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# Chapter Five

# Rehabilitation and Mine Closure

## Winchelsea Island (Akwamburrkba) Manganese Mine: Draft Environmental Impact Statement



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## Key Project Terms

Term	Definition or Elaboration
Adaptive Management	Systematic process for incrementally improving management practices by learning from the outcomes of past and current practices.
AUS China International Mining	AUS China International Mining Pty Ltd
CDM Smith	CDM Smith Australia Pty Ltd
Disturbance Envelope	Defined as the maximum area within which the Project disturbance could occur. The disturbance envelope for the Project encompasses 739 ha, inclusive of the terrestrial mining area and infrastructure, marine infrastructure, dredge spoil disposal area and transshipment area.
Environmental Aspect	An element of the Winchelsea Minings activities, products or services that can interact with the environment.
Environmental Impact	Change to the environment whether adverse or beneficial, wholly or partially resulting from Winchelsea Mining's environmental aspects. Environmental impacts can be caused directly or indirectly from a Project activity or cumulatively with other non-Project related activities in a set area.
Environmental Factor	The NT EPA listed environmental objectives to identify environmental matters that have value to the Northern Territory and that need to be protected; and to state the objective to be achieved for each matter. The NT EPA has prepared these environmental objectives and organised these in structured divisions of the environment, called environmental factors.
GHAC	Groote Holdings Aboriginal Corporation
Infrastructure Footprint	Defined as the area subject to direct placement of infrastructure and material inclusive of the terrestrial and wharf components. This area excludes the dredge spoil disposal area and transshipment area as no permanent physical infrastructure will be placed in these areas. The infrastructure footprint encompasses 339 ha within the Project area.
Project	The Project refers to the Winchelsea Island Manganese Mine Project. The Project includes establishment of a manganese mine extracting from nine separate extraction areas covering, associated terrestrial infrastructure, wharf and barge loading facility, dredged access channel, dredge spoil disposal, transshipment and cyclone moorings. The Project is inclusive of all infrastructure within the nominated Project area and directly associated activities occurring outside that area.
Project Area	The Project area is defined as wholly including mineral lease for exploration activities 32704, coastal and marine areas adjacent and connecting to mineral lease 32704, the dredge spoil disposal area and transshipment area. The entire Project area covers 1,680 ha.
Significant Impact	A significant impact of an action is an impact of major consequence having regard to: (a) the context and intensity of the impact; and (b) the sensitivity, value and quality of the environment impacted on and the duration, magnitude and geographic extent of the impact.
Sitzler	Sitzler Pty Ltd
Study Area	Refers to the area of survey or investigation for a specific study. This area may be beyond the Project area or disturbance envelope.
Tailings Storage Facility	A specially engineered and constructed impoundment into which tailings (residue) from the ore processing plant are deposited for placement in perpetuity. The storage facility is constructed with confining embankments consisting of earthen material (e.g., rock and soil) and capped following closure.
Winchelsea Island	Akwamburrkba

Term	Definition or Elaboration
Winchelsea Mining	Winchelsea Mining Pty Ltd
Xenith	Xenith Consulting Pty Ltd

## Acronyms, Abbreviations and Units

Abbreviation, Acronym or Unit	Definition
AAAC	Anindilyakwa Advancement Aboriginal Corporation
AAPA	Aboriginal Areas Protection Authority
ABS	Australian Bureau of Statistics
AFANT	Armature Fisherman's Association Northern Territory
ALARP	As Low As Reasonably Practicable
Al <sub>2</sub> O <sub>3</sub>	Aluminium Oxide
ANC	Acid Neutralising Capacity
ARC	Arnhem Coast
ASRIS	Australian Soil Resource Information System
ASS	Acid Sulfate Soils
CAN	Australian Company Numbers
ADT	Articulated Dump Truck
ALC	Anindilyakwa Land Council
Al <sub>2</sub> O <sub>3</sub>	Aluminium Oxide
ALRA	<i>Aboriginal Land Rights (Northern Territory) Act 1976</i>
Bcm	Bank Cubic Meter
BLF	Barge Loading Facility
BLM	Blue Mud Land System
BoM	Bureau of Meteorology
BWM	International Convention for the Control and Management of Ships' Ballast Water and Sediments
CD	Chart Datum
CEO	Chief Executive Officer
CP	Cemented Pisolite
CNZ	Central North Mineralisation Zone
CMZ	Central Main Mineralisation Zone
Cth	Commonwealth
CSD	Cutter Suction Dredge
CSZ	Central South Mineralisation Zone
DAFF	Department of Agriculture, Fisheries and Forestry
DAWE	Department of Agriculture, Water and the Environment
DCCEEW	Department of Climate Change, Energy, the Environment and Water

