ENGENY

CAPRICORN COPPER PTY LTD

Esperanza Pit Tailings Management Plan

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1. INTRODUCTION

1.1 Background

Capricorn Copper Pty Ltd (CCPL), a wholly owned subsidiary of 29Metals Limited, owns and operates the Capricorn Copper Mine (CCM), located in Gunpowder, Northwest Queensland. CCM is operated under the approval of Environmental Authority EPML00911413 (EA) (dated 30 September 2022) managed by the Department of Environment and Science (DES).

CCPL will recommence tailings deposition into the Esperanza Pit (EPit) at CCM, following cessation of previous tailings deposition into EPit in January 2022. Tailings deposition into the EPit will commence from May 2024, following the exhaustion of the Esperanza Tailings Storage Facility (ETSF) Lift 1. Tailings deposition will continue in EPit as described in this document, until the Tailings Storage Facility 3 (TSF3) located in the upper Esperanza catchments commissioned, planned to be early 2025.

Engeny has been engaged by CCPL to develop a Tailings Management Plan considering the additional tailings deposition proposed in EPit. This document supersedes the previous Tailings Management Plan (TMP) (GHD 2017).

The EPit was operated as an open cut mine until 2005 and has served as a mine affected water (MAW) and tailings storage facility (TSF) since that time. The EPit is located approximately 2 km south-west of the CCM processing facility.

1.2 Purpose

The purpose of this TMP is to outline the measures for minimising any potential impacts associated with additional tailings disposal into EPit on environmental values at the site, in accordance with the EA. The TMP applies to all EPit tailings disposal activities conducted within the CCM mining tenure.

1.3 Legal and other requirements

The following requirements apply to the development and implementation of this TMP.

1.3.1 Environmental Authority

Condition E4-1 of the EA requires CCM to develop and implement a Tailings Management Procedure. This EPit TMP has considered the EA requirements for a Tailings Management Procedure in its development. This document is not the Tailings Management Procedure which applies to the broader site.

1.3.2 ESR/2015/1839 Application Requirements for Activities with Impacts to Land

The *DES Guideline Application Requirements for Activities with Impacts to Land (ESR/2015/1839)* details the information to be provided to support an Environmental Authority Application (EAA) with impacts to land. This document has been considered during the development of this TMP for EPit, specifically section 5.1 which details management plans which may be relevant to include as supporting information to the EAA.

The requirements for Tailings Management specified in section 5.1 are shown in Table 1.1, and where they are addressed in this TMP.

TABLE 1.1:GUIDELINE REQUIREMENTS FOR ACTIVITIES WITH IMPACTS TO LAND

Section 5.1 Tailings Management	Report Section
Consideration for the manual for dams containing hazardous waste.	Section 3.9 and 3.10
Liners and basement preparations for any structure.	Section 2.3
How capillary rise in tailings storage facility will be managed (operationally and post closure e.g., capillary breaks).	Section 8
Proposed leak detection systems.	Section 7.2
Structural geology below dams and geotechnical and seepage implications.	Section 2.3
Fracturing and springs and potential to cause increase into structures and lift liners.	Section 2.3
Design storage allowance and design standard being adopted.	Section 3.10
Heap leach pads and carbon in pulp/leach treatment, and how the highly contaminated waters will be managed (i.e., cyanide and acid leach issues).	NA – No operational heap leach pads onsite
Pregnant/barren ponds management and risk of cascading water quality from these facilities impacting mildly contaminated dams	NA – No pregnant or barren ponds onsite
Proposed capping and closure design.	Section 8
Co-disposal options and risks.	NA – No co-disposal proposed
Geochemical characterisation	Section 4
Restriction of access of cattle and wildlife to contaminated waters in structures.	Section 3
Spillway location.	Section 2.1
Chemical storage on site (including explosives).	NA – not described in this document
Perimeter spigot—central discharge and coarse grind towards closure.	Section 3.7
Potential radionuclides and implications for environment and public health regarding radiation risks.	Section 2

1.4 System Design Plan for Regulated Structures

CCM operate three (3) *regulated structures* at the site, comprising the Esperanza Tailings Storage Facility (ETSF), the Esperanza Pit (EPit), and the Mill Creek Dam (MCD), in an integrated containment system for the purpose of sharing the Design Storage Allowance (DSA) volume across the system (as shown in **Error! Reference source not found.**).

Regulated Structures operating as an integrated containment system require a certified System Design Plan (SDP) in accordance with the requirements of the *Manual for assessing consequence categories and hydraulic performance of structures* (ESR/2016/1933, Version 5.02) (Manual) and the EA.

The *Capricorn Copper System Design Plan (QC1022_001-REP-003-2)* details relevant system operating rules for the three regulated structures, and this TMP has been developed in consideration of the SDP.

1.5 Other Relevant Documents

This TMP should be read in conjunction with the following relevant documents:

- The Operation, Maintenance & Surveillance Manual (OMS Manual) for Esperanza Pit Tailings Storage Facility (EPit TSF).
- Capricorn Copper Water Management Plan (Engeny 2023).

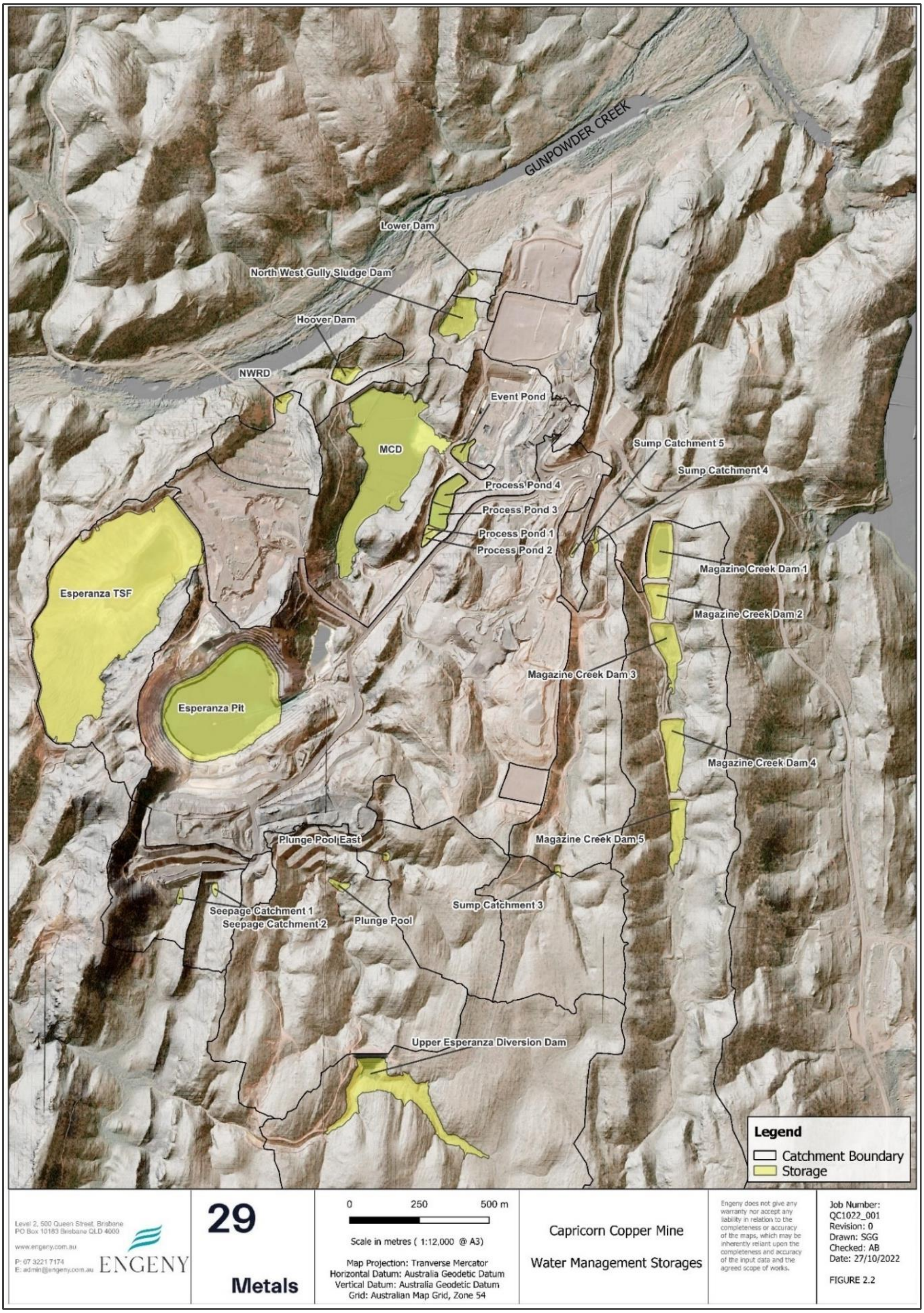

Figure 1.1:Site Plan Showing Water Storages and Surrounding Creeks

1.6 Assumptions

The following assumptions have been made in preparing this TMP:

- Tailings production volumes are estimated to remain in the range of 1.6 Mtpa to 1.7 Mtpa.
- Design parameters:
  - Consequence Category – High C.
  - Tailings Production – up to 1.4 – 1.6 Mtpa. Up to 13% of tailings to be utilised as paste backfill, 87% to TSF.
  - Settled Density – 1.4 t/m3.
- Tailings beach slope = 1.5%.
- Tailings as classified as potentially acid forming (PAF).
- Relevant information regarding current land-use and water management system can be summarised from existing data and reports.

2. EPIT SETTING

2.1 EPit Overview

The EPit was operated as an open cut mine until 2005 and has served as a MAW and tailings storage facility since that time. The EPit is located approximately 2 km south-west of the CCM processing facility. The EPit floor is at approximately 90mAHD elevation and daylights at the original surface at the lowest level at approximately 225 m AHD, although the maximum operating level has been set at 222m AHD (known as the rock bar) as water above this level would be able to report to MCD via seepage through the EPit overflow pond which is elevated a further 18m to 240m AHD by the EPit Ramp. Should water rise in the EPit to 240mAHD it would spill over an effective natural "spillway" into MCD, however the paste plant and adjacent vent shaft are below this level at approximately RL 230m AHD. The EPit floor level raised due to the deposition of tailings and currently has a lowest elevation of 200.8m AHD. Relevant EPit details are shown in Table 2.1

TABLE 2.1: EPIT DETAILS

Epit Details and Features		Reference
General		
Type	Former Open Cut Mine Workings	
Purpose	Bulk storage for tailings and mine affected water (runoff and seepage), and supply to site water demands	
Maximum Operating Level (MOL)	222 (mAHD)	Environmental Authority EPML00911413
Catchment	139.2 Ha	(Engeny, 2023)
Original Pit Floor	90 (mAHD)	(GHD, 2021)
Tailings Storage Capacity to final tailings surface	960,000 m^3	(Engeny, 2023)
Available Water Storage above final tailings surface to MOL	730.6 ML	(Engeny, 2023)
Consequence Category (DES, 2016)	High	(Engeny, 2023)
ANCOLD Risk Category	High C	(GHD, 2021)
Emergency Spillway		
Type	No Engineered Spillway, natural spillway at EPit TSF Ramp	
Crest Level	240 (mAHD)	
Design Storage Allowance		

Design Criteria	1:20 AEP 2 month plus process inputs for the 2-month wet season	(Engeny, 2023)
Volume	497 ML	
Level	EPit DSA Level – 217.2 (mAHD)	
Mandatory Reporting Level		
Design Criteria	1:10 AEP, 72 hr rainfall	(Engeny, 2023)
Volume	496.8 ML	
Level	EPit MRL – 217.2 (mAHD)	

The deposition of tailings into EPit was approved in 2017, and tailings deposition commenced in this same year, and ceased in January 2022. In the previous TMP (GHD 2017) tailings deposition in EPit was limited to RL 202 to maintain compliance with the DSA requirements which were in force at that time. The assumption in the TMP (GHD 2017) was for 4.1Mt of tailings to be deposited at a dry density of 1 t/m3. The actual observed settled density of the tailings in EPit was closer to 1.4 t/m3, as detailed in Table 4.1. this meant in as of late January 2022, an estimated volume of 6.6Mt of tailings had been generated and EPit had reached capacity (GHD 2021).

The lowest point of the tailings beach is at RL 200.8 confirmed from the latest site bathymetry results from acquired in June. The bathymetry shows significant beach in the centre of the EPit, with depressions to the north and west of the pit. It is expected without additional deposition, the tailings would continue to consolidate over time.

The EPit storage characteristics developed from bathymetric and LiDAR surveys captured during June 2023 are presented in Figure 2.1.

