




Rehabilitation and Closure Plan

2023-24

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Approvals

OGC Designation	Name	Designation	Signature	Date
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1 INTRODUCTION

1.1 Background

The conditions of Mining Licence 32-2388 (which have been incorporated into the Hauraki District Plan) and consents granted for the Martha Mine Extended Project require an annual review of a Rehabilitation and Closure Plan (“the Plan”). The conditions of consent for the Favona, Trio, Correnso, SUPA and Project Martha Mines also require the preparation of a Rehabilitation Plan. This is the twenty-fourth version of the Plan to be prepared since Extended Project activities commenced in 1999.

1.2 Relevant Conditions

The requirements for rehabilitation and closure are specified in:

- The Hauraki District Plan
- Consents and conditions relating to Storage 2 and the conveyor silt ponds
- The Waikato Regional Council consents and conditions for the Martha Mine Extended Project
- The Hauraki District Council land use consent and conditions for the Extended Project no 97/98 – 105
- The HDC land use consent for the relocation of the Cornish Pumphouse (No 85.030.009.PP)
- Condition 4 of Schedule 1 attached to Waikato Regional consents for the Favona Mine (refer consent number 109741, 109742, 109743, 109744, 109745, 109746)
- The Hauraki District Council land use consent and conditions 85.050.326.E for the Favona Underground Mine
- The HDC land use consent for the relocation of the Grand Junction Refinery Building and Strongrooms
- The HDC land use consent for the Trio Development Project, RC-15735
- Waikato Regional Council consents for the Trio Development Project (121416-121418, 121446, 121447)
- Hauraki District Council land use consent for the Trio Mine, RC-15774
- Waikato Regional Council consents for the Trio Mine (121694-121697)
- Hauraki District Council land use consent for the Correnso Underground Mine, 202.2012
- Waikato Regional Council consents for the Trio Mine (124859 – 124864)
- Hauraki District Council land use consent for the Slevin Underground Project Area, 202.2016.00000544.001
- Project Martha Schedule One. Common conditions for Hauraki District Council and Waikato Regional Council.

All of the relevant conditions are listed in **Appendix 1**. It should be noted that there are also consent conditions relating to the Rehabilitation Bond, post closure Trust (the Martha Trust) and Capitalisation Bond.

1.3 Report Content and Structure

In accordance with the consent conditions this report has been divided into two parts, Parts A and B. Part A summarises the rehabilitation activities that were carried out between 1 July 2022 to 30 June 2023 and outlines those rehabilitation activities that are planned for the coming year, i.e. 1 July 2023 to 30 June 2024. Part B outlines the rehabilitation and closure activities that would be needed should closure occur on 1 July 2024. Part B has been allowed to partially rollover this reporting period as no material changes to the bond or closure costs are foreseen.

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1 PART A ONGOING REHABILITATION OPERATIONS

1.1 Introduction

Various Waikato Regional Council and Hauraki District Council consent conditions require a OGNZL to have a Rehabilitation Plan. Generally, these conditions require that Part A of the Rehabilitation and Closure Plan shall:

- describe the programme of progressive rehabilitation (including revegetation) that is proposed for the Site for the following twelve months, should closure not be proposed during that period; and
- report on any such works undertaken during the previous year.

Appendix A contains a list of relevant Rehabilitation and Closure conditions for all projects.

Previous iterations of this Plan have separated OGNZL's progressive rehabilitation activities into mandatory or discretionary activities, with many of these activities or projects already completed. Much of this information has been removed from this year's Plan, which instead focuses on rehabilitation activities completed during the previous year and rehabilitation activities planned for the year ahead, as is required by consent conditions. For information on previously completed mandatory or discretionary projects, earlier versions (2022-2023 and earlier) of this report should be referred to.

Mining of the Correnso Underground is nearing completion and mining of the Martha Underground continues. The Martha Open Pit remains in care and maintenance, with north wall slip remediation currently consented, but not planned until at least 2028. No construction activities have been completed on the Development Site in 2022/2023, with work limited to maintenance of existing features. The next lift of TSF1A is planned for the 2023/2024 construction season.

1.2 Climate Summary

Annual and seasonal rainfall trends are displayed in Figure 1. The Cumulative Rainfall Departure (CRD) plot presents long term trends in rainfall since 2000, with a rising slope since July 2022, indicating above average rainfall in recent months. Historical rainfall data for Waihi has been collected since 1907, with annual rainfall ranging from 1249 – 3234 mm. The 2022 annual rainfall (2403 mm) was significantly more than the previous year (1560 mm in 2021), and more than the historical average of 2100 mm.

A total of 3567 mm of rain was recorded during the reporting period (June 2022 to May 2023), significantly more than the previous reporting period (1646 mm). The month with the highest rainfall during the reporting period was January 2023 (703 mm) followed by July 2022 (486 mm) and the driest month was March (64 mm) followed by August (113 mm).

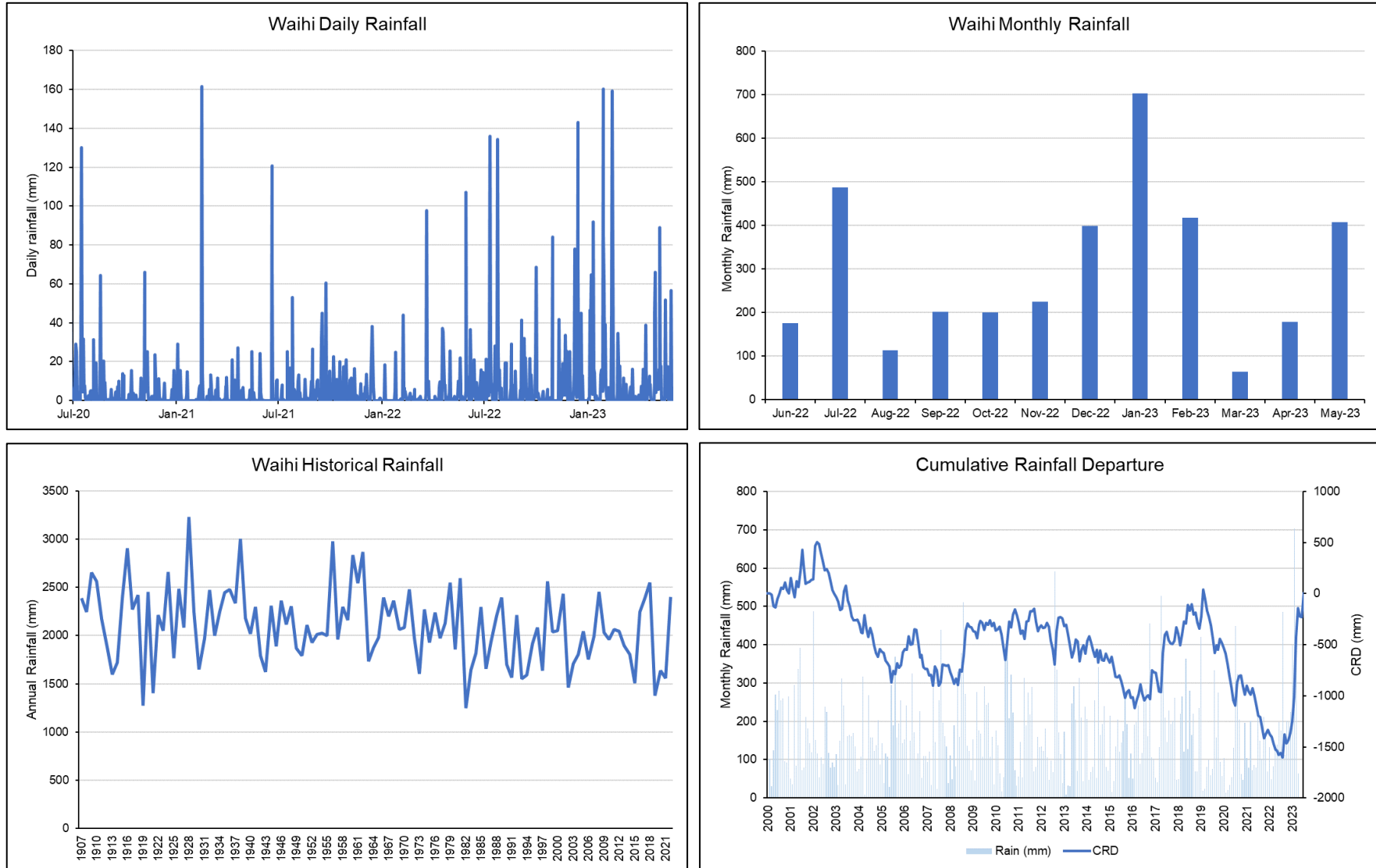


Figure 1: Waihi Rainfall Data

1.3 Closure Concept and Overview

1.3.1 Open Pit

The original closure concept plan for the Martha Pit envisaged a recreational lake with a park located to the East. After the Barry Road collapse and identification of hazard zones by GNS, a Master Rehabilitation and Closure Concept Plan was developed in 2006 by mining company staff, Waikato University, Department of Conservation, Waihi Community Vision, the Landscape Design Company along with tourism and marketing advisors (Figure 2). The Master Rehabilitation and Closure Concept Plan envisages the creation of a pit lake with a surface level of around 1104m and the development of an integrated parkland around the lake focussing on an extensive area accessible to the lake edge on its eastern side. Revegetation and amenity plantings along with extensive walkways and recreational features are incorporated within the Master Rehabilitation and Closure Concept Plan.

The Rehabilitation and Closure Concept Plan for the Martha Open Pit is considered a “work in progress” and is subject to change and more detailed landscape planning when the site nears closure. The 2006 Closure Concept Plan (Figure 2) was updated following the approval of the Martha East Layback. In 2016, changes were made to show the North Wall following remediation, including partial capping of the failed section. Other minor changes include widening of the lake to the north and southeast, an extension of the track network to accommodate the north wall remediation cutback, and minor amendments to the landscape and track network to the east of the pit. This updated plan is included as Figure 3.

Future works associated with Project Martha (approved February 2019) will not substantially change the current Closure Concept Plan. Minor changes include confined earthworks and the creation of a noise bund on the North Wall. This work is not scheduled to commence until at earliest 2028.

The landscape plan for the pit currently includes a pontoon located on the west side of the open pit and a boat ramp on the southern side. In future reporting periods, OGNZL will re-evaluate whether this is the best option in terms of providing lake access to the public.

In addition to the closure plan, a landscape vision has also been developed. It is intended that rehabilitation will establish a self-sustaining ecosystem. After extensive consultation with stakeholders the following landscaping philosophy was adopted:

- Progressive removal of exotic weed seed sources from the pit perimeter to reduce ongoing long-term maintenance of pit walls.
- Provision of a new seed bank near the pit area i.e. around the pit rim, by revegetation of primarily native seedlings local to the area.
- Weed control, mulching and maintenance particularly in the first few years and reducing as plants become established and weed seed burden depletes.
- Native plant species trials on pit walls where opportunities arise.

Generally, the aim is to preserve views of the future lake from the surrounding pit rim walkways by using low grasses and groundcovers broken up in places with some small tree species (e.g., manuka and pittosporum). This will also address the long-term issue of security for pedestrians using this walkway.

Rehabilitation undertaken to date around the Open Pit is included as Figure 4.

To assess the likely cost of ongoing maintenance around the pit post closure, current maintenance effort for weed control and maintenance around the open pit is included in Section 1.5.2.2 of this plan.

1.3.2 Development Site

The overall original concept plan for the rehabilitation of the Waste Disposal Area (Figure 5) remains generally unchanged. Figure 6 provides an updated version of Figure 5. Slight differences include the possibility of more embankment native vegetation and the presence of walking or cycling tracks. These have yet to be defined and given the time until closure, further detail will be added in future years. Figure 7 shows a summary of rehabilitation completed at the Waste Disposal Area to date.

1.3.2.1 Embankment Rehabilitation

The waste rock embankment is rehabilitated to pasture and native vegetation. OGNZL generally plants areas of the waste rock embankment in native vegetation:

- if the embankment slope exceeds 20 to 25 degrees, and there is a risk of tracking by stock and damage to the land if the area is rehabilitated to pasture, or,
- if there are awkward areas that are difficult to farm, e.g. triangles of land adjacent to ramps, or,
- if there is an ecological benefit in planting selected areas.

While shrubs and small trees have been used on site to provide a better stability option than pasture on steep batters and eliminate potential damage from stock traffic, they may also inhibit observations of possible seeps or cracks that may develop in surface areas. They also require more maintenance effort than pasture in the long term, and deep rooting tree species require removal to protect the Zone G capping layer.

The intention is to maximise the amount of pastureland available to the post-closure Trust while ensuring that native vegetation is planted in appropriate areas to ensure the long-term integrity of the capping layer, while achieving any biodiversity objectives.

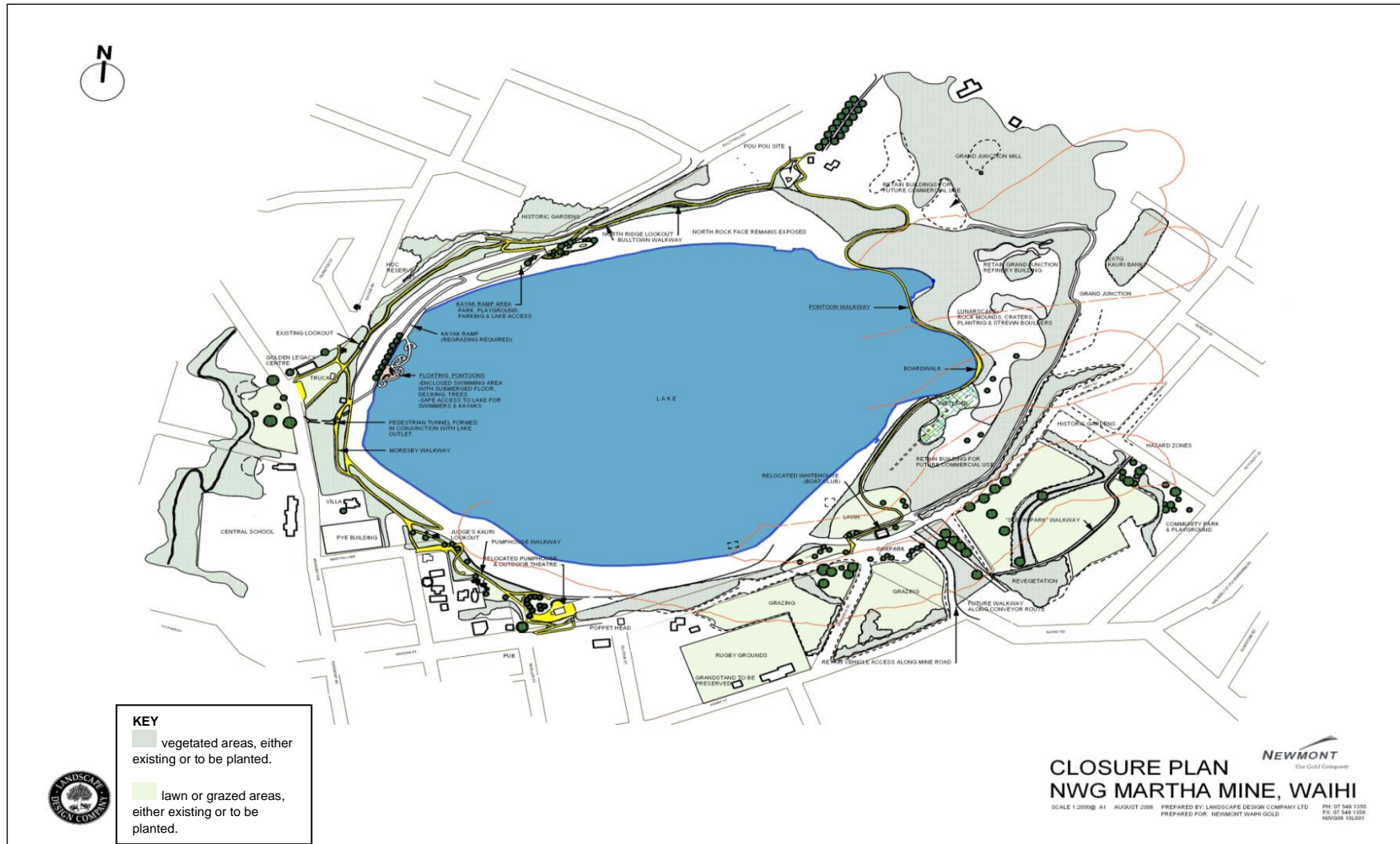


Figure 2: Newmont Waihi Gold Martha Pit Master Rehabilitation & Closure Concept Plan 2006



Figure 3: Current Closure Concept Plan for Open Pit and Surrounds



Figure 4: Rehabilitation of Open Pit and Surrounding Areas

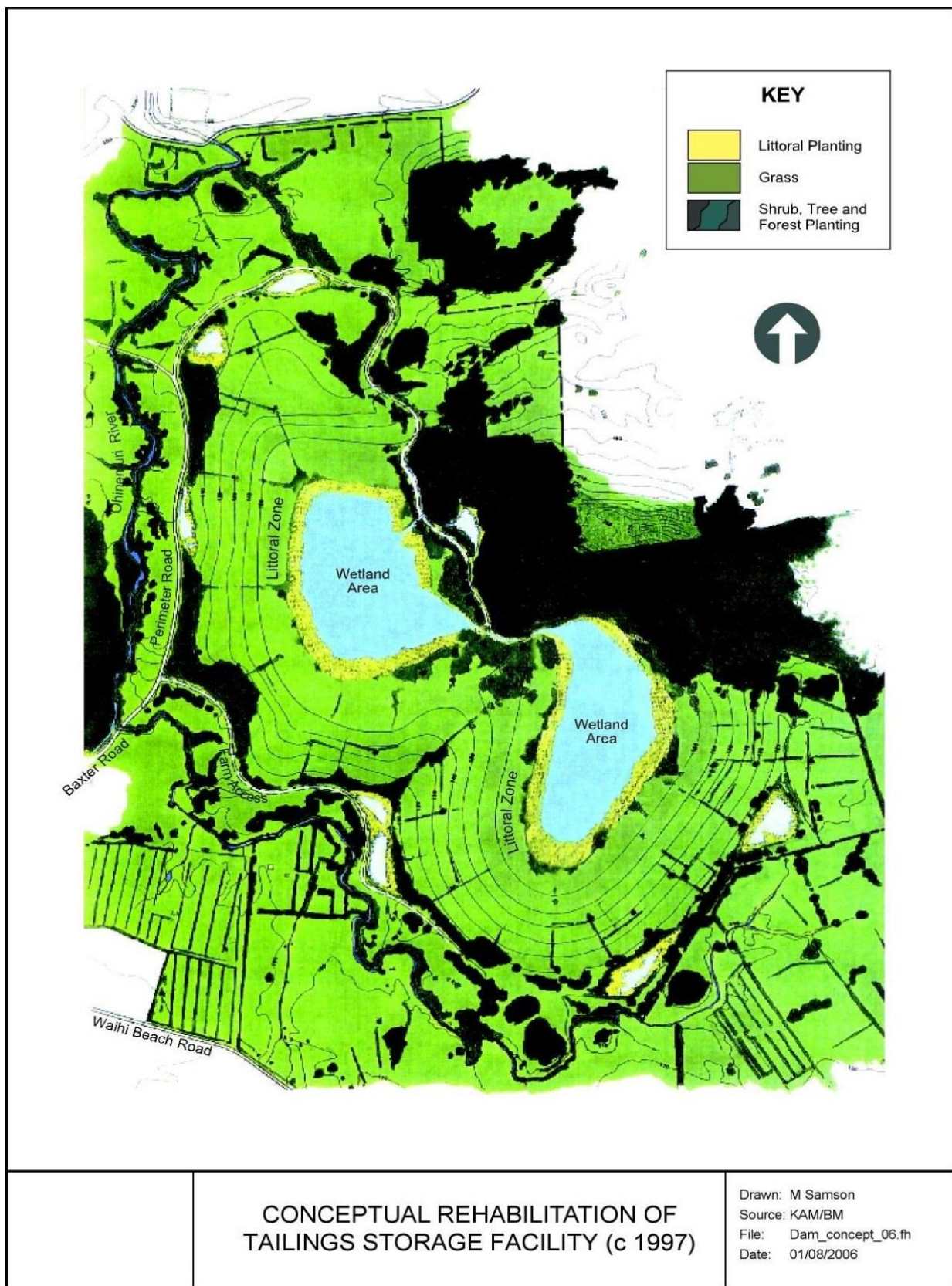


Figure 5: Newmont Waihi Gold Waste Disposal Area Closure Concept 1997

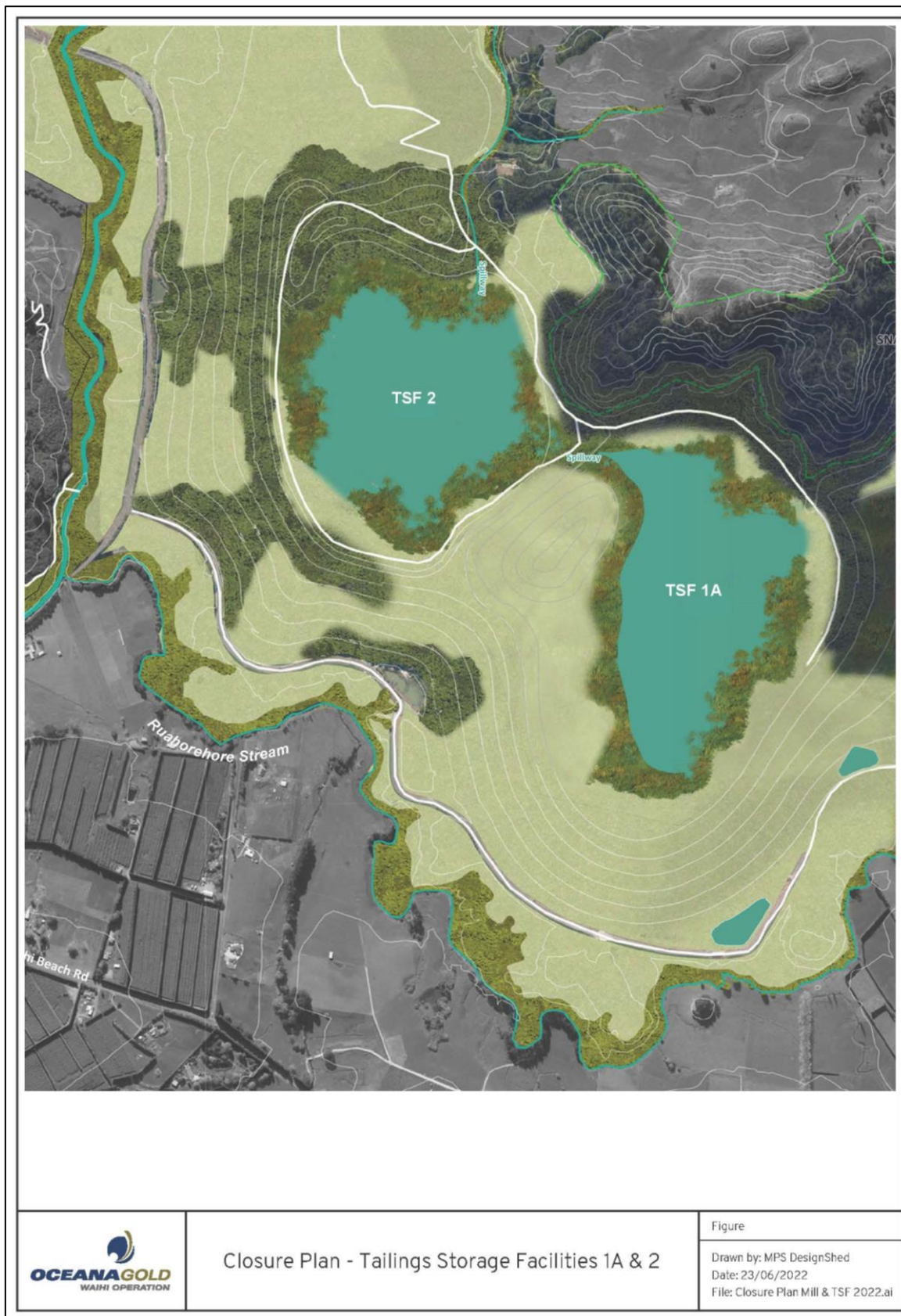


Figure 6: Current Closure Concept for Waste Disposal Area

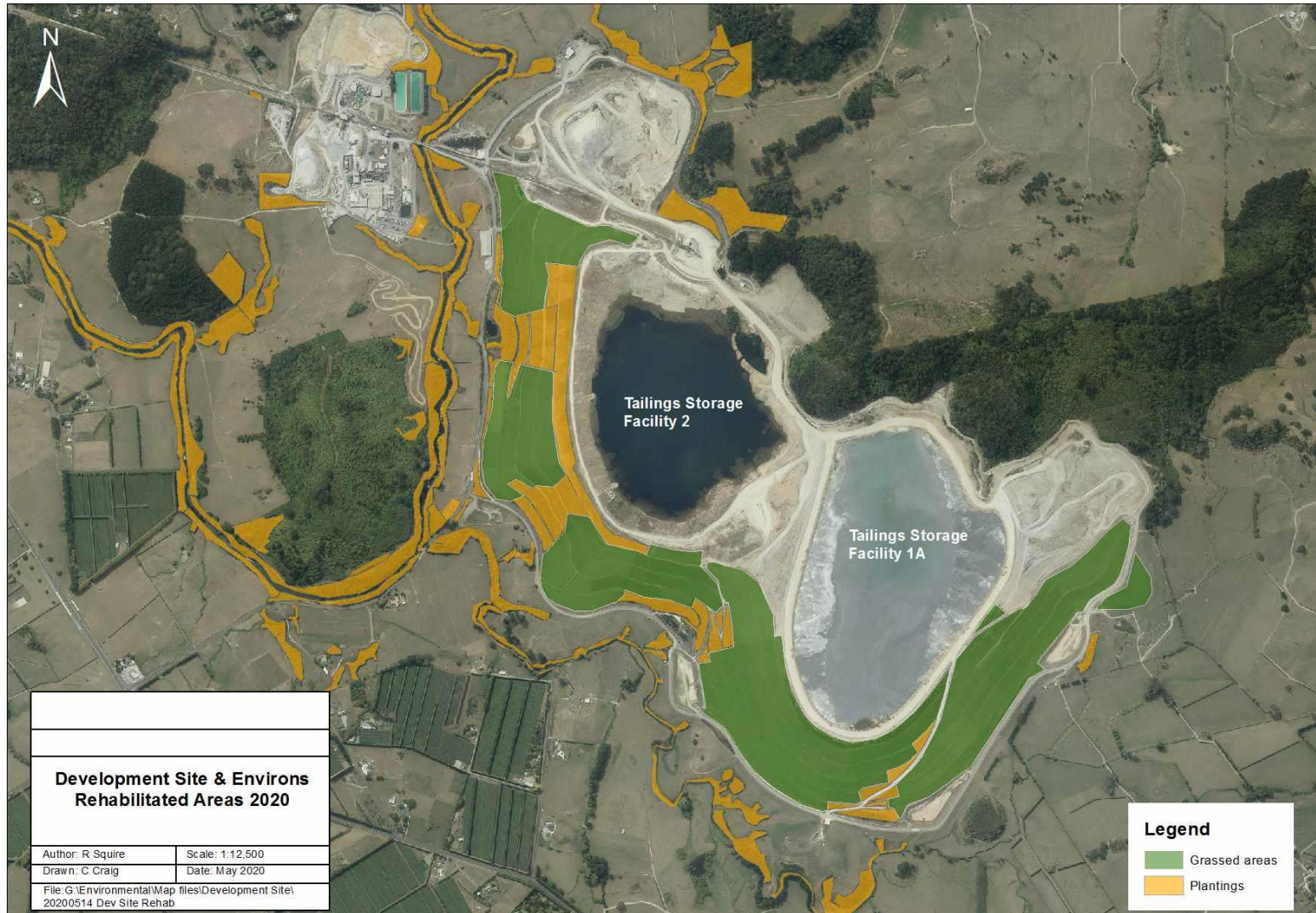


Figure 7: Rehabilitation of Waste Disposal Area to Date

1.4 Closure Criteria

As described below, the Mining Licence and consent conditions provide the overall objective for closure and subsequent handover of the site to the Martha Trust.

Schedule 1 to the Waikato Regional Council consents for the Martha Mine Extended Project states the following in condition 9:

“Prior to commencement of construction of the tailings storage facility (Storage 1A), the consent holder shall prepare a concept plan (“the Plan”) describing the proposed method of rehabilitation and closure of the Site. “The objective of this Plan shall be to ensure rehabilitation and closure of the Site in such a manner that in the long term the Site, and any structures on it, will remain stable; and any water discharging from the Site, and any groundwater under the Site, will be of a quality such that it will not adversely affect aquatic life, or other users of the water resource.”

The Hauraki District Council Land Use Consent for the Martha Mine Extended Project (No 97/98 – 105) states the following in 3.31, condition 10 (refer complementary condition in WRC Schedule 1, condition 10.10):

“The Councils shall release the rehabilitation bond on the completion of closure of the site.”

“Completion of closure of the site” means when the elements of the entire project have been demonstrated by the consent holder to the satisfaction of the Councils to have reached a stable, self-sustaining, rehabilitated state as defined by the approved Rehabilitation Plan.”

In addition, the varied Mining Licence 32-2388 condition 36 states the following in condition 36:

“Mining, processing and waste disposal operations shall be carried out in such a manner as to ensure that the surface of the land suffers as little permanent damage as possible. The licence area is to be left in a clean and tidy condition after mining operations have ceased including removing from public view any used derelict equipment and machinery and the pit faces are to be left in a stable and safe condition.”

In summary, closure will be complete when OGNZL can demonstrate that the site has reached a stable, self-sustaining, rehabilitated state as defined in the approved Rehabilitation and Closure Plan, and the open pit walls are safe and stable. For this reason, OGNZL has included current closure completion criteria within the Rehabilitation and Closure Plan so that it is clear to all parties when closure has been achieved. Closure criteria are developed in conjunction with and are agreed upon by the Councils before their incorporation into the Closure Plan.

OGNZL has developed a process for defining Closure Criteria based on a “narrative” or descriptive definition of “what” is the closure objective and “quantitative” or descriptive definition of “how” the objective is to be achieved. The quantitative method definition of each criterion may include numerical standards if appropriate for measurement and may not be required or appropriate for every closure element of the site.

Narrative criteria = closure objectives

Quantitative = methodology to achieve the narrative criteria.

It should be noted that some closure criteria are still in the process of being developed. These are included in the sections that follow and will be progressed over the coming year.

1.4.1 Discharges to Surface Water

Closure completion criteria for discharges to surface water are already stated in the conditions of consent. Preliminary criteria are suggested as follows:

Narrative:

Discharges from the site, either alone or in combination, shall not cause a significant adverse environmental effect on the receiving surface water, including users of the resource and aquatic biota.

Quantitative:

The discharges, either separately or in combination, shall not cause the receiving water standards specified below to be breached (refer Consents Tables 1 and 2).

Table 1: Receiving Water Standards

Parameter (g/m ³ unless otherwise stated)	Receiving Water Concentration	
	Hardness 20 g/m ³ CaCO ₃	Hardness 100 g/m ³ CaCO ₃
Temperature	Less than 3°C increase	Less than 3°C increase
pH	6.5 to 9.0	6.5 to 9.0
Suspended solids	For upstream concentrations of less than or equal to 100 g/m ³ the increase shall be no greater than 10 g/m ³ . For upstream concentrations of greater than 100 g/m ³ the increase shall be no greater than 10%.	For upstream concentrations of less than or equal to 100 g/m ³ the increase shall be no greater than 10 g/m ³ . For upstream concentrations of greater than 100 g/m ³ the increase shall be no greater than 10%.
Cyanide CN(wad)1	0.093	0.093
Iron	1.0	1.0
Manganese	2.0	2.0
Copper	0.003	0.011
Nickel	0.04	0.160
Zinc	0.027	0.100
Silver 1	0.0002	0.0024
Total ammonia	Refer Table 2	Refer Table 2
Antimony	0.03	0.03
Arsenic	0.190	0.190
Selenium	0.005	0.005
Mercury	0.000012	0.000012
Cadmium	0.0003	0.001

Chromium (VI)	0.01	0.01
Lead	0.0004	.0025

Notes:

- (1) Site specific derived criteria using US EPA (1985) methodology.
- (2) Monitoring of metals shall be based on the soluble test method, defined as the concentration of dissolved metals measured in that fraction which passes through a 0.45 um filter except for mercury (Hg) which shall be based on acid soluble concentrations determined on unfiltered samples.
- (3) Current analytical procedures for mercury have a practical quantification limit (PQL) of 0.0005 ppm. This PQL is acceptable for the purposes of reporting mercury concentrations. The reporting 'limit' for mercury concentrations shall be reviewed annually by the consent holder and shall be adjusted in line with improvements in analytical technology.
- (4) ~~Prior to 30 October 2007, The selenium concentration in the receiving water shall remain below the trigger limits of 0.02 g/m3 90% 97% of the time on an annual basis, and shall not exceed 0.035 g/m3 in any single analysis, based on monitoring undertaken pursuant to condition 16 of consent 971318. After 30 October 2007, selenium concentrations shall not exceed 0.005 g/m3, unless otherwise agreed with the Waikato Regional Council in writing.~~ In the event that these limits are exceeded, the consent holder shall inform the Waikato Regional Council as soon as practicable and prepare a report, to the satisfaction of the Council, to demonstrate that continued discharges at concentrations exceeding the trigger limits will have no more than minor effects on the Ohinemuri River. This report shall be provided to the Council within two months of the consent holder becoming aware of the trigger exceedance.

Table 2: Criteria for Ammonia

Chronic Criterion - g/m ³ as Ammonia							
Temp °C \ pH	0	5	10	15	20	25	30
6.50	3.0	2.8	2.7	2.5	2.5	2.5	2.4
6.75	3.0	2.8	2.7	2.6	2.5	2.5	2.5
7.00	3.0	2.8	2.7	2.6	2.5	2.5	2.5
7.25	3.0	2.8	2.7	2.6	2.5	2.5	2.5
7.50	3.0	2.8	2.7	2.6	2.5	2.5	2.5
7.75	2.8	2.6	2.5	2.4	2.3	2.3	2.4
8.00	1.82	1.70	1.62	1.57	1.55	1.55	1.59
8.25	1.03	0.97	0.93	0.90	0.90	0.91	0.94
8.50	0.58	0.55	0.53	0.53	0.53	0.55	0.58
8.75	0.34	0.32	0.31	0.31	0.32	0.35	0.38
9.00	0.195	0.189	0.189	0.195	0.21	0.23	0.27

1.4.2 Pit Lake (Surface Water)

The consent conditions address both water quality and potential flooding issues as described below.

WRC consents 971287 to 971293 and 139551.06 to 139551.08 relate to pit lake formation and discharge. Condition 19 states that discharge from the pit lake shall not commence until the discharge, after reasonable mixing, can meet the receiving water criteria specified in Table 1 and the consent holder has received written approval from WRC for the discharge to commence.

Condition 18 states that prior to commencing discharge from Pit Lake the consent holder shall complete, to the satisfaction of Waikato Regional Council, a report that clearly details the likely incremental impact that this discharge will have on the flood routing capacity of the Mangatoetoe Stream. The consent holder shall then prepare a plan of works designed to mitigate the impacts of this discharge on any potentially affected properties or public utilities in the Mangatoetoe Stream catchment. Subject to the granting of any necessary consents, and at least six months prior to commencing discharge from the Pit Lake, the consent holder shall implement those measures to the satisfaction of the WRC.

Preliminary criteria are suggested as follows:

Narrative:

Lake Discharge shall not cause a significant adverse environmental effect on the Mangatoetoe Stream, including users of the resource and aquatic biota.

Lake water quality shall be suitable for recreational purposes.

Quantitative:

1. *The lake discharge shall not cause the receiving water standards specified in Tables 1 and 2 above to be breached.*

2. *Increases to the Mangatoetoe Stream flows resulting from the lake discharge shall not exceed;*

Yet to be determined.

1.4.3 Discharge of Seepage Drainage to Surface Water

The intent is to commence direct discharge of the seepage water when the water quality proves to be acceptable. This will require the approval of WRC (refer WRC consents 971303 and 971304, condition 8).

The intent long term is to discharge the underdrainage direct to the adjacent receiving water via drains that will allow the water to flow from the manholes to the receiving water. Storage 1A has been designed to readily accommodate this but there are several deep manholes within Storage 2 and for this reason, some thought needs to be given to how the water can be direct discharged from them long term.

Preliminary criteria are suggested as follows:

Narrative:

The discharge of seepage shall not cause a significant adverse environmental effect on the Ohinemuri River or Ruahorehore Stream, including users of the resource and aquatic biota.

Quantitative:

Seepage discharges shall not cause the receiving water standards specified in Tables 1 and 2 above to be breached.

1.4.4 Discharge of Bypassed Seepage to Groundwater

The discharge of TSF bypass seepage to groundwater, subject to conditions, is authorized by WRC consent 971305 for Storage 1A and W1761 for Storage 2. Consent conditions clearly define the narrative closure criteria (refer consent 971305 condition 26 and 29 and W1761 condition 10 and 10A).

To meet the requirements of “stable” and “self-sustaining” OGNZL believes it is reasonable that the monitoring wells should demonstrate stable or improving trends in groundwater quality before closure and handover can occur. Refer to the TSF Monitoring Report – Groundwater for details on the current monitoring frequency and locations. Closure monitoring locations are likely to be a selection of the operational monitoring wells.

Preliminary criteria are suggested as follows:

Narrative:

Discharges from the site, either alone or in combination, shall not cause a significant adverse environmental effect on the receiving groundwater and surface water, or on users of these resources, or, in the case of surface water, aquatic biota.