Abbreviation, Acronym or Unit	Definition
DEPWS	Department of Environment, Parks and Water Security
DIPL	Department of Infrastructure, Planning and Logistics
DITT	Department of Industry, Tourism and Trade
Dmt	Dry Metric Tonne
DWCD	Declared Water Control District
DWT	Dead Weight Tonne
EIS	Environmental Impact Statement
EIL	Ecological Investigation Level
EL	Exploration Licence
EMP	Environmental Management Plan
EMS	Environmental Management System
EP Act	<i>Environmental Protection Act 2019</i>
EPBC Act	<i>Environmental Protection and Biosecurity Conservation Act 1999</i>
EPL	Environment Protection Licence
ERA	Environmentally Restricted Area
EV	Electric Vehicle
ESC	Erosion and Sediment Control
ESCP	Erosion and Sediment Control Plan
Fe	Iron
FIFO	Fly-In Fly-Out
g/cc	Gram per Cubic Centimetre
GDE	Groundwater Dependant Ecosystem
GEMCO	Groote Eylandt Mining Company
GHG	Greenhouse Gas
Grt	Groote land
ha	Hectares
HDPE	High Density Polyethylene
hp	Horsepower
HVAS	High-Volume Air Sampler
IAP2	International Association for Public Participation
IBRA	Interim Biogeographic Regionalisation for Australia
IEA	International Energy Agency
IECA	International Erosion Control Association

Abbreviation, Acronym or Unit	Definition
ILUA	Indigenous Land Use Agreement
IPA	Indigenous Protection Area
IUCN	International Union for Conservation of Nature
JORC	Joint Ore Reserve Committee
Kfh	Keepers Hut Land System
kg	Kilogram
km	Kilometres
ktpa	Kilo tonnes per annum
kW	KiloWatt
LA	Los Angeles
LAT	Lowest astronomical tide
LDMA	Local Decision-Making Agreements
Lit1	Littoral 1 Land System
LOM	Life of Mine
LWM	Low Water Mark
m	Metre
m <sup>3</sup>	Cubic meter
m <sup>3</sup> /hr	Cubic meter per hour
MagL	Manganiferous Laterite
mbgl	metres below ground level
MIA	Mine Infrastructure Area
ML	Megalitres
MLWM	Mean Low Water Mark
ML/yr	Megalitres per year
MMP	Mining Management Plans
MMZ	Main Mineralised Zone
MN	Mangcrete
Mn	Manganese
MNES	Matters of National Environmental Significance
MP	Member of Parliament
MRCP	Mine Rehabilitation and Closure Plan
MSL	Mean Sea Level
Mt	Million Tonnes

Abbreviation, Acronym or Unit	Definition
mtpa	Million Tonnes per Annum
MW	Megawatt
NAF	Non-Acid Forming
NAGD	National Assessment Guidelines for Dredging
NEZ	North East Mineralised Zone
NEPM	Nation Environment Protection Measure
NLC	Northern Land Council
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
NW	North West
OGV	Ocean going vessel
P	Phosphorus
P <sub>2</sub> O <sub>5</sub>	Phosphorus Pentoxide
PC	Personal Computer
PCS	Process Control System
PID	Proportional-Integral-Derivative
PLT	Point Load Result
ppt	Parts per Thousand
PM	Pisolitic Manganese
PMLU	Post-Mining Land use
PM <sub>2.5</sub>	Particulate Matter 2.5 micrometres or less
PM <sub>10</sub>	Particulate Matter 10 micrometres or less
PSU	Practical Salinity Units
Pty Ltd	Propriety Limited
Que	Queue Land System
RC	Reverse Circulation
RMP	Risk Management Plan
ROM	Run of Mine
RDU	Royalties Development Unit
RORO	Roll-on Roll-off
RUSLE	Revised Universal Soil Loss Equation
Sea Dumping Act	<i>Environmental Protection (Sea Dumping) Act 1981</i>
SEP	Stakeholder Engagement Plan

Abbreviation, Acronym or Unit	Definition
SiO <sub>2</sub>	Silicon Dioxide
SOP	Standard Operating Procedures
SM	Silicious Manganese
SSC	Suspended Sediment Concentration
SSTV	Site-Specific Trigger Values
TEC	Threatened Ecological Communities
t	Tonnes
ToR	Terms of Reference
TPWC Act	<i>Territory Parks and Wildlife Conservation Act 2000</i>
TSF	Tailings storage facility
TSP	Total Suspended Particulates
USGS	United States Geological Survey
WA	Western Australia
WMP	Water Management Plan
WDL	Waste Discharge Licence

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**We acknowledge and thank the Anindilyakwa Land Council and the Traditional Owners of Winchelsea Island, for providing permission to access survey areas and collect data for the Winchelsea Island (Akwanburrkba) Manganese Mine Project Environmental Impact Statement and supporting studies.**



## Section 5 Rehabilitation and Mine Closure

This section describes the proposed rehabilitation and decommissioning strategies for the Winchelsea Mine Project. Following completion of mining activities, the mine site will be closed and rehabilitated in accordance with an approved MRCP. A draft of the MRCP is provided in Appendix H. The final land use and closure objectives will be confirmed in consultation with relevant stakeholders however, initial Project closure objectives have been identified in the draft MRCP and are discussed in the sections below.

