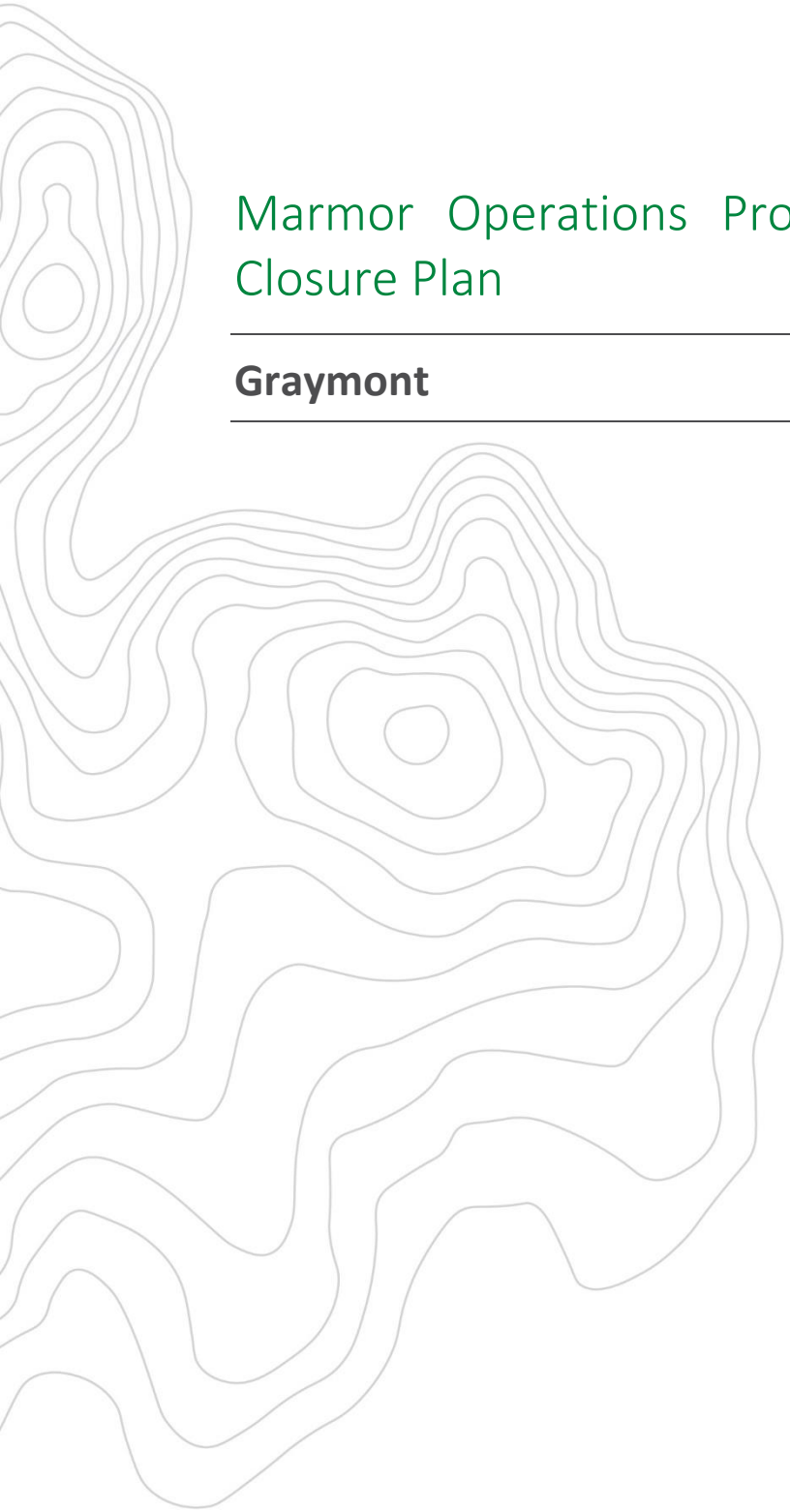
Marmor Operations Progressive Rehabilitation and Closure Plan

Graymont



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Template 2.8.1

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Abbreviations

Abbreviation	Description
AHD	Australian Height Datum
bgl	Below ground level
DES	Department of Environment and Science
EA	Environmental Authority
ECe	Saturated paste electrical conductivity
ERA	Environmentally Relevant Activity
EP Act	Qld Environmental Protection Act 1994
ERC	Estimated Rehabilitation Cost
ESP	Exchangeable sodium percentage
LOD	Land Outcome Document
ML	Mining Lease
MSES	Matter of State Environmental Significance
NUMA	Non-use management area
PoO	Plan of Operations
PMLU	Post-Mine Land Use
PRCP	Progressive Rehabilitation and Closure Plan
PRCP Schedule	Progressive Rehabilitation and Closure Plan Schedule
RA	Rehabilitation Area
RL	Reduced level
RM	Rehabilitation Milestone
ROM	Run of Mine

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1. Introduction

Marmor Limestone Quarry and Lime works (Marmor Operations) is owned and operated by Graymont Pty Ltd (Graymont). The site is located within the Rockhampton Regional Local Government Area, approximately 40 km south of Rockhampton in Central Queensland, adjacent to the township of Marmor (Figure 1).

Marmor Operations is comprised of Mining Leases (MLs) ML5763 and ML5764, covering a total area of approximately 31.3 ha. The site is situated within the Reden Range, at the southern end of a small limestone ridge. Historically, open cut mining progressed along the eastern slope of this ridge.

Marmor lime works began operation in 1904, when it was established by Mount Morgan Mining Company to supply limestone for fluxing in their smelter operations. Since then, the site has changed ownership several times, until it was acquired by Graymont in 2019 from Sibelco Lime Pty Ltd (Sibelco). Sibelco owned and operated the site from 2004 to 2019. The site has been in care and maintenance from May 2016 to present.

This rehabilitation planning part of the Progressive Rehabilitation and Closure Plan (PRCP) has been prepared to meet the requirements of the *Environmental Protection Act* 1994 (EP Act).

1.1 Purpose and scope

The Marmor Operation PRCP rehabilitation planning part provides guidance on the progressive rehabilitation of land affected by mining activities and the closure requirements of the mine once operations cease. The main purpose of a PRCP is to enable an EA holder to plan for how and where mining activities will be carried out on land in a way that maximises the progressive rehabilitation of the land to a stable condition; and provide details of the condition to which the EA holder must rehabilitate the land before the EA may be surrendered. This is a critical element of mine closure and ultimate relinquishment of the mining leases.

This PRCP has been prepared with reference to requirements for the preparation of a PRCP as set out in the Queensland Government Department of Environment and Science, *Progressive Rehabilitation and Closure Plans (PRC Plans) Guideline (ESR/2019/4964)* (PCRP guideline) (DES 2021) effective from 17 March 2021.

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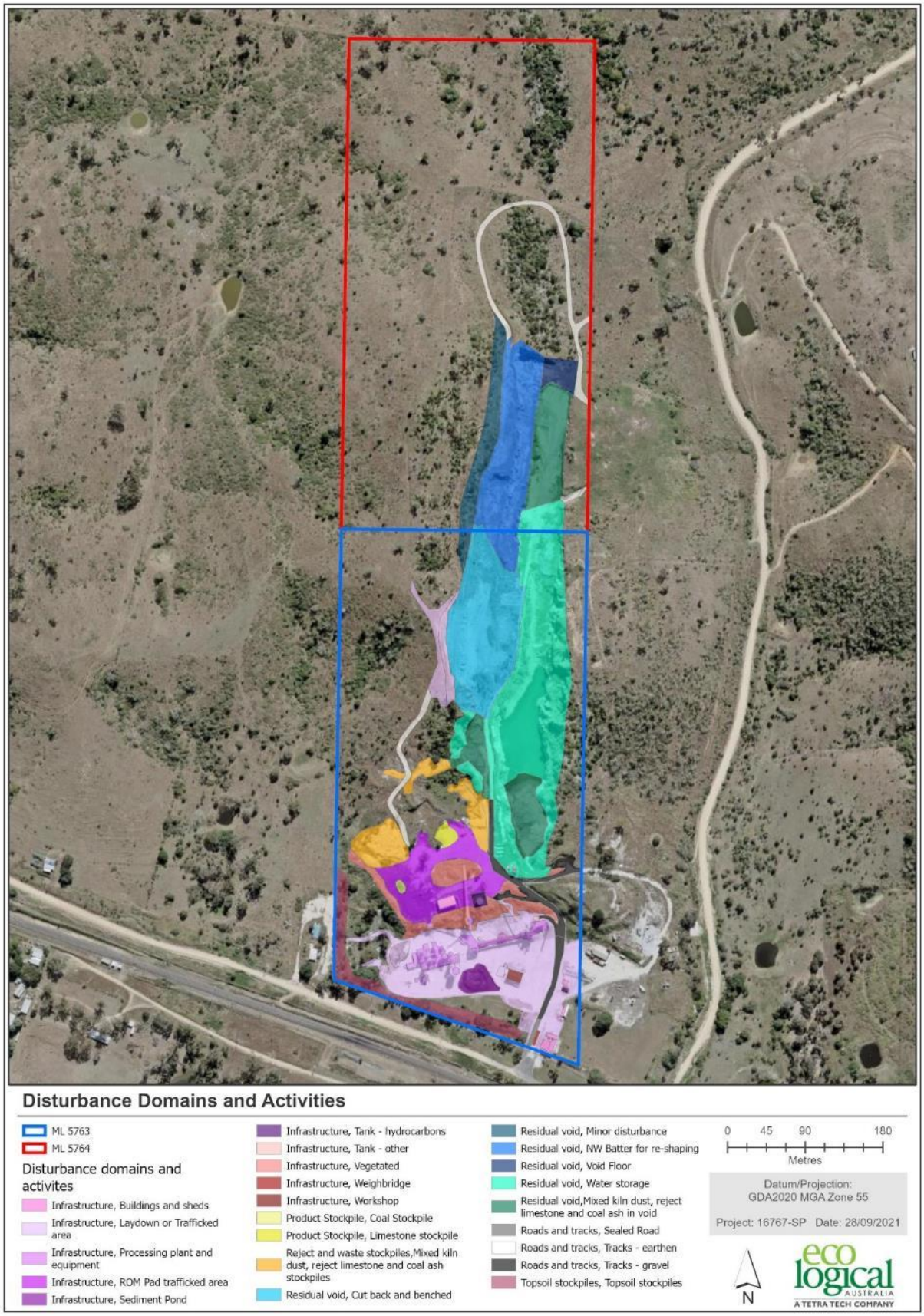

Figure 1: Locality, disturbance domains and current area of disturbance at Marmor Operations

2. Regulatory context

Rehabilitation at mining operations is regulated under the EP Act and its subordinate legislation including the *Environmental Protection Regulation 2019*. It is Queensland Government policy that land disturbed by mining activities will be rehabilitated progressively as it becomes available, to minimise the risk of environmental impacts and to reduce cumulative areas of disturbed land.

2.1 Queensland rehabilitation regulatory framework

Under amendments to the EP Act resulting from the passing of the *Mineral and Energy Resources (Financial Provisioning) Act 2018* (MERFP Act), all new and existing EA holders for a mining activity relating to a mining lease approved through a site-specific application (DES 2021) are required to prepare a PCRP following receipt of a Notice from DES.

For existing operations, the transitional arrangements mean that existing "land outcomes" (Post Mine Land Uses (PMLU) and associated completion criteria) secured in a "land outcome document" (LOD) received by DES (and not rejected) before December 2018 can be carried forward (and do not need community consultation or stakeholder agreement). According to Section 750 of the EP Act a 'land outcome document' can be:

'a) an EA

b) a document made under a condition of an EA that:

relates to the management or rehabilitation of land (e.g. rehabilitation and closure plan or residual void management plan); and

was provided to the administering authority, and had not been superseded, before 30 November 2018; and

before 15 January 2019, the administering authority had not notified the EA holder that the document was insufficient.

c) a document made under a condition of an EA that:

i relates to the management or rehabilitation of land (e.g. rehabilitation and closure plan or residual void management plan); and

ii was provided to the administering authority between 20 November 2019 and to 30 November 2021; and

iii within 20 business days after receiving the document, the administering authority had not notified the EA holder that the document was insufficient.

d) a report evaluating an EIS under section 34D of the State Development and Public Works Organisation Act 1971

e) an EIS assessment report

f) a written agreement between the EA holder and the State that is in force on 30 November 2018.'

The PCRP guideline (DES 2021) states that the land outcome document list is hierarchical and if there are inconsistencies between these documents on either the final outcomes or details of the outcome, then the document appearing first in the above list will prevail to the extent of the inconsistency.

For Marmor, the land outcome document that is relevant is the EA (EPML00319713 dated 14 February 2020). The EA contains no conditions requiring the preparation of any other rehabilitation management documents.

The EA for Marmor Operations includes specific conditions relating to rehabilitation outcomes, including the PMLU. These specific conditions are provided in Table 1.

Table 1: EA conditions relevant to rehabilitation

Condition No.	Condition
D1-1	All areas significantly disturbed by mining activities must be rehabilitated to a stable landform with a self-sustaining vegetation cover in accordance with final land use and landform design in Schedule D – Table 1.*
D1-2	Progressive rehabilitation must commence when areas become available within the operational land.
D2-1	All infrastructure, constructed by or for the environmental authority holder during the mining activities including water storage structures, must be removed from the site prior to mining lease surrender, except where agreed in writing by the post mining landowner/holder.

** See Table 17 for PMLU requirements as provided in Condition D1-1.*

3. Project Planning Section

3.1 Project Planning

This section will include background information, site location details, a description of the project and information on rehabilitation planning at Marmor.

Given the age of the site and the operation, no baseline (pre-mining) information or Environmental Impact Statement is available.

3.1.1 Site location, regional context and topography

The Marmor Operation is located approximately 40 km south of Rockhampton in Central Queensland adjacent to the small town of Marmor, within the Rockhampton Regional Local Government Area. The site covers approximately 31.1 hectares within a group of steep sided hills called the Redan Range. The site is located at the southern end of a small limestone ridge. The gradient of the natural slopes around the site ranges from 14 to 27 degrees with an average of 15 degrees (27%) (Meyers 2005). The land has been extensively cleared for agriculture, with less intense clearing taking place on the elevated steep hills where remnant native vegetation is present.

3.1.2 Climate

The Marmor Operation is located within Queensland's sub-tropical climatic zone which is characterised by high summer temperatures, warm dry winters, and distinct wet and dry seasons. It lies within the southeast trade wind belt but is too far south to experience monsoonal influence from the northwest and too far north to benefit from higher altitude cold fronts (BoM 2020a).

Climate data for the region has been captured by the Rockhampton Aero BoM weather station (station no. 039083) from August 1939 to present. Based on the climate data collected from this weather station, the region experiences an annual mean maximum temperature of 28.5°C, a mean minimum temperature of 16.8°C and a mean total annual rainfall of 815.1 mm. The long-term mean temperature is provided in Table 2 and the mean monthly rainfall is presented in Figure 2.

Rainfall data displays distinct wet and dry seasons, with high rainfall from December to March and low rainfall from June to September. Winds are primarily south-easterly; however, during the warmer months there is often a north-easterly sea breeze. The region is subject to the effects of tropical cyclones and tropical lows during the summer months which can produce wind and rainfall events that are typically short-lived and intense. The resulting run-off can cause localised flooding in the region (BoM 2020a).

Table 2: Long-term mean temperature since 1939 (BoM weather station 039083; Rockhampton Aero)

Temp (mean; °C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Min	22.2	22.2	20.9	18	14.3	11.1	9.7	10.8	13.8	17.1	19.6	21.3	16.8
Max	32	31.4	30.6	28.8	26.1	23.6	23.3	24.9	27.5	29.7	31.3	32.2	28.5

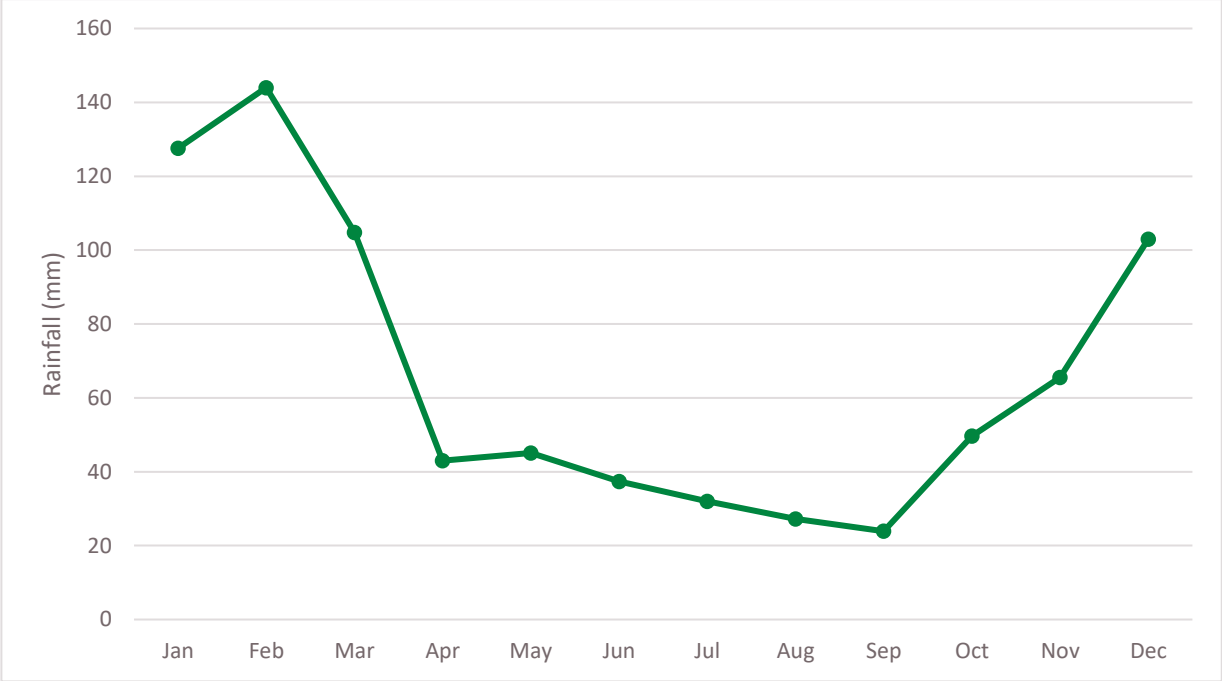

Figure 2: Mean monthly rainfall (BoM weather station 039083; Rockhampton Aero)

3.1.3 Geology and overburden geochemistry

The surface geology of the project area is mapped as Mount Holly Beds and described as Lower to Middle Devonian acid or intermediate ash flow tuff, ash-fall tuff, acid or basic flows, volcanic arenite, siltstone, mudstone, conglomerate, crinoidal and coralline limestone (more detailed stratigraphy is provided in Section 3.1.5).

The pit is located in an area with a 100 m thick bed of limestone which overlays volcanic rock and underlies beds of calcareous sandstone, siltstones and mudstone. Sandstones and siltstones also occur as lenses throughout the underlying limestone. In general, the upper beds tend to be dark grey containing buff mottling with grades ranging from 74% to 97% $CaCO_3$. The underlying beds, ranging with depth from mottled light-grey to buff, have high grades averaging approximately 98% $CaCO_3$. As the limestone is of higher strength compared to the overlying and underlying features, the limestone has been subject to less weathering than the surrounding rock. This has led to cavities and joints within the limestone being infilled with primarily silty clay (Meyers 2005).

It is recognised that the north west, north and north east void batters will need work to improve long-term stability as part of the closure strategy for the void.

The target resource is limestone and there is no risk of acid, metalliferous or saline drainage affecting the void. This is supported by void water quality data.

Void water samples were collected between 2013 and 2021. The pH ranged from 5.9 to 8.1 with an average pH of 6.7 and the EC ranged from 245 to 966 µS/cm with an average of as 497 µS/cm. These values are not indicative of acid, metalliferous or saline drainage. Sampling undertaken in September 2021 showed cadmium, chromium, copper, nickel leand and zinc concentrations in the void were below the limit of detection. Arsenic was detected at 0.002 mg/L but this is below the stock water guidelines (ANZECC and ARMCANC 2000) and is also below the freshwater ecosystems default guideline value.

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None of the water quality results to date would prevent the void from being used for water storage to support the surrounding post mine land use of cattle grazing or pose a threat to wildlife.

3.1.4 Regional and local catchment hydrology

Marmor is located within the Fitzroy River Sub-basin, in the freshwater catchment zone for the Fitzroy River.

The Marmor lease boundaries are located outside the Fitzroy River catchment floodplain according to mapping provided by the *Queensland Floodplain Assessment Overlay (QFAO[1])* which represents an estimate of areas potentially at threat of inundation by flooding. It is outside the Floodplain Investigation Area on the Floodplain Investigation Area Overlay Map OM-8B-29 (Marmor) of the *Rockhampton Region Planning Scheme (2015) - Version 2.2* (Rockhampton Planning Scheme) (Rockhampton Regional Council 2015) (see also a full assessment of flooding hazard in Section 3.5.1).

There are no major watercourses within the immediate vicinity of the site; and none of the neighbouring waterways are identified as High Ecological Value waters.

A number of minor watercourses / drainage features of the Fitzroy sub-basin occur around the site, the closest of which begins approximately 50 m from the southeast border of ML 5764. This drainage feature flows in a north-easterly direction towards Inkerman Creek (a perennial creek) which flows into Raglan Creek approximately 15 km northeast of the site.

Specific environmental values and water quality objectives are provided for the Fitzroy River Sub-basin in the *Environmental Protection (Water) Policy 2009 – Fitzroy River Sub-basin Environmental Values and Water Quality Objectives Basin No. 130 (part), including all waters of the Fitzroy River Sub-basin* (DEHP 2011a). These values and objectives cover all fresh and estuarine surface waters and groundwaters of the Fitzroy River Sub-basin.

Both the Fitzroy River and Raglan Creek discharge downstream into Keppel Bay and support a number of significant environmental values for the region including (DEHP 2011a):

- High ecological value aquatic ecosystems
- Irrigation
- Farm water supply
- Stock water
- Aquaculture
- Human consumer
- Primary, secondary and visual recreation
- Drinking water (freshwater and groundwater)
- Industrial use
- Cultural and spiritual values.

1 http://qldspatial.information.qld.gov.au/catalogue/custom/search.page?q=%22Queensland%20floodplain%20assessment%20overlay%22, accessed March 2021

3.1.5 Groundwater

3.1.5.1 Hydrostratigraphy

OVERVIEW

The Marmor site lies within a region dominated by two types of aquifer systems: alluvial and fractured rock (Figure 3). The aquifers that comprise the unconfined alluvial system include surficial sediments and floodplain alluvium. The aquifers that make up the confined fractured rock aquifer system include Mount Alma Formation and Mount Holly Formation/Erebus Beds.

ALLUVIAL (QUATERNARY)

The formation is composed of a lithology that includes clay, silt, sand, and gravel. The dominant rock within this unit is alluvium (Department of Resources 2021).

MOUNT ALMA FORMATION (LATE DEVONIAN – EARLY CARBONIFEROUS)

The formation is described as thinly interbedded fine-grained sandstone and siltstone and thick beds of conglomerate with andesitic to dacitic clasts and siltstone rip-up-clasts. It has also been described to include fossiliferous limestone and dolomite. The dominant rock unit within this formation is arenite-mudrock (Geoscience Australia 2020; Department of Resources 2021).

MOUNT HOLLY FORMATION/EREBUS BEDS[2] (LATE SILURIAN – MIDDLE DEVONIAN)

The formation is comprised of acid or intermediate ash-flow tuff, ash-fall tuff, acid or basic flows, volcanic arenite, siltstone, mudstone, conglomerate, crinoidal and coralline limestone. The dominant rock type is predominately volcanic (Australian Geological Survey Organisation 2000, Geoscience Australia 2020).

3.1.5.2 Geological structures

Two regional faults are present to the east and west to the mine site (Figure 3). They are characterised as being part of the Queenslander Fault system that extends 47 km southeast from the site. These faults are defined as eastward dipping thrust faults that strike north-west to south-east and dated from the Late Permian to Late Triassic (Withnall & Cranfield 2013; Maxwell 2019). The fault system predates the deposition of quaternary surficial sediments and establishment of the alluvial aquifer system (Department of Resources 2021).

[2] Mount Holly Formation is historical nomenclature for Erebus Beds

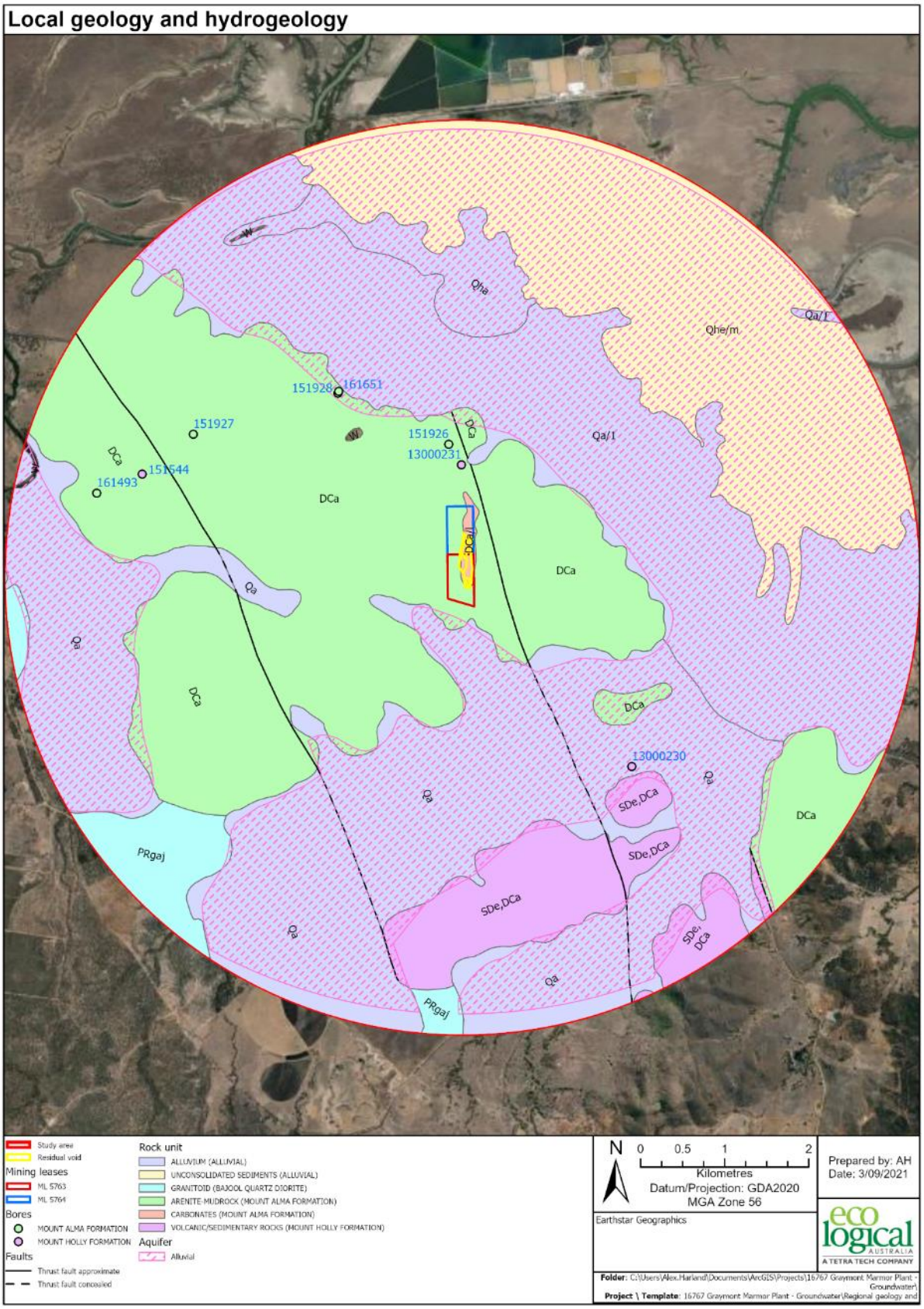

Figure 3: Local geology and hydrogeology with bores drilled between 2011-2021 and formation that they were screened in

3.1.5.3 Registered bores

Interrogation of the Bureau of Meteorology (BoM) Groundwater Explorer online database (BOM 2020b) identified 118 bores that were within a 5 km radial extent of the Operation (Figure 4). Each of these bores had an assigned number and associated bore report (Business Queensland 2021). The following sections summarise the information contained in these bore reports.

There is one licensed groundwater bore within the Marmor MLs (Water Licence 190342 for Bore 136274), which provides potable water to the amenities. This bore extracts water from the underlying Mount Alma Formation.

3.1.5.4 Regional groundwater level

Water level data are available from the BoM Groundwater Explorer database for 80 of the 118 bores. Eight of the 80 bore records presented data collected within the past 10 years and there is recent site data available for the bore on the Marmor site (136274). Table 3 presents details of the nine bores, and a summary of water levels. Figure 4 presents their locations.

Table 3: Registered bores with water level data within study area

Bore ID	SWL (mbgl)	Bore depth (m)	RSWL (mAHD)	Top of aquifer (mAHD)	Measured date	Formation name	Aquifer lithology
151544	5.2	18.3	20.8	27.2	20/07/2011	Mount Holly Formation/Erebus Beds	Siltstone
151926	21.0	49	23.0	-2.5	6/07/2013	Mount Alma Formation	Siltstone
151927	10.6	29	33.4	25.5	8/07/2013	Mount Alma Formation	Siltstone
151928	6.0	33.5	19.0	4.5	13/07/2013	Mount Alma Formation	Siltstone
161493	15.8	33.5	12.2	8.2	29/06/2016	Mount Alma Formation	Siltstone
161651	5.9	56.7	30.1	18.0	3/07/2017	Mount Alma Formation	Siltstone
13000230	0.6	19.8	10.4	1.0	14/06/2012	Mount Holly Formation/Erebus Beds	Shale
13000231	4.0	6.4	24.2	25.2	20/07/2011	Mount Holly Formation/Erebus Beds	Shale
136274	18.0	unknown	12.0	unknown	23/09/2021	Mount Alma Formation	Siltstone

The depth of the bores with recent depth readings ranged from 6.4 to 56.7 (mbgl). All bores were screened within the Mount Alma Formation and Mount Holly Formation/Erebus Bed fractured rock aquifers and were either primarily drilled for water supply, stock use or monitoring.

Groundwater level readings taken from the fractured rock aquifer system show a range between:

- 12.0 and 33.4 mAHD within the Mount Alma Formation; and
- 10.4 and 30.8 mAHD within the Mount Holly Formation.

There are no recent water level readings available taken from the alluvial aquifer system.

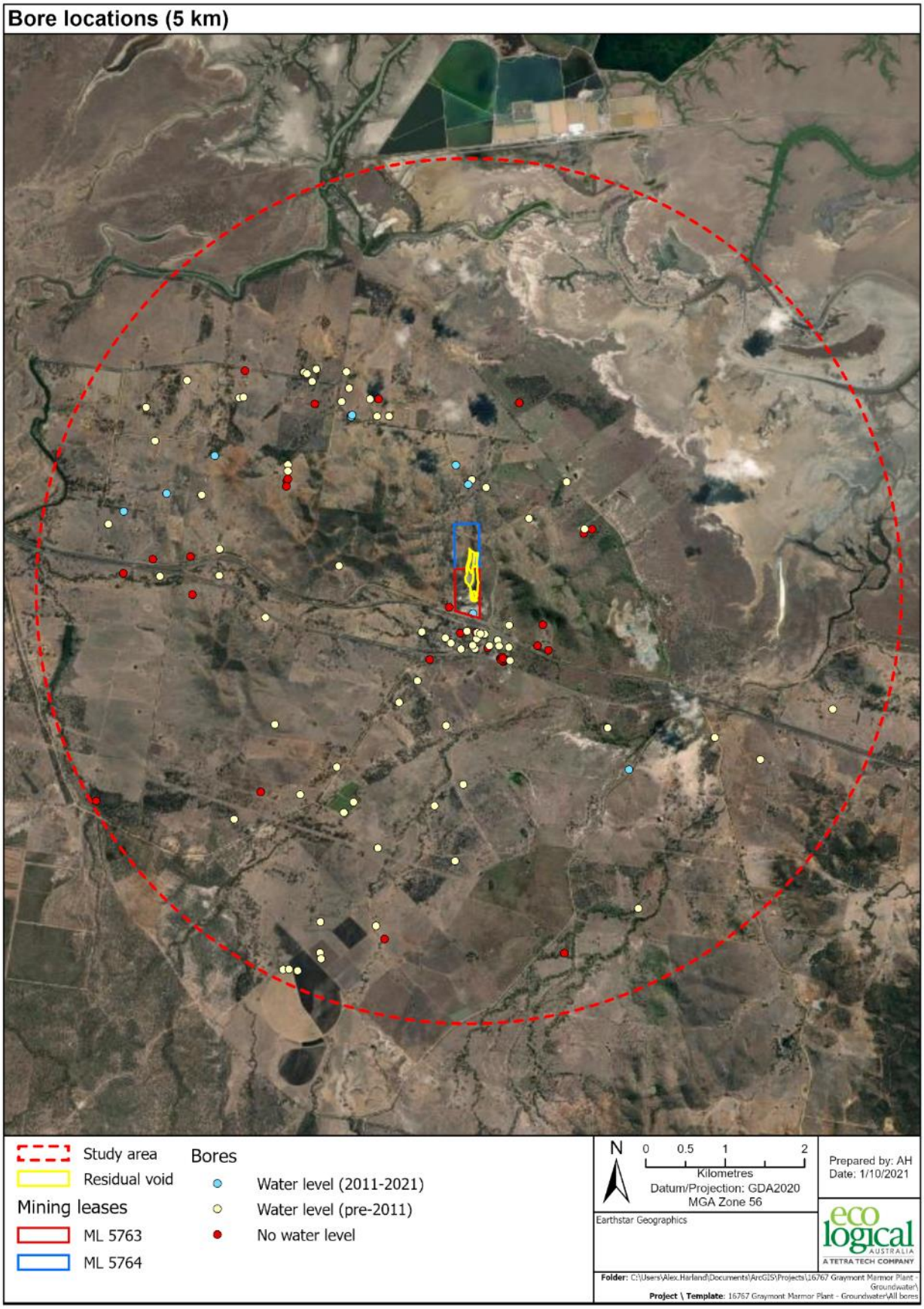

Figure 4: All bores found within the study area and information about availability of bore depth data (no water level data (red), water level data pre-2011 (yellow) and water level data between 2011-2021 (blue)).

3.1.5.5 Groundwater quality

The BoM groundwater explorer (BoM 2020b) identified 28 bores within the study area screened into the Mount Alma Formation and Mount Holly Formation/Erebus Beds that had available water quality data. Groundwater salinity (EC) ranges between 560 – 12,500 (µS/cm) and pH ranges between 7.5 – 8.5. No water quality data was available for alluvial aquifers.

Water quality measurements taken from Bore 136274, situated approximately 300 m south-east from the mine void, are summarized in Table 4.

3.1.5.6 Environmental values and water quality objectives

Environmental Protection (Water) Policy (EPP) 2009 and DEHP (2011a) outlines water quality objectives (WQOs) for environmental values (EVs) for waters within Fitzroy River Sub-basin. WQOs for Fitzroy River Sub-basin groundwaters are provided according to their chemistry zone and depth category (DEHP 2011b). However, the study area is not included in any currently defined groundwater chemistry zone. DEHP (2011a) defers to DEHP (2009) in this case. Fitzroy River Sub-basin groundwaters EVs are provided in DEHP (2011a). These EVs include:

- aquatic ecosystem[3]
- irrigation
- farm supply / use
- stock water
- primary recreation
- drinking water
- cultural and spiritual values.

Groundwater WQOs available for the nominated EV are outlined in Table 5. The data available for Bore 136274 (Table 4), was compared to these WQOs.

[3] According to DEHP (2009): "*The aquatic ecosystem EV is a default applying to all waters, and therefore the WQOs for aquatic ecosystems form the minimum WQOs for all waters. Where no human use [i.e., irrigation, farm supply, stock water etc.] EVs are identified, the WQOs identified for aquatic ecosystem protection remain applicable.*"

Table 4: Water quality data for Bore 136274

Date	pH	EC (µS/cm)	Total Alkalinity as $CaCO_3$ (mg/L)	Sulfate as SO_4 (mg/L)	Chloride (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	As (mg/L)	Cd (mg/L)	Cr (mg/L)	Cu (mg/L)	Ni (mg/L)	Pb (mg/L	Zn (mg/L)
Sep-2021	7.10	35	7	2	4	3	<1	2	<1	<0.001	<0.0001	<0.001	0.077	<0.001	<0.001	0.588
June-2020	7.69	699	-	-	-	-	-	-	-	-	-	-	-	-	-	-
June-2015	6.84	473	-	-	-	-	-	-	-	-	-	-	-	-	-	-
June-2013	-	602	-	31	46	65	3	36	1	-	-	-	-	-	-	-

Recent water quality data (2021) from Bore 136274 indicates that general physicochemical and major ions concentrations in groundwater within the mining lease meets all WQO's. This is significant given the close proximity of the bore to the mine void. However, data for Bore 136274 shows the EC was between ~400-700 µS/cm prior to 2021. This range marginally exceeds the WQO for irrigation water for sensitive crops (650 µS/cm). However, it is well within the recommended limit for moderately sensitive crops (1,300 µS/cm) and is not considered to significantly affect the use of groundwater for this EV. Although not unusual for regional groundwater, the EC at the high end of the range exceeds the WQOs for aquatic ecosystems. However, given the mixing that occurs when groundwater discharges into surface water systems, local groundwater quality is not expected to diminish aquatic ecosystem EVs. The sodium concentration (up to 36 mg/L) has also been above the WQO for raw water supply (30 mg/L). However, NHMRC (2011) (the Australian Drinking Water Guidelines or ADWG) notes that 50 mg/L is a '*typical value*' in reticulated supplies. The ADWG value for sodium is 180 mg/L (based on level at which taste become appreciable).

The recent change in EC may indicate that local groundwater maybe becoming fresher with time or it may reflect recent to high rainfall/recharge or seasonable variability in the groundwater system.

The analysis conducted in September 2021 suggest elevated copper and zinc concentrations in the groundwater. These concentrations would exceed the WQO for freshwater ecosystems, but the concentrations do not exceed the WQO for other EVs. It is believed that this may be due to cross contamination from the bore infrastructure (it is a production bore with down bore pump equipment). It is currently being investigated, but from the void water quality data, it is clear that is it not related to water quality in the void.

Table 5: WQOs applicable to Fitzroy groundwater EVs nominated in DEHP (2011a)

Environmental value and WQO source	pH	EC (µS/cm)	Total Alkalinity as $CaCO_3$ (mg/L)	Sulfate as SO_4 (mg/L)	Chloride (mg/L)	Calc(mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Copper (mg/L)	Zinc (mg/L)
Aquatic ecosystem (fresh waters, moderately disturbed (DEHP 2011a)	6.5 – 8.5	<250	ng*	<15	ng	ng	ng	ng	ng	0.0014	0.008
Irrigation and general use (DEHP 2011a and ARCANZ & ANZECC 2000)#	ng	<650	ng	ng	<175	ng	ng	<115	ng	0.2	2
Stock water (cattle) (DEHP 2011a and ARCANZ & ANZECC 2000)	ng	<5,970	ng	<1,000	ng	<1,000	ng	ng	ng	1.0	20
Primary recreation (DEHP 2011a)	6.5 – 8.5	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
Drinking water (before treatment) (DEHP 2011a)	6.5 – 8.5	<2,400+	ng	<200	ng	ng	ng	<30	ng	2	3 (aesthetic) only

** ng = no guideline value available*

 # The values are for sensitive crops

+ Value taken from NHMRC (2011), page 977

Note there are no WQOs available for the cultural use EV.

3.1.6 Pre-mining and current surrounding land use

As operations at the site began in 1904, there are no records of former land use at the site prior to mining disturbance. The soils and topography in the area are generally not suitable for cultivation but pasture establishment is common. Published land use information has been reviewed to provide the likely baseline land use associated with the site pre-mining. This has been based on current and recent land uses in the surrounding areas on similar landforms.

A number of land-uses have been mapped within and surrounding the project area as shown in Figure 5. This shows that the dominant land use in the surrounding areas are production from relatively natural environments (grazing on unimproved native pastures) or conservation land-uses (Queensland Government 2019). These were likely the pre-mining land use for the Marmor Operation.

3.1.7 Soil properties and productivity

Given the age of the site, there is no pre-mining soil survey data available for the site. Published soils and land resources information has been reviewed to provide the necessary baseline information.

The *Land Systems of the Dawson-Fitzroy area, Queensland* (CSIRO 1968) mapped the area as part of the Toonda Land System (Figure 6; Queensland Government 2018). This comprises mostly hills and slopes on gently dipping Upper Palaeozoic volcanics and extensive colluvial-alluvial slopes under softwood and/or brigalow scrub.

The soils are described as 'dark brown and grey-brown clays'. The soils of this group have uniform or gradational, medium to fine textures on parent materials that have been affected only slightly or indirectly by deep weathering. In undisturbed scrubs these soils have a granular, highly organic, surface mulch that has sub-plastic properties and strong, medium to coarse angular blocky structure in the subsoils. The friable surface soils are prone to erosion after land clearing.

Given the background geology of the project area, the uniform or gradational clay loams to clays would be classified as Red or Brown Dermosols under the current Australian Soil Classification (ASC) system. (see the soil profiles exposed above the pit walls in Figure 7). It is possible that deeper clay rich soils (Grey or Brown Vertosols under the ASC) occur in flatter areas outside the main area of disturbance. Where topsoil depths have been provided in *Land Systems of the Dawson-Fitzroy area, Queensland* (CSIRO 1968), they are generally 100 to 150 mm deep. This has guided the proposed topsoil depth to be used in site rehabilitation.

The soil types present (even when shallow) have moderate to high fertility and are used widely and successfully for the establishment of exotic pastures.

