Maximum Concentration in Groundwater[3]	50 years	300 years
TDS (mg/L)	200	200	300
Hardness ($mgCaCO_3/L$)	120	120	180
Total Alkalinity as $CaCO_3$ (mg/L)	140	140	210
Calcium (mg/L)	31	31	47
Chloride (mg/L)	15	15	23
Magnesium (mg/L)	13	13	20
Potassium (mg/L)	9	9	14
Sodium (mg/L)	28	28	42
Sulfate (mg/L)	31	30	47
Aluminium (mg/L)	4.4		6.6
Arsenic (mg/L)	0.09		0.15
Copper (mg/L)	0.04		0.06
Iron (mg/L)	6.6		9.9
Zinc (mg/L)	0.28		0.4

6.4.3.2 Quest 29 Pits

Taipan Pit

The predicted concentration evolution of the Taipan pit for 300 years post-mining is illustrated in Figure 6-26. The median prediction shows an increasing trend, with the CoPC concentration in the pit lake after 300 years being 4 times the CoPC concentration in the groundwater. There is a large uncertainty range suggesting that 5% of the realisations have a concentration 6 times of the groundwater concentration and up to a maximum of 6.5 time the groundwater concentration. The results suggest also that the likelihood of concentration being less than 3 time the groundwater concentration is 25%, and less than twice the source concentration is 5%.

[3] The maximum concentration in any of the site borehole.

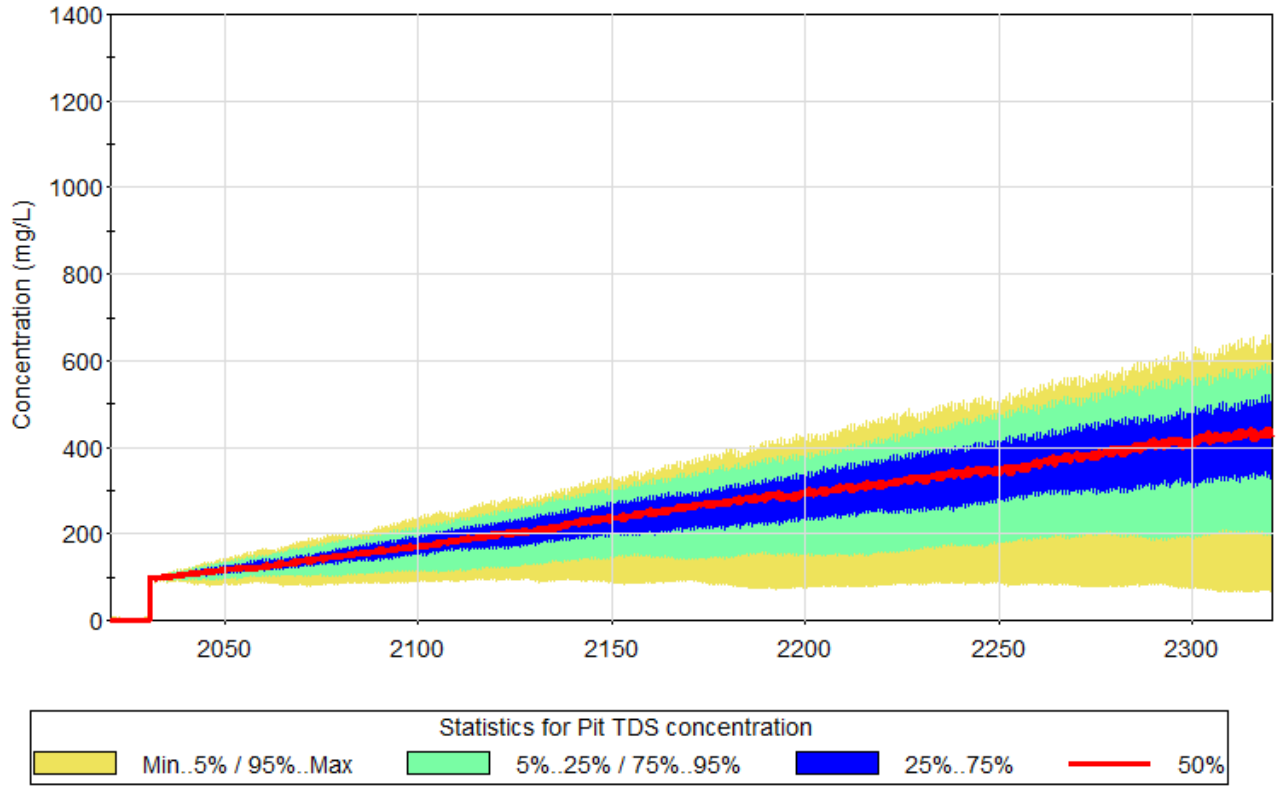


Figure 6-26 Taipan Pit Lake Concentration

South Koolpin Pit

The predicted CoPC concentration in the South Koolpin pit for 300 years post-mining is illustrated in Figure 6-27. The median prediction shows a very slow but increasing trend with the CoPC concentration in the pit lake after 300 years being 1.5 times the CoPC concentration in the groundwater. There is a large uncertainty band suggesting that 5% of the realisations have a pit lake CoPC concentration 3.5 times of the groundwater concentration and up to a maximum of 4.5 times the groundwater concentration.

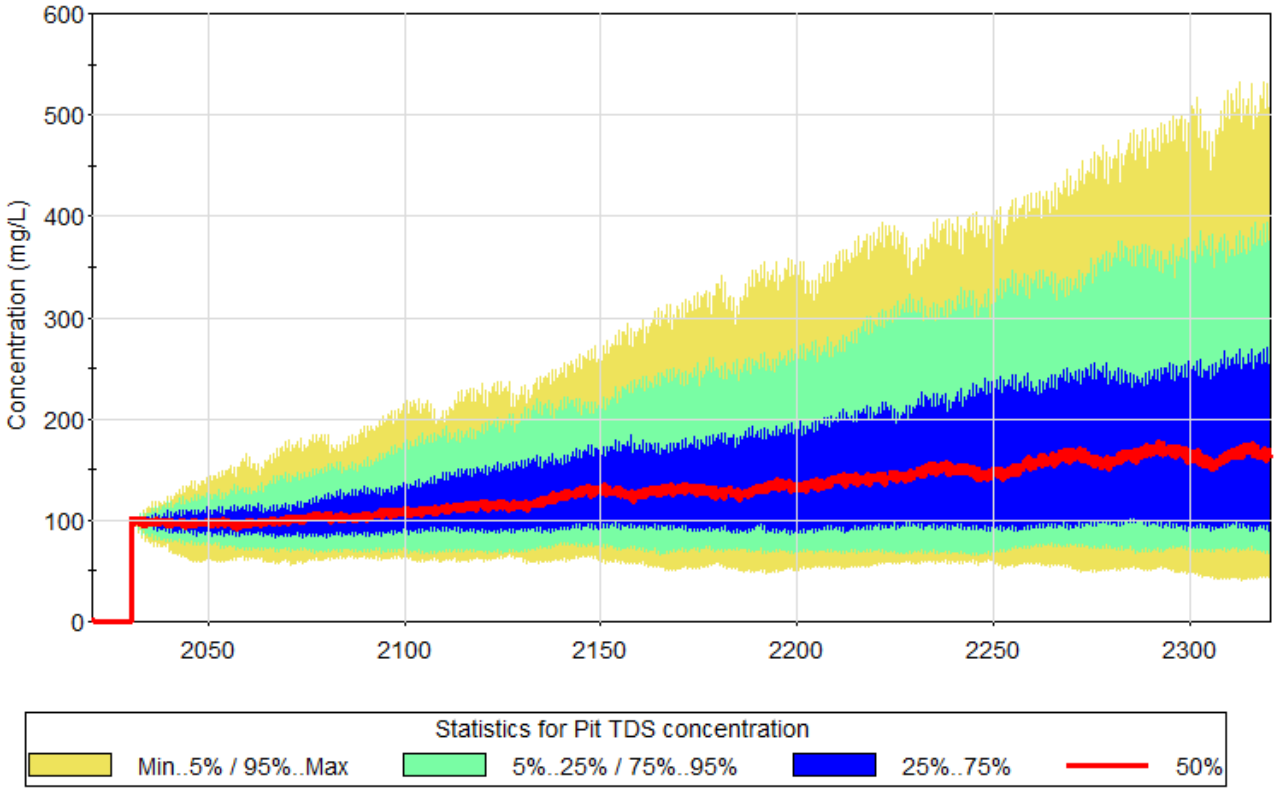


Figure 6-27 South Koolpin TDS over Time

North Koolpin Pit

The predicted CoPC concentration in the North Koolpin pit for 300 years post-mining is illustrated in Figure 6-28. The median prediction shows a very stable CoPC pit lake concentration at about half the CoPC groundwater concentration.

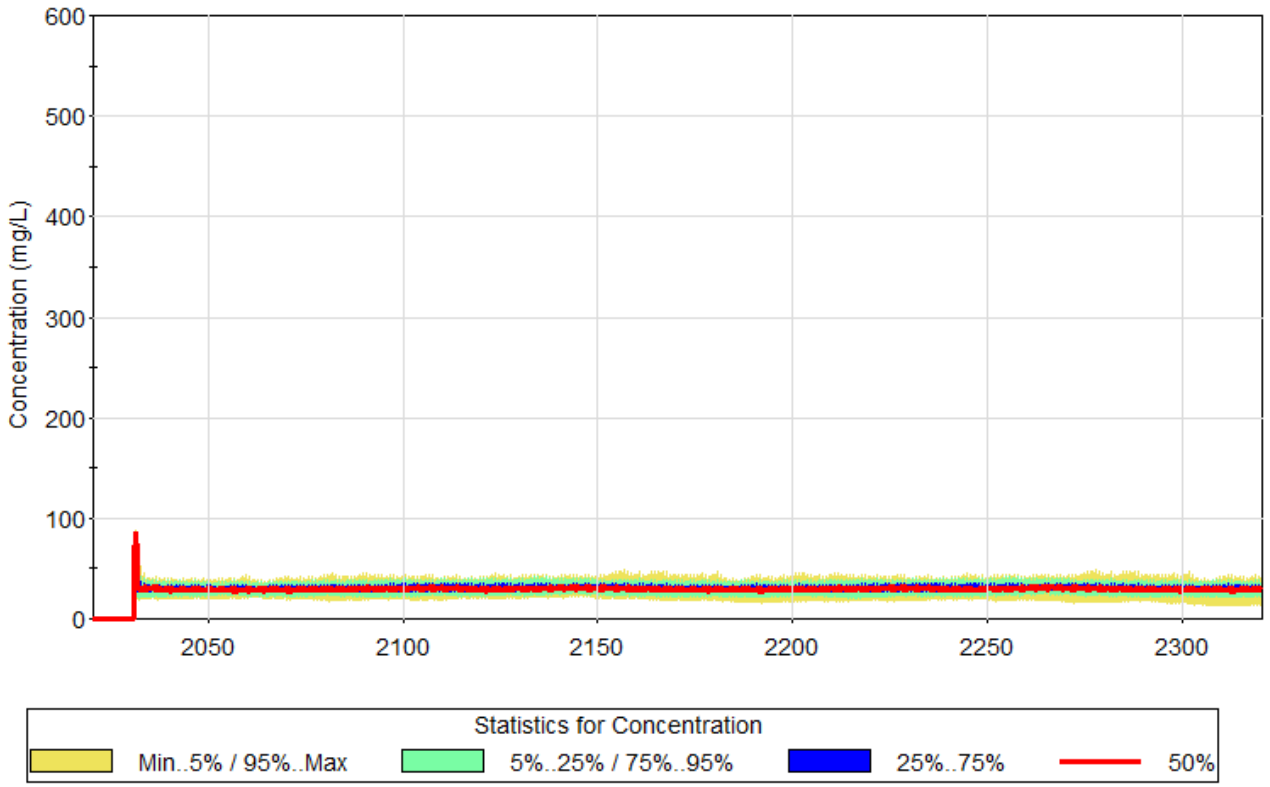


Figure 6-28 North Koolpin Pit Lake Concentration

BHS Pit

The predicted CoPC concentration in the BHS pit for 300 years post-mining is illustrated in Figure 6-29. The median prediction shows very stable CoPC pit lake concentration pit for the 300 years post-mining. There is a large uncertainty band suggesting that 5% of the realisations have a CoPC pit lake concentration 3 times of the groundwater concentration and up to a maximum of 5 times the groundwater concentration. The uncertainty range suggest also that there is equal probability that the concentrations of CoPC in the pit lake decreases.

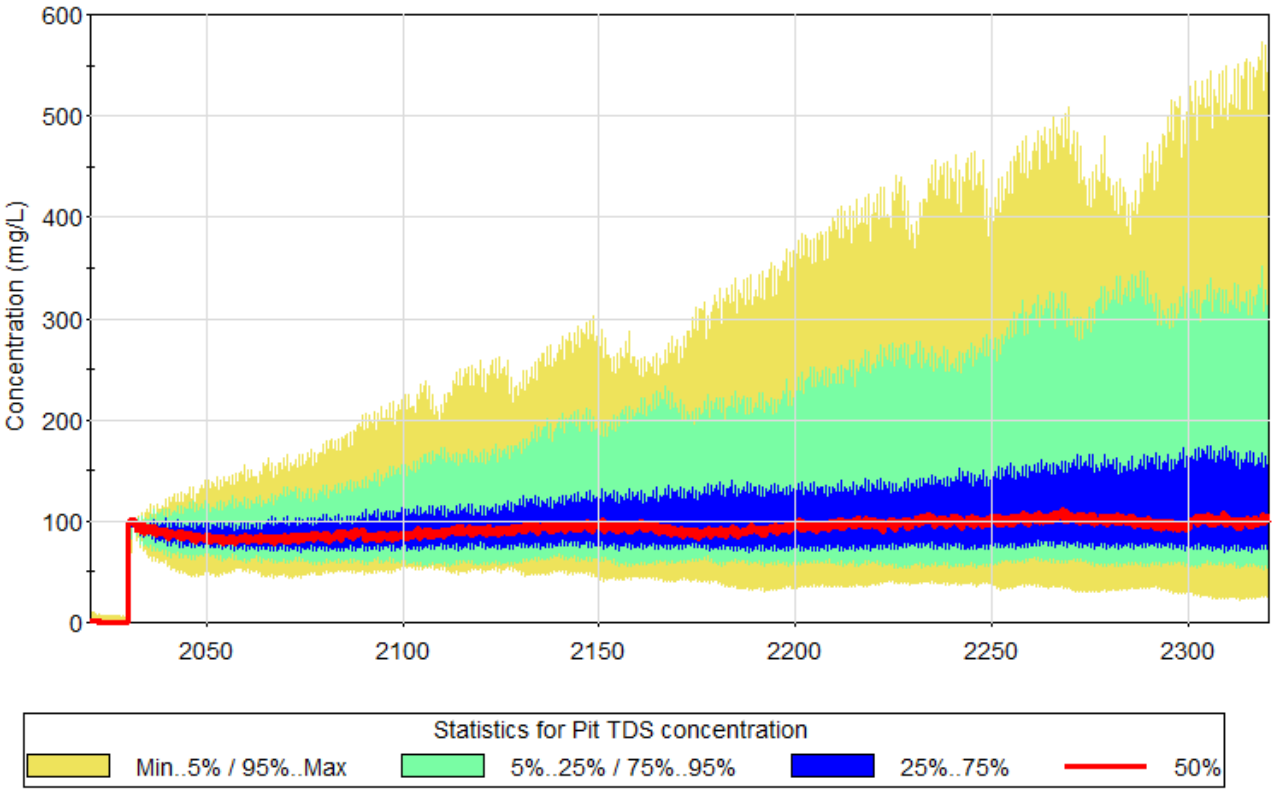


Figure 6-29 BHS Pit Lake Concentration

Summary

Table 6-20 and Table 6-21 summarise the predicted CoPC pit lake concentration at Quest 29 after 50 years and 300 years, respectively. As for the Rustlers Roost pit approach, a very conservative assumption is made by assuming that the groundwater concentration is equal to the maximum measured concentration at any of the site bore.

Table 6-20 Current and Predicted Concentration of Water Chemical Elements after 50 years in Quest 29 Pits

Parameter	Maximum Concentration in Groundwater[4]	Taipan	South Koolpin	North Kollpin	BHS
TDS (mg/L)	1000	1500	1000	300	900
Hardness ($mgCaCO_3/L$)	455	683	455	137	410
Total Alkalinity as $CaCO_3$ (mg/L)	210	315	210	63	189
Calcium (mg/L)	140	210	140	42	126
Chloride (mg/L)	14	21	14	4	13
Magnesium (mg/L)	108	162	108	32	97
Potassium (mg/L)	13	20	13	4	12

[4] The maximum concentration in any of the site borehole.

Parameter	Maximum Concentration in Groundwater[4]	Taipan	South Koolpin	North Kollpin	BHS
Sodium (mg/L)	172	258	172	52	155
Sulfate (mg/L)	560	840	560	168	504
Aluminium (mg/L)	1.6	2	2	0.5	1
Arsenic (mg/L)	0.28	0.4	0.3	0.1	0.3
Copper (mg/L)	0.06	0.1	0.1	0.02	0.1
Iron (mg/L)	19	29	19	6	17
Zinc (mg/L)	0.38	1	0.4	0.1	0.3

Table 6-21 Current and Predicted Concentration of Water Chemical Elements after 300 years in Quest 29 Pits

Parameter	Maximum Concentration in Groundwater[5]	Taipan	South Koolpin	North Kollpin	BHS
TDS (mg/L)	1000	4200	1600	300	1000
Hardness ($mgCaCO_3/L$)	455	1911	728	137	455
Total Alkalinity as $CaCO_3$ (mg/L)	210	882	336	63	210
Calcium (mg/L)	140	588	224	42	140
Chloride (mg/L)	14	59	22	4	14
Magnesium (mg/L)	108	454	173	32	108
Potassium (mg/L)	13	55	21	4	13
Sodium (mg/L)	172	722	275	52	172
Sulfate (mg/L)	560	2352	896	168	560
Aluminium (mg/L)	1.6	6.7	2.6	0.5	1.6
Arsenic (mg/L)	0.28	1.2	0.4	0.1	0.3
Copper (mg/L)	0.06	0.3	0.1	0.0	0.1
Iron (mg/L)	19	79.8	30.4	5.7	19.0
Zinc (mg/L)	0.38	1.6	0.6	0.1	0.4

[5] The maximum concentration in any of the site borehole.

6.5 Water Balance and Water Quality Modelling Key Findings

The site water balance was modelled with Goldsim software to estimate the water production and management related to the mining activities on site (pit dewatering, ore processing and other water consumption on site). The model was run in a stochastic mode to account for the parameters uncertainty that are controlling the water production. The model shows that:

- An estimated amount of 50 GL of water will need to be released during mining operation. According to current uncertainty analysis, this amount could comprise between 25 GL and 130 GL;
- The groundwater seepage into is the main inflow into the water management system as it constitutes an average of 83% of all inflows to the system with an average of 6,000 ML/yr for the life of mining operations. It is also the most uncertain contributor due to the lack of data to constrain the representative value of hydraulic conductivity of the regional aquifer. Pit dewatering volume should be monitored during operations to provide constraints on the hydraulic conductivity and refine the predictions. The uncertainty in the hydraulic conductivity has large implication for the volume of water to manage and for the period for complete recovery of pit water levels. It has however, little influence on the final pit lake stabilisation levels which approximate the groundwater table level;
- Post-mining, the pit lakes are unlikely to overflow. The water level for all lake stabilised around the groundwater table levels, suggesting that the pit lakes may act as final sink (or possibly as through flow provided the topography and potential gradient of the water table). This is supporting the conceptualisation that potential evaporation is higher than the rainfall and runoff on the pit catchment;
- As excess water is produced during mining operations, the bore field is only required to supply the demand of drinkable water (reverse osmosis water). However, at the end of mining, 55 L/s of make-up water will be required for the processing of the ore stockpiles. The model has assumed this water is to be supplied by the bore field, but it could also be sourced from an extension of the Rustlers Roost pit dewatering; and
- Post-mining, the Rustlers Roost pit lake is predicted to stabilise within 30 years post-mining (median estimate) to a level similar to the current one. The likelihood of overflow is very small (regardless of the uncertainty on model parameters including aquifer hydraulic conductivity).

The water balance model was coupled with a mass balance to quantitatively compare relative risk of potential contaminant to build up in the final void and be potentially released in the environment.

6.6 Limitations and Recommendations

The Goldsim model balances inflows and outflow of the water management systems. However, the accuracy of the predicted inflows and outflows is limited by two main sources of uncertainty:

- A parameter uncertainty. The model uses parameters that are impossible to know precisely (particularly as the model parameters are representing an average of the heterogenic real system properties). The parameter uncertainty controls the predictive uncertainty which was quantified by running the model in a stochastic mode. Hence the model results were not provided as a single prediction but as a range of plausible outcomes based on conservative assumptions; and
- A structural uncertainty. It reflects the extent to which a given model differs from the real system it is intended to represent. The water table is represented by a single value for each pit and with this assumption, preventing the model to potentially function as a through flow. As the pit lakes are predicted to stabilise near the water table elevation, the potential for the pit lake to function as through flow becomes significant. However, by ignoring the

potential pit lake leakage related to through flow conditions, the model tends to overestimate the pit lake stabilisation level rather than underestimating it.

The limitations of the model in representing inflows and outflows are listed in Table 6-22.

Table 6-22 Inflows and Outflows Model Representation Limitations

Process	Limitations
Rainfall	The rainfall used for future scenario assumes historical data. A wet and dry scenario were derived assuming a 5% increase and decrease of rainfall to represent the bounds (reported in section 4.1).
Pit wall (/pond) Runoff	A single runoff coefficient is applied to rainfall to derive the estimated runoff. The intensity of rain event, the seasonality or the nature of the soil are not considered. To overcome those simplifications, a wide range of runoff coefficient was used in the stochastic modelling approach.
Groundwater inflow	The groundwater inflow is represented through an analytical model that has several limitations: ▪ The analytical model is steady state and doesn't represent the transient inflow which is occurring during mining operations. ▪ The model assumes a horizontal water table and can't therefore represent a groundwater through flow across the pit lake. ▪ The aquifer is assumed to be homogeneous and isotropic and is represented by a single value of Kh (in general hydraulic conductivity in fractured rock aquifer drops with depth. A wide range of hydraulic conductivity has been adopted in the stochastic approach to overcome this limitation.
Water transfer inflow (pump)	Based on the planning provided by PGO.
Evaporation	Evaporation applied to lake wet surface is implemented by applying a reduction factor on pan ET to account for atmospheric water saturation near the lake surface. Evaporation is controlled by many other processes (wind, shading) that are not currently represented in the model. A wide range of evaporation factor was used in the stochastic approach to overcome this limitation
Dewatering (/water transfer to other water store)	Relying on PGO's claim of dewatering capacity.
Groundwater infiltration	Apart from the Annie Dam (unlined water storage), the groundwater seepage is not currently represented in the model as it may not be needed. Though, the model has shown that long terms pit lakes stabilisation levels in the Quest 29 sites are near the water table with potentially exceeding it. Some infiltration may occur in those instances.
Overflow	The overflow is assumed at the upper end of the provided stage height/volume curve data.
Storage (stage height/volume curve)	Proportional to the reliability of input data.
Catchment area	Based on provided shapefile of pit catchments.

7. Groundwater Management Plan

A Water Management Plan, inclusive of measures to address groundwater, has been developed and is included in Appendix I within the Draft EIS.

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Appendix A - Rustlers Roost 2020-2021 Water Quality Monitoring Results

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Appendix A-1 - Rustlers Roost Groundwater Monitoring Results (2020-2021)

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Table A.1 - Rustlers Roost Groundwater Quality

Analyte Group	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements
Analyte	SWL**(initial)**	Electrical Conductivity	pH	Temperature	Turbidity	Salinity	Total Dissolved Solids	Oxidation-Reduction Potential
Analyte Short Name	SWL (initial)	EC (field)	pH (field)	Temp (field)	Turbidity (field)	Salinity (field)	TDS (field)	ORP (field)
Units	mbTOC	µS/cm	-	°C	NTU	ppt	mg/L	mV
Toms Gully SSTV (80th percentile)	-	41	5.8 - 8.0	-	87	-	-	-
Tropical Australia Lowland Rivers	-	20 - 250	6.0 - 8.0	-	2 - 15	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-	4000	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-	-
RRMB01								
10/09/2020	4.06	-	-	-	-	-	-	-
21/10/2020	4.29	-	-	-	-	-	-	-
9/11/2020	4.65	199.3	6.14	31.8	576	0.09	130	101
4/12/2020	2.5	-	-	-	-	-	-	-
7/01/2021	2.21	169.4	5.94	30.8	36.7	0.1	109.8	217
3/02/2021	2.27	-	-	-	-	-	-	-
11/03/2021	2.18	149.9	5.74	31.1	287	0.07	96.8	32.9
16/04/2021	2.24	-	-	-	-	-	-	-
29/04/2021	2.3	130	5.35	31.2	38.2	0.06	84.5	100
8/07/2021	2.58	129.9	5.3	32.4	54.7	0.06	84	94.5
RRMB02								
9/11/2020	4.5	215.3	6.21	32.2	9.41	0.1	139.75	75
4/12/2020	4.56	-	-	-	-	-	-	-
6/01/2021	3.59	204.5	6.22	31.4	0.84	0.1	133.1	149
3/02/2021	2.83	-	-	-	-	-	-	-
10/03/2021	1.4	199	6.01	32.1	0.93	0.09	130	43.9
16/04/2021	0.78	-	-	-	-	-	-	-
29/04/2021	0.91	204	6.09	31.5	1.21	0.09	133	58
8/07/2021	1.91	193	5.88	31.8	0.76	0.09	125	72.1
RRMB03								
9/11/2020	14.99	130.7	5.78	33.2	3.68	0.06	85.15	119.8
4/12/2020	15.18	-	-	-	-	-	-	-
6/01/2021	14.42	123.9	5.8	32.6	0.71	0.1	80.6	169
3/02/2021	13.37	-	-	-	-	-	-	-
10/03/2021	11.33	124.1	5.6	33.5	8.68	0.06	81.25	23.4
16/04/2021	10.31	-	-	-	-	-	-	-
6/05/2021	10.57	126.2	5.54	32.4	5.88	0.06	81.9	118.8
7/07/2021	11.68	118	5.57	31.9	0.42	0.05	76.7	124.2
RRMB04								
10/11/2020	7.84	286.6	6.76	32.5	2.79	0.13	186.55	51.2
4/12/2020	7.98	-	-	-	-	-	-	-
6/01/2021	6.93	260.8	6.78	32.6	3.22	0.1	169.9	61
3/02/2021	5.77	-	-	-	-	-	-	-
10/03/2021	4.3	261	6.5	32.8	4.07	0.12	171	30
16/04/2021	3.65	-	-	-	-	-	-	-
6/05/2021	3.92	293.4	6.48	32.3	15.7	0.14	190.6	32.7
7/07/2021	4.95	294	6.38	31.8	4.5	0.14	190	38.8
RRMB05								
10/11/2020	16.08	269.9	6.52	32.3	1.49	0.13	175.5	-12.5
4/12/2020	16.19	-	-	-	-	-	-	-
6/01/2021	15.43	305.4	6.58	31.4	1.51	0.1	196.4	164
3/02/2021	15.16	-	-	-	-	-	-	-
11/03/2021	12.42	293.8	6.54	32	3.98	0.14	191	-93
16/04/2021	11.98	-	-	-	-	-	-	-
29/04/2021	12.16	281	6.36	31.9	1.32	0.13	182	-93
8/07/2021	12.97	271	6.22	31.5	0.69	0.13	176	-118
RRMB06								
9/11/2020	24.43	84.9	5.97	34.8	2.6	0.04	55.25	33.6

Table A.1 - Rustlers Roost Groundwater Quality

Analyte Group	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements
Analyte	SWL**(initial)**	Electrical Conductivity	pH	Temperature	Turbidity	Salinity	Total Dissolved Solids	Oxidation-Reduction Potential
Analyte Short Name	SWL (initial)	EC (field)	pH (field)	Temp (field)	Turbidity (field)	Salinity (field)	TDS (field)	ORP (field)
Units	mbTOC	µS/cm	-	℃	NTU	ppt	mg/L	mV
Toms Gully SSTV (80th percentile)	-	41	5.8 - 8.0	-	87	-	-	-
Tropical Australia Lowland Rivers	-	20 - 250	6.0 - 8.0	-	2 - 15	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-	4000	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-	-
4/12/2020	24.52	-	-	-	-	-	-	-
7/01/2021	23.88	84.4	5.9	32.3	0.81	0	55	84
3/02/2021	23.7	-	-	-	-	-	-	-
10/03/2021	20.98	78.5	5.66	33.4	0.63	0.03	50.7	37.2
16/04/2021	20.44	-	-	-	-	-	-	-
6/05/2021	20.62	81	5.64	32.7	3.1	0.04	52.7	55.9
8/07/2021	20.4	78.3	5.65	32.7	0.91	0.03	50.7	14.3
RRMB07								
10/11/2020	26.51	40.5	4.27	34.1	1.52	0.02	26.65	223.6
4/12/2020	26.65	-	-	-	-	-	-	-
6/01/2021	26.11	37.1	4.4	33.4	0.84	24.2	-	271
3/02/2021	25.82	-	-	-	-	-	-	-
10/03/2021	23.02	37.8	3.77	33.6	1.16	0.02	24.7	178.9
16/04/2021	22.22	-	-	-	-	-	-	-
6/05/2021	22.37	37.8	4.09	33.4	2.14	0.02	24.7	165.4
8/07/2021	23.23	36.1	3.84	32.5	0.44	0.02	23.4	213.2
RRMB08								
10/11/2020	27.28	89.7	5.53	33.3	1.53	0.04	57.85	149
4/12/2020	27.49	-	-	-	-	-	-	-
6/01/2021	27.53	76.3	5.45	33.4	1.02	0	49.7	188
3/02/2021	26.84	-	-	-	-	-	-	-
10/03/2021	24.75	72.7	5.08	34.3	0.45	0.03	47.4	70
16/04/2021	22.34	-	-	-	-	-	-	-
6/05/2021	21.97	75	5.23	33.2	4.32	0.03	48.7	124.8
8/07/2021	22.71	67.8	5.11	32.4	2.27	44.2	139.8	21

Table A.1 - Rustlers Roost Groundwater Quality

Analyte Group	Field Measurements	Physico-chemical	Physico-chemical	Physico-chemical	Alkalinity	Alkalinity	Alkalinity
Analyte	Dissolved Oxygen	Total Suspended Solids	Turbidity	Total Hardness	Hydroxide Alkalinity as CaC03	Carbonate Alkalinity as CaC03	Bicarbonate Alkalinity as CaC03
Analyte Short Name	DO_%sat (field)	TSS	Turbidity (lab)	Total Hardness	Alk_OH	Alk_CO3	Alk_HCO3
Units	%	mg/L	NTU	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	54	87	-	-	-	-
Tropical Australia Lowland Rivers	85-120	2 - 15	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
RRMB01							
10/09/2020	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-
9/11/2020	32.4	182	348	4	<1	<1	37
4/12/2020	-	-	-	-	-	-	-
7/01/2021	39.7	16	23.7	7	<1	<1	42
3/02/2021	-	-	-	-	-	-	-
11/03/2021	4.1	48	60	11	<1	<1	46
16/04/2021	-	-	-	-	-	-	-
29/04/2021	5.4	24	21.2	4	<1	<1	31
8/07/2021	4.8	66	46.8	4	<1	<1	38
RRMB02							
9/11/2020	2.8	<5	2.7	72	<1	<1	106
4/12/2020	-	-	-	-	-	-	-
6/01/2021	9.1	<5	<0.1	72	<1	<1	103
3/02/2021	-	-	-	-	-	-	-
10/03/2021	4.4	<5	<0.1	76	<1	<1	102
16/04/2021	-	-	-	-	-	-	-
29/04/2021	2.6	6	<0.1	72	<1	<1	94
8/07/2021	2.2	<5	<0.1	69	<1	<1	112
RRMB03							
9/11/2020	21	<5	0.6	41	<1	<1	61
4/12/2020	-	-	-	-	-	-	-
6/01/2021	11.7	<5	<0.1	41	<1	<1	60
3/02/2021	-	-	-	-	-	-	-
10/03/2021	4.9	<5	2.7	41	<1	<1	53
16/04/2021	-	-	-	-	-	-	-
6/05/2021	6.2	<5	1.3	41	<1	<1	59
7/07/2021	12.4	<5	0.1	44	<1	<1	55
RRMB04							
10/11/2020	25.9	<5	0.6	98	<1	<1	120
4/12/2020	-	-	-	-	-	-	-
6/01/2021	21.4	5	0.6	100	<1	<1	118
3/02/2021	-	-	-	-	-	-	-
10/03/2021	7.6	<5	0.7	32	<1	<1	115
16/04/2021	-	-	-	-	-	-	-
6/05/2021	3.3	8	2	108	<1	<1	130
7/07/2021	5.1	<5	6	119	<1	<1	142
RRMB05							
10/11/2020	1	<5	0.8	93	<1	<1	119
4/12/2020	-	-	-	-	-	-	-
6/01/2021	2.9	9	1.2	114	<1	<1	138
3/02/2021	-	-	-	-	-	-	-
11/03/2021	2	<5	2.7	117	<1	<1	138
16/04/2021	-	-	-	-	-	-	-
29/04/2021	2.3	8	5.6	91	<1	<1	122
8/07/2021	2.3	<5	10	187	<1	<1	195
RRMB06							
9/11/2020	4.4	<5	2.3	20	<1	<1	31

Table A.1 - Rustlers Roost Groundwater Quality

Analyte Group	Field Measurements	Physico-chemical	Physico-chemical	Physico-chemical	Alkalinity	Alkalinity	Alkalinity
Analyte	Dissolved Oxygen	Total Suspended Solids	Turbidity	Total Hardness	Hydroxide Alkalinity as CaC03	Carbonate Alkalinity as CaC03	Bicarbonate Alkalinity as CaC03
Analyte Short Name	DO_%sat (field)	TSS	Turbidity (lab)	Total Hardness	Alk_OH	Alk_CO3	Alk_HCO3
Units	%	mg/L	NTU	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	54	87	-	-	-	-
Tropical Australia Lowland Rivers	85-120	2 - 15	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
4/12/2020	-	-	-	-	-	-	-
7/01/2021	10.4	7	2.9	20	<1	<1	34
3/02/2021	-	-	-	-	-	-	-
10/03/2021	2.9	<5	1.3	13	<1	<1	27
16/04/2021	-	-	-	-	-	-	-
6/05/2021	2.5	6	3.2	20	<1	<1	29
8/07/2021	3.1	<5	1.8	20	<1	<1	31
RRMB07							
10/11/2020	29.2	<5	<0.1	<1	<1	<1	6
4/12/2020	-	-	-	-	-	-	-
6/01/2021	39.9	<5	<0.1	<1	<1	<1	2
3/02/2021	-	-	-	-	-	-	-
10/03/2021	20.9	<5	<0.1	<1	<1	<1	4
16/04/2021	-	-	-	-	-	-	-
6/05/2021	27.4	<5	<0.1	<1	<1	<1	6
8/07/2021	28.7	<5	<0.1	<1	<1	<1	<1
RRMB08							
10/11/2020	28	<5	0.6	12	<1	<1	37
4/12/2020	-	-	-	-	-	-	-
6/01/2021	33.6	6	<0.1	9	<1	<1	30
3/02/2021	-	-	-	-	-	-	-
10/03/2021	19	<5	<0.1	9	<1	<1	30
16/04/2021	-	-	-	-	-	-	-
6/05/2021	18.9	<5	<0.1	9	<1	<1	27
8/07/2021	22.94	<5	0.2	9	<1	<1	25

Table A.1 - Rustlers Roost Groundwater Quality

Analyte Group	Alkalinity	Acidity	Acidity	Acidity	Acidity	Major Ions (dissolved)	Major Ions (dissolved)
Analyte	Total Alkalinity as CaC03	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	Sulfate as SO4	Chloride
Analyte Short Name	Alk_Tot	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	SO4	Cl
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	-	210	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	1000	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
RRMB01							
10/09/2020	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-
9/11/2020	37	29	<1	29	28	31	3
4/12/2020	-	-	-	-	-	-	-
7/01/2021	42	10	<1	10	10	27	3
3/02/2021	-	-	-	-	-	-	-
11/03/2021	46	10	<1	10	10	19	2
16/04/2021	-	-	-	-	-	-	-
29/04/2021	31	20	<1	20	19	20	6
8/07/2021	38	21	<1	21	20	22	4
RRMB02							
9/11/2020	106	24	<1	23	22	<1	3
4/12/2020	-	-	-	-	-	-	-
6/01/2021	103	15	<1	15	15	<1	4
3/02/2021	-	-	-	-	-	-	-
10/03/2021	102	9	<1	9	9	<1	3
16/04/2021	-	-	-	-	-	-	-
29/04/2021	94	20	<1	20	19	<1	5
8/07/2021	112	11	<1	11	11	<1	3
RRMB03							
9/11/2020	61	41	<1	41	40	<1	3
4/12/2020	-	-	-	-	-	-	-
6/01/2021	60	19	<1	19	18	<1	3
3/02/2021	-	-	-	-	-	-	-
10/03/2021	53	19	<1	19	18	<1	3
16/04/2021	-	-	-	-	-	-	-
6/05/2021	59	35	<1	35	34	<1	3
7/07/2021	55	19	<1	19	19	<1	3
RRMB04							
10/11/2020	120	15	<1	15	14	15	4
4/12/2020	-	-	-	-	-	-	-
6/01/2021	118	10	<1	10	10	10	4
3/02/2021	-	-	-	-	-	-	-
10/03/2021	115	8	<1	8	7	9	3
16/04/2021	-	-	-	-	-	-	-
6/05/2021	130	15	<1	15	14	10	3
7/07/2021	142	6	<1	6	6	4	3
RRMB05							
10/11/2020	119	18	<1	17	16	8	4
4/12/2020	-	-	-	-	-	-	-
6/01/2021	138	12	<1	12	11	8	4
3/02/2021	-	-	-	-	-	-	-
11/03/2021	138	12	<1	12	11	8	4
16/04/2021	-	-	-	-	-	-	-
29/04/2021	122	16	<1	16	16	4	4
8/07/2021	195	7	<1	7	6	9	5
RRMB06							
9/11/2020	31	12	<1	12	12	2	2

Table A.1 - Rustlers Roost Groundwater Quality

Analyte Group	Alkalinity	Acidity	Acidity	Acidity	Acidity	Major Ions (dissolved)	Major Ions (dissolved)
Analyte	Total Alkalinity as CaC03	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	Sulfate as SO4	Chloride
Analyte Short Name	Alk_Tot	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	SO4	Cl
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	-	210	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	1000	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
4/12/2020	-	-	-	-	-	-	-
7/01/2021	34	12	<1	12	11	2	3
3/02/2021	-	-	-	-	-	-	-
10/03/2021	27	8	<1	8	7	2	2
16/04/2021	-	-	-	-	-	-	-
6/05/2021	29	12	<1	12	11	2	2
8/07/2021	31	8	<1	8	8	2	2
RRMB07							
10/11/2020	6	52	<1	52	50	<1	4
4/12/2020	-	-	-	-	-	-	-
6/01/2021	2	24	<1	24	24	<1	4
3/02/2021	-	-	-	-	-	-	-
10/03/2021	4	20	<1	20	19	<1	4
16/04/2021	-	-	-	-	-	-	-
6/05/2021	6	41	<1	41	41	1	4
8/07/2021	<1	26	<1	26	26	<1	4
RRMB08							
10/11/2020	37	58	<1	58	57	1	2
4/12/2020	-	-	-	-	-	-	-
6/01/2021	30	22	<1	22	22	2	3
3/02/2021	-	-	-	-	-	-	-
10/03/2021	30	13	<1	13	13	1	2
16/04/2021	-	-	-	-	-	-	-
6/05/2021	27	30	<1	30	30	2	3
8/07/2021	25	17	<1	17	17	1	2

Table A.1 - Rustlers Roost Groundwater Quality

Analyte Group	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)
Analyte	Calcium	Magnesium	Sodium	Potassium	Aluminium	Arsenic	Cadmium	Chromium	Cobalt
Analyte Short Name	Ca	Mg	Na	K	Al_F	As_F	Cd_F	Cr_F	Co_F
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	0.295	0.042	0.0004	0.006	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	insufficient data	0.024	0.0002	0.001	-
ANZECC 2000 Livestock Watering (beef cattle)	1000	2000	-	-	5	0.5	0.01	1	1
ANZECC 2000 long term irrigation	-	-	-	-	5	0.1	0.01	0.1	0.05
RRMB01									
10/09/2020	-	-	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-	-	-
9/11/2020	<1	1	26	<1	<0.01	0.001	<0.0001	<0.001	0.015
4/12/2020	-	-	-	-	-	-	-	-	-
7/01/2021	1	1	28	<1	<0.01	0.002	<0.0001	<0.001	0.004
3/02/2021	-	-	-	-	-	-	-	-	-
11/03/2021	1	2	22	<1	0.19	0.009	<0.0001	<0.001	0.005
16/04/2021	-	-	-	-	-	-	-	-	-
29/04/2021	<1	1	22	<1	0.04	0.002	<0.0001	<0.001	0.007
8/07/2021	<1	1	22	<1	0.02	0.001	<0.0001	<0.001	0.002
RRMB02									
9/11/2020	9	12	9	4	<0.01	0.001	<0.0001	<0.001	<0.001
4/12/2020	-	-	-	-	-	-	-	-	-
6/01/2021	9	12	9	4	<0.01	0.002	<0.0001	<0.001	<0.001
3/02/2021	-	-	-	-	-	-	-	-	-
10/03/2021	9	13	9	4	<0.01	0.002	<0.0001	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-
29/04/2021	9	12	8	4	<0.01	0.002	<0.0001	<0.001	<0.001
8/07/2021	8	12	8	4	<0.01	0.001	<0.0001	<0.001	<0.001
RRMB03									
9/11/2020	5	7	4	4	<0.01	<0.001	<0.0001	<0.001	<0.001
4/12/2020	-	-	-	-	-	-	-	-	-
6/01/2021	5	7	3	4	<0.01	0.001	<0.0001	<0.001	<0.001
3/02/2021	-	-	-	-	-	-	-	-	-
10/03/2021	5	7	4	4	<0.01	0.002	<0.0001	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-
6/05/2021	5	7	4	4	<0.01	<0.001	<0.0001	<0.001	<0.001
7/07/2021	6	7	4	4	<0.01	0.001	<0.0001	<0.001	<0.001
RRMB04									
10/11/2020	31	5	10	4	0.1	0.002	<0.0001	0.002	<0.001
4/12/2020	-	-	-	-	-	-	-	-	-
6/01/2021	30	6	8	4	0.08	0.003	<0.0001	0.001	<0.001
3/02/2021	-	-	-	-	-	-	-	-	-
10/03/2021	11	1	1	<1	0.09	<0.001	<0.0001	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-
6/05/2021	30	8	7	3	0.08	0.002	<0.0001	<0.001	<0.001
7/07/2021	33	9	5	3	<0.01	0.002	<0.0001	<0.001	<0.001
RRMB05									
10/11/2020	24	8	6	8	0.05	0.002	<0.0001	<0.001	<0.001
4/12/2020	-	-	-	-	-	-	-	-	-
6/01/2021	26	12	6	9	0.03	0.002	<0.0001	<0.001	<0.001
3/02/2021	-	-	-	-	-	-	-	-	-
11/03/2021	27	12	8	8	0.01	0.004	<0.0001	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-
29/04/2021	20	10	6	7	<0.01	0.001	<0.0001	<0.001	<0.001
8/07/2021	50	15	5	4	<0.01	0.07	<0.0001	<0.001	<0.001
RRMB06									
9/11/2020	3	3	2	5	<0.01	0.032	<0.0001	<0.001	0.001

Table A.1 - Rustlers Roost Groundwater Quality

Analyte Group	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)
Analyte	Calcium	Magnesium	Sodium	Potassium	Aluminium	Arsenic	Cadmium	Chromium	Cobalt
Analyte Short Name	Ca	Mg	Na	K	Al_F	As_F	Cd_F	Cr_F	Co_F
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	0.295	0.042	0.0004	0.006	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	insufficient data	0.024	0.0002	0.001	-
ANZECC 2000 Livestock Watering (beef cattle)	1000	2000	-	-	5	0.5	0.01	1	1
ANZECC 2000 long term irrigation	-	-	-	-	5	0.1	0.01	0.1	0.05
4/12/2020	-	-	-	-	-	-	-	-	-
7/01/2021	3	3	2	5	<0.01	0.035	<0.0001	<0.001	0.001
3/02/2021	-	-	-	-	-	-	-	-	-
10/03/2021	2	2	2	4	<0.01	0.034	<0.0001	<0.001	0.001
16/04/2021	-	-	-	-	-	-	-	-	-
6/05/2021	3	3	2	5	<0.01	0.035	<0.0001	<0.001	<0.001
8/07/2021	3	3	2	4	<0.01	0.034	<0.0001	<0.001	<0.001
RRMB07									
10/11/2020	<1	<1	1	<1	0.08	<0.001	<0.0001	<0.001	0.006
4/12/2020	-	-	-	-	-	-	-	-	-
6/01/2021	<1	<1	2	<1	0.09	<0.001	<0.0001	<0.001	0.007
3/02/2021	-	-	-	-	-	-	-	-	-
10/03/2021	<1	<1	2	<1	0.08	<0.001	<0.0001	<0.001	0.008
16/04/2021	-	-	-	-	-	-	-	-	-
6/05/2021	<1	<1	2	<1	0.11	<0.001	<0.0001	<0.001	0.008
8/07/2021	<1	<1	1	<1	0.07	<0.001	<0.0001	<0.001	0.007
RRMB08									
10/11/2020	3	1	6	6	<0.01	<0.001	<0.0001	<0.001	<0.001
4/12/2020	-	-	-	-	-	-	-	-	-
6/01/2021	2	1	6	7	<0.01	0.001	<0.0001	<0.001	<0.001
3/02/2021	-	-	-	-	-	-	-	-	-
10/03/2021	2	1	6	7	<0.01	0.001	<0.0001	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-
6/05/2021	2	1	6	6	<0.01	<0.001	<0.0001	<0.001	<0.001
8/07/2021	2	1	5	6	<0.01	<0.001	<0.0001	<0.001	<0.001

Table A.1 - Rustlers Roost Groundwater Quality

Analyte Group	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)
Analyte	Copper	Lead	Manganese	Nickel	Selenium Se (Total)	Tin	Uranium	Zinc	Iron
Analyte Short Name	Cu_F	Pb_F	Mn_F	Ni_F	Se_F	Sn_F	U_F	Zn_F	Fe_F
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	0.0018	0.0056	2.5	0.013	-	-	-	0.015	2.7
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0014	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-
ANZECC 2000 Livestock Watering (beef cattle)	2	0.1	-	1	0.02	-	0.2	20	-
ANZECC 2000 long term irrigation	0.2	2	0.2	0.2	0.02	-	0.01	2	0.2
RRMB01									
10/09/2020	-	-	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-	-	-
9/11/2020	0.001	<0.001	0.017	0.002	<0.01	<0.001	<0.001	0.048	<0.05
4/12/2020	-	-	-	-	-	-	-	-	-
7/01/2021	<0.001	<0.001	0.015	0.006	<0.01	<0.001	<0.001	0.006	0.05
3/02/2021	-	-	-	-	-	-	-	-	-
11/03/2021	0.002	<0.001	0.045	0.006	<0.01	<0.001	<0.001	0.014	0.51
16/04/2021	-	-	-	-	-	-	-	-	-
29/04/2021	0.003	<0.001	0.029	0.003	<0.01	<0.001	<0.001	0.017	0.11
8/07/2021	<0.001	<0.001	0.022	0.005	<0.01	<0.001	<0.001	0.007	0.07
RRMB02									
9/11/2020	<0.001	<0.001	0.002	<0.001	<0.01	<0.001	<0.001	0.006	<0.05
4/12/2020	-	-	-	-	-	-	-	-	-
6/01/2021	0.01	<0.001	0.003	<0.001	<0.01	<0.001	<0.001	0.018	<0.05
3/02/2021	-	-	-	-	-	-	-	-	-
10/03/2021	<0.001	<0.001	0.002	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05
16/04/2021	-	-	-	-	-	-	-	-	-
29/04/2021	0.002	<0.001	0.001	<0.001	<0.01	<0.001	<0.001	0.008	<0.05
8/07/2021	<0.001	<0.001	0.001	<0.001	<0.01	<0.001	<0.001	0.005	<0.05
RRMB03									
9/11/2020	0.003	<0.001	0.005	0.001	<0.01	<0.001	<0.001	0.022	<0.05
4/12/2020	-	-	-	-	-	-	-	-	-
6/01/2021	0.002	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	0.016	<0.05
3/02/2021	-	-	-	-	-	-	-	-	-
10/03/2021	0.001	<0.001	0.001	0.002	<0.01	<0.001	<0.001	0.011	<0.05
16/04/2021	-	-	-	-	-	-	-	-	-
6/05/2021	0.011	0.006	0.005	<0.001	<0.01	<0.001	<0.001	0.078	<0.05
7/07/2021	0.004	<0.001	<0.001	0.002	<0.01	<0.001	<0.001	0.049	<0.05
RRMB04									
10/11/2020	<0.001	<0.001	0.031	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05
4/12/2020	-	-	-	-	-	-	-	-	-
6/01/2021	<0.001	<0.001	0.24	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05
3/02/2021	-	-	-	-	-	-	-	-	-
10/03/2021	<0.001	<0.001	0.153	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05
16/04/2021	-	-	-	-	-	-	-	-	-
6/05/2021	<0.001	<0.001	0.402	<0.001	<0.01	<0.001	<0.001	0.006	0.18
7/07/2021	<0.001	<0.001	0.627	<0.001	<0.01	<0.001	<0.001	0.009	0.27
RRMB05									
10/11/2020	<0.001	<0.001	0.11	<0.001	<0.01	<0.001	<0.001	<0.005	0.22
4/12/2020	-	-	-	-	-	-	-	-	-
6/01/2021	<0.001	<0.001	0.132	<0.001	<0.01	<0.001	<0.001	0.008	0.25
3/02/2021	-	-	-	-	-	-	-	-	-
11/03/2021	<0.001	<0.001	0.147	<0.001	<0.01	<0.001	<0.001	<0.005	0.65
16/04/2021	-	-	-	-	-	-	-	-	-
29/04/2021	<0.001	<0.001	0.218	<0.001	<0.01	<0.001	<0.001	<0.005	0.54
8/07/2021	<0.001	<0.001	0.219	<0.001	<0.01	<0.001	<0.001	0.007	0.87
RRMB06									
9/11/2020	<0.001	<0.001	0.441	0.002	<0.01	<0.001	<0.001	0.013	1.71

Table A.1 - Rustlers Roost Groundwater Quality

Analyte Group	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)
Analyte	Copper	Lead	Manganese	Nickel	Selenium Se (Total)	Tin	Uranium	Zinc	Iron
Analyte Short Name	Cu_F	Pb_F	Mn_F	Ni_F	Se_F	Sn_F	U_F	Zn_F	Fe_F
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	0.0018	0.0056	2.5	0.013	-	-	-	0.015	2.7
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0014	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-
ANZECC 2000 Livestock Watering (beef cattle)	2	0.1	-	1	0.02	-	0.2	20	-
ANZECC 2000 long term irrigation	0.2	2	0.2	0.2	0.02	-	0.01	2	0.2
4/12/2020	-	-	-	-	-	-	-	-	-
7/01/2021	<0.001	<0.001	0.501	0.002	<0.01	<0.001	<0.001	0.014	1.84
3/02/2021	-	-	-	-	-	-	-	-	-
10/03/2021	<0.001	<0.001	0.462	0.002	<0.01	<0.001	<0.001	0.008	2.16
16/04/2021	-	-	-	-	-	-	-	-	-
6/05/2021	0.007	<0.001	0.476	0.001	<0.01	<0.001	<0.001	0.027	2.23
8/07/2021	<0.001	<0.001	0.491	0.001	<0.01	<0.001	<0.001	0.017	2.47
RRMB07									
10/11/2020	0.026	0.003	0.166	0.002	<0.01	<0.001	<0.001	0.019	<0.05
4/12/2020	-	-	-	-	-	-	-	-	-
6/01/2021	0.026	<0.001	0.203	0.002	<0.01	<0.001	<0.001	0.045	<0.05
3/02/2021	-	-	-	-	-	-	-	-	-
10/03/2021	0.022	<0.001	0.209	0.003	<0.01	<0.001	<0.001	0.01	<0.05
16/04/2021	-	-	-	-	-	-	-	-	-
6/05/2021	0.033	0.005	0.221	0.002	<0.01	<0.001	<0.001	0.07	<0.05
8/07/2021	0.026	<0.001	0.205	0.002	<0.01	<0.001	<0.001	0.067	<0.05
RRMB08									
10/11/2020	0.003	<0.001	0.002	<0.001	<0.01	<0.001	<0.001	0.012	<0.05
4/12/2020	-	-	-	-	-	-	-	-	-
6/01/2021	0.007	<0.001	0.004	0.001	<0.01	<0.001	<0.001	0.027	<0.05
3/02/2021	-	-	-	-	-	-	-	-	-
10/03/2021	0.002	<0.001	0.004	0.002	<0.01	<0.001	<0.001	0.007	<0.05
16/04/2021	-	-	-	-	-	-	-	-	-
6/05/2021	0.008	<0.001	0.004	<0.001	<0.01	<0.001	<0.001	0.036	<0.05
8/07/2021	0.003	<0.001	0.002	0.001	<0.01	<0.001	<0.001	0.026	<0.05

Table A.1 - Rustlers Roost Groundwater Quality

Analyte Group	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)
Analyte	Aluminium Al	Arsenic	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Tin	Uranium
Analyte Short Name	Al_T	As_T	Cd_T	Cr_T	Co_T	Cu_T	Pb_T	Mn_T	Ni_T	Se_T	Sn_T	U_T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	-	-	-	-	-	-	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	insufficient data	0.024	0.0002	0.001	-	0.0014	0.0034	1.9	0.011	0.011	-	insufficient data
ANZECC 2000 Livestock Watering (beef cattle)	5	0.5	0.01	1	1	2	0.1	-	1	0.02	-	0.2
ANZECC 2000 long term irrigation	5	0.1	0.01	1	0.5	0.2	2	0.2	0.2	0.02	-	0.01
RRMB01												
10/09/2020	-	-	-	-	-	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-	-	-	-	-	-
9/11/2020	1.29	0.002	<0.0001	0.002	0.018	0.006	0.003	0.03	0.004	<0.01	<0.001	<0.001
4/12/2020	-	-	-	-	-	-	-	-	-	-	-	-
7/01/2021	0.68	0.003	<0.0001	<0.001	0.006	0.002	<0.001	0.017	0.005	<0.01	<0.001	<0.001
3/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
11/03/2021	0.59	0.011	<0.0001	<0.001	0.006	0.007	<0.001	0.051	0.008	<0.01	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
29/04/2021	0.28	0.003	<0.0001	<0.001	0.009	0.006	<0.001	0.034	0.003	<0.01	<0.001	<0.001
8/07/2021	0.34	0.004	<0.0001	<0.001	0.01	0.005	0.001	0.026	0.008	<0.01	<0.001	<0.001
RRMB02												
9/11/2020	0.07	0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.01	<0.001	<0.001
4/12/2020	-	-	-	-	-	-	-	-	-	-	-	-
6/01/2021	<0.01	0.001	<0.0001	<0.001	<0.001	0.009	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001
3/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
10/03/2021	<0.01	0.003	<0.0001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.01	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
29/04/2021	<0.01	0.002	0.0002	<0.001	<0.001	0.002	<0.001	0.001	<0.001	<0.01	<0.001	<0.001
8/07/2021	<0.01	0.002	<0.0001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.01	<0.001	<0.001
RRMB03												
9/11/2020	0.01	<0.001	<0.0001	<0.001	<0.001	0.003	<0.001	0.006	0.001	<0.01	<0.001	<0.001
4/12/2020	-	-	-	-	-	-	-	-	-	-	-	-
6/01/2021	<0.01	<0.001	<0.0001	<0.001	<0.001	0.002	<0.001	<0.001	0.001	<0.01	<0.001	<0.001
3/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
10/03/2021	0.03	0.003	<0.0001	<0.001	<0.001	0.001	<0.001	0.002	0.002	<0.01	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
6/05/2021	0.04	0.001	<0.0001	<0.001	<0.001	0.015	<0.001	0.005	0.002	<0.01	<0.001	<0.001
7/07/2021	<0.01	0.002	<0.0001	<0.001	<0.001	0.007	<0.001	<0.001	0.002	<0.01	<0.001	<0.001
RRMB04												
10/11/2020	0.3	0.001	<0.0001	0.002	<0.001	<0.001	<0.001	0.07	<0.001	<0.01	<0.001	<0.001
4/12/2020	-	-	-	-	-	-	-	-	-	-	-	-
6/01/2021	0.12	0.003	<0.0001	<0.001	<0.001	<0.001	<0.001	0.242	<0.001	<0.01	<0.001	<0.001
3/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
10/03/2021	0.16	0.002	<0.0001	0.001	<0.001	<0.001	<0.001	0.31	<0.001	<0.01	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
6/05/2021	0.17	0.003	<0.0001	<0.001	<0.001	0.002	<0.001	0.452	<0.001	<0.01	<0.001	<0.001
7/07/2021	0.03	0.002	<0.0001	<0.001	0.001	<0.001	<0.001	0.608	<0.001	<0.01	<0.001	<0.001
RRMB05												
10/11/2020	0.08	0.002	<0.0001	<0.001	<0.001	<0.001	<0.001	0.115	<0.001	<0.01	<0.001	<0.001
4/12/2020	-	-	-	-	-	-	-	-	-	-	-	-
6/01/2021	0.05	0.002	<0.0001	<0.001	<0.001	<0.001	<0.001	0.129	<0.001	<0.01	<0.001	<0.001
3/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
11/03/2021	0.06	0.005	<0.0001	<0.001	<0.001	<0.001	<0.001	0.172	<0.001	<0.01	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
29/04/2021	0.01	0.002	<0.0001	<0.001	<0.001	<0.001	<0.001	0.249	<0.001	<0.01	<0.001	<0.001
8/07/2021	<0.01	0.083	<0.0001	<0.001	<0.001	<0.001	<0.001	0.237	<0.001	<0.01	<0.001	<0.001
RRMB06												
9/11/2020	<0.01	0.028	<0.0001	<0.001	<0.001	<0.001	<0.001	0.467	0.002	<0.01	<0.001	<0.001

Table A.1 - Rustlers Roost Groundwater Quality

Analyte Group	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)
Analyte	Aluminium Al	Arsenic	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Tin	Uranium
Analyte Short Name	Al_T	As_T	Cd_T	Cr_T	Co_T	Cu_T	Pb_T	Mn_T	Ni_T	Se_T	Sn_T	U_T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	-	-	-	-	-	-	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	insufficient data	0.024	0.0002	0.001	-	0.0014	0.0034	1.9	0.011	0.011	-	insufficient data
ANZECC 2000 Livestock Watering (beef cattle)	5	0.5	0.01	1	1	2	0.1	-	1	0.02	-	0.2
ANZECC 2000 long term irrigation	5	0.1	0.01	1	0.5	0.2	2	0.2	0.2	0.02	-	0.01
4/12/2020	-	-	-	-	-	-	-	-	-	-	-	-
7/01/2021	<0.01	0.033	<0.0001	<0.001	<0.001	<0.001	<0.001	0.487	0.001	<0.01	<0.001	<0.001
3/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
10/03/2021	<0.01	0.037	<0.0001	<0.001	<0.001	<0.001	<0.001	0.466	0.002	<0.01	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
6/05/2021	<0.01	0.037	<0.0001	<0.001	0.001	<0.001	<0.001	0.51	0.002	<0.01	<0.001	<0.001
8/07/2021	<0.01	0.039	<0.0001	<0.001	0.001	<0.001	<0.001	0.505	0.002	<0.01	<0.001	<0.001
RRMB07												
10/11/2020	0.1	<0.001	<0.0001	<0.001	0.006	0.028	0.003	0.198	0.002	<0.01	<0.001	<0.001
4/12/2020	-	-	-	-	-	-	-	-	-	-	-	-
6/01/2021	0.1	<0.001	<0.0001	<0.001	0.007	0.027	<0.001	0.198	0.002	<0.01	<0.001	<0.001
3/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
10/03/2021	0.08	<0.001	<0.0001	<0.001	0.008	0.041	<0.001	0.212	0.003	<0.01	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
6/05/2021	0.11	<0.001	<0.0001	<0.001	0.009	0.038	<0.001	0.242	0.003	<0.01	<0.001	<0.001
8/07/2021	0.08	<0.001	<0.0001	<0.001	0.008	0.029	0.002	0.208	0.003	<0.01	<0.001	<0.001
RRMB08												
10/11/2020	0.46	<0.001	<0.0001	<0.001	<0.001	0.006	<0.001	0.015	0.003	<0.01	<0.001	<0.001
4/12/2020	-	-	-	-	-	-	-	-	-	-	-	-
6/01/2021	<0.01	<0.001	<0.0001	<0.001	<0.001	0.006	<0.001	<0.001	0.001	<0.01	<0.001	<0.001
3/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
10/03/2021	<0.01	0.001	<0.0001	<0.001	<0.001	0.002	<0.001	0.003	0.002	<0.01	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
6/05/2021	0.02	<0.001	<0.0001	<0.001	<0.001	0.011	<0.001	0.004	0.002	<0.01	<0.001	<0.001
8/07/2021	0.02	0.001	<0.0001	<0.001	<0.001	0.007	<0.001	0.004	0.002	<0.01	<0.001	<0.001

