WULGURU TECHNICAL SERVICES

6 February 2024

Ref: A-EA-AMD-100417590

Department of Environment and Science

Minerals Business Centre

PO Box 7230

CAIRNS QLD 4870

ATTENTION: Teale Gibbs

Via email: *ESCairns@des.qld.gov.au*

Dear Teale,

RE: ENVIRONMENTAL AUTHORITY AMENDMENT RESPONSE TO INFORMATION REQUEST – GEORGETOWN GOLD PROJECT

Kempton Minerals Pty Ltd, a subsidiary of Savannah Goldfields Limited (SVG) (formerly Laneway Resources Limited). submitted the Environmental Authority Amendment – Georgetown Processing Project to the Department of Environment and Science (DES) on 5 April 2023 (REF: A-EA-AMD-100417590)

On 04 July 2023, the DES issued Wulguru Technical Services (WTS) with an Information Request notice, and additional information as prescribed under Section 140 of the *Environmental Protection Act 1990* is required.

WTS acknowledges the Department of Environment and Science's Information Request notice and have attached to this letter a response. We look forward to continuing to work with the DES through the EA amendment process.

Should you have any questions, please do not hesitate to contact me at scott@wulgurutechservices.com.au or 0437 799 193.

Yours sincerely,

Scott Hayes-Stanley, MSSSI

Wulguru Technical Services

Appendix A – Responses to Information Request Notice

Appendix B – Groundwater Triggers Derivation

Appendix C - Assessment against reverent sections of Schedule 8, Part 3 of EP Regulation 2019

Appendix A – Response to Information Request

Item #	Relevant section (EA Application)	Matter	Information Request	Response
1	Proposed amendment	Excluding the proposed increase from ERA31(a) to ERA31(b), the application supporting documentation does not outline the amendments being proposed to the EA. It is unclear what the current application is seeking to authorise.	Provide a justified explanation detailing what amendments are being proposed to the current EA to authorise the proposed expansion of the tailings storage facility (TSF).	An expanded TSF area is required to extend the Life of Mine (LOM) and processing capabilities. The following EA tables are proposed to be revised to define the additional surface disturbance required for the TSF expansion: • Table C1 (Contaminant Release Points, Sources Monitoring Points and Receiving Waters and Monitoring Frequency; • Table C5 (Water Storage Monitoring); • Table F1 (Final Land Use and Rehabilitation Approval Schedule); • Table G1 (Location of All Dams); and • Table G2 (Basic Detail of All Dams). Proposed tables have been provided in the Supporting Information Report, Section 1.5. No amendments are proposed to how the TSF is operated, monitored or reported on.
2	Water sampling program	Surface water samples were recently taken as per of the Receiving Environment Monitoring Program (REMP). However, a dedicated surface water sampling program that includes permanent monitoring sites, independent of release events, is required.	Provide a revised REMP in accordance with the current version of the Department of Environment and Science (DES) guideline Receiving environment monitoring program (ESR/2016/2399) and that addresses the following: • Rainwater and surface water runoff (not release samples). This must include sampling during flow in ephemeral drainage channels and creeks that discharge **from** the site from both the Sandy Creek and Four Mile Creek catchments; • Include samples collected from the pump back system in the monitoring program and ensure that they are analysed for a full suite of major ions and dissolved metals/metalloids;	The REMP design has been revised to incorporate the additional requirements. The REMP design is provided in the Supporting Information Report, Appendix G. Samples collected from the pump back system are analysed for interpretation purposes only. They will be assessed within the REMP, only where relevant. This detail has been included in the revised REMP design. Physicochemical field data (Temperature, EC, pH, DO and ORP) is collected at all REMP locations as a standard requirements. This is described in the REMP design. As above, data from other monitoring programs (groundwater, surface water, including all open pits, seepage/pump-back and TSF decant) will be addressed in the REMP for interpretation purposes, where relevant. These programs have additional compliance requirements and are assessed in more detail outside th REMP, as required by the EA.

			• Provide physicochemical field data (Temperature, EC, pH, DO and ORP) for every water sample (groundwater, surface water, including all open pits, seepage/pump-back and TSF decant).	
3	Water sampling program	All sampling programs should have the same analytical suite to allow comparison between surface water, groundwater and mine waters (seepage/pump-back and TSF decant).	Update the REMP to ensure that the following analytical suite is included for all monitoring locations: • Dissolved metals/metalloids; • All metals/metalloids included in the EA; • All major cations and anions; and Redox indicators, Fe and Mn; and Cyanide.	The REMP design has been revised accordingly, and is provided in the Supporting Information Report, Appendix G.
4	Groundwater compliance monitoring framework	Due to the fractured epithermal host rock units, mineralisation and associated metal/metalloids distribution and concentration in groundwater are highly variable. Furthermore, historic site activities/infrastructure (e.g. TSF and WRD) may be influencing the chemical quality of groundwater and potentially surface water. A statistical approach to water compliance monitoring and reporting is recommended that is consistent with the DES guidelines (DES, 2021).	Develop a groundwater compliance monitoring framework appropriate for the mineralised fractured rock system at the processing plant. Specifically: • Derive intra-bore limits such that changes in groundwater quality is detectable; and, • Subsequent notification requirements to the relevant administering authority. Develop the groundwater compliance monitoring framework in accordance with the current version of the DES guideline - 'Using monitoring data to assess groundwater quality and potential environmental impacts'. Provide all raw data used in support of the above process in the format provided by the administering authority.	A groundwater compliance monitoring framework has been developed and is provided in Appendix B to this response. Raw data has been provided with this submission.

5	Hydrogeology	Limited detail has been provided regarding the hydrogeology at the processing plant site (ML 3540). From the information provided it appears that the groundwater may be shallow.	Include a hydrogeological conceptual model for the processing plant site. The model must include the groundwater level relative to the TSF, including the proposed expansion area, to allow a determination of future risk. The hydrogeological unit of each monitoring bore must be included.	A Conceptual Hydrogeological model has been developed and is provided in the Supporting Information Report, Appendix H.
6	Potential for Surface Water /Ground Water interactions.	Based on the data provided, the degree to which the TSF has influenced groundwater underlying the processing plant site cannot be ascertained. The Sandy Creek catchment appears to be subject to recharge from additional point sources. In contrast, the unconfined regolith profile within the Four Mile Creek catchment is likely recharged by diffuse infiltration of rainwater. Further investigation into surface water/groundwater interactions is required to determine the source of recharge. Currently the potential sources include diffuse infiltration of rainwater and point source recharge from the TSF and nearby open pits that contain permanent water.	To improve understanding of the surface water/groundwater interactions and potential impacts to these values from the TSF and TSF expansion, please, at minimum, carry out the following: • Provide a surface water-groundwater interaction assessment that assesses the connectivity between the regolith groundwater system and nearest potential surface water receiving environments (Sandy Creek and Four Mile Creek). • Installation of groundwater level loggers in the regolith and fractured rock bores to better understand the hydrogeology of these systems and influences from point source recharge including any permeant water bodies, open pits and the TSF. • Complete an investigation that determines the groundwater flow direction and investigates the need for the installation of seepage interception infrastructure along the proposed southern embankment.	A Conceptual Hydrogeological model has been developed and is provided in the Supporting Information Report, Appendix H. The document describes the groundwater-surface water interaction in Section 5.7. SVG will continue to monitor the standing water levels within all groundwater bores on at least a quarterly basis. The groundwater-surface water interaction assessment concluded a low likelihood of any connection or interactions. Furthermore, the assessment found no similarities between the shallow regolith bores and TSF water quality, indicating that it is unlikely that the TSF is influencing the shallow groundwater system. For these reasons, SVG does not propose the installation of groundwater level loggers at this time. Due to slow recharge rates, quarterly monitoring of standing water levels is deemed sufficient. For the southern expansion area, although the risk of seepage is very low with dry tailings, it is recommended as a precautionary principle, an adequate seepage interception system (such as a seepage collection drain and sumps) be installed by the year 2025. Seepage management will be addressed in the detailed TSF designs, to be provided prior to construction.

7	Tailings storage facility (TSF) design	Application supporting documentation outlines that the existing TSF was constructed with a compacted clay basement layer. However, details of the expanded area and how the basement layer will be prepared or lined has not been provided. This information is necessary in determining the risk that the proposed TSF expansion may pose to environmental values of groundwater. It is noted that leading seepage management practice is to line TSF structures with a geomembrane liner atop a compacted clay liner. Information detailing the design of the proposed embankment on the southern extent of ML3540, including geotechnical characterisation of material, permeability, slope details and Factor of Safety, has not been provided.	Provide a detailed TSF design that includes, at minimum, the following: • TSF basement layer (where leading practice methods are not employed, provide appropriate justification and reasoning). • The southern embankment design, including at minimum, the geotechnical characterisation of materials to be used in the construction, the permeability of that material and the Factor of Safety to be achieved. An objective and performance outcome assessment against Schedule 8, Part 3 of the Environmental Protection Regulation 2019 and demonstration of how the design achieves the required performance standards.	The design provided in the Supporting Information Report, Appendix F is a conceptual design developed to inform the initial planning and approval phase of the Project. Detailed designs will be prepared, prior to construction and provided to the DESI. A scope of work has been developed for the detailed designs which includes the following: • Provide a design for the extended tailings area to address the concerns of seepage • Consider materials, quantities, sources of materials and lining options to provide the best solution • Provide design plans and quantities for the design • Provide a design report amendment detailing the proposed design • Provide a design for the southern wall of the proposed extension area • Consider materials, quantities, sources of materials and lining options to provide the best solution • Provide design plans detailing embankment profile and material selection requirements • Provide a design report amendment detailing the proposed design of the southern embankment The TSF basement (foundation) layer will be designed as per requirements of section 6.15 of ANCOLD Guidelines 2012. A detailed design, including the material specifications, will be provided prior to construction. The minimum allowable Factor of Safety to be achieved for the southern embankments is 1.2, in accordance with the ANCOLD Guidelines 2012. A detailed design, including the material specifications, will be provided prior to construction. An objective and performance outcome assessment has been completed and is provided in Appendix C, below.