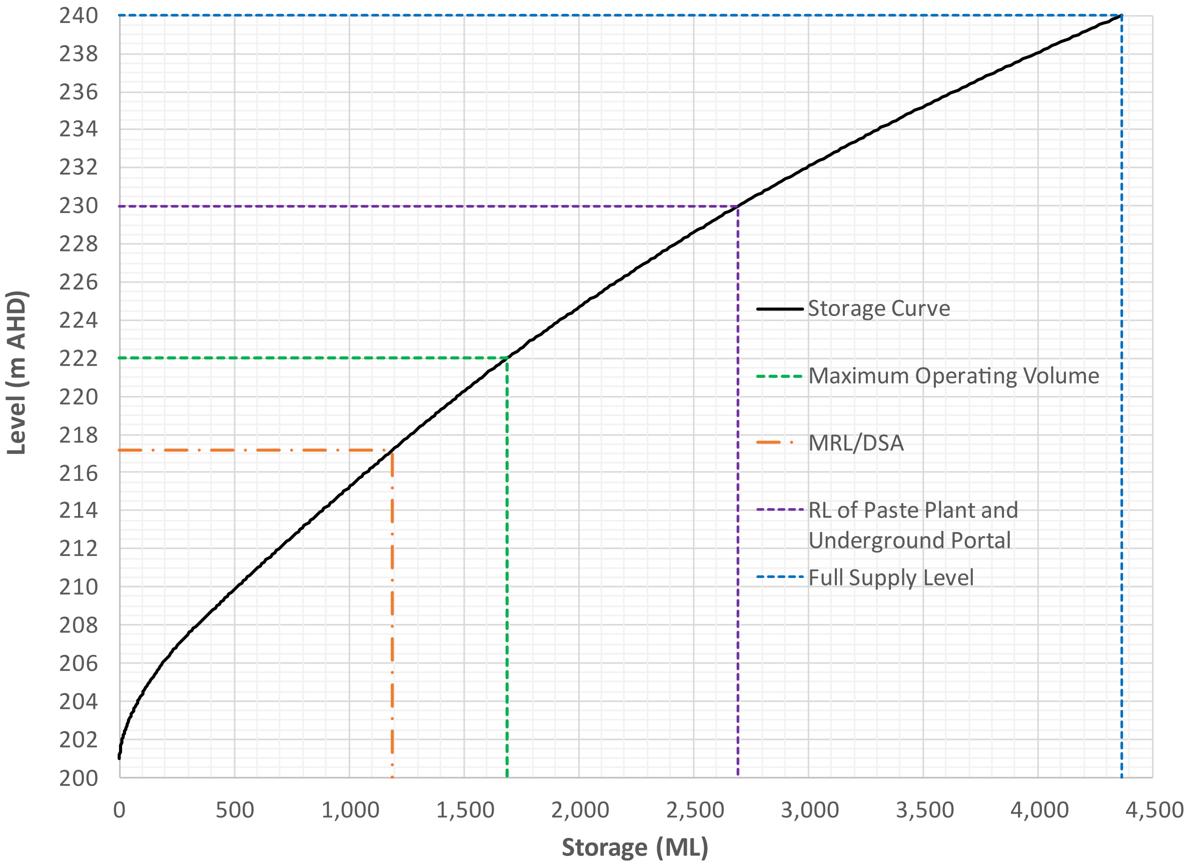

Figure 2.1: Esperanza Pit (EPit) Storage Characteristics

2.2 Climate

CCM is in a region of Northwest Queensland that experiences high rainfall events during summer and is predominantly dry in winter. Average annual rainfall for the region is approximately 500mm. Long-term climate data for the CCM water balance model was obtained from the Scientific Information for Land Owners (SILO) climate database facility hosted by the Department of Environment and Science (DES) using a Data Drill extracted at the site location (Lat -19.70 Long 139.35). The SILO climate data record produces 134 years of daily climatic data (1889-2023) at the site location based on historical nearby rainfall and weather gauging data. Rainfall and Morton's potential evapotranspiration are used to calculate rainfall-runoff with the Australian Water Balance Model (AWBM), while Morton's Lake evaporation is used to estimate evaporation losses from water storages. The SILO Data Drill rainfall data is interpolated from daily rainfall observations from regional Bureau of Meteorology rainfall stations, while the Morton's Lake evaporation and pan evaporation values are calculated from other interpolated observed climate data using industry-standard equations.

The SILO Data Drill is considered the best source of site specific long-term (greater than 100 years of data) daily climate data for the CCM given the only Bureau of Meteorology rainfall stations in the vicinity of the mine (e.g., Station Number 29094 Mammoth Mine) provide less than 35 years of daily rainfall data. On this basis, the use of this data is considered appropriate for the purpose of the modelling. Summary monthly average rainfall (SILO Data Drill) evapotranspiration and lake evaporation (all SILO Data Drill) for CCM are summarised in Table 2.2. Section **Error! Reference source not found.** summarises input climate data for the model calibration period. All input climate data are applied i n the water balance model on a daily basis using the source data (SILO Data Drill or site rainfall data) without modification.

TABLE 2.2: CCM LONG TERM AVERAGE CLIMATE DATA

Month	Rainfall (mm)	Lake Evaporation (mm)	Potential Evapotranspiration (mm)
January	127.2	213.8	295.7
February	117.9	185.2	256.2
March	76.8	186.4	281.3
April	14.9	155.6	260.8
May	11.3	124.5	213.3
June	9.1	103.1	175.9
July	5.1	112.2	192.5
August	1.8	141.8	243.4
September	6.7	172.0	291.9
October	16.3	209.6	347.3
November	37.5	217.7	343.7
December	73.4	225.3	331.6
Annual	**493.2**	**2,049.0**	**3,236.7**

2.3 Conceptual Hydrogeological Model

Previous works undertaken by GHD (2021a) reviewed hydrogeological conditions and seepage risk of the EPit, concluding that:

- The deep bedrock around the EPit had low permeability as evidenced by the lack of significant groundwater inflow to underground workings.

- Groundwater outflow was effectively prevented by a groundwater mound around the EPit; and
- If any of the geological features through the site were more permeable than general bedrock (as seems not the case) then seepage would either be intercepted by NWRD seepage interception trench or, more likely, MCD.

Previous groundwater modelling undertaken by GHD indicates that no physical evidence of seepage can be traced to the EPit (GHD, 2021a). Therefore, it is concluded that the EPit is effectively watertight up to the rock bar at RL 222. If water were to be stored above RL 222, seepage through the shallow fractured surface rock would enter MCD, after first passing through the EPit overflow pond. Historically, the EPit has stored MAW above RL 222m, and seepage rates did not impact MCD containment as the return pumping rate, and process demands are higher than the seepage inflow rate reported by CCM (13ML/day).

Engeny have recently recalculated the DSA and MRL levels and propose to recommence deposition of tailings into the EPit. The DSA and MRL have increased to RL217.2m, increasing the current tailing storage capacity by approximately 0.96 Mm^3. The available tailings decant water (the water cover) storage below the DSA / MRL is 233.8 ML and there is 496.8 ML water storage available above the decant storage to the MOL (RL 222, below the rock bar) for DSA/MRL.

The decant water should be maintained, on average, at 2m depth to act as a water cover across the tailings which are characterised as potentially acid forming (PAF). This water cover will reduce oxidation of the tailing's material, and generation of acid and metalliferous drainage.

2.3.1 General Stratigraphy

The EPit area lies within a region of regionally metamorphosed sedimentary rocks, (originally mudstones to sandstones with some limestone) and igneous rocks (metabasalts) as shown in Figure 2.2. The strata have been deformed by a long history of tectonic activity and now dips steeply to the west-northwest (GHD, 2013). This bedrock is overlain in some areas, such as the major drainage lines and Gunpowder Creek, by relatively thin layers of alluvium.

There are several areas of waste rock and tailings resulting from current and historical mining activities overlying both bedrock and alluvium.

Note there is no known risk of the presence of radionuclides within the geology at CCM.

2.3.2 Alluvium Characteristics

The frequent presence of bedrock outcrop in the creeks suggest that the alluvium is relatively thin – probably less than 10 m, although some thicker alluvium may be present above the stream bed in stranded river terraces. The alluvium appears to comprise a mix of sands and gravels, with thick silty deposits associated with river terraces and overbank flood deposits (GHD, 2013).

Given the elevation of the alluvium and relatively shallow bedrock depth, the saturated thickness of the alluvium is likely to be limited and it is unlikely that the alluvium represents a significant aquifer in the Esperanza area, although it represents pathway for some down-valley groundwater flow (GHD, 2013).

2.3.3 Bedrock Characteristics

Due to the pervasive recrystallisation associated with the post-tectonic regional metamorphism and alteration associated with mineralisation, any intergranular (primary) porosity has been sealed, with only secondary porosity, such as fracturing or dissolution remaining (GHD, 2013).

Fracturing occurs in crystalline rock due to two main processes:

- Stress relief fracturing caused by the expansion of the rock as overlying material is removed by erosion, which tends to result in sub-horizontal fracturing.
- Tectonic fracturing, which is caused by regional rock stresses, such as shearing which tends to result in sub-vertical fracturing and faulting, or compression or tension, which tends to result in moderately dipping faults and fractures.

In the Mt Gordon area, the zone of intense stress-relief fracturing tends to be limited to the upper 10 m, although may be thinner in some areas, with a fairly rapid transition to an intermediate zone of weaker fracturing to a depth of approximately 20-30 m. The stress relief fracturing is relatively permeable due to its geologically recent formation, with the exception of a shallow zone where the jointing and fracturing may be filled with clay formed from weathering of the rock mass. The permeability of the stress relief fracturing gradually decreases with depth as hydrostatic pressure keeps joints closed. AGE (1999) quoted hydraulic conductivity of siltstones and shales near the surface at 3x10-5m/s (2.6 m/d) with the highest permeability occurring in the upper 10 m, decreasing to 1x10-7 to 1x10-9 m/s (1x10-2 to 1x10-4 m/d) at about 30 m depth.

Fracturing due to tectonic stress is present within the metasediments and metavolcanics, which also caused the various faults mapped at surface and intersected within the EPit and underground workings. Due to post-tectonic metamorphism and alteration, however, these tectonic fractures have been almost totally sealed by haematite/chlorite/quartz mineralisation.

It has been noted by GHD (2013) that the Mammoth underground workings where faults are filled with soft chlorite/haematite mineralisation and groundwater inflow is distributed throughout the workings as general seepage, with no significant areas or preferential inflow. Observations of short-term flows from some faults for a few days immediately after rain, indicate that any connectivity of the faults with shallow aquifers or surface is local only. It is also likely that there is localised interconnection of the faults immediately adjacent to the mine to the surface through the numerous exploration holes drilled through the ore body.

In summary, the site is characterised by possible narrow alluvial aquifers along Gunpowder Creek and larger drainage channels, which are potentially connected to a surficial aquifer in bedrock with secondary porosity due to by stress relief fracturing, in the upper 10 – 20 m of bedrock below natural ground surface. There is no "deep aquifer", as bedrock below the surficial aquifer, including faulted zones, is relatively impermeable, due to pervasive recrystallisation of primary porosity and mineralisation of fault zones and joints. There are, however, localised, disconnected voids and drillholes that are rapidly dewatered when pumped out or when intersected by mine development and as such do not result in long distance flow paths.

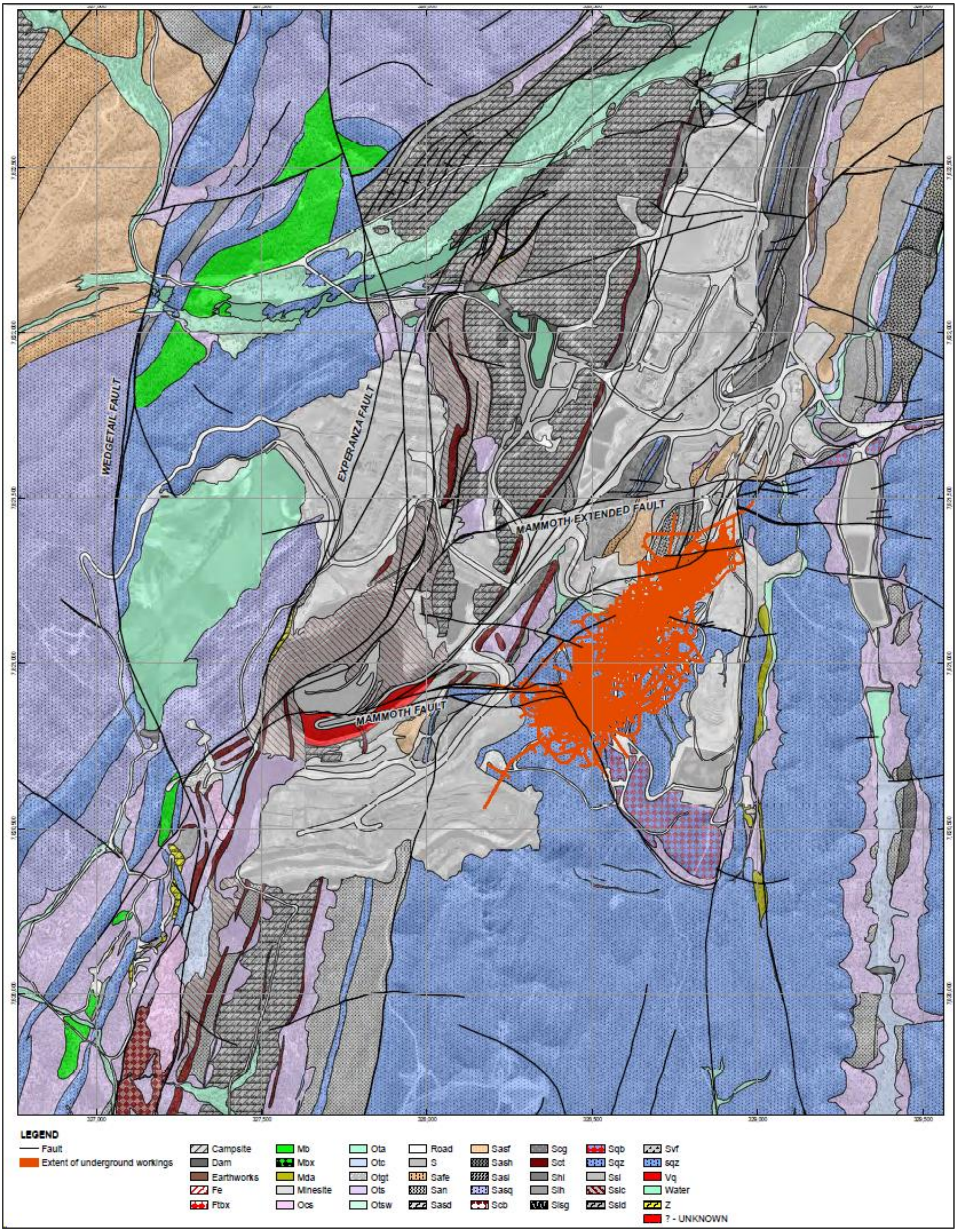

Figure 2.2: Esperanza Hydrogeology (GHD 2013)

3. MANAGEMENT MEASURES

3.1 Operation

The objectives of the EPit TSF tailings storage system are summarised as follows:

- Provide safe containment of tailings.
- Maximise tailings density from the plant to the EPit TSF through adequate dewatering and thickening.
- Maximise water recovery through the decant systems while maintaining the water cover.

This section outlines the management of tailings deposition and surface water within the EPit.