Seepage from the TSFs, in combination with all other discharges authorised from the Waste Disposal Area, shall not cause an adverse environmental effect on groundwater, or on users of this resource, outside the boundaries of Area D (Figure 8).

Quantitative:

Results from the groundwater monitoring wells shall demonstrate stable or improving trends in groundwater quality.

For surface water, the groundwater discharges, either separately or in combination with all other site discharges, shall not cause the receiving water standards specified in the consents to be breached.

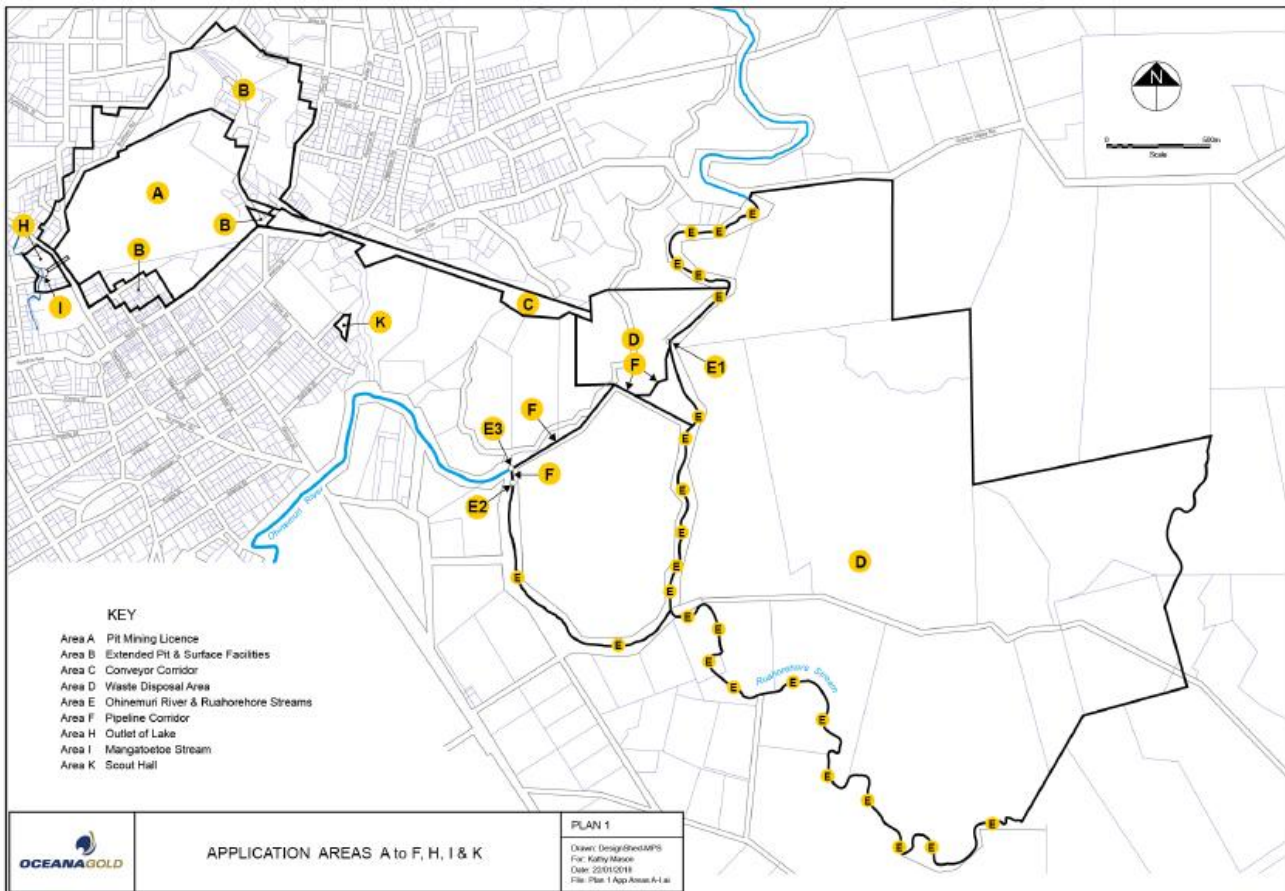


Figure 8: OGNZL Areas A to F, H, I & K

1.4.5 Soils

The closure completion criteria for soils will focus on any potential contamination of soils due to modern mining related activities such as hydrocarbon and chemical spills and/or incorrect placement and treatment of PAF rock.

Preliminary criteria are suggested as follows:

Narrative:

To identify, and as relevant remove, treat and/or appropriately dispose contaminated soil around the site to achieve regulatory requirements relevant to the proposed future use of the land.

Quantitative:

Yet to be determined.

1.4.6 Embankment Pasture

The landscape philosophy for the TSF embankments is for a combination of pasture and native plantings. The methodology for rehabilitating the embankments is well established and the results have been successful.

The key management objectives for the pasture on the embankments are to:

- Ensure good pasture cover on the embankment;
- Prevent soil erosion and scouring by storm runoff, stock and vehicles;
- Prevent growth of tall tree species on pasture that may cause wind induced soil disturbance;
- Control invasive weeds; and
- Prevent stock damage to indigenous species.

Animal productivity, while important, is a secondary objective. High stock grazing rates may lead to pugging by cattle in wet weather, soil damage, increased erosion and weed invasion. In the worst case, if left unmanaged, this could compromise the integrity of the TSF capping layer. Where the embankment has been rehabilitated in pastoral vegetation the current aim is to achieve a level of pasture productivity that is similar to land of the same slope in the district, under pastoral land use.

To support this philosophy, pastoral knowledge through the dairy industry has been applied. An Olsen phosphate level of 25 parts per million (ppm) is considered an appropriate target level for productive dairy pasture on the volcanic ash soils of the region and will ensure growth of a vigorous sward, provided fertiliser maintenance requirements are met annually. Meeting this criterion will mean that the land meets one of the minimum requirements for dairy grazing at point of closure.

Bare soil is an indication of poor pasture management in an established pasture or poor seed germination/seed distribution in new pasture and can lead to excessive runoff and subsequent soil erosion. A stable sward should have less than 10% soil exposed over a minimum of two consecutive years.

District average production figures for land of similar slope to the embankment will need to be obtained from a registered agricultural consultant to assist with the criteria. No set yield figure can be provided, as seasonal variations need to be allowed for. Once this target has been met it should be demonstrated for consecutive years, indicating that the pasture has matured and productivity stabilised.

Setting a minimum level of earthworm population that existed on an undisturbed pasture prior to topsoil being removed from Storage 2 area will indicate a healthy biological state in the soil and significantly contribute to desirable physical and chemical properties in the soil.

Considerable experience with the embankment area that has already been rehabilitated indicates that the criteria listed below are collectively achievable within five years, using the proposed methods and knowledge described above.

Preliminary criteria are suggested as follows:

Narrative:

To provide a vegetative cover that will allow a sustainable land use similar to that which existed pre-mining while minimising erosion and ensures the stability and integrity of the embankment remains

Quantitative:

1. *Phosphate levels determined by the Olsen Method should be a minimum of 25±5 ppm for two consecutive years after restoration.*
2. *Clover/grass compositional balance should be 20-30%/80-70%.*
3. *Exposed soil surfaces should be no greater than 10% of the rehabilitated area under grazing over two consecutive years.*
4. *Pasture production should equal the yearly district average for two consecutive years.*
5. *Earthworm population's average over 10 x 1 m² plots should be a minimum of 100 individuals per square metre.*

1.4.7 Embankment Native Plantings

Native shrubs and trees have been planted at various times on the embankment since 1990. The first plantings were in three locations on Storage 2 behind the West Silt Pond and S1 pond and one block in between from the 100 m to 110 m level.

The main concern with the establishment of indigenous vegetation on the embankment is the potential for deep tap roots to penetrate the Zone G sealing layer. Any breach of the sealing layer, which is designed to prevent the ingress of oxygen to the unoxidised acid generating material beneath the cover, increases the potential for acid drainage to occur and to impact on discharge water quality.

Published reports (in Marden et.al. 2005¹) indicate:

- That the majority of native plant roots are concentrated in the upper soil profile.
- The major vertical and obliquely inclined roots change abruptly and strike horizontally at a relatively shallow depth.
- The rooting depth of most New Zealand indigenous species rarely exceeded 2 m.

Based on this and the fact that the thickness of the cover materials (Zone G, H and topsoil) is approximately 2.1 m thick, it is unlikely that indigenous tree roots on the embankment will penetrate Zone G. In addition, the compaction and low permeability of Zone G will likely prevent root penetration.

A number of tall New Zealand indigenous species have been planted in the older plantings at the foot of the embankment. One species, tōtara, has self-sown with seeds introduced from mature trees growing along the Ohinemuri River between 200 and 500 metres away.

In 1998, OGNZL commissioned Landcare Research to carry out a study of the root depths of indigenous plants growing on the rehabilitated embankment area. The study concluded that mature tall tree species (i.e. greater

¹ Marden M., Rowan C., and Phillips C.: Stabilising characteristics of New Zealand indigenous riparian colonising plants. Plant and Soil (2005) 278:95-105.

than 20 m tall) are at greater risk of wind throw than shrub and small tree species². The taller species therefore were not preferred on the embankment as at maturity any wind throw could create local disturbance of the cover materials with the possibility of exposing Zone G to erosion. The overlying Zone H provides protection for Zone G; this condition must be maintained. It is also important to ensure that tree seedlings are not root bound when planted to reduce the likelihood of wind throw caused by spiralled roots. OGNZL has made the decision to remove cabbage trees from areas of the embankment where there is a risk that the tap root could damage the Zone G cap. The areas of embankment plantings where this is required are shown in Figure 9; this includes any native plantings on the second batter of the embankment or higher, but not the top of the embankment structure.



Figure 9: Embankment Plantings Requiring Deep Rooting Tree Removal

Preliminary criteria are suggested as follows:

Narrative:

1. *To provide a sustainable vegetative cover that will minimise erosion and ensures the stability and integrity of the embankment remains,*
2. *To enhance both amenity and biodiversity at the Site by providing habitat and a food source for birdlife.*

² Watson A, Phillips C, Simcock R.: Root depth Investigations of indigenous Plants: tailings dam Embankment- Martha Gold Mine, Waihi. Landcare Research Contract Report LC9798/90. April 1998).

It is noted that the second narrative criteria is not mandatory in terms of the consent conditions. It is discretionary, providing an internal goal to aspire to.

Quantitative:

To have achieved 80% canopy closure as measured from aerial photographs based on a representative area of the planting.

The expectation is that in the long term, maintenance will consist of an annual walkover to remove cabbage trees, invasive weeds and self-introduced deep rooting trees.

1.4.8 Wetland Habitats

Many wetland habitats across New Zealand have been degraded or drained, and only 10% of the country's pre-human wetland areas remain. Once tailings deposition is complete, the TSF lakes provide an opportunity to create new wetland habitats and enhance food availability for indigenous wetland bird species.

Ryder Environmental undertook an ecological assessment of TSF2 lake and found that while some wetland plant and bird species are present, there are many opportunities for enhancement when the lake is reformed. Given final tailings deposition into both TSF structures is some years away, a pond rehabilitation plan will be developed closer to closure which will set out criteria for the ponds, and proposed works to achieve the criteria.

At the request of a Peer Reviewer, the following preliminary criteria for wetland habitats are proposed, and will be refined in future reporting periods:

Narrative:

- 1. To provide a sustainable constructed wetland that will provide habitat and a food source to indigenous bird species.*

Quantitative:

Yet to be developed but will likely include wetland flora composition and/or cover criteria.

It should be noted that these criteria, once finalised, are discretionary and are not required by OGNZL's consent conditions.

1.4.9 Pit Surrounds and Pit Walls

There are essentially two separate areas to be considered:

- The pit rim walkway and associated plantings, and,
- Vegetation on the upper pit slopes.

The aim of the pit rim walkway is to create an aesthetically pleasing area for the public to enjoy with minimal weed species that will preserve views of the current mine and the future lake. The area incorporates the historic gardens to the North, exotic trees including fruit trees as a reminder of the previous inhabitants of the area, and a mixture of new exotic and native plantings which include a kauri grove and riparian planting adjacent to the

Eastern Stream. The plantings also need to regard to the Screen Planting Plan, which is a requirement of Hauraki District Council Land Use Consent No 97/98-105 and the Mining Licence.

Revegetation of the upper pit slopes is covered by Mining Licence condition 37 which states:

“The upper pit slopes shall be treated to ensure revegetation as soon as possible in the mining programme and in accordance with the current approved Rehabilitation and Closure Plan. Revegetation of the upper slopes will be carried out as far as practicable and may preserve some areas without vegetation to preserve and reflect the mining heritage of the town provided that the water quality of the Pit Lake remains suitable for direct discharge to surface waters in accordance with resource consents held by the licensee from the Waikato Regional Council.”

The pit walls above lake level on NAF material have been successfully hydroseeded with grasses and over time, other species have naturally colonised the area. Parts of the upper pit wall have been planted with a variety of indigenous species. This allows for the provision of a seed bank. The intention is to essentially let nature take its course while preventing noxious weeds and where necessary avoiding tall trees that could be susceptible to wind throw that could damage the pit slopes as well as blocking the pit lake outlet.

Some of the upper pit walls have been shotcreted and in those areas, planting is not an option. In other areas PAF material is exposed on the pit walls. No planting or hydroseeding is currently planned on the PAF pit slopes and these will essentially remain bare areas for the foreseeable future although some natural regeneration in less reactive areas will occur. Planned cutbacks of PAF areas may allow for hydroseeding in the future.

Narrative:

To provide a sustainable vegetative cover over appropriate areas of the pit that will minimise erosion, combat weed encroachment, and where practicable maintain a vegetated cover that assists in stabilising soil and enhancing visual amenity.

Quantitative:

To maintain the existing vegetative cover with a steadily reducing workload in terms of weed control.

Maintenance effort has begun to be tracked during this reporting period to assess whether this criterion is being met.

1.4.10 TSF Safety and Stability

The embankments have been designed and constructed to ensure long term safety and stability. Monitoring and review of the design and construction performance has been ongoing since construction commenced. Details for assessing the stability of the embankments were presented as a part of the permitting process. Relevant stability design detail has been considered for development of the completion criteria.

Preliminary criteria are suggested as follows:

Narrative:

That the tailings storage facilities are structurally stable and that they will not cause adverse effects on the safety of users or downstream users, or on the environment.

Quantitative:

Quantitative criteria were developed by Engineering Geology Ltd and form Appendix B. It should be noted that limits are included both for existing and yet to be installed settlement markers. The depths of fill will require confirming following installation and the deformation limits will need to be adjusted accordingly.

In addition to these quantitative criteria, there should be no visual indication of instability. Note that the Operations, Maintenance and Surveillance Manual³ includes weekly and monthly visual checklists.

1.4.11 Pit Wall Safety and Stability

As previously discussed, the key for the pit slopes is to define in practice the meaning of “safe and stable” as stated in Mining Licence condition 36 as follows:

“... The licence area is to be left in a clean and tidy condition after mining operations have ceased including removing from public view any used derelict equipment and machinery and the pit faces are to be left in a stable and safe condition.”

OGNZL made a presentation on the meaning of “safe and stable” at the 2014 peer review meeting.

The Pit Wall Risk Assessment concludes that the post-closure lives risk associated with wall failure or rock fall is de minimis, while recommending some intervention to maintain acceptable levels of risk during lake filling when the likelihood of wall failure temporarily increases. The Pit Wall Risk Assessment also indicates that the pit walls will meet international guidelines and the socially accepted norm for tolerable life risk of 10^{-5} p.a during the closure and post closure periods. It is OGNZL’s view that this tolerable risk threshold should form the basis of the closure criteria for the pit walls.

OGNZL will look to conduct a revised deterministic assessment in the coming review period. Similarly, a probabilistic assessment will be reviewed. As stage one to this process a review of Martha Pit Geotechnical Design parameters has been reviewed by AMC (March 2023).

The current monitoring system for the open pit is extensive and will continue while the pit is in care and maintenance and throughout Project Martha, however the Pit Wall Risk Assessment indicates that radar monitoring will not be required and can cease once operations are complete within the open pit. The monitoring programme will be reviewed, and quantitative closure criteria will be developed closer to closure.

Preliminary criteria are suggested as follows:

Narrative:

1. *To ensure that the Mine Lake and its surrounds (the Site) provide a safe and sustainable recreational facility for the benefit of the Waihi community.*

Quantitative:

- a) *A minimum acceptable risk threshold,*
- b) *A set of movement criteria related to movement patterns, rates and magnitudes,*
- c) *Minimum factors of safety under static and seismic conditions,*
- d) *Controlled access in areas with a significant risk of subsidence collapse and deformation risk.*
- e) *Definition of the buffer zone.*

Closure criteria will need to be developed and refined over time in response to events such as flooding and monitoring trends, therefore the costs of developing and refining these closure criteria have been allowed in the Rehabilitation Bond estimate.

1.4.12 Underground Workings

OGNZL carries out underground mining with the aim of ensuring the safety and health of employees during operations and the long-term safety and health of the community. Mining methods and practices employed at these operations focus on reducing the risks to public safety by backfilling of the workings in accordance with the relevant consent conditions. The backfilling is completed to the satisfaction of the HDC geotechnical reviewer.

Development of completion criteria will continue as these projects are developed. Preliminary criteria are suggested as follows:

Narrative:

To ensure the long-term safety of people and infrastructure located above and adjacent to the underground workings, the ventilation and escape shafts.

Quantitative:

1. *Backfilling of the stope voids and stacked developments (including ventilation rises and ore/waste passes) where geotechnical conditions require backfilling to ensure long term stability.*
2. *Backfilling of 100m of the underground workings decline from the portal,*
3. *Backfilling of the shallow section of decline between Favona and Trio, (currently used to haul to and from Correnso)*
4. *Backfilling and capping of the ventilation and escape shafts.*
5. *Barricading the ventilation portal into the pit from underground and backfilling the first 50m of the ventilation drive from the pit.*

1.5 Rehabilitation Activities Completed 2022/2023

1.5.1 Native Planting

No significant native planting was undertaken in 2022/2023. Maintenance of existing plantings was the focus during the reporting period.

1.5.2 Pest Plant and Animal Control

In 2022/2023 OGNZL developed a site wide Pest Control Management Plan incorporating both pest animals and pest plants. The objective of this Plan is to have a single document that sets out pest management priorities and responsibilities. This document is included as Appendix C.

Pest plant and animal control began to be implemented according to this Plan during the reporting period.

1.5.2.1 Pest Animal Control

In December 2022, bait and trap station networks were installed around the site to target mice, rats, possums, and mustelids. This is in addition to the existing network of bait stations installed around the Development Site to protect OGNZL electrical equipment. The new network comprises 50 Philproof bait stations and 50 DOC200 style traps, placed to protect areas of native vegetation and bird habitat around the Development Site. The network covers an area of approximately 307ha. An additional two traps are installed at Slevin Park around OGNZL's compost site (Figure 10).

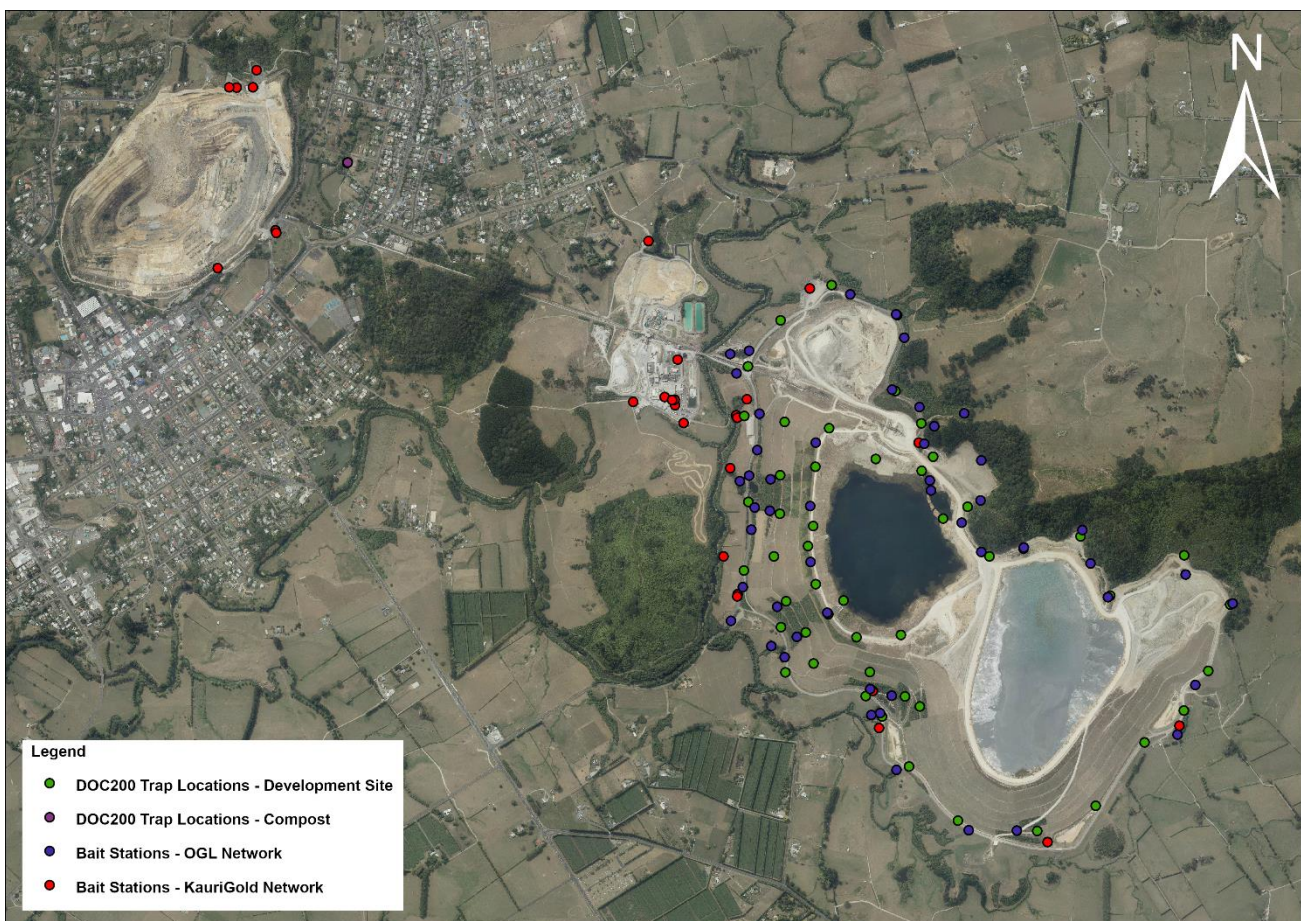


Figure 10: OGNZL Pest Control Network

Table 3 shows trap catch data as of June 2023, recorded since the network became live in January 2023.

Table 3: OGNZL Pest Control Network Trap Catch Data

Pest species	Number trapped
Rat	24
Mustelid	14
Hedgehog	10
Other	3

Turkeys and Canada geese have flocked on TSF embankments and the TSF2 lake in increasing numbers in 2021 and 2022. Turkey control was undertaken on site in the second half of 2022. Approximately 70 turkeys were removed from site by herding them into cages. A programme of Canada goose control by egg adding was implemented in spring 2022 to prevent recruitment to the adult population. A total of 168 eggs were added across the Development Site (Figure 11). Note that the number next to nest locations denotes the number of eggs added at each nest location. Pest control of adult turkeys and Canada geese using a firearm was also undertaken in early 2023 with limited success; eleven adult geese and four turkeys were shot and removed from site.



Figure 11: Canada Goose Nest Locations 2022

1.5.2.2 Pest Plant Control

Pest plant control continued throughout the reporting period. Routine weed control and maintenance activities were hindered by poor weather and contractor availability due to rain event clean-up activities.

Significant pest plant control activities undertaken during the 2023/2023 reporting period included:

Removal of deep rooting species – embankment plantings

Removal of deep rooting trees (cabbage trees and totara, in particular) in the TSF embankment plantings commenced during the reporting period to prevent damage to the Zone G capping layer. Established native plantings on the second batter and above, excluding kete plantings, were prioritised during this report period. All cabbage trees and totaras were removed by either spraying, hand pulling, or cut and pasting. Privet and other weed species encountered during the removal of deep rooting tree species were also removed. Areas treated during this reporting period are shown in Figure 13.

Biocontrol

Continued monitoring of existing biocontrol agents occurred during the reporting period (tradescantia yellow spot fungus and buddleia weevil).

The tradescantia yellow spot fungus has naturally spread around introduction sites and was also translocated to four new sites on OGNZL property during the reporting period. At the original release site, Baxter Road Bridge 1, the fungus has killed large areas of tradescantia allowing infill planting in this area. At all other locations, evidence of fungus spread is evident, but dieback of tradescantia is yet to occur. Downstream monitoring also occurs at two locations to assess whether the fungus is spreading naturally downstream (Figure 12)

A new biocontrol agent (tradescantia leaf beetle) was introduced to site to trial effectiveness.

Drone spraying – Open Pit

Aerial spraying using a drone was trialled during this reporting period. The top two batters of the Open Pit were treated in November 2022 and February of 2023 to target gorse, wilding pine, and pampas. Approximately one third of the pit rim circumference from the rip rap level down two batters was sprayed. This proved to be a successful and safe method to control pampas, although some refinement is required in the next round of spraying. Figure 14 shows a before and after views of the area treated.

Routine pest plant control

Routine pest plant control was undertaken around the rest of the site, as outlined in the Pest Control Management Plan. Not all pest plant control activities were undertaken as per the plan in 2022/2023 due to poor weather and numerous storm events. Maintenance effort for each area is reported in Table 4.



Figure 13: Embankment Plantings with Weed Control Undertaken in 2022/2023



Figure 12: Biological Control Introduction and Monitoring Sites

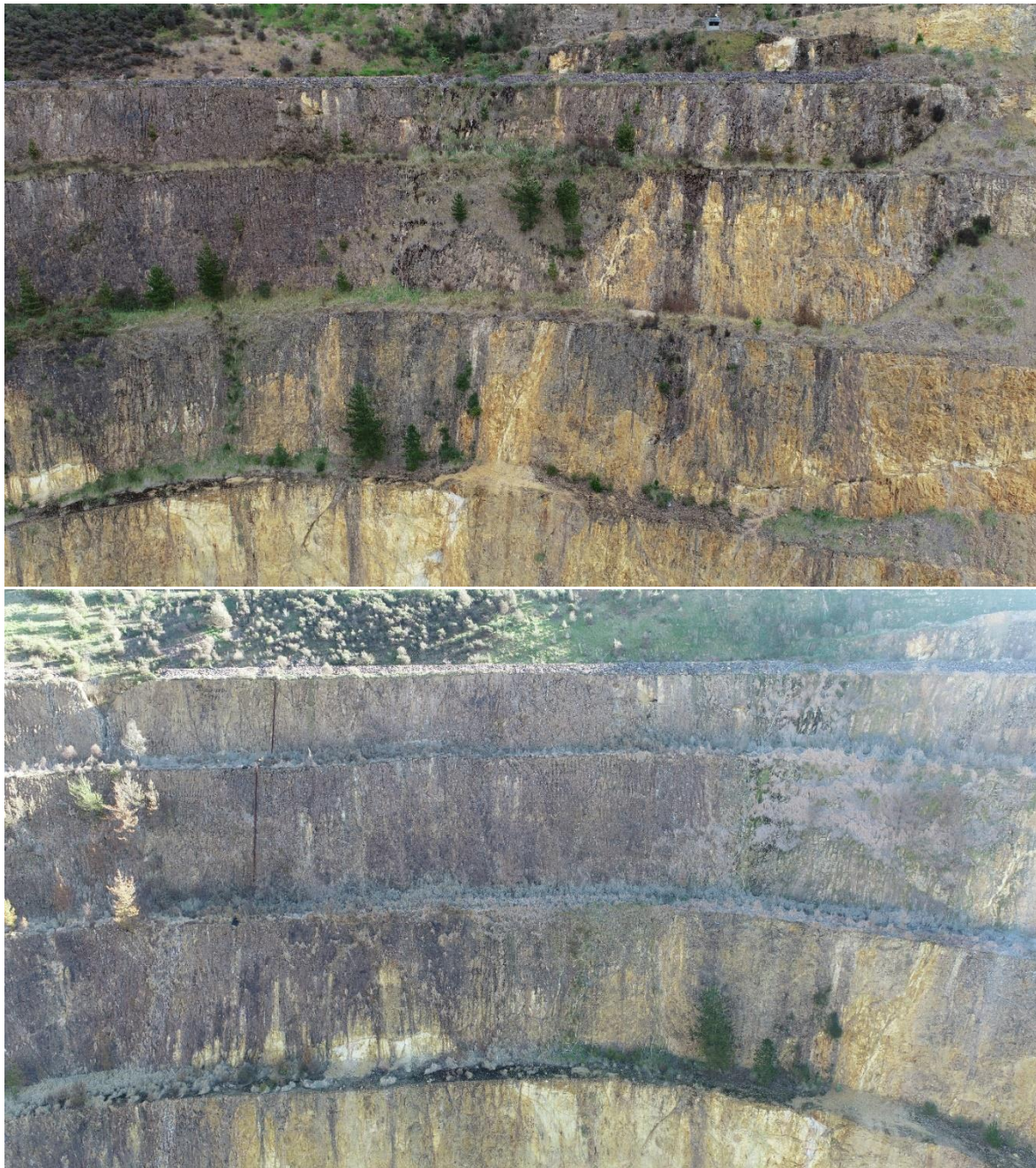


Figure 14: Open Pit North West Wall, Before and After Drone Spraying (upper image October 2022, lower image May 2023)

Maintenance effort for various rehabilitation types across the site has been derived using a combination of contractor invoices, OGL staff and contractor hours, and extrapolation of maintenance effort within rehab monitoring plots across a zone/location. Maintenance effort tracked is limited to pest plant control and associated activities; pest animal control effort is not reported in this table. Zones/locations used for reporting are from the Pest Control Management Plan. Maintenance effort is reported in number of days or weeks, based on an 8-hour day, 5-day week.

Table 4: Maintenance Effort 2022-2023

Zone / Location		Maintenance Effort 2022-2023	Target Species	Notes
Martha Open Pit				
1	Pit Rim Walkway (including Cornish Pumphouse, Slevin Park and heritage areas)	75 days (3 weeks, 3 people for weeding and maintenance + 2.5 days mowing per month)	Jerusalem cherry, loquat, ivy, wattle, pampas, broom, Spanish heath, pine, privet, cherry, agapanthus, miscanthus, tradescantia, blue corn-lily, coastal banksia, trumpet lily, macrocarpa, holly, hawthorn	Includes spraying, hand weeding, metalling, removing dead plants, drainage work, rubbish removal, signage repairs, graffiti removal, replacing boards, mowing amenity and recreational areas.
2	Northwest Wall (above Perimeter Road)	Nil	Wattle, pampas, broom, Spanish heath, pine, privet, cherry, coastal banksia	Not undertaken this reporting period due to telehandler availability and poor weather.
3	Top Pit Batter (above Perimeter Road)	6 days (2 days, 3 people)	Wattle, pampas, broom, Spanish heath, pine, privet, cherry, agapanthus, miscanthus, blue corn-lily, coastal banksia, trumpet lily, ivy	Includes chain sawing, cutting and pasting, hand pulling.
4	Future Pit Lake Edge (below Perimeter Road, above rip rap)	8 days (2 days, 4 people)	Wattle, pampas, broom, Spanish heath, pine, privet, cherry, agapanthus, miscanthus, blue corn-lily, coastal banksia, trumpet lily	Includes hand weeding, spraying, saw and pasting.
5	Inside Pit (below rip rap)	6 hours of drone spraying by contractor	Pine, gorse, pampas	One third of pit treated from rip-rap level down two batters.
6	Western Pit Screening Area	9 days (4.5 days, 2 people)	Wattle, pine	Includes 1/2-day spraying and 4 days hand weeding for 2 people. Tall trees were not removed this reporting period.
7	Eastern Pit Screening Area (noise bund)	4 days (2 days, 2 people)	Wattle, broom, privet, cherry, coastal banksia, loquat, ivy, agapanthus	Includes knapsack and unit spraying. Some areas outstanding.

8	Eastern Biocontrol Area	None	Buddleia	Quarterly monitoring.
9	Conveyor Corridor	4 days (2 days, 2 people)	All species	Spraying using spray unit. Barry Road to Development Site sections completed this reporting period. Barry Road to pit section outstanding.
Development Site				
10	Embankment Plantings	13 days (1.5 days, 8 people for main sweep of plantings, 6 additional hours of privet removal and 2 hours of pampas removal)	Ivy, gorse, wattle, pampas, broom, blackberry, Spanish heath, privet, cherry, Japanese honeysuckle, jasmine, miscanthus, nightshade, barberry, holly, hawthorn, cabbage trees, totara, rewarewa	Includes chainsawing, handpulling, cut and pasting. The focus for the reporting period were the plantings shown in Figure 13.
11	Development Site Roadsides	24 days (4 days, 2 people, 3 times)	Buddleia, gorse, pine, thistle, broom	Using spray unit, drain to fence.
12	Topsoil Stockpile	2 hours	Gorse, thistle	Knapsack spraying.
13	Central & Eastern Stockpiles	3 days (3 days, 1 person)	Buddleia, gorse, pampas, broom	Knapsack and unit spraying, spot spraying only.
14	Ignimbrite Stockpile	1.5 days	Buddleia, pine, pampas, broom	Spot spraying and some blanket spraying.
15	Northern Stockpile	Nil	Buddleia, pine, wattle, pampas, broom	Access not possible due to wet weather.
16	TSF2 Lake Edge	4 days (2 days, 2 people)	Pine, gorse, pampas, thistle, broom, willow, royal fern, wattle, miscanthus, Spanish heath	Knapsack spraying.
17	Environmental Monitoring Sites	1 days (1/2 day, 1 person, 2 times)	Grass, thistle, tradescantia, blackberry	Spraying and hand pulling weeds around piezometer enclosures.
Favona/Mill				

18	Favona Stockpile	None	All species	Aerial drone spraying delayed due to weather. Now planned for H2 2023.
19	Favona Wetland	None	Nightshade, cherries, privet, blackberry	Insufficient time to get to Favona Wetland during this reporting period.
20	Roadsides & Carparks (around the Mill, WTP, & Favona areas)	4 days (2 days, 1 person)	All species	Using spray unit.
21	Water Treatment Plant & Mill	12 days (3 days, 2 people, 2 times)	All species	Spray unit and knapsack spraying.
Town/Recreational Areas				
22	Black Hill, Winner Hill & Union Hill	22 days (Black Hill - 4 days, 3 people Union Hill – 2 days, 3 people)	All weed species	Includes spraying of track edges, debris removal, fence repairs, oak tree removals, flood damage repairs, hedge cutting, drainage works, battery ruins spraying, weed removal.
23	Moresby Ave Administration Office & Education Centre	2 days	All weed species	Cherry removal and hand weeding.
24	Riparian Margins	Nil	All weed species, particularly tradescantia	No weeding undertaken this year due to other priorities. Other maintenance effort includes fence maintenance and 2-3 weeks of flood damage repairs.
25	OGNZL Landholdings – Residential & Rural Properties and Heritage Areas	45 days (15 days, 3 people)	All weed species	Tree removal, hedge cutting, garden weeding, pot holing.

1.5.3 Rehabilitation Monitoring

Many planting and revegetation trials have been undertaken around site with the aim to determine the most successful outcomes for rehabilitation that meet operational and closure requirements while providing the best

opportunity for future land use. Standardised and scheduled monitoring of these is important to ensure relevant data and information can be collected to inform OGL's rehabilitation and closure plans. In August – September 2022, long term monitoring plots were set up and assessed using the RECCE method to help to track the progress of rehabilitation efforts and assess the effectiveness of planting techniques and revegetation trials. Twenty-six long term monitoring plots were set up in various types of rehabilitation around the site, including:

- Open pit – manuka fascining trial
- Open pit – natural revegetation
- Open pit – pohutukawa plantings
- TSF2 – capping trials
- TSF2 flax trial
- TSF2 – fascining trial
- Kete plantings
- TSF1A and TSF2 embankment plantings

Plot locations are shown in Figure 15 and Figure 16. Black dots denote plot corner locations.