Table A.1 - Rustlers Roost Groundwater Quality

Analyte Group	Metals (Total)	Metals (Total)	Metals (Total)	Nutrients	Nutrients	Nutrients	Nutrients	Nutrients
Analyte	Zinc	Iron	Ferrous Iron	Ammonia	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P
Analyte Short Name	Zn_T	Fe_T	Ferrous Iron	NH3	Nox	TKN_N	TN_N	P_Tot
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	1.4	-	-	-	-
Tropical Australia Lowland Rivers	-	-	-	0.01	-	-	0.2 - 0.3	0.01
ANZG 2018 freshwater - 95% species protection	0.008	-	-	0.9	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	20	-	-	-	-	-	-	-
ANZECC 2000 long term irrigation	2	-	-	-	-	-	5	0.05
RRMB01								
10/09/2020	-	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-	-
9/11/2020	0.064	1.47	<0.05	1.29	1.6	2.1	3.7	0.21
4/12/2020	-	-	-	-	-	-	-	-
7/01/2021	0.008	0.88	<0.05	0.3	0.13	0.3	0.4	0.03
3/02/2021	-	-	-	-	-	-	-	-
11/03/2021	0.019	1.07	0.53	0.52	<0.01	0.6	0.6	0.12
16/04/2021	-	-	-	-	-	-	-	-
29/04/2021	0.019	0.54	0.1	0.3	0.06	0.4	0.5	0.03
8/07/2021	0.012	1.05	0.21	0.74	<0.01	0.8	0.8	0.05
RRMB02								
9/11/2020	0.007	0.07	<0.05	<0.01	0.08	<0.1	<0.1	0.2
4/12/2020	-	-	-	-	-	-	-	-
6/01/2021	0.017	<0.05	<0.05	0.05	0.02	<0.1	<0.1	0.23
3/02/2021	-	-	-	-	-	-	-	-
10/03/2021	<0.005	<0.05	<0.05	<0.01	<0.01	<0.1	<0.1	0.22
16/04/2021	-	-	-	-	-	-	-	-
29/04/2021	0.009	<0.05	<0.05	<0.01	<0.01	<0.1	<0.1	0.24
8/07/2021	0.008	<0.05	<0.05	<0.01	<0.01	<0.1	<0.1	0.24
RRMB03								
9/11/2020	0.023	<0.05	<0.05	<0.01	0.09	<0.1	<0.1	0.03
4/12/2020	-	-	-	-	-	-	-	-
6/01/2021	0.015	<0.05	<0.05	0.01	0.06	<0.1	<0.1	0.02
3/02/2021	-	-	-	-	-	-	-	-
10/03/2021	0.012	0.06	<0.05	0.02	0.06	<0.1	<0.1	0.05
16/04/2021	-	-	-	-	-	-	-	-
6/05/2021	0.052	0.07	<0.05	<0.01	0.08	<0.1	<0.1	0.03
7/07/2021	0.06	<0.05	<0.05	<0.01	0.06	<0.1	<0.1	0.03
RRMB04								
10/11/2020	<0.005	<0.05	<0.05	<0.01	0.13	<0.1	0.1	0.02
4/12/2020	-	-	-	-	-	-	-	-
6/01/2021	<0.005	<0.05	<0.05	<0.01	0.06	<0.1	<0.1	0.04
3/02/2021	-	-	-	-	-	-	-	-
10/03/2021	<0.005	<0.05	<0.05	<0.01	0.01	<0.1	<0.1	0.02
16/04/2021	-	-	-	-	-	-	-	-
6/05/2021	0.01	0.35	0.22	<0.01	0.04	<0.1	<0.1	0.04
7/07/2021	0.015	0.36	0.44	0.03	<0.01	<0.1	<0.1	<0.01
RRMB05								
10/11/2020	<0.005	0.26	0.26	<0.01	0.06	<0.1	<0.1	0.08
4/12/2020	-	-	-	-	-	-	-	-
6/01/2021	0.008	0.31	0.31	<0.01	<0.01	<0.1	<0.1	0.05
3/02/2021	-	-	-	-	-	-	-	-
11/03/2021	<0.005	0.92	0.11	0.01	<0.01	<0.1	<0.1	0.02
16/04/2021	-	-	-	-	-	-	-	-
29/04/2021	0.007	1.07	1.2	0.03	<0.01	<0.1	<0.1	0.14
8/07/2021	0.009	1.06	1.17	<0.01	<0.01	<0.1	<0.1	0.04
RRMB06								
9/11/2020	0.011	1.95	2.13	<0.01	0.04	<0.1	<0.1	0.56

Table A.1 - Rustlers Roost Groundwater Quality

Analyte Group	Metals (Total)	Metals (Total)	Metals (Total)	Nutrients	Nutrients	Nutrients	Nutrients	Nutrients
Analyte	Zinc	Iron	Ferrous Iron	Ammonia	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P
Analyte Short Name	Zn_T	Fe_T	Ferrous Iron	NH3	Nox	TKN_N	TN_N	P_Tot
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	1.4	-	-	-	-
Tropical Australia Lowland Rivers	-	-	-	0.01	-	-	0.2 - 0.3	0.01
ANZG 2018 freshwater - 95% species protection	0.008	-	-	0.9	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	20	-	-	-	-	-	-	-
ANZECC 2000 long term irrigation	2	-	-	-	-	-	5	0.05
4/12/2020	-	-	-	-	-	-	-	-
7/01/2021	0.013	1.89	2.35	<0.01	0.04	<0.1	<0.1	0.62
3/02/2021	-	-	-	-	-	-	-	-
10/03/2021	0.01	2.3	1.1	<0.01	<0.01	<0.1	<0.1	0.69
16/04/2021	-	-	-	-	-	-	-	-
6/05/2021	0.024	2.5	0.26	0.03	0.02	<0.1	<0.1	0.74
8/07/2021	0.024	2.59	2.89	<0.01	<0.01	<0.1	<0.1	0.8
RRMB07								
10/11/2020	0.019	0.05	<0.05	<0.01	0.21	<0.1	0.2	<0.01
4/12/2020	-	-	-	-	-	-	-	-
6/01/2021	0.044	<0.05	<0.05	<0.01	0.18	<0.1	0.2	<0.01
3/02/2021	-	-	-	-	-	-	-	-
10/03/2021	0.01	<0.05	<0.05	0.03	0.18	<0.1	0.2	0.01
16/04/2021	-	-	-	-	-	-	-	-
6/05/2021	0.07	<0.05	<0.05	<0.01	0.19	<0.1	0.2	<0.01
8/07/2021	0.06	<0.05	<0.05	<0.01	0.15	<0.1	0.2	<0.01
RRMB08								
10/11/2020	0.026	0.48	<0.05	<0.01	0.1	<0.1	0.1	0.01
4/12/2020	-	-	-	-	-	-	-	-
6/01/2021	0.028	<0.05	<0.05	<0.01	0.04	<0.1	<0.1	<0.01
3/02/2021	-	-	-	-	-	-	-	-
10/03/2021	0.008	<0.05	<0.05	<0.01	0.04	<0.1	<0.1	0.04
16/04/2021	-	-	-	-	-	-	-	-
6/05/2021	0.045	<0.05	<0.05	<0.01	0.07	<0.1	<0.1	0.03
8/07/2021	0.039	<0.05	<0.05	<0.01	0.04	<0.1	<0.1	0.01

Appendix A-2 - Rustlers Roost Open Pit Monitoring Results (2020-2021)

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Table A.2 - Rustlers Roost Open Pit Water Quality

Analyte Group	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements
Analyte	Electrical Conductivity	pH	Temperature	Turbidity	Salinity	Total Dissolved Solids	Oxidation-Reduction Potential	Dissolved Oxygen
Analyte Short Name	EC (field)	pH (field)	Temp (field)	Turbidity (field)	Salinity (field)	TDS (field)	ORP (field)	DO %sat (field)
Units	µS/cm	-	°C	NTU	ppt	mg/L	mV	%
Toms Gully SSTV (80th percentile)	41	5.8 - 8.0	-	87	-	-	-	-
Tropical Australia Lowland Rivers	20 - 250	6.0 - 8.0	-	2 - 15	-	-	-	85-120
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	4000	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-	-
18/11/2020								
BACKHOE 0m	28.4	7.46	33	0.6	0.01	18.2	13.6	62.4
BACKHOE 10m	27.2	7.74	30.9	0.5	0.01	17.55	12.3	56.2
BACKHOE 15m	28.1	6.45	27.7	0.5	0.01	18.2	80.4	41.3
BACKHOE 20m	30.7	7.74	27	0.6	0.01	20.15	76.4	21.7
BACKHOE 25m	44	6.45	26.2	2	0.02	28.6	-49.2	19.7
18/11/2020								
BEEF BUCKET 0m	27.9	7.76	32.6	0.4	0.01	18.2	56.4	58.1
BEEF BUCKET 10m	28.2	7.72	31.9	0.5	0.01	18.2	51	57.1
BEEF BUCKET 15m	27.6	6.77	28.9	0.5	0.01	18.2	32.6	59.9
BEEF BUCKET 20m	29.6	6.49	27.4	0.5	0.01	19.5	76.7	22.1
BEEF BUCKET 25m	44	6.45	26.2	0.9	0.02	28.6	-49.2	19.7
18/11/2020								
DOLLY POT 0m	30.9	8.47	32.6	0.5	0.01	20.15	33.4	56.9
DOLLY POT 10m	35.7	8.05	32	0.8	0.01	23.4	51.7	63.1
DOLLY POT 15m	27	6.97	29.1	0.4	0.01	17.55	45.5	63.8
DOLLY POT 20m	32.4	6.63	27.5	0.7	0.01	20.8	76.9	18.8
DOLLY POT 25m	43.2	6.52	27.1	2.3	0.02	27.95	-8.3	22
18/11/2020								
SWEAT RIDGE 0m	27.9	7.34	32.9	0.4	0.01	18.2	-1.01	73.8
SWEAT RIDGE 12m	27.9	6.72	30	0.7	0.01	18.2	51.5	57.7
17/06/2021								
BACKHOE 0m	24.5	6.51	28.4	0.08	0.01	16	244.2	96.9
BACKHOE 10m	24.7	6.51	28.2	0.15	0.01	16	245.2	97
BACKHOE 15m	24.8	6.48	28	1.11	0.01	16	249.4	91.6
BACKHOE 20m	25.3	6.43	27.8	4.11	0.01	16	254	87.5
BACKHOE 25m	24.8	6.39	27.7	4.08	0.01	16	259.2	88.6
BACKHOE 27m	52.4	5.99	26.8	1.16	0.2	34	115.2	39.7
17/06/2021								
BEEF BUCKET 0m	24.9	6.55	28	0.35	0.01	16	241.8	94.2
BEEF BUCKET 5m	24.6	6.54	27.8	0.15	0.01	16	254.9	93.7
BEEF BUCKET 10m	24.9	6.46	27.9	0.83	0.01	16	251.1	87.7
BEEF BUCKET 15m	24.9	6.37	27.7	0.68	0.01	16	257.1	85.7
BEEF BUCKET 20m	24.7	6.38	27.8	0.77	0.01	16	257.2	87.1
BEEF BUCKET 27m	25.7	6.31	27.7	1.06	0.01	17	261.5	78.8
17/06/2021								
DOLLY POT 0m	24.8	6.78	27.9	0.67	0.01	16	221.3	96.5
DOLLY POT 10m	24.7	6.74	27.7	0.49	0.01	16	228.6	94.5
DOLLY POT 15m	24.9	6.72	27.5	1.17	0.01	16	232.3	90.6
DOLLY POT 20m	25	6.63	27.6	0.79	0.01	16	238	88.5
DOLLY POT 25m	25.1	6.5	27.5	1.53	0.01	16	246.1	85.3
DOLLY POT 27m	27.3	6.35	27.4	2.34	0.01	18	258.1	67.3
17/06/2021								
SWEAT RIDGE 0m	30.4	7.55	28	0.41	0.01	20	184.7	94.3
SWEAT RIDGE 5m	28.3	7.17	27.9	1.25	0.01	18	206	93.9
SWEAT RIDGE 10m	26.2	6.9	27.8	0.95	0.01	18	219.4	91.7
SWEAT RIDGE 15m	29.5	6.75	27.6	2.75	0.01	19	228.1	88.7

Table A.2 - Rustlers Roost Open Pit Water Quality

Analyte Group	Physico-chemical	Physico-chemical	Physico-chemical	Alkalinity	Alkalinity	Alkalinity	Alkalinity
Analyte	Total Suspended Solids	Turbidity	Total Hardness	Hydroxide Alkalinity as CaC03	Carbonate Alkalinity as CaC03	Bicarbonate Alkalinity as CaC03	Total Alkalinity as CaC03
Analyte Short Name	TSS	Turbidity (lab)	Total Hardness	Alk_OH	Alk_CO3	Alk_HCO3	Alk_Tot
Units	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	54	87	-	-	-	-	-
Tropical Australia Lowland Rivers	2 - 15	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
18/11/2020							
BACKHOE 0m	<5	-	<1	<1	<1	6	6
BACKHOE 10m	<5	-	<1	<1	<1	6	6
BACKHOE 15m	<5	-	<1	<1	<1	7	7
BACKHOE 20m	<5	-	<1	<1	<1	8	8
BACKHOE 25m	<5	-	<1	<1	<1	12	12
18/11/2020							
BEEF BUCKET 0m	<5	-	<1	<1	<1	7	7
BEEF BUCKET 10m	<5	-	<1	<1	<1	6	6
BEEF BUCKET 15m	<5	-	<1	<1	<1	6	6
BEEF BUCKET 20m	<5	-	<1	<1	<1	7	7
BEEF BUCKET 25m	<5	-	<1	<1	<1	10	10
18/11/2020							
DOLLY POT 0m	<5	-	<1	<1	<1	8	8
DOLLY POT 10m	<5	-	<1	<1	<1	6	6
DOLLY POT 15m	<5	-	<1	<1	<1	6	6
DOLLY POT 20m	<5	-	<1	<1	<1	8	8
DOLLY POT 25m	<5	-	<1	<1	<1	14	14
18/11/2020							
SWEAT RIDGE 0m	<5	-	<1	<1	<1	6	6
SWEAT RIDGE 12m	<5	-	<1	<1	<1	7	7
17/06/2021							
BACKHOE 0m	<5	0.5	<1	<1	<1	9	9
BACKHOE 10m	<5	0.6	<1	<1	<1	9	9
BACKHOE 15m	<5	0.4	<1	<1	<1	9	9
BACKHOE 20m	<5	0.4	<1	<1	<1	11	11
BACKHOE 25m	<5	0.4	<1	<1	<1	8	8
BACKHOE 27m	6	2.8	<1	<1	<1	24	24
17/06/2021							
BEEF BUCKET 0m	<5	0.5	<1	<1	<1	8	8
BEEF BUCKET 5m	<5	0.6	<1	<1	<1	9	9
BEEF BUCKET 10m	<5	0.4	<1	<1	<1	8	8
BEEF BUCKET 15m	<5	0.4	<1	<1	<1	9	9
BEEF BUCKET 20m	<5	0.4	<1	<1	<1	9	9
BEEF BUCKET 27m	<5	0.6	<1	<1	<1	12	12
17/06/2021							
DOLLY POT 0m	<5	0.5	<1	<1	<1	13	13
DOLLY POT 10m	<5	0.5	<1	<1	<1	9	9
DOLLY POT 15m	5	0.6	<1	<1	<1	8	8
DOLLY POT 20m	<5	0.5	<1	<1	<1	8	8
DOLLY POT 25m	<5	0.5	<1	<1	<1	8	8
DOLLY POT 27m	6	0.8	<1	<1	<1	11	11
17/06/2021							
SWEAT RIDGE 0m	6	0.5	<1	<1	<1	9	9
SWEAT RIDGE 5m	6	0.6	<1	<1	<1	8	8
SWEAT RIDGE 10m	<5	0.5	<1	<1	<1	8	8
SWEAT RIDGE 15m	<5	1.2	<1	<1	<1	9	9

Table A.2 - Rustlers Roost Open Pit Water Quality

Analyte Group	Acidity	Acidity	Acidity	Acidity	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)
Analyte	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	Sulfate as SO4	Chloride	Calcium	Magnesium
Analyte Short Name	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	SO4	Cl	Ca	Mg
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	210	-	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	1000	-	1000	2000
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-	-
18/11/2020								
BACKHOE 0m	5	-	-	-	<1	2	<1	<1
BACKHOE 10m	4	-	-	-	<1	2	<1	<1
BACKHOE 15m	4	-	-	-	<1	2	<1	<1
BACKHOE 20m	8	-	-	-	<1	2	<1	<1
BACKHOE 25m	8	-	-	-	<1	2	<1	<1
18/11/2020								
BEEF BUCKET 0m	5	-	-	-	<1	2	<1	<1
BEEF BUCKET 10m	5	-	-	-	<1	3	<1	<1
BEEF BUCKET 15m	3	-	-	-	<1	2	<1	<1
BEEF BUCKET 20m	5	-	-	-	<1	3	<1	<1
BEEF BUCKET 25m	7	-	-	-	<1	2	<1	<1
18/11/2020								
DOLLY POT 0m	3	-	-	-	<1	3	<1	<1
DOLLY POT 10m	3	-	-	-	<1	4	<1	<1
DOLLY POT 15m	5	-	-	-	<1	2	<1	<1
DOLLY POT 20m	4	-	-	-	<1	3	<1	<1
DOLLY POT 25m	9	-	-	-	<1	2	<1	<1
18/11/2020								
SWEAT RIDGE 0m	3	-	-	-	<1	2	<1	<1
SWEAT RIDGE 12m	3	-	-	-	<1	2	<1	<1
17/06/2021								
BACKHOE 0m	3	<1	<1	<1	<1	2	<1	<1
BACKHOE 10m	3	<1	<1	<1	<1	2	<1	<1
BACKHOE 15m	5	<1	<1	<1	<1	2	<1	<1
BACKHOE 20m	3	<1	<1	<1	<1	2	<1	<1
BACKHOE 25m	3	<1	<1	<1	<1	2	<1	<1
BACKHOE 27m	10	<1	<1	<1	<1	2	<1	<1
17/06/2021								
BEEF BUCKET 0m	4	<1	<1	<1	<1	2	<1	<1
BEEF BUCKET 5m	3	<1	<1	<1	<1	2	<1	<1
BEEF BUCKET 10m	5	<1	<1	<1	<1	2	<1	<1
BEEF BUCKET 15m	4	<1	<1	<1	<1	2	<1	<1
BEEF BUCKET 20m	4	<1	<1	<1	<1	2	<1	<1
BEEF BUCKET 27m	4	<1	<1	<1	<1	2	<1	<1
17/06/2021								
DOLLY POT 0m	8	<1	<1	<1	<1	2	<1	<1
DOLLY POT 10m	4	<1	<1	<1	<1	2	<1	<1
DOLLY POT 15m	4	<1	<1	<1	<1	2	<1	<1
DOLLY POT 20m	5	<1	<1	<1	<1	2	<1	<1
DOLLY POT 25m	3	<1	<1	<1	<1	2	<1	<1
DOLLY POT 27m	4	<1	<1	<1	<1	2	<1	<1
17/06/2021								
SWEAT RIDGE 0m	4	<1	<1	<1	<1	2	<1	<1
SWEAT RIDGE 5m	3	<1	<1	<1	<1	2	<1	<1
SWEAT RIDGE 10m	8	<1	<1	<1	<1	2	<1	<1
SWEAT RIDGE 15m	4	<1	<1	<1	<1	2	<1	<1

Table A.2 - Rustlers Roost Open Pit Water Quality

Analyte Group	Major Ions (dissolved)	Major Ions (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)
Analyte	Sodium	Potassium	Aluminium	Arsenic	Cadmium	Chromium	Cobalt	Copper	Lead
Analyte Short Name	Na	K	Al F	As F	Cd F	Cr F	Co F	Cu F	Pb F
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	0.295	0.042	0.0004	0.006	-	0.0018	0.0056
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	insufficient data	0.024	0.0002	0.001	-	0.0014	0.0034
ANZECC 2000 Livestock Watering (beef cattle)	-	-	5	0.5	0.01	1	1	2	0.1
ANZECC 2000 long term irrigation	-	-	5	0.1	0.01	0.1	0.05	0.2	2
18/11/2020									
BACKHOE 0m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
BACKHOE 10m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
BACKHOE 15m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
BACKHOE 20m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
BACKHOE 25m	2	1	<0.01	0.008	<0.0001	<0.001	<0.001	<0.001	<0.001
18/11/2020									
BEEF BUCKET 0m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
BEEF BUCKET 10m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
BEEF BUCKET 15m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
BEEF BUCKET 20m	2	1	0.02	<0.001	<0.0001	<0.001	<0.001	0.001	<0.001
BEEF BUCKET 25m	2	1	<0.01	0.005	<0.0001	<0.001	<0.001	<0.001	<0.001
18/11/2020									
DOLLY POT 0m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
DOLLY POT 10m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
DOLLY POT 15m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
DOLLY POT 20m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	0.001	<0.001
DOLLY POT 25m	2	1	<0.01	0.007	<0.0001	<0.001	<0.001	<0.001	<0.001
18/11/2020									
SWEAT RIDGE 0m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
SWEAT RIDGE 12m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
17/06/2021									
BACKHOE 0m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
BACKHOE 10m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
BACKHOE 15m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
BACKHOE 20m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
BACKHOE 25m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
BACKHOE 27m	2	1	<0.01	0.009	<0.0001	<0.001	0.001	<0.001	<0.001
17/06/2021									
BEEF BUCKET 0m	2	<1	<0.01	<0.001	0.0001	<0.001	<0.001	<0.001	<0.001
BEEF BUCKET 5m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
BEEF BUCKET 10m	2	<1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
BEEF BUCKET 15m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
BEEF BUCKET 20m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
BEEF BUCKET 27m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
17/06/2021									
DOLLY POT 0m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
DOLLY POT 10m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
DOLLY POT 15m	2	<1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
DOLLY POT 20m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
DOLLY POT 25m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
DOLLY POT 27m	2	1	<0.01	<0.001	0.0001	<0.001	<0.001	<0.001	<0.001
17/06/2021									
SWEAT RIDGE 0m	2	<1	<0.01	<0.001	0.0001	<0.001	<0.001	<0.001	<0.001
SWEAT RIDGE 5m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	0.002	<0.001
SWEAT RIDGE 10m	2	1	<0.01	<0.001	0.0001	<0.001	<0.001	<0.001	<0.001
SWEAT RIDGE 15m	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	0.001	<0.001

Table A.2 - Rustlers Roost Open Pit Water Quality

Analyte Group	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (Total)	Metals (Total)	Metals (Total)
Analyte	Manganese	Nickel	Selenium Se (Total)	Tin	Uranium	Zinc	Iron	Aluminium Al	Arsenic	Cadmium
Analyte Short Name	Mn F	Ni F	Se F	Sn F	U F	Zn F	Fe F	Al T	As T	Cd T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	2.5	0.013	-	-	-	0.015	2.7	-	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	1.9	0.011	0.011	-	insufficient data	0.008	-	insufficient data	0.024	0.0002
ANZECC 2000 Livestock Watering (beef cattle)	-	1	0.02	-	0.2	20	-	5	0.5	0.01
ANZECC 2000 long term irrigation	0.2	0.2	0.02	-	0.01	2	0.2	5	0.1	0.01
18/11/2020										
BACKHOE 0m	0.003	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
BACKHOE 10m	0.002	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
BACKHOE 15m	0.048	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
BACKHOE 20m	0.193	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	0.001	<0.0001
BACKHOE 25m	0.584	<0.001	<0.01	<0.001	<0.001	<0.005	0.98	<0.01	0.016	<0.0001
18/11/2020										
BEEF BUCKET 0m	0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
BEEF BUCKET 10m	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
BEEF BUCKET 15m	0.005	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
BEEF BUCKET 20m	0.112	<0.001	<0.01	<0.001	<0.001	0.006	<0.05	<0.01	<0.001	<0.0001
BEEF BUCKET 25m	0.481	<0.001	<0.01	<0.001	<0.001	<0.005	0.72	<0.01	0.006	<0.0001
18/11/2020										
DOLLY POT 0m	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
DOLLY POT 10m	<0.001	<0.001	<0.01	<0.001	<0.001	0.006	<0.05	0.02	<0.001	<0.0001
DOLLY POT 15m	0.002	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
DOLLY POT 20m	0.203	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	0.001	<0.0001
DOLLY POT 25m	0.622	<0.001	<0.01	<0.001	<0.001	<0.005	1.2	<0.01	0.01	<0.0001
18/11/2020										
SWEAT RIDGE 0m	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
SWEAT RIDGE 12m	0.052	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
17/06/2021										
BACKHOE 0m	0.043	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
BACKHOE 10m	0.022	0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
BACKHOE 15m	0.022	0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
BACKHOE 20m	0.033	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
BACKHOE 25m	0.034	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
BACKHOE 27m	0.78	<0.001	<0.01	<0.001	<0.001	<0.005	2.56	<0.01	0.012	<0.0001
17/06/2021										
BEEF BUCKET 0m	0.018	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
BEEF BUCKET 5m	0.017	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
BEEF BUCKET 10m	0.015	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
BEEF BUCKET 15m	0.03	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
BEEF BUCKET 20m	0.024	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
BEEF BUCKET 27m	0.071	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
17/06/2021										
DOLLY POT 0m	0.016	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
DOLLY POT 10m	0.012	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
DOLLY POT 15m	0.009	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
DOLLY POT 20m	0.014	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
DOLLY POT 25m	0.016	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
DOLLY POT 27m	0.259	0.002	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
17/06/2021										
SWEAT RIDGE 0m	0.017	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
SWEAT RIDGE 5m	0.014	<0.001	<0.01	<0.001	<0.001	0.006	<0.05	<0.01	<0.001	<0.0001
SWEAT RIDGE 10m	0.012	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001
SWEAT RIDGE 15m	0.014	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001	<0.0001

Table A.2 - Rustlers Roost Open Pit Water Quality

Analyte Group	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Nutrients
Analyte	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Tin	Uranium	Zinc	Iron	Ferrous Iron	Ammonia
Analyte Short Name	Cr_T	Co_T	Cu_T	Pb_T	Mn_T	Ni_T	Se_T	Sn_T	U_T	Zn_T	Fe_T	Ferrous Iron	NH3
Units	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
Toms Gully SSTV (80th percentile)	-	-	-	-	-	-	-	-	-	-	-	-	1.4
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-	-	-	0.01
ANZG 2018 freshwater - 95% species protection	0.001	-	0.0014	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-	-	0.9
ANZECC 2000 Livestock Watering (beef cattle)	1	1	2	0.1	-	1	0.02	-	0.2	20	-	-	-
ANZECC 2000 long term irrigation	1	0.5	0.2	2	0.2	0.2	0.02	-	0.01	2	-	-	-
18/11/2020													
BACKHOE 0m	<0.001	<0.001	<0.001	<0.001	0.006	<0.001	<0.01	<0.001	<0.001	<0.001	<0.05	<0.005	0.03
BACKHOE 10m	<0.001	<0.001	<0.001	<0.001	0.005	<0.001	<0.01	<0.001	<0.001	<0.001	<0.05	<0.005	<0.01
BACKHOE 15m	<0.001	<0.001	0.001	<0.001	0.061	<0.001	<0.01	<0.001	<0.001	<0.001	<0.05	<0.005	<0.01
BACKHOE 20m	<0.001	<0.001	0.001	<0.001	0.24	<0.001	<0.01	<0.001	<0.001	<0.001	0.11	<0.005	<0.01
BACKHOE 25m	<0.001	0.001	<0.001	<0.001	0.677	<0.001	<0.01	<0.001	<0.001	<0.001	2	<0.005	0.27
18/11/2020													
BEEF BUCKET 0m	<0.001	<0.001	<0.001	<0.001	0.005	<0.001	<0.01	<0.001	<0.001	<0.001	<0.05	<0.005	<0.01
BEEF BUCKET 10m	<0.001	<0.001	<0.001	<0.001	0.005	<0.001	<0.01	<0.001	<0.001	<0.001	<0.05	<0.005	<0.01
BEEF BUCKET 15m	<0.001	<0.001	<0.001	<0.001	0.01	<0.001	<0.01	<0.001	<0.001	<0.001	<0.05	<0.005	<0.01
BEEF BUCKET 20m	<0.001	<0.001	0.001	<0.001	0.123	<0.001	<0.01	<0.001	<0.001	<0.001	<0.05	<0.005	<0.01
BEEF BUCKET 25m	<0.001	0.001	0.002	<0.001	0.535	<0.001	<0.01	<0.001	<0.001	<0.001	1.09	<0.005	0.08
18/11/2020													
DOLLY POT 0m	<0.001	<0.001	<0.001	<0.001	0.004	<0.001	<0.01	<0.01	<0.001	<0.001	<0.05	<0.005	0.03
DOLLY POT 10m	<0.001	<0.001	0.002	<0.001	0.006	<0.001	<0.01	<0.001	<0.001	0.01	<0.05	-	<0.01
DOLLY POT 15m	<0.001	<0.001	<0.001	<0.001	0.005	<0.001	<0.01	<0.001	<0.001	<0.001	<0.05	<0.005	<0.01
DOLLY POT 20m	<0.001	<0.001	0.002	<0.001	0.219	<0.001	<0.01	<0.001	<0.001	<0.001	0.06	<0.005	<0.01
DOLLY POT 25m	<0.001	0.001	<0.001	<0.001	0.671	<0.001	<0.01	<0.001	<0.001	<0.001	1.9	<0.005	0.26
18/11/2020													
SWEAT RIDGE 0m	<0.001	<0.001	<0.001	<0.001	0.005	<0.001	<0.01	<0.001	<0.001	<0.001	<0.05	<0.005	<0.01
SWEAT RIDGE 12m	<0.001	<0.001	<0.001	<0.001	0.061	<0.001	<0.01	<0.001	<0.001	<0.001	<0.05	<0.005	<0.01
17/06/2021													
SWEAT RIDGE 12m	<0.001	<0.001	<0.001	<0.001	0.061	<0.001	<0.01	<0.001	<0.001	<0.001	<0.05	<0.005	<0.01
17/06/2021													
BACKHOE 0m	<0.001	<0.001	<0.001	<0.001	0.02	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	<0.01
BACKHOE 10m	<0.001	<0.001	<0.001	<0.001	0.052	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	<0.01
BACKHOE 15m	<0.001	<0.001	<0.001	<0.001	0.059	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	0.05
BACKHOE 20m	<0.001	<0.001	<0.001	<0.001	0.064	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	0.06
BACKHOE 25m	<0.001	<0.001	<0.001	<0.001	0.068	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	0.09
BACKHOE 27m	<0.001	0.002	<0.001	<0.001	0.849	<0.001	<0.01	<0.001	<0.001	<0.005	3.97	<0.05	0.57
17/06/2021													
BEEF BUCKET 0m	<0.001	<0.001	<0.001	<0.001	0.04	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	0.01
BEEF BUCKET 5m	<0.001	<0.001	<0.001	<0.001	0.047	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	<0.01
BEEF BUCKET 10m	<0.001	<0.001	0.003	<0.001	0.042	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	0.02
BEEF BUCKET 15m	<0.001	<0.001	<0.001	<0.001	0.054	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	0.04
BEEF BUCKET 20m	<0.001	<0.001	<0.001	<0.001	0.059	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	0.05
BEEF BUCKET 27m	<0.001	<0.001	<0.001	<0.001	0.108	<0.001	<0.01	<0.001	<0.001	<0.005	0.12	<0.05	0.16
17/06/2021													
DOLLY POT 0m	<0.001	<0.001	<0.001	<0.001	0.035	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	0.02
DOLLY POT 10m	<0.001	<0.001	<0.001	<0.001	0.032	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	0.01
DOLLY POT 15m	<0.001	<0.001	0.001	<0.001	0.037	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	0.08
DOLLY POT 20m	<0.001	<0.001	<0.001	<0.001	0.043	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	0.06
DOLLY POT 25m	<0.001	<0.001	<0.001	<0.001	0.037	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	0.04
DOLLY POT 27m	<0.001	<0.001	<0.001	<0.001	0.263	<0.001	<0.01	<0.001	<0.001	<0.005	0.16	<0.05	0.08
17/06/2021													
SWEAT RIDGE 0m	<0.001	<0.001	<0.001	<0.001	0.049	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	<0.01
SWEAT RIDGE 5m	<0.001	<0.001	0.002	<0.001	0.048	<0.001	<0.01	<0.001	<0.001	0.007	<0.05	<0.05	0.03
SWEAT RIDGE 10m	<0.001	<0.001	<0.001	<0.001	0.048	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05	0.03
SWEAT RIDGE 15m	<0.001	<0.001	0.002	<0.001	0.06	<0.001	<0.01	<0.001	<0.001	<0.005	0.05	<0.05	0.07

Table A.2 - Rustlers Roost Open Pit Water Quality

Analyte Group	Nutrients	Nutrients	Nutrients	Nutrients
Analyte	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P
Analyte Short Name	Nox	TKN_N	TN_N	P_Tot
Units	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-
Tropical Australia Lowland Rivers	-	-	0.2 - 0.3	0.01
ANZG 2018 freshwater - 95% species protection	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-
ANZECC 2000 long term irrigation	-	-	5	0.05
18/11/2020				
BACKHOE 0m	<0.01	0.1	0.1	<0.01
BACKHOE 10m	<0.01	0.1	0.1	<0.01
BACKHOE 15m	<0.01	<0.1	<0.1	<0.01
BACKHOE 20m	<0.01	0.1	0.1	<0.01
BACKHOE 25m	<0.01	0.3	0.3	0.01
18/11/2020				
BEEF BUCKET 0m	<0.01	<0.1	<0.1	<0.01
BEEF BUCKET 10m	<0.01	<0.1	<0.1	0.03
BEEF BUCKET 15m	<0.01	0.1	0.1	<0.01
BEEF BUCKET 20m	<0.01	0.2	0.2	0.08
BEEF BUCKET 25m	<0.01	0.2	0.2	<0.01
18/11/2020				
DOLLY POT 0m	<0.01	0.2	0.2	0.03
DOLLY POT 10m	<0.01	0.2	0.2	<0.01
DOLLY POT 15m	<0.01	<0.1	<0.1	0.02
DOLLY POT 20m	<0.01	<0.1	<0.1	0.02
DOLLY POT 25m	<0.01	0.3	0.3	0.02
18/11/2020				
SWEAT RIDGE 0m	<0.01	<0.1	<0.1	<0.01
SWEAT RIDGE 12m	<0.01	<0.1	<0.1	<0.01
17/06/2021				
BACKHOE 0m	<0.01	0.1	0.1	<0.01
BACKHOE 10m	<0.01	0.2	0.2	0.01
BACKHOE 15m	<0.01	0.2	0.2	0.02
BACKHOE 20m	<0.01	0.2	0.2	<0.01
BACKHOE 25m	<0.01	0.4	0.4	<0.01
BACKHOE 27m	<0.01	0.7	0.7	0.02
17/06/2021				
BEEF BUCKET 0m	<0.01	0.2	0.2	0.01
BEEF BUCKET 5m	<0.01	0.2	0.2	0.01
BEEF BUCKET 10m	<0.01	0.2	0.2	0.01
BEEF BUCKET 15m	<0.01	0.2	0.2	0.01
BEEF BUCKET 20m	<0.01	0.2	0.2	<0.01
BEEF BUCKET 27m	<0.01	0.2	0.2	0.03
17/06/2021				
DOLLY POT 0m	0.02	0.1	0.1	0.01
DOLLY POT 10m	0.02	0.1	0.1	<0.01
DOLLY POT 15m	<0.01	0.2	0.2	0.01
DOLLY POT 20m	<0.01	0.2	0.2	<0.01
DOLLY POT 25m	<0.01	0.2	0.2	0.01
DOLLY POT 27m	0.04	0.2	0.2	0.01
17/06/2021				
SWEAT RIDGE 0m	<0.01	0.2	0.2	0.03
SWEAT RIDGE 5m	<0.01	0.2	0.2	0.02
SWEAT RIDGE 10m	<0.01	0.1	0.1	0.01
SWEAT RIDGE 15m	<0.01	0.4	0.4	0.01

PRIMARY GOLD

Appendix A-3 - Rustlers Roost Surface Water Monitoring Results (2020-2021)

CDM Smith

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Table A.3 - Rustlers Roost Surface Water Quality

Analyte Group	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements
Analyte	SWL (initial)	Electrical Conductivity	pH	Temperature	Turbidity	Salinity	Total Dissolved Solids	Oxidation-Reduction Potential
Analyte Short Name	SWL (initial)	EC (field)	pH (field)	Temp (field)	Turbidity (field)	Salinity (field)	TDS (field)	ORP (field)
Units	mbTOC	µS/cm	-	℃	NTU	ppt	mg/L	mV
Toms Gully SSTV (80th percentile)	-	41	5.8 - 8.0	-	87	-	-	-
Tropical Australia Lowland Rivers	-	20 - 250	6.0 - 8.0	-	2 - 15	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-	4000	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-	-
RRSW2								
28/11/2016	-	38	6.4	-	-	-	-	-
26/01/2017	-	46	6.5	-	24	-	-	-
26/03/2017	-	83	7.4	-	11	-	-	-
22/02/2019	-	120	7	-	12	-	-	-
19/01/2020	-	66	6.5	-	40	-	-	-
16/02/2020	-	98	6.8	-	23	-	-	-
4/12/2020	-	19.1	5.5	29.9	899	0.01	12	269
6/01/2021	-	137.2	6.12	29.2	88.5	0.1	89.2	157
3/02/2021	-	59	6.22	29	35.7	0.03	38.35	108.4
8/03/2021	-	110.7	6.62	28.6	12.1	0.05	72.15	55
29/04/2021	-	160	6.37	27.5	18	0.07	104	70
14/05/2021	-	138.7	6.91	30.8	10.7	0.06	90	205.2
RRMCDS								
15/04/2021	-	21.7	6.31	31.5	9.2	0.01	14	191.7
RRMCUS								
15/04/2021	-	21.9	6.19	27.3	24.5	0.01	14	199.3
RRSW5								
22/08/2012	-	-	-	-	-	-	-	-
9/12/2012	-	-	-	-	-	-	-	-
20/12/2016	-	23	6.3	-	720	-	-	-
26/03/2017	-	13	6.4	-	17	-	-	-
30/06/2018	-	130	6.9	-	7	-	-	-
22/02/2019	-	160	7.8	-	14	-	-	-
20/08/2019	-	140	7.7	-	24	-	-	-
30/10/2019	-	300	7.8	-	9.1	-	-	-
16/02/2020	-	210	8.2	-	3.5	-	-	-
11/11/2020	-	313.3	7.98	35.4	17.8	0.15	203.4	72.6
3/02/2021	-	190.8	7.29	31.4	13.8	0.09	124.15	90.9
29/04/2021	-	121	7.42	29.5	6.54	0.06	79	49.8
RRSW6								
9/12/2012	-	-	-	-	-	-	-	-
20/12/2016	-	25	5.9	-	30	-	-	-
26/03/2017	-	10	5.6	-	10	-	-	-
30/06/2018	-	10	6	-	4	-	-	-
3/02/2021	-	13.8	5.46	29.7	46.8	-	9.1	126
29/04/2021	dry	-	-	-	-	-	-	-
RRSW7								
20/12/2016	-	49	4.3	-	28	-	-	-
26/01/2017	-	11	6.2	-	4.8	-	-	-
26/03/2017	-	13	6	-	21	-	-	-
30/06/2018	-	26	6.3	-	2.4	-	-	-
12/12/2018	-	17	6.2	-	3	-	-	-
22/02/2019	-	14	6.2	-	2.2	-	-	-
20/08/2019	-	30	6.3	-	3.6	-	-	-
19/01/2020	-	19	6.1	-	5.5	-	-	-
10/11/2020	-	37.8	6.43	31.6	27.2	0.02	24.7	63.9
3/02/2021	-	31.6	5.94	29.9	19.3	0.01	20.8	93.2

Table A.3 - Rustlers Roost Surface Water Quality

Analyte Group	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements
Analyte	SWL (initial)	Electrical Conductivity	pH	Temperature	Turbidity	Salinity	Total Dissolved Solids	Oxidation-Reduction Potential
Analyte Short Name	SWL (initial)	EC (field)	pH (field)	Temp (field)	Turbidity (field)	Salinity (field)	TDS (field)	ORP (field)
Units	mbTOC	µS/cm	-	℃	NTU	ppt	mg/L	mV
Toms Gully SSTV (80th percentile)	-	41	5.8 - 8.0	-	87	-	-	-
Tropical Australia Lowland Rivers	-	20 - 250	6.0 - 8.0	-	2 - 15	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-	4000	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-	-
29/04/2021	-	34.3	5.73	31.3	2.7	0.01	22.1	63.6
RRSW10								
20/12/2016	-	55	7.1	-	860	-	-	-
26/01/2017	-	24	6.6	-	44	-	-	-
26/03/2017	-	8	6.1	-	73	-	-	-
3/02/2021	-	30.2	5.77	28	13.7	0.01	19.5	103.3
29/04/2021	-	33.2	5.99	29.7	12.7	0.01	21.4	54
RRSW11								
28/11/2016	-	82	7.3	-	290	-	-	-
20/12/2016	-	81	6.8	-	610	-	-	-
26/01/2017	-	32	6.8	-	78	-	-	-
26/03/2017	-	21	6.3	-	300	-	-	-
30/06/2018	-	26	6.3	-	11	-	-	-
22/02/2019	-	36	6.2	-	2.8	-	-	-
6/01/2021	-	42.6	5.75	31.9	45.3	0	27.7	100
3/02/2021	-	38.7	5.83	29.7	7.26	0.02	25.35	96.6
8/03/2021	-	47.5	5.32	30.3	3.37	0.02	30.55	60
29/04/2021	-	45.2	5.8	30.8	10.8	0.02	29.5	46.4
14/05/2021	-	43.7	5.88	31.2	11	0.02	28	100
RRSW12								
20/12/2016	-	13	5.4	-	47	-	-	-
26/01/2017	-	14	6.1	-	24	-	-	-
26/03/2017	-	10	5.6	-	42	-	-	-
3/02/2021	-	14.6	5.15	30.1	6.97	0.05	9.75	142.8
8/03/2021	-	17.3	4.46	33.8	4.98	0.01	11.05	99
29/04/2021	dry	-	-	-	-	-	-	-
14/05/2021	dry	-	-	-	-	-	-	-
RRSW22								
22/08/2012	-	-	-	-	-	-	-	-
9/12/2012	-	-	-	-	-	-	-	-
20/12/2016	-	25	7	-	3.5	-	-	-
26/03/2017	-	21	6.9	-	9.6	-	-	-
30/06/2018	-	22	6.4	-	2.4	-	-	-
22/02/2019	-	23	7.1	-	0.7	-	-	-
20/08/2019	-	24	6.6	-	3.5	-	-	-
30/10/2019	-	27	7.1	-	1.5	-	-	-
9/11/2020	-	27.3	7.59	32.7	-	0.01	17.55	72.5
3/02/2021	-	23.1	6.55	31.4	1.19	0.01	14.95	103
29/04/2021	-	24.1	7.34	31.4	2.3	0.01	15.6	-45
RRSW23								
4/12/2020	-	38.9	6.19	33.2	373	0.02	25	256
7/01/2021	-	45.8	5.98	30	748	0	29.8	252
3/02/2021	-	57.7	6.64	29.6	36.3	0.03	37.7	104.1
8/03/2021	-	96	6.3	31.7	22.3	0.04	62.4	75.9
29/04/2021	-	143	6.13	28.3	34.4	0.07	93	87.3
14/05/2021	-	124.3	7.32	30.7	14.2	0.06	81	186

Table A.3 - Rustlers Roost Surface Water Quality

Analyte Group	Field Measurements	Physico-chemical	Physico-chemical	Physico-chemical	Alkalinity	Alkalinity	Alkalinity
Analyte	Dissolved Oxygen	Total Suspended Solids	Turbidity	Total Hardness	Hydroxide Alkalinity as CaC03	Carbonate Alkalinity as CaC03	Bicarbonate Alkalinity as CaC03
Analyte Short Name	DO_%sat (field)	TSS	Turbidity (lab)	Total Hardness	Alk_OH	Alk_CO3	Alk_HCO3
Units	%	mg/L	NTU	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	54	87	-	-	-	-
Tropical Australia Lowland Rivers	85-120	2 - 15	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
RRSW2							
28/11/2016	-	1000	-	10	<5	<5	15
26/01/2017	-	16	-	8	<5	<5	15
26/03/2017	-	14	-	16	<5	<5	36
22/02/2019	-	8	-	18	0.7	0.8	6.1
19/01/2020	-	53	-	17	<5	<5	22
16/02/2020	-	17	-	15	<5	<5	37
4/12/2020	75.1	433	1180	<1	<1	<1	2
6/01/2021	68.1	20	60.9	17	<1	<1	51
3/02/2021	81.7	10	19.2	7	<1	<1	23
8/03/2021	59	8	9.4	17	<1	<1	46
29/04/2021	50.6	11	9.7	17	<1	<1	54
14/05/2021	114.9	<5	8.3	20	<1	<1	53
RRMCDS							
15/04/2021	101.5	6	7.5	<1	<1	<1	6
RRMCUS							
15/04/2021	87.6	14	19.7	<1	<1	<1	4
RRSW5							
22/08/2012	-	9	-	60	<5	<5	83
9/12/2012	-	18	-	73	<5	<5	100
20/12/2016	-	-	-	4	<5	<5	<5
26/03/2017	-	16	-	<3	<5	<5	7
30/06/2018	-	97	-	42	<5	<5	66
22/02/2019	-	15	-	58	0.9	2.3	22
20/08/2019	-	23	-	31	<5	<5	67
30/10/2019	-	33	-	74	<5	<5	110
16/02/2020	-	6	-	71	<5	<5	87
11/11/2020	55.6	19	10.1	81	<1	<1	126
3/02/2021	67	12	3.4	65	<1	<1	71
29/04/2021	75	13	2.7	40	<1	<1	46
RRSW6							
9/12/2012	-	15	-	<3	<5	<5	6
20/12/2016	-	-	-	4	<5	<5	<5
26/03/2017	-	<5	-	<3	<5	<5	<5
30/06/2018	-	17	-	<3	<5	<5	<5
3/02/2021	63.5	8	26.7	<1	<1	<1	6
29/04/2021	-	-	-	-	-	-	-
RRSW7							
20/12/2016	-	-	-	5	<5	<5	<5
26/01/2017	-	<5	-	<3	<5	<5	<5
26/03/2017	-	6	-	<3	<5	<5	7
30/06/2018	-	<5	-	5	<5	<5	10
12/12/2018	-	<5	-	5	<5	<5	7
22/02/2019	-	11	-	<3	0.6	<0.5	<0.5
20/08/2019	-	19	-	7	<5	<5	10
19/01/2020	-	10	-	<3	<5	<5	<5
10/11/2020	57.3	8	17.9	<1	<1	<1	12
3/02/2021	55.5	<5	11.8	<1	<1	<1	10

Table A.3 - Rustlers Roost Surface Water Quality

Analyte Group	Field Measurements	Physico-chemical	Physico-chemical	Physico-chemical	Alkalinity	Alkalinity	Alkalinity
Analyte	Dissolved Oxygen	Total Suspended Solids	Turbidity	Total Hardness	Hydroxide Alkalinity as CaC03	Carbonate Alkalinity as CaC03	Bicarbonate Alkalinity as CaC03
Analyte Short Name	DO_%sat (field)	TSS	Turbidity (lab)	Total Hardness	Alk_OH	Alk_CO3	Alk_HCO3
Units	%	mg/L	NTU	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	54	87	-	-	-	-
Tropical Australia Lowland Rivers	85-120	2 - 15	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
29/04/2021	62.8	6	3	<1	<1	<1	13
RRSW10							
20/12/2016	-	-	-	21	<5	<5	27
26/01/2017	-	32	-	6	<5	<5	8
26/03/2017	-	250	-	<3	<5	<5	<5
3/02/2021	47.6	6	6.7	<1	<1	<1	8
29/04/2021	66	17	5.5	5	<1	<1	11
RRSW11							
28/11/2016	-	75	-	32	<5	<5	38
20/12/2016	-	-	-	32	<5	<5	37
26/01/2017	-	36	-	11	<5	<5	14
26/03/2017	-	490	-	4	<5	<5	8
30/06/2018	-	18	-	<3	<5	<5	7
22/02/2019	-	6	-	10	0.6	1.6	2.8
6/01/2021	46.5	11	30.9	10	<1	<1	22
3/02/2021	33.9	6	4.6	7	<1	<1	17
8/03/2021	22.4	<5	3.9	10	<1	<1	25
29/04/2021	50.9	6	3.2	7	<1	<1	13
14/05/2021	19.7	14	8.8	7	<1	<1	14
RRSW12							
20/12/2016	-	-	-	<3	<5	<5	<5
26/01/2017	-	7	-	<3	<5	<5	<5
26/03/2017	-	<5	-	<3	<5	<5	<5
3/02/2021	85.5	<5	3.6	<1	<1	<1	3
8/03/2021	65	<5	3.4	<1	<1	<1	4
29/04/2021	-	-	-	-	-	-	-
14/05/2021	-	-	-	-	-	-	-
RRSW22							
22/08/2012	-	<5	-	5	<5	<5	13
9/12/2012	-	<5	-	6	<5	<5	15
20/12/2016	-	-	-	5	<5	<5	<5
26/03/2017	-	<5	-	4	<5	<5	8
30/06/2018	-	120	-	<3	<5	<5	7
22/02/2019	-	<5	-	<3	0.7	1.3	<0.5
20/08/2019	-	13	-	<3	<5	<5	10
30/10/2019	-	11	-	5	<5	<5	9
9/11/2020	89.1	5	1.4	<1	<1	<1	5
3/02/2021	95.8	<5	0.4	<1	<1	<1	5
29/04/2021	73	8	0.6	<1	<1	<1	4
RRSW23							
4/12/2020	107.3	198	324	4	<1	<1	9
7/01/2021	81.7	402	405	5	<1	<1	13
3/02/2021	96.6	9	23.5	5	<1	<1	21
8/03/2021	118.5	5	11	12	<1	<1	38
29/04/2021	71.6	14	20.3	12	<1	<1	47
14/05/2021	116.5	<5	9.4	12	<1	<1	42

Table A.3 - Rustlers Roost Surface Water Quality

Analyte Group	Alkalinity	Acidity	Acidity	Acidity	Acidity	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)
Analyte	Total Alkalinity as CaC03	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	Sulfate as SO4	Chloride	Calcium
Analyte Short Name	Alk_Tot	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	SO4	Cl	Ca
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	-	210	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	1000	-	1000
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-	-
RRSW2								
28/11/2016	15	11	-	-	-	3	1	2.4
26/01/2017	15	9	-	-	-	2	3	2.4
26/03/2017	36	<5	-	-	-	2	3	6.3
22/02/2019	17	5	-	-	-	7	2	6.1
19/01/2020	22	-	-	-	-	2	4	3.8
16/02/2020	37	6	-	-	-	6	5	4.8
4/12/2020	2	7	<1	7	7	<1	<1	<1
6/01/2021	51	14	<1	14	14	10	3	7
3/02/2021	23	10	<1	10	9	3	3	3
8/03/2021	46	9	<1	9	8	10	2	7
29/04/2021	54	5	<1	5	5	14	4	7
14/05/2021	53	10	<1	10	9	11	2	8
RRMCDS								
15/04/2021	6	8	<1	8	8	<1	2	<1
RRMCUS								
15/04/2021	4	4	<1	4	4	<1	2	<1
RRSW5								
22/08/2012	83	<5	-	-	-	6	3	23
9/12/2012	100	<5	-	-	-	3	5	28
20/12/2016	<5	7	-	-	-	<1	<1	1.5
26/03/2017	<5	<5	-	-	-	3	4	0.6
30/06/2018	66	<5	-	-	-	2	2	16
22/02/2019	9.6	<5	-	-	-	<1	5	22
20/08/2019	67	<5	-	-	-	2	5	11
30/10/2019	110	<5	-	-	-	6	15	27
16/02/2020	87	<5	-	-	-	11	7	27
11/11/2020	126	8	<1	8	8	3	13	29
3/02/2021	71	5	<1	5	5	16	6	26
29/04/2021	46	4	<1	4	4	6	4	16
RRSW6								
9/12/2012	6	<5	-	-	-	<1	2	0.5
20/12/2016	<5	8	-	-	-	<1	3	0.6
26/03/2017	<5	10	-	-	-	<1	1	<0.5
30/06/2018	<5	<5	-	-	-	<1	<1	<0.5
3/02/2021	6	3	<1	3	3	<1	2	<1
29/04/2021	-	-	-	-	-	-	-	-
RRSW7								
20/12/2016	<5	11	-	-	-	<1	4	0.6
26/01/2017	<5	6	-	-	-	<1	2	<0.5
26/03/2017	<5	8	-	-	-	<1	1	<0.5
30/06/2018	10	<5	-	-	-	<1	2	0.6
12/12/2018	7	6	-	-	-	<1	<1	0.6
22/02/2019	1.4	5	-	-	-	<1	<1	<0.5
20/08/2019	10	<5	-	-	-	<1	2	1
19/01/2020	<5	-	-	-	-	<1	3	<0.5
10/11/2020	12	8	<1	8	8	<1	2	<1
3/02/2021	10	5	<1	5	5	<1	2	<1

Table A.3 - Rustlers Roost Surface Water Quality

Analyte Group	Alkalinity	Acidity	Acidity	Acidity	Acidity	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)
Analyte	Total Alkalinity as CaC03	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	Sulfate as SO4	Chloride	Calcium
Analyte Short Name	Alk_Tot	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	SO4	Cl	Ca
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	-	210	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	1000	-	1000
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-	-
29/04/2021	13	5	<1	5	5	<1	2	<1
RRSW10								
20/12/2016	27	6	-	-	-	<1	<1	6.8
26/01/2017	8	5	-	-	-	<1	2	1.4
26/03/2017	<5	<5	-	-	-	<1	<1	<0.5
3/02/2021	8	6	<1	6	5	<1	2	<1
29/04/2021	11	6	<1	6	6	<1	3	2
RRSW11								
28/11/2016	38	<5	-	-	-	7	<1	11
20/12/2016	37	10	-	-	-	1	1	11
26/01/2017	14	6	-	-	-	<1	1	3
26/03/2017	5	<5	-	-	-	<1	2	1.4
30/06/2018	7	<5	-	-	-	<1	3	0.5
22/02/2019	1.8	11	-	-	-	<1	1	2.8
6/01/2021	22	7	<1	7	7	1	<1	4
3/02/2021	17	7	<1	7	7	<1	1	3
8/03/2021	25	10	<1	10	10	<1	1	4
29/04/2021	13	8	<1	8	8	2	4	3
14/05/2021	14	10	<1	10	10	<1	1	3
RRSW12								
20/12/2016	<5	6	-	-	-	<1	1	<0.5
26/01/2017	<5	7	-	-	-	<1	2	<0.5
26/03/2017	<5	9	-	-	-	<1	2	<0.5
3/02/2021	3	3	<1	3	2	<1	2	<1
8/03/2021	4	6	<1	6	5	<1	2	<1
29/04/2021	-	-	-	-	-	-	-	-
14/05/2021	-	-	-	-	-	-	-	-
RRSW22								
22/08/2012	13	<5	-	-	-	<1	3	0.7
9/12/2012	15	<5	-	-	-	<1	2	1.1
20/12/2016	<5	<5	-	-	-	<1	3	0.6
26/03/2017	<5	<5	-	-	-	<1	3	0.6
30/06/2018	7	<5	-	-	-	<1	2	<0.5
22/02/2019	1.9	<5	-	-	-	<1	2	<0.5
20/08/2019	10	<5	-	-	-	<1	2	<0.5
30/10/2019	9	<5	-	-	-	2	2	0.6
9/11/2020	5	5	<1	5	5	1	2	<1
3/02/2021	5	3	<1	3	2	2	2	<1
29/04/2021	4	4	<1	4	4	<1	4	<1
RRSW23								
4/12/2020	9	6	<1	6	6	<1	3	<1
7/01/2021	13	5	<1	5	5	1	3	2
3/02/2021	21	5	<1	5	4	3	3	2
8/03/2021	38	5	<1	5	5	8	3	5
29/04/2021	47	5	<1	5	5	13	4	5
14/05/2021	42	5	<1	5	5	11	3	5

Table A.3 - Rustlers Roost Surface Water Quality

Analyte Group	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)
Analyte	Magnesium	Sodium	Potassium	Aluminium	Arsenic	Cadmium	Chromium	Cobalt	Copper
Analyte Short Name	Mg	Na	K	Al_F	As_F	Cd_F	Cr_F	Co_F	Cu_F
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	0.295	0.042	0.0004	0.006	-	0.0018
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	insufficient data	0.024	0.0002	0.001	-	0.0014
ANZECC 2000 Livestock Watering (beef cattle)	2000	-	-	5	0.5	0.01	1	1	2
ANZECC 2000 long term irrigation	-	-	-	5	0.1	0.01	0.1	0.05	0.2
RRSW2									
28/11/2016	0.9	1.9	1.8	0.16	0.007	<0.0001	<0.001	<0.001	0.001
26/01/2017	0.6	5.6	0.6	0.11	0.012	<0.0001	<0.001	0.001	0.002
26/03/2017	<0.5	9.6	1.4	<0.01	0.004	<0.0001	<0.001	<0.001	<0.001
22/02/2019	0.7	17	0.8	<0.01	0.015	<0.0001	<0.001	0.005	0.002
19/01/2020	1.9	4.3	4.1	0.44	0.012	<0.0001	<0.001	<0.001	0.002
16/02/2020	0.9	14	1	0.02	0.007	<0.0001	<0.001	0.003	0.002
4/12/2020	<1	<1	1	0.11	<0.001	<0.0001	<0.001	0.001	<0.001
6/01/2021	<1	16	<1	<0.01	0.01	<0.0001	<0.001	0.003	0.001
3/02/2021	<1	7	<1	0.19	0.009	<0.0001	<0.001	0.001	0.001
8/03/2021	<1	15	<1	0.12	0.067	<0.0001	0.004	0.005	<0.001
29/04/2021	<1	21	<1	0.07	0.046	<0.0001	0.002	0.007	<0.001
14/05/2021	<1	20	<1	0.15	0.073	<0.0001	0.004	0.005	<0.001
RRMCDS									
15/04/2021	<1	2	<1	0.18	<0.001	<0.0001	<0.001	<0.001	<0.001
RRMCUS									
15/04/2021	<1	2	<1	0.17	<0.001	<0.0001	<0.001	<0.001	0.002
RRSW5									
22/08/2012	12	0.7	1.1	0.01	0.011	<0.0001	<0.001	<0.001	0.001
9/12/2012	1	14	1.5	0.071	0.02	<0.0001	<0.001	<0.001	0.001
20/12/2016	<0.5	1.5	1	0.09	0.004	<0.0001	<0.001	<0.001	<0.001
26/03/2017	<0.5	0.6	1.3	0.03	0.002	<0.0001	<0.001	<0.001	<0.001
30/06/2018	0.7	7.7	0.9	<0.01	0.007	<0.0001	<0.001	<0.001	<0.001
22/02/2019	0.9	9.6	2.3	0.01	0.011	<0.0001	<0.001	<0.001	0.004
20/08/2019	1	18	3.1	0.01	0.012	<0.0001	<0.001	<0.001	0.003
30/10/2019	1.7	24	3	<0.01	0.024	<0.0001	<0.001	<0.001	0.001
16/02/2020	1.1	13	1.5	0.01	0.01	<0.0001	<0.001	<0.001	0.001
11/11/2020	2	23	3	<0.01	0.023	<0.0001	<0.001	<0.001	<0.001
3/02/2021	<1	10	2	0.02	0.002	<0.0001	<0.001	<0.001	<0.001
29/04/2021	<1	6	<1	0.01	0.005	0.0001	<0.001	<0.001	<0.001
RRSW6									
9/12/2012	<0.5	1.8	1.4	0.033	0.002	<0.0001	<0.001	<0.001	0.001
20/12/2016	0.6	1.9	2.1	0.11	0.002	<0.0001	<0.001	<0.001	0.002
26/03/2017	<0.5	0.7	<0.5	0.05	<0.001	<0.0001	<0.001	<0.001	<0.001
30/06/2018	<0.5	0.9	<0.5	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001
3/02/2021	<1	2	<1	0.22	0.001	<0.0001	<0.001	<0.001	0.002
29/04/2021	-	-	-	-	-	-	-	-	-
RRSW7									
20/12/2016	0.8	1.9	2.5	0.12	<0.001	<0.0001	<0.001	<0.001	0.001
26/01/2017	<0.5	1.3	<0.5	0.03	<0.001	<0.0001	<0.001	<0.001	<0.001
26/03/2017	<0.5	0.7	0.6	0.09	<0.001	<0.0001	<0.001	<0.001	<0.001
30/06/2018	1	1.2	1.8	<0.01	<0.001	<0.0001	<0.001	0.002	<0.001
12/12/2018	0.7	1.2	<0.5	<0.01	<0.001	<0.0001	<0.001	0.002	<0.001
22/02/2019	0.6	1.4	<0.5	<0.01	<0.001	<0.0001	<0.001	0.001	<0.001
20/08/2019	1.2	1.4	1.4	<0.01	<0.001	<0.0001	<0.001	0.003	<0.001
19/01/2020	0.6	1.5	0.9	0.09	<0.001	<0.0001	<0.001	0.002	<0.001
10/11/2020	<1	2	<1	<0.01	<0.001	<0.0001	<0.001	0.001	<0.001
3/02/2021	<1	2	<1	<0.01	<0.001	<0.0001	<0.001	0.001	<0.001