3.2 Environmental Management System

CCPL have an environmental management system (EMS) which is implemented to manage risk and impacts from activities at CCM, and to achieve compliance with relevant internal and external requirements. The EMS has established process for the monitoring and management of the site, including the ETSF and EPit TSF, and has detailed roles and responsibilities. The EMS is owned by the onsite Environment and Community Team, with suitably qualified professionals with significant relevant experience. The EMS is underpinned by the following 29Metals policies:

- Sustainability Policy (August 2021).
- Tailings Management Position Paper (October 2021).
- Responsible Use of Natural Resources Position Paper (October 2021).

29Metals reports on its environmental performance through the annual Sustainability and ESG Report.

3.3 Roles and Responsibilities

The roles and responsibilities associated with the operation, monitoring and maintenance of the EPit, and associated tailings delivery infrastructure are described below in Table 3.1.

Table 3.1: Key Personnel Responsibilities

Role	Responsibility
General Manager	• Oversee compliance with the requirements of the TMP • Ensure adequate resources are provided to meet requirements of the TMP
Processing Manager	• Ensure adequate processing and maintenance resources are provided to meet requirements of this plan • Ensure construction, operation and surveillance of the EPit in accordance with this TMP and the OMS Manual • Respond to out-of-tolerance conditions and manage responses in accordance with applicable trigger action response plan (TARP) outlined in this OMS Manual • Ensure change to tailings properties are identified and considered in the context of this TMP • Ensure communications processes are established to communicate relevant information with internal and external stakeholders • Ensure equipment used to monitor the performance of the EPit is appropriately maintained
Processing Superintendent	• Monitor, review and report on compliance with the requirements of this TMP and OMS Manual

	• Facilitate construction and operation of the facility in accordance with the TMP and OMS Manual • Ensure the required knowledgeable persons in the form of supervisors, workers or contractors are available to participate in management activities • Ensure tailings deposition strategy and infrastructure is in accordance with this TMP
Environment and Community Manager	• Maintain Regulated Dams Register • Ensure groundwater monitoring bores are monitored in accordance with the TMP and EA • Monitor, review and report on compliance with the requirements of this plan as it relates to EA compliance • Ensure Annual Regulated Dams Inspection completed as detailed in the EA
E&C Superintendent	• Ensure the requirements of the OMTMP are met during work activities where relevant • Co-ordinate inspections and ensure surveillance activities are completed and logged internally with actions assigned as required • Undertake monitoring activities related to environmental performance of the EPit as described in the TMP
Tailings Dams Engineer	• Undertake regulated structures inspections annually • Provide engineering input into issues and risk management • Conduct site inspections as required

3.4 Environmental Protection Measures

In considering the operation and management of tailings deposition in EPit, several measures exist which prevent or mitigate impacts to the receiving environment. A summary of these includes:

- **Seepage** - The existing EPit has been excavated into hard rock, with very low permeabilities. The EPit is considered watertight up to RL 222 (GHD 2020). The EPit is expected to be a sink for local groundwater flows, in addition to the underground workings (GHD 2020).
- **Seepage** - The existing tailings have continued to settle and consolidated over time, with the physical properties of the tailings exhibiting very low permeabilities. The achieved settled density from the previous campaign of tailings deposition was much higher than anticipated, improving tailings consolidation.
- **Seepage** – Where seepage occurs over RL222, it is intercepted by the MCD. The return pumping rate from MCD exceeds inflow rates of seepage, with pumping infrastructure including duty and standby pumping.
- **Water Quality** - The decant pond will operate as a water cover to prevent the oxidation of tailings materials. The decant pond will be managed to ensure MRL and DSA are provided in EPit.
- **Monitoring** - The existing groundwater monitoring network is proposed to be significantly enhanced, adopting the same monitoring parameters and frequency as defined in the EA for compliance groundwater monitoring bores.
- **Monitoring** – The EPit has daily inspections for water level and general conditions.
- **MAW Storage Volume** - The DSA for the integrated containment system, which includes EPit, significantly exceeds (by 47%) the EA required hydraulic performance of containing a 1 in 20 AEP wet season accumulation volume.
- **MAW Storage Volume** – CCM operate a substantial network of enhanced mechanical evaporators which reduce the inventory of MAW onsite. The evaporators and associated pumping network are maintained by dedicated resources onsite.
- **MAW Storage Volume –** CCM have infrastructure in place to treat up to 8ML a day of MAW for reuse in mining and processing. This reuse of water is in lieu of importing fresh water from Lake Waggaboonya, and results in drawdown of the MAW inventory.

3.5 Tailings Deposition Management

This TMP has been developed to achieve the following objectives with the discharge infrastructure:

- To meet the conditions of the EA.
- Minimise the risk of an uncontrolled/unauthorised discharge of water and tailings.
- Ensure efficient use of the available tailings storage capacity.
- Minimise risk of access by the public or wildlife.
- Reduce the oxidation of sulphides and the subsequent leaching of contaminants.

3.6 Tailings Delivery Infrastructure

The tailings delivery system comprises the following infrastructure:

- Two trains of tailings thickener underflow pumps trains (three pumps in series in each train) at the Ore Processing Plant.
- One HDPE tailings delivery pipelines which run from tailings thickener underflow pumps to the EPit TSF via the EPit Access Ramp.
- Tailings are discharged into the EPit via the tailings delivery pipeline which is extended into the storage on pipeline floats.

3.7 Tailings Deposition Strategy

The EPit TSF tailings deposition strategy is summarised below:

- The tailings discharge into EPit is proposed to be sub-aqueous, initially from a single line from the EPit ramp, and then from a pontoon mounted discharge point to maximise tailings deposition up to a maximum tailings level of RL 215.7 m as shown in Figure 3.1.
- Maintain a tailings beach gradient towards the EPit Access Ramp (east) for decant water reclamation.
- Maintain an average of 2 m deep water cover over the tailings beach.

The tailings discharge into EPit is proposed to be sub-aqueous, initially from a single line from the EPit ramp, and then from a pontoon mounted discharge point to maximise tailings deposition.

Based on the production figures below, the EPit TSF is expected to have a storage life of approximately 11 months.

3.8 Decant Pond Control

The purpose of the decant return water system is to maintain the decant pond in a minimum condition whilst maintaining an average of 2 m thick water cover to reduce the oxidation of sulphides and the subsequent leaching of harmful substances. The presence of a decant system also minimises the storage volume that is required for the supernatant water whilst maximising the storage volume available for tailings and rainfall runoff.

The decant pond should be closely monitored to check that it is forming in the proposed location and that it is maintained in a minimum condition. The water level in the EPit TSF should be controlled via the decant infrastructure to ensure buffer storage is available to reduce the risk of an uncontrolled discharge.

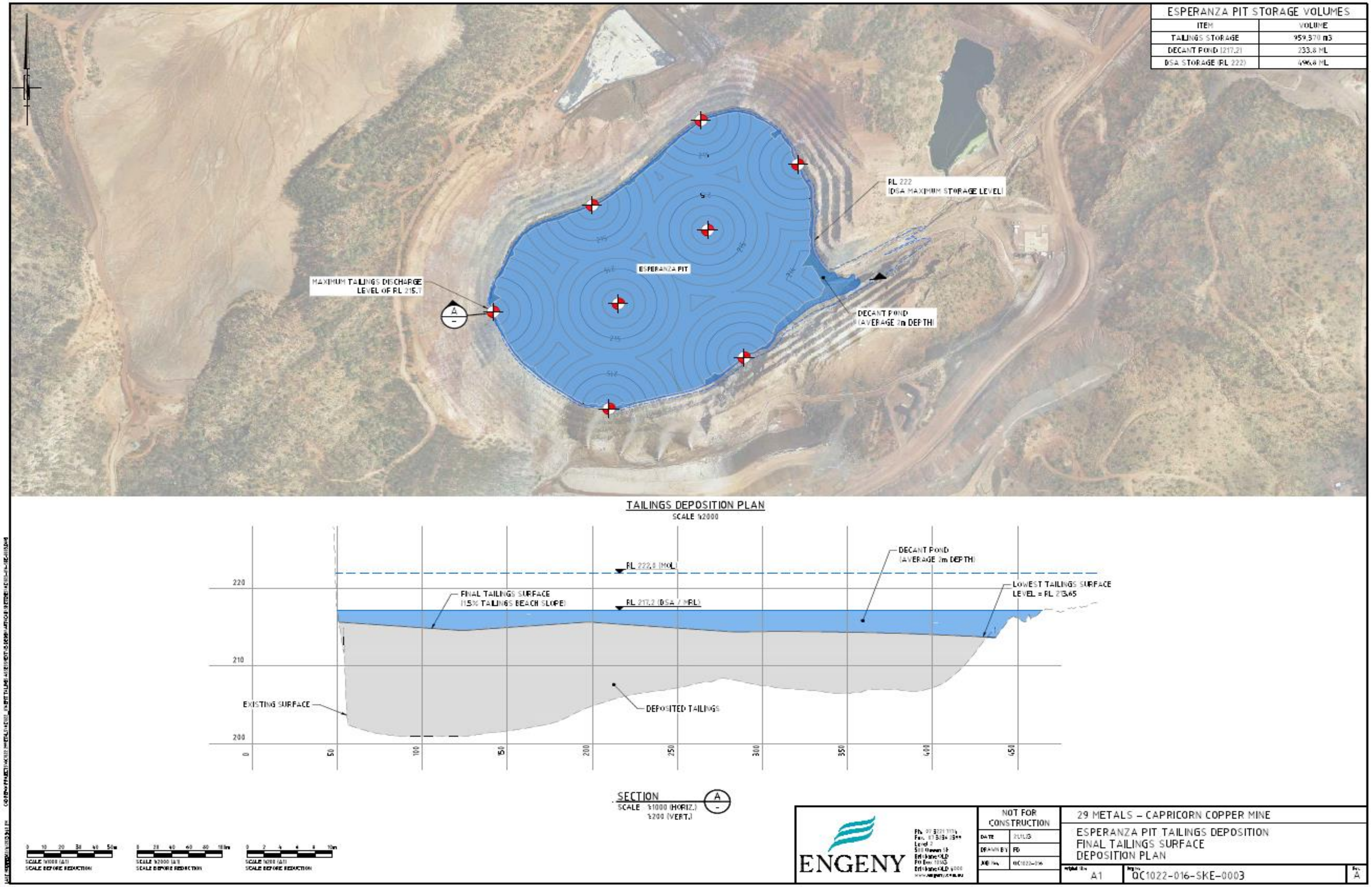

Figure 3.1: Esperanza Pit Tailings Deposition – Final Tailings Surface Deposition Plan

3.9 Consequence Category Assessment

The Consequence Category Assessment (CCA) for Esperanza Pit, Esperanza TSF and Mill Creek Dam Consequence Category Assessment (Engeny 2023) has been undertaken for EPit. A summary of the CCA is shown below in Table 3.2.

Table 3.2: EPit TSF CCA Summary (Engeny, 2023)

Component	Scenario	Consequence Category
EPit	Failure to Contain – Seepage	SIGNIFICANT
	Failure to Contain – Spill	SIGNIFICANT
	Dam Breach	HIGH
	Overall Consequence Category	**HIGH**

3.10 Hydraulic Performance Criteria

CCM have recalculated the DSA and MRL levels in EPit based on improvements to the water management system. The calculated DSA and MRL have been varied to RL217.2 m. The available tailings decant water storage below the DSA / MRL is 233.8 ML and there is 496.8 ML water storage available above the decant storage to the MOL (RL 222).

The detailed assessment for DSA and MRL for the integrated containment system is described in *The Capricorn Copper Water Balance Model Report (QC_001-REP-002-6).* The hydraulic performance criteria for EPit are shown in Table 3.3.

TABLE 3.3: EPITHYDRAULIC PERFORMANCE CRITERIA

Name of Regulated Dam	Consequence Category	Max Operating Level (mAHD)	Spillway Capacity Design Criteria	Design Storage Allowance (DSA)			Mandatory Reporting Level (MRL)		
				Design Criteria	Volume (ML)	Level (mAHD)	Design Criteria	Volume (ML)	Level (mAHD)
Esperanza Pit	High	222	1:100,000 AEP flood plus wave run-up allowance for 1:10 AEP wind **OR** Probable Maximum Flood (PMF)	95th Percentile (1:20 AEP) Wet Season Containment	496.8	217.2	1:10 AEP, 72 hr duration	496.8	217.2

3.10.1 DSA

The assessed 1:20 AEP wet season inventory increase for ETSF, EPIT and MCD is summarised as:

- The 2023/24 wet season – 264ML.
- The 2024/25 wet season – 599ML.

For the purposes of assigning a DSA, the results from the 2024/25 wet season have been adopted as the larger of the two calculated DSAs.

The containment system DSA assessment is summarised as follows:

- Combined 1:20 AEP (95th percentile or 5% AEP) wet season inventory increase in EPit, ETSF, and MCD – **599 ML.**
- Design Simulation Margin – **25% (150 ML).**
- Combined Design Storage Allowance for EPit, ETSF, and MCD – **749 ML.**

CCM have elected not to modify the MCD DSA level, to retain additional risk mitigation in the dam noting its importance in the integrated containment system and to further mitigate the risk of uncontrolled release. In addition, as the DSA cannot be less than the MRL (Section 3.5), the DSA volume is adopted as the MRL volume in EPit. This has resulted in a **combined DSA volume of 853ML**, which is 14% larger than the calculated DSA (modelled wet season increase volume of 599 ML with additional DSM volume of 150 ML, totalling 749 ML). DSA volume is apportioned to the regulated structures as follows:

- DSA volume allocated to MCD – **356 ML (RL 216.1 m).**
- DSA Volume allocated to EPit – **497 ML (RL 217.2 m).**
- DSA Volume allocated to ETSF – **0 ML.**

The DSA assessment is considered conservative for the following reasons:

- Water will still be contained in EPit above the maximum operating level of 222 m AHD however will start seeping to MCD which can be contained and pumped back to EPit at a much higher rate than the expected seepage flow rate.
- Although a DSM of 25% is considered more than adequate due to the high calibration accuracy achieved for the model, the adopted final DSM is equivalent to 42%.
- Authorised releases to Gunpowder Creek from EPit have been conservatively excluded from the DSA assessment; however, there is potential for 500ML/year release under current EA conditions (noting there are ongoing discussions with the DES regarding wet season release authority of up to 1.5GL/year).

