5 September 2022

TAILINGS STORAGE FACILITY (TSF) DESIGN REPORT

HEMI GOLD PROJECT, WA

De Grey Mining Ltd

Ref. PER2021-0290AB Rev 3

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PER2021-0290AB		
Date	Revision	Comments
2 May 2022	0	Draft - Issued for Comments
22 June 2022	1	Issued as PFS Report
30 August 2022	2	Final Issue
5 September 2022	3	Re-issue following comments from RPM

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1 TSF SUMMARY

This report presents the design for the tailings storage facility for the Hemi Gold Project in the Pilbara region of WA as part of government approvals for the project. The report has also been structured to provide the required information for a TSF design report to meet DMIRS requirements. CMW Geosciences Pty Ltd (CMW) undertook geotechnical investigations, design analyses and compiled this design report.

De Grey Mining Ltd ("De Grey"), a Western Australian based mining company listed on the Australian Securities Exchange ("ASX:DEG") is seeking to develop the Hemi Gold Project ("Project") in the Pilbara region of western Australia, some 85 kms south from the regional hub of Port Hedland.

The Project is of a scale that places it in Tier 1 category for gold mine developments. The Project consists of six deposits; Aquila, Brolga, Crow, Diucon, Eagle and Falcon, collectively known as the Hemi deposits. Although the Hemi deposits will provide ore for the Project over a mine life in excess of ten years, there is also potential for additional resources from regional deposits that may, subject to the outcomes of further studies, be processed at the Hemi processing facility and have their tailings stored in the Hemi tailings storage facility.

The location of the Hemi deposits in relation to Port Hedland and the regional deposits is shown in Figure 1, and the proposed layout of the associated infrastructure is shown in Figure 2.

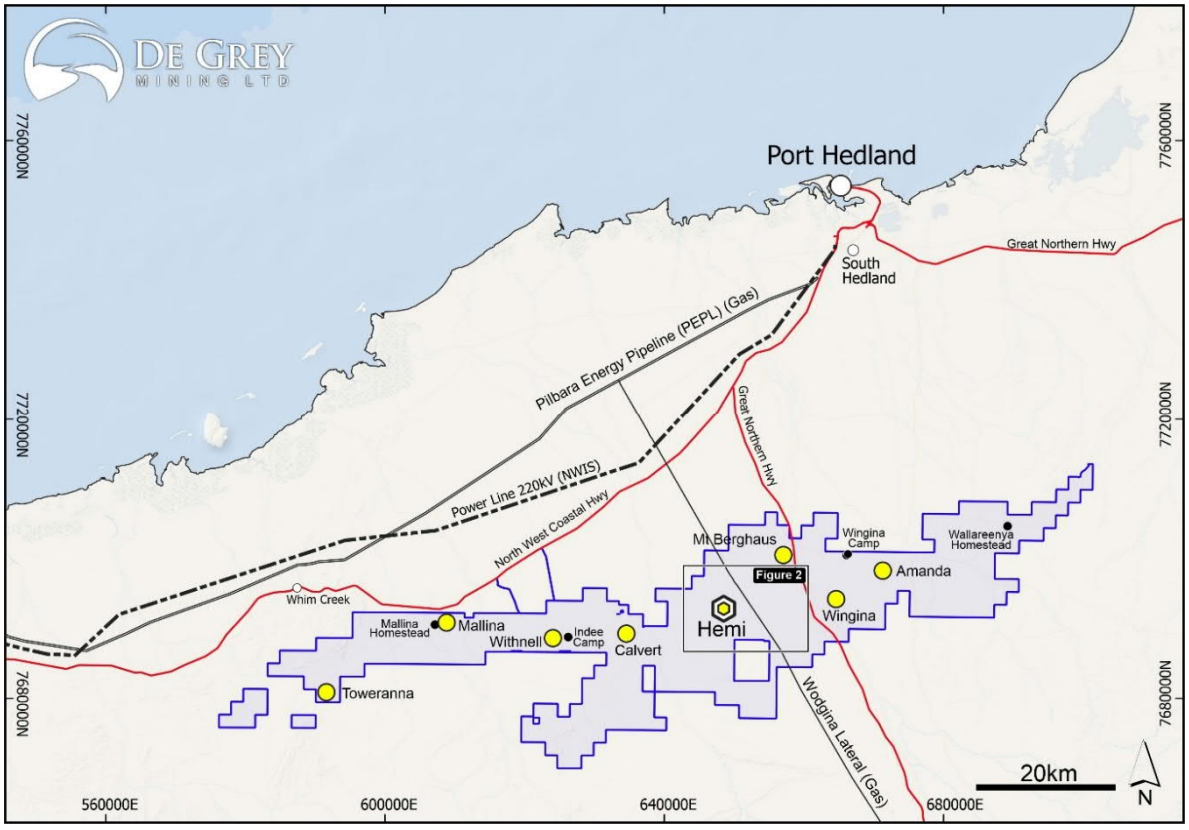

Figure 1 – Hemi Pits and Regional Pits

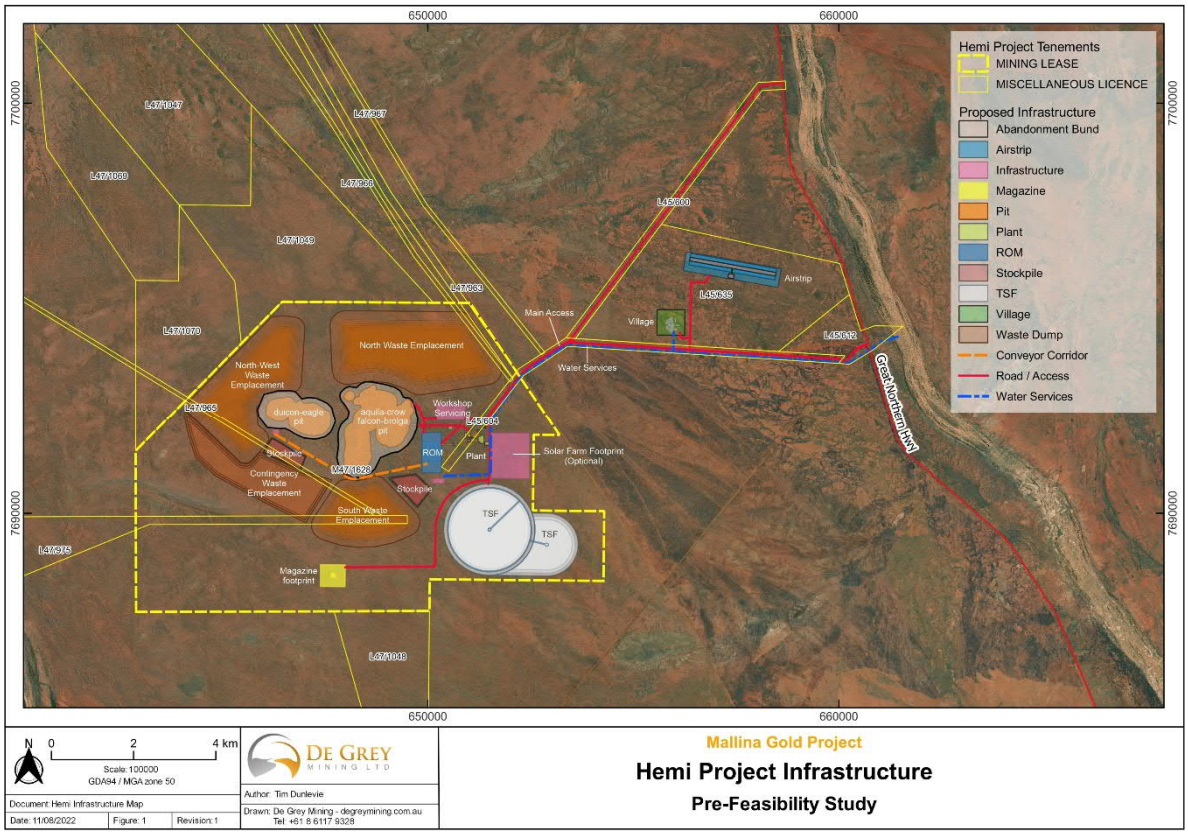

Figure 2 – Hemi Pits and Infrastructure

The Project comprises the following key components:

- The development of open cut pit operations at the Hemi deposits in a sequential manner for the life of mine;
- The construction and subsequent operation of a nominal 10.0 Mtpa processing facility located adjacent to the Hemi deposits capable of achieving 90% to 94% gold recovery from free milling and semi refractory ores;
- Staged construction of a tailings storage facility (“TSF”) with a planned capacity for 100 Mt of processed tailings slurry;
- A water supply from the local groundwater aquifer with accompanying ground water and surface water management infrastructure to facilitate mine dewatering and aquifer diversion;
- A village with messing and accommodation capacity for approximately 600 personnel;
- An airstrip with capacity for 100 seat jet aircraft; and,
- A 12 km sealed access road from the Great Northern Highway.

The following appendices complete this report:

- Appendix A – Tailings Storage Data Sheet (TSDS) and Explanatory Notes
- Appendix B – Geotechnical Investigation Factual Report - Draft
- Appendix C – Drawings
- Appendix D – Scope of Works and Technical Specification Document
- Appendix E – Seepage Analyses
- Appendix F – Stability Analyses
- Appendix G – Deformation Estimate
- Appendix H – Water Balance Analyses
- Appendix I – Dam Break Assessment

1.1 Location

The TSF is located on Mining Lease application M47/1628, approximately 900 m south of the plant site infrastructure, with an approximate centre located at (MGA, Zone 50) coordinates 7,658,600 m North and 651,500 m East. A layout plan showing the location of the TSF in relation to the development envelope and operations is presented as Drawing PER2021-0290-01.

1.2 Ownership

The Project is owned by De Grey Mining Ltd (De Grey) a Western Australian based mining company listed company listed on the Australian Securities Exchange (ASX: DEG).

2 TAILINGS STORAGE FACILITY 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 seismic requirements for the geotechnical embankment design requirements.

The *Global Industry Standard on Tailings Management* (GISTM) been considered in the design and the design is largely compliant with the GISTM. It should be noted that the GISTM covers governance, data management and risk assessment which have not been covered in this document to the GISTM requirements. In addition, consideration of an 'Extreme' consequence category has not been considered in the design. The ICMM document on '*Tailings Management Good Practice'* has similar aims as the GISTM. The TSF design is robust and appropriate for the consequence category adopted, it is therefore substantially compliant with the ICMM document.

2.2 Storage Capacity

The following factors are considered in TSF design as part of the assessment of the required storage capacity which is based on:

- Annual tailings production at 10 Mt/year
- LOM initially 10 years with potential to extend for a further 3 years, that is minimum 130 Mt (100 Mt in the initial TSF and +30 Mt in a future expansion.
- Tailings deposited at 40 - 50 % solids.
- Integrated Waste Landform (IWL) tailings parameters, which are assumed at this stage assumed, as tailings testwork is planned, but yet to be executed):
  - 1.4 t/m^3 (dry) above ground facility, nominal 45-50 % solids
  - Average beach slope 1 %

Details of the storage characteristics are further discussed in Section 3.2.2.

2.3 Tenure and Site Conditions

The TSF and associated infrastructure fits within the tenement boundaries as shown in Drawing PER2021-0290-01.

2.3.1 Climate

The project area has a semi-arid climate. The area has hot summers and mild winters. The following data provided by De Grey / sourced from as indicated has been utilised in the design.

- Average annual rainfall of 329 mm
- Mean annual evaporation 3,590 mm
- 1:1,000 yr. Annual Exceedance Probability (AEP) 72-hour event, 577 mm (BOM, 2022)
- Probable maximum precipitation (PMP) 6 hour event 950 mm (BOM, 2003, Generalised Short Duration Method)

2.3.2 Surface Conditions

The subject site and its immediate surroundings are described as being generally flat, with open woodland comprising of small to medium mallee trees, scattered shrubs, and perennial grasses (typical savannah environment) with an RL of approximate 79 m AHD on the western boundary to approximately 80 m AHD on the eastern boundary. . The broader region is also generally flat with sparse creek systems emerging from the catchments of isolated duricrust hills and ranges

2.3.3 Geology

The published geological map (*1:250,000 Port Hedland Geological Survey of Western Australia*) describes the site as being overlain by colluvium and/or residual deposits, sheetwash, talus, scree, boulder, gravel, sand and may include minor alluvial or sandplain deposits, local calcrete and reworked laterite. The site is underlain by the Mallina Basin which includes metasediments of interbedded shale, siltstone, and medium to fine-grained greywacke.

CMW has conducted a desk study and liaised with De Grey Mining geologists to gather an appreciation of the ground conditions at the proposed TSF site.

The project site is part of the Hemi Gold Project and is located in the Pilbara Craton WA (reference De Grey Mining Annual Report, De Grey Mining, 31 March 2021). It is located within the Archean Tabba greenstone belt and overlying Mallina sediments. Within the project area the greenstone belt and meta-sediments trend northeast/southwest and have been structurally deformed due to the emplacement of the nearby granitic batholith and the Mount Dove Intrusion. These deposits are overlain by quaternary age colluvium and alluvium. The gold deposit is hosted within the intrusion and close to the surface.

Based on a review of the available geological information and borehole drilling conducted during the PFS, the IWL site has surficial materials comprising alluvial deposits (sand and silt) which are approximately 15-20 m in thickness (refer Section 2.3.8). There is also some clay and cemented material (Ferricrete) near the surface within the surficial deposits, with the bedrock comprising granitoid rock.

2.3.4 Pit Geology

The geology of the pit area predominantly comprises Quartz Diorite, Diorite and sedimentary rocks. The geological profile comprises approximately 40 m of transported material over weathered rock.

A geotechnical assessment of pit materials was conducted to locate suitable clay materials for construction of the upstream zone. The clay materials to be targeted were to have a minimum fines content (passing 75 micron) of 25% and be low to medium plasticity. The total volume of clay required for the TSF Cell 1 was approximately 1.1 Mm^3 with the upstream low permeability zone (i.e. between 140,000 and 200,000 m^3 per stage). A summary of material requirements per stage is provided in Section 3.5.

The De Grey Geologists identified areas of upper and lower saprolite with the Hemi Pit area. These areas are dominated by kaolin clays (two samples of these materials were laboratory tested refer Appendix B). Modelling was performed by a De Grey Geologist using a mineralogy dataset (i.e. for Kaolin). A Boolean function was applied to the Kaolinite model against the Brolga Starter and Stage 2 Pit. The estimated clay volume (lower limit) was 1.6 Mm^3 in the Brolga Starter Pit and 3.6 Mm^3 in the Brolga Stage 2 Pit. This assessment indicates there should be available construction materials, however scheduling will need to be performed in the detailed design stage and materials will possibly need to be stockpiled for later stages of the TSF construction.

2.3.5 Hydrology

The TSF site is located in an area of sheet flow with no major defined drainage channels. The site is between the Yule and Turner Rivers, major river floods (i.e. 1:100 yr. AEP) are unlikely to affect the proposed TSF site.

The sheet flows across the undeveloped TSF site for a 1:100 yr. AEP were approximately 0.4 m at low velocity (i.e. flows basically non erosive).

2.3.6 Sub-surface and Foundations

CMW carried out a geotechnical investigation of the proposed TSF site in March - April 2022 and May 2022. The scope of fieldwork completed comprised of forty seven (47) test pits excavated to depths of up to 2.3 m using a Hitachi 36 tonne excavator fitted with an 800 mm wide-toothed bucket to investigate the underlying soil conditions and facilitate sampling for laboratory testing.

The ground conditions encountered and inferred from the investigation of the IWL site are largely homogenous. This soil profile was consistent with the published geology for the area and can be generalised and split according to the following subsurface sequences:

SAND (SP), or	Fine to medium grained, subrounded to rounded; red brown; trace fines; trace organics to a depth of 0.8 m.
CLAYEY SAND TO SANDY CLAY (SC-CL)	low to medium plasticity; sand, fine to coarse grained, subrounded to rounded; red brown to yellow brown; with gravel lateritic, ferruginous, medium to coarse grained, angular to subangular; weak to moderately cemented from 0.2 m to 1.8 m
Overlying, FERRICRETE/LATERITE	retrieved as SANDY CLAY (CL); low to medium plasticity; sand, fine to coarse grained, subrounded to rounded; red brown; with gravel lateritic, ferruginous, medium to coarse grained, angular to subangular; strong iron cementation to a maximum excavation depth of 2.8 m.

All test pits refused on these hard cemented lateritic layers around the similar depth ranging from 2.2 to 2.8 m. Iron cementation depths varied, and laterite was encountered just below the surface at TP15. It can also be concluded that gravel is of a colluvial deposition.

Based on the results of the investigations, the following was adopted in design:

- Topsoil to a maximum depth of 0.2 m will be removed from the TSF footprint for Stage 1.
- An underdrainage system comprising slotted pipes wrapped in aggregate and geotextile will be installed along the upstream toe of the TSF at the north western side of the TSF, where the ground levels are lowest. The foundation to accept the underdrainage lines will be compacted to a depth of 0.3 m.
- Cut-off trenches under the perimeter embankments, to nominally 1.5 m - 2 m below ground level (bgl) founded on sandy clay have been included in the embankment design to reduce horizontal seepage losses.

The geotechnical investigation of the TSF site is included as Appendix B.

2.3.7 Seismicity

The project area is located in a region of low to moderate seismic risk. Based on a seismic study undertaken (ref Draft NSHA18 and AS 1170.4) the following parameters have been utilised in the design:

- Operating Basis Earthquake (OBE), 1:500 year AEP, 0.04g
- Safety Evaluation Earthquake (SEE),1:5,000 year AEP, 0.12g
- Maximum Credible Earthquake (MCE), 1:10,000 year AEP, 0.2g

2.3.8 Hydrogeology

A hydrogeology investigation was conducted at the TSF site and surrounds. This investigation comprised 11 boreholes drill using RC drilling techniques to between 15 m and 24 m.

The boreholes encountered predominately silty sand / sandy silt.

Two of the bores intersected bands of clayey sand, nominally 2.5 m thick at 11 m depth. Granodiorite and Diorite Bedrock was encountered in four of the boreholes at 17.5 m, 18.5 m, 17.0 m and 15.5 m. Saprolite was noted in two boreholes at 2.5 m and 18 m. Groundwater in the boreholes was encountered between 6 m and 8 m bgl.

Falling head permeability tests were conducted in these boreholes. Each of the boreholes was cased with the bottom 6 m to 12 m cased with slotted pipe. The details of the boreholes and section of open hole tested as well as the results of the falling head permeability tests are provided in Table 1. The results of the falling head permeability tests in the bores indicate that the average permeability of the top 15 m generally varied between 2×10^{-6} and 1×10^{-5} m/s (average 8×10^{-6} m/s). Two bores had a higher permeability of 3×10^{-5} m/s which is believed due to lower fines content and little cementing below 7 mbgl. These results represent a mix of the geological conditions in the slotted section of the bores.

Table 1 – Summary of In-situ Permeability Test Results					
Bore ID	**Plan ID**	**Bore depth (m)**	**Slotted Length (m)**	**Permeability (m/day)**	**Permeability (m/s)**
HMB031	BH02	15.0	6.0	3.00	3×10^{-5}
HMB032	BH03	15.0	6.0	0.50	6×10^{-6}
HMB033	BH01	15.2	6.0	0.43	5×10^{-6}
HMB034	TSF-GW-01	20.0	12.0	0.80	9×10^{-6}
HMB035	TSF-GW-07	20.0	12.0	0.27	3×10^{-6}
HMB036	TSF-GW-04	24.0	18.0	1.00	1×10^{-5}
HMB037	TSF-GW-02	23.0	15.0	0.15	2×10^{-6}
HMB038	BH05	17.5	12.0	2.90	3×10^{-5}
HMB039	TSF-GW-05	17.0	12.0	1.30	1×10^{-5}
HMB040	TSF-GW-03	17.2	12.0	1.70	2×10^{-5}
HMB041	BH04	15.0	6.0	0.75	9×10^{-6}
HMB042	TSF-GW-O6	21.0	14.0	0.19	2×10^{-6}

Monitoring wells have been installed across the site and show water at approximately 6 m below surface from an unconfined aquifer. The groundwater flows in a north / north westerly direction and shows relatively high permeability across the near surface alluvial deposits.

The groundwater in the project area is understood to be of good quality (TDS, 900 to 1,300 mg/L, pH neutral). The water catchment for Port Hedland is located to the north of the project area. However, the pit area is between the TSF and the water catchment area. Hydrogeology Modelling is being conducted to assess seepage from the TSF and the pit area as a groundwater sink.

2.4 Retaining Structure Properties

An options study was conducted during the scoping study to investigate appropriate methods for tailings storage for the project. The main options consider were an IWL (i.e. a TSF formed within a waste dump) and a central thickened discharge facility (CTD). A central thickened discharge facility involved discharging high density thickened tailings from a central location with tailings beaching to the perimeter (this option still requires decant facilities). Other options considered were multi-cell paddock facilities with upstream raising and dry stacking.

Table 2 Advantages and Disadvantages of Options	
Advantages	**Disadvantages**
IWL: • Lower initial capital cost. • Reduce footprint area hence reduced disturbance and bonds. • Reduced closure cost due to waste nearby and reduced footprint. • Conventional type facility, reduce operational risk. • IWL upstream of the Hemi Pit, which may form a groundwater sink (i.e. any seepage would flow to the pit).	IWL: • IWL needs to be integrated with mining operations (i.e. waste placement needs to keep pace with tailings rise). • Haul distance to IWL from pit important, and has a large effect on economics. • Regulatory risk associated with seepage management of the IWL option (i.e. risk of increase in capital cost).
CTD: • Water recovered at the plant. • Lower seepage risk than conventional above ground facility. • Reduce deferred capital (i.e. minimal embankment raises required, only raising of the internal ramp).	CTD: • High initial capital cost due to thickeners and pumping requirements. • High closure cost due to large footprint area. • Likely higher operating costs due to greater thickening and pumping costs. • Large CTD surface area resulting in large amounts of runoff to be managed from large storm events. • Close proximity to the airstrip (aviation limits and possible dust to air strip). • Close proximity to the gas pipeline (buffer limits and possible corrosion of pipe).
Upstream Raising of Paddock TSF • Lower initial capital costs (on par with IWL) • Conventional type facility, reduce operational risk. • Upstream of the Hemi Pit, which may form a groundwater sink (i.e. any seepage would flow to the pit).	Upstream Raising of Paddock TSF • This type of facility is not suitable for a high hazard TSF which the TSF for the Hemi Gold Project will need to be designed. • Higher closure and environmental risks
Dry Stacking • Robust Structure, high landform stability particularly if buttressed with waste or within an IWL. • Potential lower overall risk (i.e. environmental, social, business)	Dry Stacking • High capital and operating costs • Dust generation from dry stack. • Questions relating to reliability and the suitability of this technology for a gold project with a high production throughput.

The IWL is the preferred TSF option, which will be taken forward to following studies. The IWL option is a robust storage option with manageable environment impacts, low business and regulatory risk, significant advantages in relation to closure, as mine waste can be readily deployed during mining for embankment construction at a relatively low cost .

The TSF embankments will be constructed with mine waste sourced from mining operations there is no requirement for other external resources. The embankment will be zoned with a low permeability upstream zone of clayey mine waste materials and a downstream zone of general mine waste. The clayey foundation and embankment construction materials are unlikely to be susceptible to 'piping'.

The mine waste comprises mostly oxide materials (70% oxide) and 30% transition / fresh (competent) waste and these materials are considered unlikely to liquefy from dynamic loadings or seismic activities. The mine waste materials forming the outer downstream zone of the embankment will need to be erosion resistant transition and competent waste can be deployed in this zone to meet this requirement.

Appendix D provides the technical specifications for the embankment construction materials.

2.5 Tailings Properties

2.5.1 Geotechnical Testwork

Tailings testwork was performed on a sample of tailings obtained from the metallurgy testing program, by Trilab Pty Ltd, a NATA registered laboratory. The tailings sample was a non-plastic SILT (ML) with sand, and 82% fines (% passing 75 µm). The settling test results indicated relatively rapid settling rates with the maximum dry density in the settling tests achieved under a day. The relatively rapid settling rate of settling is due to the relatively low content of clay size particles in the tailings. The consolidation test indicated that consolidation will be moderate to slow due to a high fines content.

The results of the tailings testwork are summarised below:

- Particle Size Distribution (PSD), 82% passing 75 micron, approximately 7% passing 2.7 micron.
- Undrained settled density, 1.14 t/m^3 (dry), with maximum density achieved in 5 hours.
- Drained settled density, 1.25 t/m^3 (dry), with maximum density achieved in 5 hours.
- Air drying test, final density 1.48 t/m^3 (dry) after 16 days.
- Consolidation test indicated Coefficient of Consolidations, Cv of 26 m^2/year to 74 m^2/year. Permeability of the tailings from the consolidation test was very low, k of 1x10^{-9} to 5 x 10^{-11} m/s.

Tailings settling test results are presented in Appendix J.

Based on the results of the tailings testing, the tailings in-situ dry density adopted in the design of 1.4 t/m^3 (dry) was suitably conservative. Due to the high fines content, beach slopes are expected to relatively flat, and likely to vary between nominally 0.5% towards the decant to 1% near the embankments.

2.5.2 Geochemical Testwork

Geochemical characterisation testwork and reporting was performed on a similar sample from the metallurgy testing program by SRK. The results of this testwork indicated that the tailings are non-acid forming (NAF) and have significant enrichment in Arsenic (5,000 mg/kg) and enrichment in Bi, Re, Se, W and S. Based on the testwork, the decant water quality is expected to be alkaline (pH 9.4) and brackish (TDS 3,294 mg/L).

3 TAILINGS STORAGE FACILITY DESIGN

3.1 Introduction

The design and operating objectives for this facility are:

- Optimise the removal of supernatant water from the facility and return it to the plant for re-use in processing. The removal of water will not only assist in maximising the in-situ dry density of the deposited tailings, but also minimise water consumption.
- Reducing environmental risk by maximising water recovery and minimising the potential for seepage losses downstream.
- Minimising the risks to personnel operating in the open pit in the unlikely event of tailings breach.
- Providing a safe, stable non-polluting, structure during operation and closure.

The TSF has been designed to meet safety and environmental objectives.

Drawings PER2021-0290-01 to PER2020-018-06 provide the general arrangements, and sections and details for the TSF design (refer Appendix C).

Scope of Works for the construction of the TSF is included as Appendix D. Schedules of quantities for the staged construction of the TSF are also included in Appendix D.

3.2 Hazard/Consequence Rating

The integrated waste landform (IWL) design concept proposed is a robust design based on downstream raising of the perimeter embankments which is resistant to liquefaction. Upstream embankment raising, which is not resistant to liquefaction is not proposed. The 20 m crest width also provides a high factor of safety against slip failures. The closest infrastructure that will be affected by a possible embankment failure is the Brolga – Falcon Waste Dump and ROM pad, as well as the plant and workshop, which are about 900 m northwest of the TSF.

The design presented in this study is based on a ANCOLD (2019) design consequence category of “High B”. This consequence category is based a damage type of ‘Major’ and a population at risk (PAR) of >10 and <100. This consequence category has been assessed based on the results of dam break studies.

- Potential loss of life in the pit during open pit operations or at the plant. PAR of >10 and <100.
- Major damage is characterised by downstream infrastructure being affected (value $10M to $100M), and a business consequence – of significant impact.
- Other environmental and social criteria are not as critical as infrastructure and business consequence.
- Impact area < 5 km^2 and duration < 5 years.
- Limited effect on native flora and fauna in reserves etc.

Based on the DMP Code of Practice (2013), the hazard rating for the TSF has been assessed as ‘High’, Category 1.

3.3 Design Concept

The design for the selected option, the IWL TSF is presented on the drawings which are attached in Appendix C. The storage characteristics for this facility TSF are as follows and shown in Section 3.3.2. The TSF has been designed as two adjoining cells, the main cell (Cell 1) will have a 100 Mt capacity and the second cell will have a 30+ Mt capacity. Tailings deposition will initially be into Cell 1 followed by Cell 2. Cell 2 will likely be constructed following Cell 1 and could potentially have a larger footprint. The Cell 2 design and size is likely to be re-visited in subsequent studies.

The earthworks quantities have been estimated based on AutoCAD Civil 3D modelling for each stage and the embankment design criteria in Section 3.3.3.

Based on the storage characteristics, the average rate of tailings rise for the IWL is 2.5 - 3.0 m/y, which should allow for adequate drying of tailings and hence the tailings are likely to achieve adequate tailings density and strength.

The low permeability embankment (upstream or inner embankment) will be support by the adjacent mine waste dump and it will be important that suitable mine waste is always available to be placed in advance of any compacted earthworks. Mine waste scheduling will be an important consideration.

3.3.1 Drawings

The following design drawings are presented in Appendix C.

Table 3: Drawings

Title	Drawing No.
IWL – Plan	PER2021-0290-01
Sections and Details	PER2021-0290-02
IWL – Underdrainage Plan	PER2021-0290-03
Underdrainage and Spigot Details	PER2021-0290-04
IWL – Instrumentation Plan	PER2021-0290-05
Instrumentation Details	PER2021-0290-06

3.3.2 TSF Storage Characteristics

The TSF, Cell 1 has been designed for a storage capacity of 100 Mt. The storage capacity for each stage is summarised in the table below based on a tailings in-situ dry density of 1.4 t/m^3 and an average beach slope of 1%.

Table 4: TSF Cell 1 Storage Volume and Storage Capacity				
Stage	RL (m)	Tailings Area (ha)	Storage Volumes (Mm^3)	Storage Capacity (Mt)
1	83.5	283	10.9	15.3
2	88.5	298	25.5	35.7
3	93.5	305	40.6	56.8
4	98.5	311	55.9	78.3
Final	103.5	316	71.6	100.3

Cell 2 will have a storage capacity of 30 Mt and will be constructed to the same crest level as Cell 1.

3.3.3 Embankment Design

The TSF will be an integrated waste landform (IWL) storage facility, construction within a waste dump. The TSF has been designed to store up to approx. 130+ Mt of tailings. Drawings showing the extents of the IWL is presented on Drawing 01 in Appendix C.

The embankments of the TSF will be zoned with a 6 m wide upstream zone upstream zone of low permeability roller compacted clayey mine waste and a 14 m wide downstream zone of general, traffic compacted mine waste. The low permeability clay materials (upstream) will be sourced from the oxide zone and clayey overburden within the Hemi Project area. Mine waste (downstream zone) will form the bulk of the embankment and will be sourced from mining operations. The downstream zone will provide bulk/strength and will buttress the low permeability upstream embankment zone. Figure 3A and 3B showing a typical embankment cross section is presented below.

The embankment also incorporates a cut-off trench founded on cemented gravelly material between 1.5 to 2.0 m below ground level to reduce seepage losses.

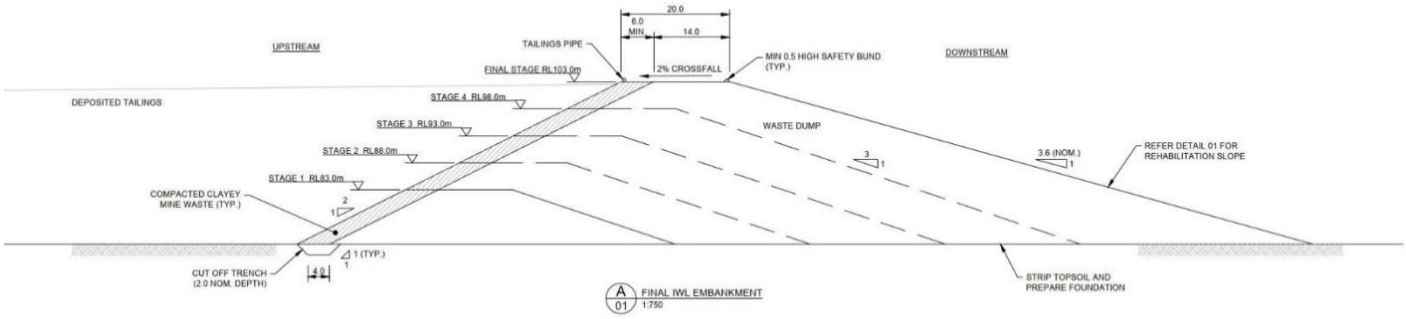

Figure 3A: Typical Cross Section TSF Perimeter Embankment

The proposed rehabilitation geometry is shown below.

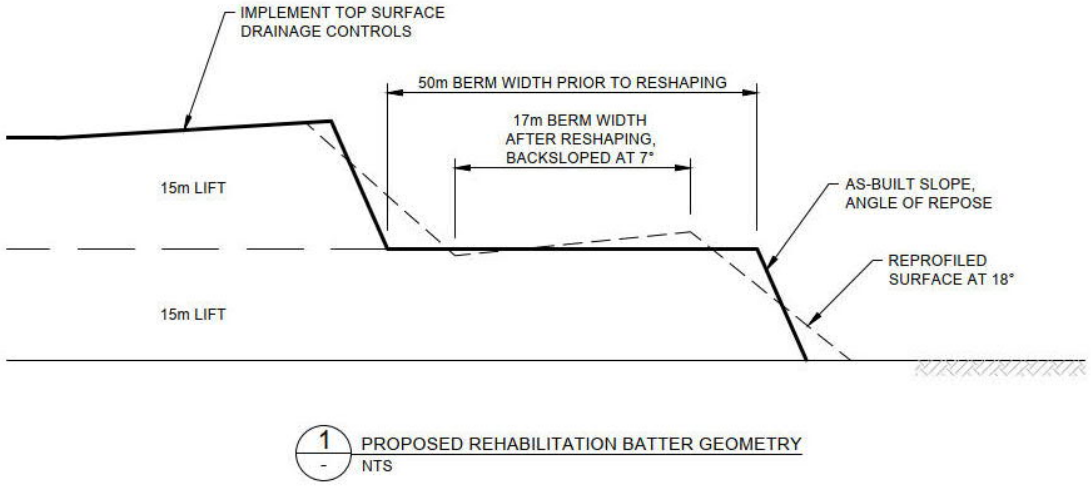

Figure 3B: Typical Cross Section TSF Rehabilitation Slope

3.3.4 Embankment geometry

The TSF embankment will be benched during operations and the benching reprofiled for closure (refer to Figure 3B on the preceding page). The minimum geotechnical overall slope requirements have design slopes of 1(V):2(H) upstream and 1(V):3(H) min. downstream, with a total crest width of 20 m. The proposed benching complies with the overall slope requirements. Equipment used to carry out construction and maintenance shall be selected to suit dimensions. The embankment crest will have a 2% cross-fall towards the upstream side, 0.5 m (min.) high mine waste windrow at the downstream crest, and above ground tailings pipeline at the upstream crest.

The design geometry of the proposed TSF Embankment construction is presented on Drawing PER2021-0290-02 in Appendix C.

3.3.5 Water recovery system

The proposed TSF will have a central decant located within the TSF comprising a rock ring filter wall. Access to the decant will be by a decant accessway constructed using mine waste. The decant structure and accessway will be raised along with the perimeter embankments.

Recovered supernatant water will be returned to the plant for re-use in the process. The pumps will require a working capacity of not less than 1,400 tph.

3.3.6 Seepage Management

Seepage from the tailings storage is minimised by the incorporation of the following seepage management measures within the design.

- A cut-off trench under the upstream zone of the embankment extends around the full perimeter of the facility. This seepage cut-off trench has a depth of 1.5 to 2 m and will be backfilled with compacted, low permeability, clayey mine waste.
- The upstream embankment zone will be construct from low permeability materials (clayey mine waste) to reduce the potential for seepage through the perimeter embankment.
- Placement and compaction of low permeability clayey waste materials with a thickness of nominally 0.5 m on the floor of the TSF around the decant with a minimum radial extent of 300 m radius from the centre of the TSF.
- Inclusion of an underdrainage system (see Section 3.37).
- Continuous recovery of decant water from the facility and re-use in the process plant.
- Provision of temporary pumps to achieve early water return from the IWL.
- Seven (7 no.) monitoring bores have been installed around the IWL.

3.3.7 Underdrainage system

The design will include an underdrainage system comprising underdrainage lines installed around the perimeter embankment upstream toe draining to an internal sump(s) within the site. The underdrainage lines will comprise slotted pipes (Megaflo) covered with selected aggregate and wrapped in geotextile stabilised with coarse aggregate/select rock.

The underdrainage lines will grade to external sump in the north and northwest section of the TSF. Pumps deployed at the sumps will allow recovery of seepage water captured by the underdrainage system.

Sizing of the underdrainage system is based on seepage analyses. The capacity of the underdrainage provides for an inflow equivalent to 2% of slurry water inflow (i.e. nominally 7.5 L/s, system capacity).

3.4 Modelling and Design Studies

3.4.1 Structural Stability

3.4.1.1 Method of Analysis

Stability analyses were undertaken to assess the stability of the TSF embankment up to a maximum crest height of RL 103.5 m (i.e. at 30 m embankment height). 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 method and GLE/Morgenstern-Price method was used in the analyses of the non-circular failures.

