5 August 2024

TAILINGS STORAGE FACILITY (TSF) CELL 3

MT MORGANS GOLD PROJECT

WA

DESIGN REPORT

Genesis Minerals Ltd (GMD)

PER2023-0063AG Rev 1

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1 EXECUTIVE SUMMARY

This document presents the design details required by the Department of Mines, Industry, Regulation and Safety (DMIRS), Western Australia, to support approvals for the construction of a new TSF Cell 3 at the Mt Morgans Gold Project (MMGP), Western Australia. MMGP is located in the northeastern goldfields of Western Australia, situated about 27 km southwest of Laverton and about 730 km northeast of Perth.

The proposed TSF Cell 3 site will be located on Mining Tenements M39/1107, M39/282 and the eastern portion of M39/395. The centre of the TSF Cell 3 site will be located at 6,813,400 m North and 421,600 m East on Zone 51 of the MGA94 geodetic datum. The plant is located approximately 0.3 km south of the TSF at MMGP.

In order to provide ongoing tailings storage at MMGP, Genesis Minerals Ltd (GMD) proposes to raise the existing Tailings Storage Facility (TSF) Cells 1 and 2 and construct an additional Cell 3 abutting and to the west of Cell 1. A design report summarising the details required for the raising of TSF Cells 1 and 2 is presented in a separate document, CMW reference PER2023-0063AF Rev 0 dated 31 July 2024. TSF Cell 3 will be constructed to a crest RL418 m which will provide a storage capacity of approximately 6.2 Mt. This corresponds to an additional storage life of approximately 2 years and 1 month, assuming a production rate of 3.0 Mtpa and tailings in-situ density of 1.4 t/m³ (dry).

The new TSF Cell 3 will have a tailings impoundment area of approximately 50 ha at the final crest RL418 m.

The perimeter embankments of TSF Cell 3 will utilise downstream construction techniques. The downstream raising method will produce a robust structure. The embankment zoning will comprise an upstream (or inner) zone of compacted clayey borrow or mine waste (Zone 1, low permeability zone) and a downstream (or outer) zone of traffic compacted mine waste (Zone 2) which provides bulk/strength and buttresses the low permeability upstream zone.

Surface water will be removed from the TSF cells by a decant pump located within a decant tower. Return water will be pumped directly to the process plant for re-use. The water recovery system, pumps and piping must be designed for a minimum recovery of not less than 100% of the slurry water (8,200 tpd), including the additional capacity for storm events. The decant tower will be accessed by a causeway constructed of mine waste. TSF Cell 3 will also incorporate an underdrainage system that discharges to an external lined sump.

Embankment stability, embankment deformation, seepage, dam break and water balance analyses have been performed to support the design for a maximum crest embankment height of 19 m above the natural ground levels.

The facility is classified, in accordance with Tables 1 and 2 of the DMP (2013) code, as hazard rating 'Category 1 – Medium'. The ANCOLD (2019) consequence rating adopted in the design is 'High C'. A dam break assessment has been performed and the hazard rating is based on this assessment.

The closure objectives for TSF are to leave the facility in a safe, stable, erosion resistant and non-polluting state. These will be achieved through the following in the design:

- Downstream slopes of TSF southern and western perimeter embankments will be rehabilitated. The maximum slope angle will be approximately 18° or 1(V):3(H) with no intermediate benches.
- The decant and underdrainage structures will be decommissioned, and the areas 'sealed'.
- The tailings top surface will be covered with a layer of non-acid forming (NAF) clayey mine waste with a minimum thickness of 0.5 m.
- Topsoil to suit local flora species will be applied as part of the cover works.

GMD as the operator of the new TSF Cell 3 makes the following commitments:

- Construction work will be undertaken in accordance with the drawings and the respective Construction Specification, Scope of Work and Technical Specification (SoW) documents.

- Construction will be supervised and monitored by personnel with experience in this type of construction.
- The TSF will be continuously managed and operated in accordance with the existing operations manuals, with this manual being revised to incorporate Cell 3.
- Independent audits will be performed annually as a minimum.
- The existing groundwater monitoring program associated with TSF will be continued and expanded to include Cell 3.
- A detailed rehabilitation/decommissioning plan will be prepared prior to the decommissioning of the facility.

The following appendices complete this report:

- Appendix A – Tailings Storage Data Sheet (TSDS) and Explanatory Notes
- Appendix B – Drawings
- Appendix C – Scope of Works and Technical Specification Document
- Appendix D – Seepage, Stability and Deformation Analyses
- Appendix E – Dam Break Assessment
- Appendix F – Water Balance Analyses
- Appendix G – Addendum to Emergency Action Plan (EAP) + Trigger Action Response Plan (TARP)

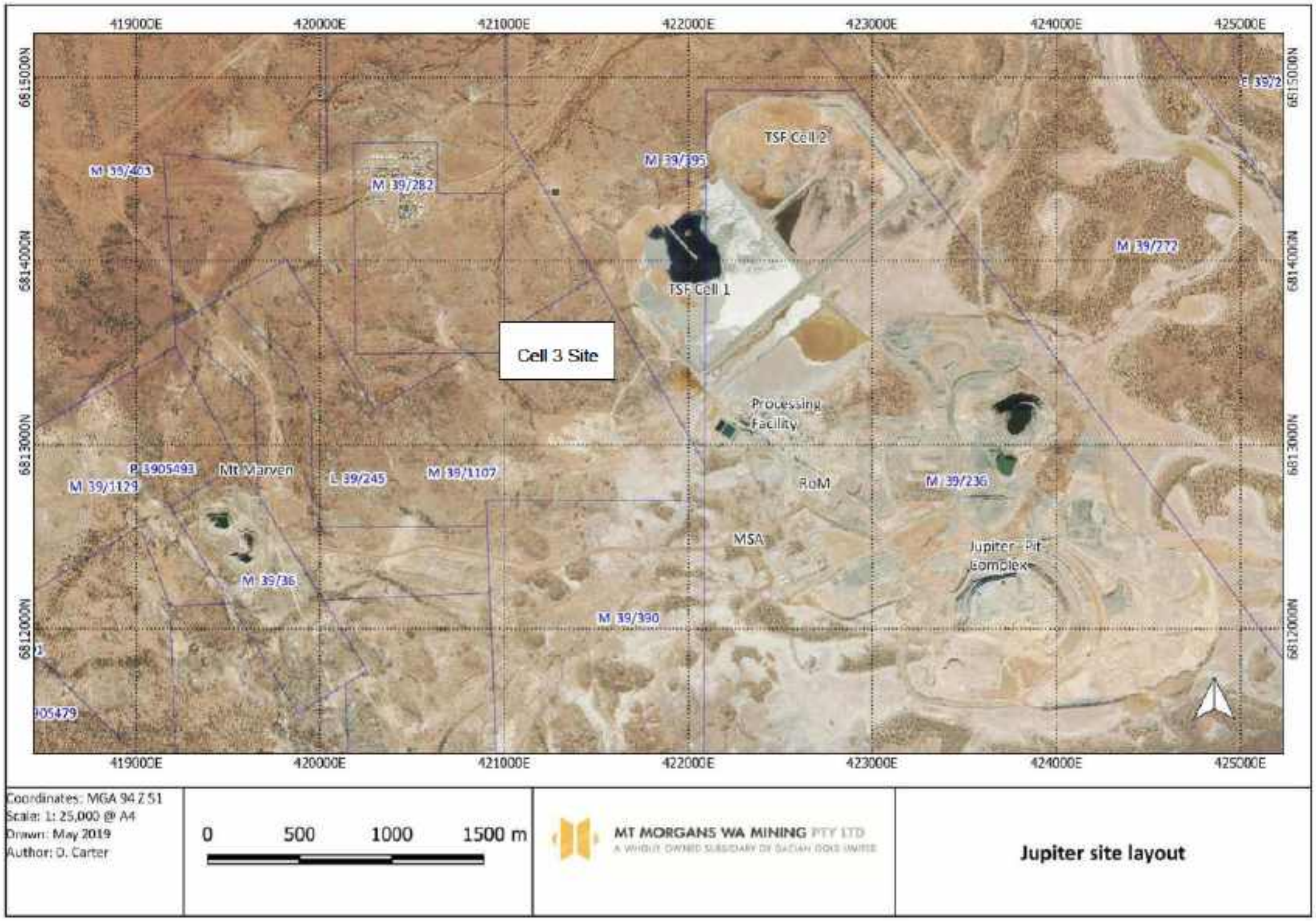

Figure 1: Site Plan

1.1 Tenure

The proposed TSF Cell 3 site will be located on Mining Tenements M39/1107 and M39/282 with the eastern portion on M39/395.

1.2 Location

The centre of proposed TSF Cell 3 site is located at 6,813,400 m North and 421,600 m East on Zone 51 of the MGA94 geodetic datum.

1.3 Ownership

Mt Morgans Gold Project (MMGP) is owned and operated by Genesis Minerals Ltd (GMD).

1.4 Plant Description and Operation

The ore is processed in a CIL plant. From the beginning of July 2022 to the time MMGP was placed on care and maintenance at the end of March 2023, a total of 2,061,201 dry tonnes of tailings were produced at 49.9% solids (on average). Historically, the TSF received tailings from the MMGP plant at a rate of 2.9 Mtpa to 3.0 Mtpa (dry).

1.5 History

A feasibility study into tailings storage at MMGP was conducted by ATC Williams in 2016. The feasibility design was utilised to obtain approvals in 2016/2017 (ref DWER licence (L9010/2016/1, dated 10 February 2017 to 9 February 2026). The stage levels and capacities that appear in the licence are from the 2016 feasibility study.

That feasibility level study was updated to a TSF Cells 1 and 2 design in a 2018 ATC design report 'Tailings Storage Facility, Design Report, 112393.03 R01 Rev 0', dated 7 May 2018, prepared for MMGP (ref: ATC (2018)).

2 TSF DESIGN CONSIDERATIONS

2.1 Introduction

Details contained in this report were compiled to DMIRS requirements and in accordance with the following guidelines:

- Department of Mines and Petroleum (2013), *'Code of practice: tailings storage facilities in Western Australia'*.
- Department of Mines and Petroleum (2015), *'Guide to the preparation of a design report for tailings storage facilities (TSFs)'*.

In addition to the DMIRS documents above, the design presented in this report has been undertaken using ANCOLD Guidelines (2019) *'Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure'*. The consequence category will determine the water management (e.g. freeboard and stormwater storage capacity required) and geotechnical embankment design requirements.

2.2 Storage Capacity

Factors that are considered in TSF design:

- Annual tailings production of 3.0 Mtpa
- Tailings density of 1.4 t/m^3 (dry)
- Tailings deposited at 45%-50% solids
- Tailings beach slope of 1.0%
- Minimum total freeboard of 0.7 m

Details of the storage characteristics are further discussed in Section 3.1.3.

2.3 Site Conditions

2.3.1 Climate

The project area has a semi-arid climate with hot summers and mild winters. The following data has been utilised in the design:

- Mean annual rainfall of 293 mm (Bureau of Meteorology (BOM) Laverton, Station 012305).
- Mean annual evaporation of approximately 2,800 mm (BOM Average Annual Pan Evaporation Map). 2,643 mm was recorded for BOM Kalgoorlie-Boulder Airport, Station 012038 by way of comparison.
- 1:100 years, 72-hour event, Annual Exceedance Probability (AEP) of 195 mm (BOM Design Rainfall for MMGP, ref GRM 2020a).
- Probable Maximum Precipitation (PMP) storm event, 3-hour duration of 550 mm (BOM (2002) '*The Estimation of Probable Maximum Precipitation in Australia: Generalised Short-Duration Method*').

2.3.2 Surface Topography

The topography in the area comprises low hills and ridges surrounded by flat alluvial floodplains. The floodplains drain to a flat salt-lake system (playa) which forms the northern extent of the Lake Carey playa.

Based on a survey dated 28 June 2023, provided by GMD to CMW, the surface elevation in the area ranges from approximately 399 m AHD in the playa to about 440 m AHD along the ridges and hills forming the northern boundary of the TSF.

At the proposed location of TSF Cell 3, the surface comprises surficial gravelly deposits on the ridges with sparse spinifex grass vegetation, interspersed by rock outcrops. To the south and east, the playa has no vegetation with a clayey surface and occasional areas of bare rock exposure. Trees up to 3 m high are present on sand islands in the playa and along the natural creek lines and on south and west facing valley sides.

2.3.3 Geology

2.3.3.1 Regional

MMGP is located within the northeastern Goldfields region of the Archean Yilgarn Craton. Primary rock types in this region include the mafic volcanics, mafic intrusives, minor ultramafics and metasediments, and a narrow band <100 m wide regionally continuous Banded Iron Formation (BIF). All rocks have undergone regional greenschist facies metamorphism (ATC 2018).

Superficial layers comprised of colluvium with evaporites, sand, clay and quartz and gypsum dunes in the low-lying areas at the eastern side of MMGP. Weathering of the underlying rock units extends to between 2 m and 60 m deep in the Jupiter Tenures.

2.3.3.2 Local

The Laverton 1: 100,000 series geological map (GSWA 1997) showed the TSF locale including the immediate Jupiter Tenures to be overlain by evaporites, sand and clay in playas, and pockets of quartz and gypsum dunes with minor silt and clay adjacent to playas. Underlying rock units and outcrops comprised meta-basalt with meta-dolerite, porphyritic in parts, and undivided, massive, equi-granular or porphyritic gabbro.

The local geology, as identified by the observation of the terrain during the site reconnaissance carried out by CMW (refer to Section 2.3.4), comprised soil layers across the proposed TSF Cell 3 area. The surficial layers were generally Gravelly SAND/Silty SAND/Sandy SILT in the more outcropping areas, with basalt cobbles floaters. These were underlain by highly to extremely weathered mafic igneous rock. The west side of the project area was predominantly Clayey SAND/SILT with gravels, overlying extremely weathered igneous rock.

2.3.4 Subsurface and Foundation

The subsurface and foundation profiles for the proposed location of TSF Cell 3 were established based on the geotechnical investigations carried out by CMW between 17 April to 21 April 2023, and 30 November to 2 December 2023 (CMW 2023b). The first investigation included seventeen (17) test pits with bulk sampling for laboratory testing that comprised materials characterisation tests, compaction tests, laboratory permeability and triaxial tests. The second investigation comprised eighteen (18) boreholes and in-situ permeability tests at six (6) locations.

The ground conditions encountered and inferred from the investigations were considered to be generally consistent with the published geology for the area and can be generalised according to the following subsurface sequence:

Silty/Clayey Gravelly SAND	fine to medium grained, subangular to subrounded; dark red-orange; silt and clay of low to no plasticity; gravel, fine to coarse, subangular to subrounded, ferruginous pisolites and nodules; trace roots. (Colluvium)
Sandy SILT/CLAY	low plasticity; dark red-orange/brown; sand fine to coarse grained, subangular to subrounded; locally with gravel, fine to coarse, subangular to subrounded, lithics; trace roots. (Extremely Weathered (EW) Meta-Basalt)
Clayey/Silty Sandy GRAVEL	fine to coarse, angular to subangular, lithics; red-green/brown; clay and silt of low to medium plasticity; sand fine to coarse grained, subangular to subrounded. (EW Meta-Basalt)
META-BASALT	very low to low strength, highly to extremely weathered (HW-EW), dark brown-red, massive to foliated, fine grained.

The distribution of these units is summarised in Table 1.

Table 1: Summary of Encountered Soil Stratigraphy

Description	Depth to base of layer (m below ground level, mbgl)		
	Minimum	Maximum	Average
Silty/Clayey Gravelly SAND	0.1	1.4	0.3
Sandy SILT/CLAY	0.1	1.0	0.5
Clayey/Silty Sandy GRAVEL	0.5	2.5 [5]	1.0
BASALT	0.7 [5]	15.0	> 15.0

Organic materials in the form of roots and rootlets were encountered within Silty/Clayey Gravelly SAND and Sandy SILT/CLAY layers from the surface to generally up to 0.4 m below ground level (mbgl).

2.3.4.1 Groundwater

Groundwater was encountered at approximately 2.2 mbgl and 1.9 mbgl (RL 396.8 m and RL 398.8 m) in two (2) of the seventeen (17) test pits, and 11.5 mbgl to 13 mbgl (RL 388.15 m to RL 396.05 m) in five (5) of the six (6) borehole locations during the recent geotechnical investigations (CWM 2023b). Another borehole location had inferred perched groundwater at approximately 0.5 mbgl (RL 398.4 m). It was noted that the two (2) test pits were located on the south of the proposed TSF Cell C site, near the playa.

2.3.4.2 Permeability

Laboratory permeability tests undertaken as part of the first geotechnical investigation (CMW 2023b) indicated in situ surficial soil permeabilities ranging between 3.5 x 10^{-9} and 5 x 10^{-9} m/s when, respectively, the Sandy SILT/CLAY and Silty/Clayey Gravelly SAND materials were compacted to 95% of maximum dry densities (Standard).

The in-situ permeability tests were undertaken inside the boreholes drilled during the second geotechnical investigation. The results indicated permeabilities of between 7.0 x 10^{-7} and 5.3 x 10^{-6} m/s within the upper 15 m, and 1.1 x 10^{-6} and 3.2 x 10^{-5} m/s within the upper 1 m of horizons.

2.3.5 Hydrology

The site lies within the Lake Carey catchment and the lake forms the most dominant hydrological feature near the site. The lakeshore proper is located approximately 2.5 km to the south of the Jupiter prospect [8] and is separated from the prospect by a banded iron formation ridge approximately 80 m high. All the watercourses and drainage lines in the vicinity of the project are ephemeral, however, flooding may occur during the summer months between January and March when high intensity rainfalls take place.

The results of surface water modelling indicate that the 100-year ARI flood level is approximately 0.5 m above the playa surface or approximately RL398 m. In a very extreme event the Lake Carey level could potentially rise to RL399 m (ref: GRM (2020)a).

Existing flood bunds have been constructed around the existing TSF Cells 1 and 2 to approximately RL398.5 m. Cell 3 has been sized such that it does not block catchment flows from the northwest and the southern embankment is aligned with the Southern TSF Cell 1 and 2 embankments adjacent to the playa lake.

2.3.6 Hydrogeology

Two hydro stratigraphic units were identified in the area namely (ref: GRM (2020)b):

- Fractured bedrock aquifer associated with the meta-basalt units.
- Aquitard clay units associated with the saprolite, saprock and saturated playa deposits.

The fractured bedrock aquifer is associated with discontinuities within the Meta-Basalt units, which underlies the saprolite and clay deposits. Borehole logs indicate that the Meta-Basalt is "weathered to very weathered" indicating that the fractures might be filled with clay with a suspected low hydraulic conductivity.

The fractured bedrock aquifer is considered a poor water resource because of the natural high groundwater salinity due to the proximity of the playa system.

Geotechnical investigations carried out as part of the TSF design (ref: ATC (2018)) indicated that the saturated playa deposits have a very low hydraulic conductivity of about 2.6×10^{-8} m/s (0.002 m/d). The assessment also indicated that the saprolite comprises clay, hence the hydraulic conductivity of the saprolite is also likely to be low at about 0.01 m/d. The thickness of the aquitard varies between 13 m at TSF MB1 to 3 m at TSF MB3.

Prior to tailings deposition, groundwater flowed in a south-easterly direction towards the playa lake, which is a groundwater sink.

Seepage was noted adjacent to discrete locations adjacent to the southwest corner of Cell 1 and along the southern embankment of Cell 1 in 2019. More recently minor seepage was noted adjacent to the eastern side of Cell 2. In response to this seepage, GRM was engaged to conduct hydrogeological assessments and compile a groundwater management plan (ref: GRM (2020)b). The groundwater management plan outlines trigger levels and groundwater management responses including recovery bores. The plan also outlines ongoing monitoring, responsibilities, reporting and review of the plan.

2.3.7 Seismicity

The project area is located in a region of low seismic risk. The Operating Basis Earthquake (OBE) of 0.06 g, as derived from AS 1170.4 (2007) for 1:475 years AEP of the 'High C' consequence category (refer Section 3.1.1), has been used in the seismic design of the TSF embankments. The corresponding Safety Evaluation Earthquake (SEE) is 0.10 g for 1:2,000 years AEP with a probability factor k_p of 1.7.

2.4 Retaining Structure Properties

The TSF Cell 3 embankments will be constructed from mine waste sourced from the mining operations and existing waste dumps at MMGP. The embankment will be zoned with an upstream zone of low-permeable clayey borrow/mine waste and a downstream zone of general mine waste materials.

The upstream low-permeable materials will be sourced from selected clayey mine waste or dried tailings materials from within the cells utilised when clayey waste is not available.

Appendices C provides the technical specifications for the embankment construction materials.

2.5 Tailings Properties

2.5.1 Tailings Testwork

Tailings testwork was performed as part of the original design work in 2016 (ref: ATC (2018)). It was performed on a submitted sample of tailings, and included Atterberg Limits, PSD with Hydrometer, soil particle density, segregation threshold, initial settled density, permeability, and shrinkage limit density.

The tailings properties were further reviewed for TFS Cell 1 embankment raise design review using test pits, Dynamic Cone Penetrometer (DCP), and Cone Penetration Tests (CPT) at five (5) locations on TSF Cell 1 in May 2020 (CMW 2020). These were followed by tailings testwork in January 2022 as part of the Cell 2 Stage 2 embankment raise construction (CMW 2022), which comprised of materials characterisation and compaction tests on the deposited tailings (dry) in TSF Cell 2, sampled within the upper 2 m of horizon.

As part of the current TSF design work, six (6) CPT with pore water pressure dissipation tests and bulk sampling of the near-surface tailings have been carried out (CMW 2023b). The samples were tested in NATA-accredited laboratories for materials characterisation, compaction, permeability and triaxial tests.

2.5.2 Geotechnical Characteristics

The following summarises the test results of tailings testwork in 2016:

- The sample was a Sandy SILT with 64% fines (material passing 75 micron size).
- The fines were low plasticity, with a Plasticity Index (PI) of 1%.
- Solids SG 2.87.
- Solids concentration of approximately 50% with low to moderate salinity.
- pH of 8.1 similar to that of the site water.
- Permeability (K) of approximately 10^{-7} m/s.
- Maximum dry density (Standard, SMDD) of between 1.78 t/m^3 and 1.89 t/m^3 with optimum moisture contents (OMC) of between 14% and 15.5%.
- Effective friction angle (ϕ') of 37° and effective cohesion (c') of 4 kPa as derived from multi-stage consolidated undrained (CU) Triaxial tests.
- The settling tests indicated the tailings settlement was relatively rapid with:
  - An initial settled density of 1.22 t/m^3 (dry)
  - A Shrinkage Limit Density of 1.69 t/m^3 (dry)

Further tailings testwork was completed by CMW in 2020 (ref: CMW (2020)) on the tailings beach 30 m away from the embankment to confirm material parameters and saturation of the tailings. CPeT and CLiq analyses of the CPTu data were conducted to update and confirm tailings strength parameters. Based on these assessments, a friction angle of 25^0 and a Su/σ_v of 0.25 were used for the deposited tailings in stability assessments. A conservative liquefied tailings undrained cohesion of 0.04 σ_v was derived (vertical stress ratio ranges from 0.03 to 0.5, with an average of 0.2).

The tailings testwork as part of the TSF Design in 2023 (ref CMW (2023)) was carried out on the tailings beach 10-30 m away from the perimeter embankments in TSF Cell 1. Along with the in-situ CPT, the laboratory test results were used to derive the following geotechnical characteristics:

- The tailings were non-plastic Sandy SILT with approximately 36% to 60% fines content and PI of 0%.
- SMDD of between 1.84 t/m^3 and 1.89 t/m^3 with OMC of between 14.5% and 15%.
- ϕ' of 32^0 to 38° and c' of 15 kPa.
- Void ratio of approximately 0.8 between 3 mbgl and 7 mbgl, and 0.7 beneath that.
- K of generally between 1 x 10^{-5} m/s to 1 x 10^{-6} m/s, which was slightly higher at 1 x 10^{-4} m/s within the upper 1 m of less consolidated layer. K was approximately 4.5 x 10^{-9} m/s to 4.8 x 10^{-9} m/s when compacted to 95% of SMDD.
- Su/σ_v of approximately 0.1 within the upper 3 m of horizon, and 0.6 below it.
- A coefficient of consolidation (C_v) of 0.17 cm^2/s, or approximately 540 m^2/yr, at t_{90}.
- Emerson Class 4 indicating materials that do not disperse in water.

2.5.3 Liquefaction Potential

Based on the CPT probing in 2023 (ref: CMW (2023)b), CMW has completed an initial screening for static/flow liquefaction using a CPT-based approach and critical state soil mechanics to estimate the state parameters (ψ) from the CPeT-IT program.

The average 'ψ' values were -0.02 within the upper 3 m of tailings and -0.1 below that. Jefferies and Been (2006) suggested that soils with a state parameter less than -0.05 are dilative at large strains. As the contractive layers were concentrated in the upper 3 m of tailings, above the interpreted phreatic levels of between 3.1 m to 3.6 below the top of tailings, it is considered that the static liquefaction risk resulting in a major embankment failure is low. However, it is imperative that proper tailings deposition and water return controls are in place, and the size of decant pond is kept to the minimum during cell operation to prevent inundation of the statically liquefiable tailings zone and to allow for the proper consolidation and drying out of tailings.

The cyclic liquefaction assessment had been conducted utilising the CLiq program. The assessment for the deposited tailings was undertaken by comparing the cyclic stress ratio (CSR) induced by earthquake activity with the cyclic resistance ratio (CRR) of the soil profile. The CSR was calculated using a design peak ground acceleration (PGA) of 0.1 g, as determined from AS1170.4 based on the requirements for the Safety Evaluation Earthquake (SEE) in the ANCOLD (2019) guidelines. The CRR was calculated using the CPT data.

The assessment in CLiq indicated that the existing deposited tailings would be categorised as having a low risk of liquefaction with estimated liquefaction potential indexes (LPI) of 0, and the factors of safety against liquefaction during an earthquake of generally >2.0 with cyclic resistance ratio (CRR) of 0.2 rising to 0.5 at approximately 12 m deep, near the bottom of the basin, and cyclic stress ratio (CSR) of approximately 0.08.

2.5.4 Geochemical Characterisation

MBS Environmental conducted geochemical characterisation testing in 2016 on tailings generated from samples of ore from Heffernans, Beresford, Allanson and Doublejay (MBS 2016).

The results of the testing indicated that the tailings samples were non-acid forming (NAF), however, samples from Allanson underground were PAF. It was noted that these samples represent nominally 7% of the ore feed (2016 mine plan). Overall the tailings were expected to be NAF. The testing indicated that the decant water would be alkaline and saline, but with a salinity less than that of the groundwater at the TSF site.

The tailings from various ore future sources should be geochemically assessed.

3 TAILINGS STORAGE FACILITY DESIGN

3.1 Introduction

The design objectives for this facility are:

- Optimising the removal of water from the facility and return to the plant for re-use in processing, which will assist in maximising the in situ dry density of the deposited tailings.
- Optimising tailings storage capacity by maximising the deposited tailings density (i.e. undertaking cyclic tailings deposition between different locations of spigot) and reducing tailings drying time.
- Sequential operation of TSF Cells 1, 2 and 3 in order to achieve optimum tailings rate of rise and thus in situ densities.
- Reducing environmental impact by maximising water recovery and minimising the potential for seepage losses.

Drawings PER2023-0063AG-01 to PER2023-0063AG-06 provide the general arrangements, and sections and details for the TSF designs (refer to Appendix B). Scope of Works and Technical Specification Document (SoW) including the schedule of quantities for the construction of TSF Cell 3 is included in Appendix C.

3.1.1 Hazard / Consequence Rating

Based on the DMP Code of Practice (2013), the hazard rating for TSF has been assessed as 'Category 1 – Medium', respectively, based on the following:

- Loss of life is possible but not expected. For the purposes of design, the Population at Risk (PAR) is ≥10 and <100 associated with the location of the plant and associated infrastructure 0.3 km to the south of the TSF.
- Adverse health effects are possible due to potential for human exposure and contamination of the environment.
- Loss of TSF storage capacity, and temporary loss of assets including infrastructure. No loss of public infrastructure is expected.
- Limited potential to damage to environment, heritage, or historical value.
- Ultimate embankment heights of approximately 19 m for TSF Cell 3.

Based on the above considerations and Table 1 of ANCOLD (2019), a 'Medium' damage is assigned. It is characterised by loss of infrastructure of the order $10M to $100M, significant impacts to business (i.e. the process plant), impact area of 5 km^2 or less, and impact duration of less than 5 years. The consequence category for 'Medium' damage with a PAR of ≥10 to <100 is 'High C'.

3.1.2 Drawings

The following drawings are presented in Appendix B.

Table 2: Drawings	
Test	**Drawing No.**
General Arrangement Plan	PER2023-0063AG-01
Cell 3 Plan	PER2023-0063AG-02
Section & Details	PER2023-0063AG-03
Underdrainage and Instrumentation Plan	PER2023-0063AG-04
Underdrainage Details	PER2023-0063AG-05
Instrumentation Details	PER2023-0063AG-06

3.1.3 TSF Storage Characteristics

TSF Cell 3 (new cell) has been designed with a storage volume of 4.4 million m^3 (Mm^3). The storage capacity will be 6.2 Mt for approximately 2.1-years life assuming an ore processing rate of 3.0 Mtpa, a tailing in situ density of 1.4 t/m^3 (dry), a beach slope of 1% and a minimum embankment freeboard of 0.5 m.

The estimated stage-by-stage impoundment areas, footprint areas, storage volumes, storage capacities, and storage life of TSF Cell 3 at MMGP are summarised in Table 3.

Table 3: TSF Storage Characteristics						
Stage	**Crest RL (m AHD)**	**Impoundment Area (ha)**	**Storage Capacity (Mm^3)**	**Storage Capacity (Mt)**	**Cumulative Storage Capacity (Mt)**	**Cumulative Storage Life (years)**
Cell 3	418	50	4.4	6.2	13.8	4.6

The storage capacity curve of TSF Cell C, plotting the storage volume against the rise in RL, is shown by Figure 2.

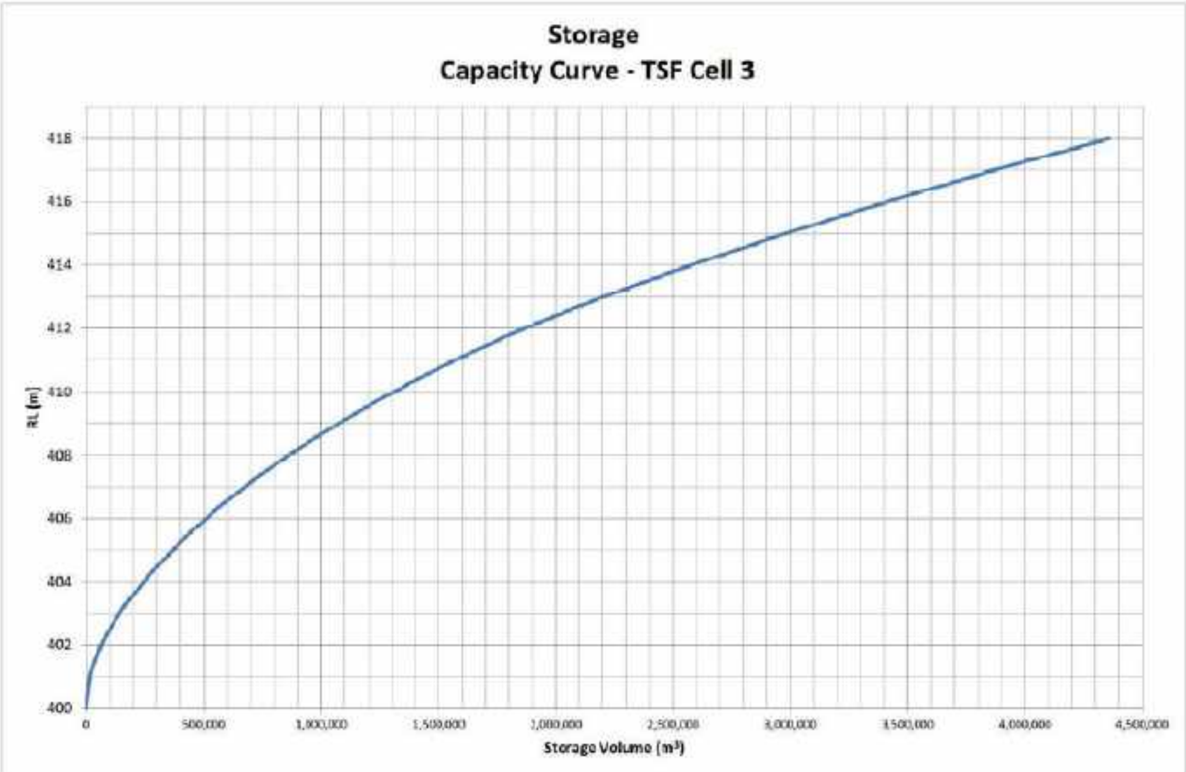

Figure 2: Storage Capacity Curve – TSF Cell 3

3.1.4 Embankment Design

The perimeter embankments of TSF Cell 3 will utilise downstream construction techniques. The downstream raising method will produce a robust structure. The embankment zoning comprises:

- An upstream (or inner) zone of compacted clayey borrow or mine waste (Zone 1) which will be a low permeability zone.
- A downstream (or outer) zone of traffic compacted mine waste (Zone 2) which provides bulk/strength and buttresses the low permeability upstream zone.

The embankment incorporates a cut-off trench excavated to a nominal depth of 1.5 m within the underlying weathered Meta-Basalt in order to reduce seepage losses.

The typical cross section of the TSF Cell 3 embankments is shown in Figure 3.

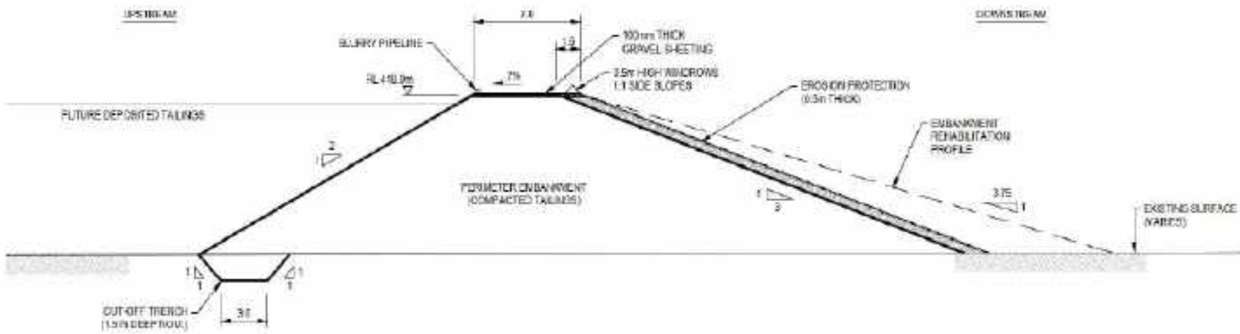

Figure 3: Typical Cross Section of TSF Cell 3 Perimeter Embankment

3.3.4 Embankment Geometry

The TSF embankments have minimum design slopes of 1(V):2(H) on the upstream and 1(V):3(H) downstream, with a typical crest width of 7 m wide. The compacted upstream zone (low-permeable clayey borrow or mine waste) will be a minimum of 5 m.

Equipment used to carry out construction and maintenance will be selected to suit the embankment dimensions. The upstream embankment crest will have a 2% cross-fall towards the upstream side, 1 m (min.) high mine waste windrow at the downstream crest, and above ground tailings pipeline at the upstream crest.

A seepage collection system in the form of underdrainage has been included as part of the design for the new Cell 3, noting a similar system has been adopted for Cells 1 and 2. It will comprise an underdrainage line grading to an outfall pipe, which drains into a sump downstream of Cell 3. The underdrainage line will extend approximately 0.8 km on the basin of Cell 3 adjacent to the upstream toe of the embankment. The outfall pipe will be placed inside a backfilled trench approximately 100 m long, 1 m wide and 1 m deep underneath the south embankment where the lowest natural topography is located.

