Mine Waste Management Plan

Vecco Critical Minerals Project

Prepared for: **Vecco Group**

MINE WASTE AND
WATER MANAGEMENT

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Table of Contents

Figures

Tables

Definitions

Acronym/Initialism	Definition
Acid and Metalliferous Drainage (AMD)	Any contaminated discharge resulting from mining and associated processing, which is formed through a series of chemical, physical and biological reactions when geological strata is exposed to oxygen and moisture as a result of ground disturbance activities.
ANC	Acid Neutralising Capacity, the capacity of a sample to neutralise acidity expressed as kg H_2SO_4 per tonne of sample.
EA	Environmental Authority
EDMS	Environmental Database Management System
NAF	Non-Acid Forming. Geochemical classification criterion for a sample that will not generate acidic conditions.
NAPP	Net Acid Producing Potential
PAF	Potentially Acid Forming. Geochemical classification criterion for a sample that has the potential to generate acidic conditions.
ROM	Run of Mine
SSE	Site Senior Executive
TSS	Technical Services Superintendent
Mine waste	Any mining related waste including overburden and process residue materials

1 Introduction

AARC Environmental Solutions Pty Ltd (AARC) is contracted by Vecco Group (Vecco) to coordinate consulting services to obtain an Environmental Authority (EA) for the Vecco Critical Minerals Project (VCMP). The VCMP is located 70 km north of Julia Creek in northwest QLD (**Figure 1-1**) and will produce approximately 5,500 t/yr vanadium pentoxide (V_2O_5) and 4,000 t/yr high purity alumina (HPA) over the anticipated 36-year minimum mine life. The open cut mine will be shallow (15 to 35 m below ground level) and operated using a standard truck and shovel procedure.

RGS Environmental Consultants Pty Ltd (RGS) was commissioned by AARC provide the required geochemical technical information to support the EA approvals process and inform development of the progressive rehabilitation and closure plan (PRCP). Stage 1 and Stage 2 of a soil capping, mine waste and final void assessment was finalised in September 2023.

Comments from the Department of Environment and Science (DES) regarding the geochemical assessment were received by AARC on 22nd September 2023. This technical report is a Mine Waste Management Plan (MWMP) intended to address those comments and facilitate the EA approval.

1.1 Scope of work

RGS has produced a stand-alone MWMP technical document (this document) to provide clarification on the operational procedures for handling mine waste. This document will provide clarity regarding planned activities to address the following queries from DES, including objectives derived from discussions between DES and AARC.

- Is the mudstone floor/black shale (Wallumbilla Formation - WLA) expected to oxidise and produce acid quickly (acid drainage possible, even probable, if exposed and not managed)?
- Should the Toolebuc orebody materials (TLBB-TLBE) be disposed of as waste due to low grade and be treated as deleterious due to the potential for neutral metalliferous drainage?
- RGS (2023) recommendations include, amongst other things, that additional work (static and kinetic leach column analyses and physical analyses include ksat and soil water characteristics) required on process residue streams as they are produced from pilot scale metallurgical programs. Will this be carried out?
- Development of operational controls are required for waste streams/disposal, in-pit and ex-pit. Please provide specific detail regarding efforts to reduce exposure timeframes of mined (acid forming) shale floor.

The scope of work to produce the MWMP consists of the following tasks.

1. Review new and existing project information, specifically from the following sources:
    - Results and recommendations from the Soil Capping, Mine Waste, and Final Void Assessment (RGS, 2023); and
    - The Vecco Pit Layout Concept: comments, slides and video produced by Optimal Mining (2023).
2. Develop a draft MWMP.
3. Finalise the draft MWMP, following receipt of comment from AARC/Vecco.

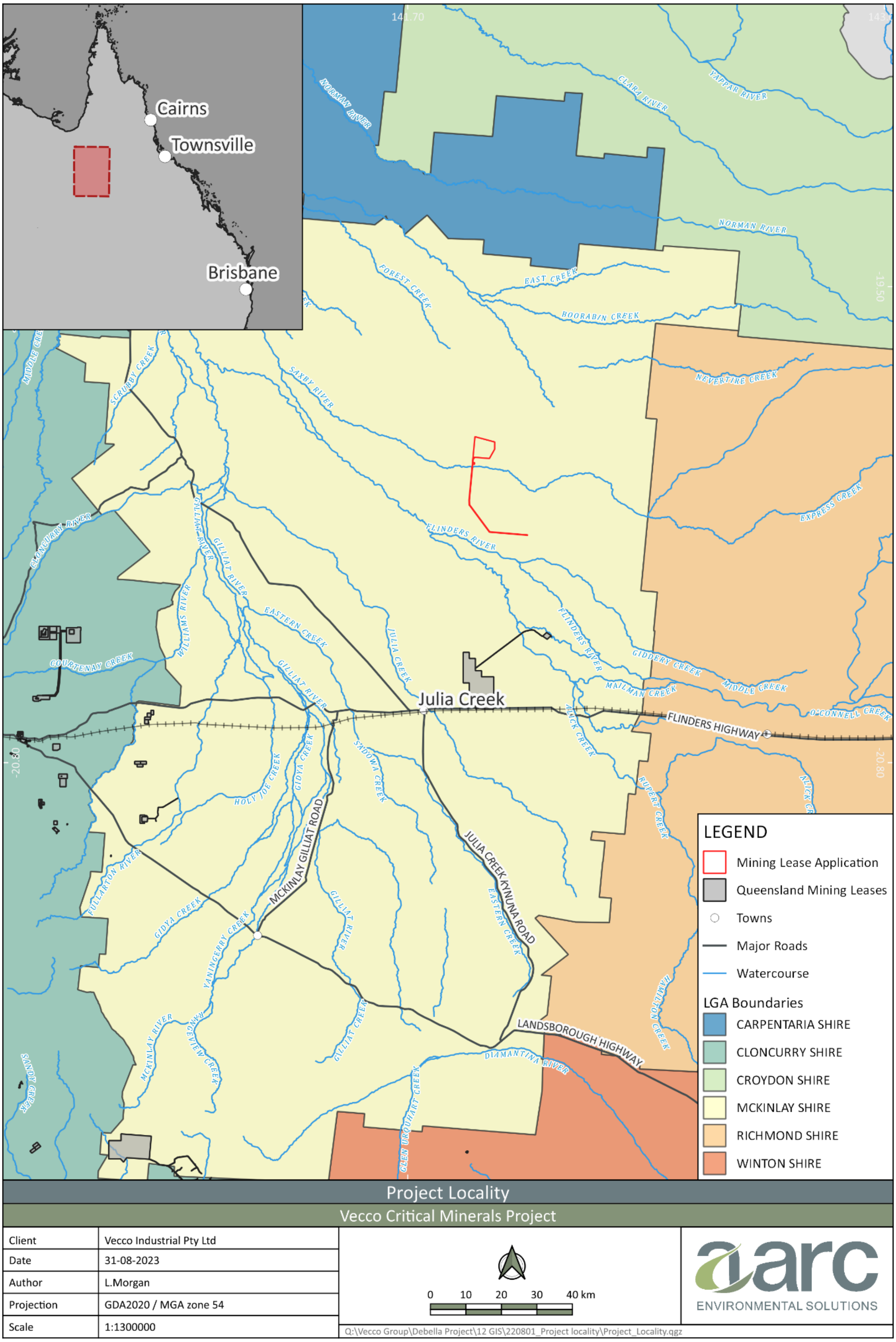


Figure 1-1: Vecco Critical Minerals Project Location

1.2 Objectives

The following MWMP objectives are generic and are typical for meeting regulatory requirements in Queensland.

1. Effective characterisation of mine waste to predict, under the proposed placement and disposal strategy, the quality of any surface runoff and seepage generated concerning potentially environmentally significant effects including salinity, acidity, alkalinity and dissolved metals, metalloids and non-metallic inorganic substances;
2. A program of progressive sampling and characterisation to identify dispersive and non-dispersive waste rock and the salinity, acid and alkali producing potential, metal and acid concentrations of mine waste materials;
3. A material balance and disposal plan demonstrating how potentially acid forming mine waste will be selectivity placed and/or encapsulated to minimise potential generation of acid and metalliferous drainage (AMD), where relevant;
4. Re-testing of mine waste geochemistry and water quality limits of parameters;
5. Where relevant, a sampling program to verify encapsulation and/or placement of potentially acid forming (PAF) mine waste materials;
6. Data for run-off water quality;
7. How often the performance of the plan will be assessed; and
8. The indicators or other criteria on which the performance of the plan will be assessed.

This MWMP aims to ensure that mine waste materials (including overburden and process residues) are managed in accordance with Queensland mining industry standards and regulatory requirements. To meet EA approval, the MWMP should align with relevant technical guidelines (COA, 2016a,b,c; DEHP, 2013; DME, 1995; DES, 2013, 2014, 2018, 2020,2021; and INAP, 2023) in a manner that minimises any potential environmental and health risks.

1.3 Document Control and Review Process

Once the EA is approved, it will be a requirement that this MWMP is reviewed by the Vecco Technical Services Department. Updates to the MWMP will typically occur once every three years.

Revision 001 of this MWMP is a draft document that was certified by Dr. Alan Robertson, Director of RGS on 19 October, 2023. The information in **Table 1-1** documents the version control and sign off by RGS and Vecco.

Table 1-1: MWMP Version Control and Approval

Document Control			
Revision	**Signatory**	**Role**	**Company approval (Signed and dated)**
Revision 001	Alan Robertson (RGS)	Document Author	Alan M Robertson 19 October 2023
Revision 001	Technical Services Superintendent (Vecco)	Document Owner	

Table 1-2 allows for future amendments to the MWMP to be progressively tracked, over the life of the project, and, if any substantive changes have been made or are proposed to be recorded.

It is advisable to document how and why changes are made to the MWMP to allow subsequent managers to understand the history of the site and follow the progressive management and operation of the mine areas.

Table 1-2: MWMP Amendment History

Document Control			
Revision	**Signatory**	**Amendment**	**Company approval (Signed and dated)**

RGS certifies that this MWMP is feasible and aims to meet the intent of the future conditions of the approved EA (i.e., the MWMP will enable Vecco to continue to progressively characterise, mine and place the mined materials so that their potential to contribute to (or to mitigate) environmental harm can be determined).

This MWMP makes use of the existing geochemical characterisation data for materials to be mined (and proposed to be mined) at the VCMP as described in **Section 2.4**.

1.4 Integration of the MWMP with other Departments

Effective management of mine waste materials (including materials that will be required to initiate and then maintain sustainable vegetation), requires communication between the geology, mine planning and technical services departments.

Without effective communication and clear workflow designation the MWMP will not meet its objectives. The information in **Table 1-3** shows the potential workflow and communication within and between Vecco departments.

