Mount Rawdon Operations Northern Waste Rock Dump Detailed Cover System Design: Concept Study Review Report

31 May 2024

Evolution MINING

okane

Integrated Mine Closure and Relinquishment Solutions

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

Evolution Mining Pty Ltd (Evolution) have requested O'Kane Consultants Pty Ltd (Okane) produce a Concept Study Review Report with respect to the Northern Waste Rock Dump (NWRD) located at the Mount Rawdon Gold Mine Operation (MRO). MRO is located 270 km north-west of Brisbane and 70 km south-west of Bundaberg, Queensland.

MRO will cease operations in 2024 and cease ore processing in 2025. A top-tier cover system is proposed for the NWRD. Pumped hydro is currently in the feasibility stages for a potential future land use beyond mining.

1.1 Report Organisation

For convenient reference, the report has been subdivided into the following sections:

- Section 1 – introduces the study, purpose, and scope of works.
- Section 2 – provides background information.
- Section 3 – review of conceptual cover system design.
- Section 4 – review of rehabilitation materials.
- Section 5 – review of revegetation.
- Section 6 – NWRD drainage considerations associated with pumped hydro.
- Section 7 – summary of information gaps identified and recommendations.
- Section 8 – list of references.

1.2 Objective and Scope

The objective is to determine if there is sufficient data to develop a detailed cover system design for the NWRD. The cover system will support the regulatory requirements contained within Section 3.6.1 of the Progressive Rehabilitation and Closure Plan (PRCP) Guideline by specifically addressing the requirements to ensure a low residual risk of acid and metalliferous drainage (AMD)[1] at the NWRD.

This report consists of the following components:

- Okane/BGC site visit.

[1]AMD (or acid rock drainage; ARD) refers to acid and metalliferous drainage which collectively includes acidic, saline, and metalliferous (metal(loid)) drainage.

- Background review and assessment of available documentation and data that will be used to develop the detailed cover system design for the NWRD.
- Identification of relevant knowledge gaps.
- Recommended further works based on the identified knowledge gaps.

1.3 Okane/BGC Site Visit

In April 2024, Okane (Lachlan Ashby and Lucia Alzetta), BGC (Jan Sterling), and site representatives conducted a site visit of MRO with the aim of conducting a walkover of the wider NWRD area, encompassing the top-tier, berms, low-grade ore stockpile, and water management dams situated east of the NWRD.

Other key areas (tailings storage facility (TSF), main pit, processing area, and borrows areas) were also inspected to better understand the landforms and infrastructure that encompass closure planning, and to support project knowledge sharing.

1.4 Documentation Reviewed

Okane has reviewed the following set of documents relevant to the project scope as listed in Table 1.1. Following a thorough review of the provided information, MRO and Okane will collaborate to assess its adequacy, identify areas where valid assumptions can be made, and identify where further investigation may be necessary, especially concerning the detailed design of the cover system.

Table 1.1: Reviewed Documentation

Author	Year	Title
ATC Williams	2014	Progressive Rehabilitation and Closure Planning – Hydraulic Assessment
ATC Williams	2024	Mount Rawdon Operation: Sampling and Testing Plan
Calibre	2023	Mount Rawdon Operations: Civil - Basis of Design Report
Calibre	2023	Mount Rawdon Options Selection Study
Cartledge Mining and Geotechnics	2024	Mount Rawdon Mine PRCP Geotechnical Assessments - NWRD
MRO	2012	Weed Management Plan
MRO	2020	Biodiversity Management Plan
MRO	2022	Mount Rawdon Progressive Rehabilitation and Closure Plan
MRO	2023	Revegetation Procedure
MRO	2023	Seepage Management Plan
MRO	2023	Mount Rawdon Operational Ground Water Management Plan
Northern Resource Consultants (NRC)	2013a	Flora and Fauna Technical Report
NRC	2013b	Waste Rock Dump Berm Design for the North Dump
NRC	2017	Final Land Use and Rehabilitation Plan

Author	Year	Title
RGS	2016	Conceptual Closure, Decommissioning and Rehabilitation Plan
RGS	2021	Northern Waste Rock Dump Characterisation
RGS	2022	Mine Material Management Plan
RGS	2023a	Erosion measurement and modelling
RGS	2023b	Geochemical Assessment of Waste Rock and Tailing Materials
Sustainable Solutions Global (SSG)	2024	Conceptual Closure Revegetation Program Mt. Rawdon Operations Queensland

2 BACKGROUND

2.1 NWRD Landform

The NWRD, positioned north-east of the pit, covers a footprint of approximately 105 hectares (ha), as shown in Figure 2.1 and Figure 2.2. The facility is utilised for the disposal of both non-acid-forming (NAF) and potential acid-forming (PAF) waste rock material. The natural terrain of the NWRD area slopes gently from east to north-east. Along the northern and eastern boundaries of the NWRD, toe seepage is collected in four water management dams (WD1 to WD4) shown by the yellow arrows in Figure 2.1.

2.2 Topography

MRO is approximately 170 m above sea level and is surrounded by rolling to steep hills (NRC, 2015). The topography of MRO falls away steeply from the top of Mount Rawdon to the north-west of the site, leading to undulating hills at the base of the mountain. The land slopes gently over 3 km to alluvial flats along the Perry River. This topographic influence may result in high levels of orographic rainfall at the mine site due to the predominant south-easterly wind direction.

2.3 Hydrology

MRO is situated in the Lower Burnett sub-catchment of the Burnett Basin catchment (NRC, 2015). Surface runoff from MRO drains into the Burnett River towards the South and into the Perry River towards the north. Swindon Creek, Rawdon Creek, and Twelve Mile Creek are ephemeral creeks that course to the north-east and discharge into the ephemeral Perry River system. A network of drainage lines within site feed Swindon Creek, Rawdon Creek, Twelve Mile Creek and Mingham Creek after rainfall. The southern area of the mine site drains to the south-east via Mingham Creek into the Burnett River.

Runoff from the mining lease travels overland rapidly, and surface flow in ephemeral creeks is sustained usually for days following rainfall (NRC, 2015). For most of the year there is no flow in the Perry River and water pools in a series of low volume waterholes.

Potentially mine impacted water from within operational areas is diverted to four containment dams (WD1-WD4) along the eastern side of the NWRD, two sediment dams (Sed Dam 1 and 3 (Sed Dam 2 now decommissioned)) downstream and immediately north-east of the TSF, and West Dam located to the south of the Western WRD (Figure 2.1). A network of diversion drains at MRO channel clean water runoff away from operational areas and prohibits mixing of potentially mine affected runoff with clean stormwater. The only exception is at Sed Dam 3 where intercepted TSF seepage collected in Sed Dam 1 migrates under the access road to mix with surface runoff (from the mine access road and borrow pit) in Sed Dam 3.

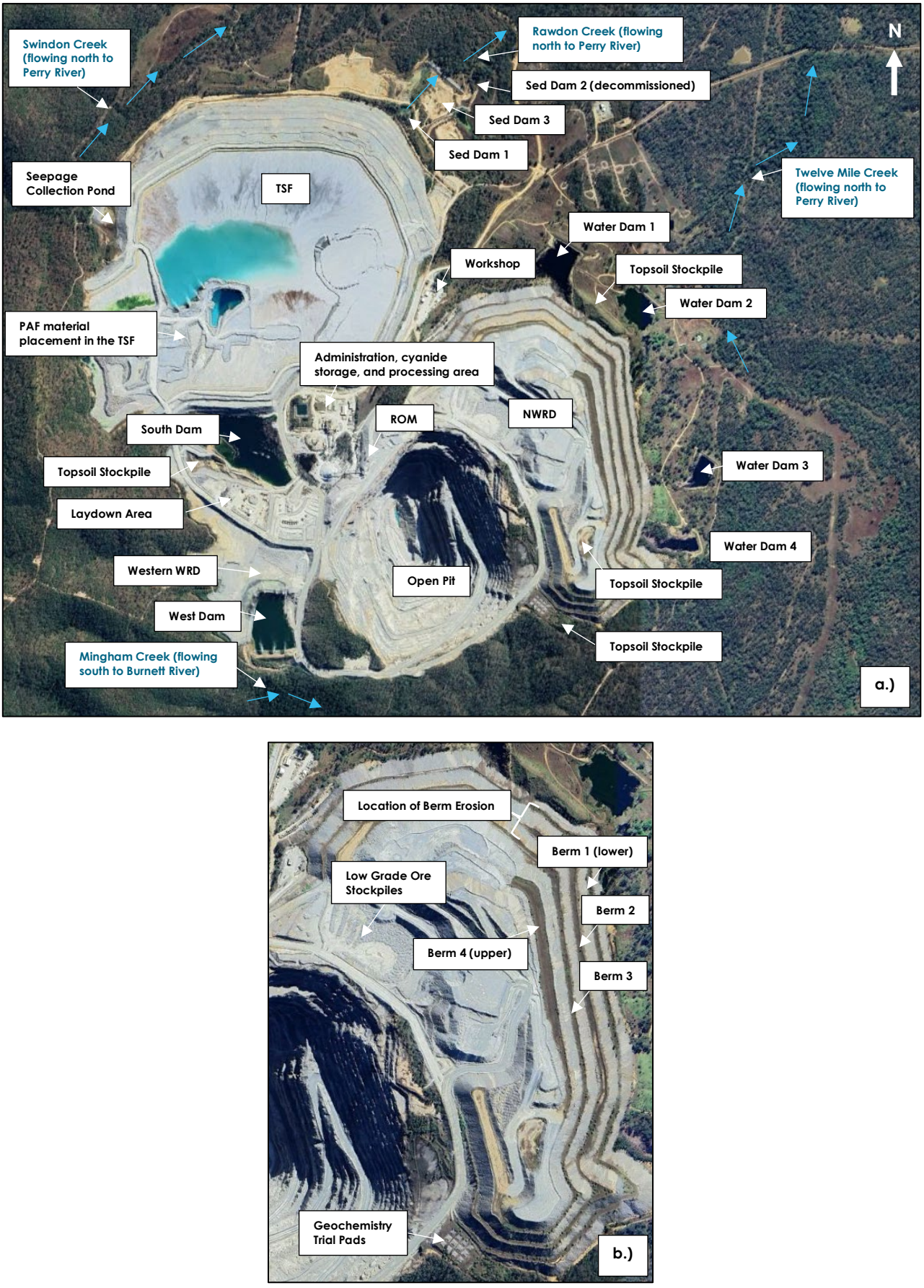

Figure 2.1: a.) Key site features at MRO, and b.) key features of the NWRD (Google Earth, 2023).

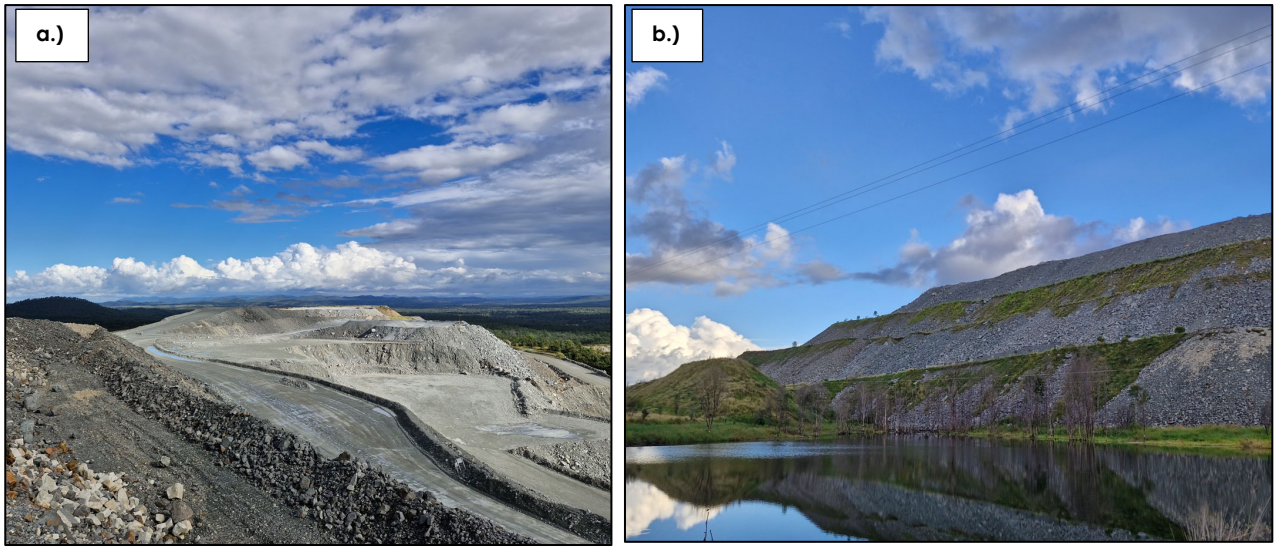

Figure 2.2: a.) Looking south across the top-tier of the NWRD, and b.) Looking south-east towards the NWRD (Okane, 2024).