The design geometry of the proposed TSF Embankment construction is presented on Drawings PER2023-0063AG-01 to PER2023-0063AG-03 in Appendix B.

3.1.5 Water Recovery System

Surface water will be removed from each cell of the TSF by a decant pump deployed within a central decant structure in each cell. Return water will be pumped directly to the process plant for re-use. The water recovery system, pumps and piping must be designed for a minimum recovery of not less than 100% of the slurry water, including the additional capacity for storm events (8,200 tpd for a tailings production of 3 Mtpa at 50% solids).

The decant accessways have design slopes of 1(V):1.5(H) and 7 m crest width. The accessways will be constructed using traffic compacted mine waste and sheeted with 0.1 m (nom.) wearing course sheeting. The crests will have 0.5 m (min.) high rock/mine windrows on both sides, with breaks in the windrow on the low side to allow surface water to run off.

3.2 Modelling and Design Studies

3.2.1 Structural Stability

3.2.1.1 Method of Analysis

Stability analyses were undertaken to assess the stability of TSF Cell 3 at the embankment crest levels of RL418 m. This is equivalent to a maximum embankment height of approximately 19 m. The analyses were undertaken in general accordance with ANCOLD (2019).

The computer software package 'Slide' was utilised to undertake the analyses. Slide is a two-dimensional slope stability program for evaluating the safety factor of circular and non-circular failure surfaces in soil and rock slopes. The stability of the slip surfaces for static and seismic loadings was assessed using vertical slice limit equilibrium methods. The Simplified Bishop, Simplified Janbu and GLE/Morgenstern-Price methods were used in the analyses of non-circular slip with a potential loss of containment failure.

The design earthquake loads for the TSF Cell 3 embankment (Safety Evaluation Earthquake, SEE (previously Maximum Design Earthquake or MDE), Operational Basis Earthquake, OBE and Maximum Credible Earthquake, MCE) were determined by consideration of the consequence category of the tailings storage and are selected as earthquakes with given AEP. ANCOLD (2019) gives guidance in selecting the AEP of the OBE and SEE, and in calculating the MCE. This guidance considers 'defensive' earthquake design through the use of TSF principles.

Since the TSF is required by ANCOLD (2019) to be designed with a 'High C' consequence category storage due to a PAR of ≥1 to <10, the OBE is 1:475 years AEP and SEE is 1:2,000 years AEP.

Stability analyses were performed for Cell 3. The following cases were examined in the stability analyses:

Case 1: Static Analysis – Long-term downstream failure of TSF embankments with drained condition based on limit equilibrium method.

Case 2: Static Analysis – Short-term downstream failure of TSF embankments with undrained condition based on limit equilibrium method.

Case 3*: Pseudo-Static Earthquake Case – As for Case 1, but under seismic loading of PGA of 0.06 g (OBE) corresponds to 1:475 year AEP.

Case 4*: Pseudo-Static Earthquake Case – As for Case 1, but under seismic loading of PGA of 0.12 g (SEE) corresponds to 1:2,000 year AEP.

Case 5: Post-Seismic Analysis – As for Case 2 utilising post-seismic strength parameters. Strength parameters in general were reduced by 20% for embankment materials and tailings are assumed to have liquefied (post liquefaction Su/σ_v).

* ANCOLD (2019) requires deformation analysis and this is presented in Section 3.2.1.4. Analyses of Case 3 and Case 4 are presented for screening/completeness.

Although the liquefaction assessment indicated a general risk category of 'low' for the MDE, post-seismic stability is made to account for tailings liquefaction based on the concept of MCE at the post-closure stage.

The phreatic surface adopted in all cases was based on the seepage analyses which considered the scenario with a maximum pond level of 0.7 m below the crest levels, and where the phreatic level extends to the embankment toe (worst-case).

3.2.1.2 Parameters

The stability analyses of the embankment were carried out using the effective stress condition (c', Ø') with pore pressure derived from the seepage analyses. The effective strength parameters were derived based on the results of the recent geotechnical investigation by CMW (ref: CMW (2023b)) and the subsequent laboratory test results, plus the information from the previous investigations (ref: ATC (2018) and CMW (2020)) and past experience with similar materials. Table 4 provides a summary of the strength parameters used in the stability analyses.

Table 4: Summary of Strength Parameters [1]

Material Type	γ (kN/m^3)	Effective Strength		Undrained Strength	Post-Seismic Strength	
		c' (kPa)	φ' (0)	S_u (kPa)	c_u (kPa)	ϕ_u (°)
Embankment – Clayey SAND/Sandy CLAY	20	0	34	0.32 σ_v	0	27
Embankment – General FILL	20	0	35	-	0	28
Embankment – Filter Gravelly SAND	20	0	45	-	0	36
Embankment – Mine Waste Rock	22	0	40	-	0	32

Table 4: Summary of Strength Parameters [1]

Material Type	Υ (kN/m^3)	Effective Strength		Undrained Strength	Post-Seismic Strength	
		c' (kPa)	ϕ' (0)	S_u (kPa)	c_u (kPa)	ϕ_u (^{0})
Embankment – Rock Cladding	22	0	35	-	0	28
Embankment – Compacted DRIED TAILINGS or CLAYEY BORROW/MINE WASTE	18.5	10	34	100	80	-
Silty/Clayey Gravelly SAND	18	0	34	-	0	27
Sandy SILT/CLAY	17	15	30	40	32	-
Clayey/Silty Sandy GRAVEL	19.5	0	36	-	0	29
BASALT (EW)	19	0	38	100	80	-
BASALT (HW)	20	0	40	230	185	-
TAILINGS (Deposited; Upper 3 m)	16	0	32	$0.1\ \sigma_v$	$0.07\ \sigma_v$ [2]	-
TAILINGS (Deposited; Below 3 mbgl)	18	5	36	$0.6\ \sigma_v$	$0.1\ \sigma_v$ [2]	-

Notes:

1. Υ – soil unit weight; c'- cohesion; φ' - angle of internal soil friction; c_u – cohesion (undrained); φ_u - angle of internal soil friction (undrained).
2. Vertical stress ratio S_u/σ_v as determined by the post-liquefaction assessment (CMW 2023b).

3.2.1.3 Results of Stability Analyses

The results of the stability analyses are summarised in Table 5 and the Slide calculation printouts are presented in Appendix D.

Table 5: Results of Stability Analyses

Case	Factor of Safety (FoS)	Recommended Minimum FoS as per ANCOLD (2019)
	Cell 3	
1	1.93	1.5
2	1.89	1.5
3	1.57	>1.0
4	1.31	>1.0
5	1.56	1.0 – 1.2

The results of the stability analyses indicate that all the cases examined had adequate factors of safety when compared with the recommended minimum factors of safety in ANCOLD (2019).

3.2.1.4 Deformation Analyses

A preliminary assessment of embankment deformation due to an earthquake was estimated using the Swaisgood (2003) method. This method utilises an empirical formula based on observed crest settlement resulting from analysed 'real' earthquakes, with no liquefaction of foundation and embankment materials.

The permanent displacements and settlements expected for 19 m (max.) high embankments were estimated under a magnitude 6.9 earthquake, corresponding with a PGA loading of 0.1 g for 1:2,000 years AEP for the SEE event. The parameters were conservatively derived based on respectively the maximum earthquake magnitude on land recorded in Western Australia (Meckering) as gathered by Geoscience Australia, and the intensity measure as outlined in AS 1170.4 (2007). The nearest earthquake to the TSF site was a magnitude of 2.8 recorded approximately 1.5 km to the east in 2019.

From the analysis, it is concluded that for the highest embankment section of approximately 19 m high, the deformations due to an SEE (MDE) event are likely to be in the order of 6 mm. Such deformation is insignificant when compared with a minimum total freeboard of 0.7 m.

3.2.1.5 General Comments in Respect to Stability

TSF Cell 3 is a robust structure and the factors of safety, which are presented in Table 5, are above the minimum requirements under worst-case conditions. The design concept provides for 'defensive' earthquake design as called for in ANCOLD (2019).

Stability is significantly influenced by the position of the phreatic surface within the deposited tailings and confining embankment. The seepage analyses have considered the 'worst-case' phreatic surface allowed in design. Under normal operating conditions with a lower phreatic surface, the factors of safety will be higher than those summarised in Table 5. Operation of the underdrainage system has an important role in reducing the phreatic surface within the embankment, therefore this should be regularly monitored.

The TSF has been designed to provide temporary water storage following extreme storm events. If water does extend to the embankment, which is considered very unlikely, it is anticipated this will be a temporary occurrence given continuous water removal from the TSF. The tailings storage should be operated in such a manner as to ensure that the `normal' supernatant pond is kept well away (≥100 m) from the embankment at all times.

3.2.2 Design Acceptance Criteria

The design of TSF is based on the ANCOLD Guidelines (2019) *'Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure'*. The consequence category will determine the water management (e.g. freeboard and stormwater storage capacity required) and geotechnical embankment design requirements. Classification of TSF, at its ultimate height, approximately 20 m, in accordance with Tables 1 and 2 of the DMP (2013) code results in a hazard rating of 'Category 1 – Medium', respectively (refer to Section 3.1.1). The ANCOLD (2019) consequence rating is 'High C' (refer to Tables 1 and 2 of ANCOLD (2019).

Embankment Design analysis should consider:

Operations Phase

- Operating Basis Earthquake (OBE) is 1 in 475 years annual exceedance probability (AEP).
- Safety Evaluation Earthquake (SEE) (previously MDE) is 1 in 2,000 years AEP.

Post Closure

- Maximum credible earthquake (MCE).

Freeboard and Water Management in accordance with ANCOLD guidelines (2019):

- Maximum credible earthquake (MCE).

- Storage of 1:100 years AEP event of 72-hour duration, plus an allowance for wave run-up for 1:10 AEP and 0.5 m of additional freeboard.
- No spillway will be required during operations. Stormwater during operations will be largely reused in the process plant over several weeks to months. Stormwater from large storm events (current PMP of 550 mm) at closure will be primarily disposed of on top-surface of TSF by evaporation, although a spillway may potentially be required. The requirement for a spillway must be reviewed as part of the closure planning.
- Minimum frequency of inspections of TSF in accordance with DMIRS guidelines.
- Embankment monitoring will be performed during the operation of TSF. Monitoring will include:
  - Monitoring bores and piezometers to monitor water levels.
  - Settlement pins to allow monitoring of embankment movement.
  - Level and movement triggers will be detailed in a trigger action response plan (TARP). The TARP will inform actions to be taken for different alert levels. Alert levels will be based on the degree of movement etc.

3.2.3 Dam Break Assessment

A dam break assessment and a review of the previous assessment (ref: ATC (2018)) have been conducted as part of this study.

Based on the assumptions that a breach would likely commence at the starter embankment crest elevation and the slurry being dilute, the previous assessment indicated that tailings would not travel far beyond the tenement boundaries. It estimated a flow of approximately 1.5 m above an assumed process plant platform elevation of RL401.5 m which, however, would not impact the adjacent Double Jay and Heffernans open pits.

3.2.3.1 Volume Released

If a TSF embankment breach is to occur, tailings would only be partially released from the storage impoundment, as the majority of the tailings beaches would have dried back. In addition, remobilised tailings will behave as a thickened slurry, with some shear strength and therefore will not be as free flowing as water, which has no shear strength.

The worst-case probable maximum precipitation (PMP) rainy day failure conditions were based on the following:

- The storage capacity of TSF Cell 3 at the maximum crest RL418 m is estimated at 4.4 m^3.
- PMP storm volume is estimated at nominal 275,000 m^3. This was based on a 3-hour PMP rainfall depth of 550 mm over a TSF catchment of 50 ha at crest RL418 m plus an assumed upstream catchment of 10 ha.
- The tailings failure volume likely to be released from the TSF at the maximum height of 19 m, in the event of an embankment failure under PMP rainy day conditions, would be of the order 1.31 Mm^3 i.e. approximately 33 % of the impounded storage capacity plus the PMP storm volume.
- Based on T. MacDonald and J. Langridge - Monopolis (1984), embankment breaches typically occur relatively quickly (typically 1 hour to 4 hours). Based on this methodology, it is estimated that the breach will occur over at least 1 hour.

The calculation of breach characteristics is included in Appendix E.

The Rourke and Luppnow Method (ref: H. Rourke, D. Luppnow, 2015) for estimating volume released from the TSF was utilised to assess potential stored volume release. This method is based on a relation between the potential volume released from a TSF and the size of the decant pond. The greater the ratio of the pond area to the total area, the greater the ratio of release volume to stored volume. Table 5 presents a summary of case data used in the analyses taken from Table 6 of the referenced paper.

Table 6: Summary of Dam Break Case Study Data (ref: H Rourke, D Luppnow, 2015)				
Name	Impoundment Storage Volume (Mm^3)	Release Volume (m^3)	Release Volume relative to Stored Volume (%)	Pool Area relative to Total Area (%)
Merriespruit	7.0	0.6	9	14
Bafokeng	13.0	3.0	23	30
Mount Polley	50.0	24.4	49	72
Kolontar	1.2	0.7	58	88
Stava	0.3	0.2	67	100

It was noted from Rourke and Luppnow analysis of past tailings storage facility (TSF) failures, that the release volume varies between 9% and 67% of stored volume. The 33% of TSF volume plus a PMP event, or approximately 1.31 Mm^3 scenario represents a likely maximum release from relatively low embankment height TSF in a semi-arid region such as the Goldfields Region of WA (i.e. the water pond should not be this large as the water balance is a negative water gain and water should not accumulate on the facility).

The Rourke and Luppnow Method demonstrates that in order to mitigate the consequence of a dam break, the pond volume and area should be minimised by the adoption of good operating practices.

3.2.3.2 Breach Characteristics

Breach characteristics for breaches from the TSF due to a dam break were assessed utilising published empirical (algebraic) methods. These methods are based on studies of past failures to provide relationships between release volume, breach development time and peak flow; and dam height and dam factor (height x stored volume).

For TSF failure, the method of M. Rico, G. Beniti, G. Diez-Herrero (2008) was utilised to estimate peak flow. This study was based on examining historic tailings dam failures. The peak flows estimated by M. Rico, G. Beniti, G. Diez-Herrero (2008) are skewed with the peak occurring quickly (i.e. less than the breach development time). For comparison, if a triangular hydrograph is assumed, the flow peak is not skewed and the peak is 'normally' distributed.

Table 7 summarises the beach development time and estimated peak flows from a dam break utilising various methods.

Table 7: Results of Dam Break Analyses					
Cell	Scenario	Peak Flow (m^3/s) M. Rico, G. Beniti, G. Diez-Herrero 2008 [1]	Peak Flow (m^3/s) triangular hydrograph [2]	Approx. Breach Development time (hrs)	Flood Volume (m^3)
3	Sunny Day	1,137	576	1	1,037,100
	Worst-Case	1,255	729	1	1,312,100
Notes: 1. Upper bound. 2. Lower bound.					

3.2.3.3 Energy Methods

The sunny day case was examined by assessing a dam break using energy methods as referenced in K. D. Seddon (2010) and estimated tailings run-out distance. The method presented in the paper assumes the tailings and the embankment liquefy and move as a block downstream.

The height of the block was assumed to be 19 m and the run-out distance a function of the residual shear strength and material density. For a residual shear strengths of 4 kPa and 7 kPa, the run-out distances of Cell 3 were estimated to be 0.55 km and 0.3 km, respectively. The estimated extent of inundation due to a dam break is illustrated by drawing PER2023-0063AG-07 in Appendix E.

Based on the analyses performed, the tailings from a dam break at TSF Cell 3 could potentially inundate the process plant, located approximately 0.3 km to the east of Cell 3.

The calculations of the run-out distances are presented in Appendix E.

3.2.3.4 Hydraulic Modelling

The result from breach modelling indicates that the maximum (peak) run-out flow from a 'dam break' under 'worst-case' (PMP) rainy day conditions will be approximately 1,137 to 1,255 m^3/s for Cell 3 over 1 hour.

As drainage at the TSF location is dominated by the natural creek lines to the west of TSF Cell 3, and the playa of Lake Carey to the south, the flow in the project area is expected to be concentrated within the playa, reducing in volume and velocity as it travels.

Flows in Table 7 were estimated to be approximately 100-200 m wide, with a maximum flow depth of approximately 1.6-2.4 m for TSF Cell 3. Flow towards the process plant is considered likely due to the short distances between the two facilities. Flow towards the open pits is considered unlikely due to the elevations of their rims plus diversion bunds around them. Refer to the preliminary inundation plan in the Drawings (Appendix B).

The following consequences of a dam break are considered most likely:

- A major dam break from TSF Cell 3 could inundate the process plant, which is located at approximately 0.3 km to the east and south of the facilities, respectively. There is potential for loss of life due to the presence of infrastructure near and around the TSF including access roads. For the purposes of design and stability analyses etc. a consequence category of 'High C' in accordance with ANCOLD (2019), with the Population at Risk (PAR) estimated at ≥10 and <100, has been used.
- No public infrastructure is likely to be affected.
- Loss of TSF storage capacity, and economic loss from plant shutdown and temporary loss of assets, repairs of damaged sections of the TSF, damage to adjacent access roads.
- Significant environmental impact with the contamination of Lake Carey, requiring environmental 'clean-up'.

3.2.3.5 Controls

The conditions for TSF embankment failure to occur would be driven largely by the embankment mass and crest width adopted, the size and extent of the decant pond on the facility, and the magnitude of a trigger seismic event, embankment deformation, the grading of the tailings and saturation of the tailings adjacent to the embankment. Effective management of the decant pond to ensure excess water is continually removed from TSF, will minimise the risk of a perimeter embankment breach and release of saturated tailings.

TSF embankment failure is not expected provided the facility is operated in accordance with the requirements set out in the existing TSF Operations Manual.

The water recovery system, pumps and piping must be designed for a minimum recovery of not less than 8,200 tpd for 100% slurry water inflow including the additional capacity needed to recover water from design storm events.

In the event that the TSF is in imminent danger of failure and breach, the Emergency Action Plan (EAP), outlined in the existing Operations Manual, would need to be enacted.

3.2.4 Erosion Control

The embankment has been designed with a downstream slope of a minimum of 18° or 1(V):3(H). The downstream slopes constructed at this angle with mine waste capping should be resistant to erosion. Further assessments may be required during construction on the erodibility of the materials to be included in the downstream batters of the TSF.

3.2.5 Seepage Analyses

3.2.5.1 Method of Analyses

Seepage analyses were undertaken to estimate the position of the phreatic surface for the embankment design at the maximum crest levels of RL418 m (i.e. at the 19 m embankment height for TSF Cell 3). The analyses were undertaken using the groundwater module of the 'Slide' software package. Slide uses a 2D finite element analysis to determine groundwater seepage for saturated, steady-state flow conditions. It should be noted that 2D modelling is a simplified approach, which does not consider 3D effects (e.g. seepage flow through geological structures such as joints).

3.2.5.2 Model Assumptions

The upstream boundary condition used in the analyses was determined based on a maximum water pond level of 0.7 m below the crest levels of RL418 m. Models have been based on normal operating conditions where the decant pond is maintained well away (≥100 m) from the embankment.

The downstream boundary condition was assumed based on the groundwater located at the ground surface level at the downstream toe of the embankment.

The material permeabilities used in the seepage analyses are based on values derived from CMW site geotechnical investigation and materials laboratory testing supplemented with assumed textbook values, appropriate to the materials. Table 8 provides a summary of the permeability used in the analyses.

Table 8: Permeability Values Adopted

Material Type	Permeability, K (m/s)
Embankment – Clayey SAND/Sandy CLAY	2.6×10^{-8}
Embankment – General FILL	1×10^{-4}
Embankment – Filter Gravelly SAND	1×10^{-5}
Embankment – Mine Waste Rock	1×10^{-4}
Embankment – Rock Cladding	1×10^{-4}
Embankment – Compacted DRIED TAILINGS or CLAYEY BORROW/MINE WASTE	5×10^{-9}

Table 8: Permeability Values Adopted	
Material Type	**Permeability, K (m/s)**
Silty/Clayey Gravelly SAND (Compacted in-situ)	5×10^{-8}
Sandy SILT/CLAY (Compacted in-situ)	3.5×10^{-8}
Clayey/Silty Sandy GRAVEL	1.1×10^{-5}
Meta-BASALT (EW)	5.3×10^{-6}
Meta-BASALT (HW)	7×10^{-7}
TAILINGS (Deposited; Upper 3 m)	1×10^{-5}
TAILINGS (Deposited; Below 3 mbgl)	1×10^{-6}

3.2.5.3 Results of Seepage Analyses

The seepage flow determinations from the analyses are summarised in Table 9, below.

Table 9: Results of Seepage Analyses				
Cell	**Scenario**	**Seepage Flow (m^3/day/m of Embankment)**	**Approximate Perimeter Embankments Total Length (m)**	**Estimated Seepage per Day for Embankment Section (m^3/day)**
3	Decant Pond ≥100 m from Embankment	1.7×10^{-1}	1,500	258

Based on the analyses, seepage from TSF Cell 3 has been estimated to be approximately 0.1716 m^3/day per metre of embankment, respectively. This is equivalent to a seepage of approximately 258 m^3/day through the perimeter embankment of Cell 3. Seepage from the TSF is expected to be lower with compaction of the lower part of the basin of Cell 3 during construction plus seepage recovery measures in the form of an underdrainage system.

Plots of the phreatic surfaces and distribution of pore pressures throughout the embankments are presented in Appendix D. The seepage from the facility is expected to be low. The seepage estimates in the table above are conservative and largely dependent on the hydraulic head and tailings permeability.

3.2.6 Water Balance

Water balance analyses for the proposed TSF Cell 3 operations have been undertaken using a spreadsheet to examine expected inflows and outflows.

Inflows and outflows for the facility were estimated on a monthly basis. Inflows include rainfall and slurry water. Outflows include evaporation, seepage losses and water retained in tailings (pore water). Water balance calculations are included in Appendix G.

Assumptions and other data adopted for the water balance are listed below:

- The rainfall and evaporation figures for the Laverton as recorded by the BOM were 293 mm and 2,800 mm, respectively.
- Tailings area of approx. 50 ha.

- A tailings runoff coefficient of 0.4 was assumed.
- Pool area equal to 3 ha (pond radius 100 m).
- Running beaches similar to pond area.
- Evaporation pan factor of 0.75.
- Average tailings residual moisture content of 35%.
- Tailings slurry density of 50% solids.
- Tailings production rate of 3.0 Mtpa.
- Permeability for seepage through deposited tailings and dam floor of 5×10^{-8} m/s.
- Seepage rate based on permeability and pond and running beach area.

The results of the analysis indicate potential annual average water returns of around 52% of the tailings slurry water deposited into the facility can be expected under average climatic conditions for Cell 3.

The results also indicate that water recovery will vary according to the management of the facility, specifically the size of the pond and running beaches. The actual quantity of water available for return to the plant may vary from the figures presented based on the following factors:

- Variations in slurry density.
- Continuity of tailings discharge.
- Distance between the discharge point and decant pond.
- Size of the decant pond and running beaches from where evaporation is greatest.
- Climatic conditions at the time of operation.
- The efficiency of the decant system during operation.

The efficacy of the water return system is the key to achieving a higher in situ tailings dry density within the TSF. The minimum capacities of the water recovery system should be not less than 8,200 tpd (or approximately 100% slurry water inflow) including the additional capacity needed to recover water from TSF Cell 3 due to design storm events.

3.3 Design and Construction Details

TSF Cell 3 will be constructed to full height (crest RL418 m) as one construction using predominantly the mining fleet. The upstream zone will likely be constructed using a civil fleet.

The estimated volume of materials required for Cell 3 construction are shown in Table 10.

Table 10: Estimated Quantities of Construction Material

Stage	Compacted Tailings or Clayey Borrow / Mine Waste (m^3)	Mine Waste incl. Select Filter Mine Waste (m^3)	Mine Waste Capping for Erosion Protection (m^3)
Cell 3	127,000	979,830	23,000

A new decant accessway and decant tower structure will be constructed in TSF Cell 3, to the final height. The decant accessway and decant filter materials will comprise compacted mine waste and select mine waste, respectively, won from the waste dumps.

The construction will also include miscellaneous items such as:

- Installation of underdrainage lines, outfall pipework and a lined sump.
- Safety windrows and sheeting of the embankment crests.
- Following embankment completion:
  - Installation of slurry pipelines and spigots.
  - Installation of return water pipeline and decant pump.
  - Ancillary systems such as electrical systems and telemetry etc.

Technical specifications are presented in Appendices C.

3.3.1 Underdrainage System

As with the existing TSF Cells 1 and 2, the design for the new TSF Cell 3 includes an underdrainage system. It will comprise slotted pipes, two (2) Megaflo 450, covered with select aggregate and wrapped in geotextile stabilised with coarse aggregate. It will be installed inside the TSF basin at 10 m away from the perimeter embankment upstream toe, where the segregation of the tailings is greatest i.e. where coarse-grained tailings would be located thus allowing more leachate into the underdrainage lines.

The underdrainage line grades to an HDPE outfall pipe with an outer diameter of 140 mm. The pipe will be installed within a trench, inside the embankment, 1 m wide and 1 m deep. The trench will be backfilled with compacted dried tailings (upstream zone materials) in order to reduce the potential for creating a preferential flow path, sealed with bentonite collars at the location of the cut-off trench and at 10 m away from the downstream of the cut-off trench.

The collection sump will be nominally 10 m wide at the base and 1.5 m high with 1:2 (v:h) side slopes, and it will be lined with HDPE liner. A pump (turret or similar) will be deployed at the sump to recover water back onto the tailings beach. A remote water level monitoring will be installed for the operation of the sump, and it will include high-level and low-level alarms and switches. Water will then be pumped back from the collection sump to the process plant or utilised in construction.

Sizing of the underdrainage system is based on seepage analyses, also allowing the capacity for an inflow equivalent to 1% of slurry water inflow (i.e. nominally 1 L/s, system capacity).

The position and details of the proposed underdrainage are detailed on drawings PER2023-0063AG-04 and PER2023-0063AG-05, respectively, included in Appendix B.

3.4 Tailings Discharge and Water Management

The following operational considerations have been incorporated into the design:

- Tailings in the form of slurry will be discharged sub-aerially and cyclically into TSF Cell 3 in thin discrete layers, not exceeding 0.3 m thickness, from multipoint spigots in order to allow optimum density and strength gain by subjecting each layer to a drying cycle. Deposition will take place via multiple spigots located on the upstream perimeter embankment crest.
- Tailings deposition is to be carried out such that the supernatant pond is maintained within and around the decant. The pond is to be maintained away from the perimeter embankments at all times.
- Water will be removed from the facility and pumped back to the mill via a decant pump located within the slotted concrete pipes in the decant and underdrainage tower.

- The tailings storage area will assume the form of a truncated prism with a depressed cone on the top surface. The facility will have the capacity to store a considerable volume of water during a storm event. The minimum freeboard for the TSF under normal operating conditions is 0.7 m, which includes an allowance for the temporary storage of the 1:100 years or 1% average exceedance probability (AEP) storm event of 72-hour duration whilst maintaining the required total freeboard (Section 4.1.1).
- On eventual decommissioning, the facility will remain as a permanent feature of the landscape and drain to an increasingly stable mass. The top surface and batters will be stabilised and rehabilitated as described in Section 5.

3.5 Quality Assurance

The SoW document for TSF Cell 3 is attached as Appendix C. This documents specifies the responsibilities, procedures, and quality control tests which verify that TSF retaining structures have been constructed in accordance with the design intent.

4 OPERATIONAL REQUIREMENTS

4.1 Management of Tailings Deposition and Water

4.1.1 Discharge Management and Decant Control

A summary of the operations design for TSF is presented in Section 3. The existing TSF Operations Manual for MMGP includes the operating procedures, inspection criteria, monitoring requirements and log sheets for the facility. The Operations Manual is reviewed as part of annual audits and will be revised to include Cell 3. Note that the tailings deposition and decant operation for Cell 3 will be similar to Cells 1 and 2.

The following routine inspection and maintenance procedures are to be carried out for the various components of the system. A minimum of one inspection is to be undertaken during each shift by an operator or shift supervisor.

The inspections should cover:

- The pipelines (tailings delivery line and water return lines) to and from the TSF.
- Leak detection.
- Pumps.
- Valves.
- Discharge locations.
- Location and size of the decant pond.
- Decant and return water pumps.
- Underdrainage system pipe flow and pumps.
- The general integrity of the embankment i.e. any new cracking (daily).
- Seepage downstream of TSF.
- Any changes to existing cracking or seepage.

A monthly independent inspection should also be performed by senior site management. The operation, safety and environmental aspects should be periodically reviewed during an annual audit inspection by a suitably experienced and qualified engineer.

4.1.2 Freeboard

The following considerations for TSF were made regarding freeboard criteria and requirements for a 'High C' consequence category TSF (Section 3.2) based on ANCOLD (2019):

- The proposed TSF has been designed such that a 1:100 years AEP, 72-hour duration storm event can be temporarily stored on top of the facility. The design, however, assumes correct operational controls are adhered to and that water is continually removed from the facility, such that minimum freeboard allowances are maintained.
- Provision of a minimum of 0.7 m freeboard comprising a minimum operational freeboard (vertical height between the tailings beach and embankment crest) of 0.3 m plus a minimum beach freeboard of 0.2 m and the allowance for the 1:100 years AEP, 72-hour event of approximately 0.2 m.

ANCOLD guidelines (2019) also recommend an allowance for wave run-up for 1:10 AEP wind for a 'High C' consequence category TSF (refer to Section 3.2.2). However, it is expected that with perimeter tailings deposition and an expected beach slope of 1.0%, the separation distance between the perimeter embankments and design storm pond will be adequate to prevent wave action reaching the embankments.

Freeboard nomenclature is illustrated in Figure 4. Intensity-frequency-duration (IFD) data pertaining to the site is presented in Figure 5. From the chart presented in Figure 5, a 1:100 years AEP, 72-hour duration rainfall depth of 195 mm was adopted for the design. Temporary storage of stormwater volume should cater for approximately 97,500 m^3 (i.e. approx. 50 ha x 195 mm) on top of TSF Cell 3. Upstream catchment area has been assumed as 10 ha in the estimate. This stormwater volume will occupy approximately 2% to 5% of the TSF basin. TSF Cell 3 also has sufficient capacity to contain the probable maximum flood (PMF) of approximately 275,000 m^3 (i.e. 50 ha x 550 mm).

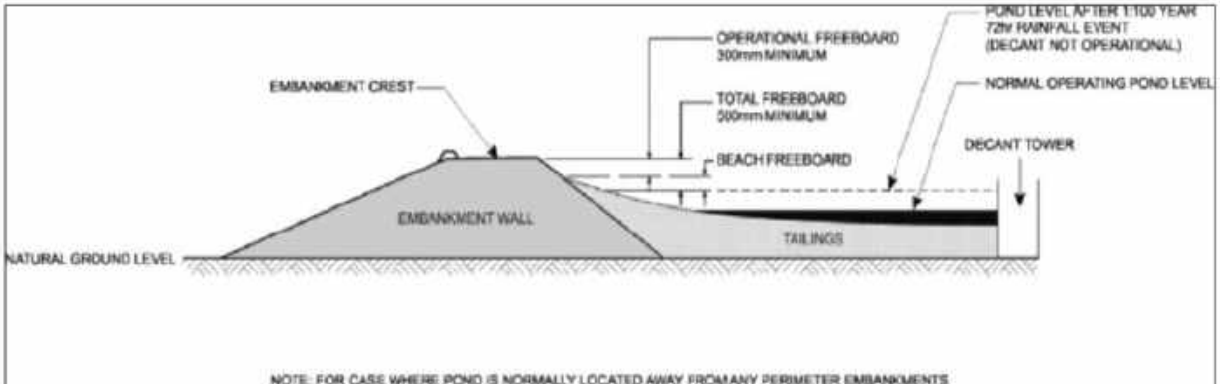

Figure 4: Freeboard Nomenclature

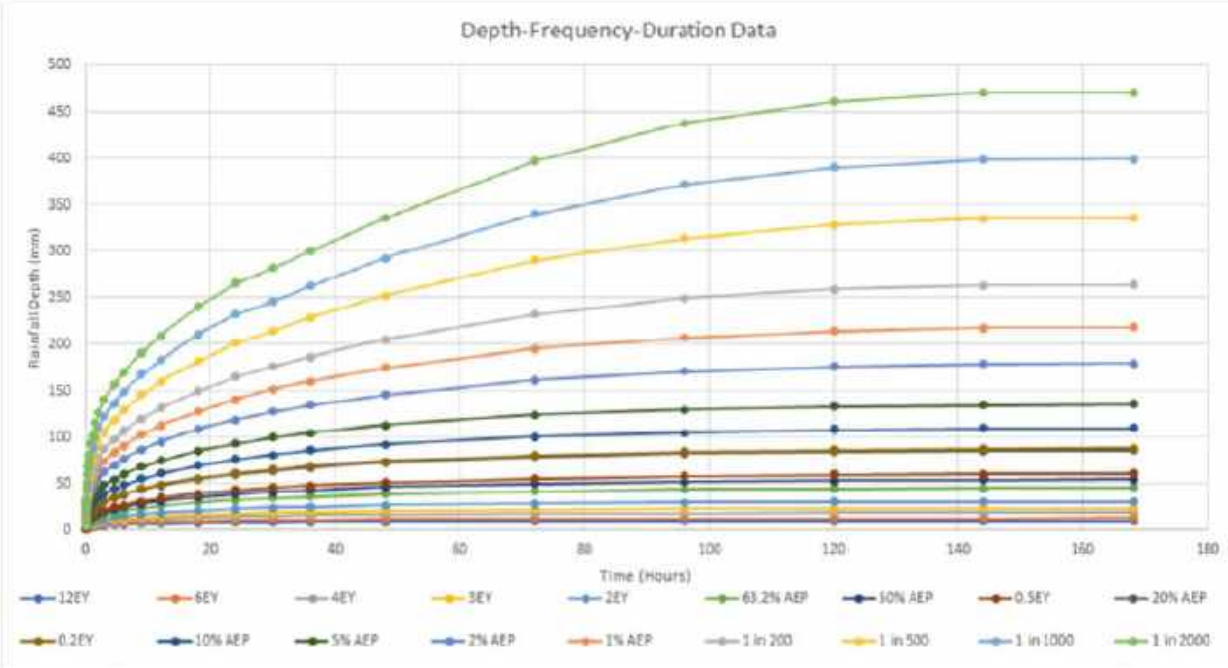

Figure 5: IFD Data (GRM 2020a)

4.2 Seepage Management

Seepage management measures for TSF include:

- An underdrainage system located along the southern perimeter embankment. The underdrainage lines will discharge into external sumps under gravity. The recovered underdrainage water is pumped back into the TSF cells.
- Compaction of part of the foundation of the TSF basin during the construction of Cell 3.
- Embankment construction using compacted fines material (dried tailings) in the upstream zone.
- Removal of supernatant (surface) water from the facility via a decant system.

4.3 Performance Monitoring and Instrumentation

4.3.1 Vibrating Wire Piezometers and Monitoring Bores

Three (3) new groundwater monitoring bores (TSFMB7, TSFMB8 and TSFMB9) and three (3) pairs of new vibrating wire piezometers (VWP10, VWP10a, VWP11, VWP11a, VWP12 and VWP12a) are to be installed around TSF Cell 3 to complement the existing TSFMB and TSFAB, and VWP, respectively.

The recent geotechnical investigation (ref: CMW (2023)b) encountered groundwater locally at depths of approximately 1.9 mbgl and 2.2 mbgl. An allowance should be made for the new TSFMB to be installed to a minimum depth of 20 mbgl for the purpose of performance monitoring.

Installation of vibrating wire piezometers (VWP) will need to be developed internally within TSF Cell 3 to enable the phreatic surface within its embankment to be monitored and stability analyses to be validated in the future. The VWP will also give early warning of seepage from the cell.