1.5 Data Management

The mine waste material characterisation program will compile geochemical and physical data. Typically, these data are provided by a commercial laboratory in portable document format (.pdf) and spreadsheets that are then stored on a server. This can lead to the eventual loss of the data. All geochemical, physical and any other relevant data associated with the characterisation of mine waste will be stored in the Geology Department geological database and/or in the environmental database management system (EDMS).

Table 1-3: MWMP Departmental Workflow

Department	Role	Tasks and responsibilities	Connections
Technical Services Department	Document control	Owner of the MWMP	→ Geology
		Compilation and updating the MWMP and ensuring that the aim and objectives will be met i.e., auditing process	
		Ensuring the MWMP is integrated with the Plans being managed by other departments e.g. the Sediment Control Plan and Water Management Plan.	→ Planning, → Environmental, → Geology, → Tech. Services
		Ensure scheduled waste rock material sampling and analytical programs are planned, ahead of mining, on an as-required basis.	← Planning, ←→ Geology
		Work with the Geology Department to develop the MWMP to obtain any necessary samples from in-fill drilling programs and/or blast hole drilling programs.	←→ Geology
		Document how changes to the MWMP will be tracked over time.	
	Life of mine planning	Rehabilitation will be completed in accordance with the conditions of the approved EA and Progressive Rehabilitation and Closure Plan.	← Planning
		The Technical Services Department must work with other departments and guide them to ensure that the operational mine plans to mine and produce coal align the legislative requirements of the Queensland Government *Mineral and Energy Resources (Financial Provisioning) Bill 2018* and the amendments to the *Environmental Protection Act 1994.*	←→ Planning ←→ Geology
	Material characterisation	Define the material types that will be mined (or processed) and need to be managed and rehabilitated to attain minimal financial liability at relinquishment. In general, all materials from soil to the deepest mined surface should be included in the MWMP.	← Geology
		Document future sampling processes and the physical and geochemical analytical methods that will be adopted in consultation with the Geology Department.	←→ Geology
		Define the geochemical and physical criteria that will be used to classify the samples from drilling and sampling programs in consultation with the Geology Department.	←→ Geology
		Manage the interpretation and classification of the analytical data.	← Geology
	Design and Construction	Implementation of approved mine plans in accordance with schedule and approvals.	← Planning, ← Environmental, ← Geology
	Financial Provisioning	Technical Services Departments are typically required to manage environmental provisioning for rehabilitation and closure, and this requires reliable outputs from short, medium and long-term mine plans.	← Planning
Geology Department	Drilling and sampling	Utilise the MWMP to develop scheduled exploration and operational drilling and sampling plans.	← Environmental, (←→ Planning)
		Implement the exploration and operation drilling and sampling plans.	
	Update geology models	Compile the material characterisation data into the geology model(s).	← Environmental
		Provide the raw data and interpreted data to the Technical Services Department.	→ Environmental
		Develop and report annual material balances and provide these to Technical Services Department.	→ Environmental
		Provide the revised geology model to the mine planning team.	→ Planning
	Issue geology model and material balances	Provide updated material balances for all mined units to the Environment team to verify that the overall aim of the rehabilitation and closure plan can continue to be met e.g. for the active (current iteration) of the mine plan is there enough topsoil, subsoil and other necessary material to achieve complete rehabilitation over the life of mine.	→ Environmental
Mine Planning Department	Life of mine planning	Development and maintenance of schedule in the Operational Mine Plan	←→ Geology, ←→ Environmental
	Scheduling	Utilise revised geology models to develop short, medium, and long-term mine plans including plans for progressive rehabilitation and closure.	← Geology
		Mine planners will need to align with environmental design criteria associated with constructed landforms to ensure that the landforms are rehabilitated to a safe and stable landform that does not cause environmental harm and will conform to the objectives of the *Environmental Protection Act 1994.*	→ Environmental
		Mine planners will provide the numerical basis from the Operational Mine Plan to the Technical Services Department for annual financial reporting (internally and externally).	→ Environmental
		Mine planners will provide the schedules and plan to Technical Services to implement on the ground.	→ Tech. Services

2 Project background

2.1 Project geology

The targeted orebody is in the Toolebuc Formation, a thin but laterally persistent geological unit of Upper Albian age from the Early Cretaceous period (**Figure 2-1**). It occurs within a thick section of fine-grained clastics in the Eromanga Basin, Queensland. The Toolebuc Formation strata is known to contain a limestone unit that is rich in Mesozoic vertebrate fossils and shows little evidence of diagenesis other than physical compaction. However, the formation is heterogeneous, and the limestone is subordinate to calcareous and bituminous siltstone, black labile sandstone, and shale which host the minerals of significance to the VCMP.

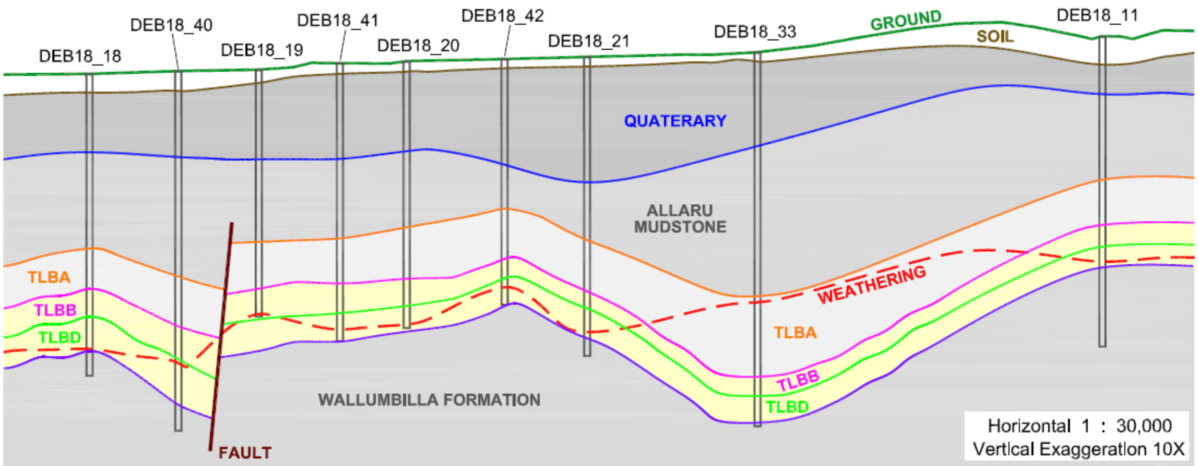


Figure 2-1: Toolebuc Formation stratigraphic profile (Source: Boyd, 2018)

The vertical mining sequence (**Table 2-1)** is described by Boyd (2022) as follows:

- The **Quaternary Alluvium** (QA) comprising of **topsoil** (thickness 0.5 m) and **subsoil** (thickness 1.5 m). Both of these soil units will be stored and preserved for the rehabilitation process.

  Topsoil / subsoil profiles and vegetation communities in the project area include:

  - **Grey Dermosols** with **Grey Vertosols** occurring on gently inclined or near-level plains within an old alluvial landscape. This SMU is distributed throughout the majority of Study Area as regions of palaeo-drainage and flood channels. The soil consists either of a sandy surface, or self-mulching sandy clay surface, with clay content increasing with depth. Vegetation is predominantly feathertop wiregrass and Mitchell grass tussock grassland.

  - **Alluvium**: with reddish brown, clay loam sandy soil unit occupying the central region of the study area, on gently inclined or near-level rises. The profile consists of only a B horizon with sandy clay loam to medium clay texture throughout. Vegetation associated with this unit includes bloodwood and Corymbia spp. woodlands.

  - **Arenosol**: Reddish brown, deep, sandy soil unit occupying the southern region of the study area, on gently inclined or near-level plains. The profile generally exhibits little or no A horizon material and therefore often comprises a B horizon with a sandy texture throughout. Vegetation associated with this unit includes wild plum (Terminalia platyphylla) and beefwood (Grevillea striata), with western bloodwood (Corymbia terminalis) and whitewood (Atalaya hemiglauca) associated in the upper canopy, and Melaleuca spp. in the sub-canopy.

- **Wondoola Beds** (WDB) consist of soil, clay, sand and gravel with an average thickness of 9.5 m and a maximum of 14 m. The WDB overburden unit will be backfilled into the mined void as waste.
- **Mudstone Horizon:** Allaru Mudstone (ALM) consists of blue-grey mudstone composed of clay-sized particles with some siltstone beds. It has an average thickness of 8.5 m, with a maximum of 17.7 m at the south end of the pit. The ALM unit is considered overburden waste material and will be used as backfill.
- **Limestone:** The Toolebuc Formation horizon (TLBA) contains low vanadium grades. TLBA thickness is 5.0 m (average), ranging to 8.4 m (maximum) in the northeast end of the pit. TLBA contains calcium oxide (CaO) up to 44.6%. Quantities of TLBA will be required for processing and neutralising acidic materials. Any remaining TLBA will be considered waste and handled accordingly.
- **Mineral Resource:** The weathered Arrolla Shale (TLBB and TLBD) are considered mineral resource. Both horizons combined have an average thickness of 4.6 m, with a maximum of 6.3 m on the southwest side of the pit. The mined resource will undergo processing as described in **Section 2.3.**
- **Floor:** The transition material between the Toolebuc Formation and Wallumbilla Formation (TLBE) is considered poor quality for vanadium but will be mined for REE. The basement Wallumbilla Formation is a blue-grey mudstone unit (WLA).

Table 2-1: Geological units and material classifications

Geological Unit	Code	Description	Material classification
Quaternary alluvium	QA	Soils and clays	Soil
Wondoola Beds	WDB	Unconsolidated sands, clay and gravels	Overburden
Allaru Mudstone	ALM	Mudstone with minor interbedded siltstone and infrequent sandstone	Overburden
Toolebuc Formation - Limestone	TLBA	St Elmo Coquina, banded shelly limestone. Minor bituminous shale.	Overburden
Toolebuc Formation	TLBB	Wilat's Crossing Oil Shale, laminated bituminous shale. Minor to common limestone bands. Manfred Coquina at base.	Orebody
Toolebuc Formation	TLBD	Arrolla Oil Shale, finely laminated bituminous shale.	Orebody (V)
Toolebuc Formation	TLBE	Arrolla Oil Shale lower transition, inferior oilshale transition to Wallumbilla Formation.	Orebody (REE)
Wallumbilla Formation	WLA	Blue to grey mudstone with minor siltstone and fine-grained carbonaceous sandstone.	Basement

2.2 Resource and mining method

The Production MLA contains the targeted vanadium ore deposit (**Figure 2-3)**. The proposed final landform and mine access road are also shown. The open pit will be mined using conventional strip mining methods with excavators and trucks. Refinement of the plan in 2022 developed the mine sequence plot, mineral resource estimates and revised the out of pit waste rock dumps (**Figure 2-2**).