The design earthquake loads for the TSF embankment *(Safety Evaluation Earthquake, SEE (previously MDE) and Operational Basis Earthquake, OBE)* was determined by consideration of the consequence category of the tailings storage and are selected as earthquakes with given annual exceedance probability (AEP). ANCOLD (2019) gives guidance in selecting the AEP of the OBE and SEE. This guidance considers 'defensive' earthquake design through the use of TSF design principles.

Since the TSF is considered as a 'High B' consequence category storage, the OBE is 1 in 475 years AEP and SEE is 1 in 5,000 years AEP.

The following cases were examined in the stability analyses:

Case 1: Static Analysis – Downstream failure of the northern embankment of the TSF with a crest level of RL 103.5 m (30 m embankment height) under drained condition based on limit equilibrium method.

Case 2: Static Analysis – As for Case 1, but with undrained condition.

ANCOLD (2019) requires deformation analyses, which is presented in Section 3.3.1.4. It should be noted that the TSF embankment and foundations are not liquefiable and hence post-seismic analyses are not applicable.

The phreatic surface adopted in all cases were based on the results from the 2D seepage modelling, refer to Section 3.4.4, particularly those comments around the adoption of the phreatic surface at RL 103 m, the maximum embankment crest level. The tailings beaches formed will likely be sloped (modelled as an average of 1%) and seepage analyses have considered the scenario of a conservative phreatic level where the decant pond is maintained at approximately 700 m from the embankment and exits at the downstream toe.

3.4.1.2 Parameters

The stability analyses of the embankment were carried out using the drained (c, φ), and undrained parameters (Su), with pore pressure derived from the seepage analyses, refer to Section 3.4.4. The effective strength parameters were assumed with a level of conservativeness based on the results of

the geotechnical investigations and the subsequent laboratory test results. The undrained parameters were assumed based on typical parameters from similar gold projects in WA. Table 5 provides a summary of the strength parameters used in the stability analyses.

Table 5: Summary of Strength Parameters

Material Type	Bulk Density (kN/m³)	Drained Parameter		Undrained Parameters
		Cohesion c/(kPa)	Friction Angle j/(degrees)	Cohesion Su/(kPa)
General Mine Waste	20	0	36	-
Clayey Mine Waste	19	5	32	75
Tailings	16	-	25	0.25 σ'v
Clayey Sand/Colluvium	18	5	30	-
Ferricrete	20	10	40	-

3.4.1.3 Results of the Stability Analyses

The results of the stability analyses for the various cases examined, under the worst-case phreatic loadings and the case where the decant pond is maintained at approximately 700 m from the embankment, are summarised in Table 6. The computer outputs are presented in Appendix F.

Table 6: Results of Stability Analyses

Case	Factor of Safety	Recommended Minimum Factors of Safety*
1	2.02	1.5
2	2.04	1.5

*Note: Recommended factors of safety in accordance with ANCOLD (2019).

The stability analyses indicate adequate factors of safety for the drained and undrained conditions when compared with the recommended minimum factors of safety in ANCOLD (2019).

The design concept for the TSF is robust with factors of safety against embankment failure likely to be greater than the minimum requirements (i.e. FoS around 2 or above for normal operating conditions). The design concept provides for 'defensive' earthquake design as called for in the 2019 ANCOLD guide through the use of downstream raising. Post seismic cases are not critical as no upstream raising of embankment is contemplated and the embankment and its foundations should not be liquifiable.

3.4.1.4 Deformation Analyses

A preliminary assessment of embankment deformation due to 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.

The permanent displacements and settlements expected for a 30 m high embankment were estimated under a Magnitude 7.5 earthquake, corresponding with a PGA loading of 0.12 g for 1: 5,000 AEP for the SEE event. The parameters were conservatively derived based on respectively the maximum earthquake magnitude as gathered by the Geoscience Australia National Seismic Hazard Assessment (NSHA18), as well the intensity measure as outlined in AS 1170.4 (2007).

From the analysis, it is concluded that for the highest embankment section, the deformation due to an SEE event is likely to be in the order of 10 mm. Such deformation is insignificant when compared with the total freeboard of 1.1 m.

3.4.1.5 General Comments in Respect to Stability

The TSF is a robust structure and the factors of safety, which are presented in Table 4, are above the required minimum and consistent in terms of what can be achieved from this style of structure.

Stability is significantly influenced by the position of the phreatic surface within the deposited tailings and confining embankment.

The tailings storage facility 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 surface. The tailings storage should be operated in such a manner as to ensure that the `normal' supernatant pond is maintained well away from the embankment at all times.

3.4.2 Design Acceptance Criteria

The design of the 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 the TSF, at its ultimate height, in accordance with Tables 1 and 2 of the DMP (2013) code results in a hazard rating of 'Category 1 – High' (Section 3.1). The ANCOLD (2019) consequence rating is 'High B' (refer Tables 1 and 2 of ANCOLD (2019).

Embankment Design analysis should consider:

<u>Operations Phase</u>

- Operating Basis Earthquake (OBE) is 1 in 475 years annual exceedance probability (AEP).
- Safety Evaluation Earthquake (SEE) (previously MDE) is 1 in 5,000 years AEP.

<u>Post Closure</u>

- Maximum credible earthquake (MCE).

<u>Freeboard and Water Management in accordance with ANCOLD guidelines (2019):</u>

- Storage of 1: 1,000 yrs. AEP storm event of 72-hour duration plus
- Allowance for wave run-up for 1:10 AEP wind and 0.5 m of additional freeboard.
- A spillway should not be required during operations, dependant on construction staging. A spillway may need to be considered as part of closure. This spillway will need to cater for a probable maximum flood (PMF).

- Stormwater from large storm events will be disposed of on the surface of the TSF by evaporation and pumping via the decant to the process water circuit.
- Minimum frequency of inspections of the TSF in accordance with DMIRS guidelines.

Embankment monitoring will be performed during operation of the TSF and will need to be extensive due to the adjacent pit downstream. The following aspects will be considered:

- Piezometers to monitor water levels.
- Monitoring should be active real-time monitoring, with data from instruments sent via telemetry to a site computer for ongoing assessment.
- 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 degree of movement etc.

3.4.2.1 Dam Break Assessment

A dam break assessment was performed for the Final Stage TSF. The scenarios examined were:

- Sunny day cases
- Worst cases (i.e. with probable maximum precipitation (PMP) into TSF)

Dam breaks from the northern embankment were considered in the assessment.

3.4.2.1.1 Breach characteristics

If a TSF embankment breach were 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 and therefore will not be as free flowing as water.

Under worst-case probable maximum precipitation (PMP) rainy day failure conditions:

- The storage capacity of the TSF was approximately 71,600,000 m^3.
- PMP storm volume is estimated at 2,983,000 m^3. This was based on a 6-hr probable maximum precipitation event (PMP) rainfall depth of 0.95 m over the total TSF catchment of 314 ha.
- The tailings failure volume is likely to be released from the TSF at the final height of nominally 30 m for the northern embankment. In the event of an embankment failure under PMP rainy day conditions, the volume of release is in the order of 25 Mm^3, i.e. approximately 33 % of the impounded storage capacity and the PMP storm volume.
- Based on T MacDonald and J Langridge – Monopolis (1984), embankment breaches typically occur relatively quickly (typically 0.5 an hour to 4 hours). Based on this methodology, it is estimated that the breach will occur over approximately 4 hours due to the wide IWL embankment crest.

The calculation of breach characteristics is included in Appendix I.

The Rourke and Luppnow Method (ref: H Rourke, D Luppnow, 2015) for estimating volume released from the TSF was also utilised to assess potential stored volume release. This method is based on a relation between the potential volume released from TSF and the size of the decant pond. The greater the ratio of the pond area to total area, the greater the ratio of release volume to stored volume. Table 7 presents a summary of case data used in the analyses taken from Table 1 of the referenced paper.

Table 7: Summary of Case Study Data (ref: H Rourke, D Luppnow, 2015)				
Name	**Impoundment Storage Volume (Mm^3)**	**Release Volume (m^3)**	**Ratio of Release Volume to Stored Volume (%)**	**Ratio of Pool Area 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 25 Mm^3 scenario represents a likely maximum release from a paddock/IWL type valley storage TSF in a semi-arid region subject to tropical cyclones such as the Port Hedland region of WA.

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.

The peak flows were then estimated using Rico M, Beniti G, Diez-Herrero G (2008) and also by assuming a triangular hydrograph.

Table 8: Results of Dam Break Analyses				
Scenario	**Peak Flow (m3/s) Rico M, Beniti G, Diez-Herrero G 2008***	**Peak Flow (m3/s) triangular hydrograph****	**Approx. Breach Development time (hrs)**	**Flood Volume (m3)**
Worst Case – North	5,200	3,890	4	25,000,000

3.4.2.1.2 Energy Methods

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

The height of the block for the Cell 1 embankment was assumed to be 30 m and the run-out distance a function of the residual shear strength and material density. For a residual shear strength of 4 kPa the run-out distance was estimated to be 1.25 km.

Based on the analyses performed, with the mining infrastructure than 300 m from the northern embankment of the TSF, the tailings from a sunny day dam break are expected to enter the mining area north of the TSF.

The calculations of the run-out distances for a sunny day case are presented in Appendix I.

3.4.2.1.3 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 could be more than 5,000 m^3/s over 4 hours.

In a worst-case scenario for the northern embankment dam break, tailings and water run-out could flow to the ROM, located about 300 m north of the TSF. Refer to the preliminary inundation plan in Appendix I. The MRL gas pipeline is approximately 1.5 km east north east of TSF Cell1 and 1 km east north east of TSF Cell 2. It is unlikely that a dam break will directly affect the pipeline.

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

- Potential Loss of human life: at the northern pit area or at the plant, depending on breach location and flow path.
- Economic loss due to plant shutdown and production loss, repairs of damaged sections of TSF and local access roads.
- Environmental impact: there will be some potential for contamination of soils and surface water requiring environmental 'clean-up'.

3.4.2.1.4 Controls

The conditions for TSF embankment failure to occur would be driven largely by the significant 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 and that the location of the pond is maintained around the decant will minimise the risk of a perimeter embankment breach and release of saturated tailings. A diversion bund north of the TSF is recommended in order to divert the released tailings around the plant and important infrastructure, to the north of the project area.

Instrumentation and monitoring comprising the vibrating wire piezometers (VWPs) are discussed in Section 4.3. A total of ten pairs of VWPs will be installed in the perimeter embankments as shown in the drawings. The VWPs, which indicate the water level within the embankments will be logged monthly and reviewed regularly (suggested quarterly) to ensure that sufficient factor of safety of the perimeter embankments is maintained.

TSF embankment failure is not expected, provided the facility is operated in accordance with the requirements set out in the TSF Operations Manual (to be compiled in subsequent design stages).

The water recovery system, pumps and piping must be designed for a recovery rate not less than 1,400 tph.

In the event that a TSF embankment was in imminent danger of failure and breach, an Emergency Action Plan (EAP) would need to be enacted (see Section 4.3.1).

3.4.3 Erosion Control

The TSF embankment will be benched during operations and the benching reprofiled for closure (refer to Figure 3B). The final downstream slopes as designed by Mine Earth will comprise a 17 m wide berm, at 15 m vertical height and batter slopes at $18^{o,}$ in order to allow for waste dump construction utilising predominantly oxide waste materials.

Further assessments will be required during mining on the erodibility of the materials to be included in the outer waste dump and downstream batters of the TSF. Erosion control is further discussed in Section 4.3 of this report.

3.4.4 Seepage Analyses

3.4.4.1 Method of Analyses

Seepage analyses were primarily undertaken to estimate the position of the phreatic surface for the final embankment design at the crest level of RL 103.5 m. 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 simplistic approach, which does not consider 3D effects.

3.4.4.2 Model Assumptions

Models have been made to account for the phreatic condition for when decant pond is about 600 m in diameter and maintained at a distance 700 m from the perimeter embankment, as well as to account for a large and uncontrolled decant pond adjacent to the perimeter embankment upstream boundary where on a maximum water pond level of RL 103 m was adopted, which is a conservative assumption base on conditions which are extremely unlikely to occur during operation. The downstream boundary condition was assumed based on the groundwater located at the ground surface level at the downstream toe of the embankment, which is also extremely unlikely to occur during operation. To generate these conditions the underdrainage at the upstream toe of the TSF is considered to be blocked and not functioning.

The material permeability used in the seepage analyses are based on values derived from the on-site tests conducted during Hydrogeology site investigation, laboratory characterisation testing of the construction materials and tailings testing results supplemented with assumed textbook values, appropriate to the materials. Underdrainage outflow of 7.5 L/s was also considered in the model. Table 9 provides a summary of the permeability used in the analyses.

Table 9: Summary of Permeability Values

Material Type	Permeability, K (m/s)
Tailings	1×10^{-7}
General Mine Waste	1×10^{-6}
Clayey Mine Waste	1×10^{-8}
Clayey Sand/Colluvium	5×10^{-6}
Cemented Clay (Ferricrete)	1×10^{-8}

3.4.4.3 Results of Analyses

The seepage flow determinations from the analyses are summarised in Table 10, below. Please note that the seepage flow details in Table 3, which have been generated by the 2D software and must not be construed as being representative of the actual day to day operating conditions.

Table 10: Results of Seepage Analyses

Case	*Approximate Embankment Length (m)	Estimated Seepage per day for Embankment (m^3/day)
Decant pond 700 m away from embankment	3,150	56.7
Decant pond next to embankment	3,150	107.1

*Approximate embankment length is only the length of the particular embankment case applicable to the analyses.

Plots of the phreatic surfaces and distribution of pore pressures throughout the embankment are presented in Appendix E. The seepage analyses indicate that with the underdrainage system in place, low seepage flow can be expected from the TSF.

3.4.4.4 Seepage Mitigation

The following seepage management controls have been incorporated in the TSF design, including:

- A supernatant water recovery system which has a capacity of not less than 1,400 tph which represents approximately 100% of the slurry water discharged to the TSF.
- A cut-off trench, to nominally 1.5 m to 2 m below ground level (bgl) to the cemented clay horizon has been included in the embankment design to reduce horizontal seepage losses.
- Underdrainage was included as part of the TSF design concept to recover leachate at the base of the TSF and divert recovered leachate to an underdrainage sump. The capacity of the underdrainage system is approximately 544 L/min.
- The foundation (i.e. the surficial clayey sand, sandy clay subgrade in the TSF footprint) to accept the underdrainage lines will be compacted to a depth 0.3 m.
- A compacted low permeability ($k<10^{-8}$ m/s) clay liner with a thickness of 0.5 m, which extends to a radius of 300 m from the centre of the TSF under the decant area to reduce seepage through the foundation.
- Vibrating Wire Piezometers (VWPs) (10 no. pairs / locations) to be installed behind the upstream compacted zone of the southern and northern embankments for early warning seepage monitoring. Monitoring and reporting details of the water levels are discussed in Section 4.3.

3.4.5 Water Balance

A water balance analysis for the proposed TSF operation has been undertaken using a spreadsheet to examine expected TSF inflows and outflows for the final Stage.

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 H.

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

- Climate data was obtained from the BOM website
- Tailings area of approx. 314 ha
- A tailings runoff coefficient of 0.4 was assumed.
- Pool area equal to approximately 10% of tailings area (radius approx. 100 m).
- Running beaches equal to approximately 10% of tailings area
- Evaporation pan factor of 0.7
- Average tailings residual moisture content of 35%
- Tailings slurry density of 45% solids
- Tailings production rate of approximately 10,000,000 tpa.
- Permeabilities for seepage through deposited tailings and dam floor of 10^{-8} m/s respectively. Estimated seepage flow around 56.7 m^3/day (conservative assumption compared with Section 3.4.4).
- Seepage/leachate recovered by the underdrainage will be pumped into the TSF and hence returned to the plant via the decant system.

The results of the analysis indicate potential annual average water returns of approximately 60% to 70% of the tailings slurry water deposited into the facility can be expected under average climatic conditions.

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. Some variation can be expected, with lower water return in summer when evaporation rates are high and higher water return in winter when evaporation rates are low.
- 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 capacity of the water recovery system should be 1,400 tph.

3.4.6 Settlement

As the TSF has been designed to be raised by downstream methods, the settlement of the tailings will have a negligible impact on the structural integrity or the operational performance of the TSF.

Cone Penetrometer Testing (CPT) investigations of the TSF will be required prior to closure, to test the tailings to extract the information necessary to assess for the final consolidation to ensure an appropriate closure cover design which can function and accommodate long term settlements. The CPT work should be supplemented with undisturbed samples taken at 2 m intervals for density moisture testing.

3.5 Design and Construction Details

The embankment of the TSF will be a zoned embankment and raised in stages. The facility will be constructed in several stages.

Construction of embankment to the design RLs will involve:

- Raising construction of the upstream embankment zone to the design RL, likely by a civil contractor.
- Waste dump construction to the design RL by the mining operation

As part of preparation works, the footprint of the facility will be cleared of vegetation. The topsoil (sands) from the footprint will be stripped to a nominal depth of 0.2 m and stockpiled for use in rehabilitation. The more substantial woody vegetation and topsoil will be stockpiled separately.

Timing of the staged works should be scheduled in order to meet the mine waste volume requirements and more importantly the filling rate of the TSF. Construction of the TSF embankment should be integrated with the ongoing mine planning, to ensure that adequate volumes of construction materials are available and scheduled.

It will also be necessary to ensure that planning of upstream select embankment lifts, is coordinated with planned downstream mine waste zone embankment construction as the waste zone must be in place prior to the placement of any upstream clayey zone. The following table summarises the materials volumes for clayey waste (upstream zone) requirements for each stage.

Table 9: Summary of Embankment Material Volumes

Stage	RL (m)	Upstream Zone Volume (m^3)	Downstream Zone Volume (m^3)
1	83.5	390,000	1,900,000
2	88.5	170,000	2,200,000
3	93.5	185,000	3,100,000
4	98.5	183,000	3,900,000
5	103.5	181,000	6,800,000

3.6 Quality Assurance

The Scope of Work and Technical Specification document is attached as Appendix D. This document specifies the responsibilities, procedures, and quality control tests which verify that the TSF retaining structure has been constructed in accordance with the design intent.

4 OPERATIONAL REQUIREMENTS

4.1 Management of Tailings Deposition and Water

A summary of the operations design for the TSF is presented in Section 3.4. An Operations Manual for the TSF outlining the operating procedures, inspection criteria, monitoring requirements and log sheets for the facility will be compiled.

The following routine inspection and maintenance procedures are to be carried out for the various components of the system. An 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 flow and sump pump.
- the general integrity of the embankments i.e. any new cracking (daily).
- seepage downstream of the TSF.
- any changes to existing cracking or seepage.

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

4.1.1 Freeboard

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

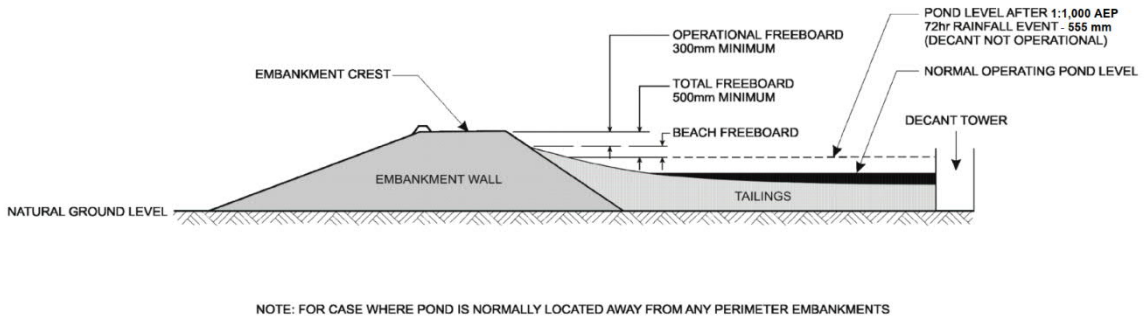

Figure 4: Freeboard Nomenclature

The proposed TSF has been designed such that a 1:1,000 yr. AEP, 72-hour duration storm event can be temporarily stored on top of the facility. The design assumes correct operational controls are adhered to and that water is continually removed from the facility, such that minimum freeboard allowances are maintained.

The design makes provision for a minimum 1.1 m total freeboard comprising minimum operational freeboard (vertical height between the tailings beach and embankment crest) of 300 mm, a minimum beach freeboard of 200 mm, and allowance for the 1:1000 yr. AEP 72 hour event of 577 mm.

ANCOLD guidelines (2019) also recommend an allowance for wave run-up for 1:10 AEP wind for a 'High B' consequence category TSF (refer to Section 3.2). However, it is expected that with perimeter tailings deposition and an expected beach slope of 1%, 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 on Figure 3. Based on the Rainfall Intensity-frequency-duration (RIFD) data pertaining to the BOM website, a 1:1,000 yr. AEP, 72-hour duration rainfall depth of 577 mm was adopted for the design. A minimum temporary storage of a stormwater volume of approximately 1,811,800 m^3 (i.e. approx. 314 ha x 0.577 m) on top the of TSF has been considered in the design.

The 6-hour PMF storm volume is 2,980,000 m^3 (catchment 314 ha, PMP 0.95 m) (this is greater than a 1:10,000 AEP 72 hr. event of 768 mm). The depressed cone on the top surface of the Cell 1 TSF should have a volume greater than 5,000,000 m^3.

4.2 Dust Control

If dust generation becomes an issue (i.e. in periods the TSF may be inactive), the tailings beaches could be irrigated (i.e. with sprinklers or similar) or mulching of the surface might be considered as a temporary solution prior to application of the final closure cover.

4.3 Performance Monitoring and Instrumentation

Groundwater monitoring bores have been established around the TSF perimeter, at the 7 locations as determined by the Project Hydrogeologist, Geowater Consulting (refer to Section 2.3.8).

Vibrating Wire Piezometers (VWPs) (10 no. pairs minimum) will be installed behind the upstream clayey zone along the perimeter embankments to allow early warning seepage monitoring for the TSF.

It is recommended that as a minimum:

- Groundwater level readings are taken monthly.
- Groundwater samples for laboratory analyses are taken quarterly.
- Information collected from the monitoring bores and piezometers be reviewed regularly and reported in an annual audit.

As a minimum a series of movement monuments should be established on the crest of the perimeter embankments to monitor embankment movement. Surveys should be conducted monthly and recorded in a spreadsheet for assessment of trends.

The requirement for additional instrumentation (i.e. monitoring bores, piezometers) associated with the TSF should be reviewed as part of the yearly audit. Seepage from the embankment should be investigated and piezometers installed to allow further assessment by a Geotechnical Engineer, as required.

4.3.1 Emergency Action Plan

The TSF Operations Manual provides a description of the operating procedures for the facility and includes an Emergency Action Plan. The Emergency Action Plan for the plant site and pits should be updated based on the results of the dam break analyses presented in Section 3.2.2.1 and inputs from site personnel. The plan should be reviewed and updated as a minimum on a yearly basis.

The plan should address:

- Management responsibilities and emergency coordination
- Muster points
- Seeking specialist geotechnical advice
- Emergency Plan Triggers
    - Freeboard less than design values
    - Elevated phreatic levels in the piezometers
    - Significant embankment distress
    - Imminent overtopping

5 CLOSURE CONSIDERATIONS

The closure objectives for the TSF are to leave the facility in a safe, stable, erosion resistant and non-polluting state.

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.

The downstream slopes of the TSF perimeter embankments will be rehabilitated as part of the waste dump rehabilitation. The final downstream slopes as designed by Mine Earth will comprise a 17 m wide berm, at 15 m vertical height and batter slopes at $18^{o,}$ in order to allow for waste dump construction utilising predominantly oxide waste materials.

The final tailings surface will grade to the decant area. Once tailings deposition has been completed within the TSF and the top surface of the tailings has gained adequate bearing capacity the surface will be covered with a store and release cover (minimum thickness 0.5 m). The store and release cover will comprise silty/clay gravel mine waste overlaid with a nominal sand topsoil layer.

The TSF concept requires the integration of the planning, construction, and closure of the TSF with waste dump construction. Materials for rehabilitation of the top-surface will be sourced from waste dumps. The rehabilitation program will include the identification of appropriate cover materials and local flora species to revegetate the surface of the facility.

Other works that will be required as part of closure involve:

- Decommissioning the decants
- Decommissioning the underdrainage system.

The underdrainage system will be operated until such time as the underdrainage flow stops or is very low. The underdrainage system would then the decommissioned by ‘sealing’ the outlet pipework.

Rehabilitation closure criteria for the TSF including observations specific to the tailings and consolidation will be developed and progressed as part of a Mine Closure Plan. Details of the criteria will be documented in the Mine Closure Plan associated with the Mining Proposal.

6 REFERENCES

The following standards and references were used in the preparation of this report.

1. Department of Mines and Petroleum (2013). '*Code of Practice, Tailings Storage Facility in Western Australia'*.
2. Department of Mines and Petroleum (2015). *'Guide to the preparation of a design report for tailings storage facilities (TSFs)'*.
3. ANCOLD (2019). '*Guidelines on Tailings Dams Planning, Design, Construction, Operation and Closure'.*
4. Australian Government Bureau of Meteorology website, http://www.bom.gov.au/.
5. Australian Government Geosciences website, http://earthquakes.ga.gov.au
6. AS 1170.4 (2007). '*Australian Standard Structural design actions Part 4: Earthquake actions in Australia'*.
7. AS 1726 (2017). '*Geotechnical Site Investigations'*.
8. Commonwealth of Australia (Geoscience Australia) (2016). 'Australian Rainfall and Runoff: A guide to flood estimation (ARR)'.
9. Swaisgood (2003). *'Embankment Dam Deformations caused by Earthquakes'.*
10. T MacDonald and J Langridge - Monopolis (1984). *'Breaching Characteristics of Dam Failures'*, Journal of Hydraulic Engineering, May 1984.
11. A Dalpatram (2011). 'Estimation of Tailings Dam Break Discharges', presentation at USSD workshop on Dam Break Analysis Applied to Tailings Dams.
12. 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.
13. K D Sneddon (2010), 'Approaches to estimation of run-out distances for liquified tailings', Mine Waste 2010, Perth Australia.

For and on behalf of
CMW Geosciences Pty Ltd

Christopher Hogg

Principal Tailings Engineer

Peer Review by Chris Lane, Consultant – L&MGSPL

Distribution: 1 copy to De Grey Mining Ltd
Original copy held by CMW Geosciences Pty Ltd

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

TAILINGS STORAGE DATA SHEET

Project operator: De Grey Mining Limited			
Project name: Hemi Operations		Date: August 2022	
TSF name: Tailings Storage Facility		Commodity: Gold	
Name of data provider: CMW / De Grey		Phone: 61 8 6117 9328	
TSF centre co-ordinates: (MGA, Zone 51) coordinates 7,658,600 m North, 651,500 m East			
Mining Tenement and Holder(s) details: M47/1628			
TSF data			
TSF status: Proposed			
Type of TSF: 1 Paddock, IWL		Number of cells: 2 1	
Hazard rating: 3 High		TSF category: 4 1	
Catchment area: 5 328 ha		Nearest water course: Turner River 6-7 km	
Date deposition started (mm/yy): NA		Date deposition completed (mm/yy): -	
Tailings discharge method: 6 multi-spigots		Water recovery method: 7 pumped central decant (in rock-ring)	
Bottom of facility sealed or lined? Y / N Yes partially lined		Type of seal or liner: 8 Compacted clayey mine waste material	
Depth to original groundwater level m: 6 to 8m		Original groundwater TDS, 900 to 1,300 mg/L, pH neutral	
Ore process: 9 Flotation, Pressure Oxidation, CIL		Tailings Deposition rate: 10 1 10 Mtpa (09/2019)	
Impoundment volume (present) m3 0 m^3		Expected maximum m3 72 x $10^6 m^3 m^3$	
Mass of solids stored (present) tonnes 0 t		Expected maximum tonnes 100 x 10^6 t	
Above ground facilities			
Foundation soils: Clayey sand to sandy clay, over Ferricrete/laterite		Foundation rocks: Granodiorite and Diorite Bedrock	
Starter bund construction materials: 11 Oxide and Mine Waste		Wall lifting by: Oxide and Mine Waste	
Wall construction method/materials: Downstream methods		Wall lifting material: 12 ,mechanically	
Present maximum wall height agl: 13 m -		Expected maximum m 30.5 m	
Crest length (present) m -		Expected maximum m 6,315 m	
Impoundment area (present) ha		Expected maximum ha 316ha	
Below ground (in-pit) facilities NA			
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: 2,500 - 3,300 mg/L	pH: 8 - 9	Solids content 45-50%	Deposited density t/m^3 1.4
Potentially hazardous substances: 14 As, CN	WAD CN: Tails 51 mg/L	Total CN mg/l: 65 mg/L	
Any other NPI listed substances in the TSF? 15 Y / N See separate report			

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

Appendix B – Geotechnical Investigation Factual Report

29 August 2022

TAILINGS STORAGE FACILITY

HEMI GOLD PROJECT
PILBARA, WA

GEOTECHNICAL INVESTIGATION FACTUAL REPORT

De Grey Mining Ltd

PER2021-0290AC Rev 0

PER2021-0290AC		
Date	Revision	Comments
22 June 2022	Rev A	Draft - Issued to client
29 August 2022	Rev 0	Final Issue

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Figure

Appendices

1 INTRODUCTION

CMW Geosciences Pty Ltd (CMW) was authorised by Rod Smith of De Grey Mining Ltd to carry out a geotechnical investigation as part of prefeasibility study and regulatory approvals for an Integrated Waste Landform (IWL) Tailings Storage Facility (TSF) for the Hemi Gold Project. An IWL is essentially a TSF surrounded by a waste dump. The site is located approximately 85 km southeast of Port Hedland, Western Australia. The scope of work and associated terms and conditions of our engagement were detailed in our services proposal referenced PER2021-0290AA Rev 0 dated 7 September 2021.

The purpose of this factual report is to describe the ground conditions encountered during geotechnical site investigations completed by CMW between February and May 2022 and to provide a geotechnical assessment of the materials proposed for the construction of the Integrated Waste Landform.

2 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The IWL is located on application of Mining Lease M47/1449-1 with an approximate centroid point of 7689197 m North and 652576 m East on Zone 50 of the MGA geodetic datum. The investigations of IWL site were originally commenced in February 2022, following heritage clearance. The site was subsequently moved approximately 1.5 km to the west and investigations at the enlarged adjoining site were completed in May 2022 following further heritage clearances.

The centroid point of the IWL is situated approximately 2 km southeast of the Hemi discovery where open-pit mining is anticipated to commence. The Hemi discovery is an intrusion-hosted form of gold mineralisation new to the Pilbara region and shows a scale of mineralisation not previously encountered in the Malina Basin. Once open-pit operations and processing of ore begin, the tailings waste will be stored in the proposed IWL facility.

The subject site and its immediate surroundings are described as being generally flat savannah country with an RL of approximately 79 m AHD on the western boundary to approximately 80 m AHD on the eastern boundary. The site is predominantly an open woodland comprising of small to medium mallee trees, scattered shrubs, and perennial grasses. The broader region is also generally flat and sparse with creek systems emerging from the catchments of isolated duricrust hills and ranges

The site is considered mostly undisturbed apart from cleared access tracks for exploration and hydrology drilling programs.

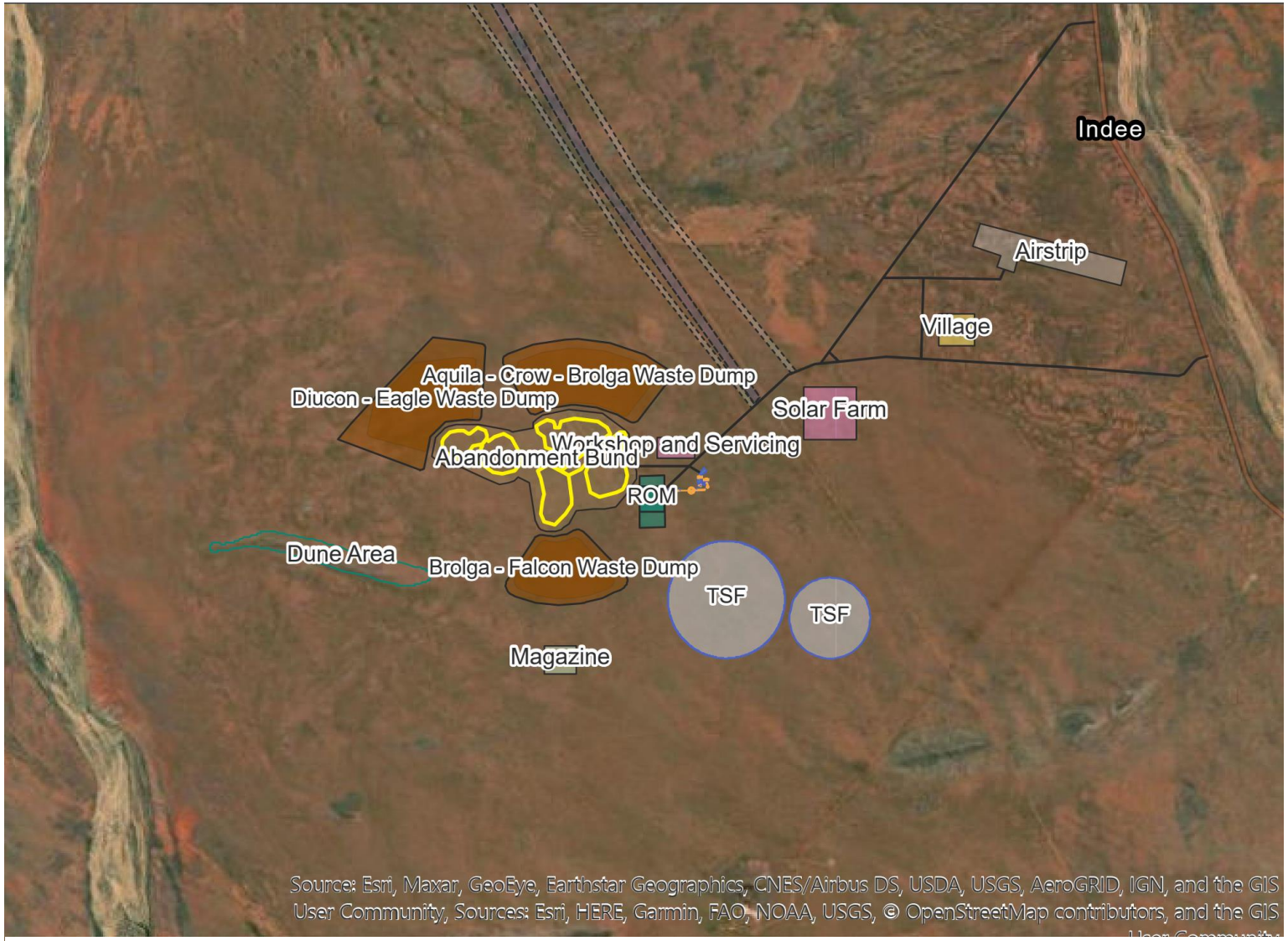


Figure 1: Hemi project site layout overview

3 FIELD INVESTIGATION

The CMW field investigations were carried out from February to May 2022. All fieldwork was carried out under the direction of personnel from CMW Geosciences Pty Ltd in general accordance with AS1726 (2017), Geotechnical Site Investigations.

The scope of fieldwork completed between February and May 2022 was as follows:

- A walkover survey of the site to assess the general landform, site conditions and geology of the proposed IWL area;
- 47 test pits, denoted TP01 to TP47, were excavated in the footprint of the proposed IWL to depths of up to 3.0 m using a Hitachi 36-tonne excavator fitted with an 800 mm wide-toothed bucket to investigate the underlying soil conditions and facilitate sampling for laboratory testing. Test pits were excavated along the pre-existing cleared tracks meaning vegetation wasn't disturbed. Engineering logs of the test pits and photographs are presented in Appendix A; and,
- Collected bulk samples from the soil and rock profiles encountered on the test pits excavated in the proposed IWL area. Liaise with De Grey Mining geologists to collect drill core samples of the white clay rock type which is proposed to be the source of waste for the IWL. All samples were freighted back to Perth for subsequent laboratory testing. Photos in Appendix C show the proposed IWL site and the drill core of the waste lining material.

The approximate locations of the respective investigation sites referred to above are shown in the attached Figure 2 – Site Investigation Plan. Test locations were selected by CMW and generally positioned in the footprint of the proposed IWL where cleared access lines allowed. Test locations were measured using a hand-held Avanza Mapping tablet and a Garmin GPS to an accuracy of ±2 m. Elevations were inferred from Google Earth to an accuracy of up to 3 m.

4 LABORATORY TESTING

A suite of soil laboratory testing was carried out as part of CMW's geotechnical investigation on representative samples generally in accordance with the requirements of the latest edition of AS1289, Methods of Testing Soils for Engineering Purposes (where applicable).