3.10.2 MRL

MRL is defined in the Manual as a level at which the dam has a remaining available volume equivalent to the Extreme Storm Storage (ESS) allowance. The ESS is defined as the highest volume / lowest level required to allow the following to be retained within the dam (Significant Consequence dams):

- The runoff from a 1:10 Annual Exceedance Probability (AEP) 72-hour duration storm plus
- A wave allowance at 1:10 AEP

The ESS volumes for the regulated structures have therefore been determined as follows:

- Containment of runoff from the 1:10 AEP 72-hour duration storm (217mm).
- Wave runup has not been calculated for EPit as there is no credible spillway containment loss from wave runup whilst EPit is at the maximum operating level (MOL) (222 mAHD). MRL has been calculated assuming a MOL of 222m AHD and as such, 18m of freeboard is provided between the spillway RL (240 mAHD) and the MOL.
- No rainfall losses (i.e., 100% runoff).
- No allowance for process inflows or pumping out of the dams (these flows are small compared to the runoff inflows).
- ESS containment for the ETSF is provided in EPit (ETSF catchment area included in the EPit ESS estimation).
- Assumes the diversion sumps upstream of EWRD (plunge pool, plunge pool east, Seepage Catchment 1 and Seepage Catchment 2) are 50% effective and the Upper Esperanza diversion dam is 100% effective in diverting the upstream clean catchment reporting to EPit.
- EPit Catchment Area – 229.0 ha (includes ETSF catchment and 50% of the upper EWRD sumps catchment).

The ESS calculated for EPit is 496.8ML, corresponding to a 217.2mAHD.

3.11 Staged Development Plans

Relevant timing related to the staging of proposed tailings deposition into EPit is presented in Table 3.4. Note that the EPit deposition timelines are based on a settled density of 1.3 dmt/m^3.

TABLE 3.4: TAILINGS STORAGE PROPOSED DEVELOPMENT

Dates	Tailings Management Function
May 2024	ETSF Lift 1 exhaustion date, surface tailings not sent to paste redirected to EPit
April 2025	EPit tailings reach capacity.
April 2025	TSF 3 commissioned, surface tailings redirected to TSF 3 from EPit

4. TAILINGS CHARACTERISATION

4.1 Tailings Characteristics

The characteristics of the tailing's materials are described in detail in section 4. A summary of the relevant characteristics for relevance includes:

- The tailings providing a range of fine material (sieve 0.075 mm), between 74% and 84% of which are clay-like particle sizes (sieve (0.002 mm) range between 3.8% and 7.9% and the remaining being silt particle sizes.
- The permeability of the tailings is low, and with consolidation, tailings permeability decreases.

4.2 Settled Density

Tailings deposition into EPit commenced in 2017 and was ceased in January 2022. Engeny have undertaken an analysis of the approximate tailings deposited into EPit over the period, and the resultant settled density (dmt/m³) as determined by bathymetry in 2019, 2020, 2022 and 2023.

Increased tailings density is typically achieved through initial settlement and longer-term consolidation. Improvements in density can be accelerated by passive processes such as drainage provisions and consolidation under self-weight or active processes such as dewatering and compaction. Tailings consolidation releases interstitial water and increases the mass of solids per unit volume, thereby increasing the volume of water required to mobilise the tailings.

This average settled density of 1.40 dmt/m³ is significantly better than initial estimates of 1.0 dmt/m³ (GHD 2017) for sub-aqueous deposition undertaken from late 2017 to early 2022 and means the tailings profile has continued to consolidate increasing the volume in EPit for MAW storage and reducing the permeability of underlying tailings.

A summary of the results is shown below in Table 4.1

TABLE 4.1: CALCULATED SETTLED DENSITY OF TAILINGS

Assessment Period	Settled Density (dmt/m³)
June 2019 to July 2020	1.30
July 2020 to July 2022	1.41
July 2022 to July 2023	1.49
Average	**1.40**

4.3 Hydraulic Conductivity

In general, the hydraulic conductivity of the tailings at CCM are low, with decreasing hydraulic conductivity as the tailings consolidate, as shown in Table 4.3 - the consolidated tailings essentially form a barrier to groundwater flows.

TABLE 4.2:HYDRAULIC PARAMETRS OF TAILINGS

Name	Kxy (m/d)	Kz (m/d)	Porosity	Specific Storage	References
ETSF Tailings - Shallow	1	1	0.3	0.01	GHD (2020)

ETSF Tailings - Intermediate	0.01	0.01	0.2	0.001	Keller et al (2015); Smith (2021)
ETSF Tailings - Deep	0.0005	0.0005	0.1	0.001	Keller et al (2015); Smith (2021)

4.4 Geotechnical Properties

Geotechnical testing of the tailings has been undertaken at CCM, as described in the following assessments:

- Raising of Esperanza Tailings Dam – Feasibility Assessment, (Maunsell, 2008).
- Final Interim Raise Design Report (GHD, 2008).
- Scope of Further Raising (GHD, November 2009).
- Esperanza TSF Raise to RL 283 (GHD, 2012).
- Advanced laboratory testing reported in Esperanza Tailings Storage Facility Design Report to RL 284 (GHD, January 2022).

Results from the testing has been presented in Table 4.3, with the general observations made from the results:

- The tailings generally comprise sandy silty clay with low to moderate plasticity. The USCS classification of the tailing would be silty-clay/clayey-silt.
- Hydraulic conductivity is low.

TABLE 4.3: GEOTECHNICAL TEST RESULTS OF TAILINGS

Parameter	Sample 4 GHD (2008)	Sample 5 GHD (2009)	Sample 6 GHD (2009)	Sample 7 GHD (2009)	CPT01 GHD (2012)	CPT03 GHD (2012)	CPT05 GHD (2012)
MDD (t/m^3)	-	1.8	1.82	1.82	-	-	-
OMC (%)	-	16.5	16.5	16.5	-	-	-
Field MC (%)	-	20.5	33.5	31.5	40.5	23	29.7
Field DD (t/m^3)	-	1.57	1.41	1.43	-	-	-
Field Density Ratio (%)	-	87%	77.5%	78.5%	-	-	-
Linear Shrinkage (%)	-	3.5	3.5		-	-	-
Liquid Limit (%)	32	25	22	26	28	23	27
Plastic Limit (%)	28	16	13	16	24	20	23
Plasticity Index (%)	8	9	9	10	4	3	4
% Passing 75 µm	-	64	62.5	60	84	71	67
Permeability (m/s)	2×10^{-8}	-	-	-	-	-	-

Table 4.4 and Figure 4.1 outline the results of tailings characterisation and particle size distribution testing and analysis undertaken by ATC Williams Pty Ltd (ATCW)

TABLE 4.4: TAILINGS CHARACTERISTICS

Material	Parameter (LoM Estimate)	Unit	Value
Thickener Underflow (Flocculated)	As-received Solids Concentration, C_W	%	49.0
	Particle Density, ρ_{st}	t/m³	2.82
	Atterberg Limits (LL / PL / PI) %	%	25 / 18 / 7
	Segregation Threshold	%	49.0
	Permeability, $k_{v,sat}$	m/s	2.96E-08 (e = 0.69) 1.96E-08 (e = 0.62) 1.67E-08 (e = 0.59)
	Maximum / Minimum Density	t/m³	0.993 / 1.88
	Initial Settled Density (5 kPa suction)	t/m³	1.525
	Shrinkage Limit Density	t/m³	1.72

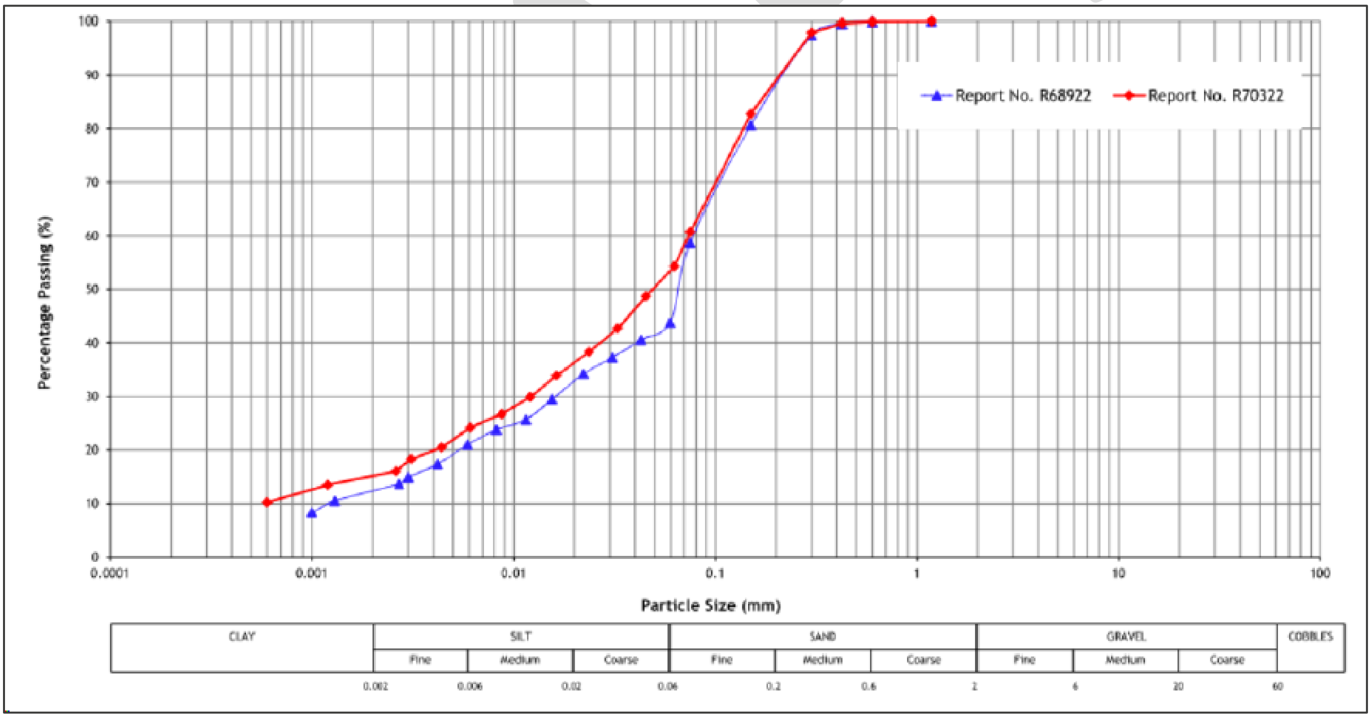

Figure 4.1: Tailings Particle Size Distribution (ATCW, 2023)

Advanced geotechnical laboratory testing results are presented in Esperanza Tailings Storage Facility, Design Report for Raise RL 284 (GHD, January 2022).

A total of ten (10) PSD tests were conducted for the tailings providing a range of fine material (sieve 0.075 mm), between 74% and 84% of which are clay-like particle sizes (sieve (0.002 mm) range between 3.8% and 7.9% and the remaining being silt particle sizes. The PSDs are shown in Figure 4.2.

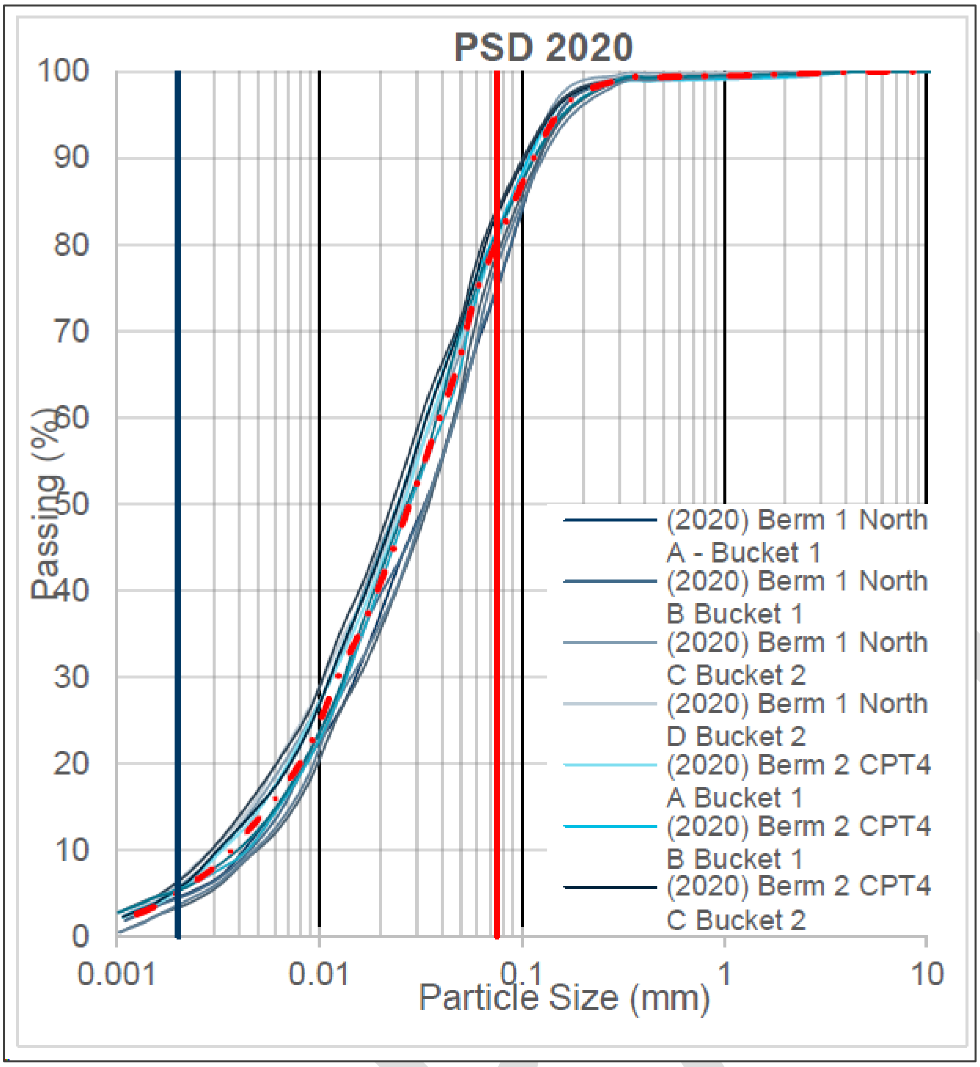

Figure 4.2: **Particle Size Distribution (PSD) of Tailings (GHD, August 2022)**

4.5 Geochemistry of Tailings

Limited geochemical characterisation of the tailings at CCM has been undertaken to date, although it is understood the tailings are categorised as potential acid forming (PAF) materials (GHD 2022).