Table A.3 - Rustlers Roost Surface Water Quality

Analyte Group	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)
Analyte	Magnesium	Sodium	Potassium	Aluminium	Arsenic	Cadmium	Chromium	Cobalt	Copper
Analyte Short Name	Mg	Na	K	Al_F	As_F	Cd_F	Cr_F	Co_F	Cu_F
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	0.295	0.042	0.0004	0.006	-	0.0018
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	insufficient data	0.024	0.0002	0.001	-	0.0014
ANZECC 2000 Livestock Watering (beef cattle)	2000	-	-	5	0.5	0.01	1	1	2
ANZECC 2000 long term irrigation	-	-	-	5	0.1	0.01	0.1	0.05	0.2
29/04/2021	<1	1	<1	<0.01	<0.001	<0.0001	<0.001	0.002	<0.001
RRSW10									
20/12/2016	1.1	1.9	2.1	0.02	0.008	<0.0001	<0.001	<0.001	<0.001
26/01/2017	0.5	1.6	1.3	0.05	0.002	<0.0001	<0.001	<0.001	0.002
26/03/2017	<0.5	<0.5	<0.5	0.04	<0.001	<0.0001	<0.001	<0.001	<0.001
3/02/2021	<1	1	<1	<0.01	0.001	<0.0001	<0.001	<0.001	<0.001
29/04/2021	<1	2	<1	<0.01	0.002	<0.0001	<0.001	<0.001	<0.001
RRSW11									
28/11/2016	0.8	1.7	2.2	0.02	0.014	<0.0001	<0.001	<0.001	0.002
20/12/2016	1	2.5	1.7	0.01	0.009	<0.0001	<0.001	<0.001	0.001
26/01/2017	0.7	1.4	1.4	0.08	0.003	<0.0001	<0.001	<0.001	0.001
26/03/2017	<0.5	1.3	0.9	0.03	0.001	<0.0001	<0.001	<0.001	<0.001
30/06/2018	<0.5	2.4	1.6	<0.01	0.001	<0.0001	<0.001	<0.001	<0.001
22/02/2019	0.6	1.8	1.6	<0.01	0.003	<0.0001	<0.001	0.004	0.002
6/01/2021	<1	2	1	<0.01	0.002	<0.0001	<0.001	0.002	0.002
3/02/2021	<1	2	1	<0.01	0.003	<0.0001	<0.001	0.003	0.001
8/03/2021	<1	2	1	<0.01	0.004	<0.0001	<0.001	0.004	<0.001
29/04/2021	<1	2	<1	<0.01	0.003	<0.0001	<0.001	0.003	<0.001
14/05/2021	<1	2	1	0.04	0.004	<0.0001	<0.001	0.003	<0.001
RRSW12									
20/12/2016	<0.5	1	1	0.07	<0.001	<0.0001	<0.001	<0.001	0.001
26/01/2017	<0.5	1.8	<0.5	0.14	<0.001	<0.0001	<0.001	<0.001	0.001
26/03/2017	<0.5	1.1	<0.5	0.14	0.001	<0.0001	<0.001	<0.001	<0.001
3/02/2021	<1	2	<1	0.05	<0.001	<0.0001	<0.001	<0.001	<0.001
8/03/2021	<1	2	<1	0.05	<0.001	<0.0001	<0.001	<0.001	<0.001
29/04/2021	-	-	-	-	-	-	-	-	-
14/05/2021	-	-	-	-	-	-	-	-	-
RRSW22									
22/08/2012	2.6	0.7	1.5	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001
9/12/2012	0.8	2.3	1.6	0.02	0.001	<0.0001	<0.001	<0.001	<0.001
20/12/2016	0.8	2.1	1.3	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001
26/03/2017	0.6	1.7	1.1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001
30/06/2018	0.5	1.7	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001
22/02/2019	0.7	1.9	1.3	<0.01	<0.001	<0.0001	<0.001	<0.001	0.001
20/08/2019	0.7	1.9	1.2	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001
30/10/2019	0.8	2.2	1.4	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001
9/11/2020	<1	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001
3/02/2021	<1	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001
29/04/2021	<1	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001
RRSW23									
4/12/2020	1	2	3	0.25	0.001	<0.0001	<0.001	<0.001	<0.001
7/01/2021	<1	4	<1	0.07	0.002	<0.0001	<0.001	<0.001	<0.001
3/02/2021	<1	7	<1	0.15	0.006	<0.0001	<0.001	<0.001	<0.001
8/03/2021	<1	12	<1	0.24	0.051	<0.0001	0.003	0.004	<0.001
29/04/2021	<1	22	1	0.32	0.022	<0.0001	0.001	0.005	<0.001
14/05/2021	<1	18	<1	0.39	0.042	<0.0001	0.002	0.004	0.005

Table A.3 - Rustlers Roost Surface Water Quality

Analyte Group	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (Total)	Metals (Total)
Analyte	Lead	Manganese	Nickel	Selenium Se (Total)	Tin	Uranium	Zinc	Iron	Aluminium Al	Arsenic
Analyte Short Name	Pb_F	Mn_F	Ni_F	Se_F	Sn_F	U_F	Zn_F	Fe_F	Al_T	As_T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	0.0056	2.5	0.013	-	-	-	0.015	2.7	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-	insufficient data	0.024
ANZECC 2000 Livestock Watering (beef cattle)	0.1	-	1	0.02	-	0.2	20	-	5	0.5
ANZECC 2000 long term irrigation	2	0.2	0.2	0.02	-	0.01	2	0.2	5	0.1
RRSW2										
28/11/2016	<0.001	0.012	<0.001	-	-	<0.0005	0.002	0.25	0.72	0.014
26/01/2017	<0.001	0.032	<0.001	-	-	<0.0005	0.01	0.19	0.31	0.017
26/03/2017	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	0.05	0.01	0.007
22/02/2019	<0.001	0.036	<0.001	-	-	<0.0005	<0.001	0.17	0.12	0.049
19/01/2020	<0.001	0.023	0.002	-	-	<0.0005	0.03	1.5	0.44	0.051
16/02/2020	<0.001	0.084	0.001	-	-	<0.0005	0.014	0.33	0.27	0.025
4/12/2020	<0.001	0.207	<0.001	<0.01	<0.001	<0.001	<0.005	0.06	0.31	<0.001
6/01/2021	<0.001	0.047	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	1.21	0.027
3/02/2021	<0.001	0.035	<0.001	<0.01	<0.001	<0.001	<0.005	0.32	0.58	0.014
8/03/2021	<0.001	0.033	<0.001	<0.01	<0.001	<0.001	<0.005	0.31	0.22	0.087
29/04/2021	<0.001	0.073	<0.001	<0.01	<0.001	<0.001	<0.005	0.55	0.17	0.066
14/05/2021	<0.001	0.054	<0.001	<0.01	<0.001	<0.001	<0.005	0.82	0.16	0.078
RRMCDS										
15/04/2021	<0.001	0.022	<0.001	<0.01	<0.001	<0.001	<0.005	0.42	0.16	<0.001
RRMCUS										
15/04/2021	<0.001	0.045	<0.001	<0.01	<0.001	<0.001	<0.005	1.07	0.53	<0.001
RRSW5										
22/08/2012	<0.001	0.006	0.001	<0.001	-	<0.0005	0.011	0.049	0.038	0.012
9/12/2012	<0.001	0.17	<0.001	<0.001	-	<0.0005	0.023	0.072	0.066	0.025
20/12/2016	<0.001	<0.005	<0.001	-	-	<0.0005	0.001	0.14	1.8	0.008
26/03/2017	<0.001	<0.005	<0.001	-	-	<0.0005	0.001	0.08	0.07	0.003
30/06/2018	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	0.26	0.1	0.015
22/02/2019	0.002	0.16	0.002	-	-	<0.0005	0.19	0.32	0.03	0.018
20/08/2019	<0.001	0.18	<0.001	-	-	<0.0005	0.054	0.47	0.07	0.02
30/10/2019	<0.001	0.14	0.002	-	-	<0.0005	0.008	0.08	0.03	0.03
16/02/2020	<0.001	<0.005	0.001	-	-	<0.0005	0.001	0.01	0.03	0.011
11/11/2020	<0.001	0.093	0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.04	0.028
3/02/2021	<0.001	0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.08	0.003
29/04/2021	<0.001	0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.02	0.006
RRSW6										
9/12/2012	<0.001	0.018	<0.001	<0.001	-	<0.0005	0.015	0.19	0.058	0.002
20/12/2016	<0.001	0.023	<0.001	-	-	<0.0005	0.003	0.21	0.23	0.003
26/03/2017	<0.001	0.015	<0.001	-	-	<0.0005	<0.001	0.19	0.06	<0.001
30/06/2018	<0.001	<0.005	<0.001	-	-	<0.0005	0.001	0.16	0.05	0.002
3/02/2021	<0.001	0.023	<0.001	<0.01	<0.001	<0.001	0.026	0.14	0.5	0.001
29/04/2021	-	-	-	-	-	-	-	-	-	-
RRSW7										
20/12/2016	<0.001	0.18	<0.001	-	-	<0.0005	0.002	0.14	0.22	<0.001
26/01/2017	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	0.09	0.05	<0.001
26/03/2017	<0.001	0.094	<0.001	-	-	<0.0005	<0.001	0.22	0.19	<0.001
30/06/2018	<0.001	0.47	<0.001	-	-	<0.0005	<0.001	0.06	0.02	<0.001
12/12/2018	<0.001	0.54	<0.001	-	-	<0.0005	<0.001	0.06	0.03	<0.001
22/02/2019	<0.001	0.24	<0.001	-	-	<0.0005	<0.001	0.08	0.02	<0.001
20/08/2019	<0.001	0.64	<0.001	-	-	<0.0005	0.001	0.13	0.03	<0.001
19/01/2020	<0.001	0.33	<0.001	-	-	<0.0005	0.006	0.41	0.12	<0.001
10/11/2020	<0.001	0.794	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.1	0.001
3/02/2021	<0.001	0.595	<0.001	<0.01	<0.001	<0.001	<0.005	0.06	0.04	<0.001

Table A.3 - Rustlers Roost Surface Water Quality

Analyte Group	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (Total)	Metals (Total)
Analyte	Lead	Manganese	Nickel	Selenium Se (Total)	Tin	Uranium	Zinc	Iron	Aluminium Al	Arsenic
Analyte Short Name	Pb_F	Mn_F	Ni_F	Se_F	Sn_F	U_F	Zn_F	Fe_F	Al_T	As_T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	0.0056	2.5	0.013	-	-	-	0.015	2.7	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-	insufficient data	0.024
ANZECC 2000 Livestock Watering (beef cattle)	0.1	-	1	0.02	-	0.2	20	-	5	0.5
ANZECC 2000 long term irrigation	2	0.2	0.2	0.02	-	0.01	2	0.2	5	0.1
29/04/2021	<0.001	0.698	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.01	<0.001
RRSW10										
20/12/2016	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	0.05	1.8	0.014
26/01/2017	<0.001	<0.005	0.002	-	-	<0.0005	0.006	0.21	0.2	0.004
26/03/2017	<0.001	<0.005	<0.001	-	-	<0.0005	0.001	0.06	0.09	0.001
3/02/2021	<0.001	0.059	<0.001	<0.01	<0.001	<0.001	<0.005	0.22	0.07	0.002
29/04/2021	<0.001	0.095	<0.001	<0.01	<0.001	<0.001	<0.005	0.52	0.01	0.002
RRSW11										
28/11/2016	<0.001	0.024	<0.001	-	-	<0.0005	<0.001	0.06	0.51	0.016
20/12/2016	<0.001	0.038	<0.001	-	-	<0.0005	<0.001	0.04	0.89	0.01
26/01/2017	<0.001	<0.005	<0.001	-	-	<0.0005	0.003	0.36	0.28	0.006
26/03/2017	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	0.18	0.88	0.012
30/06/2018	<0.001	<0.005	<0.001	-	-	<0.0005	0.002	0.06	0.06	0.002
22/02/2019	<0.001	0.65	<0.001	-	-	<0.0005	0.001	0.23	0.01	0.005
6/01/2021	<0.001	0.283	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.34	0.003
3/02/2021	<0.001	0.457	<0.001	<0.01	<0.001	<0.001	<0.005	0.12	0.06	0.003
8/03/2021	<0.001	0.518	<0.001	<0.01	<0.001	<0.001	<0.005	0.76	0.05	0.004
29/04/2021	<0.001	0.359	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.01	0.004
14/05/2021	<0.001	0.453	<0.001	<0.01	<0.001	<0.001	<0.005	1.01	0.09	0.004
RRSW12										
20/12/2016	<0.001	0.018	<0.001	-	-	<0.0005	0.002	0.05	0.36	<0.001
26/01/2017	<0.001	<0.005	<0.001	-	-	<0.0005	0.002	0.13	0.32	<0.001
26/03/2017	<0.001	0.018	<0.001	-	-	<0.0005	<0.001	0.15	0.27	0.002
3/02/2021	<0.001	0.008	<0.001	<0.01	<0.001	<0.001	<0.005	0.06	0.14	<0.001
8/03/2021	<0.001	0.007	<0.001	<0.01	<0.001	<0.001	<0.005	0.12	0.2	<0.001
29/04/2021	-	-	-	-	-	-	-	-	-	-
14/05/2021	-	-	-	-	-	-	-	-	-	-
RRSW22										
22/08/2012	<0.001	0.007	<0.001	<0.001	-	<0.0005	0.018	0.012	0.022	0.001
9/12/2012	<0.001	<0.005	<0.001	<0.001	-	<0.0005	0.015	<0.01	0.038	0.002
20/12/2016	<0.001	<0.005	<0.001	-	-	<0.0005	0.002	<0.01	0.02	0.002
26/03/2017	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	<0.01	0.02	0.001
30/06/2018	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	<0.01	<0.01	0.001
22/02/2019	<0.001	0.014	<0.001	-	-	<0.0005	0.005	0.02	<0.01	0.001
20/08/2019	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	<0.01	0.04	0.003
30/10/2019	<0.001	<0.005	<0.001	-	-	<0.0005	0.027	<0.01	0.03	<0.001
9/11/2020	<0.001	0.004	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001
3/02/2021	<0.001	0.002	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001
29/04/2021	<0.001	0.002	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.01	<0.001
RRSW23										
4/12/2020	<0.001	0.02	<0.001	<0.01	<0.001	<0.001	<0.005	0.51	0.57	0.003
7/01/2021	<0.001	0.003	<0.001	<0.01	<0.001	<0.001	<0.005	0.25	5.54	0.007
3/02/2021	<0.001	0.019	<0.001	<0.01	<0.001	<0.001	<0.005	0.27	0.61	0.009
8/03/2021	<0.001	0.013	<0.001	<0.01	<0.001	<0.001	<0.005	0.32	0.26	0.063
29/04/2021	<0.001	0.044	<0.001	<0.01	0.006	<0.001	<0.005	0.52	0.27	0.028
14/05/2021	<0.001	0.021	<0.001	<0.01	<0.001	<0.001	<0.005	0.66	0.27	0.043

Table A.3 - Rustlers Roost Surface Water Quality

Analyte Group	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)
Analyte	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Tin	Uranium	Zinc	Iron	Ferrous Iron
Analyte Short Name	Cd_T	Cr_T	Co_T	Cu_T	Pb_T	Mn_T	Ni_T	Se_T	Sn_T	U_T	Zn_T	Fe_T	Ferrous Iron
Units	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
Toms Gully SSTV (80th percentile)	-	-	-	-	-	-	-	-	-	-	-	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0002	0.001	-	0.0014	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-	-
ANZECC 2000 Livestock Watering (beef cattle)	0.01	1	1	2	0.1	-	1	0.02	-	0.2	20	-	-
ANZECC 2000 long term irrigation	0.01	1	0.5	0.2	2	0.2	0.2	0.02	-	0.01	2	-	-
RRSW2													
28/11/2016	<0.0001	0.002	0.002	0.004	<0.001	0.18	0.001	-	-	<0.0005	0.007	1.6	-
26/01/2017	<0.0001	0.002	0.002	0.003	<0.001	0.056	0.001	-	-	<0.0005	0.015	0.73	-
26/03/2017	<0.0001	<0.001	<0.001	<0.001	<0.001	0.095	<0.001	-	-	<0.0005	0.002	0.28	-
22/02/2019	<0.0001	0.002	0.006	0.001	<0.001	0.12	<0.001	-	-	<0.0005	0.001	1.5	-
19/01/2020	<0.0001	0.001	0.001	0.004	0.002	0.11	0.003	-	-	<0.0005	0.045	2.6	-
16/02/2020	<0.0001	0.002	0.004	0.003	<0.001	0.11	0.002	-	-	<0.0005	0.019	2.6	-
4/12/2020	<0.0001	<0.001	0.002	0.001	<0.001	0.279	<0.001	<0.01	<0.001	<0.001	<0.005	0.06	0.14
6/01/2021	<0.0001	0.003	0.004	0.001	<0.001	0.057	<0.001	<0.01	<0.001	<0.001	<0.005	1.76	<0.05
3/02/2021	<0.0001	0.002	0.002	0.001	<0.001	0.048	<0.001	<0.01	<0.001	<0.001	<0.005	1.28	0.17
8/03/2021	<0.0001	0.005	0.006	0.001	<0.001	0.032	<0.001	<0.01	<0.001	<0.001	<0.005	0.85	0.09
29/04/2021	<0.0001	0.003	0.008	0.001	<0.001	0.085	<0.001	<0.01	<0.001	<0.001	<0.005	1.18	0.61
14/05/2021	<0.0001	0.004	0.006	<0.001	<0.001	0.06	<0.001	<0.01	<0.001	<0.001	<0.005	1.07	0.27
RRMCDS													
15/04/2021	<0.0001	<0.001	<0.001	0.001	<0.001	0.024	<0.001	<0.01	<0.001	<0.001	<0.005	0.58	<0.05
RRMCUS													
15/04/2021	<0.0001	<0.001	<0.001	0.004	<0.001	0.054	<0.001	<0.01	<0.001	<0.001	<0.005	1.49	0.05
RRSW5													
22/08/2012	<0.0001	<0.001	<0.001	0.002	<0.001	0.051	0.001	<0.001	-	<0.0005	0.017	0.16	-
9/12/2012	<0.0001	<0.001	0.001	0.001	<0.001	0.2	0.002	<0.001	-	<0.0005	0.046	0.33	-
20/12/2016	<0.0001	0.003	0.002	0.005	0.001	0.077	0.002	-	-	<0.0005	0.009	2.2	-
26/03/2017	<0.0001	<0.001	<0.001	0.006	0.002	0.028	<0.001	-	-	<0.0005	0.005	0.48	-
30/06/2018	<0.0001	<0.001	0.002	0.002	<0.001	0.19	0.001	-	-	<0.0005	0.002	1.5	-
22/02/2019	<0.0001	<0.001	0.001	0.006	<0.001	0.33	0.004	-	-	<0.0005	0.28	0.88	-
20/08/2019	<0.0001	<0.001	0.001	0.006	<0.001	0.27	0.002	-	-	<0.0005	0.16	2.2	-
30/10/2019	<0.0001	<0.001	0.001	0.002	<0.001	0.2	0.002	-	-	<0.0005	0.036	0.49	-
16/02/2020	<0.0001	<0.001	0.001	0.002	<0.001	0.044	0.002	-	-	<0.0005	0.003	0.16	-
11/11/2020	<0.0001	<0.001	0.001	<0.001	<0.001	0.143	0.002	<0.01	<0.001	<0.001	<0.005	0.3	0.08
3/02/2021	<0.0001	0.002	0.002	0.002	<0.001	0.045	0.002	<0.01	<0.001	<0.001	<0.005	0.23	<0.05
29/04/2021	<0.0001	<0.001	0.001	<0.001	<0.001	0.051	<0.001	<0.01	<0.001	<0.001	0.022	0.07	<0.05
RRSW6													
9/12/2012	<0.0001	<0.001	<0.001	0.001	<0.001	0.031	<0.001	<0.001	-	<0.0005	0.014	0.53	-
20/12/2016	<0.0001	0.001	<0.001	0.002	<0.001	0.043	0.002	-	-	<0.0005	0.004	0.57	-
26/03/2017	<0.0001	<0.001	<0.001	<0.001	<0.001	0.018	<0.001	-	-	<0.0005	<0.001	0.38	-
30/06/2018	<0.0001	<0.001	<0.001	<0.001	<0.001	0.041	<0.001	-	-	<0.0005	0.003	2.2	-
3/02/2021	<0.0001	<0.001	<0.001	0.001	<0.001	0.028	<0.001	<0.01	<0.001	<0.001	<0.005	0.34	0.08
29/04/2021	-	-	-	-	-	-	-	-	-	-	-	-	-
RRSW7													
20/12/2016	<0.0001	0.005	<0.001	0.002	<0.001	0.23	0.002	-	-	<0.0005	0.002	0.32	-
26/01/2017	<0.0001	<0.001	<0.001	<0.001	<0.001	0.017	<0.001	-	-	<0.0005	<0.001	0.27	-
26/03/2017	<0.0001	<0.001	0.001	<0.001	<0.001	0.14	<0.001	-	-	<0.0005	<0.001	0.69	-
30/06/2018	<0.0001	<0.001	0.003	<0.001	<0.001	0.54	<0.001	-	-	<0.0005	0.003	0.98	-
12/12/2018	<0.0001	<0.001	0.002	<0.001	<0.001	0.57	<0.001	-	-	<0.0005	0.001	0.95	-
22/02/2019	<0.0001	<0.001	0.002	<0.001	<0.001	0.28	<0.001	-	-	<0.0005	0.003	0.64	-
20/08/2019	<0.0001	<0.001	0.003	<0.001	<0.001	0.69	<0.001	-	-	<0.0005	0.003	1.7	-
19/01/2020	<0.0001	<0.001	0.002	<0.001	<0.001	0.41	<0.001	-	-	<0.0005	0.002	1.2	-
10/11/2020	<0.0001	<0.001	0.002	<0.001	<0.001	0.967	<0.001	<0.01	<0.001	<0.001	<0.005	3.99	0.07
3/02/2021	<0.0001	<0.001	0.002	<0.001	<0.001	0.79	<0.001	<0.01	<0.001	<0.001	<0.005	1.44	<0.05

Table A.3 - Rustlers Roost Surface Water Quality

Analyte Group	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)
Analyte	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Tin	Uranium	Zinc	Iron	Ferrous Iron
Analyte Short Name	Cd_T	Cr_T	Co_T	Cu_T	Pb_T	Mn_T	Ni_T	Se_T	Sn_T	U_T	Zn_T	Fe_T	Ferrous Iron
Units	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
Toms Gully SSTV (80th percentile)	-	-	-	-	-	-	-	-	-	-	-	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0002	0.001	-	0.0014	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-	-
ANZECC 2000 Livestock Watering (beef cattle)	0.01	1	1	2	0.1	-	1	0.02	-	0.2	20	-	-
ANZECC 2000 long term irrigation	0.01	1	0.5	0.2	2	0.2	0.2	0.02	-	0.01	2	-	-
29/04/2021	<0.0001	<0.001	0.002	<0.001	<0.001	0.856	<0.001	<0.01	<0.001	<0.001	<0.005	0.54	0.08
RRSW10													
20/12/2016	<0.0001	0.004	0.002	0.008	0.001	0.23	0.003	-	-	<0.0005	0.02	4.9	-
26/01/2017	<0.0001	<0.001	<0.001	0.002	<0.001	0.11	0.001	-	-	<0.0005	0.018	0.83	-
26/03/2017	<0.0001	<0.001	<0.001	0.002	<0.001	0.11	<0.001	-	-	<0.0005	0.006	0.3	-
3/02/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.097	<0.001	<0.01	<0.001	<0.001	<0.005	1.4	0.05
29/04/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.094	<0.001	<0.01	<0.001	<0.001	<0.005	1.33	<0.05
RRSW11													
28/11/2016	<0.0001	0.002	0.001	0.004	<0.001	0.055	<0.001	-	-	<0.0005	0.004	1.8	-
20/12/2016	<0.0001	0.002	0.002	0.004	<0.001	0.092	0.001	-	-	<0.0005	0.006	3.2	-
26/01/2017	<0.0001	<0.001	<0.001	0.002	<0.001	0.071	<0.001	-	-	<0.0005	0.011	1.2	-
26/03/2017	<0.0001	0.002	0.004	0.007	0.002	1.2	0.003	-	-	0.0005	0.027	6.6	-
30/06/2018	<0.0001	<0.001	<0.001	0.002	<0.001	0.055	0.001	-	-	<0.0005	0.005	0.67	-
22/02/2019	<0.0001	<0.001	0.006	0.001	<0.001	0.81	<0.001	-	-	<0.0005	0.001	1	-
6/01/2021	<0.0001	<0.001	0.002	0.003	<0.001	0.308	<0.001	<0.01	<0.001	<0.001	<0.005	0.96	<0.05
3/02/2021	<0.0001	<0.001	0.004	0.002	<0.001	0.555	0.001	<0.01	<0.001	<0.001	<0.005	0.82	0.1
8/03/2021	<0.0001	<0.001	0.005	<0.001	<0.001	0.549	<0.001	<0.01	<0.001	<0.001	<0.005	0.95	0.79
29/04/2021	<0.0001	<0.001	0.002	<0.001	<0.001	0.359	<0.001	<0.01	<0.001	<0.001	<0.005	0.88	<0.05
14/05/2021	<0.0001	<0.001	0.004	<0.001	<0.001	0.476	<0.001	<0.01	<0.001	<0.001	<0.005	1.37	0.88
RRSW12													
20/12/2016	<0.0001	<0.001	<0.001	0.002	<0.001	0.025	<0.001	-	-	<0.0005	0.002	0.3	-
26/01/2017	<0.0001	<0.001	<0.001	0.001	<0.001	0.007	<0.001	-	-	<0.0005	0.003	0.29	-
26/03/2017	<0.0001	<0.001	<0.001	<0.001	<0.001	0.028	<0.001	-	-	<0.0005	0.002	0.32	-
3/02/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.011	<0.001	<0.01	<0.001	<0.001	<0.005	0.17	<0.05
8/03/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.007	<0.001	<0.01	<0.001	<0.001	<0.005	0.32	0.06
29/04/2021	-	-	-	-	-	-	-	-	-	-	-	-	-
14/05/2021	-	-	-	-	-	-	-	-	-	-	-	-	-
RRSW22													
22/08/2012	<0.0001	<0.001	<0.001	<0.001	<0.001	0.021	<0.001	<0.001	-	<0.0005	0.015	0.046	-
9/12/2012	<0.0001	<0.001	<0.001	<0.001	<0.001	0.013	<0.001	<0.001	-	<0.0005	0.035	0.063	-
20/12/2016	<0.0001	<0.001	<0.001	<0.001	<0.001	0.019	<0.001	-	-	<0.0005	0.006	0.04	-
26/03/2017	<0.0001	<0.001	<0.001	<0.001	<0.001	0.022	<0.001	-	-	<0.0005	0.002	0.03	-
30/06/2018	<0.0001	<0.001	<0.001	<0.001	<0.001	0.15	<0.001	-	-	<0.0005	0.004	0.16	-
22/02/2019	<0.0001	<0.001	<0.001	<0.001	<0.001	0.047	<0.001	-	-	<0.0005	0.002	0.05	-
20/08/2019	<0.0001	<0.001	0.001	0.001	<0.001	0.17	<0.001	-	-	<0.0005	0.002	0.67	-
30/10/2019	<0.0001	<0.001	<0.001	0.001	<0.001	0.02	<0.001	-	-	<0.0005	0.034	0.11	-
9/11/2020	<0.0001	<0.001	<0.001	<0.001	<0.001	0.008	<0.001	<0.01	<0.001	<0.001	<0.005	0.13	<0.05
3/02/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.008	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05
29/04/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.021	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	<0.05
RRSW23													
4/12/2020	<0.0001	<0.001	0.001	0.002	0.002	0.16	<0.001	<0.01	<0.001	<0.001	<0.005	1.01	1.26
7/01/2021	<0.0001	0.006	0.004	0.005	0.003	0.122	0.003	<0.01	<0.001	<0.001	<0.005	5.48	0.44
3/02/2021	<0.0001	0.001	0.002	0.007	<0.001	0.031	<0.001	<0.01	<0.001	<0.001	<0.005	1.14	0.34
8/03/2021	<0.0001	0.004	0.004	<0.001	<0.001	0.016	<0.001	<0.01	<0.001	<0.001	<0.005	0.76	0.08
29/04/2021	<0.0001	0.001	0.005	<0.001	<0.001	0.047	<0.001	<0.01	<0.001	<0.001	<0.005	0.79	0.34
14/05/2021	<0.0001	0.002	0.005	0.007	<0.001	0.023	<0.001	<0.01	<0.001	<0.001	<0.005	0.84	0.21

Table A.3 - Rustlers Roost Surface Water Quality

Analyte Group	Nutrients	Nutrients	Nutrients	Nutrients	Nutrients
Analyte	Ammonia	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P
Analyte Short Name	NH3	Nox	TKN_N	TN_N	P_Tot
Units	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	1.4	-	-	-	-
Tropical Australia Lowland Rivers	0.01	-	-	0.2 - 0.3	0.01
ANZG 2018 freshwater - 95% species protection	0.9	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	5	0.05
RRSW2					
28/11/2016	-	-	-	-	-
26/01/2017	-	-	-	-	-
26/03/2017	-	-	-	-	-
22/02/2019	-	-	-	-	-
19/01/2020	-	-	-	-	-
16/02/2020	-	-	-	-	-
4/12/2020	0.09	0.77	1.5	2.3	0.32
6/01/2021	0.05	0.19	0.3	0.5	0.02
3/02/2021	0.02	0.04	0.2	0.2	<0.01
8/03/2021	0.06	0.22	0.2	0.4	0.04
29/04/2021	0.06	0.09	0.3	0.4	0.05
14/05/2021	0.1	0.11	0.2	0.3	0.03
RRMCDS					
15/04/2021	0.11	0.01	0.3	0.3	<0.01
RRMCUS					
15/04/2021	0.17	0.02	0.4	0.4	0.02
RRSW5					
22/08/2012	-	-	-	-	-
9/12/2012	-	-	-	-	-
20/12/2016	-	-	-	-	-
26/03/2017	-	-	-	-	-
30/06/2018	-	-	-	-	-
22/02/2019	-	-	-	-	-
20/08/2019	-	-	-	-	-
30/10/2019	-	-	-	-	-
16/02/2020	-	-	-	-	-
11/11/2020	<0.01	0.04	1.7	1.7	0.04
3/02/2021	0.97	0.21	1.3	1.5	0.04
29/04/2021	<0.01	<0.01	0.6	0.6	0.01
RRSW6					
9/12/2012	-	-	-	-	-
20/12/2016	-	-	-	-	-
26/03/2017	-	-	-	-	-
30/06/2018	-	-	-	-	-
3/02/2021	0.02	0.06	0.3	0.4	<0.01
29/04/2021	-	-	-	-	-
RRSW7					
20/12/2016	-	-	-	-	-
26/01/2017	-	-	-	-	-
26/03/2017	-	-	-	-	-
30/06/2018	-	-	-	-	-
12/12/2018	-	-	-	-	-
22/02/2019	-	-	-	-	-
20/08/2019	-	-	-	-	-
19/01/2020	-	-	-	-	-
10/11/2020	1.02	0.08	1.1	1.2	<0.01
3/02/2021	0.91	0.05	1	1	<0.01

Table A.3 - Rustlers Roost Surface Water Quality

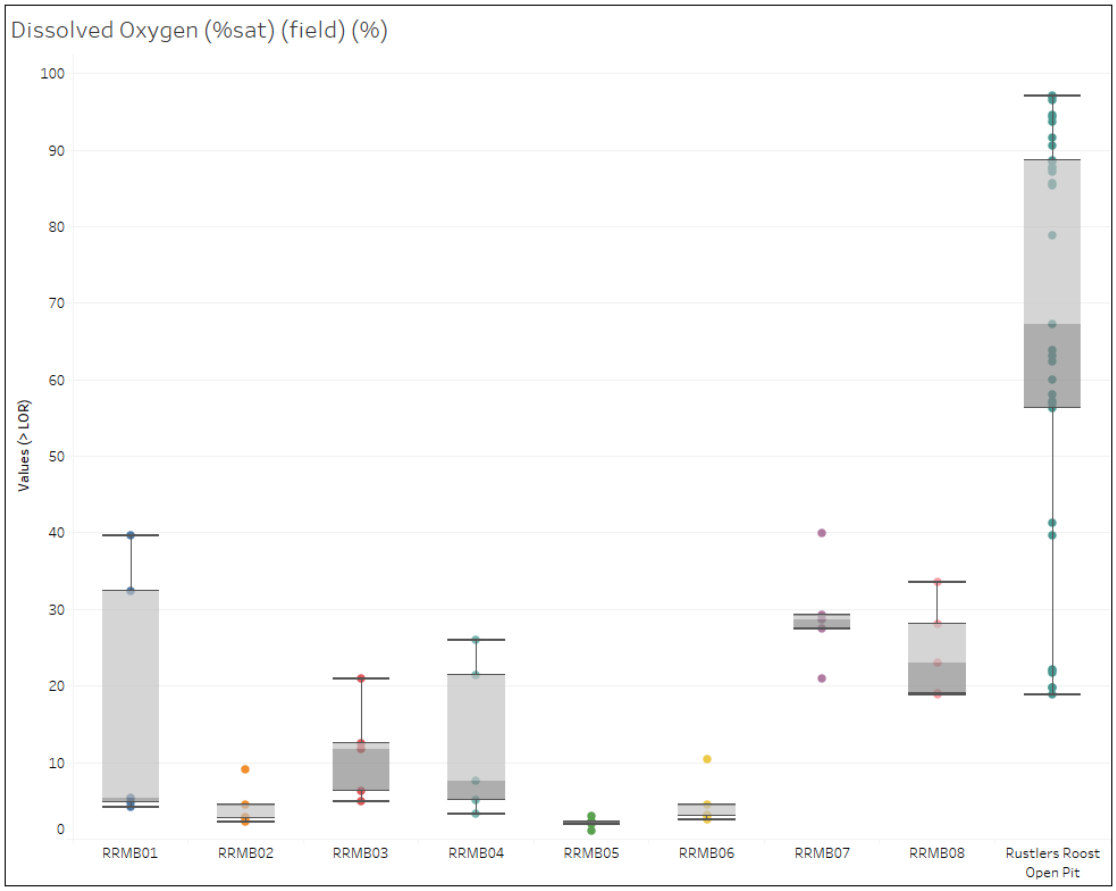
Analyte Group	Nutrients	Nutrients	Nutrients	Nutrients	Nutrients
Analyte	Ammonia	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P
Analyte Short Name	NH3	Nox	TKN_N	TN_N	P_Tot
Units	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	1.4	-	-	-	-
Tropical Australia Lowland Rivers	0.01	-	-	0.2 - 0.3	0.01
ANZG 2018 freshwater - 95% species protection	0.9	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	5	0.05
29/04/2021	1.06	<0.01	1.2	1.2	<0.01
RRSW10					
20/12/2016	-	-	-	-	-
26/01/2017	-	-	-	-	-
26/03/2017	-	-	-	-	-
3/02/2021	0.04	0.23	0.2	0.4	0.01
29/04/2021	0.02	0.02	0.4	0.4	0.02
RRSW11					
28/11/2016	-	-	-	-	-
20/12/2016	-	-	-	-	-
26/01/2017	-	-	-	-	-
26/03/2017	-	-	-	-	-
30/06/2018	-	-	-	-	-
22/02/2019	-	-	-	-	-
6/01/2021	0.11	0.02	0.2	0.2	<0.01
3/02/2021	0.08	0.04	0.2	0.2	<0.01
8/03/2021	0.11	0.02	0.2	0.2	<0.01
29/04/2021	0.08	<0.01	0.2	0.2	0.01
14/05/2021	0.26	<0.01	0.3	0.3	<0.01
RRSW12					
20/12/2016	-	-	-	-	-
26/01/2017	-	-	-	-	-
26/03/2017	-	-	-	-	-
3/02/2021	<0.01	0.02	<0.1	<0.1	<0.01
8/03/2021	0.09	0.03	0.3	0.3	<0.01
29/04/2021	-	-	-	-	-
14/05/2021	-	-	-	-	-
RRSW22					
22/08/2012	-	-	-	-	-
9/12/2012	-	-	-	-	-
20/12/2016	-	-	-	-	-
26/03/2017	-	-	-	-	-
30/06/2018	-	-	-	-	-
22/02/2019	-	-	-	-	-
20/08/2019	-	-	-	-	-
30/10/2019	-	-	-	-	-
9/11/2020	0.02	0.1	<0.1	0.1	<0.01
3/02/2021	<0.01	0.03	<0.1	<0.1	<0.01
29/04/2021	<0.01	<0.01	0.7	0.7	<0.01
RRSW23					
4/12/2020	0.02	0.13	2.4	2.5	0.29
7/01/2021	0.1	0.09	1	1.1	0.16
3/02/2021	<0.01	0.07	0.2	0.3	<0.01
8/03/2021	0.17	0.14	0.4	0.5	0.02
29/04/2021	0.02	0.01	0.3	0.3	0.02
14/05/2021	0.1	0.03	0.2	0.2	0.01

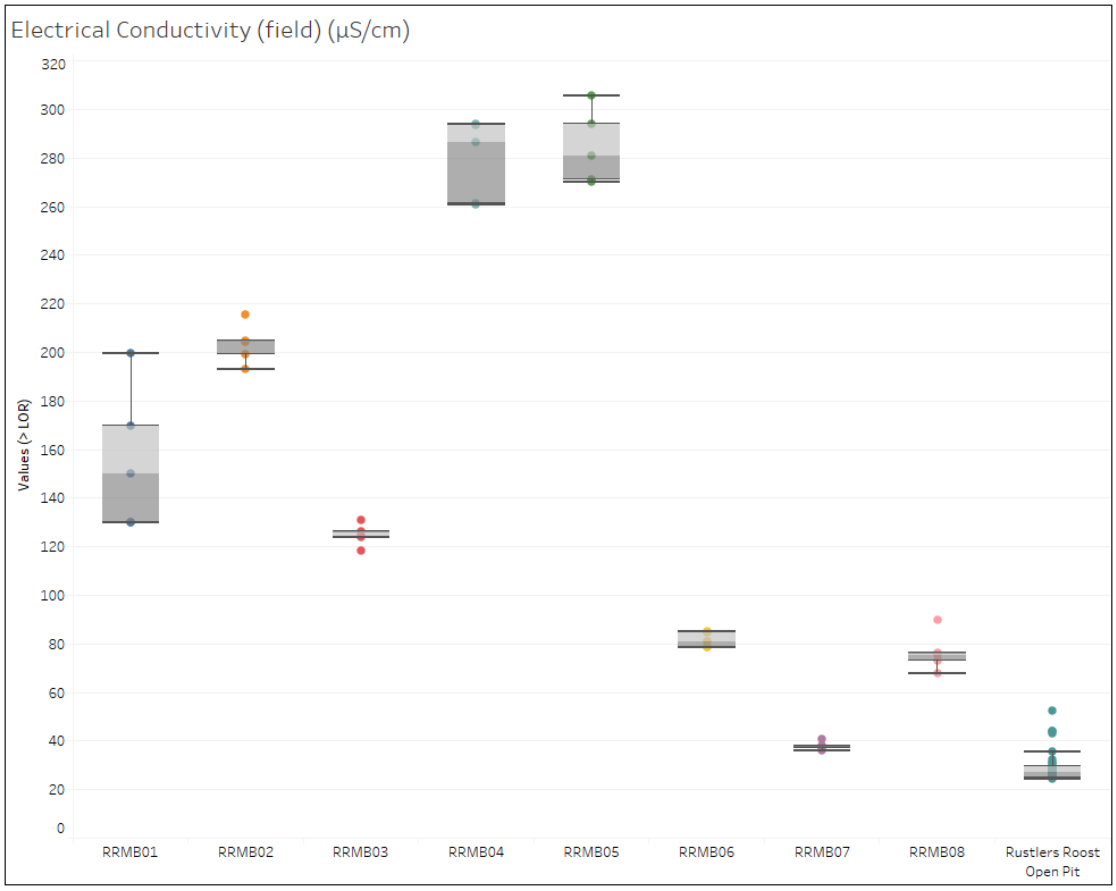
PRIMARY GOLD

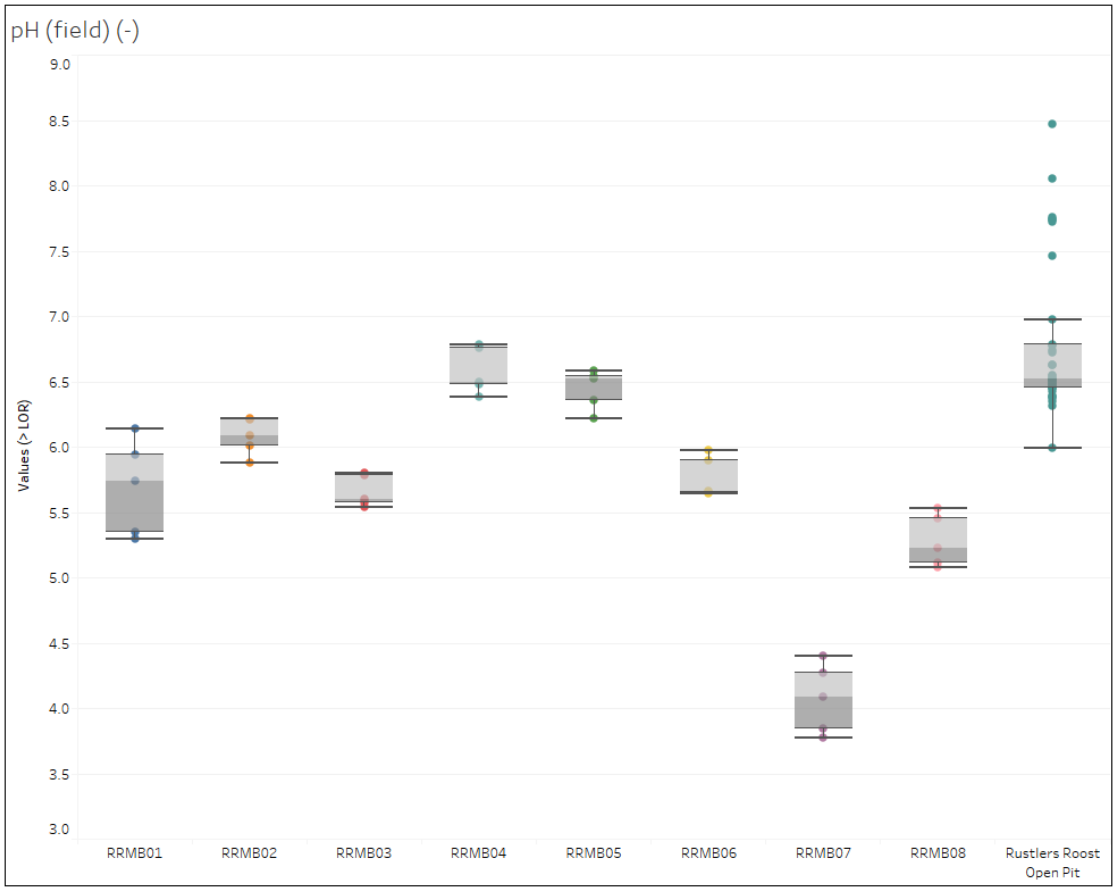
Appendix A-4 - Rustlers Roost Groundwater Box & Whisker Plots (2020-2021)

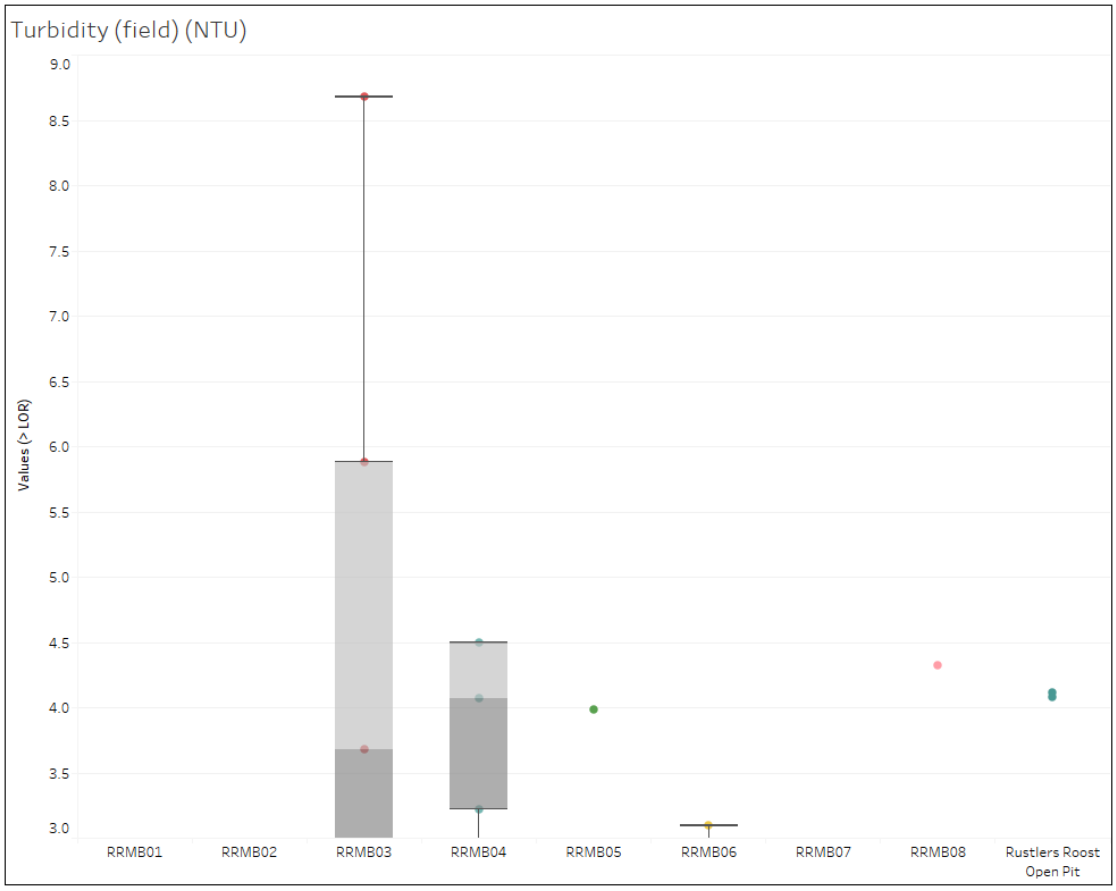
CDM Smith

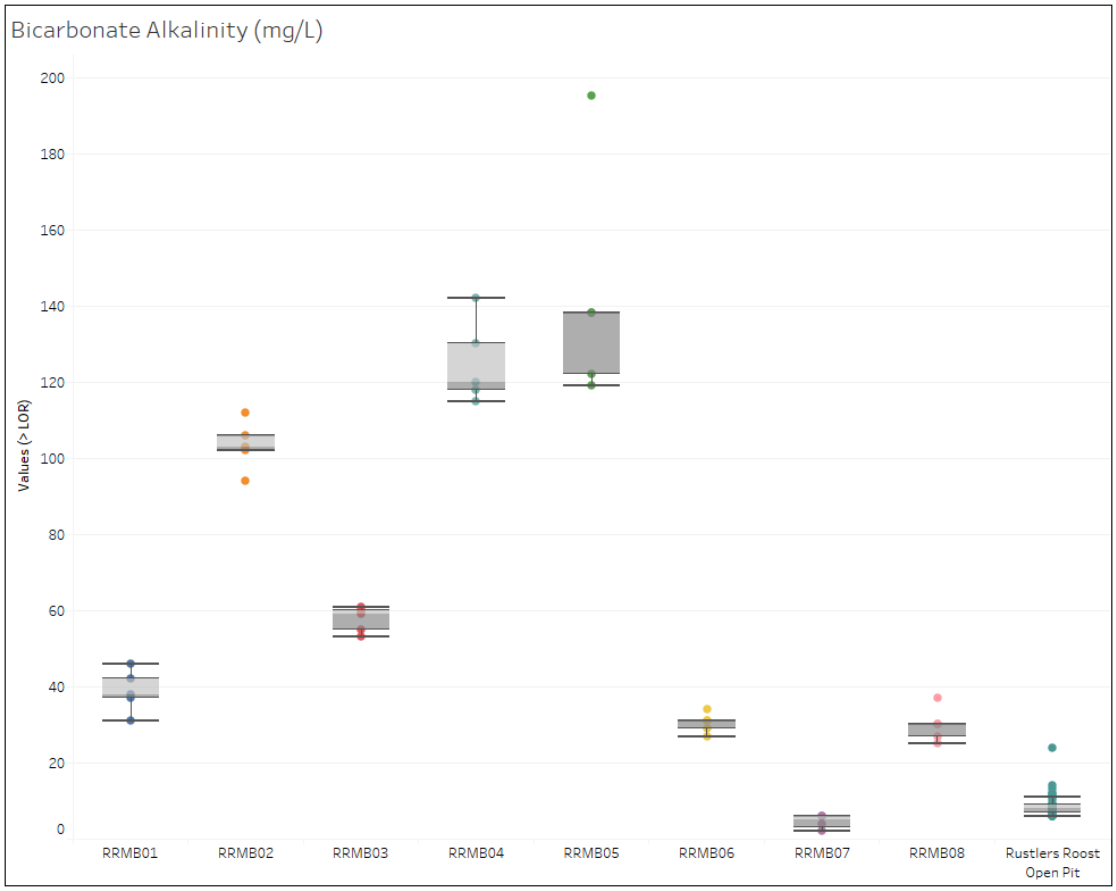
cdmsmith.com

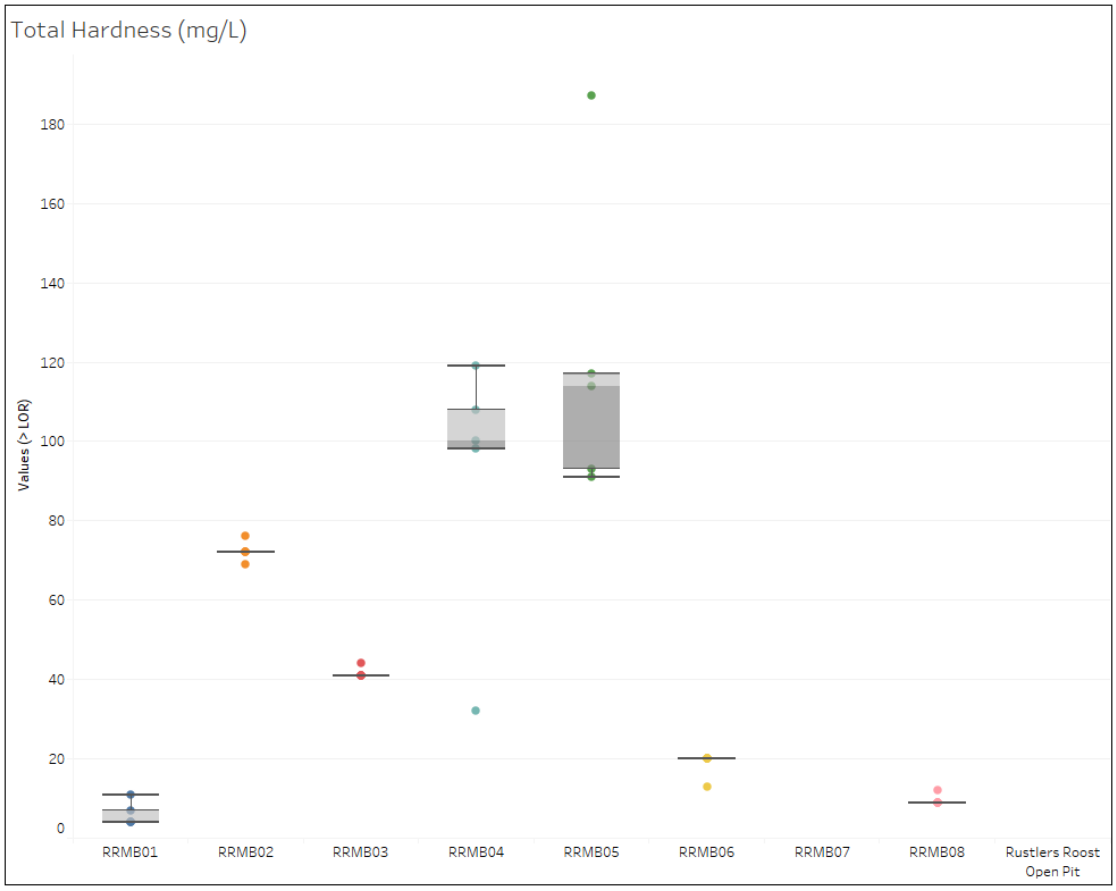

Dissolved Oxygen (%sat) (field) (%)
Values (> LOR)
100
90
80
70
60
50
40
30
20
10
0
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

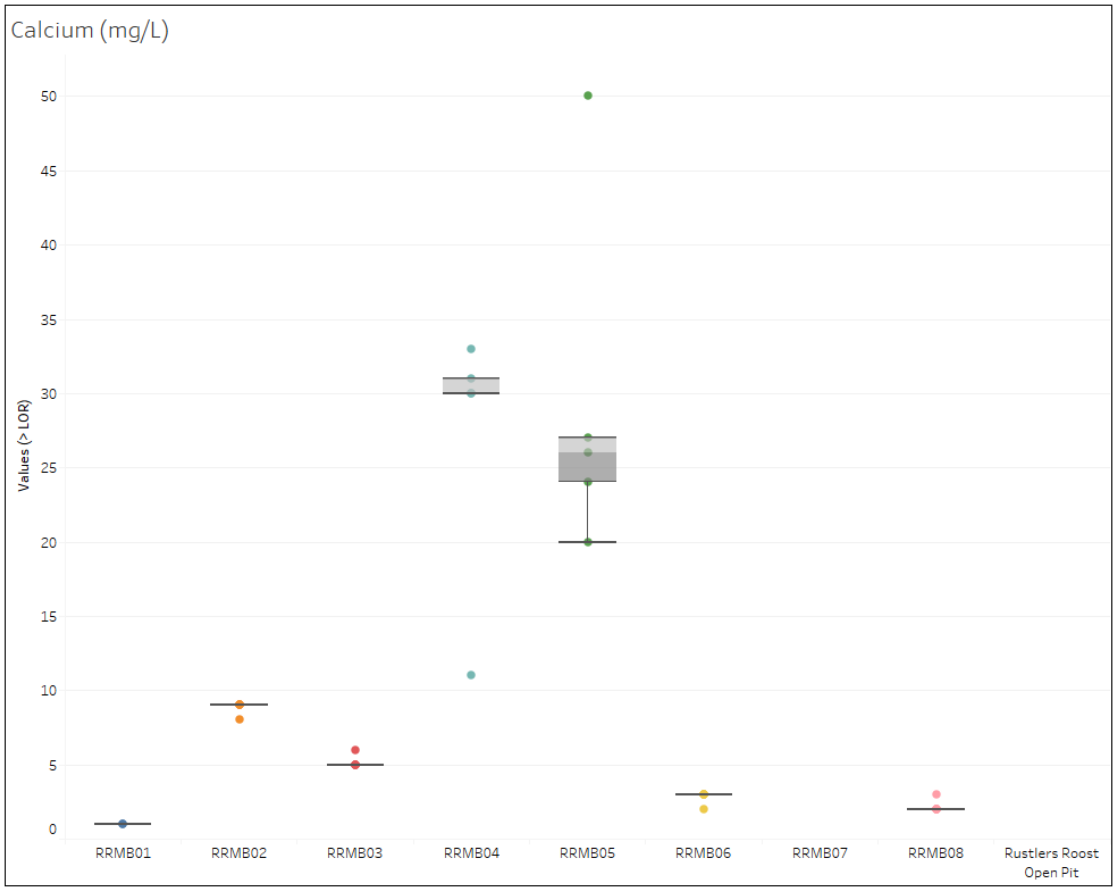

Electrical Conductivity (field) (µS/cm)
Values (> LOR)
320
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

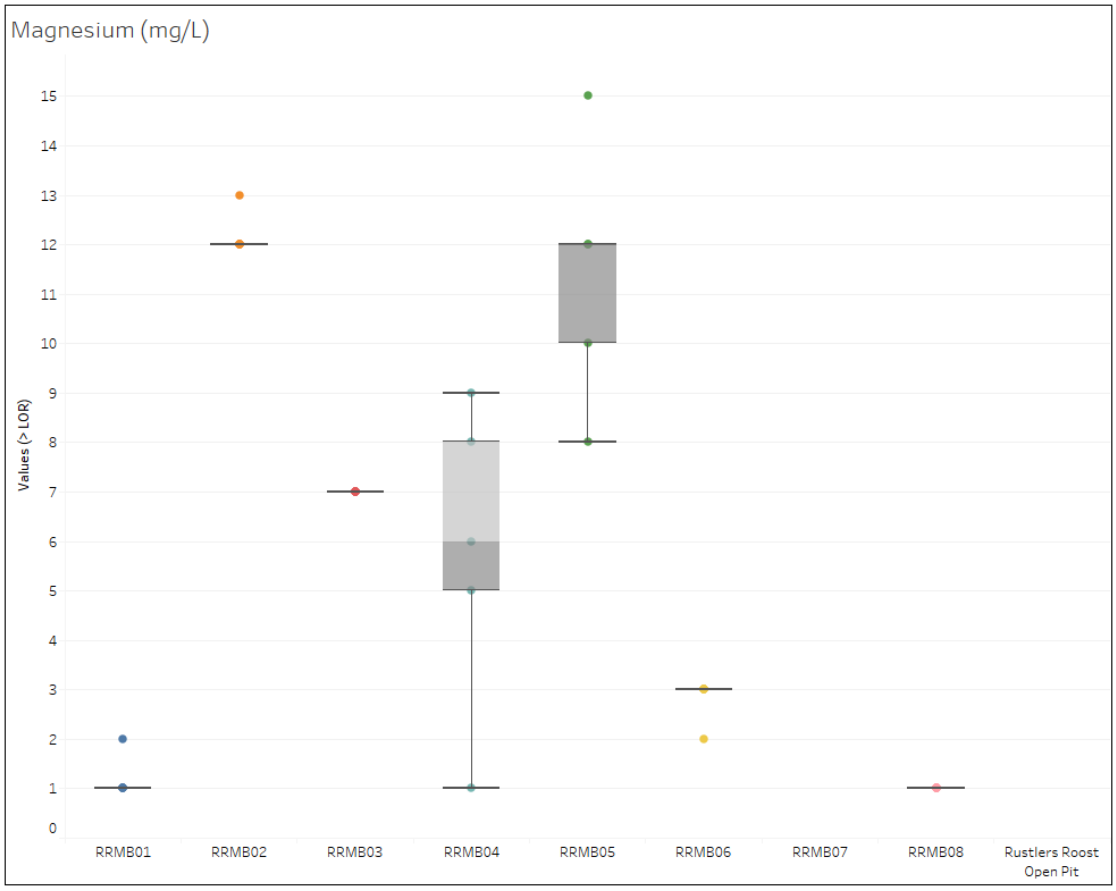

pH (field) (-)
Values (> LOR)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

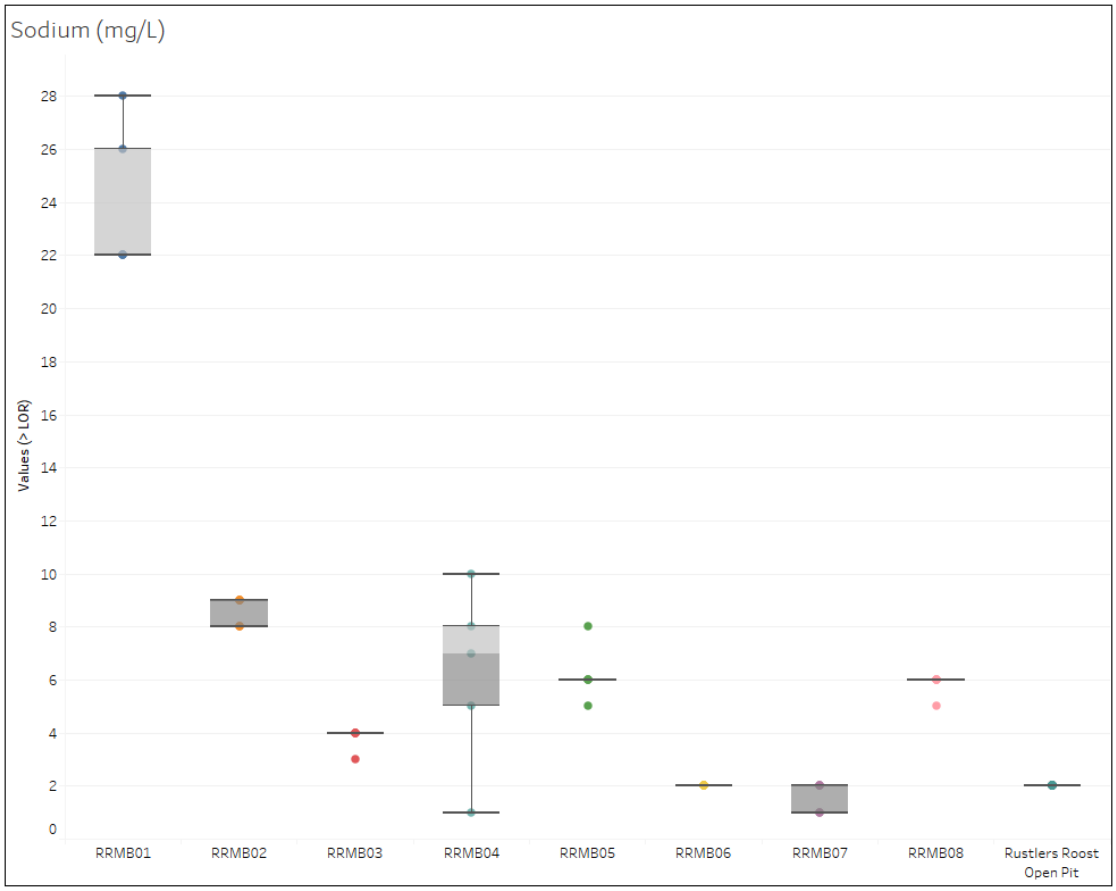

Turbidity (field) (NTU)
Values (> LOR)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

