FY25-CLOSURE MINING MANAGEMENT PLAN

Groote Eylandt Mining Company Limited (GEMCO)

ABN 26 004 618 491

Contents	Page

Authorisation Number: 126-01 (GEMCO Mine)

Planning Period: FY2025-Closure

Approval

	Compiled By	Reviewed By	Approved By
Date			
Name	**Melanie Colville**	**Michael Smith**	**Steven Hedges**
Signature	Melanie Colville		Steven Hedges

Document Control

Version	Date	Comments
1.	**27 June 2024**	**First submission to DITT**
2.	**11 August 2025**	**Redacted public version. Typographical correction page 6.**

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Information in this document that relates to the Ore Reserve and/or Mineral Resource estimate for GEMCO was declared as part of South32's annual Resource and Reserve declaration in the FY23 Annual Report (www.south32.net) issued on 8 September 2023 and prepared by Competent Persons in accordance with the requirements of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (2012) (the JORC Code). South32 confirms that it is not aware of any new information or data that materially affects the information included in the original announcements. All material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed. South32 confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original market announcement.

Information in this document that refers to Production Target and forecast financial information is based on Proved (64%) and Probable (36%) Ore Reserves. The updated Mineral Resources and Ore Reserves underpinning the Production Target have been prepared by Joshua Harvey and Mark Bryant, Competent Persons in accordance with the requirements of the JORC Code. The Mineral Resource and Ore Reserve estimates are published in South32's FY23 Annual Report (www.south32.net). The stated Production Target is based on South32's current expectations of future results or events and should not be solely relied upon by investors when making investment decisions. Further evaluation work and appropriate studies are required to establish sufficient confidence that this target will be met.

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CONTENTS

LIST OF FIGURES

LIST OF TABLES

[redacted]

1. APPLICATION FOR AUTHORISATION

1.1. Operator Details

Groote Eylandt Mining Company Proprietary Limited (GEMCO) operates a mining operation (the GEMCO Mine) located on Groote Eylandt in the Northern Territory (NT) (Figure 1-1). Key operator details are provided in Table 1-1.

TABLE 1-1 OPERATOR DETAILS

Operator Details			
Operator Name	Groote Eylandt Mining Company Proprietary Limited (GEMCO)		
ACN	004 618 491	**ABN**	26 004 618 491
Postal Address	Rowell Highway, Alyangula, Northern Territory, 0885		
Street Address	Rowell Highway, Alyangula, Northern Territory, 0885		

GEMCO is owned by South32 Ltd (60%) and Anglo Operations (Australia) Pty Ltd (40%). South32 is a globally diversified mining and metals company with operations in Australia, Southern Africa and South America. It also has a portfolio of high-quality development projects and options, and exploration prospects. The company is listed on the Australian Securities Exchange (ASX), Johannesburg Stock Exchange and London Stock Exchange, and is headquartered in Perth, Western Australia.

Anglo Operations (Australia) Pty Ltd is a wholly owned subsidiary of Anglo American Plc, a United Kingdom based mining group that is listed on the London Stock Exchange. Anglo American Plc is one of the world's largest mining companies with a diverse portfolio of interests in coal, iron ore, manganese, base metals, precious metals, and minerals.

Key GEMCO contacts for the purpose of this Mining Management Plan (MMP) are provided in Table 1-2.

TABLE 1-2 GEMCO CONTACTS

	Steven Hedges	**Michael Smith**
Title	Vice President Operations	Manager Technical Services
Postal Address	Rowell Highway Alyangula NT 0885	Rowell Highway Alyangula NT 0885
Phone	+61 8 8987 4388	+61 8 8987 4311
Email	steve.hedges@south32.net	michael.smith@south32.net

1.2. Title Details

GEMCO undertakes mining and exploration activities across several tenements on Groote Eylandt. These are listed in Table 1-3 and shown on Figure 1-2. These tenements are grouped into areas referred to as the Western Leases, Eastern Leases and Southern Lease. The Western Leases and Eastern Leases are approved under mining authorisation 0126-01. The Southern Lease is a mineral exploration licence approved under mining authorisation 0887-01.

TABLE 1-3 GEMCO TENEMENTS (GROOTE EYLANDT)

Description	Title Number	Title Holder	Activity	Grant Date	Expiry Date
Western Leases	MLN951	GEMCO	Mining and associated activities	21/05/1965	20/07/2031
	MLN952	GEMCO	Mining and associated activities	21/05/1965	20/07/2031
	MLN953	GEMCO	Mining and associated activities	21/05/1965	20/07/2031
	MLN956	GEMCO	Mining and associated activities	08/04/1974	29/09/2031
	MLN957	GEMCO	Mining and associated activities	08/04/1974	29/09/2031
	MLN958	GEMCO	Mining and associated activities	08/04/1974	29/09/2031
	MLN959	GEMCO	Mining and associated activities	08/04/1974	29/09/2031
	MLN960	GEMCO	Mining and associated activities	08/04/1974	29/09/2031
	MLN961	GEMCO	Mining and associated activities	08/04/1974	29/09/2031
	MLN2	GEMCO	Power line lease	30/09/1985	29/09/2031
	MLN3	GEMCO	Bridge lease	20/12/1984	20/07/2031
	SPL382	GEMCO	Cargo handling and wharf ancillary purposes	15/05/1974	29/05/2065
	SPL383	GEMCO	Industrial area including stockpiling of ore	15/05/1974	29/05/2065
	SPL392	GEMCO	Township lease	15/05/1974	29/05/2065
	SPL393	GEMCO	Greenbelt around township	15/05/1974	29/05/2065
	AA32517	GEMCO	Haul road corridor for MLN961	12/10/2020	29/09/2031
Eastern Leases	ML31219	GEMCO	Mining and associated activities (Northern)	04/08/2016	03/08/2041
	ML31220	GEMCO	Mining and associated activities (Southern)	04/08/2016	03/08/2041
	AA31711	GEMCO	Haul road corridor for Eastern Leases	12/10/2017	03/08/2041
Southern Lease	EL2455	GEMCO	Exploration activities	12/10/2016	11/10/2024

1.3. Project Details

Table 1-4 provides a summary of the project for which authorisation is sought under this MMP, including the project name, target commodity and location. Further details can be found in Section 2 and Section 5.

TABLE 1-4 PROJECT DETAILS

Application for Authorisation			
Application Type	Variation of Authorisation under section 38(1) of the *Mining Management Act 2001*	**Authorisation Number**	0126-01
Project Name	GEMCO Mine - Western Leases and Eastern Leases		
Planning Period	FY2025 – Closure[1]		
Target Commodity	Manganese		
Location and Access	**Location:** The GEMCO Mine is located on Groote Eylandt in the Gulf of Carpentaria, approximately 650 kilometres (km) south-east of Darwin (Figure 1-1). **Access:** The GEMCO Mine is accessed via aeroplane from Darwin or Cairns. **Nearest Towns:** There are three main townships on Groote Eylandt, namely, Alyangula, Angurugu and Umbakumba. The township of Alyangula is located adjacent to the Milner Bay Port Facility and approximately 16 km to the north of the mine industrial area, whilst Angurugu is located directly adjacent to the mine (Figure 1-1).		

[1] An MMP amendment for the FY25 planning period (termed FY25 MMPA) was submitted to the NT Department of Industry, Tourism and Trade (DITT) on 26 March 2024. The purpose of the FY25 MMPA was to provide authorisation for FY25 activities pending approval of this document.

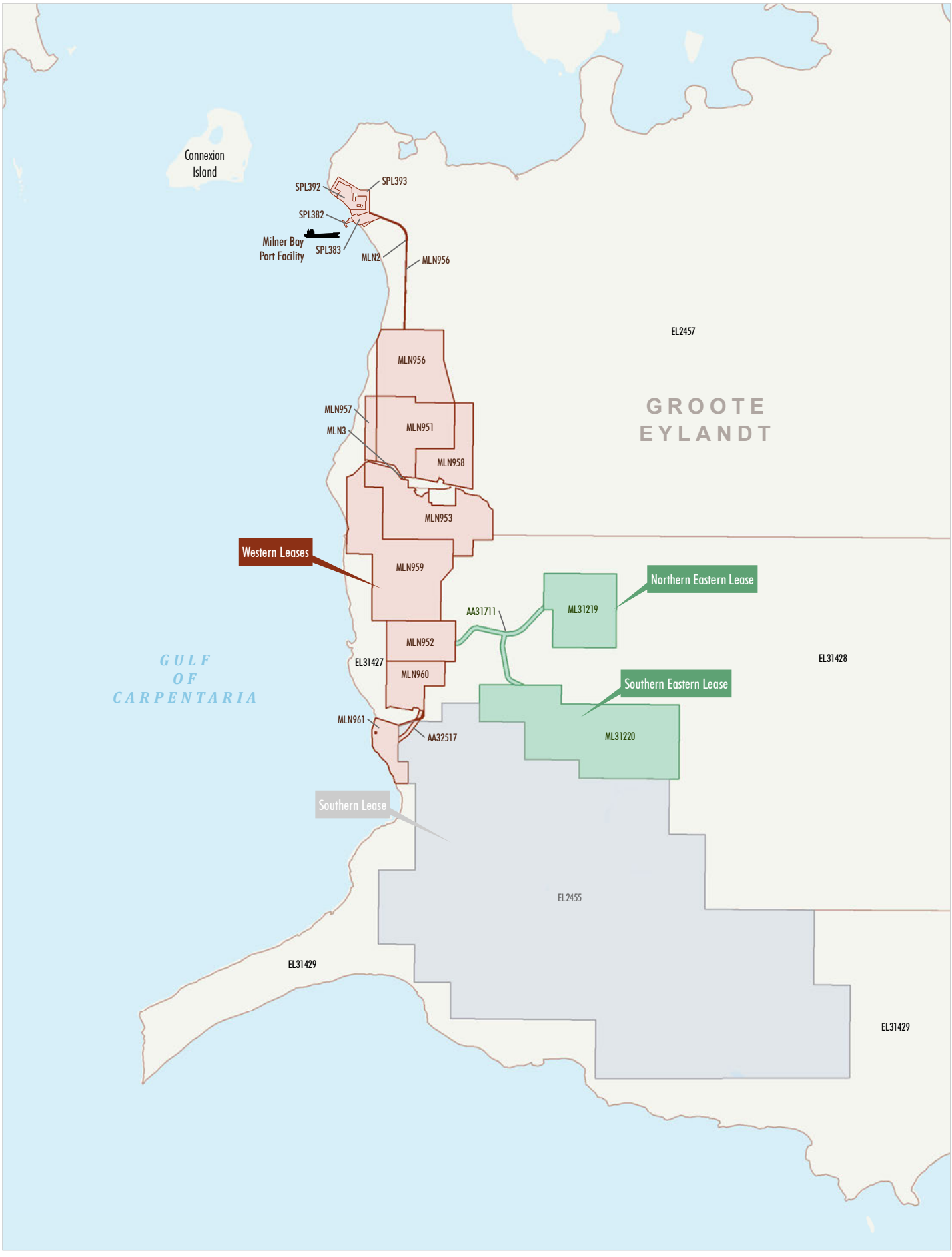
1.4. Declaration

I hereby declare that the information provided in this MMP is true and correct to the best of my knowledge and that I accept that the misrepresentation or omission of facts may delay assessment for authorisation under the *Mining Management Act 2001* (NT) (MM Act).

TABLE 1-5 DECLARATION

Declaration			
Director Name	Steven Hedges		
Director Signature		**Date**	27/06/2024
~~**Director/**~~**Company Secretary Name**	Li Ching Delaney		
~~**Director/**~~**Company Secretary Signature**		**Date**	27/06/2024

STH-23-09 ClosureMMP_202A



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Kilometres

Coordinate System: GDA94 MGA Zone 53

Legend

- Eastern Leases (Mineral Leases, Access Authority)
- Western Leases (Mineral Leases, Access Authority, Special Purpose Leases, Leasehold)
- Southern Lease (Exploration Licence - Granted)
- Exploration Licence - Application

SOUTH32 FY25 - Closure MMP

Figure 1-2
Mineral Tenements

Date: April 2024	Scale: 1:250,000	Author: RS

STH-23-09 ClosureMMP_203B

2. PROJECT SUMMARY

2.1. Overview

2.1.1. Scope and Purpose

The purpose of this MMP is to facilitate the continued operation of the GEMCO Mine on Groote Eylandt as approved under mining authorisation 0126-01.

This MMP details planned operations within the Western Leases and the Eastern Leases (listed in Table 1-3). The Southern Lease is a mineral exploration licence approved under mining authorisation 0887-01, and is subject to separate assessment and approvals. Operations within the Southern Lease are not detailed in this MMP.

Mining activities and processing operations within the Western Leases and the Southern Eastern Lease (Southern EL; ML31220) are detailed in the main text of this MMP, and as such the security estimate detailed in Section 8.2 has been developed to sufficiently allow for these works. Planned operations in the Northern Eastern Lease (Northern EL; ML31219) are dependent on the completion and outcomes of a Feasibility Study (FS) which is scheduled to occur in FY26. Accordingly, indicative planned operations and associated security value for the Northern EL are detailed separately in Appendix 9.6.

2.1.2. Project Description

A high-level description of key project aspects is provided in Table 2-1.

TABLE 2-1 PROJECT OVERVIEW

Project Aspect	Element	Description
Site History	Western Leases	Mining and processing activities have been undertaken in the Western Leases for over 60 years.
	Eastern Leases	The Eastern Leases consists of two mineral tenements termed the Northern EL (ML31219) and the Southern EL (ML31220). Exploration activities commenced in both leases in 2001.
Approval Sought	Continued Open-cut Mining and Processing	Mining activities in the Western Leases will continue to be undertaken as per historical approvals and methodology. Mining activities are scheduled to occur in the Southern EL from FY25 as described in the draft Eastern Leases Environmental Impact Statement (EIS) and Interim Mining Management Plan Amendment (MMPA) FY25, issued to NT Department of Industry, Tourism and Trade (DITT) in April 2024. Operations undertaken in accordance with this MMP will include approximately 1,656 hectares (ha) of open pit mining expansion across a number of smaller pits within the Western Leases and the Southern EL, up to a maximum of 7,150 ha. The maximum value is conservative, as progressive rehabilitation will be undertaken throughout operations.
	Open-cut Mining (Northern EL)	Mining activities are scheduled to occur in the Northern EL from FY28, subject to the outcomes of ongoing exploration works. Activities and proposed disturbance associated with the Northern EL have been considered separately (refer Appendix 9.6).
Commodity	Manganese	As at 30 June 2023, total mineral resource for dry Run-of-Mine (ROM) was 127 million tonnes (Mt), with 43.6% manganese and 47% yield[2]. Cut-off grade for dry ROM mineral resources is ≥35% manganese washed product. Indicative expected shipping rates of manganese concentrate for FY25-FY32 average 5.2 million tonnes per annum (Mtpa), with a maximum of 6.0 Mtpa in any given financial year.

[2] https://www.south32.net/investors-media/investor-centre/annual-reporting-suite

Project Aspect	Element	Description
Schedule	Exploration	FY25-FY31 (includes Grade Control drilling)
	Construction	Western Leases: Complete Southern EL: FY25
	Operation and Progressive Rehabilitation	FY25-FY32
	Closure and Rehabilitation	FY32-FY47
Exploration	Methods	During the resource development process, three phases of drilling are conducted, including exploration drilling, resource definition drilling, and grade control drilling. Following on from exploration drilling activities, two levels of geological resource modelling are conducted, including resource modelling, and grade control modelling.
Mining	Target Resource and Methodology	GEMCO employs an open cut strip mining method to mine manganese ore, whereby the deposit is divided up into several different quarries. Within each quarry the orebody is exposed and mined in sequential strips that are typically between 40-60 metres (m) wide. Mining activities are undertaken over a number of quarry areas simultaneously, with ore profile and composition differing between quarries.
	Mining Rate	The indicative mining rate for the period of the MMP is up to approximately 10.3 Mtpa of wet ROM Manganese ore totalled across the Western Leases and the Eastern Leases.
	Port	GEMCO product is shipped from the Milner Bay Port on Groote Eylandt.
	Mode of Transport	Product concentrate is transported from the processing facility via road train along the Rowell Highway to the Milner Bay Port Facility.
Processing	On-site	Processing, which includes the blending of ore, is undertaken within GEMCO mineral leases and special purpose lease.
	Key Infrastructure and Methodology	ROM ore is crushed and fed into the concentrator, and washed to remove clay and other waste impurities. The two ore size fractions (lumps and fines), and two tailings size fractions (sands and slimes) are separated using vibrating screens. The lump ore is fed into a rotating drum separator containing a ferro-silicon media and water to achieve a desired density, and is separated from waste materials using density separation. A similar process is completed for the fines using cyclones. Tailings are separated into the sands and slimes fractions using cyclones, and then pumped to the Tailings Storage Facilities (TSFs), except for some sands tailings which are pumped to the Sand Beneficiation Plant (SBP) for reprocessing.
	Processing Rate	The concentrator has a nominal production capacity of 5.2 Mtpa (wet tonnes) of manganese product.
	Sand Beneficiation Plant	A SBP, also known as the PC02 plant, was commissioned in May 2016 and runs concurrently to the existing concentrator. The SBP is designed to process up to 2.9 Mtpa (dry) of feed material, producing up to 0.7 Mtpa (dry) of PC02 product (40% nominal manganese grade).
Closure	Closure Methodology	In line with the South32 Closure Standard and GEMCO's forecast mine life, a dedicated Closure Project for the operation was initiated in FY22 to progress the forward work plan items identified in the FY22 GEMCO Mine Closure Plan (MCP) submitted to DITT in April 2023. Pre-feasibility phase study works are in progress and GEMCO will commence a comprehensive closure Feasibility Study (FS) from late 2024. It is anticipated that this study will run for approximately 18 months.
Ancillary Activities	Power Supply	The Rowell Highway Power Station is operated and maintained by GEMCO, and supplies power to the GEMCO mine site, the communities of Alyangula and Angurugu, and nearby satellite residential areas.
	Airport	GEMCO contracts Aerodrome Management Services Pty Ltd (AMS) to manage the Groote Eylandt Airport. This facility supports GEMCO's fly in/fly out (FIFO) operations, commercial Public Transport flights and light aircraft charter flights.

Project Aspect	Element	Description
Tailings Management	Tailings Storage Facilities	The total tailings production for the MMP coverage period (FY25-FY32) is approximately 33.7 Mt. There are a number of operational TSFs, several of which are currently being rehabilitated, and a single process water dam (Dam 1) that feeds the concentrator.
	Sand Tailings Reclamation	GEMCO is currently reviewing potential alternative sands-reclaim methods to those currently implemented, with a concept study scheduled for completion in FY25. Pending the outcome of the study and trials, alternative sands tailings reclamation activities (such as hydraulic mining or dredging) may commence from FY26. No change to disturbance is forecast as a result of this project.
	Tailings Storage Facility 17	TSF17 is proposed to provide additional slimes tailings storage capacity if existing active slimes TSFs (TSF13 and TSF15) reach their design storage limits (indicatively FY29). The project is currently in pre-feasibility phase, during which further studies will be completed to facilitate confirmation of the preferred construction option. Construction is expected to commence in FY26, and is planned to be undertaken on previously disturbed land.
	Tailings Repurposing	GEMCO is undertaking study works to investigate the potential for repurposing or reusing GEMCO's Manganese slime tailings to either; recover manganese via re-processing, or; repurpose the slimes material for alternative uses. The main objectives of the project are to unlock potential value in the slimes tailings, and to help reduce the final volume of slimes and overall tailings footprint on site. Current concept study works include sampling, analysis, test work and reprocessing trials to improve characterisation of the slimes material, along with a market analysis and high level techno-economic assessment of the various repurposing options. The pre-feasibility phase of this project is expected to be completed by mid-FY26, with no change to disturbance forecast during the MMP period as a result of the study works. Further project detail will be provided via a future MMPA submission should GEMCO decide to progress to project execution.
Water Management	Sources	Potable water is directly sourced from the Angurugu River where it is treated and piped to the mining infrastructure areas. GEMCO has approval to take water in accordance with Water Licence 9291005. Total water entitlements include: • 1,740 megalitres/annum for public water supply; and • 845 megalitres/annum for mining purposes.
	Management	Quarry dewatering is undertaken to ensure a safe access for personnel and heavy earthmoving equipment, and to allow mining activities to occur. Mine-impacted quarry-water is either stored on site, used for ore processing and dust suppression, or discharged into nearby bushland. Mine water is discharged to the surrounding environment, only if it meets pre-determined environmental water quality trigger levels and is considered to be excess to operational requirements.
Flood Immunity	General Specifications	Mine planning activities are carried out with the aim of providing a flood immunity protection level, where the development of quarries avoids inundation from the Emerald River and Amagula River (and all tributaries of both) up to a 1 in 100 year storm event. TSFs are designed with flood immunity up to a 1 in 100 year flooding event. Haul road crossings are installed with low flow drainage culverts designed to convey up to a 1 in 2 year ARI flood flow. High flow events typically greater than a 1 in 2 year event are designed to flow over engineered culverts, thereby avoiding potential impediments to stream flows.

Note: FY = Financial Year

2.1.3. Current and Proposed Disturbances

Existing and proposed disturbances for the project for the remaining life of mine are summarised in Table 2-2 and shown on Figure 2-1 and Figure 2-2[3].

TABLE 2-2 DISTURBANCE SUMMARY – WESTERN LEASES AND SOUTHERN EASTERN LEASES

Disturbance Type[1]	Existing (June 2024)	Proposed (FY25-FY32)	Total[4]
Site Infrastructure	316	23	339
Airport	110	0	110
Quarries / Active Mining	1,639	1,588	3,227
Tailings Storage Facilities and Dams	1,017	0	1,017
Stockpiles	155	5	160
Access and Haul Roads	570	42	612
Total Active Disturbance[2]	**3,806**	**1,656**	**5,462**
Rehabilitation[3]	1,688	1,406	3,094
Total Disturbance[4]	**5,494**	**1,656**	**7,150**

(1) Disturbance hectares are for GEMCO's Mineral Lease Tenements and Access Authority areas only, with SPL disturbance excluded (i.e. Port and Township disturbance areas).

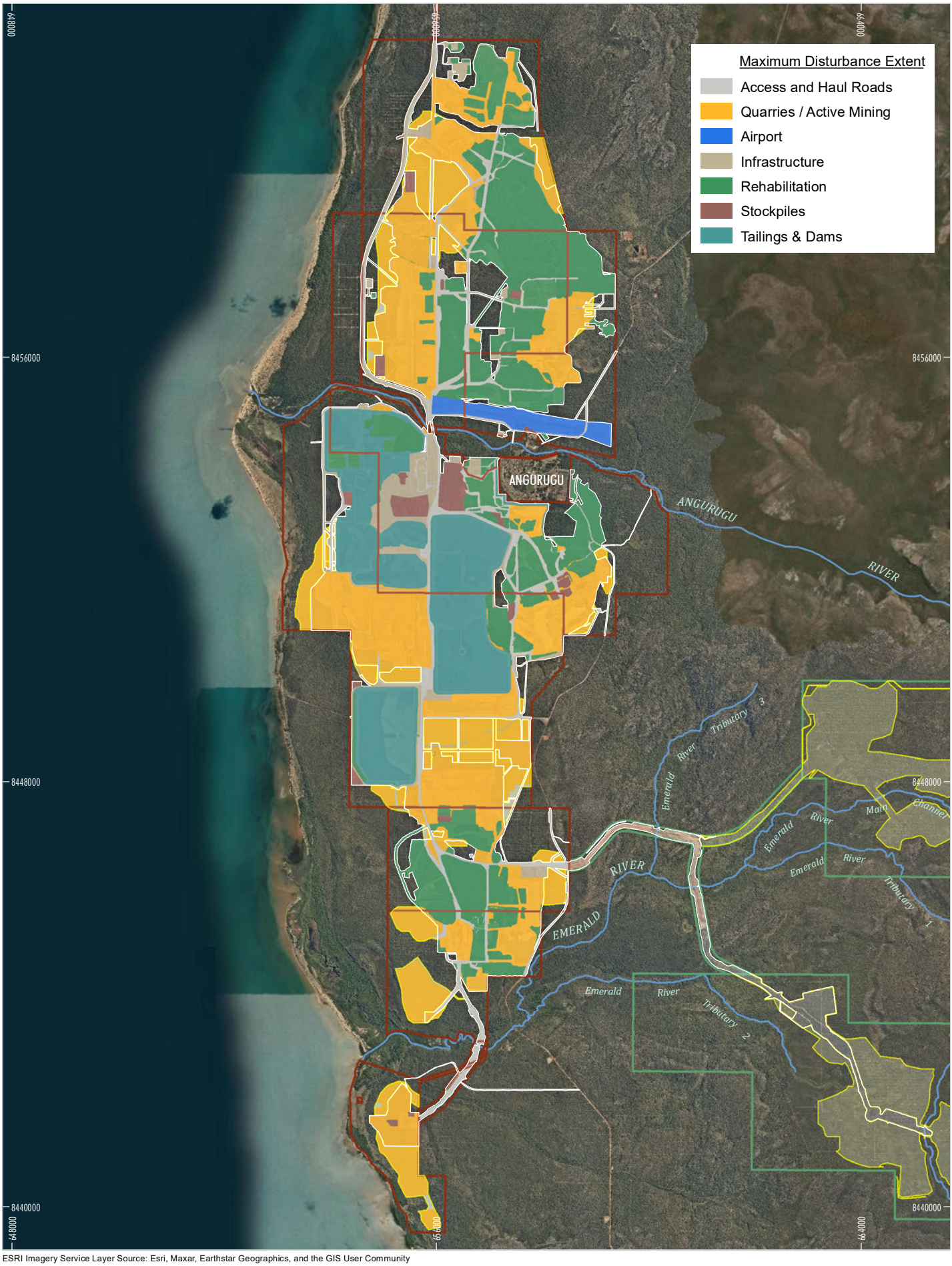
(2) Total Active Disturbance excludes Public Access Track diversions in Eastern Leases which will remain after mining completion.

(3) Proposed Rehabilitation areas are within current and future Active Disturbance areas, and thereby excluded from Proposed Total Disturbance area.

(4) Total values may not equal the sum of values in each row or column due to rounding.

GEMCO undertakes progressive rehabilitation as described in Section 5.2.1.

[3] Watercourse buffers shown on Figure 2-2 have been defined around the main channels of the Emerald and Amagula Rivers in order to minimise potential impacts. The extent of the buffers is a combination of the 1 in 100 year ARI flood extents (as per the Eastern Leases EIS), and 100 metres to either side (as per the requirements of GEMCO's Mining Agreements).



ESRI Imagery Service Layer Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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Kilometres

Coordinate System: GDA94 MGA Zone 53

Legend

- Western Leases
- Eastern Leases
- Watercourse
- Current Clearance Extent
- Maximum Planned Clearance Extent

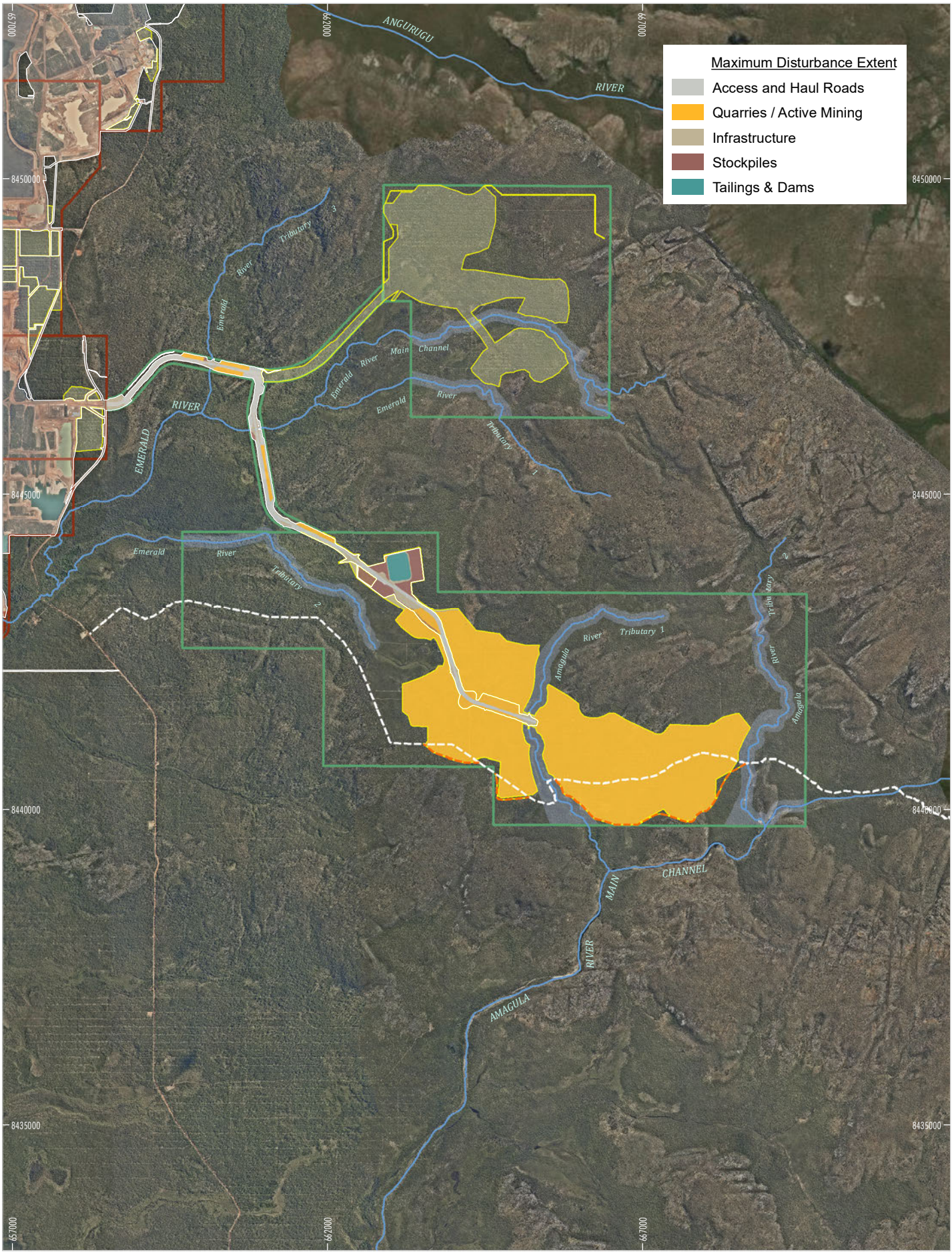
SOUTH32

FY25 - Closure MMP

Figure 2-1
Western Leases
Disturbance Summary

Date: May 2024	Scale: 1:95,000	Author: RS

STH-23-09 ClosureMMP_205E



ESRI Imagery Service Layer Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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Kilometres

Coordinate System: GDA94 MGA Zone 53

Legend

- Eastern Leases
- Western Leases
- Watercourse
- Watercourse 100 m Buffer / 1% AEP Flood Extent
- Current Clearance Extent
- Maximum Planned Clearance Extent
- Proposed Realigned Public Access Track
- Existing Public Access Track

SOUTH32 FY25 - Closure MMP

Figure 2-2
Southern Eastern Leases Disturbance Summary

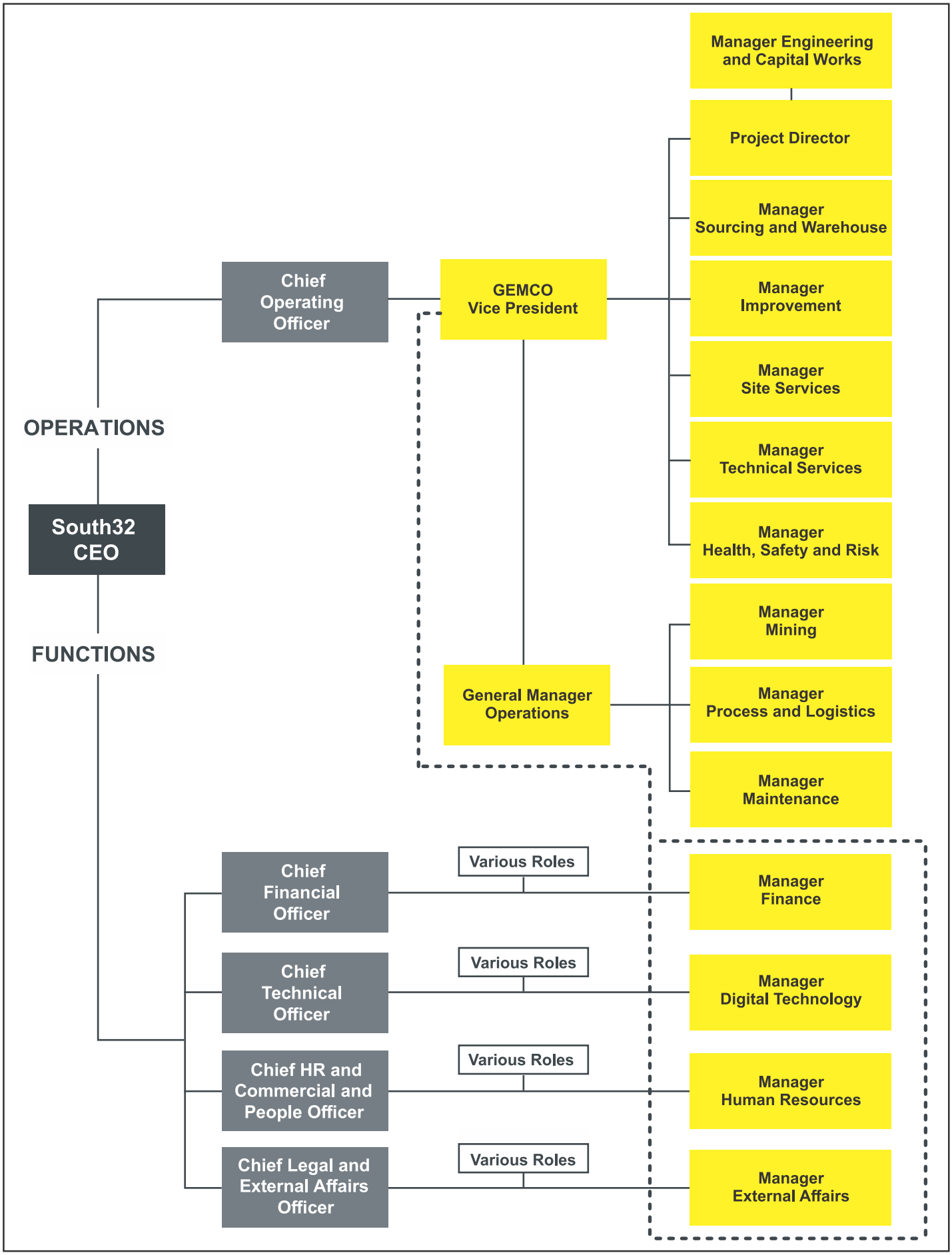
Date: May 2024	Scale: 1:80,000	Author: RS

STH-23-09 ClosureMMP_204F

2.2. Organisational Structure

The activities described in this MMP are carried out, either directly or indirectly, by both operational and functional support teams. Figure 2-3 provides the organisational structure for GEMCO's leadership team.

The Manager Technical Services is responsible for maintaining the MMP and implementing GEMCO's Environmental Management Plans. Overall accountability for all activities and compliance with this MMP is held by the Vice President Operations. Contact details for these personnel are provided in Table 1-2.



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SOUTH32 FY25 - Closure MMP

Figure 2-3
Organisational Structure

Date: March 2024		Plan No: Organisational Structure
Scale: NA		

3. SITE CONDITIONS

3.1. Site Setting

3.1.1. History of Development

GEMCO has undertaken mining activities in the Western Leases for over 60 years. Exploration activities in the Eastern Leases commenced in 2001. Construction activities in the Eastern Leases, including infrastructure and access development, were undertaken from 2022 to 2024. Mining activities are scheduled to occur in the Southern EL (ML31220) from FY25 and in the Northern EL (ML31219) from FY26. Statutory and non-statutory requirements related to GEMCO's Leases (including mining authorisation and Mining Agreements) are detailed in Section 4.

Existing disturbances are summarised in Table 2-2 and shown on Figure 2-1 and Figure 2-2.

3.1.2. Land Use

Groote Eylandt is part of an archipelago of islands known as the Groote Eylandt Archipelago, which is Aboriginal land under the *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth) (ALRA). The Anindilyakwa Land Council (ALC) is the statutory body responsible for activities within the Groote Eylandt Archipelago on behalf of the Traditional Owners.

The Groote Eylandt Archipelago is located within the East Arnhem Local Government Area (LGA). This LGA is administered by the East Arnhem Regional Council (EARC), although the EARC do not manage any infrastructure on GEMCO's mining leases or Special Purpose Leases (SPLs). The Groote Eylandt Archipelago has also been declared an Indigenous Protected Area (IPA). An IPA is an area of Indigenous-owned land or sea where the Traditional Owners have entered into an agreement with the Commonwealth Government to promote biodiversity and cultural resource conservation.

The GEMCO Mine is the main development on Groote Eylandt and extends over an area covering approximately 132 square kilometres (km^2) on the western side of the island (Figure 1-2). There is also an undeveloped mineral lease on Winchelsea Island (owned and managed by Winchelsea Mining Company Pty Ltd) and a number of small-scale eco-tourism activities, including a resort near Alyangula (see Figure 1-1). Otherwise, Groote Eylandt is largely undeveloped, with much of the island being used for traditional Aboriginal practices such as hunting and gathering.

The majority of Groote Eylandt is not open to the general public, however the ALC has nominated a number of recreation areas that can be accessed by the public, subject to a permit system. Popular recreation areas in proximity to the GEMCO Mine include Pole 24, Milyerrngmurramanja (Naked Pools), Wurruwarrkbadenumanja (Cave Paintings) and Adabarrinjumanja (Amagula Pools) (Figure 3-1).

3.1.3. Nearest Towns and Infrastructure

The main townships near to the GEMCO Mine are shown on Figure 3-1, including the mining township of Alyangula and the Aboriginal settlement of Angurugu. Alyangula is located on GEMCO's SPLs (SPL392 and SPL393) and predominantly houses the mine workforce and their families. It also serves as the regional hub for NT and Commonwealth Government services on Groote Eylandt. Residential and commercial property developments on the fringes of Alyangula have seen new areas established (i.e. Pole 7) and existing areas expanded (i.e. Pole 13) in recent years as part of the ALC's economic development plan. Further from the GEMCO Mine within the Groote Eylandt Archipelago are the Aboriginal settlements of Umbakumba on Groote Eylandt and Milyakburra on Bickerton Island (Figure 1-1).

Recreation Area Source: Anindilyakwa Land Council (ALC) Annual Report 18/19

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Kilometres

Coordinate System: GDA94 MGA Zone 53

Legend

- Eastern Leases
- Western Leases
- Township
- Public Road
- Unsealed Public Road
- Watercourse
- Outstation
- Recreation Area (Public Access by Permit)
- Telstra Hill
- Groote Eylandt Airport
- Integrated Waste Management Facility (IWMF)
- Pole 7
- Pole 13

SOUTH32 FY25 - Closure MMP

Figure 3-1
Local Setting

Date: April 2024	Scale: 1:150,000	Author: RS

STH-23-09 ClosureMMP_201A

There are also a number of small, rural Aboriginal settlements (termed “satellite communities” or “outstations”) which typically have varying levels of use, from permanent residency to occasional visitation or sporadic residency. There are six satellite communities in close proximity to the GEMCO Mine, namely Malkala, Bartalumba, Ngadumiyerrka (also known as Little Paradise), Yedikba (also known as Emerald River) and Wurrumenbumanja (also known as Leske) (Figure 3-1). Malkala, Bartalumba, Yedikba and Ngadumiyerrka are permanently occupied by Aboriginal residents while Wurrumenbumanja has varying levels of occupancy, from occasional visitation to sporadic residency.

There are two main public roads on Groote Eylandt, namely the Rowell Highway and the Angurugu-Umbakumba Road (Figure 1-1). Both roads are sealed, two lane roads and provide access between Alyangula and the mine site, and between Angurugu and Umbakumba, respectively. There are also various unsealed public access roads and tracks on the island that typically lead to satellite communities or recreation areas.

Other key infrastructure on Groote Eylandt owned and managed by GEMCO includes the airport, port facility and power station.

3.1.4. Climate

Groote Eylandt experiences a tropical climate which is characterised by hot, humid summers (during which the majority of rainfall occurs) and dry winters.

Climate data from the Bureau of Meteorology (the Bureau) weather station located at Groote Eylandt Airport (station number 014518; see Figure 3-1) has been collected since May 1999. Table 3-1 presents data for temperature and rainfall from this weather station. The nearest meteorological station with long-term evaporation data (1966-2017) is located at the Gove Airport (station number 014508).

TABLE 3-1 SUMMARY OF CLIMATE STATISTICS

Month	Average Temperature (°C)[1]		Average Rainfall (mm)[1]	Average Daily Evaporation (mm)[2]
	Minimum	Maximum		
January	25.4	33.4	247.9	5.8
February	25.1	33.1	239.8	5.2
March	23.9	32.8	265.3	5.0
April	21.9	32.5	153.3	5.4
May	19.3	30.9	29.5	5.4
June	17.1	29.0	4.3	5.2
July	15.7	28.8	2.6	5.2
August	15.4	30.2	1.2	6.1
September	17.9	32.6	7.9	6.7
October	21.2	34.2	27.0	7.2
November	23.6	34.6	125.8	7.3
December	25.1	34.5	181.0	6.7
Annual	21.0	32.2	1,275.2	5.9

(1) Recorded between May 1999 and February 2024 at the Bureau meteorological station at Groote Eylandt Airport (014518).

(2) Recorded between 1966 and 2017 at the Bureau meteorological station at Gove Airport weather station (014508).

Note: mm = millimetres, °C = degrees Celsius

Figure 3-2 and Figure 3-3 present this climate data in graphical form.

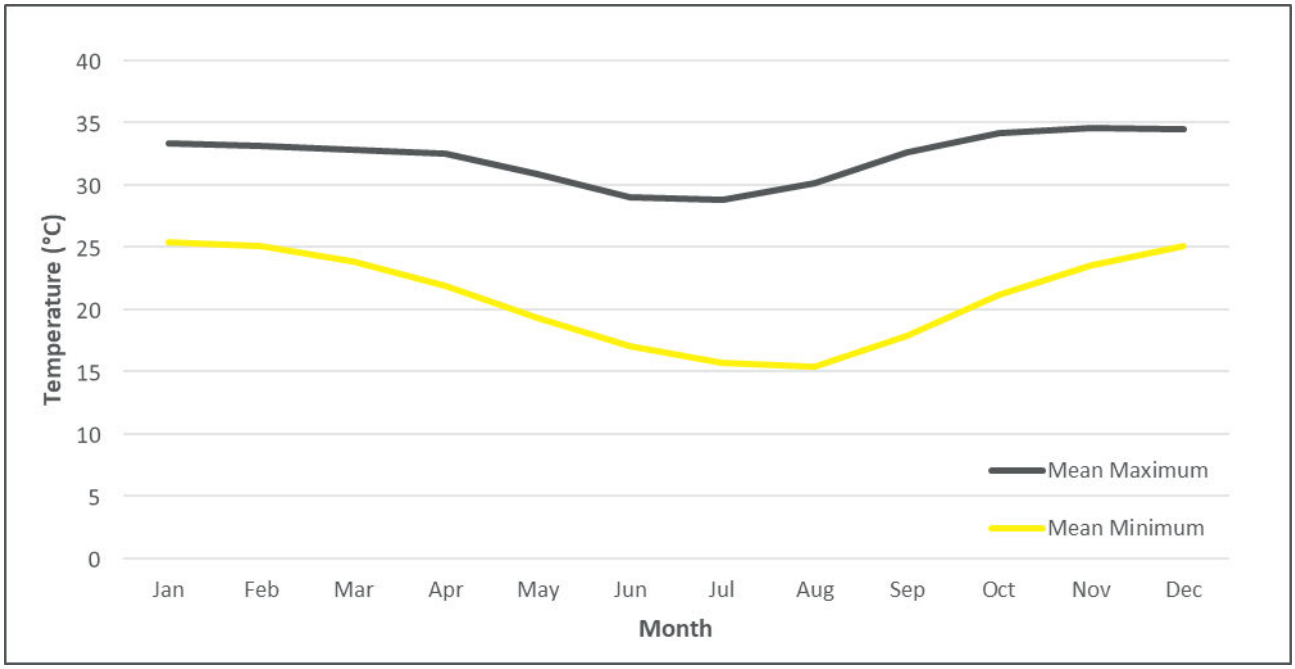


Figure 3-2 Average Long-term Monthly Temperature – Groote Eylandt Airport (Bureau Station 014518)

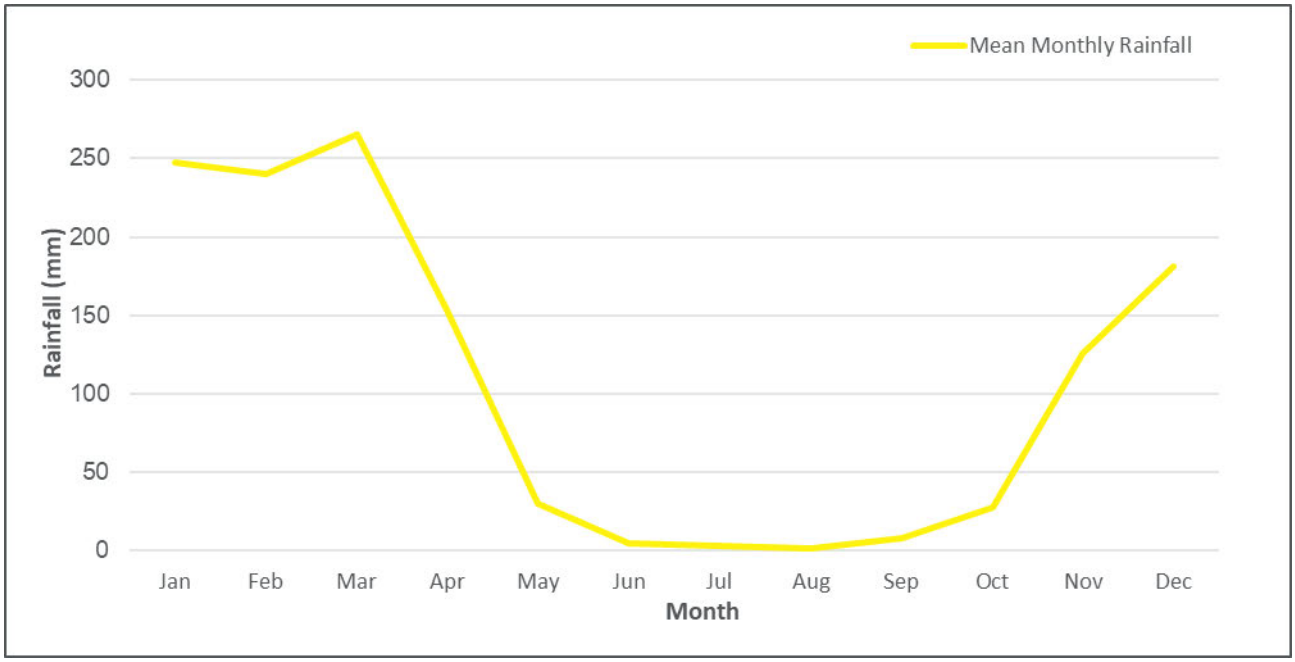


Figure 3-3 Average Long-term Monthly Rainfall – Groote Eylandt Airport (Bureau Station 014518)

Groote Eylandt experiences monsoonal rains, and may experience cyclonic winds during the passage of intense low pressure systems. Flooding associated with cyclones, storms and monsoonal troughs can typically affect the region. GEMCO uses online weather systems (the Bureau and Weatherzone) to monitor weather conditions and has well-established controls and emergency response plans in place to assess and manage potential risks to personnel and/or equipment.

Localised bushfires usually occur during the dry season period (June-November) and before the onset of rain over the summer months. It is at this time that lower humidity, high winds and lack of rain are common. Fires are generally lit by the Traditional Owners as part of their cultural burning practices, or are generated by lightning strike. GEMCO uses an online fire database (Northern Australia Fire Information) to assist with monitoring bushfires on its leases, and has trained fire and emergency personnel and resources to respond should a fire pose an immediate threat to community, personnel safety and/or GEMCO's assets.

3.1.5. Land Systems

Topsoil and Subsoil

The Western Leases are located in the lowlands, west of the main plateau of Groote Eylandt. The soils within GEMCO's planned disturbance areas are dominated by 'deep brown' and 'greyish yellow' to 'brown reddish' and 'dark brown' sandy earth loams and gradational contrast soils, with minor areas of mottled clayey sand subsoils and alluvial loamy sands relating to active drainage pathways (GT Environmental, 2017).

Vegetation communities appear to be strongly influenced by the underlying soils and geology. *Eucalyptus tetrodonta* open-forest overlying laterite material and the *E. tetrodonta* open-forest/low open-forest transition areas occur in areas where the soil type is an acid red earth. The soil is more gravelly in nature in the transition zone. An O horizon is not present in these soil profiles and soil depth increases from a few centimetres (cm) near the edge of the manganese ore outcrop to a depth of 10 m (Langkamp et al., 1979).

The dark brown A1 horizon is a hard setting sandy loam, 25 to 30 cm in depth. In laterite areas, less than 10% of the soil consists of ferro-manganiferous concretions, whereas in the transition areas these concretions make up more than 60% of the total soil. No mottles are present in these areas. The B-horizon extends down to the manganese orebody.

E. tetrodonta low open-woodland occurs in association with the manganese orebody. The A horizon extends from very dark brown sand at the surface into a dark reddish-brown sandy B horizon from 5 to 20 cm. The surface soil is hard setting and has an earthy fabric. The surface soil is underlain by the lateritised manganese orebody which outcrops frequently leaving scattered pockets of soil. The shallow profile contains visually more than 60% coarse round or angular manganiferous concretions and is therefore a gravelly lateritic brown earth.

Callitris intratropica and *E. tetrodonta* open-forest occurs over sandstone material. The profile associated with this community is a sandy brown earth. The A1 horizon is 10 to 15 cm thick and is a dark yellowish brown sand grading into a dark brown sandy A2 horizon. The loamy sand of the B horizon extends to an average depth of 1 m and is underlain by sandstone bedrock boulders. The colour varies from a yellowish red to 50 cm depth to a dark red colour near the bedrock.

The pH in surface soils for all vegetation communities is commonly near neutral with the manganese surface soil being the most acidic (pH 5.8).

The Eastern Leases are predominantly located on the Bundah land system and to a lesser extent the Yarrawirrie and Groote land systems with small areas intersecting the Effington land system. Soils are dominated by areas of deep brown to light grey brown sandy earths, loams and gradational contrast soils (dark brown to reddish brown loamy sands on undulating plains, light brownish grey to yellow brown loamy sands on undulating plains, brownish black loamy sands on level to undulating plains), with minor areas of clay loam subsoils relating to active drainage pathways, rugged upland areas with very shallow soils and dense rocky outcrops, and a densely vegetated monsoonal vine thicket. No evidence of acid sulfate soils (ASS) has been identified and the risk of ASS occurring is considered to be extremely low, given the geological origins, elevation and landforms (GT Environmental, 2015).

Topography and Geology

Groote Eylandt is dominated by Proterozoic arenites of the Dalumbu Sandstone forming a relatively low-lying plateau on the central and southern portions of the island. Headwater drainage systems incise the quartz-arenites to form radial drainage patterns. The low-lying plains to the north of the plateau are predominantly Mesozoic and Cainozoic strata overlying the Bartalumba Basalts. The majority of the western shoreline consists of the low-lying onlapping Cretaceous sediments which hosts the manganese deposit. The majority of GEMCO's mining lease area consists of Cretaceous sediments with the exception of a discontinuous narrow strip along the eastern boundary where the Proterozoic sandstone outcrops. Figure 3-4 shows the geology across Groote Eylandt, including the distribution of the manganese ore.

The Groote Eylandt manganese orebody is a sedimentary layer that gently undulates beneath the western plains of the island. It extends over an area of approximately 50 km^2 as an almost continuous horizon, varying in thickness up to 11 m and is essentially stratabound and strataform in character. The orebody consists of massive, pisolitic and oolitic manganese oxides.

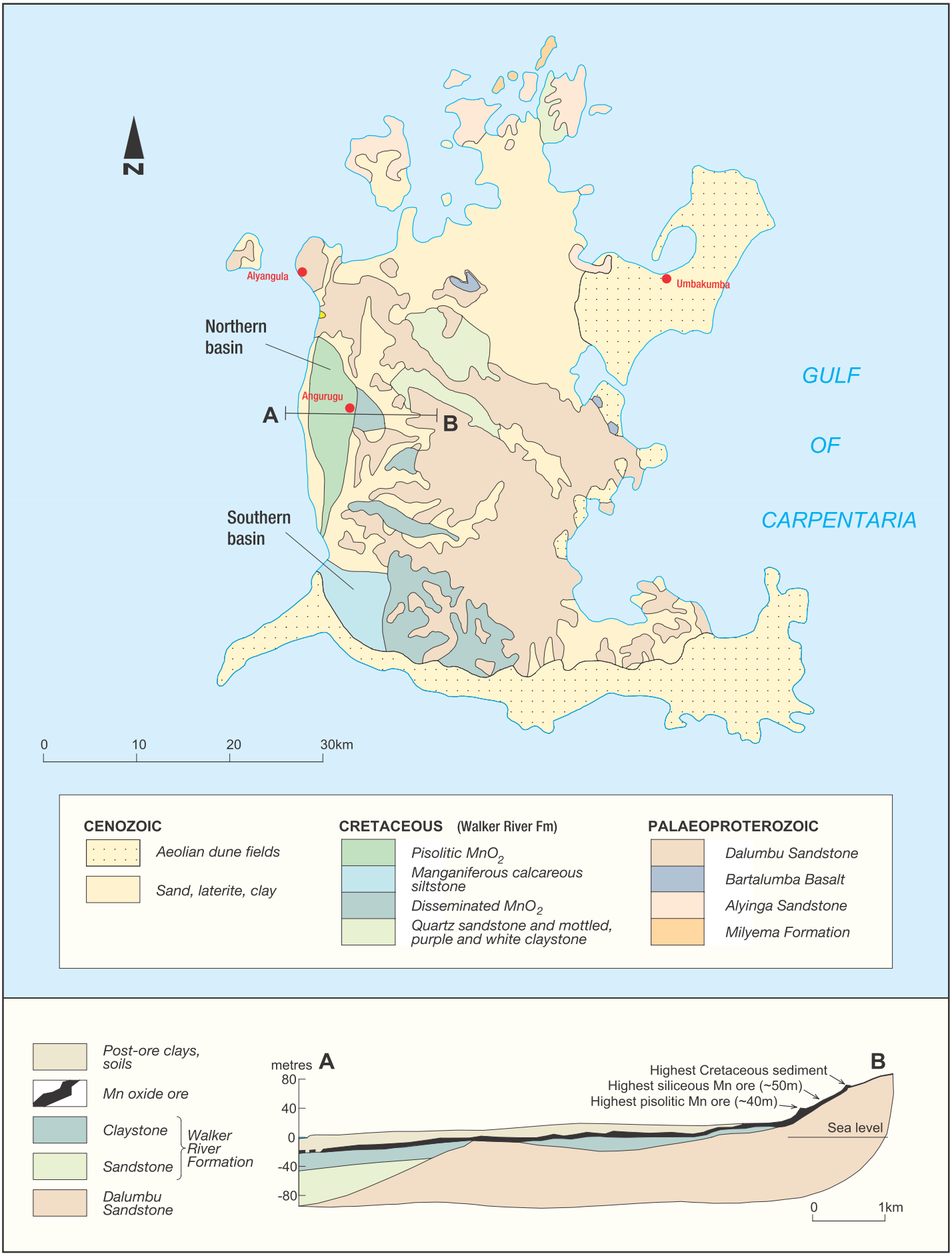
In the Western Leases, the mined ore horizon is between 0.5 m and 10 m thick. The 'middle' mining horizon is typically a massive high-grade cemented ore and loose high-grade pisolite ore whereas the 'lower' mining horizon is a massive, high silica ore.

Through the Eastern Leases the mined ore horizon is between 0.5 m and 6.0 m thick. The 'main' orebody is composed of several thin ore seams of 0.5 m to 1.5 m thick, with internal clay bands of 0.5 m to 1.0 m in thickness. These clay-rich bands contain seams of disseminated manganese and loose pisolitic ore. The overlying clays and gravels were strongly oxidised and leached to form the laterites that are now excavated off the manganese ore as overburden. In most cases, overburden thickness averages between 15 m and 35 m. The lower part of the sediments below the manganese-bearing beds comprise clayey silt and fine- to medium-grained sand. Within the sand unit are sections of well-sorted, fine- to medium-grained marine sand of high transmissivity and storage, which frequently act as aquifers. Figure 3-5 presents an indicative geological stratigraphy representative of the current mining areas.

Lithologies intersected by GEMCO's mining operations are typically composed of lateritic material that is not considered to be potentially acid-forming (PAF). As a result, very little testing has historically been required in the Western Leases to assess the Acid Mine Drainage (AMD) characteristics of overburden (i.e. waste rock), manganese ore and tailings.

In 2012, representative sands tailings samples were tested to assess the AMD characteristics of sand tailings. This testing reaffirmed sands tailings at GEMCO are relatively benign. The run-off and seepage water quality arising from the sample tested was predicted to contain low dissolved metal and sulfate concentrations. This, together with the low salinity and non-acid forming (NAF) nature of the materials tested, suggested that sands tailings are unlikely to generate acid or result in the mobilisation of metals and sulfates at levels which are likely to cause exceedance of the selected water quality guideline criteria.

In 2019, qualitative screening was undertaken along the J Quarry Haul Road alignment to assess the presence of ASS. Initial field investigations highlighted discrete pockets of potential ASS at the bridge crossing location (just downstream from the existing MLN961 tenement), however subsequent laboratory testing confirmed that only seven of 24 samples analysed met the criteria for ASS. These materials were identified to have a low capacity to generate further acidity as a result of sulfate oxidisation and it was recommended that the materials be appropriately managed via the application of lime. Following implementation of the proposed management, haul road and bridge construction works were completed with no further acidity generated.



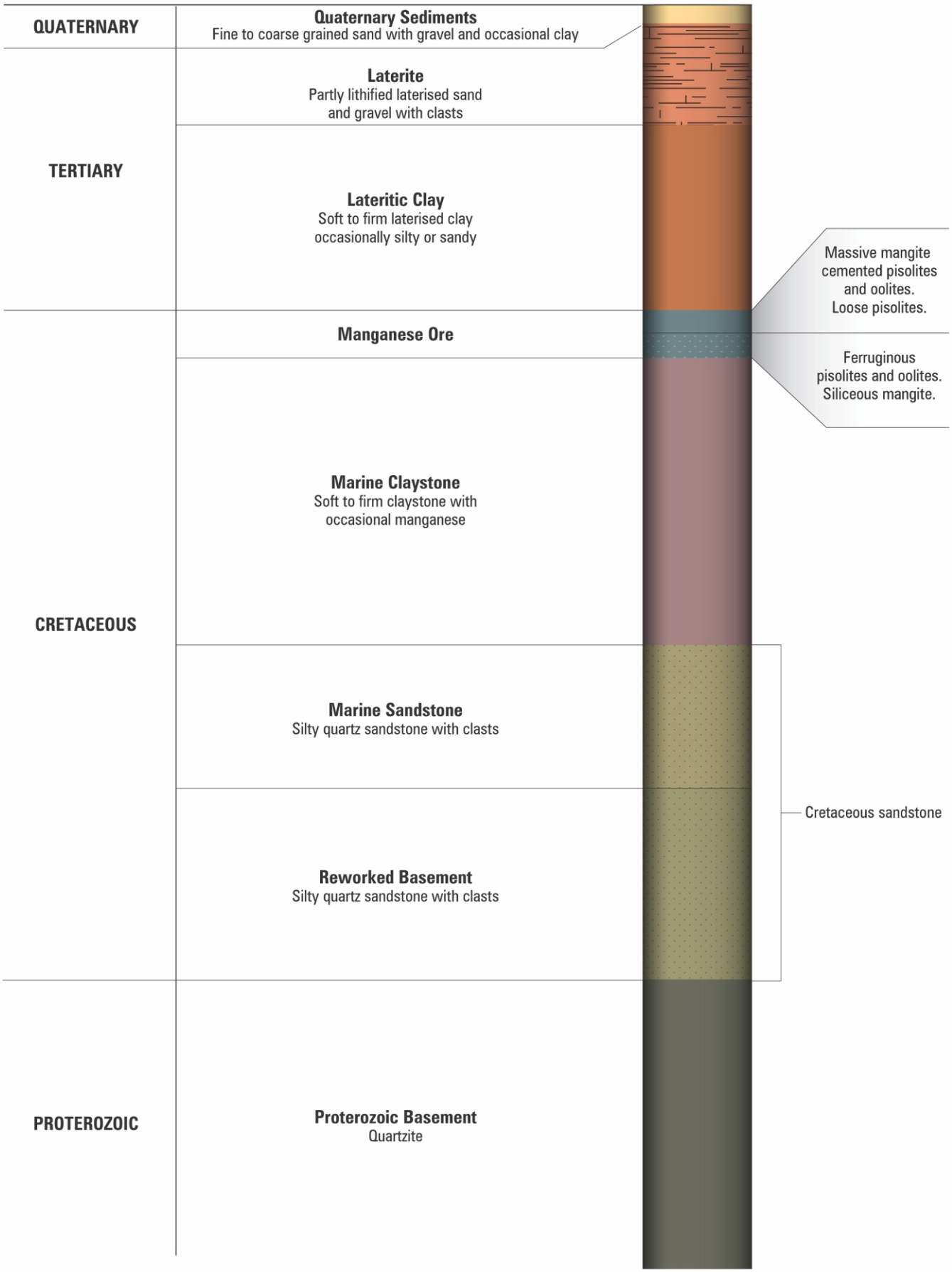
Source: Figure 41, Ferenczi, P.A., 2001. Iron ore, manganese and bauxite deposits of the Northern Territory. Department of Business, Industry and Resource Development.