2.4 Hydrogeology

The local hydrogeology is characterised by generally tight basement rocks, which are variably faulted and broadly fractured. Groundwater levels prior to mining were moderately shallow (15-20 m below ground level) and sub-parallel to the ground surface. Most bores drilled across the site have low yields and hence the pit walls are generally observed to be dry with minor local seeps. Sump pumping is low during the dry season (approximately 2-3 L/s).

2.5 Climate

The Köppen-Geiger Climate Classification positions the region as 'Cfa – humid subtropical'. This classification is defined by a temperate climate with hot summers and no significant seasonal variation in precipitation. This classification denotes regions with consistently moderate temperatures throughout the year and no dry months during the summer.

Figure 2.3 presents weather data obtained at Mount Perry 'The Pines' Station (039070) (BOM, 2024), located 14.4 km from MRO and comprising more than 120 years of data.

The mean annual rainfall is 939 mm, however rainfall statistics from Mount Perry 'The Pines' Station since 1889 (shown in NRC, 2015) indicates the high variability of annual rainfall in the region around MRO. Rainfall mainly occurs during the warmer summer months with most of the precipitation (>70 %) falling in the wet season from November to April. The highest daily rainfall recorded via the BOM is 339 mm in January 1890. The highest annual rainfall was 2,207 mm in 1893 while the lowest annual rainfall was 397 mm in 1902.

The average monthly maximum temperature ranges between 25.6 °C and 39 °C, with average monthly minimum temperatures ranging from 4.3 °C to 10.8 °C.

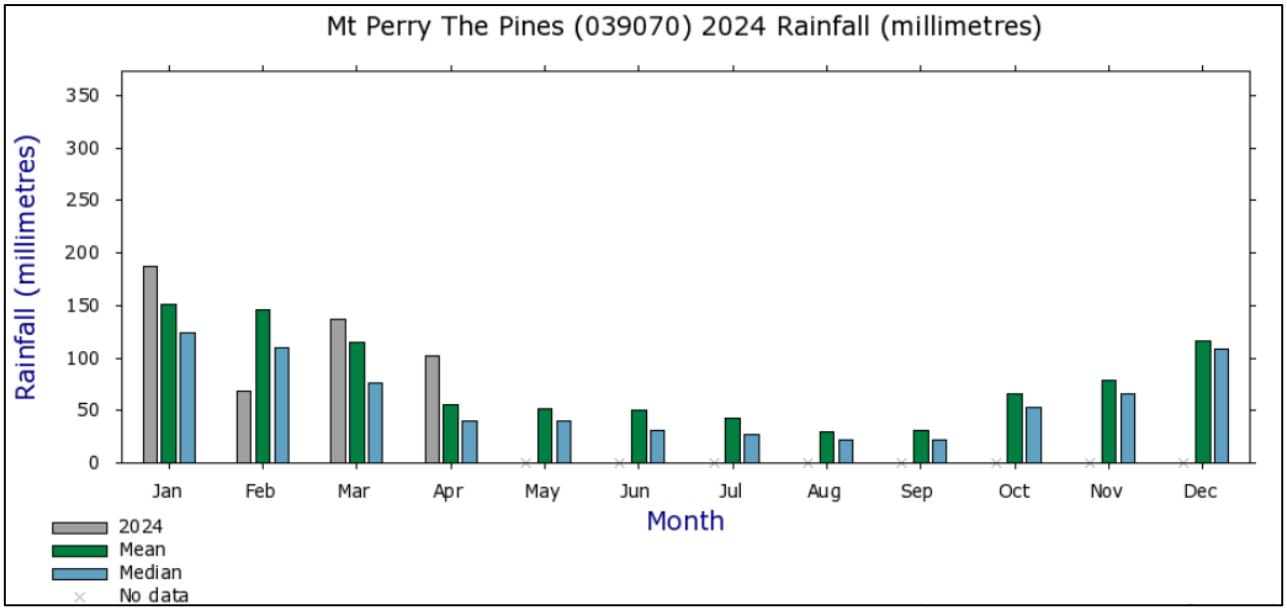

Figure 2.3: Mean monthly rainfall (BOM, 2024)

Comparison of the annual rainfall data collected using the gauges at MRO (operated since 2000) to the results from Mount Perry 'The Pines' Station reveals some variation in rainfall between the two sites, which are under 15 km apart (NRC, 2015) (Figure 2.4).

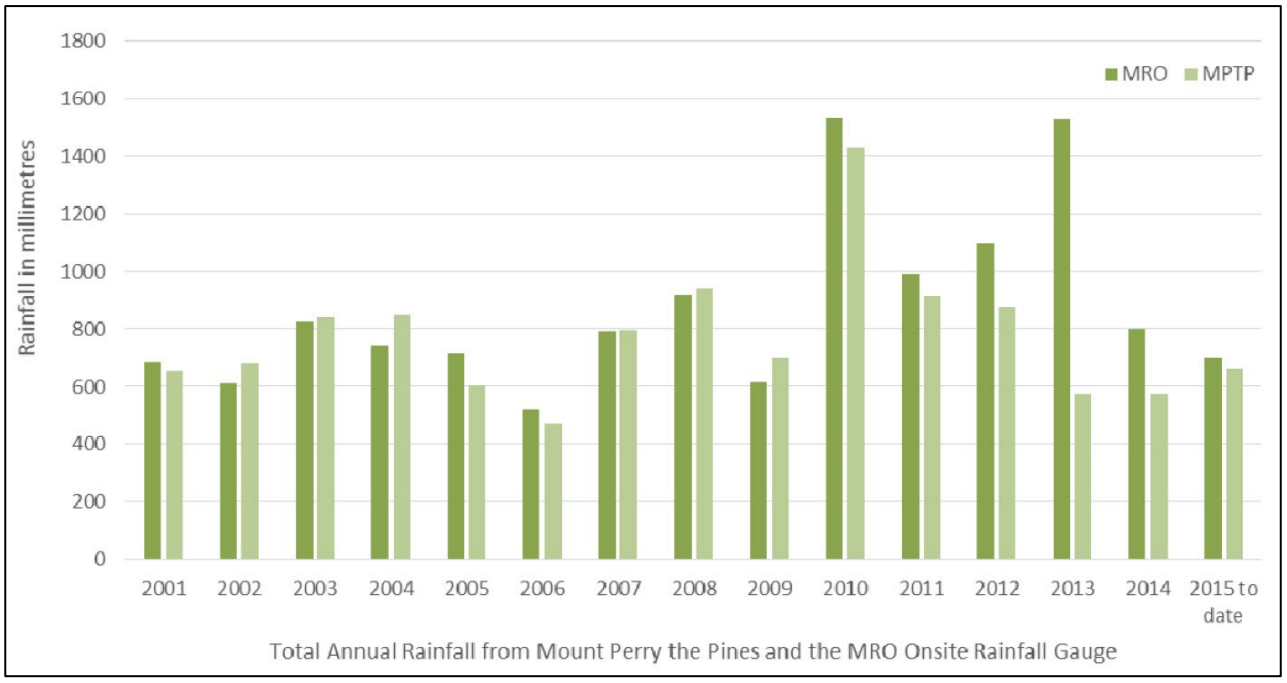

Figure 2.4: Comparison of the Mount Perry 'The Pines' Station and MRO on-site gauge (NRC, 2015)

While evaporation data was not available for the station, a comparison of evapotranspiration (ET_0) and rainfall data (available through the agricultural services branch of the BOM) for the last 12 months shows the clear influence of evapotranspiration on surface soils in the region (and the evaporative influence on a future cover system) (Table 2.1).

NRC (2015) also reported annual pan evaporation data sourced from Brian Pastures Station 040428, approximately 44 km from MRO. Annual average daily evaporation was reported at 5.3 mm, with significantly higher evaporation during the hotter summer months.

Table 2.1: Seasonal evapotranspiration across 2023-2024 (BOM, 2024)

Month	Total Evapotranspiration (mm)	Total Rainfall (mm)	Comparative Difference (mm)
Autumn 2023 (Mar, Apr, May)	313.3	181.6	131.7
Winter 2023 (Jun, Jul, Aug)	239	63.4	175.6
Spring 2023 (Sep, Oct, Nov)	506.3	41.6	464.7
Summer 2023-2024 (Dec, Jan, Feb)	397.3	252.8	144.5

2.5.1 Climate Change

The Queensland Future Climate Dashboard (the Long Paddock Database) was used to assess changing climatic patterns under a Representative Concentration Pathway (RCP) of 4.5[2]. The results for the North Burnett Region (in which MRO is located) show a warming trend and an increase in evaporation (Figure 2.5). Only a slight reduction in rainfall is predicted from 2030-2090. A similar rainfall pattern was also reported for the RCP8.5 scenario (data not shown).

[2] The radiation forcing value in the year 2100 (4.5 W/m^2). RCP4.5 is described by the IPCC as an intermediate scenario.

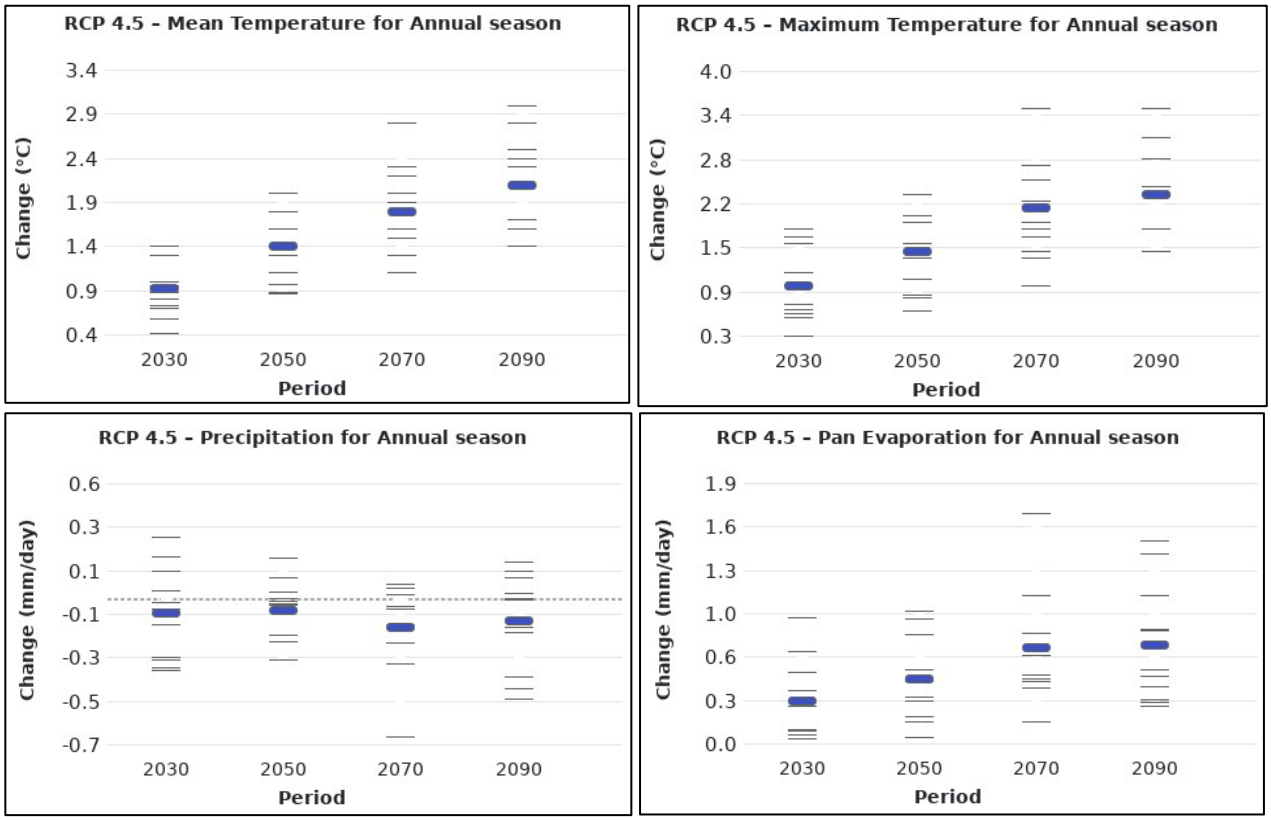

Figure 2.5: Climate change predictions for the North Burnett Region. Thinner black lines are the number of applied models. Thicker blue lines are the average values.