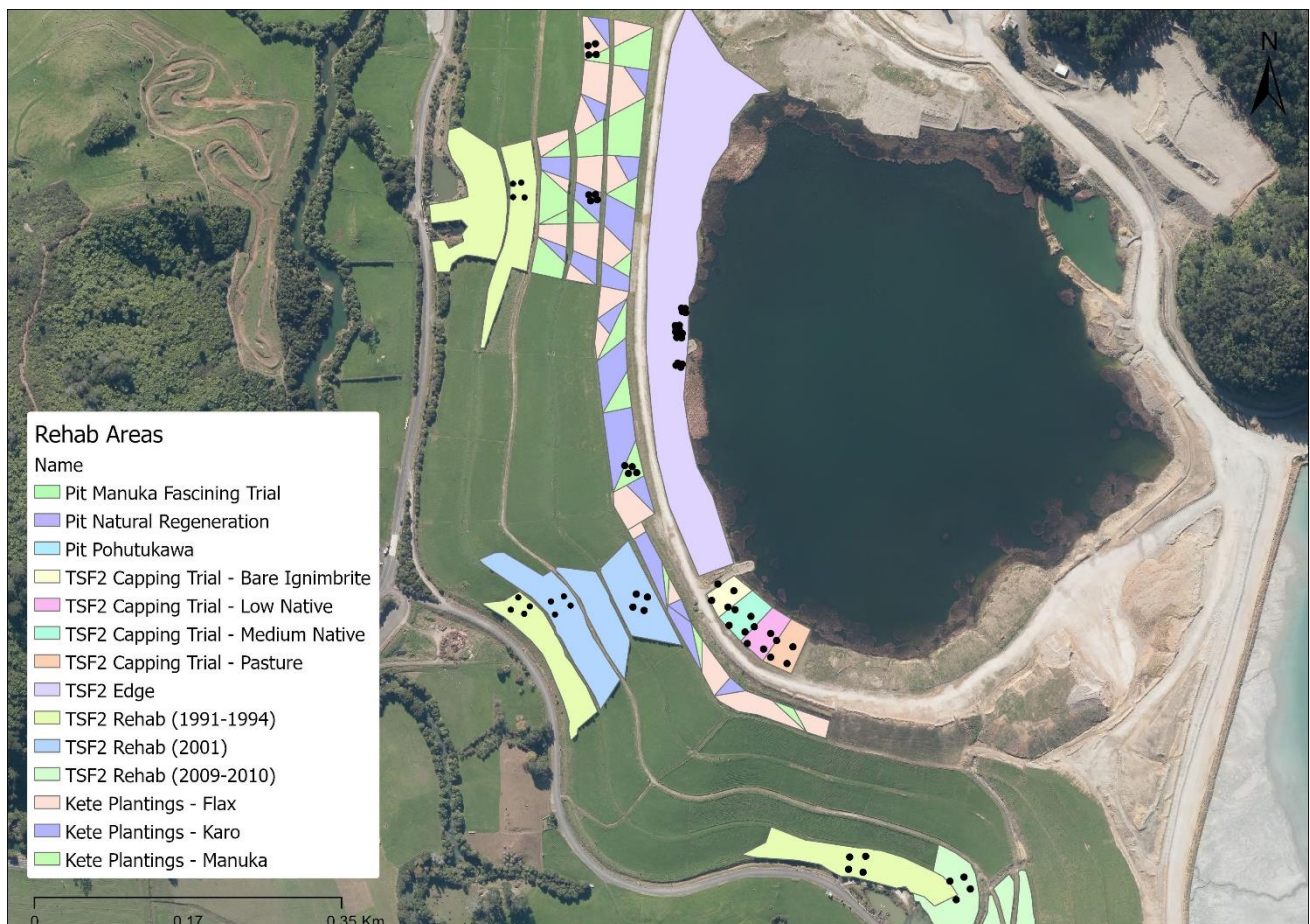


Figure 15: TSF RECCE Plot Locations

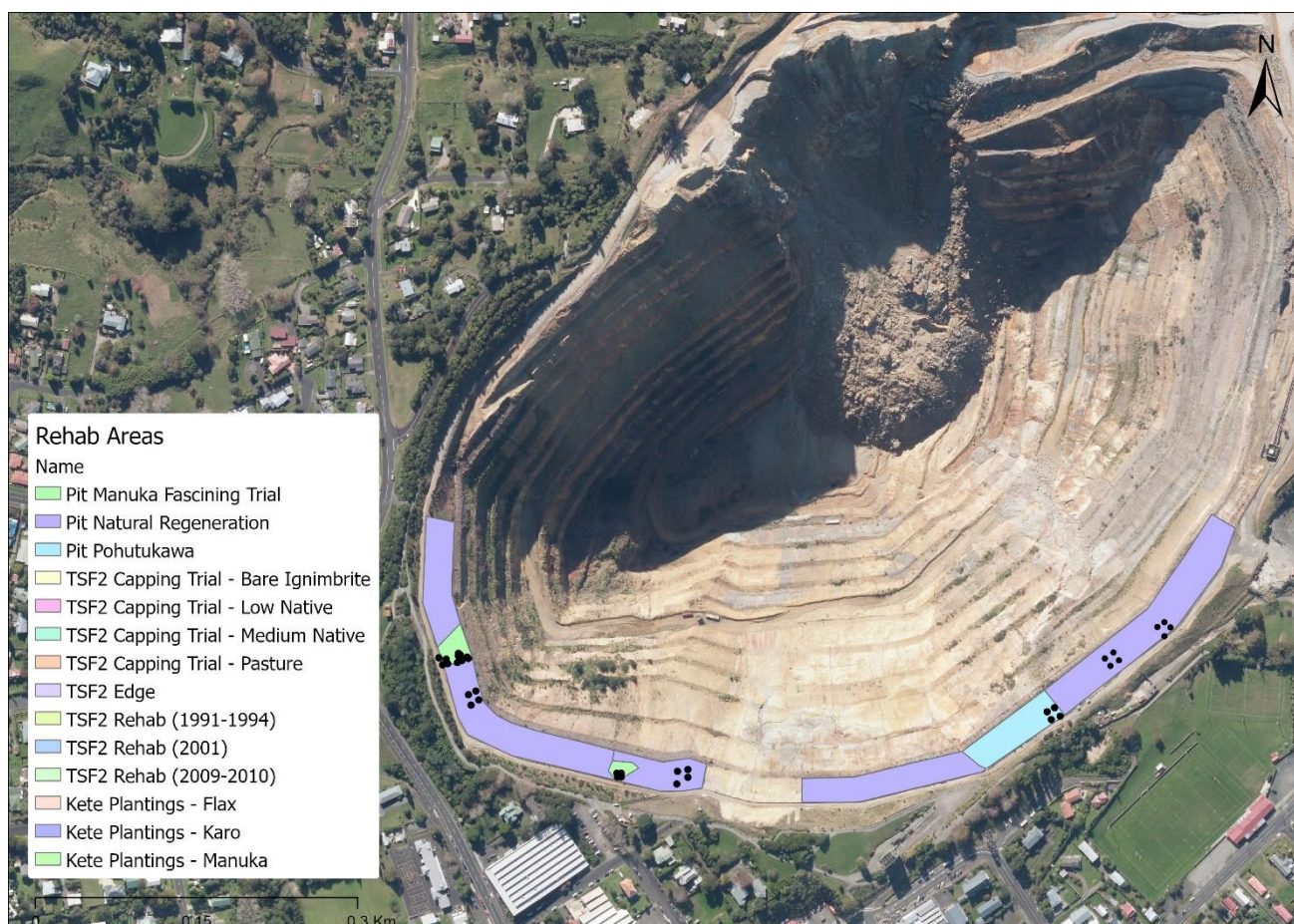


Figure 16: Open Pit RECCE Plot Locations

Monitoring plots vary in size from 5m²x5m² to 20m²x20m². Data collected from each of the plots include site description, cover-abundance of all species present, seedling species count sub plots, sapling species and count, and tree species stem count and diameter. Replicable drone photos were also taken of each plot.

The Waihi Rehabilitation Monitoring Report 2022 summarises rehabilitation efforts to date, the results of the first round of monitoring from RECCE plots, and the outcomes of planting and revegetation trials, including implications for rehabilitation and recommendations for future work. This will be completed in H2 2023.

1.5.4 Pasture Monitoring and Maintenance

Grazing of the TSF embankment pasture continues to be managed by an adjoining farmer. Conservative grazing practices such as frequent paddock rotation and only grazing young stock ensure the embankments are not damaged by grazing activities. Conservative grazing requirements have been incorporated into the grazing lease that covers the embankment areas, this applies from June 2023.

Assessment of the performance of the rehabilitated embankments is carried out annually by Dr Bob Stewart, Fertilizer and Lime Research Centre, Massey University. The objective of the assessment is to:

- Inspect the embankment for pasture and soil condition
- Determine if the fertilizer strategy for spring topdressing is working effectively.

The 2022 report forms Appendix D and pasture monitoring locations are shown in Figure 17 below. It should be noted that the 2022 report is based on soil sampling data collected and analysed in June 2022 and drone footage and photos from the same time. A site visit by Bob Stewart occurred in July 2022 but observations from this site visit will inform the 2023 report.

The soil test data from the report indicated the following:

- The pH data for both TSF1A and TSF2 was at similar levels to the previous reporting period and remain at a satisfactory level across at all but one sampling site. One site at TSF1A showed a drop in pH below guideline levels
- Olsen-P levels have decreased since 2021 and are now near or below the bottom of target range at all sites
- Sulphate-S has been trending upwards on both TSF1A and TSF2 and is above the target range
- Mg and K are within or near guidelines on both TSF1A and TSF2.

Pasture on TSF2 is described as having a good pasture composition of ryegrass/clover, with acceptable levels of weeds. Pasture cover is within guidelines (>80%). Some smearing was noted in recently grazed paddocks, but significant pugging was absent.

On TSF1A, cover was noted as being good (>90%). Pasture composition was satisfactory in some locations, but clover appeared to be shaded out in one of the monitoring locations. This area needs grazing to encourage clover growth.

The report recommendations for fertilizer application in 2022-23 are as follows:

1. For both TSFs to apply 400kg/ha 15% Potassic Superphosphate
2. Nitrogen (N) at 90kg/ha urea applied in spring, separately from the superphosphate (note this recommendation was discussed on site with Bob Stewart and the farm manager, and it was agreed N application is not currently required. The removal of this requirement will be reflected in the 2023 report).

At the date of writing this report, fertilizer has not yet been applied to TSF embankments in 2023 due to the heavy rainfall in the first half of 2023. Application is planned as soon as weather conditions allow.



Figure 17: Pasture Monitoring Locations

1.5.4.1 Pasture and Embankment Maintenance

From time to time, work is undertaken to repair or improve rehabilitated areas of the embankment. During this reporting period, this has included:

- Sump clearing along the A Ramp
- Metaling of pugged soils around stock watering troughs and manholes
- Maintenance of drainage, particularly along the Topsoil Ramp
- Drain cleaning of berms at TSF1A

1.6 Rehabilitation Activities Planned 2023/2024

1.6.1 Native Planting

No new areas of rehabilitation planting are planned for 2023/2024.

Enhancement plantings required by OGNZL's Overseas Investment Office conditions of purchase are planned at a property at Golden Valley Road. Site preparation works and planting will commence this year in an area totaling approximately 0.5ha. Approximately 400 trees are planned for planting in either 2023/2024 or 2024/2025.

1.6.2 Pest Plant and Animal Control

Pest plant and animal control will continue in 2023/2024 as outlined in the Pest Control Management Plan (Appendix C). Areas of focus for 2023/2024 are:

- Deep rooted species removal from remaining embankment plantings
- Aerial drone spraying of the second third of the open pit, focusing on the north wall area
- Aerial drone spraying of the Favona Stockpile and drains
- Weeding of the northwest wall of Martha Open Pit using a telehandler.

1.6.3 Rehabilitation Monitoring

The focus for rehabilitation monitoring for the 2023/2024 period is to complete the first Rehabilitation Monitoring Report, based on RECCE plot data collection commenced in 2022. Permanent plot data will be measured every 5 years, with another round of data collection scheduled in 2027.

Measurement of maintenance effort in rehabilitated areas around the site will continue, to inform accurate closure planning and costing.

1.6.4 Pasture Monitoring and Maintenance

Pasture monitoring and maintenance will continue in the next reporting period. Improvements include:

- Application of fertilizer to TSF embankments, as recommended by Bob Stewart
- Removal of the recommendation to apply nitrogen to embankments in spring in the next Pasture Management Report
- Requesting a new report from Bob Stewart on pasture renovation options for the embankment pasture
- Investigation into the increasing Sulphate-S in soil sampling results, if 2023 soil sampling results are still elevated
- Reporting on the embankment worm survey undertaken in 2023/2024 with a detailed methodology and a schedule for future monitoring.

1.6.5 Development Site Rehabilitation

Development Site rehabilitation activities for 2023/2024 will focus on maintenance of existing rehabilitated areas. No additional areas of rehabilitation are planned.

1.7 Peer Review Recommendations 2021/2022

The following tables sets out Peer Reviewer Recommendations from the previous reporting period and how OGNZL is planning to meet the recommendations.

Table 5: Rehabilitation Peer Reviewer Recommendations

Type	What	OGNZL Progress
	Waste Disposal Facilities	
I	Include summary of the year's climate (rainfall, storms, drought) and regional pasture production	Climate summary included in Section 1.2. OGNZL is awaiting regional pasture production data from DairyNZ, to be included from next year.

I 2021	Provide updated report on pasture renovation options for the embankment slopes. <i>Dr Bob Stewart has been asked to revise an earlier report which is not in OGNZL records.</i>	Earlier version unable to be located. This recommendation will be discussed with Bob Stewart in his next site visit (July 2023), and pasture renovation options will be requested to be included in his 2024 report.
I	Write a report on earthworm assessment in pasture areas, presenting results converted to closure metric and detailed method to enable repeating the assessment in ~5 years.	To be completed during this reporting period.
I	Set up permanent photo points (which may be from drones) that cover embankment pasture areas and take in summer to help identify seepage zones and dead grass.	This is already completed as part of the quarterly TSF Report. No new areas of seepage identified in summer 2022/2023.
C	Remediate isolated areas of erosion identified by Engineering Geology Ltd (2022a,b) and recommend any changes to design or maintenance of temporary or permanent rehabilitation.	Completed during 2022/2023.
C	Remediate areas of severe pugging and ponding in water tables and 'castle-drains'; develop new standard design details and/or maintenance to reduce occurrence or severity of such issues near water tables along benches, castle-drains, troughs, and fence lines.	Completed during 2022/2023.
I	Measure topsoil depth across the embankment slopes and in pasture and native forest areas.	To be completed in 2023/2024.
I 2021	Produce a written report documenting the treatments, monitoring and outcomes of TSF2 lake edge harakeke and 40anuka slash trials with recommendations for future rehabilitation methods, salvage and monitoring methods. <i>Scheduled for 2022/23</i>	This is to be included in the Rehabilitation Monitoring Report which reports on the first round of permanent plot data collection. This will be provided within the reporting period.
C	Report maintenance effort for TSF2 and species/areas treated, including lake edge (willow). Report locations and treatment of royal fern, acacia, miscanthus, and Spanish heath (identified in Ryder Environmental Ltd 2021) and honeysuckle (under pines).	Included in Section 1.5.2.2.
I	Use the Ryder Environmental (2021) report and TSF2 PSP data to propose a) rehabilitation trajectories b) rehabilitation options that create diverse, rich habitats for threatened native wetland species and terrestrial species. Link to updated landscape plan and embankment root zones. <i>This is scheduled for 2023 using permanent plot data and trial result data</i>	This is to be included in the Rehabilitation Monitoring Report which reports on the first round of permanent plot data collection. This will be provided within the reporting period.
P 2021	Report annual maintenance effort for embankment native plantings within kete and other areas; report seedling species and density in kete and older areas of native planting. <i>This will be reported using information from the permanent plots established in 2022</i>	Included in Section 1.5.2.2.
P	Develop plan for management and extraction of soil in stockpile F that enhance soil quality, i.e. remove scattered gorse, relieve compaction and encourage deep-rooted pasture.	Topsoil Management Procedure currently in development. Gorse control undertaken during reporting period.

Martha Pit

C 2021	Add a key to the Closure Concept Plan (RCP Fig. 2) with a table that describes each of the labelled rehabilitation areas. <i>Request needed clarification</i>	Additional details included in this year's Rehabilitation and Closure Plan. Note that this is a <i>concept</i> plan and further details will be added as the site nears closure.
I 2021	List pest plants/'invasive weeds' in the Martha Pit and pit rim walkways/ landscape area. Categorise these plants into different types of management based on impact on maintaining a 'self-sustaining groundcover'. Identify, map and prioritise species and maintenance areas (e.g. pit wall above/below 1104 RL, pit edge, lookouts, general landscaping). <i>Request needed clarification.</i>	Included in Pest Control Management Plan (Appendix C).
I	Create a new map in the Annual Work Plan showing locations of pest trees. This will include the 'Screen Area with progressive removal of pest trees', and other areas around the pit rim.	Included in Pest Control Management Plan (Appendix C).
C	Remove regrowth of pest tree species in 'Screen Area with progressive removal of pest trees': including acacia, cherry, privet and lilly pilly (there may be other species as well)	Completed in 2023.
C	Remove tree privet from within grated cover of adit by walkway while leaving native regrowth. Remove agapanthus and ivy where near the pit wall or 'pit-side' of the pit rim fence.	Completed in 2023.
P 2021	Assess triggers for management of trees (including rewarewa and pohutukawa) on pit walls to ensure stability of the pit wall above 1104 RL and develop specific vegetation management / establishment methods for survey control and prism monitoring of pit wall deformation that meets rehabilitation objectives.	Large trees (including rewarewa) are to be excluded from pit walls to ensure stability of the pit wall above 1104 RL, as rooting depths may later cause blow out of the batter in high winds. This is managed during annual weed control, where any large trees (including native trees) are removed from the pit walls. Pohutukawa is the exception as it can hold eroding cliff faces and is currently being trialled as a potential revegetation option for the pit walls. OGNZL are continuously investigating options for revegetation of the pit walls to develop vegetation establishment methods that meet rehabilitation and closure objectives.
I 2021	Include a summary of maintenance actions and effort for Martha Pit surrounds in the 2023 RCP. Separate walkway surface /drain maintenance, trimming/mowing, and 'campaign weed control'. <i>Request needed more detail to clarify areas of value</i>	Included in Section 1.5.2.2
P 2021	Identify and summarise revegetation techniques that deliver successful pit wall rehabilitation above 1104 RL and long-term rehabilitation trajectories using data from permanent plots established in 2022 within fascined and planted areas. Present in 2023 RCP.	This is to be included in the Rehabilitation Monitoring Report which reports on the first round of permanent plot data collection. This will be provided within the reporting period.
Rehabilitation and Closure Plan		
I	Refine and specify 'best practice' rehabilitation principles and quantitative criteria to guide overall rehabilitation including native terrestrial and wetland areas (plantings, fascining) on the tailings structures (embankment and ponds) that support habitats for <u>native</u> birdlife and other fauna. Include predicted	Not a priority during this reporting period, to be addressed in future reporting periods.

succession trajectories to identified reference ecosystems.

I *RCP	Develop a Section of the RCP that identifies how areas adjacent to rehabilitated shrubland, pasture and wetland will be progressively managed to support the rehabilitation closure criteria in a 'whole of landscape' biodiversity plan, including management of pest plants and animals and provision of stock shelter. Show how these complement Farm Environmental Plan/s for the OGLNZ properties.	Not a priority during this reporting period, to be addressed in future reporting periods.
C 2021	Expand and improve the schematic plans. Include a narrative that identifies changes between RCP Fig. 1 and Fig. 2. If keeping RCP Fig. 1, ensure the key differentiates between the two colours. Add a legible and informative key to RCP Fig. 2 with a table that describes each of the labelled areas.	Key included in Figure 1 in this year's Rehabilitation and Closure Plan. Additional details around changes between the plans included. Note that the changes are not material. Also note that this is a <i>concept</i> plan and further details will be added as the site nears closure.
C	Amend the RCP section describing planting pit berms as this is no longer current practice.	Removed in this version of the Rehabilitation and Closure Plan.
I *RCP	Review soil closure criteria. Add pH for areas in pasture. Develop soil criteria for indigenous ecosystems, their root zone depths (including in relation to te ao turoa).	Not a priority during the current reporting period. To be investigated in future reporting periods.
I 2021	Include a summary of actual and predicted topsoil inventory and requirements alongside other materials planned for use in rehabilitation root zones (Zone H).	Not a priority during the current reporting period. To be investigated in future reporting periods.

Table 6: Hydrogeological Peer Reviewer Recommendations

Recommendation	OGNZL Progress
Discharge of Bypass Seepage to Groundwater – Section 1.4.4 Paragraph 4 states “The company is currently collecting additional flow data to ground truth the groundwater mass balance.” Provide information on what additional flow data the company is currently collecting to ground truth its groundwater mass balance. This should be corrected in future Rehabilitation and Closure Plan reports.	Statement removed from this year's RCP.
The Peer Reviewers recommend that the RCP include a new section describing the surface – groundwater recovered system following flooding of the underground workings and formation of the Pit Lake in the Open Pit. This needs to be tied into culturally significant and environmental sensitive water bodies and springs in the region. The post closure environment is to present potential effects/changes to these water bodies. A descriptive and schematics (plan view and sections) of conceptualisation is recommended for the operational area and will encompass the mine voids and associated infrastructure (waste rock dumps and TSFs). This will include predicted or inferred groundwater levels, flow pathways and water quality, surface – groundwater interaction, particularly with respect to spring flow and surface water bodies of cultural significance. Conceptual plans/sections should be aligned to include ecological/cultural important water	OGNZL is currently working with GWS Limited to develop a monitoring plan to assess the surface-groundwater recovered system. A preliminary document will be produced during the next reporting period (2023/2024).

assets. Conceptualisation should present the pre mining and post closure hydrological environment. This will provide a baseline for environmental and cultural assessment of recovered groundwater levels and its impacts on groundwater related surface water bodies such as springs, wetlands and streams, and closure criteria for these aspects. This work would be expected to take 1 – 1.5 years (completion by first half of 2023), but continually updated as a live document as new information comes about during the progress of mining operations.

Recommendations from the 2022/2023 Geochemistry Peer Reviewer Report require large changes to the current Rehabilitation and Closure Plan, including updating closure concepts and criteria with additional stakeholder input. Given the site’s final landform is currently unknown with the Waihi North Project in the consenting phase, it is proposed that these changes are incorporated following the decision on the Waihi North Project consent applications.

Table 7: Geochemistry Peer Reviewer Recommendations

Recommendation	OGNZL Progress
<p>Oceana Gold should implement a review of the rehabilitation and closure plan with the purpose of:</p> <ol style="list-style-type: none"> 1) Taking advantage of the new and diverse experience involved at Waihi within the Oceana team, in the regulator organisations, related to Iwi with current consultants, and with subsequent peer review. 2) Modernising, developing and progressing ideas and concepts where appropriate 3) Integration of the rehabilitation and closure plan with current work related to cultural balance. 4) Increasing ownership and knowledge of the plan with current staff, regulators and consultants followed by peer reviewer. 5) Developing concepts for post closure uses of the site. 	<p>This action will be commenced once the Cultural Balance Plan has been completed.</p>
<ol style="list-style-type: none"> 1) Review current pit wall revegetation plan as part of 2022 Recommendation 1 and ensure appropriate input from Iwi and stakeholders followed by peer review. 2) Provide monitoring framework for pit wall vegetation and vegetation trials, possibly a mix of qualitative (photo or drone monitoring) and quantitative (measured plots for flora and fauna, soil testing etc). 	<ol style="list-style-type: none"> 1) This action will be commenced once the Cultural Balance Plan has been completed. 2) This is to be included in the Rehabilitation Monitoring Report which reports on the first round of permanent plot data collection. This will be provided within the reporting period.
<ol style="list-style-type: none"> 1) Review current waste rock embankment revegetation plan as part of 2022 Recommendation 1 focussing on shrubland areas and ensure appropriate input from stakeholders followed by peer reviewers. Include an assessment of linkages between areas adjacent to the embankment such as the riparian areas for streams, the hillside behind the TSF area and future wetland areas near streams or ponds above tailings. 2) For shrubland areas or riparian areas around tailings ponds provide monitoring framework for vegetation and vegetation trials, possibly a mix of qualitative (photo or drone monitoring) 	<ol style="list-style-type: none"> 1) This is proposed to be addressed following Waihi North Project consenting. 2) Rehabilitation Progress Report produced which has commenced monitoring and outlines monitoring framework.

and quantitative (measured plots for flora and fauna, soil testing etc).

1) The Martha Mine Master Rehabilitation and Closure Concept Plan that has been developed to date should be reviewed as part of 2022 Recommendation 1. Under current consenting processes the expectation for mine consent holders is that rehabilitation and closure planning would include heritage, sustainable land use and tourism as well as cultural balance. So, the masterplan, the rehabilitation and closure plan and pending cultural balance plan should be completely aligned and seamless. It may remain necessary to separate technical closure of the site to meet consent conditions from additional work that constitutes an offset or discretionary activity, however alignment between all plans would be a significant improvement.

This recommendation will be addressed once the Cultural Balance Plan is completed.

- 1) Clarify the timeline for development and completion of acceptable closure conditions and peer review of the conditions.
- 2) Clarify the locations for quantitative measurement of water quality with maps.
- 3) Prior to handover of the site, review the adequacy of the values in Tables 1 and 2, and the range of parameters that are measured, these were probably established during initial mine consent and might require update.
- 4) Provide a map that shows area D and improve narrative criteria for groundwater quality.
- 5) For vegetation types and plantings including pasture, embankment natives and pit walls and surround, improve definitions of acceptable and unacceptable plants and provide maps so that it is clear which plants are desired where and also where deep rooted species should not be permitted to establish.
- 6) Integrate closure criteria with links to surrounding areas such as riparian zones, hill side behind TSF and other adjacent areas operated by Oceana Gold. And link this work to the cultural balance plan.
- 7) Assess if other features or areas require closure criteria such as tailings supernatant water.

- 1) This is proposed to be addressed following Waihi North Project consenting.
- 2) Discharge to surface water will be from the existing two discharge locations, E1 and E2. Discharge locations of seepage water is yet to be determined, and locations will be approved by WRC, prior to any discharge commencing.
- 3) Parameters in tables 1 and 2 are the current operational limits and are currently considered adequate. These will be updated should consent conditions require it.
- 4) Map of area D included in Section 1.4.4. The narrative text is directly from consent conditions and has been approved by the Councils in earlier reporting periods.
- 5) This is now included in the Pest Control Management Plan (Appendix C).
- 6) This will be addressed once the Cultural Balance Plan is completed and a decision on the Waihi North Project has been made.
- 7) It is proposed that this should occur once a decision on Waihi North Project consenting has occurred.

- 1) A work breakdown and simplified gantt chart for the entire closure process should be completed.
- 2) The relatively new peer review team should assess adequacy of the risk register for their expert areas.
- 3) In general, more figures should be supplied so that there is certainty regarding things like
 - o Areas where large trees that might adversely affect the cap should not be permitted
 - o Likely sampling sites for discharge monitoring and compliance monitoring
 - o Likely sites for deformation monitoring

- 1) A detailed work break down and gantt chart will be produced for planned closure when the site is nearer to closure and final landforms associated with Waihi North Project are known.
- 2) It is proposed that this should occur once a decision on Waihi North Project consenting has occurred.
- 3) More images included where requested in earlier recommendations.



Appendix A – Consent Conditions

The relevant conditions are:

1. Varied Mining Licence 32-2388

3.1

Rehabilitation.

1c *The licensee shall progressively implement Part A of the approved Rehabilitation and Closure Plan and shall implement Part B of the approved Rehabilitation and Closure Plan in the event of closure occurring. The appropriate Rehabilitation and Closure Plan is the plan approved pursuant to the conditions of the resource consents granted by the Waikato Regional Council for the extended project.*

Fencing.

...

22c. *On completion of mining operations any fences not required for safety purposes to be either removed or retained by mutual agreement between the relevant territorial authorities and the licensee.*

Waste Rock Embankments and Tailings Ponds

...

32. *Immediately following the completion of tailings deposition and until rehabilitation of the surface is complete the surface level of the tailings shall be measured at not less than two-monthly intervals to provide a record of settlement."*

Rehabilitation

General

33. *The licensee shall rehabilitate the whole licence area in accordance with the approved Rehabilitation and closure Plan referred to in condition 1c, and in accordance with the work programme specified in condition 2.*

34. *The licensee shall progressively strip and stockpile, as far as practical, topsoil from all areas to be used for construction and waste disposal in the process plant and waste disposal area. This stockpiled topsoil or topsoil stripped during the course of operations shall be used to produce the maximum rehabilitation benefit.*

Mine Site

35. *At all times mining shall be carried out in a manner which will ensure that environmental disturbance is kept to a minimum. All necessary steps shall be taken by the licensee to prevent unnecessary destruction of or damage to vegetation or property and to ensure the safety of the public and livestock.*

36. *Mining, processing and waste disposal operations shall be carried out in such a manner as to ensure that the surface of the land suffers as little permanent damage as possible. The licence area is to be left in a clean and tidy condition after mining operations have ceased*

including removing from public view any used derelict equipment and machinery and the pit faces are to be left in a stable and safe condition.

37. *The upper pit slopes shall be treated to ensure revegetation as soon as possible in the mining programme and in accordance with the current approved Rehabilitation and Closure Plan. Revegetation of the upper slopes will be carried out as far as practicable and may preserve some areas without vegetation to preserve and reflect the mining heritage of the town provided that the water quality of the Pit lake remains suitable for direct discharge to surface waters in accordance with resource consents held by the licensee from the Waikato Regional Council.*
38. *Adequate drainage shall be provided on all access tracks and benches to prevent erosion of any adjacent land.*

Conveyor Route

39. *Upon completion of the project the land along the conveyor route shall be restored to its former condition unless the relevant territorial authority requires that it shall be left for use as a public walkway or other useful amenity provided that the cost of so doing does not exceed the cost of restoration to the former condition.*

Process Plant Site

40. *If, at or after the end of mining operations, the process plant or the wastewater treatment plant is dismantled, the area formerly occupied by and surrounding the dismantled plant shall be contoured, and as far as is reasonably practicable restored and in a manner that will protect water quality and avoid soil erosion.*

Tailings and Waste Disposal Site

41. *The licensee shall make good all final surfaces of the waste rock embankments, tailings storage areas, perimeter bund and any associated works in the waste and tailings disposal area at Baxter Road.*
42. *Rehabilitation of the final surface shall be progressive as areas of a practical working size become available and shall include the provision of a suitable rooting medium, contouring and drainage as required, to ensure the establishment and maintenance of a surface which will protect water quality and avoid soil erosion.*

42A

- (a) *Prior to each increase in embankments and crest height of Tailings Storage Facility 1A above RL 166, as part of the Third Stage – Continued Waihi Operations within Annex A, the licensee shall provide to the Hauraki District and Waikato Regional Councils for their approval, a report detailing the height of the crest rise, the sequence of works proposed, and an anticipated timeline in which the physical works and revegetation of the embankments and crest will occur. The approved report shall form part of the Rehabilitation and Closure Plan required by 1(c) of this licence and shall incorporate the revegetation programme in 42A(c) below.*

- (b) *The licensee shall have completed revegetation of the embankment slopes of Storage 1A to RL166 by 31st March 2014.*
- (c) *Unless otherwise agreed in writing by Hauraki District Council and Waikato Regional Council, the licensee shall undertake the revegetation planting of the embankment slopes of Storage 1A such that after 31st March 2014, all revegetation planting shall be staged relative to the annual lifts of the embankment crest, i.e. the lift undertaken in the previous season is to be revegetated while the current season's lift is being undertaken. Stockpile areas are excluded from the requirements of 42A(b) & (c).*
- (d) *If the programme in 42A(c) above is not achieved, the licensee shall forthwith provide a review to Hauraki District and Waikato Regional Councils detailing the reasons why this has occurred and measures proposed to address programme timing.*

Post Production

- 45. *The maintenance of the Martha Hill Amenity Lake and Use Buildings shall be the responsibility of the company for the period of ten (10) years following the end of production operations or until the end of the licence period whichever is the sooner.*

Annex A

The Open Pit

Rehabilitation

- 41. *At the end of mining operations the dewatering pumps will be moved and the void created will refill with water (groundwater and stormwater). It is proposed to augment the filling of the pit by taking water from the Ohinemuri River. After a period of approximately five years a new lake will be created. This will be rehabilitated into a recreational area in accordance with the approved Rehabilitation and Closure Plan.*

The Tailings and Waste Disposal Area

Rehabilitation

- 77. *The waste and tailings disposal area will be rehabilitated in accordance with the approved Rehabilitation and Closure Plan to grass and native vegetation and wetlands (with permanent ponds). This will be achieved by staged revegetation of final slopes of the disposal area as soon as disposal operations allow. Stockpiled topsoil will be used to the maximum benefit in rehabilitation.*

2. Martha Mine Extended Project - Waikato Regional Council Consents and Conditions

9.0 Rehabilitation/closure Plan

- 9.0 *Prior to commencement of construction of the tailings storage facility (Storage 1A), the consent holder shall prepare a concept plan ("the Plan") describing the proposed method of rehabilitation and closure of the Site. The objective of this Plan shall be to ensure*

rehabilitation and closure of the Site in such a manner that in the long term the Site, and any structures on it, will remain stable; and any water discharging from the Site, and any groundwater under the Site, will be of a quality such that it will not adversely affect aquatic life, or other users of the water resource.

9.1 *The plan shall be in two parts:*

- *Part A shall describe the programme of progressive rehabilitation (including revegetation) that is proposed for the Site for the following twelve months, should closure not be proposed during that period; and shall report on any such works undertaken during the previous year*
- *Part B shall:*
- *A) describe the proposed method of final rehabilitation and closure should closure occur within the following twelve months*
- *B) include an assessment of any residual risk that the Site would pose to the environment and the neighbouring community should closure occur within the following 12 months.*
- *C) include a programme for monitoring of the Site following closure, and list all maintenance works likely to be necessary at the closed Site for the foreseeable future.*

9.2 *Review*

The Plan shall be reviewed and updated annually and the concepts shall be described in more detail as appropriate.

The consent holder shall submit the Plan, and each annual review and update thereof, to the Panel for its review.

The consent holder shall then submit the peer reviewed Plan to the Waikato Regional Council for approval.

9.3 *Implementation*

The consent holder shall progressively implement Part A of the approved Plan and shall implement Part B of the approved Plan in the event of closure occurring.

3. Martha Mine Extended Project - HDC Land Use Consent and Conditions (No 97/98 – 105)

3.23 Rehabilitation

...

- (a) *The consent holder shall rehabilitate all areas that have been subjected to mining operations as part of the Extended Project.*

- (b) *Prior to the commencement of construction of the tailings storage facility (Storage 1A), the consent holder shall submit to the Council for approval detailed rehabilitation plans. These plans will be consistent with the relevant Annual Work Programme referred to in Condition 3.2 and the Rehabilitation/Closure Plan approved by the Peer Review Panel pursuant to Condition 8 of Schedule 1 to the Waikato Regional Council consents.*
- (c) *The rehabilitation plans shall set out:*
- *proposed recontouring of and rehabilitation of the noise bunds.*
 - *Landscaping and details regarding facilities proposed for the recreational reserve at the eastern end of the new mine lake;*
 - *Location of pedestrian access, tracks and viewing facilities around the extended pit perimeter;*
 - *Planting and landscaping proposals for the remainder of the upper pit benches/batters and the immediate pit surrounds, that have not already been progressively rehabilitated;*
 - *Ongoing rehabilitation measures proposed to pyritic rock areas;*
 - *Safety fencing*
 - *Maintenance proposals;*
 - *With respect to Area D the areas to be grassed*
 - *Details of the investigation and removal process for areas that may contain contaminated soils.*
- (d) *In considering these plans, Council shall take into account:*
- *the degree of compliance with the concepts described in the relevant Annual Work Programme;*
 - *their usefulness and practicability in terms of the Waihi community;*
 - *on-going maintenance issues.*

HDC 3.31, condition 10 contains the following condition:

The Councils shall release the rehabilitation bond on the completion of closure of the site.

“Completion of closure of the site” means when the elements of the entire project have been demonstrated by the consent holder to the satisfaction of the Councils to have reached a stable, self-sustaining, rehabilitated state as defined by the approved Rehabilitation Plan.”

4. Storage 2 Consents – Waikato Regional Council

Rehabilitation conditions are also specified in the existing consents for Storage 2.

The existing consents for Storage 2 state the following:

- W1761. “To discharge natural water containing waste onto the land and into the ground beneath storage 2 and the holding pond”.

12. *The Grantee shall remove at the request of the Board mining equipment, buildings, pipes, silt traps and other structural works associated with the Water Right at the expiry, surrender or abandonment of the right provided that this condition shall not apply to the water treatment plant if the relevant territorial local authority consents to its remaining.*

Note that the condition above also applies to W1751 below. In addition, the following conditions apply:

W1751 "To dam unnamed water courses in order to construct a perimeter bund and access road around the north, west and south edges of the designated areas for storages 1 and 2 for waste and tailings disposal"

1. *The rehabilitation plans and progressive rehabilitation of the site of the bund will be reviewed by a Peer Review Panel whose members will be appointed by the Grantee and approved by the Board. All costs related to the Peer Review Panel shall be borne by the Grantee.*
2. *The Grantee shall be responsible for ongoing maintenance of the rehabilitated area for the term of the right.*

Note that conditions 6 and 7 above, are also specified in W1749 "To dam unnamed water courses within the designated area for storage 2 in order to construct an impoundment structure for the containment of tailings from mining operations..."

5. Conveyor Silt Ponds – Waikato Regional Council

Condition 13 of W 1742 states the following:

"The Grantee shall rehabilitate and landscape the catchment and adjoining land surrounding the open pit site in accordance with the Rehabilitation and Closure Plan as specified in Schedule 1 of the Waikato Regional Council Consents for the Extended Martha Mine Project as granted in December 1998."

Condition 12 of W1743 states the following:

"The Grantee shall remove at the request of the Board mining equipment, buildings, pipes, silt traps and other structural works associated with this Water Right at the expiry, surrender or abandonment of the right provided that this condition shall not apply to the water treatment plant if the relevant territorial local authority consents to its remaining."

6. HDC Land use Consent 85.030.009.PP (Pumphouse Relocation)

8. Rehabilitation

"The consent holder shall rehabilitate all the areas subject of the earthworks upon completion of the works to a state as good as it was before the work commences. The rehabilitation works within Mining Licence 32-2388 shall be generally in conformity with the approved Rehabilitation and Closure Plan dated July 2001 – 2002 or any subsequent approved update".

7. Favona Underground Mine Consents – Hauraki District Council Land Use Consent 85.050.326.E

Rehabilitation

- “29. The consent holder shall prepare a Rehabilitation Plan covering all areas that may be affected by the Favona Underground Mine. This Plan shall be submitted to the Council for written approval prior to the exercise of this consent. The Plan shall set out details on flooding of the mine, plugging of the decline, landscaping, rehabilitation of the polishing pond stockpile area, planting, fencing, and ongoing maintenance and may be the same Plan that is required as a condition of consents granted by the Waikato Regional Council (see note below). The Plan shall be consistent with and complement the Rehabilitation Plan prepared for the Martha consents.
30. The consent holder may amend the Plan at any time. No amendments shall be made to the Plan without the written approval of Council. Unless otherwise agreed in writing by the Council, the consent holder shall undertake the rehabilitation works in accordance with the most recent version of the approved Rehabilitation Plan.”

