WRD and TSF Closure Procedure

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This document has been prepared based on assumptions as reported throughout and upon information and data supplied by others.

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1 Introduction

The Waste Rock Dump (WRD) and Tailings Storage Facility (TSF) Closure Management Procedure has been prepared as part of the environmental management of Calidus Resources Limited's Warrawoona Gold Project (WGP).

1.1 Purpose

The purpose of this procedure is to set forth closure specifications, construction methodology, QA/QC and monitoring requirements for the WRD and the TSF Closure to achieve safe, sustainable, non-polluting and ecologically sustainable outcomes. It is intended to be used as part of an overall framework to plan works and mitigate the environmental risks associated with the WGP.

1.2 Scope

This procedure applies to all Calidus controlled sites and their activities, employees, contractors and visitors, and is subject to the requirements of the Calidus Health, Safety and Environment (HSE) Standards and applicable environmental legislation.

1.3 Context

The environmental risks associated with WRD and TSF Closure at the WGP include:

- Potential impacts to the revegetated landscape due to erosional instability caused by gully or sheet erosion;
- Potential impacts to the rehabilitated landscape due to revegetation outcomes being less successful than predicted;
- Potential impacts due to sedimentation leaving the landform causing negative effects on ecological receptors or beneficial users;
- Potential impacts due to metalliferous drainage discharges from the WRD and TSF (See Metalliferous Drainage Management Procedure)

Section 4 provides the management actions proposed to manage these potential environmental risks at the WGP.

1.4 Definitions

Term	Definition
TSF	Tailings Storage Facility
WRD	Waste Rock Dump
NAF	Non-Acid Forming
Nickel Arsenic Zone (NAZ)	The zone of NiAs-rich waste rock that leaches soluble Nickle and Arsenic.
PAW	Plant Available Water
Bench/Berm	Flat section between batters
Batter	Slope section of landform
Inflection Point	Point at which angle changes in batter
Bulk Push	Process where dozer creates the shape of the landform profile
Final Trim	Process by which dozer cuts shape to tolerance and even compaction
Amour	Placement of durable waste over less durable/more erosive waste rock
Growth Medium	Topsoil or subsoil which is spread over prepared surfaces to promote revegetation

2 Responsibilities

All Calidus employees and contractors are required to comply with the requirements of this procedure.

Accountability for fulfilling the requirements of this procedure is dependent on the stage of Project development (exploration, construction, operations, decommissioning).

During construction stages, whether activities are undertaken by an external service provider or internal Calidus personnel, the Project Manager / Registered Manager will be accountable for ensuring the requirements of this procedure are met.

During operational, decommissioning and closure stages, the General Manager (Registered Manager) will be accountable for ensuring the requirements of this procedure are met.

Table 1: Responsibilities

Role	Responsibility
Exploration Manager/ Project Manager / Registered Manager/ General Manager	Accountable for ensuring the requirements of the procedure are met dependent on the stage of project development.
Mining Manager, Processing Manager	Implement and maintain the WRD and TSF Closure Procedure and associated Standard Operating Procedures Review the WRD and TSF Closure Procedure and associated Standard Operating Procedures Annual Audit of Compliance

Role	Responsibility
	Organise the review and update, of this WRD and TSF Closure Procedure annually Deliver monitoring/reporting data to the Environmental Department Implement and deliver awareness training programs to personnel, contactors and visitors
Site Environmental Advisor	Implement monitoring programs Maintain monitoring, rehabilitation and growth medium inventory records Implement and deliver awareness training programs to personnel, contactors and visitors
Senior Environmental Advisor	Deliver monitoring/reporting data to the appropriate regulatory authority
Construction and Operation Managers	Endorse implementation of the WRD and TSF Closure Procedure by Project personnel and contractors.
All personnel, contractors and visitors	Participate in awareness training prior to commencing duties WRD and TSF Closure Procedure in daily activities, where relevant

3 Background

The WGP is located along the Warrawoona Ridge which forms the local surface water divide with the Brockman Hay Cutting/Sandy/Camel Creek system located to the south of the ridge and the Brockman Creek to the north.

