Bluebird Gold Mine

GNH Pit TSF Conversion

Westgold Resources Limited

Reference: 754-PERGE340337-R02

20 June 2024

BLUEBIRD MINE

GNH Pit TSF Conversion – Geotechnical Assessment and TSF Design

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PREPARED FOR

Westgold Resources Limited
Great Northern Highway, Meekatharra

PREPARED BY

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QUALITY INFORMATION

[redacted]

Restriction on Disclosure and Use of Data

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
ANCOLD	Australian National Committee on Large Dams
BM	Bluebird Mine
BoM	Bureau of Meteorology
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety
DFCC	Dam Failure Consequence Category
DSA	Design water Storage Allowance
DWER	Department of Water and Environmental Regulation
ESCC	Environmental Spill Consequence Category
EAP	Emergency Action Plan
GNH	Great Northern Highway
IFD	Intensity Frequency Duration
IPTSF	In-Pit Tailings Storage Facility
PAR	Population at Risk
PSD	Particle Size Distribution
Coffey	Tetra Tech Coffey Pty Ltd
TSF	Tailings Storage Facility
TSDS	Tailings Storage Data Sheet
Westgold	Westgold Resources Limited

1. INTRODUCTION

Westgold Resources Limited (Westgold) proposes to develop and use the previously mined-out Great Northern Highway (GNH) Pit as an In-Pit Tailings Storage Facility (GNHIPTSF) at the Bluebird Mine (Bluebird). Bluebird is located approximately 15km south-south-west of Meekatharra, Western Australia. The GNH Pit is located adjacent to Great Northern Highway, within the precinct of Westgold's current Bluebird mine.

This document presents details required by the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS, 2013 and 2015) for preparation of a geotechnical assessment for the GNHIPTSF design. T

This report was commissioned by Westgold under purchase order no SE177204 dated 1 January 2024. Terms of reference are outlined in Tetra Tech Coffey Pty Ltd (Coffey) proposal '*Proposal for GNH Pit Conversion – Geotechnical Assessment and TSF Design*' (ref.754-PERGE340337-P01, dated 29 November 2023).

1.1 GENERAL

This report was compiled in general accordance with the following guidelines:

DEMIRS (2013)[1], *'Code of practice: tailings storage facilities in Western Australia'*;

DEMIRS (2015a)[2], *'Guide to the preparation of a design report for TSFs'*;

DEMIRS (2015b)[3] *'Guide to departmental requirements for the management and closure of TSFs'*; and

ANCOLD (2019)[4], *'Guidelines on Tailings Dams Planning, Design, Construction, Operation and Closure'*.

In accordance with Tables 1 and 2 of DEMIRS (2013), the proposed GNHIPTSF is classified with a hazard rating of 'Medium **- Category 2**'. Based on classification outlined in Tables 1 and 2 of ANCOLD (2019), the proposed GNHIPTSF is assigned a Dam Failure Consequence Category (DFCC) of '**High C**' due to '**Medium**' impact / damage level and a population at risk (PAR) of > 1.

1.2 SCOPE OF WORK

The objectives of the study were to undertake the following:

1.2.1 Slope assessment

- Assess potential effects of the proposed tailings storage on the stability of the GNH pit west wall, with attention on potential movement of Great Northern Highway;
- Advise on effects of dewatering on pit stability; and
- Advise on details of TSF design, to reduce the potential for adverse effects to the west wall.

1.2.2 TSF design

Compile a TSF design report, including:

- Pit wall stability assessment (other than the west wall), including consideration of wall performance post-mining;
- Review of groundwater monitoring information, with comment on groundwater management and details of monitoring / recovery bores;
- TSF design concept; and
- Input to a preliminary closure concept.

2. BACKGROUND

2.1 LOCATION

Bluebird is located approximately 15km south-south-west of Meekatharra, Western Australia. The GNH Pit is located adjacent to Great Northern Highway, within the precinct of Westgold's current Bluebird mine. A site layout plan of the proposed GNHIPTSF and Bluebird tenement boundaries is presented as Figure 1.

2.2 OWNERSHIP

The site is owned by Westgold, an ASX listed Australian based company in Western Australia.

2.3 EXISTING FACILITIES

Bluebird has open pits, underground operations, waste dumps, a processing plant, associated service facilities and an accommodation village. The tailings storage facilities at Bluebird include the active Bluebird East (BEIPTSF), the inactive Bassetts West (BWIPTSF), and future Surprise IPTSF.

2.4 HISTORY

BEIPTSF and BWIPTSF are located approximately 500 m and 1.2 km east of the processing plant respectively. BEIPTSF is the active TSF at Bluebird and was commissioned in July 2016. BWIPTSF is at capacity, has been decommissioned since 2016, and is no longer used to store new tailings.

BWPTSF was commissioned in November 1999 and operated until May 2004, when the mine site was put under care and maintenance by St Barbara Mines. Tailings deposition resumed again between August 2007 and October 2008, when Mercator Gold Pty Ltd placed the mine site under care and maintenance. GMK Exploration Pty Ltd recommissioned the facility in January 2013 and tailings deposition continued until January 2014, at which time the site was placed under care and maintenance.

Metals X acquired the Bluebird site in May 2014 and it remained under care and maintenance until approval was gained to recommence mining. Tailings deposition resumed in BWIPTSF in October 2015 and switched to BEIPTSF when the facility was commissioned in July 2016.

The Bluebird East Pit was mined until 2002 (including underground mining below the pit) before being placed in care and maintenance. The west wall of the pit is near the highway, and a monitoring program is in place to assess risk of slope failure with potential to affect the highway (currently carried out at annual intervals by Coffey).

The GNH Pit is partially connected to Bluebird East Pit, separated by a mid-pit saddle. Current approval for placement of tailings in Bluebird East Pit is to the height of the saddle connecting the pits (minus tolerance). If GNH Pit is converted to in-pit tailings storage, then the full height of the combined pit can be utilised, leading to greater storage capacity in the combined facility.

2.5 DEVELOPMENT OF NEW IPTSF

Westgold proposes to develop and use GNH Pit as an IPTSF for continued tailings storage. The development and use of the pit for tailings storage will utilise existing disturbed areas and allow the pit void to be filled, which would otherwise remain open.

It is noted that in-pit tailings storage provides the following advantages:

- Meeting sustainability objectives by using an existing void and not creating a larger mining footprint. It is noted that IPTSF development and use has been undertaken for many years in WA and is now seen as a 'leading practice'.
- Increased recovery of water when compared against an above-ground TSF.
- Significantly lower construction costs when compared against an above-ground TSF.
- Lower overall risks (in terms of operations and closure) when compared against an above-ground TSF.

3. TAILINGS PROPERTIES

3.1 PHYSICAL PROPERTIES

3.1.1 Lab testing

Tailings test work was previously conducted as part of the design report for BEIPTSF (Coffey, 2016)[5]. The work comprised PSD, hydrometer and oedometer (consolidation) testing. The tailings particle size distribution indicated the sample was a sandy silt with 75% passing a 75 micron sieve and 6% passing the 1 micron size.

3.1.2 Consolidation testing

Oedometer testing was performed as part of the design report for BEIPTSF (Coffey, 2016)[5], to confirm tailings consolidation characteristics. A bulk sample was received at the laboratory and remoulded for the test. The results are presented in Table 2 and indicated relatively good consolidation characteristics.

Table 1 - Tailings Consolidation Characteristics

Stage	m_v (m^2/kN)	c_v (m^2/year)
50 kPa	-	12.18
100 kPa	4.80×10^{-4}	18.13
200 kPa	3.83×10^{-4}	26.99
400 kPa	2.61×10^{-4}	40.18
800 kPa	1.73×10^{-4}	59.81

Tailings deposited into the proposed GNHIPTSF are expected to have the same physical properties as the tailings deposited into the existing TSFs. The tailings properties from the Coffey 2016[4] investigations can therefore be adopted for the GNHIPTSF design.

3.2 RECONCILIATION OF IN SITU TAILINGS DENSITY

A reconciliation of the average in situ tailings density was performed as part of annual audit (CMW, 2023)[6]. A density of 1.4 t/m³ was estimated for tailings deposited in the Bluebird East In-Pit TSF.

3.3 RATED THROUGHPUT

As per the CMW (2023)[6] annual audit report, the tailings production between October 2022 and September 2023 was 1.57 Mtpa, which is less than prescribed rate of 2.5 Mtpa in the Department of Water and Environmental Regulation (DWER) licence.

4. HAZARD RATING AND CONSEQUENCE CATEGORY

Hazard rating / consequence category is utilised to establish various criteria for design and to assess the risk of GNHIPTSF failure to a level appropriate to the consequences of such a failure.

4.1 DEMIRS HAZARD RATING

Based on classification criteria outlined in Tables 1 and 2 of DEMIRS (2013), the proposed GNHIPTSF was assigned a hazard rating of '**Medium - Category 2**'. The GNHIPTSF is classified as **Category 2** due to the potential for impact on Great Northern Highway. A **Medium** damage type for impact to the highway is characterised by:

- Loss of life or injury is possible although not expected (Medium);
- Limited or no potential for human exposure; (Low category)
- Temporary loss of assets is possible and economic repairs can be made (Medium);
- Insignificant loss of tailings storage capacity (Low);
- Limited potential for damage to natural environment (Low);
- Limited potential for adverse effects on flora and fauna (Low); and
- Limited or no potential for damage of items of heritage or historical value (Low).

The risk for downstream impacts is '**Low'**, due to a maximum embankment height of less than 5 m (regarding IPTSFs). An IPTSF failure if it occurred would likely not result in tailings and water spilling out and impacting people, destroying assets or damaging the environment.

Note that there will be no perimeter / containment embankments around the GNHIPTSF, therefore no dam break analysis is required.

4.2 ANCOLD CONSEQUENCE CATEGORY

Based on ANCOLD (2019), the Dam Failure Consequence Category (DFCC) for the GNHIPTSF is deemed '**High C**' due to '**Medium**' impact / damage level and PAR of > 1 (refer Tables 1 and 2 of ANCOLD, 2019). An IPTSF failure if it occurred would likely not result in tailings and water spilling out and impacting people, destroying assets or damaging the environment. A '**Medium**' impact / damage level for the GNHIPTSF is characterised by:

- Loss of infrastructure $10M < $100M;
- Significant restrictions to business (i.e. the mine);
- Public health 100 to 1000 people affected;
- Social dislocation: < 100 people or 20 business months;
- Impact area < 1 km^2;
- Impact duration < 5 years; and
- Limited effects on cleared land, ephemeral streams and non-endangered local flora and fauna.

The above categories are determined predominantly by the potential impact of a failure of the west wall on Great Northern Highway, a significant road infrastructure. The downstream impacts of a failure of the proposed tailings infrastructure would be **Minor**.

It is assessed that the impact severity on the natural environment from a potential GNHIPTSF tailings and water spill is '**Medium**', and spilling of water from the GNHIPTSF during a 1:100-year Annual Exceedance Probability (AEP), 72-hour duration storm event is unlikely, with a PAR of > 10 (assigned to the GNHIPTSF tailings and water spill event), therefore the Environmental Spill Consequence Category (ESCC) for the GNHIPTSF is deemed '**Low**'.

4.3 DESIGN CRITERIA

The following criteria were adopted for the GNHIPTSF design based on the hazard rating / consequence category assessment and data supplied by BM:

- Tailings production rate of approximately 150,000 tpa;
- Tailings dry density of 1.4 t/m^3;
- Recommended freeboard criteria and design water storage allowance (DSA):
  - Based on DEMIRS (2015a), for a 'Medium **– Category 2**' hazard rating, the GNHIPTSF shall be designed to be capable of temporarily storing rainfall from a 1:100-year Annual Exceedance Probability (AEP), 72-hour storm event (i.e. runoff water from the waste dump and impoundment pit surface areas) plus a minimum pit wall freeboard of 0.5 m (vertical height between the stormwater and minimum pit rim levels).
  - Based on ANCOLD (2019), for a '**High C**' DFCC, the GNHIPTSF shall be capable of temporarily storing rainfall from a 1:100-year AEP, 72-hour storm event plus wave run-up due to a 1:10 year AEP wind event, with provision made for an additional pit wall freeboard of 0.5 m.

4.4 REPORTING AND INSPECTION CRITERIA

Reporting and operating requirements for the GNHIPTSF, classified as '**Low - Category 3**' (based on DEMIRS, 2015a), includes the following:

- Design (including site investigation): report prepared by a competent person. Completion of tailings storage data sheet (TSDS).
- Construction: constructed by a competent person. Provision of detailed construction report with as-built drawings.
- Operations: inspection and audit every 3 years by competent person. It is recommended that routine daily inspection by site personnel and annual audit by competent person should be implemented to avoid major operational / environmental problems and provide appropriate remedial actions in due course.
- Pre-closure: inspection report by competent person confirming the current status and intended decommissioning, rehabilitation and monitoring strategies with as-built drawings.
- Relinquishment: final report by a competent person confirming closure objectives have been achieved.

Recommended inspection type for a TSF classified as '**Low**' (ANCOLD, 2019):

- Intermediate: annual;
- Routine: Daily to 3 times/ week;
- Special: as required, e.g.
  - Seepage along the downstream slope;
  - Any waste dump failure;
  - Any uncontrolled spills of tailings from the IPTSF footprint;
  - Any sustained period where the pond size exceeds the envisaged operating pond size.

5. SITE SELECTION

5.1 CLIMATE

The following climatic data from Bureau of Meteorology (BoM, 2023)[7] was used in the GNHIPTSF design:

- The nearest BoM weather station to the Bluebird site is Meekatharra Airport (Station Number 007045), which is 32 km away from BM and has collected rainfall data since 1944. The evaporation data was extracted from Department of Primary Industries and Regional Development – *Evaporation data for Western Australia* with the selection of Norseman station (GJ Luke, KL Burke and TM O'Brien, 2003).
- The mean monthly rainfall values and evaporation values are shown on Figure 1. Average annual rainfall of 232.4 mm and annual evaporation of 4,068 mm were adopted for design purposes;
- The rainfall intensity Intensity-Frequency-Duration (IFD) chart pertaining to BM is presented on Figure 2. Based on the IFD chart, a 1:100-year AEP, 72-hour storm event can be expected to generate approximately 191 mm of rainfall.

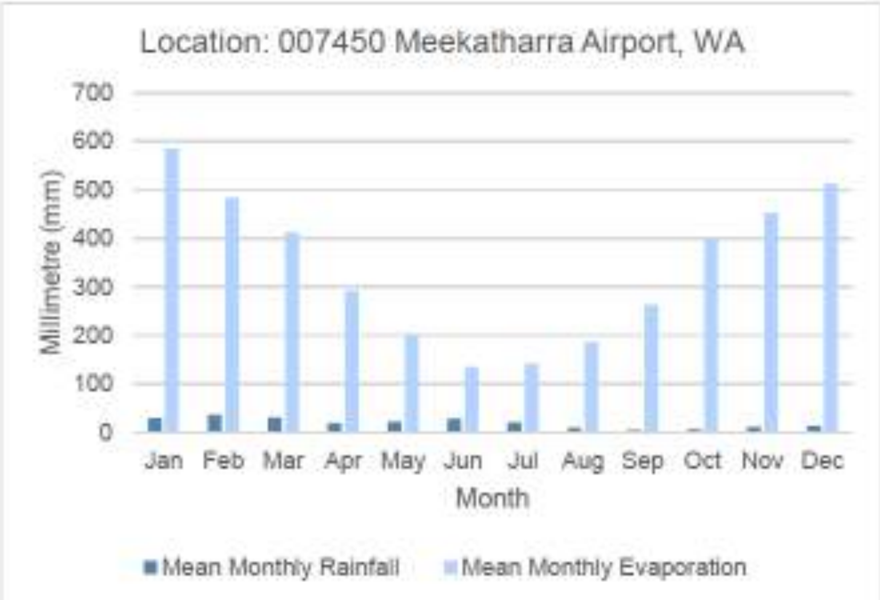

Figure 1: Monthly Rainfall and Evaporation Chart (BoM, 2023)

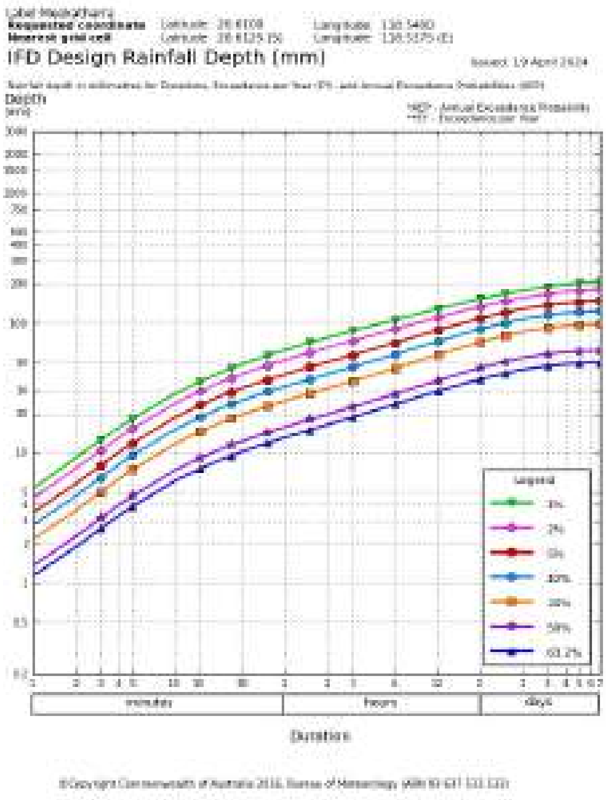

Figure 2: Rainfall Intensity Frequency-Duration(IFD) Chart (BoM, 2023)

5.2 GEOLOGY AND SOILS

The Great Northern Highway gold deposit is located on the eastern side of the Great Northern Highway opposite the Bluebird ore processing facility. This deposit was previously known as Bluebird East. The Great Northern Highway mine contains three gold lodes located around a south plunging synform and are named here the Western, Eastern and Northern Lodes.

The Western lode is located on the western limb of the fold. This part of the Great Northern Highway is made up of a main vein that is dominantly NE-SW-striking and dips approximately 65°to the SE. There are several NNE-SSW-striking veins nearby that are less continuous narrower and have lower gold grades than the main vein. Gold grades in the Western Lode are commonly greater than 10 g/t, whereas in the subordinate veins they are typically less than 2 g/t.

The gold content in the Western Lode is related to the orientation of the vein, which varies subtly along strike from south to north. South of approximately 70439A00 mN (AMG) is a 200 m long NNESSW-striking segment and north of this the lode is NNE-SSW-striking. The latter segment has a strike length of approximately 400 m and contains more gold than where it closer to N-S-striking. The gold distribution in the Western Lode was examined in terms of metal accumulation in longitudinal section. The metal distribution was subsequently transferred to a plane corresponding to the hanging wall of the vein using structure contours (Fig. 1). The SE-dipping tabular vein contains N-S-trending and south-plunging shoots that define maxima of gold content. Drilling to-date has not fully delineated the extents the gold distribution down dip of the vein.