The NT EPA ToR for the Project (NT EPA, 2021) identifies the following rehabilitation and mine closure objectives and outcomes that are to be met:

- Land disturbed by mining activities must be rehabilitated progressively as it becomes available, to minimise environmental impacts and reduce cumulative areas of disturbed land for mining;
- The proposal must be implemented in a way that meets the NT EPA's environmental objectives;
- The proposal must be implemented in a manner that disturbed land will be rehabilitated or restored to a safe and stable condition, does not cause environmental harm, and can sustain a post-mining land use;
- Open pit voids are backfilled and rehabilitated before surrender or relinquishment, unless it can be demonstrated that retaining a final pit void would ensure closure objectives are met;
- Pit lakes formed after the end of mining operations must be designed and engineered to ensure closure objectives are met; and
- The final landform is physically safe to humans and animals, geo-technically stable and geo-chemically non-polluting/non-contaminating.

These objectives and outcomes have been addressed in detail in the draft MRCP (Appendix H).

### 5.1 Mine Closure Planning

#### 5.1.1 Closure Components

As discussed in Section 4- Project Description, the Project will be a small to medium sized, owner operated manganese mine with a proposed LOM of 11 years including rehabilitation. Current disturbance on Winchelsea Island consists of exploration tracks between drill holes. The Project will consist of nine separate extraction areas, supporting infrastructure, a wharf and BLF. Site infrastructure within the mine site area will include:

- Domain 1: Stockpiles and Landforms – Overburden landforms, ore stockpiles and topsoil stockpiles;
- Domain 2: Mine Pits – Mine voids and rock quarry;
- Domain 3: Mine and Support Infrastructure – ROM, process plant, workshops for fixed and mobile plant fleet, communications infrastructure, tailings storage facilities, other miscellaneous infrastructure.
- Domain 4: Linear Infrastructure – Haul and access roads; and
- Domain 5: Marine Areas – Rock wharf and BLF consisting of a conveyor and loading infrastructure.

### 5.1.2 Post-Mining Land Use

The proposed Post-Mining Land Use (PMLU) for the Project site will be to fully close and rehabilitate the Project, with the exception of the rock wharf which will remain in situ (Figure 5.1-1). The wharf will remain in situ to avoid further marine disturbance from removal and to allow ongoing access to Winchelsea Island for rehabilitation monitoring and for cultural heritage purposes by the Traditional Owners.

The objective will be to restore the landscape as close as reasonably practicable to the pre-disturbance environment. However, it is recognised that the return of native species is likely to be less than in undisturbed areas. To achieve this PMLU, the following will be required:

- Removal of all infrastructure, unless appropriate stewardship can be established;
- All domains are made safe, geotechnically stable and non-polluting;
- Restriction of access to potentially unsafe areas with fencing and/or bunding and signage around constructed domains;
- Reinstatement of surface drainage patterns consistent with the regional drainage patterns (with exception of the three minor remaining voids (refer to Figure 5.1-1)); and
- Revegetation of disturbed areas including contouring, drainage, ripping, seeding (with suitable local species which reflect the surrounding vegetation and topography).

Further engagement with key stakeholders is required to confirm the PMLU and identification of any other mine infrastructure to remain post-closure (i.e., fences, roads, water bores). Formal agreements with post-mining landowners (the ALC) will also be established confirming that they assume on-going responsibility for any remaining infrastructure.

### 5.1.3 Closure-Outcomes and Completion Criteria

The proposed closure outcomes have been developed based on the PMLU and the closure risk assessment undertaken for the draft MRCP (Appendix H). At the cessation of mining, the Project will be rehabilitated to a condition that meets the closure outcomes identified for the relevant domains. The main aim for closure is to make the disturbed areas safe, stable, non-polluting and capable of sustaining endemic vegetation consistent with the agreed PMLU. The proposed completion criteria have been developed to provide specific targets that closure performance can be assessed with the ultimate goal of relinquishment.

The proposed closure outcomes and completion criteria will continue to be refined as the Project develops and operates. Refinements will be made in consultation with stakeholders and will consider the ongoing performance of the mine and the results of any technical assessments, research and trials, ongoing monitoring and audits. The closure outcomes and completion criteria currently proposed for the Project are presented in Table 5.1-1.