Both the WRD and the TSF use the local relief and are effectively “hidden” within the ranges. The WRD is confined on the southern side by ranges, whereas the TSF only relies on one engineered structure (as opposed to four for a conventional paddock style TSF), being a modest 17m high, 250m long embankment. Such “valley fill” TSF’s are preferred by DMIRS.

There are three land systems overlying the project area, the dominant being the Talga land system which is characterised as erosional surfaces, hill tracts and ridges on basalt, greenstones, schist, other metamorphic rocky rounded crests, steep upper slopes and more gently foot slopes.

3.1 Baseline Characterisation and Modelling

3.1.1 Characterisation and Classification

Project geology is characterised by high-Mg basaltic lavas with lesser tholeiitic, andesite, sodic dacite, potassic rhyolite, chert and banded iron formation (BIF). Surficial layers comprise of only 3% of the total mined volumes and include topsoil and subsoils which are generally coarse grained with low clay fraction proportions, the subsoils becoming more gravel rich at depth. There is a shallow oxide layer locally. The majority of the waste rock is characterised as unweathered and will be durable as mined waste rock.

3.1.2 Benchmarks and Modelling

There have been a number of landform designs, erosion modelling studies, landform trials and full-scale landform construction benchmarks which Calidus has been in a position to review during the development of this procedure. The nearby Telfer Mine has been undertaking trials and progressive rehabilitation for over twenty years (Pit 13 being the first in 1996). Currently Telfer is constructing single slope batters of between sixty and eighty metres with monitoring indicating generally good erosional stability performance.

The landform evolution modelling studies from the Telfer Project have routinely produced modelling results from durable waste rock with single slopes of sixty metres or more that are considered erosionally stable (Trajectory unpublished data). This is well in excess of the 15 to 20 metre lifts which are intended for the Warrawoona Project.

As the vast majority of the waste rock will be durable blocky waste there can be a high degree of confidence the landforms will be stable with the TSF embankment being prescribed a minimum armouring cover of 2m, a depth to which no erosion gullies cuts beyond when durable waste is being modelled over a 500-year period in the four modelling studies reviewed by the Telfer Project (Trajectory unpublished data).

Another consideration at Warrawoona is the shortfall of topsoil within which the project is placed. Trials are to be conducted with very thin topsoil layers and direct seeding into the tailings which have been characterised as being geochemically benign (GCA 2019).

The project can observe results for direct or shallow topsoil seed at older TSF landforms at Lienster and Telfer where revegetation into benign tailings is to a very high standard, particularly with respect to the establishment of woody perennials. This is likely because in benign tailings, native plants have more Plant Available Water (PAW) then waste rock, which in this case is low fines content, but are not constrained by chemical attributes of the tails.

4 WRD and TSF Closure

4.1 Prioritisation of Topsoil Media

Due to the Project location high in the Warrawoona Ranges, with some 80m of relief, there may be insufficient topsoil available that can be won from typical “grubbing and clearing” of the TSF and WRD locations, and within the site generally. Harvest and storage of growth media will be maximised during project development. What available stockpile material can be reclaimed will be conserved for closure as per the Calidus Clearing and Grubbing Procedure (CRL-ENV-PRO-002-19). Means of utilising the available media include:

- Creation of topsoil “islands” on the TSF, in parallel with direct seeding trials where there is insufficient topsoil available and full coverage is not possible
- Prioritising the spreading topsoil on the batters of the WRD’s

4.2 Specifications

Based on waste rock durability, the availability of growth media and in consideration of the surrounding environment, the waste rock dump and tailings embankment have been specified to have slopes of <18^{o} with growth media prioritised to the batters. To avoid failure risk of concentrating drains constructed over waste rock or tails, rainfall will be contained in cells which