The Eastern Lode is located east of the synform and has a strike length of nearly 700 m. This is the largest and most complicated of the lodes in the Great Northern Highway mine and is made up of two main elements. The first is an array of NE-SW-striking and east-dipping veins with an N-S-striking and east-dipping enveloping surface. The other is a sub horizontal, gently south-plunging breccia that is over 100 m wide and extends for 200 m down plunge. The east-dipping vein package persists north and south of the breccia. Remnants of these features are visible in the northern wall of the pit (Figure 2).

Individual veins may be up to several tens of centimetres wide but in section gold intervals may be several metres wide. The breccia appears to be an amalgamation of several vein orientations that produced close to massive quartz body. In section, both the vein package and breccia components of the Eastern Lode have an overall south plunge. The locus of gold mineralisation appears to have been in the sub horizontal breccia based on the thickness and grade of drilling intercepts and the intensity of associated quartz alteration and veining.

The nature of the sub horizontal breccia and its interaction with the adjoining east-dipping vein package varies from south to north. The southern half of the breccia contains two sub horizontal zones approximately 5-10 m thick and are separated by a zone about 80 m wide containing the SE dipping veins. The two breccia intervals converge northwards to a single 40 m thick body. This body becomes progressively steeper east-dipping, giving way to a package of SE-dipping intervals to the north.

The Northern lode is located north of and halfway between the Western and Eastern lodes. It contains a main steeply dipping vein and several parallel subordinate ones. The lode has approximate 170 m strike length. The southern part of the lode is NE-SW-striking and SE-dipping. The northern portion is NNW-SSE-striking and dips steeply west. The highest grade and widest part of the lode is situated north of the inflection at 7044250 mN (AMG).

5.3 HYDROGEOLOGY

Rockwater (2024)[8] report states that "*There are a number of pastoral bores and wells in the Yaloginda region, as well as Bluebird project bores; they are recorded in the Department of Water and Environmental Regulation (DWER) Water Information Reporting (WIR) database, and shown on the Meekatharra 1:100 000 Geological Sheet (Romano, Ivanic and Chen, 2017). Note that the WIR data are mostly old, and the bore locations in the database are inaccurate. Bluebird project bores have been drilled around mine pits for water supply, dewatering, or monitoring. Aquifers at Great Northern Highway/Bluebird East pits are largely restricted to the discontinuous, ferruginous quartz-carbonate mineralised rocks, where fresh or slightly weathered, and these were targeted for dewatering bores installed before and during mining of the pits. Other areas of talc chlorite, basalt and dolerite, and clayey weathered rocks are generally of low hydraulic conductivity.*"

5.4 FLORA AND FAUNA

The storage will be in a mined-out pit void. The pipeline corridor for the slurry and return water pipelines will be along existing tracks / accessways. Minor clearing will be required, this will result in limited clearing of scrub and low trees, mostly regrowth, along the track alignment. Large trees will be preserved as directed by the BM Environmental Coordinator.

6. GEOTECHNICAL ASSESSMENT

6.1 SITE VISIT

A site visit by a Principal Geotechnical Engineer from Coffey was conducted on 20 February 2024. During the visit, a visual assessment of the GNH Pit was made with a particular focus on the proposed placement of tailings, including local stability and erosion resistance, and likely access for tailings spigots. The focus of the site visit was the impact of tailings deposition on the stability of the GNH wall. A report was submitted to Westgold detailing the assessment outcomes (Coffey, 2024)[8].

6.2 GNH PIT

No significant changes to the GNH west wall were noted since the previous monitoring visit in April 2023. There are no large scale failures present in this pit wall. Several erosion gullies are present which have not changed significantly in recent monitoring intervals. The slope is approximately 65m high and benched at approximately five metre intervals. Survey provided by Westgold indicates a slope angle of approximately 40 degrees from the horizontal, which decreases to 30 degrees near the top of the slope. The south end of the pit is essentially a single slope, while the northern end is split into two segments by a wide bench approximately 25m from the top of the slope. The pit is partially filled with water.

Photographs of the western pit wall are provided below:

Figure 3 - West Wall of GNH Pit from north end

Figure 4 - Saddle between GNH and Bluebird East pits

Figure 5 - GNH Pit west wall from east side (left of frame is adjacent to GNH)

The change from one slope to a segmented slope approximately coincides with a change in weathering condition, with much fresher rock being present on the north side of the slope.

6.3 BLUEBIRD EAST TSF

During the site visit, observations were also made of the adjacent, in operation, Bluebird East In-Pit TSF.

Tailings are currently being placed from three spigots located in the north-west, north-east and south-east of the pit. The north-west spigot (pictured below) appears to deposit over relatively competent rock, with little erosion present. Significant erosion of the pit face was noted at the north-east spigot point, the pattern of erosion indicates that this erosion gully predates the placement of the spigot, and likely deepened by tailings placement. This is possibly due to the erosion gully facilitating placement of the spigot lower on the slope than would otherwise be practical.

A significant previous slope failure has previously occurred along the south edge of the Bluebird East pit. The failed area was more weathered than the GNH west face, and in general the Bluebird East pit slopes exhibited a greater degree of weathering than the GNH pit. The north-west slope below the spigot appears to have comparable rock condition to the GNH pit.

6.4 SLOPE STABILITY ANALYSIS

Assessment of the overall slope stability was made using the Rocscience program SLIDE. The Morgenstein-Price method of analysis, which uses both force and moment equilibrium, was used, with composite non-circular failure surfaces.

The following parameters were used to represent the rock mass which has been divided into three weathering conditions.

Table 2 - Rock mass parameters for slope stability assessment

Rock Type	Model	Intact UCS (MPa)	GSI	mi	D
Gravel	Mohr-Coulomb	Unit weight - 19kN/m^3, Friction angle of 36 degrees, effective cohesion of 2kPa			
Grade I	Generalised Hoek-Brown	50	80	22	0.8
Grade II	Generalised Hoek-Brown	6	50	20	0.9
Grade III	Generalised Hoek-Brown	2	40	19	1.0

The highway traffic load was represented by a 20kPa surcharge, while the mine facilities were represented by a 10kPa surcharge.

The minimum factors of safety considered are 1.3 for an internal failure of the slope, or 1.5 for a failure that affects the Great Northern Highway surface (including shoulder). The south portion of the slope is considered more critical, as this contains a greater degree of weathering and closer proximity to the highway.

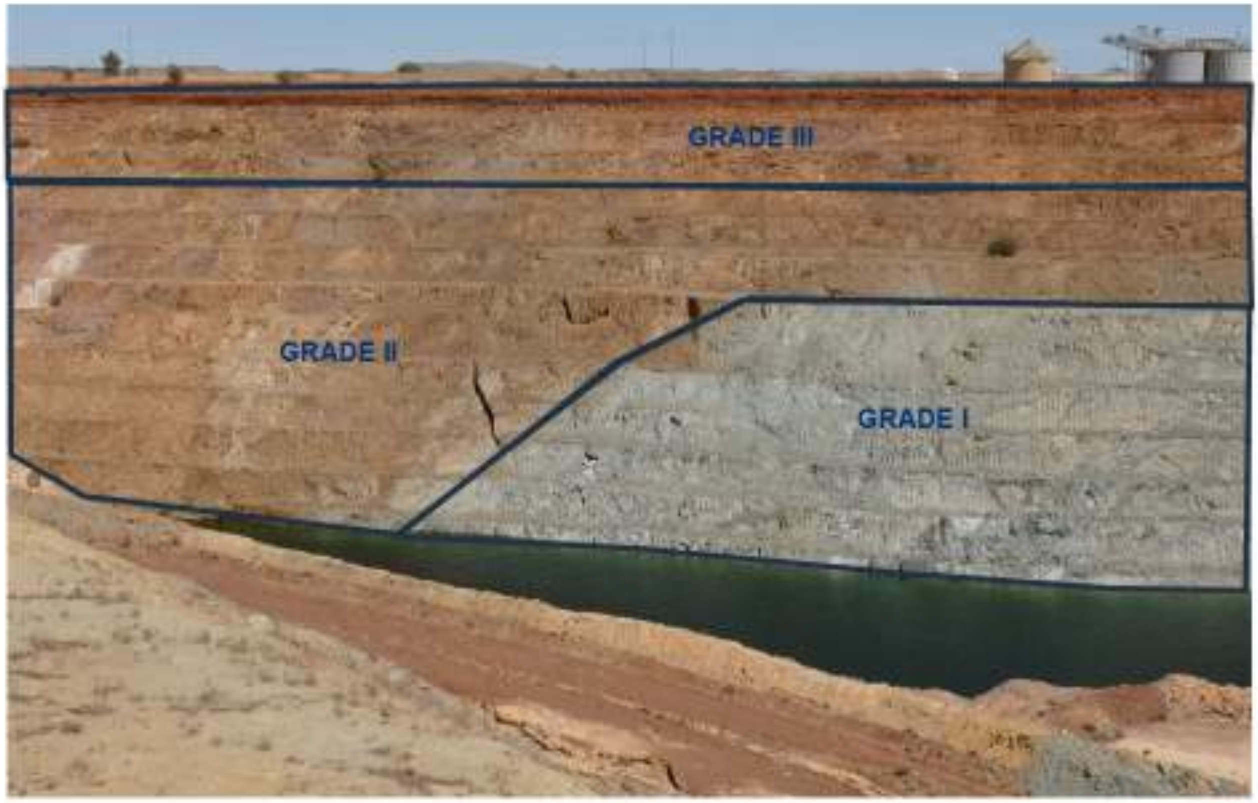

Figure 6 - Assigned weathering grades in the west wall

Slope stability under seismic load was estimated using a pseudo-static analysis. Based on AS1170.4[9] a seismic hazard factor of 0.09g is appropriate for the Meekatharra. This is multiplied by a k_p factor of 1.3 to represent a high importance category (considering the proximity of the highway) and subsequent 1,000yr recurrence interval, with half of the acceleration applied in the direction of the slope, as is typical for slope stability analysis. The material present in the slope is not susceptible to liquefaction.

The slope was also analysed under rapid drawdown conditions for a lowering of water level of 30m, with the results indicating only a minor impact.

Results of the slope stability analysis are presented below, with output plots provided in Appendix C.

Table 3 - Calculated factors of safety for west wall slope.

Scenario	Calculated FoS	Minimum
Internal Slope Failure	1.53	1.3
Failure of Road Surface	1.59	1.5
Seismic (affecting road)	1.42	1.1 [10]
Rapid drawdown	1.37	1.25

The two scenarios relating to current conditions are consistent with observations regarding the performance of the slope.

A "what-if" analysis was conducted for erosion and increased weathering at spigot locations. For this analysis two points of the slope were cut-back, with the surrounding rock increasing in weathering grade from Grade II to Grade III. The eroded sections were assigned arbitrarily, but at locations where spigots are likely to be placed. The eroded zones were not placed in the highly weathered near surface zones, as spigot placement in that zone is not recommended while the slope height is large. The what-if section is illustrated below.

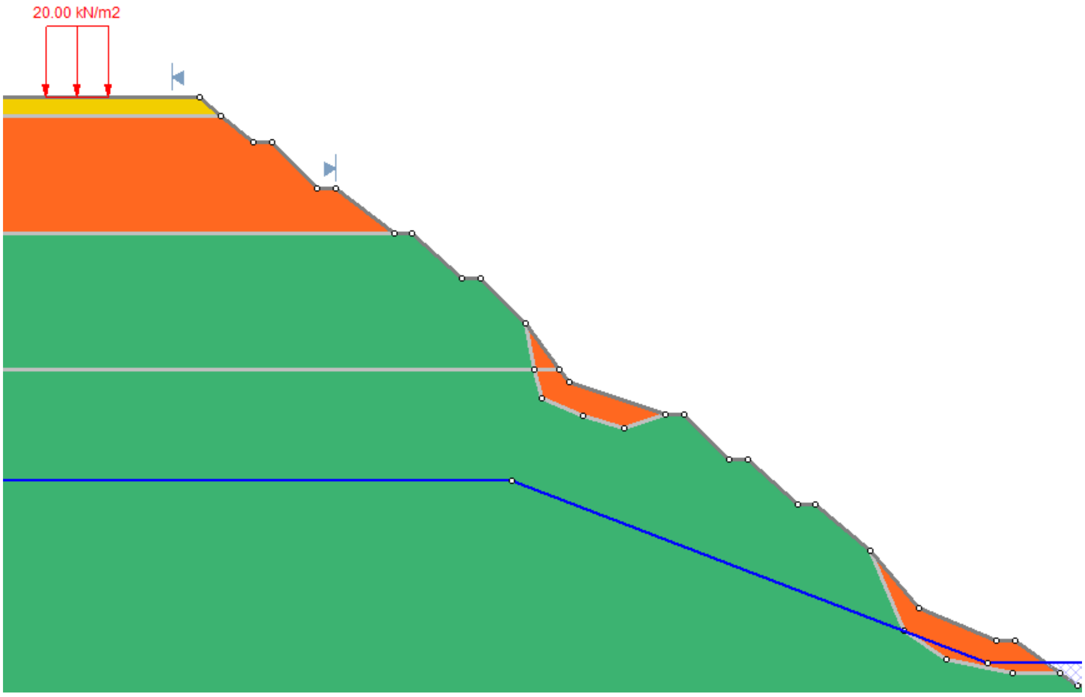

Figure 7 - What-If Analysis with eroded zones.

The analysis indicated that stability at the highway surface is not greatly affected by the development of minor erosion and weathering around spigots.

A further analysis was also carried out for a future scenario where the pit is substantially infilled with tailings, and a spigot placed within the Grade III rock has caused additional weathering to gravel. This analysis indicated that slope stability effects would be localised only, and stability of the highway surface remained at an acceptable level. At this height within the slope the spigot erosion is potentially more impactful to the road, and should be more carefully monitored, or the spigots placed elsewhere within the TSF once the tailings deposition reaches this level.

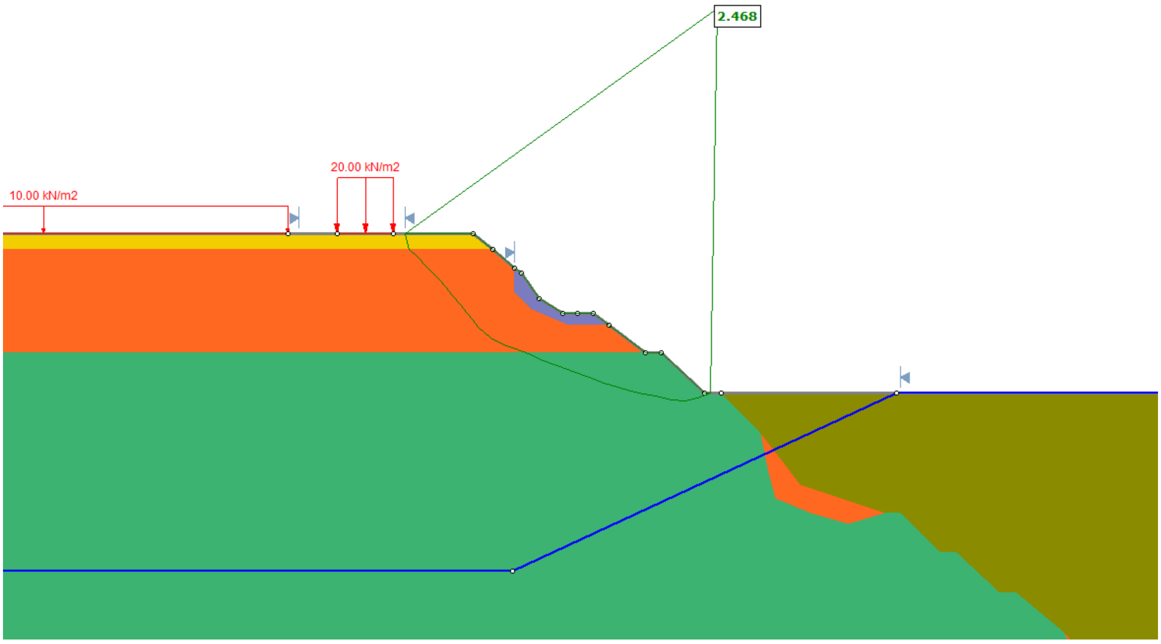

Figure 8 - Stability on an infilled pit with erosion/weathering at a high-placed spigot

6.5 STABILITY ASSESSMENT

The placement of tailings within the GNH pit will have an overall stabilising effect on the west wall that is adjacent to the Great Northern Highway.

To avoid adversely affecting west wall stability in the short to medium term, the following recommendations should be followed:

- Tailings should be placed so that the beach is formed against the west wall;
- Spigots should be placed below the top half of the slope, where the slope is closer to the highway and the grade of weathering is highest;
- The degree of erosion around the spigot location should be monitored regularly. If excessive erosion is noted, then placement at that spigot should cease and the spigot should be moved.
- Survey monitoring of the west wall should increase in frequency during the early phases of tailings placement.

7. HYDROGEOLOGICAL ASSESSMENT

Rockwater (2024)[11] conducted hydrogeological assessment of the potential impacts of GNH pit on the local groundwater and is appended with this report (Appendix D). The report is attached

7.1 GROUNDWATER LEVELS

Rockwater (2024)[11] states that "*Water levels in bores in the Yaloginda area – that are recorded in the WIR database – were reduced to m AHD using recorded ground levels or topographic contours drawn from the DEM-H version of the onesecond SRTM dataset (Geoscience Australia, 2011), and are contoured in Fig. 3. The levels indicate that premining, groundwater was flowing to the south-east from a mound centred on the ridge west of Bluebird, towards a drainage line that flows southwards to Lake Annean, where groundwater discharges and evaporates. The groundwater level at GNH pit would probably have been at about 455 m AHD prior to mining, about 15 m below ground level. A few of the water levels are impacted by dewatering or pumping from the bores/wells themselves or nearby, and there is some uncertainty in bore locations and the SRTM levels used to reduce water-level data to m AHD.*"

7.2 GROUNDWATER QUALITY

As per Rockwater (2024)[11], "*Water in the GNH pit lake (probably groundwater with minor surface-water runoff) was sampled from 2011 to 2020 and subjected to chemical analysis. The results show that the water is weakly saline, ranging from 3,400 to 5,200 mg/L TDS and overall salinity increased slightly with time. It is alkaline, and of a sodium chloride type, with low concentrations of metals. Many of the low metal concentrations recorded probably represent reporting limits rather than measured concentrations. Nitrate concentrations are high, ranging from 51 to 83 mg/L.*"

7.3 POTENTIAL IMPACTS ON TAILINGS DISPOSAL

Rockwater (2024)[11] states that, "*GNH pit has comparable geology with the neighbouring Bluebird East and Bassetts West pits, with discontinuous areas of permeable quartz-carbonate rock separated by rocks of low permeability, and so similarly-low impacts are expected once tailings are deposited in GNH pit. If tailings are emplaced to a level above the pre-mining groundwater level, i.e. about 455 m AHD, there is the potential for seepage from the tailings to surrounding groundwater, particularly down-hydraulic gradient to the south, although the rates of seepage would be expected to be low and restricted by the sealing of pores and fractures by the tailings, with minimal impacts on groundwater quality and levels. The nearest bore or well that could be impacted is 12 Mile Well located 2 km south of GNH pit. The status of the well is not known. There are no known Groundwater Dependent Ecosystems that could be affected.*"

8. GNHIPTSF DESIGN

8.1 GENERAL

The design and operation of the proposed GNHIPTSF is aimed at:

- Minimising environmental impacts (i.e. using the existing disturbed area, filling the pit void, and reducing seepage water losses);
- Allowing the facility to function with minimal daily input;
- Maximising storage capacity and providing adequate stormwater storage allowance;
- Optimising water recovery from the facility; and

- Ensuring an adequate monitoring program is in place.