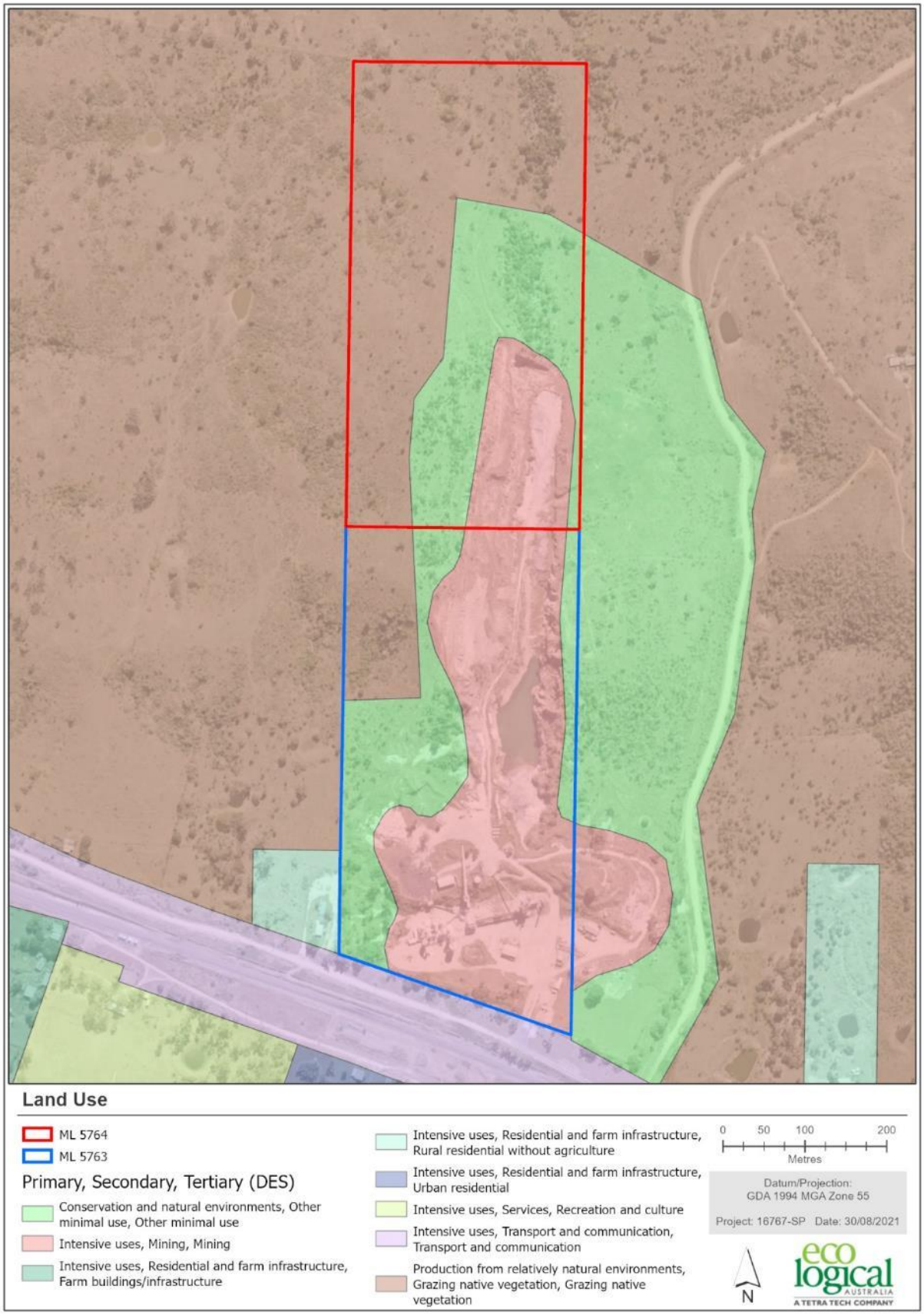

Figure 5: The land use classes within the project area (source: Queensland Government 2019)

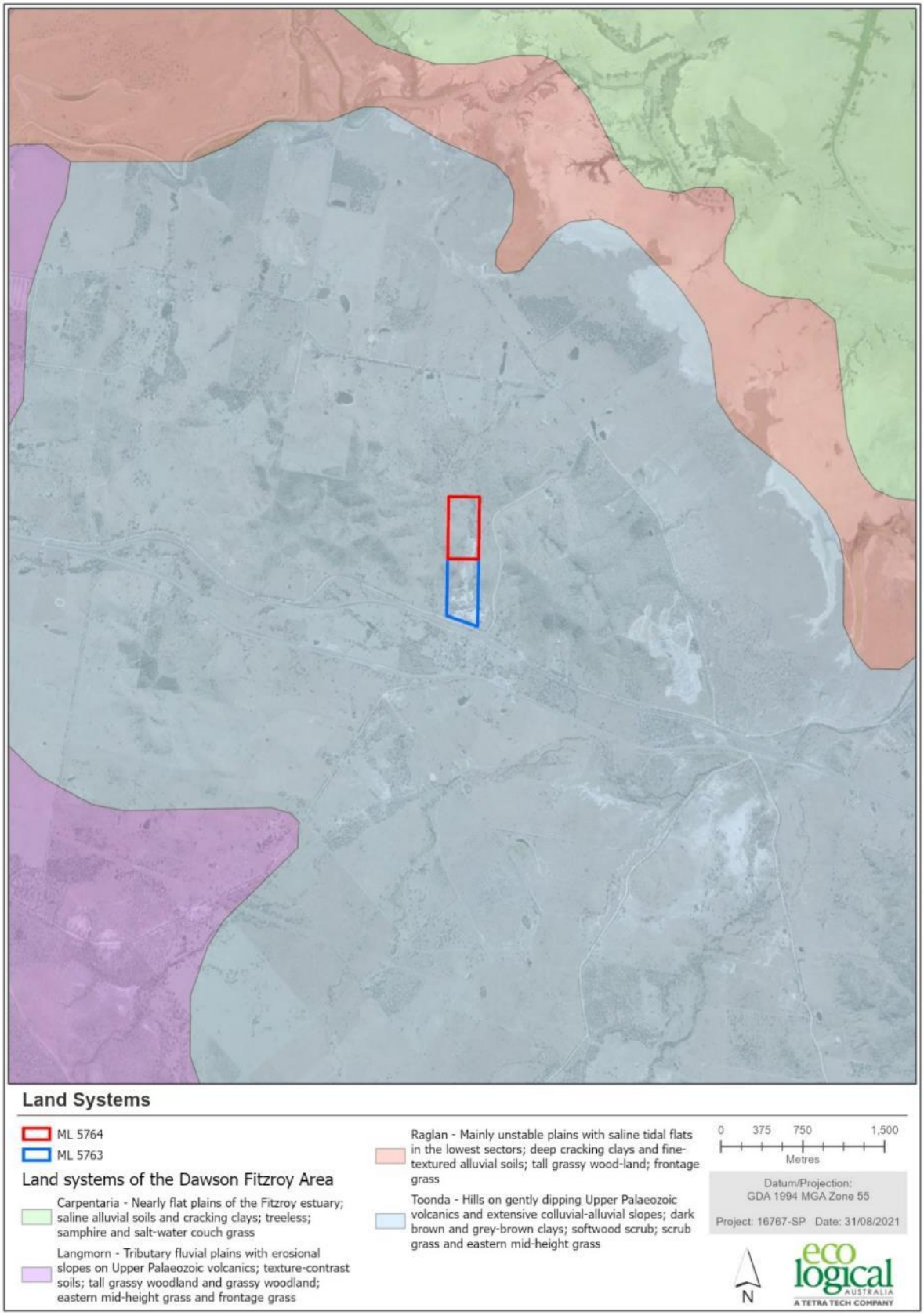

Figure 6: The land systems and associated soil types within the project area (source: CSIRO 1968 and Queensland Government 2018)

Figure 7: Photograph of the Marmor pit showing a cross section of the shallow red-brown clay soil profile over partially weathered parent material

The lease areas are outside the area below 20 m AHD and the acid sulfate soil overlay of the Rockhampton Planning Scheme (Rockhampton Regional Council 2015) and above the elevation where acid sulfate soils would be expected to occur.

3.1.7.1 Land stability

Although the published soils mapping indicates the potential for erosion following land clearing, there is no evidence of significant pre-existing land degradation/erosion in the undisturbed land within the lease areas even on steeply sloping land. Soil analysis of the stored topsoils shows that local soils have a good clay content, >90% calcium saturation (and very low sodium saturation) and are non-sodic (See Section 3.5.3). Therefore, the soils do not have characteristics that would make them pre-disposed to ongoing stability issues.

3.1.7.2 Agricultural potential and productivity

According to the Rockhampton Planning Scheme (Rockhampton Regional Council 2015), the project area is outside areas mapped as Agricultural Land Classification (ALC) Class A and B. The land is therefore not suited to high intensity land uses like cropping. The Land Systems mapping in the *Lands of the Dawson-Fitzroy Area, Queensland* (CSIRO 1968) characterises land within the project area as agricultural land class C1. Land class C1 is 'pasture land' defined as sown pastures and native pasture on high fertility soils.

Land quality with reference to the development of PMLUs is further discussed in a local, regional and state context in Section 3.3.1.1.

3.1.8 Ecological values

The site is located in an area that has been extensively cleared for agricultural activities. The surrounding landscape (outside the mining leases) is predominantly non-remnant vegetation with small, scattered patches of remnant vegetation.

According to the Queensland Government Regional Ecosystem (RE) mapping (Queensland Herbarium 2019), there are no areas of mapped remnant vegetation on ML 5763; however, there is one small patch of Category B remnant vegetation on ML 5764. The remnant vegetation on ML 5764 is a combination of REs:

- RE 11.11.16 (of concern) - *Eucalyptus cambageana*, *Acacia harpophylla* woodland on old sedimentary rocks with varying degrees of metamorphism and folding
- RE 11.3.26 (least concern) - *Eucalyptus moluccana* or *E. microcarpa* woodland to open forest on margins of alluvial plains (least concern).

This patch of remnant vegetation is approximately 2.53 ha in size and is located in the north and northeast corner of the mining lease, outside of the disturbance footprint. This will be retained as part of the rehabilitation and closure planning.

No regrowth vegetation is present within either of the MLs; however, a small patch of Category C high value regrowth (REs 11.11.16/11.3.26/11.3.1/11.3.25) occurs approximately 40 m to the east of ML 5763. Additionally, a larger patch of Category R watercourse and drainage regrowth borders the southeast corner of ML 5763 extending to the northeast away from the site (Figure 8).

Lantana and rubber vine have been recorded on the mine site. These species are considered Category 3 restricted invasive plants under the *Biosecurity Act 2014*. An eradication program for declared weeds began in 2003 in which basal spraying was carried out on infested areas in approximately 40% of the mine lease. Graymont undertakes regular maintenance weed control by engaging a local contractor to spray the weeds as required (typically three to four times per year).

A desktop fauna assessment was conducted within 3 km of the project area using the WildNet database (Appendix A; Queensland Government 2021). WildNet searches determined species or species habitat which may be present within the area. Results returned the potential presence of 10 amphibians, 93 birds, 10 ray-finned fishes, and 4 reptiles. Of these species, only 3 were listed as threatened under State or Federal legislation. Atlas of Living Australia searches (Atlas of Living Australia 2021) found occurrence records for an additional 6 bird species, one of which (squatter pigeon; southern population) is a threatened species. Likelihood of occurrence assessments were conducted for threatened species, as shown below in Table 6. Only the squatter pigeon is likely to occur close to the project area. The proposed rehabilitation has the potential to increase the availability of suitable habitat for the species (refer to habitat preferences in Table 6).

Table 6: Threatened fauna that are known to occur, or potentially occur, in or around the project area

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Habitat description	Likelihood	Justification
Calidris ferruginea	Curlew sandpiper	CE	CE	Mainly occur in both fresh and brackish waters on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms but are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. Curlew Sandpipers forage on mudflats and nearby shallow water and generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh.	Unlikely	No ALA records within proximity of the project area. No suitable habitat occurs within the project area.
Limosa lapponica baueri	Western Alaskan bar-tailed godwit	V	V	Inhabits mainly in coastal areas such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays, around beds of seagrass, saltmarsh, coastal sewage farms and saltworks, salt lakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. Rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips.	Unlikely	No ALA records within proximity of the project area. No suitable habitat occurs within the project area.
Numenius madagascariensis	Eastern curlew	CE	E	Associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sand flats.	Unlikely	No ALA records within proximity of the project area. No suitable habitat occurs within the project area.
Geophaps scripta	Squatter pigeon (southern population)	V	V	The Squatter Pigeon (southern) occurs mainly in grassy woodlands and open forests that are dominated by eucalypts. It has also been recorded in sown grasslands with scattered remnant trees, disturbed habitats (i.e., around stockyards, along roads and railways, and around settlements, in scrub and acacia growth, and remains common in heavily-grazed country north of the Tropic of Capricorn. The species is commonly observed in habitats that are located close to bodies of water.	Known	ALA species records occur within proximity to the project area.

CE = Critically Endangered, E = Endangered, V = Vulnerable

3.1.9 Project description

3.1.9.1 Underlying landholders

ML 5763 and ML5764 lie within Lot 3 on Survey Plan 252980 Rockhampton Regional Council Local Government Area. Graymont (NSW) Pty Ltd became the registered owner of Lot 3 on SP 252980 -on 24 December 2019. The tenure is Freehold.

3.1.9.2 Mining tenure

Details of the granted mining leases for the Marmor operation are provided in Table 7.

Table 7: Details of mining tenure for Marmor

Mining Lease number	Lease holder	Date granted	Expiry date	Areas (ha)	Activity
ML 5763	Graymont (NSW) Pty Ltd	01/04/1974	31/03/2031	15.4	Mining Limestone
ML5764	Graymont (NSW) Pty Ltd	01/04/1974	31/03/2031	16.1	Mining Limestone

3.1.9.3 Mining operation

Marmor Operation comprises of Mining Leases (MLs) ML5763 and ML5764 (both were granted 1/04/1974 and expire 31/03/2031), covering 15.4 and 16.1 ha respectively.

Mining was undertaken using open cut methods. No underground mining has occurred or is planned. The previous owner, Sibelco, ceased mining and crushing of limestone and other decorative stone at the site as at the time it was not economically viable.

Sibelco also ceased calcination operations prior to Graymont's site acquisition. Until the site was put into care and maintenance limestone was purchased from the Sibelco site at Calliope near Gladstone and transferred to the Marmor site where it was processed at a yearly rate of approximately 70,000 tonnes per annum. When the plant was operating, the limestone was fired on the site in a rotary kiln powered by coal as part of the calcination process to produce burnt-lime. The burnt limestone was then milled to produce quick-lime, which is sold in bulk or diverted to the hydrator where it is hydrated and sold as either bulk or bagged product.

Waste lime from the kiln baghouse was stored in a storage bin. It was mixed with reject or waste limestone and coal ash and placed in stockpiles within the mined out sections of the void and outside the void near the ROM area.

The site does not have a tailings storage facility.

As the site is in care and maintenance, current activities undertaken by Graymont are limited to site maintenance, environmental monitoring and implementation of environmental management to prevent/mitigate environmental harm.

Graymont is considering its options to restart operations at the site when favourable economic conditions exist. The site is still considered to have materials that are suitable for use as road base. However, a planned closure date of 2030 is being considered and rehabilitation planning has been undertaken on that basis.

3.1.9.4 Mine features and disturbance domains

To manage the rehabilitation of ground disturbance associated with mining activities, areas with similar forms of disturbance or that have similar rehabilitation needs have been grouped together into what are referred to as disturbance domains. Disturbance domains at Marmor are specified in the EA together with the PMLU and other post mine land requirements.

A breakdown of each disturbance domain into different disturbance or asset types is provided in Table 8. This helps to group different disturbance types into areas with the same or similar rehabilitation requirements. It forms the basis for the development of the strategy and different rehabilitation areas with different rehabilitation management requirements.

Table 8: Description of the disturbance domains at Marmor

Disturbance domains (as defined in the EA)	Details of disturbance types or assets within each domain
Product stockpiles	Limestone stockpiles Coal stockpiles
Infrastructure	Buildings and sheds (general and portable structures including administration, crib rooms, sheds, ablutions) Workshop Processing plant/equipment (inclusive of concrete pads, silos, bins and hoppers, conveyors) Tanks – hydrocarbons (and associated concrete bunds) Tanks – other Sediment pond Weighbridge Laydown or trafficked areas (gravelled areas surrounding processing plant, workshop administration and work areas) ROM pad trafficked areas (gravelled areas surrounding limestone and coal stockpiles) Vegetated (areas of minimal disturbance adjacent to other activities where vegetation has been retained or has passively regenerated)
Roads and tracks	Tracks (unsealed, gravel) Sealed road (bitumen sealed site entrance)
Topsoil stockpiles	Topsoil stockpile
Residual voids	Cut back and benched Northwest batter for re-shaping Minor disturbance Water storage Mixed coal ash, lime kiln dust and reject limestone stored in the void Void floor
Rejects & waste stockpiles	Mixed coal ash, lime kiln dust and reject limestone stockpiles

The extent of the disturbance domains at Marmor Operations is shown in Figure 1.

3.1.9.5 Notifiable activities

Notifiable activities as prescribed by Schedule 3 (29)(b)(ii) of the EP Act are undertaken at Marmor Operations, on ML 5764:

- 21 - Lime burner—manufacturing cement or lime from limestone material using a kiln and storing wastes from the manufacturing process.
- 29 - Petroleum product or oil storage (for petroleum products or oil in class 3 in packaging groups 3 of the dangerous goods code— more than 5,000L capacity).

A 10,000 L diesel fuel tank on a low stand surrounded by a concrete bund with a capacity of 25,000 L and a shut-off valve is present on the site but is no longer utilised. Fuel is stored in a 2,000L self-bunded tank that is filled on demand.

Land is required to be listed on the Environmental Management Register where notifiable activities have been or are being carried out on the land.

3.1.9.6 Environmentally relevant activities

The Environmentally Relevant Activities (ERAs), as described in the *Environmental Protection Regulations 2019*, carried out at Marmor Operations are listed in Table 9. These are included in the EA.

Table 9: Marmor ERAs

Environmentally relevant activity/activities	Location
Schedule 3 21: A mining activity that is an ineligible ERA, other than a mining activity mentioned in items 9 to 20	ML5764
Schedule 3 20: A mining activity that is an ineligible ERA, other than a mining activity mentioned in items 9 to 20	ML5763
Ancillary 41 - Cement manufacturing 2: Calcining 200t or more of limestone in a year	ML5764
Ancillary 41 - Cement manufacturing 2: Calcining 200t or more of limestone in a year	ML5763

3.1.10 Design for closure

The operation was developed at a time when consideration of rehabilitation and closure was not built into the mine design or layout of operational areas. However, the site is not in a floodplain and it not expected to overtop (see also Section 3.5.11.1), there are no watercourses on site and ecologically significant vegetation occurs outside of the main disturbance area (Sensitive receptors have been identified in Figure 8 and the spatial data for this provided separately).

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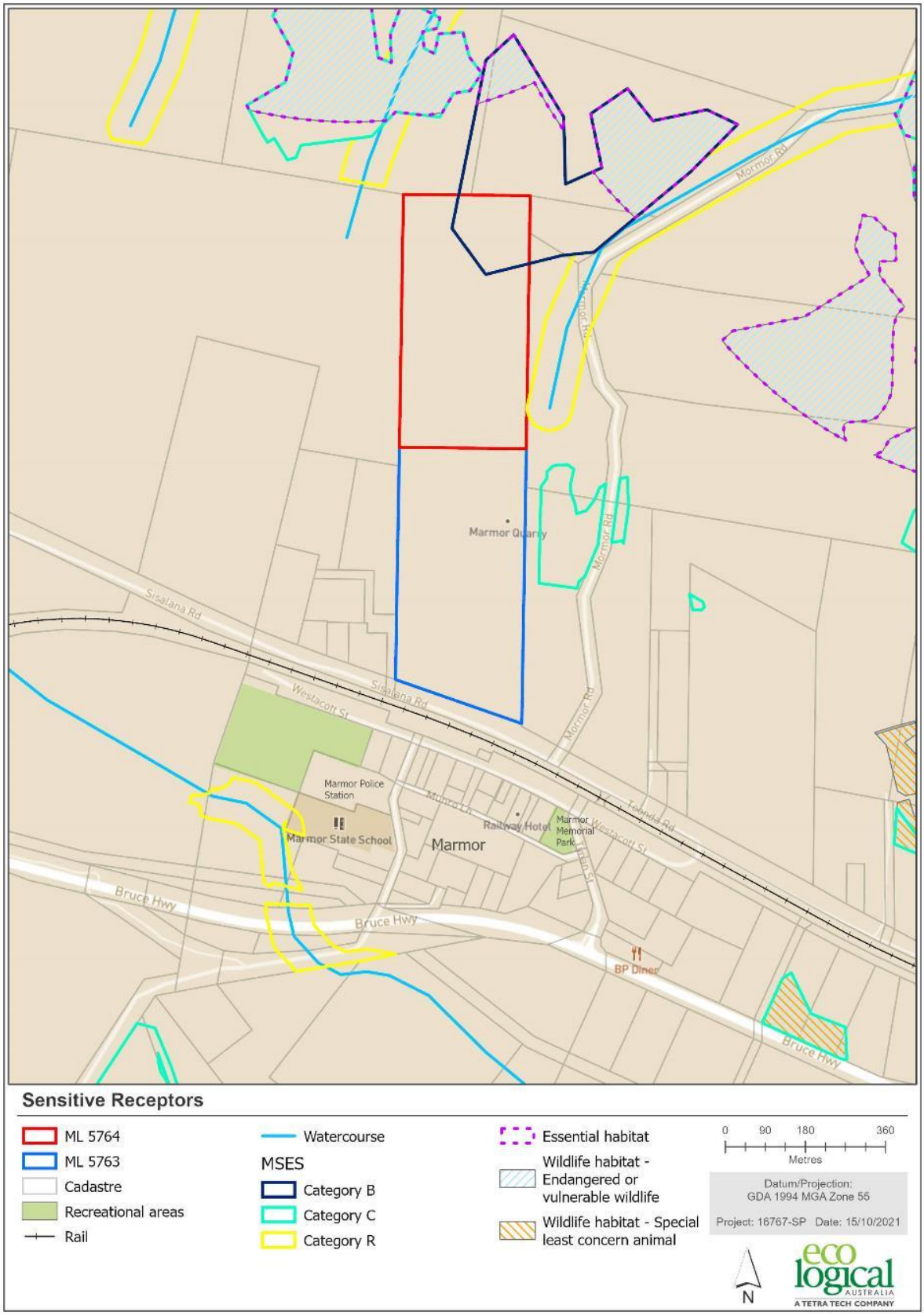

Figure 8: Sensitive receptors including Matters of State Environmental Significance (MSES) surrounding the Marmor lease areas.

There are also no geochemically reactive or acid forming wastes, no waste rock or overburden dumps, tailings dams, heap leach pads, or waste tyre stockpiles that would require selective placement.

Therefore, due to the simple mining methods used, the inert nature of the mined resource and the small scale of disturbance and the absence of significant flooding or void overtopping risk, the specific lack of documented decision making regarding the optimal location of infrastructure and facilities, will not hinder the safe and successful rehabilitation of mine-affected areas to a stable condition with an agreed PMLU.

3.1.11 Rehabilitation planning and progressive rehabilitation

3.1.11.1 Progressive rehabilitation

Condition D1-2 of the EA states that, "*Progressive rehabilitation must commence when areas become available within the operational land*". Graymont recognises the importance of progressive rehabilitation in the overall production cycle as it allows for the disturbance area to be minimised as much as practicable.

To date, only stabilisation works have been conducted in part of the void largely for operational safety. This area will be used for future revegetation research trials to inform the full scale rehabilitation of the void areas above the final pit lake waterline and is not currently available for further rehabilitation works.

No other rehabilitation and no active revegetation has been conducted to date at Marmor. Land can only be released for rehabilitation when it is no longer required for operations. Just prior to acquisition by Graymont, the Plant had been operational and all of the disturbed areas were used as part of the on-going operation of the site including the void which is used for access to future mining areas and the void waterbody which is used as a water supply for process make-up water.

The site is in care and maintenance with a view to recommencing operations. Therefore, at present none of the disturbance areas are available for rehabilitation. When operations cease completely (currently planned for 2030), progressive rehabilitation of the domains can commence.

Table 10 details the anticipated final areas of disturbance. Rehabilitation of the final void will require very small cut backs to achieve the design slopes. This is equivalent to 0.09 ha greater than the current disturbance. Current disturbance areas are shown in Figure 1 and final rehabilitation areas (total disturbance) are shown in Figure 9.

Table 10: Disturbance areas at Marmor Operations

Disturbance domain	Current disturbance (ha)
Product stockpiles	0.06
Residual voids	6.85
Infrastructure	3.72
Roads and tracks	0.74
Rejects & waste stockpiles (ex void)	0.55
Topsoil stockpiles	0.46
Total disturbance	**12.38**

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A rehabilitation schedule is presented in Appendix B.

3.1.11.2 Rehabilitation milestones

The PCRP guideline requires the development of rehabilitation milestones and milestone criteria for all rehabilitation areas that have a PMLU (DES 2021). Milestones identify significant events or steps in the rehabilitation process and will be legally enforceable commitments once the PCRP Schedule is approved. These milestones apply to areas when they become available for rehabilitation. In accordance with the PRCP guideline, for Marmor, Graymont has developed milestones, milestone criteria and PMLU completion criteria that are SMART:

- **S**pecific
- **M**easurable
- **A**chievable
- **R**elevant
- **T**ime bound.

Rehabilitation completion criteria have been developed to determine and demonstrate whether each milestone has been achieved.

The site-specific rehabilitation milestones (guided by the examples in Appendix 3 of the PRCP guideline) to be applied to each rehabilitation area are presented in Table 11 to Table 16 inclusive. Some tasks require milestones that are unique to the individual rehabilitation areas but a number of actions/milestones (such as topsoiling, revegetation and monitoring) are common to all rehabilitation areas with the same PMLU. Therefore, in the tables for each domain that follow, unique milestones are identified by a prefix for each rehabilitation area and common milestones are identified with the domain pre-fix.

Table 11: Rehabilitation milestones for rehabilitation areas within the Product Stockpile disturbance domain

Rehabilitation area	Disturbance types or assets	Milestone ID	Milestone description
RA1	Limestone stockpile	RA1_RM1	Removal of stockpiled mined limestone and placement of excess material back in the void (at RA19). Proceed to PS_RM2.
RA2	Coal stockpile	RA2_RM1	Removal of coal feedstock stockpile off-site. Proceed to PS_RM2.
Common	Product Stockpile (PS)	PS _RM2	Landform development
		PS_RM3	Topsoiling and surface preparation
		PS_RM4	Revegetation
		PS_RM5	Achievement of PMLU to stable condition (grazing)
		PS_RM6	Sustainable achievement of PMLU

Table 12: Rehabilitation milestones for rehabilitation areas within the Infrastructure disturbance domain

Rehabilitation area #	Disturbance types or assets	Milestone #	Milestone description
RA3	• Buildings and sheds (general and portable structures including administration, crib rooms, sheds, ablutions) • Weighbridge • Tanks - other	RA3_RM1	Decommissioning and demolition • Disconnect services • Bore decommissioning • Demolish and or remove buildings and tanks from site. • Break up and remove concrete pads and footings
		RA3_RM2	Landform development. Proceed to I_RM4
RA4	• Workshop • Process plant/equipment (inclusive of concrete pads, silos, bins and hoppers, conveyors) • Tanks – hydrocarbons (and associated concrete bunds)	RA4_RM1	Decommissioning and demolition • Disconnect services • Demolish and or remove equipment gantries, conveyors, silos, bins, associated buildings, workshop and hydrocarbon tanks from site. • Break up and remove concrete pads, bunds and footings
		RA4_RM2	Conduct contaminated site investigations and manage or remediate and validate as required.
		RA4_RM3	Landform development. Proceed to I_RM4
RA5	Sediment pond	RA5_RM1	Landform development. Proceed to I_RM4
RA6	ROM pad trafficked areas (gravelled areas surrounding limestone and coal stockpiles)	RA6_RM1	Remove surface aggregate /road base from laydown areas and use as soil forming material for rehabilitation of the void floor
		RA6_RM2	Landform development. Proceed to I_RM4
RA7	Laydown or trafficked areas (gravelled areas adjacent to the void) (Northern area)	RA7_RM1	Remove surface aggregate /road base from laydown areas and use as soil forming material for rehabilitation of the void floor
		RA7_RM2	Landform development. Proceed to I_RM4
RA8	Laydown or trafficked areas (gravelled areas surrounding processing plant, workshop and administration areas) (Southern area)	RA8_RM1	Remove surface aggregate /road base from laydown areas and use as soil forming material for rehabilitation of the void floor
		RA8_RM2	Landform development. Proceed to I_RM4
RA9	Vegetated (areas of minimal disturbance adjacent to other activities where vegetation has been retained or has passively regenerated)	RA9_RM1	Supplementary seeding Proceed to I_RM6
Common	Infrastructure (I)	I_RM4	Topsoiling and surface preparation (not applicable to RA9)
		I_RM5	Revegetation (not applicable to RA 9)
		I_RM6	Achievement of PMLU to stable condition (grazing)
		I_RM7	Sustainable achievement of PMLU

Table 13: Rehabilitation milestones for rehabilitation areas within the Roads and Tracks disturbance domain

Rehabilitation area	Disturbance types or assets	Milestone	Milestone description
RA10	Tracks (Earthen)	No specific milestones	Refer to Common milestones beginning RT_RM2
RA11	Tracks (Gravel)	RA11_RM1	Remove surface aggregate /road base from tracks and use as soil forming material for rehabilitation of the Residual Void (void floor mixed kiln dust, reject limestone and coal ash in void). Proceed to RT_RM2
RA12	Sealed road (bitumen sealed site entrance)	RA12_RM1	Break up, remove and off-site disposal of bitumen. Proceed to RT_RM2
Common	Roads and tracks (RT)	RT_RM2	Landform development
		RT_RM3	Topsoiling and surface preparation
		RT_RM4	Revegetation
		RT_RM5	Achievement of PMLU to stable condition (grazing)
		RT_RM6	Sustainable achievement of PMLU

Table 14: Rehabilitation milestones for rehabilitation areas within the Topsoil Stockpile disturbance domain

Rehabilitation area	Disturbance types or assets	Milestone	Milestone description
RA13	Topsoil stockpile	RA13_RM1	Landform development
		RA13_RM2	Topsoiling and surface preparation
		RA13_RM3	Revegetation
		RA13_RM4	Achievement of PMLU to stable condition (grazing)
		RA13_RM5	Sustainable achievement of PMLU

Table 15: Rehabilitation milestones for rehabilitation areas within the Residual Void disturbance domain

Rehabilitation area	Disturbance types or assets	Milestone	Milestone description
RA14	Cut back and benched area	RA14_RM1	Landform development. Proceed to RV_RM4
RA15	Northwest batter for re-shaping	RA15_RM1	Landform development. Proceed to RV_RM4
RA16	Minor disturbance	No specific milestones	Refer to Common milestones beginning RV_RM4
RA17	Water storage	No specific milestones	Refer to Common milestones beginning RV_RM4
RA18	Mixed kiln dust, reject limestone and coal ash in void and east wall reshaping	RA18_RM1	Removal of kiln dust, reject limestone and coal ash from the void and disposal off-site
		RA18_RM2	Landform development
		RA18_RM3	Surface preparation. Proceed to RV_RM4

Rehabilitation area	Disturbance types or assets	Milestone	Milestone description
RA19	Void floor	RA19_RM1	Surface preparation. Proceed to RV_RM4
Common	Residual Void (RV)	RV_RM4	Install safety bund /fencing around void
		RV_RM5	Break up remaining tracks in void (excludes RA16)
		RV_RM6	Revegetation (excludes water body in RA17)
		RV_RM7	Achievement of PMLU to stable condition (water storage)
		RV_RM8	Sustainable achievement of PMLU

Table 16: Rehabilitation milestones for rehabilitation areas within the Rejects & Waste stockpiles disturbance domain

Rehabilitation area	Disturbance types or assets	Milestone	Milestone description
RA20	Mixed kiln dust, reject limestone and coal ash stockpiles	RA20_RM1	Removal of kiln dust, reject limestone and coal ash from areas outside the void and disposal off-site
		RA20_RM2	Landform development
		RA20_RM3	Topsoiling and surface preparation
		RA20_RM4	Revegetation
		RA20_RM5	Achievement of PMLU to stable condition (grazing)
		RA20_RM6	Sustainable achievement of PMLU

The rehabilitation areas are shown in Figure 9.

A broad timeline of significant rehabilitation activities is provided in Figure 10[4]. This is reflected in the rehabilitation schedule presented in Appendix B.

Rehabilitation objectives, milestone criteria and PMLU completion criteria are presented in Section 3.3.2.

[4] Note that stabilisation works have already been conducted for RA14 (i.e. RM1 initiated).

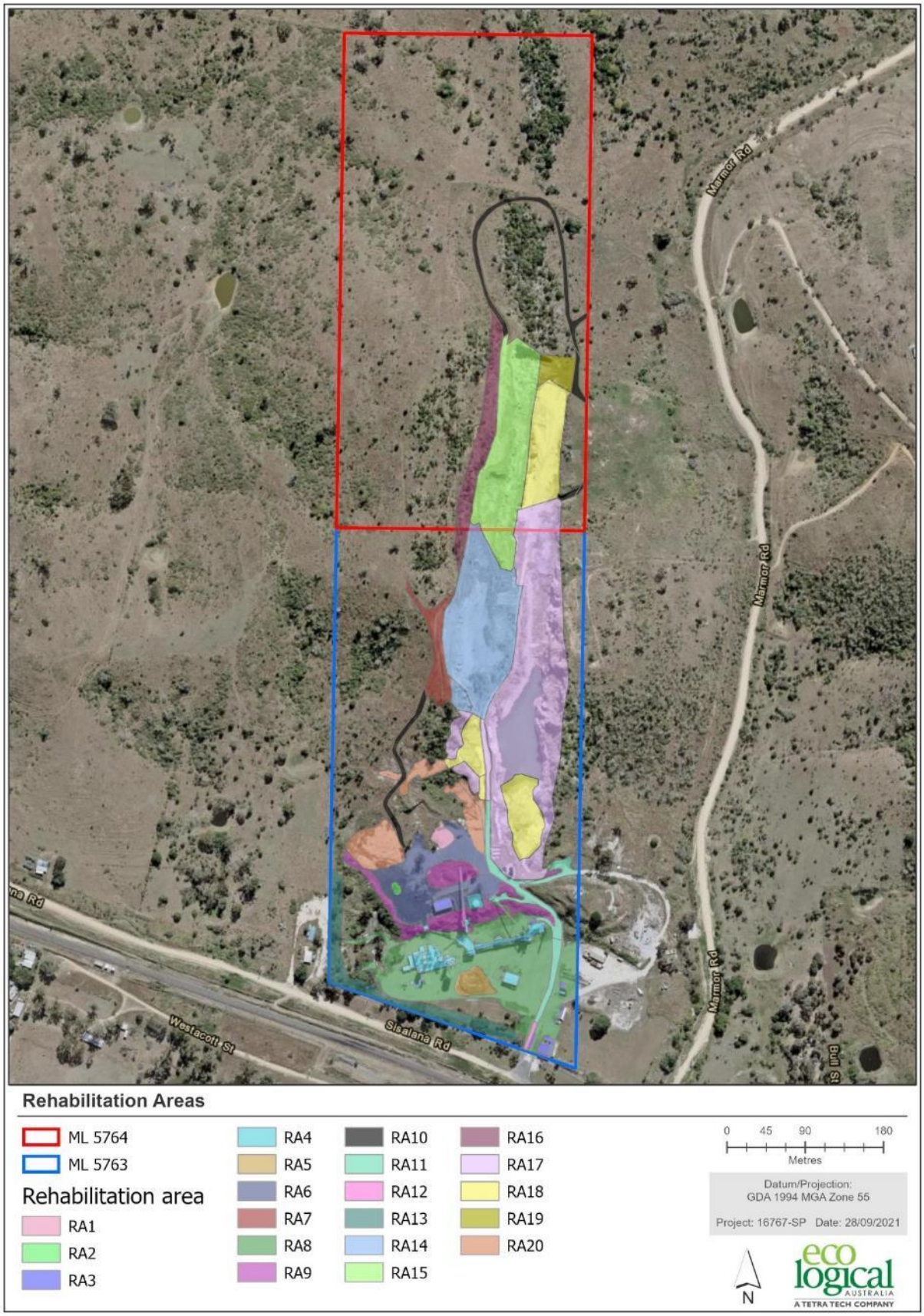

Figure 9: Rehabilitation areas at Marmor

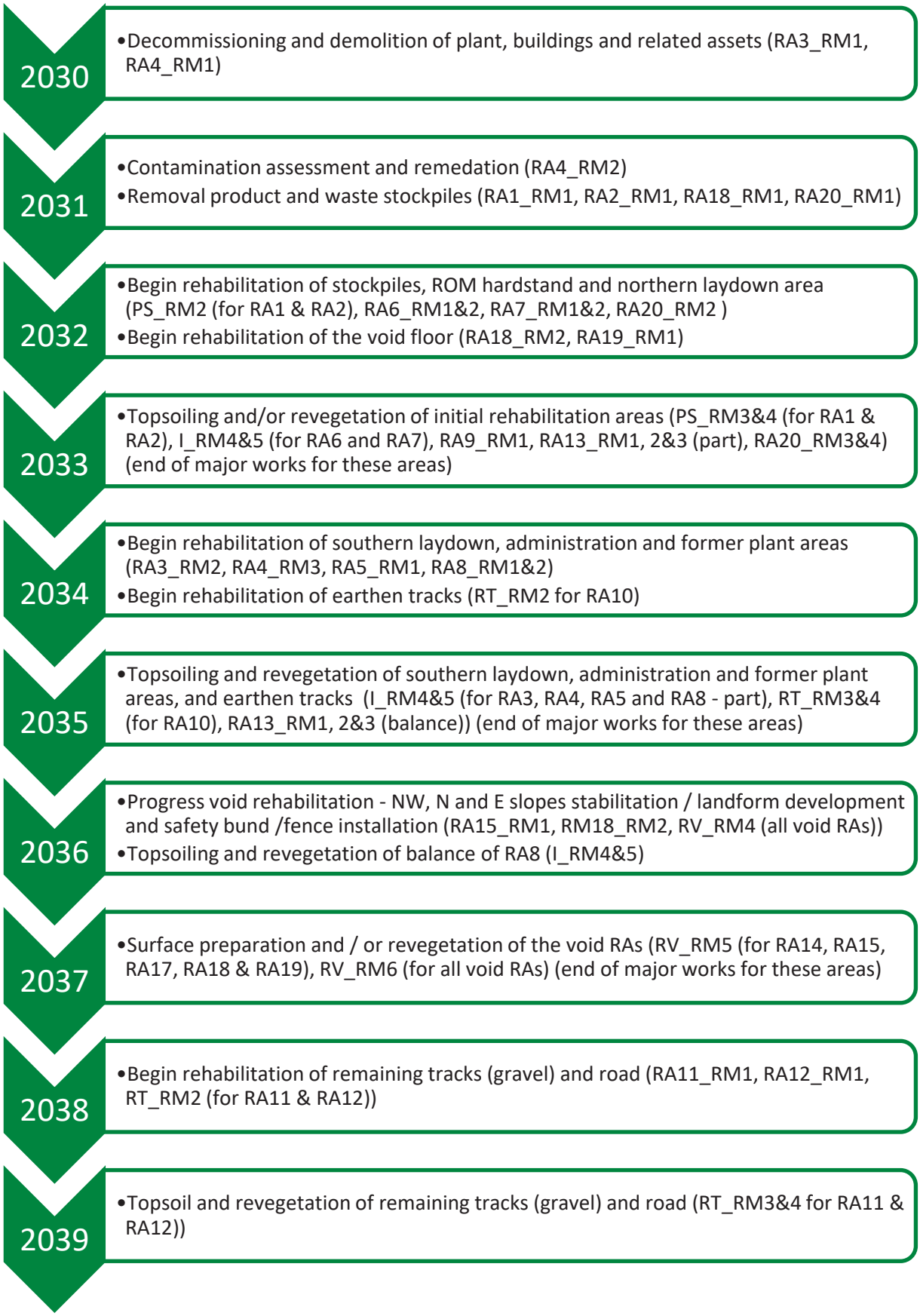

Figure 10: Timeline of scheduling significant rehabilitation works at Marmor (excluding monitoring milestones)

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3.2 Community consultation

The previous operators (Sibelco) implemented a detailed community engagement plan and identified stakeholders including regulatory agencies, Rockhampton Regional Council, Community Leaders (from the local police, Marmor State School, QCW, business community) and Marmor residents. Several engagement methods were employed to inform stakeholders of blasting events, changes in operations that may cause disruption, new developments on site. A register of engagement was maintained.

The local community was advised by Sibelco through a Marmor Community Advisory Group meeting on 18 May 2016, that the Marmor Operation would be going into care and maintenance and that Community Advisory Group meetings would be suspended. The site has not been re-opened by Graymont and as no further development or changes to operational plans have been made, no further community meetings have been held to date.

PMLUs have been previously approved through an existing LOD (the EA, Appendix C) and under transitional arrangements have been included in the PRCP. There has been no change to the proposed PMLU for any of the disturbance domains. Therefore, no additional community consultation has been undertaken to discuss the proposed PMLUs to be established during closure at Marmor. Graymont has developed a Community Engagement Plan for the Marmor Operation (presented in Appendix D) and this includes a commitment to conduct a community 'Town Hall' style event in November 2021 to discuss progressive rehabilitation of the site and the implementation of the PRCP.

The Community Engagement Plan presented in Appendix D includes:

- Consultation objectives
- Consultation approach and community engagement methods (how the community will be engaged)
- The proposed frequency of engagement (depending on the trigger)
- The types of information that will be shared and the methods/media through which this will be achieved
- Monitoring and reporting schedule to
    - record outcomes of engagement and comments received
    - document all commitments and agreements made with key stakeholders and the progress of these commitments and agreements.

Graymont has maintained the Community Engagement Register established by Sibelco (Appendix D). Although previous discussion with the community have included operational matters and the transition to care and maintenance, there are no records of specific discussion about PMLUs in the register.

3.3 Post Mine Land Use

3.3.1 Selection of PMLUs

As described above, the PMLUs for Marmor have previously been approved through an existing LOD (the EA). Condition D1-1 of the EA require that, "*All areas significantly disturbed by mining activities must be rehabilitated to a stable landform with a self-sustaining vegetation cover in accordance with final land use and landform design in Schedule D – Table 1*". The applicable LOD is presented in Appendix C and the PMLUs and criteria that are to be carried over from the EA for each disturbance domain are

provided in Table 17 (updated to reflect the remaining MLs that are relevant to the current EA). With the exception of the mine void, the PMLU for the entire site will be low intensity grazing. The void will be retained for water storage through accumulation of surface water.

Table 17: PMLUs for disturbance domains at Marmor

	Disturbance domain and rehabilitation areas					
	Product stockpiles	**Residual voids**	**Infrastructure**	**Roads and tracks**	**Rejects & waste stockpiles**	**Topsoil stockpiles**
Equivalent rehabilitation area in this PRCP	RA1 & RA2	RA14 to RA19 inclusive*	RA3 to RA9 inclusive	RA10 to RA12 inclusive	RA20*	RA13
Tenure ID[5]	ML5763	ML5763 ML5764	ML5763	ML5763 ML5764	ML5763 ML5764	ML5763
Post mine land use	Low intensity grazing	Water storage	Low intensity grazing	Low intensity grazing	Low intensity grazing	Low intensity grazing
Foliage projective cover range (%)	50	N/A	50	50	50	50

** Some reject and waste is currently stockpiled in the void and rehabilitation of these areas will be treated separately. However, the PMLU only applies to Rejects & waste stockpiles outside of the residual void.*

As discussed in Section 3.1.3, the water in the residual void has a slightly acid to alkaline pH and low total dissolved solids (c. 340 mg/L) and the background geology is inert. Although no limitations are expected in terms of water quality for stock use to support the proposed PMLU, monitoring will continue until closure to ensure that water stored in the void remains suitable for the proposed PMLU.

Areas of existing grazing land and remnant vegetation within the leases areas not affected by mining will be retained as part of the final PMLU at completion.

3.3.1.1 Consistency between the proposed PMLUs and any strategies or plans for the land

The land is zoned L1 - Rural under the Rockhampton Planning Scheme (Rockhampton Regional Council 2015).

Section 6.7.4 (Rural zone code) of the Rockhampton Planning Scheme states that the purpose of the rural zone code is to:

- ensure that land with productive capacity is maintained for a range of existing and emerging rural uses that are significant to the economy of the planning scheme area
- recognise that different types of rural land are suited to specific uses such as animal industries, horticulture, cropping, intensive animal industries, intensive grazing and extractive industries
- prevent the establishment of development which may limit the productive capacity of the land
- provide for diversification of rural industries where impacts can be managed

[5] The EA Schedule D – Table 1 still includes reference to ML 3614 (Ambrose) that has been deamalgamated from the Marmor Operation and is excluded from this Table.

- maintain the environmental values of all rural land.