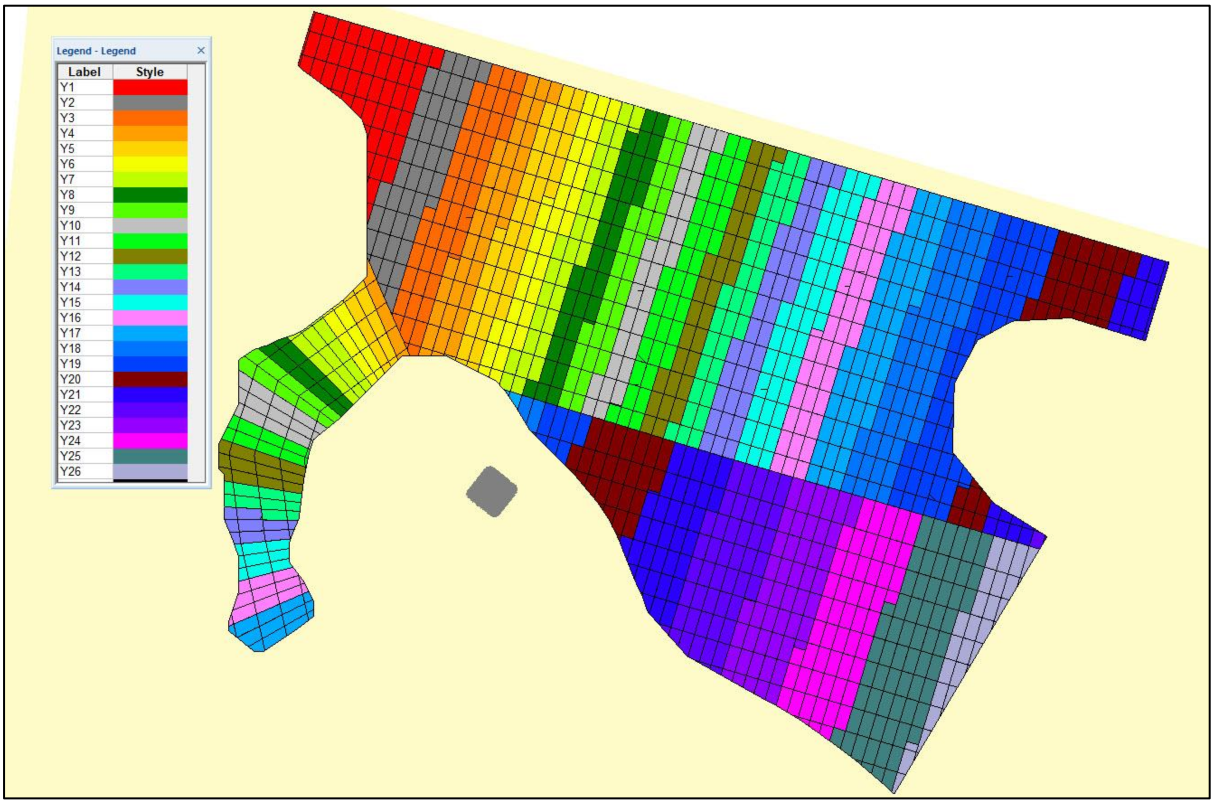


Figure 2-2: Revised 2022 sequence plot for VCMP

All mined material will be weathered and unconsolidated, and therefore blasting will not be required. The mined pit will be progressively backfilled with overburden and residue through the predicted 20-year mine life (Boyd 2022).

A small ex-pit waste dump will be developed early in the mine life until a void is developed for subsequent backfill. The ex-pit dump and backfilled void will be covered in 1.5 m of subsoil and 0.5 m of topsoil to reinstate the pre-mine soil profile. All external slopes on will be at a maximum grade of 1:10 to minimise erosion.

Operational controls to reduce environmental risk are described later in **Section 4.**

Figure 2-3: Vecco Critical Minerals Project proposed site layout

2.3 Ore processing

The concept level flowsheet in **Figure 2-4** summarises the current understanding of the treatment of run of mine (RoM) ore through to production of a bagged V_2O_5 product and a high purity alumina (HPA) product. A high-level design for the treatment of the TLBE orebody to produce a rare earth elements (REE) concentrate has also been shown.

2.3.1 V_2O_5 and HPA flow sheet

The V_2O_5 and HPA flowsheet comprises the following unit operations:

- Crushing
  - The crushing circuit will be designed to reduce the top size of the ore to below 5 mm.
  - A rolls crusher or sizer would be appropriate for this ore which is soft.
  - A scrubber will pre-condition the ore to disperse the clays from the calcite and other gangue.
  - The intention is to not promote fines generation that might impact calcite rejection but to ensure liberation of vanadium.
- Flotation
  - A reverse flotation circuit has been devised where the calcite is floated off leaving the valuable vanadium bearing minerals in the tail. This is critical in rejecting calcium.
  - Multiple stages of concentrate cleaning have shown that additional vanadium can be recovered.
  - The flotation tail will require thickening / filtration to minimise water going into leaching.
- Sulphuric acid Leach
  - Contacting the ore with H_2SO_4 in stirred tanks will extract the vanadium as a sulphate. This leach also extracts aluminium and iron as sulphates.
  - Operating in counter current fashion so that the most leached ore contacts the highest acid concentration.
  - Operating at sufficient free acid concentration to secure fast kinetics and reduce residence time at atmospheric conditions to minimise energy.
  - Operating at 20-25wt% solids to manage viscosity.
  - Finishing with a CCD wash for vanadium and acid recovery.
- Solvent Extraction
  - The leachate will be partially neutralised to be compatible with the organic solvent extraction. This can be achieved through neutralisation with ore to minimise the costs of pH adjustment. This has been assessed and will significantly reduce acid costs.
  - Contacted with organic in multiple stages of extraction with an O:A ratio to be determined. Mextral 984 H (which is an aldoxime and oxime) is successful at extracting vanadium with low amounts of Fe / V.
  - The vanadium rich organic phase will then be stripped in multiple stages with ammonia at an O:A ratio to be determined to remove vanadium into the stripped liquor. An ammonia solution has also been very successful at stripping vanadium from the organic, to produce a clean V loaded strip solution.
- Ammonium Metavanadate (AMV) precipitation
  - The stripped liquor is then pH adjusted and ammonium sulphate added to promote precipitation of NH_4VO_3. while managing impurities. Precipitation of the AMV is achieved in this process and yield and purity will be controlled through manipulation of pH and temperature, seeding.
  - The work done to date has been rudimentary but effective. Further work needs to go into understanding the optimum NH_4VO_3 conditions while minimising the precipitation of impurities (or washing them out).

- Calcination to V_2O_5
  - The filtered AMV is then dried (100 degrees celsius) and submitted to a calciner which drives the temperature to 450 degrees C. The AMV decomposes to V_2O_5 and NH_3 is then captured and recycled back to the start of the AMV precipitation.
  - Calcined V_2O_5 is then packaged into 1T bulk bags for transport.
- High Purity Alumina (HPA)
  - This process is shown as a side stream of raffinate from the solvent extraction process.
  - As described above, the leach conditions promote the extraction of aluminium into a sulphate solution. This provides a rich source of Al for purification and concentration.
  - Vecco have partnered with Lava Blue to develop a suitable stream to feed their patented HPA process.

2.3.2 Rare Earth Elements Flowsheet

- Beneficiation
  - The mine material may be subjected to a water based beneficiation process to concentrate the rare earths present in the apatite. At this time there is no clear pathway as test work is underway, but likely to involve screens and cyclones. The waste from this process can be disposed into the mining pit, subject to being suitable and compatible with the neutralised residue from the V_2O_5 flowsheet. Water, if acidic will need to be treated prior to re-use or disposal
- Leaching
  - Rare earths are extractable at modest leach conditions (pH=1, 90 degrees, 4-8hr duration). As shown in the diagram It is anticipated that an H_2SO_4 leach will be utilised.
  - The rare earths are now in liquor form as sulphates
  - The product will be thickener and filtered to recover the liquor and densify the residue.
  - The residue will be washed and neutralised for disposal with the Vanadium waste.
- Neutralisation and Precipitation
  - The liquor will be sequentially neutralised with Sodium Carbonate and the impact will be the removal of Ca and Fe, further concentrating the rare earths fraction. These waste stream will be neutralised and also co disposed with the Vanadium waste.
  - The precipitated rare earths concentrate will then be washed, filtered, dried and bagged for transport.

2.3.3 Residue summary

Process residues that will be produced in the processing flow circuit are summarised in **Figure 2-4**.

The current understanding for the management of residue can be described as follows.

- Residue Filtration
  - This is conducted to recover as much of the vanadium as possible after the CCD recovery of vanadium.
  - A test work programme has been drafted to understand the requirements for recovering V and acid and managing solid / liquid separation.
- Residue Neutralisation and Filtration
  - The leached residue must be neutralised prior to disposal. This is achieved through contact with the Ca rich concentrate (ground) from the flotation circuit (and/or TLBA) in a series of stirred tanks.
  - Final pH adjustment will be achieved though the addition of lime (calcined).
  - The neutralised residue is filtered in large plate and frame filters.

- Residue Disposal
  - Filtered, neutralised residue is to be co-disposed into the pit with other waste. The residue and mine waste will be mixed prior to disposal (mixing via a scrubber).
  - The co-disposed residue will be trucked to the pit where it will be placed inside internal embankments which will contain the residue as it dries and compacts – potentially with additional mechanical assistance (dozing/ripping).
  - As it meets compaction objectives, fresh residue can then be placed on top of compacted residue.
  - A small ex-pit facility will be used to manage any unplanned events affecting suitability for co-disposal.
- High Purity Alumina (HPA) residues
  - Waste from this process must be managed (treated and disposed) within the proposed lease boundary.