2.6 Materials

2.6.1 Soil

The PRCP (MRO, 2022) outlines the local soil in two distinct zones: topsoil and subsoil. Figure 2.6 depicts a soil profile from a topsoil stockpile located to the north (adjacent to the NWRD) during the site visit.

Materials designated for use in constructing the cover system will be sourced from stockpile areas and borrow pits, encompassing the following:

- Topsoil (nominally 0 to 50 cm depth) - top layer of the soil profile recognised by higher organic carbon content, the presence of plant roots, and containing the soil seed bank. A valuable resource suitable for use during the rehabilitation program.
- Subsoil (nominally 50 to 100 cm depth) - soil layer underlying the topsoil, identified by a decrease in organic carbon content and fewer (and finer) roots. The characteristics of subsoil materials vary markedly depending on the soil type.
- Further borrow area characterisation is being undertaken by ATC Williams (2024). This test pitting and material characterisation program expands on a borrow pit investigation in 2016 covering a broad area to the north, north-east and east of TSF and NWRD.

Figure 2.6: Soil Profile from a Topsoil Stockpile (Okane, 2024)

2.6.2 *Overburden*

The overburden at this site consists of oxide and transition materials (Figure 2.7). Oxide overburden primarily comprises highly weathered materials with some partially weathered rock present. Transition overburden consists of weathered materials with minor partially weathered rock, along with some competent fresh rock. This fresh competent rock, found within the transition overburden, may be suitable for applications such as armouring drains or serving as rock mulch in the soil cover.

RGS (2016) reported that there is approximately 6.9 M base cubic metres (bcm) of NAF waste rock in the western WRD.

Figure 2.7: Coarse overburden material comprising the angle of repose NWRD batters adjacent to the open pit (Okane, 2024).

2.7 Vegetation

According to the Department of Environment, Science, and Innovation (DESI) Regional Ecosystem mapping, several Regional Ecosystems (RE's) occur within the MRO area (Figure 2.8). The RE's are all associated with remnant vegetation, however there are also numerous patches of non-remnant vegetation within the MRO area (MRO, 2022). The vegetation community is open eucalypt woodland with an understorey that is typically grassy (Figure 2.9, Figure 2.10).

Biodiversity status indicates no concerns, and it holds an Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) status of not being representative of any threatened ecological communities (TECs). There were no observed threatened flora species (NRC, 2013a).

The vegetation community exhibits signs of significant disturbance in the form of introduced non-native species, including the highly invasive species Lantana; *Lantana camara*. Frequent low intensity burnings, cattle grazing and logging/thinning of canopy species can also be observed.

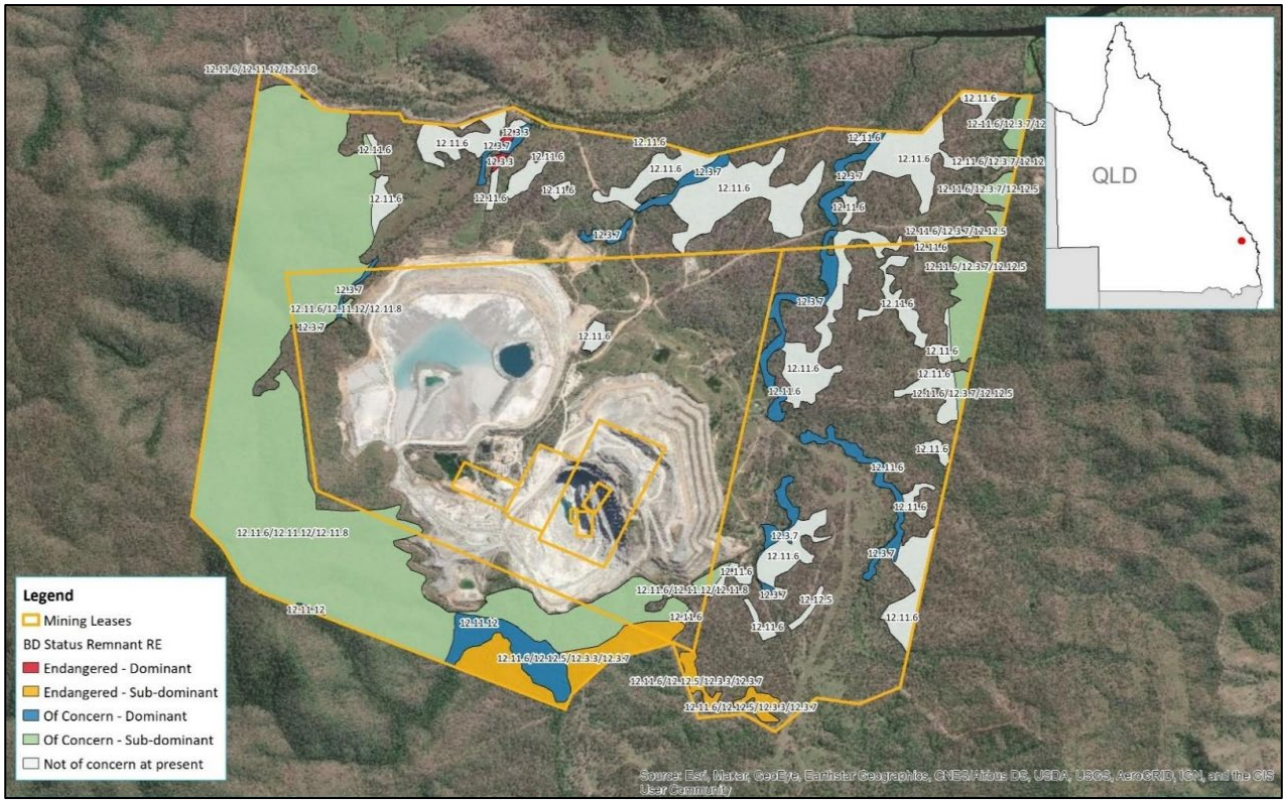

Figure 2.8: MRO Regional Ecosystems (MRO, 2022).

Figure 2.9: Typical natural woodland vegetation (photograph taken to the east of the administration area (25°16'01" S, 151°45'41" E)).

Figure 2.10: Soil profile for naturally occurring woodland vegetation (photograph taken to the east of the administration area (25°16'01" S, 151°45'41" E)).

3 CONCEPTUAL COVER SYSTEM DESIGN

The NWRD has a final approved footprint of 103 ha and contains PAF material encapsulated by NAF rock, with additional low-permeability clay layers on the benches to limit water ingress into the NAF embankments (Figure 3.1) (RGS, 2022). The final landform design is intended to shed rainfall and channel runoff through surface drainage infrastructure and the use of interception dams. During operations, the water dams collect runoff and toe seepage, which is then pumped back into the processing circuit. After decommissioning the processing plant and completion of NWRD rehabilitation, water in the water dams will be either pumped to the pit or treated through passive methods, like constructed wetlands, which are currently being tested on-site.

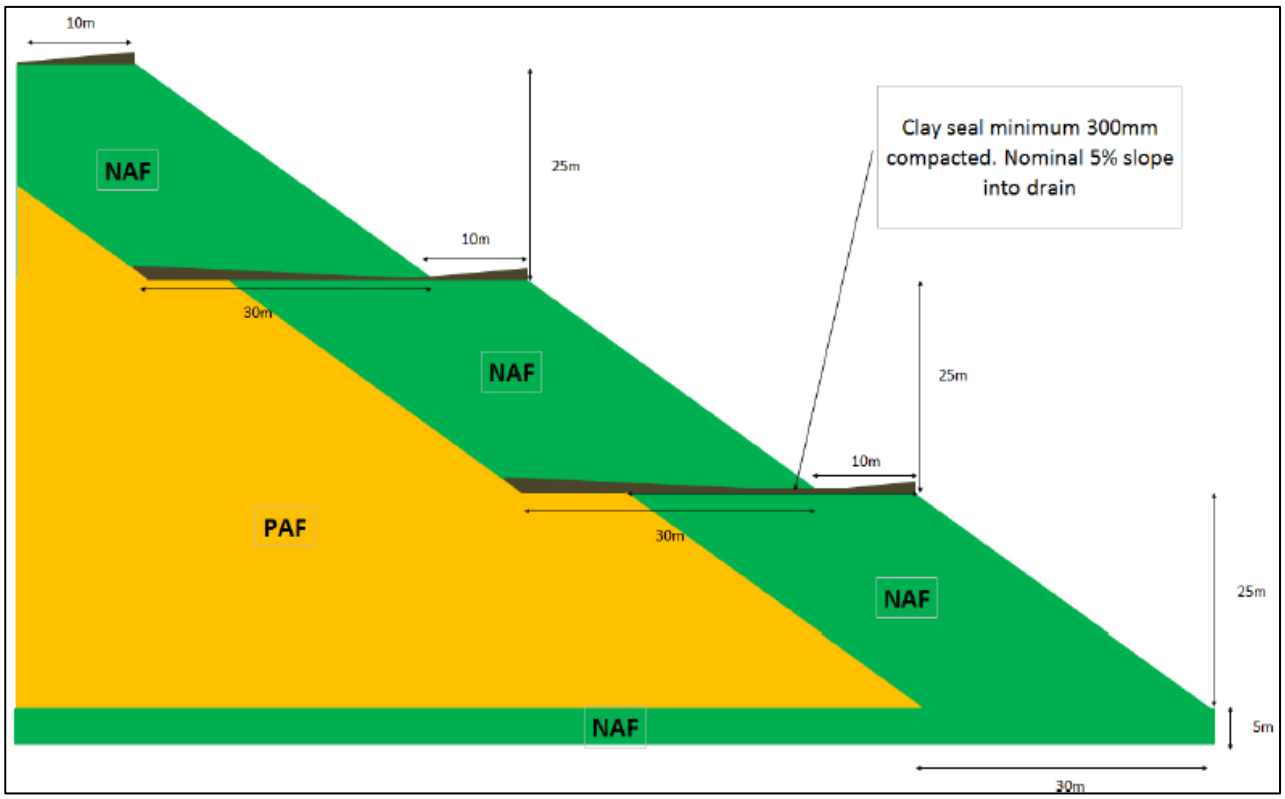

Figure 3.1: Conceptual cross-section of the NWRD and its berms.