8	Design for closure/ rehabilitation plan	No information is provided regarding the progressive rehabilitation plan for the extended TSF. In particular, the data provided show that there may be rehabilitation limitations and difficulties due to the proximity of the expanded TSF to the border of the mining lease. No cover system design has been proposed for the expanded TSF. Information such as layer thicknesses and geotechnical characterisation of the material to be used in the final design is required to ensure that the landform achieves a safe, stable and non- polluting condition. Moreover, it is not clear whether sufficient cover material will be available onsite or across satellite mining leases. Provide a quantitative assessment identifying the location and quantity of capping material available to demonstrate that the proposed rehabilitation plan can be achieved.	Provide information regarding the progressive rehabilitation plan for the expanded TSF. This includes, but is not limited to: • Risk assessment of limited achievement of rehabilitation requirements. • Specification of layer thicknesses for the cover system design. • On ground availability of cover materials with supporting geotechnical characterisation confirming their suitability for the intended use. Demonstrate how the proposed cover design will facilitate achievement of the Post Mining Land Use of grazing/native bushland.	The project will not change rehabilitation objectives stated in the EA. A conceptual TSF closure plan has been prepared for the existing TSF, and is provided in the Supporting Information Report, Appendix I. This closure plan will be extended to incorporate the proposed TSF expansion and dry stacking area. The TSF will be capped to ensure the final landform is safe, stable and non-polluting. As part of the detailed TSF designs, a revised closure plan will be developed, prior to construction, and provided to the DESI. A scope of work has been developed for the revised closure plan which includes: • Undertake a design of the tailings area final profile and arrangement for closure • Detail material movements to achieve final ground profiles for capping and rehabilitation works • Undertake a capping design detailing the capping layer materials, typical cross section, material quantities and material sources • Provide design drawings showing the final tailings area layout and profiles and capping details • Provide a design report amendment detailing the proposed final closure arrangement for the tailings storage area SVG has a PRCP currently being assessed by the DESI which details the rehabilitation requirements for the Project as a whole. The PRCP defines how the cover will facilitate achievement of the PMLU. Materials for closure will be source from on site, where suitable, or from onsite locations. SVG are investigating alternative cover options (liner) to reduce the volumes of material required for rehabilitation. This will be defined in detailed, in the revised closure plan.

Appendix B

HydroElement Solutions

GROUNDWATER TRIGGERS DERIVATION

Georgetown Gold Project

February 2024

Prepared For:

Wulguru Technical Services Pty Ltd

Contact Information	Details
Contact Person	Dr Ashish Mishra (HydroElement Solutions)
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Document Control	Description
Version 1	Dr A Mishra developed and released the document on 31/01/2024
Version 1	WTS and SVG reviewed the document on 06/02/2024
Version 2	Dr A Mishra addressed changes and released v2.0 on 06/02/2024

DISCLAIMER

HydroElement Solutions

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Introduction

The Georgetown Gold Project is owned and operated by Savannah Goldfields Limited (SVG) and operates under Environmental Authority (EA) EPML00899813. Wulguru Technical Services Pty Ltd (WTS) were engaged by SVG to prepare supporting information for an amendment to the EA, proposing new groundwater limits for the Georgetown Processing Plant and satellite mining leases (MLs). An EA amendment application was previously submitted to the Department of Environment and Science (DES). WTS have since received an information request from DES requesting further information. One of the requirements of the information request is to develop new groundwater limits for the Processing Plant and satellite MLs (Red Dam and Electric Light) in accordance with the DES guideline - 'Using monitoring data to assess groundwater quality and potential environmental impacts' (DES, 2021).

HydroElement Solutions (HESS) was engaged by WTS on behalf of SVG, to develop new groundwater limits for the Plant Site and satellite MLs in accordance with the DES (2021) guideline.

1. Objectives

This report derives suitable site-specific groundwater limits in accordance with the method outlined in the guideline '*Using monitoring data to assess groundwater quality and potential environmental impacts*' (DES, 2021 (previously DSITI 2017)) to achieve the requirement of the information request by DES.

2. Reference to Previous Studies

In order to retrieve more information on environmental values and site characteristics, previous studies were referred. These included the following:

- Water Management Strategy (ATCW, 2013)
- Surface Water Management Report (Civil IQ, 2022)
- Geochemical Impact Assessment (Geochemical Scientific, 2022)
- Hydrogeology of Plant Site, Electric Light, Red Dam, and Jubilee Plunger – Georgetown Gold Projects (RLA, 2014)
- Environmental Authority Amendment – Georgetown Processing Project Supporting Information (WTS, 2023)
- Water Management Plan (WTS, 2022).

These studies characterised the existing groundwater conditions, and hence provided the regional/local context for this study. These studies included a description of the existing hydrogeological conditions and assessed the relevant environmental values in the area.

Site Characteristics

1. Location and History

The Georgetown Gold Project is located approximately 6.5 km southwest of Georgetown and approximately 380 km southwest of Cairns in North Queensland. The site comprises a processing plant, which was recommissioned in September 2022, and a tailings storage facility (TSF). The processing plant at Georgetown Gold Project is situated across three MLs – ML 3540, ML 3591, and ML 3409, with a total area of approximately 81 hectares (ha). The existing EA allows for Environmentally Relevant Activity (ERA) 31(2(a)), which allows the site crushing, milling, grinding or screening of more than 5000 tonnes per annum of material, and mineral processing of up to 100,000 tonnes per annum.

The site was first developed in the early 1990s by Union Mining and was redeveloped by Deutsche Rohstoff Australia Pty Ltd in 2009. The current TSF was constructed in 2010. The site's operation was acquired by JKO Mining Pty Ltd in 2012, which processed about 43,000 tonnes of ore in 2012/13 (GEO-Eng, 2019). The site was placed in care and maintenance in February 2013, and was subsequently acquired by Kempton Minerals in 2018. SVG acquired the processing plant at Plant Site and accompanying MLs while it was in a state of care and maintenance, and recommenced processing in September 2022, with ore from the Agate Creek Gold Mine (WTS, 2023). Currently, there are no mining activities occurring at the satellite MLs of Red Dam and Electric Light (WTS, 2023).

2. Climate and Rainfall

Georgetown is located in the semi-arid dry tropics region and experiences the wet season during the summer months, the dry season occurs during the winter months. The area falls under the Tropical Savannah category in the Köppen Climate Classification system.

Rainfall in this area occurs primarily between December and April (**Figure 1**). Meteorological data has been sourced from the Bureau of Meteorology (BOM) weather station for the Georgetown Airport weather station – Station number 030124. The weather station has existed since 2004 and had rainfall data available till December 2023.

Rainfall data from the Georgetown Airport weather station suggests that the average annual rainfall from January 2004 to December 2021 is approximately 840 mm (**Figure 1** and **Figure 2**), with most rainfall occurring during the summer months. Average temperatures commonly exceed 30°C from December to March; the lowest mean temperatures drop below 15°C only in winter months, i.e., June to August (**Figure 1**).

Rainfall patterns throughout the year demonstrate distinct seasonal differences. The wet season occurs during the summer months of December to March, accounting for nearly 80% of the annual average rainfall, with the dry season occurring during the winter months (**Figure 1**). During the recent ten years, total annual rainfall was higher than the 20-year average in 2018, 2021, and 2023 (**Figure 2**).

Table 1 Average Monthly Temperature and Rainfall at Georgetown Airport Station

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Rainfall (030124)	252.1	202.5	127.3	21.5	14.9	6.6	11.7	1.5	4.3	11.9	73.6	130.9
Average Max Temp (030124)	33.9	33.4	33.5	32.9	30.3	28.8	28.6	30.4	33.6	36.2	36.8	36.3
Average Min Temp (030124)	23.4	22.7	21.9	19.4	16.5	14.1	13.3	13.7	17	20.5	22.8	23.6

All temperatures are in degrees Celsius, and rainfall is in mm.