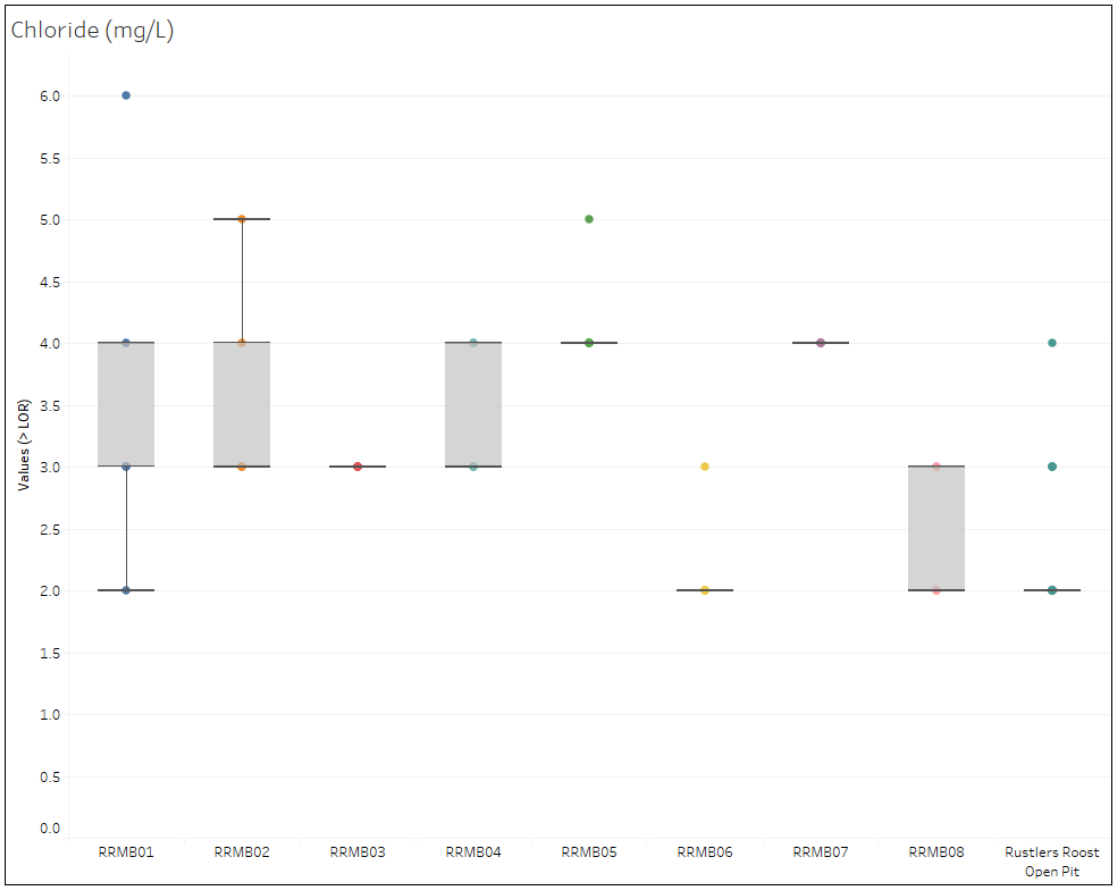

Bicarbonate Alkalinity (mg/L)
Values (> LOR)
200
180
160
140
120
100
80
60
40
20
0
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

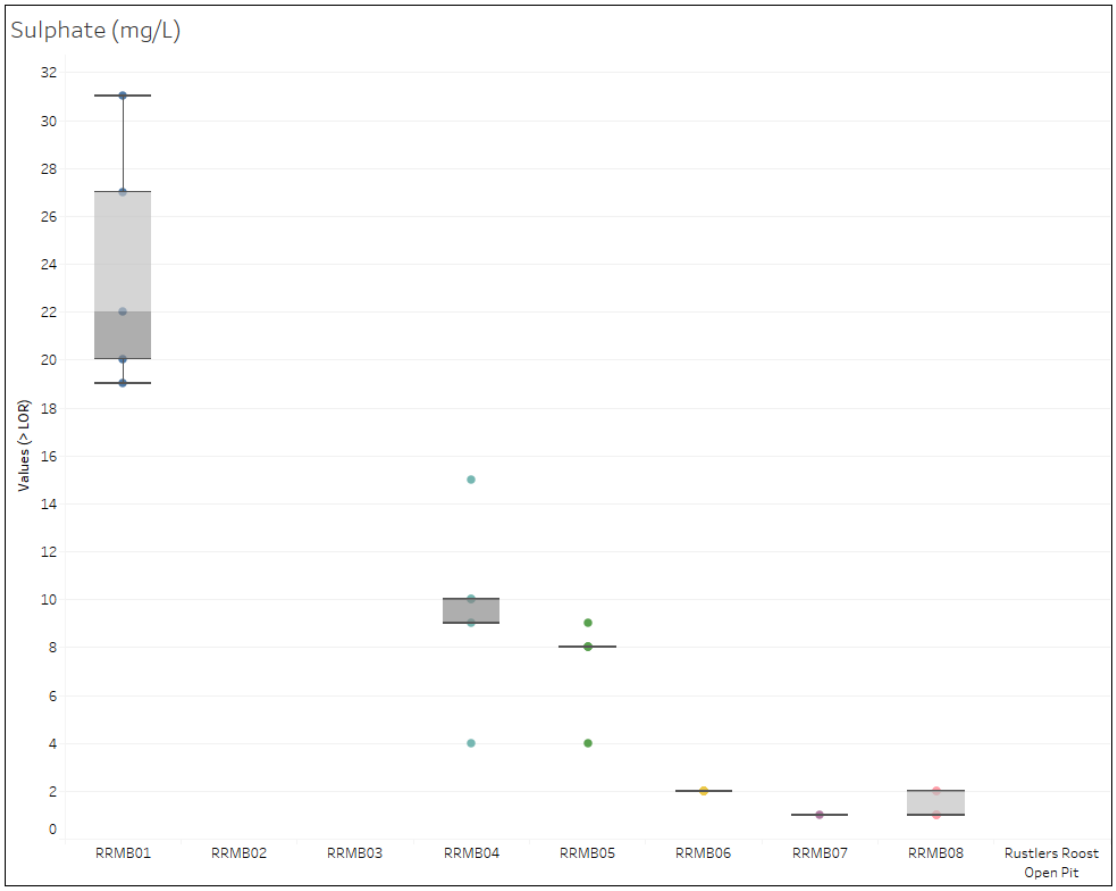

Total Hardness (mg/L)
Values (> LOR)
180
160
140
120
100
80
60
40
20
0
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

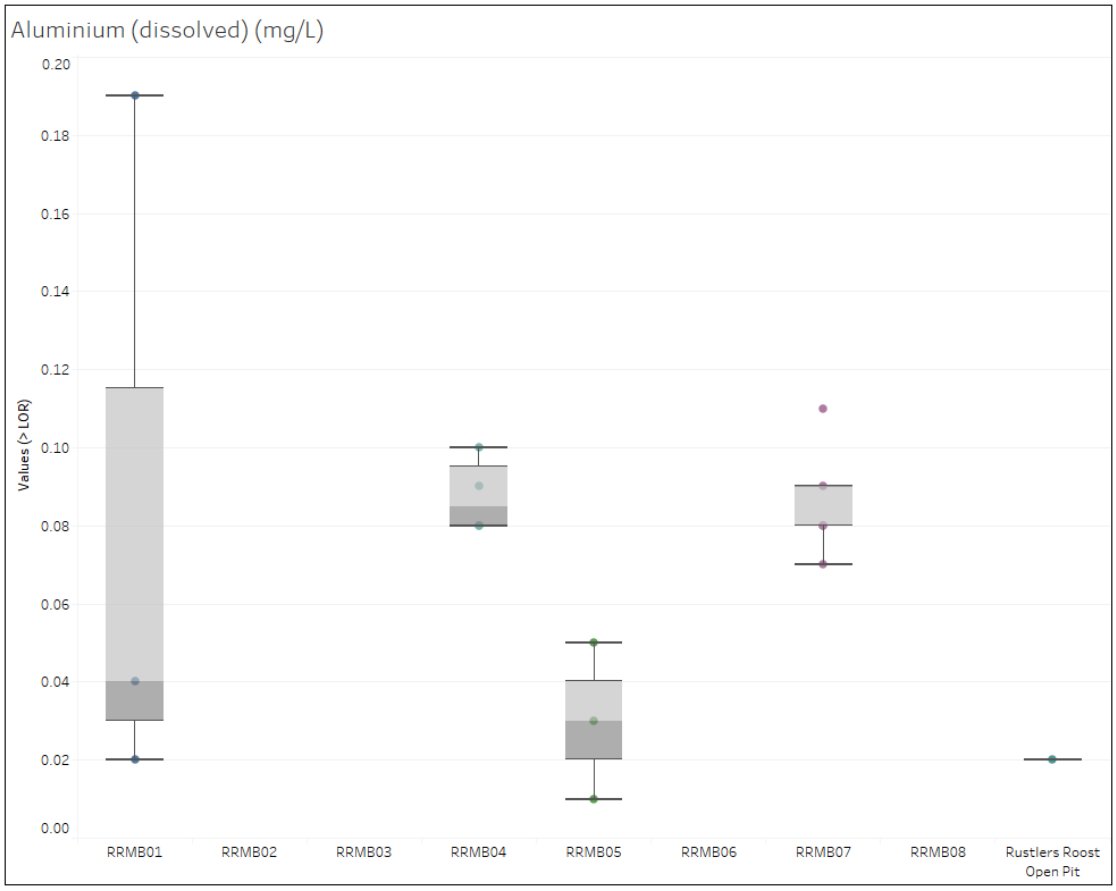

Calcium (mg/L)
Values (> LOR)
50
45
40
35
30
25
20
15
10
5
0
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

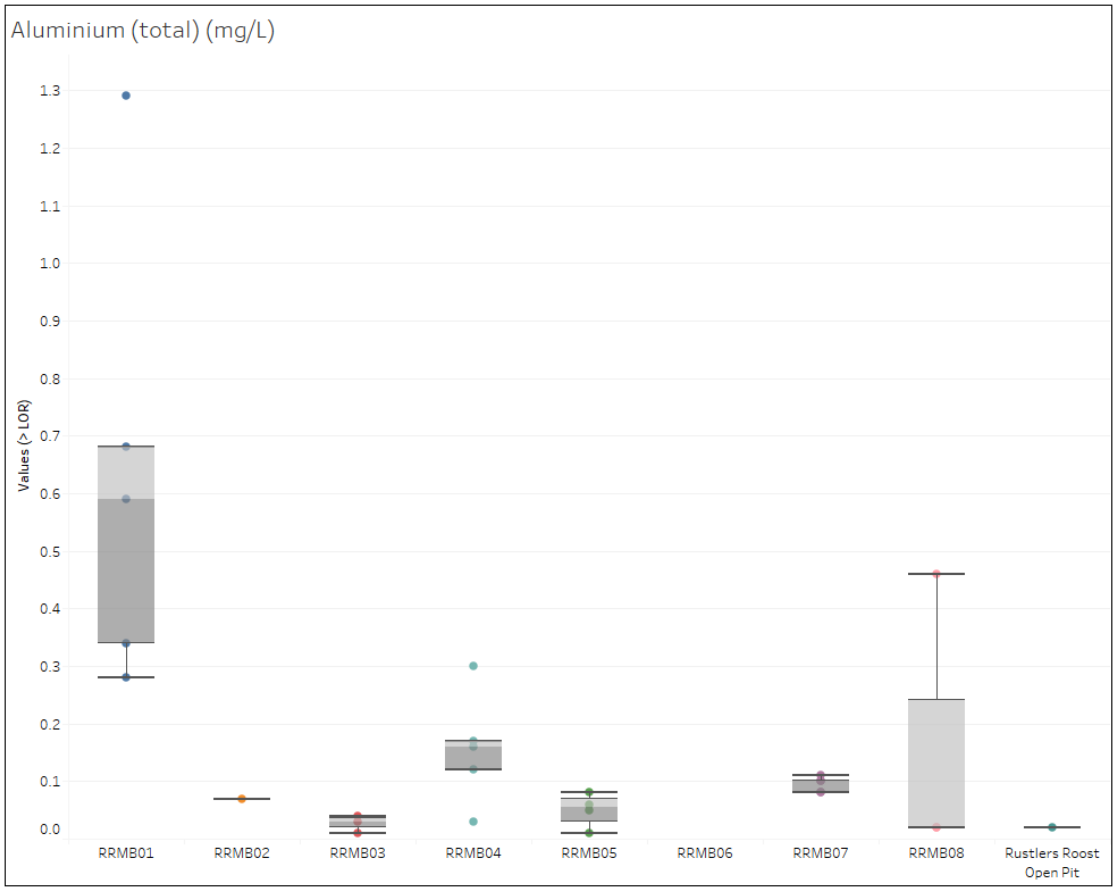

Magnesium (mg/L)
Values (> LOR)
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

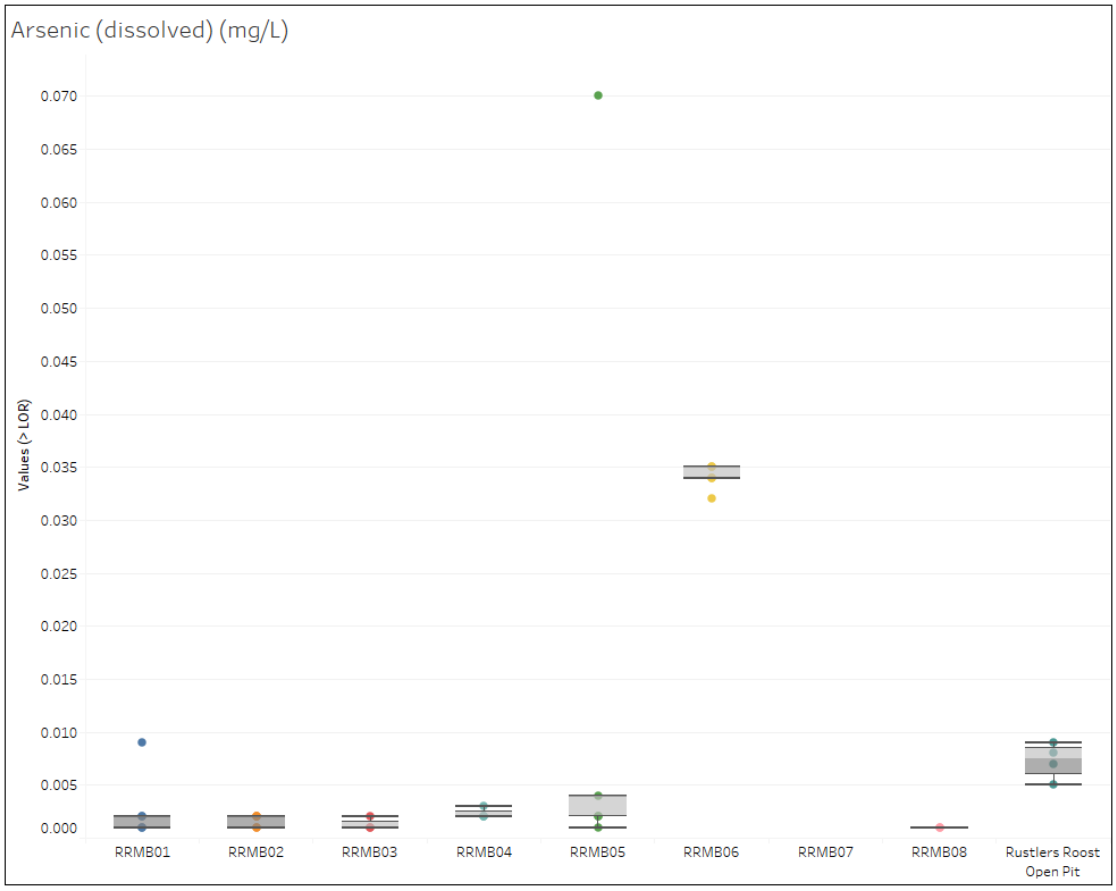

Sodium (mg/L)
Values (> LOR)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

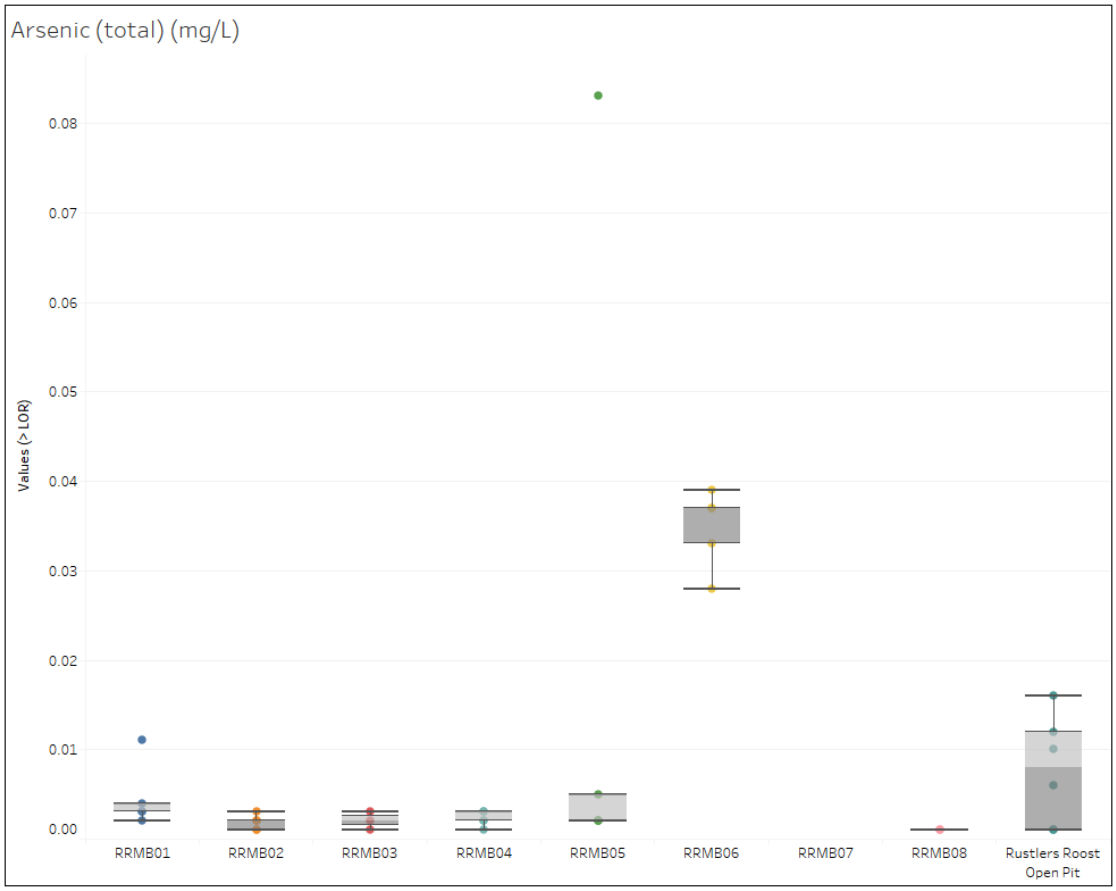

Chloride (mg/L)
Values (> LOR)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

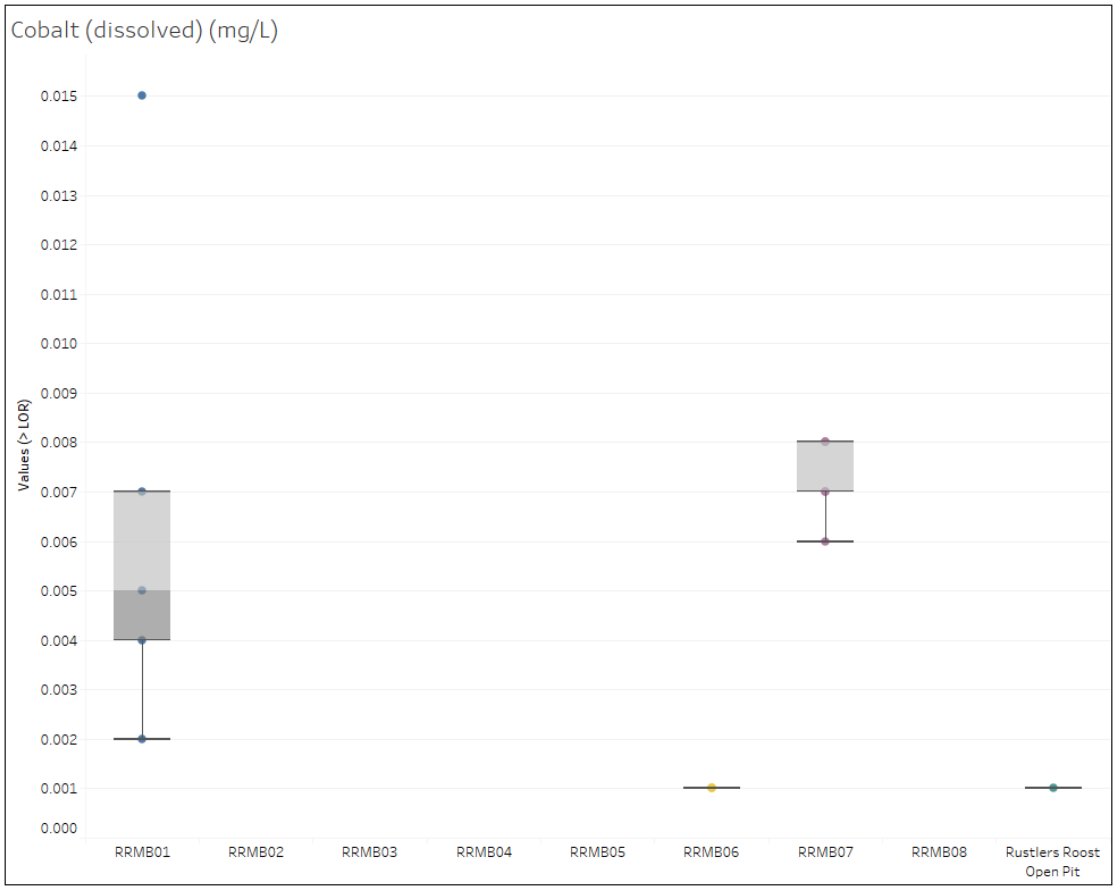

Sulphate (mg/L)
Values (> LOR)
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

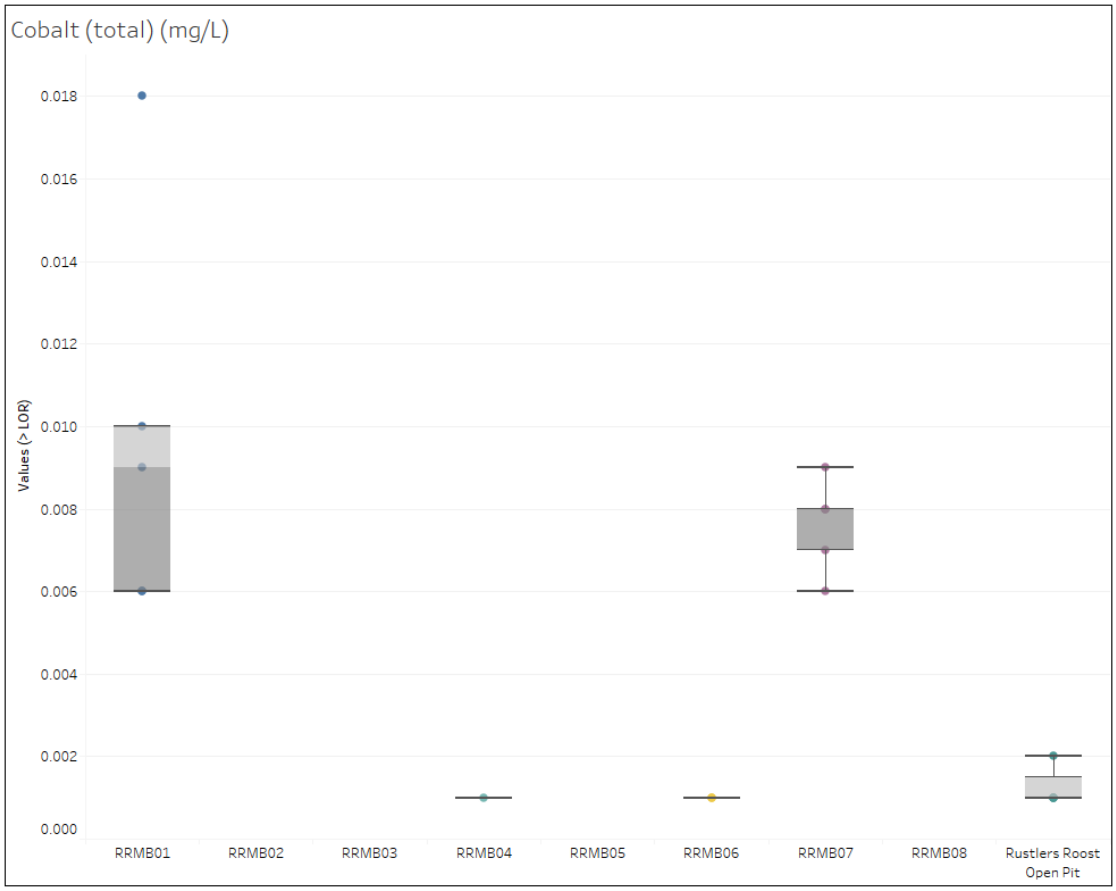

Aluminium (dissolved) (mg/L)
Values (> LOR)
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

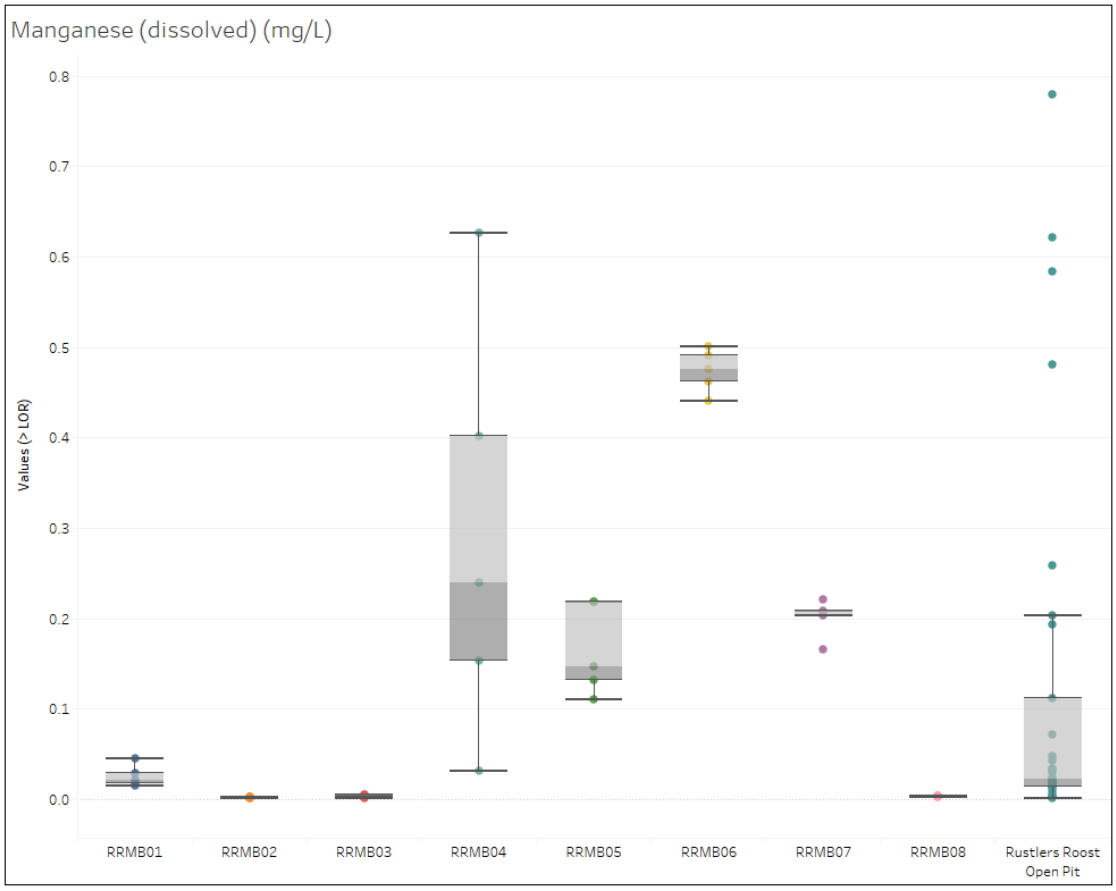

Aluminium (total) (mg/L)
Values (> LOR)
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

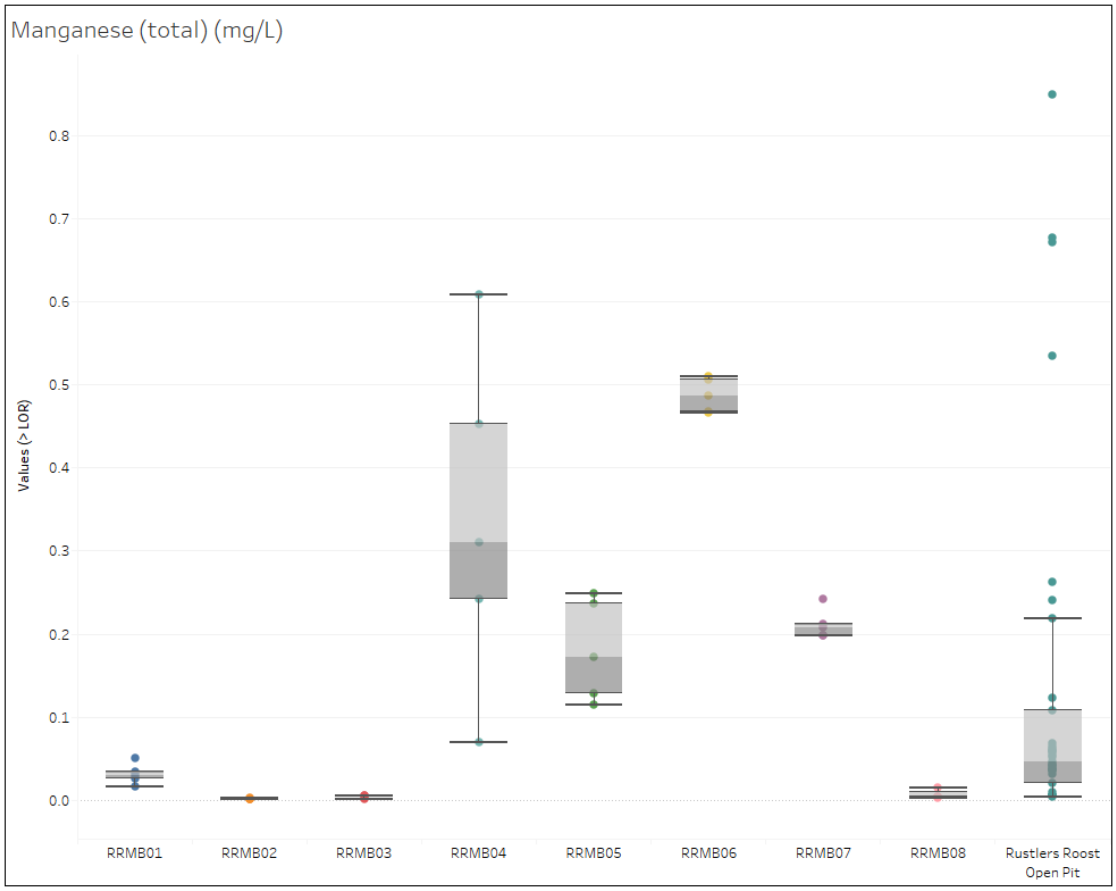

Arsenic (dissolved) (mg/L)
Values (> LOR)
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

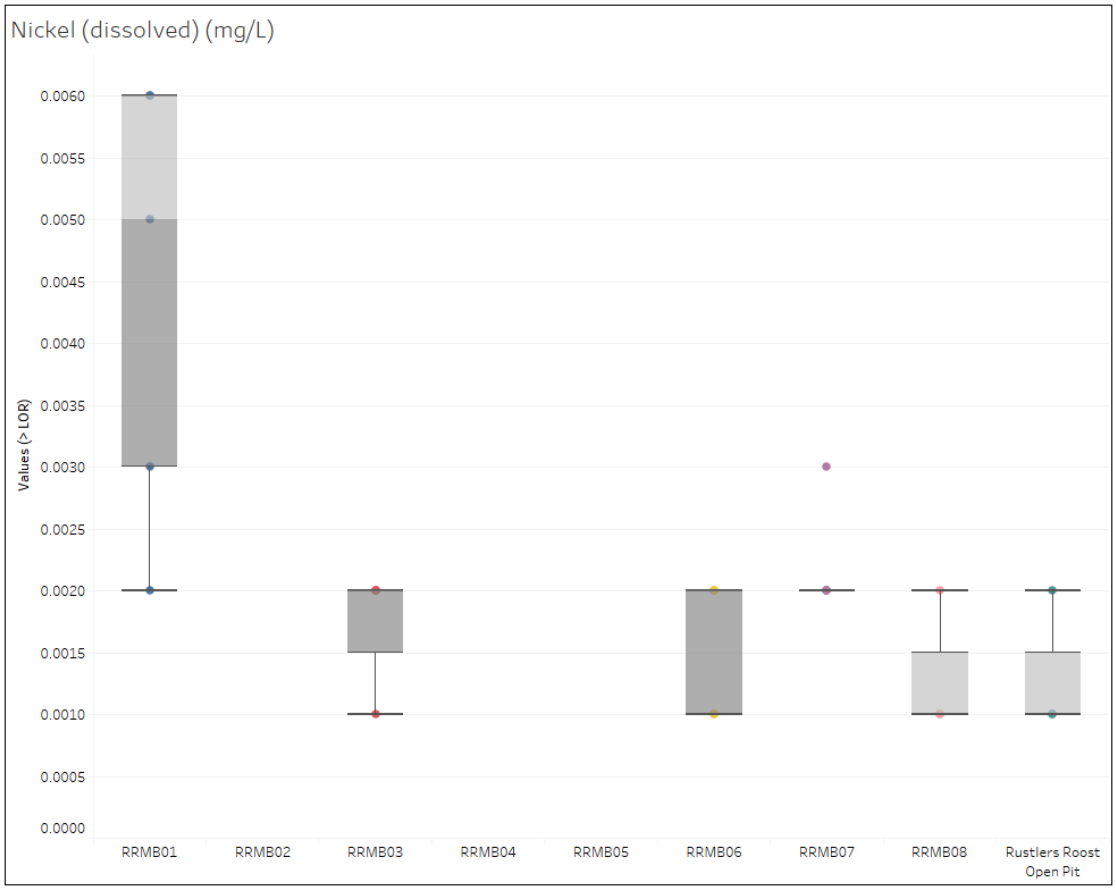

Arsenic (total) (mg/L)
Values (> LOR)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

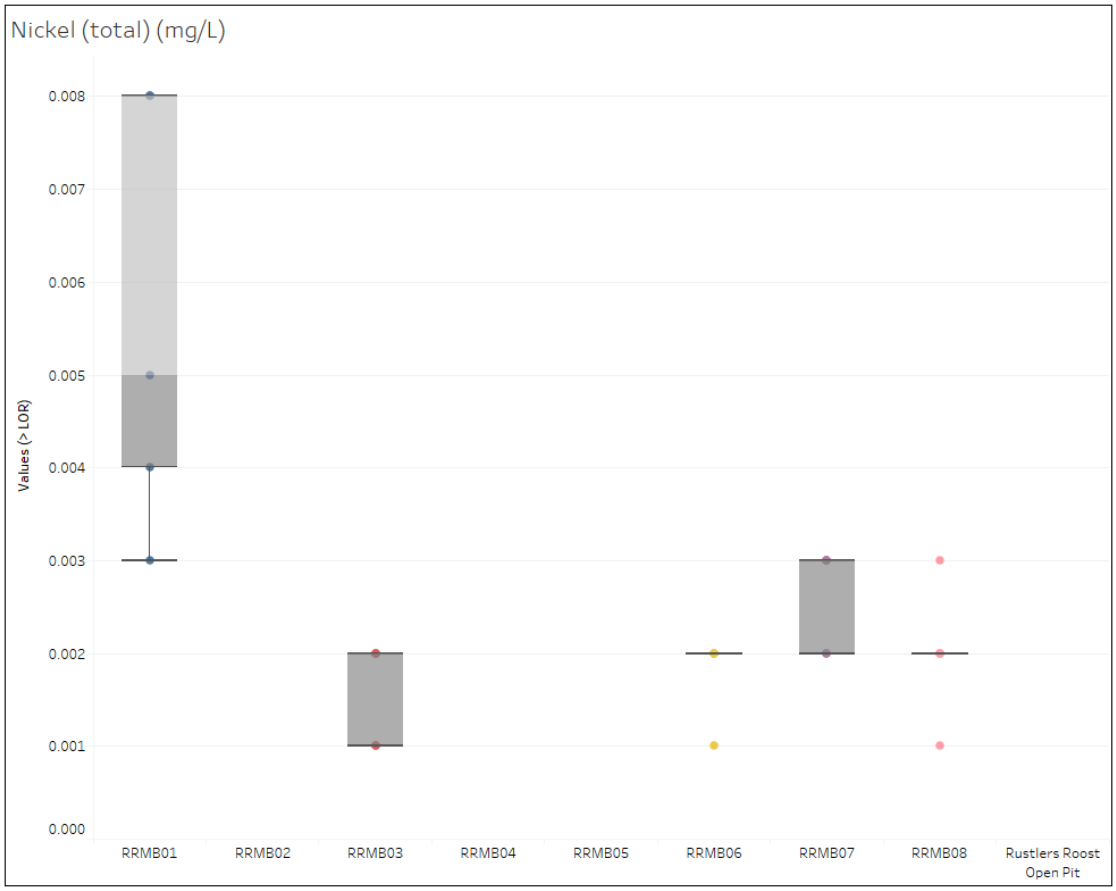

Cobalt (dissolved) (mg/L)
Values (> LOR)
0.015
0.014
0.013
0.012
0.011
0.010
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

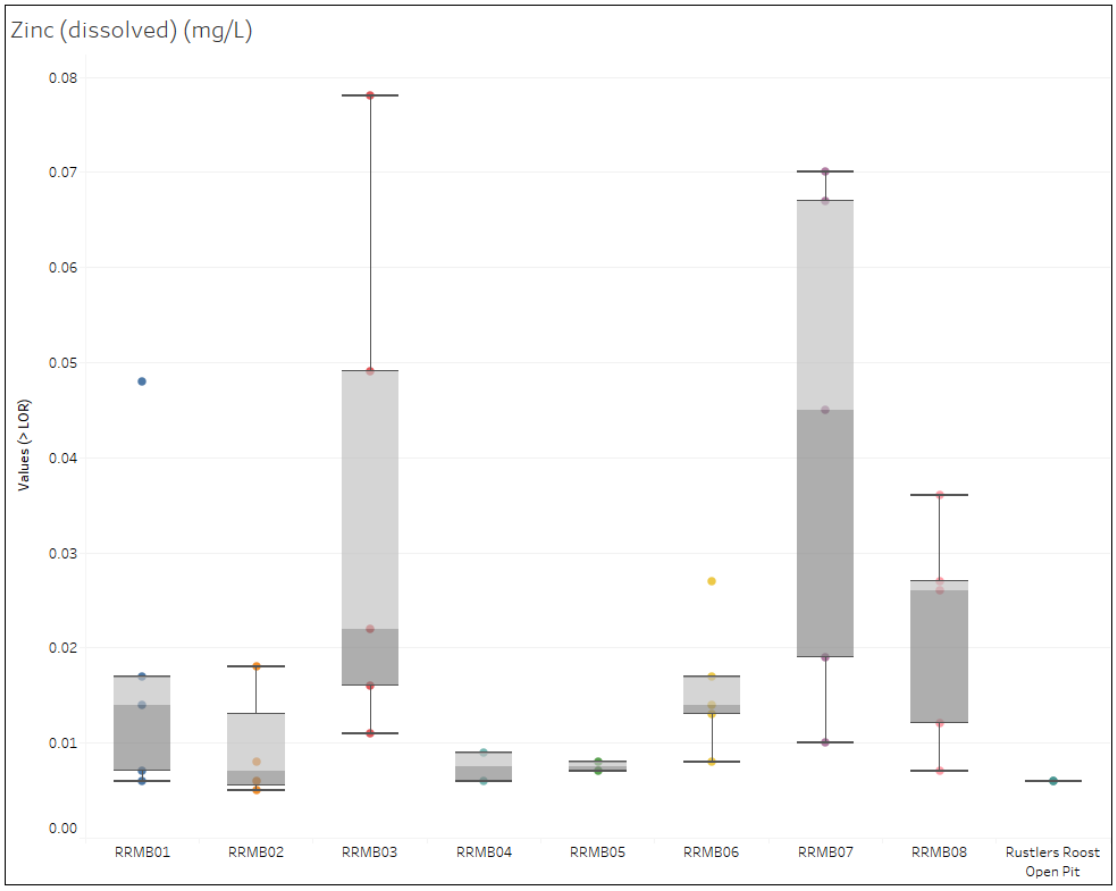

Cobalt (total) (mg/L)
Values (> LOR)
0.018
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

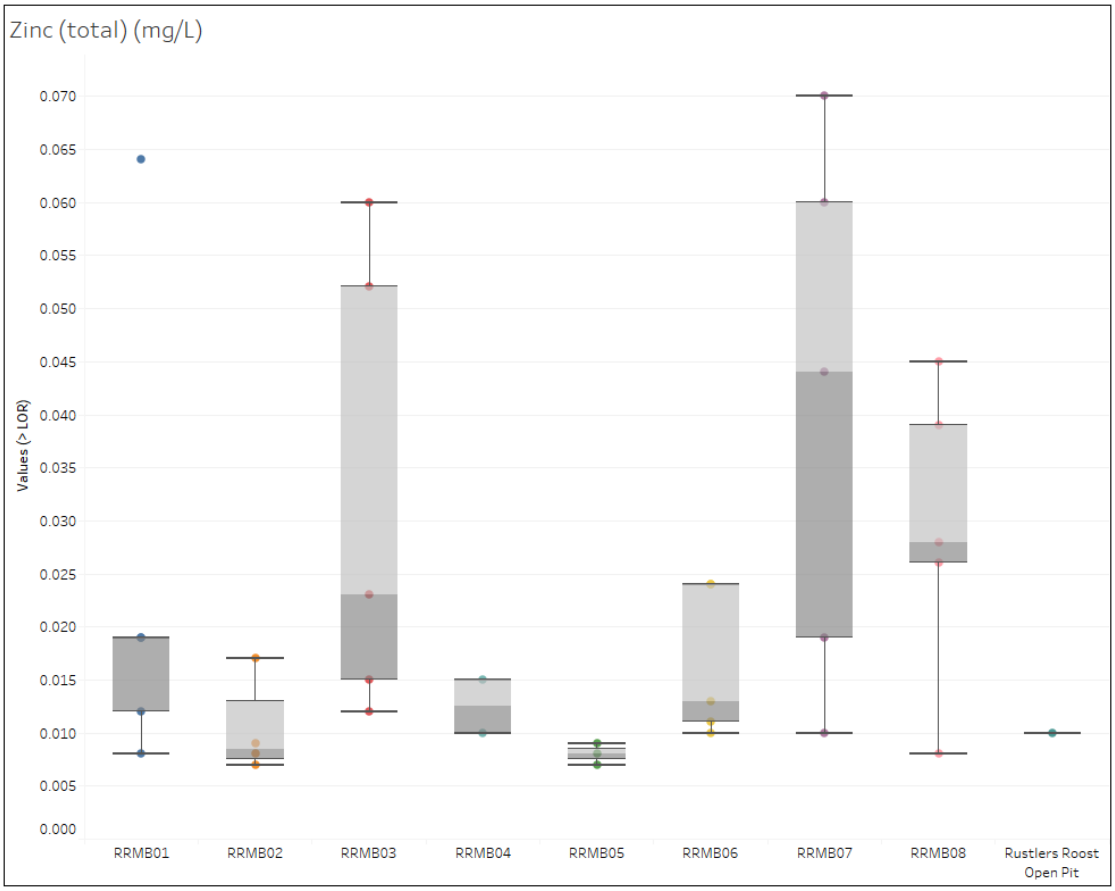

Manganese (dissolved) (mg/L)
Values (> LOR)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

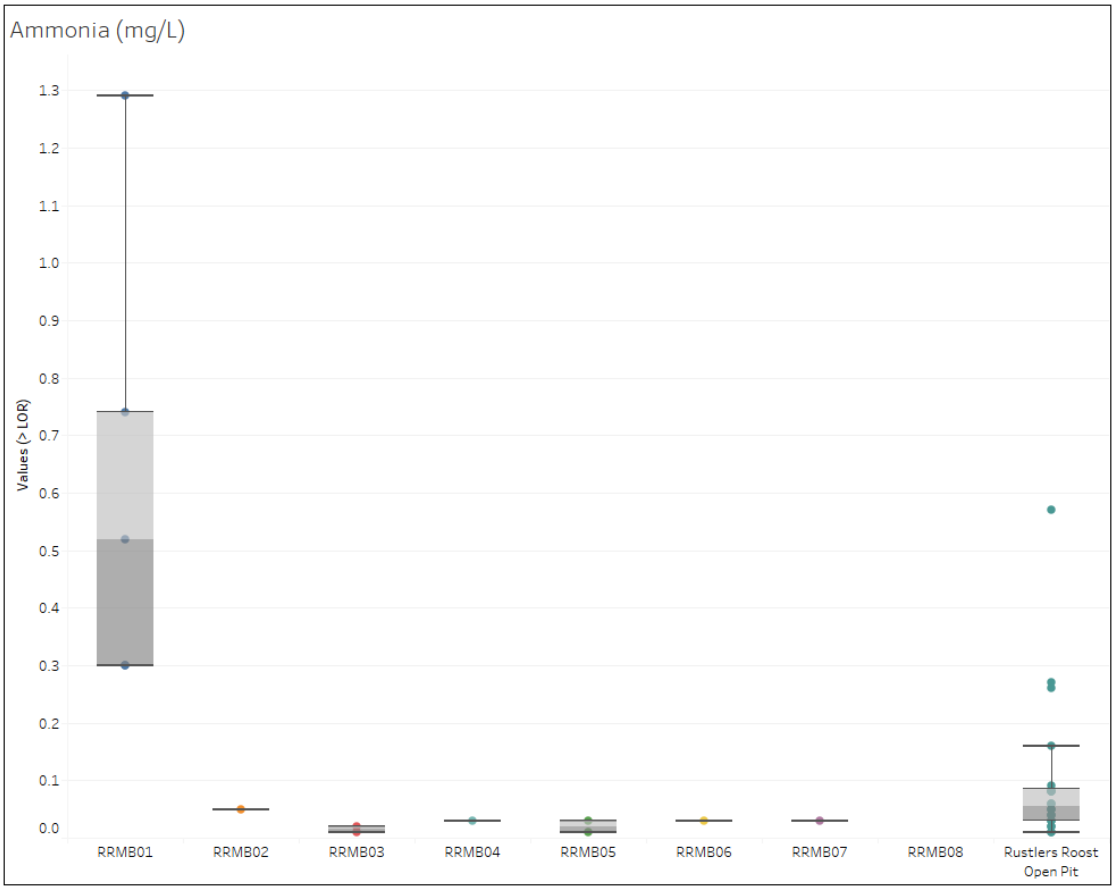

Manganese (total) (mg/L)
Values (> LOR)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

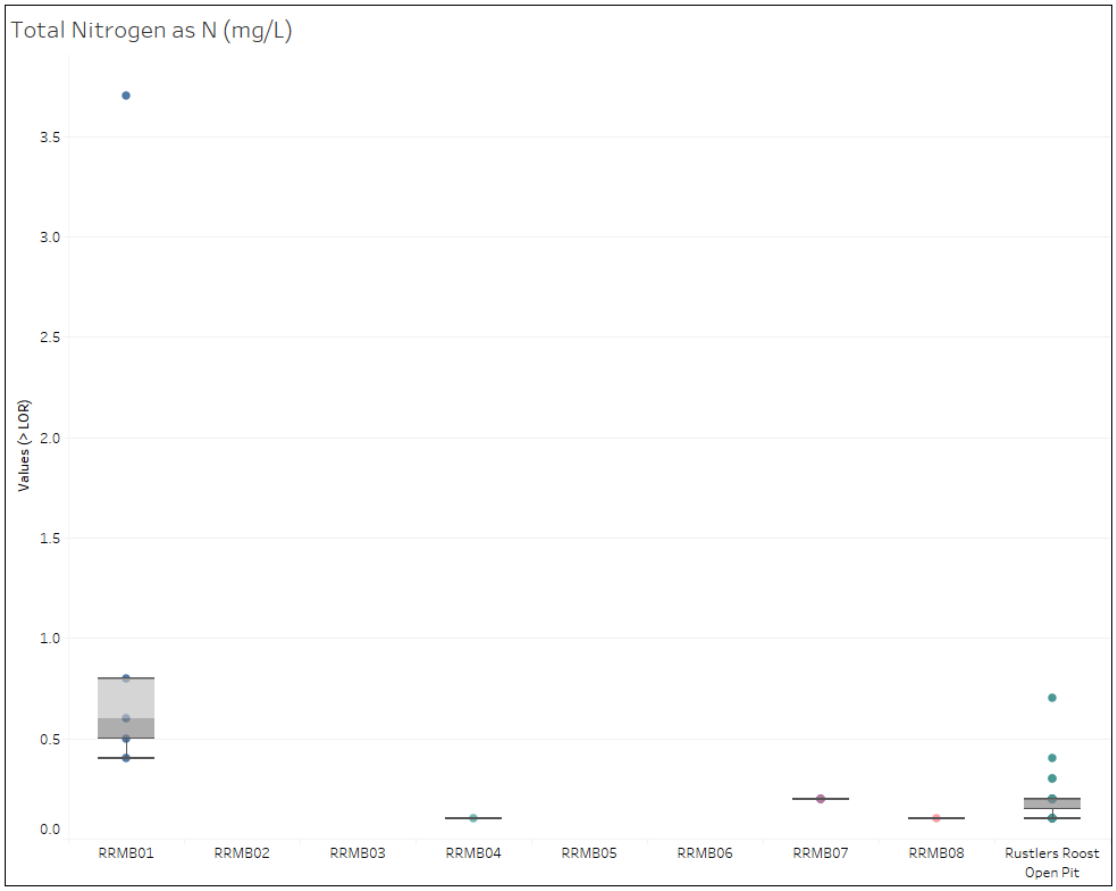

Nickel (dissolved) (mg/L)
Values (> LOR)
0.0060
0.0055
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

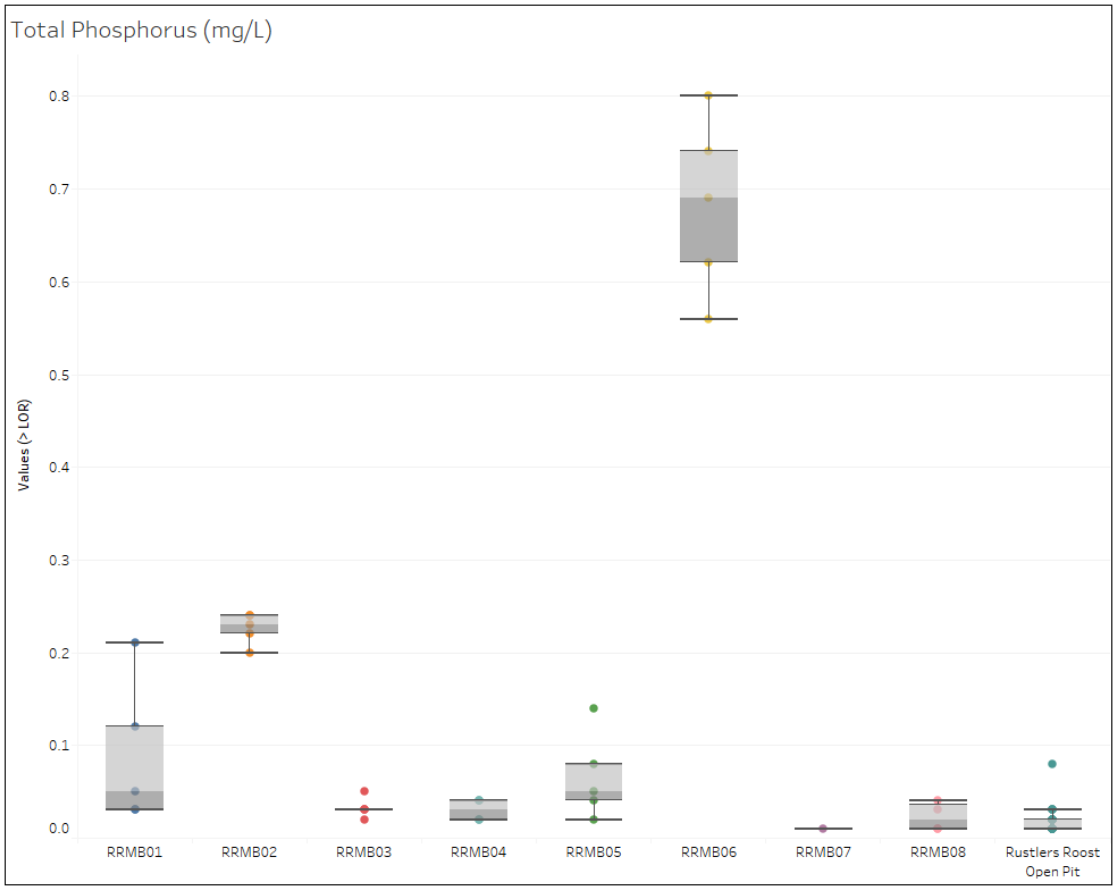

Nickel (total) (mg/L)
Values (> LOR)
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit


Zinc (dissolved) (mg/L)
Values (> LOR)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit


Zinc (total) (mg/L)
Values (> LOR)
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit


Ammonia (mg/L)
Values (> LOR)
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit


Total Nitrogen as N (mg/L)
Values (> LOR)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit


Total Phosphorus (mg/L)
Values (> LOR)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
RRMB01
RRMB02
RRMB03
RRMB04
RRMB05
RRMB06
RRMB07
RRMB08
Rustlers Roost Open Pit

Appendix B - Quest 29 2020-2021 Water Quality Monitoring Results

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Appendix B-1 - Quest 29 Groundwater Monitoring Results (2020-2021)

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Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements
Analyte	Electrical Conductivity	pH	Temperature	Turbidity	Salinity	Total Dissolved Solids	Oxidation-Reduction Potential	Dissolved Oxygen
Analyte Short Name	EC (field)	pH (field)	Temp (field)	Turbidity (field)	Salinity (field)	TDS (field)	ORP (field)	DO %sat (field)
Units	µS/cm	-	°C	NTU	ppt	mg/L	mV	%
Toms Gully SSTV (80th percentile)	41	5.8 - 8.0	-	87	-	-	-	-
Tropical Australia Lowland Rivers	20 - 250	6.0 - 8.0	-	2 - 15	-	-	-	85-120
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	4000	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-	-
Q29MB01								
08/11/2010	1213	6.85	-	-	-	-	-	-
03/12/2010	1174	6.49	-	-	-	-	-	-
25/01/2011	1079	6.09	-	-	-	-	-	-
09/05/2011	210.4	6.2	-	-	-	-	-	-
22/11/2011	964	6.81	-	-	-	-	-	-
30/01/2012	1095	6.97	-	-	-	-	-	-
27/04/2012	932	6.92	-	-	-	-	-	-
22/08/2012	1128	6.46	-	290	-	-	-	-
01/09/2015	1013	7.33	-	290	-	-	-	-
11/12/2015	954	7.1	-	270	-	-	-	-
18/01/2016	-	6.61	-	50	-	-	-	-
11/05/2016	937	7.2	-	-	-	-	-	-
02/09/2016	-	-	-	3	-	-	-	-
30/06/2018	730	6.8	-	5	-	-	-	-
15/09/2020	-	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-	-
17/11/2020	1043	6.49	32.5	3.17	0.51	676	-49	1.7
04/12/2020	-	-	-	-	-	-	-	-
11/01/2021	1012	5.96	32.2	4.67	0.5	658	-185	6.4
03/02/2021	-	-	-	-	-	-	-	-
11/03/2021	985	6.44	33	4.29	0.48	637	-30.7	1.7
16/04/2021	-	-	-	-	-	-	-	-
28/04/2021	988	6.47	32.3	3.43	0.47	643	-54	4
09/07/2021	918	6.38	31.8	3.72	0.45	598	-57	3
Q29MB02								
22/11/2011	274	6.74	-	-	-	-	-	-
30/01/2012	328.4	6.9	-	-	-	-	-	-
22/08/2012	285.8	6.49	-	400	-	-	-	-
01/09/2015	272	7.5	-	270	-	-	-	-
11/12/2015	284	7.6	-	300	-	-	-	-
18/01/2016	-	6.49	-	-	-	-	-	-
11/05/2016	336	7.5	-	-	-	-	-	-
02/09/2016	-	-	-	8	-	-	-	-
11/01/2017	-	6.9	-	7	-	-	-	-
26/03/2017	-	6.6	-	5	-	-	-	-
30/06/2018	210	6.9	-	11	-	-	-	-
15/09/2020	-	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-	-
17/11/2020	334	6.48	33.1	6.41	0.16	218	-84.6	2.2
04/12/2020	-	-	-	-	-	-	-	-
11/01/2021	336.1	5.54	32.9	0.32	0.2	218.5	-196	4.9
03/02/2021	-	-	-	-	-	-	-	-
11/03/2021	250.9	6.09	33.7	3.45	0.12	163.8	39	1.6
16/04/2021	-	-	-	-	-	-	-	-
28/04/2021	337	6.25	33.1	2.07	0.16	219	-54	3.1
08/07/2021	241.5	6.01	32.8	0.7	0.11	156	33.5	2.2
Q29MB03								
16/11/2020	83.5	5.86	33.6	5.4	0.04	54.6	116	38.5
04/12/2020	-	-	-	-	-	-	-	-

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements
Analyte	Electrical Conductivity	pH	Temperature	Turbidity	Salinity	Total Dissolved Solids	Oxidation-Reduction Potential	Dissolved Oxygen
Analyte Short Name	EC (field)	pH (field)	Temp (field)	Turbidity (field)	Salinity (field)	TDS (field)	ORP (field)	DO %sat (field)
Units	µS/cm	-	°C	NTU	ppt	mg/L	mV	%
Toms Gully SSTV (80th percentile)	41	5.8 - 8.0	-	87	-	-	-	-
Tropical Australia Lowland Rivers	20 - 250	6.0 - 8.0	-	2 - 15	-	-	-	85-120
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	4000	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-	-
11/01/2021	75.8	4.7	31.1	1.83	0	49.5	192	33.1
03/02/2021	-	-	-	-	-	-	-	-
11/03/2021	49	4.69	32.6	2.31	0.02	31.8	151.9	59.9
16/04/2021	-	-	-	-	-	-	-	-
29/04/2021	42.4	4.84	33.1	3.64	0.02	27.5	120	45
09/07/2021	38.5	4.47	32.2	0.98	0.02	25.1	122.2	45.9
Q29MB04								
16/11/2020	446	6.77	32.1	3.4	0.21	292	0.8	1.1
04/12/2020	-	-	-	-	-	-	-	-
07/01/2021	397.6	6.68	31.5	0.6	0.2	257.9	-104	9.9
03/02/2021	-	-	-	-	-	-	-	-
09/03/2021	391.7	6.56	31.5	0.39	0.18	254.8	-21.7	4.8
16/04/2021	-	-	-	-	-	-	-	-
28/04/2021	406	6.6	31.4	12.3	0.19	264	-36	4.2
09/07/2021	381	6.46	32	1.69	0.18	247	-4	2.5
Q29MB05								
17/11/2020	463	6.89	31.4	2.11	0.22	299	-44.5	1.7
04/12/2020	-	-	-	-	-	-	-	-
07/01/2021	432.1	6.86	31.5	0.6	0.2	281	-101	6
03/02/2021	-	-	-	-	-	-	-	-
08/03/2021	419.5	6.39	31.1	1.47	0.2	27.3	2.1	11.9
16/04/2021	-	-	-	-	-	-	-	-
28/04/2021	4.29	6.77	31.1	3.94	0.2	278	-21	4.5
09/07/2021	406.3	6.6	31.8	0.55	0.19	264	-23.4	2
Q29MB06								
16/11/2020	212	6.2	32.2	3.32	0.1	139	13.8	1.4
04/12/2020	-	-	-	-	-	-	-	-
11/01/2021	182.4	4.73	31.4	0.89	0.1	118.6	-52	12.4
03/02/2021	-	-	-	-	-	-	-	-
11/03/2021	166	5.93	32.6	0.68	0.08	118.9	23.8	2
16/04/2021	-	-	-	-	-	-	-	-
28/04/2021	181	5.93	31.7	1.82	0.08	117	19.8	3.9
09/07/2021	176	5.9	31.5	0.78	0.08	115	40.2	2.2
Q29MB07								
16/11/2020	437	6.53	32.4	2.67	0.21	284	-102	1
04/12/2020	-	-	-	-	-	-	-	-
07/01/2021	407.2	6.58	31.8	0.95	0.2	264.7	-154	4.7
03/02/2021	-	-	-	-	-	-	-	-
11/03/2021	382	6.44	32.2	1.35	0.18	247	-54.7	1.4
16/04/2021	-	-	-	-	-	-	-	-
28/04/2021	402	6.5	31.7	0.98	0.19	363	-29	4.1
09/07/2021	371	6.46	31.4	1	0.17	241	-32	2.3
Q29MB08								
16/11/2020	447	6.46	33	2.46	0.21	292	-52	1.2
04/12/2020	-	-	-	-	-	-	-	-
07/01/2021	428.4	6.47	32.4	1.12	0.2	278.4	-237	6
03/02/2021	-	-	-	-	-	-	-	-
09/03/2021	415.8	6.36	32.9	1.09	0.2	270	-87.5	1.7
16/04/2021	-	-	-	-	-	-	-	-
29/04/2021	439	6.4		1.98	0.22	286	-104	3.1