The in-situ HQ drill core samples were taken from two separate holes at depths of 36.30-38.75 m and 33.80-35.88 m in the Hemi Pit area. All tests were commissioned by CMW and carried out by or under the direction of Western Geotechnical & Laboratory Services, a NATA registered testing authority. Triaxial tests were carried out by E-Precision Laboratory, also a NATA registered testing authority. The extent of testing carried out to provide the geotechnical parameters required for this study is presented in Table 1 and testing certificates are presented in Appendix B.

Table 1: Laboratory Test Schedule Summary		
Type of Test	**Test Method**	**Quantity**
Particle Size Distribution (PSD)	AS 1289.3.6.1	9
Plasticity Index (PI)	AS 1289.3.1.1, 3.2.1, 3.3.1	9
Emerson Class (EC)	AS 1289.3.5.1	2
Standard Compaction (MDD)	AS 1289.5.1.1	2
Multi Stage Consolidated Undrained (CU) Triaxial Test	AS 1289.6.4.2	2
Constant head permeability at 95%	AS 1289.6.7.1	2

5 GROUND MODEL

5.1 Geology

The published geological map (*1:250,000 Port Hedland Geological Survey of Western Australia*) describes the site as being overlain by colluvium and/or residual deposits, sheetwash, talus, scree, boulder, gravel, sand and may include minor alluvial or sandplain deposits, local calcrete, and reworked laterite. The site is located within the Mallina Basin, a tectonic, rift-like basin that is comprised of metasediments of interbedded shale, siltstone, sandstone, conglomerate, BIFS, chert and medium to fine-grained wacke. Several large granitic plutons and diorites are intruded into the Mallina Basin.

5.2 Subsurface Conditions

The ground conditions encountered and inferred from the investigation of the IWL site are largely homogenous. A typical fining upwards sequence was observed while on site. The soil profile encountered on site was consistent with the published geology for the area and can be generalised and split according to the following subsurface sequences listed below.

SANDY SILTY CLAY/SAND (topsoil)	Fine to medium-grained, subrounded to rounded; brown-red; trace organics.
CLAYEY SAND/CLAYEY GRAVELLY SAND/GRAVELLY SAND	Low to medium plasticity; sand, fine to coarse-grained, subrounded to rounded; red brown to yellow brown; with gravel lateritic, ferruginous, medium to coarse-grained, angular to subangular; weak to moderately cemented.
FERRICRETE/ LATERITE	Retrieved as SANDY CLAY/ SANDY GRAVEL; low to medium plasticity; sand, medium to coarse grained, subrounded to rounded; red brown; with gravel lateritic, ferruginous, medium to coarse grained, subrounded to rounded; strong iron cementation.
SANDY GRAVELLY CLAY/GRAVELLY CLAY	low to medium plasticity; sand, coarse, sub-angular to sub-rounded; gravel, coarse-grained rounded to sub-angular. Some instances of cobble and alluvial soils.

Note: All 47 test pits refused on these hard cemented lateritic layers around the similar depth ranging from 2.2 – 3.0m. Iron cementation depths varied, and laterite was encountered in TP04, TP10, TP12, TP15, and TP32 . TP18 and 17 encountered alluvial soils that were very gravelly and well-rounded. It can also be concluded that most of the gravel is of a colluvial deposition.

The distribution of these units is presented in Table 2.

Table 2: Summary of Encountered Soil Stratigraphy

Description	Depth to base of layer (mbgl)		
	Minimum	Maximum	Average
SANDY CLAY/SAND (topsoil)	0.15	0.40	0.55
CLAYEY SAND/CLAYEY GRAVELLY SAND	0.48	2.40	1.28
FERRICRETE/LATERITE	0.92	2.44	1.81
SANDY GRAVELLY CLAY/GRAVELLY CLAY	2.21	2.96	2.63

5.3 Groundwater and Hydrology Program

Groundwater was not encountered within any of the test pits during our investigation. An extensive Hydrology campaign has been undertaken across the site and groundwater has proven to be shallow at an average depth of approximately 6m below ground level in the location of the IWL.

6 LABORATORY TEST RESULTS

6.1 Soil Classification and Permeability Results

Two laboratory permeability tests were undertaken on materials excavated from the proposed footprint of the IWL. Results of the soil classification and permeability laboratory tests provided in Appendix B are summarised in Table 3 below. Discussion of the material tested is discussed in Section 7.

Table 3: Summary of Soil Classification and Permeability Test Results													
Location & Coordinates	**Depth (mbgl)**	**Particle Size Distribution**				**Atterberg Limits**				**Standard Compaction**		**Emerson Class Number**	**Permeability**
		Cobble (%)	**Gravel (%)**	**Sand (%)**	**Fines (%)**	**LL (%)**	**PL (%)**	**PI (%)**	**LS (%)**	**OMC (%)**	**SMDD (t/m^3)**	**EC**	**K (m/s)**
Test Pit TP01	0.7 – 2.0	0	4	43	53	38	14	24	8.0	12.5	1.99	5	-
Test Pit TP06	0.2 - 1.6	0	17	60	23	28	13	15	8	-	-	-	-
Test Pit TP08	0.2 – 1.7	0	9	75	16	33	16	17	14.5	-	-	-	-
Test Pit TP33	2.0-3.0	0	57	27	16	40	13	27	9.5	10	2.04	-	2.47E-09
Test Pit TP38	2.0-2.8	0	20	63	17	34	16	18	9.0	10.5	1.99	-	1.40E-08
Drill Hole HEDD033	33.8-35.8	0	0	3	97	30	24	6	3	-	-	5	-
Drill Hole HEDD036	0.5 – 0.6	0	0	31	69	35	28	7	2	-	-	-	-
Combined sample: HEDD033 & HEDD036	-	-	-	-	-	-	-	-	-	16	1.92	-	-

Note: Gravel, sand and fines percentages are by weight, LL = Liquid Limit, PL = Plasticity Limit, PI = Plasticity Index, LS = Linear Shrinkage, NO = Not Obtainable, NP = Non-Plastic, MC = Natural Moisture Content, OMC = Optimum Moisture Content, SMDD = Standard Maximum Dry Density, EC = Emerson Class Number; K = Coefficient of Permeability

6.2 Triaxial Results

Results from the consolidated undrained (CU) triaxial tests provided in Appendix B are summarised in Table 4 below. Discussion of the testing is provided in Section 7.

Table 4: Summary of CU Triaxial Test Results

Location	Shear Stage	Confining Pressure (kPa)	U'_0 (kPa)	U'_f (kPa)	Principal Effective Stresses (kPa)			$\sigma'_1 - \sigma'_3$ (kPa)	Strain (%)
					σ'_1	σ'_3	σ'_1 / σ'_3		
TP01 (0.70 – 2.20m)	1	75	0	53	111	22	5.03	89	0.75
TP01 (0.70 – 2.20m)	2	150	0	106	211	44	4.79	167	4.39
TP01 (0.70 – 2.20m)	3	300	0	180	481	120	4.01	361	10.64
HEDD036-HEDD033 (Pit Material)	1	75	0	43	127	32	3.98	95	2.24
HEDD036-HEDD033 (Pit Material)	2	150	0	63	325	87	3.74	238	5.61
HEDD036-HEDD033 (Pit Material)	3	300	0	88	719	212	3.39	507	8.37

Note: U'_0 = Initial Pore Pressure, U'_f = Final Pore Pressure, σ'_1 = Effective Vertical Stress, σ'_3 = Effective Confining Stress.

7 GEOTECHNICAL MATERIALS ASSESSMENT

7.1 IWL Footprint Material

The subsurface sequences discussed in Section 5 are generally consistent with the results from laboratory testing of the near surface in situ materials. Based on the testing, the in-situ materials near surface at the IWL site comprised sandy clays and clayey sand, The sample TP1, 0.7 m to 2.0 m was a medium plasticity sandy clay (CI), the sample TP6, 0.2 m to 1.6 m was a low plasticity gravelly sandy clay (CL) and sample TP8, 0.2 m to 1.7 m was a medium plasticity sandy clay (CI).

The test result for the Emerson Class test of 5 indicates that the in-situ material (sample TP1, 0.7 m to 2.0 m) was non-dispersive the remoulding and breaking down of soil bonds can result in dispersive behaviour. Remoulding of the soil at a moisture content near the optimum for compaction does not increase the potential for dispersive behaviour, however further breakdown of the soil may occur, by water turbulence or concentrated rapid water flow.

The standard compaction test results on sample TP1, 0.7 m to 2.0 m were a maximum dry density of 1.99 t/m^3 at an optimum moisture content of 12.5%.

The results of the laboratory tests on the waste samples from the pit were low plasticity clay / sandy clay.

The in-situ material compacted to 95% SMDD will result in a low permeability layer that is less than 1 x 10^{-8} m/s.

Triaxial tests on sample indicated strength parameters with cohesion of 2.58 to 14.41 kPa and angle of internal friction between 34.22° and 39.69°, and corresponding coefficients of consolidation C_V of 0.260 cm^2/s.

7.2 Hemi Pit Material

The samples taken from the Hemi Pit are derived from drillholes HEDD033 and HEDD036. The interval of 33.8-35.8m for drill hole HEDD033 indicates a creamy white fine-grained clay of medium plasticity with a fines content of 97%. The interval of 0.5 -0.6m indicates a creamy white fine-grained sandy clay of medium plasticity with a fines content of 69%.

Triaxial tests on sample indicated strength parameters with cohesion of 3.11 to 14.29 kPa and angle of internal friction between 31.38° and 34.61°, and corresponding coefficients of consolidation C_V of 0.060 cm^2/s.

8 CLOSURE

The findings contained within this report are the result of limited discrete investigations conducted in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, can it be considered that these findings represent the actual state of the ground conditions away from our investigation locations.

If the ground conditions encountered during construction are significantly different from those described in this report and on which the conclusions and recommendations were based, then we must be notified immediately.

This report has been prepared for use by De Grey Mining Ltd in relation to the construction of an IWL at the Hemi Project in accordance with generally accepted consulting practice. No other warranty, expressed or implied, is made as to the professional advice included in this report. Use of this report by parties other than De Grey and their respective consultants and contractors is at their risk as it may not contain sufficient information for any other purposes.

For and on behalf of
CMW Geosciences Pty Ltd

Joe Fisher
Engineering Geologist

Reviewed by:

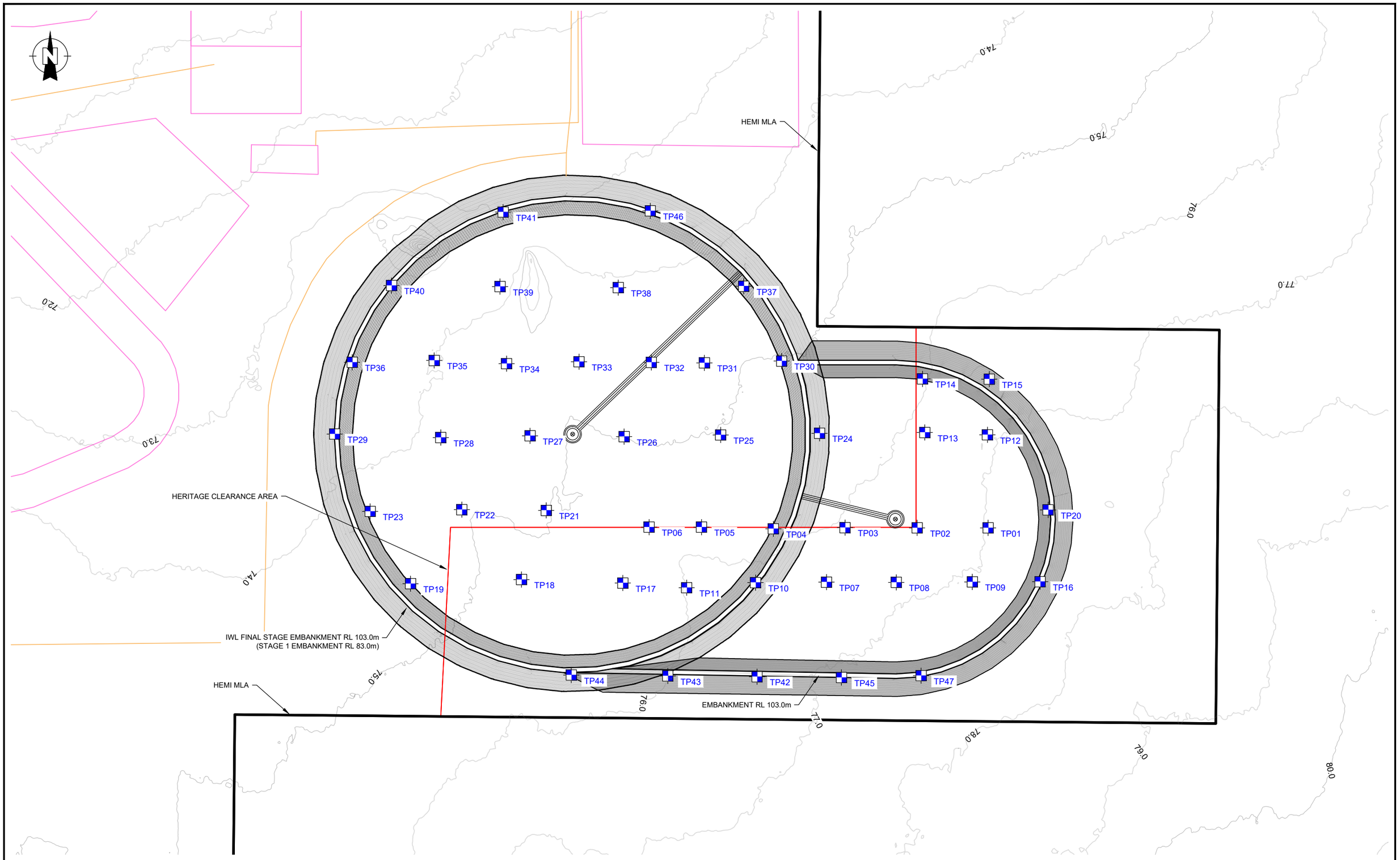
Chris Hogg
Principal Tailings Engineer

Distribution: 1 copy to DeGrey Mining Ltd (electronic)
Original held by CMW Geosciences Pty Ltd

9 REFERENCES

- AS 1289, *Methods of testing soils for engineering purposes,* Standards Australia, Sydney.
- AS 1726, *Geotechnical Site Investigations,* Standards Australia, Sydney, 2017.
- *Kalgoorlie, Sheet SH 51*, Geological Survey of Western Australia, 1:1 000 000 Geological Series, First Edition, 1976

Figure 1
Location Plan



CMW Geosciences

CLIENT: **DE GREY MINING LIMITED**		DRAWN: DE	PROJECT: PER2021-0290
PROJECT: **TSF SCOPING STUDY HEMI DEPOSIT, WA**		CHECKED: CH	FIGURE: 01
		REVISION: A	SCALE: 1:15,000
TITLE: **SITE INVESTIGATION PLAN - IWL**		DATE: 17.06.22	SHEET: A3 L

Appendix A
Test Pit Logs

TEST PIT LOG - TP01

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 01/02/2022

1:30 Sheet 1 of 1

Logged by: JF | Position: E.653296m N.7689199m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 79 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			78.8			TopSoil: SANDY SILTY CLAY: red/brown; clay, low plasticity; sand, fine to medium grained; trace organics.			
	0.7 - 2.2	B	78.3			SC: CLAYEY SAND: red/brown; sand, medium to coarse grained; clay, low plasticity; with gravel, medium to coarse grained, angular to subangular.			
				1		CL: SANDY CLAY: red/brown; clay, low plasticity; sand, fine to medium grained; gravel, medium to coarse grained, angular to subangular.	D		
						... from 1.50m to 1.50m, weak to moderate iron cementation			
				2					
			76.8			Test pit terminated at 2.20 m			
				3					
				4					

Termination Reason: Refusal on hardened laterite

Remarks: Backfilled to ground level.

TEST PIT LOG - TP02

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 01/02/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: JF
Checked by:CH

Position: E.652990m N.7689199m
Elevation: 79 m (AHD)

Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			78.8			TopSoil: SANDY SILTY CLAY: red/brown; clay, low plasticity; sand, fine to medium grained; trace organics.			
						SC: CLAYEY SAND: red/brown; sand, medium to coarse grained; clay, low plasticity; with gravel, medium to coarse grained, angular to subangular.			
			78.1	1		CL: GRAVELLY CLAY: red to yellow brown; clay, low plasticity; gravel, medium to coarse grained, angular to subangular. *... from 1.00m to 2.00m, moderate iron cementation*	D		
			76.8	2		Test pit terminated at 2.20 m			
				3					
				4					

Termination Reason: Refusal on hardened laterite

Remarks: Backfilled to ground level.

TEST PIT LOG - TP03

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 01/02/2022

1:30 Sheet 1 of 1

Logged by: JF | Position: E.652679m N.7689200m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 79 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			78.8	0		TopSoil: SANDY SILTY CLAY: red/brown; clay, low plasticity; sand, fine to medium grained; trace organics.			
						GC: CLAYEY GRAVELLY SAND: red/brown; sand, medium to coarse grained; gravel, medium to coarse grained; clay, low plasticity; angular to subangular.			
			78.2			CL: GRAVELLY CLAY: red to yellow brown; clay, low to medium plasticity; gravel, medium to coarse grained, angular to subangular. *... from 0.80m to 2.20m, weak iron cementation*	D		
			76.7	1		Test pit terminated at 2.30 m			
				2					
				3					
				4					

Termination Reason: Refusal on hardened laterite

Remarks: Backfilled to ground level.

TEST PIT LOG - TP04

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 01/02/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: JF
Checked by:CH

Position: E.652370m N.7689195m
Elevation: 79 m (AHD)

Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			78.8	0		TopSoil: SANDY SILTY CLAY: red/brown; clay, low plasticity; sand, fine to medium grained; trace organics.			
						GC: CLAYEY SANDY GRAVEL: brown/red; gravel, fine to coarse grained, subangular to subrounded; sand, medium to coarse grained; clay, low plasticity; trace roots. (moderately cemented laterite)	D		
				1		*... from 1.20m to 1.20m, increasing clay content*			
			76.9	2		*... from 2.00m to 2.00m, hard laterite capping* Test pit terminated at 2.00 m			
				3					
				4					

Termination Reason: Refusal on hardened laterite

Remarks: Backfilled to ground level.

TEST PIT LOG - TP05

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 01/02/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: JF
Checked by:CH

Position: E.652060m N.7689202m
Elevation: 79 m (AHD)

Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
	Depth	Type & Results							
			78.8	0		TopSoil: SANDY SILTY CLAY: red/brown; clay, low plasticity; sand, fine to medium grained; trace organics.			
				1		GC: CLAYEY SANDY GRAVEL: brown/red; medium to coarse grained; gravel, fine to coarse grained, subangular to subrounded; clay, low plasticity; trace roots.	D		
			76.8	2		Test pit terminated at 2.20 m			
				3					
				4					

Termination Reason: Refusal on hardened laterite

Remarks: Backfilled to ground level.

TEST PIT LOG - TP06

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 02/02/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: JF
Checked by:CH

Position: E.651834m N.7689202m
Elevation: 79 m (AHD)

Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
	Depth	Type & Results							
	0.2 - 1.6	B	78.8	1		SAND: red/brown; clay, low plasticity; sand, fine to medium grained; trace organics.	D		
						SC: CLAYEY SAND: red/brown; clay, low to medium plasticity; sand, fine to medium grained; some gravel; fine to medium grained, subangular to subrounded.			
			77.4	2		CL: GRAVELLY CLAY: red to yellow brown; clay, low plasticity; gravel, medium to coarse grained, subangular to subrounded.			
			76.2	3		Test pit terminated at 2.80 m			
				4					

Termination Reason: Refusal on hardened laterite

Remarks: Backfilled to ground level.

TEST PIT LOG - TP07

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 02/02/2022

1:30 Sheet 1 of 1

Logged by: JF
Checked by:CH

Position: E.652599m N.7688965m
Elevation: 79 m (AHD)

Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			78.7			TopSoil: SANDY SILTY CLAY: red/brown; clay, low plasticity; sand, fine to medium grained; trace organics.			
				1		GC: CLAYEY GRAVELLY SAND: red/brown; sand, medium to coarse grained; gravel, medium to coarse grained, subangular to subrounded; clay, low plasticity. *... from 1.10m to 2.00m, moderate iron cementation*	D		
			77.0	2		Test pit terminated at 2.00 m			
				3					
				4					

Termination Reason: Refusal on hardened laterite

Remarks: Backfilled to ground level.

TEST PIT LOG - TP08

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 02/02/2022

1:30 Sheet 1 of 1

Logged by: JF | Position: E.652900m N.7688964m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 79 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Structure & other observations
	0.2 - 1.7	B	78.8	0		TopSoil: SANDY SILTY CLAY: red/brown; clay, low plasticity; sand, fine to medium grained; trace organics.	D		
						GC: CLAYEY SANDY GRAVEL: red/brown; sand fine to coarse grained; gravel; fine to coarse grained, subangular to subrounded; clay, low plasticity.			
			77.3	1		CL: GRAVELLY CLAY: red to yellow brown; clay, low to medium plasticity; gravel, medium to coarse grained, angular to subangular.			
			76.8	2		Test pit terminated at 2.20 m			
				3					
				4					

Termination Reason: Refusal on hardened laterite

Remarks: Backfilled to ground level.

TEST PIT LOG - TP09

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 02/02/2022

CMW Geosciences

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Logged by: JF
Checked by:CH

Position: E.653228m N.7688966m
Elevation: 79 m (AHD)

Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			78.6			TopSoil: SANDY SILTY CLAY: red/brown; clay, low plasticity; sand, fine to medium grained; trace organics.			
				1		GC: CLAYEY GRAVELLY SAND: red/brown; sand, medium to coarse grained; gravel, medium to coarse grained, subangular to subrounded; clay, low plasticity.	D		
			77.0	2		Test pit terminated at 2.00 m			
				3					
				4					

Termination Reason: Refusal on hardened laterite

Remarks: Backfilled to ground level.

TEST PIT LOG - TP10

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 02/02/2022

CMW Geosciences

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Logged by: JF
Checked by:CH

Position: E.652293m N.7688963m
Elevation: 79 m (AHD)

Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
	Depth	Type & Results							
			78.2	1		SC: CLAYEY SAND: red/brown; clay, low plasticity; sand, fine to medium grained; trace organics.			
						GC: CLAYEY GRAVELLY SAND: red/brown; sand, medium to coarse grained; gravel, medium to coarse grained, subangular to subrounded; clay, low plasticity.	D		
			77.2	2		GC: CLAYEY SANDY GRAVEL: brown/red; gravel, fine to coarse grained, subangular to subrounded; sand, medium to coarse grained; clay, low plasticity trace roots. (very stiff laterite) *... from 2.00m to 2.00m, trace fragments*			
			76.8	3		Test pit terminated at 2.20 m			
				4					

Termination Reason: Refusal on hardened laterite

Remarks: Backfilled to ground level.

TEST PIT LOG - TP11

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 02/02/2022

CMW Geosciences

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Logged by: JF
Checked by:CH

Position: E.651996m N.7688941m
Elevation: 79 m (AHD)

Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			78.6	0		TopSoil: SANDY SILTY CLAY: red/brown; clay, low plasticity; sand, fine to medium grained; trace organics.			
						SC: CLAYEY SAND: red/brown; sand, fine to medium grained; clay, low to medium plasticity; trace gravel, fine to medium grained, subangular to subrounded.	D		
			77.3	1		GC: CLAYEY GRAVEL: white to yellow brown; gravel, medium to coarse grained, angular to subangular; clay, low to medium plasticity; sand, fine to medium grained. *... from 1.70m to 2.30m, heavily oxidised and saprolitic*			
			76.7	2		Test pit terminated at 2.30 m			
				3					
				4					

Termination Reason: Refusal on hardened laterite

Remarks: Backfilled to ground level.

TEST PIT LOG - TP12

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 02/02/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: JF
Checked by:CH

Position: E.653293m N.7689600m
Elevation: 79 m (AHD)

Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			78.7			TopSoil: SANDY SILTY CLAY: red/brown; clay, low plasticity; sand, fine to medium grained; trace organics.			
				1		SC: CLAYEY SAND: red/brown; sand, fine to medium grained; clay, low to medium plasticity; trace gravel, fine to medium grained, subangular to subrounded.	D		
			77.4			CL: GRAVELLY CLAY: red to yellow brown; clay, low to medium plasticity; gravel, medium to coarse grained, angular to subangular. (very stiff laterite)			
			77.0	2		Test pit terminated at 2.00 m			
				3					
				4					

Termination Reason: Refusal on hardened laterite

Remarks: Backfilled to ground level.

TEST PIT LOG - TP13

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 02/02/2022

CMW Geosciences

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Logged by: JF
Checked by:CH

Position: E.653023m N.7689610m
Elevation: 79 m (AHD)

Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
				1		SAND: brown/red; medium to coarse grained; some gravel, medium to coarse grained, angular to subangular; trace clay; trace rootlets.	D		
			77.4			CL: GRAVELLY CLAY: red to yellow brown; clay, low to medium plasticity; gravel, medium to coarse grained, angular to subangular.			
			77.0	2		Test pit terminated at 2.00 m			
				3					
				4					

Termination Reason: Refusal on hardened laterite

Remarks: Backfilled to ground level.

TEST PIT LOG - TP14

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 02/02/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: JF
Checked by:CH

Position: E.653013m N.7689841m
Elevation: 79 m (AHD)

Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			78.8	0		TopSoil: SANDY SILTY CLAY: red/brown; clay, low plasticity; sand, fine to medium grained; silt, no plasticity; trace organics.			
						SC: CLAYEY SAND: red/brown; sand, fine to medium grained; clay, low to medium plasticity; trace gravel, fine to medium grained, subangular to subrounded.	D		
			77.2	1		CL: GRAVELLY CLAY: red to yellow brown; clay, low to medium plasticity; gravel, medium to coarse grained, angular to subangular.			
			76.7	2		Test pit terminated at 2.30 m			
				3					
				4					

Termination Reason: Refusal on hardened laterite

Remarks: Backfilled to ground level.

TEST PIT LOG - TP15

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 02/02/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: JF
Checked by:CH

Position: E.653301m N.7689840m
Elevation: 79 m (AHD)

Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			78.6	0		TopSoil: SANDY SILTY CLAY: red/brown; clay, low plasticity; sand, fine to medium grained; trace gravel, medium to coarse grained, angular to subangular; trace organics.			
						CL: GRAVELLY CLAY: red to yellow brown; clay, low to medium plasticity; gravel, medium to coarse grained, angular to subangular. (very stiff laterite) *... from 0.40m to 0.40m, strong iron cementation*	D		
				1					
						... from 1.60m to 1.60m, moderate cementation, clay content increasing; iron rich and saprolitic			
				2					
			76.7			Test pit terminated at 2.30 m			
				3					
				4					

Termination Reason: Refusal on hardened laterite

Remarks: Backfilled to ground level.

TEST PIT LOG - TP16

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project ID: PER2021-0290
Date: 10/05/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DC Position: E.653521m N.7688967m Plant: 36 Tonne Excavator
Checked by: CH Elevation: 81 m (AHD) Contractor: Degrey Mining Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & other observations
			80.8	0		TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		S to VSt	1, 4	
						GC: CLAYEY SANDY GRAVEL: red/brown; gravel, medium grained, rounded to sub-angular; sand, coarse to medium grained, sub-rounded; clay, low plasticity.			5, 10	0.20-0.30m: DCP refusal at 400mm, hammer bounce on every layer up to one metre.
								VD St to VSt		
			80.0	1		CL: SANDY CLAY: red/brown; clay, medium plasticity; sand, fine-grained, rounded to sub-rounded.	D	H		
			79.2	2		GC: CLAYEY GRAVEL: red, yellow, white; gravel, coarse grained, angular, slightly weathered to extremely weathered; clay, low plasticity;.		VD		
			78.2	3		Test pit terminated at 2.80 m				
				4						

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP17

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 10/05/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DC
Checked by:CH

Position: E.651721m N.7688961m
Elevation: 79 m (AHD)

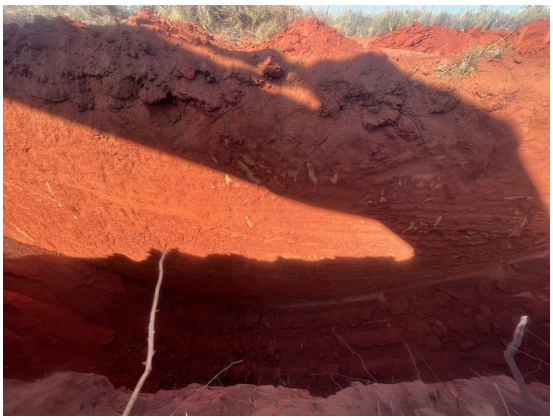
Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
	Depth	Type & Results							
			78.8			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.			
						SC: CLAYEY SAND: red/brown; sand, coarse to medium grained, sub-rounded; clay low to medium plasticity; traces gravel, fine grained, rounded to sub-angular.			
			77.9	1		GC: CLAYEY SANDY GRAVEL: red/brown; gravel, medium grained, rounded to subrounded; clay, low plasticity; sand, coarse to medium grained, sub-rounded.			
			77.5			CL: GRAVELLY CLAY: red; clay, low to medium plasticity; gravel, angular to sub-angular, coarse grained.	D		
				2					
			76.3			GP: SANDY GRAVELLY COBBLE: red/brown; cobble >6.3cm, rounded; sand, coarse grained, rounded; gravel, coarse grained, rounded to sub-angular; trace fines.			
			76.0	3		Test pit terminated at 3.00 m			
				4					

Termination Reason: Reached required depth

Remarks: Backfilled to ground level.



TEST PIT LOG - TP18

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 10/05/2022

1:30 Sheet 1 of 1

Logged by: DC | Position: E.651284m N.7688976m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 77 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			76.8			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.			
				1		SC: CLAYEY SAND: red/brown; sand, coarse to medium grained, sub-rounded; clay low to medium plasticity; traces gravel, fine grained, rounded to sub-angular.			
			75.8			GC: CLAYEY GRAVELLY SAND: red/brown; sand, coarse to medium grained, sub-rounded; gravel, coarse grained, angular to sub-angular; clay, low to medium plasticity;.	D		
			75.3	2		SC: CLAYEY SAND: red/brown; sand, coarse to medium grained, sub-rounded; clay low to medium plasticity; traces gravel, fine grained, rounded to sub-angular.			
			74.7			GP: SANDY GRAVELLY COBBLE: red/brown; cobble >8cm, rounded; gravel, coarse grained, rounded to sub-angular; sand, coarse grained, rounded; trace fines.			
			74.5			CL: GRAVELLY CLAY: red/yellow; clay, low to medium plasticity; gravel, well rounded, coarse grained.			
			74.2	3		Test pit terminated at 2.80 m			
				4					

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP19

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 10/05/2022

1:30 Sheet 1 of 1

Logged by: DC
Checked by:CH

Position: E.650805m N.7688958m
Elevation: 78 m (AHD)

Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			77.8			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.			
						GC: CLAYEY GRAVELLY SAND: red/brown; sand, coarse to medium grained, sub-rounded; gravel, fine grained, rounded to sub-angular; clay, low to medium plasticity;.			
			77.0	1		GC: CLAYEY SANDY GRAVEL: red/brown; gravel, medium to coarse grained, sub-angular to angular; clay, low plasticity; sand, coarse to medium grained, sub-rounded.			
			76.7			GC: CLAYEY GRAVELLY SAND: red; sand, coarse to medium-grained, sub-rounded; clay, low plasticity; gravel, medium grained, sub-rounded to sub-angular.	D		
				2					
			75.8			GM: GRAVELLY SILTY CLAY: mottled (yellow, red, white); clay, medium plasticity; gravel, medium grained, rounded to sub-angular;			
			74.9	3		Test pit terminated at 3.10 m			
				4					

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP20

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project ID: PER2021-0290
Date: 09/05/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DC Position: E.653555m N.7689276m Plant: 36 Tonne Excavator
Checked by: CH Elevation: 81 m (AHD) Contractor: Degrey Mining Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & other observations
			80.9			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		S	1	
						GC: CLAYEY GRAVELLY SAND: red/brown; sand, coarse to medium grained, sub-rounded; clay, low plasticity; gravel, fine grained, rounded to sub-angular.		L to VD	3, 3, 7, 10	0.30-0.40m: DCP refusal at 480mm, hammer bounce on every layer up to one metre.
			80.1	1		GC: CLAYEY SANDY GRAVEL: red/brown; gravel, coarse grained, sub-angular to angular; clay, low plasticity; sand, coarse to medium grained, sub-rounded.	D	VD		
			79.2	2		GC: CLAYEY GRAVEL: mottled (yellow, red, white); gravel, coarse grained, rounded to sub-angular; clay, low plasticity.		H		
			78.4			Test pit terminated at 2.60 m				
				3						
				4						

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP21

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 09/05/2022

1:30 Sheet 1 of 1

Logged by: DC | Position: E.651391m N.7689274m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 78 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			77.8			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		S to F	
						GC: CLAYEY GRAVELLY SAND: red/brown; sand, coarse to medium grained, sub-rounded; clay, low plasticity; gravel, fine grained, rounded to sub-angular.		St to VSt	
			77.3			GC: CLAYEY GRAVEL: red; gravel, coarse-grained, rounded to sub-angular; clay, low plasticity.		St to VSt	
			77.0	1		GC: CLAYEY GRAVELLY SAND: red/brown; sand, coarse to medium grained, sub-rounded; clay, low plasticity; gravel, fine grained, rounded to sub-angular.	D	St to VSt	
			76.0	2		SM-Cl: SILTY SANDY CLAY: mottled (yellow, red, white); clay, medium plasticity; sand, very fine grained, rounded.		St to VSt	
			75.0	3		Test pit terminated at 3.00 m			
				4					

Termination Reason: Reached required depth

Remarks: Backfilled to ground level.

TEST PIT LOG - TP22

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 09/05/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DC
Checked by:CH

Position: E.651026m N.7689277m
Elevation: 77 m (AHD)

Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			76.8			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.	D	S to F	
						GC: CLAYEY GRAVELLY SAND: red/brown; sand, coarse to medium grained, sub-rounded; clay, low plasticity; gravel, fine grained, rounded to sub-angular.		St to VSt	
			76.2	1		GC: SANDY GRAVELLY CLAY: red; clay, low to medium plasticity; sand, coarse, well rounded; gravel, coarse grained, rounded to sub-angular;		St to VSt	
			75.5			GC: CLAYEY GRAVEL: mottled (yellow, red, white); gravel, coarse grained, extremely weathered, sub-rounded to sub-angular; clay, low to medium plasticity. (weakly cemented)		St to VSt	
			75.0	2		CL: GRAVELLY CLAY: mottled (yellow, red, white); clay, medium plasticity; gravel, coarse grained, extremely weathered, sub-rounded to sub-angular. (moderately cemented)		St to VSt	
			74.4	3		Test pit terminated at 2.60 m			
				4					

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP23

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project ID: PER2021-0290
Date: 09/05/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DC Position: E.650631m N.7689270m Plant: 36 Tonne Excavator
Checked by: CH Elevation: 78 m (AHD) Contractor: Degrey Mining Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & other observations
			77.9			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		VS	1	
						SC: CLAYEY SAND: red/brown; sand, very-fine to medium grained, sub-rounded; clay, low plasticity.		L to VD	2, 5, 8, 10	0.30-0.40m: DCP refusal at 490mm, hammer bounce on every layer up to one metre.
			77.0	1		GC: CLAYEY SANDY GRAVEL: red/brown; gravel, coarse grained, sub-rounded to sub-angular; sand, coarse, sub-rounded; clay, low plasticity. (moderately cemented)	D	VD		
			76.2	2		CL: SANDY CLAY: red/brown; clay, medium plasticity; sand, coarse grained, angular.		VD		
			75.3			GC: CLAYEY GRAVEL: yellow/red/brown; gravel, coarse grained, angular; clay, low to medium plasticity.		VD		
			75.0	3		Test pit terminated at 3.00 m				
				4						

Termination Reason: Reached required depth

Remarks: Backfilled to ground level.