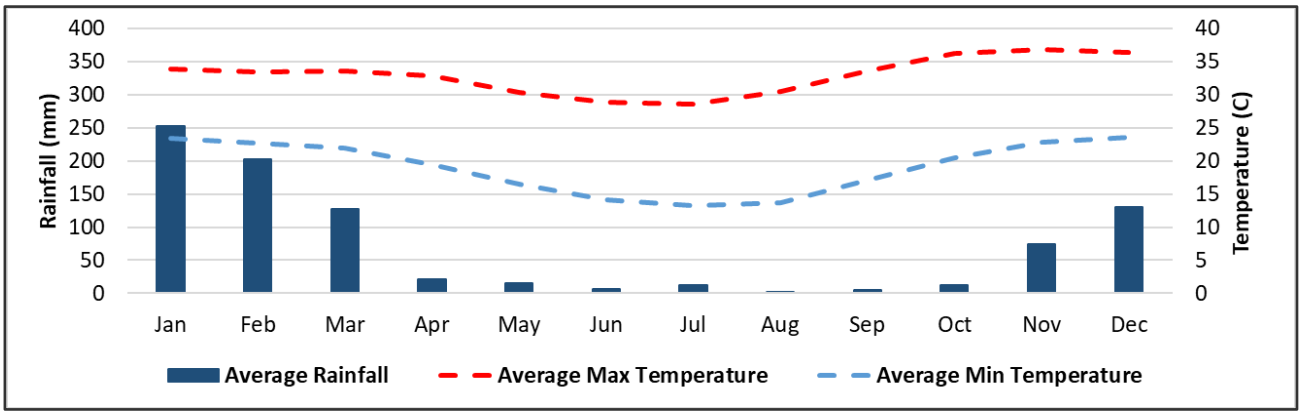

Figure 1 Monthly Rainfall and Temperatures

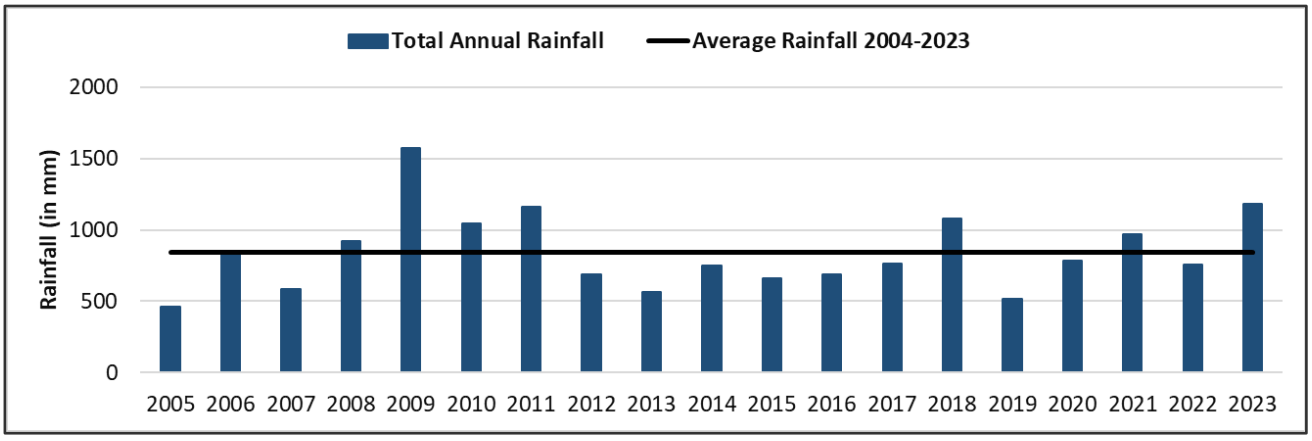

Figure 2 Total Annual Rainfall – Georgetown Airport Station (030124)

3. Hydrology and Topography

The project is situated within the drainage basin of the Gilbert River, a part of the Gulf of Carpentaria Drainage division.

The Plant Site's surface water comprises mainly 1st order streams, and the runoff discharges into Sandy Creek (towards the east of the ML) and Four Mile Creek (towards the northwest of the ML). The flow of Sandy Creek is in the northeast direction while passing the ML, after which it alters its path to the north-westerly direction, where it merges with the Etheridge River. Similarly, Four Mile Creek, flowing in a north-easterly direction past the Plant Site ML, flows into the Etheridge River. The Etheridge River, in turn, flows into the Einasleigh River, joining the Gilbert River downstream of the site. The Plant Site is located on the crest of the hill, with elevation ranging from 310 to 332 metres Australian Height Datum (mAHD) (WTS, 2022).

The Electric Light ML is located on terrain characterised by slight undulations, with elevation levels ranging between 320 and 330 mAHD (WTS, 2022). This area also 1st order ephemeral streams, with the closest stream positioned just south of the ML boundary. The streams in the vicinity ultimately drain into Quartz Blow Creek, approximately 4.1 km to the southwest. Quartz Blow Creek then flows westerly, discharging into the Etheridge River at a distance of 8 km from the ML (WTS, 2022).

The Red Dam ML is positioned on the eastern side of a gently sloping ridge, with elevation gradients varying from 280 mAHD to 300 mAHD (WTS, 2022). The site features watercourses primarily composed of first-order streams. These streams flow in a northeastern direction, converging into a second-order stream that extends for 2.7 km before joining the fifth-order Cattle Creek (WTS, 2022). Cattle Creek then follows a north-westerly path to join the Einasleigh River, located 10 km northwest of the ML (WTS, 2022).

4. Geology

The surface geology of the Georgetown Gold Project is located within the confines of the Georgetown inlier, encompassing a range of geological formations. These formations predominantly include the Archaean Einasleigh Metamorphics, the Proterozoic Robertson River Subgroup, the Etheridge Group, the Lane Creek Formation, and the Cobbold Metadolerite. Additionally, the region is marked by the intrusion of the late-stage Proterozoic Forsayth Granite into all the aforementioned geological units (NRC, 2019).

The geological basement of the Georgetown region is primarily composed of Proterozoic granitic and metamorphic rocks (Geochemical Scientific, 2022). These basement rocks have undergone alterations through three distinct phases of intrusive activity, as outlined by Morrison et al. (2019). These phases include:

- Early Devonian Plutonic deposits
- Intrusive deposits from the Early Permian and Early Carboniferous periods;
- Epithermal rhyolites.

The site's geology is characterised by regolith that has developed from the weathering of the underlying granitic host rocks (Geochemical Scientific, 2022). This site features a superficial layer of sandy-clay material with low to medium plasticity (Geochemical Scientific, 2022). Beneath this layer,

there are more deeply weathered granite profiles, which exhibit a variety of textures and overlie the fractured granitic basement rock (Geochemical Scientific, 2022).

Most of the mineralisation in the area is associated with the Etheridge Goldfield, which extends over a large area (Plentex, 2008). Mineralisation is associated with the larger regional Etheridge Goldfield. Sulfide minerals, including pyrite, arsenopyrite, galena, chalcopyrite and sphalerite (Plentex, 2008), have been observed to represent up to 50% of mineralisation in geothermal deposits hosting the ore bodies in the region.

The gold-bearing veins of the Etheridge Goldfield are predominantly mesothermal in nature, closely linked to episodes of acid igneous activity (NRC, 2019). These veins comprise a mixture of quartz, carbonate, mica, and various sulphides within highly altered fault zones. In some areas, sulphides can constitute up to 50% of the vein material (NRC, 2019). Key sulphide minerals present include pyrite, arsenopyrite, galena, chalcopyrite, and sphalerite. These minerals are often associated with higher concentrations of gold (NRC, 2019; Plentex, 2008).

5. Hydrogeology

A review of the available geological and groundwater data suggests that the main hydrogeological unit within the site includes the following:

- The weathered regolith aquifers
- Near-surface fractures in the basement
- Deep fractures in the basement

5.1 Weathered Regolith Aquifers

Occurrences of soaks are quite common throughout the site (RLA, 2013). Soaks are extremely limited groundwater sources, occurring within the weathered regolith layer above the basement geological formations (RLA, 2013). These soaks typically occur between weathered and fresh materials, within a depth range of 10 to 15 meters (RLA, 2013). These are unconfined aquifers. Hydrogeological assessments undertaken at the site indicate that these aquifers exhibit considerable hydraulic connectivity. This is primarily because the weathered regolith layer is extensive, covering the entirety of the Plant Site area (RLA, 2013).

5.2 Near-Surface Fractured Basement Aquifers

Aquifers have been identified within fractures of the basement at relatively shallow depths (RLA, 2013). Based on the depths of groundwater bores in the area, these fractures are typically found between 20 to 50 meters deep. The groundwater yield from these aquifers is usually in the range of 0.3 to 0.5 litres per second (L/S) (RLA, 2013). These aquifers are categorised as semi-confined, and their hydraulic connectivity is considered to be limited, as evidenced by the varying groundwater yields and qualities observed in boreholes located in close proximity to each other (RLA, 2013). This hydrogeological unit is also considered to be the primary water-bearing unit at Georgetown Gold Project.

5.3 Deep Fractured Basement Aquifers

It is possible that a deeper, confined, fractured bedrock aquifer exists under the basement of the bedrock, or at the boundary between the near-surface fractured zone and the underlying fresh bedrock, and exceeding the depths of more than 70 meters (RLA, 2013). However, limited information is available from this unit.

Airlift yield undertaken on bores in this unit more commonly exhibit airlift yields of <1 L/s, with the exception of the airlift yield from RDMB3, which was recorded to be 4 L/s, which is unusually high for this unit (RLA, 2013). These deep aquifers are classified as confined and have quite limited connectivity (RLA, 2013).

6. Groundwater Dependent Ecosystem

A review of the Atlas of Groundwater Dependent Ecosystems (BOM, 2023) and the Queensland Globe tool (https://qldglobe.information.qld.gov.au) indicated no groundwater-dependent ecosystems (GDEs) within the project area.