The tailings storage data sheet (TSDS) of GNHIPTSF is presented in Appendix E. The design concept for the tailings storage is based on the design parameters, tailings properties and criteria presented in Sections 3, 4 and 5. It is like other IPTSFs in WA, incorporating a surface return water recovery system and perimeter monitoring bores (MBs) around the pit.

8.2 DRAWINGS

The following drawings of the proposed GNHIPTSF design are presented in Appendix B.

Title	Drawing No.
Site Layout Plan	754-PERGE340337-DD-01
General Arrangement around the GNHIPTSF	754-PERGE340337-DD-02

8.3 STORAGE CHARACTERISTICS

It is estimated a total of 1.22Mt of tailings will be stored in the proposed GNHIPTSF, based on a tailings dry density of approx. 1.4t/m^3.Freeboard requirements

The catchment area of the proposed GNHIPTSF will primarily involve the impoundment area. Aside from supernatant water from tailings slurry, the primary ingress of water into the GNHIPTSF will be from incident rainfall (i.e., rainfall-runoff water from the limited external catchment and the impoundment pit surface area.)

Freeboard requirements for the GNHIPTSF have been designed in accordance with DEMIRS (2015a) guidelines as follows. DEMIRS freeboard criteria are summarised in Table 4, with freeboard requirements illustrated in Figure 3.

- The top tailings surface of the GNHIPTSF will assume a 'wedge formation', with a beach sloping towards the decant pond. The GNHIPTSF is designed such that the stormwater volume from 1:100-year AEP, 72-hour storm event can be temporarily stored on top of the facility and above the normal operating pond level. The normal operating pond level/extent is adopted at 15% to 20% of the tailings surface area under normal operating conditions, which is equivalent to 2 to 3 days of slurry water volume.
- Provision is made for a minimum pit wall freeboard of 0.5 m (vertical height between the stormwater and minimum pit rim levels).
- Provision is made for containment of rainfall-runoff water (from a 1:100 year AEP, 72-hour storm event) from the impoundment pit surface area within the facility.

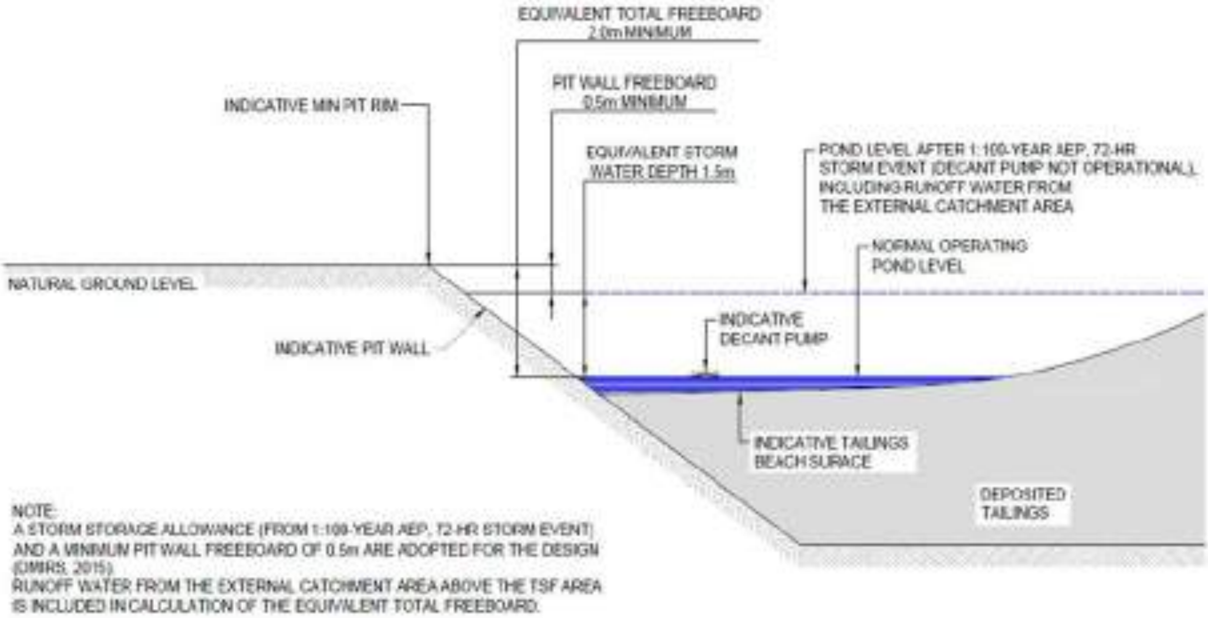

Figure 9: Freeboard requirements (Modified from DEMIRS, 2015a)

Table 4: Summary of Freeboard requirements

Facility	Catchment Area (m^2)	Minimum Pit Crest Level (mAHD)	1:100 AEP, 72-hour Storm Volume (m^3)	Maximum Operating Pond Level (mAHD)
GNHIPTSF	181,581	429.0 (at ramp on eastern side)	34,682	428.5

The design assumes correct operational controls are adhered to and water is continually removed, such that minimum freeboard allowances are maintained. Adherence to these controls will ensure adequate stormwater storage within the facility and that freeboard criteria are met It should be noted that critical freeboard criteria are particularly relevant when the tailings beach level approaches the pit rim level, that is when the facility is almost full and at closure.

The storage capacity and freeboard of the GNH pit have been calculated on the basis that this TSF is independent from the Bluebird East pit. In the ultimate condition the two TSFs are proposed to be combined, creating a storage capacity much greater than the sum of the two independent pits.

8.4 TAILINGS DEPOSITION

Tailings placement within the GNH Pit will have an overall stabilising effect on the west wall adjacent to Great Northern Highway. To avoid adversely affecting west wall stability in the short to medium term, the following recommendations should be followed:

- Tailings should be placed so that the beach is formed against the west wall;
- Spigots should be placed below the top half of the slope, where the slope is closer to the highway and the weathering grade is highest;
- The degree of erosion around the spigot location should be monitored regularly. If excessive erosion is noted, then placement at that spigot should cease and the spigot should be moved.
- Survey monitoring of the west wall should be at a greater frequency in the early stages of tailings placement.

Due to the close proximity of the pit wall to GNH, and the fact that part of the slope is a single bench, safe access to potential spigot locations is limited. A ramp is present from the north of the pit to a point on the west slope close to where Grade I and II rock intersect. The top of this ramp coincides with the location of the line that currently takes tailings to the Bluebird East in-pit TSF. As such, a tailings deposition line extending to the base of this ramp is proposed, as indicated on the layout in Appendix B.

8.4.1 Topping up

A topping up process will enable the storage capacity of the GNH pit to be maximised by filling in any depressions on the tailing surface (due to consolidation) in order to maximise storage capacity.

8.4.2 Implications with respect to tailings deposition

The following aspects are relevant to management of the IPTSF:

- The stability of the in situ pit walls is not expected to be adversely influenced by tailings placement within the facility. In any event, the wall stability will increase as the deposited tailings will buttress the toe of the walls and any existing failures.
- A pump deployed from the saddle between GNH and Bluebird East pits will allow recovery of supernatant water. The pump will be moved up the ramp as the tailings rise within the pit. It should be noted that water should not be allowed to accumulate in the pit. Dewatering will increase factors of safety against wall instability and reduce seepage into surficial laterites when the pit is nearly full.
- Routine (daily) pit rim inspections during the operation of the tailings storage facility are recommended.

Tailings placement against the west wall of the GNH pit will provide support to the wall and, ultimately, in the long term, reduce the risk of failures affecting Great Northern Highway. To avoid any adverse effects on stability, the tailings placement method and dewatering shall be carefully managed.

8.5 WATER RECOVERY

It is anticipated supernatant water liberated from the tailings slurry will be recovered using a decant pump deployed along the existing access ramp which separates the GNH and Bluebird East pits. Supernatant water recovered from the facility will be pumped back to the processing plant for reuse. All return water piping and pumping design will be by others.

Tailings deposition and the supernatant water pond shall be managed such that the pond is positioned adjacent to the pit access ramp, and at the opposite side of the pit from the discharge point. As the tailings and water levels rise within the pit, the supernatant water pond will move up the pit access ramp, with the pump to be retreated up the ramp. The ramp will provide access to the pump for operation and maintenance purposes. Operating procedures are covered in Section 10 and detailed in the Operations Manual (Appendix F).

8.6 PIT STAGING

In the ultimate condition, the GNH pit will combine with the adjacent Bluebird East pit to form a much larger TSF. The storage capacity will greatly increase when this occurs, as freeboard will need to be maintained only to the outer pit walls, rather than the separation saddle as is currently the case for Bluebird East. The GNH pit should be filled prior to Bluebird East reaching full capacity. Deposition into GNH pit from the west side is a more controlled process than spillage over the pit barrier saddle.

8.7 UNDERDRAINAGE

No underdrainage system is proposed for the GNHIPTSF, as there is a significant quantity of groundwater in the pit and it is not feasible to remove this water prior to commissioning. This will impact on consolidated tailings densities, however the tailings insitu density is expected to be acceptable as the tailings have relatively good settling characteristics and supernatant water will be continuously removed from the TSF during operations.

8.8 PIPELINE BUNDING CORRIDOR AND ACCESS TRACK

Containment bunds along both sides of the pipeline corridor will have a minimum height of 0.5 m to sufficiently contain a tailings spill in the event of infrastructure failure. Minor clearing of isolated vegetation will be required to facilitate the construction of the corridors around the GNHIPTSF. All clearing and ground disturbance will be managed by Bluebird mine in line with existing site processes.

The containment bunds will be constructed with suitable mine waste. No moisture conditioning and testing will be required for the fill materials. The access road / track will be constructed with traffic compacted suitable mine waste (nominal 0.3 m thick).

8.9 LINERS

No artificial liners are proposed, nor should they be required to be installed as part of the construction of the GNHIPTSF.

8.10 CONSTRUCTION

A Scope of Works (SoW) for the construction of pipeline bunding corridor and access road / track around the GNHIPTSF will be developed. The SoW also will include a schedule of quantities (SoQ) which will be provided to allow material requirements to be gauged for construction.

The design of the tailings and return water pumps, pipelines and the bunding corridor from the BM processing plant to the GNHIPTSF shall be prepared by an appropriately qualified mechanical engineer.

9. WATER BALANCE ANALYSIS

9.1 ANALYSIS METHOD AND INPUT PARAMETERS

Water balance analyses for the proposed GNHIPTSF during operations have been undertaken using a mathematical simulation to examine the expected inflows and outflows from the facility. Inflows and outflows for the facility were estimated monthly and under average climatic conditions. Inflows into the facility include rainfall and slurry water. Outflows include evaporation, seepage losses and water retained in the tailings (pore pressure).

The analyses examined the annual/monthly rainfall and evaporation under average climatic conditions for the year-to-year operations of GNHIPTSF. The following assumptions/parameters were used in the analyses:

- Average annual rainfall: 232 mm (Section 5.1);
- Average annual evaporation: 4068 mm (Section 5.1);
- Slurry inputs: 250,000 tpa at (assumed average) 40% solids (Coffey, 2016[5]);
- Runoff coefficient within the GNHIPTSF impoundment pit surface area: 1.0 (assumed);
- Runoff coefficient from the external catchment above the pit area: 0.5 (estimated (ARR, 1998));
- Evaporation pan factor of 0.65 (GJ Luke, KL Burke and TM O'Brien, 2003);

- Impoundment pit surface area = 181,581 m^2
- External catchment area above the pit area = 36,316 m^2
- Supernatant Pond Area (under normal operating conditions, based on tailings deposition modelling using the Muk3d software program): 15% to 20% of the tailings surface area;
- Running beach area (based on tailings deposition modelling using the Muk3d software program) and is assumed as 50% of the staged tailings surface area remaining wet;

9.2 RESULTS AND COMMENTS

A water balance has been prepared based on the tonnage of ore treated per month, slurry density, monthly water returned to the plant from the return water system and rainfall and evaporation data. Inflows comprise slurry water to the TSF, rainfall and outflows comprise, evaporation from pond and beaches, seepage and water return. Average climate statistics for Meekatharra were utilised in the analysis. The water balance is included in Appendix F. The estimated water return is between 70 and 75% of slurry water inflow (i.e. similar to that experienced for other in-pit TSFs in the northern goldfields).

The results also indicate that the water recovery will vary according to the TSF management, specifically, the pond size and running beaches. To maximise water recovery, the TSF and the monitoring bores should be operated to ensure the surface water pond is as small as practical (with correct controls, the pond size will be minimal).

In addition, the actual water quantity available for return to the plant will vary depending on the following factors:

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

10. OPERATING PROCEDURES

An Operations Manual for the in-pit facility has been prepared, and is attached in Appendix G.

This Operations Manual provides a detailed description of the operating procedures, inspection criteria, monitoring requirements and log sheets for the tailings storage.

11. INSTRUMENTATION AND MONITORING

A groundwater monitoring network is proposed prior to the filling of the GNH Pit. As part of the hydrogeological assessment, a groundwater monitoring network (comprising 2 monitoring boress) has been designed for the GNHIPTSF and Table 2 of section 2.3.7 of Rockwater 2024 report presents the locations. The bores should be monitored quarterly for:

- Water level
- pH
- EC/TDS
- Weak Acid Dissociable (WAD) Cyanide

These monitoring bores are in addition to the four existing monitoring bores in the walls of GNH pit – PWD1 to PWD3, and BEMB4. Section 2.3.7 provides the details on proposed location of recommended monitoring bores and Fig. 2 shows the conceptual bore location. The additional bores to be installed on the down-gradient (southern) side of the pit to depths of about 70m.

Inclinometers and survey prisms are present along the west wall of GNH pit for the purposes of ongoing monitoring of any pit wall movement adjacent to the highway. The prisms are currently surveyed about once every two weeks, while the inclinometer are read annually. An increased frequency of prism surveying is recommended, to at least weekly or twice weekly. Additional inclinometer readings may be required if visual observations or prism monitoring indicates a potential for movement. The location of prisms and inclinometers is indicated on Figure 10.

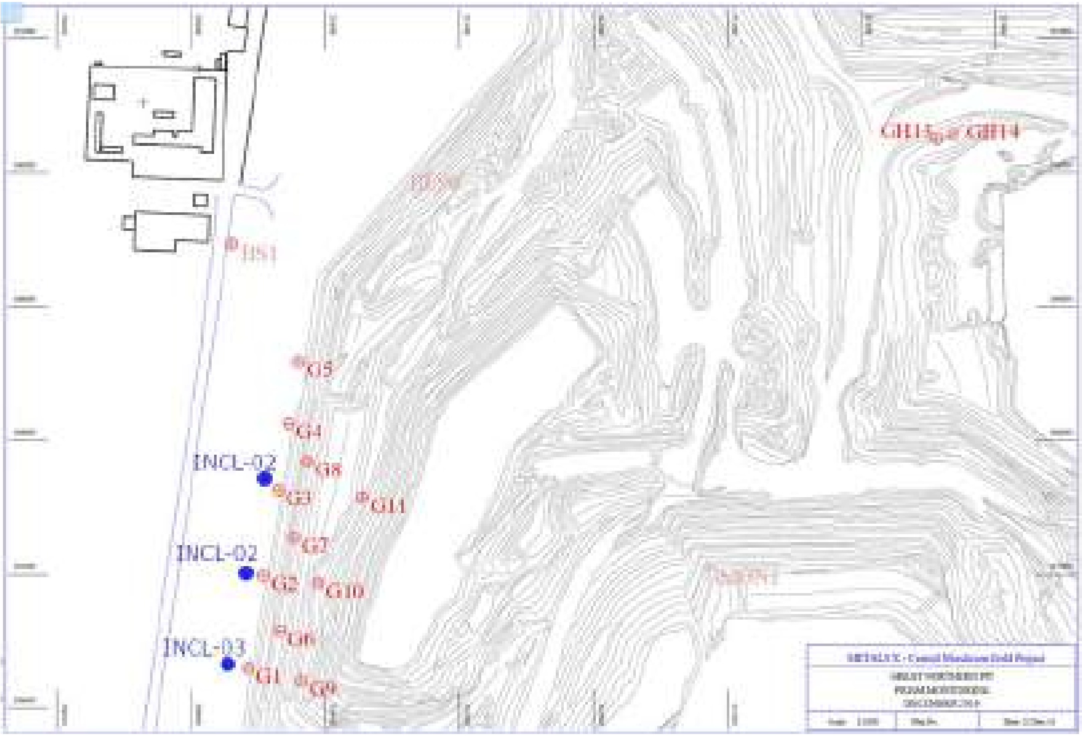

Figure 10 - Existing instrumentation locations

12. CLOSURE AND REHABILITATION CONCEPT

Upon completion of tailings placement within the facility, the surface will undergo a rehabilitation program. The rehabilitation program will include the identification of appropriate capping material and local flora species to revegetate the surface of the facility.

Prior to commencement of the rehabilitation program, the GNHIPTSF could undergo a topping-up process. Topping-up will maximise the facility's storage capacity and reduces the volume of capping material subsequently required.

Rehabilitation work is expected to commence at least three years post initial completion of filling to allow the deposited (in situ) tailings to settle and gain strength. Based on consolidation estimates, it is expected that rehabilitation work will not be able to commence for a period of approximately three years after topping-up is complete. This delay is due to the expected low strength and ongoing consolidation of the deposited tailings, as well as the requirement to develop a 'surface crust' for safe access.