TEST PIT LOG - TP24

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 09/05/2022

1:30 Sheet 1 of 1

Logged by: DC | Position: E.652569m N.7689607m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 79 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			78.9			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		S to F	
						SC: CLAYEY SAND: red/brown; sand, very fine to coarse grained, sub-rounded to sub-angular; clay, low plasticity.		St to VSt	
				1				St to VSt	
			77.5			GC: GRAVELLY COBBLY CLAY: red/brown; clay, low to medium plasticity; gravel, coarse-grained, subrounded to sub-angular; cobbles >9cm, angular to sub-angular.	D		
				2				St to VSt	
			76.5			CL: GRAVELLY CLAY: mottled (yellow, red, white) clay, medium plasticity; gravel, coarse-grained, extremely weathered, sub-rounded to sub-angular; some very hard gravel clasts.		St to VSt	
			76.1			Test pit terminated at 2.90 m			
				3					
				4					

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP25

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 09/05/2022

CMW Geosciences

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Logged by: DC | Position: E.652143m N.7689599m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 79 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			78.9	0		TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity, very-fine to medium grained, rounded; trace organics.	D	S to F	
						SC: CLAYEY SAND: red/brown; sand, very-fine to coarse grained, sub-rounded to sub angular; clay, low plasticity.		St to VSt	
				1				St to VSt	
			77.2	2		CL: GRAVELLY CLAY: red/brown; clay, low to medium plasticity; gravel, coarse grained, rounded, sub-angular.		St to VSt	
			76.4			CL: SILTY CLAY: red/brown; clay, medium to high plasticity. (moderately cemented)		St to VSt	
			76.1	3		Test pit terminated at 2.90 m			
				4					

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP26

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 09/05/2022

1:30 Sheet 1 of 1

Logged by: DC | Position: E.651726m N.7689592m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 78 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			77.9			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		S to F	
						CL: SANDY CLAY: red/brown; clay, low to medium plasticity; sand, coarse-grained, angular.			
			77.2	1		SC: CLAYEY SAND: red/brown; sand, very-fine to coarse grained, subrounded; clay, low plasticity.	D	St to VSt	
			76.3	2		CL: GRAVELLY CLAY: mottled (yellow/red/white); gravel, coarse grained, extremely weathered, sub-rounded to sub-angular; some chalcedony rocks present that make up the gravel; clay, medium plasticity; trace sand, very fine grained, rounded.		St to VSt	
			75.0	3		Test pit terminated at 3.00 m			
				4					

Termination Reason: Reached required depth

Remarks: Backfilled to ground level.

TEST PIT LOG - TP27

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 09/05/2022

1:30 Sheet 1 of 1

Logged by: DC | Position: E.651321m N.7689596m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 80.3 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			80.2			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		S to F	
						SC: CLAYEY SAND: red/brown; sand, very-fine to coarse grained, subrounded; clay, low plasticity.		St to VSt	
			79.6	1		GC: SANDY GRAVELLY CLAY: red; clay, low to medium plasticity; sand, coarse, well rounded; gravel, coarse-grained, rounded to sub-angular.	D	St to VSt	
			78.7	2		CL: SANDY CLAY: red/brown; clay, medium plasticity; coarse grained, sub-rounded to sub-angular.		St to VSt	
			77.7	3		Test pit terminated at 2.60 m			
				4					

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP28

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 08/05/2022

CMW Geosciences

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Logged by: DC | Position: E.650936m N.7689588m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 73.2 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			73.1			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		S to F	
						SC: CLAYEY SAND: red/brown; sand, very-fine to medium grained, subrounded; clay, low plasticity.		St to VSt	
			72.6			GC: CLAYEY GRAVELLY SAND: red; sand, coarse, sub-rounded; clay low plasticity; gravel, fine grained, rounded to sub-angular.		St to VSt	
			72.1	1		GC: SANDY COBBLY CLAY: red/yellow; clay, low to medium plasticity; sand, coarse-grained, sub rounded; slightly weathered cobbles >9cm, angular to sub angular;	D	St to VSt	
			71.7			SM-Cl: SILTY SANDY CLAY: mottled (yellow, red, white) clay, medium to high plasticity; sand, very fine grained, rounded ; few cobbles, sub-rounded to sub-angular >9cm.		St to VSt	
			70.4	2		Test pit terminated at 2.80 m			
				3					
				4					

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP29

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project ID: PER2021-0290
Date: 08/05/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DC Position: E.650478m N.7689603m Plant: 36 Tonne Excavator
Checked by: CH Elevation: 77 m (AHD) Contractor: Degrey Mining Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & other observations
			76.9	0		TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.	D	S to F	1	0.40-0.50m: DCP refusal at 575mm, hammer bounce on every layer up to one metre.
						GC: CLAYEY GRAVELLY SAND: red; sand, coarse, sub-rounded; gravel, fine-grained, rounded to sub-angular; clay, low plasticity.		VS to VD	3, 4, 6, 8, 10	
			76.2	1		GC: CLAYEY GRAVEL: red/brown; gravel, coarse grained, rounded, sub-angular; clay, low plasticity.		VD		
			75.7			GC: CLAYEY GRAVELLY SAND: red; sand, coarse, well rounded; gravel, fine to coarse grained, rounded to sub-angular; clay, low plasticity; trace cobbles.		VD		
			75.1	2		CL: GRAVELLY CLAY: red/brown; mostly clay, medium plasticity; gravel, medium to coarse grained, rounded to angular.		H		
			74.5	3		Test pit terminated at 2.50 m				
				4						

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP30

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project ID: PER2021-0290
Date: 08/05/2022

CMW Geosciences

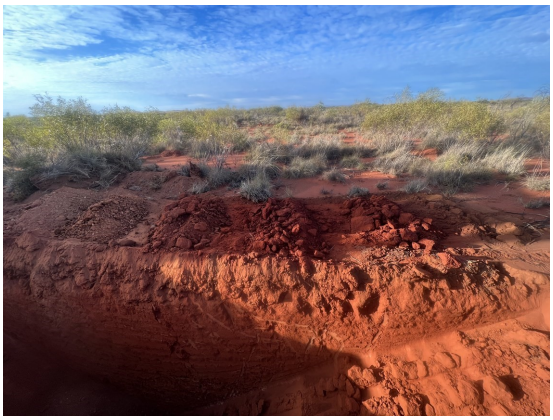
1:30 Sheet 1 of 1

Logged by: DC Position: E.652406m N.7689918m Plant: 36 Tonne Excavator
Checked by: CH Elevation: 79 m (AHD) Contractor: Degrey Mining Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & other observations
			78.7	0		TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.	D	St	5, 5, 6	0.20-0.30m: DCP refusal at 400mm, hammer bounce on every layer up to one metre.
			78.3			SC: CLAYEY SAND: red/brown; sand, coarse grained, subangular to subrounded; clay, low plasticity.		VD	10	
				1		GC: SANDY GRAVELLY CLAY: red/yellow; clay, low to medium plasticity; sand, coarse grained, subangular to subrounded; gravel; weathered, fine to medium grained, subangular to subrounded.		H		
				2				St to VSt		
			76.1	3		Test pit terminated at 2.90 m				
				4						

Termination Reason: Refusal

Remarks: Backfilled to ground level.



TEST PIT LOG - TP31

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 08/05/2022

1:30 Sheet 1 of 1

Logged by: DC | Position: E.652073m N.7689910m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 75.9 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			75.7			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.	D	S to F	
						SC: CLAYEY SAND: red/brown; sand, coarse grained, subangular to subrounded; clay, low plasticity.		St to VSt	
			75.2	1		GC: CLAYEY SANDY GRAVEL: red/brown; gravel, fine to coarse grained, subangular to subrounded; clay, low to medium plasticity; sand, coarse-grained, subangular to subrounded.		St to VSt	
			74.0	2		GC: SANDY GRAVELLY CLAY: mottled (white, yellow,red, brown); clay, low to medium plasticity; sand, fine to medium grained; gravel, medium to coarse grained, subrounded, angular to subangular.		St to VSt	
			73.1	3		Test pit terminated at 2.80 m			
				4					

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP32

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 08/05/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DC | Position: E.651844m N.7689912m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 75.9 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			75.7			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		S to F	
						SC: CLAYEY SAND: red/brown; sand, very-fine to medium grained, subrounded; clay, low plasticity.		St to VSt	
			75.2	1		GC: SANDY GRAVELLY CLAY: red; clay, low to medium plasticity ; sand, coarse, well rounded; gravel, coarse grained, rounded to sub-angular. (laterite)		St to VSt	
			74.7			CL: GRAVELLY CLAY: red, mostly clay, medium plasticity ; gravel, coarse grained, rounded to sub-angular;	D	St to VSt	
			74.0	2		CL: SANDY CLAY: red/brown; mostly clay, medium plasticity; sand, fine to medium grained, rounded to sub-angular.		St to VSt	
			73.2	3		Test pit terminated at 2.70 m			
				4					

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP33

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 08/05/2022

1:30 Sheet 1 of 1

Logged by: DC | Position: E.651532m N.7689915m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 78.7 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			78.5			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		S to F	
						SC: CLAYEY SAND: red/brown; sand, very-fine to medium grained, subrounded; clay, low plasticity.		St to VSt	
			78.0			GP: SANDY GRAVEL: red; sand, coarse, rounded to sub-angular; gravel, coarse grained rounded to sub-angular; trace fines.		St to VSt	
			77.7	1		CL: GRAVELLY CLAY: red/brown; clay, low to medium plasticity; gravel, fine grained, sub-rounded to sub-angular.	D	St to VSt	
	2.0 - 3.0	B	76.7	2		GC: SANDY COBBLY CLAY: red/yellow; clay, low to medium plasticity; sand, coarse grained, sub rounded; slightly weathered cobbles >9cm, angular to sub angular;		St to VSt	
			75.7	3		Test pit terminated at 3.00 m			
				4					

Termination Reason: Reached required depth

Remarks: Backfilled to ground level.

TEST PIT LOG - TP34

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 08/05/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DC
Checked by:CH

Position: E.651219m N.7689907m
Elevation: 73.8 m (AHD)

Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			73.6			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		S to F	
						SC: CLAYEY SAND: red/brown; sand, very-fine to medium grained, subrounded; clay, low plasticity.		St to VSt	
			73.1			GC: CLAYEY GRAVEL: red/brown; gravel, fine grained, sub-rounded, sub-angular; clay, medium plasticity.		St to VSt	
			72.7	1		GC: SANDY GRAVELLY CLAY: red/yellow/white; clay, low to medium plasticity; sand, coarse, sub-rounded; gravel, coarse grained, subrounded.	D	St to VSt	
			71.4	2		SM-Cl: SILTY SANDY CLAY: red/yellow/white; clay, medium plasticity; sand, coarse to medium grained, sub-rounded, angular; oxide rich. (moderately cemented)		St to VSt	
			70.8	3		Test pit terminated at 3.00 m			
				4					

Termination Reason: Reached required depth

Remarks: Backfilled to ground level.

TEST PIT LOG - TP35

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 08/05/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DC | Position: E.650907m N.7689921m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 66.3 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			66.1			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		S to F	
						GC: CLAYEY GRAVELLY SAND: red/brown; sand, very fine to coarse grained, subrounded; clay, low plasticity; gravel, coarse grained, sub-rounded to angular (lateritic).		St to VSt	
			65.6	1		GC: CLAYEY SANDY GRAVEL: red/brown; gravel, coarse grained, rounded, sub angular; clay, low to medium plasticity; sand, coarse grained, sub rounded.		St to VSt	
			64.9			CL: GRAVELLY CLAY: red/brown; clay, low to medium plasticity; gravel, coarse grained, rounded to subrounded; trace sand.	D	St to VSt	
			64.2	2		CL: SILTY CLAY: yellow/red/white; clay, medium plasticity. (moderately cemented)		St to VSt	
			63.4	3		Test pit terminated at 2.90 m			
				4					

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP36

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project ID: PER2021-0290
Date: 08/05/2022

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1:30 Sheet 1 of 1

Logged by: DC Position: E.650554m N.7689913m Plant: 36 Tonne Excavator
Checked by: CH Elevation: 71.7 m (AHD) Contractor: Degrey Mining Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & other observations
			71.6			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		VS	1	
						GC: CLAYEY GRAVELLY SAND: red/brown; sand, very fine to coarse grained, subrounded; clay, low plasticity; gravel, coarse grained, sub-rounded to angular (lateritic).		MD to VD	3, 4, 7, 6, 10	
			71.1			GC: CLAYEY SANDY GRAVEL: red/brown; gravel, coarse grained, rounded, sub angular; clay, low to medium plasticity; sand, coarse grained, sub rounded.		VD		
			70.4	1		CL: GRAVELLY CLAY: red/brown; clay, low to medium plasticity; gravel, coarse grained, rounded to subrounded; trace sand.	D	H		
			69.7	2		CL: SILTY CLAY: yellow/red/white; clay, medium to high plasticity.		H		
			68.7	3		Test pit terminated at 3.00 m				0.40-0.50m: DCP refusal at 600mm, hammer bounce on every layer up to one metre.
				4						

Termination Reason: Reached required depth

Remarks: Backfilled to ground level.

TEST PIT LOG - TP37

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project ID: PER2021-0290
Date: 07/05/2022

CMW Geosciences

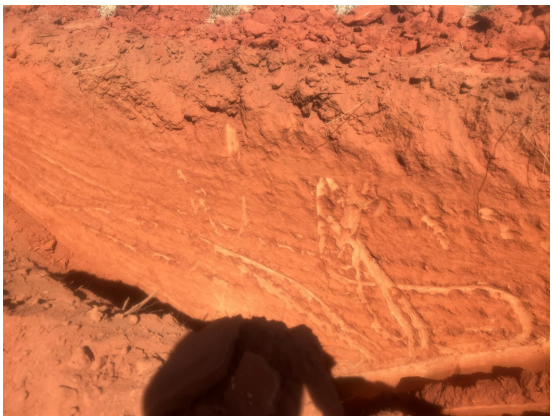
1:30 Sheet 1 of 1

Logged by: DC Position: E.652242m N.7690241m Plant: 36 Tonne Excavator
Checked by: CH Elevation: 81.6 m (AHD) Contractor: Degrey Mining Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & other observations
			81.4	0		TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		St to VSt	3, 5	0.20-0.30m: DCP refusal at 400mm, hammer bounce on every layer up to one metre.
			80.9			SC: CLAYEY SAND: red/brown; sand, coarse to medium grained; clay, low plasticity; trace gravel, fine to medium grained, subangular to subrounded.		D to VD	7, 10	
				1		GC: CLAYEY SANDY GRAVEL: red/brown; coarse to medium grained; gravel; medium to coarse grained, subangular to subrounded.		VD		
			80.4			SC: CLAYEY SAND: red/brown; sand, medium to coarse grained; clay, low to medium plasticity; some gravel, fine to medium grained, subangular to subrounded.	D	VD		
			79.0	2		Test pit terminated at 2.60 m				
				3						
				4						

Termination Reason: Refusal

Remarks: Backfilled to ground level.



TEST PIT LOG - TP38

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 07/05/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DC | Position: E.651701m N.7690234m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 78 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			77.8			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		S to F	
						SC: CLAYEY SAND: red/brown; sand, fine to medium-grained; clay, low plasticity; trace gravel, fine to medium-grained subangular to subrounded.		St to VSt	
			77.3	1		GC: CLAYEY SANDY GRAVEL: red/brown; gravel, medium to coarse grained, rounded; clay, low plasticity; sand, coarse grained, sub-rounded.	D	St to VSt	
			76.5			SC: CLAYEY SAND: red/brown; sand, coarse grained, subangular to subrounded; clay, low to medium plasticity.		St to VSt	
	2.0 - 2.8	B	76.0	2		GC: CLAYEY SANDY GRAVEL: red/yellow; gravel, medium to coarse grained, subangular to subrounded; clay, low to medium plasticity; sand, coarse grained, subangular to subrounded. (moderately cemented)		St to VSt	
			75.2	3		Test pit terminated at 2.80 m			
				4					

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP39

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 07/05/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DC
Checked by:CH

Position: E.651191m N.7690239m
Elevation: 75.2 m (AHD)

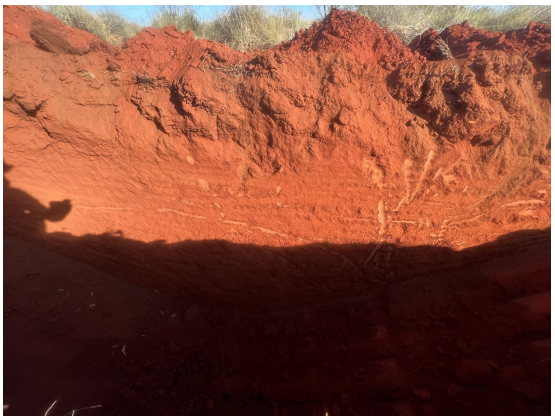
Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			75.0	0		TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		S to F	
						SC: CLAYEY SAND: red/brown; sand, coarse grained, subangular to subrounded; clay, low plasticity.		St to VSt	
			74.1	1		GC: SANDY GRAVELLY CLAY: red/yellow; clay, low to medium plasticity; sand, coarse grained, subangular to subrounded; gravel; fine to medium grained, subangular to subrounded. (moderately cemented)	D	St to VSt	
			72.5	2		Test pit terminated at 2.70 m			
				3					
				4					

Termination Reason: Refusal

Remarks: Backfilled to ground level.



TEST PIT LOG - TP40

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project ID: PER2021-0290
Date: 07/05/2022

CMW Geosciences

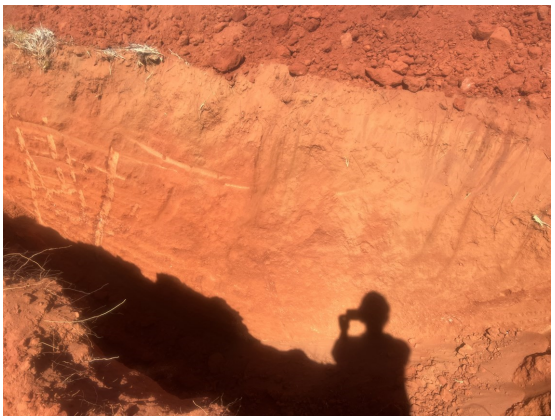
1:30 Sheet 1 of 1

Logged by: DC Position: E.650723m N.7690243m Plant: 36 Tonne Excavator
Checked by: CH Elevation: 83.5 m (AHD) Contractor: Degrey Mining Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & other observations
			83.3	0		TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.	D	St	3, 3	0.30-0.40m: DCP refusal at 450mm, hammer bounce on every layer up to one metre.
						SC: CLAYEY SAND: red/brown; sand, fine to medium grained; clay, low plasticity; trace gravel, fine to medium grained; subangular to subrounded.		D to VD	6, 9, 10	
			82.8	1		GC: CLAYEY SANDY GRAVEL: red/brown; low plasticity; sand, medium to coarse grained; gravel, fine to coarse grained, subangular to subrounded; some clay.				
				2				VD		
								St to VSt		
			80.7	3		Test pit terminated at 2.80 m				
				4						

Termination Reason: Refusal

Remarks: Backfilled to ground level.



TEST PIT LOG - TP41

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project ID: PER2021-0290
Date: 07/05/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DC Position: E.651205m N.7690560m Plant: 36 Tonne Excavator
Checked by: CH Elevation: 72.7 m (AHD) Contractor: Degrey Mining Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & other observations
			72.5	0		TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.	M to D	MD to D	3, 4	0.30-0.40m: DCP refusal at 500mm, hammer bounce on every layer up to one metre.
						SC: CLAYEY SAND: red/brown; sand, fine to medium grained; clay, low plasticity; some gravel; fine to medium grained, subangular to subrounded.		D to VD	5, 8, 10	
			71.6	1		GC: CLAYEY SANDY GRAVEL: brown to red brown; gravel, fine to coarse grained, subangular to subrounded; clay, low to medium plasticity; sand, medium to coarse grained.		VD		
	2.0 - 2.8	B	70.6	2		GC: SANDY GRAVELLY CLAY: white/yellow/brown; clay, low to medium plasticity, moist; sand, fine to medium grained; gravel, medium to coarse grained, angular to subangular.		H		
			69.9	3		Test pit terminated at 2.80 m				
				4						

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP42

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 10/05/2022

1:30 Sheet 1 of 1

Logged by: DC | Position: E.652300m N.7688557m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 80 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			79.9			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		S to F	
						SC: CLAYEY SAND: red/brown; sand, coarse to medium grained, sub-rounded; clay, low to medium plasticity; traces gravel, fine grained, rounded to sub-angular. (moderately cemented)		St to VSt	
			79.3	1		GC: CLAYEY SANDY GRAVEL: red/brown; gravel, medium grained, angular to sub-angular; clay, low to medium plasticity; sand, coarse to medium grained, sub-rounded.		St to VSt	
			78.8	2		GC: CLAYEY GRAVELLY SAND: red/brown; sand, coarse to medium grained, sub-rounded; clay, low to medium plasticity; gravel, medium grained, rounded to subrounded. (moderately cemented)	D	St to VSt	
			77.8			CL: GRAVELLY CLAY: red/yellow; clay, low to medium plasticity; gravel, coarse, sub-rounded to angular. (moderately cemented)		St to VSt	
			77.2	3		Test pit terminated at 2.80 m			
				4					

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP43

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 10/05/2022

1:30 Sheet 1 of 1

Logged by: DC | Position: E.651915m N.7688561m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 78 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			77.9	0		TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		S to F	
						SC: CLAYEY SAND: red/brown; sand, coarse to medium grained, sub-rounded; clay low to medium plasticity; traces gravel, fine grained, rounded to sub-angular.		St to VSt	
			76.9	1		GC: CLAYEY GRAVELLY SAND: red/brown; sand, coarse to medium grained, sub-rounded; clay, low to medium plasticity; gravel, medium grained, rounded to subrounded. (moderately cemented)	D	St to VSt	
			76.2	2		CL: SILTY CLAY: yellow/red/white, medium plasticity.		St to VSt	
			75.5	3		Test pit terminated at 2.50 m			
				4					

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP44

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project ID: PER2021-0290
Date: 10/05/2022

1:30 Sheet 1 of 1

Logged by: DC Position: E.651499m N.7688565m Plant: 36 Tonne Excavator
Checked by: CH Elevation: 79 m (AHD) Contractor: Degrey Mining Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & other observations
			78.9	0		TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.		VS	1	0.10-0.20m: DCP refusal at 250mm, hammer bounce on every layer up to one metre.
						SC: CLAYEY SAND: red/brown; sand, coarse to medium grained, sub-rounded; clay low to medium plasticity; traces gravel, fine grained, rounded to sub-angular.		D to VD	7	
				1					10	
			77.6			GC: CLAYEY GRAVELLY SAND: red/brown; gravel, medium grained, rounded to subrounded; clay, low plasticity; sand, coarse to medium grained, sub-rounded.	D	H		
			77.0	2		CL: GRAVELLY CLAY: red/brown; clay medium plasticity; gravel, slightly weathered to extremely weathered, coarse-grained, angular to sub-angular, some chalcedony present as part of the gravel. (moderately cemented)		H		
			76.2			Test pit terminated at 2.80 m				
				3						
				4						

Dynamic Cone Penetrometer (Blows/100mm): 5 10 15

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP45

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 10/05/2022

CMW Geosciences

1:30 Sheet 1 of 1

Logged by: DC
Checked by:CH

Position: E.652664m N.7688554m
Elevation: 80 m (AHD)

Plant: 36 Tonne Excavator
Contractor: Degrey Mining

Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components)	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			79.8	0		TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.	D	VS to H	
						SC: CLAYEY SAND: red/brown; sand, coarse to medium grained, sub-rounded; clay, low to medium plasticity; traces gravel, fine grained, rounded to sub-angular. (moderately cemented)		D to VD	
			79.1	1		GC: CLAYEY SANDY GRAVEL: red/brown; sand, coarse to medium grained, sub-rounded; gravel, medium to coarse grained, sub-rounded to sub-angular; clay, low to medium plasticity.		D to VD	
			78.4	2		GC: GRAVELLY COBBLY CLAY: yellow/red/white; clay, medium plasticity; gravel, coarse, sub-rounded; cobbles >9cm, sub-rounded.		H	
			77.3	3		Test pit terminated at 2.70 m			
				4					

Termination Reason: Refusal

Remarks: Backfilled to ground level.

TEST PIT LOG - TP46

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project: PER2021-0290
Date: 07/05/2022

CMW Geosciences

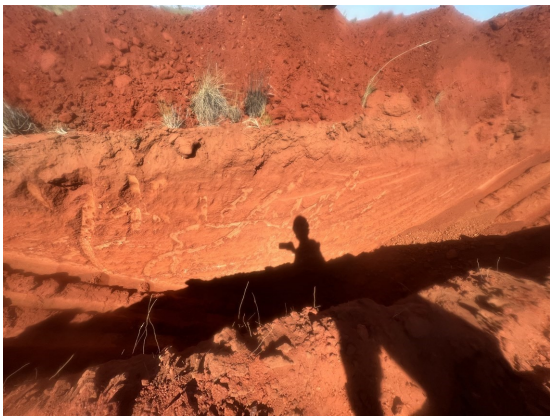
1:30 Sheet 1 of 1

Logged by: DC | Position: E.651839m N.7690565m | Plant: 36 Tonne Excavator
Checked by:CH | Elevation: 77 m (AHD) | Contractor: Degrey Mining | Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Structure & other observations
			76.8	0		TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.	M to D	VS	
			76.3			SC: CLAYEY SAND: red/brown; sand, fine to medium-grained; some gravel; clay, low plasticity; fine to medium-grained, subangular to subrounded.		D to VD	
				1		GC: CLAYEY SANDY GRAVEL: brown/red; gravel, fine to coarse grained, subangular to subrounded; clay, low to medium plasticity; sand, medium to coarse grained.		VD	
			75.3	2		GC: SANDY GRAVELLY CLAY: white to yellow/brown; clay, low to medium plasticity; sand, fine to medium grained; gravel, medium to coarse grained, angular to subangular.		VSt	
			74.2	3		Test pit terminated at 2.80 m			
				4					

Termination Reason: Refusal

Remarks: Backfilled to ground level.



TEST PIT LOG - TP47

Client: Degrey Mining
Project: TSF Design Mallina Project
Location: Port Hedland
Project ID: PER2021-0290
Date: 10/05/2022

1:30 Sheet 1 of 1

Logged by: DC Position: E.653007m N.7688562m Plant: 36 Tonne Excavator
Checked by: CH Elevation: 81 m (AHD) Contractor: Degrey Mining Dimensions : 0.80m x 2.50m

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & other observations
			80.8			TopSoil: SANDY SILTY CLAY: brown/red; clay, low plasticity; sand, very-fine to medium grained, rounded; trace organics.	D	VS	1, 5	0.20-0.30m: DCP refusal at 350mm, hammer bounce on every layer up to one metre.
			80.6			SC: CLAYEY SAND: red/brown; sand, coarse to medium grained, sub-rounded; clay, low to medium plasticity; traces gravel, fine grained, rounded to sub-angular. (moderately cemented)		L to VD	6, 10	
				1		GC: CLAYEY SANDY GRAVEL: red/brown; sand, coarse to medium grained, sub-rounded; gravel, medium to coarse grained, sub-rounded to sub-angular; clay, low to medium plasticity.		VD		
			79.0	2		SM-Cl: SILTY SANDY CLAY: yellow/red/white; clay, medium plasticity; sand, very fine grained, rounded.		VSt		
			78.5			Test pit terminated at 2.50 m				
				3						
				4						

Termination Reason: Refusal

Remarks: Backfilled to ground level.

Appendix B
Laboratory Test Reports

WESTERN GEOTECHNICAL & Laboratory Services

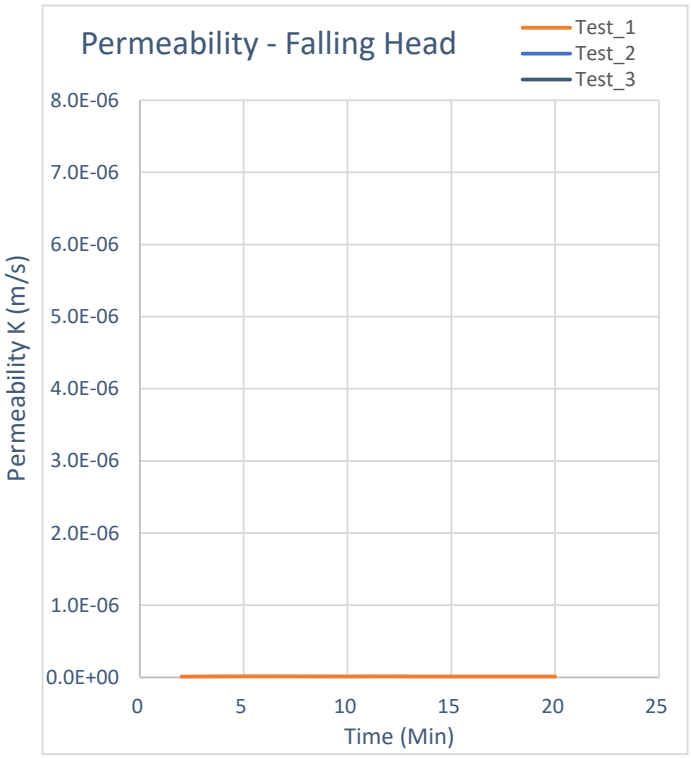
SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT AS 1289.6.7.2

Client:	CMW Geosciences	*Ticket No.*	S6590
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.9503_1_FHPERM
Project:	Mallina Project	*Sample No.*	WG22.9503
Location:	Pilbara, WA	*Date Sampled:*	Not Specified
Sample Identification	TP038 2.0-2.8m	*Date Tested:*	16/06 - 21/06/22

TEST RESULTS - FALLING HEAD PERMEABILITY

Sampling Method: Sampled by Client, Tested as Received



Compaction Details	
Compaction Method	AS1289.5.1.1
Hammer Type	Standard
% Retained of 19.0mm	4.5
Maximum Dry Density (t/m^3)	1.991
Optimum Moisture (%)	10.7
Target Dry Density Ratio	95
Target Moisture Ratio	100

Specimen Conditions at Compaction	
Laboratory Density Ratio (%)	95.0
Laboratory Moisture Ratio (%)	99.9
Surcharge (kPa)	3

Coefficient of Permeability K_{20} (m/s) **1.40E-08**

Comments:

Approved Signatory:

Name: Cody O'Neill

Date: 23/June/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	CMW Geosciences	*Ticket No.*	S6590
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.9503_1_PI
Project:	Mallina Project	*Sample No.*	WG22.9503
Location:	Pilbara, WA	*Date Sampled:*	Not Specified
Sample Identification:	TP038 2.0-2.8m	*Date Tested:*	17/06/2022

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**34**
AS 1289.3.2.1	**Plastic Limit (%)**	**16**
AS 1289.3.3.1	**Plasticity Index (%)**	**18**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**9.0**
AS 1289.3.4.1	**Length of Mould (mm)**	**250**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**Curled**

Comments:

Approved Signatory:

Name: Natasha Bielawski

Date: 20/June/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599

Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

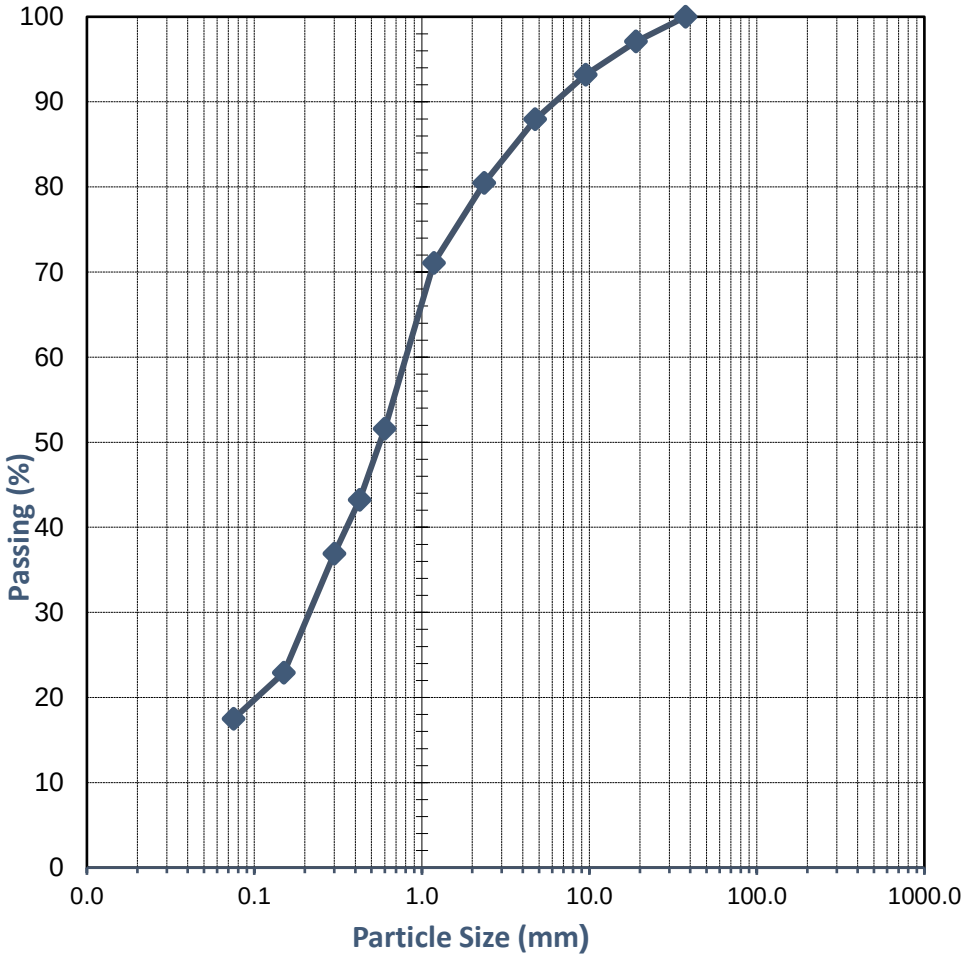
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S6590
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.9503_1_PSD
Project:	Mallina Project	*Sample No.*	WG22.9503
Location:	Pilbara, WA	*Date Sampled:*	Not Specified
Sample Identification:	TP038 2.0-2.8m	*Date Tested:*	16/06 - 17/06/22

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	100
19.0	97
9.5	93
4.75	88
2.36	80
1.18	71
0.600	52
0.425	43
0.300	37
0.150	23
0.075	17



Comments:

Approved Signatory:

Name: Brooke Elliott

Date: 17-June-2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.1.1

Client:	CMW Geosciences	*Ticket No.*	S6590
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.9503_1_SMDD
Project:	Mallina Project	*Sample No.*	WG22.9503
Location:	Pilbara, WA	*Date Sampled:*	Not Specified
Sample Identification:	TP038 2.0-2.8m	*Date Tested:*	16-06-2022

TEST RESULTS - Standard Maximum Dry Density

Sampling Method: Sampled by Client, Tested as Received

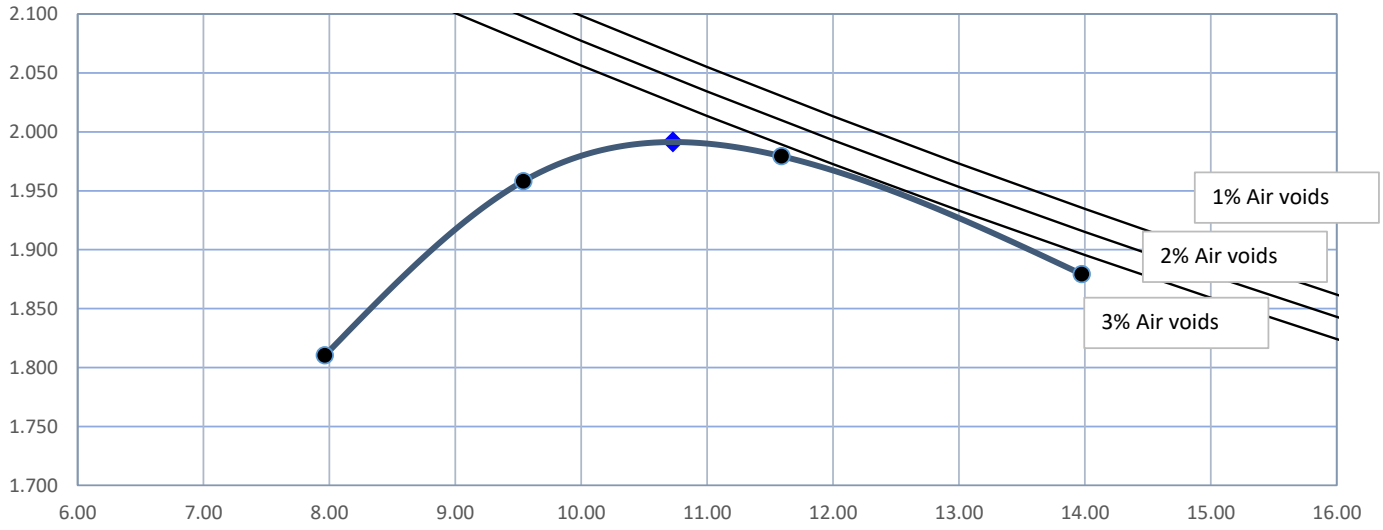
Sample Curing Time: 2 hrs

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 4 **Material + 37.5mm (%)** -

Moisture Content (%)	**8.0**	**9.5**	**11.6**	**14.0**	
Dry Density (t/m³)	**1.810**	**1.958**	**1.979**	**1.879**	