All sulphide-containing material has the potential, when exposed to water and air, to produce run-off and/or leachate with increased concentrations of solutes. The key questions to be addressed are the extent to which this may occur and whether the risk to the environment is of a magnitude that needs to be mitigated to produce an acceptable outcome.

Past geochemical testing (Environmental Earth Scientists 2012, EMM 2015, GHD 2018, Earth Systems 2020) has shown that the historic tailings exhibit high concentrations of total S and sulfide S, hence have a high Maximum Potential Acidity (MPA), with limited Acid Neutralising Capacity (ANC). This correlates to strongly positive Net Acid Production Potential (NAPP) values indicating a high probability of being acid-forming. This suggestion is further supported by low Net Acid Generation (NAG) pH test results.

Multi-element testing indicates that tailings samples are significantly enriched (Geochemical Abundance Indices (GAI) of 3 or greater) in silver (Ag), arsenic (As), bismuth, (Bi), copper (Cu), lead (Pb), antimony (Sb) and thallium (Tl) (Environmental Earth Scientists, 2012).

A summary of previous assessments is detailed below:

EMM (2015)

- EMM carried out excavation of 10 test pits through the Old Mammoth TSF, Total S of the tailings were generally over 1% and acid neutralising capacity was generally 0 kg H_2SO_4/t, indicating the tailings are potentially acid forming (PAF) with no lag, consistent with the low pH of less than 4 in water extracts.

GHD (2018)

- GHD carried out excavation of 10 test pits (TP01 to TP10) on the Old Mammoth TSF through the cover system into the tailings and drilled six boreholes (BH01 to BH06) to the full depth of the TSF and into natural ground.
- Geochemical results confirmed all tailings had high total S greater than 1%, had negligible ANC of generally less than 10 kg H_2SO_4/t, and were PAF.
- Multi-element data shows the tailings solids still contain high metal contents:
  - Ag 2-10ppm.
  - Co 60 to 380ppm.
  - Cu 0.1 to 1.2%.

Earth Systems (2020)

- Earth Systems (ES, 2020) was engaged to co-ordinate Quantitative X-Ray Diffraction (QXRD) analyses of 28 tailings samples to identify the presence of iron-oxide phases (e.g., goethite, hematite) that may facilitate sulfate removal from process water in the EPit via bacterially induced pyrite precipitation.
- dominant mineral in the tailing's samples analysed is quartz, with smaller proportions of pyrite, muscovite, kaolinite and siderite. The Maximum Potential Acidity (MPA) calculated from the mineralogy is elevated (16-109 kg H_2SO_4 per tonne) due to the presence of pyrite (0.8-6.5 wt.%). The calculated ANC is generally low (<6.2 kg H_2SO_4 per tonne). Therefore, the Net Acid Production Potential (NAPP; NAPP = MPA - ANC) of these samples ranges from 14 to 104 kg H_2SO_4 per tonne of tailings, and hence all samples are classified as PAF.

4.5.1 Laboratory Analysis

Engeny have reviewed recently supplied laboratory results (ALS reference BR23079597) from tailings testing conducted between 16/10/2022 and 19/02/2023, presented in Table 4.5, reporting all tailings as potentially acid forming, with reported pH following oxidation ranging between 2.2 and 3.0 and calculated MPA elevated between 57-356 kg H_2SO_4 per tonne.

TABLE 4.5: LABORATORY RESULTS (BR23079597)

SAMPLE	S	NAG @ pH 4.5	NAG @ pH 7.0	pH	Calc. MPA 30.6 x %S = MPA
UNIT	%	kg/t	kg/t	pH Unit	kgH_2SO_4/t
16/10/22 Final Tail DS	2.98	49.4	64.8	2.5	91.188
16/10/22 Final Tail NS	4.32	79.3	96.3	2.2	132.192
23/10/22 Final Tail DS	3.55	57.6	69.6	2.5	108.63
23/10/22 Final Tail NS	4.22	66.9	83.9	2.4	129.132
30/10/22 Final Tail DS	2.82	44.3	60.9	2.6	86.292
30/10/22 Final Tail NS	4.24	74.4	94.1	2.4	129.744
6/11/22 Final Tail DS	3.3	61.5	96	2.5	100.98
6/11/22 Final Tail NS	1.88	31.5	54.2	2.8	57.528
13/11/22 Final Tail DS	4.65	77.9	96.8	2.5	142.29
13/11/22 Final Tail NS	4.03	61.3	78.2	2.3	123.318

20/11/22 Final Tail DS	6.51	90.6	119	2.4	199.206
27/11/22 Final Tail DS	4.02	70.5	89.8	2.5	123.012
27/11/22 Final Tail NS	11.65	82.2	126	2.4	356.49
4/12/22 Final Tail DS	2.74	51	66.8	2.8	83.844
4/12/22 Final Tail NS	2.45	26.9	55.3	3	74.97
18/12/22 Final Tail DS	4.06	71.6	91.4	2.4	124.236
18/12/22 Final Tail NS	4.27	76.1	97	2.4	130.662
25/12/22 Final Tail DS	3.04	57.4	77.3	2.6	93.024
25/12/22 Final Tail NS	2.78	38.8	51.2	2.7	85.068
1/01/23 Final Tail DS	7	114	142	2.4	214.2
1/01/23 Final Tail NS	6.12	98	120	2.4	187.272
15/1/23 Final Tail DS	3.62	71.2	85.4	2.4	110.772
15/1/23 Final Tail NS	3.76	73.6	90.6	2.4	115.056
12/2/23 Final Tail DS	5.9	98.5	127	2.3	180.54
12/2/23 Final Tail NS	5.54	86.7	113	2.3	169.524
19/2/23 Final Tail DS	4.17	67.6	95.9	2.4	127.602
19/2/23 Final Tail NS	4.29	77.5	95.4	2.4	131.274
Mean Results	**4.36**	**68.75**	**90.29**	**2.47**	**133.63**
Min Results	**1.88**	**26.9**	**51.2**	**2.2**	**57.528**
Max Results	**11.65**	**114**	**142**	**3**	**356.49**

5. WATER MANAGEMENT

5.1 System Overview

The CCM water management system (WMS) consists of:

- Mine water storages (including the EPit and the MCD).
- Tailings storage facilities (ETSF, with EPit being proposed to again be used for tailings deposition).
- Underground workings and storages.
- Water transfer infrastructure including pipelines and pumps.
- External water supplies.
- Processing plant.

The purposes of the CCM WMS include:

- Containment and storage of mine affected water runoff and seepage.
- Containment and dewatering of tailings.
- Maintaining reliable supply to operational water demands, including the improvements in the efficiency of mine water recycling to operational water demands to reduce reliance on external water supplies.
- Avoiding mine water accumulation through enhanced evaporation and controlled releases of treated MAW.
- Reducing reliance of raw water from Lake Waggaboonya.
- Clean water diversions dams and drains to improve performance of the mine water containment system.
- Sediment control.

The CCM water management system is primarily made up of the EPit, the ETSF and the MCD which form the integrated containment system for CCM. The EPit, ETSF and MCD are classified as regulated structures.

The structures are operated as an integrated (shared) containment system for the purpose of sharing DSA. As required by condition G3-1 of the EA, the operation requirements of the CCM integrated containment system were detailed in the *System Design Plan (SDP) (Engeny, 2023).*

Water management at the site is governed by the *Capricorn Copper Water Management Plan (Engeny, 2023b).*

5.2 EPit Water Management

Water accumulated in the EPit is attributed to the following sources:

- Supernatant bleed from the tailings disposal.
- Catchment rainfall runoff.
- Groundwater inflows; and
- Pumped inflows from other storage / seepage collection areas.

Surface water management is undertaken to prevent overflow and maintain sufficient capacity for extreme rainfall events. The key objectives of the water management strategy are as follows:

- Meet the conditions of the Environmental Authority.
- Minimise the risk of an uncontrolled/unauthorised discharge (overflow or seepage).
- Maintain water cover that is an average of 2 m deep over the tailings beach.
- Operate seepage collection systems at the Northern Waste Rock Dump Sump, Hoover Dam Sump and Old Mammoth TSF/Sump 6.
- Operate high-capacity evaporators to manage pit inventories according to prevailing climatic conditions.
- Maximise the re-use of MAW in mining and processing, so as to limit raw water imports from Lake Waggaboonya.
- Maximise clean water flows away from site.

5.2.1 Return Water Infrastructure

The existing return water system in the EPit is summarised in Table 5.1.

Table 5.1: Return Water Infrastructure

Location	Description	Type	Pumping to	Pipe Size
EPit Ramp	Permanent installation Activation: Manual Start/Stop	1 x XH100 diesel pump	High-Capacity Evaporators located on Eastern embankment (400-200 evaporators)	355 mm HDPE
EPit Ramp	Permanent installation Activation: Manual Start/Stop	2 x Southern Cross pump with 200 kW motor	High-Capacity Evaporators located on Western embankment (600-300 evaporators)	355 mm HDPE
EPit Ramp	Permanent installation Activation: Manual Start/Stop	2 x Southern Cross pump with 200 kW motor	High-Capacity Evaporators located on Southern embankment (600-300 evaporators)	355 mm HDPE
EPit Ramp	Permanent installation Activation: Manual Start/Stop	1 x 18.5kW submersible pump per evaporator	Floating Evaporators located on EPit (200E evaporators)	N/A
EPit Ramp	Temporary installation Activation: Manual Start/Stop	400-40 electric pumps x 2 (one on standby) HV 1Kv trailing cable 20kL Fuel cell Poly and Floats 500x630mm 415V to 1000V Transformer 500kva generator x 2 (one on standby)	Mill Creek Dam	250 mm HDPE

5.2.2 Water Management Strategy

The key features of the EPit water management strategy are summarised below:

- The EPit will receive thickened tailings inflows from the Ore Processing Plant via the underflow from the final tails thickener.
- The EPit will receive rainfall runoff from approximately 139.2 ha of contributing catchment.
- The final tailings beach surface and operational decant pond levels will be kept below the regional groundwater table (~ RL 225m) so that EPit will act as a sink, rather than a source, and receive groundwater inflows during tailings disposal operations.

- Water level in the EPit shall be maintained below the MRL and shall provide at least the design DSA on 1 November each year.
- Decant water from the EPit is to be pumped into Mill Creek Dam and then to Pond 3 and 4 (in the interim) or to the new WTP, for treatment and then re-use around site as required.
- High-capacity mechanical evaporators are to be operated as much as possible to manage the water inventory where weather conditions permit.
- Decant water from ETSF is to be pumped to EPit to minimise water stored at ETSF.
- North Waste Rock Dump interception trench is transferred to EPit.
- Sump 6 seepage is transferred to the EPit when the water level.
- The EPit does not have a "constructed" spillway, however, there are various levels of control for outflow that facilitate compliance with the intent of the spillway requirements as per the EA. These include the following features (GHD, 2017):
  - Rock Bar at RL 222 m - above this level minor seepage could occur into the TSF access ramp pond area and subsequently into the downstream Mill Creek Dam. This level has been set as the maximum desirable water level to limit seepage from the EPit.
  - Hydraulic Divide at RL 225 – significant seepage is prevented by a hydraulic divide within the site groundwater system between EPit and the Mill Creek Dam at RL 225.
  - Access Ramp at approximate RL 229 m – unrestricted inflow to EPit would cause a significant amount of water to back up against the access ramp, which is likely to increase seepage into the downstream Mill Creek Dam through the hydraulic divide.
  - EPit ramp at RL 240 m – At this level in the Pit, there will be uncontrolled discharge from EPit along the haul road and into Mill Creek Dam. The discharge from the Pit will be determined by the cross-sectional area of flow on the eastern perimeter where the haul road enters the Pit.
- The level to which EPit could rise above the rock bar level RL 222 m to accommodate the design volume was assessed in the report (GHD, 2017). It was found that the peak level was extremely unlikely to exceed RL 222. From this assessment, it was determined that EPit does not require a formal spillway to facilitate its safe operation.
- Where the RL222 m(AHD) is exceeded, overflows and seepage are captured in Mill Creek Dam.

5.2.3 Decant Pond Control

The purpose of the decant return water system is to maintain the decant pond in a minimum condition whilst maintaining water cover of an average depth of 2m to reduce / prevent the oxidation of sulphides and the subsequent leaching of harmful substances. The presence of a decant system also minimises the storage volume that is required for the supernatant water whilst maximising the storage volume available for tailings and rainfall runoff.

The decant pond should be closely monitored to check that it is forming in the proposed location and that it is maintained in a minimum condition. The water level in the EPit TSF should be controlled via the decant infrastructure to ensure buffer storage is available to reduce the risk of an uncontrolled discharge.

5.3 Pit Water Quality During and Post Operations

Surface water runoff and seepage from mine landforms and disturbed areas can potentially contain a variety of contaminants, including sediment, low pH, heavy metals, and soluble salts. The EPit water quality is summarised in Table 5.2, with the mean for each parameter presented for the period of February 2023 to October 23.

The water quality parameters and analytes of the MCD, EPit and ETSF generally exceed trigger limits, contaminant limits and stock watering limits specified in the EA. This indicates that the water stored on site is of poor quality and has potential to negatively impact waterways and the environment downstream of the mine in the event of release to the environment.

Detailed water quality results are shown in Table 5.2. all results are presented as dissolved metals unless otherwise stated.