The closure concept for the GNHIPTSF domain is to:

1. Remove all infrastructure (including pontoon pumps, delivery and discharge pipes and valves, power cables, footings, etc.) and dispose of in accordance with appropriate BM standards and government regulations.
2. Cut standpipe piezometers and groundwater MBs at ground level and install covers so that they are less obtrusive, but still available for monitoring.
3. Construct a safe, stable and non-polluting landform, and minimize the State's post-relinquishment maintenance and management liability (as far as practicable).
4. Establish an inert non-vegetated capping layer.
5. Ensure no long-term groundwater liability for BM, subsequent land users, or the State.

The GNHIPTSF will be incorporated into the site closure plan. Prior to closure, the cover materials should be characterised and tailings consolidation properties in the GNHIPTSF confirmed.

13. BIBLIOGRAPHY

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8. Tetra Tech Coffey Pty Ltd (2024). *'GNH In-pit Tailings Facility – West Wall Stability Review, Westgold Resources Limited'*, ref. 754-PERGE340337-R01 dated 20 March 2024.
9. AS 1170.4-2007 Structural Design Actions - Part 4: Earthquake actions in Australia
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12. Tetra Tech Coffey Pty Ltd (2016). *'Higginsville TSF Audit 2023, Higginsville Gold Operations'*, ref. 754-PERGE327769 Rev 0.
13. Tetra Tech Coffey (2023) Great Northern Highway Pit - Report on Annual Monitoring 2023 (754-PERGE318186_R01)
14. Tetra Tech Coffey Pty Ltd (2024). *'GNH In-pit Tailings Facility – West Wall Stability Review, Westgold Resources Limited'*, ref. 754-PERGE340337-R01 dated 20 March 2024.

APPENDIX A: IMPORTANT INFORMATION ABOUT YOUR TETRA TECH COFFEY REPORT

As a client of Tetra Tech Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Tetra Tech Coffey to help you interpret and understand the limitations of your report.

Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Tetra Tech Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Tetra Tech Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Tetra Tech Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Tetra Tech Coffey to be advised how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Tetra Tech Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Tetra Tech Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Tetra Tech Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Tetra Tech Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Tetra Tech Coffey to work with other project design professionals who are affected by the report. Have Tetra Tech Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they incorporate the report findings.

Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Tetra Tech Coffey for information relating to geoenvironmental issues.

Rely on Tetra Tech Coffey for additional assistance

Tetra Tech Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design towards construction, speak with Tetra Tech Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Tetra Tech Coffey to other parties but are included to identify where Tetra Tech Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Tetra Tech Coffey closely and do not hesitate to ask any questions you may have.

APPENDIX B: DRAWINGS

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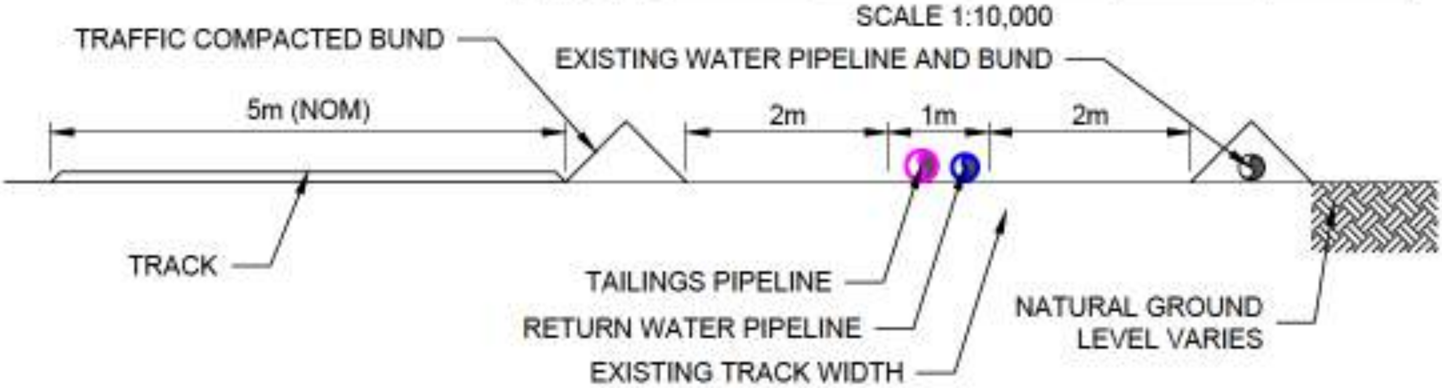

A TYPICAL PIPELINE BUNDING
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APPROVED:	SSE			
DATE:	19/06/2024			
SCALE:	AS SHOWN		TITLE:	GENERAL ARRANGEMENT
ORIGINAL SIZE:	A4		PROJECT NO: 754-PERGE340337	DWG NO: 754-PERGE340337-01 REV: A

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CONTOUR INTERVALS U.N.O
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DESIGN TOPOGRAPHY: 1m & 5m

COORDINATE SYSTEM

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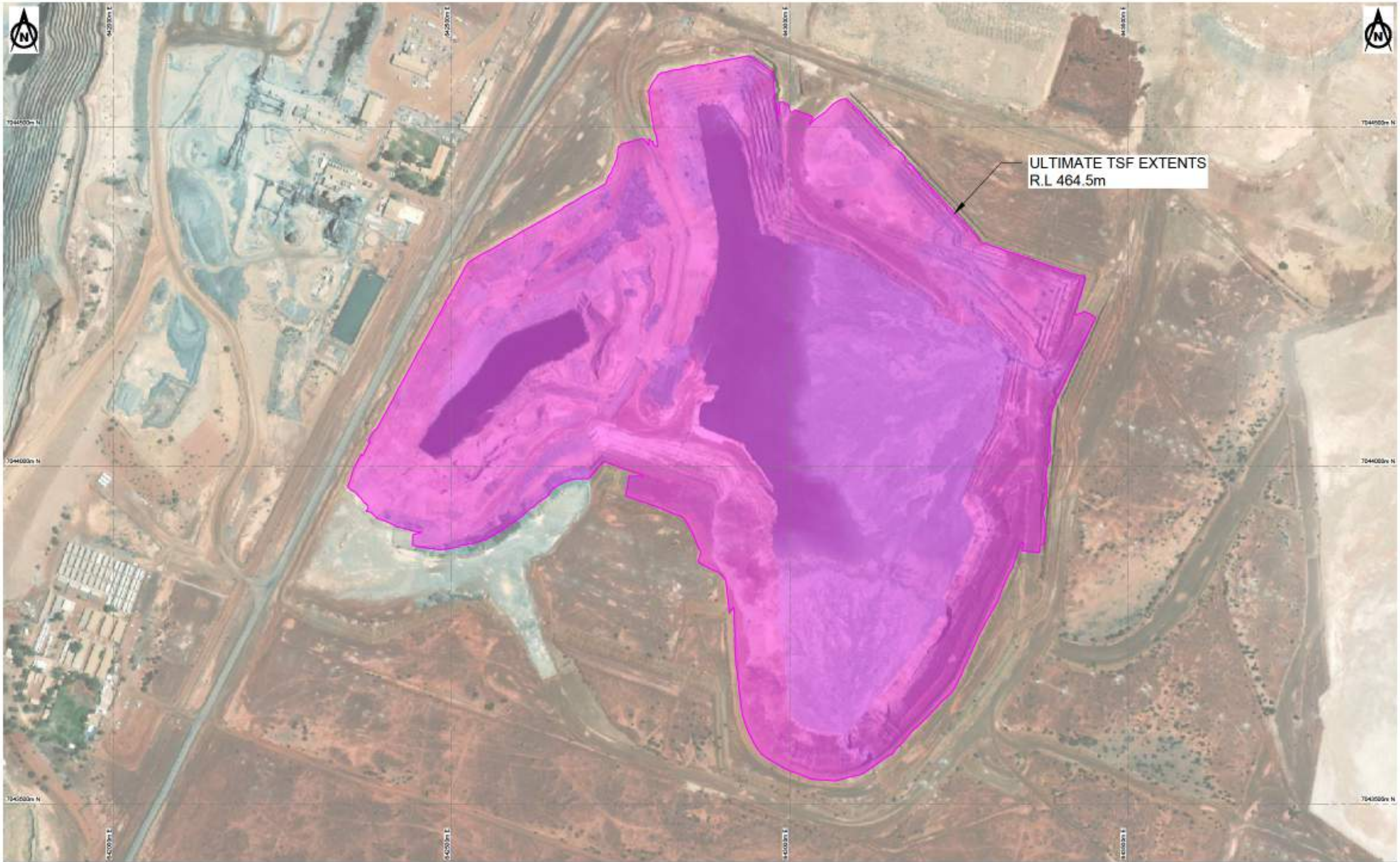
TETRA TECH COFFEY

CLIENT: WESTGOLD RESOURCES LTD

PROJECT: GNH PIT TSF
BULEBIRD GOLD MINE MEEKATHARRA

TITLE: GENERAL ARRANGEMENT - GNH PIT EXTENTS

PROJECT NO. 754-PERGE340337 | DWG NO. 754-PERGE340337-03 | REV. A



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COORDINATE SYSTEM
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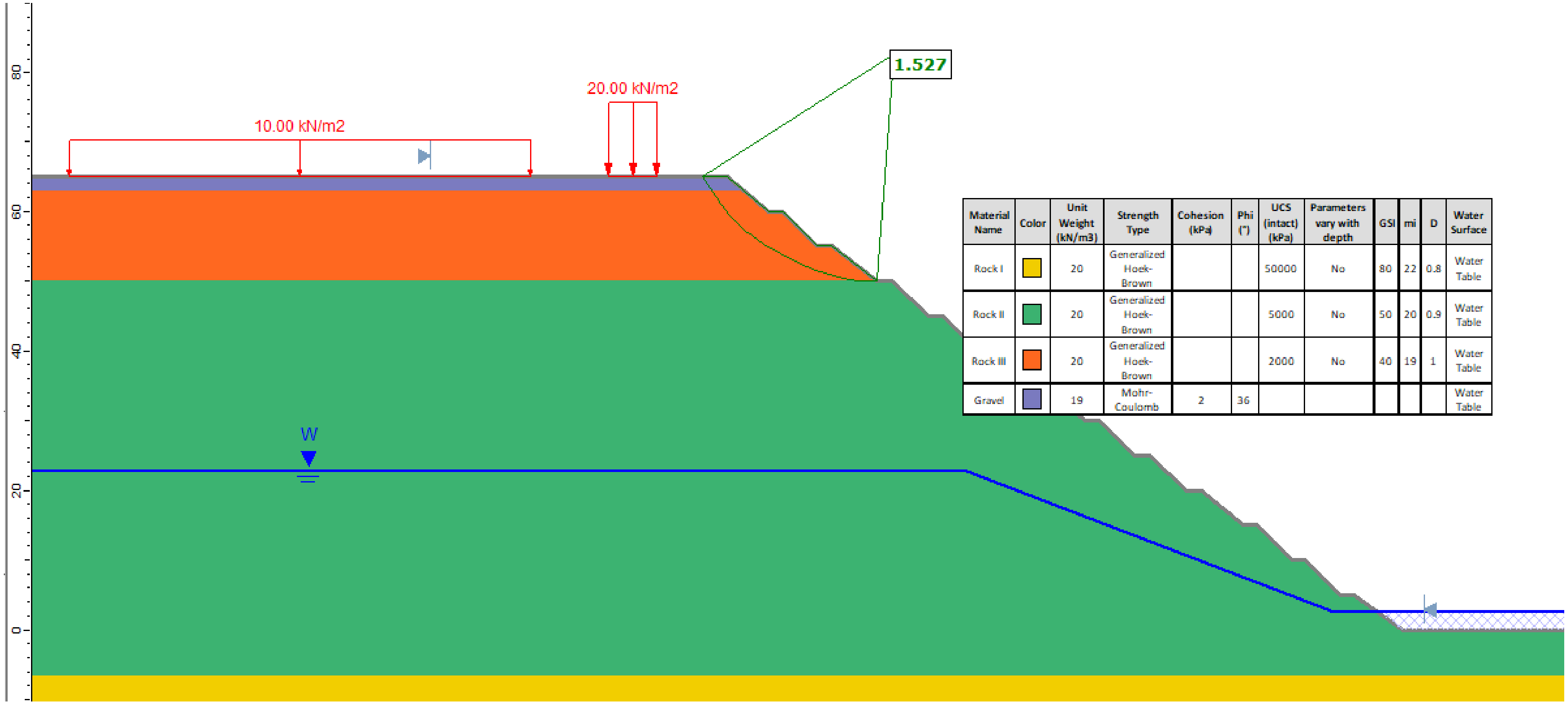
PROJECT: GNH PIT TSF
BULEBIRD GOLD MINE MEEKATHARRA
TITLE: GENERAL ARRANGEMENT - ULTIMATE TSF EXTENTS
PROJECT NO. 754-PERGE340337
DWG NO. 754-PERGE340337-03
REV. A

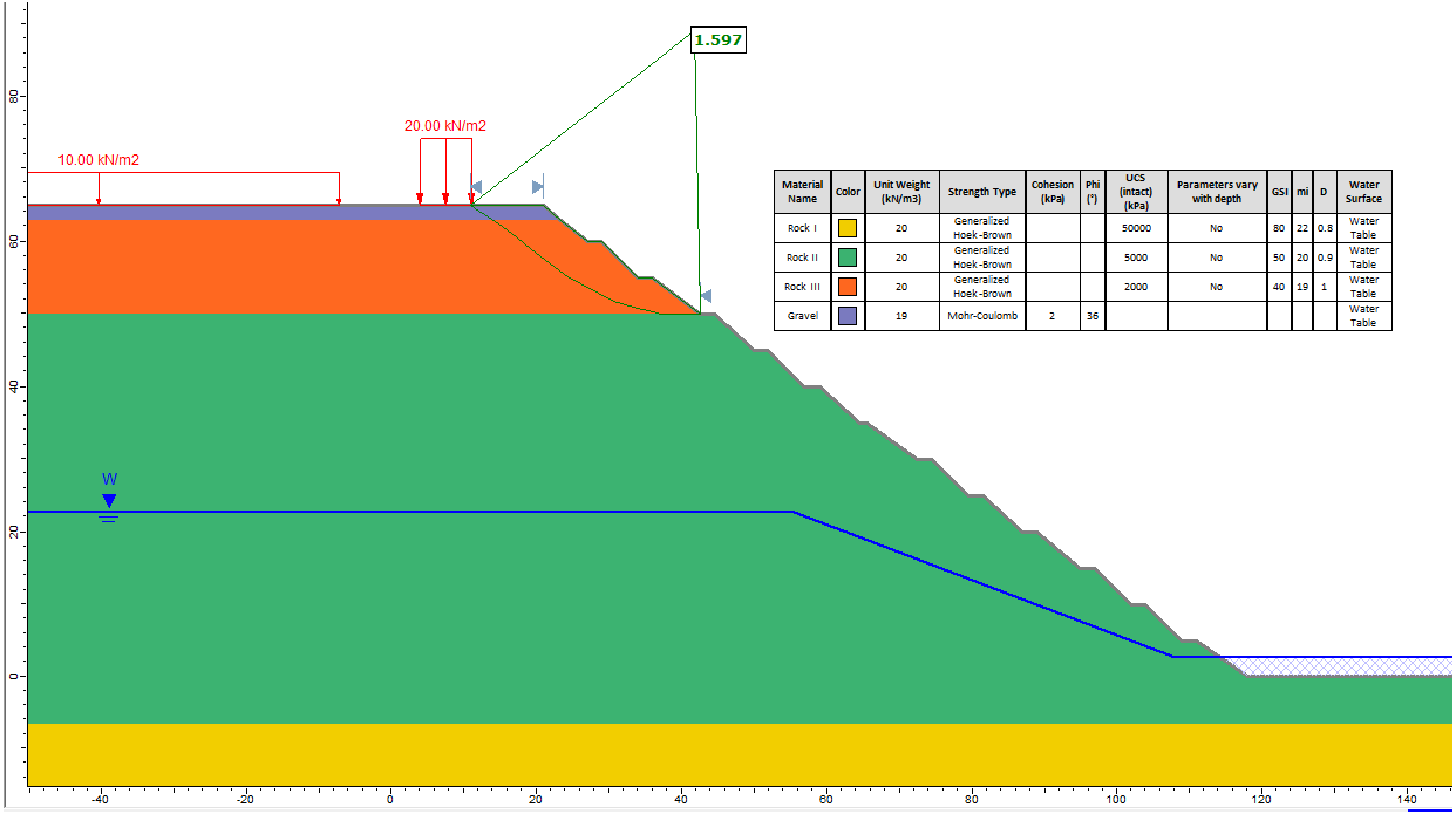
APPENDIX C: RESULTS OF SLOPE STABILITY ANALYSES

Normal Conditions, Local Slope Failure



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	UCS (intact) (kPa)	Parameters vary with depth	GSI	mi	D	Water Surface
Rock I		20	Generalized Hoek-Brown			50000	No	80	22	0.8	Water Table
Rock II		20	Generalized Hoek-Brown			5000	No	50	20	0.9	Water Table
Rock III		20	Generalized Hoek-Brown			2000	No	40	19	1	Water Table
Gravel		19	Mohr-Coulomb	2	36						Water Table