Dry Density (t/m³)



Standard Maximum Dry Density (t/m³) **1.99**

Optimum Moisture Content (%) **10.5**

Comments: *The above air void lines are derived from a calculated apparent particle density of 2.69 t/m³*

Approved Signatory:

Name: Brooke Elliott

Date: 17-June-2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599

Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

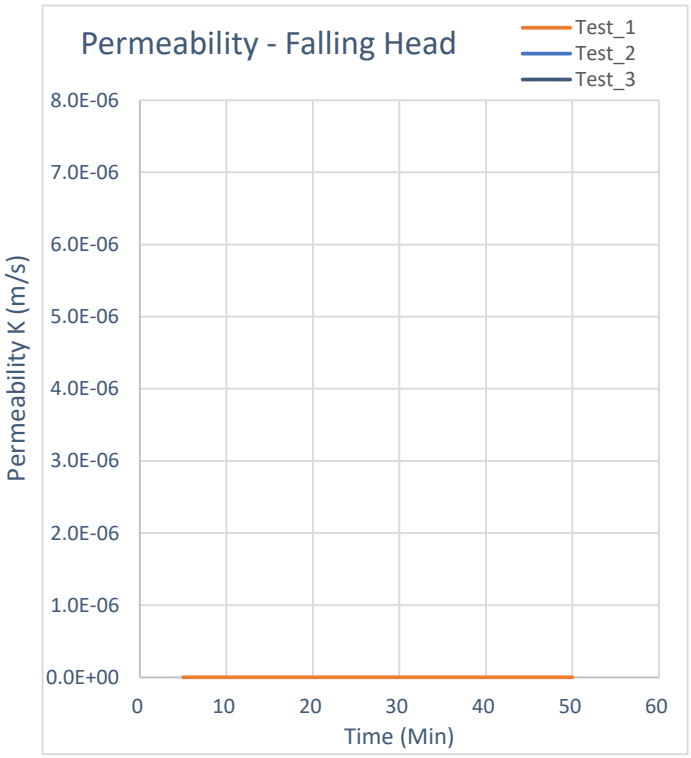
SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT AS 1289.6.7.2

Client:	CMW Geosciences	*Ticket No.*	S6590
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.9505_1_FHPERM
Project:	Mallina Project	*Sample No.*	WG22.9505
Location:	Pilbara, WA	*Date Sampled:*	Not Specified
Sample Identification	TP033 2.0-3m	*Date Tested:*	17/06 - 21/06/22

TEST RESULTS - FALLING HEAD PERMEABILITY

Sampling Method: Sampled by Client, Tested as Received



Compaction Details	
Compaction Method	AS1289.5.1.1
Hammer Type	Standard
% Retained of 19.0mm	0
Maximum Dry Density (t/m^3)	2.044
Optimum Moisture (%)	10.2
Target Dry Density Ratio	95
Target Moisture Ratio	100

Specimen Conditions at Compaction	
Laboratory Density Ratio (%)	95.0
Laboratory Moisture Ratio (%)	100.1
Surcharge (kPa)	3

Coefficient of Permeability K_{20} (m/s) **2.47E-09**

Comments:

Approved Signatory:

Name: Cody O'Neill

Date: 23/June/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	CMW Geosciences	*Ticket No.*	S6590
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.9505_1_PI
Project:	Mallina Project	*Sample No.*	WG22.9505
Location:	Pilbara, WA	*Date Sampled:*	Not Specified
Sample Identification:	TP033 2.0-3m	*Date Tested:*	17/06/2022

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**40**
AS 1289.3.2.1	**Plastic Limit (%)**	**13**
AS 1289.3.3.1	**Plasticity Index (%)**	**27**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**9.5**
AS 1289.3.4.1	**Length of Mould (mm)**	**125**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**Curled**

Comments:

Approved Signatory:

Name: Natasha Bielawski

Date: 20/June/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599

Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

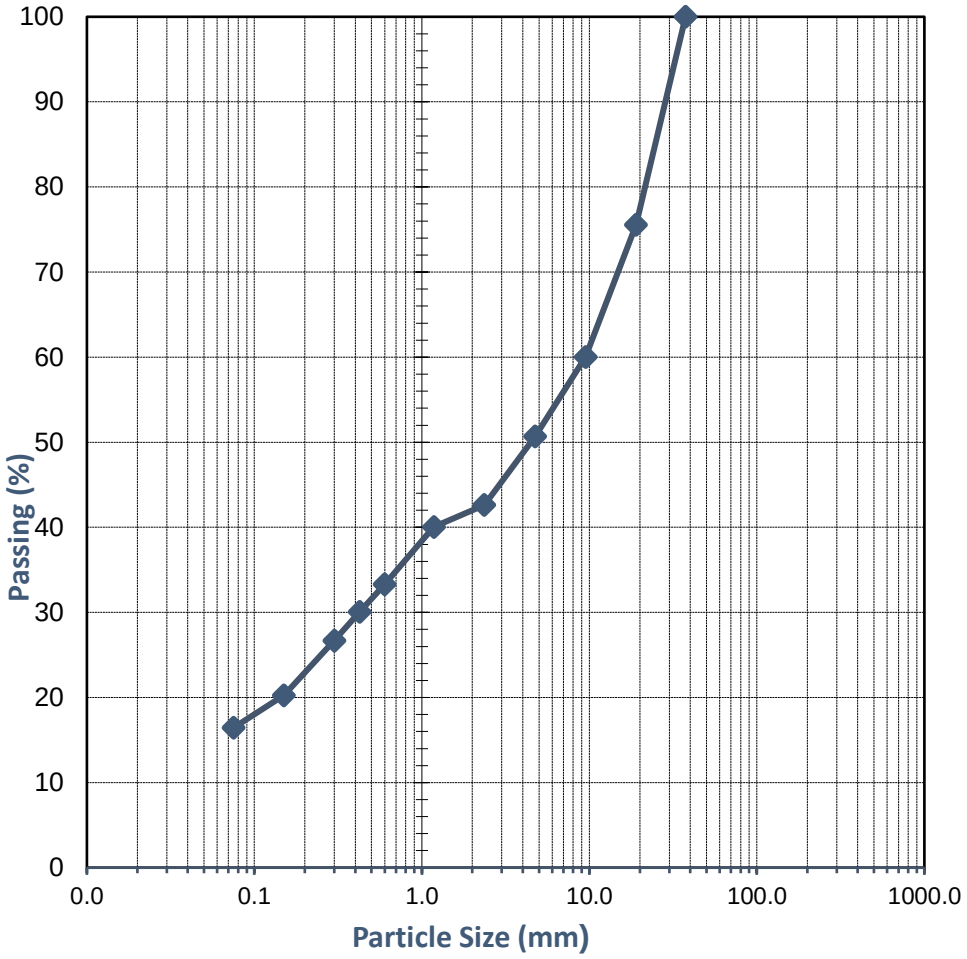
TEST REPORT - AS 1289.3.6.1, *AS 1289.1.1

Client:	CMW Geosciences	*Ticket No.*	S6590
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.9505_1_PSD
Project:	Mallina Project	*Sample No.*	WG22.9505
Location:	Pilbara, WA	*Date Sampled:*	Not Specified
Sample Identification:	TP033 2.0-3m	*Date Tested:*	16/06 - 17/06/22

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	100
19.0	76
9.5	60
4.75	51
2.36	43
1.18	40
0.600	33
0.425	30
0.300	27
0.150	20
0.075	16



*Comments: *Deviation from test method, insufficient material as per test method requirements. NATA accreditation does not cover the performance of this service.*

Approved Signatory:

Name: Brooke Elliott

Date: 17-June-2022

Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.5.1.1

Client:	CMW Geosciences	*Ticket No.*	S6590
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.9505_1_SMDD
Project:	Mallina Project	*Sample No.*	WG22.9505
Location:	Pilbara, WA	*Date Sampled:*	Not Specified
Sample Identification:	TP033 2.0-3m	*Date Tested:*	17-06-2022

TEST RESULTS - Standard Maximum Dry Density

Sampling Method: Sampled by Client, Tested as Received

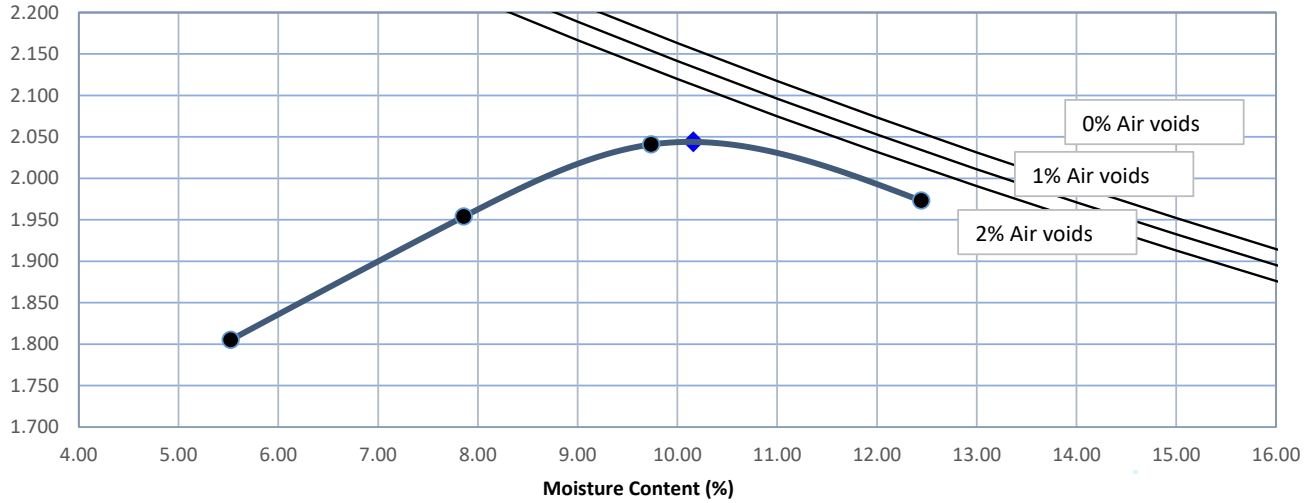
Sample Curing Time: 2

Method used to Determine Liquid Limit: Visual / Tactile Assessment by Competent Technician

Material + 19.0mm (%): 0 **Material + 37.5mm (%)** -

Moisture Content (%)	**5.5**	**7.9**	**9.7**	**12.4**	
Dry Density (t/m³)	**1.805**	**1.954**	**2.041**	**1.973**	

Dry Density (t/m³)



Standard Maximum Dry Density (t/m³) **2.04**

Optimum Moisture Content (%) **10.0**

Comments: ***The above air void lines are derived from a calculated apparent particle density of 2.76 t/m³***

Approved Signatory: JWaldron

Name: Jason Waldron

Date: 20-June-2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	CMW Geosciences	*Ticket No.*	S6590
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.9506_1_PI
Project:	Mallina Project	*Sample No.*	WG22.9506
Location:	Pilbara, WA	*Date Sampled:*	Not Specified
Sample Identification:	TP041 2.0-2.8m	*Date Tested:*	17/06/2022

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**38**
AS 1289.3.2.1	**Plastic Limit (%)**	**15**
AS 1289.3.3.1	**Plasticity Index (%)**	**23**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**10.0**
AS 1289.3.4.1	**Length of Mould (mm)**	**250**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**Curled**

Comments:

Approved Signatory: Coneill

Name: Cody O'Neill

Date: 20/June/2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599

Accredited for compliance with ISO/IEC 17025 - Testing

WESTERN GEOTECHNICAL & Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

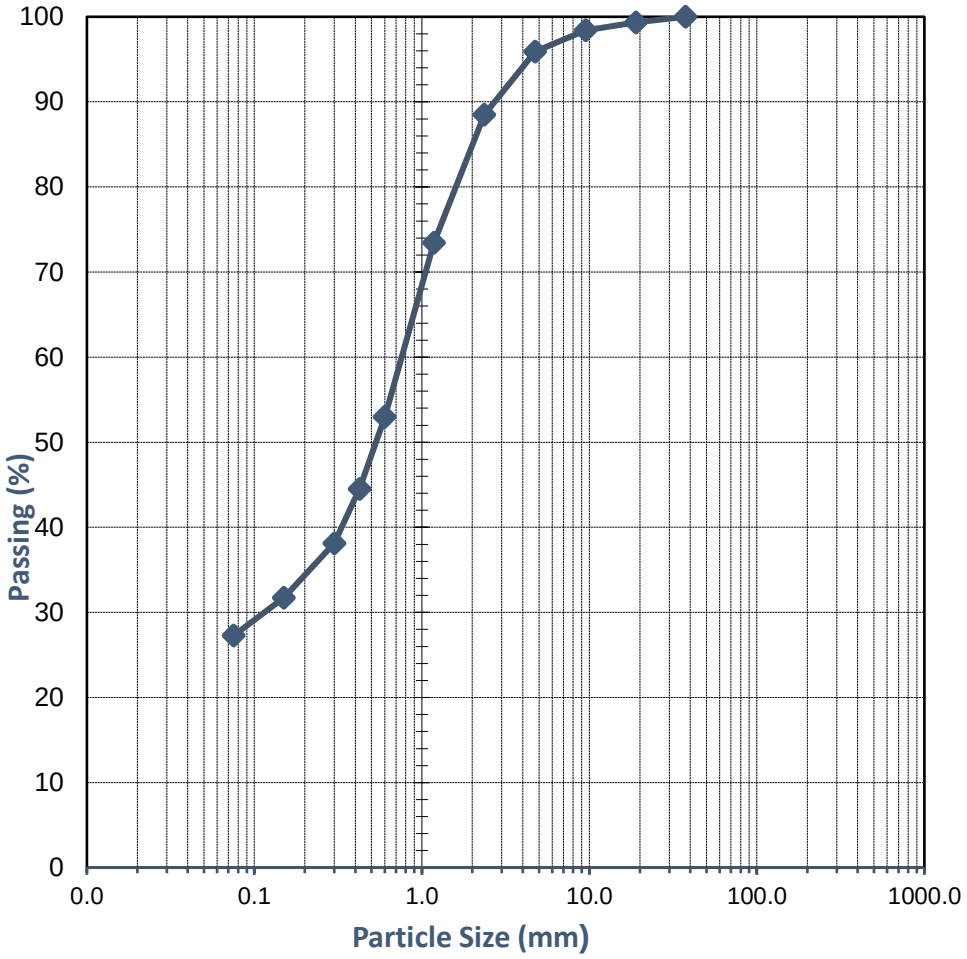
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S6590
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG22.9506_1_PSD
Project:	Mallina Project	*Sample No.*	WG22.9506
Location:	Pilbara, WA	*Date Sampled:*	Not Specified
Sample Identification:	TP041 2.0-2.8m	*Date Tested:*	16/06 - 17/06/22

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: Sampled by Client, Tested as Received

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	100
19.0	99
9.5	98
4.75	96
2.36	88
1.18	73
0.600	53
0.425	45
0.300	38
0.150	32
0.075	27



Comments:

Approved Signatory:

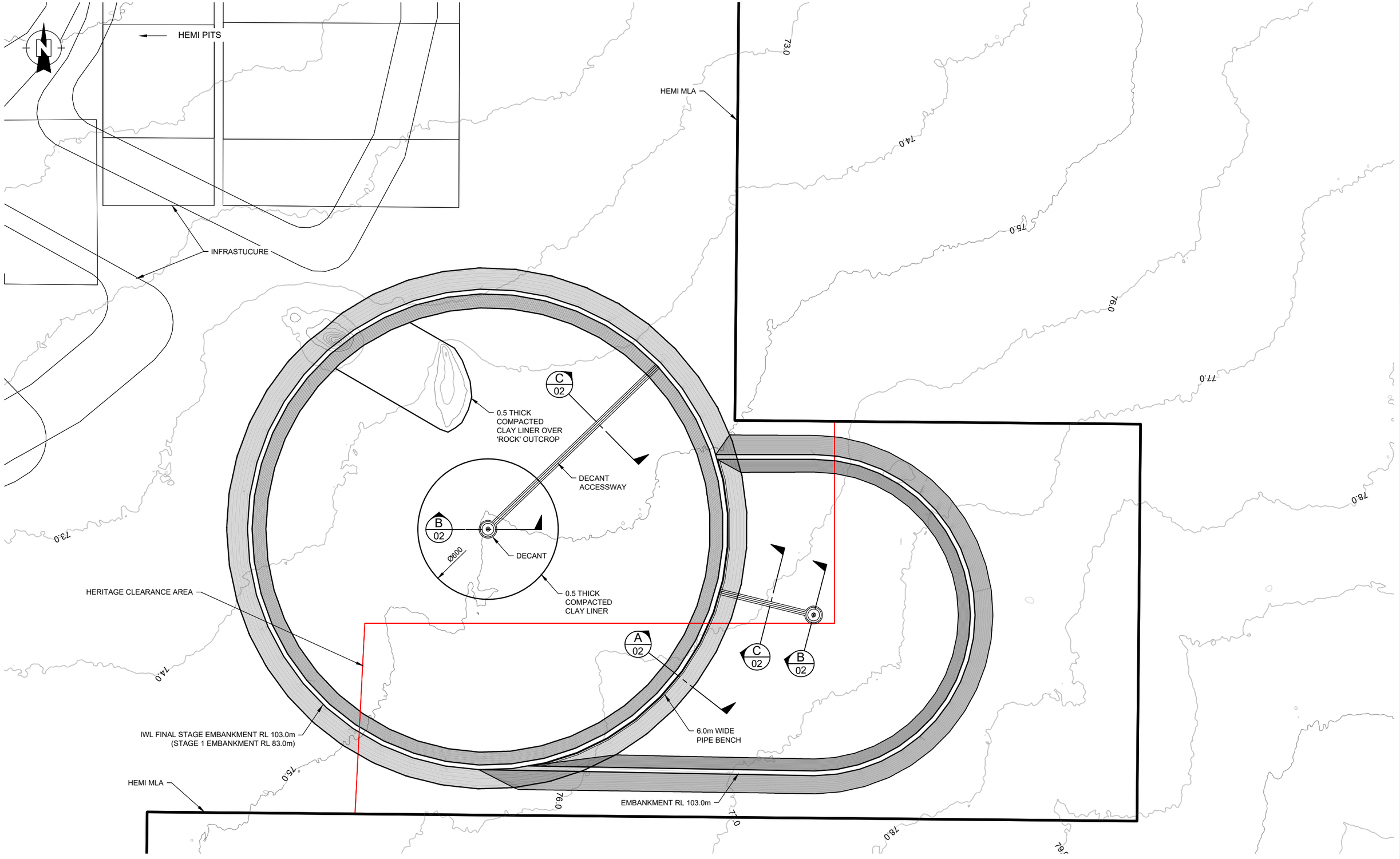
Name: Brooke Elliott

Date: 17-June-2022

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

Appendix C – Drawings

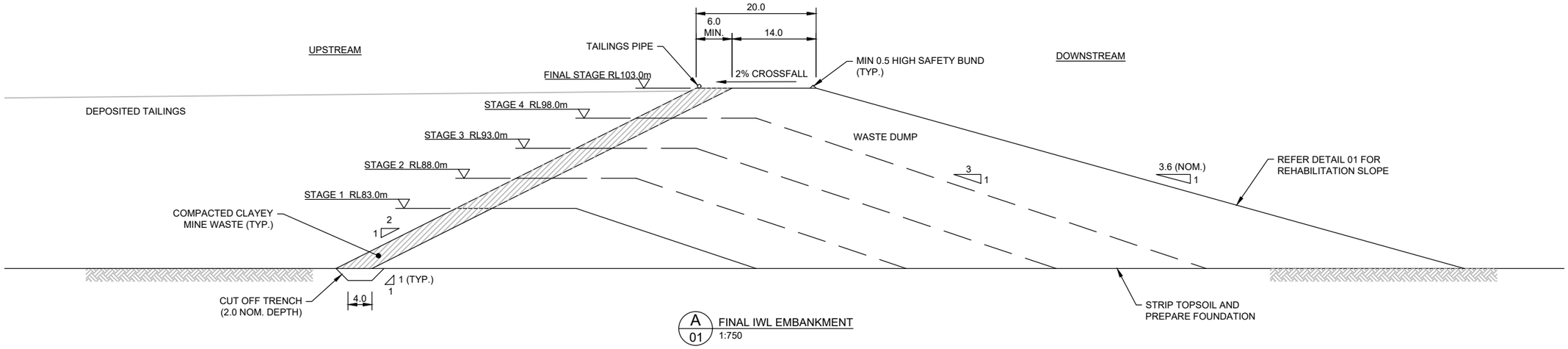


NOTES:

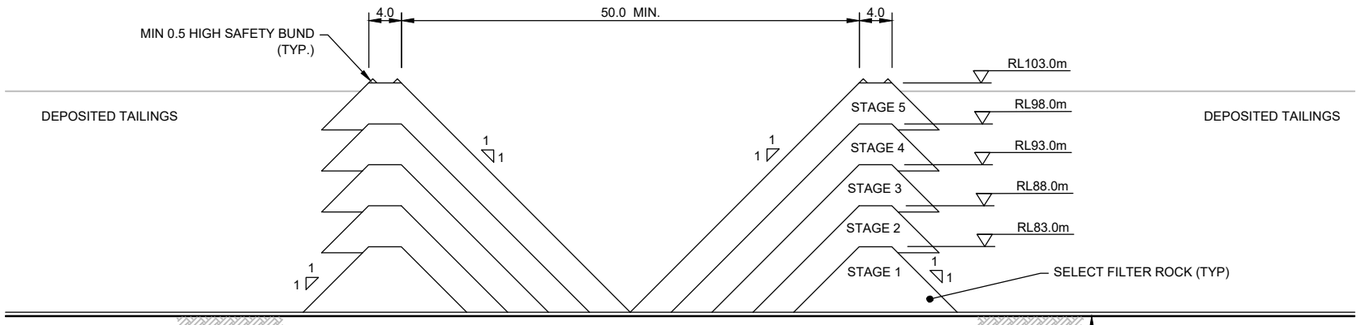
1. AERIAL FROM BING MAPS
2. ALL DIMENSIONS IN METRES UNO

CMW Geosciences

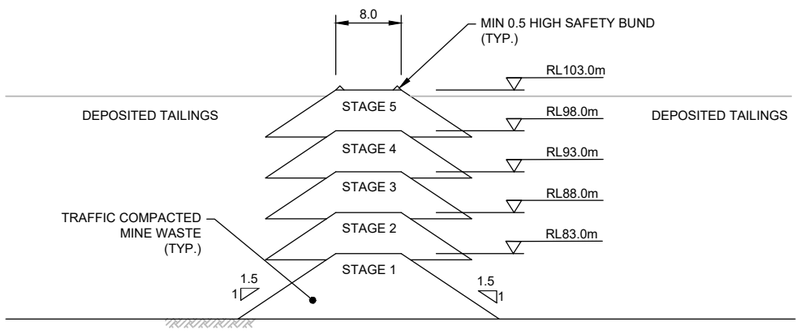
CLIENT: DE GREY MINING LIMITED		DRAWN: DE	PROJECT: PER2021-0290
PROJECT: TSF SCOPING STUDY HEMI DEPOSIT, WA		CHECKED: CH	DRAWING: 01
		REVISION: A	SCALE: 1:15,000
TITLE: IWL - PLAN		DATE: 11.03.22	SHEET: A3 L



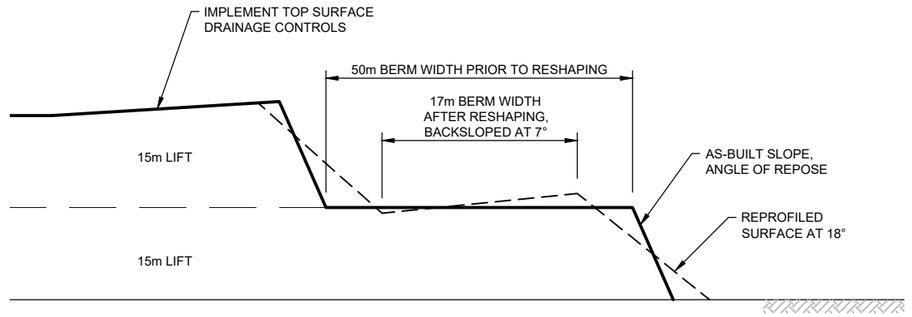
A 01 FINAL IWL EMBANKMENT
1:750



B 01 DECANT ROCK RING
1:750



C 01 DECANT ACCESSWAY
1:750



1 - PROPOSED REHABILITATION BATTER GEOMETRY
NTS

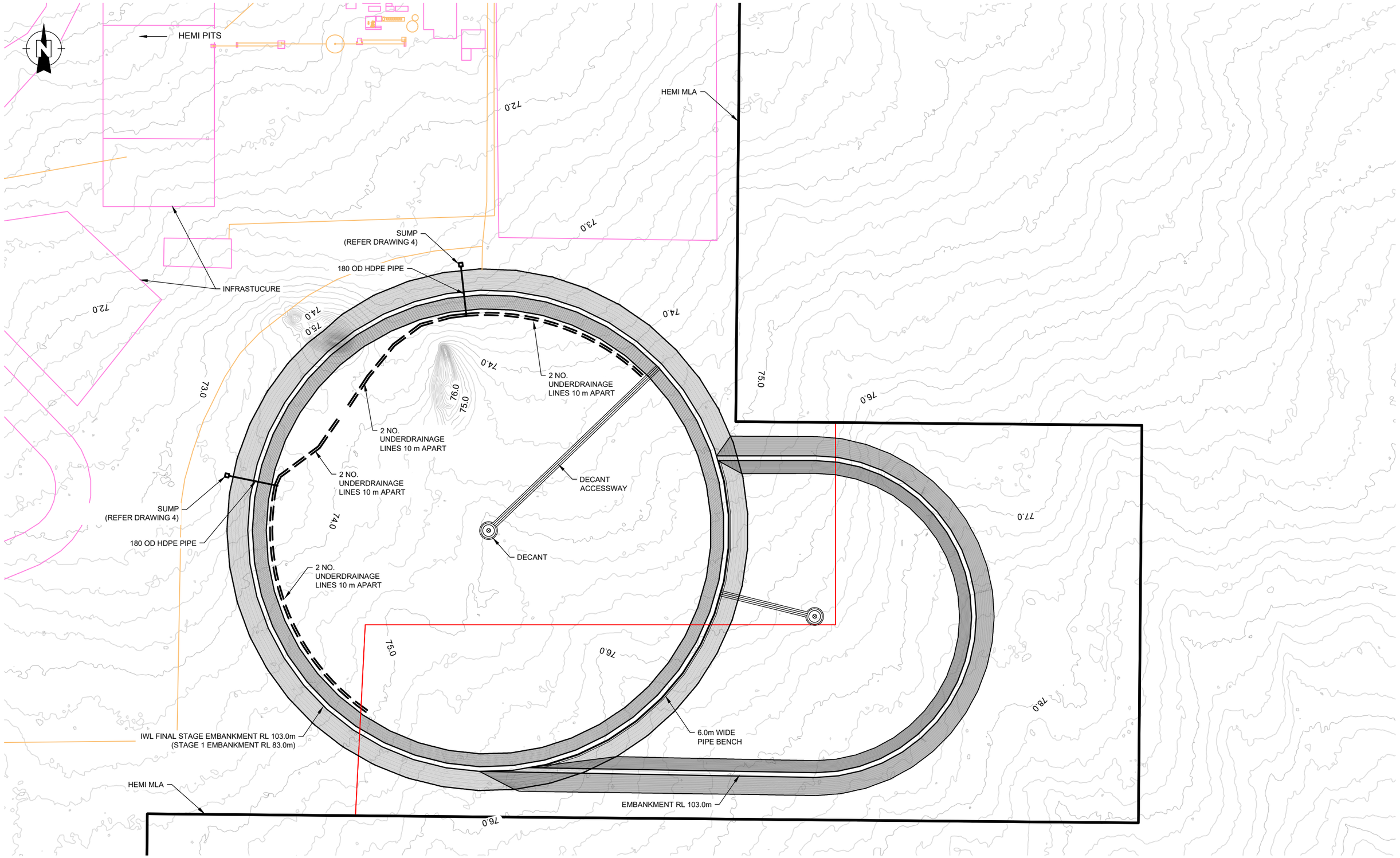
NOTES:

1. ALL DIMENSION IN METRES UNLESS SPECIFIED.

1:750 0 7.5 15 22.5 30 37.5 m

CMW Geosciences

CLIENT: DE GREY MINING LIMITED		DRAWN: DE	PROJECT: PER2021-0290
PROJECT: TSF SCOPING STUDY HEMI DEPOSIT, WA		CHECKED: CH	DRAWING: 02
		REVISION: A	SCALE: 1:750
TITLE: SECTIONS & DETAILS		DATE: 11.03.22	SHEET: A3 L



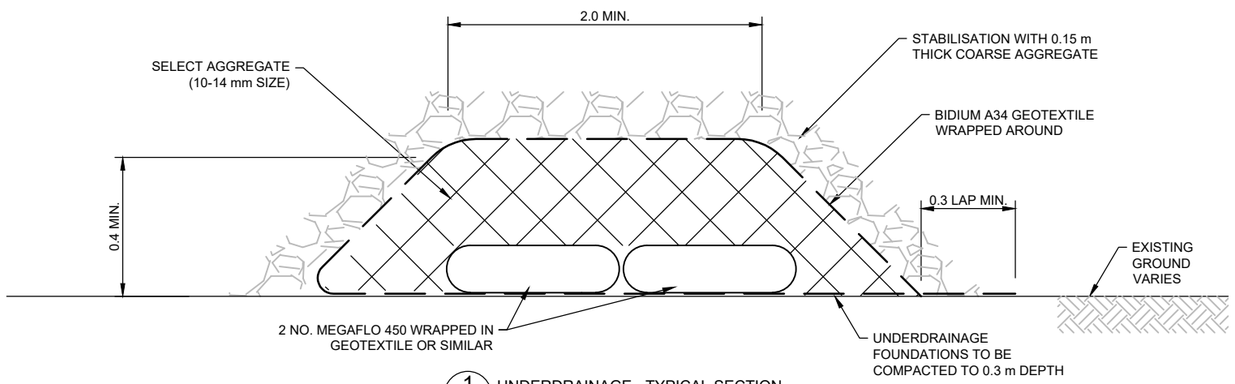
NOTES:

1. AERIAL FROM BING MAPS

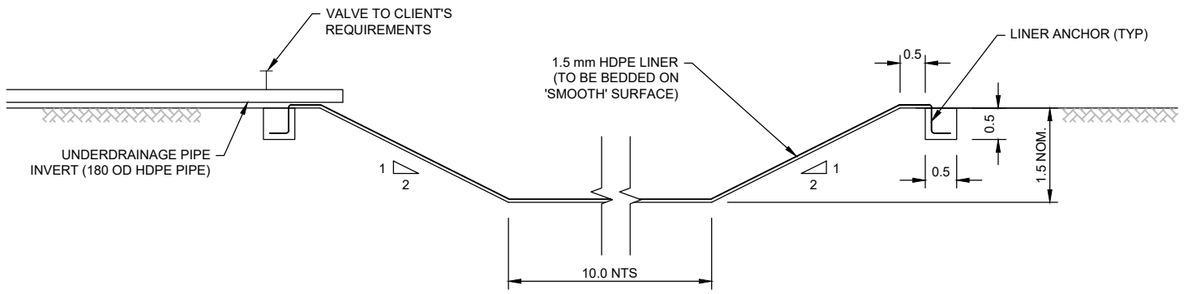
1:15000 0 150 300 450 600 750 m

CMW Geosciences

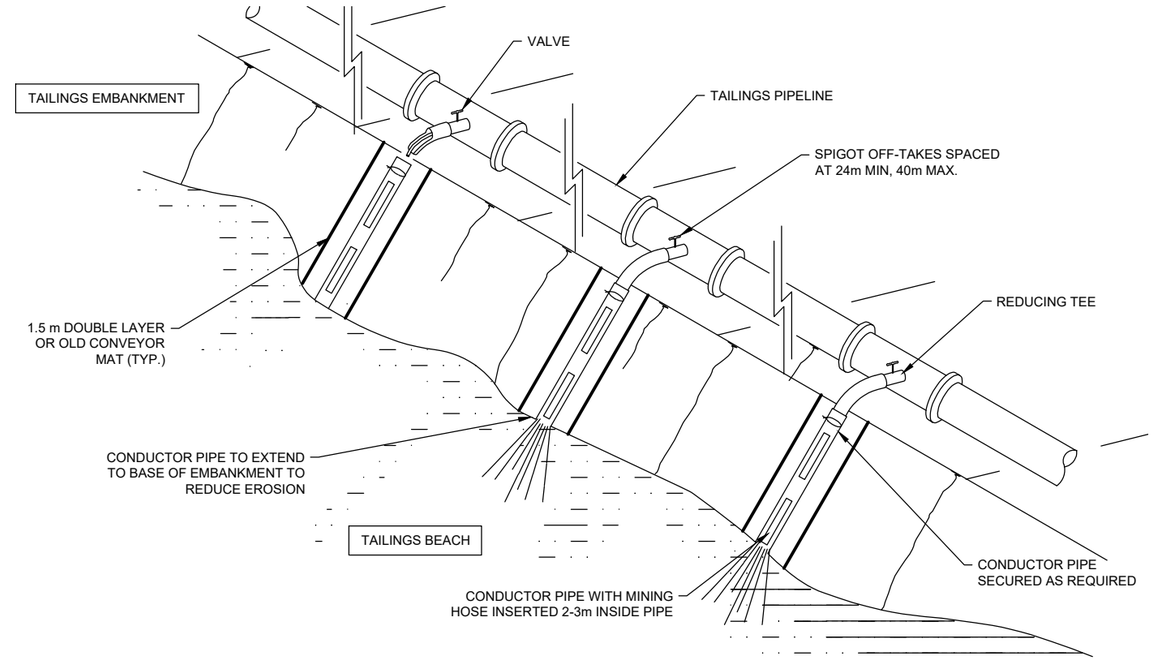
CLIENT: DE GREY MINING LIMITED		DRAWN: DE	PROJECT: PER2021-0290
PROJECT: TSF SCOPING STUDY HEMI DEPOSIT, WA		CHECKED: CH	DRAWING: 03
		REVISION: A	SCALE: 1:15,000
TITLE: IWL - UNDERDRAINAGE PLAN		DATE: 11.03.22	SHEET: A3 L



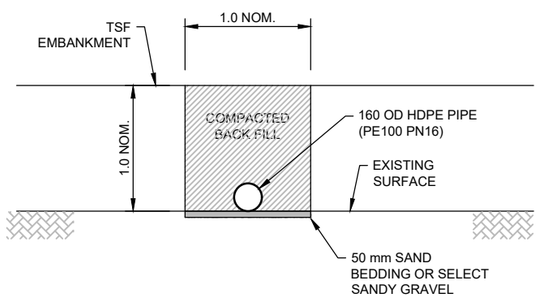
1/03 UNDERDRAINAGE - TYPICAL SECTION
NTS



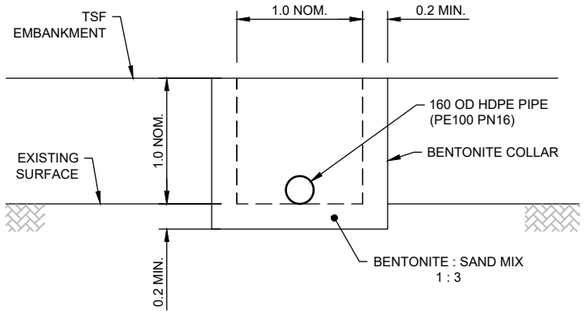
UNDERDRAINAGE SUMP - TYPICAL DETAIL
1:100



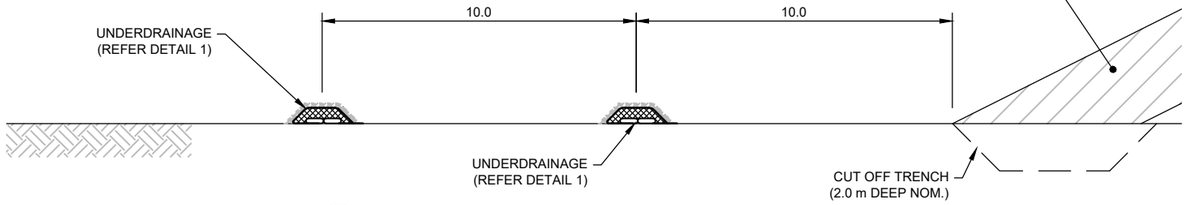
PROPOSED SPIGOT ARRANGEMENT
ISOMETRIC VIEW (NTS)