Table 2-2: Summary of process residues produced at VCMP

Processing stage	Process residue	Description	Disposal
V Crushing	Beneficiated rejects	Rejected ore material coarser than 5 mm, mostly acid consuming	Backfilled into pit void
V Flotation	Ca-rich concentrate	Ca rich waste <5 mm which is then ground to fines	Re-used to neutralise acid leach residue
Sulfuric acid leach, solvent extraction and AMV precipitation	Leached vanadium residue (untreated tailings)	Strongly acidic (pH 2) due to contact with H_2SO_4. Particle size – mostly silt (94%) and some clay (6%)	Undergoes further processing i.e., neutralisation with Ca-rich concentrate and/or TLBA (limestone)
Tailings neutralisation	Treated vanadium tailings	Fine tailings neutralised to pH 8-9. Material has excess acid neutralising capacity.	Mixed and co-disposed with other mine waste and allowed to dry before backfilling into pit void
Al solvent extraction (Lava Blue)	HPA residue	Very fine (clay-sized) residue that is mildly acidic (pH 4 after treatment)	Disposal options still under consideration
REE Crushing	Beneficiated rejects	Rejected coarse material from the TLBE orebody	Likely to be co-disposed with acid consuming V coarse rejects and backfilled into pit void
REE acid leach	Leached REE residue (untreated)	Likely to be strongly acidic due to contact with H_2SO_4 requiring neutralisation.	Further testing required to confirm neutralisation process

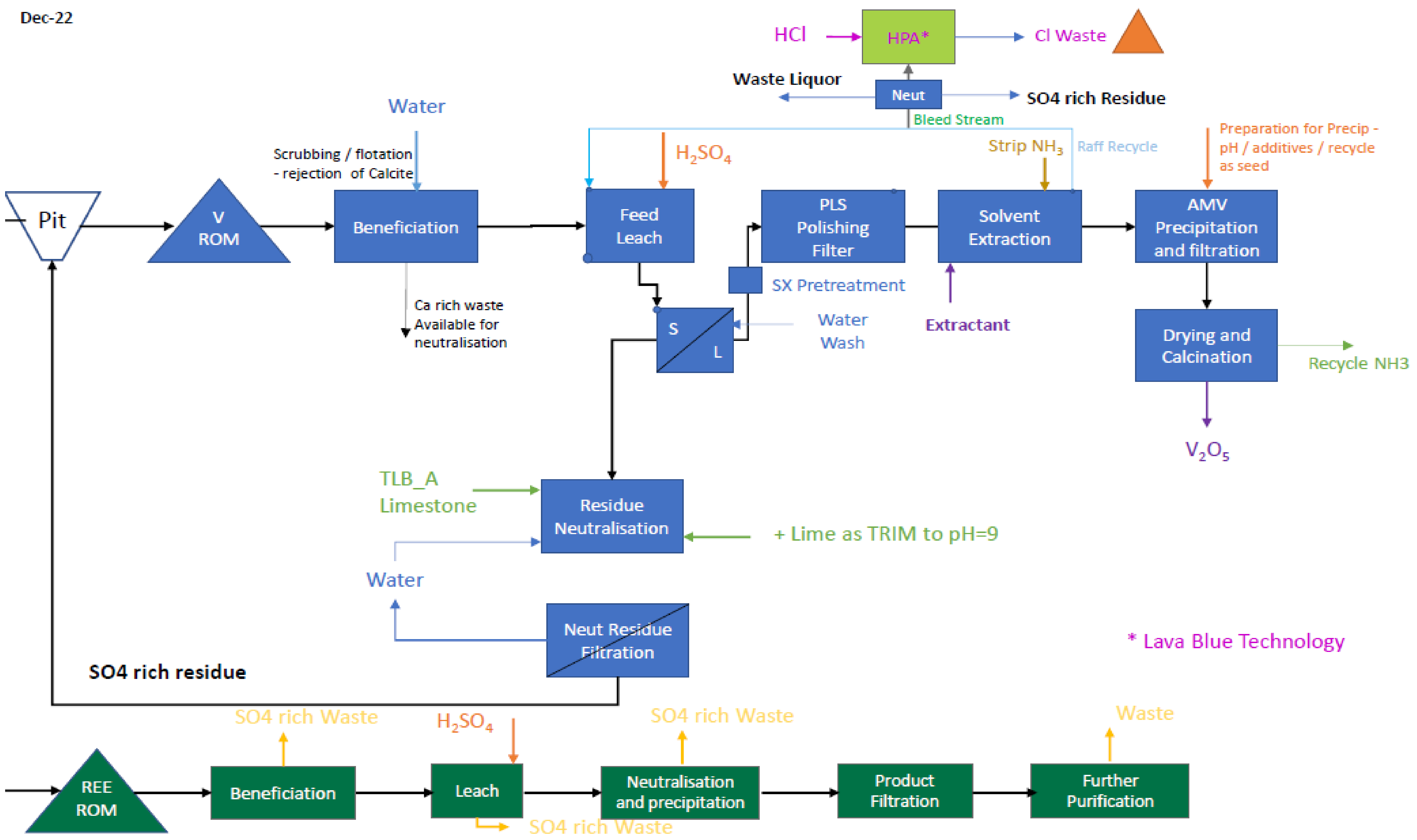


Figure 2-4: Processing flow circuit at VCMP

2.4 Mine waste materials

Mine waste materials (including mined materials and process residue) that will be managed during the development of the project may include the following.

1. **Rehabilitation material**

These are beneficial materials that can be utilised for landform design, cover systems and water management features. Rehabilitation materials have favourable fertility, geochemical and physical attributes such as;

- Extremely weathered units such as topsoil (O and A soil horizons), and subsoil (B and C soil horizons) that are defined in the geology model as Quaternary Alluvium (**Section 2.1).** Soil is preferred as a growth medium for re-establishing vegetation.
- Oxidised and fully weathered to weathered units (such as saprolite and saprock) including the Wondoola Beds, Allaru Mudstone and Toolebuc Limestone units (**Section 2.1**). Weathered rock materials may be used to supplement soil materials if volumes are insufficient. Limestone also has a beneficial use as an acid consuming material.

2. **Cover materials**

Cover materials are beneficial rehabilitation units utilised for the final phases of rehabilitation that may be selectively placed within the upper profile of the rehabilitated landform in a cover system. For this project, it is proposed to reinstate the original soil profile over the backfilled mined materials. Overburden mine waste that has been characterised as non-acid forming (NAF) and non-deleterious can be used as a bulk fill to separate or encapsulate higher risk materials from the overlying growth medium.

3. **Deleterious mine waste**

Deleterious mine waste includes overburden strata that is not suitable for rehabilitation purposes. When left exposed, deleterious mine waste may produce acid, saline, or metalliferous drainage and generally require management to reduce potential environment risk. Deleterious mine waste may also be sodic and/or dispersive, which can lead to issues with physical stability on final landforms. Material characterisation studies have demonstrated that some of the basement Wallumbilla Formation (WLA) is deleterious.

4. **Process residues**

Process residues are produced from the processing plant by refining the targeted orebody. They can include residues, tailings, or reject streams. At most mine sites, process residues are deleterious. However, at the VCMP, some process residues (e.g., beneficiated rejects) rich in calcite have beneficial potential use as neutralising (acid consuming) materials. Others, such as the HPA residue, have unfavourable properties and will require management. Several options for the HPA disposal are currently under investigation, such as a separate TSF, or co-disposal with vanadium or beneficiated rejects. RGS has yet to make any recommendations as there is not yet sufficient sample mass available for complete geochemical and physical characterisation. This is an intended future work scope.

3 Mine waste characteristics

The geochemical and physical characteristics of mine waste (including mined materials and process residues) at VCMP were reported in RGS (2023). A summary overview is provided here.

3.1 Sampling program

RGS received from Vecco three batches of mine waste samples from 36 drill holes obtained from drilling programs between 2021 to 2022. The samples included:

- 343 samples of soil, overburden, orebody and basement i.e., from surface to the deepest geological unit likely to be disturbed by mining operations; and,
- 21 samples of process residue, such as treated and untreated vanadium tailings, HPA residue, tailings supernatant, and process water.

As mine stage plans had not yet been finalised when these drilling programs took place, some geochemical samples were taken from exploratory holes that are now located outside of the current pit shell. Therefore, samples presented here provide a greater spatial representation than would normally be required for an operating mine.

3.2 Mined material classification

3.2.1 Geochemical classification

A program of static and kinetic geochemical tests was used to determine the likely geochemical characteristics of the mine waste materials (RGS, 2023).

The results in **Figure 3-1** show that shallow units from Quarternary Alluvium (QA) to the Allaru Mudstone (ALM) overburden unit contain some total sulfur content, as well as excess neutralising capacity and are generally classified as non-acid forming (NAF), or non-acid forming – low capacity (NAF-LC). The sulfur is present as sulfate minerals such as gypsum and barite and acid conditions are highly unlikely due to the moderate acid neutralising capacity (ANC). ALM transition materials, the underlying TLBA (limestone), and the orebody (TLBB-TLBD) unit have very high ANC and the majority are classified as acid consuming (AC).

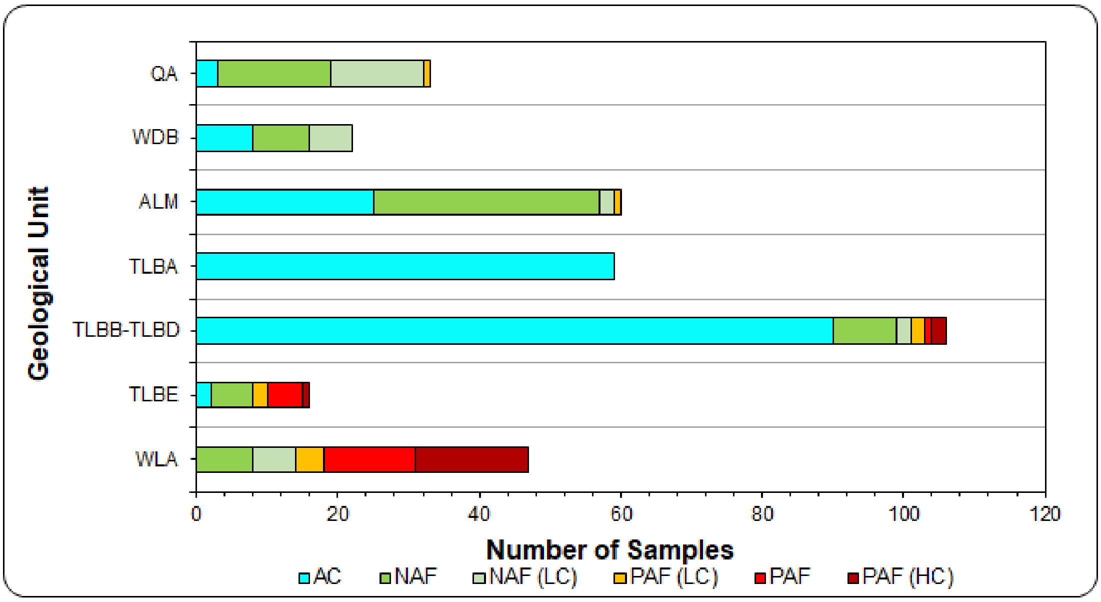


Figure 3-1: Geochemical classifications for mine materials from VCMP

Towards the base of the TLBD unit, and through the majority of the TLBE orebody and WLA basement materials, the geochemical classification indicates that some PAF and PAF – high capacity (PAF-HC) materials occur at depths >30 m. Although the orebody (TLBB to TLBE) contains higher concentrations of total sulfur and sulfide sulfur compared to the overburden, this is counteracted by the ANC. Initially, ANC is high in the orebody but it diminishes with depth, whereas the ANC in the WLA is low.