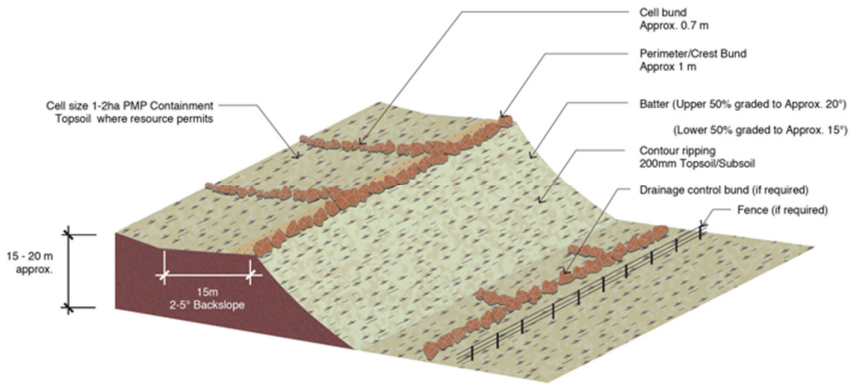
can hold a PMP except for the area overlying any NAZ containment cells, in which case the surface will grade away from the footprint of these cells.

The specifications and schematic for the landform closure are set out in Table 1 and Figure 1 respectively.

Table 1 WRD and Tailings Closure Specifications

Design Feature	Specification
Bench Height For Single Slope	10-20m
Maximum Batter Slope Angle (Upper Section)	20° (the batter face may include a crest platform of 1-2 of angle of repose slope formed through the process of crest bund construction and five the profile a 'mesa' features)
Maximum Batter Slope Angle (Lower Section)	15°˚
Maximum Average Slope (Batter Section)	< 18°
Inflection Point	Any location from lower to upper one third of slope
Armouring	2m minimum durable fresh water rock armouring - TSF only if required.
Crest/Perimeter Configuration Top/Flat sections	Perimeter Crests will have bund to contain PMP, minimum 1m, and grade away from the perimeter for 10-20m at 2.5° – 5°
Drainage Flat Surfaces - Cell Containments	Cell bunds every between 1 – 2 ha of a height to contain PMP which will be approximately 0.7m.
Drainage Tailings Top Surface - Cell Containments and Spillway	Most of the top surface of the TSF will be managed with drainage containment cells as described above. A Closure spillway will be constructred to convey run off from natural ground and portions of the tailings surface which cannot be configured into containment cells. This spillway will be constructed over high durability natural ground and the area which is not covered by cells and the spillway will be covered with durable waste rock to act as a sedimentation trap.
Growth Media - WRD	Growth Media placed on batter surfaces to a depth of 200mm.

Design Feature	Specification
Growth Media - TSF	Growth Media placed on batter surfaces to a depth of 200mm. To the extent growth media is available it will be spread to 150mm. Flat surfaces will be the subject of trials to ascertain if direct seeding will be successful in response to the significant shortage of both topsoil and subsoil. The surface cover may involve a mix of growth media and non-growth media covered areas.
Substrate Integration	Deep Rip/contour plough surface



Trajectory

NOTES
Fencing required only if stock access restriction required
Trials will be instigated to ascertain if direct seeding into tails is feasible
Sediment interception bunds at the toe will be constructed only where sediment loss is probable

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Warrawoona WRD and TSF Closure Specifications

FIGURE 01

4.2 Construction Methodology and Tolerances

The following sequence of works will occur in the closure implementation procedures. These activities will be controlled by the Mining Manager and the Processing Manager respectively:

1. Bulk Push. Push waste rock with large dozers to the design shape to a tolerance of both +/- 1° +/- 10cm.

2. Final Trim. Cut batters to design shape using lighter low track dozers (such that there is even track compaction and primarily only track shoes are visible in the final surface which is planar. Where “marry in” is required this is completed so that it is gentle/well graded to avoid water concentration.

3. Armour: Where armour is required place armour to the specified depth (2m minimum) as directed. The armour can be placed at both the top and the bottom of the batter at the optimum

density. Oversize material in many cases can be extracted from the general waste rock being spread and pushed to the bottom. The armour should be placed to +/- 10cm however locally there may be instances of +/- 200mm due to the fraction size.

4. Growth Media Batters: Growth Media will be placed at a depth of 200mm on batters. 200mm is the maximum depth in any one location and the placement of growth media should be measured by the volume tipped out for spreading, not by depth measurements on the batter. Some bare or thin patches are acceptable due to the difficulty of spreading a thin layer with dozers. A light, low centre of gravity dozer must be used so that the soil structure is not destroyed, and the target spread depth and evenness can be achieved. Soil should be placed at both the top of the batter and by reversing Articulated Dump Trucks up the lower 50% of the batter and tipping to the correct density. This will minimise the distance the growth media is spread and the degradation of the soil.