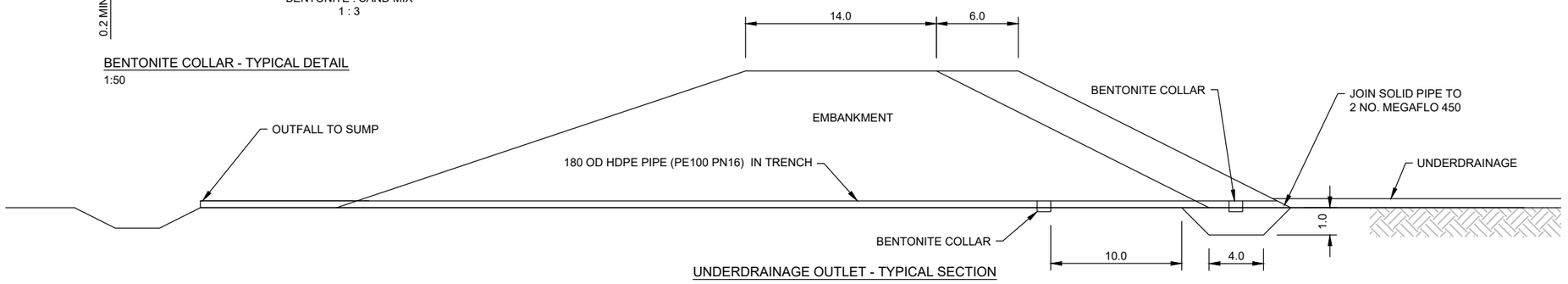
UNDERDRAINAGE TRENCH - TYPICAL DETAIL
1:50



BENTONITE COLLAR - TYPICAL DETAIL
1:50



2/03 EMBANKMENT & UNDERDRAINAGE LINES - TYPICAL SECTION
1:100



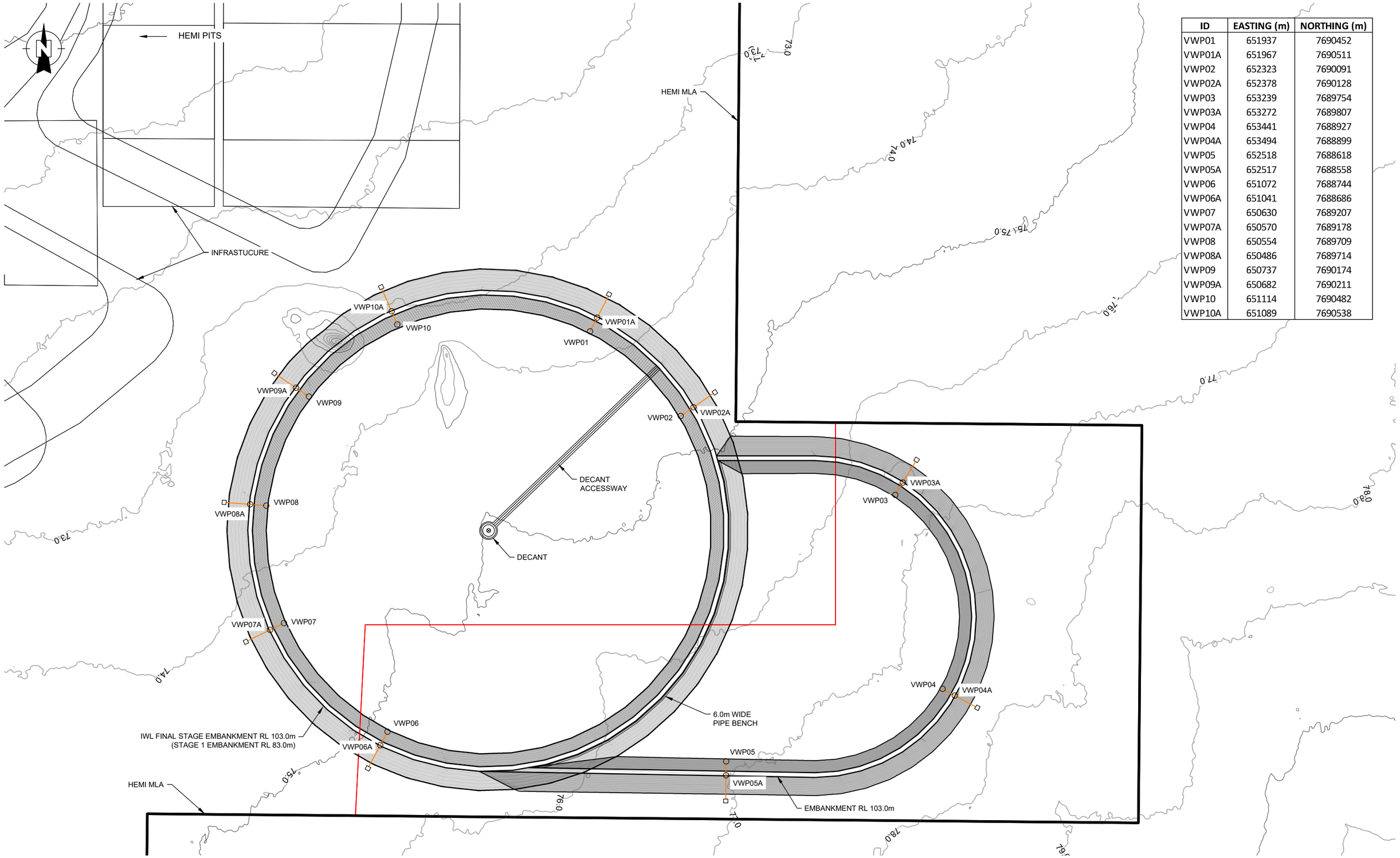
UNDERDRAINAGE OUTLET - TYPICAL SECTION
NTS

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: DE GREY MINING LIMITED		DRAWN: DE	PROJECT: PER2021-0290
PROJECT: TSF SCOPING STUDY HEMI DEPOSIT, WA		CHECKED: CH	DRAWING: 04
		REVISION: A	SCALE: AS SHOWN
TITLE: UNDERDRAINAGE AND SPIGOT DETAILS		DATE: 07.04.22	SHEET: A3 L



ID	EASTING (m)	NORTHING (m)
VWP01	651937	7690452
VWP01A	651967	7690511
VWP02	652323	7690091
VWP02A	652378	7690128
VWP03	653239	7689754
VWP03A	653272	7689807
VWP04	653441	7688927
VWP04A	653494	7688899
VWP05	652518	7688618
VWP05A	652517	7688558
VWP06	651072	7688744
VWP06A	651041	7688686
VWP07	650630	7689207
VWP07A	650570	7689178
VWP08	650554	7689709
VWP08A	650486	7689714
VWP09	650737	7690174
VWP09A	650682	7690211
VWP10	651114	7690482
VWP10A	651089	7690538

LEGEND:

- TRENCH
- VWP
- TERMINAL BOX

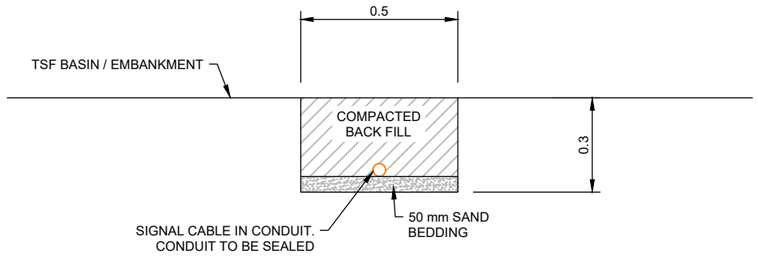
NOTES:

1) FOR INSTRUMENTATION DETAILS REFER DRAWING 06

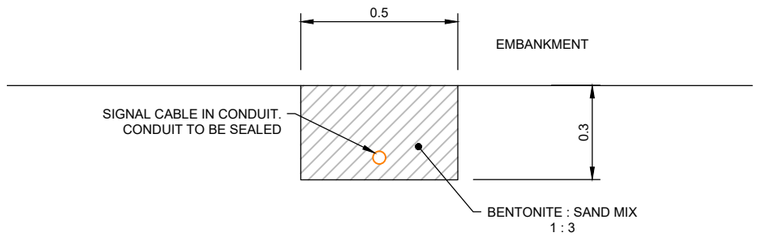
1:15000 0 150 300 450 600 750 m

CMW Geosciences

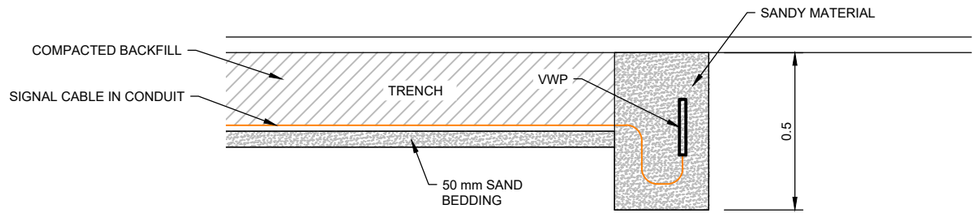
CLIENT: DE GREY MINING LIMITED		DRAWN: DE	PROJECT: PER2021-0290
PROJECT: TSF SCOPING STUDY HEMI DEPOSIT, WA		CHECKED: CH	DRAWING: 05
		REVISION: A	SCALE: 1:15,000
TITLE: IWL - INSTRUMENTATION PLAN		DATE: 07.04.22	SHEET: A3 L



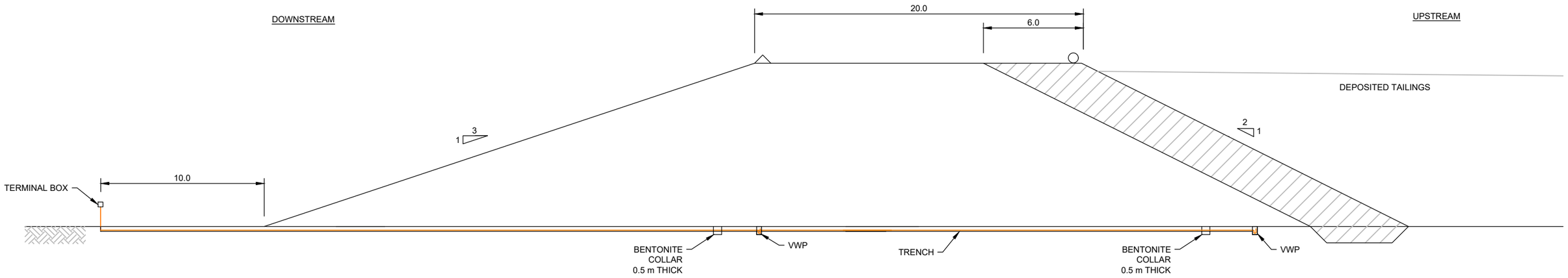
VWP TRENCH - TYPICAL DETAIL
1:20



BENTONITE COLLAR - TYPICAL DETAIL
1:20



VIBRATING WIRE PIEZOMETER - TYPICAL DETAIL
1:20



EMBANKMENT - TYPICAL SECTION
1:250

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

1:250 0 2.5 5 7.5 10 12.5 m

CMW Geosciences

CLIENT: DE GREY MINING LIMITED		DRAWN: DE	PROJECT: PER2021-0290
PROJECT: TSF SCOPING STUDY HEMI DEPOSIT, WA		CHECKED: CH	DRAWING: 06
		REVISION: A	SCALE: AS SHOWN
TITLE: INSTRUMENTATION DETAILS		DATE: 07.04.22	SHEET: A3 L

Appendix D – Scope of Works and Technical Specification Document

17 August 2021

TAILINGS STORAGE FACILITY

HEMI GOLD PROJECT, WA

SCOPE OF WORKS AND TECHNICAL SPECIFICATION

De Grey Mining Ltd

Ref. PER2021-0290AH Rev 0

Unit 19 Wembley Green Offices,
127 Herdsman Parade, Wembley, WA 6014

www.cmwgeosciences.com

Table of Contents

1 INTRODUCTION

This Scope of Work covers the construction of the embankments for the Tailings Storage Facility and associated infrastructure and is to be read in conjunction with the Drawings.

The works mainly involve bulk earthworks to construct the perimeter embankments and decant facilities for the Tailing Storage Facility /Integrated Waste Landform.

The Scope of Work shall comprise the provision of all material, construction plant, equipment, labour, supervision, tools, services, warehousing if required, testing equipment, and each and every item of expense necessary for the construction, acceptance testing and preparing of "as built" drawings and documents for work shown in the drawings, schedules and specifications forming part of the construction of the tailings storage embankments for the Tailing Storage Facility (TSF) at the at the Hemi Gold Project.

All works shall be constructed complete and operational except as specifically excluded and shall include all necessary auxiliary works, accessories and the incorporation of all miscellaneous material, minor parts and other such items, whether or not the items are specified, where it is clearly the intent that they should be supplied or where they are obviously required and necessary to complete and commission the work.

1.1 Drawings

The following Drawings complete this Scope of Work:

Table 3: Drawings

Title	Drawing No.
IWL – Plan	PER2021-0290-01
Sections and Details	PER2021-0290-02
IWL – Underdrainage Plan	PER2021-0290-03
Underdrainage and Spigot Details	PER2021-0290-04
IWL – Instrumentation Plan	PER2021-0290-05
Instrumentation Details	PER2021-0290-06

1.2 Code of Practice

Unless otherwise specified, or shown on the drawings, the Contractor is to provide all materials and carry out all the work in accordance with the latest revisions of the relevant Australian Standard Codes.

All work under this Contract shall be performed strictly in accordance with the following specifications, drawings and other documents, which by this reference forms part of this Contract, unless expressly noted otherwise.

AS 1289 Methods of testing soils for engineering purposes.

AS 1726 Geotechnical site investigations.

AS 3798 Guidelines on earthworks for commercial and residential developments.

The Works shall be carried out to comply with the latest revision of the Drawings, Codes and Standards specified, or where no standards are specified, to Australian Standards, or to the appropriate British or other recognised Standards.

Before making any change in any work under the Contract to comply with any revisions to the relevant codes and standards, the Contractor shall give to the De Grey Mining Ltd (Principal) written notice

specifying the reason therefore and requesting his direction thereon. The Principal shall decide whether a change is necessary and issue an order accordingly under the provisions of the General Conditions of Contract.

1.3 Site inspection

The Contractor shall inspect the site and must allow for the following factors in their price:

- The nature and requirements of the work to be done.
- 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 nearest sources of suitable construction material which complies with this Specification.
- The source of water for construction purposes.
- The Contractor is to manage saline water usage, hydrocarbon storage and dust suppression to the Principal's requirements.
- Prevailing climatic conditions for the site.

1.4 Safety

The Contractor shall:

- Carry out the works in a safe manner and comply with all of Principal's procedures and guidelines.
- Conform to all relevant Acts or Statutes of Parliament, Regulations, By-Laws or Orders relating to the safety of persons and property on or about the site.

1.5 Site location and description

The TSF site is approximately 388 hectares in total area. The proposed TSF site approximately 1.5 kms south east of the Hemi Pit.

The TSF site and its immediate surroundings are described as being generally flat, with open woodland comprising of small to medium mallee trees, scattered shrubs, and perennial grasses (typical savannah environment) with an RL of approximate 79 m AHD on the western boundary to approximately 80 m AHD on the eastern boundary.

2 DESCRIPTION OF WORK – SPECIFIC

The Scope of Work shall include, but is not necessarily limited to the following:

2.1 General

The work shall include:

- Attend a Site Induction of approximately five (5) hours' duration before the commencement of works if they have not already attended one in the last six (6) months.
- Carry out all works indicated or implied in the Drawings or in the Specification.
- Supply all labour, plant and materials (except those indicated as being supplied by the Principal) necessary for completion of the works.

- Maintain all works as required by the Contract documents and for the period stated therein.

All construction shall be to the minimum lines and grades shown on the Drawings or as required by the Owner's Representative as work progresses.

During the progress of the works, the Owner's Representative may find it necessary to revise the lines, levels and grades of any part of the works because of the conditions revealed by the works.

2.2 Survey

The Principal will supply survey services including:

- Supply of survey datums/bench marks.
- Initial pegging of the embankment toes.
- Initial pickup of the embankment foundations.
- As built survey of the completed works
- Estimation of earthworks placed.

The Contractor shall:

- Be responsible for the protection of all permanent and temporary beacons or bench marks, and Principal supplied pegging.
- Setting out and construction of the works from the Principal supplied pegging provided.
- Ensure initial and/or final surveys are undertaken by the Principal prior to the removal or placement of any material, especially where such action will destroy or cover the surface just surveyed.

The Contractor may undertake their own survey of any item, either in conjunction with the Principal, or separately. The Contractor and Owners Representative shall agree on the results of measurement surveys that are carried out prior to any works being covered up or within seven (7) days of a survey being undertaken. Should agreement not be reached, the difference shall be documented such that the matter can be later decided without disruption to the Contractor's programme.

The maximum permissible horizontal deviation from the finished lines or zone boundaries shall be -0m to +0.5m.

Vertical deviation shall be -0m to +0.2m, provided no abrupt changes in slope or level are present on any finished surface.

Measurement for payment of all embankment fill material shall be made for the compacted material, measured in place and only to the design lines and grades required (excluding 'tolerances').

2.3 Clearing and Establishment Works

The work shall include:

- Remove all vegetable matter and scrub from the area of the proposed TSF footprint. The area to be cleared shall extend approximately 5m past the downstream toe of the embankment. All stripped vegetation should be pushed into heaps in locations as indicated by the Owner's Representative.
- Remove all solid obstructions, tree stumps, roots and logs from beneath the footprint of the TSF perimeter embankment.
- Clear the agreed routes of all haul roads of all vegetation standing and fallen. Push this vegetation into heaps as approved by the Owner's Representative.

- Form up, lay base course as is necessary and do all things necessary to form and maintain haul roads linking the pit area to the site and other haul roads necessary for the works and which are approved by the Owner's Representative.
- Keep all haul roads sprayed and wetted to totally prevent the generation of airborne dust during the course of road construction and usage.
- Prepare a quality assurance and quality control programme to cover all aspects of work included within this Construction Specification for the Principals approval.
- On subsequent stages, remove gravel wear course materials from the embankment crests, and stockpile for re-use if possible.
- Provide all things necessary to implement the approved QA/QC programme.

2.4 Foundation Preparation

The work shall include:

- Strip topsoil from the TSF footprint to a nominal depth below the natural ground surface of 0.2 m. The depth of stripping may be increased as directed by the Owner's Representative. Stockpiling of topsoil shall be in areas nominated by the Owner's Representative. Stockpiles shall have a maximum height of 2.0m and side slopes of 1 (vertical) to 1.5 (horizontal).
- Tyne, moisture condition (to within –2% / +2% of OMC) and compact the TSF embankment foundation and areas within the TSF basin to accept the underdrainage and clay liner around the decant. The prepared surface of the embankment footprint should be compacted using a minimum of 6 passes of a 12t vibratory roller.
- Prepare the foundation for the cut-off trench under the starter embankment as shown on drawings by excavating to Ferricrete / cemented laterite, a nominal depth of 2 m below the existing ground surface or as directed by the Owner's 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 Owner's Representative.
- 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 until the base of all excavations has been inspected and approved by the Owner's Representative.
- Allow for keeping water from excavations by pumping, dewatering, or other suitable means, and adequately dispose of it clear of the works.
- The cut-off trench backfill shall comply with the following:
    - Moisture content at the time of placement is within -2%, +3% of the optimum moisture content as determined from laboratory test 5.1.1 of AS1289 with moisture curing of materials as required during embankment construction.
    - Each layer is compacted to achieve a density ratio greater than 95% of standard maximum dry density, as determined from laboratory test AS 1289.5.1.1.
    - Materials specifications as detailed in Section 2.5.1

2.5 Earthworks

2.5.1 TSF Embankment Construction – Upstream Zone

The work shall include:

- Construct the tailings storage embankment using selected approved clayey mine waste material sourced from the Hemi pit area. Suitable material shall comprise well graded clay free of organic matter and other deleterious material. The material shall comply with the following limits:
    - Fines content (material finer than 75 micron), greater than 30%.
    - Fines shall be low plasticity with a Plasticity index (PI) less than 35%.
    - Maximum particle size, 150mm

De Grey Geologists identified areas of upper and lower saprolite with the Hemi Pit area. These areas are dominated by kaolin clays. The estimated clay volume (lower limit) was 1.6 Mm^3 in the Brolga Starter Pit and 3.6 Mm^3 in the Brolga Stage 2 Pit. Prior to construction, zones within the pit area should be confirmed for use in construction (i.e. by identification, sampling and testing). Only material approved by the Engineer/Owner's Representative should be utilised in construction.

The contractor shall:

- Adjust the moisture content of the clayey mine waste, approved for use in the perimeter embankment construction. Moisture condition the borrow to within the range of -2%, +2% of the optimum moisture content (OMC) as determined from laboratory test 5.1.1 of AS1289. The borrow materials shall be cured to ensure the moisture is thoroughly mixed and evenly spread through all materials proposed for embankment construction.
- Place all fill material comprising the perimeter embankment in homogeneous horizontal layers not exceeding 0.3m loose lift thickness. Each lift shall be compacted by a minimum of 6 passes of a 12t 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 embankments. Largest size should be 150mm.
- Each layer shall be compacted to achieve a density ratio greater than 95% of the maximum dry density - standard compaction as determined from laboratory test AS 1289.5.1.1. The actual number of passes of a 12t vibratory roller or an approved equivalent to achieve a density greater than 95% standard compaction (AS 1289.5.1.1) shall be determined on site using roller trials.
- All materials shall be stockpiled, transported and placed in such a manner as to minimise segregation.
- Construct and maintain haul road(s) between the ramp at the pit area and the works at the TSF.
- Construct and maintain access ramps as required to enable the construction equipment to access the TSF. The location of these ramps shall be approved by the Owner's Representative prior to commencement of these works. The ramps may be left in place at the discretion of the Principal.
- The crests of the completed embankment shall be graded to the inside (upstream) of the storage at a 2% cross fall. A windrow of not less than 0.5m height (or 1/2 wheel height of largest vehicle) shall be left on the outside of the crest of embankment.
- Sheet the crest of the perimeter and internal embankments, and the decant accessway with 100mm thick laterite gravel wearing course. The laterite gravel shall be sourced from a location nominated (pit areas/waste dump area) by the Owner's Representative and from reclaimed gravel wear course materials if deemed suitable for reuse (subsequent stages).

- Carry out testing to comply with the Specification and QA/QC procedures.
- Allow for keeping water from the works during construction by shaping finished surfaces with a fall to the storage.

2.5.2 Decant Accessway

The work shall include:

- Construct the decant accessway using traffic compacted mine waste sourced from the pit or waste dump areas located adjacent to the storage. Well grade mine waste shall be utilised near the perimeter embankment. Hard rock waste should only be used within 200 m of the rock-ring decant.
- The mine waste should be placed in layers no greater than 1.5m thick and trafficked by construction equipment across the full width of the layer.

2.5.3 Waste Dump Construction

Following completion of the foundation preparation, the TSF embankment construction can commence. The downstream waste zone can be constructed using tradition waste dump techniques, including tipping from minor faces and paddock dumping (i.e. not dumping off a high face); however, the following points should be noted.

- The mine waste within 14 m of the upstream zone shall be placed in 1m 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 2/3 the layer thickness.
- The upstream face of the waste dump shall be 'smooth', free of projections (large cobbles and boulders (>0.3m)) and voided rock in order to allow for placement of the upstream zone. Trimming of the waste dump face may be required.
- Preference should be made to placing large boulders and cobbles towards the downstream of the dump.

2.6 Decant structure

The decant structure will comprise a rock ring type decant. Refer to drawing PER2021-0290-02 for details.

Only clean select rock fill material with a low fines content shall be placed to form the rock ring decant. Select rock fill material shall be selected clean, fines-free (<3% passing 75µm), competent rock mine waste with a well-graded particle size distribution between 50mm and 300mm. All filter rock shall be carefully placed in such a manner as to minimise segregation.

The Contractor shall:

- Complete placement of the compacted clay liner (0.3 m thick) constructed from clayey mine waste compacted to the same standards as the upstream zone (i.e. 95% of SMDD).
- Transport all materials to construct the decant.
- Transport select decant filter rock from the designated source and place around the decant. Selected rock shall comprise clean mine waste material, free of fines, sourced from a location nominated by the Owner's Representative.

2.7 Underdrainage

The Contractor must complete the installation of the underdrainage system in accordance with the Scope of Works and Technical Specifications and Drawings. The drainage lines and sumps should be constructed to the lines and levels as shown on the drawings PER2021-0290-03 and PER2021-0290-04.

As part of the underdrainage line, the Contractor shall supply and install the two slotted pipes (Megaflo 450) and the geotextile covering, 10-14 mm (nom.) select aggregate, BIDIM A34 geotextile wrap, and 0.15 mm thick select rock/erosion protection cover. The underdrainage lines in the northern part of the TSF will join HDPE solid pipes to allow flow under gravity to external sumps.

The Contractor must also provide 180 mm dia. HDPE pipes that allow discharge of the flow from the underdrainage lines to external sumps. The sumps must comprise an open pit 1.5 m deep (nom.) with 10 m wide base and 1:2 (V:H) sloped wall, with a smooth surface which is to be covered by 1.5 mm HDPE liner.

The Contractor shall:

- The liner / geotextile should be stored and handled in accordance with the manufacturers. The liner / geotextile must not be dragged across the subgrade which could damage the liner / geotextile.
- The subgrade to accept the underdrainage lines shall be graded ‘smooth’ i.e. cleared of tree stumps, large stones, and other sharp objects that could damage the geotextile and slotted pipework.
- The drain shall generally follow the slope of the ground surface.
- The geotextile should be rolled out onto the subgrade from the upslope end. The slotted pipe should be laid on the geotextile and the geotextile and pipe stabilised with drainage medium.
- The geotextile must be lapped both side-to-side and end-to-end, in the direction of aggregate placement. The minimum lap should be 0.3 m. Alternatively, adjacent panels can be sewn together rather than overlapped.
- Aggregate must be carefully placed over the geotextile and slotted pipe to form the aggregate layer, as shown on the drawings.
- The geotextile should then be folded over, adequately lapped and stabilised with erosion protection.
- The underdrainage lines should not be trafficked or disturbed by vehicles.
- Any liner, geotextile and slotted pipe which becomes damaged or displaced during filling or other operations shall be removed and replaced.

2.8 Completion

The Contractor shall:

- Batter down the sides of the borrow pits, as appropriate, for stability on completion of the work. Materials not considered suitable for use in the works shall be evenly spread over the borrow pit surface.
- 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.

2.9 Construction sequence

The Contractor shall liaise with the Principal to agree a sequence for the works. The Contractor shall endeavour to complete the external embankments in the sequence agreed.

The contractor shall install vibrating wire piezometers (VWP) and cabling within trenches as shown on the drawings, refer PER2021-0290-05 and PER2021-0290-06. The Contractor should plan for this installation as part of the works. The installation of the VWPs will be monitored on a full time basis by the Owner's Representative and Engineer.

3 EXCLUSIONS

The following works will be performed by others:

- At the completion of the construction of the embankments, the Principal will install the tailings distribution pipework (pipes, spigots, droppers etc) on the embankment crest.
- Placement of all pump equipment at the decant.
- Crushing and screening of waste rock to produce road-base and decant filter rock.
- Placement of all associated electrical equipment at the decant structure.

The Contractor shall:

- Fully co-operate with the pipe handling and operating crew and shall work in with their activities at all times.
- Avoid damaging the tailings distribution pipework and any electrical installations which is either operational or has been removed from the crest of the storage by the Principal. Any pipework or electrical equipment damaged by the Contractor through carelessness shall be replaced at no additional cost to the Principal.

4 PRINCIPAL SUPPLIED ITEMS

4.1 Survey

The Principal will provide co-ordinates and levels of survey marks within the vicinity of the storage. The works shall be set out all lines and levels using the survey marks provided.

4.2 Materials

The Principal will supply mine waste for construction of the embankment from designated sources. The Contractor shall make their own arrangements for loading and hauling of materials.

4.3 Water

Water will be made available to the Contractor at no charge. Supply will be from a standpipe located at the plant site. Access to the standpipe will not be exclusive to the Contractor. The Contractor shall determine the type and suitability of the water supplies for use in this Contract. The Contractor shall make their own arrangements for loading and hauling of water.

5 QUALITY CONTROL AND QUALITY ASSURANCE

The required quality standards for implementation of this Scope of Work are the ISO 9001:2000 Standard Series and the Contractor shall comply with the requirements of these standards.

6 INSPECTION AND TESTING

6.1 Inspection

The Owners Representative will be entitled, at all times to inspect, examine and test the materials and workmanship being provided under the Contract. Such inspection, examination or testing, if made, shall not release the Contractor from any obligation under the Contract.

The Contractor shall co-operate with and provide full opportunity to the Owners Representative to monitor regularly the progress of the Works of the Contractor and his Subcontractors to the detailed extent necessary to satisfy progress relative to the Construction Program.

All pertinent information to enable the Owners Representative to determine the adequacy of the advance planning for material procurement, machine and manpower resources to meet the Construction Program shall be made freely available to the Owners Representative.

These requirements shall be incorporated in orders placed with Subcontractors.

6.2 Test Plans

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

Compliance testing of compaction shall be at the rate of not less than 1 field density test per layer per material type per 2,500m^2 (or 1 test per 750m^3). Standard compaction testing should be performed (as a minimum) to a ratio of 1 standard compaction to 3 field density tests, or as directed by the Owners Representative. It is envisaged that the laboratory technician will be required on site full time during starter embankment construction. It is estimated that a minimum of 516 field density tests will be required on the perimeter embankment compacted tailings fill (quantity approx. 387,000m^3).

The Contractor shall, at their own expense, rework or replace and re-test materials which do not meet the compaction requirements.

Clayey mine waste (Upstream zone):

- Field density testing of compaction shall be at the rate of not less than 1 test per layer per material type per 2,500m^2 or 1 test per 750m^3
- Compliance testing for percentage of fines and Plasticity Index (PI) shall be at the minimum rate of 1 test per 10,000m^3.

No testing of the waste dump zone is envisaged.

The Contractor shall, at his own expense, rework or replace materials which do not meet the compaction and other compliance requirements.

Test certificates shall be made available to the Owner's Representative on an ongoing basis throughout the construction.

7 PERMITS, LICENCES AND APPROVALS

Further to the General Conditions of Contract, the Principal will obtain the Department of Mines, Industry Regulation and Safety (DMIRS) and Department of Water and Environmental Regulation (DWER) approvals.

All other necessary permits, licenses and approvals shall be obtained by the Contractor.

8 SUBSTITUTIONS

The Contractor shall:

- Not substitute any alternative to the equipment and materials included in the Works without the prior written consent of the Principal.
- Make diligent efforts to utilise the specified Materials to be incorporated into the Works but where the Contractor considers there are commercial or other advantages to be derived by the Principal, the Contractor may submit a proposal for a substitute material for approval by the Principal prior to commencement of the work. Such proposal for substitution shall be in writing and state reasons for and (if applicable) advantages of the substitute material. The Principal shall determine whether the substitute material will be permitted and such determination shall be binding and conclusive upon the Contractor. Approval of a substitution will be given as a variation under of the General Conditions of Contract incorporating any adjustment to the Contract Sum.

9 MATERIALS

Where the Principal agrees to supply Materials to the Contractor in the performance of the Contract then the following conditions will apply:

- The items shall be included in the Contractor's materials procurement schedules. The Contractor shall, upon arrival at Site to commence work, check and ensure that Principal Supplied Materials are available and will not cause any delay to the Contractor's work progress.
- Items stored by the Principal, shall be removed from the Principal's store or storage area by the Contractor when required by him or when directed by the Owner’s Representative (whichever is the sooner). However, no items shall be removed from the Principal's store or storage area by the Contractor without first obtaining authority from the Owners Representative and the Contractor shall sign receipts or other documentation required acknowledging receipt of the Free Issue Materials.
- From the time the Principal Supplied Materials are removed from the Principal's store or storage area or are delivered to the site the Contractor shall be responsible for and shall keep safely and in good order all those Principal Supplied Materials including any returnable packing or containers.
- The Contractor shall account for all Principal Supplied Materials used and shall return to the Principal in good order and condition any Principal Supplied Materials remaining unused on completion of the work. Subject to any insurance cover the Contractor shall be responsible for the cost of replacement or repair of any Principal Supplied Materials lost or damaged while he is responsible therefore.
- The Contractor shall immediately notify the Owners Representative of any damaged to or loss of any of those Principal Supplied Materials at any time and shall as soon as possible specify the extent and circumstances of the damage or loss.
- Principal Supplied Materials used by the Contractor are used at the sole risk of the Contractor. Any failure to perform the Contract by the Contractor shall not be excused by any matter or thing arising from or incidental to the use of Principal Supplied Materials.

10 DATA REQUIREMENTS

As built Drawings, should be supplied to the Owner's Representative within 14 days of practical completion of the work.

11 ESTIMATE OF QUANTITIES

A preliminary estimate of quantities has been provided to allow material requirements to be gauged for staged construction. The figures have not been calculated by a Quantity Surveyor and are provided for convenience only.