7. Environmental Values and Use of Groundwater

There are currently no Environmental Values provided in guidelines relating to the Gilbert River Basin. The most relevant environmental values have been derived from the EPP Water in the water management plan (WTS, 2022), which include the following:

- For waters that may be used for agricultural purposes – the suitability of the water for agricultural purposes.
- For waters that may be used for recreation or aesthetic purposes – the suitability of water for
    - Primary recreational use; or
    - Secondary recreational use; or
    - Visual recreational use
- For water that may be used for drinking water – the suitability of the water for supply as drinking water having regard to the level of treatment of the water.
- For waters that may be used for industrial purposes – the suitability of the water for industrial use.
- The cultural and spiritual values of the water.

Groundwater Monitoring Network

1. Existing Groundwater Monitoring Network

The groundwater network consists of 20 monitoring bores, which are monitored quarterly at the Plant Site, Electric Light, and Red Dam at the locations detailed in Table C7 of the EA EPML00899813. These groundwater bores were installed in 2009 and 2010. The details of the bores are presented in **Table 2** below.

Table 2 Details of Groundwater Bores at Georgetown Gold Project

Monitoring point	Coordinates		Elevation (mAHD)	Monitoring Frequency
	Easting	Northing		
Compliance Bores				
Plant Site				
PSMB1	764148	7971110	326.691	Quarterly
PSMB2	765228	7971273	309.584	
PSMB3	763461	7971672	319.429	
PSMB4	763298	7971539	316.711	
PSMB5	764687	7971667	324.859	
PSMB7	764973	7971528	317.468	
PSMB8	765204	7971521	320.687	
PSMB9	764881	7971197	319.439	
PSMB10	764651	7971201	319.181	
PSMB11*	763651	7971551	330.795	
PSMB12	763873	7971394	326.401	
PSMB13	763401	7971468	319.914	
PSMB14	763997	7971467	319.678	
Electric Light				
ELMB1	772455	7989229	324.845	Quarterly
ELMB2	772264	7988601	313.625	

Red Dam				
RDMB1	785974	8015064	301.905	Quarterly
RDMB2	786995	8015060	281.019	
Reference Bores				
Plant Site				
PSMB6	764891	7971672	320.127	Quarterly
Electric Light				
ELMB3	772621	7989282	319.982	Quarterly
Red Dam				
RDMB3	786878	8014924	282.621	Quarterly

*Bore PSMB11 is installed within an existing exploration hole, and may not accurately reflect the quality of groundwater in the Four Mile Creek fractured rock system. As such, it is recommended that PSMB11 be removed from the compliance network.

Table 3 Bore Construction Details of Groundwater Bores

Site	Elevation (mAHD)	Depth (m)	Screened Interval (m)	Aquifer	Catchment
PSMB1	326.691	29	17-29	Unconfined regolith	Sandy Creek
PSMB2	309.584	11	8-14	Unconfined regolith	Sandy Creek
PSMB3	319.429	14	8-14	Unconfined regolith	Four Mile Creek
PSMB4	316.711	14	8-14	Unconfined regolith	Four Mile Creek
PSMB5	324.859	10.5	4.5-10.5	Unconfined regolith	Sandy Creek
PSMB6	320.127	11	5-11	Fracture Granite (semi-confined)	Sandy Creek
PSMB7	317.468	29	23-29	Fracture Granite (semi-confined)	Sandy Creek
PSMB8	320.687	29	23-29	Fracture Granite (semi-confined)	Sandy Creek
PSMB9	319.439	11	5-11	Unconfined regolith	Sandy Creek
PSMB10	319.181	12	6-12	Unconfined regolith	Sandy Creek
PSMB11*	330.795	29^	23-29	Granite (semi-confined)	Four Mile Creek
PSMB12	326.401	29	23-29	Fracture Granite (semi-confined)	Four Mile Creek
PSMB13	319.914	11	5-11	Fracture Granite (semi-confined)	Four Mile Creek

PSMB14	319.678	29	23-29	Fracture Granite (semi-confined)	Four Mile Creek
Red Dam					
RDMB1	301.905	28	16-28	Granite (semi-confined)	Red Dam
RDMB2	281.019	31.2	N/A	N/A	Red Dam
RDMB3	282.621	101.5	77.5-101.5	Schist	Red Dam
Electric Light					
ELMB1	324.845	22	13-22	Fracture Granite	Electric Light Lease
ELMB2	313.625	21	9-21	Fracture Granite	Electric Light Lease
ELMB3	319.982	100	68.5-98.5	Fracture Granite	Electric Light Lease

^Bore PSMB11 is installed within an existing exploration hole with a total depth of 150 meters, and the screened interval was installed from 24 to 30 meters below ground surface (RLA, 2013).

*Bore PSMB11 may not accurately reflect the quality of groundwater in the Four Mile Creek fractured rock system. As such, it is recommended that PSMB11 be removed from the compliance network.

2. Groundwater Monitoring Analytes

Samples collected from these bores were analysed for analytes outlined in EA EPML00899813 Table C8, as detailed in **Table 4** below.

Table 4 Groundwater Monitoring Analytes

Parameter	Units	Analysis Type
pH	pH Unit	In-situ
Electrical Conductivity	µS/cm	
Chloride	mg/L	Laboratory Analysis
Sulphate (SO42-)	mg/L	
Aluminium	mg/L	
Antimony	mg/L	
Arsenic	mg/L	
Bismuth	mg/L	
Cadmium	mg/L	
Cobalt	mg/L	
Copper	mg/L	

Lead	mg/L	
Mercury	mg/L	
Nickel	mg/L	
Selenium	mg/L	
Silver	mg/L	
Tin	mg/L	
Zinc	mg/L	
Cyanide (Free)	mg/L	
Cyanide (WAD)	mg/L	

3. Existing EA Groundwater Triggers and Limits

The groundwater quality at the site is assessed against the groundwater trigger and contaminant limit outlined in Table C8 of the EA, which is also summarised in **Table 5** below.

It is important that the triggers and limits are suitable and be fit for purpose, so that they can effectively provide an early warning of any potential impacts to groundwater from mining activities. If the triggers and limits are too high, they may not indicate any emerging contamination issues. On the other hand, if triggers and limits are too low, then any natural variability may be mistaken for contamination events and result in unnecessary reporting and investigation.

The current EA trigger levels and limits, which are based on the reference bore approach, are not suitable for groundwater bores at the Georgetown Gold project. The concentration of metals and minerals in groundwater bores at the site are highly variable, likely due to the fractured epithermal host rock units and mineralisation (Geochemical Scientific, 2022).

As such, a statistical approach to water compliance monitoring and reporting was recommended by previous studies undertaken, and accordingly, suitable groundwater limits have been derived in accordance with the DES guidelines (DES, 2021).

Table 5 Current EA Groundwater Trigger Levels and Contaminant Limits

Quality Characteristic	Contaminant Limit (mg/L unless otherwise specified)	Trigger Levels (µg/L unless otherwise specified)
Electrical Conductivity	1000 (µS/cm)	500(µS/cm)
pH (pH Unit)	4.0 (minimum) 9.0(maximum)	6.0(minimum) 7.5(maximum)
Level and chloride	For interpretation purposes	

Sulphate (SO4)	1000	80th percentile of the reference
Aluminium	5	55
Antimony	Reference value	80th percentile of the reference
Arsenic	0.5	13
Bismuth	Reference value	80th percentile of the reference
Cadmium	0.01	0.2
Cobalt	1	2.8
Copper	1	1.4
Lead	0.1	3.4
Mercury	0.002	0.6
Nickel	1	11
Selenium	0.02	11
Silver	Reference value	0.05
Tin	Reference value	3
Zinc	20	8
Cyanide (Free)	0.5	7
Cyanide (WAD)	For interpretation purposes	

Identifying Site-Specific Contaminant Triggers and Limits

The site-specific contaminant trigger and limits for groundwater at Georgetown Gold Project are proposed in this section. The guideline "*Using monitoring data to assess groundwater quality and potential environmental impacts*" (DES, 2021 (previously DSITI 2017)) has been used to determine the groundwater limits.

1. Pre-processing of Monitoring data

1.1 Monitoring Data

WTS provided the groundwater data used in this assessment on behalf of SVG. All results and interpretations are based on the data provided. Only basic QA/QC check, such as unit inconsistencies and missing values, have been undertaken on the provided data. It is assumed that the quality of the data is checked by the WTS prior to providing it to HydroElement Solutions.

1.2 Treatment of Below Limit of Reporting (LOR)

All values below the LOR of any given parameter were replaced with 'halves of the LOR' as per DES (2021) guideline. The percentage of observations below LOR was calculated for each parameter in each bore, and has been reported in the statistical summary.

1.3 Treatment of Outliers

In accordance with DES (2021), outliers have been identified and assessed. The outliers were identified using the four-standard deviation of the mean method outlined in DES (2021) guideline. Values that were greater than four standard deviations from the mean were identified as outliers. These outlier data points were flagged. Outliers have been identified but have not been excluded from the time-series plots. Outliers were excluded from the statistical summary when deriving new limits in accordance with DES (2021) guideline.

1.4 Summary of Statistics

Raw groundwater monitoring data were analysed using the methodology for groundwater data analysis described in DES (2021). Summary statistics for all monitoring bores, detailing number of

samples analysed; percentage of observations below LOR; minimum and maximum values, and 5th, 20th, 50th, 80th and 95th percentile for each parameter analysed.