Normal conditions - Great Northern Highway affected by slip surface



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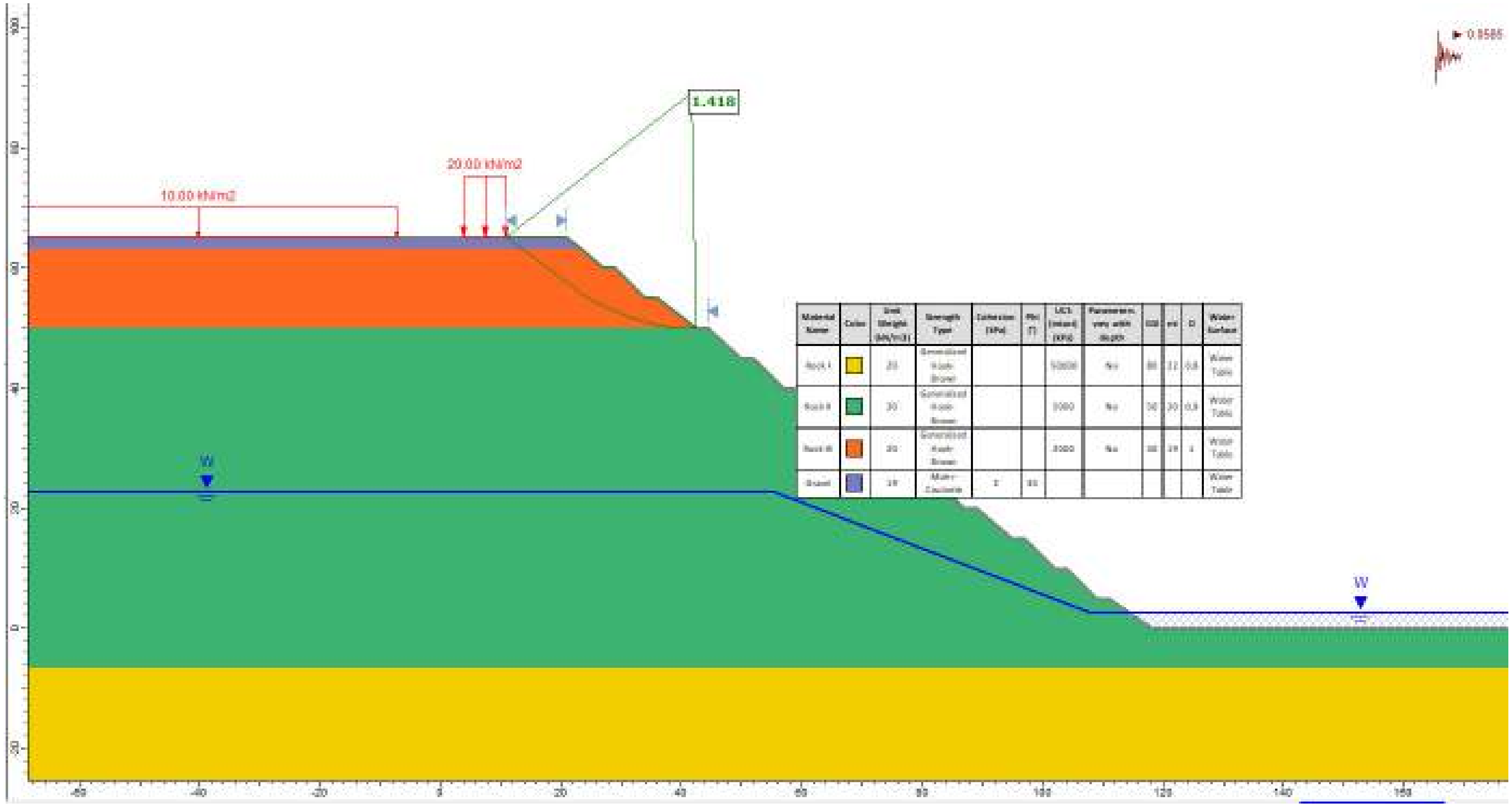
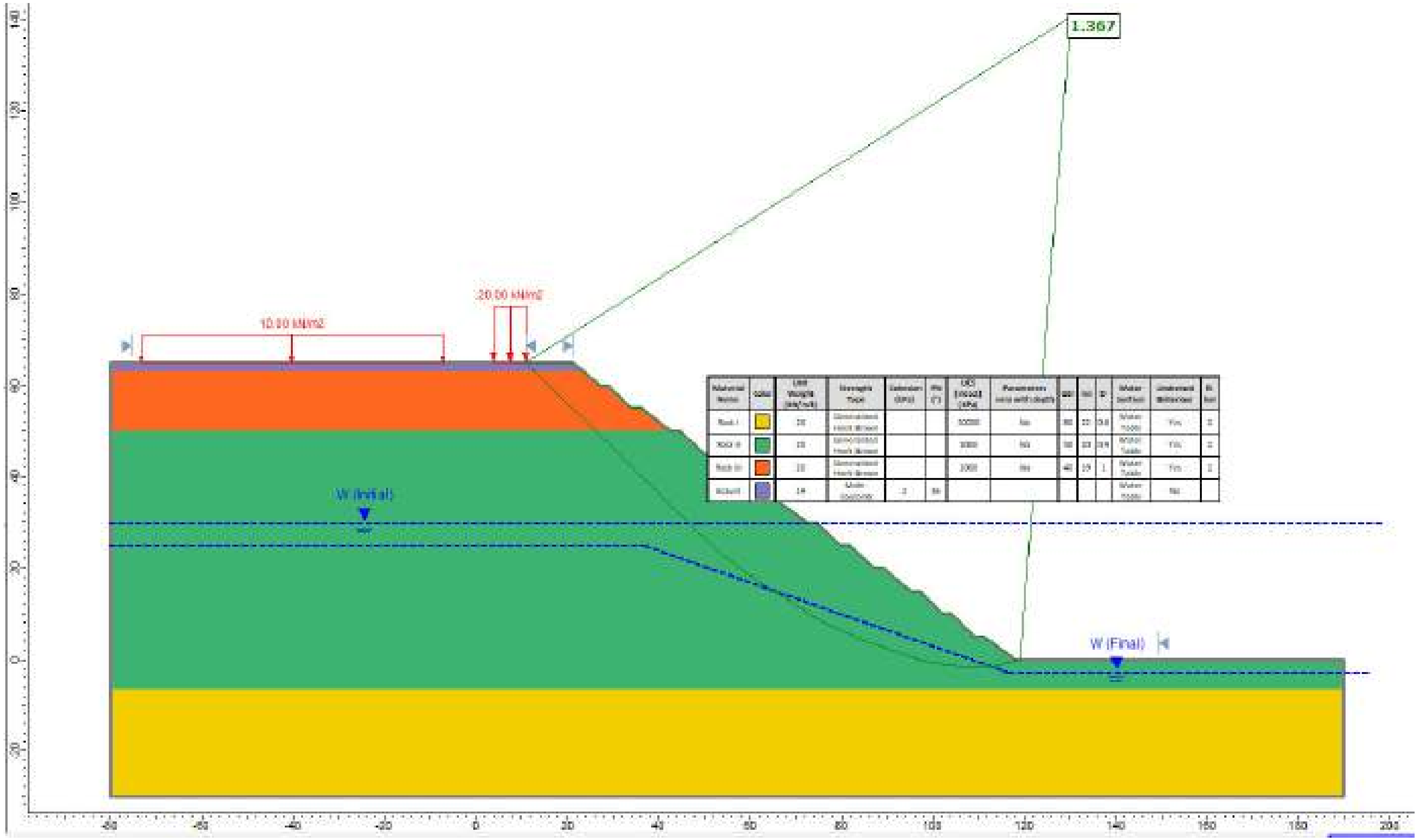
Rock I		20	Generalized Hoek-Brown			50000	No	80	22	0.8	Water Table
Rock II		20	Generalized Hoek-Brown			5000	No	50	20	0.9	Water Table
Rock III		20	Generalized Hoek-Brown			2000	No	40	19	1	Water Table
Gravel		19	Mohr-Coulomb	2	36						Water Table

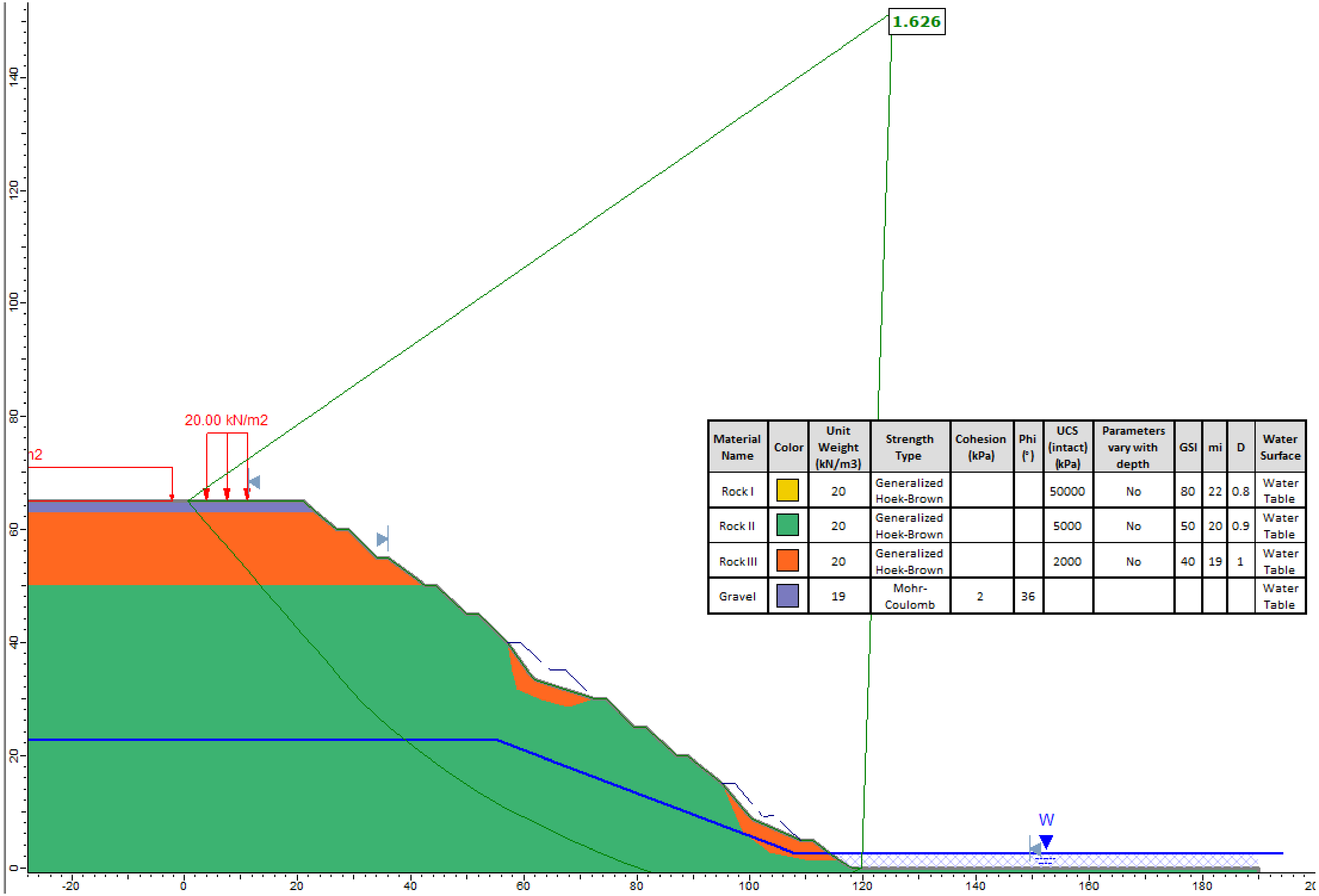
Seismic Conditions



Rapid Drawdown (Dewatering) Conditions



What-If? Scenario - Spigot Erosion and Weathering - Slip surface affects road (Slip surfaces above erosion zones are excluded)



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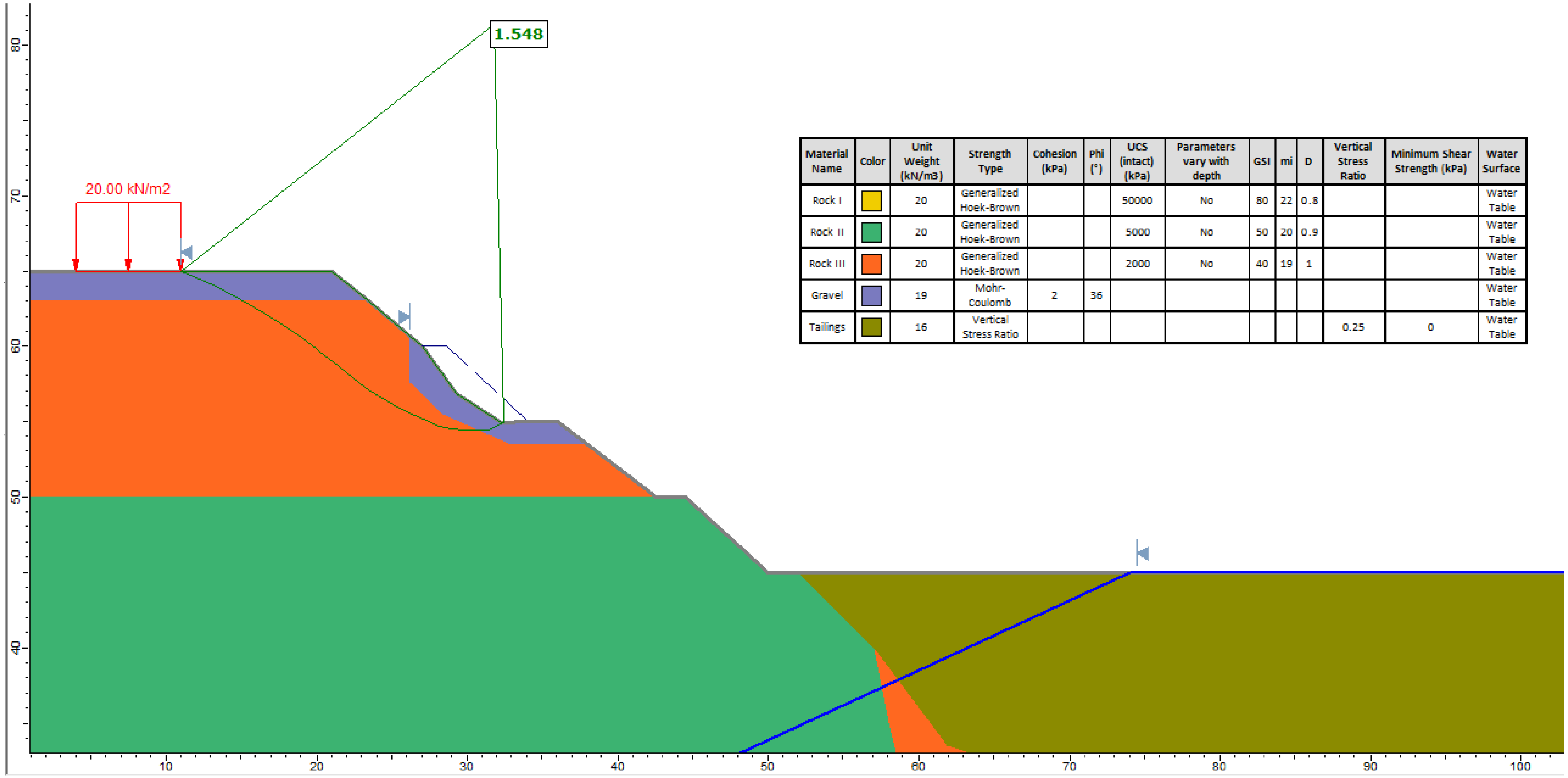
Rock I		20	Generalized Hoek-Brown			50000	No	80	22	0.8	Water Table
Rock II		20	Generalized Hoek-Brown			5000	No	50	20	0.9	Water Table
Rock III		20	Generalized Hoek-Brown			2000	No	40	19	1	Water Table
Gravel		19	Mohr-Coulomb	2	36						Water Table

What If Scenario - Tailings Infill, high spigot placement and erosion/weathering



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	UCS (intact) (kPa)	Parameters vary with depth	GSI	mi	D	Vertical Stress Ratio	Minimum Shear Strength (kPa)	Water Surface
Rock I		20	Generalized Hoek-Brown			50000	No	80	22	0.8			Water Table
Rock II		20	Generalized Hoek-Brown			5000	No	50	20	0.9			Water Table
Rock III		20	Generalized Hoek-Brown			2000	No	40	19	1			Water Table
Gravel		19	Mohr-Coulomb	2	36								Water Table
Tailings		16	Vertical Stress Ratio								0.25	0	Water Table

APPENDIX D: ROCKWATER HYDROGEOLOGICAL ASSESSMENT REPORT

Report No. 188-17/24/01

GNH IN-PIT TSF, BLUEBIRD MINE

HYDROGEOLOGICAL ASSESSMENT

REPORT FOR
WESTGOLD RESOURCES LTD

MARCH 2024

Rockwater
HYDROGEOLOGICAL AND ENVIRONMENTAL CONSULTANTS

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Tables

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1 INTRODUCTION

Westgold Resources Limited (Westgold) is planning to store tailings in the Great Northern Highway (GNH) pit at Bluebird mine-site at Yaloginda, 15 km south of Meekatharra (Figure 1). Tailings are currently being stored in Bluebird East pit, which is alongside (east) of GNH pit, but that pit is near capacity. Previously, tailings were placed in Bassetts West pit, further to the east (Fig. 2).

A hydrogeological assessment of the potential impacts – on the local groundwater – of the tailings storage is required. This report presents the data collected and the results of the hydrogeological assessment by Rockwater.

1.1 CLIMATE

Meekatharra (and Bluebird) has a semi-arid climate. The nearest Bureau of Meteorology (BoM) station to Bluebird with a long data record is at Meekatharra Airport (Stn. 007045), located just east of the town.

Rainfall has been recorded at Meekatharra airport since 1944. Annual rainfall has averaged 234 mm, and although irregular, much of the rain falls in the months January to July (Table 1). Rainfall over the winter months is generally associated with the passage of cold fronts. Summer rainfall mostly results from thunderstorms, or cyclonic weather activity in the north.

Table 1: Average Rainfalls at Meekatharra, and Dam Evaporation (mm)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Av. Rainfall	29.4	36.1	30.8	18.8	21.6	28.5	20.0	10.6	4.9	5.9	11.6	14.2	233.8
Dam Evap.	380	314	267	190	131	87	92	121	170	259	293	333	2,637

Dam evaporation at Meekatharra (Luke, Burke, and O'Brien, 1988) averages 2,637 mm/year, and on average exceeds rainfall in all months of the year and by a factor of 11 overall.

Monthly mean minimum temperatures at Meekatharra range from 7.5^{O}C in July to 24.5^{O}C in January; and mean maximum temperatures range from 19.4^{O}C in June to 39.0^{O}C in January.

2 HYDROGEOLOGICAL ASSESSMENT

2.1 GEOLOGY

The geology of the GNH – Bluebird East pit is described by Timms (2006). The GNH lobe of the larger pit includes a foliated ultramafic (talc carbonate and talc schist) and high-Mg basalt, with a north-easterly trending dolerite dyke along the axis of the pit, pinching out in the south-west. There is a north-westerly trending fault zone that dips steeply to the ENE and juxtaposes basalt to the west with ultramafic schist to the east.

There are broad areas of mineralisation, mainly in an alteration zone within the ultramafics; this zone includes ferruginous quartz-carbonate.

2.2 MINING HISTORY

Mining of the Bluebird East / GNH pit commenced in 1993 and ended with underground mining at GNH from 2001 to September 2002.

Dewatering was mostly from pit-perimeter bores that were screened in permeable quartz-carbonate; and then from mid-1999 from pit (and underground) sumps (Rockwater, 2003).

Volumes of water pumped from the GNH/Bluebird East pit gradually decreased from about 60,000 m^3/mth (1,940 m^3/d) in 1994, to about 40,000 m^3/mth in year 2000; and then about 5,000 to 10,000 m^3/mth (160 to 320m^3/d) during underground mining (160 to 320 m^3/d).

2.3 HYDROGEOLOGY

2.3.1 GENERAL

There are a number of pastoral bores and wells in the Yaloginda region, as well as Bluebird project bores; they are recorded in the Department of Water and Environmental Regulation (DWER) Water Information Reporting (WIR) database, and shown on the Meekatharra 1:100 000 Geological Sheet (Romano, Ivanic and Chen, 2017). Note that the WIR data are mostly old, and the bore locations in the database are inaccurate.

Bluebird project bores have been drilled around mine pits for water supply, dewatering, or monitoring.