Estimate of Quantities

Date	2-May-22
Job No	PER2021-0048
File	
Subject	Quantities
Revision	0

PROJECT : **INTEGRATED WASTE LANDFORM - STAGE 1**

CLIENT : **DE GREY MINING LIMITED**

LOCATION : **MALLINA GOLD PROJECT**

Item	Description	Unit	Quantity	Rate	Amount
1.00	**Preliminaries**				
1.01	Site establishment and general cost (including mobilisation and demobilisation)	Item	10% of earthworks cost excluding liner and underdrainage		$ 1,500,000
2.00	**Preliminaries & Site Preparation**				
2.01	Clear and Grub TSF area	ha	388	$ 1,366.98	$ 530,388
2.02	Topsoil Stripping (0.2m) and move to stockpile	m^3	776,000	$ 1.92	$ 1,489,920
2.03	Site preparation in TSF basin (around decant and under underdrainage lines)	m^2	342,800	$ 1.76	$ 603,328
3.00	**Perimeter Embankment**				
3.01	Prepare embankment foundation for the whole footprint	m^2	373,800	$ 1.76	$ 657,888
3.02	Excavate cut-off trench under upstream zone of embankment	m^3	72,000	$ 7.89	$ 568,080
3.03	Backfill cut-off trench under upstream zone of embankment with roller compacted clayey mine waste	m^3	72,000	$ 9.91	$ 713,520
3.04	Borrow, transport, place, moisture condition and roller compact clay mine waste material to upstream zone of embankment	m^3	315,000	$ 9.91	$ 3,121,650
3.05	Borrow, transport, place, moisture condition and compact mine waste material to downstream zone of embankment **(by Mining Fleet)**	m^3	1,900,000	$ -	$ -
3.06	Place selected mine waste to build windrows on both sides of embankment.	m^3	13,000	$ 11.09	$ 144,170
3.07	Sheet perimeter embankment crest with 0.1 m base course	m^3	13,000	$ 15.99	$ 207,870
4.00	**Decant**				
4.01	Borrow, transport, place, moisture condition and compact clayey waste material to liner area around decant (0.5m thick)	m^3	141,375	$ 9.91	$ 1,401,026
4.02	Borrow, transport, place, moisture condition and compact mine waste material to decant accessway	m^3	160,000	$ 3.52	$ 563,200
4.03	Place selected mine waste to build windrows on both sides of the decant accessway	m^3	1,960	$ 11.09	$ 21,736
4.04	Sheet perimeter embankment and decant accessway crests with 0.1 m base course	m^3	784	$ 15.99	$ 12,536
4.05	Win, haul and place select filter rock to decant ring	m^3	18,240	$ 15.99	$ 291,658
5.00	**Underdrainage**				
5.01	Supply and install 2 No. Megaflo 450 underdrainage, including aggregate, geotextile	m	3,000	$ 150.00	$ 450,000
5.02	Construct trench through embankment and backfill (including Bentonite collars)	m	400	$ 60.00	$ 24,000
5.03	Supply and install 180 dia underdrainage outfall pipe	m	440	$ 135.00	$ 59,400
5.04	Install underdrainage sump	item	2		$ 40,000
6.00	**Miscellaneous**				
6.01	QA/QC Iincluding enginer visits and QA/QC testing	Allow			$ 230,000
6.02	Supply and Install 14 no. VWP piezometers	Allow			$ 84,000
6.03	Supply and install tailings deposition pipeline, values, off-takes etc		by others		
6.04	Supply and install decant return water pipeline, values etc		by others		
6.05	Supply and install decant pumps, underdrainage bore pump		by others		
6.06	Supply and install electrical equipment		by others		
	SUB-TOTAL				**$ 12,714,371**
	TOTAL COST (excl. GST)				**$ 12,714,371**

Notes:

Date	21-Apr-21
Job No	PER2021-0048
File	
Subject	Quantities
Revision	0

PROJECT : **INTEGRATED WASTE LANDFORM - STAGE 2**

CLIENT : **DE GREY MINING LIMITED**

LOCATION : **MALLINA GOLD PROJECT**

Item	Description	Unit	Quantity	Rate	Amount
1.00	**Preliminaries**				
1.01	Site establishment and general cost (including mobilisation and demobilisation)	Item			$ 308,596
		10% of earthworks cost excluding liner and underdrainage			
2.00	**Preliminaries & Site Preparation**				
2.01	Clear and Grub TSF area	ha		$ 1,366.98	$ -
2.02	Topsoil Stripping (0.1m) and move to stockpile	m^3		$ 1.92	$ -
2.03	Site preparation in TSF basin	m^2		$ 1.76	$ -
3.00	**Perimeter Embankment**				
3.01	Prepare embankment foundation for the whole footprint	m^2	168,600	$ 1.76	$ 296,736
3.02	Excavate cut-off trench under upstream zone of embankment	m^3		$ 7.89	$ -
3.03	Backfill cut-off trench under upstream zone of embankment with roller compacted clayey mine waste	m^3		$ 9.91	$ -
3.04	Borrow, transport, place, moisture condition and roller compact clay mine waste material to upstream zone of embankment	m^3	186,500	$ 9.91	$ 1,848,215
3.05	Borrow, transport, place, moisture condition and compact mine waste material to downstream zone of embankment **(by Mining Fleet)**	m^3	2,200,000	$ -	$ -
3.06	Place selected mine waste to build windrows on both sides of embankment.	m^3		$ 11.09	$ -
3.07	Sheet perimeter embankment crest with 0.1 m base course	m^3	13,000	$ 15.99	$ 207,870
3.08	Remove pipework and replace after raising	m	6,400	$ 18.00	$ 115,200
4.00	**Decant**				
4.01	Borrow, transport, place, moisture condition and compact mine waste material to decant accessway	m^3	89,000	$ 3.52	$ 313,280
4.02	Place selected mine waste to build windrows on both sides of the decant accessway	m^3	1,960	$ 11.09	$ 21,736
4.03	Sheet perimeter embankment and decant accessway crests with 0.1 m base course	m^3	784	$ 15.99	$ 12,536
4.04	Win, haul and place select filter rock to decant ring	m^3	16,910	$ 15.99	$ 270,391
5.00	**Underdrainage**				
5.01	Supply and install Megaflo 450 underdrainage, including aggregate, geotextile	m		$ 75.00	$ -
5.02	Supply and install Megaflo 300 underdrainage, including aggregate, geotextile	m		$ 60.00	$ -
5.03	Supply and install 250 dia underdrainage outfall pipe	m		$ 135.00	$ -
5.04	Install underdrainage sump	item			$ -
6.00	**Miscellaneous**				
6.01	QA/QC lincluding enginer visits and QA/QC testing	Allow			$ 115,000
6.02	Raise and re-install tailings deposition pipeline		see item 3.08		
6.03	Raise and re-install decant return water pipeline		by others		
6.04	Raise and re-install decant pumps, underdrainage bore pump		by others		
6.05	Raise and re-install electrical equipment		by others		
	SUB-TOTAL				**$ 3,509,561**
	No Contiengency				$ -
	TOTAL COST (excl. GST)				**$ 3,509,561**

Notes:

Date	21-Apr-21
Job No	PER2021-0048
File	
Subject	Quantities
Revision	0

PROJECT : **INTEGRATED WASTE LANDFORM - STAGE 3**

CLIENT : **DE GREY MINING LIMITED**

LOCATION : **MALLINA GOLD PROJECT**

Item	Description	Unit	Quantity	Rate	Amount
1.00	**Preliminaries**				
1.01	Site establishment and general cost (including mobilisation and demobilisation)	Item			$ 314,111
		10% of earthworks cost excluding liner and underdrainage			
2.00	**Preliminaries & Site Preparation**				
2.01	Clear and Grub TSF area	ha		$ 1,366.98	$ -
2.02	Topsoil Stripping (0.1m) and move to stockpile	m^3		$ 1.92	$ -
2.03	Site preparation in TSF basin	m^2		$ 1.76	$ -
3.00	**Perimeter Embankment**				
3.01	Prepare embankment foundation for the whole footprint	m^2	168,600	$ 1.76	$ 296,736
3.02	Excavate cut-off trench under upstream zone of embankment	m^3		$ 7.89	$ -
3.03	Backfill cut-off trench under upstream zone of embankment with roller compacted clayey mine waste	m^3		$ 9.91	$ -
3.04	Borrow, transport, place, moisture condition and roller compact clay mine waste material to upstream zone of embankment	m^3	184,400	$ 9.91	$ 1,827,404
3.05	Borrow, transport, place, moisture condition and compact mine waste material to downstream zone of embankment **(by Mining Fleet)**	m^3	3,100,000	$ -	$ -
3.06	Place selected mine waste to build windrows on both sides of embankment.	m^3		$ 11.09	$ -
3.07	Sheet perimeter embankment crest with 0.1 m base course	m^3	13,000	$ 15.99	$ 207,870
3.08	Remove pipework and replace after raising	m	6,400	$ 18.00	$ 115,200
4.00	**Decant**				
4.01	Borrow, transport, place, moisture condition and compact mine waste material to decant accessway	m^3	89,000	$ 3.52	$ 313,280
4.02	Place selected mine waste to build windrows on both sides of the decant accessway	m^3	1,960	$ 11.09	$ 21,736
4.03	Sheet perimeter embankment and decant accessway crests with 0.1 m base course	m^3	784	$ 15.99	$ 12,536
4.04	Win, haul and place select filter rock to decant ring	m^3	21,660	$ 15.99	$ 346,343
5.00	**Underdrainage**				
5.01	Supply and install Megaflo 450 underdrainage, including aggregate, geotextile	m		$ 75.00	$ -
5.02	Supply and install Megaflo 300 underdrainage, including aggregate, geotextile	m		$ 60.00	$ -
5.03	Supply and install 250 dia underdrainage outfall pipe	m		$ 135.00	$ -
5.04	Install underdrainage sump	item			$ -
6.00	**Miscellaneous**				
6.01	QA/QC lincluding enginer visits and QA/QC testing	Allow			$ 115,000
6.02	Raise and re-install tailings deposition pipeline		see item 3.08		
6.03	Raise and re-install decant return water pipeline		by others		
6.04	Raise and re-install decant pumps, underdrainage bore pump		by others		
6.05	Raise and re-install electrical equipment		by others		
	SUB-TOTAL				**$ 3,570,217**
	No Contiengency				$ -
	TOTAL COST (excl. GST)				**$ 3,570,217**

Notes:

Date	21-Apr-21
Job No	PER2021-0048
File	
Subject	Quantities
Revision	0

PROJECT : **INTEGRATED WASTE LANDFORM - STAGE 4**

CLIENT : **DE GREY MINING LIMITED**

LOCATION : **MALLINA GOLD PROJECT**

Item	Description	Unit	Quantity	Rate	Amount
1.00	**Preliminaries**				
1.01	Site establishment and general cost (including mobilisation and demobilisation)	Item			$ 319,724
		10% of earthworks cost excluding liner and underdrainage			
2.00	**Preliminaries & Site Preparation**				
2.01	Clear and Grub TSF area	ha		$ 1,366.98	$ -
2.02	Topsoil Stripping (0.1m) and move to stockpile	m^3		$ 1.92	$ -
2.03	Site preparation in TSF basin	m^2		$ 1.76	$ -
3.00	**Perimeter Embankment**				
3.01	Prepare embankment foundation for the whole footprint	m^2	168,600	$ 1.76	$ 296,736
3.02	Excavate cut-off trench under upstream zone of embankment	m^3		$ 7.89	$ -
3.03	Backfill cut-off trench under upstream zone of embankment with roller compacted clayey mine waste	m^3		$ 9.91	$ -
3.04	Borrow, transport, place, moisture condition and roller compact clay mine waste material to upstream zone of embankment	m^3	182,400	$ 9.91	$ 1,807,584
3.05	Borrow, transport, place, moisture condition and compact mine waste material to downstream zone of embankment **(by Mining Fleet)**	m^3	3,900,000	$ -	$ -
3.06	Place selected mine waste to build windrows on both sides of embankment.	m^3		$ 11.09	$ -
3.07	Sheet perimeter embankment crest with 0.1 m base course	m^3	13,000	$ 15.99	$ 207,870
3.08	Remove pipework and replace after raising	m	6,400	$ 18.00	$ 115,200
4.00	**Decant**				
4.01	Borrow, transport, place, moisture condition and compact mine waste material to decant accessway	m^3	89,000	$ 3.52	$ 313,280
4.02	Place selected mine waste to build windrows on both sides of the decant accessway	m^3	1,960	$ 11.09	$ 21,736
4.03	Sheet perimeter embankment and decant accessway crests with 0.1 m base course	m^3	784	$ 15.99	$ 12,536
4.04	Win, haul and place select filter rock to decant ring	m^3	26,410	$ 15.99	$ 422,296
5.00	**Underdrainage**				
5.01	Supply and install Megaflo 450 underdrainage, including aggregate, geotextile	m		$ 75.00	$ -
5.02	Supply and install Megaflo 300 underdrainage, including aggregate, geotextile	m		$ 60.00	$ -
5.03	Supply and install 250 dia underdrainage outfall pipe	m		$ 135.00	$ -
5.04	Install underdrainage sump	item			$ -
6.00	**Miscellaneous**				
6.01	QA/QC lincluding enginer visits and QA/QC testing	Allow			$ 115,000
6.02	Raise and re-install tailings deposition pipeline		see item 3.08		
6.03	Raise and re-install decant return water pipeline		by others		
6.04	Raise and re-install decant pumps, underdrainage bore pump		by others		
6.05	Raise and re-install electrical equipment		by others		
	SUB-TOTAL				**$ 3,631,962**
	No Contiengency				$ -
	TOTAL COST (excl. GST)				**$ 3,631,962**

Notes:

Date	21-Apr-21
Job No	PER2021-0048
File	
Subject	Quantities
Revision	0

PROJECT : **INTEGRATED WASTE LANDFORM - STAGE 5**

CLIENT : **DE GREY MINING LIMITED**

LOCATION : **MALLINA GOLD PROJECT**

Item	Description	Unit	Quantity	Rate	Amount
1.00	**Preliminaries**				
1.01	Site establishment and general cost (including mobilisation and demobilisation)	Item			$ 353,719
		10% of earthworks cost excluding liner and underdrainage			
2.00	**Preliminaries & Site Preparation**				
2.01	Clear and Grub TSF area	ha		$ 1,366.98	$ -
2.02	Topsoil Stripping (0.1m) and move to stockpile	m^3		$ 1.92	$ -
2.03	Site preparation in TSF basin	m^2		$ 1.76	$ -
3.00	**Perimeter Embankment**				
3.01	Prepare embankment foundation for the whole footprint	m^2	329,300	$ 1.76	$ 579,568
3.02	Excavate cut-off trench under upstream zone of embankment	m^3		$ 7.89	$ -
3.03	Backfill cut-off trench under upstream zone of embankment with roller compacted clayey mine waste	m^3		$ 9.91	$ -
3.04	Borrow, transport, place, moisture condition and roller compact clay mine waste material to upstream zone of embankment	m^3	180,500	$ 9.91	$ 1,788,755
3.05	Borrow, transport, place, moisture condition and compact mine waste material to downstream zone of embankment **(by Mining Fleet)**	m^3	6,800,000	$ -	$ -
3.06	Place selected mine waste to build windrows on both sides of embankment.	m^3		$ 11.09	$ -
3.07	Sheet perimeter embankment crest with 0.1 m base course	m^3	13,000	$ 15.99	$ 207,870
3.08	Remove pipework and replace after raising	m	6,400	$ 18.00	$ 115,200
4.00	**Decant**				
4.01	Borrow, transport, place, moisture condition and compact mine waste material to decant accessway	m^3	89,000	$ 3.52	$ 313,280
4.02	Place selected mine waste to build windrows on both sides of the decant accessway	m^3	1,960	$ 11.09	$ 21,736
4.03	Sheet perimeter embankment and decant accessway crests with 0.1 m base course	m^3	784	$ 15.99	$ 12,536
4.04	Win, haul and place select filter rock to decant ring	m^3	31,160	$ 15.99	$ 498,248
5.00	**Underdrainage**				
5.01	Supply and install Megaflo 450 underdrainage, including aggregate, geotextile	m		$ 75.00	$ -
5.02	Supply and install Megaflo 300 underdrainage, including aggregate, geotextile	m		$ 60.00	$ -
5.03	Supply and install 250 dia underdrainage outfall pipe	m		$ 135.00	$ -
5.04	Install underdrainage sump	item			$ -
6.00	**Miscellaneous**				
6.01	QA/QC lincluding enginer visits and QA/QC testing	Allow			$ 115,000
6.02	Raise and re-install tailings deposition pipeline		see item 3.08		
6.03	Raise and re-install decant return water pipeline		by others		
6.04	Raise and re-install decant pumps, underdrainage bore pump		by others		
6.05	Raise and re-install electrical equipment		by others		
	SUB-TOTAL				**$ 4,005,913**
	No Contiengency				$ -
	TOTAL COST (excl. GST)				**$ 4,005,913**

Notes:

Date	2-May-22
Job No	PER2021-0048
File	
Subject	Quantities
Revision	0

PROJECT : **INTEGRATED WASTE LANDFORM - EXTENSION FINAL HEIGHT**

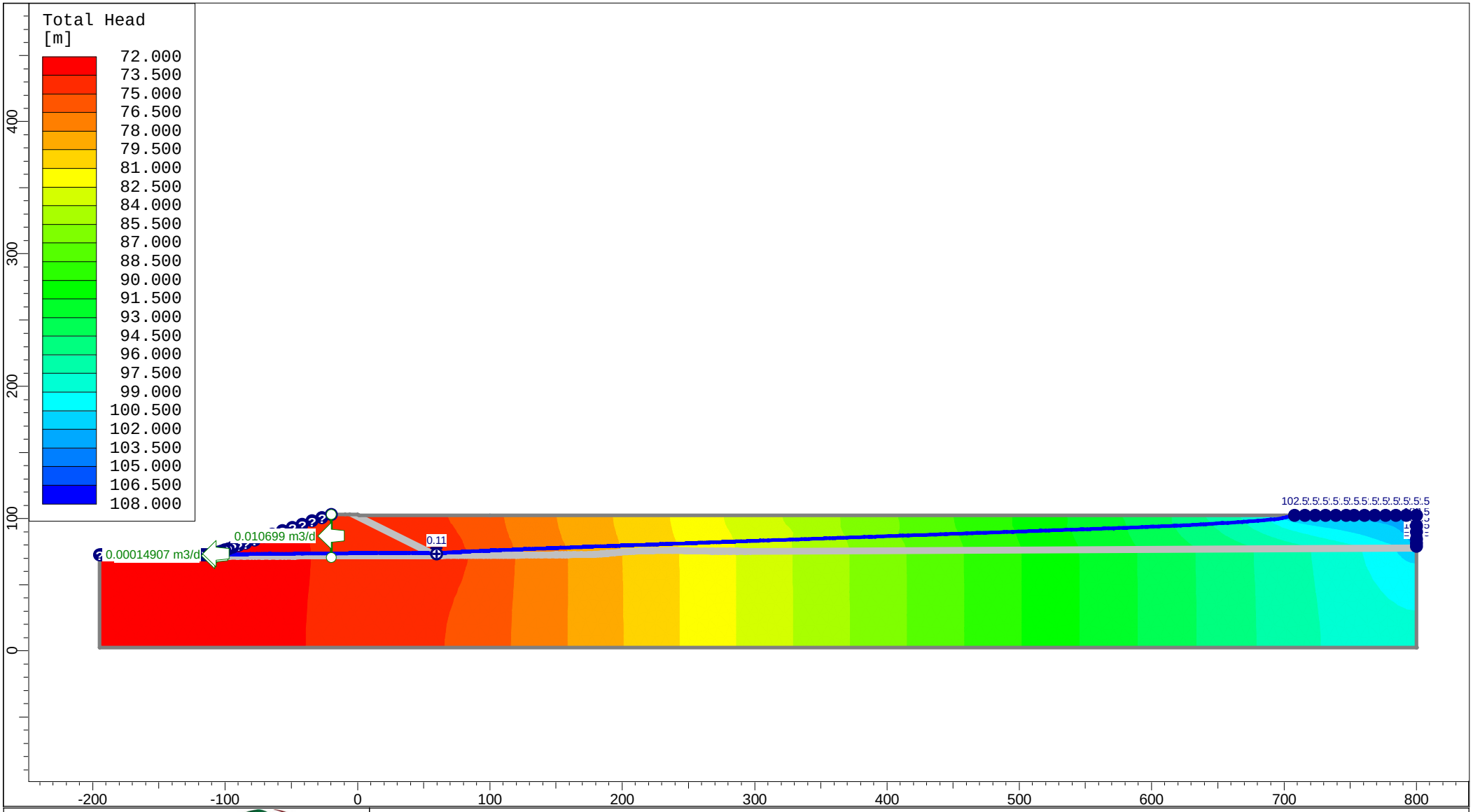
CLIENT : **DE GREY MINING LIMITED**

LOCATION : **MALLINA GOLD PROJECT**

Item	Description	Unit	Quantity	Rate	Amount
1.00	**Preliminaries**				
1.01	Site establishment and general cost (including mobilisation and demobilisation)	Item			$ 1,500,000
		10% of earthworks cost excluding liner and underdrainage			
2.00	**Preliminaries & Site Preparation**				
2.01	Clear and Grub TSF area	ha	170	$ 1,366.98	$ 232,387
2.02	Topsoil Stripping (0.2m) and move to stockpile	m^3	340,000	$ 1.92	$ 652,800
2.03	Site preparation in TSF basin	m^2	282,800	$ 1.76	$ 497,728
3.00	**Perimeter Embankment**				
3.01	Prepare embankment foundation for the whole footprint	m^2	562,100	$ 1.76	$ 989,296
3.02	Excavate cut-off trench under upstream zone of embankment	m^3	43,200	$ 7.89	$ 340,848
3.03	Backfill cut-off trench under upstream zone of embankment with roller compacted clayey mine waste	m^3	43,200	$ 9.91	$ 428,112
3.04	Borrow, transport, place, moisture condition and roller compact clay mine waste material to upstream zone of embankment	m^3	615,600	$ 9.91	$ 6,100,596
3.05	Borrow, transport, place, moisture condition and compact mine waste material to downstream zone of embankment **(by Mining Fleet)**	m^3	7,992,200	$ -	$ -
3.06	Place selected mine waste to build windrows on both sides of embankment.	m^3	8,000	$ 11.09	$ 88,720
3.07	Sheet perimeter embankment crest with 0.1 m base course	m^3	8,000	$ 15.99	$ 127,920
4.00	**Decant**				
4.01	Borrow, transport, place, moisture condition and compact clayey waste material to liner area around decant	m^3	141,400	$ 9.91	$ 1,401,274
4.02	Borrow, transport, place, moisture condition and compact mine waste material to decant accessway	m^3	199,000	$ 3.52	$ 700,480
4.03	Place selected mine waste to build windrows on both sides of the decant accessway	m^3	1,960	$ 11.09	$ 21,736
4.04	Sheet perimeter embankment and decant accessway crests with 0.1 m base course	m^3	784	$ 15.99	$ 12,536
4.05	Win, haul and place select filter rock to decant ring	m^3	114,400	$ 15.99	$ 1,829,256
5.00	**Underdrainage**				
		Allow			$ 500,000
5.01	Supply and install 2 No. Megaflo 450 underdrainage, including aggregate, geotextile	m		$ 150.00	$ -
5.02	Construct trench through embankment and backfill (including Bentonite collars)	m		$ 60.00	$ -
5.03	Supply and install 180 dia underdrainage outfall pipe	m		$ 135.00	$ -
5.04	Install underdrainage sump	item			$ -
6.00	**Miscellaneous**				
6.01	QA/QC Iincluding enginer visits and QA/QC testing	Allow			$ 450,000
6.02	Supply and Install 6 no. VWP piezometers	Allow			$ 45,000
6.01	Supply and install tailings deposition pipeline, values, off-takes etc		by others		
6.02	Supply and install decant return water pipeline, values etc		by others		
6.03	Supply and install decant pumps, underdrainage bore pump		by others		
6.04	Supply and install electrical equipment		by others		
	SUB-TOTAL				**$ 15,918,689**
	TOTAL COST (excl. GST)				**$ 15,918,689**

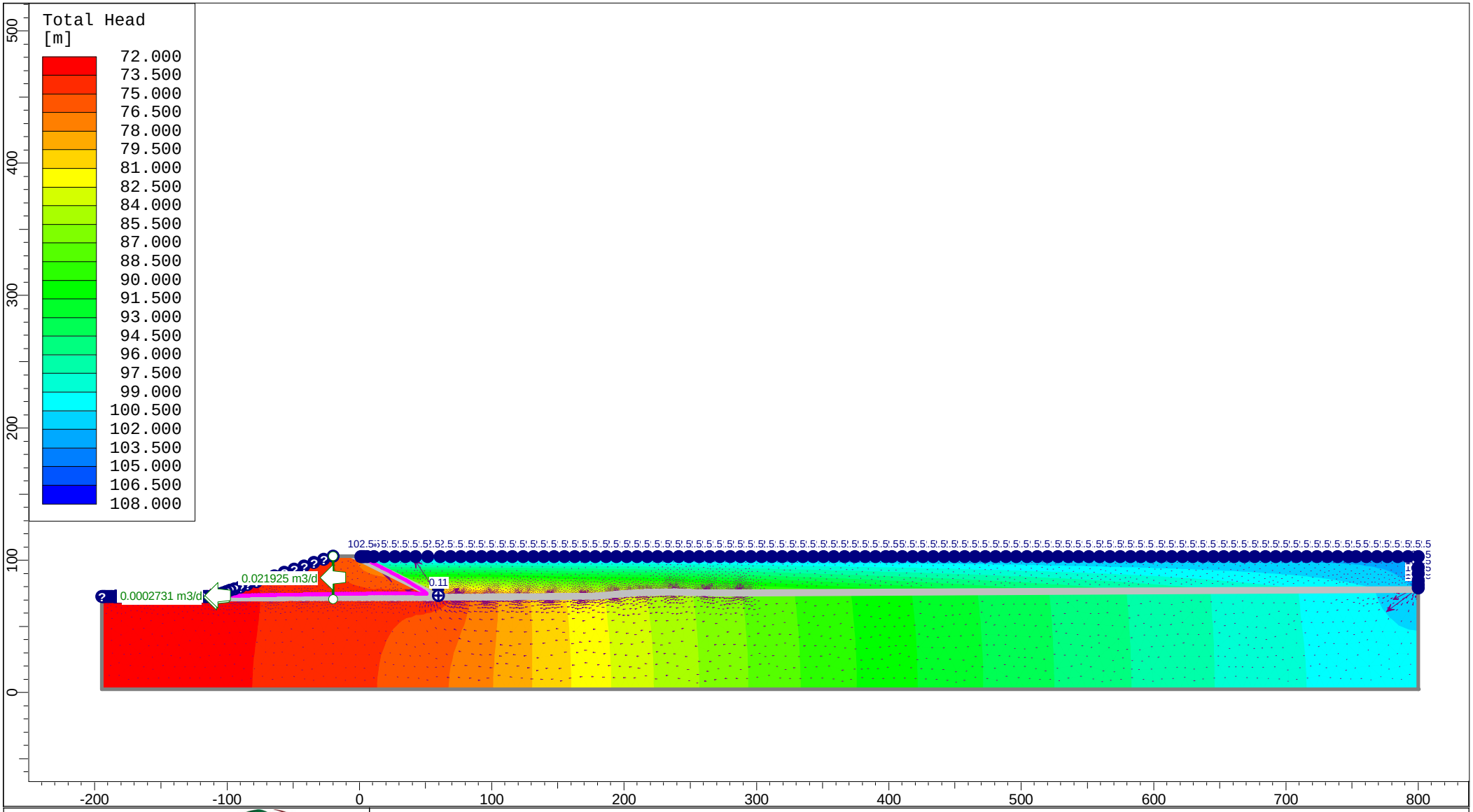
Notes:

Appendix E – Seepage Analyses



CMW Geosciences	*Project*	Hemi Gold Project	
	Scenario	Seepage - Normal Pond	
	Drawn By	SW	*Company* CMW
	Date	23/06/2022	*File Name* seepage - normal.slmd

SLIDEINTERP 9.009



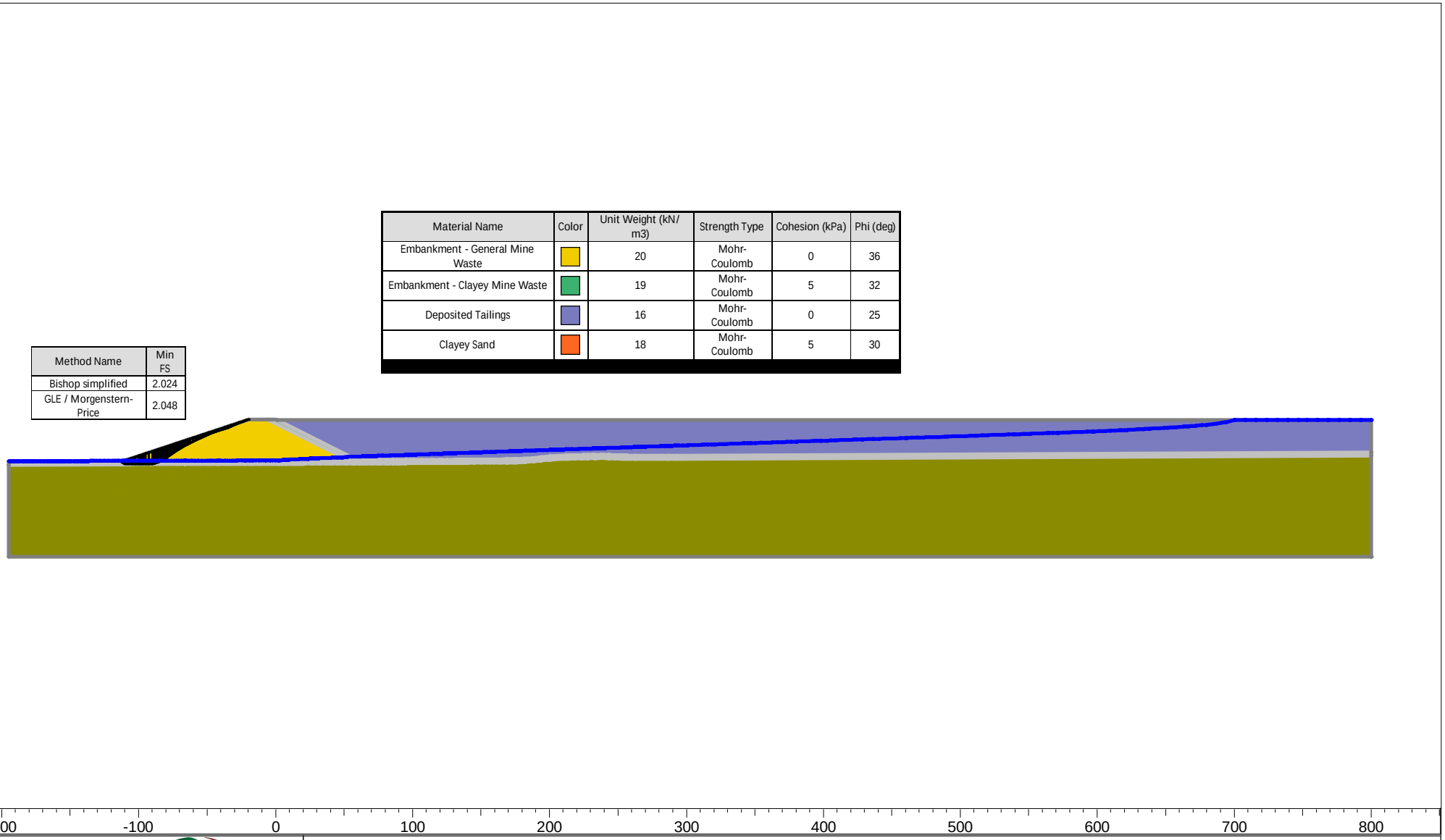
CMW Geosciences	*Project*	Hemi Gold Project	
	Scenario	Seepage - Next to Embankment	
	Drawn By	SW	*Company* CMW
	Date	22/06/2022	*File Name* seepage.slmd

SLIDEINTERP 9.009

Appendix F – Stability Analyses

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Embankment - General Mine Waste		20	Mohr-Coulomb	0	36
Embankment - Clayey Mine Waste		19	Mohr-Coulomb	5	32
Deposited Tailings		16	Mohr-Coulomb	0	25
Clayey Sand		18	Mohr-Coulomb	5	30

Method Name	Min FS
Bishop simplified	2.024
GLE / Morgenstern-Price	2.048



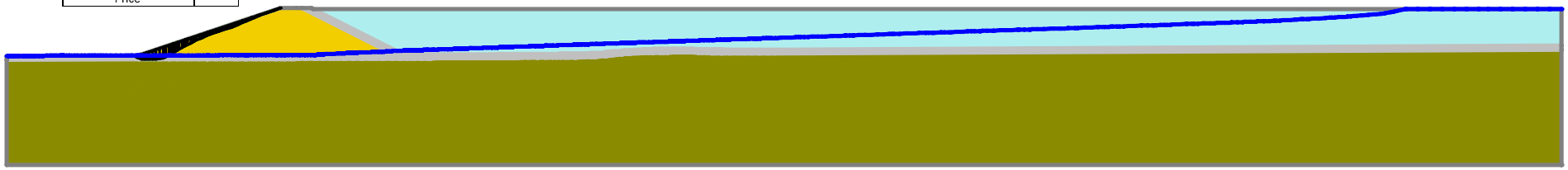
CMW Geosciences

SLIDEINTERP 9.009

Project	Hemi Gold Project		
Scenario	Case 1: Drained		
Drawn By	SW	*Company*	CMW
Date	22/06/2022	*File Name*	Drained.slmd

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Vertical Strength Ratio	Minimum Shear Strength (kPa)
Embankment - General Mine Waste		20	Mohr-Coulomb	0	36		
Embankment - Clayey Mine Waste		19	Mohr-Coulomb	5	32		
Clayey Sand		18	Mohr-Coulomb	5	30		
Ferricrete		22	Mohr-Coulomb	10	40		
Desposited Tailings (U)		16	Vertical Stress Ratio			0.25	0
Embankemnt - Clayey Mine Waste (U)		20	Mohr-Coulomb	0	75		

Method Name	Min FS
Bishop simplified	2.024
GLE / Morgenstern-Price	2.045



SLIDEINTERP 9.009

Project	Hemi Gold Project		
Scenario	Case 2: Undrained		
Drawn By	SW	*Company*	CMW
Date	22/06/2022	*File Name*	Undrained.slmd

Appendix G – Deformation Estimate

Embankment Deformation

Swaisgood (1998)

SEF, % settle	0.042	PGA (g)	0.09
H, m	21	M	7.5
Crest Settlement, mm	8.7		

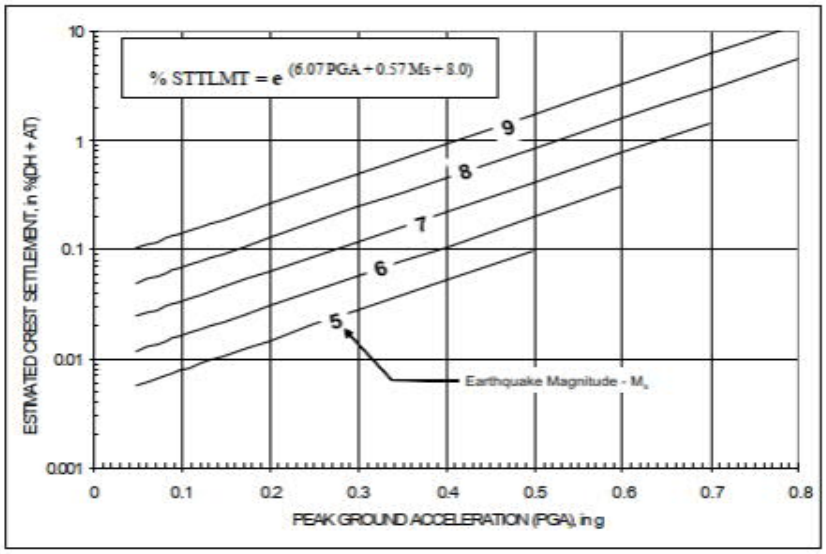


Figure 2. Chart for estimating crest settlement

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 H – Water Balance Analyses

PROJECT TSF

CLIENT De Grey

LOCATION Mallina Project

SUBJECT : WATER BALANCE TOTAL TAILINGS STREAM CALENDAR YEAR

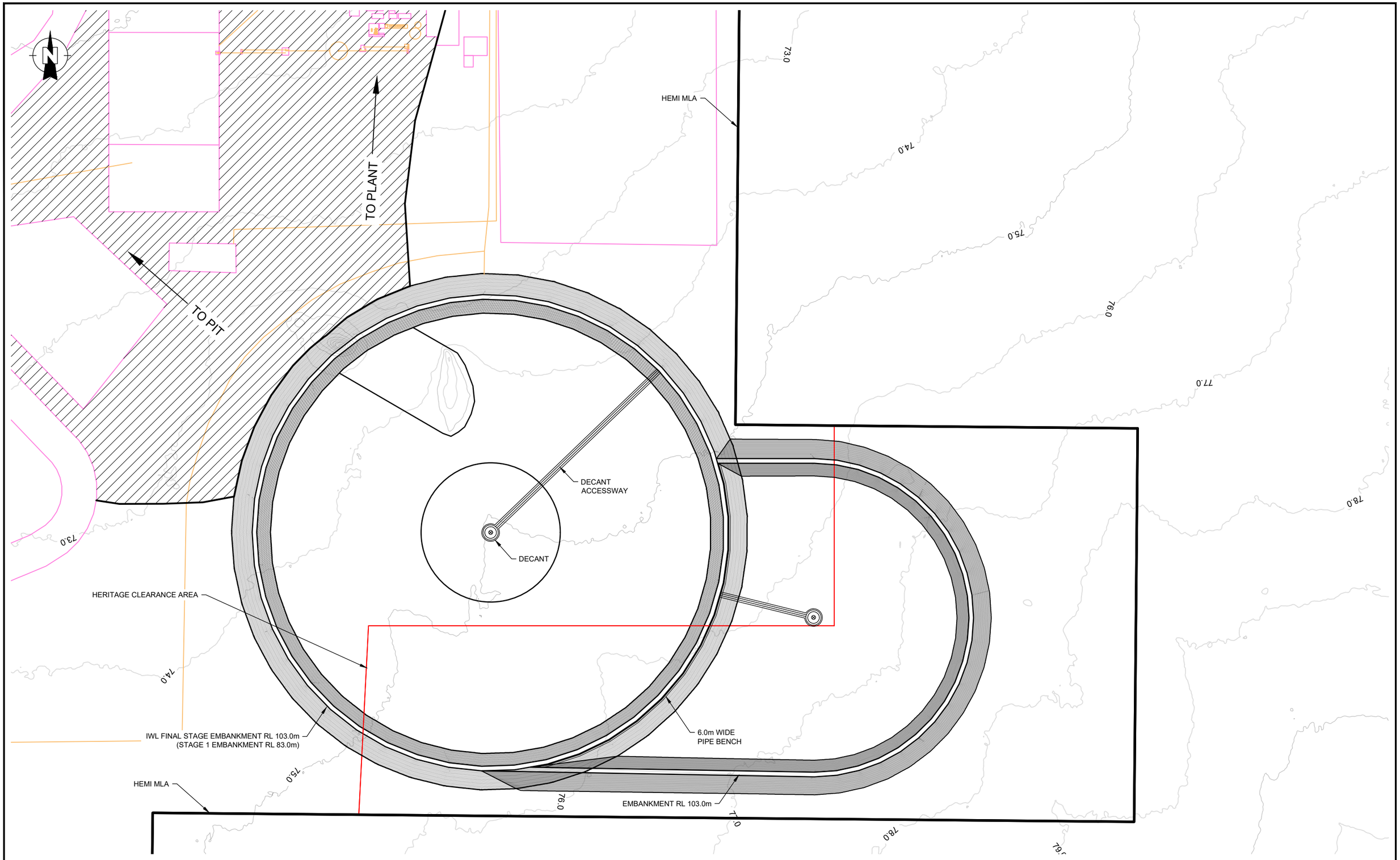
Date	22-Jun-22
Job No	PER2021-1290
File	0
Subject	Water Balance
Revision	0