Based on the total sulfur and sulfide sulfur (CRS) plots presented in RGS (2023), higher sulfur concentrations appear to be controlled geospatially. Sulfide sulfur contents >1% were observed in the southern drill holes but are less frequent within the current northerly proposed pit shell. Nevertheless, RGS recommends that the deeper TLBE orebody and WLA basement materials are conservatively treated as PAF due to their low ANC and are managed appropriately.

Operational controls to reduce the exposure and oxidation of higher risk materials are described in **Section 4.**

3.2.2 Multi-element concentrations

Concentrations of total (2-acid digest) multi elements increase gradually with depth and are higher in the overburden than in topsoils and subsoils. The total multi-element concentrations peak in the Toolebuc limestone and orebody, and are particularly elevated in Bi, Ce, Cs, Cu, P, Rb, Sc, Se, Th, V, and Zn compared to baseline soils. The basement (WLA) concentrations are higher than topsoil but lower than the orebody samples for all elements.

Despite the natural mineralisation, soluble metals and metalloids concentrations from static, 16-hour leach testing remain low in the soil and overburden units and present negligible environmental risk. This trend continues in the orebody, which has low or below the limit of reporting metal and metalloid concentrations, with only a few exceptions - Mn, Mo, Ni, Se, Sr, and Zn. Similarly, in the basement (WLA), only Ni, Se, Sr, and Zn are above the limit of reporting.

Kinetic leachate concentrations for overburden units demonstrate a moderate to rapid initial flush followed by steady but slow salt release, with low concentrations of trace elements. Orebody materials have a slow initial flush and salt release, with variable concentrations of trace elements. The mobility of K, Li, Rb, Se, Sr, and U is higher in orebody samples than in other materials. Kinetic leachate concentrations for the basement (WLA) are typical for PAF materials, demonstrating a decline in pH over time (from pH 6.8 to pH 3.8) and an increase in the concentration of acid-mobilised elements such as F, Cd, Li, Ni, Rb, Sr, and Zn with successive leach events.

3.2.3 Sodicity and Dispersion

Soil textures range from clay to sandy loam. Cation exchange capacity (CEC) and exchangeable sodium percent (ESP) are variable, but Wondoola Bed (WDB) and Allaru Mudstone (ALM) samples are more likely to have salinity and sodicity issues compared to topsoil and subsoil. Overall, Mudstone ALM samples have some limitations regarding salinity and sodicity but are suitable as rocky soil mulch. Durability is expected to be low as the materials are weathered and poorly consolidated. WDB can be used as a bulk fill but it is generally unconsolidated.

3.3 Process residue classification

3.3.1 Geochemical classification

Treated vanadium tailings and HPA residue samples were characterised geochemically and results are reported in RGS (2023).

The treated tailings are alkaline (pH 10) and moderately saline. The total sulfur content is elevated from the H_2SO_4 acid leach, but sulfide sulfur is negligible (<0.03%). RGS also measured titratable actual acidity (TAA), which was also very low, verifying successful neutralisation of the acidic untreated residue with calcite. Overall, the treated vanadium tailings were classified as non-acid forming (NAF).

The HPA residue is mildly acidic (pH 4.5), moderately saline, and has high total sulfur and negligible sulfide sulfur. The untreated sample is classified as acid forming (AF).

3.3.2 Multi-element concentrations

Soluble concentrations from static 16 hour leach testing of major cations, anions, and trace elements in the treated vanadium tailings are low or below the limit of reporting with the exception of Mo, Sr, and V. Compared to the treated supernatant, shake flask extraction leachate concentrations were slightly higher for Sr, but lower for V, and much lower for Mo, which provides an indication of the order of solubility of these elements.

Kinetic leaching data for the treated tailings demonstrates that the pH drops slightly from 9.0 to 6.8 under oxidising (free leach) conditions but remains circumneutral. Under saturated conditions, the pH remains constant. Concentrations of Ca, As, K, Mo, Sb, and V are higher in treated tailings than in the overburden units but are not expected to exceed environmental limits. Overall, the treated tailings have a slight risk in terms of saline drainage but a low risk of AMD.

The untreated HPA residue sample had a small sample mass (140 g) and due to its water holding characteristics, could not generate sufficient leachate for a full soluble ME analysis suite. It contained high concentrations of Ca and Cl compared to other major cations and anions, such as Mg, Na, K, and SO_4.

To minimise the environmental risk posed by the raw HPA residue, the residue will be pH neutralised with the calcite flotation stream or the addition of fine limestone from the TLBA unit to reach a pH of 8.5 to 9. This waste stream will then be blended with the main vanadium process residue. Additional static and kinetic leach analyses of the neutralised HPA residue will be done by RGS when additional sample mass is available for metallurgical programs.

4 Mining method and disposal plan

4.1 Mining method

Mining will progress with a starter pit and a small out-of-pit waste dump and continue over the mine life using shallow (< 35 m deep) truck and shovel, strip mining methods and progressive in-pit backfilling to slightly above pre-mine topography (**Figure 4-5**). During the commencement of mining a small external mine waste storage area will be required, and it will be constructed of geochemically inert material. Soil cover systems will be built on these areas to reinstate pre-mine vadose conditions that will minimise seepage to the underlying weathered rock. The initial external waste dump and all backfilled landform slopes will be < 1:10 angles that will reduce the potential for erosion due to surface runoff. The surface of all rehabilitated landforms will comprise a 2 m soil cover with 1.5 m of subsoil and 0.5 of topsoil.

As the open pit is developed the mined pit will be backfilled. The backfilled void will reduce the size of the final residual void at the end of the mine life (**Figure 4-3**). The backfill design aims to cover the reactive WLA floor as quickly as possible. The proposed operational procedure includes a ramp down from the ring road to a low-level dump pass, which will cover the floor as quickly as possible with either treated tailings or acid consuming waste material. Cover materials will be hauled around the western end of the pit (**Figure 4-4**), or alternatively across the bridge located in the middle of the pit to tip out at a low level and cover the floor with minimum exposure time.

The life of mine schedule has been planned to cover the floor as quickly as possible (**Figure 4-1**). In the current schedule, the median length of time that the floor is exposed is three days, and the average is 9 days (**Figure 4-2**). The schedule has been set up to ensure the dig progression directions allow for backfilling to occur as quickly as possible once the block is fully mined.