STH-23-09 ClosureMMP_010A

SOUTH32 FY25 - Closure MMP

Figure 3-4
Geology of Groote Eylandt

Date: May 2024		Plan No: Geology of Groote Eylandt
Scale: NA		



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SOUTH32

FY25 - Closure MMP

Figure 3-5
Typical Geological Profile

Date: May 2024		Plan No: Typical Geological Profile
Scale: NA		

In 2020, an ASS Management Plan was developed by RGS Environmental Pty Ltd. This study took soil samples from boreholes located proximal to the Emerald River, from the Northern and Southern Tributary crossings and from potential borrow sources. It was concluded that ASS are not a significant issue, however they do exist as discrete zones within the Emerald River, as well as the Southern and Northern Tributaries. These can be mitigated using minimal liming.

In the Eastern Leases, a detailed assessment of overburden geochemistry was completed for the Environmental Impact Statement (EIS). This assessment confirmed that materials are generally NAF and will generate low salinity runoff, with minimal trace elements. However, a small area of PAF material was identified in the north-western portion of the Southern EL (ML31220). GEMCO has developed a procedure for the monitoring, handling and emplacement of any PAF material encountered during mining operations to ensure that potential risks are appropriately managed (refer Section 7.5.15). The procedure has also been developed to meet the PAF management commitments in the EIS and the associated recommendations from Assessment Report 77.

Vegetation

The vegetation on Groote Eylandt is generally characterised by species and communities that are widespread across northern Australia, and strongly reflects the geology, topography and fire regime of the area. In 2017, the NT Department of Environment, Parks and Water Security (DEPWS) undertook island-wide vegetation mapping, defining vegetation communities using Vegetation Mapping Units (VMUs). The VMUs found within the Western and Eastern Leases are listed in Table 3-2 and shown in Figure 3-6, Figure 3-7 and Figure 3-8. In 2018-2019, GEMCO engaged Cumberland Ecology to ground-truth the DEPWS mapping for the Western Leases and surrounding area.

The most common vegetation communities comprise open woodland to open-forests that are dominated by *E. tetrodonta* (Darwin Stringybark) and *Eucalyptus miniata* (Darwin Woollybutt) with a low shrub or tussock grass understorey (VMUs 10, 10a and 10b). These vegetation communities typically occur on the gently undulating sandy and lateritic soils. Also common are vegetation types that comprise a mix of *E. tetrodonta, E. miniata, Corymbia polycarpa* (Long-fruited Bloodwood) and *Callitris intratropica* (Northern Cypress Pine) with a low shrub/tussock/hummock grass understorey (VMUs 40, 40a, 40b, 42 and 11). These vegetation types were found to be the more dominant communities growing on the lateritic plains and lowland areas. Smaller areas of monsoon vine forests and *Melaleuca* spp. dominated open-forests and woodland are also present.

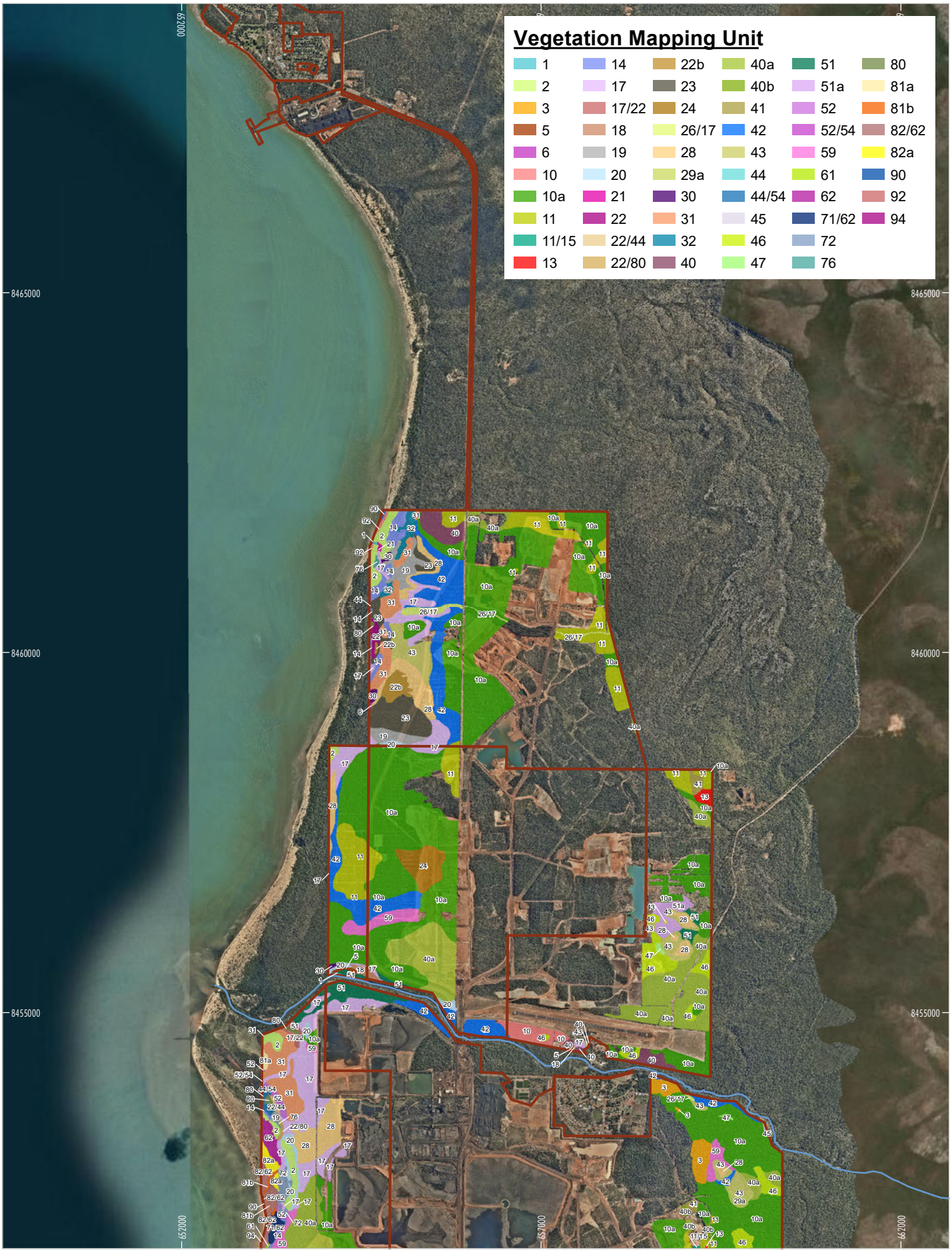
TABLE 3-2 VEGETATION MAPPING UNITS

VMU	Name
Individual VMUs	
1	Mangrove low closed-forest/closed-forest
2	Dry coastal monsoon vine closed-forests/low closed-forests
3	Dry sub-coastal (inland) monsoon vine-forests (includes Quaternary sands not associated with drainage and not coastal (often at margins of sandplain and consolidated lithologies)
5	Riparian monsoon vine-forests with *Melaleuca cajuputi* and/or *Melaleuca leucadendra*
6	Seepage monsoon vine-forests with *Melaleuca cajuputi* and/or *Melaleuca leucadendra* isolated emergents
10	*Eucalyptus tetrodonta* / *E. miniata* open-forest to woodland with low shrub or tussock grass understorey
10a	*Eucalyptus tetrodonta* / *E. miniata* open-forest with low shrub or tussock grass understorey on lowland plains and rises
10b	*Eucalyptus tetrodonta* / *E. miniata* open-forest with low shrub and mixed tussock/hummock grass understorey on upland plateau surfaces, mostly associated with deeply weathered land surfaces
11	*Eucalyptus tetrodonta* / *E. miniata* / *Callitris intratropica* open-forest with mixed shrub/tussock grass understorey
13	*Eucalyptus tetrodonta* / *E. kombolgiensis* Woodland with shrubby or open hummock grassland understorey

VMU	Name
14	*Acacia latescens* / *A. torulosa* tall shrubland; *Eucalyptus tetrodonta* / *E. kombolgiensis* open-forest; *Eriachne triseta* / *Schoenus sparteus* grassland (dune swale complex or on island sandstones)
15	*Callitris intratropica* / *Acacia* spp. tall open-forest, with shrubland complex on sandstone
17	*Melaleuca viridiflora* or *Melaleuca cajuputi* or *Melaleuca leucadendra* or *Melaleuca ferruginea* / *Eucalyptus polycarpa* / *Eucalyptus bigalerita* open-forest with *Pandanus spiralis* and Mixed tussock grassland understorey
18	*Melaleuca leucadendra* and/or *Melaleuca cajuputi* / *Dillenia alata* +/- *Melaleuca viridiflora* open-forest with fern/sedge understorey (Swamp Forests - Emerald River) Gullies in sandstone
19	*Melaleuca cajuputi* or *Melaleuca ferruginea* / *M. leucadendra* open-forest with fern/bracken understorey. *Corymbia bella* and/or *Eucalyptus bigalerita* woodland occurs on the fringes
20	*Melaleuca cajuputi* / *Corymbia bella* or *Eucalyptus bigalerita* open-forest with shrubby understorey often including monsoon vine forest species
21	Mixed *Melaleuca* open-forests/ monsoon vine-forests
22	*Melaleuca cajuputi* low closed-forest / *Dapsilanthus ramosus* sedgeland/closed sedgeland (permanent swamps/sedgelands)
22b	*Melaleuca cajuputi* shrubland / *Dapsilanthus ramosus* sedgeland/closed sedgeland (permanent swamps/sedgelands)
23	*Melaleuca cajuputi* / *M. viridiflora* low open-forest with *Dapsilanthus elatior* sedgeland understorey
24	*Eucalyptus tetrodonta* +/- *E. miniata* low open-forest/woodland with low tree or mixed perennial tussock grass / *Sorghum interjectum* tussock grassland understorey
26	Riparian woodland to open-forest of *Melaleuca leucadendra*, *Corymbia polycarpa*, *Eucalyptus tetrodonta* on ephemeral rivers/streams in drier sub-coastal lowlands
28	*Melaleuca* spp. (*M. viridiflora* / *M. cajuputi* / *M. ferruginea*) woodland to low woodland on alluvial plains with sedge understorey
29a	*Eucalyptus tetrodonta, Corymbia ferruginea* woodland on sandy lowland plains with tussock grass ground layer
30	*Eucalyptus tetrodonta, Corymbia kombolgiensis, Corymbia polycarpa* woodland with shrubby understorey of monsoon vine thicket woodland on deeply weathered lowlands and stabilised coastal sands in the east
31	*Eucalyptus tetrodonta, Corymbia kombolgiensis, Melaleuca viridiflora* / *leucadendra, Corymbia polycarpa, Corymbia foelscheana* open-forest/woodland with shrubby understorey and tussock grasses on lowlands including stabilising sands in the east where transitional into VMU 30
32	*Acacia* spp., *Melaleuca dealbata, Melaleuca viridiflora, Corymbia polycarpa, Asteromyrtus symphyocarpa* low woodland on quaternary sandplains
40	*Eucalyptus tetrodonta* / *E. miniata* / *E. polycarpa* +/- *Callitris intratropica* woodland with low shrub or tussock/hummock grass understorey
40a	*Eucalyptus tetrodonta* / *E. miniata* +/- *E. polycarpa* woodland with low shrub and tussock grass dominated understorey on lateritic plains and low rises (generally lowlands)
40b	*Eucalyptus tetrodonta* +/- *E. miniata* +/- *Callitris intratropica* woodland to open woodland with low shrub/hummock/tussock grass understorey on shallow rocky soils usually derived from sandstone. Plateaus, hills and rises
41	*Callitris intratropica* / *Eucalyptus tetrodonta* / *E. kombolgiensis* open woodland with hummock grassland understorey
42	*Eucalyptus polycarpa* / *E. tetrodonta* / *E. miniata* woodland with sedge spp./ low shrub understorey
43	*Melaleuca viridiflora* / *Eucalyptus polycarpa* / *Grevillea pteridifolia* open woodland with *Asteromyrtus symphyocarpa* and *Vetiveria elongata* tussock grassland
44	*Melaleuca leucadendra* or *Melaleuca cajuputi* woodland with *Ischaemum* spp. understorey adjacent to the estuarine zone
45	*Eucalyptus polycarpa* open woodland with sedges, short tussock grass understorey and areas of grassland
46	*Eucalyptus tetrodonta* / *E. miniata* low woodland with tussock grass understorey
47	*Eucalyptus tetrodonta* / *Corymbia polycarpa* / *Melaleuca viridiflora* low open woodland with *Asteromyrtus symphyocarpa* shrubland
48	*Eucalyptus tetrodonta* and/or *Corymbia kombolgiensis* +/- *Corymbia polycarpa*, *Corymbia ferruginea* open woodland to woodland with *Acacia* spp., *Grevillea* spp., *Terminalia carpentariae* and mixed hummock/tussock grasses on sandstone

VMU	Name
51	Alluvial woodland to open woodland with *Corymbia bella*, *Corymbia polycarpa* and *Eucalyptus bigalerita* +/- *Corymbia grandifolia, Corymbia foelscheana, Corymbia confertiflora, Eucalyptus tetrodonta, Eucalyptus tectifica, Erythrophleum chlorostachys*
51a	*E. bigalerita* woodland
51b	*Eucalyptus bigalerita* / *Corymbia bella* open woodland
52	*Melaleuca viridiflora* and *Pandanus spiralis* +/- *Corymbia bella* and/or *Eucalyptus bigalerita* and/or *Corymbia polysciada* (in north) open-woodland adjacent to estuarine zone. *Chrysopogon elongatus* tussock grassland
54	*Melaleuca acacioides* low open woodland adjacent to estuarine zone
59	*Eucalyptus tetrodonta* / *Erythrophleum chlorostachys* / *Corymbia polycarpa* woodland on lateritic lowland plains
61	*Melaleuca ferruginea* / *Melaleuca viridiflora* / *Melaleuca cajuputi* +/- *Corymbia polycarpa* open woodland to low open woodland with *Pandanus spiralis, Grevillea pteridifolia* and 'wet' tussock grass ground layer (*Germainia grandiflora*, *Ischaemum* spp.) and sedges (*Dapsilanthus* spp.) in wet dune swales and open drainage systems
62	Open-woodland to scattered trees of monsoon species on sand or cemented sand dunes (*Sterculia quadrifida, Diospyros humilis, Drypetes deplanchei, Santalum* spp.*, Diospyros maritima, Pouteria sericea, Brachychiton paradoxus, Hakea arborescens*)
71	*Acacia* spp., *Pandanus spiralis* open shrublands to *Chrysopogon elongatus*, mixed annual grasses, *Tephrosia* spp., *Euphorbia* spp., *Tribulopsis angustifolia* grassland/forbland on active dunes
72	*Acacia* spp. and/or mixed species shrublands (*Melaleuca* spp.*, Terminalia carpentariae, Buchanania obovata, Grevillea* spp.*, Banksia dentata, Verticordia cunninghamii*) on coastal sandplains and stabilising dunes with mixed sedge/tussock grass ground layer (*Triodia microstachya, Dapsilanthus spathaceus, Schoenus sparteus*)
76	*Acacia* spp. with scattered monsoon species emergents closed tall shrubland to low open-forest on cemented sand dunes
80	*Eleocharis* spp., *Cyperus* spp. sedgeland
81a	Closed tussock grassland on margins of estuarine zone (*Heteropogon triticeus, Chrysopogon elongatus, Triodia* spp. [Dry])
81b	*Pseudoraphis spinescens*, *Paspalum scrobiculatum* closed grassland in wet swales or plains on quaternary coastal sands with emergent *Pandanus spiralis* +/- *Melaleuca* spp.
82	Grassland on stabilized primary dune, rearward cemented dunes and sandplains
82a	Tussock grassland on sandplains and stabilised dunes of *Sorghum plumosum* and *Chrysopogon elongatus*
84	*Lepironia* spp. or *Dapsilanthus ramosus* and *Dapsilanthus elatior* sedgeland fringing permanent waterbodies
88	Brackish water sedge swamp - *Schoenoplectus litoralis, Eleocharis* spp., *Cyperus* spp.
90	Strand vegetation varying from samphire, grassland, and *Casuarina equisetifolia* open woodland
92	*Chrysopogon, Enneapogon, Canavalia, Cassytha, Triodia* grassland/forbland complex with scattered emergent low trees on frontal or active quaternary dunes and plains and cemented dunes on islands
94	Beach Sand
100	Saline Tidal Flats +/- emergent isolated trees and (chenopod) shrubs
200	Disturbed
201	Regrowth/Rehabilitation
202	Cleared
Combination VMUs	
10b/15	See VMU descriptions above
10b/41	See VMU descriptions above
1/100	Mangrove low closed-forest/closed-forest / Saline Tidal Flats +/- emergent isolated trees and (chenopod) shrubs
11/15	*Eucalyptus tetrodonta* / *E. miniata* / *Callitris intratropica* open-forest with mixed shrub/tussock grass understorey / *Callitris intratropica* open-forest; *Acacia* spp. Tall shrubland complex on sandstone
13/40b	See VMU descriptions above
13/41	See VMU descriptions above

VMU	Name
17/26	See VMU descriptions above
17/22	*Melaleuca viridiflora* or *Melaleuca cajuputi* or *Melaleuca leucadendra* or *Melaleuca ferruginea* / *Eucalyptus polycarpa* / *Eucalyptus bigalerita* open-forest with *Pandanus spiralis* and mixed tussock grassland understorey / *Melaleuca cajuputi* low closed-forest / *Dapsilanthus ramosus* sedgeland/closed sedgeland (permanent swamps/sedgelands)
22/44	*Melaleuca cajuputi* low closed-forest / *Dapsilanthus ramosus* sedgeland/closed sedgeland (permanent swamps/sedgelands) / *Melaleuca leucadendra* or *Melaleuca cajuputi* woodland with *Ischaemum* spp. understorey adjacent to the estuarine zone
22/80	*Melaleuca cajuputi* low closed-forest / *Dapsilanthus ramosus* sedgeland/closed sedgeland (permanent swamps/sedgelands) / *Eleocharis* spp., *Cyperus* spp. sedgeland
26/17	Riparian woodland to open-forest of *Melaleuca leucadendra, Corymbia polycarpa, Eucalyptus tetrodonta* on ephemeral rivers/streams in drier sub-coastal lowlands / *Melaleuca viridiflora* or *Melaleuca cajuputi* or *Melaleuca leucadendra* or *Melaleuca ferruginea* / *Eucalyptus polycarpa* / *Eucalyptus bigalerita* open-forest with *Pandanus spiralis* and Mixed tussock grassland understorey
26/42	See VMU descriptions above
28/42	See VMU descriptions above
40b/13	See VMU descriptions above
40b/41	See VMU descriptions above
41/48	See VMU descriptions above
42/45	See VMU descriptions above
42/51	*Eucalyptus polycarpa* / *E. tetrodonta* / *E. miniata* woodland with sedge spp./ low shrub understorey / Alluvial woodland to open woodland with *Corymbia bella, Corymbia polycarpa* and *Eucalyptus bigalerita +/- Corymbia grandifolia, Corymbia foelscheana, Corymbia confertiflora, Eucalyptus tetrodonta, Eucalyptus tectifica, Erythrophleum chlorostachys*
44/1	*Melaleuca leucadendra* or *Melaleuca cajuputi* woodland with *Ischaemum* spp. understorey adjacent to the estuarine zone / Mangrove low closed-forest/closed-forest
44/54	*Melaleuca leucadendra* or *Melaleuca cajuputi* woodland with *Ischaemum* spp. understorey adjacent to the estuarine zone / *Melaleuca acacioides* low open woodland adjacent to estuarine zone
52/54	*Melaleuca viridiflora* and *Pandanus spiralis +/- Corymbia bella* and/or *Eucalyptus bigalerita* and/or *Corymbia polysciada* (in north) open-woodland adjacent to estuarine zone. *Chrysopogon elongatus* tussock grassland / *Melaleuca acacioides* low open woodland adjacent to estuarine zone
71/62	*Acacia* spp., *Pandanus spiralis* open shrublands to *Chrysopogon elongatus*, mixed annual grasses, *Tephrosia* spp., *Euphorbia* spp., *Tribulopsis angustifolia* grassland/forbland on active dunes / Open woodland to scattered trees of monsoon species on sand or cemented sand dunes (*Sterculia quadrifida, Diospyros humilis, Drypetes deplanchei, Santalum, Diospyros maritima, Pouteria sericea, Brachychiton paradoxus, Hakea arborescens*)
82/62	Grassland on stabilized primary dune, rearward cemented dunes and sandplains / Open woodland to scattered trees of monsoon species on sand or cemented sand dunes (*Sterculia quadrifida, Diospyros humilis, Drypetes deplanchei, Santalum, Diospyros maritima, Pouteria sericea, Brachychiton paradoxus, Hakea arborescens*)
201/3	Regrowth/Rehabilitation / Dry sub-coastal (inland) monsoon vine-forests (includes Quaternary sands not associated with drainage and not coastal [often at margins of sandplain and consolidated lithologies])
201/11	Regrowth/Rehabilitation / *Eucalyptus tetrodonta* / *E. miniata* / *Callitris intratropica* open-forest with mixed shrub/tussock grass understorey
201/17	Regrowth/Rehabilitation / *Melaleuca viridiflora* or *Melaleuca cajuputi* or *Melaleuca leucadendra* or *Melaleuca ferruginea* / *Eucalyptus polycarpa* / *Eucalyptus bigalerita* open-forest with *Pandanus spiralis* and mixed tussock grassland understorey
201/40a	Regrowth/Rehabilitation / *Eucalyptus tetrodonta* / *E. miniata +/- E. polycarpa* woodland with low shrub and tussock grass dominated understorey on lateritic plains and low rises (generally lowlands)



ESRI Imagery Service Layer Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
Vegetation Survey Data Source: Cumberland Ecology (2021)

N

0 2

Kilometres

Coordinate System: GDA94 MGA Zone 53

Legend

- Eastern Leases
- Western Leases
- Watercourse

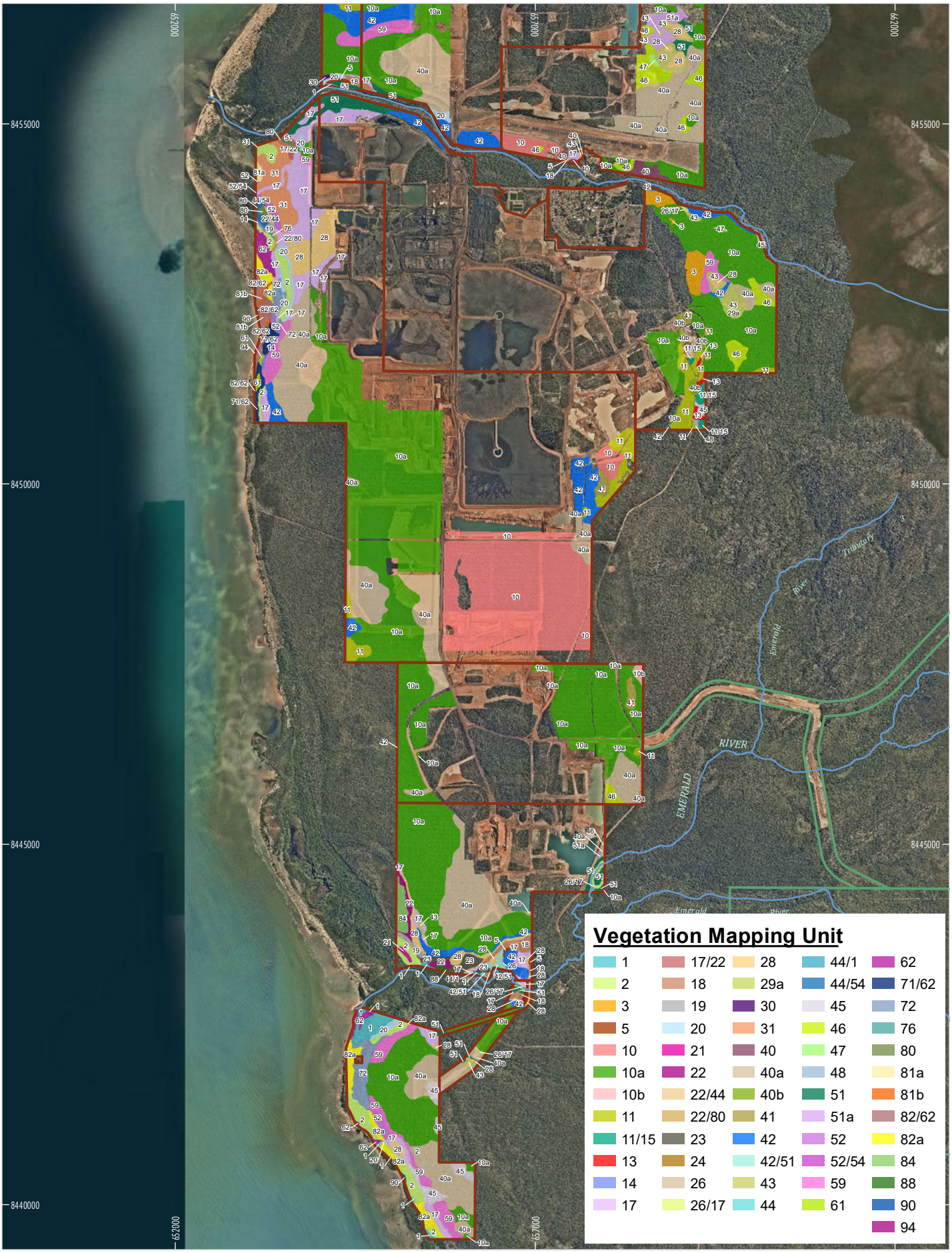
SOUTH32

FY25 - Closure MMP

Figure 3-6
Vegetation Communities
Western Leases (North)

Date: April 2024	Scale: 1:70,000	Author: RS

STH-23-09 ClosureMMP_214C



ESRI Imagery Service Layer Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
Vegetation Survey Data Source: Cumberland Ecology (2021)

N

0 2

Kilometres

Coordinate System: GDA94 MGA Zone 53

Legend

- Eastern Leases
- Western Leases
- Watercourse

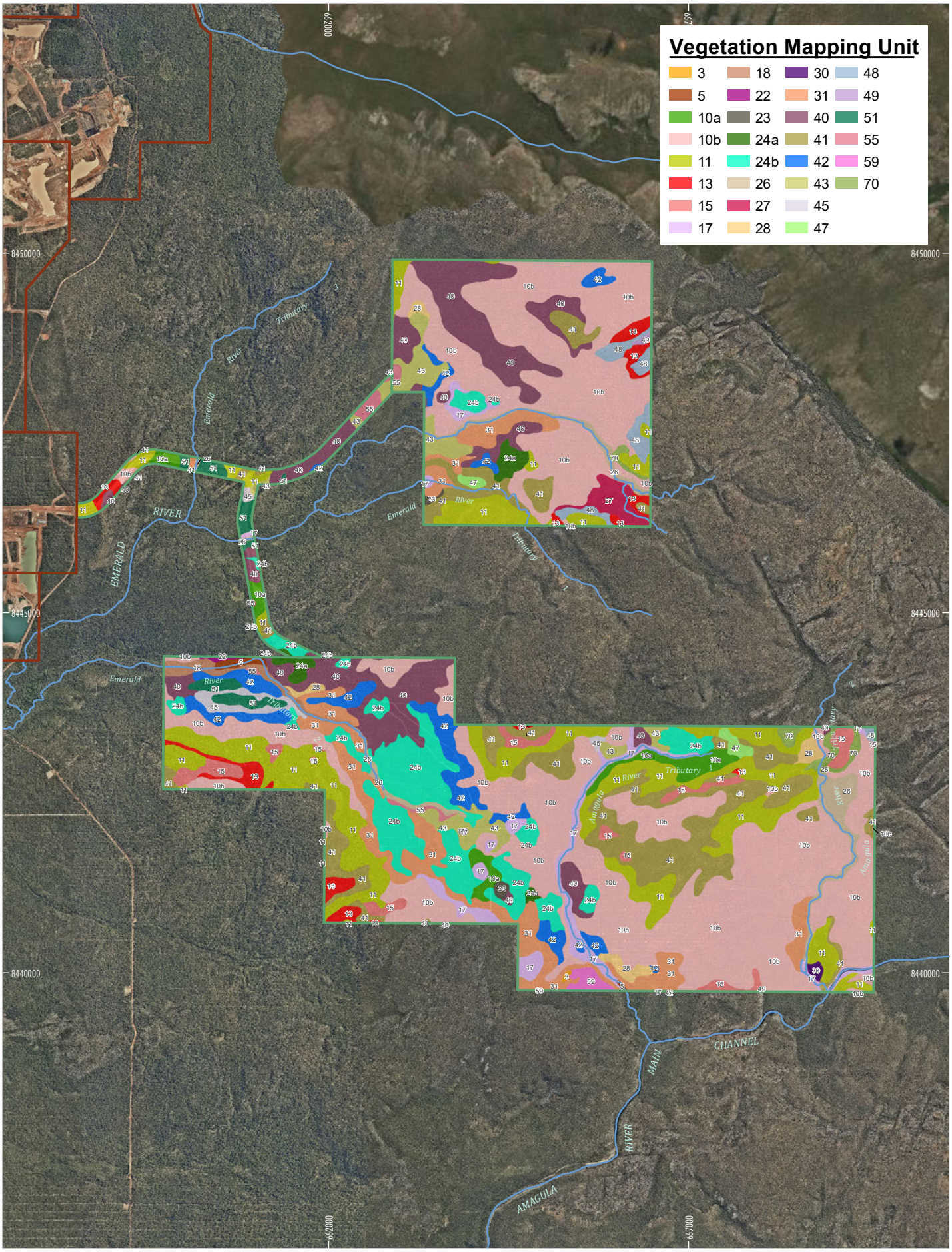
SOUTH32

FY25 - Closure MMP

Figure 3-7
Vegetation Communities
Western Leases (South)

Date: April 2024	Scale: 1:70,000	Author: RS

STH-23-09 ClosureMMP_216C



ESRI Imagery Service Layer Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
Vegetation Survey Data Source: Department of Environment, Parks and Water Security. © Northern Territory of Australia

N

0 2

Kilometres

Coordinate System: GDA94 MGA Zone 53

Legend

- Eastern Leases
- Western Leases
- Watercourse

SOUTH32 FY25 - Closure MMP

Figure 3-8
Vegetation Communities
Eastern Leases

Date: April 2024	Scale: 1:70,000	Author: RS

STH-23-09 ClosureMMP_213B

3.1.6. Hydrogeology

Table 3-3 provides the key hydrostratigraphic units across the Western and Eastern Leases including expected thickness, while Plate 1 presents them visually. The site comprises Cretaceous and Tertiary Aged sediments underlain by crystalline bedrock.

TABLE 3-3 HYDROSTRATIGRAPHIC UNITS - WESTERN AND EASTERN LEASES

Time Period	Formation	Lithology	Hydrostratigraphy	Stratigraphic thickness (m)	Comment
Quaternary	Unnamed	Soil, sand, shelly sand, beach ridges	Upper Aquifer	Thickness between 1 m and 15 m	Seasonally dry in some locations
Tertiary	Unnamed	Clays, sandy clay, Laterite			
		Smectite; stiff to very stiff clay, sandy clay, gravelly clay, lateritic clay	Upper Aquitard, leaky	Up to 30 m thick	Corresponds to overburden or post-strip
Cretaceous	Mullaman Beds	Manganese Orebody	Orebody Aquifer	Thickness between 1 m and 11 m	Contains vertical macropores which result in high vertical conductivity (Kv)
		Glauconitic clay and sand succession, claystone	Partial or leaky Aquitard	1 m to 20 m thick	Variable thickness between 1 and 20 m
		Poorly cemented fine to coarse grained sand and sandstone, quartz rich	Lower Aquifer	1 m to > 50 m thick	Primary Aquifer / water bearing unit on Western and Eastern Leases
Paleo-Proterozoic	Dalumbu Sandstone	Quartzite, re-crystallised, partly weathered	(Low Permeability) Aquitard	Sandstone basement outcrops in eastern part of Western Leases and deepens to greater than 100 m below ground in the Western Leases near the coastal margin. The basement surface undulates significantly across the Western Leases. For geological surface geometry refer to WSP Australia Pty Ltd (WSP) 2024.	Bedrock depth defines base of Lower Aquifer

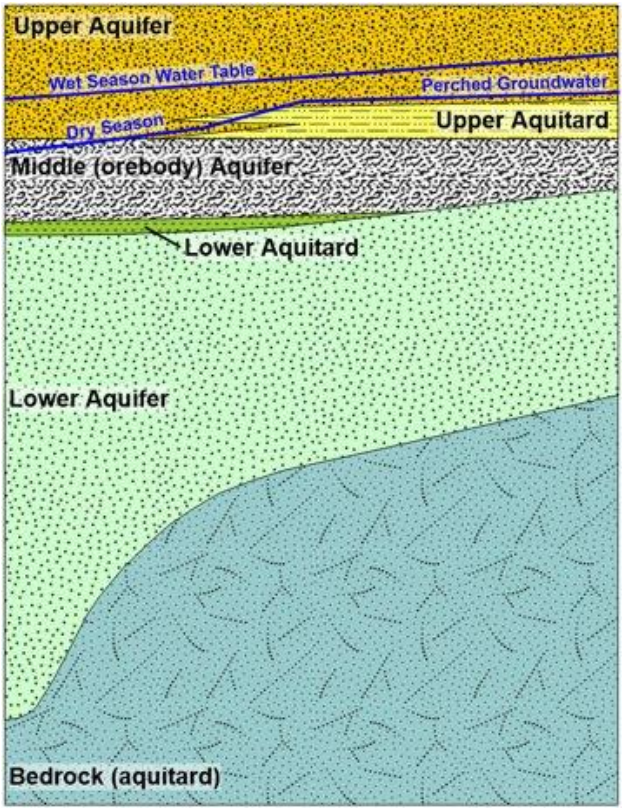


Plate 1 Key Hydrostratigraphic Units of Groote Eylandt

The total package of sediments extends from ground surface to more than 100 m in areas corresponding to paleochannels. Sandstone basement outcrops in the eastern part of Western Leases and deepens to greater than 100 m below ground in the western lease near the coastal margin. The basement surface undulates significantly across the Western Leases. For surface geometry refer WSP (2024) as this geological surface is a key hydrogeological conceptual model feature.

Groundwater generally flows in a west-north-westerly, westerly and west-south-westerly direction for all aquifers present in the Western and Eastern Leases (WSP, 2024). Groundwater flow occurs from bedrock outcrop areas in the east toward the coast in the west, with some minor modification of flow direction resulting from groundwater discharge at the Angurugu and Emerald Rivers (perennial streams). Locally groundwater has been lowered in some areas by dewatering at active quarries due to large scale dewatering operations, conversely groundwater mounding is present in areas where ongoing tailings deposition and excess water to bush occurs. Both of these processes are however heavily buffered by wet season recharge and very permeable surface and subsurface ground conditions.

Groundwater levels are generally shallow across the site, ranging from approximately 20 m below ground in the eastern parts of the Western Leases, shallowing to less than 3 m near the coast.

The primary aquifer is the Cretaceous Lower Aquifer which contains permeable sands ranging in thickness between 1 m and more than 50 m. Yields between 20 and 70 litres per second (L/s) have been recorded from production bores targeting this aquifer unit. There are no production bores currently targeting the ore body and Upper Aquifers across the Western and Eastern Leases, however yields are expected to be low to moderate at less than 5 L/s. All production bores present in the Western and Eastern Leases target the Lower Aquifer. This includes off-lease production bores present at Angurugu and several outstation locations.

Groundwater quality across the site is generally very fresh with salinity reporting at less than 200 milligrams per litre (mg/L) for the Lower, Ore Body and Upper Aquifers. Groundwater pH is generally slightly acidic between 5.5 and 6.5. Groundwater quality is suitable for many purposes including drinking, stock watering, and domestic and industrial uses given the prevalence of low salinity groundwater across Groote Eylandt.

Groundwater is not currently used to supply potable water to the Western Leases mine operations. Potable surface water for the Western Leases is obtained from the Angurugu River. Water for production and mining purposes is largely sourced / re-used from onsite water storages and dewatering activities. In the Southern EL there is one low yielding production bore providing groundwater to support potable water generation (see Section 3.1.7).

The nearest third-party bores are production bores in the Angurugu community. Three operational production bores are known to be in use by Power and Water. The bores target the Lower Aquifer Sands (Mullaman Beds).

3.1.7. Hydrology

The GEMCO Mine lies across several surface water catchments. These are generally classified as high conservation or ecological value systems. There are currently no declared beneficial users or allocation plans of surface water or groundwater on Groote Eylandt according to the NT Extraction Licence Register. Key hydrological features across the Western and Eastern Leases comprise (Figure 3-1):

- **Angurugu River**. A perennial river system that flows in a westerly direction towards the coast separating GEMCO's northern and central quarries. The river flows all year round and receives baseflow from the Upper Aquifer (and potentially the Lower Aquifer) during the dry season.

- **Emerald River**. This river is perennial, receiving surface water flow in the wet season along with input from groundwater. Its headwaters originate within the ELN mine areas EL1->EL4 and are in the upper reaches of the Emerald River catchment. ELS areas EL5 and EL6 are in the upper reaches of the Emerald River with flow in a westerly direction with discharge via an extensive estuary at the southern end of the Western Leases (near J and O Quarries).

- **Ndunga Creek**. This creek is located in the northern part of the Western Leases and is ephemeral in nature, only flowing during the wet season when rainfall reaches a sufficient threshold to result in surface water runoff. Flow is in a westerly direction from outcrop areas towards the coast.

- **Amagula River**. This River is located in the southeastern part of the Eastern Leases and is perennial in nature, only flowing during the wet season when rainfall reaches a sufficient threshold to result in surface water runoff. Eastwards of ELS (EL6), surface and groundwater will discharge via the Amagula River catchment. Flow is in a southerly direction from outcrop areas towards the coast on the southern side of Groote Eylandt.

The Angurugu River is utilised by GEMCO for potable water supply and is piped across the mining operation. The river also provides potable water to Alyangula township. GEMCO takes water under their existing Water Licence 9291005. Total water entitlements are:

- 1,740 megalitres/annum for public water supply; and

- 845 megalitres/annum for mining purposes.

Water from the Angurugu River and Upper Part of the Emerald River is suitable for potable supply (with treatment), with salinity less than 500 mg/L. The lower portions of both Rivers are tidal (estuarine) becoming brackish. Both rivers support aquatic ecosystem values, including aquatic fauna and flora.

3.1.8. Flora

Species of Conservation Significance

The Commonwealth Protected Matters Search Tool (Commonwealth Department of Climate Change, Energy, the Environment and Water [DCCEEW], 2023) indicates that no threatened ecological communities or flora species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) are likely to be present on Groote Eylandt.

The NT Natural Resource (NR) Maps tool (DEPWS, 2020) holds records for two threatened flora species on Groote Eylandt, namely *Utricularia singeriana* and *Eleocharis retroflexa*. *Utricularia singeriana* is listed as Vulnerable under the *Territory Parks and Wildlife Conservation Act 1976* (NT) (TPWC Act) and *Eleocharis retroflexa* is listed as Data Deficient under the TPWC Act and Vulnerable under the EPBC Act. Recent flora surveys have shown that *Utricularia singeriana* occurs at multiple locations in different parts of Groote Eylandt. *Eleocharis retroflexa* is only known from records in south-eastern parts of Groote Eylandt.

Introduced Flora

There are eighteen declared weed species recorded in Alyangula and the Western Leases, four of which are also Weeds of National Significance (WoNS; Table 3-4). There are an additional seven species of weeds which are not currently declared, but which are known to occur and are actively managed by GEMCO (Table 3-4).

Cumberland Ecology (2015) found that there were no declared weeds and that in general, very few weed species were present within the Eastern Leases. METServe (2024) surveyed disturbed areas in the Eastern Leases and recorded three weed species (Hyptis [*Mesosphaerum suaveolens*], Flannel Weed [*Sida cordifolia*] and Caribbean Stylo [*Stylosanthes hamata*]). Hyptis and Flannel Weed are Class B and C weeds under the *Weeds Management Act 2001* (NT). These species, together with risk from other weed species, will continue be managed under the GEMCO Weed Management Plan and biosecurity measures for the Eastern Leases.

Table 3-4 describes the classification of weeds within the NT in accordance with the *Weeds Management Act 2001* (NT) and other Commonwealth and Territory legislation.

TABLE 3-4 WEED CLASSIFICATIONS

Classification	Description
A	**To be eradicated** Reasonable effort must be made to eradicate the plant within the NT
B	**Growth and spread to be controlled** Reasonable attempts must be made to contain the growth and prevent the movement of the plant
C	**Not to be introduced to the Territory** All Class A and B weeds are also considered to be Class C Weeds
Not Classified	**Weeds of environmental concern** Weeds that may threaten natural ecosystems but are not declared under the *Weeds Management Act 2001* (NT)
Weeds of National Significance	**Weed of National Significance** WoNS are identified by the Australian Government

Table 3-5 provides a list of priority weed species occurring, or previously occurring, on GEMCO's leases.

TABLE 3-5 SIGNIFICANT WEED SPECIES

Common Name	Botanical Name	Classification	Location
Bellyache bush	*Jatropha gossypiifolia*	A/C; WoNS	Alyangula & Mine site
Gamba grass	*Andropogon gayanus*	A/C; WoNS	Alyangula & Mine sit
Grader grass	*Themeda quadrivalvis*	B/C; WoNS	Alyangula & Mine site
Neem	*Azadirachta indica*	B/C	Alyangula & Mine site
Prickly pear	*Opuntia* spp.	A/C	Alyangula
Ornamental rubber vine	*Cryptostegia madagascariensis*	A/C; WoNS	Alyangula
Physic Nut	*Jatropha curcas*	A/C	Alyangula
Cats Claw Creeper	*Dolichandra unguis-cati*	A/C	Alyangula
Caltrop	*Tribulus terrestris*	B/C	Alyangula
Candle bush	*Senna alata*	B/C	Alyangula
Coffee bush	*Leucaena leucocephala*	Not declared	Alyangula & Mine site
Gambia pea	*Crotalaria goreensis*	Not declared	Alyangula & Mine site
Guinea grass	*Megathyrsus maximus*	Not declared	Alyangula & Mine site
Mission grass (annual)	*Cenchrus pedicellatus*	Not declared	Mine site
Mission grass (perennial)	*Cenchrus polystachios*	B/C	Alyangula & Mine site
Singapore daisy	*Sphagneticola trilobata*	Not declared	Alyangula
Common Sensitive Plant	*Mimosa pudica* var. *unijuga*	B/C	Alyangula & Mine site
Flannel weed	*Sida cordifolia*	B/C	Alyangula & Mine site
Hyptis	*Hyptis suaveolens*	B/C	Alyangula & Mine site
Mossman River grass	*Cenchrus echinatus*	B/C	Alyangula
Paddy's lucerne	*Sida rhombifolia*	B/C	Alyangula
Para grass	*Urochloa mutica*	Not declared	Alyangula & Mine site
Snakeweed	*Stachytarpheta jamaicensis*	B/C	Alyangula & Mine site
Wild passionfruit	*Passiflora foetida*	Not declared	Alyangula & Mine site
Coffee senna	*Senna occidentalis*	B/C	Alyangula & Mine site

Section 7.5.6 provides further detail on the management of these species.

3.1.9. Fauna

Listed Threatened or Migratory Species

A total of 39 species of native mammals, 237 bird species, 73 reptile species and 18 amphibian species are known to occur within GEMCO's Western Leases based on a search of the Atlas of Living Australia database (CSIRO, 2024).

To date, seven fauna species currently listed under the EPBC Act and/or the TPWC Act have been recorded within the Western Leases. A summary of these species is provided in Table 3-6.

TABLE 3-6 THREATENED FAUNA SPECIES RECORDED WITHIN GEMCO'S WESTERN LEASES

Species	EPBC Act Status	TPWC Act Status	Description of Location
Northern Hopping Mouse (*Notomys aquilo*)	Endangered	Vulnerable	Recorded east of the northern quarries adjacent to the Western Leases boundary. Pre-2000 records from J Quarry (Webb, 1992).
Northern Quoll (*Dasyurus hallucatus*)	Endangered	Critically Endangered	Recorded at numerous locations across the Western Leases, including Alyangula.
Merten's Water Monitor (*Varanus mertensi*)	Endangered	Vulnerable	Recorded in areas associated with low-lying swamps or drainage lines in the Western Leases area.
Northern Masked Owl (*Tyto novaehollandiae kimberli*)	Vulnerable	Vulnerable	Recorded in open eucalypt forest and *Melaleuca* swamp forest habitats in the Western Leases. Known records associated with N Quarry, F Quarry (near Wet Tip), and north-east of D Quarry.
Ghost Bat (*Macroderma gigas*)	Vulnerable	Not Listed	Recorded in *E. tetrodonta* / *C. intratropica* within the Western Leases, and in adjacent areas.
Salt Water Crocodile (*Crocodylus porosus*)	Migratory	Not Listed	Widespread migratory species.
Rainbow Bee-eater (*Merops ornatus*)	Migratory	Not Listed	Widespread migratory species.

A total of 25 native mammal species, 54 bird species, 31 reptile species and 6 amphibian species are known to occur within the Eastern Leases based on surveys conducted by Cumberland Ecology (2015). To date, ten fauna species listed under the EPBC Act and/or the TPWC Act have been recorded in the Eastern Leases area. A summary of these species is provided in Table 3-7.

TABLE 3-7 THREATENED FAUNA SPECIES RECORDED WITHIN GEMCO'S EASTERN LEASES

Species	EPBC Act Status	TPWC Act Status	Description
Northern Hopping Mouse (*Notomys aquilo*)	Endangered	Vulnerable	Recorded north of the realigned Northern EL haul road corridor, and in the Northern EL. Recorded in north-west Southern EL, including Southern EL haul road corridor.
Northern Quoll (*Dasyurus hallucatus*)	Endangered	Critically Endangered	Recorded at numerous locations across the Eastern Leases and within the haul road corridors.
Northern Blue-tongued Skink (*Tiliqua scincoides intermedia*)	Critically Endangered	Not Listed	Detected in the Southern EL and Southern EL haul road corridor.
Merten's Water Monitor (*Varanus mertensi*)	Endangered	Vulnerable	Recorded mainly in aquatic habitat in the Southern EL. Recorded in the Northern EL.
Northern Masked Owl (*Tyto novaehollandiae kimberli*)	Vulnerable	Vulnerable	Recorded in open eucalypt forest with low shrub or tussock grass understorey habitat in the Northern EL and Southern EL.
Ghost Bat (*Macroderma gigas*)	Vulnerable	Not Listed	Recorded foraging at several locations in *E. tetrodonta / E. miniata* open-forest and *C. polycarpa / Melaleuca* open woodland communities within the Eastern Leases.
Northern Brushtail Possum (*Trichosurus vulpecula arnhemensis*)	Vulnerable	Not Listed	Sighted by NT Government biologists on the Dalumba Bay track in the Southern EL in 2007 (NT Government, 2024).
Brush-tailed Rabbit-rat (*Conilurus penicillatus*)	Vulnerable	Endangered	Recorded in the Southern EL, Northern EL, including haul road alignment.
Salt Water Crocodile (*Crocodylus porosus*)	Migratory	Not Listed	Recorded in Amagula River within the Southern EL.
Rainbow Bee-eater (*Merops ornatus*)	Migratory	Not Listed	Recorded in woodland and open-forest, particularly those communities dominated by *E. tetrodonta* and *E. miniata.*

Table 3-8 provides a list of threatened species with the potential to occur within GEMCO's Western Leases. These species have not been recorded within the Western Leases in recent or historical surveys however they have previously been listed on the Commonwealth Protected Matters Database (then Department of Agriculture, Water and the Environment, 2020) and/or identified by URS (2012) as having a possible presence within the leases. Table 3-8 also lists several threatened migratory shorebirds that have been sighted on the coastal margins of the Western Leases and in the vicinity of the port.

TABLE 3-8 THREATENED FAUNA SPECIES WITH THE POTENTIAL TO OCCUR WITHIN GEMCO'S WESTERN LEASES

Species	EPBC Act Status	TPWC Act Status	Description
False Water Rat (*Xeromys myoides*)	Vulnerable	Not Listed	Unlikely. Favours mangroves and areas with permanent water. Large areas of suitable habitat are not present in the Western Leases. Closest records are at the Arnhem Swamp on the northern Arnhem land coast.
Gouldian Finch (*Erythrura gouldiae*)	Endangered	Vulnerable	Not sighted on Groote Eylandt since a single report by Wilkins (1924).
Brush-tailed Rabbit-rat (*Conilurus penicillatus*)	Vulnerable	Endangered	Several recent (post-2000) records in the Eastern Leases. Older records associated with the Western Leases at Angurugu, but these may not be accurately geo-located.
Lesser Sand Plover (*Charadrius mongolus*)	Endangered / Migratory	Endangered	Coastal foreshore flats and near-coastal saline wetlands. Potential habitat near the port.
Greater Sand Plover (*Charadrius leschenaultii*)	Vulnerable / Migratory	Vulnerable	Coastal foreshore flats and near-coastal saline wetlands. Potential habitat near the port.
Eastern Curlew (*Numenius madagascariensis*)	Critically Endangered / Migratory	Critically Endangered	Coastal foreshore flats and near-coastal saline wetlands. Potential habitat near the port.
Bar-tailed Godwit (Northern Siberian) (*Limosa lapponica menzbieri*)	Endangered	Critically Endangered	Coastal foreshore flats and near-coastal saline wetlands. Potential habitat near the port.
Bar-tailed Godwit (Western Alaskan) (*Limosa lapponica baueri*)	Endangered	Vulnerable	Coastal foreshore flats and near-coastal saline wetlands. Potential habitat near the port.
Great Knot (*Calidris tenuirostris*)	Vulnerable / Migratory	Critically Endangered	Coastal foreshore flats and near-coastal saline wetlands. Potential habitat near the port.
Red Knot (*Calidris canutus*)	Vulnerable / Migratory	Endangered	Coastal foreshore flats and near-coastal saline wetlands. Potential habitat near the port.
Curlew Sandpiper (*Calidris ferruginea*)	Critically Endangered / Migratory	Critically Endangered	Coastal foreshore flats and near-coastal saline wetlands. Potential habitat near the port.
Asian Dowitcher (*Limnodromus semipalmatus*)	Vulnerable / Migratory	Not Listed	Coastal foreshore flats and near-coastal saline wetlands. Potential habitat near the port.
Green Turtle (*Chelonia mydas*)	Vulnerable / Migratory	Not Listed	Marine, potential habitat near the port.
Flatback Turtle (*Natator depressus*)	Vulnerable / Migratory	Not Listed	Marine, potential habitat near the port.
Hawksbill Turtle (*Eretmochelys imbricata*)	Vulnerable / Migratory	Vulnerable	Marine, potential habitat near the port.
Pale Field Rat (*Rattus tunneyi*)	Not Listed	Vulnerable	One specimen (skull only) in NT Museum from Angurugu (1972). The skull is damaged preventing some comparative measurements. Could be *R. tunneyi*, or less likely another *Rattus* species.

Table 3-9 provides a list of threatened species with the potential to occur within GEMCO's Eastern Leases. These species have not been recorded within the Eastern Leases in recent or historical ecological surveys however they have previously been listed on the Commonwealth Protected Matters Database (then Department of Agriculture, Water and the Environment, 2020) and/or identified by URS (2012) or Cumberland Ecology (2015) as having a possible presence within the leases.

TABLE 3-9 THREATENED FAUNA SPECIES WITH THE POTENTIAL TO OCCUR WITHIN GEMCO'S EASTERN LEASES

Species	EPBC Act Status	TPWC Act Status	Description
False Water Rat (*Xeromys myoides*)	Vulnerable	Not Listed	Low. No suitable habitat within Eastern Leases and species has not been recorded on Groote Eylandt.
Gouldian Finch (*Erythrura gouldiae*)	Endangered	Vulnerable	Not sighted on Groote Eylandt since a single report by Wilkins (1924).
Pale Field Rat (*Rattus tunneyi*)	Not Listed	Vulnerable	Low. Limited habitat (tall grasslands) occurs within Eastern Leases and species has not been recorded within Eastern Leases.
Red Goshawk (*Erythrotriorchis radiatus*)	Endangered	Vulnerable	Low. Potential habitat present in Eastern Leases but species has not been recorded on Groote Eylandt.
Partridge Pigeon (Eastern) (*Geophaps smithii smithii*)	Vulnerable	Vulnerable	Low. Potential habitat present and species recorded on Groote Eylandt outside of Eastern Leases.
Fork-tailed Swift (*Apus pacificus*)	Migratory	Not Listed	Moderate. Potential habitat present and species recorded on Groote Eylandt outside of Eastern Leases.
Barn Swallow (*Hirundo rustica*)	Migratory	Not Listed	Low. Potential habitat present in Eastern Leases but species has not been recorded on Groote Eylandt.
Rufous Fantail (*Rhipidura rufifrons*)	Migratory	Not Listed	Moderate. Potential habitat present and species recorded on Groote Eylandt outside of Eastern Leases.
Oriental Plover (*Charadrius veredus*)	Migratory	Not Listed	Low. No suitable habitat within Eastern Leases and species has not been recorded on Groote Eylandt.
Oriental Pratincole (*Glareola maldivarum*)	Migratory	Not Listed	Low. No suitable habitat within Eastern Leases and species has not been recorded on Groote Eylandt.
Plains Death Adder (*Acanthophis hawkei*)	Vulnerable	Not Listed	Low. No suitable habitat within Eastern Leases and species has not been recorded on Groote Eylandt.

Section 7.5.4 provides further detail on the management of these species.

Introduced Terrestrial Vertebrates

There are five feral/pest animals currently known to be present on Groote Eylandt. These are the Domestic Dog (*Canis familiaris*), Asian Gecko (*Hemidactylus frenatus*), House Mouse (*Mus musculus*), Rat (*Rattus* sp.) and Cat (*Felis catus*). The distribution of these species appears to be largely limited to areas in the vicinity of Angurugu, Umbakumba and Alyangula. Feral cats are known to occur across Groote Eylandt, including in areas far from the main townships. Their density away from the main towns appears to be very low, but their pattern of density across the island is not understood. In 2023, GEMCO conducted a large-scale camera grid survey across western Groote Eylandt, with the intent to take a 'snap shot' of feral cat density, and to understand what factors – such as proximity to townships, or mining or other types of disturbance – might contribute to feral cat abundance. The results from that study are still being analysed and are expected to be known later in 2024.

Cane Toads (*Rhinella marinus*) remain absent from the island due to a collaborative quarantine and biosecurity program led by GEMCO and the Anindilyakwa Land and Sea Rangers despite all adjacent mainland areas now being affected by this invasive species. Section 7.5.5 provides further detail on GEMCO's Cane Toad management measures.

Aquatic Invertebrates

Aquatic invertebrates are good bio-indicators for the health status of aquatic ecosystems. The presence or absence of particular species, diversity, composition and abundance of communities provide general measures of health which can be used to assess impacts on aquatic systems.

In 2012, URS conducted a study that sampled freshwater aquatic macroinvertebrates within the Angurugu and Emerald River systems. Taxa diversity for Groote Eylandt was comparable with unimpaired samples from southern Gulf of Carpentaria drainage basins, with 117 taxa sampled. No exotic macroinvertebrates were recorded during the survey.

In 2015, Cumberland Ecology completed a study that sampled freshwater aquatic macroinvertebrates within the Amagula and Emerald River systems. The analysis indicated that the watercourses were in good to moderate condition for macroinvertebrates. A more recent study undertaken along the Emerald River (C&R Consulting, 2019) found a similar diversity of macroinvertebrate taxa to the URS (2012) study (on comparison of raw data).

Ants

Surveys conducted by URS (2012) indicated that the ant fauna of Groote Eylandt is widely represented across the Top End with 95% of the species recorded during the survey found across the region. A total of 103 native ant species were recorded while 5 exotic species are known from the area: *Monomorium destructor, M. floricola, M. pharaonis, Paratrechina longicornis*, and *Tetramorium simillimum*. In various surveys conducted between GEMCO, the ALC and the NT Government between 2015-2019, Singapore Ant (*Trichomyrmex destructor*) and Big-Headed Ant (*Pheidole megacephala*) have been recorded as widespread on Groote Eylandt, with various records of Tropical Fire Ants (*Solenopsis geminata*).

3.1.10. Sacred Sites

The *Northern Territory Aboriginal Sacred Sites Act 1989* (NT) (Sacred Sites Act) provides protection to all sacred sites in the NT and is administered by the Aboriginal Areas Protection Authority (AAPA). To enhance the protection of sacred sites, Traditional Owners can elect to register or record a sacred site with the AAPA. The Sacred Sites Act also provides a mechanism for project proponents to lodge an application for an Authority Certificate with the AAPA.

GEMCO holds an Authority Certificate for the Eastern Leases (C2016/145) and is in the process of obtaining an Authority Certificate for the Western Leases (anticipated to be finalised in FY25). Until such time as an Authority Certificate is granted for the Western Leases, GEMCO will continue to manage sacred sites in accordance with the Instructions Report prepared by the ALC and the Mining Agreement entered into between GEMCO and the ALC.

GEMCO's mine path is designed to avoid identified sacred sites and their buffer zones. GEMCO's Permit to Clear (PTC) process also ensures both GEMCO and the ALC assess an area for cultural sites prior to disturbance. This is in addition to GEMCO's requirement to inform the ALC of the mine plan and associated works as part of quarterly Mining Liaison Committee (MLC) Meetings (Section 3.3.4). [redacted]

3.1.11. Archaeology and Heritage

Several pieces of legislation establish lists or registers which offer statutory protection to places and objects that are considered to have cultural values (Section 4.1). A summary of results from these public registers is provided below:

- The World Heritage Register, the (Australian) National Heritage Register and the Commonwealth Heritage Register (established under the EPBC Act) do not list any sites within or in close proximity to the GEMCO Mine.
- No declarations under the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth) have been made for areas within or in close proximity to the GEMCO Mine.
- The NT Heritage Register (established under the *Heritage Act 2011* [NT]) lists the following sites, which are shown on Figure 3-12.
    - The Angurugu Heritage Precinct, which is located in the Angurugu township beyond the boundary of the GEMCO Mine. This is the only 'declared' heritage site listed;
    - The Emerald River Cemetery, which is located south of the Emerald River beyond the boundary of the GEMCO Mine; and
    - The site of the Emerald River Mission, which is located south of the Emerald River beyond the boundary of the GEMCO Mine.

There are no activities planned that are expected to have a significant impact on the sites described above.

[redacted]

[redacted]

3.2. Conceptual Site Model

Table 3-10 presents the Conceptual Site Model for the GEMCO Mine.

TABLE 3-10 CONCEPTUAL SITE MODEL

Disturbance Area / Activity Source	Potential Contaminants of Concern	Pathways	Potential Receptors	GEMCO Activity / Shared Activity for Community and GEMCO
Quarries (Pits)	Water Metals (particularly Mn) Salinity Turbidity Drawdown	Seepage. Overtopping. Pit dewatering.	Emerald River. Angurugu River. Unnamed surface waters. Groundwater. Land / soil. Groundwater Dependent Ecosystems (GDEs).	GEMCO activity
	Air Dust	Wind entrainment from disturbed areas.	Angurugu. Yedikba.	
Blasting	Air Dust Noise Air quality Vibration	Blasting liberation of dust to air. Blasting noise – airblast and ground vibration. Air emissions from blasting.	Angurugu. Yedikba. Cultural heritage (rock art [Eastern Leases]).	GEMCO activity
Tailings Storage Facilities (TSFs)	Water Metals Salinity Turbidity	Seepage. Overtopping. Dewatering. Failure.	Angurugu River. Groundwater. Land / soil.	GEMCO activity
	Air Dust	Wind entrainment from disturbed areas not under wet tails.	Angurugu.	
Minor Water Storage Facilities (other than Quarries (Pits) / TSFs)	Water Metals (particularly Mn) Salinity Turbidity	Seepage. Overtopping. Failure.	Emerald River. Angurugu River. Unnamed surface waters. Groundwater. Land / soil.	GEMCO activity
Water discharge activities (bushland)	Water Metals (particularly Mn) Salinity Turbidity Waterlogging	Bush discharge pipes.	Groundwater. Land / soil. GDEs. Native terrestrial ecosystems.	GEMCO activity

Disturbance Area / Activity Source	Potential Contaminants of Concern	Pathways	Potential Receptors	GEMCO Activity / Shared Activity for Community and GEMCO
Landfill (Integrated Waste Facility)	Wastes (Solid / Liquid) General waste / putrescible - landfill leachate, odour, hygiene.	Seepage. Runoff. Wind-blown waste.	Malkala. Public patrons. Surrounding native terrestrial ecosystems. Groundwater. Land/soil. Unnamed surface waters.	Shared Activity for Community and GEMCO
	Battery temporary storage - acid	Seepage. Runoff.		
	Tyre temporary storage – fire	Fire.		
	Other temporary storage – e.g. solvents	Seepage. Runoff. Fumes.		
	Green waste disposal – weeds and pests	Biosecurity risk – spread weeds and pests. Wind dispersal. Seed bank / sprouting.		
	Sewage sludge disposal – human waste, biological hazards, odour, hygiene.	Seepage. Spillage. Overtopping. Wind-spread odours.		
Port Operations and Stockpiles	Solids Mn solids	Seepage. Runoff.	Milner Bay.	GEMCO activity
	Air Dust	Dust liberation to air from stockpiles, conveyors, loaders, bare areas.	Alyangula.	
Processing Plant and Stockpiles	Solids Mn solids	Seepage. Runoff.	Angurugu River. Groundwater. Land / soil.	GEMCO activity
	Air Dust	Dust liberation to air from stockpiles, conveyors, bare areas.	Angurugu.	
Airport (managed by AMS)	Fuel Storage and Use Hydrocarbons (fuels)	Seepage. Spills – Runoff.	Angurugu River. Groundwater. Land / soil.	Shared Activity for Community and GEMCO
	Air Air quality	Fire – explosion. Air emissions from combustion.	Angurugu. Airport patrons. Native terrestrial ecosystems.	
	Biological Weeds and pests	Biosecurity risk from freight, luggage, passengers.	Native terrestrial ecosystems.	
Fuel Receipt and Storage – Port	Fuel Storage Hydrocarbons (fuels)	Seepage. Spills – Runoff.	Milner Bay. Groundwater.	Shared Activity for Community and GEMCO
		Volatiles liberation to air. Fire – explosion.	Alyangula. Fuel customers.	