**Table 5.1-1 Proposed Closure Outcomes and Completion Criteria**

Closure Domain	Closure Outcome	Completion Criteria	Measurement Tools
All Domains	The Project is rehabilitated to a state that there are no ongoing health and safety concerns.	<ul style="list-style-type: none"> <li>Employee and public safety is included in closure planning and closure management/monitoring programs.</li> </ul>	<ul style="list-style-type: none"> <li>Health and Safety/Incident Register.</li> <li>Safety inspections.</li> <li>Annual rehabilitation/compliance audit.</li> <li>Annual reporting via MMP.</li> </ul>
	The visual impact of the rehabilitated site is compatible with the surrounding landscape and acceptable to stakeholders.	<ul style="list-style-type: none"> <li>The post-mining profile is integrated into the surrounding landscape.</li> </ul>	<ul style="list-style-type: none"> <li>Stakeholder engagement register.</li> <li>Review of pre- and post-mining imagery.</li> </ul>
	Rehabilitation and closure activities are compliant with applicable legislation, authorisations, licences, permits and commitments.	<ul style="list-style-type: none"> <li>All applicable rehabilitation and closure obligations are met.</li> <li>All requirements in the Closure Obligations Register are completed.</li> </ul>	<ul style="list-style-type: none"> <li>Annual rehabilitation/compliance audit.</li> <li>Annual reporting via MMP.</li> <li>Closure Obligations Register.</li> <li>Letters of acceptance for responsibility/tenure/ownership for any infrastructure retained on site.</li> </ul>
	Rehabilitate disturbed areas to support a self-sustaining vegetation and habitats similar to surrounding areas and the agreed PMLU.	<ul style="list-style-type: none"> <li>PMLU agreed and achieved in accordance with the closure outcomes and completion criteria and to the written satisfaction of DITT and ALC.</li> <li>Weed species not impacting upon vegetation or the PMLU.</li> <li>Revegetation species comprised of local provenance native species, self-sustaining and similar to form and function to surrounding environment.</li> <li>Cover materials capacity to retain water and nutrient resources is consistent with the target ecosystems of the local landscape.</li> </ul>	<ul style="list-style-type: none"> <li>Annual rehabilitation/compliance audit.</li> <li>Annual reporting via MMP.</li> <li>DITT Certificate of Closure.</li> <li>Landscape/vegetation monitoring.</li> <li>Records of material characterisation, movement and disposal.</li> </ul>
	Protect fauna throughout LOM and leave the site free of hazards after closure.	<ul style="list-style-type: none"> <li>With exception of the rock wharf, no mine infrastructure remaining on site (unless formally agreed) with all disturbed areas revegetated and natural drainage patterns reinstated (exclusion of three remaining voids that will be graded to prevent fauna entrapment – refer to Figure 5.1-1).</li> </ul>	<ul style="list-style-type: none"> <li>Annual rehabilitation/compliance audit.</li> <li>Asset, hazardous materials and contaminated sites register.</li> </ul>

Closure Domain	Closure Outcome	Completion Criteria	Measurement Tools
Stockpiles and Landforms	Final landform and stockpile structures are safe, chemically and physically stable, non-polluting landforms that minimise erosion and support vegetation.	<ul style="list-style-type: none"> <li>Stockpiles reformed to reinstate natural topography.</li> <li>Landform stability is consistent with design criteria and comparable to the local landscape.</li> <li>Compliance with detailed engineering design, specifications and 'as-constructed' drawings.</li> <li>Landforms show no visible evidence of slumping or failure of constructed slopes or batters.</li> <li>Landforms show evidence of successful revegetation.</li> </ul>	<ul style="list-style-type: none"> <li>Landform construction audit.</li> <li>Records of material movement and disposal.</li> <li>Annual rehabilitation/compliance audit.</li> <li>Closure management plan.</li> <li>Safety and environmental inspections pre- and post-closure.</li> <li>Monitoring or revegetated areas to ensure environmental targets are met.</li> </ul>
	Surface water, marine water and groundwater processes and water quality are not adversely affected by rehabilitated landforms resulting in adverse impact to terrestrial and aquatic ecosystems and land uses.	<ul style="list-style-type: none"> <li>Surface water and groundwater management infrastructure not required post-closure are removed.</li> <li>Water quality generally reflects the background levels and are safe for ecosystems.</li> </ul>	<ul style="list-style-type: none"> <li>Annual rehabilitation/compliance audit.</li> <li>Water monitoring (in accordance with MMP).</li> </ul>
Mine Pits	Final pit design is structurally and geotechnically safe, stable and non-polluting and entry is restricted to the public and fauna.	<ul style="list-style-type: none"> <li>With exception of three remaining voids (NEZ 1, NEZ 2 and NEZ 3) there are no remaining mining voids (refer to Figure 5.1-1).</li> <li>Compliance with detailed engineering design, specifications and 'as-constructed' drawings</li> </ul>	<ul style="list-style-type: none"> <li>Audit of pit design to confirm compliance.</li> <li>Records of operational inspections and monitoring.</li> <li>Safety and environmental inspections pre and post closure.</li> <li>Annual rehabilitation/compliance audit.</li> <li>Stakeholder engagement plan.</li> <li>Compliance management plan.</li> </ul>
	Groundwater hydrological processes and water quality are not adversely affected, resulting in adverse impact to groundwater uses.	<ul style="list-style-type: none"> <li>Groundwater management infrastructure not required post-closure are removed.</li> <li>Environmental monitoring results meet targets for the surrounding natural ecosystem</li> </ul>	<ul style="list-style-type: none"> <li>Annual rehabilitation/compliance audit.</li> <li>Water monitoring (in accordance with MMP).</li> </ul>
Mine and Support Infrastructure	Final TSF structures are safe, stable and non-polluting, minimise erosion, support vegetation, achieve maximum water shedding and limit infiltration.	<ul style="list-style-type: none"> <li>Extent of slumping, slipping or deflation on TSFs to remain at or below acceptable threshold over long-term.</li> </ul>	<ul style="list-style-type: none"> <li>Records of operational inspections and monitoring as per a TSF Management Plan.</li> <li>Final TSF closure report at cessation of operations.</li> </ul>