(Note: Conditions 29 & 30 are complementary to Condition 4 of Schedule One – General Consents granted by the Waikato Regional Council).”

6. Favona Underground Mine Consents – Waikato Regional Council

Schedule 1 attached to resource consent numbers 109741, 109742, 109743, 109744, 109745 and 109746 states the following:

7. Rehabilitation Plan

“The consent holder shall prepare a Rehabilitation Plan covering all areas that may be affected by the Favona Underground Mine. This Plan shall be submitted to the Council for written approval prior to the exercise of this consent. The Plan shall set out details on flooding of the workings, plugging of the decline, landscaping, rehabilitation of the polishing pond stockpile area, planting, fencing, and ongoing maintenance and may be the same Plan that is required pursuant to condition 27 of the land-use consent granted by the Hauraki District Council. The Plan shall be in alignment with the Rehabilitation Plan prepared for the Martha consents.

The consent holder may amend the Plan at any time. No amendments shall be made to the Plan without the written approval of the Council. Unless otherwise agreed in writing by the Council, the consent holder shall undertake the rehabilitation works in accordance with the most recent version of the approved Rehabilitation Plan.”

8. Screen Planting Conditions

The conditions of Hauraki District Council Land Use Consent No 97/98-105 and the varied Mining Licence 32-2388 require the preparation of a management plan for screen planting to mitigate the visual effects of the Extended Pit and the Grey Street noise bund.

Specifically the screen planting conditions are as follows:

“3.14 Screen Planting

- (a) *Prior to the exercising of the consent, the consent holder shall prepare and submit to the Council for approval a plan and schedule indicating planting proposals to mitigate the visual effects of extending the open pit. This plan and schedule will include:*
- *An outline of the type and approximate number of plants to be used;*
 - *Details of the trees and plants to be relocated as a result of mining activities and the position that those trees and plants will be relocated;*
 - *A planting plan on a suitable scale agreed with Council;*
 - *A schedule of implementation;*
 - *A programme for the progressive removal of invasive exotic trees, plants and seedling (e.g. wattle and pine) in order that the intended mix of native and exotic plants becomes the dominant species.*

Within twelve months of granting this consent, the consent holder shall commence implementing the planting schedule.

- (b) *The noise bunds at Grey Street and to the west of the pit shall be hydroseeded and planted in accordance with the plan referred to in (a) above immediately following completion of construction of the bunds.”*

Mining Licence condition 25 is similar to the aforementioned condition.

In addition Mining Licence condition 6 states the following under the heading “Construction Operations”.

“Vegetation outside of the area 5 metres from the final pit perimeter as shown in Annex A to the licence boundary shall be protected and retained to the maximum extent practicable and where necessary, particularly opposite the top of Martha Street and Savage Road, shall be supplemented to minimise the visual impact of the project.”

9. Grand Junction Refinery and Strong Rooms Relocation Consent

10. A landscaping plan be prepared and approved by HDC’s Planning and Environmental Services Manager within 6 months of relocating the Refinery and Strong room/s. The landscaping plan shall facilitate public viewing from the Pit-Rim walkway and accommodate future public access to the building. Maintenance of the landscaped area shall be the responsibility of the consent holder.
17. That the Martha Mine Rehabilitation Plan (MMRP) shall be updated to take account of the CMP requirement, as part of the 2010 Annual Review Programme, and that the CMP, once completed, be incorporated by reference into the MMRP.

10. Trio Development Project HDC Land Use Consent RC-15735

3. The land use activities permitted under this consent for all activities relating to the Trio Development Project within the Trio Project Area as described in the application documents, being the construction and use of an exploration access incline and decline and

associated underground workings and facilities, include, but are not limited to, the following activities:

...

- Rehabilitation activities, including backfilling with waste rock and flooding with treated water and water from the Ohinemuri River.
20. The consent holder shall prepare a Rehabilitation Plan covering all areas that may be affected by the construction and use of the workings associated with the Trio Development Project. This plan shall be submitted to the Waikato Regional Council and Hauraki District Council (the "Councils") for written approval within 2 months to the exercise of this consent. The Plan shall set out details on flooding the underground workings, backfilling the vent shaft and access decline, and removal of surface infrastructure and planting of surface areas affected. As a minimum the Plan shall provide for the backfilling of the initial 200m length of the access decline tunnel from the current Favona access tunnel. The consent holder may amend the Plan at any time. No amendments shall be made to the Plan without the written approval of the Councils. Unless otherwise agreed in writing by the Councils, the consent holder shall undertake the rehabilitation works in accordance with the approved Rehabilitation Plan.

The Plan shall be consistent with and complement the Rehabilitation Plan required by the conditions of consent for the Martha and Favona mines.

11. Trio Development Project WRC Consents (121416-121418, 121446, 121447).

Schedule 1, Condition 4:

The consent holder shall prepare a Rehabilitation Plan covering all areas that may be affected by the construction and use of the workings associated with the Trio Development Project. This plan shall be submitted to the Waikato Regional Council and the Hauraki District Council (the "Councils") for written approval within 2 months of the exercise of this consent. The Plan shall set out details on flooding the underground workings, backfilling the vent shaft and access decline, and removal of surface infrastructure. The consent holder may amend the Plan at any time. No amendments shall be made to the Plan without the written approval of the Councils. Unless otherwise agreed in writing by the Councils, the consent holder shall undertake the rehabilitation works in accordance with the approved Rehabilitation Plan.

12. Trio Mine HDC Land Use Consent.

24. The consent holder shall prepare a Rehabilitation Plan covering all areas that may be affected by the construction and use of the workings associated with the Trio Underground Mine Project. This Plan shall be submitted to the Waikato Regional Council and Hauraki District Council for written approval prior to the exercise of this consent.

- 24.1 The Plan shall be in two parts:

Part A shall describe the programme of progressive rehabilitation (including re-vegetation and backfilling) that is proposed for the site for the following twelve months, should closure

not be proposed during that period; and shall report on any such works undertaken during the previous year.

Part B shall:

- describe the proposed method of rehabilitation and closure should closure occur within the following 12 months;
- include an assessment of an residual risk that the site would pose to the environment and the neighbouring community should closure occur within the following 12 months; and
- include a programme for monitoring of the site following closure, and list all maintenance works likely to be necessary at the closed site for the foreseeable future.

24.2 Review

The Plan shall be reviewed and updated annually and the concepts shall be described in more detail as appropriate.

The consent holder shall submit the Plan, and each annual review and update thereof, to the Peer Review Panel (as required by the Martha Extended Project) for its review.

The consent holder shall then submit the peer reviewed Plan to the Hauraki District Council and Waikato Regional Council for approval.

24.3 Implementation

The consent holder shall implement Part A of the approved Plan and shall implement Part B of the approved Plan in the event of closure occurring.

24.4 Rehabilitation Plans associated with the Martha Extended Project and Favona Mines

The rehabilitation Plan may also include any other information that the consent holder wishes, and may be combined with the Rehabilitation Plan(s) associated with the Martha open pit and Favona underground mines.

13. Trio Mine WRC Consents (121694-121697)

Schedule 1, condition 4:

4. The consent holder shall prepare a Rehabilitation Plan covering all areas that may be affected by the construction and use of the workings associated with the Trio Underground Mine Project. This Plan shall be submitted to the Waikato Regional Council and Hauraki District Council for written approval prior to the exercise of this consent.

- 4.1 The Plan shall be in two parts:

Part A shall describe the programme of progressive rehabilitation (including re-vegetation and backfilling) that is proposed for the site for the following twelve months, should closure not be proposed during that period; and shall report on any such works undertaken during the previous year.

Part B shall:

- describe the proposed method of rehabilitation and closure should closure occur within the following 12 months;
- include an assessment of an residual risk that the site would pose to the environment and the neighbouring community should closure occur within the following 12 months; and,
- include a programme for monitoring of the site following closure, and list all maintenance works likely to be necessary at the closed site for the foreseeable future.

4.2 Review

The Plan shall be reviewed and updated annually and the concepts shall be described in more detail as appropriate.

The consent holder shall submit the Plan, and each annual review and update thereof, to the Peer Review Panel (as required by the Martha Extended Project) for its review.

The consent holder shall then submit the peer reviewed Plan to the Hauraki District Council and Waikato Regional Council for approval.

4.3 Implementation

The consent holder shall implement Part A of the approved Plan and shall implement Part B of the approved Plan in the event of closure occurring.

4.4 Rehabilitation Plans associated with the Martha Extended Project and Favona Mines

The Rehabilitation Plan may also include any other information that the consent holder wishes, and may be combined with the Rehabilitation Plan(s) associated with the Martha open pit and Favona underground mines.

14. Correnso Mine HDC Consent

4. Rehabilitation Plan

The consent holder shall prepare a Rehabilitation Plan covering all areas that may be affected by the construction and use of the workings associated with the underground mining within Area L of the Golden Link Project Area. This plan shall be submitted to the Waikato Regional Council and the Hauraki District Councils (the "Councils") for written approval prior to the exercise of this consent. The Plan shall set out details on backfilling and flooding the underground workings, backfilling the vent shaft and access decline, and removal of surface infrastructure. The consent holder may amend the Plan at any time. No amendments shall be made to the Plan without the written approval of the Councils.

Unless otherwise agreed in writing by the Councils, the consent holder shall undertake the rehabilitation works in accordance with the approved Rehabilitation Plan.

15. Correnso Mine WRC Consents 124859-124864

73 The consent holder shall prepare a Rehabilitation Plan (Plan) covering all areas that may be affected by the construction and use of workings associated with the Correnso Underground Mine. This plan shall be submitted to Waikato Regional Council and Hauraki District Council for written approval prior to the commencement of the Correnso Underground Mine.

a) The Plan shall be in two parts:

i) Part A shall describe the programme of progressive rehabilitation (including revegetation and backfilling) that is proposed for the site(s) for the following twelve months, should closure not be proposed during that period; and shall report on any such works undertaken during the previous year.

b) Part B shall:

- i) Describe the proposed method of rehabilitation and closure should closure occur within the following 12 months;
- ii) Include an assessment of any residual risk that the site(s) would pose to the environment and the neighbouring community should closure occur within the following 12 months, and
- iii) Include a programme for monitoring of the site(s) following closure, and list all maintenance works likely to be necessary at the closed site(s) for the foreseeable future.

c) The consent holder shall implement Part A of the approved Plan and shall implement Part B of the approved Plan in the event of closure occurring.

16. Slevin Underground Project Area (SUPA) HDC Consent 202.2016.00000544.001

36 The consent holder shall prepare a Rehabilitation Plan (Plan) covering all areas that may be affected by the construction and use of workings associated with the Slevin Underground Mine. This plan shall be submitted to Waikato Regional Council and Hauraki District Council for written approval prior to the commencement of the Slevin Underground Mine.

a) The Plan shall be in two parts:

i) Part A shall describe the programme of progressive rehabilitation (including revegetation and backfilling) that is proposed for the site(s) for the following twelve months, should closure not be proposed during that period; and shall report on any such works undertaken during the previous year.

b) Part B shall:

- iv) Describe the proposed method of rehabilitation and closure should closure occur within the following 12 months;
 - v) Include an assessment of any residual risk that the site(s) would pose to the environment and the neighbouring community should closure occur within the following 12 months, and
 - vi) Include a programme for monitoring of the site(s) following closure, and list all maintenance works likely to be necessary at the closed site(s) for the foreseeable future.
- c) The consent holder shall implement Part A of the approved Plan and shall implement Part B of the approved Plan in the event of closure occurring.

17. Martha Drill Drive Project (MDDP) HDC Consent 202.2017.00000664.001

(conditions superceded by Project Marths)

28 The consent holder shall prepare a Rehabilitation Plan (Plan) covering all areas that may be affected by the construction and use of workings associated with the MDDP. This plan shall be submitted to Waikato Regional Council and Hauraki District Council for written approval prior to the commencement of the MDDP.

a) The Plan shall be in two parts:

i) Part A shall describe the programme of progressive rehabilitation (including backfilling) that is proposed for the site(s) for the following twelve months, should closure not be proposed during that period and shall report on any such works undertaken during the previous year.

b) Part B shall:

i) Describe the proposed method of rehabilitation and closure should closure occur within the following 12 months;

ii) Include an assessment of any residual risk that the site(s) would pose to the environment and the neighbouring community should closure occur within the following 12 months; and

iii) Include a programme for monitoring of the site(s) following closure, and list all maintenance works likely to be necessary at the closed site(s) for the foreseeable future.

c) The consent holder shall implement Part A of the approved Plan and shall implement Part B of the approved Plan in the event of closure occurring.

29 The Plan shall be reviewed and updated annually and the concepts shall be described in more detail as appropriate.

30 The consent holder shall submit the Plan, and each annual review and update thereof, to the Peer Review Panel (as required by the Martha Extended Project HDC Consent No. 97/98-

105) for its review.

31 The consent holder shall then submit the peer reviewed Plan to Hauraki District Council and Waikato Regional Council for approval.

32 The Rehabilitation Plan may also include any other information that the consent holder wishes, and may be combined with the Rehabilitation Plan(s) associated with the Martha open pit and underground mines of Favona, Trio, CEPPA and SUPA.

18. Project Martha Consent HDC/WRC Common Conditions

23 The consent holder shall rehabilitate all areas that have been subject to mining activities as authorised as part of this consent.

24 The consent holder shall prepare a Rehabilitation and Closure Plan covering all areas that may be affected by the mining activities authorised as part of this consent. The plan shall be submitted to the Councils for certification at least 30 working days prior to the commencement of mining activities authorised by this consent. If certification is not provided within 30 working days of the Councils' receipt of the Rehabilitation and Closure Plan mining activities authorised by this consent may commence.

25 The Rehabilitation and Closure Plan shall be in two parts:

a. Part A shall describe the programme of rehabilitation (including re-vegetation and backfilling) that is proposed for the site(s) for the following twelve months, should closure not be proposed during that period; and shall report on any such works undertaken during the previous year;

b. Part B shall:

i. Describe the proposed method of rehabilitation and closure should closure occur within the following 12 months;

ii. Include an assessment of any residual risk that the site(s) would pose to the environment and the neighbouring community should closure occur within the following 12 months; and

iii. Include a programme for monitoring of the sites(s) following closure, and list all maintenance works likely to be necessary at the closed site(s) for the foreseeable future.

19. Project Martha HDC Land Use Consent Conditions

60. The consent holder shall prepare and implement a maintenance programme for the removal of invasive exotic trees, plants and seedlings in areas surrounding the Martha Pit. The maintenance programme shall be documented in the Rehabilitation and Closure Plan required in accordance with Condition 24 of Schedule One.

Appendix B – EGL Closure Criteria



3 June 2021

NEWMONT WAIHI GOLD TAILINGS STORAGE FACILITIES CLOSURE CRITERIA

1.0 INTRODUCTION

Newmont Waihi Gold require criteria to be developed that must be satisfied before official closure of the tailings storage facilities (Storage 1A and Storage 2). In broad terms the criteria are to ensure that the tailings storage facilities are structurally stable and that they will not cause adverse effects on the safety of users and downstream users, or on the environment.

Engineering Geology Ltd has developed closure criteria based on measured and/or calculated parameters. They are summarised below in the following sections.

2.0 STABILITY

The criteria for stability are based on industry accepted standards for dams. They are summarised below:

Based on measured pore pressures and best estimates of soil strengths the following criteria should be achieved:

- a. Static Factor of Safety (FoS) ≥ 1.5
- b. Seismic OBE (permanent displacements less than 20mm)
MDE (permanent displacements less than 0.5m)

3.0 DEFORMATION

Criteria are provided for both total deformation and rate of deformation.

3.1. Total Deformation

The total deformation criteria are based on typical post-construction embankment shoulder settlements at 10 years after end of construction published in Fell *et al.* (2005). They report settlements of generally less than 0.5% to 0.7% of the depths of fill, at 10 years after construction, are observed for well and reasonably to well compacted rockfills and compacted earthfills. We recommend values of 0.75% and 0.5% for Storage 2 and Storage 1A respectively. Higher values are appropriate for Storage 2 as the embankment fill consists of more weathered mine waste than in Storage 1A. Total horizontal movements have been taken equal to approximately two thirds of vertical movement.



The proposed total deformation criteria are summarised in Table 1.

TABLE 1. Proposed Closure Deformation Criteria

TSF	TOTAL SETTLEMENT (%H)	TOTAL HORIZONTAL MOVEMENT (%H)
Storage 2	0.75	0.5
Storage 1A	0.5	0.35

Note: H= total depth of fill plus depth of natural soil where it may exist beneath the embankment.

Limits for horizontal and vertical deformations for individual settlement markers, based on the criteria in Table 1, are provided in Tables 2 and 3 for Storage 2 and Storage 1A respectively. Some of the settlement markers have not yet been installed. The depth of fill will need to be confirmed following installation of the markers and the deformation limits revised accordingly.

3.2. Rate of Deformation

At closure settlements are expected to be very small and review of monitoring to date generally indicates this to be the case. However, closure criteria also need to take into consideration the inherent error in the measurements and the frequency of survey (annually). The level of accuracy of survey measurements is about +/-10mm for vertical measurements and +/- 20mm for horizontal movements. There is a higher degree of error associated with the horizontal measurements compared to vertical and this needs to be reflected in the closure criteria. To account for the inherent error in survey measurements we propose that the rate of movement criteria be based on the average change in measurements over a period of 5 years. This will help smooth out any errors that could otherwise affect results if a shorter period of time was considered.

The recommend criteria are:

- a. the average rate of settlement and horizontal movement should be less than 5mm/year over a period of 5 years before closure
- b. the last measurement should be within the limits of accuracy of measurement (i.e. +/-10mm vertically or +/-20mm for horizontal deformations) from the expected average value based on measurements from the previous 5 years of monitoring.

3.3. Assessment of Compliance

Assessment of compliance with the proposed criteria is not difficult now that all the data are in an excel spreadsheet. When evaluating the deformation data any sudden large changes in movement outside the normal behaviour should be checked. Sometimes they can be due to survey error or disturbance of the settlement marker. If there is any doubt the settlement marker should be re-surveyed.

4.0 PIEZOMETERS

Piezometers are installed in the embankments and foundations. Closure criteria for piezometers depend on where the piezometers are located. Criteria for piezometers located

in the downstream shoulder and foundations are governed by consideration of stability. Criteria for piezometers located in the upstream shoulder (Zone B) are based on control of seepage from the tailings. The recommended criteria are summarised below:

- a. Downstream shoulder: $ru < 0.35$ (governed by static stability)
- b. Base of embankment: $ru < 0.4$ (governed by seismic stability)
- c. Upstream shoulder: $ru < 0.5$ (to avoid excessive seepage)

$$\text{Where } ru = \frac{\text{Pore water Pressure (kPa)}}{\text{Vertical Overburden Pressure (kPa)}}$$

In addition piezometers must demonstrate a steady response for at least 2 years with annual seasonal fluctuations of less than 1m, unless located in the foundations or base of the embankment where a greater seasonal fluctuation can be expected.

5.0 REHABILITATION

With time the stored tailings consolidate and gain in strength. Ultimately it may be possible to reclassify the tailings storage facilities so they are no longer considered dams. Criteria to enable the TSF's to be declassified as dams are yet to be developed.

Prepared by
ENGINEERING GEOLOGY LTD

Trevor Matuschka, CPEng, Category A Recognised Engineer

Encl: Tables 2 and 3

Table 2. Storage 2 Settlement Marker Deformation Criteria for Closure

Section	Bench	Fill Depth (m)	Soil Depth (m)	Total (m)	Total Permissible Deformation	
					Horizontal (mm)	Vertical (mm)
B	110	7.2	2.3	9.5	47.5	71.25
	120	19.8	2.3	22.1	110.5	165.75
	130	28.0	2.3	30.3	151.5	227.25
	142	37.6	2.3	39.9	199.5	299.25
	156	48.8	2.3	51.1	255.5	383.25
C	110	9.8	2.5	12.3	61.5	92.25
	120	18.0	2.5	20.5	102.5	153.75
	130	28.6	0.5	29.1	145.5	218.25
	142	40.9	0.5	41.4	207	310.5
	156	52.0	0.5	52.5	262.5	393.75
C	110	9.5	2.3	11.8	59	88.5
	120	17.5	2.3	19.8	99	148.5
	130	26.9	2.3	29.2	146	219
	142	41.4	0.5	41.9	209.5	314.25
	156	52.4	0.5	52.9	264.5	396.75
E	110	8.0	2	10	50	75
	120	17.5	0.5	18	90	135
	130	25.5	0.5	26	130	195
	142	37.7	0.5	38.2	191	286.5
	156	46.1	3	49.1	245.5	368.25
F	110	12.6	1	13.6	68	102
	120	19.4	2	21.4	107	160.5
	130	20.2	2.5	22.7	113.5	170.25
	142	29.1	2.5	31.6	158	237
	156	40.9	2.5	43.4	217	325.5
Y	110	8.1	2.5	10.6	53	79.5
	120	14.2	2.5	16.7	83.5	125.25
	130	20.1	2.5	22.6	113	169.5
	142	29.7	2.5	32.2	161	241.5
	156	42.9	2.5	45.4	227	340.5
Z	110	12.5	2.5	15	75	112.5
	120	18.2	2.5	20.7	103.5	155.25
	130	28.5	2.5	31	155	232.5
	142	41.5	2.5	44	220	330
	156	50.9	2.5	53.4	267	400.5

TABLE 3. Storage 1A Settlement Marker Deformation Criteria for Closure

Section	Bench	Fill Depth (m)	Soil Depth (m)	Total (m)	Total Permissible Deformation	
					Horizontal (mm)	Vertical (mm)
G	120	10.3	0	10.3	36.05	51.5
	130	17.8	2	19.8	69.3	99
	140	27.0	2.5	29.5	103.25	147.5
	152	40.3	2.5	42.8	149.8	214
	165	52.2	2.5	54.7	191.45	273.5
	177.25	62.4	2.5	64.9	227.15	324.5
H	110	12.3	0	12.3	43.05	61.5
	120	20.1	0	20.1	70.35	100.5
	130	29.0	0	29	101.5	145
	140	38.1	0	38.1	133.35	190.5
	152	49.3	0	49.3	172.55	246.5
	165	61.3	0	61.3	214.55	306.5
I	177.25	72.6	0	72.6	254.1	363
	120	14.2	0	14.2	49.7	71
	130	23.0	0	23	80.5	115
	140	30.2	1.5	31.7	110.95	158.5
	152	38.5	1.5	40	140	200
	165	50.3	1.5	51.8	181.3	259
J	177.25	59.0	1.5	60.5	211.75	302.5
	120	11.2	0	11.2	39.2	56
	130	16.8	2.5	19.3	67.55	96.5
	140	25.4	2.5	27.9	97.65	139.5
	152	34.0	2.5	36.5	127.75	182.5
	165	42.2	2.5	44.7	156.45	223.5
K	177.25	50.4	2.5	52.9	185.15	264.5
	120	11.9	0.0	11.9	41.65	59.5
	130	18.4	1.0	19.4	67.9	97
	140	25.1	1.0	26.1	91.35	130.5
	152	30.2	2.0	32.2	112.7	161
	165	36.4	2.0	38.4	134.4	192
L	177.25	43.2	2.0	45.2	158.2	226
	130	5.9	0.0	5.9	20.65	29.5
	140	12.8	1.0	13.8	48.3	69
	152	19.5	1.0	20.5	71.75	102.5
	165	22.9	1.0	23.9	83.65	119.5
	177.25	33.4	1.0	34.4	120.4	172
M	130	16.1	0.0	16.1	56.35	80.5
	140	23.1	1.0	24.1	84.35	120.5
	152	33.6	1.0	34.6	121.1	173
	165	44.7	1.0	45.7	159.95	228.5
	177.25	56.9	1.0	57.9	202.65	289.5

Appendix C – Pest Control Management Plan 2023

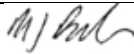


Waihi Pest Control Management Plan

Date: June 2023

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Approvals

OGC Designation	Name	Signature	Date
Authored by	C McArthur/K Gillard	C McArthur/K Gillard	13/06/2023
Reviewed by	R Squire	R Squire	28/06/2023
Approved by	Mark Burroughs		29/06/2023

Revision History

Date	Revision No.	Reason for Revision	By
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PURPOSE

The purpose of the Waihi Pest Control Management Plan is to:

- Prevent the spread of pest plant and animal species on OceanaGold NZ Ltd Waihi (OGNZL) managed areas
- Prevent the spread of plant pathogens to, and within, OGNZL's operational areas
- Ensure compliance with Waikato Regional Council's [Waikato Regional Pest Management Plan 2022-2032](#) prepared pursuant to the [Biosecurity Act 1993](#)
- Ensure compliance with the [Biosecurity \(National PA Pest Management Plan\) Order 2022](#)
- Reduce pest plant and animal densities on site
- Improve survivorship rates of native species.

For the purposes of this plan, a pest is defined as any undesirable organism which establishes to the detriment or exclusion of desired plant or animal species.

1 SCOPE

This plan describes the management of pests on OGNZL controlled land and is integral to the activities of all personnel, including contractors identified in Section 4. The following areas are those where pest plants and animals occur and upon which this plan focuses:

- Martha Open Pit and surrounds (including the Pit Rim Walkway and Slevin Park)
- Conveyor corridor
- Development Site (including impoundments, embankment plantings, roadsides, and stockpiles)
- Water Treatment Plant and Mill operational areas
- Favona/Underground surface operational areas
- Exploration core sheds and drill sites
- Black Hill, Winner Hill and Union Hill
- Moresby Administration Office and Education Centre gardens and surrounds
- OGNZL Waihi residential and rural properties
- Riparian margins along the Ohinemuri River, Ruahorehore Stream, Eastern Stream, Mangatoetoe Stream and surrounding tributaries.

This Plan does not cover farm properties owned by OGNZL leased to other parties for grazing. It is the responsibility of lessees to control pests on leased properties.

2 LEGAL REQUIREMENTS

Pest management activities at Waihi are governed by the Waikato Regional Pest Management Plan 2022-2032. Waikato Regional Council has developed this document in accordance with the Biosecurity Act 1993.

The Hazardous Substances and New Organisms Act 1996 (HSNO) requires that many chemicals commonly used in agriculture and horticulture be under the control of an approved handler. The pesticides used on site are normally such chemicals. An approved handler is a

person who is formally recognised and certified by New Zealand's Environmental Protection Authority to purchase, store, transport, handle and use hazardous chemicals.

The Biosecurity (National PA Pest Management Plan) Order 2022 requires OGNZL, as an owner of land containing kauri trees, to meet certain rules to prevent the spread of kauri dieback (*Phytophthora agathidicida* (PA)).

3 RISK

Uncontrolled pest plant and animal infestations can pose a risk to human and livestock health, the environment, land productivity, community opportunities, and aesthetics. The introduction of the Waikato Regional Pest Management Plan 2022-2032 places a legal obligation on OGNZL to control pest populations on all land controlled by OGNZL and where mining or associated activities are the source of pests to external sites.

3.1 Impacts of Pest Plants and Animals

While disturbed sites such as the Martha Open Pit, Mill, and Development Site may not be directly impacted by pests during the operational phase, negative impacts include the following:

- Risk of bites, stings & scratches from pest animals and plants (reactions could include irritation, allergic reactions or disease)
- Unightly appearance of weeds around operational areas, presenting poor public image, , obscuring stored equipment, collecting litter and generating negative staff attitudes.
- Closure and reclamation costs are affected where there is a weed seed bank built up, prolonging weed control into closure
- Uncontrolled weeds on operational areas provide seed sources to spread onto neighbouring properties, undisturbed sites and invade adjacent rehabilitation
- Native flora and fauna populations can be adversely impacted by pest species, which affects the environmental values of the area
- Potential for animal pests to interfere with operational equipment (e.g. electrical switchgear)
- Animal pests may browse on pasture on embankments or surrounding farmland, or on planted native vegetation
- Deep rooted trees can cause stability and integrity issues on landforms such as the TSF embankments or pit walls
- The introduction of kauri dieback to the site may cause process loss if MPI imposes restrictions on the site, or mitigation earthworks may be required.

Several risks arise with the use of pesticides to control plant and animal populations. These include but are not limited to:

- Human health risks (both acute and chronic)
- Detrimental effects to non-target species (e.g. spray drift of herbicides onto 'valued' pasture or horticulture, non-target animals eating baits or caught in traps)
- Environmental contamination to soil or water through mishandling or misapplication of chemicals
- Social acceptability of chemical applications.

3.2 Risk Mitigation and Operational Controls

To prevent the spread of pests, the following controls are put in place:

- Pest Animal Management Strategy including the DOC200 trap network, bait stations and avian pest control
- An active Weed Control Strategy
- Machinery arriving to or departing site is to be clean of vegetation
- Publicly accessible walkways are maintained to minimise the risk of spreading kauri dieback
- Earthworks within a kauri hygiene zone must adhere to an approved PA management plan

To manage the risk from chemical application the following controls are put in place:

- Utilise only preferred contractors with approved handler qualifications
- Spray in calm conditions (often early morning) in which fine droplets will settle. Any drift should be in a direction away from sensitive crops, desirable species and water bodies
- Use the correct sprayer, spray nozzles and pressure to minimise fine spray and drift. In some situations, an anti-drift additive should be used
- Apply animal poisons using specified techniques or in designed dispensers
- Use pesticides which are appropriate to the pest being controlled, and which have no significant impact on the surrounding environment
- Use the correct spray concentration for the target weed and the selected application technique
- Observe all site safety procedures when dealing with herbicides, both in concentrated and dilute form
- Spray equipment is to be of a good standard and well maintained
- Ensure all potentially affected persons receive prior notification of pest control activities and appropriate signage is installed prior to chemicals being laid
- Ensure Safety Data Sheets (SDS) are available to all personnel using hazardous chemicals and new chemicals go through the new chemical evaluation procedure.

To mitigate risks from physical control techniques:

- Restrict usage of firearms to low powered rifles used by specified users approved by the General Manager
- Use of approved traps is restricted to trained operators only
- Chainsaws shall only be used by qualified operators
- Hand tool usage will be managed through specific training, Job Hazard Analyses and/or Standard Operating Procedures (SOP).

4 PEST MANAGEMENT RESPONSIBILITIES

All OGNZL properties and responsibilities were divided into zones to allow for the implementation of area specific pest management activities. Refer to Table 1 and Table 2. Weed Control Zones and Responsibilities. for areas covered by the Pest Animal Management Programmes. For areas covered by the Weed Control Strategy, refer Figure 2: Weed Control Zones and Table 2. The following tables detail key personnel in pest management and their responsibilities.

Table 1. Pest Animal Management Zones and Responsibilities.

Zone	Areas Included	Department Responsible	Pest Control Personnel / Contractors
Red	Kauri Gold Bait Station Network (Pit & Baxter Rd Operational)	Site Services	Kauri Gold Services
Blue	OGNZL Bait Station Network (Development Site Operational & Rehabilitation)	Environment	OGNZL Environmental Staff
Green	OGNZL DOC200 Trap Network (Development Site Rehabilitation)	Environment	OGNZL Environmental Staff
Development Site	Avian pest control on TSF2 lake edge, TSF embankments and surrounding farmland	Environment	OGNZL Environmental Staff & Contractors (Lavington Trust)

Table 2. Weed Control Zones and Responsibilities.

Zone	Areas Included	Department Responsible	Pest Control Personnel / Contractors
Martha Open Pit			
1	Pit Rim Walkway (including Cornish Pumphouse, Slevin Park and heritage areas)	Site Services	Kauri Gold Services
2	Northwest Wall (above Perimeter Road)	Environmental	Kauri Gold Services
3	Top Pit Batter (above Perimeter Road)	Environmental	Kauri Gold Services
4	Future Pit Lake Edge (below Perimeter Road, above rip rap)	Environmental	Kauri Gold Services
5	Inside Pit (below rip rap)	Environmental	Dronezup Limited
6	Western Pit Screening Area	Environmental	Kauri Gold Services
7	Eastern Pit Screening Area	Environmental	Kauri Gold Services
8	Eastern Biocontrol Area	Environmental	OGNZL Environmental Staff
9	Conveyor Corridor	Site Services	Kauri Gold Services
Development Site			
10	Embankment Plantings	Environmental	Kauri Gold Services & OGNZL Environmental Staff
11	Development Site Roadsides	Site Services	Kauri Gold Services
12	Topsoil Stockpile	Environmental	Farm Manager & Kauri Gold Services

13	Central & Eastern Stockpiles	Environmental	Kauri Gold Services & OGNZL Environmental Staff
14	Ignimbrite Stockpile	Environmental	Kauri Gold Services & OGNZL Environmental Staff
15	Northern Stockpile	Environmental	Kauri Gold Services & OGNZL Environmental Staff
16	TSF2 Lake Edge	Environmental	Kauri Gold Services & OGNZL Environmental Staff
17	Environmental Monitoring Sites	Environmental	Kauri Gold Services & OGNZL Environmental Staff
Favona & Mill			
18	Favona Stockpile	Environmental	Dronezup Limited
19	Favona Wetland	Environmental	Kauri Gold Services
20	Roadsides & Carparks (around the Mill, WTP & Favona areas)	Site Services	Kauri Gold Services
21	Water Treatment Plant & Mill	Site Services	Kauri Gold Services
Town & Recreational Areas			
22	Black Hill, Winner Hill & Union Hill	Site Services	Kauri Gold Services
23	Moresby Ave Administration Office & Education Centre	Site Services	Kauri Gold Services
24	OGNZL Landholdings – Residential & Rural Properties and Heritage Areas ¹	Site Services	Kauri Gold Services
25	Riparian Margins (Ohinemuri River, Ngatikoi Walkway, Ruahorehore Stream, Eastern Stream & surrounding tributaries)	Environmental	Kauri Gold Services

4.1 Preferred Suppliers

In addition to OGNZL Environmental and Site Services Staff with pest control responsibilities, local contractors are also used to conduct pest control activities. OGNZL preferred suppliers are those contractors who have current inductions and whose employees hold requisite

¹ For OGNZL owned properties that are leased for grazing, it is the responsibility of the lessee to ensure that the property is kept weed free. This condition is incorporated into lease conditions where appropriate.

qualifications (e.g. Approved Handler Certificates, chainsaw qualifications, working at heights etc.).

Table 3 lists the current preferred suppliers, their primary contact, and responsibilities.

Table 3. OGNZL Preferred Suppliers.

Company	Primary Contact	Responsibilities
Kauri Gold Services (KGS)	Ian Keys	Manage weeds by undertaking weed control as directed by OGNZL authorised persons.
Dronezup Limited	Jordan Salmons	Undertake weed spraying using drone.
Lavington Trust	Greg van der Lee	Advise on the installation and monitoring of pest animal traps and bait stations.
Connovation Limited	Victoria Davies	Supply of traps, lures and pest animal toxins.

5 PEST MANAGEMENT AND IDENTIFICATION

5.1 Pest Animal Species

Pest animals present upon OGNZL owned and leased properties include, but are not limited to, the following (priority species in **bold**):

- **Canada geese (*Branta canadensis*)**
- Feral cats (*Felis catus*)
- Feral goats (*Capra hircus*)
- Hares (*Lepus copenus europaeus*)
- **Mice (*Mus spp.*)**
- **Mustelids (*Mustella spp.*) ferret, stoat and weasel**
- **Possums (*Trichosurus vulpecula*)**
- Rabbits (*Oryctolagus cuniculus*)
- **Rats (*Rattus spp.*)**
- **Turkeys (*Meleagris gallopavo*)**
- Wasps (Paper *Polistes spp.* and German *Vespula spp.*)

5.2 Pest Plant Species

Pest plants present upon OGNZL owned and leased properties include, but are not limited to, the following (priority species in **bold**):

- African Lily (*Agapanthus praecox*)
- **Alligator weed (*Alternanthera philoxeroides*)**
- **Barberry (*Berberis spp.*)**
- **Blackberry (*Rubus fruticosus*)**
- **Black nightshade (*Solanum nigrum*)**
- Blue corn lily (*Aristea ecklonii*)
- Boneseed (*Chrysanthemoides monilifera*)

- **Broom (*Cytisus scoparius*)**
- **Buddleia (*Buddleja davidii*)**
- Coastal banksia (*Banksia integrifolia*)
- Dock (*Rumex obtusifolius*)
- **Eliagnus (*Elaeagnus x reflexa*)**
- **Flowering cherry (*Prunus spp.*)**
- Formosa lily (*Lilium formosanum*)
- Foxglove (*Digitalis purpurea*)
- **Gorse (*Ulex europaeus*)**
- Hawthorn (*Crataegus spp.*)
- Holly (*Ilex aquifolium*)
- Inkweed (*Phytolacca octandra*)
- Ivy (English *Hedera helix*, German *Senecio mikaniodes*, Cape *Senecio angulatus*,
Fragrant *Hedera colchica*)
- **Japanese honeysuckle (*Lonicera japonica*)**
- **Japanese walnut (*Juglans ailantifolia*)**
- Jasmine (*Jasminum polyanthum*)
- Jerusalem cherry (*Solanum pseudocapsicum*)
- Loquat (*Eriobotrya japonica*)
- Morning glory (*Ipomoea indica*)
- **Pampas (*Cortaderia jubata & C. selloana*)**
- **Privet (*Ligustrum spp.*)**
- Ragwort (*Jacobaea vulgaris*)
- **Royal fern (*Osmunda regalis*)**
- **Spanish heath (*Erica lusitanica*)**
- Stinging nettle (*Urtica urens*)
- **Variegated thistle (*Silybum marianum*)**
- **Nodding thistle (*Carduus nutans*) and plumeless thistle (*Carduus acanthoides*)**
- **Wandering jew/willy (*Tradescantia fluminensis*)**
- **Wattle (*Acacia spp.*)**
- Wilding pine (*Pinus spp.*)
- Willow (*Salix spp.*)
- **Woolly nightshade (*Solanum mauritanum*)**

The Pest Plant Management Strategy prioritises pests in the following order:

1. Species designated for eradication by Waikato Regional Council (e.g., Alligator weed)
2. Control of isolated infestations to avoid pest plants and animals becoming established and harder to eradicate (including the development of weed seedbanks)
3. Risk of spread into adjacent environments (neighbouring properties, riparian areas or adjacent to fresh rehabilitation) – particularly species designated for ‘Containment’ by Waikato Regional Council
4. Visibility of the pests to the public
5. Knock back larger existing infestations to encourage desirable species and reduce weed seed sources (this could entail removal of mature trees).