Disturbance Area / Activity Source	Potential Contaminants of Concern	Pathways	Potential Receptors	GEMCO Activity / Shared Activity for Community and GEMCO
Fuel Storage – Mine Site	Fuel Storage Hydrocarbons (fuels)	Seepage. Spills – Runoff.	Angurugu River. Groundwater. Land / soil.	GEMCO activity
		Volatiles liberation to air. Fire – explosion.	Angurugu.	
Power Station	Fuel Use Hydrocarbons (fuels) – line from storage	Seepage. Spills – Runoff.	Milner Bay. Groundwater. Land / soil.	Shared Activity for Community and GEMCO
	Air Air quality	Fire – explosion. Air emissions from combustion.	Alyangula. Native terrestrial ecosystems.	
Portable and Fixed Gensets	Fuel Storage and Use Hydrocarbons (fuels)	Seepage. Spills – Runoff.	Emerald River. Alyangula River. Unnamed surface waters. Groundwater. Land / soil.	GEMCO activity
	Air Air quality	Fire – explosion. Air emissions from combustion.		
Waste Water Treatment Facility	Waste / Chemical Storage Sludge (biological hazards). Other Chemical storage (e.g. flocculants).	Seepage. Spills – Runoff. Overtopping.	Milner Bay. Groundwater. Land / soil.	Shared Activity for Community and GEMCO
	Air Chlorine storage and use Odour	Gas leak. Wind-spread odours.	Alyangula.	
Sewage Outfall	Waste Disposal Treated effluent -biological hazards	Discharge pipe to ocean.	Milner Bay. Recreational water values.	Shared Activity for Community and GEMCO
	Air Odour	Wind-spread odours.	Alyangula.	
Water Treatment Facility	Waste / Chemical Storage Filter backwash water Other Chemical storage (e.g. coagulants, caustic soda)	Seepage. Spills – Runoff. Overtopping.	Angurugu River. Groundwater. Land / soil.	Shared Activity for Community and GEMCO
	Air Chlorine storage and use	Gas leak.	Angurugu (> 1 km).	
Excavation and Loading Ore (Quarries)	Air Dust Noise Air emissions	Wind entrainment from unsealed roads. Dust generation to air from digging, handling, loading. Dust generation to air from vehicle movements. Noise from machinery operation. Air emissions from fuel combustion.	Angurugu. Yedikba.	GEMCO activity

Disturbance Area / Activity Source	Potential Contaminants of Concern	Pathways	Potential Receptors	GEMCO Activity / Shared Activity for Community and GEMCO
Ore Haulage	Air Dust Noise Air emissions	Wind entrainment from unsealed roads. Dust generation to air from vehicle movements. Dust generation to air from vehicle loads. Noise from vehicle movements. Air emissions from fuel combustion.	Malkala. Angurugu. Alyangula. Yedikba.	GEMCO activity
Workshops (various)	Waste / Chemical Storage Hydrocarbons Degreasers / detergents	Seepage. Spills – Runoff.	Angurugu River. Milner Bay. Groundwater. Land / soil.	GEMCO activity
Shipping and Ore Loading – Ocean Going Vessels (OGVs)	Solids Mn solids	Runoff. Spillage.	Milner Bay.	GEMCO activity
	Air Air emissions Dust	Air emissions from fuel combustion. Dust entrainment during loading to air.	Alyangula. Milner Bay.	
	Fuel Transfer Hydrocarbons	Spillage, refuelling.	Milner Bay.	
	Biological Pests	Biosecurity risk from foreign vessels (e.g. marine pests).	Milner Bay. Broader Groote ecosystems e.g. marine habitats.	
Surface water abstraction	Water Angurugu River water withdrawal	Piped abstraction (under licence).	Angurugu River.	Shared Activity for Community and GEMCO
General Transport Activities to Eylandt	Air Air emissions	Air emissions from fuel combustion.	All Groote Eylandt native ecosystems, particularly western.	Shared Activity for Community and GEMCO
	Biological Weeds and pests	Biosecurity risk from freight, luggage, passengers.		
Cleared areas (general)/ Areas under rehabilitation	Air Dust	Wind entrainment to air from disturbed areas.	All surrounding communities. Native terrestrial ecosystems.	GEMCO activity

Note: Mn = manganese

3.3. Socio-Economic Status

3.3.1. Workforce Description and Demography

GEMCO has a permanent workforce of approximately 1,100 people including both GEMCO employees and embedded contracting partner's personnel (agency contractors). As at 15 April 2024, GEMCO's workforce consisted of 1,051 employees and 71 agency contractors. In addition, GEMCO engages a facilities management contractor (ESS) to service the FIFO camp and Alyangula township who employ approximately 100 personnel. GEMCO's temporary workforce of service contractors may increase by up to 10% for short-term maintenance activities or project work.

The GEMCO workforce live either residentially on Groote Eylandt (15%) or FIFO from Darwin or Cairns (85%). Approximately 50% of the workforce is aged between 35 to 50 years and 17% are female, with approximately 50% having worked at GEMCO for more than 5 years (as at 15 April 2024).

Since commencing operations in the mid-1960s, GEMCO has sought to be a partner in the success of local Indigenous people, providing employment and economic opportunities.

Consistent with the principles of South32's Reconciliation Action Plan, GEMCO is committed to:

- Ensuring our leaders and employees are culturally aware and have the skills and knowledge to respectfully engage with local Aboriginal and Torres Strait Islander people in their day-to-day work;
- Continuing to build and maintain strong relationships with Traditional Owners and families living in the communities on Groote Eylandt;
- Working together with local communities to find unique ways in which we can contribute to positive outcomes for the communities on Groote Eylandt, both now and beyond the life of the mine;
- Fostering a diverse and inclusive workplace with meaningful job opportunities for local Indigenous people living on Groote Eylandt; and
- Ensuring our procurement processes support a diverse range of Indigenous suppliers on a wide variety of projects.

GEMCO's Local Indigenous Participation Strategy aims to support the long term social and economic aspirations of local Indigenous people through targeted activities including:

- Local supply opportunities – support local Indigenous contractors to tender for GEMCO contracts;
- Business capability development – support the long-term sustainability of local Indigenous businesses beyond the life of the GEMCO mine operations;
- School-to-work pathways – provide school students with information, site tours and work experience;
- Indigenous Trainee Program – provide young people with traineeships to develop skills and capability; and
- Direct Employment – connect with local job seekers to provide direct employment opportunities across the operation and encourage our major contracting partners to do the same.

3.3.2. Economic Output

[redacted]

Whilst production and royalties will be negatively impacted in the near term as a result of Tropical Cyclone Megan[4], expected royalty forecasts are reported to the Territory Revenue Office (TRO) on a six-monthly basis and the next update based on best available information at the time will be provided to the TRO in July 2024.

[4] Tropical Cyclone Megan was a significant weather event that passed to the northeast of Groote Eylandt as a tropical low and formed into a cyclone to the east of Groote Eylandt in mid-March 2024, causing widespread flooding and storm damage. At the time of writing, GEMCO is in the process of assessing the extent of damage and associated repair requirements.

3.3.3. Community Benefits

South32's Social Performance Standard (Appendix 9.5) guides the development of collaborative and transparent relationships with host communities to ensure that each operation creates enduring social, environmental, and economic value.

GEMCO defines its communities as those which are directly involved with GEMCO's operations. This includes:

- The Traditional Owners of Groote Eylandt;
- Residents of the Groote Eylandt communities of Alyangula, Angurugu, Malkala, Umbakumba and Bickerton Island;
- The wider East Arnhem Region of the NT; and
- GEMCO's FIFO bases of Cairns and Darwin.

As part of South32 Social Performance Standard, GEMCO regularly conducts social baseline assessments to better understand the social context in which it operates. The most recent Social Baseline Assessment was undertaken in April 2024 by WSP. This assessment provides a detailed understanding of Groote Eylandt's social context and informs GEMCO's Social Investment Plan (SIP).

Social Investment Plan (SIP)

GEMCO's SIP (formerly called a Community Investment Plan) is updated annually and establishes a framework for its investments in social and economic development on Groote Eylandt and its broader communities. Through this SIP, GEMCO seeks to develop strategic partnerships to support education, community health and safety, youth engagement, employment and economic development.

GEMCO's long-term and short-term social investment objectives, as outlined in the SIP, are as follows:

- **Long-term objective**: To support improved social outcomes and build capacity for the Traditional Owners of Groote Eylandt. This can be achieved by working with the Traditional Owners (through the ALC), the NT Government and the Commonwealth Government to identify key areas for investment to support the realisation of a sustainable post-mining future for Groote Eylandt.
- **Short-term objective**: To have a positive social impact in the following focus areas:
    - Education and leadership;
    - Economic participation;
    - Natural resource resilience;
    - Good health and social wellbeing; and
    - Supporting the community and amenity of GEMCO's primary communities of Alyangula and Angurugu.

GEMCO's annual social community investment program is outlined in Table 3-11.

TABLE 3-11 GEMCO'S ANNUAL SOCIAL INVESTMENT PROGRAM

Mechanism	Purpose	Resource[1]	Timeframe	Implementation at Operation
Operational Investment	Projects aligned with focus areas, longer term sustainability and risk management	FY25 Value: [redacted]	Ongoing for mine life	**Biosecurity and Quarantine** ALC - Payment for two Biosecurity Officer positions within the ALC Land and Sea Rangers, with focus on cane toad incursion risk. Including key equipment (cane toad detection dogs [CTDDs], expenses).
			Ongoing for mine life	**Weed Data Collection and Practices** Collaborating with Anindilyakwa Land and Sea Rangers to share weed data, practices and management
	Expand the provision of health services to benefit all residents	FY25 Value: [redacted]	Usually more than 1 year	NT Health – Expansion of Groote Eylandt Medical Services
Strategic Investment	Projects aligned with focus areas, longer term sustainability	FY25 Value: $1.27m	Usually more than 1 year	**Education and Leadership** • Graham (Polly) Farmer Foundation • GEBIE Next Generation – Youth Engagement Program **Good Health and Social Wellbeing** • MJD Foundation • Bush Fit Mob - Youth Sport and Recreation Program • Peacemakers - Indigenous Community Safety Program **Economic Participation** • Bush Medijina – Business Development Program **Natural Resource Resilience** • Recreational Area Access Improvement Program
Donations	Ad-hoc discretionary spend to support operational objectives	FY25 Value: $120k	Grant funding released three times per calendar year for individual projects with a defined outcome	Supports community groups and not-for-profit organisations to deliver programs of community benefit to Groote Eylandt, Cairns and Darwin. Grants are managed through the GEMCO Grants committee (senior GEMCO staff).
Community Events	A series of community events designed to build an inclusive and supportive community	FY25 Value: $140k	Delivered throughout each calendar year	Community events include: • Picnic Day • Children's Christmas Party • National Reconciliation Week • NAIDOC Week • International Women's Day
In-kind and Admin support	Company goods and services to support community benefit, including administration of employee / contractor time	Determined by operation. Can be strategic investment / donations beyond Social Investment Funding.	As determined by operation	GEMCO supports short and long-term community development projects through the provision of in-kind support. At GEMCO, this can include: • Seats on charter flights • Allocation of GEMCO housing for community partners • Professional support for community organisations (committee participation) • Access to GEMCO Freight service at low/no cost • Training provided to community organisations (e.g. First Aid) • Provision of low/no cost utilities • Utilisation of GEMCO property maintenance • % External Affairs employee time for community projects

(1) As a result of GEMCO's annual budget cycle, values for FY26 onwards are not currently available but are expected to be in line with the FY25 values provided.

Community Services

GEMCO operates and maintains many of the essential services on Groote Eylandt including:

- **Rowell Highway Power Station:** Supplies power to the GEMCO mine site, Alyangula township and Pole 7 (~1,000 residents), Pole 13 Aboriginal corporations (~100 residents), Malkala community (~120 Indigenous residents) and Angurugu community (~850 Indigenous residents).

- **Water and Sewerage:** Essential water and sewerage services are provided to the GEMCO mine site and Alyangula township. Water services are also provided to the Malkala community, Pole 7 developments and Pole 13 Indigenous businesses.

- **Groote Eylandt Fuel Suppliers:** GEMCO's public fuel bowsers are located in Alyangula and are utilised by most government services, residents and Indigenous community members as the primary source of fuel. This facility is supplied and maintained by GEMCO at no cost to the community.

- **GEMCO Expanded Medical Service:** GEMCO provides funding to NT Health for a full-time Doctor on Groote Eylandt to expand the provision of health services to benefit all residents.

- **Groote Eylandt Airport:** GEMCO contracts Aerodrome Management Services Pty Ltd (AMS) to manage the Groote Eylandt Airport. This facility supports GEMCO's FIFO operations, commercial Regular Public Transport flights operated by Airnorth and light aircraft charter flights.

- **Fire and Emergency Services:** GEMCO provides Fire and Emergency Response support for the wider Groote Eylandt community. This team is often called upon to provide support to NT Health to supplement ambulance capacity during periods of increased community activity.

- **Electrical Distribution and Repair:** GEMCO maintains a High Voltage lines crew to support repairs to power outages in Alyangula. During historical power outages in the Angurugu community, the NT Power and Water Corporation required GEMCO's support to conduct emergency repairs. GEMCO's resources on Groote Eylandt are essential for service continuity to communities in the region.

- **Housing for NT Government Services:** As of March 2024, 11 NT Government employees providing essential services to Groote Eylandt were renting properties from GEMCO. These properties continue to be maintained by GEMCO's residential maintenance team.

- **Township Security:** GEMCO's security team provides additional support to the NT Police to ensure community order in challenging times. This important relationship is highly valued by NT Police and is vital to ensuring the safety of Groote Eylandt residents and the good order of the community.

3.3.4. Stakeholder Engagement

GEMCO undertakes consultation with stakeholders utilising a range of methods at varied frequencies. Engagement with stakeholders is planned annually and considers the specific engagement needs of the individual stakeholder.

Engagement methods range from low level engagement (i.e. access to the South32 website) to high level engagement (i.e. face to face meetings). The type of engagement defined for each stakeholder group is aligned to the level of engagement required, with high priority stakeholders requiring increased engagement. A summary of GEMCO's stakeholders and their relevant engagement priority and methods are detailed in Table 3-12, Table 3-13 and Table 3-14 describe in more detail the types of engagement methods utilised and the key engagement priorities for GEMCO.

TABLE 3-12 GEMCO STAKEHOLDER ENGAGEMENT – SUMMARY

		Engagement Method										
Stakeholder Group	**Engagement Priority**	*South32 website*	*Social media*	*Site-wide and community briefs*	*Community events*	*Media releases and advertisements*	*Community Perception Surveys*	*Community Grants Program*	*Community Development Programs/Partnerships*	*Regular Community Engagement*	*Community Information Sessions*	*Face to face meetings and briefings*
Anindilyakwa Land Council (on behalf of the Anindilyakwa people)	H	x	x	x	x	x	x	x	x			x
Alyangula community	H	x	x	x	x	x	x	x	x	x	x	
Angurugu community	H	x	x	x	x	x	x	x	x	x	x	
Umbakumba community	H	x	x	x	x	x	x	x	x	x	x	
Milyakburra community	H	x	x	x	x	x	x	x	x	x	x	
Satellite communities	M		x	x	x	x	x	x	x			
Non-resident employees and contractors (FIFO)	H	x	x	x	x	x	x	x				
Northern Territory community	H	x	x			x		x				
Australian Government	H	x	x			x	x		x	x	x	x
Northern Territory Government	H	x	x			x	x		x	x	x	x
Education	H	x	x	x	x	x	x	x	x	x	x	x
Police	H	x	x	x	x	x	x		x	x	x	x
Health	H	x	x	x	x	x	x	x	x	x	x	x
East Arnhem Regional Council	H	x	x	x	x	x	x	x	x	x	x	x
Aboriginal corporations	H	x	x	x	x	x	x	x	x	x	x	x
Businesses (local)	M	x	x	x	x	x	x	x		x		
Suppliers (non-local)	M	x	x			x	x			x		x
Interested Organisations	H	x	x			x				x		
State/National Media	L		x		x	x				x		x
Women	H	x	x	x	x	x	x	x	x	x	x	x
Elders	H	x	x	x	x	x	x	x	x	x	x	x
Children/youth	M	x	x	x	x		x	x	x			
Religious Organisations	L	x	x	x	x	x	x	x	x			
Industry bodies	H	x	x	x	x	x	x		x	x	x	x
Community Organisations (local)	L	x	x	x	x	x	x	x	x	x	x	x

H = High, M = Medium, L = Low

TABLE 3-13 GEMCO ENGAGEMENT METHODS

Objective	Engagement Method	Comments
Low Level Engagement	South32 Website	Managed by South32 corporate and available to most stakeholders.
	Social Media	GEMCO Community Facebook and Instagram pages managed by External Affairs.
	Site-wide and Community Briefs	Information notices distributed to GEMCO employees and key stakeholders through social media and a community email distribution list.
	Community Events	Annual events delivered by GEMCO in Alyangula such as Picnic Day, Children's Christmas Party, and National Reconciliation Week activities.
	Media Releases and Advertisements	Media releases and advertisements are supplied to local, state and national newspapers.
Medium Level Engagement	Community Perception Survey	Conducted triennially, this is a survey that includes households and organisations in all four Groote Eylandt communities.
	Community Grants Program	This funding model is acknowledged as an important stakeholder engagement tool. Donation rounds are held tri-annually and are open to community organisations in GEMCO's local communities.
High Level Engagement	Strategic Community Partnerships	A Strategic Community Partnership is an investment into a community development program with a specific stakeholder.
	Regular Community Engagement	GEMCO's External Affairs team has an office in Angurugu, fostering regular community engagement. The team conducts community engagement in Umbakumba, Malkala and other satellite communities on an as needs basis.
	Community Information Sessions	GEMCO conducts or attends regular community information sessions held by stakeholders on Groote Eylandt.
	Face to Face Meetings and Briefings	This method of engagement, consisting of a personal one-on-one meeting between South32 and the stakeholder, is considered to be the best exchange of communication and consultation and is the preferred engagement method with high priority stakeholders.

TABLE 3-14 GEMCO STRATEGIC ENGAGEMENT OBJECTIVES

Objective	Description	Priority Stakeholders
Safe Operations	GEMCO undertakes internal engagement to reinforce South32's safety guarantee and create a shift in how GEMCO employees recognise hazards and respond to incidents to improve safety outcomes. GEMCO also engages with external stakeholders to support a positive relationship between community members and GEMCO workforce.	Internal Workforce Neighbouring Communities Community Justice Group NT Police Territory Families Department of Chief Minister & Cabinet (DCM&C)
Social License to Operate	GEMCO operates on Aboriginal Freehold Land and recognises the importance of maintaining its social license. Building and maintaining a positive working relationship with the Anindilyakwa people is essential to the delivery of GEMCO's business plan.	NT Government Anindilyakwa Land Council (ALC) Groote Eylandt Aboriginal Trust (GEAT) Neighbouring Communities Community Organisations and Service Providers
Life of Mine Planning and Execution	GEMCO engages with relevant Traditional Owners and the ALC to continually agree and monitor ongoing mining plans and activities and ensure appropriate land access agreements are in place.	ALC Neighbouring Communities Relevant Traditional Owners

Objective	Description	Priority Stakeholders
Closure Planning	GEMCO is working closely with stakeholders to understand the impacts of closure and to work collaboratively on solutions to create a positive post mining legacy.	ALC NT Government – primarily the Department of Industry, Tourism and Trade (DITT), Department of Chief Minister and Cabinet, and National Indigenous Australians Agency (NIAA) Groote Eylandt businesses Traditional Owners Service Providers
Water Regulatory Reform	DEPWS is reviewing its approach to water management. GEMCO's Technical Services team will engage directly with DEPWS to ensure that water offtake and discharge activities comply with regulatory guidelines.	Internal Workforce DEPWS ALC
GEMCO Air Emission Management	GEMCO has an extensive dust monitoring program, and continues to identify how the operation can better manage dust. Ensuring our workforce and external stakeholders are aware of these efforts and the results ensures we are managing any reputational risks related to dust.	Internal Workforce NT Government ALC Neighbouring Communities Groote Eylandt Organisations
Indigenous Participation	The key focus of GEMCO's Indigenous Participation Coordinator is to support increased employment outcomes and pathways for local Indigenous people.	GEMCO Indigenous workforce members and their leaders ORIC Organisations ALC Groote Eylandt Schools Relevant Government Service Providers GEBIE CDP
Eastern Leases	GEMCO is planning to commence mining in the Southern Eastern Lease in FY25.	ALC Land & Sea Rangers DEPWS Groote Eylandt Organisations Internal Workforce

The ALC, as the representative body of the Traditional Owners of Groote Eylandt, is a high priority stakeholder (Table 3-12). GEMCO's engagement strategy with the ALC includes consideration of specific requirements under the Mining Agreements that are in place for the Western Leases and the Eastern Leases. [redacted]

The MLC meet on a quarterly basis to review the progress of mining and discuss proposed activities and developments. [redacted] ALC endorsement of this MMP has been sought (Appendix 9.2), and ongoing communication throughout the term of the MMP will be maintained utilising the MLC meeting forum.

4. STATUTORY AND NON-STATUTORY REQUIREMENTS

4.1. Statutory Requirements

Operations within GEMCO's Western Leases are undertaken in accordance with the following approvals:

- Land owner approval granted in the form of a Mining Agreement and a Haul Road Agreement between GEMCO and the ALC pursuant to the *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth) (ALRA);
- Regulatory approval granted in the form of Mineral Leases and an Access Authority under the *Mineral Titles Act 2010* (NT) (MT Act) and Special Purposes Leases (SPLs) under the *Special Purposes Leases Act 1953* (NT); and
- Regulatory approval granted in the form of a Mining Authorisation (0126-01) under the *Mining Management Act 2001* (NT) (MM Act).

Operations within GEMCO's Eastern Leases are undertaken in accordance with the following approvals:

- Land owner approval granted in the form of a Mining Agreement and a Haul Road Agreement between GEMCO and the ALC pursuant to ALRA;
- Regulatory approval granted in the form of Mineral Leases and an Access Authority under the MT Act;
- Regulatory approval granted under the EPBC Act (EPBC 2014/7228);
- Regulatory approval granted under the *Environment Assessment Act 1982* (NT) (EA Act)[5]; and
- Regulatory approval granted in the form of a Mining Authorisation (0126-01) under the MM Act.

Table 4-1 summarises the key Commonwealth and NT legislation applicable to the GEMCO Mine.

TABLE 4-1 RELEVANT COMMONWEALTH AND TERRITORY LEGISLATION

Legislation	Administering Authority	Intent of Legislation	Relevance to the GEMCO Mine
Mining			
Mineral Titles Act 2010 (NT)	NT Department of Industry, Tourism and Trade (DITT)	The MT Act establishes a framework for granting and regulating mineral titles, including Mineral Leases, that authorise mining and associated activities.	The Mineral Leases associated with the GEMCO Mine (Table 1-3) allow GEMCO to undertake mining and associated activities. A Mineral Lease cannot be granted until a Mining Agreement under the ALRA is in place, and the grant of a Mineral Lease is a precursor to the grant of Authorisation under the MM Act.
Special Purposes Leases Act 1953 (NT)	NT Department of Infrastructure, Planning and Logistics	The *Special Purposes Leases Act 1953* provides a system for granting and regulating leases for purposes other than pastoral, agricultural, mining and private residential use.	The SPLs associated with the Western Leases (Table 1-3) allow GEMCO to utilise the Alyangula township and Milner Bay port areas as part of its mining operation on Groote Eylandt. The SPLs were granted prior to the introduction of the ALRA. Therefore, the area associated with the SPLs is freehold Crown land.

[5] Now superseded by the *Environment Protection Act 2019* (NT) (EP Act).

Legislation	Administering Authority	Intent of Legislation	Relevance to the GEMCO Mine
Mining Management Act 2001 (NT)	DITT	The MM Act aims to protect the environment by establishing a system whereby mining activities that will result in a substantial disturbance require an Authorisation. Operators of mines who require an Authorisation under the MM Act must submit an application to the NT DITT accompanied by an MMP.	The GEMCO Mine is currently authorised under the MM Act (Authorisation 0126-01). GEMCO is required under this legislation to operate in accordance with an approved MMP. This MMP has been prepared to seek a variation to GEMCO's existing authorisation to facilitate the continuation of the mining for FY25 – FY32.
Environment			
Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act)	Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW)	The EPBC Act provides a framework to protect and manage nationally and internationally important flora, fauna, ecological communities, heritage places and other matters, defined in the EPBC Act as matters of national environmental significance (MNES).	Operations in the Western Leases predate the introduction of the EPBC Act. Therefore, approval under the EPBC Act is not required (Section 43A). Nonetheless, GEMCO adheres to a range of internal environmental management plans aimed to minimise the potential for impacts to MNES listed under the EPBC Act. Section 7.5.4 provides further details. Approval for the Eastern Leases under the EPBC Act was granted in June 2016 (EPBC 2014/7228). A variation to this approval was granted in July 2020 to change the haul road alignment. The variation also included a request to extend the time to commence the project by five years. A summary of GEMCO's performance against the EPBC Act approval conditions is provided in Section 7.3.
Environment Protection Act 2019 (NT) (EP Act)	Northern Territory Environment Protection Authority (NT EPA)	The EP Act aims to promote ecologically sustainable development by establishing a framework for assessing potential environmental impacts of development projects.	Operations in the Western Leases predate the introduction of the EP Act and its predecessor the EA Act. Therefore, an environmental licence under the EP Act, or assessment under the EA Act, is not required. Following assessment under the EA Act, the NT EPA recommended the Eastern Leases Project for approval in March 2016, subject to 20 recommendations, in the form of Assessment Report 77. This report summarises the NT EPA's assessment findings and recommendations. A summary of GEMCO's performance against the Assessment Report 77 recommendations is provided in Section 7.3.
Environment Protection Legislation Amendment Act 2023 (NT) (Amendment Act)	Northern Territory Environment Protection Authority (NT EPA)	The Amendment Act will amend the EP Act to implement a new environmental (mining) licensing framework for mining activities, commencing 1 July 2024. The MM Act will be repealed at this time, and environmental provisions folded into the EP Act.	GEMCO carry out mining activities under Authorisation 126-01. Approval of this MMP submission is sought under the current MM Act. GEMCO will transition into the new environmental (mining) licensing framework as required on submission of a future MMP Amendment or via the transition process as defined by NTG, whichever occurs first.
Territory Parks and Wildlife Conservation Act 1976 (NT) (TPWC Act)	Department of Environment, Parks and Water Security (DEPWS) – Parks and Wildlife Commission	The TPWC Act provides for the declaration of land to be a sanctuary, park, reserve or protected area by the Administrator. The TPWC Act also provides for the protection of animals and plants and the preparation of management plans for parks and reserves.	GEMCO has a permit in place to interfere with protected wildlife (Permit No. 72743)[6] , specifically for the capture and relocation of snakes from residential and operational areas. Additionally, GEMCO adheres to a range of internal management plans aimed to minimise the potential for impacts to threatened fauna and flora species listed under the TPWC Act. Section 7.5.4 provides further details.

[6] Expiry date: 20 June 2026

Legislation	Administering Authority	Intent of Legislation	Relevance to the GEMCO Mine
Bushfires Management Act 2016 (NT)	DEPWS – Bushfires NT	The *Bushfires Management Act 2016* provides a framework for the mitigation, management and suppression of bushfires in the NT and outlines when permits are required for the lighting of fires.	As the GEMCO Mine is not located within a prescribed fire protection zone, fire breaks and permits to burn are not required under the *Bushfires Management Act 2016.* However, a fire danger period may be declared over parts of the NT. In the event of such a declaration applying to the GEMCO Mine, GEMCO would ensure that that a permit under the *Bushfires Management Act 2016* is obtained prior to conducting controlled burns. Despite there being no legal requirement for a permit to burn, GEMCO manages burning in accordance with *PRO-4149 Permit to Clear and Burn Vegetation* which involves an internal permitting process.
Marine Pollution Act 1999 (NT)	DEPWS	The purpose of the *Marine Pollution Act 1999* is to protect the marine and coastal environment by minimising intentional and negligent discharges of ship-sourced pollutants into coastal waters. The *Marine Pollution Act 1999* applies to all vessels in NT waters.	GEMCO's operations are conducted adjacent to marine environments, including Milner Bay, Angurugu River and the Emerald River. These environments are managed in accordance with *STA-3085 Land and Biodiversity Management Plan*. Section 7.5.2 provides further details.
Waste Management and Pollution Control Act 1998 (NT)	DEPWS – NT EPA	The *Waste Management and Pollution Control Act 1998* provides for the protection of the environment through the encouragement of effective waste management, pollution prevention and control practices.	GEMCO operate a waste disposal facility in accordance with an Environmental Protection Licence (EPL289)[7] issued under the *Waste Management and Pollution Control Act 1998*. A renewal application for this licence was submitted in May 2024 and GEMCO are awaiting issue of the new licence. All waste is disposed in accordance with *GEM-STA-3316 Waste Management Standard.* Section 7.5.1 provides further details.
Water Act 1992 (NT)	DEPWS – Water Resources Division	The *Water Act 1992* provides the legislative framework for water planning and entitlements for most water resources in the NT. The *Water Act 1992* also provides for the investigation, allocation, use, control, protection, management and administration of surface water and groundwater resources.	GEMCO holds an abstraction licence (Licence No. 9291005) for the abstraction of potable water from the Angurugu River. GEMCO is currently testing a series of advanced dewatering bores to assist the efficiency of mine dewatering. If the trials prove viable, a groundwater abstraction licence will be required to undertake advanced dewatering. Section 7.5.8 provides further details on GEMCO's water management system.
Weeds Management Act 2001 (NT) (WM Act)	DEPWS – Weed Management Branch	The WM Act aims to protect the NT from the adverse impacts of weeds and identifies the responsibilities of all landholders in relation to the management of declared weeds and prevention of their spread.	Weed management is undertaken in accordance with *GEM-STA-3091 Weed Management Plan*. GEM-STA-3091 is structured to address weed risks in accordance with their declared status and the statutory requirements of any relevant weed management plans. Section 7.5.6 provides further details.
Biosecurity Act 2015 (Cth)	DCCEEW	The *Biosecurity Act 2015* provides a framework for managing biosecurity risks such as diseases and pests that may cause harm to human, animal or plant health.	GEMCO's quarantine and biosecurity measures are outlined in *GEM-STA-3091 Weed Management Plan* and *GEM-STA-3082 Cane Toad Management Plan*. Both GEM-STA-3091 and GEM-STA-3082 are structured to address the requirements of applicable statutory weed management plans and the *NT Biosecurity Strategy 2016 – 2026*, respectively. Sections 7.5.5 and 7.5.6 provide further details.

[7] Expiry date: 30 June 2024. Renewal application currently being prepared.

Legislation	Administering Authority	Intent of Legislation	Relevance to the GEMCO Mine
Health and Safety			
Public and Environmental Health Act 2011 (NT)	Department of Health	The *Public and Environmental Health Act 2011* includes the objectives to monitor, assess and control environmental conditions, factors and agents, facilities and equipment and activities, services, and products that impact on or may impact on public and environmental health.	GEMCO has an extensive governance framework for managing the public and environmental health risks associated with its accommodation facilities (including food preparation and potable water sources). This framework is designed to assist GEMCO with meeting its objectives in relation to public and environment health and to ensure compliance with the *Public and Environmental Health Act 2011*.
Work Health and Safety (National Uniform Legislation) Act 2011 (NT)	Department of the Attorney-General and Justice	The *Work Health and Safety (National Uniform Legislation) Act 2011* aims to promote health and safety in the workplace.	GEMCO has an extensive governance framework for managing health and safety risks associated with the operation of the mine site. This framework is designed to assist GEMCO with meeting its objectives in relation to health and safety and to ensure compliance with all applicable legislation.
Dangerous Goods Act 1998 (NT)	Department of the Attorney-General and Justice – NT WorkSafe Division	The *Dangerous Goods Act 1998* aims to provide for the safe handling of dangerous goods.	GEMCO manage the storage, transport and handling of hazardous materials in accordance with this legislation. *GEM-PRO-3196 Hazardous Materials Management* outlines how materials are to be managed to minimise the potential for hazardous materials to pose risk to health, safety and environment across site. In addition, the web-based ChemAlert system is used to register the dangerous goods stored across site. Safety Data Sheet (SDS) documentation is also kept on GEMCO's intranet with hard copies available at numerous locations across site. *GEM-STA-3055 Crisis and Emergency Management* outlines GEMCO's process for responding to emergencies involving bulk hazardous materials, such as hydrocarbon fuel fire.
Culture and Heritage			
Aboriginal Land Rights (Northern Territory) Act 1976 (Cth) (ALRA)	Commonwealth Department of the Prime Minister and Cabinet	The ALRA provides a comprehensive scheme for the claiming and granting of freehold title to traditional Aboriginal land in the NT. It provides Aboriginal landowners with legal title to traditional lands and establishes Land Councils to assist Aboriginal people in the management of their land. The ALRA also outlines a process for obtaining consent from the Traditional Owners for both exploration and mining activities on Aboriginal land.	Groote Eylandt is Aboriginal land under the ALRA and the ALC is the Land Council responsible for managing this land. Consent for mining is obtained in the form of a Mining Agreement with the ALC. Section 4.2.1 provides detail on GEMCO's obligations under the Mining Agreements in place for the Western Leases and Eastern Leases.
Northern Territory Aboriginal Sacred Sites Act 1989 (NT) (Sacred Sites Act)	NT Aboriginal Areas Protection Authority (AAPA)	The Sacred Sites Act provides a framework for protecting sacred Aboriginal sites. Sacred sites are places in the landscape that have a special significance under Aboriginal tradition. The Sacred Sites Act provides a mechanism for registering sacred sites and issuing Authority Certificates in relation to sacred sites.	An Authority Certificate provides conditions for any works undertaken on or near sacred sites. GEMCO holds an Authority Certificate for the Eastern Leases (C2016/145) and is in the process of obtaining an Authority Certificate for the Western Leases (anticipated to be finalised in FY25). Section 3.1.10 provides further details on the location of sacred sites across the GEMCO Mine.

Legislation	Administering Authority	Intent of Legislation	Relevance to the GEMCO Mine
Heritage Act 2011 (NT)	Department of Territory Families, Housing and Communities - Heritage Branch	The *Heritage Act 2011* provides protection for the following two classes of cultural heritage: • All places and objects formally assessed and added to the NT Heritage Register; and • All Aboriginal and Macassan places and objects (whether previously documented or not), as listed in the Aboriginal and Macassan Sites Database.	It is a requirement of the *Heritage Act 2011* that a Work Approval be obtained from the Department of Territory Families, Housing and Communities prior to any disturbance of a heritage place or object as declared or protected under this Act. Section 7.5.11 provides further details.

4.2. Non-Statutory Requirements

4.2.1. Mining Agreement

GEMCO's non-statutory obligations are chiefly embodied in the separate Mining Agreements in place for the Western Leases and Eastern Leases between GEMCO and the ALC, dated 4 October 2006 and 17 May 2016, respectively.

[redacted]

- [redacted]

Section 5 of this MMP outlines GEMCO's operational activities, and Section 7 describes GEMCO's environmental management structure. The processes described are designed to ensure compliance with GEMCO's environmental obligations under the Mining Agreements.

[redacted]

4.2.2. South32 Corporate Standards

South32's Code of Business Conduct (the Code) sets the standards of conduct expected from its people, partners and suppliers across all its operations, including GEMCO. The Code, together with South32's values of care, trust, togetherness and excellence, is to guide every decision made by every individual across the business.

The standards of conduct outlined in the Code include:

- **Health and Safety:** South32's priority is to ensure everyone goes home safe and well every day, and it is the responsibility of those who work for South32 to operate safely and prevent workplace injuries and illnesses, and be fit for work every day.

- **Inclusion, Diversity and Equity:** South32 value and strive to build inclusion, diversity and equity in the workplace and those who work for South32 are responsible for being inclusive, co-operating with one another and treating others fairly, with respect and dignity, and without discrimination.

- **Human Rights:** Those who work for South32 are expected to create and maintain a work environment that respects human rights, and conduct business in accordance with applicable laws and recognised international human rights.

- **Privacy:** South32 respect and protect the personal information and privacy of others and all personal information must be collected, managed and used in accordance with South32's Privacy Policy and applicable privacy laws.

- **Communities:** South32 seek to build, manage and maintain strong and sustainable relationships with its host communities by complying with the commitments it makes towards these communities and working with community stakeholders to address concerns through regular, open and honest communication.

- **Environment:** South32 is an environmentally responsible business and those who work for South32 are responsible for being environmentally aware, complying with applicable laws and regulations, understanding the environmental risks and impacts of the work and minimising South32's footprint, and reporting actual or potential environmental incidents.

- **Government:** South32 recognise the authority of governments and always seeks open, non-partisan, ethical, legal and constructive relationships with government.

- **Fraud, Bribery and Corruption:** South32 prohibit fraud, bribery and corruption in any form, and complies with applicable anti-bribery and corruption laws wherever it conducts business.

- **Conflicts of Interest:** Those who work for South32 have a responsibility to act honestly and to identify and disclose a situation involving an actual, potential or perceived conflict of interest, and ensure nothing they do, conflicts with their responsibilities to South32.

- **Fairness:** South32 compete fairly, ethically and comply with applicable competition laws across the globe, and its people must not engage in collusive or co-operative conduct with a competitor.

- **Suppliers:** South32 work towards effective, fair, equitable and streamlined procurement processes with its suppliers and aim to only work with suppliers who have strong values and standards of conduct and share South32's commitment to lawful business practices.

- **Economics:** South32 comply with applicable economic sanctions and its people must follow its sanction compliance due diligence and related screening processes.

- **Asset Protection:** South32 prohibit falsifying, stealing, concealing or otherwise tampering with company information and data in order to protect its company assets, including confidential information and intellectual property.

- **Speak Up:** South32's Speak Up Policy is the global 'whistleblower' policy, people are to raise concerns where standards of conduct are not being followed. For example, discrimination, bullying or harassment, fraud, bribery or corruption, misuse of company assets or a human rights violation.

As a global company, South32 operate in accordance with applicable laws and regulations of the countries where it operates. It is mandatory to follow all company policies, standards, procedures and processes as they are relevant to each operation.

GEMCO has a suite of documentation to ensure compliance with South32's Code and corporate policies, in addition to meeting appropriate regulatory requirements. These standards, procedures and processes are detailed within this MMP where relevant.

4.2.3. International and National Guidelines

GEMCO conducts operations in accordance with a number of guidelines, codes of practice and best practice initiatives, as directed by the Code and supporting documentation (South32/GEMCO policies and standards) or other regulatory bodies.

These are detailed within the relevant sections of this MMP and include guidelines relating to environmental management and monitoring, construction of TSFs and closure planning.

5. OPERATIONAL ACTIVITIES

GEMCO's operations involve resource development, manganese ore extraction via open cut mining methods, processing ore in the concentrator, and transporting a final product to the Milner Bay port facility for shipping. Figure 5-1 provides a schematic of the production process. Ongoing project works are also undertaken to support the progression of mining activities via life-extension and the execution of sustaining capital projects. The activities associated with resource development, mining, processing, and projects are described in detail in the following sections.

[redacted]

5.1. Resource Development

GEMCO undertakes ongoing exploration drilling and geological resource modelling to improve its understanding of manganese mineralisation (depth, thickness, quality and continuity) across its lease areas.

Three phases of drilling are carried out at GEMCO as part of the resource development process:

- **Exploration Drilling:** Exploration drilling activities are undertaken in order to assess the potential for manganese mineralisation across GEMCO's exploration leases. The type and extent of drilling is described in various MMPs covering the Southern and Eastern Leases and is not included in this MMP.

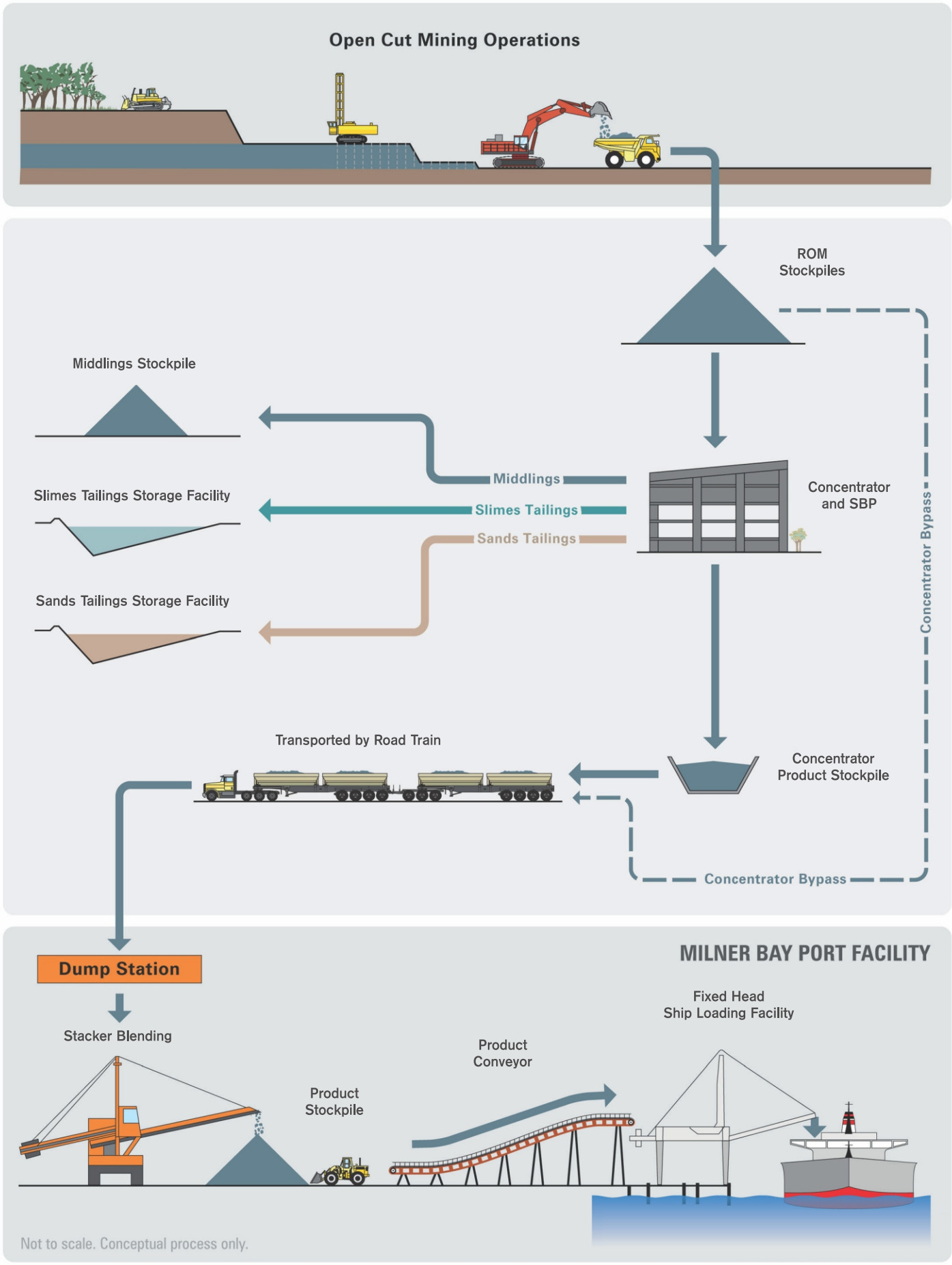
- **Resource Definition Drilling:** Resource definition drilling is designed to improve the confidence and assess the extent of mineralisation within the leases. Reverse circulation (RC) drilling is typically used for this phase of drilling, which is supplemented by diamond drilling for density and other geo-metallurgical properties.

- **Grade Control Infill Drilling:** Grade control RC infill drilling is conducted immediately ahead of mining (approximately 2 years) to improve the resolution of the geological model for short-term planning purposes. This phase of drilling is conducted within the short-term mining footprint and is closely followed by disturbance activities associated with preparation and extraction of the ore.

There are two types of geological resource modelling undertaken as part of GEMCO's exploration resource development program:

- **Resource Modelling:** Resource models are developed annually to define the extent of manganese mineralisation across GEMCO's lease areas based on exploration and resource definition drilling results. The resource models are used for long-term mine planning and form the basis for reporting of GEMCO's Mineral Resources and Ore Reserves as detailed in Section 5.1.2.

- **Grade Control Modelling:** Grade Control models are developed each year for specific areas of the deposit based on infill drilling results, in-field geological mapping, and short-term reconciliation results. The grade control models are used by the short-term planning team to guide targeted exploration drilling campaigns, as well as inform subsequent Resource model updates.



STH-23-09 Closure MMP_004A

SOUTH32 FY25 - Closure MMP

Figure 5-1
Production Process

Date: May 2024		Plan No: Production Process
Scale: NA		

5.1.1. Planned Exploration Activities

Planning for exploration occurs annually, and is a sequential process whereby results from previous years are used to plan future drill locations. [redacted]

[redacted]

[redacted]								
[redacted]								
[redacted]								
[redacted]								
[redacted]								

[redacted]

Clearing of access tracks and drill pads is required to undertake exploration drilling activities. Clearing is carried out using a scrub dozer in accordance with *GEM-PRO-4149 Permit to Clear and Burn Vegetation* and related documents. Tracks are nominally 3 m wide, and pads are typically the following dimensions: RC 18 m by 10 m (including track width); DDH 18 m x 15 m (including track width) (Plate 2).

Clearing is conducted using the "blade up" method, whereby the blade of the dozer is lifted to ensure topsoil is largely undisturbed and retains vegetative material (i.e. roots and tubers) and the soil seed bank. This facilitates natural regrowth of tracks and pads and therefore, no active rehabilitation is undertaken. Exploration tracks and pads are left for vegetation to regenerate naturally, and all holes are capped and filled immediately after drilling (*SWI-21257 Exploration Marking - Clearing Lines - Drill Pads*).

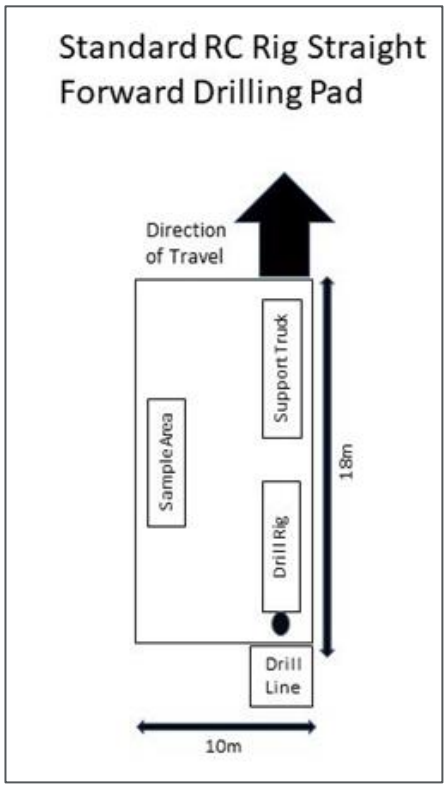


Plate 2 Clearing Dimension of RC Drill Pad

5.1.2. Mining Reserves

GEMCO's Mineral Resources and Ore Reserves are reported each financial year in accordance with ASX Listing Rule requirements[8]. It is noted that the Mineral Resources and Ore Reserves reported in the South32 Annual Report are expressed in dry metric tonnes in line with the JORC Code[9], while most of the quantities in this MMP are expressed in wet metric tonnes.

Mining operations on the Western Leases and Eastern Leases are expected to conclude by FY32, excluding closure activities and any contribution from development of the Southern Lease, which is contingent on separate approvals currently underway. Development of the Southern Lease would be expected to extend the life of the operation due to sharing of fixed and mobile plant, and ore blending with material from GEMCO's other lease areas.

5.2. Mining Activities

5.2.1. Mining Process

GEMCO employs an open cut strip mining method, whereby the deposit is divided up into a number of different quarries. Within each quarry the orebody is exposed and mined in sequential strips that are typically between 40 m – 60 m wide. The nature and extent of the orebody ultimately drive quarry dimensions, however typical quarry depths vary between 10 m – 25 m, and mining strips are generally between 400 m to 1,500 m long. The mining process involves the following sequence of activities (indicatively shown in Figure 5-2):

- **Vegetation clearing and grubbing**. Vegetation across future mining areas is cleared and grubbed using dedicated 'scrub-clearing' bulldozers. Historically GEMCO has windrowed the cleared vegetation and disposed via controlled burning in the Western Leases areas, however progressed a vegetation mulching trial during 2023 to assess the potential of creating and using woody debris to aid in rehabilitation. Based on the trial outcomes, GEMCO will revise the site Rehabilitation Standard to prioritise mulching of the forest resource as the preferred method of vegetation removal across the Southern EL and Western leases, and include additional monitoring and management requirements for vegetation disposal via burning, should it be required.

- **Topsoil stripping and recovery**. Topsoil is stripped and pushed into windrows, before being picked up by loaders or excavators and placed into haul trucks. The topsoil is then either placed directly on areas that are ready for rehabilitation or temporarily stockpiled in designated areas for later use.

- **Overburden stripping**. Subsoil and overburden material are excavated to gain access to the ore. When commissioning a new quarry / mining area, a fleet of excavators and haul trucks is used to remove the subsoil and overburden. This material is either temporarily stockpiled or placed directly within previously mined quarries to enable rehabilitation activity. For subsequent strips, subsoil stripping continues with the excavator and haul truck fleet, whilst the preferred method of overburden movement is dozer-push stripping. For routine mining operations, there is no further overburden segregation.

- **Drilling and blasting the manganese ore**. The ore is drilled and blasted to break up the material so it can be easily handled. Where ore mining is planned in close proximity to communities, sensitive receptors, and key infrastructure, additional controls[10] are implemented to limit the potential for negative blasting impacts to such areas.

[8] The South32 Annual Reporting Suite 2023 can be accessed online via the South32 Investor Centre: https://www.south32.net/investors-media/investor-centre/annual-reporting-suite

[9] The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (2012) produced by the Australasian Joint Ore Reserves Committee.

[10] Additional controls may include blast vibration monitoring, visual inspections, and designated non-blasting areas.

- **Mining ore**. A fleet of haul trucks and excavators is used to extract the ore and transport it via a network of dedicated haul roads to the Run-of-Mine (ROM) stockpile area, located adjacent to the Primary Crushing Station (PCS), as shown in Figure 5-3.

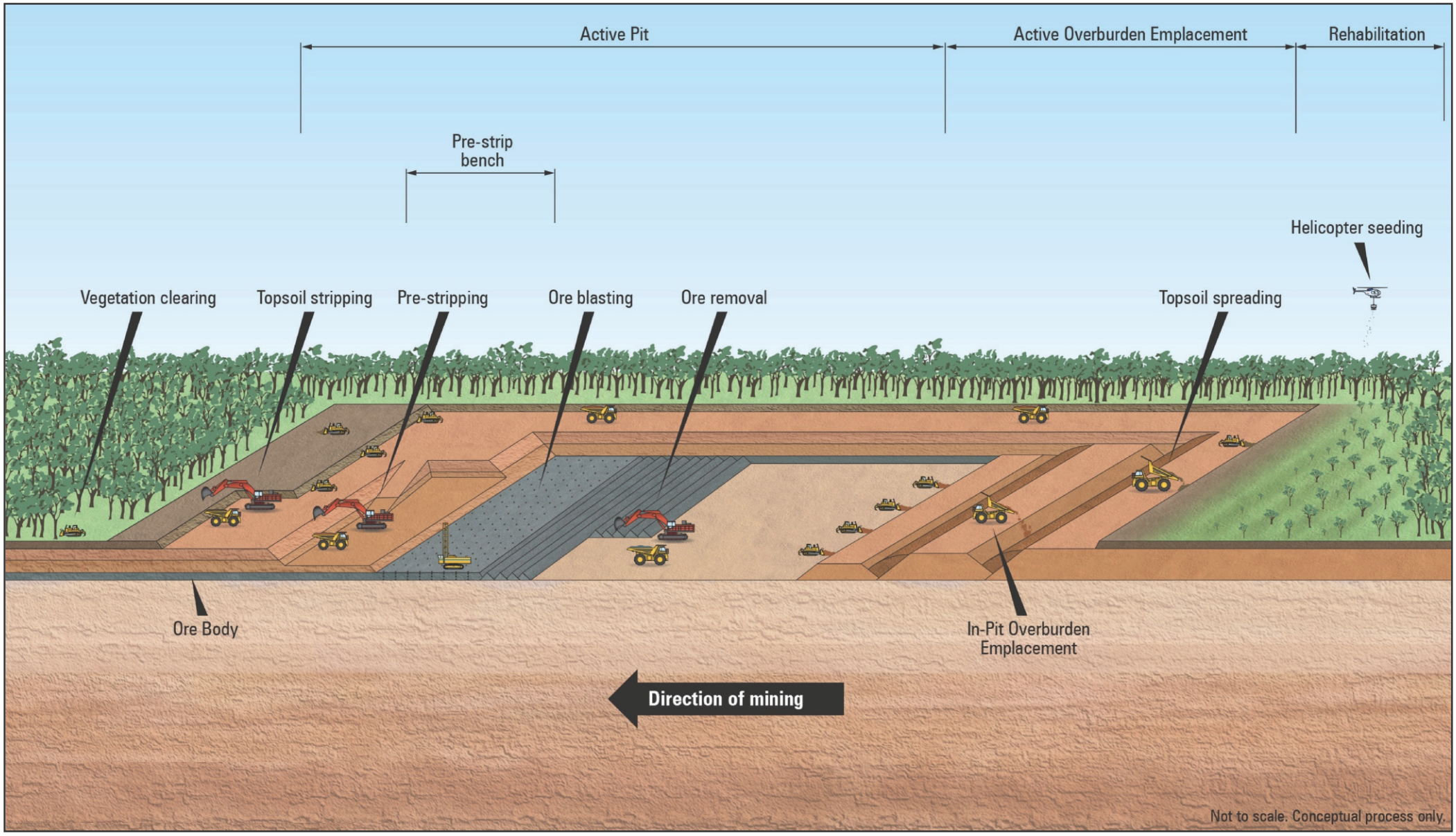
- **Ore blending**. A dedicated fleet of loaders and haul trucks is used to deliver a Concentrator feed Ore Blend from various ore stockpiles on the ROM, along with a small proportion of direct feed from ore mining activities.

- **Backfilling quarries following ore removal**. Dozers and haul trucks are used to backfill quarries with overburden and subsoil material up to the Post Mining Surface (PMS) level, to create a stable and free-draining final landform.

- **Progressive rehabilitation**. Haul trucks and dozers are used for topsoil placement on PMS areas, where this material is spread at a thickness ranging from 0.1 m to 0.3 m, with thickness variation guided by pre-mining soil surveys. The topsoil and underlying subsoil are subsequently ripped to aid with surface water ingress and plant growth. Following topsoil placement, revegetation activities finalise the progressive rehabilitation process, prior to rehabilitation monitoring commencement. Revegetation uses seeds from native trees, shrubs and grass species, and is primarily undertaken via aerial seeding. Further detail on GEMCO's progressive rehabilitation is provided in Section 7.5.3.

- **Sands tailings reclaim**. Since 2016, GEMCO's mining activities have included the reclaiming of sand tailings material from existing TSFs for processing through the Sands Beneficiation Plant (SBP). This process involves using a fleet of haul trucks and excavators to extract the sand tailings and transport it to designated stockpiles located near the concentrator. The processing of sands reclaim material, in conjunction with online material from the Concentrator rejects circuit, produces a manganese fines product known as PC02, as detailed in Section 5.3.1.

Mining activities are undertaken over a number of quarry areas simultaneously, with ore profile and composition differing between quarries. Quarry locations are named using alphabetical letters, and may be further defined by their geographical location (e.g. B South Quarry). The location of the quarry areas within the Western Leases is shown in Figure 5-4.

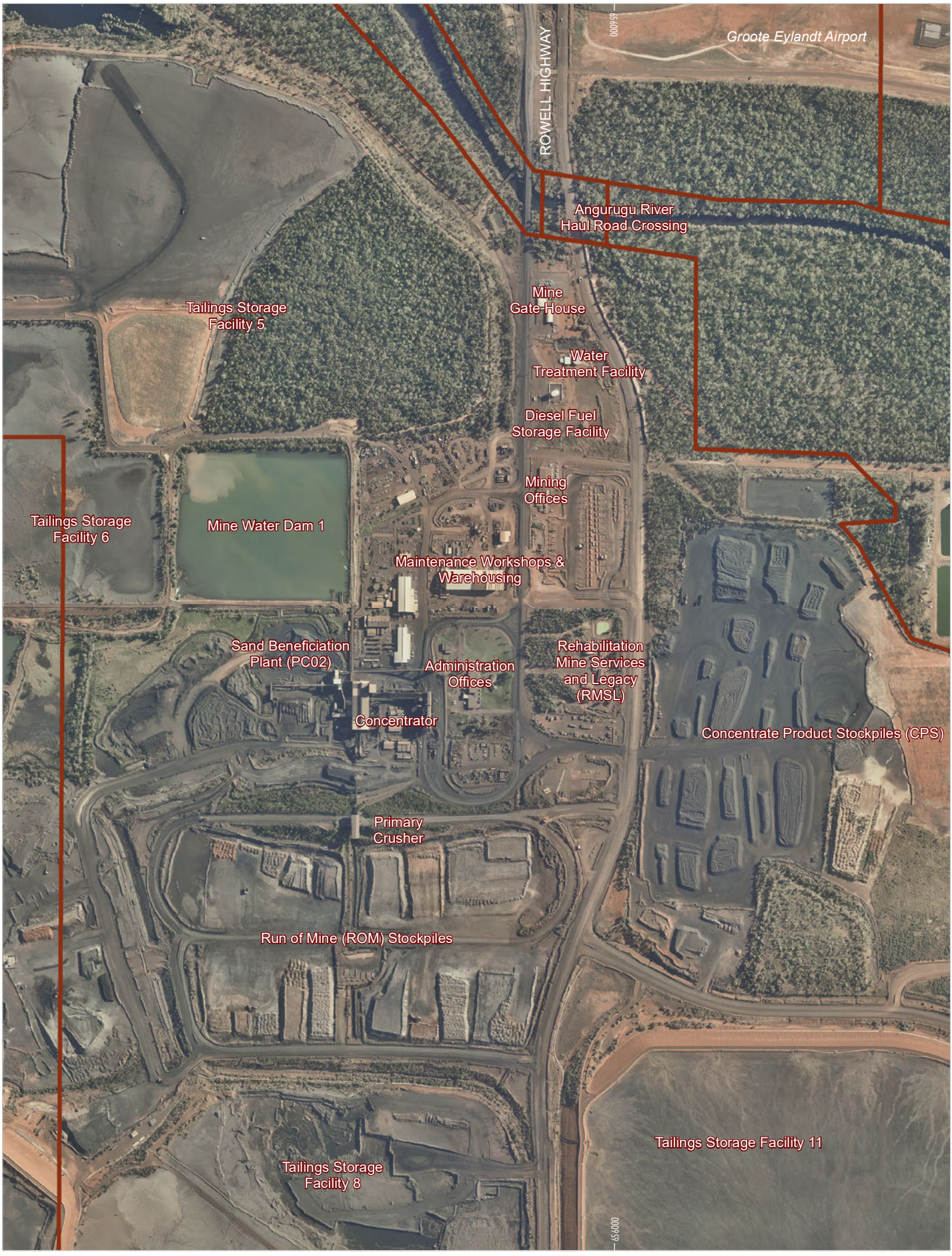


STH-23-09 Closure MMP_005A

SOUTH32 FY25 - Closure MMP

Figure 5-2
Open Cut Mining
Operations Schematic

Date: May 2024		Plan No: Open Cut Mining Operations Schematic
Scale: NA		



STH-23-09 ClosureMMP_219A

N

0 300

Metres

Coordinate System:
GDA94 MGA Zone 53

Legend

Western Leases

SOUTH32 FY25 - Closure MMP

Figure 5-3
Main Infrastructure Area

Date: April 2024	Scale: 1:10,000	Author: RS

ESRI Imagery Service Layer Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

N

0 3

Kilometres

Coordinate System: GDA94 MGA Zone 53

Legend

- Western Leases
- Eastern Leases
- Watercourse
- Tailings & Dams
- Access and Haul Roads

SOUTH32

FY25 - Closure MMP

Figure 5-4
Project Layout (Quarries)

Date: May 2024	Scale: 1:95,000	Author: RS

STH-23-09 ClosureMMP_217C

5.2.2. Mine Planning

Mine planning at GEMCO is undertaken in an iterative and incremental manner whereby additional detail is progressively built into mine plans over time.

Life of Operations Planning

The South32 Group Planning team develop GEMCO's annual Life of Operations Plan (LoOP) to define the life of mine operations strategy and inform business valuation processes. The LoOP is developed to optimise value from the operation based on a current understanding of the orebody and various input assumptions and constraints, providing guidance for the extraction sequence and timing of various mining areas over the remaining mine life. It also provides the basis for developing the PMS to inform closure cost estimates and environmental assessment.

[redacted] As outlined in Section 7, GEMCO will report on its performance against this MMP in annual EMRs and provide updated forecast values for the remaining years of the MMP if required.

[redacted]

Medium-Term Planning

The South32 Group Planning team coordinates development of an annual Medium-Term Plan (MTP) in conjunction with key operational stakeholders. The main objective of the MTP is to enable the value defined by the LoOP by translating the LoOP pathway into an feasible mine plan.

A key output of the annual MTP is a detailed Mine Development Path, which outlines mining activities required to be progressed over the medium-term in order to enable and unlock the optimised value of the operation as defined through the LoOP. By regularly tracking and reviewing the schedule, scope and cost status of activities detailed in the Mine Development Path, such as project studies and execution works, the Operations' Leadership Team and Planning Teams work together to execute the MTP.

Short-Term Planning

GEMCO's Technical Services team are responsible for delivering a series of Short-Term Plans (STPs), including the annual 2-year Budget, monthly Full-Year Forecasts, and weekly Integrated Plans. These plans are a more detailed subset of the LoOP and MTP, whereby mine planning elements such as mine schedules, mine designs, water management, ore stockpiling, blending, and rehabilitation requirements are progressively refined over time. Further detail of these various STP elements is outlined in the following sections.

[11] *GEMCO Recommended Scenario May 24 to FY26* and *Project Lemonade Case 01a.6b* referenced, with Southern Lease (EL2455) excluded.

Mine Scheduling

A series of mine schedules is developed to refine the LoOP and MTP quarry and cut extraction sequence to guide operations. Key input considerations for STP mine schedules include resource / geology model updates, capital portfolio delivery, equipment/plant performance, as well as operations and model performance reconciliations. There are also various external factors which influence the mine schedule including market demands, resource constraints, weather, and Environmental, Social and Governance considerations.