1.5 Identifying Temporal Trends

Time-series plots for each bore and contaminant were generated, showing a visual temporal pattern in data and the results of a non-seasonal Mann-Kendall trend test on time series where more than three data points were available. Temporal trends were analysed using a visual assessment of the entire time period of the available data and the double-sided p-value of the Mann-Kendall test. Trends were considered statistically significant if the p-value was <0.05. The analytes showing increasing temporal trends were excluded from the statistical summary when deriving new limits in accordance with DES (2021) guideline.

2. Proposed Site-Specific Limits for Groundwater

To derive suitable site-specific limits for groundwater quality for Georgetown Gold Project, sufficient good-quality monitoring data is required. As per DES (2021), it is recommended that for estimates of 20th and 80th percentiles, a minimum of 18 samples is required over at least 12 and preferably 24 months. It is noted that the number of data points available for individual groundwater bores at Georgetown Gold Project, during development of this report is not sufficient for all EA analytes. This is also likely because monitoring at Georgetown Gold Project has been conducted quarterly. In addition, the site has undergone changes in ownership multiple times. Due to these numerous handovers, comprehensive data on groundwater quality has not been consistently transferred. As such, the number of observations after removing outliers were not sufficient for all bores and analytes to derive site-specific groundwater limits.

However, DES (2021) also states that in order to increase the number of observations, multiple bores that represent the same aquifer, geology, and ionic composition can be combined to calculate more robust descriptive statistics. Taking this approach, data from bores screened within the same lithologies and catchment within the Plant Site were combined, and groundwater limits were derived using the percentiles. Similarly, all bores at Red Dam and Electric Light site were also combined to increase the number of observations and robustness of the statistical summary. The groups are outlined in **Table 6** below.

Table 6 Grouping of Groundwater Bores

Group	Bores
Sandy Creek Regolith	PSMB1
	PSMB2
	PSMB5
	PSMB9
	PSMB10
Sandy Creek Fractured Rock	PSMB6

	PSMB7
	PSMB8
Four Mile Creek Regolith	PSMB3
	PSMB4
Four Mile Creek Fractured Rock	PSMB11
	PSMB12
	PSMB13
	PSMB14
Red Dam Bores	RDMB1
	RDMB3
Electric Light bores	ELMB1
	ELMB2
	ELMB3

The DES (2021) guideline recommends compliance approaches for groundwater quality assessment based on comparing a number of consecutive sample tests at compliance bores to a limit based on percentile calculations. This approach is mainly aimed at reducing the false non-compliances, while ensuring that any potential impacts are detected early. The recommended compliance approaches in the guideline are as follows:

- Single Limit (95th percentile) – 3 consecutive test samples exceed the limit. If a toxicant default guideline (ANZG 2018) is adopted, this can be applied as the limit.
- Limit A (80th percentile) and Limit B (95th percentile) – 5 consecutive test samples exceed the Limit A and 3 consecutive test samples exceed the Limit B. If toxicant default guideline (ANZG 2018) is adopted, it should be applied as a Limit B not Limit A.

In accordance with DES (2021) guideline, a single-limit approach (95th percentile) has been applied for the site. These single limits are derived using 95th percentile (and 5th percentile for lower limit of pH) of the outlier removed monitoring data of the grouped bores.

The hierarchy of the trigger derivation approach was in accordance with DES (2021) guideline and as follows:

- **ANZG (2018) default guideline values (DGVs)** - In accordance with DES (2021) guideline, where ANZG (2018)/ANZECC (2000) default guideline values (DGVs) were suitable, they were adopted as the limit.
- **Water Quality Objectives (WQOs)** - DES (2021) guidelines suggest that where ANZG (2018) DGVs are not available or not suitable, use of the Water Quality Objectives (WQOs) (the regional objectives defined under Schedule 1 of the Environmental Protection (Water and Wetland Biodiversity) Policy 2019) (EPP Water) should be considered. However, the site is

situated within the Gilbert Drainage Basin (Basin no. 917), for which the WQOs are not defined in the EPP Water. As such, WQOs were not used.

- **Percentiles** - Therefore, where ANZG (2018) DGVs were not available or unsuitable, 95th percentile of the grouped bores was used to derive the limit. The grouped 95th percentile was not suitable for some bores within the group. For those bores, bore-specific limits were derived using 95th percentile of the bore alone, if sufficient number of observations (i.e., >18 observations) were available. Where the number of observations was <18 observations, but more than eight (8) observations, interim limits have been derived, which will be revised once sufficient observations are available.

The derived site-specific groundwater limits were tested by comparing them with the 80th percentile of the groundwater monitoring data at each bore with the proposed limit. The proposed groundwater limits for each section have been outlined in the sections below.

2.1 Proposed Limits for Sandy Creek Regolith Bores

The proposed groundwater limits for Sandy Creek Regolith Bores are outlined in **Table 7** below. These limits area applicable to the following bores:

- PSMB1
- PSMB2
- PSMB5
- PSMB9
- PSMB10

The limits derived using grouped bores were unsuitable for bore PSMB9 for EC and total lead. Since bore PSMB9 did not have sufficient number of observations (i.e., >18 observations), bore-specific limit was not derived for these analytes. However, in accordance with the DES (2021) guideline, since bore PSMB9 had more than eight (8) observations for both these analytes, an interim bore-specific limit was derived. These are required to be revised when sufficient observations (i.e., 18) are available.

Table 7 Proposed Limits for Sandy Creek Regolith Bores (Plant Site)

Analytes	Unit	Proposed Limits	Derivation Method
pH	Ph Units	6 to 8.5	Existing EA Limit; derived from ANZECC (2000) default guideline value.
EC	µS/cm	2890; For PSMB9 - 7900	Derived using 95 percentile of grouped bores. Limit for PSMB9, derived using 95th percentile of PSMB9
Sulfate	mg/L	1219.5	Derived using 95 percentile of grouped bores.
Aluminium Dissolved	mg/L	3.72	Derived using 95 percentile of grouped bores.
Aluminium Total	mg/L	9.521	Derived using 95 percentile of grouped bores.

Antimony Dissolved	mg/L	0.0015	Derived using 95 percentile of grouped bores.
Antimony Total	mg/L	0.0015	Derived using 95 percentile of grouped bores.
Arsenic Dissolved	mg/L	0.019	Derived using 95 percentile of grouped bores.
Arsenic Total	mg/L	0.0436	Derived using 95 percentile of grouped bores.
Bismuth Dissolved	mg/L	0.6384	Derived using 95 percentile of grouped bores.
Bismuth Total	mg/L	0.00065	Derived using 95 percentile of grouped bores.
Cadmium Dissolved	mg/L	5.00E-04	Derived using 95 percentile of grouped bores.
Cadmium Total	mg/L	0.00067	Derived using 95 percentile of grouped bores.
Cobalt Dissolved	mg/L	0.03905	Derived using 95 percentile of grouped bores.
Cobalt Total	mg/L	0.047	Derived using 95 percentile of grouped bores.
Copper Dissolved	mg/L	0.017	Derived using 95 percentile of grouped bores.
Copper Total	mg/L	0.021	Derived using 95 percentile of grouped bores.
Lead Dissolved	mg/L	0.0161	Derived using 95 percentile of grouped bores.
Lead Total	mg/L	0.017; For PSMB9 - 0.27	Derived using 95 percentile of grouped bores. Limit for PSMB9, derived using 95th percentile of PSMB9
Mercury Dissolved	mg/L	5.50E-05	Derived using 95 percentile of grouped bores.
Mercury Total	mg/L	1.00E-04	Derived using 95 percentile of grouped bores.
Nickel Dissolved	mg/L	0.015	Derived using 95 percentile of grouped bores.
Nickel Total	mg/L	0.0266	Derived using 95 percentile of grouped bores.
Selenium Dissolved	mg/L	0.005	Derived using ANZG (2018) Default Guideline Value for 99% Species Protection
Selenium Total	mg/L	0.005	Derived using ANZG (2018) Default Guideline Value for 99% Species Protection
Silver Dissolved	mg/L	0.025	Derived using 95 percentile of grouped bores.
Silver Total	mg/L	0.021	Derived using 95 percentile of grouped bores.
Tin Dissolved	mg/L	0.025	Derived using 95 percentile of grouped bores.
Tin Total	mg/L	0.025	Derived using 95 percentile of grouped bores.
Zinc Dissolved	mg/L	0.0853	Derived using 95 percentile of grouped bores.
Zinc Total	mg/L	0.11925	Derived using 95 percentile of grouped bores.
Free Cyanide	mg/L	0.007	Derived using ANZG (2018) Default Guideline Value for 95% Species Protection
WAD Cyanide	mg/L	For Interpretation Only.	

Major Ions	mg/L	For Interpretation Only.

Cells highlighted in yellow are interim triggers and must be revised once sufficient observations are available.