The purpose of the zone will be achieved through development in the zone that accommodates predominantly rural uses. The return of mine impacted land to a pasture PMLU for agricultural use is therefore consistent with the current zoning.

The planning scheme also states that non-rural uses may be appropriate where they do not detract from the productivity and can demonstrate a direct relationship with the rural use in the immediate locality; or the potential to make a contribution to primary production or the diversification of rural industries. Therefore, the PMLU of the residual void for the creation of a water storage (for primary industry use such as stock watering) is also consistent with the planning scheme.

Regional interests (relating to agricultural land) are designated in the *Regional Planning Interests Act* 2014 (RPI Act) and include Strategic Cropping Land. The project area is outside mapped areas of Strategic Cropping Land.

State interests, relating to land areas requiring protection for sustainable agriculture, are recognised by the *State Planning Policy – July 2017* (DILGP 2017). They include Important Agricultural Areas (IAAs) as identified by the Queensland Agricultural Land Audit (DAFF 2013). Designation of land as an IAA is based on Agricultural Land Classification (ALC) (DILGP 2017) with ALC Class A and ALC Class B land protected for sustainable agricultural use. The project area is outside mapped areas of IAAs and areas recognised as ALC Class A and B. Therefore, the designation of a PMLU of grazing is consistent with the quality of the land at Marmor and also consistent with State and Regional Interests with respect to the protection of valuable productive agricultural land.

Plans for the rehabilitated areas are compatible with the surrounding land use (see Figure 5) and broader regional economic priorities. The importance of continued growth in agricultural production is recognised in the Rockhampton Region Economic Development Strategy Summary Report (RPS 2015). Rockhampton is the beef capital in Australia and the Fitzroy Natural Resource Management (NRM) region is home to one of the largest concentrations of beef capital in the country. In 2012/13, there were almost 3 million head of cattle in the NRM region, or some 23.4% of the State herd.

The designation of a PMLU of grazing is therefore consistent with Local Government Planning Scheme zoning, State Government State and Regional Planning Interests as well as Regional Economic and Development Strategies.

The final land use for all areas within the lease boundaries, including rehabilitation areas as well as un-mined pasture and remnant vegetation areas, is shown in Figure 11.

Figure 11: Final PMLU and Rehabilitation Areas

3.3.2 Rehabilitation objectives and completion criteria

Rehabilitation objectives for Marmor have been developed to ensure that the EA approval conditions for rehabilitation are met (see Table 1). They also address the overall rehabilitation aims as described in the PRCP Guidelines that rehabilitated land should be safe, stable, not cause harm to the environment and is able to sustain an agreed PMLU.

Specific rehabilitation objectives, milestone criteria and PMLU completion criteria have been developed for each rehabilitation area and milestone described in Table 11 to Table 16 in Section 3.1.11.2 to reflect the different activities undertaken within each domain and rehabilitation area. These are presented for each area in the following sections together with a justification for the selection of critical milestone criteria.

3.3.2.1 Basis for selection of critical milestone and completion criteria

The following sections provide the technical basis for the selection of a number of the critical milestone and completion criteria, particularly those related to the creation of stable landforms and the sustainability of the PMLU.

MAXIMUM SLOPES FOR GRAZING PMLU

The *Guidelines for agricultural land evaluation in Queensland* (DSITI & DNRM 2015) do not provide maximum slopes for the Land Capability Classes originally approved in the EA and the Land Suitability Framework for the Central Queensland Coast area (DNRM & DSITI 2013), which includes Marmor, does not provide land quality requirements for native or improved pasture. Therefore, the requirements for other parts of Qld have been reviewed and used as the basis of the completion criteria developed. Maximum slopes (based on land stability or erosion hazard) for land classified as suitable (i.e., classes 1 to 3 inclusive) range from 15 to 20 % (for rigid, non-sodic soils) for rainfed pasture in the subtropics (DME 1995, DNRM & DSITI 2013). This has formed the basis for maximum slope angles that can be safely used for establishing the grazing PMLU before significant management intervention is required to prevent stability or erosion issues.

Only one Rehabilitation Area (RA7) will likely approach this maximum slope angle due to its current landscape position. In all in all other areas, the average slope will not exceed 8%.

As roads and tracks are either surrounded by or adjacent to other Rehabilitation areas or areas of existing pasture and are of limited spatial extent, these areas will be graded to conform to the surrounding landforms.

MAXIMUM SLOPES FOR RESIDUAL VOID WALLS (WATER STORAGE PMLU)

These have been based on the geotechnical assessment and rehabilitation recommendations provided in Meyers (2005) and Rocktest Consulting (2014). Where battering back is required to provide acceptable slope stability the following has been recommended:

- North and north-west walls (Rehabilitation Area 15) – batters not to exceed 40^{o} (84%)
- North-east wall (Rehabilitation Area 18) batters not to exceed 40^{o} (84%)

The battering back of the south west slope (Rehabilitation Area 14) undertaken in 2014 was considered appropriate by Rocktest Consulting (2014) through the achievement of:

- Bench heights up to 20 m
- Berm widths 10 m
- Batter angles not exceeding 53^{o} (133%).

PROVISION OF FOLIAGE PROJECTIVE COVER FOR MINIMISING EROSION AND ENSURING LONG-TERM STABILITY FOR THE GRAZING PMLU

It is recognised that increasing ground cover reduces soil erosion. The Queensland Government (2013) recognises that the critical level of cover for pastures in tussock grasslands is about 40% cover and 1000kg/ha of dry grass and that ideally, this level of cover should exist at the beginning of the summer storm season (generally prior to November).

However, research work on post-mine landforms in central and southern Queensland shows that groundcover of at least 50% is required to significantly reduce soil erosion rates (Loch 2000, NRA 2000, So et al. 2018), with reductions in erosion rates becoming diminishingly smaller as cover increases beyond this value. This corresponds to the foliage projective cover already nominated in the EA and is considered appropriate for ensuring land stability under the grazing PMLU at Marmor.

TOPSOIL DEPTH FOR THE GRAZING PMLU

The depth of topsoil used needs to be suitable for the adequate establishment of the target vegetation. In general, a depth of between 150 mm and 300 mm is acceptable (DME 1995), with shallower depths being adequate where soils are expected to have good water holding capacity and inherent fertility. The assessment of topsoil in stockpiles at Marmor has shown that the soils have good nutrient holding capacity and soil textures (clay content) that provide good water holding capacity. Where topsoil depths have been provided for soils in the region in CSIRO (1968), they are generally 100 to 150 mm deep.

A topsoil depth of depth of 150 mm is considered suitable for the establishment and maintenance of pasture at Marmor.

IMPORTED TOPSOIL QUALITY

The stockpiled topsoil has been assessed as being of good quality and stable (Section 3.5.3). However, there is insufficient topsoil available in the stockpiles to rehabilitate all areas requiring topsoil. Therefore, topsoil will be imported to make up for the shortfall. To ensure the soil is stable and of suitable quality, minimum stands for pH, salinity (measured as saturated paste electrical conductivity or ECe), stoniness and stability/erosion risk have been established to reflect the PMLU and species mix selected. To minimise stability and erosion risks, imported soils will need to have a low risk of dispersion, i.e., they will need to be non-sodic (exchangeable sodium percentage – ESP <6%) and have Emerson Aggregate Test class of 3 (2), 3 (1), 4, 5, 6, 7 or 8 (Hazleton and Murphy 2007). that demonstrate a low dispersion risk.

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3.3.2.2 Product Stockpile Domain

Table 18 provides the rehabilitation objectives, rehabilitation milestones and completion criteria for the Product Stockpile Domain. This domain contains Rehabilitation Area 1 (Limestone stockpile) and Rehabilitation Area 2 (Coal stockpile). There are no other assets / equipment within this area. The area is bounded by Rehabilitation Area 6 (which is part of the Infrastructure Domain) (Figure 11).

3.3.2.3 Infrastructure Domain

Table 19 provides the rehabilitation objectives, rehabilitation milestones and completion criteria for the Infrastructure Domain. This domain contains Rehabilitation Areas 3 and 4 (which includes all the buildings, processing plant and associated structures and tanks), Rehabilitation Area 5 (sediment pond), Rehabilitation Area 6 (the ROM area), Rehabilitation Areas 7 and 8 (two separate laydown and trafficked areas) and Rehabilitation Area 9 which is disturbed but currently well vegetations and stable areas with or adjacent to other operational areas (Figure 11).

Roads and Tracks Domain

Table 20 provides the rehabilitation objectives, rehabilitation milestones and completion criteria for the Roads and Tracks Domain. This domain contains Rehabilitation Area 10 (earthen tracks), Rehabilitation area 11 (gravel tracks) and Rehabilitation Area 12 (sealed bitumen road entrance) (Figure 11).

3.3.2.4 Topsoil Stockpile Domain

Table 21 provides the rehabilitation objectives, rehabilitation milestones and completion criteria for the Topsoil Stockpile Domain (Rehabilitation Area 13, Figure 11).

3.3.2.5 Residual Void Domain

Table 22 provides the rehabilitation objectives, rehabilitation milestones and completion criteria for the Residual Void Domain. This domain contains Rehabilitation Area 14 (cut back area in the southwest of the void), Rehabilitation 15 (northwest and northern batters needing reshaping), Rehabilitation 16 (areas of minor disturbance above Rehabilitation Areas 15), Rehabilitation Area 17 (base of the void containing the pit lake), Rehabilitation Area 18 (Areas used for storage of mine waste within the void including the north east wall requiring reshaping) and Rehabilitation Area 19 (the remaining void floor to the north of the void) (Figure 11).

3.3.2.6 Rejects & Waste Stockpiles Domain

Table 23 provides the rehabilitation objectives, rehabilitation milestones and completion criteria for the Rejects & Waste Stockpiles Domain. This domain contains Rehabilitation Area 20 (a series of mixed rejects and waste stockpiles outside of the void) (Figure 11).

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Table 18: Marmor Operations rehabilitation objectives, rehabilitation milestones and completion criteria – Product Stockpile Domain

Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation
Limestone Stockpile (RA1) specific milestones				
The rehabilitated site will not present an unacceptable hazard to persons, stock or native fauna	RA1_RM1	Removal of stockpiled mined limestone and placement back in the void (at RA19)	• All excess limestone feed stock has been removed and placed back in the void+ • No equipment or built structures remain in the rehabilitation area	• Photographic records • ITP hold point (product stockpile removal)
Coal Stockpile (RA2) specific milestones				
The rehabilitated site will not present an unacceptable hazard to persons, stock or native fauna	RA2_RM1	Removal of stockpiled coal fuel and disposed off-site	• All coal has been removed and disposed of at an appropriately licenced waste • No equipment or built structures remain in the rehabilitation area	• Photographic records • Waste tracking records • ITP (product stockpile removal)
Product Stockpile (PS) Domain common milestones				
The rehabilitation areas is reshaped to provide a stable landform. Maximum slopes are suitable for supporting the PMLU without causing land degradation The rehabilitation area is reshaped to provide free drainage Surface water is managed to maintain landform stability	PS_RM2	Landform development	• Finalise engineering and final design plans • All major earthworks have been completed in accordance with the final engineering and design plan • Average slope does not exceed 8% • Final landform does not contain any low points that may pond water • Installation of water management structures have been certified by an appropriately qualified person as conforming to the design standard specified in the Surface water management Section of the PRCP	• Final survey data & ITP (landform development) including Surface water management sign off
Land quality and soil quality suitable for establishing vegetation required to sustaining the rainfed grazing PMLU	PS_RM3	Topsoiling and surface preparation	• Ripping completed to specifications (depth of 500 mm at 500 – 800 mm spacings) • An assessment of stockpiled soil quality and suitability for rehabilitation has been completed by an appropriately qualified	• Rehabilitation records & ITPs (Topsoil) • Topsoil quality assessment (this PRCP)

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Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation

			person to confirm soil is suitable for target vegetation establishment
			• Topsoil placed to an average depth of 150 mm
			• If imported topsoil is required, it will be analysed prior to delivery and suitability for rehabilitation will be assessed by an appropriately qualified person to confirm it is suitable for target vegetation establishment
			• If used, imported topsoil stone content does not exceed 20% by volume
			• If used, imported topsoil is electrical conductivity (salinity as ECe) <4 dS/m
			• If used, imported topsoil has a pH range 5.5 to 8.0
			• If used, imported topsoil is stable, with low dispersion risk characterised by
			  ○ non-sodic properties (exchangeable sodium percentage <6%)
			  ○ Emerson Aggregate Test Classes result of 3 (2), 3 (1), 4, 5, 6, 7 or 8
				• Imported topsoil analysis certificates

Agreed PMLU is established and sustainably maintained	PS1_RM4	Revegetation	• For stockpiled topsoil, amelioration has been applied according to the Site preparation and topsoiling Section of the PRCP • For imported topsoil, amelioration has been applied according to the recommendations of an appropriately qualified person based on soil analytical results • The pasture species used and the seeding rate applied are consistent with the Revegetation Section of the PRCP	• ITPs (Revegetation) • Records of seed purchase • Rehabilitation records
	PS1_RM5	Achievement of PMLU to stable condition (grazing)	• Rehabilitation reference sites have been established • Rehabilitation monitoring has been undertaken at the frequency specified in the PRCP • Rehabilitation monitoring has been undertaken using the methods specified in the PRCP • Monitoring shows that no declared pest plants are recorded in the rehabilitation domain (or if present the % cover of declared pest	• Periodic rehabilitation monitoring reports • Records of repair works

Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation
			plant species is no more than in the surrounding vegetation and is not increasing relative to reference conditions) • Within 24 months of revegetation, the average standing biomass of established pasture is no less than 1000 kg/ha at the end of the dry season or no less than 70% of that at the reference sites established on unmined areas within the lease, whichever is lower • The ground cover will, on average, be dominated by native and introduced grass, legume and herb/forb species recognised as pasture species or known to be palatable and provide forage for livestock • Average groundcover is greater than or equal to 50% • No evidence of persistent surface ponding and waterlogging affecting pasture health • An appropriate carrying capacity has been calculated that will allow for sustainable long-term grazing • Certification from an appropriately qualified person that the area has achieved stable condition • No active gully erosion (i.e., >0.3m deep) is present in the rehabilitated areas • All water management structures are stable and functioning as per the design • Erosion repair works have been conducted where monitoring has identified a deviation from the required performance • Vegetation maintenance and or additional soil amelioration has been undertaken where groundcover or standing biomass does not meet the milestone criteria and is not on the desired trajectory • Rehabilitation repair works and weed control have been undertaken where rehabilitation does not meet the milestone criteria and is not on the desired trajectory	
	PS1_RM6	Sustainable achievement of PMLU	All completion criteria have been met on at least three consecutive monitoring events conducted no more frequently than once annually	Periodic rehabilitation monitoring reports

+ Some limestone will be used as rock protection for surface water management during rehabilitation.

Table 19: Marmor Operations rehabilitation objectives, rehabilitation milestones and completion criteria – Infrastructure Domain

Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation
Buildings and sheds, Weighbridge and Tanks – other (RA3) specific milestones				
The rehabilitated site will not present an unacceptable hazard to persons, stock or native fauna	RA3_RM1	Decommissioning • Disconnect services • Demolish and or remove buildings and tanks from site • Break up and remove concrete pads and footings	• All services have been disconnected • Bore decommissioned according to the preferred practices nominated in the Minimum Construction Requirements for Water Bores in Australia • Hazardous building materials have been identified, and managed and removed by appropriately licenced contractors • All infrastructure assets have been demolished and demolition waste removed to an appropriately licenced waste facility	• Demolition and waste removal records • ITPs (demolition and equipment removal) • photographic records
The rehabilitation areas is reshaped to provide a stable landform. Maximum slopes are suitable for supporting the PMLU without causing land degradation The rehabilitation area is reshaped to provide free drainage Surface water is managed to maintain landform stability	RA3_RM2	Landform development	• Finalise engineering and final design plans • All major earthworks have been completed in accordance with the final engineering and design plan • Average slope does not exceed 8% • Final landform does not contain any low points that may pond water • Installation of water management structures have been certified by an appropriately qualified person as conforming to the design standard specified in the Surface water management Section of the PRCP	• Final survey data & ITP (landform development) including Surface water management sign off
Workshop, Process plant/equipment (inclusive of concrete pads, silos, bins and hoppers, conveyors) and Tanks – hydrocarbons (and associated concrete bunds) (RA4) specific milestones				
The rehabilitated site will not present an unacceptable hazard to persons, stock or native fauna	RA4_RM1	Decommissioning : • Disconnect services • Demolish and or remove buildings and tanks from site • Break up and remove concrete pads and footings	• All services have been disconnected • Hazardous building materials have been identified, and managed and removed by appropriately licenced contractors • All infrastructure assets have been demolished and demolition waste removed to an appropriately licenced waste facility	• Demolition and waste removal records • ITPs (Demolition and equipment removal) • photographic records

Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation

Contamination associated with notifiable activities identified, risk to human or ecological receptors in terrestrial or aquatic environments assessed and remediation carried out or site management plan approved and implemented	RA4_RM2	Remediation of contaminated land	• Site Investigation Report prepared and certified by an appropriately qualified person
			• If required, remediation is carried out and validated sampling has been complete
			• Site removed from Contaminated Land Register by the registrar; or
			• A Site Management Plan:
			  ○ is prepared and certified by an appropriately qualified person and
			  ○ includes a statement by the underlying landholder accepting responsibility to implement the Site Management Plan
				• Site investigation report
				• Records of validation sampling to confirm contaminant removal
				• ITP (Contamination assessment)
				• Records of removal of site from the Contaminated Land Register or records of agreement with background landholder

The rehabilitation areas is reshaped to provide a stable landform. Maximum slopes are suitable for supporting the PMLU without causing land degradation The rehabilitation area is reshaped to provide free drainage Surface water is managed to maintain landform stability	RA4_RM3	Landform development	• Finalise engineering and final design plans • All major earthworks have been completed in accordance with the final engineering and design plan • Average slope does not exceed 8% • Final landform does not contain any low points that may pond water • Installation of water management structures have been certified by an appropriately qualified person as conforming to the design standard specified in the Surface Water Management Section of this PRCP	• Final survey data & ITP (landform development) including Surface water management sign off
Sediment pond (RA5) specific milestones				
The rehabilitation areas is reshaped to provide a stable landform. Maximum slopes are suitable for supporting the PMLU without causing land degradation The rehabilitation area is reshaped to provide free drainage	RA5_RM1	Landform development	• Sediment tested for contaminants • If contaminated, sediment removed to an appropriately licenced waste facility • Sediment dam bund pushed onto sediment dam and area levelled • All major earthworks have been completed • Average slope does not exceed 8%	• Sediment analysis results and waste tracking • Final survey data & ITP (landform development)

Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation
Surface water is managed to maintain landform stability			• Final landform does not contain any low points that may pond water	
ROM pad trafficked areas, Laydown or trafficked areas Northern area, Laydown or trafficked areas Southern area (RA6, RA7 and RA8) specific milestones				
The rehabilitated site will not present an unacceptable hazard to persons, stock or native fauna	RA6_RM1, RA7_RM1 and RA8_RM1	Removal of surface aggregate/road base from laydown areas and use as soil forming material for rehabilitation of the void floor	• No equipment or built structures remain in the rehabilitation area • Surface aggregate removed to 300 mm • Aggregate placed on RA19 and RA18	• Site inspection and photographic records • ITPs (equipment removal)
ROM pad trafficked areas, Laydown or trafficked areas Southern area (RA6 and RA8) specific milestones				
The rehabilitation areas is reshaped to provide a stable landform. Maximum slopes are suitable for supporting the PMLU without causing land degradation The rehabilitation area is reshaped to provide free drainage Surface water is managed to maintain landform stability	RA6_RM2 and RA8 RM2	Landform development	• Finalise engineering and final design plans • All major earthworks have been completed in accordance with the final engineering and design plan • Average slope does not exceed 8% • Final landform does not contain any low points that may pond water • Installation of water management structures have been certified by an appropriately qualified person as conforming to the design standard specified in the Surface water management Section of the PRCP	• Final survey data & ITP (landform development) including Surface water management sign off
Laydown or trafficked areas Northern area (RA7) specific milestones				
The rehabilitation areas is reshaped to provide a stable landform. Maximum slopes are suitable for supporting the PMLU without causing land degradation The rehabilitation area is reshaped to provide free drainage Surface water is managed to maintain landform stability	RA7_RM2	Landform development	• Finalise engineering and final design plans • All major earthworks have been completed in accordance with the final engineering and design plan • Average slope does not exceed 15% • Final landform does not contain any low points that may pond water • Installation of water management structures have been certified by an appropriately qualified person	• Final survey data & ITP (landform development) including Surface water management sign off

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Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation
			as conforming to the design standard specified in the Surface water management Section of the PRCP	
Vegetated (areas of minimal disturbance adjacent to other activities where vegetation has been retained or has passively regenerated) (RA9) specific milestones				
Agreed PMLU is established and sustainably maintained	RA9_RM1	Supplementary seeding (revegetation)	• Existing ground cover vegetation composition and condition reviewed for suitability with respect to PMLU • Where required, weed management conducted • Where required overseeding conducted with pasture species consistent with the Revegetation Section of the PRCP	• Vegetation conditions report • ITP (Revegetation)
Infrastructure (I) common milestones				
Land quality and soil quality suitable for establishing vegetation required to sustaining the rainfed grazing PMLU	I_RM4	Topsoiling and surface preparation	• Ripping completed to specifications (depth of 500 mm at 500 – 800 mm spacings) • An assessment of stockpiled soil quality and suitability for rehabilitation has been completed by an appropriately qualified person to confirm soil is suitable for target vegetation establishment • Topsoil placed to an average depth of 150 mm • If imported topsoil is required, it will be analysed prior to delivery and suitability for rehabilitation will be assessed by an appropriately qualified person to confirm it is suitable for target vegetation establishment • If used, imported topsoil stone content does not exceed 20% by volume • If used, imported topsoil is electrical conductivity (salinity as ECe) <4 dS/m • If used, imported topsoil has a pH range 5.5 to 8.0 • If used, imported topsoil is stable, with low dispersion risk characterised by	• Rehabilitation records & ITPs (Topsoil) • Topsoil quality assessment (this PRCP) • Imported topsoil analysis certificates

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Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation
			○ non-sodic properties (exchangeable sodium percentage <6%) ○ Emerson Aggregate Test Classes result of 3 (2), 3 (1), 4, 5, 6, 7 or 8	
Agreed PMLU is established and sustainably maintained	I_RM5	Revegetation	• For stockpiled topsoil, amelioration has been applied according to the Site preparation and topsoiling Section of the PRCP • For imported topsoil, amelioration has been applied according to the recommendations of an appropriately qualified person based on soil analytical results • The pasture species used and the seeding rate applied are consistent with the Revegetation Section of the PRCP	• ITPs (Revegetation) • Records of seed purchase • Rehabilitation records
	I_RM6	Achievement of PMLU to stable condition (grazing)	• Rehabilitation reference sites have been established • Rehabilitation monitoring has been undertaken at the frequency specified in the PRCP • Rehabilitation monitoring has been undertaken using the methods specified in the PRCP • Monitoring shows that no declared pest plants are recorded in the rehabilitation domain (or if present, the % cover of declared pest plant species is no more than in the surrounding vegetation and is not increasing relative to reference conditions) • Within 24 months of revegetation, the average standing biomass of established pasture is no less than 1000 kg/ha at the end of the dry season or no less than 70% of that at the reference sites established on unmined areas within the lease whichever is lower • The ground cover will, on average, be dominated by native and introduced grass, legume and herb/forb	• Periodic rehabilitation monitoring reports • Records of repair works

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Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation
			species recognised as pasture species or known to be palatable and provide forage for livestock • Average groundcover is greater than or equal to 50% • No evidence of persistent surface ponding and waterlogging affecting pasture health • An appropriate carrying capacity has been calculated that will allow for sustainable long-term grazing • Certification from an appropriately qualified person that the area has achieved stable condition • No active gully erosion (i.e., >0.3m deep) is present in the rehabilitated areas • All water management structures are stable and functioning as per the design • Erosion repair works have been conducted where monitoring has identified a deviation from the required performance • Vegetation maintenance and or additional soil amelioration has been undertaken where groundcover or standing biomass does not meet the milestone criteria and is not on the desired trajectory • Rehabilitation repair works and weed control have been undertaken where rehabilitation does not meet the milestone criteria and is not on the desired trajectory	
	I_RM7	Sustainable achievement of PMLU	• All completion criteria have been met on at least three consecutive monitoring events conducted no more frequently than once annually	• Periodic rehabilitation monitoring reports

Table 20: Marmor Operations rehabilitation objectives, rehabilitation milestones and completion criteria – Roads and Tracks Domain

Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation
Tracks (gravel) (RA11) specific milestones				
The rehabilitated site will not present an unacceptable hazard to persons, stock or native fauna	RA11_RM1	Removal of surface aggregate/road base from laydown areas and use as soil forming material for rehabilitation of the void floor	• No equipment or built structures remain in the rehabilitation area • Surface aggregate removed to 300 mm • Aggregate placed on RA19 and RA18	• Site inspection and photographic records • ITPs (equipment removal)
Sealed Road (RA12) specific milestones				
The rehabilitated site will not present an unacceptable hazard to persons, stock or native fauna	RA12_RM1	Break up, remove and off-site disposal of bitumen	• Bitumen has been removed and disposed of at a licenced waste facility • No equipment or built structures remain in the rehabilitation area	• Site inspection and photographic records • Waste tracking records • ITPs (stockpile and equipment removal)
Roads and Tracks (RT) common milestones				
The rehabilitation areas is reshaped to provide a stable landform. The rehabilitation area is reshaped to provide free drainage Surface water is managed to maintain landform stability	RT_RM2	Landform development	• Finalise engineering and final design plans • All major earthworks have been completed in accordance with the final engineering and design plan • Roads and tracks are graded to conform to the surrounding landforms • Final landform does not contain any low points that may pond water	• Final survey data & ITP (landform development) including Surface water management sign off
Land quality and soil quality suitable for establishing vegetation required to sustaining the rainfed grazing PMLU	RT_RM3	Topsoiling and surface preparation	• Ripping completed to specifications (depth of 500 mm at 500 – 800 mm spacings) • An assessment of stockpiled soil quality and suitability for rehabilitation has been completed by an appropriately qualified person to confirm soil is suitable for target vegetation establishment • Topsoil placed to an average depth of 150 mm	• Rehabilitation records & ITPs (Topsoil) • Topsoil quality assessment (this PRCP) • Imported topsoil analysis certificates

Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation

			• If imported topsoil is required, it will be analysed prior to delivery and suitability for rehabilitation will be assessed by an appropriately qualified person to confirm it is suitable for target vegetation establishment
			• If used, imported topsoil stone content does not exceed 20% by volume
			• If used, imported topsoil is electrical conductivity (salinity as ECe) <4 dS/m
			• If used, imported topsoil has a pH range 5.5 to 8.0
			• If used, imported topsoil is stable, with low dispersion risk characterised by
			  ○ non-sodic properties (exchangeable sodium percentage <6%)
			  ○ Emerson Aggregate Test Classes result of 3 (2), 3 (1), 4, 5, 6, 7 or 8	

Agreed PMLU is established and sustainably maintained	RT_RM4	Revegetation	• For stockpiled topsoil, amelioration has been applied according to the Site preparation and topsoiling Section of the PRCP • For imported topsoil, amelioration has been applied according to the recommendations of an appropriately qualified person based on soil analytical results • The pasture species used and the seeding rate applied are consistent with the Revegetation Section of the PRCP	• ITPs (Revegetation) • Records of seed purchase
	RT_RM5	Achievement of PMLU to stable condition (grazing)	• Rehabilitation reference sites have been established • Rehabilitation monitoring has been undertaken at the frequency specified in the PRCP • Rehabilitation monitoring has been undertaken using the methods specified in the PRCP • Monitoring shows that no declared pest plants are recorded in the rehabilitation domain (or if present the % cover of declared pest plant species is no more than in the surrounding vegetation and is not increasing relative to reference conditions)	• Periodic rehabilitation monitoring reports • Records of repair works

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Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation
			• Within 24 months of revegetation, average standing biomass of established pasture is no less than 1000 kg/ha at the end of the dry season or no less than 70% of that at the reference sites established on unmined areas within the lease whichever is lower • Average groundcover is greater than or equal to 50% • No evidence of persistent surface ponding and waterlogging affecting pasture health • An appropriate carrying capacity has been calculated that will allow for sustainable long-term grazing Certification from an appropriately qualified person that the area has achieved stable condition • No active gully erosion (i.e., >0.3m deep) is present in the rehabilitated areas • All water management structures are stable and functioning as per the design • Erosion repair works have been conducted where monitoring has identified a deviation from the required performance • Vegetation maintenance and or additional soil amelioration has been undertaken where groundcover or standing biomass does not meet the milestone criteria and is not on the desired trajectory • Rehabilitation repair works and weed control have been undertaken where rehabilitation does not meet the milestone criteria and is not on the desired trajectory	
	RT_RM6	Sustainable achievement of PMLU	• All completion criteria have been met on at least three consecutive monitoring events conducted no more frequently than once annually	• Periodic rehabilitation monitoring reports

Table 21: Marmor Operations rehabilitation objectives, Rehabilitation milestones and completion criteria – Topsoil stockpiles

Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation
The rehabilitation areas is reshaped to provide a stable landform. The rehabilitation area is reshaped to provide free drainage Surface water is managed to maintain landform stability	RA13_RM1	Landform development	• Topsoil stockpile removed and re-used for rehabilitation on-site. • No equipment or built structures remain in the rehabilitation area • Average slope does not exceed 8% • Final landform does not contain any low points that may pond water • Installation of water management structures have been certified by an appropriately qualified person as conforming to the design standard specified in the Surface water management Section of the PRCP	• Photographic records • ITP (Topsoil) • Final survey data & ITP (landform development) including Surface water management sign off
Land quality and soil quality suitable for establishing vegetation required to sustaining the rainfed grazing PMLU	RA13_RM2	Topsoiling and surface preparation	• Ripping completed to specifications (depth of 500 mm at 500 – 800 mm spacings) • An assessment of stockpiled soil quality and suitability for rehabilitation has been completed by an appropriately qualified person to confirm soil is suitable for target vegetation establishment • Topsoil placed to an average depth of 150 mm	• Rehabilitation records & ITPs (Topsoil) • Topsoil quality assessment (this PRCP)
Agreed PMLU is established and sustainably maintained	RA13_RM3	Revegetation	• For stockpiled topsoil, amelioration has been applied according to the Site preparation and topsoiling Section of the PRCP • The pasture species used and the seeding rate applied are consistent with the Revegetation Section of the PRCP	• ITPs (Revegetation) • Records of seed purchase
	RA13_RM4	Achievement of PMLU to stable condition (grazing)	• Rehabilitation reference sites have been established • Rehabilitation monitoring has been undertaken at the frequency specified in the PRCP • Rehabilitation monitoring has been undertaken using the methods specified in the PRCP • Monitoring shows that no declared pest plants are recorded in the rehabilitation domain (or if present the % cover of declared pest plant species is no more than in the surrounding vegetation and is not increasing relative to reference conditions) • Within 24 months of revegetation, the average standing biomass of established pasture is no less than 1000 kg/ha at the end of	• Periodic rehabilitation monitoring reports • Records of repair works

Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation
			the dry season or no less than 70% of that at the reference sites established on unmined areas within the lease whichever is lower • The ground cover will, on average, be dominated by native and introduced grass, legume and herb/forb species recognised as pasture species or known to be palatable and provide forage for livestock • Average groundcover is greater than or equal to 50% • No evidence of persistent surface ponding and waterlogging affecting pasture health • An appropriate carrying capacity has been calculated that will allow for sustainable long-term grazing • Certification from an appropriately qualified person that the area has achieved stable condition • No active gully erosion (i.e., >0.3m deep) is present in the rehabilitated areas • All water management structures are stable and functioning as per the design • Erosion repair works have been conducted where monitoring has identified a deviation from the required performance • Vegetation maintenance and or additional soil amelioration has been undertaken where groundcover or standing biomass does not meet the milestone criteria and is not on a desired trajectory • Rehabilitation repair works and weed control have been undertaken where rehabilitation does not meet the milestone criteria and is not on a desired trajectory	
	RA13_RM5	Sustainable achievement of PMLU	• All completion criteria have been met on at least three consecutive monitoring events conducted no more frequently than once annually	• Periodic rehabilitation monitoring reports

Table 22: Marmor Operations rehabilitation objectives, Rehabilitation milestones and completion criteria –Residual Void

Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation
Cut back and benched area (RA14) specific milestones				

The rehabilitated site will not present an unacceptable hazard to persons, stock or native fauna
The rehabilitation areas is reshaped to provide a stable landform.
	RA14_RM1	Landform development	• Finalise engineering and final design plan so that
			  ○ Bench heights up to 20 m
			  ○ Berm widths no less than 10 m
			  ○ Batter angles not exceeding 53° (133%)
			• All major earthworks have been completed in accordance with the final engineering and design plan
			• Final landform drains to the residual void
			• Certification from an appropriately qualified person that the area has achieved stable condition
				• Final survey data and/or ITPs (landform development)
				• Site inspection and photographic records

Northwest batter for re-shaping (RA15) specific milestones				
The rehabilitated site will not present an unacceptable hazard to persons, stock or native fauna The rehabilitation areas is reshaped to provide a stable landform.	RA15_RM1	Landform development	• Finalise engineering and final design plan so that batters of RA15 will be battered back to no more than 40° (83%) • Assess microbat usage of the adit in the void and develop and implement an appropriate mitigation and closure strategy • Final landform drains to the residual void • All major earthworks have been completed in accordance with the final engineering and design plan • Certification from an appropriately qualified person that the area has achieved stable condition	• Microbat report preparation • Final survey data and/or ITPs (landform development) • Site inspection and photographic records
Mixed kiln dust, reject limestone and coal ash in void and east wall reshaping (RA18) specific milestones				
The rehabilitated site will not present an unacceptable hazard to persons, stock or native fauna	RA18_RM1	Removal of kiln dust, reject limestone and coal ash from the void and disposal off-site	• Waste has been classified prior to removal and disposal at an appropriately licensed waste management facility • All waste materials are removed from the void • Sampling undertaken to validate waste removal	• Photographic records • ITPs (waste removal) • Validation sampling • Waste tracking certificates

Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation
The rehabilitation areas is reshaped to provide a stable landform.	RA18_RM2	Landform development	• Finalise engineering and final design plan so that batters of RA15 will be battered back to no more than 40° (83%) • Final landform drains to the residual void • All major earthworks have been completed in accordance with the final engineering and design plan • Certification from an appropriately qualified person that the area has achieved stable condition	• Final survey data and/or ITPs (landform development) • Site inspection and photographic records
Enhance natural regeneration of native species in the residual void	RA18_RM3	Surface preparation	• Remaining accessible void floor areas have been ripped (to the maximum practical depth to 500 mm or scarified where ripping is impractical • Soil forming material (recovered surface aggregate from RA6, RA7, RA8 and RA11) placed in accessible locations	• Site inspection and photographic records • ITP (Void reparations)
Void floor (RA19) specific milestones				
Enhance natural regeneration of native species in the residual void	RA19_RM1	Surface preparation	• Remaining accessible void floor areas have been ripped (to the maximum practical depth up to 500 mm) or scarified where ripping is impractical • Soil forming material (recovered surface aggregate from RA6, RA7, RA8 and RA11) placed in accessible locations	• Site inspection and photographic records • ITP (void preparation)
Residual Void (RV) common milestones				
The rehabilitated site will not present an unacceptable hazard to persons, stock or native fauna	RV_RM4	Install safety bund /fencing around void	The void is bunded and or fenced and warning signage erected according to the specifications in the Void Closure section of the PRCP	• ITP (fencing and signage) • Site inspection and photographs
Enhance natural regeneration of native species in the residual void	RV_RM5	Break up remaining tracks in void	Ripping of remaining tracks within the void is completed to specifications (depth of 500 mm at 500 – 800 mm spacings)	• Site inspection and photographic records • ITP (void preparation)

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Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation
	RV_RM6	Revegetation (excludes water body in residual void)	• Aerial seeding has been undertaken using appropriate methods and native species mix determined through research trials	• ITPs (Revegetation) • Records of seed purchase
Agreed PMLU is established and sustainably maintained	RV_RM7	Achievement of PMLU to stable condition (water storage)	• Rehabilitation monitoring has been undertaken at the frequency specified in the PRCP • Rehabilitation monitoring has been undertaken using the methods specified in the PRCP • Water quality meets the Australian Water Quality Guidelines for Primary Industries – Stock (cattle) water use • The established vegetation communities contain native species with a range of growth forms and structural elements • The established vegetation communities contain natives species that are characteristic of the vegetation communities mapped in the surrounding landscape • Rehabilitation repair works undertaken where rehabilitation consistently does not meet completion criteria and is not on a desired trajectory	• Periodic rehabilitation monitoring reports • Water quality data • Records of repair works
	RV_RM8	Sustainable achievement of PMLU	All completion criteria have been met on at least three consecutive monitoring events conducted no more frequently than once annually	Periodic rehabilitation monitoring reports

Table 23: Marmor Operations rehabilitation objectives, Rehabilitation milestones and completion criteria – Waste and Reject Stockpiles (ex-void)

Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation
The rehabilitated site will not present an unacceptable hazard to persons, stock or native fauna	RA20_RM1	Removal of kiln dust, reject limestone and coal ash from stockpile locations and disposal off-site	• Waste has been classified prior to removal and disposal at an appropriately licensed waste management facility • All waste materials are removed from the stockpiles • Sampling undertaken to validate waste removal	• Photographic records • ITPs (waste removal) • Validation sampling • Waste tracking certificates
• The rehabilitation areas is reshaped to provide a stable landform • The rehabilitation area is reshaped to provide free drainage • Surface water is managed to maintain landform stability	RA20_RM2	Landform development	• Finalise engineering and final design plans • All major earthworks have been completed • Average slope does not exceed 8% • Final landform does not contain any low points that may pond water • Installation of water management structures have been certified by an appropriately qualified person as conforming to the design standard specified in the Surface water management Section of the PRCP	• Final survey data & ITPS (landform development) • Surface water management sign off
Land quality and soil quality suitable for establishing vegetation required to sustaining the rainfed grazing PMLU	RA20_RM3	Topsoiling and surface preparation	• Ripping completed to specifications (depth of 500 mm at 500 – 800 mm spacings) • An assessment of stockpiled soil quality and suitability for rehabilitation has been completed by an appropriately qualified person to confirm soil is suitable for target vegetation establishment • Topsoil placed to an average depth of 150 mm • If imported topsoil is required, it will be analysed prior to delivery and suitability for rehabilitation will be assessed by an appropriately qualified person to confirm it is suitable for target vegetation establishment • If used, imported topsoil stone content does not exceed 20% by volume • If used, imported topsoil is electrical conductivity (salinity as ECe) <4 dS/m • If used, imported topsoil has a pH range 5.5 to 8.0	• Rehabilitation records & ITPs (Topsoil) • Topsoil quality assessment (this PRCP) • Imported topsoil analysis certificates

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Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation

			• If used, imported topsoil is stable, with low dispersion risk characterised by
			  ○ non-sodic properties (exchangeable sodium percentage <6%)
			  ○ Emerson Aggregate Test Classes result of 3 (2), 3 (1), 4, 5, 6, 7 or 8	

Agreed PMLU is established and sustainably maintained	RA20_RM4	Revegetation	• For stockpiled topsoil, amelioration has been applied according to the Site preparation and topsoiling Section of the PRCP • For imported topsoil, amelioration has been applied according to the recommendations of an appropriately qualified person based on soil analytical results • The pasture species used and the seeding rate applied are consistent with the Revegetation Section of the PRCP	• ITPs (Revegetation) • Records of seed purchase
	RA20_RM5	Achievement of PMLU to stable condition (grazing)	• Rehabilitation reference sites have been established • Rehabilitation monitoring has been undertaken at the frequency specified in the PRCP • Rehabilitation monitoring has been undertaken using the methods specified in the PRCP • Monitoring shows that no declared pest plants are recorded in the rehabilitation domain (or if present the % cover of declared pest plant species is no more than in the surrounding vegetation and is not increasing relative to reference conditions) • Within 24 months of revegetation, average standing biomass of established pasture is no less than 1000 kg/ha at the end of the dry season or no less than 70% of that at the reference sites established on unmined areas within the lease whichever is lower • The ground cover will, on average, be dominated by native and introduced grass, legume and herb/forb species recognised as pasture species or known to be palatable and provide forage for livestock • Average groundcover is greater than or equal to 50% • No evidence of persistent surface ponding and waterlogging affecting pasture health	• Periodic rehabilitation monitoring reports • Records of repair works

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Rehabilitation objectives	Milestone reference	Rehabilitation milestones	Milestone Completion Criteria	Validation
			• An appropriate carrying capacity has been calculated that will allow for sustainable long-term grazing • Certification from an appropriately qualified person that the area has achieved stable condition • No active gully erosion (i.e., >0.3m deep) is present in the rehabilitated areas • All water management structures are stable and functioning as per the design • Erosion repair works have been conducted where monitoring has identified a deviation from the required performance • Vegetation maintenance and or additional soil amelioration has been undertaken where groundcover or standing biomass does not meet the milestone criteria and is not on a desired trajectory • Rehabilitation repair works and weed control have been undertaken where rehabilitation does not meet the milestone criteria and is not on a desired trajectory	
	RA20_RM6	Sustainable achievement of PMLU	• All completion criteria have been met on at least three consecutive monitoring events conducted no more frequently than once annually	• Periodic rehabilitation monitoring reports

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3.4 Non-Use Management Areas

No non-use management areas (NUMAs) will be present at Marmor at closure. They have not been considered during the preparation of this PRCP.

3.5 Rehabilitation Management Methodology

The following information contains information on issues that may affect the whole site (Section 3.5.1 to Section 3.5.10) and those relevant to specific areas or rehabilitation activities (remaining Sections).

3.5.1 Hydrogeological assessment

The groundwater setting and information of groundwater depth and characteristics is provided in Section 3.1.5. The following sections provide a hydrological assessment as it relate to the interaction of the void with groundwater resources and the potential for impact on groundwater quality and groundwater levels.

3.5.1.1 Regional groundwater flow

Based on groundwater elevations recorded in the region (Section 3.1.5.4), regional groundwater flow within the fractured rock aquifer system appears to flow from outcropping areas in the northwest to lower lying elevations in the southeast (Figure 12). It is unknown if groundwater flow is constrained by the presence of the Queenslander fault system due to the absence of water level data from bores within close proximity of the faults. However, regionally, data from Bores 151927, 151544 and 161493 suggest groundwater is able to flow across the fault system.

The fractured rock aquifer is likely to be recharged at outcropping areas from direct rainfall and surface water flows, along with seepage in areas where the alluvial sediments overlay the formation. No groundwater springs or other potential discharge locations are reported within the study area.

Groundwater flow in the alluvial system likely follows topography, draining from the higher topographic elevations to lower lying regions. Recharge of the alluvial aquifer system is likely to occur via direct rainfall and lateral flows from estuaries and watercourses. Discharge from the alluvial system would likely be towards lower lying areas or into nearby perennial watercourses or drainage features (Inkerman Creek) (Figure 13). Discharge of alluvial flows may also occur to the two aquatic GDEs that are registered in the study area which are artificial water storages (i.e., dams).