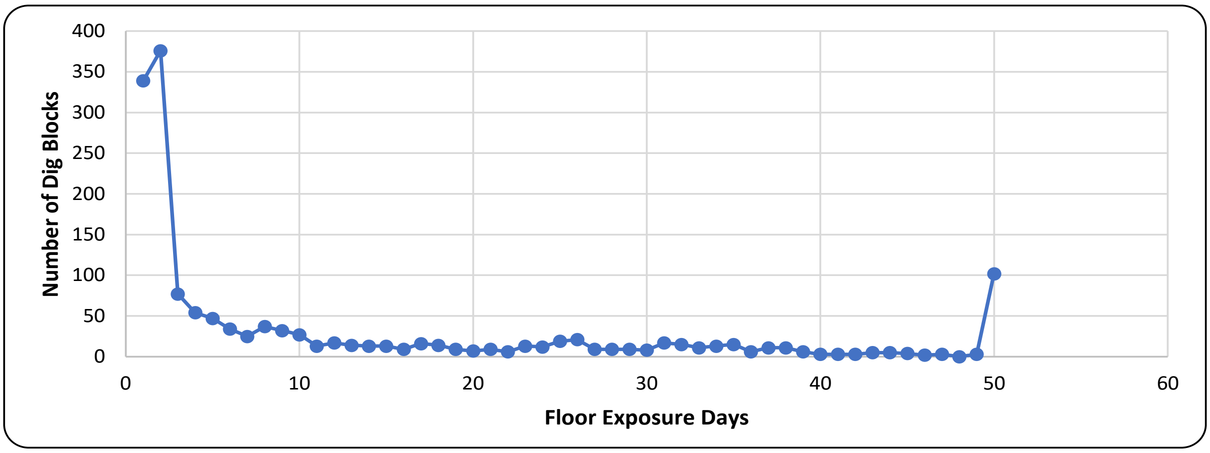


Figure 4-1: Dig blocks Vs floor exposure days

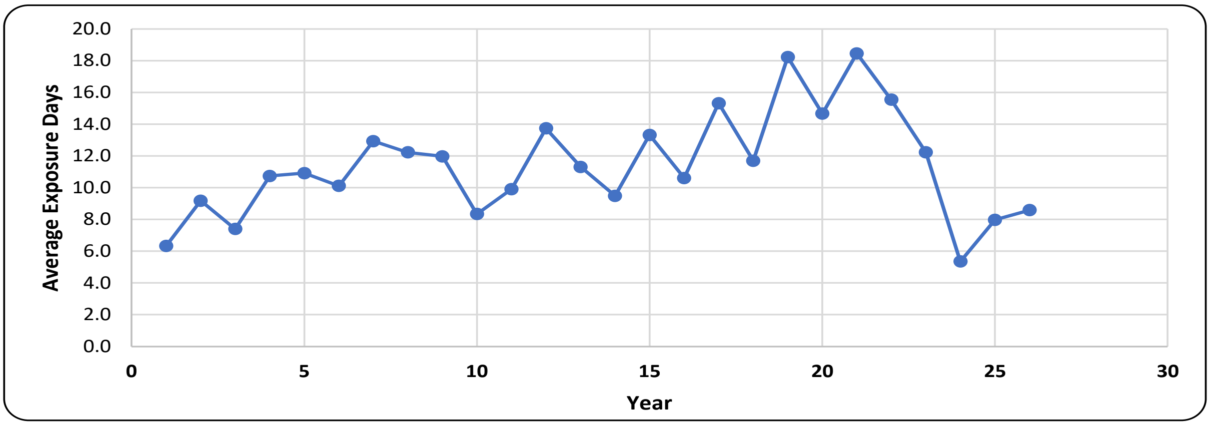


Figure 4-2: Average exposure days by year

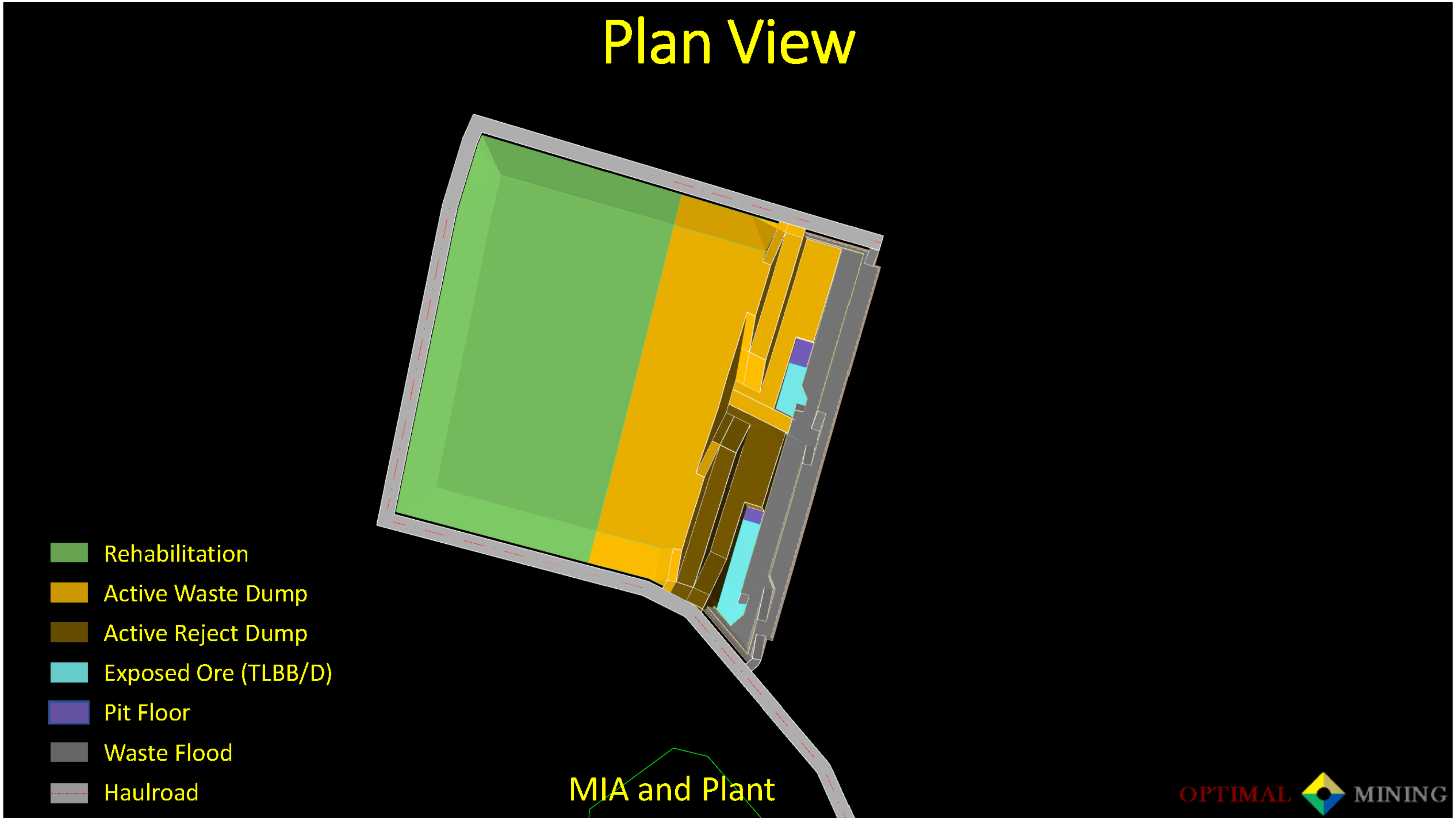


Figure 4-3: Plan view design of active open pit

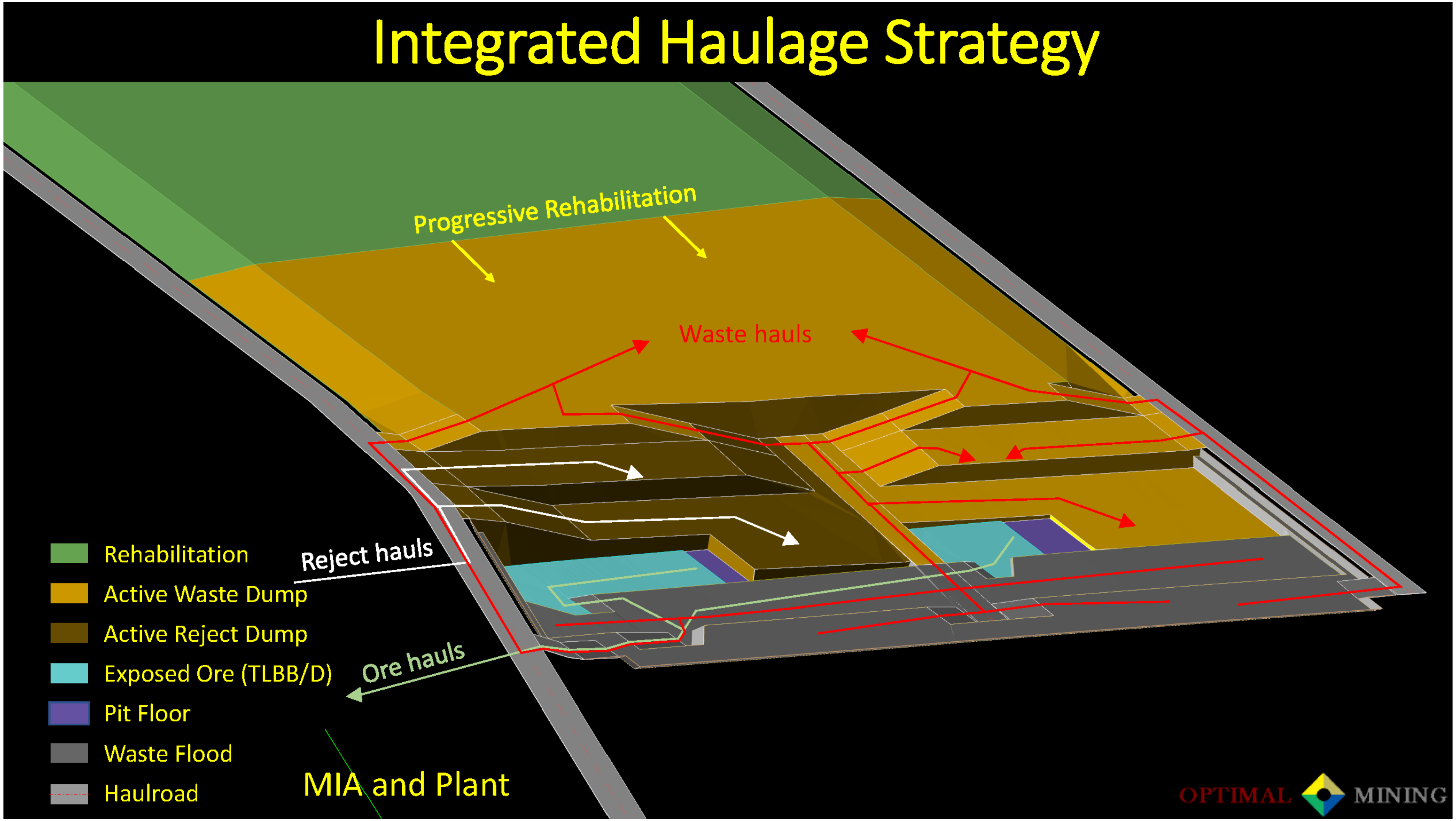


Figure 4-4: Haulage flows for ore, rejects, and waste, showing progressive rehabilitation

4.2 Disposal plan

The disposal plan aims to replicate the in-situ soil profile as closely as possible using mined materials and process residue (**Figure 4-5**). Reformation of the soil profile will reinstate the shrinking-swelling properties that occur naturally, including the gilgai microrelief structures that help to direct surface water flows and provide shelter and nutrients for vegetation to re-establish.

Beginning from the pit floor, potentially reactive material in the basement (WLA) unit will be covered generally within 3-9 days to reduce oxidation (**Section 4.1**). Cover material will consist of co-disposed overburden mine waste and treated vanadium tailings that have been neutralised to pH 8 - pH 9 and are acid consuming (**Section 2.3**). The cover materials will be allowed to dry within an internal embankment before subsequent layers are placed over the top.

NAF and acid consuming (AC) overburden mine waste (e.g., ALM, WDB, and TLBA units) will be co-mingled and placed as bulk fill on top of the neutralised tailings cover materials. The volume of this material is expected to increase by a bulking factor of 30% compared to the in-situ units. After a soil cover is placed over the top, the new ground level is expected to be approximately 1 to 2 m higher than the pre-mined ground level (**Figure 4-5**). Landforms will be contoured so that slope angles between the new and existing levels are no higher than 1:10 to reduce the potential for erosion.

Subsoil and topsoil units will be replaced over top of the bulk fill material in the reverse order to which they were excavated. Topsoil and subsoil will be stored in separate stockpiles and utilised with minimal storage time (< two months). The new backfilled profile will be less structured than the in-situ profile and have lower permeability. However, natural weathering processes over the following 5 to 30 years will cause the soil and underlying units to compact and crack, creating preferential pathways for surface water to seep back into the groundwater profile. These weathering processes will cause the land to subside approximately 10 % by volume compared to the post-mined ground level.

During the wet season, while the pit is open, surface water is expected to seep diffusely through the newly backfilled profile at a slower rate than would occur through the in-situ material (**Figure 4-5**). Contact with the exposed mine waste materials is not expected to negatively impact groundwater quality, provided that the reactive WLA floor is not allowed to oxidise. In addition, the volume of recharge from the groundwater sump will decrease laterally with distance from the open pit. Slightly elevated concentrations of Mo, Sr, and V that may occur from exposed neutralised tailings materials were investigated in RGS (2023) but are unlikely to exceed freshwater trigger values (AWG, 2018).

Table 4-1 provides a summary of the mine waste materials and their potential uses or management requirements.

4.3 Performance Review/Indicators

The performance of the backfilled profile will be assessed annually or when any non-compliance incidents occur. This will be achieved by reviewing monitoring data acquired through implementation of the monitoring program for the VCMP and any non-compliance incidents associated with emergency and contingency plans described in **Sections 6** and **7** of this MWMP.

Typical parameters to be monitored in the approved EA include:

- Dust and particulate matter, if required in response to a complaint or request from the administering authority;
- Surface water quality; and
- Groundwater.