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements
Analyte	Electrical Conductivity	pH	Temperature	Turbidity	Salinity	Total Dissolved Solids	Oxidation-Reduction Potential	Dissolved Oxygen
Analyte Short Name	EC (field)	pH (field)	Temp (field)	Turbidity (field)	Salinity (field)	TDS (field)	ORP (field)	DO %sat (field)
Units	µS/cm	-	°C	NTU	ppt	mg/L	mV	%
Toms Gully SSTV (80th percentile)	41	5.8 - 8.0	-	87	-	-	-	-
Tropical Australia Lowland Rivers	20 - 250	6.0 - 8.0	-	2 - 15	-	-	-	85-120
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	4000	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-	-
09/07/2021	596	6.61	32	1.8	0.28	390	-112	7.4
16/11/2020	259.7	6.13	31.7	11.1	0.12	169	36.8	1.9
04/12/2020	-	-	-	-	-	-	-	-
07/01/2021	232.7	6	31.4	2.29	0.1	151.2	20	10.9
03/02/2021	-	-	-	-	-	-	-	-
11/03/2021	211.3	5.82	31.8	0.35	0.1	137.8	35.9	1.4
16/04/2021	-	-	-	-	-	-	-	-
06/05/2021	238.8	5.87	30.7	1.08	0.11	155.3	66.2	13.7
08/07/2021	229	5.65	31.4	1.07	0.11	148	50	2.6

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Physico-chemical	Physico-chemical	Physico-chemical	Alkalinity	Alkalinity	Alkalinity	Alkalinity
Analyte	Total Suspended Solids	Turbidity	Total Hardness	Hydroxide Alkalinity as CaC03	Carbonate Alkalinity as CaC03	Bicarbonate Alkalinity as CaC03	Total Alkalinity as CaC03
Analyte Short Name	TSS	Turbidity (lab)	Total Hardness	Alk_OH	Alk_CO3	Alk_HCO3	Alk_Tot
Units	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	54	87	-	-	-	-	-
Tropical Australia Lowland Rivers	2 - 15	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
Q29MB01							
08/11/2010	-	-	-	-	-	-	-
03/12/2010	73	-	-	-	<5	183	-
25/01/2011	84	-	-	-	<5	-	-
09/05/2011	470	-	-	-	<5	171	-
22/11/2011	5	-	-	-	<5	146	-
30/01/2012	68	-	-	-	<5	183	-
27/04/2012	21	-	-	-	5	-	-
22/08/2012	50	-	-	-	<5	132	-
01/09/2015	60	-	-	-	97	<5	-
11/12/2015	70	-	-	-	<5	131	-
18/01/2016	59	-	340	<5	<5	140	140
11/05/2016	6	-	-	-	<5	-	-
02/09/2016	10	-	-	-	<5	144	-
30/06/2018	10	-	-	-	<5	170	-
15/09/2020	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-
17/11/2020	<5	11.6	410	<1	<1	105	105
04/12/2020	-	-	-	-	-	-	-
11/01/2021	18	1.7	396	<1	<1	53	53
03/02/2021	-	-	-	-	-	-	-
11/03/2021	8	6.6	441	<1	<1	110	110
16/04/2021	-	-	-	-	-	-	-
28/04/2021	14	28.6	400	<1	<1	105	105
09/07/2021	8	24.8	379	<1	<1	94	94
Q29MB02							
22/11/2011	65	-	-	-	<5	171	-
30/01/2012	59	-	-	-	5	195	-
22/08/2012	60	-	-	-	<5	116	-
01/09/2015	70	-	455	<5	<5	107	107
11/12/2015	70	-	-	-	<5	129	-
18/01/2016	-	-	340	<5	<5	140	140
11/05/2016	24	-	-	-	5	134	-
02/09/2016	10	-	-	-	<5	154	-
11/01/2017	10	-	-	-	133	<5	-
26/03/2017	10	-	-	-	<5	192	-
30/06/2018	5	-	-	-	5	134	-
15/09/2020	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-
17/11/2020	<5	16.5	115	<1	<1	132	132
04/12/2020	-	-	-	-	-	-	-
11/01/2021	<5	7.5	128	<1	<1	145	145
03/02/2021	-	-	-	-	-	-	-
11/03/2021	<5	7.4	135	<1	<1	136	136
16/04/2021	-	-	-	-	-	-	-
28/04/2021	6	11.5	119	<1	<1	130	130
08/07/2021	<5	2.2	94	<1	<1	102	102
Q29MB03							
16/11/2020	<5	1	24	<1	<1	34	34
04/12/2020	-	-	-	-	-	-	-

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Physico-chemical	Physico-chemical	Physico-chemical	Alkalinity	Alkalinity	Alkalinity	Alkalinity
Analyte	Total Suspended Solids	Turbidity	Total Hardness	Hydroxide Alkalinity as CaC03	Carbonate Alkalinity as CaC03	Bicarbonate Alkalinity as CaC03	Total Alkalinity as CaC03
Analyte Short Name	TSS	Turbidity (lab)	Total Hardness	Alk_OH	Alk_CO3	Alk_HCO3	Alk_Tot
Units	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	54	87	-	-	-	-	-
Tropical Australia Lowland Rivers	2 - 15	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
11/01/2021	<5	0.6	28	<1	<1	33	33
03/02/2021	-	-	-	-	-	-	-
11/03/2021	<5	0.7	10	<1	<1	16	16
16/04/2021	-	-	-	-	-	-	-
29/04/2021	<5	<0.1	7	<1	<1	12	12
09/07/2021	<5	0.2	10	<1	<1	12	12
Q29MB04							
16/11/2020	<5	0.3	170	<1	<1	195	195
04/12/2020	-	-	-	-	-	-	-
07/01/2021	7	2.2	172	<1	<1	184	184
03/02/2021	-	-	-	-	-	-	-
09/03/2021	<5	4.7	181	<1	<1	194	194
16/04/2021	-	-	-	-	-	-	-
28/04/2021	8	5.8	186	<1	<1	177	177
09/07/2021	<5	6.6	170	<1	<1	171	171
Q29MB05							
17/11/2020	5	8.7	188	<1	<1	210	210
04/12/2020	-	-	-	-	-	-	-
07/01/2021	7	10.5	186	<1	<1	200	200
03/02/2021	-	-	-	-	-	-	-
08/03/2021	<5	9.3	191	<1	<1	210	210
16/04/2021	-	-	-	-	-	-	-
28/04/2021	10	8.2	200	<1	<1	185	185
09/07/2021	<5	6.1	112	<1	<1	125	125
Q29MB06							
16/11/2020	<5	0.6	63	<1	<1	97	97
04/12/2020	-	-	-	-	-	-	-
11/01/2021	<5	1.2	55	<1	<1	84	84
03/02/2021	-	-	-	-	-	-	-
11/03/2021	<5	0.4	70	<1	<1	84	84
16/04/2021	-	-	-	-	-	-	-
28/04/2021	7	5.7	55	<1	<1	78	78
09/07/2021	<5	1.2	58	<1	<1	80	80
Q29MB07							
16/11/2020	<5	8.9	172	<1	<1	177	177
04/12/2020	-	-	-	-	-	-	-
07/01/2021	7	28.2	173	<1	<1	182	182
03/02/2021	-	-	-	-	-	-	-
11/03/2021	7	22.6	172	<1	<1	178	178
16/04/2021	-	-	-	-	-	-	-
28/04/2021	11	12.4	176	<1	<1	171	171
09/07/2021	8	23.3	167	<1	<1	162	162
Q29MB08							
16/11/2020	<5	1.1	159	<1	<1	183	183
04/12/2020	-	-	-	-	-	-	-
07/01/2021	8	5.6	162	<1	<1	186	186
03/02/2021	-	-	-	-	-	-	-
09/03/2021	<5	10.5	162	<1	<1	202	202
16/04/2021	-	-	-	-	-	-	-
29/04/2021	12	7.2	165	<1	<1	182	182

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Physico-chemical	Physico-chemical	Physico-chemical	Alkalinity	Alkalinity	Alkalinity	Alkalinity
Analyte	Total Suspended Solids	Turbidity	Total Hardness	Hydroxide Alkalinity as CaC03	Carbonate Alkalinity as CaC03	Bicarbonate Alkalinity as CaC03	Total Alkalinity as CaC03
Analyte Short Name	TSS	Turbidity (lab)	Total Hardness	Alk_OH	Alk_CO3	Alk_HCO3	Alk_Tot
Units	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	54	87	-	-	-	-	-
Tropical Australia Lowland Rivers	2 - 15	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
09/07/2021	6	29.9	193	<1	<1	255	255
16/11/2020	12	5.8	75	<1	<1	111	111
04/12/2020	-	-	-	-	-	-	-
07/01/2021	7	3.2	74	<1	<1	99	99
03/02/2021	-	-	-	-	-	-	-
11/03/2021	<5	<0.1	63	<1	<1	86	86
16/04/2021	-	-	-	-	-	-	-
06/05/2021	5	9.6	74	<1	<1	86	86
08/07/2021	<5	5.2	77	<1	<1	81	81

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Acidity	Acidity	Acidity	Acidity	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)
Analyte	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	Sulfate as SO4	Chloride	Calcium
Analyte Short Name	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	SO4	Cl	Ca
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	210	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	1000	-	1000
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
Q29MB01							
08/11/2010	-	-	-	-	-	-	-
03/12/2010	<5	-	-	-	390	12	140
25/01/2011	<5	-	-	-	440	13	140
09/05/2011	<5	-	-	-	350	14	130
22/11/2011	<5	-	-	-	6	3	17
30/01/2012	<5	-	-	-	350	13	130
27/04/2012	5	-	-	-	300	9	120
22/08/2012	12	-	-	-	330	10.4	128
01/09/2015	14	-	-	-	44	9.9	132
11/12/2015	29	-	-	-	445	9.2	118
18/01/2016	12	-	-	-	250	6	87
11/05/2016	<5	-	-	-	-	4	18
02/09/2016	<5	-	-	-	6.1	5.4	24.7
30/06/2018	19	-	-	-	8.4	4.8	29.2
15/09/2020	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-
17/11/2020	22	<1	22	21	380	7	110
04/12/2020	-	-	-	-	-	-	-
11/01/2021	16	<1	16	15	355	7	109
03/02/2021	-	-	-	-	-	-	-
11/03/2021	12	<1	12	11	386	6	119
16/04/2021	-	-	-	-	-	-	-
28/04/2021	13	<1	13	13	393	7	109
09/07/2021	9	<1	9	9	373	6	104
Q29MB02							
22/11/2011	<5	-	-	-	300	12	110
30/01/2012	<5	-	-	-	6	10	110
22/08/2012	23	-	-	-	418	10.2	131
01/09/2015	29	-	-	-	397	9.2	118
11/12/2015	21	-	-	-	397	9.3	124
18/01/2016	13	-	-	-	250	6	87
11/05/2016	5	-	-	-	5	3	23
02/09/2016	12	-	-	-	6.1	5.1	24.6
11/01/2017	12	-	-	-	4.9	4.8	26.4
26/03/2017	<5	-	-	-	1.6	5.3	25.4
30/06/2018	-	-	-	-	-	-	24
15/09/2020	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-
17/11/2020	17	<1	17	16	14	4	28
04/12/2020	-	-	-	-	-	-	-
11/01/2021	17	<1	17	17	16	5	30
03/02/2021	-	-	-	-	-	-	-
11/03/2021	12	<1	12	11	25	4	31
16/04/2021	-	-	-	-	-	-	-
28/04/2021	14	<1	15	14	19	5	28
08/07/2021	11	<1	11	10	8	5	21
Q29MB03							
16/11/2020	14	<1	14	13	3	3	8
04/12/2020	-	-	-	-	-	-	-

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Acidity	Acidity	Acidity	Acidity	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)
Analyte	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	Sulfate as SO4	Chloride	Calcium
Analyte Short Name	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	SO4	Cl	Ca
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	210	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	1000	-	1000
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
11/01/2021	21	<1	21	21	3	3	8
03/02/2021	-	-	-	-	-	-	-
11/03/2021	9	<1	9	9	2	2	4
16/04/2021	-	-	-	-	-	-	-
29/04/2021	22	<1	22	21	2	2	3
09/07/2021	11	<1	11	11	1	2	4
Q29MB04							
16/11/2020	19	<1	19	18	19	5	45
04/12/2020	-	-	-	-	-	-	-
07/01/2021	13	<1	13	13	14	5	44
03/02/2021	-	-	-	-	-	-	-
09/03/2021	9	<1	9	9	15	6	46
16/04/2021	-	-	-	-	-	-	-
28/04/2021	12	<1	12	12	15	9	48
09/07/2021	7	<1	7	7	15	4	45
Q29MB05							
17/11/2020	12	<1	12	11	10	5	49
04/12/2020	-	-	-	-	-	-	-
07/01/2021	9	<1	9	9	9	6	48
03/02/2021	-	-	-	-	-	-	-
08/03/2021	8	<1	8	8	9	6	50
16/04/2021	-	-	-	-	-	-	-
28/04/2021	8	<1	8	8	9	6	52
09/07/2021	10	<1	10	10	4	4	25
Q29MB06							
16/11/2020	20	<1	20	19	5	3	12
04/12/2020	-	-	-	-	-	-	-
11/01/2021	28	<1	28	27	2	3	9
03/02/2021	-	-	-	-	-	-	-
11/03/2021	11	<1	11	11	2	3	10
16/04/2021	-	-	-	-	-	-	-
28/04/2021	13	<1	13	13	2	5	9
09/07/2021	11	<1	11	10	4	3	10
Q29MB07							
16/11/2020	27	<1	27	26	16	8	39
04/12/2020	-	-	-	-	-	-	-
07/01/2021	14	<1	14	14	14	8	38
03/02/2021	-	-	-	-	-	-	-
11/03/2021	12	<1	12	11	11	6	39
16/04/2021	-	-	-	-	-	-	-
28/04/2021	17	<1	17	17	14	8	41
09/07/2021	8	<1	8	8	11	6	39
Q29MB08							
16/11/2020	28	<1	28	27	22	4	39
04/12/2020	-	-	-	-	-	-	-
07/01/2021	17	<1	17	16	21	6	40
03/02/2021	-	-	-	-	-	-	-
09/03/2021	20	<1	20	19	19	6	42
16/04/2021	-	-	-	-	-	-	-
29/04/2021	19	<1	19	19	19	7	43

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Acidity	Acidity	Acidity	Acidity	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)
Analyte	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	Sulfate as SO4	Chloride	Calcium
Analyte Short Name	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	SO4	Cl	Ca
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	210	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	1000	-	1000
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
09/07/2021	10	<1	10	9	15	16	56
16/11/2020	26	<1	26	25	11	4	17
04/12/2020	-	-	-	-	-	-	-
07/01/2021	20	<1	20	19	12	5	15
03/02/2021	-	-	-	-	-	-	-
11/03/2021	16	<1	16	16	12	4	12
16/04/2021	-	-	-	-	-	-	-
06/05/2021	33	<1	33	33	18	4	15
08/07/2021	17	<1	17	16	24	4	16

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)
Analyte	Magnesium	Sodium	Potassium	Aluminium	Arsenic	Cadmium	Chromium	Cobalt	Copper
Analyte Short Name	Mg	Na	K	Al F	As F	Cd F	Cr F	Co F	Cu F
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	0.295	0.042	0.0004	0.006	-	0.0018
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	insufficient data	0.024	0.0002	0.001	-	0.0014
ANZECC 2000 Livestock Watering (beef cattle)	2000	-	-	5	0.5	0.01	1	1	2
ANZECC 2000 long term irrigation	-	-	-	5	0.1	0.01	0.1	0.05	0.2
Q29MB01									
08/11/2010	-	-	-	-	-	-	-	-	-
03/12/2010	43	20	6.9	0.31	0.011	0.0006	0.011	0.001	0.005
25/01/2011	41	19	6.6	0.019	0.011	0.0001	0.008	0.001	0.001
09/05/2011	38	22	6.8	0.024	0.035	0.0001	0.006	0.001	0.001
22/11/2011	6.4	6	4.8	0.01	0.013	0.0001	0.001	0.001	0.006
30/01/2012	42	22	6.7	0.01	0.012	0.0001	0.006	0.001	0.001
27/04/2012	38	22	7.5	0.01	0.064	0.0001	0.005	0.001	0.001
22/08/2012	41.5	23	7.2	<0.01	0.026	0.0005	0.00354	<0.001	<0.001
01/09/2015	43.1	26.9	7.2	<0.01	0.00185	<0.0001	0.00305	<0.001	<0.001
11/12/2015	39	25.6	6.5	<0.01	0.0032	<0.0001	0.00336	<0.001	<0.001
18/01/2016	30	23	6	<0.01	0.036	<0.0001	<0.001	0.001	<0.001
11/05/2016	7.5	-	5.3	0.015	0.024	0.0001	0.001	0.001	0.001
02/09/2016	9.7	7.7	6.2	<0.01	0.024	0.00113	0.00129	<0.001	0.00285
30/06/2018	11.5	8.6	5.4	-	-	-	-	-	-
15/09/2020	-	-	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-	-	-
17/11/2020	33	30	6	<0.01	0.09	<0.0001	<0.001	<0.001	<0.001
04/12/2020	-	-	-	-	-	-	-	-	-
11/01/2021	30	27	6	<0.01	0.093	<0.0001	<0.001	<0.001	<0.001
03/02/2021	-	-	-	-	-	-	-	-	-
11/03/2021	35	31	6	<0.01	0.106	<0.0001	<0.001	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-
28/04/2021	31	28	6	<0.01	0.098	<0.0001	<0.001	<0.001	<0.001
09/07/2021	29	28	6	<0.01	0.099	<0.0001	<0.001	<0.001	<0.001
Q29MB02									
22/11/2011	38	18	6.2	0.014	0.011	0.0001	0.005	0.001	0.001
30/01/2012	36	6.9	7.2	0.01	0.012	0.0001	0.006	0.001	0.001
22/08/2012	42.5	26.6	7.3	<0.01	0.00185	<0.0001	0.00323	<0.001	<0.001
01/09/2015	39	25	6.5	<0.01	0.0032	<0.0001	<0.001	0.00336	<0.001
11/12/2015	40.4	25	6.9	-	-	-	-	-	-
18/01/2016	29	23	6	<0.01	0.036	<0.0001	<0.001	0.001	<0.001
11/05/2016	8.8	7.7	5.1	0.018	0.024	0.0001	0.001	0.001	0.001
02/09/2016	10	8	6.7	<0.01	0.0145	<0.0001	<0.001	<0.001	<0.001
11/01/2017	10.9	7.7	6.9	<0.01	0.0185	<0.0001	<0.001	<0.001	<0.001
26/03/2017	10.8	7.6	5.9	<0.01	0.0175	<0.0001	<0.001	<0.001	<0.001
30/06/2018	10	7.4	4.5	0.01	0.006	0.0001	0.001	0.001	0.001
15/09/2020	-	-	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-	-	-
17/11/2020	11	8	5	<0.01	0.023	<0.0001	<0.001	<0.001	<0.001
04/12/2020	-	-	-	-	-	-	-	-	-
11/01/2021	13	9	5	<0.01	0.021	<0.0001	<0.001	<0.001	<0.001
03/02/2021	-	-	-	-	-	-	-	-	-
11/03/2021	14	9	5	<0.01	0.013	<0.0001	<0.001	0.005	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-
28/04/2021	12	8	4	<0.01	0.024	<0.0001	<0.001	<0.001	<0.001
08/07/2021	10	6	4	<0.01	0.015	<0.0001	<0.001	0.002	<0.001
Q29MB03									
16/11/2020	1	2	1	<0.01	<0.001	<0.0001	<0.001	<0.001	0.003
04/12/2020	-	-	-	-	-	-	-	-	-

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)
Analyte	Magnesium	Sodium	Potassium	Aluminium	Arsenic	Cadmium	Chromium	Cobalt	Copper
Analyte Short Name	Mg	Na	K	Al F	As F	Cd F	Cr F	Co F	Cu F
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	0.295	0.042	0.0004	0.006	-	0.0018
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	insufficient data	0.024	0.0002	0.001	-	0.0014
ANZECC 2000 Livestock Watering (beef cattle)	2000	-	-	5	0.5	0.01	1	1	2
ANZECC 2000 long term irrigation	-	-	-	5	0.1	0.01	0.1	0.05	0.2
11/01/2021	2	2	1	<0.01	<0.001	<0.0001	<0.001	0.001	0.001
03/02/2021	-	-	-	-	-	-	-	-	-
11/03/2021	<1	2	<1	<0.01	<0.001	0.0001	<0.001	<0.001	0.006
16/04/2021	-	-	-	-	-	-	-	-	-
29/04/2021	<1	2	<1	<0.01	<0.001	<0.0001	<0.001	0.001	0.007
09/07/2021	<1	2	<1	<0.01	<0.001	0.0002	<0.001	0.002	0.009
Q29MB04									
16/11/2020	14	5	4	<0.01	0.2	<0.0001	<0.001	0.003	<0.001
04/12/2020	-	-	-	-	-	-	-	-	-
07/01/2021	15	5	4	<0.01	0.172	<0.0001	<0.001	0.001	<0.001
03/02/2021	-	-	-	-	-	-	-	-	-
09/03/2021	16	5	4	<0.01	0.168	<0.0001	<0.001	0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-
28/04/2021	16	5	4	<0.01	0.157	<0.0001	<0.001	<0.001	<0.001
09/07/2021	14	5	3	<0.01	0.132	<0.0001	<0.001	<0.001	<0.001
Q29MB05									
17/11/2020	16	6	4	<0.01	0.079	<0.0001	<0.001	<0.001	<0.001
04/12/2020	-	-	-	-	-	-	-	-	-
07/01/2021	16	5	4	<0.01	0.083	<0.0001	<0.001	<0.001	<0.001
03/02/2021	-	-	-	-	-	-	-	-	-
08/03/2021	16	5	4	<0.01	0.082	<0.0001	<0.001	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-
28/04/2021	17	6	4	<0.01	0.076	<0.0001	<0.001	<0.001	<0.001
09/07/2021	12	5	7	<0.01	0.003	<0.0001	<0.001	<0.001	<0.001
Q29MB06									
16/11/2020	8	8	3	<0.01	0.009	<0.0001	<0.001	<0.001	<0.001
04/12/2020	-	-	-	-	-	-	-	-	-
11/01/2021	8	7	3	<0.01	0.012	<0.0001	<0.001	<0.001	<0.001
03/02/2021	-	-	-	-	-	-	-	-	-
11/03/2021	11	8	4	<0.01	0.012	<0.0001	<0.001	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-
28/04/2021	8	7	2	<0.01	0.012	<0.0001	<0.001	<0.001	<0.001
09/07/2021	8	6	3	<0.01	0.013	<0.0001	<0.001	<0.001	<0.001
Q29MB07									
16/11/2020	18	8	4	<0.01	0.028	<0.0001	<0.001	0.002	<0.001
04/12/2020	-	-	-	-	-	-	-	-	-
07/01/2021	19	8	4	<0.01	0.046	<0.0001	<0.001	0.001	<0.001
03/02/2021	-	-	-	-	-	-	-	-	-
11/03/2021	18	8	4	<0.01	0.036	<0.0001	<0.001	0.002	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-
28/04/2021	18	7	4	<0.01	0.055	<0.0001	<0.001	0.001	<0.001
09/07/2021	17	7	4	0.01	0.028	<0.0001	<0.001	<0.001	<0.001
Q29MB08									
16/11/2020	15	13	3	<0.01	0.014	<0.0001	<0.001	0.003	<0.001
04/12/2020	-	-	-	-	-	-	-	-	-
07/01/2021	15	14	4	<0.01	0.018	<0.0001	<0.001	0.002	<0.001
03/02/2021	-	-	-	-	-	-	-	-	-
09/03/2021	14	17	4	<0.01	0.018	<0.0001	<0.001	0.003	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-
29/04/2021	14	16	3	<0.01	0.013	<0.0001	<0.001	0.002	<0.001

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)
Analyte	Magnesium	Sodium	Potassium	Aluminium	Arsenic	Cadmium	Chromium	Cobalt	Copper
Analyte Short Name	Mg	Na	K	Al F	As F	Cd F	Cr F	Co F	Cu F
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	0.295	0.042	0.0004	0.006	-	0.0018
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	insufficient data	0.024	0.0002	0.001	-	0.0014
ANZECC 2000 Livestock Watering (beef cattle)	2000	-	-	5	0.5	0.01	1	1	2
ANZECC 2000 long term irrigation	-	-	-	5	0.1	0.01	0.1	0.05	0.2
09/07/2021	13	44	4	<0.01	0.008	<0.0001	<0.001	0.001	<0.001
16/11/2020	8	10	4	0.01	0.011	<0.0001	<0.001	<0.001	<0.001
04/12/2020	-	-	-	-	-	-	-	-	-
07/01/2021	9	11	4	0.01	0.012	<0.0001	<0.001	<0.001	<0.001
03/02/2021	-	-	-	-	-	-	-	-	-
11/03/2021	8	9	4	0.01	0.013	<0.0001	<0.001	<0.001	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-
06/05/2021	9	9	4	<0.01	0.01	<0.0001	<0.001	<0.001	0.004
08/07/2021	9	8	4	<0.01	0.01	<0.0001	<0.001	<0.001	<0.001

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (Total)	Metals (Total)
Analyte	Lead	Manganese	Nickel	Selenium Se (Total)	Tin	Uranium	Zinc	Iron	Aluminium	Arsenic
Analyte Short Name	Pb F	Mn F	Ni F	Se F	Sn F	U F	Zn F	Fe F	Al T	As T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	0.0056	2.5	0.013	-	-	-	0.015	2.7	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-	insufficient data	0.024
ANZECC 2000 Livestock Watering (beef cattle)	0.1	-	1	0.02	-	0.2	20	-	5	0.5
ANZECC 2000 long term irrigation	2	0.2	0.2	0.02	-	0.01	2	0.2	5	0.1
Q29MB01										
08/11/2010	-	-	-	-	-	-	-	-	-	-
03/12/2010	0.001	1.2	0.009	-	-	-	0.032	19	-	-
25/01/2011	0.001	1	0.001	-	-	-	0.002	17	-	-
09/05/2011	0.001	0.74	0.001	-	-	-	0.001	4.8	-	-
22/11/2011	0.001	0.12	0.002	-	-	-	0.047	0.55	-	-
30/01/2012	0.001	1.5	0.001	-	-	-	0.003	17	-	-
27/04/2012	0.001	0.78	0.001	-	-	-	0.005	5.3	-	-
22/08/2012	<0.001	1.04	<0.001	-	-	<0.0005	0.048	15.1	-	-
01/09/2015	<0.001	1.24	<0.001	-	-	<0.0005	0.0014	0.046	-	-
11/12/2015	<0.001	1.07	<0.001	-	-	<0.0005	0.0044	0.01	-	-
18/01/2016	<0.001	0.74	<0.001	-	-	<0.0005	0.009	17	-	-
11/05/2016	0.001	0.13	0.001	-	-	-	0.004	1.4	-	-
02/09/2016	<0.001	0.144	0.00188	-	-	<0.0005	0.0846	<0.01	-	-
30/06/2018	-	-	-	-	-	-	-	-	-	-
15/09/2020	-	-	-	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-	-	-	-
17/11/2020	<0.001	0.694	<0.001	<0.01	<0.001	<0.001	<0.005	4.22	0.02	0.092
04/12/2020	-	-	-	-	-	-	-	-	-	-
11/01/2021	<0.001	0.722	<0.001	<0.01	<0.001	<0.001	<0.005	3.78	0.03	0.097
03/02/2021	-	-	-	-	-	-	-	-	-	-
11/03/2021	<0.001	0.677	<0.001	<0.01	<0.001	<0.001	<0.005	3.85	0.02	0.119
16/04/2021	-	-	-	-	-	-	-	-	-	-
28/04/2021	<0.001	0.68	<0.001	<0.01	<0.001	<0.001	0.014	1.85	<0.01	0.123
09/07/2021	<0.001	0.676	<0.001	<0.01	<0.001	<0.001	<0.005	3.97	<0.01	0.122
Q29MB02										
22/11/2011	0.001	1.2	0.001	-	-	-	0.003	16	-	-
30/01/2012	0.001	1	0.001	-	-	-	0.004	3.6	-	-
22/08/2012	<0.001	1.31	<0.001	-	-	<0.0005	0.0089	0.012	-	-
01/09/2015	<0.001	1.07	<0.001	-	-	<0.0005	0.0044	0.01	-	-
11/12/2015	-	-	-	-	-	-	-	-	-	-
18/01/2016	<0.001	0.74	<0.001	-	-	<0.0005	0.009	17	-	-
11/05/2016	0.001	0.16	0.002	-	-	-	0.028	2.4	-	-
02/09/2016	<0.001	0.153	<0.001	-	-	<0.0005	0.0083	0.064	-	-
11/01/2017	<0.001	0.191	<0.001	-	-	<0.0005	0.0037	0.026	-	-
26/03/2017	<0.001	0.273	<0.001	-	-	<0.0005	0.0141	0.21	-	-
30/06/2018	0.005	0.25	0.001	-	-	<0.0005	0.004	0.09	-	-
15/09/2020	-	-	-	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-	-	-	-
17/11/2020	<0.001	0.134	<0.001	<0.01	<0.001	<0.001	<0.005	1.96	0.02	0.021
04/12/2020	-	-	-	-	-	-	-	-	-	-
11/01/2021	<0.001	0.202	<0.001	<0.01	<0.001	<0.001	<0.005	2.02	<0.01	0.021
03/02/2021	-	-	-	-	-	-	-	-	-	-
11/03/2021	<0.001	0.249	0.003	<0.01	<0.001	<0.001	0.021	0.29	<0.01	0.028
16/04/2021	-	-	-	-	-	-	-	-	-	-
28/04/2021	<0.001	0.156	<0.001	<0.01	<0.001	<0.001	0.006	1.59	<0.01	0.025
08/07/2021	<0.001	0.263	0.002	<0.01	<0.001	<0.001	0.018	1.04	<0.01	0.019
Q29MB03										
16/11/2020	<0.001	0.057	0.006	<0.01	<0.001	<0.001	0.022	0.17	<0.01	<0.001
04/12/2020	-	-	-	-	-	-	-	-	-	-

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (Total)	Metals (Total)
Analyte	Lead	Manganese	Nickel	Selenium Se (Total)	Tin	Uranium	Zinc	Iron	Aluminium	Arsenic
Analyte Short Name	Pb F	Mn F	Ni F	Se F	Sn F	U F	Zn F	Fe F	Al T	As T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	0.0056	2.5	0.013	-	-	-	0.015	2.7	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-	insufficient data	0.024
ANZECC 2000 Livestock Watering (beef cattle)	0.1	-	1	0.02	-	0.2	20	-	5	0.5
ANZECC 2000 long term irrigation	2	0.2	0.2	0.02	-	0.01	2	0.2	5	0.1
11/01/2021	<0.001	0.137	0.009	<0.01	<0.001	<0.001	0.022	0.09	<0.01	<0.001
03/02/2021	-	-	-	-	-	-	-	-	-	-
11/03/2021	<0.001	0.013	0.012	<0.01	<0.001	<0.001	0.055	<0.05	0.01	<0.001
16/04/2021	-	-	-	-	-	-	-	-	-	-
29/04/2021	<0.001	0.016	0.013	<0.01	<0.001	<0.001	0.074	<0.05	<0.01	<0.001
09/07/2021	<0.001	0.021	0.016	<0.01	<0.001	<0.001	0.082	<0.05	0.02	<0.001
Q29MB04										
16/11/2020	<0.001	0.24	0.02	<0.01	<0.001	<0.001	0.027	<0.05	0.01	0.209
04/12/2020	-	-	-	-	-	-	-	-	-	-
07/01/2021	<0.001	0.296	0.008	<0.01	<0.001	<0.001	0.027	0.24	<0.01	0.159
03/02/2021	-	-	-	-	-	-	-	-	-	-
09/03/2021	<0.001	0.284	0.006	<0.01	<0.001	<0.001	0.062	0.46	<0.01	0.169
16/04/2021	-	-	-	-	-	-	-	-	-	-
28/04/2021	<0.001	0.287	0.005	<0.01	<0.001	<0.001	0.039	0.43	0.29	0.177
09/07/2021	<0.001	0.278	0.004	<0.01	<0.001	<0.001	0.028	0.46	<0.01	0.173
Q29MB05										
17/11/2020	<0.001	0.198	<0.001	<0.01	<0.001	<0.001	0.011	0.84	<0.01	0.072
04/12/2020	-	-	-	-	-	-	-	-	-	-
07/01/2021	<0.001	0.226	<0.001	<0.01	<0.001	<0.001	0.006	0.73	<0.01	0.072
03/02/2021	-	-	-	-	-	-	-	-	-	-
08/03/2021	<0.001	0.219	<0.001	<0.01	<0.001	<0.001	0.007	0.76	<0.01	0.079
16/04/2021	-	-	-	-	-	-	-	-	-	-
28/04/2021	<0.001	0.237	<0.001	<0.01	<0.001	<0.001	0.012	0.93	<0.01	0.085
09/07/2021	<0.001	0.265	<0.001	<0.01	<0.001	<0.001	<0.005	1.38	0.01	0.004
Q29MB06										
16/11/2020	<0.001	0.167	<0.001	<0.01	<0.001	<0.001	0.008	0.25	<0.01	0.009
04/12/2020	-	-	-	-	-	-	-	-	-	-
11/01/2021	<0.001	0.204	<0.001	<0.01	<0.001	<0.001	0.027	0.66	<0.01	0.012
03/02/2021	-	-	-	-	-	-	-	-	-	-
11/03/2021	<0.001	0.198	<0.001	<0.01	<0.001	<0.001	<0.005	0.94	<0.01	0.013
16/04/2021	-	-	-	-	-	-	-	-	-	-
28/04/2021	<0.001	0.182	<0.001	<0.01	<0.001	<0.001	0.015	0.49	<0.01	0.014
09/07/2021	<0.001	0.182	<0.001	<0.01	<0.001	<0.001	0.007	0.98	<0.01	0.016
Q29MB07										
16/11/2020	<0.001	0.517	0.001	<0.01	<0.001	<0.001	<0.005	2.37	0.02	0.028
04/12/2020	-	-	-	-	-	-	-	-	-	-
07/01/2021	<0.001	0.485	<0.001	<0.01	<0.001	<0.001	<0.005	1.63	<0.01	0.043
03/02/2021	-	-	-	-	-	-	-	-	-	-
11/03/2021	<0.001	0.78	<0.001	<0.01	<0.001	<0.001	<0.005	4.35	<0.01	0.039
16/04/2021	-	-	-	-	-	-	-	-	-	-
28/04/2021	<0.001	0.478	<0.001	<0.01	<0.001	<0.001	0.014	1.92	<0.01	0.058
09/07/2021	<0.001	0.563	<0.001	<0.01	<0.001	<0.001	0.006	2.21	<0.01	0.037
Q29MB08										
16/11/2020	<0.001	0.552	0.005	<0.01	<0.001	<0.001	0.009	0.82	0.02	0.014
04/12/2020	-	-	-	-	-	-	-	-	-	-
07/01/2021	<0.001	0.765	0.002	<0.01	<0.001	<0.001	<0.005	1.36	0.01	0.018
03/02/2021	-	-	-	-	-	-	-	-	-	-
09/03/2021	<0.001	0.905	0.002	<0.01	<0.001	<0.001	0.024	1.67	0.02	0.018
16/04/2021	-	-	-	-	-	-	-	-	-	-
29/04/2021	<0.001	0.867	<0.001	<0.01	<0.001	<0.001	<0.005	1.36	<0.01	0.013

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (Total)	Metals (Total)
Analyte	Lead	Manganese	Nickel	Selenium Se (Total)	Tin	Uranium	Zinc	Iron	Aluminium	Arsenic
Analyte Short Name	Pb F	Mn F	Ni F	Se F	Sn F	U F	Zn F	Fe F	Al T	As T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	0.0056	2.5	0.013	-	-	-	0.015	2.7	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-	insufficient data	0.024
ANZECC 2000 Livestock Watering (beef cattle)	0.1	-	1	0.02	-	0.2	20	-	5	0.5
ANZECC 2000 long term irrigation	2	0.2	0.2	0.02	-	0.01	2	0.2	5	0.1
09/07/2021	<0.001	1.16	<0.001	<0.01	<0.001	<0.001	<0.005	2.3	<0.01	0.014
16/11/2020	<0.001	0.192	0.003	<0.01	<0.001	<0.001	0.023	0.76	0.28	0.01
04/12/2020	-	-	-	-	-	-	-	-	-	-
07/01/2021	<0.001	0.259	0.004	<0.01	<0.001	<0.001	0.018	1.09	0.07	0.011
03/02/2021	-	-	-	-	-	-	-	-	-	-
11/03/2021	<0.001	0.251	0.004	<0.01	<0.001	<0.001	0.018	1.41	0.01	0.014
16/04/2021	-	-	-	-	-	-	-	-	-	-
06/05/2021	<0.001	0.299	0.002	<0.01	<0.001	<0.001	0.052	1.45	0.02	0.013
08/07/2021	<0.001	0.302	0.002	<0.01	<0.001	<0.001	0.019	1.89	<0.01	0.011

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)
Analyte	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Tin	Uranium	Zinc	Iron
Analyte Short Name	Cd T	Cr T	Co T	Cu T	Pb T	Mn T	Ni T	Se T	Sn T	U T	Zn T	Fe T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	-	-	-	-	-	-	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0002	0.001	-	0.0014	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-
ANZECC 2000 Livestock Watering (beef cattle)	0.01	1	1	2	0.1	-	1	0.02	-	0.2	20	-
ANZECC 2000 long term irrigation	0.01	1	0.5	0.2	2	0.2	0.2	0.02	-	0.01	2	-
Q29MB01												
08/11/2010	-	-	-	-	-	-	-	-	-	-	-	-
03/12/2010	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	0.0052	-
25/01/2011	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	0.0023	-
09/05/2011	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	<0.001	-
22/11/2011	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	<0.001	-
30/01/2012	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	<0.001	-
27/04/2012	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	<0.001	-
22/08/2012	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	<0.001	-
01/09/2015	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	<0.001	-
11/12/2015	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	<0.001	-
18/01/2016	<0.0001	<0.001	0.002	<0.001	<0.001	<0.001	-	-	-	-	0.007	-
11/05/2016	<0.0001	<0.001	-	<0.001	<0.001	<0.001	-	-	-	-	0.0018	-
02/09/2016	0.0004	<0.001	-	<0.001	<0.001	<0.001	-	-	-	-	0.031	-
30/06/2018	-	-	-	-	-	-	-	-	-	-	-	-
15/09/2020	-	-	-	-	-	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-	-	-	-	-	-
17/11/2020	<0.0001	<0.001	<0.001	<0.001	<0.001	0.738	<0.001	<0.01	<0.001	<0.001	<0.005	3.88
04/12/2020	-	-	-	-	-	-	-	-	-	-	-	-
11/01/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.776	0.001	<0.01	<0.001	<0.001	0.01	4.24
03/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
11/03/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.734	0.001	<0.01	<0.001	<0.001	<0.005	3.97
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
28/04/2021	<0.0001	<0.001	<0.001	0.002	<0.001	0.712	<0.001	<0.01	<0.001	<0.001	0.015	4.56
09/07/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.712	<0.001	<0.01	<0.001	<0.001	0.009	4.34
Q29MB02												
22/11/2011	<0.0001	<0.001	<0.001	0.003	<0.001	<0.001	-	-	-	-	0.0232	-
30/01/2012	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	<0.001	-
22/08/2012	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	0.045	-
01/09/2015	<0.0001	<0.001	0.00325	<0.001	<0.001	0.0005	-	-	-	-	0.0093	-
11/12/2015	-	-	-	-	-	-	-	-	-	-	-	-
18/01/2016	-	-	-	-	-	-	-	-	-	-	-	-
11/05/2016	<0.0001	<0.001	-	<0.001	<0.001	<0.001	-	-	-	-	0.0106	-
02/09/2016	<0.0001	<0.001	-	<0.001	<0.001	<0.001	-	-	-	-	0.0029	-
11/01/2017	<0.0001	<0.001	-	<0.001	<0.001	<0.001	-	-	-	-	0.0012	-
26/03/2017	<0.0001	<0.001	-	<0.001	<0.001	<0.001	-	-	-	-	0.0048	-
30/06/2018	<0.0001	<0.001	-	<0.001	<0.001	0.0011	-	-	-	-	0.0014	-
15/09/2020	-	-	-	-	-	-	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-	-	-	-	-	-	-
17/11/2020	<0.0001	<0.001	<0.001	<0.001	<0.001	0.145	<0.001	<0.01	<0.001	<0.001	<0.005	1.97
04/12/2020	-	-	-	-	-	-	-	-	-	-	-	-
11/01/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.192	<0.001	<0.01	<0.001	<0.001	<0.005	1.78
03/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
11/03/2021	<0.0001	<0.001	0.004	<0.001	<0.001	0.228	0.002	<0.01	<0.001	<0.001	0.013	1.71
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
28/04/2021	<0.0001	<0.001	<0.001	0.003	<0.001	0.17	<0.001	<0.01	<0.001	<0.001	0.01	2.19
08/07/2021	<0.0001	<0.001	0.003	<0.001	<0.001	0.27	0.002	<0.01	<0.001	<0.001	0.026	1.13
Q29MB03												
16/11/2020	<0.0001	<0.001	<0.001	0.004	<0.001	0.06	0.007	<0.01	<0.001	<0.001	0.025	0.19
04/12/2020	-	-	-	-	-	-	-	-	-	-	-	-

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)
Analyte	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Tin	Uranium	Zinc	Iron
Analyte Short Name	Cd T	Cr T	Co T	Cu T	Pb T	Mn T	Ni T	Se T	Sn T	U T	Zn T	Fe T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	-	-	-	-	-	-	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0002	0.001	-	0.0014	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-
ANZECC 2000 Livestock Watering (beef cattle)	0.01	1	1	2	0.1	-	1	0.02	-	0.2	20	-
ANZECC 2000 long term irrigation	0.01	1	0.5	0.2	2	0.2	0.2	0.02	-	0.01	2	-
11/01/2021	<0.0001	<0.001	<0.001	0.002	<0.001	0.141	0.01	<0.01	<0.001	<0.001	0.032	0.13
03/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
11/03/2021	<0.0001	<0.001	<0.001	0.007	<0.001	0.013	0.012	<0.01	<0.001	<0.001	0.056	<0.05
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
29/04/2021	0.0001	<0.001	0.001	0.008	<0.001	0.014	0.01	<0.01	<0.001	<0.001	0.076	<0.05
09/07/2021	0.0001	<0.001	0.002	0.012	<0.001	0.02	0.018	<0.01	0.001	<0.001	0.09	<0.05
Q29MB04												
16/11/2020	0.0001	<0.001	0.003	<0.001	<0.001	0.268	0.025	<0.01	<0.001	<0.001	0.031	<0.05
04/12/2020	-	-	-	-	-	-	-	-	-	-	-	-
07/01/2021	<0.0001	<0.001	0.001	<0.001	<0.001	0.29	0.008	<0.01	<0.001	<0.001	0.028	0.28
03/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
09/03/2021	<0.0001	<0.001	<0.001	0.004	<0.001	0.254	0.006	<0.01	<0.001	<0.001	0.061	0.54
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
28/04/2021	0.0028	<0.001	0.001	0.013	0.044	0.301	0.008	<0.01	<0.001	<0.001	0.472	0.87
09/07/2021	<0.0001	<0.001	<0.001	0.009	0.002	0.27	0.004	<0.01	<0.001	<0.001	0.071	0.72
Q29MB05												
17/11/2020	<0.0001	<0.001	<0.001	<0.001	<0.001	0.215	<0.001	<0.01	<0.001	<0.001	0.013	0.8
04/12/2020	-	-	-	-	-	-	-	-	-	-	-	-
07/01/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.214	<0.001	<0.01	<0.001	<0.001	0.006	0.87
03/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
08/03/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.242	<0.001	<0.01	<0.001	<0.001	0.009	0.75
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
28/04/2021	<0.0001	<0.001	<0.001	<0.001	0.002	0.226	<0.001	<0.01	<0.001	<0.001	0.024	0.86
09/07/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.274	<0.001	<0.01	<0.001	<0.001	0.008	1.47
Q29MB06												
16/11/2020	<0.0001	<0.001	<0.001	<0.001	<0.001	0.198	<0.001	<0.01	<0.001	<0.001	0.01	0.27
04/12/2020	-	-	-	-	-	-	-	-	-	-	-	-
11/01/2021	<0.0001	<0.001	<0.001	0.004	<0.001	0.186	<0.001	<0.01	<0.001	<0.001	0.029	0.6
03/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
11/03/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.211	<0.001	<0.01	<0.001	<0.001	0.006	1.05
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
28/04/2021	<0.0001	<0.001	<0.001	0.008	<0.001	0.2	<0.001	<0.01	<0.001	<0.001	0.02	0.95
09/07/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.195	<0.001	<0.01	<0.001	<0.001	0.011	1.07
Q29MB07												
16/11/2020	<0.0001	<0.001	0.002	<0.001	<0.001	0.541	<0.001	<0.01	<0.001	<0.001	<0.005	2.28
04/12/2020	-	-	-	-	-	-	-	-	-	-	-	-
07/01/2021	<0.0001	<0.001	0.001	<0.001	<0.001	0.498	<0.001	<0.01	<0.001	<0.001	<0.005	1.85
03/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
11/03/2021	<0.0001	<0.001	0.002	<0.001	<0.001	0.82	<0.001	<0.01	<0.001	<0.001	<0.005	4.25
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
28/04/2021	<0.0001	<0.001	<0.001	0.002	<0.001	0.49	<0.001	<0.01	<0.001	<0.001	0.016	2.29
09/07/2021	<0.0001	<0.001	0.001	<0.001	<0.001	0.583	<0.001	<0.01	<0.001	<0.001	<0.005	2.78
Q29MB08												
16/11/2020	<0.0001	<0.001	0.004	<0.001	<0.001	0.574	0.006	<0.01	<0.001	<0.001	0.008	0.81
04/12/2020	-	-	-	-	-	-	-	-	-	-	-	-
07/01/2021	<0.0001	<0.001	0.002	<0.001	<0.001	0.752	0.002	<0.01	<0.001	<0.001	<0.005	1.5
03/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
09/03/2021	<0.0001	<0.001	0.003	<0.001	<0.001	0.943	0.002	<0.01	<0.001	<0.001	0.028	2.04
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
29/04/2021	<0.0001	<0.001	0.002	<0.001	<0.001	0.745	<0.001	<0.01	<0.001	<0.001	<0.005	1.49

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)
Analyte	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Tin	Uranium	Zinc	Iron
Analyte Short Name	Cd T	Cr T	Co T	Cu T	Pb T	Mn T	Ni T	Se T	Sn T	U T	Zn T	Fe T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	-	-	-	-	-	-	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0002	0.001	-	0.0014	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-
ANZECC 2000 Livestock Watering (beef cattle)	0.01	1	1	2	0.1	-	1	0.02	-	0.2	20	-
ANZECC 2000 long term irrigation	0.01	1	0.5	0.2	2	0.2	0.2	0.02	-	0.01	2	-
09/07/2021	<0.0001	<0.001	0.002	<0.001	<0.001	1.08	0.001	<0.01	<0.001	<0.001	<0.005	2.82
16/11/2020	<0.0001	<0.001	<0.001	0.003	0.001	0.236	0.005	<0.01	<0.001	<0.001	0.031	1.08
04/12/2020	-	-	-	-	-	-	-	-	-	-	-	-
07/01/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.257	0.003	<0.01	<0.001	<0.001	0.02	1.28
03/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
11/03/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.266	0.004	<0.01	<0.001	<0.001	0.022	1.56
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
06/05/2021	<0.0001	<0.001	<0.001	0.007	<0.001	0.331	0.004	<0.01	<0.001	<0.001	0.058	1.95
08/07/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.327	0.003	<0.01	<0.001	<0.001	0.028	1.98

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Metals (Total)	Nutrients	Nutrients	Nutrients	Nutrients	Nutrients
Analyte	Ferrous Iron	Ammonia	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P
Analyte Short Name	Ferrous Iron	NH3	Nox	TKN_N	TN_N	P_Tot
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	1.4	-	-	-	-
Tropical Australia Lowland Rivers	-	0.01	-	-	0.2 - 0.3	0.01
ANZG 2018 freshwater - 95% species protection	-	0.9	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	5	0.05
Q29MB01						
08/11/2010	-	-	-	-	-	-
03/12/2010	-	-	-	-	-	-
25/01/2011	-	-	-	-	-	-
09/05/2011	-	-	-	-	-	-
22/11/2011	-	-	-	-	-	-
30/01/2012	-	-	-	-	-	-
27/04/2012	-	-	-	-	-	-
22/08/2012	-	-	-	-	-	-
01/09/2015	-	-	-	-	-	-
11/12/2015	-	-	-	-	-	-
18/01/2016	-	-	-	-	-	-
11/05/2016	-	-	-	-	-	-
02/09/2016	-	-	-	-	-	-
30/06/2018	-	-	-	-	-	-
15/09/2020	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-
17/11/2020	5	0.01	0.05	<0.1	<0.1	0.06
04/12/2020	-	-	-	-	-	-
11/01/2021	4.47	<0.01	<0.01	<0.1	<0.1	0.09
03/02/2021	-	-	-	-	-	-
11/03/2021	2.89	0.02	<0.01	<0.1	<0.1	0.09
16/04/2021	-	-	-	-	-	-
28/04/2021	<0.05	0.02	<0.01	<0.1	<0.1	0.09
09/07/2021	4.83	0.01	<0.01	<0.1	<0.1	0.09
Q29MB02						
22/11/2011	-	-	-	-	-	-
30/01/2012	-	-	-	-	-	-
22/08/2012	-	-	-	-	-	-
01/09/2015	-	-	-	-	-	-
11/12/2015	-	-	-	-	-	-
18/01/2016	-	-	-	-	-	-
11/05/2016	-	-	-	-	-	-
02/09/2016	-	-	-	-	-	-
11/01/2017	-	-	-	-	-	-
26/03/2017	-	-	-	-	-	-
30/06/2018	-	-	-	-	-	-
15/09/2020	-	-	-	-	-	-
21/10/2020	-	-	-	-	-	-
17/11/2020	0.39	0.23	0.02	0.3	0.3	0.1
04/12/2020	-	-	-	-	-	-
11/01/2021	2.12	0.21	<0.01	0.2	0.2	0.13
03/02/2021	-	-	-	-	-	-
11/03/2021	0.38	0.12	<0.01	0.1	0.1	0.09
16/04/2021	-	-	-	-	-	-
28/04/2021	2.3	0.12	<0.01	0.2	0.2	0.11
08/07/2021	1.08	0.02	<0.01	<0.1	<0.1	0.14
Q29MB03						
16/11/2020	0.17	<0.01	0.03	<0.1	<0.1	<0.01
04/12/2020	-	-	-	-	-	-

Table B.2 - Quest 29 Groundwater Quality

Analyte Group	Metals (Total)	Nutrients	Nutrients	Nutrients	Nutrients	Nutrients
Analyte	Ferrous Iron	Ammonia	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P
Analyte Short Name	Ferrous Iron	NH3	Nox	TKN_N	TN_N	P_Tot
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	1.4	-	-	-	-
Tropical Australia Lowland Rivers	-	0.01	-	-	0.2 - 0.3	0.01
ANZG 2018 freshwater - 95% species protection	-	0.9	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	5	0.05
11/01/2021	0.1	<0.01	0.02	<0.1	<0.1	<0.01
03/02/2021	-	-	-	-	-	-
11/03/2021	<0.05	0.01	0.08	<0.1	<0.1	0.01
16/04/2021	-	-	-	-	-	-
29/04/2021	<0.05	0.04	0.12	0.2	0.3	<0.01
09/07/2021	<0.05	<0.01	0.15	<0.1	0.2	<0.01
Q29MB04						
16/11/2020	<0.05	<0.01	0.03	<0.1	<0.1	0.05
04/12/2020	-	-	-	-	-	-
07/01/2021	0.29	<0.01	<0.01	<0.1	<0.1	0.05
03/02/2021	-	-	-	-	-	-
09/03/2021	0.55	<0.01	0.03	<0.1	<0.1	0.07
16/04/2021	-	-	-	-	-	-
28/04/2021	<0.05	0.02	<0.01	<0.1	<0.1	0.1
09/07/2021	0.73	<0.01	<0.01	<0.1	<0.1	0.08
Q29MB05						
17/11/2020	0.98	0.02	0.03	<0.1	<0.1	0.03
04/12/2020	-	-	-	-	-	-
07/01/2021	0.91	<0.01	<0.01	<0.1	<0.1	0.02
03/02/2021	-	-	-	-	-	-
08/03/2021	0.96	<0.01	0.03	<0.1	<0.1	0.04
16/04/2021	-	-	-	-	-	-
28/04/2021	0.98	<0.01	<0.01	<0.1	<0.1	0.05
09/07/2021	1.61	0.02	<0.01	<0.1	<0.1	0.11
Q29MB06						
16/11/2020	0.25	0.02	0.02	<0.1	<0.1	0.02
04/12/2020	-	-	-	-	-	-
11/01/2021	0.2	0.03	<0.01	<0.1	<0.1	0.05
03/02/2021	-	-	-	-	-	-
11/03/2021	1.11	<0.01	<0.01	<0.1	<0.1	0.05
16/04/2021	-	-	-	-	-	-
28/04/2021	1.1	<0.01	<0.01	<0.1	<0.1	0.08
09/07/2021	1.1	<0.01	<0.01	<0.1	<0.1	0.1
Q29MB07						
16/11/2020	2.95	<0.01	0.05	0.1	0.2	0.02
04/12/2020	-	-	-	-	-	-
07/01/2021	2.37	0.02	<0.01	<0.1	<0.1	0.01
03/02/2021	-	-	-	-	-	-
11/03/2021	5.38	<0.01	<0.01	<0.1	<0.1	0.03
16/04/2021	-	-	-	-	-	-
28/04/2021	<0.05	0.01	<0.01	<0.1	<0.1	0.05
09/07/2021	2.85	<0.01	<0.01	<0.1	<0.1	0.02
Q29MB08						
16/11/2020	0.81	0.01	0.09	<0.1	<0.1	<0.01
04/12/2020	-	-	-	-	-	-
07/01/2021	0.54	0.06	<0.01	<0.1	<0.1	<0.01
03/02/2021	-	-	-	-	-	-
09/03/2021	2.07	0.17	0.03	0.2	0.2	0.02
16/04/2021	-	-	-	-	-	-
29/04/2021	2.41	0.06	<0.01	0.2	0.2	<0.01

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Analyte Group	Metals (Total)	Nutrients	Nutrients	Nutrients	Nutrients	Nutrients
Analyte	Ferrous Iron	Ammonia	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P
Analyte Short Name	Ferrous Iron	NH3	Nox	TKN_N	TN_N	P_Tot
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	1.4	-	-	-	-
Tropical Australia Lowland Rivers	-	0.01	-	-	0.2 - 0.3	0.01
ANZG 2018 freshwater - 95% species protection	-	0.9	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	5	0.05
09/07/2021	3.46	0.11	<0.01	0.2	0.2	0.01
16/11/2020	0.18	<0.01	0.05	<0.1	<0.1	0.06
04/12/2020	-	-	-	-	-	-
07/01/2021	1.27	0.01	<0.01	<0.1	<0.1	0.04
03/02/2021	-	-	-	-	-	-
11/03/2021	1.47	<0.01	<0.01	<0.1	<0.1	0.09
16/04/2021	-	-	-	-	-	-
06/05/2021	1.96	<0.01	0.03	<0.1	<0.1	0.13
08/07/2021	2.27	<0.01	<0.01	<0.1	<0.1	0.12

PRIMARY GOLD

Appendix B-2 - Quest 29 Open Pit Monitoring Results (2020-2021)

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Table B.2 - Quest 29 Open Pit Water Quality

Analyte Group	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements
Analyte	Electrical Conductivity	pH	Temperature	Turbidity	Salinity	Total Dissolved Solids	Oxidation-Reduction Potential	Dissolved Oxygen
Analyte Short Name	EC (field)	pH (field)	Temp (field)	Turbidity (field)	Salinity (field)	TDS (field)	ORP (field)	DO %sat (field)
Units	µS/cm	-	°C	NTU	ppt	mg/L	mV	%
Toms Gully SSTV (80th percentile)	41	5.8 - 8.0	-	87	-	-	-	-
Tropical Australia Lowland Rivers	20 - 250	6.0 - 8.0	-	2 - 15	-	-	-	85-120
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	4000	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-	-
Q29SW BHS Pit								
06/06/2015	317	7.5	-	7	-	-	-	-
11/04/2016	317	7.5	-	6	-	-	-	-
07/07/2016	323	7.6	-	3	-	-	-	-
04/11/2016	380	7.8	-	1.8	-	-	-	-
20/12/2016	330	7.5	-	35	-	-	-	-
26/03/2017	460	6.9	-	3.5	-	-	-	-
30/06/2018	440	7.2	-	0.5	-	-	-	-
09/02/2019	379	7.54	-	-	-	-	-	-
22/02/2019	370	7.8	-	1.8	-	-	-	-
20/08/2019	400	7.4	-	6.5	-	-	-	-
30/10/2019	510	7.8	-	1.5	-	-	-	-
06/04/2020	220	7.8	-	1.1	-	-	-	-
17/11/2020	483	8.31	32.8	14.6	0.23	312	42.4	71.4
03/02/2021	285.2	6.34	31.2	28.6	0.13	185	-5.8	90.1
08/03/2021	-	-	-	-	-	-	-	-
27/04/2021	297.5	7.58	30.2	1.73	0.14	193	82.8	88.7

Table B.2 - Quest 29 Open Pit Water Quality

Analyte Group	Physico-chemical	Physico-chemical	Physico-chemical	Alkalinity	Alkalinity	Alkalinity	Alkalinity
Analyte	Total Suspended Solids	Turbidity	Total Hardness	Hydroxide Alkalinity as CaC03	Carbonate Alkalinity as CaC03	Bicarbonate Alkalinity as CaC03	Total Alkalinity as CaC03
Analyte Short Name	TSS	Turbidity (lab)	Total Hardness	Alk_OH	Alk_CO3	Alk_HCO3	Alk_Tot
Units	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	54	87	-	-	-	-	-
Tropical Australia Lowland Rivers	2 - 15	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
Q29SW BHS Pit							
06/06/2015	<10	-	44.9	<5	<5	27	27
11/04/2016	<5	-	45	<5	<5	24	<5
07/07/2016	<5	-	49.7	<5	<5	28	28
04/11/2016	8	-	67	<5	<5	47	47
20/12/2016	<5	-	51	<5	<5	35	35
26/03/2017	<5	-	81	<5	<5	12	12
30/06/2018	<5	-	92	<5	<5	16	16
09/02/2019	-	-	-	<5	<5	31	31
22/02/2019	7	-	64	<5	<5	28	28
20/08/2019	19	-	75	<5	<5	41	41
30/10/2019	8	-	85	<5	<5	47	47
06/04/2020	<5	-	37	<5	<5	44	44
17/11/2020	28	8.2	78	<1	<1	76	76
03/02/2021	<5	1.2	87	<1	<1	22	22
08/03/2021	-	-	-	-	-	-	-
27/04/2021	<5	0.9	56	<1	<1	38	38

Table B.2 - Quest 29 Open Pit Water Quality

Analyte Group	Acidity	Acidity	Acidity	Acidity	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)
Analyte	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	Sulfate as SO4	Chloride	Calcium
Analyte Short Name	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	SO4	Cl	Ca
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	210	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	1000	-	1000
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
Q29SW BHS Pit							
06/06/2015	<5	-	-	-	101	4.5	12.8
11/04/2016	<5	-	-	-	102	5.7	13
07/07/2016	<5	-	-	-	111	4.9	14.4
04/11/2016	<5	-	-	-	140	6	19
20/12/2016	<5	-	-	-	96	5	14
26/03/2017	<5	-	-	-	170	3	25
30/06/2018	<5	-	-	-	180	3	28
09/02/2019	<5	-	-	-	114	4	20
22/02/2019	<5	-	-	-	130	3	19
20/08/2019	<5	-	-	-	130	4	23
30/10/2019	<5	-	-	-	160	5	25
06/04/2020	<5	-	-	-	60	3	13
17/11/2020	7	<1	7	7	117	7	23
03/02/2021	5	<1	5	4	162	4	25
08/03/2021	-	-	-	-	-	-	-
27/04/2021	4	-	-	-	79	2	16

Table B.2 - Quest 29 Open Pit Water Quality

Analyte Group	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)
Analyte	Magnesium	Sodium	Potassium	Aluminium	Arsenic	Cadmium	Chromium	Cobalt	Copper
Analyte Short Name	Mg	Na	K	Al F	As F	Cd F	Cr F	Co F	Cu F
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	0.295	0.042	0.0004	0.006	-	0.0018
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	insufficient data	0.024	0.0002	0.001	-	0.0014
ANZECC 2000 Livestock Watering (beef cattle)	2000	-	-	5	0.5	0.01	1	1	2
ANZECC 2000 long term irrigation	-	-	-	5	0.1	0.01	0.1	0.05	0.2
Q29SW BHS Pit									
06/06/2015	3.1	41.9	4.3	0.0824	0.00145	<0.0001	-	<0.001	0.00466
11/04/2016	3.1	41.3	4.5	0.0485	0.0026	0.0001	-	<0.001	0.0052
07/07/2016	46	3.4	4.5	0.0427	0.0013	0.0001	-	<0.001	0.00276
04/11/2016	4.4	55	5.6	0.02	0.002	<0.0001	-	<0.001	0.003
20/12/2016	3.7	41	4.3	0.01	0.002	<0.0001	-	<0.001	0.002
26/03/2017	4.4	53	3.8	<0.01	0.001	0.0003	-	<0.001	0.001
30/06/2018	5.3	53	3.7	0.01	0.001	0.0001	-	<0.001	0.002
09/02/2019	4	46	4	0.15	0.003	<0.0001	-	<0.001	0.002
22/02/2019	3.8	41	3.4	<0.01	0.002	<0.0001	-	<0.001	0.002
20/08/2019	4.5	45	4.4	<0.01	0.002	<0.0001	-	<0.001	0.002
30/10/2019	5.5	57	5.3	0.02	0.003	<0.0001	-	<0.001	0.003
06/04/2020	1.3	91	4	<0.01	0.004	<0.0001	-	<0.001	0.002
17/11/2020	5	49	6	<0.01	0.007	<0.0001	<0.001	<0.001	0.003
03/02/2021	6	48	4	0.08	0.006	<0.0001	<0.001	<0.001	0.001
08/03/2021	-	-	-	-	-	-	-	-	-
27/04/2021	4	24	3	0.01	0.005	<0.0001	<0.001	<0.001	0.002