5.3 Plant Pathogens

Plant pathogens that may be present at OGNZL's site and regional work areas are:

- Kauri dieback (*Phytophthora agathidicida*)
- Myrtle rust (*Austropuccinia psidii*)

6 PEST ANIMAL MANAGEMENT STRATEGY

The pest animal management strategy for the site focuses on the priority species listed in section 5.1. The strategy comprises varying control methods depending on the target species and is designed to protect native flora and fauna, and OGNZL facilities and pastureland.

An overview of the pest animal management strategy is set out in the following sections.

6.1 DOC 200 Trap Network - Rats and Mustelids

Rats and mustelids are controlled around the Development Site by a network of 50 DOC200 style traps (Figure 1). Traps are installed to protect native plants and birds within the Development Site area. Traps are checked and reset monthly by the OGNZL Environmental Officer using dried rabbit or eggs as lure. Trap catch data is updated in the field on the TrapNZ app and is stored on the TrapNZ website: <https://www.trap.nz/node/16172116>

Trap placement may be reviewed periodically based on trap catch data.

A SOP is currently in development for the operation of the Development Site DOC200 network.



Figure 1: OceanaGold Waihi Trap and Bait Station Network.

6.2 Bait Stations - Possums, Rats and Mice

A network of 50 Philproof bait stations were installed around the site in 2022 to control possums, rats, and mice (Figure 1). The station locations are selected to protect native plants and birds, and OGNZL facilities within the Development Site area. The bait stations are currently baited with DoubleTap pellets (diphacinone and cholecalciferol toxin) on a monthly schedule by the OGNZL Environmental Officer. Bait take and resupply is recorded using the TrapNZ app and website: <https://www.trap.nz/node/16172116>.

Additionally, bait stations are installed for rat and mice control around electrical equipment and site infrastructure. These stations are resupplied with brodifacoum by Kauri Gold contractors each month.

Bait station placement and bait type may be amended periodically based on bait take.

A SOP is currently in development for the operation of the bait station network.

6.3 Canada Geese and Turkeys

Canada geese are common during spring and summer on the TSF embankments and around the margins of the TSF2 lake, where they nest. Turkeys are resident on embankments and surrounding farmland year-round.

Canada geese are predominantly controlled around site by egg addling during the early nesting season, generally from September to October. Surveillance is undertaken by the Environmental Officer to identify when and where nesting begins. Nests are located by walking the TSF lake edge on foot in teams and eggs are either shaken or pierced to sterilise the eggs. Once eggs are sterilised, they are returned to nests, so geese do not lay another clutch. Nest locations and the number of eggs sterilised at each nest is recorded for monitoring purposes.

Adult Canada geese and turkeys may also be controlled on site using a firearm, at the discretion of the General Manager. The procedure for pest control using a firearm is included in WAI-200-PRO-039.

7 PEST PLANT MANAGEMENT STRATEGY

7.1 Weed Control Strategy

Details of the weed control strategy are set out in Table 4, including the frequency of control, target species, and anything of note for each individual zone or location (such as method of control or specific priorities). Each location has been assigned a number, as listed in the table below. These zones are displayed on a map in Figure 2.

Table 4. Weed Control Strategy.

Zone / Location		Frequency	Target Species	Notes
Martha Open Pit				
1	Pit Rim Walkway (including Cornish Pumphouse, Slevin Park and heritage areas)	6 monthly	Jerusalem cherry, loquat, ivy, wattle, pampas, broom, Spanish heath, pine, privet, cherry, agapanthus, miscanthus, tradescantia, blue corn-lily, coastal banksia, trumpet lily, macrocarpa, holly, hawthorn	Regular weed control currently undertaken around the pit rim walkway, with most weed species well controlled in each round between 2 - 4 times per year.
2	Northwest Wall (above Perimeter Road)	3 yearly	Wattle, pampas, broom, Spanish heath, pine, privet, cherry, coastal banksia	Weed control using telehandler. To be completed in 2023 and every 3 years thereafter. Priority given to large tree species that have the potential to cause wall instability.
3	Top Pit Batter (above Perimeter Road)	Annually	Wattle, pampas, broom, Spanish heath, pine, privet, cherry, agapanthus, miscanthus, blue corn-lily, coastal banksia, trumpet lily, ivy	Weed control using telehandler for NW wall, where it is nearly vertical. If safe to do so, walk other sections that aren't too steep or use top and bottom spray line.
4	Future Pit Lake Edge (below Perimeter Road, above rip rap)	Annually	Wattle, pampas, broom, Spanish heath, pine, privet, cherry, agapanthus, miscanthus, blue corn-lily, coastal banksia, trumpet lily	If safe to do so, walk sections that aren't too steep or use top and bottom spray line for weed control along batter.
5	Inside Pit (below rip rap)	Annually	Pine, gorse, pampas	Drone spraying below rip rap to be completed during 2023. Spraying 1/3 of the area at a time, on an annual rotation (each section being sprayed 3 yearly).
6	Western Pit Screening Area	Annually	Wattle, pine	Currently large wattle and pine trees provide a screening function at the western side of the pit. These will go through the process of progressive removal, where each year a site visit will be conducted and a plan made for which individual trees require

				removal that year (if any), and any mitigation or infill planting required.
7	Eastern Pit Screening Area	Annually	Wattle, broom, privet, cherry, coastal banksia, loquat, ivy, agapanthus	Large dense plantings have screening function for residential properties along the eastern side of the pit. Most weeds can be removed except for large weed trees that would leave a considerable gap in the block of plantings if removed.
8	Eastern Biocontrol Area	Quarterly	Buddleia	No active weed control in this area - no spraying to be done past the haul road gates or near buddleia plants. Area reserved for quarterly monitoring of buddleia leaf weevil biocontrol agent. Refer to Section 1.3.6.7.2 in RCP and Biocontrol Monitoring Instructions for more details.
9	Conveyor Corridor	Annually	All species	Spraying along conveyor belt from the Open Pit to the Development Site at Waste Loadout. Most species removed from corridor to keep area clear for maintenance.
Development Site				
10	Embankment Plantings	Annually	Ivy, gorse, wattle, pampas, broom, blackberry, Spanish heath, privet, cherry, Japanese honeysuckle, jasmine, miscanthus, nightshade, barberry, holly, hawthorn, cabbage trees, totara, rewarewa	Annual sweep of embankment plantings with large team required to cover the area (Sustainability Department to team up with Kauri Gold). Remove weeds and all deep rooting tree species from embankments (excluding the first/lowest batter of the TSF).
11	Development Site Roadsides	3-6 monthly	Buddleia, gorse, pine, thistle, broom	Weed control on roadsides carried out 6 monthly, or more frequently if required. Where appropriate, the spraying boom can be used.
12	Topsoil Stockpile	Annually	Gorse, thistle	Annual check of stockpile, with gorse controlled as it appears.
13	Central & Eastern Stockpiles	Annually	Buddleia, gorse, pampas, broom	Weeds sprayed or pulled as they appear on stockpiles.
14	Ignimbrite Stockpile	Annually	Buddleia, pine, pampas, broom	Weeds sprayed or pulled as they appear on stockpiles.

15	Northern Stockpile	Annually	Buddleia, pine, wattle, pampas, broom	Weeds sprayed or pulled as they appear on stockpiles.
16	TSF2 Lake Edge	Annually	Pine, gorse, pampas, thistle, broom, willow, royal fern, wattle, miscanthus, Spanish heath	Weeds identified in Ryder Environment Ltd 2021 report (willow, royal fern, wattle, miscanthus and Spanish heath) have been controlled. Control of other weeds is ongoing, particularly pine and gorse.
17	Environmental Monitoring Sites	6 monthly	Grass, thistle, tradescantia, blackberry	Sites to be sprayed before each sampling round include groundwater enclosures, underdrain/manhole accessways, piezometers and river sites.
Favona/Mill				
18	Favona Stockpile	As required	All species	Weed control using drone spraying in areas that can't be accessed on foot. First round to be completed in 2023.
19	Favona Wetland	Annually	Nightshade, cherries, privet, blackberry	Spot weed control of invasive species through the wetland area.
20	Roadsides & Carparks (around the Mill, WTP, & Favona areas)	3-6 monthly	All species	Weed control on gravelled areas carried out 6 monthly, or more frequently if required. Where appropriate, the spraying boom can be used.
21	Water Treatment Plant & Mill	3-6 monthly	All species	Weed control on gravelled areas carried out 6 monthly, or more frequently if required. Where appropriate, the spraying boom can be used.
Town/Recreational Areas				
22	Black Hill, Winner Hill & Union Hill ²	6 monthly	All weed species	Weeds sprayed or pulled mostly along walkways.
23	Moresby Ave Administration Office & Education Centre	3-6 monthly	All weed species	Gardens weeded by hand, surrounding areas including carparks sprayed.
24	Riparian Margins	Annually	All weed species, particularly tradescantia	Weed control along the Ohinemuri River and Ruahorehore Stream in areas planted under the Bridge-to-

² OGNZL is not responsible for weed control throughout these areas where the land is not owned by OGNZL but does undertaken maintenance work along walkways and riparian plantings.

				Bridge Planting Scheme. Eastern Stream and surrounding tributaries also included.
25	OGNZL Landholdings – Residential & Rural Properties and Heritage Areas (excluding grazing leases)	3-6 monthly	All weed species	Gardens weeded by hand, hedging cut back, other areas such as driveways and standalone weeds sprayed.

7.2 Biological Control

The use of biological control agents has been explored by OGNZL as an alternative option to chemical and mechanical weed control. It uses the pest’s natural predators in controlling their population to minimise their environmental impact. This specifically targets certain weed species, reducing the impact on non-target species and requires minimal maintenance effort to sustain. OGNZL has introduced buddleia leaf weevil to the Martha Pit and Development Site, trialled tradescantia yellow leaf spot fungus as biocontrol along the riverbank, and observed the impacts of Nodding Thistle Receptacle Weevil which naturally arrived on site. Additionally, in 2023 WRC supplied OGNZL tradescantia leaf beetles to trial as supplementary biocontrol. See Figure 3 below for the current biocontrol sites.

Quarterly monitoring of biocontrol introduction sites and downstream sites is undertaken to track the effectiveness and dispersion of biological control agents. Further details and instructions on monitoring can be found [here](#).



Figure 2: Weed Control Zones



Figure 3: Biocontrol Sites

8 PLANT PATHOGEN MANAGEMENT STRATEGY

Staff and contractors working in areas where incursions of plant pathogens may occur undergo training to enable identification and reporting of possible plant pathogen infections. This training is conducted by OGNZL's consultant ecologists or OGNZL Environmental staff. Staff who receive the training include pest control contractors, Exploration field personnel and Environmental staff.

Any sighting of a possible plant pathogen should be reported to the Environmental Department who can advise on appropriate next steps. Generally, this would include photographing and recording the location of the sighting, reporting the sighting to the relevant agency, and following any instructions or advice provided by that agency. It may also include immediate biosecurity procedures such as washing clothing, footwear, and equipment or infected plant removal.

OGNZL is also required to follow the rules set out in The Biosecurity (National PA Pest Management Plan) Order 2022 which relates to kauri dieback. The three rules that are directly applicable to OGNZL are:

- Plan rule 3: restriction on the movement of kauri
- Plan rule 5: earthworks PA risk management plan
- Plan rule 10: open tracks and roads in kauri forest

Other rules may apply to OGNZL activities in certain situations or locations.

Plan rule 3 applies to the propagation and sale of kauri trees. A person who produces or propagates a kauri must not allow the kauri to be moved unless they have, and operate in accordance with, an approved production plan. While OGNZL does not produce or propagate kauri trees, it ensures that any kauri trees purchased for rehabilitation planting are from a supplier with an approved production plan.

Plan rule 5 requires any earthworks in a kauri hygiene zone to be undertaken in accordance with an approved earthworks management plan. To ensure this requirement is met, all earthworks undertaken by OGNZL and its contractors must be approved via an Excavation Permit (WAI-470-FOR-007). During the Excavation Permit sign off process, senior Environmental staff and the person in charge of the earthworks will assess whether the planned work to be undertaken is within a kauri hygiene zone and if an earthworks management plan is required. Environmental staff will assist in the preparation of this plan if it is required.

Plan rule 10 applies to owners of land with public tracks and/or roads in kauri forests. This rule is applicable to OGNZL managed and maintained tracks around the Martha Open Pit and Union Hill. The rule requires the owner to either:

- ensure all tracks and roads avoid kauri hygiene zones, or
- install 1 or more cleaning stations to remove visible soil and organic matter from risk items, or

- install track surfacing to minimise the risk of the spread of kauri dieback.

OGNZL complies with the third option by maintaining a hard packed metalled surface around the pit rim and union hill walkways, with adequate drainage that drains surface water away from kauri trees.

OGNZL also has a Kauri Dieback Management Plan (KDMP) for work undertaken on Department of Conservation Land in the Wharekairauponga catchment of the Coromandel Forest Park, authorised by DOC Access Arrangement 48614-AA. The plan requires the installation, operation, and use of boot wash stations and the cleaning and sterilisation of all gear and equipment used in the area. This document is included as Appendix A.

Whilst myrtle rust is not covered by a National Pest Management Plan, any sightings should still be reported to OGNZL Environmental Staff. Confirmed infections will be removed by the Environmental Team if required to protect other plants. Guidance on identifying and removing myrtle rust can be found at this website: <https://www.myrtlerust.org.nz/what-to-do-if-you-find-myrtle-rust/#remove>.

9 MONITORING & MEASUREMENT

OGNZL operational areas are currently subject to periodic inspection through various systems (e.g. environmental inspections, management inspections), which contain sections on land management including the presence of animal & plant pests. The site is also subject to inspection by the Regulatory peer reviewer and WRC specialist inspectors, who provide advice on pest presence and priority.

All areas of onsite herbicide storage and/or use, including contractors' on-site facilities, are also routinely inspected as provided for in the management and environmental inspection schedules; to verify that chemical management and housekeeping practices comply with legislation, each chemical's SDS, and this Plan.

10 TRAINING

All employees including contractors are made aware of pest management including weed transport mechanisms, wash down procedures for vehicles when leaving weedy areas and clean-up of equipment through induction, toolbox meetings or, where applicable, as part of formal induction training connected to their job.

It is the responsibility of each supervisor to ensure that staff are aware of pest management and are provided with the appropriate instruction and supervision.

All personnel involved in pest control activities are required to have the appropriate qualifications, training, and experience to undertake work safely and effectively, or be under the direct supervision of a qualified and experienced person. Such training may involve Growsafe® certificates, chainsaw qualifications, JHA training etc.

11 IMPROVEMENT OPPORTUNITIES

It is anticipated that effective ongoing pest control activities will reduce the occurrence and abundance of pests over time. The effective implementation of the programmes will also result in some species being eliminated or reduced to surveillance level (where most time is spent looking for the pest), while the spread of other species will be reduced to discrete areas (which requires ongoing monitoring to reduce seed bank re-establishment).

As new products and techniques become available or are trialled, modifications to pest control activities can be introduced which may:

- Utilise alternative or new chemicals with better efficacy (better kill) or more selective effects (sparing desirable species)
- Use chemicals of lower toxicity (including organic), making them safer to use and more socially acceptable
- Involve alternative techniques. For example: aerial or boom application, spot spraying, physical removal (cultivation, hand weeding, burning), chemical control, fencing, poisons, kill traps, cage traps, shooting.
- Utilise more effective traps or baits.

WRC is regularly trialling biological controls for pest species within the region. Should any of these be deemed successful, OGNZL will investigate the suitability of these for pest control onsite.

Appendix D – Massey Fertilizer Report

SOIL AND PASTURE GROWTH ANALYSIS AND FERTILISER RECOMMENDATIONS FOR THE TAILINGS STORAGE FACILITY, WAIHI GOLD MINE, JULY 2022

ATTN: G. McDonald

Introduction

Because of the continuing COVID-19 pandemic, soil sampling was again carried out by Oceana Gold personnel and assessment of pasture cover, soil surface condition and pasture composition on the Waste Disposal Facility was based on ground and drone images supplied by Oceana Gold. The images were mainly from the areas around the sites sampled for soil analysis, where physical inspection would normally occur on site. Additionally, images taken using a drone provided a wider angle overview of the rehabilitation pasture. The images supplied were sufficient for the required assessments to be carried out. Soil sampling was carried out by Grant McDonald of Oceana Gold using a standard soil corer. The samples were sent to Hills Laboratories for analysis and the results made available to me for assessment.

Pasture Growth

Since mid-2016 there has been a single set of cages on TSF2 (Control) that are used as a control for assessing pasture production on TSF1A. Data summarised in Table 1 includes annual Dry Matter (DM) yield, % performance of TSF1A relative to TSF2 and 2021 DM yields adjusted for slope (80% flat land equivalent).

	2020	2020	2021	2021	2021 slope adjustment
	Kg/DM/ha	% control	Kg/DM/ha	% control	Kg/DM/ha
TSF1A-D	5625	140	5960	117	7450
TSF1A-E	3470	86	4803	81	6004
TSF1 mean	4547	113	5381	106	6726
TSF2 (control)	4018		5071		6339

Table 1: Summary of DM production for TSF1A and TSF2 (control)

DM Production in 2021 is approximately 20 - 30 % higher than that in 2019 and 2020 (Table 1, Figure 1). This is most likely due to better rainfall in 2021, although pasture productivity is still showing the effects of the La Nina-induced summer moisture deficits. These conditions may well extend into next summer if the predicted persistence of a strong La Nina into 2023 eventuates. The details of the impact of summer dry periods was documented in my 2021 report, which showed that DM production in wetter months was comparable to that occurring in the same months in years where no drought occurred.

Pasture Condition 2022

On TSF2, the pasture in image Ai has been recently grazed has a good ryegrass/clover balance and weed content is within acceptable limits. Ground cover is good (>90%) and very little soil damage is evident. The B and C images indicate more recent grazing at these sites. Pasture composition also appears acceptable but there is some hoof damage that has caused surface smearing and some reduction in ground cover, suggesting stock were on the area when it was getting too wet. Grazing management requires soil moisture levels to be considered when managing stock access. However, the absence of significant pugging suggests this is being managed reasonably well overall.

The pasture cover on TSF2 is greater than 80% and therefore remains within guidelines.

On TSF1A, images A show a good grass cover at > 90% and pasture composition a satisfactory mixed grass/clover sward with few weeds evident. There is no evidence of pugging. The pasture shown in image Bi comprises mainly ryegrass, with clover most likely being shaded out, and the pasture appears rank. It needs grazing to encourage clover growth. Image Bii shows good ground cover.

Overall, pasture composition and ground cover for TSF1A also appear to be within guidelines.

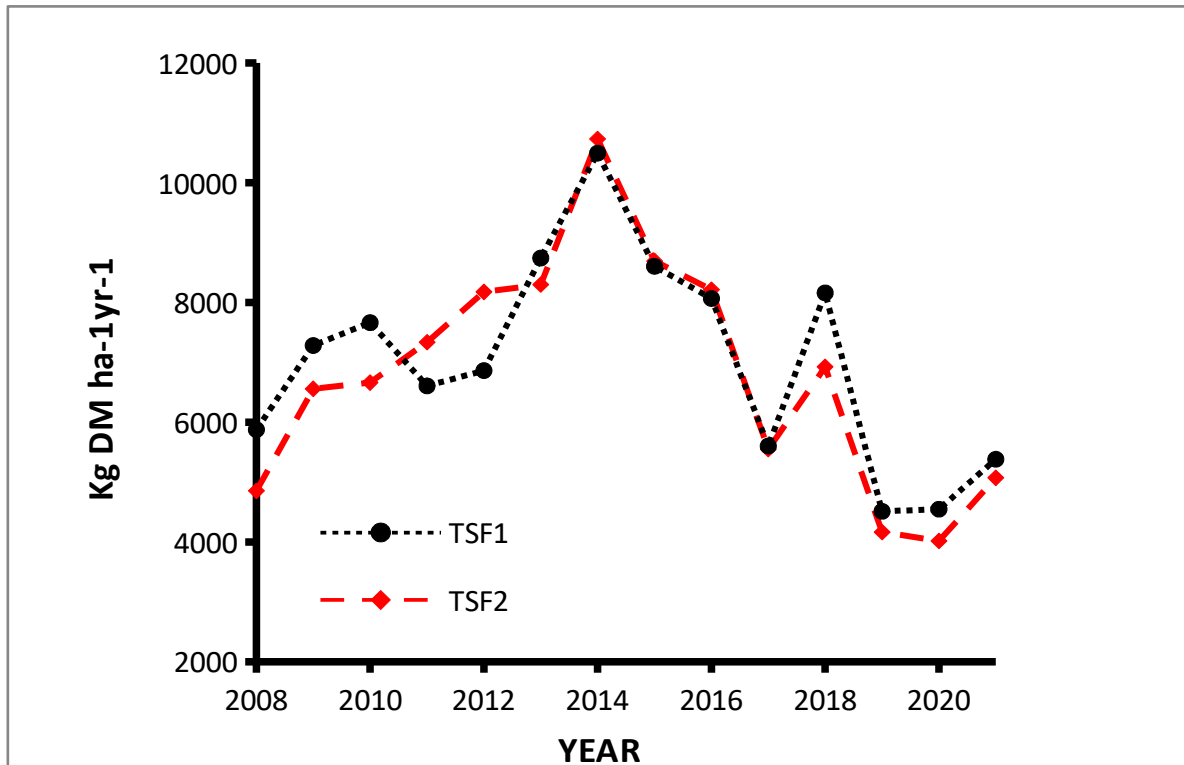


Figure 1: Pasture growth data for 2008 – 2021. There is no statistically significant difference between the annual yields from TSF1A and TSF2. The variation from year to year usually reflects climate differences, particularly rainfall.

SOIL TESTS

The following soil test ranges (Table 2) are suitable targets for the rehabilitation soils and are consistent with the rehabilitation guidelines;

<u>Soil Test</u>	<u>Range</u>	<u>Units</u>
pH	5.8-6.0	pH units
Olsen-P	20-30	µg ml ⁻¹
K – MAF Quick Test	7-10	MAF units
Sulphate-S	10-12	µg g ⁻¹
Mg – MAF Quick Test	8-10	MAF units

Table 2: Target soil test ranges for rehabilitated soils

Table 3 summarises soil test data from 2015 to 2022. The 2022 soil pH for TSF2 is similar to that of previous years at 5.9 (Table 3), and the mean pH remains within the soil test guidelines (Table 2). However, the pH is trending downwards on one of the TSF1A sampling sites TSF1A B).

Mean Olsen-P levels are below the target range of 20 - 30 $\mu\text{g P ml}^{-1}$ (Table 2) on both TSF1A and TSF2 sites at 18 and 17 $\mu\text{g P ml}^{-1}$ respectively (Table 3).

Mean TSF2 $\text{SO}_4\text{-S}$ levels have increased at sample sites A and B over 2021 and 2022 (Table 3). This may indicate contamination at these sites from overland flow from higher sulphate materials farther up the embankment, or rising sulphate levels in surface groundwater. There appears to be no acidity involved as the soil pH has been relatively stable at 5.9 for the last 3 years. While $\text{SO}_4\text{-S}$ is not at levels that are of concern, if the rise in $\text{SO}_4\text{-S}$ continues investigation of possible causes would be prudent. Mean sulphate-sulphur ($\text{SO}_4\text{-S}$) is at 96 $\mu\text{g/g SO}_4\text{-S}$ on TSF1A, compared with 178 $\mu\text{g/g}$ in 2021, and is at the lower end of the range of measurements of previous years (Table 3).

Mean potassium (K) levels at 6 and 5.5 MAF Units for TSF2 and TSF1A respectively (Table 3) are within measurement error of both the 2021 results and guidelines (Table 2). Magnesium (Mg) at 16 (TSF2) and 17 MAF Units (TSF1A) remains within or above guidelines for pasture (Table 3).

TSF2	<i>2015</i>	<i>2016</i>	<i>2017</i>	2018	<i>2019</i>	<i>2020</i>	<i>2021</i>	2022
pH	5.9 (5.6-6.1)	6.1 (5.7-6.4)	6.0 (5.7-6.2)	6.0 (5.9-6.1)	5.8 (5.5-6.1)	5.9 (5.6-6.1)	5.9 (5.7-6.0)	5.9 (5.8-6.0)
Olsen P ($\mu\text{gP/ml}$)	26 (18-46)	30 (23-32)	21 (15-30)	24 (16-35)	26 (19-35)	24 (19-32)	23 (15-37)	17 (14-21)
S ($\mu\text{gS/g}$)	49 (35-77)	76 (52-118)	52.7 (22-89)	46 (28-58)	60 (32-96)	76 (39-119)	117 (73-175)	188 (66-285)
K (MAF Quick Test)	7 (5-8)	7 (6-8)	7 (6-8)	7.6 (6-10)	9 (8-11)	8 (5-13)	7.7 (7-9)	6 (4-10)
Mg (MAF Quick Test)	12 (10-17)	18 (10-21)	13.7 (10-19)	18.6 (17-20)	17.3 (15-22)	15 (9-21)	16 (10-23)	16 (10-20)
TSF1A								
pH	5.9 (5.9-6)	6.0 (5.9-6.1)	5.9 (5.8-6.0)	6.0 (6.0-6.1)	5.8 (5.8-5.9)	6 (5.9-6.1)	5.9 (5.9-6.0)	5.7 (5.5-6.0)
Olsen P ($\mu\text{gP/ml}$)	37 (17-45)	20 (15 – 26)	26 (22-30)	28.5 (26-31)	23.5 (23-24)	26.5 (23-32)	21 (20-22)	18 (17-19)
S ($\mu\text{gS/g}$)	155 (101-209)	146 (120-273)	155 (72-238)	99 (82-117)	158 (78-238)	149 (101-197)	178 (137-219)	96 (80-113)
K (MAF Quick Test)	5 (4-6)	4 (3-4)	6 (6-6)	4 (3-5)	6.5 (4-9)	6.5 (6-7)	6 (4-8)	5.5 (5-6)
Mg (MAF Quick Test)	16 (10-22)	13 (11-15)	18 (14-22)	18 (12-24)	16 (12-20)	16.5 (16-17)	16.5 (15-18)	17 (10-20)

Table 3: Nutrient levels 2015-2022. The lead figure is the average and figures in brackets the range of values obtained.

Recommended Fertiliser Applications for TSF2 and TSF1A

The 2022 soil analysis results show a decrease in Olsen P to below the target range of 20 – 30. MAF Quick Test K values are just within error of the target range and I will continue with a recommendation of 15% K-super for now. If MAF-K values decrease over 2022/2023, then I will suggest a return to 30% K-super. MAF Quick Test Mg results are within or above guidelines (Table 2) and require no further action. Since TSF2 and TSF1A have similar Olsen P and MAF-K levels, a uniform rate across the site is recommended.

Recomendations

TSF2 and TSF1A : 400 kg/ha 15% Potassic Superphosphate

Nitrogen (N) at 90 kg urea ha⁻¹ should continue to be applied as soon as growth begins in spring, consistent with drystock farming as the primary land use. These rates of N should be applied across both TSF2 and TSF1A separately from the superphosphate.

The pH levels of TSF2 are similar to last year but one of the TSF1A sites (B) shows a drop below guidelines. This may not be significant but liming needs will be reassessed on the basis of 2023 analyses. There is no need to consider liming the rehabilitation in 2022.

R B Stewart

9 July 2022



Rehabilitation and Closure Plan

2023-24

Part B

Document Reference: WAI-200-PLN-011

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1 INTRODUCTION

The following sections address the requirements of Part B of the annually updated Rehabilitation and Closure Plan (Plan) required by condition 25 of Schedule 1 Common Conditions of the resource consents for Project Martha. In short, Part B assumes cessation of mining by 30 June 2024, and describes:

- the proposed method of rehabilitation and closure should occur within the following 12 months;
- an assessment of any residual risk that the site(s) would pose to the environment and the neighbouring community should occur within the following 12 months; and
- a programme for monitoring of the sites(s) following closure, and list all maintenance works likely to be necessary at the closed site(s) for the foreseeable future.

In meeting the Part B Plan requirements of the conditions of the resource consents condition 25, Part B also addresses the requirements of several land use consent conditions.

The works outlined in Part B of the Plan are subject to peer review (condition 7 of Schedule 1). In previous years, Part B has presented both the description of the works and the estimated cost of undertaking them. The cost estimates establish the appropriate Rehabilitation and Capitalisation Bond quanta. Under the conditions of consent the bond quanta are not subject to peer review. This year, the bond estimates are presented in separate reports.

2 STARTING ASSUMPTIONS

2.1 Date of Cessation of Mining

The Plan covers the period to 30 June 2024, which sets the assumed date for cessation of mining.

2.2 Mitigation Measures

OceanaGold Rehabilitation and Closure standard 5.27 states “Mitigation measures shall be clearly documented in closure plans”. Closure mitigation is a continual process and methods of mitigation at the Waihi site include:

- Inter-departmental 6 monthly closure meetings
- Annual bond reviews and updates
- Annual rehabilitation and closure plan revisions
- Annual plan external reviews (Peer Review)
- Annual closure risk assessments
- Closure identified as an Environmental Material Risk (EMR)
- Internal and external company audits

2.3 Closure Period

Completion of closure of the site is that point in time when the elements of the entire project have been demonstrated by OceanaGold to have reached a stable, self-sustaining and rehabilitated state to the satisfaction of the Councils. This is a point in time defined as “closure” and is deemed to be reached when:

- the pit slopes are shown to be in a stable and safe condition;
- any water discharging from the site, and any groundwater under the site, achieves a quality that it will not adversely affect aquatic life, or other users of the water resource;
- any structures on the site are stable;
- all revegetation required for the extended project is complete, and monitoring demonstrates it to be self-sustaining; and
- all modern underground stopes infilled.

The minimum time to complete closure of the site after cessation of mining is determined by conditions 20(b) and (c) of discharge permit 971293, which provides for discharge from the pit lake into the Mangatoetoe Stream. Condition 20(b) states:

“... The consent holder shall monitor the effect of Pit Lake discharge on the Mangatoetoe Stream for a minimum period of five years after the lake first overflows. ...”

Condition 20(c) states:

“The consent holder shall, in consultation with the Waikato Regional Council, develop and undertake a monitoring programme during lake filling and for a period of up to 5 years after filling for the purpose of locating any springs that may be reactivated or result from connections from Pit Lake.”

Estimates of the time to fill the lake indicate a duration of 7.5 years, and conditions 20(b) and (c) stipulate another five years to monitor the lake overflow. For the purposes of this report, an additional year is added to provide for removal of plant and equipment, to complete a range of technical studies, reports, plans and manuals, and the initial work for drafting and letting the closure works contract (or contracts). The resulting closure period duration of 12.5 years is assumed.

In practice, Closure will be achieved in many areas well within that timeframe.

Discharge permit 971293 is currently active however will be superseded by discharge permit AUTH139551.06.01 when activated.

2.4 Timing

Some activities are more significant than others in terms of timing. In particular, the following is assumed:

- the bulk of the demolition, dismantling and salvaging of plant including buildings, fuel storage, explosives magazines, crushers, conveyors, vehicle wash bays, and stores would take place early in the process, i.e. years one and two;
- items such as pumps, pipework, refuge chambers, and fans would be retrieved from underground as soon as possible to allow backfilling to be completed prior to the commencement of flooding of the open pit;
- rehabilitation of exposed PAF at the embankment at the waste disposal area could commence immediately;
- prompt rehabilitation of PAF areas would allow collection pond water to be direct discharged;

- capping of the tailings surface of Storage 1A following lowering of the water within the impoundment to allow the tailings to dry over the first summer, capping expected to take one to two years to complete, i.e. years 2 and 3;
- water treatment would be required until the water quality improved sufficiently to allow direct discharge, particularly for the Storage 1A tailings pond (three years). The assumption for TSF1A decant and process water is 6 months of cyanide treatment followed by 2.5 years of metals treatment, and for three years of metals reduction treatment for other sources; and
- lake filling would commence one year after closure is confirmed and would take approximately 7.5 years.

2.5 Current Mine Status

The scope of works to rehabilitate the Waihi gold mines covers all of the consented projects and assumes the following status for each.

2.5.1 Martha Mine

Mining within the Martha pit ended in April 2015 following a rock fall from the northeast pit wall that compromised the north wall ramp access. In April 2016, another larger (approximately 2 million tonnes) failure occurred in the same location. Project Martha consent to reopen and mine the pit was granted in February 2019. No surface mining has commenced with current focus on the mining of the Martha Underground.

2.5.2 Martha Mine East Layback

The Martha East Layback project ended with the access restriction created by the April 2015 rock fall. The Project Martha consent should eventually see resumption of mining the Eastern Wall, however timing is unknown.

2.5.3 Martha Exploration Project

There is no plan to start this project and the project's consents have effectively lapsed.

2.5.4 Favona and Trio Mines

Mining at the Favona and Trio underground mines is complete.

Favona and Trio infrastructure (declines and Trio vent shaft) continue in operation to service Correnso and Martha Underground.

2.5.5 Correnso Project

Mining in Correnso has been completed, with some backfilling of development drives still required to meet consent conditions.

2.5.6 SUPA Project

No mining is planned to take place in the orebodies under SUPA during the period covered by this Plan.

2.5.7 MDDP

The Martha Development Drive Project is complete and is now considered part of Project Martha Underground.

2.5.8 Project Martha

Development and mining of Martha Underground is intended to continue in the period covered by this Plan. Stopping commenced in Q3 of 2021.

2.6 Rehabilitation Areas

Progressive rehabilitation takes place during the life of the mine. Areas that have been or will be rehabilitated within the coming year are not included in the areas for rehabilitation following sudden closure. The areas assumed for rehabilitation and included in this Plan are summarised in Table 1 and **Figure 1**. The area accounts for a 1.2m crest raise on TSF1A during the period, creating more exposed embankment requiring rehabilitation.

Table 1: Rehabilitation Areas.

Mine Element	Area (ha)
Martha pit surface facilities area	6.30
Conveyor corridor	1.34
Mill, water treatment plant, polishing pond stockpile etc.	18.12
Waste disposal area (WDA)	
1A Embankments	8.00
Load-out area and workshop	3.25
Conveyor area	5.12
Eastern haul road	1.32
Tailings storage facility 1A capping	11.24
Tailings storage facility 2 capping	2.00
WDA stockpiles - topsoil	3.98
WDA stockpiles - other	34.62
Total:	95.29

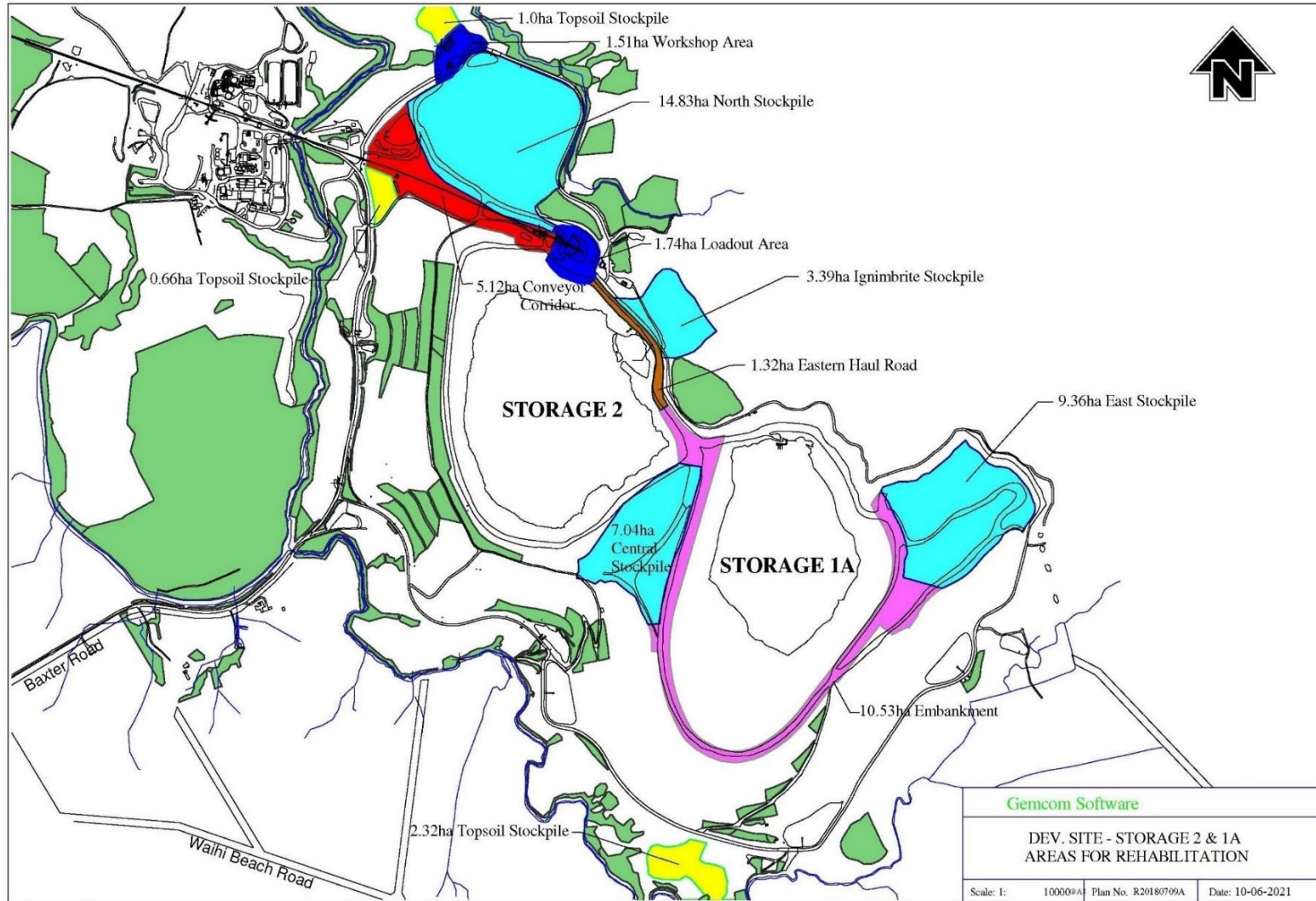


Figure 1: WDA Rehabilitation Areas

3 MARTHA MINE

3.1 Closure

3.1.1 Overview

The conceptual closure plan for the open pit prepared in 2008 and shown in Figure 2Error! Reference source not found. remains mostly unchanged. However, as part of Stage 4, the north wall will require realignment (Figure 3).