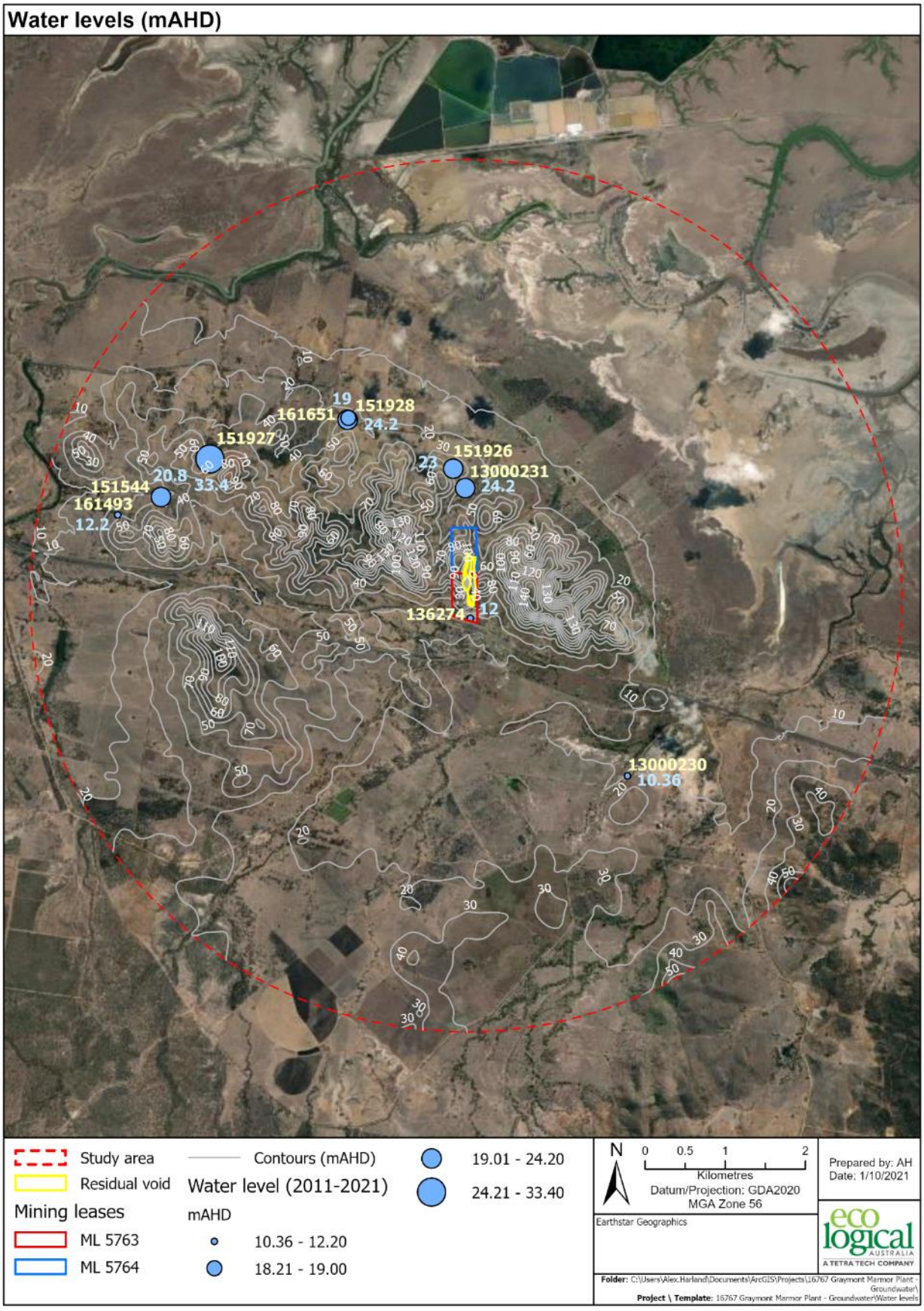

Figure 12: Topographical contours and bore water levels within the study area

3.5.1.2 Mine void groundwater interaction and water quality

The Marmor resource is situated within a lens of limestone and dolomite (Mount Alma Formation). Groundwater discharge / seepage into the void has not been observed/recorded to date (Meyers 2005; Rocktest Consulting 2014; Sibelco 2014). The base of the void is situated at a maximum depth of approximately 30 mAHD while RSWL values from bore (136274) closest to the void is 12 mAHD. The lack of observed seepage is likely due to a hydraulic disconnection between the void and local groundwater table.

Void water samples were collected between 2013 and 2021. The pH ranged from 5.9 to 8.1 with an average pH of 6.7 and the EC ranged from 245 to 966 µS/cm with an average of as 497 µS/cm. These values suggest that that any present void lake water is likely derived from rainfall and site surface water run-off. The most recent water quality results and trends in EC and pH for samples taken from the void and the Bore within the lease boundary show no similarity and the data supports the view that it is unlikely that groundwater quality is significantly affected by the surface water within the mine void due to hydraulic disconnection.

3.5.1.3 Groundwater dependent ecosystems (GDEs)

AQUATIC

Two high potential aquatic GDEs exist in the study area (Figure 13). Both exist to the north-east and north-west of the study area and are characterised as artificial/highly modified wetlands. Groundwater flow into these GDEs is considered intermediate (BoM 2020c).

TERRESTRIAL

No high potential terrestrial GDEs exist in the study area.

SUBTERRANEAN

No high potential subterranean GDEs exist in the study area (BoM 2020c). However, the limestone rock of the Mount Alma Formation, in which the void is located, is registered as an unclassified subterranean GDE. The geological feature is considered to be a potential GDE within the BoM GDE Atlas due to the possibility of cavernous karstic features. These features may provide an environment for subterranean ecosystems to exist. The void, however, does not intersect the groundwater table at its current level and therefore does not directly interact with the potential ecosystem.

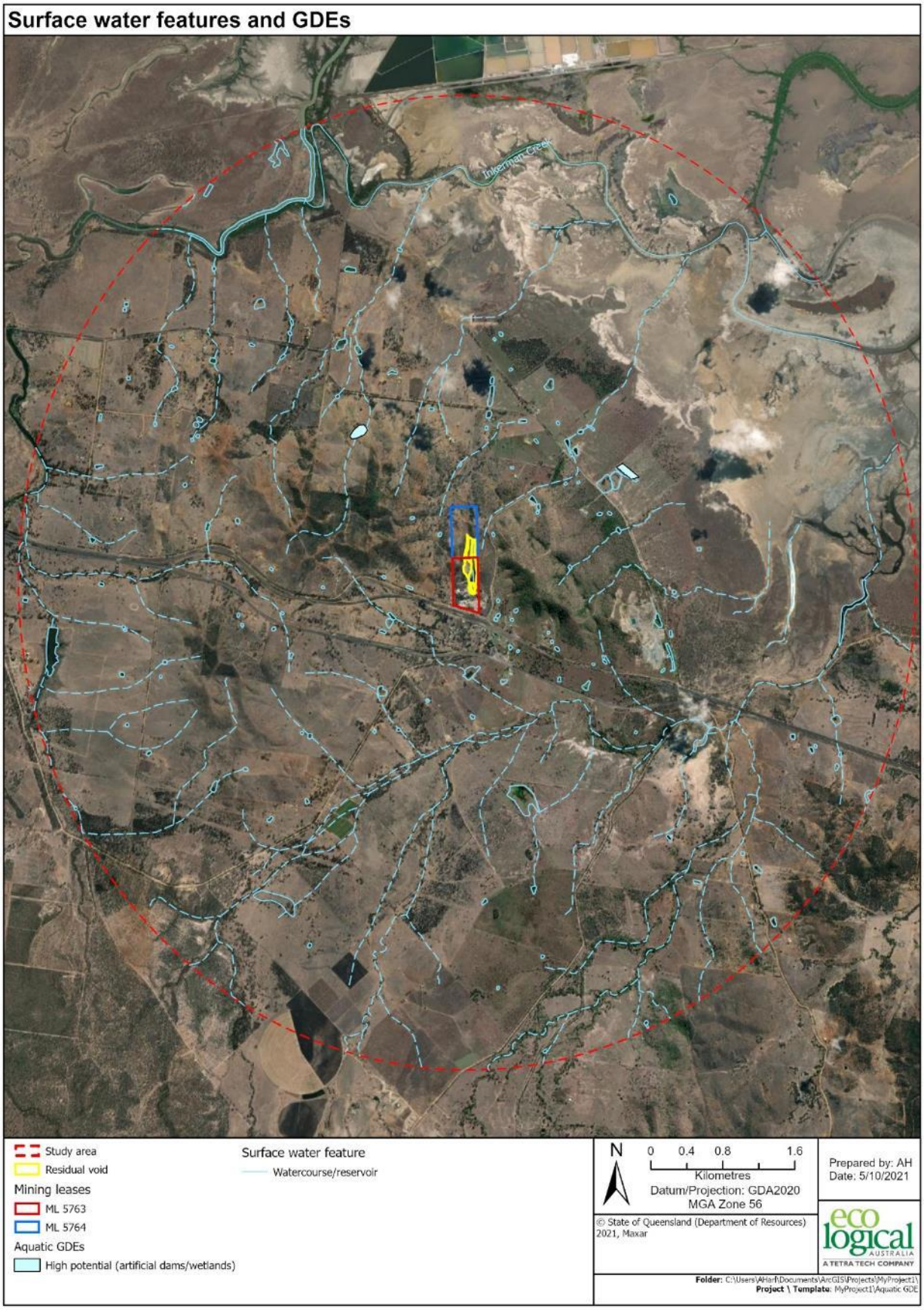

Figure 13: Location of surface water features and GDEs

3.5.1.4 Groundwater conceptualisation and hydrological summary

The two main aquifer systems within the study area are the shallow, alluvial system and fractured rock. The fractured rock aquifer is utilised for water supply and comprises two main geological formations: Mount Alma Formation and Mount Holly Formation/Erebus Beds. Based on regional bore reports, the fractured rock aquifer lithology is mainly fractured siltstone and shale (Figure 3).

Two thrust faults exist to the east and west of the site, that may influence regional groundwater flow. However, water levels from bores to the east and west of the western most fault indicate a flow path down gradient following topography. RSWL (mAHD) values locally follow this trend, being influenced by topography, flowing in a general north to south-east direction (Figure 12).

Groundwater salinity (EC) ranges from 560-12,500 µS/cm within a 2 km area, with pH ranging between circum-neutral to mildly alkaline (pH 7.5 to 8.5). Recent water quality sampling from the bore within the mining lease (summarised in Table 4) shows groundwater at the site currently meets WQOs (Table 5) for groundwater EVs for the Fitzroy River Sub-basin.

The fractured rock aquifer system is likely to be predominately recharged at outcropping areas through direct rainfall or surface water flows. In areas where the alluvial sediments overlay the fractured rock may induce recharge through seepage.

There are two high potential aquatic GDEs located to the northwest and north east of the site. These are understood to be artificial water storage areas (dams) that are likely supplied by surface water run off via the ephemeral creeks and from through flow from the alluvial sediments.

The limestone rock in which the quarry is located is referenced as an unclassified subterranean GDE. It is likely registered in this manner due to the potential for the karstic rock to be an environment for stygofauna to exist. The quarry does not intersect the groundwater table and is located in the unsaturated zone of the limestone rock and is therefore unlikely to be a point of recharge for the unclassified subterranean GDE.

There have been no observations of groundwater seepage into the mine void. This is consistent with observed groundwater levels which are measured to be 12 mAHD, locally, within the mining lease. The view that the void is disconnected from the local groundwater table is further supported by the dissimilarity in recent trends in water quality between the void and the groundwater.

The outcomes from the groundwater conceptualisation have allowed to conclusions to be drawn about the potential impacts to groundwater water level and water quality due to the presence of the Marmor quarry. It was found that there is a 'low risk' of impact to groundwater resources, primarily due to the base of the mine void being located above the groundwater table. Additionally, recharge of the fractured rock aquifer with water from the void has not and would not be expected to diminish groundwater quality and thus existing environmental values would be protected.

As the void does not intersect the groundwater, there is no risk of the void creating localised drawdown of the water table.

3.5.2 Flooding

The EA has a pre-approved land outcome for a void. As such floodplain modelling is not specifically required for the PRCP. The likelihood of flooding connecting the void with surrounding waterways and the of overtopping has been examined.

The site does not sit within a defined floodplain, however, a review of publicly available flood assessments that cover the site was undertaken to assess the flood susceptibility of the site, specifically:

- Queensland Globe (https://qldglobe.information.qld.gov.au/)
- Queensland Department of Resources Flood Check Queensland (https://floodcheck.information.qld.gov.au/)
- Australian Flood Risk Information Portal (https://afrip.ga.gov.au/flood-study-web/#/search)

There are no major watercourses within the site and surrounding areas. Some minor watercourses of the Fitzroy sub-basin exist around the site (Figure 14) that flow in a north-easterly direction away from the site.

Available flood information showed that there is the potential for some flooding on site during a 1% Annual Exceedance Probability (AEP) flood event (Figure 15) and during more extreme events (Figure 16) that approximate the probable maximum flood (PMF). These results show that some isolated flooding may occur during the 1% AEP event with more broadscale flooding occurring only in more extreme events. Combining the flood information with the contours of the site (Figure 17) indicates that the localised flooding identified would largely drain into the residual void. The potential flooding even for the PMF does not result in the whole of the void being flooded and there is no direct connection between flooding in the void and surrounding water courses, there is no direct continuity between flooding within the void Therefore, flooding is not anticipated to impact the surrounding users or the environment. The likelihood of water spilling from the former mining pit is discussed in Section 3.5.11.1.

The nominated post mining land uses (PMLUs) of grazing (on either undisturbed or rehabilitated land) and water storage are not anticipated to change the likelihood of flooding. The areas potentially affected by minor flooding under extreme events will not contain any mine waste landforms after the site has been fully rehabilitated. There are no significant constructed post-mine landforms in the potentially affected area. The species chosen for pasture establishment are tolerant of short periods of waterlogging.

Minor localised and short-term flooding in extreme events will not affect either final landform stability, or the establishment and sustainability of nominated PMLUs at Marmor.

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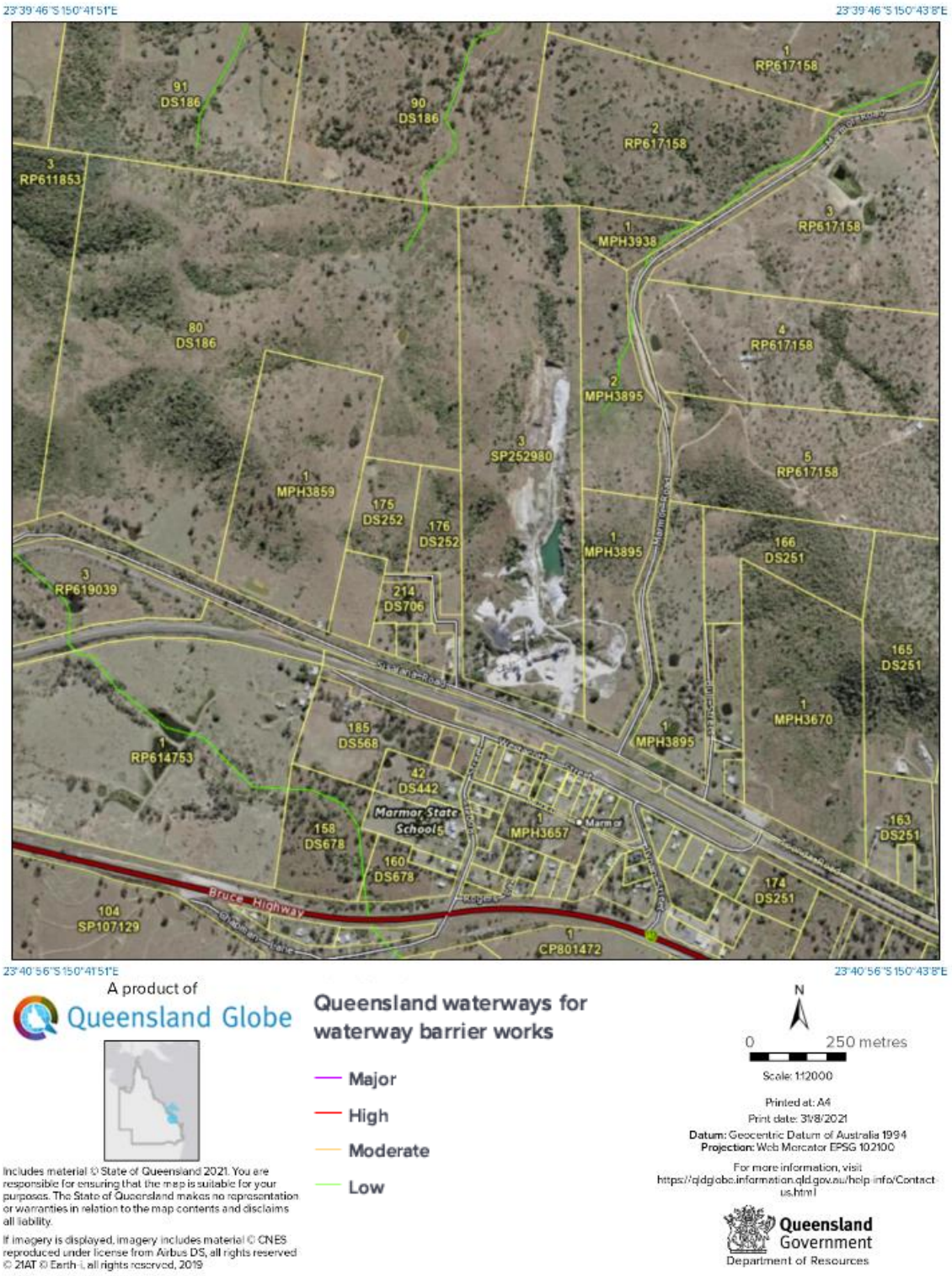

Figure 14: Waterways around the Marmor Operations (note: the Marmor MLs lie totally within Lot 3/SP252980)[6]

[6] https://qldglobe.information.qld.gov.au/qldglobe/print/H10fX8iZt, access August 2021

Figure 15: 1% AEP flood extent around the Marmor Operations7 where variants of blue blocks on the map indicate depth of water

[7] https://spatial-gis.information.qld.gov.au/arcgis/rest/directories/arcgisoutput/FloodCheck/FloodCheck_Print_GPServer/_ags_83e3e8ab83dd416084bfcea0f2a8a3a7.pdf, accessed August 2021

Figure 16: Extreme events (approximation of the PMF) flood extent around the Marmor Operations8 where variants of blue blocks on the map indicate depth of water

[8] https://spatial-gis.information.qld.gov.au/arcgis/rest/directories/arcgisoutput/FloodCheck/FloodCheck_Print_GPServer/_ags_29939c4c227d445f8c240c9491138b14.pdf, accessed August 2021

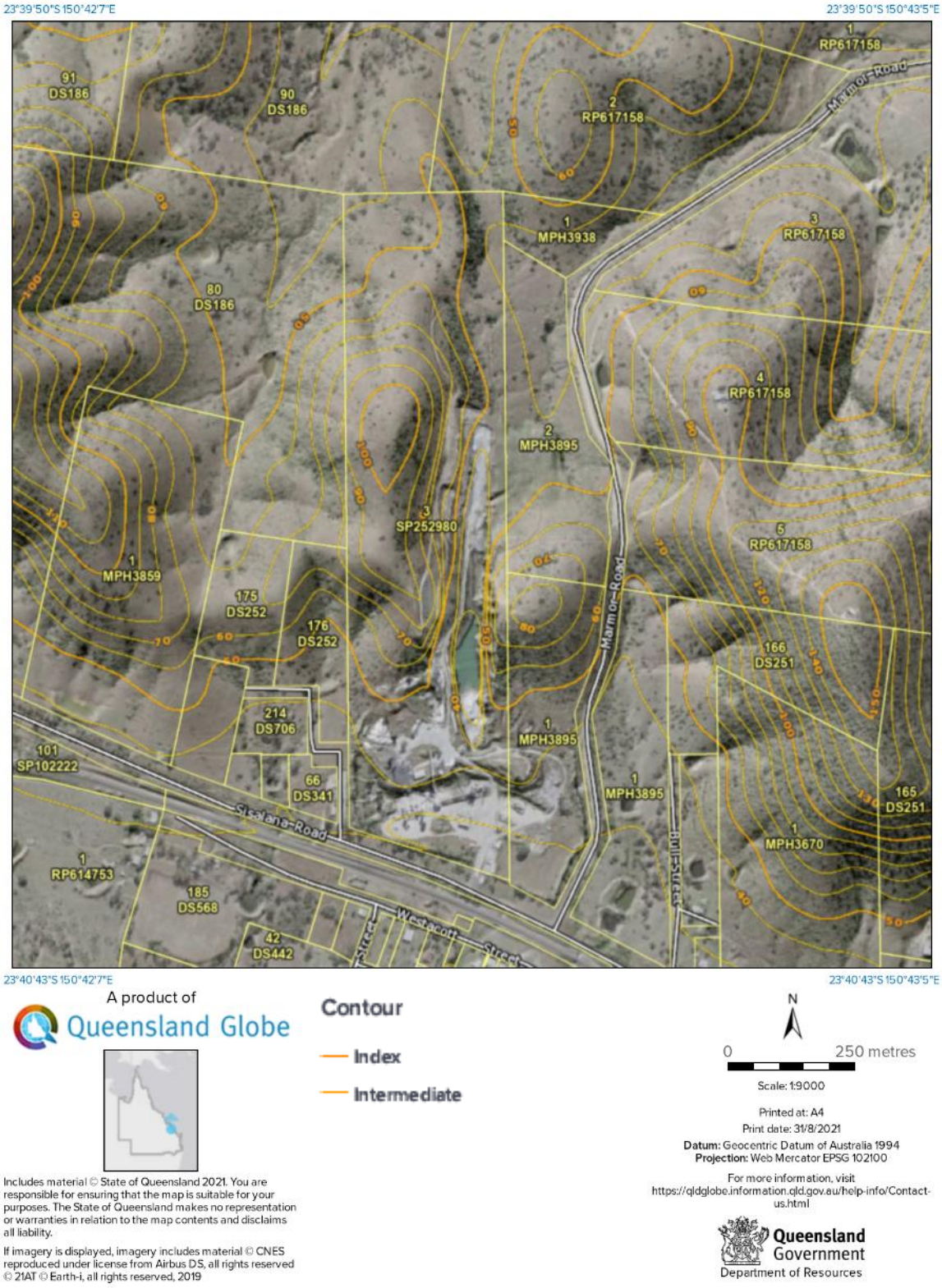

Figure 17: Ten metre contour lines around the Marmor Operations9

[9] https://qldglobe.information.qld.gov.au/qldglobe/print/rJ-m58obF, accessed August 2021

3.5.3 Soil and capping material assessment

3.5.3.1 Topsoil

The topsoil stockpile is located to the south of site and contains 5,300 m^3 of material for use during rehabilitation. The total topsoil requirement for closure has been estimated as 7,494 m^3. There is an estimated material deficit of 2,194 m^3 and an allowance for the importation of topsoil from an offsite location has been provided in the ERC.

No additional disturbance is planned at Marmor and no further topsoil stripping will be undertaken. All existing stripped topsoil has been placed in low stockpiles awaiting re-spreading. The stockpile is currently well vegetated and supports mature trees which will have assisted in maintaining biological activity (Figure 18).

Figure 18: View of the well vegetated topsoil stockpile at the Marmor Operations

Graymont commissioned soil analysis of the stockpiled topsoil in October 2020. A summary of the results is provided in Table 24. The results have been reviewed for this PRCP by Dr. Andrew Butler, a Certified Professional Soil Scientist. Overall, the soils were found to have slightly to moderately basic pH (in $CaCl_2$). The effective cation exchange capacity of the soils (a measure of inherent fertility) was high to very high. Not surprisingly, the background geology the cation exchange complex is dominated by calcium (>90% saturation) and exchangeable sodium percentage is <0.5%. Therefore, the soils are non-sodic. This property and the high calcium saturation will prevent dispersion and will promote stability and structure formation. The soils have low chloride content and low to moderate electrical conductivity. Some of the electrical conductivity measured will be due to the presence of sparingly soluble 'salts' other than sodium chloride (that are released into the dilute soil extract used for routine EC screening analysis). When the EC is adjusted to reflect the chloride content, the salinity rating are low to very low .

Available nitrogen concentrations were found to be generally adequate and likely reflect the ongoing litter inputs, organic matter accumulation and nutrient cycling occurring in the surface of the well vegetated stockpile. Although the available phosphorus levels were adequate for native species, for

productive pasture establishment inclusive of legumes (as selected for Marmor in Section 3.5.9.1) an additional phosphatic fertiliser application would be beneficial. Some samples were low in available potassium and establishment fertiliser applications will be required.

The source of the imported topsoil required to complete rehabilitation works has yet to be identified, but the completion criteria contain minimum standards for the quality of the material to be imported to ensure that it is suitable for the achievement of the nominated PMLU (Section 3.3.2).

Table 24: Soil quality analysis from the soil stockpiles

Analyte	Units	Sample number					
		1	2	3	4	5	Average
pH (in $CaCl_2$)	Units	7.68	7.82	7.66	7.84	7.87	7.77
Electrical Conductivity	(dS/m)	0.18	0.12	0.23	0.12	0.12	0.15
Estimated chloride EC	(dS/m)	0.01	0.01	0.01	0.01	0.01	0.01
Textural Class		Sandy clay loam/silty clay loam	Sandy clay loam/silty clay loam	Sandy clay loam/silty clay loam	Sandy clay loam/silty clay loam	Sandy clay loam/silty clay loam	Sandy clay loam/silty clay loam
Approximate clay content based on texture class (DNR 1997)	%	32	32	32	32	32	32
Salinity rating (DNR 1997)	NA	Low	Low	Very low*	Low	Low	Low
Exchangeable calcium	cmol+/kg	38	86	33	118	154	86
Exchangeable magnesium	cmol+/kg	1.97	2.03	2.37	2.17	2.32	2.17
Exchangeable potassium	cmol+/kg	0.19	0.15	0.35	0.54	0.29	0.30
Exchangeable sodium	cmol+/kg	0.09	0.12	0.14	0.05	0.03	0.09
Effective Cation Exchange Capacity (ECEC)	cmol+/kg	41	89	35	121	156	88
Exchangeable sodium percentage (ESP)	%	0.22	0.14	0.40	0.04	0.02	0.16
Sodicity rating (DNR 1997)	NA	Non-sodic	Non-sodic	Non-sodic	Non-sodic	Non-sodic	Non-sodic
Chloride	mg/kg	13.2	< 10	19.3	17	< 10	16.5
Mehlich 3 extractable Nitrate-N	mg N/kg	33	21	61	6.4	15	27.3
Mehlich 3 extractable Phosphorus (P)	mg P/kg	34.1	14.1	51.8	42.4	21.8	32.8

*When adjusted for chloride content and estimated chloride EC (= ([Chloride] mg/kg)/10000)*6.64) (DNR 1997).

3.5.3.2 Capping requirements

No reactive wastes or geochemically unstable materials that require the placement of an engineered capping layer will remain on-site at Marmor at relinquishment. No engineered capping is required and therefore no capping material assessment is necessary.

3.5.4 Waste characterisation and waste stockpile removal

Lime kiln dust, coal ash and reject limestone has been stored in stockpiles adjacent to the ROM area and at three locations within the residual void domain. The material has been mixed during collection, storage and stockpiling.

This material is viewed as waste by the DES and the EA does not currently allow for disposal of mine wastes on-site. Therefore, the current rehabilitation strategy is to remove this material back to virgin ground using excavators and trucks. Following appropriate landfill waste characterisation, it will be disposed of at a suitably licenced off-site waste management facility. No mine waste will remain on site under the current strategy and no waste characterisation (other than to support off-site disposal) is necessary to support the rehabilitation strategy.

A validation sampling plan will be developed and implemented by an appropriately qualified person to verify that all waste material has been removed.

Graymont believes that given its nature and the weathering that has already occurred, the mixed lime kiln dust, coal ash and reject limestone is material that could be successfully rehabilitated on-site. Although the material has been stored within the residual void, it has not adversely affected water quality or compromised the planned post-mine land use for the void. Therefore, Graymont will investigate options to amend the EA to allow this material to be retained on site as part of site rehabilitation and closure and undertake supporting research. If this is successful, the PRCP will be amended.

There are no other waste rock dumps, overburden dumps, tailings dams, heap leach pads, or waste tyre stockpiles at Marmor for which waste characterisation is required.

3.5.5 Cover design

No reactive wastes or geochemically unstable materials that require the placement of an engineered capping layer will remain on-site at Marmor at relinquishment. No engineered capping or cover design is required.

3.5.6 Landform design

This section relates to the landform development of the areas outside the Residual Void Domain (largely within ML 5763). The areas includes all disturbance associated with the Rehabilitation Areas in Table 25. The Landform development for the Residual Void Domain is provided in Section 3.5.11.

Table 25: Rehabilitation areas outside the Residual Void

Rehabilitation area	Disturbance types or assets
RA1	Limestone stockpile
RA2	Coal stockpile

Rehabilitation area	Disturbance types or assets
RA3	• Buildings and sheds (general and portable structures including administration, crib rooms, sheds, ablutions) • Weighbridge • Tanks - other
RA4	• Workshop • Process plant/equipment (inclusive of concrete pads, silos, bins and hoppers, conveyors) • Tanks – hydrocarbons (and associated concrete bunds)
RA5	Sediment pond
RA6	ROM pad trafficked areas (gravelled areas surrounding limestone and coal stockpiles)
RA7	Laydown or trafficked areas (gravelled areas adjacent to the void) (Northern area)
RA8	Laydown or trafficked areas (gravelled areas surrounding processing plant, workshop and administration areas) (Southern area)
RA9	Vegetated (areas of minimal disturbance adjacent to other activities where vegetation has been retained or has passively regenerated)
RA10	Tracks (Earthen)
RA11	Tracks (Gravel)
RA12	Sealed road (bitumen sealed site entrance)
RA13	Topsoil stockpile
RA20	Mixed kiln dust, reject limestone and coal ash stockpiles

3.5.6.1 Existing landform

The existing landforms in the disturbance areas are dominated by:

- the slightly elevated cut and fill area adjacent to the southern access to the void where the Product stockpiles (RA1 and RA2) trafficked ROM area (RA6) and Rejects & waste stockpiles (RA20) are located (referred to as the 'upper area' below) and
- the southern part of the site, adjacent to Sisalana Road where the bulk of the infrastructure (RA3, RA4, RA8), sediment dam (RA5), bitumen road (RA12) and topsoil stockpiles (RA13) are located.

These two areas are separated by the slopes of the upper area that have spontaneously revegetated (RA9) and are connected by gravel tracks (RA11).

The balance of the existing disturbed landform is a small laydown area (RA7) adjacent to the RA14 and earthen tracks (RA 10) that largely conform to the existing surrounding land surface.

3.5.6.2 Final landform design requirements

There are no significant reconstructed landforms at Marmor. All product, waste & reject and topsoil stockpiles will be removed to surrounding ground level during site rehabilitation. No mine waste landforms (such as overburden, reactive waste or tailings dams) will remain following closure.

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Therefore there will be no significant post-mine landforms that require detailed engineering design to achieve landform stability, encapsulation hazardous mine waste and the nominated PMLU.

Minimum slope requirements consistent with the soils present on-site and the nominated grazing PMLU have been discussed in Section 3.3.2.1. The objective it to provide final landforms and surface water management that minimises the risk of erosion in rehabilitation areas.

The following provides the concept for the final landform design. Final engineering and landform plans will be prepared after the cessation of mining operations.

3.5.6.3 Final landform concept design

and the majority of the landform currently drains to the west the slope down to the lower area.

Following removal of existing stockpiles and surface aggregate from the upper area occupied by RA1, RA2, RA6, minor earthworks will reshape the landform to drain toward the western boundary with an average grade of 0.5-1%. This is intended to improve surface water management by breaking up the catchment above the main upper and lower rehabilitation areas with the grazing PMLU. This is to minimising flows over the slope between the upper to the lower areas during earthworks and vegetation establishment. Additional drainage controls will also be used (see Section 3.5.7). A concept final landform for ML 5763 is shown in Figure 19 with cross sections provided in Figure 20. Cross section C-C' shows the upper area.

Remaining areas currently under small waste & reject stockpiles and minor earthen tracks to the north of the upper area will be graded to conform with the surrounding landform.

Following the removal of waste & reject stockpiles the small section of the upper area adjacent to the void minor earthworks will reshape the landform to drain towards the final void with an average grade of 0.5-1% (cross section C-C' in Figure 20).

The lower area is largely occupied by RA3, RA4, RA5 and RA8. After the decommissioning and removal of all infrastructure, backfilling of the sediment dam according to the methods outlined in Section 3.5.13 and aggregate removal, minor earthworks will reshape the landform to direct surface flows to the existing exit point for this catchment adjacent to the front gate. Final grades will average 3-5% (cross section D-D' in Figure 20).

The topsoil stockpiles (RA13) will be gradually removed during rehabilitation works. The area will be graded to conform to the surrounding ground level, but a small diversion bank will be retained to the west and south of the lease boundary for surface water management (see Section 3.5.7 and Figure 22).

The remaining minor earthen tracks (in ML 5764) will be graded to conform to the surrounding landform (not shown).

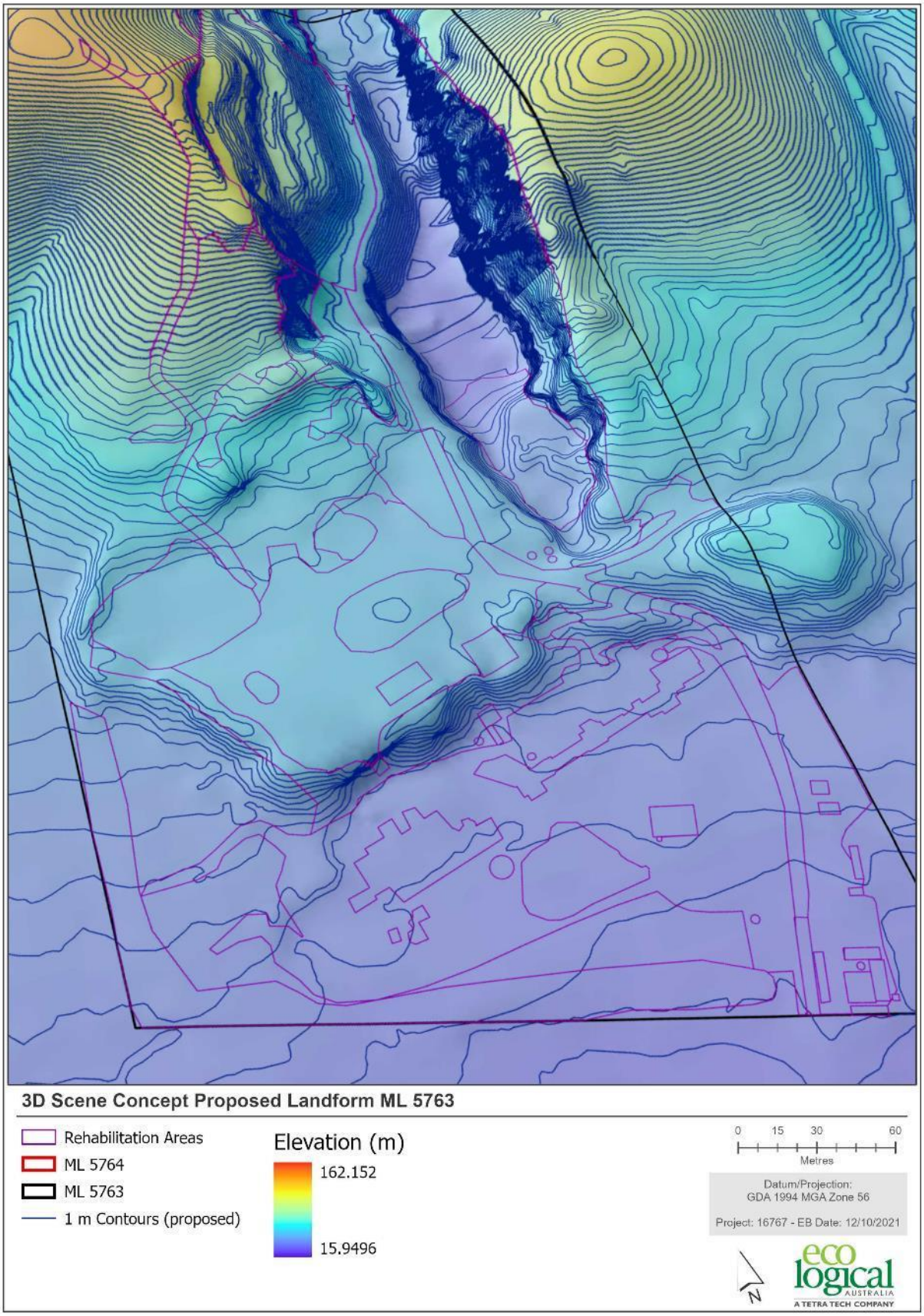

Figure 19: Concept final landform for areas within ML 5763 (1 m contours)

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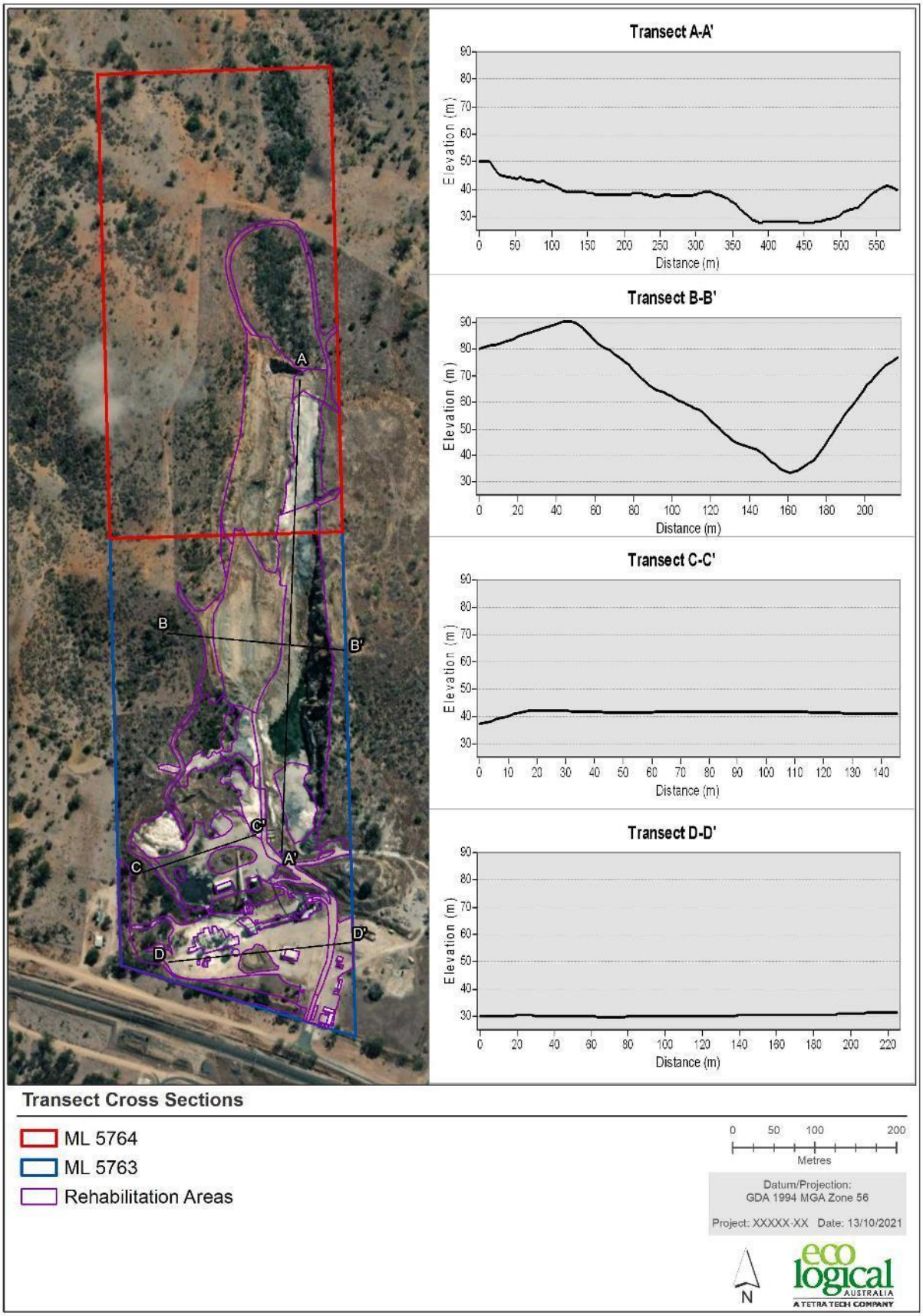

Figure 20 Concept final landform cross sections for areas within ML 5763 and the whole void

3.5.7 Surface water management

The main potential sources of contamination at Marmor include:

- Stored or waste petroleum hydrocarbons (from fuel storage, the workshop and minor spills)
- lime products and kiln dust (potentially alkali solids such as quick lime and hydrated lime)
- Coal and coal ash (metals, salts and potentially minor amounts of PAHs).

A conceptual site model (CSM - Figure 21) shows the source, likely significant pathways and environmental and sensitive receptors.

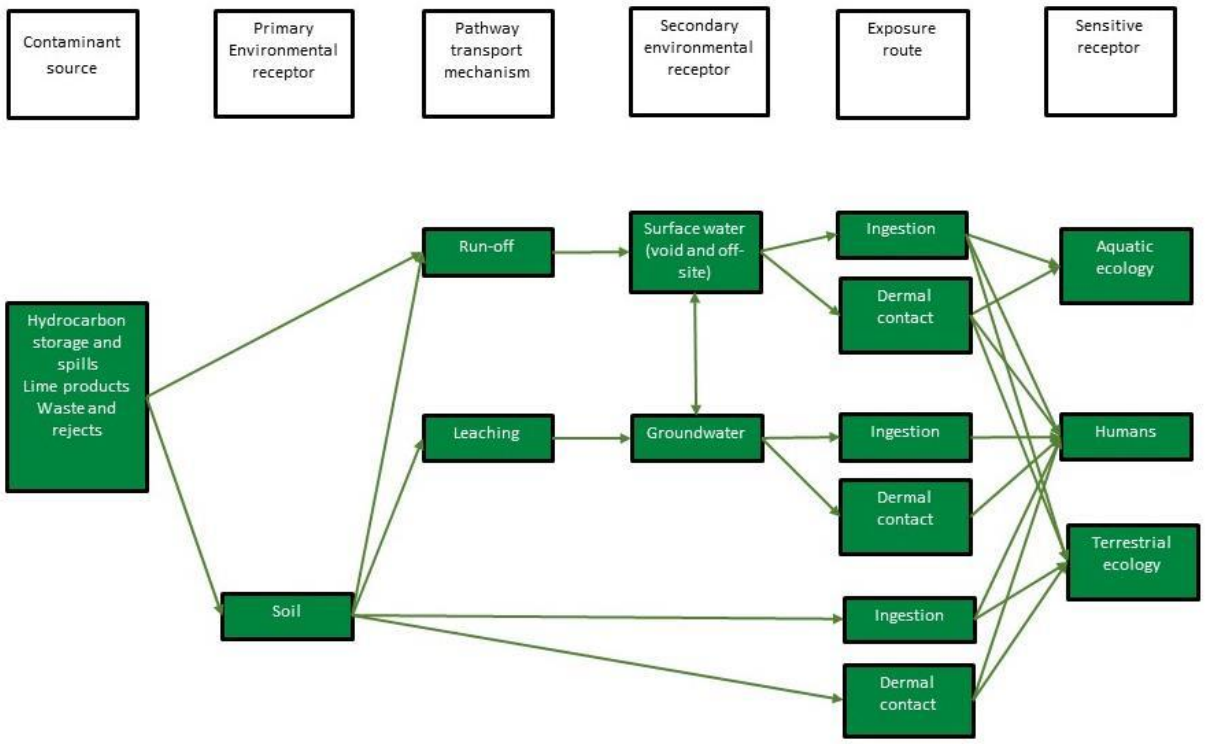

Figure 21: Conceptual site model

3.5.7.1 Operational water management

The site water management plan developed by the previous owners (Sibelco 2014) and has been adopted by Graymont. It is summarised below.