Closure Domain	Closure Outcome	Completion Criteria	Measurement Tools
		<ul style="list-style-type: none"> <li>Quality and rate of seepage of water from the TSF to remain at or below acceptable threshold over the long-term.</li> </ul>	<ul style="list-style-type: none"> <li>Geotechnical testing of tailings prior to capping and cover.</li> <li>Records of material characterisation, movement and disposal.</li> <li>Site inspection/audit by a suitably qualified and competent TSF consultant every two years during operations and rehabilitation and an engineering status report at completion of mining activities.</li> <li>Safety and environmental inspections pre- and post-closure.</li> <li>Annual rehabilitation/compliance audit.</li> <li>Monitoring of revegetated areas to ensure environmental targets are met.</li> <li>Closure management plan.</li> </ul>
	All process and supporting infrastructure (ROM, process plant, miscellaneous infrastructure areas) are removed, unless agreed to retain with key stakeholders.	<ul style="list-style-type: none"> <li>No unauthorised infrastructure remaining on site.</li> <li>Infrastructure has been decommissioned in accordance with legal obligations and commitments.</li> </ul>	<ul style="list-style-type: none"> <li>Safety and environmental inspections pre- and post-closure.</li> <li>Written acceptance of final condition / retained infrastructure from ALC (subsequent landholder).</li> <li>Annual rehabilitation/compliance audit.</li> <li>Closure management plan.</li> <li>Closure obligations register.</li> </ul>
	Waste and contamination is removed/remediated.	<ul style="list-style-type: none"> <li>Confirmed contaminated sites are managed in accordance with the Northern Territory Contaminated Land Guideline (2017).</li> <li>Contaminated material is removed, remediated or encapsulated and does not pose a long-term risk.</li> <li>Waste streams managed to prevent unmanaged waste remaining at closure.</li> </ul>	<ul style="list-style-type: none"> <li>Records of operation spill and clean-up.</li> <li>Contaminated site investigations and reports.</li> <li>Contaminated Site Assessment (if required based on records and site investigations).</li> <li>Preliminary Site Investigation (PSI) prior to planned closure.</li> <li>Annual rehabilitation/compliance audit.</li> </ul>
	Disturbed alignments and footprints are rehabilitated to a stable, resilient and	<ul style="list-style-type: none"> <li>Revegetated areas show evidence of successful revegetation.</li> </ul>	<ul style="list-style-type: none"> <li>Safety and environmental inspections pre- and post-closure.</li> </ul>

Closure Domain	Closure Outcome	Completion Criteria	Measurement Tools
	functioning landscape to reflect the PMLU.		<ul style="list-style-type: none"> <li>Annual rehabilitation/compliance audit to include landform stability, surface drainage, erosion control features.</li> <li>Stakeholder engagement register.</li> <li>Monitoring of revegetated areas to ensure environmental targets are met.</li> <li>Closure management plan.</li> </ul>
	Surface water, marine water and groundwater processes and water quality are not adversely affected by rehabilitated areas resulting in adverse impact to terrestrial and aquatic ecosystems and land uses.	<ul style="list-style-type: none"> <li>Surface water and groundwater management infrastructure not required post-closure are removed.</li> <li>Water quality generally reflects the background levels and is safe for ecosystems.</li> </ul>	<ul style="list-style-type: none"> <li>Annual rehabilitation/compliance audit.</li> <li>Water monitoring (in accordance with MMP).</li> </ul>
Linear Infrastructure	Haul and access roads are removed, unless agreed to retain with key stakeholders, contamination remediated and footprint rehabilitated to reflect the agreed PMLU.	<ul style="list-style-type: none"> <li>Haul roads and access tracks removed on and off tenements unless agreed to retain with key stakeholders.</li> <li>Revegetated areas show evidence of successful revegetation.</li> <li>Contaminated material is removed, remediated or encapsulated and does not pose a long-term risk.</li> </ul>	<ul style="list-style-type: none"> <li>Safety and environmental inspections pre- and post-closure.</li> <li>Written acceptance of final condition / retained infrastructure from ALC (subsequent landholder).</li> <li>Annual rehabilitation/compliance audit to include landform stability, surface drainage, erosion control features.</li> <li>Stakeholder engagement register.</li> <li>Monitoring of revegetated areas to ensure environmental targets are met.</li> <li>Closure management plan.</li> </ul>
Marine Areas	All infrastructure is removed, unless agreed to retain with key stakeholders.	<ul style="list-style-type: none"> <li>No unauthorised infrastructure remaining on site (the rock wharf is excluded as this will remain as per agreement with Traditional Owners).</li> <li>Infrastructure has been decommissioned in accordance with legal obligations and commitments</li> </ul>	<ul style="list-style-type: none"> <li>Safety and environmental inspections pre- and post-closure.</li> <li>Written acceptance of final condition / retained infrastructure from ALC (subsequent landholder).</li> <li>Annual rehabilitation/compliance audit.</li> <li>Closure management plan.</li> <li>Closure obligations register.</li> </ul>