2.2 Proposed Limits for Sandy Creek Fractured Rock Bores

The proposed groundwater limits for Sandy Creek Fractured Rock Bores are outlined in **Table 8** below. These limits are applicable to the following bores:

- PSMB6
- PSMB7
- PSMB8

Table 8 Proposed Limit for Sandy Creek Fractured Rock Bores (Plant Site)

Analytes	Unit	Proposed Limits	Derivation Method
pH	pH units	6 to 8.5	Existing EA Limit; derived from ANZECC (2000) default guideline value.
EC	µS/cm	2564.5	Derived using 95 percentile of grouped bores.
Sulfate	mg/L	850.45	Derived using 95 percentile of grouped bores.
Aluminium Dissolved	mg/L	2.25	Derived using 95 percentile of grouped bores.
Aluminium Total	mg/L	8.9	Derived using 95 percentile of grouped bores.
Antimony Dissolved	mg/L	0.0048	Derived using 95 percentile of grouped bores.
Antimony Total	mg/L	0.00495	Derived using 95 percentile of grouped bores.
Arsenic Dissolved	mg/L	0.3256	Derived using 95 percentile of grouped bores.
Arsenic Total	mg/L	0.405	Derived using 95 percentile of grouped bores.
Bismuth Dissolved	mg/L	0.5922	Derived using 95 percentile of grouped bores.
Bismuth Total	mg/L	0.001	Derived using 95 percentile of grouped bores.
Cadmium Dissolved	mg/L	0.00063	Derived using 95 percentile of grouped bores.
Cadmium Total	mg/L	0.0023	Derived using 95 percentile of grouped bores.
Cobalt Dissolved	mg/L	0.15	Derived using 95 percentile of grouped bores.
Cobalt Total	mg/L	0.15	Derived using 95 percentile of grouped bores.
Copper Dissolved	mg/L	0.0144	Derived using 95 percentile of grouped bores.
Copper Total	mg/L	0.086	Derived using 95 percentile of grouped bores.
Lead Dissolved	mg/L	0.0154	Derived using 95 percentile of grouped bores.
Lead Total	mg/L	0.274	Derived using 95 percentile of grouped bores.

Mercury Dissolved	mg/L	0.00005	Derived using 95 percentile of grouped bores.
Mercury Total	mg/L	0.0002	Derived using 95 percentile of grouped bores.
Nickel Dissolved	mg/L	0.01165	Derived using 95 percentile of grouped bores.
Nickel Total	mg/L	0.0206	Derived using 95 percentile of grouped bores.
Selenium Dissolved	mg/L	0.005	Derived using ANZG (2018) Default Guideline Value for 99% Species Protection
Selenium Total	mg/L	0.005	Derived using ANZG (2018) Default Guideline Value for 99% Species Protection
Silver Dissolved	mg/L	0.025	Derived using 95 percentile of grouped bores.
Silver Total	mg/L	0.025	Derived using 95 percentile of grouped bores.
Tin Dissolved	mg/L	0.025	Derived using 95 percentile of grouped bores.
Tin Total	mg/L	0.025	Derived using 95 percentile of grouped bores.
Zinc Dissolved	mg/L	0.0853	Derived using 95 percentile of grouped bores.
Zinc Total	mg/L	0.218	Derived using 95 percentile of grouped bores.
Free Cyanide	mg/L	0.0504	Derived using 95 percentile of grouped bores.
WAD Cyanide	mg/L	For Interpretation Only.	
Major Ions	mg/L	For Interpretation Only.	

2.3 Proposed Limits for Four Mile Regolith Bores

The proposed groundwater limits for Four Mile Creek Regolith Bores are outlined in **Table 9** below. These limits are applicable to the following bores:

- PSMB3
- PSMB4

Even after grouping, these bores did not have sufficient number of observations (i.e., >18 observations). However, since there were more than eight (8) observations, interim limits were derived, in accordance with DES (2021) guideline. These are highlighted in yellow in **Table 9** below. The interim limits must be revised when sufficient observations (i.e., 18) are available.

The interim limits derived using grouped bores were unsuitable for bore PSMB4 for many analytes. However, bore PSMB4 did not even have sufficient number of observations to derive interim bore-specific limits (i.e., >8 observations). Hence, even suitable interim bore-specific limits could not be derived for PSMB4.

Table 9 Proposed Limits for Four Mile Creek Regolith Bores (Plant Site)

Analytes	Unit	Proposed Limits	Derivation Method

pH	pH units	6 to 8.5	Existing EA Limit; derived from ANZECC (2000) default guideline value.
EC	µS/cm	4100	Derived using 95 percentile of grouped bores.
Sulfate	mg/L	2000	Derived using 95 percentile of grouped bores.
Aluminium Dissolved	mg/L	1.14625	Derived using 95 percentile of grouped bores.
Aluminium Total	mg/L	8.774	Derived using 95 percentile of grouped bores.
Antimony Dissolved	mg/L	0.0015	Derived using 95 percentile of grouped bores.
Antimony Total	mg/L	0.0015	Derived using 95 percentile of grouped bores.
Arsenic Dissolved	mg/L	0.0128	Derived using 95 percentile of grouped bores.
Arsenic Total	mg/L	0.0353	Derived using 95 percentile of grouped bores.
Bismuth Dissolved	mg/L	0.0005	Derived using 95 percentile of grouped bores.
Bismuth Total	mg/L	0.0005	Derived using 95 percentile of grouped bores.
Cadmium Dissolved	mg/L	0.000215	Derived using 95 percentile of grouped bores.
Cadmium Total	mg/L	0.00029	Derived using 95 percentile of grouped bores.
Cobalt Dissolved	mg/L	0.10415	Derived using 95 percentile of grouped bores.
Cobalt Total	mg/L	0.0914	Derived using 95 percentile of grouped bores.
Copper Dissolved	mg/L	0.0074	Derived using 95 percentile of grouped bores.
Copper Total	mg/L	0.0177	Derived using 95 percentile of grouped bores.
Lead Dissolved	mg/L	0.0067	Derived using 95 percentile of grouped bores.
Lead Total	mg/L	0.0259	Derived using 95 percentile of grouped bores.
Mercury Dissolved	mg/L	0.000265	Derived using 95 percentile of grouped bores.
Mercury Total	mg/L	0.00041	Derived using 95 percentile of grouped bores.
Nickel Dissolved	mg/L	0.01105	Derived using 95 percentile of grouped bores.
Nickel Total	mg/L	0.0202	Derived using 95 percentile of grouped bores.
Selenium Dissolved	mg/L	0.005	Derived using ANZG (2018) Default Guideline Value for 99% Species Protection.
Selenium Total	mg/L	0.005	Derived using ANZG (2018) Default Guideline Value for 99% Species Protection.
Silver Dissolved	mg/L	0.0041	Derived using 95 percentile of grouped bores.
Silver Total	mg/L	0.11975	Derived using 95 percentile of grouped bores.
Tin Dissolved	mg/L	0.025	Derived using 95 percentile of grouped bores.
Tin Total	mg/L	0.025	Derived using 95 percentile of grouped bores.

Zinc Dissolved	mg/L	0.1245	Derived using 95 percentile of grouped bores.
Zinc Total	mg/L	0.1252	Derived using 95 percentile of grouped bores.
Free Cyanide	mg/L	0.007	Derived using ANZG (2018) Default Guideline Value for 95% Species Protection.
WAD Cyanide	mg/L	For Interpretation Only.	
Major Ions	mg/L	For Interpretation Only.	

Cells highlighted in yellow are interim triggers and must be revised once sufficient observations are available.

2.4 Proposed Limits for Four Mile Fractured Rock Bores

The proposed groundwater limits for Four Mile Creek Fractured Bores are outlined in **Table 10** below. These limits are applicable to the following bores:

- PSMB11
- PSMB12
- PSMB13
- PSMB14

While limits for PSMB11 have been proposed in this report, it is recommended that bore PSMB11 be removed from the compliance network. This is because monitoring bore PSMB11 was installed within an existing exploration hole with a total depth of 150 meters, and the screened interval was installed from 24 to 30 meters below ground surface (RLA, 2013; Geochemical Scientific, 2022). This raises concerns about the bore's ability to provide representative samples of local groundwater conditions. Additionally, the absence of a bore log for PSMB11 further questions its suitability as a reliable point for measuring the extent of future impacts from site activities. Given these issues, PSMB11's data may not accurately reflect the quality of groundwater in the Four Mile Creek fractured rock system. As such, it is recommended that PSMB11 be removed from the compliance network.

Table 10 Proposed Limit for Four Mile Creek Fractured Rock Bores (Plant Site)

Analytes	Unit	Proposed Limits	Derivation Method
pH	Ph Units	6 to 8.5	Existing EA Limit; derived from ANZECC (2000) default guideline value.
EC	µS/cm	6009.5	Derived using 95 percentile of grouped bores.
Sulfate	mg/L	3255	Derived using 95 percentile of grouped bores.
Aluminium Dissolved	mg/L	4.675	Derived using 95 percentile of grouped bores.
Aluminium Total	mg/L	10.88	Derived using 95 percentile of grouped bores.
Antimony Dissolved	mg/L	0.001525	Derived using 95 percentile of grouped bores.