VWP are to be installed as part of the embankment construction. Allowance needs to be made for 3 pairs for a total of 6 no. of VWP. Each pair will have VWP installed in a trench 0.5 m wide and 0.3 m deep, with one VWP installed at nominally 10 m away from the upstream toe of the embankment, and another VWP directly underneath the upstream crest of TSF Cell 3 embankment. Bentonite collars will be required to reduce the potential for the development of a seepage pathway. The read-out cables are to be installed in PVC electrical conduit to ensure they are not damaged during deposition.

A terminal box containing the data loggers is to be placed downstream of the final embankment toe to avoid vehicular damage. The loggers are to be downloaded periodically (typically monthly depending upon the variability of pore pressure responses) for analysis. The collected information should be reviewed regularly, acted upon as necessary, and reported in the annual audit.

The pore pressure readings collected from the VWP, and the standing water levels recorded in the new and existing TSFMB, are also used if required to adjust the design phreatic surfaces used in the stability analysis models.

The positions and details of the proposed TSFMB and VWP are detailed on drawings PER2023-0063AG-04 and PER2023-0063AG-06, respectively, and shown in Figure 6 and Table 11.

For both the VWP and existing, it is recommended that as a minimum:

- Groundwater level readings are taken monthly.
- Groundwater samples for laboratory analyses are taken quarterly.
- Water level readings from the VWP are taken on a minimum monthly basis, with the readings plotted and graphed to allow an inferred phreatic surface within the facility to be modelled, and trends to be recognised.

The requirement for additional instrumentation (i.e. MB, VWP) associated with the TSF should be reviewed as part of the yearly audit.

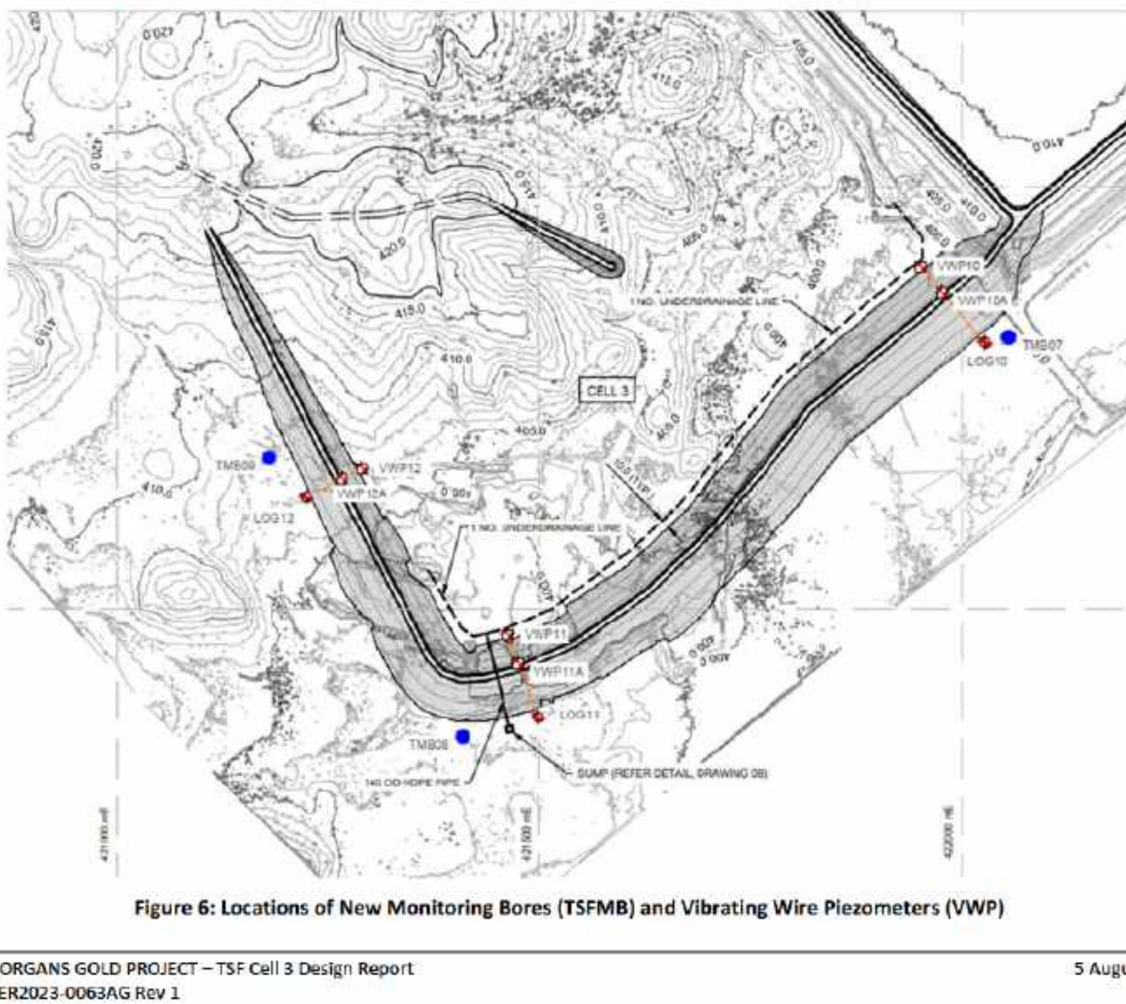

Figure 6: Locations of New Monitoring Bores (TSFMB) and Vibrating Wire Piezometers (VWP)

Table 11: Locations of New TSFMB and VWP			
ID	Depth (mbgl)	Easting (m)	Northing (m)
TSFMB7	20	422,055	6,813,323
TSFMB8		421,409	6,812,849
TSFMB9		421,179	6,813,179
VWP10	0.25	421,951	6,813,405
VWP10a		421,977	6,813,375
VWP11		421,462	6,812,969
VWP11a		421,475	6,812,935
VWP12		421,289	6,813,166
VWP12a		421,266	6,813,154

4.3.2 Decommissioning of Existing Instrumentation

The construction of TSF Cell C would require the decommissioning of TSFMB2, TSFAB03, an existing sump SP01 and seepage intersection trenches to the west-southwest of TSF Cell 1.

TSFMB2 and TSFAB03 must be 'sealed' using grout. SP01 and the seepage intersection trenches must be backfilled using compacted dried tailings (upstream materials) to prevent these from becoming a path of least resistance for seepage.

Additionally, should there be open exploration boreholes within the footprint of the proposed TSF Cell C location, these must be 'sealed' using the same approach to the decommissioning of TSFMB2 and TSFAB03.

4.3.3 Displacement Monitoring

High-resolution surveys are conducted every 6 months from an unmanned aerial vehicle (UAV) or "drone". These provide a detailed survey of the surface of the TSF to +/- 100 mm resolution. Surveys are conducted every 4 to 6 months. Digital terrain models are prepared from the survey data and successive models can be compared to determine any deformation magnitude greater than the LIDAR limits of vertical accuracy of +/-100 mm.

4.3.4 Visual Inspections

Driving or walk-around inspections of the TSF are to be undertaken to observe any irregularities in the normal configuration of the embankment, embankment toe areas, and tailings beach that may indicate internal erosion of the embankment or instability. In particular, any embankment cracking and damp or wet areas on batter slopes or toe areas are to be noted.

Inspections should be carried out daily, whilst documented independent inspections should be undertaken as part of an annual audit for submission to regulatory authorities.

4.3.5 Emergency Action Plan

The existing Operations Manual provides a description of the operating procedures for the facility and includes an Emergency Action Plan (EAP). The EAP for the process plant and TSF has been reviewed against the dam break assessment presented in Section 3.2.3. The EAP should be reviewed and updated at a minimum on a yearly basis.

As part of this design report, an addendum to the EAP along with definition of Trigger Action Response Plan (TARP) have been included in Appendix G.

The EAP includes:

- Management responsibilities and emergency coordination.
- Muster points.
- Seeking specialist geotechnical advice.
- Emergency Plan Triggers:
    - Freeboard less than design values.
    - Elevated piezometer levels.
    - Significant embankment distress.
    - Imminent overtopping.
- Seepage from the embankment should be investigated and additional instruments (i.e. VWP) installed to allow further assessment by a Geotechnical Engineer, may be required.

5 CLOSURE CONSIDERATIONS

5.1 Overview

The closure objectives for the TSF Cell 3 are to leave the facility in a safe, stable, erosion resistant and non-polluting state. These will be achieved through the following in the design:

- Downstream slopes of TSF perimeter embankments will be rehabilitated. The maximum slope angle will be approximately 18^0 or 1(V):3(H) with no intermediate benches on Cell 3.
- The decant structures within each cell will be decommissioned, and the areas 'sealed'.
- The tailings top-surface will be covered with a layer of non-acid forming (NAF) clayey mine waste with a minimum thickness of 0.5 m.
- Topsoil to suit local flora species will be applied as part of the cover works.

The closure concept for the TSF provides for:

- The surface of the TSF and embankment batters will need to be erosion resistant.
- A store and release cover system design to reduce infiltration of water into the tailings profile and allow excess water which may form temporary ponds to evaporate.

5.2 Decommissioning

During decommissioning the decant towers within each TSF cell will be dismantled, with concrete pipes removed to just below the tailings surface. At final closure, the decant structures will be decommissioned, and the areas 'sealed'. This will involve:

- Removing excess filter rock around the decant structure to the surrounding tailings level.
- Covering the rock layer surrounding the decant structure with geofabric to prevent movement of fine material through rock voids.
- Backfilling the annulus of the decant and underdrainage structures to the adjacent tailings level.

- Capping the TSF basin areas with nominal 0.5 m thick NAF mine waste (to be validated with field trials or otherwise).
- All pipes, valves and pumping systems will be removed.

The underdrainage systems will be decommissioned when there is negligible flow from the outfall pipes. The underdrainage should be decommissioned by removing the valves and grouting the outfall pipe in order to seal the system.

5.3 Rehabilitation

Rehabilitation and revegetation work will be carried out at the end of the storage life to stabilise the top surface and all batters. In order to provide for the long-term stability of the structure, the top surface of the TSF cells will be capped with mine waste. The MCP will contain detailed plans for the rehabilitation of the TSF.

5.4 Performance Monitoring against Closure Criteria

Rehabilitation closure criteria for TSF including observations specific to the tailings and consolidation will be developed and progressed as part of the MCP. Details of the criteria will be documented in the MCP.

6 REFERENCES

Australian National Committee on Large Dams, ANCOLD (2019). *'Guidelines on Tailings Dam Planning, Design, Construction, Operation and Closure'*.

AS 1170, *Structural design actions*, Standards Australia, Sydney, 2007.

AS 1289, *Methods of testing soils for engineering purposes*, Standards Australia, Sydney.

Australian Government Bureau of Meteorology website, http://www.bom.gov.au/.

Australian Government Geosciences website, http://earthquakes.ga.gov.au.

A Dalpatram (2011), *Estimation of Tailings Dam Break Discharges*, presentation at USSD workshop on Dam Break Analysis Applied to Tailings Dams.

ATC Williams (2018), *'Mt Morgans Gold Project, Western Australia, Tailings Storage Facility, Design Report'*, prepared for Mt Morgans WA Mining Pty Ltd, ref 112393.03 R01 Rev 0.

Boulanger, R.W., and Idriss, I.M. (2014), *CPT and SPT Based Liquefaction Triggering Procedures*, Report No. UCD/CGM-14/01, Department of Civil and Environmental Engineering, College of Engineering, University of California at Davis, April 2014.

CMW (2020). *'TSF Slope Stability Assessment, Mt Morgans Gold Mine, WA'*, ref. PER2020-0002AG Rev 0, dated 18 May 2020.

CMW (2022). *'Construction of TSF Cell 2 Raise RL 408 m to RL 412 m, Mount Morgans Gold Operation – Construction Report'*, ref. PER2021-0261AF Rev 0, dated 26 May 2022.

CMW (2023a), *'Tailings Storage Facilities, Mt Morgans Gold Project, WA, Annual Audit and Management Review'*, ref. PER2023-0157AB Rev 1 dated 21 September 2023.

CMW (2023b), *'Tailings Storage Facilities (TSF) Cells 1 & 2 Raises + New Cell 3, Mt Morgans Gold Project, WA, Geotechnical Investigation Report'*, ref. PER2023-0063AB Rev 1 dated 22 January 2024.

Commonwealth of Australia, Geoscience Australia (2016). *'Australian Rainfall and Runoff: A guide to flood estimation (ARR)'*.

Department of Mines and Petroleum, DMP (2013). '*Code of Practice, Tailings Storage Facility in Western Australia*'.

Department of Mines and Petroleum, DMP (2015). '*Guide to the preparation of a design report for tailings storage facilities (TSFs)*'.

Fell, MacGregor & Stapledon (2005), *Geotechnical Engineering of Dams*.

GRM (2016), '*MMGP Feasibility Level Study, Hydrogeological Dewatering Investigations*', ref. J150010R02, dated October 2016.

GRM (2020a) memo, '*Mt Morgans Gold Project TSF Surface Water Assessment*', prepared for Mt Morgans WA Mining Pty Ltd, ref J2012TM02, dated 3 May 2020.

GRM (2020b) report, '*Groundwater Management Plan, Mt Morgans Tailings Storage Facility, Mount Morgans Gold Mine*', prepared for Mt Morgans WA Mining Pty Ltd, ref J2012R01.

H Rourke and D Luppnow (2015), *The Risks of Excess Water on Tailings Facilities and its Application to Dam-Break Studies*, Tailings and Mine Waste Management for the 21st Century, Sydney NSW.

Hvorslev J M, *Time Lag and Soil Permeability in Groundwater Observations*, Bull. 36, 50 pp., U.S. Corps of Eng., Waterways Exp. Sta., Vicksburg, Miss., 1951.

K D Seddon (2010), *Approaches to the estimation of run-out distances for liquified tailings*, Mine Waste 2010, Perth Australia.

Luke, G.J et al (1987), *Evaporation Data for Western Australia*, Resource Management Technical Report No. 65, Government of Western Australia – Department of Primary Industries and Regional Development.

MBS Environmental (2016), '*Tailings Geochemical Characterisation*', August 2016.

Rico, M., Benito, G., Diez-Herrero, A. (2008), *Floods from Tailings Dam Failures*, Journal of Hazardous Materials 154 (2008) 79-87.

Swaisgood (2003), *Embankment Dam Deformations caused by Earthquakes*.

T MacDonald and J Langridge - Monopolis (1984), *Breaching Characteristics of Dam Failures*, Journal of Hydraulic Engineering, May 1984.

Seed, H.B., and Idriss, I.M. (1971), *Simplified procedure for evaluating soil liquefaction potential*, J. Geotech. Engrg. Div., ASCE, 97(9), 1249-1273.

Terzaghi, K. (1943), *Theoretical Soil Mechanics*, 1st ed. New York: J. Wiley and Sons, Inc.

Appendix A:
Tailings Storage Data Sheet (TSDS) and Explanatory Notes

TAILINGS STORAGE DATA SHEET

Project operator: Genesis Minerals Ltd (GMD)			
Project name: Mt Morgans Gold Project (MMGP)		Date: August 2024	
TSF name: TSF Cell 3		Commodity: Gold	
Name of data provider: GMD / CMW		Phone: +61 8 6222 4920	
TSF centre co-ordinates: (MGA51, GDA94) coordinates 421,600 m (E) and 6,813,400 m (N)			
Mining Tenement and Holder(s) details: M39/282, M39/395 and M39/1107			
TSF data			
TSF status: Proposed			
Type of TSF: [1] Paddock		Number of cells: [2] 1	
Hazard rating: [3] Medium		TSF category: [4] 1	
Catchment area: [5] 160.4 ha		Nearest water course: Lake Carey, approx. 2 km south	
Date deposition started (mm/yy): -		Date deposition completed (mm/yy): -	
Tailings discharge method: [6] multi-spigots		Water recovery method: [7] pumped central decants	
Bottom of facility sealed or lined? Y / N No		Type of seal or liner: [8] N/A	
Depth to original groundwater level m: 0.6		Original groundwater TDS mg/l: >200,000	
Ore process: [9] CIL		Tailings Deposition rate: [10] 3 Mtpa	
Impoundment volume (present) m^3: -		Expected maximum m^3: 4.4 M approx.	
Mass of solids stored (present) tonnes: -		Expected maximum tonnes: 6.2 M approx.	
Above ground facilities			
Foundation soils: clayey sand/sandy clay and residual clay (extremely weathered basalt)		Foundation rocks: extremely to highly weathered basalt	
Starter bund construction materials: [11] mine waste rock, well graded sandy gravel filter/support, clayey sand/sandy clay, geomembrane (ES1) liner		Wall lifting by: -	
Wall construction method/materials: compacted construction materials as above		Wall lifting material: [12] -	
Present maximum wall height agl m: [13] -		Expected maximum m: 19	
Crest length (present) km: -		Expected maximum km: 1.6	
Impoundment area (present) ha: -		Expected maximum ha: 50	
Below ground (in-pit) facilities N/A			
Initial pit depth (maximum) m:		Area of pit base ha:	
Thickness of tailings (present) m:		Expected maximum m:	
Current surface area of tailings ha:		Final surface area of tailings ha:	
Properties of tailings and return water			
TDS mg/l: 6,000 – 152,000	pH: 6.9 – 7.8 (Jul-Aug 2023)	Solids content: 49.9%	Deposited density t/m^3: 1.46
Potentially hazardous substances: [14] None	WAD CN mg/l: <0.004 – 0.055 (Aug 2023)		Total CN mg/l: N/A
Any other NPI listed substances in the TSF? [15] Y / N: N			

Explanatory notes for completing tailings storage data sheet

The following notes are provided to assist the proponent to complete the tailings storage data sheet.

1. Paddock (ring-dyke), cross-valley, side-hill, in-pit, depression, waste fill, central thickened discharge, stacked tailings
2. Number of cells operated using the same decant arrangement
3. See Table 1 – Hazard rating system in the Code of practice
4. See Table 2 – Matrix of hazard ratings in the Code of practice
5. Internal for paddock (ring-dyke) type, internal plus external catchment for other facilities
6. End of pipe, (fixed), end of pipe (movable) single spigot, multi-spigots, cyclone, central thickened discharge (CTD)
7. Gravity feed decant, pumped central decant, floating pump, wall/side mounted pump
8. Clay, synthetic
9. See list below for ore process method
10. Tonnes of solids per year
11. Record only the main material(s) used for construction, e.g. clay, sand, silt, gravel, laterite, fresh rock, weathered rock, tailings, clayey sand, clayey gravel, sandy clay, silty clay, gravelly clay or any combination of these materials
12. Any one or combination of the materials listed under item 11 above
13. Maximum wall height above the ground level (not AHD or RL)
14. Arsenic, Asbestos, Caustic soda, Copper sulphide, Cyanide, Iron sulphide, Lead, Mercury, Nickel sulphide, Sulphuric acid, Xanthates, radioactive elements
15. NPI – National pollution inventory (contact Department of Environmental Protection for information on NPI listed substances)

Ore process methods

The ore process methods may be recorded as follows:

Acid leaching (Atmospheric)	Flotation
Acid leaching (Pressure)	Gravity separation
Alkali leaching (Atmospheric)	Heap leaching
Alkali leaching (Pressure)	Magnetic separation
Bayer process	Ore sorters
Becher process	Pyromet
BIOX	SX/EW (Solvent extraction/Electro wining)
Crushing and screening	Vat leaching
CIL/CIP	Washing and screening

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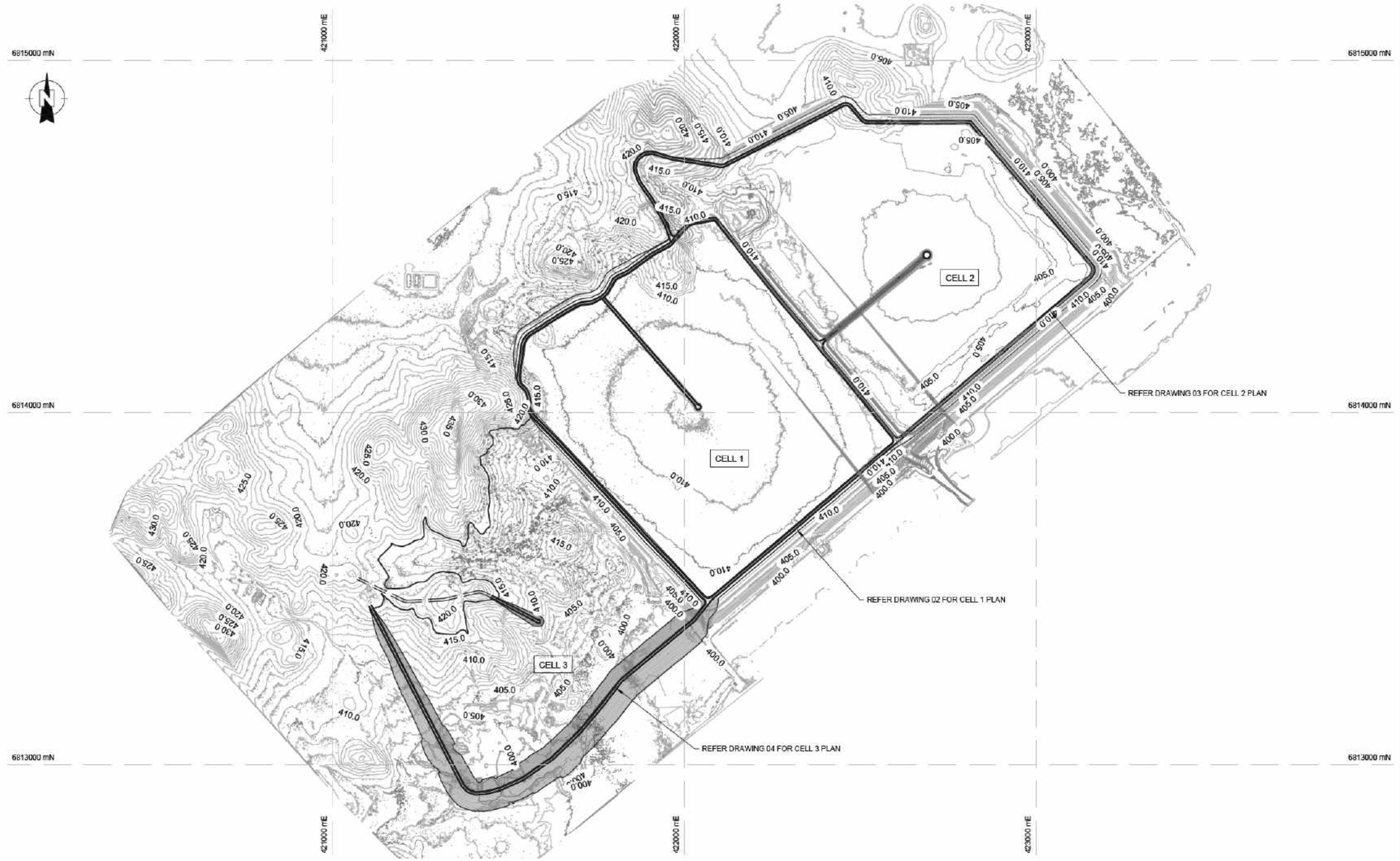
Appendix B:
Drawings



NOTES:

1. ALL DIMENSIONS IN METRES UNO

CLIENT: GENESIS MINERALS LTD (GDM)		DRAWN: PA	PROJECT: PER2023-0063AG
PROJECT: NEW TSF CELL 3		CHECKED: CH	DRAWING: 01
		REVISION: 1	SCALE: 1:10,000
TITLE: GENERAL ARRANGEMENT - PLAN		DATE: 05.08.24	SHEET: A3 L

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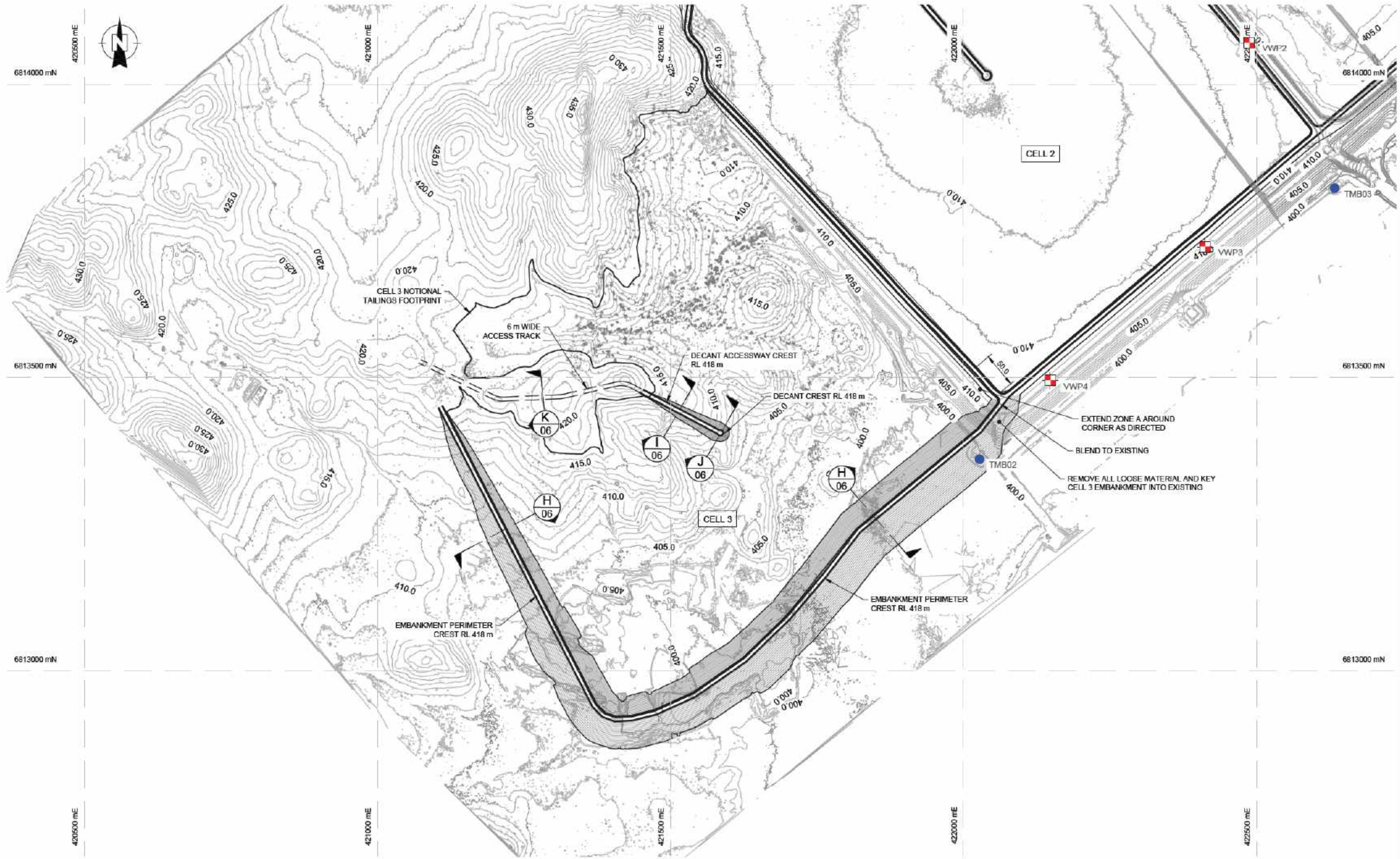

NOTES:

1. ALL DIMENSIONS IN METRES UNO

LEGEND:

- TMB01 MONITORING BORE
- VWP1 VIBRATING WIRE PIEZOMETER

1:6000 — 0 60 120 180 240 300 m

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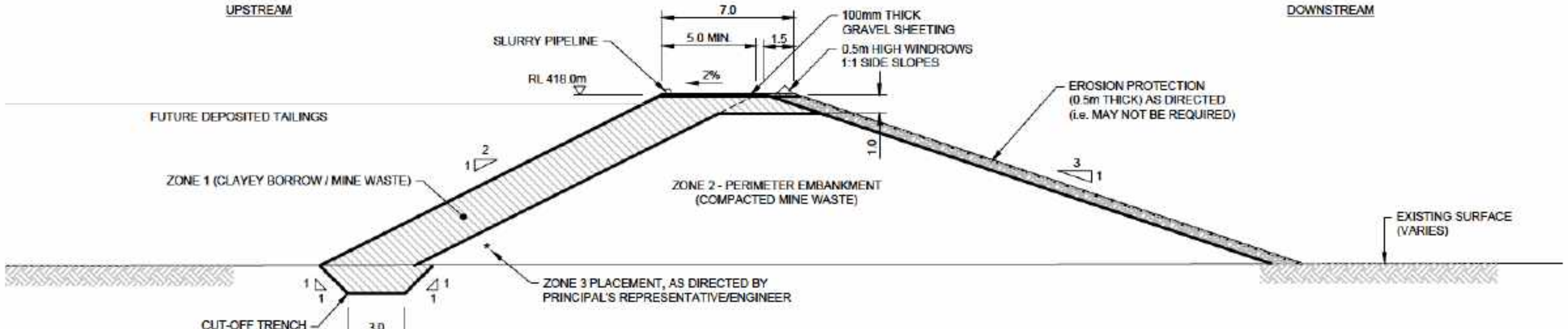
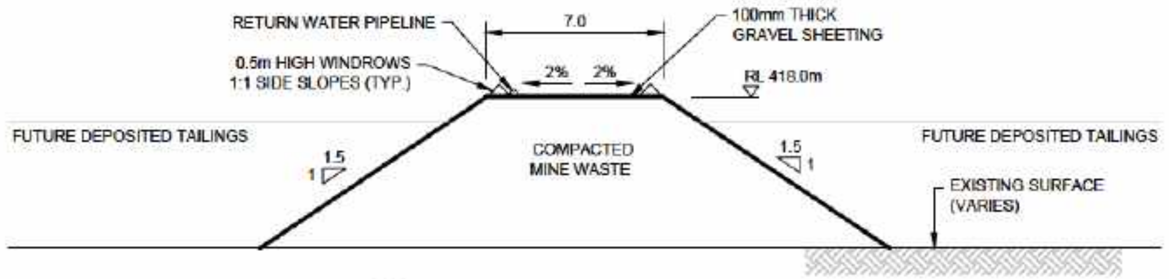
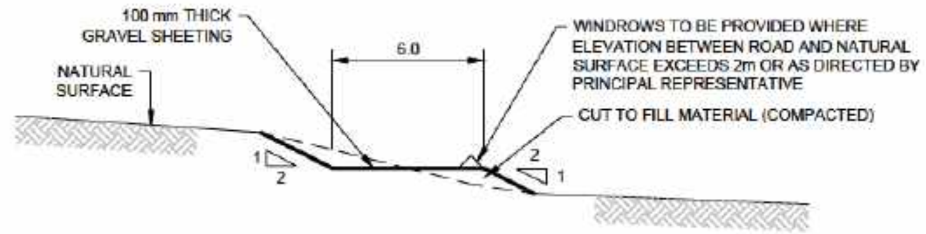
CLIENT: GENESIS MINERALS LTD (GDM)		DRAWN: PA	PROJECT: PER2023-0063AG
PROJECT: NEW TSF CELL 3		CHECKED: CH	DRAWING: 02
		REVISION: 1	SCALE: 1:6000
TITLE: CELL 3 - PLAN		DATE: 05.08.24	SHEET: A3 L



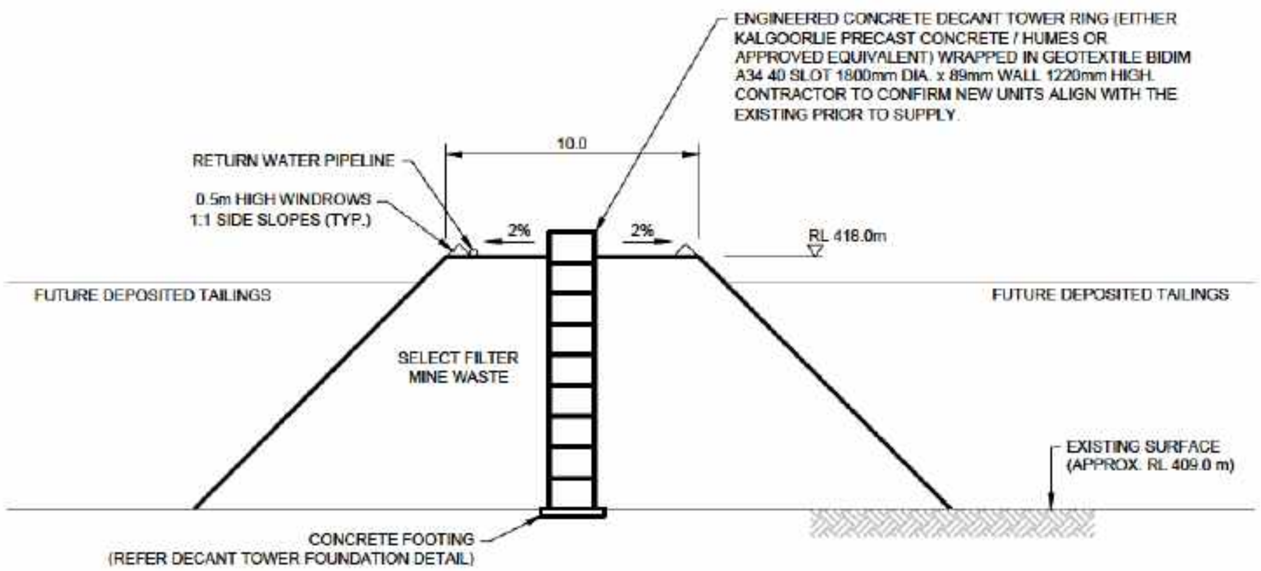
H / 04 PERIMETER EMBANKMENT - TYPICAL SECTION
1:300



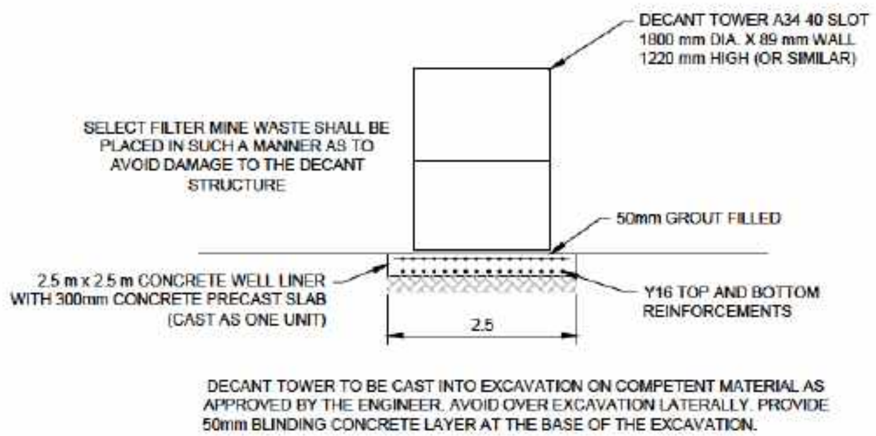
I / 04 DECANT ACCESSWAY - TYPICAL SECTION
1:300



K / 04 ACCESS TRACK - TYPICAL SECTION
1:300



J / 04 DECANT TOWER - TYPICAL SECTION
1:300



DECANT TOWER FOUNDATION - TYPICAL DETAIL
1:100

NOTES:

1. ALL DIMENSIONS IN METRES UNO

1:300 — 0 3 6 9 12 15 m

CLIENT: GENESIS MINERALS LTD (GDM)	DRAWN: PA	PROJECT: PER2023-0063AG
PROJECT: NEW TSF CELL 3	CHECKED: CH	DRAWING: 03
	REVISION: 1	SCALE: 1:300
TITLE: CELL 3 TYPICAL CROSS SECTIONS	DATE: 05.08.24	SHEET: A3 L