Key features of the current closure design of the NWRD are:

- The NWRD cover system addresses potential AMD and enhances dump stability by encapsulating PAF waste with a NAF rock cover.
- The structure consists of four 25 m lifts with an inner PAF core and external NAF batters made from gravel to boulder-sized materials for stability and erosion control.
- Water management is designed to minimise percolation and control runoff, with features to collect rainfall and manage surface flow separately from mine-impacted flows.

- The system includes contour drains and rock-armoured structures, with a configuration of NAF rock, compacted fine-grained material, and topsoil for vegetation support and erosion resistance, ensuring long-term sustainability.

3.1 Design Objectives

The design objectives of the PRCP are aligned with the context outlined in the Post Mine Land Description (MRO, 2022), as illustrated in Figure 3.2. Within the PRCP guidelines, specific objectives, indicators, and completion criteria have been established for each post mining land use (PMLU), detailing the rehabilitation areas, their current land use, and the proposed PMLU for each area (MRO, 2022).

Rehabilitation area (RA)	Rehabilitation area description	Post-Mine Description
1 Residual Void (Pit)	MRO operates a single, open-cut pit with a surface area of 71.35 ha and a surface level of RL125 m AHD.	Water storage for low-intensity grazing/stock water
2 WRDs, Run of Mine (ROM) and stockpiles	The Northern WRD is utilised for the disposal of both NAF and PAF waste rock material. The facility covers an area of approximately 105 ha. The outer batters will remain at angle of repose as a rock face only. The Western Waste Rock Dump is utilised for temporary storage of NAF only. The final approved footprint of the facility is 73 ha however the current disturbance footprint is 49.1 ha. The ROM is utilised for temporary storage or ore until processing.	Low-intensity grazing/ open woodland Note: NWRD open woodland only as grazing is not practicable.

Figure 3.22: Extraction from Post Mine Land Descriptions for MRO Rehabilitation areas.

Specific to the NWRD, the landform design objectives and key design criteria for the top of the NWRD, as reported by RGS (2022), aim to achieve the overall site objectives of the PRCP. These include the following:

- The final NWRD landform will be profiled during the reshape to direct surface flow towards the western access ramp.
- The cover system will be built on the reshaped landform.
- Maximise surface runoff from the cover system.
- Store infiltrated water within the cover system to support vegetation.
- Minimise the ingress of air and water through the cover to limit sulfide oxidation rates and percolation of water into the underlying waste rock.

The key design criteria for the top of the NWRD (RGS, 2022) are:

- The landform is profiled to direct surface flow towards the western access ramp.
- Low-grade ore and PAF material from the top and western side are removed before the final landform is rehabilitated with an engineered cover system.
- Competent NAF rock is placed over exposed waste rock to create a basal layer (interim NAF rock cover) up to 3.0 m thick.
- A low-permeability layer of fine-grained clay/silt/sand is added over the basal NAF rock, consisting of two compacted layers, each 0.25 m thick.
- NAF oxide regolith dominated by saprolite is placed over the compacted low-permeability layer, totalling 2.0 m in thickness.
- NAF waste rock is added over the oxide regolith, with a particle size distribution of 75 mm to 250 mm, measuring up to 1.0 m thick.
- Topsoil, measuring 0.2 m thick, is applied over or within (to create a rocky mulch) the NAF waste rock to fill voids and support vegetation growth.
- Surface flow from the top of the cover system is directed towards the western access ramp, where part of the ramp is retained as an access road and the remainder is converted into a rock-armoured drain to guide flow to the base of the NWRD.
- Surface flow is further diverted to various locations, including the open pit, the southern side of the NWRD, and either into WD4 or the surrounding environment.

It is important to note that the geotechnical stability report (Cartledge, 2024), identified localised areas, mainly in the north wall, with a factor of safety less than the stablished criteria. Buttressing these areas is recommended to enhance long-term stability. This potential buttress could also serve as an opportunity for closure to incorporate a drainage system from the top-tier cover system design of the NWRD.

3.2 Conceptual Design

Environmental conceptual models were constructed before numerical modelling commenced (RGS, 2022). These models serve as the basis for understanding the environmental processes associated with the NWRD. The conceptual models guided the development of numerical modelling studies to assess the likely environmental performance of the NWRD.

The conceptual model for the eastern and southern slopes of the NWRD, featuring berms and angle-of-repose batters, illustrates the top tier requiring a cover system. The cover system will be installed on an existing 3 m NAF rock interim cover built during operations, with various potential configurations outlined for the final design.

Surface flow from the cover system will be directed towards the western access ramp, with part of it serving as an access road and another part converted into a rock-armoured drain. Surface flow will be diverted to various destinations including the open pit, the southern side of the NWRD, WD4, or the receiving environment. Features of the reported model are:

- The NWRD cover system aims to achieve neutral pH drainage by encapsulating PAF waste within a NAF rock outer core, neutralising any acidic runoff as it passes through.
- The purpose of the NAF rock armour is to maintain long-term stability, prevent mineralised sediment movement into the environment, and avoid the need for soil cover systems prone to failure, particularly if placed on sloped.
- NAF external batters feature a 30 m horizontal and 25 m vertical cover over the internal waste rock cover system configurations.
- The preferred configuration of the cover system layering for top surfaces, including the 10 m wide benches and the top surface of the NWRD, is described in detail in the following section.

With respect to groundwater seepage, flow paths for potential contaminant seepage and disturbance to groundwater from the NWRD are along natural drainages that enter Twelve Mile Creek (MRO, 2023). Mitigation of groundwater contaminant seepage from the WRD involves interception dams that store runoff from the NWRD (WD1-WD4) and monitoring wells that intercept groundwater downgradient of WD1 and WD2.

3.3 Cover System Configurations

SEEP/W modelling was used to evaluate the cover water balance across various configurations for the NWRD (RGS, 2022). This analysis considered a range of factors, including climate variability, measured data, and inferred inputs. Based on the results, Option 1B was identified as the most effective configuration to meet the design objectives for the NWRD.

Option 1B is recommended as the preferred configuration for the NWRD cover system, as illustrated in Figure 3.3 and consists of:

- NAF competent rock as a basal layer (up to 3.0 m).
- Low permeability clay/silt/sand (2 x 0.25 m compacted layers).
- NAF oxide regolith (up to 2.0 m).
- NAF waste rock (up to 1.0 m).
- Topsoil filling voids in the rock cover to create a rocky mulch (up to 0.2 m).

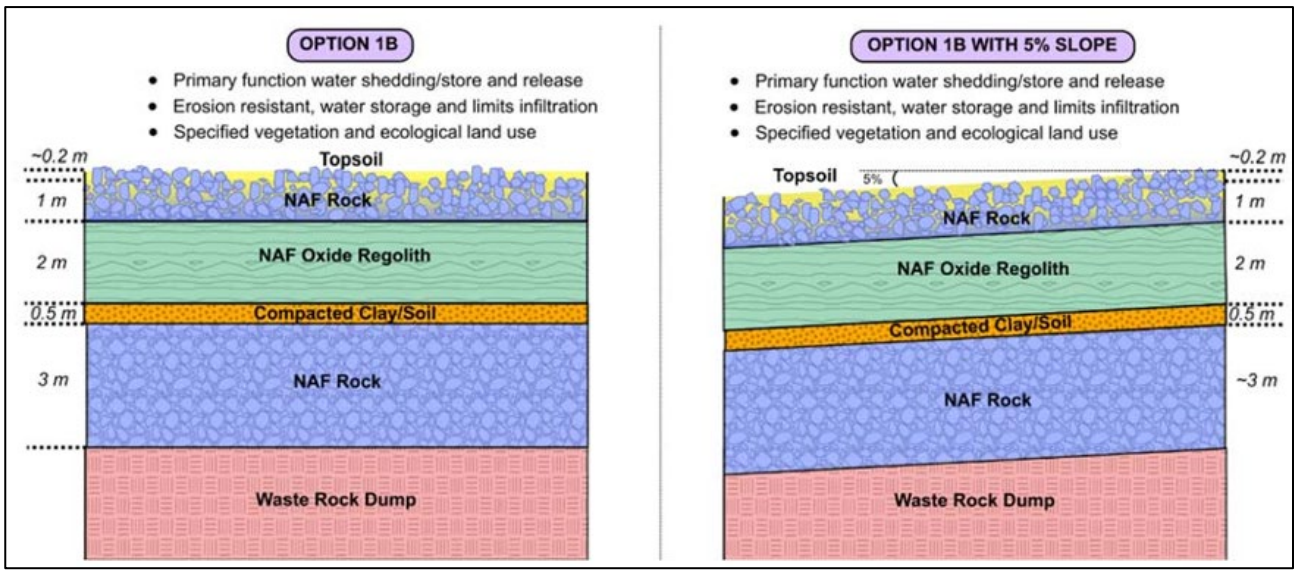

Figure 3.33: Preferred cover system outcome design for the NWRD (RGS, 2022).

3.4 Erosion Measurement and Modelling

An erosion assessment was completed which examined soil erosion and deposition using lab analyses and numerical modelling (RGS, 2023a). The methodology involved multiple stages:

- Stage 1: Static laboratory analyses on small samples (<2.36 mm particle size distribution (PSD)) for initial soil property assessments, such as sodium content and stability.
- Stage 2: Use of bulk samples (<150 mm PSD) to simulate erosion using a tilting flume rainfall simulator under controlled lab conditions, applying varied rainfall intensities and slope gradients. It's important to note that the samples were subjected to a sequence of rainfall events to simulate the impact of rain on a rehabilitated surface, which includes:
    - A common rainfall event (1 in 1-year).
    - A less common rainfall event (1 in 10-year).
    - A rare, intense rainfall event (1 in 100-year), with all events occurring within a week.
- Stage 3: Numerical erosion modelling:
    - The MINErosion 3 model was selected for its ability to integrate measured data, providing a realistic forecast of erosion under specific field conditions (So et al., 2018). This was preferred over directly using complex models like SIBERIA or CAESAR-LISFLOOD, which require extensive and detailed data that might not be available at early project stages (such as Environmental Impact Statement, Pre-Feasibility, and Feasibility stages) (RGS, 2023a).
    - Predicted erosion rates under different environmental conditions, accounting for specific rainfall events and slope angles.

    - Highlighted the effectiveness of soil cover systems in reducing erosion, suggesting long-term sustainability with appropriate vegetation cover.

- Stage 4: Proposition of field trials to:
    - Validate numerical modelling predictions.
    - Ensure real-world performance of proposed rehabilitation designs, confirming that theoretical models align with practical outcomes.

Key findings from the erosion assessment are presented in Figure 3.4 and Figure 3.5, with key findings consisting of:

- Erosion rates for discrete storm events varied significantly:
    - 30 mm/hr storm event resulted in erosion rates of 0.15-0.38 tonnes per hectare (t/ha).
    - 60 mm/hr storm event resulted in erosion rates of 0.37-0.61 t/ha.
    - 90 mm/hr storm event resulted in erosion rates of 0.45-1.64 t/ha.
- Cumulative erosion rates from three consecutive storm events over five days ranged from 0.99-2.50 t/ha and were strongly influenced by soil type.
- Long-term modelling indicated that with 30 % vegetation cover on an 80 m slope, erosion rates could potentially reduce to between 0.2-1.1 t/ha after five years.