All waste rock or ore has been moved from the surface facilities area and with no mining planned, no further use of the area is proposed before 30 June 2024.

Without safe access, the pumping and any other equipment currently within the pit is assumed to be abandoned.

A pit closure timeline is provided in Appendix A.

3.1.2 Pit Wall Stabilisation Works

3.1.2.1 Pit Wall Hazard Identification and Scaling

At the completion of mining, a Hazard Management Plan would be written to identify areas around the lake edge that may be prone to softening, and to identify areas that need to be scaled and rocks removed.

3.1.2.2 Riprap for Lake

The riprap around the lake edge is complete, other than that section that was lost with the northeast wall failure. This lost section will be reinstated during the failure remediation works.

3.1.3 Pit Lake and Park

3.1.3.1 Lake Level Studies and Grand Junction B/Western Adit

Based on technical work carried out for the Extended Project, it was determined that the lake level should be conservatively set at RL 1104 (mine datum). The level was set relative to the adjacent Mangatoetoe Stream, and historic mine workings at the western end of the pit were considered. In this regard, the lowest known potential exit point was described as the former warm spring which flowed from an adit at RL 1106 (mine datum).

It is assumed that Grand Junction B shaft will require capping given that it is in the vicinity of the lake outlet.

3.1.3.2 Drainage Tunnel and Outlet Channel

OceanaGold's predecessor commissioned URS (now AECOM) to complete an outlet design review for the Martha pit lake, and this was completed in February 2011. The report updates investigations carried out in late-1996. The recommended outlet is a 1.8m diameter pipe approximately 150m long, which discharges to the Mangatoetoe Stream.

As part of Project Martha, a replacement discharge consent was applied for. AUTH 139551.08.01 was granted December 2018. This allows discharge of the overflow from the lake via an outlet structure and channel to the Mangatoetoe Stream.

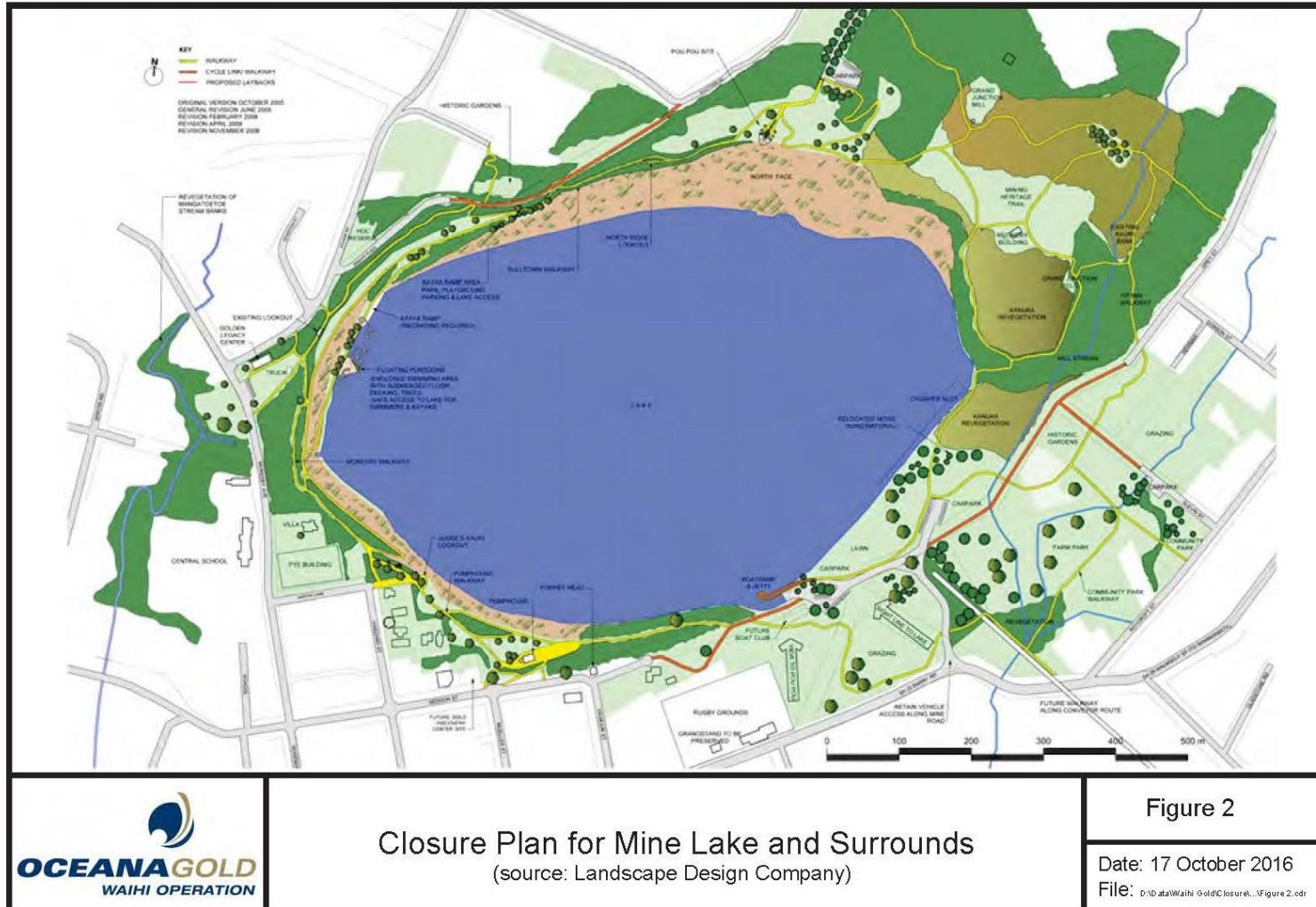


Figure 2: Closure Plan for Mine Lake and Surrounds



Figure 3: Project Martha Closure Plan

3.1.3.3 Lake Filling

It was previously assumed that the existing mine dewatering booster pumps would be used to pump water from the Ohinemuri River to fill the lake. With access into the pit now restricted it may not be possible to recover those pumps, but there are a range of other pumps and pipework currently in use underground or at the process plant that would become available upon cessation of mining.

3.1.3.4 Lime Addition to Lake

For sudden closure, the assumption is that limestone is added to the lake during and beyond filling to maintain lake water pH.

The remodelled predictions for lake water quality undertaken by AECOM in 2018 identified a need to add alkalinity to the lake to ensure robust water quality at lake filling. The predictions suggested that alkalinity should be added to the river water as it is discharged to the lake, to provide 60 g/m³ of CaCO₃. It is predicted that up to 3,450t of alkalinity as calcium carbonate should be added to the total river water volume with this likely to be undertaken by lining an open channel, along which the river water flows, with limestone. Assuming 50% efficiency in alkalinity production from limestone, a mass of 6,900t of limestone comprising clean 25-50 mm chip would be required in the open channel over the filling period.

To maximise the alkalinity input to the lake during filling, and based on advice from AECOM, OceanaGold proposed installing limestone in channels or swales along the length of the haul road. This proposal was described in previous versions of the Plan but is now possible only at the upper end of the north wall ramp. Limestone addition will also be possible on the benches of the remediated northeast wall, during and after this work is complete.

Once full, the lake is assumed to require an ongoing addition of limestone at an annual rate of 30t of alkalinity (as CaCO₃) to maintain lake water pH in the long term. With approximately 50% dosing efficiency for limestone, this amounts to 60t limestone annually. The type of limestone used would be fine lime supplied in bulk form to a lime silo from where a prescribed quantity would be added to a batch mixing tank via a screw feeder. The lime would be dosed at a set rate into a known flow rate of water and discharged onto the surface of the lake via a floating diffuser arrangement.

A reassessment of changes to the long-term lake water quality predictions resulting from the northeast wall failure is planned, i.e. to determine whether the remediated wall contains less or more sulphides and whether those sulphides are more or less reactive.

3.1.4 Surface Facilities Area

3.1.4.1 NAG Testing Programme

At closure, it is expected that a testing programme would be carried out at the Surface Facilities Area (SFA) to identify PAF rock, including PAF sheeting that would need to be removed.

It is assumed that scraping 200mm of residual PAF material from an area of 2ha will be required, with this material pushed into the base of the crusher slot, or possibly into the pit.

3.1.4.2 Filling Crusher Slot and Recontouring SFA

It is assumed that the crusher slot would be filled at closure. The slot requires 83,000m³ of material to fill, and the ramp area adjacent to it requires 7,000m³.

3.1.4.3 Revegetation

The SFA, which totals around 6.3ha, will be covered in 0.5m of subsoil and laid with 100m of topsoil and grassed.

3.1.5 Noise Bund

Material from the Grey Street noise bund will be used to provide the subsoil and topsoil required to rehabilitate the SFA. The bund contains 120,300m³ of suitable NAF material, compared with a minimum of about 30,000m³ required for SFA rehabilitation. The excess could either be disposed of at the pit or used to address any potential shortfall of subsoil and topsoil at the waste disposal area.

3.1.6 Lakeside Amenities

3.1.6.1 Historic Structures

Works associated with the relocation of the Pumphouse and Grand Junction Refinery Building are complete. Eight pillars of the Powerhouse Foundations removed during the Grand Junction Refinery building shift will be reinstated.

3.1.6.2 Pit Rim Walkway

The pit rim walkway will be re-established on the proposed North Wall noise bund (Figure 3). Rehabilitation of other areas around the pit are complete, although adding or forming approximately 500m of walkway in the Grand Junction area and surrounds is provided for.

3.1.6.3 Amenities Block/Services (South Side of Lake)

The Whitehouse Building, which sits outside the high and medium hazard zones, could be used as a lakeside amenities block.

3.1.6.4 South Wall Boat Ramp

A new sealed access road from the Whitehouse to a boat launching ramp located in the southeast corner of the pit between the Royal and Martha hazard zone is provided for.

The south wall boat ramp is assumed to include a jetty for ease of launching and retrieving craft. As previously noted, the ramp is assumed to be a concrete slab of around 200m² in area and x 0.5m thick.

3.1.6.5 Recreational Pontoons

In the event of sudden closure, a swimming pontoon is provided for, located at the western end of the pit. The shape of the pontoon approximates that shown in the pit closure concept plan (**Error! Reference source not found.**Figure 3) and includes a submerged swimming area.

3.1.6.6 Carpark

The assumption is that the Whitehouse carpark would be used. The carpark is sealed and in good condition.

3.1.6.7 Access Road and Carpark Maintenance

It is expected that maintenance of the access roads and carpark would be necessary and is provided for.

3.1.6.8 Interpretation Boards

OceanaGold has placed interpretation boards and signage around the pit rim walkway. The assumption is that no further interpretation boards would be necessary in the event of sudden closure.

3.1.6.9 Lookouts and Seating

The assumption is that existing lookouts and seating are appropriate, and no further allowance is made in this year's bond report.

3.1.7 Planting and Landscaping

3.1.7.1 Native and Exotic Tree Planting

Some further planting may be necessary in the surface facilities area only. The assumption is to plant around 1.2ha of kanuka vegetation as shown in Figure 3, plus some other individual trees.

3.1.7.2 Mowing

Some of the walkways, plantings and viewing platforms that are either built or proposed on land around the pit perimeter are or will be on land not managed by the Martha Trust. It is unclear who will be responsible for these areas in the long term. OceanaGold, LINZ, DOC and the Hauraki District Council will need to resolve this issue in the future. Maintenance may be self-funding through tourism operations and grazing, but as this remains unresolved, is provided for.

3.2 Post-Closure

In the absence of an obvious owner for the pit lake recreational facilities, routine maintenance is provided in perpetuity for the:

- Access road, parking areas and boat ramp;
- Floating pontoons;
- Pit rim walkway;
- Lake outlet structure; and
- Parkland (mowing).

Event-driven maintenance is included on a two to 10-year cycle for the pontoons, pit rim walkway and lake outlet on the assumption that major rainstorms or earthquakes could require additional effort beyond the routine. Refurbishment and replacement is included for the floating docks and the lake outlet structure on 30-year and 50-year cycles respectively.

4 CONVEYOR, PROCESS PLANT AND WTP

4.1 Closure

4.1.1 Decommissioning

4.1.1.1 Process Plant and Water Treatment Plant

All buildings, plant and equipment associated with the conveyor, polishing pond stockpile, process plant and water treatment plant will be decommissioned and removed from site (Figure 4).

Concrete footings, plinths, bunds etc. would be either buried or broken up and disposed of in the tailings storage facilities.

It is proposed to decommission and remove the water treatment plant. OceanaGold is in negotiation with the Councils regarding water treatment plant removal, which is expected to require a consent variation.

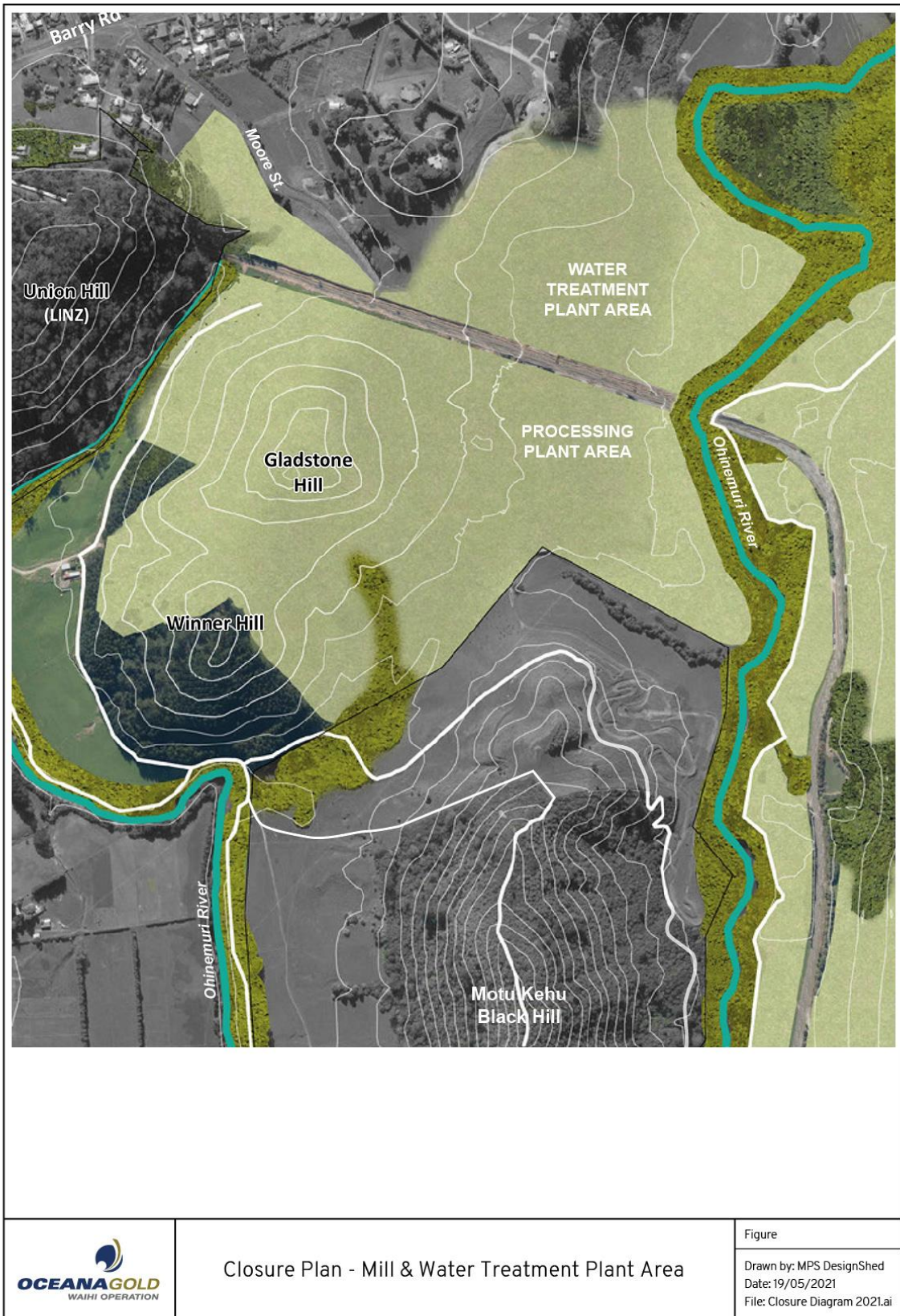


Figure 4: Mill and WTP area.

4.1.1.2 Conveyor

There has been a strong desire indicated by members of the community (expressed through the WCV) to leave the Union Hill tunnel open and incorporate the conveyor corridor as an extension to the Waihi walkway network. Allowing public access to the conveyor tunnel introduces safety and additional maintenance obligations, none of which should fall to OceanaGold under sudden closure, or to the Martha Trust post-closure. The conveyor walkway option is not included in the Plan.

Once the mechanical plant and any PAF and concrete is removed from along the conveyor trace, the area would be ripped. The portals at each end of the conveyor tunnel would be plugged with a 10m³ concrete bulkhead to prevent access.

The conveyor passes through Armco culverts beneath Grey Street and Barry Road. A decision would need to be made regarding these culverts. In practice they could either be left open to allow stormwater drainage to pass to the Barry Road silt pond, or alternatively they could be filled. In the case of the Barry Road culvert this may involve ripping up the road to fill beneath it. Further work is needed closer to closure to accurately identify how these culverts would be rehabilitated.

The land along the conveyor route is owned by various parties including LINZ. It does not form any of the land to be handed over to the Martha Trust at the end of closure.

4.1.2 Contaminated Soil

There is no expectation of a major issue with contaminated soil. Nevertheless, investigations of potentially contaminated soils at the processing plant area, and its removal, is provided for. A volume equivalent to 1m depth of material across 20% of the mill area is assumed.

4.1.3 Stockpile Removal

There is currently waste rock on the polishing pond stockpile and the stockpile will be utilized in the 2022-23 period. If sudden closure occurred, the waste rock would be used to backfill open underground stopes.

If any ore remains in the ROM stockpile at 30 June 2024, it would be processed in short order.

4.1.4 Revegetation

There is a possibility the processing plant area could be a future industrial site for Waihi and that many of the buildings, offices, carparks and roads would be left in place.

The remaining two thirds of the process plant area (i.e. that area not occupied by buildings and roads), the conveyor trace, and the WTP and stockpile areas will be recontoured, topsoiled, fertilised and grassed. It is assumed that the restored land would be used for the purposes of grazing, and maintenance costs have not been included because this land would either be sold or leased to a local farmer. For the conveyor trace, maintenance costs will fall to the owner of the land.

4.2 Post-Closure

With the areas secured and returned to productive pasture, or owned by others, there are no post-closure obligations associated with the conveyor, stockpile areas, or process plant water treatment plant areas.

5 WASTE DISPOSAL AREA

5.1 Closure

5.1.1 Overview

The conceptual closure plan for the tailings storage facilities (TSFs) initially prepared in 1998 remains fundamentally unchanged (refer Figure 5). It comprises a partial capping of the tailings against the embankment crest, retention of part of the impoundments as shallow ponds, and planting of the embankments and capping including a wetland littoral zone around the ponds. Spillways would be constructed to discharge into and from Storage 2.

Figure 6 shows the areas that would need to be rehabilitated for Storage 1A. For the scenario of sudden closure within the coming year it is assumed that:

- The bulk of the 24ha is assumed to be PAF that will be covered with compacted, low permeability Zone G, followed by Zone H growth layer and topsoil;
- Rehabilitation of the unfinished parts of the waste rock embankments would commence immediately following sudden closure;
- Additional capping would be completed on the Storage 2 tailings pond, and revegetated using riparian planting along the pond edge and pasture elsewhere;
- The rehabilitated Storage 2 pond water would continue to flow into a tributary of the Ohinemuri River (TB1), north of the tailings storage facilities;
- Rehabilitation of the Storage 1A tailings pond would need to be delayed for a period, assumed to be around one year, to allow the tailings to consolidate prior to receiving capping and plantings as described for Storage 2;
- Once water quality in the Storage 1A pond improves sufficient to obviate the need for continued treatment, the pond would discharge to the Storage 2 pond and thence to the Ohinemuri via the TB1 tributary;
- Some modifications to the underdrainage system would be progressively implemented, diverting individual drains to the river as water quality improves;
- As one of the last activities, the haul roads and waste loadout area, which are assumed to be sheeted with PAF, would be covered with a 0.6m thick Zone G layer to exclude air and water before receiving growth layers, topsoil and plantings;
- The NAF stockpile footprints, primarily those of the Northern stockpile and ignimbrite stockpile located to the east of the Storage 2 pond, would be recontoured and planted; and
- Some water reticulation and fencing across the rehabilitated areas is installed for farming purposes.



Figure 5: TSF Rehabilitation Concept

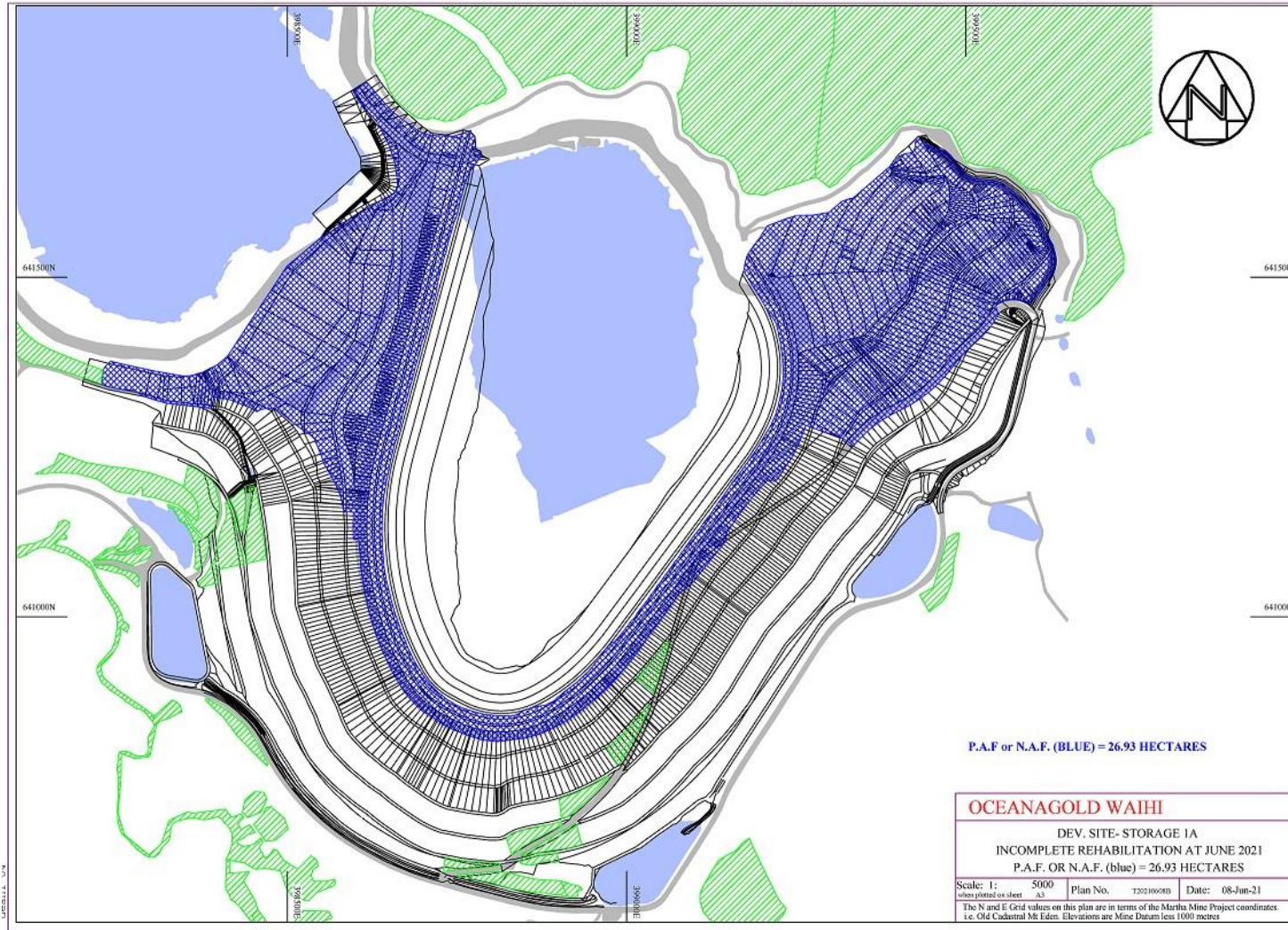


Figure 6: TSF1A Areas for Rehabilitation

5.1.2 Waste Rock Embankments

The total area assumed to be PAF, including the Waste Loadout, the workshop area, the eastern haul road, the eastern and central stockpiles and the Storage 1A embankment is 28.69ha. Rehabilitation of these areas would comprise:

- a Zone G capping layer with a thickness of 1.5m on the Storage 1A embankment;
- a Zone G capping layer with a thickness of 0.6m on the other PAF areas;
- a Zone H subsoil layer, with a thickness of 0.5m across the total area; and
- a topsoil layer, nominally 100mm thick, across the full area to which fertiliser is added and grass seed sown.

The materials balance available for rehabilitation was reassessed as part of this review. This indicated a surplus of all material required to complete the rehabilitation works. There is 751,516m³ of material in the North Stockpile of which approximately 300,000m³ of material is suitable for Zone G. This is sufficient to complete TSF1A to the level planned during the coming reporting period.

The assumption is that two construction seasons would be necessary to complete the embankment rehabilitation works.

5.1.3 Native Plants

The assumption is that there may be some awkward or steep areas that would be better planted in native shrubs than grassed/grazed. Planting of an area of 2ha is provided for, including five years of maintenance.

5.1.4 Tailings Capping

Project Martha ore is planned to be processed throughout 2023-24, and it has yet to be shown that the tailings will be NAF. The continued assumption is that limestone would be applied to the tailings surface prior to placement of the capping material at an application rate of 80 t/ha.

Once limestone application is complete, geotextile would be laid prior to capping with 1.5m of ignimbrite, 0.5m of subsoil and 0.1m of topsoil.

Revegetation may produce superior results without subsoils and topsoil placed over the ignimbrite capping. It is assumed that this comment may have been specific to the planting of the riparian margins of the cap. In any event, the closure works assumption for this Plan remains that soils will be placed across all of the capped area.

The tailings capping requirement was reviewed last in 2020 with input from Engineering Geology. The capping objective is to minimise the area of capping while protecting the embankment crest by ensuring sufficient separation between the crest and the residual pond edge. A capping area of around one third the existing pond area was considered adequate and adopted for TSF1A. This equates to a capping width of around 70m.

TSF2 already has more than one third of the original pond area capped, although there are zones along the western shoreline where the separation between crest and water's edge is only 40-50m. The assumption is that additional capping will occur in these zones, bringing the average width of the capping for TSF2 to around 80m.

It is expected that capping of TSF2 could be completed over one summer (Year 1), while Storage 1A may need to be capped over two consecutive summers depending on tailings consolidation and pore pressure dissipation rates.

5.1.5 Riparian Planting around Tailings Pond Areas

A strip of riparian planting along the shoreline of each of the tailings ponds as described last year is provided for. This will comprise a 2-3m strip of wetland plants on the lake margin, outside of which (on the cap) is a 5-8m wide strip laid with locally sourced Manuka slash (fascinating).

The remaining areas of capping receive subsoils and topsoil, fertiliser and grass.

5.1.6 Tailings Pond Spillways and Siting

In June 2013, OceanaGold's predecessor engaged Engineering Geology to produce drawings for the outlets/spillways for the tailings ponds. Those drawings were included in that version of the Plan and are not repeated here.

5.1.7 Underdrainage Modifications

It is expected that underdrainage (seepage) could be progressively discharged as the drainage quality and volume from individual drains improves. It is assumed that this takes place progressively over the period of closure. Gravity outlet systems would be constructed to allow the ten toe drain sumps and one seepage outlet for TSF2, and five toe drain sumps and two seepage outlets for TSF1A to discharge direct to the receiving waters.

As previously, the ability to divert good quality seepage to the nearby Ruahorehore Stream is built into the TSF1A seepage collection system, and that only a small amount of work would be necessary to institute the diversions. In contrast, more work would be required and has been assumed for TSF2.

5.1.8 Limestone Addition to Haul Roads

The requirement for applying limestone to the haul roads, as assumed in some of the past Plans, is confirmed by EGi to be unnecessary.

EGi also offered an alternative of ripping and liming these areas to form NAF prior to the placement of plant growth and topsoil layers. The alternative approach may be less expensive and warrants further investigation for future Plans.

5.1.9 Eastern Haul Road Capping

Once the embankment and tailings rehabilitation is complete, the haul roads would be decommissioned and rehabilitated. Due to the material used for sheeting, the assumption is that the road surfaces are PAF. The Eastern Haul Road is assumed to be capped with 0.6m of Zone G material, followed by Zone H material (0.5m depth) and topsoil (0.1m depth).

5.1.10 Rehabilitation of Stockpile Areas

It is expected that the land beneath the Northern NAF stockpile and the ignimbrite stockpile would require some minor recontouring prior to topsoiling with 100mm of topsoil and grassing (topsoil is not required on the topsoil stockpiles). This is a conservative assumption as material from both stockpiles will be used for rehabilitation elsewhere in the waste disposal area, and the recontouring would be done as part of the material recovery.

The main stockpile areas were carried over as no change has occurred (Table 2).

Table 2: NAF Stockpile areas

Location of NAF Areas	Area (m ²)
Northern NAF Stockpile	14.83
Ignimbrite Stockpile	3.39
Topsoil E (Torrens)	1.00
Topsoil F (South)	2.32

Rehabilitation is assumed to occur progressively over two years.

Rehabilitation of the central stockpile is included with the rehabilitation of the waste rock embankments.

5.1.11 Ponds

It is assumed that for sudden closure, the following ponds would be retained around the waste disposal area:

- West silt pond
- S1
- S3
- S4
- S5
- NSPSP

These ponds could provide water storage opportunities for other water users in the future. It is also noted that in 2014 Hauraki District Council consented a new water take for Waihi township above the processing plant site near the Golden Valley Bridge, and the ponds could provide potential water storage. It may also be possible for an industrial water user to set up at the processing plant site and to use the water that is stored on site. In summary, the ponds could be a valuable asset/water source in the future for the Martha Trust, or for others. As assumed last year, the assumption is that the ponds will be retained.

Some work associated with pond outlets, e.g. provision of a culvert under the perimeter road from S1, is provided for.

The assumption is that NCP would be filled in at closure, but that this work would be done as part of the recovery of material from and rehabilitation of the northern NAF stockpile.

5.1.12 Fencing, Water Reticulation and Farm Races

It is assumed that once rehabilitation has taken place, fencing and water reticulation would be completed on the embankments.

The fencing on the TSF2 embankment is essentially complete. For TSF1A, some additional fencing and water reticulation is required. On the capped tailings areas for both TSFs, fencing will also be required, particularly to separate the riparian plantings from the areas of pasture.

The total area of new fencing will be 55ha. It is assumed that all areas are fenced into 1ha paddocks, with a mix of nine wire battened fences and fences with four electric wires. Timing is assumed to coincide with that of completion of capping and planting, i.e. in Year 1 for TSF2 and spread across Years 2 and 3 for TSF1A.

Six new water troughs with associated pipework and installation, as assumed previously, are included, giving a total of 24 troughs on the TSFs.

Formation of farm races at the waste disposal area would be spread across the three years of TSF rehabilitation works.

5.1.13 Drain Maintenance

The embankments are constructed, and drainage is progressively installed, so that the embankments do not pond water. While construction of drains as a separate work item is not required, maintenance is required of the surface drainage systems during the closure period. In the first four years of closure the assumption is that surface drains would require cleaning while earthworks were being carried out. The amount of silt reaching the ponds would quickly reduce as rehabilitation works were completed and vegetation becomes established. The assumption is that during the closure period monthly checks would be carried out to determine what if any maintenance of the drains may be necessary.

Once rehabilitation is complete there would be minimal erosion, similar to adjacent farmland, and drain maintenance would decrease.

5.1.14 One-off events

It is possible that the occurrence of one-off events such as heavy rainstorms may require review/design of remedial work/construction work, e.g. slumping that might block the perimeter drains and require stabilisation or settlement/deformation of an outlet weir from the pond that requires reconstruction of the outlet weir. It is assumed that such events could occur randomly at intervals ranging typically between two and ten years.

5.2 Post-Closure

5.2.1 Waste Rock Embankments

Annual walkover surveys and reports by a professional engineer, in line with the requirements stipulated by NZSOLD, are assumed for the waste rock embankments in perpetuity. In addition, the Site Management Coordinator (refer s7.1.6) would undertake regular and routine embankment walkover checks and wilding tree control.

Provision is also made for routine maintenance of the embankments, for additional event-driven maintenance on a six-year to 20-year cycle, and for more extensive maintenance effort following extreme events on a 50-year cycle.

Routine and event-driven maintenance, and periodic (50-year cycle) refurbishment of the TSF pond outlets is included in perpetuity.

5.2.2 Other

It is assumed that fences, water supply, farm races and the like are maintained by whomever leases the land.

6 UNDERGROUND MINES

6.1 Closure

6.1.1 Decommissioning

As in the previous Plans, removal of underground pumping equipment soon after the cessation of mining is assumed once the Project Martha pit portals are sealed.

6.1.2 Underground Workings/Decline

Conditions of consent require the backfilling of a short section of the Trio access development, of the two existing ventilation shafts, and of the Favona portal.

For Correnso, the consent conditions require the backfilling of any open stopes at closure, and of certain sections of overlapping development.

The underground volumes to be backfilled as required under the conditions of the consents is in Table 3.

Table 3: Underground closure backfilling

Description	Quantity (m ³)
Backfill Correnso stopes and stacked development	111,000
Backfill SUPA stopes and stacked development	8,400
Backfill Project Martha portals (x2)	2,200
Backfill Project Martha Development	13,000
Backfill Project Martha Vent rise	1,500
Backfill Trio decline (approx. 200m)	5,000
Backfill portal	2,650
TOTAL	143,750

There is likely to be waste rock volumes on the surge stockpile at 30 June 2024, so this material would provide the bulk of the backfill material. The polishing pond stockpile will also have waste rock available to use as backfill.

6.1.3 Portal Box Cut

Rehabilitation of the box cut would be one of the last underground-associated activities to take place. It would involve battering down of the box cut, bringing in material and recontouring to blend it in with the natural contours of the landscape.

The majority of the work would comprise dozing in the sides of the box cut, the material from which is NAF. The area would then be topsoiled and grassed.

6.1.4 Ventilation/Escap Shafts

There are two, 2.4m diameter shafts (a ventilation shaft and an escape shaft) for Favona as well as the Trio Vent Shaft which has a diameter of 3.5m, to be backfilled. The escape shaft contains a ladderway that would need to be removed before filling with waste.

Assuming a depth of 100m and shaft diameter of 2.4m for the two Favona shafts, and a depth of 138m and diameter of 3.5m for the Trio ventilation shaft, approximately 500m³ of backfill material would be needed for each of the Favona shafts, and 1,400m³ would be required for the Trio Ventilation Shaft. The shafts are steel lined and based on similar work underground it would be feasible to fill these shafts by tipping waste rock down them.

Concrete would then be poured to secure the top of the shafts. It is assumed that one ready mix truck full (5m³) of low strength concrete would be sufficient for the two Favona shafts, and 15m³ would be necessary for the Trio Ventilation shaft (total 25m³ of concrete for all three shafts).

6.1.5 Stockpiles

There is currently material on the Polishing Pond Stockpile and more is planned to be placed there.

Up to 40,000m³ of waste rock could be on the surge stockpile near the underground portal to be used as underground backfill. However, volumes are often less.

The assumption is that the following stockpile footprints will require rehabilitation (Table 4).

Table 4: Underground stockpiles.

Stockpile	Footprint (m ²)
Polishing Pond Stockpile	77,000
Ore and Waste Stockpile, and magazine	32,400
TOTAL	109,400

The assumption is that any PAF material will have been removed for placement underground, and that the whole area requires ripping, topsoiling and grassing.

6.1.6 Ponds

The assumption is that at closure, a number of ponds around the Mill area would need to be filled (Table 5).

Table 5: Mill ponds.

Pond	Volume (m ³)	Area (m ²)
Mill Collection Pond	4,243	5,400
Favona Stockpile Collection Ponds	13,800	7,900
TCP1	159	1,000
TCP2	1,831	1,800
TOTAL	20,033	16,100

Rehabilitation comprises dozing in the walls of the ponds to form free-draining landforms before the areas are topsoiled and grassed.

6.1.7 Haul Roads

The haul roads from the underground portal to the stockpiles and Process Plant would be ripped, limed, topsoiled, fertilised and grassed. Removal of an assumed 1m depth of PAF is included.