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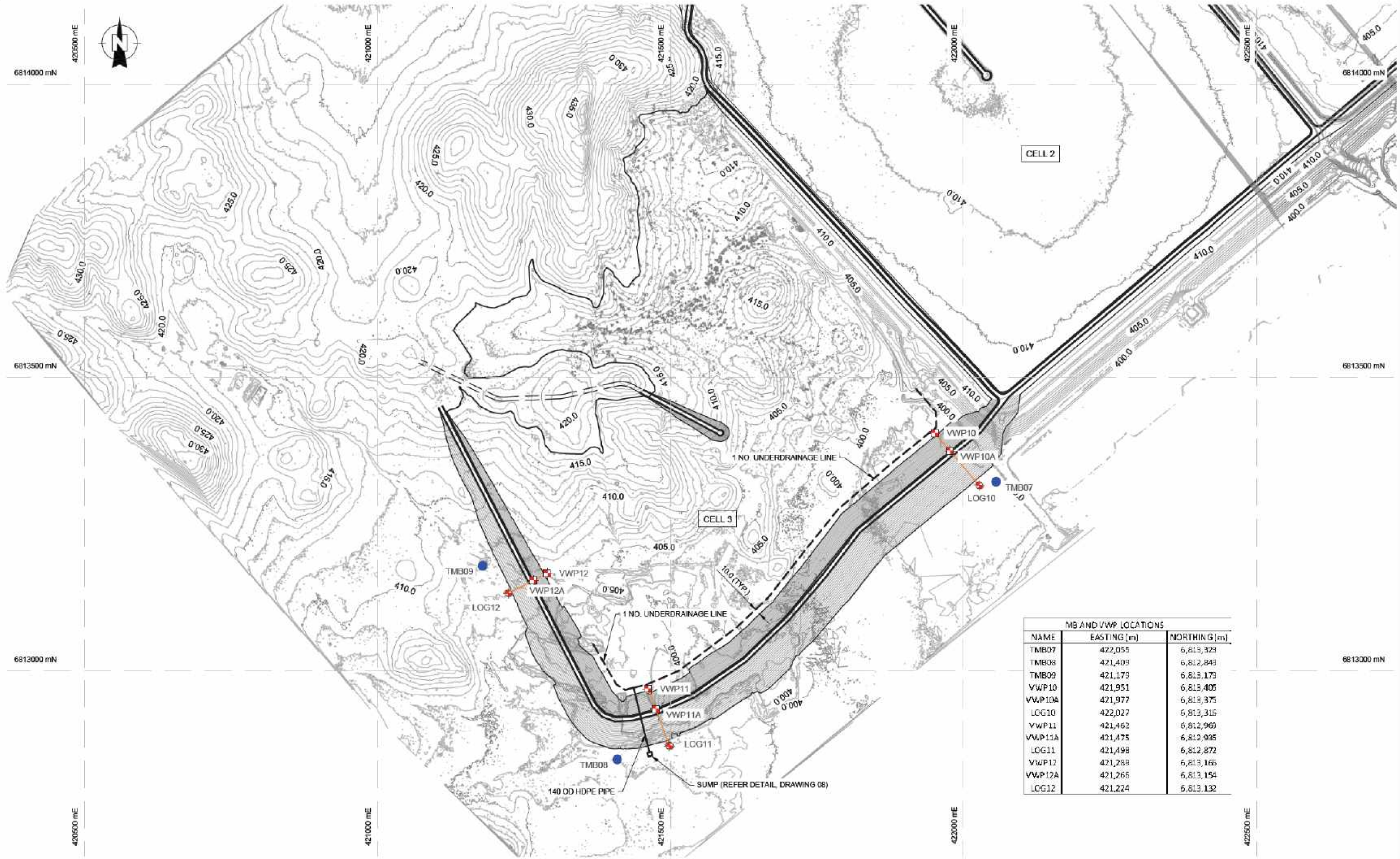


MB AND VWP LOCATIONS		
NAME	EASTING (m)	NORTHING (m)
TMB07	422,055	6,813,323
TMB08	421,409	6,812,848
TMB09	421,179	6,813,179
VWP10	421,951	6,813,405
VWP10A	421,977	6,813,375
LOG10	422,027	6,813,315
VWP11	421,462	6,812,969
VWP11A	421,475	6,812,935
LOG11	421,498	6,812,872
VWP12	421,289	6,813,166
VWP12A	421,266	6,813,154
LOG12	421,224	6,813,132

LEGEND:

- ● TMB01 MONITORING BORE
- VWP1 VIBRATING WIRE PIEZOMETER
- TRENCH
- TERMINAL BOX / LOGGER

NOTES:

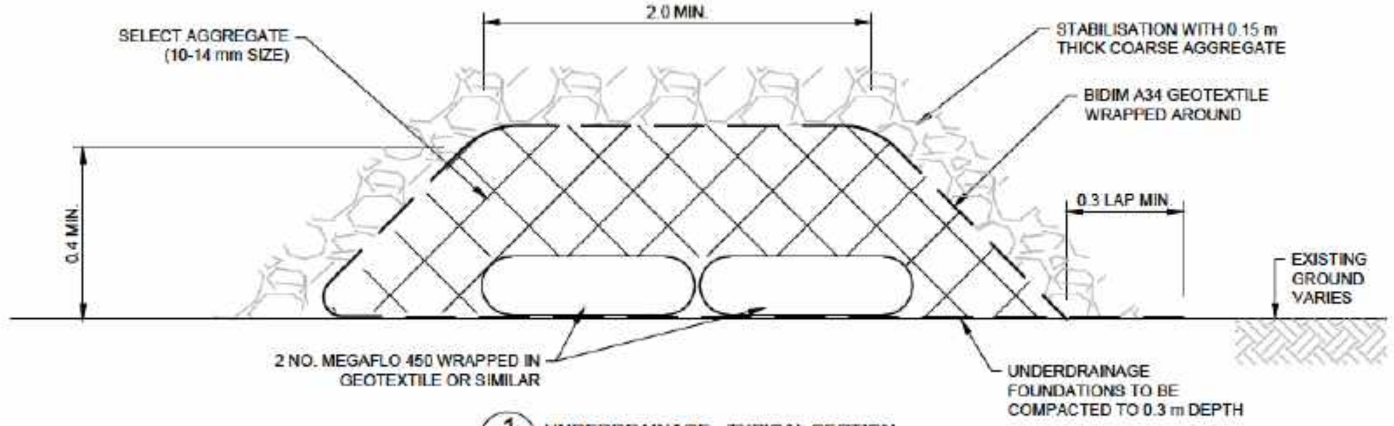
1. ALL DIMENSIONS IN METRES UNO

0 60 120 180 240 300 m

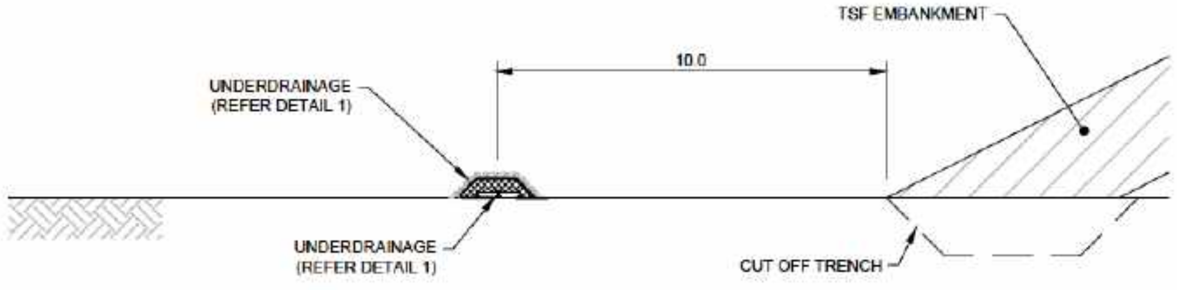
1:6000

CMW Geosciences

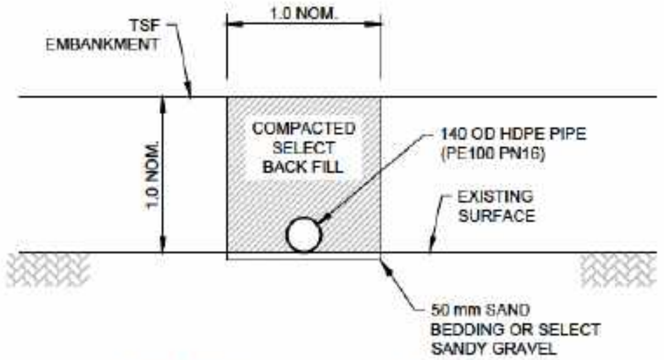
CLIENT: GENESIS MINERALS LTD (GDM)	DRAWN: PA	PROJECT: PER2023-0063AG	
PROJECT:	CHECKED: CH	DRAWING: 04	
NEW TSF CELL 3	REVISION: 1	SCALE: 1:6000	
TITLE: CELL 3 - INSTRUMENTATION & UNDERDRAINAGE PLAN	DATE: 05.08.24	SHEET: A3 L	



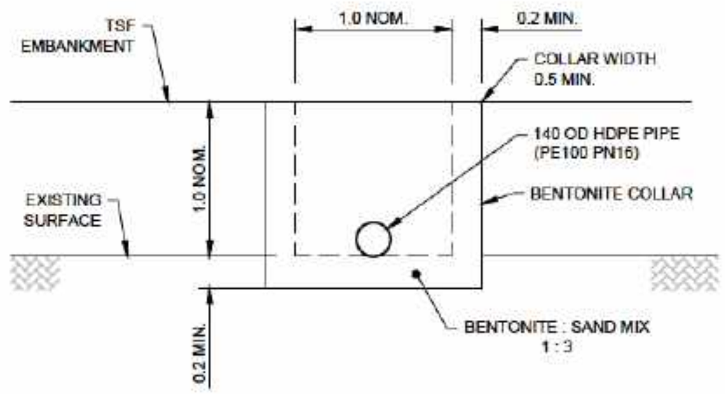
1 / 09 UNDERDRAINAGE - TYPICAL SECTION
NTS



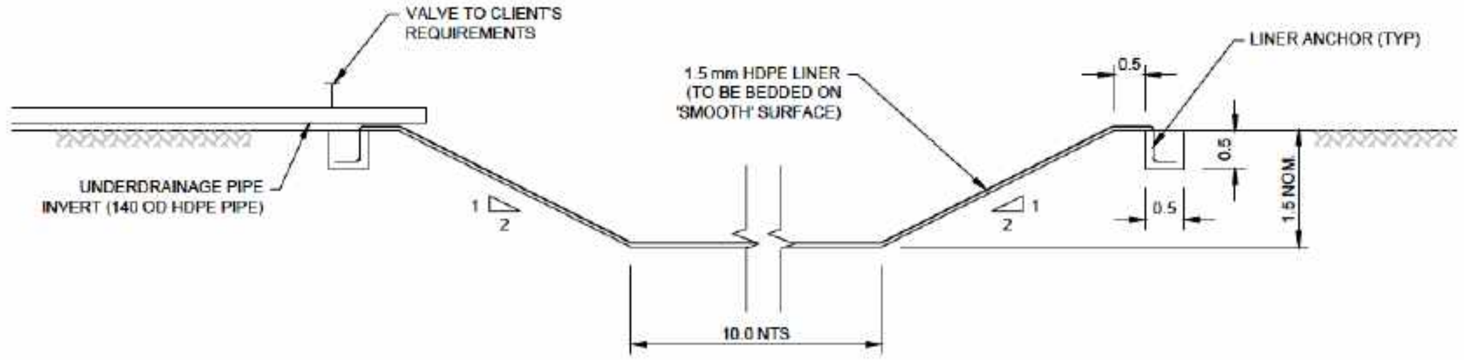
2 / 09 EMBANKMENT & UNDERDRAINAGE LINES - TYPICAL SECTION
1:100



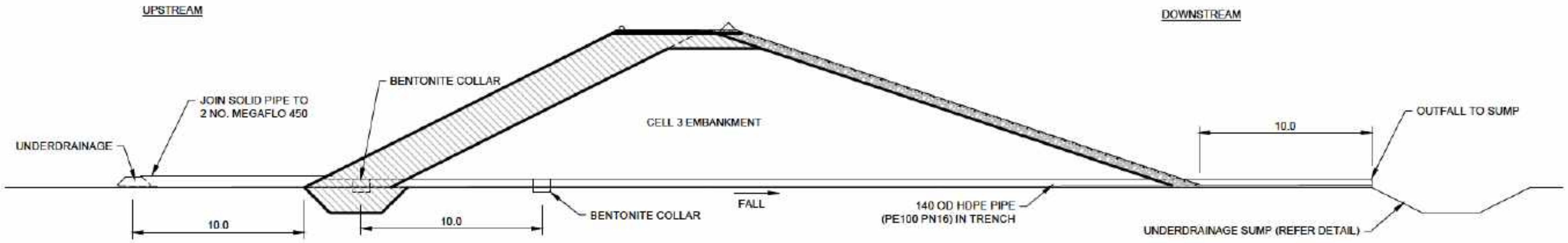
UNDERDRAINAGE TRENCH - TYPICAL DETAIL
1:50



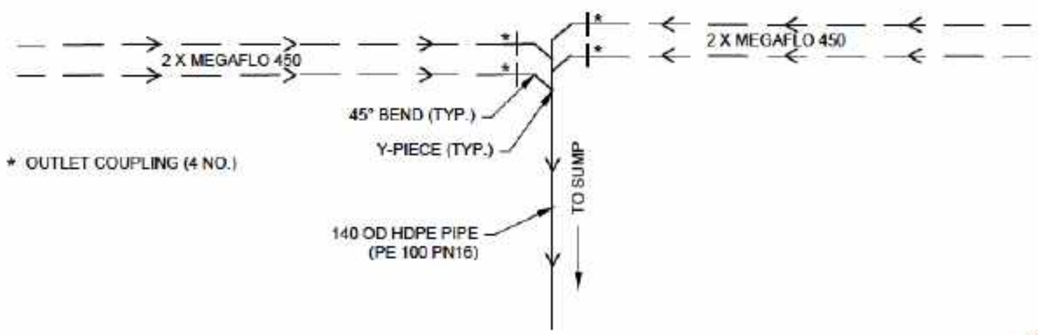
BENTONITE COLLAR - TYPICAL DETAIL
1:50



UNDERDRAINAGE SUMP - TYPICAL DETAIL
1:100



UNDERDRAINAGE OUTLET - TYPICAL SECTION
NTS



* OUTLET COUPLING (4 NO.)

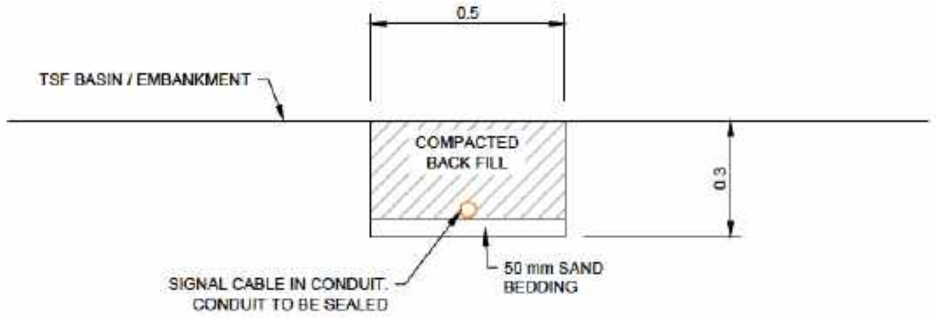
PIPELINE SCHEMATIC TO SUMP - TYPICAL DETAIL
NTS

1:20 — 0, 0.2, 0.4, 0.6, 0.8, 1.0 m

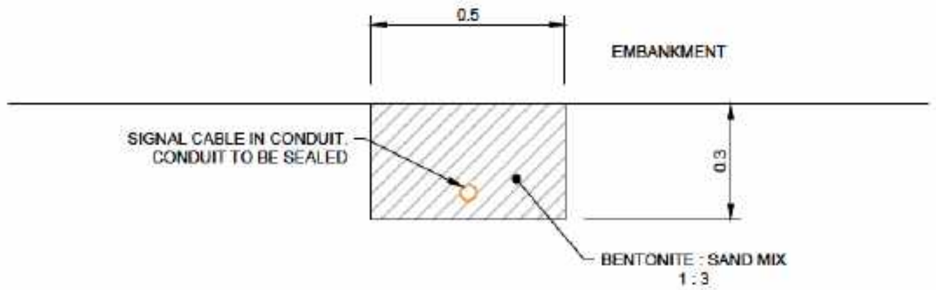
1:250 — 0, 2.5, 5, 7.5, 10, 12.5 m

CMW Geosciences

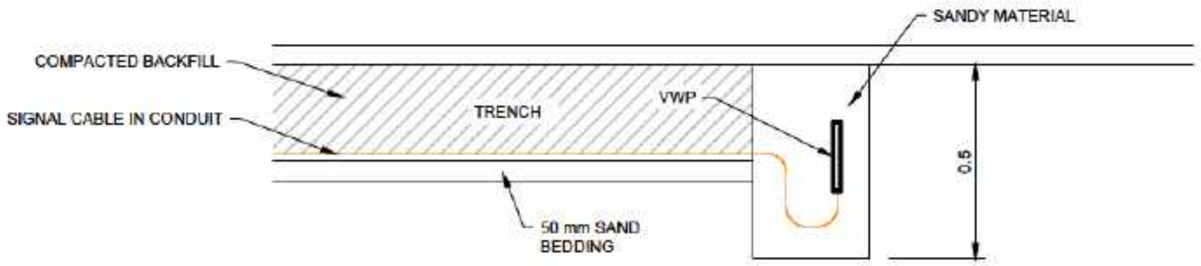
CLIENT: GENESIS MINERALS LTD (GDM)		DRAWN: PA	PROJECT: PER2023-0063AG
PROJECT: NEW TSF CELL 3		CHECKED: CH	DRAWING: 05
		REVISION: 1	SCALE: AS SHOWN
TITLE: CELL 3 - UNDERDRAINAGE DETAILS		DATE: 05.08.24	SHEET: A3 L



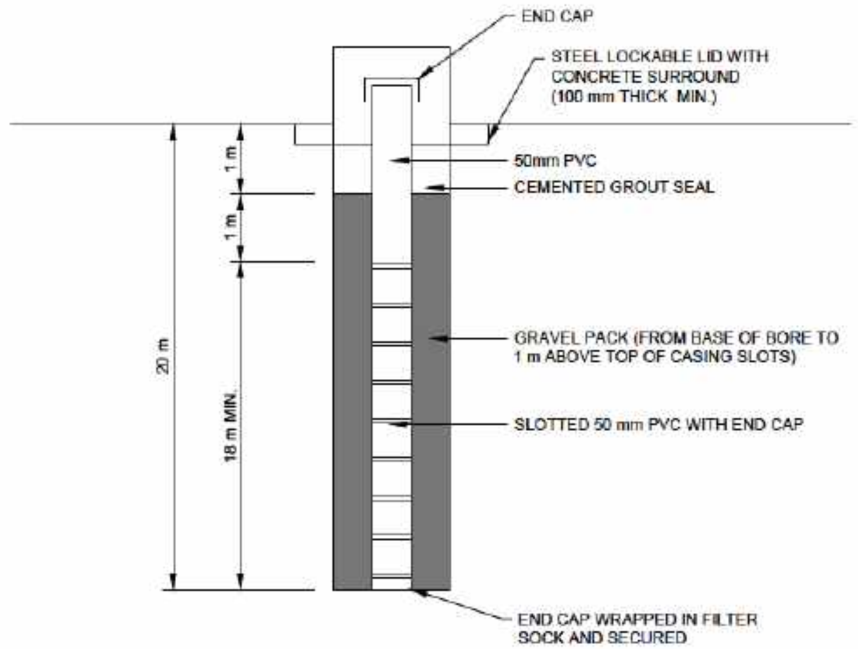
VWP TRENCH - TYPICAL DETAIL
1:20



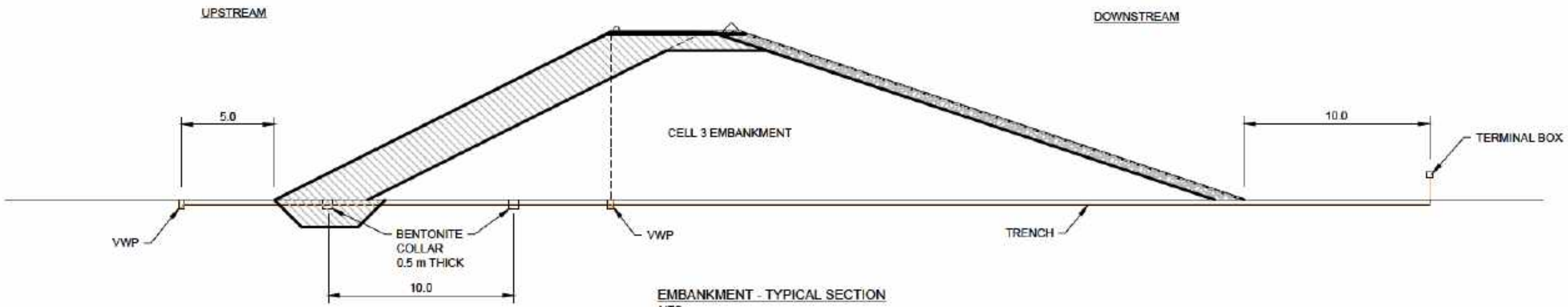
BENTONITE COLLAR - TYPICAL DETAIL
1:20



VIBRATING WIRE PIEZOMETER - TYPICAL DETAIL
1:20



MONITORING BORE - TYPICAL DETAIL
NTS



EMBANKMENT - TYPICAL SECTION
NTS

NOTES:

1. HEAVY DUTY VIBRATING WIRE PIEZOMETER REFERS TO 3.5 BAR (50 PSI) PIEZOMETER MODEL NO. 52610530 BY DGSI
2. ARMOURED SIGNAL CABLE MODEL NO. 50613586 BY DGSI
3. ALL DIMENSION IN METRES UNO

1:20 — 0 0.2 0.4 0.6 0.8 1.0 m

CMW Geosciences

CLIENT: **GENESIS MINERALS LTD (GDM)**		DRAWN: PA	PROJECT: PER2023-0063AG
PROJECT: **NEW TSF CELL 3**		CHECKED: CH	DRAWING: 06
		REVISION: 1	SCALE: AS SHOWN
TITLE: **CELL 3 - INSTRUMENTATION DETAILS**		DATE: 05.08.24	SHEET: A3 L

Appendix C:
Scope of Works and Technical Specification Document

MT MORGANS WA MINING PTY LTD

MMGP-01-099
TAILINGS STORAGE FACILITY (TSF) CELL 3
CONSTRUCTION WORKS
ANNEXURE C
SCOPE OF WORK

MT MORGANS GOLD OPERATION

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Scope of Work

1. Summary

This document is for the construction of Tailings Storage Facility (TSF) Cell 3. TSF Cell 3 abuts Cells 1 and 2 the current operating cells. This Scope of Work, in conjunction with the drawings, outlines the requirements for constructing:

- Construct embankment to form the paddock facility;
- Constructed decant accessway infrastructure;
- Install the decant facility;
- Install the underdrainage system, including all pipework and sumps; and
- Construct access tracks and other miscellaneous infrastructure.

The Scope of Work generally includes the following:

(a) mobilisation of necessary Contractor Personnel, Contractor Plant and Equipment, establishment of facilities and demobilisation;

(b) supply, operation, maintenance and management of Contractor Plant and Equipment;

(c) where the embankment and access track are constructed on undisturbed ground, clearing, topsoil removal and stockpiling;

(d) embankment and access track foundation preparation;

(e) embankment and decant accessway construction;

(f) decant structure installation;

(g) underdrainage system installation; and

(h) access track construction.

2. Definitions

The following definitions are referred to or are generally applicable to this Scope of Work, otherwise terms have the same meaning as set out in clause 1.1 of the General Conditions.

‘AS’ means Australian Standards.

‘BCM’ means the in-situ volume of soil or rock material measured in cubic metres and determined by measurement of the void or voids resulting from excavation.

‘CCM’ means the volume of soil or rock material measured in cubic metres, placed and compacted to the applicable specification.

‘Drawings’ means the drawings listed in section 3 of this Scope of Work.

‘LCM’ means the volume of soil or rock material measured in cubic metres, placed and not compacted.

‘OMC’ means optimum moisture content.

‘MMGP’ means Mt Morgans Gold Project.

‘SMDD’ means standard maximum dry density.

‘TSF’ means tailings storage facility.

‘VWP’ means vibrating wire piezometer.

3. Drawings & Documents

The following Drawings are included in Appendix A alongside the Estimate of Quantities for TSF Cell 3 constructions. Any conflicts identified by the Contractor between the Drawings and the Scope of Work must be brought to the immediate attention of the Principal's Representative.

Title	**Drawing No.**	**Rev**
General Arrangement	PER2023-0063AG-01	0
Cell 3 Plan	PER2023-0063AG-02	0
Section & Details	PER2023-0063AG-03	0
Underdrainage and Instrumentation Plan	PER2023-0063AG-04	0
Underdrainage Details	PER2023-0063AG-05	0
Instrumentation Details	PER2023-0063AG-06	0

Table 1: List of Drawings & Documents

4. Construction Program

The Contractor shall prepare a Construction Schedule that clearly shows the critical path and the following Milestone Dates.

- Commencement Date;
- Clearing and grubbing complete;
- Foundation preparation complete;
- Embankment construction complete;
- Decant accessway and tower complete;
- Underdrainage installation and
- Date for Practical Completion.

During execution of the Works, the Contractor shall:

- update its' Construction Program on a weekly basis; and
- fully cooperate with other Contractors and the Principals operations personnel at all times to coordinate activities ensuring the embankment raises are constructed in accordance with the Scope of Work and in the agreed time frame.

5. Quality Assurance

The Contractor shall prepare, for the approval of the Principal Representative, a Quality Assurance Plan relating to the Works and in accordance with the Principals' General Conditions Construction prior to commencement.

6. Detailed Scope of Work

6.1 Site Inspection

The Contractor shall inspect the Site and make an allowance for the following factors in the Schedule of Rates:

- the nature and requirements of the work to be undertaken;
- all conditions on and adjacent to the Site;
- access to the Site;
- the types of soil and vegetation present on the Site;
- the expected or known water table;
- the location of sources of suitable construction material which complies with this Scope of Work;
- the source of water for construction purposes;
- management of saline water use, hydrocarbon storage and dust suppression to the Principal's requirements; and
- prevailing climatic conditions for the Site.

6.2 Protection of the Works

The Contractor shall allow for taking all necessary steps to protect the Works from damage due to the action of water resulting from weather conditions. It is the responsibility of the Contractor to familiarise itself with the weather conditions of the region and to implement appropriate actions to suitably respond to any such event. Any damage as a result of inadequate or no protection must be satisfactorily repaired by the Contractor at its own cost. This may include drainage diversion works and pump with disposal of water clear of the works area.

6.3 Clearing and Establishment Works

6.3.1 Clearing

The Contractor shall clear and grub vegetation from the TSF embankment footprint, TSF impoundment, access track footprint, and the topsoil stockpile area as generally shown on Drawings PER2023-0063AG-01 to 06, whichever is applicable, or as otherwise determined by the Principal's Representative based on site conditions.

All solid obstructions, tree stumps, roots and logs must be removed from beneath the footprint of the TSF perimeter embankment, access track and topsoil stockpile area. Clearing and grubbing shall also be carried out in areas of temporary works including haul roads, tracks, laydown areas and the like.

In general, any woody debris from small trees and tall shrubs should be pushed into stockpiles on the downstream side of the embankment footprint. Vegetation shall remain separate from topsoil except for grasses and small shrubs (less than 0.3 m in height), which may be stripped and blended with topsoil.

The Contractor shall commence any clearing only after ensuring that:

- it is in possession of a Principal approved Land Clearing Request and map that clearly shows the area to be cleared;
- a copy of the approved Land Clearing Request and accompanying map has been distributed to all supervisors and operators of the Contractor's Plant and Equipment to be used for the clearing;
- the area to be cleared has been clearly delineated by the Principal's surveyors; and
- the Contractor Plant and Equipment to be used for clearing, has passed the Principal's weed and seed inspection.

6.3.2 Topsoil Removal

Once vegetation clearing and grubbing has been completed, the Contractor shall remove at least 150 mm of topsoil from cleared areas of the embankment and access track footprint, TSF impoundment and temporary works areas unless otherwise directed by the Principal Representative.

Depending on the area, it is expected that topsoil stripping will involve dozing into windrows followed by loading and haulage to the designated stockpile location. Topsoil stockpiles may be 2 m high and shall not be disturbed after placement.

Topsoil is not to be stripped while wet or during periods of strong winds. When required, the Contractor shall apply non-hypersaline water to areas where topsoil removal is being undertaken to reduce dust.

6.3.3 Existing topsoil stockpile relocation

Where the existing topsoil stockpiles impinges on the Works area, the Contractor shall load, haul and relocate the existing topsoil stockpile to the designated area as directed by the Principal Representative.

6.4 Foundation Preparation

6.4.1 6 m Wide Access Track Foundation Preparation

Following topsoil stripping, foundation preparation is to be completed over the 6 m wide access track footprint area, ready for the 6 m wide access track construction (refer to Drawings PER2023-0063AG-01 to 06, whichever is applicable)

Foundation preparation works shall include:

- stripping of near surface loose or unsuitable materials; and
- proof rolling, as directed.

6.4.2 Embankment Foundation Preparation –Perimeter Embankment

Following topsoil stripping, foundation preparation is to be completed over the perimeter embankment footprint area (including area of the cut-off trench), ready for the embankment construction (refer to Drawings PER2023-0063AG-01 to 06, whichever is applicable). The area cleared shall extend approximately 5 m past the downstream toe of the embankment.

Foundation preparation works shall include:

- stripping of near surface loose or unsuitable materials;

- ripping areas of exposed soil or highly weathered rock (to a minimum 150 mm depth), moisture conditioning and proof rolling to form a suitable surface on which to place fill;

- prepare the foundation for the cut-off trench under the embankment as shown on Drawings PER2023-0063AG-01 to 06, whichever is applicable, by excavating into meta-Basalt, to a nominal depth of 1.5 m below the existing ground surface or as directed by the Principal Representative. The depth shall be increased if loose gravels or sands are present in the excavation, so the base of the excavation is in competent low permeability material or rock. Side batters shall have a minimum slope of 1:1;

- ripping may be necessary to construct the cut-off excavation. Blasting in the tailings storage area is not anticipated. No blasting or excavation into or through any competent rock shall be undertaken unless approval has been received from the Principal Representative;

- if water ingress occurs within the cut-off trench, the trench shall be quickly backfilled using clayey borrow material or reclaimed tailings compacted as directed by the Principal Representative. The Contractor shall allow for keeping water from excavations by pumping, dewatering, or other suitable means, and adequately dispose of the water at a location clear of the Works;

- all areas to receive fill shall be left in a clean and suitable condition to allow an uninterrupted placement of fill. No fill shall be placed in the cut-off trench until the base of all excavations has been inspected and approved by the Principal Representative; and

- excavated material shall be disposed of within the TSF impoundment area as directed by the Principal Representative.

- note that unreasonable over-break will not be paid for by the Principal and shall be at the sole discretion of the Principal’s Representative in respect of approval of quantities for excavation and backfill.

Once the cut-off trench has been excavated, it shall be backfilled with material conforming to the specification detailed in section 6.6.2 and placed/compacted in accordance with section 6.6.8.

6.5 6 m Wide Access Track Construction

The 6 m wide access track is to be constructed as shown on Drawings PER2023-0063AG-01 to 06, whichever is applicable.

The Contractor shall:

- where required, excavate, grade and roller compact the existing natural surface to the design;

- where fill material (mine waste) is required, it shall comply with the following specification in Section 6.6.5;

- it shall be sheeted with a minimum thickness of 100 mm of fine mine waste wear course material. A smooth drum roller should be used, and the final surface of the access track graded. Note where the fill height is more than 0.5 m high from the natural surface or as directed by the Principal Representative, windrows will be required on the downstream crest side.

6.6 Embankment Construction

6.6.1 General

The TSF Cell 3 perimeter embankment is to be constructed as shown on Drawings PER2023-0063AG-01 to 06, whichever is applicable, using clayey mine waste in the upstream zone and general mine waste in the downstream zone. Mine waste should be sourced from areas approved by the Principal's Representative.

The Contractor shall:

- ensure suitable embankment fill material is well mixed to ensure uniform distribution of fines;
- ensure that all materials shall be stockpiled, transported and placed in such a manner as to minimise segregation;
- allow for keeping water from the Works during construction by shaping finished surfaces with a fall to the centre of the storage;
- allow for maintaining the stockpile areas free of large accumulations of water;
- maintain access roads, haul roads and/or ramp(s), as appropriate, to the designated stockpile areas to enable the fill materials to be recovered and hauled to the work area. The Contractor shall submit details of the proposed ramps to the Principal Representative for approval prior to the commencement of construction. It is envisaged that existing haul/access roads can be utilised; and
- carry out testing to comply with the material specification and Quality Assurance Plan.

6.6.2 Zone 1 – Clayey Borrow / Mine Waste

Zone 1 – Clayey Borrow / Mine Waste will be sourced from within MMGP. These must meet the requirements listed in Table 2.

Item	Test Method	Requirement
Soil Classification (USCS)	AS 1726	CL / CI / CH
Particle Size Distribution	AS 1289	100% passing 150 mm, ≥35% passing 0.075 mm, <65% passing 0.075 mm
Plasticity Index	AS 1289	>10% and ≤30%
Liquid Limit	AS 1289	>30% and <60%
Permeability (k)	AS 1289	≤5x10^{-9} m/s at 95% SMDD

Table 2: Properties of Zone 1 – Clayey Borrow / Mine Waste

Testing frequencies as per Section 8.

6.6.3 Zone 2 – Mine Waste

Zone 2 – Mine Waste will be sourced from within MMGP, and must meet the requirements listed in Table 3.

Item	Test Method	Requirement
Soil Classification (USCS)	AS 1726	GM / GC / SP / SM / SC / CL / CI / CH, cobbles, and boulders (<300 mm at upstream face)
Particle Size Distribution	AS 1289	100% passing 300 mm (at upstream face) 100% passing 600 mm (away from upstream face)

Table 3: Properties of Zone 2 – Mine Waste

No testing is required for Zone 2 – Mine Waste as this material requires placement (traffic compaction) to achieve a mechanical interlock.

6.6.4 Traffic Compacted Laterite / Transitional Mine Waste

Zone 3 – Traffic Compacted Laterite/Transitional Waste, if used, must meet the requirements listed in Table 4.

Item	**Test Method**	**Requirement**
Soil Classification (USCS)	AS 1726	SC / SP / SM / GM / GC, with cobbles and a trace of boulders
Particle Size Distribution	AS 1289	100% passing 300 mm, ≥85% passing 60 mm, ≥10% to ≤30% passing 0.075 mm

Table 4: Properties of Zone 3 – Traffic Compacted Laterite / Transitional Mine Waste

No testing is required for Zone 3 – Traffic Compacted Laterite/Transitional Waste as this material is to be traffic compacted as placed.

6.6.5 Fine Mine Waste Wearing Course

The wear course material will be free issued by the Principal and available for collection by the Contractor at the nominated Waste Dump area. It shall be the Contractors responsibility to ensure that the material complies with the following specification:

- fines content (material finer than 75 micron) less than 15% (subject to testing); and,
- maximum particle size of 50 mm.

6.6.6 Mine Waste Material

The mine waste material will be free issued by the Principal and available for collection by the Contractor at the nominated Waste Dump area. It shall be the Contractors responsibility to ensure that the material complies with the following specification:

- well graded material;
- fines content (material finer than 75 micron) more than ≥10% (subject to testing); and,
- maximum particle size of 300 mm.

6.6.7 Production and Management of Construction Materials

General requirements of the Contractor during the production and management of construction materials shall be as follows:

- the Contractor shall excavate, haul, blend, and condition if necessary, material from nominated sources to achieve the uniform materials for embankment construction in accordance with section 6.6.6**Error! Reference source not found.**;
- the Contractor shall screen, load, haul, blend and condition if necessary, the free issued material reclaimed from the nominated Waste Dump to achieve the uniform materials for embankment construction in accordance with section 6.6.3 to 6.6.7;
- construction materials shall be stockpiled only in areas designated by the Principal Representative; and,
- the Contractor shall recognise that particular problems associated with management of materials will inevitably occur. The constraints of space, time and the order in which materials

will be excavated may require re-handling of materials and the use of temporary stockpiles. The Contractor shall allow for the time and work requirements to meet these needs in its' Construction Schedule. All associated costs shall be deemed to be included in the Schedule of Rates.