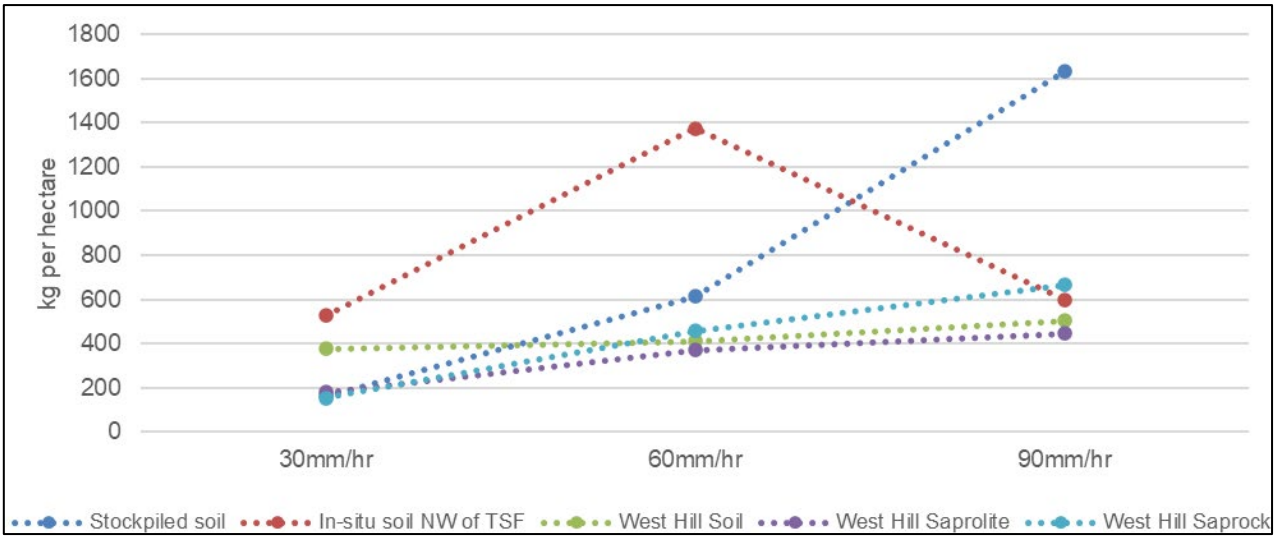

Figure 3.44: Discrete event erosion measurement (RGS, 2023a).

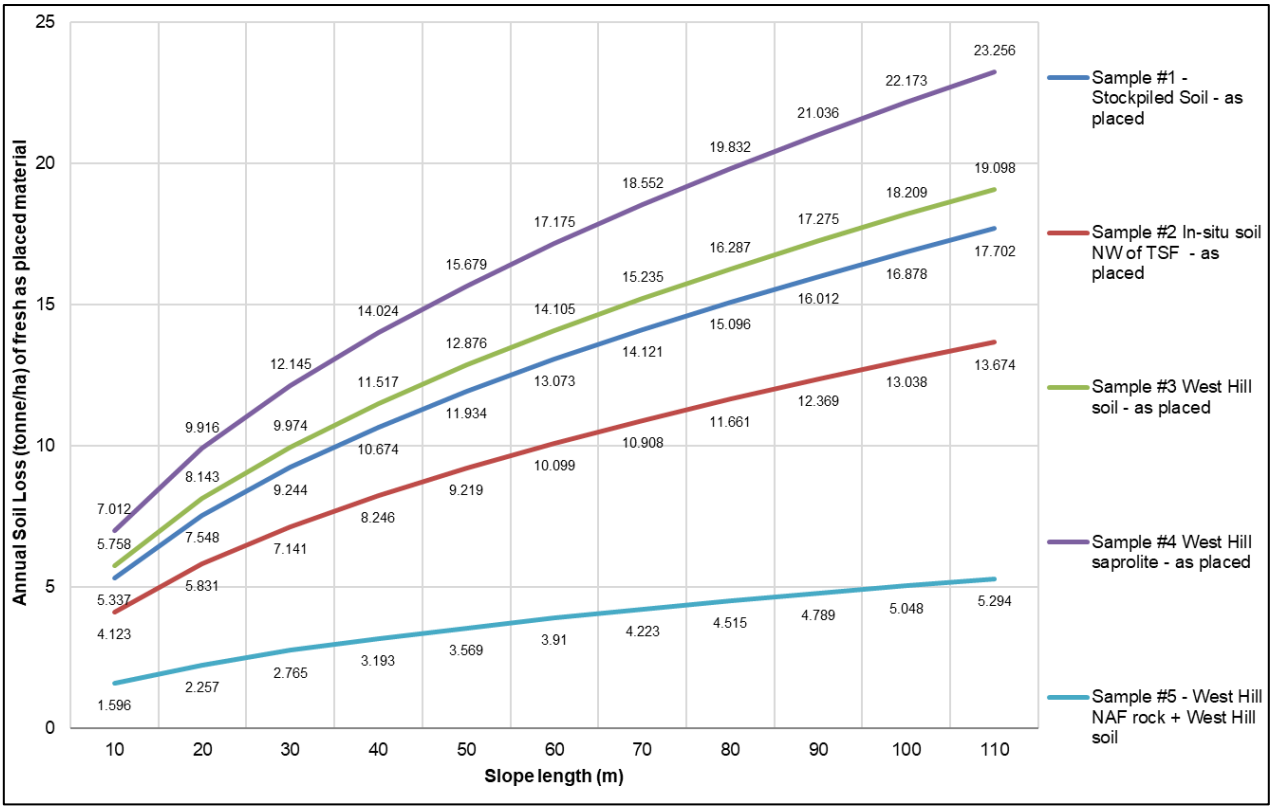

Figure 3.55: Modelled annual erosion rates for as-placed material with a 5% slope angle and slope lengths from 10 m to 110 m (RGS, 2023a).

3.5 Identified Gaps

Information gaps have been identified in the cover modelling design methodology with respect to appropriate timeframe for design rainfall events. The key points highlighting the identified information gaps and their implications are:

- The current cover modelling design does not factor in the potential impacts of climate change, which could lead to an underestimation of erosion and infiltration rates due to more frequent and intense weather events.

- Storm events were modelled with a 10-year recurrence for infiltration, which may not accurately reflect the increasing intensity and frequency of storms in the closure timeframes.

- Erosion modelling used a 100-year annual exceedance probability (AEP) which potentially overlooks extreme climate patterns and longer closure timeframes. The previous hydraulic assessment recommended a 0.1 % AEP (ATC Williams, 2014).

- Erosion flume tests exclude rock particles larger than 75 mm, and geotechnical labs use smaller particle sizes for certain measurements. This introduces uncertainty in results, potentially impacting erosion predictions.

- Cover field trials have the potential to calibrate flume testing. To Okane's knowledge these field trials have not been conducted, however it is understood that vegetation/cover trials may be undertaken by ATC Williams to support a TSF cover system design in 2024. Erosion measurements are not included in the planned monitoring system for the cover trial however would be a useful inclusion.

- The surface water management plan for the NWRD does not detail structures to manage runoff from top surfaces and berms of the final landform. This gap in definition could lead to unanticipated runoff issues (RGS, 2022).

- The hydraulic assessment as part of the PRCP (ATC Williams, 2014) analyses the effects of peak runoff velocities and flow depth on the NWRD. However, it does not address surface capping, surface water management structures, and the effects of these flows on erosion in the mine water management plan.

- The geotechnical assessment in the PRCP (Cartledge, 2024) does not consider the surface water management structures and varying phreatic surface elevations within the NWRD. It's reported that one of the most sensitive components of the geotechnical model is the hydrogeological surface modelling of the long-term groundwater trends used for the analysis. Variations in this model will be significant to the geotechnical stability of the dump; hence, sensitivities to the phreatic surface variations will be required to assess the long-term stability impacts.

- It is worth noting that based on the assessed aerial survey, a local failure of the berms in the northern section of the NWRD has been observed. Its location is detailed in Figure 2.1b. However, details regarding the nature of the failure have not been documented in the received reports or been provided anecdotally.

4 WASTE ROCK AND REHABILITATION MATERIALS

The Mine Material Management Plan (RGS, 2022) reported the completion of a test pit and drilling program (RGS, 2016) to quantify volumes and soil quality, geochemical and physical properties of regolith units that could be used to construct the cover system on the TSF.

It was reported that in September 2022 an additional soil quality assessment commenced for geochemical and physical characterisation of five bulk (1 m³) samples of:

- Topsoil provided from an existing stockpile.
- Topsoil from a location to the north of TSF.
- Topsoil, saprolite and saprock from West Hill.

The splits from these bulk samples underwent soil quality, geochemical, and physical characterisation. These samples also provided data on erosion rates, supporting the modelling of proposed soil cover systems for the TSF and the NWRD. Part of the result of this laboratory characterisation is reported in the erosion assessment report (RGS, 2023a).

Results from the erosion assessment indicate that RGS has completed geochemical and physical testing for topsoil, subsoil, saprolite, saprock, and fresh rock samples down-gradient of the TSF and West Hill. The analytical program was designed to measure erosion rates, surface water quality under slopes of 5 %, 10 %, and 20 %, and rainfall intensities of 30, 60, and 90 mm/hour (Figure 3.4). Data from the 3 m x 1 m flume tests were used to model probable erosion rates for specific rainfall events.

4.1 Material Balance and Growth Media

There are several topsoil stockpiles located across the site. The available stockpile balance as of 2021 was approximately 670,000 m³ (ATC Williams, 2024). It is understood that some of these stockpiles may have been depleted, and their locations cannot be confirmed at this stage. Therefore, the topsoil inventory and material balance require updating, which will necessitate a drone survey or equivalent type of surveying method.

To support previous borrow area investigations and background soil sampling (Figure 4.1a), field investigations are currently underway (Figure 4.1b) to improve confidence in quantities for available materials to be used for closure works, with respect to both material properties (physical structure and soil fertility) and available volumes (ATC Williams, 2024). This material characterisation currently includes the following parameters:

- pH and Electrical Conductivity (EC)
- Exchangeable cations and Cation Exchange Capacity (CEC)
- Nitrogen (N) and Phosphorous (P), Total metal(loid)s

- Total Organic Carbon (TOC) and Organic Matter (OM)