6.1.8 Access Road

The access road around the Process Plant area is sealed and would be useful for future farm access. For this reason, it is assumed to be left in place.

6.1.9 Water Management

During rehabilitation operations, clean water from undisturbed areas of the catchment above the portal would continue to be directed around the work areas until earthworks were complete and a successful pasture had developed. The open drain would then be filled to eliminate a potential safety hazard and the need for ongoing maintenance. Fill material would be sourced from the 'unsuitables' stockpile at the waste disposal area. It is assumed that approximately 4,000 m³ of material would be needed to complete the work.

6.1.10 Ancillary Facilities

In the event of sudden closure it is likely that the Underground Amenities office would be retained for some form of use post-mining.

As described above for the process plant area, excavation and removal of an average of 1m of contaminated material over part of the area is assumed.

6.1.11 Fencing

Upon completion of rehabilitation, the security fence surrounding the shafts would no longer be necessary and would be removed. Depending on the final land use, the security fence around the processing plant may also be removed.

6.1.12 Maintenance

Depending upon the final land use, ongoing maintenance may be limited to normal pasture maintenance or weed control. This will involve fertilising the soil, removing weeds etc. In the early years, land restored to pasture will need to be managed in such a way that it is not overgrazed or pugged. After that time, the area should be able to be managed in a similar way to surrounding farmland. The assumption is that the farmer/new owner would take responsibility for this task.

6.2 Post-Closure

No ongoing maintenance or monitoring associated with the underground mines is assumed beyond Closure.

7 ADMINISTRATION

This section covers the management, monitoring and maintenance elements of closure, aftercare, and post-closure.

7.1 Closure

7.1.1 Staffing Overview

It is assumed that the Councils would need staff to complete rehabilitation and closure activities until such time that the site reaches Closure, at which time the Martha Trust is able to take responsibility of the ongoing management of the site. The Councils' responsibilities would include completing all physical rehabilitation and closure tasks, monitoring and maintenance, water treatment, and the necessary administrative tasks.

Initially, a greater number of staff would be required, and it is expected that a Site Manager with engineering experience would be needed for the first two years to oversee the bulk of the rehabilitation earthworks around the site. By Year 3, much of the remaining work would relate to environmental monitoring, inspections, and general maintenance as opposed to major decommissioning and earthworks activities. By Year 5, it is expected that environmental monitoring and maintenance would be the remaining routine tasks. At that point in time, all activities could be managed by one person, referred to as the Site Management Coordinator.

The staffing assumptions are outlined in the following sub-sections.

7.1.2 Site Manager

The Site Manager would be a full-time role for the initial two years while the bulk of the demolition of plant and earthmoving activities were taking place. One of the Site Manager's initial tasks would be to draw up a tender document for the rehabilitation of the site, and then to form a Rehabilitation Earthworks contract. The

Site Manager would oversee all works on site and act as the Company Liaison Officer, including managing a liaison forum to keep residents and interested parties informed of rehabilitation activities if such a forum is deemed desirable by the Councils. It is assumed that no Council Liaison Officer would be necessary, given that the Councils would be carrying out the work.

Beyond Year 2 it is expected that the environmental staff, and later the Site Management Coordinator, would take on the main site management role.

7.1.3 Management Support

It is assumed that some logistics/administrative support would be needed during the first four years of closure. The equivalent of one person employed full time for the first three years to undertake logistics/clerical duties while the bulk of the closure activity are taking place, and part-time in Year 4, is provided for.

7.1.4 Accountancy

It is assumed that a full-time accountant would be necessary for a period of two years. Beyond that time it could be assumed that there would be only minor accountancy requirements including annual tax statements and accounts, and for that reason the costs have been progressively reduced over the remainder of the 13-year closure period.

7.1.5 Environmental

One Environmental Officer and one Environmental Technician are assumed to be required on a full-time basis for Years 1 to 2. Beyond that time, the Environmental Officer would continue through to Year 5.

As part of the transfer from Environmental Staff to the Site Management Coordinator, a long-term Surveillance and Maintenance Manual would be prepared for the waste disposal area and the Pit Lake Area. The Site Management Coordinator would be expected to follow the requirements of the manual. The manual would include monitoring and maintenance requirements, check sheets and trigger levels to warn of any possible problems at an early stage. The Manual would also include a requirement for inspections by appropriately qualified professionals, reducing in frequency over time. At the time of these inspections, all monitoring data would be reviewed, and the Surveillance and Maintenance Manual would be updated and amended as necessary.

By Year 5, the Environmental Officer would be retained on site on a part-time basis (or alternatively full time for six months) for the purpose of training the Site Management Coordinator.

7.1.6 Site Management Coordinator

The position would commence in Year 5, with some overlap with an Environmental Officer for the purposes of training. This would be a full-time role for Years 5 to 8, reducing to part-time thereafter.

The Site Management Coordinator would be responsible for the following:

- engaging contractors and consultants to provide necessary external services;
- undertaking routine inspections at regular intervals, after heavy rain as necessary, and following unusual events such as earthquakes;
- determining whether the pit lake outlet and tailings pond outlets require clearance, and carrying out any necessary work in a timely manner;

- identifying and removing noxious weeds above lake level in the open pit;
- identifying and scaling down rocks on the pit walls that may be a public safety issue;
- identifying and removing any large trees in the vicinity of the tailings ponds, pit lake or embankment that could be susceptible to wind throw and potential damage (e.g. to capping layers or blocking outlets) and removing in a timely manner;
- determining whether any surface drains require maintenance, and either carrying out that work if minor, or arranging suitable contractors if necessary;
- arranging reagent supply and maintenance on an as required basis for the limestone addition plant;
- carrying out pest and weed control;
- arranging for contract mowing of grassed areas adjacent to the pit lake on a regular basis;
- maintaining buildings and facilities as necessary, e.g. access roads, farm races, carparks, lookouts and later the amenities block adjacent to the lake etc.;
- regularly inspecting the waste disposal area to ensure that grazing is being carried out responsibly, fertiliser and lime is being applied as necessary, and that nothing untoward such as cracking and erosion are occurring;
- inspecting and maintaining/replacing pH and conductivity meters, water level dippers and flow meters; and
- entering data and maintaining records.

7.1.7 Gardener/Caretaker

In the event of sudden closure, it would also be necessary to hire a gardener/caretaker to maintain existing plantings and generally keep things tidy and secure for a period spanning Years 1 to 5.

7.1.8 Water Treatment Plant Operators

The assumption is that staff comprising a supervisor and six operators would be needed to run the water treatment plant for the assumed three years of decant and other water treatment.

It may be that the labour costs could be reduced by automating the water treatment plant or manning it for example during daytime hours and not at night. This will be given further consideration in future Plans.

7.1.9 Geotechnical Monitoring

Assistance would be required to ensure that:

- rehabilitation operations take place in accordance with the required engineering specifications as required by the conditions of consent, and the requirements of the Building Act; and
- ongoing monitoring and maintenance requirements are being attended to.

Assistance would be required for two construction seasons (October to March, i.e. six months each) to test the embankment and haul road capping. The role requires a Senior Technician. The Councils could choose to retain the existing contractors, Geotechnics, to carry out this role.

7.1.10 Surveying Assistance

Surveying would be required over the entire closure period, but primarily during the initial two years during which the bulk earthworks are completed. As the lake is being filled and earthworks are being completed at the waste disposal area, surveyors would be needed for the purposes of monitoring, and to produce as built plans. In the longer term, surveying would be required for the purposes of monitoring only.

7.1.11 Fixed Plant Maintenance Technicians

The assumption is that operating plant (including pumping and pipeline systems and any associated flowmeters/telemetry etc.) would require maintenance for the first two years. This would include maintenance of the seepage system and tailings decant pumps. The work would be carried out by the WTP staff.

7.1.12 Ancillaries

7.1.12.1 Vehicles

Vehicles would need to be provided for those staff members who need them. It is assumed that four to five vehicles are needed for Years 1 and 2, reducing progressively beyond that point (Table 6).

Table 6: Closure staffing.

	Year							
	1	2	3	4	5	6	7	8-13
Site Manager	1	1						
Underground (Miner)	0.5							
Environmental	1	1	1	1	1	1	1	0.5
WTP Operators	1	1						
Maintenance	1	1	1	1	1	1		
Site Co-Ordinator							1	1
Total Number	4.5	4	2	2	2	2	2	1 p.a.

7.1.12.2 Office Expenses

For the early years of closure, offices would be needed for the various staff on site. There are a number of office facilities around the site that could be utilised, e.g. the pit Whitehouse and/or the underground office facilities.

Office expenses would include such things as cleaning, tea, coffee, couriers, postage, photocopying, printing, stationery, phone, power, and computing facilities.

7.1.12.3 Long Term Building/Administration Costs

In the long term, there would need to be equipment storage and office facilities for use by the Site Management Coordinator. It is assumed this building is required from Year 6 onwards. The running costs allowed include general repairs and maintenance, power, telephone, consumables (tea/coffee, stationery, couriers, postage etc.), water and computer hire.

7.1.12.4 Long Term Maintenance Costs

Long term maintenance costs are expected to include consumables required for long term maintenance activities such as weed/pest control, minor seeding/planting, maintenance of facilities e.g. signs, repair of security fencing, etc. The work would be carried out by the Site Management Coordinator.

7.1.12.5 Scout Den

As part of their agreement with OceanaGold, the Scouts had the option of moving their building near to the pit lake at some later date if they wished. They have since confirmed that they wish to remain in their current location.

7.1.12.6 Rates

HDC has informed OGNZL that it imposes rates on its reserves. WRC also charges rates to trust property. The 2022-23 bond review includes the updated rating position and any associated costs from both HDC and WRC.

7.1.12.7 Insurances

The conditions of consent specify that the Rehabilitation Bond should:

“...enable the Councils in the event of the bonds being called upon, to purchase Industrial and Special Risk Insurance in the sum of \$12 million (1998 dollars) and Public Liability Insurance in the sum of \$5 million (1998 dollars)...”

Using the CPI, the inflated level of cover for these two policies is currently around \$17 million and \$7 million respectively.

7.1.13 Water Treatment Costs

The post-mining volumes requiring water treatment were reviewed. Last calendar year's treatment volumes, excluding mine dewatering volumes and adjusted for average rainfall are adopted.

The decant water volumes for treatment also assume an additional 50,000m³ in Year 1 to reduce the volume on TSF1A from its current 500,000m³ to assist drying of tailings prior to capping.

Three years of treatment to remove metals from all sources, and an initial six months of cyanide treatment for decant and water from the Mill Contingency Pond (MCP), is assumed.

7.1.14 Environmental Management and Monitoring

7.1.14.1 Overview

It is expected that if the mine closed suddenly, the Councils would continue to require a level of monitoring, maintenance and reporting that would reduce as closure proceeds in preparation for handing the relevant areas over to the Martha Trust.

Many monitoring activities would cease, but some monitoring of revegetation and discharge quality, for example, would need to continue for a period. Once dewatering ceases, the monitoring focus would change from settlement and possible effects on bore users, to rebound and monitoring for the occurrence of springs as the lake level rises. Elution water would not be required once ore processing had ceased, and biological monitoring would not be required once discharges from the water treatment plant cease.

There is no provision for peer review during the closure period. The assumption is that peer review would not be required if the Councils were managing the site, as opposed to OceanaGold, because there would be no perceived need for “independence”.

The function of the peer review panel is to provide independent advice to both OceanaGold and to the Councils in specific technical areas that the latter cannot provide from in-house expertise. The peer review panel provides an independent check, particularly for the Councils, that the advice provided by OceanaGold's specialists is appropriate.

The assumption under sudden closure is that OceanaGold ceases to exist as a viable entity, that mining ceases, and that the Councils take over responsibility for closing the site. Under these circumstances, the Councils would be expected to continue to seek technical advice and would engage suitably qualified specialists directly. Whether those advisors are the existing peer reviewers, or any other appropriately qualified party, would be up to the Councils. In any event, there is no need for the Councils to engage two sets of specialists, each set providing advice covering the same disciplines.

It is assumed that the Council's will continue to require technical support for the following disciplines for which there is currently a peer review role:

- Hydrogeology;
- Geochemistry;
- Revegetation;
- Iwi observer;
- Geotech – underground;
- Geotech – TSFs; and
- Geotech – pit.

The level of technical input required through the closure period is assumed to comprise:

- Advice from the full suite of advisors at current peer reviewer levels for Years 1 and 2 for finalising closure criteria, for assessing pit wall stability and modelled lake water quality prior to the start of pit rewatering, and for checking underground backfilling;
- Beyond Year 2, little to no input required in relation to the underground mines, revegetation, and TSF stability, with reduced inputs on lake (and other) water quality;
- Pit stability advice continues at current levels into Year 3 or 4, which is assumed to coincide with the period of least stability during rewatering;
- Reduced technical support required during Years 4 to 6;
- Increased support in Year 7, and some in Year 8 in relation to lake water quality prior to the lake's first discharge;
- Minimal advice during Years 9 to 12; and
- Advice from the full suite of advisors in Year 13 to provide final sign off against closure criteria (in practice, sign off on TSF stability and revegetation could, in all probability, be provided earlier than Year 13).

In addition to the above, provision is included for a range of other specialist inputs from Council staff and/or consultants including:

- Updating pit factors of safety;
- Defining pit stability and closure criteria;
- Pit wall prism monitoring interpretation;
- Prism monitoring trend analyses;
- Ground rebound and spring monitoring;
- Pit lake water quality monitoring and reporting;
- Pit lake water quality management handover report preparation;
- Preparation of a maintenance and surveillance monitoring plan for the waste disposal area;

- Undertaking deformation surveys of the waste rock embankments;
- An updated dam breach analysis;
- A dam safety review;
- Preparation of an emergency action plan;
- Tailings and piezometric level monitoring;
- Waste disposal area inspections and reports;
- Waste disposal area water monitoring;
- River and stream water quality monitoring; and
- Monitoring of private bore water levels and responses.

Also included is equipment replacement, maintenance, calibration and physical work involved in undertaking the monitoring.

Further detail of the key elements of closure period monitoring follow.

7.1.14.2 General

7.1.14.2.1 Rehabilitation and Closure Plan

The Rehabilitation and Closure Plan is revised annually over the life of the project. Under sudden closure, no further revisions would be required.

7.1.14.2.2 Monitoring of Noise and Vibration

No blast vibration monitoring is assumed during the closure period. Even if some blasting was required, e.g. to form the lake outlet tunnel (currently assumed to be bored) or to remove foundations, the monitoring requirement is expected to be minimal.

Similarly, some minimal noise monitoring could continue while construction operations were being carried out and only during the daytime as work would not be carried out at night.

7.1.14.2.3 Surveying

The costs of surveying at the waste disposal area, settlement monitoring and maintenance of the in-pit robotic maintenance system are provided for.

7.1.14.2.4 Revegetation Inspection

Revegetation of the embankment has to date been well managed and based on years of experience there should be no issue in terms of revegetating the remaining areas. Nevertheless, the Councils could seek advice on rehabilitation matters. The assumption is that inspections would need to take place during the closure period, but they would be phased out over time.

During the early stage of the closure period (Years 1 to 3), it is expected that the Soil Scientist would carry out an annual inspection and write a report in addition to reviewing the Rehabilitation and Closure Plan and/or providing advice when needed. After Year 3, the bulk of the rehabilitation works would be complete, and inspections should only need to take place every five years until the end of the closure period.

7.1.14.2.5 Environmental Monitoring Equipment

The assumption is that the monitoring equipment held on site at present would be available for immediate use by the Councils, and later the Martha Trust.

7.1.14.2.6 Monitoring Equipment, Maintenance & Consumables

Servicing equipment, repairs, and replacement of consumables are provided for, progressively reducing after Year 3 as water treatment ceases.

7.1.14.3 Martha Mine

7.1.14.3.1 Pit Slope Monitoring

Under sudden closure, it is assumed that a considerable amount of geotechnical work would be required prior to flooding the pit; including updating factors of safety; finalising closure criteria studies; hazard mapping; reviewing, and if appropriate revising, the pit wall monitoring system; groundwater monitoring; crack monitoring etc.

There will be some initial works and set up required. The frequency and intensity of monitoring is expected to reduce with time.

An updated Pit Slope Management Plan was submitted in 2019 as part of Project Martha conditions.

7.1.14.3.2 Lake Filling Surface Rebound/Spring Monitoring

Once lake filling commences, it is expected that monitoring would focus on surface rebound and spring monitoring as opposed to dewatering induced settlement. The monitoring involved is expected to include surveying and piezometer monitoring.

The Waihi township survey takes place twice a year and takes two people approximately thirty working days to complete and requires a professional surveyor to supervise the process and write up the data. The data is then adjusted by Engineering Geology Ltd, and an annual report prepared.

For the rebound monitoring, some rationalisation of the current monitoring programme could be assumed, by reducing the number of survey sequences. The assumption is that the monitoring could be reduced by about one half.

The assumption is that the surveying would take place on a six-monthly basis during lake filling and for three years beyond. This is because changes to the rhyolitic tephra, which is sensitive to pore pressure, would occur at the end of lake filling and it is the rhyolitic tephra on which the town is built. An additional three years of surveying beyond the end of lake filling is recommended to cover any lag period that might occur.

7.1.14.3.3 Lake Water Quality – Monitoring and Reporting

Water quality monitoring is assumed throughout the full closure period, with the monitoring intensity reducing once the lake is full and discharging.

7.1.14.4 Waste Disposal Area

7.1.14.4.1 Maintenance/Surveillance

The scope of monitoring and surveillance of the TSFs is assumed as current Plans detail. Surveillance is expected to reduce over time and depend on geotechnical recommendations and dam safety regulations.

7.1.14.4.2 Water Monitoring

Water monitoring at the waste disposal area during the closure and post closure periods is expected to consist of the following:

- Groundwater quality and water levels,
- Underdrainage water quality and flows,
- Tailings pond water quality,
- Embankment runoff water quality.

Underdrainage from the tailings storage facilities would flow direct to receiving waters via gravity outlets following modifications to the existing seepage system. For TSF2, it is assumed that there would be ten toe drain sumps and one seepage outlet, and for TSF1A, there would be five toe drain sumps and two outlets for seepage. All of these would flow via gravity.

Similarly, the overflow from the rehabilitated tailings ponds would require monitoring, and hand-held pH and conductivity meters would be appropriate for this purpose. Water reporting to the collection ponds is now discharged without treatment provided in-line monitoring indicates appropriate water quality. Further advances in rehabilitation prior to and following sudden closure would result in pond water quality improvements, and the existing monitoring could be continued for a period. Drainage flows would be best monitored in the long-term using a bucket and stopwatch. Groundwater levels could be measured if this was deemed necessary.

7.1.14.4.3 Ohinemuri River/Ruahorehore Stream Monitoring

During the closure period, particularly while treated water was being discharged, the assumption is that some of the current, very extensive biological and water quality monitoring would continue, reducing with time.

As a final downstream check during the post closure period, sampling within the Ohinemuri River and Ruahorehore Stream (both upstream and downstream of the site) is assumed to occur twice a year.

7.1.14.5 Underground Mines

The assumption is that some monitoring of private bores would be carried out. This might involve a private bores or existing OceanaGold piezometers. The monitoring would take place as the lake level rises and there is a corresponding readjustment in the surrounding groundwater levels. Beyond that time the lake would be a sink with groundwater moving towards the lake.

The assumption is that the bores would be sampled six monthly for a range of cations and anions, pH, EC and iron and manganese.

7.2 Post-Closure

7.2.1 Martha Trust

Provision for the administration and running of the Martha Trust in perpetuity is included. It is assumed that Trustees will draw an honorarium and will be covered by Trustees liability insurance. Other Trust-specific operating requirements include asset insurance cover, public liability insurance and accounting, legal and consulting services.

7.2.2 Staffing

The Martha Trust will employ one part-time staff member; the Site Management Coordinator, who will be familiar with and managing the site at the time it is handed over to the Trust. This is essentially a continuation of the role as described above in s7.1.6, but need not be the same individual as the Trust will be able to engage another person should it so choose and as the need arises. However, the position would be permanently retained, reporting to the Trustees.

The Site Management Coordinator will be provided with a vehicle and the tools and equipment required to undertake the routine maintenance and monitoring tasks. Equipment maintenance and consumables, along with a building and its associated operating and maintenance, are provided for.

7.2.3 Environmental Management and Monitoring

The Site Management Coordinator's responsibilities will include routine checking and maintenance tasks associated with the pit lake, its outlet, and the waste disposal area, and engaging and paying others to undertake monitoring or maintenance work where the scope or scale is beyond that of the Site Management Coordinator's responsibilities or capabilities.

Specifically, the role will undertake the:

- Routine maintenance tasks described in s3.2 and s5.2 in perpetuity;
- Management of the continued pit wall monitoring for four years (or 10 years from the time of the initial lake discharge), including the servicing and calibration of equipment, and the coordination of consulting inputs and reporting;
- Maintenance and supply of limestone to the pit lake water treatment plant, and the replacement or refurbishment of plant as required;
- Collection of surface water and groundwater samples, delivery for analysis, the maintenance of a monitoring database and the routine reporting of results to the Councils; and
- Reporting to the Trustees.

8 RESIDUAL RISK

8.1 Background

An assessment of the residual risk associated with the closed site was first undertaken in 1997 (and reported in 1998 in the first Capitalisation Sum report). While some changes were made to that assessment in subsequent years, the first full assessment review was undertaken and reported in the 2015 Capitalisation Sum report. That review was supported by a range of other risk studies, including an updated risk assessment and dam breach analysis for the waste rock embankments (2011) and the first pit wall risk assessment (2014). In 2020 a Comprehensive Dam Safety Review (CDSR) was undertaken for both TSFs. This assessed compliance with New Zealand Society of Large Dams (NZSOLD) requirements.

The pit wall risk assessment was reviewed and updated in 2016. At the time of preparing this Plan, the updated assessment findings were in draft form, but initial feedback on the draft is that the conclusions are overly conservative. The updated findings, including the noted conservatism, are included in this latest residual risk assessment.

The conditions of consent require assessment of the residual risks for the closed site, i.e. for the post-closure period. Residual risk through the closure period was included for the first time in the 2014 residual risk assessment. Both closure and post-closure residual risks are included in this Plan.

The closure risk assessment is based on the post-closure risk assessment, excluding any risk events that cannot occur during the closure period. It is derived by:

- Taking the post-closure risk assessment and checking it for completeness, incorporating any changes since the previous assessment;
- Identifying which of the events in the risk register could occur during the closure period and which during the post-closure period; and
- Quantifying each risk event appropriate to the period in which it is assumed to occur.

Detail of the risk assessment method is contained in the bond reports. The method is known to the Councils, having been developed in conjunction with them in 1997, is described in the 2015 Capitalisation Sum report, and that description is repeated in this year's version of the Capitalisation Sum report. The full description is not repeated here.

8.2 Climate Change

A consequence of climate change could be increased intense rainfall and flood potential. Potential impacts need to be assessed as part of OGNZL standard 5.0 Closure and Rehabilitation Management. 5.3.2 *Adequate consideration shall be given to the effects of climate change and flood planning during closure planning.*

With each project phase, technical reports are created to support the consent application. In 2018 GHD Ltd produced Appendix I Water Management Assessment for Project Martha. This includes rainfall and flood hydrological model analysis that incorporates potential climate change impacts.

In addition, specifically for Tailings Storage Facilities, Probable Maximum Precipitation (PMP) must be calculated as part of NZSOLD required dam break studies and routine operational freeboard management. This ensures enough freeboard is maintained on the facilities to ensure there is little risk of overtopping. PMP analysis was reviewed updated in 2020 and considered the effects of climate change. An extra 1m is added to the PMP sum as another factor of safety and reassurance that the TSF's have the capacity to receive extreme weather precipitation.

At closure, TSF spillways will be created which will lead to a tributary of the Ohinemuri (TB1) where surplus water is direct discharged to receiving waters.

8.3 Findings

An abridged version of the risk register listing the credible and material risk events, and the period during which each risk exists (the exposure period), is summarised in Table 7. A full copy of the risk register is provided in Appendix B.

8.3.1 Risk Profile

The risk profile ranks all of the analysed risk events in descending order of risk quotient (the product of likelihood and consequence). It provides a clear focus on those events that pose the greatest risk. The risk profiles for both the closure and post-closure periods are shown in Figure 7.

8.3.1.1 Closure Risk Profile

Figure 7 shows that during closure the Pit-21 Hazard zone collapse and Pit-1c Pit wall failure – damage risk events dominate the profile.

Table 7: Risk Register Summary.

Risk Event ID	Short Description	Exposure Period		Comment
		Closure	Post-Closure	
Pit-1b	Pit wall failure - safety	✓	✓	Likelihood of a wall failure causing serious injury or loss of life derived from updated pit wall risk assessment.
Pit1-c	Pit wall failure - damage	✓	✓	New risk event. Likelihood and magnitude derived from updated pit wall risk assessment.
Pit-1e	Pit wall failure - floodwave		✓	Seiche analysis confirms that wall failures cannot generate waves capable of overtopping pit rim. Risk only exists once the lake is full <u>and</u> open to the public.
Pit 1f	Pit wall failure prevention	✓	✓	New risk event. Assumed preventative action taken against pending pit wall failure, incurring cost to Councils during closure, or the Martha Trust post-closure.
Pit-7b	Pit lake outlet failure		✓	Risk assumed to be material only once outlet formed and in use.
Pit-8a	Pit lake water quality	✓	✓	Buffering of lake water pH incurs greater cost than assumed in closure estimate.
Pit-21	Hazard zone collapse	✓	✓	
WDA-5	TSF bypass seepage	✓	✓	
WDA-8	Catastrophic tailings release	✓	✓	
WDA-27	Delay in reducing PIC		✓	Only a risk to the Martha Trust, which is assumed to seek a lower potential impact classification (PIC) to reduce embankment surveillance costs.

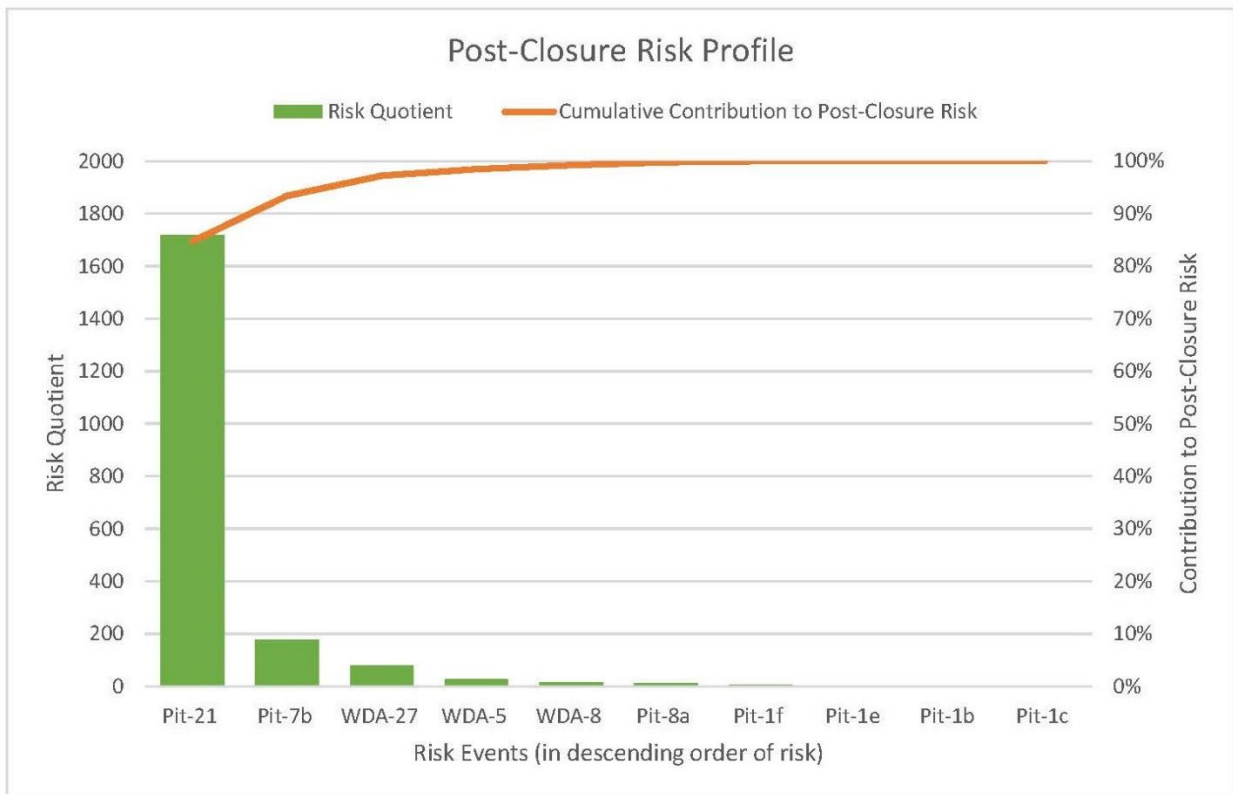
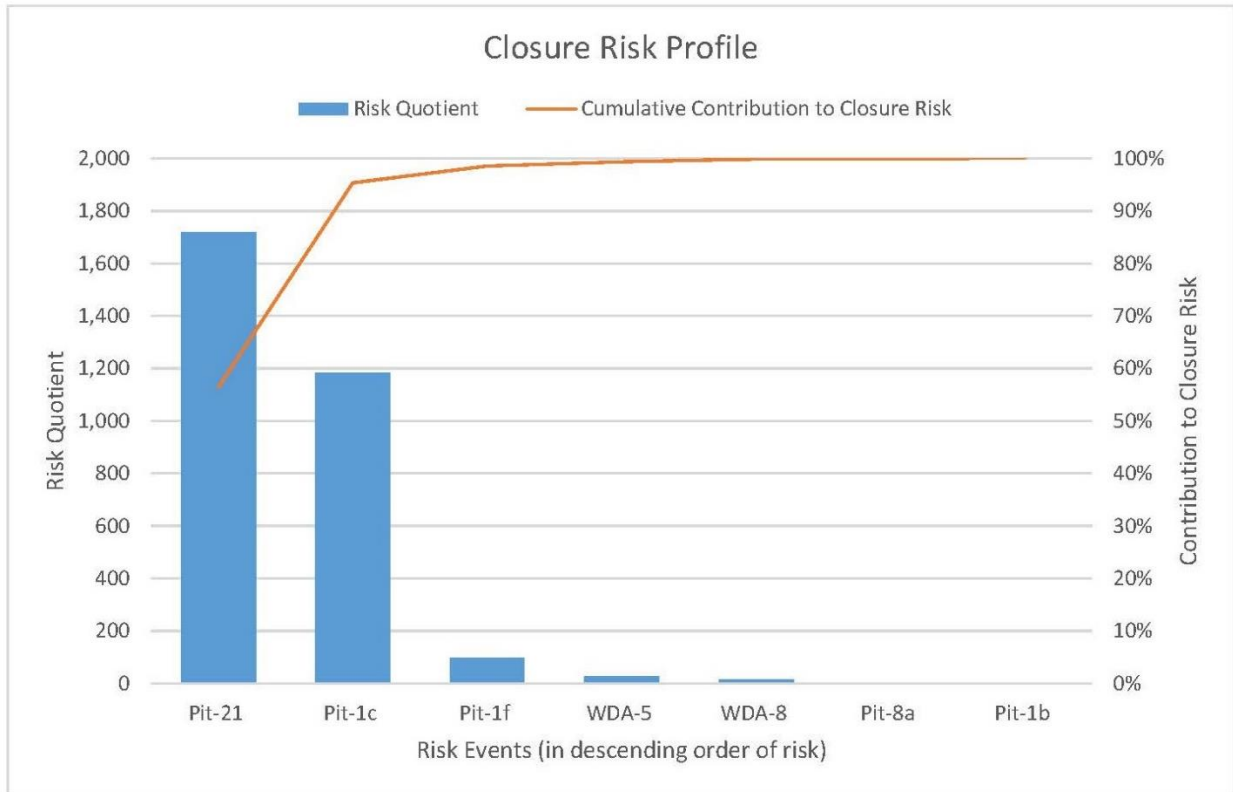


Figure 7: Risk Profiles.

The risk quotient provides a quantitative and directly comparable value of the risk each event poses during the closure period. For example, the second-highest ranked risk event (Pit1-c Pit wall failure – damage, risk quotient = 1,200) poses 70% of the closure risk posed by the top-ranked risk event (Pit-21 Hazard zone collapse, risk quotient = 1,700). The third-highest ranked risk event (Pit-1f Pit wall failure prevention) poses a little over 5% of the risk posed by Pit-21.

The risk profile also shows the cumulative contribution of each event to the total closure risk. Pit-21 poses around 55% of the total closure risk, and, with Pit-1c included, the two top-ranked risks represent about 95% of the total closure risk.

8.3.1.2 Post-Closure Risk Profile

The post-closure risk profile is also dominated by the Pit-21 Hazard zone collapse risk event. The event has the same risk quotient as exists through the closure period. However, because the risk posed by the other post-closure risk events is either equal to or less than that during the closure period, the Pit-21 risk event represents 85% of the total post-closure risk.

The total post-closure risk is about two thirds that assessed for the closure period.

The events that pose the same level of risk in the closure and post-closure periods, listed in descending order of risk, are:

- Pit-21 Hazard zone collapse;
- WDA-5 TSF bypass seepage; and
- WDA-8 Catastrophic tailings release.

Events that pose a lower risk in the post-closure period than during the closure period, listed in descending order of risk and their post-closure risk expressed as a percentage of the closure risk (in brackets) are:

- Pit-1f Pit wall failure prevention (4%);
- Pit-1b Pit wall failure – safety (76%); and
- Pit-1c Pit wall failure - damage (effectively 0%).

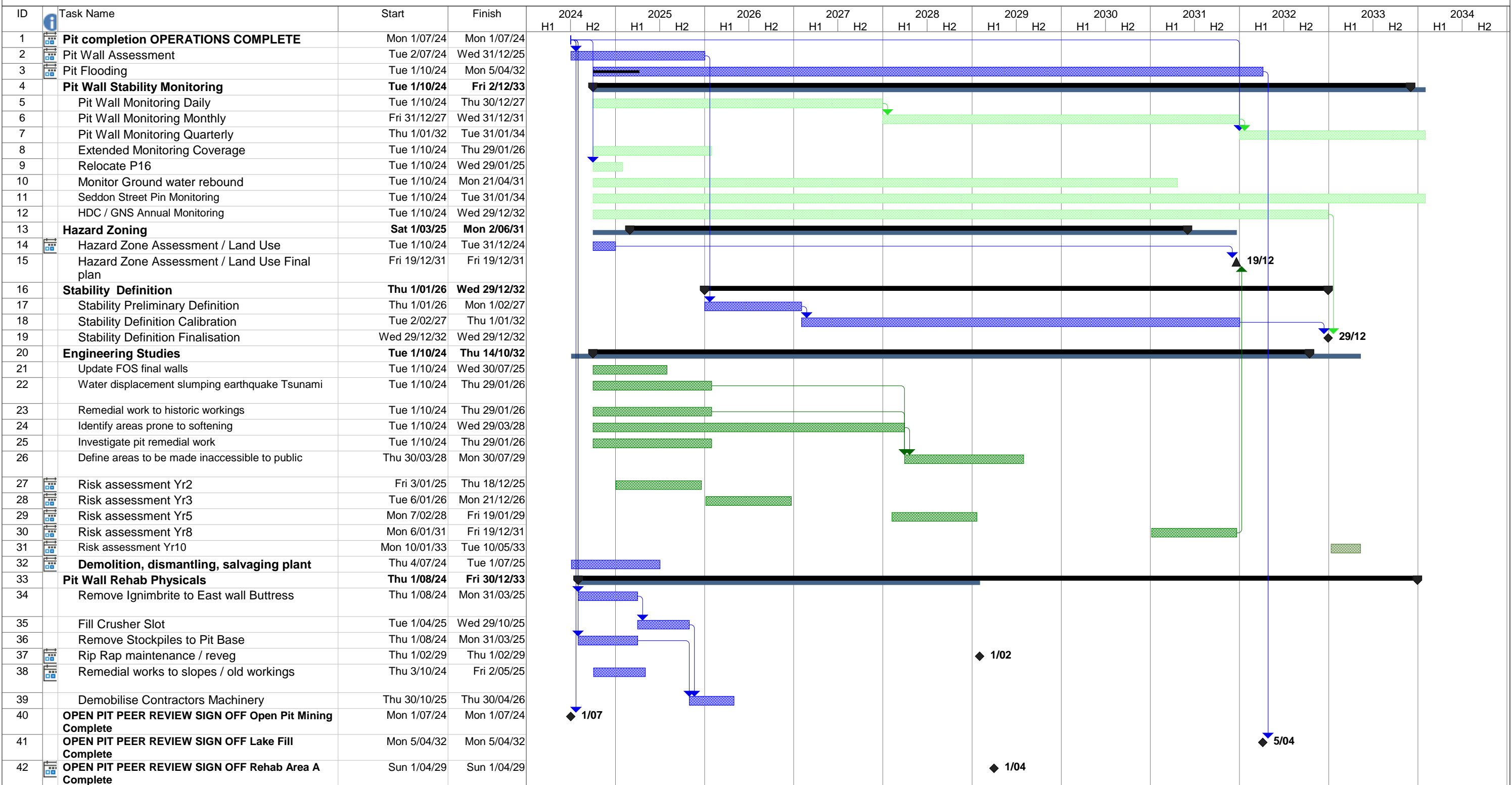
The risk associated with Pit-8a Pit lake water quality increases in the post-closure period, which is to be expected.

There are also three events that pose a material risk only in the post-closure period. Listed in descending order of risk these are:

- Pit-7b Pit lake outlet failure;
- WDA-27 Delay in reducing PIC; and
- Pit-1e Pit wall failure – floodwave.