6.6.8 Temporary Roads & Ramps

The Contractor shall construct and maintain all temporary roads for haulage of embankment fill and other construction materials and equipment. The location of temporary roads shall be approved by the Principal Representative prior to construction.

The Contractor shall also construct and maintain access ramps as required to enable Contractor Plant and Equipment to access the embankment. The location of these ramps shall be approved by the Principal Representative prior to construction. The ramps may be required to be left in place or removed at completion of the Works, at the discretion of the Principal Representative.

6.6.9 Embankment Construction – Perimeter Embankment

The Contractor shall construct the perimeter embankment using material as specified and in accordance with the following:

Upstream Zone (Zone 1) Clayey Borrow / Mine Waste

The Contractor shall:

- Adjust the moisture content of Zone 1 materials, which have been approved for use in the perimeter embankment construction. Moisture condition the borrow to within the range of -2% / +2% of the OMC as determined in accordance with AS1289.5.1.1. The borrow materials shall be cured to ensure the moisture is thoroughly mixed and evenly spread through all materials proposed for embankment construction.
- Place Zone 1 material in homogeneous horizontal layers not exceeding 0.3 m loose lift thickness. Each lift shall be compacted by a minimum of 6 passes of a 12 t vibratory roller or approved equivalent. Placement should be continuous. If a break in fill placement allows the exposed surface to dry, it should be lightly tyned, watered and compacted prior to fill placement recommencing. No oversize rock is to be placed into the embankment. Largest size should be 150 mm.
- Each of Zone 1 layer shall be compacted to achieve a density ratio greater than 95% of the SMDD as determined from laboratory test carried out in accordance with AS1289.5.1.1. The actual number of passes of a 12 t vibratory roller or an approved equivalent to achieve a density greater than 95% SMDD shall be determined on site using roller trials.

Downstream Zone

Following completion of the foundation preparation, TSF Cell 3 embankment construction can commence. The downstream mine waste section of the embankment (Zone 2) can be constructed using traditional mine waste dump techniques, including tipping from minor faces and paddock dumping (i.e. not dumping off a high face). The following points should however be noted:

- The mine waste within 20 m of the upstream zone shall be placed in ≤0.5 m nominal thick layers and trafficked by construction equipment across the full width of the layer. The maximum particle size in this zone should be a maximum of ≤1/2 the layer thickness.
- The upstream face of Zone 2 shall be 'smooth', free of projections i.e. large cobbles and boulders greater than 0.15 m in size and voided rock, in order to allow for placement of the upstream zone. Trimming of the mine waste face may be required.
- Preference should be made to placing large boulders and cobbles towards the downstream of Zone 2.

General

- form windrows of adequate height on both crest edges as the Works proceed to comply with mine safety and operational guidelines. The windrows shall be raised as the Works proceed. Loose edge materials shall be removed as the Works proceeds;
- the Quality Assurance Plan shall include inspection and testing protocols to the satisfaction of the Principal Representative. The plan must include protocols for soil testing and traffic management and chains of command for allowing testing and no-go areas while testing is being undertaken;
- shape the crests of the completed external (perimeter) and internal embankment to the inside (upstream) of the storage, with a cross fall of at least 2%;
- at the final nominated embankment relative level a windrow of not less than 500 mm height or half the wheel height of the largest vehicle likely to traffic across the embankment crest (whichever is greatest) shall be left on the downstream crest side (as a minimum) of all perimeter embankment; and
- sheet the embankment crests with a minimum thickness of 100 mm of a fine mine waste material wearing course material. The fine mine waste material will be free and available for the Contractor to screen, collect and haul from the nominated Waste Dump area as required (refer to section 6.6.4).

6.6.10 Decant Accessway Construction

The Contractor shall construct the decant accessway using traffic compacted well graded Mine Waste material meeting the specification outlined in section 6.6.5;

The material will be free issued and available for the Contractor to screen, collect and haul from the nominated Waste Dump area as required.

The decant access causeway shall be constructed to the lines and levels as shown on Drawings PER2023-0063AG-01 to 06, whichever is applicable.

A windrow of not less than 500 mm height or half the wheel height of the largest vehicle likely to traffic across the embankment crest (whichever is greatest) shall be left on both sides of the decant access causeways. The windrows shall have gaps left at 100 m centres to facilitate water runoff flow to prevent ponding on the crests.

The crest of the decant accessway shall be sheeted with fine mine waste wearing course material to a thickness of 100 mm. The material will be free and available for the Contractor to screen, collect and haul from the nominated Waste Dump area as required (refer to section 6.6.4).

6.7 Decant Structure

The decant structure comprises of engineered “decant tower” concrete well rings manufactured by either Humes or Kalgoorlie Precast Concrete (or approved equivalent) surrounded by filter rock. Refer to PER2023-0063AG-01 to 06, whichever is applicable, for details.

All rock shall be carefully placed to ensure the concrete well rings are not dislodged or damaged. Any damaged well rings shall be reported to the Principal Representative and repaired or replaced by the Contractor at their cost.

The Contractor shall:

- load and haul of all free issued fill materials from the nominated Waste Dump to construct the decant. Only clean select rock fill material with a low fines content shall be placed around the decant tower. Select rock fill material shall be clean, fines-free (<3% passing 75µm), competent rock Mine Waste with a well-graded particle size distribution between 50 mm and 300 mm;
- supply, load, haul and place the concrete well rings including the geotextile membrane on the existing decant tower; and
- placement of free issued select decant filter rock, shall be progressively placed around the decant tower as the concrete liners are installed to ensure stability. Placement of the decant filter rock shall be carefully placed in such a manner as to minimise segregation and damage to the concrete well liners.

6.8 Underdrainage System

The underdrainage system will be in the form of an underdrainage, as follows:

- An underdrainage line grading to an outfall pipe, which drains into a sump downstream of the TSF, will be constructed along the southern embankment alignment.
- The underdrainage line will comprise slotted pipes, two (2) Megaflo 450, covered with select aggregate and wrapped in geotextile stabilised with 0.15 m thick coarse aggregate. The minimum lap on the geotextile will be 0.3 m. It will be installed inside the TSF basin at 10 m away from the perimeter embankment upstream toe.
- The underdrainage line grades to an HDPE outfall pipe with an outer diameter of 140 mm. The pipe will be installed within a trench 1 m wide and 1 m deep. The trench will be backfilled with in-situ spoils and sealed with bentonite collars at the location of the cut-off trench and at 10 m away from the downstream of the cut-off trench.
- The collection sump will be nominally 10 m wide at the base and 1.5 m high with 1:2 (v:h) side slopes, and it will be lined with HDPE liner. The excavation to accept the HDPE liner shall be ‘smooth’ and free of projections that could damage the liner. A pump (turret or similar) will be deployed at the sump to recover water back onto the tailings beach. A remote water level monitoring will be installed for the operation of the sump, and it will include high level and low level alarm and switch.

Pipeline gradients, excavation and backfill requirements, and materials requirements shall be as shown on the Design Drawings.

6.9 Completion

The Contractor shall meet the requirements listed here:

- clean up all rubbish, remove all plant and supply materials, trim all banks neatly, spread all excavated material not specified to be removed from the site and leave the site in a clean and tidy condition;
- provide redline as-built drawings and quantities to the Principal within two weeks of the completion of the Works; and
- all Contractor Personnel and Contractor Plant and Equipment specific to the Works shall be promptly demobilised from the Site.

7. Construction Tolerances

The Contractor shall carry out the Works in accordance with the tolerances set out in Table 2.

Structure	Item	Tolerance
Embankment	Embankment crest level	+0.2 m, -0 m
	Slopes:	
	Downstream	+/- 2% of Specified
	Upstream	+/- 2% of Specified
	Crest Width	+ 0.5 m, - 0 m
Internal Zones	Width	+/- 100 mm

Table 2: Construction Tolerances

8. Testing.

8.1 Field Compaction Trials

Prior to the commencement of embankment fill layer placement, field compaction trials shall be conducted by the Contractor for the Tailings Material.

- in a relatively level location within the cleared embankment footprint following foundation preparation, mark out a 5 m wide by 20 m long area;
- place a layer of loose, moisture condition embankment fill tailings material at 300 mm thickness;
- trim the layer with a grader;
- execute two passes of a 12 t pad foot roller over place fill to provide a smooth and level formation and conduct two reference density tests;
- repeat as required until a density greater than 95% standard compaction is achieved; and
- additional compaction trials maybe constructed using materials with varying degrees of moisture conditioning to optimise the methodology for embankment fill tailings material placement.

8.2 Test Plans

Compliance tests will be carried out by a qualified technician from a NATA registered laboratory engaged by the Contractor.

The Contractor shall provide, not later than seven (7) days after award of the Contract, a certified testing program and the name of the testing authority.

The testing program shall include details of procedures, standards and acceptance levels and conform to the requirements of specifications forming part of the Contract documentation.

Compliance testing on the embankment fill tailings material shall be carried out during the embankment construction in accordance with the following:

Property	Test Method	Minimum Testing Frequency	
		Sample from Pit	Placed Compacted Material
Moisture Content	AS 1289		1:750 m^3 (per layer)
Soil Classification	AS 1726	1:10,000 m^3	
Plasticity Index (PI)	AS 1289	1:10,000 m^3	
Particle Size Distribution (PSD)	AS 1289	1:10,000 m^3	
Field Density (FD) with 1x SMDD per 3 FD	AS 1289		1: 2,500 m^2 /layer or 1:750 m^3 (per layer)

Table 3: Quality Control Tests

At the embankment of TSF Cell 3, no testing will be required on Zone 2 – mechanically placed mine waste. The exception being the physical testing as per Section 8.

The TSF foundation preparation will be checked for compaction, using a testing frequency of 1 field density test per 2,500 m^2 per layer.

Each test location shall be identified by the Principal Representative. The test location and result will be deemed to be representative of the section or volume of work being tested. Test certificates shall be made available to the Principal Representative on an ongoing basis throughout the construction.

Table 4 provides details of remedial action to be undertaken by the Contractor should results of field density testing for the embankment fill tailings material that does not meet the specified % SMDD. The Contractor shall rework or replace materials which do not meet the compaction and other compliance requirements at its' own expense.

Remedial Action for Compacted Embankment Material			
Category	**Hilf Density Ratio (%SMDD)**	**Moisture Variation (%)**	**Remedial Action**
A	Fail by less than 1%	Pass	Re-roll (no. of passes to be specified by the Principal Representative, min. 3)
B	Fail by 1% or more	Pass, but no more than 1.0% wet of OMC limit *	Rip, re-water, re-roll and re-test
C	Fail by 1% or more	Pass, but 1.0% or more wet of OMC limit *	Rip, re-roll and re-test
D	Pass	Fail, between 1% and 3% dry of OMC limit *	Re-roll (no. of passes to be specified by the Principal Representative, min. 3)
E	Pass	Fail, more than 3% dry of OMC limit *	Rip, water, re-roll and re-test
F	Pass	Fail, more than 3% wet of OMC limit *	Rip, moisture condition (dry back), re-roll and re-test
G	Fail (Other than above)	Fail (Other than above)	Remove fill, replace and re-test
* OMC limit = -2% / +2% of OMC			

Table 4: Remedial Action for Compacted Embankment Material

9. Principal Supply

The Principal shall provide the following facilities, technical services, consumables, materials, and equipment. All other items required to complete the Works apart from those expressly detailed below as being provided by the Principal shall be the responsibility of the Contractor.

The Principal does not warrant the adequacy of any facilities, services or technical support provided by it toward the performance of the Works.

9.1 Facilities at the Site

The provision of Principal Facilities is as per that stated in the General Conditions Construction.

The Principal shall make the existing Jupiter processing plant crib room and ablution facility available for the Contractor's use. The Contractor shall liaise with the Principal and agree to suitable use times to ensure integration with existing Principal's operations personnel.

9.2 Technical and Other Services

The Principal will provide the technical services as set out in the following.

9.2.1 TSF Design

Design of the TSF Cell and preparation of the requisite drawings for construction.

9.2.2 Geotechnical Engineering Support

A geotechnical engineering consultant acting on behalf of the Principal will attend the Site at regular intervals during the Works to:

- assess the foundation preparation for subsequent embankment construction;
- assess embankment construction;
- assess underdrainage installation; and
- assess the decant facility construction.

9.2.3 Surveying

The Principal will provide the following surveying services required for the performance of the Works. The Principal's scope of survey will include:

- establishment and maintenance of temporary benchmark (TBM) stations as required;
- establishing all secondary survey stations required for setting out and pick-up;
- setting out;
- survey of the Works to determine payment;
- pick up of “as builts”; and
- preparation of “as built” drawings.

The Contractor will ensure that survey TBM stations established by the Principal Representative are not disturbed. In the event that a survey TBM station is damaged or is likely to be disturbed by the Contractor's operations, it shall immediately notify the Principal Representative and repair or replace such control station at its cost.

The Contractor shall be deemed to have allowed in its schedule of rates for all reasonable delays or interruption of its work caused by surveying activities.

9.3 Consumables

The Contractor is to provide an estimate of diesel fuel consumption on a weekly basis for the duration of the Works. Diesel fuel will be supplied by the Principal to the Contractor up to a maximum of 5% over the total volume (in litres) estimated to be consumed by the Contractor as set out in Table 8. The consumption of Diesel Fuel above this allowance will be set-off or deducted from the Contractor's progress claim at the landed cost to the Site per litre.

The Contractor shall at all times be required to maintain and promptly supply adequate records of diesel fuel usage to allow the Principal to claim GST and Fuel Tax Credits (FTC) related to all diesel fuel supplied by the Principal. Should the Contractor fail to maintain and promptly supply adequate records, such that the Principal is unable to claim GST and FTC where eligible, the Principal may set-off or deduct amounts otherwise claimable from the Contractor's progress claim.

9.4 Materials and Equipment

The Principal will provide the following materials and equipment at the Site required for execution of the Works.

- water for construction - it shall be the Contractors responsibility to collect and haul the water. Two (2) locations are available for water collection, being:
  - Saline water located at the north east location of TSF Cell 2. The current pump is capable of approximately 8 l/s. It is the Contractor responsibility to supply and install a suitable standpipe including necessary pipe, 50 kL (minimum) storage tank, valves and fittings. The Contractor shall for the duration of the contract be responsible for the operation and maintenance of the Principal supplied pump, generator and fuel pod including interconnecting electrical and mechanical infrastructure. Note: when water is not extracted by the Contractor, the water shall continue to discharge into the TSF cell 1 as is current practice.
  - Hypersaline water located near the Jupiter administration offices. A standpipe is available.

- Mine Waste fill material required for the construction of the access track and decant accessway. This Mine Waste material will be available from the nominated Waste Dump area and it shall be the Contractors responsibility to screen and condition as required to ensure the material conforms to the specification outlined in section 6.6.5;

- Fine mine waste material required for the sheeting of the crest of the TSF permitter and dividing embankment, decant accessway and access track. This fine Mine Waste material will be available from the nominated Waste Dump area and it shall be the Contractors responsibility to screen and condition as required to ensure the material conforms to the specification in section 6.6.4.

- Erosion protection material required for the construction of the perimeter/dividing embankment. This material will be available from the nominated Waste Dump area and it shall be the Contractors responsibility to screen and condition as required to ensure the material conforms to the specification outlined in section 6.6.3.

- Select fill rock material for the decant structure will be available from the nominated Waste Dump area. It shall be the Contractors responsibility to screen as required to ensure the material conforms to the specification outlined in section 6.7; and

- TSF tailings fill material.

Estimate of Fuel Consumption (Litres)		
Week	**FTC Eligible(L)**	**FTC Ineligible(L)**
W1	...	...
W2	...	...
W3	...	...
W4	...	...
W5	...	...
W6	...	...
W7	...	...
W8	...	...
W9	...	...
W10	...	...
W11	...	...
W12	...	...
W13	...	...
W14	...	...
W15	...	...
W16	...	...
W17	...	...
W18	...	...
W19	...	...
TOTAL	...	...

Table 8: Contractor's Estimate of Diesel Fuel Consumption

10. Contractor Supply

10.1 General

In accordance with the Principal's General Conditions for Construction, the Contractor must supply all Contractor Plant and Equipment; Contractor Personnel; all consumables; and any other plant, equipment or material set out in the Contract that is necessary for the proper performance of the Works.

10.2 Contractor Plant and Equipment

The Contractor shall provide all Plant and Equipment to be utilised during the course of the Works as set out in Table 9.

In regard to the provision of a geotechnical laboratory transportable building, the Contractor shall ensure that the transportable building is supplied with an in-built grey water collection system. The grey water system shall also have provision for a suitable connection allowing the grey water to be pumped empty with a mobile grey water truck collection unit.

The Principal will make provision for the supply and connection of potable water and power to the building; however, telecommunications will be the responsibility of the Contractor, which is to make suitable provision for accessing the Telstra network. An area to the rear (southern side) of the existing process water dam shall be made available for the Contractor to locate the Geotechnical laboratory transportable building.

10.3 Contractor Personnel

The Contractor Personnel schedule and roster arrangements is set out in Table 10. It is estimated that … flight seats will be required.

10.4 Surveying – Equipment GPS

The Contractor shall be responsible for all works associated with setting-up and maintaining the GPS facilities on all of their equipment.

Description	Quantity
...	...
...	...
...	...
...	...
...	...
...	...
...	...
...	...
...	...
...	...
...	...
...	...
...	...

Table 9: Contractor and Plant and Equipment Schedule

Employee Category	Roster	Hours per shift	Personnel Numbers																			
			Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14	Wk 15	Wk 16	Wk 17	Wk 18	Wk 19	Wk 20
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Table 10: Contractor Personnel and Roster Schedule

11. Exclusions

11.1 Tailings and Decant Pipework

The existing tailings and decant pipework located at the TSF Cell 1 and 2 facility is controlled and operated by the Principal and shall be operational during the Works. Any sections of piping on Cell 1 and 2 will be removed by the Principal.

In the event of damage, the Principal Representative shall be immediately notified of any damage, no matter how minor, and the damage shall be rectified at the Contractor's cost.

11.2 VWP and Monitoring Bores

Installed around the existing TSF Cells are a series of VWP and monitoring bores. The Contractor shall identify such structures and ensure that no damage is incurred during the Works. In the event of damage, the Principal Representative shall be immediately notified of any damage, no matter how minor, and the damage shall be rectified at the Contractor's cost.

11.3 Maintain Access to TSF Cell 2

During construction, the Principals operations personnel will require access to the existing TSF Cell 2 Facility, including access to the decant facility. The dividing embankment between Cell 1 and Cell 2 is to be maintained in a trafficable condition at all times. When access is compromised for any period of time, the Contractor shall communicate with the Principal Representative providing a minimum of seven days' notice such that an alternative arrangement/ agreement is required.

Appendix A

Date	5-Aug-24
Job No	PER2023-0063
File	PER2023-0063AG
Subject	Quantities
Revision	1

PROJECT : TAILINGS STORAGE FACILITY (TSF) CELL 3

CLIENT : GENESIS MINERALS LTD (GMD)

LOCATION : MT MORGANS GOLD PROJECT (MMGP)

Item	Description	Unit	Quantity	Rate	Amount
1.00	**Embankment Construction, Crest RL 418 m**				
	Preliminaries & Site Preparation				
1.01	Site establishment, including all preliminaries, insurances etc., mobilisation, demobilisation, borrow management, maintenance of existing tracks	Item	1		$ -
1.02	Site clearing including grubbing and stockpiling of vegetation from the TSF footprint area (extend approx. 5 m past the final downstream toe of embankments)	ha	58	$ -	$ -
1.03	Strip topsoil (0.1 m thick) from TSF footprint area and stockpile separately from vegetation	m^3	58,000	$ -	$ -
	Earthworks				
1.04	Prepare perimeter embankment foundation	m^2	130,000	$ -	$ -
1.05	Moisture condition and compact TSF basin (to 0.3 m depth)	m^2	510,000		
1.06	Excavate cut-off trench beneath perimeter embankment (1.5-2.5 m deep, 3 m wide at base)	m^3	19,000	$ -	$ -
1.07	Backfill cut-off trench beneath perimeter embankment (1.5-2.5 m deep, 3 m wide at base) with roller compacted clay materials	m^3	19,000	$ -	$ -
1.08	Borrow, transport, place and roller compact clay materials to embankment	m^3	108,000	$ -	$ -
1.09	Borrow, transport, place and traffic compact mine waste to embankment	m^3	970,000	$ -	$ -
1.10	Capping of downstream embankment with 0.5 m thick mine waste material - erosion protection	m^3	23,000	$ -	$ -
1.11	Borrow, transport, place and traffic compact mine waste to decant accessway	m^3	9,500	$ -	$ -
1.12	Sheet perimeter embankment and decant accessway crests with gravel (0.1 m thick over the crest width minus windrows)	m^3	830	$ -	$ -
2.00	**Decant Structure**				
2.01	Concrete footing (2.5 m x 2.5 m x 0.3 m)	m^3	1.9	$ -	$ -
2.02	Place select filter rock around Decant	m^3	330	$ -	$ -
2.03	1.8 m Dia Concrete well liners	No.	8		
3.00	**Underdrainage**				
3.01	Supply and install underdrains; comprising aggregate, geotextile, slotted pipe wrapped in geotextile (Megaflo 450, length x 2)	m	900	$ -	$ -
3.02	Supply and install solid outfall pipe (plus tee piece)	m	150	$ -	$ -
3.03	Install underdrainage sump	Item	1	$ -	$ -
	SUB-TOTAL				$ -

		Date	5-Aug-24
CMW Geosciences		Job No	PER2023-0063
		File	PER2023-0063AG
		Subject	Quantities
		Revision	1

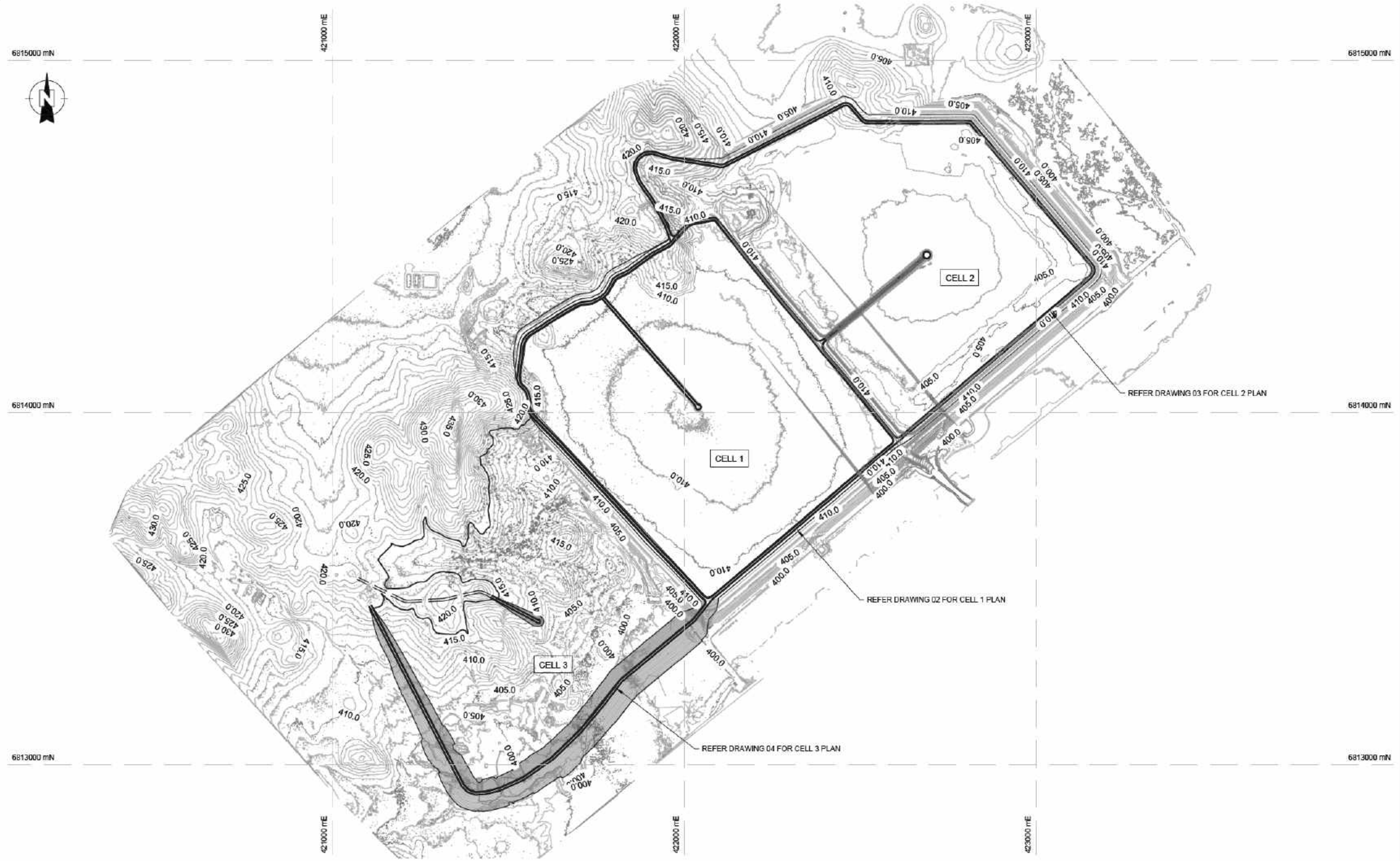
PROJECT : TAILINGS STORAGE FACILITY (TSF) CELL 3

CLIENT : GENESIS MINERALS LTD (GMD)

LOCATION : MT MORGANS GOLD PROJECT (MMGP)

Item	Description	Unit	Quantity	Rate	Amount
3.00	**INSTRUMENTATION**			$ -	$ -
3.01	Excavate trenches for VWPs	m	340	$ -	$ -
3.02	Lay VWP cables in trenches for future connection, 2-pair twisted 22 AWG to AS/NZS 1125/3808 (or similar), allow snaking	m	450	$ -	$ -
3.03	Trench backfill	m^3	340	$ -	$ -
3.04	Bentonite backfill	m^3	3	$ -	$ -
3.05	VWP, pressure = 350 kPa with frequency range = 2000 - 3500 Hz (or similar)	item	6	$ -	$ -
3.06	Terminal Box, incl. annual fee of approx. $500/yr (allow 5 yrs) for IP-VPN services	item	3	$ -	$ -
3.07	Monitoring bores, 20 m min. depths	item	3	$ -	$ -
	SUB-TOTAL				$ -
3.0	**Ancillary Items**				
3.01	Airfares for Contractors / Superintendent personnel	No.			$ -
3.02	Accommodation and meals for Contractors	Person days			$ -
3.03	Fuel supplied by Principal	L			$ -
3.04	Construction monitoring costs (Superintendent and vehicle incl misc)	Item			$ -
3.05	QA/QC Geotechnical Testing	Days			by Client
3.06	Construction report and office support	Allow			by Client
	SUB-TOTAL				$ -
	No Contingency				$ -
	TOTAL COST-STAGE 1				$ -

Notes:



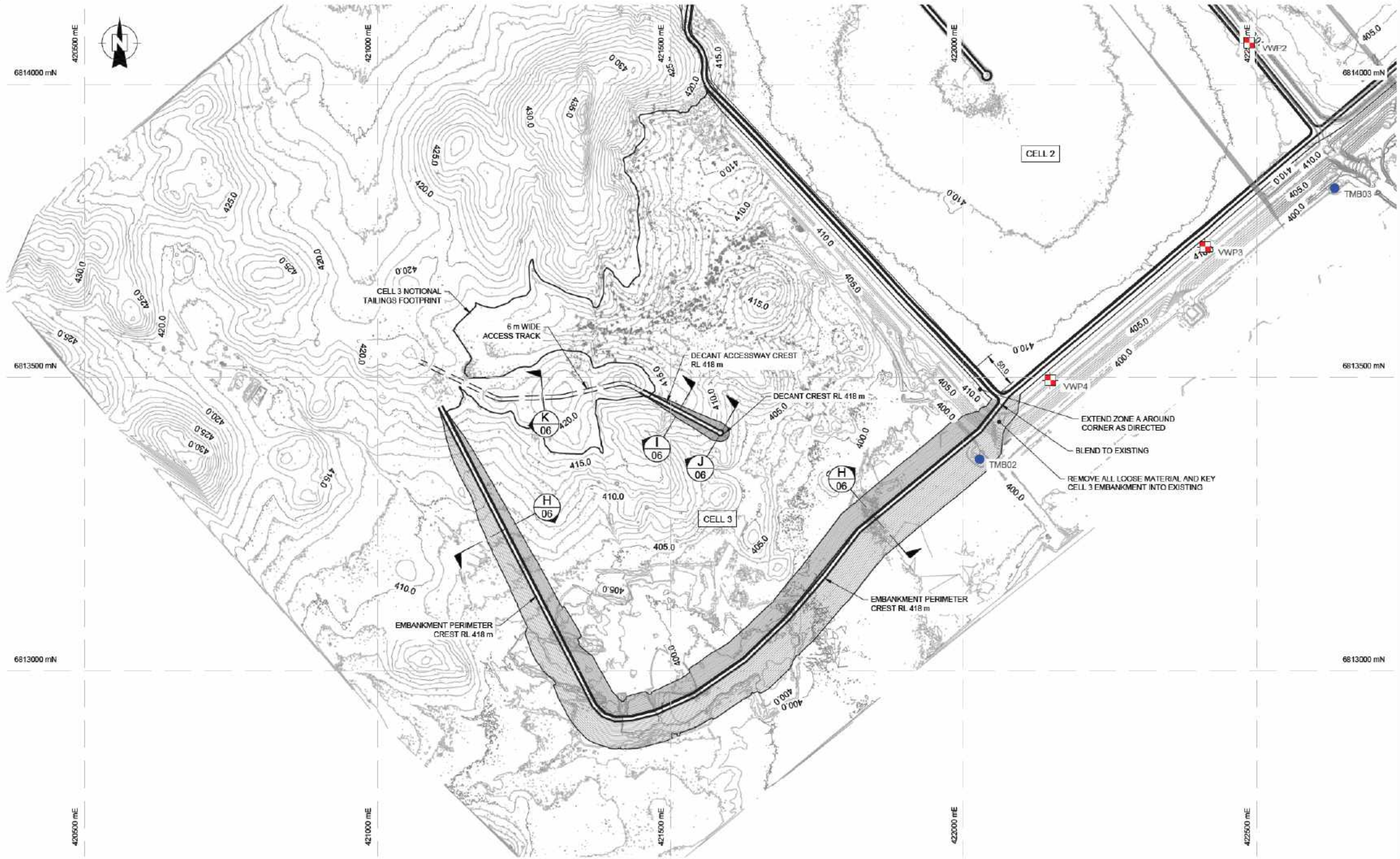
NOTES:

1. ALL DIMENSIONS IN METRES UNO

1:10 000 — 0 100 200 300 400 500 m

CMW Geosciences

CLIENT: GENESIS MINERALS LTD (GDM)		DRAWN: PA	PROJECT: PER2023-0063AG
PROJECT: NEW TSF CELL 3		CHECKED: CH	DRAWING: 01
		REVISION: 1	SCALE: 1:10,000
TITLE: GENERAL ARRANGEMENT - PLAN		DATE: 05.08.24	SHEET: A3 L



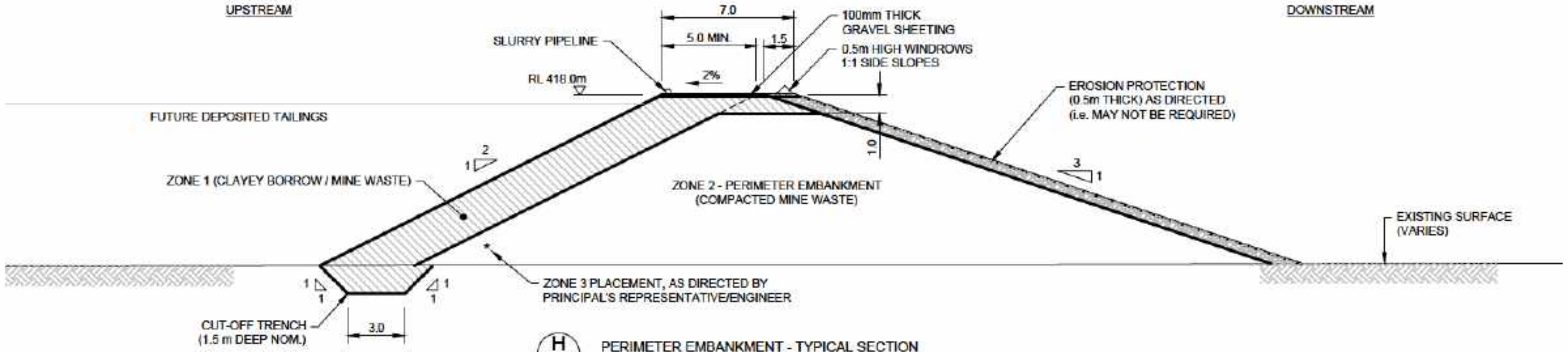
NOTES:

1. ALL DIMENSIONS IN METRES UNO

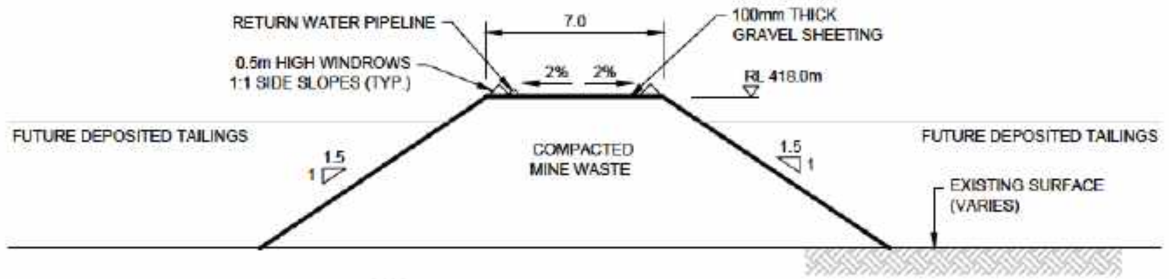
LEGEND:

- TMB01 MONITORING BORE
- VWP1 VIBRATING WIRE PIEZOMETER

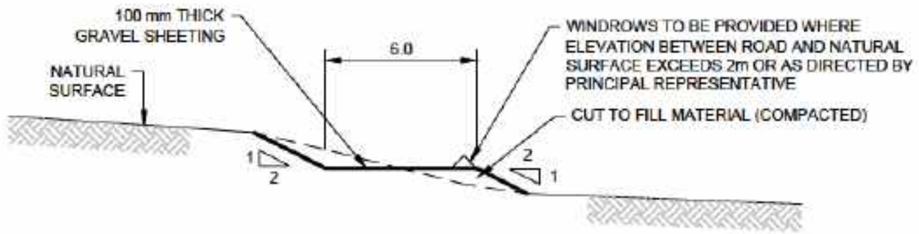
CMW Geosciences	CLIENT: GENESIS MINERALS LTD (GDM)	DRAWN: PA	PROJECT: PER2023-0063AG
	PROJECT: NEW TSF CELL 3	CHECKED: CH	DRAWING: 02
		REVISION: 1	SCALE: 1:6000
	TITLE: CELL 3 - PLAN	DATE: 05.08.24	SHEET: A3 L



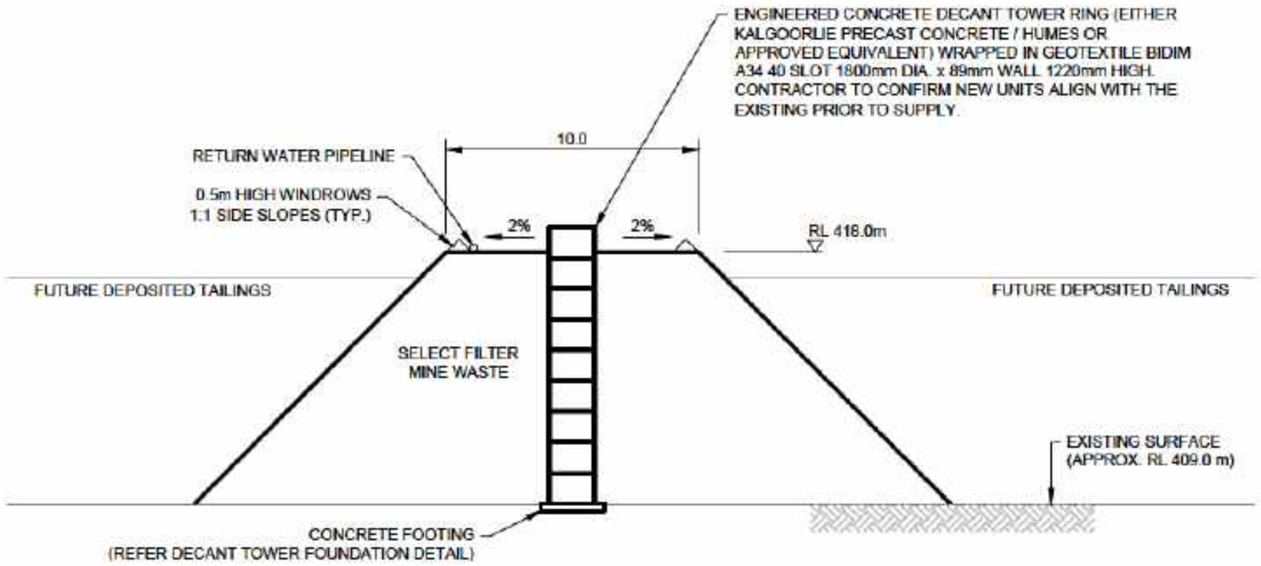
H / 04 **PERIMETER EMBANKMENT - TYPICAL SECTION**
1:300



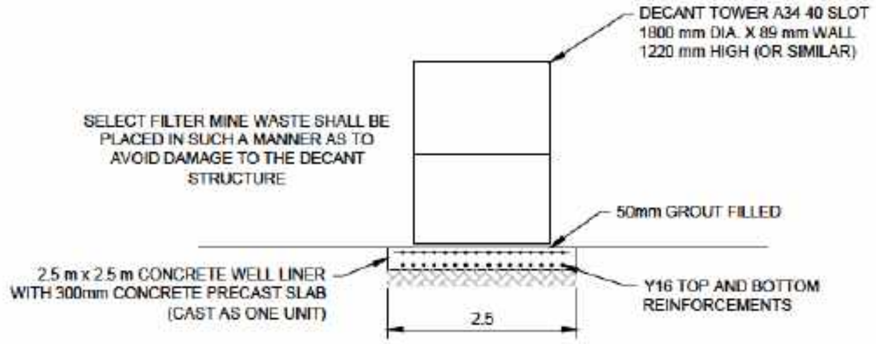
I / 04 **DECANT ACCESSWAY - TYPICAL SECTION**
1:300



K / 04 **ACCESS TRACK - TYPICAL SECTION**
1:300



J / 04 **DECANT TOWER - TYPICAL SECTION**
1:300



DECANT TOWER TO BE CAST INTO EXCAVATION ON COMPETENT MATERIAL AS APPROVED BY THE ENGINEER. AVOID OVER EXCAVATION LATERALLY. PROVIDE 50mm BLINDING CONCRETE LAYER AT THE BASE OF THE EXCAVATION.