TABLE 5.2: EPIT WATER QUALITY

Parameter	Units	Result
pH	-	3.21
Conductivity	µS/cm	5324
Aluminium	mg/L	75.98
Total Arsenic	mg/L	0.06
Boron	mg/L	0.065
Cadmium	mg/L	0.0008
Calcium	mg/L	427
Chromium	mg/L	0.017
Cobalt	mg/L	7.71
Copper	mg/L	76.05
Iron	mg/L	16.45
Total Fluoride	mg/L	1.53
Lead	mg/L	0.0024
Magnesium	mg/L	283.36
Manganese	mg/L	22.58
Mercury	mg/L	0.0002
Molybdenum	mg/L	0.002
Nickel	mg/L	2.078
Sulphate as SO4	mg/L	3165.91
Total Anions	mg/L	66.54

Parameter	Units	Result
Total Cations	mg/L	55.59
TDS	mg/L	4294.31
Hardness CaCO3	mg/L	2232.72
Uranium	mg/L	0.035
Zinc	mg/L	1.85

5.4 Risk of Uncontrolled Releases

A spill risk assessment for the 2023-2024 wet season was undertaken for regulated structures (EPit, ETSF and MCD) and site storages that are at risk of overflowing offsite (Hoover Dam). Key results can be summarised as follows:

- Overflow events only occur in results above the 95th percentile. Further analyses of overflow results (i.e., assessment of the number of realisations in which an overflow occurs) indicate that there is around a 1% chance of an external spill event occurring from Hoover Dam as a result of an overflow from MCD.
- The EPit does not overflow in any scenario.

6. FUGITIVE EMISSIONS MANAGEMENT

6.1 General

The tailings being deposited into the EPit are pumped as slurry. There is no direct release of emissions from this process.

6.2 Dust

The tailings at CCM are deposited as a wet slurry which does not produce dust, and the initial deposition will be via sub-aqueous means. The potential for tailings to dry and produce dust for the EPit is limited, given the adoption of a 2m water cover to prevent oxidation of PAF tailings.

6.3 Gas

There is no known gas emitted from the EPit, or the tailings discharge.

7. MONITORING

7.1 General

Monitoring and surveillance of tailings storage facilities includes routine inspections on-site and a review of key monitoring information and data. This is in line with the requirements of the CCM EMS as described in section 3.2.

The main objectives of monitoring and surveillance are to:

- Ensure operations comply with relevant conditions as per the EA.
- Identify any dam safety risks.
- Ensure design intentions for all the facilities are met and that the construction is safe.
- Monitor and document dam performance, including instrumentation data.
- Understand and be ready to implement the Dam Safety Emergency Management Plan (ERP) if required.

7.2 Inspections

Monitoring and Surveillance inspections are required to be undertaken to monitor the condition and ultimately safety of the dams and structures within the EPit. The purpose of scheduled inspections is to identify visual or monitoring data deficiencies that either require maintenance or trigger a response under the Trigger Action Response Plan (TARP).

Based on the Consequence Category (ANCOLD, 2012) of 'High C', the following dam safety inspections will be completed for the EPit as part of the surveillance program as shown in Table 7.1.

TABLE 7.1: SURVEILLANCE INSPECTION

Inspection Type	Frequency	Responsible
Daily	Daily	Processing
Monthly	Monthly	Environment
Intermediate and Regulated Structures Inspection (same inspection)	Annually	Environment
Comprehensive	On first filling then 2-Yearly	Environment
Event Driven	As Required	Environment

A summary of task requirements for each inspection classification are listed in Table 7.2.

TABLE 7.2: SURVEILLANCE INSPECTION REQUIREMENTS

Task	Inspection Type					
	Daily	Monthly	Intermediate	Comprehensive	Regulated Dam	Event-driven	Dam Safety Review
Visual inspection to identify physical deficiencies or changes in observed conditions of the dams (Varying levels of assessment and inspector experience)	x	x	x	x	x		x
Collection and summary of monitoring data		x	x	x	x		x
Review and interpretation of monitoring data		x	x	x	x		x
Review of previous recommendations and progress on actions carried out to address these recommendations			x	x	x		x
Review of freeboard and operational activities that may influence dam safety	x	x	x	x	x		x
A review of conformance with conditions of the EA, as-constructed drawings and changing circumstances which may lead to a modification in consequence category			x	x	x		x
An assessment of adequacy of available storage in each regulated dam on the 1st of November of that year					x		
A review of evidence of conformance with the current OMS		x	x	x	x		
Provision of recommendations to address any deficiencies identified by the inspection			x	x	x		x
A review of the owner's whole dam safety management program (Dam Safety Review)							x

In the following sections the characteristics and requirement of CCM's inspection programs for the different inspection's levels are described. It is important to highlight that all routine inspections must be carried out by a competent operator/inspector with adequate knowledge about the facilities, their function, and their normal safety condition.

7.2.1 Daily Inspections

Daily routine inspections shall be undertaken by nominated Processing personnel. Daily inspections shall include:

- Highwall geotechnical stability.
- Water level.
- Spillways condition.
- Spigots and pipeline conditions.
- Return water pumps and pipelines conditions.
- High-capacity mechanical evaporators, and flow meters.
- Seepage collection systems.

The actions to be undertaken during the Daily Routine Inspection are detailed in Table 7.3.

TABLE 7.3: DAILY ROUTINE VISUAL INSPECTION

Issue	Action	Resource
Operation	Operation of decant and tailings discharge systems.	Daily Routine Visual Inspection Form
Surveillance	Identify and report any deficiencies by visual observation of the embankment. Prevent environmental issues.	Daily Routine Visual Inspection Form
Maintenance	Any deficiencies identified during routine surveillance to be reported to CCM Process Superintendent to determine and plan the appropriate maintenance action.	Maintenance Activities
Emergency Response	Identify and respond to any observed deficiency requiring emergency response by implementing the appropriate procedure.	ERP

The operator must have a good understanding of the Daily Routine Visual Inspection and Reporting procedure to perform efficient inspection and surveillance reporting. The operator must also be familiar with safety issues and operational performance to report any observation judged relevant concerning the safety and performance of the facility (not otherwise covered by the Inspection Report Form).

7.2.2 Monthly Inspections

Monthly surveillance inspections shall be undertaken by nominated Environment personnel. The purpose of the monthly inspection is to assess the status of the facility and its features in terms of its structural and operational safety and performance. Monthly inspections shall include:

- Highwall geotechnical stability.
- Water levels.
- Spillways conditions.
- Instrumentation monitoring.
- Spigots and pipeline conditions.
- Return water pumps and pipelines conditions.
- High-capacity evaporators, and flow meters.
- Seepage collection systems.
- EPit Ramp.
- Access Roads.

The actions to be undertaken during the monthly Routine Inspection are detailed in Table 7.4.

TABLE 7.4: MONTHLY ROUTINE INSPECTION PROGRAM

Issue	Action	Resource
Operation	Evaluate and report the tailings discharge and water management plans performance.	OMS Manual
Surveillance	Identify and report any deficiencies, by structured observation of the EPit and surrounds, with recommendations for corrective actions. Prevent environmental issues.	Monthly Routine Visual Inspection Form
Maintenance	Inspect maintenance actions undertaken during the last month and evaluate EPit and equipment status.	Maintenance Activities
Emergency Response	Analyse incident data and evaluate on the surveillance and maintenance management performance.	Emergency Response Team (ERT) Emergency Notification Emergency Response Plan ERT Scheduled TSF Emergency Simulation

The Environment personnel must have a good understanding of the Routine Inspection and Reporting procedure to perform efficient inspection and surveillance reporting.

7.2.3 Intermediate and Comprehensive Inspection Program

Intermediate and Comprehensive inspections must be generally carried out in accordance with the requirements of the ANCOLD guidelines (ANCOLD, 2012).

Intermediate inspections aim for the identification of deficiencies by visual examination of the dam and review of surveillance data against prevailing knowledge. Equipment is not necessarily operated. This inspection must be performed by a suitably qualified and experienced person.

For the case of comprehensive inspections, these aim to identify deficiencies by a thorough onsite inspection; by evaluating data; and by applying current criteria and prevailing knowledge. In addition, equipment should be test operated to identify deficiencies. This inspection must be performed a suitably qualified and experienced person.

7.2.4 RPEQ Annual Inspections

Annual inspections shall be conducted by a Registered Professional Engineer of Queensland (RPEQ) to evaluate the condition of the EPit relative to dam safety, containment, and operational performance objectives. The annual inspections are intended to be more thorough than a routine inspection. The annual inspection shall include:

- Visual inspection of the facility, any auxiliary infrastructure and monitoring instrumentation and operating practices.
- A review of routine inspection reports.
- A review of decant pond water levels and any instrumentation monitoring data.
- Review and reconciliation of available survey data to determine the tailings volume occupied and in situ tailings density achieved in the previous 12 months and how this compares with predicted values.
- Preparation of a report summarising the following:
  - Visual observations including inspection photographs.

- A summary of the current EPit TSF status including compliance with the design intent, this OMS, regulatory and internal governance requirements,
- Any recommendations to address observed defects or non-compliances and the status of previous recommendations. Recommendations may include changes to operating practices, maintenance, repairs and other works, investigation or assessment, or additional surveillance.

7.2.5 Other Inspections

Additional special / event driven inspections shall be undertaken on an as-required basis as follows:

- Seismic activity (Mw > 4.5) within 50km of the facility.
- Before the start of the wet season (31st October).
- Following an overflow event; and
- Following any significant rain event whereby greater than 100 mm of rain has fallen, during one (1) rain event.

7.2.6 Performance Data

Key operational performance criteria applicable to EPit should be recorded at the frequency specified in Table 7.5. This is to assist with identifying whether the facility is operating in accordance with the design intent and this OMS.

Table 7.5: Reporting Frequency for Typical Performance Data

Monitoring Type	Frequency
Rainfall	Daily
Tailings Tonnes Delivered (actual tailings tonnes delivered to EPit– Bathymetry) and tailings beach profile	Three-Monthly
Tailings Slurry Volume Delivered (actual tailings slurry volume from thickeners delivered to EPit)	Monthly
Decant Return Volume (volume of decant water pumped to MCD or HCME's)	Monthly
Decant pond water level and location	Daily
Monitoring of Downstream Monitoring Bores	Monthly
Highwall Geotechnical Stability	Daily
Seepage Collection System	Daily
Operation of High-Capacity Mechanical Evaporators	Daily

7.2.7 Monitoring Instrumentation

Groundwater quality and level (mbgl) are monitored by several groundwater bores across the site, some which are compliance bores with prescribed limits as per Schedule C Table 5 in the EA. CCM are proposing to install additional groundwater monitoring bores to increase the effectiveness of the groundwater monitoring network at CCM. The locations of existing groundwater bores and proposed additional bores are shown below in **Figure 7.1**.

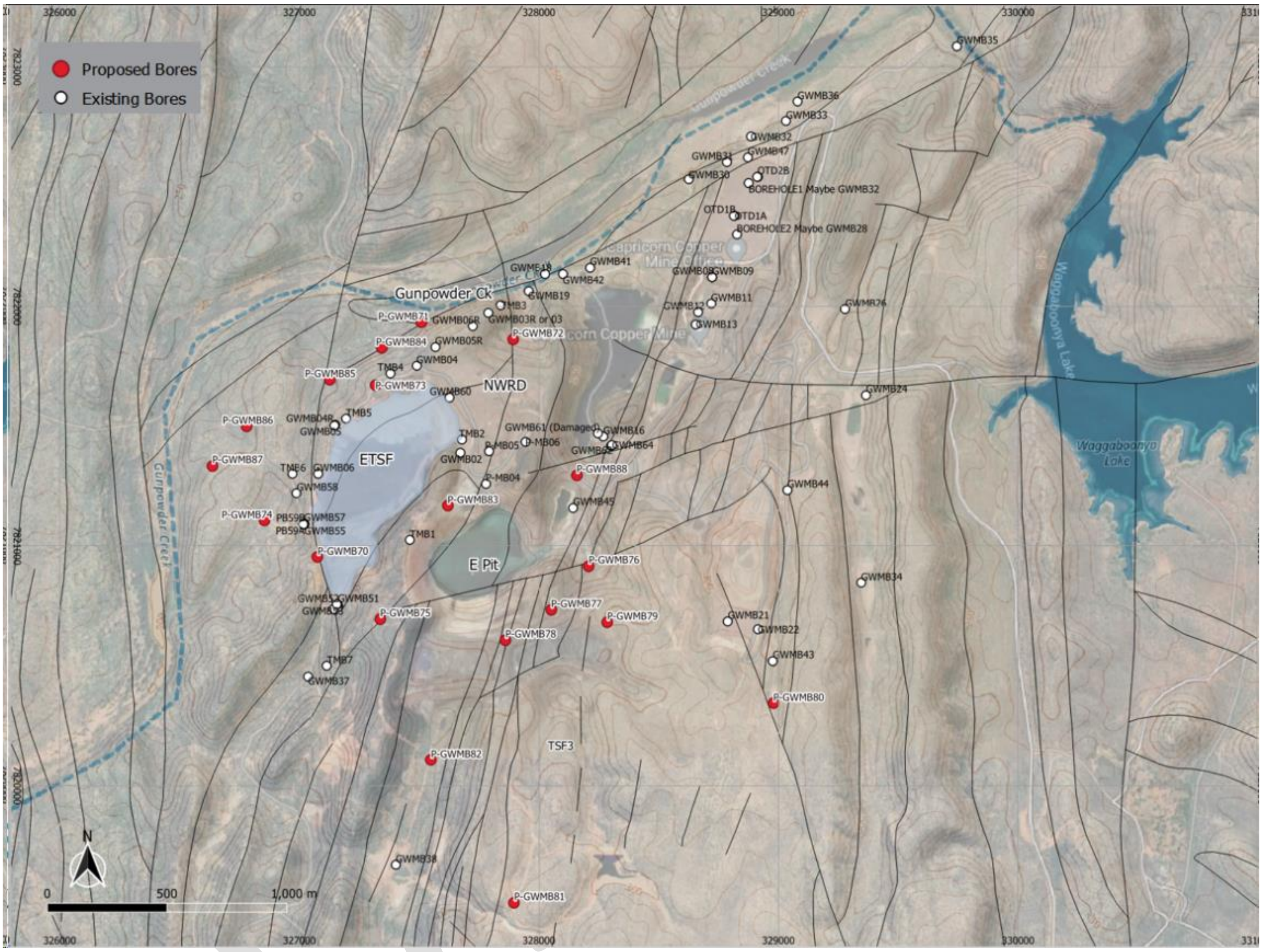

Figure 7.1: **Groundwater Monitoring Bores**

The monitoring points and their monitoring frequency are presented in **Error! Reference source not found.**.