APPENDIX A
MARTHA PIT CLOSURE TIMELINE

MARTHA PIT CLOSURE PLANNING DRAFT FOR DISCUSSION



Project: Pit Closure
Date: Tue 27/06/23

Task		External Tasks		Inactive Summary		Start-only		Deadline	
Split		External Milestone		Manual Task		Finish-only			
Milestone		Inactive Task		Duration-only		External Tasks			
Summary		Inactive Milestone		Manual Summary Rollup		External Milestone			
Project Summary		Inactive Milestone		Manual Summary		Progress			

APPENDIX B
RESIDUAL RISK REGISTER

OCEANA GOLD NEW ZEALAND LIMITED - CLOSURE AND POST-CLOSURE RISK ASSESSMENT

Risk Register

Created: 20 December 2013
Latest update: 28 May 2021

Captured all risks from 1997 assessment.
Updated based on post-closure risk workshop outputs
and latest pit wall risk assessment.

1998 ID	ID	Short Description	Consequences	Risk Quotient		Exposure Period	Comments
				Closure	Post-Closure		
PIT							
1.1	Pit-1a	Failure of wall near pumphouse	Damage to Cornish pumphouse. Capital/clean up cost \$1.5-3M. Relocation would represent worst-case, at cost of \$3M Plus establish two additional monitoring benchmarks \$2-5k. Annual O&M costs \$2-4k p a			Post-Closure	Since this risk was originally identified, the pumphouse has been moved from pit rim, which mitigates the risk that is now considered immaterial. The risk was identified and quantified in the original 1998 risk assessment, so this is a change from the inputs to the initial Capitalisation Sum derivation.
1.2	Pit-1b	Pit wall failure - safety	Serious injury or loss of life	9.7E-02	7.4E-02	Closure & Post-Closure	The fatality risk associated with a pit wall failure is shown to be acceptable, so could be considered to be immaterial and excluded on that basis. In any event the Martha Trust would not incur direct costs relating to a serious injury or fatality, e.g. the societal cost of a fatality, typically referred to as the value of statistical life. NZ's Accident Compensation Act ensures that the Trust is most unlikely to be directly liable, and the Trust's operating costs include the payment of premiums for public liability insurance in perpetuity. A wall failure resulting in injury could however result in an enquiry into the ongoing safety risk in order to prevent a recurrence. For the Trust, the cost would be limited to that associated with engaging professional advice (legal, engineering etc.). Physical remedial works are covered in Pit-1c.
1.3	Pit-1c	Pit wall failure - damage	Damage to property	1,184	0	Closure & Post-Closure	Pit wall failure and risk has been assessed in a separate study (Lane, 2016), the results from which are used as inputs. The model provides for costs associated with any magnitude failure, but assumes dependence between moderate, large and major failures on each wall. Only one (the one with the largest risk quotient), is assumed to occur during each model simulation (2,000 simulations run). While there is some relationship between Pit-1b and Pit-1c, the likelihood associated with Pit-1b is many magnitudes less than that of Pit-1c, that any dependence can reasonably be, and is, ignored. Damage to the existing power lines was considered, and is assumed to be covered in the fixed component of the occurrence cost.
1.4	Pit-1d	Pit wall failure - buffer area				Post-Closure	Pit wall failure and risk has been assessed in a separate study (Lane, 2016), the results from which are used as inputs. Failure affecting the buffer zone around the pit perimeter is included in Pit-1c.
	Pit-1e	Pit wall failure - floodwave	Serious injury or loss of life caused by a floodwave generated by a large and rapid wall failure into the lake, and damage to property should the wave overtop the pit perimeter.	0.0E+00	3.2E-01	Post-Closure	This risk was first identified in the 2014 risk assessment review. Seiche magnitude and risk has been assessed in separate studies (PSM and Lane, 2014, respectively), the results from which are used as inputs. The current closure plan limits the areas near lake level to the launching ramp and swimming pontoons. The PSM study shows that wave heights are insufficient to overtop the pit rim at any other location. There remains a fatality risk for anyone present at either of these sites at the time of the seiche, however that risk is significantly less than analysed for a potential east end park, which has been shown to be negligible. As described for event Pit-1b, the Trust would not be liable for any related societal cost and the Trust's operating costs include the payment of premiums for public liability insurance in perpetuity. Because a seiche is generated by a wall failure, and the enquiry-related costs are already included for a fatal wall failure in risk event Pit-1b, no similar cost need inclusion as an occurrence cost for the seiche risk. It is however likely that a large wave would damage both the launching ramp and swimming pontoons. The occurrence cost to repair
	Pit-1f	Pit wall failure prevention	Cost to implement prevention actions	97	4	Closure & Post-Closure	This is a new risk identified during the 2016 pit wall risk assessment/review. It provides input to the risk cost to the rehabilitation bond, agreed to by OGC during the 2015 peer review meeting, and to the risk cost for the capitalisation sum. The prevention cost is based on unloading of approx 10% of the top of the wall, but only applies to large and major failures as it is not cost-effective for smaller failures..
2.1	Pit-2a	Dust	Non-compliance with consent limits			Post-Closure	This risk only exists during operations, and potentially at some reduced level during the closure period. It was excluded as it is not a post-closure issue.
2.2	Pit-2b	Contaminated soil	Cost of remediation			Post-Closure	This issue was excluded on the assumption that any contaminated areas would be identified and excavated, the excavated material being disposed of to the tailings storage facilities, early in the closure period and prior to the Councils signing off that all closure criteria are met. Not a post-closure issue.
3.1	Pit-3a	Rebound damage to pumphouse	Cost of repair			Post-Closure	Excluded during the 1998 assessment of the basis that the settlement and rebound effects would be minor and less than those occurring during dewatering (none), and would be complete by the end of the closure period. The risk could not therefore exist post-closure and was excluded from the analysis. Confirmed in the 2014 review.
3.2	Pit-3b	Rebound damage to buildings	Cost of repair			Post-Closure	Excluded during the 1997 assessment of the basis that the settlement and rebound effects would be minor and less than those occurring during dewatering (none), and would be complete by the end of the closure period. The risk could not therefore exist post-closure and was excluded from the analysis. Confirmed in the 2014 review.
3.3	Pit-3c	Rebound damage to services	Cost of repair			Post-Closure	As for buildings.
4.1	Pit-4a	Dewatering affects groundwater supplies	Cost to provide equivalent alternative water supplies			Post-Closure	Conceivably could occur during dewatering and for part of the pit flooding period, but hasn't. Presents no risk following closure.
4.2	Pit-4b	Groundwater contamination	Cost to provide equivalent alternative water supplies			Post-Closure	During pit rewatering there could be a reversal of the existing inward flow of groundwater such that contaminated water from within the old mine workings potentially affects water quality in bores surrounding the township. However, any outward flow would be into the lower aquifer, which is too deep and has insufficient yield to be used for water supply purposes (at this time). Final lake level is going to be lower than the pre-existing groundwater level in Martha Hill so flows after pit flooding groundwater flows will again be towards the pit prior to the start of the post-closure period.

TABLE B-1: RISK REGISTER

1998 ID	ID	Short Description	Consequences	Risk Quotient		Exposure Period	Comments
				Closure	Post-Closure		
5.1	Pit-5a	Blast noise	Excessive noise due to blasting recorded outside pit boundaries.			Operations	Operational risk only.
5.2	Pit-5b	Pumphouse damage	Repair of blast vibration induced damage to pumphouse.			Operations	Operational risk only. The risk of structural damage to the Pump House as a result of blasting vibration was originally identified as a separate issue as the risk was considered greater here than for other structures in Waihi due to its proximity to the pit and its design/construction.
5.3	Pit-5c	Blast vibration	Non-compliance with consent limits			Operations	Operational risk.
5.4	Pit-5d	Fly rock	Worker and public safety			Operations	Operational risk.
6.1	Pit-6a	Noise	Non-compliance with consent limits			Operations	Operational risk.
6.2	Pit-6b	Stringent noise standards	Unworkable limit has significant cost implications on mining contract.			Operations	Operational risk.
7.1	Pit-7a	Flooding	Pit lake discharge causes flooding in Mangatoetoe catchment			Post-Closure	Lake discharge issues can only occur after lake filling is complete. The lake discharge weir will be designed to maximise flood routing such that the proportion of lake flow in the Mangatoetoe reduces with increasing rainfall. Given the necessary sign-off processes within the consents, and those required to achieve "closure", this is not considered a credible post-closure risk
7.2	Pit-7b	Outlet failure	Cost to repair or replace damaged outlet structures.	0	176	Post-Closure	Routine maintenance of the outlet structure and tunnel is assumed to be required during the post-closure period. This is a base cost included in the Martha Trust's operational budget. Post-closure, there is a risk that the proposed lake outlet tunnel and associated structures could be damaged, for example as a result of an earthquake. This may be insurable. As underground structures are less susceptible to earthquake damage than above-ground structures, the likely consequence is that some maintenance of the works would be required, particularly at the portals. The 1998 estimate of cost to undertake this work was \$80,000 to \$400,000 (median and P95). These values are retained in 2016, but adjusted for inflation. The 1998 assessment also considered an increased maintenance costs would be incurred following a failure. The \$2,000 to \$5,000
8.1	Pit-8a	Lake water quality	Additional cost to treat lake water	4	11	Closure & Post-Closure	This risk was included in the 1998 assessment, at which time chemical modelling indicated a lake water quality suitable for discharge. Recent modelling indicates otherwise, and the base costs include treatment (alkalinity addition) in perpetuity. The 2014 review based the revised consequential cost to represent an increase of 50-100% of the annual base cost (median and P95), and increased the likelihood by an order of magnitude. These assumption are retained, with adjustment for inflation. Given the currently assumed water treatment system required in the base case to maintain lake quality, the previously identified alternative mitigation options are redundant
8.2	Pit-8b	Aquatic biology	Degraded lake water quality reduces diversity of biota			Post-Closure	A less-than-expected water quality could reduce the diversity of biota in the lake. However, unless the water quality is compromised to the point where it cannot be used for recreational purposes (refer Pit-8-c) or discharged without treatment (Pit-8a), there is no consequence.
8.3	Pit-8c	Public amenity/health	Degraded lake water quality prevents the lake's use or poses health hazard.			Post-Closure	Failure to meet safe swimming water quality equates to a failure to meet a closure criterion, meaning that closure is not achieved. Once closure is achieved, the issue can't be a post-closure risk as the proposed base case lake mitigation option (water treatment) must be capable of achieving this minimum standard. The risk that achieving the minimum standard may cost more than expected is covered in the preceding risk event (Pit-8a).
9.0	Pit-9	Lake filling delays	Additional overhead costs associated with extended rewatering period			Closure	The rehab bond assumes a certain period to flood the pit, but a if series of droughts reduces river flow, rewatering could take longer and there would be increased costs. Assumed closure period already includes a 12-month delay allowance, which is considered sufficient to render this risk inconsequential. A closure risk, but not in the post-closure period.
10.0	Pit-10	Regulatory change	Additional treatment costs or installation and operation of alternative discharge to the Ohinemuri River.			Post-Closure	Such a change could result in an unacceptable discharge quality necessitating a delay in gaining permission to discharge, or necessitating change to the currently proposed discharge, e.g. the piping of the lake outlet to the Ohinemuri River where the additional dilution prevents significant adverse effect, and/or treatment of lake water prior to discharge (covered in risk event Pit-8a). In any event, this issue would need to be resolved before OGC receives sign-off from the Council indicating that site closure has been attained. This is therefore not a post-closure risk.
11.1	Pit-11a	Fuels and solvents				Post-Closure	The management of these substances is undertaken in accordance with the appropriate regulations. Any contamination of soils in the pit or ancillary area as a result of spills during operation is expected to be cleaned up as part of the closure activities. The cost associated with this work is a base cost. This ceases to be an issue during closure, and hence is not a post-closure risk.
11.2	Pit-11b	Explosives				Post-Closure	As for fuels and solvents.
12.1	Pit-12a	Noise bund ARD				Operation & Closure	If some unoxidised material is incorporated in the bund, acidic run-off and/or leachate could result. This has not been an issue during operations, so is considered to be a non-issue. Significant attention was given to the identification and handling of potentially acid-forming (PAF) rock during bund construction. These processes did identify mis-classified PAF fill during bund construction and resulted in re-excavation and removal of the affected areas.
12.2	Pit-12b	Noise bund instability				All	A slump or failure of the outside shoulder of the bund could block Eastern Stream and cause flooding. The consequence is the cost of repair of the bund, repair of any resulting flood damage to, and possible purchase of, neighbouring properties and a fine for an unauthorised discharge. With the removal of the bund early during the closure period, this ceases to be an issue. Circumstances have changed since 1998 and, following identification of the subsidence hazard zones, there are no longer any adjacent private properties that could be affected.
13.0	Pit-13	Uncontrolled spring flow				Post-Closure	Some increase in spring flows or "damp" areas could potentially occur as groundwater level returns to near pre-mining levels. This issue is not considered significant due to the conservative level adopted for the lake level, and the distance from the lake to town areas that lie below this level. For the areas of town at an elevation of less than RL1104 m, i.e. primarily in the south and west, no mining was undertaken so the risk is very low.
14.1	Pit-14a	Mine manager's house damage				Post-Closure	Mine manager's house has been removed

TABLE B-1: RISK REGISTER

1998 ID	ID	Short Description	Consequences	Risk Quotient		Exposure Period	Comments
				Closure	Post-Closure		
14.2	Pit-14b	Grand Junction refinery damage				Post-Closure	No risk from mining once mining and rehab is completed. Relocated refinery building at less risk during rehabilitation activities than prior to its relocation.
14.3	Pit-14c	Grand Junction powerhouse damage				Operation & Closure	Base costs allow for reinstatement of columns. No other deliberate or accidental damage considered credible in the post-closure period.
15.0	Pit-15	Revegetation failure				Post-Closure	It has been accepted by the Councils that rehabilitation will not be possible for all of the pit wall exposed above the lake.
	Pit-16	Vandalism of WTP	Cost of repair or replacement to lake water treatment plant.			Closure & Post-Closure	Normal insurance against theft or vandalism mitigates this risk. Insurance premiums are included as a base case of the Martha Trust operating costs.
	Pit-17	Unidentified PAF	If not Identified and removed/remediated, PAF could adversely affect lake or other surface waters (excludes pit walls and noise bund, which are covered elsewhere).			Closure	With the exception of pit wall PAF areas above lake level, identification and remediation of PAF is an obligation during closure activities, and satisfactory resolution is required to achieve closure. There is currently no waste rock in stockpile in the SFA, and following cessation of mining in 2015, no possibility of the current situation changing. The surface of the SFA will be covered with NAF from the noise bund. The risk that the noise bund material contains PAF is covered elsewhere (Pit-12a).
	Pit-18	Public safety	Drownings, accidents involving lake users.			Post-Closure	The Martha Trust cannot be responsible for swimming/boating safety accidents within the pit lake, but could be implicated if any accidents were directly attributable to the mining remnants, e.g. pit wall failure etc. The pit wall risk assessment indicates that the level of post-closure lives risk was <i>de minimis</i> . The Martha Trust operating costs provide for the Trust to purchase and maintain public liability insurance.
	Pi-19	Lake fails to fill	Unable to create promised recreational lake. Cost of change to closure plans, or sealing to allow filling.			Closure	Not a credible risk. Lake level is set at 2m below the lowest known potential outlet, and some 10m below the groundwater level existing prior to the start of the modern mining period.
	Pit-20	LINZ prevent lake access	LINZ excludes the public from using the lake, and Martha Trust from undertaking lake-related maintenance.			Post-Closure	LINZ manages the land under the lake and much of the land surrounding the lake, including the lake outlet site. As the manager of the land on behalf of the people of NZ, it is inconceivable that LINZ would exclude the public from using the lake and surrounding amenities, or could successfully do so. Nor is it reasonable to assume that it would prevent the Trust from undertaking lake-related management/maintenance activities, as in doing so LINZ would inherit that responsibility. The OGC proposal is to return to the closure plan with an east end park, meaning access to the lake would not be via LINZ land (unless the area can be extracted from the Trust deed and passed to LINZ)
	Pit-21	Hazard zone collapse	Serious injury or fatality. Cost to fence off and remediate collapsed area, and potentially to realign affected section of pit rim walkway.	1,718	1,718	Closure & Post-Closure	This is a new risk not considered in 1998, and follows the identification of hazard zones in 2002. Hazard zone collapse risk has been assessed in a separate study (Lane, 2014) from which the likelihood of a future collapse is drawn. If the risk were to apply, it would relate to the pit rim walkway development over the Mary, Martha and Empire hazard zones. It is assumed that as the land owner, the Trust would need to make the area safe by fencing off the collapse, rerouting any affected walkway. Also include for some native planting to mitigate visual effects. The Royal and Edward zones overlie areas that, for the most part, do not form parts of the Trust land, so would not contribute materially to the risk. However, collapses into the historic underground workings are a legacy issue for the NZ government and for HDC, not for OGC or the Trust, and without any occurrence cost falling to the Trust, the risk is excluded from any potential contribution
PROCESS PLANT, WTP AND CONVEYOR CORRIDOR							
16.1	Mill-1a	Conveyor noise				Post-Closure	Operational issue only.
16.2	Mill-1b	Mill noise				Post-Closure	Operational issue only.
16.3	Mill-1c	Noise exceedance				Post-Closure	Operational issue only.
17.1	Mill-2a	Conveyor dust				Post-Closure	Operational issue only.
17.2	Mill-2b	Lay-down area dust				Post-Closure	Extended Project construction issue only.
17.3	Mill-2c	Stockpile dust	Effects on crops, amenity, health, soil contamination, or a non-compliance.			Post-Closure	Operational risk. This was identified as five separate risks in the 1998 assessment, all of which were excluded.
18.0	Mill-4	Minewater pipeline burst				Post-Closure	Operational issue only.
19.0	Mill-5	Decant pipeline burst				Operation & Closure	Operational and short term (3 years) closure issue only.
20.0	Mill-6	Tailings pipeline burst				Post-Closure	Operational issue only.
21.0	Mill-7	Seepage pipeline burst				Operation & Closure	Seepage quality needs to be suitable for direct discharge prior to achieving Closure. Not a post-closure risk.
22.0	Mill-8	Collection pond pipeline burst				Operation & Closure	These pipes will be decommissioned by the end of closure, and the pond water quality will have improved considerably in response to rehab completion, so this is not a post-closure issue.
23.0	Mill-9	Mill bridge failure				All	Post-closure, while the bridge is expected to remain, its use will be limited to farm purposes for which the Martha Trust is not A risk of failure does not exist post-closure.
24.1	Mill-10a	WTP chemical spills				Post-Closure	Operational issue only.
24.2	Mill-10b	WTP tank collapse				Operation & Closure	If the WTP is mothballed, as proposed in 1998, then the tanks would contain only water and there would be no consequence of a failure. However, the WTP is over-sized for providing treatment for any contaminated water stream arising at the closed site. It is also over-sized for use as a community treatment facility, although part of the WTP could be retained and used for this purpose - in which case it would not be a Martha Trust responsibility. OGC is proposing to decommission the WTP as part of the closure works, which would occur prior to achieving closure. Once removed, there is no possible risk.
25.0	Mill-11	Treated water out-of-spec				Operation & Closure	Operational and closure risk, after which treatment ceases (by definition) and the risk ceases to exist.
26.1	Mill-12a	Mill chemical spills				Post-Closure	Operational issue only.
26.2	Mill-12b	Mill tank collapse				Post-Closure	Operational issue only.
27.0	Mill-13	Chemicals handling and storage				Post-Closure	Operational issue only.
28.1	Mill-14a	Stockpile - soil contamination				Post-Closure	Leaching of oxidation by-products is expected to cause soil contamination beneath the ore stockpile. As it will occur, the issue is not a risk and has been accounted for in the base cost of the process plant clean-up at the end of operations.
28.2	Mill-14b	Stockpile - groundwater contamination				Post-Closure	Some minor quantities of stockpile leachate may be reaching groundwater and affecting quality. A cut-off drain was installed down-catchment of the mill and ancillary areas (down-catchment of the Mill Contingency Pond) that could be re-commissioned in the unlikely event that contaminated groundwater appears 10 to 13 years after removal of the contaminants from the stockpile. Covered in WDA-5.

1998				Risk Quotient		Exposure		Comments	
ID	ID	Short Description	Consequences	Closure	Post-Closure	Period			
28.3	Mill-14c	Stockpile - surface water contamination				Operations	An operational risk. The stockpiles will be empty at closure, and the area contoured, covered and planted as part of the closure activities.		
29.0	Mill-15	MCP discharge				Post-Closure	Operational risk only.		
30.0	Mill-16	Contaminated soil				Post-Closure	Site clean-up of contaminated soils within the process plant area is covered as a base cost (refer also Mill-14a).		
31.0	Mill-17	Hazardous material storage/handling				Post-Closure	Operational risk only.		
32.0	Mill-18	Regulatory change to discharge standards				Operations	A business risk during operations. During the early part of closure while the WTP is still in service, the significantly reduced volumes for treatment mean that the mass load and concentrations of contaminants will less and the available dilution proportionately greater. The treated water discharge ceases during closure and there is no post-closure risk.		
33.0	Mill-19	Conveyor tunnel collapse				Operations	During operations, this is a business risk only. Opportunities to leave the tunnel open for future tourism purposes is still under consideration, and may be considered if no liability is transferred to the Martha Trust. The current default option is to plug both portals with concrete to prevent access - no consequence in the post-closure period.		
34.0	Mill-20	Insufficient WTP capacity				Post-Closure	Operational risk only.		
35.0	Mill-21	Unacceptable air emissions				Post-Closure	Operational risk only.		
	Mill-22	Chemical spill from WTP	Environmental damage to Ohinemuri River			Operation & Closure	The lime spill into the Waitekauri at Golden Cross initiated a review of whether a similar incident was possible at Waihi. To attain closure, the WTP would no longer be operating. Whether mothballed, as originally proposed, or decommissioned and removed as currently proposed, there would be no remaining bulk storage of lime or any other chemical, hence no potential to spill.		
WASTE DISPOSAL AREA									
36.0	WDA-1	Collection pond water quality				Operation & Closure	One of the success criteria that OGC must attain before site closure is complete is that collection pond water quality must not discharges must not cause an exceedance of the in-river water standards. Water quality in the ponds relies primarily on successful completion of rehabilitation on the waste rock embankment structures. Once successfully rehabilitated, the risk of poor water quality occurring in the ponds was considered by the expert panel to be inconceivable. The panel's position was based on experience with improving run-off quality as rehabilitation advances, and the risk is further mitigated by the role of the site management coordinator (which is broader than proposed in 1998)		
37.0	WDA-2	Collection pond sediment discharge				Post-Closure	The operational risk. Once the embankments are capped, experience and practice shows that the quality of run-off improves and sediment in the minor quantities that might flow through these very large ponds poses no risk to the receiving environment.		
38.0	WDA-3	Perimeter drain failure	A small topsoil slump from the toe of the embankment, or a localised failure of the perimeter bund, causes deterioration in site discharge water quality.			Closure & Post-Closure	In 1998, the likelihood of either failure was assessed as low, and with little to no post-closure consequences the risk was excluded. The role of the site management coordinator was expanded to deal with exactly this sort of event, and costs for event-driven maintenance is included in the base cost - the risk is mitigated.		
39.1	WDA-4a	Contractors workshop - contaminated soil				Closure	Removal of any contaminated soil is an expected requirement of closure. This is a base cost.		
39.2	WDA-4b	Solvents, hydrocarbon spill				Closure	Management of hazardous substances is covered by regulation. Any contamination by these products would be cleaned up at closure.		
39.3	WDA-4c	Workshop pad ARD				Post-Closure	No PAF material used in the construction of the pad on which the workshop is founded, and any surface contamination would be removed as part of the rehabilitation activities, the cost of which is included in the base costs.		
40	WDA-5	Tailings bypass seepage	Cost to install and operate K drain(s) and a small passive treatment system.	25	25	Closure & Post-Closure	The potential for bypass seepage from the tailings is limited by the: <ul style="list-style-type: none"> • Low permeability of the tailings, which increases with time due to consolidation; • Natural containment provided by the generally low permeability bedrock, particularly the weathered bedrock; and • Upward groundwater gradients. This risk event now also includes the consequences of drainage system failure - previously WDA-9. To warrant any remedial action, the volume and/or quality of seepage would need to be capable of having an adverse effect on the receiving surface waters- much of the current seepage, especially from TSF2 wouldn't have a significant adverse effect. The risk is further mitigated by the role and responsibilities of the site management coordinator. If bypass seepage did occur in the post-closure period, it would be in such minor quantities and of a quality that no detectable change would be expected to be measurable following dilution. Additionally, the ongoing monitoring of seepage quality shows improvements with time as the TSFs mature and the control processes designed to control acid generation (soil and water covers) take effect. In summary, the likelihood for potential bypass seepage affecting the rivers is low. As this risk event represents several events (WDA-5, 6, and 9), the expert panel increased the likelihood from the 10 ⁻⁵ per annum assessed in 1998 by half an order of magnitude. It is worth noting that an engineering risk assessment of the waste rock embankments (Lane, 2011) assessed the combined likelihood of a contaminant (leachate) release due to collection system failure or earthquake was 2.4 x 10 ⁻⁵ p.a. during the operational period and 2.5 x 10 ⁻⁷ p.a. in the post-closure period. The likelihood assessed by the expert panel in 2014 is twice the operational likelihood derived during the earlier detailed study and more than two orders of magnitude greater than that derived for the post-closure likelihood. Given that the causes/initiating events of (leachate and/or tailings) bypass seepage are not limited solely to the drain failure, the 2014 likelihood is considered a reasonable estimate for the operational period. While it is grossly overstated for the post-closure period, the 2014 value has been retained for conservatism. Assuming bypass seepage did occur, the solution would be to install a K drain near to area of concern and to collect and treat seepage prior to discharge as has been the practice during operations. For the minor quantities involved, a passive treatment system such as a small wetland or mussel shell reactor place close to the area of concern would be appropriate.		
41.0	WDA-6	Waste rock bypass seepage				Post-Closure	Refer above to WDA-5. While the source is different, the causative agent, the collection systems, and the environmental pathways are the same as for tailings seepage. The solution would also be the same, and based on experience the likelihood is also similar. The consequence assigned to WDA-5 assumes several K drains and one or two passive treatment systems, which is sufficient to include seepage reporting to the groundwater beyond the toe of the waste rock embankments originating from either source.		

1998 ID	ID	Short Description	Consequences	Risk Quotient Closure Post-Closure	Exposure Period	Comments
42.0	WDA-7	Perimeter bund ARD			Post-Closure	While included in the 1998 as an unknown, with passing time it is possible to eliminate this risk event. It is known that some small quantities of PAF are contaminating the perimeter bund around TSF1A (TSF2 was constructed before PAF material was excavated from the Martha pit). The extensive monitoring of groundwater and surface water demonstrates that this material is not having a significant, or possibly even measurable, effect on the surface receiving waters.
43	WDA-8	Catastrophic tailings release	Repair of breach to encapsulate PAF waste rock and tailings. Clean-up of tailings deposited in the flood plain down-catchment. Compensation for affected landowners. Management, legal and regulatory costs.	16 16	Closure & Post-Closure	In the original risk assessment (1998), based on the evidence of Dr. Trevor Matuschka, a sudden release of tailings due to an embankment failure was assessed as being inconceivable. On technical grounds, the proposal was to exclude this risk event from inclusion in the risk cost. However, at that time it was accepted that tailings dams failure was of particular interest to the Councils and the public due to then-recent events in Spain (Los Frailes) and at Golden Cross. As a result, Waihi Gold decided to include this risk for political reasons. A sudden release of tailings is typically an insurable risk, and in 1998 the solution was to include a consequence equal to the cost of insurance premiums for a period of 50 years, beyond which the catastrophic failure was deemed not to be credible. By adopting this approach, no recognition was given to likelihood of failure, i.e. by including the cost of premiums in the Capitalisation Sum, the assumption was of a 100% probability of failure on the day the Trust inherited ownership of the closed site liabilities. One of the objectives of the first-principles review of the Capitalisation Sum in 2014 was to assess the need and appropriateness of insurance. There are two reasons for reviewing this aspect. First, if coverage of the risk events can be included in the risk cost (contingent liability) component of the Capitalisation Sum, then the Trust should not be burdened with the cost of unnecessary premiums. Secondly, if cover for the risk events can be included in the risk cost component, then doing so offers better security as the required funds will be available without relying on an insurance company to decide whether or not there are circumstances that warrant honouring the policy or not. Thirdly, if insurance does provide the best risk treatment, the review provides background information for assessing the reasonableness of the cost of insurance cover. The inputs to the 2014 review were based on a detailed engineering risk assessment (Lane, 2011), a dam break analysis (Matuschka, 2011) and a detailed remediation estimate (Storer, 2014). The approach in this review is to ignore insurance as an option in the first instance, and to derive a risk cost based solely on the risk assessment outputs. If necessary, the inclusion of insurance cover in the risk cost can be included if it offers a more cost-effective treatment, i.e. reduces the overall contingency liability component of the Capitalisation Sum. The likelihood of a catastrophic release of tailings in the post-closure period is derived in a separate study (Lane, September 2011), and is considered negligible (1 in 1 million). The very low likelihood means that the risk could be considered to be immaterial and excluded from the assessment, however it is retained at this stage for continuity and to see if its inclusion is warranted. The consequences of an embankment breach are also defined in a separate study (Engineering Geology, July 2012), which were used to estimate a cost for clean up, structural repair, compensation and administration and management costs (Storer, 2014).
44.0	WDA-9	Seepage release	Collection and treatment of released seepage following drainage system failure		Post-Closure	This issue relates to release of tailings pore fluids or waste rock leachate as a result of failure of the underdrainage system, i.e. it differs from the issue of bypass seepage addressed in issues 40 and 41. During the 2014 review, the expert panel assessed that drain failure did not pose a credible risk. It is known that the drains will block and/or fail over time. This is not a concern geotechnically, nor environmentally unless the seepage is of sufficiently poor quality and/or occurring in such quantities as to adversely affect the receiving water. The collection and treatment of such seepage is covered above in WDA-5.
45.0	WDA-10	Waste rock embankment damage			Post-Closure	This issue was assessed and is included in the engineering risk assessment, and above in risks event WDA-8. the repair of minor damage due to wind-thrown vegetation, rainfall or earthquake etc. is covered in the Martha Trust's operating costs, i.e. the site management coordinator.
46.0	WDA-11	Embankment overtopping			Closure & Post-Closure	This is a possible initiating event for a catastrophic failure of the embankment release of tailings, which is covered in WDA-8. Post-closure, tailings pond water is of suitable quality to discharge and other than the potential geotechnical consequences covered in WDA-8, any overflow would have no adverse effect.
47.0	WDA-12	Wildlife health			Post-Closure	Operational risk only.
48.0	WDA-13	Revegetation failure			Post-Closure	Experience over the past 25 years indicates that OGC's revegetation procedures are effective and confirms that there is no realistic likelihood of large failures. Repair of small failures are included in the base costs.
49.0	WDA-14	Non-compliant noise			Post-Closure	Operational risk only.
50.0	WDA-15	Tailings dust			Operation & Closure	There has been no tailings dust issue during operations even when a substantial beach formed on TSF2 due to the regional weather and poor drainage characteristics of the tailings, which prevent the tail drying out. Post-closure, tailings will be inundated to a depth sufficient to ensure a water cover even following an extended drought, eliminating the risk of tailings dust.
51.0	WDA-16	Waste rock dust			Operations	Operational risk only. No exposed waste rock in post-closure period.
52.0	WDA-17	Loss of dust control			Post-Closure	Operational risk only.
53.0	WDA-18	Regulatory change to discharge standards			Closure	Achieving a pond water quality suitable for discharge is one of the success criteria that OGC needs to meet before Closure is attained (and has already been achieved for TSF2). This is not a post-closure risk
54.0	WDA-19	Hazardous material storage/handling			Post-Closure	Operational risk only.
55.0	WDA-20	Tailings ponds significantly larger than planned			Post-Closure	There is no consequence if the proportions of covered to pond areas differ in reality following rehabilitation of the tailings storage facilities surface to that promoted during the consent process.
56.0	WDA-21	Flood erosion damage at TSF toe			Post-Closure	Remediation of event-driven damage is provided for in the Martha Trust operating costs, i.e. is a base cost.
57.0	WDA-22	Insufficient NAF material for rehab.			Closure	This is not a post-closure risk. Routine updates are made of the material balances required for completion of the waste rock embankment construction (for which there is an excess) and rehabilitation (for which there is sufficient quantities).
58.0	WDA-23	Failure to achieve Zone A spec.			Post-Closure	Operational risk only.
59.0	WDA-24	Failure to achieve Zone G spec.			Post-Closure	Operational risk only.

TABLE B-1: RISK REGISTER

1998 ID	ID	Short Description	Consequences	Risk Quotient Closure Post-Closure		Exposure Period	Comments
60.0	WDA-25	Degraded tailings pond water quality				Post-Closure	The only credible initiating event would be exposure of tailings for a considerable period, i.e. sufficient for them to drain and de-saturate sufficiently to allow sulphide oxidation to occur during an extended drought. The closure proposal is to set the final water level in the TSF impoundments sufficiently above the tailings level to avoid exposing the tail under most extreme drought events. Even if an extreme drought were to drop the water level to tailings level or less, the period(s) of exposure would be short and very infrequent, and the inherent buffering capacity in the tail would prevent water quality degradation until it is all consumed. Over time, the tail will be buried under a layer of inert sediment from up-catchment, providing an additional factor of safety against water quality degradation.
61.0	WDA-26	Impacts of rare & endangered species				Operations	No species were identified within the currently disturbed footprint, and no proposal to increase that area. Not a post-closure risk.
	WDA-27	Delay in achieving low PIC	Incremental cost of continuing the surveillance required for a medium/high PIC for a further period of 2 to 12 years	0	78	Post-Closure	The expectation is that once tailings deposition ceases, followed by a period of consolidation and capping of the impoundment perimeter(s), a potential impact assessment will reduce the PIC from a medium (or high) to low classification, with a commensurate reduction in the required level and cost of surveillance on the embankments. The base case assumption is that reclassification will be achieved by closure. If a reduction in PIC is not achieved at closure, the Martha Trust will be required to continue with the higher level of surveillance until the reclassification is achieved. The delay of 2-12 years represents a period of 15 to 25 years beyond the last tailings deposition
OFF-SITE & MISCELLANEOUS							
62.0	Off-1	Contractors accident				Operation & Closure	This is a business risk that exists only during operations and part of closure and therefore is not for consideration within this assessment.
63.0	Off-2	Traffic				Post-Closure	Operational risk only.
64.0	Off-3	Bulltown Road tip				Post-Closure	A concern was raised about the potential for leachate from the tip to enter the pit lake and compromise the water quality. Consideration of the separation distances between the two facilities eliminated this as a risk - the tip and the pit are sited in different catchments.
65.0	Off-4	Unacceptable visual impacts				Post-Closure	Operational risk only.
66.0	Off-5	Road stopping not approved				Operations	In 1998, there was a very small risk that the Hauraki District Council might not pursue the applications to stop the roads required for the Extended Project. This was never a post-closure risk, and the expert panel excluded it from quantification (and HDC stopped the roads that allowed the Extended Project to proceed). While not the same roads as considered in the Extended Project, the 2014 expert panel identified it as a potential risk to the current closure concept for the pit. However, if HDC doesn't want to stop any of the roads around Grey St/Slevin St, then there is no need to pursue this further. It is not a post-closure risk.
67.0	Off-6	Receiving environment degradation by others				Post-Closure	Operational risk only.
68.0	Off-7	Community opposition to project				Post-Closure	Operational risk only.
69.0	Off-8	Unacceptable CO ₂ discharges				Post-Closure	The imposition of, for example, a carbon tax is a business risk. It ceases at the end of operations.
70.0	Off-9	Decrease in property values				Closure	A study in support of the Extended Project consent applications showed that the operation has increased property values in Waihi, a prediction that has been confirmed by subsequent studies. OGC has given an undertaking to divest itself of its holdings at the end of the project in a way that prevents significantly and artificially depressing the property market. It is expected, that in order to maximise its commercial return, OGC will abide by this commitment. The sale of property is not included as a cost reduction in either the Rehab Bond or the Cap Sum, is not a Martha Trust responsibility, and is not a post-closure risk.
	Off-10	Monitoring boreholes fail	Collapse or drainage into monitoring boreholes causes localised settlement and property damage.			Closure & Post-Closure	Some groundwater monitoring boreholes may be operating up until the achievement of closure. The concern was a repeat of the Gladstone Rd incident. Several factors militate against this being an issue. First, groundwater would have rebounded to pre-mining levels, meaning that drainage down the hole cannot occur. Secondly, new bores are grouted during installation of the piezometers. Thirdly, while some of the old monitoring wells are open, as they rely on manual dipping of water levels, if these were to create a problem they would have already done so.
	Off-11	Mining remnant liability	Damage to historic mining remnants requires remediation and additional protection works.			Post-Closure	The historic remnants located on land currently proposed to be owned and managed by the Martha Trust are limited to the Grand Junction refinery and power house. The refinery is surrounded with a security fence, and could remain closed if necessary. The optimal solution would be to allow public use/access provided this was done in a way that avoids increasing the Trust's liability. Final details are being worked on as part of the ongoing closure planning. The power house foundations are too robust to be considered a damage liability, which would not be the Trust's responsibility in any event.
	Off-12	Inability to relinquish land	NWG is unable to divest all of its land holdings			Closure & Post-Closure	This is a risk to OGC only. It relates primarily to Union Hill and Slevin Park as the urban and rural properties will always be saleable.
UNDERGROUND							
	UG-1	Sinkhole formation	Fatality or serious injury to member(s) of public. Remediation of property damage.			Post-Closure	Given the detailed geotechnical evaluations and peer review, and the backfilling of all areas of potential ground instability, this was not considered a credible post-closure risk.