DECANT TOWER FOUNDATION - TYPICAL DETAIL
1:100

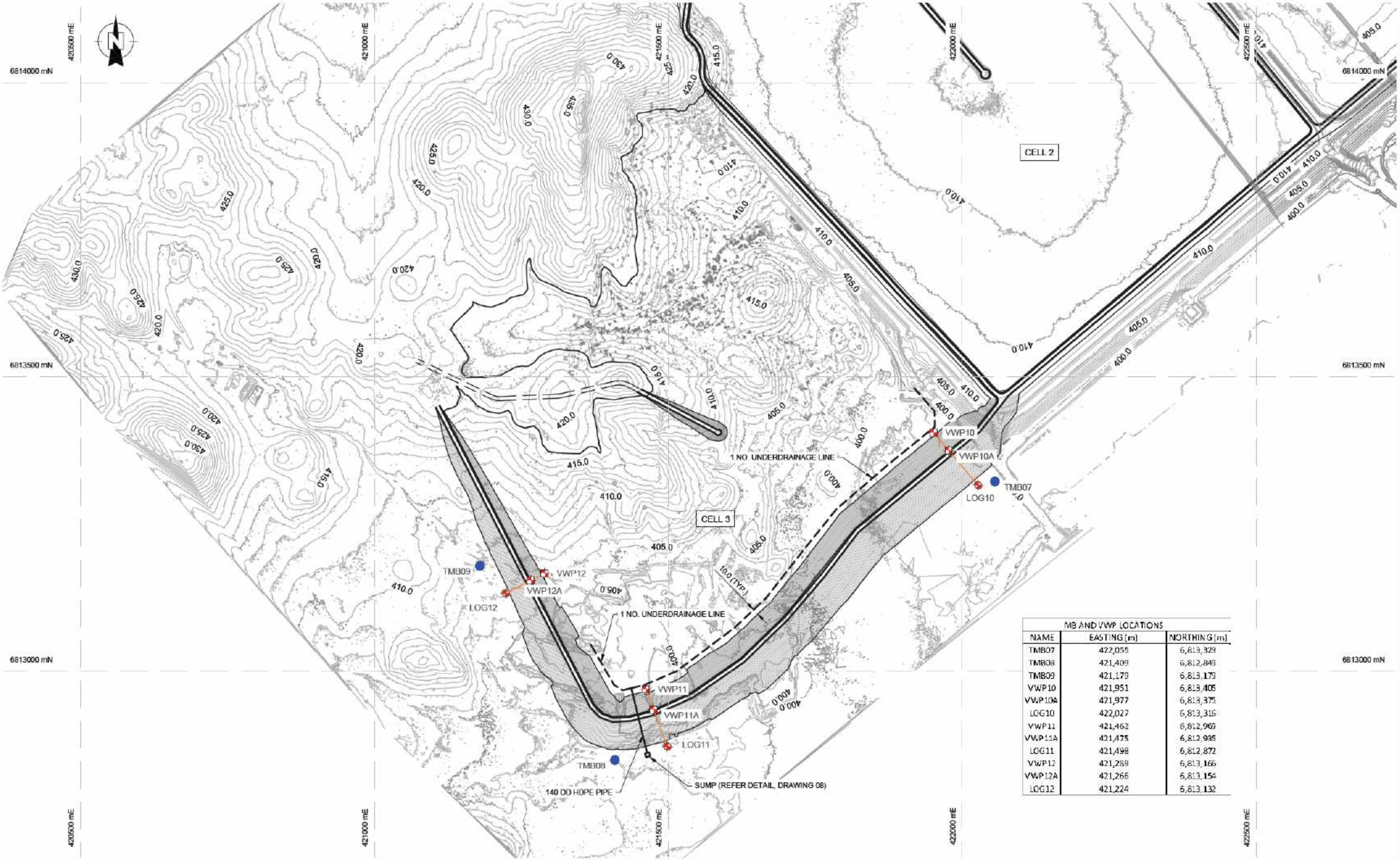
NOTES:

1. ALL DIMENSIONS IN METRES UNO

1:300 — 0 3 6 9 12 15 m

CMW Geosciences

CLIENT: **GENESIS MINERALS LTD (GDM)**	DRAWN: PA	PROJECT: PER2023-0063AG
PROJECT: **NEW TSF CELL 3**	CHECKED: CH	DRAWING: 03
	REVISION: 1	SCALE: 1:300
TITLE: **CELL 3 TYPICAL CROSS SECTIONS**	DATE: 05.08.24	SHEET: A3 L



MB AND VWP LOCATIONS		
NAME	EASTING (m)	NORTHING (m)
TMB07	422,055	6,813,323
TMB08	421,409	6,812,848
TMB09	421,179	6,813,179
VWP10	421,951	6,813,405
VWP10A	421,977	6,813,375
LOG10	422,027	6,813,316
VWP11	421,462	6,812,969
VWP11A	421,475	6,812,935
LOG11	421,498	6,812,872
VWP12	421,289	6,813,166
VWP12A	421,266	6,813,154
LOG12	421,224	6,813,132

LEGEND:

- TMB01 MONITORING BORE
- VWP1 VIBRATING WIRE PIEZOMETER
- TRENCH
- TERMINAL BOX / LOGGER

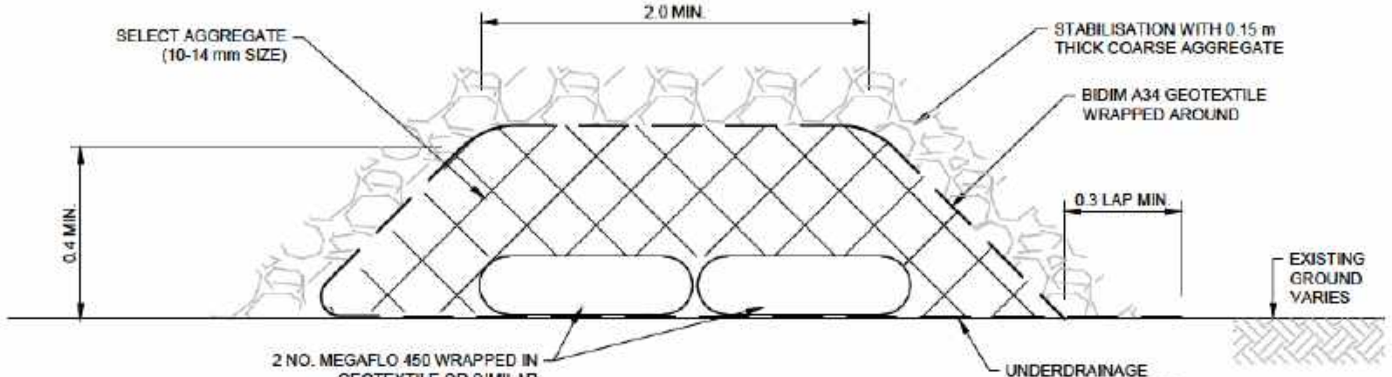
NOTES:

1. ALL DIMENSIONS IN METRES UNO

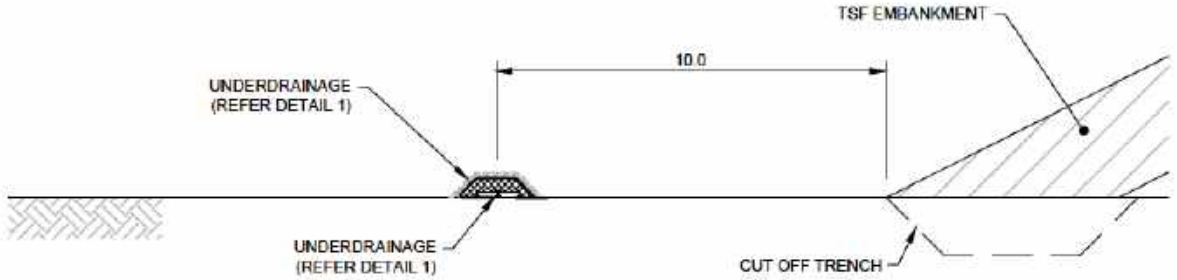
0 60 120 180 240 300 m
1:6000

CMW Geosciences

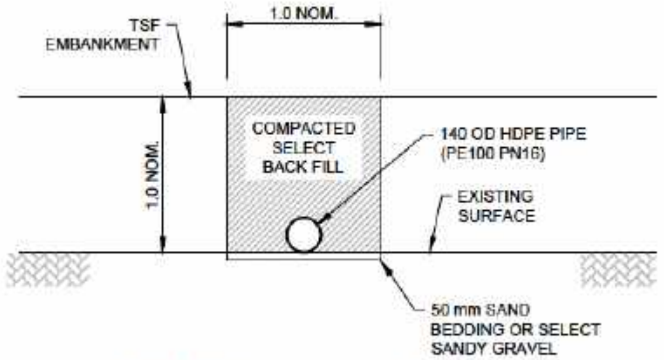
CLIENT: GENESIS MINERALS LTD (GDM)	DRAWN: PA	PROJECT: PER2023-0063AG
PROJECT: NEW TSF CELL 3	CHECKED: CH	DRAWING: 04
	REVISION: 1	SCALE: 1:6000
TITLE: CELL 3 - INSTRUMENTATION & UNDERDRAINAGE PLAN	DATE: 05.08.24	SHEET: A3 L



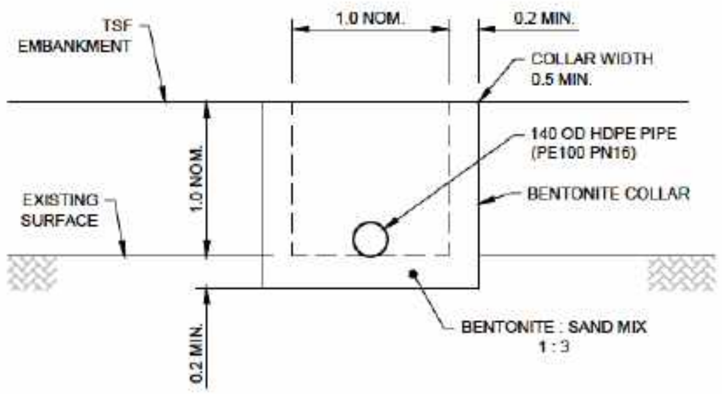
1/09 UNDERDRAINAGE - TYPICAL SECTION
NTS



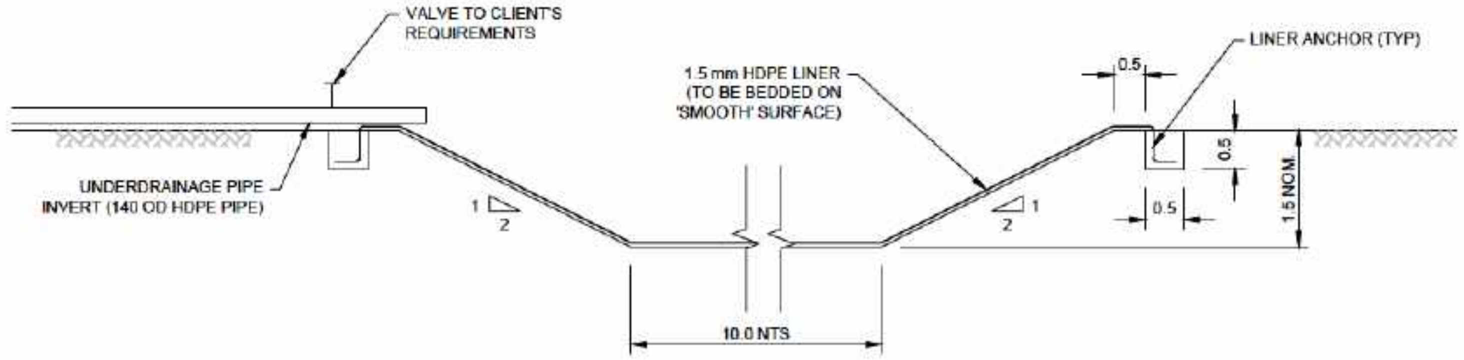
2/09 EMBANKMENT & UNDERDRAINAGE LINES - TYPICAL SECTION
1:100



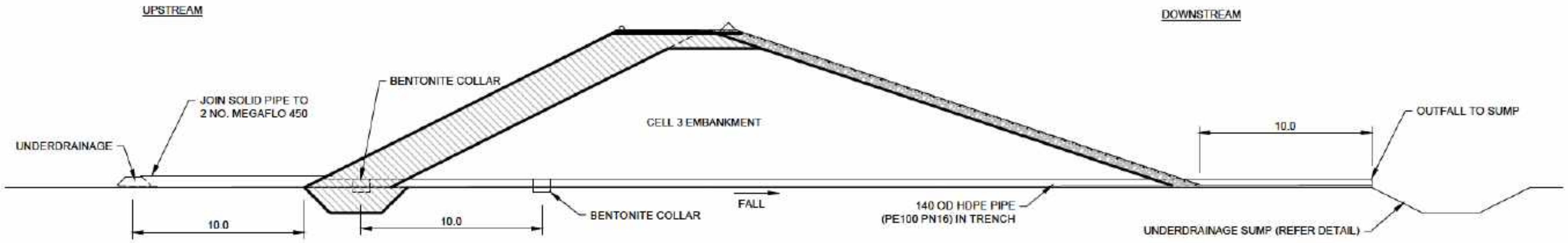
UNDERDRAINAGE TRENCH - TYPICAL DETAIL
1:50



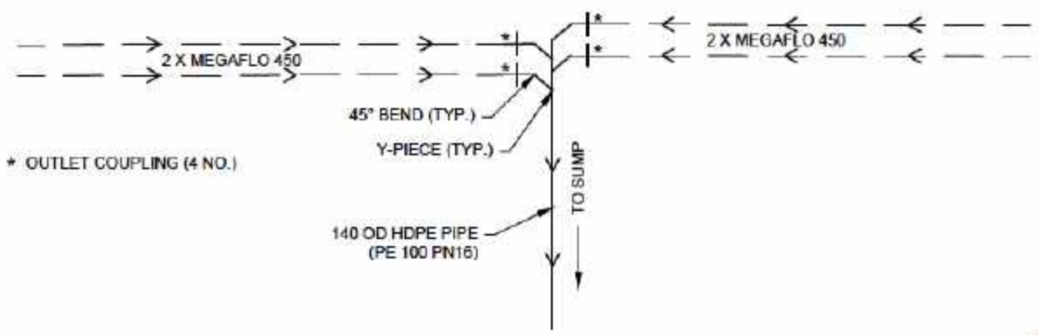
BENTONITE COLLAR - TYPICAL DETAIL
1:50



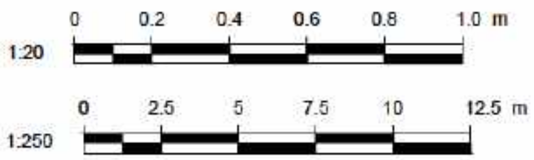
UNDERDRAINAGE SUMP - TYPICAL DETAIL
1:100



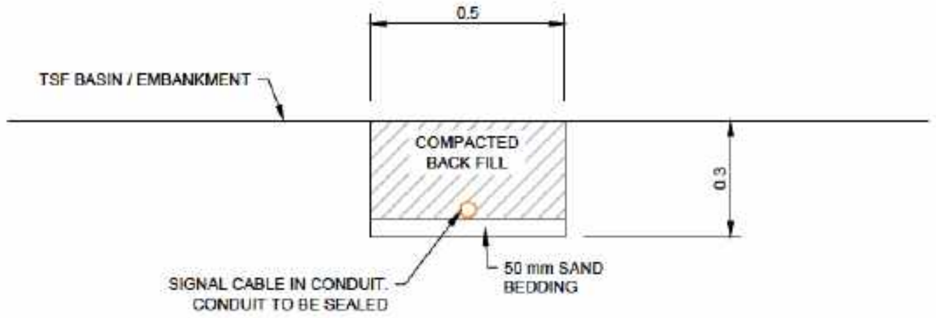
UNDERDRAINAGE OUTLET - TYPICAL SECTION
NTS



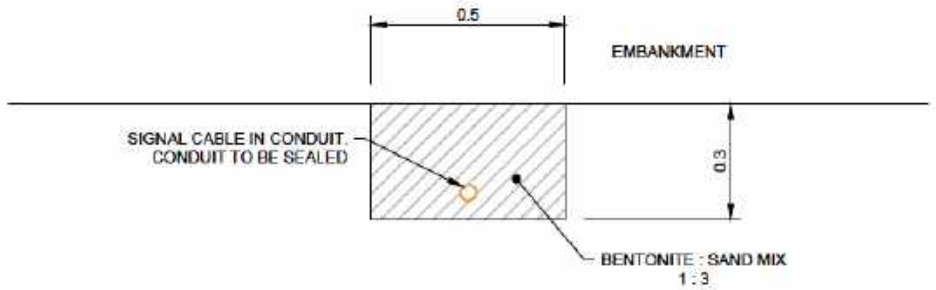
PIPELINE SCHEMATIC TO SUMP - TYPICAL DETAIL
NTS



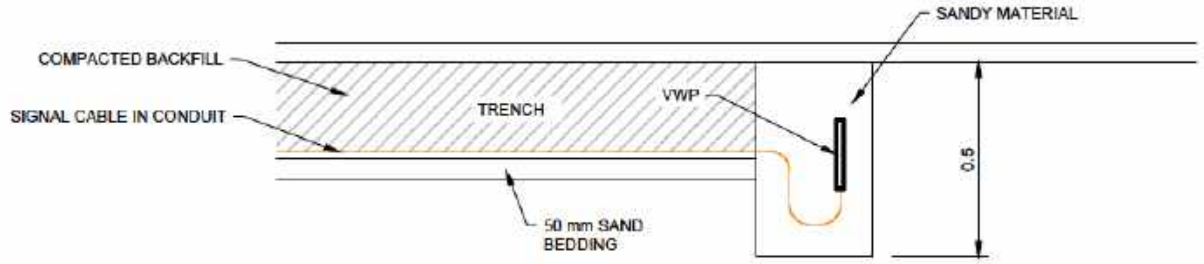
CMW Geosciences	CLIENT: GENESIS MINERALS LTD (GDM)	DRAWN: PA	PROJECT: PER2023-0063AG
	PROJECT:	CHECKED: CH	DRAWING: 05
	NEW TSF CELL 3	REVISION: 1	SCALE: AS SHOWN
	TITLE: CELL 3 - UNDERDRAINAGE DETAILS	DATE: 05.08.24	SHEET: A3 L



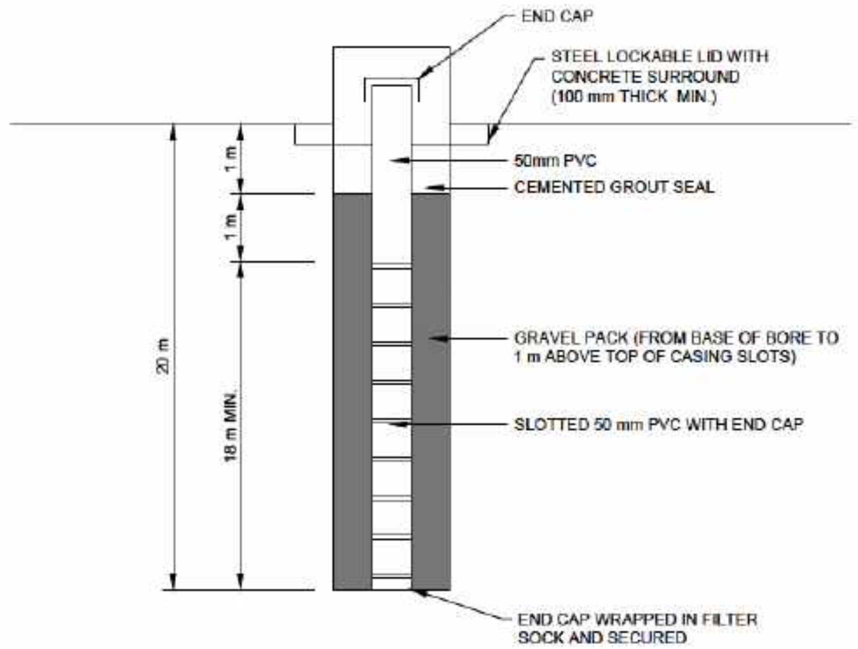
VWP TRENCH - TYPICAL DETAIL
1:20



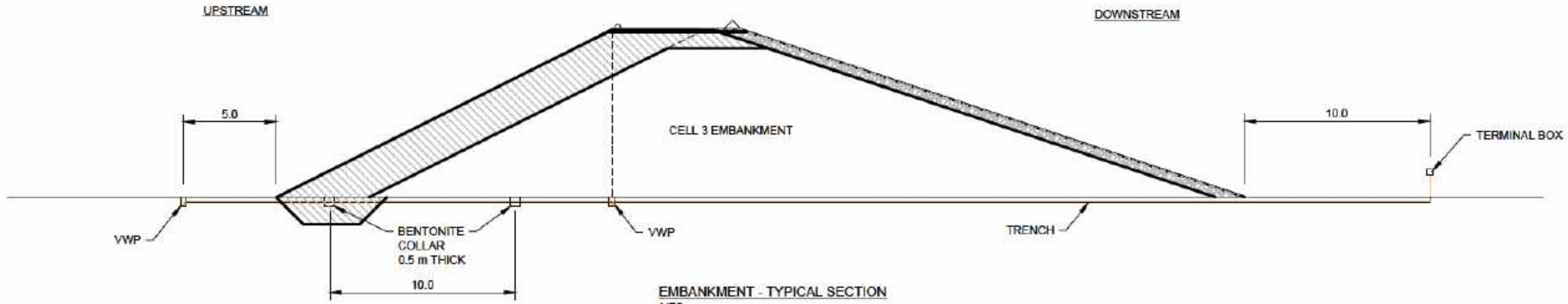
BENTONITE COLLAR - TYPICAL DETAIL
1:20



VIBRATING WIRE PIEZOMETER - TYPICAL DETAIL
1:20



MONITORING BORE - TYPICAL DETAIL
NTS



EMBANKMENT - TYPICAL SECTION
NTS

NOTES:

1. HEAVY DUTY VIBRATING WIRE PIEZOMETER REFERS TO 3.5 BAR (50 PSI) PIEZOMETER MODEL NO. 52610530 BY DGSI
2. ARMOURED SIGNAL CABLE MODEL NO. 50613586 BY DGSI
3. ALL DIMENSION IN METRES UNO

1:20 — 0 0.2 0.4 0.6 0.8 1.0 m

CMW Geosciences

CLIENT: **GENESIS MINERALS LTD (GDM)**	DRAWN: PA	PROJECT: PER2023-0063AG
PROJECT: **NEW TSF CELL 3**	CHECKED: CH	DRAWING: 06
	REVISION: 1	SCALE: AS SHOWN
TITLE: **CELL 3 - INSTRUMENTATION DETAILS**	DATE: 05.08.24	SHEET: A3 L

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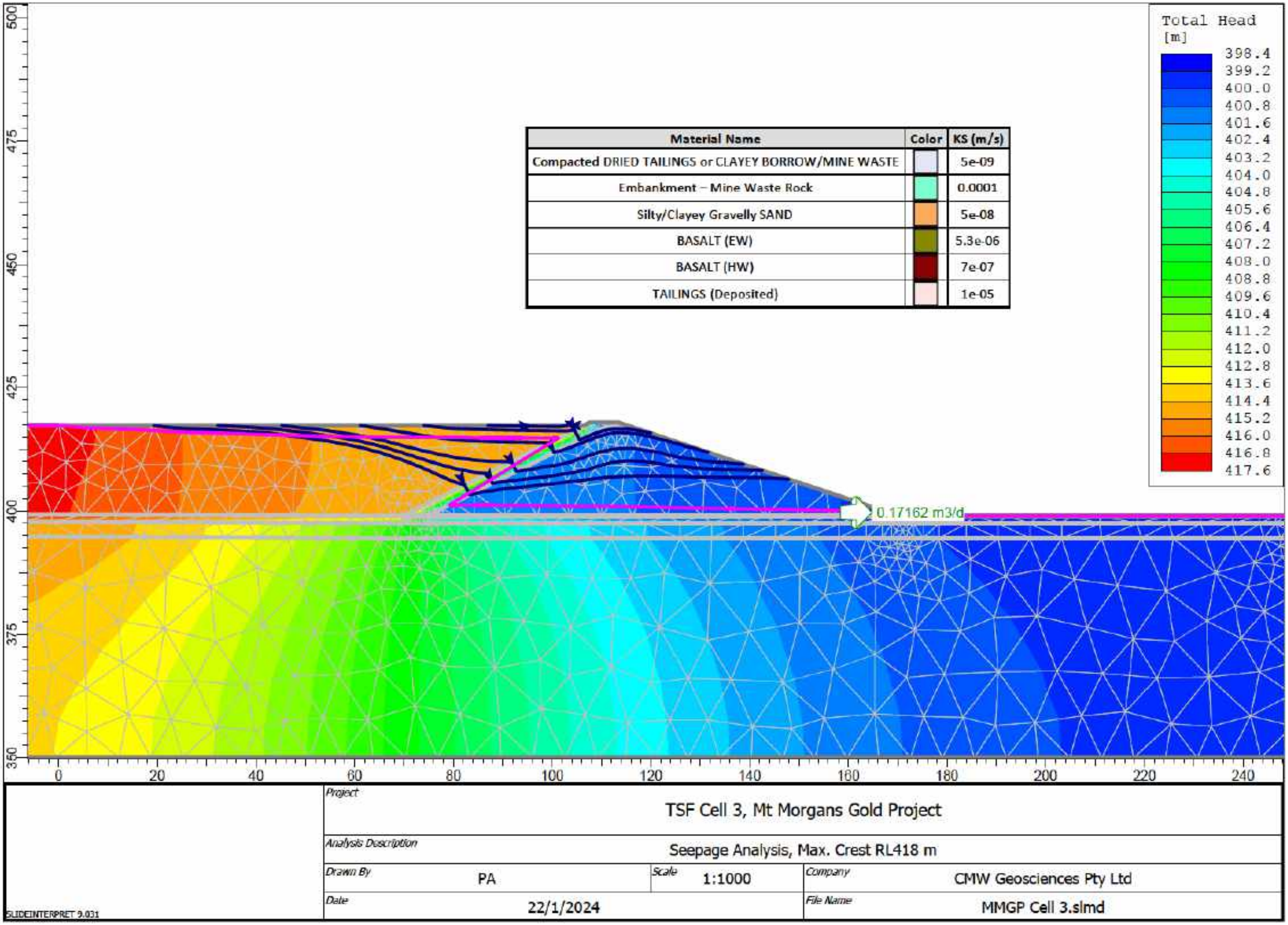
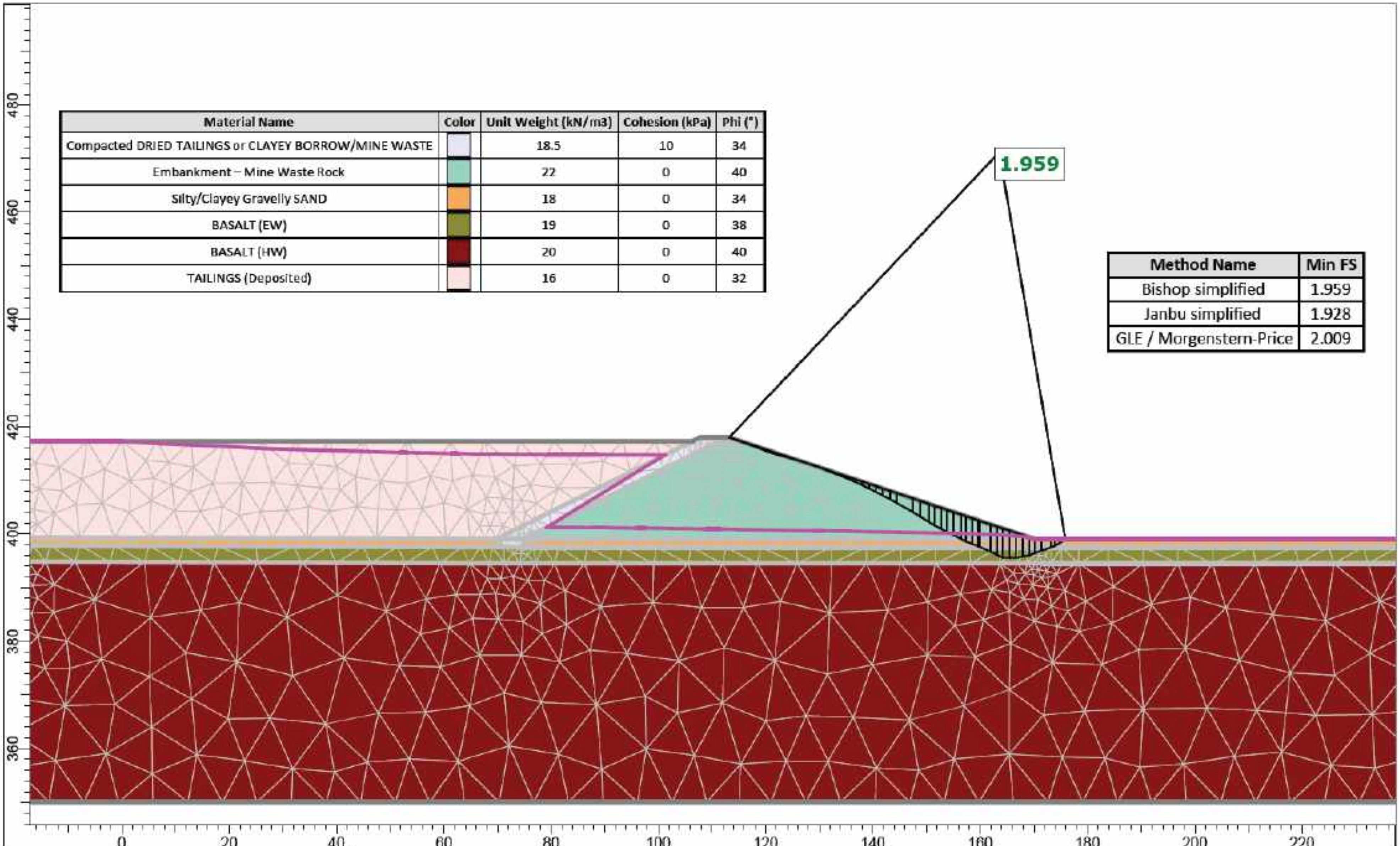
Appendix D:
Seepage, Stability and Deformation Analyses



Material Name	Color	KS (m/s)
Compacted DRIED TAILINGS or CLAYEY BORROW/MINE WASTE		5e-09
Embankment – Mine Waste Rock		0.0001
Silty/Clayey Gravelly SAND		5e-08
BASALT (EW)		5.3e-06
BASALT (HW)		7e-07
TAILINGS (Deposited)		1e-05



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (°)
Compacted DRIED TAILINGS or CLAYEY BORROW/MINE WASTE		18.5	10	34
Embankment – Mine Waste Rock		22	0	40
Silty/Clayey Gravelly SAND		18	0	34
BASALT (EW)		19	0	38
BASALT (HW)		20	0	40
TAILINGS (Deposited)		16	0	32