The monitoring points and their monitoring frequency are presented in **Error! Reference source not found.**. As is observed, there are existing b ores, and additional monitoring bores proposed for installation to increase the monitoring of EPit TSF and the site more broadly.

Table 7.6: Groundwater Monitoring Bores

Monitoring Point	Purpose of Monitoring Bore	Monitoring Frequency
GWMB02	EPit	1 sample every 3 months for groundwater quality; and
TMB01	EPit	

GWMB45	EPit	1 measurement every month for groundwater level
GWMB83 (Proposed)	EPit	
GWMB75 (Proposed)	EPit	
GWMB78 (Proposed)	EPit	
GWMB77 (Proposed)	EPit	
GWMB76 (Proposed)	EPit	
GWMB72 (Proposed)	NWRD Seepage	
GWMB41	NWRD Seepage	

Groundwater monitoring must be completed in accordance with conditions C5-1 to C5-5 of the EA. Monitoring of compliance bores for groundwater quality must be completed quarterly, and monthly for groundwater level at locations specified in EA Schedule C – Table 5. It is proposed that all monitoring bores in Table 7.6 are monitored in line with the EA conditions.

The EA defines groundwater trigger levels and contaminants levels in Schedule C – Table 6, as shown in Table 7.7.

Table 7.7: EA Schedule C - Table 6 (Groundwater Trigger Levels and Contaminant Levels)

Parameter*	Trigger Level# (µg/L unless otherwise specified)	Contaminant Limit # (mg/L unless otherwise specified)
pH (pH units)	6.0 – 8.5	
EC (µS/cm)	435	1,000
Sulfate (SO42-)	80th percentile[1] of reference bore level[2] or 250 mg/L, whichever is higher	95th percentile[1] of reference bore[2] concentration[3] or 1,000, whichever is lower
Fluoride (F-)	80th percentile[1] of reference bore concentration[2]	2
Major cations	For interpretive purposes only	
Major anions	For interpretive purposes only	
Aluminium	80th percentile[1] of reference bore[2] concentration[3] or 55, whichever is higher	95th percentile[1] of reference bore[2] concentration[3] or 5, whichever is lower
Arsenic4	80th percentile[1] of reference bore[2] concentration[3] or 13, whichever is higher	95th percentile[1] of reference bore[2] concentration[3] or 0.5, whichever is lower
Boron	80th percentile1 of reference bore2 concentration3 or 370, whichever is higher	95th percentile[1] of reference bore[2] concentration[3] or 5, whichever is lower

Parameter*	Trigger Level# (µg/L unless otherwise specified)	Contaminant Limit # (mg/L unless otherwise specified)
Cadmium	80th percentile[1] of reference bore[2] concentration[3] or 0.2, whichever is higher	95th percentile[1] of reference bore[2] concentration[3] or 0.01, whichever is lower
Chromium4	80th percentile[1] of reference bore[2] concentration[3] or 1.0, whichever is higher	95th percentile[1] of reference bore[2] concentration[3] or 1, whichever is lower
Cobalt	80th percentile[1] of reference bore[2] concentration[3]	95th percentile[1] of reference bore[2] concentration[3] or 1, whichever is lower
Copper	80th percentile[1] of reference bore[2] concentration[3] or 1.4, whichever is higher	95th percentile[1] of reference bore[2] concentration[3] or 1, whichever is lower
Lead	80th percentile[1] of reference bore[2] concentration3 or 3.4, whichever is higher	95th percentile[1] of reference bore[2] concentration[3] or 0.01, whichever is lower
Manganese	80th percentile[1] of reference bore[2] concentration[3] or 1900, whichever is higher	95th percentile[1] of reference bore[2] concentration[3]
Nickel	80th percentile[1] of reference bore[2] concentration[3] or 11, whichever is higher	95th percentile[1] of reference bore[2] concentration[3] or 1, whichever is lower
Uranium	80th percentile[1] of reference bore[2] concentration[3]	95th percentile[1] of reference bore[2] concentration[3] or 0.2, whichever is lower
Zinc	80th percentile[1] of reference bore[2] concentration[3] or 8.0	95th percentile[1] of reference bore[2] concentration[3] or 20, whichever is lower
Total Hardness	For interpretive purposes only	

1. Must be determined in accordance with QWQG (2009) and ANZECC (2000) methodology.

2. Reference bores are specified in Schedule C - Table 5 (Groundwater Monitoring Locations and Frequency).

3. Where the 80th/95th percentile of a groundwater trigger level/contaminant limit is exceeded for a compliance bore and the reference bore also exceeds this concentration during the same sampling event, the value of the reference bore applies as the groundwater trigger level/contaminant limit for that sampling event.

4. Site specific trigger levels and contaminant limits for groundwater (80th and 95th percentile of reference site concentration) must be calculated in accordance with QWQG (2009) and ANZECC (2000) methodology if sufficient monitoring data is available. The environmental authority holder must maintain a database documenting all relevant groundwater monitoring data and calculation of 80th/95th percentiles adopted as groundwater trigger levels and contaminant limits.

5. Routine analysis for this parameter is based on combined/total species of the element, where the exceedance of a groundwater trigger level or contaminant limit is identified, an additional sample must be taken and analysed as soon as practicable to determine and quantify speciated forms of this element.

6. For all groundwater monitoring, metals and metalloids must be measured and reported as both total (unfiltered) and dissolved (field filtered) concentrations.

7.2.8 Geochemical Monitoring

In line with the requirements of the EA, characterisation of tailings to identify the potential to generate contaminated seepage or leachate must be undertaken at a minimum frequency of once every month during tailings deposition. Characterisation must include:

- Determining the acid producing potential through calculating both the 'Net Acid Producing Potential' and the 'Net Acid Generation test'.
- Determining the level of aluminium, arsenic, boron, cadmium, chromium, cobalt, copper, lead, manganese, nickel, uranium and zinc.
- Where the acid producing potential of tailings material has not been conclusively determined, tailings material must be considered as acid forming unless further geochemical testing demonstrates otherwise.

In addition to the above monitoring requirements from the EA, the following geochemical testing is recommended on the same monthly frequency:

- Total Sulfur (S).
- Total Sulfate (SO_4).
- Chromium Reducible Sulfur (Scr).
- Total alkalinity.
- 1:5 pH and EC.
- 1:5 Soluble major cations (Ca, Mg, Na, K).
- 1:5 Soluble major anions (Cl, SO_4).
- 1:5 Water-soluble metals (15 metals).

8. CLOSURE STRATEGY

The existing closure strategy for the EPit is to remain as a residual void and groundwater sink, and for EPit to maintain a water cover, as defined in the Capricorn Copper Post Mine Land Use Plan (PMLUP). The retention of a water cover over the tailings beach in closure, which is reliant on the pit lake equilibrium level, prevents drying and exposure of tailings to atmosphere. This is expected to maintain saturated, oxygen deficient conditions in the tailings and prevent oxidation of sulphides.

Engeny have been engaged to undertake a final void water and solute balance model to determine how an increased tailings deposition strategy will impact the final void pit lake in the EPit at closure by:

- Determining the equilibrium pit lake level and recovery rate for the final void following the cessation of mining.
- Assessing the final void pit lake water quality over time (limited to salt as electrical conductivity (EC)).

The assessment will be completed for a base case (i.e., current conditions without additional tailings deposition in EPit) and an increased tailings deposition scenario with final tailings beach to RL 215.7. Sensitivity analysis will be undertaken on both scenarios to assess the impacts of changes to assumed groundwater inflow rates at closure.

The final void water balance model (WBM) was developed using the GoldSim software and simulates inflows from rainfall runoff over the residual final void catchment (including direct rainfall), groundwater and seepage inflows, and evaporative outflows. Subsequent sections of this report detail the methodology and inputs used to develop the final void WBM.

The following assumptions regarding the final void catchment and design were made, including:

- The current EPit catchment (as per the current site WBM) will be inclusive of proposed diversions post closure.
- Areas that are currently disturbed within the EPit catchment will be rehabilitated.
- The ETSF is capped and rehabilitated, with surface water diverted away from EPit in closure.
- The current EPit storage curve (as per the current site WBM) is assumed to be reflective of the base case modelling scenario final void design.
- The model adopted the existing AWBM parameters for relevant catchment as described in *The Capricorn Copper Water Balance Model Report* Engeny (2023).
- Groundwater inflow rates have been adopted from *Capricorn Copper Pty Ltd Life of Mine Project 2020 Groundwater Modelling* (GHD 2020).
- The starting pit lake level is assumed to be the top of the 2m water cover over the final tailings surface.

The final void catchments are shown in Figure 8.1 and Table 8.2.

TABLE 8.1: FINAL VOID CATCHMENT LANDUSE BREAKDOWN

Land Classification			Total Catchment Area (ha)
Natural Catchment (ha)	Rehab Catchment (ha)	Pit/Tailings Catchment ha)	
5.8	12.0	22.2	40.0

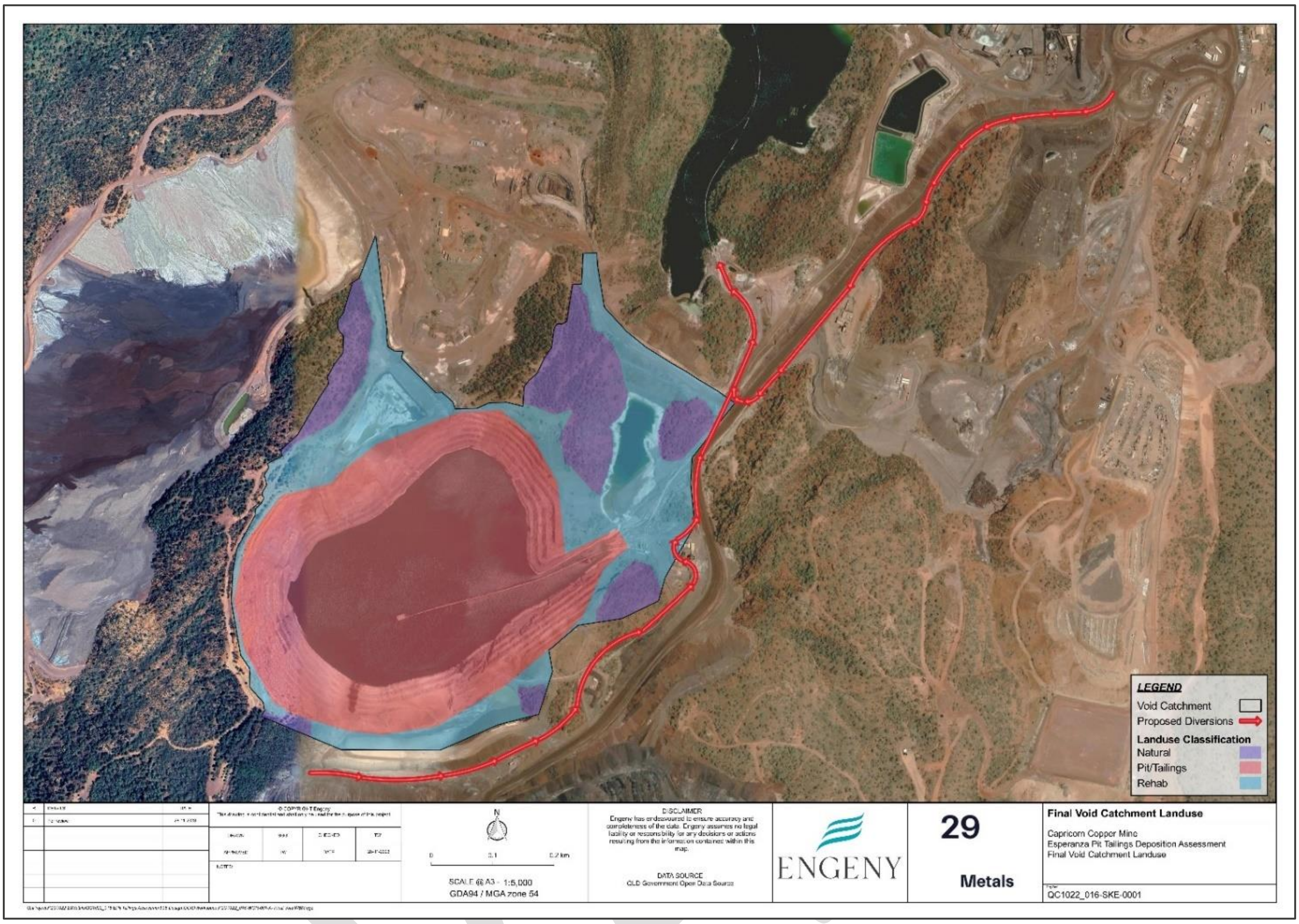

Figure 8.1: Final Void Design and Catchment Characteristics

The existing tailings surface and pit shell comprising the base case scenario, and the proposed final tailings surface comprising the increased tailings scenario are shown previously in Figure 3.1.

The void storage characteristics for both the base case and increased tailings deposition scenarios are provided in

Table 8.2.

TABLE 8.2: FINAL VOID CHARACTERISTICS

Scenario	Floor Level (mAHD)	Spill Level (mAHD)	Full Supply Volume (ML)	Overflows To
Base Case	200.8	240.0	4331.5	External
Increased Tailings Deposition	213.65 (lowest point of tailings surface) – 215.7 (highest point of tailings surface)	240.0	3357.7	External

The mean results as shown in Figure 8.2 for the base case scenario adoping the median range of predicted groundwater inflows from GHD 2020 show a gradual increase in pit lake level throughout the simulation period as shown in Figure 8.2. The EPit maintains significant freeboard under all modelled conditions. The void also stays below the assumed pre mining groundwtaer level of RL 225. These modelled outcomes do not significantly change using the minimum or maximum predicted groundwater inflows from GHD 2020.