GEMCO has short-term planning processes in place to effectively manage delivery of mine schedule outputs in-line with all input considerations. The indicative mine schedule for the MMP coverage period (FY25-FY32), based on GEMCO's LoOP25 Plan[12] – and therefore excluding any mine-path timing impacts from Tropical Cyclone Megan – is shown in Figure 5-5.

Mine Design

Mine designs for all mining activities in each strip are prepared in line with design parameters detailed in GEMCO's *Quarry Design and Layout Parameters Procedure (GEM-PRO-4078)* to enable execution of the mine schedule.

The input assumptions adopted for each design also consider a number of factors including productivity, cost, safety, environment and product requirement. Figure 5-6 illustrates the cross section of typical quarry designs for various stages in the mining process (as described in Section 5.2.1). Appendix 9.3 provides examples of the mine designs for overburden pre-stripping (excavator and dozer push).

In addition, Access and Haul Road development at GEMCO is undertaken in line with GEMCO's *Mine Road Design, Construction and Maintenance Standard (GEM-STA-4218)*.

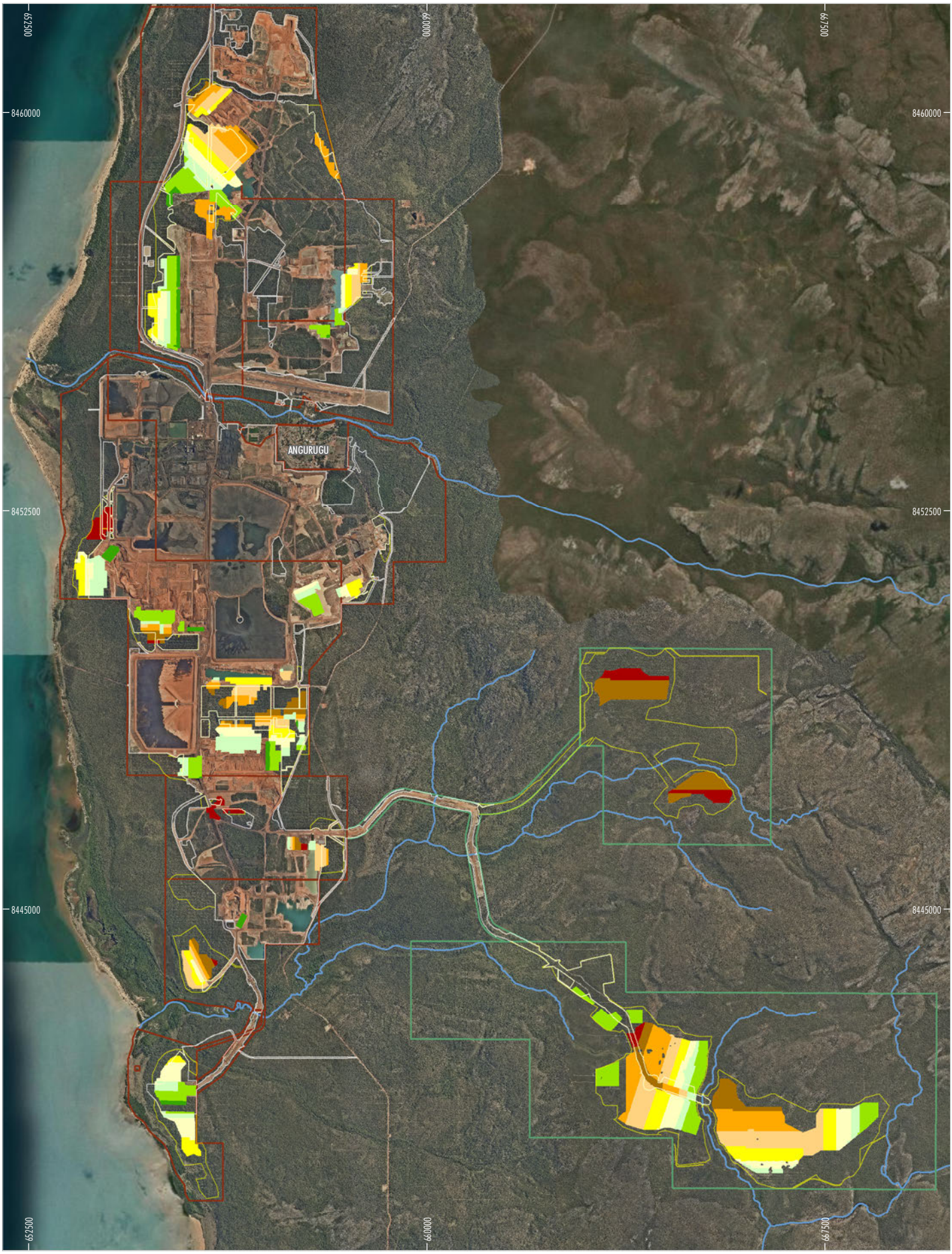
GEMCO employs a risk assessment methodology on all non-routine mine designs to effectively manage potential hazards. In areas where slope stability is a concern, GEMCO engages qualified geotechnical consultants to assess the risk of executing the proposed design. This may be in areas where mining is planned to occur adjacent to frequently travelled roads, near the base of TSFs or where geological drilling has indicated strata present with unfavourable stability conditions.

Water Management

Based on GEMCO's ore horizons being increasingly below the water table as operations progress through the mine life, the is potential for a number of quarries to intersect the water table during the mining process. This results in a requirement for water management and quarry dewatering activities to occur in order to safely access and mine these areas.

GEMCO's water management approach for mining is informed by groundwater models, surface water runoff and flood modelling, and site water balance requirements, where the volume and quality of water entering active mining areas is assessed. The usual process for quarry dewatering entails the installation of drainage channels along the edge of the mining cut, which are designed to drain surface water runoff to a sump. From there quarry-water is then able to be pumped to dedicated in-pit water storages using a network of pumps and pipelines. Depending on the quality, this water is either stored for future use for ore processing and dust suppression, or it is discharged into surrounding bushland if it meets specific environmental discharge quality trigger levels and is determined to be excess to operational requirements. Further Water Management specific information can be found in Sections 7.5.8 and 7.5.9, as well as in the annually updated Mine Water Operational Strategy.

[12] LoOP25 Preferred Plan Case 11 referenced, which excludes Southern Lease (EL2455) development.



ESRI Imagery Service Layer Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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Kilometres

Coordinate System: GDA94 MGA Zone 53

Legend

- Western Leases
- Eastern Leases
- Current Clearance Extent
- Maximum Planned Clearance Extent
- FY 2024
- FY 2025
- FY 2026
- FY 2027
- FY 2028
- FY 2029
- FY 2030
- FY 2031
- FY 2032

SOUTH32

FY25 - Closure MMP

Figure 5-5
Indicative Mine Schedule

Date: May 2024	Scale: 1:95,000	Author: RS

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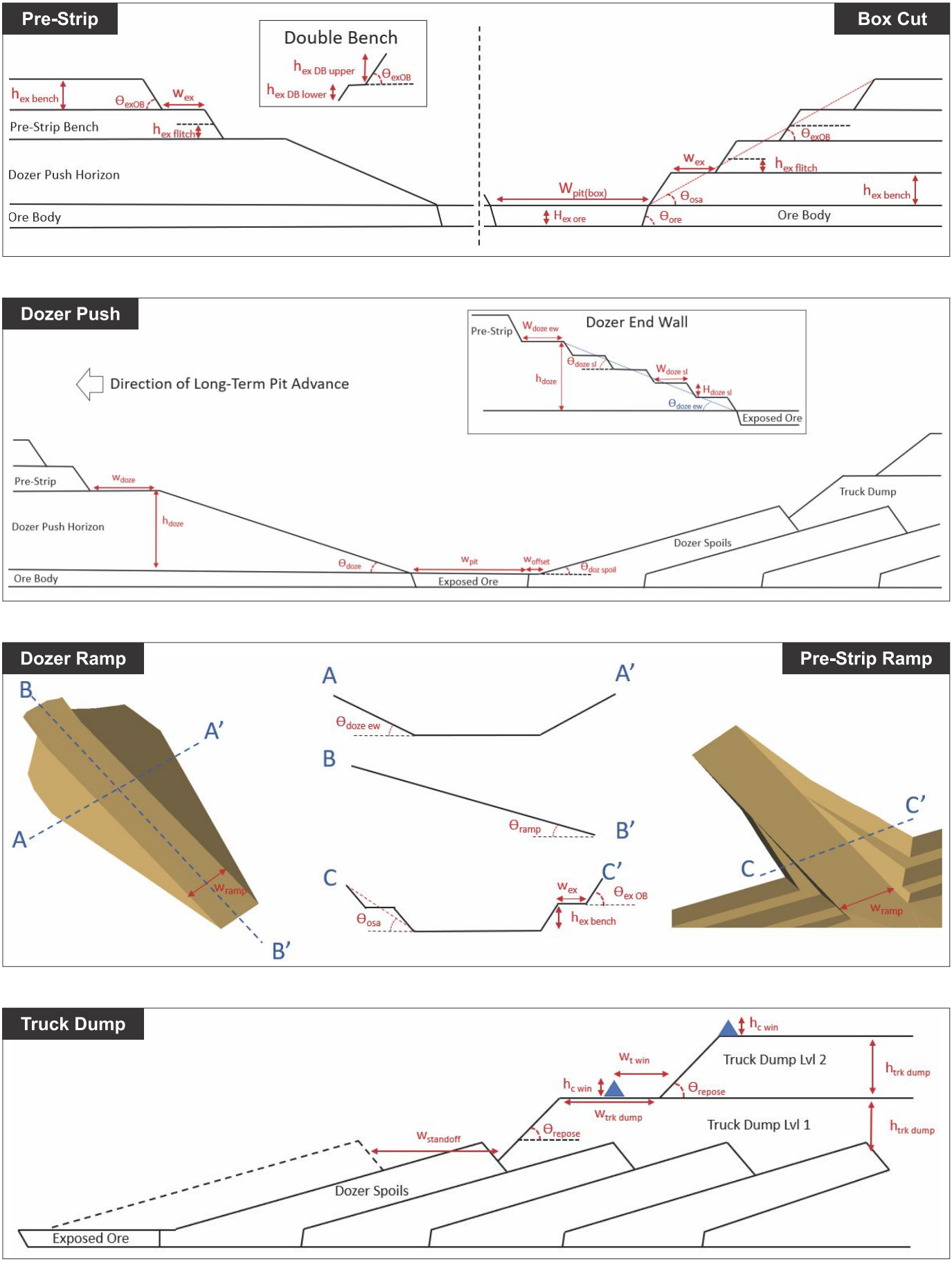


STH-23-09 ClosureMMP_006A

SOUTH32

FY25 - Closure MMP

Figure 5-6
Typical Quarry Designs

Date: May 2024		Plan No:
Scale: NA		Typical Quarry Designs

Ore Stockpiling and Blending

Ore is transported from quarries via a network of dedicated haul roads and stockpiled at the ROM located at the PCS (Figure 5-3). Given each quarry has different ore characteristics, stockpiles are typically built according to the source quarry, thereby maintaining ore stockpiles with similar characteristics at the ROM.

Stockpile sizes vary based on both upstream and downstream operational factors (ore mining rates and concentrator blend feed rates), as well as being influenced by ore material characteristics and seasonal weather factors. Given the variability of mining conditions and ore characteristics across GEMCO's mining areas, from time to time temporary ore stockpiles may need to be established adjacent to quarry areas within the active mining footprint to help maintain mine path stability. Surface water run-off from ore stockpiles is contained within surface drains which direct water to site storages for use as process water.

A dedicated fleet of loaders and haul trucks is used to deliver a Concentrator feed ore blend from the various ore stockpiles on the ROM, along with a small proportion of direct feed from ore mining activities. Variations of the ore blend enable GEMCO to optimise Concentrator performance and saleable ore production based on the ore characteristics and product marketing specifications at any particular time. The ore blending process directly influences GEMCO's production profile and is managed by the site Geology team working in coordination with the Processing & Logistics and Sales & Marketing teams.

Rehabilitation

Rehabilitation is an integral component of the lifecycle of GEMCO's operations. Rehabilitation is planned to restore mined land to the PMS final landform design and develop a self-sustaining open woodland, similar to the pre-mining environment and the surrounding undisturbed land. Rehabilitation activities are also aligned with GEMCO's Mine Closure Plan (MCP), which is detailed in Section 8. The key objectives of GEMCO's PMS final landform design and rehabilitation plans include:

- Reinstate the original pre-mined ground surface as closely as practicable;
- Reinstate surface drainage to minimise areas of standing water, unless the pre-mined surface contained such an area;
- Minimise rehandling of overburden in construction of the PMS;
- Maximise PMS final landform and progressive rehabilitation areas developed during each calendar year, whilst avoiding rehabilitation activities during the annual wet-season; and
- Maximise direct-return topsoil placement volumes immediately prior to the annual wet-season, and minimise topsoil stockpiling and rehandle volumes.

It is not practicable to display a mine design showing the final PMS landform for the full extent of the Western Leases, and in practice the PMS is incrementally developed via backfill dumping and dozing activities. Hence, the PMS landform is incorporated into mine designs for these activities in each mining strip; with example designs provided in Appendix 9.3. Additionally, the Closure Pre-Feasibility Study (PFS) is evaluating and refining post-mining landform designs and associated drainage requirements.

The progressive rehabilitation process described above typically negates the need for above-ground Waste Rock Dumps at GEMCO.

Rehabilitation execution and monitoring activities are undertaken by mining operations and environment teams, as detailed in Sections 5.2.1 and 7.5.3, respectively.

5.3. Processing Activities

[redacted] As outlined in Section 7, GEMCO will report on its performance against this MMP in annual EMRs and provide updated forecast values for the remaining years of the MMP if required.

[redacted]

5.3.1. Treatment and Ore Processing Operations

Concentrator

Manganese ore contained within the ROM stockpiles is fed into the concentrator where it is processed to a final product for transport. This process involves the following steps (as shown in Figure 5-7):

- ROM ore is crushed at the PCS and placed on a surge stockpile ahead of the concentrator.
- Crushed ore is fed into the concentrator and washed using a drum scrubber to remove clay components.
- Washed ore is then screened into size fractions using vibrating screens. This results in two size fractions of ore (lump and fines) and two size fractions of waste material known as tailings (sands and slimes). Size fractions are classified in Table 5-4.
- The lump ore is fed into a rotating drum separator containing a ferrosilicon media[14] which, has been mixed with water to achieve a desired density. The manganese ore is separated from waste materials (such as quartz and silica) due to the difference in their density. The ore, being denser than the ferrosilicon media, sinks to the bottom of the separator, enabling it to be removed. The less dense waste materials float to the top and overflow at the discharge end of the drum.
- The fine ore is fed into a series of cyclones which also contain a ferrosilicon media. Similar to the processing of lump ore, the heavier manganese is separated from waste materials based on density.
- Inert waste material from the rotating drum separator and cyclones is combined to form a course waste material known as middlings, which is stockpiled for later use in operational activities.
- Tailings are separated into the sands and slimes fractions using cyclones. Tailings are then pumped to purpose built TSFs, with the exception of some sands tailings which are pumped to the SBP for reprocessing.

[redacted]

[14] Ferrosilicon (approximately 15% silicon and 85% iron) is defined as non-hazardous under the hazardous chemicals rating system and ultimately oxidises after exposure to air and water.

TABLE 5-4 SIZE FRACTIONS OF ORE AND TAILINGS

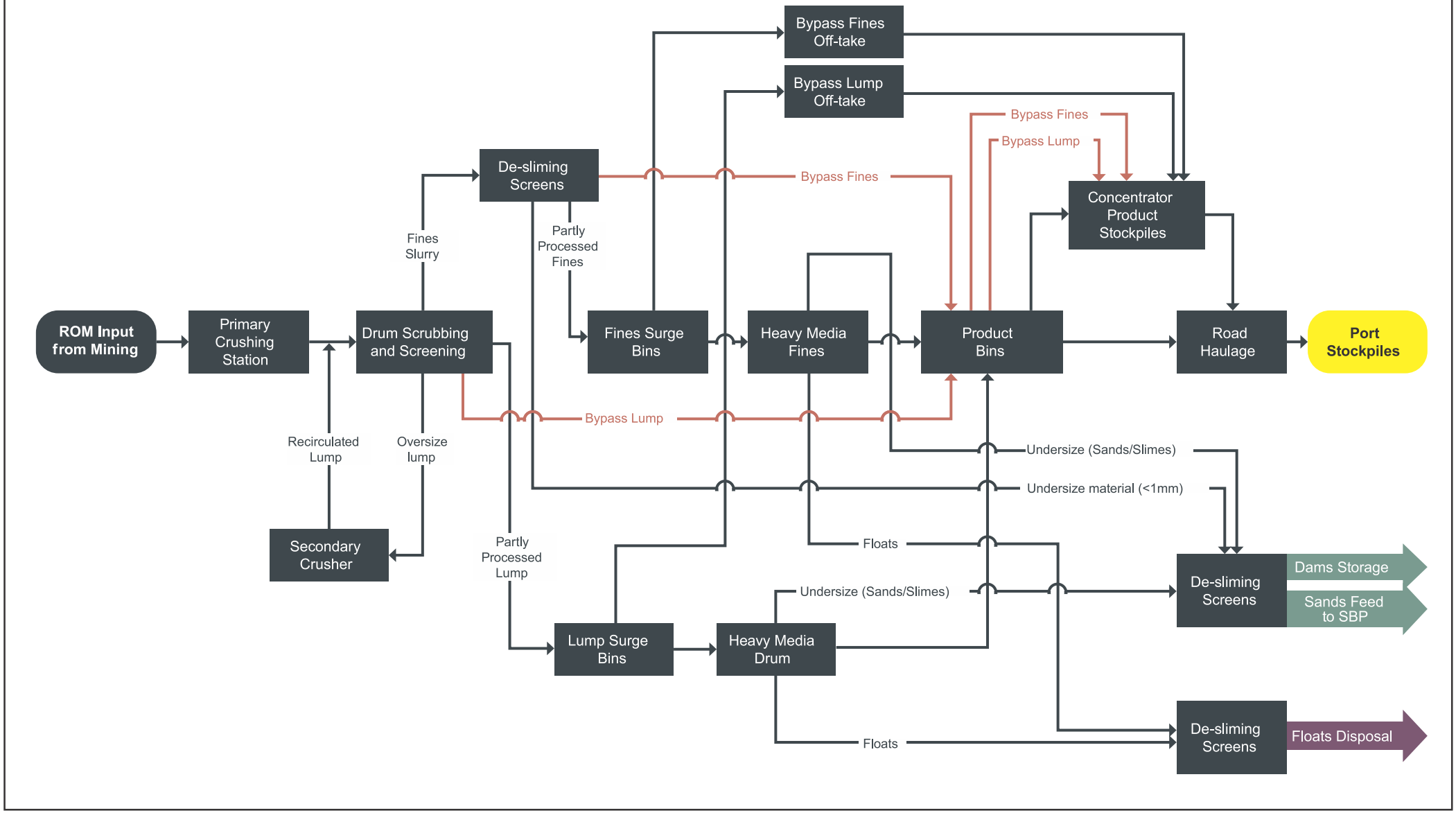
Size Fraction	Minimum (mm)	Maximum (mm)
Lump Ore	6.7	85
Fines Ore	0.5	15
Sands Tailings	0.08	2
Slimes Tailings	N/A	0.1

The concentrator has a production capacity of approximately 5.2 million tonnes per annum (Mtpa) (wet tonnes) of manganese product and uses approximately 2,250 megalitres of water per month. The majority of the water used (approximately 65%) is recycled water, returned from the TSFs. Dam 1 is GEMCO's only purpose-built water storage facility and it provides the concentrator with the main supply of water for processing. Dam 1 is fed by water dewatered from quarries and recycled water from the TSFs (see Section 5.3.3). On the very rare occasion, a small portion of potable water is utilised from the Angurugu River under licence.

Sand Beneficiation Plant (SBP)

A SBP, also known as the PC02 plant, was commissioned in May 2016 and runs concurrently to the existing concentrator. The SBP is designed to process up to 2.9 Mtpa (dry) of feed material, producing up to 0.7 Mtpa (dry) of PC02 product (40% nominal manganese grade). PC02 processing involves the following steps (as shown in Figure 5-8):

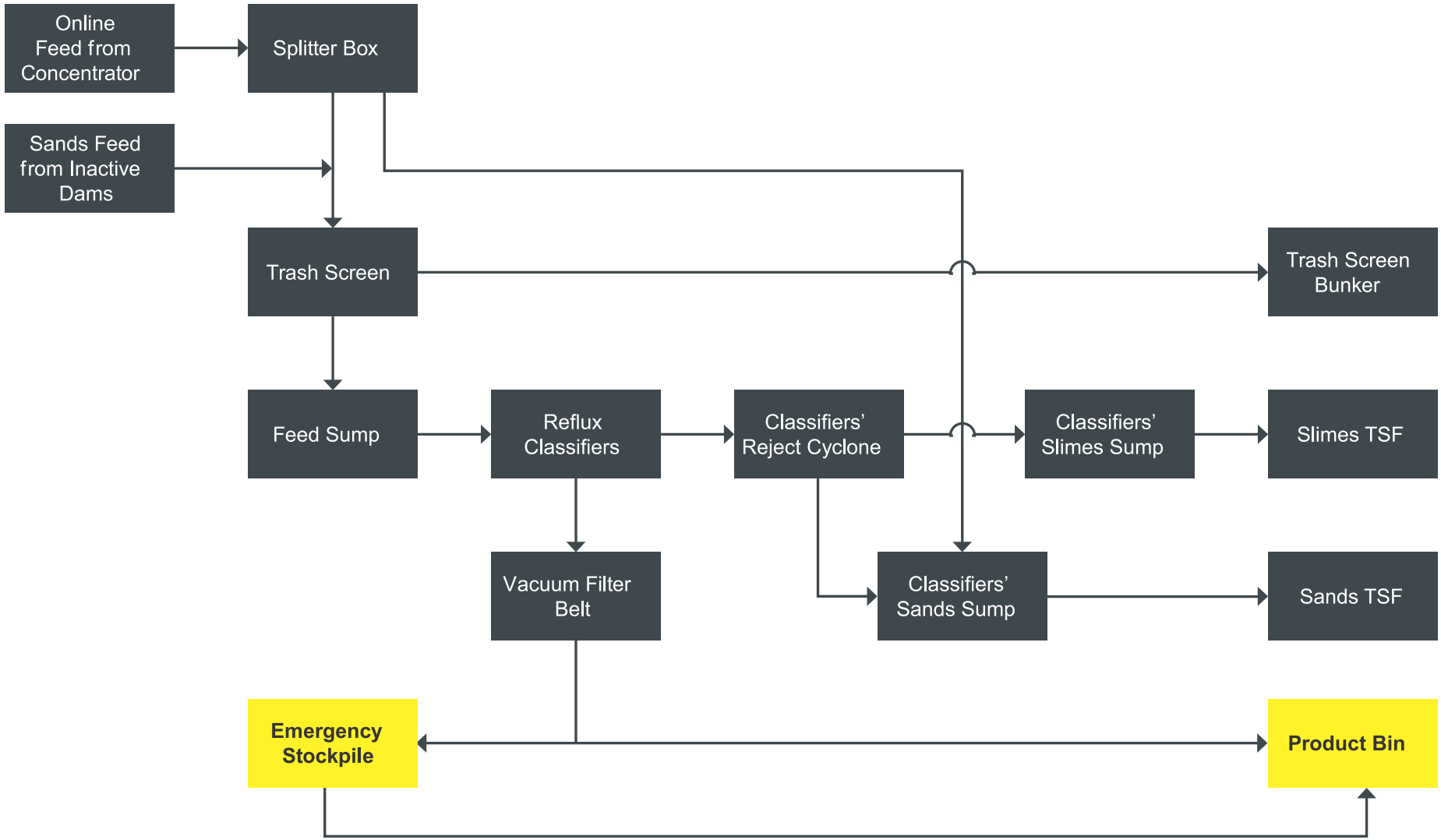
- Sands material is reclaimed from an existing sands TSF (TSF reclaim feed) or is directed to the SBP from the concentrator (online feed).
- Material is screened to remove course reject material (> 2 mm) and fed into a series of reflux classifiers for separation based on density (similar to the processing of lump and fines ore).
- The product from the reflux classifier is fed onto a horizontal vacuum belt filter for dewatering (to achieve an acceptable moisture level for transport).
- The reject stream (i.e. overflow from reflux classifiers) is pumped into a cyclone to separate slimes from sands. Tailings are then pumped to purpose built TSFs.



SOUTH32 FY25 - Closure MMP

Figure 5-7
Concentrator Process Flow Diagram

Date: April 2024		Plan No: Concentrator Process Flow Diagram
Scale: NA		



SOUTH32

FY25 - Closure MMP

Figure 5-8
SBP Process Flow Diagram

Date: April 2024		Plan No: SBP Process Flow Diagram
Scale: NA		

Sands Tailings Reclamation Project

The sands reclaim operations described above includes the process whereby a fleet of haul trucks and excavators extract and transport sand tailings material from existing TSFs for subsequent processing through the SBP. However, as operations progress deeper and towards the extremities of old TSFs, the use of haul trucks and excavators is becoming more challenging and less productive.

The Sands Tailings Reclamation project is reviewing potential alternative sands-reclaim methods, with the main project objectives including:

- **Maintain current and forecast SBP production rates**; offset the increasing challenges of sands reclaim mining operations and mitigate potential production, cost and revenue impacts.
- **Safety improvement**; reduce geotechnical risk exposure as sands reclaim operations progress into more challenging areas.
- **Maximise resource recovery**; maintain and/or improve the long-term value of SBP production by maximising the amount of potential sands tailings resource that can be considered PC02 Reserve after application of mining-method adjustment factors.

Due to the benign nature of the sand tailings, it may also be utilised as void backfill material and/or as an alternate subsoil medium.

The project is currently in the concept study phase, which is scheduled for completion during FY25. The concept study will guide a decision on project progression and any associated trials, whereby sands reclaim material could potentially be hydraulically mined or dredged and pumped to the SBP utilising excess water from GEMCO's water management processes. Pending the outcome of the study and trials, alternative sands tailings reclamation activities may commence by FY26. No change to disturbance is forecast as a result of this project.

5.3.2. Product Handling Operations

GEMCO's treatment and ore processing operations produce two main product streams – Concentrator Product and SBP Product. The downstream handling of GEMCO's product streams to support shipping from the Milner Bay Port is detailed below.

Concentrator Product

This material is transported from the Concentrator product storage bins via a dedicated road train haulage fleet. The Product is either hauled to the Milner Bay Port Facility or the Concentrate Product Stockpiles (CPS), depending on quality characteristics and product specifications which are varied over time.

- The majority of Concentrator product is hauled directly to the Milner Bay Port Facility (Figure 3-1), then unloaded and stockpiled at the port stockpile area according to grade and sizing. The stockpiles are reclaimed based on shipping requirements and optimisation of available port stockpile capacity. Surface water run-off from the Milner Bay stockpiles drains to a containment facility to the east of the stockpiles, which is left to evaporate naturally.
- The CPS (Figure 5-3) typically consists of product that does not initially meet target product specifications and may require blending, however may also be used for storing on-specification product to aid with operational efficiencies as required. The amount of product stored at the CPS can vary day-to-day based on concentrator throughput and subsequent reclaiming for shipping, however it serves as an important product buffer stocking point for the operation. Surface water run-off from the CPS is captured in a sediment pond installed to the north of the stockpile area.

SBP Product

The handling and storage of PC02 product is distinct from the storage of Concentrator product described above:

- Due to its fine particle size (0-2 mm), the PC02 product has an innate ability to "hold" moisture and has the potential to liquify when agitated during transportation. Due to this liquefaction risk, PC02 has a Transportable Moisture Limit which is managed during product handling operations.

- GEMCO manages any post-production moisture ingress by transferring the PC02 product directly from an enclosed product bin at the mine site into covered road-train trailers for transport to the Milner Bay Port Facility. It is then unloaded at Miner Bay via a covered conveyer and stockpiled in a purpose-built storage shed. The PC02 storage shed has a fully enclosed roof and partially open sides that allow generous airflow and free drainage of any process water run-off.

Shipping at the Milner Bay Port Facility (located on SPL382 and SPL383) is undertaken via dedicated ship loading infrastructure, with support from front-end loaders for both Concentrator and PC02 product material movements.

5.3.3. Tailings Storage Facilities (TSFs)

As described in Section 5.3.1 processing of manganese ore results in the production of concentrate products (manganese lump and fines) and waste products (middlings and tailings) (Figure 5-1).

Middlings vary from approximately 3% to 7% of the plant feed and are re-used as road base construction material or as stemming in blasting. Tailings comprise approximately 45% to 50% of the plant feed and are pumped (via overland pipelines) from the concentrator and PC02 plant to dedicated sands and slimes storage facilities.

Geochemical testing undertaken on middlings and tailings has confirmed that both materials typically contain low concentrations of metals (except manganese) and have negligible capacity to generate acid. Leachate from these materials is typically pH neutral and low in salinity and trace metals.

GEMCO's TSFs are conventional wet storage facilities typically constructed within mined quarry pits (excluding TSF15). All current active TSFs have been designed, constructed and are operated in accordance with the Australian National Committee on Large Dams (ANCOLD) *Guidelines on Tailings Dams – Planning, Design, Construction Operation and Closure – Revision 1* (2019).

GEMCO TSFs maintain freeboard that is calculated based on a wet season storage allowance below the spillway invert for the volume of a 1% Annual Exceedance Probability (AEP), 72-hour storm event (550 mm rainfall). Compacted earth material (sourced from within GEMCO's leases) is used to construct elevated walls to create additional storage space and to ensure surface run-off does not enter the facility. Tailings slurry is deposited into active TSFs to develop a beach and maintain a tailings water decant pond. Tailings water (i.e. the supernatant water and rainfall runoff) that collects within the pond is decanted to Dam 1 where it is reused in processing operations.

Formal inspections of all TSFs are conducted daily by operational personnel and by specialist consultants on an annual basis as per the requirements of the ANCOLD Guidelines (2019). GEMCO maintains an extensive groundwater and surface water monitoring network to ensure that no adverse environmental impacts arise from the storage of tailings as per GEMCO's *Tailings Management System* (*GEM-PLN-30063*).

Table 5-5 provides a description of all current TSFs and Dam 1, and Figure 5-9 illustrates the location of these facilities.

TABLE 5-5 DESCRIPTION OF TSFS AND DAM 1

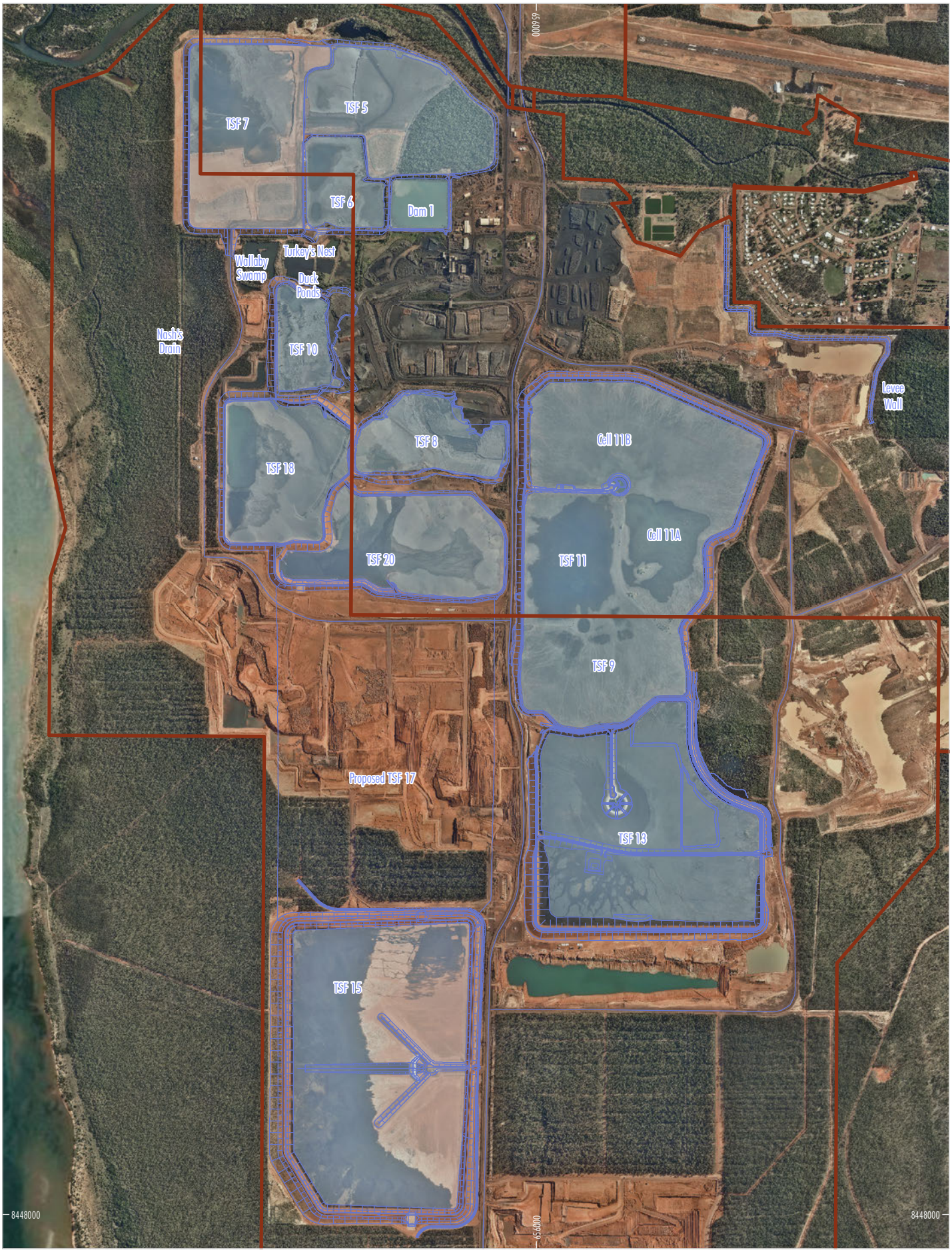
Facility	Surface Catchment Area (ha)	Design Capacity (Mt)	Design Capacity (Mm^3)	Description
Dam 1	12	200 megalitres	200 megalitres	Dam 1 is the process water dam that feeds the concentrator. Dam 1 is fed from TSF11, TSF18, TSF20, B South and F3 water storage quarries and other stormwater catchment areas.
TSF5	42	6.1	3.8	Slimes storage facility that has been decommissioned. TSF5 is undergoing a capping trial with the aim to progress successful rehabilitation across the surface of the facility.
TSF6	24	2.4	1.5	Slimes storage facility that has been decommissioned. TSF6 is undergoing a capping trial with the aim to progress successful rehabilitation across the surface of the facility.
TSF7	77	11.7	7.2	Slimes storage facility that has been decommissioned. TSF7 is undergoing a capping trial with the aim to progress successful rehabilitation across the surface of the facility.
TSF8	44	5.4	3.5	Sands storage facility that has been decommissioned. Sands tailings from TSF8 are scheduled to be reclaimed and re-processed through the SBP.
TSF9-TSF11a	-	16.7	9.4	Slimes storage facilities that are encompassed by TSF11.
TSF10	26	4.1	2.8	Sands storage facility that has been decommissioned. Sands tailings from TSF10 are scheduled to be reclaimed and re-processed through the SBP.
TSF11	229	10.6	9.2	Slimes storage facility that encompasses TSF9 and TSF11a. Settled tailings has created capacity which can be utilized at a later date. Sands tailings are being used to cap TSF11 – sands capping trial currently underway.
TSF12	-	1.9	1.2	Sands storage facility that is encompassed by TSF14 and TSF18.
TSF13[1]	141	10.9	13.9	Active slimes facility. Fill date is estimated to be during FY29.
TSF14	-	5.4	3.3	Sands storage facility that is encompassed by TSF18.
TSF15[1]	200	12.6	15.3	Active slimes facility. Fill date is estimated to be during FY29.
TSF16	-	6.4	4.8	Inactive sands storage facility that adjoins TSF8 and TSF18, and is encompassed by TSF20.
TSF17[2]	150	5.4	7.3	Proposed new slimes storage facility required once TSF13 and TSF15 capacity exhausted (refer below).
TSF18[1]	59	5.9	3.0	Active sands storage facility that adjoins TSF8, TSF10 and TSF16. It encompasses the former TSF12 and 14. Fill date is estimated to be during FY29.
TSF20[1]	76	13.8	8.7	Active sands storage facility that adjoins, TSF8 and encompasses the former TSF16. Fill date is estimated to be during FY26.

(1) Design capacities for Active TSF's based on May 2024 Survey Reconciliation data, with estimated fill dates based on LoOP25.

(2) TSF17 surface area and design capacities are indicative based on Concept Study - to be confirmed via further study works.

Note: Mm^3 = million cubic metres

GEMCO operates a life of operation planning process that includes the ongoing evaluation of existing tailings management strategies and procedures. This includes TSF construction and design principles, water management and ongoing monitoring. This planning process ensures that sufficient capacity is available to meet tailings storage requirements associated with ongoing and future mine production, whilst ensuring that tailings are stored and managed with no significant adverse environmental impacts.



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Coordinate System: GDA94 MGA Zone 53

Legend

- Western Leases
- Eastern Leases
- Tailings Storage Facility (TSF)

SOUTH32

FY25 - Closure MMP

Figure 5-9
TSF Site Plan

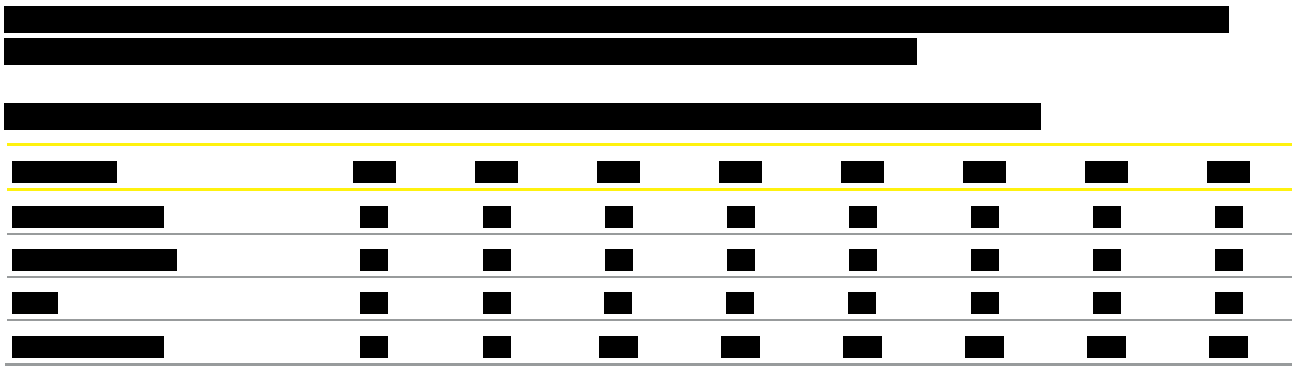
Date: April 2024	Scale: 1:30,000	Author: RS

STH-23-09 ClosureMMP_206A

Table 5-6 provides the tailings discharge densities used for planning purposes. Stored sands and slimes tailings typically settle to a density of 1.50 and 0.85 tonnes per cubic metre, respectively.

TABLE 5-6 TAILINGS DISCHARGE DENSITIES

Waste Type	Densities (%)
Concentrator sand tailings discharge density	19.4
Concentrator slimes tailings discharge density	10.8
PC02 sand tailings discharge density	23.8
PC02 slimes tailings discharge density	4.8



Tailings Storage Facility 17 Project

The GEMCO TSF17 project is proposed as GEMCO's final slimes TSF, and is required to deliver additional slimes tailings storage capacity to support ongoing operations when existing active slimes TSFs (TSF13 and TSF15) reach their design storage limits. Based on the current tailings production forecast (LoOP25), TSF17 storage capacity will be required during FY29, however timing and storage capacity requirements are dependent on development of various mining areas in the LoOP Preferred Plan, as well as the outcomes of Tailings Density Improvement project works.

A concept study on TSF17 was completed in Q4 FY23 which recommended ES-Quarry as the preferred location for TSF17, as well as an alternative option to construct a raise on TSF15. The ES-Quarry area is planned to be mined in advance of TSF17 storage capacity being required, and will therefore provide an area of approximately 150 ha of previously disturbed land on which to build the new storage facility. The project is currently in pre-feasibility phase, during which further study works will be completed to lock-down the project plan.

The project will be timed to deliver a commissioned facility in advance of the predicted fill date of TSF13 and TSF15. Construction is currently expected to commence in 2026, with timing to be further refined through the pre-feasibility phase.

6. RISK ASSESSMENT

South32 defines risk as "The effect of uncertainty on objectives. These can be positive (opportunity) or negative (threat)". This definition and GEMCO's risk management processes and systems are based on *ISO 31000 – Risk Management — Guidelines*. GEMCO's risk management principles and the *South32 Material Risk Management Standard* provide the guiding principles for the management of material risks within all South32 Operations. GEMCO's risk assessment matrix is provided in Appendix 9.4.

6.1. Risk Identification

The identification of environmental and operational hazards and risks occurs daily and is essential for making informed decisions before starting any task. Risk identification occurs both on the job and systematically through scheduled activities. For example, risks can be identified:

- When work is being designed and planned (Work Design, Safe Work Instruction [SWI], Job Safety Analysis [JSA]).
- During scheduled work completion, preventative work orders in relation to an inspection, service or when maintenance activities must be executed.
- When unscheduled work is being completed (including executing a Preventative Maintenance [PM01] corrective work order created by a planner).
- During desktop/administrative activities including:
    - GEMCO Departmental risk register reviews.
    - Internal and External Assurance task and shared learnings.
    - Change management activities.
    - Life of Operations Plan (LoOP) development.
    - Budget planning cycles.
    - Incident investigations (internal or external).

6.2. Recording Identified Hazards and Risks

Upon identification of risks, information is entered into the GEMCO Department baseline risk registers. Subsequently, any material risks, safety fatality risks (as defined by the South32 Safety Standard), and any additional single fatality risks not covered by the South32 Safety Standard are entered in Global 360 (G360) our Risk Management Software. This can occur at any time throughout the year.

This forms the basis of the GEMCO risk management data by providing information on:

- Hazards and Risk Events;
- Causes;
- Impacts;

- Severity;
- Financial Materiality rating; and
- Non-Financial Materiality rating.

6.3. Risk Assessment Processes

For Risks identified as material, a Risk Owner is appointed and using a Bowtie Risk Analysis, controls are identified to prevent or mitigate the risk event. Once a control has been identified, measures, or performance standards, are defined that must be achieved for it to meet its design and operating objectives. The Risk Owner evaluates whether the risk is tolerable by determining and recording the Residual Risk Rating.

Non-Material risk assessments are conducted by the work group using tools such as Workplace Risk Assessment and Control, JSA and Take 5.

A baseline risk register is maintained, which includes the full and complete list of both material and non-material risks of an operation, function, or project that have the potential to impact our purpose, strategy, and/or business plans.

Monitoring and review of risk is undertaken because it is acknowledged that the risk is not static, and the risk register is a live document. Each GEMCO Department reviews its risk register at least annually or when a change to the risk profile is identified.

7. ENVIRONMENTAL MANAGEMENT

7.1. Environmental Management System

GEMCO's Environmental Management System is designed to appropriately manage the key environmental risk aspects outlined in Section 6.

7.2. Environmental Policy and Objectives

South32's Sustainability Policy[15] guides environmental and social management as well as sustainability planning for the business.

The Sustainability Policy is supported by a number of standards which assist to minimise environmental and social impacts, support regulatory compliance and drive continual improvement. This includes the South32 Environment and Climate Change Standard (refer Appendix 9.5). This document sets the minimum expectations for all South32 operations with regards to environmental management. The general requirements outlined are modelled on the *ISO 14001:2015 Environmental Management Systems* Standard, and complements the International Council on Mining and Metals (ICMM, 2023) *Mining Principles: Performance Expectations* and the *Ten Principles of the UN Global Compact* (United Nations Global Compact, 2024).

The performance requirements outlined in the South32 Environment and Climate Change Standard include the following:

- **Environmental Commitments:** We protect the environment in a way that demonstrates our values and are aligned with the ICMM commitments for mining and protected areas.
- **Environmental and Climate Resilience Management:** We understand our local and regional context and have processes in place to ensure we minimise adverse environmental impacts and remain resilient to changes in climate conditions.
- **Energy and Decarbonisation Planning:** In pursuit of South32's emission reduction target and net zero goals, we apply the decarbonisation principles to protect and unlock value for the business whilst supporting a fair and equitable transition for our people and communities.
- **Water Stewardship:** We manage water resources using a holistic approach to promote better water use, effective catchment management and contribute to improved water security and sanitation.
- **Biodiversity and Land Stewardship:** We manage Biodiversity and Land through an integrated land use planning process designed to protect ecosystem services and biodiversity values for future generations.
- **Waste Stewardship:** We manage our waste streams to minimise environmental impact and realise value.

7.3. Environmental Commitments

Table 7-1 summarises the key environmental commitments for the GEMCO Mine relevant to this MMP period.

[15] South32's Sustainability Policy can be accessed here: https://www.south32.net/docs/default-source/corporate-governance/sustainability-policy-(2).pdf

TABLE 7-1 GEMCO MINE COMMITMENTS

Commitment	Source	Due Date	Status
Milner Bay hydrocarbon remediation project	Legacy	Ongoing	A sonic drill rig was deployed in September 2023 to acquire fresh uncontaminated interface substrate for further analysis. Five test bores were commissioned. Lab work was conducted to ascertain if microbial amendments can be applied in a way that avoids deleterious interference from iron and manganese rich strata. As of February 2024, the geochemical report (draft) has been received from Commonwealth Scientific and Industrial Research Organisation (CSIRO). The data will be used to inform remediation trials commencing at the end of the wet season in 2024.
Salvaged Timber Trial in Rehabilitation	Eastern Leases EIS	Ongoing	This commitment relates to a trial within existing GEMCO rehabilitation areas to assess the value of using salvaged timber resources in promoting habitat values for fauna species. The salvaged timber trial for fauna return was established in FY23 in one rehabilitation plot, with two control plots. Monitoring of results of the trial will continue in subsequent years. Results from this trial will be considered in the review of the Eastern Leases rehabilitation completion criteria, and in the revision of GEMCO's site Rehabilitation Standard to incorporate mulching and using woody debris to aid in rehabilitation, as noted in Section 5.2.1.
Eastern Leases Completion Criteria for Rehabilitation Areas	Supplement to Eastern Leases EIS	FY25	A review of existing rehabilitation completion criteria for GEMCO operations will be undertaken to ensure they are fit-for-purpose for the Eastern Lease, including completion criteria relevant to fauna.
Fire Management Strategy	Supplement to Eastern Leases EIS	FY24	Procedures in relation to controlled burning of rehabilitation and requirements for resilience of rehabilitation to fire will be developed for the project. A *Fire Management Strategy for Rehabilitation Areas* was completed in early 2024 and will be considered with stakeholders (ALC and Traditional Owners).
Mulching Trial	ALC Commitments	FY24	GEMCO successfully conducted a mulching trial in FY24 and is planning to mobilise a dedicated unit to site in early FY25,
Closure Forward Work Plans and Feasibility to support Closure Plan	MMP, Eastern Leases NT Assessment Report	FY25 to Closure	Progress development of closure forward work plans from pre-feasibility, to feasibility to closure.
Biosecurity and Upper Catchment Area Monitoring and Management: [redacted]	Eastern Leases Mining Agreement	Prior to mining (FY25)	The Biosecurity Management Plan was implemented during construction activities in FY23 and FY24. This included weed management, quarantine inspections, and induction training. The UCAMMP has been prepared. Should GEMCO wish to undertake mining or exploration activities within the 'Upper Catchment Area', ALC approval of the UCAMMP will be sought.

Commitment	Source	Due Date	Status
Stakeholder Engagement: Consultation requirements for Eastern Leases approvals will be included in an update to the GEMCO Stakeholder Engagement Plan (SEP), prior to the commencement of construction. New or updated consultation actions will be communicated to relevant GEMCO and community personnel.	Eastern Leases Mining Management Plan Amendment (MMPA)	Complete	The SEP was updated in 2021 to include the consultation requirements for the Eastern Leases. Refer to section 3.3.4 for details.
Rock Art Heritage Site Condition Re-Assessment: GEMCO will complete a re-assessment of the condition of Eastern Leases rock art sites prior to the commencement of mining to provide an updated baseline of rock art condition, in consultation with the ALC.	Eastern Leases MMPA	Complete	GEMCO engaged a suitably qualified consultant to conduct a rock art condition re-assessment in July 2023.
Burn Trial in Rehabilitation Areas	Eastern Leases EIS	Complete	GEMCO conducted the burn trial in Western Leases rehabilitation (two plots) in 2022. The trial was monitored in 2023 and a Fire Management Strategy subsequently developed for discussion with key stakeholders (ALC and Traditional Owners).
Air Quality Monitoring Network: PM_{10} will be monitored at Angurugu and Yedikba.	Eastern Leases EIS	Complete	An additional High Volume Air Sampler (HVAS) PM_{10} air quality monitoring site has been installed at Yedikba Outstation. Monitoring commenced in June 2022 and will continue during mining.
Environmental Commitments: Ensure that the GEMCO Eastern Leases Project is implemented in accordance with the environmental commitments and safeguards: • Identified in the final EIS for the GEMCO Eastern Leases Project (draft EIS and Supplement to the draft EIS) • Recommended in NT EPA Assessment Report 77. The NT EPA considers that all safeguards and mitigation measures outlined in the EIS are commitments made by GEMCO.	NT EPA Assessment Report 77– Rec. 1	Ongoing	GEMCO maintains a commitments register for the Eastern Leases Project. Performance against these commitments will be reported annually in GEMCO EMRs.
Project Amendments: Advise the NT EPA and the responsible Minister of any alterations to the GEMCO Eastern Leases Project, in accordance with clause 14A of the Environmental Assessment Administrative Procedures.	NT EPA Assessment Report 77– Rec. 2	As required	No material alterations to the Eastern Leases Project have been made or are proposed in this MMP.
Weed Management: Assessment Report: A Weed Management Plan for the control and management of weeds shall be prepared. The Weed Management Plan must identify the species of weeds and their location in and around the GEMCO Eastern Leases Project and outline methods for eradicating/controlling existing infestations. It must identify actions to prevent introduction of new weed species from vehicles, machinery or any other method, and align with Statutory Weed Management Plans. Eastern Leases MMPA: GEMCO will complete a survey within the Eastern Leases to identify the presence of weed species that have become established since the Cumberland Ecology (2015) study completed for the EIS. A program to manage any identified outbreaks will be developed prior to the commencement of construction.	NT EPA Assessment Report 77 – Rec. 3 Eastern Leases MMPA	Complete	GEMCO have prepared an updated Weed Management Plan to reflect NT Statutory Weed Management Plans and management requirements for the Eastern Leases. The updated document has also been prepared to address the requirements of EPBC 2014/7228 (the relevant conditions of EPBC 2014/7228 are reproduced below in this table). A number of weed surveys were conducted in FY23 and FY24 to monitor the presence, extent and location of weed infestations. Any identified weeds were subsequently treated. Weed management will continue in accordance with GEMCO's Weed Management Plan and the Biosecurity Management Plan prepared for the Eastern Leases. Further details on the Weed Management Plan are provided in Section 7.5.6.

Commitment	Source	Due Date	Status
Cane Toad Management: The Proponent shall re-evaluate the risk assessment and management strategy for the cane toad. The amended assessment should be used to prepare a Cane Toad Management Plan (CTMP), in consultation with experts in the management of cane toads.	NT EPA Assessment Report 77 – Rec. 4	Complete	GEMCO have developed and implemented an updated CTMP in consultation with DEPWS, specialists and other stakeholders as required under EPBC 2014/7228 (the relevant conditions of EPBC 2014/7228 are reproduced below in this table). The CTMP continues to be reviewed and updated to ensure it is fit for requirements, including any GEMCO Mine or Groote Eylandt wide changes. Further details on the CTMP are provided in Section 7.5.5.
Offsets: Should the Commonwealth Government decide that offsets are required to compensate for the residual significant impacts to MNES, GEMCO shall submit an offset plan. The offset plan should clearly define the mitigation, management and compensatory measures that will be implemented on site. Any offset measures should be consistent with the Commonwealth Government's Offset Policy and calculator.	NT EPA Assessment Report 77 – Rec. 5	Complete	The conditions of EPBC 2014/7228 require that GEMCO provide biodiversity offsets to compensate for residual impacts of the Eastern Leases. GEMCO has developed a Biodiversity Offset Strategy (BOS) in consultation with the ALC, NT regulatory agencies and DCCEEW, and is currently progressing key programs under the BOS. A Biodiversity Offset Management Plan (BOMP) has been prepared and was approved by DCCEEW on 29 April 2024. Further details on the BOS and the BOMP are provided in Section 7.5.17.
Offsets: In consideration of Recommendation 5, the offset plan should take into account the different ecological requirements and threats to each of the listed species considered to be at significant risk from the GEMCO Mine as identified in Assessment Report 77.	NT EPA Assessment Report 77 – Rec. 6	Complete	The BOS and BOMP have been prepared taking into account contemporary conservation advice and threats to the listed species identified within the Eastern Leases in EPBC 2014/7728. GEMCO have also prepared an updated internal Threatened Species Management Plan (TSMP) to reflect contemporary regulatory requirements and conservation advice that includes management requirements for listed fauna species identified within the Eastern Leases.
Rehabilitation: GEMCO shall prepare and implement a Rehabilitation Plan for the GEMCO Eastern Leases Project. The Rehabilitation Plan should include objectives for the creation of threatened species habitat and recolonisation by threatened species populations, and identify explicit criteria for evaluation. The plan should include a sampling design and sampling methods for monitoring that will enable measurable evaluation of outcomes against identified criteria, in order to demonstrate the effectiveness of the Rehabilitation Plan for threatened species. The Rehabilitation Plan should be revised accordingly in response to the results of trials in prescribed burning of rehabilitated areas.	NT EPA Assessment Report 77 – Rec. 7	Ongoing	GEMCO have prepared an updated Rehabilitation Standard and Rehabilitation Monitoring and Evaluation Procedure that encompasses the Eastern Leases. Annual rehabilitation planning is conducted. As rehabilitation monitoring programs progress, additional updates will be made as required. The updated GEMCO Mine Closure Plan (MCP) in 2023 includes Eastern Leases requirements.
Closure Plan: GEMCO shall prepare a Closure Plan for the GEMCO Eastern Leases Project that includes closure criteria that have been developed in consultation with relevant stakeholders and approved by DITT, including provisions for unplanned closure.	NT EPA Assessment Report 77 – Rec. 8	Complete	GEMCO prepared an updated MCP in 2022 that includes Eastern Leases requirements, in consultation with the ALC and DITT. The MCP was finalised in 2023.

Commitment	Source	Due Date	Status
Groundwater Monitoring: GEMCO shall develop and implement a Groundwater Monitoring Program to monitor groundwater level. The Program should be of an appropriate sampling density and frequency to detect water level variations resulting from dewatering for Project mining activities, accounting for seasonality. The numerical groundwater model used to predict drawdown levels should be validated at regular intervals against the results of the Groundwater Monitoring Program, and appropriate management measures developed if adverse impacts are detected.	NT EPA Assessment Report 77 – Rec. 9	Complete	The Eastern Leases Water Management Plan (ELWMP) includes a groundwater monitoring and response program with a requirement for regular validation of the groundwater model. Further details on the ELWMP are provided in Section 7.5.9.
GDE Monitoring: Assessment Report: GEMCO shall prepare a Groundwater Dependent Ecosystem Monitoring Plan (GDEMP) that is consistent with the details provided in the EIS. The GDEMP should include reporting requirements and appropriate protocols in the event that adverse impacts are identified. Eastern Leases EIS: The GDEMP will commence one year prior to the commencement of mining within 2 km of Groundwater Dependent Ecosystems (GDEs) in order to establish the baseline condition of vegetation.	NT EPA Assessment Report 77 – Rec. 10 Eastern Leases EIS	Complete	GEMCO has developed an Eastern Leases GDEMP. In 2023, GEMCO engaged a suitably qualified consultant to conduct a GDE survey to determine baseline conditions prior to mining commencing. The survey consisted of an early dry season and a late dry season survey. The GDEMP was updated and is in the process of being finalised following the GDE survey. Monitoring of GDEs will continue in accordance with the updated GDEMP. Further details on the Eastern Leases GDEMP are provided in Section 7.5.14.
Watercourse: GEMCO shall not mine within any watercourse or any watercourse buffer.	NT EPA Assessment Report 77 – Rec. 11	Ongoing	The Eastern Leases mine plan avoids disturbance to local watercourses or watercourse buffers as identified in the EIS and Mining Agreement (refer Figure 2-2).
Water Management Plan: Assessment Report: GEMCO shall prepare a Water Management Plan that is consistent with the details provided in the EIS. The Plan should include a suitable groundwater and surface water monitoring program, reporting requirements and appropriate protocols in the event that adverse impacts are identified, and emergency discharge protocols and limits. The Water Management Plan should contain a project water balance that includes water transfers, consumption and quarry water volumes; surface water quality monitoring and reporting; storage water quality monitoring and reporting; and discharge monitoring and reporting. Eastern Leases EIS: The groundwater monitoring network established as part of EIS groundwater investigations will continue to be utilised throughout the life of the project.	NT EPA Assessment Report 77 – Rec. 12 Eastern Leases EIS	Complete	GEMCO has developed a Water Management Plan for Eastern Leases. Water Monitoring: GEMCO resumed the Eastern Leases water monitoring program in August 2022. The program includes monitoring of surface water quality, groundwater quality and water levels at the locations and frequencies described in section 6.4 of the Eastern Leases MMPA. Water Accounting Framework: The existing GEMCO site water balance was expanded to include Eastern Leases following commencement of the project, to fulfil internal reporting obligations and DITT's water reporting requirements. Water accounting is undertaken in accordance with the Minerals Council of Australia *User Guide, Water Accounting Framework for the Minerals Industry* (2022). Further details on the ELWMP are provided in Section 7.5.9.
Erosion and Sediment Control: GEMCO shall prepare an Erosion and Sediment Control Plan that is consistent with the details provided in the EIS and includes the additional recommendations provided in NT EPA Assessment Report 77. The Erosion and Sediment Control Plan should be cross-referenced with the Rehabilitation Plan and other relevant sub-plans of the MMP, and approved prior to the commencement of works.	NT EPA Assessment Report 77 – Rec. 13	Complete	GEMCO has developed an Erosion and Sediment Control Standard for the Eastern Leases. Further details are provided in Section 7.5.10.

Commitment	Source	Due Date	Status
PAF Material Monitoring: Assessment Report: If PAF material cannot be avoided, GEMCO shall prepare a management plan for the handling and storage of materials identified as PAF and/or capable of generating seepage that does not accord with water quality parameters. The plan should include details of the monitoring program to verify that the handling and storage of materials is effective. Eastern Leases EIS: There will be specific management measures for the handling and placing of overburden from any area identified as containing PAF material. This will involve monitoring for PAF material and selectively handling and burying any PAF material. In addition, samples will be collected at random from overburden emplacements and analysed on-site using net acid generation tests as a rapid screening tool.	NT EPA Assessment Report 77 – Rec. 14 Eastern Leases EIS	Ongoing	GEMCO has developed a procedure for the monitoring and management of any PAF material that has the potential to be encountered during Eastern Leases operations. Monitoring is required when mining clay overburden at depths below 15 m that are within 500 m of boreholes EL-S-MB05 and EL-S-MB06. Whilst mining activities had not commenced, GEMCO undertook PAF sampling as part of the 2023 drilling campaign in the Eastern Leases. One drill hole indicated trace elements of pyritic material, however the record was several meters below the ore horizon and therefore will not be disturbed. No further PAF materials have been detected. Once mining commences, monitoring will be undertaken in accordance with GEMCO's *Eastern Leases Procedure for Management of Potentially Acid Forming Overburden Material*. Further details on the procedure are provided in Section 7.5.15.
Communication: GEMCO shall develop a communication strategy to ensure the public and surrounding community, including the persons likely to access Pelican's Nest or to use the unsealed track that comes off the Emerald River Road and provides access to Dalumba Bay, are informed about changes to site access and relocation/restricted access of roads/tracks.	NT EPA Assessment Report 77 – Rec. 15	Ongoing	GEMCO will continue to engage with community stakeholders using a range of measures described in the GEMCO SEP. Refer to Section 3.3.4 for details.
Manuport Heritage Site: GEMCO shall consult with the ALC, the Heritage Branch of the Department of Territory Families, Housing and Communities, and any other relevant stakeholder, in relation to a suitable management approach for the single archaeological site (i.e. the manuport), which is located within the Project disturbance footprint. Approvals in accordance with the *Heritage Act 2011* shall be obtained by GEMCO prior to disturbing the site.	NT EPA Assessment Report 77 – Rec. 16	Complete	The Manuport was relocated in 2021 following endorsement from the ALC. The site was surveyed at the time of removal so that the Manuport can be returned to its original location at the completion of mining.
Cultural Heritage Management Plan: GEMCO shall prepare a Cultural Heritage Management Plan (CHMP) for the protection of sites of archaeological significance. The CHMP must include employee and contractor induction and awareness of the significance of site protection; methods to register and record monitoring; and obligations under the *Heritage Act 2011*. The CHMP should include provisions to monitor sites for impacts from dust, blasting and unauthorised access, and provisions for corrective actions in the event that adverse impacts are detected. The results of the additional surveys completed for two clustered sites (i.e. sites ELS06 to ELS13 and ELS15 in the Southern EL, and ELN04 to ELN06 and ELN08 to ELN13 in the Northern EL) should be used to inform the CHMP before the commencement of the Project.	NT EPA Assessment Report 77 – Rec. 17	Complete	GEMCO have developed a CHMP for Eastern Leases, in consultation with the ALC. This plan includes measures for the monitoring and management of known archaeological and Sacred Sites. Further details on the CHMP are provided in Section 7.5.11.