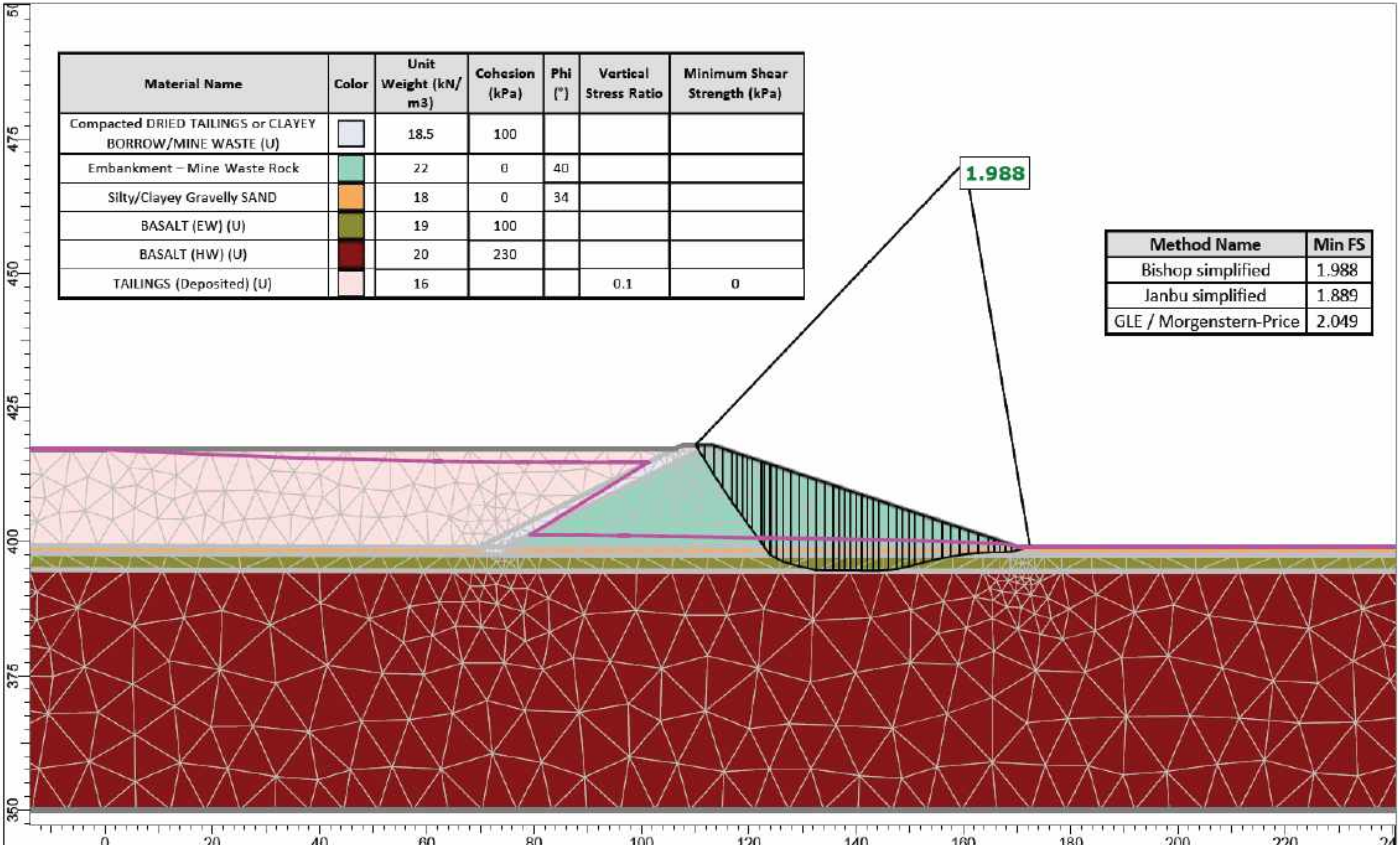
Method Name	Min FS
Bishop simplified	1.959
Janbu simplified	1.928
GLE / Morgenstern-Price	2.009

Project	TSF Cell 3, Mt Morgans Gold Project		
Analysis Description	Stability Analysis Case 1, Max. Crest RL418 m		
Drawn By PA	*Scale* 1:1000	*Company*	CMW Geosciences Pty Ltd
Date 22/1/2024		*File Name*	MMGP Cell 3_Stability.slmd

SLIDEINTERPRET 9.031

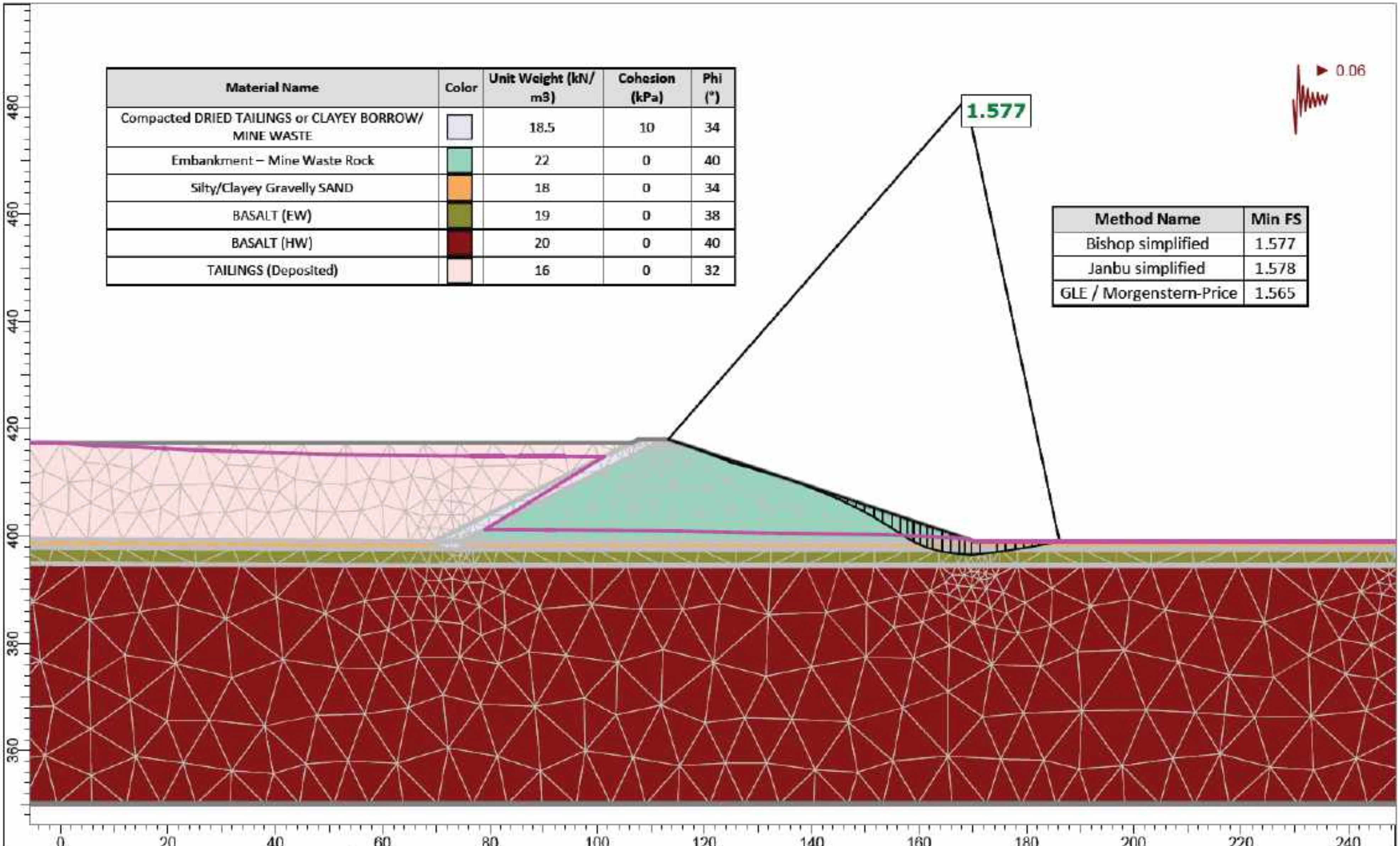
Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (°)	Vertical Stress Ratio	Minimum Shear Strength (kPa)
Compacted DRIED TAILINGS or CLAYEY BORROW/MINE WASTE (U)		18.5	100			
Embankment – Mine Waste Rock		22	0	40		
Silty/Clayey Gravelly SAND		18	0	34		
BASALT (EW) (U)		19	100			
BASALT (HW) (U)		20	230			
TAILINGS (Deposited) (U)		16			0.1	0

Method Name	Min FS
Bishop simplified	1.988
Janbu simplified	1.889
GLE / Morgenstern-Price	2.049



Project	TSF Cell 3, Mt Morgans Gold Project
Analysis Description	Stability Analysis Case 2, Max. Crest RL418 m
Drawn By	PA
Scale	1:1000
Company	CMW Geosciences Pty Ltd
Date	22/1/2024
File Name	MMGP Cell 3_Stability.slmd

SLIDEINTERPRET 9.031

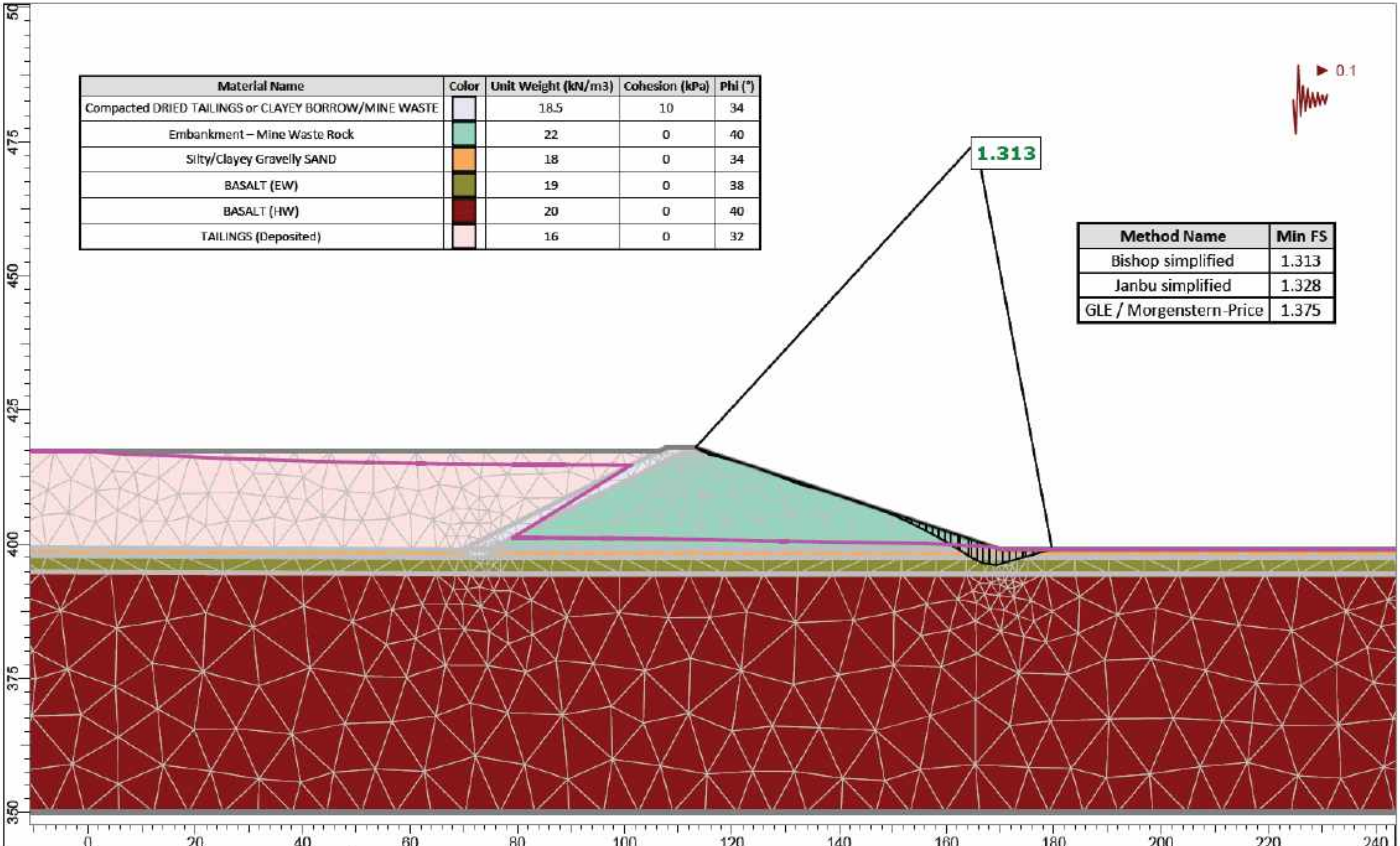


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (°)
Compacted DRIED TAILINGS or CLAYEY BORROW/ MINE WASTE		18.5	10	34
Embankment – Mine Waste Rock		22	0	40
Silty/Clayey Gravelly SAND		18	0	34
BASALT (EW)		19	0	38
BASALT (HW)		20	0	40
TAILINGS (Deposited)		16	0	32

Method Name	Min FS
Bishop simplified	1.577
Janbu simplified	1.578
GLE / Morgenstern-Price	1.565

Project	TSF Cell 3, Mt Morgans Gold Project		
Analysis Description	Stability Analysis Case 3, Max. Crest RL418 m		
Drawn By	PA	*Scale*	1:1000
Company	CMW Geosciences Pty Ltd		
Date	22/1/2024	*File Name*	MMGP Cell 3_Stability.slmd

SLIDEINTERPRET 9.031

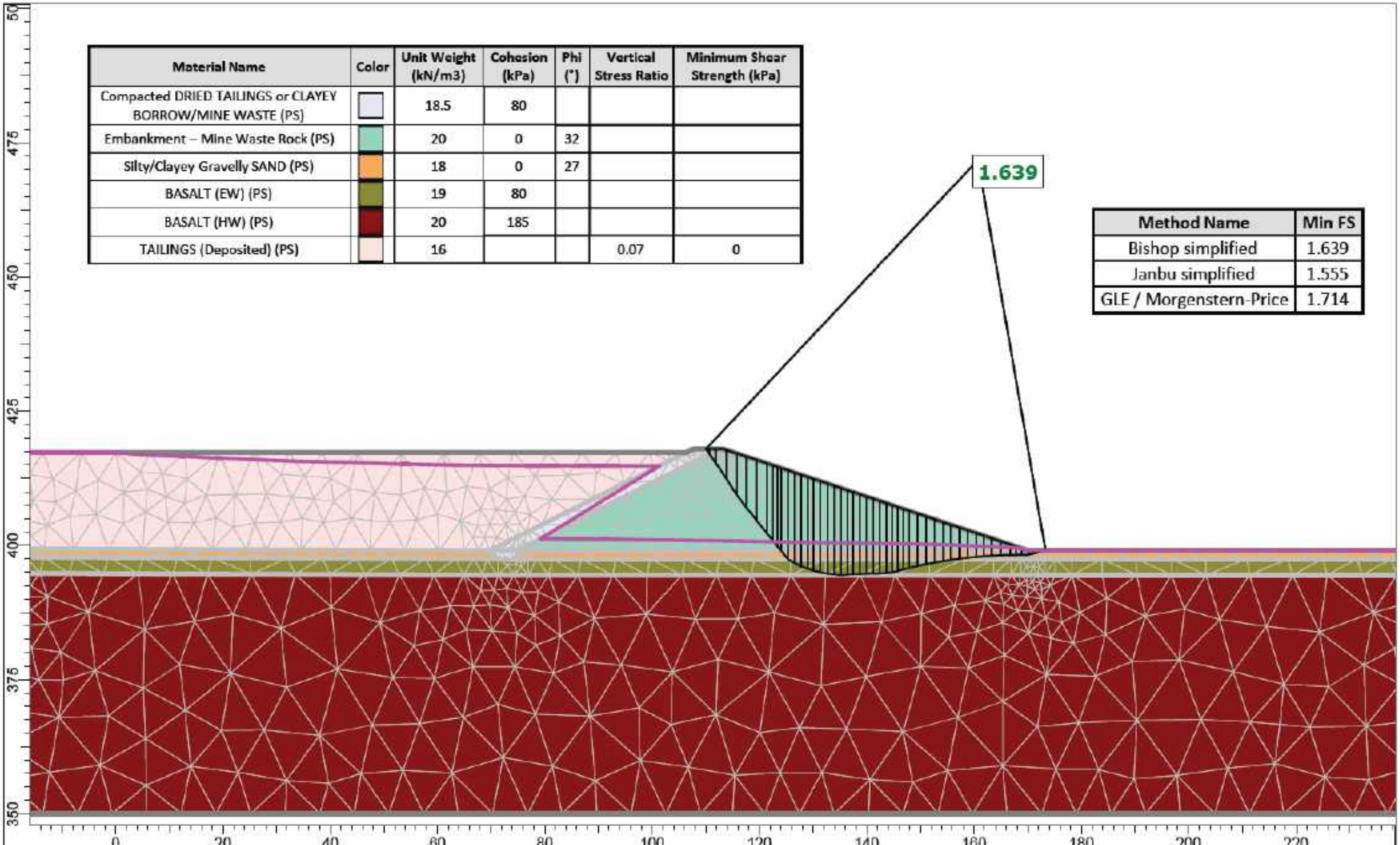


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (°)
Compacted DRIED TAILINGS or CLAYEY BORROW/MINE WASTE		18.5	10	34
Embankment – Mine Waste Rock		22	0	40
Silty/Clayey Gravelly SAND		18	0	34
BASALT (EW)		19	0	38
BASALT (HW)		20	0	40
TAILINGS (Deposited)		16	0	32

Method Name	Min FS
Bishop simplified	1.313
Janbu simplified	1.328
GLE / Morgenstern-Price	1.375

Project	TSF Cell 3, Mt Morgans Gold Project		
Analysis Description	Stability Analysis Case 4, Max. Crest RL418 m		
Drawn By	PA	*Scale*	1:1000
Company	CMW Geosciences Pty Ltd		
Date	22/1/2024	*File Name*	MMGP Cell 3_Stability.slmd

SLIDEINTERPRET 9.031



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (°)	Vertical Stress Ratio	Minimum Shear Strength (kPa)
Compacted DRIED TAILINGS or CLAYEY BORROW/MINE WASTE (PS)		18.5	80			
Embankment – Mine Waste Rock (PS)		20	0	32		
Silty/Clayey Gravelly SAND (PS)		18	0	27		
BASALT (EW) (PS)		19	80			
BASALT (HW) (PS)		20	185			
TAILINGS (Deposited) (PS)		16			0.07	0

Method Name	Min FS
Bishop simplified	1.639
Janbu simplified	1.555
GLE / Morgenstern-Price	1.714

Project	TSF Cell 3, Mt Morgans Gold Project
Analysis Description	Stability Analysis Case 5, Max. Crest RL418 m
Drawn By	PA
Scale	1:1000
Company	CMW Geosciences Pty Ltd
Date	22/1/2024
File Name	MMGP Cell 3_Stability.slmd

SLIDEINTERPRET 9.031

Embankment Deformation - TSF Mt Morgans Gold Project

Swaisgood (1998)

SEF, % settle	0.031	PGA (g)	0.1
H, m	19	M	6.9
Crest Settlement, mm	6.0		

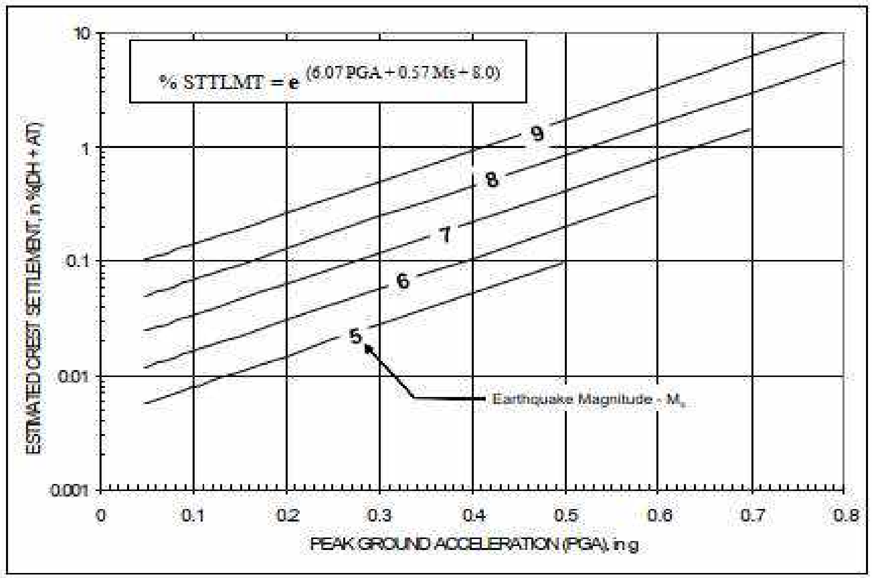


Figure 2. Chart for estimating crest settlement

4 RESULTS OF REGRESSION ANALYSES

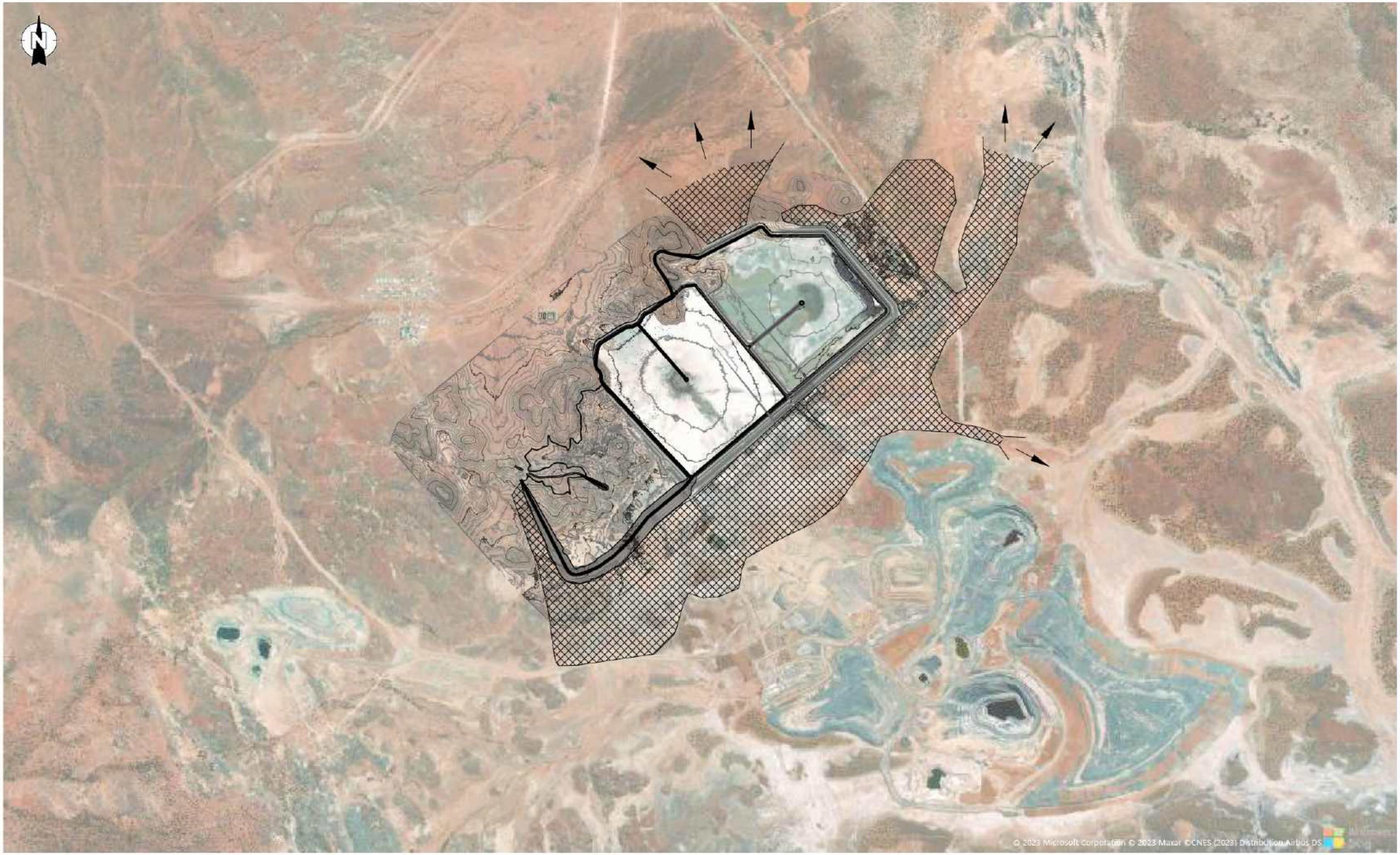
The regression analyses also provided a mathematical relationship between the crest settlement and the two factors, PGA and M. This relationship can be expressed as:

$$\%\ \text{Settlement} = e^{(6.07\ PGA + 0.57\ M - 8.00)} \qquad (1)$$

where % Settlement = the amount of settlement of the crest of the dam (in meters) divided by the height of the dam plus the thickness of the alluvium (in meters) times 100 (see. Fig 1); PGA = peak horizontal ground acceleration of the foundation rock (in g) recorded or estimated at the dam site; and M = earthquake magnitude (in surface-wave scale: M_S).

This relationship is illustrated in Figure 2.

Appendix E:
Dam Break Assessment



NOTES:

1. ALL DIMENSIONS IN METRES UNO

CMW Geosciences

CLIENT: GENESIS MINERALS LTD (GDM)	DRAWN: PA	PROJECT: PER2023-0063AG
PROJECT: NEW TSF CELL 3	CHECKED: CH	DRAWING: 07
	REVISION: 1	SCALE: 1:20,000
TITLE: ESTIMATED INUNDATION PLAN	DATE: 05.08.24	SHEET: A3 L

CMW Geosciences

PROJECT	: Tailings Storage Facility (TSF) Cell 3 Design	Date	5-Aug-24
CLIENT	: Genesis Minerals Ltd	Job No	PER2023-0063AG
LOCATION	: Cell 3, Mt Morgans Gold Project, WA	Rev	2
SUBJECT	: Dam Break Study, Worse Case		
Scenario:	Worst Case (PMP Rainy Day Failure Conditions)		

BREACH CHARACTERISTICS	Using Empirical Method		MacDonald and Langridge - Monopolis (1984)
Input Parameters	**Value**	**Unit**	**Comments**
New Embankment Crest Level	418.0	mRL	From design
Approx. NGL	399.0	mRL	From design
Maximum Embankment Height (on Northern Side)	19.0	m	From design
Approximate Emb Length corresponding to Highest Section	350	m	assumed
Embankment Crest Width	7.0	m	From design
Upstream Embankment Slope	2.0	H to 1V	From design
Downstream Embankment Slope	3.0	H to 1V	From design
Embankment Cross Section Area	1,035.5	m^2	Embankment cross section area at highest section
Total Tailings Tonnes stored in TSF	4.40	Mt	Estimated total storage capacity
Dry Density	1.4	t/m^3	From design
Bulk Density	1.80	t/m^3	From tailings testwork
Tailings Volume stored in TSF (V_T)	3,142,857	m^3	Estimated total tailings volume
PMP Storm Volume over TSF Catchment	275,000	m^3	*Rainy Day Failure Scenario - PMP storm event adopted 3 hrs 550 mm - Area - 500,000 m^2 (50 ha)*
Total Released Tailings Volume from the TSF (V_F)	1,312,100	m^3	Allowed for released tailings ~ 33% of storage volume
	1,073	acre-feet	Converted from m^3 to acre-feet (1 acre-feet = 1233 m3)

Note: For conservative assessment, it was assumed that embankment breaches will be occurred through the whole embankment height. Tailings released from the embankment breaches were assumed to be liquefied.

Output Parameters - Breach Characteristics	Value	Unit	Comments		
Breach Shape - Trapezoidal Side Slopes	2	V to 1H	Adopted approximate trapezoidal breach shape (T MacDonald and J Langridge - Monopolis, 1984)		
Breach Height (H_b)	19.0	m	Adopted the bottom of the breach is at the base of the embankment		
	62.3	feet	Converted from meter to feet		
Breach Formation Factor ($V_F \times H_b$)	24,929,900	$m^3 \times m$	Used this figure to predict the volume of embankment material removed during a breach		
	6.7E+04	acre-ft x ft	Converted from $m^3 \times m$ to acre-feet x feet		
Embankment Volume Eroded during Breach (V_M)	1.3E+04	yrd^3	Embankment volume removed during a breach (determined from **Figure 1**, T MacDonald and J Langridge - Monopolis, 1984)		
	10,006	m^3	Converted from cubic yard to cubic meter (1 cubic yard = 0.765 cubic meter)		
Average Breach Width (W_{ave})	10	m	Calculated based on the removed embankment volume during a breach and embankment geometry		
Base Breach Width (W_b)	0	m	Calculated based on the removed embankment volume during a breach and embankment geometry		
Top Breach Width (W_t)	19	m	Calculated based on the removed embankment volume during a breach and embankment geometry		
Breach Shape Area (A_F)	184	m^2	Breach shape area at highest embankment section		
Equivalent Released Tailings Volume behind Breach Area	71,840	m^3	Used this figure to estimate the equivalent tailings failed length behind breach area		
Equivalent Tailings Failed Length behind Breach Area (x_g)	390	m	Calculated based on the released tailings volume (behind breach area) and breach shape		
Adopted Breach Development Time (t_F)	1.0	hour	Determined from **Figure 2**, T MacDonald and J Langridge - Monopolis, 1984)	2.7 check	
Released Tailings Run-out Flow (Q_F) - average flow	364	m^3/s	Calculated based on released tailings volume and breach development time		
Peak Tailings Run-out Flow (Q_p)	729	m^3/s	Assuming a triangular hydrograph		
Peak Tailings Run-out Flow (Q_p)	1,255	m^3/s	Based on Rico M, Benito G, Diez-Herrero G 2008	Run-out distance (Dmax)	13 km

CMW Geosciences

PROJECT	: Tailings Storage Facility (TSF) Cell 3 Design	Date	5-Aug-24
CLIENT	: Genesis Minerals Ltd	Job No	PER2023-0063AG
LOCATION	: Cell 3, Mt Morgans Gold Project, WA	Rev	2
SUBJECT	: DAM BREAK STUDY, SUNNY DAY		
Scenario:	Sunny Day Conditions		

BREACH CHARACTERISTICS	Using Empirical Method		MacDonald and Langridge - Monopolis (1984)
Input Parameters	**Value**	**Unit**	**Comments**
New Embankment Crest Level	418.0	mRL	From design
Approx. NGL	399.0	mRL	From design
Maximum Embankment Height (on Northern Side)	19.0	m	From design
Approximate Emb Length corresponding to Highest Section	350	m	assumed
Embankment Crest Width	7	m	From design
Upstream Embankment Slope	2	H to 1V	From design
Downstream Embankment Slope	3	H to 1V	From design
Embankment Cross Section Area	1,035.5	m^2	Embankment cross section area at highest section
Total Tailings Tonnes stored in TSF	4.40	Mt	Estimated total storage capacity
Dry Density	1.4	t/m^3	From design
Bulk Density	1.80	t/m^3	From design
Tailings Volume stored in TSF (V_T)	3,142,857	m^3	Estimated total tailings volume
PMP Storm Volume over TSF Catchment	0	m^3	*Rainy Day Failure Scenario - PMP storm event adopted 3 hrs 550 mm - Area - 500,000 m2 (50 ha)*
Total Released Tailings Volume from the TSF (V_F)	1,037,100	m^3	Allowed for released tailings ~ 33% of storage volume
	848	acre-feet	Converted from m^3 to acre-feet (1 acre-feet = 1233 m3)

Note: For conservative assessment, it was assumed that embankment breaches will be occurred through the whole embankment height. Tailings released from the embankment breaches were assumed to be liquefied.

Output Parameters - Breach Characteristics	Value	Unit	Comments
Breach Shape - Trapezoidal Side Slopes	2	V to 1H	Adopted approximate trapezoidal breach shape (T MacDonald and J Langridge - Monopolis, 1984)
Breach Height (H_b)	19.0	m	Adopted the bottom of the breach is at the base of the embankment
	62.3	feet	Converted from meter to feet
Breach Formation Factor (V_F x H_b)	19,704,900	m^3 x m	Used this figure to predict the volume of embankment material removed during a breach
	5.3E+04	acre-ft x ft	Converted from m^3 x m to acre-feet x feet
Embankment Volume Eroded during Breach (V_M)	1.1E+04	yrd^3	Embankment volume removed during a breach (determined from **Figure 1**, T MacDonald and J Langridge - Monopolis, 1984)
	8,293	m^3	Converted from cubic yard to cubic meter (1 cubic yard = 0.765 cubic meter)
Average Breach Width (W_{ave})	8	m	Calculated based on the removed embankment volume during a breach and embankment geometry
Base Breach Width (W_b)	-1	m	Calculated based on the removed embankment volume during a breach and embankment geometry
Top Breach Width (W_t)	18	m	Calculated based on the removed embankment volume during a breach and embankment geometry
Breach Shape Area (A_F)	152	m^2	Breach shape area at highest embankment section
Equivalent Released Tailings Volume behind Breach Area	51,879	m^3	Used this figure to estimate the equivalent tailings failed length behind breach area
Equivalent Tailings Failed Length behind Breach Area (x_e)	340	m	Calculated based on the released tailings volume (behind breach area) and breach shape
Adopted Breach Development Time (t_F)	1.0	hour	Determined from **Figure 2**, T MacDonald and J Langridge - Monopolis, 1984) 2.5 check
Released Tailings Run-out Flow (Q_F) - average flow	288	m^3/s	Calculated based on released tailings volume and breach development time
Peak Tailings Run-out Flow (Q_p)	576	m^3/s	Assuming a triangular hydrograph
Peak Tailings Run-out Flow (Q_p)	1,137	m^3/s	Based on Rico M, Benito G, Diez-Herrero G 2008 Run-out distance (Dmax) 12 km

	CLIENT: Genesis Minerals Ltd	DESIGNER:	PA
CMW Geosciences	PROJECT: TSF Cell 3 Design	CHECKED:	CH
		REVISION:	2
	TITLE: Cell 3 Preliminary Dam Break Assessment - Worst Case	DATE:	05/08/2024
		PROJECT:	PER2023-0063AG

Step 1: Estimate runout volume following a dam overtopping, embankment stability or piping failure

Total volume of tailings and water in the facility at the time of failure, V_T (m^3):	3,417,857	
Volume of tailings and water released at failure, V_F (m^3):	1,364,665	Eq. 7 Rico et. Al. 2007

$$V_F = 0.354 \times V_T^{1.008}$$

Assumptions:

The formula represents the maximum tailings volume that can be released in the most extreme situation in which pond volume was empouted following the dam break.

The failure mechanism is from the base of the facility to the highest embankment level at RL1491m.

Step 2: Estimate preflow horizontal distance of failure volume.

Embankment height, h_o (m):	19	
Embankment Length 1	350	
Estimated pre-flow horizontal distance, x_o embankment 1(m):	390	Seddon K. D. 2010

Assumptions:

Failure occurs along full length of embankment. Failure at aech embankment is assessed.

Eneregy based linear method as per Seddon K.d> 2010

Zero grade.

$$H_o x_o = h x_f$$

$$\therefore h = (x_o / x_f) H_o$$

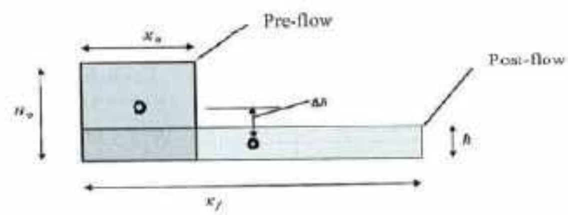


Figure 2 Simplified flow slide geometry

Step 3: Estimate runout distance following a dam overtopping, embankment stability or piping failure.

Bulk unit weight (kN/m^3):	18	
Undrained shear strength (kPa):	1	
Estimated post-flow horizontal distance of failure volume, x_f embankment 1 (m):	2065	Eqn. 6 Seddon K.D. 2010

$$x_f^2 + x_o x_f - 2\gamma x_o H_o^2 / s_u = 0$$

Runout distance, R_o embankment 1 (m):	1675	Eqn. 7 Seddon K.D. 2010

$$Ro = x_f - x_o$$

CMW Geosciences	CLIENT: **Genesis Minerals Ltd**	DESIGNER: PA
	PROJECT: **TSF Cell 3 Design**	CHECKED: CH
		REVISION: 2
	TITLE: **Cell 3 Preliminary Dam Break Assessment - Worst Case**	DATE: 05/08/2024
		PROJECT: PER2023-0063AG

Step 1: Estimate runout volume following a dam overtopping, embankment stability or piping failure

Total volume of tailings and water in the facility at the time of failure, V_T (m^3):	3,417,857	
Volume of tailings and water released at failure, V_F (m^3):	1,364,665	Eq. 7 Rico et. Al. 2007

$$V_F = 0.354 \times V_T^{1.008}$$

Assumptions:

The formula represents the maximum tailings volume that can be released in the most extreme situation in which pond volume was empouted following the dam break.

The failure mechanism is from the base of the facility to the highest embankment level at RL1491m.

Step 2: Estimate preflow horizontal distance of failure volume.

Embankment height, h_o (m):	19	
Embankment Length 1	350	
Estimated pre-flow horizontal distance, x_o embankment 1(m):	390	Seddon K. D. 2010

Assumptions:

Failure occurs along full length of embankment. Failure at aech embankment is assessed.
Eneregy based linear method as per Seddon K.d> 2010
Zero grade.

$$H_o x_o = h x_f$$

$$\therefore h = (x_o / x_f) H_o$$

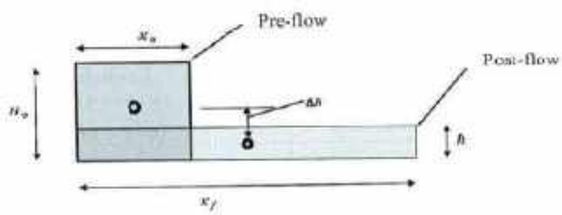


Figure 2 Simplified flow slide geometry

Step 3: Estimate runout distance following a dam overtopping, embankment stability or piping failure.