5. Growth Media Flats: Growth Media will be placed at a depth of 150mm on flat areas. The material should be tipped out in a configuration that minimises spread distances. A light, low centre of gravity dozer must be used so that the soil structure is not destroyed. There may be in sufficient coverage for growth media over all flat areas. Trials will occur to ascertain if tailings can function as a growth media.

6. Drainage Flat Areas: Flat areas will be cut and levelled according to the design shapes provided. Crest bunds will be constructed at batter crests to 1m with cell bunds to 0.7m. For all bunds, the surfaces will grade away from the bund by at least 1 degree for 20m. The bunds will be formed from in situ material constructed in accordance with Figure 1.

7. Contour Ripping & Seeding: Contour ripping will be undertaken with a light dozer, such that sliding is minimised. A winged tine is used to create a trough bank approximately 1m deep and 1m from crest to crest with only narrow or no flat sections between the crests. The ripping needs to remain on or as close as possible to contour at all times and the design of the plough needs to ensure there is good mixing of the soil and the substrate.

8. Spillway. The closure spillway constructed to discharge runoff through natural ground adjoins the TSF and the area of the TSF which is not covered by cells and the spillway will be covered with durable waste rock to act as a sedimentation trap. The spillway is constructed at the beach level of the TSF, so that no ponding occurs on the TSF prior to discharge.

9. Dust

Dusting of the tailings is not anticipated to be problematic due to the calcareous nature of the tails and the coarse grind (150 micron). Trials will determine the dust strategy. Options include a thin layer of waste gravel across the tailings surface. Given the fresh process water there is not a requirement for metres of waste rock to act as a capillary break.

4.3 QA/QC

A Standard Operating Procedure for WRD TSF rehabilitation be developed and will include t specifications quality controls. The controls will include:

- Angles of cut batters and cut quality - +/- 1º and +/- 10cm. (Measured very 100m of batter cut)
- Total depth of cover layer for TSF Armour (minimum 2m);

- Water shedding grade of cover over NAZ (1 degree or greater);
- Depth of soil cover (Max 0.2m in any one location);
- Top Sections +/- 0.5m across entire top finished
- Crest and Cell bunds +/- 0.1m from level across length
- Backslope away from crest bunds for 10-20m at 2.5-5^{o};

It will be assigned to the Mining Manager to approve set outs and carry out and record these checks on a weekly basis where closure works are occurring

4.4 Adaptive Management

This closure document is a live document and will updated throughout the life of the project. Trials of direct vegetation, ongoing feedback from the regulator and industry peer group will assist Calidus in meeting objectives of Mine Closure.

5 Monitoring

The objective of this, WRD and TSF Closure Procedure is to ensure that the constructed landforms are safe, stable, non-polluting and ecologically sustainable.

Landform monitoring will include revegetation performance monitoring and erosional stability monitoring. These methods may be ground based methods, remote sensing methods, or a combination of both. Once developed they will be consistent with good practice.

6 Reporting

Monitoring reports will be provided to the State and Commonwealth Governments as annual reporting requirements.

6.1 Annual Review

An Annual Monitoring Report will be developed with the results of the monitoring programs across the WGP. This report will outline the monitoring data captured during the reporting period and the analysis required to report compliance against management targets and conditioned environmental objectives.

6.2 Annual Environment Monitoring Report

An Annual Environmental Monitoring Report (AEMR) will be submitted in accordance with the relevant licence conditions once the WGP is approved and a licence is issued.

7 Related Documentation:

CRL-ENV-PRO-002-19 Calidus Clearing and Grubbing Procedure

CRL-ENV-PRO-022-19 Metalliferous Drainage Management Procedure

8 References

ATC William (2019) Warrawoona Project: Feasibility, Tailings Storage Design

GCA (2019) Warrawoona Project: Geochemical Characterisation of Tailings-Slurry Sample and Implications for Tailings Management

GCA (2019) Warrawoona Project: Characterisation of Mine-Waste & Ore Samples (Klondyke and Copenhagen Pits) –Implications for Mining-Stream Management

Mine Earth (2019) Warrawoona Project: Soil and Landform Assessment