Closure Domain	Closure Outcome	Completion Criteria	Measurement Tools
	Surrounding marine environment is not adversely affected by removing or rehabilitating areas surrounding wharf, resulting in adverse impact to the marine ecosystem.	<ul style="list-style-type: none"> <li>▪ Water quality generally reflects the background levels and is safe for marine ecosystems.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Water monitoring (in accordance with MMP).</li> <li>▪ Annual rehabilitation/compliance audit.</li> <li>▪ Closure management plan.</li> <li>▪ Closure obligations register.</li> </ul>





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DATA SOURCE  
Eotl, Maxar, Geosyde, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.  
Northern Territory Government 2023  
Winchelsea Mining Pty Ltd.

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Figure 5.1-1

**Expected Mine Voids and Infrastructure at Closure**

DRG Ref: FIG8-1\_MineRehab



## 5.1.4 Closure Plans

### 5.1.4.1 Planned Closure

During the operational phase of mine, closure activities will generally involve stockpiling of topsoil, construction of compliant infrastructure, removal and treatment of contaminated soil, waste management, erosion control and monitoring of the surrounding environment. Rehabilitation will be undertaken progressively through the LOM. Closure planning will be refined throughout the LOM as the Project develops and new information becomes available.

At closure, the planned strategy involves the following components:

- Infrastructure decommissioning and removal unless authorised agreements in place with third parties to retain infrastructure;
- Remediation of contaminated sites;
- Closure of any other features on site including TSF, water dams, etc;
- Research and trials throughout LOM;
- Progressive rehabilitation throughout LOM;
- Closing knowledge gaps throughout LOM; and
- Post-closure monitoring.

Detailed closure work programs for each domain have been drafted in the MRCP (Appendix H). These include specific closure tasks, rehabilitation activities, research and trials, monitoring and maintenance tasks, and proposed work schedules. Closure plans may change with amendments to completion criteria throughout the LOM. Closure work activities that are common to all domains are listed below:

- Remove all domestic rubbish that cannot be recycled to landfill (located on Groote Eylandt). All hazardous wastes to be removed from site by licenced waste contractor and to an approved waste management/recycling facility. Contaminated sites will be remediated;
- Revegetation and seeding with local native provenance species to reflect the surrounding vegetation and topography;
- Display clear and visible signage that the site is under rehabilitation and no unauthorised access is permitted;
- Reinstatement of surface drainage patterns consistent with the regional drainage patterns;
- Install erosion and sediment controls where erosion is evident or likely to occur (in accordance with the ESCP);
- Continue with progressive rehabilitation throughout the LOM to inform final closure design;
- Land m56
- Management and remediation;
- Implementation of the post-closure monitoring plan (landscape/vegetation monitoring, water monitoring, geotechnical stability of landforms, etc);
- Key stakeholder engagement;
- Public safety assessment; and

- Annual reporting of closure activities and monitoring in the MMP.

#### 5.1.4.2 Unplanned or Unexpected Closure

In the event of unexpected closure that leads to permanent closure of the Project, the following broad steps will be taken:

- The site will be made safe as follows:
  - Open pit areas will be backfilled, where possible, as planned.
  - Overburden material will be utilised to backfill the open pit areas.
  - Toe-bunds will be installed around the perimeter of all stockpiles (if not already constructed), to contain any sediment generation within the disturbance envelope.
- A care and maintenance plan will be developed;
- A final version of the MRCP will be developed and once approved by DITT will be implemented; and
- Closure monitoring will commence as soon as practicable with a maximum lag time of twelve months to commence monitoring.

#### 5.1.4.3 Suspended Operations

If closure conditions are temporary, the following broad steps will be implemented:

- The site will be made safe by installing temporary safety features including gates, signage, safety bunds and/or other safety devices as required;
- A caretaker will be appointed and a care and maintenance plan will be developed;
- All monitoring will be undertaken as per operational requirements;
- All plant will be shut in and any mobile plant or equipment will either be stored and immobilised or removed from site; and
- Where closure is greater than twelve months all dangerous goods and hazardous materials will be removed from site and all waste facilities will be moved into a state of closure to prevent waste dispersal.