Bulk unit weight (kN/m^3):	18	
Undrained shear strength (kPa):	4	
Estimated post-flow horizontal distance of failure volume, x_f embankment 1 (m):	947	Eqn. 6 Seddon K.D. 2010

$$x_f^2 + x_o x_f - 2\gamma x_o H_o^2 / s_u = 0$$

Runout distance, R_o embankment 1 (m):	557	Eqn. 7 Seddon K.D. 2010

$$Ro = x_f - x_o$$

	CLIENT:	Genesis Minerals Ltd	DESIGNER:	PA
CMW Geosciences Chapman Morton Woodward	PROJECT:	TSF Cell 3 Design	CHECKED:	CH
			REVISION:	2
	TITLE:	Cell 3 Preliminary Dam Break Assessment - Worst Case	DATE:	05/08/2024
			PROJECT:	PER2023-0063AG

Step 1: Estimate runout volume following a dam overtopping, embankment stability or piping failure

Total volume of tailings and water in the facility at the time of failure, V_T (m^3):	3,417,857	
Volume of tailings and water released at failure, V_F (m^3):	1,364,665	Eq. 7 Rico et. Al. 2007

$$V_F = 0.354 \times V_T^{1.008}$$

Assumptions:

The formula represents the maximum tailings volume that can be released in the most extreme situation in which pond volume was empouted following the dam break.

The failure mechanism is from the base of the facility to the highest embankment level at RL1491m.

Step 2: Estimate preflow horizontal distance of failure volume.

Embankment height, h_e (m):	19	
Embankment Length 1	350	
Estimated pre-flow horizontal distance, x_o embankment 1(m):	390	Seddon K. D. 2010

Assumptions:

Failure occurs along full length of embankment. Failure at aech embankment is assessed.

Eneregy based linear method as per Seddon K.d> 2010

Zero grade.

$$H_o x_o = h x_f$$

$$\therefore h = (x_o / x_f) H_o$$

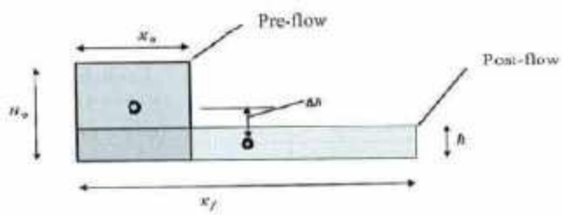


Figure 2 Simplified flow slide geometry

Step 3: Estimate runout distance following a dam overtopping, embankment stability or piping failure.

Bulk unit weight (kN/m^3):	18	
Undrained shear strength (kPa):	4	
Estimated post-flow horizontal distance of failure volume, x_f embankment 1 (m):	947	Eqn. 6 Seddon K.D. 2010

$$x_f^2 + x_o x_f - 2\gamma x_o H_o^2 / s_u = 0$$

Runout distance, R_o embankment 1 (m):	557	Eqn. 7 Seddon K.D. 2010

$$Ro = x_f - x_o$$

CMW Geosciences (Chapman Morter Woodward)	CLIENT: **Genesis Minerals Ltd**	DESIGNER:	PA
	PROJECT: **TSF Cell 3 Design**	CHECKED:	CH
		REVISION:	2
	TITLE: **Cell 3 Preliminary Dam Break Assessment - Worst Case**	DATE:	05/08/2024
		PROJECT:	PER2023-0063AG

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Estimated pre-flow horizontal distance, x_o embankment 1(m):	390	Seddon K. D. 2010

Assumptions:

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Eneregy based linear method as per Seddon K.d> 2010
Zero grade.

$$H_o x_o = h\, x_f$$

$$\therefore h = (x_o / x_f) H_o$$

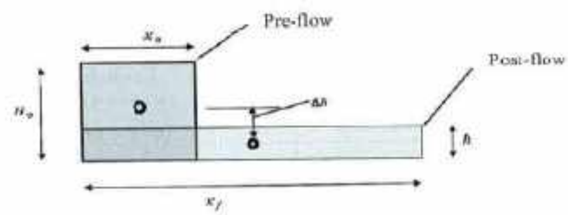

Figure 2 Simplified flow slide geometry

Step 3: Estimate runout distance following a dam overtopping, embankment stability or piping failure.

Bulk unit weight (kN/m^3):	18	
Undrained shear strength (kPa):	7	
Estimated post-flow horizontal distance of failure volume, x_f embankment 1 (m):	678	Eqn. 6 Seddon K.D. 2010

$$x_f^2 + x_o x_f - 2\gamma x_o H_o^2 / s_u = 0$$

Runout distance, R_o embankment 1 (m):	288	Eqn. 7 Seddon K.D. 2010

$$Ro = x_f - x_o$$

Appendix F:
Water Balance Analyses

PROJECT	**: TAILING STORAGE FACILITY (TSF) CELLS 1 & 2 RAISES + NEW CELL 3 DESIGN**
CLIENT	**: GENESIS MINERALS LTD (GMD)**
LOCATION	**: MT MORGANS GOLD PROJECT, WA**
SUBJECT	**: WATER BALANCE TOTAL TAILINGS STREAM CALENDAR YEAR - CELL 3**

Date	5-Aug-24
Job No	PER2023-0063
File	PER2023-0023AC
Subject	Water Balance
Revision	2

		Month	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**
INFLOWS		Days per month	31	28.25	31	30	31	30	31	31	30	31	30	31	
RAINFALL															
Rainfall (mm)			8.90	56.80	41.50	19.60	14.00	15.00	15.70	9.90	7.10	13.60	19.70	28.80	250.60
Average Daily Rainfall (mm)			0.29	2.01	1.34	0.65	0.45	0.50	0.51	0.32	0.24	0.44	0.66	0.93	
Tailings Dam Storage Area (m2)			500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	
Runoff Coefficient Tailings			0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	
Catchment Area above Storage (m2)			100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	
Runoff Coefficient Catchment			0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	
Pool Area (m2)			31,416	31,416	31,416	31,416	31,416	31,416	31,416	31,416	31,416	31,416	31,416	31,416	
Running Beaches (m2)			31,416	31,416	31,416	31,416	31,416	31,416	31,416	31,416	31,416	31,416	31,416	31,416	
Rainfall Inflow Total Volume (m3/day)			76.9	538.2	358.4	174.9	120.9	133.8	135.6	85.5	63.4	117.4	175.8	248.7	
SLURRY WATER															
Tonnes per year	3,000,000														
Total tonnes per month			250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	3,000,000
% Solids =	50		50	50	50	50	50	50	50	50	50	50	50	50	
Tailings Output Solids (tpd)			8,064.5	8,849.6	8,064.5	8,333.3	8,064.5	8,333.3	8,064.5	8,064.5	8,333.3	8,064.5	8,333.3	8,064.5	
Volume of Water (m3/day)			8,064.5	8,849.6	8,064.5	8,333.3	8,064.5	8,333.3	8,064.5	8,064.5	8,333.3	8,064.5	8,333.3	8,064.5	3,000,000.0
OTHER WATER INFLOWS															
Pit Dewatering (m3/day)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Other			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Other Water Inflow Total (m3/day)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL INFLOW (m3/day)			**8,141**	**9,388**	**8,423**	**8,508**	**8,185**	**8,467**	**8,200**	**8,150**	**8,397**	**8,182**	**8,509**	**8,313**	
OUTFLOW-LOSSES FROM TAILINGS DAM			**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**
EVAPORATION (from pond and beaches)															
Evaporation Rate (mm)			410.55	323.25	282.46	184.35	118.24	82.65	91.96	124.81	184.35	275.89	327.38	394.13	2,800
Pan Factor			0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	
Monthly Dam Evaporation Rate (mm)			307.9	242.4	211.8	138.3	88.7	62.0	69.0	93.6	138.3	206.9	245.5	295.6	
Average Daily Evaporation Rate (mm)			9.93	8.58	6.83	4.61	2.86	2.07	2.22	3.02	4.61	6.67	8.18	9.54	
Pool Area & Running Beaches (m2)			62,832	62,832	62,832	62,832	62,832	62,832	62,832	62,832	62,832	62,832	62,832	62,832	
Daily Evaporation Loss/Outflow (m3/day)			624.1	539.2	429.4	289.6	179.7	129.8	139.8	189.7	289.6	419.4	514.2	599.1	
EVAPO-TRANSPIRATION (from drying tailings)															
Evaporation Rate (mm)			410.55	323.25	282.46	184.35	118.24	82.65	91.96	124.81	184.35	275.89	327.38	394.13	
Evapo-transpiration Rate (Pan/3)			136.8	107.7	94.2	61.4	39.4	27.5	30.7	41.6	61.4	92.0	109.1	131.4	
Average Daily Evapo-transpiration Rate (mm)			4.41	3.81	3.04	2.05	1.27	0.92	0.99	1.34	2.05	2.97	3.64	4.24	
Area Transpiring (m2)			125,663.7	125,663.7	125,663.7	125,663.7	125,663.7	125,663.7	125,663.7	125,663.7	125,663.7	125,663.7	125,663.7	125,663.7	
Daily transpiration Loss (m3/day)			554.7	479.3	381.7	257.4	159.8	115.4	124.3	168.6	257.4	372.8	457.1	532.6	
SEEPAGE															
Downstream Embankment (m3/day)			258.0	258.0	258.0	258.0	258.0	258.0	258.0	258.0	258.0	258.0	258.0	258.0	
Upstream Embankment (m3/day)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Seepage Rate m/sec	5.00E-08														
Dam Floor (m3/day)			271.4	271.4	271.4	271.4	271.4	271.4	271.4	271.4	271.4	271.4	271.4	271.4	
Total Seepage Outflow (m3/day)			529.4	529.4	529.4	529.4	529.4	529.4	529.4	529.4	529.4	529.4	529.4	529.4	
RETENTION															
Tailings Output (tpd)			8,064.5	8,849.6	8,064.5	8,333.3	8,064.5	8,333.3	8,064.5	8,064.5	8,333.3	8,064.5	8,333.3	8,064.5	
Assumed Moisture Content of Tailings (average)		35.0%													
Volume Retained in Tailings (m3/day)			2,822.6	3,097.3	2,822.6	2,916.7	2,822.6	2,916.7	2,822.6	2,822.6	2,916.7	2,822.6	2,916.7	2,822.6	
TOTAL OUTFLOW-LOSSES FROM TAILINGS DAM			**4,530.8**	**4,645.3**	**4,163.0**	**3,993.1**	**3,691.5**	**3,691.3**	**3,616.1**	**3,710.4**	**3,993.1**	**4,144.2**	**4,417.5**	**4,483.7**	
BALANCE INFLOW-OUTFLOW/LOSSES (m3/day)			3,610.5	4,742.5	4,259.8	4,515.2	4,493.9	4,775.9	4,584.0	4,439.6	4,403.6	4,037.8	4,091.7	3,829.5	
BALANCE INFLOW-OUTFLOW/LOSSES (m3/month)			111,926.4	133,976.0	132,055.0	135,454.6	139,310.8	143,275.7	142,104.7	137,628.5	132,108.4	125,170.9	122,750.0	118,715.4	
RETURN WATER TO THE PLANT (if available)															
Total Water Return per month (balance of inflow -outflow for planning)			111,926.4	133,976.0	132,055.0	135,454.6	139,310.8	143,275.7	142,104.7	137,628.5	132,108.4	125,170.9	122,750.0	118,715.4	
Volume of Water (m3/day),estimated at			3,610.5	4,742.5	4,259.8	4,515.2	4,493.9	4,775.9	4,584.0	4,439.6	4,403.6	4,037.8	4,091.7	3,829.5	
Average water return			45%	54%	53%	54%	56%	57%	57%	55%	53%	50%	49%	47%	**52.5%**
			JAN	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	
Summary of Water Balance															
Water shortfall (make up water) or excess of requirements (m3/day)			**-4,454**	**-4,107**	**-3,805**	**-3,818**	**-3,571**	**-3,557**	**-3,480**	**-3,625**	**-3,930**	**-4,027**	**-4,242**	**-4,235**	
Total water in excess of requirements (m3/month)			**-138,074**	**-116,024**	**-117,945**	**-114,545**	**-110,689**	**-106,724**	**-107,895**	**-112,371**	**-117,892**	**-124,829**	**-127,250**	**-131,285**	**-1,425,524**
Total water in excess of requirements (m3/year) =			**-1,425,524**												

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Appendix G: Addendum Emergency Action Plan (EAP) + Trigger Action Response Plan (TARP)

1 INTRODUCTION

This Emergency Safety Plan (EAP) applies to the TSF Cell 3 at the Mt Morgans Gold Project (MMGP), located 27 km southwest of Laverton and about 730 km northeast of Perth, Western Australia. MMGP is owned by Genesis Minerals Ltd (GMD).

This is a live document, this version is presented as part of the design of staged embankment raises on the facilities. The EAP should be reviewed and updated at least annually.

2 RESPONSIBILITIES

Operational responsibilities for the dam have been allocated to:

- Tailings deposition and decant operation: Civils Superintendent
- Routine inspections and monitoring: Civils Superintendent / Mill Foreperson
- Surveillance and safety reporting: CMW or an independent 3rd Party
- Routine maintenance: GMD Maintenance Manager

An emergency response would typically be initiated by the Mill Manager or Civils Superintendent and the emergency coordinated by a delegated Emergency Services Coordinator.

3 EMERGENCY IDENTIFICATION, EVALUATION & CLASSIFICATION

TSF Cell 3 has been designed with an adequate factor of safety against failure but unpredictable events due to nature or human intervention may compromise the integrity of the facility. For this reason a matrix of response is required to be actioned should such an event occur. To assist with this several levels of alert have been provided where a different level of awareness and notification is required.

3.1 Emergency Action Plans

One alert level and two levels of action have been identified:

Level 1	**Alert Status (early indications)**
Level 2	**Damage Apparent (possible impending failure)**
Level 3	**Catastrophic – Dam Failure is or has occurred**

Procedures have been identified for each level of emergency in Plates P1, P2 and P3 (at the back of this document).

3.2 Reporting Procedures

3.2.1 Level 1 ~ Alert

Any unusual behaviour in the operation of the facility should always be evaluated. The following events fall into this category:

- New seepage is occurring from the embankment.

- New wet soft areas have developed on the embankment.
- Minor cracking on crest or batter slopes of the embankment.
- Movement readings indicate a significant increase in movement (refer TARP document).
- Lack of freeboard on TSF Cell 3 (i.e. operational freeboard =/<0.3 m).

If any of the above are observed, immediate action should be taken in accordance with the Level 1 Action Plan (Plate P1).

3.2.2 Level 2 ~ Damage Apparent

The advancement from a Level 1 to a Level 2 indicates the dam is suffering some distress. Care should be taken not to be complacent in identifying a potential Level 2 event, since it is possible that a Level 2 situation can progress to a Level 3 in a short period of time where it would be impossible to prevent an incident.

In this category damage is already occurring, or has occurred, and there is potential for damage to a section of the dam to occur (partial dam weakening). The followings are indicative of a Level 2 category:

- Sudden increase in the volume of seepage flow, erosion is noted.
- Flowing seepage water noted from upper sections of the embankment.
- Seepage water is cloudy or is discoloured, tailings observed in the water (indicating possible internal piping).
- Localised slumping is evident of the embankment crest or batter slopes.
- Sinkholes or other movements occur in deposited tailings.
- Discontinuity of alignment of dam crest or profile is noted in excess of 100 mm.
- Collected rainfall is in danger of overtopping the dam, or significant overtopping of the dam is occurring from wave action and/or wind set up.

If any of the above take place immediate action is required in accordance with Level 2 Action Plan (Plate P2). The undertaking of any repair or remedial works shall only be initiated if it is SAFE to do so especially if heavy equipment is to be used. Keep clear unless absolutely necessary.

Restrict access to TSF Cell 3, notify downstream personnel (i.e. at plant) , close potentially affected roads, advise government agencies and design consultant.

3.2.3 Level 3 ~ Embankment Failure or Break

This level of emergency is called for when one or more of the following has occurred, access to be limited:

- Embankment collapse;
- Breach of embankment is starting to occur, resulting in loss of tailings or floodwater;
- Overtopping and/or erosion of the embankment;
- Outflow of tailings and/or rainwater;
- Mobilisation and outflow of tailings due to liquefaction by earthquake.

Actions must be taken immediately in accordance with Level 3 Action Plan (Plate P3) including advising downstream personnel, close roads, advise design consultants, government agencies. Appoint an Emergency

Services Coordinator. Restrict access to the dam and priorities those who enter the area, set up road blocks to the TSF Cell 3 area. Enter with extreme care and initiate hazard initiatives and management plan.

4 NOTIFICATION

As detailed above, notification of an emergency situation to relevant authorities and organisations is the responsibility of the Mill Manager. The contact details of all individuals and organisations are maintained in the site emergency management plan.

- Mill Manager – GMD
- Mill Foreperson – GMD
- Police, Fire and Ambulance. State Emergency Services
- Regional Inspector of Mines i.e. DEMIRS and DWER in Kalgoorlie
- CMW Geosciences Pty Ltd (Perth Office) or Dams Safety Advisor

5 ACCESS AND COMUNICATIONS

Access to the TSF Cell 3 is from the plant site which is located approximately 0.3 km to the east of the cell.

The mine operates an extensive two-way radio and an internal phone system.

6 INUNDATION MAP

The result from breach modelling indicates that the flow from a 'dam break' under 'worst case' (PMP) rainy day conditions will vary based on the actual failure mode (i.e. piping or embankment collapse). Typical flows have been estimated in the range of 1,137 to 1,255 m^3/s with a breach development of approx. 1 hour. It has been estimated that the flow depths downstream at the peak flow will be around 1.6-2.4 m, decreasing away from the embankment.

The following consequences of a dam break are considered most likely to be:

- A dam break from TSF Cell 3 could inundate the process plant, which is located at approximately 0.3 km to the east of the facility. There is potential for loss of life due to the presence of infrastructure near and around the TSF including access roads. For the purposes of design and stability analyses etc. a consequence category of 'High C' in accordance with ANCOLD (2019), with the Population at Risk (PAR) estimated at ≥10 and <100, has been used.
- No public infrastructure is likely to be affected.
- Loss of TSF storage capacity, and economic loss from plant shutdown and temporary loss of assets, repairs of damaged sections of the TSF, damage to adjacent access roads.
- Significant environmental impact with the contamination of Lake Carey, requiring environmental 'clean-up'.

An Inundation Map is shown on the following page.

Figure 1: Inundation Map

7 PREVENTATIVE ACTIONS

Possible preventative actions for various trigger levels are provided in the table below.

Table 1: Preventative Actions		
Trigger Level	**Issue**	**Actions**
1	New seepage is occurring from the embankment	• Monitor decant pond level and extent on TSF Cell 3 • Reduce decant water pond, as appropriate • Monitor seepage for flow and turbidity
	Minor cracking of embankment	Monitor cracks for additional movement. Escalate to level 2 if movement continues.
	Lack of freeboard	Reduce decant water pond level
2	Sudden increase in seepage, turbid seepage occurring from the embankment	• Monitor decant pond level and extent on TSF Cell 3 • Reduce decant water pond, as appropriate • Monitor seepage for flow and turbidity
	Slumping of embankment (sinkholes etc)	Buttress the embankment downstream of the slump. Escalate to level 3 if movement continues.

Table 1: Preventative Actions		
Trigger Level	**Issue**	**Actions**
	Imminent overtopping of embankment	Reduce decant water pond level on facility. Escalate to Level 3 if pumps etc can't cope (i.e. level continues to rise)
		All of the above: notification of personnel from downstream (i.e. plant)
3	Embankment collapsing	Evacuation of personnel from downstream (i.e. plant)
	Overtopping of embankment	

The following completes the EAP:

- Dam Location and Description Summary; and
- Inundation Map.

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TSF Cells 1 and 2 – Dam Safety Plan – Summary Information

Location: Mt Morgans Gold Project

TSF Cell 3 approx. centre at 6,813,400 m North and 421,600 m East (MGA94 Zone 51)

Description:

The TSF Cell 3 embankments will be constructed from mine waste sourced from the mining operations and existing waste dumps at MMGP. The embankment will be zoned with an upstream zone of low-permeable clayey borrow/mine waste and a downstream zone of general mine waste materials.

The upstream low-permeable materials will be sourced from selected clayey mine waste or dried tailings materials from within the cells utilised when clayey waste is not available.

The TSF embankments have minimum design slopes of 1(V):2(H) on the upstream and 1(V):3(H) downstream, with a typical crest width of 7 m wide. The compacted upstream zone (low-permeable clayey borrow or mine waste) will be a minimum of 5 m.

Spillway: No spillway

Catchment Area: approx. 50 ha (internal area only)

Consequence Category: High C

Alert Levels:

Level 1	Alert Status (early indications)
Level 2	Damage Apparent (possible impending failure)
Level 3	Catastrophic – Dam Failure is or has occurred

Notification Protocols: Refer to flowcharts at back of EAP

Flood Plain Name: Flat salt-lake system (playa) which forms the northern extent of the Lake Carey playa

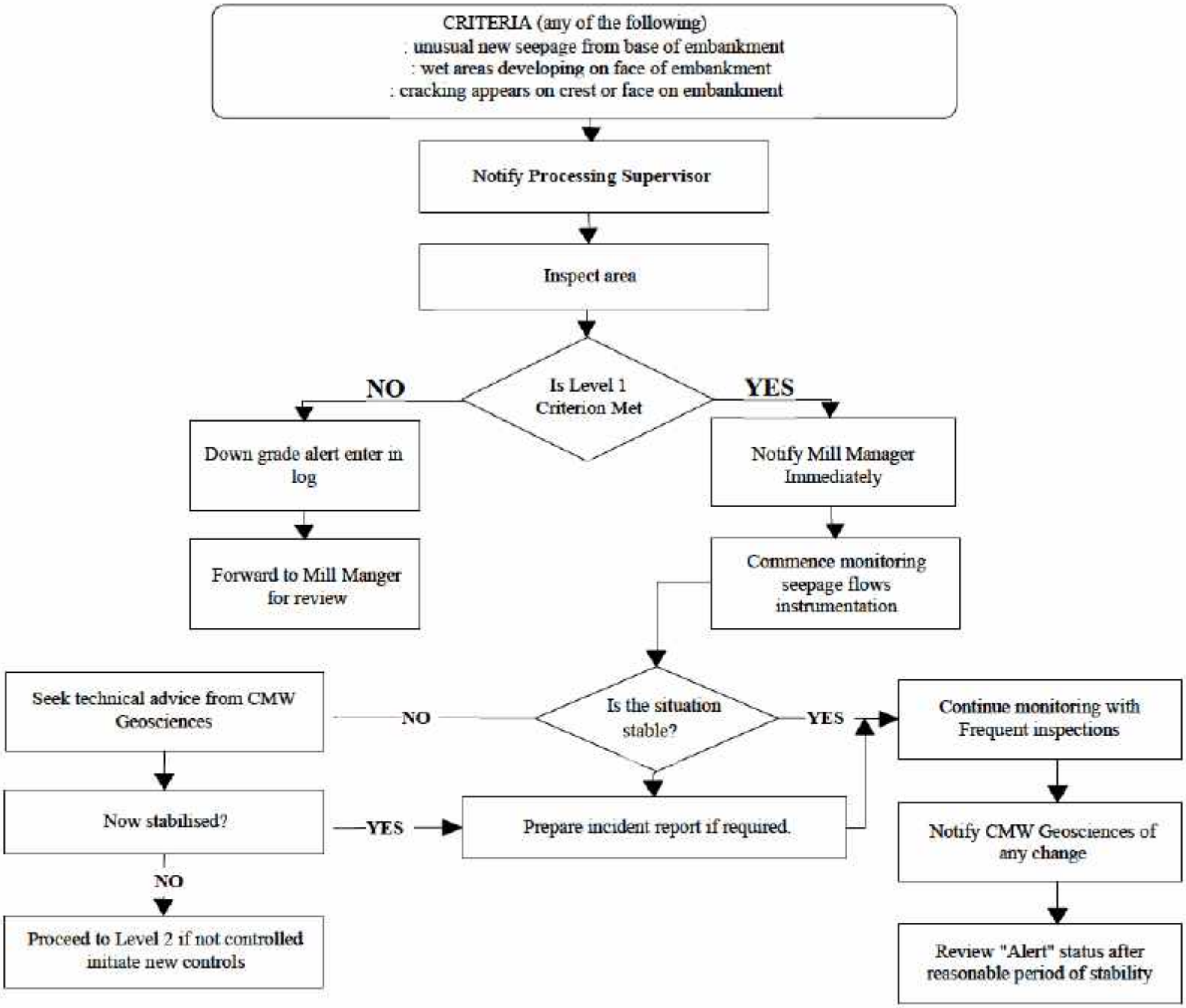
Consequences of Dam Failure:

Flow of tailings and water to plant area which is located at approximately 0.3 km to the east of the TSF Cell 3. Loss of human life is possible. The PAR is expected to be moderate (>10 to <100).

Flow from a break of any embankment will flow in Lake Carey.

LEVEL 1 - ACTION PLAN
STATUS "ALERT"

Mill Manager:	...
Processing Supervisor:	...
CMW Geosciences:	**0499 311 109**

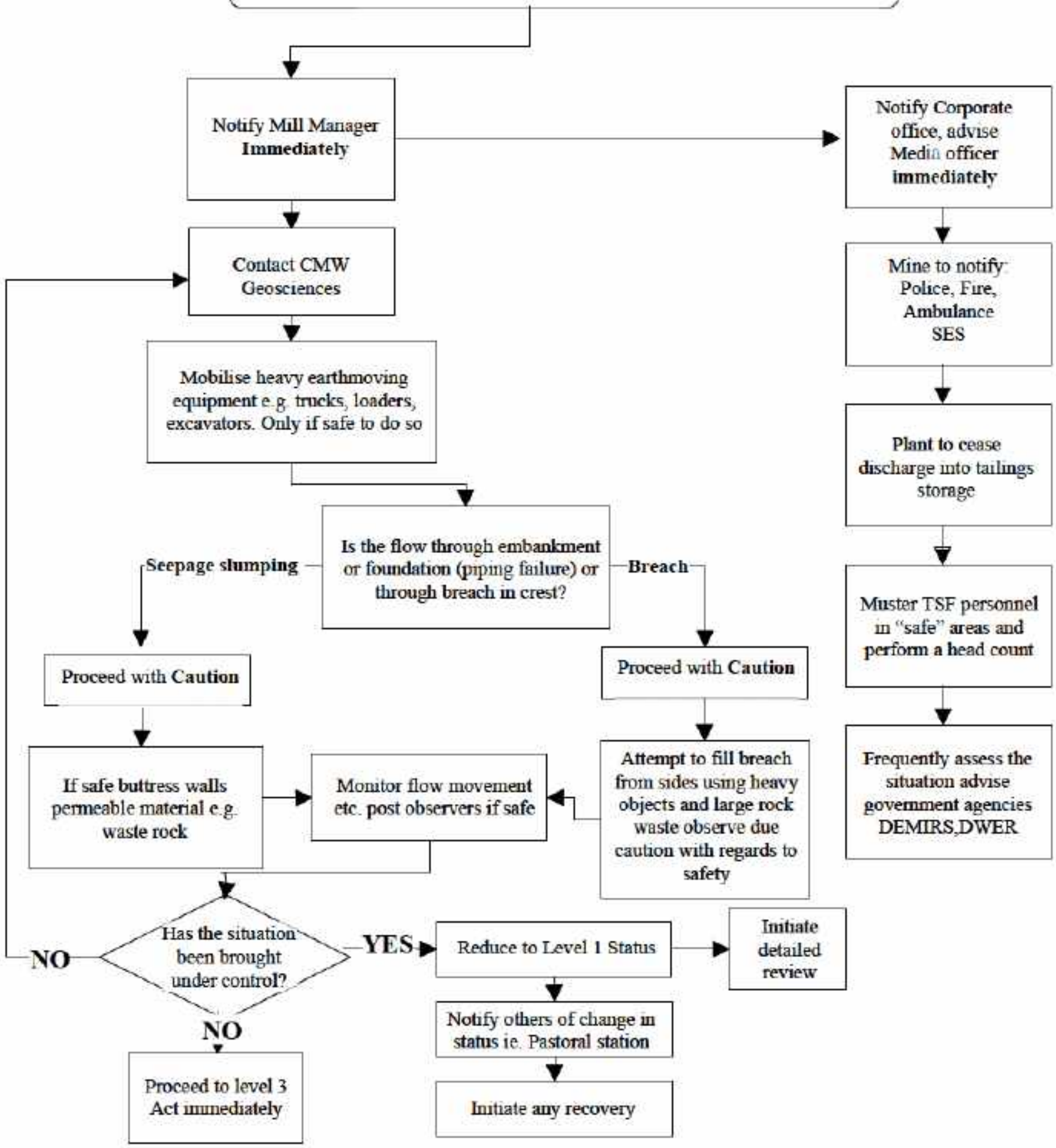


LEVEL 2 – DAM SAFETY EMERGENCY PLAN
STATUS: DAMAGE HAS OCCURRED

Mill Manager:	...
Processing Supervisor:	...
Police, Fire, Ambulance	000
SES (Generic)	132 500
CMW Geosciences:	0499 311 109
Tailings Manager:	...

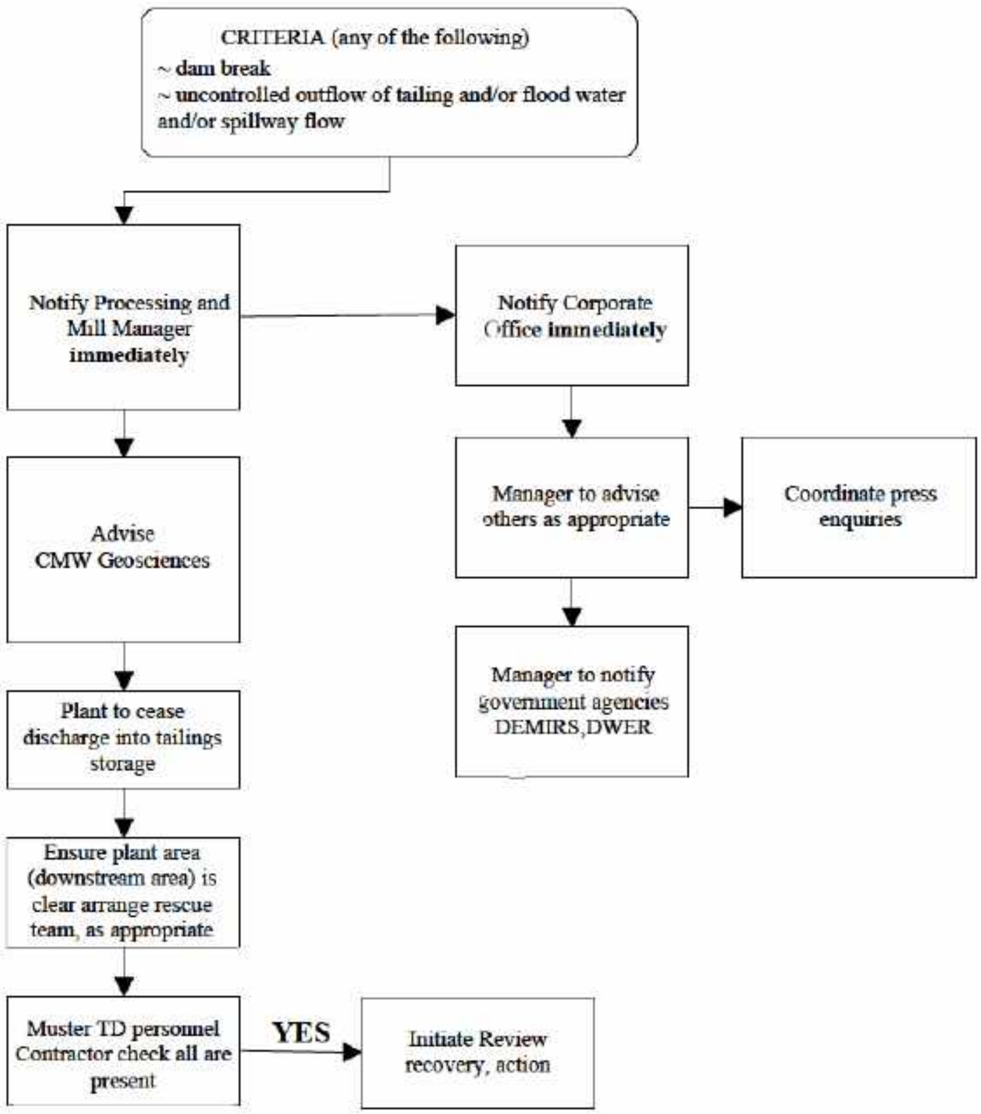
CRITERIA (any of the following)

: erosion hole formed water
: leakage >50 litres per second
: Overtopping of dam imminent, or waves overtopping
: breach of dam imminent
: increasing seepage flow rate, turbid flows
: slumps on dam face
: discontinuity of dam alignment



LEVEL 3 - ACTION PLAN
STATUS: DAM FAILURE

Mill Manager:	...
Processing Supervisor:	000
SES (Generic):	132 500
CMW Geosciences:	0499 311 109
Tailings Manager:	...



5.0 EMERGENCY CONTACT NUMBERS as at …/…/… (insert date)

Mount Morgans Gold Project (MMGP)

Mill Manager
Currently: Mr/Mrs/Ms
Work phone number: …

Processing Supervisor
Currently: Mr/Mrs/Ms
Work phone number: …
Mobile phone number: …
Email: …

Genesis Minerals Ltd (GMD)

Phone number: …

Consultants

CMW Geosciences Pty Ltd
Tailings Team leader: [redacted]
Work phone number:
Mobile phone number:
E-mail:

Review Consultant: [redacted]
Mobile phone number: …

SES Emergency Line 132 500
Local SES 132 500
Mine Rescue …
Work phone : …
Mobile phone : …

DEMIRS
Inspector: …
Phone Number: …

DWER
Inspector: …
Phone Number: …

TSF CELL 3, MT MORGANS GOLD PROJECT (MMGP), WA - TRIGGER ACTION RESPONSE PLAN (TARP)

Level	Embankment Deformation	Seepage	Seismic
0	<50 mm lateral or <25 mm settlement in a quarter	Embankment toe dry	Earthquake MM <5
1	50 to 100 mm lateral or 25 to 50 mm settlement in a quarter	Water seeping from embankment	Earthquake MM 6-8
2	>100 mm lateral or >50 mm settlement in a quarter	Water flow from embankment	Earthquake MM =>9

For reactions to above trigger events refer to the EAP for TSF Cell 3, MMGP

Instrument ID	Easting (m)	Northing (m)	Proposed Max. Embankment Crest RL (m)	Surface RL (m)	Depth Instrument below Proposed Max. Embankment Crest RL (m)	Warning Trigger Level, WTL (mbgl)	Action Trigger Level, WTL (mbgl)
TMB07	422055	6813323	418	398.84	19.16	0.5	0.0
TMB08	421409	6812849	418	403.02	14.98	0.5	0.0
TMB09	421179	6813179	418	408.00	10.00	0.5	0.0

Instrument ID	Easting (m)	Northing (m)	Proposed Max. Embankment Crest RL (m)	Instrument = 0.5 mbgl, RL (m)	Depth Instrument below Proposed Max. Embankment Crest RL (m)	Warning Trigger Level, WTL (m RL)	Action Trigger Level, WTL (m RL)
VWP10	421951	6813405	418	398.50	19.50	397.0	400.0
VWP10a	421977	6813375	418	398.28	19.72	396.8	399.8
VWP11	421462	6812969	418	400.48	17.53	399.0	402.0
VWP11a	421475	6812935	418	401.82	16.18	400.3	403.3
VWP12	421289	6813166	418	405.84	12.16	404.3	407.3
VWP12a	421266	6813154	418	406.12	11.88	404.6	407.6