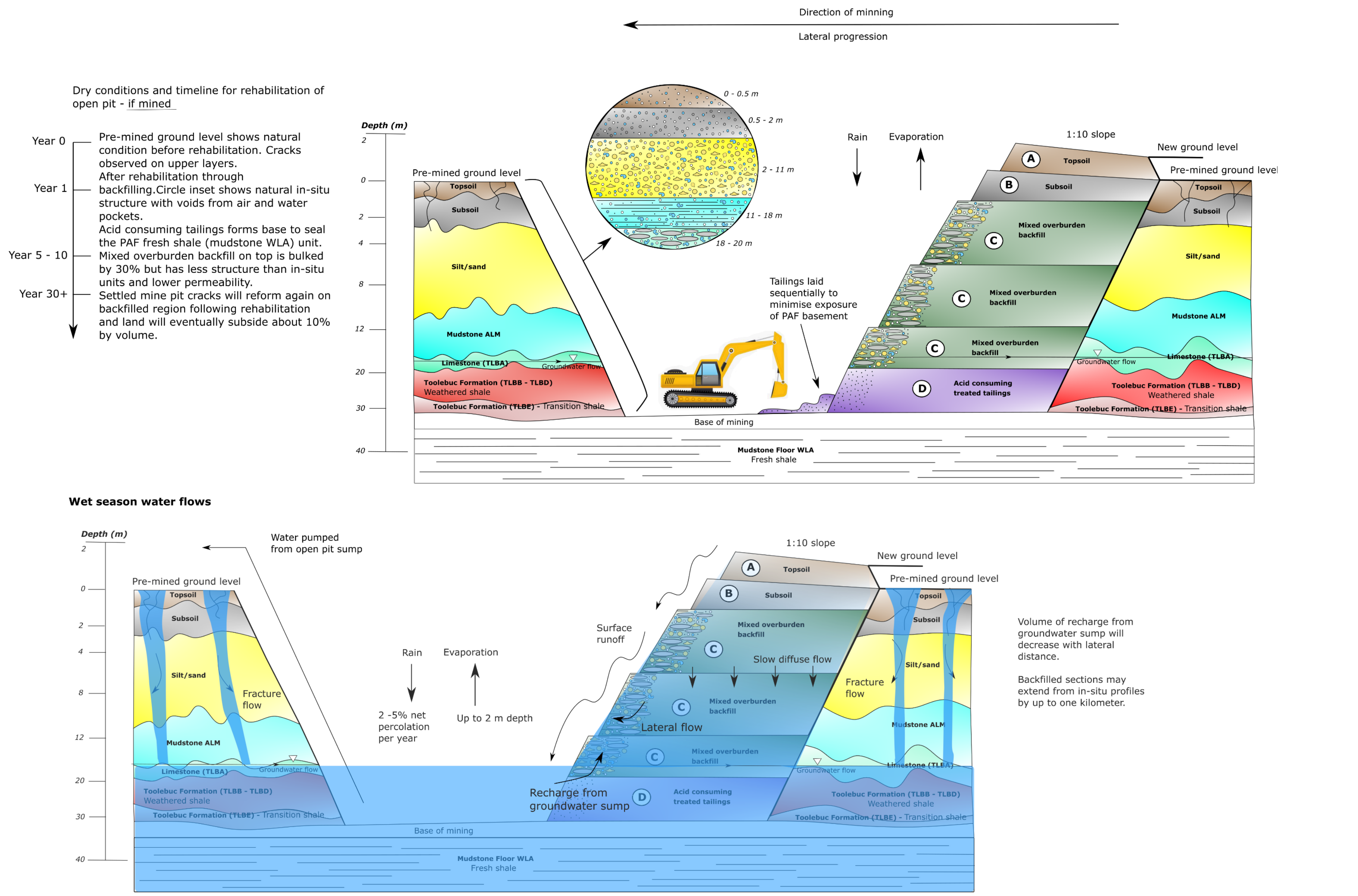
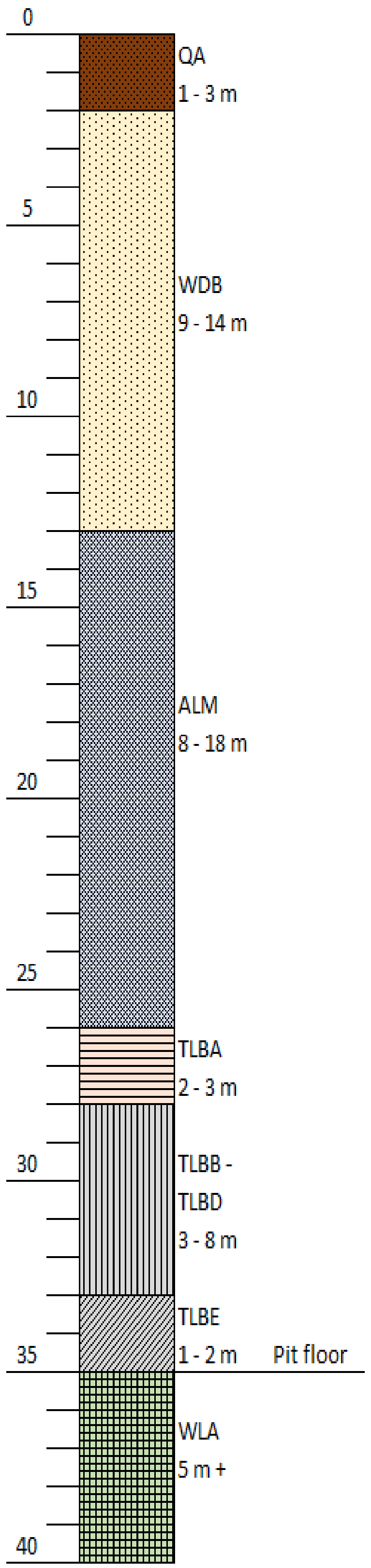
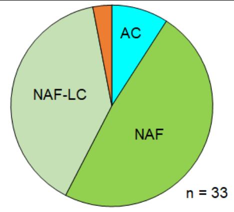
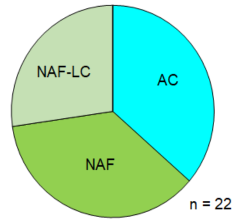
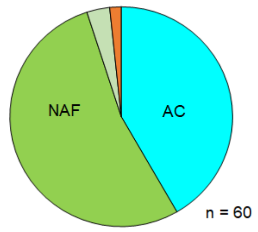
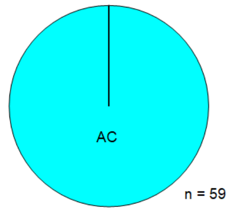
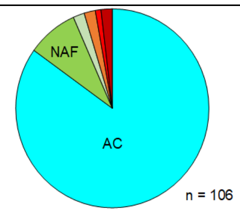
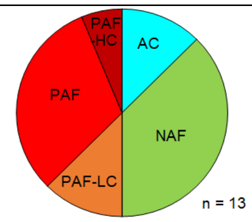
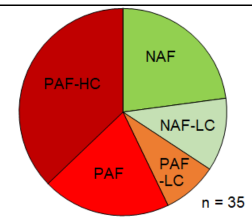


Figure 4-5: Cross section of open pit and backfill, and wet season water flows

Table 4-1: Summary of VCMP material types and management

Unit	Picture	Material type	Thickness in profile	Geochemical classification	Mine waste classification	Application or management
Quaternary alluvium (QA)		Soil			Rehabilitation material – growth medium	Topsoil and subsoil sourced from Quaternary Alluvium contains some sulfate minerals such as gypsum ($CaSO_4 \cdot 2H_2O$) and barite ($BaSO_4$) but are highly unlikely to be acid-forming. These are beneficial rehabilitation materials with sufficient nutrient content to perform as a growth medium and have no limitations in terms of sodicity and dispersion.
Wondoola Beds (WDB)		Overburden			Rehabilitation or cover material – bulk soil/rock fill	The overburden Wandoola Beds (WDB) are relatively thick and consist of non-acid forming (NAF) and acid consuming (AC) unconsolidated silt and sand. Non-acid forming sulfate minerals may be present. The materials can be sodic and dispersive and are less suitable as a growth medium but could be used as a bulk fill or cover material over higher risk TLBE rejects or WLA basement.
Allaru Mudstone (ALM)		Overburden			Rehabilitation or cover material – bulk soil/rock fill Some neutralising capacity in lower transition materials	The overburden Allaru mudstone (ALM) has low total sulfur compared to other materials and is equally likely as WDB to be sodic/dispersive. This unit is suitable for rehabilitation as bulk fill or as a cover material, and the ANC tends to increase with depth towards the underlying limestone unit.
Toolebuc Formation – Limestone (TLBA)		Overburden			Rehabilitation material – neutralising agent	The limestone (TLBA) unit has very high ANC which greatly exceeds its potential acid generation from total sulfur content. This unit is a valuable resource as a neutralising agent and could be used in the processing circuit on untreated vanadium tailings. Excess volume of TLBA could be alternatively utilised as bulk fill or as a cover material due to its acid consuming properties.
Toolebuc Formation – Wilat's Crossing and Arrolla Oil Shale (TLBB – TLBD)		Orebody (V)			Process residue	Neutralised treated vanadium tailings (pH 8-9) are acid consuming and are suitable for use as cover materials over the reactive mudstone WLA (PAF) pit floor. Tailings may also be mixed and co-disposed with overburden mine waste to reduce drying times. Trigger values for freshwater quality from this unit are: V (6 µg/L), Mo (34 µg/L). There is no current trigger data for Sr (AWG, 2018).
Toolebuc Formation – transition (TLBE)		Orebody (REE)			Process residue	Beneficiated rejects from the TLBE orebody have an increased PAF risk, compared to orebody from the TLBB-TLBD which has more ANC. Any small volume of waste TLBE material should be deposited on the pit floor and encapsulated with at least 20 m of acid-consuming treated tailings or overburden mine waste to prevent any potential metalliferous drainage issues.
Wallumbilla Formation (WLA)		Basement			Deleterious mine waste	The Wallumbilla Formation (WLA) mudstone unit contains elevated total and sulfide sulfur, but is low in ANC. This lack of buffering capacity classifies it as PAF, although the environmental risk is variable geospatially, ranging from PAF-HC to NAF. Conservatively, materials should be treated as deleterious and encapsulated quickly with a minimum 20 m of AC cover.

5 Risk assessment

5.1 Potential Environmental Issues, Impacts and Controls

The potential environmental issues, impacts and controls associated with storage of mine waste at the VCMP initial ex-pit and in-pit backfilled areas are described in **Table 5-1**.

There is negligible potential for AMD from overburden mine waste materials (e.g., WDB, ALM, and TLBA), and no selective handling and treatment measures are proposed. Quaternary Alluvium soils will be used as a soil capping to emulate a natural soil profile over time as weathering processes occur.

PAF mine waste identified in the TLBE and WLA units will require active management measures during operations and at closure as described in **Table 5-1**. Essentially, PAF mine waste generated from processing the TLBE orebody will be identified and placed at the base of the open pit profile to be encapsulated. Similarly, the exposure of the PAF mudstone WLA unit on the pit floor will be covered as priority within a median of three days with acid consuming treated tailings and/or overburden mine waste material. Encapsulation will occur preferably below the pre-mining groundwater level (within the TLBA unit), no closer than 20 m to external batters and be progressively covered with at least 20 m of mine waste consisting of acid consuming and NAF materials.