Antimony Total	mg/L	0.0015	Derived using 95 percentile of grouped bores.
Arsenic Dissolved	mg/L	0.023	Derived using 95 percentile of grouped bores.
Arsenic Total	mg/L	0.0277	Derived using 95 percentile of grouped bores.
Bismuth Dissolved	mg/L	0.19175	Derived using 95 percentile of grouped bores.
Bismuth Total	mg/L	0.0005	Derived using 95 percentile of grouped bores.
Cadmium Dissolved	mg/L	0.000465; For PSMB11 - 0.5265	Derived using 95 percentile of grouped bores. Limit for PSMB11, derived using 95th percentile of PSMB11
Cadmium Total	mg/L	0.0006; For PSMB11 - 0.38	Derived using 95 percentile of grouped bores. Limit for PSMB11, derived using 95th percentile of PSMB11
Cobalt Dissolved	mg/L	0.0424; For PSMB11 - 0.1845	Derived using 95 percentile of grouped bores. Limit for PSMB11, derived using 95th percentile of PSMB11
Cobalt Total	mg/L	0.0688; For PSMB11 - 0.1845	Derived using 95 percentile of grouped bores. Limit for PSMB11, derived using 95th percentile of PSMB11
Copper Dissolved	mg/L	0.0116; For PSMB11 - 0.2875	Derived using 95 percentile of grouped bores. Limit for PSMB11, derived using 95th percentile of PSMB11
Copper Total	mg/L	0.0315; For PSMB11 - 0.32	Derived using 95 percentile of grouped bores. Limit for PSMB11, derived using 95th percentile of PSMB11
Lead Dissolved	mg/L	0.0355; For PSMB11 - 0.2335	Derived using 95 percentile of grouped bores. Limit for PSMB11, derived using 95th percentile of PSMB11
Lead Total	mg/L	0.0511; For PSMB11 - 0.29	Derived using 95 percentile of grouped bores. Limit for PSMB11, derived using 95th percentile of PSMB11
Mercury Dissolved	mg/L	0.00006	
Mercury Total	mg/L	0.0005	
Nickel Dissolved	mg/L	0.0106; For PSMB11 - 0.153	Derived using 95 percentile of grouped bores. Limit for PSMB11, derived using 95th percentile of PSMB11
Nickel Total	mg/L	0.01835; For PSMB11 - 0.1545	Derived using 95 percentile of grouped bores. Limit for PSMB11, derived using 95th percentile of PSMB11

Selenium Dissolved	mg/L	0.005; For PSMB11 - 0.0133	Derived using ANZG (2018) Default Guideline Value for 99% Species Protection; Limit for PSMB11, derived using 95th percentile of PSMB11.
Selenium Total	mg/L	0.005; For PSMB11 - 0.01435	Derived using ANZG (2018) Default Guideline Value for 99% Species Protection; Limit for PSMB11, derived using 95th percentile of PSMB11.
Silver Dissolved	mg/L	0.017	Derived using 95 percentile of grouped bores.
Silver Total	mg/L	0.025	Derived using 95 percentile of grouped bores.
Tin Dissolved	mg/L	0.025	Derived using 95 percentile of grouped bores.
Tin Total	mg/L	0.025	Derived using 95 percentile of grouped bores.
Zinc Dissolved	mg/L	7.66	Derived using 95 percentile of grouped bores.
Zinc Total	mg/L	8.0766	Derived using 95 percentile of grouped bores.
Free Cyanide	mg/L	0.007	Derived using ANZG (2018) Default Guideline Value for 95% Species Protection
WAD Cyanide	mg/L	For Interpretation Only	
Major Ions	mg/L	For Interpretation Only	

Cells highlighted in yellow are interim triggers and must be revised once sufficient observations are available.

2.5 Proposed Limits for Red Dam Bores

The proposed groundwater limits for Red Dam Bores are outlined in **Table 11** below. These limits are applicable to the following bores:

- RDMB1
- RDMB2
- RDMB3

Table 11 proposed Limits for Red Dam Bores (Red Dam Site)

Analytes	Unit	Proposed Limits	Derivation Method
pH	pH units	6 to 8.5	Existing EA Limit; derived from ANZECC (2000) default guideline value
EC	µS/cm	1400	Derived using 95 percentile of grouped bores.
Sulfate	mg/L	46.75	Derived using 95 percentile of grouped bores.
Aluminium Dissolved	mg/L	0.0455	Derived using 95 percentile of grouped bores.

Aluminium Total	mg/L	45.31	Derived using 95 percentile of grouped bores.
Antimony Dissolved	mg/L	0.02325	Derived using 95 percentile of grouped bores.
Antimony Total	mg/L	0.0237	Derived using 95 percentile of grouped bores.
Arsenic Dissolved	mg/L	0.58	Derived using 95 percentile of grouped bores.
Arsenic Total	mg/L	0.6095	Derived using 95 percentile of grouped bores.
Bismuth Dissolved	mg/L	0.61	Derived using 95 percentile of grouped bores.
Bismuth Total	mg/L	0.0026	Derived using 95 percentile of grouped bores.
Cadmium Dissolved	mg/L	0.00224	Derived using 95 percentile of grouped bores.
Cadmium Total	mg/L	0.003525	Derived using 95 percentile of grouped bores.
Cobalt Dissolved	mg/L	0.005	Derived using 95 percentile of grouped bores.
Cobalt Total	mg/L	0.12575	Derived using 95 percentile of grouped bores.
Copper Dissolved	mg/L	0.0094	Derived using 95 percentile of grouped bores.
Copper Total	mg/L	0.683	Derived using 95 percentile of grouped bores.
Lead Dissolved	mg/L	0.0005	Derived using 95 percentile of grouped bores.
Lead Total	mg/L	0.041	Derived using 95 percentile of grouped bores.
Mercury Dissolved	mg/L	0.0001625	Derived using 95 percentile of grouped bores.
Mercury Total	mg/L	0.00033	Derived using 95 percentile of grouped bores.
Nickel Dissolved	mg/L	0.0062	Derived using 95 percentile of grouped bores.
Nickel Total	mg/L	0.174	Derived using 95 percentile of grouped bores.
Selenium Dissolved	mg/L	0.005	Derived using ANZG (2018) Default Guideline Value for 99% Species Protection.
Selenium Total	mg/L	0.005	Derived using ANZG (2018) Default Guideline Value for 99% Species Protection.
Silver Dissolved	mg/L	0.005	Derived using 95 percentile of grouped bores.
Silver Total	mg/L	0.007	Derived using 95 percentile of grouped bores.
Tin Dissolved	mg/L	0.0025	Derived using 95 percentile of grouped bores.
Tin Total	mg/L	0.025	Derived using 95 percentile of grouped bores.
Zinc Dissolved	mg/L	0.1028	Derived using 95 percentile of grouped bores.
Zinc Total	mg/L	0.3659	Derived using 95 percentile of grouped bores.
Free Cyanide	mg/L	0.007	Derived using ANZG (2018) Default Guideline Value for 95% Species Protection.
WAD Cyanide	mg/L	For Interpretation Only.	

Major Ions	mg/L	For Interpretation Only.

2.6 Proposed Limits for Electric Light Bores

The proposed groundwater limits for Electric Light Bores are outlined in **Table 12** below. These limits area applicable to the following bores:

- ELMB1
- ELMB2
- ELMB3

Table 12 Proposed Limits for Electric Light Bores (Electric Light Site)

Analytes	Unit	Proposed Limits	Derivation Method
pH	pH units	6 to 8.5	Existing EA Limit; derived from ANZECC (2000) default guideline value.
EC	µS/cm	1789	Derived using 95 percentile of grouped bores.
Sulfate	mg/L	89.55	Derived using 95 percentile of grouped bores.
Aluminium Dissolved	mg/L	0.03	Derived using 95 percentile of grouped bores.
Aluminium Total	mg/L	17	Derived using 95 percentile of grouped bores.
Antimony Dissolved	mg/L	0.0015	Derived using 95 percentile of grouped bores.
Antimony Total	mg/L	0.001825	Derived using 95 percentile of grouped bores.
Arsenic Dissolved	mg/L	0.023	Derived using 95 percentile of grouped bores.
Arsenic Total	mg/L	0.0264	Derived using 95 percentile of grouped bores.
Bismuth Dissolved	mg/L	0.598	Derived using 95 percentile of grouped bores.
Bismuth Total	mg/L	0.0005	Derived using 95 percentile of grouped bores.
Cadmium Dissolved	mg/L	0.00005	Derived using 95 percentile of grouped bores.
Cadmium Total	mg/L	0.0003	Derived using 95 percentile of grouped bores.
Cobalt Dissolved	mg/L	0.0025	Derived using 95 percentile of grouped bores.
Cobalt Total	mg/L	0.0279	Derived using 95 percentile of grouped bores.
Copper Dissolved	mg/L	0.0005	Derived using 95 percentile of grouped bores.
Copper Total	mg/L	0.02025	Derived using 95 percentile of grouped bores.
Lead Dissolved	mg/L	0.0005	Derived using 95 percentile of grouped bores.
Lead Total	mg/L	0.026	Derived using 95 percentile of grouped bores.

Mercury Dissolved	mg/L	0.000135	Derived using 95 percentile of grouped bores.
Mercury Total	mg/L	0.000225	Derived using 95 percentile of grouped bores.
Nickel Dissolved	mg/L	0.006	Derived using 95 percentile of grouped bores.
Nickel Total	mg/L	0.04135	Derived using 95 percentile of grouped bores.
Selenium Dissolved	mg/L	0.005	Derived using ANZG (2018) Default Guideline Value for 99% Species Protection.
Selenium Total	mg/L	0.005	Derived using ANZG (2018) Default Guideline Value for 99% Species Protection.
Silver Dissolved	mg/L	0.004325	Derived using 95 percentile of grouped bores.
Silver Total	mg/L	0.003875	Derived using 95 percentile of grouped bores.
Tin Dissolved	mg/L	0.012625	Derived using 95 percentile of grouped bores.
Tin Total	mg/L	0.025	Derived using 95 percentile of grouped bores.
Zinc Dissolved	mg/L	0.03365	Derived using 95 percentile of grouped bores.
Zinc Total	mg/L	0.07925	Derived using 95 percentile of grouped bores.
Free Cyanide	mg/L	0.007	Derived using ANZG (2018) Default Guideline Value for 95% Species Protection.
WAD Cyanide	mg/L	For Interpretation Only.	
Major Ions	mg/L	For Interpretation Only.	