2.3.2 WATER INFORMATION REPORTING DATA

Hydrogeological data for the area that are available in the WIR database are summarised in Table 2 (Page 3). Some of the mining project bores that had few data or were recorded in the same location, have been omitted from the table, as there are a substantial number of groundwater data-points for the area.

They indicate generally low to groundwater yields from the bores, with a maximum of 360 KL/d; and generally low groundwater salinity (less than 1,400 mg/L TDS.

2.3.3 AQUIFER CHARACTERISTICS

Aquifers at Great Northern Highway/Bluebird East pits are largely restricted to the discontinuous, ferruginous quartz-carbonate mineralised rocks, where fresh or slightly weathered, and these were targeted for dewatering bores installed before and during mining of the pits.

Other areas of talc chlorite, basalt and dolerite, and clayey weathered rocks are generally of low hydraulic conductivity.

2.3.4 GROUNDWATER LEVELS, FLOW DIRECTION

Water levels in bores in the Yaloginda area – that are recorded in the WIR database – were reduced to m AHD using recorded ground levels or topographic contours drawn from the DEM-H version of the one-second SRTM dataset (Geoscience Australia, 2011), and are contoured in Fig. 3. The levels indicate that pre-mining, groundwater was flowing to the south-east from a mound centred on the ridge west of Bluebird, towards a drainage line that flows southwards to Lake Annean, where groundwater discharges and evaporates. The groundwater level at GNH pit would probably have been at about 455 m AHD prior to mining, about 15 m below ground level.

A few of the water levels are impacted by dewatering or pumping from the bores/wells themselves or nearby, and there is some uncertainty in bore locations and the SRTM levels used to reduce water-level data to m AHD.

Table 2: Summary of WIR Data

Site Ref	Name	Easting	Northing	RLGL	Depth	KL/d	TDS	(WL, mbgl)	RLWL	Aquifer
		(m)	(m)	(m AHD)	(m)		(mg/L)		(m AHD)	
70200062	Wbbs1	647036	7035330	463.6	99			11	452.6	BIF
70200064	Wbbs3	646848	7034976	463.9	63			11.6	452.3	Ag
70211574	Three Mile W	645621	7056403		0	22				
70211575	White W	639531	7056536	483.6	29.87	251		13.72	469.9	
70211579	Blacktank W	635935	7057049	474.1	14.02	14		11.58	462.5	
70211581	Mount Obal	630929	7058205	462.6	21.95	41	1050	9.75	452.9	
70211582	Red W	633876	7058215	468.8	26			20	448.8	
70211586	Yaloginda	642956	7049939	490.6	21.34	38	1230	18.29	472.3	
70211589	No 3	641616	7045000	485.1	80	360	<1,000	17.8	467.3	
70211591	ER 6	641616	7045000		107	>300				Talc-Chl-Schist
70211592	ER 5	641616	7045000		107	52				Talc-Chl-Schist
70211595	Wb17	641752	7043981	469.7	120	175		19.7	450.0	
70211601	Bob	641752	7043981		70	0				Chl schist
70211602	Bob 21	641752	7043981		65	5				Chl schist
70211606	C.W.B. 7	641414	7043216	450.46	74			10	440.5	
70211607	Myp 1	640865	7044805	492.9	66		1280	20.5	472.4	
70211608	Myp -2	640817	7043909	496.8	70		4700	20.4	476.4	
70211609	H006-729.20	640936	7041911		33		500			calcrete
70211611	Bassetts	645871	7037556	469.2	21.64	8	620	17.68	451.5	silcrete
70211612	Geoff	645145	7034258	459.5	23.16	9	1365	8.53	451.0	
70211613	Railway W	639729	7036978	458.1	13.41	4		9.1	449.0	
70211618	H006-718.86	638004	7034084	454	30		580	5.5	448.5	ironstone
70211620	Gap (Govt) W	633370	7036897	483.9	2.74	2		2.13	481.8	
70211622	Homestead W	633370	7036897		7.01	55		5.18		Limestone
70211624	Gap W	634341	7038031	474.3	0		770	4.3	470.0	
70211626	Little Gap W	631957	7034756	473.4	0		960	4.9	468.5	
70211899	Ted W	650456	7032758	469.8	76.2		1430	12.5	457.3	greeenstone
70211965	Fardell	651003	7047671	492	19.81	36	1000	12.8	479.2	calcrete
70211967	Stock Yard W	650783	7044670	482.6	13.72	36	888	10.5	472.1	silcrete
70213018	12 Mile W	641621	7042381	439.6	67	5	820	16.5	423.1	
70213019	Johnses W	639180	7044072	478.7	0		740	10	468.7	
70213020	C.W.B.1	641414	7043216	457.64	86			15	442.6	
70213021	C.W.B. 4	641414	7043216	454.4	64			12	442.4	
70213022	C.W.B. 5	641414	7043216	461.19	64			19	442.2	
70213023	H006-735.30	643064	7047420		102					
70213025	Chunderloo	635658	7044960	513	16.46	76	730	15.24	497.8	granite
70213026	Rabbit	645107	7031842	456.3	9.14	32	680	5.49	450.8	
70213028	2 Mile	637061	7039389		0		800			
70213029	Railway	640964	7037835		0		660			
70213030	H006-729.01	640079	7040090		60					
70213031	H006-725.01	640079	7040090		49.5					
70213033	Little Gap W	632697	7035607	477.6	9.14	4		6.71	470.9	limestone
70213034	Norie	633150	7036492	487.1	24.38	3		17.07	470.0	granite
70213036	Rabbit Fence	635597	7034719		0		660			
70219171	2-97	644075	7056292		0		725			
70219172	3-97	644075	7056292		0		680			
70219173	Electric	644071	7056291		0		680			

2.3.5 GROUNDWATER QUALITY

The bores and wells in the WIR database (Table 2) had salinities of generally less than 1,000 mg/L TDS near Bluebird (Fig. 4), with some higher salinities at depth.

Water in the GNH pit lake (probably groundwater with minor surface-water runoff) was sampled from 2011 to 2020 and subjected to chemical analysis. The results are given in Table 3.

Table 3: Results of Analyses, GNH Pit Lake

Date	10-Jun-11	17-Dec-12	14-Dec-15	23-May-18	26-Mar-19	03-May-20
Conductivity (µS/cm@ 25 C)	5,600	6,200	6,200	6,200	9,100	7,500
Total Dissolved Solids (mg/L)	4,000	3,350	3,800	3,800	5,154	4,600
pH	8	8.5	8.5	8.4	8.36	8.3
Alkalinity (mg/L CaCO3)	140	140	140	110	110	130
Alkalinity as HCO3 (mg/L)	140	150	150	120	120	150
Alkalinity CO3 (mg/L)	1	9	9	4	8	2
Hardness (mg CaCO3/L)	1,200	1,100	1,600	1,800	2,200	2,300
Potassium (mg/L)	45	34	54	30	39	37
Sodium (mg/L)	730	700	960	550	820	670
Calcium (mg/L)	130	110	160	190	200	220
Magnesium (mg/L)	200	190	260	330	420	430
Chloride (mg/L)	1,800	1,800	2,000	1,600	1,800	2,000
Sulphate (mg/L)	270	260	290	860	940	1,100
Iron (Sol.) (mg/L)	0.02	0.03	0.007	0.005	0.005	0.005
Manganese (mg/L)	0.005	0.005	0.004	0.002	0.002	0.001
Zinc (mg/L)	0.03	0.02	0.005		0.005	0.005
Aluminium (mg/L)	0.02	0.03	0.018	0.005	0.005	0.005
Nickel (mg/L)	0.005	0.009	0.001	0.002	0.004	0.005
Arsenic (mg/L)	0.04	0.049	0.048	0.4	0.43	0.45
Cadmium (mg/L)	0.002	0.001	0.0001	0.0001	0.0001	0.0001
Chromium (mg/L)	0.042	0.047	0.038	0.004	0.004	0.005
Cobalt (mg/L)	0.005	0.01	0.001	0.009	0.012	0.011
Copper (mg/L)	0.005	0.005	0.001	0.001	0.001	0.001
Cyanide (mg/L)	0.01	0.004				
Fluoride F (mg/L)		0.3		0.2	0.1	0.1
Lead (mg/L)	0.001	0.005	0.001	0.001	0.001	0.001
Mercury(mg/L)	0.0001	0.0001	0.00005	0.00005	0.00005	0.00005
Nitrate as NO_3 (mg/L)	83	76		51	87	71
Nitrite as NO_2 (mg/L)		0.76		0.2	0.6	0.5
Fluoride F (mg/L)		0.3		0.2	0.1	0.1

The results show that the water is weakly saline, ranging from 3,400 to 5,200 mg/L TDS and overall salinity increased slightly with time. It is alkaline, and of a sodium chloride type, with low concentrations of metals. Many of the low metal concentrations recorded probably represent reporting limits rather than measured concentrations. Nitrate concentrations are high, ranging from 51 to 83 mg/L.

Groundwater levels and quality are also monitored in six bores around the Bassetts West pit/TSF, and in four bores around the Bluebird East pit TSF. Bore locations are shown in Figure 2, and the results from BEMB1–4 and BWEMB 1–6 for key parameters from the analyses and field measurements for 2022 and 2023 are given in Tables 4 and 5.

Table 4: Bluebird East TSF Monitoring Bores BEMB 1–4, Analysis Results for Key Parameters

	Units	BEMB1	BEMB1	BEMB1	BEMB1
Date		09-Jul-22	11-Oct-22	08-Jan-23	22-Apr-23
Total CN	mg/L	0.025	0.007	< 0.004	< 0.004
WAD CN	mg/L	0.007	< 0.004	< 0.004	< 0.004
pH	pH	7.9	7.9	7.8	7.9
pH Field	pH	7.1	7.13	7.13	6.95
Total Dissolved Solids	mg/L	1300	1200	1100	1300
SWL	mbtc	57.26	55.47	55.94	55.09

	Units	BEMB2	BEMB2	BEMB2	BEMB2
Date		10-Jul-22	11-Oct-22	08-Jan-23	22-Apr-23
Total CN	mg/L	0.057		0.01	
WAD CN	mg/L	0.038		0.011	
pH	pH	7.9		7.9	
pH Field	pH	7.28		7.13	
Total Dissolved Solids	mg/L	1100		1100	
SWL	mbtc	50.28		49.64	
Comment			Dry		Dry

	Units	BEMB3	BEMB3	BEMB3	BEMB3
Date		09-Jul-22	11-Oct-22	08-Jan-23	22-Apr-23
Total CN	mg/L	< 0.004	< 0.004	< 0.004	< 0.004
WAD CN	mg/L	< 0.004	< 0.004	< 0.004	< 0.004
pH	pH	7.9	7.9	7.9	8
pH Field	pH	7.27	7.13	7.16	7.04
Total Dissolved Solids	mg/L	880	920	910	890
SWL	mbtc	35.74		35.44	35.09

	Units	BEMB4	BEMB4	BEMB4	BEMB4
Date	Date	10-Jul-22	12-Oct-22	09-Jan-23	02-Apr-04
Total CN	mg/L	< 0.004	< 0.004	< 0.004	< 0.004
WAD CN	mg/L	< 0.004	< 0.004	< 0.004	< 0.004
pH	pH	8.1	8.2	8.1	8.2
pH (Field)	pH	7.66	7.53	7.39	7.31
Dissolved Solids	mg/L	1400	1400	1400	1400
SWL	mbtc	25.15	23.42		24.39

The results from both sets of monitoring bores indicate circum-neutral pH, salinities within the range of the pre-mining groundwater, and low cyanide (particularly WAD cyanide) concentrations. Metal concentrations were also very low. The minimal impacts could be explained at Bluebird East by the low groundwater levels in the bores that indicate much of the flow of water is from the groundwater into the pit, rather than from the pit to the surrounding groundwater. However, the groundwater levels in the Bassetts West bores have recovered to around pre-mining levels since tailings emplacement there ceased in July 2016, and there are also only minor impacts on groundwater quality there.

Table 5: Bassetts West TSF Monitoring Bores, Analysis Results for Key Parameters

	Units	BWMB1	BWMB1	BWMB1	BWMB1
Date		08-Jul-22	12-Oct-22	08-Jan-23	21-Apr-23
Total CN	mg/L	0.007	0.014	0.067	< 0.004
WAD CN	mg/L	< 0.004	< 0.004	0.055	< 0.004
pH	pH	7.8	7.9	7.9	8.1
pH (Field)	pH	7.22	7.23	7.16	7.31
Total Dissolved Solids	mg/L	1100	1100	1000	1100
SWL	mbtc	13.27	12.86		13.11

	Units	BWMB2	BWMB2	BWMB2	BWMB2
Date		08-Jul-22	12-Oct-22	09-Jan-23	21-Apr-23
Total CN	mg/L	0.007	< 0.004	< 0.004	< 0.004
WAD CN	mg/L	< 0.004	< 0.004	< 0.004	< 0.004
pH	pH	7.9	8.1	8.1	8.2
pH (Field)	pH	7.33	7.26	7.65	7.38
Dissolved Solids	mg/L	960	990	970	980
SWL	mbtc	14.13	14.23		14.04

	Units	BWMB3	BWMB3	BWMB3	BWMB3
Date		08-Jul-22	13-Oct-22	08-Jan-23	21-Apr-23
Total CN	mg/L	0.22	0.034	0.041	< 0.004
WAD CN	mg/L	0.15	< 0.004	0.018	< 0.004
pH	pH	7.9	8	7.8	8
pH Field	pH	7.23	7.29	7.12	7.14
Dissolved Solids	mg/L	1600	1300	1500	1600
SWL	mbtc	34.75			13.72

	Units	BWMB4	BWMB4	BWMB4	BWMB4
Date		08-Jul-22	13-Oct-22	09-Jan-23	21-Apr-23
Total CN	mg/L	0.011	0.011	< 0.004	< 0.004
WAD CN	mg/L	< 0.004	< 0.004	< 0.004	< 0.004
pH	pH	8	8.1	7.9	8.1
pH (Field)	pH	7.38	7.26	7.21	7.16
Dissolved Solids	mg/L	1000	1200	1000	880
SWL	mbtc		11.04		13.34

	Units	BWMB5	BWMB5	BWMB5	BWMB5
Date		09-Jul-22	13-Oct-22	08-Jan-23	20-Apr-23
Total CN	mg/L	0.2	0.19	0.13	0.011
WAD CN	mg/L	0.004	0.039	0.016	0.009
pH	pH	7.7	7.8	7.8	7.9
pH Field	pH	7.13	7.09	7.04	6.61
Dissolved Solids	mg/L	3000	3100	3000	2800
SWL	mbtc	34.48	33.89		34.47

	Units	BWMB6	BWMB6	BWMB6	BWMB6
Date		08-Jul-22	13-Oct-22	09-Jan-23	21-Apr-23
Total CN	mg/L	0.18	0.16	0.17	0.031
WAD CN	mg/L	0.006	0.013	0.034	0.027
pH	pH	8.3	8.1	8	8
pH Field	pH	8.66	8.67	8.06	7.85
Dissolved Solids	mg/L	1400	1400	1600	1600
SWL	mbtc			13.72	13.72

2.3.6 POTENTIAL IMPACTS OF TAILINGS DISPOSAL

GNH pit has comparable geology with the neighbouring Bluebird East and Bassetts West pits, with discontinuous areas of permeable quartz-carbonate rock separated by rocks of low permeability, and so similarly-low impacts are expected once tailings are deposited in GNH pit.

If tailings are emplaced to a level above the pre-mining groundwater level, i.e. about 455 m AHD, there is the potential for seepage from the tailings to surrounding groundwater, particularly down-hydraulic-gradient to the south, although the rates of seepage would be expected to be low and restricted by the sealing of pores and fractures by the tailings, with minimal impacts on groundwater quality and levels.

The nearest bore or well that could be impacted is 12 Mile Well located 2 km south of GNH pit. The status of the well is not known. There are no known Groundwater Dependent Ecosystems that could be affected.

2.3.7 RECOMMENDED MONITORING PROGRAMME

There are four existing monitoring bores in the walls of GNH pit – PWD1 to PWD3, and BEMB4 (Fig. 2). These bores should continue to be monitored, before and during tailings emplacement in GNH pit. It is recommended that additional bores be installed on the down-gradient (southern) side of the pit to depths of about 70 m.

Conceptual bore locations are shown in Fig. 2 and are listed in Table 6.

Table 6: Recommended Monitoring Bore Locations

Name	mE	mN
GNHMB1	642450	7043890
GNHMB2	642560	7043950

The bores should be monitored quarterly for the following parameters:

- Water Level
- pH
- EC/TDS
- Weak Acid Dissociable (WAD) Cyanide

3 CONCLUSIONS

The main aquifers in the GNH pit are disconnected mineralised zones of ferruginous quartz-carbonate altered rocks as in the neighbouring Bluebird East and Bassetts West pits, which have also been used to store tailings.

The results of groundwater monitoring around Bassetts west and Bluebird East have indicated minimal impact on groundwater, with circum-neutral pH, low WAD cyanide levels, and low salinity. Metal concentrations have also been low. Based on this, it is expected that any impacts of tailings emplacement in GNH pit would also be small.

Two additional monitoring bores are recommended to be installed on the southern side of GNH pit; together with the existing bores, they would be used to monitor groundwater levels and quality.