There is a low to moderate risk of sodicity and potential dispersion and erosion issues at the VCMP. Potentially sodic/dispersive materials were identified in the QA, WDB, and ALM, with exchangeable sodium percentage (ESP) values generally increasing with depth. The following hierarchical of control strategies in order of priority can be categorised as:

- prevention of impact;
- minimisation of impact and/or likelihood through rehabilitation trials; and
- interception and control of impact.

The control measures will depend on topography, mining method, material type, soil/rock types, mineralogy, and available amelioration resources, if required (e.g., gypsum, fertilizer and rock mulch). Control measures are documented in **Table 5-1**.

Monitoring of PAF material management and placement, surface water quality, and groundwater quality will be completed to review performance and ensure that key performance indicators are being met.

Table 5-1: Potential Environmental Issues, Impacts and Controls

Potential Issue	Potential Impact	Control Measures
AMD	• Contamination of surface water and seepage from backfilled areas.	• Overburden mine waste is AC or NAF and the risk of AMD from backfilled areas is negligible. PAF mine waste material generated from TLBE processing or the exposure of WLA basement will be identified and placed at the base of the open pit profile (preferably below the pre-mining groundwater level), no closer than 20 m from external batters, and be progressively covered with at least 20 m of AC/NAF mine waste material. Monitoring of mine waste placement, surface water quality and groundwater quality will be used to ensure that key performance indicators are met.
Salinity	• Contamination of surface water and seepage from backfilled areas.	• Low salinity levels and low concentrations of dissolved solids are expected to be generated from backfilled areas. If left unmanaged, PAF waste rock materials generated from TLBE beneficiated rejects or the exposure of WLA basement have the potential to generate neutral metalliferous drainage and will therefore be placed at the base of the open pit profile (preferably below the pre-mining groundwater level), no closer than 20 m from external batters, and be progressively covered with at least 20 m of AC/NAF mine waste material. Monitoring of mine waste placement, surface water quality and groundwater quality will be used to ensure that key performance indicators are met.
Dust from waste rock materials	• Dust interaction with workforce and the receiving environment.	• Vecco will employ all reasonable and feasible avoidance and mitigation measures so that dust and particulate matter emissions generated from mine waste disposal do not cause exceedances of levels described in the approved EA. Measures may include dust suppression, monitoring and analysis of dust and particulate emissions and rehabilitation of the backfilled areas.
Metals/metalloids leachate	• Leaching of metals/metalloids into surface runoff and groundwater.	• Metals/metalloids are sparingly soluble from AC/NAF mine waste and therefore low concentrations of dissolved metals/metalloids are expected to be generated from the backfilled areas. PAF mine waste material generated from TLBE processing or the exposure of WLA basement will be identified and placed at the base of the open pit profile (preferably below the pre-mining groundwater level), no closer than 20 m from external batters, and be progressively covered with at least 20 m of AC/NAF mine waste material. Monitoring of mine waste placement, surface water quality and groundwater quality will be used to ensure that key performance indicators are met.
Dispersion and erosion	• Loss of sediment from backfilled areas and potential release to surface run-off	• Progressive rehabilitation of the backfilled areas to minimise loss of sediment in accordance with the approved EA. • Low angle slopes (1:10), installation and maintenance of drainage and sediment and erosion control structures to control and treat surface run-off from the backfilled areas.

6 Monitoring

6.1 Monitoring Programs

Monitoring of solid materials and contact water associated with the backfilled areas forms an important part of the on-site management of mine waste materials and will be completed in accordance with the approved EA and this MWMP.

The monitoring program is primarily aimed at identifying potential impacts to ensure that management practices are appropriate or are modified accordingly. Monitoring will be conducted by trained on-site personnel or by specialist consultants as engaged by Vecco.

Progressive characterisation of mine waste materials was completed from 2021 to 2023 and additional sampling and characterisation will be completed if water quality monitoring indicates that the backfilled areas are not performing according to predictions.

Leachate from the backfilled areas will be included in the site water quality monitoring program and will be monitored in accordance with the relevant conditions of the approved EA and relevant site plans.

6.2 Monitoring Records

Monitoring records for mine waste materials will be maintained by the Vecco Technical Services Department and will be stored in a geological database and/or an EDMS.

6.3 Integrated Monitoring and Management

Monitoring that may interact with mine waste management includes surface water, groundwater, and rehabilitation monitoring and general inspections. Items considered may include:

- Water quality – surface water;
- Water quality – groundwater;
- Seepage/leachate production and quality;
- Visual inspections;
- Geochemistry of placed mine waste as backfill; and
- Vegetation coverage and establishment.

Monitoring results will be used to continuously improve the mine waste management strategy.

6.4 MWMP Review

The Vecco Technical Services Department is responsible for communicating the outcomes of a review of the backfill performance to site personnel and contractors. An annual review will be undertaken by the Technical Services Department and/or suitably qualified specialist consultants. If management practices are not effective, changes to the management will be made and implemented for the VCMP, if approved.

The review process will include consideration of monitoring results. Any changes in operational practices will be incorporated into the documentation and communicated to responsible employees and contractors.

Suitable criteria to establish whether mine waste management practices are effective are as follows:

- no complaints in relation to mine waste management;
- full compliance with the requirements of the approved EA, relevant site plans and this MWMP;
- no uncontrolled release of leachate with elevated turbidity or other water quality issues; and
- continual improvement in mine waste management practices.

All matters relating to mined materials and process residue will be managed by the Technical Services Department.

7 Contingency and environmental incident plans

7.1 Operational Contingencies

Vecco has developed operational contingencies for scenarios that may occur throughout the life of mine operations. Each scenario may have more than one contingency of which a portion of the contingencies may be enacted in that event based on the site conditions at the time. The scenarios and contingencies are presented in **Table 7-1**.

Table 7-1: Operational Contingencies

Scenario	Possible Contingencies
Wet weather preventing access to backfill disposal location	• Temporary storage of mine waste at temporary VCMP stockpile area.
Lack of water for dust suppression	• If dust and particulate matter monitoring indicates a potential issue, review mine waste dumping practices. • Implement changes to mine waste dumping practices (e.g., based on climatic conditions).
Abnormal monitoring results	• Investigation into cause of results and potential mitigation measures required. • Implement mitigation measures.
Elevated sediment loss at the initial small out-of-pit waste dump and/or from backfilled areas	• Review dump/backfill construction methodology and dumping practices. • Review dump/backfill surface runoff drainage and sediment pond design. • Implement any required mitigation measures.

7.2 Environmental Incident Response

If any Vecco personnel suspect that the backfilled pit is not operating as planned, this will be reported to the Technical Services Department and Site Senior Executive (SSE) (or SSE delegate) as soon as practicable within 24 hours. Any non-compliance with the conditions of the approved EA will be investigated and the administering authority notified as required.

During certain climatic events, such as prolonged drought or storm/flood events, release of dust and particulate matter or any uncontrolled release of turbid water containing elevated sediment from sediment dams or water or any other relevant water quality parameters, that monitoring indicates does not meet the approved EA conditions, will be managed in accordance with the following general principles:

1. **Investigate, Review and Mitigate**
    - Investigate the incident, review monitoring data and implement any required mitigation measures, where possible.
2. **Notify**
    - Notify Supervisor and Technical Services Department and/or SSE.
    - The Vecco Technical Services Department, in consultation with the SSE, will consider the need to contact downstream landholders, DES and other stakeholders in accordance with the requirements of the EA. The Emergency Response Management Plan (ERMP) will also be consulted.
3. **Control the release**
    - Control the release source (e.g., sediment dam). May be completed in conjunction with Principle 1.

The Technical Services Department will be responsible for commencement of an investigation into any uncontrolled release of dust and particulate matter or turbid water/water quality that does not meet the approved EA condition requirements and may include visual inspections and additional water quality monitoring. Potential mitigation measures will then be implemented to prevent further impacts, where practical.

The Technical Services Department will also review this MWMP, related operational plans, site procedures and monitoring records. If required, management plans and site procedures will be amended.

Where an incident occurs that results in an emergency or incident which results in, or may result in, environmental harm or the release of contaminants not in accordance with the approved EA, the administering authority will be notified in writing within 24 hours.

Written advice will be provided to the administering authority, no more than 10 business days following the initial notification of an emergency, incident or information about circumstances which result or may result in environmental harm or the release of contaminants, including the following:

- Results and interpretation of any samples taken and analysed;
- Outcomes of actions taken at the time to prevent or minimise environmental harm; and
- Proposed actions to prevent a recurrence of the emergency or incident.

8 Certification

As described in **Section 1.4**, RGS certifies that this MWMP is feasible and would meet the intent of the relevant approved EA conditions (i.e., the successful implementation of the MWMP will minimise the potential for environmental harm). The Qualifications of the RGS personnel suitably qualified to certify this MWMP are provided below.

8.1 Suitably Qualified Persons – RGS Company Details

The core business of RGS is to undertake static and kinetic chemical and physical material characterisation studies and produce certified mine material, mine rehabilitation and mine closure plans that include sampling, analytical and monitoring programs.

RGS is an owner-operated leading environmental consulting company that has been operating successfully for the past 16 years. RGS provides timely and cost-effective solutions to complex environmental management issues from exploration through the planning, operational and closure phases of small to large scale mining projects. The company has gained an international reputation as a leading provider of environmental management services to the mining and mineral processing industry and takes pride in being flexible, practical and innovative. RGS is committed to delivering on time and within budget; technical excellence; consistent quality; and continual improvement of our service delivery and skills.

RGS personnel have provided services to more than 600 mining and mineral processing projects in Algeria, Argentina, Australia, Bangladesh, Botswana, Brazil, China, Ghana, India, Indonesia, Laos, Malaysia, Mozambique, Namibia, New Caledonia, New Zealand, Papua New Guinea, Philippines, Romania, Thailand, Turkey and Vietnam. RGS has worked on more than 150 coal mine projects in Queensland, New South Wales, Western Australia, Africa, New Zealand, Indonesia, Laos and Bangladesh. Our clients range from small to large mining companies including Anglo American, BHP Billiton, CS Energy, Evolution Mining, Glencore, MMG, Rio Tinto, Stanwell Corporation and Vale.

8.2 Suitably Qualified Persons – Relevant Experience

RGS Personnel

Alan Robertson has a PhD in Pure and Applied Chemistry and has over 30 years of experience completing geochemical studies for the mining and mineral processing industry. He has worked on projects for major mining companies (e.g., Anglo American, BHP Billiton, Glencore, Rio Tinto and Vale) in Australia, Asia, Africa, Europe and South America for both coal and metalliferous mines.

Alan has expertise in mine waste characterisation, development of Mine Waste and AMD management plans, and design of mine waste storage facilities from conception through to closure.

Alan is regularly engaged to provide independent environmental advice and legal expert witness services on mine closure and rehabilitation aspects of mining operations in Australia.

9 List of references

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