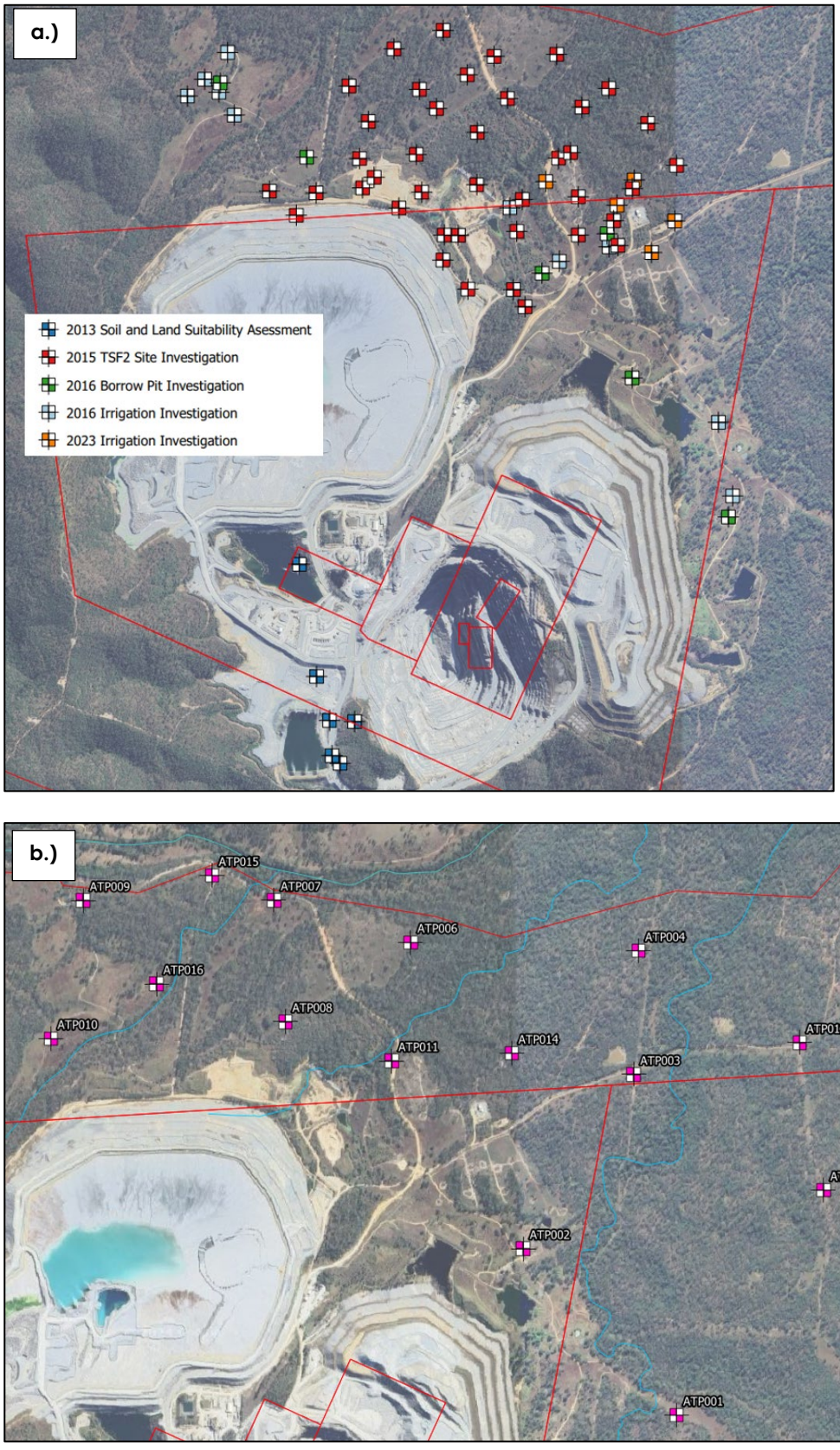

Figure 4.1: a.) previous borrow area assessments, and b.) current borrow area assessment being completed (ATC Williams, 2024).

Physical Properties:

- Emerson Class
- PSD (sieve and hydrometer)
- Standard Compaction and Atterberg Limits
- Permeability
- Soil Water Characteristic Curves (SWCC)

Preliminary results (i.e., logging of back-hoe advanced test pits) indicate the widespread presence of silty sand topsoil across the investigation area, with the subsoil profile consisting of brown/grey clay of variable thicknesses (ATC Williams, 2024). Test pit refusal broadly ranged from 0.4-2.4 mbgl. Soil fertility results were not available at the time of completing this report. It is anticipated that the laboratory results will be available to support the NWRD detailed cover system design.

The identified proposed material characterisation and soil parameters scope (ATC Williams, 2024) complies with an AG-3 agricultural soil suite scale (Figure 4.2). It is noted that Agricultural Soil Suite AG-3 will provide a comprehensive data set to ascertaining suitability with regards to rehabilitation materials.

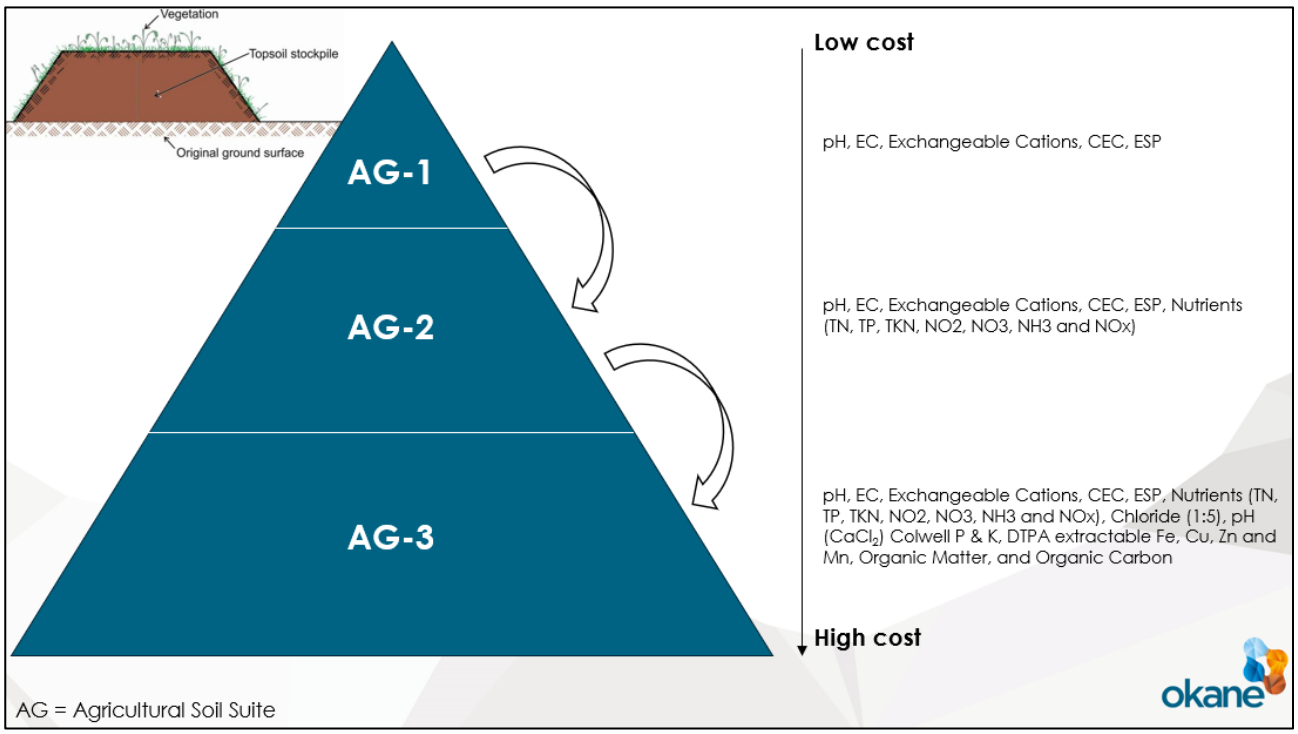

Figure 4.2: Agricultural soil suite scheme (adapted from ALS, 2024).

Outside of the works being completed by ATC Williams (2024), topsoil stockpile sampling was previously completed at four locations (TS1-TS4), and berm 1-4 soil sampling completed at 22 locations (RGS, 2021). The topsoil stockpile and berm soil samples were classified as sandy loam to

loam. PSD analysis of the topsoil stockpile and berm soil samples were shown to contain a mixture of clay, silt, sand, and gravel, with little variability between the samples.

While the RGS (2021) factual report did not provide detailed interpretation of results, the topsoil stockpile and berm soil macronutrient (N and P) and plant available micronutrient concentrations reported were conducive to vegetation establishment. The CEC is predominantly exchangeable calcium and magnesium in the topsoil stockpiles and on the berms.

The exchangeable sodium percentage (ESP) values in the topsoil stockpiles were greater than 10 % and did indicate the presence of sodic soils, however ESP was reported to be lower in the berm soil material (~2 %) suggesting largely non-sodic conditions. Some rill formation and dispersion of topsoil stockpile material, and material applied to drainage channels, was observed during the site visit on sloped material that was yet to support vegetation (Figure 4.3).

The waste rock assessment also presented in RGS (2021) is discussed in the section below.

Figure 4.3: Rill erosion on sloped soil material to the north of the TSF.

4.2 Waste Rock Material Characterisation

The NWRD characterisation program (RGS, 2021) investigated the physical and geochemical properties of the NWRD batter material and associated berms to inform the development of a final landform and cover design.

The testing program included a variety of physical and chemical testing methods performed on soil and waste rock samples. This included evaluation of pH, EC, nutrient content, and metal(loid) availability with a total of 48 samples collected. For waste rock, 41 samples were tested for total metal(loid)s, net acid producing potential, and water-extractable elements. Physical testing was performed on 12 samples, comprising permeability, PSD, Atterberg limits, maximum dry density on soils, and point load testing and Los Angeles Abrasion testing on waste rock material.

Key findings from the investigation included:

- Geochemical testing confirms that the exterior of the NWRD primarily consists of NAF waste rock, capable of neutralising additional acidity.
- Physical testing reveals that the exterior waste rock is highly durable, with high hardness and slow degradation, providing effective armouring for the NWRD batters.
- The in-situ measured hydraulic conductivity (based on Guelph Permeameter measurements) of the compacted clay layers are unlikely to significantly impede water infiltration through the berms into underlying waste rock. Further compaction of these berm materials would achieve lower permeability.
- Nutrients and soil fertility parameters are largely comparable between stockpiled soil and soil on the berms. While clay is placed on the berms to impede percolation of water in to underlying waste rock, plant roots could potentially provide pathways for water to reach underlying rock.
- Water ponding in troughs on the berms (immediately adjacent to the batters) enhances the potential for infiltration into the NWRD.

Figure 4.4 provides an important comparison of vegetation coverage and compacted clay exposure on the NWRD berms under different weather conditions. The 2024 site visit image, taken following a period of high rainfall, shows water-logged conditions, high grass coverage, and small trees and shrubs along the batter edges, confirming ponding and higher water availability at the base of the batters. In contrast, the 2021 image shows patchy vegetation coverage and the potential for clay cracking and water infiltration with direct atmospheric exposure.

Figure 4.4: Vegetation coverage on berm 2 during wetter conditions in April 2024 (left (Okane, 2024)) and drier conditions in May 2021 (right (RGS, 2021))

4.3 NWRD Encapsulation

The NWRD contains PAF material encapsulated by NAF (Figure 3.1) (RGS, 2022). This encapsulation design is supported by site PAF/NAF placement records and Deswik models. Key features of the encapsulation of the NWRD are:

- Low permeability clay layers are present on the berms (and extending into the NWRD), reducing water ingress into the NAF embankments.
- The design of the final landform aims to manage rainfall and runoff, directing it along berms to stormwater systems and proposed drop structures.
- NWRD water collected during operations is recycled through the processing circuit.
- As built layering of encapsulated PAF material on the NWRD is available (RGS, 2022), which includes schematics of the changes to the NWRD PAF rehandle, reflecting requirements of the Financial Year 2022 Life of Mine.
- The NWRD was designed and built to produce neutral pH drainage via encapsulating PAF waste within an outer core of neutralising rock. Therefore, any acidic runoff can be neutralised as it passes through the NAF rock batters.
- The inner PAF core of the NWRD was covered via the construction of external NAF batters, built at the angle of repose utilising competent rock comprising gravel > 20 mm diameter up to boulders in the range of 1.0 m diameter (RGS, 2022). The nominal PSD is D80 > 250 mm.

4.3.1 Percolation through Waste Rock Material

With respect to water percolation through the NWRD, toe seepage sampling (SW01-SW04), from the eastern side of the NWRD where seeps report to WD1-WD4, was completed as part of the RGS (2021) program. Analysis of seepage water in SW01-SW04 indicated neutral conditions (pH 7-8) and EC in the range of 3,000-4,500 µS/cm. Dissolved metal(loid) concentrations in the seepage samples were spatially variable with some exceedances of aquatic freshwater ecosystem (95% species protection) and livestock drinking water criteria, most prevalent in SW01-SW02 at the north-eastern boundary of the NWRD. These exceedances were mainly in the form of elevated levels of cadmium, copper, manganese, nickel, sulfate, and zinc. RGS (2021) report that there is no correlation between rainfall events and seepage, and that seepage is steady throughout the year.

Consistent with the toe seepage results, kinetic testing results for NAF, medium PAF, and high PAF rock indicate circum-neutral leachate quality over a 2-year testing period (2016-2018) (RGS, 2021). RGS (2021) reported that while the potential for acidic drainage is expected to be low assuming proper management of waste rock materials, there is evidence to suggest saline (sulfate) and metalliferous (metals and metalloids) drainage could be considered moderate/high risk for the NWRD.