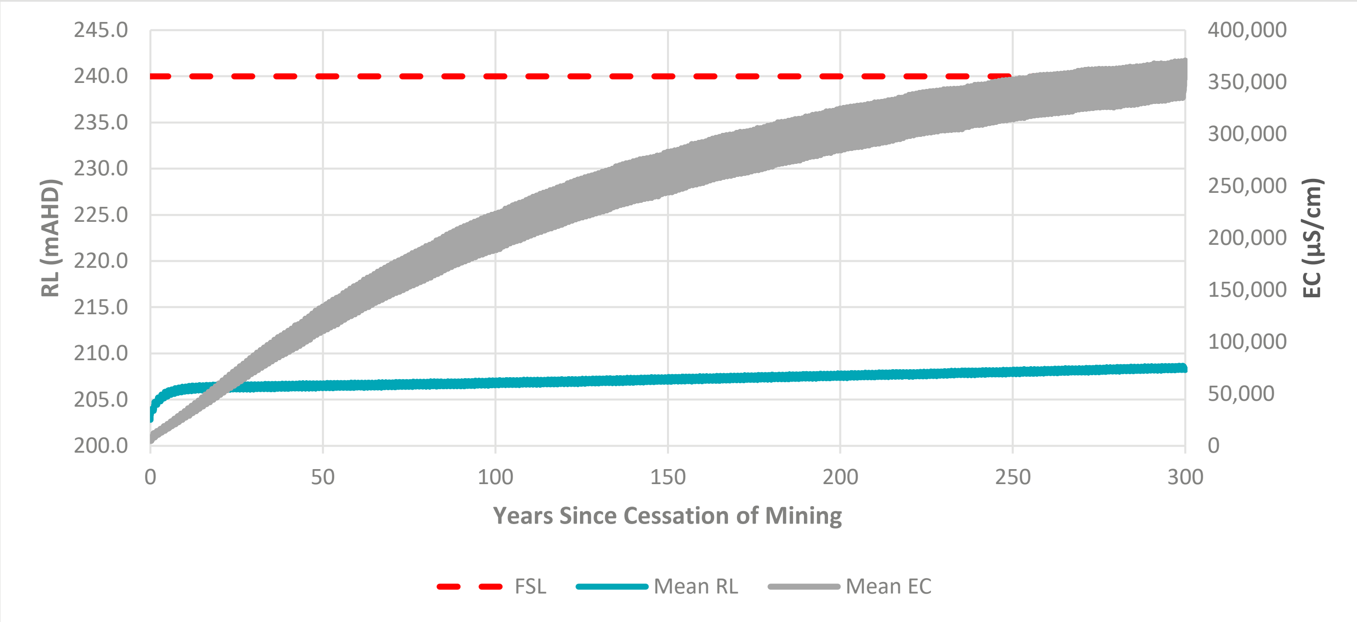

Figure 8.2: Predicted Mean Final Void Water Levels and Quality – Base Case

The mean results for the base case scenario adoping the median range of predicted groundwater inflows from GHD 2020 shows a gradual increase in pit lake level throughout the simulation period as shown in Figure 8.3. The EPit maintains significant freeboard under all modelled conditions. The void also stays below the assumed pre mining groundwtaer level of RL 225. These modelled outcomes do not significantly change using the minimum or maximum predicted groundwater inflows from GHD 2020.

The additional tailings deposition up to RL215.7 (top of tailings) does not impact the ability to maintain a water cover over tailings during closure, with the mean pit lake equilibrium level being 1.9m (RL 217.6) higher than the top of tailings.

It is noted the minimum pit lake equilibrium level modelled was RL 214.8, there may be some periods where very dry conditions prevail, where the tailings beach is partially exposed.

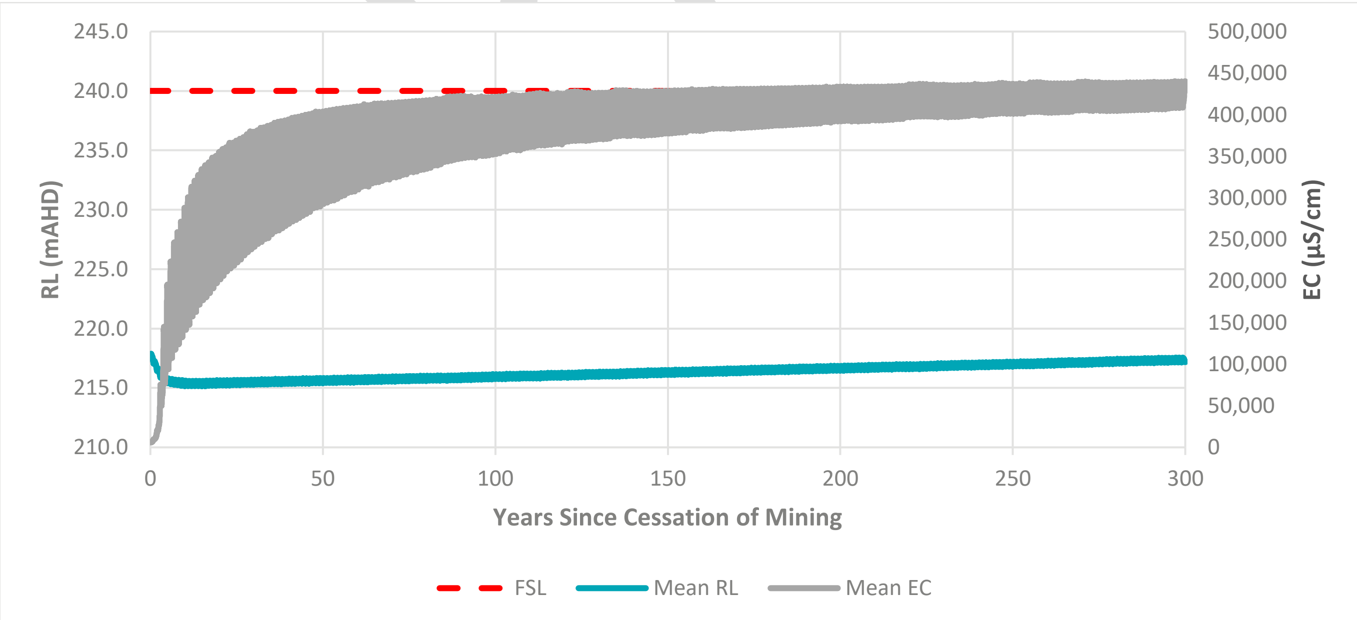

Figure 8.3: Predicted Final Void Water Levels and Quality – Increased Tailings Deposition Scenario

Based on this assessment, the following conclusions are noted:

- For all scenarios, the residual void did not reach equilibrium, with a gradual increasing trend continuing to be observed in modelled results.

- The mean pit lake equilibrium level under all scenarios exceeds the top of tailings, so it is reasonable to expect a water cover to be available post closure to prevent the oxidation of PAF tailings in the void.
- The void lake elevations for all scenarios remain below the assumed pre-mining groundwater level of RL225.0, and the void is likely to continue to act as a groundwater sink post closure.
- Due to evapo-concentration, the modelled salinity of the void water quality increases throughout the simulation period.
- All void lake elevations stay at least 19.3 metres below the void full supply level at the modelled maximum, and there are no modelled overflows. Pit lake levels continue to fluctuate seasonally with changes in rainfall and evaporation after reaching equilibrium level.
- Oscillation in pit lake levels for the void under the modelled scenarios (i.e., the difference between the minimum and maximum modelled levels) ranges between 5 and 8.9m.

9. RISK ASSESSMENT

An environmental risk assessment was undertaken for the proposed recommencement of tailings deposition into EPit considering potential impacts on surface and groundwater resources. Using the information presented in this document, and the likelihood of occurrence and consequence criteria (Table 9.1 and Table 9.2), the significance of the risks was identified using Table 9.3. This approach is consistent with AS/NZS 4360:2004: Risk Management and AS/NZS ISO 31000:2009 Risk Management - Principals and Guidelines (AS/NZS 2009; 2004).

The significance of the risks is defined as:

- High significance: a significant risk with a high likelihood of impact which is considered unacceptable or intolerable and may be irreversible or persistent.
- Moderate significance: a level of risk which is not acceptable with moderate severity with impacts persisting over time but that can be mitigated.
- Low significance: the risk is low with any impacts, short in duration and reversible.
- Insignificant: an insignificant risk and any potential impacts are acceptable, and no risk treatment is necessary with the impact restricted to the immediate area of activity.

TABLE 9.1: LIKELIHOOD CRITERIA

Rank	Likelihood	Description
E	Rare	An event that has not previously been experienced in the industry but may occur in exceptional circumstances
D	Unlikely	An event not likely to occur in the industry over 10 years
C	Possible	An event that may occur in the industry over 10 years
B	Likely	An event likely to occur more than once a year in the industry
A	Almost Certain	A common event that is likely to occur in industry multiple times per year

TABLE 9.2: CONSEQUENCE CRITERIA

Consequence	Description
1-Minor	Minimal impact on ecosystem; contained on mining lease, and/or reversible in one shift
2-Low	Moderate impact on ecosystem; contained on mining lease, and/or reversible in 1 to 5 years
3-Moderate	Significant impact on ecosystem; impact contained on mining lease, and /or reversible in ~10 years
4-Major	Significant harm or irreversible impact (for example to World Heritage area); widespread, catchment area, long term, greater than 10 years
5-Catastrophic	Significant harm or irreversible impact on high value receptors or environmental values (for example to World Heritage area); widespread, long term

TABLE 9.3: RISK MATRIX

Consequence	1-Minor	2-Low	3-Moderate	4-Major	5-Catastrophic
Likelihood					
A-Almost Certain	Moderate	Moderate	High	Catastrophic	Catastrophic
B-Likely	Moderate	Moderate	Moderate	High	Catastrophic
C-Possible	Low	Moderate	Moderate	High	High
D-Unlikely	Low	Low	Moderate	Moderate	High
E-Rare	Low	Low	Low	Moderate	High

As summarised in Table 9.4 below, the risk to both surface water and groundwater flow and quality as a result of the proposed recommencement of tailings deposition into EPit is considered low as:

- No uncontrolled discharges are expected from the CCM WMS resulting from EPit tailings deposition, and consequently no changes are expected to the existing surface water flow regime in Gunpowder Creek.
- The EPit is effectively watertight up to RL 222, with deep drainage limited by the parent material in the pit and the significant volume of consolidated tailings which is of low hydraulic conductivity.
- Existing seepage controls are expected to be sufficient to manage any potential seepage where MAW exceeds RL 222, including interception by Mill Creek Dam and the NWRD Sump.

TABLE 9.4: RISK OF POTENTIAL SURFACE WATER AND GROUNDWATER IMPACTS

Aspect	Risk Event	Consequence	Likelihood	Residual Risk	Justification and Control
Surface Water Flow	Changes to the existing flow regime (including baseflow) in Gunpowder Creek	1 - Minor	E - Rare	Low	EPit tailings deposition is not expected to result in any change to the existing flow regime in Gunpowder Creek, with no overflow events from the EPit under any modelled scenarios (Engeny 2023)
Surface Water Quality	Reduction in water quality in Gunpowder Creek resulting from increased seepage expression from EPit	1 - Minor	C - Possible	Low	The EPit is effectively watertight up to RL 222. Existing seepage controls (Mill Creek Dam and NRWD seepage sump) are expected to manage seepage where the EPit MAW inventory exceeds RL 222. Seepage from EPit is expected to drain to the underground workings or be intercepted by MCD. The pumps at MCD have enough capacity to pump back seepage inflows into MCD at a higher rate than seepage from EPit. The pumping system includes a duty and standby pumping infrastructure.
Release of Tailings	Failure of the EPit Ramp	4 - Major	D – Unlikely	Moderate	Failure of EPit Ramp is not credible under RL222 (Engeny 2022b). No tailings will be stored above RL222, so any failure would result in release of MAW only.
Groundwater Flow	Changes to the existing	1 - Minor	C - Possible	Low	No changes are expected to the existing groundwater flow regime.

Aspect	Risk Event	Consequence	Likelihood	Residual Risk	Justification and Control
(bore/aquifer yield and water levels)	flow regime (including baseflow) in Gunpowder Creek				The EPit is effectively watertight up to RL 222, with deep drainage limited by the parent material in the pit and the significant volume of consolidated tailings which is of low hydraulic conductivity.
Groundwater Quality	Reduction in groundwater quality resulting from increased seepage	1 - Minor	C - Possible	Low	The EPit is effectively watertight up to RL 222, with deep drainage limited by the parent material in the pit and the significant volume of consolidated tailings which is of low hydraulic conductivity.
Closure	Sink does not remain terminal sink post closure	3 – Moderate	D – Unlikely	Moderate	The EPit is modelled to remain a terminal sink, with the additional tailings deposition to RL 215.7 below the modelled pit lake equilibrium level of RL 217.6. The modelling has demonstrated a residual water cover will remain over the tailings beach post closure, preventing oxidation of tailings.

10. REFERENCES

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11. QUALIFICATIONS

(a) In preparing this document, including all relevant calculations and modelling, Engeny Australia Pty Ltd (Engeny) has exercised the degree of skill, care and diligence normally exercised by members of the engineering profession and has acted in accordance with accepted practices of engineering principles.

(b) Engeny has used reasonable endeavours to inform itself of the parameters and requirements of the project and has taken reasonable steps to ensure that the works and document is as accurate and comprehensive as possible given the information upon which it has been based including information that may have been provided or obtained by any third party or external sources which has not been independently verified.

(c) Engeny reserves the right to review and amend any aspect of the works performed including any opinions and recommendations from the works included or referred to in the works if:

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   (ii) Engeny considers it prudent to revise any aspect of the works in light of any information which becomes known to it after the date of submission.

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(g) This Report does not provide legal advice.