		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)			65.20	84.80	68.20	19.90	22.30	24.40	14.20	5.70	1.50	1.70	2.30	18.90	329
Average Daily Rainfall (mm)			2.10	3.00	2.20	0.66	0.72	0.81	0.46	0.18	0.05	0.05	0.08	0.61	
Tailings Dam Storage Area (m2)			3,140,000	3,140,000	3,140,000	3,140,000	3,140,000	3,140,000	3,140,000	3,140,000	3,140,000	3,140,000	3,140,000	3,140,000	
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)			0	0	0	0	0	0	0	0	0	0	0	0	
Runoff Coefficient Catchment			0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	
Pool Area (m2)	100m radius	31415.92654	31,500	31,500	31,500	31,500	31,500	31,500	31,500	31,500	31,500	31,500	31,500	31,500	
Running Beaches (m2)	10%		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	
Rainfall Inflow Total Volume (m3/day)			2996.9	4277.2	3134.8	945.2	1025.0	1158.9	652.7	262.0	71.2	78.1	109.2	868.7	
SLURRY WATER															
Tonnes per year	10,000,000														
Total tonnes per month			833,333	833,333	833,333	833,333	833,333	833,333	833,333	833,333	833,333	833,333	833,333	833,333	10,000,000
% Solids =	45		45	45	45	45	45	45	45	45	45	45	45	45	
Tailings Output Solids (tpd)			26,881.7	29,498.5	26,881.7	27,777.8	26,881.7	27,777.8	26,881.7	26,881.7	27,777.8	26,881.7	27,777.8	26,881.7	
Volume of Water (m3/day)			32,855.4	36,053.8	32,855.4	33,950.6	32,855.4	33,950.6	32,855.4	32,855.4	33,950.6	32,855.4	33,950.6	32,855.4	12,222,222.2
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)			**35,852**	**40,331**	**35,990**	**34,896**	**33,880**	**35,110**	**33,508**	**33,117**	**34,022**	**32,934**	**34,060**	**33,724**	

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)			364	320	317	271	246	197	219	246	329	321	374	386	**3,590**
Pan Factor			0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	
Monthly Dam Evaporation Rate (mm)			254.8	224.0	221.9	189.7	172.2	137.9	153.3	172.2	230.3	224.7	261.8	270.2	
Average Daily Evaporation Rate (mm)			8.22	7.93	7.16	6.32	5.55	4.60	4.95	5.55	7.68	7.25	8.73	8.72	
Pool Area & Running Beaches (m2)			281,500	281,500	281,500	281,500	281,500	281,500	281,500	281,500	281,500	281,500	281,500	281,500	
Daily Evaporation Loss/Outflow (m3/day)			2,313.7	2,232.1	2,015.0	1,780.0	1,563.7	1,294.0	1,392.1	1,563.7	2,161.0	2,040.4	2,456.6	2,453.6	
EVAPO-TRANSPIRATION (from drying tailings)															
Evaporation Rate (mm)			364	320	317	271	246	197	219	246	329	321	374	386	
Evapo-transpiration Rate (Pan/3)			121.3	106.7	105.7	90.3	82.0	65.7	73.0	82.0	109.7	107.0	124.7	128.7	
Average Daily Evapo-transpiration Rate (mm)			3.91	3.78	3.41	3.01	2.65	2.19	2.35	2.65	3.66	3.45	4.16	4.15	
Area Transpiring (m2)			285,850.0	285,850.0	285,850.0	285,850.0	285,850.0	285,850.0	285,850.0	285,850.0	285,850.0	285,850.0	285,850.0	285,850.0	
Daily transpiration Loss (m3/day)			1,118.8	1,079.3	974.3	860.7	756.1	625.7	673.1	756.1	1,044.9	986.6	1,187.9	1,186.4	
SEEPAGE															
Downstream Embankment (m3/day)			56.7	56.7	56.7	56.7	56.7	56.7	56.7	56.7	56.7	56.7	56.7	56.7	
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	1.00E-08	Lower K than TSF1 site													
Dam Floor (m3/day).			27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	
Total Seepage Outflow (m3/day)			83.9	83.9	83.9	83.9	83.9	83.9	83.9	83.9	83.9	83.9	83.9	83.9	
RETENTION															
Tailings Output (tpd)			26,881.7	29,498.5	26,881.7	27,777.8	26,881.7	27,777.8	26,881.7	26,881.7	27,777.8	26,881.7	27,777.8	26,881.7	
Assumed Moisture Content of Tailings (average)		35.0%													
Volume Retained in Tailings (m3/day)			9,408.6	10,324.5	9,408.6	9,722.2	9,408.6	9,722.2	9,408.6	9,408.6	9,722.2	9,408.6	9,722.2	9,408.6	
TOTAL OUTFLOW-LOSSES FROM TAILINGS DAM			**12,925.1**	**13,719.8**	**12,481.9**	**12,446.9**	**11,812.3**	**11,725.8**	**11,557.7**	**11,812.3**	**13,012.1**	**12,519.6**	**13,450.6**	**13,132.5**	
BALANCE INFLOW-OUTFLOW/LOSSES (m3/day)			22,927.2	26,611.2	23,508.4	22,448.9	22,068.1	23,383.7	21,950.4	21,305.1	21,009.8	20,414.0	20,609.3	20,591.6	
BALANCE INFLOW-OUTFLOW/LOSSES (m3/month)			710,744.6	751,766.1	728,759.0	673,467.5	684,111.7	701,512.3	680,463.0	660,458.4	630,294.1	632,833.8	618,279.0	638,340.4	
RETURN WATER TO THE PLANT (if available)															
Total Water Return per month (balance of inflow -outflow for planning)			710,744.6	751,766.1	728,759.0	673,467.5	684,111.7	701,512.3	680,463.0	660,458.4	630,294.1	632,833.8	618,279.0	638,340.4	
Volume of Water (m3/day),estimated at			22,927.2	26,611.2	23,508.4	22,448.9	22,068.1	23,383.7	21,950.4	21,305.1	21,009.8	20,414.0	20,609.3	20,591.6	
Average water return			70%	74%	72%	66%	67%	69%	67%	65%	62%	62%	61%	63%	**66%**

	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)	**-9,928**	**-9,443**	**-9,347**	**-11,502**	**-10,787**	**-10,567**	**-10,905**	**-11,550**	**-12,941**	**-12,441**	**-13,341**	**-12,264**	
Total water in excess of requirements (m3/month)	**-307,774**	**-266,752**	**-289,760**	**-345,051**	**-334,407**	**-317,006**	**-338,055**	**-358,060**	**-388,224**	**-385,685**	**-400,240**	**-380,178**	**-4,111,192**
Total water in excess of requirements (m3/year) =	**-4,111,192**												

Appendix I – Dam Break Assessment



NOTES:

1. ALL DIMENSIONS IN METRES UNO

1:15000 0 150 300 450 600 750 m

CMW Geosciences

CLIENT: DE GREY MINING LIMITED		DRAWN: DE	PROJECT: PER2021-0290
PROJECT: TSF PFS STUDY HEMI DEPOSIT, WA		CHECKED: CH	DRAWING: 07
		REVISION: A	SCALE: 1:15,000
TITLE: IWL - PRELIMINARY INUNDATION PLAN		DATE: 01.09.22	SHEET: A3 L

C:\Users\DarrenE\CMW Geosciences Pty Ltd\Perth office - PER2021-0290 TSF Design, PFS, Mallina Project\Drawings\PER2021-0290-07 INUNDATION PLAN 010922.dwg,
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PROJECT	**: Hemi Gold Project**
CLIENT	**: De Grey**
LOCATION	**: Pilbara**
SUBJECT	**: Dam Break Study, Worse Case**
Scenario:	**TSF Worst Case (PMP Rainy Day Failure Conditions)**

Date	25-Apr-22
Job No	PER2021-0290
Rev	0

BREACH CHARACTERISTICS	**Using Empirical Method**		**MacDonald and Langridge - Monopolis (1984)**
Input Parameters	**Value**	**Unit**	**Comments**
New Embankment Crest Level	103.0	mRL	From design
lowest level	73.0	mRL	From design
Maximum Embankment Height (on South-Western Side)	30.0	m	From design
Approximate Emb Length corresponding to Highest Section	1,000	m	assumed
Embankment Crest Width	20.0	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	2,850.0	m^2	Embankment cross section area at highest section
Total Tailings Tonnes stored in TSF	100.00	Mt	Estimated total storage capacity
Dry Density	1.4	t/m^3	From design
Bulk Density	1.2	t/m^3	From design
Tailings Volume stored in TSF (V_T)	71,428,571	m^3	Estimated total tailings volume
PMP Storm Volume over TSF Catchment	**2,983,000**	m^3	*Rainy Day Failure Scenario - PMP 6 hr storm event - 900 mm*
Total Released Tailings Volume from the TSF (V_F)	**24,555,819**	m^3	Allowed for released tailings ~ 67% of storage volume
	20,078	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_o)	**30.0**	m	Adopted the bottom of the breach is at the base of the embankment
	98.4	feet	Converted from meter to feet
Breach Formation Factor (V_F x H_o)	**736,674,557**	m^3 x m	Used this figure to predict the volume of embankment material removed during a breach
	2.0E+06	acre-ft x ft	Converted from m^3 x m to acre-feet x feet
Embankment Volume Eroded during Breach (V_M)	**2.0E+05**	yrd^3	Embankment volume removed during a breach (determined from **Figure 1**, T MacDonald and J Langridge - Monopolis, 1984)
	151,009	m^3	Converted from cubic yard to cubic meter (1 cubic yard = 0.765 cubic meter)
Average Breach Width (W_{ave})	53	m	Calculated based on the removed embankment volume during a breach and embankment geometry
Base Breach Width (W_b)	38	m	Calculated based on the removed embankment volume during a breach and embankment geometry
Top Breach Width (W_t)	68	m	Calculated based on the removed embankment volume during a breach and embankment geometry
Breach Shape Area (A_F)	**1,590**	m^2	Breach shape area at highest embankment section
Equivalent Released Tailings Volume behind Breach Area	**1,669,441**	m^3	Used this figure to estimate the equivalent tailings failed length behind breach area
Equivalent Tailings Failed Length behind Breach Area (x_o)	1,050	m	Calculated based on the released tailings volume (behind breach area) and breach shape
Adopted Breach Development Time (t_F)	3.50	hour	Determined from **Figure 2**, T MacDonald and J Langridge - Monopolis, 1984) 7.8 check
Released Tailings Run-out Flow (Q_F) - average flow	1,949	m^3/s	Calculated based on released tailings volume and breach development time
Peak Tailings Run-out Flow (Q_P)	3,898	m^3/s	Assuming a triangular hydrograph
Peak Tailings Run-out Flow (Q_P)	5,202	m^3/s	Based on Rico M, Beniti G, Diez-Herrero G 2008 Run-out distance (Dmax) 126 km

CMW Geosciences Pty Ltd, Chapman Morton Woodward	CLIENT: **De Grey Mining Ltd**	DESIGNER:	SW
	PROJECT: **Hemi Gold Project**	CHECKED:	CH
		REVISION:	0
	TITLE: **PRELIMINARY DAM BREAK ASSESSMENT-ENERGY METHOD**	DATE:	22/06/2022
		PROJECT:	

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):	74,411,571	
Volume of tailings and water released at failure, V_F (m^3):	30,452,073	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 folllowing 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_0 (m):	30	
Embankment Length 1	1,000	
Estimated pre-flow horizontal distance, x_0 embankment 1(m):	1,050	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.

$$H_o x_o = h\, x_f$$

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

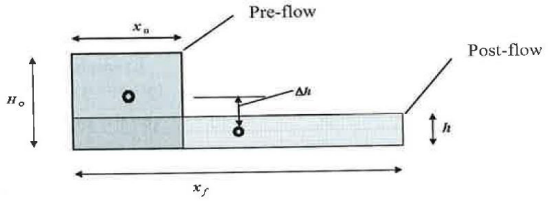

Figure 2 Simplified flow slide geometry

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

Bulk unit weight (kN/m^3):	16	
Undrained shear strength (kPa):	4	Range 1-7kPa
Estimated post-flow horizontal distance of failure volume, x_f embankment 1 (m):	**2274**	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_0 embankment 1 (m):	**1224**	Eqn. 7 Seddon K.D. 2010
		Approx. 0.5km if yield stress is 7kPa

$$Ro = x_f - x_o$$

Appendix J – Tailings Laboratory Test Certificates

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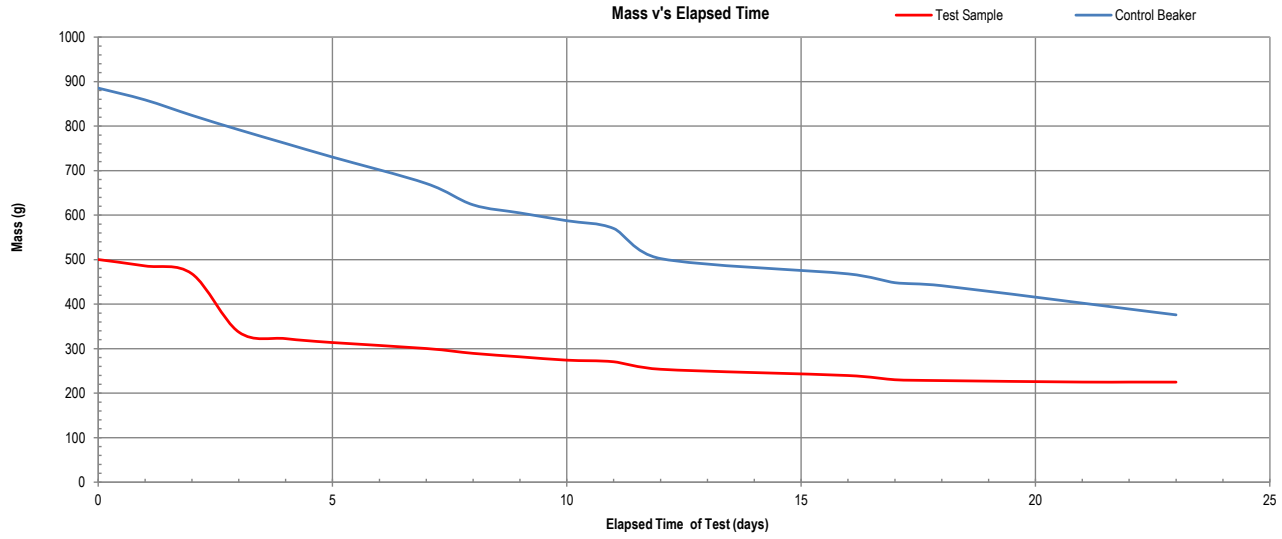
AIR DRYING TEST REPORT

Air Drying Test Procedure - as Supplied by Client

Client	CMW Geosciences	**Report No.**	P22050080-AD
Address	PO Box 2147 Churchland, WA 6018	**Test Date**	27/06/2022
		Report Date	20/07/2022
Project	Mallina Gold Project PFS		
Client ID	Submitted Tailings Samples	**Depth (m)**	Not Supplied
		Sample Type	Tailings at 45% solids

RESULTS OF TESTING

Date	Control Beaker			Test Sample		Decant	
	Temperature (° C)	Mass (g)	Evaporation (g)	Mass (g)	Evaporation (g)	Mass (g)	Decantation (g)
27/06/2022 Start Date	16.4	885.4	-	500.2	-	500.2	-
27/06/2022	16.4	885.4	0.0	500.2	0.0	500.2	0.0
28/06/2022	16.1	858.9	26.5	485.9	14.3	485.9	0.0
29/06/2022	16.0	824.2	61.2	468.2	32.0	352.4	115.8
30/06/2022	16.4	791.8	93.6	337.2	163.0	337.2	0.0
01/07/2022	15.8	761.0	124.4	322.5	177.7	322.5	0.0
02/07/2022	15.7	730.4	155.0	313.7	186.5	313.7	0.0
04/07/2022	15.5	671.1	214.3	300.3	199.9	300.3	0.0
05/07/2022	15.6	623.1	262.3	289.4	210.8	289.4	0.0
06/07/2022	15.5	604.9	280.5	281.7	218.5	281.7	0.0
07/07/2022	15.7	587.4	298.0	274.1	226.1	274.1	0.0
08/07/2022	15.7	570.0	315.4	270.5	229.7	270.5	0.0
09/07/2022	15.5	502.4	383.0	253.7	246.5	253.7	0.0
13/07/2022	15.3	468.0	417.4	239.6	260.6	239.6	0.0
14/07/2022	16.1	448.2	437.2	230.1	270.1	230.1	0.0
15/07/2022	16.0	441.5	443.9	228.2	272.0	228.2	0.0
18/07/2022	15.8	402.3	483.1	224.9	275.3	224.9	0.0
19/07/2022	16.1	389.0	496.4	224.9	275.3	224.9	0.0
20/07/2022	16.2	375.9	509.5	224.8	275.4	224.8	0.0



Remarks: Final Dry Density (t/m3) 1.478

Sample/s supplied by client

Authorised Signatory

T. Lockhart

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ATTERBERG LIMITS TEST REPORT

Test Method: AS 1289 2.1.1, 3.2.1, 3.3.1, 3.4.1

Client	CMW Geosciences	**Report No.**	P22050080-AL
		Workorder No.	0020583
Address	PO Box 2147 Churchland, WA 6018	**Report Date**	01/07/2022
Project	Mallina Gold Project PFS		

Sample No.	22050080					
Liquid Limit Determination	AS 1289.3.1.2					
Test Date	30/06/2022					
Client ID	Submitted Tailings Sample					
Depth (m)	Not Supplied					
Liquid Limit (%)	Not Obtainable					
Plastic Limit (%)	Not Obtainable					
Plasticity Index (%)	Non plastic					
Linear Shrinkage (%)	Not Obtainable					
Moisture Content (%)	19.7					

Sample No.						
Liquid Limit Determination						
Test Date						
Client ID						
Depth (m)						
Liquid Limit (%)						
Plastic Limit (%)						
Plasticity Index (%)						
Linear Shrinkage (%)						
Moisture Content (%)						

NOTES/REMARKS: The samples were tested oven dried, dry sieved and in a 125-250mm mould.

Sample/s supplied by the client * Cracking occurred + Curling occurred

Accredited for compliance with ISO/IEC 17025 - Testing.
The results of the tests, calibrations, and/or measurements included in this document are traceable to the International System of Units (SI). References are traceable to National Measurement Institutes or laboratories accredited to ISO/IEC 17025 by a signatory to the ILAC MRA.

Tested at Trilab Perth Laboratory

Authorised Signatory

A. Harrap

NATA
WORLD RECOGNISED ACCREDITATION

Laboratory No. 9926

Trilab
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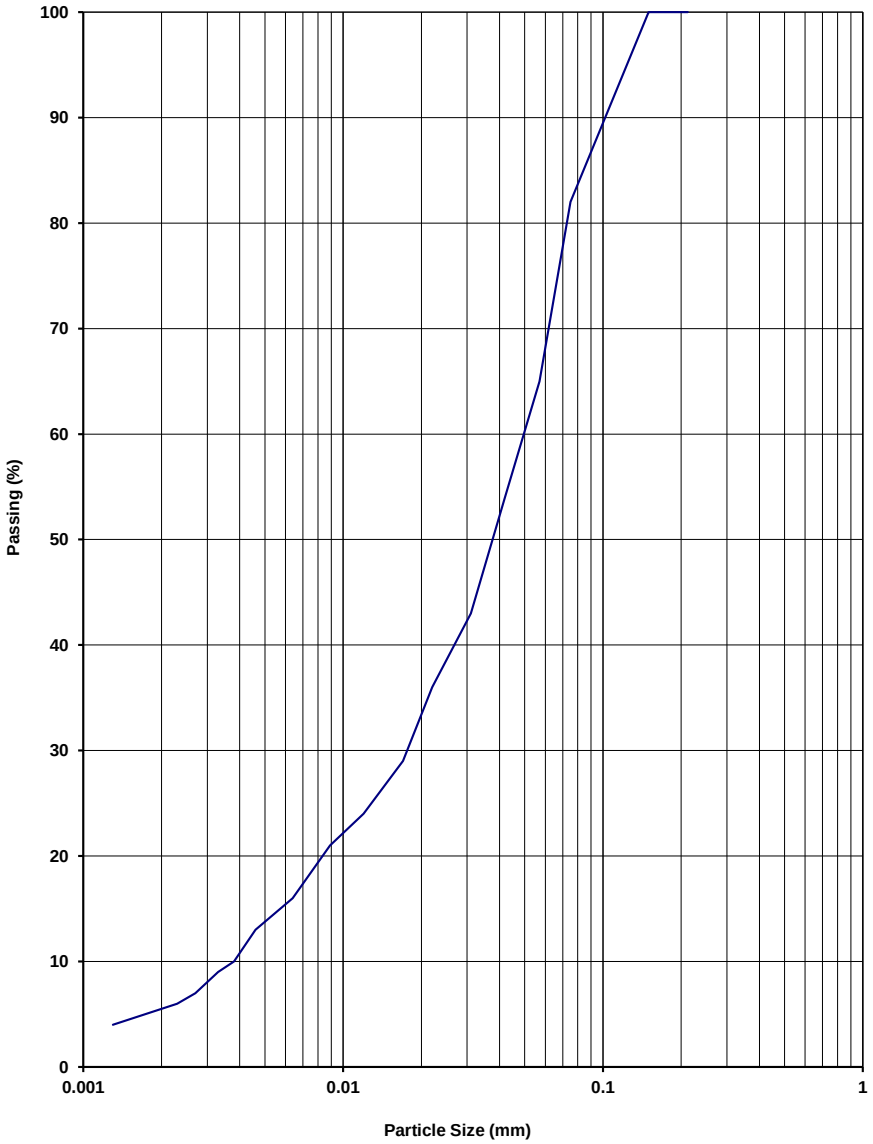
PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1

Client	CMW Geosciences	**Report No.**	P22050080-G
		Workorder No.	0020583
Address	PO Box 2147 Churchland, WA 6018	**Test Date**	27/6/2022
		Report Date	6/7/2022
Project	Mallina Gold Project PFS		
Client ID	Submitted Tailings Sample	**Depth (m)**	Not Supplied

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	
13.2	
9.5	
6.7	
4.75	
2.36	
1.18	
0.600	
0.425	
0.300	
0.212	
0.150	100
0.075	82
0.057	65
0.042	54
0.031	43
0.022	36
0.017	29
0.012	24
0.0089	21
0.0064	16
0.0046	13
0.0038	10
0.0033	9
0.0027	7
0.0023	6
0.0013	4



NOTES/REMARKS: -

Moisture Content 19.7% -2.36mm Soil Particle Density(t/m^3) 2.68

Sample/s supplied by the client

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Tested at Trilab Perth Laboratory

Authorised Signatory

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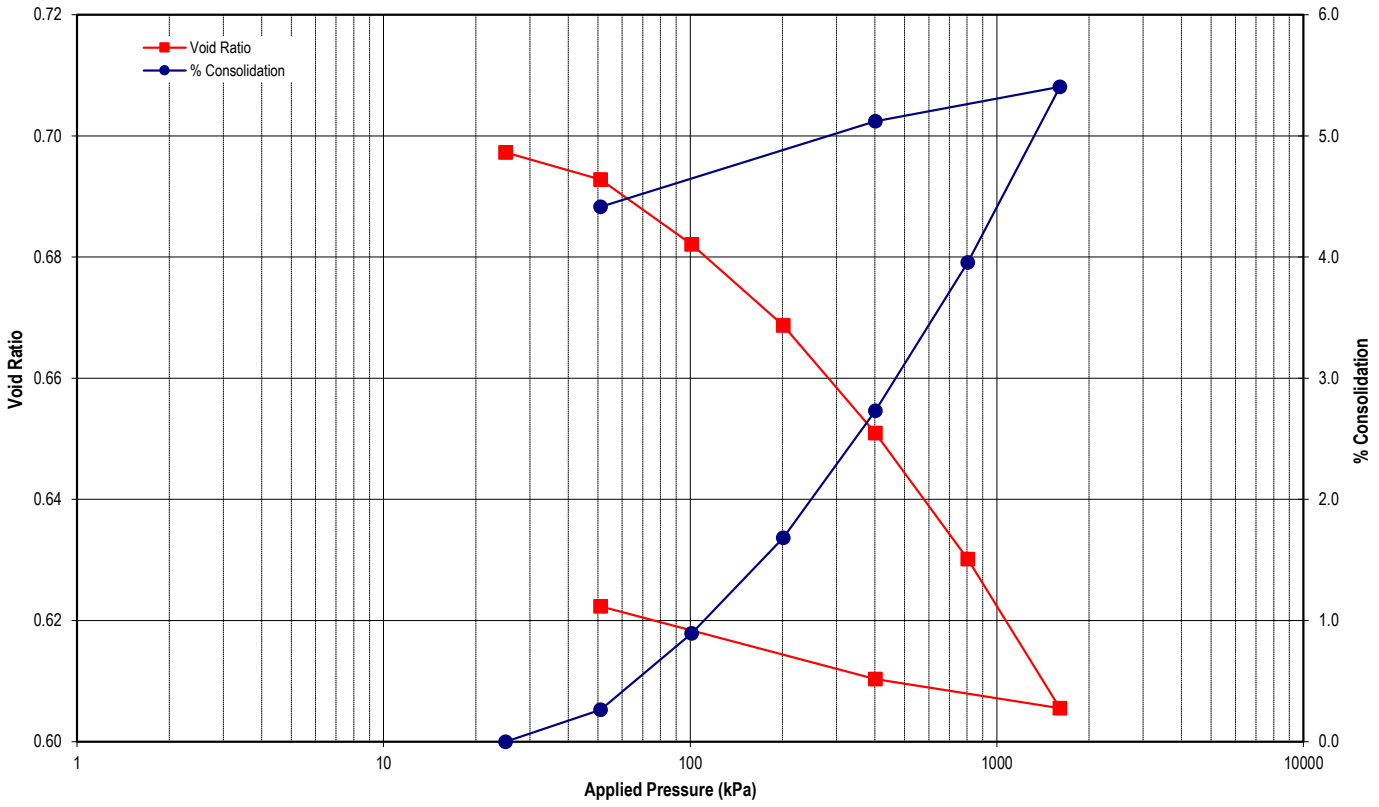
OEDOMETER TEST REPORT

Test Method: AS1289.6.6.1, 3.5.1

Client:	CMW Geosciences	**Report No.:**	P22050080-OED
		Workorder No.	20583
Address:	PO Box 2147 Churchland, WA 6018	**Test Date:**	27/06/2022
		Report Date:	13/07/2022
Project:	Mallina Gold Project PFS		
Client Id.:	Submitted Tailings Sample	**Depth (m):**	Not Supplied
Description:	SILT - grey		



Initial Wet Density (t/m^3):	1.88	Initial Moisture (%):	19.8	Initial Height (mm):	19.74
Initial Dry Density (t/m^3):	1.57	Final Moisture (%):	23.3	Final Height (mm):	18.80
Initial Mass (g):	111.27	Initial Voids Ratio:	0.703	Test Condition:	Inundated on load
Particle Density (t/m^3):	2.68	Initial Degree of Saturation (%):	78.8	Remoulded Sample	

Remarks:

REP03103

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Tested at Trilab Perth Laboratory

Authorised Signatory

C. Channon

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OEDOMETER TEST REPORT

Test Method: AS1289.6.6.1, 3.5.1

Client:	CMW Geosciences	**Report No.:**	P22050080-OED
		Workorder No.	20583
Address:	PO Box 2147 Churchland, WA 6018	**Test Date:**	27/06/2022
		Report Date:	13/07/2022
Project:	Mallina Gold Project PFS		
Client Id.:	Submitted Tailings Sample	**Depth (m):**	Not Supplied
Description:	SILT - grey		

TEST RESULTS

Stage	Load (kPa)	Cc	k (m/s)	Cv (m^2/yr) t_{50}	Cv (m^2/yr) t_{90}	Mv ($kPa^{-1}x10^{-3}$)	C_a x 10^{-3}	% Consolidation
1	25-51	0.014	1.7E-09	0.22	55.13	0.101	0.00	0.3
2	51-101	0.036	2.3E-09	0.23	57.80	0.127	0.36	0.9
3	101-201	0.045	1.5E-09	0.16	60.13	0.080	0.00	1.7
4	201-402	0.059	8.9E-10	0.29	54.38	0.053	0.00	2.7
5	402-804	0.069	4.1E-10	0.03	42.04	0.031	0.23	4.0
6	804-1607	0.082	2.4E-10	0.35	41.84	0.019	1.28	5.4
7	1607-402	0.008	5.7E-11	171.16	73.53	0.002	0.07	5.1
8	402-51	0.013	1.7E-10	9.63	25.64	0.021	0.07	4.4

Remarks:

REP03103

Accredited for compliance with ISO/IEC 17025 - Testing.
The results of the tests, calibrations, and/or measurements included in this document are traceable to the International System of Units (SI). References are traceable to National Measurement Institutes or laboratories accredited to ISO/IEC 17025 by a signatory to the ILAC MRA.

Tested at Trilab Perth Laboratory

Authorised Signatory

C. Channon

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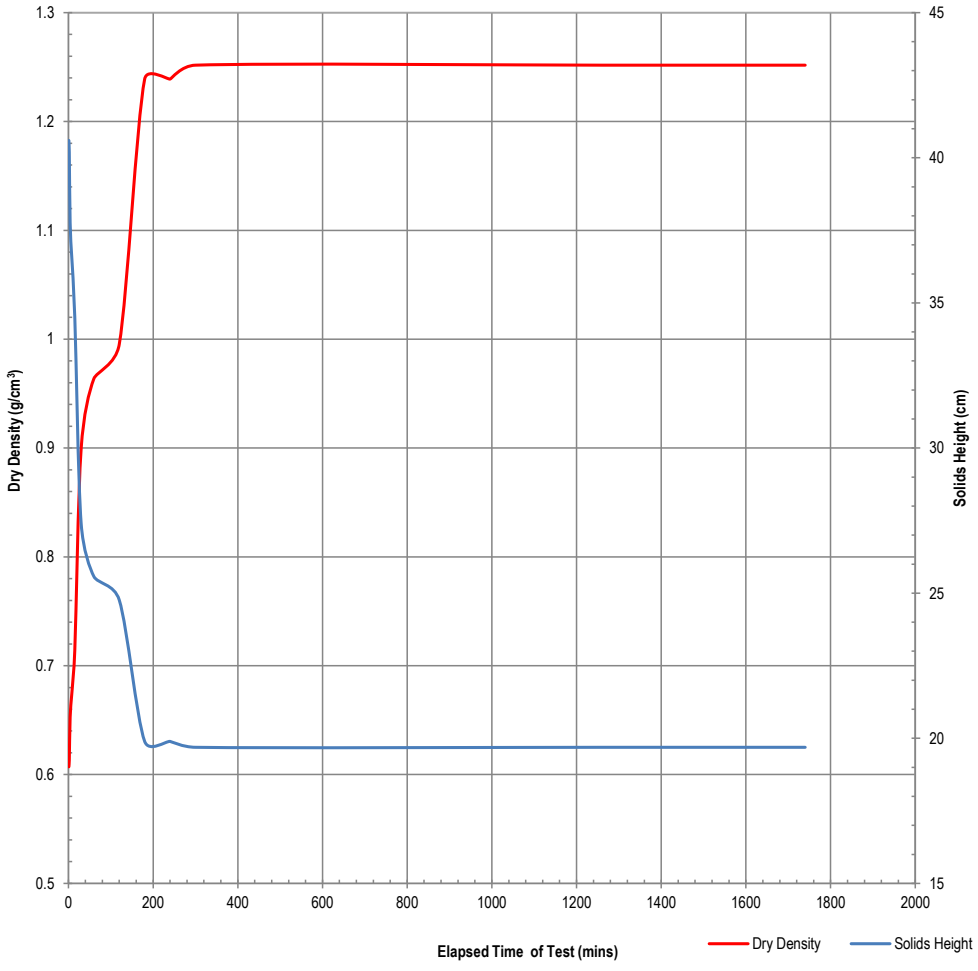
SETTLING TEST REPORT

Settling Test Procedure - as Supplied by Client

Client	CMW Geoscience	**Report No.**	22050080-SETL
Address	PO Box 2147 Churchland, WA 6018	**Test Date**	27/06/2022
		Report Date	07/07/2022
Project	Mallina Gold Project PFS		
Client ID	Submitted Tailings Sample	**Depth (m)**	Not Supplied
Description	SILT - grey	**Sample Type**	Poured Slurry

RESULTS OF TESTING

Initial Mass of Slurry (g):	2720	**Volume of water in Cylinder (ml)**		2000.0
Settling Test Type:	Drained	**Mass of dry waste material (g)**		1214.2



Elapsed Time (min)	Solids Height (cm)	Dry Density (g/cm³)
1	40.60	0.607
2	40.19	0.613
4	37.75	0.653
8	36.54	0.675
15	34.51	0.714
30	27.40	0.899
60	25.58	0.964
120	24.76	0.995
180	19.89	1.239
240	19.89	1.239
300	19.69	1.252
1260	19.69	1.252
1500	19.69	1.252
1620	19.69	1.252
1740	19.69	1.252

Remarks:

Sample/s supplied by client

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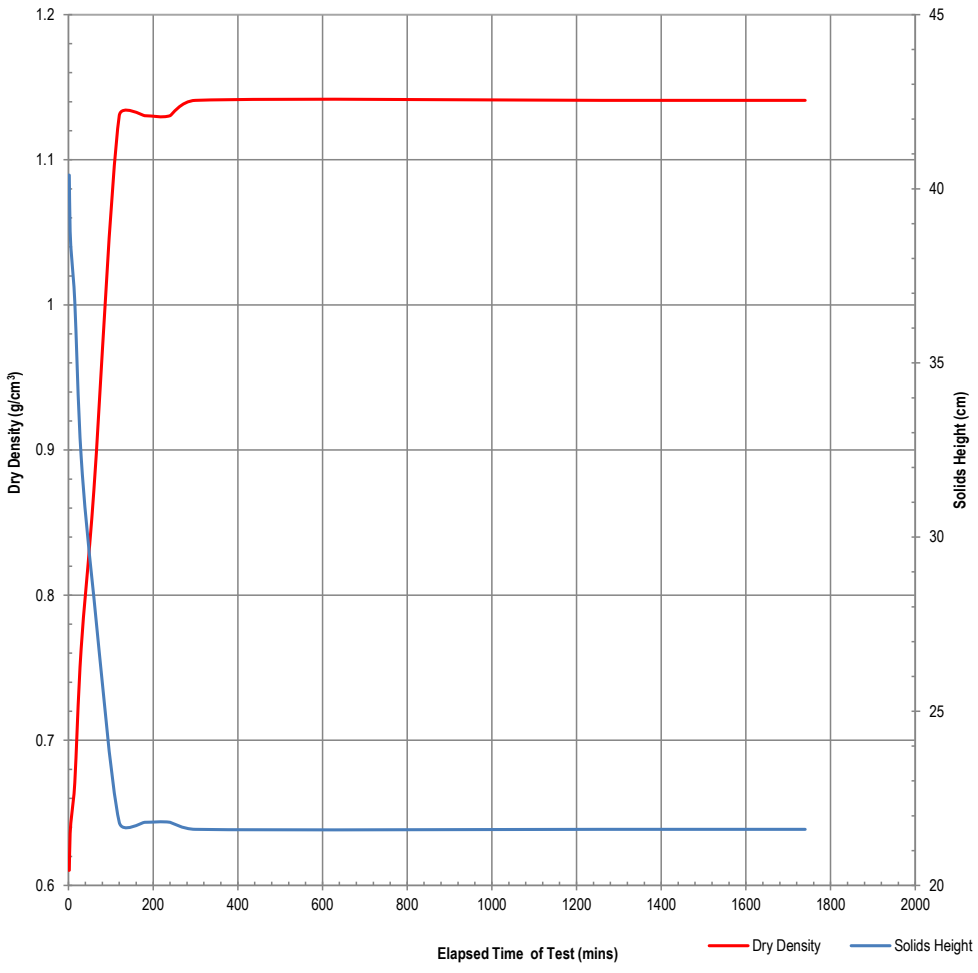
SETTLING TEST REPORT

Settling Test Procedure - as Supplied by Client

Client	CMW Geoscience	**Report No.**	22050080-SETL
Address	PO Box 2147 Churchland, WA 6018	**Test Date**	27/06/2022
		Report Date	07/07/2022
Project	Mallina Gold Project PFS		
Client ID	Submitted Tailings Sample	**Depth (m)**	Not Supplied
Description	SILT - grey	**Sample Type**	Poured Slurry

RESULTS OF TESTING

Initial Mass of Slurry (g):	2720	**Volume of water in Cylinder (ml)**		2000.0
Settling Test Type:	Undrained	**Mass of dry waste material (g)**		1220.8



Elapsed Time (min)	Solids Height (cm)	Dry Density (g/cm³)
1	40.39	0.610
2	40.39	0.610
4	38.78	0.636
8	37.97	0.649
15	36.76	0.671
30	32.31	0.763
60	28.27	0.872
120	21.81	1.130
180	21.81	1.130
240	21.81	1.130
300	21.61	1.141
1260	21.61	1.141
1380	21.61	1.141
1500	21.61	1.141
1620	21.61	1.141
1740	21.61	1.141

Remarks:

Sample/s supplied by client