Dated: 11 March 2024 **Rockwater Pty Ltd**

[redacted]

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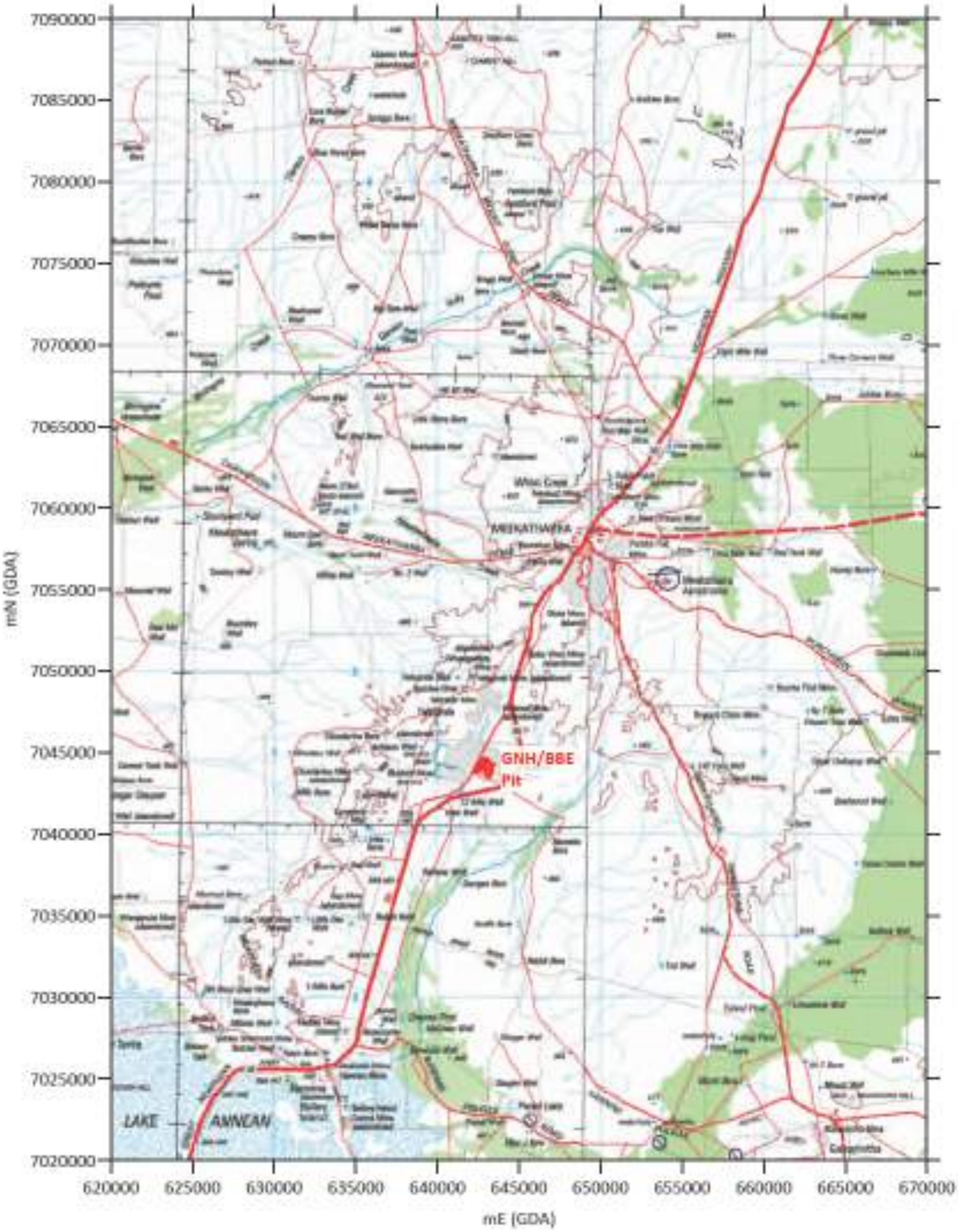
FIGURES

FIGURE 1



location.srf

CLIENT: Westgold

PROJECT: GNH Pit TSF

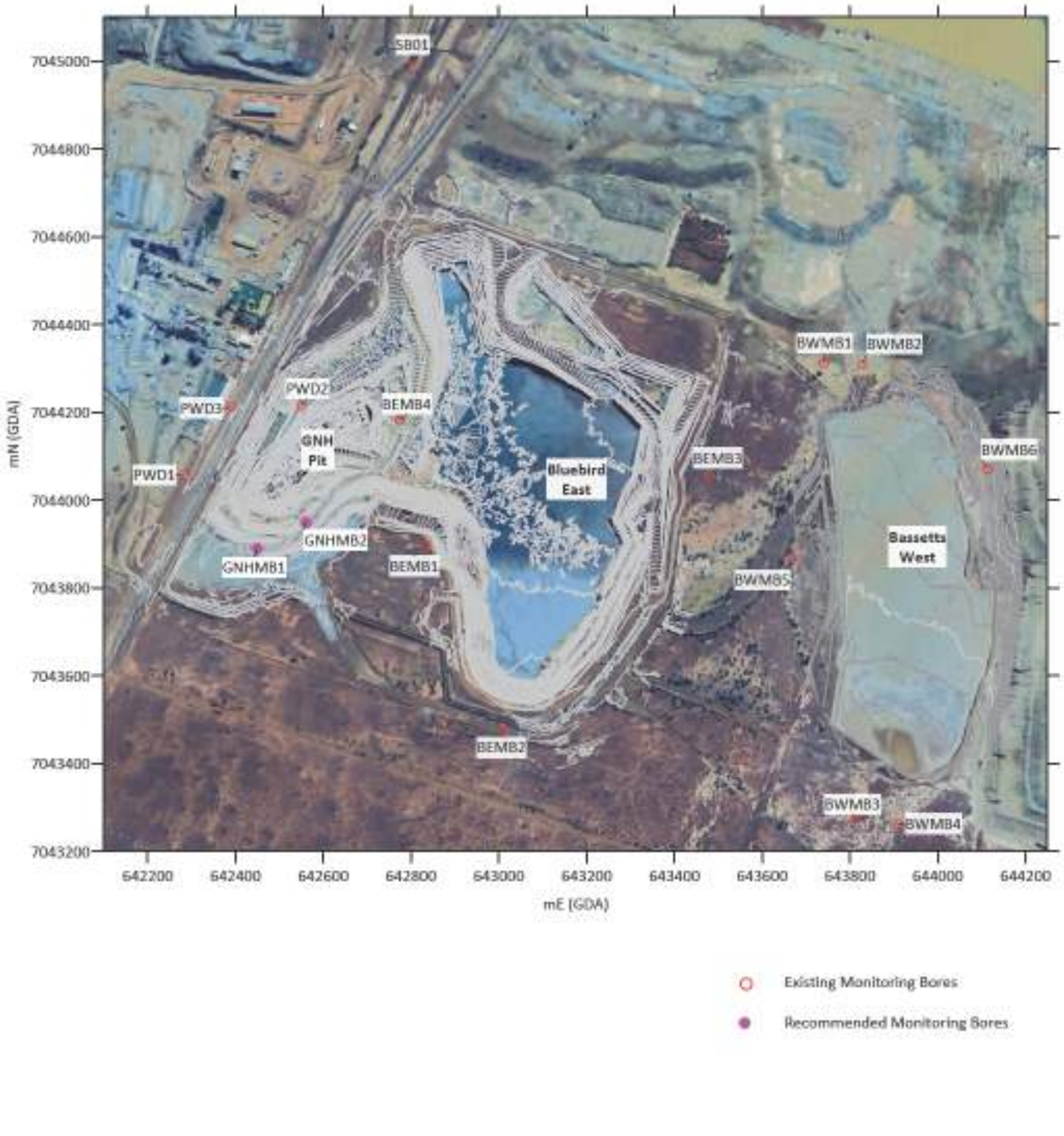
DATE: March 2024

Dwg No: 188-17/24/1-1

LOCALITY MAP

Rockwater Pty Ltd

FIGURE 2



mon bore locs.srf

CLIENT: Westgold

PROJECT: GNH Pit TSF

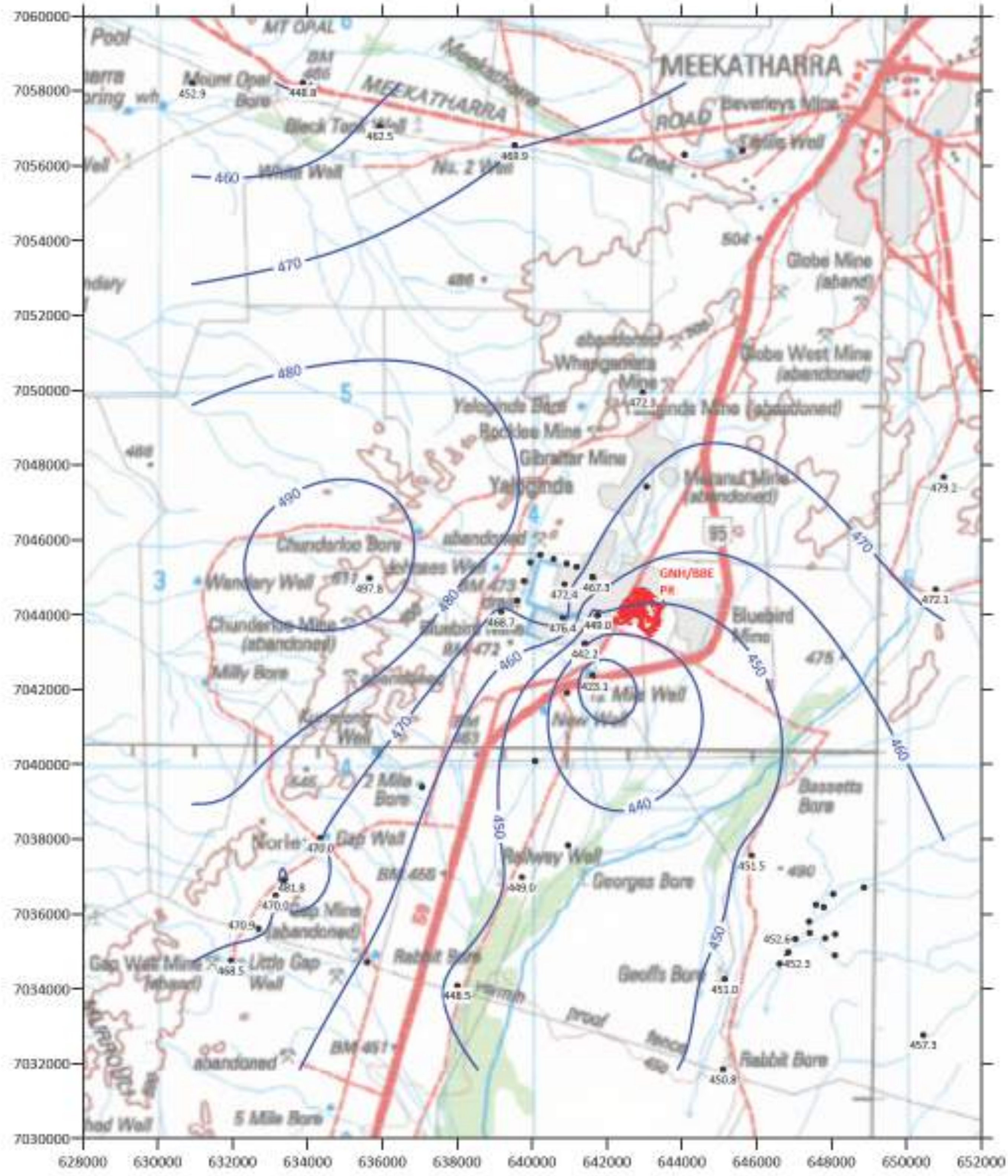
DATE: March 2024

Dwg No: 188-17/24/1-2

PITS & MONITORING BORE LOCATIONS

Rockwater Pty Ltd

FIGURE 3

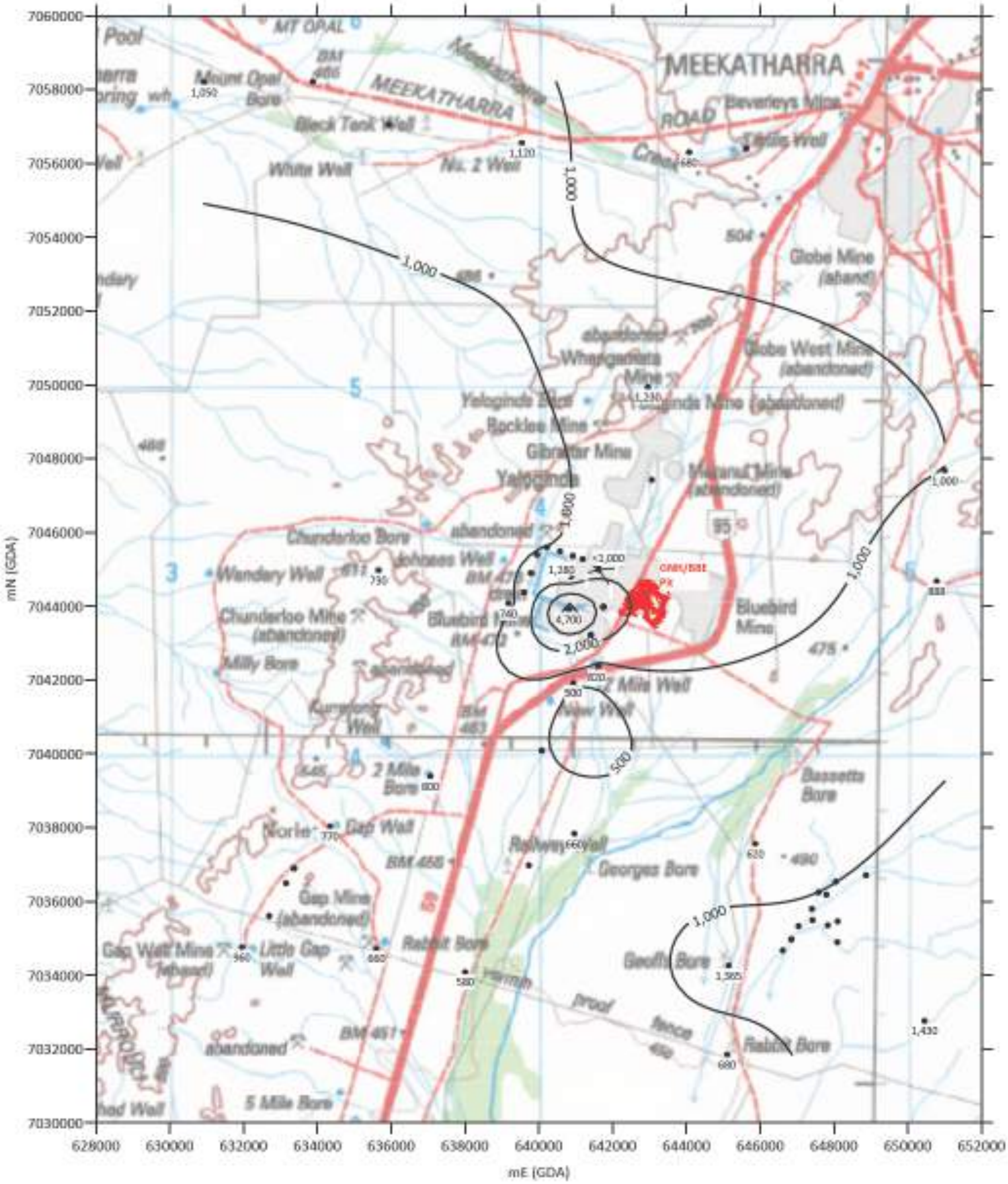


rwls.srf

CLIENT: Westgold Resources PROJECT: GNH Pit TSF DATE: March 2024 Dwg No: 188-17/24/1-3	GROUNDWATER LEVELS (m AHD), WIR DATABASE BLUEBIRD AREA

Rockwater Pty Ltd

FIGURE 4



tds.srf

CLIENT: Westgold Resources

PROJECT: GNH Pit TSF

DATE: March 2024

Dwg No: 188-17/24/1-4

GROUNDWATER SALINITY (mg/L TDS), WIR DATABASE

BLUEBIRD AREA

Rockwater Pty Ltd

APPENDIX E: TAILINGS STORAGE DATA SHEET

TETRA TECH COFFEY

TAILINGS STORAGE DATA SHEET					
Please answer all questions, with separate sheets for cells of different ages.			Coffey Job No.:	754-PERGE340337	
			Ref No.:	-	
1 PROJECT DATA					
1.1	Project Name:	Bluebird Gold Mine, Meekatharra	1.2	Date:	June 2024
1.3	TSF Name:	GNH pit TSF	1.4	Commodity:	Gold
1.5	Name of Data Provider:*	Westgold / Coffey	1.6	Phone:*	9220 5700
1.7	TSF Centre Co-ordinates (GDA 2020/MGA Zone 51):			m North	m East
1.8	Lease Numbers:	M51/459, M51/491			
2. TSF DATA					
2.1	TSF Status:	Proposed ☒ Current ☐ Disused ☐ Rehabilitated ☐			
2.2	Type of TSF:[1]	In-pit	2.2.1	Number of cells:[2]	-
2.3	Hazard Rating:[3]	Low	2.4	TSF Category:[4]	3
2.5	Catchment Area:[5]		2.6	Nearest Watercourse:	Polelle Creek
2.7	Date Deposition Started (mm/yy):	N/A	2.7.1	Date Deposition Completed (mm/yy):	N/A
2.8	Tailings Discharge Method:[6]	Single-spigot	2.8.1	Water Recovery Method:[7]	Centrifugal pump
2.9	Bottom of Facility Sealed or Lined?:	No	2.9.1	Type of Seal or Liner:[8]	N/A
2.10	Depth to Original Groundwater Level:	455 mAHD	2.10.1	Original Groundwater TDS:	3,400 – 5,200 mg/L
2.11	Ore Process:[9]	CIP	2.12	Material Storage Rate:[10]	250,000 tpa (solids)
2.13	Impoundment Volume (present):	N/A	2.13.1	Expected Maximum:	869, 181m^3
2.14	Mass of Solids Stored (present):	N/A	2.14.1	Expected Maximum:	1.22 tonnes
3. ABOVE GROUND FACILITIES					
3.1	Foundation Soils:	N/A	3.1.1	Foundation Rocks:	N/A
3.2	Starter Bund Construction Materials:[11]	N/A	3.2.1	Wall Lifting by:[12]	N/A
3.3	Wall Construction by:	N/A	3.3.1	Wall Lifting Material:[13]	N/A
3.4	Present Maximum Wall Height:[14]	N/A	3.4.1	Expected Maximum:	N/A
3.5	Crest Length (present):	N/A	3.5.1	Expected Maximum:	N/A
3.6	Impoundment Area (present):	N/A	3.6.1	Expected Maximum:	N/A
4. BELOW GROUND / IN-PIT FACILITIES – N/A					
4.1	Initial Pit Depth (maximum):	95.0 m	4.2	Area of Pit Base:	
4.3	Thickness of Tailings (present):	N/A	4.3.4	Expected Maximum Tailings Thickness:	54.0 m
4.4	Current Surface Area of Tailings:	N/A	4.5	Final Surface Area of Tailings:	
5. PROPERTIES OF TAILINGS					
5.1	TDS:	4,300 mg/L	5.2	pH:	9.3
5.3	Solids Content:	35%	5.4	Deposited Density:	1.4 t/m^3
5.5	WAD CN:	65 mg/L	5.6	Total CN:	N/A
5.7	Potentially Hazardous Substances:[15]	Low Cynaide levels			
5.8	Any Other NPI Listed Substances in the TSF?[16]	N/A			

Not to be recorded in the database; for 1, 2, 3 etc. see explanatory notes below.

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 etc.
2. Number of cells operated using the same decant arrangement.
3. See Table 1 in the Guidelines.
4. See Figure 1 in the Guidelines
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, CTD (Central Thickened Discharge) etc.
7. Gravity feed decant, pumped decant, floating pump etc.
8. Clay, synthetic etc.
9. See list below for ore process method.
10. Tonnes of solids per year
11. Record only the main material(s) used for construction eg: clay, sand, silt, gravel, laterite, fresh rock, weathered rock, tailings, clayey sand, clayey gravel, sandy clay, silty clay, gravelly clay, etc or any combination of these materials.
12. Wall lifting method during the reporting period, if raised.
13. If the wall has been raised during the reporting period, the wall lifting material used. Is it tailings or any other (or combination of) material(s) listed under item 11 above.
14. Maximum wall height above the ground level (not AHD or RL).
15. Arsenic, Asbestos, Caustic soda, Copper sulphide, Cyanide, Iron sulphide, Lead, Mercury, Nickel sulphide, Sulphuric acid, Xanthates etc.
16. NPI – National Pollution Inventory. Contact Dept of Environmental Protection for information on NPI listed substances.