4.4 Identified Gaps

Information gaps have been identified in the characterisation and identification of rehabilitation materials. The key points highlighting the identified information gaps and their implications are:

- To better understand the material parameters development and rationale used in the cover design by RGS (2022).

5 REVEGETATION

5.1 Objectives

The PRCP (MRO, 2022) currently defines the PMLU for the NWRD as Open Woodland, while the outer batters will remain at angle of repose as a rock face only. In rehabilitation areas with rock face batters, post-activity land suitability is expected to be Class VII: Land that is unsuitable for cultivation but suitable for grazing and forestry with severe limitations (DSITI & DNRM, 2015). Low-intensity grazing was deemed not feasible due to the geographical characteristics of the landform (as displayed in Figure 3.1).

5.2 Methods

5.2.1 Surface Preparation

The Conceptual Closure Revegetation Program (SSG, 2024) mandates a soil nutrient analysis prior to utilising topsoil stockpiles, assessing the need for ameliorants or fertilisers. Topsoil application of at least 100 mm thickness is standard, with erosion and sediment control measures implemented as required. This standard is consistent with the proposed conceptual cover of 200 mm soil/rocky mulch, although surface contouring is encouraged to minimise dispersion and the impacts of runoff.

5.2.2 Treatments

SSG (2024) includes the suggestion of gypsum ($CaSO_4$) and organic matter application to enhance soil structure and promote long-term stability and nutrient retention. Organic materials like manure, straw, mulch, and wood chips stimulate soil biological activity and root function, facilitating plant growth. Lime ($CaCO_3$) application aids in soil stabilisation by neutralising acidity and enhancing structural stability through managing the effects of sodium and magnesium. The resultant increase in alkalinity promotes nutrient availability, particularly phosphorus. Furthermore, the program recommends the use of nitrogen, phosphorus, and potassium (NPK) fertilisers to boost soil nutrient levels in revegetation areas, tailored to specific seed mix requirements for the associated PMLU.

5.2.3 Weed Management

As outlined in the Weed Management Plan (MRO, 2012), the different control techniques available for weed control include chemical, mechanical, and biological control, as well as the use of fire. Each of these techniques and its suitability to the mine site are described in the plan. However, chemical control is the major technique recommended for the control of all weeds on-site. Foliar herbicides should be applied for the control of most weeds.

Weed species that have previously been recorded at MRO have been given below:

- Giant rat's tail grass (*Sporobolus pyramidalis and S. natalensis*).

- Mother of Millions (*Bryophyllum* spp.).
- Groundsel Bush (*Baccharis halimifolia*).
- African love grass (*Eragrostis curvula*).
- Lantana (*Lantana camara*).

5.3 Berm Vegetation Trial

The Waste Rock Dump Berm Design (NRC, 2013b) aimed to redirect runoff away from the dump, thus reducing the infiltration of water through the NAF cap into the PAF core. Figure 5.1 illustrates the berm design which includes the following features:

- A 2-3 m wide section at the bottom of the drain was proposed with an armour layer to a depth of 100 mm using well-graded, coarse NAF waste.
- The cut to be filled with select material, not exceeding 150 mm in depth, and placed below the drain batter to ensure water flow onto the armoured section.
- The material then compacted and conditioned to the desired invert level below the drain batter.
- Available clay from a clay stockpile or borrow area was proposed to construct a conditioned drain liner.
- The lining specifications were suggested to be a minimum of 200 mm thick at its shallowest point, while the bottom of the drain area was around 300 mm thick.
- The surface would be slightly scarified and seeded with pasture species and couch grass.

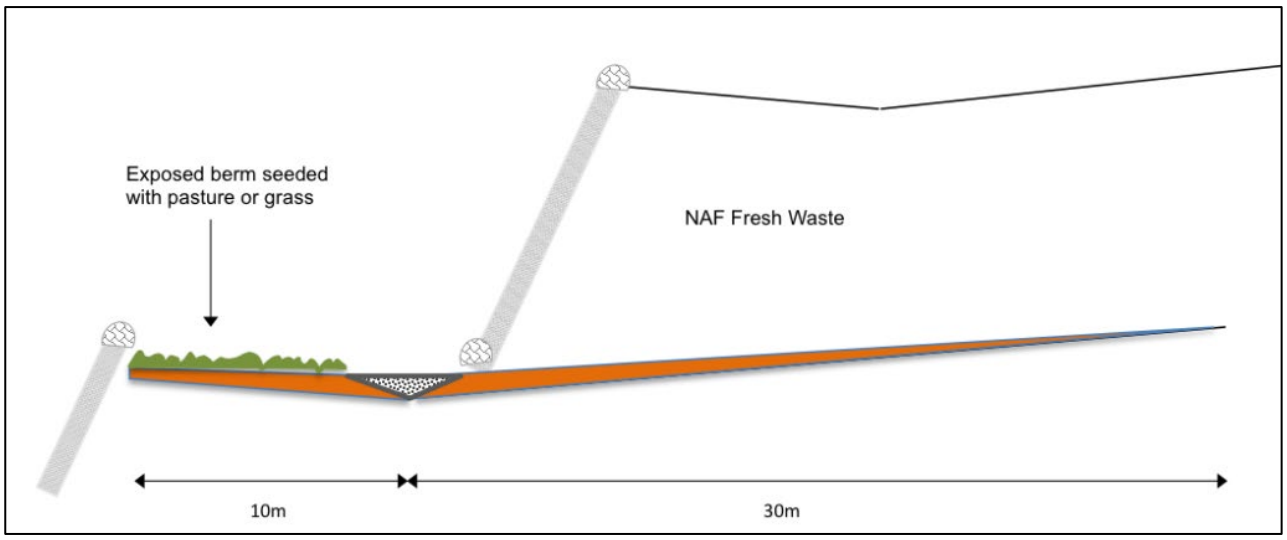

Figure 5.1: Berm Design (NRC, 2013b)

5.3.1 Site Observations

In April 2024, a survey of the Berm Vegetation Trial at the NWRD was conducted by Okane, BGC, and site personnel (see Figure 5.2) where grasses species were noted to be the dominant with species. Acacia shrubs were observed at the toe of the upper embankment and the crest, possibly due to the drier conditions within those areas. Surface water pooling within the centre of the berm was observed with 100 % ground cover.

It was observed that invasive weed species may prevent the establishment of native vegetation community types, especially during high rainfall years. In order to establish native vegetation communities, invasive weed species will most likely need to be managed.

Figure 5.2: Berm Vegetation Trial at NWRD, April 2024.

5.4 Identified Gaps

Information gaps have been pinpointed in the revegetation documentation, prompting concerns regarding NWRD's capacity to achieve its current objective and PMLU goals. This misalignment indicates a constrained potential for rehabilitation to meet the performance indicators specified in the completion criteria devised for open woodland vegetation at MRO.

Key points highlighting the identified information gaps are as follows:

- The suitability of PMLU as open woodland at NWRD. Vegetation associated with the PMLU vegetation community (RE 12.12.5) need to be considered with respect to their deeper root systems and therefore the risk of impacting the integrity of the cover system.

- The completion criteria developed for open woodlands success in supporting vegetation may not align with the most feasible and practical option with respect to the designed cover system. The proposed seed mix includes large trees with root systems that could compromise the integrity of the cover system.

- The geochemical and geotechnical testing on stockpiled topsoil will inform and determine if soil amelioration is required, as outlined in the PRCP (MRO, 2022).

- Vegetation trials hold significant potential to inform and refine rehabilitation practices. The findings derived from vegetation trials will enhance completion criteria by understanding vegetation success, thereby contributing to the formulation of attainable closure criteria for the NWRD.

- The efficacy of treatments outlined in MRO (2022), such as gypsum, mulch, and fertiliser for targeting the potentially low-nutrient and erosive materials, have not been tested to demonstrate the enhancement of vegetation growth. The trailblazer partnership between MRO and the University of Queensland Sustainable Minerals Institute (UQ SMI) is seeking to address this knowledge gap through completion of vegetation trials at the mesoscale.

- Absence of details regarding the current weed species present (including potential invasive seed banks within topsoil stockpiles), the effectiveness of implemented control measures, and ongoing monitoring efforts to assess their success in managing weed infestations.

6 MOUNT RAWDON PUMPED HYDRO

6.1 Linkages with the NWRD drainage

Evolution Mining, and it's ICA partners, have recently submitted the Environmental Impact Statement (EIS) for the Mount Rawdon Pumped Hydro Project to the Queensland Coordinator-Generals office for assessment.

The conceptual engineering design for the pit cutback places the Lower Reservoir Waste Rock Dump (LRWRD) in alignment with and abutting the northern batters of the NWRD (Figure 6.1). The proposed LRWRD provides an opportunity to integrate the final NWRD landform drainage system into a future LRWRD expansion to the north. This expansion can be designed from concept design with bridging structures and gentler gradients, offering improved drainage options compared to those along and across the eastern batters of the NWRD.

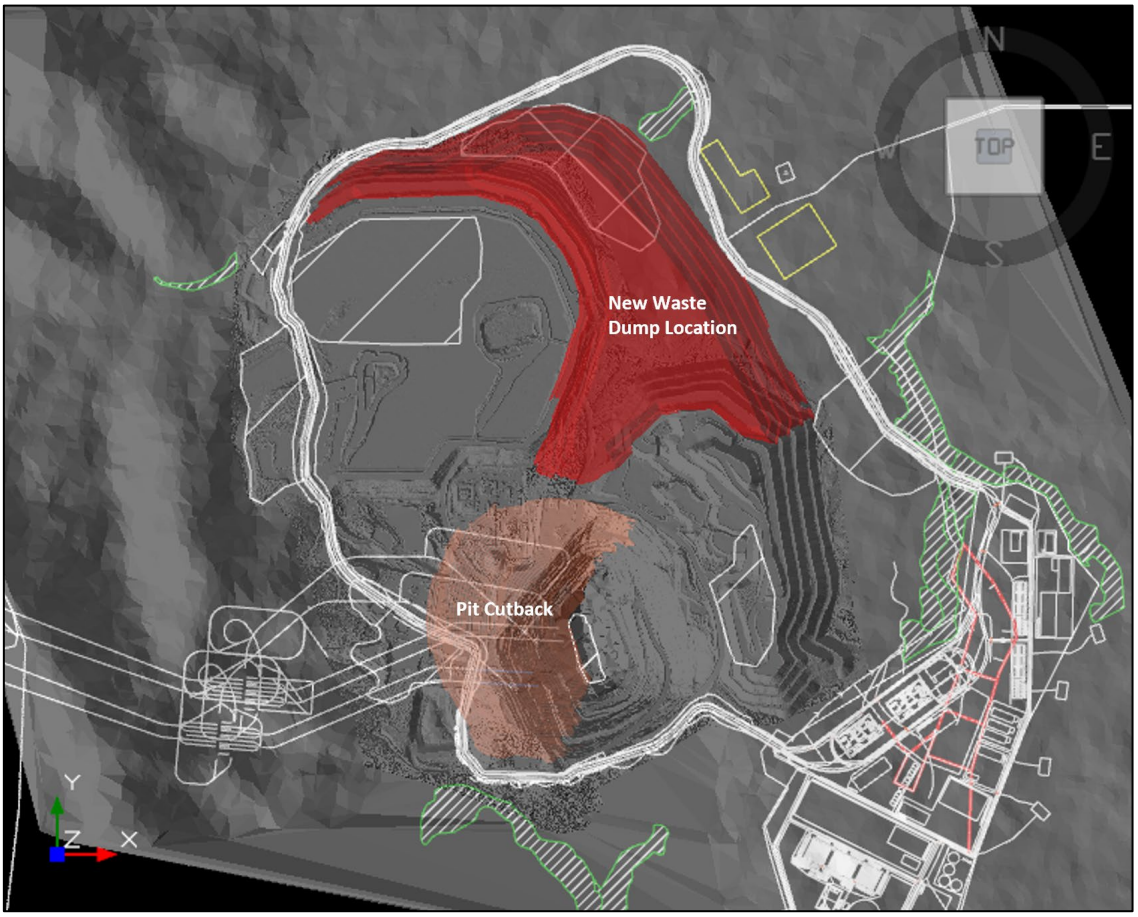

Figure 6.1: Conceptual pit cutback and LRWRD design.