OBJECTIVES

The objectives are:

- To ensure access to secure and sufficient water resources to service operations
- To minimising impacts to offsite environmental value. This is achieved through:
  - Identifying, separating and controlling clean and dirty waters
  - Ensuring the appropriate containment or treatment of waters affected by site operations.

TARGETS AND PERFORMANCE INDICATORS

The target is compliance with EA conditions

- C1-1 - Contaminants must not be released from site to any waters or the bed and banks of any waters.
- C2-1 - All reasonable and practicable erosion protection measures and sediment control measures must be implemented and maintained to minimise erosion and the release of sediment.

The performance indicators are

- No contaminants are released from site.
- Erosion and sediment controls are in place, maintained and monitored during rainfall for effectiveness.

CONTROLS

Appropriate water management controls are provided below. Although some fixed measures apply to the site in care and maintenance, others will be applied when operations resume.

- The extent of disturbed / exposed areas is to be kept to the minimum area necessary for works.
- Disturbed land will be rehabilitated as soon as it is available.
- Vehicle wash-down will be carried out in a designated area so that washings (including concrete washings) will not enter waterways or stormwater drains.
- Earth diversion bunds and catch drains are installed upslope of excavations to prevent surface water entering these areas.
- Sediment controls (sediment traps, the sediment dam and dams) are regularly maintained.
- All runoff from the coal storage and feed line handling area and limestone stockpiles is directed into a sediment trap before being directed to the void.
- Stormwater runoff from building roof areas is harvested directly into tanks for re-use on site.
- Mechanical sweepers are used to collect spilt product and thus minimise the potential to be mobilised in run off.
- Stormwater from the main processing plant is directed to a sediment dam on the trafficked / laydown area to the south of the main plant. Any overflow from this and stormwater from other parts of the main infrastructure area is directed (in some areas by the topsoil stockpile bund) through rock filter dams to off-site table drains along Sisalana Road which borders the southern lease boundary.
- All hydrocarbons are stored in above ground tanks contained within bunds (to AS 1940).
- Any stormwater captured within the bund is checked to make sure it is free from contaminants or wastes prior being released through the lockable value.
- Spill control equipment is stocked at specific locations around the site for spill response.
- Vehicles are to be well maintained to avoid fuel and oil leakages.
- Re-fuelling of trucks on site will take place away from drainage lines and in isolated/bunded areas to minimise the risk of environmental contamination and to contain spills.

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- Fuels, oils and chemicals required for construction and operation will be stored appropriately. Any spillages will be immediately contained and absorbed with a suitable material and disposed in an approved manner.
- All staff to be appropriately trained in procedures for the management of fuel and chemical spills and the location and use of spill kits.

MONITORING AND PERFORMANCE

The following operational monitoring of erosion and sediment control measures is conducted:

- Visual inspection of the sedimentation dam ensure basin is free of weeds (Monthly as required)
- Visual inspection of sediment dam freeboard (Monthly and after rainfall)
- Cleaning and removal of sediment from sediment traps and dam (prior to 1 November annually and as required)
- Dewatering of sediment dam prior to the wet season (prior to 1 November annually)

No water quality monitoring is required as a conditions of the EA. Water quality monitoring of the void and groundwater has been infrequent during care and maintenance, but it has been restarted and has been formalised in this PRCP to address potential contaminants of concern at Marmor (Section 3.7.3). Any adverse results will be investigated and action taken as required.

Although coal and mixed coal ash, kiln dust and rejects has been stored within the void catchment, there is no indication that this has led to significant contamination of the water in the void (Sections 3.1.3)

No complaints have been received regarding run off from site.

3.5.7.2 Rehabilitation and closure water management

The objective will be to use Best Practice site management procedures to control the severity and extent of soil erosion and pollutant transport during the rehabilitation and provide long-term stability for closure.

CONTAMINANT MANAGEMENT

The rehabilitation strategy for the Marmor Operations ensures that all known sources of potential contaminants that pose a risk to environmental values of the receiving environment will be removed. A contaminated land site investigation will be undertaken at closure and the site remediated to a safe condition.

At closure, it is not expected that water stored in the void will require any additional treatment to reduce contaminants.

REHABILITATION CONSTRUCTION EROSION AND SEDIMENT CONTROL

Contractors engaged to undertake earthworks and rehabilitation will be required to provide a detailed Erosion and Sediment Control Plan (ESCP) to Graymont as part of the contract deliverables. The ESCP must be approved by Graymont prior to site establishment and commencement of ground disturbance. The ESCP, including designs specifications, should be consistent with the *Best Practice Erosion & Sediment Control* series (IECA 2008).

As well as the operational water management measures, the following would be expected as a minimum

- Where possible, works will be scheduled to occur outside the main wet season.
- Work will be scheduled to minimise the extent of disturbed / exposed areas as much as possible.
- Disturbed land will be revegetated as soon as possible following earthworks.
- Upslope diversion banks to direct clean water away from areas under rehabilitation. Existing well vegetated areas can be used to safety convey water away from the structures using level spreaders (slopes up to 10%). Temporary division or catch drains will be used to divide the catchment of the upper and lower areas within ML 5763 so that waters ca be directed to separate sediment control structures prior to release. Three permanent diversion banks will be required to manage site water post-closure (see below). These should be installed prior to major works being undertaken (Figure 22).
- The bitumen road at the entrance to be retained for as long as possible.
- A temporary rock pad rumble strip to be established at the site entry / exit to reduce loose soil material being moved off site and onto the roads servicing the site.
- Temporary sediment controls to be implemented to minimise off site sediment transport including the use of sediment fencing (or equivalent) or temporary covers for any earthen material temporarily stockpiled onsite.
- Additional temporary sediment controls to be constructed where stormwater leaves the site. Based on the success of operational controls, rock filter dams would be appropriate. The concept design incudes two possible exist points in the southwestern and south eastern corners of the site (Figure 22).

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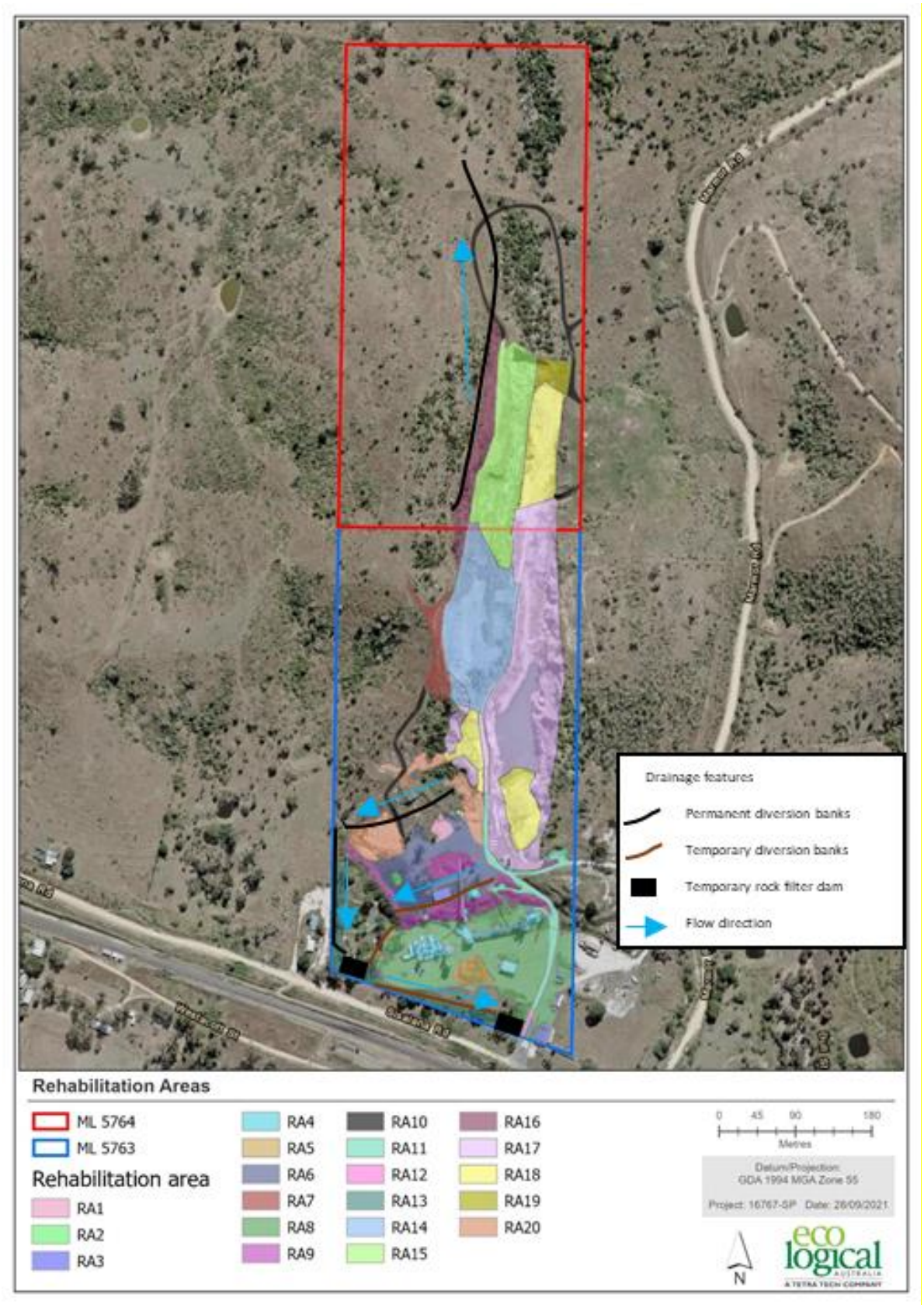

Figure 22: Rehabilitation areas showing concept of significant temporary and permanent drainage and ESCP features

Erosion and sediment control (ESC) measures to be inspected daily by the construction manager (or nominated representative) during periods of runoff-producing rainfall, and de-silted, repaired and amended as appropriate to maintain the ESCP water quality objectives. This should include:

- Daily site inspections during periods of runoff-producing rainfall including all drainage, erosion and sediment control measures; occurrences of excessive sediment deposition (whether on-site or off-site); all site discharge points.
- Weekly site inspections including all drainage, erosion and sediment control measures; occurrences of excessive sediment deposition (whether on-site or off-site); occurrences of construction materials, litter or sediment placed, deposited, washed or blown from the site, including deposition by vehicular movements; litter and waste receptors; oil, fuel and chemical storage facilities.
- Site inspections immediately prior to anticipated runoff-producing rainfall including all drainage, erosion and sediment control measures; all temporary (e.g. over-night) flow diversion and drainage works.
- Site inspections immediately following runoff-producing rainfall including treatment and de-watering requirements of sediment control structures basins and the need for its removal; all drainage, erosion and sediment control measures; occurrences of excessive sediment deposition (whether on-site or off-site); occurrences of construction materials, litter or sediment placed, deposited, washed or blown from the site, including deposition by vehicular movements; occurrences of excessive erosion, sedimentation, or mud generation around the site office, car park and material storage areas.
- In addition, monthly site inspections including proposed staging of future site clearing, earthworks and site/soil stabilisation.
- Water quality monitoring must be carried out on any controlled off-site release points, including water pH and suspended solids.
- Water quality monitoring at the nominated monitoring stations to be carried out monthly and following significant rainfall (>25mm in 72hrs) (additional water quality monitoring maybe required if the WQOs are not being met).

The minimum WQOs for water leaving site are:

- Water pH released from a controlled sediment structure outflow must be within the range 6.5 to 8.5.
- Suspended Solids released from controlled sediment structure outflows must be no greater than 50mg/L.
- No visible films or odour.
- No visible litter washed from the site.

Non-compliance with agreed performance criteria will be identified by the following and investigation and corrective action undertaken as required:

- Visual inspections identifying:
  - build-up of sediment off the site
  - excessive sediment build-up on the site

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  - excessive erosion on the site
  - release of construction material from the site
  - poor vegetation establishment
  - poorly maintained, damaged or failed ESC devices.
- Poor water quality outside of the ESCP WQOs or complaints received.

All temporary ESC measures will be removed once and waste removed from site when vegetation is established and the risk of erosion and sediment generation has been minimised.

PERMANENT FEATURES FOR CLOSURE

Minimising potential run off over the void slopes at closure was recommended by Meyers (2005. Therefore, a diversion bank will be constructed above the crest the reshaped slopes in Rehabilitation Area 15 within the void. This is to direct water away from the reshaped slopes to ensure stability is maintained (Figure 22). As much as possible, this will be integrated with the alignment of the proposed safety bund. Water will be safely discharged to the existing stable vegetated area on gently sloping area (Figure 22) via a level spreader.

Run on to the main rehabilitation areas upslope of Rehabilitation Areas RA1, RA2 and RA6 (Figure 22) largely from well vegetated areas will be directed away from the disturbance area via a diversion bank to the western boundary. Water will be safely discharged to the existing stable vegetated area via a level spreader.

The topsoil stockpile along the western boundary of ML 5763 currently prevent site water from flowing across on to the neighbouring property. This rehabilitation strategy will be to retain this aspect of the current water management plan. During rehabilitation the area will be reshaped to provide a permanent bund directing water to the southern boundary (Figure 22).

Final engineering and landform plans will be prepared after the cessation of mining operations and the locations and design specifications of the permanent diversions formalised. All permanent structures will be designed and constructed according to the *Best Practice Erosion & Sediment Control* series (IECA 2008).

3.5.8 Site preparation and topsoiling

All compacted areas will be ripped to a depth of 500 mm at 500 – 800 mm spacings.

Based on the baseline soils information, topsoil will be placed to a depth of 150 mm for all areas with a nominated PMLU of grazing (see further justification in Section 3.3.2.1).

Based on the soil test results, soil characteristics and crop requirements, an establishment dressing of a compound fertiliser containing N, P (low), K and S (such as Crop King 88 or equivalent) will be applied at a rate of 300 kg/ha (3 kg/100 sq m). After incorporation of fertiliser, a seedbed will be preparation using harrows.

Fertiliser will be only be applied to areas of existing vegetation (Rehabilitation Area 9) if vegetation appear to be deficient of ground cover is low

3.5.9 Revegetation

3.5.9.1 Areas with a grazing PMLU

On the advice of Stewart Buck an Agronomist with Department of Agriculture and Fisheries (DAF) Extension Service in Rockhampton, the following species mix, suited to the Marmor area, has been selected for pasture establishment:

- Black Spear Grass (*Heteropogon contortus*). This native species is useful for providing erosion control for slopes up to 20°. It grows on a wide variety of well-drained soils, with surface textures ranging from loamy sand to clay loam, and uniform or texture contrast soils, as well as on very fertile clay loams. While well-adapted to low fertility, it is not tolerant of extremely low fertility, nor poor drainage or high levels of salinity. It is most abundant where the average annual rainfall is 600–1,000 mm, and where there are marked wet and dry seasons. It does tolerate short periods of inundation on otherwise well-drained soils but is not tolerant of prolonged flooding or waterlogging (Cook et al., 2020).
- Forest Bluegrass (*Bothriochloa bladhii ssp. glabra*) – Swann Forest cultivar. This hardy naturalised species grows on moderately fertile or infertile soils, with a wide range of textures from sandy loam to clays (including hard-setting clay loams) provided exchangeable aluminium levels are fairly low (they are zero at this site) and pH is 5.5 to 8.4. A drought-hardy species, particularly if well grazed to reduce the amount of foliage and hence, water use. Cultivars have been successful mostly in areas with rainfall >750 mm, although can tolerate as low as 600 mm/yr. It can stand temporary waterlogging and flooding, but not tolerant of permanently wet conditions. The species is not fertility demanding, but may respond to moderate inputs of applied nitrogen on infertile soils. It is tolerant of heavy grazing by cattle and sheep, adjusting growth habit to prostrate to accommodate pressure (Cook et al., 2020).
- Shrubby Stylo (*Stylosanthes scabra*) - Siran cultivar. This exotic perennial forage legume is well adapted to infertile, friable or hard-setting, sandy-surfaced soil, though less well adapted to heavier textured alkaline soils. It is an extremely drought-hardy species, occurring in areas with rainfall as low as 350 mm/yr although it has mainly been used in areas with an annual rainfall of 600–900 (–2,000) mm. Some types at least are not very tolerant of waterlogging (Cook et al., 2020).

Seeding rates will be 2 kg/ha of each species in the mix. Seeding will occur in the late dry season or early wet season to make the best use of summer rains and high temperatures. Press wheels or harrows will be used after sowing to optimise soil-to-seed contact.

Fertiliser and seeding rates will be adjusted based on monitoring of the performance of revegetation works.

Germination should be visible two to six weeks after seeding (or after the first wetting rains). If germination has failed, attempts will be made to re-seed while there is a probability of follow-up wet season rain, although this should be avoided if the soil is too wet and will be damaged through trafficking. Long range weather forecasts will be used to assist in making this decision. Where required the water stored in the void can be used to assist in early vegetation establishment if there is a period of drought following seeding or germination. Re-seeding and any associated earthworks and soil preparation should not be undertaken later than 1 April. In such an event, re-treatment should be

scheduled for the following wet season. Some minor earthworks/seed bed preparation may be required prior to re-seeding.

3.5.9.2 Residual void

BASIS FOR APPROACH

Although the residual void will primarily provide the catchment for a water storage that occupies the base of the void, limestone mines and quarries provide good conditions for vegetation establishment even in the absence of topsoil. This can be seen in the natural regeneration of groundcovers, shrubs and trees in just nine years at Marmor (Figure 30) as well as other examples in Figure 23 and Figure 24.

Figure 23: Spontaneous establishment of Casuarinas on the weathered batters (left) in bunded material sourced from the void floor (right) and even the void floor (left) at a closed limestone quarry in NSW (Source: ELA)

Figure 24: West wall of the Mt Fubilan open pit in PNG showing the contrasting spontaneous vegetation establishment on the favourable upper limestone and the absence of it on the lower siltstone (Source A. Butler)

It is likely therefore that there will be natural regeneration in the void. Therefore, although the rehabilitation outcome for the void has previously been agreed and is nominated in the existing EA as

water storage, there is an opportunity to enhance rehabilitation outcomes for the void and increase surface stability within without affecting achievement of the nominated PMLU. Assisting natural regeneration would be expected to reduce potential sediment run off into the void and improve the quality of the water stored in the void.

The nature of the limestone resource will allow Graymont to implement rehabilitation methods that maximise opportunities for assisting natural regeneration within areas of the void that will not be occupied by water most of the time.

The potential conservation value of old limestone quarry or mine sites has long been recognised (Davis 1979) as has their potential for spontaneous regeneration. This is because not only so they provide a refuge against the loss of natural or semi-natural landscapes particularly in areas extensively cleared for agriculture (including grazing) (Davis 1979, Tropek et al. 2010), but they provide a broad range of habitats and ecological niches (Thompson & Green 2010), some of which may be rare locally (Tropek et al. 2010). Davis (1979) suggested that some sites play an important role in wildlife conservation and that this factor should be considered in any programme of land reclamation.

There are numerous examples of natural regeneration (sometimes referred to as spontaneous succession, spontaneous restoration or passive revegetation) of limestone quarries and mines documented from all over the world. Davis (1997) provides examples of natural recolonisation of limestone quarries by volunteer species leading to the development of attractive and species-rich communities in many parts of the United Kingdom. Tropek et al. (2010) cite numerous European and International examples of the conservation value provided by quarry sites for vascular plants, butterflies, spiders and wild bees. Tropek et al (2010) observed that spontaneously restored post-mining sites did not differ in species richness from the sites that had been actively managed and topsoil applied but they supported more rare species.

Gilardelli et al. (2015) found that time was found to be the most important factor in determining successional phase established in quarries where spontaneous regeneration has occurred. They observed that spontaneous revegetation begins immediately after quarry abandonment followed by a trend parallel to that of natural primary succession (i.e., early phase dominance in annual ruderal and herb species with few pioneers and little shrub and tree cover followed by a continuous and progressive turnover of life forms and species assemblages with increasing time since the last mining progressing perennial woody species). They observed that the relative change in life forms present over time, could reveal the natural progress of the rehabilitation through recognised successional phases.

Tropek et al. (2010) concluded the high conservation potential of limestone quarries could be realised by allowing succession to progress spontaneously with minimal intervention and cautioned against the apparently well intentioned removal of the diversity of growing conditions through more intense rehabilitation techniques. In the absence of specific requirements for active management of geochemical or safety hazards, Tropek et al. (2010) recommended restoration should involve suitable near-natural methods, such as brush matting, use of native hay containing plant propagules, or direct sowing of target species. Davis (1979) also noted that applying appropriate ecological techniques may make it possible to rehabilitate derelict and barren sites for amenity and conservation purposes using older (spontaneously restored) quarries as models (Davis 1979). Graymont's approach is consistent with

these recommendations and recognises that the regeneration process can be accelerated by enhancing growing conditions with the resources available and targeted reseeding.

ENHANCEMENT OF GROWING CONDITIONS IN THE VOID

The blasting and shaping of void wall to improve long-term stability and provide slopes covered in with a range of particle sizes with superior water holding capacity to the current areas of exposed rock and compacted benches. Based on the rehabilitation schedule this will improve growing conditions over large sections of the void in part or all of Rehabilitation Areas 14, 15 and 18.

In the absence of topsoil, more compacted areas of the void floor (RA18 after waste removal and RA19) will be ripped (where possible) or at the minimum scarified to break up the compacted surface. Aggregate recovered from gravel tracks (Rehabilitation Area 11), trafficked laydown areas (Rehabilitation Areas 6, 7 and 8) will be placed on these locations to provide a looser soil forming material that will improve water availability and physical growing conditions for root development. This material will be loose tipped to provide a hummocked surface to provide a range of relief and microclimates, thereby creating a range of ecological niches.

REVEGETATION METHOD

Given the nature of the landforms in the void and the difficulties associated with revegetation on steep batters, all rehabilitation areas within the void domain will be revegetated using direct seeding using unmanned aerial vehicles (AUVs or drones). As payloads have increased, AUVs are now routinely used for mine rehabilitation for areas that are difficult to unsafe to access using conventional methods. Given the small area of revegetation required, UAVs offer a rapid and cost effective method for Marmor. The method of seed delivery (such as the use of pellets or coatings to prevent light seed being lost) will need some development and RA14 will be used for direct seeding trials prior to the selection of the most appropriate method for the rest of the void.

REVEGETATION SPECIES SELECTION

Vegetation species selection has been based on the species characteristically present in RE 11.11.16 (of concern) which also occurs within the lease boundary (see Section 3.1.8), likely availability of seed commercially, know tolerance of site conditions (such as shallow skeletal soils, drought or low fertility) or previous use in mine rehabilitation. The following preliminary species list has been selected:

- *Eucalyptus cambageana*
- *Eucalyptus moluccana*
- *Eucalyptus crebra*
- *Lysiphyllum carronii*
- *Acacia rhodoxylon*
- *Atalaya hemiglauca*
- *Dodonaea viscosa*
- *Bothriochloa bladhii subsp. bladhii and /or subsp. glabra*
- *Chrysopogon fallax.*

Trials will be undertaken using this list on Rehabilitation Area 14 to determine which of these species offers the best chance of success for the remaining areas of the void.

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3.5.10 Rehabilitation implementation quality control

Inspection and Test Plans (ITPs) that include specific witness or hold points have been developed for key rehabilitation milestones at Marmor. They will ensure that records are maintained for verification of the completion of critical rehabilitation milestones nominated in Section 3.3.2.

These ITPs are provided in Appendix E and cross referenced in the PRCP Schedule (Appendix B and provided separately).

3.5.11 Void closure

The following sections describe the design considerations and rehabilitation strategy for the residual void to ensure it is safe, stable, does not cause environmental harm and can sustain the agreed PMLU (water storage).

The residual void will be 6.76 ha in size with a maximum length of approximately 620 m and a maximum width of approximately 150 m.

3.5.11.1 Potential for environmental harm

Section 3.5.1 and Section 3.5.2 have already shown that the void does not intersect local groundwater aquifers and will not be connected to surrounding surface waters even during PMF event. This is further supported by water balance modelling undertaken for the void (see below).

The quality of the surface water stored within the void does not pose a threat to local groundwater resources and there is no indication that local water quality has been affected by seepage through the void. The void will not act as a permanent groundwater sink and will not adversely affects groundwater levels in the surrounding area.

WATER BALANCE AND OVERTOPPING

An assessment of the water balance in the final void been undertaken using hydrologic modelling. A water balance model was created by considering rainfall, evaporation, contributing catchment area and hydrogeologic characteristics of the area. Conceptually, the final void was considered as a localised sink as per Figure 25.

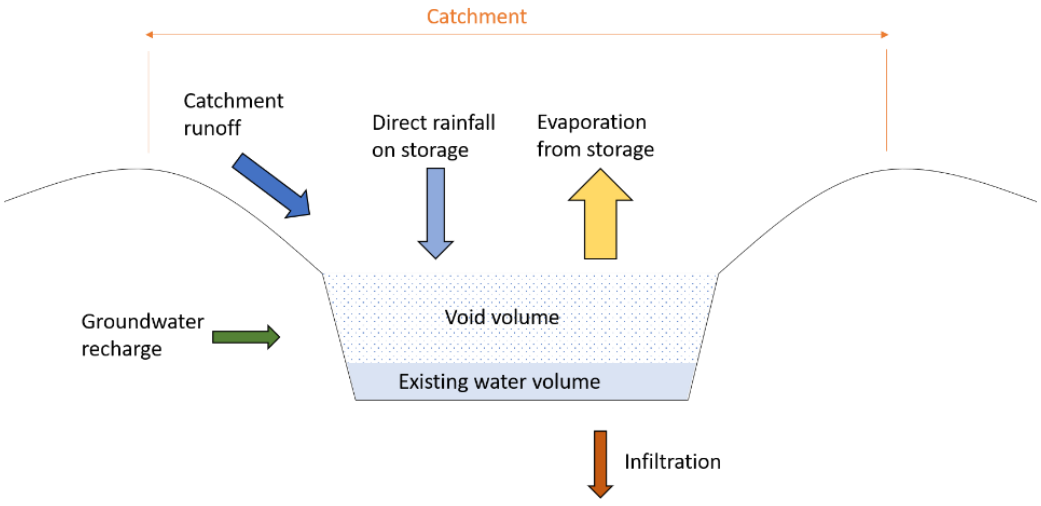

Figure 25 Water balance model representation

Based on the conceptual model, a water balance model was developed using the following inputs:

- Daily rainfall and evaporation from SILO[10] at latitude -23.65° and longitude 150.70° from 01/01/2010 - 02/09/2021
- Void contributing catchment area – 10.79 ha (calculated based on available contour information), including:
  - Grazing area – 4.03 ha
  - Void walls area – 6.35 ha
  - Void lake area – 0.41 ha
- Groundwater recharge & filtration – None (no groundwater interaction with the pit lake (ELA, 2021))
- Runoff coefficient for surface waters for catchment area under grazing – 0.61 (Engineers Australia (2014) and DSITI (2015)) based on:
  - 10-year Average Recurrence Interval (ARI), 1 hour rainfall intensity of 63.5 mm[11] (at latitude -23.68° and longitude 150.71°)
  - Fraction impervious – 0% (due to the post mining land use of grazing)
- Runoff coefficient for surface waters for catchment areas within the void – 0.76 (Engineers Australia (2014) and DSITI (2015)) based on:
  - 10-year Average Recurrence Interval (ARI), 1 hour rainfall intensity of 63.5 mm[11] (at latitude -23.68° and longitude 150.71°)
  - Fraction impervious – 50% (assuming a mixture of hard rock, blasted scree slopes and aggregate equivalent to unsealed roads).

The water balance model operated on a difference calculation (i.e., at the start of the simulation it has a net zero water level that represents the initial water level within the void). The simulation then runs to observe the change in water level over time. The results are presented in Figure 26. Over the period modelled, the water level generally fluctuated within a band of approximately +/- 2 m from initial level. However, in the last 2 years of the simulation, there was a downward trend in water level with evaporation rate significantly greater than the rainfall rate, such that the inflows were lower than losses from the system.

For any one rainfall event that occurred during the simulation, the maximum increase in water level was 1.93 m. The model showed that 811 mm rainfall across approximately four days (24/1/2013-27/1/2013) (approximately equivalent to the average annual rainfall total) caused the water level increase. This is comparable to between a 0.5% and 0.2% Annual Exceedance Probability (AEP) four-day event.

A sensitivity analysis was undertaken by altering the fraction impervious surface within the void area. The assumed value of 50% was replaced with values of between 20% and 90%, resulting in a runoff coefficient of 0.67 and 0.87, respectively. This change produced no significant changes to the results.

[10] https://www.longpaddock.qld.gov.au/silo/

[11] http://www.bom.gov.au/water/designRainfalls/revised-ifd/

The maximum modelled increase to water level was between 1.89 m and 1.95 m under the range of runoff coefficients and the overall trend in water level was unaffected.

Therefore, based on the modelled behaviour of the void the freeboard of approximately 10 m is anticipated to be adequate to prevent overtopping.

The apparent decline in water level from 2018 is due to three consecutive years with annual rainfall substantially below average (450, mm, 245 mm, and 612 mm for 2018, 2019 and 2020 respectively compared to an average of 815 mm) coupled with high evaporation rates (particularly in 2018 and 2019). This is in line with site observations.

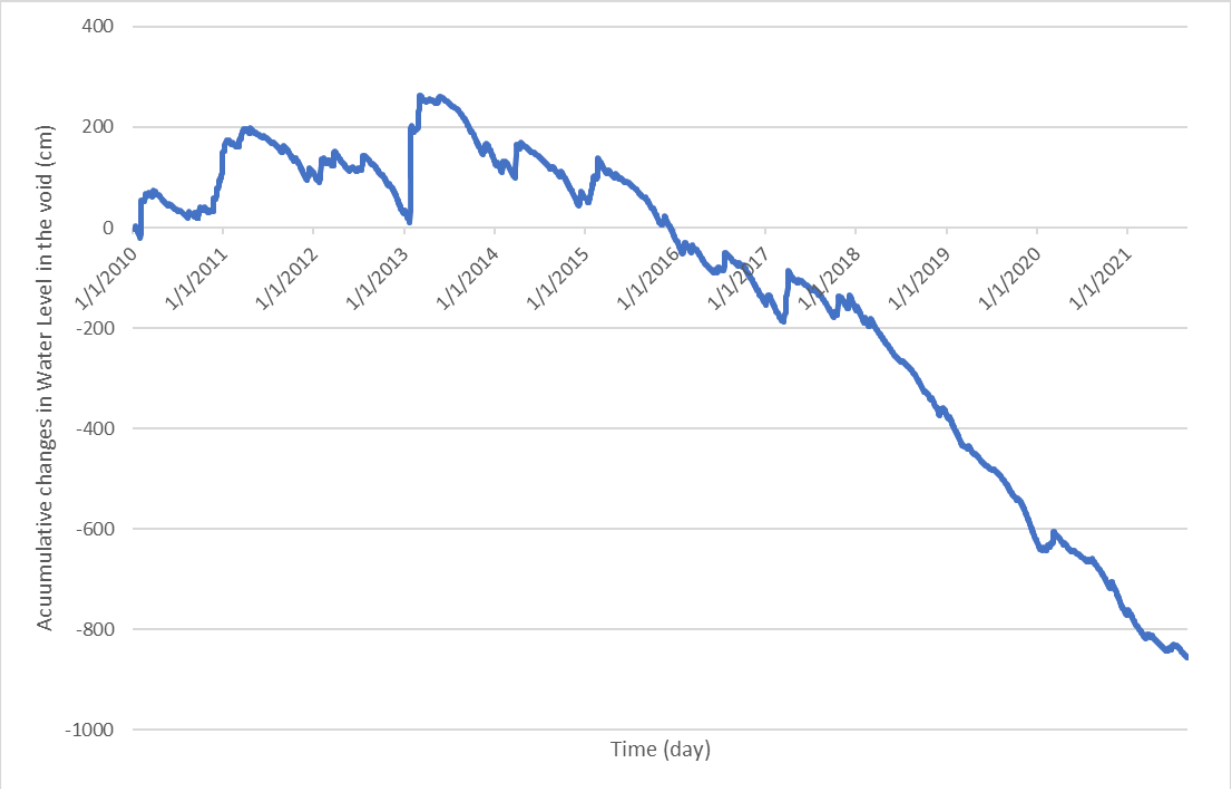

Figure 26 Water balance for simulation of the void

3.5.11.2 Void safety and stability

A geotechnical assessment was undertaken for the void and a rehabilitation plan prepared in 2005 (Meyers 2005, Appendix F). A further geotechnical assessment was made in 2014 following the implementation of stabilisation works within the void (Rocktest Consulting 2014).

Stabilisation works to improve operational mine safety involving a cut back and benching of the southwester section of the void wall were undertaken in July 2014 (Figure 27). This area is included in Rehabilitation Area 14. Prior to these works, a pinnacle (or bull-nose) existed adjacent to the 5 m wide haul road. It was steep (>75^{o}) with a height of > 60 m. This was a significant safety issue and limited safe access to the southern entrance to the void. Using a top down approach three benches were excavated below the crest of the pinnacle to achieve:

- Bench heights 10 m – 20 m

- Berm widths 10 m
- Batter angles 53°.

The geotechnical assessment undertaken in 2014 “considered [this] to be a valid strategy for reducing the risk associated with rockfall” (Rocktest Consulting 2014).

Figure 27: Satellite images of the south west wall of the void at Marmor from September 2013 (left) showing the removal of the pinnacle (circled), battering back and benching (June 2020 – right).

Due to natural weathering over the years, vegetation has established on the south-east wall. The 2005 rehabilitation plan recommended that the south-east face be allowed to weather naturally and that revegetation of the face be encouraged to further reduce erosion and instability. This area is adjacent to the current water body in the void and included in Rehabilitation Area 17.

The recognised instability in the north and north-west walls (Rehabilitation Area 15) (see rock falls between 2005 and 2014 in Figure 30) will be addressed by battering back these wall to 40°. At this stage the plan is to use a modified production blast technique without subdrilling and with low energy back holes to minimize backbreak as recommended by Meyers (2005). The same approach will be used to address instability in the north-east wall. This area is adjacent to areas used for backfilling with kiln dust, reject limestone and coal ash (Rehabilitation Area 18). This is not expected to increase the lateral extent of the disturbance area by more than 20 m. Some of this will occur within areas already identified as ‘minor disturbance’ within the Residual Void Domain resulting in additional disturbance of approximately 0.09 ha. A visualisation of the concept final landform for the void is provided in Figure 28 and a concept design cross section (A-A’) provided in .Figure 29.

Final engineering and landform plans will be prepared after the cessation of mining operations.

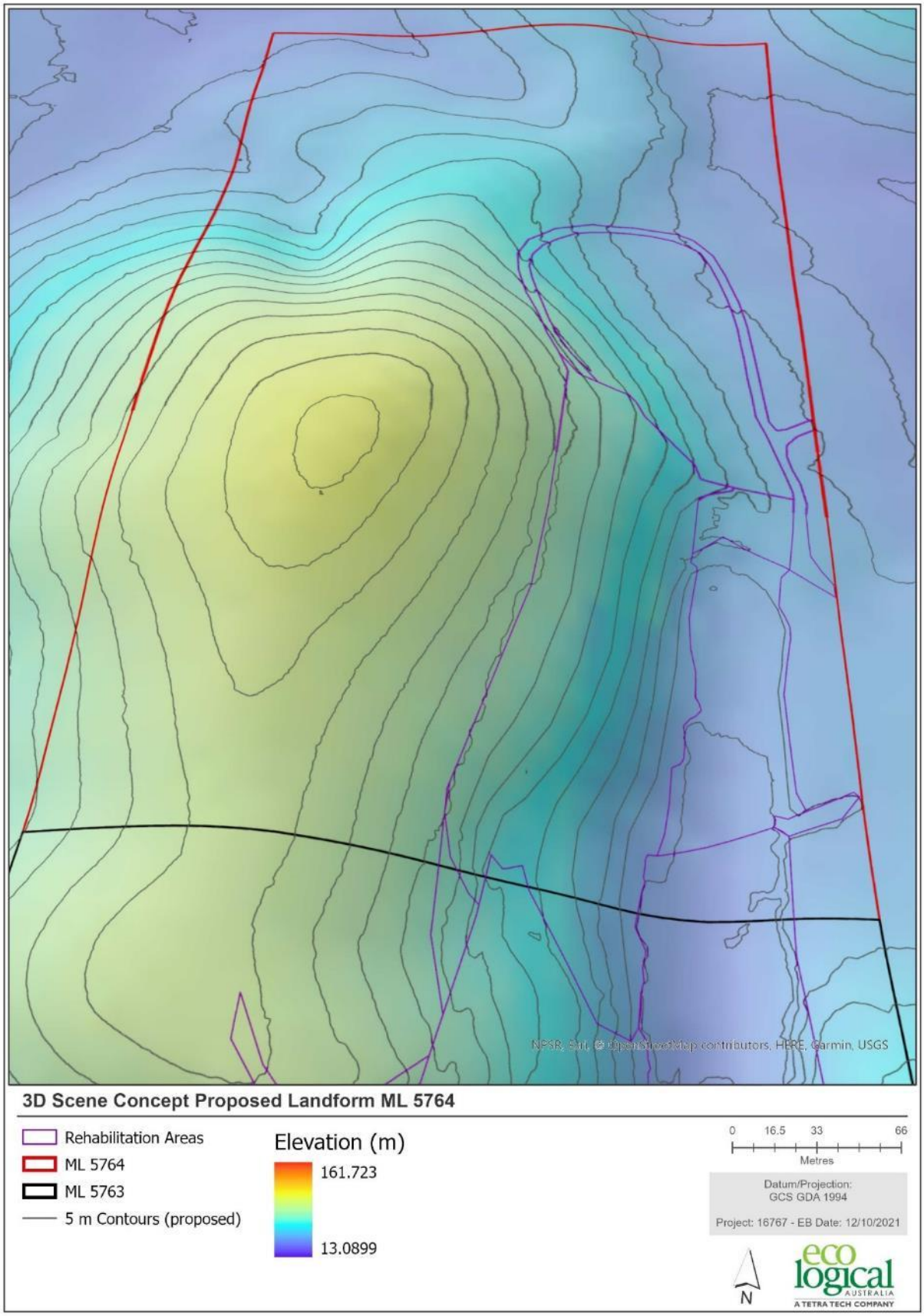

Figure 28: Concept final landform in ML 5764 (5 m contours) including reshaped areas within Rehabilitation Areas 15 and 18

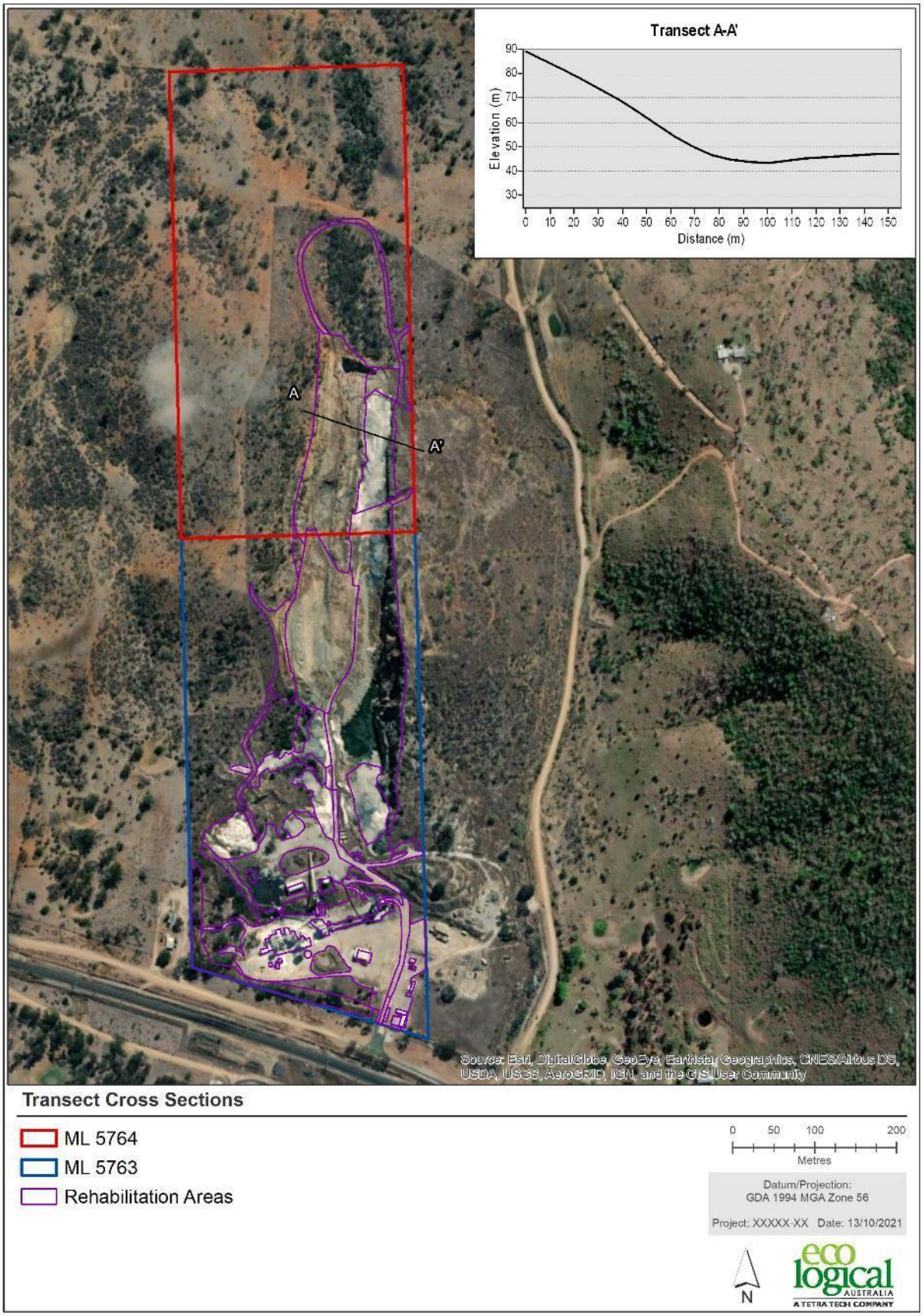

Figure 29: Concept final landform in cross section for reshaped areas within Rehabilitation Areas 15 and 18

The work will be supervised by an appropriately qualified engineer (such as a Registered Professional Engineer of Queensland (RPEQ) or equivalent) to ensure the works are undertaken to the specifications provided in Meyers (2005) (or as updated prior to works implementation). ITPs will be used to provide an audit trail of the completion of key milestones. As built drawings will be generated validate 'as built' profiles for comparison to the design requirements. Any variances will be investigated and rectified as required.