## 5.2 Rehabilitation Planning

Mine rehabilitation for the Project site will occur progressively with mining activities to limit the total disturbed mining area at any time. Emphasis will be placed on early rehabilitation of surface features to minimise the visual impact of the Project on its surroundings. The mining operation is relatively compact when compared with other surface mines of similar capacity, resulting in a much-reduced environmental footprint.

Topsoil will be stripped and stockpiled for future rehabilitation and kept separate from overburden materials. To avoid long-term stockpiling, where possible topsoil stripped for mining will be placed directly onto rehabilitation areas. The optimum timing for replacement of topsoil is prior to the commencement of the wet season (approximately early to mid-December). A proposed closure and rehabilitation schedule, developed for the MRCP (Appendix H), is presented in Table 5.3-1. Final landform profiles will be shaped and seeded where necessary to minimise erosion and surface water

runoff. Where possible, landforms will be shaped to be like the pre-mining landform. The ex-pit TSF will be rehabilitated at the end of Year 6 and the in-pit TSF at the end of the mine life. Any necessary weed control will also be undertaken. Further work is being undertaken to validate economic opportunities for re-purposing the remaining three mine voids in the NEZ 1, 2 and 3 extraction area.

Generally, rehabilitation activities will consist of:

- Contouring the final landforms to allow for surface water drainage and installation of erosion controls where necessary;
- Spreading topsoil directly onto rehabilitation areas and keeping topsoil separate from overburden material. Where immediate spreading is not possible, topsoil will be stockpiled for later use. Topsoil will be managed in accordance with a Clearing and Topsoil Procedure;
- Ripping the final landforms following topsoil spreading to minimise compaction, promote plant growth through root, water and nutrient penetration, reduce the risk of erosion, and prevent surface water runoff and seed loss;
- Revegetation following topsoil ripping using local, provenance species and densities of species based on distributions across Winchelsea Island. Seeds will be sourced from within the mineral lease where possible and stored effectively to ensure seeds remain viable. Seeding methods are still to be decided upon, however seeding should be undertaken at the start of the wet season (December/January) to promote germination; and
- Undertaking any necessary weed control.

Further details of rehabilitation activities and the timing of these activities for each closure domain is available in the MRCP (Appendix H). Figure 5.3-1 presents the progressive rehabilitation program split into four phases.

### 5.2.1 Research, Investigation and Trials

Rehabilitation trials will be undertaken during the LOM to form an understanding of the potential rehabilitation success of activities at closure. During these trials, the species to be used during rehabilitation will be selected and seeds collected. The results of rehabilitation trials will also be used to refine completion criteria and inform final closure designs.

Trials currently identified in the MRCP (Appendix H) to improve the rehabilitation knowledge base include vegetation trials and growth media trials. These will consist of soil characterisation studies of topsoil and other growth media and optimum seed planting mixes for local soil and climatic conditions to understand vegetation recruitment on disturbed surfaces and post-closure landforms.

## 5.3 Monitoring and Maintenance

Monitoring will be undertaken to assess and demonstrate progress towards mine rehabilitation, meeting the closure objectives and completion criteria. Monitoring allows a proponent to assess whether completion criteria have been fulfilled or are likely to be fulfilled and will be targeted towards those closure issues that relate directly to the agreed completion criteria. Where closure monitoring shows that completion criteria are unlikely to be met, corrective actions will be identified and implemented, outcomes and targets re-evaluated and any updates to the program will be incorporated into any subsequent iterations of the MRCP.

In general, closure and post-closure monitoring will include:

- Rehabilitation monitoring and rehabilitation compliance audit – confirm that rehabilitated areas are likely to become comparable to similar areas that have not been disturbed by mining and that rehabilitation is in line with legal obligations and closure designs. Audits to be conducted annually, monitoring to be conducted quarterly post-closure;