Table B.2 - Quest 29 Open Pit Water Quality

Analyte Group	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (Total)	Metals (Total)
Analyte	Lead	Manganese	Nickel	Selenium Se (Total)	Tin	Uranium	Zinc	Iron	Aluminium	Arsenic
Analyte Short Name	Pb F	Mn F	Ni F	Se F	Sn F	U F	Zn F	Fe F	Al T	As T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	0.0056	2.5	0.013	-	-	-	0.015	2.7	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-	insufficient data	0.024
ANZECC 2000 Livestock Watering (beef cattle)	0.1	-	1	0.02	-	0.2	20	-	5	0.5
ANZECC 2000 long term irrigation	2	0.2	0.2	0.02	-	0.01	2	0.2	5	0.1
Q29SW BHS Pit										
06/06/2015	<0.001	0.00887	<0.001	-	-	<0.0005	0.0244	0.032	0.191	0.0017
11/04/2016	<0.001	0.0102	0.00201	-	-	<0.0005	0.0452	0.02	0.163	0.0037
07/07/2016	<0.001	<0.005	0.00066	-	-	<0.0005	0.013	0.006	0.0997	0.0017
04/11/2016	<0.001	0.02	<0.001	-	-	<0.0005	0.013	0.02	0.02	0.002
20/12/2016	<0.001	<0.005	<0.001	-	-	<0.0005	0.002	<0.01	0.18	0.003
26/03/2017	<0.001	<0.005	0.006	-	-	<0.0005	0.017	<0.01	0.02	0.002
30/06/2018	<0.001	<0.005	0.002	-	-	<0.0005	0.006	<0.01	0.02	0.001
09/02/2019	<0.001	0.007	0.001	-	-	<0.0005	<0.001	0.07	-	-
22/02/2019	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	<0.01	0.02	0.002
20/08/2019	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	<0.01	0.07	0.003
30/10/2019	<0.001	<0.005	0.002	-	-	<0.0005	0.014	<0.01	0.04	0.003
06/04/2020	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	<0.01	0.03	0.005
17/11/2020	<0.001	0.002	0.002	<0.01	<0.001	<0.001	<0.005	<0.05	0.08	0.008
03/02/2021	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.12	0.006
08/03/2021	-	-	-	-	-	-	-	-	-	-
27/04/2021	<0.001	0.002	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.01	0.005

Table B.2 - Quest 29 Open Pit Water Quality

Analyte Group	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)
Analyte	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Tin	Uranium	Zinc	Iron
Analyte Short Name	Cd T	Cr T	Co T	Cu T	Pb T	Mn T	Ni T	Se T	Sn T	U T	Zn T	Fe T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	-	-	-	-	-	-	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0002	0.001	-	0.0014	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-
ANZECC 2000 Livestock Watering (beef cattle)	0.01	1	1	2	0.1	-	1	0.02	-	0.2	20	-
ANZECC 2000 long term irrigation	0.01	1	0.5	0.2	2	0.2	0.2	0.02	-	0.01	2	-
Q29SW BHS Pit												
06/06/2015	<0.0001	<0.001	<0.001	0.00688	0.00053	0.0173	0.00106	-	-	<0.0005	0.0239	0.118
11/04/2016	0.00012	<0.001	<0.0001	0.00676	0.00095	0.0303	0.00214	-	-	<0.0005	0.06	0.14
07/07/2016	0.00008	<0.001	<0.001	0.00439	<0.001	0.0146	0.00096	-	-	0.00009	0.0313	0.096
04/11/2016	<0.0001	<0.001	<0.001	0.003	<0.001	0.019	<0.001	-	-	<0.0005	0.005	0.03
20/12/2016	<0.0001	<0.001	<0.001	0.005	0.06	0.003	0.002	-	-	<0.0005	0.008	0.19
26/03/2017	0.0004	<0.001	<0.001	0.002	<0.001	0.011	0.006	-	-	<0.0005	0.018	0.03
30/06/2018	0.0002	<0.001	<0.001	0.003	<0.001	0.008	0.003	-	-	<0.0005	0.007	0.03
09/02/2019	-	-	-	-	-	-	-	-	-	-	-	-
22/02/2019	<0.0001	<0.001	<0.001	0.002	<0.001	0.012	<0.001	-	-	<0.0005	0.002	0.03
20/08/2019	<0.0001	<0.001	<0.001	0.003	<0.001	0.055	0.001	-	-	<0.0005	0.003	0.23
30/10/2019	<0.0001	<0.001	<0.001	0.004	<0.001	0.027	0.003	-	-	<0.0005	0.014	0.08
06/04/2020	<0.0001	<0.001	<0.001	0.003	<0.001	0.028	0.001	-	-	<0.0005	0.013	0.07
17/11/2020	<0.0001	<0.001	<0.001	0.004	<0.001	0.169	0.003	<0.01	<0.001	<0.001	<0.005	0.12
03/02/2021	<0.0001	<0.001	<0.001	0.002	<0.001	0.011	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05
08/03/2021	-	-	-	-	-	-	-	-	-	-	-	-
27/04/2021	<0.0001	<0.001	<0.001	0.002	<0.001	0.013	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05

Table B.2 - Quest 29 Open Pit Water Quality

Analyte Group	Metals (Total)	Nutrients	Nutrients	Nutrients	Nutrients	Nutrients
Analyte	Ferrous Iron	Ammonia	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P
Analyte Short Name	Ferrous Iron	NH3	Nox	TKN_N	TN_N	P_Tot
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	1.4	-	-	-	-
Tropical Australia Lowland Rivers	-	0.01	-	-	0.2 - 0.3	0.01
ANZG 2018 freshwater - 95% species protection	-	0.9	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	5	0.05
Q29SW BHS Pit						
06/06/2015	-	-	-	-	-	-
11/04/2016	-	-	-	-	-	-
07/07/2016	-	-	-	-	-	-
04/11/2016	-	-	-	-	-	-
20/12/2016	-	-	-	-	-	-
26/03/2017	-	-	-	-	-	-
30/06/2018	-	-	-	-	-	-
09/02/2019	-	-	-	-	-	-
22/02/2019	-	-	-	-	-	-
20/08/2019	-	-	-	-	-	-
30/10/2019	-	-	-	-	-	-
06/04/2020	-	-	-	-	-	-
17/11/2020	<0.05	0.03	0.03	0.6	0.6	0.01
03/02/2021	<0.05	<0.01	0.04	0.2	0.2	<0.01
08/03/2021	-	-	-	-	-	-
27/04/2021	<0.05	<0.01	0.02	0.1	0.1	<0.01

PRIMARY GOLD

Appendix B-3 - Quest 29 Surface Water Monitoring Results (2020-2021)

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Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements
Analyte	Electrical Conductivity	pH	Temperature	Turbidity	Salinity	Total Dissolved Solids	Oxidation-Reduction Potential	Dissolved Oxygen
Analyte Short Name	EC (field)	pH (field)	Temp (field)	Turbidity (field)	Salinity (field)	TDS (field)	ORP (field)	DO_%sat (field)
Units	µS/cm	-	°C	NTU	ppt	mg/L	mV	%
Toms Gully SSTV (80th percentile)	41	5.8 - 8.0	-	87	-	-	-	-
Tropical Australia Lowland Rivers	20 - 250	6.0 - 8.0	-	2 - 15	-	-	-	85-120
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	4000	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-	-
Date	EC (field)	pH (field)	Temp (field)	Turbidity (field)	Salinity (field)	TDS (field)	ORP (field)	DO_%sat (field)
Q29SW Leach								
06/06/2015	793	5.1	-	7	-	-	-	-
29/03/2016	729	5.2	-	3	-	-	-	-
11/04/2016	761	5.1	-	1	-	-	-	-
11/05/2016	737	5	-	5	-	-	-	-
07/07/2016	840	5	-	4	-	-	-	-
04/11/2016	920	5.5	-	0.8	-	-	-	-
28/11/2016	870	5	-	2.6	-	-	-	-
20/12/2016	980	3.9	-	0.8	-	-	-	-
26/01/2017	750	5.8	-	3	-	-	-	-
26/03/2017	590	6.5	-	4.8	-	-	-	-
30/06/2018	660	7.1	-	15	-	-	-	-
09/02/2019	552	7.53	-	-	-	-	-	-
22/02/2019	550	7.7	-	0.7	-	-	-	-
20/08/2019	660	7.4	-	2	-	-	-	-
30/10/2019	1000	7.8	-	1.4	-	-	-	-
06/04/2020	450	8.8	-	0.6	-	-	-	-
15/09/2020	943	8.31	29.1	2.17	-	612	181	99.8
21/10/2020	1344	8.28	33.5	1.2	0.66	873	195.4	109.4
11/11/2020	1574	8.47	37.3	4.32	0.77	1020.5	74.6	83
04/12/2020	1002	7.7	34.1	10.23	0.49	651	183	109.6
11/01/2021	522	7.01	34.2	4.06	0.2	340.2	195	88.9
03/02/2021	428.9	7.95	31.9	5.36	0.2	278.85	88.4	98.4
11/03/2021	467	7.21	33.3	1.77	0.22	305.5	53.5	77.1
16/04/2021	476.8	7.97	32.5	2.1	0.23	310	124.3	110.2
27/04/2021	509	7.96	30.8	2.33	0.24	331.5	75.7	94.8
16/06/2021	597	8.06	28.3	0.42	0.29	388	177.9	110.5
09/07/2021	595	7.23	26	6.51	0.27	383.5	64.7	65.7
Q29SW1								
29/03/2016	150	6.99	-	-	-	-	-	-
11/04/2016	152	7.4	-	9	-	-	-	-
07/07/2016	212	6.9	-	5	-	-	-	-
04/11/2016	456	7	-	6	-	-	-	-
28/11/2016	270	6.6	-	2.7	-	-	-	-
20/12/2016	78	6.6	-	72	-	-	-	-
26/01/2017	98	6.5	-	17	-	-	-	-
26/03/2017	120	6.9	-	5.8	-	-	-	-
09/02/2019	150	6.99	-	5.8	-	-	-	-
22/02/2019	170	6.6	-	6.4	-	-	-	-
16/02/2020	220	6.3	-	12	-	-	-	-
06/04/2020	270	6.6	-	2.7	-	-	-	-
12/11/2020	49.2	7.25	28.9	over	0.02	31.85	93.5	53.8
09/12/2020	145	6.6	29.5	478	0.07	94	66.2	38.4
11/01/2021	147.8	5.26	32.8	21.5	0.1	96.3	161	116
03/02/2021	144.9	6.05	30.2	29.8	0.07	94.25	110.6	93.1
11/03/2021	185.6	6.08	29.1	4.88	0.09	120.9	53.1	77.7
16/04/2021	223	6.24	29.2	8.2	0.1	145	161	83
27/04/2021	272.6	6.44	29.2	4.17	0.13	176.8	92.2	87.5
Q29SW2								

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements
Analyte	Electrical Conductivity	pH	Temperature	Turbidity	Salinity	Total Dissolved Solids	Oxidation-Reduction Potential	Dissolved Oxygen
Analyte Short Name	EC (field)	pH (field)	Temp (field)	Turbidity (field)	Salinity (field)	TDS (field)	ORP (field)	DO %sat (field)
Units	µS/cm	-	°C	NTU	ppt	mg/L	mV	%
Toms Gully SSTV (80th percentile)	41	5.8 - 8.0	-	87	-	-	-	-
Tropical Australia Lowland Rivers	20 - 250	6.0 - 8.0	-	2 - 15	-	-	-	85-120
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	4000	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-	-
29/03/2016	35	6.88	-	-	-	-	-	-
11/04/2016	37	7.3	-	43	-	-	-	-
28/11/2016	32	6.7	-	18	-	-	-	-
20/12/2016	16	6.3	-	1500	-	-	-	-
26/01/2017	22	6.5	-	61	-	-	-	-
26/03/2017	24	6.7	-	9.1	-	-	-	-
09/02/2019	35	6.88	-	9.1	-	-	-	-
22/02/2019	35	6.6	-	62	-	-	-	-
16/02/2020	43	6.4	-	52	-	-	-	-
06/04/2020	32	6.7	-	18	-	-	-	-
04/12/2020	22.5	5.94	27	360	0.01	15	300	81.1
07/01/2021	37.9	7.44	29	80	0	24.6	201	60.5
03/02/2021	23.9	5.91	28.5	152	0.01	15.6	121.7	91..0
08/03/2021	30.6	6.27	28	83.2	0.01	20.1	87.5	74.7
16/04/2021	44.6	6.6	27.3	21	0.02	29	190.8	80.6
06/05/2021	46.1	6.24	25.1	41	0.02	29.9	85.6	64.2
Q29SW3								
29/03/2016	63	7.37	-	-	-	-	-	-
11/05/2016	29	7.3	-	17	-	-	-	-
20/12/2016	74	4.4	-	120	-	-	-	-
26/03/2017	55	7.1	-	18	-	-	-	-
09/02/2019	63	7.37	-	18	-	-	-	-
06/04/2020	64	7.1	-	3.2	-	-	-	-
03/02/2021	-	-	-	-	-	-	-	-
06/05/2021	-	-	-	-	-	-	-	-
Q29SW4								
20/12/2016	12	6.1	-	1300	-	-	-	-
26/01/2017	34	6.6	-	38	-	-	-	-
26/03/2017	32	6.7	-	54	-	-	-	-
09/02/2019	40	7.07	-	54	-	-	-	-
22/02/2019	37	6.8	-	17	-	-	-	-
16/02/2020	44	6.6	-	39	-	-	-	-
06/04/2020	28	6.6	-	91	-	-	-	-
04/12/2020	20.6	5.81	32.4	220	0.01	13	172	81.2
11/01/2021	41.3	5.71	34.4	26.1	0	26.8	140	105.9
03/02/2021	24.8	5.72	29.5	74.6	0.01	16.25	126.9	95.5
08/03/2021	35.8	5.78	32.3	15.5	0.01	12.4	96.1	78.5
16/04/2021	64	6.77	29.4	60.1	0.03	42	157	97.6
29/04/2021	34.7	5.7	29.4	13.8	0.01	22.75	98	97.8
Q29SW5								
07/07/2016	44	7.1	-	8	-	-	-	-
20/12/2016	24	6.3	-	46	-	-	-	-
26/03/2017	29	6.7	-	20	-	-	-	-
09/02/2019	26	7.05	-	20	-	-	-	-
22/02/2019	28	7	-	7.2	-	-	-	-
30/10/2019	51	7	-	2.7	-	-	-	-
16/02/2020	41	6.7	-	13	-	-	-	-
06/04/2020	37	7.6	-	1.3	-	-	-	-
11/11/2020	52.1	8.11	34.6	7.36	0.02	33.8	40.5	54.7
03/02/2021	28.7	6.48	32.5	27.1	0.01	18.85	99.1	95.8

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements	Field Measurements
Analyte	Electrical Conductivity	pH	Temperature	Turbidity	Salinity	Total Dissolved Solids	Oxidation-Reduction Potential	Dissolved Oxygen
Analyte Short Name	EC (field)	pH (field)	Temp (field)	Turbidity (field)	Salinity (field)	TDS (field)	ORP (field)	DO %sat (field)
Units	µS/cm	-	°C	NTU	ppt	mg/L	mV	%
Toms Gully SSTV (80th percentile)	41	5.8 - 8.0	-	87	-	-	-	-
Tropical Australia Lowland Rivers	20 - 250	6.0 - 8.0	-	2 - 15	-	-	-	85-120
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	4000	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-	-
27/04/2021	51	7.34	29.1	5.14	0.02	32.5	85.9	79.2
Q29SW6								
20/12/2016	32	6.5	-	44	-	-	-	-
26/01/2017	34	6.5	-	20	-	-	-	-
26/03/2017	29	6.8	-	18	-	-	-	-
30/06/2018	29	6.77	-	-	-	-	-	-
09/02/2019	29	6.77	-	18	-	-	-	-
06/04/2020	51	6.6	-	3.3	-	-	-	-
11/01/2021	29.9	6.56	29.5	15.1	0	19.5	174	86.9
03/02/2021	27.4	6.3	30.8	28.9	0.01	17.55	102.9	89.7
08/03/2021	39.7	6.08	33.5	9.7	0.02	26	31.5	68.1
16/04/2021	48.3	6.33	29.2	25	0.02	31	166	66.5
27/04/2021	53.7	6.53	28.3	8.54	0.02	34.5	93.7	77.2
Q29SW7								
20/12/2016	49	6.6	-	66	-	-	-	-
26/01/2017	58	7.1	-	18	-	-	-	-
26/03/2017	67	7.2	-	16	-	-	-	-
30/06/2018	64	7.41	-	-	-	-	-	-
22/02/2019	67	7.2	-	16	-	-	-	-
16/02/2020	19	6	-	2.7	-	-	-	-
12/11/2020	38.4	8.33	29.2	over	0.02	24.7	58.9	74.3
11/01/2021	80.9	7.75	36.1	17.9	0	52.5	161	167.2
03/02/2021	66.1	6.64	33.3	45.4	0.03	42.9	92.1	112.6
16/04/2021	-	-	-	-	-	-	-	-
Q29SW7								
27/04/2021	-	-	-	-	-	-	-	-
20/12/2016	34	6.6	-	67	-	-	-	-
09/02/2019	20	6.39	-	-	-	-	-	-
11/01/2021	20.9	4.1	32.5	19.1	0	13.7	132	45.7
03/02/2021	31.7	6.2	30.9	39.7	0.01	20.8	109.8	102.4
08/03/2021	75.5	6.51	31.8	9.41	0.03	49.4	45.3	87.4
16/04/2021	114	7.12	87.9	13.2	0.05	74	153	77
27/04/2021	124	6.76	29.6	12.2	0.06	80	64.7	66

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Physico-chemical	Physico-chemical	Physico-chemical	Alkalinity	Alkalinity	Alkalinity	Alkalinity
Analyte	Total Suspended Solids	Turbidity	Total Hardness	Hydroxide Alkalinity as CaC03	Carbonate Alkalinity as CaC03	Bicarbonate Alkalinity as CaC03	Total Alkalinity as CaC03
Analyte Short Name	TSS	Turbidity (lab)	Total Hardness	Alk_OH	Alk_CO3	Alk_HCO3	Alk_Tot
Units	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	54	87	-	-	-	-	-
Tropical Australia Lowland Rivers	2 - 15	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
Date	TSS	Turbidity (lab)	Total Hardness	Alk_OH	Alk_CO3	Alk_HCO3	Alk_Tot
Q29SW Leach							
06/06/2015	<10	-	151	<5	<5	<5	<5
29/03/2016	20	-	142	<5	<5	<5	<5
11/04/2016	<10	-	145	<5	<5	<5	<5
11/05/2016	10	-	137	<5	<5	<5	<5
07/07/2016	<5	-	167	<5	<5	<5	<5
04/11/2016	23	-	210	<5	<5	<5	<5
28/11/2016	22	-	190	<5	<5	<5	<5
20/12/2016	<5	-	190	<5	<5	<5	<5
26/01/2017	7	-	140	<5	<5	<5	<5
26/03/2017	6	-	120	<5	<5	6	<5
30/06/2018	98	-	150	<5	<5	22	22
09/02/2019	-	-	-	<5	<5	26	26
22/02/2019	8	-	120	<5	<5	26	26
20/08/2019	51	-	140	<5	<5	35	35
30/10/2019	7	-	200	<5	<5	44	44
06/04/2020	<5	-	93	<5	14	18	33
15/09/2020	<5	-	211	<1	<1	43	43
21/10/2020	5	-	258	<1	<1	43	43
11/11/2020	6	0.9	275	<1	<1	37	37
04/12/2020	6	3.3	183	<1	<1	35	35
11/01/2021	6	1.3	85	<1	<1	26	26
03/02/2021	<5	11.7	45	<1	<1	41	41
11/03/2021	<5	0.8	90	<1	<1	24	24
16/04/2021	<5	2.8	100	<1	<1	31	31
27/04/2021	<5	0.5	108	<1	<1	28	28
16/06/2021	<5	0.8	128	<1	<1	31	31
09/07/2021	<5	0.7	144	<1	<1	38	38
Q29SW1							
29/03/2016	-	-	-	<5	<5	24	24
11/04/2016	30	-	35.5	<5	<5	<5	20
07/07/2016	<5	-	46.2	<5	<5	<5	23
04/11/2016	10	-	132	<5	<5	<5	35
28/11/2016	<5	-	86	<5	<5	27	27
20/12/2016	9	-	25	<5	<5	11	11
26/01/2017	<5	-	20	<5	<5	16	16
26/03/2017	<5	-	26	<5	<5	24	24
09/02/2019	<5	-	26	<5	<5	24	24
22/02/2019	6	-	37	<5	<5	22	22
16/02/2020	9	-	54	<5	<5	25	25
06/04/2020	<5	-	86	<5	<5	27	27
12/11/2020	812	879	9	<1	<1	9	9
09/12/2020	16	46.1	34	<1	<1	26	26
11/01/2021	14	8	22	<1	<1	26	26
03/02/2021	<5	13.6	38	<1	<1	24	24
11/03/2021	<5	3.4	45	<1	<1	24	24
16/04/2021	<5	5.6	60	<1	<1	29	29
27/04/2021	<5	2.3	60	<1	<1	30	30
Q29SW2							

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Physico-chemical	Physico-chemical	Physico-chemical	Alkalinity	Alkalinity	Alkalinity	Alkalinity
Analyte	Total Suspended Solids	Turbidity	Total Hardness	Hydroxide Alkalinity as CaC03	Carbonate Alkalinity as CaC03	Bicarbonate Alkalinity as CaC03	Total Alkalinity as CaC03
Analyte Short Name	TSS	Turbidity (lab)	Total Hardness	Alk_OH	Alk_CO3	Alk_HCO3	Alk_Tot
Units	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	54	87	-	-	-	-	-
Tropical Australia Lowland Rivers	2 - 15	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
29/03/2016	-	-	-	<5	<5	10	10
11/04/2016	40	-	5.6	<5	<5	<5	8
28/11/2016	8	-	5	<5	<5	14	14
20/12/2016	17	-	<3	<5	<5	<5	<5
26/01/2017	49	-	4	<5	<5	7	7
26/03/2017	120	-	4	<5	<5	9.9	6
09/02/2019	120	-	4	<5	<5	10	10
22/02/2019	140	-	7	<5	<5	13	13
16/02/2020	28	-	11	<5	<5	17	17
06/04/2020	8	-	5	<5	<5	14	14
04/12/2020	214	336	<1	<1	<1	5	5
07/01/2021	26	52	<1	<1	<1	8	8
03/02/2021	57	70	<1	<1	<1	7	7
08/03/2021	32	41.9	<1	<1	<1	12	12
16/04/2021	8	14.8	<1	<1	<1	12	12
06/05/2021	12	29.9	7	<1	<1	18	18
Q29SW3							
29/03/2016	-	-	-	<5	<5	27	27
11/05/2016	20	-	8.3	<5	<5	<5	9
20/12/2016	8	-	19	<5	<5	<5	<5
26/03/2017	<5	-	21	<5	<5	24	24
09/02/2019	<5	-	21	<5	<5	27	27
06/04/2020	8	-	25	<5	<5	29	29
03/02/2021	-	-	-	-	-	-	-
06/05/2021	-	-	-	-	-	-	-
Q29SW4							
20/12/2016	71	-	<3	<5	<5	<5	<5
26/01/2017	18	-	6	<5	<5	10	10
26/03/2017	64	-	5	<5	<5	12	12
09/02/2019	64	-	5	<5	<5	10	10
22/02/2019	9	-	6	<5	<5	12	12
16/02/2020	32	-	12	<5	<5	17	17
06/04/2020	71	-	5	<5	<5	10	10
04/12/2020	90	194	<1	<1	<1	4	4
11/01/2021	7	18.6	4	<1	<1	12	12
03/02/2021	22	34.2	<1	<1	<1	7	7
08/03/2021	<5	9.3	<1	<1	<1	13	13
16/04/2021	26	46.4	13	<1	<1	10	10
29/04/2021	8	7.2	<1	<1	<1	11	11
Q29SW5							
07/07/2016	<5	-	13.3	<5	<5	14	14
20/12/2016	6	-	7	<5	<5	<5	<5
26/03/2017	12	-	7	<5	<5	13	13
09/02/2019	12	-	7	<5	<5	12	12
22/02/2019	9	-	7	<5	<5	10	10
30/10/2019	5	-	14	<5	<5	17	17
16/02/2020	20	-	8	<5	<5	11	11
06/04/2020	14	-	8	<5	<5	25	25
11/11/2020	6	2.9	13	<1	<1	14	14
03/02/2021	6	9.5	<1	<1	<1	9	9

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Physico-chemical	Physico-chemical	Physico-chemical	Alkalinity	Alkalinity	Alkalinity	Alkalinity
Analyte	Total Suspended Solids	Turbidity	Total Hardness	Hydroxide Alkalinity as CaC03	Carbonate Alkalinity as CaC03	Bicarbonate Alkalinity as CaC03	Total Alkalinity as CaC03
Analyte Short Name	TSS	Turbidity (lab)	Total Hardness	Alk_OH	Alk_CO3	Alk_HCO3	Alk_Tot
Units	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	54	87	-	-	-	-	-
Tropical Australia Lowland Rivers	2 - 15	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
27/04/2021	<5	3.1	13	<1	<1	14	14
Q29SW6							
20/12/2016	30	-	10	<5	<5	11	11
26/01/2017	9	-	8	<5	<5	11	11
26/03/2017	<5	-	7	<5	<5	13	13
30/06/2018	-	-	-	<5	<5	10	10
09/02/2019	<5	-	7	<5	<5	10	10
06/04/2020	30	-	18	<5	<5	19	19
11/01/2021	6	11	<1	<1	<1	8	8
03/02/2021	<5	9.2	<1	<1	<1	9	9
08/03/2021	<5	5.6	13	<1	<1	23	23
16/04/2021	8	13	13	<1	<1	15	15
27/04/2021	<5	5.3	17	<1	<1	16	16
Q29SW7							
20/12/2016	-	-	17	<5	<5	15	15
26/01/2017	<5	-	21	<5	<5	23	23
26/03/2017	<5	-	25	<5	<5	29	29
30/06/2018	-	-	-	<5	<5	31	31
22/02/2019	<5	-	25	<5	<5	29	29
16/02/2020	<5	-	4	<5	<5	<5	<5
12/11/2020	2000	2100	4	<1	<1	7	7
11/01/2021	<5	15.7	25	<1	<1	30	30
03/02/2021	7	22.1	18	<1	<1	25	25
16/04/2021	-	-	-	-	-	-	-
Q29SW7							
27/04/2021	-	-	-	-	-	-	-
20/12/2016	-	-	11	<5	<5	13	13
09/02/2019	-	-	-	<5	<5	11	11
11/01/2021	<5	11.4	7	<1	<1	12	12
03/02/2021	6	9.7	7	<1	<1	17	17
08/03/2021	<5	6.3	29	<1	<1	38	38
16/04/2021	7	8.1	40	<1	<1	48	48
27/04/2021	10	3.2	45	<1	<1	50	50

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Acidity	Acidity	Acidity	Acidity	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)
Analyte	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	Sulfate as SO4	Chloride	Calcium
Analyte Short Name	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	SO4	Cl	Ca
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	210	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	1000	-	1000
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
Date	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	SO4	Cl	Ca
Q29SW Leach							
06/06/2015	16	-	-	-	341	6	48.6
29/03/2016	10	-	-	-	320	4.4	45.8
11/04/2016	11	-	-	-	324	5.6	46.7
11/05/2016	14	-	-	-	312	4.9	44.1
07/07/2016	13	-	-	-	370	8.9	53.9
04/11/2016	12	-	-	-	460	7	66
28/11/2016	10	-	-	-	430	12	62
20/12/2016	17	-	-	-	390	6	61
26/01/2017	9	-	-	-	320	5	45
26/03/2017	<5	-	-	-	230	6	39
30/06/2018	<5	-	-	-	280	3	45
09/02/2019	<5	-	-	-	187	4	34
22/02/2019	<5	-	-	-	220	3	35
20/08/2019	<5	-	-	-	260	4	42
30/10/2019	<5	-	-	-	380	7	60
06/04/2020	<5	-	-	-	170	3	26
15/09/2020	8	-	-	-	383	8	63
21/10/2020	2	-	-	-	539	12	77
11/11/2020	11	<1	10	10	559	12	82
04/12/2020	4	<1	4	4	380	8	55
11/01/2021	4	<1	4	4	172	4	24
03/02/2021	4	<1	4	4	55	4	13
11/03/2021	3	<1	3	3	164	2	26
16/04/2021	4	<1	4	4	164	2	27
27/04/2021	4	-	-	-	175	2	30
16/06/2021	2	<1	<1	<1	201	3	35
09/07/2021	3	<1	3	2	240	2	41
Q29SW1							
29/03/2016	2	-	-	-	38	4	6
11/04/2016	9	-	-	-	41.2	2.9	6.6
07/07/2016	10	-	-	-	61	3.4	8.4
04/11/2016	<5	-	-	-	162	8.2	24.3
28/11/2016	8	-	-	-	91	4	16
20/12/2016	<5	-	-	-	17	2	5
26/01/2017	9	-	-	-	22	3	3.8
26/03/2017	6	-	-	-	27	3	5.2
09/02/2019	<5	-	-	-	38	4	5.2
22/02/2019	9	-	-	-	43	3	6.7
16/02/2020	9	-	-	-	66	7	10
06/04/2020	8	-	-	-	91	4	16
12/11/2020	11	<1	11	10	<1	2	2
09/12/2020	6	<1	6	6	31	5	7
11/01/2021	6	<1	6	6	26	4	4
03/02/2021	7	<1	7	7	35	4	7
11/03/2021	5	<1	5	4	51	2	8
16/04/2021	9	<1	9	8	60	4	11
27/04/2021	6	-	-	-	76	3	11
Q29SW2							

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Acidity	Acidity	Acidity	Acidity	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)
Analyte	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	Sulfate as SO4	Chloride	Calcium
Analyte Short Name	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	SO4	Cl	Ca
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	210	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	1000	-	1000
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
29/03/2016	1	-	-	-	2	3	<1
11/04/2016	<5	-	-	-	3.6	2	0.8
28/11/2016	<5	-	-	-	1	2	0.6
20/12/2016	<5	-	-	-	<1	<1	<0.5
26/01/2017	7	-	-	-	<1	2	0.6
26/03/2017	<5	-	-	-	<1	2	0.6
09/02/2019	<5	-	-	-	2	3	0.6
22/02/2019	<5	-	-	-	<1	2	1
16/02/2020	6	-	-	-	<1	3	1.7
06/04/2020	<5	-	-	-	1	2	0.6
04/12/2020	5	<1	5	5	<1	1	<1
07/01/2021	4	<1	4	4	<1	2	<1
03/02/2021	4	<1	4	4	<1	2	<1
08/03/2021	4	<1	4	4	1	2	<1
16/04/2021	4	<1	4	4	3	2	<1
06/05/2021	7	<1	7	7	1	4	1
Q29SW3							
29/03/2016	1	-	-	-	2	3	3
11/05/2016	6	-	-	-	<1	1.3	1.2
20/12/2016	10	-	-	-	1	2	2.4
26/03/2017	<5	-	-	-	2	2	3.8
09/02/2019	<5	-	-	-	2	3	3.8
06/04/2020	<5	-	-	-	2	3	4.1
03/02/2021	-	-	-	-	-	-	-
06/05/2021	-	-	-	-	-	-	-
Q29SW4							
20/12/2016	<5	-	-	-	<1	<1	<0.5
26/01/2017	7	-	-	-	1	3	0.9
26/03/2017	<5	-	-	-	2	2	0.7
09/02/2019	<5	-	-	-	3	3	0.7
22/02/2019	<5	-	-	-	1	2	0.7
16/02/2020	<5	-	-	-	<1	3	1.7
06/04/2020	<5	-	-	-	<1	2	0.6
04/12/2020	6	<1	6	6	<1	<1	<1
11/01/2021	4	<1	4	4	<1	3	<1
03/02/2021	4	<1	4	3	<1	2	<1
08/03/2021	4	<1	4	4	2	2	<1
16/04/2021	5	<1	5	5	12	2	2
29/04/2021	5	<1	5	5	1	3	<1
Q29SW5							
07/07/2016	<5	-	-	-	1.8	1.5	2
20/12/2016	6	-	-	-	<1	1	1.1
26/03/2017	<5	-	-	-	<1	2	1.1
09/02/2019	<5	-	-	-	<1	2	1.1
22/02/2019	<5	-	-	-	<1	1	0.9
30/10/2019	<5	-	-	-	3	2	2.1
16/02/2020	<5	-	-	-	1	4	1.3
06/04/2020	<5	-	-	-	1	2	1.2
11/11/2020	7	<1	7	7	<1	2	2
03/02/2021	4	<1	4	3	<1	2	<1

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Acidity	Acidity	Acidity	Acidity	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)
Analyte	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	Sulfate as SO4	Chloride	Calcium
Analyte Short Name	Acidity as CaCO3	Acidity as CaCO3 (pH 3.7)	Acidity as CaCO3 (pH 8.3)	Acidity as H2SO4	SO4	Cl	Ca
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	210	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	1000	-	1000
ANZECC 2000 long term irrigation	-	-	-	-	-	-	-
27/04/2021	5	-	-	-	2	1	2
Q29SW6							
20/12/2016	<5	-	-	-	<1	1	1.8
26/01/2017	7	-	-	-	<1	2	1.2
26/03/2017	<5	-	-	-	<1	2	1.1
30/06/2018	1	-	-	-	<1	2	1
09/02/2019	<5	-	-	-	<1	2	1.1
06/04/2020	6	-	-	-	1	3	2.8
11/01/2021	3	<1	3	3	<1	2	<1
03/02/2021	4	<1	4	3	<1	2	<1
08/03/2021	5	<1	5	4	<1	2	2
16/04/2021	6	<1	6	6	1	2	2
27/04/2021	5	-	-	-	2	2	2
Q29SW7							
20/12/2016	5	-	-	-	2	2	3.4
26/01/2017	6	-	-	-	2	3	4.3
26/03/2017	<5	-	-	-	2	2	5.2
30/06/2018	2	-	-	-	2	5	6
22/02/2019	<5	-	-	-	2	2	5.2
16/02/2020	5	-	-	-	<1	4	0.5
12/11/2020	9	<1	9	9	<1	2	<1
11/01/2021	4	<1	4	4	2	5	5
03/02/2021	5	<1	5	5	3	4	4
16/04/2021	-	-	-	-	-	-	-
Q29SW7							
27/04/2021	-	-	-	-	-	-	-
20/12/2016	<5	-	-	-	<1	2	2.1
09/02/2019	<5	-	-	-	<1	1	<1
11/01/2021	4	<1	4	3	<1	3	1
03/02/2021	3	<1	3	3	<1	2	1
08/03/2021	5	<1	5	5	2	3	5
16/04/2021	6	<1	6	6	2	3	8
27/04/2021	6	<1	6	6	3	4	8

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)
Analyte	Magnesium	Sodium	Potassium	Aluminium	Arsenic	Cadmium	Chromium	Cobalt	Copper
Analyte Short Name	Mg	Na	K	Al_F	As_F	Cd_F	Cr_F	Co_F	Cu_F
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	0.295	0.042	0.0004	0.006	-	0.0018
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	insufficient data	0.024	0.0002	0.001	-	0.0014
ANZECC 2000 Livestock Watering (beef cattle)	2000	-	-	5	0.5	0.01	1	1	2
ANZECC 2000 long term irrigation	-	-	-	5	0.1	0.01	0.1	0.05	0.2
Date	Mg	Na	K	Al_F	As_F	Cd_F	Cr_F	Co_F	Cu_F
Q29SW Leach									
06/06/2015	7.2	98.5	6.3	1.36	0.0013	0.00598	-	0.0202	0.0579
29/03/2016	6.8	87.9	5.4	1.44	0.0019	0.00512	-	0.0191	0.0654
11/04/2016	6.8	91.1	5.5	1.3	0.0016	0.00516	-	0.019	0.0595
11/05/2016	6.6	86.4	5.3	1.28	0.00135	0.00528	-	0.0188	0.0584
07/07/2016	108	7.8	7.5	1.42	0.00125	0.00516	-	0.019	0.0618
04/11/2016	10	130	7.9	1.6	0.001	0.0069	-	0.026	0.054
28/11/2016	9.5	110	7.4	1.3	0.001	0.0064	-	0.021	0.036
20/12/2016	9.4	120	6.9	0.83	0.001	0.0056	-	0.02	0.035
26/01/2017	7.1	91	5.4	0.36	0.002	0.0045	-	0.014	0.015
26/03/2017	5.2	66	3.8	0.07	0.002	0.0031	-	0.006	0.007
30/06/2018	8.9	77	5.2	0.06	0.004	0.0004	-	<0.001	0.003
09/02/2019	6	62	4	0.08	0.007	<0.0001	-	<0.001	<0.001
22/02/2019	6.6	59	4.3	0.099	0.007	<0.0001	-	<0.001	0.002
20/08/2019	8.9	76	5.4	0.12	0.006	<0.0001	-	<0.001	0.002
30/10/2019	13	110	8.2	0.18	0.014	<0.0001	-	<0.001	0.002
06/04/2020	6.8	56	3.7	0.1	0.004	<0.0001	-	<0.001	0.002
15/09/2020	13	131	9	0.11	0.018	<0.0001	-	<0.001	0.003
21/10/2020	16	161	11	0.1	0.018	<0.0001	<0.001	<0.001	0.002
11/11/2020	17	172	13	0.13	0.013	<0.0001	<0.001	<0.001	0.002
04/12/2020	11	110	7	0.08	0.011	<0.0001	<0.001	<0.001	0.001
11/01/2021	6	51	4	0.05	0.006	<0.0001	<0.001	<0.001	<0.001
03/02/2021	3	23	4	0.06	0.003	<0.0001	<0.001	<0.001	0.002
11/03/2021	6	42	3	0.03	0.003	0.0002	<0.001	<0.001	0.002
16/04/2021	8	45	3	0.03	0.005	<0.0001	0.001	<0.001	<0.001
27/04/2021	8	47	3	0.04	0.006	<0.0001	<0.001	<0.001	0.003
16/06/2021	10	54	4	0.05	0.008	<0.0001	<0.001	<0.001	0.004
09/07/2021	10	61	4	0.04	0.008	<0.0001	<0.001	<0.001	<0.001
Q29SW1									
29/03/2016	4	15	2	0.16	0.003	<0.0001	-	<0.001	0.003
11/04/2016	4.6	13.6	1.6	0.106	0.0033	<0.0001	-	0.00107	0.00272
07/07/2016	6.1	20.6	1.8	0.0428	0.0026	<0.0001	-	0.001	0.0013
04/11/2016	17.4	33.5	3.2	0.0403	0.00305	<0.0001	-	0.00273	0.00217
28/11/2016	11	23	2	<0.01	0.002	<0.0001	-	<0.001	0.002
20/12/2016	3.1	3.6	2.7	0.21	0.006	<0.0001	-	<0.001	0.003
26/01/2017	2.6	9.4	1.6	0.13	0.003	<0.0001	-	<0.001	0.003
26/03/2017	3.3	9.8	1.7	0.05	0.003	<0.0001	-	<0.001	0.002
09/02/2019	3.3	9.8	1.7	0.16	0.003	<0.0001	-	<0.001	0.003
22/02/2019	5	15	1.8	<0.01	0.002	<0.0001	-	<0.001	0.001
16/02/2020	7.1	20	3	<0.01	0.004	<0.0001	-	0.002	0.002
06/04/2020	11	23	2	<0.01	0.002	<0.0001	-	<0.001	0.002
12/11/2020	1	1	3	0.09	0.004	<0.0001	<0.001	<0.001	<0.001
09/12/2020	4	8	4	<0.01	0.004	<0.0001	<0.001	<0.001	0.002
11/01/2021	3	11	2	<0.01	0.002	<0.0001	<0.001	<0.001	<0.001
03/02/2021	5	12	2	0.01	0.004	<0.0001	<0.001	<0.001	0.003
11/03/2021	6	12	2	0.1	0.003	<0.0001	<0.001	<0.001	0.002
16/04/2021	8	15	2	0.15	0.003	<0.0001	<0.001	<0.001	<0.001
27/04/2021	8	20	2	0.06	0.002	<0.0001	<0.001	0.001	0.005
Q29SW2									

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)
Analyte	Magnesium	Sodium	Potassium	Aluminium	Arsenic	Cadmium	Chromium	Cobalt	Copper
Analyte Short Name	Mg	Na	K	Al F	As F	Cd F	Cr F	Co F	Cu F
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	0.295	0.042	0.0004	0.006	-	0.0018
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	insufficient data	0.024	0.0002	0.001	-	0.0014
ANZECC 2000 Livestock Watering (beef cattle)	2000	-	-	5	0.5	0.01	1	1	2
ANZECC 2000 long term irrigation	-	-	-	5	0.1	0.01	0.1	0.05	0.2
29/03/2016	<1	4	1	0.18	0.001	<0.0001	-	<0.001	<0.001
11/04/2016	0.9	4.1	1.2	0.14	0.001	<0.0001	-	<0.001	0.00159
28/11/2016	0.8	4.2	1.5	0.11	<0.001	<0.0001	-	<0.001	<0.001
20/12/2016	<0.5	1.2	1.3	0.07	<0.001	<0.0001	-	<0.001	<0.001
26/01/2017	0.7	2.3	0.6	0.19	<0.001	<0.0001	-	<0.001	0.001
26/03/2017	0.6	2.6	0.7	0.17	0.001	<0.0001	-	<0.001	<0.001
09/02/2019	0.6	2.6	0.7	0.18	0.001	<0.0001	-	<0.001	<0.001
22/02/2019	1	4	1.5	0.06	0.001	<0.0001	-	<0.001	<0.001
16/02/2020	1.7	3.7	1.3	0.08	0.002	<0.0001	-	<0.001	0.001
06/04/2020	0.8	4.2	1.5	0.11	<0.001	<0.0001	-	<0.001	<0.001
04/12/2020	<1	1	2	0.52	<0.001	<0.0001	<0.001	<0.001	0.001
07/01/2021	<1	3	<1	0.11	<0.001	<0.0001	<0.001	<0.001	<0.001
03/02/2021	<1	3	<1	0.1	<0.001	<0.0001	0.002	<0.001	0.001
08/03/2021	<1	3	<1	0.4	0.002	<0.0001	<0.001	<0.001	<0.001
16/04/2021	<1	5	1	0.11	0.001	<0.0001	<0.001	<0.001	<0.001
06/05/2021	1	4	2	0.21	0.001	<0.0001	<0.001	<0.001	<0.001
Q29SW3									
29/03/2016	3	3	2	0.2	0.278	<0.0001	-	<0.001	0.002
11/05/2016	1.3	1.8	1.3	0.38	0.00785	<0.0001	-	<0.001	0.00204
20/12/2016	3.1	1.5	1.8	0.07	0.28	<0.0001	-	<0.001	0.002
26/03/2017	2.8	2	1.4	0.08	0.033	<0.0001	-	<0.001	<0.001
09/02/2019	2.8	2	1.4	0.2	0.278	<0.0001	-	<0.001	0.002
06/04/2020	3.5	4.4	2	0.02	0.12	<0.0001	-	<0.001	0.001
03/02/2021	-	-	-	-	-	-	-	-	-
06/05/2021	-	-	-	-	-	-	-	-	-
Q29SW4									
20/12/2016	<0.5	1.2	1	0.07	<0.001	<0.0001	-	<0.001	<0.001
26/01/2017	0.99	3.8	1.1	0.18	<0.001	<0.0001	-	<0.001	0.001
26/03/2017	0.8	3.7	1.1	0.29	<0.001	<0.0001	-	<0.001	<0.001
09/02/2019	0.8	3.7	1.1	0.08	0.002	<0.0001	-	<0.001	<0.001
22/02/2019	0.9	3.9	1.4	0.04	<0.001	<0.0001	-	<0.001	<0.001
16/02/2020	1.8	3.6	1.8	0.07	0.001	<0.0001	-	<0.001	0.001
06/04/2020	0.8	3.7	1	0.17	<0.001	<0.0001	-	<0.001	<0.001
04/12/2020	<1	1	2	0.32	<0.001	<0.0001	<0.001	<0.001	<0.001
11/01/2021	1	4	1	0.04	<0.001	<0.0001	<0.001	<0.001	<0.001
03/02/2021	<1	3	<1	0.08	<0.001	<0.0001	0.001	<0.001	<0.001
08/03/2021	<1	4	1	0.22	<0.001	<0.0001	<0.001	<0.001	<0.001
16/04/2021	2	6	2	0.34	<0.001	<0.0001	<0.001	<0.001	<0.001
29/04/2021	<1	4	1	0.18	<0.001	<0.0001	<0.001	<0.001	<0.001
Q29SW5									
07/07/2016	2.2	2	1.6	0.0316	0.0165	<0.0001	-	<0.001	0.00282
20/12/2016	1	1.1	1.7	0.08	0.005	<0.0001	-	<0.001	0.001
26/03/2017	1.2	2.5	1	0.16	0.004	<0.0001	-	<0.001	<0.001
09/02/2019	1.2	2.5	1	0.09	0.002	<0.0001	-	<0.001	<0.001
22/02/2019	1.1	1.9	1	0.03	0.009	<0.0001	-	<0.001	0.001
30/10/2019	2.2	2.4	2.1	0.03	0.026	<0.0001	-	<0.001	0.002
16/02/2020	1.2	2.7	1.7	0.07	0.009	<0.0001	-	<0.001	0.003
06/04/2020	1.2	2.5	1.2	0.03	0.017	<0.0001	-	<0.001	0.001
11/11/2020	2	2	1	0.02	0.03	<0.0001	<0.001	<0.001	<0.001
03/02/2021	<1	2	<1	0.38	0.004	<0.0001	<0.001	<0.001	<0.001

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Major Ions (dissolved)	Major Ions (dissolved)	Major Ions (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)
Analyte	Magnesium	Sodium	Potassium	Aluminium	Arsenic	Cadmium	Chromium	Cobalt	Copper
Analyte Short Name	Mg	Na	K	Al F	As F	Cd F	Cr F	Co F	Cu F
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	0.295	0.042	0.0004	0.006	-	0.0018
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	-	-	-	insufficient data	0.024	0.0002	0.001	-	0.0014
ANZECC 2000 Livestock Watering (beef cattle)	2000	-	-	5	0.5	0.01	1	1	2
ANZECC 2000 long term irrigation	-	-	-	5	0.1	0.01	0.1	0.05	0.2
27/04/2021	2	4	1	0.12	0.022	0.0001	<0.001	0.001	0.007
Q29SW6									
20/12/2016	1.4	1.4	1.9	0.04	0.008	<0.0001	-	<0.001	0.001
26/01/2017	1.2	2.6	1.5	0.11	0.006	<0.0001	-	<0.001	0.002
26/03/2017	1.2	2.3	1	0.13	0.005	<0.0001	-	<0.001	<0.001
30/06/2018	1	2	1	0.11	0.012	<0.0001	-	<0.001	<0.001
09/02/2019	1.2	2.3	1	0.11	0.012	<0.0001	-	<0.001	<0.001
06/04/2020	2.7	4.3	1.6	<0.01	0.015	<0.0001	-	<0.001	0.001
11/01/2021	<1	2	1	0.06	0.003	<0.0001	<0.001	<0.001	<0.001
03/02/2021	<1	2	<1	0.49	0.005	<0.0001	<0.001	<0.001	<0.001
08/03/2021	2	2	1	0.15	0.007	<0.0001	<0.001	<0.001	<0.001
16/04/2021	2	2	2	0.2	0.011	<0.0001	<0.001	<0.001	<0.001
27/04/2021	3	4	1	0.14	0.009	<0.0001	<0.001	0.001	0.004
Q29SW7									
20/12/2016	2.1	1.7	2	0.13	0.005	<0.0001	-	<0.001	0.003
26/01/2017	2.6	2.3	1.3	0.07	0.006	<0.0001	-	<0.001	0.002
26/03/2017	3	2.3	1.5	0.08	0.006	<0.0001	-	<0.001	<0.001
30/06/2018	3	3	2	0.11	0.011	<0.0001	-	<0.001	0.001
22/02/2019	3	2.3	1.5	0.08	0.006	<0.0001	-	<0.001	<0.001
16/02/2020	0.6	1.9	<0.5	0.02	<0.001	<0.0001	-	0.001	<0.001
12/11/2020	1	1	2	0.16	0.037	<0.0001	<0.001	<0.001	0.002
11/01/2021	3	3	2	<0.01	0.014	<0.0001	<0.001	<0.001	<0.001
03/02/2021	2	3	1	0.47	0.011	<0.0001	<0.001	<0.001	0.001
16/04/2021	-	-	-	-	-	-	-	-	-
Q29SW7									
27/04/2021	-	-	-	-	-	-	-	-	-
20/12/2016	1.4	1.4	1.9	0.04	0.007	<0.0001	-	<0.001	0.001
09/02/2019	<1	2	<1	0.02	<0.001	<0.0001	-	<0.001	<0.001
11/01/2021	1	2	1	0.05	0.004	<0.0001	<0.001	<0.001	<0.001
03/02/2021	1	2	<1	0.41	0.006	<0.0001	<0.001	<0.001	<0.001
08/03/2021	4	3	1	0.21	0.008	<0.0001	<0.001	<0.001	<0.001
16/04/2021	5	3	2	0.12	0.007	<0.0001	<0.001	<0.001	<0.001
27/04/2021	6	4	2	0.05	0.008	<0.0001	<0.001	<0.001	<0.001

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (Total)	Metals (Total)
Analyte	Lead	Manganese	Nickel	Selenium Se (Total)	Tin	Uranium	Zinc	Iron	Aluminium	Arsenic
Analyte Short Name	Pb_F	Mn_F	Ni_F	Se_F	Sn_F	U_F	Zn_F	Fe_F	Al_T	As_T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	0.0056	2.5	0.013	-	-	-	0.015	2.7	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-	insufficient data	0.024
ANZECC 2000 Livestock Watering (beef cattle)	0.1	-	1	0.02	-	0.2	20	-	5	0.5
ANZECC 2000 long term irrigation	2	0.2	0.2	0.02	-	0.01	2	0.2	5	0.1
Date	Pb_F	Mn_F	Ni_F	Se_F	Sn_F	U_F	Zn_F	Fe_F	Al_T	As_T
Q29SW Leach										
06/06/2015	<0.001	0.291	0.0926	-	-	<0.0005	0.339	0.01	1.48	0.0015
29/03/2016	<0.001	0.257	0.0869	-	-	0.00119	0.292	<0.01	1.68	0.00265
11/04/2016	<0.001	0.255	0.0862	-	-	0.00101	0.306	0.006	1.36	0.002
11/05/2016	<0.001	0.273	0.0893	-	-	<0.0005	0.321	0.008	1.4	0.00155
07/07/2016	<0.001	0.317	0.1	-	-	<0.0005	0.369	0.018	1.54	0.0015
04/11/2016	<0.001	0.37	0.11	-	-	0.0007	0.38	0.01	1.5	0.001
28/11/2016	<0.001	0.35	0.095	-	-	<0.0005	0.32	0.02	1.1	0.001
20/12/2016	0.31	0.084	<0.001	-	-	<0.0005	0.28	<0.01	0.86	0.002
26/01/2017	0.24	0.065	<0.001	-	-	<0.0005	0.21	<0.01	0.82	0.002
26/03/2017	<0.001	0.12	0.039	-	-	<0.0005	0.12	<0.01	0.14	0.002
30/06/2018	<0.001	<0.005	0.005	-	-	<0.0005	0.005	<0.01	0.41	0.006
09/02/2019	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	<0.05	-	-
22/02/2019	<0.001	<0.005	<0.001	-	-	<0.0005	0.002	<0.01	0.15	0.007
20/08/2019	<0.001	<0.005	<0.001	-	-	0.0007	<0.001	<0.01	0.13	0.006
30/10/2019	<0.001	<0.005	<0.001	-	-	0.002	0.002	<0.01	0.2	0.015
06/04/2020	<0.001	<0.005	<0.001	-	-	<0.0005	0.002	<0.01	0.11	0.006
15/09/2020	<0.001	0.005	<0.001	<0.01	<0.001	0.001	<0.005	<0.05	0.13	0.02
21/10/2020	<0.001	0.033	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.13	0.019
11/11/2020	<0.001	0.017	0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.15	0.013
04/12/2020	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.17	0.013
11/01/2021	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.08	0.006
03/02/2021	<0.001	0.032	<0.001	<0.01	<0.001	<0.001	<0.005	0.06	0.13	0.003
11/03/2021	<0.001	0.002	0.002	<0.01	<0.001	<0.001	<0.005	<0.05	0.04	0.004
16/04/2021	<0.001	<0.001	0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.12	0.006
27/04/2021	<0.001	0.004	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.04	0.005
16/06/2021	<0.001	0.002	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.07	0.008
09/07/2021	<0.001	0.002	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.05	0.009
Q29SW1										
29/03/2016	<0.001	0.043	<0.001	-	-	<0.0005	<0.001	0.17	-	-
11/04/2016	<0.001	0.0565	<0.001	-	-	<0.0005	0.0095	0.118	0.953	0.00405
07/07/2016	<0.001	0.0355	<0.001	-	-	<0.0005	0.01	0.072	0.246	0.0037
04/11/2016	<0.001	0.194	0.00163	-	-	<0.0005	0.0229	0.118	0.305	0.0052
28/11/2016	<0.001	0.044	<0.001	-	-	<0.0005	0.003	0.01	0.05	0.004
20/12/2016	<0.001	0.001	<0.001	-	-	<0.0005	0.003	0.17	0.42	0.011
26/01/2017	0.025	<0.005	<0.001	-	-	<0.0005	0.001	0.12	0.2	0.003
26/03/2017	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	0.09	0.05	0.004
09/02/2019	<0.001	0.043	<0.001	-	-	<0.0005	<0.001	0.17	0.05	0.004
22/02/2019	<0.001	0.041	<0.001	-	-	<0.0005	0.004	0.02	0.11	0.004
16/02/2020	<0.001	0.25	0.001	-	-	<0.0005	0.01	0.02	0.15	0.011
06/04/2020	<0.001	0.044	<0.001	-	-	<0.0005	0.003	0.01	0.05	0.004
12/11/2020	0.003	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	0.22	9.03	0.068
09/12/2020	<0.001	0.175	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.69	0.006
11/01/2021	<0.001	0.037	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.11	0.004
03/02/2021	0.001	0.006	0.001	<0.01	<0.001	<0.001	<0.005	0.48	0.92	0.004
11/03/2021	<0.001	0.04	<0.001	<0.01	<0.001	<0.001	<0.005	0.1	0.2	0.004
16/04/2021	<0.001	0.048	<0.001	<0.01	<0.001	<0.001	<0.005	0.13	0.14	0.004
27/04/2021	<0.001	0.033	<0.001	<0.01	<0.001	<0.001	<0.005	0.09	0.08	0.002
Q29SW2										

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (Total)	Metals (Total)
Analyte	Lead	Manganese	Nickel	Selenium Se (Total)	Tin	Uranium	Zinc	Iron	Aluminium	Arsenic
Analyte Short Name	Pb F	Mn F	Ni F	Se F	Sn F	U F	Zn F	Fe F	Al T	As T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	0.0056	2.5	0.013	-	-	-	0.015	2.7	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-	insufficient data	0.024
ANZECC 2000 Livestock Watering (beef cattle)	0.1	-	1	0.02	-	0.2	20	-	5	0.5
ANZECC 2000 long term irrigation	2	0.2	0.2	0.02	-	0.01	2	0.2	5	0.1
29/03/2016	<0.001	0.034	0.001	-	-	<0.0005	<0.001	0.38	-	-
11/04/2016	<0.001	0.0152	<0.001	-	-	<0.0005	0.0087	0.132	4.34	0.002
28/11/2016	<0.001	0.006	<0.001	-	-	<0.0005	<0.001	0.16	0.31	<0.001
20/12/2016	<0.001	<0.005	<0.001	-	-	<0.0005	0.001	0.11	6.9	0.004
26/01/2017	<0.001	<0.005	<0.001	-	-	<0.0005	0.01	0.22	0.72	0.002
26/03/2017	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	0.18	0.1	0.002
09/02/2019	<0.001	0.034	<0.001	-	-	<0.0005	<0.001	0.38	0.1	0.002
22/02/2019	<0.001	0.015	<0.001	-	-	<0.0005	0.005	0.21	0.84	0.002
16/02/2020	<0.001	<0.005	<0.001	-	-	<0.0005	0.002	0.5	0.69	0.003
06/04/2020	<0.001	0.006	<0.001	-	-	<0.0005	<0.001	0.16	0.31	<0.001
04/12/2020	<0.001	0.01	<0.001	<0.01	<0.001	<0.001	<0.005	0.5	6.68	0.003
07/01/2021	<0.001	0.013	<0.001	<0.01	<0.001	<0.001	<0.005	0.3	1.25	0.001
03/02/2021	<0.001	0.005	0.001	<0.01	<0.001	<0.001	<0.005	1.39	2.61	<0.001
08/03/2021	<0.001	0.009	<0.001	<0.01	<0.001	<0.001	<0.005	0.34	1.11	0.002
16/04/2021	<0.001	0.025	<0.001	<0.01	<0.001	<0.001	<0.005	0.42	0.34	0.001
06/05/2021	<0.001	0.06	<0.001	<0.01	<0.001	<0.001	<0.005	0.63	0.5	0.002
Q29SW3										
29/03/2016	<0.001	0.003	<0.001	-	-	<0.0005	<0.001	0.13	-	-
11/05/2016	<0.001	0.0221	0.00118	-	-	<0.0005	0.0085	0.224	1.68	0.0105
20/12/2016	0.021	0.001	<0.001	-	-	<0.0005	0.003	0.08	0.97	0.35
26/03/2017	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	0.1	0.05	0.037
09/02/2019	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	0.13	0.05	0.037
06/04/2020	<0.001	<0.005	<0.001	-	-	<0.0005	0.002	0.05	0.13	0.14
03/02/2021	-	-	-	-	-	-	-	-	-	-
06/05/2021	-	-	-	-	-	-	-	-	-	-
Q29SW4										
20/12/2016	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	0.1	4.7	0.002
26/01/2017	0.008	<0.005	<0.001	-	-	<0.0005	0.006	0.23	0.51	0.001
26/03/2017	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	0.25	0.15	<0.001
09/02/2019	<0.001	0.028	<0.001	-	-	<0.0005	<0.001	0.3	0.15	<0.001
22/02/2019	<0.001	0.018	<0.001	-	-	<0.0005	<0.001	0.14	0.21	0.001
16/02/2020	<0.001	0.028	<0.001	-	-	<0.0005	<0.001	0.38	0.49	0.002
06/04/2020	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	0.29	1.6	0.001
04/12/2020	0.001	0.015	<0.001	<0.01	<0.001	<0.001	<0.005	0.34	4.2	0.003
11/01/2021	<0.001	0.042	<0.001	<0.01	<0.001	<0.001	<0.005	0.19	0.05	<0.001
03/02/2021	<0.001	0.004	<0.001	<0.01	<0.001	<0.001	<0.005	1.16	1.18	<0.001
08/03/2021	<0.001	0.013	<0.001	<0.01	<0.001	<0.001	<0.005	0.19	0.32	<0.001
16/04/2021	<0.001	0.016	<0.001	<0.01	<0.001	<0.001	<0.005	0.26	0.76	<0.001
29/04/2021	<0.001	0.027	<0.001	<0.01	<0.001	<0.001	<0.005	0.15	0.4	<0.001
Q29SW5										
07/07/2016	<0.001	0.00394	<0.001	-	-	<0.0005	0.0123	0.23	0.239	0.023
20/12/2016	<0.001	<0.005	<0.001	-	-	<0.0005	0.003	0.09	0.3	0.007
26/03/2017	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	0.13	0.13	0.005
09/02/2019	<0.001	0.016	<0.001	-	-	<0.0005	<0.001	0.09	0.13	0.005
22/02/2019	<0.001	<0.005	<0.001	-	-	<0.0005	0.002	0.07	0.16	0.014
30/10/2019	<0.001	<0.005	<0.001	-	-	<0.0005	0.007	0.03	0.03	0.03
16/02/2020	<0.001	0.006	0.001	-	-	<0.0005	0.023	0.12	0.22	0.02
06/04/2020	<0.001	<0.005	<0.001	-	-	<0.0005	0.005	0.09	0.1	0.026
11/11/2020	<0.001	0.006	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.05	0.029
03/02/2021	<0.001	0.008	<0.001	<0.01	<0.001	<0.001	<0.005	0.22	0.36	0.006