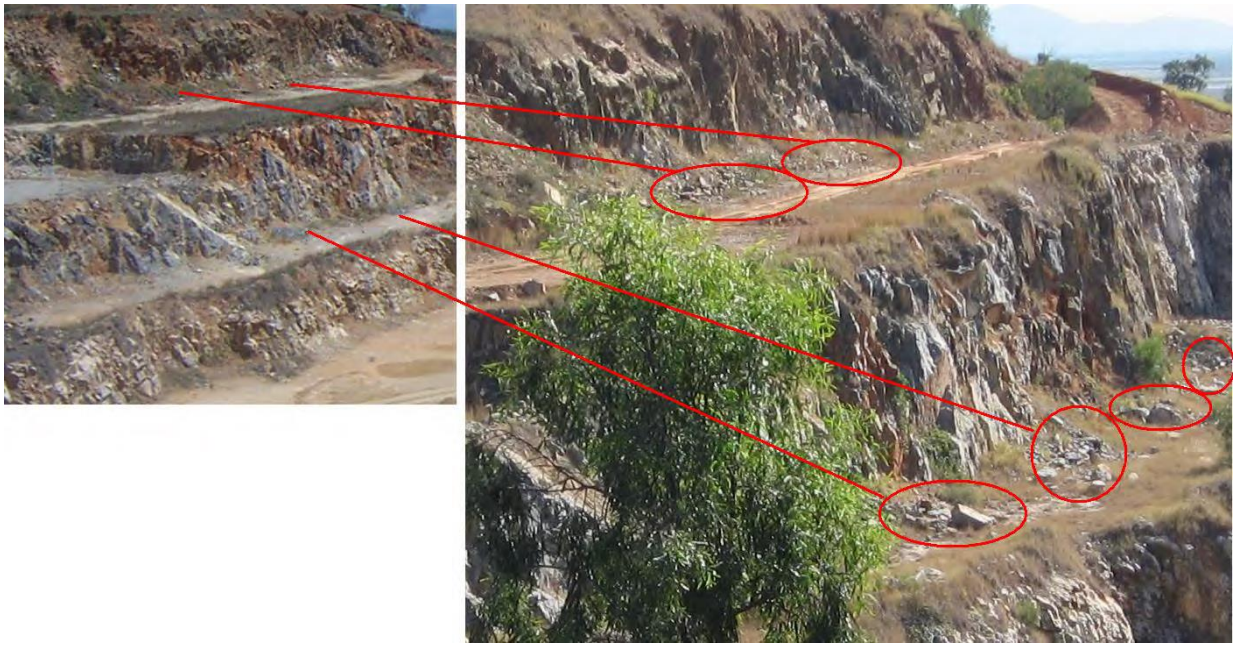

Figure 30: Instability in steep benches on the north-west wall of the void (circles show rock fall at corresponding locations between 2005 and 2014; from Meyer 2005 and Rocktest Consulting 2014). Note the establishment of a tree, shrubs and grasses in the berms in the nine years between the images

A safety bund wall will be constructed around the perimeter of the residual void to limit wildlife, stock and human access. The bund will be constructed of rock salvaged from the void during stabilisation works. Additional characterisation will be conducted to confirm that none of the construction material is acid generating. The bund will be a minimum of 2 m high and 4 m across the base. Signage will be erected outside the safety bund wall to include signs warning of the safety risk and prohibiting unauthorised access. Signs will be erected every 100 m of length of the bund and will comply with *AS 1319-1994 Safety signs for the occupational environment.*

Where bund construction is impractical or may cause an unplanned drainage diversion, (steep sections of the slopes particularly on the eastern side of the void) or where access may be required in the future (such as the ramp down to the water storage), fencing and or lockable gates will be installed. This will be constructed of chain-link fencing mesh (or similar) at least 3 metres high with the top, middle and bottom of the mesh restrained by galvanised straining wire. Posts will be set in concrete at not more than 10 m spacings and be provided with braces as required. The wire mesh will be topped with strands of barbed wire angled outward from the protected area. All tall vegetation will be cleared within 5 metres of the perimeter of the fence and appropriate warning signs attached the fence mesh (as per the specifications for the bund above).

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Refer to Section 3.5.12 for safety aspects relating to an adit located in the void wall.

3.5.11.3 Achievement of the agree PMLU

Void water quality data has been reviewed and discussed in Section 3.1.3. Due to the nature of the geology and void wall geochemistry and with the removal of waste material from the void during closure, specific long-term geochemical modelling is not warranted. There is no significant geochemical risk that would prevent the achievement of the water storage PMLU in the long-term. Routine monitoring of void water quality will be undertaken (Section 3.7.3) and mitigation measures developed is water quality trends indicate that it will not be suitable for stock use as is currently expected.

Although conservation outcomes are not the agreed PMLU, additional revegetation works that support the agreed PMLU though further stabilisation of the void slopes and reducing sediment run off into the void water storage are described in Section 3.5.9.2).

3.5.12 Underground mining

The mine is operated by open cut mining methods. No significant underground workings have been developed nor are any planned for the life of mine. However, a 3 m wide portal is present in the west wall that opens into a 50 m long adit (Figure 31). This is potential microbat habitat.

Prior to closure, the adit will be monitored for microbat activity by an appropriately qualified professional to determine the value of the adit and any species that may be utilising it. This will allow the most appropriate method of closure to be developed, particularly if the area is likely to be affected by works required to provide wall stability.

If the adit is used as microbat habitat, for closure, a bat compatible grid or gate will be installed that prevents human access but allows safe ingress and egress for bats (Figure 31). Additional mitigation measures will be developed to minimise impacts from closure works on any threatened species present. This may include but will not be limited to the timing of works to avoid key breeding season.

If the adit does not provide micro-bat habitat it will be sealed with concrete

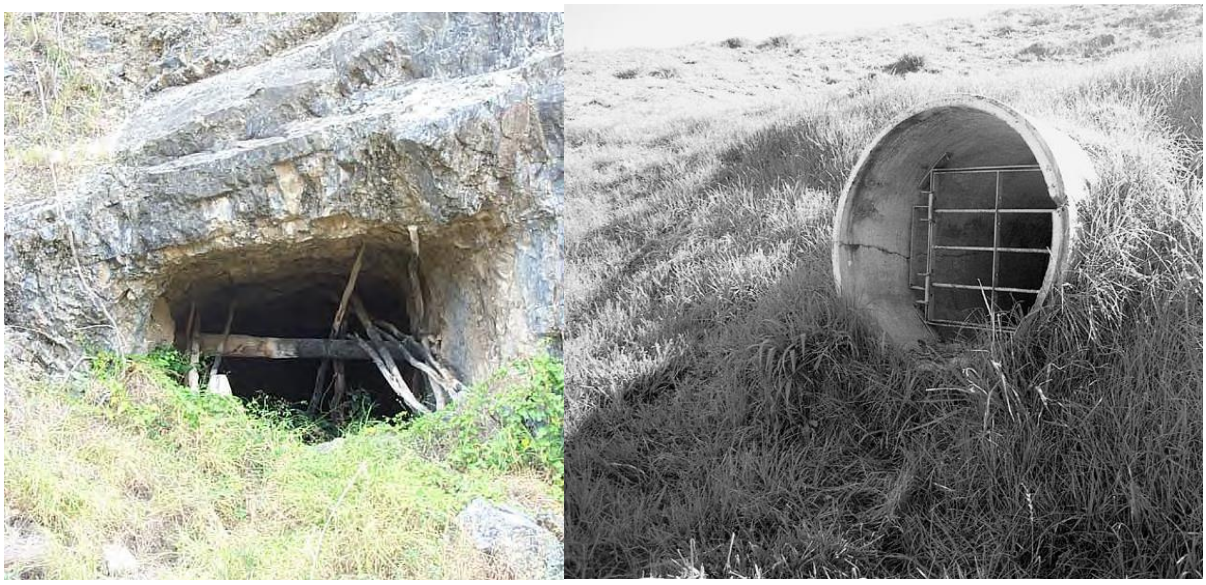

Figure 31: Disused portal and adit on the west wall (left) and a bat compatible grid / gate structure that could be used for closure of the adit (right) if it is used as roosting habitat (Source NSW National Parks and Wildlife Service 2001)

3.5.13 Built infrastructure and services decommissioning

No infrastructure will remain at the completion of rehabilitation.

3.5.13.1 Services

All service connections (electricity, water and wastewater) will be disconnected in coordination with service providers and all associated service infrastructure (such as poles and wires, pipework) will be removed from site.

3.5.13.2 Bores

The water licence associated with the on-site bore will surrendered and the bore decommissioned in consultation with the Queensland Department of Resources according to the preferred practices nominated in the Minimum Construction Requirements for Water Bores in Australia (National Uniform Drillers Licensing Committee 2020). The bore casing will be cut off at least 0.5 m below the surface and decommissioned by fully grouting from the bottom of the bore to the surface.

3.5.13.3 Buildings, plant and equipment

Existing management plans and registers will be reviewed for the presence of hazardous substances on site (such as equipment containing PCB, lead paint or asbestos building materials). Where information is not available, additional surveys for hazardous materials will be undertaken to identify any materials that require specialist contractors for removal and disposal. All other works will be undertaken once the site has been cleared of any hazardous materials.

Where possible, serviceable demountable buildings will be sold or provided for community use. Those that cannot be re-used along with all other general buildings, sheds and tanks used to store non-hazardous materials will be emptied, decommissioned, demolished and all waste materials removed from site. All concrete slabs and footings that are less than 0.5 m deep will be broken up and removed. Footings below 0.5 m will not interfere with rehabilitation operations or the nominated PMLU and will remain in situ.

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All conveyors and gantries will be dismantled and their associated waste removed from site.

Fuel storage tanks will be emptied and decommissioned with the remaining fuel removed by a licenced contractor. Plant and infrastructure used for processing (including the kiln), workshop and fuel storage (including bunds and slabs) will be decommissioned and demolished and all waste materials removed from site. All concrete slabs and footings that are less than 0.5 m deep will be broken up and removed.

Areas that may have been affected by notifiable activities (hydrocarbon storage, lime burning), the workshop area or areas potentially contaminated through the operation of the plant and equipment (RA4 and the sediment in RA5) will undergo a contaminated site investigation and a Site Investigation Report will be prepared by an appropriately qualified person. If the investigation demonstrates that on-site remediation or removal of contaminated material is required, these works will be undertaken and validation sampling has been completed. Where appropriate, an application will then be made to remove the site from Contaminated Land Register. Where the Site Investigation Report determines that contamination can safely remain in-situ (under appropriate management), a Site Management Plan will be prepared by an appropriately qualified person that will include a statement by the underlying landholder (Graymont (NSW) Pty Ltd) accepting responsibility to implement the Site Management Plan.

3.5.13.4 Roads, tracks and hardstands

The aggregate used to create the trafficable surfaces around the administrations, plant and stockpile areas and on unsealed (gravel) roads will be removed to 300 mm and used to enhance the natural regeneration potential of areas within the void floor (see Section 3.5.9.2).

Following the removal of surface aggregate, these areas will be reshaped to create the final landforms and surface drainage pattern as described in Section 3.5.6, before site preparation, topsoiling (Section 3.5.8) and revegetation (Section 3.5.9).

Unsealed tracks that remain within the void domain will not be stripped of aggregate during rehabilitation, but they will be ripped in preparation for revegetation.

3.5.13.5 General

Vehicle hygiene controls will be implemented to minimise the risk of weeds being transported to the site.

3.6 Risk Assessment

Potential environmental risks associated with not achieving rehabilitation outcomes that are safe, stable, non-polluting and the failure to achieve the agreed PMLUs have been assessed with current and additional risk control measures identified. The residual risk after controls has been assessed according the criteria presented in Table 26 to Table 28.

The risk assessment outcomes are presented in Table 29.

All control measures identified have been incorporated into the rehabilitation and closure planning outlined in the PRCP.

Table 26: Likelihood measures

Level	Rating	Description	Frequency
5	Almost certain	The event is expected to occur in most circumstances	More than once a year
4	Likely	The event will probably occur in most circumstances	At least once per year
3	Possible	The event should occur at some time	At least once in 3 years
2	Unlikely	The event could occur at some time	At least once in 10 years
1	Rare	The event may only occur in exceptional circumstances	Less than once in 15 years

Table 27: Consequence measures

Rating (level)	Health	Financial Impact	Environment
Insignificant (1)	Minor injuries not requiring first aid or near miss. No psychological stress	Less than $10,000	Contained, reversible impact managed by on site response
Minor (2)	First Aid treatment and/or one off counselling	$10,000 to $100,000	Contained, reversible impact managed by internal response
Moderate (3)	Medical treatment required and/or psychological intervention/treatment required	$100,000 to $1,000,000	Contained, reversible impact managed by external agencies
Major (4)	Serious or extensive injuries and/or significant and long term psychological stress	$1,000,000 to $10,000,000	Uncontained, reversible impact managed by a coordinated response from external agencies
Catastrophic (5)	Death or severe permanent physical and/or psychological disablements	Greater than $10,000,000	Uncontained, irreversible impact

Table 28: Risk assessment matrix

	Consequence				
Likelihood	**Insignificant (1)**	**Minor (2)**	**Moderate (3)**	**Major (4)**	**Catastrophic (5)**
Almost certain (5)	**Moderate (5)**	**High (10)**	**High (15)**	**Extreme (20)**	**Extreme (25)**
Likely (4)	**Low (4)**	**Moderate (8)**	**High (12)**	**High (16)**	**Extreme (20)**
Possible (3)	**Low (3)**	**Moderate (6)**	**Moderate (9)**	**High (12)**	**High (15)**
Unlikely (2)	**Low (2)**	**Low (4)**	**Moderate (6)**	**Moderate (8)**	**High (10)**
Rare (1)	**Low (1)**	**Low (2)**	**Low (3)**	**Low (4)**	**Moderate (5)**

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Table 29: Risk assessment outcomes

Risk / Threat (Aspect)	Impact	Overview of current controls	Additional controls or actions required (and cross reference to rehabilitation milestones or location in PRCP)	Residual risk
Site contamination	Contamination present poses a threat to human or animal safety	• Hydrocarbons are stored in above ground tanks contained within AS • 1940 compliant bunds with lockable valves. • When the site is operational, mechanical sweepers are used to collect spilt lime products to minimise the potential for mobilisation around and off site. • Run off from the processing plant area is directed to a sediment dam on site. • Monitoring of groundwater quality (prior to the site going into care and maintenance)	• Remaining stockpiled coal will be removed for off-site disposal (Rehabilitation milestones RA2_RM1 in Table 18) • Site Investigation Report prepared and certified by an appropriately qualified person. Remediation and validation sampling undertaken and / or a Site Management Plan prepared (Rehabilitation milestone RA4_RM2 in Table 19) • Kiln dust, reject limestone and coal ash stockpiled inside and outside the void will be removed from site and disposed of at an appropriately licensed waste management facility. Validation sampling undertaken to confirm all waste removed (Rehabilitation milestones RA18_RM1 in Table 22, RA20_RM1 in Table 23) • Sediment dam tested for contaminants prior to rehabilitation to determine management requirements (Rehabilitation milestone RA5_RM1 in Table 19) • The groundwater monitoring program will be restored and action taken in the event of results indicating the potential for environmental harm (Rehabilitation milestone RV_RM7 in Table 22)	Low (4)
Mining infrastructure	Mining infrastructure poses a threat to human or animal safety	The rehabilitation strategy is to remove all mine assets and infrastructure	• All services disconnected (Rehabilitation milestones RA3_RM1 and RA4_RM1 in Table 19) • Site bore decommissioned and rehabilitated (Rehabilitation milestone RA3_RM1 in Table 19) • Hazardous building materials identified, managed and removed by appropriately licenced contractors (Rehabilitation milestone RA3_RM1 and RA4_RM1 in Table 19) • All infrastructure to be removed from Rehabilitation Areas (Rehabilitation milestones RA1_RM1 and	Low (4)

Risk / Threat (Aspect)	Impact	Overview of current controls	Additional controls or actions required (and cross reference to rehabilitation milestones or location in PRCP)	Residual risk
			RA2_RM1 in Table 18; RA3_RM1, RA4_RM1, R63_RM1, RA7_RM1 and RA8_RM1 in Table 19; RA11_RM1 and RA12_RM1 in Table 20)	
Steep slopes and the water storage in residual void	Site poses a threat to human or animal safety (fall and drowning)	Unauthorised access is prohibited	• A safety bund and /or fence will be constructed around the residual void with appropriate signage to prevent unauthorised or accidental access (Rehabilitation milestone RV_RM4 in Table 22).	Moderate (5)
Landform instability in void walls	Void final landform is not stable and will result in degradation and off site impacts	• Geotechnical assessments have been conducted to assess current stability and to inform the rehabilitation strategy for the residual void • All surface water within the residual void drains to the void • Stabilisation works have already been conducted in part of the void • Revegetation trials will be undertaken to increase certainty that revegetation can be achieved in the void to enhance stability and run-off quality	• Slopes requiring stabilisation works (RA15 and RA18) will be reshaped according to recommendations in Meyer (2005) or to specifications verified as suitable (for RA14) in Rocktest Consulting (2014) (Rehabilitation milestones RA14_RM1, RA15_RM1, RA18_RM1) • Run off from unmined areas will be directed away from the void crest where practical (see Section 3.5.7) • Natural regeneration will be enhanced through revegetation works to further improve long-term stability within the void (Rehabilitation milestone RV_RM5 and RV_RM6 in Table 22)	Low (4)
Landform instability in domains other than the void	Final landforms outside the void are not stable and will result in degradation and off site impacts	• There are no large, engineered landforms (such as waste rock dumps or tailings storage facilities) that require detailed landform design • Most disturbance areas requiring rehabilitation outside the void have low slope gradients • There is no evidence of land on the lease areas being prone to instability • Topsoil in stockpiles to be used for rehabilitation has been assessed and results reviewed by a Certified Professional Soil Scientist for this PRCP. The soil is non-sodic and has properties that provide stability.	• Any topsoil imported for rehabilitation will have to meet soil quality and soil stability criteria (Rehabilitation milestones PS_RM3 in Table 18; I_RM4 in Table 19; RT_RM3 in Table 20; RA20_RM3 in Table 23) • Landform development and final landform slopes are consistent with the quality of the soils and the nominated PMLU (Section 3.3.2) • Landform development criteria provided in milestones and water management measures specified (Rehabilitation milestones PS_RM2 in Table 18; RA4_RM2, RA5_RM1, RA6_RM2, RA7_RM2 and RA8_RM2 in Table 19; RT_RM2 in **Error! Reference source not found.**; RA13_RM1 in Table 21; RA20_RM2 in Table 23)	(Low (4)

Risk / Threat (Aspect)	Impact	Overview of current controls	Additional controls or actions required (and cross reference to rehabilitation milestones or location in PRCP)	Residual risk
			• Minimum ground cover required specified that are known to minimise soil erosion (Section 3.2.2 and rehabilitation milestones PS1_RM5 in Table 18; I_RM6 in Table 19; RT_RM5 in Table 20; RA13_RM4 in Table 21; and RA20_RM_RM5 in Table 23) • Erosion monitoring requirements and erosion criteria and requirements for erosion repair provided (Rehabilitation milestones PS1_RM5 in Table 18; I_RM6 in Table 19; RT_RM5 in Table 20; RA13_RM4 in Table 21; and RA20_RM_RM5 in Table 23) • All areas require certification from an appropriately qualified person that the area has achieved stable condition (Rehabilitation milestones PS1_RM5 in Table 18; I_RM6 in Table 19; RT_RM5 in Table 20; RA13_RM4 in Table 21; and RA20_RM_RM5 in Table 23)	
Flooding	Flooding threatens stability of rehabilitated landforms	The site is not in a floodplain and flooding assessment determined that landforms or PMLU unlikely to be affected even under extreme events (Section 3.5.2)	• No additional controls required	Low (2)
Void presence, void geochemistry and void water quality	Void presents a risk to surface and groundwater resources	• It is highly unlikely that the void will connect to surface water through overtopping or flooding (Section 3.5.2 and 3.5.11.1) • The void is above the local groundwater level and the void does not intercept the local aquifer. Given the differences in the quality of the void and local groundwaters there is considered to be no connection between the two. The presence of the void will not result in drawdown of the local water table (Section 3.5.1) • There are no waterways on site and none that is adjacent to sources of pollution that could impact on them	• Kiln dust, reject limestone and coal ash stockpiled inside the void will be removed from site and disposed of at an appropriately licensed waste management facility. Validation sampling undertaken to confirm all waste removed (Rehabilitation milestone RA18_RM1 in Table 22) • The void and groundwater monitoring program will be restored and action taken in the event of adverse results (Rehabilitation milestone RV_RM7 in Table 22)	Low (4)

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Risk / Threat (Aspect)	Impact	Overview of current controls	Additional controls or actions required (and cross reference to rehabilitation milestones or location in PRCP)	Residual risk
		• Previous groundwater and void water quality (prior to the site going into care and maintenance)		
Mine waste landforms provide an on-going source of pollutants	Mine wastes present a risk to surface and groundwater resources	• No significant mine waste landforms are to remain under the rehabilitation strategy for Marmor	• Kiln dust, reject limestone and coal ash stockpiled outside the void will be removed from site and disposed of at an appropriately licensed waste management facility. Validation sampling undertaken to confirm all waste removed (Rehabilitation RA20_RM1 in Table 23)	
Insufficient topsoil quantity and quality	Inability to achieve and sustain nominated post-mine land use (grazing)	• Mass balance conducted and topsoil shortfall identified (Section 3.5.3) • Topsoil in stockpiles to be used for rehabilitation has been assessed and results reviewed by a Certified Professional Soil Scientist for this PRCP and amelioration recommended. The topsoil has good nutrient and water retention properties. (Section 3.5.3) • Topsoil available is suited to PMLU	• Any topsoil imported for rehabilitation will have to meet soil quality and soil stability criteria (Rehabilitation milestones PS_RM3 in Table 18; I_RM4 in Table 19; RT_RM3 in Table 20; RA20_RM3 in Table 23) • Minimum topsoil depth for rehabilitated areas has been specified (Rehabilitation milestones PS_RM3 in Table 18; I_RM4 in Table 19; RT_RM3 in Table 20; RA13_RM2 in Table 21; RA20_RM3 in Table 23) • Topsoil amelioration required according to expert advice (Rehabilitation milestones PS_RM4 in Table 18; I_RM5 in Table 19; RT_RM4 Table 20; RA13_RM3 in Table 21; RA20_RM4 in Table 23)	Low(4)
Vegetation selected is not suited to site conditions	Inability to achieve and sustain nominated post-mine land use (grazing)	• The seed mix chosen was recommended by an Agronomist with Department of Agriculture and Fisheries (DAF) Extension Service in Rockhampton (Section 3.5.9) • The species mix is well suited to the available soil resources and site conditions (Section 3.5.9)	Criteria requiring adherence to the nominated species mix and seeding rate is specified in the Revegetation Section of the PRCP (Rehabilitation milestones PS_RM4 in Table 18; I_RM5 in Table 19; RT_RM4 in **Error! Reference source not found.**; RA13_RM3 in Table 21; RA20_RM4 in Table 23)	Low(2)
Inadequate water supply /drought	Poor pasture establishment and inability to achieve and sustain nominated post-mine land use (grazing)	• The seed mix chosen was recommended by an Agronomist with Department of Agriculture and Fisheries (DAF) Extension Service in Rockhampton and species are tolerant of dry conditions (Section 3.5.9)	No additional controls required	Low(4)

Risk / Threat (Aspect)	Impact	Overview of current controls	Additional controls or actions required (and cross reference to rehabilitation milestones or location in PRCP)	Residual risk
		• The void water storage can be used as a water source for irrigation during periods of drought • Contingency measures included in rehabilitation monitoring and maintenance program (Section 3.7)		
Rehabilitated vegetation not suitable for grazing use	Pasture quality not suitable to achieve and sustain nominated post-mine land use (grazing)	• The seed mix chosen was recommended by an Agronomist with Department of Agriculture and Fisheries (DAF) Extension Service in Rockhampton (Section 3.5.9) • Contingency measures included in rehabilitation monitoring and maintenance program (Section 3.7)	• Vegetation composition, weed presence and monitoring requirements and vegetation maintenance requirements provided (Rehabilitation milestones PS1_RM5 in Table 18; I_RM6 in Table 19; RT_RM5 in **Error! Reference source not found.**; RA13_RM4 in Table 21; and RA20_RM_RM5 in Table 23) • Requirement to establish a sustainable stocking rate provided (Rehabilitation milestones PS1_RM5 in Table 18; I_RM6 in Table 19; RT_RM5 in Table 20; RA13_RM4 in Table 21; and RA20_RM_RM5 in Table 23)	Low(4)
Void water quality unsuitable for stock watering	Inability to achieve and sustain nominated post-mine land use (water storage)	Groundwater and void water quality Monitoring (prior to the site going into care and maintenance)	• Kiln dust, reject limestone and coal ash stockpiled inside the void will be removed from site and disposed of at an appropriately licensed waste management facility. Validation sampling undertaken to confirm all waste removed (Rehabilitation milestone RA18_RM1 in Table 22) • The void and groundwater monitoring program will be restored and action taken in the event of adverse results (Rehabilitation milestone RV_RM7 in Table 22)	Low (4))

3.6.1 Rehabilitation trials

The battered back slopes of Rehabilitation Area 15 provide an ideal location to conduct trials to evaluate the most appropriate species mix and seed delivery methods for the proposed revegetation methods for the residual void presented in Section 3.5.9.2. Trials of aerial seeding will be conducted using UAVs.

The trial will determine the need for and type of seed coating or bulking agent (required for small seeds). Coatings can be used to protect the seed until the first rains following seeding or may contain microbial inoculants with and without trial seed coatings to determine which method is most effective in achieving ground cover and seedling emergence. It will also allow for the selection of the species best suited to the site conditions. The details of the trial methods will be developed in cooperation with a specialist contractor.

The trial will be conducted for at least two years and will commence not less than two years prior to the scheduled revegetation of the void. Amendments will be made to the PRCP planning part as required to reflect changes to revegetation species of techniques. Milestone will also be reviewed and amended accordingly.

3.7 Monitoring and Maintenance

Section 3.3.2 contains information on the objectives and completion criteria against which the completion of rehabilitation milestone and the successful achievement of PMLU to stable a condition.

The prescriptive criteria (requiring the completion of an action) will be captured in the QA/QC procedures outlined in the IITPs (Section 3.5.10 and Appendix E).

The following sections provide the routine monitoring requirements to determine rehabilitation progress against milestones for the achievement of agreed PMLUs to stable a condition. The data will be used to determine maintenance requirements.

All monitoring will be undertaken by appropriately qualified professionals.

3.7.1 Areas with a low intensity grazing PMLU

3.7.1.1 Vegetation monitoring

MONITORING PLOT ESTABLISHMENT

The central 50 m transect of the plot should be aligned across the slope and placed no closer than 10 m from the outer perimeter of the rehabilitation area to avoid possible edge effects. Both ends of each transect should be permanently marked with labelled star pickets and GPS co-ordinates (including the map datum and zone) at the end markers recorded.

The plot layout is illustrated in Figure 32. The assessment plot constitutes a 50 x 10 m area within which the vegetation attributes are assessed as described in the following sections.

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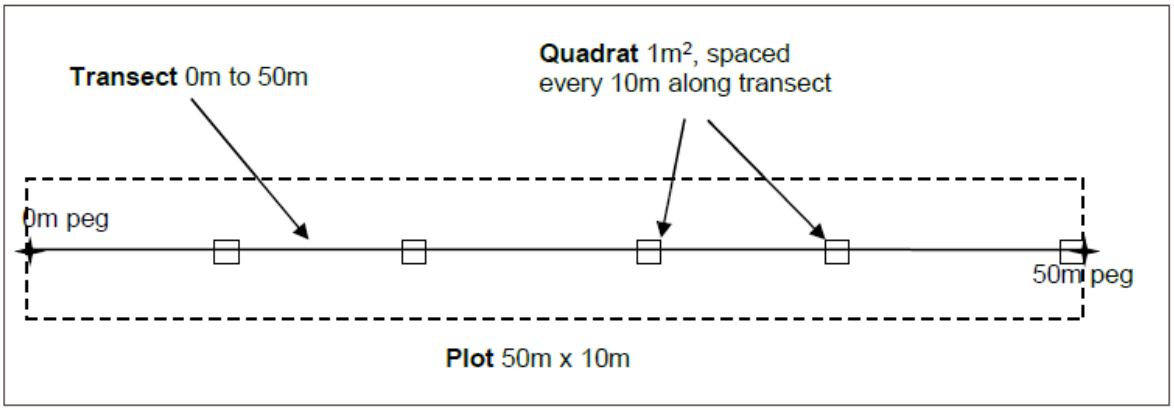

Figure 32: Pasture vegetation monitoring plot layout

PHOTOGRAPHIC RECORDS

Photographs should be taken from each end of the transect on each monitoring occasion as a permanent visual record of the development of the rehabilitation.

GROUND COVER

Observations of the type of cover (limited to the cover present below 0.5 m above ground level) are made at point intercepts along the centre line of the 50 m transect at 0.5 m intervals. Cover types are: vegetation (including all live vegetation and standing senescent vegetation that is still attached to the main plant and is not in intimate contact with the soil); litter; rock or bare ground. The cover type that is intercepted directly below each point is recorded. A total of 100 observations are made per transect and the data recorded on a standard proforma. At the end of each transect before moving on to the next location, a quality assurance (QA) check of the data will be made. The sum of all counts for each cover type and will be checked to ensure it adds up to 100. If it does not, the proforma will be reviewed to check for counting errors or the assessment repeated as required. Ground cover % is calculated as 100 minus bare ground counts.

VEGETATION COMPOSITION (INCLUDING DECLARED WEEDS)

Within each of the 5 x 1 m^2 quadrats along the transect

- % projective cover of declared plant pests to the nearest 1%.
- All species observed and % groundcover to the nearest 5%. Species are to be classified according to lifeform (e.g., perennial grass, annual grass, herb, shrub etc) and
- Species classified according to suitability for pasture / forage or know palatability (from resources such as pasture species for land types in Qld https://futurebeef.com.au/knowledge-centre/land-types-in-grazing-land-management/ , https://ausgrass2.myspecies.info/ and Cook et al. 2020 or literature sources).

Plot average declared weed ground cover and pasture/palatable species richness and cover should be calculated form the data from individual quadrats

STANDING BIOMASS

Photographs will be taken of the standing biomass with an appropriate height marker. Standing pasture will be cut with battery or hand shears close to ground in 5 x 1m^2 quadrats outside each fixed monitoring plot within the area photographed. Cut pasture will be collected into large plastic bags and weighed to the nearest gram. The following steps will be used to calculate standing biomass:

1. Sub-sample each of the 'wet' sample quadrats and combine into one sub-sample.
2. Measure the wet weight of the combined sub-sample
3. Oven dry the sub-sample. This can be done by a commercial laboratory or can be done using a microwave oven. For the latter:
    a. Place the combined sample in a suitable container and reweigh.
    b. Microwave on high for about 30 seconds to 1 minute.
    c. Take out, let moisture steam off, then reweigh.
    d. Repeat until the sample no longer loses weight.
    e. Reweigh the dry pasture on its own and record.
4. Calculate dry matter percentage of the sub-sample (100 x (dry weight/wet weight))
5. Use this dry matter percentage (DM%) to determine the dry matter weight of each 1 m^2 quadrat (quadrat wet weight x (DM%/100))
6. Calculate the equivalent dry matter weight for each quadrat for one hectare (kg DM/ha) (quadrat dry weight x 10).

Once this has been done several times, it should be possible to establish a series of photo standards (like the one in using the plot photos and the standing biomass measurements to be used for future estimates of standing biomass.

Figure 33: Example of a photo standard of Black Speargrass with a pasture yield of 2,450 kg DM/ha

ESTABLISHMENT OF CARRYING CAPACITY

Over-stocking causes pasture and soil degradation in the long-term. It is therefore useful to estimate the carrying capacity of the rehabilitated land particularly through the dry season to inform sustainable stocking rates for relinquishment.

For sown pastures, approximately 40% of the standing biomass can be sustainably grazed. Cattle of approximately 450 kg can consume approximately 8 kg DM per day to maintain body weight (or 1,700 kg DM/head for a 210 day dry season).

To calculate carrying capacity divide demand / head (in kg) by the supply (standing biomass in kg x 0.4) to derive area (ha) required per head of cattle.

SAMPLING INTENSITY AND REPLICATION

The total area to be rehabilitated to the low intensity grazing PMLU is only 5.52 ha in total. Usually a sampling intensity of one plot per 9 ha is adequate. However, to provide robust data that can be used for statistical analysis, monitoring will be conducted at a minimum of four representatives locations within the rehabilitated areas (with a focus on larger areas former infrastructure and waste stockpile areas) and three reference locations in unmined areas to the north and west of the void.

3.7.1.2 Erosion, stability and ponding

As areas are relatively small, the whole area returned to grazing will be traversed to look for signs of active erosion and the development of rills and gullies. This can be conducted as a wandering transect with the observer meandering the full width of the rehabilitation area across the slope to maximise the likelihood of encountering erosion features. Active erosion as defined in the Australian Soil and Land Survey Field Handbook 3rd Edition (The National Committee on Soil and Terrain, 2009).

Areas of slumping or showing evidence of ponding (>10 m^2) will also be identified using the same approach. at this time

Active erosion features, slumping and ponded areas will be photographed and logged with a GPS. This will be provided to Graymont to allow follow up repairs as required.

3.7.1.3 Land management

The wandering transect used to examine erosion and stability will also be used to identify any areas of poor cover and significant declared weed infestations. These will be logged with a GPS and provided to Graymont to allow follow up repairs as required.

3.7.1.4 Water management structures

Section 3.5.7 provides the recommended monitoring for water management structures.

3.7.2 Areas with a water storage PMLU

3.7.2.1 Vegetation monitoring

SPECIES COMPOSITION AND LIFEFORMS

Where safe access allows (such as along ripped tracks or the northern section of the void), vegetation establishment will be assessed at a minimum of three locations using 50 x 10 m plots (as per Section . Native species richness and lifeforms will be recorded (as per Section 5.4.1 of *the BioCondition: A*

Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual. Version 2.2 , Eyre et al 2015).

The established vegetation communities contain natives species that are characteristic of the vegetation communities mapped in the surrounding landscape

Species present will be compared with the species listed in the *Technical Description* for RE 11.11.16 (Eucalyptus *cambageana*, *Acacia harpophylla* woodland on old sedimentary rocks with varying degrees of metamorphism and folding. Lowlands) to confirm that the revegetation contains natives species that are characteristic of the vegetation communities mapped in the surrounding landscape.

The use of UAVs will also be considered if safe access cannot be secured.

PHOTOGRAPHS

Photographs should be taken from each end of the transect on each monitoring occasion as a permanent visual record of the development of the rehabilitation.

3.7.3 Water quality

Surface water quality sampling will be undertaken according to the methods presented in the *Monitoring and Sampling Manual: Environmental Protection (Water) Policy* (DES 2018). Samples will be collected into appropriate containers supplied by the laboratory and chilled. Holding times specified in the manual (or as advised by the receiving laboratory) will be adhered to and samples will be analysed by a NATA accredited laboratory. Appropriate duplicates and sampling blanks should be taken for assessment of reproducibility and cross-contamination control.

The following analytical suites apply

- Suite A: pH, EC, total suspended solids and major ions (Ca, Mg, K, Na, Cl, SO_4 and alkalinity)
- Suite B: Total metals (As, Cd, Cr, Cu, Ni, Pb, Se, Zn) and PAHs.

Results will be compared to ARMCANZ & ANZECC (2000) guidelines for stock water (cattle).

Groundwater sampling will be undertaken according to the same methods and for the same suite of as above with the addition of total petroleum hydrocarbons (TPH). The data will be used to inform the contaminated land investigation to be undertaken at closure.

Results will be compared the WQOs identified in Section 3.1.5.6.

3.7.4 Monitoring schedule and frequency

Table 30 provides the proposed monitoring schedule and frequency for Marmor.

Table 30: Monitoring schedule

Indicator	When monitoring should be initiated	Preferred time of year	Frequency and duration
Photographs (both PMLUs)	In the year after revegetation has been undertaken	Between February and May	Annually until all milestone criteria have been bet on 3 consecutive occasions

Indicator	When monitoring should be initiated	Preferred time of year	Frequency and duration
Pasture groundcover and standing biomass %	In the year after revegetation has been undertaken	In the dry season (between May and November)	Annually until all milestone criteria have been bet on 3 consecutive occasions
Pasture vegetation composition	In the year after revegetation has been undertaken	Between February and May to provide the best opportunities for grass identification	Annually until all milestone criteria have been bet on 3 consecutive occasions
Pasture dry season carrying capacity	Within at least 5 years after vegetation establishment	In the dry season (between May and November)	Once
Erosion, stability and ponding (pasture areas)	In the year after revegetation has been undertaken	Between February and May	Annually until all milestone criteria have been bet on 3 consecutive occasions
Land management (pasture areas)	In the year after revegetation has been undertaken	Between February and May	Annually until all milestone criteria have been bet on 3 consecutive occasions
Void vegetation composition	In the year after revegetation has been undertaken	Between February and May to provide the best opportunities for grass identification	Annually until all milestone criteria have been bet on 3 consecutive occasions
Void water quality	Within 6 months of the finalisation and approval of the PRCP	Wet season and dry season	Every 6 months for suite A Every 12 months for Suite B Until all milestone criteria have been bet on 3 consecutive occasions
Groundwater quality	Within 6 months of the finalisation and approval of the PRCP	Wet season and dry season	Every 6 months for suite A Every 12 months for Suite B and TPH Until the bore is decommissioned

3.7.5 Reporting

A short report will be prepared after of each monitoring event, to record the results obtained and any immediate performance of land management issues identified will be documented after each event.

An annual report will be prepared after completion of ach full round of annual sampling. This will contain details of the methods used, the data collected, quality assurance data. The data will be analysed against the milestone completion criteria and an assessment made of rehabilitation performance. It will also include an assessment of trends (both positive and negative). The report will provide recommendations for repairs or additional management action and any changes required to the monitoring methods or frequency. It will also include a statement regarding the achievement of each PMLU to a stable condition.

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3.7.6 Maintenance and contingency measures

Monitoring or site observations may indicate that rehabilitation is not meeting the desired rehabilitation outcomes and management intervention may be required as identified in Table 31.