Commitment	Source	Due Date	Status
Blast Management Plan: Assessment Report: GEMCO shall prepare a Blast Management Plan that specifies ground vibration limits for the rock art sites, as well as periodic monitoring of rock shelters with art to confirm their integrity. The Blast Management Plan should align with the objectives and principles of the CHMP and be prepared and revised in conjunction with the CHMP. Eastern Leases MMPA: GEMCO will complete visual monitoring of specific rock art sites within five days of blast events that occur within 700 m of a rock art site. GEMCO will establish monitoring site(s) to allow blast vibration levels representative of sensitive rock art sites to be recorded and assessed against impact criteria.	NT EPA Assessment Report 77 – Rec. 18 Eastern Leases MMPA	Prior to mining (FY25)	GEMCO has prepared a Blast Management Plan for the Eastern Leases to provide management criteria for rock art sites identified in the Eastern Leases EIS. No monitoring has been undertaken to date as mining activities have not commenced. Once mining commences, monitoring will be undertaken in accordance with the Blast Management Plan. Further details on the Blast Management Plan are provided in Section 7.5.13.
Commitments: GEMCO must implement all conditions of approval and mitigation measures contained in the Environmental Management Plan and must ensure all staff and contractors comply with all requirements of conditions of approval and mitigation measures contained in the Environmental Management Plan. The Environmental Management Plan, and sub-plans, should form part of the MMP. In preparing each plan, GEMCO shall include any additional measures for environmental protection and monitoring contained in NT EPA Assessment Report 77.	NT EPA Assessment Report 77 – Rec. 19	Ongoing	GEMCO's induction and training procedures have been updated to consider the Eastern Leases EIS and regulatory approval requirements. GEMCO maintains a commitments register for Eastern Leases.
Reporting: The Authorisation for the GEMCO Eastern Leases Project should include a condition requiring the Proponent to make and publish an EMR to satisfy the requirements of the MM Act relevant to the EMR. The NT EPA recommends the EMR be made available to the public at 12-month intervals, for the duration of the life of the proposed action.	NT EPA Assessment Report 77 – Rec. 20	Ongoing	GEMCO has commenced reporting, and will continue to report, on Eastern Leases activities in annual EMRs.
Within 5 business days after the commencement of the action, GEMCO must advise the then Department of Agriculture, Water and Environment (now DCCEEW) in writing of the actual date of the commencement of the action.	EPBC Act Approval (2014/7228) – Condition 1	Complete	GEMCO advised the then Department of Agriculture, Water and the Environment on 20 June 2022 of the date of the commencement of the action on 17 June 2022.
GEMCO must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, and make them available upon request to DCCEEW. Such records may be subject to audit by DCCEEW or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits may be posted on DCCEEW's website. The results of audits may also be publicised through the general media.	EPBC Act Approval (2014/7228) – Condition 2	Ongoing	GEMCO maintains records substantiating activities associated with, or relevant to, the conditions of approval.

Commitment	Source	Due Date	Status
Within three months of every 12-month anniversary of the commencement of the action, or otherwise in accordance with an annual date that has been agreed to in writing by the Commonwealth Minister, GEMCO must publish a report on their website addressing compliance with each of the conditions of this approval, including implementation of any management plans as specified in the conditions. Documentary evidence providing proof of the date of publication must be provided to DCCEEW at the same time as the compliance report is published. The reports must remain published on the website for the duration of the approval, or until otherwise agreed to by the Minister in writing. Following 12 months after the completion of the action and any requirements under these conditions, GEMCO may seek the Minister's written approval to cease annual reporting.	EPBC Act Approval (2014/7228) – Condition 3	Ongoing	The GEMCO Eastern Leases Project 2023 Annual Compliance Report, has been published to the South32 website and addresses compliance with this condition. Documentary evidence of the date of publication is provided to DCCEEW at the same time as the compliance report is published.
Upon the direction of the Minister, GEMCO must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the Minister. The independent auditor and audit criteria must be approved by the Minister prior to the commencement of the audit. The audit report must address the criteria to the satisfaction of the Minister.	EPBC Act Approval (2014/7228) – Condition 4	If required	N/A - No direction with regards to an independent audit has been received from the Minister.
GEMCO may choose to revise the Environment Management Plan (EMP) approved by the Minister under condition 10 without submitting it for approval under section 143A of the EPBC Act, if the taking of the action in accordance with the revised EMP would not be likely to have a new or increased impact. If GEMCO makes this choice they must… …ii. subject to condition 5B, implement the revised EMP from the revised EMP implementation date.	EPBC Act Approval (2014/7228) – Condition 5	If required	N/A - The EMP has not been revised.
5A. GEMCO may revoke its choice under condition 5 at any time by notice to DCCEEW. If GEMCO revokes the choice to implement a revised EMP, without approval under section 143A of the EPBC Act, the EMP approved by the Minister must be implemented.	EPBC Act Approval (2014/7228) – Condition 5	If required	N/A - Not triggered.
5B. If the Minister gives a notice to GEMCO that the Minister is satisfied that the taking of the action in accordance with the revised EMP would be likely to have a new or increased impact, then: i. Condition 5 does not apply, or ceases to apply, in relation to the revised EMP; and ii. GEMCO must implement the EMP approved by the Minister. To avoid any doubt, this condition does not affect any operation of conditions 5 and 5A in the 10 business day period before the day the notice is given. At the time of giving the notice the Minister may also notify that for a specified period of time that condition 5 does not apply to the EMP required under the approval.	EPBC Act Approval (2014/7228) – Condition 5	If required	N/A - Not triggered.

Commitment	Source	Due Date	Status
If, at any time after ten years from the date of this approval, GEMCO has not substantially commenced the action, then GEMCO must not undertake substantial commencement of the action without the written agreement of the Minister.	EPBC Act Approval (2014/7228) – Condition 6	N/A	GEMCO has commenced the action on 17 June 2022, which is less than ten years from the date of the approval (23 June 2016).
Unless otherwise agreed to in writing by the Minister, GEMCO must publish all management plans and reports referred to in these conditions of approval on its website. Each management plan and report must be published on the website within 20 business days after being approved. The management plan and/or report must remain on the website for the period this approval has effect.	EPBC Act Approval (2014/7228) – Condition 7	Ongoing	The documents to which this condition currently applies are the Eastern Leases EMP and the Eastern Leases BOS (June 2021). Both documents have been published on the South32 website and are accessible at the following link: GEMCO Documents (south32.net)
GEMCO must not clear more than 1,525 ha of native vegetation for the purpose of the action.	EPBC Act Approval (2014/7228) – Condition 8	Ongoing	Records of disturbance within the Eastern Leases have been maintained. Vegetation clearing has not exceeded 1,525 ha of native vegetation.
For the better protection of the impacted species, GEMCO must comply with recommendations 3, 4, 7 and 8 of Assessment Report 77 once those recommendations are included as conditions in an MMP authorising the action under the MM Act.	EPBC Act Approval (2014/7228) – Condition 9	Ongoing	The recommendations 3, 4, 7 and 8 of the Assessment Report 77 have been included as conditions in the FY21-FY24 MMPA. The plans mentioned in the Assessment Report 77 are: • Weed Management Plan • Cane Toad Management • Rehabilitation Plan • Closure Plan A discussion on compliance with these management plans is included in the annual EMR, which is prepared under the MMP for each financial year.
For the better protection of the impacted species, the approval holder must prepare and submit an Environment Management Plan (EMP) for approval by the Minister. The EMP must include, all requirements detailed in the EPBC approvals. The EMP must be submitted to the Minister for approval prior to the commencement of the action. Construction must not occur until the EMP has been approved by the Minister. The approved EMP must be implemented.	EPBC Act Approval (2014/7228) – Condition 10	Complete	The EMP was prepared and submitted to the then Department of Agriculture, Water and the Environment in 2021. The current version of the EMP was approved on 26 September 2021.
GEMCO must prepare and submit a Biodiversity Offsets Strategy (BOS) for the Minister's approval. The BOS must outline and describe the strategy for providing offsets for the significant residual impacts of the action on impacted species. GEMCO must not commence the action unless the Minister has approved the BOS in writing. The BOS must… …If the Minister approves the BOS then the approved BOS must be implemented.	EPBC Act Approval (2014/7228) – Condition 11	Complete	The Eastern Leases BOS was approved on 6 July 2021. The action was commenced after the approval of the BOS on 17 June 2022. The BOMP required in condition 12 describes specific programs to implement the approved BOS.

Commitment	Source	Due Date	Status
GEMCO must prepare a Biodiversity Offset Management Plan (BOMP) to describe specific programs to implement the approved BOS described in condition 11. GEMCO must submit the BOMP to the Minister within 12 months of the commencement of the action. The action cannot continue for more than 24 months from the date of commencement of the action unless the Minister has approved the BOMP. The approved BOMP must be implemented. The BOMP must… … g. include a regime for: i. planning and setting a biennial (2 year) work program; ii. monitoring outcomes; iii. reporting outcomes against the work program; and iv. adaptive management.	EPBC Act Approval (2014/7228) – Condition 12	Complete	The BOMP was approved on 29 April 2024.
GEMCO must implement the programs and/or actions included in the BOMP required by condition 12, in accordance with the requirements below… …c. The impact reconciliation report shall: i. require GEMCO to submit spatial data identifying the areas of native vegetation cleared during the previous two years to 30 March ii. include the methodology for calculating the monies required to be expended on programs and/or actions pursuant to the requirements of this approval.	EPBC Act Approval (2014/7228) – Condition 13	Ongoing	The impact reconciliation report will be submitted by 31 August 2024.

Note: PM_{10} = particles with a diameter of 10 micrometres or less

7.4. Environmental Training and Education

GEMCO is committed to educating its employees and contractors about their individual responsibilities regarding health, safety and environmental management. This is accomplished through the implementation of appropriate induction, training and education programs.

Prior to commencing work, all personnel are required to complete GEMCO's site induction program. An important component of the site induction covers targeted environmental issues, including:

- **Legal and other requirements:** a summary of key environmental legislation and other requirements and the consequences of non-compliance;
- **Land and Biodiversity:** information on Groote Eylandt's threatened species and the importance of quarantine and biosecurity measures relating to Cane Toads, weeds etc.;
- **Water:** emphasis on the importance of water efficiency and the main water users;
- **Dust:** what GEMCO is doing to manage dust and how employees and contractors can manage this issue;
- **Waste:** where to dump waste appropriately and GEMCO's land-based spill response procedure;

- **Incidents:** how to report environmental incidents/hazards and the importance of doing so; and
- **Risk assessment:** how to complete risk assessments and the importance of considering environmental risks and impacts.

Records of personnel who have completed the site induction are maintained by the GEMCO Training Department.

Emergency response training is also completed in line with *GEM-STA-3055 Crisis and Emergency Management Plan.* Routine training for both the Incident Management Team (IMT) and emergency response personnel is conducted via desktop and practical exercises (of varying levels) and specific IMT workshops.

The competency of personnel to adhere to GEMCO's health, safety and environment procedures is validated through 'workplace interactions' which are conducted regularly by all personnel. All GEMCO employees and contractors are subject to safety observations. The number of workplace interactions conducted across departments is reviewed regularly at site leadership meetings.

7.5. Environment Management Plan (EMP)

GEMCO's EMP is guided by a range of risk-specific Management Plans and Procedures, including the following:

- STA-3316 Waste Management Standard (see Section 7.5.1);
- STA-3085 Land and Biodiversity Management Plan (see Section 7.5.2);
- STA-22700 Rehabilitation Standard (see Section 7.5.3);
- STA-3056 Threatened Species Management Plan (see Section 7.5.4);
- STA-3082 Cane Toad Management Plan (see Section 7.5.5);
- STA-3091 Weed Management Plan (see Section 7.5.6);
- PLN-30122 Air Emissions Management Plan (see Section7.5.7);
- PLN-30133 Western Leases Water Management Plan (see Section 7.5.8);
- PRO-6501 Eastern Leases Water Management Plan (see Section 7.5.9);
- PLN-6504 Eastern Leases Erosion and Sediment Control Standard (see Section 7.5.10);
- PLN-6505 Eastern Leases Cultural Heritage Management Plan (see Section 7.5.11);
- PLN-9009 Eastern Leases Biosecurity Management Plan (see Section 7.5.12);
- PRO-5079 Eastern Leases Blast Management Plan (see Section 7.5.13);
- PLN-6503 Eastern Leases Groundwater Dependent Ecosystem Monitoring Program (see Section 7.5.14);
- PRO-9007 Eastern Leases Procedure for Management of Potentially Acid Forming Overburden Material (see Section 7.5.15);

- Eastern Leases Project Environment Management Plan (see Section 7.5.16); and
- Eastern Leases Biodiversity Offset Strategy / Biodiversity Offset Management Plan (see Section 7.5.17).

A summary of each Management Plan is provided in the following sections, and the full plans are available to DITT on request.

7.5.1. Waste Management Standard

Objectives and Targets

The primary objectives of the GEMCO Waste Management Standard are to:

- Ensure waste is managed in a safe and effective manner to reduce risk to human health and the environment; and
- Ensure compliance with regulatory requirements that apply to waste management, including requirements outlined in the *Waste Management and Pollution Control Act 1998* (NT), the *Waste Management and Pollution Control (Administration) Regulations 1998* (NT) and the conditions of GEMCO's EPL289. Compliance with these conditions is reported annually to the NT EPA.

The plan applies to waste management activities within GEMCO's operational areas, excluding process waste (overburden, tailings and process water). It also addresses domestic waste generated from residential and small business activities in the townships of Alyangula and Angurugu.

Management and Mitigation Measures

Waste management programs are designed to minimise the impact of waste on the environment. The hierarchy of waste management applied at GEMCO is:

- **Eliminate:** Use products that do not generate a waste or use the product completely, leaving no residue;
- **Reduce:** Reduce the quantity of waste that is generated;
- **Reuse:** Use products that allow a secondary use for the waste product;
- **Recycle:** Determine an alternative use for the waste product, which may include reprocessing of the product; and
- **Disposal:** Remove waste from the mine site, which may include treatment of the product, incineration or deposit at a landfill site.

Waste products are eliminated and reduced wherever practicable. This is achieved by rationalising the number of products on site and finding alternative products that are recyclable and assist in volume reduction.

The following sections outline the management of the various waste streams generated by GEMCO and the Groote Eylandt community.

Domestic Landfill

GEMCO manages an Integrated Waste Management Facility in accordance with EPL289. The facility is located to the east of the Rowell Highway approximately 9 km to the south of Alyangula (Figure 3-1). The wet tip, dry tip and green tip are located within the same compound, which is a fenced facility.

Signage clearly states the type of waste material that can and cannot be disposed of at each tip inside the compound. Facility staff also assist to ensure waste is being disposed of in the correct locations.

The Integrated Waste Management Facility is licensed to accept listed hazardous wastes, as defined in Schedule 2 of the *Waste Management and Pollution Control (Administration) Regulations 1998* (NT). There is signage located at the wet tip that indicates appropriate waste types for disposal in this area.

Management controls include weed control, provision of information, community awareness programs, management of cells, provisions for recycling items and listed waste depots.

Rubber Waste

Once the life of a tyre has expired (e.g. retreading and or repair is no longer viable), it is stockpiled at various locations across site. Other rubber products (e.g. worn conveyor belts) are also stockpiled with the tyre waste. Small amounts of rubber products (other than tyres and conveyor belts) are sent to the dry tip for burial.

Once a sufficient volume of rubber waste is stockpiled, it is buried at depth within active quarry areas.

Scrap Steel

GEMCO currently sends high grade scrap steel off the island for recycling. Low grade uncontaminated scrap steel that is uneconomical to transport and recycle is disposed of in GEMCO's licensed landfill facility or in open mining voids where it is placed at a suitable depth and above the water table. In the event light trucks and light vehicles are disposed, all lubricants, batteries, coolant and fuels are drained/removed prior to disposal. The location of any disposed items in open voids is recorded.

Inert waste

During the planning period, GEMCO will utilise pit voids for the disposal of additional inert materials from project work (e.g. demolished building) that are not economically viable for recycling. Bulk clean-ups utilise significant room within the Integrated Waste Management Facility which results in additional tree clearing. Using available pit voids (tree clearing already undertaken) will assist in limiting GEMCO's disturbance footprint and rehabilitation requirements. Only inert materials that pose no risk to groundwater quality will be disposed in these voids. No waste defined as 'listed waste' under the *Waste Management and Pollution Control Act 1998* will be disposed of in this manner. The location of any disposed items in open voids is recorded.

Bio-remediation Facility

Land farming is a bio-remediation process where contaminated soil is stockpiled and turned on a regular basis. Micro-organisms break down hydrocarbons into water and carbon dioxide. GEMCO operates a land farm to bioremediate hydrocarbon contaminated soil and absorbent material. This facility is located within the C Quarry area (Figure 5-4). Informational signage ensures that personnel using the area have sufficient information to use the facility. The facility is tested to determine when soils contaminated with hydrocarbons have been remediated to an acceptable level for onsite disposal as backfill in quarries, with minimal risk to the environment. Land farming is conducted in accordance with *PRO-3171 Land Farm Management*.

Minor Storage/Hazardous Goods

Small amounts of assorted waste and hazardous products are stored at various areas across the mine site, wet tip, port and township. This includes storage by departments that produce large amounts of waste and therefore, manage the waste stream within the department (e.g. mobile workshop waste oil).

All wastes shipped off Groote Eylandt are taken to Darwin for repair, reuse, recycling or disposal by contractors.

The Non-Process Infrastructure (NPI) Department manage a large volume of the hazardous materials and recyclable items for sending off Groote Eylandt for GEMCO and for large parts of Groote Eylandt. Examples of hazardous materials and recycled items include but are not limited to:

- White goods;
- De-gassed air conditioners;
- Used fluorescents bulbs;
- Filters – drained and squashed in Intermediate Bulk Containers;
- Computers;
- PVC insulated cable;
- Oil;
- Batteries;
- Paint thinners;
- Asbestos;
- Printer cartridges; and
- Scrap metal (bins located around site).

The priority given to certain waste types is based on the risk associated with the waste. As GEMCO's operations are located 650 km from Darwin, the priority with waste management often lies more with suitable storage and transport systems until longer term arrangements can be made. For this reason, GEMCO operates a waste management (holding) facility at the Integrated Waste Management Facility.

Monitoring, Reporting and Review

GEMCO monitors landfill leachate on a quarterly basis. Water quality data are compared against the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (formerly ANZECC & ARMCANZ, 2000) for slightly to moderately disturbed (95% species protection) freshwater ecosystems (ANZG, 2018; referred to herein as the Water Quality Guidelines).

Any non-conformances and associated corrective actions are reported as part of the annual EMR. In addition, the Waste Management Standard and associated procedures are reviewed on a regular basis, and in response to monitoring results.

7.5.2. Land and Biodiversity Management Plan

Objectives and Targets

GEMCO's Land and Biodiversity Management Plan (LBMP) provides an overarching framework for managing the potential impacts to land and biodiversity resulting from GEMCO's operations. Potential impacts include loss of habitat for local flora and fauna, invasive flora and fauna species, impacts to surface water and groundwater, interference with cultural sites, site contamination and impacts to areas of conservation significance.

The key objectives of the LBMP are to:

- Ensure compliance with relevant Commonwealth and Territory legislation (as outlined in Section 4.1);
- Ensure compliance with South32's Environment and Climate Change Standard (Appendix 9.5) which requires the collection of biodiversity baseline information, mandates the use of controls consistent with the biodiversity mitigation hierarchy and requires the effectiveness of the controls to be validated; and
- Improve current land and biodiversity management applications to ensure sustainable and functional ecosystems both during operations and post-closure.

To meet the objectives of South32's Environment and Climate Change Standard, GEMCO has developed the following biodiversity goals:

- Minimise impacts on biodiversity by protecting biodiversity values where possible or to enhance biodiversity where protection is not possible;
- Provide offsets where protection and enhancement of biodiversity values cannot be achieved;
- Ensure no loss of species; and
- Leave sustainable, functioning ecosystems that mimic regional landscapes.

To meet these objectives and goals, the LBMP includes information relating to:

- The location of designated protected areas and areas of high conservation value;
- A baseline assessment of the biodiversity values for all environments potentially impacted;
- Controls to mitigate biodiversity impacts including consideration of biodiversity offsets;
- A monitoring review program to assess the biodiversity impacts and effectiveness of the controls; and
- Contaminated sites and environmental liabilities.

Management and Mitigation Measures

Two baseline-style terrestrial studies have been conducted relevant to GEMCO's Western Leases area. An initial survey was undertaken by Webb (1992) followed by a site wide Flora and Fauna Survey in 2012 by URS (URS, 2012). A large-scale camera survey was also conducted across western Groote Eylandt which will provide detailed information on small mammal populations once the data is fully analysed. The survey results provide a baseline of species found on the western side of Groote Eylandt. GEMCO uses this information, together with results from ongoing terrestrial flora and fauna surveys, to manage impacts utilising the biodiversity mitigation hierarchy.

Another major biodiversity study was conducted within the marine environment. The Australian Institute of Marine Science conducted a study in 2011–2012 to assess the impact of mining operations on the surrounding coastal ecosystems (Trott, 2012). This study detailed potential contaminants caused by mining on the local species of fish, molluscs and coral. Recommendations arising from the study were incorporated into GEMCO's annual marine monitoring program in 2013. This monitoring program is detailed in Section 7.5.8.

GEMCO's land and biodiversity management framework is designed to prevent adverse impacts from occurring or, if this is not possible, to limit these to an acceptable level.

The four levels of management listed below are ordered from the highest to the lowest conservation level:

1. **Avoid:** avoiding impacts altogether.

2. **Minimise:** implementing decisions or activities that are designed to reduce the impacts of a proposed activity on biodiversity.

3. **Rehabilitate:** measures undertaken to restore or reclaim areas to agreed post-closure uses, recognising impacts to biodiversity have already occurred.

4. **Compensate:** offsetting for the impact by protecting substitute environments or improving knowledge to enhance future management measures through research and development.

Land disturbance and clearing requires approval from a number of stakeholders to ensure that all land related criteria, including areas of cultural or environmental significance, have been assessed prior to disturbance. These criteria are assessed through *PRO-4149 Permit to Clear and Burn Vegetation*, and *FRM-4862 Permit to Clear*. When a disturbance request is received, an assessment is undertaken on the:

- Nature of disturbance;
- Tenure;
- Relativity of disturbance in relation to mine plan;
- Areas of environmental significance (e.g. riparian corridors, significant flora and fauna species, ecologically significant areas);
- Rehabilitation requirements; and
- Cultural relevance of disturbance areas, including consultation with the ALC.

All personnel must comply with the requirements outlined in the permit.

PRO-4144 Topsoil Management outlines the method used when direct placement of topsoil on areas that are ready for rehabilitation is not practicable and hence stockpiling is required. For each rehabilitation area, a clearing and topsoil record and rehabilitation record is maintained. These are internal electronic records used to track the placement and location of topsoil stockpiles and the quality of rehabilitation efforts (including the management techniques applied to rehabilitation works).

Monitoring, Reporting and Review

GEMCO undertakes ongoing rehabilitation monitoring, weed monitoring and control, annual marine monitoring, biosecurity inspections, and an ongoing Cane Toad detection program to measure and protect biodiversity at GEMCO.

Any non-conformances and associated corrective actions are reported as part of the annual EMR. The LBMP is reviewed on a regular basis, and in response to monitoring results.

7.5.3. Rehabilitation Standard

Objectives and Targets

GEMCO's Rehabilitation Standard outlines the requirements for mine site rehabilitation to ensure the rehabilitation strategy and management structure aligns with leading practices and meets GEMCO's obligations under the Mining Agreement (Section 4.2.1). The objectives of the Rehabilitation Standard are detailed in Table 7-2 below.

TABLE 7-2 REHABILITATION OBJECTIVES

Objective	Guiding Principles
Safe to humans and wildlife	• Mine voids within the Western Leases will be backfilled to the most practicable and cost-effective extent during operations. • Mine voids within the Eastern Leases will be backfilled to the PMS to create a stable and free draining landform to broadly replicate the pre-mining topography. • Tailings dams will be de-watered and capped to be made stable. • Areas of unstable ground will be stabilised as appropriate to ensure that there is no risk to humans or animals. • Hazardous materials will be removed or treated.
Non-polluting	• Leachate will be managed to prevent mobilisation from sources of potential contaminants such as tailings. • Contaminated land will be remediated to prevent runoff and seepage.
Stable	• All residual slopes will be stabilised in line with the PMS final landform design. • Slopes will have vegetative cover preventing erosion. • Above surface tailings dam walls will be reshaped and managed to prevent erosion.
Sustain an agreed post mining land-use	• The post mining landform (areas previously mined, excavated, dumped over or topsoil stripped) will be re-seeded with local native tree and shrub species. • Some areas of rehabilitation may be returned to alternative land-uses where agreed with Traditional Owners and where stabilisation of the post-mining landform will enable such activities to be established.

Management and Mitigation Measures

Rehabilitation requires the input and collaboration from a broad team at GEMCO including the Planning, Rehabilitation Mine Services, Environment, Group Closure and External Affairs teams.

The Rehabilitation Standard outlines the broad process of rehabilitation and the responsible department, including the following:

- **Landform design**: Undertaken by the Technical Services (Mine Planning) Department and includes consideration of factors such as placement, height and footprint, effective drainage design, erosion minimisation and habitat effectiveness;
- **Tree clearing requirements**: Undertaken by the Mining Department preferentially during the dry season to ensure the least amount of disturbance to vegetation and topsoil;
- **Topsoil management**: Undertaken by the Mining Department, and includes stripping, movement, stockpiling, spreading and scarification of topsoil;
- **Seed collection, management and rehabilitation seeding**: Undertaken by the Rehabilitation Team as soon as possible following the completion of topsoil spreading and ripping and as close as possible to the start of the wet season;

- **Weed control**: Undertaken by the Rehabilitation Team; and
- **Rehabilitation monitoring and compliance**: Coordinated by the Environment Team.

These processes are supported by a range of procedures and management plans including:

- PRO-4149 Permit to Clear and Burn Vegetation;
- PRO-4192 Vegetation Clearing; and
- PRO-4144 Topsoil Management.

Monitoring, Reporting and Review

Rehabilitation monitoring is undertaken in accordance with GEMCO's *PRO-30195 Rehabilitation Monitoring and Evaluation Procedure*.

The monitoring program is designed to meet three key objectives:

- **Scientific assessment:** to provide data on specific indicators from control sites throughout GEMCO's leases to provide a scientifically sound basis for the performance targets proposed in draft completion criteria;
- **Evaluation of ecosystem development:** to assess the condition of rehabilitated sites against completion criteria to determine the trajectory towards successful achievement of rehabilitation objectives and thereby the potential for relinquishing the mining tenements; and
- **Continuous improvement:** to provide results which allow refinement of rehabilitation techniques and practices, and assessment of specific management objectives.

Monitoring of rehabilitation includes, but is not limited to, flora and fauna surveys and topsoil quality monitoring.

The information obtained via the rehabilitation monitoring program enables GEMCO to identify sites where remedial work may be required, and to assess long-term rehabilitation practices and make improvements to the program when necessary. When monitoring identifies a non-conformance, appropriate mitigation measures are put in place. Depending on the nature of the non-conformance, corrective action may include supplementary planting, weed control or complete re-establishment of areas of rehabilitation that are deemed unviable. Any non-conformances and associated corrective actions are reported as part of the annual EMR.

All aspects of GEMCO's rehabilitation processes are subject to periodic compliance review to ensure target outcomes are being met and compliance with the South32 Environment and Climate Change Standard is maintained.

7.5.4. Threatened Species Management Plan

Objectives and Targets

The purpose of the Threatened Species Management Plan (TSMP) is to provide guidelines to minimise the impacts of mining and exploration on fauna species of conservational significance found on Groote Eylandt. The TSMP assists GEMCO to implement appropriate fauna management measures, and outlines reporting procedures for recording threatened fauna species which could be encountered during mining operations and associated exploration activities.

The objective of the TSMP is to provide a summary of activities and potential disturbances to threatened species across the GEMCO Mine. Effective management of threatened species is a fundamental requirement for ecologically sustainable development. As such, GEMCO is committed to complying with the TSMP.

The objectives of the TSMP are to:

- Guide all activities that have the potential to cause land disturbance within GEMCO's tenements in regard to fauna management.
- Promote appropriate fauna management measures from mine planning to mine operations.
- Address relevant statutory obligations and the conditions of GEMCO approvals for exploration and operational activities; and
- Consult with external stakeholders during the development of GEMCO threatened species management measures. This may include engagement with the ALC, NT EPA, DEPWS and DCCEEW, as required.

The TSMP was revised by GEMCO in 2021 to consider the DEPWS *Groote Archipelago Threatened Species Management Plan 2019-2028* (DEPWS, 2019) and threatened fauna species listed under NT and Commonwealth legislation that were identified in the Eastern Leases EIS (Hansen Bailey, 2015a) as present or having the potential to occur within the Eastern Leases.

Management and Mitigation Measures

A three-level management hierarchy has been developed to broadly classify and assign the appropriate level of management response for threatened species (Table 7-3). The TSMP describes how the management hierarchy is to be implemented. The category assigned to each species is not fixed, as changes in species records, their conservation significance (as listed by the TPWC Act or EPBC Act) or GEMCO's planned activities may require a change to the level of management response.

The management hierarchy developed by GEMCO was reviewed during the 2021 TSMP update to include Eastern Leases threatened species.

TABLE 7-3 MANAGEMENT HIERARCHY FOR THREATENED SPECIES

	Level 1	Level 2	Level 3
Summary of Category	Species recorded on the GEMCO leases, and potential for significant impact to the species as a result of mining and/or exploration activities in the next five years.	Species recorded on GEMCO Leases, and there is limited potential of significant impact to the species as a result of mining and/or exploration activities in the next five years.	Species not previously identified on the GEMCO leases but has the potential to occur on GEMCO leases.
Summary of Level of Management Required	Implement higher level specific management plans and monitoring (TSMP Section 7.2), plus general environmental management measures and monitoring (TSMP Section 6).	Implementation of specific monitoring required (TSMP Section 7.3), plus general environmental management measures and monitoring (TSMP Section 6).	Implementation of general environmental management measures and monitoring (TSMP Section 6).
Species Currently in Category	Northern Hopping-mouse	Northern Quoll Merten's Water Monitor Northern Masked Owl Ghost Bat Brush-tailed Rabbit-rat Northern Blue-tongued Skink	Threatened species with the potential to occur within GEMCO leases. These species are listed on the *EPBC Act List of Threatened Fauna* and/or identified by URS (2012) or Cumberland Ecology (2015) as having the potential to occur within the Eastern Leases or Western Leases (Table 3-8 and Table 3-9).

The following control measures are used at an operational level to minimise the potential impacts of the GEMCO mine and exploration activities on fauna:

- Ensuring all mining and exploration activities are undertaken in accordance with the TSMP and GEMCO management procedures and plans.
- Checking proposed development areas against GEMCO's environment constraints areas maintained on Geographic Information System (GIS) layers within the South32 GIS drives.
- Retaining all records of areas that have been disturbed by mining operations in a disturbance register to assist with rehabilitation planning.
- Planning rehabilitation activities as part of the mining process and not as a stand-alone activity.
- Planning progressive rehabilitation with the rapid return of topsoil to facilitate successful rehabilitation and therefore fauna returns within rehabilitated areas.

When operational activities require the clearing of new areas, a PTC is required before works commence. This PTC process includes:

- Approval from the Rehabilitation Planner;
- Approval from the Environment Team;
- Approval from the ALC (via External Affairs Department);
- Clearance plans to identify the extent of the area authorised to be cleared; and
- Final approval from the Manager Technical Services.

As part of the PTC process, the Environment Team identify potential threatened species issues within the proposed clearing area. Mitigation measures may be recommended, including the need for a pre-clearance survey for threatened species.

In accordance with the Air Emissions Management Plan (AEMP), dust control measures such as road watering and progressive rehabilitation of disturbed areas will be used to minimise dust from the mine site that may adversely affect fauna or fauna habitats.

Approval will be sought from the Environment Team where controlled burning of adjoining native vegetation is required to reduce local fuel loads. Necessary precautions will be made by GEMCO to prevent unwanted fires during mining operations.

The Environment Team regularly review the conservation status of fauna species, and the development of State/Territory and Commonwealth fauna management strategies and action plans.

Management measures for threatened species that occur on Groote Eylandt are described in GEMCO's TSMP. The mitigation approach adopted for the 2023 TSMP for threatened species management in the Eastern Leases includes:

- Avoidance of impacts to maintain viable populations critical to threatened species and maintenance of habitat of critical importance for the survival of the species and populations;

- Minimisation of impacts through scheduling, maintaining habitat connectivity, applying modified approaches to clearing and project activities;
- Consideration of opportunities to improve restoration or rehabilitation areas for target species; and
- Offset of residual impacts as compensatory measures and voluntary conservation action options to manage the residual impact on threatened species.

Monitoring, Reporting and Review

An assessment of the potential to impact threatened species in an area proposed for clearing is undertaken as part of GEMCO's PTC process as required.

Any non-conformances and associated corrective actions are reported as part of the annual EMR. The TSMP is reviewed on a regular basis, and following any changes in species records, their conservation significance (as listed by the TPWC Act or EPBC Act) or GEMCO's planned activities.

7.5.5. Cane Toad Management Plan

Objectives and Targets

The Cane Toad Management Plan (CTMP) establishes a framework to prevent the unwanted migration of Cane Toads (*Rhinella marina*) to Groote Eylandt. It presents a risk-based approach to the various pathways by which Cane Toads might arrive on Groote Eylandt and details operational controls to minimise the risk of unwanted migration, including procedures for early detection.

The objectives of the CTMP are to:

- **Maximise Cane Toad knowledge:** Broad (including public) awareness and knowledge of Cane Toads and their potential impacts, management options and animal welfare must be raised to increase acceptance, capacity and surveillance efforts to detect and remove toads. Any control program must recognise that Cane Toads require animal welfare consideration and control must be targeted and not cause suffering to non-target animals.
- **Detail current Cane Toad management techniques:** GEMCO acknowledges the risk of Cane Toad establishment through its mining-related activities and implements a broad range of controls to prevent Cane Toad establishment on Groote Eylandt.

Management and Mitigation Measures

The threat posed by Cane Toads is taken very seriously by GEMCO. As such, a range of controls are implemented to manage this risk in collaboration with the ALC. These controls include:

- **Cane Toad awareness programs and signage:** This includes the provision of information in site inductions, during pre-start safety meetings and cane toad awareness sessions, on charter and commercial flights, via promotional material and signage at entry points and in the community;
- **Cane Toad fencing:** Exclusion fencing is in place at all regular freight packing and shipping yards in Darwin and at the Milner Bay Port Facility and are subject to regular inspection;
- **Cane Toad traps:** Traps are in place at Darwin freight packing and shipping yards and the Milner Bay Port Facility;

- **eDNA monitoring:** Sampling of water in key waterbodies and waterways for Cane Toad deoxyribonucleic acid (DNA), with samples analysed by specialist laboratory for presence and/or absence;

- **Spotlighting:** Wet season spotlighting activities of key areas for the presence of Cane Toads; and

- **Quarantine and biosecurity inspection procedures:** Procedures include inspections and storage requirements of any equipment or other items bound for Groote Eylandt. For the majority of freight, a Cane Toad Detection Dog (CTDD) is used to inspect the freight upon arrival on Groote Eylandt. Review of barge operators performance against Cane Toad control procedures and risk assessments is conducted by GEMCO and the ALC. An additional (second) biosecurity position with the ALC, and second trained CTDD, was sponsored by GEMCO from 2022 to further support this program.

Monitoring, Reporting and Review

GEMCO's response to Cane Toad incidents is undertaken in accordance with *PRO-3090 Cane Toad Response Plan*. All events (including near-misses) are recorded in G360 and are subject to GEMCO's investigation procedure as required. These records help quantify the risk by determining the frequency and type of incursion event. This increases GEMCO's understanding of the risk and helps to continually improve risk management to prevent Cane Toad incursions. Specific reviews, for example the freight pathways and Cane Toad survivability reviews completed in 2022-2023, have also been conducted to further refine the risk and required controls.

Any non-conformances and associated corrective actions are reported as part of the annual EMR. The CTMP is reviewed on a regular basis, and as required (e.g. post-incident, audit recommendation).

7.5.6. Weed Management Plan

Objectives and Targets

The intent of the *GEM-STA-3091 Weed Management Plan* is to provide a clear and consistent process for managing and preventing the occurrence and spread of weeds across the GEMCO Mine. The plan will also be used to inform weed management practises for the wider Groote Eylandt community and aligns with the *Top End Weed Management Planning Guide* produced by DEPWS (2018). Refer to Section 7.5.12 for details of the *Eastern Leases Biosecurity Management Plan (GEM-PLN-9009)*.

The specific objectives of the Weed Management Plan are to:

- Comply with all applicable legislation, regulations and regional weed management plans;

- Prioritise weed species for control, with consideration to:

    - The declaration status of the species;

    - Any Statutory Weed Management Plan requirements;

    - Specific risks on Groote Eylandt; and

    - Feasibility of eradication or control;

- Identify priority treatment areas that may provide high value improvements in terms of eradication or containment over time;

- Outline control treatment options and timing for priority weed species; and
- Define longer term management actions that will ensure the intent and objectives of the Weed Management Plan are met and provide for further improvement in weed management across Groote Eylandt.

Management and Mitigation Measures

Weed spread prevention is the most successful and cost-effective type of weed management available. GEMCO has several procedures that aim to prevent the introduction of weeds and or mitigate their propagation and spread. These are summarised in Table 7-4 below.

TABLE 7-4 GEMCO WEED MANAGEMENT PROCEDURES

South32 Procedure	Weed Management Actions	Responsibility
Quarantine Inspection (PRO-30252)	Barge inspections are conducted at the Alyangula freight port and require visual inspection of all barge freight including vehicle and equipment, for soil, seeds or plant matter. Container inspections are conducted prior to barging.	Contracted ALC Biosecurity Officers / Environment Team
Vehicle and Equipment Inspection Checklist (FRM-3872), Eastern Leases Biosecurity Management Plan (PLN-9009)	Inspection and decontamination of all GEMCO and contractor vehicles and equipment prior to entry and upon exiting the exploration areas and grid tracks. If cleaning is required, this is conducted at a designated decontamination area. Contaminated debris is securely bagged and relocated to the GEMCO waste facility.	Exploration Team
Vegetation Clearing (PRO-4192)	Earthmoving equipment must be washed thoroughly at the mine site wash-pad prior to commencing work if there is a possibility that weed seeds may be transferred by the machine. If clearing a site contaminated with weeds the equipment shall be washed on site prior to relocation. Minimisation of the clearing area and any related disturbance to land surface or native vegetation.	All operators
Topsoil Management (PRO-4144)	Identification, planned recovery and deposition of topsoil must be addressed prior to any ground disturbing activities. An appropriate area for receipt of cleared topsoil must be identified and prepared prior to stripping of topsoil to enable direct return of the soil resource. Where practicable, topsoil will be returned to an area that is near to its source within two weeks of stripping to maximise rehabilitation results. Stockpiling of topsoil is considered a last resort when there is no area available for direct return or remediation. Stockpiles are located in open areas away from sources of airborne weed seed. The Rehabilitation Team manages weed outbreaks on the stockpile and surrounding areas. If a stockpile becomes infested by weeds, the Rehabilitation Team (with Environment Team advice) assess further management requirements prior to utilisation in rehabilitation or remediation areas.	Mine Planning Team Rehabilitation Team
Rehabilitation Monitoring and Evaluation (PRO-30195)	Rehabilitation Monitoring shall be undertaken / coordinated by the Environment Team and includes recording the presence and abundance of any weed species. This information is shared with and used by the Rehabilitation Team to assess weed management priorities, annual weed treatment programs and/or immediate actions. Progressive (routine) recording of weeds is undertaken by the Rehabilitation Team for mining lease areas, and by the Operations Team for non-mining areas.	Environment Team

In addition to the prevention strategies outlined above, GEMCO utilises the following weed control methods:

- **Physical:** Hand pulling / grubbing, felling, slashing / mowing, cultivation, mulching, burial / capping;
- **Chemical:** Aerial spray, foliar spray, basal bark, cut stump and soil application; and
- **Land management:** Quarantine, revegetation / rehabilitation, replacement planting, fire.

Priority species are outlined within the Weed Management Plan. Weed control activities are undertaken by GEMCO's Rehabilitation Team in mining lease areas and GEMCO Operations Team in non-mining areas.

Monitoring, Reporting and Review

Pre- and post-wet season monitoring is undertaken at known weed locations and at priority treatment areas to verify weed treatment activities and outcomes. The results of these surveys are used to update GEMCO's weed mapping database (Survey123) in order to monitor the spread of weeds across the mining leases and identify priority areas for weed management. Surveillance at newly established rehabilitation sites and areas disturbed by fire is also undertaken. Any non-conformances and associated corrective actions are reported as part of the annual EMR.

GEMCO is part of the Groote Eylandt Weed Working Group led by the ALC Land and Sea Rangers. This group meets to share knowledge and information, and to coordinate holistic weed management across the Groote Eylandt region. A detailed review of the Weed Management Plan is conducted every three years in consultation with relevant internal and external stakeholders, including the ALC.

7.5.7. Air Emissions Management Plan

Objectives and Targets

The objectives of air emissions management are to minimise the generation of dust from mining operations and to keep associated environmental risks to as low as reasonably practicable. The Air Emissions Management Plan (AEMP) outlines the management strategies, actions and key performance indicators that are used to manage air emissions across the GEMCO lease area. The plan also outlines monitoring programs to understand air emission levels and allow for the effective and timely implementation of contingency measures if required.

GEMCO's air emission guidelines are summarised in Table 7-5.

TABLE 7-5 GEMCO'S AIR EMISSION GUIDELINES (FY24)

Pollutant	Particle Size	Averaging Period	Guideline Value	Reference
Particulate Matter	PM_{10}	24 hours	50 µg/m³	NEPC (2021)[a]
Particulate Matter	PM_{10}	Annual	25 µg/m³	NEPC (2021)
Particulate Matter	$PM_{2.5}$	24 hours	25 µg/m³	NEPC (2021)
Particulate Matter	$PM_{2.5}$	Annual	8 µg/m³	NEPC (2021)
Manganese	PM_4[b]	Annual	0.84 µg/m³	Internal Adopted Guideline Value (based on TCEQ chronic ReV[c])

(a) National Environment Protection Council (2021).

(b) PM_4: The Reference Value (ReV) is based on Mn associated with respirable particles (being less than 5 micrometres [µm] in aerodynamic diameter). Because the current definition of respirable particles is ≤4 µm (ISO 7708:1995), sampling methods have been adapted to enable quantification of Mn in the PM_4 fraction.

(c) The Texas Commission on Environmental Quality's (TCEQ) chronic ReV has been adopted by GEMCO as the most current and scientifically appropriate health-based criterion for risk assessment (TCEQ, 2017).

Note: µg/m³ = micrograms per cubic metre

Management and Mitigation Measures

GEMCO has High Volume Air Sampler (HVAS) monitoring units in the townships of Alyangula and Angurugu (Figure 3-1). The sampling units are located in areas aimed to capture the highest risk of dust emissions given the prevailing winds during the wet and dry seasons. The township of Umbakumba, located on the far eastern side of the island, is not expected to be impacted by current mining operations and is not included in the scope of the AEMP.

In accordance with Eastern Leases EIS commitments, the AEMP was reviewed for the Eastern Leases and includes an additional HVAS site at Yedikba Outstation (Figure 3-1) prior to the commencement of construction. This site was installed and commissioned in June 2022 to provide PM_{10} air emissions monitoring data representative of the community location closest to the Eastern Leases. An additional HVAS was simultaneously installed to measure $PM_{2.5}$ dust, in line with the Angurugu and Alyangula monitoring sites. In January 2023, the Yedikba PM_{10} HVAS was reconfigured to directly measure PM_4 manganese to align with the Angurugu and Alyangula monitoring sites.

An additional $PM_{2.5}$ monitor is planned to be installed in FY25 on Telstra Hill to monitor background $PM_{2.5}$ levels to inform investigations into potential causes of dust exceedances (Figure 3-1).

In addition to the HVAS monitors, GEMCO has a series of real time E-sampler monitors in Alyangula and Angurugu which provide real time monitoring results and raise alerts for the operational teams to proactively assess dust emissions and respond accordingly. Further details on GEMCO's dust management activities are outlined within various supporting documents to the AEMP including *PRO-3057 Dust Management Procedure – Mining* and *PRO-3059 Dust Management Procedure – Process and Logistics*.

Burning of native vegetation by local community members persists throughout the dry season predominantly affecting areas on the western side of Groote Eylandt. As a result of this activity, dust monitoring will often record high levels of $PM_{2.5}$ and PM_{10}. These results are considered outliers and are not recorded as a breach of the guidelines since these emissions are not sourced from mining activities.

Following consultation with the ALC through the quarterly MLC, GEMCO commenced the process of excluding exceedances that are not sourced from mining activities, referred to as 'exceptional events', from the calculation of the PM_{10} and $PM_{2.5}$ annual averages. Exceedances of the National Environment Protection Measure (NEPM) 24-hour guideline that are potentially related to mining activities are classified as 'operational', while those where the source cannot be definitively determined are classified as 'inconclusive'. This process was endorsed by the ALC through the MLC and commenced from 15 May 2021.

Monitoring, Reporting and Review

The HVAS monitoring units are sampled on a six-day basis to ensure that monitoring is conducted on every day of the week over a given period, which ensures random sampling. Filter papers are collected and dispatched to a National Association of Testing Authorities (NATA)-accredited laboratory for analysis. The filter papers are sampled for PM_{10} by weight and for PM_{10} manganese by acid digestion and Inductively Coupled Plasma Mass Spectrometry analysis. Any non-conformances and associated corrective actions are reported as part of the annual EMR.

Table 7-6 outlines the guiding principles used to inform the GEMCO dust exceedance investigations. Bushfire impact is inferred from the dust notifications arising from GEMCO's Dust Trigger Action Response Plan (TARP) and the results of dust sample analyses.

TABLE 7-6 GEMCO DUST EXCEEDANCE CLASSIFICATIONS

Classification	Guiding Principles
Operational	Prevailing wind direction in the direction of GEMCO operations. High manganese content recorded > $PM_{2.1}$ fraction.[a] Real-time monitoring alerts recorded when the wind is from GEMCO operations.
Exceptional Event	Prevailing wind direction is not in the direction of GEMCO operations. High < $PM_{1.4}$ fraction recorded. Low manganese content recorded. No alerts recorded in the real-time monitoring network when the wind is occurring from the direction of GEMCO operations.
Inconclusive	Prevailing wind direction is not in the direction of GEMCO operations. High manganese content recorded in the < $PM_{1.4}$ fraction. No alerts recorded in the real-time monitoring network when the wind is occurring from the direction of GEMCO operations.
Bushfire Influence	**Guiding Principles**
Yes	High < $PM_{1.4}$ fraction. Observation of smoke on GEMCO dust notification form.
No	Low < $PM_{1.4}$ fraction.

(a) Emissions of < $PM_{2.5}$ are primarily associated with combustion processes and vehicle exhaust, rather than material movements and related mining activities (Parsons, 2018). Given the configuration of the HVAS fractionator plates, which measure $PM_{2.1}$ rather than $PM_{2.5}$, the $PM_{2.1}$ fraction is used to determine whether manganese is likely operational.

GEMCO undertakes a monthly review of data monitoring data as part of its internal Dust and Noise Working Group. This includes reviewing monitoring trends, stakeholder engagement, and investigating dust control projects. The AEMP is reviewed on a regular basis, and in response to monitoring results.

7.5.8. Western Leases Water Management Plan

Objectives and Targets

The Western Leases Water Management Plan (WLWMP) provides information on environmental and sustainability issues associated with the surface water and groundwater managed by GEMCO. The plan is inclusive of all water on both mine lease land and in receiving environments.

Surface Water Management Systems

Potable Water

GEMCO has an abstraction licence (Licence No. 9291005) to abstract potable water from the Angurugu River, which is processed at a water treatment facility after which it is then piped to Alyangula, the mine site and communities in Malkala and Bartalumba Bay. An additional treatment facility is located at the water storage tank in Alyangula which processes secondary treatment, where necessary. The township pipeline supplies the port and power station.

Potable water is used for human consumption, domestic purposes, dust suppression, vehicle washing, and irrigation.

Clean Water

In undisturbed mining lease areas, surface water follows natural topography in an east to west direction towards the coast.

Diversion drains are established around active quarries to limit the flow of water into the quarries. Any excess water is transferred to storages or diverted into bushland.

Quarry Water

Excess water is contained in quarries or TSFs and may be transferred between storage facilities to reduce discharge to bushland. Water is preferentially sourced using dewatered quarry water or abstracted bore water.

The concentrator and other processing infrastructure use water from a range of sources, with the majority provided by the tailing dams. Service water, fire water, and dust suppression systems are fed from return water and Angurugu River water.

Groundwater is intercepted by quarries across the mine site. Due to each quarry location and seasonal conditions, the volume of water that contributes to groundwater recharge can vary.

Sediment-affected Water – Port Facility

Surface water runoff from the port is managed by collection sumps and pumped to a settling dam at the southern end of the port to avoid sediment-laden runoff from the area entering Milner Bay.

Sediment-affected Water – Mine Site

Runoff around processing and administration areas enters a drainage system connected to contained storage, which is ultimately transferred into the processing circuit via Dam 1.

Sewage Water

Effluent water produced from the mine is piped into the sewage treatment plant which is maintained by GEMCO's NPI Team. A containment dam receives the sewage where it undergoes natural biodegradation.

Excess Water Disposal Project

The Excess Water Disposal project proposes a two-phased approach for water infrastructure developments to improve GEMCO's management of excess water. The project approach is summarised in the following sections, with regulatory approvals for the overall project being managed via a separate and dedicated process.

Phase 1 – Water Integration

The Water Integration phase of the project is designed to allow GEMCO to transfer water between the Central / Southern quarries and Northern quarries across the Angurugu River. Specifically, the project plans to install pumping infrastructure in GEMCO's Central quarries water storage (ES), and pipelines across the Angurugu River, to facilitate pumping of excess water for discharge into the Northern quarries water storage (NH2). The main objectives for the project include:

- Enabling more effective management of excess water disposal via bush discharge. Water that is confined in the south will be moved to the north for more effective distribution.
- Facilitate improved management of water quality by providing more flexibility and capacity for mixing of water from different source quarries.
- Develop high benefit infrastructure for subsequent integration with the proposed phase 2 Ocean Outfall infrastructure.

All infrastructure would be on GEMCO's Western Leases and within previously disturbed cleared areas, with the exception of the Angurugu River pipeline crossing, an element of the project which is still being finalised. The existing Angurugu River pipe bridge is outside GEMCO's Western Leases areas but under an agreement with the ALC accommodates dewatering pipelines and a potable water pipeline. Options include using the existing pipeline bridge via replacement of the existing dewatering pipeline, or alternative arrangements via GEMCO's other bridge structures across the Angurugu River.

The project construction is planned from around Q1 FY26 to Q3 FY26. The preliminary design for phase 1 infrastructure requires approximately 1.4 ha of disturbance, which is included in the proposed Western Leases disturbance detailed in Section 2.1.3.

Phase 2 – Ocean Outfall

The Ocean Outfall phase of the project proposes pumping excess water from the mining operation to the Milner Bay Port facility for marine discharge. This project will be subject to a separate approvals process. The main objectives for the project include:

- **Reduce reliance on bush discharge for excess water disposal**; will provide an alternative release mechanism that will assist the operation sustainably manage water volumes;
- **Improve water quality risk mitigation**; a marine discharge option would allow the risk of potentially increasing salinity in groundwater to be better managed compared to bush discharge; and
- **Maintain production rates**; enable the business to maintain current levels of mine production by reducing water management risks.

Various options for excess water disposal were considered in previous study phases. The marine discharge option was recommended for further development. The project is currently in the feasibility phase of study works. The marine discharge option consists of establishing dedicated pumping infrastructure in GEMCO's Northern quarries water storage (currently NH2), an onshore pipeline along the Rowell Highway to the Milner Bay Port Facility, and ocean outfall infrastructure for marine discharge.

The onshore pipeline would be unburied apart from sections across roads, access tracks or waterways. Based on current water balance modelling for the operation, the project is currently designing to facilitate pumping of up to 80 gigalitres per year excess water to the ocean outfall at Milner Bay, with further review of transfer and discharge capacity requirements of the project to be undertaken during the FS phase in FY25.

The offshore infrastructure, consisting of a pipeline and diffuser system, would enable ocean outfall around 500-600 m offshore adjacent to GEMCO's Port facility. The initial section of the offshore pipeline would be buried to maintain stability through the surf zone and the remainder positioned on the ocean floor. The diffuser system would consist of around 30 outlet ports spaced every 5 m to allow adequate dispersion of the freshwater plume. The offshore plume impact area would be proposed at the discharge point.

Construction for the project is planned to commence around Q3 FY26 and be completed in Q2 FY27.

Quarry Water Flocculant Treatment Trials

Following Tropical Cyclone Megan, a number of quarries & storage dams across site approached their storage capacity as a result of heavy rainfall. To support mining operations in these quarries, mine water is proposed to be discharged off-lease into the surrounding bushland. GEMCO is currently assessing treatment options that will allow mine water to be of a suitable quality so that it can be discharged to the receiving environment. If testing proves effective and the water quality is deemed to be suitable (i.e. below defined trigger levels) for off-lease dewatering, a full scale application to treat mine water will be considered.

Surface Water Monitoring

The surface water monitoring program is undertaken in accordance with the WLWMP and broadly comprises:

- Stream flow gauging;
- Water quality monitoring of the receiving environment;
- Discharge monitoring; and
- Water accounting.

Stream Flow Gauging

Flow meter readings are collected monthly at the pump station located on the Angurugu River, while river level readings are collected weekly at the gauging station as detailed in the WLWMP.

Abstraction volumes are monitored and measured against GEMCO's approved abstraction limits as detailed in the abstraction licence (Licence No. 9291005).

Receiving Environment Water Quality Monitoring

Water quality monitoring data is collected using in-situ field readings and water samples across sites along the Angurugu River and Emerald River, including sites upstream and downstream of the mining activities (Figure 3-1). Surface water trigger values applicable to impact monitoring sites are measured against ANZG (2018) default guideline values using a 95% protection for aquatic ecosystems. Further details are available in the WLWMP.

Discharge Monitoring

Dewatering activities are monitored to ensure these activities pose minimal risk to the environment. With the progression of GEMCO's mine plan, additional sites will be brought into the program during the planning process. If particular water quality trigger values are exceeded, water is contained until the data demonstrates that it meets the trigger values.

As the mining footprint expands closer to the coast, which may result in potential saltwater intrusion within GEMCO quarries, GEMCO has adopted an interim default trigger value of 250 µS/cm. While studies are being undertaken by the University of Queensland to determine a GEMCO site specific trigger value, an EC TARP will be implemented. The TARP involves monitoring and alternative use for water that exceeds 250 µS/cm.

Dewatering activities have been endorsed by the ALC based on conditions including notification of ALC and Traditional Owners in advance of discharge, in-situ water quality of the discharge, laboratory testing of the water quality, and no discharge to off-lease land between July and October. In 2022, the ALC endorsed extended off-lease dewatering all year round with conditions involving free draining requirements, additional observation wells, additional monitoring bores, and vegetation health monitoring.

Water Accounting

GEMCO reports on water inputs, outputs and recycled water for surface and groundwater flows in accordance with the *Water Accounting Framework for the Minerals Industry* (Minerals Council of Australia, 2022). Where possible, flow meters are used to collect monthly flow volumes.

Groundwater Monitoring

The groundwater monitoring network is made up of smaller networks that target auxiliary activities associated with GEMCO's operations. Monitoring bores have been installed in the vicinity of the sewage treatment plant, at the port facility, across the GEMCO leases, at Milner Bay and specifically around the TSFs, dry tips and wet tips.

Across the mine, 28 groundwater monitoring bores are strategically located to monitor changes in groundwater levels and quality, which are monitored on a quarterly to annual basis.

A network of 49 groundwater bores located around the active and decommissioned TSFs monitor groundwater levels and quality. These are monitored on a biannual to annual basis. Bores will be installed with the construction of new tailings facilities to monitor and manage groundwater quality. Additional bores around TSF15 have been installed and incorporated into the 2024 tailings monitoring program.

Sewage Monitoring Program

Sewage effluent and mixing zone monitoring is undertaken monthly and undertaken in accordance with the conditions of the Waste Discharge Licence WDL 163-01 and site-based protocols available in *SWI-21577 Sewage Effluent and Plume Monitoring*.

Marine Monitoring Program

GEMCO samples marine waters and sediments using the sampling method in the marine environmental monitoring program. Additionally, every second year, concentrations of certain analytes within oysters (*Saccostrea* sp.) and two fish species, Stripey Snapper (*Lutjanus carponotatus*) and Blackspot Tuskfish (*Choerodon schoenleinii*), are measured.

Reporting and Review

Any non-conformances and associated corrective actions related to the WLWMP are reported as part of the annual EMR. The WLWMP is reviewed on a regular basis, and as risk profiles undergo change in response to monitoring results.

7.5.9. Eastern Leases Water Management Plan

Objectives and Targets

The purpose of the Eastern Leases Water Management Plan (ELWMP) is to provide a framework for the management of water resources within the Eastern Leases, including:

- Outlining regulatory approvals requirements and performance measures for Eastern Leases water management;
- Providing an overview of the water management strategy for Eastern Leases and measures to minimise potential impacts to the surrounding environment;
- Description of the Eastern Leases surface water and groundwater monitoring network and programs; and
- Discussion of response programs for the review of Eastern Leases water monitoring results.

The ELWMP sets out the procedures for the management of surface and groundwater within the Eastern Leases and associated Haul Road Corridor. The ELWMP has been developed in accordance with the requirements of the *Mining Management Plan Structure Guide for Mining Operations* (then NT Department of Primary Industry and Resources [DPIR], 2017). The objectives and targets of the ELWMP are listed in Table 7-7.

TABLE 7-7 ELWMP OBJECTIVES AND TARGETS

Objective	Target
Address all statutory requirements	Ensure all relevant statutory requirements are addressed.
Maximise reuse of quarry water to minimise external water demand	All quarry water to be reused for dust suppression or potentially to assist with irrigation to extend the annual rehabilitation season.
Minimise discharges of quarry water	Mine water dams will have sufficient capacity to contain predicted inflows from all historical rainfall events. Ensure the health of existing watercourses, including riparian zones.
Minimise the generation of mine contact water	Clean runoff to be directed away from quarries and other disturbed areas.

Surface Water Management System

The water management system has been designed based on the following key principles:

- Divert clean runoff around areas disturbed by mining activities;
- Control sediment-affected water in accordance with *PLN-6504 Eastern Leases Erosion and Sediment Control Plan*, which will involve capturing and treating sediment-affected water in appropriate sediment control structures; and
- Contain quarry water in on-site water storages and reuse of quarry water to meet operational demands (mine water supply).

Clean Water

Diversion drains will be established to direct clean water (i.e. runoff from undisturbed areas) away from quarries and other disturbed areas. The exact sizes of drains will depend on the area of the contributing catchment and will be determined during detailed design and implemented in accordance with the principles described in *PLN-6504 Eastern Leases Erosion and Sediment Control Plan*.

Quarry Water

Quarry water is obtained through groundwater inflows to the quarries and runoff from the surrounding catchment. The most recent water balance model predicts that the quarries will receive up to 947 megalitres/annum of inflow and runoff (under median rainfall conditions) (WRM Water & Environment Pty Ltd, 2021).

Surface water inflows into quarry voids is minimised through the use of perimeter catchment drains. Nevertheless, quarries will receive water via direct rainfall and runoff from residual catchment areas. The quantity of catchment runoff varies depending on climatic conditions.

Quarry water is captured in sumps constructed in the floors of quarries. The collected water is pumped from these sumps to on-site mine water dams or contingency void storage (if required). Mine water dams are designed to have no contributing catchment besides their own footprint. Water is extracted from storage dams as required to meet operational demands.

The water balance model (WRM Water & Environment Pty Ltd, 2021) has confirmed that mine water dams and contingency void storage have sufficient capacity to contain all historically recorded rainfall events, whilst maintaining freeboard greater than the 1% AEP 120-hour storm volume.

The collected quarry water is reused for operational purposes, primarily dust suppression. The water demand for dust suppression is estimated to be up to 849 megalitres/annum under median conditions. Quarry water collected in the Eastern Leases will be used preferentially for dust suppression. Water required to supply the crib facilities located within the Eastern Leases will be provided through a production bore.

The water balance model (WRM Water & Environment Pty Ltd, 2021) predicted that controlled discharges will not be required, even under the wettest modelled scenario. Notwithstanding, controlled discharge is a contingency measure that can be used during extreme wet conditions. In the event that controlled discharge is required, excess water will be discharged to bushland in accordance with the existing practices at the Western Leases. Discharge locations will be strategically selected in consultation with the ALC to minimise the risk of the undiluted discharge water flowing directly into watercourses within Eastern Leases.

Discharge limits have been developed in accordance with the principles of the Water Quality Guidelines. The receiving environment is classified as a high conservation or ecological value system. The Water Quality Guidelines recommend that high conservation or ecological value system should be afforded the following level of protection:

- No change in physical or chemical stressors beyond natural variability; and
- No increase in toxicant concentrations beyond background values.

Accordingly, the management goal for water discharges is to maintain the background water quality. Baseline water quality in the Emerald and Amagula Rivers was monitored from January 2014 to December 2019. The maximum concentrations recorded during this period have been adopted as the discharge limits (see ELWMP for further detail).

The background EC in both the Emerald and Amagula Rivers is very low. These background values have not been adopted as Eastern Leases discharge limits, as these very low thresholds may unnecessarily constrain the ability to discharge (when needed). The Water Quality Guidelines recommend that the EC for freshwater should not be increased above 1,500 µS/cm. This value has been adopted as the discharge limit for EC.

Sediment-affected Water

Runoff from the following areas may contain elevated levels of suspended sediment:

- Overburden Emplacement Areas (OEAs);
- Haul roads; and
- Mine infrastructure such as staff facilities (crib huts), parking areas and dams.

Runoff from OEAs and infrastructure areas will be collected and treated in sediment dams and traps. Smaller sediment traps facilitate the removal of coarse sediments close to the source before the water is directed to larger sediment dams for settling of finer sediments. The quantity and location of sediment traps will vary depending on the progression of overburden emplacement. All sediment control structures will be designed in accordance with the principles of the International Erosion Control Association (2008) *Best Practice Erosion and Sediment Control Guidelines*. Sediment dams and traps will be routinely desilted to maintain storage capacity.

Further details on management of sediment-affected water are provided in *PLN-6504 Eastern Leases Erosion and Sediment Control Plan*.

Hydrocarbons

Spills of hydrocarbons and other hazardous materials have the potential to impact upon water quality. To manage the risk of a release of these materials to the environment, GEMCO will continue to enforce the following control and response procedures for Eastern Leases:

- PRO-3115 Land Based Spill Response; and
- PRO-3196 Hazardous Chemicals Management Procedure.