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (dissolved)	Metals (Total)	Metals (Total)
Analyte	Lead	Manganese	Nickel	Selenium Se (Total)	Tin	Uranium	Zinc	Iron	Aluminium	Arsenic
Analyte Short Name	Pb F	Mn F	Ni F	Se F	Sn F	U F	Zn F	Fe F	Al T	As T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	0.0056	2.5	0.013	-	-	-	0.015	2.7	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-	insufficient data	0.024
ANZECC 2000 Livestock Watering (beef cattle)	0.1	-	1	0.02	-	0.2	20	-	5	0.5
ANZECC 2000 long term irrigation	2	0.2	0.2	0.02	-	0.01	2	0.2	5	0.1
27/04/2021	<0.001	0.035	0.001	<0.01	<0.001	<0.001	0.008	0.15	0.08	0.027
Q29SW6										
20/12/2016	<0.001	<0.005	<0.001	-	-	<0.0005	0.003	0.08	0.26	0.011
26/01/2017	<0.001	0.001	<0.001	-	-	<0.0005	0.024	0.1	0.24	0.008
26/03/2017	<0.001	<0.005	<0.001	-	-	<0.0005	<0.001	0.12	0.14	0.007
30/06/2018	<0.001	0.01	<0.001	-	-	<0.0005	<0.001	0.08	-	-
09/02/2019	<0.001	0.01	<0.001	-	-	<0.0005	<0.001	0.08	0.14	0.007
06/04/2020	<0.001	<0.005	<0.001	-	-	<0.0005	0.007	0.03	0.28	0.039
11/01/2021	<0.001	0.008	<0.001	<0.01	<0.001	<0.001	<0.005	0.1	0.36	0.004
03/02/2021	<0.001	0.006	<0.001	<0.01	<0.001	<0.001	<0.005	0.22	0.62	0.006
08/03/2021	<0.001	0.014	<0.001	<0.01	<0.001	<0.001	<0.005	0.17	0.21	0.007
16/04/2021	<0.001	0.051	0.002	<0.01	<0.001	<0.001	<0.005	0.17	0.33	0.015
27/04/2021	<0.001	0.089	<0.001	<0.01	<0.001	<0.001	<0.005	0.12	0.13	0.01
Q29SW7										
20/12/2016	<0.001	0.001	<0.001	-	-	<0.0005	0.005	0.17	0.46	0.011
26/01/2017	<0.001	<0.005	<0.001	-	-	<0.0005	0.002	0.13	0.21	0.009
26/03/2017	<0.001	<0.005	<0.001	-	-	<0.0005	0.001	0.13	0.07	0.009
30/06/2018	0.001	0.014	0.001	-	-	<0.0005	<0.001	0.24	-	-
22/02/2019	<0.001	<0.005	<0.001	-	-	<0.0005	0.001	0.13	0.07	0.009
16/02/2020	<0.001	0.23	<0.001	-	-	<0.0005	<0.001	0.11	0.04	<0.001
12/11/2020	<0.001	0.003	0.002	<0.01	<0.001	<0.001	0.021	0.26	9.9	0.418
11/01/2021	<0.001	0.013	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05	0.28	0.021
03/02/2021	<0.001	0.008	<0.001	<0.01	<0.001	<0.001	<0.005	0.32	0.53	0.016
16/04/2021	-	-	-	-	-	-	-	-	-	-
Q29SW7										
27/04/2021	-	-	-	-	-	-	-	-	-	-
20/12/2016	<0.001	<0.005	<0.001	-	-	<0.0005	0.001	0.08	0.39	0.014
09/02/2019	<0.001	0.069	<0.001	-	-	<0.0005	0.007	0.17	-	-
11/01/2021	<0.001	0.019	<0.001	<0.01	<0.001	<0.001	<0.005	0.11	0.33	0.006
03/02/2021	<0.001	0.009	<0.001	<0.01	<0.001	<0.001	<0.005	0.26	0.39	0.008
08/03/2021	<0.001	0.023	<0.001	<0.01	<0.001	<0.001	<0.005	0.2	0.23	0.006
16/04/2021	<0.001	0.041	<0.001	<0.01	<0.001	<0.001	<0.005	0.19	0.2	0.01
27/04/2021	<0.001	0.083	<0.001	<0.01	<0.001	<0.001	<0.005	0.25	0.06	0.01

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)
Analyte	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Tin	Uranium	Zinc	Iron
Analyte Short Name	Cd_T	Cr_T	Co_T	Cu_T	Pb_T	Mn_T	Ni_T	Se_T	Sn_T	U_T	Zn_T	Fe_T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	-	-	-	-	-	-	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0002	0.001	-	0.0014	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-
ANZECC 2000 Livestock Watering (beef cattle)	0.01	1	1	2	0.1	-	1	0.02	-	0.2	20	-
ANZECC 2000 long term irrigation	0.01	1	0.5	0.2	2	0.2	0.2	0.02	-	0.01	2	-
Date	Cd_T	Cr_T	Co_T	Cu_T	Pb_T	Mn_T	Ni_T	Se_T	Sn_T	U_T	Zn_T	Fe_T
Q29SW Leach												
06/06/2015	0.00608	<0.001	0.0204	0.0639	0.00068	0.29	0.0931	-	-	0.00121	0.339	0.102
29/03/2016	0.00502	<0.001	0.0186	0.0671	0.00072	0.252	0.0856	-	-	0.00131	0.285	0.074
11/04/2016	0.00516	0.0002	0.0189	0.061	<0.001	0.258	0.0866	-	-	0.00111	0.302	0.036
11/05/2016	0.00522	<0.001	0.0187	0.0624	0.00065	0.275	0.0877	-	-	0.00115	0.32	0.098
07/07/2016	0.00614	<0.001	0.0226	0.0643	0.00083	0.331	0.103	-	-	0.000968	0.357	0.076
04/11/2016	0.0069	<0.001	0.024	0.053	<0.001	0.35	0.1	-	-	0.0009	0.36	0.02
28/11/2016	0.0063	<0.001	0.021	0.048	<0.001	0.35	0.098	-	-	0.0006	0.3	0.05
20/12/2016	0.0058	<0.001	0.021	0.04	0.31	0.09	<0.001	-	-	0.0006	0.29	0.05
26/01/2017	0.0046	<0.001	0.015	0.022	0.24	0.065	<0.001	-	-	<0.0005	0.2	0.04
26/03/2017	0.0032	<0.001	0.006	0.01	<0.001	0.12	0.04	-	-	<0.0005	0.12	<0.01
30/06/2018	0.0026	0.006	0.001	0.02	<0.001	0.084	0.023	-	-	0.0008	0.047	0.08
09/02/2019	-	-	-	-	-	-	-	-	-	-	-	-
22/02/2019	<0.0001	<0.001	<0.001	0.002	<0.001	0.032	0.001	-	-	<0.0005	0.004	0.03
20/08/2019	<0.0001	<0.001	<0.001	0.003	<0.001	0.026	<0.001	-	-	0.0007	0.002	<0.01
30/10/2019	<0.0001	<0.001	<0.001	0.002	<0.001	0.066	0.001	-	-	0.0021	0.004	0.03
06/04/2020	<0.0001	<0.001	<0.001	0.002	<0.001	<0.005	<0.001	-	-	<0.0005	0.009	0.04
15/09/2020	<0.0001	<0.001	<0.001	0.004	<0.001	0.063	<0.001	<0.01	<0.01	0.001	<0.005	<0.05
21/10/2020	<0.0001	<0.001	<0.001	0.003	<0.001	0.106	0.001	<0.01	<0.001	<0.001	<0.005	<0.05
11/11/2020	<0.0001	<0.001	<0.001	0.002	<0.001	0.044	0.001	<0.01	<0.001	<0.001	<0.005	<0.05
04/12/2020	0.0001	<0.001	<0.001	0.003	<0.001	0.05	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05
11/01/2021	<0.0001	<0.001	<0.001	0.002	<0.001	0.019	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05
03/02/2021	<0.0001	<0.001	<0.001	0.003	<0.001	0.046	0.001	<0.01	<0.001	<0.001	<0.005	0.27
11/03/2021	0.0002	<0.001	<0.001	0.002	<0.001	0.009	0.003	<0.01	<0.001	<0.001	0.005	<0.05
16/04/2021	<0.0001	<0.001	<0.001	0.002	<0.001	0.011	<0.001	<0.01	<0.001	<0.001	<0.005	0.09
27/04/2021	0.0001	<0.001	<0.001	0.001	<0.001	0.009	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05
16/06/2021	<0.0001	<0.001	<0.001	0.005	<0.001	0.019	<0.001	<0.01	<0.001	<0.001	<0.005	<0.05
09/07/2021	<0.0001	<0.001	<0.001	0.003	<0.001	0.018	0.001	<0.01	<0.001	<0.001	<0.005	<0.05
Q29SW1												
29/03/2016	-	-	-	-	-	-	-	-	-	-	-	-
11/04/2016	<0.0001	<0.001	0.00111	0.00394	0.00159	0.0552	0.00101	-	-	<0.0005	0.0088	0.436
07/07/2016	<0.0001	<0.001	0.00134	0.00203	0.00069	0.0497	0.00063	-	-	<0.0005	0.0111	0.328
04/11/2016	<0.0001	<0.001	0.00298	0.00413	0.00167	0.212	0.00217	-	-	<0.0005	0.044	0.54
28/11/2016	<0.0001	<0.001	0.001	0.002	<0.001	0.05	<0.001	-	-	<0.0005	0.002	0.36
20/12/2016	<0.0001	<0.001	<0.001	0.005	0.042	0.002	0.007	-	-	<0.0005	0.005	0.5
26/01/2017	<0.0001	<0.001	<0.001	0.004	0.035	<0.001	0.001	-	-	<0.0005	0.002	0.28
26/03/2017	<0.0001	<0.001	<0.001	0.003	<0.001	0.029	<0.001	-	-	<0.0005	0.002	0.23
09/02/2019	<0.0001	<0.001	<0.001	0.003	<0.001	0.029	<0.001	-	-	<0.0005	0.002	0.23
22/02/2019	<0.0001	<0.001	<0.001	0.002	<0.001	0.053	<0.001	-	-	<0.0005	0.003	0.43
16/02/2020	<0.0001	<0.001	0.003	0.002	0.002	0.35	0.001	-	-	<0.0005	0.013	1.7
06/04/2020	<0.0001	<0.001	0.001	0.002	<0.001	0.05	<0.001	-	-	<0.0005	0.002	0.36
12/11/2020	0.0002	0.007	0.009	0.029	0.435	0.833	0.008	<0.01	<0.001	0.004	0.049	5.76
09/12/2020	<0.0001	<0.001	<0.001	0.004	0.006	0.162	0.002	<0.01	<0.001	<0.001	0.011	0.51
11/01/2021	<0.0001	<0.001	<0.001	0.002	0.001	0.049	<0.001	<0.01	<0.001	<0.001	<0.005	0.32
03/02/2021	<0.0001	<0.001	<0.001	0.002	0.001	0.044	<0.001	<0.01	<0.001	<0.001	<0.005	0.42
11/03/2021	<0.0001	<0.001	<0.001	0.003	<0.001	0.043	<0.001	<0.01	<0.001	<0.001	0.018	0.27
16/04/2021	<0.0001	0.001	<0.001	0.003	<0.001	0.056	<0.001	<0.01	<0.001	<0.001	<0.005	0.35
27/04/2021	<0.0001	0.003	<0.001	0.003	<0.001	0.034	<0.001	<0.01	<0.001	<0.001	<0.005	0.23
Q29SW2												

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)
Analyte	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Tin	Uranium	Zinc	Iron
Analyte Short Name	Cd T	Cr T	Co T	Cu T	Pb T	Mn T	Ni T	Se T	Sn T	U T	Zn T	Fe T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	-	-	-	-	-	-	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0002	0.001	-	0.0014	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-
ANZECC 2000 Livestock Watering (beef cattle)	0.01	1	1	2	0.1	-	1	0.02	-	0.2	20	-
ANZECC 2000 long term irrigation	0.01	1	0.5	0.2	2	0.2	0.2	0.02	-	0.01	2	-
29/03/2016	-	-	-	-	-	-	-	-	-	-	-	-
11/04/2016	<0.0001	0.0024	0.00093	0.00283	0.00206	0.025	0.00195	-	-	<0.0005	0.0111	1.9
28/11/2016	<0.0001	<0.001	<0.001	<0.001	0.001	0.023	<0.001	-	-	<0.0005	0.002	0.81
20/12/2016	0.0004	0.009	0.006	0.009	0.26	0.005	0.015	-	-	0.0022	0.011	10
26/01/2017	<0.0001	0.002	<0.001	0.003	0.027	0.001	0.002	-	-	<0.0005	0.019	1.4
26/03/2017	<0.0001	<0.001	<0.001	<0.001	<0.001	0.008	<0.001	-	-	<0.0005	0.002	0.31
09/02/2019	<0.0001	<0.001	<0.001	<0.001	<0.001	0.008	<0.001	-	-	<0.0005	0.002	0.31
22/02/2019	<0.0001	0.001	0.001	0.004	0.003	0.11	0.004	-	-	<0.0005	0.035	2.4
16/02/2020	<0.0001	0.001	0.002	0.002	0.002	0.16	0.001	-	-	<0.0005	0.006	3.7
06/04/2020	<0.0001	<0.001	<0.001	<0.001	0.001	0.023	<0.001	-	-	<0.0005	0.002	0.81
04/12/2020	<0.0001	0.008	0.003	0.007	0.015	0.104	0.005	<0.01	<0.001	0.001	0.01	7.68
07/01/2021	<0.0001	0.001	<0.001	<0.001	<0.001	0.019	<0.001	<0.01	<0.001	<0.001	<0.005	1.51
03/02/2021	<0.0001	0.002	<0.001	0.001	0.002	0.019	0.001	<0.01	<0.001	<0.001	<0.005	1.59
08/03/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.014	<0.001	<0.01	<0.001	<0.001	<0.005	0.58
16/04/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.028	<0.001	<0.01	<0.001	<0.001	<0.005	0.84
06/05/2021	<0.0001	<0.001	<0.001	0.001	0.001	0.091	<0.001	<0.01	<0.001	<0.001	0.006	1.65
Q29SW3												
29/03/2016	-	-	-	-	-	-	-	-	-	-	-	-
11/05/2016	<0.0001	0.0014	0.00054	0.00313	0.00179	0.0408	0.00196	-	-	<0.0005	0.0105	0.844
20/12/2016	<0.0001	0.005	0.002	0.006	0.042	0.004	0.005	-	-	<0.0005	0.01	1.9
26/03/2017	<0.0001	<0.001	<0.001	0.001	<0.001	0.013	<0.001	-	-	<0.0005	0.002	0.14
09/02/2019	<0.0001	<0.001	<0.001	0.001	<0.001	0.013	<0.001	-	-	<0.0005	0.002	0.14
06/04/2020	<0.0001	<0.001	<0.001	0.003	0.002	0.06	0.002	-	-	<0.0005	0.016	0.37
03/02/2021	-	-	-	-	-	-	-	-	-	-	-	-
06/05/2021	-	-	-	-	-	-	-	-	-	-	-	-
Q29SW4												
20/12/2016	<0.0001	0.007	0.004	0.006	0.17	0.004	0.02	-	-	0.002	0.011	7
26/01/2017	<0.0001	0.001	<0.001	0.002	0.047	<0.001	0.002	-	-	<0.0005	0.011	1.2
26/03/2017	<0.0001	<0.001	<0.001	<0.001	0.001	0.013	<0.001	-	-	<0.0005	0.002	0.36
09/02/2019	<0.0001	<0.001	<0.001	<0.001	0.001	0.013	<0.001	-	-	<0.0005	0.002	0.36
22/02/2019	<0.0001	<0.001	<0.001	<0.001	0.001	0.035	<0.001	-	-	<0.0005	<0.001	0.78
16/02/2020	<0.0001	0.001	0.001	0.002	0.003	0.11	<0.001	-	-	<0.0005	0.002	2.5
06/04/2020	<0.0001	0.002	<0.001	0.002	0.003	0.029	0.001	-	-	<0.0005	0.003	2.6
04/12/2020	<0.0001	0.005	0.002	0.006	0.013	0.076	0.003	<0.01	<0.001	<0.001	0.009	4.02
11/01/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.037	<0.001	<0.01	<0.001	<0.001	<0.005	0.38
03/02/2021	<0.0001	0.001	<0.001	0.002	0.002	0.02	<0.001	<0.01	<0.001	<0.001	<0.005	1.23
08/03/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.012	<0.001	<0.01	<0.001	<0.001	<0.005	0.24
16/04/2021	<0.0001	0.001	<0.001	<0.001	0.002	0.026	<0.001	<0.01	<0.001	<0.001	<0.005	1.1
29/04/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.027	<0.001	<0.01	<0.001	<0.001	<0.005	0.47
Q29SW5												
07/07/2016	<0.0001	<0.001	<0.001	0.00447	0.00182	0.0374	0.00153	-	-	0.000055	0.0279	0.518
20/12/2016	<0.0001	<0.001	<0.001	0.002	0.039	0.001	0.003	-	-	<0.0005	0.005	0.42
26/03/2017	<0.0001	<0.001	<0.001	<0.001	<0.001	0.029	<0.001	-	-	<0.0005	0.002	0.29
09/02/2019	<0.0001	<0.001	<0.001	<0.001	<0.001	0.029	<0.001	-	-	<0.0005	0.002	0.29
22/02/2019	<0.0001	<0.001	<0.001	0.002	<0.001	0.037	<0.001	-	-	<0.0005	0.004	0.36
30/10/2019	<0.0001	<0.001	<0.001	0.002	<0.001	0.037	<0.001	-	-	<0.0005	0.008	0.17
16/02/2020	<0.0001	<0.001	<0.001	0.005	0.002	0.032	0.002	-	-	<0.0005	0.032	0.55
06/04/2020	<0.0001	<0.001	<0.001	0.002	<0.001	0.035	0.001	-	-	<0.0005	0.016	0.36
11/11/2020	<0.0001	<0.001	<0.001	<0.001	0.013	0.022	<0.001	<0.01	<0.001	<0.001	<0.005	0.1
03/02/2021	<0.0001	<0.001	<0.001	0.003	0.001	0.018	<0.001	<0.01	<0.001	<0.001	<0.005	0.43

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)	Metals (Total)
Analyte	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Tin	Uranium	Zinc	Iron
Analyte Short Name	Cd T	Cr T	Co T	Cu T	Pb T	Mn T	Ni T	Se T	Sn T	U T	Zn T	Fe T
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	-	-	-	-	-	-	-	-	-	-	-
Tropical Australia Lowland Rivers	-	-	-	-	-	-	-	-	-	-	-	-
ANZG 2018 freshwater - 95% species protection	0.0002	0.001	-	0.0014	0.0034	1.9	0.011	0.011	-	insufficient data	0.008	-
ANZECC 2000 Livestock Watering (beef cattle)	0.01	1	1	2	0.1	-	1	0.02	-	0.2	20	-
ANZECC 2000 long term irrigation	0.01	1	0.5	0.2	2	0.2	0.2	0.02	-	0.01	2	-
27/04/2021	<0.0001	<0.001	<0.001	0.002	<0.001	0.08	<0.001	<0.01	<0.001	<0.001	<0.005	0.27
Q29SW6												
20/12/2016	<0.0001	<0.001	<0.001	0.002	0.11	0.001	0.002	-	-	<0.0005	0.006	0.48
26/01/2017	<0.0001	<0.001	<0.001	0.004	0.035	0.002	0.002	-	-	<0.0005	0.03	0.41
26/03/2017	<0.0001	<0.001	<0.001	0.001	<0.001	0.049	<0.001	-	-	<0.0005	0.002	0.32
30/06/2018	-	-	-	-	-	-	-	-	-	-	-	-
09/02/2019	<0.0001	<0.001	<0.001	0.001	<0.001	0.049	<0.001	-	-	<0.0005	0.002	0.32
06/04/2020	<0.0001	0.002	0.001	0.003	0.002	0.13	0.002	-	-	<0.0005	0.023	0.78
11/01/2021	<0.0001	<0.001	<0.001	0.001	<0.001	0.014	<0.001	<0.01	<0.001	<0.001	<0.005	0.35
03/02/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.016	<0.001	<0.01	<0.001	<0.001	<0.005	0.33
08/03/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.013	<0.001	<0.01	<0.001	<0.001	<0.005	0.21
16/04/2021	<0.0001	<0.001	<0.001	0.002	0.001	0.063	0.001	<0.01	<0.001	<0.001	<0.005	0.6
27/04/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.097	<0.001	<0.01	<0.001	<0.001	<0.005	0.23
Q29SW7												
20/12/2016	<0.0001	0.002	<0.001	0.005	0.027	0.002	0.005	-	-	<0.0005	0.014	0.64
26/01/2017	<0.0001	<0.001	<0.001	0.002	0.027	<0.001	0.002	-	-	<0.0005	0.006	0.39
26/03/2017	<0.0001	<0.001	<0.001	0.001	0.002	0.021	<0.001	-	-	<0.0005	0.003	0.27
30/06/2018	-	-	-	-	-	-	-	-	-	-	-	-
22/02/2019	<0.0001	<0.001	<0.001	0.001	0.002	0.021	<0.001	-	-	<0.0005	0.003	0.27
16/02/2020	<0.0001	<0.001	0.002	<0.001	<0.001	0.24	<0.001	-	-	<0.0005	<0.001	0.51
12/11/2020	0.0008	0.037	0.04	0.058	0.049	0.935	0.053	<0.01	<0.001	0.002	0.699	11.8
11/01/2021	<0.0001	<0.001	<0.001	0.002	0.001	0.017	<0.001	<0.01	<0.001	<0.001	<0.005	0.39
03/02/2021	<0.0001	<0.001	<0.001	0.002	0.003	0.015	<0.001	<0.01	<0.001	<0.001	0.006	0.75
16/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
Q29SW7												
27/04/2021	-	-	-	-	-	-	-	-	-	-	-	-
20/12/2016	<0.0001	0.001	0.001	0.003	0.12	0.002	0.005	-	-	<0.0005	0.01	0.7
09/02/2019	-	-	-	-	-	-	-	-	-	-	-	-
11/01/2021	<0.0001	<0.001	<0.001	0.002	<0.001	0.025	<0.001	<0.01	<0.001	<0.001	0.019	0.5
03/02/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.018	<0.001	<0.01	<0.001	<0.001	<0.005	0.44
08/03/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.017	<0.001	<0.01	<0.001	<0.001	<0.005	0.46
16/04/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.041	<0.001	<0.01	<0.001	<0.001	<0.005	0.46
27/04/2021	<0.0001	<0.001	<0.001	<0.001	<0.001	0.13	<0.001	<0.01	<0.001	<0.001	<0.005	0.56

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Metals (Total)	Nutrients	Nutrients	Nutrients	Nutrients	Nutrients
Analyte	Ferrous Iron	Ammonia	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P
Analyte Short Name	Ferrous Iron	NH3	Nox	TKN_N	TN_N	P_Tot
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	1.4	-	-	-	-
Tropical Australia Lowland Rivers	-	0.01	-	-	0.2 - 0.3	0.01
ANZG 2018 freshwater - 95% species protection	-	0.9	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	5	0.05
Date	Ferrous Iron	NH3	Nox	TKN_N	TN_N	P_Tot
Q29SW Leach						
06/06/2015	-	-	-	-	-	-
29/03/2016	-	-	-	-	-	-
11/04/2016	-	-	-	-	-	-
11/05/2016	-	-	-	-	-	-
07/07/2016	-	-	-	-	-	-
04/11/2016	-	-	-	-	-	-
28/11/2016	-	-	-	-	-	-
20/12/2016	-	-	-	-	-	-
26/01/2017	-	-	-	-	-	-
26/03/2017	-	-	-	-	-	-
30/06/2018	-	-	-	-	-	-
09/02/2019	-	-	-	-	-	-
22/02/2019	-	-	-	-	-	-
20/08/2019	-	-	-	-	-	-
30/10/2019	-	-	-	-	-	-
06/04/2020	-	-	-	-	-	-
15/09/2020	<0.05	0.04	0.02	0.5	0.5	0.01
21/10/2020	<0.05	0.02	0.01	0.6	0.6	<0.01
11/11/2020	<0.05	0.02	0.1	0.6	0.7	<0.01
04/12/2020	<0.05	0.07	0.03	0.4	0.4	0.02
11/01/2021	<0.05	0.1	0.02	0.4	0.4	<0.01
03/02/2021	<0.05	0.01	0.11	0.2	0.3	0.02
11/03/2021	<0.05	0.04	0.38	0.2	0.6	0.01
16/04/2021	<0.05	0.06	0.14	0.2	0.3	<0.01
27/04/2021	<0.05	0.02	0.06	0.1	0.2	<0.01
16/06/2021	<0.05	0.04	<0.01	0.3	0.3	<0.01
09/07/2021	0.12	<0.01	<0.01	0.3	0.3	<0.01
Q29SW1						
29/03/2016	-	-	-	-	-	-
11/04/2016	-	-	-	-	-	-
07/07/2016	-	-	-	-	-	-
04/11/2016	-	-	-	-	-	-
28/11/2016	-	-	-	-	-	-
20/12/2016	-	-	-	-	-	-
26/01/2017	-	-	-	-	-	-
26/03/2017	-	-	-	-	-	-
09/02/2019	-	-	-	-	-	-
22/02/2019	-	-	-	-	-	-
16/02/2020	-	-	-	-	-	-
06/04/2020	-	-	-	-	-	-
12/11/2020	0.96	0.5	0.79	3	3.8	0.53
09/12/2020	<0.05	0.1	0.91	0.9	1.8	0.04
11/01/2021	<0.05	0.01	0.08	0.2	0.3	<0.01
03/02/2021	0.14	0.01	0.1	0.1	0.2	0.01
11/03/2021	0.09	0.08	<0.01	0.1	0.1	<0.01
16/04/2021	0.1	0.03	0.04	0.2	0.2	<0.01
27/04/2021	<0.05	<0.01	0.03	<0.1	<0.1	<0.01
Q29SW2						

Table B.3 - Quest 29 Surface Water Quality

Analyte Group	Metals (Total)	Nutrients	Nutrients	Nutrients	Nutrients	Nutrients
Analyte	Ferrous Iron	Ammonia	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P
Analyte Short Name	Ferrous Iron	NH3	Nox	TKN_N	TN_N	P_Tot
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	1.4	-	-	-	-
Tropical Australia Lowland Rivers	-	0.01	-	-	0.2 - 0.3	0.01
ANZG 2018 freshwater - 95% species protection	-	0.9	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	5	0.05
29/03/2016	-	-	-	-	-	-
11/04/2016	-	-	-	-	-	-
28/11/2016	-	-	-	-	-	-
20/12/2016	-	-	-	-	-	-
26/01/2017	-	-	-	-	-	-
26/03/2017	-	-	-	-	-	-
09/02/2019	-	-	-	-	-	-
22/02/2019	-	-	-	-	-	-
16/02/2020	-	-	-	-	-	-
06/04/2020	-	-	-	-	-	-
04/12/2020	0.72	0.04	0.08	0.7	0.8	0.1
07/01/2021	0.19	0.04	0.01	0.3	0.3	<0.01
03/02/2021	0.27	<0.01	0.02	0.4	0.4	0.03
08/03/2021	0.08	<0.01	0.03	0.2	0.2	<0.01
16/04/2021	0.19	0.14	0.02	0.2	0.2	<0.01
06/05/2021	0.22	0.04	0.06	0.3	0.4	0.03
Q29SW3						
29/03/2016	-	-	-	-	-	-
11/05/2016	-	-	-	-	-	-
20/12/2016	-	-	-	-	-	-
26/03/2017	-	-	-	-	-	-
09/02/2019	-	-	-	-	-	-
06/04/2020	-	-	-	-	-	-
03/02/2021	-	-	-	-	-	-
06/05/2021	-	-	-	-	-	-
Q29SW4						
20/12/2016	-	-	-	-	-	-
26/01/2017	-	-	-	-	-	-
26/03/2017	-	-	-	-	-	-
09/02/2019	-	-	-	-	-	-
22/02/2019	-	-	-	-	-	-
16/02/2020	-	-	-	-	-	-
06/04/2020	-	-	-	-	-	-
04/12/2020	0.55	0.06	0.05	0.6	0.6	0.07
11/01/2021	0.09	0.04	0.03	0.2	0.2	<0.01
03/02/2021	0.38	<0.01	0.02	0.3	0.3	0.01
08/03/2021	<0.05	0.03	0.04	<0.1	<0.1	<0.01
16/04/2021	0.14	0.13	<0.01	0.3	0.3	0.04
29/04/2021	<0.05	0.01	<0.01	0.2	0.2	<0.01
Q29SW5						
07/07/2016	-	-	-	-	-	-
20/12/2016	-	-	-	-	-	-
26/03/2017	-	-	-	-	-	-
09/02/2019	-	-	-	-	-	-
22/02/2019	-	-	-	-	-	-
30/10/2019	-	-	-	-	-	-
16/02/2020	-	-	-	-	-	-
06/04/2020	-	-	-	-	-	-
11/11/2020	<0.05	<0.01	0.07	0.2	0.3	0.03
03/02/2021	0.07	0.02	0.03	0.1	0.1	<0.01

Table B.3 - Quest 29 Surface Water Quality

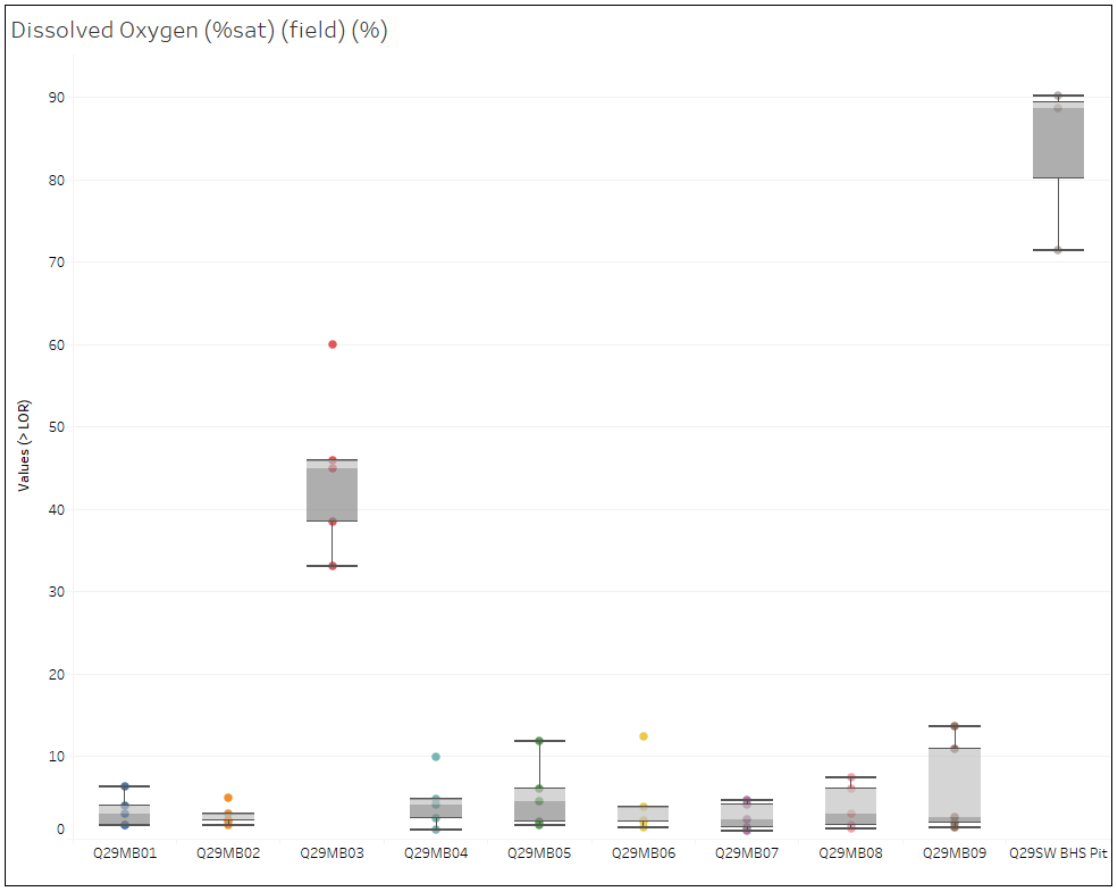
Analyte Group	Metals (Total)	Nutrients	Nutrients	Nutrients	Nutrients	Nutrients
Analyte	Ferrous Iron	Ammonia	Nitrite + Nitrate as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P
Analyte Short Name	Ferrous Iron	NH3	Nox	TKN_N	TN_N	P_Tot
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Toms Gully SSTV (80th percentile)	-	1.4	-	-	-	-
Tropical Australia Lowland Rivers	-	0.01	-	-	0.2 - 0.3	0.01
ANZG 2018 freshwater - 95% species protection	-	0.9	-	-	-	-
ANZECC 2000 Livestock Watering (beef cattle)	-	-	-	-	-	-
ANZECC 2000 long term irrigation	-	-	-	-	5	0.05
27/04/2021	<0.05	<0.01	0.02	0.2	0.2	0.05
Q29SW6						
20/12/2016	-	-	-	-	-	-
26/01/2017	-	-	-	-	-	-
26/03/2017	-	-	-	-	-	-
30/06/2018	-	-	-	-	-	-
09/02/2019	-	-	-	-	-	-
06/04/2020	-	-	-	-	-	-
11/01/2021	<0.05	0.02	0.02	0.2	0.2	0.02
03/02/2021	0.07	0.02	0.02	0.1	0.1	<0.01
08/03/2021	<0.05	0.16	0.03	0.2	0.2	<0.01
16/04/2021	0.1	0.09	0.03	0.3	0.3	0.01
27/04/2021	<0.05	0.08	0.02	0.2	0.2	<0.01
Q29SW7						
20/12/2016	-	-	-	-	-	-
26/01/2017	-	-	-	-	-	-
26/03/2017	-	-	-	-	-	-
30/06/2018	-	-	-	-	-	-
22/02/2019	-	-	-	-	-	-
16/02/2020	-	-	-	-	-	-
12/11/2020	0.9	0.2	0.46	2.3	2.8	1.54
11/01/2021	<0.05	0.14	0.09	0.2	0.3	0.01
03/02/2021	0.09	0.05	0.09	0.2	0.3	0.03
16/04/2021	-	-	-	-	-	-
Q29SW7						
27/04/2021	-	-	-	-	-	-
20/12/2016	-	-	-	-	-	-
09/02/2019	-	-	-	-	-	-
11/01/2021	0.07	0.03	0.05	0.3	0.4	<0.01
03/02/2021	0.09	<0.01	0.02	0.1	0.1	0.01
08/03/2021	<0.05	<0.01	0.03	<0.1	<0.1	<0.01
16/04/2021	0.05	0.01	0.02	0.1	0.1	<0.01
27/04/2021	<0.05	0.01	<0.01	0.4	0.4	<0.01

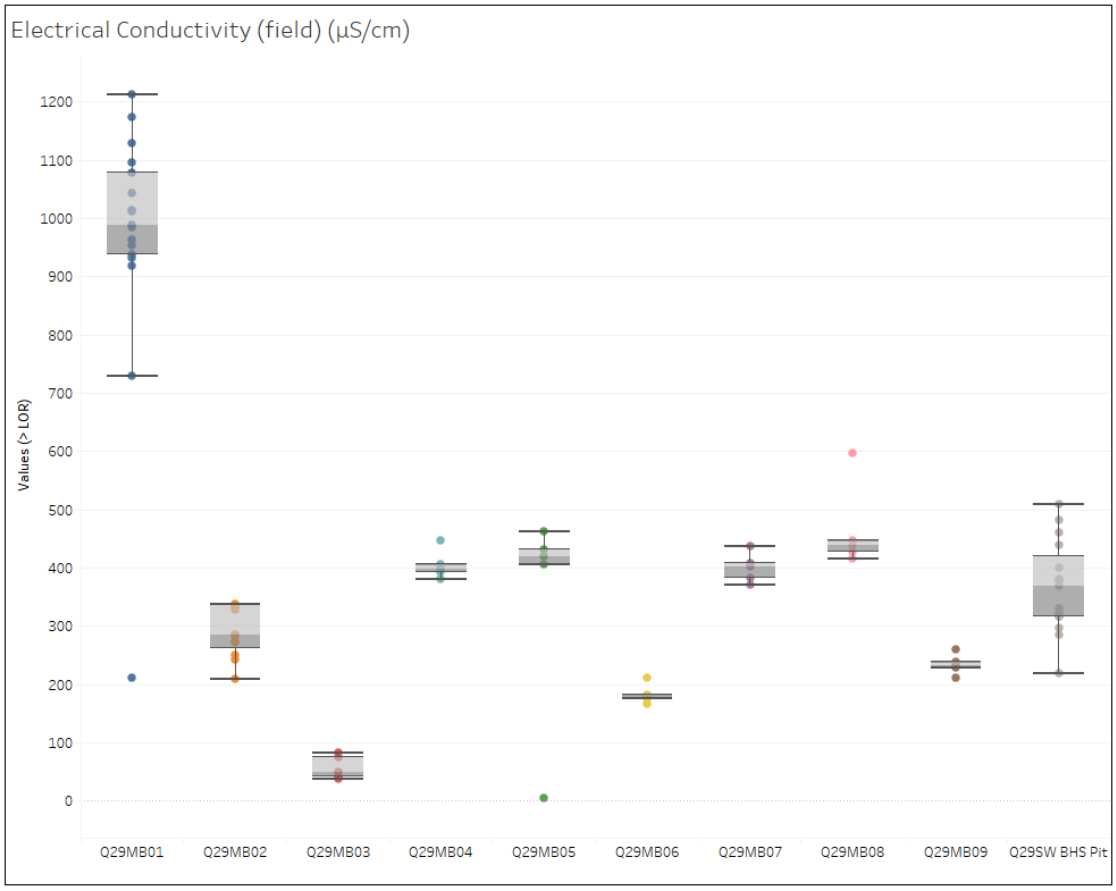
PRIMARY GOLD

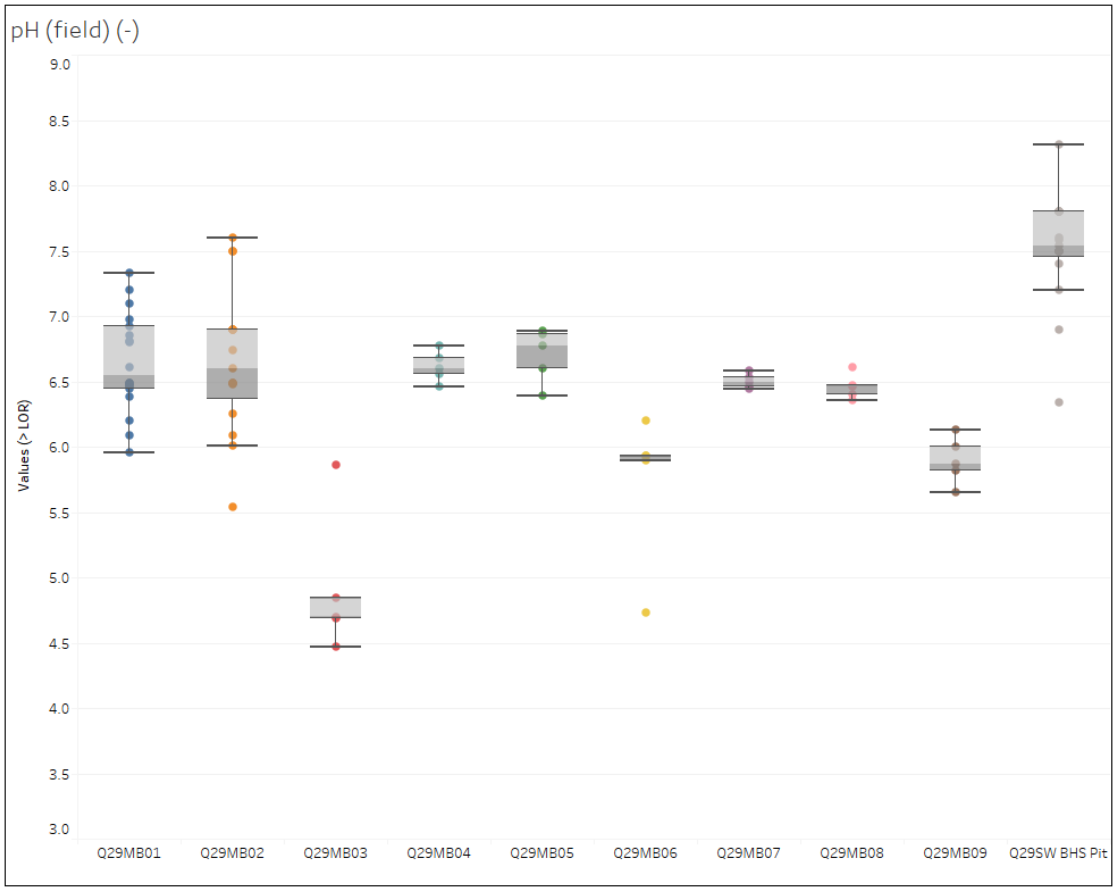
Appendix B-4 - Quest 29 Groundwater Box & Whisker Plots (2020-2021)

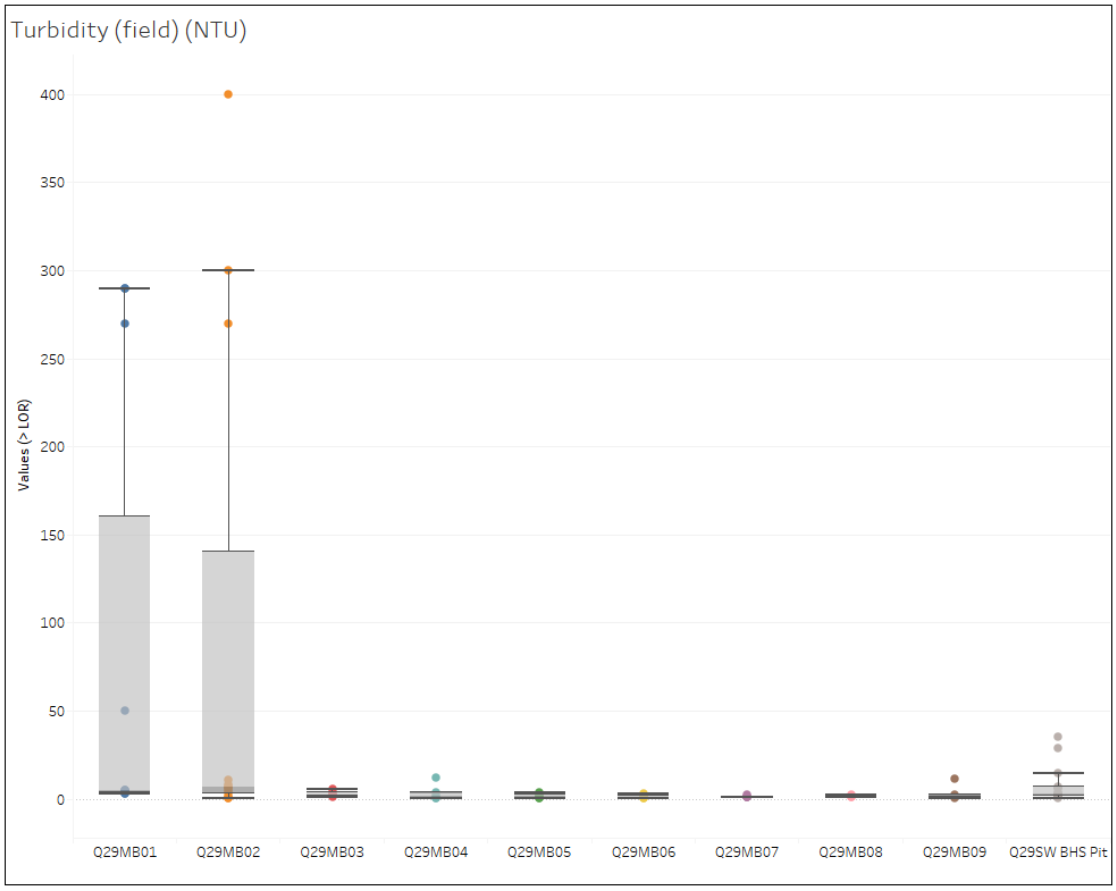
CDM Smith

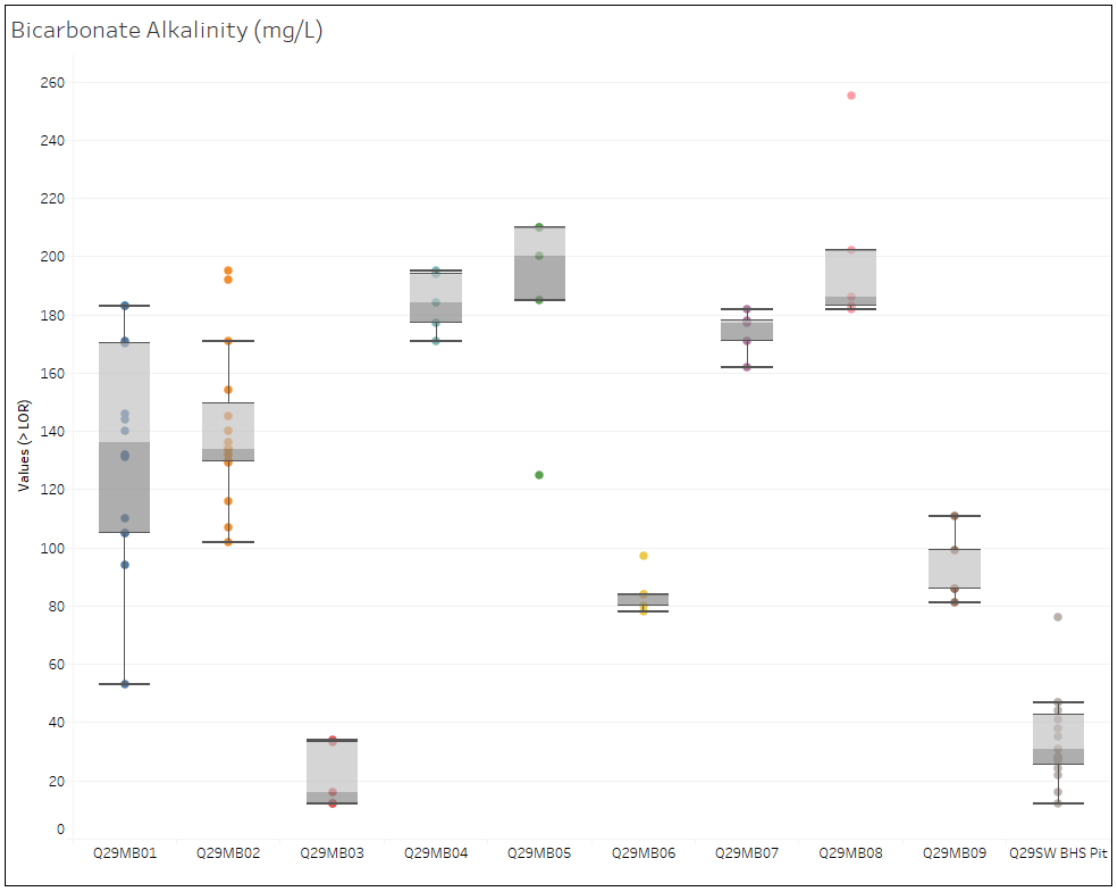
cdmsmith.com

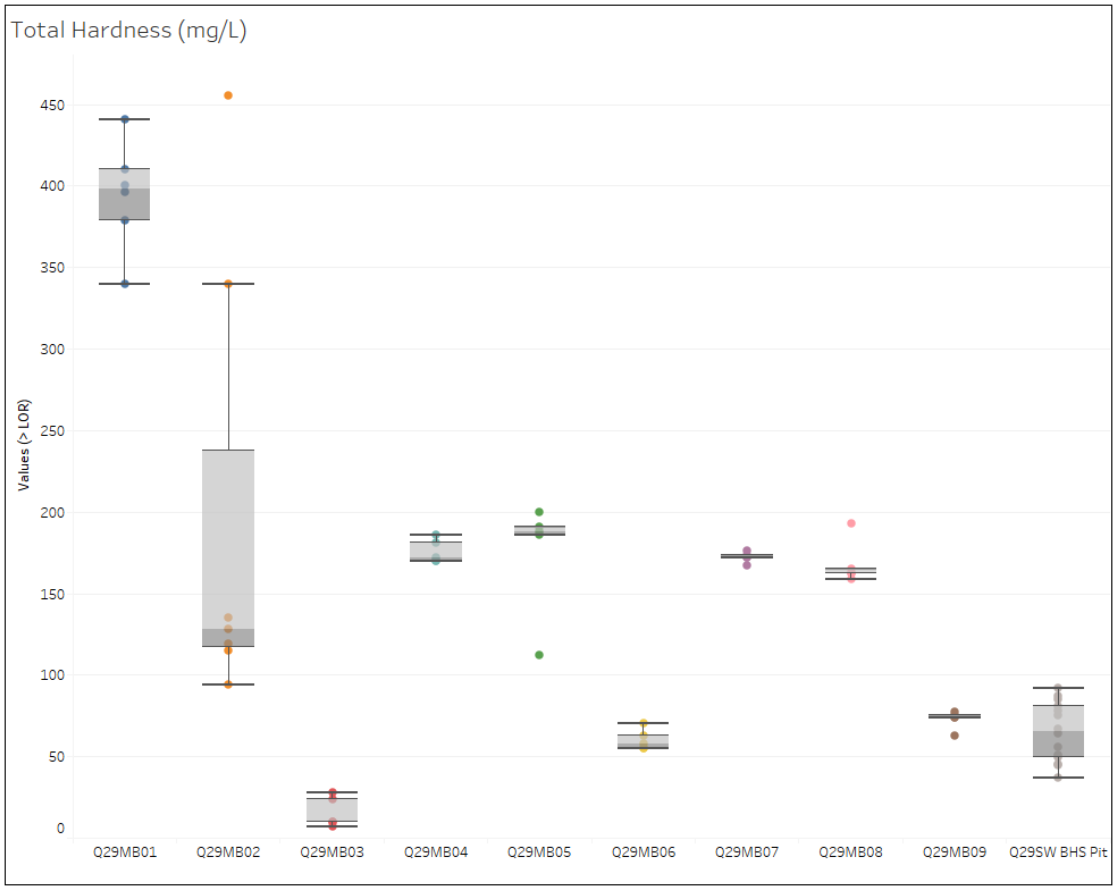

Dissolved Oxygen (%sat) (field) (%)
Values (> LOR)
0
10
20
30
40
50
60
70
80
90
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

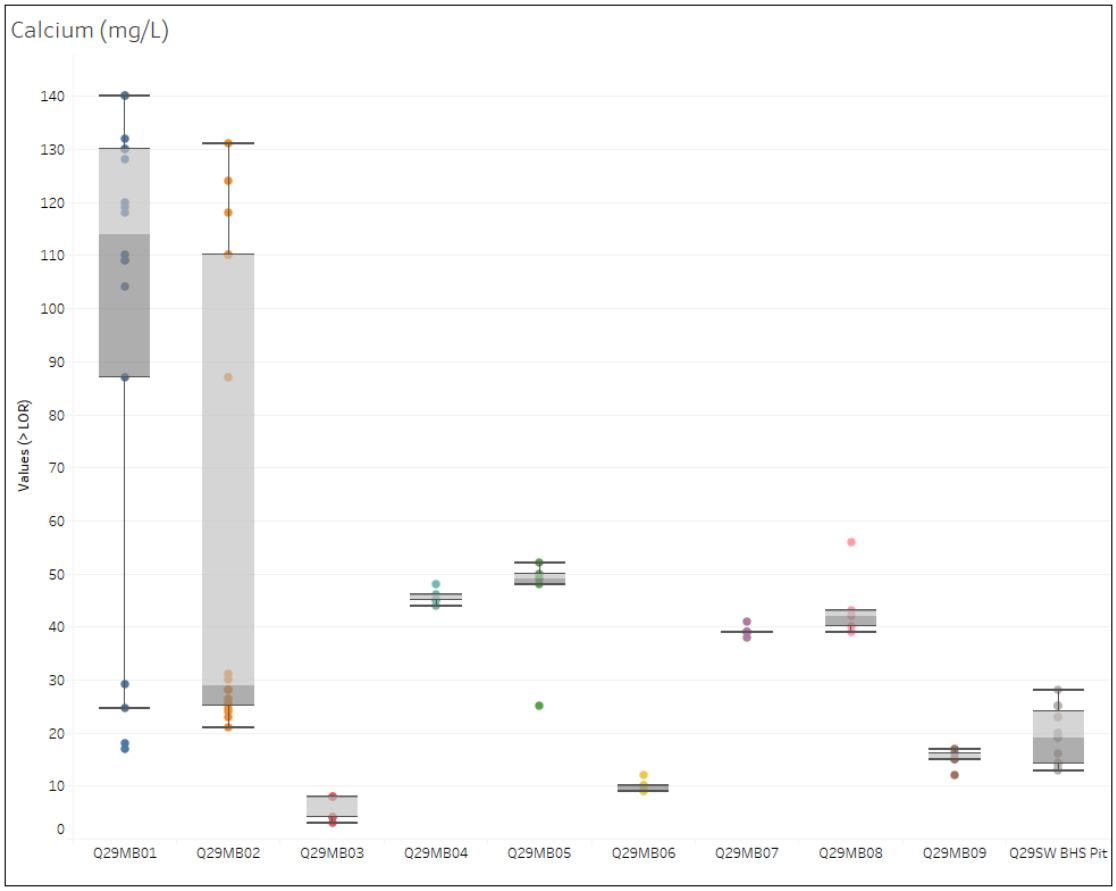

Electrical Conductivity (field) (µS/cm)
Values (> LOR)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

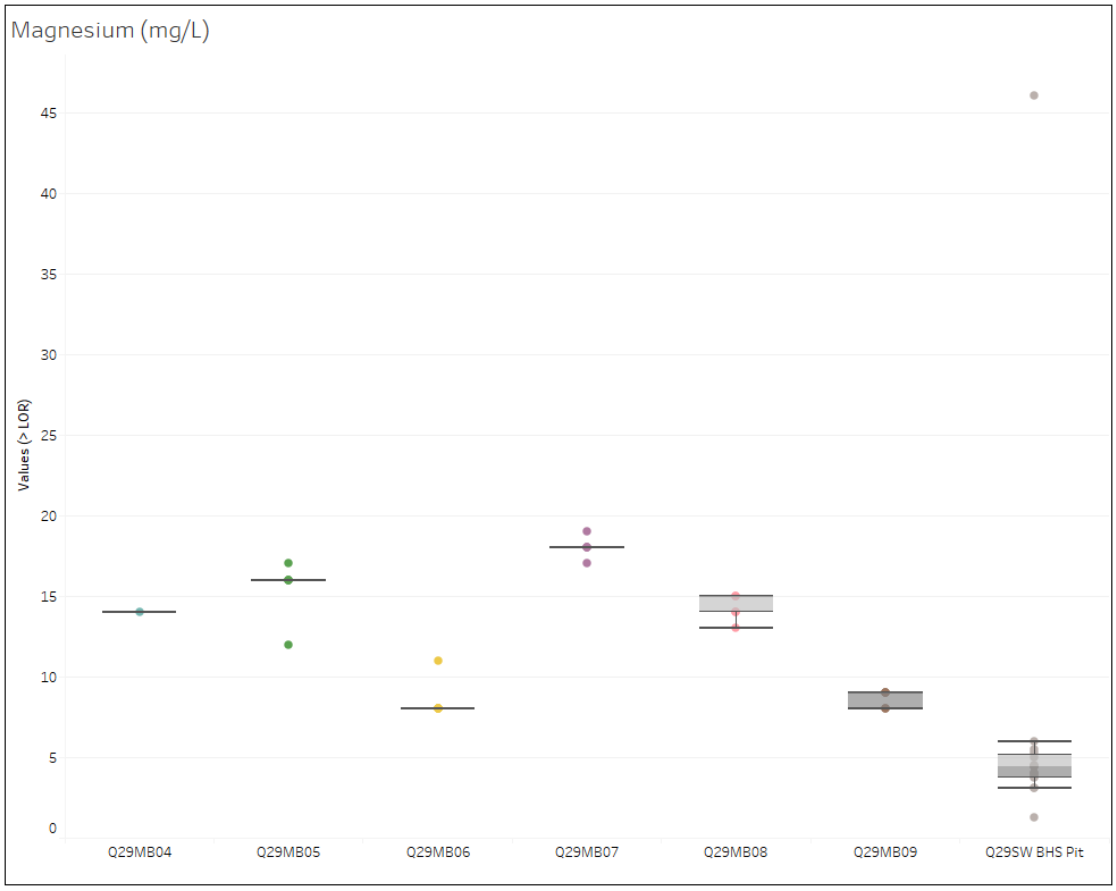

pH (field) (-)
Values (> LOR)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

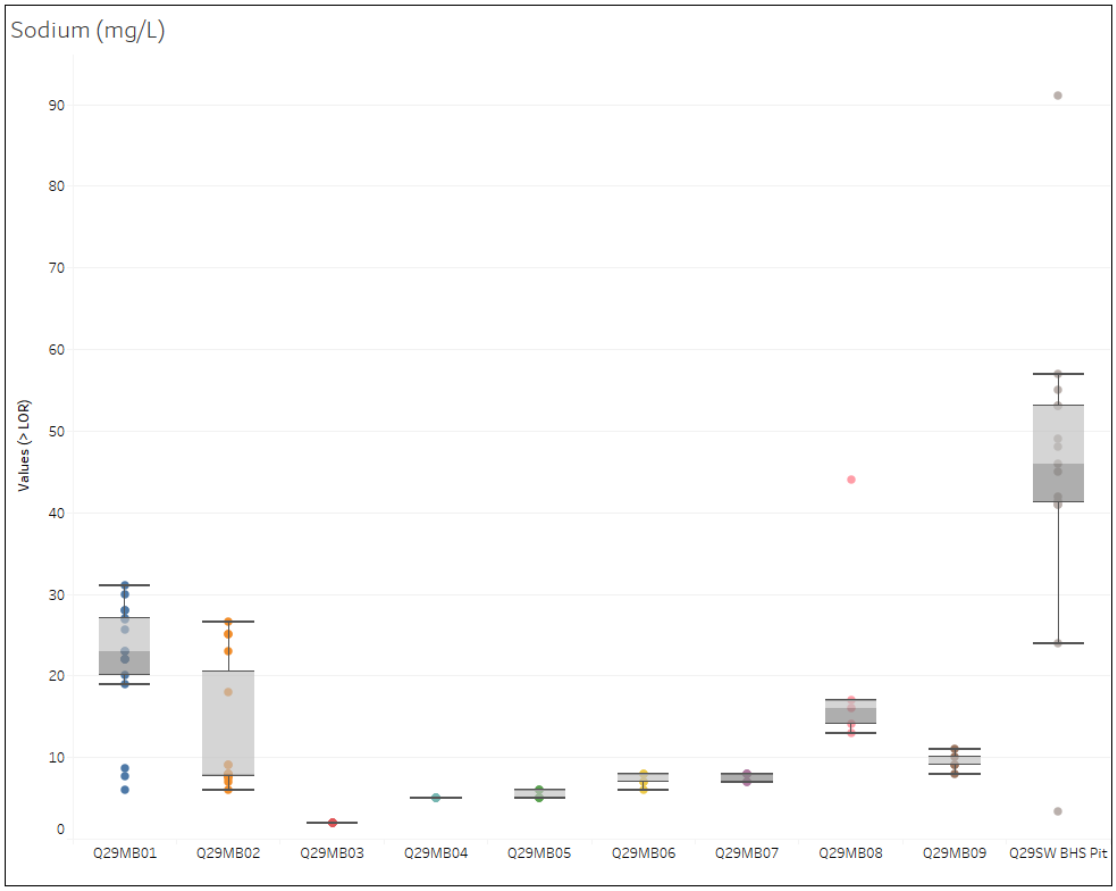

Turbidity (field) (NTU)
Values (> LOR)
400
350
300
250
200
150
100
50
0
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

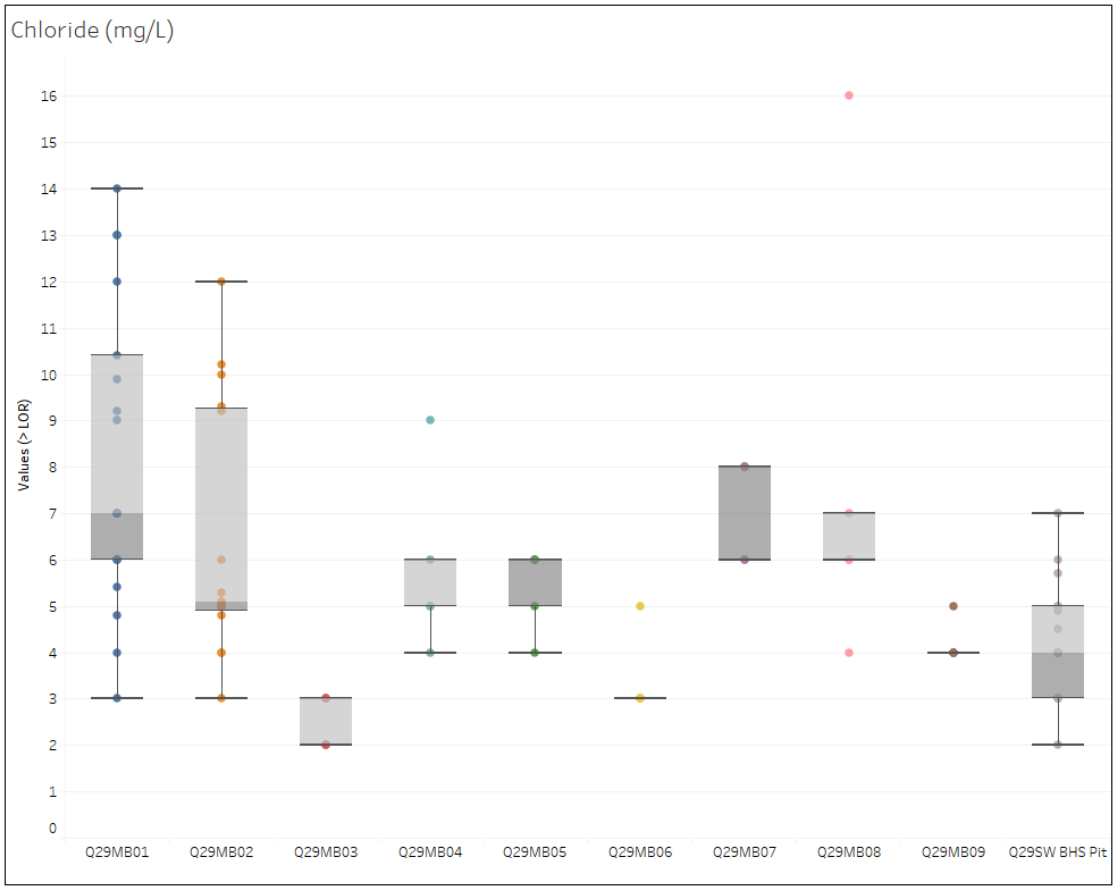

Bicarbonate Alkalinity (mg/L)
Values (> LOR)
260
240
220
200
180
160
140
120
100
80
60
40
20
0
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