Table 31: Contingency measures

Issue	Maintenance treatment
Poor vegetation cover establishment	Adjust fertiliser / soil ameliorant inputs and reseed during appropriate seasonal conditions. Increase irrigation frequency if rainfall inadequate If issue persists conduct additional soil sampling and seek input from an appropriately qualified professional.
Pasture species inconsistent with PMLU	Review rehabilitation strategy and planting lists. Review weed control measures or control frequency Conduct reseed during appropriate seasonal conditions.
Erosion	Review water management controls and amend as required Fill erosion features, provide soil surface protection and reseed during appropriate seasonal conditions.
Water quality does not meet requirements for the PMLU	Investigate quality of drainage or seepage inputs Consider remediation or treatment options Consider alternative PMLU

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Appendix A Wildnet species list

Queensland Government

WildNet species list

Search Criteria: Species List for a Specified Point
Species: Animals
Type: Native
Queensland status: All
Records: All
Date: Since 1980
Latitude: -23.6718
Longitude: 150.7091
Distance: 3
Email: adam.garthwaite@ecoaus.com.au
Date submitted: Monday 30 Aug 2021 11:47:53
Date extracted: Monday 30 Aug 2021 11:50:01

The number of records retrieved = 117

Disclaimer
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The State of Queensland disclaims all responsibility for information contained in this product and all liability (including liability in negligence) for all expenses, losses, damages and costs you may incur as a result of the information being inaccurate or incomplete in any way for any reason.
Information about your Species lists request is logged for quality assurance, user support and product enhancement purposes only.
The information provided should be appropriately acknowledged as being derived from WildNet database when it is used. As the WildNet Program is still in a process of collating and vetting data, it is possible the information given is not complete. Go to the WildNet database webpage (https://www.qld.gov.au/environment/plants-animals/species-information/wildnet) to find out more about WildNet and where to access other WildNet information products approved for publication. Feedback about WildNet species lists should be emailed to wildlife.online@des.qld.gov.au.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Hylidae	*Cyclorana alboguttata*	greenstripe frog		C		3
animals	amphibians	Hylidae	*Cyclorana brevipes*	superb collared frog		C		2
animals	amphibians	Hylidae	*Litoria caerulea*	common green treefrog		C		2
animals	amphibians	Hylidae	*Litoria fallax*	eastern sedgefrog		C		5
animals	amphibians	Hylidae	*Litoria gracilenta*	graceful treefrog		C		1
animals	amphibians	Hylidae	*Litoria nasuta*	striped rocketfrog		C		1
animals	amphibians	Hylidae	*Litoria rothii*	northern laughing treefrog		C		1
animals	amphibians	Hylidae	*Litoria rubella*	ruddy treefrog		C		3
animals	amphibians	Limnodynastidae	*Limnodynastes peronii*	striped marshfrog		C		1
animals	amphibians	Limnodynastidae	*Limnodynastes salmini*	salmon striped frog		C		2
animals	birds	Acanthizidae	*Gerygone olivacea*	white-throated gerygone		C		1
animals	birds	Accipitridae	*Aquila audax*	wedge-tailed eagle		C		1
animals	birds	Accipitridae	*Haliastur sphenurus*	whistling kite		C		3
animals	birds	Anatidae	*Anas gracilis*	grey teal		C		1
animals	birds	Anatidae	*Anas superciliosa*	Pacific black duck		C		5
animals	birds	Anatidae	*Aythya australis*	hardhead		C		2
animals	birds	Anatidae	*Chenonetta jubata*	Australian wood duck		C		1
animals	birds	Anatidae	*Cygnus atratus*	black swan		C		3
animals	birds	Anatidae	*Dendrocygna eytoni*	plumed whistling-duck		C		2
animals	birds	Anatidae	*Nettapus coromandelianus*	cotton pygmy-goose		C		1
animals	birds	Anatidae	*Oxyura australis*	blue-billed duck		C		1
animals	birds	Anhingidae	*Anhinga novaehollandiae*	Australasian darter		C		2
animals	birds	Anseranatidae	*Anseranas semipalmata*	magpie goose		C		1
animals	birds	Ardeidae	*Ardea alba modesta*	eastern great egret		C		2
animals	birds	Ardeidae	*Ardea intermedia*	intermediate egret		C		3
animals	birds	Ardeidae	*Bubulcus ibis*	cattle egret		C		2
animals	birds	Ardeidae	*Egretta garzetta*	little egret		C		1
animals	birds	Ardeidae	*Egretta novaehollandiae*	white-faced heron		C		2
animals	birds	Artamidae	*Cracticus nigrogularis*	pied butcherbird		C		1
animals	birds	Artamidae	*Gymnorhina tibicen*	Australian magpie		C		3
animals	birds	Cacatuidae	*Eolophus roseicapilla*	galah		C		1
animals	birds	Cacatuidae	*Nymphicus hollandicus*	cockatiel		C		2
animals	birds	Campephagidae	*Coracina novaehollandiae*	black-faced cuckoo-shrike		C		1
animals	birds	Charadriidae	*Charadrius ruficapillus*	red-capped plover		C		1
animals	birds	Charadriidae	*Elseyornis melanops*	black-fronted dotterel		C		2
animals	birds	Charadriidae	*Vanellus miles*	masked lapwing		C		1
animals	birds	Charadriidae	*Vanellus miles novaehollandiae*	masked lapwing (southern subspecies)		C		3
animals	birds	Ciconiidae	*Ephippiorhynchus asiaticus*	black-necked stork		C		1
animals	birds	Cisticolidae	*Cisticola exilis*	golden-headed cisticola		C		1
animals	birds	Columbidae	*Geopelia humeralis*	bar-shouldered dove		C		2
animals	birds	Columbidae	*Geopelia striata*	peaceful dove		C		3
animals	birds	Columbidae	*Ocyphaps lophotes*	crested pigeon		C		1
animals	birds	Corvidae	*Corvus orru*	Torresian crow		C		3
animals	birds	Cuculidae	*Centropus phasianinus*	pheasant coucal		C		1
animals	birds	Cuculidae	*Chalcites minutillus barnardi*	Eastern little bronze-cuckoo		C		1
animals	birds	Estrildidae	*Taeniopygia bichenovii*	double-barred finch		C		3

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Falconidae	*Falco berigora*	brown falcon		C		1
animals	birds	Gruidae	*Antigone rubicunda*	brolga		C		2
animals	birds	Halcyonidae	*Dacelo novaeguineae*	laughing kookaburra		C		2
animals	birds	Halcyonidae	*Todiramphus macleayii*	forest kingfisher		C		1
animals	birds	Hirundinidae	*Cheramoeca leucosterna*	white-backed swallow		C		1
animals	birds	Hirundinidae	*Petrochelidon ariel*	fairy martin		C		2
animals	birds	Jacanidae	*Irediparra gallinacea*	comb-crested jacana		C		1
animals	birds	Laridae	*Chroicocephalus novaehollandiae*	silver gull		C		1
animals	birds	Laridae	*Hydroprogne caspia*	Caspian tern		SL		1
animals	birds	Laridae	*Sternula albifrons*	little tern		SL		1
animals	birds	Maluridae	*Malurus cyaneus*	superb fairy-wren		C		1
animals	birds	Maluridae	*Malurus melanocephalus*	red-backed fairy-wren		C		2
animals	birds	Megapodiidae	*Alectura lathami*	Australian brush-turkey		C		1
animals	birds	Meliphagidae	*Entomyzon cyanotis*	blue-faced honeyeater		C		1
animals	birds	Meliphagidae	*Lichmera indistincta*	brown honeyeater		C		4
animals	birds	Meliphagidae	*Meliphaga lewinii*	Lewin's honeyeater		C		1
animals	birds	Meliphagidae	*Melithreptus gularis*	black-chinned honeyeater		C		1
animals	birds	Meliphagidae	*Philemon citreogularis*	little friarbird		C		2
animals	birds	Meliphagidae	*Philemon corniculatus*	noisy friarbird		C		1
animals	birds	Meliphagidae	*Ramsayornis fasciatus*	bar-breasted honeyeater		C		1
animals	birds	Monarchidae	*Grallina cyanoleuca*	magpie-lark		C		2
animals	birds	Monarchidae	*Myiagra rubecula*	leaden flycatcher		C		1
animals	birds	Nectariniidae	*Dicaeum hirundinaceum*	mistletoebird		C		2
animals	birds	Oriolidae	*Sphecotheres vieilloti*	Australasian figbird		C		2
animals	birds	Otididae	*Ardeotis australis*	Australian bustard		C		1
animals	birds	Pachycephalidae	*Colluricincla harmonica*	grey shrike-thrush		C		1
animals	birds	Pachycephalidae	*Pachycephala rufiventris*	rufous whistler		C		3
animals	birds	Pardalotidae	*Pardalotus striatus*	striated pardalote		C		2
animals	birds	Pelecanidae	*Pelecanus conspicillatus*	Australian pelican		C		4
animals	birds	Phalacrocoracidae	*Microcarbo melanoleucos*	little pied cormorant		C		2
animals	birds	Phalacrocoracidae	*Phalacrocorax sulcirostris*	little black cormorant		C		2
animals	birds	Podargidae	*Podargus strigoides*	tawny frogmouth		C		1
animals	birds	Podicipedidae	*Poliocephalus poliocephalus*	hoary-headed grebe		C		1
animals	birds	Podicipedidae	*Tachybaptus novaehollandiae*	Australasian grebe		C		3
animals	birds	Pomatostomidae	*Pomatostomus temporalis*	grey-crowned babbler		C		2
animals	birds	Psittacidae	*Aprosmictus erythropterus*	red-winged parrot		C		3
animals	birds	Psittacidae	*Platycercus adscitus*	pale-headed rosella		C		2
animals	birds	Psittacidae	*Trichoglossus chlorolepidotus*	scaly-breasted lorikeet		C		2
animals	birds	Psittacidae	*Trichoglossus moluccanus*	rainbow lorikeet		C		2
animals	birds	Rallidae	*Gallinula tenebrosa*	dusky moorhen		C		2
animals	birds	Rallidae	*Porphyrio melanotus*	purple swamphen		C		3
animals	birds	Recurvirostridae	*Himantopus himantopus*	black-winged stilt		C		2
animals	birds	Rhipiduridae	*Rhipidura leucophrys*	willie wagtail		C		1
animals	birds	Scolopacidae	*Arenaria interpres*	ruddy turnstone		SL		1
animals	birds	Scolopacidae	*Calidris ferruginea*	curlew sandpiper		CR	CE	1
animals	birds	Scolopacidae	*Calidris ruficollis*	red-necked stint		SL		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Scolopacidae	*Limosa lapponica baueri*	Western Alaskan bar-tailed godwit		V	V	1
animals	birds	Scolopacidae	*Numenius madagascariensis*	eastern curlew		E	CE	1
animals	birds	Scolopacidae	*Numenius phaeopus*	whimbrel		SL		1
animals	birds	Scolopacidae	*Tringa incana*	wandering tattler		SL		1
animals	birds	Scolopacidae	*Tringa nebularia*	common greenshank		SL		1
animals	birds	Scolopacidae	*Tringa stagnatilis*	marsh sandpiper		SL		1
animals	birds	Threskiornithidae	*Platalea flavipes*	yellow-billed spoonbill		C		1
animals	birds	Threskiornithidae	*Platalea regia*	royal spoonbill		C		1
animals	birds	Threskiornithidae	*Plegadis falcinellus*	glossy ibis		SL		1
animals	birds	Threskiornithidae	*Threskiornis molucca*	Australian white ibis		C		3
animals	birds	Threskiornithidae	*Threskiornis spinicollis*	straw-necked ibis		C		1
animals	ray-finned fishes	Ambassidae	*Ambassis agassizii*	Agassiz's glassfish				1
animals	ray-finned fishes	Anguillidae	*Anguilla reinhardtii*	longfin eel				2
animals	ray-finned fishes	Apogonidae	*Glossamia aprion*	mouth almighty				1
animals	ray-finned fishes	Atherinidae	*Craterocephalus stercusmuscarum*	flyspecked hardyhead				2
animals	ray-finned fishes	Clupeidae	*Nematalosa erebi*	bony bream				2
animals	ray-finned fishes	Eleotridae	*Hypseleotris compressa*	empire gudgeon				1
animals	ray-finned fishes	Eleotridae	*Hypseleotris klunzingeri*	western carp gudgeon				1
animals	ray-finned fishes	Megalopidae	*Megalops cyprinoides*	oxeye herring				2
animals	ray-finned fishes	Melanotaeniidae	*Melanotaenia splendida splendida*	eastern rainbowfish				1
animals	ray-finned fishes	Mugilidae	*Mugil cephalus*	sea mullet				1
animals	reptiles	Chelidae	*Emydura macquarii krefftii*	Krefft's river turtle		C		1
animals	reptiles	Chelidae	*Wollumbinia latisternum*	saw-shelled turtle		C		1
animals	reptiles	Colubridae	*Tropidonophis mairii*	freshwater snake		C		3
animals	reptiles	Elapidae	*Furina diadema*	red-naped snake		C		1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992.*
The codes are Extinct (EX), Extinct in the Wild (PE), Critically Endangered (CR), Endangered (E), Vulnerable (V), Near Threatened (NT), Special Least Concern (SL) and Least Concern (C).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999.*
The values of EPBC are Extinct (EX), Extinct in the Wild (XW), Critically Endangered (CE), Endangered (E), Vulnerable (V) and Conservation Dependent (CD).

Records - The first number indicates the total number of records of the taxon (wildlife records and species listings for selected areas).
This number is output as 99999 if it equals or exceeds this value. A second number located after a / indicates the number of specimen records for the taxon.
This number is output as 999 if it equals or exceeds this value.

Appendix B PRCP Schedule

Provided separately as original Excel table

Appendix C Marmor EA

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Permit

Environmental Protection Act 1994

Environmental authority EPML00319713

This environmental authority is issued by the administering authority under Chapter 5 of the Environmental Protection Act 1994.

Environmental authority number: EPML00319713

Environmental authority takes effect on 14 February 2020

Environmental authority holder(s)

Name(s)	Registered address
GRAYMONT (NSW) PTY LTD	Level 16, 111 Pacific Highway NORTH SYDNEY NSW 2060 Australia

Environmentally relevant activity and location details

Environmentally relevant activity/activities	Location(s)
Schedule 3 21: A mining activity that is an ineligible ERA, other than a mining activity mentioned in items 9 to 20	ML5764
Schedule 3 21: A mining activity that is an ineligible ERA, other than a mining activity mentioned in items 9 to 20	ML5763
Ancillary 41 - Cement manufacturing 2: Calcining 200t or more of limestone in a year	ML5764
Ancillary 41 - Cement manufacturing 2: Calcining 200t or more of limestone in a year	ML5763

Additional information for applicants

Environmentally relevant activities

The description of any environmentally relevant activity (ERA) for which an environmental authority (EA) is issued is a restatement of the ERA as defined by legislation at the time the EA is issued. Where there is any inconsistency between that description of an ERA and the conditions stated by an EA as to the scale, intensity or manner of carrying out an ERA, the conditions prevail to the extent of the inconsistency.

An EA authorises the carrying out of an ERA and does not authorise any environmental harm unless a condition stated by the EA specifically authorises environmental harm.

Queensland Government

A person carrying out an ERA must also be a registered suitable operator under the *Environmental Protection Act 1994* (EP Act).

Contaminated land

It is a requirement of the EP Act that an owner or occupier of contaminated land give written notice to the administering authority if they become aware of the following:

- the happening of an event involving a hazardous contaminant on the contaminated land (notice must be given within 24 hours); or
- a change in the condition of the contaminated land (notice must be given within 24 hours); or
- a notifiable activity (as defined in Schedule 3) having been carried out, or is being carried out, on the contaminated land (notice must be given within 20 business days);

that is causing, or is reasonably likely to cause, serious or material environmental harm.

For further information, including the form for giving written notice, refer to the Queensland Government website www.qld.gov.au, using the search term 'duty to notify'.

Take effect

Please note that, in accordance with section 200 of the EP Act, an EA has effect:

a) if the authority is for a prescribed ERA and it states that it takes effect on the day nominated by the holder of the authority in a written notice given to the administering authority-on the nominated day; or

b) if the authority states a day or an event for it to take effect-on the stated day or when the stated event happens; or

c) otherwise-on the day the authority is issued.

However, if the EA is authorising an activity that requires an additional authorisation (a relevant tenure for a resource activity, a development permit under the *Sustainable Planning Act 2009* or an SDA Approval under the *State Development and Public Works Organisation Act 1971*), this EA will not take effect until the additional authorisation has taken effect.

If this EA takes effect when the additional authorisation takes effect, you must provide the administering authority written notice within 5 business days of receiving notification of the related additional authorisation taking effect.

If you have incorrectly claimed that an additional authorisation is not required, carrying out the ERA without the additional authorisation is not legal and could result in your prosecution for providing false or misleading information or operating without a valid environmental authority.

Filiz Tansley
Department of Environment and Science
Delegate of the administering authority
Environmental Protection Act 1994

Date issued: 14 February 2020

Enquiries:
Minerals Business Centre
Department of Environment and Science

Phone: 07 4222 5352
Email: ESCairns@des.qld.gov.au

It is noted that on 5 June 2019, mining lease (ML) 3614 was de-amalgamated to a new environmental authority, as such this environmental authority no longer has authorisation to those tenures and associated activities.

Obligations under the *Environmental Protection Act 1994*

In addition to the requirements found in the conditions of this environmental authority, the holder must also meet their obligations under the EP Act, and the regulations made under the EP Act. For example, the holder must comply with the following provisions of the Act:

- general environmental duty (section 319)
- duty to notify environmental harm (section 320-320G)
- offence of causing serious or material environmental harm (sections 437-439)
- offence of causing environmental nuisance (section 440)
- offence of depositing prescribed water contaminants in waters and related matters (section 440ZG)
- offence to place contaminant where environmental harm or nuisance may be caused (section 443)

Other permits required

This permit only provides an approval under the *Environmental Protection Act 1994*. In order to lawfully operate you may also require permits / approvals from your local government authority, other business units within the department and other State Government agencies prior to commencing any activity at the site. For example, this may include permits / approvals with your local Council (for planning approval), the Department of Transport and Main Roads (to access state controlled roads), the Department of Natural Resources, Mines and Energy (to clear vegetation), and the Department of Agriculture and Fisheries (to clear marine plants or to obtain a quarry material allocation).

Schedule of Conditions

The aforementioned description of the ERA for which this authority is issued is simply a restatement of the activity as prescribed in the legislation at the time of issuing this authority. Where there is conflict between the above description of the ERA for which this authority is issued and the conditions as specified in this authority as to the scale, intensity or manner of carrying out of the ERA, then such conditions prevail to the extent of the inconsistency.

This authority incorporates the following schedule of conditions relevant to various issues.

Schedule 3A – General Financial Assurance

A1-1 Provide a financial assurance in the amount and form required by the administering authority prior to the commencement of activities proposed under this environmental authority.

Note: The calculation of financial assurance for condition (A1-1) must be in accordance with Guideline 17 and may include a performance discount. The amount is defined as the maximum total rehabilitation cost for complete rehabilitation of all disturbed areas, which may vary on an annual basis due to progressive rehabilitation. The amount required for financial assurance must be the highest Total Rehabiltiation Cost calculated for any year of the Plan of Operations and calculated using the formula: (Financial Assurance = Highest Total Annual Rehabiliation Cost x Percentage Required)

A1-2 The financial assurance is to remain in force until the administering authority is satisfied that no claim on the assurance is likely.

Note: Where progressive rehabilitation is completed and acceptable to the administering authority, progressive reductions to the amount of financial assurance will be applicable where rehabilitation has been completed in accordance with the acceptance criteria defined within this environmental authority.

Maintenance of measures, plant and equipment

A2-1 The environmental authority holder must ensure:

a) that all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority are installed; and

b) that such measures, plant and equipment are maintained in a proper condition; and

c) that such measures, plant and equipment are operated in a proper manner.

Monitoring

A3-1 Record, compile and keep all monitoring results required by this environmental authority and make available for inspection all or any of these records upon request by the administering authority.

A3-2 Where monitoring is a requirement of this environmental authority, ensure that a competent person(s) conducts all monitoring.

Storage and handling of flammable and combustible liquids

A4-1 Spillage of all flammable and combustible liquids must be contained within an on-site containment system and controlled in a manner that prevents environmental harm (other than trivial harm) and maintained in accordance with Section 5.9 of AS 1940 – Storage and Handling of Flammable and Combustible Liquids of 1993.

END OF CONDITIONS FOR SCHEDULE 3A

Schedule 3B – Air Quality

B1-2 The release of noxious or offensive odours or any other noxious or offensive airborne contaminants resulting from the activity must not cause a nuisance at any odour sensitive place.

Dust Nuisance

B2-1 The release of dust and/or particulate matter resulting from the activity must not cause an environmental nuisance at any dust sensitive place.

B2-2 Excedence of any of the following levels when measured at any dust sensitive place is an environmental nuisance for the purposes of condition B2-1.

- Dust deposition of 120 milligrams per square metre per day, when monitored in accordance with Australian Standard AS 3580.10 of 1991; OR
- A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometre (µm) (PM10) suspended in the atmosphere of 150 micrgrams per cubic metre over a 24 hour averaging time, at a dust sensitive place downwind of the site, when monitored in accordance with:
- Australian Standard AS 3580.9.6 'Ambient air – Particulate matter – Determination of suspended particulate PM10 high-volume sampler with size-selective inlet – Gravimetric method', or
- Any alternative method of monitoring PM10 which may be permitted by the 'Air Quality Sampling Manual' as published from time to time by the administering authority.

B2-3 When requested by the Administering Authority, dust and particulate monitoring must be undertaken to investigate any complaint of environmental nuisance caused by dust and/or particulate matter, and the results notified with 14 days to the administering authority following completion of monitoring. Monitoring must be carried out at a place(s) relevant to the potentially affected dust sensitive place and at upwind control sites and must include:

- For a complaint alleging dust nuisance, dust deposition; and
- For a complaint alleging adverse health effects caused by dust, the concentration per cubic metre of particulate matter with an aerodynamic diameter of less than 10 micrometre (µm) (PM10) suspended in the atmosphere over a 24hr averaging time.

The release of contaminants to the atmosphere

B3-1 Contaminants must not be released to the atmosphere from a release point shown in Schedule B – Table 1 other than:

a) In accordance with the criteria shown in Schedule B – Table 1; and

b) Directed vertically upwards, with no impedance.

B3-2 Contaminants must be released to the atmosphere from a release point at a height and a flow rate not less than the corresponding height and velocity stated for that release point in Schedule B – Table 1.

Contaminants must not be released to the atmosphere from a release point at a concentration, as measured at a monitoring point, in excess of that stated in Schedule B – Table 1 and must be monitored not less frequently than stated in Schedule B – Table 1.

Schedule B – Table 1 (Release of Contaminants)

Release point number	Minimum release height (metres)	Minimum velocity (m/sec)	Contaminant release	Maximum release limit	Sampling frequency
RP1 Rotary Kiln Exhaust	25	--	Particulates	100mg/Nm^3 dry 12% CO_2	Annually

B3-4 When requested by the Administering Authority, contaminant monitoring and recording must be undertaken to investigate any complaint of air contamination, and the results notified within 14 days to the administering authority. If you can provide evidence through monitoring that the limits in Schedule B Table 1 are not being exceeded then you shall not be in break of condition B2-1 with regards to any release of the contaminants listed in Schedule B Table 1. When monitoring is requested the following must be complied with:

- Monitoring provisions for the release points listed in Schedule B – Table 1 must comply with the Austrlaian Standard AS 4323.1 – 1995 'Stationary source emissions Method 1: Selection of sampling positions'.
- The following tests must be performed for each required determination specified in Schedule B – Table 1:
- Gas velocity and volume flow rate;
- Gas temperature
- Water vapour concentration (moisture content),
- Where practicable samples must be taken when emissions are expected to be at maximum rates.
- During the sampling period the following additional information must be gathered:
- Production rate at the time of sampling;
- Pressure drop across fabric filter dust collector;
- Raw materials used;
- Number of equipment and mixing vessels operating;
- Operating or mixing temperature;
- Product made; and
- Reference to the actual test methods and accuracies.

B3-5 If monitoring indicates exceedance of the relevant limits in Schedule B Table 1, then the environmental authority holder must:

- Address the complaint including the use of appropriate dispute resolution if required or;
- Immediately implement dust abatement measures so that emissions of dust from the activity do not result in further environmental nuisance.

Fabric Filter Dust Collector (FFDC)

B4-1 All collected material removed from the FFDC must be handled or disposed of in a manner that minimises dust emissions.

B4-2 All contaminant emissions from Release Point 1 in Schedule B Table 1 must be treated via the FFDC emission control system except during emergency shut-down.

Fuel Burning

B5-1 The sulphur content of any fuel burned in industrial fuel burning equipment is not to exceed 3 percent by weight.

B5-2 The fuels that may be burned in industrial fuel burning equipment are coal and fuel oil.

B5-3 Reclaimed fuel oil must only be sourced from an oil recycler who is the holder of a current registration certificate for a development approval for that activity under the Environmental Protection Act 1994.

END OF CONDITIONS FOR SCHEDULE 3B

Schedule 3C – Water Management

Release to waters

C1-1 Contaminants must not be released from the site to any waters or the bed and banks of any waters.

Erosion protection measures and sediment controls

C2-1 All reasonable and practicable erosion protection measures and sediment control measures must be implemented and maintained to minimise erosion and the release of sediment.

Bunding

C3-1 All petroleum storage tanks must be bunded according to the Australian Standards for The Storage and Handling of Flammable and Combustible Liquids (Section 5.9 AS 1940).

C3-2 Where it is impractical to completely roof a bunded area the holder of this environmental authority must ensure that any stormwater captured within the bund is free from contaminants or wastes prior to any release.

END OF CONDITIONS FOR SCHEDULE 3C

Schedule 3D – Land Management

Rehabilitation landform criteria

D1-1 All areas significantly disturbed by mining activities must be rehabilitated to a stable landform with a self-sustaining vegetation cover in accordance with final land use and landform design in Schedule D – Table 1.

Schedule D – Table 1 (Final Land Use and Rehabilitation Approval Schedule)

	DISTURBANCE TYPE					
	Product stockpiles	**Residual voids**	**Infrastructure**	**Roads and tracks**	**Rejects & waste stockpiles**	**Topsoil stockpiles**
Tenure ID	ML3614 ML5763 Lot 1 MPH3895	ML3614 ML5763 ML5764	ML3614 ML5763 Lot 1 MPH3895	ML3614 ML5763 ML5764 Lot 1 MPH3895	ML3614 ML5763 ML5764	ML5763
Projective surface area	0.5ha	8ha	3ha	0.7ha	2ha	0.05ha
Post mine land use	Low intensity grazing	Water storage	Low intensity grazing	Low intensity grazing	Low intensity grazing	Low intensity grazing
Post mine land description	Flat vegetated land	Open void	Flat revegetated land	Flat revegetated land	Slightly elevated with slopes <6:1	Flat revegetated land
Post mine land capability classification	VII	Class VIII	VII	VII	VII	VII
Projective cover range (%)	50%	N/A	50%	50%	50%	50%
Species Mix	Rhodes grass		Rhodes grass	Rhodes grass	Rhodes grass	Rhodes grass

D1-2 Progressive rehabilitation must commence when areas become available within the operational land.

Infrastructure

D2-1 All infrastructure, constructed by or for the environmental authority holder during the mining activities including water storage structures, must be removed from the site prior to mining lease surrender, except where agreed in writing by the post mining land owner/holder.

Note: this is not applicable where the landowner/holder is also the environmental authority holder.

END OF CONDITIONS FOR SCHEDULE 3D

Schedule 3E – Noise and Vibration

Noise nuisance

E1-1 Subject to Conditions (E1-2) and (E1-3) noise from the mining activity must not cause an environmental nuisance, at any sensitive or commercial place.

E1-2 When requested by the administering authority, noise monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolour nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within 14 days to the administering authority following completion of monitoring.

E1-3 If the environmental authority holder can provide evidence through monitoring that the limits defined in Schedule E – Table 1 and 2 inclusive, are not being exceeded then the holder is not in breach of Condition (E1-1). Monitoring must include:

- LA, max adj, T; and
- The level and frequency of occurrence or impulsive or tonal noise; and
- Atmospheric conditions including wind speed and direction; and
- Location, date and time of recording.

E1-4 If monitoring indicates exceedance of the limits in Schedule E – Table 1 and 2, then the environmental authority holder must:

- Address the complaint including the use of appropriate dispute resolution if required; or
- Immediately implement noise abatement measrues so that emission of noise from the activity do not result in further environmental nuisance.

E1-5 The method of measurement and reporting of noise levels must comply with the latest edition of the Environmental Protection Agency's Nosie Measurement Manual.

Schedule E – Table 1 (Noise Limits)

Noise level dB(A) measured as	Monday to Saturday			Sundays and public holidays		
	7am-6pm	6pm-10pm	10pm-7am	9am-6pm	6pm-10pm	10pm-9am
	Noise measured at a 'Noise sensitive place'					
L_{A10}, adj, 10 mins	b/g+5	b/g+5	b/g+5	b/g+5	b/g+5	b/g+0
L_{A1}, adj, 10 mins	b/g+10	b/g+10	b/g+5	b/g+10	b/g+10	b/g+5
	Noise measured at a 'Commercial place'					
L_{A10}, adj, 10 mins	b/g+10	b/g+10	b/g+5	b/g+10	b/g+10	b/g+5
L_{A1}, adj, 10 mins	b/g+15	b/g+15	b/g+10	b/g+15	b/g+15	b/g+10

Vibration nuisance

E2-1 Subject to Conditions (E2-2) and (E2-3) must not cause an environmental nuisance at any sensitive or commercial place.

E2-2 When requested by the administering authority, vibration monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolour nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within 14 days to the administering authority following completion of monitoring.

E2-3 If the environmental authority holder can provide evidence through monitoring that the limits defined in Schedule E – Table 3 are not being exceeded then the holder is not in breach of (E2-1). Monitoring must include:

- Location of the blast(s) within the mining area (including which bench level); and
- Atmospheric conditions including temperature, relative humidity and wind speed and direction; and
- Location, date and time of recording.

E2-4 If monitoring indicates exceedance of the relevant limits in Schedule E – Table 3, then the environmental authority holder must:

- Address the complaint including the use of appropriate dispute resolution if required; or
- Immediately implement vibration abatement measures so that vibration from the activity does not result in further environmental nuisance.

Schedule E – Table 3 (Vibration Limits)

Location	**Vibration Measured**	
	Monday to Friday 9am – 3pm	**Saturday, Sundays and public holidays**
Sensitive or commercial place	5mm/s peak particle velocity for nine (9) out of ten (10) consecutive blasts and not greater than 10mm/s peak particle velocity at any time	**No blasting to occur**

Note: The method of measurement and reporting of vibration levels must comply with the latest edition of the Department of Environment and Resource Management vibration and air blast overpressure monitoring guideline.

END OF CONDITIONS FOR SCHEDULE 3E

Schedule 3F – Waste Management

Waste Handling

F1-1 All regulated waste removed from the site must be removed by a person who holds a current environmental authority to transport such as waste under the provisions of the *Environmental Protection Act 1994.*

END OF CONDITIONS FOR SCHEDULE 3F

Schedule 3G – Community

Complaint response

G1-1 All complaints received must be recorded including details of complainant, reasons for the complaining, investigations undertaken, conclusions formed and actions taken. This information must be made available for inspection by the administering authority on request.

END OF CONDITIONS FOR SCHEDULE 3G

END OF PART 3

Definitions

"acceptance criteria" means the measures by which the actions implemented to rehabilitate the land are deemed to be complete. The acceptance criteria indicate the success of the rehabilitation outcome or remediation of areas which have been significantly been disturbed by the mining activities. Acceptance criteria may include information regarding:

- vegetation establishment, survival and succession;
- vegetation productivity, sustained growth and structure development;
- fauna colonisation and habitat development;
- ecosystem processes such as soil development and nutrient cycling, and the recolonisation of specific fauna groups such as collembola, mites and termites which are involved in these processes;
- microbiological studies including recolonisation by mycorrhizal fungi, microbial biomass and respiration;
- effects of various establishment treatments such as deep ripping, topsoil handling, seeding and fertiliser application on vegetation growth and development;
- resilience of vegetation to disease, insect attack, drought and fire;
- vegetation water use and effects on ground water levels and catchment yields.

'airblast overpressure' means energy transmitted from the blast site within the atmosphere in the form of pressure waves. The maximum excess pressure in this wave, above ambient pressure is the peak airblast overpressure measured in decibels linear (dB).

'ambient (or total) noise' at a place, means the level of noise at the place from all sources (near and far), measured as the Leq for an appropriate time interval.

'competent person' means a person with the demonstrated skill and knowledge required to carry out the task to a standard necessary for the reliance upon collected data or protection of the environment.

'authority' means an environmental authority (mining activities) under the *Environmental Protection Act 1994*.

'blasting' means the use of explosive materials to fracture:

a) rock, coal and other minerals for later recovery, or

b) structural components or other items to facilitate removal from a site or for reuse.

'commercial place' means a work place used as an office or for business or commercial purposes, which is not part of the mining activity and does not include employees' accommodation or public roads.

'dam' means a containment or proposed containment whether permanent or temporary, which is designed to contain, divert or control flowable substances. However this does not include a fabricated or manufactured tank or container designed to a recognised standard.

'dust sensitive place' means-

- a dwelling, mobile home or caravan park, residential marina or other residential place;

- a motel, hotel or hostel;
- a kindergarten, school, university or other educational institution;
- a medical centre or hospital;
- a protected area;
- a public park or gardens;
- a place used as an office for business or commercial purposes and includes the curtilage of any such place.

'environmental authority holder' means the holder of this environmental authority.

'hazardous waste' means any substance, whether liquid, solid or gaseous, derived by or resulting from, the processing of minerals that tends to destroy life or impair or endanger health.

'infrastructure' means water storage dams, roads and tracks, buildings and other structures built for the purpose of the mining activities but does not include facilities required for the long term management of mining impacts or the impacts or the protection of potential resources. Such facilities include dams containing hazardous waste, waste rock dumps, voids, or ore stockpiles and building or other structures whose ownership can be transferred and which have a residual beneficial use for the next owner of the operational land or the background land owner.

"L_{A10}, adj, 10 mins" means the A-weighted sound pressure level, *(adjusted for tonal character and impulsiveness of the sound)* exceeded for 10% of any 10-minute measurement period, using Fast response.

"L_{A1}, adj, 10 mins" means the A-weighted sound pressure level, *(adjusted for tonal character and impulsiveness of the sound)* exceeded for 1% of any 10-minute measurement period, using Fast response.

"L_A, max adj, T" means the average maximum A-weighted sound pressure level, adjusted for noise character and measured over any 10 minute period, using Fast response.

'land' in the 'land schedule' of this document means land excluding waters and the atmosphere.

'land capability' as defined in the DME 1995 Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland.

'land suitability' as defined in the DME 1995 Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland.

'land use' term to describe the selected post mining use of the land, which is planned to occur after the cessation of mining operations.

'mandatory reporting level' means the volume below the spillway crest, equivalent to the lower of the AEP, 72 hour storm or the AEP wave allowance (AEP is the annual exceedance probability).

'mineral' means a substance which normally occurs naturally as a part of the earth's crust or is dissolved or suspended in water within or upon the earth's crust and includes a substance which may be extracted from such a substance, and includes-

a) clay if mined for its ceramic properties, kaolin and bentonite;

b) foundry sand;

c) hydrocarbons and other substance or matter occurring in association with shale or coal and necessarily mined, extracted, produced or released by or in connection with mining for shale or coal or for the purpose of enhancing the safety or current or future mining operations for coal or the extraction or proxuction of mineral oil therefrom;

d) limestone if mined for use for its chemical properties;

e) marble;

f) mineral oil or gas extracted or produced from shale or coal by in situ processes;

g) peat;

h) salt including brine;

i) shale from which mineral oil may be extracted or produced;

j) silica, including silica sand, if mined for use for its chemical properties;

k) rock mined in rock or slab form for building or monumental purposes;

but does not include –

l) living matter;

m) petroleum within the meaning of the Petroleum Act 1923;

n) soil, sand, gravel or rock (other than rock mined in block or slab form for building or monumental purposes) to be used or to be supplied for use as such, whether intact or in broken form;

o) water.

'noxious' means harmful or injurious to health or physical well being, other than trivial harm.

'non-standard' means a mining operation that if in the opinion of the administering authority does not have a low risk of serious environmental harm and the activities can not comply with the criteria for standard mining activities prescribed in schedule 1A of the *Environmental Protection Regulation 1998*. The standard mining activity trigger criteria are as follows;

- the mining activities do not or will not cause more than 10ha of land to be significantly disturbed at any one time;

- the mining activities do not or will not cause more than 5ha of land to be significantly disturbed at any one time;

a) in a riverine area;

b) because of mine workings;

- the mining activities are not or will not be carried out in, or within 2km of a category A *Environmentally Sensitive Area;*
- the mining activities are not or will not be carried out in, or within 1km of a category B *Environmentally Sensitive Area;*
- the mining activities do not include a level 1 environmentally relevant activity
- no more than 20 persons are carrying out or will, at any one time, carry out the mining activities;

'offensive' means causing reasonable offence or displeasure; is disagreeable to the sense; disgusting, nauseous or repulsive, other than trivial harm.

'peak particle velocity (ppv)' means a measure of ground vibration magnitude which is the maximum rate of change of ground displacement with time, usually measured in millimetres/second (mms^{-1}).

'protected area' means – a protected area under the *Nature Conservation Act 1992*, or

a) a marine park under the *Marine Parks Act 1992*, or

b) a World Heritage Area.

'progressive rehabilitation' means rehabilitation (defined below) undertaken progressively or a staged approach to rehabilitation as mining activities are ongoing.

'reference site' (or analogue site) may reflect the original location adjacent area or another area where rehabilitation success has been completed for a similar biodiversity. Details of the reference site may be as photographs, computer generated impages and vegetation models etc.

'rehabilitation' the process of reshaping and revegetating land to restore it to a stable landform and in accordance with the acceptance criteria set out in this environmental authority and, where relevant, includes remediation of contaminated land.

'representative' means a sample set which covers the variance in monitoring or other data either due to natural changes or operational phases of the mining activities.

'residual void' means an open pit resulting from the removal of ore and/or waste rock which will remain following the cessation of all mining activities and completion of rehabilitation processes.

'self sustaining' means an area of land which has been rehabilitatied and has maintained the required acceptance criteria without human intervention for a period nominated by the administering authority.

'sensitive place' means:

a) a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises, or

b) a motel, hotel or hostel, or

c) an educational institution, or

d) a medical centre or hospital, or

e) a protected area under the *Nature Conservation Act 1992*, the *Marine Parks Act 1992* or a World Heritage Area, or

f) a public park or gardens.

'significant disturbance' – includes land

a) if it is contaminated land; or

b) it has been disturbed and human intervention is needed to rehabilitate it

   i. to a state required under the relevant environmental authority; or

if the environmental authority holder does not require the land to be rehabilitated to a particular state – to its state immediately before the disturbance.

Some examples of disturbed land include:

- areas where soil has been compacted, removed, covered, exposed or stockpiled;
- areas where revegetation has been removed or destroyed to an extent where the land has been made susceptible to erosion; (vegetation & topsoil)
- areas where the land use suitability or capability has been diminished;
- areas within a watercourse, waterway, wetland or lake where mining activities occur;
- areas submerged by tailings or hazardous contaminant storage and dam walls in all cases;
- areas under temporary infrastructure. Temporary infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dams, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be removed after mining activities have ceased; or
- areas where land has been contaminated and a suitability statement has not been issued.

However the following areas are not included:

- areas off lease (e.g. roads or tracks which provide access to the mining lease);
- areas previously significantly disturbed which have achieved the rehabilitation outcomes;

- by agreement with the EPA, areas previously significantly disturbed which have not achieved the rehabilitation objective(s) due to circumstances beyond the control of the mine operator (such as climatic conditions);

- areas under permanent infrastructure. Permanent infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dams, bores, buildings, fixed machinery, hardstand areas, airstrups, helipads etc) which is to be left with agreement with the landowner. The agreement to leave permanent infrastructure must be recorded in the Landowner Agreement and lodged with the EPA.

- Disturbances that pre-existed the grant of tenure unless those areas are disturbed during the term of tenure.

'waters' includes a river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea) and any part thereof.

END OF DEFINITIONS

END OF ENVIRONMENTAL AUTHORITY

Appendix D Graymont Community Engagement Plan and Community Engagement Register

GRAYMONT

MARMOR COMMUNITY ENGAGEMENT PLAN

GRAYMONT

Consultation Objectives

Key objectives have been defined as follows:

› Ensure factual information about the project, including operational, rehabilitation and closure plans, is widely available to those stakeholders with an interest

› Provide stakeholders with an opportunity to ask questions

› Identify areas of concern with respect to the facility and respond to these within a timely manner

› Build relationships with stakeholder groups within the area

› Demonstrate how community feedback is being used in the development and operation of the facility. Following the focus group sessions, these were confirmed. A number of participants highlighted the need for Graymont to ensure that better transparency and balance transpired in the consultation provided and the information disseminated.

Targets and Key Performance Indicators

Target	Key Performance Indicator
Zero verified community complaints received regarding site operations	Number of community complaints received and the timeframes/response in resolving issues
Initiate at least one community based meeting/forum regarding site operations	Record of meeting in diary If formal meeting, record meeting minutes
Site operations to engage in or provide support to at least one community based project	Number of community project involvements

Consultation Approach

Designed to identify a consultation approach that aims to achieve the objectives

It is also designed to identify a consultation approach somewhat determined by types of issues and level of perceived impacts on the community and stakeholders

- It will include:
  - Identifying stakeholders
  - Developing factual information about the project and development
  - Conducting awareness raising events to inform and engage stakeholders about the project, and seek their input
  - Providing community updates as the site progresses
  - Providing feedback mechanisms and how comments will be considered/actions taken
  - Providing timely, and accurate responses
  - Providing documented concerns, enquiries and feedback
  - Providing ongoing and meaningful consultation

Key Stakeholders

All stakeholders to Graymont's operations have varying degrees of interest or concern with our operations and as a result varying needs for information and engagement. Stakeholders also change from time to time, depending on issue or circumstance. Therefore it is essential to identify not only the stakeholder but the key issues that group may have with our operations.

The following list details some key stakeholders identified by the Marmor site which are the focus of this community and stakeholder engagement plan for site operations.

- Department of Environment and Science

- Department of Resources
- Rockhampton Regional Council
- Marmor Fire Brigade
- Marmor Police
- Community Members
  - Heather Clark
  - Peter Volling
  - Mark Sherwood
  - Emma Leach
  - Tony Rutherford
  - Merv Hillier
  - James Wetzlar

As the site is still in care and maintenance, the Marmor Community Engagement Plan remains suspended until such time as there are plans to renew operations. At that time, Graymont will review the list of stakeholder and implement the Plan in full

Stakeholders

- The stakeholder list is dynamic and people will move in and out of the consultation processes depending on their personal interest at any given time
- Consultation program is designed to facilitate this process
- The stakeholders and areas of interest help Graymont to recognise and adequately respond to the various key interests of the stakeholders

Stakeholder engagement processes .

- Preferences for active/personal engagement processes include:
  - Group meetings
  - Information sessions
  - Community forums

» Facility briefings

› Preferences for passive / support engagement include:

» Facility newsletter / community update

» Fact sheets

» Letters

» Complaints register

Suspension of Community Engagement during Care and Maintenance

› The site has been in care and maintenance since May 2016 hence there hasn't been any community engagement events over the past 6 years. However, a community townhall event is being planned for the 18th November 2021 to discuss the progressive rehabilitation plan of the site.

Community Engagement Methods

Proactive			
Engagement methods	**Rationale/ Current Situation – Desired Outcome Target**	**Frequency**	**Responsibility**
Conduct local community based projects	• Portray a positive image to key stakeholders that Graymont is a caring corporate citizen, considers stakeholders concerns and is a "Good Neighbour".	One per year	Site Manager
Advise neighbours of a blast 24 hours in advance	• Allow neighbours to be aware of risk • Build rapport with neighbour – site aware of potential impact of activities on neighbours	In accordance with blast schedule	Site Manager
Advise key stakeholders via letter or other means prior to	• Provide community awareness of	As required	Site Manager

Proactive			
Engagement methods	**Rationale/ Current Situation – Desired Outcome Target**	**Frequency**	**Responsibility**
a change in standard operations that may cause disruption to the local community	ongoing site operations		
Consultation with relevant government agencies shall be conducted for all new developments proposed onsite. Consultation will be sought at the concept phase to determine approval processes and key stakeholder issues associated with the proposal.	• Prevent more stringent conditions on operations • Build community and stakeholder confidence in site operations by clearly communicating the environmental management and performance of site operations.	When required	QLD Environmental Advisor
Reactive			
Engagement methods	**Rationale/ Current Situation – Desired Outcome Target**	**Frequency**	**Responsibility**
Complaints received shall be managed in accordance with the **EHS Incident Notification & Investigation Procedure**	• Ensure timely response to complaints	When received	QSE Coordinator after consultation with Operations Manager
Media enquiries received by the site shall be managed by the Corporate EHS Team.	• Ensure accurate and consistent information about site operations is delivered to media outlets	When received	Corporate EHS Team
Government agency enquiries shall be responded to by the QSE coordinator or the Corporate EHS Team	• Ensure accurate and consistent information about site operations is delivered to government agencies.	When received	Corporate EHS Team

GRAYMONT

Communication protocols

A number of communication protocols will be developed to enhance engagement processes overall. These include:

» Timing and distribution of communication material

» Traffic change notifications

» Enquiries and complaints management

»Progressive rehabilitation status

» Unresolved complaints / disputes

» Media protocols.

Monitoring and reporting

This has been included to facilitate the monitoring, checking and reporting on potential issues and measuring the effectiveness of the stakeholder engagement program. Reporting will include:

› Quarterly sustainability reporting to the Graymont Board that incorporates

» Stakeholder engagement – including economic and social benefits reporting

» Environmental reporting

» Rehabilitation progress

› Complaints, breaches and incidents.

Monitoring and Reporting Schedule

Description of monitoring	Timing/ Frequency	Report to:	Follow up action:
Record of all meeting minutes at all stakeholder related meetings and forums	When required	Forward meeting minutes to key stakeholders	Operations Manager/QSE Coordinator

Record and file all correspondence with key stakeholders	Ongoing	Maintain site diary entry.	QSE Coordinator
All complaints to be tracked, investigated and signed off	When required	Report in JDE and review annually with Corporate EHS team	QSE Coordinator
Track all commitments and agreements made with key stakeholders and the progress of these commitments and agreements	Ongoing	Corporate EHS team annually	Community Engagement Plan and Community Advisory Group Meetings (held quarterly)

Complaints

In the event of an environmental complaint, the receiver of the complaint shall document details from the complainant. As a minimum, the following information will be collected:

» the date and time of the complaint;
» the method by which the complaint was made;
» any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect; and
» the nature of the complaint.

Site personnel will conduct an initial investigation to verify the complaint. If the investigation has determined that the source of the complaint is from site activities, corrective actions will be developed and assigned to specified site personnel to rectify the cause of complaint or minimise any future events from occurring. Site personnel will respond to the complaint (if contact details are available) with the outcome of its investigation and advise of any actions that have or will be taken to prevent or minimise future impacts. The outcomes of the investigation and the close out of any corrective actions will be documented in JDE (JD Edwards Incident recording and tracking system).

Any environmental complaint will prompt a review of the sites legal compliance and environmental risk registers.

Management Review

Management review is to ensure that rigour is retained and systems and processes are continuously evaluated. The facility manager will chair a review of community engagement processes and performance every 12 months.