Responses to spills of hazardous materials spills are also included the Emergency Services routine drill schedule.

Infrastructure areas that are used for refuelling or servicing of vehicles will be equipped with spill kits to prevent hydrocarbon contamination.

Potable Water

A water treatment plant will be operated and maintained within the Eastern Leases to provide potable water from the production bore.

Surface Water Monitoring

The surface water monitoring program is undertaken in accordance with the ELWMP, and broadly consists of the following components:

- Stream flow gauging;
- Water quality monitoring of the receiving environment; and
- Water accounting.

Stream Flow Gauging

GEMCO operates two gauging stations located on the main channel of Emerald Creek, located downstream of the Southern EL and downstream of the Northern EL. These stations are adequate for monitoring potential impacts of mining operations on streamflow in the Emerald River.

Receiving Environment Water Quality Monitoring

The Eastern Leases monitoring network includes eight monitoring locations, and is in addition to the monitoring program undertaken for the Western Leases (Section 7.5.8). The locations of Eastern Leases surface water monitoring sites are detailed in the ELWMP. The water quality data collected from January 2014 to December 2019 represents the baseline water quality prior to mining operations. Surface water monitoring has occurred quarterly since mid-2022 in accordance with the ELWMP.

The surface water monitoring network includes sites located upstream, within and downstream of the Eastern Leases. The upstream monitoring sites will not be impacted by mining activities and are therefore used as reference sites. Changes in water quality from the reference sites to the downstream sites may indicate an impact due to mining operations, where the variances are found to be different to natural variations in upstream and downstream data recorded in pre-mining conditions.

During construction and mining operations, water quality monitoring will be conducted on a quarterly basis. In the event that controlled discharge is required, additional monitoring events will be undertaken before and after the discharge event. Baseline water quality monitoring identified several metals that are generally below the level of reporting. Such parameters are not included in quarterly monitoring but will be monitored annually to confirm that concentrations of these metals have not increased from baseline levels.

Table 7-8 lists the water quality parameters that will be measured. The results of surface water quality monitoring will be compared to the trigger values detailed in the ELWMP.

TABLE 7-8 RECEIVING ENVIRONMENT WATER QUALITY MONITORING PARAMETERS – EASTERN LEASES

Monitoring Frequency	Parameter
Quarterly	**Physico-chemical parameters – Field**
	pH, Redox Potential (ORP), EC, Turbidity, Temperature, Dissolved Oxygen
	Physico-chemical parameters – Laboratory
	Total suspended solids (TSS), total hardness as $CaCO_3$, Bicarbonate Alkalinity as $CaCO_3$, Carbonate Alkalinity as $CaCO_3$, Hydroxide Alkalinity as $CaCO_3$ and Total Alkalinity as $CaCO_3$
	Ions
	Sulfate as SO_4, Chloride, Calcium, Magnesium, Potassium, Sodium, Ionic balance, total anions, total cations
	Nutrients
	Total Nitrogen, Nitrate and Nitrite, Total Kjeldahl Nitrogen (KN), Total Phosphorus
	Metals and Metalloids
	Aluminium, Barium, Iron, Manganese, Zinc
Annually (in addition to quarterly monitoring parameters)	**Metals and Metalloids**
	Arsenic, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Mercury, Lead, Nickel, Selenium, Uranium, Vanadium

Water Accounting

Surface water volumes will be accounted for and reported in accordance the *Water Accounting Framework for the Minerals Industry* (Minerals Council of Australia, 2014), with reference to the ICMM *Water Stewardship Framework* (ICMM, 2014). Water accounting data is reported annually in GEMCO's EMR and in South32 corporate reporting metrics.

Groundwater Monitoring

Groundwater Quality Monitoring

The groundwater monitoring network for the Eastern Leases was established in January 2014 and consists of 22 monitoring bores (i.e. nested deep and shallow bores) across 16 locations. When bores are intercepted by mining, replacement bores will be established if necessary at suitable alternative locations, if required. The current locations of groundwater monitoring bores are presented in the ELWMP.

Low flow sampling groundwater bores will be undertaken bi-annually. Table 7-9 lists the parameters that are monitoring during construction and operations. The results of groundwater quality monitoring are compared to the trigger values detailed in the ELWMP.

TABLE 7-9 GROUNDWATER QUALITY MONITORING PARAMETERS

Monitoring Frequency	Parameter
Bi-annual	**Physico-chemical parameters – Field**
	pH, EC, Temperature, Dissolved Oxygen
	Physico-chemical parameters – Laboratory
	Total hardness as $CaCO_3$, Bicarbonate Alkalinity as $CaCO_3$, Carbonate Alkalinity as $CaCO_3$, Hydroxide Alkalinity as $CaCO_3$ and Total Alkalinity as $CaCO_3$
	Ions
	Major anions (CO_3, HCO_3, Cl, SO_4), major cations (Ca, Mg, Na, K)
	Nutrients
	Total Nitrogen, Nitrate and Nitrite, Ammonium, total Phosphorus
	Metals and Metalloids
	Aluminium, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Manganese, Mercury, Nickel, Lead, Selenium, Uranium, Vanadium, Zinc
	Hydrocarbons
	Total petroleum hydrocarbons, total recoverable hydrocarbons

Water Level Monitoring

The water level data collected from June 2014 to October 2019 represents the baseline groundwater levels. During construction, water levels have been measured bi-annually in accordance with the ELWMP. During operations, water levels in the Eastern Leases groundwater monitoring bores will be monitored using electronic loggers. Water levels will also be measured manually during bi-annual sampling of groundwater quality. The measured groundwater levels will be compared to trigger values detailed in the ELWMP.

Eastern Leases Water Trigger Response Plan

A surface water and groundwater response plan has been developed to address any impacts to water levels or water quality that are greater than predicted. Table 7-10 outlines the management responses that will be implemented if the trigger values are exceeded. Any non-conformances and associated corrective actions will be reported as part of the annual EMR.

TABLE 7-10 WATER TRIGGERS AND RESPONSES – EASTERN LEASES

Aspect	Monitoring	Trigger	Response
Surface water quality	Quarterly water quality monitoring at eight sites.	Water quality trigger values are exceeded on two consecutive monitoring rounds.	Investigate the cause of the trigger exceedance. If Eastern Leases operations are determined to be a cause of the exceedance, the exceedance will be recorded as an incident in GEMCO's event management system and reported in accordance with external notification procedures. GEMCO will also review the need for additional controls (which may include modification of mining activities).
Mine water storages	Real-time mine water dam level sensors. Weekly dam level records from GEMCO survey. Monthly monitoring of dam storage volumes and water quality parameters.	Storage volume in a mine water dam is within 10% of its maximum design capacity.	Consider whether there is sufficient storage capacity available in other dams or quarries on a weekly basis. If transferring water to other Eastern Leases storages is not feasible, consider whether discharge may be required (having regard to prevailing and forecast weather conditions). If it is likely that discharge will be required, schedule an additional round of water quality monitoring as soon as practicable. This will enable compliance with discharge limits to be determined prior liaison with the ALC over any potential discharge event.

Aspect	Monitoring	Trigger	Response
Groundwater quality	Bi-annual water quality monitoring at ten locations.	Water quality trigger values are exceeded on two consecutive monitoring rounds.	Investigate the cause of the trigger exceedance. If Eastern Leases operations are determined to be a cause of the exceedance, the exceedance will be recorded as an incident in GEMCO's event management system and reported in accordance with external notification procedures. GEMCO will also review the need for additional controls (which may include modification of mining activities).
Groundwater levels	Automated monitoring of groundwater levels at ten locations.	Recorded water level is below the trigger value.	Engage an expert to investigate the cause of the greater than anticipated drawdown. If Eastern Leases operations are determined to be a cause of the exceedance, the exceedance will be recorded as an incident in GEMCO's event management system and reported in accordance with external notification procedures. GEMCO will also review the need for additional controls (which may include modification of mining activities).

Reporting and Review

The ELWMP is reviewed on a regular basis, and if any of the following occurs:

- A significant change in mining progression from what was anticipated during the last review of the ELWMP;
- An incident or trigger exceedance that highlights the need for adjustment of the water management system; and
- Any other changes are proposed to improve the effectiveness of the water management system.

GEMCO maintains and undertakes regular reviews of the Eastern Leases numerical groundwater model for the prediction of groundwater drawdown levels. Material changes to groundwater model predictions will be incorporated in revisions of the ELWMP and reported via the annual EMR.

7.5.10. Eastern Leases Erosion and Sediment Control Standard

Objectives and Targets

The objective of the Eastern Leases Erosion and Sediment Control (ESC) Standard is to provide strategies to manage soil erosion and sediment generation while minimising the potential for adverse impacts to downstream water quality. The ESC Standard also ensures that ESC measures are in place to adequately manage flood risks.

Specific design objectives for the management of ESC within the Eastern Leases are to:

- Maintain the beneficial uses of the Emerald River, Angurugu River and their receiving coastal waters;
- Include ESC controls for all Eastern Leases catchments to minimise the need for any release of sediment to downstream receiving waters; and
- Ensure that a risk-based approach is implemented by GEMCO during the Eastern Leases planning to ensure that ESC management structures are appropriately designed and sited.

Key targets for the ESC Standard are to:

- Integrate ESC measures into the planning phases of Eastern Leases construction and mining operations, including design of OEAs and topsoil stockpiles;
- Ensure catchments are managed by water type and that the movement of water within the site is appropriately managed;
- Minimise the duration and extent of topsoil/spoil exposure where possible;
- Stabilise disturbed areas where possible;
- Minimise the requirement for discharge of surface water from Eastern Leases and maximise the potential that any discharge water will achieve compliance with Eastern Leases water quality criteria;
- Establish a monitoring program for ESC structures within the Eastern Leases; and
- Ensure that ESC measures are maintained in efficient working order at all times.

Management and Mitigation Measures

The ESC Standard includes both proactive and reactive management and mitigation measures designed to minimise potential impacts of sediment on receiving waters. The primary management measure for ESC is the early planning and installation of structures prior to and during ground disturbance within each catchment, and the timely rehabilitation of land post-mining. Rehabilitation will be undertaken in accordance with GEMCO's Rehabilitation Standard and associated procedures.

ESC measures will be considered during planning and established prior to disturbance to reduce the potential for sediment-laden stormwater discharging to the receiving environment. ESC measures for catchments receiving quarry water from disturbed areas shall be designed and constructed by suitably qualified and experienced persons. The development of ESC management measures will also be documented in accordance with the GEMCO PTC process (GEM-PRO-4149).

The following principles underpin the approach to ESC management for the Eastern Leases:

- Erosion control – prevention or minimisation of erosion caused by runoff on disturbed surfaces;
- Drainage control – a secondary erosion control, prevention or minimisation of erosion caused by concentrated flows;
- Appropriate management and separation of different water types through/around the area of concern; and
- Sediment control – trapping or retention of sediment generated from either overland flow or concentrated flow.

Erosion Controls

Erosion controls include:

- Installation of sediment basins as the primary control where OEAs are external to a quarry (and not draining back into a quarry) due to the rehabilitation timeframes required. External OEAs will be limited to the footprint of future mining areas (i.e. sediment basins will likely be temporary structures);

- Disturbed areas, excluding active quarry areas, will have a suitable ground cover established (generally prior to the next wet season) to minimise wind and water erosion potential at the source. For example:
    - Areas available for permanent rehabilitation will be revegetated in accordance with the GEMCO Rehabilitation Standard and associated procedures;
    - Haul roads and hardstand areas will have a suitable road base to minimise erosion at the time of construction and will also include sediment traps;
    - Externally draining embankment batters and haul road "roll-over" protection bunds will be reshaped and appropriate erosion controls applied at the time of construction; and
    - Topsoil stockpiles will have appropriate erosion controls applied (vegetation cover preferred) as soon as possible after establishment.

Drainage Controls

Drainage is to be used to convey and separate diverted clean water, stormwater or quarry water. Drainage structures for the Eastern Leases are classified as either permanent or operational (constructed on a temporary basis).

Permanent drainage refers to diversion channels that will be in place throughout the life of the Eastern Leases. These channels require a higher level of design to limit the potential maintenance liability for the period between when mining has ceased and final rehabilitation of GEMCO has been completed. Permanent drainage channels shall be designed by a suitably experienced and qualified person. For all permanent diversions, vegetation will be used as the primary method of stabilising channel bed and banks, benches and floodplain drainage paths.

Operational drainage controls shall be designed and constructed in accordance with the *Best Practice Erosion and Sediment Control Guidelines* (International Erosion Control Association [IECA], 2008) and the Eastern Leases Basis of Design document. The NSW Guideline *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) will also be used for further reference in the design and implementation of operational drainage controls.

Specific design standards are applied to operational drains that convey runoff to a sediment basin or quarry water dam, including:

- As a minimum, drains constructed in catchments with a disturbance duration risk rating of medium or higher (as per the ESC Standard) shall be topsoiled and seeded to minimise potential for channel erosion; and
- Drains constructed with a high slope (>1.8%) shall be lined with appropriate engineered armouring (liners, rock or similar), where possible.

Sediment Controls

The following sediment controls will be adopted at the Eastern Leases:

- Sediment control measures shall be designed and constructed in accordance with the *Best Practice Erosion and Sediment Control Guidelines* (IECA, 2008);
- Supplementary sediment control measures will be used as required to reduce the movement of sediment from the location that it was entrained and are considered an important component of best practice sediment control. Such measures may include excavated sediment traps, rock check dams or sediment fencing/bunds;

- Sediment basins will be designed to trap a proportion of entrained sediment. Designs implemented for sediment basis (including flow-through basins, wet basins and containment basins) will depend on operational function and risk rating assigned to each catchment area in accordance with the ESC Standard;

- The sediment storage volume will be de-silted on an annual basis (at a minimum); and

- All sediment basins shall be constructed with a spillway with appropriate drainage controls. An energy dissipator will be included downstream of the spillway where required. The spillway and downstream controls shall be designed and constructed in accordance with the *Best Practice Erosion and Sediment Control Guidelines* (IECA, 2008).

Monitoring, Reporting and Review

Monitoring will be undertaken to confirm the success of the ESC and quarry water management structures and to identify any necessary remedial actions. Monitoring will include routine inspections of structures identified on the ESC and quarry water inventory asset register for the Eastern Leases, with additional inspections triggered on a rain event basis.

Details on the frequency of routine inspections and the triggers for event-based monitoring inspections are detailed in Table 7-11 and Table 7-12, respectively.

TABLE 7-11 ROUTINE EROSION AND SEDIMENT CONTROL AND QUARRY WATER MONITORING FREQUENCY

Control Type	Monitoring Frequency
Erosion	Pre-wet season inspections (prior to start of November).
Drainage, Sediment and quarry water dams	Pre- and post-wet season inspections (prior to start of November and end of May).
Watercourse and drainage line crossings	Inspection frequency to be per the Haul Road Crossing Design Overview Report (Hansen Bailey, 2015b), i.e. bi-monthly during the wet season (November to end of May) and following rain events greater than 50% AEP.

TABLE 7-12 EVENT BASED EROSION AND SEDIMENT CONTROL AND QUARRY WATER MONITORING FREQUENCY

Catchment risk rating	Trigger for Inspection – Rainfall	Average Inspection Frequency
Low	70 mm over 5 days	6 times a year
Medium		
High		
Very High	105 mm over 24 hours	Once per year

These routine inspections will be undertaken in each catchment area within the Eastern Leases where ESC structures are in place, and will document:

- Water quality (field pH, EC and turbidity);

- Sediment storage volume;

- The condition of all ESC structures (i.e. record findings from the review of signs of erosion/scour, deterioration that requires maintenance);

- Occurrences of excessive sediment deposition (whether on lease or downstream of sediment basins) that require remedial action or maintenance; and
- Any failure of ESC structures, or where significant maintenance work is required.

To assist monitoring and maintenance, the sediment storage volume will be clearly marked on each permanent storage dam.

Maintenance responses that are identified during an inspection will be actioned in Systems, Applications and Products in Data Processing (SAP) and/or G360. Maintenance shall be undertaken prior to the next wet season, where feasible (i.e. start of November each calendar year).

Examples of deficiencies in ESC management measures that will trigger maintenance actions include, but are not limited to:

- Damage/scouring to ESC and quarry water structures;
- Sediment deposition in excess of the sediment storage volume;
- Damage/deterioration of access tracks or the ability to inspect/monitor, or maintain and/or operate area/infrastructure/equipment;
- Spill, contaminated or waste materials accumulated/deposited in ESC structures or their associated catchment areas; and
- Outlet controls of spillways and discharge points.

Should an ESC inspection or other investigation identify any significant non-conformances or corrective actions, this will be recorded as an incident and responded to following GEMCO's event (incident) reporting and management procedures. Any non-conformances and associated corrective actions are also reported as part of the annual EMR.

The Eastern Leases ESC Standard is reviewed on an annual basis, and in response to monitoring results from routine or event-based inspections.

7.5.11. Eastern Leases Cultural Heritage Management Plan

Objectives and Targets

The Eastern Leases CHMP sets out the procedures for the management of cultural heritage sites within and adjacent to the Eastern Leases and Haul Road Corridor. The key objectives of the CHMP are to:

- Address all statutory requirements;
- Mitigate potential direct and indirect impacts to archaeological and sacred sites; and
- Monitor the potential direct and indirect impacts on archaeological and sacred sites.

Management and Mitigation Measures

The majority of known archaeological and Sacred Sites fall outside the Eastern Leases limits of mining and will not be directly impacted.

GEMCO management actions under the CHMP include:

- Maintaining a database of known archaeological and sacred sites within and external to the mining leases (refer Sections 3.1.10 and 3.1.11). The database includes the buffer zones to be maintained around the Sacred Sites, as agreed with the ALC in the Eastern Leases Mining Agreement;
- Maintaining restrictions on the access to archaeological sites by GEMCO personnel and contractors. The GEMCO site induction includes information on the restrictions in place to limit access to Aboriginal land and archaeological and Sacred Sites listed in the CHMP;
- Continuing to implement the GEMCO PTC process (GEM-PRO-4149) for Eastern Leases. This process ensures that all land-related criteria, including areas of cultural or environmental significance, are assessed prior to any new disturbance;
- Management of dust impacts through implementation of the AEMP (refer Section 7.5.7);
- Implementation of the Blast Management Plan that will include blasting limits to protect archaeological rock shelter sites and controls for potentially sensitive cultural heritage or archaeological sites (refer Section 7.5.13);
- Procedures for the management of previously unrecorded archaeological finds; and
- Site inductions for all personnel who conduct work within the Eastern Leases.

Monitoring, Reporting and Review

Monitoring commitments under the CHMP include:

- Monitoring of dust impacts at rock art sites will be conducted annually for the duration of Eastern Leases operations. Monitoring will be conducted at reference sites within the Eastern Leases. The ALC will be consulted prior to any monitoring events and will be invited to participate in the monitoring process;
- Regular inspections by GEMCO when mining in proximity of Eastern Leases sacred sites, to ensure that the required buffer zones for each site are being maintained (refer Figure 3-11); and
- Visual monitoring of specific rock art sites will be completed by GEMCO within five days of every blast event that occurs within 700 m of a site. The Eastern Leases Blast Management Plan and associated monitoring and management commitments are described in Section 7.5.13.

In addition to the general incident response process, GEMCO will:

- Report any incidents where monitoring indicates Eastern Leases activities have impacted Aboriginal archaeological or sacred sites, in accordance with Section 29 of the MM Act and per *GEM-PRO-3151 Event and Action Management Procedure*; and
- Report any Eastern Leases incidents involving Aboriginal archaeological or sacred sites to the ALC, as required under the Eastern Leases Mining Agreement.

The CHMP is reviewed on an annual basis, and in response to monitoring results. Any proposed changes to CHMP monitoring and mitigation strategies will be discussed with the ALC prior to updating the document.

7.5.12. Eastern Leases Biosecurity Management Plan

Objectives and Targets

The purpose of the Biosecurity Management Plan is to describe the risk-based monitoring and management approaches for biosecurity threats to the Mining Agreement Area that could occur as a result of GEMCO mining activities within the Eastern Leases.

The Eastern Leases Biosecurity Management Plan is required under Clause 7.6 of the Eastern Leases Mining Agreement between GEMCO and the ALC.

Management and Mitigation Measures

Key biosecurity risks that could occur due to GEMCO activities within the Eastern Leases include:

- Introduction of the Cane Toad (*Rhinella marinus*) during the transport of materials and personnel to Groote Eylandt for the construction and operation of the Eastern Leases;
- Introduction of, or an increase in, populations of feral fauna species within the Eastern Leases following construction and mining activities; and
- Introduction of weed species to the Eastern Leases, leading to impacts on biodiversity values and threatened species.

GEMCO maintain a range of documents that describe requirements for the monitoring, management and responses to biosecurity risks within their area of operations. A summary of the key GEMCO biosecurity management documents is provided in Table 7-13.

TABLE 7-13 GEMCO BIOSECURITY MANAGEMENT FRAMEWORK DOCUMENTS

GEMCO Document	Biosecurity Management Scope
General Biosecurity Management	
Biosecurity Incident Response Procedure	Describes the procedures to notify, investigate, respond to and report all GEMCO biosecurity incidents that occur at the GEMCO Port Facility. Outlines requirements for the handling, transport and disposal of any biosecurity waste material identified by GEMCO.
Crisis and Emergency Management Plan	Provides Material Emergency Risk Management Guides for key risks. One of the Material Emergency Risk Management Guides within the plan includes GEMCO response actions in the event of Cane Toads being introduced Groote Eylandt.
Packaging and Freight Standard	Identifies packaging requirements for all goods transported to Groote Eylandt for use by GEMCO, including controls to minimise the potential for any introduction of feral pest species.
Quarantine Inspection Procedures	Describes GEMCO quarantine requirements for all freight going to Groote Eylandt, including the need for all freight to be free of cane toads, weeds and other invasive pest species; and Outlines inspection requirements for all GEMCO barges and cargo that is transported to Groote Eylandt.
Groote Eylandt Airport General Aviation Operations Code of Conduct	Describes the quarantine and biosecurity requirements that must be adhered to by all General Aviation personnel servicing Groote Eylandt Airport.
Threatened Species Management Plan	Outlines controls to prevent the introduction of Cane Toads to Groote Eylandt as a result of GEMCO activities. Describes GEMCO and ALC management measures for feral animals.
Land and Biosecurity Management Plan	Describes GEMCO monitoring and control measures to prevent the introduction and spread of invasive species on Groote Eylandt, including weeds, marine pests, ants, mosquitos, cats, dogs and cane toads.

GEMCO Document	Biosecurity Management Scope
Cane Toad Management	
Cane Toad Management Plan	Outlines the processes, activities and reporting requirements for GEMCO in relation to Cane Toad management; Describes the general legal and regulatory requirements for Cane Toad management; Describes potential pathways where GEMCO activities could lead to introduction of Cane Toads to Groote Eylandt; Details monitoring and operational controls (developed in consultation with external Cane Toad management specialists) to minimise the risks of GEMCO activities leading to unwanted migration of Cane Toads to Groote Eylandt; Describes the GEMCO programs to ensure Cane Toad awareness for all employees and contractors; and Outlines the Cane Toad management and response accountabilities for GEMCO personnel and contractors.
Cane Toad Response Plan	Provides GEMCO responsibilities and accountabilities for Cane Toad monitoring and control; and Identifies potential GEMCO Cane Toad introduction scenarios and responses required for each event.
Cane Toad Management Procedures	Procedures for Cane Toad quarantine monitoring, inspections of freight and toad management controls (exclusion fencing, etc.).
Weed Management	
Weed Management Plan	Provides accountabilities for GEMCO personnel and contractors in relation to weed management; Describes the general legal and regulatory requirements and guidelines relevant to GEMCO weed management activities; Describes potential pathways where GEMCO activities could lead to the introduction of weed species to Groote Eylandt and identifies known weed species of concern, or those with the potential to occur; Details monitoring and management responses (developed in consultation with external Weed Management specialists) to identify, prioritise and treat weed outbreaks within GEMCO operational or management areas; Lists weed control methods that can be used by GEMCO personnel and contractors and those that are appropriate for priority weed species.

Monitoring, Reporting and Review

Monitoring, reporting and review processes in relation to biosecurity are described in the various management plans listed in Table 7-13.

7.5.13. Eastern Leases Blast Management Plan

Objectives and Targets

The Blast Management Plan sets out the procedures for the management of blasting within the Eastern Leases. The key objectives of the Blast Management Plan are to:

- Meet all statutory requirements for all blast related activities and events for the life of the Eastern Leases;
- Prevent nuisance noise and vibration impacts on sensitive receptors for the life of the Eastern Leases;
- Preserve the well-being of the local community in relation to blasting impacts; and
- Preserve the cultural value of significant heritage sites by preventing blasting-related impacts.

Management and Mitigation Measures

GEMCO has committed to minimising potential impacts from blasting activities associated with its operations. Additional blast management measures required for Eastern Leases have been developed to minimise potential impacts to the surrounding community and Archaeological rock art sites, as a result of blast vibration, overpressure, fly rock, fume and dust.

The Blast Management Plan outlines specific management measures and procedures for the Eastern Leases, including:

- Blast Design Limits: each blast will be specifically designed to minimise impacts and meet relevant criteria at all receptors and rock art sites. The design process will target limits to conservatively allow for some uncertainty in blast effects, with criteria for rock art sites developed following a geotechnical review of all sites (Red Earth Engineering, 2021); and

- Blast Design Process: the design process will follow a staged review until a satisfactory design is developed that meets the target limits at all receptors and rock art sites. Ground vibration and overpressure calculations will be based on the recommended method in AS2187.2-2006 (or later revision of this Standard) or on an alternative method that can be shown to provide results of similar or better accuracy.

Monitoring, Reporting and Review

Eastern Leases blast events will be monitored to confirm blasting impacts remain within the criteria described in the Blast Management Plan. Monitoring of blast impacts will occur at the nearest potentially impacted receptor or location representative of the closest heritage site(s) identified in the blast design process. For heritage sites, the location(s) with the greatest potential to be impacted may be at a greater distance from a blast event where a site has a significantly lower ground vibration criterion. With the potentially most affected location correctly identified for each blast event, meeting the criteria at that location ensures the criteria would be met at all other sensitive locations.

As noted previously, visual monitoring of specific rock art sites will be conducted by GEMCO within five days following every blast event within 700 m of a site.

GEMCO will investigate any potential exceedance of blast impact criteria or significant impacts to rock structures associated with known archaeological heritage sites and, if required, report findings to the ALC and regulatory agencies.

To review the accuracy of the blast design process, comparisons will be made between predicted blast impacts and results from the blast monitoring program. These comparison reviews will occur:

- Quarterly for the first 12 months following the commencement of blasting within the Eastern Leases;

- Annually after the first 12 months from the commencement of blasting within the Eastern Leases; and

- Within 48 hours following any measured exceedance of relevant criteria at any blast monitoring location or if visible fume is noted at a receptor or rock art site.

Results from these reviews, including any revisions to the blast design process or monitoring arrangements, will be considered as part of annual updates to the Blast Management Plan and reported as part of the annual EMR.

7.5.14. Eastern Leases Groundwater Dependent Ecosystem Monitoring Program

Objectives and Targets

The key objectives of the GDEMP for the Eastern Leases are to:

- Confirm the presence of GDEs and potential GDEs located within the Eastern Leases, based on a review of the Eastern Leases EIS and contemporary vegetation mapping (then Department of Environment and Natural Resources, 2018);
- Develop a monitoring program to be implemented by GEMCO for the review of GDEs during Eastern Leases mining operations; and
- Provide a procedure for the review and investigation of data gathered within the Eastern Leases to confirm any potential impacts to GDEs.

Management and Mitigation Measures

Management and mitigation measures undertaken are detailed in Section 2 of the GDEMP.

Monitoring, Reporting and Review

Monitoring sites include:

- Eight sites on the Amagula and Emerald Rivers located downstream of areas of predicted groundwater drawdown;
- Three sites located on the Emerald and Amagula River tributaries in areas where groundwater drawdown in predicted; and
- Five sites within wetland areas where groundwater drawdown is predicted.

Monitoring at each site will be completed:

- One year after mining commences;
- Every three years during mine operations;
- One year after closure; and
- A further four events following closure, each five years apart (i.e. up to 20 years after closure).

For each year in which monitoring takes place, monitoring will be completed in the late wet season (where access is available), or early in the dry season (May to June) and again in the late dry season (October to November).

Information to be collected and analysed during each GDEMP monitoring event will include:

- General distribution of potential GDEs;
- *Tropical Rapid Appraisal of Riparian Condition* method data (Dixon et al. 2006), which includes an assessment of riparian condition (for riparian sites only) using 24 parameters. These parameters are used to calculate a Condition Rating and Pressure Index, and will track the condition of potential GDE communities over time. The parameters include a review of vegetation structure, soils, dominant species, evidence of fauna activities, the presence of weeds and other disturbance;
- Floristic plots, which will include:
    - Flora species richness;
    - Height and percentage foliage cover of all stratum;
    - Basal area;
    - Composition of ground cover;
    - Other notes on vegetation condition, such as fire history, as required; and
    - Where surface water is present, aquatic flora species richness.
- Groundwater monitoring data for Eastern Leases; and
- Reference photographs for each site.

Monitoring values that would indicate a possible impact of groundwater drawdown to GDEs that would trigger a GEMCO TARP investigation are provided in Table 7-14. It is noted that these investigations would be undertaken to determine the cause of any potential impacts and appropriate management responses. Where such an investigation determines that impacts to a GDE are related to GEMCO activities within the Eastern Leases, then this will be recorded as an incident and responded to following the GEMCO procedures for event (incident) reporting and investigation.

TABLE 7-14 GDE MONITORING PROGRAM INVESTIGATION TARP

Monitoring Parameter	Changes that would trigger GEMCO investigation
Vegetation mapping	Reduction in the distribution of a VMU that is a GDE or potential GDE of more than 1 ha between monitoring events.
Riparian Condition Rating	Significant reduction in riparian Condition Rating across multiple sites between monitoring events that is not explained by natural variations. A significant reduction would be a reduction in Condition Rating class such as from very good to good, or good to fair etc.
Flora species richness	Significant reduction in species richness across multiple sites between monitoring events that is not explained by seasonal/rainfall patterns (as statistically determined by an analysis of similarities [ANOSIM] and similarity percentage [SIMPER] tests).
Flora species composition	Significant changes in species composition (as statistically determined by ANOSIM and SIMPER tests) between monitoring events across multiple sites that is not explained by seasonal/rainfall patterns.
Canopy health	Significant loss of canopy cover due to dieback at multiple sites between monitoring events that is not explained by fire. A significant change would be one that changes the structural classification of the vegetation community (e.g. from rainforest to open-forest or from woodland to open woodland etc.).

Any non-conformances and associated corrective actions are also reported as part of the annual EMR. The GDEMP is reviewed on a regular basis, and in response to monitoring results.

7.5.15. Eastern Leases Procedure for Management of PAF Overburden Material

Objectives and Targets

Geochemical testing undertaken to support the Eastern Leases EIS identified a small area of PAF material in the north-western portion of the Southern EL. To address this potential risk and associated EIS commitment, GEMCO have developed a procedure that outlines the monitoring and management requirements for PAF material that may be encountered during mining within the Eastern Leases.

Management and Mitigation Measures

Monitoring to identify PAF material will be undertaken when mining clay overburden at depths below 15 m that are within 500 m of boreholes identified in the Eastern Leases EIS. Samples will be collected ahead of mining within these areas from the cuttings of selected drill holes in order to identify any PAF material. During mining operations, recently excavated and dumped material sourced from within 500 m of the relevant groundwater bores will also be randomly sampled. Samples will be analysed for Net Acid Generation (NAGpH). Test samples with a NAGpH of less than 4.5 will be considered PAF, while samples with a NAGpH of 4.5 or greater will be classified as NAF.

Any mining blocks identified as PAF will be selectively handled and emplaced with a cover of traffic-compacted NAF overburden to limit the infiltration of air and water.

Monitoring, Reporting and Review

Surface run-off and groundwater seepage water downstream of Eastern Leases OEAs will be monitored on a quarterly basis during mining operations. Sample results outside of the relevant water quality trigger values in ELWMP (refer Section 7.5.9) will be investigated to determine whether AMD is a contributing factor.

In the event that AMD is identified in surface runoff and groundwater seepage monitoring downgradient of OEA(s) where PAF material has been buried, GEMCO will investigate the source using additional overburden sampling and testing. Remediation options may include addition of limestone to identified PAF materials during placement and/or reducing the amount of time that any identified PAF material is exposed to weathering conditions prior to covering with NAF material.

Any non-conformances and associated corrective actions will be reported as part of the annual EMR. The Eastern Leases PAF Material Monitoring and Management Procedure is reviewed on a regular basis, and in response to monitoring results.

7.5.16. Eastern Leases Project Environment Management Plan

Objectives and Targets

The purpose of the Eastern Leases EMP is to satisfy Condition 10 of EPBC 2014/7228. The objectives of the plan are to:

- Demonstrate how the GEMCO Weed Management Plan has considered, where relevant, the *Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses* (Department of Sustainability, Environment, Water, Population and Communities, Canberra, 2012);
- Demonstrate how the GEMCO CTMP has considered, where relevant, the *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads* (Department of Sustainability, Environment, Water, Population and Communities, Canberra, 2011); and

- Outline management measures, in addition to those related to weeds and Cane Toads, to minimise the risk on impacted species, including those related to vehicle collisions with the impacted species, the prohibition of pets and firearms, waste management measures, and staff inductions.

Management and Mitigation Measures

The threat posed by Cane Toads is taken very seriously by GEMCO. As such, a range of controls are implemented to manage this risk in collaboration with the ALC. These are summarised in Section 7.5.5.

Weed spread prevention is the most successful and cost-effective type of weed management available. GEMCO has several procedures that aim to prevent the introduction of weeds and or mitigate their propagation and spread. These are summarised in Section 7.5.6.

Management measures, in addition to those related to weeds and Cane Toads, are required to minimise the impacts of the project on EPBC Act listed threatened species. These additional measures are listed in Condition 10 of EPBC 2014/7228, and summarised below.

- **Signage in relation to vehicle collisions with impacted species:** This includes installation and maintenance of relevant signage at the entrance to the major haul roads, and at strategic locations as drivers enter the Northern EL and Southern EL, noting the presence of wildlife;

- **Prohibition of pets and firearms:** Animals (including pets) and firearms are prohibited from being brought on to the project site, excluding working dogs (e.g. CTDDs);

- **Waste management:** Waste management actions adopted within the project site to avoid attracting and propagating vermin and feral cats, including:

    - Sealed, labelled waste containers will be provided at all crib huts and other locations where waste is generated.

    - For waste that cannot be stored in sealed containers (e.g. wooden pallets), the waste will be neatly stored in designated areas prior to its collection.

    - All designated waste storage areas will be clean and well-maintained, and isolated from surface water drainage systems.

    - Waste will be collected and taken off-site on a regular schedule (at least weekly for putrescible waste).

    - Spills will be cleaned up using absorbent materials, suitable for the type and volume of the spill. GEMCO has a *Land Based Spill Response Procedure* which describes methods and materials for cleaning up spills.

    - The induction process includes information on waste management (i.e. disposing of waste in the appropriate bins) and reporting and/or cleaning up spills.

- **Reporting observations of particular species:** GEMCO employees and contractors will report sightings of feral cats or impacted species in the project site to their shift supervisor who will communicate this to the GEMCO Environment Specialist; and

- **Inductions:** Inductions for GEMCO employees and contractors include descriptions of impacted species, potential impacts, and the actions that must be taken by all employees and contractors to minimise impacts on the species.

Monitoring, Reporting and Review

The monitoring, reporting and review frameworks for the CTMP and Weed Management Plan are provided in Section 7.5.5 and Section 7.5.6, respectively.

Wildlife signs are inspected quarterly to confirm that they are in good condition, reflective, clean and legible. In the event of the inspection indicating that the signs require repair or cleaning, this will be entered into the GEMCO's maintenance workflow process and repair, cleaning or replacement will be scheduled.

On an annual basis, the Environment Specialist will review the data on vehicle collisions with impacted species to determine if there are trends (e.g. locations where collisions frequently occur or particular times of day when collisions occur more frequently). Based on these trends, the GEMCO Mining Department will determine whether additional measures are required to reduce the risk of vehicle collisions with impacted species.

Any incidents of injury or death to impacted species will be reported in the Annual Compliance Report prepared by the Environment Specialist in accordance with Condition 3 of EPBC 2014/7228.

The following steps will be taken in the event of pets or firearms being brought on to the project site:

- The incident will be reported to the relevant GEMCO Department Manager as well as the Mine Manager, and the pet and/or firearm will be removed from the project site.
- An investigation will be undertaken into the incident.
- The person responsible for bringing the pet and/or firearm to the project site will be subject to penalties. In the event of a firearm being brought on to the project site, GEMCO will also notify the Groote Eylandt Police Department.

Inspections of waste storage areas in the project site will be undertaken as follows:

- Waste storage areas will be inspected by the waste management provider weekly to confirm that they are sealed, clean and well-maintained and to check for signs of pests (e.g. rodent droppings).
- In the event of the inspection indicating that replacement, repair or cleaning of the waste storage area is required or if vermin are sighted, this will be raised as part of GEMCO's maintenance workflow system.
- In the event of waste not being collected as scheduled, the waste management provider will confirm the reason for the delay and whether any additional actions are required to ensure timely collection of waste in future.

Sightings of feral cats will be reported and acted upon as follows:

- All GEMCO employees and contractors will be required to report sightings of feral cats within the project site.
- If the feral cat has been recorded in the vicinity of GEMCO's infrastructure (e.g. crib huts), the Environment Specialist, in consultation with the waste management provider, will determine if there are any additional actions that can be undertaken to avoid attracting feral cats to the facility (e.g. increasing the frequency of waste collection).
- The Environment Specialist will report the sightings of feral cats to the ALC.

7.5.17. Eastern Leases Biodiversity Offsets Strategy / Biodiversity Offsets Management Plan

The Eastern Leases Biodiversity Offsets Strategy (BOS) and Biodiversity Offsets Management Plan (BOMP) are required as part of the EPBC Approval of the Eastern Leases project (EPBC 2014/7228), and demonstrate how GEMCO will use biodiversity offset funds generated from clearing land in the Eastern Leases to offset associated impacts to EPBC-listed species (Northern Hopping-mouse, Brush-tailed Rabbit-rat, Northern Quoll, and Masked Owl [northern]).

The approved BOS outlines in general terms the strategy of providing biodiversity offsets for the Eastern Leases project via management of high priority weeds which would otherwise have a negative impact on the impacted EPBC-listed species. The approved BOMP gives specific detail on how this will be achieved, including:

- Which weed species are to be included in the biodiversity offsets program;
- What areas are to be covered by the offsets program;
- What biodiversity offset targets are to be achieved for each weed species;
- The program of works to achieve the biodiversity offset targets;
- The monitoring program used to assess progress towards the biodiversity offset targets; and
- The reporting program used to demonstrate and communicate progress towards the biodiversity offset targets.

Objectives and Targets

The overall objective of the offsets program is to effectively manage the emerging threat of invasive transforming weeds (high-priority weeds) in the offset management area by the end of the program (2032). Targets for the program are detailed in the approved BOMP, which can be viewed at GEMCO Documents (south32.net).

Management and Mitigation Measures

Management measures for the BOMP will be implemented in accordance with the following strategies:

- Directly control high priority weeds with the aim of:
    - Eradication: Gamba Grass (*Andropogon gayanus*), Grader Grass (*Themeda quadrivalvis*), Perennial Mission Grass (*Cenchrus polystachios*), Para Grass (*Urochloa mutica*), and Buffel Grass (*Cenchrus ciliaris*).
    - Control: Annual Mission Grass (*Cenchrus pedicellatus*) and Guinea Grass (*Megathyrsus maximus* var. *maximus*).
    - Prevention: Fountain Grass (*Cenchrus setaceus*), Olive Hymenachne (*Hymenachne amplexicaulis*), Thatch Grass (*Hyparrhenia rufa*), and Molasses Grass (*Melinis minutiflora*).
- Undertake island-wide weed mapping surveys every second year (2023, ..., 2031).
- Develop a quarantine system and a TARP targeted at high priority weeds.
- Develop a community awareness program in relation to high priority weeds.

- Develop and resource training and capacity building programs for ALC Rangers.
- Implement a monitoring, planning and reporting cycle for the life of the offsets program.

Monitoring, Reporting and Review

As part of the offsets program, data on the presence of weeds and the effectiveness of weed treatment will be collected. Monitoring will occur at an operational level, whereby weed infestations will be regularly monitored as part of routine weed treatment. In addition, a thorough, systematic search for weed infestations will take place as part of an island-wide weed mapping survey every second year. Weed monitoring data will:

- Be used to track performance against the overall outcomes of the offset and targets for individual weed species.
- Provide crucial operational data on the success of weed treatment practices, allowing for any adjustments to be made to the practices.

An annual planning process will occur as part of the offsets program, with planning for future offsets activities being guided by monitoring results. As part of the planning process, works completed in the previous 12 months will be reviewed (e.g. whether they were completed as scheduled) and the impact of the works will be assessed (e.g. whether targets were met). A rolling workplan for the subsequent two years will be developed each year, including a schedule of work, resources and targets to be achieved.

As required by Condition 13 of EPBC 2014/7228, GEMCO will prepare and submit an impact reconciliation report to DCCEEW every second year. These reports will contain a summary of native vegetation cleared as part of the project, the offset funds generated as a result of clearing, the offset works completed in the preceding two years, and the outcomes achieved, and a work program for the subsequent two-year period.

8. CLOSURE PLANNING

South32 implemented a Closure Standard in 2019 and updates the Standard approximately every two years. There are six key elements to the Closure Standard, namely:

- Closure Commitments;
- Closure Planning;
- Closure Cost Estimate / Provision;
- Progressive Rehabilitation;
- Closure Execution (including post closure monitoring and relinquishment); and
- Roles and Responsibilities.

As a signatory to the ICMM, South32 is aligned to the ICMM's guiding principal of "encouraging responsible closure" and develops all Company closure plans in accordance with the *Integrated Mine Closure – Good Practice Guide, 2nd Edition* (ICMM, 2019).

The most recent version of the GEMCO MCP was provided to the ALC for comment in June 2022. Ten meetings were held with representatives from the ALC over a period of approximately seven months to discuss aspects of closure planning for GEMCO, noting that the MCP had been prepared at a concept level. The MCP was refined to address feedback that could be addressed within the available timeframe and subsequently submitted to DITT in early April 2023. The MCP:

- Incorporates feedback from DITT on previous versions of the MCP;
- Has been comprehensively reviewed by the ALC;
- Is structured in accordance with the *Mining Management Plan Structure Guide for Mining Operations* (DPIR, 2017) as per guidance provided by DITT;
- Meets the requirements of South32's Closure Standard;
- Contains a comprehensive closure forward work program to address knowledge gaps and progress closure planning at GEMCO; and
- Aligns with the ICMM (2019) *Integrated Mine Closure – Good Practice Guide, 2nd Edition*.

The MCP covers all mining operations and associated activities undertaken by GEMCO on Groote Eylandt (including mining leases, SPLs, sub-leases and Section 19 ALRA Agreements) and applies to the management of the approved mine at all stages of the mine life.

In accordance with South32's Closure Standard, the MCP is updated every three years, as well as when there is a significant change to operations.

GEMCO will commence a comprehensive closure PFS in mid-2024. It is anticipated that this study will run for approximately 18 months, therefore, the timing for submission of the next version of the MCP, which will evolve from concept level to PFS level of accuracy, is proposed to be early 2026 (i.e. 3 years from submission of the previous MCP). This will ensure that the study outcomes are incorporated into the updated MCP and to allow for extensive engagement with the ALC prior to submitting the updated MCP.

8.1. Life of Operations Plan – Unplanned Closure

The MCP is integrated with the GEMCO LoOP, that currently forecasts mine operations to cease by FY32 (excluding operations within the Southern Lease). The LoOP is updated and reforecast annually.

Unplanned closure could result from a number of internal or external factors. As such, the specific nature of GEMCO's response to unplanned closure would be tailored to meet the individual circumstances driving the decision.

In the event of unplanned closure, GEMCO would:

- Immediately suspend operations and implement GEMCO's Care and Maintenance Plan;
- Advise all relevant internal and external stakeholders of the decision to move to unplanned closure through a series of stakeholder forums; and
- Complete the closure PFS and progress into the closure FS phase. During this period operations would remain in active Care and Maintenance. This phase of work will potentially take 2 years. Key outputs of the FS include:
    - Update the closure risk assessment for GEMCO closure;
    - Host stakeholder forums to collaborate on closure risks and opportunities;
    - Formalise and agree on Closure Completion Criteria and next land use opportunities;
    - Complete required technical studies to close any identified closure knowledge gaps;
    - Submit a Detailed Closure Plan and Closure Execution Plan for approval by ALC, DITT, NT EPA and other external stakeholders as required;
    - Develop an updated schedule for closure execution; and
    - Continue monitoring of Care and Maintenance activities to ensure continued compliance to operating licences and approvals.

GEMCO operations would remain in active Care and Maintenance until all internal and external approvals are granted to allow for the commencement of closure activities. Closure execution would be undertaken as per the Closure Execution Plan, with the broad approach would involve:

- Establishing a dedicated site-based closure owner's team, which would likely be composed of existing key personnel from the existing GEMCO operations team combined with some subject matter experts from the South32 Group functions;
- All assets agreed to remain for future use clearly demarcated for preservation;
- Decommissioning and de-energisation of non-essential infrastructure;

- Demolition and disposal of fixed process infrastructure and assets in accordance with the agreed closure schedule;
- Closure and rehabilitation earthworks to pit voids, stockpiles and TSFs in accordance with the agreed closure methodology and schedule;
- Gradual, sequenced demolition and disposal of remaining NPI as they become redundant;
- Continued monitoring as per licence requirements; and
- Establishment of the agreed post-closure monitoring network and monitoring frequency to monitor compliance to agreed closure and rehabilitation completion criteria post closure.

The Detailed Closure Plan and Closure Execution Plan would be domain-based and draw on the MCP, as well as ongoing rehabilitation and closure experience gained by subject matters experts from various GEMCO and South32 Group functional teams (e.g. Technical Services, Rehabilitation, Closure Studies, Environment, External Affairs).

Where there are programs that require action over an extended period of time (e.g., remediation of Milner Bay), GEMCO will develop appropriate governance arrangements for the continued implementation of these programs in consultation with key stakeholders.

8.2. Background for Costing of Closure Activities

South32 maintain an internal closure provision estimate that is updated on a six-monthly basis and undergoes a re-base on a 3-yearly basis. The process is in accordance with South32 and international accounting procedures and is audited by KPMG. This process enables South32 and Anglo American to ensure that the provision estimate remains current.

Table 8-1 summarises the mining disturbance across the GEMCO operation used for the security estimate in Appendix 9.7.1. Figure 2-1 and Figure 2-2 provide a visual representation of current disturbance as at 31 March 2024. The information in Table 8-1 is accurate as at 31 March 2024. Disturbance tracking is conducted on a quarterly basis across the operation taking into consideration progressive rehabilitation as well as new or expanded activities.

TABLE 8-1 GEMCO DISTURBANCE SUMMARY

Disturbance Type[1]	Existing (June 2024)	Proposed (FY25-FY32)	Total[4]
Site Infrastructure	316	23	339
Airport	110	0	110
Quarries / Active Mining	1,639	1,588	3,227
Tailings Storage Facilities and Dams	1,017	0	1,017
Stockpiles	155	5	160
Access and Haul Roads	570	42	612
Total Active Disturbance[2]	**3,806**	**1,656**	**5,462**
Rehabilitation[3]	1,688	1,406	3,094
Total Disturbance[4]	**5,494**	**1,656**	**7,150**

(1) Disturbance hectares are for GEMCO's Mineral Lease Tenements and Access Authority areas only, with SPL disturbance excluded (i.e. Port and Township disturbance areas).

(2) Total Active Disturbance excludes Public Access Track diversions in Eastern Leases which will remain after mining completion.

(3) Proposed Rehabilitation areas are within current and future Active Disturbance areas, and thereby excluded from Proposed Total Disturbance area.

(4) Total values may not equal the sum of values in each row or column due to rounding.

Closure costing has been developed in line with the NT DITT Security Calculation Procedure (2016). Where applicable, costs per unit (i.e. $/ha, $/m^3) and individual items costs have been developed using GEMCO rates or a third-party estimate. The total number of units and material quantities requiring rehabilitation is based on the disturbance data above. [redacted]

9. APPENDICES

9.1. Abbreviations and Units

Abbreviation	Description
°C	degrees Celsius
%	percent
AAPA	Aboriginal Areas Protection Authority
AEMP	Air Emissions Management Plan
AEP	Annual Exceedance Probability
ALC	Anindilyakwa Land Council
ALRA	*Aboriginal Land Rights (Northern Territory) Act 1976* (Cth)
AMD	Acid Mine Drainage
AMS	Aerodrome Management Services Pty Ltd
ANCOLD	Australian National Committee on Large Dams
ARI	Average Recurrence Interval
ASS	Acid sulfate soils
ASX	Australian Stock Exchange
the Bureau	the Bureau of Meteorology
BOMP	Biodiversity Offset Management Plan
BOS	Biodiversity Offset Strategy
CHMP	Cultural Heritage Management Plan
cm	centimetres
the Code	South32 Code of Business Conduct
CPS	Concentrate Product Stockpiles
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTDD	Cane Toad Detection Dog
Cth	Commonwealth
CTMP	Cane Toad Management Plan
DCCEEW	Cth Department of Climate Change, Energy, the Environment and Water
DDH	Diamond Drill Holes
DEPWS	NT Department of Environment, Parks and Water Security
DITT	NT Department of Industry, Tourism and Trade
DPIR	then NT Department of Primary Industry and Resources
EARC	East Arnhem Regional Council
EC	Electrical Conductivity
EIS	Environmental Impact Statement
ELWMP	Eastern Leases Water Management Plan
EMP	Environment Management Plan (as required under the conditions of EPBC 2014/7228)

Abbreviation	Description
EMR	Environmental Mining Report
EP Act	*Environment Protection Act 2019* (NT)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
ESC	Erosion and Sediment Control
FIFO	Fly In/Fly Out
FS	Feasibility Study
FY	Financial Year
GDE	Groundwater Dependent Ecosystem
GDEMP	Groundwater Dependent Ecosystem Monitoring Program
GEBIE	Groote Eylandt and Bickerton Island Enterprises
GEMCO	Groote Eylandt Mining Company Proprietary Limited
GIS	Geographic Information System
ha	hectare
HVAS	High Volume Air Sampler
ICMM	International Council on Mining and Metals
IECA	International Erosion Control Association
IMT	Incident Management Team
IPA	Indigenous Protected Area
JORC Code	Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves
JSA	Job Safety Analysis
km	kilometres
km^2	square kilometres
Kv	vertical conductivity
LBMP	Land and Biodiversity Management Plan
LGA	Local Government Area
LoOP	Life of Operations Plan
L/s	litres per second
$\mu g/m^3$	micrograms per cubic metre
µm	micrometres
m	metres
mm	millimetres
Mm^3	million cubic metres
MCP	Mine Closure Plan
mg/L	milligrams per litre
ML	Mineral Lease
MLC	Mining Liaison Committee
MM Act	*Mining Management Act 2001* (NT)
MMP	Mining Management Plan

Abbreviation	Description
MMPA	Mining Management Plan Amendment
Mn	manganese
MNES	Matters of National Environmental Significance
MT Act	*Mineral Titles Act 2010* (NT)
Mt	million tonnes
MTP	Medium-Term Plan
Mtpa	million tonnes per annum
NAF	Non-acid forming
NAGpH	Net Acid Generation
NATA	National Association of Testing Authorities
NEPM	National Environment Protection Measure
Northern EL	Northern Eastern Lease (ML31219)
NPI	Non-Process Infrastructure
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
OEA	Overburden Emplacement Area
PAF	Potentially acid-forming
PCS	Primary Crushing Station
PFS	Pre-Feasibility Study
PM_{10}	particles with a diameter of 10 micrometres or less
PMS	Post Mining Surface
PTC	Permit to Clear
ReV	Reference Value
RC	Reverse circulation
ROM	Run-of-Mine
SAP	Systems, Applications and Products in Data Processing
SBP	Sands Beneficiation Plant
SEP	Stakeholder Engagement Plan
SIP	Social Investment Plan
Southern EL	Southern Eastern Lease (ML31220)
SPL	Special Purpose Lease
STP	Short-Term Plan
SWI	Safe Work Instruction
TARP	Trigger Action Response Plan
TCEQ	Texas Commission on Environmental Quality
TPWC Act	*Territory Parks and Wildlife Conservation Act 1976* (NT)
TRO	Territory Revenue Office
TSF	Tailing Storage Facility

Abbreviation	Description
TSMP	Threatened Species Management Plan
UCAMMP	Upper Catchment Area Monitoring and Management Plan
VMU	Vegetation Mapping Units
Water Quality Guidelines	*Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018)
WLWMP	Western Leases Water Management Plan
WoNS	Weed of National Significance
WRM	WRM Water & Environment Pty Ltd
WSP	WSP Australia Pty Ltd

9.2. ALC Letter of Receipt

Anindilyakwa Land Council

26 June 2024

Mr Steve Hedges
VP GEMCO Operations South32
ALYANGULA NT 0885
Via Email: Steve.Hedges@south32.net

Re: ALC Acknowledgement of Receipt FY25-Closure Mining Management Plan

Dear Steve,

Thank you for providing to the ALC on the 13th June 2024 a copy of GEMCO FY25-Closure Mining Management Plan, (FY25-Closure MMP), for our review and consideration.

The Anindilyakwa Land Council, (ALC), recognises the importance of this document as an integral part of GEMCO's operational planning and regulatory compliance and of the ALC/GEMCO Mining Agreements. The ALC acknowledges the receipt of this document and provides in principle support for the submission process with the Northern Territory Government.

The ALC will review the document and undertake any necessary consultations that may be required with Traditional Owners whose lands the GEMCO's planned operations covers and may be impacted by changes this FY25-Closure MMP presents compared to the previous approved mine management plan. Due to the importance of this document and its comprehensive nature, this review and consultation process will not be complete prior to your planned submission date prior to the end of June 2024. As such, subsequent to this review and consultation process, the ALC's reserves the right to make comment and request changes to the FY25-Closure MMP and that these changes are submitted by GEMCO to the Northern Territory Government and are included in the FY25-Closure MMP being reviewed and considered by Northern Territory Government.

If you require further clarification around this letter, please contact Michael Trainor on michael.trainor@alcnt.com.au.

Yours Sincerely,

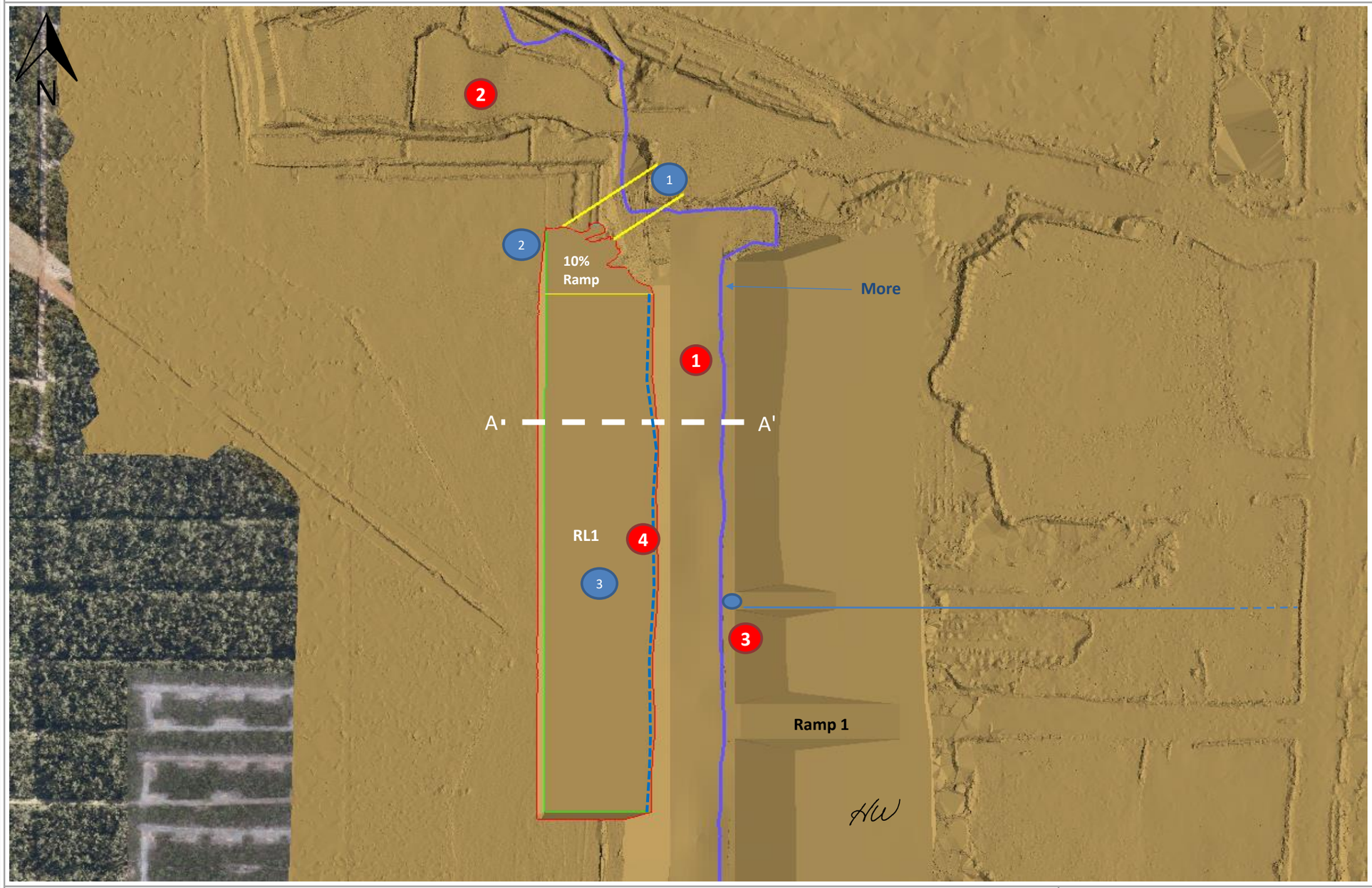
Mark Hewitt
Chief Executive Officer
Anindilyakwa Land Council

30 Bougainvillea Drive, Alyangula NT | PO Box 172, Alyangula NT 0885
T: (08) 8987 4006 | **F:** (08) 8987 4099 | **E:** admin@alcnt.com.au

9.3. Example Mine Designs

9.3.1. Excavator Pre-Strip Design - Overburden Stripping

NH_13_01-04_PS



PARAMETER	STANDARD	DESIGN
Depth to Design	Metres	3-4m
Mass	Wet Tonnes	414,873
Minimum Bench Width	> 40 Metres	70
Batter Angle	45-60°	45
Catch Berm Width	5-10 Metres	N/A
Ramp Width	> 30 Metres	>25
Ramp Gradient	< 10 %	10%
Edge of DZ Offset	>15 Metres	NA

HAZARDS*

Backfill (Rehandle)	%	NA
Weeds	Yes/No	No
Geotech Concerns	Yes/No	No

1. NH_12 strip
2. NH Northern Boxcut - Void
3. Pumping Infrastructure
4. Establish safety bunds along the eastern face.

INSTRUCTIONS

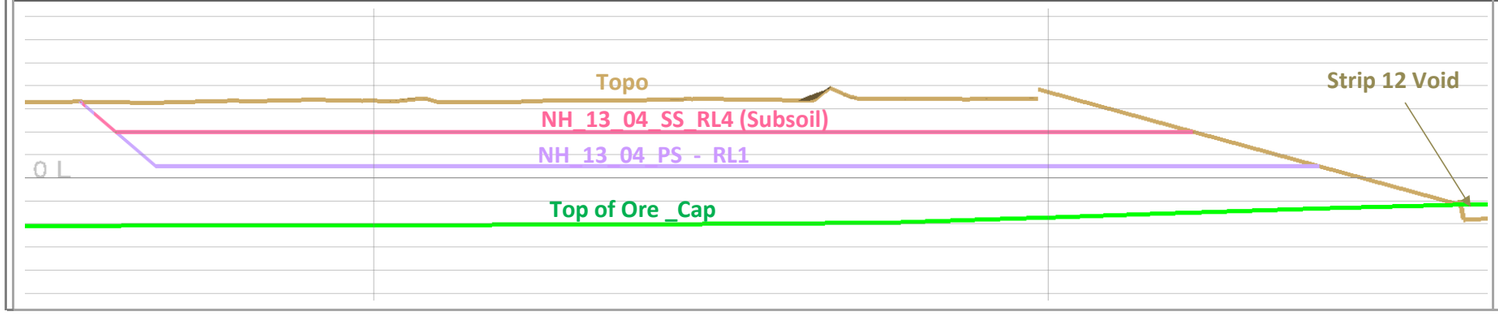
1. Doze in TS access and tie into northern bc access. Establish compliant intersection and required traffic managment

2. Setup dig face at the crest of the ramp and bench mine to RL3 targeting the Subsoil RL4 following **PV3 Surface NH_13_04_SS**.Haul SS to NH central section/ramp 2).

3. Bench mine remainder of the prestrip to RL1 following **PV3 surface NH_13_04_PS.** Haul material to the southern part of NH PMS dump.

4.