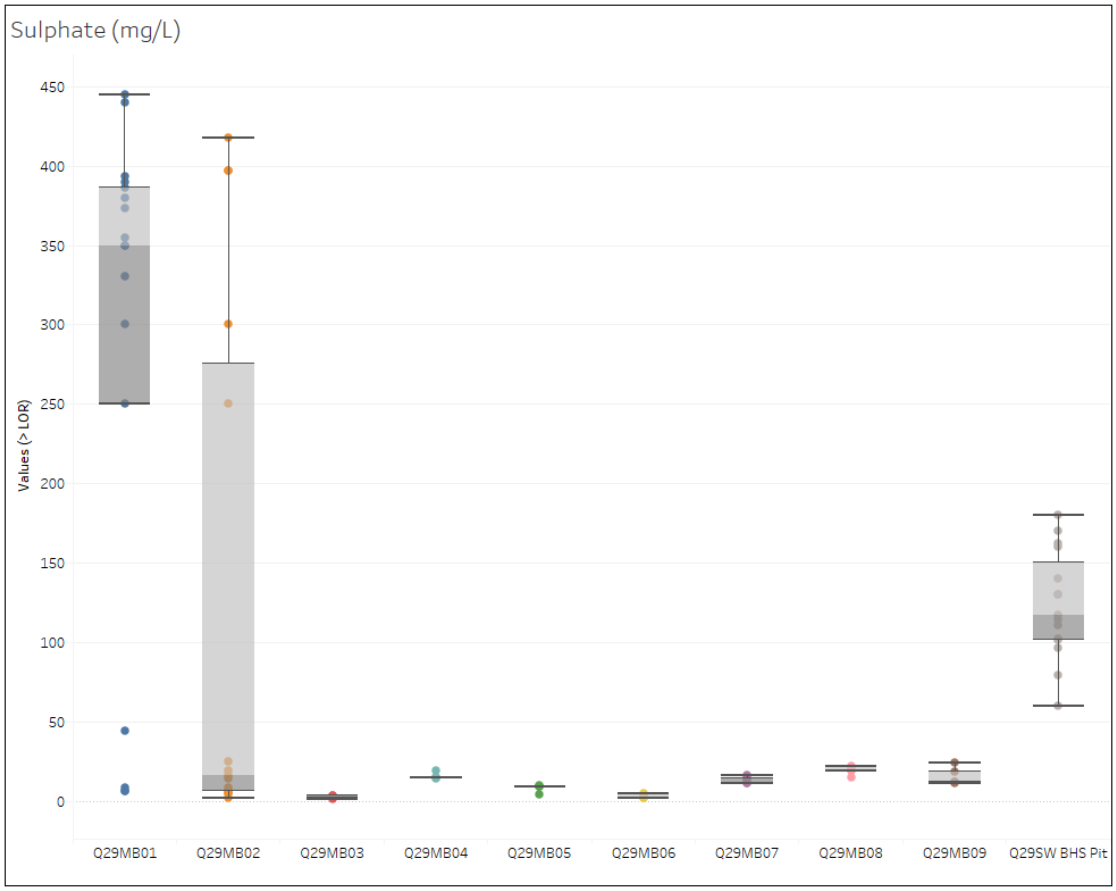

Total Hardness (mg/L)
Values (> LOR)
450
400
350
300
250
200
150
100
50
0
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

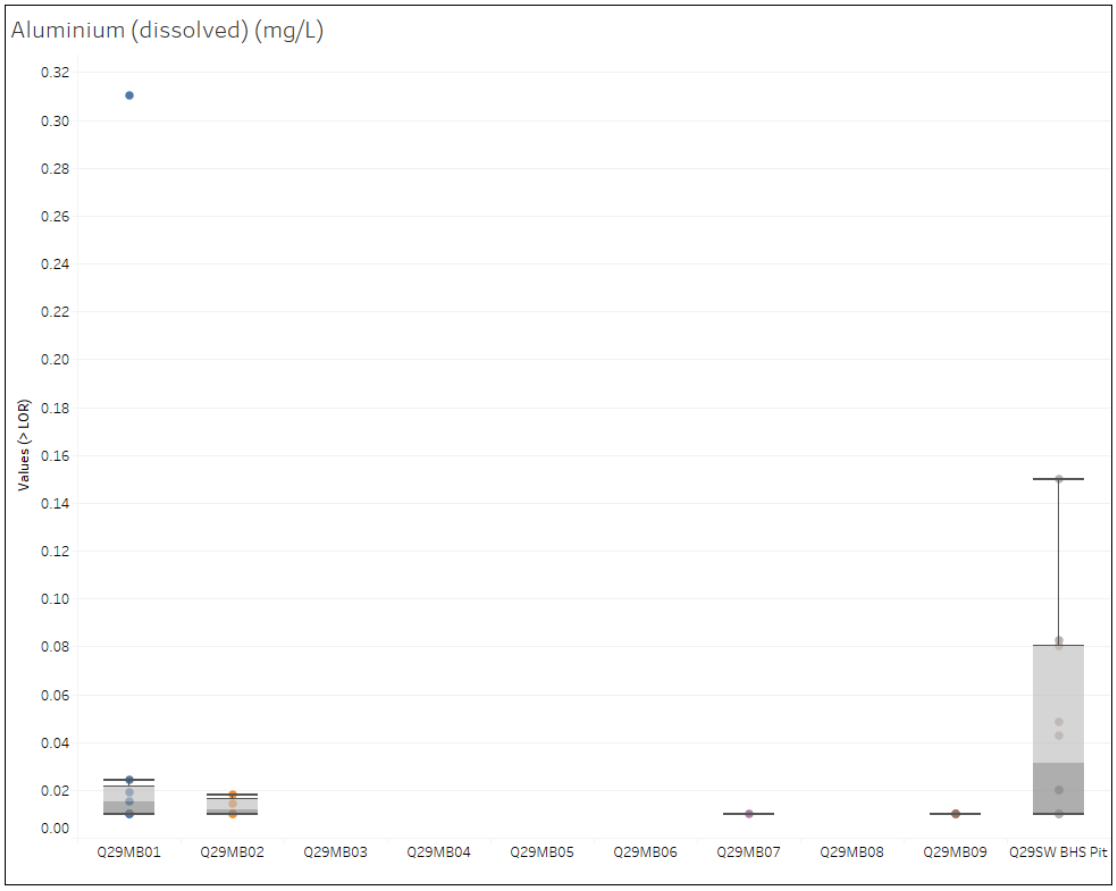

Calcium (mg/L)
Values (> LOR)
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

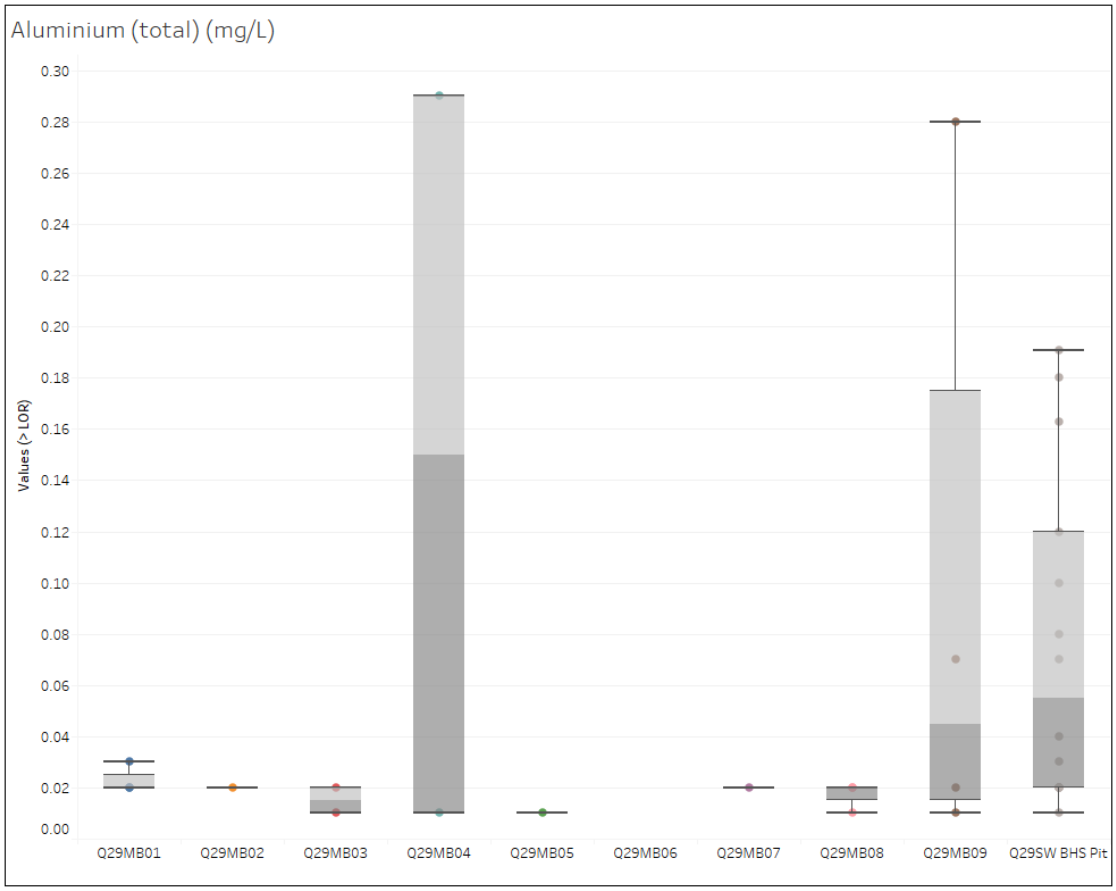

Magnesium (mg/L)
Values (> LOR)
45
40
35
30
25
20
15
10
5
0
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

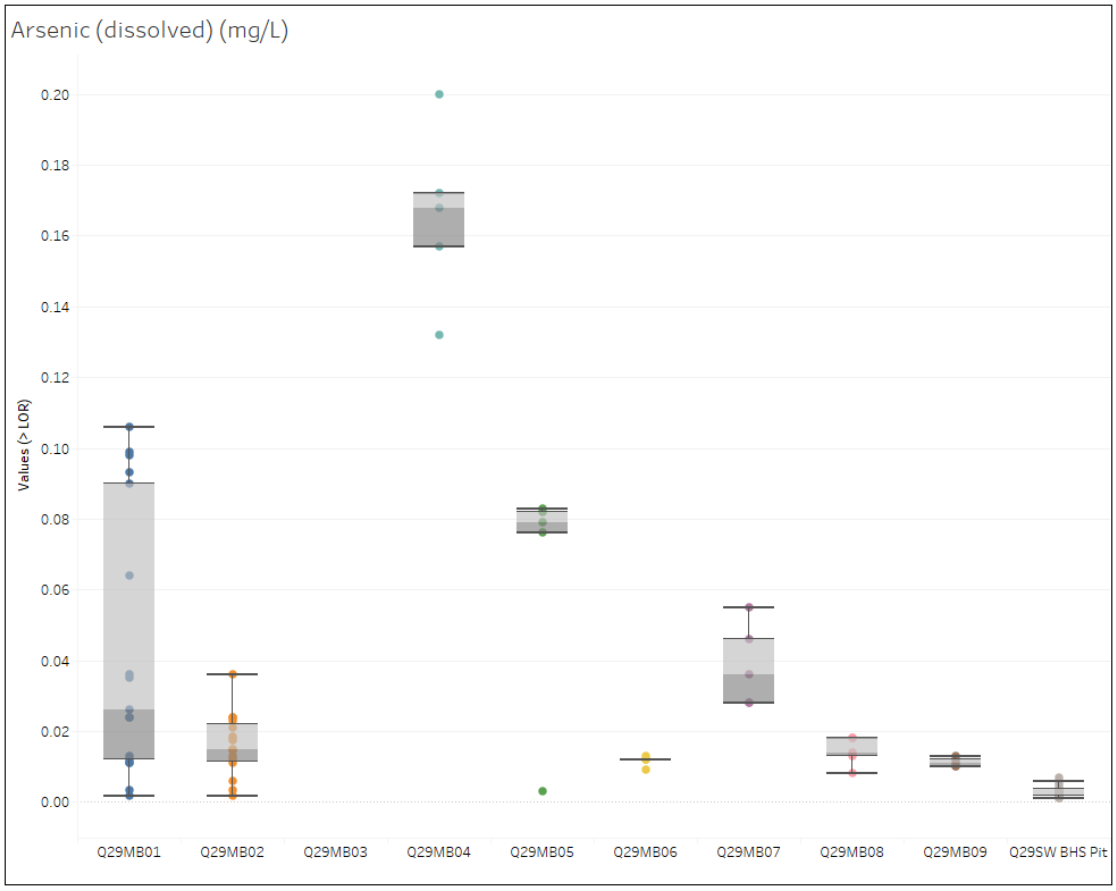

Sodium (mg/L)
Values (> LOR)
0
10
20
30
40
50
60
70
80
90
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

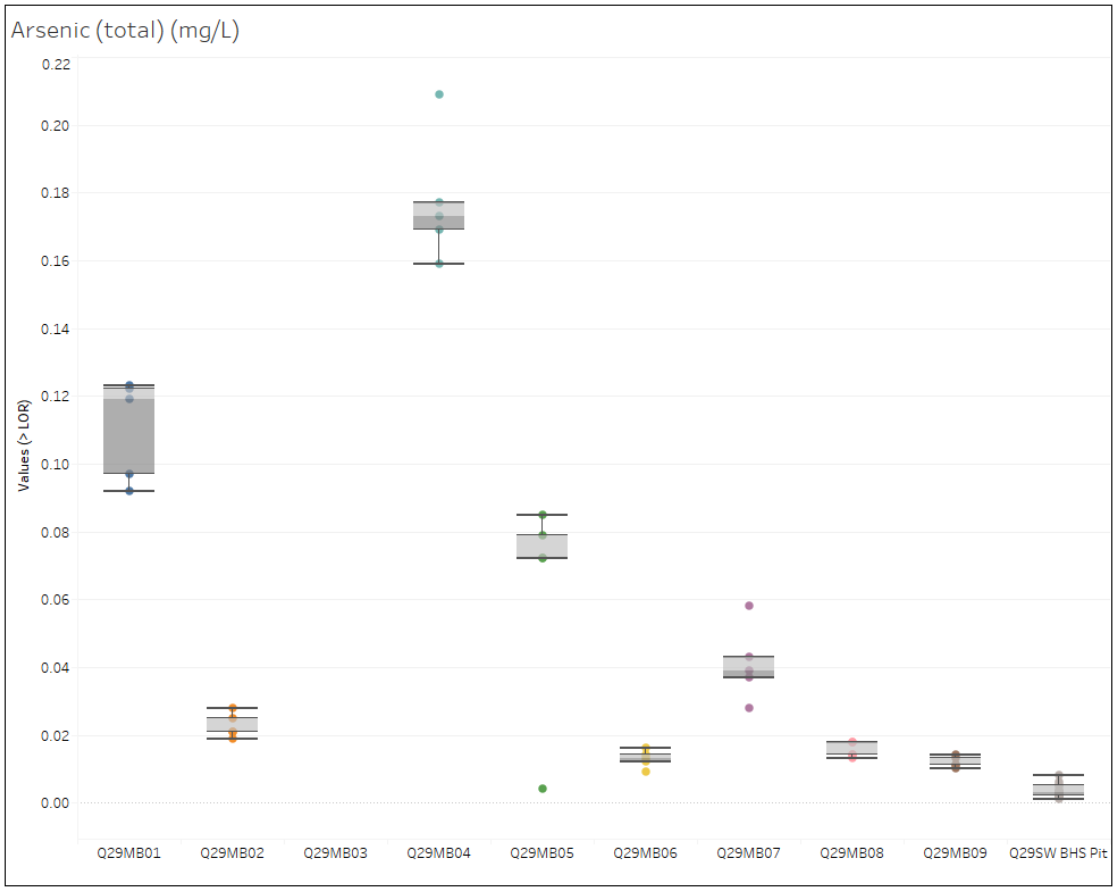

Chloride (mg/L)
Values (> LOR)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

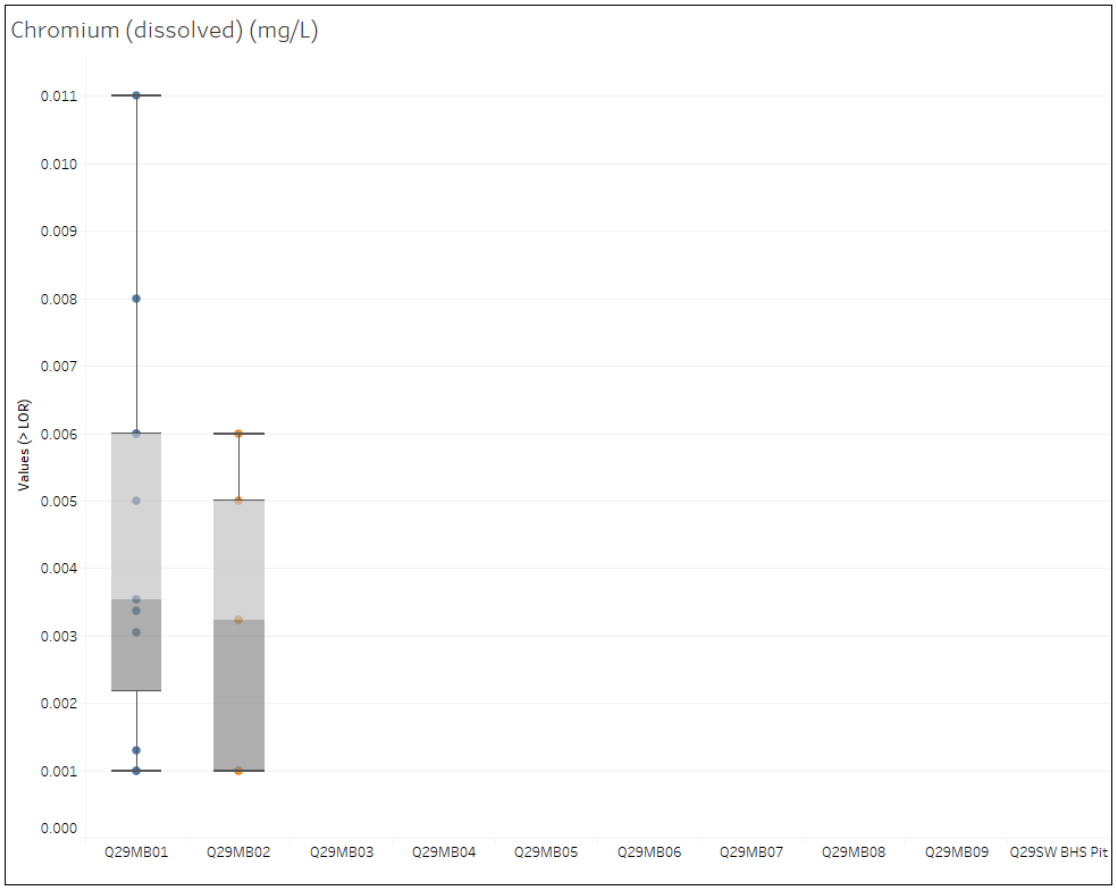

Sulphate (mg/L)
Values (> LOR)
450
400
350
300
250
200
150
100
50
0
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

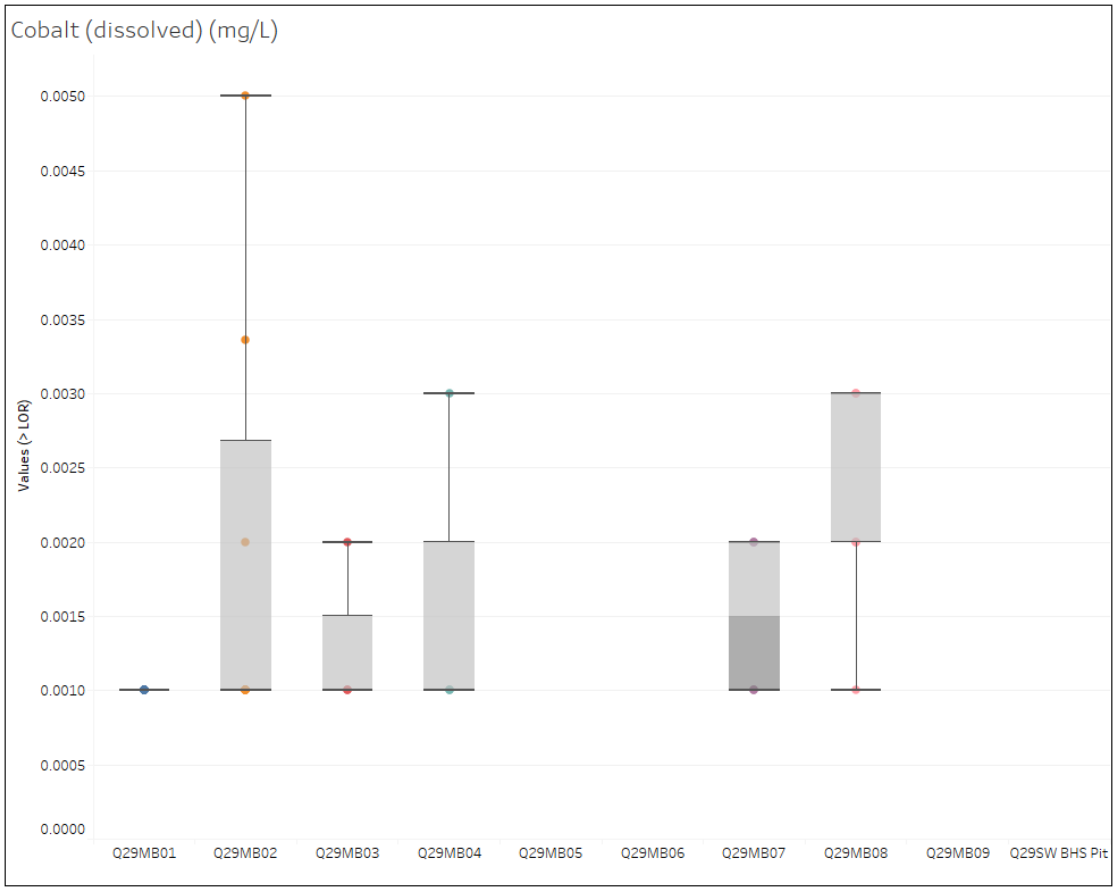

Aluminium (dissolved) (mg/L)
Values (> LOR)
0.32
0.30
0.28
0.26
0.24
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

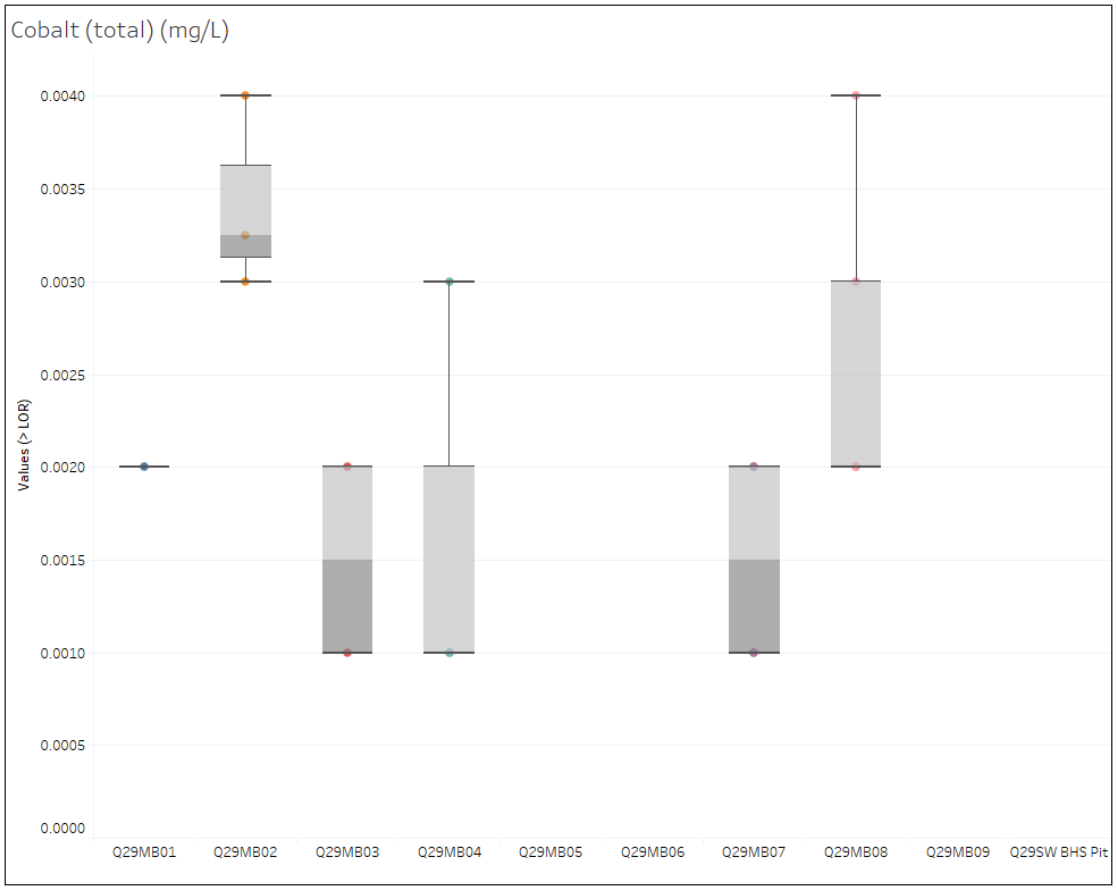

Aluminium (total) (mg/L)
Values (> LOR)
0.30
0.28
0.26
0.24
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

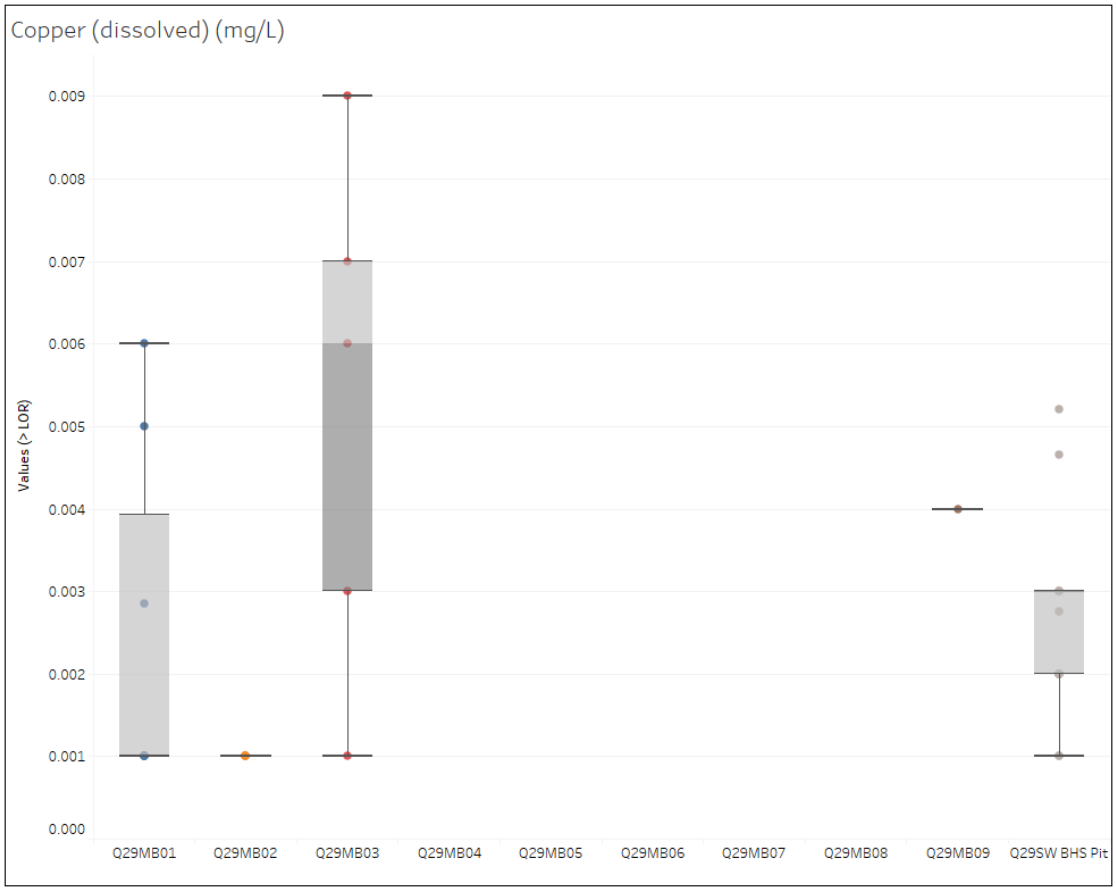

Arsenic (dissolved) (mg/L)
Values (> LOR)
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

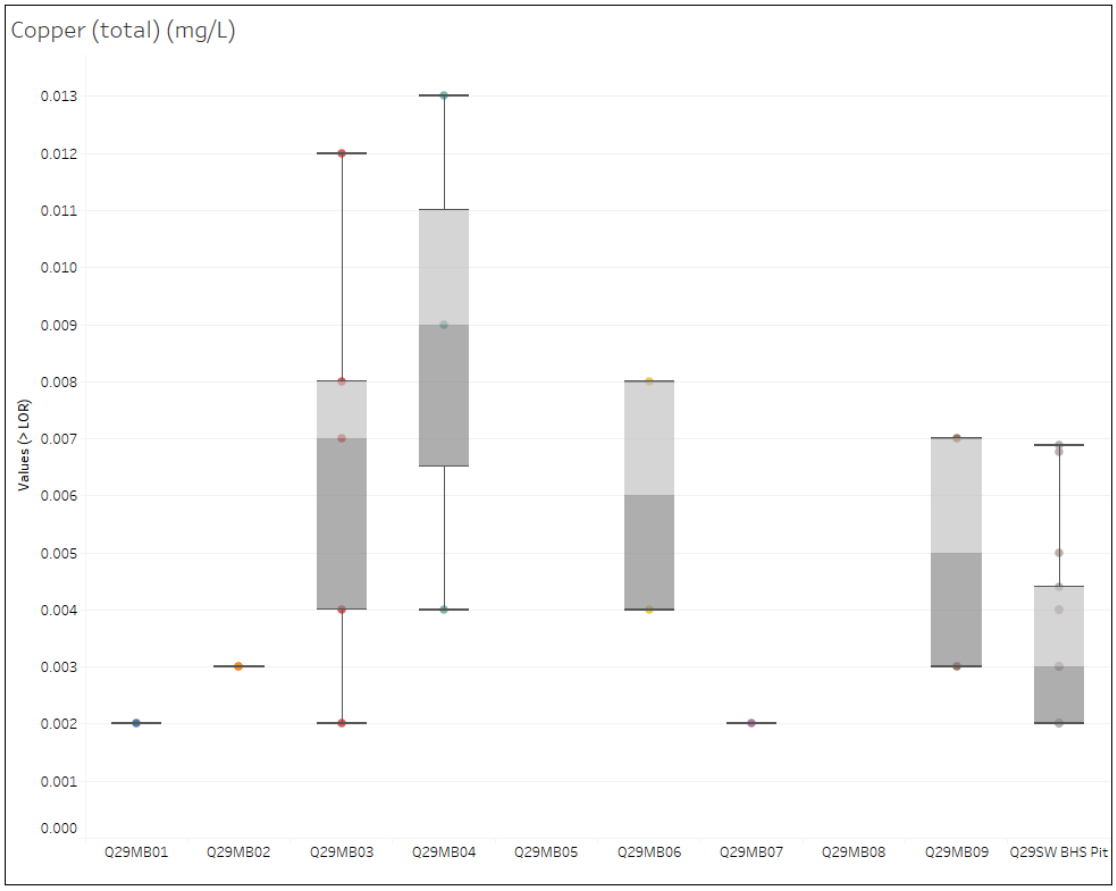

Arsenic (total) (mg/L)
Values (> LOR)
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

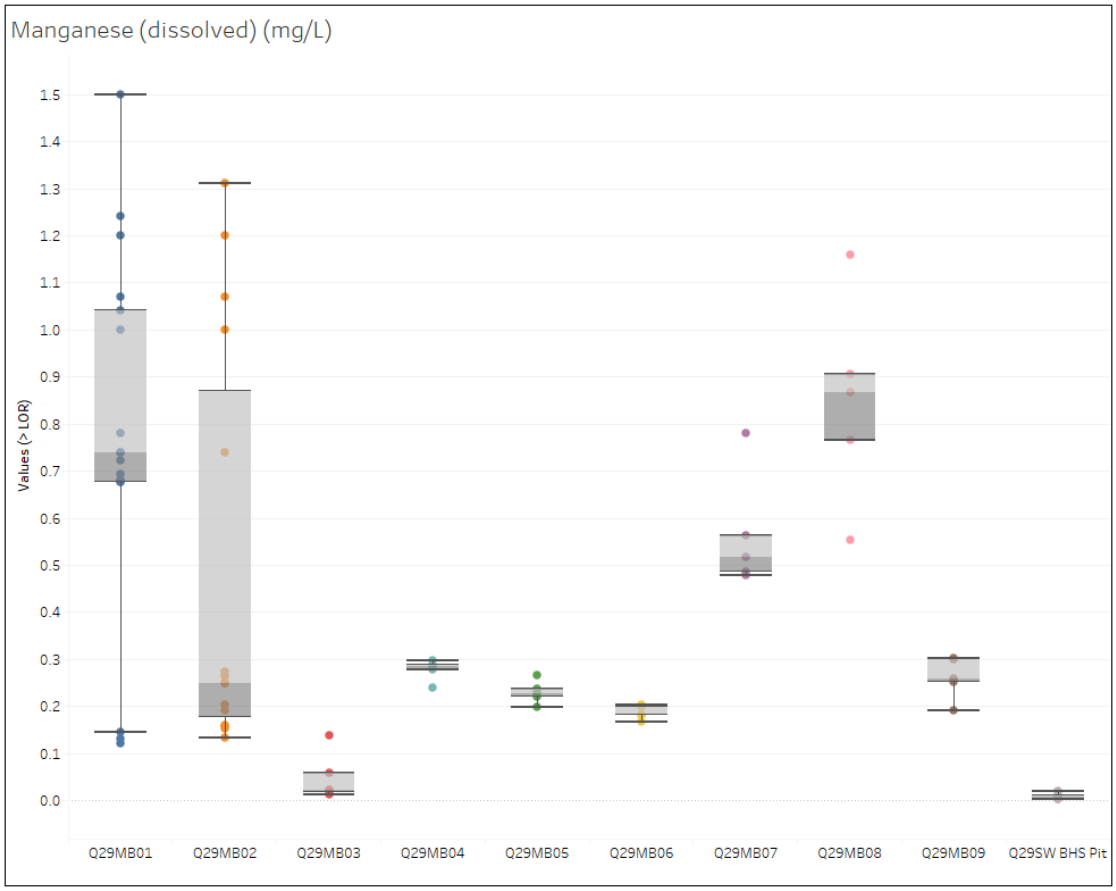

Chromium (dissolved) (mg/L)
Values (> LOR)
0.011
0.010
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

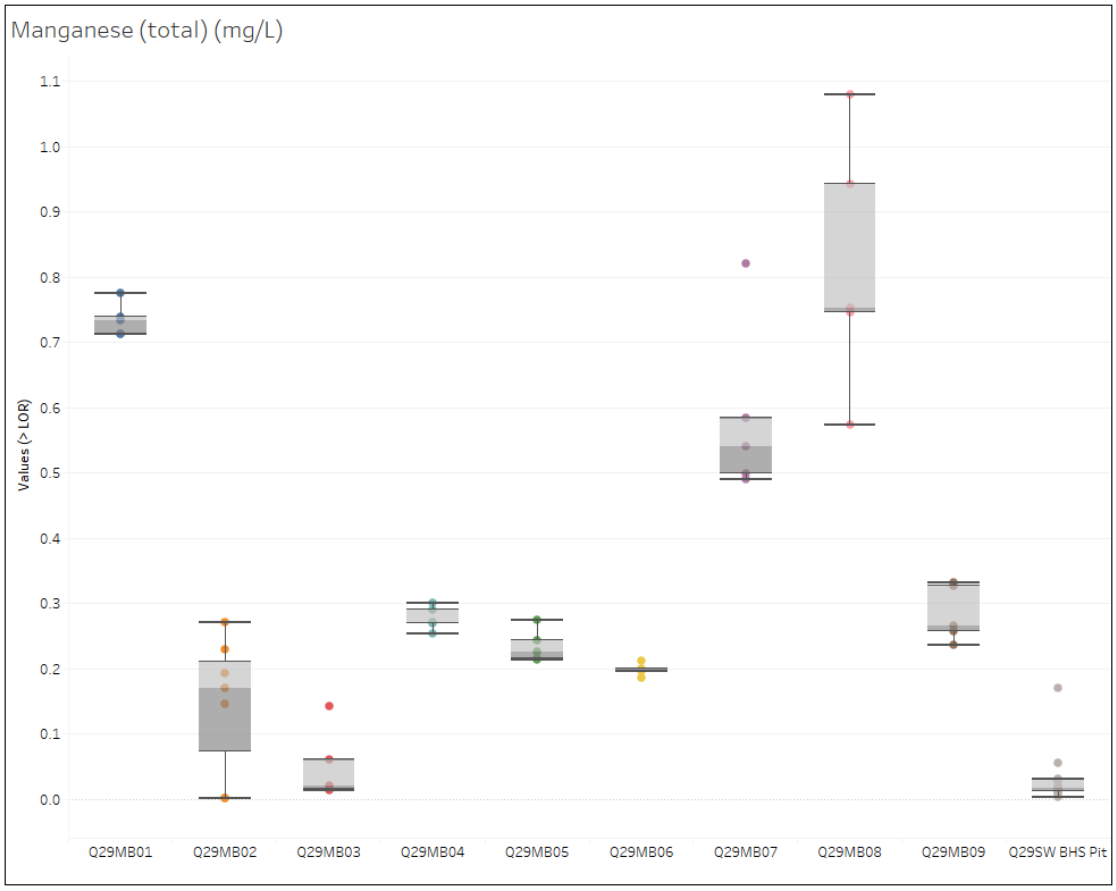

Cobalt (dissolved) (mg/L)
Values (> LOR)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

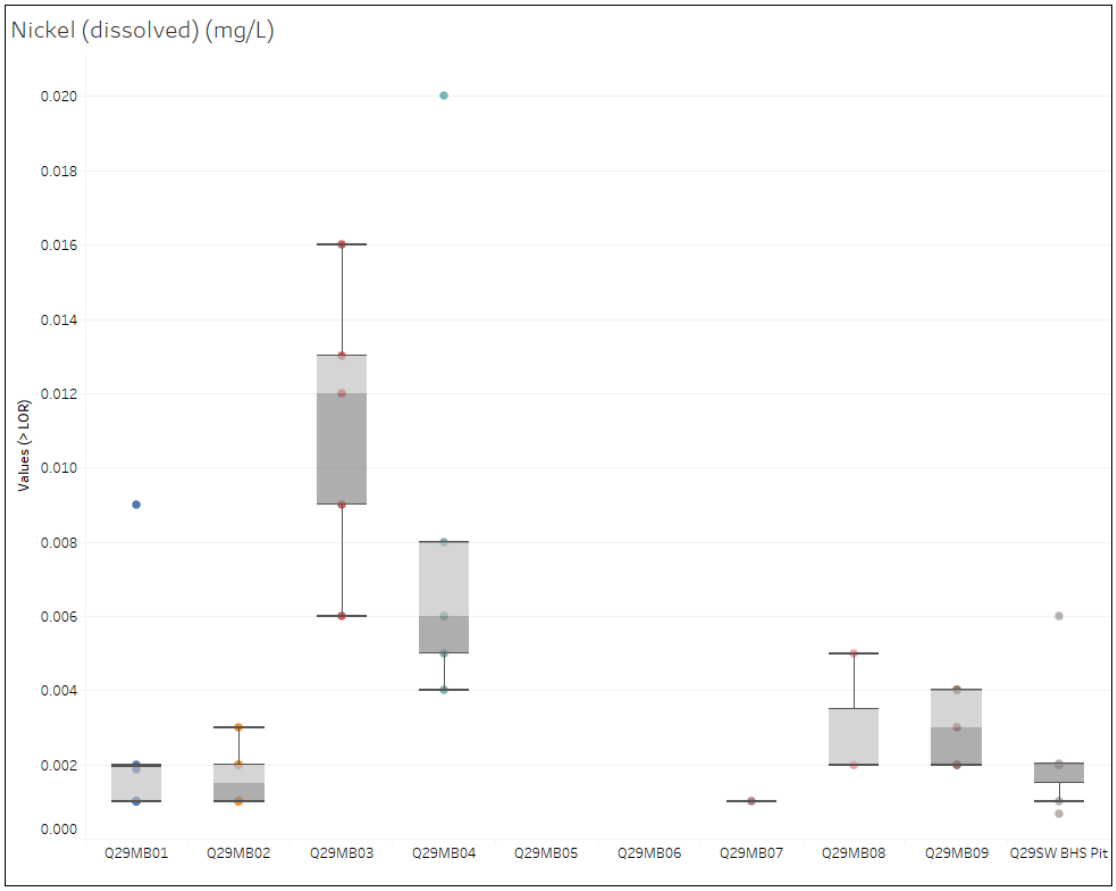

Cobalt (total) (mg/L)
Values (> LOR)
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

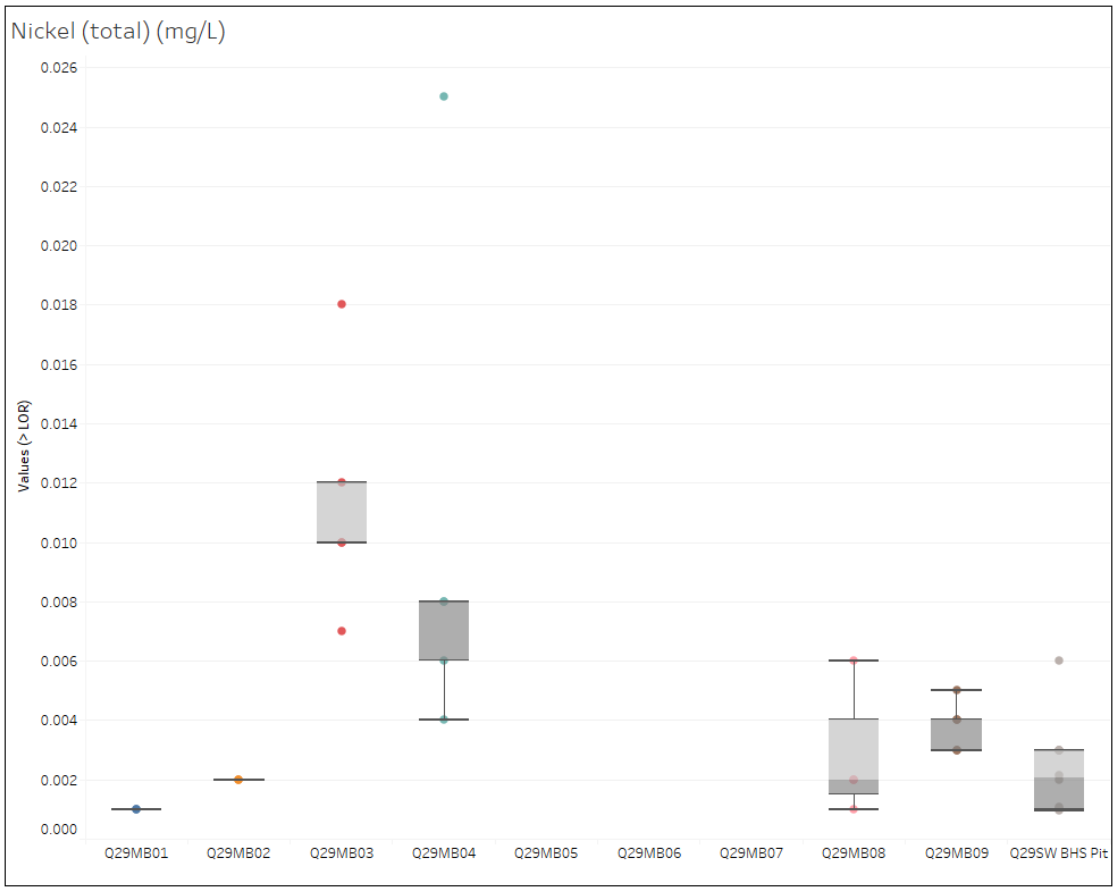

Copper (dissolved) (mg/L)
Values (> LOR)
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

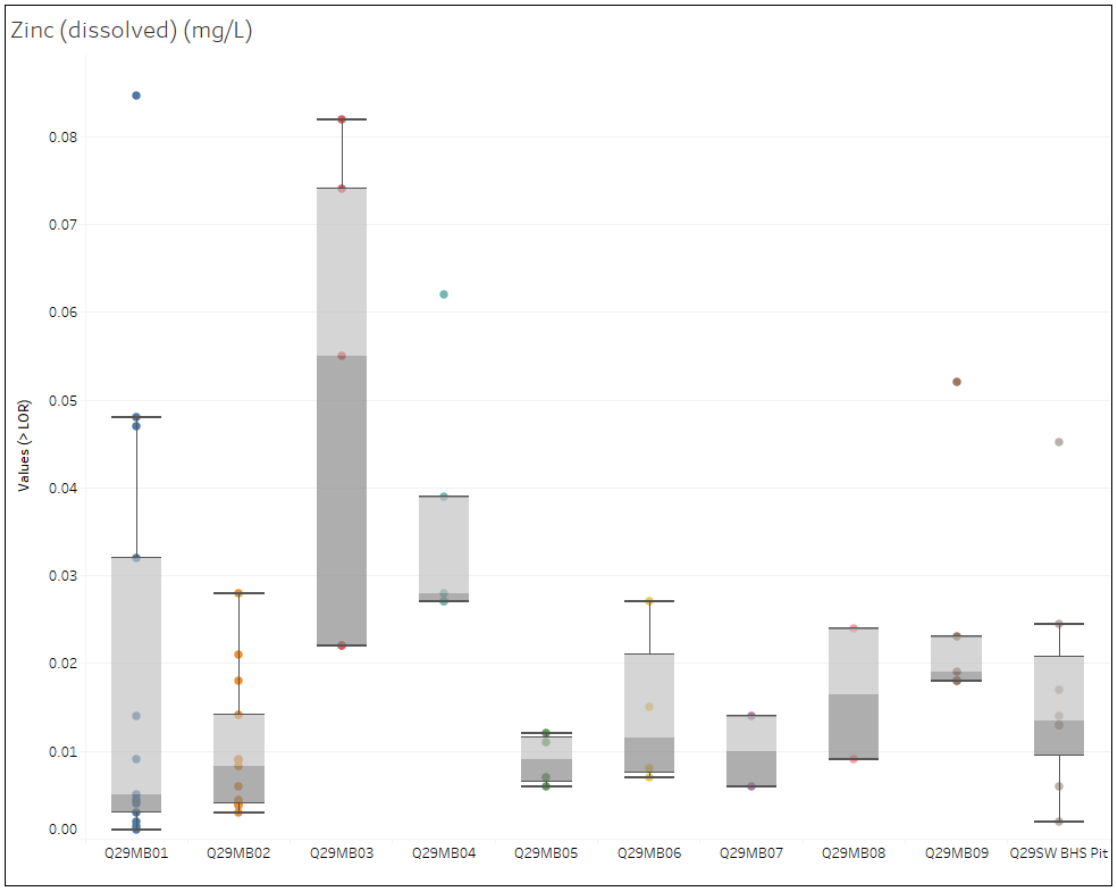

Copper (total) (mg/L)
Values (> LOR)
0.013
0.012
0.011
0.010
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

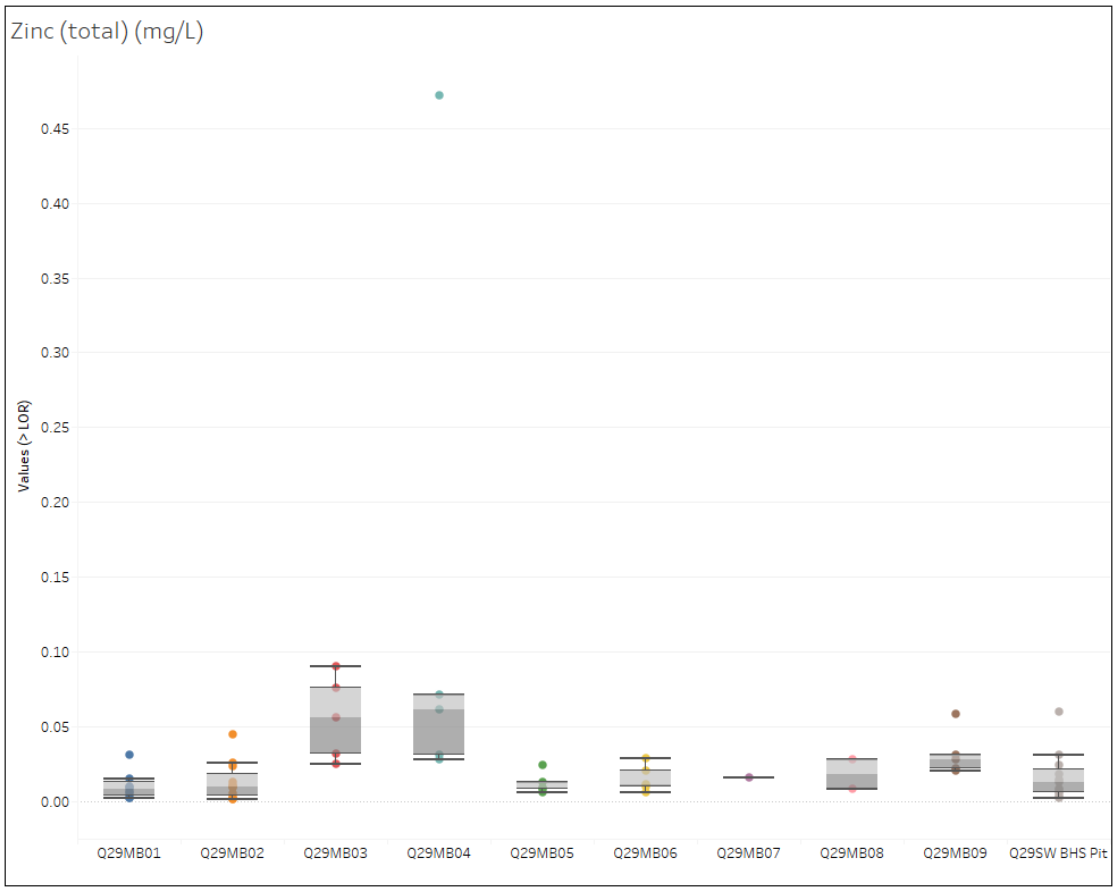

Manganese (dissolved) (mg/L)
Values (> LOR)
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

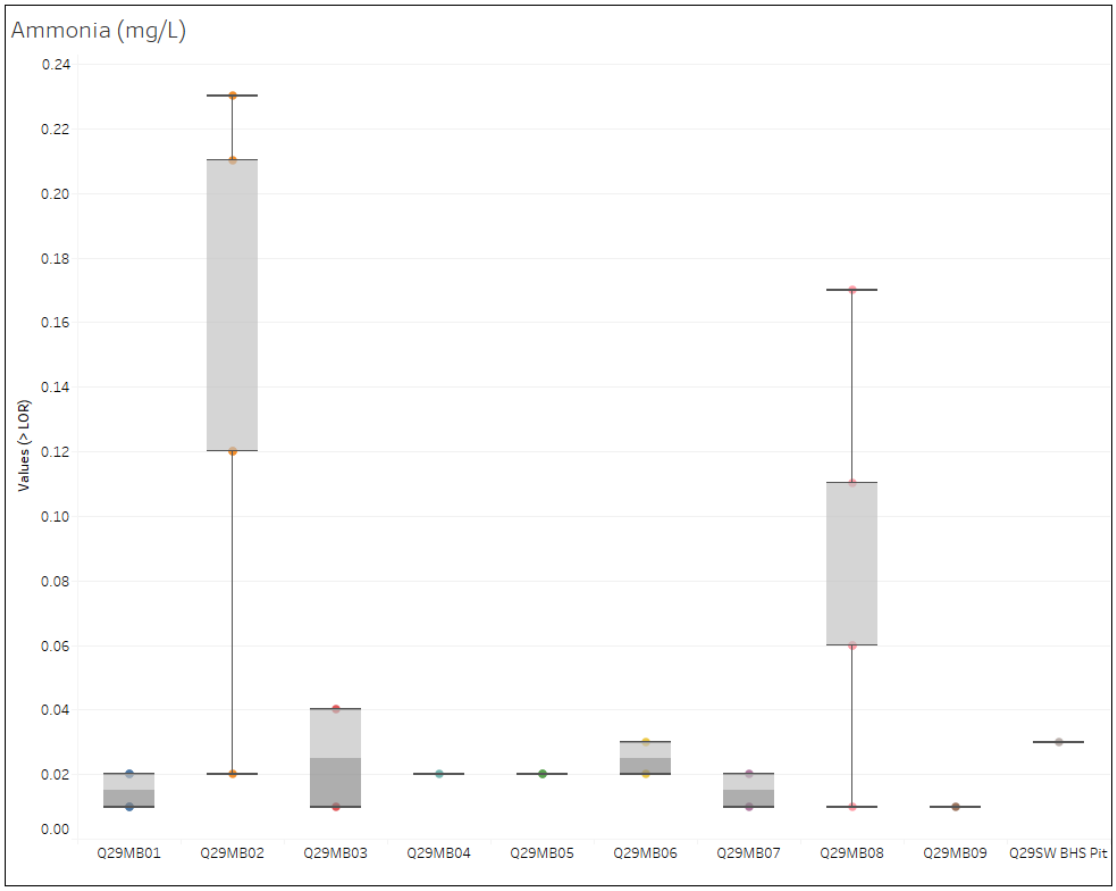

Manganese (total) (mg/L)
Values (> LOR)
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

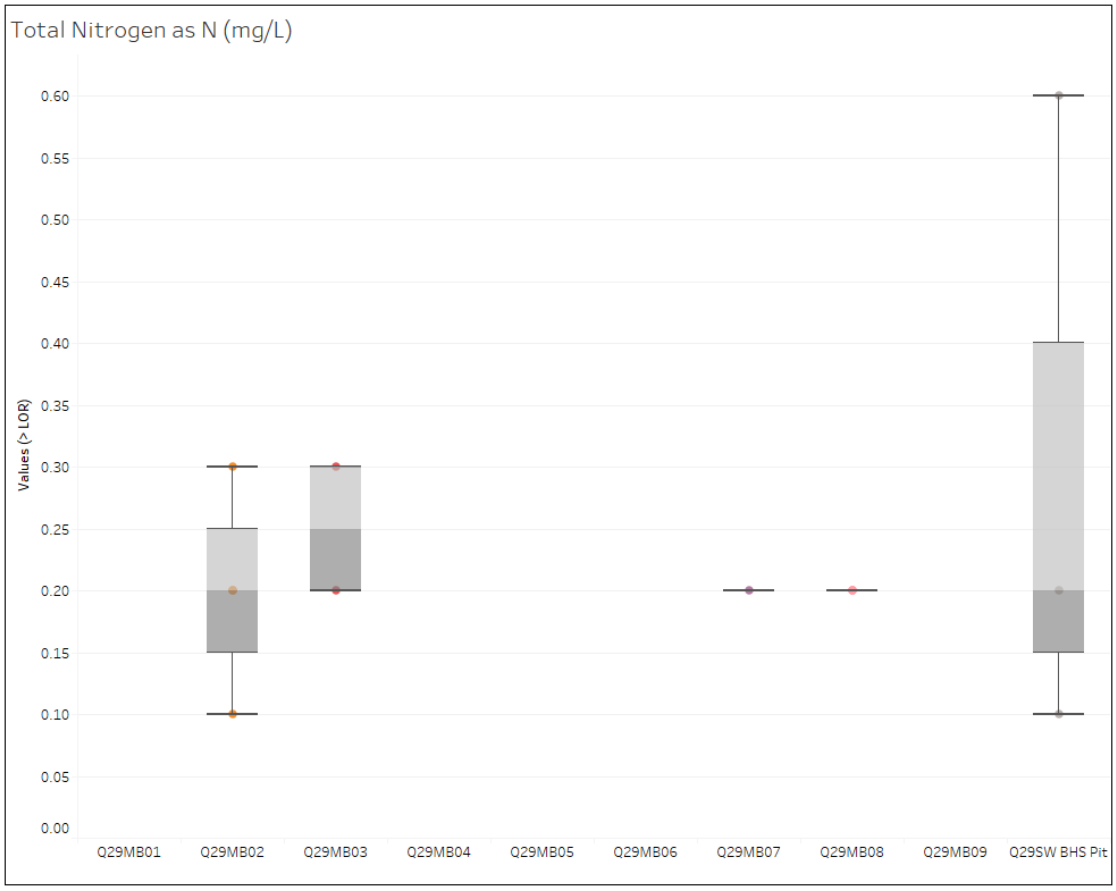

Nickel (dissolved) (mg/L)
Values (> LOR)
0.020
0.018
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit

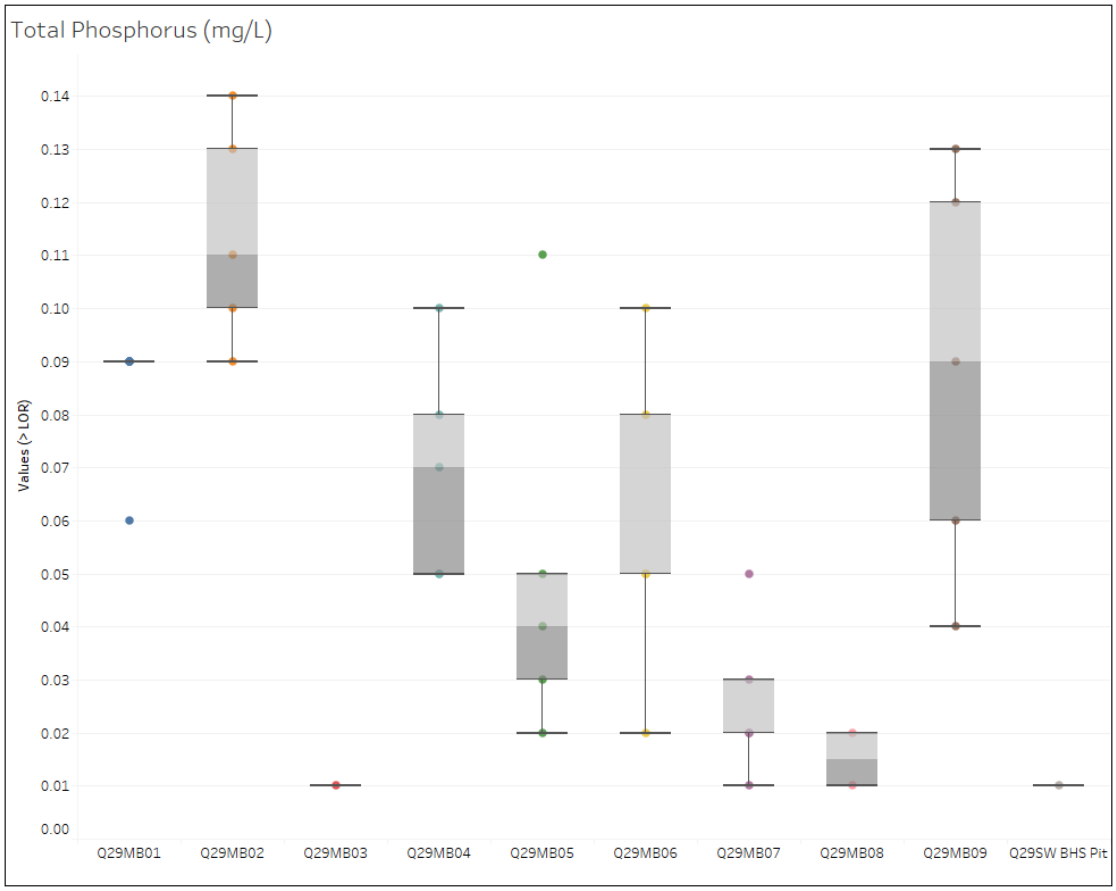

Nickel (total) (mg/L)
Values (> LOR)
0.026
0.024
0.022
0.020
0.018
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit


Zinc (dissolved) (mg/L)
Values (> LOR)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit


Zinc (total) (mg/L)
Values (> LOR)
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit


Ammonia (mg/L)
Values (> LOR)
0.24
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit


Total Nitrogen as N (mg/L)
Values (> LOR)
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit


Total Phosphorus (mg/L)
Values (> LOR)
0.14
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
Q29MB01
Q29MB02
Q29MB03
Q29MB04
Q29MB05
Q29MB06
Q29MB07
Q29MB08
Q29MB09
Q29SW BHS Pit