Table 13 Proposed New Limits for Plant Site, Red Dam, and Electric Light

Analytes	Unit	Plant Site				Red Dam Bores	Electric Light Bores
		Sandy Creek Regolith Bores	Sandy Creek Fractured Rock Bores	Four Miles Regolith Bores	Four Miles Fractured Rock Bores		
pH	pH Units	6 to 8.5				6 to 8.5	6 to 8.5
EC	µS/cm	2890; For PSMB9 - 7900	2564.5	4100	6009.5	1400	1789
Sulfate	mg/L	1219.5	850.45	2000	3255	46.75	89.55
Aluminium Dissolved	mg/L	3.72	2.25	1.14625	4.675	0.0455	0.03
Aluminium Total	mg/L	9.521	8.9	8.774	10.88	45.31	17
Antimony Dissolved	mg/L	0.0015	0.0048	0.0015	0.001525	0.02325	0.0015
Antimony Total	mg/L	0.0015	0.00495	0.0015	0.0015	0.0237	0.001825
Arsenic Dissolved	mg/L	0.019	0.3256	0.0128	0.023	0.58	0.023
Arsenic Total	mg/L	0.0436	0.405	0.0353	0.0277	0.6095	0.0264
Bismuth Dissolved	mg/L	0.6384	0.5922	0.0005	0.19175	0.61	0.598
Bismuth Total	mg/L	0.00065	0.001	0.0005	0.0005	0.0026	0.0005

Cadmium Dissolved	mg/L	0.0005	0.00063	0.000215	0.000465; For PSMB11 - 0.5265	0.00224	0.00005
Cadmium Total	mg/L	0.00067	0.0023	0.00029	0.0006; For PSMB11 - 0.38	0.003525	0.0003
Cobalt Dissolved	mg/L	0.03905	0.15	0.10415	0.0424; For PSMB11 - 0.1845	0.005	0.0025
Cobalt Total	mg/L	0.047	0.15	0.0914	0.0688; For PSMB11 - 0.1845	0.12575	0.0279
Copper Dissolved	mg/L	0.017	0.0144	0.0074	0.0116; For PSMB11 - 0.2875	0.0094	0.0005
Copper Total	mg/L	0.021	0.086	0.0177	0.0315; For PSMB11 - 0.32	0.683	0.02025
Lead Dissolved	mg/L	0.0161	0.0154	0.0067	0.0355; For PSMB11 - 0.2335	0.0005	0.0005
Lead Total	mg/L	0.017; For PSMB9 - 0.27	0.274	0.0259	0.0511; For PSMB11 - 0.29	0.041	0.026
Mercury Dissolved	mg/L	5.5E-05	0.00005	0.000265	0.00006	0.000162	0.000135
Mercury Total	mg/L	0.0001	0.0002	0.00041	0.0005	0.00033	0.000225
Nickel Dissolved	mg/L	0.015	0.01165	0.01105	0.0106; For PSMB11 - 0.153	0.0062	0.006
Nickel Total	mg/L	0.0266	0.0206	0.0202	0.01835; For PSMB11 - 0.1545	0.174	0.04135

Selenium Dissolved	mg/L	0.005	0.005	0.005	0.005; For PSMB11 - 0.0133	0.005	0.005
Selenium Total	mg/L	0.005	0.005	0.005	0.005; For PSMB11 - 0.01435	0.005	0.005
Silver Dissolved	mg/L	0.025	0.025	0.0041	0.017	0.005	0.004325
Silver Total	mg/L	0.021	0.025	0.11975	0.025	0.007	0.003875
Tin Dissolved	mg/L	0.025	0.025	0.025	0.025	0.0025	0.012625
Tin Total	mg/L	0.025	0.025	0.025	0.025	0.025	0.025
Zinc Dissolved	mg/L	0.0853	0.0853	0.1245	7.66	0.1028	0.03365
Zinc Total	mg/L	0.11925	0.218	0.1252	8.0766	0.3659	0.07925
Free Cyanide	mg/L	0.007	0.0504	0.007	0.007	0.007	0.007
WAD Cyanide	mg/L	For Interpretation Only					
Major Ions	mg/L						

Cells highlighted in yellow are interim triggers and must be revised once sufficient observations are available.

3. Compliance Approach and Criteria

The compliance approach recommended in the DES (2021) guideline have been selected for groundwater at Georgetown Gold Project. As the site-specific groundwater limits are derived using percentiles, DES (2021) suggests that the groundwater quality assessment should be based on comparing several consecutive sampling results at compliance bores to the derived site-specific limit. This approach aims to reduce the probability of false non-compliance, while ensuring that the selected approach is sufficiently sensitive to detect potential impacts.

In accordance with DES (2021) guideline for single limit (using 95th percentile), non-compliance occurs when three (3) consecutive sampling events exceed the site-specific groundwater limit. It is recommended that the criteria to trigger an investigation should be the following:

- Compare the groundwater monitoring results with the site-specific groundwater limits in **Table 13**. If the groundwater data exceeds the site-specific limits for three (3) consecutive sampling events, non-compliance occurs and requires investigation.

Following the approaches outlined in DES (2021), it is recommended that the Mann-Kendall test should be undertaken to assess if the trend is statistically significant. If a statistically significant trend is observed for any analyte at any groundwater bore, it should be further investigated.

It is recommended that when an investigation criterion is triggered, the bore and the analyte should be investigated. An investigation should assess the potential for environmental harm and should include a written report outlining:

- Details of the investigations carried out.
- Actions taken to prevent environmental harm.

Conclusion and Recommendations

In accordance with DES (2021) guideline, a single-limit approach (95th percentile) has been applied for the groundwater bores at Plant Site and satellite MLs – Red Dam and Electric Light, instead of the existing groundwater trigger and limits, outlined in Table C8 of the EA. These single limits are derived using 95th percentile of the outlier-removed monitoring data of the bores grouped as per their geology, catchment, and water type. The derived site-specific groundwater limits were tested by comparing them with the 80th percentile of the groundwater monitoring data at each bore. In accordance with DES (2021) guideline for single limit approach (95th percentile), non-compliance occurs when three (3) consecutive sampling events exceed the proposed groundwater limit.

The grouped 95th percentile was not suitable for some bores. For those bores, bore-specific limits were derived, if sufficient number of observations (i.e., >18 observations) were available. Where the number of observations was <18, interim limits have been derived (provided the number of observations was >8), which will be revised once sufficient observations are available.

1. Recommendations

The following recommendations are made:

- It is recommended to update the interim limits as soon as sufficient data becomes available.
- The proposed limits for Four Mile Regolith bores, specifically PSMB4, are not suitable. Due to insufficient data, primarily because this bore is often dry, suitable bore-specific limits could not be established. Therefore, it is recommended to revise the proposed limits for this bore once adequate observations are available. Meanwhile, there is a possibility that this bore may exceed the new proposed limits. In such cases, the inappropriateness of the proposed limits and their interim status should be taken into account. Additionally, it is advised to employ other methods, like comparing concentrations with historical ranges and analysing temporal trends distinct from seasonal variations, to detect any potential impacts.
- Until these limits are implemented, exceedances should continue to be compared with the current EA trigger levels and contaminant limits.
- It is recommended that bore PSMB11 be removed from the compliance network, as the data from PSMB11 may not accurately reflect the quality of groundwater in the Four Mile Creek fractured rock system.

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Appendix C

Assessment against reverent sections of Schedule 8, Part 3 of EP Regulation 2019

Part 3 - Environmental objectives and performance outcomes

Water

POs:

(d) the disturbance of any acid sulfate soil, or potential acid sulfate soil, will be managed to prevent or minimise adverse effects on environmental values

Comment:

There are no acid sulfate soils in the mine area. No adverse effects are foreseen.

(e) acid producing rock will be managed to ensure that the production and release of acidic waste is prevented or minimised, including impacts during operation and after the environmental authority has been surrendered;

Comment:

The Plant receives ore from the Agate Creek Mine. A geochemical assessment has previously been completed for Agate Creek ore, and determined that the ore is low risk given that the ANC:MPA ratio of the Agate Creek ore samples is high (>5). Therefore, there are substantially more acid-neutralising than acid-generating minerals in the samples.

(h) the activity will be managed so that adverse effects on environmental values are prevented or minimised

Comment:

The proposed TSF expansion, incorporating dry stacked tailings methods, aims to reduce potential seepage and leachate during recharge events. For the southern expansion area, although the risk of seepage is very low with dry tailings, it is recommended as a precautionary principle, an adequate seepage interception system to be installed.

Existing management controls will continue to be implemented across the proposed expansion, including all Regulated Dam requirements and environmental monitoring commitments.

Land

(1) There is no actual or potential disturbance or adverse effect to the environmental values of land as part of carrying out the activity.

Comment:

Disturbance area will be minimised as much as possible. The proposed area is within the footprint of the Project and does not contain and significant flora or fauna species for protection. All existing management controls, including waste management and spill response procedures will continue to be implemented.

Critical Design Requirements

(1) The design of the facility permits the site at which the activity is to be carried out to operate in accordance with best practice environmental management.

Comment:

All structures are designed in accordance with latest standards/guidelines.