CROSS-SECTION



LEGEND

- Treeline / Topsoil
- Top of Ore Contours
- RL — Survey RLs
- / x — Bores / Exploration Drill Holes (In-Situ Areas)
- Lease Boundary / Significant Sites
- HV Roads & Accesses
- Pipelines & Pumps
- Drains
- Rehabilitation
- Backfill Crest / Toe
- Proposed Dozer Crest

APPROVALS

Design Engineer: Sam Lucas
Signature: S.Lucas Date: 19/07/2023

Snr. Short-Term Engineer: Hamish Williamson
Signature: HW Date: 19/07/23

Supt. Prod Mining: T. Shaw
Signature: T. Shaw Date: 19/7/23

NH_13_01-04_PS

DESIGN CHECKLIST		Yes / No	Comments
Are design parameters within standard? (If not, highlight as a hazard on the plan).		Yes	
Is HV access designed, STA-4218 compliant, and visible on the plan?		Yes	Steup compliant intersection
Has an area inspection been completed with Ops stakeholders and any visual / surveyed hazards identified? Are the hazard stated in the plan?		Yes	Exsiting mine area
Is there a history of geotechnical failure in the area, or have geotechnical hazards have been identified? If so, are operational controls outlined on the plan? - Superintendent approval required		N/A	
Is mining activity within 50m of surface constraints or 200m of a TSF embankment? If so, highlight as a hazard on the plan and identify operational controls - Superintendent approval required		N/A	
Has previous pit/strip operations performance & reconciliation information been incorporated in the plan?		Yes	
Geology engaged - if ore is exposed, no dig poygons are shown on the plan:	initials (date) in comments:	N/A	
Operations engaged and plan is operationally achievable:	initials (date) in comments:	TS	Discussed with TS for ramp access & TMP
Other Stakeholders engaged	initials (date) in comments:	N/A	
Are pit dewatering requirements shown on the plan and aligned with the longer-term water management strategy (i.e low points, pump ramps, pumping infrastructure, etc.)?		Yes	
Does the design include allowance for pit crest access to enable inspections and lighting plant installs?		Yes	
Have design quantities* (volumes & tonnes) been checked as correct?		Yes	
Have all legend items been considered and shown on the plan?		Yes	
Have all enabling activities been identified on the plan and instructions provided for inclusion in the week and / or month plan?		Yes	
If a box cut, complex design or significant backfill - has the Snr. Engineer been consulted and a stage plan developed and attached?		N/A	
Does the design provide >15m reversing room for the dozer fleet at the proposed dozer push crest?		N/A	
If a box cut, is the highwall ore mining ramp position optimised and exposes top of ore (flat pad of ore)?		N/A	
If a box cut, has a pump ramp been designed in at 12% grade, 15m wide with a 15m x 15m flat pad?		N/A	water management infrastructure already in place
Has this design been added into the Mine Design Tracker on Sharepoint?		Yes	
Is the design within an active WRAC area? Check WRAC folder and Vulcan Layer, if applicable attach the WRAC to the plan.		N/A	

Engineer Signature: Sam Lucas Date: 19/07/2023

DATA MANAGEMENT:

Design Strings:	Z:\Planning\Area_Name\NH\Short Term\NH_13
Topography:	Z:\Survey\CurrentPU\SURFACES\07-2023\Dozer\NH_12_01-04_DZnh-230711-dz.00t
Cuts:	FY24_CUTS_V1
Top of Ore:	N/A
Geotechnical Mine Design Document(s) (Sharepoint Location):	N/A
TSF-specifc WRAC / TARP Document(s) (Sharepoint Location):	N/A
Geotechnical Engineered Design:	N/A

SCHEDULING VOLUMES

	Density	Short-Term		Budget	Variance - if RED.
		BCM	WET Tonnes	WET Tonnes	
NH_13_04_SS	1.96	99,562	195,142		
NH_13_04_PS	1.96	112,108	219,732		
				-	
				-	
TOTAL	**1.96**	**211,670**	**414,873**	**0**	

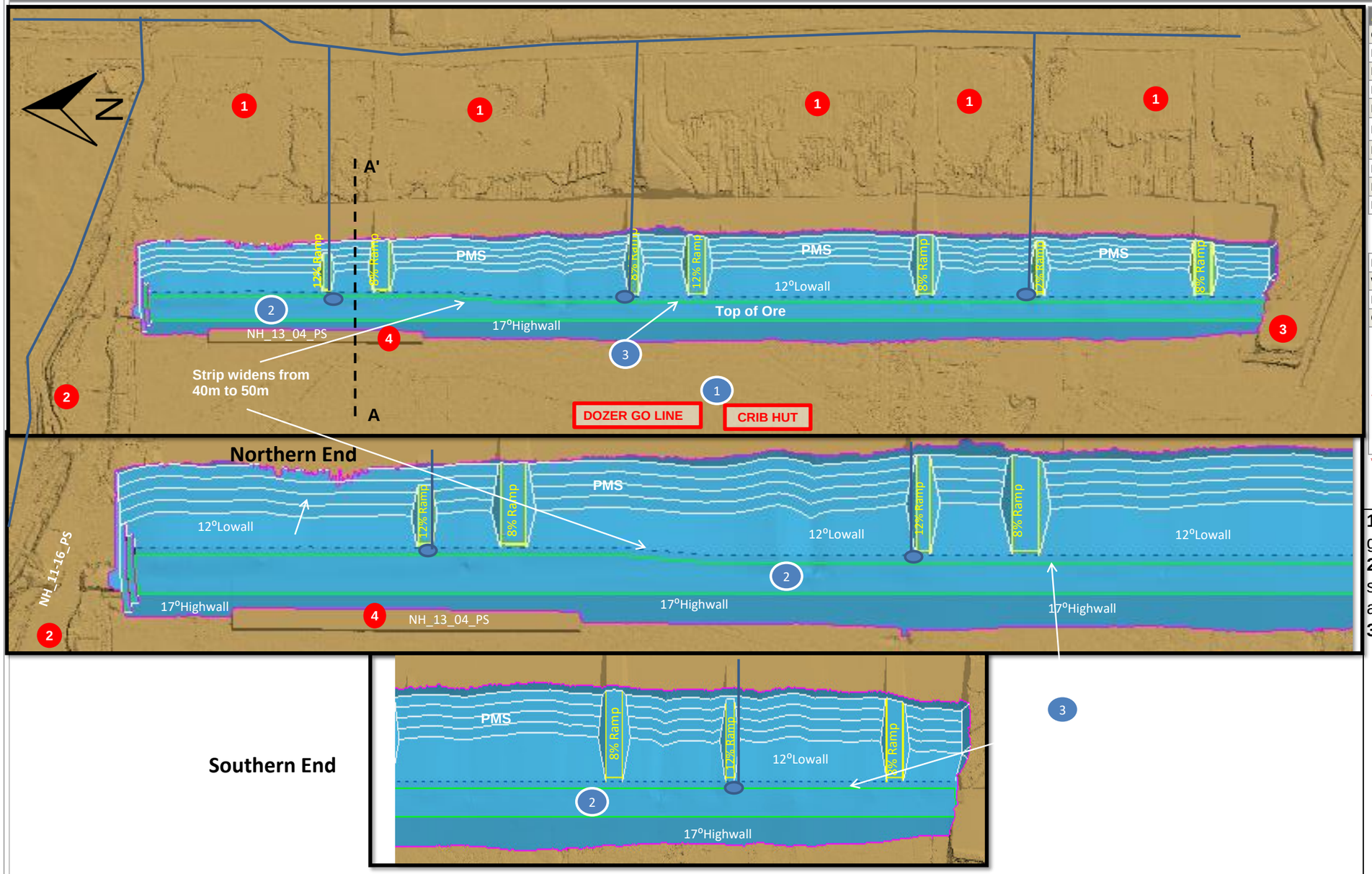
Engineer Signature: Sam Lucas Date: 19/07/2023

SET OUT CHECKLIST:	Yes/No
Vulcan:	
MORE Line updated	NA
All non-approved strings and triangulations removed	✓
DXF (strings & .00t), exported to Z:\Planning\Area_Name\01. PV3 dxfs	✓
Design strings copied for Survey - Z:\Survey\CurrentPU\grsetout.dgd.isis	✓
ProVision:	
DXF (strings & .00t, no dig polygons) uploaded	✓
All old strings and triangulations in the area removed	✓
Comms:	
Emailed to DL-MAN-GEMCO-Designs	✓
Mine Design Tracker - design status updated to "Approved"	✓
Volumes communicated to Scheduler	✓
Paper Plan:	
Upload to Sharepoint > Secured GEMCO > Production Planning > Mine Design	✓
Upload to Sharepoint > Production Planning > Short Term Planning > Plan and Forecast	✓

Engineer Signature: Sam Lucas Date: 19/07/23

9.3.2. Dozer Strip Design - Overburden Stripping

NH_13_01-04_DZ



PARAMETER	STANDARD	DESIGN
OB Thickness	Metres	<10m
Doze Mass	Wet Tonnes	1,816,499
Pit Width	> 40 Metres	40m - 50m
Highwall Angle	17°-20°	17º
Backfill Angle	10°-12°	12º
Endwall Angle	17°-25°	N/A
Ramp Width	> 30 Metres	30m
Ramp Gradient	< 10 %	8%
Flat Pad at Base of Ramp	> 15 Metres	10m
Edge of Ore Offset	5-10 Metres	10m

HAZARDS*

Backfill (Rehandle)	%	0%
Weeds	Yes/No	No
Endwall Assist	Yes/No	No
Geotech Concerns	Yes/No	No

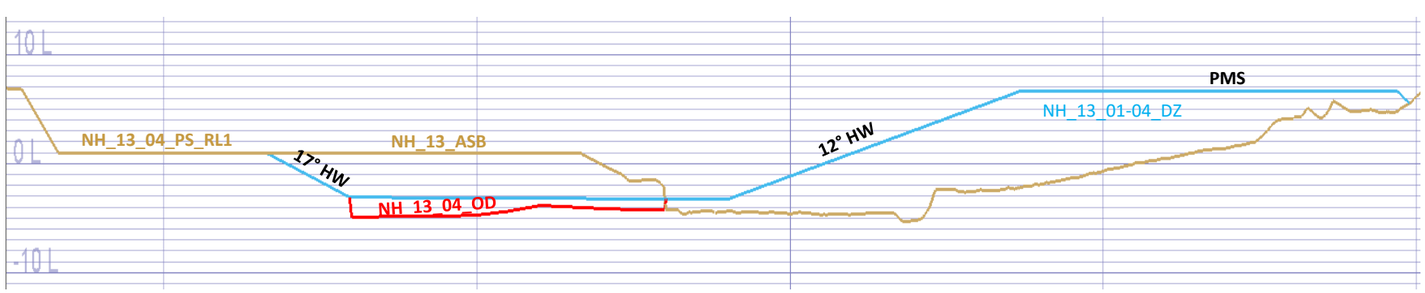
1.PMS Ready for Topsoil
2. NH_11-16 Boxcut
3. NH Southern Boxcut
4. NH_13_04_PS

*NB: Hazards indicative only - Ops inspection of area required.

INSTRUCTIONS

1. Prep Work Area. Set up crib hut and Dozer go line on the hihgwall side of the pit
2. Follow PV3 surface **NH_13_01-04_DZ**, starting from the north and working south, achieving top of ore.
3. Dig edge of ore drain along ore offset

CROSS SECTION A-A'



LEGEND

- Treeline / Topsoil
- Top of Ore Contours
- RL — Survey RLs
- / x — Bores / Exploration Drill Holes (In-situ Areas)
- Go Line and Crib Hut
- Lease Boundary / Significant Sites
- HV Roads & Accesses
- Pipelines & Pumps
- Drains
- Backfill Crest / Toe
- Rehabilitation

APPROVALS

Design Engineer: Sam Lucas
Signature: S.Lucas Date: 18/08/2023

Snr. Geology: Sam Samarua
Signature: S.Samarua Date: 26/08/2023

Snr. Short-Term Engineer: Blake Elliott
Signature: B. Elliott Date: 26/08/2023

Supt. Prod Mining: Mick Murray
Signature: Mick Murray Date: 26.8.23

NH_13_01-04_DZ

DESIGN CHECKLIST	Yes / No	Comments
Are design parameters within standard (If not, highlighted as a hazard on the plan)?	Yes	
Is HV access designed, STA-4218 compliant, and visible on the plan?	Yes	
Has an area inspection been completed with Ops stakeholders and any visual / surveyed hazards identified? Are the hazard stated in the plan?	Yes	
Is there a history of geotechnical failure in the area, or have geotechnical hazards have been identified? If so, are operational controls outlined on the plan? - Superintendent approval required	N/A	
Is mining activity within 50m of surface constraints or 200m of a TSF embankment? If so, highlight as a hazard on the plan and identify operational controls - Superintendent approval required	No	
Has previous pit/strip operations performance & reconciliation information been incorporated in the plan?	Yes	
Geology engaged - if ore is exposed, no dig poygons are shown on the plan: initials (date) in comments:	N/A	
Operations engaged and plan is operationally achievable: SG/12/10	Yes	
Other Stakeholders engaged initials (date) in comments:	Yes	
Are pit dewatering requirements shown on the plan and aligned with the longer-term water management strategy (i.e low points, pump ramps, pumping infrastructure, etc.)?	Yes	Existing dewatering in place
Does the design include allowance for pit crest access to enable inspections and lighting plant installs?	Yes	
Have design quantities* (volumes & tonnes) been checked as correct?	Yes	
Have all legend items been considered and shown on the plan?	Yes	
Have all enabling activities been identified on the plan and instructions provided for inclusion in the week and / or month plan?	Yes	3 Monthly Plan
Does the design provide >15m reversing room for the dozer fleet at the proposed dozer push crest?	Yes	
Does the design include sufficient flat areas in the backfill for paddock tipping any wet material or re-handled backfill?	Yes	
Is the pump ramp designed in for spoil fit purposes at 15m wide and 12% grade from bottom of ore?	Yes	
If cross-fall (>3%) and/or ore dip (>10%) has a strategy been approved by the Snr Engineer?	N/A	
Has a spoil balance been completed and pre-strip or post-strip required approved by the Snr Engineer?	Yes	Pre-strip design released separately for spoil pit
Is the spoil balance in the ramp area <10,000t? If not, adjust the design properly.	Yes	enough room for spoil
If post-strip is planned, is there a sufficient flat pad on the proposed ore mining ramp for a re-grade to ore?	N/A	Post not required
If post-strip is planned, is there an inset diagram showing top of ore contours for Ops dewatering guidance / context?	N/A	
Has this design been added into the Mine Design Tracker on Sharepoint?	Yes	
Is the design within an active WRAC area? Check WRAC folder and Vulcan Layer, if applicable attach the WRAC to the plan.	N/A	

Engineer Signature: Sam Lucas Date:18/08/2023

DATA MANAGEMENT:

Design Strings:	Z:\Planning\Area_Name\NH\Short Term\FY_24\NH_13\NH_13_01-04_DZ
Topography:	Z:\Planning\Area_Name\NH\Short Term\FY_24\NH_13\nh_asb_230808.00t
Cuts:	Z:\Planning\Cuts\FY24\FY23_CUTS_V3
Top of Ore:	Z:\Geology\4. Resource Modelling\3. Short Term (STGM)\PublishedSurfaces_Nth_Quarrys\1. Surfaces Tri\0723_NH_Quarry\NH_0723_Cap.srt
Post Mining Surface (PMS):	Z:\Planning\PMS 2023-BF.00t
Geotechnical Mine Design Document(s) (Sharepoint Location):	NA
TSF-specifc WRAC / TARP Document(s) (Sharepoint Location):	NA
Geotechnical Engineered Design:	NA

Engineer Signature: Sam Lucas Date:18/08/2023

SET OUT CHECKLIST:	Yes/No
Vulcan:	
MORE Line updated	YES
All non-approved strings and triangulations removed	YES
DXF (strings & .00t), exported to Z:\Planning\Area_Name\01. PV3 dxfs	YES
Design strings copied for Survey - Z:\Survey\CurrentPU\grsetout.dgd.isis	YES
ProVision:	
DXF (strings & .00t, no dig polygons) uploaded	YES
All old strings and triangulations in the area removed	YES
Comms:	
Emailed to DL-MAN-GEMCO-Designs	YES
Mine Design Tracker - design status updated to "Approved"	YES
Volumes communicated to Scheduler	YES
Paper Plan:	
Upload to Sharepoint > Secured GEMCO > Production Planning > Mine Design	YES
Upload to Sharepoint > Production Planning > Short Term Planning > Plan and Forecast	YES

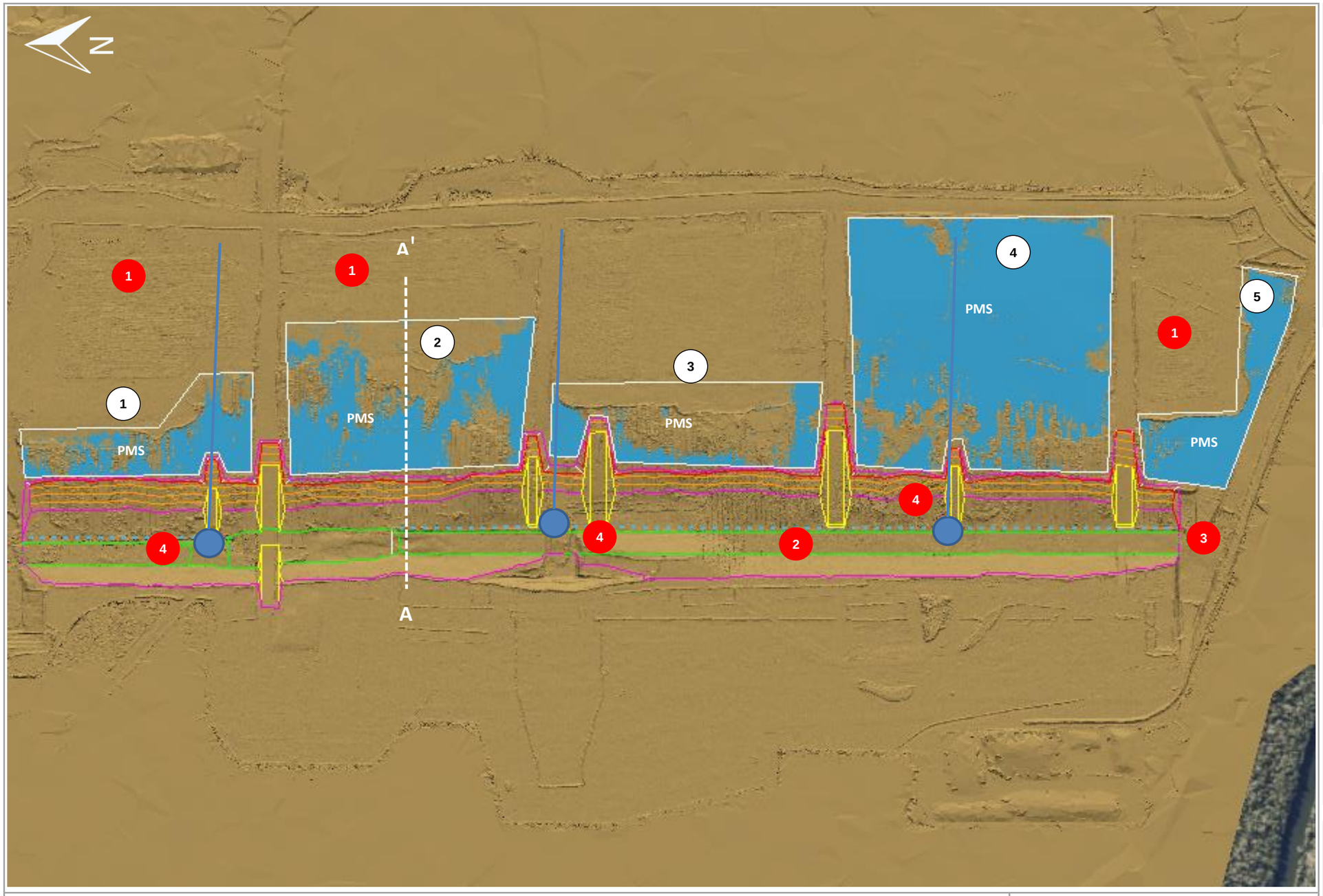
Engineer Signature: Anthony Christie Date: 26/08/2023

Dozer Volumes

	Density	Short-Term		Budget	Variance - Explain if RED.
			Wet Tonnes	Wet Tonnes	
NH_13_01-0	1.96	926,785	1,816,499		
TOTAL	**1.96**	**926,785**	**1,816,499**	**0**	

9.3.3. Backfill Dump Design - PMS Development

NH_PMS_DUMP_FEB24



PARAMETER	STANDARD	DESIGN
Dump Height	< 15 Metres	4m
Min. Tiphead Width	> 40 Metres	> 40 Metres
Cut Mass	ROMt	620,236
Fill Mass	ROMt	606,493
Repose Angle	30°	30°

HAZARDS*

Approved for Weeds	Yes / No	No
Approved for Scrap	Yes / No	No
Geotech Concerns	Yes/No	No

1. Topsoiled areas. Do not disturb
2. NH_15 dozer strip
3. NH_15-16 boxcut.
4. Active pipes and pumping infrastructure

INSTRUCTIONS

1. Follow PV3 surface
NH_PMS_DUMP_FEB24.00t

STAGES

Area	CUT TONNES	FILL TONNES
1	69,862	40,788
2	177,637	109,141
3	220,443	62,647
4	115,517	292,644
5	36,777	101,273

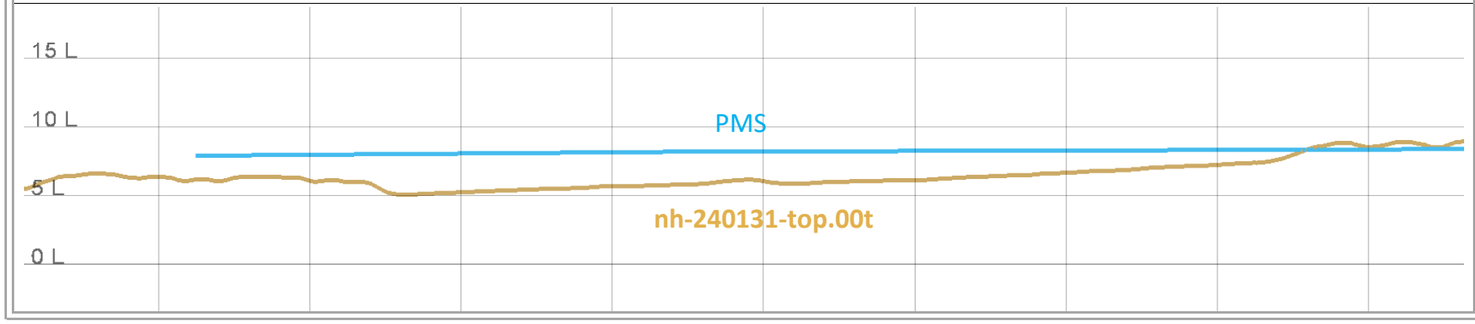
APPROVALS

Engineer Design: jtuckett — Jack Tuckett
Signature: — Date: 01/02/24

Snr. Short-Term Engineer:
Signature: Slucas — Date: 2/2/24

Supt. Prod Mining:
Signature: — Date: 2/2/24

A — CROSS-SECTION — A'



LEGEND

- Treeline / Topsoil
- Run-Off Contours
- RL — Survey RLs
- Future Cut / Future Cut Crest
- Lease Boundary / Significant Sites
- HV Roads & Access
- Pipelines & Pumps
- Drains
- Rehabilitation
- FY22 Rehab Target

NH_PMS_DUMP_FEB24

DESIGN CHECKLIST:		Yes / No	Comments
Are design parameters within standard? (If not, highlight as a hazard on the plan).		Yes	
Is HV access designed, STA-4218 compliant, and visible on the plan?		Yes	
Is the activity within 50m of a mine lease boundary or significant site? (If so, highlight as a hazard on the plan).		No	
Has an area inspection been completed with Ops stakeholders and any visual / surveyed hazards identified?	Initials (date):	Yes	
Is there a history of geotechnical failure in the area, or have geotechnical hazards have been identified? (If so, identify operational controls on the plan - Superintendent approval required).		No	
Is mining activity within 50m of surface constraints or 200m of a TSF embankment? (If so, highlight as a hazard on the plan and identify operational controls - Superintendent approval required).		NA	
Has previous pit/strip operations performance & reconciliation information been incorporated in the plan?		Yes	
Geology engaged - where there is a questionable MORE line (no future mining)?	Initials (date):		
Operations engaged and plan is operationally achievable:	SB (2/9):		
Other Stakeholders engaged	TW(2/9):		
Are pit dewatering requirements shown on the plan and aligned with the longer-term water management strategy (i.e low points, pump ramps, pumping infrastructure, etc.)?		Yes	
Does the design include allowance for pit crest access to enable inspections and lighting plant installs?		Yes	
Have design quantities* (volumes & tonnes) been checked as correct?		Yes	
Have all legend items been considered and shown on the plan?		Yes	
Does the closure surface tie-in practically with the topography and follow the annual water strategy? (If not, consult Senior Engineer).		Yes	
Does the design align with the monthly and / or annual strategy?		Yes	
If this is a tiered dump, is appropriate access to lower dump levels considered and / or maintained (HV running width)?		NA	
Is there a minimum 15m offset from active pump ramps , HV accesses and any exposed ore?		Yes	
Is there a minimum 10m offset from future mining areas (e.g. quarry pit crests, spoil room)?		Yes	
Is the dump split into stages as required to target priority areas?		NA	
Have all enabling activities been identified on the plan and communicated for inclusion in the week and / or month plan?		Yes	

Engineer Signature: Jack Tuckett jtuckett Date: 01/02/24

DATA MANAGEMENT:

Design Strings:	Z:\Planning\Dumps\FY24\Short Term\NH\NH_PMS_DUMP_FEB24
Topography:	Z:\Survey\CurrentPU\SURFACES\01-2024\Dozers\NH_15_01-04_DZ\nh-240131-top.00t
Closure Surface:	Z:\Planning\Rehab\FY24\PMS_SURFACES\NH_FY24_PMS_SS.00t

Engineer Signature: Jack Tuckett jtuckett Date: 01/02/24

Snr. Eng. Signature: Date:

SET OUT CHECKLIST:	Yes/No
Vulcan:	
All non-approved strings and triangulations removed *(peer to confirm)*	Yes
DXF (strings & .00t), exported to Z:\Planning\Area_Name\01. PV3 dxfs	Yes
Design strings copied for Survey - Z:\Survey\CurrentPU\grsetout.dgd.isis	Yes
ProVision:	
DXF (strings & .00t) uploaded	Yes
All old strings and triangulations in the area removed *(peer to confirm)*	Yes
Comms:	
Emailed to DL-MAN-GEMCO-Designs	Yes
Mine Design Tracker - design status updated to "Approved"	Yes
Volumes communicated to Scheduler	Yes
Paper Plan:	
Upload to Sharepoint > Secured GEMCO > Production Planning > Mine Design	Yes
Upload to Sharepoint > Production Planning > Short Term Planning > Plan and Forecast	Yes

Engineer Signature: Jack Tuckett jtuckett Date: 02/02/2024

Peer Eng. Signature: Date:

Area	Cut (BCM)	FILL (BCM)	Cut (Tonnes)	Fill (Tonnes)
1	35,644	20,810	69,862	40,788
2	90,631	55,684	177,637	109,141
3	112,471	31,963	220,443	62,647
4	58,937	149,308	115,517	292,644
5	18,764	51,670	36,777	101,273
Total	316,447	309,435	620,236	606,493

9.3.4. Topsoil Dump Design - Progressive Rehabilitation

NH_TS_AUG23

PARAMETER	STANDARD	DESIGN
Rehab Area	Ha	15.0
Rehab Thickness	mm	0.8
Topsoil Returned	Wet Tonnes	68,465
Row Spacing	m	20

HAZARDS*

Weeds	Yes/No	No
Geotech Concerns	Yes/No	No

1. Pipelines in area.

*NB: Hazards indicative only - Ops inspection of area required.

INSTRUCTIONS

Do not commence dumping topsoil until PMS compliance has been confirmed by Production Planning.

1. Ensure access to topsoil dump is compliant with STA-4218 and prepped.
2. Fill in any low spots within the TS dump area and prep for dumping.
3. Utilise PV enabled dozer to deep rip dump lines for T&S guidance following design NH_TS_AUG23.
4. Paddock dump topsoil toe to toe on dump lines.
5. Deep rip subsoil between windrows prior to spreading.
6. Spread topsoil from East to West incorporating stockpiled and fresh material.
7. Lightly final rip,cross rip and perimeter rip (scarify) topsoil.

STAGES

Area Approach		No
AREA	**Ha**	**TONNES**
NH_TS_AUG23	16	68,465

LEGEND

- Area to Rehabilitate
- Topsoil Rows
- Topsoil Already Placed
- Tree Line
- Mine Lease Boundary
- HV Roads & Access
- Pipelines
- Drains
- Bores
- Rehab

APPROVALS

Engineer Design: Adam Mitchell — A.Mitchell
Signature: — Date: 15/08/2023

Snr. Short-Term Engineer: Nicolas Johnston
Signature: N.Johnston — Date: 17/8/23

Supt. Prod Mining: Mick Murray
Signature: Mick Murray — Date: 17.8.23

NH_TS_AUG23

DESIGN CHECKLIST:	**Yes / No**	**Comments:**
Is HV access designed, STA-4218 compliant, and visible on the plan?	Yes	
If within 50m of a mine lease boundary or significant site, are they identified as a hazard on the plan?	No	More than 50m
Operations been engaged and the plan is operationally achievable:	Yes	
Other stakeholders engaged (e.g. Environment, RMSL teams):	Yes	
Does the design align with the monthly and / or annual rehabilitation strategy, including accessible LV tracks? Consult MT Planning if items aren't aligned with the annual rehab strategy.	Yes	
Are dewatering requirements shown on the plan and aligned with the annual water management strategy? (i.e. drains, pipeline, culvert, infrastructure installs and removals)?	Yes	
Does the design consider the geotechnical stability of the surrounding area and is no closer than 35m from existing and / or proposed pit crests and / or tipheads?	N/A	
Is the area split into stages (e.g. STG1, STG2, ...) as required for the monthly and / or annual schedule?	N/A	
Have design quantities* (volumes & tonnes) been checked as correct?	Yes	
Have all enabling activities been identified on the plan and instructions provided for inclusion in the week and /or month plan?	Yes	
Have all legend items been considered and shown on the plan?	Yes	
Has a PMS surface been provided and approved for the area (e.g. a dump plan)?	Yes	
Is the rehab designed no closer than 10m from existing and / or proposed roads?	No	
Does the design require special treatment (e.g. covers a previous road or infrastructure area, or is earmarked for remediation)? If "Yes", consult MT Planning for guidance.	N/A	
Have weeds been identified in the surrounding area? If "Yes", consult MT Planning.	N/A	

*NOTE: If design quantity variance against budget ±10%, reconcile and flag with Snr Engineer and Scheduling team.

Engineer Signature: Adam Mitchell *A.Mitchell* Date: 15/08/2023

SCHEDULING VOLUMES

Wet Density Topsoil 1.44

SHORT-TERM

	Ha	Wet Tonnes		
NH_TS_AUG23	15.8	68,465		
TOTAL	**15.8**	**68,465**		

DATA MANAGEMENT:

Design Strings:	Z:\Planning\Rehab\FY24\FY24_REHAB_PLANS\NH_TS_AUG23
Topography:	

Engineer Signature: Adam Mitchell *A.Mitchell* Date: 15/08/2023

Snr. Short-Term Engineer: Date:

SET OUT CHECKLIST:	Yes/No
Vulcan:	
All non-approved strings and triangulations removed *(peer to confirm)*	
DXF (strings & .00t), exported to Z:\Planning\Area_Name\01. PV3 dxfs	
Design strings copied for Survey - Z:\Survey\CurrentPU\grsetout.dgd.isis	
ProVision:	
DXF (strings & .00t) uploaded	
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Mine Design Tracker - design status updated to "Approved"	
Volumes communicated to Scheduler	
Paper Plan:	
Upload to Sharepoint > Secured GEMCO > Production Planning > Mine Design	
Upload to Sharepoint > Production Planning > Short Term Planning > Plan and Forecast	

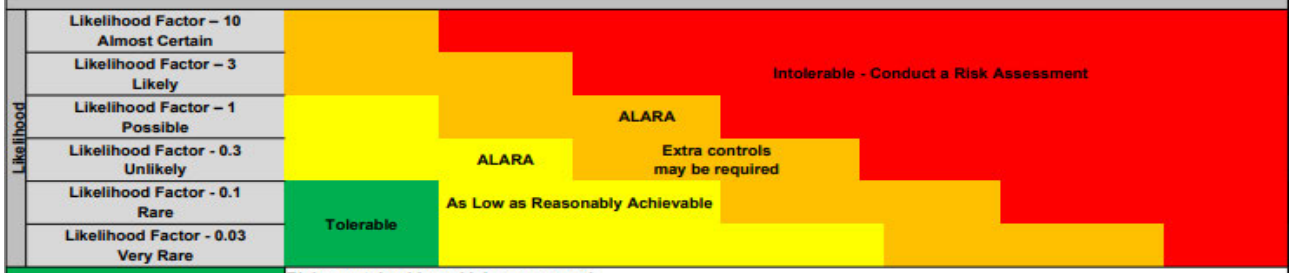
Engineer Signature: Date:

Peer Eng. Signature: Date:

9.4. Risk Assessment Matrix

Appendix C Risk Matrix

Likelihood	Severity Factor 1 Low	Severity Factor 3 Minor	Severity Factor 10 Moderate	Severity Factor 30 Major	Severity Factor 100 Severe	Severity Factor 300 Extreme	Severity Factor 1000 Catastrophic
Likelihood Factor – 10 Almost Certain	10	30	100	300	1000	3000	10000
Likelihood Factor – 3 Likely	3	9	30	90	300	900	3000
Likelihood Factor – 1 Possible	1	3	10	30	100	300	1000
Likelihood Factor - 0.3 Unlikely	0.3	0.9	3	9	30	90	300
Likelihood Factor - 0.1 Rare	0.1	0.3	1	3	10	30	100
Likelihood Factor - 0.03 Very Rare	0.03	0.09	0.3	0.9	3	9	30



	Risks are tolerable and job can proceed
	Risks are as Low As Reasonably Achievable
	Risks are as Low As Reasonably Achievable but additional controls may be required
	Intolerable - Conduct a Risk Assessment

Appendix D Severity Table

Severity table

Severity Level	Impact Types						Severity Factor
	Health[1] & Safety	Environment	Community	Reputation	Legal	Financial[2]	
7	>50 fatalities. Permanent impairment >30% of body to more than 500 persons.	Permanent severe impact/s to land, biodiversity, ecosystem services, water resources or air.	Severe, widespread community health, safety or security impacts (>1000 households) or human rights violations; complete destruction of >1000 houses or community infrastructure; complete irreversible desecration of multiple structures/objects/places of global significance.	Crisis event or publication of highly confidential material information resulting in international media, government, regulator, NGO campaigning and employee condemnation of the company (>6 months). Long term damage to company reputation.	Bankruptcy, closure / nationalisation of operations on multiple sites.	≥ US$1 billion	1000
6	>20 fatalities. Permanent impairment >30% of body to more than100 persons.	Severe impact/s (>20years) to land, biodiversity, ecosystem services, water resources or air.	Extensive community health, safety or security impacts (>200 households) or human rights violations; extended serious disruption to people's lives (>1000 households); extensive damage to >1000 houses or community infrastructure or structures/ objects/places of global cultural significance.	Crisis event or publication of confidential material information resulting in international media, government, regulator, NGO campaigning and employee condemnation of the company (< 6 months). Ongoing condemnation results in damage of the reputation of the company.	Lack of valid operating title, forced closure of an operation, competition , anti-corruption , international trade law or tax breach; Major personal injury class actions. Nationalisation of Operation by host government.	≥ US$250 million to <US$1 billion	300
5	2-20 fatalities Permanent impairment >30% of body more than 10 persons.	Serious or extensive impact/s (<20 years) to land, biodiversity, ecosystem services, water resources or air.	Serious community health, safety or security impacts (>50 households) or human rights violations; extended disruption to people's lives (>200 households), extensive damage to >200 houses or structures/ objects/places of national cultural significance.	Serious national and international negative media attention. General public and NGO adverse reaction with interest from regulators (< 3 months). Structured campaigning from employees, NGOs or communities having a major impact on the Region / Asset reputation.	Prosecutions for criminal breaches resulting in jail terms for employees or agents or defendant to major civil litigation.	≥ US$100 million to < US$250 million	100
4	Single fatality. Permanent impairment >30% of body to one or more persons.	Major impact/s (<5 years) to land, biodiversity, ecosystem services, water resources or air.	Serious community health, safety or security impacts (<50 households). Multiple allegations of human rights violations; extended disruption to people's lives (>50 households); extensive damage to >50 houses; moderate irreversible damage to structures/ objects/places of national cultural significance.	Adverse national media attention. General public and NGO adverse reaction with interest from regulators with no material outcome. Structured campaigning from employees, NGOs or communities having a major impact on the Region / Asset reputation.	Significant civil litigation.	≥ US$25 million to <US$100 million	30
3	Permanent impairment <30% of body to one or more persons. Restricted or lost days due to injury or illness.	Moderate impact/s (<1 year) to land, biodiversity, ecosystem services, water resources or air.	Moderate community health, safety or security impacts (<50 households). Single allegation of human rights violations; moderate disruption to people's lives (<50 households); extensive damage to <50 houses; moderate reversible damage to structures/objects/ places of national cultural significance.	Attention from regional media and/or heightened concern by local community. Criticism by community, NGOs or activists. Asset reputation adversely affected.	Breach of regulation. Lack of valid exploration title.	≥ US$5 million to < US$25 million	10
2	Objective but reversible impairment. Medical treatment injury or illness.	Minor impact/s (<3 months) to land, biodiversity, ecosystem services, water resources or air.	Minor community health, safety or security impacts (<10 households) or human rights infringements; inconvenience to livelihoods <6 months; moderate damage to <50 houses or community infrastructure; minor, reversible damage to structures/ objects/places of regional cultural significance.	Adverse local public or media attention and complaints. Heightened scrutiny from regulator. Asset reputation is adversely affected with a small number of people.	Minor legal issues and non-compliances with commitments.	≥US$500,000 to <US$5 million	3
1	Low-level short-term subjective symptoms or inconvenience. No medical treatment.	Low-level impact/s to land, biodiversity, ecosystem services, water resources or air.	Single low level community health, safety or security impact; low-level inconvenience <2 weeks; minor, reversible, low-level disturbance or minor damage to a single house or structure/object/place of regional cultural significance.	Public concern restricted to local complaints. Low-level interest from local media and/or regulator.	Low-level legal issue.	<U$500,000	1

(1) Impairment to be determined using the American Medical Association Guide to Permanent Impairment.
(2) Where the financial impact is expected to be a one-off amount, it must be calculated as the resultant change in the Earnings Before Interest and Tax (EBIT) in that year. Where the financial impact is expected to be an ongoing annual reduction in EBIT, it must be calculated as the Net Present Value (NPV) of those future reductions in EBIT. Where South32 is the operator the impact is taken as 100%

Appendix E: Likelihood Table

Likelihood Table			
Uncertainty	**Business** Based on South32 and industry experience and expected future conditions, the risk event:	**Projects** Based on South32 and industry experience and expected future conditions, with similar studies or projects, the risk event:	**Likelihood Factor**
Almost Certain	Could be incurred more than once in a year.	Could be expected to occur more than once during the study or project delivery.	**10**
Likely	Could be incurred over a 1 - 2 year budget period.	Could easily be incurred and has generally occurred in similar studies or projects.	**3**
Possible	Could be incurred within a 5 year strategic planning period.	Incurred in a minority of similar studies or projects.	**1**
Unlikely	Could be incurred within a 5 - 20 year time frame.	Known to happen, but only rarely.	**0.3**
Rare	Could be incurred in a 20 - 50 year timeframe.	Has not occurred in similar studies or projects, but could.	**0.1**
Very rare	For a system failure: This consequence has not happened in the industry in the last 50 years. For a natural hazard: The predicted return period for a risk of this strength/ magnitude is one in 100 years or longer.	Conceivable, but only in extreme circumstances.	**0.03**

9.5. GEMCO Standards

ENVIRONMENT AND CLIMATE CHANGE STANDARD

DOCUMENT TYPE	STANDARD	DOCUMENT ID/NO.	
Applicability	Global ✓	Operation ☐	Function ☐
If Operation or Function specific			
Effective from	25 May 2015		
Document Owner	Danie Murray	Title:	Vice President, Technical & HSE Stewardship
Approved by	Vanessa Torres	Title:	Chief Technical Officer
Version No.	5.0	Status:	Approved for Use
Date approved	22 December 2022		
Next review date	21 December 2024		

REVISION HISTORY

Version No.	Approval Date	Approver	Description
1.0	25/05/2015	Graham Kerr	New – Approved for Use
2.0	21/01/2016	Graham Kerr	Modifications to wording of 'no-go' statements within the Environment Commitment section.
3.0	31/10/2017	Graham Kerr	Addition of 'Water Resources' and 'Land, Biodiversity and Rehabilitation' sections, as well strengthening connection with business planning process in relation to GHG emissions forecasting and abatement opportunities.
4.0	20/10/2020	Graham Kerr	Addition of minimum performance requirements for common environment risks and increased focus on waste stewardship (new section) and biodiversity (inc. adoption of no net loss requirement for major expansions and new projects)
5.0	22/12/2022	V Torres	Updated and renamed

ACKNOWLEDGEMENT TO COUNTRY

We acknowledge and pay our respects to the Indigenous, Traditional and Tribal Peoples of the lands, waters, territories, and cultural landscape on which South32 is located and where we conduct our business.

We acknowledge and respect the unique cultural and spiritual relationships that Indigenous, Traditional and Tribal Peoples have to the land, waters, and territories, and that these relationships underpin their physical, spiritual, cultural, and economic well-being.

We respect the collective rights of Indigenous, Traditional and Tribal Peoples, including the right to self-determination, and the right to enjoy and maintain their traditional knowledge, distinctive spiritual practices, and traditional way of life.

Contents

1. Purpose

In line with the South32 Purpose, Code of Business Conduct and Breakthrough # 6, we commit to creating value for our owners and partners through environmental and social leadership. The Environment and Climate Change Standard is a key foundation to enable the business to deliver on these strategic objectives, whilst also supporting the management of the South32 Climate Change and Environment strategic risk.

2. Scope and Application

The Standard sets the minimum expectations for all operations under the operational control of South32, who must implement and demonstrate full conformance with the requirements within the agreed implementation period (18 months from date of approval). Beyond the requirements of the Standard, it is expected that operations will implement additional measures and controls to ensure conformance with local regulatory requirements and management of environmental and climate change risk exposures.

Application to Greenfield Exploration and Operations in Care & Maintenance / Closure

Exploration activities and operations subject to 'care and maintenance' or 'closure' are required to undertake baseline risk review and develop a corresponding Environment Management Plan (EMP) for internal purposes that adequately addresses all identified environmental exposures. The management measures are to be developed consistent with Sections 7 and 8.1 and be informed by Performance Standards provided in Appendix C, other Sections of the Standard to be applied as appropriate. The Plan should also address all relevant local regulatory requirements and be authorised in accordance with Appendix A.

Application to Studies and Major Projects (e.g. Type B and C)

Studies and Major Projects are required to undertake a baseline risk review and develop a corresponding Environment and Climate Change Management Plan (ECCMP) for internal purposes that adequately addresses the identified environment and climate-related exposures. The management measures should be informed through application of the *Environmental Requirements for Projects Guideline* (where appropriate) and the physical impacts of climate change assessments (Section 8.2), whilst also addressing relevant local regulatory requirements and future approval needs. The ECCMP is to be authorised in accordance with Appendix A.

The risk profile and associated ECCMP is to be subject to a review and update prior to each investment tollgate, progressively increasing in level of maturity and conformance to this Standard through each study phase with the forward study work program (for future study phases) addressing the remaining gaps to ensure full conformance at point of transition to 'operational' phase.

Application to non-operated Joint Venture Operations

This Standard does not apply to non-operated JV operations, however, should be used to inform and influence environmental management practises, where appropriate, to ensure environmental outcomes are consistent with the intent of this Standard and the broader South32 Purpose and Sustainability Policy.

3. Key contacts

Angela Vanstone, Senior Manager Environment

4. Review of this document

This Standard will be reviewed as necessary by the Document Owner, but no less frequently than every three years.

5. References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Document ID/No.	Title
Link	Sustainability Policy
Link	Health Standard
Link	Social Performance Standard
Link	Dam Management Standard
Link	Closure Standard
Link	Risk Management Standard
Link	Health, Safety, Environment, Community (HSEC) Reporting Standard
Link	Supply Standard
Link	Asset Management Standard
Link	Training Standard
Link	2nd Line Stewardship Standard
Link	Contractor Management Standard
Link	Sustainability and Business Conduct Supplier Requirements
TBA	Environment Requirements for Projects Guideline

6. Terms and definitions

For the purposes of this document, the following terms and definitions apply:

Term	Meaning
Area of Influence	The boundary that takes into account South32's business activities, and their potential direct, indirect and/or cumulative impacts on the environment. The area of influence may vary depending on the type and severity of environmental impact being considered within the regional context (e.g. air shed, water catchment, bioregion), and if relevant based on the risk profile, consider other 'outside of the gate' factors such as port, shipping or transportation activities through highly sensitive areas. These must align to the HSEC Reporting Standard, Appendix 4: Decision tree for reporting boundary. As a minimum, the area of influence should include: – South32 operational footprints including land owned, managed and leased. – Extent of potential impacts associated with executing activities associated with the operation (inclusive of potential cumulative and/or indirect impacts), including but not limited to: o water catchments that the operation interacts with (i.e. extracts from or discharges into, etc). o groundwater systems that the operation interacts with (i.e. dewatering, injection, drawdown etc). o external waste disposal facilities associated with the operation (including port facilities). o the extent of the airshed that the operations interact with. o the bioregion in which the operation is located within.
Environmental Data	Data associated with environmental monitoring programs such as: – Air Quality, including Ambient and Point Sources. – Surface and Groundwater, including chemistry and physicals (e.g. depth, pressure etc). – Land and Biodiversity, including rehabilitation performance and soil monitoring where relevant. – Weather conditions, either sourced from on-lease monitoring or public monitoring stations. – Energy and greenhouse gas (GHG) Emissions.

Term	Meaning
Key Environmental Features	– Owned, leased or managed land as well as activities under South32 operational control. – Contaminated sites (confirmed, inferred or potential). – Designated protected areas and high conservation value areas (incl. designated offset areas) via IBAT. – Distribution of IUCN red list and other listed threatened species (e.g. State or Federally listed). – Sensitive human receptors, including host communities. – Water resources (natural sources of surface and sub-surface water, irrespective of quality, that sustain ecosystems, communities and/or are utilised for recreational, agricultural or other commercial purposes) and water catchments. – Areas of potential acid forming materials or other mineralisation with potential HSEC impacts (for example, asbestos) as defined by recognised standards (for example, INAP: The International Network for Acid Prevention: Global Acid Rock Drainage Guide). – Areas of stockpiled materials required to support rehabilitation. – Areas of cultural significance, including archaeological and anthropological sites. – Other activities (e.g. other resource extraction, agriculture) with potential cumulative or indirect impacts.
Risk assessment	Risks must be assessed in consideration of: – South32 Risk Management Standard. – Current and reasonably foreseeable activities consistent with the integrated planning process (life of operations, medium term etc) through to closure of the operation. – Impacts to land and biodiversity, heritage, air and water quality, climate change (see Physical Impacts of Climate Change below), noise, vibration, light, erosion, amenity, acid rock drainage, salinity, radioactivity, metal leaching, mined waste rock and waste disposal. The identified risks must be suitably integrated into the operational risk management process.
Physical Impacts of Climate Change	Risk assessments should also identify South32's potential exposure to the physical impacts of climate change with aim to enhance operational resilience, ensure business continuity and inform investment planning via the integrated planning process. Factors considered as part of the assessment include: – acute risks from the increased frequency and/or severity of extreme weather events such as floods; – chronic risks from longer-term changes in climate patterns (e.g. sustained higher temperatures, drought). The assessment is to be undertaken in line with the methodology in *Operations Manual, Physical Impact of Climate Change Risk Assessment Program (South32, 2022).*
Greenhouse gas (GHG) emissions	For our reporting purposes, GHG emissions are the combined anthropogenic emissions of carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), perfluorocarbons (PFCs) and sulphur hexafluoride (SF6). They are measured in carbon dioxide equivalent (CO2-e). Hydrofluorocarbons (HFCs) GHG emissions are currently not relevant for our reporting purposes. – Scope 1: GHG emissions from our own operations, including self-generated electricity (on-site). – Scope 2: GHG emissions associated with the generation of purchased electricity (external). – Scope 3: GHG emissions that are associated with carbon emissions in our value chain.
Important biodiversity and/or ecosystems	Determined taking into account: – Regulatory requirements. – IUCN Protected Areas Categories I - VI (refer to World Database on Protected Areas (WDPA) under IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (2012), sections GN93 and GN94). – Reasonable stakeholder expectations. – World Database on Key Biodiversity Areas (KBAs).
Water Resource Threat and Opportunity Analysis	Analysis to include: – Risk screening using the World Resource Institute 'Aqueduct Water Risk Atlas' tool. – Internal factors such as projected water sourcing, dewatering, discharge, and storage requirements and how these will likely change over the life of operation (informed by value of water assessment). – External factors such as physical impacts of climate change, stability of regulatory framework, community issues and cumulative impacts/needs associated with the water catchment area. Risk screening to be based on a minimum 10-year time horizon, with level of risk to be assessed in accordance with the South32 Risk Management Standard.

Term	Meaning
Biodiversity Threat and Opportunity Analysis	Analysis to include: – Location of the operation with respect to declared biodiversity hotspots or areas of high conservation value (located within or adjacent to), and likely interaction with IUCN species and habitats, including number of species and their conservation status (IUCN Red List). – Outputs from the IBAT assessment, including Species Threat Abatement and Restoration (STAR) ratings. – Internal factors such as the nature of operation (mine, fixed footprint etc) and total lease area and projected disturbance footprint. Information to be sourced from the Life of Operation Plan. – External factors such as physical impacts of climate change, stability of regulatory framework, community issues and cumulative impacts/needs associated with the bioregion. Risk screening to be based on a minimum 10-year time horizon, with level of risk to be assessed in accordance with the South32 Risk Management Standard.
Value of Water Assessment	The assessment process designed to understand the future water needs of the operations and/or project and assess the risk / value to production associated with the projected water sourcing, dewatering and discharge requirements. The process incorporates: – Water resource forecast for the life of operation/project. – Climate risk factors, adapted from the World Resources Institute Water Risk Aqueduct tool. – Environmental, social and cultural risks factors. The process also enables alternate options (to de-risk the plan) to be evaluated using the above criteria.
Decarbonisation Principles	1. Protect and unlock value: we will prioritise decarbonisation options that protect and unlock value, such as those that: – reduce operating and carbon costs – mitigate commercial risks; or – enhance our competitive position in a low-carbon economy. 2. Optionality: we will – Make short-term decisions that support the most value accretive long-term approach to the transition. – Preserve optionality and match our decarbonisation options with the evolution of energy markets and technology. 3. Mitigation Hierarchy: we will use the mitigation hierarchy in evaluating options to deliver our mid-term commitment and reach net-zero: – Avoid // Design projects to avoid creating emissions. – Mitigate // measures designed to reduce the intensity or amount of GHG released to the atmosphere from existing facilities. – Offset // retirement of credit credits to offset residual GHG emissions. – Our approach to decarbonisation applies the mitigation hierarchy. This means we prioritise avoidance of emissions and, where avoidance is not possible, we mitigate GHG emissions through efficient initiatives or transition to low-carbon energy. We intend only to use voluntary carbon offsets after these options have been fully explored. Carbon credits may be used to comply with regulatory requirements in South Africa and Australia. 4. Just transition: we will support a fair, equitable and inclusive transition for our people, communities and other stakeholders in accordance with our Just Transition guiding principles referenced in South32's Climate Change Action Plan.
Hierarchy of Controls	To be applied to all environmental and climate change risks when developing and accessing adequacy of controls, refer Annexure B.
Rehabilitation Resources	Includes all materials required to undertake rehabilitation activities, includes resources such as: Overburden, Topsoil, Mulch, Felled vegetation, and alternate growth media and/or artificial habitat structures.
No Net Loss and Biodiversity Mitigation Hierarchy	No net loss is a goal for a development project/activity in which the impacts on biodiversity it causes are balanced or outweighed by measures taken to avoid and minimise the impacts, to restore affected areas and finally to offset the residual impacts, so that no loss remains. The outcome is enabled through the application of the Biodiversity Mitigation Hierarchy, refer Annexure B.

Term	Meaning
Source Pathway Receptor Model	 When risk assessing the aspect, ensure consideration that there may be multiple *Sources, Pathways, Receptors and Consequences* also that some receptors could eventually act as new or additional pathways.
ICMM	International Council on Mining and Metals (ICMM) was founded in 2001, as a CEO-led leadership organisation, to improve sustainable development performance in the mining and metals industry.
Waste Mitigation Hierarchy	The waste management hierarchy is a conceptual framework designed to guide and rank waste management decisions at both the individual and organisational level. Refer Annexure B.
Integrated Planning Process	Encompasses life of operation, medium term and short-term planning and budgeting processes. For more detail, refer to the Integrated Planning Procedure.

7. General Requirements

The following requirements provide an environmental management framework that ensures appropriate focus and accountability, continuous improvement and a standardised process is in place that prevents environmental harm and demonstrates best-practice environmental management. The general requirements section is modelled on the International Organisation for Standardisation (ISO) 14001 Environmental Management System Standard and complements the ICMM Sustainable Development Principles and Performance Expectations and the Ten Principles | UN Global Compact.

7.1 Leadership and Accountability

Consistent with the requirements of the South32 Sustainability Policy, the South32 Senior Leadership Team demonstrate leadership and accountability by ensuring that:

- plans, objectives and targets for the improvement of environmental and climate change performance is established, communicated and implemented;
- activities required to meet external commitments related to environmental and climate change aspects (e.g. contextual water targets, emission reduction targets etc) are adequately planned and resourced;
- resources necessary to achieve conformance with the requirements outlined within this Standard (including management of environmental risks) and applicable local regulatory requirements have been identified and adequately provisioned for, supported by clearly defined roles and responsibilities;
- individuals are empowered and expected to stop work where there is a threat to the environment; and
- action is taken to address breaches or non-compliance with external and internal environmental requirements.

In addition, at operational level:

- the Vice President Operation (or equivalent role for Greenfield Development Projects) shall appoint a process owner who will have accountability for governing the implementation of this Standard at their respective operation.

7.2 Risk Identification and Management

Complementing the Risk Management Standard, processes shall be in place that ensure:

- All relevant personnel are involved in risk identification and assessment processes, such as environmental and other relevant subject matter experts and operational personnel who interact with and/or influence environmental and climate change performance outcomes.
- All relevant environmental and climate change risks must be included on each operation / function / project's baseline risk profile. The risk profile must be reviewed on an annual basis (or investment tollgates for projects/studies) and be informed through assessment of:
    - Local and regional context (refer Section 8.2.1 & 8.2.2), including cumulative impacts.
    - Current environmental performance.
    - Regulatory compliance and stability of legislative framework.
    - Exposure to the common environmental risk areas (refer Section 8.2.4) and application of the source-pathway-receptor model.
    - Analysis of significant internal and external environmental events and hazards, including physical impacts of climate change (refer Section 8.2.3).
- All risks that meet the materiality threshold (as defined within Risk Management Standard) and/or relate to the common environmental risk areas (refer Section 8.2.4) are managed within Global360. Note: for risks associated with the common environment risk areas that are below the materiality threshold, the following fields should be populated in Global360 at a minimum:
    - Risk type, family and category.
    - Risk event title and description.
    - Risk causes and impacts.
    - Risk ratings (i.e. impact levels and residual risk rating).
    - Risk owner and status.
    - Current controls including control name, control description, control owner and control status (note: Control Performance Standards are only required for risks that meet the materiality threshold, as defined within the Risk Management Standard).
- Controls are identified, developed, and implemented to reduce risk as low as reasonably practicable (ALARP), with control design informed through application of the:
    - relevant mitigation hierarchy (per Appendix B).
    - performance standards for the common environment risk areas (per Appendix C).

7.3 Improvement Planning

Processes shall be in place to enable and drive continuous improvement relevant to environmental and climate change performance, at both Group and Operational level. This includes ensuring:

- key environmental and climate change performance targets and objectives are incorporated into (where relevant):
    - Business Scorecard and Key Performance Indicators (KPIs).
    - Integrated Planning and Business Planning (and budgeting) Process.
    - Local Environment Improvement Plans (EIPs), where appropriate;
- processes to monitor progress against the agreed plans are in place and occur at regular intervals or whenever there is a change to activities or operating conditions; and
- reward and incentive schemes (where in place) are designed such that environment performance is not compromised in order to maximise the financial reward.

7.4 Legal and Other Requirements

Processes shall be in place to ensure that all applicable environmental legal and other obligations are met. Obligations are to be identified and evaluated for compliance and documented in a register.

- At a Group level, the register must:
  - list all relevant external commitments and regulatory requirements associated with environmental performance that apply at either a 'whole of portfolio' or 'regional' level (e.g. ICMM performance expectations, NGER reporting obligations etc);
  - define the processes in place that address the commitment/s and regulatory requirements; and
  - be checked regularly for currency.
- At an Operational level, the register must:
  - list all environmental licences, permits, authorisations and approval documents issued to the operation by an external authority, including expiry/renewal dates;
  - define the approach and accountability for maintaining compliance with each requirement, commitment and/or obligation associated with the above documents;
  - be checked regularly for currency;
  - include or provide reference to records that show periodic evaluation of compliance, with actions to be loaded and managed through Global360 to address identified gaps; and
  - be accessible to relevant personnel, with changes or updates communicated as appropriate.
- At both Group and Operational level, processes must be in place to monitor, assess and respond to environmental regulatory reform within the jurisdictions in which we operate.

7.5 Communication and Consultation

Processes must be in place to ensure the workforce is:

- engaged in understanding their role in the effective management of relevant environmental and climate change aspects; and
- involved in environmental and climate change hazard identification, risk assessment, workplace inspections and event investigations.

7.6 Document Control and Data Management

- Documents and procedures related to environmental and climate change management must be:
  - reviewed and approved by authorised and competent personnel;
  - current, dated, controlled by revision and readily available to relevant stakeholders;
  - maintained in accordance with local regulatory requirements; and
  - managed in accordance with local Document Control processes.
- EQuIS must be used to manage all environmental data collected to inform and report on performance and compliance. Authorisations must be in place for the use of an alternate data management system (refer to authorisations table in Appendix A).
- Data governance routines shall be documented and in place for all environmental data (type and frequency commensurate with the risk exposure), including processes to:
  - Monitor equipment health (if using field and/or real-time instrumentation).
  - Monitor and address data upload issues into EQuIS.
  - Respond to current/emerging monitoring trends to minimise risk exposure and ensure regulatory compliance is maintained.
  - Assess and drive improved environmental performance, including improvements in data accuracy.

7.7 Training and Competency

In accordance with the Training Standard, training programs focussed on key environmental and climate change management aspects shall be developed and periodically reviewed. At a minimum, the programs must:

- Be informed by an environmental training needs or skills analysis based on delivery of business plan and mandate deliverables and applicable legislative requirements.
- Include induction packages and activity/aspect specific trainings packages (informed by the training needs and skills analysis), designed commensurate with level of environmental risk exposure.
- Incorporate processes to assess and verify competency (where appropriate), with records maintained and accessible via the Learning Management System (LMS), or equivalent.

7.8 Change Management

Processes shall be in place to manage change to ensure associated environmental and climate-related risks are managed appropriately. At a minimum, the change management process should:

- identify any change relating to people, plant, procedures, products, services or processes that could impact the environment, emissions profile or climate resilience of the operation;
- assess new hazards and/or increased risks of existing hazards to the environment resulting from a change and develop appropriate controls; and
- include consultation with all interested and affected personnel.

7.9 Contractor and Supplier Management

Operations, Functions, Projects and Greenfields Exploration shall ensure that they meet the requirements of the Contractor Management Standard and the Contractor Management Responsibility Assignment Matrix, and ensure:

- work is planned and controls are in place to minimise risk to the environment, including appropriate supervisions and verification processes commensurate with the risk exposure; and
- training, competency and qualification requirements relevant to environmental tasks/activities being performed are determined and in place prior to commencement of work.

Where appropriate, mechanisms shall be established to enable procurement of environmental performance and GHG reporting data of vendors and suppliers (existing and prospective) to inform:

- supplier assessment and selection processes; and
- GHG emissions reporting.

7.10 Event Reporting and Investigation

In accordance with the HSEC Reporting Standard, processes shall be in place to ensure:

- all hazards, near misses and events with an environmental consequence (actual or potential) are promptly reported and recorded in Global360, inclusive of regulatory compliance related matters; and
- significant environmental events are investigated (by appropriately trained personnel), actions identified and managed through Global360, and learnings shared.

7.11 Management Review

A management review process shall be in place to ensure the continued suitability, adequacy and effectiveness of environmental and climate change plans and programs in meeting business and operational objectives. The management review shall form a part of the annual business planning and alignment process, include senior management representation and give consideration to:

- the extent to which the current plan, objectives and targets have been met;
- changes in internal and external context, such as changes in operational development path (LoOP) and legislative reform processes, that could influence the business' future environmental and climate change performance;
- threats and opportunities identified within the integrated planning process and risk registers;
- information on environmental and climate change performance and trends taking into consideration data from events (internal and external), monitoring programs, regulatory compliance, and audit/assurance results;
- adequacy of resources to execute required environmental and climate change management activities, including external commitments; and
- opportunities for continual improvement.

8. Environmental and Climate Change Performance Requirements

8.1 Environmental Commitments

We protect the environment in a way that demonstrates our values and are aligned with the ICMM commitments for mining and protected areas.

8.1.1 Exploration and extraction of resources must not occur within the boundaries of World Heritage listed properties.

8.1.2 Exploration and extraction of resources must not occur adjacent to World Heritage listed properties unless internal (Appendix A) and external approvals are obtained.

8.1.3 Exploration and extraction of resources must not occur within or adjacent to the boundaries of International Union for Conservation of Nature (IUCN) Protected Areas Categories I to IV unless internal approvals (Appendix A) and external approvals are obtained.

8.1.4 Exploration and extraction of resources must not occur within or adjacent to the boundaries of any protected area defined under legislation unless internal (Appendix A) and external approvals are obtained.

8.2 Environmental and Climate Resilience Management

We understand our local and regional context and have processes in place to ensure we minimise adverse environmental impacts and remain resilient to changes in climate conditions.

8.2.1 Identify and map key features within the area of influence in accordance with the definition referenced in section 6.

8.2.2 Establish the baseline or reference conditions for land, biodiversity, water resources and air within the area of influence.

8.2.3 Assess potential physical impacts of climate change across all South32 operations, supply chain, and design stages of studies and projects using current climate modelling data. The assessment shall be undertaken at a frequency commensurate with risk exposure, with outcomes incorporated (where relevant) into:

- Operational and Group-level Risk Registers (including studies and projects).
- Integrated Planning Process (including closure planning processes).
- Resource and Reserves Governance.