ORE PROCESS METHODS

The ore process methods may be recorded as follows:

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

APPENDIX F: WATER BALANCE

PROJECT	**: GNH pit design**		
CLIENT	**: Westgold Resources limited**		TETRA TECH COFFEY
LOCATION	**: Bluebird Mine**	Date	14-Jun-24
		Job No	754-PERGE340337
SUBJECT	**: WATER BALANCE - GNHIPTSF** 2,500,000 tpa (dry), 40% Solids	Rev	A

Month	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**ANNUAL**
Days per Month	31	28	31	30	31	30	31	31	30	31	30	31	365
INFLOWS													
RAINFALL													
Rainfall (mm/month)	29.4	35.9	30.8	18.8	21.6	28.5	20.2	10.6	4.9	5.9	11.6	14.2	428.10
Average Daily Rainfall (mm)	0.95	1.28	0.99	0.63	0.70	0.95	0.65	0.34	0.16	0.19	0.39	0.46	
Pit Surface Area (m²)	181,581	181,581	181,581	181,581	181,581	181,581	181,581	181,581	181,581	181,581	181,581	181,581	
Runoff Coefficient: Tailings/Area around the Pit	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
External Catchment Area (m2)	36,316	36316.20	36316.20	36316.20	36316.20	36316.20	36316.20	36316.20	36316.20	36316.20	36316.20	36316.20	
Runoff Coefficient for External Catchment Area	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	
Pool Area (m²)	1,059	1,332	1,491	1,642	1,793	2,038	2,189	2,345	2,479	3,063	3,234	3,412	
Running Beaches (m²)	3,001	3,775	4,226	4,652	5,080	5,775	6,203	6,644	7,024	8,677	9,164	9,666	
Rainfall Inflow Total Volume (m³/day)	189.4	256.1	198.5	125.2	139.2	189.8	130.2	68.3	32.6	38.0	77.2	91.5	46,419
SLURRY WATER													
Tailings Production Rate (t/year)	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	
Tailings Production Rate (t/day)	6,849	6,849	6,849	6,849	6,849	6,849	6,849	6,849	6,849	6,849	6,849	6,849	
% Solids	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	
Volume of Water (m³/day)	10,274	10,274	10,274	10,274	10,274	10,274	10,274	10,274	10,274	10,274	10,274	10,274	3,750,000
TOTAL INFLOW (m³/day)	**10,463**	**10,530**	**10,472**	**10,399**	**10,413**	**10,464**	**10,404**	**10,342**	**10,307**	**10,312**	**10,351**	**10,365**	**3,796,419**
OUTFLOWS													
EVAPORATION (from pond and beaches)													
Pan Evaporation (mm/day)	18.87	17.13	13.29	9.77	6.55	4.50	4.58	6.03	8.77	12.87	15.07	16.55	4,064
Evaporation Pan Coefficient	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	
Average Daily Evaporation Rate (mm/day)	12.27	11.14	8.64	6.35	4.26	2.93	2.98	3.92	5.70	8.37	9.79	10.76	
Pool Area & Running Beaches (m²)	4,061	5,107	5,717	6,294	6,873	7,814	8,392	8,989	9,503	11,740	12,398	13,078	
Daily Evaporation Loss/Outflow (m³/day)	49.81	56.87	49.39	39.95	29.26	22.85	24.99	35.25	54.15	98.22	121.42	140.67	21,999
EVAPO-TRANSPIRATION (from drying tailings)													
Average Daily Evaporation Rate (mm/day)	6.29	5.71	4.43	3.26	2.18	1.50	1.53	2.01	2.92	4.29	5.02	5.52	1,355
Drying Tailings Beach Area (m²)	3,001	3,775	4,226	4,652	5,080	5,775	6,203	6,644	7,024	8,677	9,164	9,666	
Daily Evaporation Loss (m³/day)	18.88	21.56	18.72	15.14	11.09	8.66	9.47	13.36	20.52	37.23	46.02	53.32	8,338
SEEPAGE (estimated average value)													
Leakage From Pit Floor (m³/day)	43.20	43.20	43.20	43.20	43.20	43.20	43.20	43.20	43.20	43.20	43.20	43.20	
Total Seepage Outflow (m³/day)	43.20	43.20	43.20	43.20	43.20	43.20	43.20	43.20	43.20	43.20	43.20	43.20	15,768
RETENTION													
Assumed Moisture Content of Tailings (average)	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	
Volume Retained in Tailings (m³/day)	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	2,397	875,000
TOTAL OUTFLOW/LOSSES (m³/day)	**2,509**	**2,519**	**2,509**	**2,496**	**2,481**	**2,472**	**2,475**	**2,489**	**2,515**	**2,576**	**2,608**	**2,634**	**921,105**
BALANCE													
INFLOWS - OUTFLOWS (m³/day)	**7,954**	**8,011**	**7,964**	**7,904**	**7,932**	**7,992**	**7,929**	**7,853**	**7,791**	**7,736**	**7,743**	**7,731**	**2,875,314**
RETURN WATER TO THE PLANT (if available)													
Total Water Return (m³/day)	7,954	8,011	7,964	7,904	7,932	7,992	7,929	7,853	7,791	7,736	7,743	7,731	**2,875,314**
Average Water Return	77.4%	78.0%	77.5%	76.9%	77.2%	77.8%	77.2%	76.4%	75.8%	75.3%	75.4%	75.2%	
Annual Water Return Available (m3/year)	**2,875,314**												
Annual Average Water Return (as % of tailings slurry water)	**76.7%**												
Summary of Water Balance	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	
Water shortfall or excess of requirements (m3/day)	-2,320	-2,263	-2,310	-2,370	-2,342	-2,282	-2,345	-2,421	-2,483	-2,538	-2,531	-2,543	
Water shortfall or excess of requirements (m3/hr)	-97	-94	-96	-99	-98	-95	-98	-101	-103	-106	-105	-106	
Total water in excess of requirements (m3/month)	-71,911	-63,358	-71,614	-71,112	-72,591	-68,467	-72,688	-75,044	-74,475	-78,675	-75,920	-78,832	-874,686
Total water in excess of requirements (m3/year) =	-874,686												

APPENDIX G: OPERATIONS MANUAL

Bluebird Gold Mine

GNH Pit TSF Conversion – Operations Manual

Westgold Resources Limited

Reference: 754-PERGE340337-R03

20 June 2024

BLUEBIRD MINE

GNH Pit TSF Conversion – Operations Manual

Report reference number: 754-PERGE340337-R03
20 June 2024

PREPARED FOR

Westgold Resources Limited
Great Northern Highway, Meekatharra

PREPARED BY

Tetra Tech Coffey Pty Ltd
[redacted]

QUALITY INFORMATION

[redacted]

Distribution

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Restriction on Disclosure and Use of Data

CONTENTS

1. INTRODUCTION

This manual is intended to be used by process plant staff who undertake daily inspections of the GNH Pit Tailings Storage Facility (GNHIPTSF). The purpose of this Operations Manual (OM) and the existing proformas is to allow both shift and daily inspection records to be taken and recorded and, if required, reported to senior staff. The provisions of the OM must be strictly adhered to by the owner and the storage must be operated strictly in accordance with its provisions. Coffey shall not be liable in any respect whatsoever for any damage to or failure in the operations of the tailings storages resulting from failure of the Owner, its servants or agents to comply with the provisions of this OM.

This document sets out details of the components of the storage facility which are influenced by the general day to day activities. Each of these components form part of the overall operation of the storage facility and attention must be paid to each component to ensure the storage facility is operated to achieve the design objectives.

The components which are influenced by the general day to day activities include:

- Tailings deposition
- Decant pump operation
- Routine inspections and maintenance

2. SUMMARY OF OPERATIONAL PROCEDURES

2.1 GENERAL

The following considerations relate to the operation of the GNHIPTSF:

- Frequent inspections should be made of the tailings line, water return line, discharge point, water recovery system and the position of the supernatant pond in relation to the water recovery system. The facility should be inspected in accordance with the mine's Operating License.
- Only by regular inspection and appropriate remedial action can the performance of the water return system be optimised and operational problems be avoided.
- Operation, safety and environmental aspects should be periodically reviewed during an inspection by a suitably experienced and qualified engineer. This inspection should be done at least once every year.
- The operational design of the facilities is aimed at:
    - Providing maximum return water to the plant
    - Maximising tailings storage capacity
    - Reducing environmental impacts

2.2 GNH PIT TAILINGS STORAGE FACILITY

The following considerations have been incorporated into the design of the GNHIPTSF:

- Tailings should be placed so that the beach is formed against the west wall;
- Spigots should be placed below the top half of the slope, where the slope is closer to the highway and the weathering grade is highest;
- The degree of erosion around the spigot location should be monitored regularly. If excessive erosion is noted, then placement at that spigot should cease and the spigot should be moved.

- Survey monitoring of the west wall should be at a greater frequency in the early stages of tailings placement. Twice weekly measurements are recommended.
- Tailings discharge or spigotting is to be carried out such that the pond of supernatant water is located adjacent to the ramp at the eastern side of the GNH Pit.

3. COMPONENTS OF TAILINGS STORAGE FACILITY

3.1 DEPOSITION OF TAILINGS

The method of deposition of tailings into the storage is one of the major controlling factors in achieving:

- Higher in-situ densities in the tailings storage
- Higher water returns
- Maintaining pit wall stability

In order to understand the tailings deposition requirements a detailed knowledge of the components of the tailings system is required. These components include:

- Tailings Pipe-work
- Spigotting Process
- Ring Main Flushing

3.1.1 Tailings pipe-work

Tailings is transported from the process plant to the active tailings storage via a large diameter HDPE pipe. A spur line will be constructed from the main line going to the GNH Pit TSF. At the spigot/discharge point the tailings delivery pipe extends a minimum distance of 5.0m over the pit rim crest, from where the tailings is deposited into the facility.

3.2 SPIGOTTING PROCESS

3.2.1 GNHIPTSF

Tailings deposition into GNHIPTSF will be undertaken so that the beach is formed against the west wall. The degree of erosion around the spigot location should be monitored regularly. If excessive erosion is noted, then placement at that spigot should cease and the spigot should be moved.

The GNHIPTSF will have a storage volume of approximately 869,181 m^3. It is estimated a total of 1.22Mt of tailings will be stored in the proposed GNHIPTSF, based on a tailings dry density of approximately 1.4 t/m^3.

3.2.2 Main flushing

The pipelines should be flushed with tailings return water when deposition into the facility is stopped for any reason or when the spigot point is changed. Doing so will reduce the likelihood of pipe blockage. The flushing operation will be supervised by the Shift Foreman.

3.3 RETURN WATER OPERATION

During tailings deposition, the facilities will house a manually operated decant pump which removes supernatant water by a dedicated pumping system that delivers the water back to the processing plant. The location of the supernatant water pond will be controlled by the tailings discharge sequence employed.

The pond should be maintained at the smallest practical operational size to maximise water return to the plant.

The size of the pond will be largely governed by the efficiency of the decant pump in removing water from the tailings storage. Other controlling factors will be:

- evaporation from the surface of the pond;
- variations to the input of tailings water (percentage solids);
- rainfall events;
- difference in permeability between the tailings and the underlying rock units; and
- the ratio of horizontal to vertical permeability of the tailings.

3.4 ROUTINE INSPECTIONS AND MAINTENANCE

Routine inspections, as detailed below, are to be undertaken by an operator or shift supervisor, in accordance with the mine's Operating License. The date and time of each inspection is to be entered into the Shift Foreman's log book and is to be signed by the person allocated to undertake the inspection on that shift to ensure the requirements have been undertaken. The existing proformas utilised for the adjacent Bluebird East in-pit TSF will be revised for use with GNHIPTSF.

The Shift Inspection Log Sheet is to be filled out on a daily basis. The frequency of the routine inspection is to be increased if any untoward conditions are observed at any time.

The inspections should cover:

- The pipelines (tailings delivery line and water return line) to and from the tailings storage facility.
- Leak detection.
- Pumps.
- valves.
- Tailings discharge point.
- Location and size of the water pond.
- The decant pump.
- Seepage from the facility as indicated by monitoring bores.
- The general integrity of the crest and pit walls i.e. any new cracking (daily).
- Any changes to existing cracking or seepage.

3.4.1 Tailings lines

The tailings line is to be inspected a least once per shift, in accordance with the mine's Operating License. The date and time of each inspection is to be entered into the Shift Foreman's log book.

All tailings lines will be bunded. The HDPE tailings lines are sensitive to temperature, and the expansion and contraction of this line can cause leaks, and in extreme situations, failure of the pipeline. Any leaks or failures of the tailings pipeline should be immediately reported to the following personnel or project equivalents and an incident report completed.

- Shift Foreman or
- Mill Superintendent (Processing Manager)

3.4.2 Decant system

The position and size of the pond and the position of the decant pump should be inspected at the same time as the tailings lines are inspected. Any abnormalities should be reported immediately to the following personnel or project equivalents:

- Shift Foreman or
- Mill Superintendent (Processing Manager)

The return water lines to the process water pond at the plant should also be inspected at the same time as the tailings line. Any leaks or failure of the water pipeline should be immediately reported to the following personnel or project equivalents:

- Shift Foreman or
- Mill Superintendent (Processing Manager)

3.5 PIT WALLS

Part of the general activities of the Shift Foreman, when visiting the storage facilities, shall be to inspect the pit walls, including the pit rim. The inspection shall note any cracking or new features, such as slumping, pit wall failures or scour (caused by tailings deposition or rainfall runoff) or any other obvious changes or problems.

4. EMERGENCY ACTION PLAN

4.1 RESPONSE ACTIONS

To enable the emergency action plan to be implemented and to allow a safe and timely response to be instigated, the attached documents (Personnel Contact Details, Assembly Points and Staff Confirmation Log) outline current information pertaining to assembly points and contact names. The sheets shall be reviewed at least six monthly or updated as required when new staff become responsible for activities in and around the facilities.

Contractors shall also be made familiar with the location of the assembly point and be made aware of their reporting responsibilities and to whom they shall report to.

The attached sheets should provide a list of relevant contact details of staff associated with the tailings storage, senior site responsible staff, safety officers and emergency services.

4.2 TAILINGS LINES AND RETURN WATER LINES

The tailings lines from the process plant to the tailings storage and the return water lines from the decant pump to the processing plant are to be located inside bunded open trenches to contain any spillage of materials resulting from lines which develop leaks or burst during operation.

The pipelines will be fitted with flow meters and telemetry to allow active monitoring in the plant control room. In the event of flow meter readings indicating pipeline failure, the affected pipeline is to be shut down until repaired and the spilled materials collected and/or pumped, as appropriate, and deposited in the GNHIPTSF.

4.3 DECANT PUMP

The decant pump is operated manually. The pumps are only switched off during:

- Shutdowns;
- When dirty water is pumped into the evaporation pond; and

- When it is necessary during periods of rainfall to ensure minimal water on the storage.

4.4 TAILINGS STORAGE

No personnel shall enter the base of the GNHIPTSF during operations (i.e. start-up). Access should be confined to ramps associated with decants. Personnel should complete a pit wall/rim inspection and HAZOPS assessment before entering the pit.

Under normal operating conditions, the water pond will initially pond against the ramp on the eastern side of the facility.

In the unlikely event of a major pit wall/mine waste embankment failure, the tailings within the facility will likely remain within the facility or confined within the adjacent pits.

Actions to control a pit wall failure affecting decant or tailings deposition (i.e. tailings is not likely to go beyond the confines of the pits) would include:

- Assess the requirement to shut down of the process plant or reduce throughput.
- Contact a suitably qualified geotechnical organisation for technical assistance.
- Advise relevant government departments particularly DMP and Department of Environment Regulation (DER).
- Prior to the commencement of any repairs undertake (as appropriate) a thorough inspection of the area with the assistance of a geotechnical specialist.
- Repair the damaged area, if appropriate.
- Prepare an incident report, detailing all factors prior to the incident and the situation after cleanup. The report should identify causes of the problem and what actions will be taken to prevent a similar occurrence. This report should detail the ongoing monitoring programme to fully assess the impact of the incident.
- Advise all appropriate government departments as necessary of the incident, review DMP conditions of licence in respect to the timing of advising the DMP and reporting criteria.

It must be stressed however, that the safe operation of the GNHIPTSF relies upon the implementation of operational procedures which comprise tailings deposition, decant operation; and routine inspections and maintenance, as set out in this Operations Manual.

5. INCIDENT REPORTING

The undertaking of regular inspections and monitoring is aimed at identifying any problems prior to them causing a major impact on the operation or integrity of the structure. The inspections may result in the identification of an event that may require reporting to senior staff and in some cases to relevant government departments (DEMIRS and/or DER), i.e. new seepage as indicated by monitoring bores.

In addition to incidents that require reporting under section 78 and 79 of the Mine Safety and Inspection Act of 1994, the following events or occurrences also need to be reported to DMP within 7 days or sooner of identifying an incident/problem or likely incident/problem. DER conditions of licence should also be reviewed in respect to the timing and detail required for incident reports.

Copies of the current lease and licence conditions (DEMIRS and DER) relevant to the tailings storages should be attached to this document to allow for easy reference. Each time the DEMIRS mining lease conditions or DER conditions or licence are renewed or updated all conditions should be checked for any changes, with appropriate confirmation they have been read and records have been updated and will be acted upon as considered appropriate.

Typical reporting events include:

- Any fauna death on or near the GNHIPTSF (not road kill).
- Any uncontrolled release of tailings slurry or return water and the cause (pipe break, overtopping, pump malfunction, automatic switch malfunction, operator error, etc.).
- Impact from seepage (vegetation distress, soil contamination, water quality changes).
- Defects to the tailings storage facility covering such things as the pit walls and return water system (i.e. pertaining to safety issues).
- Changes in water quality that exceed prescribed conditions of licence criteria.
- Increases in production tonnages.

It is recommended that prior to submitting an incident report to DEMIRS/DER that an assessment be undertaken to confirm the nature, type and impact of the incident by either senior site staff or an independent organisation. If an incident requires reporting to the DMP, as a minimum, the DMP incident report form should be used as well as any other reporting requirements i.e. DER reporting criteria.

6. CLOSURE

This OM is to be read in conjunction with the Design Report. This OM contains copies of proforma log sheets and lists of information to be inspected and recorded on a daily, monthly or yearly basis