7 SUMMARY OF KNOWLEDGE GAPS

Based on the review of information, the following aspects have been identified as gaps summarised in Table 7.1. Okane have developed a 'traffic light' system to assess knowledge gaps in accordance with the current level of understanding and extent of future works required to clarify these knowledge gaps. The status column indicates the current degree of knowledge as follows:

- Orange reflects those knowledge gaps whereby some degree of information is available, however further work is required to accurately gauge the extent of the issue or gap.
- Red reflects those knowledge gaps whereby very little information is known.

Table 7.1: Summary of Information Gaps and Recommended Works

Category	Knowledge Gap	Evidence / Risk	Recommended Works	Status
Revegetation	Post Mining Land Use	• PMLU objective has been identified for the site as open woodland (PRCP, 2022). • Large trees associated with the PMLU vegetation community (RE 12.12.5) need to be considered with respect to their deeper root systems and therefore the risk of impacting the integrity of the cover system.	• Review and re-align PMLU objectives to ensure feasibility for NWRD performance.	
	Completion Criteria	• The completion criteria developed for open woodlands success does not align at the NWRD as waste rock landforms inherently possess distinct objectives and characteristics.	• Completion criteria are refined and customised for waste rock landform domains. • Consideration of species that would be most suitable of cover integrity, which may include non-native species (e.g. pasture grasses) • Completion criteria should outline the conditions that most closely define the values desired for the site and that can be realistically achieved whilst demonstrating effect leading-practice techniques.	
	Waste Rock Landform Vegetation Trials	• Vegetation trials hold significant potential to inform and refine rehabilitation practices, such as weed management, seed mix refinement, and testing of soil treatments. • Additionally, they can contribute to informing the completion criteria and establishing a knowledge base regarding achievable vegetation levels for waste rock landforms.	• Establishing vegetation trials with experimentation on variables such as the use of gypsum and different growth media (outlined in the PRCP) is recommended to gain insight into their effectiveness in enhancing soil quality and promoting successful vegetation establishment.	
Weed Management and Monitoring		• Repeated use of herbicides can lead to weeds developing resistance, rendering the herbicides less effective in controlling weed populations. • Uncontrolled weed infestations can disrupt the surrounding ecosystem, leading to habitat degradation and loss of biodiversity.	• Effective weed management is essential for facilitating land reclamation and closure activities, as part of industry best practice and for compliance with environmental regulation. • Updating the Weed Management Plan (MRO, 2012) to comprehensively identify all weed species present at MRO. • Assess the efficacy of weed control measures to improve strategies and inform long-term	

Category	Knowledge Gap	Evidence / Risk	Recommended Works	Status
			management planning through the analysis of trends and patterns.	
Rehabilitation Materials	Topsoil Characterisation	• Soil testing to assess the geotechnical and geochemical properties of topsoil has been advised in both the PRCP and Mine Material Management Plan. Limited topsoil stockpile sampling was completed by RGS (2021), and borrow area assessments and soil sampling have been undertaken between 2013-2024 (Figure 4.1).	• Soil sampling of the topsoil stockpiles is recommended to be undertaken to ascertain if soil amelioration is required (as outlined in the PRCP, 2022).	
	Overburden Materials	• The assessment of geotechnical and geochemical properties of overburden material has been advised.	• Propose material characterisation parameters (Subsoil, regolith, NAF waste rock) to scope from ATC Williams (2024).	
	Material Balance	• Topsoil material balance is under ongoing refinement to improve confidence in both material properties and available volumes within proposed borrow areas. • An understanding of where this material is sourced, its properties, and volumes will form the NAF layer and compacted clay layers. •	• Generate a material balance inventory to assess material quantities including information from the ongoing Sampling and Testing Plan 2024. • Characterisation of oxides and trans oxides is required for the materials. • Refine material properties according to results from the ongoing Sampling and Testing Plan (ATC Williams, 2024).	
Cover System Design	Cover system numerical modelling	• NP modelling potentially overlooking extreme climate patterns and longer closure timeframes.	• Extend modelling results to include the analysis of high-intensity rainfall events exceeding the 1 in 100-year event, and consider the long-term climate sequence, accounting for climate change.	
	Erosion modelling	• Erosion modelling potentially overlooking extreme climate patterns and longer closure timeframes.	• Evaluate erosion yield for high intensity rainfall patterns accounting for closure timeframes. • Erosion monitoring is reported to have been completed on trial pads in the Cover Trial and Performance Monitoring Plan, but no results have been reported. • Erosion on the top surfaces and hydraulic system of the NWRD final landform has not been assessed. • Landform evolution modelling (LEM) should be considered to compliment the erosion modelling (which is focused on erosion rates) in alignment with comments from DESI. LEM has the advantage of pin-pointing where sheet washing and incising may occur	

Category	Knowledge Gap	Evidence / Risk	Recommended Works	Status
			on the top-tier cover system to guide early monitoring and maintenance while vegetation takes hold.	
	Surface Water Management	• A plan view of the surface water management has not been provided. Therefore, the directions of the slopes and their integration with the overall site surface water plan remain unclear. It is only suggested that water would be directed to the pit and to interception dams (RGS, 2022). • Water egressing from the NWRD reports elevated concentrations of sulfate and nitrate, as well as occasionally reporting elevated concentrations of dissolved heavy metals (MRO, 2020). Seepage and surface water from the NWRD is reported to be captured by interception dams such as WD2. The monitoring plan does not address mitigation measures of contaminated groundwater, other than monitoring seepage at the toe of the NWRD and at the interception dams. • The risk of berm overtopping failure during high-intensity rain events has not been addressed in the design. A review of Deswik contour lines indicate a slight longitudinal fall of the berms to the north.	• Define a surface water management plan according to high intensity storm events based on closure timeframes. • Conduct an options assessment for hydraulic systems to determine the most appropriate long-term methods for shedding and moving water from the top tier and berms of the NWRD. • The longitudinal fall of the berms should be assessment in Deswik by running a catchment analysis. A low grade with result in insufficient runoff and increase infiltration into the berm. • It is noted that a wetland is currently being constructed at WD2. Once the wetland is functional, include groundwater quality remediation measures in the monitoring plan. • Evaluate the risk of berms overtopping, define AEP of this occurring, and consequence to overall landform design. An assessment is required to work out how the risk of high energy and high-volume flows can be reduced using either a series of drop-down structures or alternative flow paths for clean water other than the berms. This could be undertaken as part of the sensitivity analysis recommended under 'Geotechnical Stability' below.	
	Geotechnical Stability	• The geotechnical assessment in the PRCP (Cartledge, 2024) has not accounted for surface water management structures and varying phreatic surface elevations within the NWRD. The analysis does not consider worst-case scenarios regarding these varying phreatic surface elevations. Variations in the water management design are likely to have substantial impacts on the geotechnical stability of the final landform.	• A sensitivity analysis of the phreatic surface variations is recommended to assess the potential effects on long-term stability of the NWRD final landform. • Assess the impact on geotechnical stability of surface water management structures on the local hydrogeological model of the NWRD final landform.	
	Monitoring	• Monitoring plan and potential monitoring equipment provided, but locations and quantities have not been specified.	• Data and findings from ATC Williams' trial work for the mine site TSF should be made available to inform the	

Category	Knowledge Gap	Evidence / Risk	Recommended Works	Status
		• Cover trials have been planned but no updates or results have been provided. ATC Williams is planning to design cover trials for the TSF in late 2024. • Ongoing assessments to ensure water quality from rehabilitated areas is reported to have been tested but have not been provided.	NWRD cover system. Assess results from monitoring of these trials if available.	

8 REFERENCES

ATC Williams. (2014). Progressive Rehabilitation and Closure Planning – Hydraulic Assessment.

ATC Williams. (2024). Mount Rawdon Operation: Sampling and Testing Plan. April 2024.

Bureau of Meteorology (BOM). 2024. Climate Data Online - Map search. Available at: http://www.bom.gov.au/climate/data/index.shtml.

DSITI & DNRM (2015). Guidelines for agricultural land evaluation in Queensland (2nd edition). Queensland Government (Department of Science, Information Technology and Innovation and Department of Natural Resources and Mines), Brisbane, Queensland.

Mount Rawdon Operations (MRO). 2021. Biodiversity Management Plan. July 2023. Version 1.

Mount Rawdon Operations (MRO). 2022. Progressive Rehabilitation and Closure Plan. November 2022. Version 2.

Mount Rawdon Operations (MRO). 2012. Weed Management Plan. July 2012.

Neldner, V.J., Butler, D.W. and G.P. Guymer (2019) Queensland's regional ecosystems: Building a maintaining a biodiversity inventory, planning framework and information system for Queensland, Version 2.0, Queensland Herbarium, Queensland Department of Environment and Science, Brisbane.

Northern Resource Consultants (NRC). 2013a. Flora and Fauna Technical Report: Mount Rawdon Operations. March 2013.

Northern Resource Consultants (NRC). 2013b. Waste Rock Dump Berm Design for the North Dump: Mount Rawdon Operations. April 2013.

Northern Resource Consultants (NRC). 2015. Mount Rawdon Operations: Application to Amend the Environmental Authority to Facilitate a Revision to the Groundwater Monitoring Program. November 2015.

Northern Resource Consultants (NRC). 2017. Mount Rawdon Gold Mine – Final Land Use and Rehabilitation Plan.

Regional ecosystems descriptions - Queensland's Regional Ecosystems - Publications | Queensland Government. https://www.publications.qld.gov.au/dataset/redd/resource/42657ca4-848f-4d0e-91ab-1b475faa1e7d?inner_span=True.

RGS (2016) Conceptual Closure, Decommissioning and Rehabilitation Plan. Mount Rawdon Tailings Storage Facility. July 2016.

RGS Environmental Consultants Pty Ltd (RGS). 2021. Northern Waste Rock Dump Characterisation: Northern Waste Rock Dump Design Project. July 2021.

RGS Environmental Consultants Pty Ltd (RGS). 2022. Mine Material Management Plan: Landform, cover system and final void design and assessment. November 2022.

RGS Environmental Consultants Pty Ltd (RGS). 2023a. Erosion measurement and modelling: Mount Rawdon Operations. March 2023.

RGS Environmental Consultants Pty Ltd (RGS). 2023b. Geochemical Assessment of Waste Rock and Tailings. October 2023.

So H, Khalifa A, Yu B, Caroll C, Burger P, Mulligan D. (2018). MINErosion 3: Using measurements on a tilting flume-rainfall simulator facility to predict erosion rates from post-mining landscapes in Central Queensland, Australia. PLoS ONE 13(3).

Sustainable Solutions Global (SSG). 2024. Conceptual Closure Revegetation Program Mt. Rawdon Operations Queensland. February 2024.

Young, R.E., Manero, A., Miller, B.P., Kragt, M.E., Standish, R.J., Jasper, D.A., & Boggs, G.S. (2019). A framework for developing mine-site completion criteria in Western Australia.

For further information contact:

Benjamin Freidman
Senior Closure Consultant
bfreidman@okaneconsultants.com

O'Kane Consultants Pty Limited

2/14 Heussler Terrace
Milton QLD 4064
Australia

Telephone: (07) 3367 8063
Facsimile: (07) 3367 8052
Web: www.okc-sk.com