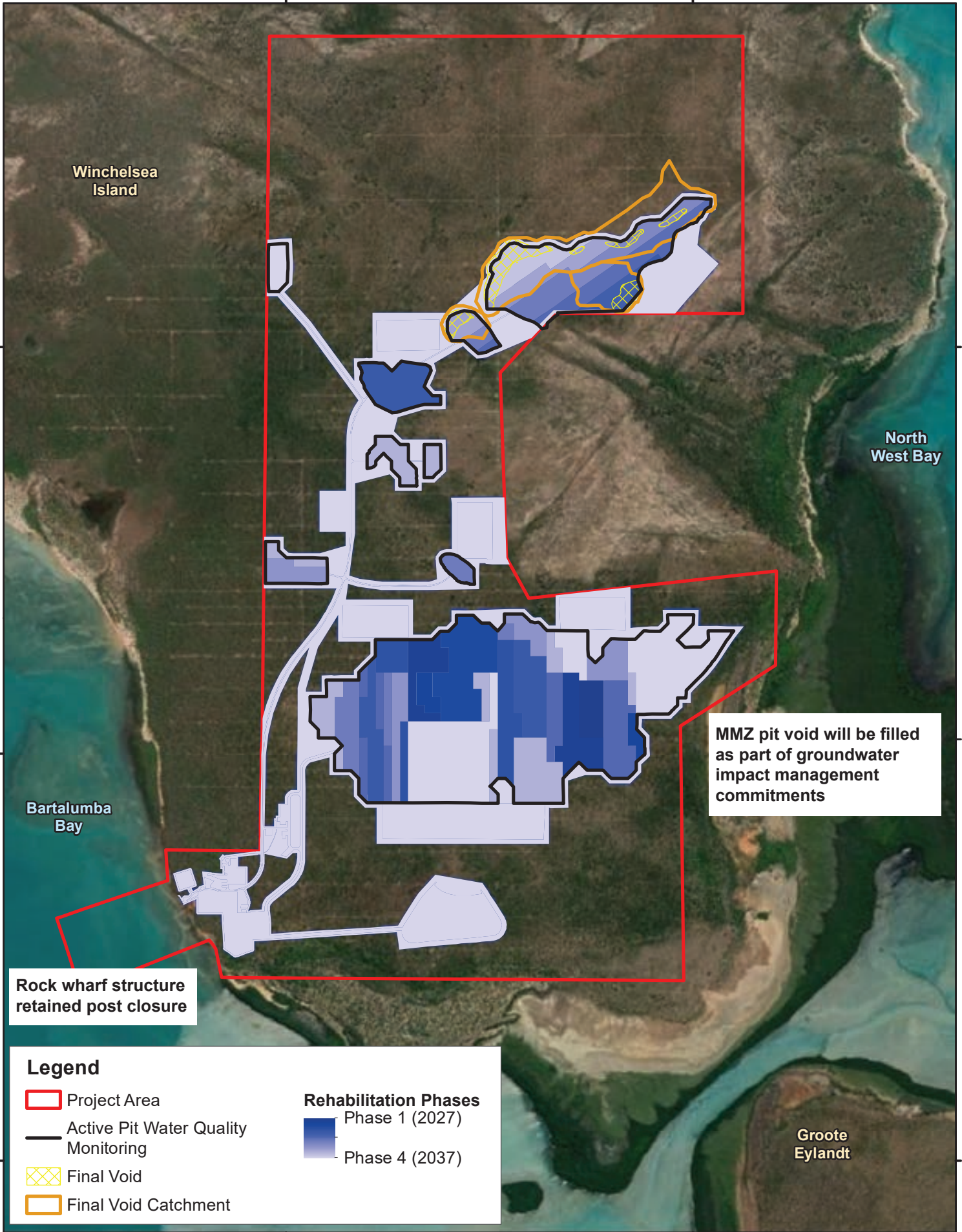
- Landform monitoring and landform construction audit – confirm that final landforms and soils are structurally safe, stable, non-polluting, erosion resistant and have been rehabilitated in accordance with approved design parameters. Audits to be conducted annually, monitoring to be conducted quarterly post-closure;
- Geotechnical audit – confirm earthworks have been completed as per designs and there is no significant subsidence or slumping. Confirm there is no significant erosion occurring. Audits to be conducted biannually; and
- Water monitoring – surface and groundwater monitoring to confirm that water quality is in alignment with agreed guideline values. Monitoring to be conducted monthly during the wet season and quarterly during the dry season. Water monitoring will be conducted throughout operations, decommissioning, closure and post-closure.

The need for maintenance will be identified during routine inspections and other monitoring occurring during the closure and post-closure phases. Where additional work is required, it will be scheduled and conducted in a timely manner and in accordance with management plans. Maintenance programs that may be required include (but are not limited to) landform remediation, drainage system maintenance, erosion control activities, road maintenance activities, weed management and supplementary seeding. Further details of monitoring and maintenance activities are provided in the MRCP (Appendix H).

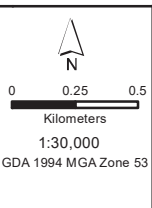
**Table 5.3-1 Preliminary Closure and Rehabilitation Schedule**

Mining Schedule	Operations										Decommissioning/Closure/Post-Closure									
	10 Years										10 Years									
	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
<b>All Domains</b>																				
Closure Work Tasks																				
Research, Investigation and Trials																				
Progressive Rehabilitation																				
Final Closure Rehabilitation																				
Infrastructure Decommissioning and Removal																				
Remediate Contaminated Areas (if required)																				
Availability of Closure Materials Resources																				
Confirm Final Landholder (ALC) and Stakeholder Closure Uses																				
Performance Monitoring and Maintenance Tasks																				





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**DATA SOURCE**  
Esri, Maxar, Geoeye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Northern Territory Government 2023, Winchelsea Mining Pty Ltd.



Figure 5.3-1  
**Progressive Mine Rehabilitation Phase 1 to 4: 2024 - 2037**  
DRG Ref: FIG9\_X\_Prog\_Rehab\_All

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