MARMOR COMMUNITY ENGAGEMENT REGISTER

Type of Engagement	Consultation Date	People Involved	Issues Raised / information provided	Outcomes of engagement and/or actions taken	Responsibility
Resident's Complaint	17 March 2014	M Hollier (complainant)	Dust on car	ICAM investigation to determine causes. Controls implemented	Site Manager
Marmor News (Newsletter)	1st April 2015	Site and Community	Refer to Newsletter	Information only.	Site Manager
Resident's Complaint	24 January 2015	Troy McMillan (Complainant)	Dust on car	ICAM investigation to determine causes. Controls implemented	Site Manager
Quarterly Marmor Community Advisory Group	16th March 2016	H Clark P Volling M Sherwood E Leach T Rutherford	Build up of dust on parked cars	Dust sent for analysis to check if it was from site. Refer to meeting minutes	Site Manager
Quarterly Marmor Community Advisory Group	18th May 2016	H Clark P Volling M Hollier E Leach J Wetzlar	Mine to go into care and maintenance	Site phones redirected to Calliope site Refer to meeting minutes	Site Manager

Appendix E Graymont Rehabilitation ITPs

Rehabilitation Inspection and Test Plan: Product Stockpile Removal

Site: Marmor Sheet number:_____

Applied to Rehabilitation Area RA1 and RA2

Reference	Milestone	Milestone Criteria or action required	Responsible party	Result, comment or record details	Hold or witness point	Date	Hold/Witness Point Signature
RA1_M1	Removal of stockpiled mined limestone and placement back in the void (at RA19)	All excess limestone feed stock has been removed and placed back in the void			Hold		
		No equipment or built structures remain in the rehabilitation area			Witness		
		Photographic records provided			Witness		
RA2_M1	Removal of stockpiled coal fuel and disposed off-site	Waste facility identified and waste classification requirements determined			Witness		
		Analysis of material undertaken and waste classification determined			Hold		
		All coal has been removed and disposed of at an appropriately licenced waste			Hold		
		No equipment or built structures remain in the rehabilitation area			Witness		
		Waste tracking records provided			Witness		
		Photographic records provided			Witness		

Rehabilitation Inspection and Test Plan: Landform development (ex void)

Site: Marmor Rehabilitation Area (s)_____ Sheet number:_____

Applies to: Rehabilitation Areas RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8, RA10, RA11, RA12, RA13, RA20

Reference (circle)	Milestone	Milestone Criteria or action required	Responsible party	Result, comment or record details	Hold or witness point	Date	Hold/Witness Point Signature
RA5_RM1	Landform development	Sediment dam sediment tested for contaminants			Witness		
		As required contaminated sediment removed to an appropriately licenced waste facility			Hold		
		Waste tracking records provided			Witness		
PS_RM2 RA3_RM2 RA4_RM3 RA5_RM1 RA6_RM2 RA7_RM2 RA8_RM2 RT_RM2 RA13_RM1 RA20_RM2	Landform development	Engineering and design plans finalised			Hold		
		ESCP provided by the contractor and approved			Hold		
		Average slope does not exceed the standard specified in the relevant PRCP milestone criteria			Witness		
		Final landform does not contain any low points that may pond water			Witness		
		Installation of water management structures has been certified by an appropriately qualified person as conforming to the design standard specified in the Surface water management Section of the PRCP			Hold		
		As built survey data has been provided			Witness		

Reference (circle)	Milestone	Milestone Criteria or action required	Responsible party	Result, comment or record details	Hold or witness point	Date	Hold/Witness Point Signature
		All major earthworks have been completed in accordance with the final engineering and design plan			Hold		

Rehabilitation Inspection and Test Plan: Landform development – Residual Void

Site: Marmor Rehabilitation Area (s)_____ Sheet number:_____

Applied to Rehabilitation Area RA14, RA15, RA18

Reference (circle)	Milestone	Milestone Criteria or action required	Responsible party	Result, comment or record details	Hold or witness point	Date	Hold/Witness Point Signature
RA14_RM1 RA15_RM1 RA18_RM2	Landform development	Engineering and design plans finalised			Hold		
		Bat survey of adit conducted and report received			Witness		
		Closure plan for adit finalised and incorporated into engineering schedule			Hold		
		Final landform slopes meet the milestone criteria specified in the PRCP			Witness		
		As built survey data has been provided			Witness		
		Certification from an appropriately qualified person that the area has achieved stable condition			Witness		
		All major earthworks have been completed in accordance with the final engineering and design plan			Hold		

Rehabilitation Inspection and Test Plan: Waste Removal

Site: Marmor Rehabilitation Area (s)_____ Sheet number:_____

Applied to Rehabilitation Area RA18 and RA20

Reference (circle)	Milestone	Milestone Criteria or action required	Responsible party	Result, comment or record details	Hold or witness point	Date	Hold/Witness Point Signature
RA18_RM1 RA20_RM1	Removal of kiln dust, reject limestone and coal ash from the void / stockpiles and disposal off-site	Waste facility identified and waste classification requirements determined			Witness		
		Analysis of material undertaken and waste classification determined			Hold		
		All stockpiled has been removed and disposed of at an appropriately licenced waste			Witness		
		Validation sampling has been undertaken and confirmation received from an appropriately qualified person that all waste has been removed			Hold		
		Waste tracking records provided			Witness		
		Photographic records provided			Witness		

Rehabilitation Inspection and Test Plan: Demolition and Equipment Removal

Site: Marmor Rehabilitation Area (s)_____ Sheet number:_____

Applied to Rehabilitation Area RA3, RA4

Reference (circle)	Milestone	Milestone Criteria or action required	Responsible party	Result, comment or record details	Hold or witness point	Date	Hold/Witness Point Signature
RA3_RM1 RA4_RM1	Decommissioning	All services have been disconnected			Hold		
		Bore decommissioned according to the preferred practices nominated in the Minimum Construction Requirements for Water Bores in Australia (RA3)			Witness		
		Presence of hazardous building materials have been assessed			Witness		
		Hazardous building managed and removed by appropriately licenced contractors			Hold		
		All infrastructure assets have been demolished and demolition waste removed to an appropriately licenced waste facility			Hold		
		Waste tracking data provided			Witness		
		Photographic records provided			Witness		

Rehabilitation Inspection and Test Plan: Topsoil

Site: Marmor Rehabilitation Area (s)_____ Sheet number:_____

Applies to: Rehabilitation Areas RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8, RA10, RA11, RA12, RA13, RA20

Reference (circle)	Milestone	Milestone Criteria or action required	Responsible party	Result, comment or record details	Hold or witness point	Date	Hold/Witness Point Signature
PS_RM3 I_RM4 RT_RM3 RA13_RM2 RA20_RM3	Topsoiling and surface preparation	Ripping completed to specifications (depth of 500 mm at 500 – 800 mm spacings)			Hold		
		An assessment of stockpiled soil quality and suitability for rehabilitation has been completed by an appropriately qualified person to confirm soil is suitable for target vegetation establishment		Included in PRCP	Witness		
		Is imported topsoil required?		If yes complete imported topsoil requirements else proceed to topsoil depth record	NA		
		Has imported topsoil source been analysed prior to delivery and suitability for rehabilitation assessed by an appropriately qualified person suitable for use			Hold		

Reference (circle)	Milestone	Milestone Criteria or action required	Responsible party	Result, comment or record details	Hold or witness point	Date	Hold/Witness Point Signature
		and as meeting the following requirements? • stone content does not exceed 20% by volume • electrical conductivity (salinity as ECe) <4 dS/m • pH range 5.5 to 8.0 • non-sodic properties (exchangeable sodium percentage <6%) • Emerson Aggregate Test Classes result of 3 (2), 3 (1), 4, 5, 6, 7 or 8					
		Certificates of imported topsoil analysis provided			Witness		
		Topsoil placed to an average depth of 150 mm			Witness		
		Photographic records provided			Witness		

Rehabilitation Inspection and Test Plan: Revegetation (ex-void)

Site: Marmor Rehabilitation Area (s)_____ Sheet number:_____

Applies to: Rehabilitation Areas RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8, RA9, RA10, RA11, RA12, RA13, RA20

Reference (circle)	Milestone	Milestone Criteria or action required	Responsible party	Result, comment or record details	Hold or witness point	Date	Hold/Witness Point Signature
RA9_RM1	Supplementary seeding (revegetation)	Existing ground cover vegetation composition and condition reviewed for suitability with respect to PMLU and management needs identified			Hold		
		Weed management conducted if required			Witness		
		Overseeding conducted if required			Witness		
PS_RM4 I_RM5 RT_RM4 RA13_RM3 RA20_RM4	Revegetation	For stockpiled topsoil, amelioration has been applied according to the Site preparation and topsoiling Section of the PRCP			Witness		
		For imported topsoil, amelioration has been applied according to the recommendations of an appropriately qualified person based on soil analytical results			Witness		
		The pasture species used and the seeding rate applied are consistent with the			Hold		

Reference (circle)	Milestone	Milestone Criteria or action required	Responsible party	Result, comment or record details	Hold or witness point	Date	Hold/Witness Point Signature
		Revegetation Section of the PRCP					
		Records of seed purchase provided			Witness		
		Photographic records provided			Witness		

Rehabilitation Inspection and Test Plan: Void Preparation

Site: Marmor Rehabilitation Area (s)_____ Sheet number:_____

Applies to: Rehabilitation Areas RA14, RA15, RA16, RA17 (excluding water body), RA18, RA19

Reference (circle)	Milestone	Milestone Criteria or action required	Responsible party	Result, comment or record details	Hold or witness point	Date	Hold/Witness Point Signature
RV_RM5	Break up remaining tracks in void	Ripping of remaining tracks within the void is completed to specifications (depth of 500 mm at 500 – 800 mm spacings)			Hold		
		Photographic records provided			Witness		
RA18_RM3 RA19_RM1	Surface preparation	Remaining accessible void floor areas have been ripped (to the maximum practical depth to 500 mm or scarified where ripping is impractical			Hold		
		Soil forming material (recovered surface aggregate from RA6, RA7, RA8 and RA11) placed in accessible locations			Witness		
		Photographic records provided			Witness		

Rehabilitation Inspection and Test Plan: Revegetation (Residual Void)

Site: Marmor Rehabilitation Area (s)_____ Sheet number:_____

Applies to: Rehabilitation Areas RA14, RA15, RA16, RA17 (excluding water body), RA18, RA19

Reference (circle)	Milestone	Milestone Criteria or action required	Responsible party	Result, comment or record details	Hold or witness point	Date	Hold/Witness Point Signature
RV_RM6	Revegetation	Species selection and application method finalised through research			Hold		
		Aerial seeding has been undertaken using appropriate methods and native species mix determined through research trials			Hold		
		Records of seed purchase provided			Witness		
		Photographic records provided			Witness		

Rehabilitation Inspection and Test Plan: Fencing and signage

Site: Marmor Rehabilitation Area (s)_____ Sheet number:_____

Applies to: The whole of the void (RA14, RA15, RA16, RA17 (excluding water body), RA18, RA19)

Reference (circle)	Milestone	Milestone Criteria or action required	Responsible party	Result, comment or record details	Hold or witness point	Date	Hold/Witness Point Signature
RV_RM4	Install safety bund /fencing around void	The void is bunded and or fenced and warning signage erected according to the specifications in the Void Closure section of the PRCP			Hold		
		Photographic records provided			Witness		

Appendix F Rehabilitation of the Marmor Pit (Meyers 2005)

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Memorandum

To: Gary Bradtke

From: Tony Meyers

Date: 20/04/2005

Re: **REHABILITATION OF THE MARMOR PIT**

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1. SUMMARY

This report presents a plan for the rehabilitation of the Marmor pit. Sections 2 to 6 present a detailed discussion of the site conditions and the stability analyses. Section 7 presents a series of recommendations for the remediation based on the results and conclusions in the previous sections.

2. LOCATION AND ENVIRONMENT

The pit is located on ML5763 and ML5764 situated on an east facing, north-south striking limestone ridge within a group of low-lying hills known as the Redan Range. There are no permanent watercourses in the vicinity; the nearest being Twelve Mile Creek three kilometers to the east which has wetlands (Photo 1) to the north east. It is not therefore envisaged that there would be any significant issues associated with pit water, dump water overflow or groundwater flow leaving the site.

The region is lightly populated and used predominantly for low intensity grazing. The only residence[1] in view of the pit is located on a west facing rise 500m to the east.

The average gradient[2] of the natural slopes around the site is 15^{o} (1V:3.7H); a value significant if rehabilitation aims to recreate a land surface appearing "natural". Table 1 lists the approximate distances from the pit crests to the lease boundaries. These dimensions are significant if the pit walls, particularly the eastern wall, require laying back to achieve long-term stability.

Most of the slopes are covered by less than 30cm of topsoil. This feature, and extensive clearing for agriculture, has resulted in there being a scarcity of significant vegetation cover. The vegetation that is there includes predominantly native grasses with sparse trees of varieties including Eucalyptus Cambageana, Eucalyptus Moluccana and Acacia Hapophylla. Most of the lease is classified by the Queensland Department of Environment as being within a regional ecosystem zone containing vegetation that is "not of concern". However, a region 300m north of the pit has been designated as containing "remnant [vegetation] of concern". While there is no legal requirement for Unimin to preserve this vegetation, any rehabilitation would obviously seek to do so.

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[1] It is understood that this property is, or was, owned by the local Inspector of Mines.

[2] The natural gradient β_n is in the range $14^{o} \leq \beta_n \leq 27^{o}$

Table 1. Shortage distance from the pit crest to the closest lease boundary.

Pit crest	Distance to lease boundary (m)
North	370
South	200
East	78
West	150

3. GEOLOGY

The resource comprises a 100m thick bed of limestone which dips steeply to the west/north-west and strikes north to north-east. The bed overlies volcanics and underlies beds of calcareous sandstone, siltstones and mudstone. Lenses of sandstones and siltstones occur within the limestone. The limestone is fine to coarse grained with highly variable characteristics. In general the upper beds tend to be dark grey containing buff mottling with grades ranging from 74% to 97% $CaCo_3$. The underlying beds, ranging with depth from mottled light-grey to buff, have high grades averaging ≈98% $CaCo_3$. Within the beds, particularly around the 50mRL at the northern end of the pit and midway along the eastern pit wall around the 40mRL, are pods of white, high grade coarsely crystalline limestone (Photo 2). This crystalline rock is generally unsuitable for use as unblended kilnstone due to its propensity for high energy decrepitation.

The limestone is of high strength whereas the underlying volcanics and overlying calcareous sandstone, siltstones and mudstone are of lower strength. The limestone has therefore weathered less than the surrounding rocks, the latter having weathered to depths of up to 10m. Cavities and joints within the limestone at shallow depths have been infilled with the products of this weathering which comprise predominantly red-brown silty clay (Photo 2). This contamination has reduced the purity and consistency of much of the shallow limestone making it unsuitable for use as kilnstone. Several structurally induced pit wall instabilities are associated with the presence of this infill.

Green to dark-grey andesitic dykes, up to 2m thick, randomly intersect the beds (Photo 3). These dykes are most noticeably, albeit not necessarily more prevalent, on the eastern pit slope. Their presence does not appear to have any obvious influence on wall stability.

3.1 Macrostructure

Visual evidence suggests that the rockmass contains several major faults (Figure 1).

A north/south striking fault F1 has caused uplift along the west side of the pit. Mottled north/south striking lenses within the limestone (Photo 4) are possibly associated with shearing that occurred during this faulting.

Photo 5 shows deformations, associated with fault F3, which have caused upthrust to the southern part of the pit. This faulting has caused drag induced folding on the western wall. A slight valley, coincident with the location of this fault, is likely due to erosion of rock that was sheared during faulting; It can be expected that with time this localised erosion will continue. Approximately 50m north of F3, a series of smaller “sympathetic” faults, striking in a direction similar to F3, are likely associated with drag caused by F3. It can similarly be expected that localised erosion will occur around this faulted rock.

An east/west striking shear zone (Photo 6) at the northern boundary of current mining activity is likely associated with F4 and F5. While it is known that limestone occurs beyond F6, there is little information available as to its characteristics. Limited data obtained from two drill holes, reported on by Dunstan (2004[3]), suggests that its characteristics may be similar to those of the limestone exposed at the north end of the pit.

3.2. Microstructure

The micro-structure tends to be highly variable due to the rockmass being significantly deformed. Limited surface mapping within the pit indicates that, in general, the rockmass is intersected by at least three sets of discontinuities. It is also intersected by an extensive network of random discontinuities, a feature making the pit prone to random instabilities.

Table 1 summarises the mean orientations of the discontinuity sets. One set is made up of bedding which tends to dip towards the west/north-west at about 50^{o}-70^{o}. One steep set of joints, J1, tends to dip towards the north/north-east at 60^{o}-80^{o} and a shallower set, J2, dips towards the south-east/south-west at 35^{o}-60^{o}.

Table 1. Orientation of micro-structure

	Set		
Description	**Bedding**	**Jointing, J1**	**Jointing, J2**
Dip direction	279±19	038±13	172±28
Dip angle	48±26	74±10	48±22

4. MINING

Early mining at the south end of the pit created a slot bounded by pit walls up to 50m high with batter angles up to 75^{o} having no, or inadequate, berms. Due to natural weathering over the years, the establishment of vegetation on the south-east wall and a 10m deep pool of water between the walls, this section of the pit has taken on the appearance of a small, steep sided, natural valley. However, the presence of overhanging rock on the east wall, likely to have been loosened by overly aggressive blasting and inadequate scaling, has left this section of wall in a dangerous condition. A 3m wide portal (Photo 7) into the west wall opens into a 50m long adit within which a colony of bats resides.

Since Unimin has owned the site, only limited mining has occurred from the pit with the majority of it being for roadstone excavated from the north end. Mining practices have been superior to those used previously with 5m high benches having been constructed with adequately wide berms. No kilnstone has recently been extracted as it is now sourced from Calliope.

A significant volume of limestone of unknown characteristics remaining in the floor of the pit and an unknown amount remains beyond its northern extent. Unimin geologists believe that its characteristics would be similar to those elsewhere and as such it would be of highly variable quality; a characteristic unfavorable to profitable bulk mining. In addition, as the floor is less than 50m wide, any deeper excavation would soon incur the considerable expense involved in pushing back the west wall by cutting back the overlying sediments and low grade limestone. More extensive excavation would also require a drill, trucks, excavator and mobile crushing

[3] Dunstan, K (2004) Marmor Limestone Quarry – John Wells Lime. Internal due diligence study report. 15pp.

plant be obtained. The equipment currently on site is not of a standard suitable for safe and cost effective mining. These reasons contribute to the decision that the pit will not be mined further.

5. WALL STABILITY

Due to the large amount of variability in the orientation of the discontinuities and the extensive faulting, almost all of the walls contain unstable wedges and planes. This situation is not conducive to safe mining or the long term stability of the walls.

Figures 2 to 4 show stereoplots upon which typical discontinuities from each set have been plotted in the form of great circles. On each plot, the bold line represents the slope wall and the dotted "cone" represents an estimated 40^{o} friction angle for the discontinuities. The area between the slope wall and the cone is referred to as the "critical region". The potential for dominant forms of instability was assessed by considering the location of the great circles representing the sets relative to this area. The assessment criteria were as follows:

- If the hinge of a great circle fell within a critical region it indicated a kinematic potential for planar failure involving the particular set.
- If the intersection of any two great circles fell within a critical region it indicated a kinematic potential for wedge failure along the line of intersection of the two sets.
- If the great circle for a steeply dipping set mirrored that for the wall it indicated a kinematic potential for toppling failure.

The shaded regions within the plots envelope the orientations of the lines formed by the intersection of the discontinuities. The relative locations of these regions indicate the following:

- On the north wall there is a high likelihood for wedge failure involving bedding and J2 and a high likelihood for it involving J1 and J2;
- On the west wall there is a low to moderate likelihood for wedge failure involving J1 and J2;
- On the east wall there is a high likelihood for planar failure on bedding. There is also a high likelihood for wedge failure involving bedding and J1. There is a moderate likelihood for it involving bedding and J2. Photo 8 shows an example of the latter mode.

The conclusion that the discontinuity structure is conducive to instability is supported by visual evidence which indicates that instability affects ≈10% to 50% of the north and west walls and up to 90% of sections of the east wall. The locations of the unstable features tend to be random. For example, Photo 9 shows a 5m high stable section of the west wall, cut parallel to the F4 shear zone involving J1, adjacent to a section of the same wall that contains a large proportion of overhanging blocks and wedge failures. A 40m high section at the south end of the same wall tends to be one of the more stable walls in the pit (Photo 10).

It is often considered acceptable to have ≈10% unstable walls in those sections of pit where there is an insignificant consequence[4] if failures were to occur, which is a situation applicable to most of this pit. There is therefore a greater that acceptable proportion of unstable walls. However, the discontinuity structure is not conducive to stability and hence even if mining procedures were adopted that aimed to reduce wall instability in

[4] Slopes above or below haul roads or infrastructure (e.g. permanent plant, buildings pumps etc.) would often be considered to have a medium to high consequence associated with wall failure. Walls bounded by berms that have no infrastructure and do not carry traffic may have a lower consequence associated with instability.

the short term (e.g. decoupled blasting), the pit would still likely have produce a high proportion of unstable walls over the medium to long term.

6. WALL STABILIZATION

If no attempt is made to stabilize the current walls they will continue to deteriorate in the short to medium term. The mechanism involved at various locations in the pit is for sliding to be triggered by a reduction in the shear strength of the discontinuities along which the sliding eventually occurs. Such a reduction is likely due to one or a combination of the following:

- an increase in water pressure within the discontinuity during periods of heavy rainfall;
- a decrease in the strength of the rock containing the discontinuities as a result of erosion;
- an increase in the width of a discontinuity as a result of root jacking caused by the roots of trees or large bushes entering a discontinuity.

If the pit area is to be retained for the long term (e.g. longer than 10 years) and if mining is no longer to occur, or if the area behind some of the crests is inaccessible, the most cost effective means to produce more stable walls would be to allow the instabilities to occur naturally. Unfortunately, as the instabilities occur at random locations and at random intervals it is not possible to target the specific sections of each wall where they will occur and know when they will occur. Therefore, to reduce the likelihood that personnel or equipment are present when instability occurs, all walls higher than 5m should be placed out of bounds.

As the pit area is not to be mined, the stability of the walls will need to be increased as part of the rehabilitation program. The most cost effective means of doing so would be to reduce their batter angle.

A probabilistic based wedge failure stability analysis was carried out using the software SWedge[5] to determine the approximate angles required to reduce to less than 10% the probability for the mechanisms discussed in Section 5 to occur.

Table 2 summarizes the results from the analyses in terms of the failure mechanisms and the required angles. The results indicate that the east walls would need to be battered back to 38^{o} and the north wall to 40^{o}; the latter angle would be a practical specification for both walls. The results also indicate that the south-west wall is acceptably stable at its current angle; a result supported by visual evidence.

The recommended angle will produce walls that are significantly steeper than the surrounding natural surface however typical erosion rates of between 5 and 25mm/year will tend to flatten them further over the long term.

Figure 5 shows a representation of what the pit would look like with the walls battered back to 40^{o} without additional benching. The newly created crest would remain within the lease boundaries; a concern specifically for the east wall. Approximately 144,000BCM of rock would need to be excavated and the cost of drilling, blasting and excavation would be ≈$1.0m assuming a $7/BCM mining cost.

If the south-east and south-west walls were to be battered back, 10m high benches and 5m wide berms should be excavated into them for safety and to assist vegetation to grow. Doing so would however push back their crests by a further 20m however the crests would still remain within the lease boundaries. This additional excavation would require an additional 250,000BCM of rock to be excavated at an additional cost of ≈$1.75m.

[5] SWedge is produced by RocScience, www.rocscience.com

There would be little opportunity to offset many of the costs as most of this rock excavated would be unsuitable for burning, being predominantly volcanics and sediments. Some of it may be crushed and sold to the nearby saltworks for use as drying pond borders however it is unlikely that markets could be found for the majority of it. The rock would therefore need to be stockpiled on site or preferably left as backfill in the pit.

Due to the high costs that would be incurred to batter back and bench the south-east and south west walls, it is recommended that they not be touched and be left to weather naturally. This weathering process will likely involve more instabilities developing with chutes naturally battering the face back to the 40^{o} angle. The rock involved in these instabilities should be allowed to rill out onto the floor. Eventually it can be blended in with the wall to create a natural appearance.

Another consideration is that battering back the currently stable south-west wall will destroy its natural appearance and will almost certainly destroy the adit and hence the bat colony. To prevent this undesirable outcome, is a further reason to leave this wall as is and allow it to weather naturally. Being kept steep, rather than being battered back, will also act to reduce the rate at which it erodes.

Table 2. Batter angles required to achieve stability

Wall	**Mechanism**	**Sets involved**	**Batter angle required to achieve PF ≤10%**
East	Planar sliding	Bedding	48^{o}
	Wedge	Bedding and J1	38^{o}
		Bedding and J2	58^{o}
North	Wedge		52^{o}
		J1 and J2	40^{o}
West	Wedge		Any

7. RECOMMENDATIONS

1. In the short term, construct a 2m high bund, 15m behind the crests of the south-east and south-west walls. Construct a three-wire fence between the bund and the crest. Hang signs from the fence at 20m spacings warning of the steep drop off.
2. In the short term, construct a fence at least 50m in front of the toe of the south-east wall to reduce the likelihood that personnel are in the path of falling rocks. Personnel are to be informed as to why the fence is there and instructed that they are not to go beyond it.
3. Allow the south-east face to weather naturally. In the short term, encourage grasses and bushes to vegetate its face. A well vegetated wall is less prone to erosion and is less likely to be required to be battered back and benched when the site is eventually abandoned. Any rill from slips should be blended in with the wall, covered with topsoil, leaf litter and revegetated.
4. Batter back the north-east, north and north-west walls to 40^{o}. High cost smoothwall blasting techniques should not be required if a modified production blast without subdrilling and with low energy back holes can be used effectively to minimize backbreak. Scale loose rock from a faces and allow the broken rock to rill naturally out from the face Shape the muckpile to give it a natural appearance and compact. Where possible spread fine rock over the larger broken rock and cover with topsoil and leaf litter. Vegetate with trees, bushes and grasses.
5. In the short term, ensure that groundwater flow is controlled and is not able to flow over any crests, particularly those on the south-east wall.
6. In the short term, implement a strategy for routinely monitoring the stability of the south-east and south west. This strategy will involve inspecting behind the crests every month for any cracking that may be a sign of impending wall instability. Instability can be expected on the south-east wall and, as long as the fence and bund remain competent, should not be a problem. Instability is not expected on the south-west wall. If indications suggest that it is developing, the toe of this wall must also be isolated from personnel.
7. Remove, or level, stockpiles of rock lying within the pit and around the site. Remove any waste materials, discarded equipment and signs of mining activity.
8. In the short term, implement a weed control program around the pit floor and areas beyond the pit. Actively carry out revegetation using local species planted through leaf litter.
9. Preferably in the long term, the pond in the base of the pit can be planted with wetland species and become a feature in the revegetation program. Local frogs and fish (preferably rare) should be encouraged to breed there. However, these plans may need to be carried out later if in the short term the pond is required to provide water for the site.
10. If possible, encourage local residents to be part of the revegetation program thereby providing them with a sense of ownership of the site. A positive story in the local paper can help to recruit the locals.

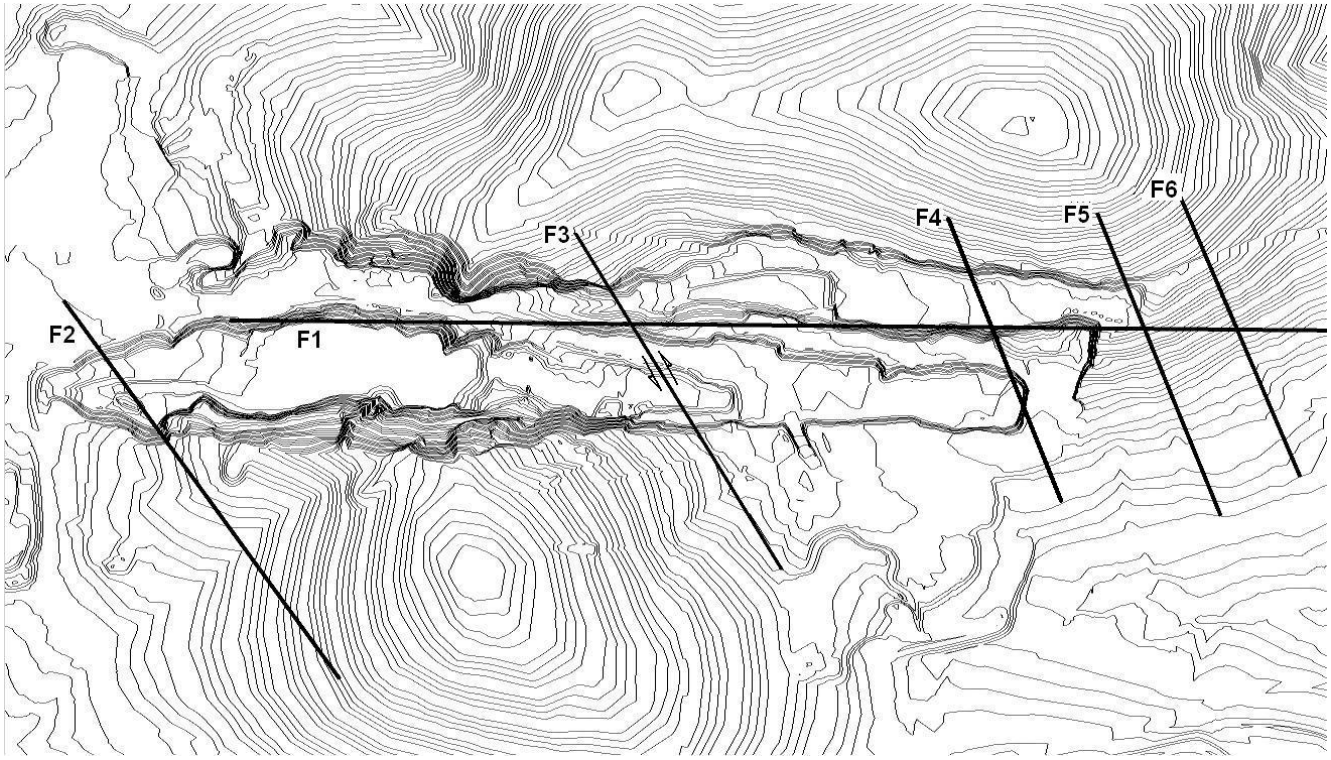

Figure 1. Plan view of pit showing approximate locations of major faults.

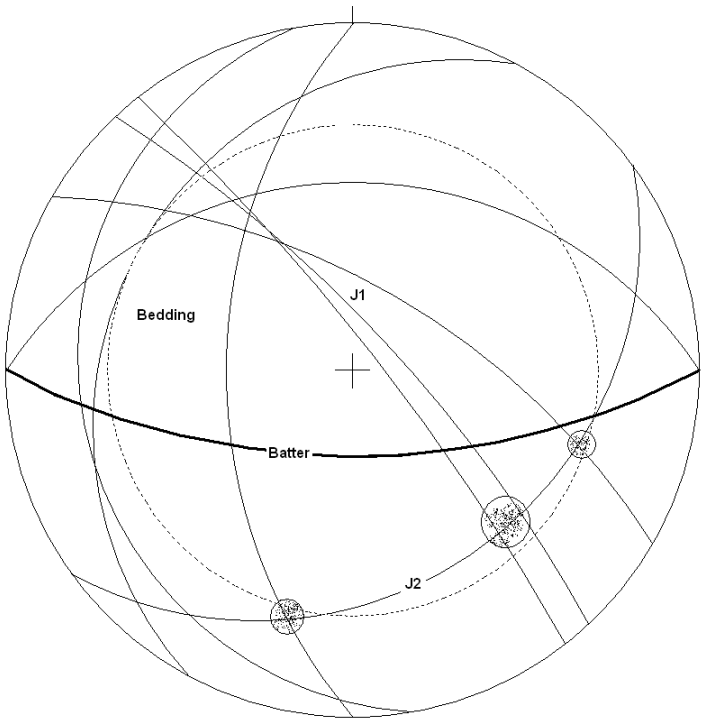

Figure 2. Stereoplot showing great circles representing typical discontinuities and a 60^o north wall (bold line) plotted as great circles and a cone (dotted line) representing a 40^o friction angle.

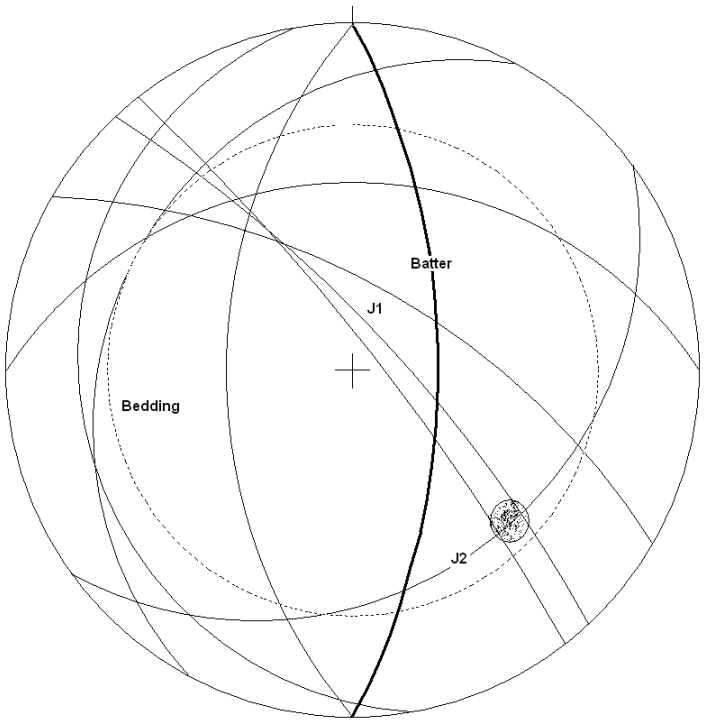

Figure 3. Stereoplot showing great circles representing typical discontinuities and a 60^o west wall (bold line) plotted as great circles and a cone (dotted line) representing a 40^o friction angle.

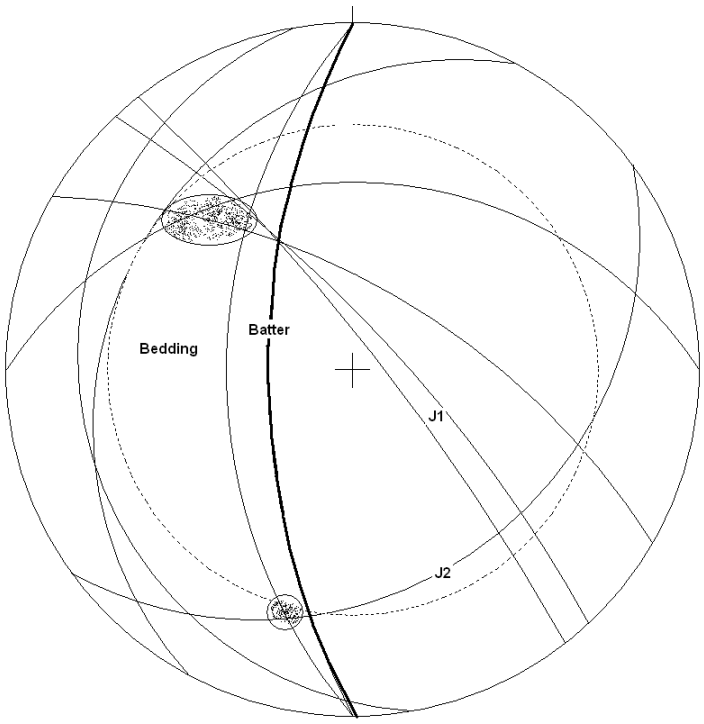

Figure 4. Stereoplot showing great circles representing typical discontinuities and a 60^o east wall (bold line) plotted as great circles and a cone (dotted line) representing a 40^o friction angle.

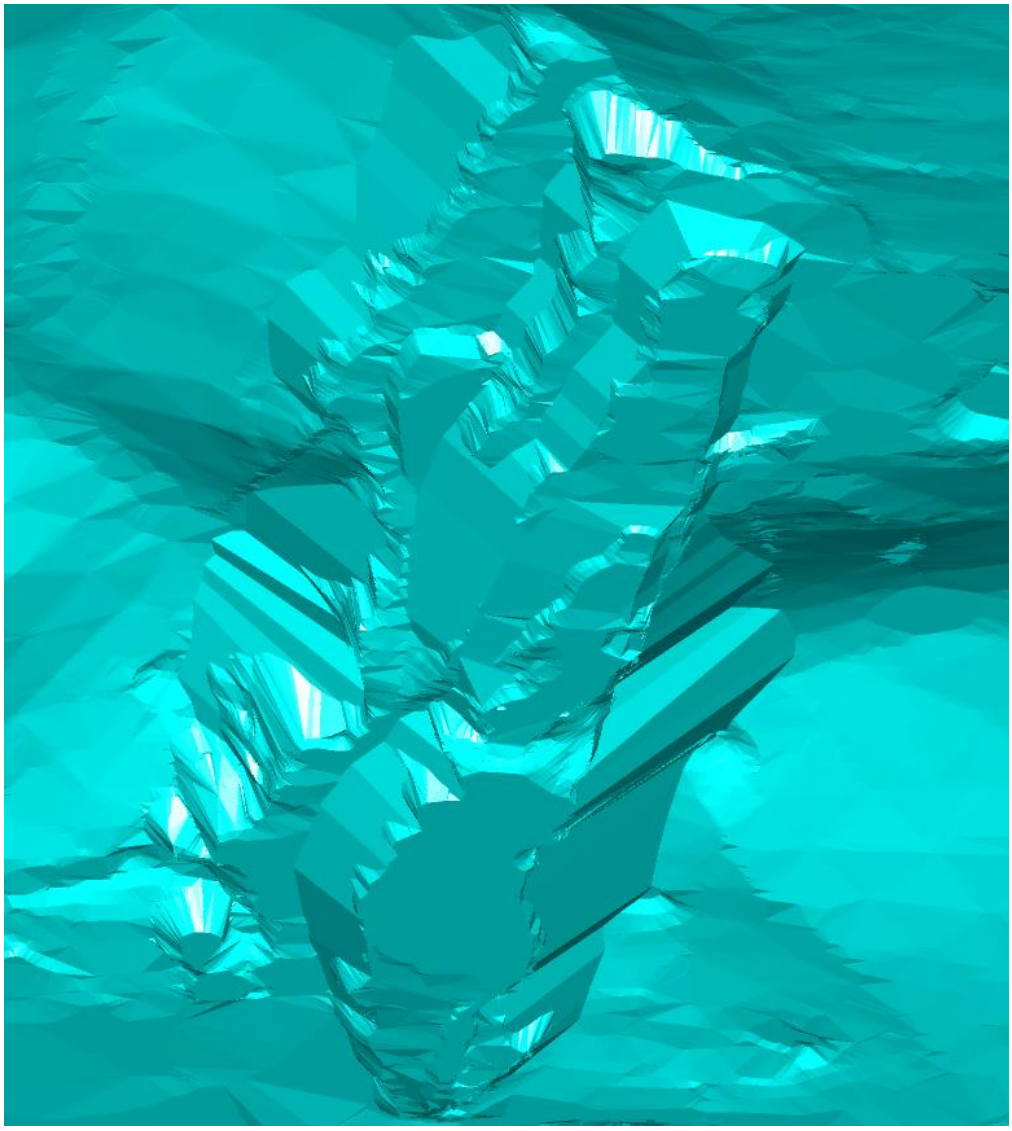

Figure 5. Pit looking north with walls laid back to 40^{o}

Photo 1. Twelve Mile Creek wetlands, 3km north east of site.

Photo 2. Cavities within the limestone infilled with red-brown clay.

Photo 3. Andesite intrusion.

Photo 4 Mottled lenses in hand sample aligning with and hence possibly associated with fault F1

Photo 5 Upthrust and drag folds caused by fault F3.

Photo 6 East-west striking shear zone at northern extent of pit associated with F4 and F5.

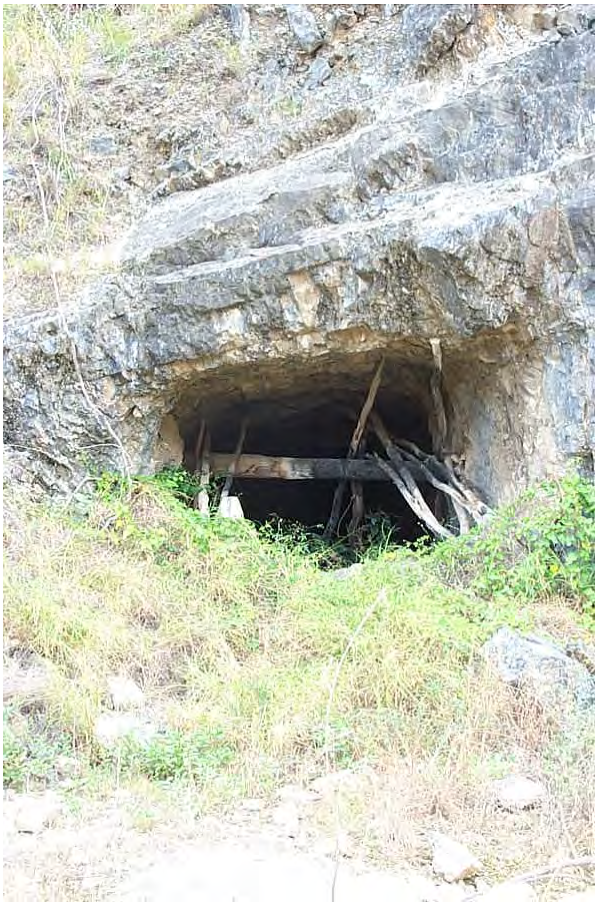

Photo 7 Portal into the west wall.

Photo 8. Wedge failure on south east wall

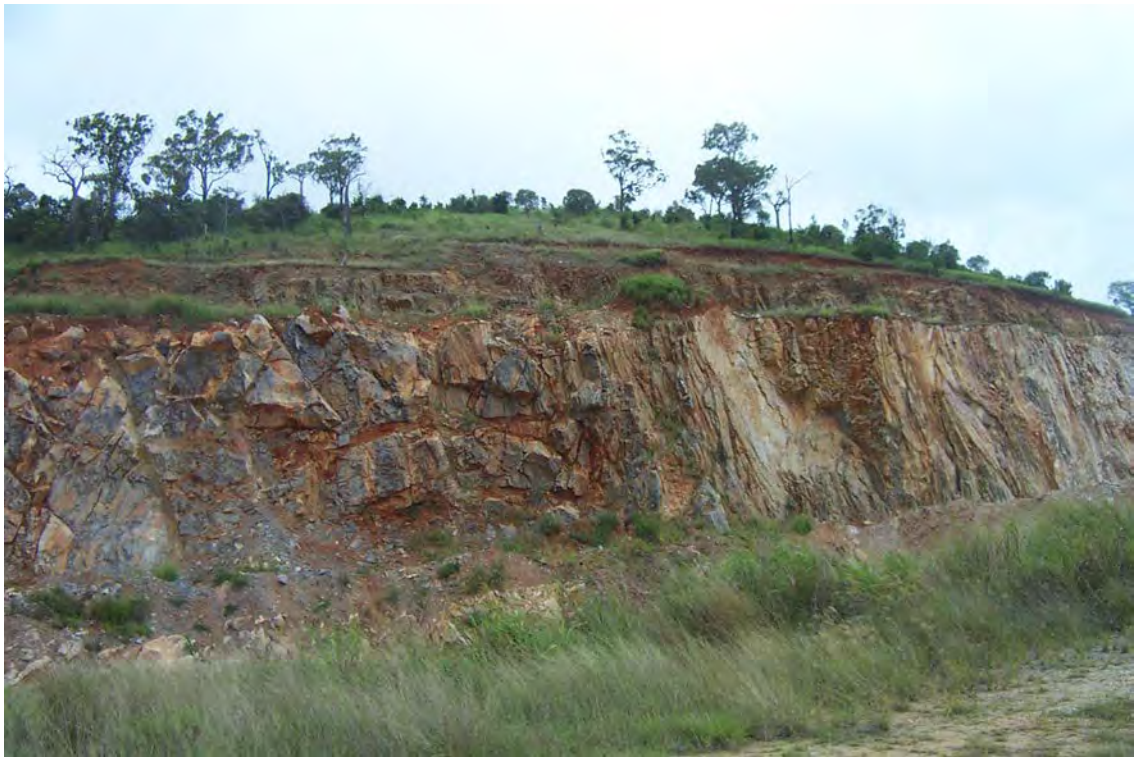

Photo 9. Variability in the stability of adjacent sections of the same wall.

Photo 10. Relatively stable southwest wall.

Appendix G PRCP spatial data (supplied separately)

SPATIAL DATA

A separate file is submitted with PRCP containing the required content of spatial information (shapefiles) for the submission of a PRC plan.

The following information is provided:

- the location and maximum extent of disturbance footprint for the mine life
- the PMLU for the area within the resource tenure(s) (note there are no NUMAs)
- the rehabilitation areas within the resource tenure(s) (note there are no improvement areas).
- sensitive receptors (no sensitive receptors have been identified by Graymont)
- extent of a floodplain (the lease areas are not located in a floodplain)
- existing rehabilitation (if the PRC plan is for an existing EA) (No areas have been rehabilitated to date).

Table 32 contains details of the data supplied separately.

Table 32: Spatial Checklist

File	Spatial information requirements	File name
1	PRC plan - polygon	EPML00319713_PRCplan_PRCP_PY_15102021

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