8.2.4 Use the suite of minimum performance requirement (Appendix C) to inform management of common environmental risk areas (as relevant to the operation/project, based on risk profile):

- Air Emissions Management
- Contamination Prediction and Management
- Rehabilitation and Biodiversity Management
- Water Management
- Waste Management
- Environmental Approvals Planning and Governance.

8.3 Energy and Decarbonisation Planning

In pursuit of South32's emission reduction target and net zero goals, we apply the decarbonisation principles to protect and unlock value for the business whilst supporting a fair and equitable transition for our people and communities.

8.3.1 Maintain GHG emissions forecast/s for the life of operation that is:

- Inclusive of Scope 1, 2 and 3 emissions.
- Aligned with operational performance, regulatory requirements, capital allocation and external supply contracts.
- Embedded in the integrated planning process (or with study/project documentation for Major Projects).

8.3.2 Identify, prioritise and provision for energy sourcing, energy efficiency and emission reduction initiatives within the integrated planning process (or project scoping for studies, major projects) that:

- Appropriately mitigate risks such as resource access, operational, carbon liability, value chain and product marketing.
- Are consistent with the decarbonisation principles and South32's Climate Change Action Plan (CCAP).
- Support delivery of our regulatory requirements and public targets, goals and commitments.
- Are evaluated using internal carbon pricing protocols.

8.3.3 Identify impacts, opportunities and mitigation measures for our people, communities and other stakeholders to support a just transition, integrating the outcomes into decarbonisation and business planning processes.

8.4 Water Stewardship

We manage water resources using a holistic approach to promote better water use, effective catchment management and contribute to improved water security and sanitation.

8.4.1 Every 5 years (minimum), undertake a water resource threat and opportunity screening process to identify and assess socio-environmental factors relevant to the water catchment/s and how these could potentially impact future operational water needs/requirements. The outputs are to inform:

- Operational and/or project risk profiles.
- 'Value of Water' assessment process (e.g. inform risk factors applied within the assessment).
- Opportunities to collaborate and promote improved stewardship outcomes within the catchment.

8.4.2 As part of the integrated planning process, undertake/maintain a Value of Water assessment related to the water sourcing, dewatering and discharge requirements for the life of operations. Outputs are to inform:

- Operational and/or project risk profiles.

- The prioritisation and provisioning of water-related infrastructure and sourcing strategies.

8.4.3 Maintain an operational and/or project water balance, that is:

- Aligned with the requirements of Minerals Council of Australia (MCA) Water Accounting Framework.
- Maintained commensurate with the operational and/or project risk profile, including annual verification processes to ensure accurate allocation of 'type' based on water quality (e.g. Type 1, Type 2, Type 3).
- Used to inform the Value of Water assessment (e.g. input into the water resource forecast).

For Operations with a water-resource related Material Risk

8.4.4 Identify and implement controls that must:

- Use the 'water management' minimum performance requirements (Annexure C) to inform design, implementation and verification (noting application will vary based on local context).
- Where relevant, consider potential socio-environmental factors within the catchment (including future climate risks) and how these could influence the catchment over the life of the operation.

8.4.5 Develop and execute site specific contextual water target/s or objective/s that:

- Consider and support the management of the water-resource related Material Risk and/or the broader stakeholders and catchment needs.
- Is authorised in accordance with Appendix A.

8.5 Biodiversity and Land Stewardship

We manage Biodiversity and Land through an integrated land use planning process designed to protect ecosystem services and biodiversity values for future generations.

8.5.1 Every 5 years (minimum), undertake a biodiversity threat and opportunity screening process to identify and assess land and biodiversity related factors relevant to the bioregion and how these could potentially impact future operational needs/requirements. The outputs are to inform:

- Operational and/or project risk profiles.
- Identification, prioritisation and provisioning for strategic land acquisitions, mitigation measures, conservation initiatives (inclusive of biodiversity research) and/or progressive rehabilitation activities required to minimise the identified operational risks.
- Opportunities to collaborate and promote improved land and biodiversity outcomes within the bioregion.

8.5.2 For all Greenfield Development and Life Extension Projects that involve land clearing, a Biodiversity Mitigation Strategy must be in place that articulates operational controls and conservation initiatives that the project and/or major expansion will undertake to demonstrate alignment with South32's commitment to 'no net loss' for these types of projects. The strategy must be:

- Aligned with the Biodiversity Mitigation Hierarchy.
- Authorised by Vice President Operations (or equivalent role for Type C projects).
- Integrated into project / operational planning and budgeting processes.

For Operations with a biodiversity-related Material Risk

8.5.3 Identify and implement controls that must:

- Use the 'rehabilitation and biodiversity management' minimum performance requirements (Annexure C) to inform control design, implementation and verification (noting application will vary depending on local context).

- Where relevant, consider the potential cumulative impacts on ecosystem functionality and associated biodiversity aspects from land use in the surrounding area, including projected changes associated with climate and regional development and how these may influence the surrounding land use over the life of the operation.

8.6 Waste Stewardship

We manage our waste streams to minimise environmental impact and realise value.

8.6.1 Identify, classify and record wastes generated and/or managed on site, with management of each waste stream informed through application of the waste mitigation hierarchy.

8.6.2 Maintain a 'waste-generation' forecast for the life of operations within the integrated planning process, with the forecast used to inform:

- Operational and/or project risk profiles.
- The identification, prioritisation and provisioning for future waste storage (internal or external) and associated infrastructure requirements.

8.6.3 Implement governance processes (risk-based) to verify the treatment, handling and disposal of waste is being undertaken in accordance with local jurisdiction and/or specific company requirements where stipulated (inclusive of on and off-site waste management).

9. Assurance

Complimentary to the 2nd Line Stewardship Standard, processes shall be in place to ensure:

- 1st line verification has been established to ensure environmental processes are implemented, and controls are effective; and
- site based inspection, testing and verification activities are identified, scheduled and recorded.

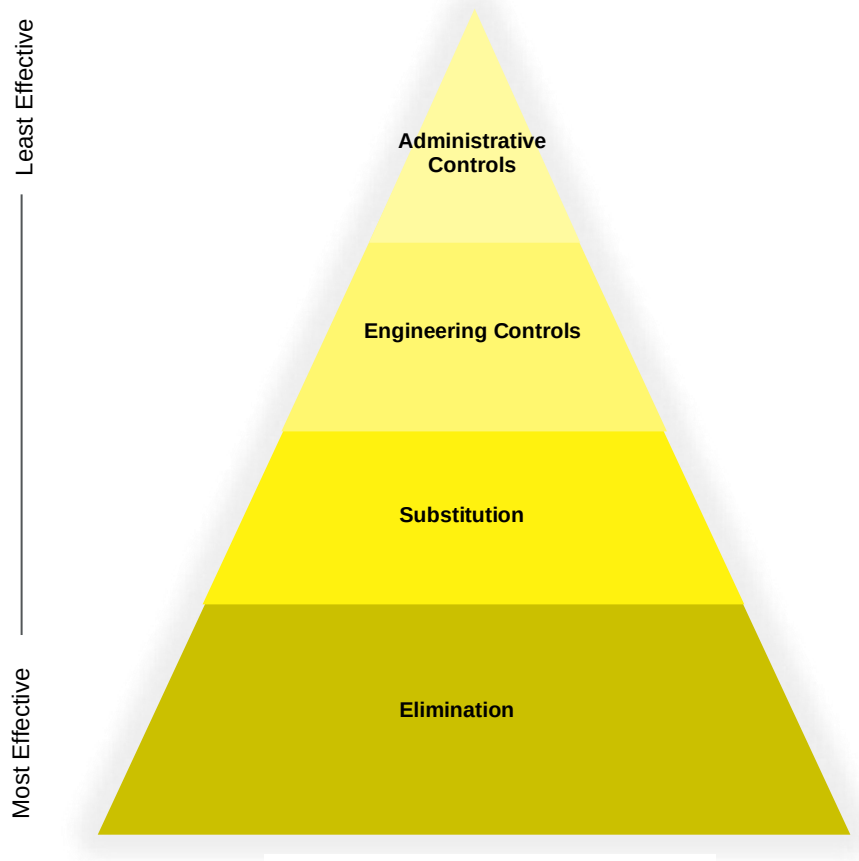
The Environment Function shall ensure a 2nd line stewardship program is established to monitor conformance with requirements set out in this Standard and identify material gaps in 1st Line controls and processes.

Appendix A – Environmental Authorities

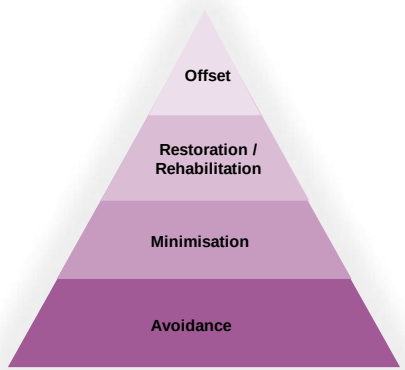
Authority Description and Role		Endorse	Approve	Inform
Activities requiring internal approval (as outlined in Section 8.1)				
	COO	✓		
OR	CDO	✓		
	CEO		✓	
Environmental Management Plans (as outlined in Section 2: Scope and Application)				
	Site / Operations Manager (for operations)		✓	
OR	Senior Manager Greenfield Exploration (for applicable region)		✓	
	VP Greenfields Exploration / VP Operations			✓
Environment and Climate Change Management Plans (as outlined in Section 2: Scope and Application)				
	Study / Project Lead (or Manager)	✓		
	Senior Manager Concept Studies		✓	
OR	Project Director (for applicable region)		✓	
Environment Data managed outside of EQuIS				
	HSE Lead/Manager	✓		
	VP Operation (or equivalent for projects)		✓	
	Senior Manager Environment			✓
Operational-level External Commitments, Targets and Goals* (e.g. Environmental Approval commitments, Contextual Water Targets etc)				
	VP Tech and HSE Stewardship	✓		
AND	VP Sustainability Strategy	✓		
AND	VP Operation	✓		
	COO		✓	
	CEO			✓
Group-Level External Commitments, Targets and Goals* (e.g. Group-level Emission Reduction or Water Efficiency Targets etc)				
	CTO	✓		
AND	COO	✓		
AND	CLEAO	✓		
	CEO (on behalf of Board)		✓	

* Depending on investment size and/or requirements for pre-commitments, additional authorisation/s may be required as per the Investment Standard.

Appendix B – Mitigation Hierarchy (applied to Environment and Climate Change aspects)



Hierarchy of Controls
(applies to all environmental and climate change-related risks)



Biodiversity Mitigation Hierarchy

Water Mitigation Hierarchy

Waste Mitigation Hierarchy

Decarbonisation Mitigation Hierarchy

Appendix C – Performance Standards, Common Environment Risks

Refer to the following pages for minimum performance requirements associated with common environmental risk areas (as defined under Section 8.2) applicable to South32 operations and projects. Recognising each operation and project operates within its own unique context (i.e. operating, jurisdiction, local and regional socio-environmental), the requirements outlined within each risk area are to be used to inform local control design and implementation (in addition to meeting local regulatory requirements) to manage the identified environmental risk exposures. Additional controls and considerations may need to be applied to ensure the desired level of risk reduction is achieved, and conformance to regulatory requirements is maintained.

For ease of reference, the common environmental risks area included in this Appendix are:

C.1 – Air Emissions Management

C.2 – Contamination Prediction and Management

C.3 – Rehabilitation and Biodiversity Management

C.4 – Water Management

C.5 – Waste Management

C.6 – Environmental Approvals Planning and Governance

C.1: AIR EMISSION MANAGEMENT

Scope and Application	Intent
This Performance Standard represents the minimum performance requirements with respect to air emissions management and should be applied where there is an air emission related operational risk exposure, with consideration also given to the local/regional operating context and regulations It covers emissions of particulate matter, gases, odour, noise, vibration and light and should consider the acute, incremental and cumulative ambient impacts on sensitive receptors, including communities located within the airshed.	To ensure operations and projects under the operational control of South32 have identified and minimised air pollutants (and their potential impacts) by taking a risk-based approach using the Source-Pathway-Receptor (SPR) assessment method. Evaluation and management of air emissions should be done in consideration of the significance of point/diffuse source and cumulative impacts, taking effective measures to design and implement controls to ensure legal compliance and protect ambient air quality as it relates to the sensitive receptors.

Performance Standard

1. Planning

1.1 Identify, characterise, map and document operational emission sources using the SPR method for all sources at the operation and their method of release into the environment factoring in cumulative impacts within the airshed. This information is to be used to identify and document potential community health hazards and environmental impacts with consideration of cumulative impacts for other material emission sources within the airshed. *Note: Consideration should be given to development of an air emissions dispersion model, commensurate with the level of risk exposure*.

1.2 Apply the hierarchy of controls (refer Appendix B) when developing controls to mitigate the identified air emission risk/s and enable compliance with regulatory requirements (and/or adopted internal criteria), documenting within a fit for purpose air emission management plan/strategy. The plan/strategy must provide clear responsibilities, accountabilities and objectives in relation to operational air emission management, and be structured to ensure sufficient visibility and governance in relation to:

- Regulatory compliance and risk management including governance and verification process in relation to monitoring program execution and data analysis.
- Management of operational air emission impacts through all phases on the operations life, including informing asset management and capital allocation decisions in relation to operational dust management and abatement requirements.
- Improving operational performance (e.g. reduction in dust levels) and supporting regional air quality stewardship outcomes.

1.3 Develop internal criteria on ambient air quality when government regulations are absent or inadequate to ensure protection of local community health and the environment. The criteria must have formal approval from the VPO and be in line with jurisdictionally accepted regulations, guidelines and/or methodologies. *Note: In the absence of appropriate air quality performance limits/measures in operational licences or authorisations, due consideration should be made to aligning monitoring programs and performance criteria to jurisdictional or national air quality guidance standards (e.g. Air Quality NEPM (AUS) and NEM: AQA (RSA)).*

1.4 Develop and implement a fit for purpose monitoring program that enables verification of adequacy of controls in managing operational air emissions risk/s whilst also addressing regulatory requirements. The program should also incorporate:

- Reference and/or background ambient conditions, including meteorological characteristics affecting pollutant dispersion, for material emissions sources within the airshed.
- Trigger Action Response Plan/s (TARP) to enable response to abnormal operating conditions (i.e. significant increase in dust levels) and/or exceedances of legal requirements or trends towards such exceedances, including immediate measures to protect the airshed and community health.

1.5 Undertake change management procedures to identify and assess potential impacts to the operational emissions profile (and surrounding airshed) as a result of a change in operating context (i.e. change in production volumes, operating location etc).

2. Implementation

2.1 Execute the identified controls and associated verification activities to ensure their effectiveness in managing the risk/s.

2.2 Design, construct, operate and maintain abatement control infrastructure in accordance with relevant standards and local legislative requirements and ensure the design accounts for potential failure scenarios.

3. Performance measurement

3.1 Execute monitoring program activities and associated adaptive management processes as per the TARP, recording exceedances of adopted criteria and associated correction actions in G360 (and externally, per regulatory requirements)

3.2 Store and manage environmental monitoring data within EQuIS, unless authorisation is in place as per South32 Environment Standard requirements (Section 7.6).

3.3 Operate and maintain/calibrate monitoring equipment in line with manufacturer specifications and/or relevant standards applicable to the jurisdiction. The maintenance regime should be integrated into the site asset management system (e.g. SAP).

For additional guidance, including tools and templates to support implementation of this Performance Standard please refer to Air Emissions Management Knowledge Portal on the Environment Hub.

C.2: CONTAMINATION PREDICTION and MANAGEMENT

Scope and Application	Intent
This Performance Standard represents the minimum performance requirements with respect to the prediction and management of contamination and should be applied where there is an existing or potential for contamination to lease areas or the receiving environment (herein referred to as 'contamination'), or where there is potential impact from mine-site drainage, including those that may naturally occur. The design and implementation of the management approach should also be informed by the local/regional operating context and regulatory requirement relevant to operating jurisdiction.	To ensure that contamination risks associated with operations and projects under the operational control of South32 are effectively identified and managed by taking a risk-based approach and employing the Source-Pathway-Receptor (SPR) assessment method to minimise adverse environmental impacts, maintain compliance, prevent impacts to human health and reduce long-term costs and closure liabilities. The emphasis is on early identification of contamination, detailed analysis of the risk exposure to environment and community receptors, and implementation of fit for purpose control (management) strategies to manage the exposure.

Performance Standard

1. Planning

1.1 Identify and assess the potential environmental contamination risks associated with the transport, storage, use, transfer and disposal of hazardous materials, including failures of primary and secondary containment structures. This should include the identification and assessment of 'high-risk' areas such as bulk/hazardous material storage locations and maintenance/laydown areas and potential for contamination from mine drainage (including those that may naturally occur).

1.2 Develop and maintain a contamination lands register (or equivalent) for land currently or previously owned, leased and/or managed (including legacy sites). The register must adhere to local regulatory requirements, but as a minimum include:

- Map of location and extent of existing contamination (in GIS), including location of sensitive receptors.
- A description of the wastes and/or potential contaminants of concern, impacted media (e.g. soils, sediments, groundwater, surface water) and summary of the site history where known.
- An assessment of Per-and Polyfluorinated Substances (PFAS) and acid rock drainage (ARD) including predicted volumes, storage locations, characterisation and long-term geochemical predictions.
- An understanding of 'natural' processes that could create, influence or exacerbate a contamination risk (including ARD).
- Risk assessment detailing exposure risks for the environment and/or the community, including assessment of any immediate risks that may require active management.
- The register should be integrated with the site Closure Plan and associated provision (as appropriate).

1.3 Develop and implement appropriate controls using the hierarchy of controls (refer Appendix B) to manage the identified contamination risk/s and develop and implement appropriate inspection regimes and spill prevention processes for the 'high-risk' areas.

1.4 Where contamination exists that poses an immediate or near-term risk to the environment or community, develop a remediation action plan (or equivalent) with level of response and timing commensurate with the risk exposure. The remediation action plan must consider local regulatory requirements, contain clear responsibilities, accountabilities and objectives and be approved by the VPO. The plan is to be integrated into the integrated and closure planning processes.

2. Implementation

2.1 Execute the identified controls and associated inspection / verification activities to ensure their effectiveness in managing the contamination risk/s.

2.2 Implement the activities outlined in the approved remediation actions plan/s

2.3 Update the contamination lands register (including files in GIS) at a minimum every three (3) years, or more frequently as determined by a change in operating context or following a contamination event.

2.4 Commensurate with the contamination risk exposure, ensure that induction, general awareness and job specific training contains additional elements relating to contamination risks and how they are managed.

3. Performance measurement

3.1 Execute monitoring programs to assess performance of control and remediation measures to associated predicted outcomes and program objectives (i.e. track location and extent of contamination), verify compliance and facilitate reporting requirements.

3.2 Store and manage environmental monitoring data within EQuIS, unless authorisation is in place as per South32 Environment Standard requirements (Section 7.6).

3.3 Where appropriate, operate and maintain/calibrate monitoring equipment (e.g. piezometers) in line with manufacturer specifications and/or relevant standards applicable to the jurisdiction. The maintenance regime should be integrated into the site work management system (e.g. SAP).

For additional guidance, including tools and templates to support implementation of this Performance Standard please refer to Contamination Prediction and Management Knowledge Portal on the Environment Hub.

C.3: REHABILITATION AND BIODIVERSITY MANAGEMENT

Scope and Application	Intent
This Performance Standard represents the minimum performance requirements to be applied where there is a rehabilitation and/or biodiversity-related operational risk exposure, with consideration also given to the local/regional operating context and regulatory requirements.	To ensure that rehabilitation and biodiversity aspects associated with operations and projects under the operational control of South32 are managed in a manner that does not cause any long-term negative change to biodiversity values and ecosystem services, noting our commitment to work towards 'no net loss' biodiversity outcome for all Greenfield Development and Life Extension Projects (refer Section 8.5 of Environment Standard).

Performance Standard

1. Planning

1.1 Identify and document the location, extent and significance of sensitive biodiversity features within the development footprint.

1.2 Understand the land use and biodiversity values within the surrounding bioregion that could be potentially impacted as a cumulative result of South32 and other stakeholders' activities, with consideration given to projected changes in the future.

1.3 Apply the biodiversity mitigation hierarchy (refer Appendix B) within mine and operational planning processes to a level commensurate with the significance of biodiversity values within the development footprint and broader bioregion (e.g. establishment of buffer zones around sensitive features, development of ecological linkages, funding of conservation initiatives or research activities).

1.4 Develop and integrate vegetation clearing and progressive rehabilitation activities into life of operations plan, medium term planning as well as operational budgeting and closure planning processes developed consistent with regulatory requirements (where they exist) with adequate consideration given to:

- Storage, management and availability of rehabilitation resources (and associated risk exposure e.g. topsoil deficit).
- Final landform/characteristics (as determined in the site closure plan).
- Completion criteria.
- Development of key performance metrics related to progressive rehab activities, which should be approved by the VPO (or equivalent role for Greenfield Exploration or Projects-related rehabilitation activities) and include external stakeholder input where required.

1.5 Develop and implement a fit for purpose monitoring program to verify the adequacy of progressive rehabilitation activities against agreed completion criteria and key performance metrics. The program should also incorporate:

- Relevant control sites to enable reference and/or background conditions to be understood (including changes over time).
- Trigger Action Response Plan/s (TARP) to enable response to performance issues.

1.6 Ensure expansions or changes in the development footprint trigger relevant biodiversity assessments (refer to Requirement 1.1) prior to disturbance. Outputs should inform changes in operational risk profile and planning/mitigation/offset requirements including the vegetation clearing and progressive rehabilitation activities, external approval processes and future biodiversity research priorities and offsetting requirements (where appropriate).

2. Implementation

2.1 Develop and implement a fit for purpose permit to clear (or equivalent) process relevant to the operational context, that considers sensitive biodiversity features and required mitigation processes commensurate with the significance of the feature and applicable legal requirements.

2.2 Execute operational controls and associated inspection / verification processes to verify their operating effectiveness.

2.3 Execute vegetation clearing and progressive rehabilitation consistent with the approved life of operations plan, medium term plan as well as operational budgeting.

2.4 Where required, identify and execute prioritised research activities that address material knowledge gaps of biodiversity values related to operational risk profile, improve rehabilitation outcomes to enable adopted performance criteria to be met, and/or facilitate future external approval processes.

3. Performance measurement

3.1 Execute monitoring programs to assess performance against adopted rehabilitation and biodiversity criteria to manage and protect key aspects in line with the agreed program objectives, with implementation of adaptive management measures to address performance issues in line with the documented TARP.

3.2 Environmental data is to be stored and managed within EQuIS, unless authorisation is in place as per South32 Environment Standard requirements (Section 7.6).

For additional guidance, including tools and templates to support implementation of this Performance Standard please refer to Land, Biodiversity and Rehabilitation Knowledge Portal on the Environment Hub.

C.4: WATER MANAGEMENT

Scope and Application	Intent
This Performance Standard represents the minimum performance requirements with respect to water management and should be applied where there is a water related operational risk exposure. It covers water management activities for all types and sources of water and must consider 'inside and outside the gate' users and stakeholders – this includes water discharged offsite or released/provided to third parties for reuse, treatment, or discharge. Consideration should also be given to local regulations pertaining to water management and discharge.	To ensure we achieve compliant, efficient, safe and sustainable management and protection of water resources and address the current and future needs of ecosystems with consideration of other users within the catchments around South32 operations. The requirements provide the basis for the development of a fit for purpose, meaningful and integrated approach to water management that will support conformance with local regulatory requirements whilst also addressing relevant social, health, environmental, operational and economic aspects.

Performance Standard

1. Planning

1.1 Identify, assess, and document potential water impacts, and risks associated with the operation (e.g. surface water, hydrogeological) including management approach and measures with consideration of:
- Operational water needs over the life of operation (note: value of water assessment can be used to inform this).
- Cumulative water demand and availability of water resources within the broader catchment, including future changes in climate as informed by the physical impacts of climate change assessment process.
- Tailings and dam water management and planning requirements associated with the South32 Dams Standard.

1.2 Apply the water mitigation hierarchy (refer Annexure B) when developing controls to mitigate the identified water risk/s and document within a fit for purpose water management plan, inclusive of an operational water strategy. The plan should provide clear responsibilities and accountabilities in relation to water management, and be structured to ensure sufficient visibility and governance in relation to:
- Regulatory compliance and risk management including governance and verification process in relation to monitoring program execution and data analysis.
- Management of water resources through all phases on the operations life including water forecasting and predictive hydrological modelling processes to inform asset management decisions and future water infrastructure requirements, referring to the South32 Dams Standard for water prediction requirements when applicable.
- Improving operational performance (e.g. efficiency) and supporting regional water stewardship outcomes.

1.3 Establish (where appropriate) internal criteria on water abstraction, dewatering, discharge volumes or water quality where government regulations are insufficient to adequately protect key characteristics of the receiving environment (environment and/or community receptors). The criteria must have formal approval from the Vice President Operations and be in line with jurisdictionally accepted regulations, guidelines and/or methodologies. Note: where there is limited country specific guidelines, it is suggested that Australian New Zealand Environment and Conservation Council guidelines (ANZECC,2018) be used.

1.4 Develop and implement a fit for purpose monitoring program that enables verification of adequacy of controls in managing the identified water risks, whilst also addressing regulatory requirements. The program should also incorporate:
- Baseline and/or reference condition monitoring, as appropriate (noting 2-year baseline period generally applies).
- Trigger Action Response Plans (TARP) to enable response to abnormal operating conditions (i.e. floods, droughts) and/or exceedances of legal requirements or trends towards such exceedances, including immediate measures to protect the catchment and community health.

1.5 Employ change management procedures for changes to the operating context that have the potential to materially impact the water-related operational risk profile and/or catchment quality, function and use.

2. Implementation

2.1 Execute the identified controls and associated verification activities to ensure their effectiveness in managing the risk/s.

2.2 Design, construct, operate and maintain water withdrawal, storage, treatment and discharge facilities in accordance with relevant standards and local legislative requirements and ensure the design accounts for:
- Potential failure scenarios.
- Expected flows and quality, including significant storm events with consideration to outcomes and recommendations from the Physical Impacts of Climate Change Assessment outcome (Section 8.2, performance requirement 8.2.3).

3. Performance measurement

3.1 Execute monitoring program activities and associated adaptive management processes as per the TARP (as required).

3.2 Store and manage water level, quality and volume monitoring data within EQuIS, unless authorisation is in place as per South32 Environment Standard requirements (Section 7.6).

3.3 Operate, maintain and calibrate monitoring equipment in line with manufacturer specifications and/or any relevant standards applicable to the jurisdiction. The maintenance regime should be incorporated into the site work management system (e.g. SAP) and evidence of maintenance/calibration maintained.

For additional guidance, including tools and templates to support implementation of this Performance Standard please refer to the Water Stewardship Knowledge Portal on the Environment Hub.

C.5: WASTE MANAGEMENT

Scope and Application	Intent
This Performance Standard represents the minimum performance requirements with respect to waste management and should be applied where there is a waste related operational risk exposure with consideration also given to the local/regional operating context and regulations. It should be applied to all forms of 'waste' generated at South32, whether hazardous or non-hazardous, mineral or non-mineral, in accordance with South32's definition of 'waste' which is "*any discarded, rejected, unwanted, surplus or abandoned matter*".	To ensure sound waste management principles are implemented across all South32 operations with respect to classification, management and disposal of waste. The minimum performance requirements can be complimented by the application of the Waste Reduction Framework (at the discretion of the operation) to identify and evaluate 'waste to value' opportunities. Effective characterisation, quantification and management of our wastes and by-products ensure long term benefits to our business, society and communities in which we operate.

Note: Management of Tailings facilities should be undertaken in accordance with the Sourth32 Dam Management Standard and Global Industry Standard on Tailings Management (GISTM).

Performance Standard

1. Planning

1.1 Develop and maintain an inventory/register of wastes generated or received and disposed on or off-site. The register should include:
- The quantities, characteristics and potential risks and impacts for identified waste stream.
- Details of the waste storage facilities associated with each waste stream (including onsite and offsite storages), including storage capacities and current volumes particularly for on-site storage facilities.
- Historical and abandoned landfills, including their location.

1.2 Ensure future waste volumes and waste storage facilities are adequately considered into the integrated planning processes, informed by the waste generation forecast as per Section 8.6.

1.3 Develop and implement appropriate controls using the waste mitigation hierarchy (refer Annexure B) to ensure adequate management of the identified waste streams to minimise risk to environmental and other sensitive receptors. This should include:
- Measures to investigate and implement (where appropriate) ways to design out waste or promote improved reuse and recycling of the identified waste streams, consistent with the waste mitigation hierarchy and circular economy principles.
- Processes that support adequate segregation of waste streams to provide for efficient disposal and future resource recovery.
- Operational procedures and associated control measures to ensure the safe handling, on-site and off-site transportation, storage and disposal of wastes commensurate with their degree of hazard and compatibility.

2. Implementation

2.1 Execute the identified controls and associated verification activities to ensure their effectiveness in managing the identified waste streams and associated risk exposure.

2.2 Maintain records of wastes in accordance with local regulatory requirements, including:
- Volumes and type of waste sent to offsite and/or 3rd party operated waste facilities.
- Volumes and type of waste disposed of within on-site storage facilities, with level of process automation commensurate (e.g. manual data capture, automated weighbridge and data collection) with the level of risk exposure.
- Location of on-site waste landfills and storage areas, including processes to ensure understanding of waste volumes within the facilities (historical volumes and current, vs design capacity).

2.3 Disposal of waste must only be carried out in engineered and approved facilities and in accordance with established operational procedures and applicable local laws and regulations. Processes should be in place to ensure that these facilities are physically, biologically and chemically safe.

3. Performance measurement

3.1 Inspect and monitor on-site waste handling and storage facilities taking a risk-based approach commensurate with the degree of hazard of the waste. Corrective actions must be taken (and recorded in Global360) where unacceptable conditions are identified.

3.2 Undertake verification assessments (governance processes) of contractors and 3rd party waste facilities (used to treat and dispose of waste generated by South32) to verify that the wastes have been managed in accordance with local jurisdiction and/or specific company requirements. The type and frequency of the verification assessments should be commensurate with the level of risk.

For additional guidance, including tools and templates to support implementation of this Performance Standard please refer to the Waste Stewardship Knowledge Portal on the Environment Hub

C.6: ENVIRONMENTAL APPROVALS PLANNING AND GOVERNANCE

Scope and Application	Intent
This Performance Standard provides the minimum performance requirements to be applied where environmental (regulatory) approvals are required to support operational continuity, LoOP development path and/or Type C project development. The Standard does not apply to secondary approvals, minor amendments or licencing/authorisation renewal processes. Note: Requirements 1.2 and 1.3 do not apply to Type C Projects.	To promote a consistent approach with respect to environmental approvals planning and governance processes, supporting effective planning and delivery of external environmental approvals required to deliver LoOP development pathway and/or Type C projects thus minimising time delays and ensuring appropriate integration into BAU operations.

Performance Standard

1. Planning

1.1 Clear accountability and decision-making processes for each stage of approvals planning and execution needs to be established through a documented model (e.g. RACI or RAPID model). While each site or project is unique, the model should ensure clear decision-making authority and appropriate resources are available for successful long-term delivery of approvals.

1.2 Undertake an environmental approvals baseline risk assessment[i] to document and quantify environmental approvals risk exposure relevant to the whole of operation and associated development path, with outcomes including identified controls to be recorded within G360. The assessment should be undertaken with input from a multi-stakeholder group and include the following considerations (as a minimum):

- Stability of the applicable legislative framework, including potential changes to regulations or policy that could impact future approvals (e.g. biodiversity offset requirements, legislated GHG emission targets, etc) and inherent complexity of securing approvals within the jurisdiction based on internal / external benchmarking.
- Compliance with regulatory requirements including current compliance, historic/legacy compliance challenges and compliance with any proposed or likely rule changes).
- External socio-environmental factors, such as cumulative impact (water, biodiversity, approvals) and potential for NGO activism in relation to current operation and/or future development options.
- Maturity / stability of the LoOP, medium term plan and/or associated development path.
- Review of all South32 public policy positions (e.g. regulatory reform, investor briefings consultation submissions) and commitments (e.g. Climate Change Action Plan, water targets etc) that have relevance to future approval requirements.

1.3 Implement an environmental approval planning and screening process to understand environmental constraints, study requirements and assessment timelines (including range analysis based on internally and externally benchmarking data, with adoption of P50 or P90 scenario to be informed by risk exposure as identified in Perf Req 1.1[ii]) for each of the projects identified within the LoOP development path. The output of the planning/screening process should be used to inform:

- approvals-related LoOP assumptions as per the integrated planning procedure; and
- study work plans and associated budget considerations for the listed projects.

1.4 For Studies and Projects, environmental aspects must be adequately considered through the respective study phases and investment tollgates, informed through application of the 'Environment Requirements for Projects' Guideline.

2. Implementation

2.1 Develop an Environmental Approvals Strategy (EAS) to support delivery of the LoOP development path and/or Type C Project. The EAS must:

- Identify the optimised approvals sequence and associated approval campaigns and document timeframe assumptions.
- Articulate the risks, opportunities and proposed mitigations associated with the EAS.
- Be reviewed annually (per Perf Requirement 3.1), or as part of the respective study phase tollgates for Type C Projects.
- Be integrated into and approved by the VP Operation and VP Planning as part of the LoOP and medium-term planning processes (or equivalent role/s and process/es for Type C projects).

2.2 Consistent with the approved EAS, develop and implement environmental approval campaign/s which are to include the following as a minimum:

- Appointment of suitably qualified and experienced approvals consultancy, as required.
- Conduct a campaign-specific risk assessment to identify threats, opportunities and mitigations associated with the campaign, with the outcomes to be incorporated into a project risk register and used to inform the development of an environmental approvals work plan.
- Review of environmental compliance, including consideration of 3rd party legal review for project if non-compliance risk is identified as a key factor within risk assessment.
- Progress the required baseline studies and impact assessments[iii].
- Engage with relevant internal / external stakeholders in accordance with an approved Stakeholder Management Plan.

	– Develop routines to ensure senior stakeholders are kept informed of progress, changes, risks and required mitigations (level of governance required to be informed by risk exposure). *Note: A clear, documented escalation protocol should in place to ensure timely escalation of material issues.* – Implement processes to ensure integration of approval commitments and obligations into operational 'business as usual' processes (e.g. operational management plans/procedures, resourcing), including training of relevant staff and contractors.
2.3	Changes in business direction or project scope that impact the EAS must be approved through a documented change management process considering risks (e.g. schedule delays, resourcing or financial impacts, license to operate) and opportunities (e.g. reduction of environmental impacts, increased environmental benefits) associated with the changes.
3.	**Performance measurement**
3.1	Implement an annual review (or at a frequency aligned to the investment tollgate process for Type C projects) to ensure: – That the Baseline Risk Assessment (where applicable) and campaign specific risk assessments remain fit for purpose and reflective of current and future operating conditions (and/or project requirements) and changes in external landscape (environmental compliance, regulatory reform and political/social environment etc). – That the EAS remains aligned with the LoOP development path or Type C project deliverables, and associated assumptions (e.g. confirm that adopted approval timeframe assumptions are still valid based on external benchmarking and internal risk profile, and associated appetite).

For additional guidance, including tools and templates to support implementation of this Performance Standard please refer to Environmental Regulation and Reform Knowledge Portal on the Environment Hub.

[i] Whole of Asset Risk Assessment to be supplemented by more specific 'project by project' risk assessment as per Performance Requirement 2.2

[ii] For guidance: P90 (or similar risk evaluation) assessment timing should be used for operations exposed to approvals-related material risk, other operations may use P50 or P90 timing based on local context/risk appetite. Data used for P50 and P90 timing assumptions must be informed through benchmarking of relevant environmental approvals within the jurisdiction (and internal approvals data where available). To be reviewed annually.

[iii] Note: Impact assessments can only be progressed once project description has been confirmed).

SOCIAL PERFORMANCE

DOCUMENT TYPE	STANDARD	DOCUMENT ID/NO.	
Applicability	Global ✓	Operation ☐	Function ☐
If Operation or Function specific			
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5	17/06/2021	K O'Rourke	Updated
6	26/08/2022	K Tovich	Community requirements updated, social performance requirements added and Standard renamed from Community Standard to Social Performance Standard
7	31/05/2023	K O'Rourke	Updated requirements for Human Rights Impact Assessment, Indigenous Traditional and Tribal Peoples and Cultural Heritage.

Contents

1. Purpose

The purpose of this Standard is to set minimum performance requirements for South32's Social Performance. It guides the development of collaborative and transparent relationships with host communities and the identification and management of social impacts and risks associated with our activities.

In line with our Purpose and Values, we want to ensure we are developing natural resources in a way that benefits our stakeholders. Trust and transparency are essential to the way we operate, and we work closely with all our stakeholders, considering different perspectives and working together to create enduring social, environmental, and economic value.

The Standard supports the delivery of our Purpose, our Code of Business Conduct, our Sustainability Policy, Our Approach to Human Rights, Our Approach to Aboriginal and Torres Strait Islander Peoples' Cultural Heritage, Breakthrough 3, Breakthrough 6 and relevant ICMM Mining Principles and other external frameworks. Where applicable, this Standard also outlines requirements for consideration of project-affected people as per the Global Industry Standards on Tailings Management.

2. Scope

The Social Performance Standard is applicable to all South32 Operations, Functions, Projects, and Greenfields Exploration where South32 has operational control. The mandatory performance requirements for each stage of the business cycle are documented in Appendix A. Where differences exist between this Standard and local laws or regulations, the higher standard will apply.

Where South32 is not the operating party, these minimum requirements will be made available to the Operator so that similar standards and systems can be encouraged.

3. Key contacts

Holly Buschman, Vice President Sustainability Strategy and Community

4. Review of this document

This Standard will be reviewed as necessary by the Document Owner, but no less frequently than every two years.

5. References

The following documents are referred to in the Standard such that some, or all, of their content constitutes requirements of the Standard and should be read in conjunction with this document.

Title
Stakeholder Engagement Planning Guide
Complaints and Grievance Process Guideline
Social Performance Reporting Requirements Guidance Note
Our Approach to Human Rights
Human Rights Risk Self-Assessment Tool
Human Rights Guidance Note

Title
Our Approach to Cultural Heritage Aboriginal and Torres Strait Islanders
Social Investment Plans
Social Investment Procedure
Social Impact Measurement Framework

6. Terms and definitions

For the purposes of this document, the following terms and definitions apply:

Abbreviation / Acronym / Term	Meaning
ICMM	International Council of Mining and Metals
IFC	International Finance Corporation
LoOP	Life of Operations Planning
FPIC	Free Prior Informed Consent as defined in IFC Performance Standard 7 and ICMM Indigenous Peoples and Mining Position Statement. FPIC comprises a process, and an outcome. Through this process Indigenous Peoples are: (i) able to freely make decisions without coercion, intimidation or manipulation; (ii) given sufficient time to be involved in project decision making before key decisions are made and impacts occur; and (iii) fully informed about the project and its potential impacts and benefits.
Indigenous, Traditional and Tribal Peoples	In line with international standards, we use the collective term Indigenous, Traditional and Tribal Peoples, where we operate, we recognise regional terms. North America: Native American's and First Nation Peoples; South America: Ethnic Peoples; Australia: Aboriginal and Torres Strait Islanders. Where possible we use the specific names as identified by a group, supporting self-identification and self-determination.
Cultural Heritage	Cultural Heritage is the legacy passed down from previous generations to the present, and can be tangible (such as artefacts, natural landscapes, buildings) and intangible (such as language, stories, connectedness, rituals, beliefs, cultural landscapes and customs) often continued in living cultures to be passed to future generations.
Human Rights	All internationally recognised human rights as set out in the Universal Declaration of Human Rights, the International Covenant on Civil and Political Rights, the International Covenant on Economic, Social and Cultural Rights, and the ILO Declaration on Fundamental Principles and Rights at Work
Social Performance	Social performance is the outcome of a company's engagement, activities and commitments that can directly and indirectly impact stakeholders or affect the quality of its relationships with them.

7. Performance Requirements

The performance requirements set the minimum standard to guide the development of collaborative and transparent relationships, identify, prevent, and mitigate negative social impacts, and enhance development opportunities.

Annual planning processes will drive continuous improvement in Social Performance at a global level and at all stages of the business cycle. Social Performance will be considered in the development of objectives and targets and incorporated into:

- *Annual Business Plans (Global, Operational and Functional);*
- *Business Scorecard / Key Performance Indicators (KPIs); and*
- *Life of Operations Planning (LoOP) activities.*

Plans will be monitored, reviewed, and updated when there is a change to activities which may impact communities.

7.1 Understanding and managing our social impacts

Our plans must be informed by, and inform, an understanding of our potential and actual, direct, and indirect impacts on host communities.

7.1.1 Socio Economic baseline

Socio-economic research provides an understanding of the social and economic context of host communities, identifies critical community issues, and can inform business planning and decision making with communities and other potentially affected people or groups.

- Complete a Socio-economic Baseline Study of local communities.
- Review and update at least every 5 years or where a change to an activity or host community could significantly alter impacts.

7.1.2 Impact assessments

Impact Assessments identify risks and impacts from activities on host communities, and the actions to prevent, mitigate, and remedy potential and actual adverse impacts. We respect the rights of all stakeholders and focus our efforts on those people who are most vulnerable to harm, marginalised, or at risk of having basic dignity and equality undermined. In many circumstances Human Rights Impact Assessments and Social Impact Assessments can be completed together (see Human Rights Guidance Note).

7.1.2.1 **Social Impact Assessments**

- Complete a Social Impact Assessment and develop actions to mitigate negative impacts and realise positive impacts.
- Review the assessment annually and consider actions as part of business planning (7.7.1 Social Impacts Management Plan). Complete a Social Impact Assessment at least every 5 years or earlier if a change to an activity or host community could significantly alter impacts.

7.1.2.2 **Human Rights Risk and Impact Assessments**

- Where the Human Rights risk is considered low (refer to the Human Rights Guidance Note), complete the South32 Human Rights Risk Self-Assessment annually. Consider actions in business planning and manage risks as per South32 risk management processes.
- Where the Human Rights risk is considered higher either due to the location or activity (refer to the Human Rights Guidance Note):

- Complete an independent Human Rights Impact Assessment informed by the Danish Institute for Human Rights', Human Rights Impact Assessment Guidance and Toolbox at least every 5 years or earlier if a change to an activity, host community or the Human Rights context could significantly alter impacts;
- Annually complete a Human Rights Risk Self-Assessment (except in years when a Human Rights Impact Assessment is conducted) to review the Human Rights Impact Assessment, identify emerging risks and ensure adequate controls are in place. Incorporate identified actions into business planning in accordance with South32 risk management policies.

7.1.3 Social Risk Assessment

- Identify, analyse, and manage social, community and reputational risks as required by the Material Risk Management Standard.
- Complete a social risk assessment for new or development activities which could significantly alter impacts on existing or new communities or when significant external changes occur.

7.1.4 Community Perceptions

- Assess and evaluate host communities' support and trust by completing a community perception review.
- The review can be either, regular pulse surveys or standalone surveys completed at least every 3 years which:
  - Measure the levels of community support and trust; and
  - Determine the factors which have influenced the level of community support and trust.
- Review findings with internal and external stakeholders to develop actions which strengthen relationships and address the identified opportunities for improvement as part of business planning (7.7 Social Performance Plans).

7.1.5 Community and Legal Commitments

- Identify and document legal and other community related requirements and commitments.
- Assign, communicate and track accountability for managing each requirement.

7.2 Stakeholder Engagement

To build strong, mutually beneficial relationships we need to have regular, open, and inclusive dialogue with our stakeholders to understand their expectations, concerns, and interests.

7.2.1 Identification

- Identify and document potentially affected stakeholders including those people who are most vulnerable to harm, marginalised, or at risk of having their basic dignity and equality undermined.
- Use ICMM Community Development Toolkit, Tool 1: Stakeholder Identification to inform the identification of stakeholders.

7.2.2 Analysis

- Complete and maintain analysis of stakeholders informed by ICMM Community Development Toolkit, Tool 2: Stakeholder Analysis to understand their interest, influence, and the extent to which our activities may impact them.

7.2.3 Engagement

- Develop, document, and implement an annual Stakeholder Engagement Plan, informed by stakeholder analysis, and completed as required by Stakeholder Engagement Plan Guide. The Plan should be participatory, non-discriminatory, and not pose any risks to stakeholders.

- Record, assign and communicate accountability for managing stakeholder commitments.

7.2.4 Review

- Review stakeholder identification, analysis, and engagement annually, consider emerging issues, context changes, risks, and the LoOP and, if required, update.

7.3 Indigenous, Traditional and Tribal Peoples

We respect the unique cultural and spiritual relationships that Indigenous, Traditional and Tribal Peoples have to the land, ecosystems, waters and seas, and their rich contribution to society. Our engagement is guided by the UN Declaration on the Rights of Indigenous Peoples, we are committed to working together to build lasting, meaningful relationships for the benefit of all. We will:

- Engage with Indigenous, Traditional and Tribal Peoples using culturally appropriate methods to foster relationships based on transparency and trust.
- Collaborate with Indigenous, Traditional and Tribal Peoples when completing socio economic baseline studies, social impact assessments, human rights assessments, and stakeholder engagement to understand and act upon the impacts and opportunities for Indigenous, Traditional and Tribal Peoples.
- Apply the principles and processes of free, prior, and informed consent in seeking to obtain and maintain agreed outcomes with Indigenous, Traditional and Tribal Peoples where adverse impacts are likely to occur to them, including as a result of relocation or disturbance of land and territories or cultural heritage.
- Seek to agree on and fully document engagement and consultation plans, and where possible, agreements, with potentially impacted Indigenous, Traditional and Tribal Peoples.
- Recognise the data sovereignty of Indigenous, Traditional and Tribal Peoples, and respect the ownership and application of information and data about them.
- Celebrate and promote Indigenous, Traditional and Tribal Peoples' culture. Develop and deliver training in partnership with Indigenous, Traditional and Tribal Peoples for employees and contractors to increase their cultural awareness.

7.4 Community Complaints and Grievance Mechanisms

- Develop a community grievance mechanism that is activity specific, locally appropriate, and culturally sensitive and informed by the Complaints and Grievance Process Guidelines.
- Analyse data and consider actions as part of business planning (7.7 Social Performance Plans).

7.5 Land Acquisition and Resettlement

Land and territory are a key tangible and intangible resource, which can be fundamental to economic livelihood and are tied to individual and collective values. Involuntary resettlement occurs when affected people do not have the right to refuse land acquisition and this has the potential to put vulnerable populations at risk. A process which respects and protects the rights of impacted stakeholders must be implemented.

- Avoid acquisition of land which results in involuntary physical or economic displacement.
- If involuntary physical or economic displacement is unavoidable:
    - CLEAO endorsement and Chief Executive Officer approval is required for any displacement process.
    - An application for approval must demonstrate that analysis of alternatives has been completed including social and project costs. Actions must be planned to minimise impacts and improve, where applicable, the quality of life of impacted people with emphasis on

vulnerable people.

- Avoid expropriation by working towards a negotiated settlement.

- Involuntary physical resettlement or economic displacement processes completed by, or on behalf of South32, shall be informed by IFC Performance Standard 5: Land Acquisition and Involuntary Resettlement.

7.6 Cultural Heritage

Management of Cultural Heritage will be informed by the principle of 'avoidance first'. The process to manage Cultural Heritage must:

- Create a Cultural Heritage Risk at each operation or project and develop controls to mitigate them, with regular control management activities set.
- Engage with Indigenous, Traditional and Tribal peoples consistent with Section 7.3 Indigenous, Traditional and Tribal Peoples.
- Engage appropriate independent and qualified third-party heritage professionals to identify, document and manage cultural heritage and values, both tangible and intangible, in partnership with the impacted stakeholders.
- Confirm impacted stakeholders have adequate, independent advice and or representation for decision making on impacts to cultural heritage and provide a culturally appropriate grievance mechanism.
- Collect, store and maintain cultural heritage data in a culturally appropriate manner with consideration of security, authorization and custodianship.
- Utilise where practicable, heritage agreements to document the agreed approach to identify, manage and protect cultural heritage.
- Establish procedures to catalogue, monitor and audit cultural heritage, and develop responses to unauthorized impacts or the identification of new information.
- Provide South32 employees, contractors and visitors with training that acknowledges South32's principles and approaches to cultural heritage, commensurate to their position.
- Identify stakeholders in line with Our Approach to Indigenous, Traditional and Tribal Peoples Engagement.

7.7 Social Performance Plan

A Social Performance Plan, informed by the understanding of the context, impacts and stakeholders' development priorities contributes to the lasting social, physical and economic wellbeing of communities. Plans are successful when actions are developed and implemented in partnership with communities, governments, and other stakeholders and integrated into business planning.

- Analyse data from Understanding and Managing our Social Impacts (7.1) and Stakeholder Engagement (7.2) to develop an integrated Social Performance Plan which includes Social Impacts (7.7.1), Social Investment (7.7.2) and Economic Development (7.7.3).
- Plans must be reviewed and updated annually as part of business planning. Approvals for plans are described in Appendix B.

7.7.1 Social Impact Management plan

- Work with stakeholders to identify, document and prioritise actions which prevent and mitigate negative social and human rights impacts (7.1.2).
- Where material social impacts are identified due to the transition to a lower carbon economy, develop a Just Transition Plan.

- Where material social impacts are identified due to physical impacts of climate change, consider development of a Climate Change Adaptation Plan.

7.7.2 Social Investment

- Identify and implement social investments which contribute to local social development and align with long-term community objectives.
- Align investments with South32 social investment focus areas as defined.
- Follow the requirements of Social Investment Procedure including investment exclusions.
- Monitor and evaluate investment performance using the Social Impact Measurement Framework.

7.7.3 Economic development

- Develop Economic Development plans which contribute to local economic development through employment, procurement, business development, and, where appropriate, regional economic development.
- Include targets informed by local context including women and people with diverse backgrounds, where appropriate engage with Indigenous, Traditional and Tribal Peoples to create sustainable economic and employment opportunities.

8. Assurance and Reporting

Processes must be implemented to meet the Performance Requirements of the Assurance Standard and 2nd Line Stewardship Standard.

Reporting must be completed as required by Social Performance Reporting Guidance Note.

Appendix A – Standard implementation across the business lifecycle

The Standard's Performance Requirements are to be implemented to address the different levels of risk and opportunity through the business cycle. The following table documents the Performance Requirements which are applicable to each activity.

Activity	Minimum Performance requirements
Operated / Controlled Exploration	7.1.3 7.2 7.3 7.4 7.5 7.6 8
Non-operated (non-controlled) exploration	The Standard will be provided to the Operator to encourage similar standards and systems.
Capital projects (Excluding operations projects)	Performance requirements must be implemented consistent with the Project Management Framework.
Merger acquisitions and divestments	7.1.3
Operations (mining, processing)	All Where a Performance Requirement has been met as part of the Community Standard, periodic reviews as required by this Standard must be completed. The Performance Requirement doesn't need to be updated until triggered by this Standard.
Closure	All
Non-operated Joint Ventures	The Standard will be provided to the Operator to encourage similar standards and systems.

Appendix B – Plan approvals

	Plan	Endorse	Approve	Inform
	Stakeholder Engagement Plan			
	Senior Manager External Affairs for relevant region		•	
	VP Operation	•		
	Chief Legal and External Affairs Officer			•
	Social Impact Management Plan			
	Senior Manager External Affairs for relevant region	•		
	VP Operation		•	
	Chief Legal and External Affairs Officer			•
	Social Investment Plan			
	VP Operation	•		
	Senior Manager External Affairs for relevant region		•	
	Chief Legal and External Affairs Officer			•
	Economic Development			
	Senior Manager External Affairs for relevant region	•		
and	Supply Operations Manager	•		
and	Human Resources Manager	•		
	VP Operation		•	
	VP Supply			•
	Chief Legal and External Affairs Officer			•

9.6. Northern Eastern Lease

9.6.1. Project Summary

GEMCO is evaluating the potential for further development of the Eastern Leases Project via mining developments in the Northern Eastern Lease (Northern EL). The lease was granted to GEMCO in 2016.

The project would use the same open cut mining methods used at GEMCO's existing operations. Manganese ore from the project would be transported via haul road to the Western Leases and washed at the concentrator. Project ore would be blended with ore from GEMCO's other operational quarry areas. The project would be operated as part of GEMCO's existing operations and would not be an independent mine. Project evaluation is still being performed, however there could up to 6 million tonnes (Mt) of ore mined over the life of the project.

The primary objective of the project is to optimise the development of manganese resources in the Eastern Leases in a socially and environmentally sustainable manner. The project has potential to:

- Help extend GEMCO's operational life by up to 2 years, which provides two additional years of economic benefits including royalties (including for the Traditional Owners), employment and tax payments; and
- Help provide a source of manganese ore to the rapidly developing battery manufacturing facilities in Asia to help to support the transition to a lower carbon economy.

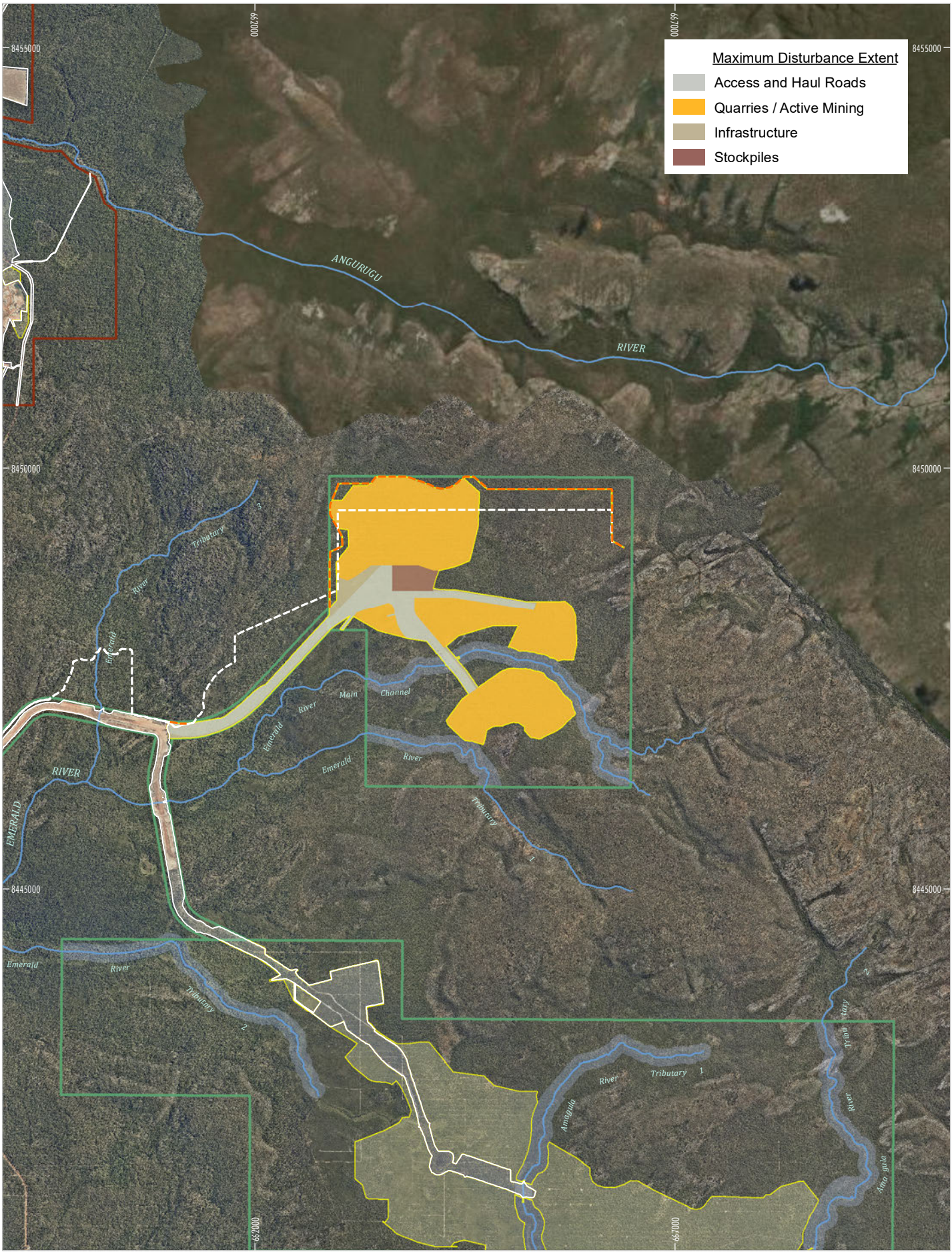
The project does not involve any upgrade to GEMCO's existing, approved facilities (e.g. concentrator, port), with proposed project works limited to activities to be undertaken within the project area, located wholly within the Eastern Leases Haul Road Corridor (Access Authority AA31711) and Northern EL Mineral Lease (ML31219).

Given that the project would be operated as part of GEMCO's existing operations, very limited infrastructure is required to be developed as part of the project.

A small construction workforce would be required for the construction phase. The project operations workforce would be drawn from GEMCO's existing workforce and there would be no net increase in the size of GEMCO's workforce. No additional workforce accommodation would be required to be constructed as part of the project

Construction works for the project would commence during FY28, pending the outcomes of further study works and internal approvals.

Proposed disturbances for the Northern EL tenement areas are summarised in Table 9-1 and shown on Figure 9-1.



ESRI Imagery Service Layer Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

N

0 2

Kilometres

Coordinate System: GDA94 MGA Zone 53

Legend

- Eastern Leases
- Western Leases
- Watercourse
- Watercourse 100 m Buffer / 1% AEP Flood Extent
- Current Clearance Extent
- Maximum Planned Clearance Extent
- Proposed Realigned Public Access Track
- Existing Public Access Track

SOUTH32

FY25 - Closure MMP

Figure 9-1
Northern Eastern Leases Disturbance Summary

Date: May 2024	Scale: 1:60,000	Author: RS

STH-23-09 ClosureMMP_215C

TABLE 9-1 DISTURBANCE SUMMARY – NORTHERN EASTERN LEASE

Disturbance Type[1]	Existing (June 2024)	Proposed (FY25-FY32)	Total[4]
Site Infrastructure	0	20	20
Airport	0	0	0
Quarries / Active Mining	0	352	352
Tailings Storage Facilities and Dams	0	0	0
Stockpiles	0	15	15
Access and Haul Roads	0	96	96
Total Active Disturbance[2]	**0**	**479**	**479**
Rehabilitation[3]	0	136	136
Total Disturbance[4]	**0**	**479**	**479**

(1) Disturbance hectares are for GEMCO's Mineral Lease Tenements and Access Authority areas only, with SPL disturbance excluded (i.e. Port and Township disturbance areas).

(2) Total Active Disturbance excludes Public Access Track diversions in Eastern Leases which will remain after mining completion.

(3) Proposed Rehabilitation areas are within current and future Active Disturbance areas, and thereby excluded from Proposed Total Disturbance area.

(4) Total values may not equal the sum of values in each row or column due to rounding.

9.6.2. Site Conditions

The site conditions of the Northern EL are in-line with the conditions outlined in Section 3, with more area specific information detailed in the Eastern Leases EIS.

9.6.3. Statutory and Non-Statutory Requirements

Operations within GEMCO's Northern EL would be undertaken in accordance with the following statutory requirements as detailed in Section 4.1:

- Land owner approval granted in the form of a Mining Agreement and Haul Road Agreement between GEMCO and the ALC pursuant to ALRA;
- Regulatory approval granted in the form of Mineral Leases and an Access Authority under the MT Act;
- Regulatory approval granted under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) (EPBC 2014/7228);
- Regulatory approval granted under the *Environment Assessment Act 1982* (NT) (EA Act)[16]; and
- Regulatory approval granted in the form of a Mining Authorisation (0126-01) under the MM Act.

GEMCO's non-statutory obligations for the Northern EL are chiefly embodied in the Eastern Leases Mining Agreement in place between GEMCO and the ALC, as well as the South32 Corporate Standards, and International and National Guidelines detailed in Section 4.2.

[16] Now superseded by the *Environment Protection Act 2019* (NT) (EP Act).

9.6.4. Operational Activities

[redacted]

[redacted]

[redacted]								
[redacted]								
[redacted]								
[redacted]								
[redacted]								

[redacted]

Mining operational activities in the Northern EL will be undertaken using the same open cut mining methods used at GEMCO's existing operations in the Western and Southern EL areas, as detailed in Section 5.2. [redacted]

[redacted]

[redacted]								
[redacted]								
[redacted]								
[redacted]								
[redacted]								

Manganese ore from the Northern EL will be hauled to GEMCO's existing processing facilities on the Western Leases and blended with ore from other operational areas to produce final saleable product via the treatment, ore processing and product handling operations as detailed in Section 5.3. [redacted]

[redacted]

[redacted]								
[redacted]								
[redacted]								
[redacted]								
[redacted]								

Tailings material from the Northern EL will be stored in existing TSFs and potential future TSFs on GEMCO's Western Leases, as detailed in Section 5.3. [redacted]

[redacted]

[redacted]

[redacted]								
[redacted]								
[redacted]								
[redacted]								
[redacted]								

[redacted]

9.6.5. Risk Assessment

GEMCO's risk management principles and the *South32 Material Risk Management Standard* provide the guiding principles for the management of material risks within all South32 Operations. GEMCO's risk management processes and systems, based on *ISO 31000 – Risk Management — Guidelines* and detailed in Section 6 of the FY25-Closure MMP, will be used for the identification, assessment and management of risks associated with the Northern EL Project.

9.6.6. Environmental Management

The Environmental Management System implemented for GEMCO's Northern EL Project will be aligned with the Environmental Policy and Objectives outlined in Section 7.2, and the Environmental Commitments detailed in Section 7.3. GEMCO will ensure that its environmental requirements for the project are achieved by undertaking Environmental Training and Education as detailed in Section 7.4, and implementing a range of risk-specific Environment Management Plans as detailed in Section 7.5.

9.6.7. Closure Planning

The progressive rehabilitation and closure of the Northern EL mining areas will be undertaken in-line with the Standards, Policies and Procedures outlined in Section 8.1, and in accordance with all closure-related requirements detailed in the Eastern Leases Regulatory Approvals Commitments Register.

Closure costing for the Northern EL has been developed in line with the NT DITT *Security Calculation Procedure* (2016). Where applicable, costs per unit (i.e. $/ha, $/m^3) and individual items costs have been developed using GEMCO rates or a third-party estimate, with the total number of units and material quantities requiring rehabilitation based on the disturbance data outlined in Table 9-1. [redacted]

9.7. Security Calculations

[redacted]

[redacted]

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